DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
FORT NORFOLK, 803 FRONT STREET
NORFOLK, VIRGINIA 23510-1096

REPLY TO
ATTENTION OF:

CENAO-TS-RA (405-80a) 30 March 2005

MEMORANDUM FOR Commander, HQUSACE, Attn: CEMP-NAD (Silver), 441 G Street, N.W., Washington, D. C. 203147-1000

SUBJECT: Transfer of 27.5 acres known as the Camp Pendleton, National Guard Target Range, Virginia Beach, Virginia

1. Per a request from the Navy by way of a letter dated January 21, 2005, attached as Exhibit 'A", this office is requesting approval to transfer 27.5 acres of land back to the Navy for acceptance and accountability.

2. The Navy has indicated the parcel is needed as a buffer and for sensitive Navy Training.

3. This transfer is being made in accordance with ER 405-1-2, paragraph 11-92 as authorized under 10 U. S. C. 2571(a) and it is being made without reimbursement.

4. This parcel was originally acquired by the United States of America in fee for use by the Navy.

5. The transfer to the Army from the Navy of these 27.5 acres of unimproved land was made by way of a letter and DD 1354, Transfer and Acceptance of Military Real Property form that was dated 15 November 1977, as shown in Exhibit "B". In that transfer, an Aviation Easement and restrictive rights were reserved to fly aircraft fifty feet above the parcel. The easement also prohibited erection or construction above fifty feet from ground level; the right to prohibit schools, housing and other structures to be used for human habitation; and the right to impose noise occasioned by ordnance explosions, firing of weapons, movement of vehicles and low flying aircraft. The Navy also reserved the right to use the site for training after coordination with the Norfolk District.

6. The site is unimproved with no utilities. The Navy has funded the Army's Administrative Fee for this transfer and paid for the environmental documentation.

7. Both the Army and the Navy have granted License Agreements that have continually allowed the 27.5 acre site to be used by the Virginia Army National Guard for training purposes. The current License effective 15 November 1992, was written for 25 years as shown in Exhibit "C".

8. The property has been used for Virginia Army National Guard Purposes since 1945 and is subject to an existing License that the Navy has agreed to honor. The National Guard has also agreed to the transfer, as noted in the attached letter identified as Exhibit "D". The National Guard has requested that the Navy grant them an easement for the use of Rifle Range Road. The Navy has stated they have control over the land under Rifle Range Road and the National Guard will have ingress/egress rights as requested. Exhibit "E".

9. Both Army and Navy appraisers have agreed that the value of the 27.5 acre parcel is between $415,000 and $550,000 as shown in Exhibit "F". This value is under the Congressional Reporting threshold of $750,000 as outlined in Title 10 USC 2662. At the time the property was transferred to the Army, the value was indicated to be $27,600.00.

10. The property was nominated to be included on the National Historical Register in 2005, and this nomination was coordinated with both the Navy and the Virginia Army National Guard.

11. A Record of Environmental Consideration (REC) and Preliminary Assessment Screening (PAS) have been prepared and a copy is attached to the Report of Excess. It has been determined that "No Significant Environmental Effects are anticipated due to this transfer".

12. An Environmental Baseline Study (EBS) (ENCL 1) and Finding of Suitability to Transfer (FOST) (ENCL 2) have been prepared and it has been determined that the transfer poses no current or future risk to health or the environment. A copy of the FOST is attached for signature of the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) as requested by the Navy.

13. The transfer will be effective as of the date the Letter of Transfer (ENCL 3) is signed by the Secretary of the Navy. The Navy has requested an effective transfer date of no later than May 1, 2006.

14. Attached are a Letter of Transfer and a draft DD 1354 (ENCL 4) for the Camp Pendleton, National Guard Target Range Site, Virginia Beach, Virginia. Please forward the Letter of Transfer for signature by DASA (I&H) and have them forward the same to the Secretary of the Navy for acceptance. The fully executed Letter of Transfer and this package should be returned to this office through normal channels for signing of the 1354 and completion of the transfer to the Navy by the local Corps and Navy real property offices.

15. It is the District's recommendation that this transfer be approved and the Letter of Transfer be forwarded to DASA (I&H) for signature.

16. The local Navy office has asked that they be notified when this package is ready to be forwarded from HQUSACE to DASA so that their approval package can be released from their HQ to go to the Secretary of the Navy for approval at the same time. Points of contact for the local Navy Office are Sherri De Martino at (757) 322-4924 or Matt Kurtz at (757) 444-3346, ext. 341.

17. Should you have any questions, please contact David B. Parson at (757) 201-7736.

Encls

DILLARD H. HORTON
Chief, Real Estate Branch

EXHIBITS

ENCLOSURE

DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION, MID-ATLANTIC
1510 GILBERT ST.
NORFOLK, VA 23511-2737

IN REPLY REFER TO:
4700
Code 00
21 JAN 2005

Colonel Prettyman-Beck
U.S. Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Colonel Prettyman-Beck:

We appreciate the time you and your staff gave us on January 5, 2005 to discuss our dredging requirements and Camp Pendleton real estate concerns.

As we discussed, we are developing a potential military construction project to deepen the existing channel adjacent to the Deperming Station as well as the approach into Norfolk Naval Shipyard (NAVSHPYD). To address Navy aircraft carrier requirements, it is ideal to maintain a 47-foot deep channel to NAVSHPYD and a 50-foot deep channel to the Deperming Station. Planning efforts are underway and we intend to develop the project documentation as a potential FY08 Navy program project. We will keep your staff engaged as circumstances warrant and are prepared to reimburse the Corps as necessary.

The second initiative concerns 27.5 acres of undeveloped land, under custody and control of the Army, commonly known as the Rifle Range at Camp Pendleton that is adjacent to the northern Navy boundary of Naval Air Station (NAS) Oceana, Dam Neck Annex. Since the Navy transfer of this property to the Army many years ago, changes in operational and training technology, along with local community growth and development have made it apparent that appropriate steps must be taken to ensure that this area will continue to serve as a buffer and allow for continued sensitive Navy training. Currently, the National Guard operations do not pose an operational conflict; however, the Navy desires to seek a greater level of involvement in the day-to-day administration of the property. We are interested in jointly exploring the options, which could include returning the property to Navy custody and control if the Army determines the property is or will be excess to their needs in order to protect the Navy mission. At this time, a transfer is only conceptual in nature, as this type of action would require Army and Navy Secretariat involvement/approval and Congressional reporting in accordance with Title 10 United State Code 2662.

For both of these projects, we propose to convene teams of experts to identify the scope of work and implementation plans. Thank you for being available to assist us. My point of contact is Mr. David S. Brown at (757) 322-2873 or email: david.s.brown@navy.mil.

Sincerely,

G. E. EICHERT
Commanding Officer
CAPT, CEC, U.S. Navy
By direction of the Commander

EXHIBIT "A"

CAMP PENDLETON

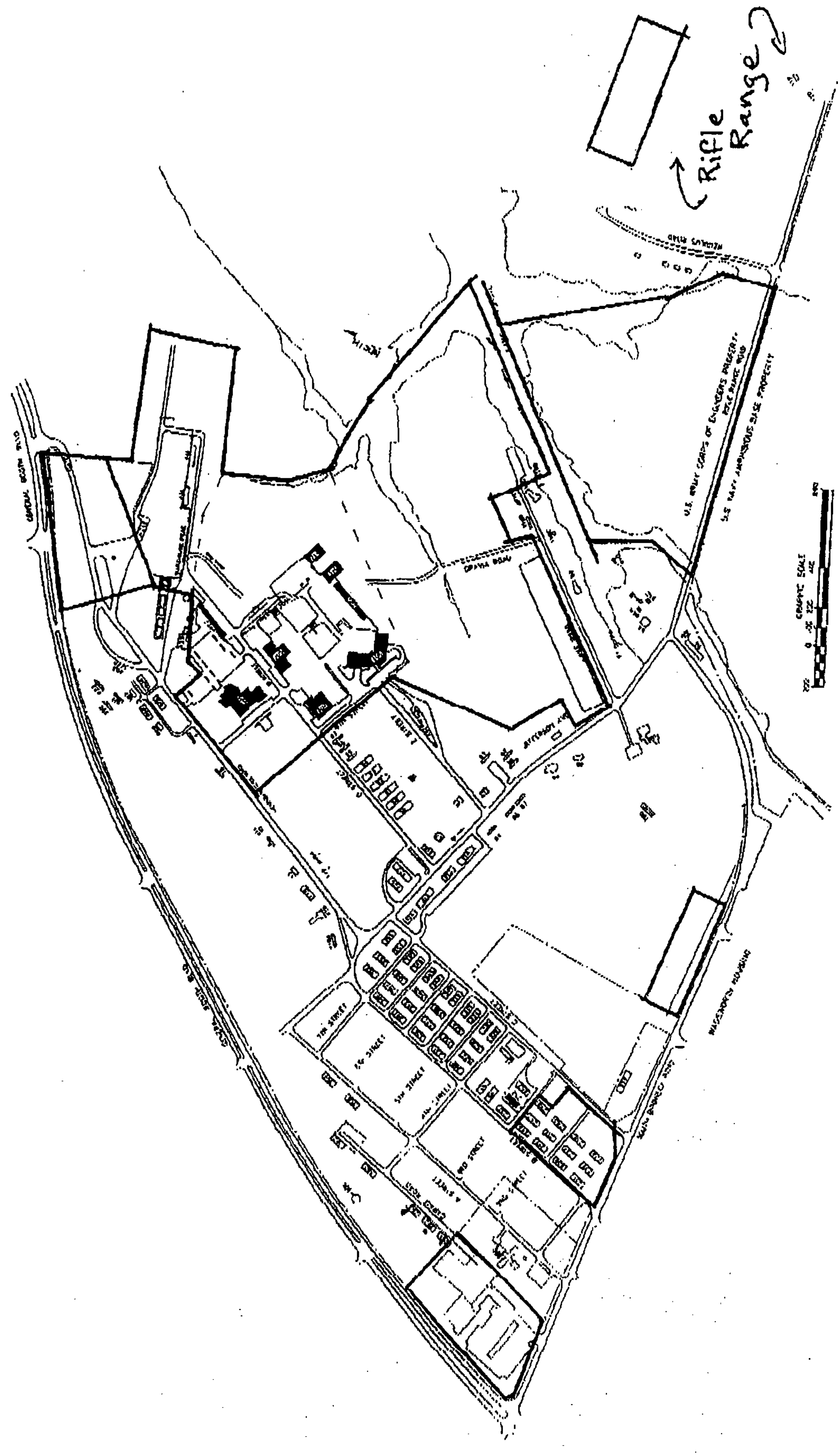


EXHIBIT "A"

TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

1. FROM: (Installation/Activity/Service)
Commander, Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511

2. OPERATING UNIT	3. DISTRICT CODE	4. OPERATING AGENCY	5. DATE	6. JOB NUMBER	7. SERIAL NUMBER	8. CONTRACT NUMBER
62470	05	25		N/A	N/A	N/A

9. TO: (Installation/Activity/Service)
District Engineer
Norfolk District
U.S. Army Corps of Engineers
Norfolk, Virginia 23510

10. OPERATING UNIT	11. DISTRICT CODE	12. OPERATING AGENCY	13. ACCOUNTING NUMBER	14. ACCOUNTABLE OFFICE NUMBER	16. PROJECT NUMBER

15. TYPE OF TRANSACTION
A: ☐ NEW CONSTR. ☒ EXISTING FAC. ☐ CAPITAL IMP. ☐ OTHER (Specify)
B: ☐ BENF/O ☐ PHYSICAL COM. ☐ FINAN. COM. ☒ OTHER (Specify) (Transfer)

ITEM NO. 17	CATEGORY CODE 18	FACILITY (Category description) 19	NO. OF UNITS 20	TYPE 21	UNIT OF MEAS. 22	TOTAL QUANTITY 23	COST 24	DRAWING NUMBERS 25	REMARKS 26
		CLASS I							
1	911-40	Land/Acq. Condemnation			AC	27.5	$26,600.00		

Transfer of 27.5 acres of unimproved land, U.S. Naval Amphibious Base, Little Creek, South Virginia Beach, Virginia

27. STATEMENT OF COMPLETION: The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side.

TRANSFERRED BY (Signature) C.R. Oscar

DATE 8 OCT 1977

TITLE (Area Engr./Base Engr./DPWO) Vice Commander

28. ACCEPTED BY (Signature) [signature]

DATE 15 Nov 77

TITLE (Post Engr./Base Civ. Engr./Navy Rep.)
WILLIAM C. FIELDEN, LTC, NGB
USPFO for Virginia

29. PROPERTY VOUCHER NUMBER 1-78

DD FORM 1 NOV 61 1354

SUPERSEDES ENG FORMS 290 AND 290B AND NAVDOCKS FORM 2317.

S/N 0102-013-4000

PLATE NO. [illegible]

EXHIBIT "D"

30. RESERVED RIGHTS

This transfer of 27.5 acres of land is subject to the following provisions and restrictions:

a. At such time as the property may be outleased, out licensed, transferred reported excess, or otherwise disposed of or out permitted by the Department of the Army, said authorized use or disposal will be subject to the following easement:

DESCRIPTION OF AVIGATION EASEMENT AND
RESTRICTIVE RIGHTS

An easement defined as the right to fly any aircraft, including helicopters, over the property at an elevation above fifty feet; the right to prohibit the erection or construction of any facility extending above fifty feet from ground level; the right to prohibit the erection of any school, housing or other structures to be used for human habitation and the right of imposition of noise occasioned by ordance explosions, firing of weapons, movement of vehicular equipment and low aircraft/helicopter over-flights.

b. It is understood and agreed that at such times as may be dictated by its requirements, and as may be compatible with other uses of the property, the Department of the Navy will be permitted to make occasional use of the property for training purposes. Provided, however, such Navy use is fully coordinated with the District Engineer, Norfolk District, U. S. Army Corps of Engineers or such persons or parties as may be designated by the District Engineers.

31. REMARKS

INSTRUCTIONS

This form has been designed and issued for use in connection with the transfer of military real property between the military departments and to or from other government agencies. It supersedes ENG Forms 290 and 290B *(formerly used by the Army and Air Force)* and NAVDOCKS Form 2317 *(formerly used by the Navy)*.

Existing instructions issued by the military departments relative to the preparation of the three superseded forms are applicable to this form to the extent that the various items and columns on the superseded forms have been retained. Additional instructions, as appropriate, will be promulgated by the military departments in connection with any new items appearing hereon.

With the issuance of this DD form, it is not intended that the departments shall revise and reprint manuals and directives simply to show the number of this DD form. Such action can be accomplished through the normal course of revision for other reasons.

PLAT. 0. 21971(2)

EXHIBIT "B"

NARRATIVE DESCRIPTION OF 27.5 ACRES

BEGINNING at a point of intersection of the center line of Virginia State Secondary Route No. 633, also known as Prosperity Road, with the center line of South Birdneck Road, formerly known as Beach Road; thence, along the center line of South Birdneck Road S 87° 29' E 1169.32 feet, more or less, to a point, which said point forms the point of intersection of the boundary line between lands of the Commonwealth of Virginia, known as Camp Pendleton, and lands of the United States of America under the cognizance of the Department of the Navy and identified as the Camp Pendleton Family Housing Area; thence leaving the center line of South Birdneck Road and proceeding northeasterly along said boundary line N 49° 38' E 1249.72 feet; thence, N 29° 20' E 82.8 feet to a point identified as the TRUE POINT OF BEGINNING; thence, the following ten (10) courses and distances; N 29° 20' E 170.7 feet; N 26° 38' W 387.8 feet; N 42° 15' E 772.3 feet; N 47° 09' E 515.7 feet; S 26° 49' E 444.6 feet; S 06° 10' W 231.0 feet; S 37° 34' E 445.6 feet; S 56° 02' E 205.8 feet; S 15° 48' W 223.1 feet; S 85° 25' W 1369.3 feet to the true point of beginning and containing some 27.5 acres of land, more or less, and being as identified on Department of the Navy, NAVFAC Drawing No. 980411, dated 23 September 1963, last revised 12 March 1975, and entitled "Naval Amphibious Base, Norfolk, Virginia, Real Estate Summary Map, South Virginia Beach", as Target Range License to Commonwealth of Virginia NOy(R)-67708 - 1 January 1965, 27.5 acres.

EXHIBIT "B"

DEPARTMENT OF THE ARMY
LICENSE FOR NATIONAL GUARD PURPOSES

The SECRETARY OF THE ARMY hereby grants to the ~~State~~ Commonwealth *of* Virginia, *hereinafter referred to as the licensee, a license for a period of* twenty-five (25) *years, commencing on* 15 November 1992, and ending on 14 November 2017, *but revocable at the will of the Secretary of the Army, to use and occupy for year-round training and support of the* Virginia Army *National Guard, certain land and improvements comprising a portion of the* military maneuvers area, known as the TRAINING SITE CAMP PENDLETON *MILITARY RESERVATION,* Virginia Beach, Virginia *, located substantially as shown in red on Exhibit "A," attached hereto and made a part hereof, and more particularly described as follows:*

Shown on Exhibit "B" attached hereto and made a part hereof.

THIS LICENSE is granted subject to the following provisions and conditions:

1. That the use and occupancy herein authorized shall be without cost or expense to the Regular Establishment of the Military Departments of the Department of Defense and shall be under the general supervision and subject to the approval of the Secretary of the Army or his duly authorized representative and subject also to such rules and regulations as he may from time to time prescribe.

2. That the licensee shall maintain and keep in good repair and condition the premises herein authorized to be used, and all costs of operations, maintenance, and restoration occasioned by reason of the occupancy of the premises by the licensee shall be paid for from funds available to the licensee, or from funds other than those appropriated for the Regular Establishment of the said Departments.

3. That the United States (hereinafter referred to as the Government) reserves the right to use the property included in this license, or any part thereof, including all buildings and improvements situated thereon, for such purposes as the Department of the Army deems necessary in the interest of national defense.

~~*4. That the Government will not be responsible for any injury to persons or damage to*~~ *property arising out of or incident to the use or occupancy of the licensed property by the licensee, howsoever such injury or damage may be caused, and the licensee shall indemnify and save the Government harmless from any and all claims for any such injury or damage, excepting claims for injury or damage arising from activities of the Government on the said property which are being conducted exclusively for the benefit of the Government. Nothing contained in this condition shall be construed to be in derogation of the rights and remedies afforded aggrieved parties by Federal statute. It is understood that the obligations imposed on the licensee by this condition are limited to those not prohibited from being assumed by the laws of* ~~*the State*~~.

~~*5. That the licensee shall pay the cost, as determined by the duly authorized representa-*~~ *tive of the Secretary of the Army, of producing and/or supplying any utilities and other services furnished by the Government or through Government-owned facilities for the use of the licensee, including the licensee's proportionate share of the cost of operation and maintenance* ~~*of the Government-owned facilities by which such utilities or services are produced or sup-*~~

EXHIBIT "C"

~~*plied. Payment shall be mad the manner prescribed by said represe ive upon bills rendered monthly. The Government shall be under no obligation to furnish utilities or services.*~~

6. That no addition to or alteration or improvement of the premises shall be made without prior written authorization from the Secretary of the Army or his duly authorized representative. All additions, alterations, and improvements so authorized shall be maintained by the licensee in good repair and condition. Permanent additions, alterations and improvements (which shall be so designated by the Secretary of the Army or his duly authorized representative) shall, upon completion, become and remain the property of the Government.

7. That the facilities included in this license shall not be used for the quartering of personnel engaged in Virginia Army *National Guard activities except when such personnel are in the Federal service or participating in authorized training .*

~~*8. That as of the date of commencement of this license a joint survey of the property*~~ *included thereunder, indicating the exact condition thereof, shall be made ~~by the duly~~ authorized representative of the Secretary of the Army (or a representative designated by him) and by a representative of the Adjutant General, State of* Commonwealth Virginia *. A written report of said survey ~~shall~~ be attached hereto as Exhibit "~~B~~" "C" and become a part hereof as fully ~~as if~~ originally incorporated herein. A like survey and report shall be made* ~~*upon termination of this license.*~~

DELETED

9. That this license may be relinquished by the licensee upon giving thirty (30) days' notice in writing to the Secretary of the Army through his duly authorized representative.

10. That, on or before the expiration of this license or its relinquishment by the licensee, the licensee shall vacate the premises, remove all property of the licensee therefrom (excluding those permanent additions, alterations, and improvements which under the provisions of Condition 6 hereof have become the property of the Government), and restore the premises to as good condition as that existing upon the date of commencement of the term of this license, damages beyond the control of the licensee and due to fair wear and tear excepted. If, however, this license is revoked, the licensee shall vacate the premises, remove said property therefrom, and restore the premises as aforesaid within such time as the Secretary of the Army may designate. In either event, if the licensee shall fail or neglect to remove said property and so restore the premises, then at the option of the Secretary of the Army said property shall either become the property of the Government without compensation therefor, or the Secretary of the Army may cause the property to be removed and the premises to be so restored at the expense of the licensee, and no claim for damages against the Government or its officers or agents shall be created by or made on account of such removal and restoration.

Should the Government revoke this license, the licensee shall have at least thirty (30) days from date of written revocation to remove all property therefrom and restore premises.

11. That the licensee shall abide by all present and future environmental laws and regulations with regards to their use of the premises and furthermore, the licensee shall comply with the findings of Environmental Assessment Report dated May 6, 1992, prepared in conjunction with the proposed use by:

a. Implementation of erosion and sedimentation control measures to slow the eutrophication process of Lake Christine, and the licensee shall plant or maintain the existing vegetation buffer to filter run-off before it reaches Lake Christine, prior to the start of any projects comtemplated by the licensee's master plan, or any other projects contemplated during the term of the license.

b. Implementation of other actions required to protect the environment, historical, and natural attributes of this property as directed by the said officer to remedy violations of statutes and regulations (including regulations lawfully established by the said officer) by the licensee. The said officer is hereinafter designated as the Commander, Norfolk District Corps of Engineers.

12. That the licensee may mutually agree with the Department of Defense elements for the temporary or intermittent use of the premises by such elements for joint or individual training purposes provided such uses do not interfere with National Guard use, and upon concurrence of the Director, Army National Guard, National Guard Bureau.

13. That the licensee may, upon the concurrence of the Director, Army National Guard, National Guard Bureau, issue licenses to non-profit community service type activities under the same conditions as permitted to Active service type activities by Army Installation Commanders under existing Army regulations.

14. That upon the termination of the National Guard mission, the Guard shall remain responsible to protect and maintain the facility until transferred to, and acceptance by another accountability officer is accomplished, or in accordance with applicable laws, rules, and regulations.

15. That the use of the property is permitted subject to the following avigation and other restrictive rights reserved by the Department of the Navy in the property transfer.

a. The right to fly any aircraft, including helicopters over the property at an elevation above fifty feet; the right to prohibit the erection or construction of any facility extending above fifty feet from ground level; the right to prohibit the erection of any school, housing, or other structures to be used for human habitat, and the right of imposition of noise occasioned by ordnance explosions, firing of weapons, movement of vehicular equipment and low aircraft/helicopter over-flights.

b. It is understood and agreed that at such times as may be dictated by its requirements, and may be compatible with other uses of the property, the Department of the Navy will be permitted to make occasional use of the property for training purposes provided, however, such Navy use is fully coordinated with the Commander, Norfolk District, Corps of Engineers, or such persons or parties as may be designated by the Commander.

16. That accountability for the property comprising the licensed facility is accepted by the United States Property and Fiscal Officer for the Commonwealth of Virginia.

17. That the United States will not be responsible for damages to the property of the licensee, except as permitted under 28 U.S.C. 2671, et seq.

18. That for purposes of continuity, it is hereby agreed that this license supersedes Department of the Army License No. DACA65-3-88-06.

Prior to execution of this license, Condition No. 10 was amended, Condition Nos. 11, 12, 13, 14, 15, 16, 17, and 18 were added, and Condition Nos. 4, 5, and 8 were deleted.

This transaction is not subject to Title 10, United States Code, Section 2662.

IN WITNESS WHEREOF, I have hereunto set my hand this 14th *day of* June *19*94 *, by authority of the Secretary of the Army.*

Robert P. Turner

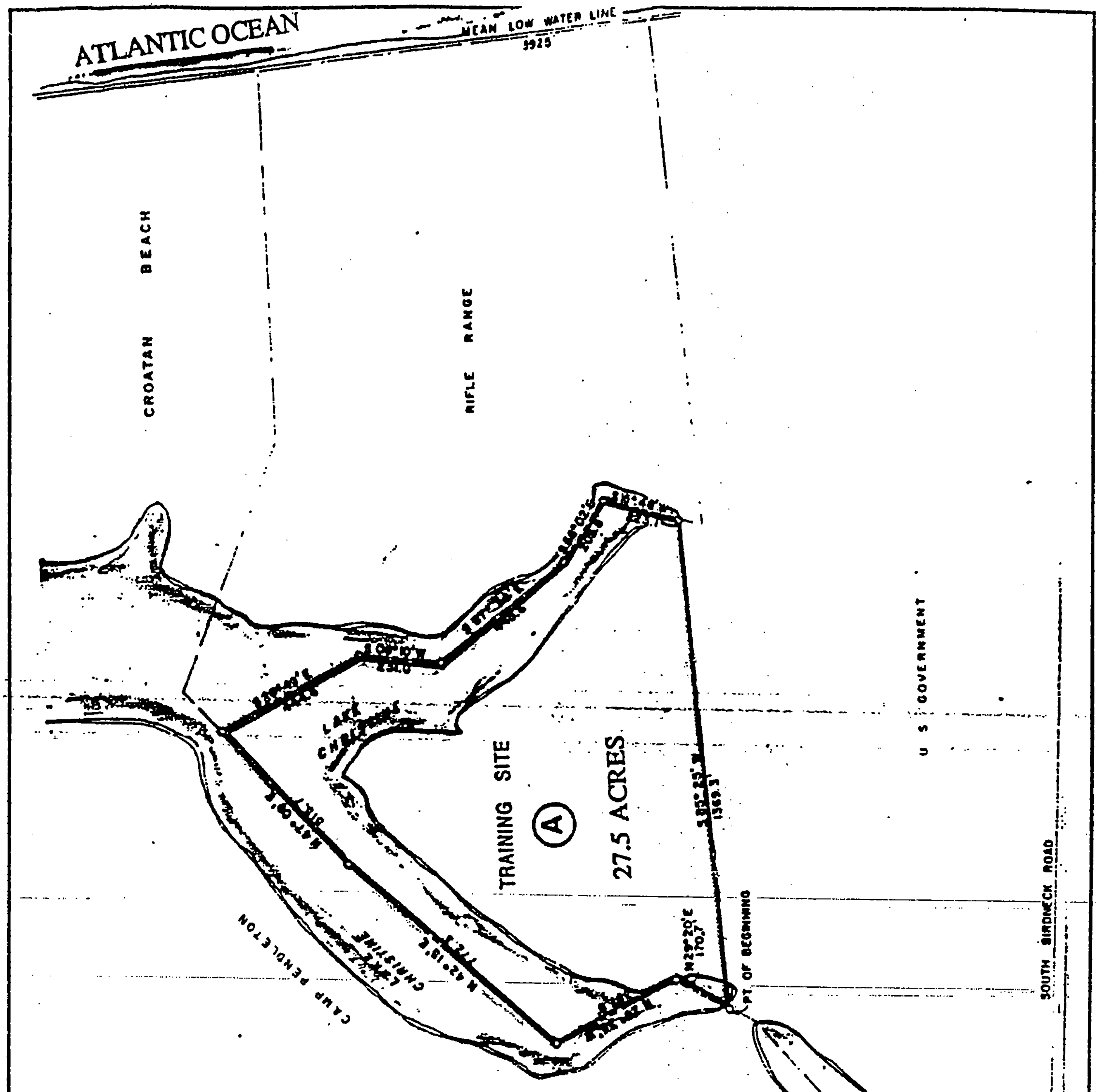
ROBERT P. TURNER
Chief, Real Estate Division

The above license, including all the provisions and conditions thereof, is hereby accepted this day of 19 .

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

BY: John W. Castles

TITLE: The Adjutant General



CORPS OF ENGINEERS, U. S. ARMY
NORTH ATLANTIC DIVISION, NORFOLK DISTRICT
NORFOLK, VIRGINIA

REAL ESTATE
DEPARTMENT OF THE ARMY LICENSE
ISSUED TO
VIRGINIA ARMY NATIONAL GUARD
FOR USE OF
TRAINING SITE-CAMP PENDLETON,VIRGINIA

DRAWN BY: D.B.P.	DATE: 11/3/92	DWG. NO. N/A
CHKD BY:	SCALE: NONE	SHEET 1 OF 1

DATE	BY	REVISION

NAO FM 984-E

EXHIBIT "A"

DACA65-3-93-11
VA Army National Guard
Training Site
Camp Pendleton, Virginia

DESCRIPTION

BEGINNING at a point of intersection of the center line of Virginia State Secondary Route No. 633, also known as Prosperity Road, with the center line of South Birdneck Road, formerly known as Beach Road; thence along the center line of South Birdneck Road S 87° 29' E 1169.32 feet, more or less, to a point, which said point forms the point of intersection of the boundary line between lands of the Commonwealth of Virginia, known as Camp Pendleton, and lands of the United States of America under the cognizance of the Department of the Navy and identified as the Camp Pendleton Family Housing area; thence leaving the center line of South Birdneck Road and proceeding northeasterly along said boundary line N 49° 38' E 1249.72 feet; thence, N 29° 20' E 82.8 feet to a point identified as the True Point of Beginning; thence, the following ten (10) courses and distances; N 29° 20' E 170.7 feet; N 26° 38' W 387.8 feet; N 42° 15' E 772.3 feet; N 47° 09' E 515.7 feet; S 26° 49' E 444.6 feet; S 06° 10' W 231.0 feet; S 37° 34' E 445.6 feet; S 56° 02' E 205.8 feet; S 15° 48' W 223.1 feet; S 85° 25' W 1369.3 feet to the true point of beginning and containing some 27.5 acres of land, more or less, and being identified as on Corps of Engineers, U.S. Army, North Atlantic Division, Norfolk District, drawing for License Contract No. DACA65-3-93-11, dated 3 November 1993 and labeled Exhibit "A".

EXHIBIT "B"

Recommend Approval:

By: ______________________
Director, Division of Engineering and Buildings

Recommend Approval:

By: ______________________
Director, Department of General Services

APPROVED BY THE GOVERNOR:

Pursuant to §2.1-504.2 of the Code of Virginia (1950), as amended, as the official designee of the Governor of Virginia, as authorized and designated by Executive Order 35 (91), dated May 30, 1991, I hereby approve the acquisition of the demised premises pursuant to this Lease Agreement and the execution of this instrument for, on behalf of, and in the stead of the Governor of Virginia.

Michael E. [illegible]

Secretary of Administration

5/27/94

(Date)

Date: 24 Feb 92

State: VA

VaARNG
RECORD OF ENVIRONMENTAL CONSIDERATION

1. **Title:** Department of Army License Contract No. DACA65-3-88-6, SMR

2. **Description of Proposed Action:** (Include existing environmental setting) Proposed action includes licensing 27.5 acres of unimproved land located at the National Guard Target Range, Camp Pendleton, Virginia Beach, Virginia for year round training and support of the National Guard.

3. **Anticipated Start Date and/or Duration of Proposed Action:** 14 Nov 92 - 14 Nov 97

4. **It has been determined that the action (choose one)**

   a. **Is adequately covered in the existing EA** X **EIA** ____ **EIS** ____

   entitled Environmental Assessment of Camp Pendleton, State Military Reservation

   and dated March 1992

   b. **Qualifies for Categorical Exclusion #____ Appendix A, AR 200-2.**

   c. **Is exempt from NEPA requirements under the provisions of (cite superseding law).**

SIGNED: Lloyd R. Scott
Lloyd R. Scott, COL
Facilities Management Officer

DATE: 27 Feb 92

CONCURRENCE: Robert P. Turner
(Land/site owner/manager)

DATE: May 22, 1992

CONCURRENCE: Eileen Sullivan Williams
Eileen S. Williams
Environmental Specialist

DATE: 27 Feb 92

CONCURRENCE: (Commander) Thaddeus E. Mendenhall
Thaddeus Mendenhall, LTC
SMR Commander

DATE: 2 March 92

ENVIRONMENTAL ASSESSMENT
CAMP PENDLETON
STATE MILITARY RESERVATION

PREPARED FOR
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

P.N. 91057.01

MAY 6, 1992

Ellen Gilinsky

Ellen Gilinsky, Ph.D
Senior Environmental Scientist

John L. Combs, P.E.
Vice President

PREPARED BY

RESOURCE
INTERNATIONAL, LTD.

ENGINEERS • SURVEYORS • PLANNERS
ENVIRONMENTAL CONSULTANTS & DESIGNERS

P.O. BOX 6160 • 406 AIR PARK ROAD • ASHLAND, VA 23005
(804) 798-1409 • FAX (804)798-2718

1.0 EXECUTIVE SUMMARY

The proposed projects under consideration in the SMR Master Plan have been assessed for their potential significant impact in accordance with Section 102 (2) (c) of the National Environmental Policy Act. The purpose of the Master Plan is to incorporate into one document the proposed construction of new training facilities with existing facilities. The Plan fuses the future training needs of the VaARNG with the need for preservation of land use and natural resources.

The current setting of the SMR, as well as the intended projects, the need for these projects, and possible alternatives for these projects, are described in detail in this report. A review of the meteorological conditions, air quality, geological resources and wildlife in the area revealed that the proposed projects will not significantly affect these resources. No rare, threatened or endangered species have been recorded from the project area. A previous Phase I archaeological study did not uncover any significant finds, and there are no structures currently on the National Register of Historic Places. However, the chapel on post is being considered for inclusion on the National Register and acceptance is expected.

Several areas of wetlands were identified on SMR as part of a separate study. In general, these areas are associated with Lake Christine or with several drainage swales along General Booth Boulevard. Few, if any, impacts to wetlands are expected with implementation of the Master Plan.

The water quality of Lake Christine, which is already considered a culturally eutrophic lake, may be affected by implementation of the Master Plan as the lake receives run-off of nutrients and sediment from both the SMR and residential neighborhoods to the north. Strict erosion and sedimentation measures should be implemented as part of the master plan in order to slow the eutrophication process, and a vegetative buffer should be established around the lake to further filter run-off before it reaches the lake.

A noise study conducted in 1987 identified that the SMR is within the Oceana Naval Air Station (ONAS) Noise Zone II contour for a normally unacceptable noise level. Therefore, operations at ONAS tend to minimize any adverse noise impacts due to activities at SMR. In order to shield SMR neighbors from additional noise, both seasonal and daily restrictions have been placed on range firing. In addition, plants should be placed along the northern fence lines to provide visual screening and noise reduction for that neighborhood.

There is no evidence of active contamination on SMR, and therefore a risk assessment was not performed. It is recommended that the debris from an abandoned dump site located along General Booth Boulevard be removed from SMR property.

Based upon this review of the Master Plan and the environmental setting of SMR, it can be concluded that these activities will not have a significant impact on the quality of the human environment. Therefore, it is recommended that a FINDING OF NO SIGNIFICANT IMPACT is warranted, and an Environmental Impact Statement does not need to be prepared.

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
OFFICE OF THE ADJUTANT GENERAL OF VIRGINIA
JOINT FORCE HEADQUARTERS - VIRGINIA
BUILDING 316, FORT PICKETT
BLACKSTONE, VIRGINIA 23824-6316

REPLY TO
ATTENTION OF

VAAG (405)

25 February 2005

MEMORANDUM FOR Department of the Army, Norfolk District, Corps of Engineers, ATTN: CENAO-RE-A (Mr. David Parson), Fort Norfolk, 803 Front Street, Norfolk, Virginia 23510-1096

SUBJECT: Department of the Army Parcel (27.5 AC) at Camp Pendleton, VA

1. Reference Department of the Navy Letter, 21 JAN 2005, regarding Camp Pendleton real estate concerns. (Encl 1)

2. We have a 25-year DA license to use the 27.5 AC parcel which expires 14 NOV 2017. The licensed area includes Rifle Range Road which is our only means of ingress/egress to our Rifle Range. (Encl 2)

3. We concur with the Navy's initiative to transfer the land from the Army to the Navy. However, we will need an easement from the Navy to ensure our continued use of Rifle Range Road.

4. Oral or written communication regarding the above should be directed to LTC Gilbert Hanzlik of my staff at the above address, Attn: VAFM PRN 160, telephone (804) 298-6401 or DSN 438-6401, fax (804) 298-6400 or DSN 438-6400, e-mail *gil.hanzlik@va.ngb.army.mil.*

Claude A. Williams

Encls

CLAUDE A. WILLIAMS
MG, VaARNG
The Adjutant General

EXHIBIT "D"

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
9742 MARYLAND AVENUE
NORFOLK, VA 23511-3095

Ph: 757-322-4924
Fx: 757-322-4059

IN REPLY REFER TO:

Camp Pendleton Land Transfer
RES-SD
March 23, 2006

ADVANCE COPY VIA FACSIMILE TRANSMISSION

Mr. Dillard Horton, Chief, Real Estate Branch
U.S. Army Corps of Engineers, Norfolk District
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Horton:

As you are aware, the Navy hopes to reacquire a 27.5-acre tract of land which was transferred to the Department of the Army in 1977. This property is located at Camp Pendleton adjacent to the rifle range and is currently covered by Army License DACA65-3-93-11, which allows the Virginia National Guard (VNG) to conduct low-intensity training on the site. Please be advised that, following the return of the property to Navy custody, the Commander, Navy Region, Mid-Atlantic, has expressed a willingness to issue a license to cover VNG's continuing use of the site and the use of Rifle Range Road for ingress/egress.

As requested by your office, we will seek Deputy Assistant Secretary of the Navy (Installations and Facilities) approval of a license term extending until November 14, 2017, which is the expiration date of the existing Army license.

If you have any questions, please contact me at 757-444-3346 ext. 341 or Sheri DeMartino, Realty Specialist, at 757-322-4924.

Sincerely,

MATTHEW D. KURTZ
Real Estate Contracting Officer
Real Estate Services
By direction of the Commanding Officer

EXHIBIT "E"

Parson, David B NAO

From: Barnes, Wayne T NAO
Sent: Wednesday, March 08, 2006 7:23 AM
To: Parson, David B NAO
Subject: FW: Camp Pendleton Transfer Info
Attachments: Aerial Photo.doc; camp_p_survey.pdf

Dave,

I agree with Steven's approach.

From: White, Steven C CIV NAVFAC Lant [mailto:steven.c.white@navy.mil]
Sent: Tuesday, October 18, 2005 9:17 AM
To: Barnes, Wayne T NAO
Subject: Camp Pendleton Transfer Info

Wayne,

Attached is an aerial photo and survey of the 27.5 acres for your info.

<<Aerial Photo.doc>> <<camp_p_survey.pdf>>
The three biggest drawbacks to the property are these:
1. Preservation zoning: would apply to the property if sold; can't be developed and likelihood it would be rezoned is low.

2. Poor access: property is essentially landlocked; does not extend to the ocean, per survey
3. Submerged land: about 20% of the property extends into the middle of Lake Christine; not all high land

The highest and best use would likely be something similar to park use. I have four sales that Aubrey Graham used in an appraisal of Navy land on Lake Rudee that the Navy was considering disposing of to the City for a park (under special legislation). He correlated to $20,000 per acre. I think if we had the 27 acres appraised we would reach a similar conclusion. As a recap, I concluded that the value was probably $15,000 - $20,000 per acre or $415,000 to $550,000. I don't think the value is near $750,000.

Let me know if you have any concerns with this.

Thanks for your help.
Steven

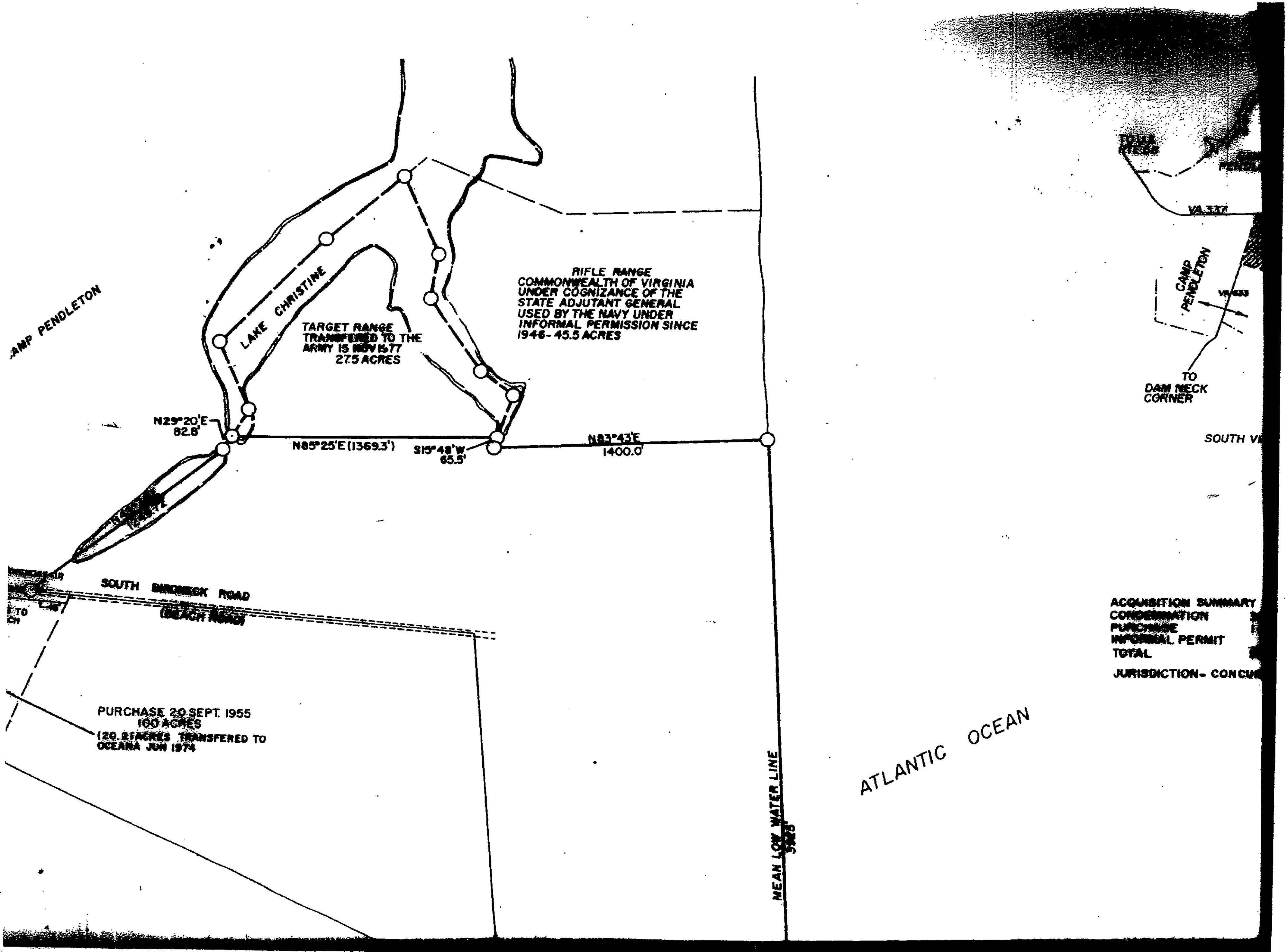
Steven C. White
Navy Staff Appraiser
Naval Facilities Engineering Command (NAVFAC), Atlantic
Real Estate Business Line
Phone: 757-322-4930 DSN: 262-4930
Fax: 757-322-4059
steven.c.white@navy.mil

EXHIBIT "F"

Camp Pendleton Military Reservation, Virginia Beach, VA27.5 acres

Aerial Photo

"U.S. ARMY" is the Subject Property


CAMP PENDLETON
LAKE CHRISTINE
TARGET RANGE
TRANSFERED TO THE
ARMY 15 NOV 1977
27.5 ACRES
RIFLE RANGE
COMMONWEALTH OF VIRGINIA
UNDER COGNIZANCE OF THE
STATE ADJUTANT GENERAL
USED BY THE NAVY UNDER
INFORMAL PERMISSION SINCE
1946 - 45.5 ACRES
N29°20'E
82.8'
N85°25'E (1369.3')
S15°48'W
65.5'
N83°43'E
1400.0'
SOUTH ROAD
PURCHASE 20 SEPT. 1955
160 ACRES
TRANSFERED TO
OCEANA JUN 1974
MEAN LOW WATER LINE
ATLANTIC OCEAN
VA 337
CAMP PENDLETON
TO
DAM NECK
CORNER
ACQUISITION SUMMARY
CONDEMNATION
PURCHASE
INFORMAL PERMIT
TOTAL
JURISDICTION- CONCU

FINDING OF SUITABILITY TO TRANSFER PROPERTY at CAMP PENDLETON, VIRGINIA from the UNITED STATES ARMY to the UNITED STATES NAVY

1.0 PURPOSE

The purpose of this Finding of Suitability to Transfer (FOST) is to document environmental findings prior to transfer of custody and control of 27.5 acres from the United States Army (Army) to the U.S. Navy (Navy). The property currently owned by the Army through the U.S. Army Corps of Engineers, Norfolk District was formerly under Navy custody until 1977, when it was transferred to the Army. Upon transfer back to the Navy, the property will be made part of the Dam Neck Annex to Naval Air Station Oceana, to which it is adjacent and of which it was once part.

2.0 COORDINATION

The above described proposed transfer has been coordinated with Federal, state and local environmental resource agencies. The coordination memo, a list of agencies contacted and responses received are provided as Enclosures 1 and 2 to this FOST. The addressee list was developed with the assistance of Virginia Department of Environmental Quality's office of Environmental Impact Review. No objections to the proposed transfer were received.

3.0 DESCRIPTION OF PROPERTY, INTENDED REUSE AND ASSOCIATED RISK

3.1 Description. The property is located in southeastern Virginia within the City of Virginia Beach on the Camp Pendleton State Military Reservation (CP SMR). It lies between 0.25 and 0.50 miles from Virginia Beach's Atlantic Ocean coastline and its center is near 36° 48' 56" N. Lat; 75° 58' 23" W. Long. The site is generally triangular in shape and bounded at the south by Rifle Range Road and its other two sides extend into branches of Lake Christine. This 27.5-acre property has been lightly used for the purpose of Virginia Army National Guard training.

The emergent component of the property is densely wooded, comprised of delineated jurisdictional Palustrine wetlands, and it has been used sporadically since 1908 for military training. It has been little used since 1969. Weapons are not known to ever have been discharged from or into this parcel. The CP SMR rifle range lies to the east of the property and is oriented away from it, toward the ocean. No structures are currently located on the subject property and there is no evidence of any from review of historical aerial photography (dating back to 1949), USGS "Quad" sheets (dating back to 1948) and Army National Guard maps (dating back to

ENCL 2

1933). Interviews of persons having long-term familiarity with the property and CP SMR support this conclusion. Farming is the only known activity on this property before it was put to use for military training purposes.

3.2 Intended Reuse. Transferring the land back to the Navy will not affect the ecological character of the property. The Navy intends to maintain the property largely in its present state and does not intend to significantly change its character or the nature or tempo of its use.

3.3 Associated Risk. The environmental risks of transferring this property to the Navy are negligible. Of greater risk, because of demand value arising from its proximity to the ocean would be transferring it to an entity that might seek to develop it for commercial, residential, or recreational purposes.

4.0 ENVIRONMENTAL DOCUMENTATION

Receipt of property by the Navy from another Federal agency, when there is no anticipated or proposed substantial change in land use, is categorically excluded from environmental impact analysis under the National Environmental Policy Act (NEPA), per 32 C.F.R. § 775.6 (f)(27). Such action is similarly excludable from NEPA analysis under Army Regulation 200-2, app. B, sec. II (f)(3).

5.0 ENVIRONMENTAL BASELINE SURVEY FINDINGS

An Environmental Baseline Survey (EBS), completed in December 2005, found no evidence that hazardous substances were stored on or disposed of on the property, or that petroleum hydrocarbons were released on the property. There were no specific contamination issues and there were no unusual environmental concerns raised during the preparation of the EBS that would affect the proposed transfer.

6.0 ENVIRONMENTAL CONDITION OF PROPERTY

The Office of the Secretary of Defense, the Armed Services, and the U.S. Environmental Protection Agency (USEPA) jointly developed environmental categories to describe the environmental condition of Department of Defense property. Also mandated is the use of specific color maps showing each of the seven environmental condition categories. The categories and their corresponding map colors are as follows:

> *Category 1. (WHITE)* – areas where no release or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas). The area might have been used to store hazardous substances or petroleum products.

Category 2. (BLUE) – areas where only a release or disposal of petroleum products and/or their derivatives has occurred (including migration of petroleum products from adjacent areas).

Category 3. (LIGHT GREEN) – areas where a release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial action.

Category 4. (DARK GREEN) – areas where a release, disposal, and/or migration of hazardous substances has occurred and all remedial actions necessary to protect human health and the environment have been taken.

Category 5. (YELLOW) – areas where a release, disposal, and/or migration of hazardous substances has occurred and removal or remedial actions are under way, but all required remedial actions have not yet taken place.

Category 6. (RED) – areas where a release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.

Category 7.(GRAY) – areas that are not evaluated or require additional evaluation.

After an analysis of all available data, the subject parcel was classified as *Category 1. (WHITE).*

7.0 HAZARDOUS SUBSTANCES NOTIFICATION

Under *U.S. Code, Title 42, Chapter 116 – Emergency Planning and Community Right-To-Know, Subchapter I – Emergency Planning and Notification*, a hazardous substance notification is not required. Beyond there being no known listed hazardous substances that exceed the threshold planning quantity established for such substance, there is no evidence of any storage, release, or disposal of hazardous or toxic wastes or pesticides having occurred on the property. This Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) priority list is revised and published on a 2-year basis, with a yearly informal review and revision. The list for 2005 is published at: http://www.atsdr.cdc.gov/clist.html. In consideration of the military uses in the vicinity of the parcel, several substances were initially considered likely to be present and if found to be present would have triggered the requirements of CERCLA Section 120(h). These substances include: radiological materials, polychlorinated biphenyls (PCB), asbestos containing materials (ACM), lead-based paint (LBP), unexploded ordnance (UXO) and explosive waste. Because there was no release, disposal, or any threshold storage of hazardous substances on the property, the requirements of CERCLA Section 120(h) are not triggered by this transfer.

8.0 DEED RESTRICTIONS

The parcel proposed for transfer is not subject to covenants, conditions or deed restrictions.

9.0 FINDING OF SUITABILITY TO TRANSFER

The proposal to transfer the above-described 27.5 acres from the Army to the Navy has been adequately assessed for environmental hazards and impacts. Transfer of this property poses no current or future risk to human health or the environment. It is, therefore, suitable for transfer.

Date

Raymond J. Fatz
Deputy Assistant Secretary of the Army
(Environment, Safety, and Occupational Health)

Enclosures:

1. Coordination memo to regulatory agencies
2. Regulator responses

Incorporated by reference:

Environmental Baseline Survey, U.S. Army Corps of Engineers Property,
Camp Pendleton, Virginia

Enclosure 1. ***REGULATOR CONTACT MEMO***

From: Richard Muller [mailto:rm@marstel-day.com]
Sent: Monday, November 28, 2005 7:42 PM
To: 'karen_mayne@fws.gov'; 'ethel.eaton@dhr.virginia.gov'; 'renee.hypes@dcr.virginia.gov'; 'bwparolari@deq.virginia.gov'; 'andrew.zadnik@dgif.virginia.gov'; 'chellis@deq.virginia.gov'; wcouch@vbgov.com; dmwillis@deq.virginia.gov

Subject: Property Transfer at Camp Pendleton, VA

The U.S. Army proposes to transfer 27.5 acres at Camp Pendleton State Military Reservation (CP SMR) that it owns through the U.S. Army Corps of Engineers, Norfolk District (Army) to the U.S. Navy (Navy). Department of Defense procedures require that regulatory agencies be notified of its intent to sign a Finding of Suitability to Transfer (FOST) and this message requests your opinions and concerns, if any, regarding the transfer of property described below. Marstel-Day, LLC, whom I represent, has been contracted by the Army to prepare the FOST and the Environmental Baseline Survey (EBS) that supports it.

Background: The property was transferred to the Army from the Navy in 1977 and it will be reintegrated under Navy ownership with the Dam Neck Annex to Naval Air Station Oceana, with which it is physically contiguous. Transfer to the Navy will not effect any changes in use from the present use of the property. Adjacent land south of the property is owned by the Navy and all other lands surrounding the property are part of Camp Pendleton, which is a Virginia Army National Guard (VANG) training area and is owned by the State of Virginia.

Department of Defense regulations require that before the Federal government can transfer property, the transferring agency must prepare a FOST. In a case such as this, where no release or disposal of hazardous substances or petroleum products has occurred, the determination of suitability must be based on an EBS and the EBS must be documented in the FOST. The EBS is currently in preliminary draft form and under review by the Army and the Navy, but I will forward a PDF of the document in its present state if you desire.

Site Specifics: The property is between 0.25 and 0.50 miles from Virginia Beach's Atlantic Ocean coastline and its center is near 36° 48' 56" N. Lat; 75° 58' 23" W. Long. The site is generally triangular in shape and bounded along the south by Rifle Range Road and its other two sides extend into branches of Lake Christine. *The attached map is extracted from the EBS.* The property, which is a densely wooded jurisdictional wetland, has been in light use for the purpose of Virginia Army National Guard training. No weapons were ever discharged from or into this site. The SMR rifle range lies to the east and downrange is toward the ocean. The Navy has no plans to alter the subject property's condition or use.

No structures are currently located on the subject property and there is no evidence from review of historical aerial photography (back to 1949), USGS "Quad" sheets (back to 1948) and Army National Guard maps (back to 1933) that any ever were. Several interviews were also conducted with personnel having a long-term familiarity with Camp Pendleton to support this conclusion. The only known use of this property before being incorporated into CP SMR was for farming, which ceased by 1911 when the Camp Pendleton's military training function was first established.

We appreciate your taking the time to consider the effect this transfer may have on your resource areas of concern.

Sincerely,
Richard Muller
Marstel-Day, LLC
www.marstel-day.com
home office/fax: 757.638.1092
mobile: 757.439.8147

MEMO DISTRIBUTION

Charlie Ellis
Virginia Department of Environmental Quality
Division of Environmental Enhancement
Environmental Impact Review
629 E. Main Street, 6th Floor
Richmond, VA 23219
804/698-448
chellis@deq.state.va.us

Karen Mayne, Supervisor
US Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061
804/693-6694
karen_mayne@fws.gov

Derwood Willis
DEQ Federal Facilities Section / Waste
804/698-1092
dmwillis@deq.virginia.gov

Ethel R. Eaton, Ph.D., Manager
Office of Review and Compliance
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, Virginia 23221
(804) 367-2323, ext. 112
fax (804) 367-2391
ethel.eaton@dhr.virginia.gov

Renee Hypes
Conservation and Recreation/Division of Natural Heritage
804/371-2708
renee.hypes@dcr.virginia.gov

Bert W. Parolari, Jr.
Virginia Water Protection Permit Manager
Virginia Department of Environmental Quality
5636 Southern Blvd.
Virginia Beach, VA 23462
(757) 518-2166 (Voice)
(757) 518-2103 (Fax)
bwparolari@deq.virginia.gov

Andrew K. Zadnik
Game and Inland Fisheries
804/367-2733
andrew.zadnik@dgif.virginia.gov

Thomas W. Couch, Administrator
Virginia Beach Wetlands Board
Dept of Planning, Oper. Bldg. #2, #115
2405 Courthouse Drive
Virginia Beach, VA 23456-9040
Telephone Number: (757) 426-5790/427-4621
Fax Number: (757) 426-5667
wcouch@vbgov.com

Enclosure 2. ***REGULATOR RESPONSES***

U.S. Fish and Wildlife Service

-----Original Message-----
From: Eric_Davis@fws.gov [mailto:Eric_Davis@fws.gov]
Sent: Tuesday, November 29, 2005 3:37 PM
To: rm@marstel-day.com
Subject: Fw: Property Transfer at Camp Pendleton, VA

Rich,

Transferring the property to a Federal agency will have no effect on Federally listed species. FYI, transfers from Federal to private status may affect Federally listed plants because the laws provide fewer protections to listed plants on private property.

Eric Davis
USFWS, Virginia Field Office
(804) 693-6694 ext. 104

Virginia Department of Game and Inland Fisheries

-----Original Message-----
From: Andrew Zadnik [mailto:Andrew.Zadnik@dgif.virginia.gov]
Sent: Thursday, December 01, 2005 3:20 PM
To: rm@marstel-day.com
Cc: ProjectReview.Richmond_PO.DGIF@dgif.virginia.gov
Subject: Re: Property Transfer at Camp Pendleton, VA

We do not anticipate a significant adverse impact upon critical wildlife resources under our jurisdiction to occur due to this project.

Thank you,

Andrew K. Zadnik
Environmental Services Section Biologist
Department of Game and Inland Fisheries
4010 West Broad Street
Richmond, VA 23230

Virginia Department of Environmental Quality

From: Ellis,Charles [mailto:chellis@deq.virginia.gov]
Sent: Wednesday, December 14, 2005 9:51 AM
To: rm@marstel-day.com
Cc: karen_mayne@fws.gov; ethel.eaton@dhr.virginia.gov; renee.hypes@dcr.virginia.gov; Parolari,Bert; andrew.zadnik@dgif.virginia.gov; Irons,Ellie
Subject: RE: Property Transfer at Camp Pendleton, VA

Rich - Thank you for your November 28 e-mail on this subject. Our comments follow.

We have no objection to the transfer of property from the Army to the Navy as described in your e-mail. However, we remind the Navy, through this correspondence, of its obligations under applicable environmental laws in the event the Navy decides to change the use of the property in any way.

DEQ's Office of Environmental Impact Review (DEQ-OEIR) coordinates Virginia's review of Federal environmental documents prepared pursuant to the National Environmental Policy Act and responds to appropriate Federal officials on behalf of the Commonwealth. In addition, DEQ-OEIR is the lead agency for coordinating Virginia's review of Federal consistency determinations prepared pursuant to the Coastal Zone Management Act. The Navy may contact DEQ-OEIR (Ellie Irons, Program Manager, telephone (804) 698-4325 or Charlie Ellis, Environmental Impact Review Coordinator, telephone (804) 698-4488) if it has questions regarding of State reviews relative to these two legal requirements.

Charlie Ellis

DEQ-OEIR

December 14, 2005

LETTER OF TRANSFER
FOR
REAL PROPERTY KNOWN AS THE
27.5 ACRE CAMP PENDLETON
NATIONAL GUARD TARGET RANGE
VIRGINIA BEACH, VIRGINIA

FROM: THE DEPARTMENT OF THE ARMY

TO: THE DEPARTMENT OF THE NAVY

The Department of the Navy ("Navy") requested transfer of 27.5 acres of unimproved land known as the Camp Pendleton, National Guard Target Range, Virginia Beach, Virginia, to support Navy mission requirements. The Virginia Army National Guard currently uses the property under a 25 year, Department of the Army License No. DACA65-3-93-11.

For the Department of the Army ("Army"), I, Joseph W. Whitaker, Deputy Assistant Secretary of the Army (Installations and Housing) OASA (I&E), do hereby transfer at no cost to the Navy jurisdiction custody and control of the subject property, containing 27.5 acres with improvements thereon, and all rights, interests and appurtenances, as described and set forth herein (Attachment 1.c), such transfer to be subject to the specific retention of obligations, liabilities, and restrictions as stated in Article 4.

Article 1 – Authority:

This transfer is pursuant to the authority outlined in

Article 2 – Effective Date of Transfer:

This Letter of Transfer shall be effective upon the date of acceptance by the Navy.

Article 3 – Possession and Accountability:

The real property is being transferred in an "as-is, where-is" condition, and subject to any easements, obligations, liabilities, reservations and restrictions as are specifically retained or assumed elsewhere in this Letter of Transfer. Full administrative jurisdiction and control for the real property will transfer from the Army to the Navy as of the date of acceptance by the Navy. By a copy of this Letter of Transfer, the Army requests the US Army Corps of Engineers, Norfolk District, 803 Front Street, Norfolk, VA 23510-1096, to transfer the original acquisition documents to the Navy along with any audited real estate maps.

ENCL 3

Article 4 – Environmental Responsibilities:

a. Based on the Environmental Baseline Survey (EBS), dated December 2005, the Record of Environmental Consideration, dated February 15, 2006, the Finding of Suitability to Transfer and the PAS Statement of Findings, dated February 15, 2006, for Camp Pendleton, National Guard Target Range, Virginia Beach, Virginia, the Army has determined that transfer of the real property does not present an unacceptable risk to human health or the environment. The Navy acknowledges that it has received and reviewed the environmental documentation, and is aware of the existing conditions associated with the property.

b. The Navy agrees herewith to be responsible for all necessary actions with respect to any contamination on the real property after the date of transfer, whether such contamination was on, under, or around the real property on the date of transfer, or, which is spilled, released, and/or disposed of thereon after the date of transfer.

Article 5 – National Environmental Policy Act Requirements:

The Army, in transferring the real property to the Navy, has prepared a Record of Environmental Consideration, dated February 15, 2006, to satisfy the requirements of the National Environmental Policy Act of 1969, 42 U.S.C. *et seq*.

Article 6 – Reporting Requirements:

This transfer is exempt from the Congressional notification provisions of Title 10 USC 2662. The estimated value is between $415,000 and $550,000.

Article 7 – Legal Description (TRACT D):

All that certain parcel of land being located in the City of Virginia Beach, State of Virginia, identified as 27.5 acres Camp Pendleton Target Range, Parcel "D" on the Department of the Navy, Bureau of Yards & Docks, Atlantic Division, Norfolk, Virginia, Real Estate Summary Map, NAFAC DWG No. 980411, for the Naval Amphibious Base, dated, approved 23 September1963 and revised 12 March 1975.

Being a portion of a 360.49 acres tract acquired by way of condemnation civil No. 1927, dated 3 February 1955, as recorded in the Clerk's Office of the Circuit Court of the City of Virginia Beach, Commonwealth of Virginia, subject to easements for public roads, right of ways and utilities, if any, not shown of record and rights in the portion of the beach and court roads which transverse this land.

See attached description and plat Exhibits "A" and "B".

Article 8 – Source of Title:

The United States of America acquired title of the subject tract by way of condemnation as noted in Civil No. 1927, dated 3 February 1955. Records indicate it was acquired as a portion of the Naval Amphibious Base, Norfolk, Virginia. It has been used for Virginia National Guard since 1945. The site was transferred from the Navy to the Army by letter and DD 1354, Transfer and Acceptance of Military Real Property form dated 15 November 1977.

Article 9 –Reservations, Restrictions, and Exceptions:

Reservations, Restrictions, or Exceptions are the Aviation and Restrictive Easement rights as shown in the transfer from the Navy to the Army and no others Reservations, Restrictions, or Exceptions are reserved unless noted in this transfer letter.

NOW THEREFORE, in consideration of the foregoing, I hereby approve and deliver this Letter of Transfer and cause jurisdiction, custody, and control of the real property described herein to be transferred to the Navy, effective upon the date of acceptance, as recorded below.

Dated this _________ day of __________________, 2006

THE DEPARTMENT OF THE ARMY

By: ________________________________

JOSEPH W. WHITAKER
Deputy Assistant Secretary of the Army
(Installations and Housing)
OASA (I&E)

THE DEPARTMENT OF THE NAVY hereby accepts the transfer of the real property in accordance wit the terms and conditions set forth herein:

Dated this _________ day of __________________, 2006

THE DEPARTMENT OF THE NAVY

By: ________________________________

WAYNE ARNY
Deputy Assistant Secretary of the Navy
(Installations and Facilities)

Attachments:

1. Real Estate Exhibits
   - "A" Legal Description
   - "B" Plat
   - 1. a. Location Map
   - 1. b. Parcel Map
   - 1. c Transfer and Acceptance of Real Property Form
2. Army Decision Documents

NARRATIVE DESCRIPTION OF 27.5 ACRES

BEGINNING at a point of intersection of the center line of Virginia State Secondary Route No. 633, also known as Prosperity Road, with the center line of South Birdneck Road, formerly known as Beach Road; thence, along the center line of South Birdneck Road S 87° 29' E 1169.32 feet, more or less, to a point, which said point forms the point of intersection of the boundary line between lands of the Commonwealth of Virginia, known as Camp Pendleton, and lands of the United States of America under the cognizance of the Department of the Navy and identified as the Camp Pendleton Family Housing Area; thence leaving the center line of South Birdneck Road and proceeding northeasterly along said boundary line N 49° 38' E 1249.72 feet; thence, N 29° 20' E 82.8 feet to a point identified as the TRUE POINT OF BEGINNING; thence, the following ten (10) courses and distances; N 29° 20' E 170.7 feet; N 26° 38' W 387.8 feet; N 42° 15' E 772.3 feet; N 47° 09' E 515.7 feet; S 26° 49' E 444.6 feet; S 06° 10' W 231.0 feet; S 37° 34' E 445.6 feet; S 56° 02' E 205.8 feet; S 15° 48' W 223.1 feet; S 85° 25' W 1369.3 feet to the true point of beginning and containing some 27.5 acres of land, more or less, and being as identified on Department of the Navy, NAVFAC Drawing No. 980411, dated 23 September 1963, last revised 12 March 1975, and entitled "Naval Amphibious Base, Norfolk, Virginia, Real Estate Summary Map, South Virginia Beach", as Target Range License to Commonwealth of Virginia NOy(R)-67708 - 1 January 1965, 27.5 acres.

EXHIBIT "A"

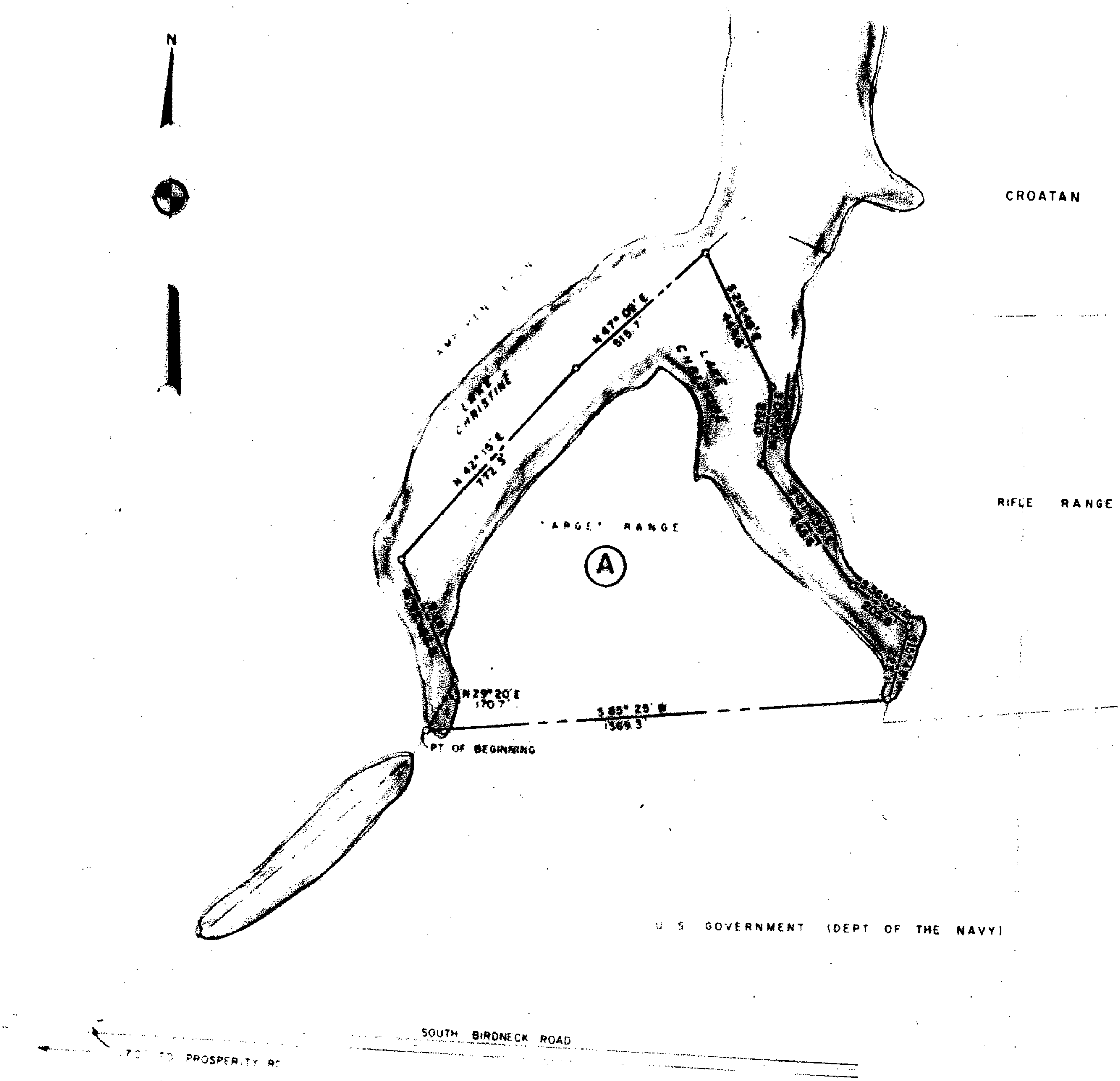
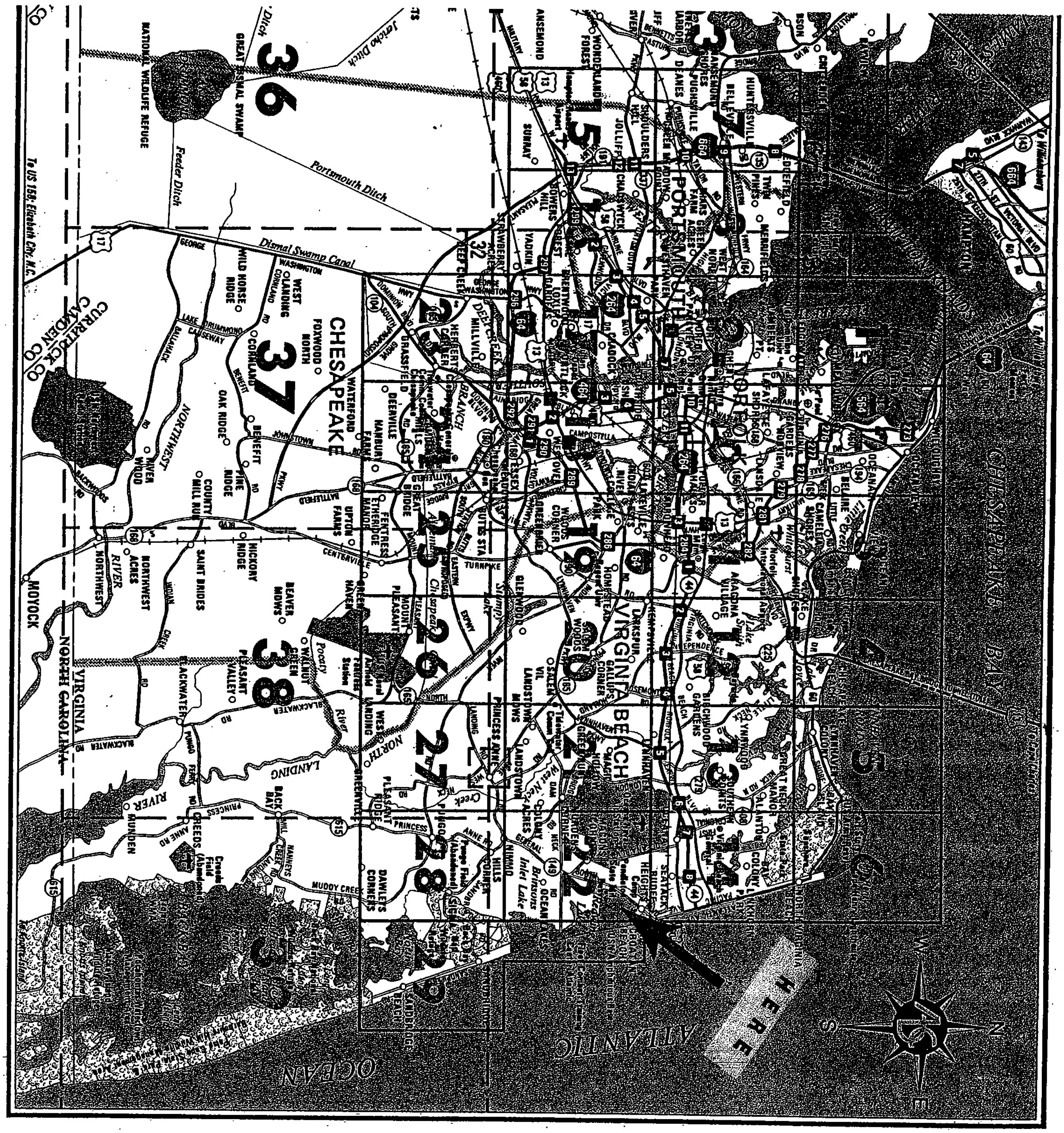
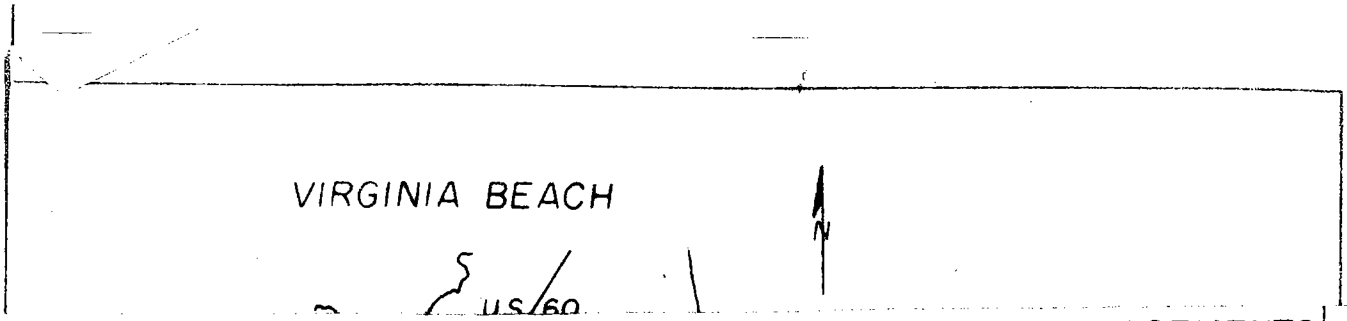

N
CROATAN
RIFLE RANGE
LAKE CHRISTINE
N 47° 09' E
815.7'
N 42° 15' E
772.5'
RANGE
A
N 29° 20' E
170.7'
S 85° 25' W
1369.3'
PT OF BEGINNING
GOVERNMENT (DEPT OF THE NAVY)
SOUTH BIRDNECK ROAD
PROSPERITY

EXHIBIT "B"

LOCATION MAP
CAMP
PENDLETON



1a



EA ACQUIRED BY PURCHASE 20 SEPT. 1955 IS SUBJECT TO EASEMENTS BLIC ROADS, RIGHTS OF WAY AND UTILITIES, IF ANY, NOT SHOWN OF ORD, AND THE RIGHTS OF THE PUBLIC IN THE PORTIONS OF BEACH URT HOUSE ROADS WHICH TRAVERSE THIS LAND.

MNATION MISC. 1927 ACQUIRED SUBJECT TO THE RIGHTS IN THE PUBLIC AND MAINTAIN VA. STATE HIGHWAY NO. 633.

MD	REVISED TO REFLECT EXISTING CONDITIONS	12 ... 1975	[illegible]
R COR	DESCRIPTION OF AMENDMENT OR CORRECTION	DATE	LANTDOCKS APPROVAL

IV DWG. NO.
411

DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS
ATLANTIC DIVISION
NORFOLK 11, VIRGINIA

ALKER

NAVAL AMPHIBIOUS BASE

NORFOLK VIRGINIA

ACT. CODE NO. 61414 MANAGEMENT CINCLANTFLT

REAL ESTATE DIV

REAL ESTATE SUMMARY MAP

SOUTH VIRGINIA BEACH

OR REAL PROP MGMT

DATE	CODE IDENT. NO.	SIZE	NAVFAC DWG. NO.
[illegible] 7/23/63	80091	F	980411 1b
CKS FOR CHIEF BUDOCKS	SCALE GRAPHIC	SHEET 1 OF 1	

DETERMINATION APPROVING TRANSFER
NATIONAL GUARD TARGET RANGE, CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA BEACH, VIRGINIA

1. The attached Report of Excess (ROE) pertaining to 27.5 acres of unimproved fee-owned land located in Virginia Beach, Virginia has been reviewed for accuracy and completeness.

2. The property has not been screened with Army installations within a 50-mile radius of the property, other Major Army Commands, or DOD agencies. The Navy transferred the site to the Army in 1977, and has asked that it be transferred back to them to satisfy mission requirements.

3. I have determined that Department of the Army's control and accountability are not needed over this property, nor is this property needed for the discharge of the Army's responsibilities. The property is therefore excess to the Department of Army, but the existing License to the National Guard should remain in place under Navy's control and accountability.

4. The proposed transfer action to the Navy is approved subject to the Navy's acceptance of the property "as-is, where-is and the incorporation of any notices and restrictions stated in the Report of Excess, the Finding of Suitability to transfer and the Environmental Baseline Survey and in any subsequent land conveyance documents.

Date

JOSEPH W. WHITAKER
Deputy Assistant Secretary of the Army
(Installations and Housing)
OASA (I&E)

ENCL 24

REPORT OF EXCESS

A. GENERAL:

1. Installation: NATIONAL GUARD TARGET RANGE, CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA BEACH, VIRGINIA

2. General property description/characteristics of the property:

Acreage 27.5 ; Land character undeveloped .

3. United States property interest:

{ X } fee simple title { } easement { } in-lease
{ } other.

4. Army interest:

{ X } direct control { } permit from a Federal Agency

{ } withdrawn from the public domain.

5. Type of jurisdiction:

{ } exclusive { X } concurrent
{ } proprietary { } partial

6. If other than proprietary, is jurisdiction to be relinquished?
{ } Yes { X } No, Explain.

7. Attach documentation required by AR 5-10. Reduction and Realignment Actions

8. Describe impact on installation resources: property acquired by Army from the Navy for use by the Virginia National Guard (VaANG) for training and will continue to be used by the VaANG for training

9. Describe impact on the local civilian community, if any: None

10. Is withdrawn public domain land included in the excess area?
{ } No { X } Yes, attach information required by Appendix E, Notice of relinquishment.

11. Information on nature and extent of Congressional involvement, if any.
State Congressional districts: None .

12. Is there a post cemetery located on the property? { X } No { } Yes, attach summary of post cemetery record. Is it eligible for transfer to the Veterans Affairs? { } No { } Yes, describe.

13. Does the area contain a private cemetery or burial plot? { X } No { } Yes, attach data on location and ownership, including specific information on outstanding rights. Describe any special restrictions or issues.

14. List any site specific limitations, restrictions, or conditions to be included in the disposal document for compatibility with the operation of the installation (note, if operational impact is significant, disposal may not be possible): Aviation Easement and Restrictive Rights and License to the Virginia National Guard.

15. Utilities are provided by { } public utility companies } private utility companies { } installation facilities.

a. Describe the availability of utilities to the area proposed for disposal. None

b. Is the utility distribution system being disposed of? N/A

c. Are sewage treatment, power generating or water treatment facilities located on the disposal site? { X } No { } Yes, Describe condition, including whether the facilities were built to Army standards or do they meet standards for public/private operation. ______________________.

16. Data on potential for industrial property. N/A

17. REMARKS - include any legal, policy, or mission factors you are aware of that may affect the proposed disposal of the property: None

18. STEWART B. MCKINNEY HOMELESS REQUIREMENTS:

{ X } Mckinney Act requirements do not apply to this action.

{ } Mckinney Act requirements apply, necessary screening has been completed, and no interest was expressed.

19. Estimated Costs to further process the outgrant: None

USACE District costs: ____Paid by Navy________________

Installation costs: _______None_______________

Funds are currently available { } Yes { } No (X)N/A
If no, how will costs be funded? __________________

20. Date premises will be vacated: effective as of the date property is accepted by the Navy

21. Names of interested parties: _______United States Navy___________________

22. Installation Point of Contact: David B. Parson, (757) 201-7736

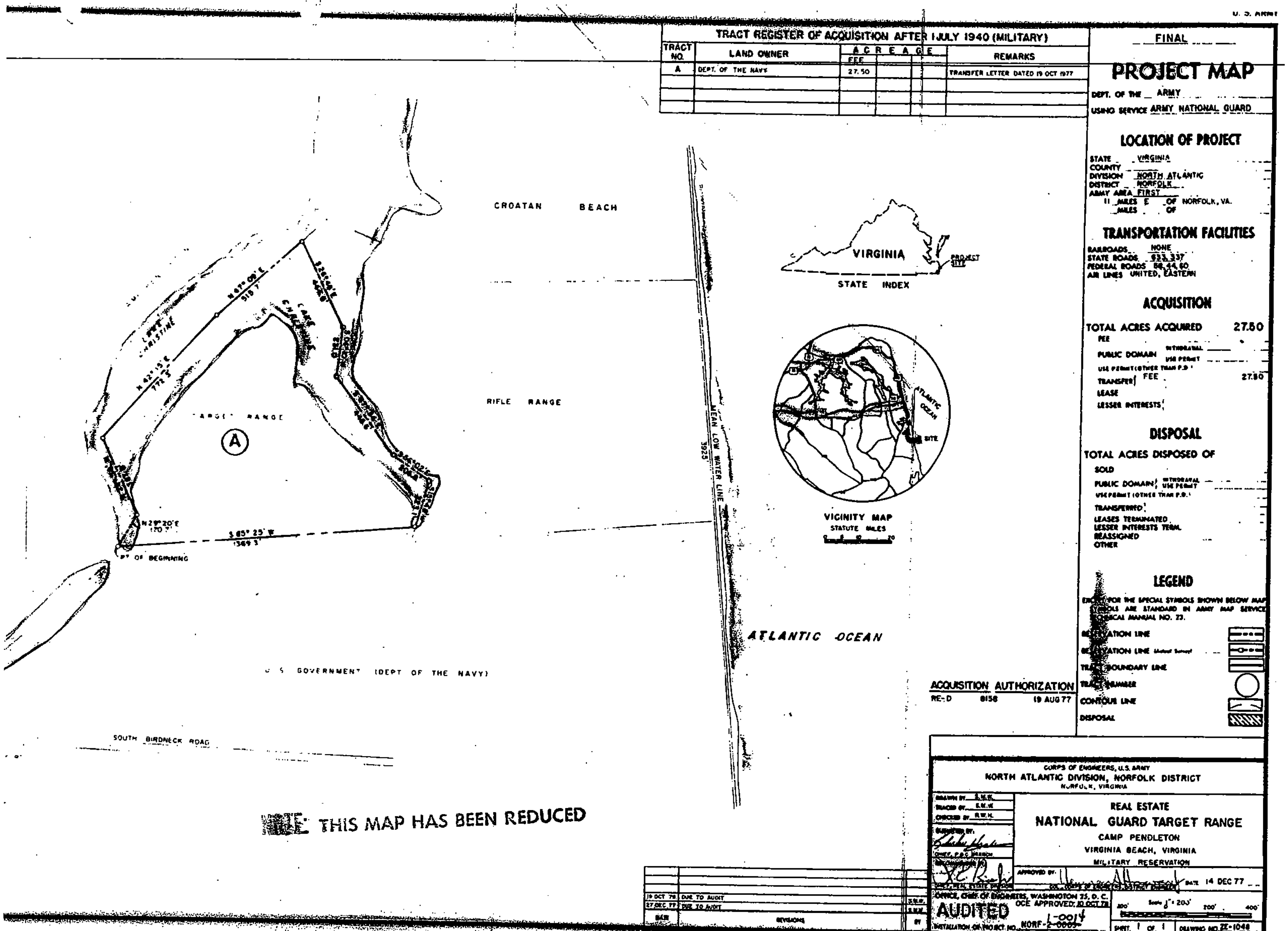
23. BASED ON THE INFORMATION PROVIDED ABOVE, I RECOMMEND THE DISPOSAL BE

{ X } APPROVE { } DENIED.

30 March 2006
DATE
Dillard H. Horton

SIGNATURE
Title: Chief, Real Estate Branch,
Norfolk District Corps of Engineers

Encl 1. Maps showing the nearest project or installation boundary; acreage, character of land, and the number and type of improvements, if both land and improvements are included.



U. S. ARMY
TRACT REGISTER OF ACQUISITION AFTER 1 JULY 1940 (MILITARY)
TRACT NO. | LAND OWNER | ACREAGE FEE | REMARKS
A | DEPT. OF THE NAVY | 27.50 | TRANSFER LETTER DATED 19 OCT 1977
FINAL
PROJECT MAP
DEPT. OF THE ARMY
USING SERVICE ARMY NATIONAL GUARD
LOCATION OF PROJECT
STATE VIRGINIA
COUNTY
DIVISION NORTH ATLANTIC
DISTRICT NORFOLK
ARMY AREA FIRST
11 MILES E OF NORFOLK, VA.
TRANSPORTATION FACILITIES
RAILROADS NONE
STATE ROADS 623, 337
FEDERAL ROADS 58, 44, 60
AIR LINES UNITED, EASTERN
ACQUISITION
TOTAL ACRES ACQUIRED 27.50
FEE
PUBLIC DOMAIN WITHDRAWAL USE PERMIT
USE PERMIT (OTHER THAN P.D.)
TRANSFER FEE 27.50
LEASE
LESSER INTERESTS
DISPOSAL
TOTAL ACRES DISPOSED OF
SOLD
PUBLIC DOMAIN WITHDRAWAL USE PERMIT
USE PERMIT (OTHER THAN P.D.)
TRANSFERRED
LEASES TERMINATED
LESSER INTERESTS TERM.
REASSIGNED
OTHER
LEGEND
TRACT BOUNDARY LINE
TRACT NUMBER
CONTOUR LINE
DISPOSAL
ACQUISITION AUTHORIZATION
RE-D 8158 19 AUG 77
CROATAN BEACH
RIFLE RANGE
TARGET RANGE
A
LAKE CHRISTINE
N 29° 20' E 170'
S 85° 25' W 1349'
PT OF BEGINNING
MEAN LOW WATER LINE
3925'
VIRGINIA
PROJECT SITE
STATE INDEX
ATLANTIC OCEAN
SITE
VICINITY MAP
STATUTE MILES
ATLANTIC OCEAN
U S GOVERNMENT (DEPT OF THE NAVY)
SOUTH BIRDNECK ROAD
THIS MAP HAS BEEN REDUCED
CORPS OF ENGINEERS, U.S. ARMY
NORTH ATLANTIC DIVISION, NORFOLK DISTRICT
NORFOLK, VIRGINIA
REAL ESTATE
NATIONAL GUARD TARGET RANGE
CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA
MILITARY RESERVATION
14 DEC 77
OFFICE, CHIEF OF ENGINEERS, WASHINGTON 25, D. C.
OCE APPROVED
AUDITED
NORF-2-0009
1-0014
SCALE 1" = 200'
SHEET 1 OF 1
19 OCT 78 DUE TO AUDIT
27 DEC 77 DUE TO AUDIT
REVISIONS

REPORT OF AVAILABILITY
(Not Applicable, no improvements included)

B. IMPROVEMENTS:

1. Are Government buildings and improvements included in the area:
{ } Yes { X } No.

If yes, give details on each building and improvement and attach copy of floor plan, if applicable:

Building Identification No.___________________,

Condition of the facilities__________________________.

Type of funds used for construction: { } Appropriated
{ } Nonappropriated (X) N/A

Proposed method of disposal _____________________________,

Does disposal comply with MCA Program, Disposal of Structures, construction directive, and the installation master plan
{ } Yes { } No, explain

Mobilization statement _______________________

Estimated commercial value______________________

Installed Equipment or related personal property. If such is not to be sold with improvement, explain.

Family housing information required by AR 210-50, Family Housing Management

Explanation of proposals to dispose of structure transferred less than two years before to the using command.

2. Is there Asbestos Containing Material (ACM)? { } No { } Yes, attach condition and type

3. Is there lead-based paint? { } No { } Yes, Attach survey results.

4. Site Restoration to be performed, if any.

5. Actions necessary to remove hazards and associated costs:

6. Approvals for Special Use facilities or improvements:

{ } The Army Materiel Command (ATTN: AMCEN-R) for improvements located on industrial installations.

{ } The Office of Transportation, Energy and Troop Support (ATTN: DALO-TSM) for Army rail equipment.

{ } The US Army Health Services Command (ATTN: HSLO-F) for hospitals and medical facilities under its command.

{ } The Chief of Chaplains, HQDA (ATTN: DACH-IML), for chapel facilities.

{ } The US Army Housing Division (ATTN" DAIM-FDH) for Unaccompanied Personnel Housing (UPH) , formerly "Troop Housing", for only such of those facilities categorized as "permanent".

{ } The US Army Housing Division (ATTN: DAIM-FDH) for improvements eligible for or on the National Register of Historic Places

{ } The Assistant Chief of Staff for Installation Management (ACSIM) for environmentally contaminated or hazardous improvements. This is not required for improvements contaminated with asbestos only.

{ } The Deputy Chief for Logistics (ATTN: DALO-TSM) for logistics warehouses.

BASED ON THE INFORMATION PROVIDED ABOVE, I RECOMMEND THE DISPOSAL BE

{ } APPROVED { } DENIED.

________________ ________________________

DATE SIGNATURE
Title

Encl 1. Maps showing the nearest project or installation boundary; acreage character of land, and the number and type of improvements, if both land and improvements are included. Use existing maps whenever feasible.

on proposal occupancy or use: ______________________________

7. WETLANDS:

{ } This property is not located within a wetlands area and, therefore, does not fall under the purview of Executive Order 11990.

{ X } This property is located within a wetlands area and does fall under the purview of Executive Order 11990, accordingly, the following restrictions must be incorporated in the disposal document:

____

8. ENDANGERED SPECIES:

{ X } This action will not jeopardize the habitat of any endangered species of fish, wildlife, or plants pursuant to the Endangered Species Act.

{ } This action jeopardize the habitat of endangered species of fish, wildlife, and/or plants identified on an attached map. Accordingly, the following restrictions must be incorporated in the disposal document to protect the habitat:

____

9. FISH AND WILDLIFE COORDINATION ACT:

{ X } This action will not jeopardize fish and wildlife species or habitat integral to Congressionally authorized mitigation or General Plans, or Army agreed to recommendations in Fish and Wildlife reports prepared under the provisions of the FWCA.

{ } This action will jeopardize fish and wildlife species or habitat integral to Congressionally authorized mitigation or General Plans, or Army agreed to recommendations in Fish and Wildlife reports prepared under the provisions of the FWCA Impact description: ______________

RECOMMENDED ACTIONS PRIOR TO DISPOSAL: ______________

10. HISTORICAL AND CULTURAL RESOURCES:

{ } The area has been surveyed for historical and cultural resources and there have been none identified on this property, and this action is in compliance with the National Historic Preservation Act and other relevant laws; Executive Order 11593, Protection and Enhancement of the Cultural Environment; or any MOA's related thereto.

{ } A survey has identified historical and/or cultural resources on this property. This action has been coordinated with the State Historic Preservation Officer and the Advisory Council on Historic Preservation in accordance with 36 CFR 800. The following restrictions must be incorporated into the disposal document to protect the resource: ______________________

{ } Native American graves have been identified on this property. Refer to requirements of the American Indian Religious Freedom Act and Native American's Grave Protection and Repatriation Act.

{ } Archaeological site or resources have been identified on this property. Refer to the Antiquities Act; Archaeological and Historical Preservation Act; and Archaeological Resources Protection Act.

11. Did past activity involve the use of insecticide, fungicide, and rodenticide so that compliance with the Federal Insecticide, Fungicide, and Rodenticide Act will necessary, e.g. Agricultural, golf courses, restaurants:

{ } Yes { X } No

12. Will the proposed disposal impact an area designated under the Wild and Scenic Rivers Act? { } Yes { X } No

13. Will the proposed disposal activity require compliance with the Clean Air Act, the Toxic Substances Control Act; or other special purpose environmental laws? Explain (X) NO

14. NEPA REQUIREMENTS:

{ X } This action falls under one of the Categorical Exclusions (CX) contained in AR 200-2. The environmental effect of the action has been considered. A Record of Environmental Consideration (REC) is attached.

{ } The impact of this action is considered to be minimal or insignificant. An Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI) is attached/is being prepared.

{ } The impact of this action is considered to be significant. An Environmental Impact Statement (EIS) , or supplement thereto, is attached/is being prepared.

15. The COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) and the Environmental Baseline Survey (EBS):

{ X } An EBS in accordance with AR 200-1 has been conducted and no HTRW substances were identified as released, stored, or disposed on the property in the threshold quantities. Copy of the EBS is attached.

{ } An EBS has been conducted which indicates HTRW substances were released, stored, or disposed on the property in the threshold quantities. The CERCLA notice should be included in the disposal document. Copy of the EBS is attached containing the details. Choose one:

a. Remedial actions have been taken so that the property is considered safe for disposal.

b. Remedial actions have not been taken. Provide details and justification for disposal in the current condition.

____

16. REAL PROPERTY CONTAMINATED WITH AMMUNITION, EXPLOSIVES OR CHEMICALS.

{ } The property has been remediated using the most appropriate technology consistent with the proposed disposal of the property.

{ X } Transfer is to another Federal agency for compatible use of surface de-contaminated real property, subject to the following limitations, restrictions and prohibitions concerning the use of the property, to ensure personnel and environmental protection:______________________

{ } Access rights should be reserved to implement any monitoring plan.

{ } Coordination with HQDA, DACS-SF and DAMO-SWS attached with the Land Disposal Site Plan (LDSP). Reference AR 385-64, "US Army Explosives Safety Program."

17. WASTE DISPOSAL (The Solid Waste Recovery Act, as amended; Resource Conservation and Recovery Act (RCRA)).

Waste treatment facilities, landfills, or other waste disposal sites:

{ } are { X } are not located on the site.

Treatment, disposal or storage of waste defined by EPA as having the following characteristics - corrosivity, ignitability, reactivity, or toxicity - { } was not { } was on the site.

identify sites. Are sites noted on the site map? Are the sites active? Do they have appropriate RCRA permits? Explain

18. UNDERGROUND AND OTHER STORAGE TANKS.

{ X } There are no UST on the property.

{ X } There are no above ground storage tanks for fuel or other regulated substances.

{ } There are UST on the property. Tanks are in compliance with current laws and regulations: ______ Yes ______ No.

{ } There are above ground storage tanks for fuel or other regulated substances on the property. Tanks are in compliance with current laws and regulation: ______ Yes ______ No.

19. Remediation and restoration recommendations:

(1) release property without complete elimination of the hazards. Attach justification, based on type of hazard.

(2) remediate to a level of restricted use. Explain restriction.

(3) remediate to a level of unrestricted use when economically and technically feasible and when GSA or other recipient will accept the property only in an unrestricted use condition.

(4) remediate to a level necessary to protect public health and welfare and the environment. Additional remediation may be conducted when justified in accordance with the economic analysis:

19. ADDITIONAL COMMENTS:

3/28/06
DATE

Mark T. Mansfield
SIGNATURE
MARK T. MANSFIELD
Title: Chief, Planning and Policy Branch,
Norfolk District Corps of Engineers

Encl 2. Attach environmental reports and data (REC, CX, EA, EIS, EBS) and any other documentation of compliance with environmental and cultural considerations.

REPORT OF EXCESS

C. ENVIRONMENTAL and CULTURAL CONSIDERATION:

1. Is there a Care and custody plan? No-property being transferred to the U.S. Navy, who will be responsible for care and custody

- Responsible agency for custody and accountability
- Security measures necessary to prevent degradation
- Source of funds
- Estimated cost to implement plan which separately identified any cost for any family housing area

2. Has an Environmental Compliance Assessment System (ECAS) review been performed within the last year? { X } No { } Yes, explain status of any recommendations or installation restoration.

3. Does the property have PCB containing transformers in service? Are they marked in accordance with applicable laws and regulations: { } Yes { X } No

4. COASTAL ZONE MANAGEMENT (CZM) (if applicable):

{ } CZM is not applicable.

{ X} CZM is applicable and the proposed disposal is/will be consistent with the approved state CZM Plan. State any restriction which may need to be in the disposal document. Describe any commitments or agreements made under a CZM.

5. CLEAN WATER ACT (FEDERAL WATER POLLUTION CONTROL ACT):

{ X } This disposal action will not involve the discharge of any pollutants into the waters of the United States.

{ } This action will entail the discharge of pollutants into the water of the United States.

6. FLOODPLAIN:

{ } This property is not located within the 100 year floodplain and does not fall under the purview of Executive Order 11988.

{X } This property is located within the 100 year floodplain and does fall under the purview of Executive Order 11988 and the disposal documents should contain the following restrictions on proposal occupancy or use:

____

7. WETLANDS:

{ } This property is not located within a wetlands area and, therefore, does not fall under the purview of Executive Order 11990.

{ X } This property is located within a wetlands area and does fall under the purview of Executive Order 11990, accordingly, the following restrictions must be incorporated in the disposal document:

____

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RECOMMENDED ACTIONS PRIOR TO DISPOSAL: __________________

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{X } A survey has identified historical and/or cultural resources on this property. This action has been coordinated with the State Historic Preservation Officer and the Advisory Council on Historic Preservation in accordance with 36 CFR 800. The following restrictions must be incorporated into the disposal document to protect the resource: ______________________

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11. Did past activity involve the use of insecticide, fungicide, and rodenticide so that compliance with the Federal Insecticide, Fungicide, and Rodenticide Act will necessary, e.g. Agricultural, golf courses, restaurants:

{ } Yes { X } No

12. Will the proposed disposal impact an area designated under the Wild and Scenic Rivers Act? { } Yes { X } No

13. Will the proposed disposal activity require compliance with the Clean Air Act, the Toxic Substances Control Act; or other special purpose environmental laws? Explain (X) NO

14. NEPA REQUIREMENTS:

{ X } This action falls under one of the Categorical Exclusions (CX) contained in AR 200-2. The environmental effect of the action has been considered. A Record of Environmental Consideration (REC) is attached.

{ } The impact of this action is considered to be minimal or insignificant. An Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI) is attached/is being prepared.

{ } The impact of this action is considered to be significant. An Environmental Impact Statement (EIS) , or supplement thereto, is attached/is being prepared.

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{ } An EBS has been conducted which indicates HTRW substances were released, stored, or disposed on the property in the threshold quantities. The CERCLA notice should be included in the disposal document. Copy of the EBS is attached containing the details. Choose one:

a. Remedial actions have been taken so that the property is considered safe for disposal.

b. Remedial actions have not been taken. Provide details and justification for disposal in the current condition.

---

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{ X } Transfer is to another Federal agency for compatible use of surface de-contaminated real property, subject to the following limitations, restrictions and prohibitions concerning the use of the property, to ensure personnel and environmental protection:________________________

{ } Access rights should be reserved to implement any monitoring plan.

{ } Coordination with HQDA, DACS-SF and DAMO-SWS attached with the Land Disposal Site Plan (LDSP). Reference AR 385-64, "US Army Explosives Safety Program."

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Waste treatment facilities, landfills, or other waste disposal sites:

{ } are { X } are not located on the site.

Treatment, disposal or storage of waste defined by EPA as having the following characteristics - corrosivity, ignitability, reactivity, or toxicity - { } was not { } was on the site.

RECORD OF ENVIRONMENTAL CONSIDERATION (REC)

Proponent: U.S. Army Corps of Engineers, Norfolk District

Project Title: Transfer of Property at Camp Pendleton, Virginia

Brief Description: The proposed action consists of the transfer to the U.S. Navy of 27.5 acres of property that the U.S. Army owns on the Camp Pendleton State Military Reservation. This property, which was transferred to the Army from the Navy in 1977, will be combined with the Dam Neck Annex to the Naval Air Station Oceana, with which it is physically contiguous. The property is a densely wooded area that has been lightly used by the Virginia Army National Guard for training.

Anticipated Date and/or Duration of Proposed Action: This transfer will take place approximately on 1 May 2006.

Reason for Using Record of Environmental Consideration:
This project is categorically excluded under the provisions of AR 200-2, App. B, sec. II (f)(3),

"Transfer of real property administrative control within the Army, to another military department, or to other federal agency, including the return of public domain lands to the Department of Interior, and reporting of property as excess and surplus to the GSA for disposal(REC required)."

and no extraordinary circumstances exist as defined in paragraph 651.29(b). The environmental effects of this project will be totally insignificant and are documented in the attached Preliminary Assessment Screening (PAS).

Signed: Mark T. Mansfield
MARK T. MANSFIELD
Chief, Planning and Policy Branch
USACE, Norfolk District

Date: 2/15/06

Concurrence: Dillard H. Horton
DILLARD H. HORTON
Chief, Real Estate Branch
USACE, Norfolk District

Date: 2/15/06

PRELIMINARY ASSESSMENT SCREENING (PAS)

1. REAL PROPERTY TRANSACTION: This project consists of the transfer of 27.5 acres of property at the Camp Pendleton State Military Reservation from the U.S. Army to the U.S. Navy. This property, which is currently owned by the Army through the U.S. Army Corps of Engineers, Norfolk District, will be combined with the Dam Neck Annex to the Naval Air Station Oceana, with which it is physically contiguous. The property was previously owned by the U.S. Navy until 1977, when it was transferred to the U.S. Army. It has been used for training by the Virginia Army National Guard since that transfer.

a. A COMPREHENSIVE RECORDS SEARCH was carried out during October and November 2005. The Planning and Policy, Engineering, and Real Estate Branches of the Norfolk District Corps of Engineers were contacted about this proposed project. An extensive records search including Federal and state environmental databases was carried out as part of the preparation of an Environmental Baseline Survey which was prepared as part of the transfer process. Records on file at the Department of Historic Resources have also been examined to determine the location of known sites of historical or archaeological significance in the vicinity of this project.

b. A SITE INVESTIGATION was performed on October 18, 2005 and included an examination of all relevant maps (USGS quadrangle maps, boundary survey, etc.).

2. The results of this PAS are provided in the Statement of Findings.

PAS STATEMENT OF FINDINGS

1. The area proposed for transfer is located in southeastern Virginia within the city of Virginia Beach on the Camp Pendleton State Military Reservation. The site, which is triangular in shape, is located east of General Booth Boulevard and about 0.25 to 0.5 miles from the Atlantic Ocean. Two sides of the site extend into branches of Lake Christine, a small fresh water lake located mostly within the Reservation. The site is a densely wooded wetland area that has been used sporadically since 1908 for military training although very little since 1969. There is no evidence of weapons firing into or from the area. There are currently no structures on the property and no evidence of the existence of any structures as far back as 1933.

2. The visual inspection did not reveal any additional areas of environmental concern. The entire area is a jurisdictional wetlands area which either drains poorly into Lake Christine or is flooded by the lake when its levels are high from rainfall. The site is vegetated with mostly deciduous trees and shrubs such as red maple, red oak, white oak, yellow poplar, cedar, loblolly pine, swamp black gum, tupelo gum, sweet gum, poison ivy, goldenrod, and rhododendron. In addition to the heavy undergrowth on the site, there are also a large number of trees blown down by Hurricane Isabel.

3. Camp Pendleton was placed on the National Register of Historic Places in 2005 as the Camp Pendleton/State Military Reservation Historic District. The historic district contains 105 buildings, six sites, and three structures which are considered contributing elements of the district. None of these contributing elements are located within the area to be transferred. A check of the Virginia Department of Historic Resources database resulted in the finding that no archaeological sites have been recorded within the installation.

4. No significant environmental effects are anticipated from this action. The use of the property is not expected to change with the transfer of the property to the Navy since the Navy intends to maintain the property largely in its present undeveloped state. No significant effects on air or water pollution, rare or endangered species, flora, fauna, archaeological or historical resources, or noise levels are anticipated with project implementation.

Recommendation: This project should be approved as described.

Signed: Helene Haluska
Prepared by: HELENE HALUSKA
USACE, Norfolk District

Date: February 15, 2006

Signed: Mark T. Mansfield
Approved by: MARK T. MANSFIELD
Chief, Planning and Policy Branch
USACE, Norfolk District

Date: 2/15/06

COMPLIANCE WITH ENVIRONMENTAL STATUTES

Federal Policies	Compliance*
National Historic Preservation Act	Full
Coastal Zone Management Act	Full
Endangered Species Act	Full
Clean Water Act	Full
Clean Air Act	Full
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	Full
Solid Waste Disposal Act (RCRA)	Full
Executive Order 11990, Protection of Wetlands	Full
Executive Order 11988 as amended by Executive Order 12148, Floodplain Management	Full

* Full - Having met all requirements of the statute for the current stage of planning.
Partial - Some requirements of the regulations remain to be met.

LEASE NO. 123-L0036

SUPPLEMENTAL AGREEMENT NO.2
TO LICENSE CONTRACT NO.DACA65-3-92-08
STATE MILITARY RESERVATION, CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA

THIS SUPPLEMENTAL AGREEMENT NO. 2 is made and entered into this 21st day of June, 2001, by and between the United States of America, Lessee hereinafter designated as the "Government" and the Commonwealth of Virginia, Department of Military Affairs, 501 East Franklin Street, Richmond, Virginia, lessor, hereinafter designated the "Virginia Air National Guard".

WITNESSTH THAT:

WHEREAS, by license No. DACA65-3-92-08, dated the 6th day of December 1991, the Government granted the use of 28.9218 acres of land at State Military Reservation, Camp Pendleton, located in the vicinity of the City of Virginia Beach, Virginia, which had been acquired by Lease from the Commonwealth of Virginia, for a term of twenty-five (25) years to the Virginia National Guard; and

WHEREAS, by Supplemental Agreement, No. 1 to License No. DACA65-3-92-08, the Government granted the use of the additional 12.0782 acres of land to the Virginia Air National Guard; and

WHEREAS, the Virginia Air National Guard has requested the said License be amended to give them permission to use an additional 19.37 acres, which the Government Leased from the Commonwealth at State Military Reservation, Camp Pendleton, for National Guard purposes; and

WHEREAS, it has been determined that the aforementioned amendment would be in the best interest of the Virginia Air National Guard and the Government.

NOW THEREFORE, the parties hereto do mutually agree as follows:

1. That License Contract No. DACA65-3-92-08 is hereby amended to grant to the Virginia Air National Guard the use of an additional 19.37 acres of land at State Military Reservation, Camp Pendleton, in the vicinity of the City of Virginia Beach, Virginia making the total acreage of the Licensed parcels 60.37± acres.

2. That the term for the use of this parcel shall be the same as that for the other parcels outlined in this lease.

3. That the Exhibits "A-1" (site map) and "A-2" (legal description) are attached hereto and made a permanent part of this Supplemental Agreement and the parties hereto acknowledge receipt of a copy of the "Final Environmental Baseline Survey, Camp Pendleton State Military Reservation, Virginia Beach, Virginia, dated October 1999".

4. That all other terms and conditions of said License shall be and remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement No. 2 as of the date first above written.

WITNESS:

Julia A. Talbott

JULIA A. TALBOTT
Realty Specialist

Robert F. Menke

ROBERT F. MENKE
Realty Specialist

UNITED STATES OF AMERICA

By: William E. Edwards

WILLIAM E. EDWARDS, DIRECTOR
AIR FORCE REAL ESTATE AGENCY
(Print or type name)
Director, Deputy Assistant Secretary of the Air Force (Installations)

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

By: Claude A. Williams

CLAUDE A. Williams
(Print or type name)
The Adjutant General

Supplemental Agreement No. 2
License Contract No. DACA65-3-92-08

APPROVED AS TO FORM:

____DAY OF ________________________, 2000 1

____

District Counsel
Norfolk District Corps of Engineers

APPROVED AS TO FORM:

18th DAY OF May, ~~2000~~ 2001

____

Sr. Assistant Attorney General

RECOMMENDED APPROVAL
DIVISION OF ENGINEERING AND BUILDINGS

BY: _______________________________

____

(Print or typed Name)
Director

RECOMMENDED APPROVAL
DEPARTMENT OF GENERAL SERVICES

BY: _______________________________

____

(Print or Type Name)
Director

APPROVED BY THE GOVERNOR

Pursuant to § 2.1-504.2 of the Code of Virginia (1950), as amended, and by the authority delegated to me under Executive Order Number 31(94) dated October 25, 1994, I hereby approve the acquisition of the demised promises pursuant to this agreement and the execution of this instrument for and on behalf of the Governor of Virginia.

6/7/01
____
Date

____

____

(Print or type name)
Secretary of Administration

District of Columbia
City ~~of~~ WASHINGTON

I hereby certify that the foregoing instrument was acknowledged before me by ____ the Deputy Assistant Secretary of the Air Force (Installations) on behalf of the United States of America, this ____ day of ______________________, 200~~0~~.

My commission expires: ______________________

____

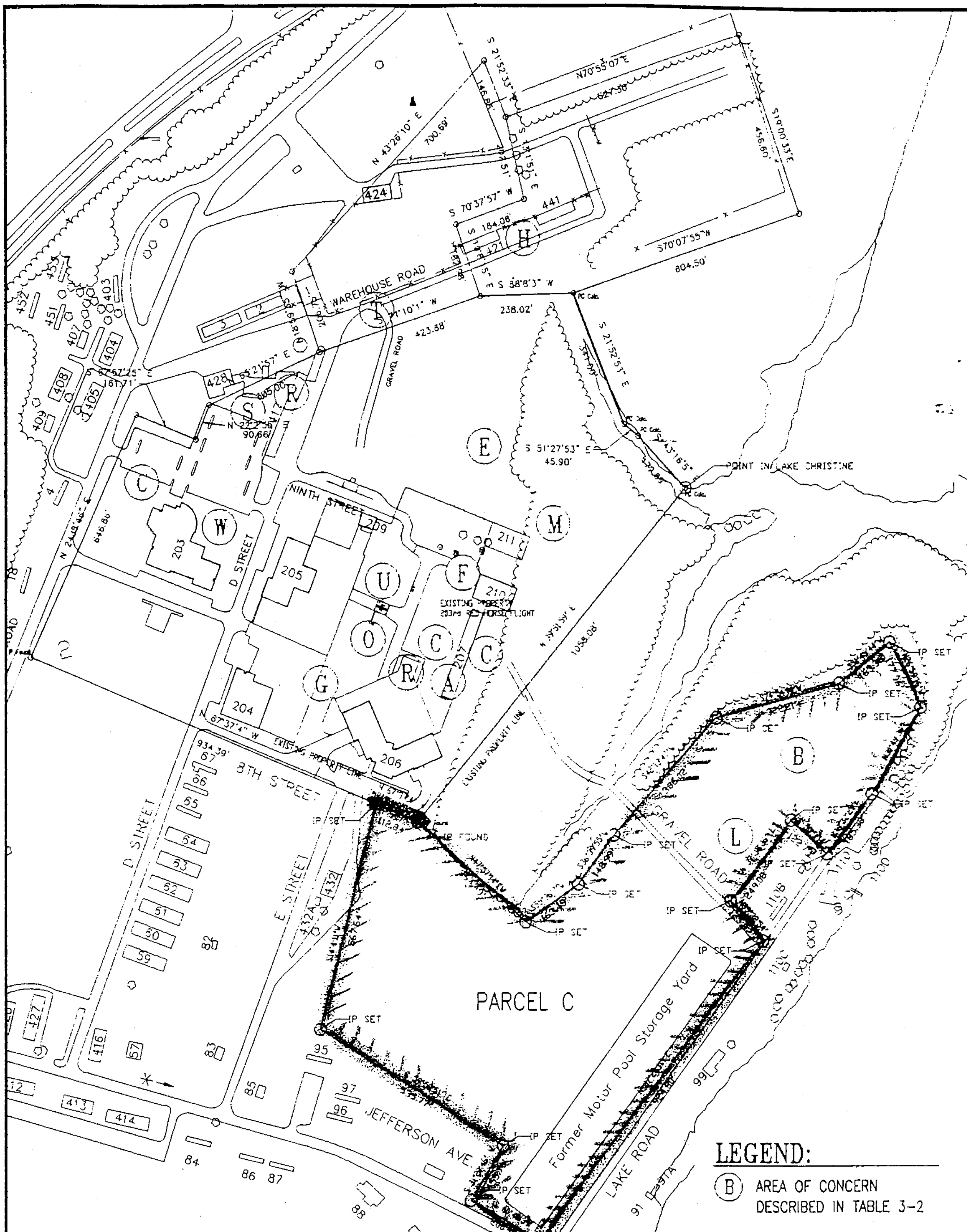
____
(Printed Name)

COMMONWEALTH OF VIRGINIA
At Large, to wit:

I hereby certify that the foregoing instrument was acknowledged before me by CLAUDE A. WILLIAMS The Adjutant General of Virginia, on behalf of the Commonwealth of Virginia, this 20th day of JUNE, 200~~0~~1.

My commission expires: 31 MARCH 2005

[signature]
RODERICK L. McALLISTER
(Printed Name)



SCALE: 1" = 450'

Oct. 1999

EXHIBIT "A-1"

FIGURE

EBS

AREAS OF CONCERN WITHIN PROPERTY BOUNDARIES
VIRGINIA AIR NATIONAL GUARD, VIRGINIA BEACH

3-1

FILE NAME: PROP-BOUND.DWG

203RD Red Horse Flight
P.O. Box 180
Virginia Beach, Virginia 23458-0180

Acquisition Office, U.S. Army Corps of Engineers, Norfolk District

Located substantially as shown on Exhibit "A", attached hereto and made part hereof, and described as follows:

Parcel C - Beginning at a pin along the southern side of Existing Parcel A; along existing property line N67°37'04"W a distance of 112.82' to a pin on the existing property line; thence, S14°04'11"W a distance of 567.64' to a pin near facility 97; thence, S59°58'51"E a distance of 535.77' to a pin located between facility 97, and the asphalt training site: thence, S31°20'39"W a distance of 155.70' to a pin 25' offset from Jefferson Avenue; thence, S60°43'39"E a distance of 200.96' parallel to Jefferson Avenue, to a pin near the north east corner of the intersection of Jefferson Avenue and Lake Road; thence, N37°28'11"E a distance of 924.80' parallel to Lake road to a pin on the north east corner of Lake Road and a gravel road; thence, N39°32'54"W a distance of 125.82' parallel to Gravel Road to a pin; thence, N37°38'36"E a distance of 249.08' offset to the west side of facility 110B to a pin; thence, S50°09'14"E a distance of 122.73' to a pin located 15' offset from a concrete parking apron; thence, N38°32'29"E a distance of 185.30' parallel to concrete apron to a pin; thence, N38°32'29"E a distance of 185.30' parallel to concrete apron to a pin; thence, N30°49'36"E a distance of 246.41' parallel to wooded area to a pin; thence, N26°59'16"W a distance of 177.96' parallel to wooded area to a pin; thence, S51°45'44"W a distance of 163.38' parallel to wooded area to a pin; thence, S74°54'00"W a distance of 322.21' parallel to wooded area to a pin; thence, S41°13'47"W a distance of 386.02' parallel to wooded area to a pin; thence, S36°39'55"W a distance of 148.99' parallel to wooded area to a pin; thence, S55°36'07"W a distance of 163.49' parallel to wooded area to a pin; thence, N47°57'14"W a distance of 364.49' parallel to wooded area to the point of beginning, and containing 19.3698 acres.

Dated this 18th day of April, 1999

EXHIBIT "A-2"

Michael A. McCarthy,
Lt. Col,
Deputy Commander
203RD Red Horse Flight
P.O. Box 180
Virginia Beach,
Virginia 23458-0180

SUPPLEMENTAL AGREEMENT NO. 1
TO LICENSE CONTRACT NO. DACA65-3-92-08
STATE MILITARY RESERVATION
CAMP PENDLETON, VIRGINIA

THIS SUPPLEMENTAL AGREEMENT NO. 1 is made and entered into this 13TH day of November, 1997, by and between the United States of America, hereinafter designated as the Government, and the Commonwealth of Virginia, Department of Military Affairs, hereinafter designed as the Licensee.

WITNESSTH THAT:

WHEREAS, by License No. DACA65-3-92-08, dated the 6th day of December 1991, the Government allowed the Licensee to use 28.9218 acres of land that is owned in fee by the Commonwealth of Virginia and leased to the United States of America, for use by the Department of the Air Force, under the terms and conditions of Lease No. DACA65-5-85-26, said land being located at the State Military Reservation known as Camp Pendleton, Virginia; and

WHEREAS, in accordance with Condition No. 4 of the aforementioned lease, the Government reserved an option to acquire use of additional acreage, on the same terms and conditions as shown in the original agreements; and

WHEREAS, by way of Supplemental Agreement No. 2 to Lease No. DACA65-5-85-26, an additional 12.0782 acres of land, known as Parcel B,was leased to the Government; and

WHEREAS, the Government and the Licensee hereby wish to amend the said license agreement to allow the Licensee to use the said 12.0782 additional acres for year round training and support of the Virginia Air National Guard; and

WHEREAS, it has been determined that this amendment would be in the best interest of the Government.

NOW THEREFORE, the parties hereto do mutually agree as follows:

1. That License Contract No. DACA65-3-92-08 is hereby amended to allow the Licensee to use the said 12.0782 additional acres on the same terms and conditions as shown in the original license agreement.

2. That the said 12.0782 acre Parcel "B" is as described in the Lease No. DACA65-5-85-26 and as shown on the attached Exhibit "B".

3. That all other terms and conditions of said license shall be and remain in full force and effect.

IN WITNESS WHEREOF, I have set my hand by authority of the Secretary of the Air Force as of the date first above written.

UNITED STATES OF AMERICA

By: William E. Edwards

Title: DIRECTOR
Air Force Real Estate Agency

The above Supplemental Agreement No. 1 to License Contract No. DACA65-3-92-08 with all the conditions therein is hereby accepted this 14th day of October, 1997.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

By: Carroll Thackston
CARROLL THACKSTON
Major General, VaARNG
THE ADJUTANT GENERAL

SUPPLEMENTAL AGREEMENT NO. 1 TO
LICENSE CONTRACT NO. DACA65-3-92-08

APPROVED AS TO FORM:

15th day of July ,1997

Senior Assistant Attorney General

RECOMMEND APPROVAL:
DIVISION OF ENGINEERING AND BUILDINGS

BY:
Nathan I. Broocke
Director

RECOMMEND APPROVAL:
DEPARTMENT OF GENERAL SERVICES

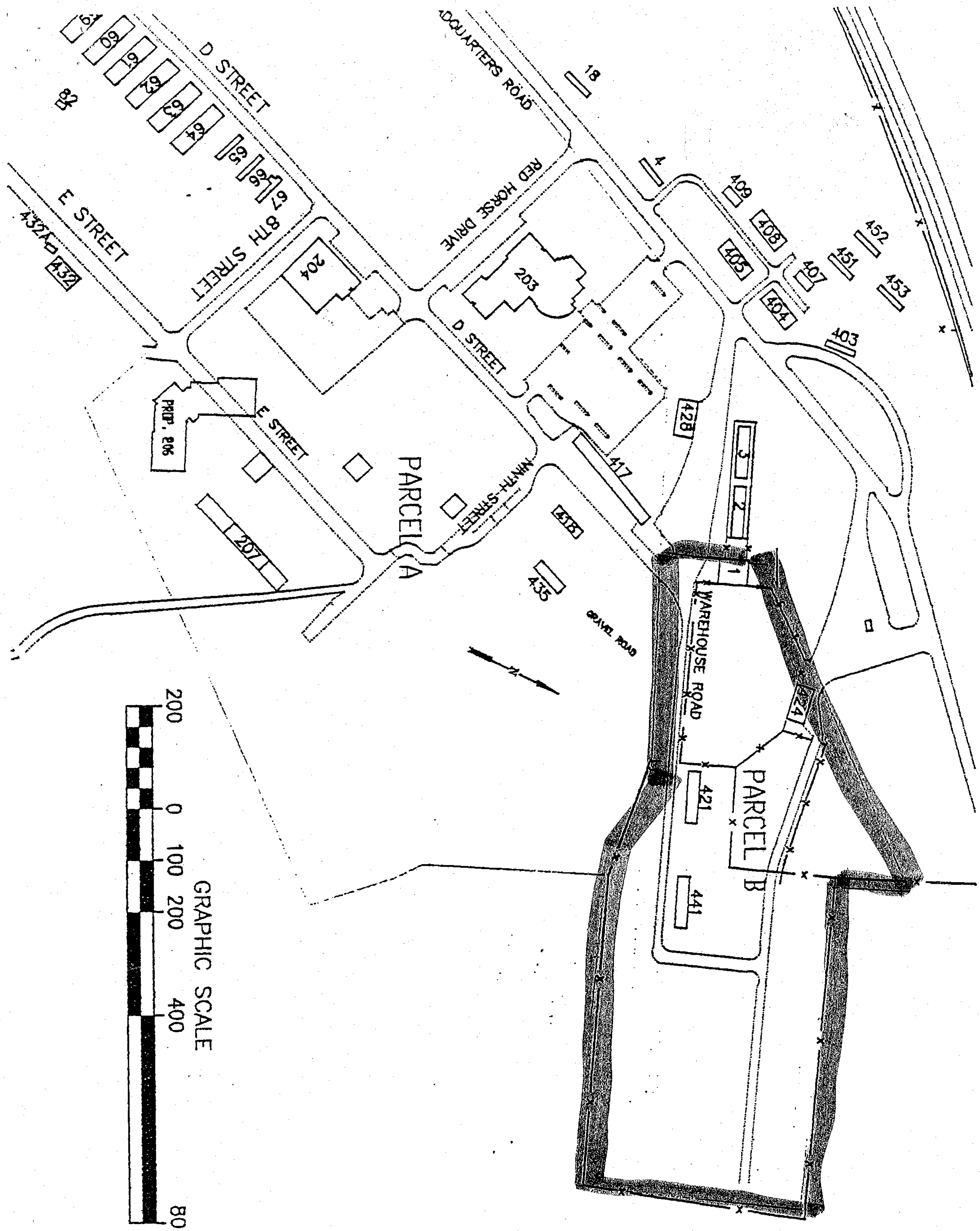
BY:
Donald C. Williams
Director

APPROVED BY THE GOVERNOR:

Pursuant to § 2.1-504.2 of the Code of Virginia (1950), as amended, and by the authority delegated to me under Executive Order Number 31 (94), dated October 25, 1994, I hereby approve the acquisition of the demised premises pursuant to this License and the execution of this instrument for and on behalf of the Governor of Virginia.

10/3/97
Date

Michael E. Thomas
Secretary of Administration



LOCALITY MAP

EXHIBIT "B"

DEPARTMENT OF THE AIR FORCE
LICENSE FOR NATIONAL GUARD PURPOSES

The SECRETARY OF THE AIR FORCE hereby grants to the Commonwealth *of* Virginia , *hereinafter referred to as the licensee, a license for a period of* (25) *years, commencing on* 2 October 1987 *but revocable at the will of the Secretary of the Air Force, to use and occupy for year-round training and support of the* Virginia Air *National Guard, certain land and improvements comprising a portion of the* State Military Reservation, Camp Pendleton, Virginia, which is land owned in Fee by the Commonwealth of Virginia and leased to the Department of the Air Force under Lease Contract No. DACA65-5-85-26.

located substantially as shown in red on Exhibit "A", attached hereto and made a part hereof, and described as follows:

Parcel A - Beginning at a pin in the southeast intersection of Headquarters Road and Eighth Street Extended; along east side of Headquarters Road N24°08'46"E a distance of 646.66' to a pin, at the northeast intersection of Ninth Street and Headquarters Road; thence, S67°57'25"E along the north side of Ninth Street a distance of 161.71' to a pin; thence, N22°02'35"E 90.66' to a pin; thence, N65°21'57"E a distance of 305.00' to a pin; thence, N71°17'19"E 423.88' to a pin; thence, N88°08'03"E 238.02' to a pipe; thence, S21°52'53"E a distance of 341.00' to a point in Lake Christine; thence, S51°27'53"E 45.90' to a point in Lake Christine; thence S43°16'05"E 172.89' to a point in Lake Christine; thence, S39°51'59"W a distance of 1,058.08' to a pin on the south side of Eighth Street; thence, N67°37'04"W along the south side of Eighth Street a distance of 1,047.21' to the point of beginning and containing 28.9218 acres.

THIS LICENSE is granted subject to the following conditions:

1. That the use and occupancy herein authorized shall be without cost or expense to the Regular Establishment of the Military Departments of the Department of Defense and shall be under the general supervision and subject to the approval of the Secretary of the Air Force or his duly authorized representative and subject also to such rules and regulations as he may from time to time prescribe.

2. That the licensee shall maintain and keep in good repair and condition the premises herein authorized to be used, and all costs of operations, maintenance, and restoration occasioned by reason of the occupancy of the premises by the licensee shall be paid for from funds available to the licensee, or from funds other than those appropriated for the Regular Establishment of the said Departments.

3. That the United States (hereinafter referred to as the Government) reserves the right to use the property included in this license, or any part thereof, including all buildings and improvements situated thereon, for such purposes as the Department of the Air Force deems necessary in the interest of national defense.

~~4. That the Government will not be responsible for any injury to persons or damage to~~ *property arising out of or incident to the use or occupancy of the licensed property by the licensee howsoever such injury or damage may be caused, and the licensee shall indemnify and save the Government harmless from any and all claims for any such liability or damage, excepting claims for injury or damage arising from activities of the Government on the said property which are being conducted exclusively for the benefit of the Government. Nothing contained in this condition shall be construed to be in derogation of the rights and remedies afforded aggrieved parties by Federal statute. It is understood that the obligations imposed on the licensee by this condition are limited to those not prohibited from being assumed by the laws* ~~of the State.~~

~~5. That the licensee shall pay the cost, as determined by the duly authorized representa-~~ *tive of the Secretary of the Air Force, of producing and/or supplying any utilities and other services furnished by the Government or through Government-owned facilities for the use of the licensee, including the licensee's proportionate share of the cost of operation and maintenance of the Government-owned facilities by which such utilities or services are produced or supplied. Payment shall be made in the manner prescribed by said representative upon bills* ~~rendered monthly. The Government shall be under no obligation to furnish utilities or services.~~

DELETED

6. That no addition to or alteration or improvement of the premises shall be made without prior written authorization from the Secretary of the Air Force or his duly authorized representative. All additions, alterations, and improvements so authorized shall be maintained by the licensee in good repair and condition. ~~Permanent additions, alterations, and improvements (which shall be so designated by the Secretary of the Air Force or his duly authorized representative) shall, upon completion, become and remain the property of the Government.~~

7. That the facilities included in this license shall not be used for the quartering of personnel engaged in Virginia Air *National Guard activities except when such personnel are in the Federal service* ~~or~~ *participating in authorized training* , or when such personnel are in the Virginia State Service.

8. That as of the date of commencement of this license a joint survey of the property included thereunder, indicating the exact condition thereof, shall be made by the duly authorized representative of the Secretary of the Air Force (or a representative designated by him) and by a representative of the Adjutant General, ~~*State*~~ Commonwealth *of* Virginia *. A written report of said survey shall be attached hereto as Exhibit "B" and become a part hereof as fully as if originally incorporated herein. A like survey and report shall be made upon termination of this license.*

9. That this license may be relinquished by the licensee upon giving thirty (30) days' notice in writing to the Secretary of the Air Force through his duly authorized representative.

~~10. That, on or before the expiration of this license or its relinquishment by the~~ *licensee, the licensee shall vacate the premises, remove all property of the licensee therefrom (excluding those permanent additions, alterations, and improvements which under the provisions of Condition 6 hereof have become the property of the Government), and restore the premises to as good condition as that existing upon the date of commencement of the term of this license, damages beyond the control of the licensee and due to fair wear and tear excepted. If, however, this license is revoked, the licensee shall vacate the premises, remove said property therefrom, and restore the premises as aforesaid within such time as the Secretary of the Air Force may designate. In either event, if the licensee shall fail or neglect to remove said property and so restore the premises, then at the option of the Secretary of the Air Force said property shall either become the property of the Government without compensation therefor, or the Secretary of the Air Force may cause the property to be removed and the premises to be so restored at the expense of the licensee, and no claim for damages against the Government or* ~~its officers or agents shall be created by or made on account of such removal and restoration.~~

DELETED

Prior to execution of this License Agreement, Condition No(s) 4, 5, and 10 were deleted, Condition No(s) 6, 7, and 8 were modified, and Condition No(s) 11, 12, 13, 14, 15, and 16 were added on Page 5 and shall be a permanent part of this agreement.

IN WITNESS WHEREOF, I have hereunto set my hand this 6th *day of* December *19* 91 *, by authority of the Secretary of the Air Force.*

ROBERT P. TURNER
Chief, Real Estate Division

The above instrument, together with all the conditions thereof, is hereby accepted this 10TH *day of* OCTOBER *19*91 *.*

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

JOHN G. CASTLES, MG, USA, Adjutant General

11. That all liabilities, obligations, and duties of the licensee are and shall be contingent upon the availability of federal funds given to the licensee by the National Guard Bureau for the purposes in question. Unless and until such federal funds are made available to the licensee for the purpose of paying the obligations and liabilities or performing the contractual duties in question, the licensee shall not be required to pay or perform the same.

12 That the United States will not be responsible for damages to the property of the licensee, except as permitted under 28 U.S.C. 2671, et seq.

13 That whenever and for whatever reasons this license is terminated, all improvements to the licensed real property shall, at the option of the Commonwealth of Virginia, be removed by the Government at its expense or become and remain the property of the Commonwealth of Virginia in accordance with the terms of the underlying lease for the use of this property from the Commonwealth of Virginia to the Government.

14 That the land and improvements covered hereby are occupied by the United States under Lease No. DACA65-5-85-26 from the Commonwealth of Virginia, Department of Military Affairs for the period beginning 2 October 1987 and ending 1 October 2012. Said lease shall continue for a period of twenty-five years or until the demised premises are no longer used by the lessee for Virginia Air National Guard purposes. The Government also has the option of renewing the lease for an additional twenty-five year period upon the same terms and conditions as the original lease.

15 That the United States of America has exercised its option to extend its Lease Contract No. DACA65-5-85-26 for an additional twenty-five (25) years via Supplemental Agreement No. 1 to the said lease. Therefore, this license is hereby extended for an additional 25 years and will expire according to the terms found in Supplemental Agreement No. 1 to Lease Contract No. DACA65-5-85-26 on 1 October 2037.

16 That the terms of Lease No. DACA65-5-85-26, dated 2 October 1987, (Exhibit "C") from the Commonwealth of Virginia to the Government, whereby the real property now licensed was leased to the Government, together with any supplements and other amendments thereto, shall have precedence and prevail over any conflicting terms contained in this License.

COMMONWEALTH OF VIRGINIA
At Large, to wit:

I hereby certify that the foregoing instrument was acknowledged before me by Robert P. Turner, Chief of the Real Estate Division, United States Army Engineer District, Norfolk, on behalf of the United States of America, this 6th day of December, 1991.

My commission expires: June 19, 1993.

Donald [illegible]

COMMONWEALTH OF VIRGINIA
At Large, to wit:

I hereby certify that the foregoing instrument was acknowledged before me by Major General John G. Castles, the Adjutant General of Virginia, on behalf of the Commonwealth of Virginia, this 15th day of October, 19 91.

My commission expires: Jan. 16 1993

Mary D. [illegible]

APPROVED AS TO FORM:

Date: 8 OCT 1991

Russell L. Boraas
Russell L. Boraas
Assistant Attorney General

~~RECOMMEND APPROVAL:~~

Date:

Ruby G. Martin, Acting Director
Department of General Services
Commonwealth of Virginia

Pursuant to § 2.1-504.3 of the Code of Virginia, as the Governor of the Commonwealth of Virginia, I hereby approve the foregoing lease of real property to the United States of Virginia.

Date:

L. Douglas Wilder
Governor of Virginia

License File No.: 123-L036

RECOMMEND APPROVAL:
DIVISION OF ENGINEERING AND BUILDINGS

By: [signature]
Director

RECOMMEND APPROVAL:
DEPARTMENT OF GENERAL SERVICES

By: RBSmith

APPROVED BY THE GOVERNOR:

Pursuant to § 2.1-504.2 of the Code of Virginia (1950), as amended, as the official designee of the Governor of Virginia, as authorized and designated by Executive Order 35 (91), dated May 30, 1991, I hereby approve the acquisition of the demised premises pursuant to this Lease Agreement and the execution of this instrument for, on behalf of, and in the stead of the Governor of Virginia.

Ruby G. Martin

Ruby G. Martin
Secretary of Administration

10-31-91
(Date)

JOINT SURVEY AND INSPECTION OF CONDITION OF GOVER. NT LEASED PROPERTY-
SECTION III - INTERIOR CONDITION OF INDIVIDUAL ROOM

(Use reverse side for added items and remarks on questioned or disputed items, repairs to be made, etc. Attach sheet, if necessary.)

LEASE NO.	TYPE OF ROOM	FLOOR NO.	ROOM NO.

FLOOR AND FLOOR COVERING *(Include stairways and stair covering)*

WALLS

CEILING

DOORS AND WINDOWS *(Include skylights and other openings)*

PLUMBING *(Include pipes, toilets and lavatories, drinking fountains, etc.)*

ELECTRICAL FIXTURES

HEATING *(Include radiators, thermostats, etc.)*

WOODWORK *(Include trim and baseboard, and hallways)*

OTHER EQUIPMENT *(Include stove, refrigerator, washer, dryer, etc.)*

EXHIBIT "B"

ENG FORM 3143 a (EM 405-1-660)
1 JUN 60

GPO 88 5471

LEASE NO. 123-L0036

SUPPLEMENTAL AGREEMENT NO.3
TO LEASE CONTRACT NO. DACA65-5-85-26
STATE MILITARY RESERVATION, CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA

THIS SUPPLEMENTAL AGREEMENT NO. 3 is made and entered into this 21st day of JUNE, 2001, by and between the Commonwealth of Virginia, Department of Military Affairs, 501 East Franklin Street, Richmond, Virginia, lessor, hereinafter designated the "Commonwealth" and the United States of America, Lessee hereinafter designated as the "Government".

WITNESSTH THAT:

WHEREAS, by Land Lease No. DACA65-5-85-26, dated the 2nd day of October 1987, the Commonwealth granted a Lease to the Government for the use of 28.9218 acres of land for a term of Twenty-five (25) years with an option on a Twenty-five years extension and an option to lease an additional 12.0782 acres, at The State Military Reservation, Camp Pendleton, in the vicinity of the City of Virginia Beach, Virginia; and

WHEREAS, by Supplemental Agreement, No. 1 to Land Lease No. DACA65-5-85-26, the Commonwealth extended the said lease for an additional twenty-five years as outlined in the option shown in the original Land Lease to the Government; and

WHEREAS, by Supplemental Agreement, No. 2 to Land Lease No. DACA65-5-85-26, the Commonwealth granted the use of the additional 12.0782 acres of land as outlined in the original Land Lease to the Government; and

WHEREAS, the Government has requested that the said Lease be amended to permit the use an additional 19.37 acres of land at State Military Reservation, Camp Pendleton for Air National Guard purposes; and

WHEREAS, it has been determined that the aforementioned amendment would be in the best interest of the Commonwealth and the Government.

NOW THEREFORE, the parties hereto do mutually agree as follows:

1. That Lease Contract No. DACA65-5-85-26 is hereby amended to grant to the Government the use of an additional 19.37 acres of land at the State Military Reservation, Camp Pendleton, in the vicinity of the City of Virginia Beach, Virginia making the total acreage of leased parcels 60.37± acres.

2. That the term of the use of the additional 19.37 acres will coincide with the remaining term of the other parcels.

3. That the Exhibits "A-1" (map) and "A-2" (legal description) are attached hereto and made a permanent part of this Supplemental Agreement and the parties hereto acknowledge receipt of a copy of the "Final Environmental Baseline Survey, Camp Pendleton State Military Reservation, Virginia Beach, VA, dated October 1999".

4. That all other terms and conditions of said Lease shall be and remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement No. 3 as of the date first above written.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

By: Claude A. Williams

CLAUDE A. Williams
(Print or type name)
The Adjutant General

UNITED STATES OF AMERICA
By: William E. Edwards
WILLIAM E. EDWARDS, DIRECTOR
AIR FORCE REAL ESTATE AGENCY
(Print or type name)
Deputy Assistant
Secretary of the Air Force
(Installations)

WITNESS:

Julia A. Talbott
JULIA A. TALBOTT
Realty Specialist

Robert F. Menke
ROBERT F. MENKE
Realty Specialist

Supplemental Agreement No. 3
Lease Contract No. DACA65-5-85-26

APPROVED AS TO FORM:

26th DAY OF June, 2001

Robert Osswald

for District Counsel
Norfolk District Corps of Engineers

APPROVED AS TO FORM:

18th DAY OF May, 2001

Assistant Attorney General

RECOMMENDED APPROVAL DIVISION OF ENGINEERING AND BUILDINGS	RECOMMENDED APPROVAL DEPARTMENT OF GENERAL SERVICES
BY: ______________	BY: ______________
(Print or typed Name) Director	(Print or Type Name) Director

APPROVED BY THE GOVERNOR

Pursuant to § 2.1-504.2 of the Code of Virginia (1950), as amended, and by the authority delegated to me under Executive Order Number 31(94) dated October 25, 1994, I hereby approve the acquisition of the demised promises pursuant to this agreement and the execution of this instrument for and on behalf of the Governor of Virginia.

6/7/01
Date

(Print or type name)
Secretary of Administration

District of Columbia
City of WASHINGTON

I hereby certfy that the foregoing instrument was acknowledged before me by ______________________________
the Deputy Assistant Secretary of the Air Force (Installations) on behalf of the United States of America, this ____ day of ______________________, 2001

My commission expires: ______________________

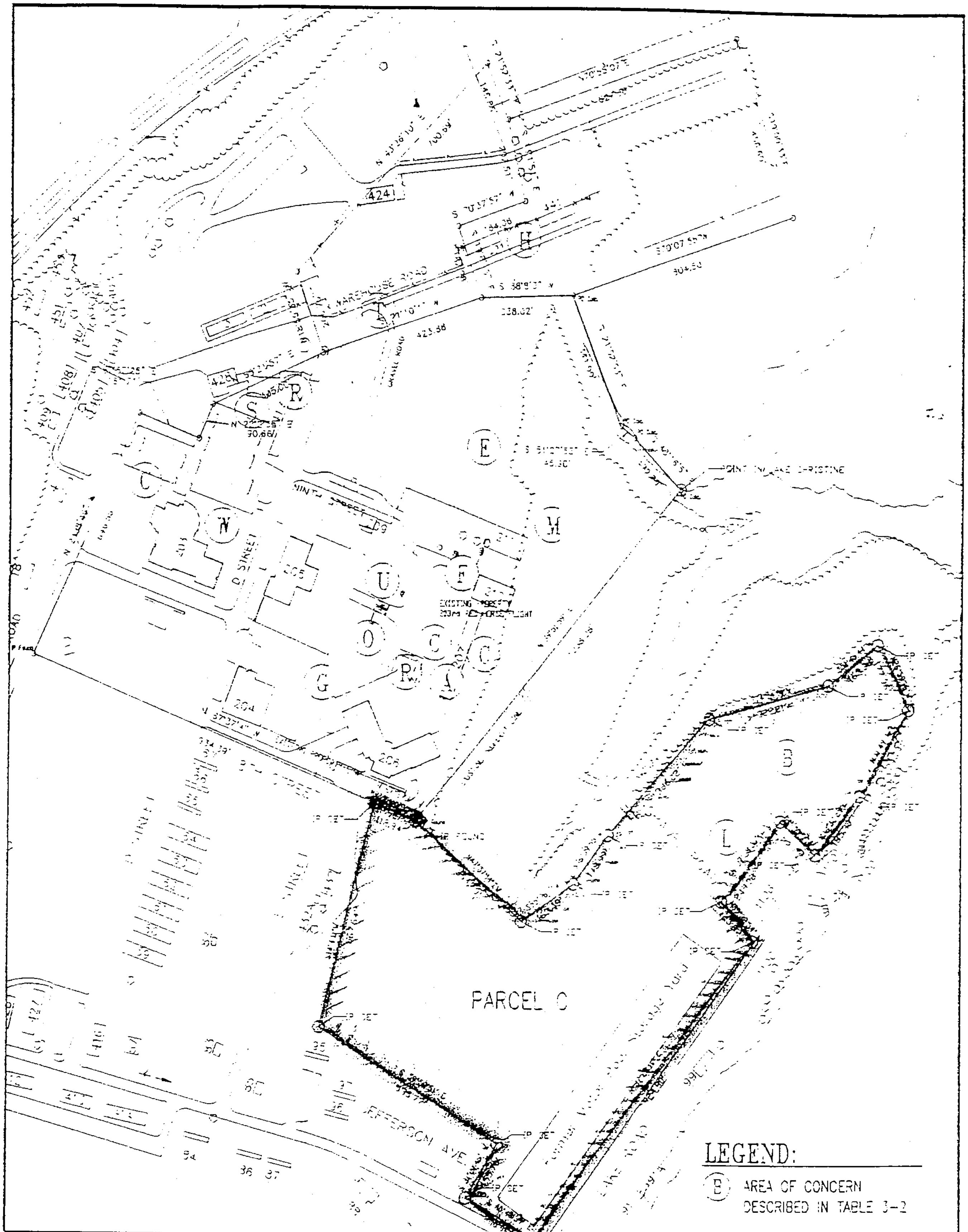
____
____
(Printed Name)

COMMONWEATH OF VIRGINIA
At Large, to wit:

I hereby certfy that the foregoing instrument was acknowledged before me by CLAUDE A. WILLIAMS
The Adjutant General of Virginia, on behalf of the Commonwealth of Virginia, this 20th day of JUNE, 2001

My commission expires: 31 MARCH 2005

RODERICK L. McALLISTER
(Printed Name)



SCALE: 1" = 450'

EXHIBIT "A-1"

Oct. 1999

FIGURE

EBS

AREAS OF CONCERN WITHIN PROPERTY BOUNDARIES
VIRGINIA AIR NATIONAL GUARD, VIRGINIA BEACH

3-1

FILE NAME: PROP BOUND DWG

203RD Red Horse Flight
P.O. Box 180
Virginia Beach, Virginia 23458-0180

Acquisition Office, U.S. Army Corps of Engineers, Norfolk District

Located substantially as shown on Exhibit "A", attached hereto and made part hereof, and described as follows:

Parcel C - Beginning at a pin along the southern side of Existing Parcel A; along existing property line N67°37'04"W a distance of 112.82' to a pin on the existing property line; thence, S14°04'11"W a distance of 567.64' to a pin near facility 97; thence, S59°58'51"E a distance of 535.77' to a pin located between facility 97, and the asphalt training site: thence, S31°20'39"W a distance of 155.70' to a pin 25' offset from Jefferson Avenue; thence, S60°43'39"E a distance of 200.96' parallel to Jefferson Avenue, to a pin near the north east corner of the intersection of Jefferson Avenue and Lake Road; thence, N37°28'11"E a distance of 924.80' parallel to Lake road to a pin on the north east corner of Lake Road and a gravel road; thence, N39°32'54"W a distance of 125.82' parallel to Gravel Road to a pin; thence, N37°38'36"E a distance of 249.08' offset to the west side of facility 110B to a pin; thence, S50°09'14"E a distance of 122.73' to a pin located 15' offset from a concrete parking apron; thence, N38°32'29"E a distance of 185.30' parallel to concrete apron to a pin; thence, N38°32'29"E a distance of 185.30' parallel to concrete apron to a pin; thence, N30°49'36"E a distance of 246.41' parallel to wooded area to a pin; thence, N26°59'16"W a distance of 177.96' parallel to wooded area to a pin; thence, S51°45'44"W a distance of 163.38' parallel to wooded area to a pin; thence, S74°54'00"W a distance of 322.21' parallel to wooded area to a pin; thence, S41°13'47"W a distance of 336.02' parallel to wooded area to a pin; thence, S36°39'55"W a distance of 148.99' parallel to wooded area to a pin; thence, S55°36'07"W a distance of 163.49' parallel to wooded area to a pin; thence, N47°57'14"W a distance of 364.49' parallel to wooded area to the point of beginning, and containing 19.3698 acres.

Dated this 18th day of April, 1999

EXHIBIT "A-2"

Michael A. McCarthy,
Lt. Col,
Deputy Commander
203RD Red Horse Flight
P.O. Box 180
Virginia Beach,
Virginia 23458-0180

SUPPLEMENTAL AGREEMENT NO. 2
TO
LEASE NO. DACA65-5-85-26

This Supplemental Agreement, made and entered into this ____26__ day of __February______, 1997, by and between the Commonwealth of Virginia, Department of Military Affairs, 501 East Franklin Street, Richmond, Virginia, Lessor, hereinafter referred to as the "Commonwealth" and the United States of America, Lessee, hereinafter called the "Government".

WITNESSETH:

WHEREAS, on the 2nd day of October, 1987, the aforesaid lease was entered into by and between the Commonwealth and the Government for the land described therein located on the State Military Reservation, Camp Pendleton, Virginia Beach, Virginia; and

NOW THEREFORE, the Government is exercising its option, described in the therein above mentioned lease, to lease additional acreage (Parcel B containing 12.0782 acres) under the same terms and conditions as are contained therein in the above mentioned lease with respect to Parcel "A."

The Government agrees that it shall make improvements to Parcel "B" and thereafter provide continuing maintenance of Parcel "B," at the expense of the Government, for the use of the Virginia Air National Guard described in the aforesaid lease or an acceptable substitute unit.

It is understood and agreed by the parties hereto that all other terms and conditions of Lease No. DACA65-5-85-26 and supplemental agreements thereto, shall remain the same and in full effect.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement No. 2 as of the date first above written.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

By: Carroll Thackston

CARROLL THACKSTON
Major General, VaARNG
The Adjutant General

THE UNITED STATED OF AMERICA

By: William E. Edwards

ROBERT F. [illegible]
WILLIAM E. EDWARDS, DIRECTOR
AIR FORCE REAL ESTATE AGENCY
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS)

SUPPLEMENTAL AGREEMENT NO. 2
TO LEASE NO. DACA65-5-85-26

APPROVED AS TO FORM:

8th day of August, 1996.

William A. Diamond

William A. Diamond
Assistant Attorney General

RECOMMEND APPROVAL:
DIVISION OF ENGINEERING AND

BY: N I Broocke

Nathan I. Broocke
Director

RECOMMEND APPROVAL:
DEPARTMENT OF GENERAL SERVICES

By: Donald C Williams

Donald C. Williams
Director

APPROVED BY THE GOVERNOR:

Pursuant to § 2.1-504.2 of the Code of Virginia (1950), as amended, and by the authority delegated to me under Executive Order Number 31 (94), dated October 25, 1994, I hereby approve the acquisition of the demised premises pursuant to this License and the execution of this instrument for and on behalf of the Governor of Virginia

9/19/96
Date

Michael E. Thomas

Michael E. Thomas
Secretary of Administration

Air Guard (40 Acres)

LEASE NO. 123-L036

SUPPLEMENTAL AGREEMENT NO. 1
TO
LEASE NO. DACA65-5-85-26

This Supplemental Agreement, made and entered into this 4th day of December, 1991 ~~1990~~, by and between the Commonwealth of Virginia, Department of Military Affairs, 501 East Franklin Street, Richmond, Virginia, Lessor, hereinafter referred to as the "Commonwealth", and the United States of America, Lessee, hereinafter called the "Government".

WITNESSETH:

WHEREAS, on the 2nd day of October, 1987, the aforesaid lease was entered into by and between the Commonwealth and the Government for the land described therein located on the State Military Reservation, Camp Pendleton, Virginia Beach, Virginia; and

WHEREAS, by virtue of mutually agreed terms set forth in Paragraph 3. of said lease, the Government hereby elects to extend Lease DACA65-5-85-26 covering Parcel A for an additional twenty-five (25) years upon the same terms and conditions.

NOW, THEREFORE, this lease is amended as follows:

Change Paragraph 3. to read as follows:

"3. TERM OF THE LEASE. The term of this lease shall commence on the 2nd day of October, 1987 and shall continue for a period of fifty (50) years thereafter or until such earlier time as the demised premises are no longer used by the Lessee for Virginia Air National Guard purposes."

It is understood and agreed by the parties hereto that all other terms and conditions of Lease DACA65-5-85-26 shall remain the same and in full effect.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement No. 1 as of the date first above written.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MILITARY AFFAIRS

BY John W. Castles

THE UNITED STATES OF AMERICA

BY Robert P. Turner
ROBERT P. TURNER
Chief, Real Estate Division
U.S. Army Engineer District, Norfolk

COMMONWEALTH OF VIRGINIA
At Large, to wit:

I hereby certify that the foregoing instrument was acknowledged before me by Robert P. Turner, Chief of the Real Estate Division, United States Army Engineer District, Norfolk, on behalf of the United States of America, this 4th day of December, 1991.

My commission expires: 9 June 1993

Diane D. Mountain

DIANE D. MOUNTAIN
(Printed Name)

COMMONWEALTH OF VIRGINIA
At Large, to wit:

I hereby certify that the foregoing instrument was acknowledged before me by Major General John G. Castles, the Adjutant General of Virginia, on behalf of the Commonwealth of Virginia, this 10th day of October, 1991.

My commission expires: Jan 16 1993

Mary S. Sunderlin

Mary S. Sunderlin
(Printed Name)

CASE NO. 1231036

LAND LEASE

BETWEEN
THE COMMONWEALTH OF VIRGINIA,
DEPARTMENT OF MILITARY AFFAIRS

AND

THE UNITED STATES OF AMERICA

Air Guard

LN 3768

Department of the Army, Corps of Engineers
North Atlantic Division, Norfolk District
Lease No. DACA65-5-85-26

THIS LEASE, made and entered into this 2nd day of October, 1987, by and between the Commonwealth of Virginia, Department of Military Affairs, Lessor, whose address is 501 East Franklin Street, Richmond, Virginia 23219, and whose interest in the property hereinafter described is that of fee owner for its successors and assigns, hereinafter called the "Commonwealth", and the United States of America, Lessee, hereinafter called the "Government".

WITNESSETH: The parties hereto for the consideration hereinafter mentioned covenant and agree as follows:

1. The Commonwealth hereby leases to the Government for it and its assigns exclusive use of the following described premises located on State Military Reservation, Camp Pendleton, in the vicinity of the City of Virginia Beach, Virginia.

<u>Parcel A.</u> - Beginning at a pin at the southeast intersection of Headquarters Road and Eighth Street Extended; along east side of Headquarters Road N 24°08'46" E a distance of 646.66' to a pin, at the northeast intersection of Ninth Street and Headquarters Road; thence S 67°57'25" E along the north side of Ninth Street a distance of 161.71' to a pin; thence N 22°02'35" E 90.66' to a pin; thence N 65°21'57" E a distance of 305.00' to a pin; thence S 71°17'19" W 423.88' to a pin; thence S 88°08'03" W 238.02' to a pipe; thence S 21°52'53" E a distance of 341.00' to a point in Lake Christine; thence S 51°27'53" E 45.90' to a point in Lake Christine; thence S 43°16'05" E 172.89' to a point in Lake Christine; thence S 39°51'59" W a distance of 1,058.08' to a pin on the south side of Eighth Street; thence N 67°37'04" W along the south side of Eighth Street of 1,047.21' to the point of beginning and containing 28.9218 acres.

2. CONSIDERATION. The consideration for this lease to the Government and the options granted to the Government herein shall be the establishment by the Government of a new Virginia Air National Guard construction engineering unit, which shall be located on the demised premises together with the construction and continuing maintenance of such facilities upon said premises as are needed for the housing and training of said unit, all at the expense of the Government.

3. TERM OF THE LEASE. The term of this lease shall commence on the date when the fully executed lease agreement is approved, in writing, by the Governor of the Commonwealth or his designee and shall continue for a period of twenty-five (25) years thereafter or until such earlier time as the demised premises are no longer used by the lessee for Virginia Air National Guard purposes. The Government is hereby granted an option to renew the lease of Parcel A for an additional twenty-five (25) years upon the same terms and conditions, provided that the Government shall given written notice of its exercise of said option by delivering said notice to the Adjutant General of Virginia no later than one year prior to the expiration date of this lease.

4. OPTION TO LEASE ADDITIONAL ACREAGE. The Commonwealth hereby grants to the Government an option to lease, on the same terms and conditions as are contained herein with respect to Parcel "A", an additional tract of land located on the State Military Reservation, Camp Pendleton, in the City of Virginia Beach, Virginia, to be used for the expansion of facilities for the housing and training of the aforesaid Virginia Air National Guard Unit or acceptable substitute unit. Said tract is described as follows:

> Parcel B. - Beginning at a pipe at the northeast corner of the aforementioned Parcel A in the dividing line of said property and subdivision of Croatan Beach (renamed "Lake Christine") thence S 88°08'03" W a distance of 238.02' to a pin; thence S 71°17'19" W a distance of 423.88' to a pin; thence N 19°00'56" W a distance of 206.68' to a pin; thence N 43°26'10" E 700.62' to a pin in the dividing line of said property and "Parcel 29 - Croatan Beach", thence along said dividing line S 21°52'53" E a distance of 146.76' to a pipe; thence N 70°55'07" E 627.30' to a pipe; thence S 19°00'53" E a distance of 456.60' to a pipe; thence S 70°55'07" W a distance of 6043.50' to a pipe, the point of beginning and containing 12.0782 acres.

This option may be exercised only during the original twenty-five (25) year term of the lease of Parcel "A". The lease of Parcel "B" shall commence on such date as the Government exercises this option by delivering written notice thereof to the Adjutant General of Virginia, and shall continue until the expiration of the lease of Parcel "A", so that the lease of Parcels "A" and "B" shall terminate simultaneously, whether because of the passage of time or because the demised premises are no longer used by the lessee for Virginia Air National Guard purposes, whichever occurs first.

The Commonwealth further grants to the Government an option to extend said lease for a period of twenty-five (25) years, said option to be identical to and exercised in the same manner as the option to extend the lease on Parcel "A", which is granted herein. The consideration for the lease of Parcel "B" shall be the improvement and continuing maintenance of Parcel "B" by the Government at its expense for the use of the said Virginia Air National Guard unit or acceptable substitute unit.

5. IMPROVEMENTS. The Government may, at its sole expense, make such improvements on the demised premises as it deems necessary. The design and location of all buildings and any appurtenant structures of any nature erected by the Government on Parcels "A" and "B" shall be subject to review by the Commonwealth's Art and Architectural Review Council and to the approval of the Governor of the Commonwealth pursuant to § 2.1-488.4 of the Code of Virginia. Regardless of the reason for which the leases may be terminated, at such time as the lease of either or both Parcels "A" and "B" terminates, all improvements thereon shall, at the option of the Commonwealth and without any additional consideration, be removed by the Government or become and remain the property of the Commonwealth. During the term of the lease of Parcel "A" or "B" or any extension thereof, any improvements erected upon Parcel "A" and/or "B" shall be maintained by the Government, at its expense, in a high state of repair so that they remain attractive and useful for their normal purposes and do not deteriorate and/or become unsightly. In the event that the Government allows the demised premises and/or the improvements which it constructs thereon to deteriorate and/or become unsightly, the Commonwealth may repair and maintain said premises and the improvements thereon and the Government shall reimburse it for any expenses incurred thereby.

6. UTILITIES. All utilities serving the demised premises shall be separately metered from the rest of Camp Pendleton and all expenses for utilities serving the demised premises shall be paid by the Government.

7. INTERIM FACILITIES. During the construction of necessary facilities on Parcel "A" the United States may continue to use for the housing and training of said Virginia Air National Guard unit, those facilities described in paragraph 4 of the "Authorization To Use Camp Pendleton" executed by Major General John G. Castles, Adjutant General of Virginia, and approved by the Secretary of Transportation, Andrew B. Forgarty, on 31 May 1984, a copy of which is attached hereto as Exhibit "A". Each of the individual interim facilities described in said paragraph may continue to be used by the United States until such time as a permanent facility serving the purpose of the interim facility is constructed or until 31 May 1995, whichever comes first. Said interim facilities shall be used under the terms and conditions of said "Authorization To Use Camp Pendleton".

8. INGRESS AND EGRESS. During the term of this lease or any extension thereof, the Government is hereby granted the right-of-ingress and egress to the demised premises by way of the now-existing main road or any other main roads hereafter constructed, leading from the Camp Pendleton's main entrance to Parcel "A" and/or Parcel "B" and including the right-of-ingress and egress over main roads on other lands of the lessor, provided such ingress and egress is necessary and not otherwise conveniently available to the Government. Said right-of-ingress and egress shall be subject to such reasonable restrictions as may be imposed by the Commonwealth to preserve and protect said roadway (for example, restrictions as to weights of vehicles and loads). Said right-of-ingress and egress shall also be subject to such restrictions as to hours and times of operation as may be imposed by the Commonwealth upon Camp Pendleton generally.

9. COMMAND AUTHORITY. The overall command and control of Camp Pendleton shall remain vested in the Governor of the Commonwealth of Virginia and those appointed under him. This acknowledgement of the Governor's command and control in this lease shall not in any way be interpreted to change the responsibility of the Government for the demised premises or its liability resulting from injury to persons and property thereon.

10. USE BY THE COMMONWEALTH. Nothing herein shall prohibit the Government from permitting use of all or portions of the demised premises by the Virginia Army National Guard, other organizations of the Virginia militia, and other agencies and institutions of the Commonwealth in addition to the planned use of the premises by the Virginia Air National Guard.

11. Any notice under the terms of this lease shall be in writing, signed by a duly authorized representative of the party giving such notice and, if given by the Government, shall be addressed to the Lessor at Commonwealth of Virginia, Department of Miliary Affairs, 501 East Franklin Street, Richmond, Virginia 23219, and, if given by the Lessor, shall be addressed to District Engineer, U.S. Army Engineer District, Norfolk, ATTN: Real Estate Division, 803 Front Street, Norfolk, Virginia 23510-1096. Either party may at any time give notice to the other of a new address for the delivery of notices.

12. FACILITY NONDISCRIMINATION.

a. As used in this section, the term "facility" means Parcels A and B and the interim facilities described in paragraph 7 of this lease.

b. Both parties agree that they will not discriminate by segregation or otherwise against any person or persons, because of race, color, religion, sex, or national origin, in their use of the facilities.

c. It is agreed that either party's noncompliance with the provisions of this section shall constitute a material breach of this lease. In the event of such noncompliance, either party may take appropriate action to enforce compliance, may terminate this lease or may pursue such other remedies as may be provided by law.

IN WITNESS WHEREOF, the Commonwealth of Virginia and the United States of America have caused this lease agreement to be executed by their duly authorized representatives.

COMMONWEALTH OF VIRGINIA,
DEPARTMENT OF MILITARY AFFAIRS

BY: John G. Castles

JOHN G. CASTLES, MG
Adjutant General

THE UNITED STATES OF AMERICA

BY: ______________________

L. E. RICE, JR.
Chief, Real Estate Division
U.S. Army Engineer District, Norfolk

State of Virginia
At Large, to-wit:

I hereby certify that the foregoing Land Lease was acknowledged by John G. Castles, the Adjutant General of Virginia, on behalf of the Commonwealth of Virginia, before me and in my jurisdiction, this 2nd day of October, 1987.

My Commission expires:

March 29, 1991

Janet L. Loth

Notary Public

State of Virginia
At Large, to-wit:

I hereby certify that the foregoing Land Lease was acknowledged by L. E. Rice, Jr., Chief, Real Estate Division, U.S. Army Engineer District, Norfolk, on behalf of the United States of America, before me and in my jurisdiction, this 24th day of September, 1987.

My Commission expires:

June 4, 1989

Notary Public

Approved as to Form

this 2nd day of October, 1987.

BY: Russell L. Boraas
RUSSELL L. BORAAS
Assistant Attorney General

Recommended Approval:

N I Broocke
NATHAN I. BROOCKE, DIRECTOR
Division of Engineering and Building
Department of General Services

Recommended Approval:

Wendell E. Seldon
WENDELL E. SELDON, DIRECTOR
Department of General Services

Pursuant to Section 2.1-504.2 of the Code of Virginia and by the authority delegated to me by the Governor of the Commonwealth of Virginia as Secretary of Administration, by Executive Order Number 29 (86) dated November 15, 1986, I hereby approve the above lease of real property by the Commonwealth of Virginia on behalf of the Governor.

Carolyn J. Moss
CAROLYN J. MOSS
Secretary of Administration

November 16, 1987

Real Estate Division

Ms. Mary Sue Terry
Attorney General
Office of the Attorney General
Superior Court Building
101 North Eight Street
Richmond, Virginia 23219

Dear Ms. Terry:

Enclosed is fully executed copy of Land Lease No. DACA65-5-85-26 for The Virginia Air National Guard Construction Engineer Engineering Unit, located on State Military Reservation, Camp Pendleton, Virginia Beach, Virginia.

Thank you for your cooperation in this matter.

Sincerely,

D. Bruce Sharp,
Acting Chief, Real Estate Division

Enclosure
Copy Furnished:
Dept. of Army & Air Force, National Guard Bureau, ATTN: NGB-JA,
Wash., D. C. 20310-2500
Commonwealth of Va., Dept. of Military Affairs, Adjutant General's Office,
501 E. Franklin St., Rich, Va. 23219-2317
Dept. of Army & Air Force, National Guard Bureau, ATTN: ANGSC/DEP
Andrews AFB, Md. 20331-6008
Cdr., 203rd CEF(HR), ATTN: DEMO, P. O. Box 180, Va. Beach, Va.
Cdr., Dept. of Army & Air Force, National Guard Bureau, ATTN: ANGSC/DEP
Wash., D.C. 20310-2500
Commonwealth of Va., The Adjutant General, ATTN: VAFM, 501 E. Franklin
St., Rich., Va. 23219
LTC. William A. Prosise, Jr., 203rd Civil Eng. Flight (Heavy Repair),
P. O. Box 180, Va. Beach, Va. 23458
Commonwealth of Va., Dept. of Military Affairs, ATTN: VAAG-JA, 501 E.
Franklin St., Rich., Va. 23219

SUPPLEMENTAL AGREEMENT NO. 3
to
LICENSE NO. DACA65-3-92-08
between
THE UNITED STATES OF AMERICA
and
STATE MILITARY RESERVATION, CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA

THIS SUPPLEMENTAL AGREEMENT NO. 3 is made and into this 24 day of Aug, 2014 by and between the United States of America (Government (Grantor) granted to the Commonwealth of Virginia, Department of Military Affairs, 501 East Franklin Street, Richmond, Virginia (Virginia Air National Guard (Grantee).

WITNESSETH:

WHEREAS, by license agreement DACA65-3-92-08 commencing 2 October 1987 and terminating 1 October 2037 for the use and occupancy of 28.9218 acres of land for fifty (50) years; and

WHEREAS, by Supplemental Agreement No. 2 to License No. DACA65-3-93-08, the Government granted the use an additional 12.0782 acres of land to the Virginia Air National Guard; and

WHEREAS, Supplemental Agreement No. 2, the license was amended to give the Virginia Air National Guard the use of an additional 19.37 acres of land at the State Military Reservation Camp Pendleton, in the vicinity of the City of Virginia Beach, Virginia making the total acreage of the Licensed parcels 60.37± acres; and

WHEREAS, The Government would like to now extend the License DACA65-3-92-08 for an additional twenty-five (25) years to correspond with the extension of Lease DACA65-5-85-26;

NOW, THEREFORE, the parties hereto, in consideration of mutual benefits to be derived hereunder, do hereby amend said (instrument type) in the following respects and in these respects only:

The term of this license shall be extended and commence on the 2 October 2037 and shall continue for a period of twenty-five (25) years thereafter or until such earlier time as the demised premises are no longer used by the Virginia Air National Guard.

All other terms and conditions of the aforesaid (type of instrument) are hereby ratified and, except as modified by this Supplemental Agreement, shall remain in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand by authority of the _____ (Grantee) this ______ day of _______________, 2014.

COMMONWEALTH OF VIRIGNIA
MILITARY AFFAIRS

____

THIS SUPPLEMENTAL AGREEMENT (or AMENDMENT) is also executed by The Government under the authority of the Secretary of the Air Force this 24 day of Sep, 2014.

UNITED STATES OF AMERICA

C Diane Bailey
C. DIANE BAILEY, GS-15, DAF
Chief, Real Estate Transactions Division
Installations Directorate

United States
Department of
Agriculture

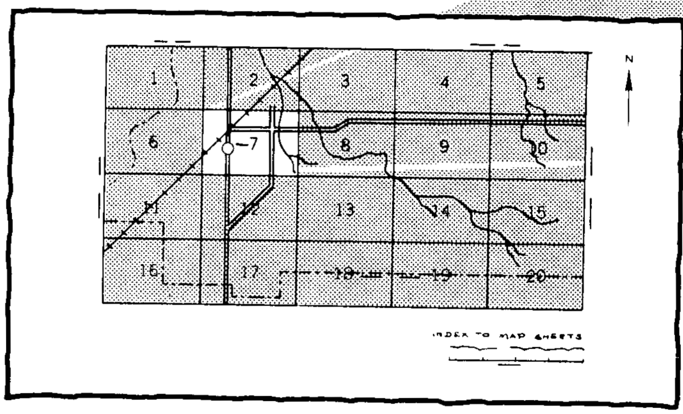
Soil
Conservation
Service

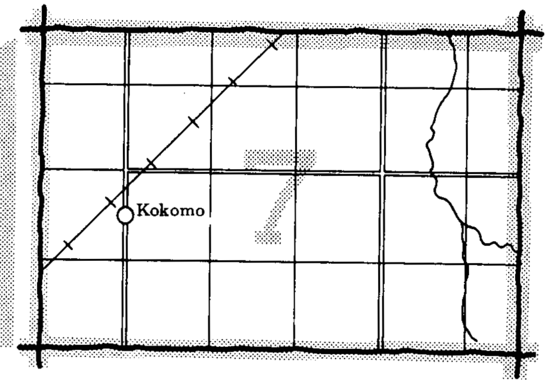
In cooperation with
Virginia
Polytechnic
Institute and
State University

Soil Survey of City of Virginia Beach, Virginia

HOW TO USE

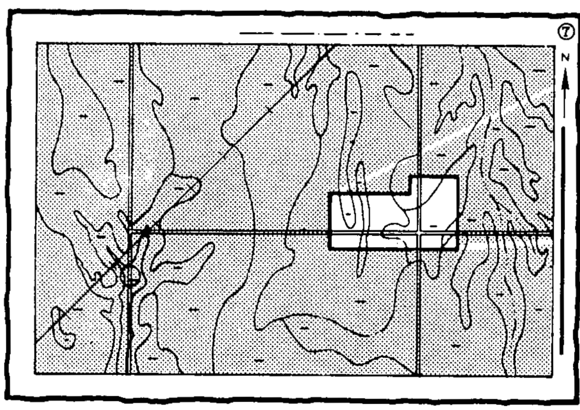
1. Locate your area of interest on the "Index to Map Sheets."

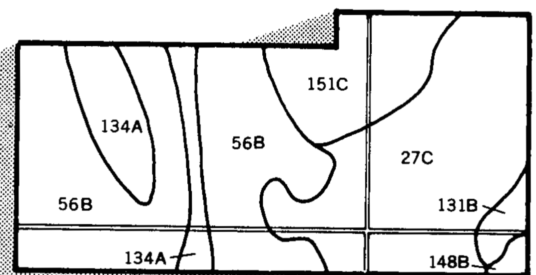




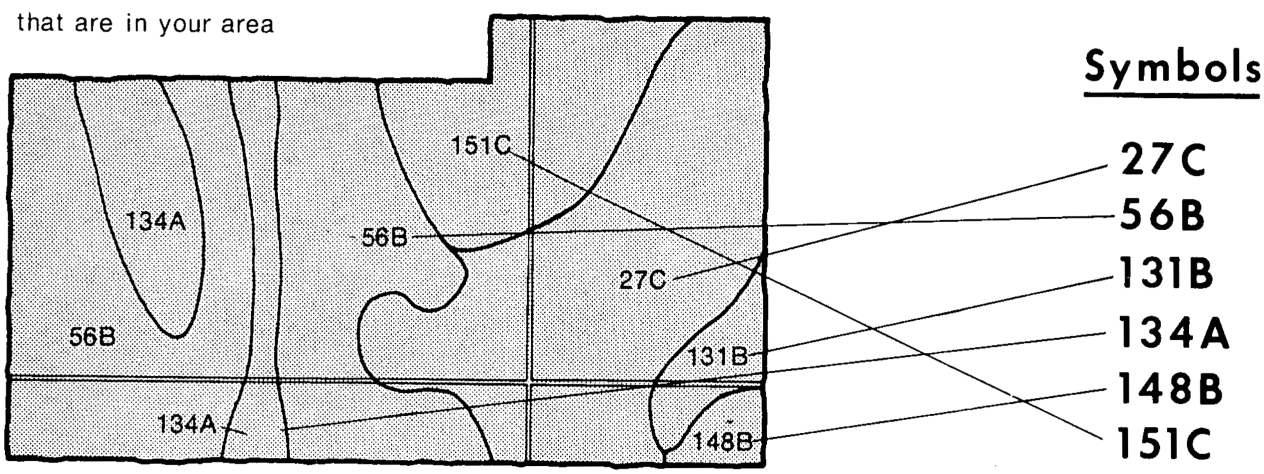
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



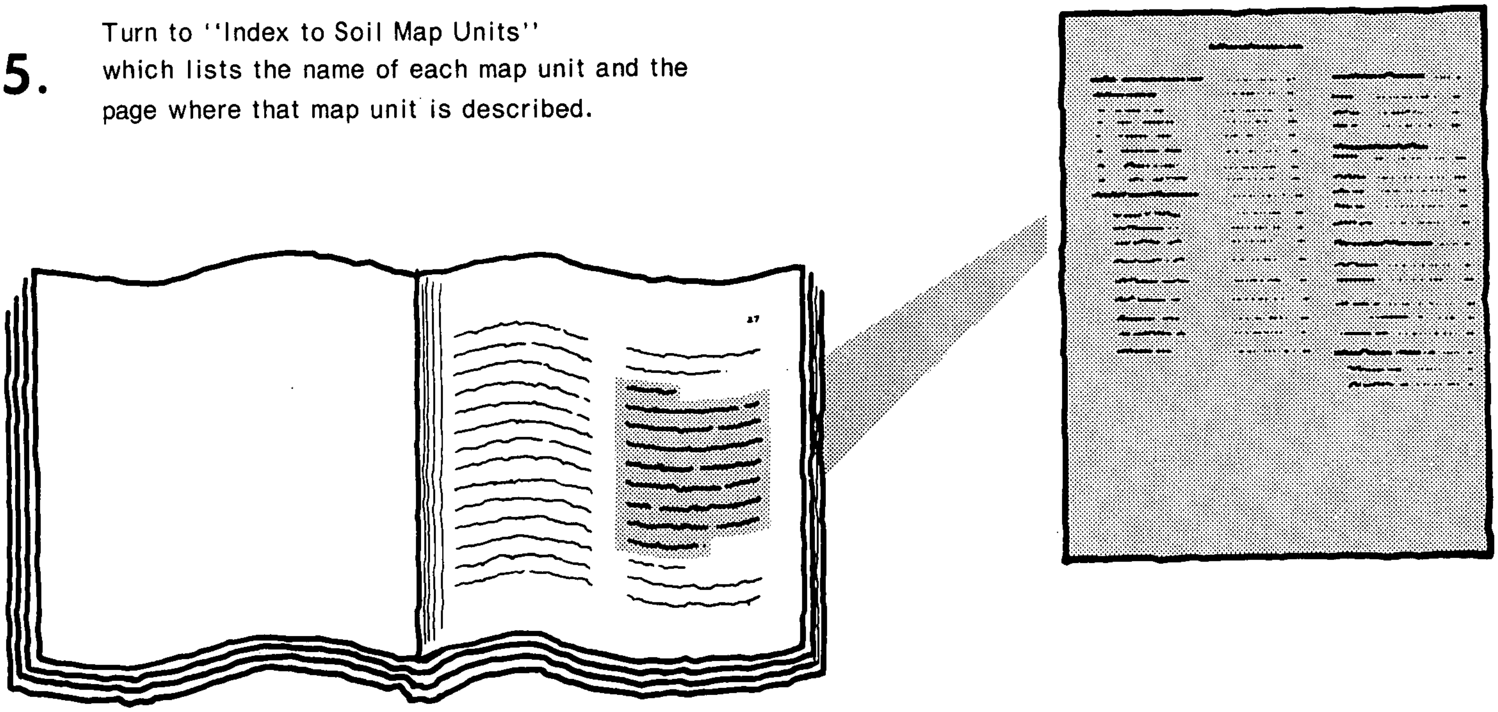


4. List the map unit symbols that are in your area

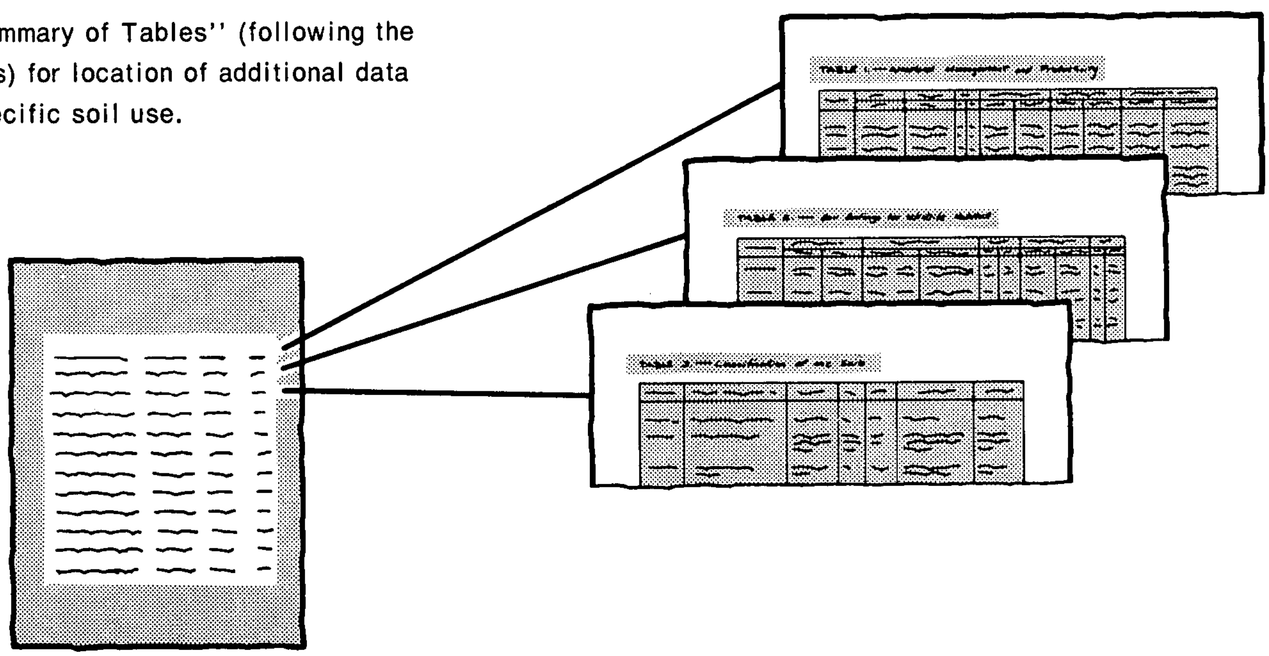


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service and the Virginia Polytechnic Institute and State University. The survey is part of the technical assistance furnished to the Virginia Dare Soil and Water Conservation District and was financed in part by the Virginia Soil and Water Conservation Commission and the City of Virginia Beach City Council.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A cultivated area of Acredale silt loam adjacent to a housing development.

Contents

soil series

Issued September 1985

Index to Map Units

Summary of Tables

Foreword

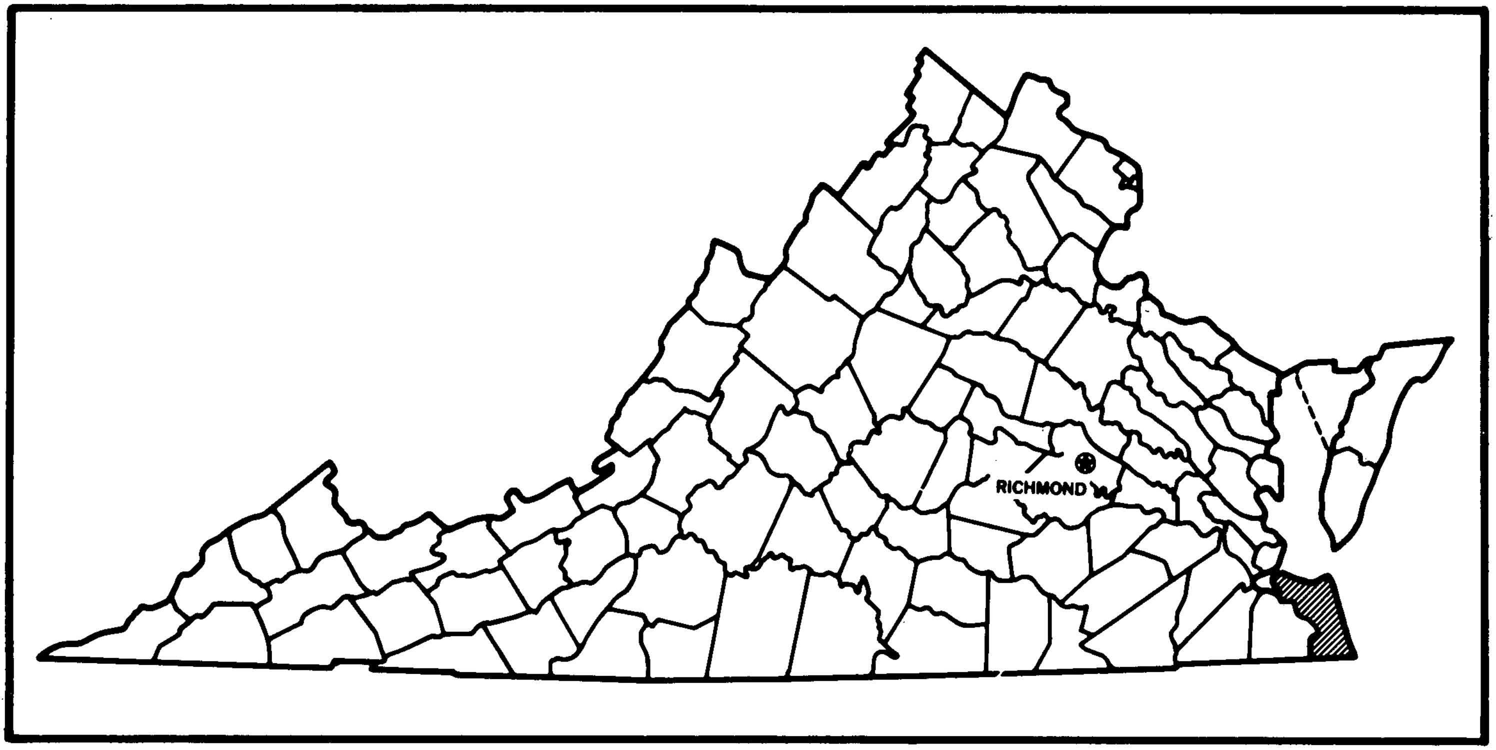
This soil survey contains information that can be used in land-planning programs in the City of Virginia Beach. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service, the Cooperative Extension Service, or the soil scientist for the City of Virginia Beach Environmental Services.

Manly S. Wilder
State Conservationist
Soil Conservation Service



Location of City of Virginia Beach in Virginia.

Soil Survey of
City of Virginia Beach, Virginia

By Danny R. Hatch, James E. Belshan, Steve M. Lantz,
George R. Swecker, and Dave E. Starner,
Virginia Polytechnic Institute and State Univesity

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Virginia Polytechnic Institute and State University

THE CITY OF VIRGINIA BEACH is in the extreme southeastern corner of Virginia and was formed in 1963 from a merger of Princess Anne County and the town of Virginia Beach. Richmond, the State capital, is 117 miles to the northwest, and Raleigh, North Carolina, is 190 miles to the southwest. The City of Virginia Beach has an area of about 309 square miles, or 197,590 acres. Its population has grown from about 20,000 in 1940 to nearly 260,000 in 1981.

This soil survey provides additional and more detailed information to a survey that was published in 1945, when the area was known as Princess Anne County (*6*). The descriptions, names, and boundaries of the soils in this survey do not in all instances agree with those in the earlier survey or with those in adjoining counties. The differences are the results of an expanded knowledge of the soils, changes in methods of soil classification, and differences in the detail of the maps.

General Nature of the Survey Area

This section provides data about the climate of the survey area and describes some of the natural and cultural factors that influence land use.

Climate

Provided by Virginia Polytechnic Institute and State University.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Norfolk in the period 1949 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 42 degrees F, and the average daily minimum temperature is 33 degrees. The lowest temperature on record, which occurred at Norfolk on January 17, 1977, is 5 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Norfolk on July 23, 1952, is 103 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 45 inches. Of this, 25 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 22 inches. The heaviest 1-day rainfall during the period of record was 7.41 inches at Norfolk on August 31, 1964. Thunderstorms occur on about 37 days each year, and most occur in summer.

The average seasonal snowfall is 7.2 inches. The greatest snow depth at any one time during the period of record was 11 inches. On an average of 1 day, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 58 percent. Humidity is higher at night, and the average at dawn is about 78 percent. The sun shines 63 percent of the time possible in summer and 56 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 10.6 miles per hour, in March.

The survey area frequently is subject to storms out of the northeast during fall, winter, and spring. These storms can produce localized flooding and severe shoreline erosion. The summer in Virginia Beach produces numerous thunderstorms whose strong winds and heavy rains sometimes result in localized flooding. Although Virginia Beach is north of the track usually followed by hurricanes and tropical storms, the City has been struck infrequently by hurricanes.

Physiography, Relief, and Drainage

The City of Virginia Beach lies entirely within the Tidewater area of the Atlantic Coastal Plain. The physiography of the survey area consists of narrow, subdued, well drained ridges; broad, poorly drained flats; and coastal areas (*3*). The ridges generally are oriented in a north-south direction and are separated by the broad flats. The rounded ridgecrests mainly are 5 to 15 feet above the lower lying flats. Some areas on Pungo Ridge have an elevation of 18 to 21 feet above sea level. The Oceana Ridge, in the northern part of the city, has some elevations as much as 25 to 30 feet above sea level, and slightly higher elevations are in some western parts of the city.

The coastal areas consist of marshes, beaches, and dunes. The dunes on the Outer Banks of the survey area typically range from 20 to 25 feet in elevation, but a few solitary dunes south of False Cape are about 55 feet above sea level. The wooded dunes in the Cape Henry area range from about 20 to 85 feet above sea level.

Most of the survey area is nearly level to gently sloping. Some areas near drainageways, mostly in the northern part of the survey area, are strongly sloping to steep. Dunes in the coastal areas are mostly gently sloping to steep.

Several large rivers and bays and many lakes and drainageways are throughout the survey area. Some drainageways are bordered by low ridges consisting of well drained or moderately well drained soils; some are bordered by a narrow rim of well drained to somewhat poorly drained soils that grade to poorly drained soils farther from the edge of the drainageway.

The drainage pattern in the survey area is fairly well defined in the northern third and is more poorly defined in the southern two-thirds. The northern areas are drained by the Lynnhaven River, Little Creek, and the Elizabeth River. The southern part is drained by West Neck, Back Bay, the North Landing River, and Blackwater Creek. These drainageways are influenced by windtides. The water is highest when sustained southerly breezes cause flooding in low-lying (generally less than 3 feet above sea level) areas adjacent to the drainageways. Remnants of a former small eastward-flowing drainage network, which includes Rudee Inlet, Owl Creek, Redwing Lake, and Lake Tecumseh, are part of a once larger system that has been nearly destroyed by headland retreat of the coast.

Industry

The City of Virginia Beach has a broad economy based on agriculture, tourism, light industry, and the military.

Most farms are in the southern part of the survey area. The major crops are corn, soybeans, and small grains and some vegetables and other specialty crops.

Much of the industry in the area is related to services for the more than 1.5 million tourists that visit Virginia Beach each year. Light industry and providing a civilian workforce and services for the numerous military installations in and near the survey area also play an important role in the local economy.

How This Survey Was Made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; and the kinds of native plants or crops. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Areas dominated mostly by poorly drained to well drained soils; on uplands

The map units in this group mostly are inland. The soils formed mainly in marine and fluvial deposits on upland ridges and side slopes and on broad, nearly level flats. The soils have a subsoil that dominantly is loamy.

1. Acredale-Tomotley-Nimmo

Poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of nearly level soils in broad flat areas mainly in the central and southern parts of the City. Slopes range from 0 to 2 percent. The map unit makes up about 41 percent of the survey area. Acredale soils make up about 50 percent of the map unit, Tomotley soils about 18 percent, Nimmo soils about 14 percent, and soils of minor extent about 18 percent.

The Acredale soils are slowly permeable. They have a surface layer of silt loam, a subsoil of silt loam and silty clay loam, and a substratum of fine sandy loam.

The Tomotley soils are moderately permeable. They have a surface layer of loam, a subsoil of loam and sandy clay loam, and a substratum of loamy sand.

The Nimmo soils are moderately permeable. They have a surface layer of loam, a subsoil of sandy loam and loam, and a substratum of fine sand.

The minor soils are somewhat poorly drained Augusta, Chapanoke, and Dragston soils and very poorly drained Hyde, Nawney, and Portsmouth soils. The Augusta, Chapanoke, and Dragston soils are around the outer edges of this map unit and on small knolls at slightly higher elevations. The Hyde and Portsmouth soils are in slight depressions, and the Nawney soils are in swampy drainageways.

This map unit is used mostly for cultivated crops, but some areas are in woodland or are used for community development. A large part of the map unit has been cleared and drained; the drained areas have good suitability for cultivated crops. The unit is suitable for woodland, but wetness in some areas limits the use of heavy equipment. The main limitation for community development is a seasonal high water table.

2. State-Tetotum-Augusta

Well drained, moderately well drained, and somewhat poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of nearly level to gently sloping soils on broad ridges and side slopes. These areas are mainly in the northern part of the City. Slopes range from 0 to 6 percent. The map unit makes up about 15 percent of the survey area. State soils make up about 24 percent of the map unit, Tetotum soils about 22 percent, Augusta soils about 13 percent, and soils of minor extent about 41 percent.

The State soils are on side slopes. They have a surface layer of loam, a subsoil of loam, and a substratum of sandy loam. They are well drained and have moderate permeability.

The Tetotum soils are on low-lying ridges and side slopes. They have a surface layer of loam, a subsoil of loam and clay loam, and a substratum of loamy sand. They are moderately well drained and have moderate permeability.

The Augusta soils are on low-lying ridges and side slopes. They have a surface layer of loam. The upper part of the subsoil is loam and clay loam, and the lower part is clay loam. The substratum is loamy sand. The soils are somewhat poorly drained and have moderate permeability.

The minor soils of this map unit are Urban land and Udorthents, poorly drained Acredale and Tomotley soils, well drained Bojac and Rumford soils, moderately well drained Yeopim soils, and somewhat poorly drained Chapanoke soils. The Chapanoke and Yeopim soils mainly are adjacent to major drainageways and have a subsoil mostly of silt loam or silty clay loam. The Rumford soils are on steeper side slopes. The Bojac soils have a subsoil of fine sandy loam and are on ridges. The Acredale and Tomotley soils are in depressions. Urban land and Udorthents commonly are in the vicinity of residential and commercial centers where the soils have been disturbed by grading and construction.

Most areas of this map unit are in community development or are used for cultivated crops. The remaining areas are in woodland. Most of the unit has good suitability for cultivated crops and woodland. Most areas are suited to community development, but some are limited by a seasonal high water table.

3. Dragston-Munden-Bojac

Somewhat poorly drained, moderately well drained, and well drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of areas of nearly level soils on narrow ridges and side slopes throughout the City. Slopes range from 0 to 2 percent. The map unit makes up about 11 percent of the survey area. Dragston soils make up about 22 percent of this map unit, Munden soils about 21 percent, Bojac soils about 13 percent, and soils of minor extent about 44 percent.

The Dragston soils are somewhat poorly drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of sandy loam, and a substratum of sandy loam.

The Munden soils are moderately well drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of sandy loam and loam, and a substratum of sand.

The Bojac soils are well drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of fine sandy loam and loam, and a substratum of fine sand.

The minor soils of this map unit are well drained State soils, moderately well drained Tetotum soils, somewhat poorly drained Augusta soils, poorly drained Nimmo soils, and very poorly drained Portsmouth soils. The Augusta and Tetotum soils are on ridges, on side slopes, and in slight depressions. The State soils are on upland ridges. The Nimmo soils are in slight depressions and on flats at lower elevations, and the Portsmouth soils are on flats and in depressions. In the southern part of the City these depressions are circular and are called Carolina Bays.

This map unit is used mainly for cultivated crops, but some areas are used for woodland or are in community development. Most of this map unit has been cleared, and some areas have been drained. The unit has good suitability for cultivated crops and woodland, and fair suitability for community development. The main limitations are a seasonal high water table and rapid permeability in the substratum.

4. Udorthents-Urban land

Well drained or moderately well drained soils that have a loamy substratum and areas covered by buildings and roads; formed in disturbed material

This map unit consists of nearly level to steep soils in urban areas that have been excavated and graded or covered by impervious material. These areas are mostly in the northern half of the City. Slopes range from 0 to 25 percent. The unit makes up about 8 percent of the survey area. Udorthents make up about 34 percent of this map unit, Urban Land about 31 percent, and soils of minor extent about 35 percent.

Udorthents are in areas that have been altered by excavation or covered by fill material. They are variable in color, texture, and permeability.

Urban land consists of areas covered by parking lots, buildings, and other structures.

The minor soils in this map unit consist of small areas of undisturbed soils.

Onsite investigation is needed to determine the suitabilities and limitations of this unit for any use.

Areas dominated mostly by very poorly drained mineral and organic soils; in marshes and swamps that are subject to flooding

The map units in this group are in coastal marshes and inland swamps. The soils formed in fluvial mineral deposits or in organic material. The soils have an organic substratum or a loamy substratum.

5. Dorovan-Pocaty-Nawney

Very poorly drained soils that consist of organic or loamy material; formed in organic material or fluvial sediments

This map unit consists of level, frequently flooded soils on the flood plains of the North Landing River, West Neck Creek, and their tributaries. The areas are mostly in the southwestern section of the City. Slopes range from 0 to 1 percent. The map unit makes up about 10 percent of the survey area. Dorovan soils make up about 41 percent of this map unit, Pocaty soils about 19 percent, Nawney soils about 9 percent, and soils of minor extent about 31 percent.

The Dorovan soils are in broad, forested flood plains. They have a surface layer of partially decomposed organic material underlain by highly decomposed organic material.

The Pocaty soils are on broad, flat marshes. They have a surface layer of partially decomposed organic material underlain by layers of highly decomposed organic material that has a high sulphur content.

The Nawney soils are in wooded drainageways and on flood plains. They have a surface layer of silt loam and a substratum of loam and loamy sand.

The minor soils are poorly drained Acredale, Nimmo, and Tomotley soils; moderately well drained Munden and Tetotum soils; and somewhat poorly drained Augusta and Dragston soils. These soils are on ridges and nearly level transitional areas near uplands.

This map unit has little suitability for most uses other than as wetland wildlife habitat and for woodland. Flooding and the high content of organic matter are the main limitations.

6. Backbay-Nawney

Very poorly drained soils that have a thin organic surface layer over a loamy substratum; formed in fluvial sediments

This map unit consists of nearly level, frequently flooded soils on the flood plains of Back Bay and its tributaries. Most areas are in the southeastern section of the City. Slopes range from 0 to 1 percent. The unit makes up about 7 percent of the survey area. Backbay soils make up about 56 percent of the map unit, Nawney soils about 11 percent, and soils of minor extent about 33 percent.

The Backbay soils are in broad, flat marshes. They have a surface layer of partially decomposed organic material and a substratum of sandy clay loam and silty clay loam.

The Nawney soils are in wooded drainageways and on flood plains. They have a surface layer of silt loam and a substratum of loam and loamy sand.

The minor soils are poorly drained Acredale, Duckston, Nimmo, and Tomotley soils; somewhat poorly drained Augusta and Dragston soils; and moderately well drained to somewhat poorly drained Corolla soils. These soils are on ridges and nearly level transitional areas near uplands.

This map unit has little suitability for most uses other than as wetland wildlife habitat and for woodland. Flooding is the main limitation.

Areas dominated mostly by very poorly drained to excessively drained, sandy soils; in coastal areas

The map units in this group contain soils that formed in sandy, marine or eolian deposits or in organic material. The sandy soils are excessively drained to poorly drained, and the organic soils have sandy substratum and are very poorly drained.

7. Newhan-Duckston-Corolla

Excessively drained to poorly drained soils that have a sandy substratum; formed in marine and eolian sediments

This map unit consists of nearly level to steep, very rapidly permeable soils on grass- and shrub-covered sand dunes, flats, and depressions along coastal areas of the Atlantic Ocean and the Chesapeake Bay. Slopes range from 0 to 30 percent. The unit makes up about 5 percent of the survey area. Newhan soils make up about 27 percent of the map unit, Duckston soils about 20 percent, Corolla soils about 16 percent, and soils of minor extent about 37 percent.

The Newhan soils are on undulating to steep coastal dunes. They have a surface layer and substratum of fine sand. They are excessively drained.

The Duckston soils are on nearly level flats and in shallow depressions between coastal dunes. They have a surface layer of fine sand and a substratum of sand. They are poorly drained and are flooded in some areas after heavy rainfall and by overwash by saltwater.

The Corolla soils are on low, undulating coastal dunes and on flats. They have a surface layer and substratum of fine sand. They are somewhat poorly drained to moderately well drained.

The minor soils of this map unit are Beaches, Psamments, and very poorly drained Backbay soils. The Backbay soils are in broad, flat, frequently flooded marshes. Beaches are adjacent to the ocean and bay and are covered twice daily by saltwater. Psamments are sandy materials that have been disturbed by excavation, grading, or filling.

Most areas of this map unit are covered by salt-tolerant grasses and shrubs. Many areas are in their natural state, and other areas are used as sites for recreation and cottages, or they are in community development. The salt spray in areas close to the ocean or bay causes sparse vegetation and poor stability. The areas farther inland have more vegetation and are more stable. The major limitations of this unit for community development are a seasonal high water table, the very rapid permeability, slope, and the instability of sparsely vegetated areas.

8. Pamlico-Fripp-Lakehurst Variant

Very poorly drained, excessively drained, and moderately well drained soils that are organic or sandy; formed in organic material or in marine or eolian sediments

This map unit consists of nearly level to steep, wooded soils in depressions and on sand dunes in the northeastern corner of the City. Slopes range from 0 to 30 percent. The map unit makes up about 3 percent of the survey area. Pamlico soils make up about 30 percent of this map unit, Fripp soils about 15 percent, Lakehurst

Variant soils about 11 percent, and soils of minor extent about 44 percent.

The Pamlico soils are in depressions between relic sand dunes. They have a surface layer of partially decomposed organic material and layers of highly decomposed organic material underlain by sand. They are very poorly drained, have moderate permeability, and usually have water on the surface.

The Fripp soils are on undulating to steep relic sand dunes. The upper part of the surface layer is sand, and the lower part is fine sand. The subsoil and substratum are fine sand. The soils are excessively drained and have very rapid permeability.

The Lakehurst Variant soils are on low-lying relic sand dunes and toe slopes. The soils are sand throughout. They are moderately well drained and have very rapid permeability.

The minor soils of this map unit are excessively drained Newhan soils and very poorly drained Rappahannock soils. The Newhan soils are on sparsely vegetated and unstable sand dunes. The Rappahannock soils are in low marshes that are flooded daily by saltwater.

Most areas of this map unit are wooded. A few areas are used for recreation or community development. The major limitations of this map unit for community development are water on the surface, slope, and very rapid permeability.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, State loam, 2 to 6 percent slopes, is one of two phases in the State series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Newhan-Corolla fine sands, 0 to 15 percent slopes, is an example of a complex.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Beaches is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1—Acredale silt loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats. The areas of this soil commonly are oval or irregular in shape and range from 2 to 4,000 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is grayish brown silt loam about 7 inches thick. The subsoil is 43 inches thick. It is mainly gray silt loam and silty clay loam with yellowish brown mottles. The substratum is mottled gray and yellowish brown fine sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Chapanoke soils, poorly drained Nimmo and Tomotley soils, and very poorly drained Hyde, Nawney, and Portsmouth soils. The Augusta and Chapanoke soils are on slightly higher elevations and in undulating areas adjacent to creeks, rivers, and drainageways. The Hyde, Nawney, and Portsmouth soils are in slight depressions. The Nimmo and Tomotley soils are on broad flats. Also included are areas that have water ponded on the surface after heavy rains or during prolonged wet periods. A few small areas mostly in the northern part of the City and east of Oceana Ridge have a subsoil that extends to a depth of more than 60 inches. Included soils make up about 15 percent of the unit.

The permeability of this Acredale soil is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair, and the soil dries slowly. The subsoil has a moderate shrink-swell

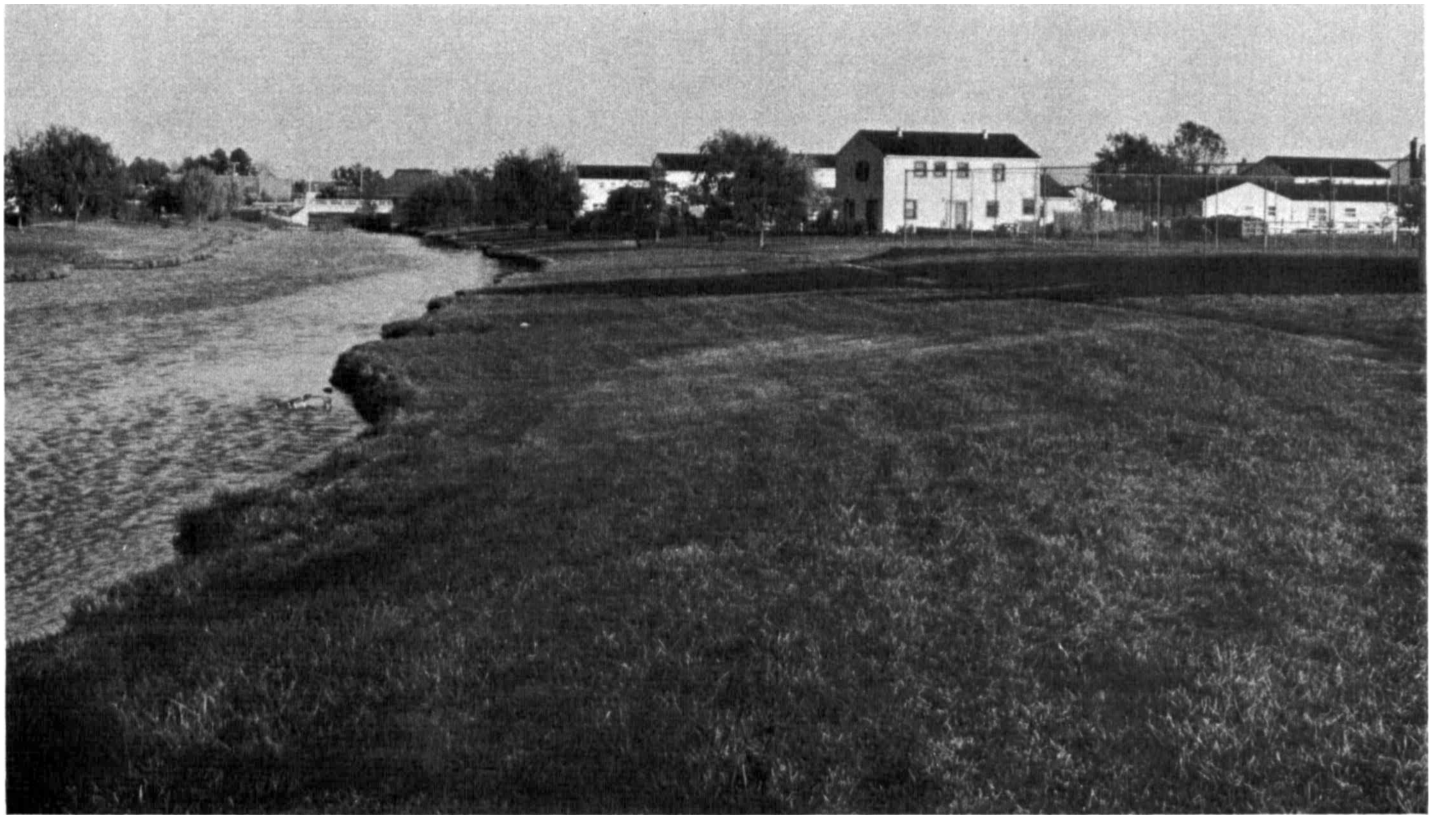


Figure 1.—Community development on an area of Acredale silt loam near a canal.

potential. The root zone extends to a depth of 60 inches or more. The surface layer mainly ranges from extremely acid through strongly acid, but the reaction varies because of local liming practices. The subsoil and substratum range from very strongly acid through neutral. The soil is moderate in organic matter content and medium in natural fertility. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are used for community development or woodland (fig. 1).

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, oaks, and sweetgum. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIIw.

2—Acredale-Urban land complex. This unit consists of deep, poorly drained soils and areas covered by parking lots, buildings, and other structures. The areas are on broad inland flats, commonly are irregularly shaped, and range from 2 to 1,000 acres. The unit is about 40 percent Acredale soils, 35 percent urbanized areas, and 25 percent other soils. The soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Acredale soils is grayish brown silt loam about 7 inches thick. The subsoil is 43 inches thick. It mainly is gray silt loam and silty clay loam with yellowish brown mottles. The substratum is mottled gray and yellowish brown fine sandy loam to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, poorly drained Tomotley soils, and somewhat poorly drained Augusta and Chapanoke soils. The Tomotley soils are nearly level. The Augusta and Chapanoke soils are at slightly higher elevations. The Udorthents are on nearly level areas that have been disturbed by grading, excavating, or filling.

The permeability of these Acredale soils is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair, and the soil dries slowly. The subsoil has a moderate shrink-swell potential. The soil is moderate in organic matter content and medium in natural fertility. The surface layer ranges mainly from extremely acid through strongly acid, but the reaction varies because of local liming practices. The subsoil and substratum range from very strongly acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

The Acredale soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

This unit is not assigned to a capability subclass.

3—Augusta loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low inland ridges and side slopes. The areas of this soil commonly are long and irregular in shape and range from 2 to 150 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is light olive brown loam about 8 inches thick. The subsoil is 37 inches thick. The upper 10 inches is light yellowish brown loam and clay loam with yellowish brown and strong brown mottles. The lower 27 inches mostly is gray clay loam with brown mottles. The substratum is mottled brown and gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Dragston and Chapanoke soils, and poorly drained Acredale and Tomotley soils. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale and Tomotley soils are in slight depressions. The Chapanoke and Dragston soils are on low ridges and side slopes. Also included are areas of mainly undulating soils adjacent to lakes, bays, and large drainageways. The slopes of those soils range from 15 to 30 percent and are 20 to 50 feet long, and the soils generally have more sand and less clay in the subsoil than this Augusta soil. These areas are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Augusta soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard mainly is slight. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, yellow-poplar, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table is the main limitation of the unit for community development, especially as a site for septic tanks, buildings, roads and streets, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

The capability subclass is IIIw.

4—Augusta-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained Augusta soils and areas covered by parking lots, buildings, and other structures. The areas are on low inland ridges and side slopes, commonly are irregularly shaped, and range from 2 to 75 acres. The unit is about 40 percent Augusta soils, 35 percent urbanized areas, and 25 percent other soils. The soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Augusta soils is light olive brown loam about 8 inches thick. The subsoil is 37 inches thick. The upper 10 inches is light yellowish brown loam and clay loam with yellowish brown and strong brown mottles. The lower 27 inches mostly is gray clay loam with brown mottles. The substratum is mottled brown and gray loamy sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Chapanoke and Dragston soils, and poorly drained Acredale and Tomotley soils. The Udorthents are nearly level. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale and Tomotley soils are in slight depressions, and the Dragston soils are on low ridges and side slopes.

The permeability of these Augusta soils is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Augusta soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of the unit for community development, especially as a site for septic tanks, buildings, roads and streets, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

This unit is not assigned to a capability subclass.

5—Backbay mucky peat. This soil is deep, nearly level, and very poorly drained. It is in broad, brackish marshes adjacent to Back Bay. The areas of this soil commonly are irregularly shaped and range from 2 to 1,200 acres. Slopes are less than 1 percent.

Typically, the upper 11 inches of this soil is very dark brown partially decomposed organic material. The next 11 inches is black silt loam. The substratum extends to a depth of at least 60 inches. It mostly is gray sandy clay loam and silty clay loam with light olive brown mottles.

Included with this soil in mapping are small areas of poorly drained Duckston, Nimmo, and Tomotley soils and very poorly drained Nawney and Pocaty soils. The Nimmo, Tomotley, Nawney, and Duckston soils are at slightly higher elevations. The Pocaty soils are nearly level. Some included areas of this unit along the west side of the Outer Banks have stratified sand in the substratum. Some units that border coarser textured upland soils have a coarser textured substratum. Included soils make up about 20 percent of the unit.

The permeability of this Backbay soil is moderate or moderately slow. The available water capacity is high, but the water is brackish. Surface runoff is very slow. The substratum has a moderate shrink-swell potential. The soil commonly is very strongly acid through moderately acid in the organic surface layer and is strongly acid through neutral in the mineral layers. The soil is flooded by wind tides and is continuously saturated.

Most areas of this soil are in native marsh vegetation such as black needlerush, cattails, olney threesquare, and cordgrass.

The soil is limited for most uses other than as wildlife habitat. The major limitations for most uses are a year-round water table at the surface, low strength, flooding, and the organic matter on the surface.

The capability subclass is VIIIw.

6—Beaches. This unit consists of long, narrow areas adjacent to the Chesapeake Bay and the Atlantic Ocean. The areas consist mostly of sandy material deposited by wave action and that is flooded daily by tides. The areas range from 2 to 70 acres. Slopes range from 0 to 10 percent.

Included with this unit in mapping are small areas of Corolla and Newhan soils that are at higher elevations and that support salt-tolerant grasses and shrubs. Also included are areas that have a high content of gravel and shells. Included areas make up about 15 percent of the unit.

This unit is used mostly for recreation and wildlife habitat. Daily tidal flooding limits most other uses.

This unit is not assigned to a capability subclass.

7—Bojac fine sandy loam. This soil is deep, nearly level, and well drained. It is on low inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 130 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark brown fine sandy loam about 8 inches thick. The subsoil is 30 inches thick. It is strong brown fine sandy loam and loam. The substratum mostly is brownish yellow and yellow loamy fine sand and fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained State soils and moderately well drained Munden and Tetotum soils. The State soils are on low ridges, and the Munden and Tetotum soils are in slight depressions. Also included are small areas adjacent to lakes, bays, and large drainageways that have slopes of 15 to 30 percent and that are 20 to 50 feet long. These areas mainly are undulating and are dissected by many short drainageways. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring, and some soils in the Bayville area have more coarse sand and gravel than this Bojac soil. Included soils make up about 15 percent of the unit.

The permeability of this Bojac soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is very friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in community development or woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, stubble mulching, and using crop residue are practices that help to maintain organic matter content and tilth, reduce erosion and crop damage, and improve moisture in the soil. Tilling within the proper range of moisture content reduces soil compaction and clodding.

The potential productivity for trees on this soil is moderately high, especially for oaks, loblolly pine, and sweetgum. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this soil for community development, especially for septic tank absorption fields. In some areas drainage is needed to help overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. In areas used as sites for septic tanks, the permeability causes a hazard of contamination to water.

The capability class is I.

8—Chapanoke silt loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low inland ridges and on side slopes that border major drainageways. The areas commonly are irregular in shape or long and narrow and range from 2 to 130 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is light brownish gray silt loam about 3 inches thick. The subsoil is 43 inches thick. The upper part is olive yellow silt loam and silty clay loam with brown and gray mottles. The lower part is mottled, gray silty clay loam and silty clay. The substratum mostly is mottled, light yellowish brown silt loam and fine sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Augusta soils, poorly drained Acredale soils, and other somewhat poorly drained soils that have slow permeability. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale soils are in small depressions, and the Augusta soils are on low ridges and side slopes. Also included are areas of mainly undulating soils adjacent to lakes, bays, and large drainageways. The slopes of these soils range from 15 to 30 percent and are 20 to 50 feet long, and the soils generally have more sand and less clay in the subsoil than this Chapanoke soil. These areas are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Chapanoke soil is moderately slow in the subsoil and moderate in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. Tilth is fair, and the soil dries slowly. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid through moderately acid, but reaction of the surface layer varies because of local liming practices. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are in community development or woodland. Some areas are used for cultivated crops.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper soil moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIw.

9—Chapanoke-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on low, inland ridges and on side slopes that border major drainageways. The areas commonly are irregular in shape or long and narrow and range from 3 to 120 acres. They are about 40 percent Chapanoke soils, 35 percent urbanized areas, and 25 percent other soils. The Chapanoke soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Chapanoke soils is light brownish gray silt loam about 3 inches thick. The subsoil is 43 inches thick. The upper part is olive yellow silt loam and silty clay loam with brown and gray mottles. The lower part is mottled, gray silty clay loam and silty clay. The substratum mostly is mottled, light yellowish brown silt loam and fine sandy loam to a depth of at least 60 inches.

Included with this complex in mapping are areas of Udorthents, moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Augusta soils, poorly drained Acredale soils, and other somewhat poorly drained soils that have slow permeability. The Udorthents are nearly level. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale soils are in small depressions and the Augusta soils are on low ridges and side slopes.

The permeability of the Chapanoke soils is moderately slow in the subsoil and moderate in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. Tilth is fair, and the soil dries slowly. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid to moderately acid, but reaction of the surface layer varies because of local liming practices. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Chapanoke soils in this unit are used mostly for lawns, gardens, and parks.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

This unit is not assigned to a capability subclass.

10—Corolla fine sand. This soil is deep, nearly level to gently sloping, and moderately well drained to somewhat poorly drained. It is on low coastal dunes and flats. The areas of this soil commonly are irregularly shaped and range from 2 to 275 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer of this soil is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches of the substratum is pale brown fine sand. The lower part is pale brown, mottled fine sand and grayish brown sand.

Included with this soil in mapping are small areas of excessively drained Newhan soils and poorly drained Duckston soils. The Newhan soils are at higher elevations, and the Duckston soils are in depressions. Included soils make up about 20 percent of the unit.

The permeability of this Corolla soil is very rapid. Available water capacity is very low. Surface runoff is slow. The wind erosion hazard is moderate. The soil has a low shrink-swell potential. It is low in natural fertility and organic matter content. It commonly ranges from extremely acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 3 feet, mainly during winter and spring.

Most areas of this soil are in native grasses and shrubs. Some areas are used as sites for beach cottages and recreation.

This soil is poorly suited to farming because of low natural fertility, very low available moisture, and blowing sand. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. The areas adjacent to the coastline support only salt-tolerant plants such as American beachgrass, marshhay cordgrass, and northern bayberry. The plants mainly are sparse in these areas, and thus the soil is susceptible to wind and water erosion. The areas farther from the effects of the salt spray support a larger variety of herbaceous plants and trees such as loblolly pine, live oak, and maple, though potential productivity for trees is low. These inland areas are less susceptible to wind and water erosion and generally are more stabilized.

The seasonal high water table and the very rapid permeability are the main limitations of this unit for community development. The seasonal high water table limits use of the soil as a site for buildings or roads; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soil for septic tank absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

The capability subclass is VIIs.

11—Corolla-Duckston fine sands. This unit consists of deep, nearly level to gently sloping soils in coastal areas. The Corolla soils are on low, undulating coastal dunes and flats. The Duckston soils are on low flats and in shallow depressions between the dunes. The areas commonly are irregularly shaped and range from 3 to 75 acres. They are about 45 percent moderately well drained to somewhat poorly drained Corolla soils, 35 percent poorly drained Duckston soils, and 20 percent other soils. The Corolla and Duckston soils are so intermingled that it was not practical to map them separately. Slopes range from 0 to 4 percent on the Corolla soils and from 0 to 2 percent on the Duckston soils.

Typically, the surface layer of the Corolla soils is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches of the substratum is pale brown fine sand. The lower part is mottled, pale brown fine sand and grayish brown sand.

Typically, the surface layer of the Duckston soils is dark grayish brown fine sand about 4 inches thick. The substratum is grayish brown and gray sand to a depth of at least 60 inches.

Included with this complex in mapping are small areas of Psamments and excessively drained Newhan soils. The Newhan soils are at higher elevations, and the Psamments are nearly level.

The permeability of these Corolla and the Duckston soils is very rapid. Both soils have very low available water capacity. Surface runoff is slow. Both soils are low in natural fertility and organic matter content. The soils commonly range from extremely acid through neutral. A seasonal high water table during winter and spring is at a depth of 1 foot to 3 feet in the Corolla soils and is between the surface and a depth of 1 foot in the Duckston soils. The Duckston soils are frequently flooded throughout most of the year.

Most areas of these soils are in native grasses and shrubs. Some areas are used as sites for beach cottages and recreation.

The soils of this unit are poorly suited to most types of farming because of wetness, blowing sand, and low natural fertility. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as American beachgrass, marshhay cordgrass, wax myrtle, and northern bayberry. The plants mainly are sparse on these areas, and thus the soils are susceptible to wind and water erosion. The Duckston soils usually have a denser stand of grasses and shrubs. The areas of this unit that are farther from the effects of salt spray support a larger variety of plants and trees such as loblolly pine, live oak, and maple, though potential productivity for trees is low. These inland areas are less susceptible to wind and water erosion and generally are more stabilized.

The seasonal high water table and very rapid permeability of the unit and the hazard of flooding on the Duckston soils are the main limitations of this unit for community development. The water table limits the soils as a site for buildings or roads and streets; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soils as a site for septic tank absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as sites for septic tanks.

The capability subclass is VIIw.

12—Dorovan mucky peat. This soil is deep, nearly level, and very poorly drained. It is in swamps adjacent to major rivers and their tributaries. Most areas of this soil are in the vicinity of the North Landing River. The areas commonly are irregularly shaped and range from 3 to 1,300 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is dark brown partially decomposed organic material about 4 inches thick. The subsurface layers mostly are dark brown highly decomposed organic material 74 inches thick. The substratum is dark gray silt to a depth of at least 80 inches.

Included with this soil in mapping are small areas of very poorly drained Nawney and Pocaty soils. The Nawney soils are at slightly higher elevations, and the Pocaty soils are at lower elevations. Also included are small areas of soils that have a thinner organic surface layer than this Dorovan soil. These areas are between Dorovan soils and upland mineral soils. Included soils make up about 25 percent of the unit.

The permeability of this Dorovan soil is moderate. The available water capacity is very high. Surface runoff is very slow. The shrink-swell potential is low. The soil ranges from extremely acid through slightly acid. It is flooded frequently by wind tides and is continuously saturated.

This soil is limited for most types of farm and nonfarm uses by wetness, low strength, flooding, and the high organic matter content. Most areas are wooded, and the potential productivity for trees is moderate, especially for water-tolerant species such as baldcypress, blackgum, and water tupelo. A few loblolly pine are in some areas. Wetness and low strength of the organic material severely limit timber management and harvesting and limit the soil for most uses other than as wetland wildlife habitat.

The capability subclass is VIIw.

13—Dragston fine sandy loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 170 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 9 inches thick. The subsoil is sandy loam 29 inches thick. The upper part mostly is light yellowish brown; the lower part is mottled brown, gray, and red. The substratum is mottled, light gray sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Munden and Tetotum soils, somewhat poorly drained Augusta soils, and poorly drained Nimmo and Tomotley soils. The Munden and Tetotum soils are at slightly higher elevations. The Nimmo and Tomotley soils are in slight depressions, and the Augusta soils are on low ridges and side slopes. Included soils make up about 15 percent of the unit.

The permeability of this Dragston soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in community development or woodland.

Drained areas of this soil are well suited to cultivated crops. Drainage systems are difficult to install, however, because of the wet, sandy substratum. The soil sometimes is droughty during the growing season, and crop response to lime and fertilizer is limited by the available water capacity. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, hold moisture in the soil, and reduce crusting.

The potential productivity for trees on the soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this unit for community development, especially for septic tank absorption fields and building sites. Drainage helps to improve the suitability of the soil as a site for septic tanks, but the design and installation of septic tanks must meet State and local criteria. In areas used as sites for septic tanks, the rapid permeability causes a hazard of contamination to water. Drainage and landscaping will help to improve the suitability of the soil as a building site.

The capability subclass is IIw.

14—Dragston-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on low ridges and side slopes. The areas are irregularly shaped and range from 2 to 30 acres. They are about 40 percent Dragston soils, 35 percent urbanized areas, and 25 percent other soils. The Dragston soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Dragston soil is dark grayish brown fine sandy loam about 9 inches thick. The subsoil is sandy loam 29 inches thick. The upper part mostly is light yellowish brown; the lower part is mottled brown, gray, and red. The substratum is mottled, light gray sandy loam to a depth of at least 60 inches.

Included with this unit in mapping are small areas of Udorthents, moderately well drained Munden and Tetotum soils, somewhat poorly drained Augusta soils, and poorly drained Nimmo and Tomotley soils. The Munden and Tetotum soils are at slightly higher elevations, and the Nimmo and Tomotley soils are in slight depressions. The Augusta soils are on low ridges and side slopes.

The permeability of these Dragston soils is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Dragston soils in this unit are used mainly for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this unit for community development, especially for septic tank absorption fields and building sites. Drainage helps to improve the suitability of the soil as a site for septic tanks, but the design and installation of septic tanks must meet State and local criteria. In areas used as sites for septic tanks, the rapid permeability causes a hazard of contamination to water. Drainage and landscaping will help to improve the suitability of the soil as a building site.

This unit is not assigned to a capability subclass.

15—Duckston fine sand. This soil is deep, nearly level, and poorly drained. It is in shallow depressions between dunes and on low flats between the dunes and the marshes. The areas of this soil commonly are irregularly shaped and range from 2 to 230 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sand about 4 inches thick. The substratum is grayish brown and gray sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of very poorly drained Backbay soils and moderately well drained to somewhat poorly drained Corolla soils. The Backbay soils are at lower elevations, and the Corolla soils are at higher elevations. Also included are areas that have water on the surface after heavy rainfall or during prolonged wet periods and a few areas that are adjacent to marshes and that have an organic surface layer. Included soils make up about 20 percent of the unit.

The permeability of this Duckston soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is slight. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring. This soil is frequently flooded during most of the year.

This soil is very poorly suited to farming because of wetness, low natural fertility, and blowing sand from adjacent areas. Most areas of this soil are in native grasses and shrubs. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as marshhay cordgrass, northern bayberry, and bulrush. The areas farther from the effects of salt spray support a larger variety and denser stands of herbaceous plants.

Trees such as loblolly pine, red bay, red maple, sweet gum, and water oak are on areas adjacent to marshes, but the potential productivity is low. Only a few included areas support stands of merchantable loblolly pine. Wetness limits the use of heavy equipment.

Flooding, the seasonal high water table, and the sandy texture of the substratum are the main limitations of this soil for community development. Flooding and the seasonal high water table limit use of the soil as a site for septic tank absorption fields, buildings, and roads. The seasonal high water table and the instability of the substratum limit excavations.

The capability subclass is VIIw.

16E—Fripp sand, 2 to 30 percent slopes. This soil is deep, undulating to steep, and excessively drained. It is on the high wooded coastal dunes of the Cape Henry area. The areas of the soil commonly are long and narrow and range from 2 to 400 acres.

Typically, the surface layer of this soil is dark grayish brown sand about 5 inches thick. The subsurface layer is light brownish gray fine sand 7 inches thick. The subsoil is mottled, brown and yellowish brown fine sand 8 inches thick. The substratum is brownish yellow and very pale brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Lakehurst Variant soils, excessively drained Newhan soils, and very poorly drained Pamlico soils. The Lakehurst Variant soils are on low dunes. The Pamlico soils are in depressions, and the Newhan soils are undulating. Included soils make up about 15 percent of the unit.

The permeability of this Fripp soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is extremely acid or very strongly acid.

Most areas of this soil are in woodland. A few areas are used for recreation.

Slope in some areas and the very low available water capacity make this soil generally unsuitable for farming. The potential productivity for trees on this soil is moderate, especially for species such as loblolly pine and oaks. The very low available water capacity limits seedling growth and survival, and slope limits the use of timber equipment.

The very rapid permeability and slope are the main limitations of this soil for community development. Slope limits the use of the soil as a site for roads, buildings, and excavations. The permeability causes a hazard of contamination to water supplies in areas used as sites for septic tanks, and the design and installation of septic tanks must meet State and local criteria.

The capability subclass is VIIs.

17—Hyde silt loam. This soil is deep, nearly level, and very poorly drained. It is on broad flats and in slight depressions. The areas of this soil commonly are long and narrow and range from 2 to 120 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silt loam about 16 inches thick. The subsoil mostly is mottled, grayish brown and olive gray silty clay loam and silty clay 42 inches thick. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils and very poorly drained Portsmouth soils. The Acredale, Nimmo, and Tomotley soils are at slightly higher elevations. The Portsmouth soils are nearly level. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 15 percent of the unit.

The permeability of this Hyde soil is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is medium in natural fertility, and the surface layer is high in organic matter content. The soil mainly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1/2 foot during wet seasons.

Most areas of this soil have been drained by ditching and are used for cultivated crops. Most of the remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rainfall. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for sycamore, yellow-poplar, sweetgum, oaks, and loblolly pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, and the use of heavy timber equipment is limited during periods of heavy rainfall and during wet seasons.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIIw.

18—Lakehurst Variant sand. This soil is deep, nearly level to undulating, and moderately well drained. It is on the low, wooded dunes and toe slopes in the Cape Henry area. The areas of this soil commonly are long and narrow and range from 2 to 75 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer of this soil is dark grayish brown sand about 4 inches thick. The subsurface layer is light brownish gray sand 20 inches thick. The subsoil is dark reddish brown sand 8 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled, yellowish brown sand in the upper part and mostly mottled yellowish brown, dark reddish brown, and yellowish red sand in the lower part.

Included with this soil in mapping are small areas of excessively drained Fripp and Newhan soils and very poorly drained Pamlico soils. The Fripp and Newhan soils are at higher elevations, and the Pamlico soils are in depressions. Included soils make up about 15 percent of the unit.

The permeability of this Lakehurst Variant soil is very rapid, and available water capacity is very low. Surface runoff is slow. The erosion hazard is slight. The soil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil has low organic matter content and natural fertility. It commonly is extremely acid or very strongly acid. A seasonal high water table is at a depth of 1-1/2 to 3 feet during winter and spring.

Most areas of this soil are in woodland. A few areas are used for recreation.

This soil is poorly suited to cultivated crops because of the very low moisture holding capacity, undulating slopes, and low natural fertility.

The potential productivity for trees on this soil is moderate, especially for loblolly pine and oaks and some other hardwoods. The very low moisture holding capacity limits seedling growth and survival. The low, narrow dunes and the adjacent wet soils commonly limit the use of heavy equipment.

The seasonal high water table and the very rapid permeability are the main limitations of this unit for community development. The seasonal high water table limits use of the soil as a site for buildings or roads; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soil for septic tank absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

The capability subclass is VIIs.

19—Munden fine sandy loam. This soil is deep, nearly level, and moderately well drained. It is on low inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 200 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this Munden soil is dark grayish brown fine sandy loam about 8 inches thick. The subsoil is 24 inches thick. It is yellowish brown sandy loam in the upper part and mottled, yellowish brown and brown loam and sandy loam in the lower part. The substratum is mottled brown, gray, and red sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Dragston soils. The Bojac and State soils are at slightly higher elevations, and the Augusta and Dragston soils are in slight depressions. The Tetotum soils are on low ridges and side slopes. Also included are undulating areas that have slopes of 15 to 30 percent that are 20 to 50 feet long. These areas are adjacent to lakes, bays, and large drainageways and are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Munden soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It mainly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in woodland or community development.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration. Tilling within the proper range of moisture content helps to reduce soil compaction and clodding.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tank absorption fields must meet State and local criteria. In areas used as a site for septic tanks, the permeability causes a hazard of contamination to water.

The capability subclass is IIw.

20—Munden-Urban land complex. This complex consists of deep, nearly level, moderately well drained soils and areas covered by buildings, parking lots, and other structures. The unit is on low inland ridges and side slopes. The areas commonly are irregularly shaped and range from 2 to 80 acres. They are about 40 percent Munden soils, 35 percent urbanized areas, and 25 percent other soils. The Munden soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of this Munden soil is dark grayish brown fine sandy loam about 8 inches thick. The subsoil is 24 inches thick. It is yellowish brown sandy loam in the upper part and mottled, yellowish brown and brown loam and sandy loam in the lower part. The substratum is mottled brown, gray, and red sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, well drained Bojac and State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Dragston soils. The Udorthents are nearly level. The Bojac and State soils are at slightly higher elevations, and the Augusta and Dragston soils are in slight depressions. The Tetotum soils are on low ridges and side slopes.

The permeability of the Munden soils is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It mainly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

The Munden soils in this unit are used mostly for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tank absorption fields must meet State and

local criteria. In areas used as a site for septic tanks, the permeability causes a hazard of contamination to water.
This unit is not assigned to a capability subclass.

21—Nawney silt loam. This soil is deep, nearly level, and very poorly drained. It is on flood plains and in drainageways. The areas commonly are long and narrow or irregular in shape and range from 2 to 500 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is dark gray silt loam about 5 inches thick. The substratum extends to a depth of 60 inches or more. It is gray loam to a depth of 44 inches and gray loamy sand at a depth of more than 44 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils; very poorly drained Backbay, Dorovan, Portsmouth, and Rappahannock soils; and areas near the Dorovan soils that have an organic surface layer more than 8 inches thick. The Backbay and Rappahannock soils are at low elevations, and the Dorovan soils are in depressions. The other included soils are at slightly higher elevations. Included soils make up about 25 percent of the unit.

The permeability of this Nawney soil is moderate. Available water capacity is moderate. Surface runoff is very slow. The substratum has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more but is restricted for some plants by the seasonal high water table. The soil is low in natural fertility, and the surface layer has moderate organic matter content. The soil ranges from extremely acid through strongly acid above a depth of 40 inches and from extremely acid through slightly acid below 40 inches. The water table is between the surface and a depth of 1/2 foot throughout most of the year, and the soil is frequently flooded, especially from late fall through late spring.

Flooding and the water table make this soil generally unsuited to most uses other than woodland and wildlife habitat, and most areas are in woodland. The potential productivity for trees on this soil is moderate. The common trees are water-tolerant baldcypress, water tupelo, sweetgum, and red maple. The rate of seedling mortality is high for most other species. The seasonal high water table causes roots to grow close to the surface, thus increasing the hazard of uprooting during windy periods. Wetness and flooding limit the use of heavy equipment.

The capability subclass is VIIw.

22E—Newhan fine sand, 2 to 30 percent slopes. This soil is deep, undulating to steep, and excessively drained. It is on grass- and shrub-covered high sand dunes in coastal areas (fig. 2). The areas of this soil commonly are long and narrow or irregular in shape and range from 2 to 250 acres.

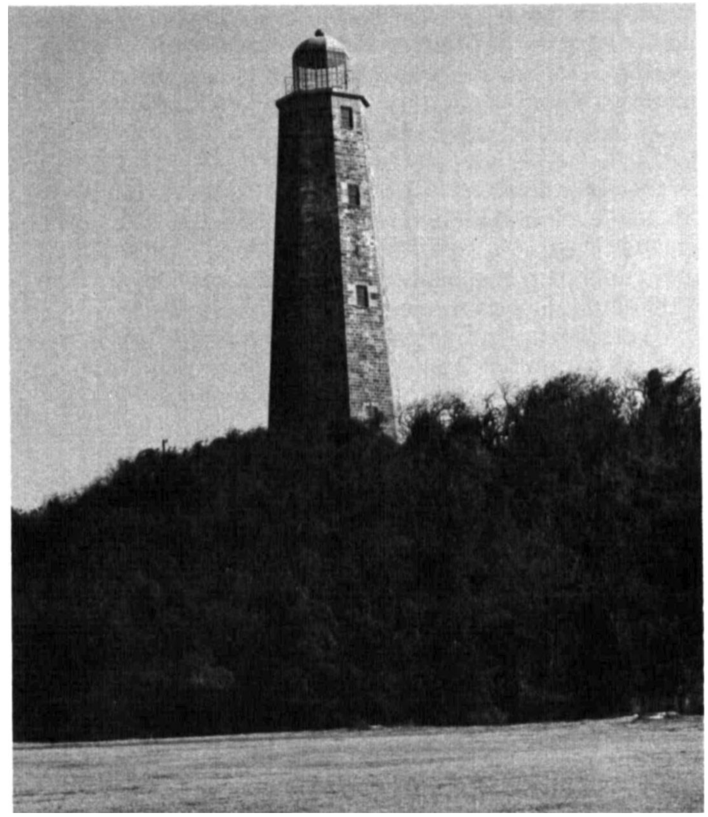


Figure 2.—Cape Henry lighthouse on a dune of Newhan fine sand, 2 to 30 percent slopes.

Typically, the surface layer of this soil is grayish brown fine sand about 3 inches thick. The substratum is very pale brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Duckston soils, moderately well drained to somewhat poorly drained Corolla soils, and beaches. The Corolla and Duckston soils are at lower elevations. Included soils make up about 20 percent of the unit.

The permeability of this Newhan soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe. The soil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges from extremely acid through neutral.

Some areas of this soil are used as sites for cottages and recreation, but the soil is poorly suited for most other uses because of the low natural fertility, very low available moisture holding capacity, slopes, and blowing sand. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the

Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as sea-oats, American beachgrass, coastal panicgrass, and beach heather. This vegetation mainly is sparse in these areas, and thus the soil is susceptible to wind and water erosion. The areas that are farther from the effects of salt spray support a larger variety and denser stand of grasses and shrubby trees and are less susceptible to wind erosion. The dominant species are loblolly pine and live oak, but the potential productivity is low.

The permeability and slope are the main limitations of this soil for community development. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks. Slope limits the soil as a site for roads, buildings, and excavations.

The capability subclass is VIIIs.

23C—Newhan-Corolla fine sands, 0 to 15 percent slopes. This unit consists of deep soils in coastal areas, mostly behind the primary foredune. The Newhan soils are excessively drained and are on low sand dunes, and the Corolla soils are moderately well drained to somewhat poorly drained and are on flats and low knolls. The areas of this unit are irregularly shaped and range from 2 to 160 acres. They are about 55 percent undulating to rolling Newhan soils, 35 percent nearly level to undulating Corolla soils, and 10 percent other soils. The Newhan and Corolla soils are so intermingled that it was not practical to map them separately. Slopes range from 0 to 6 percent on the Corolla soils and from 2 to 15 percent on the Newhan soils.

Typically, the surface layer of the Newhan soils is grayish brown fine sand about 3 inches thick. The substratum is very pale brown fine sand to a depth of at least 60 inches.

Typically, the surface layer of the Corolla soils is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches is pale brown fine sand. The lower part is mottled, pale brown fine sand and grayish brown sand.

Included with this unit in mapping are small areas of Psamments and poorly drained Duckston soils. The Psamments are nearly level, and the Duckston soils are in depressions.

The permeability of these Newhan and the Corolla soils is very rapid. Both soils have very low available water capacity. Surface runoff is slow. The wind erosion hazard is severe on the Newhan soils and moderate on the Corolla soils. Both soils have a low shrink-swell potential, and the root zone extends to a depth of 60 inches or more in both. The soils are low in organic matter content and natural fertility. They commonly range from extremely acid through neutral. A seasonal high water table is at a depth of 1 foot to 3 feet in Corolla soils, mostly during winter and spring.

Some areas of this unit are used for cottages and recreation, but blowing sand, salt spray, and low natural fertility make the soil generally unsuitable for most other uses.

Most areas of this unit are in natural grasses and shrubs. The vegetation mostly is sparse stands of salt-tolerant plants such as American beachgrass, sea-oats, marshhay cordgrass, northern bayberry, and waxmyrtle. The Newhan soils are sparsely vegetated and are especially susceptible to wind erosion.

The seasonal high water table of the Corolla soils, the very rapid permeability of the Newhan and Corolla soils, and the slope of Newhan soils are the main limitations of this unit for community development. They especially limit the soils as a site for buildings, septic tank absorption fields, or roads. Special design, grading, and addition of base material will help to overcome the limitations for building sites and roads. Drainage helps to improve the suitability of the soil as a site for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria and the rapid permeability causes a hazard of water contamination in areas used as sites for septic tanks. Wind erosion is a further limitation for building sites and roads, and the use of a plant cover to stabilize the sand is needed in some areas.

The capability subclass is VIIIs.

24—Nimmo loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats. The areas of this soil commonly are oval or irregularly shaped and range from 2 to 1,200 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark gray loam about 7 inches thick. The subsoil is 26 inches thick. It mostly is light gray and gray fine sandy loam and loam with yellowish brown mottles. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Tomotley soils, and very poorly drained Portsmouth and Nawney soils. The Dragston and Augusta soils are at slightly higher elevations. The Nawney soils are in drainageways, and the Portsmouth soils are in depressions. Also included are soils that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 15 percent of the unit.

The permeability of this Nimmo soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are in woodland or community development.

Drained areas of this soil are well suited to cultivated crops, but drainage systems are difficult to install in some areas because of the wet, sandy substratum. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sycamore, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy equipment.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability subclass is IIIw.

25—Nimmo-Urban land complex. This unit consists of deep, nearly level, poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on broad inland flats. The areas commonly are irregularly shaped and range from 2 to 570 acres. They are about 40 percent Nimmo soils, 35 percent urbanized areas, and 25 percent other soils. The Nimmo soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Nimmo soils is dark gray loam about 7 inches thick. The subsoil is 26 inches thick. It mostly is light gray and gray fine sandy loam and loam with yellowish brown mottles. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this unit in mapping are small areas of Udorthents, somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Tomotley soils, and very poorly drained Portsmouth soils. The Augusta and Dragston soils are at slightly higher elevations, and the Portsmouth soils are in depressions. The Acredale and Tomotley soils and the Udorthents are nearly level.

The permeability of the Nimmo soils is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

The Nimmo soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

This unit is not assigned to a capability subclass.

26—Pamlico mucky peat, ponded. This soil is deep, nearly level, and very poorly drained. It is in depressions and troughs between wooded coastal dunes in the Cape Henry area. The areas of this soil commonly are long and narrow and range from 2 to 350 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark brown partially decomposed organic material about 6 inches thick over very dark brown highly decomposed organic material 24 inches thick. The substratum is dark grayish brown sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas on narrow ridges of excessively drained Fripp soils and moderately well drained Lakehurst Variant soils. Also included are small areas that consist of organic layers more than 51 inches thick. Included soils make up about 15 percent of the unit.

The permeability of this Pamlico soil is moderate or moderately rapid in the organic layers and rapid in the substratum. Available water capacity is very high. Surface runoff is very slow, and water is ponded on the surface of many areas. The shrink-swell potential is low. The soil is extremely acid in the organic layers and ranges from extremely acid through strongly acid in the substratum. A seasonal high water table is at or near the surface mostly during winter and spring.

The seasonal high water table and the high organic matter content make this soil generally unsuited to most uses other than as a wetland wildlife habitat. The potential productivity for trees on this soil is moderate, especially for water-tolerant species such as baldcypress and water tupelo. The rate of seedling mortality is high for all but those species. The seasonal high water table causes roots to grow close to the surface, increasing the hazard of uprooting during windy periods. Wetness and water on the surface limit the use of heavy equipment.

The capability subclass is VIIw.

27—Pamlico-Lakehurst Variant complex. This unit is in the low, wooded swamps and on low dunes in the interior of the Cape Henry area. It mostly consists of nearly level Pamlico soils and nearly level to undulating Lakehurst Variant soils. The Pamlico soils are very poorly drained and deep and are in depressions and troughs. The Lakehurst Variant soils are moderately well drained and deep and are on low, narrow dunes and toe slopes. The areas of this unit are long and narrow and range from 5 to 1,200 acres. They are about 55 percent Pamlico soils, 35 percent Lakehurst Variant soils, and 10 percent other soils. The Pamlico and Lakehurst Variant soils are so intermingled that it was not practical to map them separately. Slopes are less than 1 percent on the Pamlico soils and range from 0 to 4 percent on the Lakehurst Variant soils.

Typically, the surface layer of the Pamlico soils is very dark brown partially decomposed organic material about 6 inches thick over very dark brown highly decomposed organic material 24 inches thick. The substratum is dark grayish brown sand to a depth of at least 60 inches.

Typically, the surface layer of the Lakehurst Variant soils is dark grayish brown sand about 4 inches thick. The subsurface layer is light brownish gray sand 20 inches thick. The subsoil is dark reddish brown sand 8 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled, yellowish brown sand in the upper part and mostly is mottled yellowish brown, dark reddish brown, and yellowish red sand in the lower part.

Included with this unit in mapping are small areas of excessively drained Fripp soils on high ridges.

The permeability of these Pamlico soils is moderate or moderately rapid in the organic layers and rapid in the substratum. Available water capacity is very high in the Pamlico soils. Surface runoff is very slow, and water is ponded on the surface of many areas. The erosion hazard is slight, and the shrink-swell potential is low. The root zone in the Pamlico soils extends generally to a depth of 60 inches or more but is restricted for some trees by a seasonal high water table that is at or near the surface mostly in winter and spring. The Pamlico soils have low natural fertility. They are extremely acid in the organic layers and range from extremely acid to strongly acid in the substratum.

The permeability of these Lakehurst Variant soils is very rapid, and available water capacity is very low. Surface runoff is slow. The erosion hazard is slight on the Lakehurst Variant soils, and the shrink-swell potential is low. The root zone extends generally to a depth of 60 inches or more but is restricted for some trees by a seasonal high water table at a depth of 1-1/2 to 3 feet. The Lakehurst Variant soils have low organic matter content, have low natural fertility, and are extremely acid or very strongly acid.

The seasonal high water table in both soils and the organic-matter content of the Pamlico soils limit this unit for most uses other than woodland, as wetland wildlife habitat, and for limited recreation. Most areas are wooded, and the potential productivity for trees is moderate. The Lakehurst Variant soils commonly support loblolly pine and oaks and other hardwoods. Water-tolerant species such as baldcypress and water tupelo mostly are on the Pamlico soils. Seasonal wetness especially limits the use of heavy equipment on this unit.

The capability subclass is VIIw.

28—Pocaty peat. This soil is deep, nearly level, and very poorly drained. It is in broad freshwater marshes that are mostly adjacent to the North Landing River and its major tributaries. The areas of this soil commonly are irregularly shaped and range from 2 to 1,000 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark brown partially decomposed organic material about 12 inches thick. The subsurface layer is dark brown, black, and dark gray highly decomposed organic material to a depth of 60 inches. The substratum is at a depth of more than 60 inches and is dark gray silt loam.

Included with this soil in mapping are small areas of Udorthents and very poorly drained Backbay, Dorovan, and Nawney soils. The Nawney soils are nearly level. The Backbay soils are mostly between the Pocaty soils and upland mineral soils, and the Dorovan soils are at a slightly higher elevation. The Udorthents are adjacent to waterways. Included soils make up about 15 percent of the unit.

The permeability of this Pocaty soil is moderate. Available water capacity is very high, but the water is brackish. Surface runoff is very slow. The shrink-swell potential is low. The soil ranges from very strongly acid through neutral, but upon drying or exposure to air it becomes extremely acid. The soil is frequently flooded by wind tides and is continuously saturated.

Most areas of this soil are in native grasses and sedges, mostly black needlerush, cattails, olney threesquare, and cordgrass. Low strength, flooding, and the high organic matter and sulfur content of this soil limit it for most uses other than as a wetland wildlife habitat.

The capability subclass is VIIIw.

29—Portsmouth loam. This soil is deep, nearly level, and very poorly drained. It is mostly on broad inland flats and in slight depressions. The areas of this soil commonly are irregularly shaped, but some areas are in circular depressions called Carolina Bays, which are mostly south of Creeds in the southern part of the City. The areas of this soil range from 2 to 400 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is very dark gray loam about 13 inches thick. The subsoil is 23 inches thick. It mostly is grayish brown silt loam in the upper part and dark brown and grayish brown sandy loam in the lower part. The substratum is mottled yellow, brown, and gray stratified sand, loamy sandy and sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils; somewhat poorly drained Dragston soils; and very poorly drained Hyde soils. The Dragston soils are on low ridges and side slopes of the Carolina Bays. The Hyde soils are on flats, and in low depressions. The other soils are at slightly higher elevations. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods and soils that have less clay than this Portsmouth soil. Included soils make up about 15 percent of the unit.

The permeability of this Portsmouth soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in natural fertility, and the surface layer is high in organic matter content. The soil commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1/2 foot mostly during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. Most of the remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Drainage systems are difficult to install in some areas, however, because of the wet, sandy substratum and are limited in the Carolina Bays by the lack of suitable outlets. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment during periods of heavy rainfall and during wet seasons.

The seasonal high water table is the main limitation of the soil for community development, especially as a site for septic tank absorption fields, excavations, buildings, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria. The instability of the sandy substratum limits excavation.

The capability subclass is IIIw.

30—Psamments, undulating. This unit is mostly in coastal areas where sand dunes have been disturbed or where dredging operations occur. It consists of deep, well drained and moderately well drained sandy material that has been disturbed during excavation, filling, or grading. The areas of this unit commonly are irregularly shaped and range from 2 to 100 acres. Slopes range from 0 to 25 percent.

Included with this unit in mapping are small undisturbed areas of excessively drained Fripp and Newhan soils, moderately well drained Corolla and Lakehurst Variant soils, poorly drained Duckston soils, and soils that are not as well drained as Psamments. Many areas have nonsoil material, such as concrete, asphalt, wood, and glass. Included soils make up about 20 percent of the unit.

The permeability of this unit is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe, especially on the steep parts with no plants. Reaction ranges from extremely acid through moderately acid. Most areas have a seasonal high water table about 1-1/2 feet from the surface mostly during winter and spring.

Some areas of this unit have been used as sites for roads and buildings. Onsite investigation is needed, however, to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

31—Psamments-Urban land complex. This unit consists of areas that have been disturbed by excavating, grading, or filling and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 150 acres. They are about 40 percent Psamments, 35 percent urbanized areas, and 25 percent other soils. Slopes range from 0 to 2 percent. The Psamments and urbanized areas are so intermingled that it was not practical to map them separately.

Included with this unit in mapping are small areas of excessively drained Fripp and Newhan soils and moderately well drained Corolla soils. Also included are some fill areas that have nonsoil material, such as concrete, wood, glass, and asphalt.

The permeability of the Psamments is very rapid. Available water capacity is low. Surface runoff is slow. The erosion hazard is slight. Reaction ranges from extremely acid through moderately acid. Most areas have a seasonal high water table at a depth of 1-1/2 feet.

Onsite investigation is needed to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

32—Rappahannock mucky peat, strongly saline. This soil is deep, nearly level, and very poorly drained. It is mostly in the northern part of the City in tidal marshes along creeks, rivers, and bays that are flooded daily with saltwater. Most areas are along the Elizabeth and Lynnhaven Rivers. The areas of this soil commonly are irregularly shaped and range from 2 to 50 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark grayish brown partially decomposed organic material about 11 inches thick. The subsurface layer is very dark grayish brown highly decomposed organic material 26 inches thick. The substratum extends to a depth of at least 80 inches. It is dark greenish gray silt loam in the upper part and black highly decomposed organic material in the lower part.

Included with this soil in mapping are small areas of very poorly drained Nawney and Pamlico soils. The Nawney soils are in drainageways. The Pamlico soils are in troughs and at the heads of drainageways. Some areas on Rudee Inlet have a very thin organic surface layer or a mineral surface layer that is underlain by semifluid silt or silt loam sediments. Also included are areas adjacent to the north side of Broad Bay that are underlain by sandy sediments. Included soils make up about 20 percent of the unit.

The permeability of this Rappahannock soil is moderate. Available water capacity is very high, but the water is saline. The shrink-swell potential is low. The soil ranges from neutral through moderately alkaline but becomes very strongly acid through moderately acid after exposure to air and when dry. The soil is flooded daily by tidal waters and is continuously saturated.

Most areas of this soil are in saltgrass, smooth cordgrass, and some black needlerush. The daily tidal flooding and the high organic matter content and high sulfur content limit this soil for most uses other than as wetland wildlife habitat.

The capability subclass is VIIIw.

33E—Rumford fine sandy loam, 6 to 35 percent slopes. This soil is deep, strongly sloping to steep, and well drained. It is on side slopes that border major lakes, bays, rivers, and drainageways mostly in the northern part of the City. The areas of this soil commonly are irregularly shaped and range from 3 to 500 acres. Slopes mostly range from 15 to 25 percent.

Typically, the surface layer of this soil is very dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown fine sandy loam 7 inches thick. The subsoil is 36 inches thick. It is strong brown sandy clay loam, fine sandy loam, and loamy fine sand. The substratum mostly is yellowish brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small, nearly level areas of well drained Bojac and State soils, moderately well drained Tetotum and Yeopim soils, and Udorthents. Also included are soils that are similar to this Rumford soil but that have more clay or less clay in the subsoil or that do not have a well defined subsoil. Some areas have narrow drainageways and wet colluvial areas at the base of slopes, and seepage is common in some units on the lower part of the slopes. Some other areas that have a northeast exposure are severely eroded and unstable. Included soils make up about 25 percent of the unit.

The permeability of this Rumford soil is moderately rapid. Available water capacity is low. Surface runoff is medium to very rapid. The erosion hazard is moderate to severe. The shrink-swell potential is low. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid.

Most areas of this soil are in woodland. A few areas are used for community development.

The short, strongly sloping to steep slopes limit this soil for most types of farming. The potential productivity for trees is moderately high, especially for loblolly pine. Slope limits the use of equipment for woodland management and harvesting, and its use increases the erosion hazard.

Slope and seepage are the main limitations of this soil for community development, especially for building sites, for lawns and gardens, as a site for septic tank absorption fields, and for most types of recreation. The design and installation of septic tanks in this soil must meet State and local criteria. Slope stabilization and the prevention of erosion are main management concerns on areas of this soil that have had vegetation removed and on many areas that have a northeast exposure.

The capability subclass is VIe.

34A—State loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is on broad inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 750 acres.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and Rumford soils and moderately well drained Munden and Tetotum soils. The Bojac soils are on ridges and side slopes and the Munden and Tetotum soils are in slight depressions. The Rumford soils are strongly sloping to steep. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring. Included soils make up about 15 percent of the unit.

The permeability of this State soil is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are in community development or are used for cultivated crops. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. In some areas drainage is needed to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability class is I.

34B—State loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 190 acres.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum soils and well drained Bojac soils. The Tetotum soils are in slight depressions, and the Bojac soils are on ridges and side slopes. Included soils make up about 10 percent of the unit.

The permeability of this State soil is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content, reduce crusting, increase water infiltration, and reduce erosion.

The potential productivity for trees on this soil is very high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and for septic tank absorption fields. In some areas drainage is needed to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability subclass is IIe.

35—State-Urban land complex. This unit is on broad ridges and side slopes. It consists of deep, nearly level, well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 200 acres. They are about 40 percent State soils, 35 percent urbanized areas, and 25 percent other soils. The State soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this unit in mapping are areas of well drained Bojac and Rumford soils, moderately well drained Munden and Tetotum soils, and Udorthents. The Bojac soils and Udorthents are nearly level, and the Rumford soils are strongly sloping to steep. The Munden and Tetotum soils are in slight depressions. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring.

The permeability of these State soils is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate.

Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

The State soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

This unit is not assigned to a capability subclass.

36—Tetotum loam. This soil is deep, nearly level, and moderately well drained. It is on low ridges and side slopes on inland areas on the lower part of the Coastal Plain. The areas of this soil commonly are irregularly shaped and range from 2 to 480 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is brown loam about 10 inches thick. The subsoil is 48 inches thick. It mostly is yellowish brown loam and clay loam with gray and brown mottles in the lower part. The substratum is mottled brown, yellow, and gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and State soils; moderately well drained Munden and Yeopim soils; and somewhat poorly drained Augusta, Chapanoke, and Dragston soils. The Bojac and State soils are at slightly higher elevations. The Munden soils are on low ridges and side slopes. The other soils are in slight depressions. Also included are areas of undulating soils adjacent to lakes, bays, and large drainageways. These areas have slopes of 15 to 30 percent that range from 20 to 50 feet long. They are dissected by many short drainageways and generally have more sand and less clay in the subsoil than is typical for this Tetotum soil. Included soils make up about 15 percent of the unit.

The permeability of this Tetotum soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of greater than 60 inches. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. The soil is wet and cold in the early spring, and planting and tillage sometimes are delayed because of wetness. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seed and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria.

The capability subclass is IIw.

37—Tetotum-Urban land complex. This unit is on low ridges and side slopes. It consists of deep, nearly level, moderately well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 100 acres. They are about 40 percent Tetotum soils, 35 percent urbanized areas, and 25 percent other soils. The Tetotum soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Tetotum soils is brown loam about 10 inches thick. The subsoil is 48 inches thick. It mostly is yellowish brown loam and clay loam with gray and brown mottles in the lower part. The substratum is mottled brown, yellow, and gray loamy sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of well drained Bojac and State soils, moderately well drained Munden soils, somewhat poorly drained Augusta and Dragston soils, and Udorthents. The Bojac and State soils are at slightly higher elevations. The Augusta and Dragston soils are in slight depressions. The Udorthents and Munden soils are nearly level.

The permeability of these Tetotum soils is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

The Tetotum soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria.

This unit is not assigned to a capability subclass.

38—Tomotley loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats and in shallow drainageways. The areas of this soil commonly are irregularly shaped or oval and range from 2 to 700 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown loam about 7 inches thick. The subsoil is 38 inches thick. It mainly is gray and light brownish gray loam and sandy clay loam with yellowish brown mottles. The substratum is mottled, gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Nimmo soils, and very poorly drained Nawney and Portsmouth soils. The Augusta and Dragston soils are at slightly higher elevations. The Nimmo and Acredale soils are on flats and in shallow drainageways. The Nawney soils are in drainageways, and the Portsmouth soils are in slight depressions. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 25 percent of the unit.

The permeability of this Tomotley soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is moderate in organic matter content and low in natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are in community development or woodland.

Drained areas of this soil are well suited to cultivated crops (fig. 3). Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

The capability subclass is IVw.

39—Tomotley-Urban land complex. This unit is on broad inland flats. It consists of deep, nearly level, poorly drained soils and areas covered by parking lots, buildings, and other structures. The areas of the unit commonly are irregularly shaped and range from 2 to 260 acres. They are about 40 percent Tomotley soils, 35 percent urbanized areas, and 25 percent other soils. The Tomotley soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Tomotley soils is dark grayish brown loam about 7 inches thick. The subsoil is 38 inches thick. It mainly is gray and light brownish gray loam and sandy clay loam with yellowish brown mottles. The substratum is mottled, gray loamy sand to a depth of at least 60 inches.

Included with this complex in mapping are areas of poorly drained Acredale and Nimmo soils, somewhat poorly drained Augusta and Dragston soils, and Udorthents. The Acredale and Nimmo soils are on broad flats. The Augusta and Dragston soils are at slightly higher elevations. The Udorthents are nearly level.

The permeability of these Tomotley soils is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is moderate in organic matter content and low in natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between

Figure 3.—Drainage ditch on Tomotley loam.

the surface and a depth of 1 foot during winter and spring.

The Tomotley soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

This unit is not assigned to a capability subclass.

40—Udorthents, loamy. This unit consists of deep, well drained and moderately well drained soil material in areas that have been altered during excavation or covered by earthy fill material. Udorthents are mostly in and near urban areas, major highways, canals, and mining operations. The areas of this unit are irregularly shaped and range from about 2 to 200 acres. Slopes range from 0 to 25 percent.

Included with this unit in mapping are small areas of undisturbed soils. Also included are small bodies of water and areas of more poorly drained disturbed soils. Many areas have inclusions of nonsoil material, such as asphalt, concrete, wood, and glass. Inclusions make up about 25 percent of the unit.

The permeability and available water capacity of these Udorthents is variable. Surface runoff is rapid, and the erosion hazard is severe on steep areas with no vegetation.

These Udorthents generally are not suited to farming and are limited for most types of community development and recreation, but some areas are used for community development. Onsite investigation is needed to determine the suitability and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

41—Udorthents-Urban land complex. This unit consists of two main land types: (1) deep, nearly level, well drained and moderately well drained soil material in areas that have been altered during excavation or covered by earthy fill material; (2) areas covered by parking lots, buildings, and other structures. The two are so intermingled that it was not practical to map them separately. The areas of this unit commonly are irregularly shaped and range from 2 to 250 acres. They are about 40 percent Udorthents, 35 percent Urban land, and 25 percent other soils. Slopes range from 0 to 2 percent.

Included with this unit in mapping are small areas of mostly undisturbed soils. Many fill areas have inclusions of nonsoil materials, such as concrete, wood, glass, and asphalt.

The permeability, runoff, and available water capacity of this unit are variable. The erosion hazard is slight.

An onsite investigation is needed to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

42—Urban land. This unit consists of areas where more than 80 percent of the surface is covered by parking lots, buildings, and other structures. Examples are military installations, shopping centers, and industrial parks. These areas are throughout the survey area, but the largest are in business districts and along main roads. The areas of this unit commonly are irregularly shaped and range from about 2 to 270 acres. Slopes range from 0 to 2 percent.

Included with this unit in mapping are areas of undisturbed soils and Udorthents. The undisturbed soils are mainly between streets and sidewalks, in yards, and in traffic islands and circles. The Udorthents are areas where the natural soils have been disturbed by grading, excavating, or filling. These areas generally are less than 500 square feet. Included soils make up about 20 percent of the unit.

Onsite investigation is needed to determine the suitabilities and limitations of this unit for any use.

This unit is not assigned to a capability subclass.

43—Yeopim silt loam. This soil is deep, nearly level, and moderately well drained. It is on uplands and side slopes bordering major drainageways mostly in the northern part of the City. The areas of this soil commonly are irregularly shaped and range from 2 to 100 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam 5 inches thick. The subsoil is 71 inches thick. The upper part is yellowish brown and light olive brown silt loam and silty clay loam. The lower part is mottled gray and brown silty clay loam. The substratum is yellowish brown loamy sand to a depth of at least 84 inches.

Included with this soil in mapping are small areas of well drained State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Chapanoke soils. The State and Tetotum soils are at slightly higher elevations, and the Augusta and Chapanoke soils are in slight depressions. Also included are areas of undulating soils adjacent to lakes, bays, and large drainageways. These soils have slopes of 15 to 30 percent that range from 20 to 50 feet long, are dissected by many short drainageways, and generally have more sand in the subsoil than is typical for this Yeopim soil. Areas of Yeopim soil that have a subsoil less than 60 inches deep are generally west of Oceana Ridge and in the Blackwater area of the City. Also included are small areas of soils that are similar to this Yeopim soil but that have slow permeability. Included soils make up about 15 percent of the unit.

The permeability of this Yeopim soil is moderately slow in the subsoil and moderately rapid in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and spring.

Most areas of this soil are in community development. The remaining areas are in woodland or are used for cultivated crops.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. The soil is usually wet and cold in the early spring, and wetness often interferes with planting and tillage. The surface layer is thin, and tilth is only fair, but tilling within the proper soil moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the moderately slow to slow permeability, and low strength are the main limitations of this unit for community development. The seasonal high water table and the permeability limit the soil as a site for septic tank absorption fields. Drainage helps to improve the suitability for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria.

The capability subclass is IIw.

44—Yeopim-Urban land complex. This unit is on uplands bordering major drainageways that are mostly in the northern part of the City. It consists of deep, nearly level, moderately well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 5 to 150 acres. They are about 40 percent Yeopim soils, 35 percent urbanized areas, and 25 percent other soils. The Yeopim soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Yeopim soils is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam 5 inches thick. The subsoil is 71 inches thick. The upper part is yellowish brown and light olive brown silt loam and silty clay loam. The lower part is mottled gray and brown silty clay loam. The substratum is yellowish brown loamy sand to a depth of at least 84 inches.

Included with this unit in mapping are areas of well drained State soils, moderately well drained Tetotum soils, somewhat poorly drained Augusta and Chapanoke soils, and Udorthents. The State and Tetotum soils are at slightly higher elevations, and the Augusta and Chapanoke soils are in slight depressions. The Udorthents are nearly level. Also included are small areas of soils that are similar to these Yeopim soils but that have slow permeability.

The permeability of these Yeopim soils is moderately slow in the subsoil and moderately rapid in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and spring.

The Yeopim soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table, the moderately slow to slow permeability, and low strength are the main limitations of this unit for community development. The seasonal high water table and the permeability limit the soil as a site for septic tank absorption fields. Drainage helps to improve the suitability for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria. The low strength limits the soil as a site for local streets and roads, but this limitation can be overcome by strengthening or replacing the base material.

This unit is not assigned to a capability subclass.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable levels of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope range is mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 94,055 acres of the land area of the City of Virginia Beach meets the soil requirements for prime farmland. However, because of rapidly expanding urban development and areas that are not drained and developed for cropland, the Soil Conservation Service and the Agricultural Extension Service estimate that only about 50,000 acres, or nearly 31 percent of the land area, is prime farmland that is used for crop production.

A recent trend in land use in some parts of the survey area has been toward the loss of some prime farmlands to industrial and urban uses (fig. 4). The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more wet, erodible, droughty, and difficult to cultivate and usually are less productive.

Soil map units that make up prime farmland in the City of Virginia Beach are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have a seasonal high water table may qualify for prime farmland if the limitation is overcome by drainage. In table 5 the need for drainage is shown in parentheses after the map unit name. Onsite evaluation is necessary to see if the limitation has been overcome.

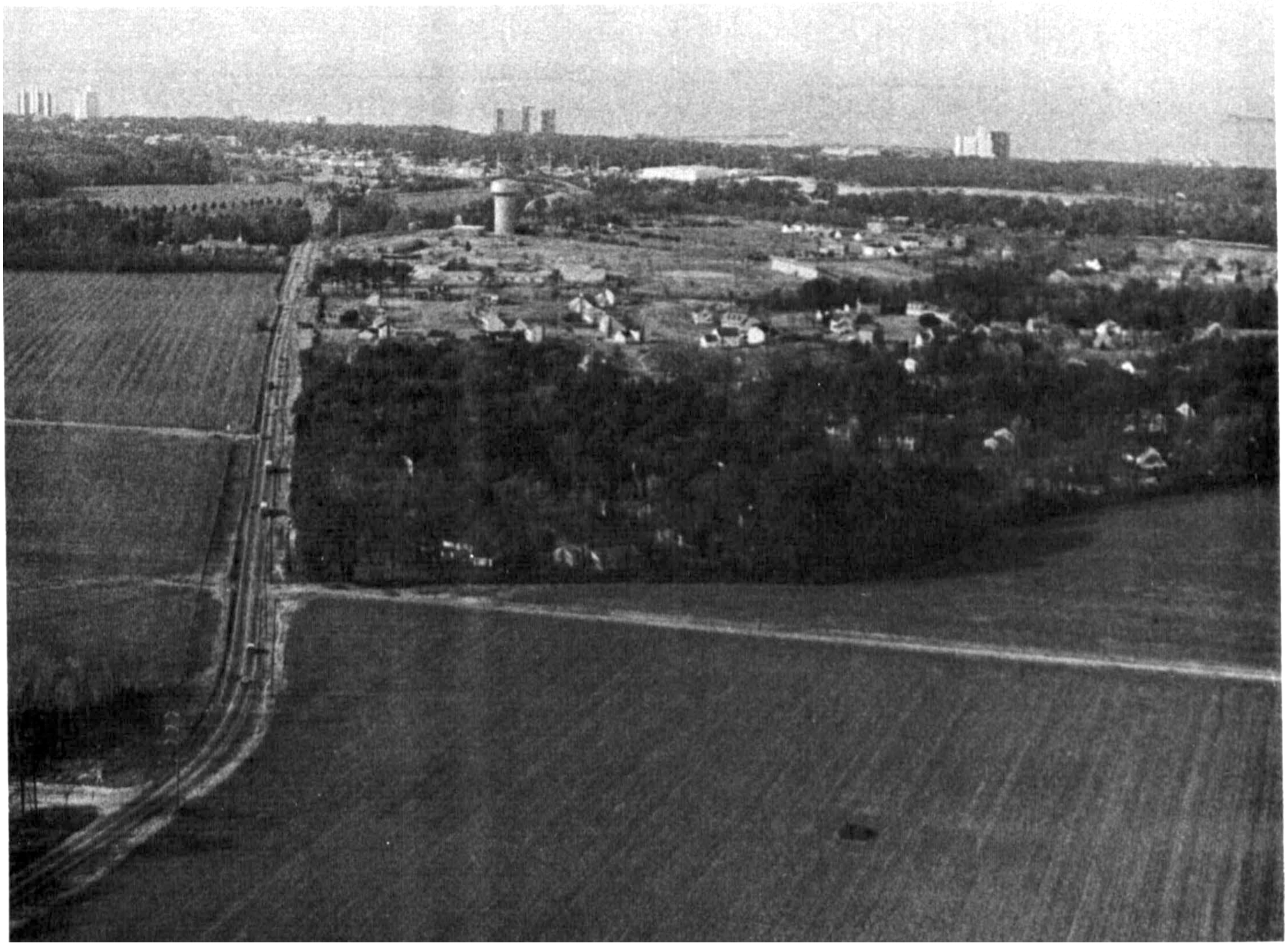


Figure 4.—Urban development near an area of prime farmland.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where sandy layers, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Beach, Dune, and Marsh System

L.E. Cullipher, district conservationist, Soil Conservation Service, assisted with the preparation of this section.

A group of narrow landforms that are parallel to the coast of the survey area makes up what is called the beach, dune, and marsh system. The system is part of the barrier islands range that includes Cape Henry, Sandbridge, Back Bay National Wildlife Refuge, and False Cape State Park. The landforms that make up the system have formed from unconsolidated sandy sediments, and they generally are separated from the mainland by estuaries.

The system is subject to stress and continual change by wave, wind, and tidal forces. Seasonal and other cyclic fluctuations in wave patterns and intensity combine with ocean storms and hurricanes to form and re-form the islands. The beaches and dunes migrate in response to these fluctuations, and storm overwash and winds periodically carry sands inland, leaving substantial deposits of new sediment on the islands.

The system has a strong appeal to man as a recreational and living area, but the beach environment is hostile to plant life. Even native plants that are suited to seaside conditions are difficult to establish and maintain. The sandy soils are extremely low in available water, organic matter content, and fertility. Plants are constantly subject to salt spray and blowing sand.

The plants along the dunes are grouped together in what has been called "the salt spray community." A number of natural forces on the beach influence plant life, but by far the most important factor is salt spray. Plants vary considerably in their tolerance to salt spray. The most tolerant beach grasses and herbaceous plants are closest to the ocean. Plants with less tolerance to the salt spray and violent winds of frontal areas are farther inland.

The coastal plants are grouped in four generalized zones, depending upon their tolerance to salt spray (fig. 5). These zones are: (1) the pioneer zone, or grass zone, which is closest to the ocean and has the most direct exposure to the elements; (2) the shrub zone, which mainly starts behind the protection of frontal dunes; (3) the forest zone, which is adjacent to the shrub zone; (4) the marsh zone, which is on the edge of Back Bay. While there is always intergrading and overlapping of plants between zones, many species are nearly exclusive to a particular zone.

The prevalent plants in the pioneer zone are: American beachgrass, coastal panicgrass, bitter panicum, sea-oats, and marshhay cordgrass.

The prevalent plants in the shrub zone are: northern bayberry, wax myrtle, marsh elder, groundsel tree, Virginia creeper, trumpetcreeper, poison ivy, and seaside bluestem.

The prevalent plants in the forest zone are: live oak, loblolly pine, black cherry, and muscadine grape.

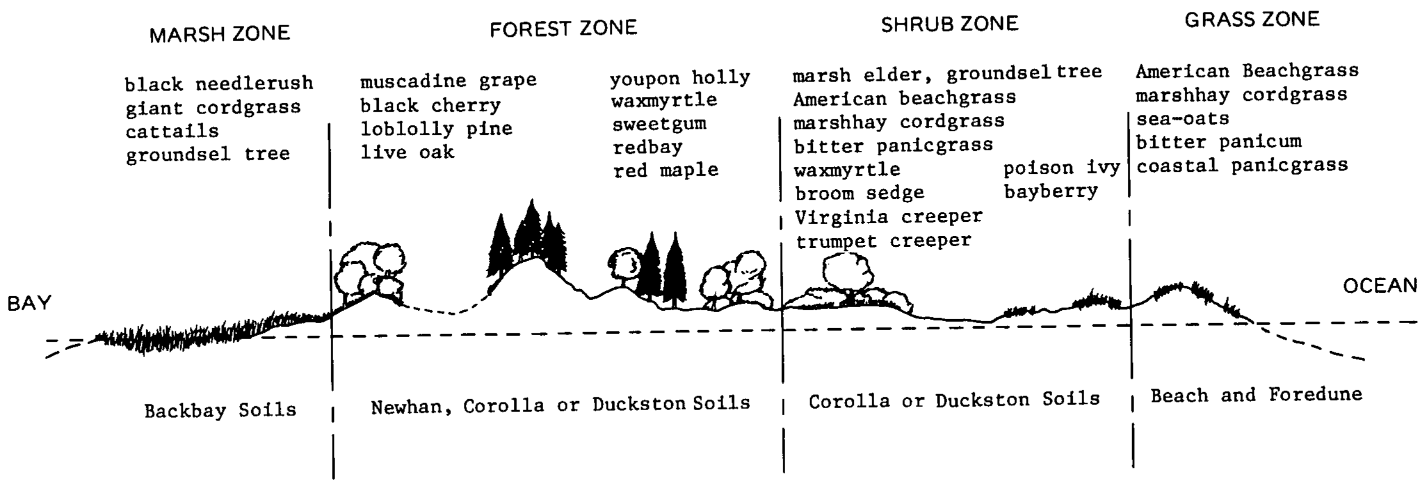


Figure 5.—Characteristic soil types and dominant vegetation between Back Bay and the Atlantic Ocean.

The prevalent plants in the marsh zone are: black needlerush, giant cordgrass, cattails, and groundsel tree.

Some of the plants in the four zones, along with simple structures such as fences, help to stabilize the dunes and the shoreline. All of the plants respond well to applications of fertilizer, and those in the forest, shrub, and grass zones respond well to irrigation.

Crops and Pasture

James Belote, agronomist, Virginia Polytechnic Institute and State University Extension Service, assisted with the preparation of this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

The City of Virginia Beach had nearly 44,000 acres of cropland in 1981, according to the Virginia Cooperative Extension Service. Corn, wheat, and soybeans were grown on most of this acreage. Some areas were used for vegetables, pasture, and ornamentals. With proper management, most upland soils in the survey area are well suited to most crops commonly grown in the area.

This survey area has numerous broad, flat upland areas consisting of very poorly drained or poorly drained soils. The limitations of these soils are a seasonal high water table and the lack of adequate surface drainage. Many of these soils have water on the surface after heavy rainfall, thereby hindering the use of heavy equipment and harming the crops. To remove this excess water, most farmers construct networks of shallow open ditches. They then shape the fields to enhance surface runoff. However, adequate outlets for drainage systems are not available in some areas. In the southern part of the City, wind tides make drainage difficult.

No-till farming, or conservation tillage, is a practice in which a second crop is planted in the stubble of the first crop without plowing under or burning the stubble. With proper fertilization and weed control, the additional moisture held by the stubble can help boost crop yields in droughty years.

The soils of the survey area are naturally acid. When the soils are put under cultivation, lime is required to bring the acidity to a level the crops can tolerate.

Soil erosion is not as critical in this survey area as it is in other parts of the state. Erosion does occur, however, even on the nearly level areas. Erosion can be minimized on the gently sloping areas by using contour cropping and conservation tillage.

The Virginia Cooperative Extension Service estimated that only 1,500 acres of the City's farmland was in pasture or hay in 1981. It is not economically feasible for most farmers to use cropland for long-term beef production or dairy operations when high annual yields can be obtained from row crops. Generally, wetness is the main limitation of the soils for pasture and hay.

The carrying capacity of pastures can be enhanced by using drainage, proper stocking rates, rotational and deferred grazing, and lime and fertilizer. Overgrazing and grazing when the soil is too wet cause compaction of the surface layer and damage the stands of grasses and legumes. Most soils are not suited to alfalfa because of the seasonal high water table. Much of the hay and pasture in the survey area is a mixture of fescue and clover.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow or droughty; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed soil map units" and in table 6.

Woodland Management and Productivity

Woodland covers about 57,600 acres, or 35 percent of the land area, in the City of Virginia Beach. The common trees on the uplands are southern red oak, white oak, hickory, sweet gum, and loblolly pine. The main species on bottom land or in swamps are baldcypress, tupelo gum, maple, willow oak, and water oak. Most of the woodland is used for wildlife habitat, recreation, and esthetic purposes. Much of the merchantable timber is on soils with a seasonal high water table which limits the use of heavy equipment during wet seasons.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

One of the major sources of recreation in the City of Virginia Beach is the nearly 40 miles of coastline along the Chesapeake Bay and the Atlantic Ocean. Boating, swimming, hiking, and camping facilities are available throughout the City. Some of the major recreation areas for swimming are Chesapeake Beach, the Oceanfront resort area, and Sandbridge Beach, as well as the numerous lakes and rivers.

The City has an extensive system of parks and wildlife areas managed by local, State, and Federal agencies. The parks, particularly Seashore State Park, are popular camping, hiking, and picnic areas.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is firm after rains and is not dusty when dry.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

The combinations of marshland, farmland, woodland, and open water areas in the City of Virginia Beach attract a wide variety of wildlife. Numerous State and Federal wildlife refuges and management areas provide habitat for waterfowl, deer, fish, and small game. The marshes of Virginia Beach provide an excellent habitat for shorebirds and migratory waterfowl such as ducks and geese. The marshes are primarily around Back Bay, the North Landing River, and the Lynnhaven River. The City's abundant water resources provide an excellent habitat for numerous saltwater and freshwater sport fish. Back Bay is popular for bass fishing, while the Chesapeake Bay and Atlantic Ocean are known for their abundance of spot, bluefish, trout, flounder, and other saltwater species. The survey area's cropland, fallow fields, cutover woodland, and forests provided a habitat for game species such as white-tailed deer, rabbit, and squirrel. Quail and dove, as well as numerous species of other birds, are abundant in the area.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, sorghum, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are tall fescue, coastal bermudagrass, blackwell switchgrass, and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, foxtail millet, pokeberry, beggarweed, partridgepea, switchcane, and crabgrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, blackgum, red maple, dogwood, hickory, holly, redbay, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are cardinal, autumn-olive, and rem-red amur honeysuckle.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, redcedar, and baldcypress.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, and slope. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, reeds, marsh elder, groundsel tree, marsh hibiscus, and cattails.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, killdeer, meadowlark, mourning dove, field sparrow, and cottontail.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, and mink.

Engineering

Bartley Tuthill, soil scientist, City of Virginia Beach Environmental Services, assisted with the preparation of this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by a cemented pan or a very firm dense layer, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table. Many of the soils in the City of Virginia Beach have a seasonal high water table and a sandy substratum that hinder excavations and make the use of well points and embankment stabilization equipment necessary for such excavations.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness. In soils with a seasonal high water table, local health department officials may approve the use of septic tank absorption fields provided that certain management practices are applied. Some of these practices include the installation of an oversize drainfield and enhancing surface runoff with proper landscaping and ditching. Homesites on these soils need sufficient area to install the needed management practices.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and sandy layers can cause construction problems.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential or slopes of 15 to 25 percent. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing (fig. 6). Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil) and the thickness of suitable material. Acidity and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick. All other soils are rated as an improbable source.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They have little or no gravel and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Figure 6.—Mining sand on Bojac and Munden soils on Pungo Ridge.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of organic matter or salts. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected mostly by slope and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by soil texture. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Wetness and slope affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years (fig. 7). The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

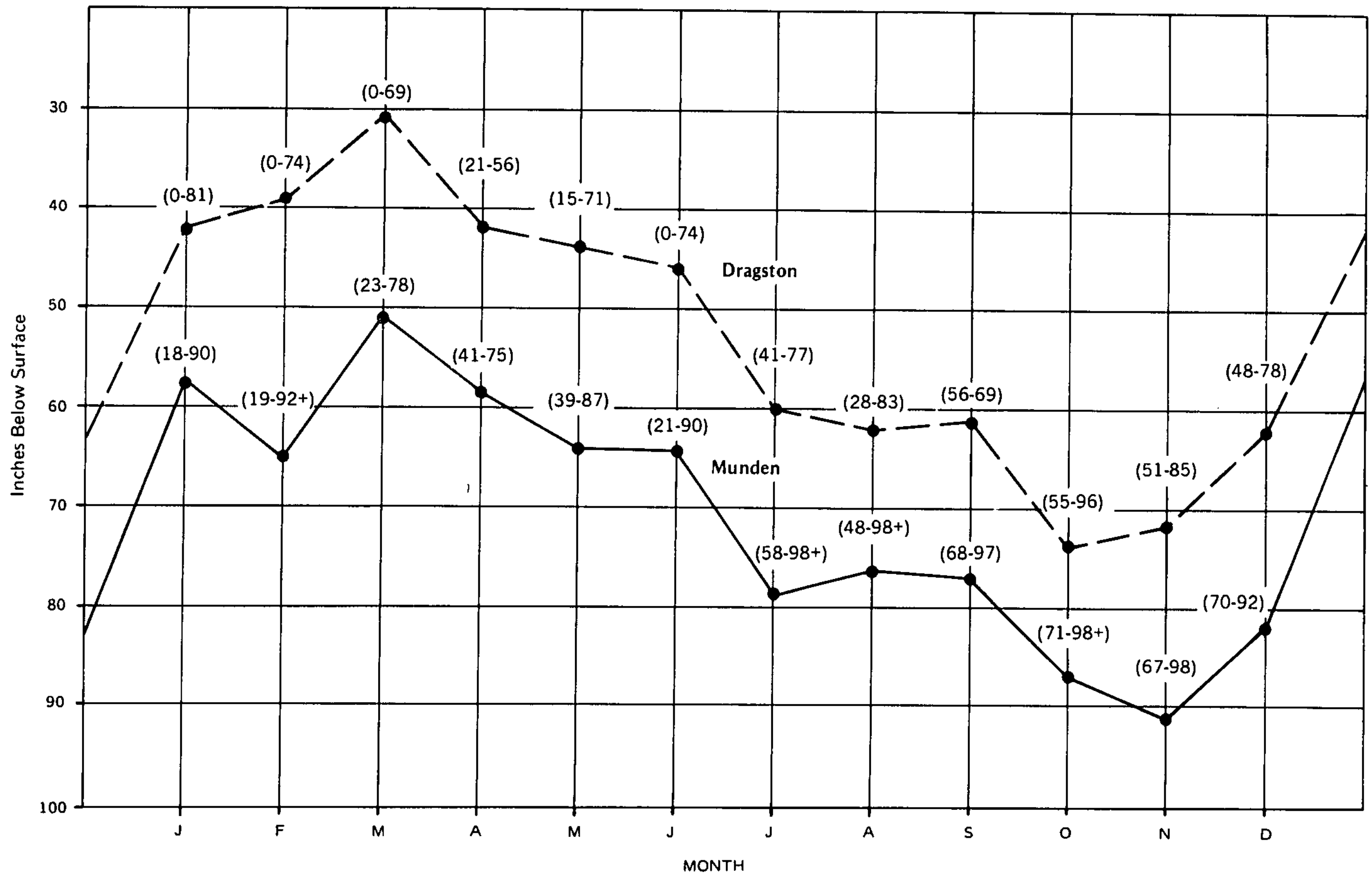


Figure 7.—Average monthly water table levels of a somewhat poorly drained Dragston soil and a moderately well drained Munden soil during 1976-81. The range in parentheses is the maximum and minimum for each month.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 16 shows the expected initial subsidence, which usually is a result of drainage, and annual subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquults (*Aqu*, meaning water, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Ochraquults (*Ochra*, meaning presence of ochric epipedon, plus *aquults*, the suborder of the Ultisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Ochraquults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Ochraquults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Acredale series

The soils of the Acredale series are deep and poorly drained. They formed in loamy marine and fluvial sediments. The Acredale soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Acredale soils commonly are near Augusta, Chapanoke, Dragston, Hyde, Nawney, Nimmo, Portsmouth, and Tomotley soils. The Acredale soils have more gray in the upper part of the argillic horizon than the Augusta, Chapanoke, or Dragston soils. The Acredale soils do not have an umbric epipedon, as do the Hyde and Portsmouth soils, and have more silt and clay in the subsoil than the Nimmo soils and less sand and more silt in the subsoil than the Tomotley soils. The Acredale soils are not subject to flooding as are the Nawney soils.

Typical pedon of Acredale silt loam, about 4.5 miles northwest of Princess Anne, 1,700 feet south-southwest of the intersection of Lynhaven Parkway and Princess Anne Road:

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common fine and very fine roots; common fine and medium pores; strongly acid; clear smooth boundary.

B1tg—7 to 15 inches; light brownish gray (10YR 6/2) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and very fine roots; common very fine vesicular pores and few fine tubular pores; many very fine sand grains coated and bridged with clay; very strongly acid; abrupt smooth boundary.

B21tg—15 to 35 inches; gray (5Y 5/1) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; friable, sticky, plastic; common very fine roots; few fine vesicular pores and few fine tubular pores; many thin continuous clay films on faces of peds; many very fine sand grains coated and bridged with clay; pockets of silt 1/2 inch to 3 inches in diameter that are white when dry; very strongly acid; clear smooth boundary.

B22tg—35 to 43 inches; mottled light greenish gray (5GY 7/1), dark gray (N 4/0), and yellowish brown (10YR 5/8) silt loam; moderate fine and medium subangular blocky structure; friable, sticky, plastic; few very fine roots; few very fine vesicular pores; few thin discontinuous clay films on faces of peds; few very fine sand grains coated and bridged with clay; few fine prominent yellowish red stains along root channels; very strongly acid; clear smooth boundary.

IIB3tg—43 to 50 inches; mottled light gray (10YR 6/1), light greenish gray (5GY 7/1), and yellowish brown (10YR 5/8) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few fine vesicular pores; few thin discontinuous clay films on faces of peds; few sand grains coated and bridged with clay; many clean sand grains; common pockets of clean white sand up to 3 inches in diameter; strongly acid; clear wavy boundary.

IICg—50 to 66 inches; mottled gray (5Y 6/1), light olive gray (5Y 6/2), and yellowish brown (10YR 5/8) fine sandy loam; massive; very friable, nonsticky, nonplastic; few very fine vesicular pores; many fine flakes of mica; moderately acid.

The solum thickness ranges from 40 to 60 inches. The A horizon in unlimed areas ranges from extremely acid through strongly acid. The B and C horizons range from very strongly acid through neutral.

The A horizon has hue of 10YR or 2.5Y, value of 2 through 6, and chroma of 1 through 3. Where value is 2 or 3, the horizon is less than 6 inches thick. The A horizon is silt loam, loam, or very fine sandy loam.

The B1 horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 2. It is loam or silt loam. Some pedons do not have a B1 horizon.

The hue, value, and chroma of the B2t horizon are similar to those of the B1 horizon. The lower part of the B2t horizon has hue of 5GY and 5G, value of 4 through 6, and chroma of 1. The upper part of the B2t horizon is silty clay loam or silt loam. The lower part is loam, clay loam, silt loam, silty clay loam, or silty clay.

Most pedons have a B3 horizon that has hue of 10YR through 5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 2; or hue of 5GY or 5G, value of 4 through 6, and chroma of 1. The texture of the B3 horizon is similar to that of the lower part of the B2t horizon but ranges to sandy loam or sandy clay loam in some pedons.

The hue, value, and chroma of the C horizon are similar to those of the B3 horizon. The C horizon mainly is sand, loamy sand, sandy loam, or fine sandy loam. In some pedons it has thin strata of finer textured material.

Augusta series

The soils of the Augusta series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. The Augusta soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Augusta soils commonly are near Acredale, Chapanoke, Tetotum, Tomotley, and Yeopim soils. The Augusta soils are not as gray in the upper part of the argillic horizon as are the Acredale or Tomotley soils. The Augusta soils have more brown mottles near the surface than the Tetotum or Munden soils and have less silt in the argillic horizon than the Chapanoke or Yeopim soils.

Typical pedon of Augusta loam, about 3,500 feet west-northwest of the junction of West Landing and West Neck Roads, and 350 feet north of West Landing Road:

Ap—0 to 8 inches; light olive brown (2.5Y 5/4) loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; few fine and common very fine roots; strongly acid; abrupt smooth boundary.

B1t—8 to 13 inches; light yellowish brown (2.5Y 6/4) loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B21t—13 to 18 inches; light yellowish brown (2.5Y 6/4) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B22t—18 to 27 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B23tg—27 to 34 inches; light brownish gray (2.5Y 6/2) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles, common medium distinct light gray (10YR 6/1) mottles, and common fine and medium prominent black (N 2/0) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B24tg—34 to 45 inches; light gray (10YR 6/1) clay loam; few medium prominent brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear wavy boundary.

IIC—45 to 63 inches; mottled light yellowish brown (2.5Y 6/4) and light gray (10YR 6/1) loamy sand; massive; very friable; many clean sand grains; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from very strongly acid through moderately acid.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 or 4. Some pedons have an A2 horizon with hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 2 through 4. The A horizon is sandy loam, loam, or silt loam.

The B1 horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 3 through 8. It has high- or low-chroma mottles. It is sandy loam, silt loam, loam, or sandy clay loam.

The upper part of the B2t horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 through 6. It has high- or low-chroma mottles. The lower part of the B2t horizon has hue of 10YR through 5Y, value of 5 through 7, and chroma of 1 or 2, and it is mottled. Some pedons do not have a dominantly gray matrix but are mottled in many shades. The B2t horizon is loam, silt loam, clay loam, or sandy clay loam.

Some pedons have a B3 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is sandy loam, loam, or clay loam.

The hue, value, and chroma of the IIC horizon are similar to those of the lower part of the B2t horizon. The IIC horizon mainly is sand, loamy sand, or sandy loam. Some pedons are stratified and have pockets or layers of sandy clay loam or clay loam. Some pedons do not have a lithologic discontinuity.

Backbay series

The soils of the Backbay series are deep and very poorly drained. They formed in organic material and the underlying loamy marine and fluvial sediments. The Backbay soils are in marshes on the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Backbay soils commonly are near Corolla, Dragston, Duckston, Nawney, Nimmo, and Tomotley soils. The Backbay soils are frequently flooded and have a histic epipedon, whereas the Corolla, Dragston, Duckston, Nimmo, and Tomotley soils are not frequently flooded and do not have a histic epipedon. The Backbay soils are in marshes; the Nawney soils are wooded and have less than 8 inches of organic material on the surface.

Typical pedon of Backbay mucky peat, about 1,900 feet from the eastern side of Long Island and 1,000 feet from the northern edge of Long Island, in the Back Bay National Wildlife Refuge:

Oe—0 to 11 inches; very dark brown (10YR 2/2) mucky peat (hemic material); about 36 percent fiber, 28 percent rubbed; massive; common fine and medium roots; very pale brown (10YR 7/3) sodium pyrophosphate extract; slight sulfide odor; strongly acid; clear smooth boundary.

A1—11 to 22 inches; black (10YR 2/1) silt loam; weak medium granular structure; slightly sticky, slightly plastic; common fine and medium roots; slightly acid; clear smooth boundary.

C1g—22 to 33 inches; gray (10YR 5/1) sandy clay loam; massive; sticky, slightly plastic; few medium roots; few fine flakes of mica; neutral; clear smooth boundary.

C2g—33 to 47 inches; gray (N 6/0) silty clay loam; common medium distinct light olive brown (2.5Y 5/6) mottles; massive; slightly sticky, plastic; few fine flakes of mica; neutral; gradual smooth boundary.

C3g—47 to 60 inches; gray (N 6/0) silty clay loam; many coarse distinct light olive brown (2.5Y 5/6) mottles; massive; slightly sticky, plastic; common fine flakes of mica; neutral.

The soil ranges from very strongly acid through moderately acid in the organic surface layer and from strongly acid through neutral in the mineral horizons. The sulfur content in the organic surface layer ranges from 0.1 to 1.4 percent.

The O horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is mucky peat or muck.

The A1 horizon has hue of 7.5YR through 2.5Y or is neutral, has value of 2 or 3, and has chroma of 0 through 2. It is sandy loam, loam, or silt loam.

The Cg horizon has hue of 10YR through 5BG or is neutral, has value of 4 through 7, and has chroma of 0 through 2. It mainly is sandy loam, loam, silt loam, sandy clay loam, clay loam, or silty clay loam. It commonly is stratified. Some pedons have subhorizons of sandy or clayey material. Flakes of mica are few to common.

Bojac series

The soils of the Bojac series are deep and well drained. They formed in loamy fluvial and marine sediments. The Bojac soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Bojac soils commonly are near Munden, State, and Tetotum soils. The Bojac soils do not have gray mottles in the subsoil as do the Munden soils. The Bojac soils have less clay in the argillic horizon than the State or Tetotum soils.

Typical pedon of Bojac fine sandy loam, about 3,100 feet north-northwest of the junction of Princess Anne Road and Pungo Ferry Road, 900 feet west of Princess Anne Road and 3,000 feet north of Pungo Ferry Road:

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable, slightly sticky, nonplastic; common fine and very fine roots; moderately acid; abrupt smooth boundary.

B21t—8 to 15 inches; strong brown (7.5YR 5/8) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and very fine roots; many sand grains bridged and coated with clay; strongly acid; clear smooth boundary.

B22t—15 to 32 inches; strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and common very fine roots; few thin discontinuous clay films on faces of peds; many sand grains bridged and coated with clay; very strongly acid; clear smooth boundary.

B23t—32 to 38 inches; yellowish brown (10YR 5/8) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common sand grains bridged and coated with clay; very strongly acid; clear smooth boundary.

C1—38 to 48 inches; brownish yellow (10YR 6/6) loamy fine sand; single grain; loose; few fine roots; many sand grains stained; strongly acid; clear smooth boundary.

C2—48 to 62 inches; mottled brownish yellow (10YR 6/8) and yellow (10YR 7/8) fine sand; single grain; loose; few very fine roots; moderately acid.

The solum thickness ranges from 30 to 50 inches. The soil in unlimed areas is very strongly acid through moderately acid. The silt content ranges from 20 to 40 percent in the textural control section.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 or 4. It is loamy sand, sandy loam, fine sandy loam, or loam.

Some pedons have a B1 horizon that has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 6. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has hue of 5YR through 10YR, value of 5 or 6, and chroma of 4 through 8. In some pedons it has low-chroma mottles at a depth of more than 40 inches. The B2t horizon mainly is sandy loam, fine sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the B2t horizon. The B3 horizon is loamy sand or loamy fine sand.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 3 through 8. Some pedons have high- and low-chroma mottles. The C horizon commonly is stratified and ranges from sand to loamy fine sand.

Chapanoke series

The soils of the Chapanoke series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. Chapanoke soils are on uplands on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Chapanoke soils commonly are near Acredale, Augusta, Tetotum, and Yeopim soils. The Chapanoke soils are not as gray in the upper part of the argillic horizon as are the Acredale soils, have more gray near the surface than the Yeopim soils, and have more silt in the argillic horizon than the Augusta or Tetotum soils.

Typical pedon of Chapanoke silt loam, about 4,300 feet northwest of the junction of Hungarian Road and Blackwater Road:

A1—0 to 3 inches; light brownish gray (10YR 6/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; common fine and few medium pores; extremely acid; clear smooth boundary.

B1t—3 to 7 inches; olive yellow (2.5Y 6/6) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable, sticky, slightly plastic; few fine and medium roots; common fine and few medium pores; thin discontinuous clay films on faces of peds; extremely acid; clear smooth boundary.

B21t—7 to 12 inches; olive yellow (2.5Y 6/6) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles, few fine distinct strong brown (7.5YR 5/8) mottles, and few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable, sticky, slightly plastic; few fine and medium roots; few fine and medium pores; thin discontinuous clay films on faces of peds; extremely acid; clear smooth boundary.

B22t—12 to 18 inches; mottled light brownish gray (10YR 6/2), light reddish brown (2.5YR 6/4), and strong brown (7.5YR 5/8) silty clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, slightly plastic; few fine roots along faces of prisms; few very fine and fine pores; thin discontinuous clay and silt films on faces of peds; extremely acid; clear smooth boundary.

B23tg—18 to 32 inches; gray (5Y 5/1) silty clay; common coarse prominent strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, plastic; few fine roots along faces of prisms; few very fine and fine pores; thin continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B24tg—32 to 39 inches; mottled gray (5Y 5/1), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/8) silty clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; friable, sticky, plastic; few fine roots along faces of prisms; few very fine and fine pores; thin discontinuous clay films on faces of peds; few fine flakes of mica; extremely acid; clear smooth boundary.

B25tg—39 to 46 inches; light gray (10YR 6/1) silty clay loam; common medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable, sticky, slightly plastic; few fine roots; few fine pores; thin discontinuous clay films on faces of peds; few fine flakes of mica; very strongly acid; clear smooth boundary.

C1—46 to 53 inches; light yellowish brown (10YR 6/4) silt loam; few fine faint yellowish brown (10YR 5/6) mottles and few medium distinct strong brown (7.5YR 5/8) mottles; massive; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; few fine flakes of mica; extremely acid; gradual smooth boundary.

C2—53 to 72 inches; light yellowish brown (10YR 6/4) fine sandy loam; few fine faint yellowish brown (10YR 5/6) mottles and few medium distinct strong brown (7.5YR 5/8) mottles; massive; friable, slightly sticky, nonplastic; few fine roots; few fine pores; few fine flakes of mica; few old root channels surrounded by iron concretions; pockets of white very fine sand in old root channels; extremely acid.

The solum thickness is more than 40 inches. The soil in unlimed areas ranges from extremely acid through moderately acid. Few to many fine flakes of mica are in the lower part of the solum in most pedons.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. Some pedons have an A2 horizon that has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 3. It has high- or low-chroma mottles. The A horizon is loam or silt loam.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 3 through 6. It is loam or silt loam. High- or low-chroma mottles are few or common. Some pedons do not have a B1 horizon.

The upper part of the B2t horizon has hue of 2.5Y or 5Y, value of 5 through 7, and chroma of 4 through 6. The lower part of the B2t horizon has hue of 10YR through 5GY or is neutral, has value of 5 through 7, and has chroma of 0 through 2, and is mottled. The B2t horizon typically is silt loam, clay loam, or silty clay loam but ranges to loam and silty clay in the lower part.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is loam, fine sandy loam, very fine sandy loam, silt loam, or sandy clay loam.

The C horizon has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8. It commonly is sand, loamy sand, sandy loam, fine sandy loam, or silt loam that is stratified or in pockets and lenses.

Corolla series

The soils of the Corolla series are deep and moderately well drained to somewhat poorly drained. They formed in sandy marine sediments. The Corolla soils are on coastal areas on the lower part of the Coastal Plain. Slopes range from 0 to 6 percent.

Corolla soils commonly are near Backbay, Duckston, and Newhan soils. The Corolla soils are not as gray in the upper part of the substratum as the Backbay or Duckston soils, and they have mottles in the substratum, which is not typical of the Newhan soils.

Typical pedon of Corolla fine sand, in False Cape State Park, about 4 miles north-northwest of the Virginia-

North Carolina state line and 1,000 feet west of the Atlantic Ocean:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sand; single grain; loose; many clean sand grains, common sand grains stained with organic material; extremely acid; clear broken boundary.
C1—3 to 18 inches; pale brown (10YR 6/3) fine sand; single grain; loose; few pink and blue, common strong brown, and many black sand size mineral grains; extremely acid; clear smooth boundary.
C2—18 to 25 inches; pale brown (10YR 6/3) fine sand; few medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; few pink and blue, common strong brown, and many black sand size mineral grains; extremely acid; clear smooth boundary.
C3g—25 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; few pink and blue, common brown, and many black sand size mineral grains; extremely acid.

The thickness of the sandy horizons is more than 72 inches. The soil ranges from extremely acid through neutral. The soil has few to many mineral grains that are black, red, pink, dark brown, or white. Some pedons have a buried A horizon between depths of 25 and 60 inches. It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

Most pedons have a thin A horizon that has hue of 10YR, value of 4 through 6, and chroma of 1 or 2. It is sand or fine sand.

The upper part of the C horizon has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. The lower part of the C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Some pedons have few to many high- and low-chroma mottles below a depth of 18 inches. The C horizon is sand or fine sand.

Dorovan series

The soils of the Dorovan series are deep, very poorly drained, and organic. They formed in partially decomposed plant remains. The Dorovan soils are in inland swamps on the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Dorovan soils commonly are near Nawney and Pocaty soils. The Nawney soils are mineral soils, and the Pocaty soils support marsh vegetation and have a high content of sulfur.

Typical pedon of Dorovan mucky peat, 1,400 feet west of the west end of Pungo Ferry Bridge, 100 feet north of Pungo Ferry Road:

Oe—0 to 4 inches; dark brown (7.5YR 3/2) mucky peat (hemic material) consisting of partially decomposed roots, leaves, twigs, and moss; about 50 percent rubbed fiber; massive; slightly sticky; many very fine and fine roots and common medium roots; extremely acid; gradual wavy boundary.
Oa1—4 to 28 inches; dark brown (7.5YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; moderately acid; clear smooth boundary.
Oa2—28 to 41 inches; very dark grayish brown (10YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; small accumulation of silt in lower part; moderately acid; clear smooth boundary.
Oa3—41 to 78 inches; very dark grayish brown (10YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; pale brown (10YR 6/3) sodium pyrophosphate extract; old reedy marsh vegetation evident in upper 6 inches before rubbing; slightly acid; abrupt smooth boundary.
IIC—78 to 80 inches; dark gray (5Y 4/1) silt; massive; sticky, nonplastic; moderately acid.

The thickness of the organic material is more than 51 inches. The soil ranges from extremely acid through slightly acid.

The Oe horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 through 3. Rubbed fiber content ranges from 20 to 50 percent and is dominantly mucky peat (hemic material).

The Oa horizon has hue of 2.5YR through 10YR, value of 2 or 3, and chroma of 1 through 3. Rubbed fiber content is less than 17 percent and is dominantly muck (sapric material).

The IIC horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 1 or 2. It is silt, silt loam, silty clay, silty clay loam, or clay.

The Dorovan soils in this survey area are a taxadjunct because they have a higher pH in the middle and lower organic layers and are redder in the upper organic layers than defined in the range for the series. These differences do not significantly affect the use and management of the soils.

Dragston series

The soils of the Dragston series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. The Dragston soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Dragston soils commonly are near Acredale, Backbay, Munden, Nimmo, Tetotum, and Tomotley soils. The Dragston soils are not as gray in the upper part of the argillic horizon as the Acredale, Nimmo, or Tomotley soils; have less clay in the subsoil than the Tetotum soils; have more gray near the surface than the Munden soils; and are not flooded and do not have a histic epipedon as do the Backbay soils.

Typical pedon of Dragston fine sandy loam, about 2,000 feet south-southwest of junction of Dam Neck Road and Oceana Boulevard, and 75 feet west-northwest of Oceana Boulevard:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; few fine and common very fine roots; moderately acid; abrupt smooth boundary.

B21t—9 to 19 inches; light yellowish brown (2.5Y 6/4) sandy loam; common medium distinct brownish yellow (10YR 6/8) mottles, few fine faint light brownish gray (10YR 6/2) mottles, and few fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; few sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B22t—19 to 29 inches; mottled light yellowish brown (2.5Y 6/4), light gray (10YR 7/1), strong brown (7.5YR 5/8), and red (2.5YR 4/8) sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few sand grains coated and many bridged with clay; very strongly acid; clear smooth boundary.

B3tg—29 to 38 inches; light gray (10YR 7/1) sandy loam; many medium distinct light yellowish brown (2.5Y 6/4) mottles and common fine and medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few very fine roots; few sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

Cg—38 to 60 inches; light gray (10YR 7/1) sandy loam; many medium and coarse strong brown (7.5YR 5/8) mottles and few fine prominent red (2.5YR 4/8) mottles; massive; friable, nonsticky, nonplastic; very strongly acid.

The solum thickness ranges from 25 to 50 inches. The soil in unlimed areas is very strongly acid or strongly acid. Silt content ranges from 20 to 50 percent in the textural control section.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 through 4. It is fine sandy loam, sandy loam, or loam.

Some pedons have a B1 horizon that has hue, value, and chroma similar to those of the upper part of the B2t horizon. The B1 horizon is sandy loam, fine sandy loam, or loam.

The upper part of the B2t horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 through 8. It is mottled. The lower part of the B2t horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 6, and has chroma of 0 through 8. It is mottled with high and low chromas. Some pedons have subhorizons that are mottled and do not have a dominant matrix color. The B2t horizon mainly is fine sandy loam, sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

The B3 horizon has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is loamy fine sand, sandy loam, or fine sandy loam. Some pedons do not have a B3 horizon.

The C horizon has hue of 10YR or 2.5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 8. The C horizon is sand, loamy sand, or sandy loam.

Duckston series

The soils of the Duckston series are deep and poorly drained. They formed in sandy marine sediments. The Duckston soils are on coastal areas on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Duckston soils commonly are near Backbay, Corolla, and Newhan soils. The Duckston soils do not have a histic epipedon as do the Backbay soils, and they have more gray in the substratum than the Corolla or Newhan soils.

Typical pedon of Duckston fine sand, about 4 miles north of the North Carolina-Virginia state line and 2,500 feet west of the Atlantic Ocean:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sand; single grain; loose; common fine and medium roots; few clean sand grains; extremely acid; clear smooth boundary.

C1g—4 to 15 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; few black and strong brown fine mineral grains; extremely acid; gradual wavy boundary.

C2g—15 to 60 inches; gray (10YR 6/1) sand; single grain; loose; few black and strong brown fine mineral grains; extremely acid.

The thickness of the sandy horizons is more than 72 inches. The soil ranges from extremely acid through neutral. The soil has few or common mineral grains that are black, pink, strong brown, or white. Some pedons have a buried A horizon that has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is sand or fine sand.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is sand or fine sand.

The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is sand or fine sand.

Fripp series

The soils of the Fripp series are deep and excessively drained. They formed in sandy marine and eolian sediments. The Fripp soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 2 to 30 percent.

Fripp soils commonly are near Lakehurst Variant, Newhan, and Pamlico soils. Fripp soils do not have gray and reddish mottles in the substratum as do the Lakehurst Variant soils, and they have a brown cambic horizon which Newhan soils do not have. The Fripp soils are not subject to ponding and do not have an organic layer as do the Pamlico soils.

Typical pedon of Fripp sand, 2 to 30 percent slopes, about 400 feet west of the west end of 69th Street, in Seashore State Park:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; common very fine to coarse roots; many clear sand grains and few pink and red sand grains; extremely acid; clear smooth boundary.

A2—5 to 12 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; common very fine roots, few fine roots, and common medium roots; few pink, green, opaque, and red sand grains; extremely acid; clear smooth boundary.

Bir&C—12 to 20 inches; mottled brown (7.5YR 4/4) (Bir) and yellowish brown (10YR 5/6) (C) fine sand; single grain; loose; dark brown discontinuous pockets; (7.5YR 4/4) mainly in upper 4 inches; few very fine roots and fine and common medium roots; few clear, common opaque, few pink and common iron stained sand grains; extremely acid; gradual wavy boundary.

C1—20 to 29 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; few very fine roots and fine and common medium roots; common clear and few opaque, green, and pink sand grains; extremely acid; gradual wavy boundary.

C2—29 to 60 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; few very fine and fine roots; many clear, common opaque, and few pink and green sand grains; very strongly acid.

The thickness of the sandy horizons is more than 80 inches. The soil is extremely acid or very strongly acid. The combined silt and clay content is less than 5 percent.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 2. The A horizon is sand or fine sand.

The Bir part of the Bir&C horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 through 6. In some pedons the Bir horizon or a Bhir horizon is continuous enough to be a separate horizon. The C part of the Bir&C horizon and the upper part of the C horizon have hue of 10YR, value of 5 or 6, and chroma of 6 or 8. The lower part of the C horizon has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. The Bir&C and C horizons are sand or fine sand.

The Fripp soils in this survey area are a taxadjunct because they have a weak spodic horizon at a depth of 12 to 20 inches, which is not defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Hyde series

The soils of the Hyde series are deep and very poorly drained. They formed in loamy marine and fluvial sediments. Hyde soils are on the lower part of the Coastal Plain on inland flats and in slight depressions. Slopes range from 0 to 1 percent.

Hyde soils commonly are near Acredale and Tomotley soils. The Hyde soils have an umbric epipedon, but the Acredale and Tomotley soils do not.

Typical pedon of Hyde silt loam, about 4,500 feet southwest of the intersection of Oceana Boulevard and Bells Road, and 4,300 feet northwest of the intersection of Oceana Boulevard and Harper Road:

Ap—0 to 8 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine and medium pores; extremely acid; clear smooth boundary.

A12—8 to 16 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine and medium pores; extremely acid; abrupt smooth boundary.

B21tg—16 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few very fine and fine roots; many fine and medium pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

B22tg—28 to 37 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct olive yellow (2.5Y 6/6) mottles and few medium distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine and fine roots; many fine and medium pores; thin patchy clay films and silt coatings on faces of peds; extremely acid; clear smooth boundary.

B23tg—37 to 45 inches; dark grayish brown (2.5Y 4/2) silty clay; many medium distinct olive yellow (2.5Y 6/6) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; common very fine and fine pores; thin patchy clay films and silt coatings on faces of peds; extremely acid; gradual smooth boundary.

B24tg—45 to 53 inches; mottled light olive gray (5Y 6/2), olive yellow (2.5Y 6/8), and strong brown (7.5YR 5/8) silty clay loam; weak fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; many very fine and fine pores; thin patchy clay films and silt coatings on faces of peds;

few medium flakes of mica; very strongly acid; clear smooth boundary.

B3tg—53 to 58 inches; light olive gray (5Y 6/2) loam; common medium distinct brownish yellow (10YR 6/6) mottles, few medium prominent strong brown (7.5YR 5/8) mottles, and few medium distinct olive yellow (2.5Y 6/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine pores; thin patchy clay films and silt coatings on faces of peds; few medium flakes of mica; very strongly acid; abrupt smooth boundary.

IICg—58 to 72 inches; light gray (10YR 7/2) fine sand; single grain; loose; fluid sands in water table; very strongly acid.

The solum thickness ranges from 40 to 70 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Some pedons have few or common flakes of mica in the lower part of the B horizon and in the C horizon. Organic matter content of the A horizon ranges from 4 to 15 percent.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silt loam, loam, or their mucky analogs.

The upper part of the B2tg horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 or 2. The lower part of the B2tg horizon has hue of 10YR through 5GY, value of 4 through 6, and chroma of 1 or 2 and is mottled in shades of brown or red. The B2tg horizon is silt loam or silty clay loam in the upper part and ranges from silt loam to silty clay in the lower part.

The B3tg horizon has hue, value, and chroma similar to those of the B2tg horizon. The B3tg horizon ranges from loam to silty clay.

The IIC horizon has hue of 10YR through 5Y, value of 5 through 7, and chroma of 1 or 2. It mainly is sand, fine sand, loamy sand, or sandy loam. Some pedons have thin strata of finer textured material.

The Hyde soils in this survey area are a taxadjunct because they have a higher base status in the lower part of the argillic horizon than is defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Lakehurst Variant

The soils of the Lakehurst Variant are deep and moderately well drained. They formed in sandy marine and eolian sediments. The Lakehurst Variant soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 0 to 4 percent.

Lakehurst Variant soils commonly are near Fripp, Newhan, and Pamlico soils. The Lakehurst Variant soils have gray and reddish mottles in the substratum; neither the Fripp nor the Newhan soils have mottles. The Pamlico soils are subject to ponding and have an organic layer.

Typical pedon of Lakehurst Variant sand, about 5,700 feet southeast of the intersection of Shore Drive and Atlantic Avenue, 1,500 feet south of Shore Drive, in Seashore State Park:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; common fine and medium roots; many clear and few pink sand grains; common organic stained sand grains; extremely acid; clear smooth boundary.

A2—4 to 24 inches; light brownish gray (10YR 6/2) sand; single grain; loose; few fine and common medium and coarse roots; many clear and few pink and light brown sand grains; extremely acid; clear wavy boundary.

Bhir—24 to 32 inches; dark reddish brown (5YR 3/3) sand; single grain; loose; few fine and medium roots; common opaque few clear and pink, and many iron stained sand grains; extremely acid; gradual wavy boundary.

C1—32 to 45 inches; yellowish brown (10YR 5/6) sand; few medium distinct light gray (10YR 7/2) mottles; single grain; loose; few fine roots; few medium distinct dark reddish brown (5YR 3/2) weakly cemented brittle concretions 2 to 10 millimeters in diameter; few light brown and opaque, and common clear sand grains; very strongly acid; clear wavy boundary.

C2—45 to 53 inches; mottled yellowish brown (10YR 5/6) and dark reddish brown (5YR 3/3) sand; single grain; loose; darker material is stratified, pocketed, and weakly cemented; few light brown and common clear and iron stained sand grains; very strongly acid; gradual wavy boundary.

C3—53 to 72 inches; mottled yellowish brown (10YR 5/4) and yellowish red (5YR 5/8) sand; single grain; loose; few light brown and common clear and iron stained sand grains; very strongly acid.

The thickness of the sandy horizons is more than 80 inches. The soil is extremely acid or very strongly acid. The combined silt and clay content is less than 5 percent.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The A horizon is sand or fine sand.

The Bhir horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 3 through 5. It is sand or fine sand.

The upper part of the C horizon has hue of 5YR through 10YR, value of 5 or 6, and chroma of 6 or 8. Some pedons have concretions. The lower part of the C horizon has hue of 5YR through 10YR, value of 3 through 7, and chroma of 2 through 8. The lower part of the C horizon commonly has high- or low-chroma mottles and weakly cemented concretions. The C horizon is sand or fine sand.

Munden series

The soils of the Munden series are deep and moderately well drained. They formed in loamy fluvial and marine sediments. The Munden soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Munden soils commonly are near Bojac, Dragston, and Nimmo soils. The Munden soils have less gray in the argillic horizon than the Dragston or Nimmo soils. The Munden soils have brown and gray mottles in the argillic horizon, whereas the Bojac soils do not have mottles in the argillic horizon.

Typical pedon of Munden fine sandy loam, about 1-1/4 miles southwest of Princess Anne and 4-1/4 miles southeast of Stumpy Lake, 136 feet due south of North Landing Road and 100 feet southeast of a small cemetery:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 15 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; strongly acid; clear smooth boundary.

B22t—15 to 25 inches; yellowish brown (10YR 5/6) loam; common medium faint light brown (7.5YR 6/4) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B23t—25 to 32 inches; brown (10YR 5/3) and yellowish brown (10YR 5/8) sandy loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; few small pockets of sand up to 1-1/2 inches in diameter; very strongly acid; clear smooth boundary.

C—32 to 62 inches; mottled yellowish brown (10YR 5/8), light brownish gray (10YR 6/2), and yellowish red (5YR 5/6) sand; single grain; loose; many stained sand grains; strongly acid.

The solum thickness ranges from 25 to 45 inches. The soil in unlimed areas ranges from very strongly acid through moderately acid. Silt content ranges from 20 to 40 percent in the textural control section.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 1 through 4. Some pedons have an A1 horizon that has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 2 through 4. The A horizon is sandy loam, fine sandy loam, or loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 4 through 8. It mainly is sandy loam, fine sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the B2t horizon, or it is mottled with high and low chromas without a dominant matrix color. It is sandy loam, fine sandy loam, or loamy sand.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is sand, fine sand, loamy sand, or loamy fine sand.

Nawney series

The soils of the Nawney series are deep and very poorly drained. They formed in loamy fluvial sediments. The Nawney soils are in inland drainageways and on flood plains on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Nawney soils commonly are near Acredale, Backbay, Dorovan, Nimmo, Pocaty, Rappahannock, and Tomotley soils. The Nawney soils are flooded frequently; the Acredale, Nimmo, and Tomotley soils usually are not flooded. The Backbay soils have an organic surface layer and support marsh vegetation, and the Pocaty and Dorovan soils are deep organic soils. The Nawney soils are flooded with freshwater and are wooded; the Rappahannock soils are flooded daily with saline water and support only marsh vegetation.

Typical pedon of Nawney silt loam, about 3,200 feet south of the junction of Princess Anne Road and Holland Road and about 4,500 feet southwest of the junction of Princess Anne Road and Seaboard Road:

O2—4 inches to 0; partially decomposed roots, leaves, and twigs and highly decomposed very dark grayish brown (10YR 3/2) organic material; many very fine and medium roots; very strongly acid; abrupt wavy boundary.

A1—0 to 5 inches; dark gray (10YR 4/1) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak fine granular structure; very friable; slightly sticky, slightly plastic; many fine and medium roots; strongly acid; clear wavy boundary.

C1g—5 to 43 inches; gray (10YR 6/1) loam; massive; friable; slightly sticky, slightly plastic; common fine and medium roots; strongly acid; gradual wavy boundary.

C2g—43 to 60 inches; gray (10YR 6/1) stratified sand, loamy sand, and sandy loam; massive; slightly sticky, slightly plastic; strongly acid.

The loamy horizons extend to a depth of 40 to 60 inches. The soil ranges from extremely acid through strongly acid above a depth of 40 inches and from extremely acid through slightly acid below 40 inches. Some pedons have one or more buried A horizons.

The A horizon has hue of 7.5YR through 5Y or is neutral, has value of 2 through 5, and has chroma of 0 through 2. Some pedons have high-chroma mottles. The A horizon commonly is fine sandy loam, sandy loam, loam, or silt loam but ranges to loamy sand, sandy clay loam, clay loam, and silty clay loam.

The C horizon has hue of 10YR through 5GY or is neutral, has value of 4 through 7, and has chroma of 0 through 2. Some pedons have high-chroma mottles, and some pedons are highly variegated with high- and low-chroma mottles. The C horizon above a depth of 40 inches commonly is sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, or silty clay loam. Pockets or strata of coarser or finer textured material are in some pedons. Below 40 inches the C horizon commonly is highly stratified and ranges from sand to clay.

Newhan series

The soils of the Newhan series are deep and excessively drained. They formed in sandy marine and eolian sediments. The Newhan soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 2 to 30 percent.

Newhan soils commonly are near Corolla, Duckston, Lakehurst Variant, and Fripp soils. The Newhan soils do not have mottles or gray in the substratum as do the Corolla, Lakehurst Variant, and Duckston soils. The Newhan soils do not have a brown cambic horizon as do the Fripp soils.

Typical pedon of Newhan fine sand, 2 to 30 percent slopes, about 2.3 miles north of the North Carolina-Virginia state line, 300 feet west of the Atlantic Ocean:

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; common very fine and fine roots; common sand grains stained with organic material; few pink and red sand grains; extremely acid; clear smooth boundary.

C—3 to 72 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; common opaque, pink, white, and strong brown sand grains; extremely acid.

The sandy material extends to a depth of more than 72 inches. The soil ranges from extremely acid through neutral. The combined content of silt and clay is less than 5 percent.

The A horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is sand or fine sand. Some pedons do not have an A horizon.

The C horizon has hue of 10YR, value of 6 or 7, and chroma of 1 through 4. It is sand or fine sand.

Nimmo series

The soils of the Nimmo series are deep and poorly drained. They formed in loamy fluvial and marine sediments overlying sandy sediments. The Nimmo soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Nimmo soils commonly are near Acredale, Backbay, Dragston, Munden, Nawney, Tomotley, and Portsmouth soils. The Nimmo soils have less silt and clay in the argillic horizon than the Acredale soils, have more gray in the argillic horizon than the Dragston or Munden soils, and have less clay in the argillic horizon than the Tomotley soils. The Nimmo soils are not subject to flooding as are the Nawney and Backbay soils, and they do not have an umbric epipedon as do the Portsmouth soils.

Typical pedon of Nimmo loam, 4.5 miles south of Pungo, about 0.85 mile southeast of the junction of Vaughan Road and Princess Anne Road, and 0.8 mile northeast of the junction of Mill Landing Road and Princess Anne Road:

Ap—0 to 7 inches; dark gray (10YR 4/1) loam; weak fine granular structure; friable, nonsticky, slightly plastic; many fine roots; common clean sand grains; strongly acid; abrupt smooth boundary.

B21tg—7 to 14 inches; light gray (10YR 6/1) fine sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and few medium and coarse roots; many sand grains coated and bridged with clay; strongly acid; clear smooth boundary.

B22tg—14 to 25 inches; gray (10YR 5/1) loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine medium and coarse roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B23tg—25 to 33 inches; gray (10YR 5/1) fine sandy loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary.

IICg—33 to 60 inches; light gray (10YR 7/1) fine sand; single grain; loose; common very fine black mineral grains; few medium yellowish brown (10YR 5/4) sand grains; few coarse sand grains; strongly acid.

The solum thickness ranges from 25 to 45 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Silt content ranges from 20 to 50 percent in the textural control section.

The A1 or Ap horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 1 or 2. Where value is 3, the A horizon is less than 6 inches thick. The A horizon is sandy loam, fine sandy loam, or loam.

The Btg horizon has hue of 10YR through 5Y, value of 4 through 7, and chroma of 1 or 2. It commonly is loam, fine sandy loam, or sandy loam. Some pedons have thin layers of silt loam or sandy clay loam.

The IIC horizon has hue of 7.5YR through 5Y or is neutral, has value of 3 through 8, and has chroma of 0 through 8. It is sand, loamy sand, or fine sand.

Pamlico series

The soils of the Pamlico series are deep and very poorly drained. They formed in partially decomposed organic matter over sandy marine sediments. The Pamlico soils are in depressions between coastal dunes on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Pamlico soils commonly are near Fripp, Lakehurst Variant, and Rappahannock soils. The Pamlico soils have water on the surface and have an organic layer; the Fripp and Lakehurst Variant soils do not. The Pamlico soils are wooded and are ponded with freshwater; the Rappahannock soils are flooded daily with saltwater and support only marsh vegetation.

Typical pedon of Pamlico mucky peat, ponded, about 6,400 feet south-southeast of the junction of Igloo Road and Shore Drive, in the central part of Seashore State Park:

Oe—0 to 6 inches; very dark brown (10YR 2/2) mucky peat (hemic material) consisting of partially decomposed roots, leaves, twigs, and moss; about 40 percent rubbed fiber; friable; extremely acid; gradual wavy boundary.

Oa—6 to 30 inches; very dark brown (10YR 2/2) muck (sapric material); about 4 percent rubbed fiber; massive; friable; dark yellowish brown (10YR 3/4) sodium pyrophosphate extract; extremely acid; gradual wavy boundary.

IIC—30 to 60 inches; dark grayish brown (10YR 4/2) sand; single grain; loose, nonsticky, nonplastic; very strongly acid.

The thickness of the organic material ranges from 16 to 40 inches. The soil is extremely acid in the organic layers and ranges from extremely acid through strongly acid in the mineral layer.

The Oe horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Rubbed fiber content ranges from 20 to 50 percent.

The Oa horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Rubbed fiber content is less than 17 percent. Sodium pyrophosphate color test results typically are 10YR 3/4, 4/4, 6/4, or 5/4.

The IIC horizon has hue of 10YR, value of 3 through 5, and chroma of 2. It is sand or loamy sand.

Pocaty series

The soils of the Pocaty series are deep and very poorly drained. They formed in partially decomposed plant remains and are in the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Pocaty soils commonly are near Dorovan and Nawney soils. The Pocaty soils have a high content of sulfur, which is not characteristic of the Dorovan or Nawney sils. The Pocaty soils support marsh vegetation, whereas the Dorovan and Nawney soils are wooded.

Typical pedon of Pocaty peat, about 4,800 feet east of the intersection of Indian Creek Road and Blackwater Road, 900 feet north of Milldam Creek:

Oi—0 to 12 inches; very dark brown (10YR 2/2) peat (fibric material) comprised of partially decomposed leaves, stems, and roots; about 75 percent fiber rubbed; massive; many fine and medium roots; weak sulfide odor; strongly acid; gradual smooth boundary.

Oe—12 to 20 inches; very dark brown (10YR 2/2) mucky peat (hemic material); about 35 percent fiber rubbed; massive; many fine and medium roots; moderate sulfide odor; moderately acid; clear smooth boundary.

Oa1—20 to 41 inches; black (10YR 2/1) muck (sapric material); about 15 percent fiber rubbed; massive; common fine and medium roots; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

Oa2—41 to 48 inches; black (10YR 2/1) muck (sapric material); less than 5 percent fiber rubbed; massive; few fine and medium roots; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

Oa3—48 to 60 inches; dark gray (10YR 4/1) muck (sapric material); less than 5 percent fiber rubbed; massive; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

IICg—60 to 80 inches; dark gray (10YR 4/1) silt loam; massive; slightly sticky, nonplastic; flows easily between fingers when squeezed; slightly acid.

The thickness of the organic layers is more than 51 inches. The soil ranges from very strongly acid through neutral in its natural state. The sulfur content ranges from 0.75 percent to about 4 percent in individual layers within a depth of 40 inches. The organic materials are mainly from herbaceous plants. Mineral strata less than 12 inches thick are in the control section of some pedons.

The surface tier has hue of 7.5YR through 5Y, value of 2 through 4, and chroma of 1 through 3. It commonly is mucky peat (hemic) or peat (fibric) but ranges to muck (sapric) in some pedons.

The subsurface tier and the bottom tier have hue of 7.5YR through 5Y or are neutral, have value of 2 through 4, and have chroma of 0 through 4. They dominantly are muck (sapric) but are mucky peat (hemic material) in the upper part of most pedons.

The IICg horizon has hue of 7.5YR through 5Y or is neutral, has value of 2 through 6, and has chroma of 0 through 4. It commonly is loamy but ranges from sandy to clayey.

Portsmouth series

The soils of the Portsmouth series are deep and very poorly drained. They formed in loamy marine and fluvial sediments overlying sandy sediments. The Portsmouth soils are in inland depressions and on flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Portsmouth soils commonly are near Acredale, Nimmo, and Tomotley soils. The Portsmouth soils have an umbric epipedon; the Acredale, Nimmo, and Tomotley soils have an ochric epipedon.

Typical pedon of Portsmouth loam, about 3,650 feet southeast of the junction of Gum Bridge and Charity Neck Roads, 4,000 feet northeast of the junction of Charity Neck and Nawney Creek Roads:

A1—0 to 13 inches; very dark gray (10YR 3/1) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; many fine pores; extremely acid; clear smooth boundary.

B21tg—13 to 21 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and few fine roots; few fine pores; few sand grains coated and bridged with clay; extremely acid; clear wavy boundary.

B22tg—21 to 25 inches; grayish brown (2.5Y 5/2) silt loam; few medium faint light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine and common very fine pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

IIB23tg—25 to 32 inches; dark brown (10YR 4/2) sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common very fine and fine pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

IIB3tg—32 to 36 inches; grayish brown (10YR 5/2) sandy loam; many coarse distinct brownish yellow (10YR 6/6) mottles and few fine prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; common very fine and fine pores; few sand grains coated and bridged with clay; thin layer of silty clay loam in lower part; extremely acid; clear smooth boundary.

IIC1—36 to 42 inches; mottled olive yellow (2.5Y 6/6), grayish brown (2.5Y 5/2), and light gray (10YR 7/2) sand; single grain; loose; extremely acid; abrupt smooth boundary.

IIC2—42 to 60 inches; stratified light gray (10YR 7/1), yellowish brown (10YR 5/8), and gray (N 6/0) stratified loamy sand and sandy loam; sandy loam is massive, friable, and slightly plastic; loamy sand is single grain, loose, nonsticky, and nonplastic; extremely acid.

The solum thickness ranges from 25 to 40 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or fine sandy loam.

Some pedons have a B1tg horizon that has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 or 2. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 or 2. Some pedons have high-chroma mottles throughout. The B2tg horizon mainly is loam, silt loam, or sandy loam. Some pedons have a thin subhorizon that is sandy clay loam or silty clay loam.

The B3tg horizon has hue, value, and chroma similar to those of the B2tg horizon. The B3tg horizon is sandy loam or loamy sand. Some pedons do not have a B3tg horizon.

The IIC horizon has hue of 10YR through 2.5Y or is neutral, has value of 5 through 7, and has chroma of 0 through 2. In some pedons it is mottled or variegated in bright colors. It mainly is sand or loamy sand. Some pedons have strata of finer textured material.

Psamments

Psamments in this survey area consist mostly of well drained and moderately well drained, sandy material that has been disturbed during excavation, grading, or filling. The soil from the excavated areas has been used as foundation material for roads, buildings, or similar uses. Many of the fill areas consist of stockpiled material from dredging operations. Some fill areas contain nonsoil materials such as stumps and old building materials. Many other areas of Psamments consist of dune land that has been altered and landscaped for use as military bases or for urban development. Slopes range from nearly level to steep; some areas are complex or undulating.

Psamments commonly are near undisturbed Corolla, Duckston, Fripp, and Newhan soils.

A typical pedon is not given for Psamments because of their variability. The depth of the fill areas ranges from 20 inches to at least 30 feet. The soil material has hue of 7.5YR or 10YR, value of 4 through 8, and chroma of 1 through 4. It is sand, fine sand, or loamy sand. Reaction ranges from extremely acid to moderately acid.

Rappahannock series

The soils of the Rappahannock series are deep and very poorly drained. They formed from partially decomposed organic materials and strata of loamy marine and fluvial sediments. The Rappahannock soils are in tidal marshes on the lower part of the Coastal Plain. Slopes are less than 1 percent.

Rappahannock soils commonly are near Nawney and Pamlico soils. Rappahannock soils are flooded daily with saline water and support marsh vegetation; the Nawney and Pamlico soils are not flooded and are wooded.

Typical pedon of Rappahannock mucky peat, strongly saline, about 3,600 feet east of the junction of Kings Grant Road and Winchester Lane, 4,000 feet north-northeast of the junction of Virginia Beach Boulevard and North Lynnhaven Road:

Oe—0 to 11 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material); about 44 percent fiber rubbed; massive; nonsticky; many fine and medium roots; strong sulfur odor; moderately alkaline; clear smooth boundary.

Oa1—11 to 37 inches; very dark grayish brown (10YR 3/2) muck (sapric material); about 10 percent fiber rubbed; massive; nonsticky; common fine and medium roots; flows easily between fingers when squeezed; strong sulfur odor; moderately alkaline; abrupt smooth boundary.

IIC—37 to 51 inches; dark greenish gray (5GY 4/1) silt loam; massive; slightly sticky, nonplastic; flows easily between fingers when squeezed; moderately alkaline; abrupt smooth boundary.

IIIOa2—51 to 80 inches; black (10YR 2/1) muck (sapric material); about 12 percent fiber rubbed; massive; flows easily between fingers when squeezed; strong sulfur odor; moderately alkaline.

Sulfur content is more than 0.75 percent in one or more horizons within 40 inches of the surface. The organic layers of the control section are dominantly sapric material; hemic material is in the surface tier of most pedons. Mineral strata at least 12 inches thick are within 51 inches of the surface. Reaction ranges from neutral to moderately alkaline throughout the profile. After drying, reaction ranges from very strongly acid to moderately acid.

The organic material in all tiers has hue of 10YR through 5Y or is neutral, has value of 2 or 3, and has chroma of 0 through 2. It is muck (sapric material) or mucky peat (hemic material).

The mineral strata have hue of 10YR through 5GY, value of 3 through 5, and chroma of 1 or 2. They are silt loam, silty clay loam, loamy sand, or sandy loam.

Rappahannock soils in this survey area are a taxadjunct because they are inundated daily by water which contains more salt than defined in the range for the series. This does not significantly affect the use and management of the soils.

Rumford series

The soils of the Rumford series are deep and well drained. They formed in sandy fluvial and marine sediments. The Rumford soils are on side slopes on inland areas on the lower part of the Coastal Plain. Slopes range from 6 to 35 percent.

Rumford soils commonly are near State, Tetotum, and Yeopim soils. Rumford soils have less clay in the argillic horizon and are steeper than any of those soils.

Typical pedon of Rumford fine sandy loam, 6 to 35 percent slopes, 2,700 feet northeast of the intersection of First Colonial Road and Old Donation Parkway, and 6,000 feet southeast of the intersection of First Colonial Road and Great Neck Road:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; friable, nonsticky, nonplastic; many very fine and common fine medium and coarse roots; common fine pores; extremely acid; clear smooth boundary.

A2—3 to 10 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few fine and common medium and coarse roots; common medium and fine pores; extremely acid; gradual wavy boundary.

B21t—10 to 16 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common fine and medium pores; many sand grains coated and bridged with clay; extremely acid; clear smooth boundary.

B22t—16 to 27 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; few fine pores; many sand grains coated and bridged with clay; few pockets up to 2 inches in diameter of brownish yellow (10YR 6/6) loamy coarse sand; very strongly acid; clear smooth boundary.

B23t—27 to 41 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; few fine pores; many sand grains coated and bridged with clay; few pockets up to 1 inch in diameter of brownish yellow (10YR 6/6) loamy coarse sand; very strongly acid; gradual wavy boundary.

B3—41 to 46 inches; strong brown (7.5YR 5/6) loamy fine sand; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few fine pores; few pockets up to 1 inch in diameter of brownish yellow (10YR 6/6) loamy coarse sand, strongly acid; clear wavy boundary.

C1—46 to 54 inches; yellowish brown (10YR 5/8) fine sand; single grain; loose; few strata of strong brown (7.5YR 5/6) fine sand; strongly acid; clear wavy boundary.

C2—54 to 72 inches; light yellowish brown (10YR 6/4) fine sand; few fine distinct light gray (10YR 6/1) mottles; single grain; loose; strongly acid.

The solum thickness ranges from 30 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is loamy sand, sandy loam, or fine sandy loam.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is loamy sand, sandy loam, or fine sandy loam. Some pedons do not have an A2 horizon.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. It is sandy loam, fine sandy loam, or sandy clay loam.

The B3 horizon has hue, value, and chroma similar to those of the B2t horizon and is loamy sand, loamy fine sand, fine sandy loam, or sandy loam.

The C horizon has hue of 10YR, value of 5 through 8, and chroma of 4 through 8. It is sand, fine sand, sandy loam, or very fine sandy loam.

The Rumford soils in this survey area are a taxadjunct because they have more weatherable minerals in the control section than is defined in the range for the series. This difference does not affect the use and management of the soils.

State series

The soils of the State series are deep and well drained. They formed in loamy fluvial and marine sediments. The State soils are on uplands and side slopes on inland areas on the lower part of the Coastal Plain. Slopes range from 0 to 6 percent.

State soils commonly are near Bojac, Tetotum, Rumford, and Yeopim soils. The State soils have more clay in the subsoil than the Bojac soils, do not have gray mottles in the argillic horizon as do the Tetotum and Yeopim soils, and have more clay in the subsoil than the Rumford soils and are not as steep.

Typical pedon of State loam, 0 to 2 percent slopes, about 110 feet east-northeast of intersection of First Colonial Road and Old Donation Parkway, and 2,100 feet southeast of the intersection of Mill Dam Road and First Colonial Road:

Ap—0 to 11 inches; dark brown (10YR 4/3) loam; weak fine granular structure; friable, slightly sticky, nonplastic; many fine and common medium roots; strongly acid; abrupt smooth boundary.

B21t—11 to 25 inches; strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; common fine and medium roots; common thin discontinuous clay films on faces of peds; few krotovinas up to 1/2 inch in diameter filled with Ap material; very strongly acid; gradual smooth boundary.

B22t—25 to 33 inches; strong brown (7.5YR 5/6) loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common thin discontinuous clay films on faces of peds; few krotovinas up to 1/2 inch in diameter filled with Ap material; very strongly acid; gradual smooth boundary.

B23t—33 to 47 inches; yellowish brown (10YR 5/6) loam; few coarse distinct strong brown (7.5YR 5/6) stains; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common thin discontinuous clay films on faces of peds; clay bridging between sand grains; very strongly acid; gradual smooth boundary.

B3t—47 to 56 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, nonplastic; few fine roots; few weak clay bridging between sand grains; very strongly acid; gradual smooth boundary.

C—56 to 64 inches; yellowish brown (10YR 5/6) sandy loam; massive; very friable, nonsticky, nonplastic; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas is very strongly acid or strongly acid in the A and B horizons and ranges from very strongly acid through moderately acid in the C horizon.

The A horizon has hue mainly of 7.5YR or 10YR, value of 3 through 6, and chroma of 2 through 6. Where value is 3 and chroma is 2 or 3, the thickness of the A horizon is 6 inches or less. The A horizon is sandy loam, fine sandy loam, loam, or silt loam.

Some pedons have a B1 horizon that has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. In some pedons the lower part of the B2t horizon is mottled and includes matrix hue of 2.5Y. The B2t horizon is sandy clay loam, clay loam, loam, sandy loam, or silt loam.

The B3 horizon has hue, value, and chroma similar to those of the B2t horizon and in some pedons is mottled. The B3 horizon is loam, sandy clay loam, or sandy loam.

The C or IIC horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is mottled in some pedons. The C horizon is sand, loamy sand, or sandy loam. It is stratified in some pedons.

Tetotum series

The soils of the Tetotum series are deep and moderately well drained. They formed in loamy fluvial and marine sediments. The Tetotum soils are on ridges and side slopes in inland areas on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Tetotum soils commonly are near Augusta, Bojac, Chapanoke, State, Rumford, and Yeopim soils. The Tetotum soils have more brown in the upper part of the B horizon than the Augusta soils. The Tetotum soils have gray mottles in the argillic horizon; the Bojac, State, and Rumford soils do not have gray mottles in the argillic horizon. The Tetotum soils have less silt in the argillic horizon than the Chapanoke or Yeopim soils.

Typical pedon of Tetotum loam, about 3,100 feet north-northwest of junction of Indian River Road and West Neck Road and 6,700 feet south-southeast of West Neck Road and North Landing Road:

Ap—0 to 10 inches; brown (10YR 4/3) loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; few krotovinas filled with worm casts; strongly acid; clear smooth boundary.

B1t—10 to 15 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; few thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B21t—15 to 20 inches; yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; few thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—20 to 26 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B23t—26 to 36 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; common medium distinct strong brown (7.5YR 5/8) mottles and many medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B3t—36 to 58 inches; mottled yellowish brown (10YR 5/6), pale brown (10YR 6/3), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/8) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; gradual smooth boundary.

IIC—58 to 70 inches; mottled pale brown (10YR 6/3), reddish yellow (7.5YR 6/8), and light brownish gray (10YR 6/2) loamy sand; massive; very friable, nonsticky, nonplastic; many clean sand grains; strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 3 or 4. Some pedons have an A2 horizon that has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. The A horizon is fine sandy loam, loam, or silt loam.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. It is fine sandy loam or loam. Some pedons do not have a B1 horizon.

The upper part of the B2t horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. The lower part of the B2t horizon has matrix hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8. It has high- and low-chroma mottles. In some pedons the lower part of the B2t horizon is mottled in high and low chromas and does not have a dominant matrix color. The B2t horizon typically is clay loam or loam, but some pedons have thin subhorizons of sandy clay loam or silt loam.

Most pedons have a B3 horizon that has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is sandy loam, sandy clay loam, or loam.

The IIC horizon has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8, or it is mottled and does not have dominant matrix color. It is sand, loamy sand, sandy loam, or sandy clay loam.

Tomotley series

The soils of the Tomotley series are deep and poorly drained. They formed in loamy marine and fluvial sediments. Tomotley soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Tomotley soils commonly are near Acredale, Augusta, Backbay, Dragston, Hyde, Nawney, Nimmo, and Portsmouth soils. The Tomotley soils have more sand

and less silt in the argillic horizon than the Acredale soils, have more gray in the argillic horizon than the Augusta or Dragston soils, and have more clay in the argillic horizon than the Nimmo soils. The Tomotley soils are not subject to flooding as are the Nawney and Backbay soils, and they do not have an umbric epipedon as do the Hyde and Portsmouth soils.

Typical pedon of Tomotley loam, about 2,100 feet North of Indian River Road, 2,000 feet west of West Neck Road, 3,000 feet north of the junction of Indian River Road and West Neck Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine pores; moderately acid; abrupt smooth boundary.

B21tg—7 to 31 inches; gray (10YR 6/1) and light brownish gray (10YR 6/2) loam; common fine and medium distinct yellowish brown (10YR 5/8) mottles and common coarse distinct light yellowish brown (2.5Y 6/4) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine and fine roots; common fine and medium pores; common sand grains coated and bridged with clay; very strongly acid; gradual smooth boundary.

B22tg—31 to 45 inches; gray (10YR 6/1) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) mottles and common coarse prominent brownish yellow (10YR 6/6) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few fine pores; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

IICg—45 to 66 inches; light brownish gray (10YR 6/2) and light gray (2.5Y 7/2) loamy sand; many coarse distinct pale yellow (2.5Y 7/4) mottles and common medium prominent brownish yellow (10YR 6/8) mottles; massive; very friable, nonsticky, nonplastic; many clean sand grains; small pockets of white sand and gray sandy loam; few fine flakes of mica; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 1 or 2. It is sandy loam, loam, or silt loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 or 2. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2t horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 6, and has chroma of 0 through 2. It is loam, clay loam, sandy clay loam, silt loam, or silty clay loam.

Some pedons have a B3 horizon that has hue of 10YR through 5Y or is neutral, has value of 5 through 7, and has chroma of 0 through 2. In most pedons it has high- and low-chroma mottles. It is fine sandy loam, loam, sandy clay loam, or silt loam.

The IICg horizon has hue of 10YR through 5GY or is neutral, has value of 6 or 7, has chroma of 0 through 2, and is mottled. It ranges mainly from sand to sandy clay loam or loam. Some pedons are stratified, and some have strata of silty clay or silty clay loam.

Udorthents

Udorthents consist of areas where the natural soil has been altered by excavation or covered by earthy fill material. The areas are well drained or moderately well drained. The excavated areas mainly are borrow pits from which the soil has been removed and used as foundation material for roads or buildings. In some areas the exposed substratum of the excavated soil is sand or loamy sand. The fill areas are sites where at least 20 inches of earthy fill material covers the natural soil or where borrow pits, dumps, natural drainageways, or low-lying areas have been filled. Slopes range from nearly level to steep, and some areas are undulating.

A typical pedon is not given for these soils because of their variability. The fill areas mainly are more than 20 inches deep and are as thick as 30 to 40 feet in places. Many areas have inclusions of nonsoil material, such as concrete, wood, glass, and asphalt. The soils are very stratified and are variable in color and texture.

Udorthents have hue of 7.5YR through 5G, value of 4 through 7, chroma of 3 through 8. The texture is variable and ranges from sandy loam to silty clay loam. The material ranges from extremely acid through slightly acid.

Yeopim series

The soils of the Yeopim series are deep and moderately well drained. They formed in loamy marine and fluvial sediments. The Yeopim soils are on uplands on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Yeopim soils commonly are near Acredale, Augusta, Chapanoke, State, Tetotum, and Rumford soils. The Yeopim soils have more brown in the upper part of the argillic horizon than the Acredale, Augusta, or Chapanoke soils and have more silt in the argillic horizon than the Tetotum soils. The Yeopim soils have gray mottles in the argillic horizon; the State and Rumford soils do not have gray mottles.

Typical pedon of Yeopim silt loam, about 4,200 feet east-northeast of junction of Mill Dam Road and First Colonial Road and 3,800 feet northeast of the junction of Old Donation Parkway and First Colonial Road:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; common fine and medium roots; few fine pores; extremely acid; abrupt smooth boundary.

A2—3 to 8 inches; light yellowish brown (2.5Y 6/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine medium and coarse roots; common fine pores; extremely acid; clear smooth boundary.

B21t—8 to 23 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and few medium roots; common fine and very fine pores; few thin discontinuous clay films on faces of peds; extremely acid; clear wavy boundary.

B22t—23 to 33 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct brownish yellow (10YR 6/6) and gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common fine pores; many thin continuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

B23t—33 to 79 inches; mottled gray (10YR 5/1), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/8) silty clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm, slightly sticky, slightly plastic; few fine and medium roots along faces of prisms; few fine pores; many thick continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

IIC—79 to 84 inches; yellowish brown (10YR 5/6) loamy sand; massive; very friable, nonsticky, nonplastic; strongly acid.

The solum thickness is more than 40 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Common to many fine flakes of mica are in the lower part of the solum in most pedons.

The A1 horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 through 4. The A2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 through 6. The A horizon is loam or silt loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 through 8. It is loam or silt loam.

The upper part of the B2t horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 4 through 8. The lower part of the B2t horizon has hue, value, and chroma similar to those of the upper part but has chroma of 1 or 2. In most pedons the lower part of the B2t horizon does not have a dominant matrix color. The B2t horizon typically is clay loam, silt loam, or silty clay loam. Some pedons are silty clay or loam in the lower part.

Some pedons have a B3 horizon that has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 5. Mottles of high contrast range from few to many. The B3 horizon is fine sandy loam, very fine sandy loam, silt loam, sandy clay loam, or loam.

The C or IIC horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 6. It is sand, loamy sand, sandy loam, or fine sandy loam.

Formation of the Soils

This section describes the factors and processes that have affected the formation and morphology of the soils in the City of Virginia Beach.

Factors of Soil Formation

Soils are formed through the interaction of five major factors: parent material, climate, plant and animal life, relief, and time. The relative influence of each factor varies from place to place, and in some places one factor dominates the formation of a soil and determines most of its properties and characteristics.

Parent Material

Parent material is the material from which soils form. Most of the soils in the City of Virginia Beach formed in layers of marine and fluvial sediments that mainly are 2,000 to 5,000 feet thick over bedrock. These sediments range in texture from sand to clay. The texture of the sediments is a reflection of the environment in which they were deposited thousands of years ago. In shallow, backwater areas where the water was very still, fine textured silt and clay particles settled to the bottom and accumulated. As the level of the ocean would rise and fall at any given site, the environment of deposition would also vary, thereby resulting in the accumulation of sediments in layers of differing texture. These horizontal layers range in thickness from less than an inch to many feet. The soils of the survey area formed in the uppermost layers, commonly in the sediments at a depth of 3 to 6 feet.

Soils inherit many chemical and physical properties from their parent material. For example, soils formed on relic beaches, such as Pungo Ridge, have a loamy texture. The Bojac, Munden, and Dragston soils typically formed in these settings. Soils formed on broad flats once covered by shallow bays have a silty texture. An example of such broad flats can be observed west of Princess Anne Courthouse on Princess Anne Road. Acredale soils are commonly on these flats. In most parts of the survey area the soils are underlain mostly by sandy sediments, usually at a depth of 4 to 6 feet. In some areas this sandy material has pockets or thin strata of finer textured sediments.

Some soils in the City of Virginia Beach reflect an environment of deposition that occurred in fast-moving water. This is most evident in the northwestern corner of the survey area, dominantly in the Bayside Borough. Most soils in this area have rounded gravel up to 3/4 inch in diameter. These coarse fragments generally are more abundant in the substratum of the soils, but can occur throughout the profile and generally are evident on the surface.

Other soils in the City of Virginia Beach have developed predominantly in sandy sediments. The Newhan, Corolla, and Fripp soils along the coastal areas are typical of soils that formed from eolian and water-washed sediments.

Although the dominant parent material of most soils in the survey area is marine and fluvial sediments, some have developed from partially decomposed plant materials. Pamlico soils formed from herbaceous and woody plant remains in depressions and troughs in the Cape Henry area. Pocaty and Rappahannock soils formed from herbaceous marsh vegetation. All of these organic soils formed under saturated or ponded conditions that allowed only minimal decomposition of plant materials.

Climate

This survey area has a humid, mild climate with a peak summer rainfall. This type of climate causes strong weathering and leaching in the soils. Calcium, magnesium, potassium, and other plant nutrients are leached from the soil by percolating rainwater. This generally results in soils with high acidity and low to medium natural fertility. Farmers rely on the application of lime and fertilizers to make up for the leaching process.

The warm, moist conditions help accelerate the weathering of minerals, resulting in the formation of more clays. Some clay is gradually translocated by the percolation of rainwater from the surface layer into the subsoil; therefore, the highest clay content in most soils is in the subsoil, generally causing slower permeability in the subsoil than in the surface layer.

Plant and Animal Life

Living organisms of all types influence soil formation. Vegetation adds organic matter to the soil through leaf fall and plant roots. The roots also create large voids in which water and air can move. Many plant nutrients are stored in organic matter. Additionally, organic matter supplies food for bacteria, fungi, earthworms, and ants, all of which aid in improving soil structure.

Organisms also create organic compounds that influence soil formation. Many organic acids are created that break down minerals, releasing nutrients such as phosphorus and potassium. Fungi commonly dominate in pine needle litter and can create water repellency if the litter becomes dry. Water beads on the litter, as it does on a waxed metal surface, and the movement of water into the soil is hindered until the volume of water is great enough to break the surface tension.

Man influences soil formation through land use that causes erosion, compaction of the soil, and depletion of the natural soil fertility. Proper tillage, fertilization, and soil conservation, on the other hand, can change the soil into a more productive medium for plant growth. Man also mines the soil or alters the soil for construction purposes. The rate of water infiltration into the soil is decreased and runoff is increased by construction activities and by the structures that result from construction. The additional runoff can increase erosion and cause flooding in low areas.

Relief

The relief, or topography, in the City of Virginia Beach generally consists of broad, flat areas broken by a few long, narrow subdued ridges that are oriented north to south. Gently sloping to steep areas are adjacent to lakes, bays, and major drainageways.

Relief affects soil formation by controlling surface runoff and thus the rate of water infiltration into the soil. Relief commonly affects the development of a soil or the drainage. The steeper Rumford soils for example, generally have poorly developed layers; the Hyde soils in depressional areas mainly are very poorly drained, whereas the State soils on higher convex areas are well drained.

Natural differences in elevation and shape of the surface of the land account for many of the differences among soils that formed in the same kind of parent material. This is evident in the Bojac, Munden, and Nimmo soils (fig. 8). All three soils formed in loamy sediments. However, the Bojac soils are on slightly higher, convex areas and are well drained; the Munden soils are on intermediate landscape positions, are moderately well drained, and have mottles in the lower part of the subsoil; and the Nimmo soils are in low-lying landscape positions, are poorly drained, and have a gray subsoil. The differences in topography cause free water to leave the well drained soils and accumulate in the poorly drained soils.

The Acredale, Yeopim, and Chapanoke soils are another example of soils that formed from the same parent material but are different because of differences in relief and because of a resulting process called the "dry edge effect," in which soils with better drainage are along the rim of some lakes, bays, and drainageways (fig. 9). The short, steeper slopes adjacent to bodies of water help to lower the water table in soils within about 500 feet of the drainage area. The dry edge effect results in moderately well drained Yeopim soils adjacent to the drainageways, somewhat poorly drained Chapanoke soils farther from the drainageways, and poorly drained Acredale soils even farther from the drainageways.

Time

The length of time that the parent material has been in place and exposed to the active forces of climate and plant and animal life strongly influences the nature of the soil.

Older soils have developed distinct layers, or horizons, as the parent material is gradually altered by the breakdown and translocation of minerals, the accumulation of organic material, and changes in color. State soils are an example of older, more developed soils.

Young soils are essentially unaltered or slightly altered parent material. These soils generally have a thin surface layer, no subsoil, and a substratum directly beneath the surface layer. Nawney and Newhan soils are young soils. The Nawney soils formed in very recent alluvial sediments in drainageways, and the Newhan soils formed in sandy materials recently deposited by wind and water.

Major Soil Horizons

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface down to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, called A, B, and C horizons. These major horizons may be further subdivided by the use of numbers and letters to indicate changes within one horizon. An example would be the B2t horizon, a B horizon that contains an accumulation of clay.

The A horizon is the surface layer. An A1 horizon is that part of the surface layer that has the largest accumulation of organic matter. The A horizon is also the layer of maximum leaching, or eluviation, of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, this horizon is called an A2 horizon.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. In some soils the B horizon formed by alteration in place rather than by illuviation. The alteration can be caused by oxidation and reduction of iron or by the

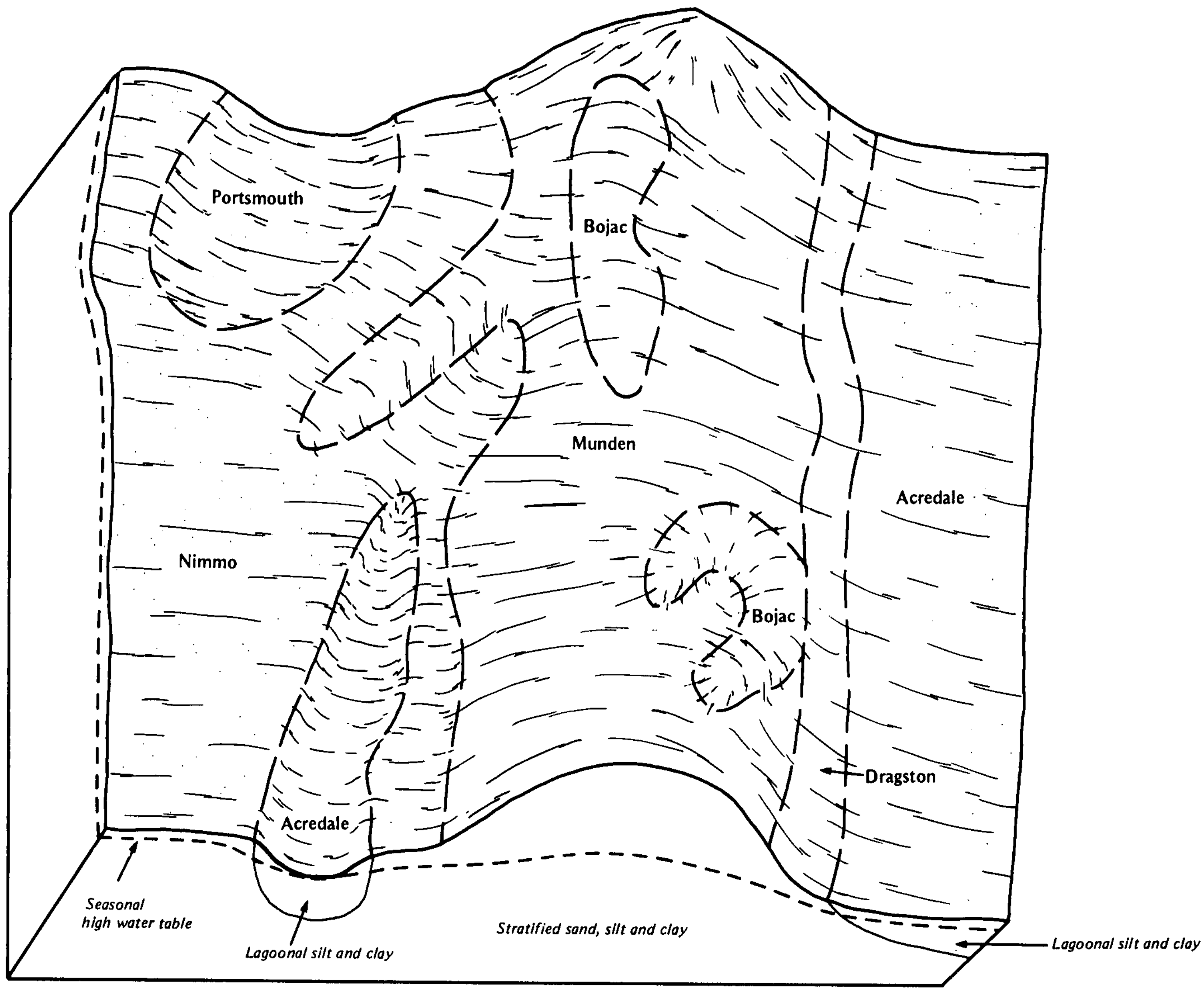


Figure 8.—Relationship between relief and soils.

weathering of clay minerals. The B horizon commonly has blocky or prismatic structure, and it generally is firmer and lighter in color than the A1 horizon but darker in color than the C horizon.

The C horizon is below the B horizon or, in some cases, below the A horizon. It consists of materials that are little altered by the soil-forming processes, but it can be modified by weathering.

Many low-lying areas adjacent to major rivers, creeks, and bays consist of soils with thick accumulations of organic materials. They are called organic soils, and they can be divided into different layers depending upon the degree of decomposition of the organic materials.

The Oi layer consists of fibric materials. These are the least decomposed of all the organic soil materials and are commonly referred to as peat.

The Oe layer consists of hemic materials, commonly referred to as mucky peat. These are intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

The Oa layer consists of sapric materials. These are the most highly decomposed of the organic materials

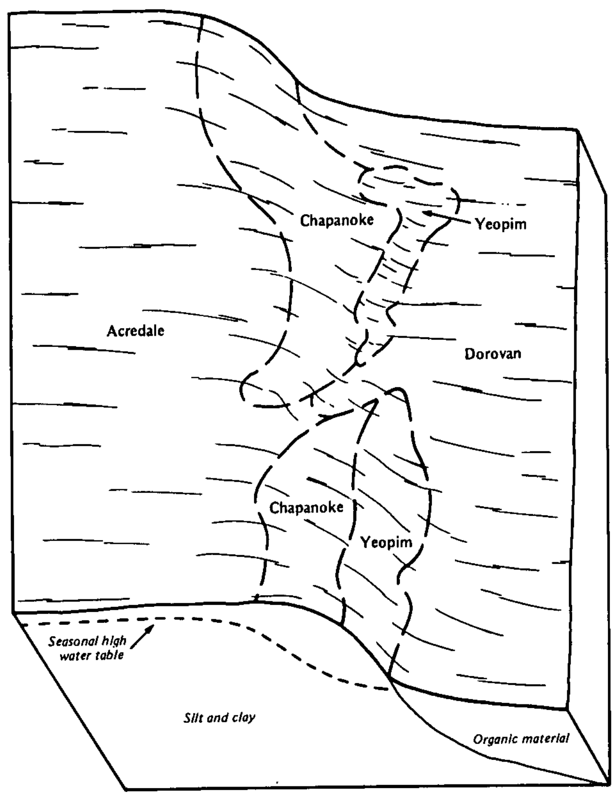


Figure 9.—The dry edge effect on the water table.

and are commonly referred to as muck. Muck is the dominant type of organic material in the organic soils of the City of Virginia Beach.

Processes of Soil Horizon Differentiation

Several processes are involved in the formation of soil horizons, especially the formation of mineral soil horizons. Among those processes are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes are continually taking place and have been for thousands of years.

The accumulation and incorporation of organic matter takes place with the decomposition of plant residue. Organic soils have formed under extremely wet and anerobic conditions where plant residue has not completely decomposed. These additions darken the surface layer and help to form the A1 horizon in mineral soils. Organic matter, once lost, normally takes a long time to replace. In the City of Virginia Beach, the organic matter content of the surface layer of mineral soils averages about 1 to 2 percent.

For mineral soils to have distinct subsoil horizons, it is believed that some of the lime and soluble salts must be leached before the translocation of clay minerals. Among the factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

Well drained and moderately well drained soils in the City of Virginia Beach have a yellowish brown to strong brown subsoil. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains. In some soils, however, the colors are inherited from the materials in which the soil formed. The structure of well drained and moderately well drained soils is subangular blocky, and the subsoil contains more clay than the overlying surface layer.

The reduction and transfer of iron, called gleying, is associated mainly with the wetter, more poorly drained soils. Moderately well drained to somewhat poorly drained soils have yellowish brown and strong brown mottles, which indicate the segregation of iron. In poorly drained soils, such as Acredale and Nimmo soils, the subsoil and underlying materials are grayish, which indicates reduction and transfer of iron by removal in solution.

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Glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A system that retains protective amounts of residue mulch on the surface of the soil throughout the year using no-tillage, strip stillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fast intake (in tables). The rapid movement of water into the soil.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A1 or Ap horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O or A horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, texture, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1949-78 at Norfolk, Virginia]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	48.9	32.4	40.7	75	12	138	3.47	2.51	4.56	6	3.0
February---	50.7	33.1	41.9	78	15	136	3.19	2.01	4.18	6	2.0
March------	57.5	39.4	48.5	84	24	283	3.70	2.59	4.69	7	1.0
April------	68.0	48.0	58.0	89	31	541	2.69	1.86	3.34	6	0.0
May--------	75.5	57.0	66.3	93	41	814	3.56	2.05	4.46	7	0.0
June-------	83.3	65.5	74.4	97	51	1032	3.49	2.07	4.76	6	0.0
July-------	86.8	70.0	78.4	07	59	1190	5.56	3.46	7.21	8	0.0
August-----	85.5	69.4	77.5	96	57	1158	5.56	2.62	8.16	7	0.0
September--	79.9	64.0	72.0	94	49	957	4.02	1.62	5.88	5	0.0
October----	69.9	53.2	61.6	87	34	668	3.36	1.30	4.48	5	0.0
November---	60.7	42.8	51.8	81	25	360	2.80	1.22	4.40	5	0.0
December---	51.8	34.9	43.4	74	18	180	3.20	2.69	3.92	6	1.2
Yearly:											
Average--	68.2	50.8	59.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	5	---	---	---	---	---	---
Total----	---	---	---	---	---	7,456	44.62	26.00	60.10	44	7.2

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1949-78 at Norfolk, Virginia]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 27	March 18	April 5
2 years in 10 later than--	February 28	March 15	April 3
5 years in 10 later than--	February 12	March 1	March 18
First freezing temperature in fall:			
1 year in 10 earlier than--	December 4	November 22	November 5
2 years in 10 earlier than--	December 8	November 24	November 12
5 years in 10 earlier than--	December 11	December 6	November 22

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1949-78 at Norfolk, Virginia]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	272	233	214
8 years in 10	283	254	226
5 years in 10	292	273	246
2 years in 10	322	290	246
1 year in 10	332	345	268

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Acredale silt loam	36,125	18.1
2	Acredale-Urban land complex	6,190	3.1
3	Augusta loam	3,270	1.7
4	Augusta-Urban land complex	785	0.4
5	Backbay mucky peat	9,775	4.9
6	Beaches	645	0.3
7	Bojac fine sandy loam	2,870	1.5
8	Chapanoke silt loam	1,890	1.0
9	Chapanoke-Urban land complex	335	0.2
10	Corolla fine sand	895	0.5
11	Corolla-Duckston fine sands	770	0.4
12	Dorovan mucky peat	8,830	4.5
13	Dragston fine sandy loam	4,500	2.3
14	Dragston-Urban land complex	260	0.1
15	Duckston fine sand	1,935	1.0
16E	Fripp sand, 2 to 30 percent slopes	790	0.4
17	Hyde silt loam	440	0.2
18	Lakehurst Variant sand	325	0.2
19	Munden fine sandy loam	4,275	2.2
20	Munden-Urban land complex	235	0.1
21	Nawney silt loam	4,305	2.2
22E	Newhan fine sand, 2 to 30 percent slopes	1,915	1.0
23C	Newhan-Corolla fine sands, 0 to 15 percent slopes	1,250	0.6
24	Nimmo loam	10,435	5.3
25	Nimmo-Urban land complex	425	0.2
26	Pamlico mucky peat, ponded	1,095	0.6
27	Pamlico-Lakehurst Variant complex	750	0.4
28	Pocaty peat	3,540	1.8
29	Portsmouth loam	2,130	1.1
30	Psamments, undulating	775	0.4
31	Psamments-Urban land complex	520	0.3
32	Rappahannock mucky peat, strongly saline	795	0.4
33E	Rumford fine sandy loam, 6 to 35 percent slopes	2,805	1.4
34A	State loam, 0 to 2 percent slopes	5,740	2.9
34B	State loam, 2 to 6 percent slopes	710	0.4
35	State-Urban land complex	695	0.4
36	Tetotum loam	6,060	3.1
37	Tetotum-Urban land complex	875	0.4
38	Tomotley loam	14,280	7.2
39	Tomotley-Urban land complex	2,155	1.1
40	Udorthents, loamy	4,175	2.1
41	Udorthents-Urban land complex	3,655	1.8
42	Urban land	3,710	1.9
43	Yeopim silt loam	1,330	0.7
44	Yeopim-Urban land complex	220	0.1
W	Water	38,105	19.1
	Total	197,590	100.0

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
1	Acredale silt loam (where drained)
3	Augusta loam (where drained)
7	Bojac fine sandy loam
8	Chapanoke silt loam (where drained)
13	Dragston fine sandy loam (where drained)
17	Hyde silt loam (where drained)
19	Munden fine sandy loam
24	Nimmo loam (where drained)
29	Portsmouth loam (where drained)
34A	State loam, 0 to 2 percent slopes
34B	State loam, 2 to 6 percent slopes
36	Tetotum loam
38	Tomotley loam (where drained)
43	Yeopim silt loam

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
1---------------- Acredale	IIIw	135	45	55	220	560	10.0
2---------------- Acredale-Urban land	---	---	---	---	---	---	---
3---------------- Augusta	IIIw	110	35	45	200	450	6.5
4---------------- Augusta-Urban land	---	---	---	---	---	---	---
5---------------- Backbay	VIIIw	---	---	---	---	---	---
6**. Beaches							
7---------------- Bojac	I	105	30	50	150	500	6.0
8---------------- Chapanoke	IIw	120	35	45	200	450	7.5
9---------------- Chapanoke-Urban land	---	---	---	---	---	---	---
10--------------- Corolla	VIIs	---	---	---	---	---	---
11--------------- Corolla-Duckston	VIIw	---	---	---	---	---	---
12--------------- Dorovan	VIIw	---	---	---	---	---	---
13--------------- Dragston	IIw	125	40	50	225	500	7.5
14--------------- Dragston-Urban land	---	---	---	---	---	---	---
15--------------- Duckston	VIIw	---	---	---	---	---	---
16E-------------- Fripp	VIIs	---	---	---	---	---	---
17--------------- Hyde	IIIw	135	45	55	250	560	10.0
18--------------- Lakehurst Variant	VIIs	---	---	---	---	---	---
19--------------- Munden	IIw	130	40	50	250	540	9.5

See footnote at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
20: Munden-Urban land	---	---	---	---	---	---	---
21: Nawney	VIIw	---	---	---	---	---	---
22E: Newhan	VIIIs	---	---	---	---	---	---
23C: Newhan-Corolla	VIIIs	---	---	---	---	---	---
24: Nimmo	IIIw	130	40	50	250	540	9.5
25: Nimmo-Urban land	---	---	---	---	---	---	---
26: Pamlico	VIIw	---	---	---	---	---	---
27: Pamlico-Lakehurst Variant	VIIw	---	---	---	---	---	---
28: Pocaty	VIIIw	---	---	---	---	---	---
29: Portsmouth	IIIw	135	45	55	250	540	10.0
30: Psamments	---	---	---	---	---	---	---
31: Psamments-Urban land	---	---	---	---	---	---	---
32: Rappahannock	VIIIw	---	---	---	---	---	---
33E: Rumford	VIe	---	---	---	---	---	---
34A: State	I	120	40	55	220	510	7.5
34B: State	IIe	120	40	55	220	510	7.5
35: State-Urban land	---	---	---	---	---	---	---
36: Tetotum	IIw	115	45	35	215	515	7.0
37: Tetotum-Urban land	---	---	---	---	---	---	---
38: Tomotley	IIIw	130	40	50	240	530	9.5

See footnote at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
39: Tomotley-Urban land	---	---	---	---	---	---	---
40**. Udorthents							
41: Udorthents-Urban land	---	---	---	---	---	---	---
42**. Urban land							
43: Yeopim	IIw	110	30	45	200	450	6.5
44: Yeopim-Urban land	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
1 Acredale	1w	Slight	Severe	Severe	Slight	Loblolly pine	96	Loblolly pine.
						Sweetgum	100	
						White oak	86	
						Water oak	86	
2*:								
Acredale	1w	Slight	Severe	Severe	Slight	Loblolly pine	96	Loblolly pine.
						Sweetgum	100	
						White oak	86	
						Water oak	86	
Urban land.								
3 Augusta	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine, sweetgum, American sycamore, yellow-poplar.
						Sweetgum	90	
						American sycamore	90	
						White oak	80	
						Southern red oak	80	
						Water oak	---	
4*:								
Augusta	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine, sweetgum, American sycamore, yellow-poplar.
						Sweetgum	90	
						American sycamore	90	
						White oak	80	
						Southern red oak	80	
						Water oak	---	
Urban land.								
7 Bojac	3o	Slight	Slight	Slight	Slight	Southern red oak	70	Loblolly pine, sweetgum.
						Loblolly pine	80	
						Sweetgum	80	
8 Chapanoke	2w	Slight	Moderate	Moderate	Slight	Loblolly pine	92	Loblolly pine, yellow-poplar, sweetgum, American sycamore.
						Sweetgum	---	
						Yellow-poplar	---	
						Water oak	---	
						Southern red oak	---	
9*:								
Chapanoke	2w	Slight	Moderate	Moderate	Slight	Loblolly pine	92	Loblolly pine, yellow-poplar, sweetgum, American sycamore.
						Sweetgum	---	
						Yellow-poplar	---	
						Water oak	---	
						Southern red oak	---	
Urban land.								
12 Dorovan	4w	Slight	Severe	Severe	Severe	Baldcypress	70	Baldcypress.
						Blackgum	70	
						Sweetbay	---	
13 Dragston	2w	Slight	Moderate	Slight	Slight	Southern red oak	80	Loblolly pine, sweetgum, yellow-poplar.
						Loblolly pine	86	
						Sweetgum	90	
						Yellow-poplar	90	
						White oak	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
14*: Dragston	2w	Slight	Moderate	Slight	Slight	Southern red oak	80	Loblolly pine, sweetgum, yellow-poplar.
						Loblolly pine	86	
						Sweetgum	90	
						Yellow-poplar	90	
						White oak	---	
Urban land.								
16E Fripp	4s	Slight	Moderate	Moderate	Slight	White oak	---	Loblolly pine.
						Loblolly pine	70	
						American beech	---	
						Hickory	---	
17 Hyde	1w	Slight	Severe	Severe	Slight	White oak	---	Loblolly pine, sweetgum.
						Loblolly pine	96	
						Sweetgum	97	
						Water oak	88	
18 Lakehurst Variant	4s	Slight	Moderate	Moderate	Slight	Loblolly pine	74	Loblolly pine.
						White oak	---	
						American beech	---	
						Hickory	---	
						Sweetgum	---	
19 Munden	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine.
						Sweetgum	90	
						White oak	76	
20*: Munden	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine.
						Sweetgum	90	
						White oak	76	
Urban land.								
21 Nawney	4w	Slight	Severe	Severe	Severe	Baldcypress	---	
						Water tupelo	---	
						Red maple	---	
						Sweetgum	---	
						Water oak	---	
24 Nimmo	2w	Slight	Severe	Severe	Slight	Loblolly pine	95	Loblolly pine, sweetgum.
						Sweetgum	95	
						White oak	80	
25*: Nimmo	2w	Slight	Severe	Severe	Slight	Loblolly pine	95	Loblolly pine, sweetgum.
						Sweetgum	95	
						White oak	80	
Urban land.								
26 Pamlico	4w	Slight	Severe	Severe	Severe	Baldcypress	---	Water tupelo.
						Water tupelo	---	
27*: Pamlico	4w	Slight	Severe	Severe	Severe	Baldcypress	---	Water tupelo.
						Water tupelo	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Common trees	Site index	
27*:								
Lakehurst Variant	4s	Slight	Moderate	Moderate	Slight	Loblolly pine	74	Loblolly pine.
						White oak	---	
						American beech	---	
						Hickory	---	
						Sweetgum	---	
29 Portsmouth	1w	Slight	Severe	Severe	Slight	Loblolly pine	96	Loblolly pine, sweetgum.
						Sweetgum	---	
						Red maple	---	
						Water oak	---	
						Willow oak	---	
						Sweetbay	---	
						Redbay	---	
33E Rumford	3r	Slight	Moderate	Slight	Slight	Southern red oak	66	Loblolly pine.
						Loblolly pine	80	
34A, 34B State	1o	Slight	Slight	Slight	Slight	Southern red oak	86	Black walnut, yellow-poplar, loblolly pine.
						Yellow-poplar	100	
						Virginia pine	86	
						Loblolly pine	96	
35*:								
State	1o	Slight	Slight	Slight	Slight	Southern red oak	86	Black walnut, yellow-poplar, loblolly pine.
						Yellow-poplar	100	
						Virginia pine	86	
						Loblolly pine	96	
Urban land.								
36 Tetotum	2w	Slight	Moderate	Slight	Slight	Loblolly pine	88	Loblolly pine.
						Sweetgum	86	
						Southern red oak	76	
						Yellow-poplar	90	
37*:								
Tetotum	2w	Slight	Moderate	Slight	Slight	Loblolly pine	88	Loblolly pine.
						Sweetgum	86	
						Southern red oak	76	
						Yellow-poplar	90	
Urban land.								
38 Tomotley	2w	Slight	Severe	Severe	Slight	Loblolly pine	94	Loblolly pine, sweetgum, American sycamore.
						Sweetgum	90	
39*:								
Tomotley	2w	Slight	Severe	Severe	Slight	Loblolly pine	94	Loblolly pine, sweetgum, American sycamore.
						Sweetgum	90	
Urban land.								
43 Yeopim	2w	Slight	Moderate	Slight	Slight	Loblolly pine	91	Loblolly pine.
						Sweetgum	---	
						Yellow-poplar	---	
						Southern red oak	---	
						White oak	---	
44*:								
Yeopim	2w	Slight	Moderate	Slight	Slight	Loblolly pine	91	Loblolly pine.
						Sweetgum	---	
						Yellow-poplar	---	
						Southern red oak	---	
						White oak	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
44*: Urban land.								

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1 Acredale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
2*:					
Acredale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
3 Augusta	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
4*:					
Augusta	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
5 Backbay	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
6*. Beaches					
7 Bojac	Slight	Slight	Slight	Slight	Slight.
8 Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
9*:					
Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
10 Corolla	Severe: wetness, too sandy.	Severe: too sandy.	Severe: wetness, too sandy.	Severe: too sandy.	Severe: droughty.
11*:					
Corolla	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Duckston	Severe: flooding, wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness, flooding.	Severe: too sandy.	Severe: droughty, flooding.
12 Dorovan	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
13 Dragston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
14*:					
Dragston-------------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Urban land.					
15-------------------- Duckston	Severe: flooding, wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness, flooding.	Severe: too sandy.	Severe: droughty, flooding.
16E------------------- Fripp	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
17-------------------- Hyde	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
18-------------------- Lakehurst Variant	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
19-------------------- Munden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
20*:					
Munden---------------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
21-------------------- Nawney	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.
22E------------------- Newhan	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
23C*:					
Newhan---------------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
Corolla--------------	Severe: wetness, too sandy.	Severe: too sandy.	Severe: wetness, too sandy.	Severe: too sandy.	Severe: droughty.
24-------------------- Nimmo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
25*:					
Nimmo----------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
26-------------------- Pamlico	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
27*: Pamlico	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lakehurst Variant	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
28 Pocaty	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus, flooding.	Severe: excess salt, excess sulfur, ponding.
29 Portsmouth	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30. Psamments					
31*: Psamments.					
Urban land.					
32 Rappahannock	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus, excess salt.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: excess salt, excess sulfur, ponding.
33E Rumford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
34A State	Slight	Slight	Slight	Slight	Slight.
34B State	Slight	Slight	Moderate: slope.	Slight	Slight.
35*: State	Slight	Slight	Slight	Slight	Slight.
Urban land.					
36 Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
37*: Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
38 Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
39*: Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
40. Udorthents					
41*: Udorthents.					
Urban land.					
42*. Urban land					
43-------------------- Yeopim	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
44*: Yeopim---------------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1 Acredale	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
2*:										
Acredale	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
3 Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
4*:										
Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land										
5 Backbay	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
6*. Beaches										
7 Bojac	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8 Chapanoke	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
9*:										
Chapanoke	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
10 Corolla	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
11*:										
Corolla	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Duckston	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor.
12 Dorovan	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
13 Dragston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair.
14*:										
Dragston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair.
Urban land.										
15 Duckston	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor.
16E Fripp	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
17 Hyde	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
18------------------ Lakehurst Variant	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
19------------------ Munden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
20*:										
Munden-------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
21------------------ Nawney	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
22E----------------- Newhan	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
23C*:										
Newhan-------------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Corolla------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
24------------------ Nimmo	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
25*:										
Nimmo--------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
26------------------ Pamlico	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
27*:										
Pamlico------------	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
Lakehurst Variant-	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
28------------------ Pocaty	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
29------------------ Portsmouth	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
30. Psamments										
31*:										
Psamments.										
Urban land.										
33E----------------- Rumford	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
34A, 34B------------ State	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
35*:										
State-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
36----------------- Tetotum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
37*:										
Tetotum-----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
38----------------- Tomotley	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
39*:										
Tomotley----------	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Urban land.										
40. Udorthents										
41*:										
Udorthents.										
Urban land.										
42*. Urban land										
43----------------- Yeopim	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
44*:										
Yeopim------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1 Acredale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
2*:						
Acredale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
Urban land.						
3 Augusta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
4*:						
Augusta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Urban land.						
5 Backbay	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding, excess humus.
6*. Beaches						
7 Bojac	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Slight.
8 Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
9*:						
Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
Urban land.						
10 Corolla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
11*:						
Corolla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
Duckston	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: droughty, flooding.
12 Dorovan	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding.	Severe: ponding, flooding, excess humus.
13 Dragston	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
14*:						
Dragston	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Urban land.						
15 Duckston	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: droughty, flooding.
16E Fripp	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
17 Hyde	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
18 Lakehurst Variant	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
19 Munden	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
20*:						
Munden	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.						
21 Nawney	Severe: cutbanks cave, wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
22E Newhan	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
23C*:						
Newhan	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Corolla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
24 Nimmo	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
25*:						
Nimmo	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.						
26 Pamlico	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27*:						
Pamlico	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding.	Severe: ponding, excess humus.
Lakehurst Variant	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
28 Pocaty	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
29 Portsmouth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30. Psamments						
31*: Psamments.						
Urban land.						
32 Rappahannock	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
33E Rumford	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
34A State	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: low strength.	Slight.
34B State	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: low strength.	Slight.
35*:						
State	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: low strength.	Slight.
Urban land.						
36 Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
37*:						
Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Urban land.						
38 Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
39*:						
Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.						
40. Udorthents						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
41*:						
Udorthents.						
Urban land.						
42*. Urban land						
43----------------- Yeopim	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
44*:						
Yeopim------------	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1----- Acredale	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
2*:					
Acredale-----	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
3----- Augusta	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness.
4*:					
Augusta-----	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness.
Urban land.					
5----- Backbay	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
6*. Beaches					
7----- Bojac	Moderate: wetness.	Severe: seepage.	Severe: wetness, seepage.	Severe: seepage.	Fair: thin layer.
8----- Chapanoke	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
9*:					
Chapanoke-----	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Urban land.					
10----- Corolla	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.
11*:					
Corolla-----	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Duckston-----	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12------------------ Dorovan	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: ponding, excess humus.
13------------------ Dragston	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
14*:					
Dragston-----------	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
Urban land.					
15------------------ Duckston	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
16E----------------- Fripp	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
17------------------ Hyde	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
18------------------ Lakehurst Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
19------------------ Munden	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
20*					
Munden-------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
Urban land.					
21------------------ Nawney	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
22E----------------- Newhan	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
23C*:					
Newhan-------------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Corolla------------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
24------------------- Nimmo	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
25*:					
Nimmo---------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
26------------------- Pamlico	Severe: ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
27*:					
Pamlico-------------	Severe: ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Lakehurst Variant--	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
28------------------- Pocaty	Severe: flooding, seepage, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
29------------------- Portsmouth	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
30. Psamments					
31*:					
Psamments.					
Urban land.					
32------------------- Rappahannock	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
33E------------------ Rumford	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
34A, 34B------------ State	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
35*:					
State---------------	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
36------------------ Tetotum	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
37*:					
Tetotum------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
Urban land.					
38------------------ Tomotley	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
39*:					
Tomotley-----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
40. Udorthents					
41*:					
Udorthents.					
Urban land.					
42*. Urban land					
43------------------ Yeopim	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness.	Fair: wetness, thin layer.
44*:					
Yeopim-------------	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness.	Fair: wetness, thin layer.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1----------------------- Acredale	Poor: low strength, wetness.	Probable-------------	Improbable: too sandy.	Poor: wetness.
2*:				
Acredale--------------	Poor: low strength, wetness.	Probable-------------	Improbable: too sandy.	Poor: wetness.
Urban land.				
3----------------------- Augusta	Fair: wetness.	Probable-------------	Improbable: excess fines.	Good.
4*:				
Augusta---------------	Fair: wetness.	Probable-------------	Improbable: excess fines.	Fair: small stones.
Urban land.				
5----------------------- Backbay	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
6*. Beaches				
7----------------------- Bojac	Good-----------------	Probable-------------	Improbable: too sandy.	Good.
8----------------------- Chapanoke	Poor: wetness, low strength.	Probable-------------	Improbable: excess fines.	Poor: wetness.
9*:				
Chapanoke-------------	Poor: wetness, low strength.	Probable-------------	Improbable: excess fines.	Poor: wetness.
Urban land.				
10---------------------- Corolla	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
11*:				
Corolla---------------	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Duckston--------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
12---------------------- Dorovan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
13---------------------- Dragston	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: thin layer.
14*:				
Dragston--------------	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: thin layer.
Urban land.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
15------------------- Duckston	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
16E------------------ Fripp	Fair: slope.	Probable------------	Improbable: too sandy.	Poor: too sandy, slope.
17------------------- Hyde	Poor: low strength, wetness.	Probable------------	Improbable: excess fines.	Poor: wetness.
18------------------- Lakehurst Variant	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
19------------------- Munden	Fair: wetness.	Probable------------	Improbable: too sandy.	Fair: thin layer.
20*:				
Munden---------------	Fair: wetness.	Probable------------	Improbable: too sandy.	Fair: thin layer.
Urban land.				
21------------------- Nawney	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
22E------------------ Newhan	Fair: slope.	Probable------------	Improbable: too sandy.	Poor: too sandy, slope.
23C*:				
Newhan---------------	Good----------------	Probable------------	Improbable: too sandy.	Poor: too sandy.
Corolla--------------	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
24------------------- Nimmo	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: thin layer, wetness.
25*:				
Nimmo----------------	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: thin layer, wetness.
Urban land.				
26------------------- Pamlico	Poor: low strength, wetness.	Probable------------	Improbable: too sandy.	Poor: excess humus, wetness.
27*:				
Pamlico--------------	Poor: low strength, wetness.	Probable------------	Improbable: too sandy.	Poor: excess humus, wetness.
Lakehurst Variant----	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
28------------------- Pocaty	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, excess salt, wetness.
29------------------- Portsmouth	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30. Psamments				
31*: Psamments.				
Urban land.				
32 Rappahannock	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, excess salt, wetness.
33E Rumford	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
34A, 34B State	Good	Probable	Improbable: too sandy.	Good.
35*: State	Good	Probable	Improbable: too sandy.	Good.
Urban land.				
36 Tetotum	Fair: wetness.	Probable	Improbable: excess fines.	Fair: too clayey, small stones.
37*: Tetotum	Fair: wetness.	Probable	Improbable: excess fines.	Fair: too clayey, small stones.
Urban land.				
38 Tomotley	Poor: wetness.	Probable	Improbable: excess fines.	Poor: wetness.
39*: Tomotley	Poor: wetness.	Probable	Improbable: excess fines.	Poor: wetness.
Urban land.				
40. Udorthents				
41*: Udorthents.				
Urban land.				
42*. Urban land				
43 Yeopim	Poor: low strength.	Probable	Improbable: excess fines.	Good.
44*: Yeopim	Poor: low strength.	Probable	Improbable: excess fines.	Good.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
1----------------- Acredale	Moderate: seepage.	Severe: thin layer, wetness.	Slight---------	Percs slowly---	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
2*:						
Acredale---------	Moderate: seepage.	Severe: thin layer, wetness.	Slight---------	Percs slowly---	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
Urban land.						
3----------------- Augusta	Moderate: seepage.	Severe: piping, wetness.	Moderate: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness.
4*:						
Augusta----------	Moderate: seepage.	Severe: piping, wetness.	Moderate: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness.
Urban land.						
5----------------- Backbay	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, flooding.	Ponding, flooding, excess salt.	Wetness, excess salt.
6*. Beaches						
7----------------- Bojac	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Soil blowing---	Favorable.
8----------------- Chapanoke	Moderate: seepage.	Severe: wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness, erodes easily.
9*:						
Chapanoke--------	Moderate: seepage.	Severe: wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness, erodes easily.
Urban land.						
10---------------- Corolla	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
11*:						
Corolla----------	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
Duckston---------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
12---------------- Dorovan	Moderate: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave.	Ponding, flooding, subsides.	Ponding, flooding.	Wetness.
13---------------- Dragston	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
14*: Dragston	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Urban land.						
15 Duckston	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
16E Fripp	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
17 Hyde	Slight	Severe: wetness.	Slight	Percs slowly	Wetness	Wetness, erodes easily.
18 Lakehurst Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
19 Munden	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Favorable.
20*: Munden	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Favorable.
Urban land.						
21 Nawney	Severe: seepage.	Severe: wetness.	Slight	Flooding	Flooding	Wetness.
22E Newhan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
23C*: Newhan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
Corolla	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Droughty.
24 Nimmo	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
25*: Nimmo	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Urban land.						
26 Pamlico	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
27*:						
Pamlico	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.
Lakehurst Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
28 Pocaty	Moderate: seepage.	Severe: excess humus, ponding.	Moderate: salty water.	Ponding, flooding, excess salt.	Ponding, flooding, excess salt.	Wetness, excess salt.
29 Portsmouth	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Wetness.
30. Psamments						
31*: Psamments.						
Urban land.						
32 Rappahannock	Slight	Severe: excess humus, ponding, excess salt.	Severe: salty water.	Ponding, flooding, excess salt.	Ponding, flooding, excess salt.	Wetness, excess salt.
33E Rumford	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
34A State	Moderate: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Favorable	Favorable.
34B State	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Slope	Favorable.
35*:						
State	Moderate: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Favorable	Favorable.
Urban land.						
36 Tetotum	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Favorable.
37*:						
Tetotum	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Favorable.
Urban land.						
38 Tomotley	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Wetness.
39*:						
Tomotley	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness	Wetness.
Urban land.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
40. Udorthents						
41*: Udorthents.						
Urban land.						
42*. Urban land						
43 Yeopim	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, erodes easily.	Erodes easily.
44*: Yeopim	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, erodes easily.	Erodes easily.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1 Acredale	0-7	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	7-15	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	15-43	Silt loam, silty clay loam.	CL	A-4, A-5, A-6, A-7	0	100	100	90-100	70-95	20-45	7-25
	43-66	Sandy loam, loamy sand, sand.	SM, SC, SM-SC, SW-SM	A-2, A-3, A-4	0	100	100	55-75	5-40	<30	NP-15
2*:											
Acredale	0-7	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	7-15	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	15-43	Silt loam, silty clay loam.	CL	A-4, A-5, A-6, A-7	0	100	100	90-100	70-95	20-45	7-25
	43-66	Sandy loam, loamy sand, sand.	SM, SC, SM-SC, SW-SM	A-2, A-3, A-4	0	100	100	55-75	5-40	<30	NP-15
Urban land.											
3 Augusta	0-8	Loam	ML, CL-ML	A-4	0	90-100	75-100	75-100	51-75	<35	NP-10
	8-45	Sandy clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	75-100	75-95	51-80	20-45	5-25
	45-63	Sandy loam, loamy sand, sand.	SM, SP-SM, ML, SM-SC	A-2, A-4, A-1	0	75-100	55-100	30-90	10-70	<25	NP-5
4*:											
Augusta	0-8	Loam	ML, CL-ML	A-4	0	90-100	75-100	75-100	51-75	<35	NP-10
	8-45	Sandy clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	75-100	75-95	51-80	20-45	5-25
	45-63	Sandy loam, loamy sand, sand.	SM, SP-SM, ML, SM-SC	A-2, A-4, A-1	0	75-100	55-100	30-90	10-70	<25	NP-5
Urban land.											
5 Backbay	0-11	Mucky-peat	Pt	A-8	---	---	---	---	---	---	---
	11-22	Sandy loam, loam, silt loam.	SM, CL, SM-SC, CL-ML	A-4, A-6	0	100	100	60-100	35-90	<22	NP-12
	22-60	Stratified sandy loam to silty clay loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	60-100	35-95	<40	NP-20
6*. Beaches											
7 Bojac	0-8	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-2, A-4	0	95-100	95-100	55-100	30-60	<25	NP-7
	8-38	Fine sandy loam, loam, sandy loam.	ML, SM	A-2, A-4	0	95-100	95-100	55-100	20-60	<35	NP-10
	38-62	Stratified loamy fine sand to sand.	SM, SP, SW-SM	A-1, A-2, A-3	0	80-100	75-100	12-100	2-35	<20	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8----------------- Chapanoke	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-90	<30	NP-7
	7-53	Silty clay loam, silt loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	85-100	60-95	22-49	8-30
	53-72	Fine sandy loam, loamy fine sand.	SM, SM-SC, ML	A-2, A-4	0	100	100	50-85	15-55	<30	NP-7
9*: Chapanoke--------	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-90	<30	NP-7
	7-53	Silty clay loam, silt loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	85-100	60-95	22-49	8-30
	53-72	Fine sandy loam, loamy fine sand.	SM, SM-SC, ML	A-2, A-4	0	100	100	50-85	15-55	<30	NP-7
Urban land.											
10---------------- Corolla	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
11*: Corolla---------	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
Duckston---------	0-72	Fine sand, sand	SP-SM, SP	A-3	0	100	95-100	60-75	3-10	---	NP
12---------------- Dorovan	0-4	Mucky peat--------	Pt	---	0	---	---	---	---	---	---
	4-78	Muck--------------	Pt	---	0	---	---	---	---	---	---
	78-80	Silt to clay.	CL, ML	A-6, A-7,	0	100	100	90-100	85-95	20-45	8-30
13---------------- Dragston	0-9	Fine sandy loam	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<20	NP-8
	9-38	Fine sandy loam, sandy loam, loam.	SM-SC CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<25	NP-10
	38-60	Sand, loamy sand, sandy loam.	SM, SP-SM, SM-SC	A-1, A-2, A-3	0	95-100	85-100	35-70	5-30	<18	NP-7
14*: Dragston---------	0-9	Fine sandy loam	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<20	NP-8
	9-38	Fine sandy loam, sandy loam, loam.	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<25	NP-10
	38-60	Sand, loamy sand, sandy loam.	SM, SP-SM, SM-SC	A-1, A-2, A-3	0	95-100	85-100	35-70	5-30	<18	NP-7
Urban land.											
15---------------- Duckston	0-72	Fine sand, sand	SP-SM, SP	A-3	0	100	95-100	60-75	3-10	---	NP
16E--------------- Fripp	0-5	Sand-------------	SP, SP-SM	A-3	0	100	98-100	85-99	0-5	---	NP
	5-60	Fine sand, sand	SP, SP-SM	A-3	0	100	98-100	85-99	0-5	---	NP
17---------------- Hyde	0-16	Silt loam--------	CL-ML, ML	A-4	0	100	98-100	85-100	60-90	<25	NP-7
	16-58	Silt loam, loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	98-100	90-100	75-95	22-42	7-20
	58-72	Variable---------	---	---	---	---	---	---	---	---	---
18---------------- Lakehurst Variant	0-4	Sand-------------	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
	4-72	Sand, fine sand	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
19---------------- Munden	0-8	Fine sandy loam	SM, SC, SM-SC	A-4	0	100	98-100	60-95	35-75	<22	NP-10
	8-32	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	98-100	60-95	30-75	<30	NP-15
	32-62	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	98-100	50-90	5-35	<18	NP-7
20*:											
Munden-----------	0-8	Fine sandy loam	SM, SC, SM-SC	A-4	0	100	98-100	60-95	35-75	<22	NP-10
	8-32	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	98-100	60-95	30-75	<30	NP-15
	32-62	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	98-100	50-90	5-35	<18	NP-7
Urban land.											
21---------------- Nawney	0-5	Silt loam--------	CL	A-6, A-7	0	100	98-100	85-100	55-95	30-45	10-24
	5-43	Stratified sandy loam to silty clay loam.	SM, SC, ML, CL	A-4, A-6, A-7	0	100	98-100	60-100	35-95	14-46	3-25
	43-60	Variable---------	---	---	---	---	---	---	---	---	---
22E--------------- Newhan	0-72	Fine sand, sand	SP	A-3	0	95-100	95-100	60-75	0-5	---	NP
23C*:											
Newhan-----------	0-72	Fine sand, sand	SP	A-3	0	95-100	95-100	60-75	0-5	---	NP
Corolla----------	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
24---------------- Nimmo	0-7	Loam-------------	SM, SC, SM-SC, ML	A-4	0	100	95-100	60-85	36-60	<22	NP-10
	7-33	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0	100	95-100	60-95	30-75	<30	NP-15
	33-60	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	95-100	50-80	5-35	<18	NP-7
25*:											
Nimmo------------	0-7	Loam-------------	SM, SC, SM-SC, ML	A-4	0	100	95-100	60-85	36-60	<22	NP-10
	7-33	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0	100	95-100	60-95	30-75	<30	NP-15
	33-60	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	95-100	50-80	5-35	<18	NP-7
Urban land.											
26---------------- Pamlico	0-30	Mucky peat-------	Pt	---	0	---	---	---	---	---	---
	30-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-20	---	NP
27*:											
Pamlico----------	0-30	Mucky peat-------	Pt	---	0	---	---	---	---	---	---
	30-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-20	---	NP
Lakehurst Variant---------	0-4	Sand-------------	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
	4-72	Sand, fine sand	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
28---------------- Pocaty	0-12	Peat-------------	Pt	A-8	---	---	---	---	---	---	---
	12-20	Mucky-peat, muck	Pt	A-8	---	---	---	---	---	---	---
	20-60	Muck-------------	Pt	A-8	---	---	---	---	---	---	---
	60-80	Variable---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29---------------- Portsmouth	0-13	Loam-------------	SM, SM-SC, ML	A-2, A-4	0	98-100	98-100	65-95	30-65	<30	NP-7
	13-36	Loam, sandy loam, silt loam.	SC, CL-ML, CL	A-4, A-6	0	98-100	98-100	75-95	36-70	18-40	7-18
	36-60	Stratified sand to loamy sand.	SP-SM, SP, SM	A-1, A-2, A-3	0	98-100	98-100	45-65	3-25	---	NP
30. Psamments											
31*: Psamments.											
Urban land.											
32---------------- Rappahannock	0-11	Mucky peat-------	Pt	A-8	0	---	---	---	---	---	---
	11-37	Mucky peat, muck	Pt	A-8	0	---	---	---	---	---	---
	37-51	Variable---------	---	---	---	---	---	---	---	---	---
33E--------------- Rumford	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	90-100	85-100	55-85	30-50	<25	NP-6
	10-41	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	55-85	30-50	<34	NP-12
	41-72	Stratified sandy loam to gravelly sand.	SM, SP, GP, GM	A-1, A-2, A-3, A-4	0	50-100	35-100	20-85	2-40	<25	NP-6
34A, 34B--------- State	0-11	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	95-100	95-100	65-95	45-85	<28	NP-15
	11-56	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	75-100	35-80	24-40	8-22
	56-64	Stratified sand to fine sandy loam.	SM, SM-SC, SP-SM	A-1, A-2, A-3, A-4	0	85-100	75-100	40-90	5-50	<25	NP-7
35*: State-----------	0-11	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	95-100	95-100	65-95	45-85	<28	NP-15
	11-56	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	75-100	35-80	24-40	8-22
	56-64	Stratified sand to fine sandy loam.	SM, SM-SC, SP-SM	A-1, A-2, A-3, A-4	0	85-100	75-100	40-90	5-50	<25	NP-7
Urban land.											
36---------------- Tetotum	0-10	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	85-100	80-100	65-95	45-85	<30	NP-15
	10-58	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0-2	85-100	80-100	60-95	35-85	30-45	10-20
	58-70	Stratified sand sandy to clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
37*: Tetotum---------	0-10	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	85-100	80-100	65-95	45-85	<30	NP-15
	10-58	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0-2	85-100	80-100	60-95	35-85	30-45	10-20
	58-70	Stratified sand to sandy clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
38----------------- Tomotley	0-7	Loam---------------	ML	A-4	0	98-100	95-100	75-100	51-98	<40	NP-10
	7-45	Loam, silt loam, clay loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	98-100	95-100	75-98	30-70	20-40	6-18
	45-66	Variable----------	---	---	---	---	---	---	---	---	---
39*: Tomotley---------	0-7	Loam---------------	ML	A-4	0	98-100	95-100	75-100	51-98	<40	NP-10
	7-45	Loam, silt loam, loam, clay loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	98-100	95-100	75-98	30-70	20-40	6-18
	45-66	Variable----------	---	---	---	---	---	---	---	---	---
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											
43----------------- Yeopim	0-8	Silt loam---------	ML, CL-ML	A-4	0	100	100	85-100	55-80	<30	NP-7
	8-79	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	22-49	8-30
	79-84	Stratified sand to loam.	SM, ML, SM-SC, SP-SM	A-2, A-3, A-4	0	98-100	98-100	50-95	5-80	<20	NP-7
44*: Yeopim-----------	0-8	Silt loam---------	ML, CL-ML	A-4	0	100	100	85-100	55-80	<30	NP-7
	8-79	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	22-49	8-30
	79-84	Stratified sand to loam.	SM, ML, SM-SC, SP-SM	A-2, A-3, A-4	0	98-100	98-100	50-95	5-80	<20	NP-7
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
1 Acredale	0-7	8-15	1.20-1.35	0.6-2.0	0.17-0.20	3.6-5.5	<2	Low	0.37	3	2-4
	7-15	12-20	1.20-1.35	0.6-2.0	0.17-0.20	4.5-7.3	<2	Low	0.37		
	15-43	18-34	1.25-1.40	0.06-0.2	0.13-0.20	4.5-7.3	<2	Moderate	0.37		
	43-66	5-18	1.30-1.50	2.0-20	0.04-0.12	4.5-7.3	<2	Low	0.24		
2*:											
Acredale	0-7	8-15	1.20-1.35	0.6-2.0	0.17-0.20	3.6-5.5	<2	Low	0.37	3	2-4
	7-15	12-20	1.20-1.35	0.6-2.0	0.17-0.20	4.5-7.3	<2	Low	0.37		
	15-43	18-34	1.25-1.40	0.06-0.2	0.13-0.20	4.5-7.3	<2	Moderate	0.37		
	43-66	5-18	1.30-1.50	2.0-20	0.04-0.12	4.5-7.3	<2	Low	0.24		
Urban land.											
3 Augusta	0-8	10-25	1.25-1.50	0.6-2.0	0.15-0.22	4.5-6.0	<2	Low	0.24	4	.5-2
	8-45	20-35	1.30-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low	0.24		
	45-63	3-18	1.30-1.50	2.0-6.0	0.06-0.12	4.5-6.0	<2	Low	0.24		
4*:											
Augusta	0-8	10-25	1.25-1.50	0.6-2.0	0.15-0.22	4.5-6.0	<2	Low	0.24	4	.5-2
	8-45	20-35	1.30-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low	0.24		
	45-63	3-18	1.30-1.50	2.0-6.0	0.06-0.12	4.5-6.0	<2	Low	0.24		
Urban land.											
5 Backbay	0-11	---	0.10-0.20	2.0-6.0	0.15-0.22	4.5-6.0	2-8	Low	----	---	20-80
	11-22	10-27	1.15-1.35	0.2-2.0	0.16-0.20	5.1-7.3	2-4	Low	0.20		
	22-60	8-34	1.20-1.40	0.2-2.0	0.14-0.20	5.1-7.3	<2	Moderate	0.20		
6*. Beaches											
7 Bojac	0-8	3-8	1.20-1.50	2.0-6.0	0.10-0.18	4.5-6.0	<2	Low	0.28	3	.5-2
	8-38	11-16	1.35-1.55	2.0-6.0	0.10-0.17	4.5-6.0	<2	Low	0.28		
	38-62	1-8	1.30-1.50	>6.0	0.02-0.07	4.5-6.0	<2	Low	0.28		
8 Chapanoke	0-7	7-27	1.30-1.50	2.0-6.0	0.15-0.24	3.6-6.5	<2	Low	0.43	5	.5-2
	7-53	18-35	1.30-1.50	0.2-0.6	0.15-0.22	3.6-6.5	<2	Low	0.43		
	53-72	7-28	1.30-1.50	0.6-2.0	0.15-0.24	3.6-6.5	<2	Low	0.37		
9*:											
Chapanoke	0-7	7-27	1.30-1.50	2.0-6.0	0.15-0.24	3.6-6.5	<2	Low	0.43	5	.5-2
	7-53	18-35	1.30-1.50	0.2-0.6	0.15-0.22	3.6-6.5	<2	Low	0.43		
	53-72	7-28	1.30-1.50	0.6-2.0	0.15-0.24	3.6-6.5	<2	Low	0.37		
Urban land.											
10 Corolla	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low	0.10	5	<.5
11*:											
Corolla	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low	0.10	5	<.5
Duckston	0-72	0-4	1.60-1.70	>20	0.02-0.05	3.6-7.3	<2	Low	0.10	5	.5-1
12 Dorovan	0-4	---	0.25-0.40	0.6-2.0	0.25-0.50	3.6-4.4	<2	-----------	----	---	20-80
	4-78	---	0.35-0.55	0.6-2.0	0.25-0.50	3.6-4.4	<2	-----------	----		
	78-80	10-50	1.40-1.65	0.06-2.0	0.12-0.19	3.6-6.5	<2	Moderate	----		
13 Dragston	0-9	4-12	1.20-1.50	2.0-6.0	0.08-0.15	4.5-5.5	<2	Low	0.24	4	.5-1
	9-38	10-18	1.25-1.45	2.0-6.0	0.08-0.16	4.5-5.5	<2	Low	0.17		
	38-60	2-12	1.35-1.55	6.0-20.0	0.04-0.10	4.5-5.5	<2	Low	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
14*:											
Dragston---------	0-9	4-12	1.20-1.50	2.0-6.0	0.08-0.15	4.5-5.5	<2	Low----------	0.24	4	.5-1
	9-38	10-18	1.25-1.45	2.0-6.0	0.08-0.16	4.5-5.5	<2	Low----------	0.17		
	38-60	2-12	1.35-1.55	6.0-20	0.04-0.10	4.5-5.5	<2	Low----------	0.17		
Urban land.											
15---------------- Duckston	0-72	0-4	1.60-1.70	>20	0.02-0.05	3.6-7.3	<2	Low----------	0.10	5	.5-1
16E--------------- Fripp	0-5	<5	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	5-60	<5	1.30-1.70	>20	0.04-0.03	3.6-5.0	<2	Low----------	0.10		
17---------------- Hyde	0-16	5-18	1.30-1.50	0.6-2.0	0.13-0.20	3.6-5.5	<2	Low----------	0.17	5	4-15
	16-58	18-35	1.30-1.40	.06-0.2	0.15-0.20	3.6-5.5	<2	Low----------	0.43		
	58-72	---	---	---	---	---	---	-------------	----		
18---------------- Lakehurst Variant	0-4	0-2	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	4-72	0-4	1.35-1.65	>20	0.02-0.06	3.6-5.0	<2	Low----------	0.10		
19---------------- Munden	0-8	4-16	1.20-1.35	2.0-6.0	0.06-0.15	4.5-6.0	<2	Low----------	0.20	4	1-2
	8-32	8-18	1.20-1.35	2.0-6.0	0.08-0.17	4.5-6.0	<2	Low----------	0.17		
	32-62	2-12	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low----------	0.17		
20*:											
Munden-----------	0-8	4-16	1.20-1.35	2.0-6.0	0.06-0.15	4.5-6.0	<2	Low----------	0.20	4	1-2
	8-32	8-18	1.20-1.35	2.0-6.0	0.08-0.17	4.5-6.0	<2	Low----------	0.17		
	32-62	2-12	1.35-1.55	---	0.04-0.08	4.5-6.0	<2	Low----------	0.17		
Urban land.											
21---------------- Nawney	0-5	10-27	1.20-1.35	0.6-2.0	0.14-0.22	3.6-5.5	<2	Low----------	0.32	5	2-3
	5-43	18-35	1.25-1.50	0.6-2.0	0.10-0.22	3.6-5.5	<2	Moderate-----	0.28		
	43-60	---	---	---	---	3.6-6.5	---	-------------	----		
22E--------------- Newhan	0-72	0-3	1.60-1.70	>20	<0.05	3.6-7.3	<2	Low----------	0.10	5	<.5
23C*:											
Newhan-----------	0-72	0-3	1.60-1.70	>20	<0.05	3.6-7.3	<2	Low----------	0.10	5	<.5
Corolla----------	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low----------	0.10	5	<.5
24---------------- Nimmo	0-7	4-14	1.20-1.35	2.0-6.0	0.06-0.15	3.6-5.5	<2	Low----------	0.17	4	1-2
	7-33	8-18	1.20-1.35	0.6-2.0	0.08-0.17	3.6-5.5	<2	Low----------	0.17		
	33-60	1-8	1.35-1.55	6.0-20	0.04-0.08	3.6-5.5	<2	Low----------	0.17		
25*:											
Nimmo------------	0-7	4-14	1.20-1.35	2.0-6.0	0.06-0.15	3.6-5.5	<2	Low----------	0.17	4	1-2
	7-33	8-18	1.20-1.35	0.6-2.0	0.08-0.17	3.6-5.5	<2	Low----------	0.17		
	33-60	1-8	1.35-1.55	6.0-20	0.04-0.08	3.6-5.5	<2	Low----------	0.17		
Urban land.											
26---------------- Pamlico	0-30	---	0.20-0.65	0.6-6.0	0.24-0.40	3.6-5.5	<2	Low----------	----	---	20-80
	30-60	5-10	1.60-1.75	6.0-20	0.02-0.10	3.6-5.5	<2	Low----------	0.10		
27*:											
Pamlico----------	0-30	---	0.20-0.65	0.6-6.0	0.24-0.40	3.6-5.5	<2	Low----------	----	---	20-80
	30-60	5-10	1.60-1.75	6.0-20	0.02-0.10	3.6-5.5	<2	Low----------	0.10		
Lakehurst Variant--------	0-4	0-2	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	4-72	0-4	1.35-1.65	>20	0.02-0.06	3.6-5.0	<2	Low----------	0.10		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
28---------------- Pocaty	0-12	---	0.05-0.20	2.0-6.0	0.15-0.20	4.5-7.3	2-16	Low----------	----	---	30-90
	12-20	---	0.10-0.35	0.6-2.0	0.20-0.25	4.5-7.3	2-16	Low----------	----		
	20-60	---	0.20-0.55	0.6-2.0	0.20-0.30	4.5-7.3	2-16	Low----------	----		
	60-80	5-50	1.30-1.60	0.06-0.2	0.06-0.18	4.5-7.3	<2	Low----------	0.02		
29---------------- Portsmouth	0-13	5-25	1.30-1.40	0.6-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	4-8
	13-36	20-35	1.45-1.55	0.6-2.0	0.14-0.20	3.6-5.5	<2	Low----------	0.28		
	36-60	2-10	1.40-1.65	2.0-20	0.02-0.05	3.6-5.5	<2	Low----------	0.17		
30. Psamments											
31*: Psamments.											
Urban land.											
32---------------- Rappahannock	0-11	---	0.10-0.60	0.6-2.0	0.22-0.26	6.6-7.8	>16	Low----------	----	---	20-65
	11-37	---	0.10-1.00	0.6-2.0	0.22-0.26	6.6-7.8	>16	Low----------	----		
	37-51	---	---	---	---	---	---	-------------	----		
33E--------------- Rumford	0-10	6-15	1.25-1.45	2.0-6.0	0.08-0.14	3.6-5.5	<2	Low----------	0.24	4	.5-2
	10-41	8-18	1.25-1.45	2.0-6.0	0.10-0.15	3.6-5.5	<2	Low----------	0.17		
	41-72	2-18	1.25-1.50	>2.0	0.04-0.10	3.6-5.5	<2	Low----------	0.17		
34A, 34B---------- State	0-11	10-18	1.20-1.35	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low----------	0.38	5	<2
	11-56	18-34	1.35-1.50	0.6-2.0	0.14-0.19	4.5-5.5	<2	Low----------	0.28		
	56-64	2-15	1.35-1.50	2.0-20	0.02-0.10	4.5-6.0	<2	Low----------	0.17		
35*: State------------	0-11	10-18	1.20-1.35	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low----------	0.38	5	<2
	11-56	18-34	1.35-1.50	0.6-2.0	0.14-0.19	4.5-5.5	<2	Low----------	0.28		
	56-64	2-15	1.35-1.50	2.0-20	0.02-0.10	4.5-6.0	<2	Low----------	0.17		
Urban land.											
36---------------- Tetotum	0-10	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.37	4	.5-2
	10-58	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	58-70	5-30	1.25-1.45	2.0-20	0.06-0.15	3.6-5.5	<2	Low----------	0.32		
37*: Tetotum----------	0-10	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.37	4	.5-2
	10-58	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	58-70	5-30	1.25-1.45	2.0-20	0.06-0.15	3.6-5.5	<2	Low----------	0.32		
Urban land.											
38---------------- Tomotley	0-7	5-27	1.20-1.40	2.0-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	2-4
	7-45	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low----------	0.20		
	45-66	5-30	1.30-1.50	2.0-6.0	0.05-0.12	3.6-5.5	<2	Low----------	0.20		
39*: Tomotley---------	0-7	5-27	1.20-1.40	2.0-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	2-4
	7-45	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low----------	0.20		
	45-66	5-30	1.30-1.50	2.0-6.0	0.05-0.12	3.6-5.5	<2	Low----------	0.20		
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
43---------------- Yeopim	0-8	4-15	1.20-1.40	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.37	4	.5-2
	8-79	20-35	1.40-1.60	0.2-0.6	0.15-0.20	3.6-5.5	<2	Low----------	0.37		
	79-84	5-25	1.40-1.60	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.17		
44*:											
Yeopim-----------	0-8	4-15	1.20-1.40	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.37	4	.5-2
	8-79	20-35	1.40-1.60	0.2-0.6	0.15-0.20	3.6-5.5	<2	Low----------	0.37		
	79-84	5-25	1.40-1.60	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.17		
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
1 Acredale	D	None	---	---	0-1.0	Apparent	Dec-Apr	---	---	High	High.
2*:											
Acredale	D	None	---	---	0-1.0	Apparent	Dec-Apr	---	---	High	High.
Urban land.											
3 Augusta	C	None	---	---	1.0-1.5	Apparent	Jan-May	---	---	High	Moderate.
4*:											
Augusta	C	None	---	---	1.0-1.5	Apparent	Jan-May	---	---	High	Moderate.
Urban land.											
5 Backbay	D	Frequent	Very long	Jan-Dec	+1-0	Apparent	Jan-Dec	---	---	High	High.
6*. Beaches											
7 Bojac	B	None	---	---	4.0-6.0	Apparent	Nov-Apr	---	---	Low	High.
8 Chapanoke	C	None	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	High	High.
9*:											
Chapanoke	C	None	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	High	High.
Urban land.											
10 Corolla	D	None	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low	Low.
11*:											
Corolla	D	None	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low	Low.
Duckston	A	Frequent	Brief	Jan-Dec	0-1.0	Apparent	Jan-Dec	---	---	Low	Low.
12 Dorovan	D	Frequent	Very long	Jan-Dec	+1-0.5	Apparent	Jan-Dec	4-12	51-78	High	High.
13 Dragston	C	None	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	Low	High.
14*:											
Dragston	C	None	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	Low	High.
Urban land.											
15 Duckston	A	Frequent	Brief	Jan-Dec	0-1.0	Apparent	Jan-Dec	---	---	Low	Low.
16E Fripp	A	None	---	---	>6.0	---	---	---	---	Low	Low.
17 Hyde	D	None	---	---	0-0.5	Apparent	Dec-Apr	---	---	High	High.
18 Lakehurst Variant	A	None	---	---	1.5-3.0	Apparent	Nov-May	---	---	Low	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
19----------------- Munden	B	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	Low-------	High.
20*: Munden------------	B	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	Low-------	High.
Urban land.											
21----------------- Nawney	D	Frequent----	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	---	---	High------	High.
22E---------------- Newhan	A	None---------	---	---	>6.0	---	---	---	---	High------	Low.
23C*: Newhan------------	A	None---------	---	---	>6.0	---	---	---	---	High------	Low.
Corolla-----------	D	None---------	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low-------	Low.
24----------------- Nimmo	D	None---------	---	---	0-1.0	Apparent	Dec-Apr	---	---	Low-------	High.
25*: Nimmo-------------	D	None---------	---	---	0-1.0	Apparent	Dec-Apr	---	---	Low-------	High.
Urban land.											
26----------------- Pamlico	D	Rare---------	---	---	+2-0	Apparent	Dec-May	4-20	10-36	High------	High.
27*: Pamlico-----------	D	Rare---------	---	---	+2-0	Apparent	Dec-May	4-20	10-36	High------	High.
Lakehurst Variant	A	None---------	---	---	1.5-3.0	Apparent	Nov-May	---	---	Low-------	High.
28----------------- Pocaty	D	Frequent----	Very long	Jan-Dec	+1-1.0	Apparent	Jan-Dec	---	---	High------	High.
29----------------- Portsmouth	D	None---------	---	---	0-0.5	Apparent	Dec-Apr	---	---	High------	High.
30. Psamments											
31*: Psamments.											
Urban land.											
32----------------- Rappahannock	D	Frequent----	Very brief	Jan-Dec	+2-0.5	Apparent	Jan-Dec	---	---	High------	High.
33E---------------- Rumford	B	None---------	---	---	>6.0	---	---	---	---	Low-------	High.
34A, 34B----------- State	B	None---------	---	---	4.0-6.0	Apparent	Dec-Jun	---	---	Moderate	High.
35*: State-------------	B	None---------	---	---	4.0-6.0	Apparent	Dec-Jun	---	---	Moderate	High.
Urban land.											
36----------------- Tetotum	C	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	High------	High.
37*: Tetotum-----------	C	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	High------	High.
Urban land.											

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
38----------------- Tomotley	D	None---------	---	---	0-1.0	Apparent	Dec-Mar	---	---	High------	High.
39*: Tomotley----------	D	None---------	---	---	0-1.0	Apparent	Dec-Mar	---	---	High------	High.
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											
43----------------- Yeopim	B	None---------	---	---	1.5-2.5	Apparent	Nov-Mar	---	---	Moderate	High.
44*: Yeopim------------	B	None---------	---	---	1.5-2.5	Apparent	Nov-Mar	---	---	Moderate	High.
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Acredale	Fine-silty, mixed, thermic Typic Ochraqualfs
Augusta	Fine-loamy, mixed, thermic Aeric Ochraquults
Backbay	Fine-loamy, mixed, nonacid, thermic Histic Humaquepts
Bojac	Coarse-loamy, mixed, thermic Typic Hapludults
Chapanoke	Fine-silty, mixed thermic Aeric Ochraquults
Corolla	Thermic, uncoated Aquic Quartzipsamments
*Dorovan	Dysic, thermic Typic Medisaprists
Dragston	Coarse-loamy, mixed, thermic Aeric Ochraquults
Duckston	Siliceous, thermic Typic Psammaquents
*Fripp	Thermic, uncoated Typic Quartzipsamments
*Hyde	Fine-silty, mixed, thermic Typic Umbraquults
Lakehurst Variant	Thermic, uncoated Haplaquodic Quartzipsamments
Munden	Coarse-loamy, mixed, thermic Aquic Hapludults
Nawney	Fine-loamy, mixed, acid, thermic Typic Fluvaquents
Newhan	Thermic, uncoated Typic Quartzipsamments
Nimmo	Coarse-loamy, mixed, thermic Typic Ochraquults
Pamlico	Sandy or sandy-skeletal, siliceous, dysic, thermic Terric Medisaprists
Pocaty	Euic, thermic Typic Sulfihemists
Portsmouth	Fine-loamy over sandy or sandy-skeletal, mixed, thermic Typic Umbraquults
Psamments	Psamments
*Rappahannock	Loamy, mixed, euic, thermic Terric Sulfihemists
*Rumford	Coarse-loamy, siliceous, thermic Typic Hapludults
State	Fine-loamy, mixed, thermic Typic Hapludults
Tetotum	Fine-loamy, mixed, thermic Aquic Hapludults
Tomotley	Fine-loamy, mixed, thermic Typic Ochraquults
Udorthents	Udorthents
Yeopim	Fine-silty, mixed, thermic Aquic Hapludults

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SMR CAMP PENDLETON
COMPREHENSIVE STORMWATER MANAGEMENT PLAN
VIRGINIA BEACH, VA

OWNER
VDMA
FT PICKETT
BUILDING 316
BLACKSTONE, VIRGINIA 23824
ATTN: MR MATT THOMPSON
PHONE: (434) 298-6402

BASE TOPOGRAPHY
DATUM INFORMATION
HORIZONTAL: STATE PLANE SOUTH
VERTICAL: NAVD 88, FT
TOPO PROVIDED BY CITY OF VIRGINIA BEACH

ENGINEER
STANTEC CONSULTING SERVICES INC.
5209 CENTER STREET
WILLIAMSBURG, VIRGINIA 23188
PHONE: (757) 220-6869
FAX: (757) 229-4507
ATTN: CHRISTY S. HILL, P.E.

STATISTICAL DATA
TOTAL PROPERTY AREA:	343.6 ACRES
TOTAL PLANNING AREA: (EXCLUDES LAKE CHRISTINE AND VIRGINIA AQUARIUM)	280.7 ACRES

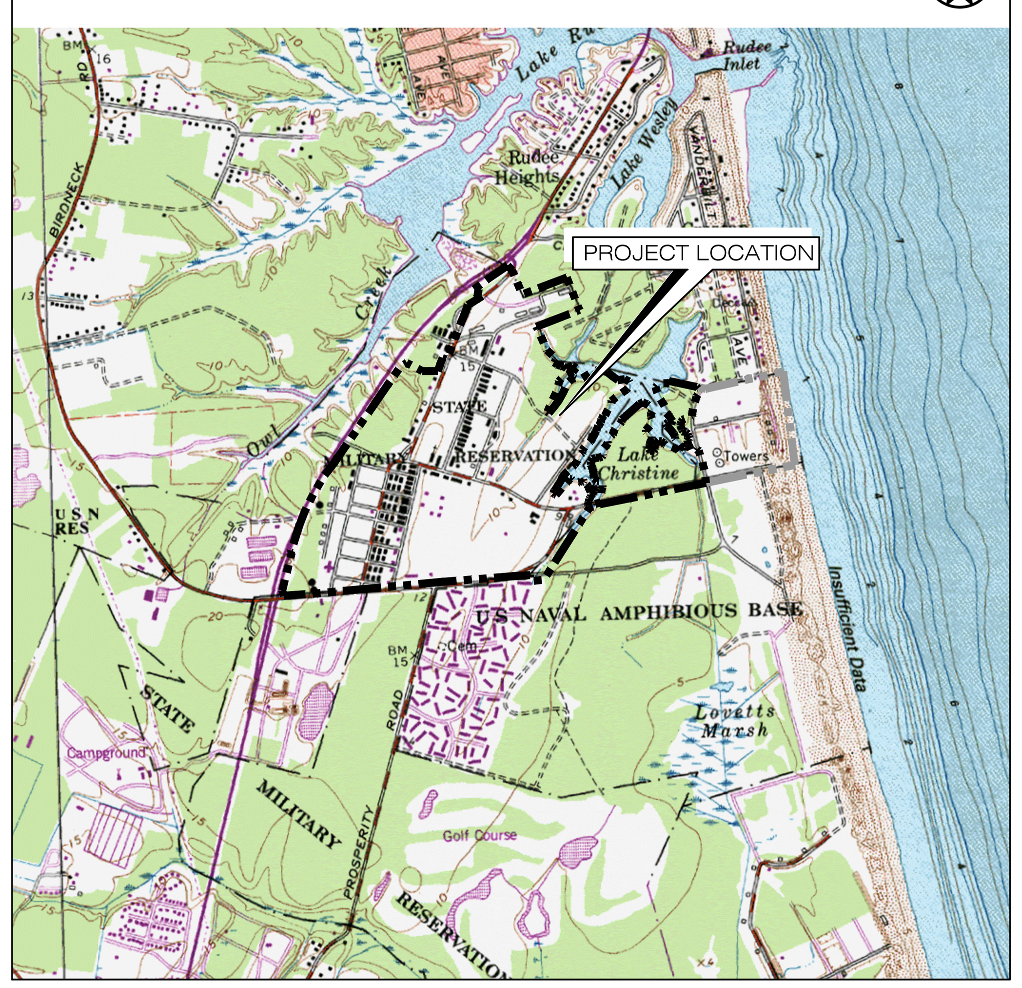
PROJECT NARRATIVE
STANTEC HAS WORKED WITH THE VIRGINIA DEPARTMENT OF MILITARY AFFAIRS (VDMA) TO DEVELOP A COMPREHENSIVE STORMWATER MANAGEMENT (SWM) PLAN IN COMPLIANCE WITH VIRGINIA REGULATIONS (9VAC25-870-92) TO ADDRESS STORMWATER QUALITY AND QUANTITY REQUIREMENTS FOR FUTURE DEVELOPMENT AT SMR CAMP PENDLETON, LOCATED IN VIRGINIA BEACH, VIRGINIA. THIS STORMWATER MANAGEMENT PLAN IS BASED ON FUTURE DEVELOPMENT PLANS AS DEPICTED IN THE "VDMA CAMP PENDLETON REAL PROPERTY MASTER PLAN" DOCUMENT, PREPARED FOR THE VDMA AND DATED JUNE 2013. THIS DOCUMENT OUTLINES FUTURE PLANNING EFFORTS AT SMR CAMP PENDLETON FOR APPROXIMATELY THE NEXT 25 YEARS.

SMR CAMP PENDLETON IS APPROXIMATELY 343.6 ACRES. HOWEVER, PORTIONS OF THE SITE HAVE LAND USE AGREEMENTS OR ARE LEASED TO OTHER ENTITIES INCLUDING THE CITY OF VIRGINIA BEACH, THE VIRGINIA AIR NATIONAL GUARD, THE ARMY, THE FBI, COMMONWEALTH CHALLENGE, NAS OCEANA DAM NECK ANNEX, AND THE US NAVY. THE COMPREHENSIVE SWM PLAN IS BASED ON A PLANNING AREA THAT EXCLUDES LAKE CHRISTINE AS WELL AS THE VIRGINIA AQUARIUM AND MARINE SCIENCE CENTER AREA. THE PLANNING AREA USED FOR STORMWATER COMPLIANCE CALCULATIONS IS APPROXIMATELY 280.7 ACRES.

STORMWATER RUNOFF FROM SMR CAMP PENDLETON ULTIMATELY DISCHARGES INTO THE ATLANTIC OCEAN (HUC CODE AO23); HOWEVER, AT A SUB-WATERSHED SCALE, THE SITE DISCHARGES TO LAKE CHRISTINE ALONG THE NORTHERN BORDER AND OWL CREEK AND RUDEE INLET ALONG THE WESTERN BORDER. SMALL AREAS ALONG THE EASTERN BORDER DISCHARGE DIRECTLY TO THE ATLANTIC OCEAN. THERE ARE SEVERAL EXISTING STORMWATER BEST MANAGEMENT PRACTICES (BMPs) ONSITE; HOWEVER, IT IS NOT THE INTENT OF THIS SWM PLAN TO UTILIZE LAKE CHRISTINE AS A STORMWATER BMP FOR FUTURE DEVELOPMENT.

SHEET INDEX

VICINITY MAP: 1" = 2000'



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0 600 1200
SCALE (FEET)

DATE: 8/30/16
FIRST SUBMITTAL

REVISIONS:

DATE	COMMENTS	DATE	
2/14/17	REVISED PER DEQ COMMENTS		

NOTE: AS A COMPREHENSIVE STORMWATER MANAGEMENT PLAN, THIS SUBMITTAL WILL NOT REQUIRE A CONSTRUCTION GENERAL PERMIT ISSUANCE AFTER PLAN APPROVAL. HOWEVER, EACH INDIVIDUAL PROJECT DESIGNED FOR CONSTRUCTION WILL REQUIRE DEQ REVIEW AND APPROVAL AND BE SUBJECT TO THE APPROVED COMPREHENSIVE STORMWATER MANAGEMENT PLAN, THE VIRGINIA STORMWATER MANAGEMENT PROGRAM LAWS AND REGULATIONS, THE GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM CONSTRUCTION ACTIVITIES, THE VIRGINIA EROSION AND SEDIMENT CONTROL LAWS AND REGULATIONS, AND POTENTIALLY OTHER ENVIRONMENTAL PERMITTING NEEDS REGULATED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY.

NOTE: EROSION AND SEDIMENT CONTROL WILL BE ASSESSED AS PROJECTS ARE FUNDED AND INDIVIDUAL CONSTRUCTION PLANS ARE SUBMITTED TO DEQ FOR REVIEW AND APPROVAL.

COMMONWEALTH OF VIRGINIA
CHRISTY S. HILL
Lic. No. 50755
PROFESSIONAL ENGINEER

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Williamsburg, VA 23188
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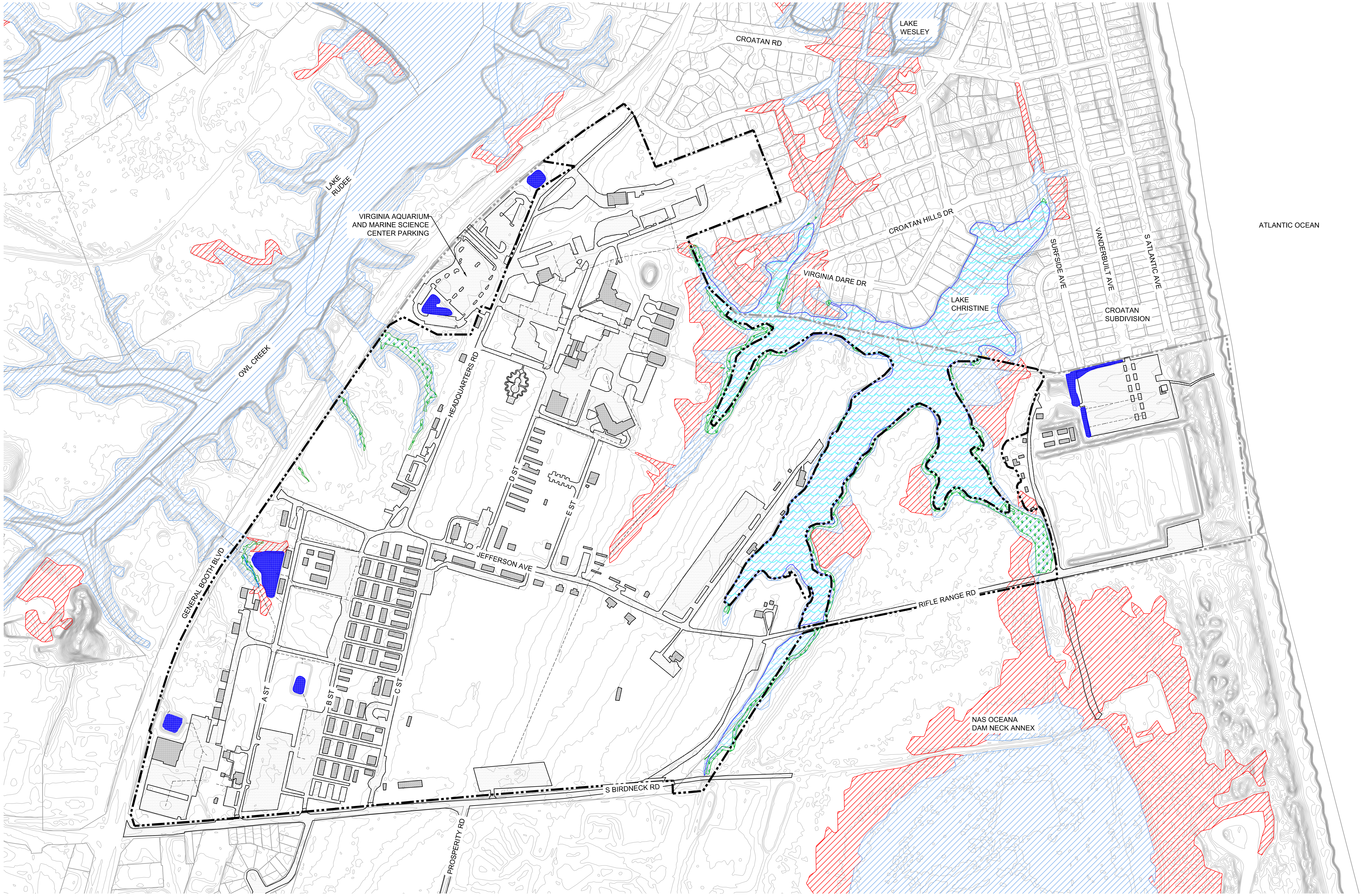
FOR:
SMR CAMP PENDLETON
COMPREHENSIVE SWM PLAN
VIRGINIA BEACH, VIRGINIA

TITLE:
COVER SHEET

DRAWN BY: SMS	DESIGNED BY: KAH/CSH
CHECKED BY: CSH	APPROVED BY: CSH/DAP
PROJECT NUMBER: 203400616	SCALE: N/A
DATE: 8/30/16	FILE PATH: U:/203400616

SHEET:
1



LEGEND:

- STUDY AREA LIMITS
- PROJECT LIMITS
- APPROXIMATE OPEN WATER
- APPROXIMATE WETLANDS
- 100 YEAR FEMA FLOOD LINE
- 500 YEAR FEMA FLOOD LINE
- EXISTING BMP
- EXISTING STORM SEWER
- EXISTING PAVEMENT
- EXISTING BUILDING
- PARCEL LINE

N

0 300 600
SCALE (FEET)

COMMONWEALTH OF VIRGINIA
Christy S Hill
CHRISTY S. HILL
Lic. No. 50755
2/14/17
PROFESSIONAL ENGINEER

PREPARED BY:

Stantec
5209 Center Street
Williamsburg, VA 23188
PHONE: (757) 220-6869 FAX: (757) 229-4507

FOR:

SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:

EXISTING CONDITIONS

DRAWN BY: SMS	DESIGNED BY: CSH
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PROJECT NUMBER: 203400616	SCALE: AS SHOWN
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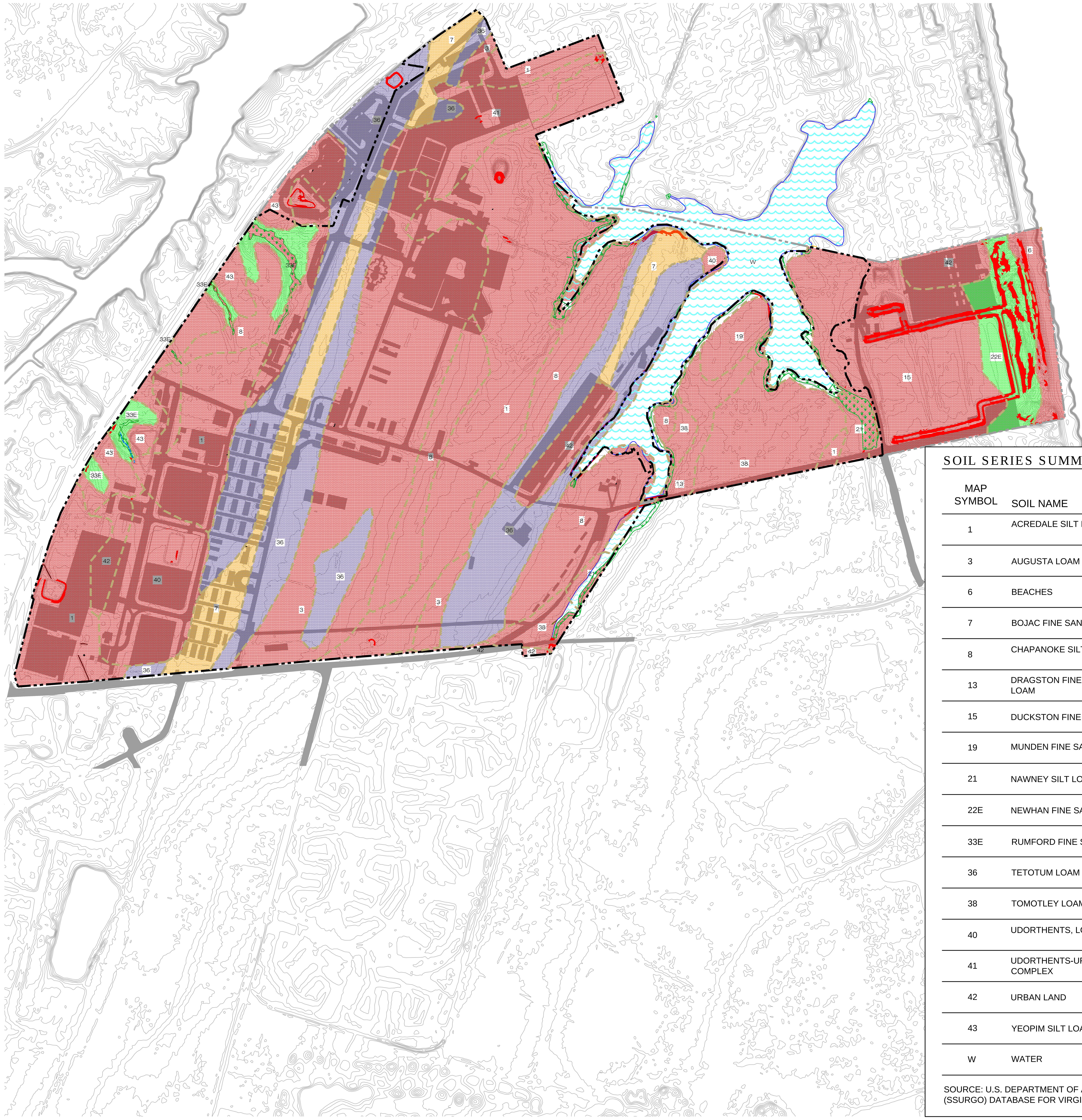
SHEET:

2 OF 8



LEGEND:

- STUDY AREA LIMITS
- PROJECT LIMITS
- APPROXIMATE OPEN WATER
- APPROXIMATE WETLANDS
- SOIL MAP UNIT (4D2)
- GOOD LID SUITABILITY
- MODERATE LID SUITABILITY (WATER TABLE 4.0-6.0 FEET)
- POOR LID SUITABILITY (WATER TABLE 1.5-2.5 FEET)
- POOR LID SUITABILITY
- UNSUITABLE FOR LID (20%+ SLOPES)

LID SUITABILITY CRITERIA

LID SUITABILITY	SOIL SLOPES %	DEPTH TO WATER TABLE (FT)	DEPTH TO BEDROCK (FT)	PERMEABILITY (IN/HR)
SUITABLE	<20	>5	>5	>0.6
MODERATELY	<20	>5	>4	<0.6
NOT SUITABLE	>20	<5	<5	<0.6

* ADDITIONAL AREAS THROUGHOUT THE ENTIRE PROJECT SITE MAY BE FEASIBLE FOR LID BASED ON MORE DETAILED SOILS ANALYSIS TO BE COMPLETED IN FUTURE PHASES

SOIL SERIES SUMMARY

MAP SYMBOL	SOIL NAME	SLOPE (%)	DRAINAGE	SOIL PROFILE DEPTHS	WATER TABLE/ FLOODING FREQUENCY	HYDRIC	(Ksat) IN/HR	HYDROLOGIC SOIL GROUP	DEPTH TO BEDROCK
1	ACREDALE SILT LOAM	0-2	POORLY	DEEP	0-1 FEET/ NONE	Y	0.06-0.20	D	>5 FEET
3	AUGUSTA LOAM	0-2	SOMEWHAT POORLY	DEEP	1-1.5 FEET/ NONE	N	0.57-1.98	D	>5 FEET
6	BEACHES	N/A	N/A	DEEP	N/A/ NONE	N	N/A	--	N/A
7	BOJAC FINE SANDY LOAM	0-2	WELL	DEEP	4-6 FEET/ NONE	N	1.98-5.95	A	>5 FEET
8	CHAPANOKE SILT LOAM	0-2	SOMEWHAT POORLY	DEEP	1-1.5 FEET/ NONE	N	0.20-1.98	D	>5 FEET
13	DRAGSTON FINE SANDY LOAM	0-2	SOMEWHAT POORLY	DEEP	1-1.5 FEET/ NONE	N	1.98-5.95	D	>5 FEET
15	DUCKSTON FINE SAND	0-2	POORLY	DEEP	0-1 FEET/ FREQUENT	Y	19.98	D	>5 FEET
19	MUNDEN FINE SANDY LOAM	0-2	MODERATELY WELL	DEEP	1-1.5 FEET/ NONE	N	1.98-5.95	B	>5 FEET
21	NAWNEY SILT LOAM	0-1	VERY POORLY	DEEP	0-0.5 FEET/ FREQUENT	Y	0.06-1.98	D	>5 FEET
22E	NEWHAN FINE SAND	2-30	EXCESSIVELY	DEEP	>5 FEET/ NONE	N	19.98	A	>5 FEET
33E	RUMFORD FINE SANDY LOAM	6-35	WELL	DEEP	>5 FEET/ NONE	N	1.98-5.95	A	>5 FEET
36	TETOTUM LOAM	0-2	MODERATELY WELL	DEEP	1.5-2.5 FEET/ NONE	N	0.57-1.98	C	>5 FEET
38	TOMOTLEY LOAM	0-2	POORLY	DEEP	0-1 FEET/ NONE	Y	0.57-1.98	C	>5 FEET
40	UDORTHENTS, LOMY	0-25	N/A	DEEP	>5 FEET/ NONE	N	N/A	--	>5 FEET
41	UDORTHENTS-URBAN LAND COMPLEX	0-2	N/A	DEEP	N/A/ NONE	N	N/A	--	0 FEET
42	URBAN LAND	0-2	N/A	DEEP	N/A/ NONE	N	0.00	--	0 FEET
43	YEOPIM SILT LOAM	0-2	WELL - MODERATELY WELL	DEEP	1.5-2.5 FEET/ NONE	N	0.20-0.57	C	>5 FEET
W	WATER	N/A	MODERATELY WELL	DEEP	N/A/ NONE	N	N/A	--	N/A

SOURCE: U.S. DEPARTMENT OF AGRICULTURE, NATURAL RESOURCE CONSERVATION SERVICE SOIL SURVEY GEOGRAPHIC (SSURGO) DATABASE FOR VIRGINIA BEACH, VIRGINIA

N

0 500 100

SCALE (FEET)

COMMONWEALTH OF VIRGINIA
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CHRISTY S. HILL
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PROFESSIONAL ENGINEER

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FOR:

SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:

INFILTRATION PRACTICE SUITABILITY

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
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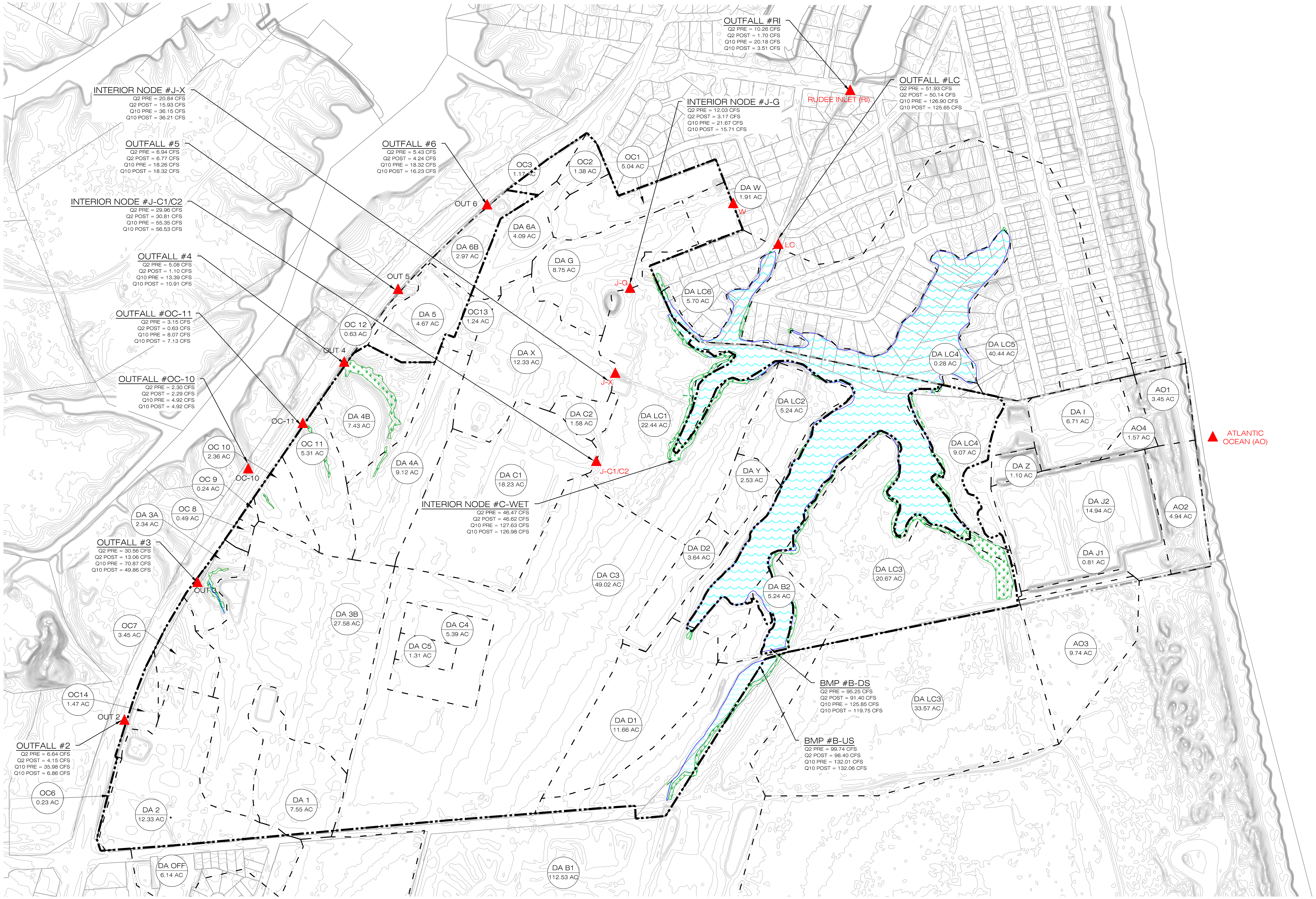


LEGEND:

STUDY AREA LIMITS

PROJECT LIMITS

APPROXIMATE OPEN WATER

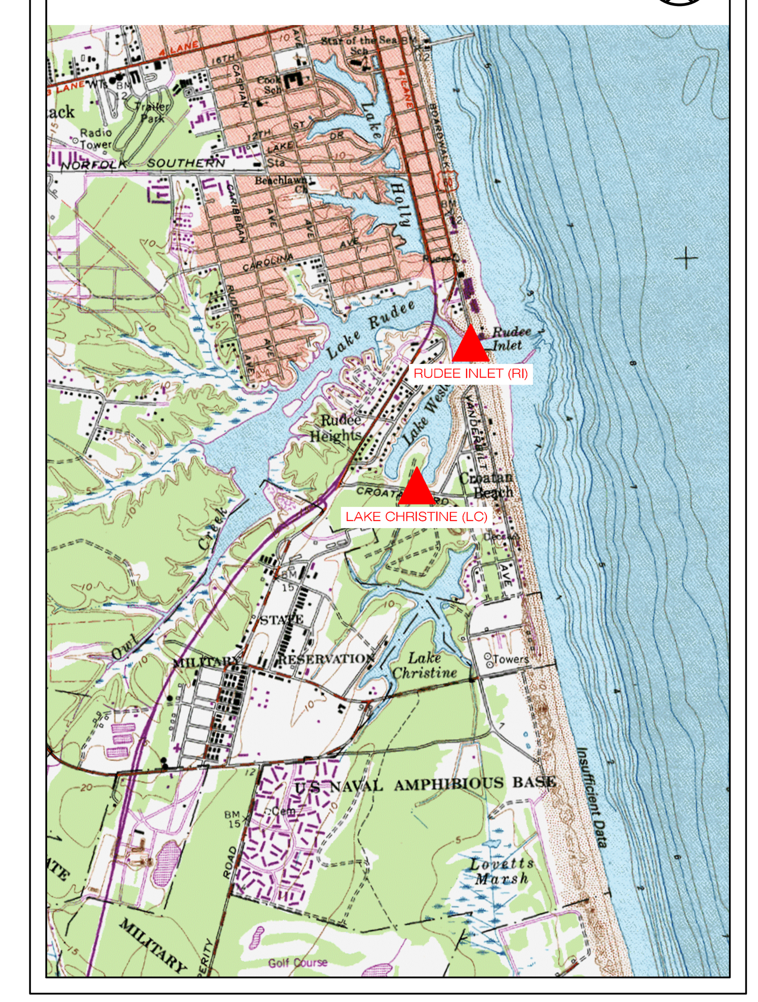
APPROXIMATE WETLANDS

POST DRAINAGE AREAS

OC 12 0.63 AC — POST DRAINAGE AREA LABELS

OUT 5 — OUTFALL LABELS

INSET: 1" = 2500'



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SCALE (FEET)

COMMONWEALTH OF VIRGINIA
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FOR:

SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:

WATERSHED SUMMARY (1)

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
PROJECT NUMBER: 203400616	SCALE: AS SHOWN
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SHEET:

4 OF 8

CURVE NUMBER SUMMARY

DA	AREA (AC)	PRE CN	Tc (hrs)	DA	AREA (AC)	POST CN	Tc (hrs)
*AO1	3.453	63.73	0.083	*AO1	3.451	63.71	0.083
*AO2	4.942	58.32	0.083	*AO2	4.942	58.33	0.083
*AO3	9.74	78.73	0.588	*AO3	9.740	77.70	0.588
*AO4	1.57	59.09	0.083	*AO4	1.571	59.11	0.083
B1	112.533	87.24	0.928	B1	112.529	86.84	0.928
B2	5.244	84.79	0.693	B2	5.244	84.61	0.693
C1	18.232	83.17	0.342	C1	18.232	83.35	0.342
C2	1.198	90.31	0.083	C2	1.575	93.61	0.083
C3	55.718	80.59	0.695	C3	49.023	80.76	0.695
C4	*included in DA-C3*			C4	5.389	78.39	0.083
C5	*included in DA-C3*			C5	1.304	83.25	0.083
D1	11.665	77.95	0.852	D1	11.662	78.25	0.582
D2	3.634	95.91	0.083	D2	3.634	95.91	0.083
G	4.982	85.13	0.333	G	8.748	87.23	0.224
*I	6.71	92.16	0.083	*I	6.711	92.12	0.083
*J1	0.813	87.59	0.083	*J1	0.813	87.59	0.083
*J2	14.938	73.87	0.421	*J2	14.938	73.92	0.421
LC	34.235	93.18	0.083	LC	34.237	93.25	0.083
LC1	22.596	78.54	0.541	LC1	22.439	77.90	0.541
LC2	5.235	54.92	0.194	LC2	5.234	54.87	0.194
LC3	54.247	76.36	0.788	LC3	54.246	76.35	0.788
LC4	9.347	79.34	0.288	LC4	9.347	79.11	0.288
LC5	40.441	86.65	0.162	LC5	40.441	86.65	0.162
LC6	5.702	89.56	0.296	LC6	5.701	89.56	0.296
OC1	5.039	81.11	0.462	OC1	5.040	87.17	0.274
OC2	1.377	67.16	0.083	OC2	1.378	77.81	0.083
OC3	1.175	42.91	0.083	OC3	1.175	45.72	0.083
OC6	0.226	80.00	0.083	OC6	0.226	80.00	0.083
OC7	5.584	76.03	0.688	OC7	3.454	70.85	0.688
OC8	0.488	76.20	0.083	OC8	0.488	76.19	0.083
OC9	0.241	77.05	0.083	OC9	0.241	76.78	0.083
OC10	2.365	74.57	0.631	OC10	2.365	74.56	0.631
OC11	5.306	71.73	0.338	OC11	5.306	72.37	0.338
OC12	0.628	74.76	0.083	OC12	0.628	75.01	0.083
OC13	1.237	77.90	0.083	OC13	1.238	84.56	0.083
OC14	1.502	77.00	0.607	OC14	1.465	77.18	0.607
V	2.169	85.44	0.367	V	*included in DA-G*		
W	3.507	79.95	0.677	W	1.907	77.31	0.677
X	12.555	88.11	0.456	X	12.333	89.13	0.456
Y	2.526	66.84	0.205	Y	2.526	66.84	0.205
*Z	1.096	82.14	0.241	*Z	1.096	80.13	0.241
1	7.549	77.65	0.365	1	7.547	75.39	0.365
2A	15.805	86.67	0.442	2A	18.474	87.73	0.442
3A	17.329	79.02	0.413	3A	2.339	50.50	0.457
3B	13.088	83.32	0.327	3B	27.579	85.24	0.327
4A	9.124	72.06	0.513	4A	9.123	73.53	0.513
4B	7.431	56.38	0.689	4B	7.431	57.23	0.689
5	4.67	91.17	0.083	5	4.671	90.26	0.083
6A	4.086	75.61	0.230	6A	4.085	83.40	0.230
6B	2.966	84.38	0.083	6B	2.966	84.42	0.083

*NOT INCLUDED IN THE PLANNING AREA, SO EXISTING CONDITIONS MODELED PRE AND POST.
**SEE APPENDIX A OF THE COMPREHENSIVE SWM REPORT FOR ADDITIONAL DETAILS/INPUTS.

NODE SUMMARY

NODE	Existing Routed Peak Discharge (cfs)			Proposed Routed Peak Discharge (cfs)			Percent Difference		
ID	1-YR	2-YR	10-YR	1-YR	2-YR	10-YR	1-YR	2-YR	10-YR
LC	31.01	51.93	126.90	29.81	50.14	125.65	-3.9%	-3.4%	-1.0%
RI	7.02	10.26	20.18	1.13	1.70	3.51	-83.9%	-83.4%	-82.6%
OC-10	1.48	2.30	4.92	1.48	2.29	4.92	0.0%	-0.4%	0.0%
OC-11	1.72	3.15	8.07	0.25	0.63	7.13	-85.5%	-80.0%	-11.6%
OUT-2	4.94	6.64	35.98	3.13	4.15	6.86	-36.6%	-37.5%	-80.9%
OUT-3	17.52	30.56	70.87	6.60	13.06	49.86	-62.3%	-57.3%	-29.6%
OUT-4	2.75	5.08	13.39	0.29	1.10	10.91	-89.5%	-78.3%	-18.5%
OUT-5	3.59	6.94	18.26	3.39	6.77	18.32	-5.6%	-2.4%	0.3%
OUT-6	2.11	5.43	18.32	1.42	4.24	16.23	-32.7%	-21.9%	-11.4%
J-C1/C2*	21.41	29.96	55.35	22.13	30.81	56.53	3.4%	2.8%	2.1%
J-G	8.74	12.03	21.67	0.62	3.17	15.71	-92.9%	-73.6%	-27.5%
J-X*	15.53	20.84	36.15	15.93	21.18	36.21	2.6%	1.6%	0.2%

*Discharges into proposed restored stormwater conveyance system to handle flow increases and convey into Lake Christine (Node LC), where compliance is achieved.

BMP	Ex. Water Surface Elevation (ft)			Pr. Water Surface Elevation (ft)			Percent Difference		
ID	1-YR	2-YR	10-YR	1-YR	2-YR	10-YR	1-YR	2-YR	10-YR
LC	4.98	5.27	6.07	4.95	5.25	6.06	-0.6%	-0.4%	-0.2%
BMP-B-US	5.15	5.60	6.68	5.14	5.58	6.65	-0.2%	-0.4%	-0.4%
BMP-B-DS	4.98	5.28	6.08	4.96	5.25	6.07	-0.4%	-0.6%	-0.2%
C-WET	6.22	6.80	7.33	6.23	6.81	7.33	0.2%	0.1%	0.0%
BMP-I	7.24	7.37	7.65	7.24	7.37	7.65	0.0%	0.0%	0.0%
BMP-1	9.36	9.66	10.67	9.28	9.55	10.54	-0.9%	-1.1%	-1.2%
BMP-2	7.70	8.83	9.89	5.82	6.42	8.18	-24.4%	-27.3%	-17.3%
BMP-3	6.41	6.82	7.86	6.69	7.41	8.84	4.4%	8.7%	12.5%
BMP-5	8.48	8.77	9.44	8.44	8.73	9.42	-0.5%	-0.5%	-0.2%
BMP-6	10.33	10.75	11.57	10.20	10.62	11.52	-1.3%	-1.2%	-0.4%
SA-4	3.1	3.42	4.22	4.12	4.55	4.97	32.9%	33.0%	17.8%
SA-11	5.32	5.57	6.19	6.09	6.53	6.84	14.5%	17.2%	10.5%
BMP-G	-	-	-	8.37	8.59	9.54	-	-	-

*THE INCREASE AT THE OUTFALL OF BMP-3 REFLECTS THE FORCED DRAINAGE CONDITIONS; HOWEVER, COMPLIANCE IS ACHIEVED AT OUT-3.
**SEE APPENDIX B OF THE COMPREHENSIVE SWM REPORT FOR ADDITIONAL DETAILS OR INPUTS. SEE APPENDIX C AND E FOR SUMMARY COMPARISONS.

1 YEAR ENERGY BALANCE

Outfall Number	Outfall Channel Character	Storm Event	I.F.	Storm Flow Summary: Existing Peak (CFS)	Proposed Peak (CFS)	Change in Flow (%)	RV Pre	RV Post	Qallow. (cfs)	1-YR E.B. Required (Yes/No)	Attenuation (Yes/No)	qo/qi	Fig. 6-1 Vs/Vr	Storage Volume Required (Ac Ft)	QDEV	1-YR E.B. Achieved (Y/N)
LC	Manmade Channel to Tidal System	1	0.80	31.07	31.7	2.03	26.388	26.851	24.43	No	No					
OC-10	Natural Channel (No New Dev.)	1	0.80	1.48	1.48	0.00	0.246	0.246	1.18	No	No					
OC11	Manmade Channel to Tidal System	1	0.80	2.91	3.05	4.81	0.350	0.363	2.24	No	No					
OUT-2	Natural Channel to Non-Tidal System	1	0.80	19.56	23.75	21.42	2.403	2.908	12.93	Yes	No	0.54	0.26	0.76	3.13	Y
OUT-3	Manmade Channel to Tidal System	1	0.80	36.89	40.27	9.16	4.467	4.526	29.13	No	No					
OUT-4	Manmade Channel to Tidal System	1	0.80	4.58	5.12	11.79	0.751	0.821	3.35	No	No					
OUT-5	Manmade Channel to Tidal System	1	0.80	11.87	12.14	2.27	0.976	0.991	9.35	No	No					
OUT-6	Manmade Channel to Tidal System	1	0.80	7.58	9.38	23.75	0.719	0.885	4.93	No	No					
RI	Manmade Channel to Tidal System	1	0.80	7.02	1.13	-83.90	0.980	0.171	32.19	No	Yes					
J-G	Natural Channel to Lake Christine	1	0.80	8.74	21.78	149.20	0.953	2.140	3.11	Yes	No	0.14	0.51	1.09	0.62	Y
J-X	Natural Channel to Lake Christine	1	0.80	15.53	15.93	2.58	1.903	1.955	12.09	Yes	No	0.76	0.19	0.37	15.93	N
J-C1C2	Natural Channel to Lake Christine	1	0.80	21.41	22.13	3.36	2.407	2.528	16.31	Yes	No	0.74	0.20	0.50	22.13	N
BMP-1	Storm Sewer System to Natural Channel	1	0.80	5.99	5.21	-13.02	0.694	0.614	5.42	Yes	Yes	Proposed conditions re-routed through BMP-3, see Out-3 for compliance.				

NOTE: The storage volumes computed were initial design estimates. The volumes were refined and overall energy balance compliance achieved during final H&H routing.

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FOR:
SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:
WATERSHED SUMMARY (2)

COMMONWEALTH OF VIRGINIA
Christy S. Hill
CHRISTY S. HILL
Lic. No. 50755
2/14/17
PROFESSIONAL ENGINEER

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
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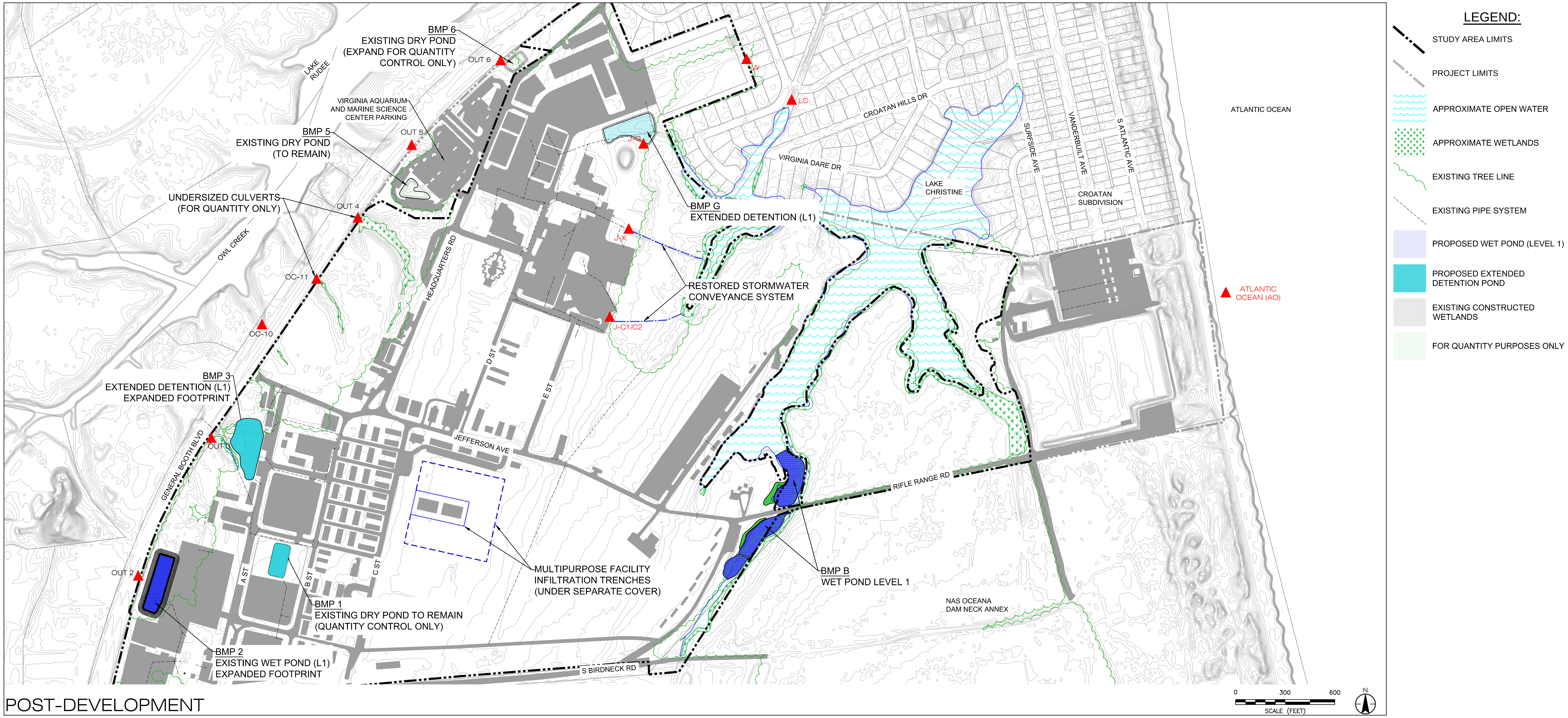

POST-DEVELOPMENT

Treatment Volume and Nutrient Load		
Pre-ReDevelopment Treatment Volume (acre-ft)	7.4580	7.3341
Pre-ReDevelopment Treatment Volume (cubic feet)	324,872	319,471
Pre-ReDevelopment TP Load (lb/yr)	204.12	200.72
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.73	0.74
Baseline TP Load (lb/yr) (0.41 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*111.38*

1ADJUSTED LAND COVER SUMMARY:
PRE REDEVELOPMENT LAND COVER MINUS PERVIOUS LAND COVER (FOREST/OPEN SPACE OR MANAGED TURF) ACREAGE PROPOSED FOR NEW IMPERVIOUS COVER.

ADJUSTED TOTAL ACREAGE IS CONSISTENT WITH POST-REDEVELOPMENT ACREAGE (MINUS ACREAGE OF NEW IMPERVIOUS COVER).

COLUMN I SHOWS LOAD REDUCTION REQURIEMENT FOR NEW IMPERVIOUS COVER (BASED ON NEW DEVELOPMENT LOAD LIMIT, 0.41 LBS/ACRE/YEAR).

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	8.0537
Final Post-Development Treatment Volume (cubic feet)	350,818
Final Post-Development TP Load (lb/yr)	220.42
Final Post-Development TP Load per acre (lb/acre/yr)	0.79

Post-ReDevelopment Treatment Volume (acre-ft)	7.3341
Post-ReDevelopment Treatment Volume (cubic feet)	319,471
Post-ReDevelopment Load (TP) (lb/yr)*	200.72
Post-ReDevelopment TP Load per acre (lb/acre/yr)	0.74
Max. Reduction Required (Below Pre-ReDevelopment Load)	20%

Post-Development Treatment Volume (acre-ft)	0.7196
Post-Development Treatment Volume (cubic feet)	31,347
Post-Development TP Load (lb/yr)	**19.70**

TP Load Reduction Required for Redeveloped Area (lb/yr)	40.14

TP Load Reduction Required for New Impervious Area (lb/yr)	**15.97**

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	7.81	3.08	8.38	62.90	82.17
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	9.26	0.00	37.56	97.21	144.03
Impervious Cover (acres)	3.93	0.00	9.69	40.92	54.54
					280.74

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	7.65	3.08	8.12	59.71	78.56
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	9.14		36.12	93.29	138.55
Impervious Cover (acres)	4.21		11.39	48.03	63.63
					280.74

VRRM REDEVELOPMENT CRITERIA		EXISTING CONDITIONS			PROPOSED CONDITIONS			FINAL CREDIT
FACILITY ID	**BMP Type (per VSWMH)**	**TP Removal Efficiency (%)**	**IIB Prop Loading (lb TP/yr)**	**TP Load Removed, Direct Drainage (lb TP/yr)**	**TP Removal Efficiency (%)**	**IIB Prop Loading (lb TP/yr)**	**TP Load Removed, Direct Drainage (lb TP/yr)**	**TP Load Removed, Direct Drainage (lb TP/yr)**
2	WET POND (L1)	45	22.32	10.04	*45*	*27.42*	12.34	2.30
3	ED POND (L1)	15	14.58	2.19	*15*	*44.11*	6.62	4.43
B	WET POND (L1)	-	-	-	*45*	*141.85*	63.83	63.83
G	ED POND (L1)	-	-	-	*15*	*17.4*	2.61	2.61
							TOTAL PROPOSED REMOVAL (lbs TP/yr):	**73.17**
							REQUIRED REMOVAL (lbs TP/yr):	**56.11**
							OVER / UNDER Treatment (lbs TP/yr):	**17.06**
							REQUIRED OFFSITE COMPLIANCE (lbs TP/yr):	**0.00**

COMMONWEALTH OF VIRGINIA
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FOR:
SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:
SWM PLAN

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
PROJECT NUMBER: 203400616	SCALE: AS SHOWN
DATE: 8/30/16	FILE PATH: U:\203400616

SHEET:
6 OF 8

Extended Detention Maintenance Schedule	
Task	Frequency
Do Not Mow (marsh or wetland vegetation within bed of basin)	Ongoing
Mow (embankment, banks, emergency spillway, and upland areas)	Minimum of twice per year to manage groundcover, prevent growth of woody vegetation, and allow for observations and inspections
Remove Trash and Debris (inlets, basin, and spillways)	Minimum of twice per year and as needed to maintain flow
Overseed, lime, and fertilize groundcover as required to maintain adequate stabilization	As needed in the fall according to the results of soil testing
Repair Erosion (embankment, banks, and auxiliary spillway)	Within 30 days of discovery during observations and inspections
Repair Rodent Burrows (embankment, banks, and auxiliary spillway)	Within 30 days of discovery during observations and inspections
Remove Sediment from forebay	As needed based upon observations and inspections; generally every 5 to 7 years or when 50% capacity has been reached
Remove Sediment and Replace Displaced Riprap in outlet protection	As needed based upon observations and inspections
Remove Sediment from main BMP	As needed based upon observations and inspections
Repair/Replace Spillway components as needed (corrosion of metal, cracking and spalling of concrete and plastic/PVC, dry rot in wood, etc.)	As needed based upon observations and inspections
Inspect low-flow orifice for clear pathway; de-clog if blocked	Twice per year recommended
Remove dead or dying shallow marsh vegetation and replace with species, size, and density specified in the design plan	As needed based upon observations and inspections

THE FOLLOWING INFORMATION SHOULD BE PRINTED ON THE APPROVED STORMWATER MANAGEMENT PLAN FOR STATE AND FEDERAL PROJECTS. MUCH OF THIS INFORMATION WAS PROVIDED IN A SEPARATE O&M PLAN, BUT DEQ REQUESTS THAT THE INFORMATION BE PRINTED ON THE PLAN SHEETS.

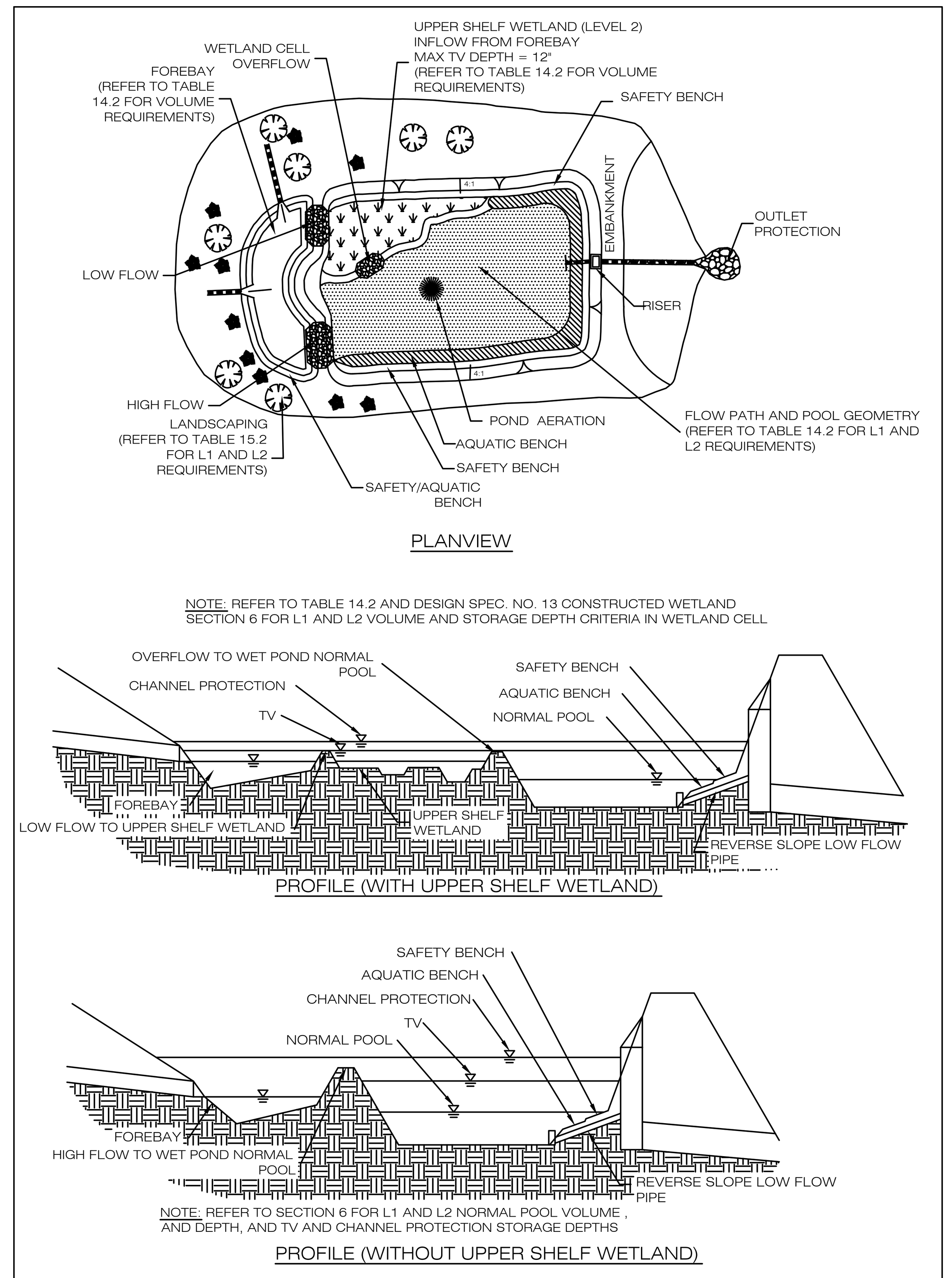
A. A DESCRIPTION OF THE REQUIREMENTS FOR INITIAL INSTALLATION AND LONG-TERM MAINTENANCE, MAINTENANCE INSPECTIONS, AND A RECOMMENDED SCHEDULE OF INSPECTIONS AND MAINTENANCE OF THE STORMWATER MANAGEMENT FACILITIES.

B. THE IDENTIFICATION OF A PERSON(S) OR POSITION(S) WHO WILL BE RESPONSIBLE FOR MAINTENANCE INSPECTION AND MAINTENANCE.

C. THE MAINTENANCE INSPECTION SCHEDULE AND MAINTENANCE REQUIREMENTS. THE SCHEDULE AND REQUIREMENTS SHOULD BE IN ACCORDANCE WITH THE VIRGINIA BMP CLEARINGHOUSE, THE VIRGINIA SWM HANDBOOK, THE MS4 PERMIT (IF APPLICABLE) AND/OR THE MANUFACTURER'S SPECIFICATIONS. WHEN SELECTING NON-PROPRIETARY BMPS, CLEARLY INDICATE WHICH VERSION OF THE BMP IS BEING INSTALLED (APPROVED 2011 OR DRAFT 2013 VERSION AND LEVEL 1 OR LEVEL 2 DESIGN).

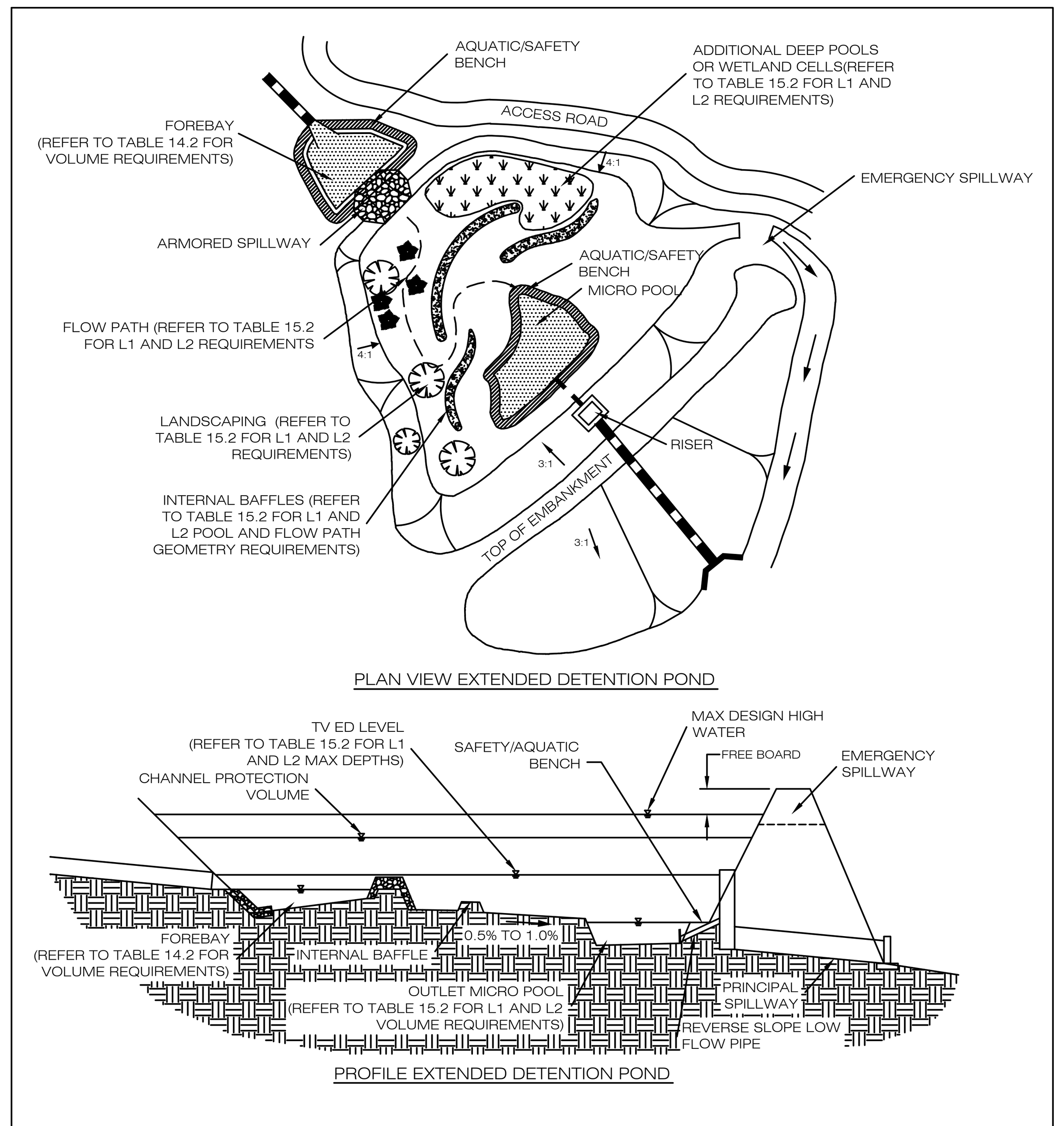
Constructed Wetlands Maintenance Schedule	
Task	Frequency
Do Not Mow (aquatic vegetation within wetland)	Ongoing
Mow (embankment, banks, emergency spillway, and upland areas)	Minimum of twice per year to manage groundcover, prevent growth of woody vegetation, and allow for observations and inspections
Remove Trash and Debris (inlets, basin, and spillways)	Minimum of twice per year and as needed to maintain flow
Overseed, lime, and fertilize groundcover as required to maintain adequate stabilization	As needed in the fall according to the results of soil testing
Repair Erosion (embankment, banks, and emergency spillway)	Within 30 days of discovery during observations and inspections
Repair Rodent Burrows (embankment, banks, and auxiliary spillway)	Within 30 days of discovery during observations and inspections
Remove Sediment from forebay	As needed based upon observations and inspections; generally every 5 to 7 years or when 50% capacity has been reached
Remove Sediment and Replace Displaced Riprap in outlet protection	As needed based upon observations and inspections
Remove Sediment from main BMP	As needed based upon observations and inspections
Repair/Replace Spillway components as needed (corrosion of metal, cracking and spalling of concrete and plastic/PVC, dry rot in wood, etc.)	As needed based upon observations and inspections
Inspect low-flow orifice for clear pathway; de-clog if blocked	Twice per year recommended
Remove dead or dying aquatic and shallow marsh vegetation and replace with species, size, and density specified in the design plan	As needed based upon observations and inspections
Remove Invasive Species (cattails, phragmites, etc.)	As needed and when coverage exceeds 15% of wetland cell
Thinning of Woody Growth within wetland cell	Approximately 5 and 10 years after initial installation to guide a forested wetland into a more mature state

WET POND MAINTENANCE SCHEDULE	
Task	Frequency
Do Not Mow (marsh or wetland vegetation within bed of basin)	Ongoing
Mow (embankment, banks, emergency spillway, and upland areas)	Minimum of twice per year to manage groundcover, prevent growth of woody vegetation, and allow for observations and inspections
Remove Trash and Debris (inlets, basin, and spillways)	Minimum of twice per year and as needed to maintain flow
Overseed, lime, and fertilize groundcover as required to maintain adequate stabilization	As needed in the fall according to the results of soil testing
Repair Erosion (embankment, banks, and auxiliary spillway)	Within 30 days of discovery during observations and inspections
Repair Rodent Burrows (embankment, banks, and auxiliary spillway)	Within 30 days of discovery during observations and inspections
Remove Sediment from forebay	As needed based upon observations and inspections; generally every 5 to 7 years or when 50% capacity has been reached
Remove Sediment and Replace Displaced Riprap in outlet protection	As needed based upon observations and inspections
Remove Sediment from main BMP	As needed based upon observations and inspections
Repair/Replace Spillway components as needed (corrosion of metal, cracking and spalling of concrete and plastic/PVC, dry rot in wood, etc.)	As needed based upon observations and inspections
Inspect low-flow orifice for clear pathway; de-clog if blocked	Twice per year recommended
Open Riser to access and test valves	Annually to prevent from seizing
Remove dead or dying aquatic and shallow marsh vegetation and replace with species, size, and density specified in the design plan	As needed based upon observations and inspections



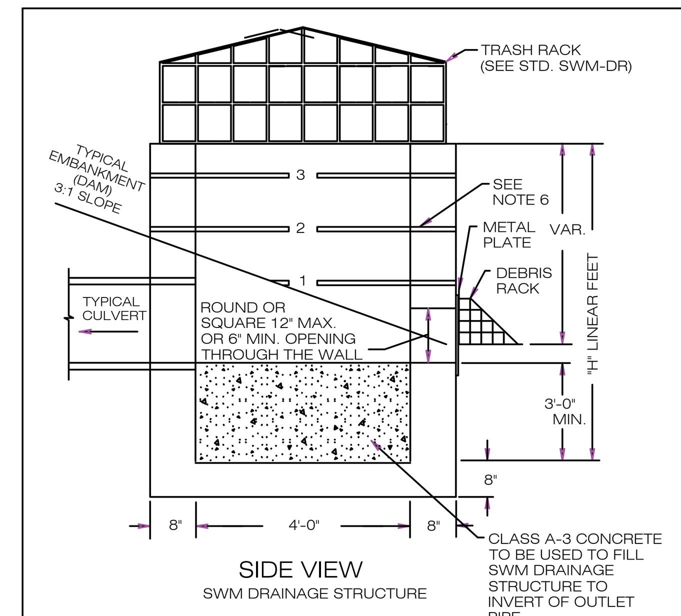
WET POND (TYP.)

NTS



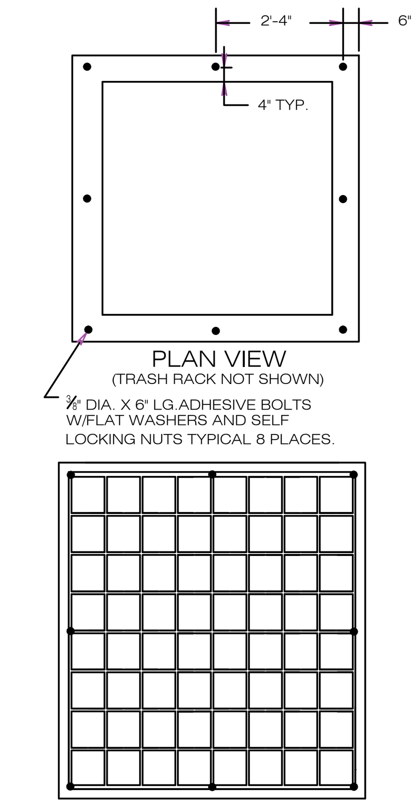
EXTENDED DETENTION POND (TYP.)

NTS



SIDE VIEW

SWM DRAINAGE STRUCTURE



APPROXIMATE QUANTITIES
CAST-IN-PLACE CLASS A-3 CONCRETE TO BE USED.
MAXIMUM DEPTH (H) TO BE 12'-8".

PIPE SIZE	12"	15"	18"	24"	30"	36"	42"
MINIMUM DEPTH H	5'-0"	5'-3 "	5'-6 "	6'-1"	6'-7 "	7'-2"	7'-8 "
CU. YDS. CONCRETE	2.665	2.773	2.878	3.078	3.624	3.437	3.598

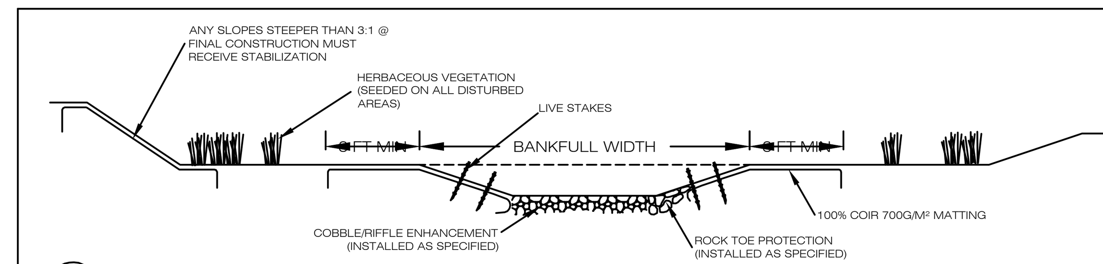
INCREMENT PER FOOT OF ADDITIONAL DEPTH "H" = 0.461 CU. YDS.

NOTES:

1. COST OF TRASH RACK AND DEBRIS RACK ARE TO BE INCLUDED IN THE BID PRICE FOR THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
2. STRUCTURE MAY BE PRECAST OR CAST IN PLACE. SEE SHEET 2 OF 2 FOR DETAILS ON PRECAST STRUCTURE.
3. WEEP HOLES SHALL NOT BE PROVIDED.
4. STEPS ARE TO BE PROVIDED WHEN HEIGHT OF STRUCTURE IS 4'-0" OR GREATER ABOVE INVERT OF OUTLET PIPE. FOR STEP DETAILS SEE STANDARD ST-1.
5. FOR DETAILS ON METAL PLATE, DEBRIS RACK AND TRASH RACK SEE STANDARD SWM-DR.
6. MARK HEIGHT OF STRUCTURE, IN BLACK, WITH 4" HIGH NUMERALS AND 1" WIDE HORIZONTAL STRIPES AT 1' INTERVALS FROM INVERT OF WATER QUALITY ORIFICE (ALL VISIBLE SIDES).
7. THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE, STANDARD SWM-1 MAY BE MODIFIED WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED AS A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION. SEE STANDARD SWM-DR, SHEET 1 OF 5, FOR TEMPORARY MODIFICATION DETAILS.
8. THE SIZE OF THE WATER QUALITY ORIFICE SHALL BE SPECIFIED ON THE PLANS. ADDITIONAL OPENINGS IN THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE TO BE PROVIDED WHEN SPECIFIED ON THE PLANS.

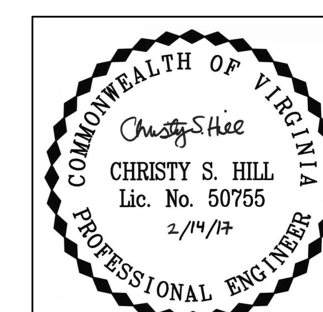
DETAIL: VDOT STORMWATER MANAGEMENT (SWM-1) RISER AND TRASH RACK

NTS



TYPICAL CHANNEL STABILIZATION DETAIL

NTS



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SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:

NOTES AND DETAILS

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
PROJECT NUMBER: 203400616	SCALE: AS SHOWN
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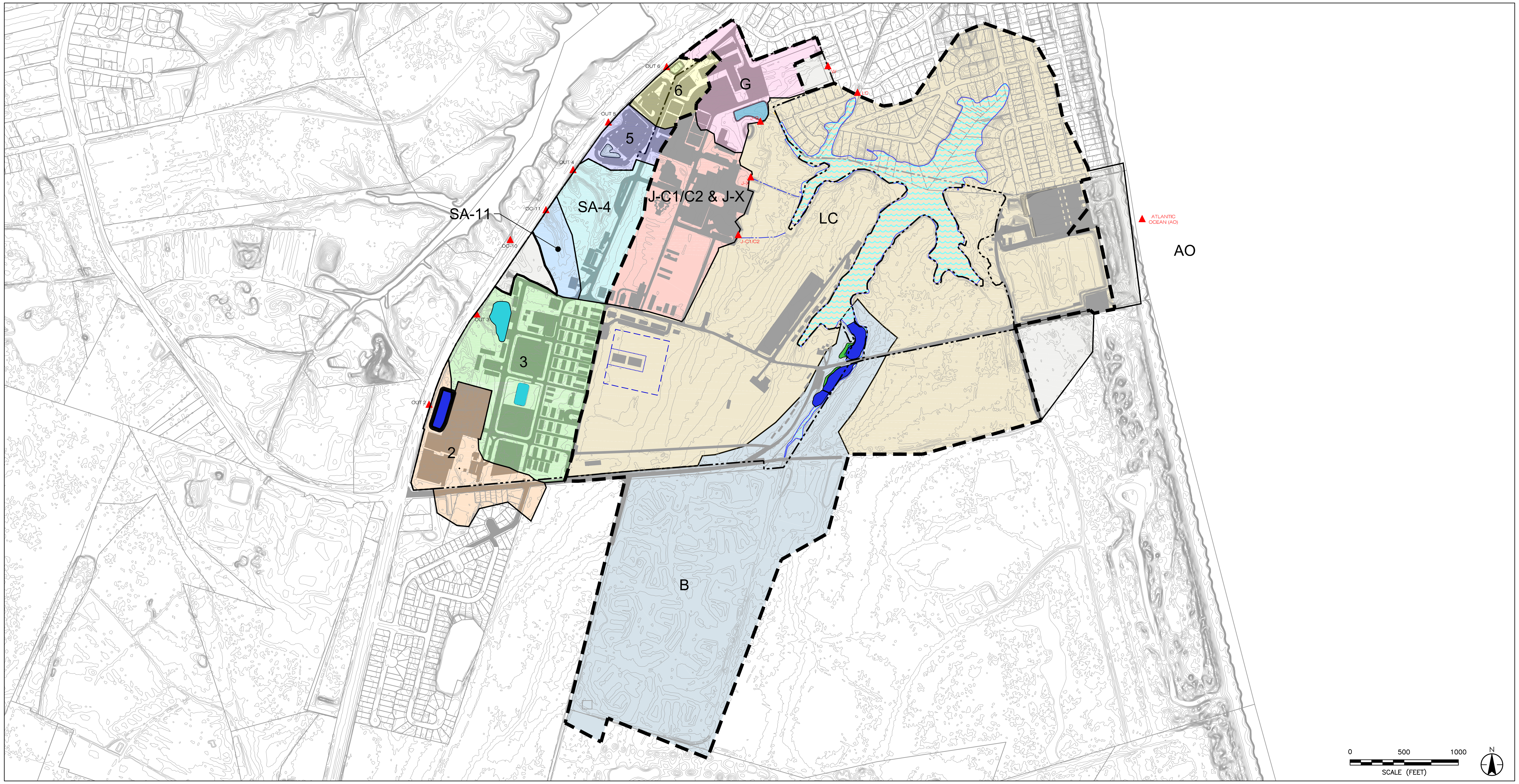

LEGEND:

- STUDY AREA LIMITS
- PROJECT LIMITS
- LAKE CHRISTINE DRAINAGE BOUNDARY
- APPROXIMATE OPEN WATER
- APPROXIMATE WETLANDS
- BMP 2
- BMP 3
- SA-11
- SA-4
- BMP 5
- BMP 6
- J-G
- J-C1/C2/J-X
- LAKE CHRISTINE
- BMP B
- NO NEW DEVELOPMENT

Watershed ID	Existing Facility ID	Proposed Facility ID	BMP Type (per VSWMH)	Treatment Provided	PROPOSED LANDUSE CONDITIONS				Proposed Minimum Treatment Volume (ac-ft)	Channel Protection Volume (ac-ft)	10-YR Proposed Cumulative Detention Volume (ac-ft)	Discharge Node	Drainage Area ID	NOTES
					Drainage Area (ac)	Forest/Open Space (ac)	Managed Turf (ac)	Impervious Cover (ac)						
OWL CREEK	1	1	ED POND (L1)	Quality and Quantity	7.55	0.00	4.51	3.04	*Existing BMP to remain as-is.*			OUT-3	1	Modify outlet structure to discharge into BMP-3.
OWL CREEK	2	2	WET POND (L1)	Quality and Quantity	18.47	1.22	6.11	11.14	0.19	0.76	1.27	OUT-2	2A	Expand existing footprint and upgrade to accommodate future development.
OWL CREEK	3	3	ED POND (L1)	Quality and Quantity	35.13	1.16	17.68	16.29	1.08	1.15	2.19	OUT-3	1 & 3B	Upgrade to accommodate future development.
OWL CREEK	5	5	DRY POND	Quantity only	4.67	0.55	1.02	3.10	*Existing BMP to remain as-is.*			OUT-5	5	
OWL CREEK	6	6	ED POND (L1)	Quantity only	7.05	0.99	2.03	4.03	0.08	0.22	0.42	OUT-6	6A & 6B	Expand existing footprint and upgrade to accommodate future development.
OWL CREEK	N/A	SA-4	RISER CONTROL	Quantity only	16.55	7.80	6.10	2.66	0	0.24	0.56	OUT-4	4A & 4B	Proposed undersized outlet
OWL CREEK	N/A	SA-11	RISER CONTROL	Quantity only	5.31	4.33	0.90	0.08	0	0.10	0.22	OC-11	OC11	Proposed undersized outlet
LAKE CHRISTINE	N/A	*C1/C2	RESTORED SW CONVEYANCE	Quantity only	19.81	0.00	13.40	6.40	0	0	0	J-C1C2	C1 & C2	Channel to be designed to safety convey runoff downstream until compliance achieved.
LAKE CHRISTINE	N/A	*X	RESTORED SW CONVEYANCE	Quantity only	12.33	0.00	5.20	7.13	0	0	0	J-X	X	Channel to be designed to safety convey runoff downstream until compliance achieved.
LAKE CHRISTINE	N/A	B	WET POND (L1)	Quality and Quantity	117.77	27.28	33.78	56.71	5.19	6.62	14.67	LC	B1 & B2	Designed to treat offsite drainage coming into Lake Christine.
LAKE CHRISTINE	N/A	G	ED POND (L1)	Quality and Quantity	15.17	3.00	5.58	6.59	0.64	0.85	1.89	LC	G, OC1 & OC2	New proposed BMP.

*In lieu of channel protection controls, restored stormwater conveyance channels are proposed within the natural channels to safety convey the proposed runoff downstream to a point where compliance is achieved.

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FOR:

SMR CAMP PENDLETON
VIRGINIA BEACH, VA

TITLE:

IMPLEMENTATION PLAN

DRAWN BY: SMS	DESIGNED BY: CSH
CHECKED BY: CSH/DAP	APPROVED BY: CSH/DAP
PROJECT NUMBER: 203400616	SCALE: AS SHOWN
DATE: 8/30/16	FILE PATH: U:\203400616

SHEET:

8 OF 8

STATE MILITARY RESERVATION

CAMP PENDLETON

VIRGINIA BEACH, VIRGINIA

SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN

January 2017

SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN

VIRGINIA ARMY NATIONAL GUARD
STATE MILITARY RESERVATION
CAMP PENDLETON
VIRGINIA BEACH, VIRGINIA

Prepared for:

Virginia Department of Military Affairs
Building 316, Fort Pickett
Blackstone, Virginia 23824

Updated by:

EEE Consulting, Inc.
8525 Bell Creek Road
Mechanicsville, Virginia 23116

January 2017

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APPENDICES

1. REGULATORY INTRODUCTION

1.1 GENERAL APPLICABILITY AND PURPOSE [40 CFR 112.1(a)]

This Spill Prevention, Control and Countermeasure (SPCC) Plan establishes procedures, methods and equipment and other requirements for equipment to prevent the discharge of oil and hazardous substances from the Virginia Department of Military Affairs' (DMA), State Military Reservation (SMR) - Camp Pendleton in Virginia Beach, Virginia. This Plan identifies potential spill sites and details spill prevention procedures, inspection programs, and required training of personnel. This Plan fulfills the requirements for an SPCC Plan as required by the United States Environmental Protection Agency (EPA) Regulation Title 40, Code of Federal Regulations, Part 112 (40 CFR 112), and Army Regulation (AR) 200-1, Chapter 11, and describes spill detection, reporting, containment, cleanup and disposal procedures.

1.2 REGULATORY REQUIREMENTS [40 CFR 112.1(b)]

This Plan has been prepared and implemented in accordance with EPA 40 CFR 112, Oil Pollution Prevention, and AR 200-1, Environmental Protection and Enhancement.

References used in the development of this Plan are contained in **Appendix D**. A table cross-referencing plan section with sections of 40 CFR 112 is included in **Appendix D**.

1.2.1 40 CFR 112.1(d) Requirements

An SPCC Plan must be written and certified for an on-shore installation when one or more of the following conditions exist:

- There is a reasonable potential for discharging oil from fixed facilities into waters of the United States; or
- The facility is not subject to the control of the US Department of Transportation or the US Department of the Interior as defined in specific memoranda of understanding, or;
- The oil storage capacity on-site exceeds either:
  1) 42,000 gallons of total underground storage; or
  2) 1,320 gallons of total aboveground storage in containers of 55 gallons or more capacity.
- The facility is not regulated as an underground storage tank facility under 40 CFR Part 280 or Part 281.
- The facility is not used exclusively for wastewater treatment and oil recovery is a by-product of that process.

1.2.2 AR 200-1 Requirements

Army Regulation (AR) 200-1, Chapter 11 requires that each installation prepare, maintain, and implement an SPCC Plan whenever any of the following conditions are met:

- Required by 40 CFR 112, Oil Pollution Prevention, because of the volume of stored petroleum, oil, and lubricants (POLs) or because the storage location is such that a spill could be reasonably expected to discharge into or upon navigable waters;
- Hazardous materials are stored in more than “consumer quantities”; or
- Hazardous waste is generated and the facility qualifies as a “large quantity generator.”

1.2.3 SMR Specific Requirements

An SPCC Plan is required for SMR because:

- There is a reasonable potential for discharging oil from fixed facilities into waters of the United States, and;
- Fuel storage capacity exceeds 1,320 gallons total aboveground storage in containers of 55 gallons or more capacity, and;
- The facility is not regulated under 40 CFR Parts 280 or Part 281, and;
- The facility is not used exclusively for wastewater treatment and oil recovery is a by-product of that process; and
- Hazardous materials are stored in more than “consumer quantities.”

2. DEFINITIONS [40 CFR 112.2]

Acronyms and definitions for this Plan are found in **Appendix A**.

3. GENERAL SPCC PLAN REQUIREMENTS [40 CFR 112.3]

3.1 FACILITY OPERATIONAL PRIOR TO AUGUST 18, 2002 [40 CFR 112.3(a)]

The SMR was operational prior to August 16, 2002; therefore, the SPCC Plan must be amended as needed to comply with revisions to 40 CFR 112 published on July 17, 2002 and April 1, 2009, in the Federal Register. Amendments must be certified by a Professional Engineer (PE), and implemented no later than November 10, 2011. This version of the Plan, dated January 2017, includes the required amendments.

3.2 FACILITY OPERATIONAL ON OR AFTER AUGUST 18, 2002 [40 CFR 112.3(b)]

Not applicable.

3.3 ONSHORE DRILLING OR WORKOVER RIGS [40 CFR 112.3(c)]

Not applicable.

3.4 PROFESSIONAL ENGINEER CERTIFICATION [40 CFR 112.3(d)]

This Plan has been reviewed and certified by a P.E. who attests: that he/she is familiar with 40 CFR 112; that he/she or his/her agent is familiar through site review with SMR; that the Plan has been prepared in accordance with good engineering practice; that procedures required for inspections and testing have been established; and that this Plan is adequate for the SMR facility. The signed certification statement is located in **Appendix E**.

3.5 PLAN AVAILABILITY [40 CFR 112.3(e)]

A complete copy of this Plan is maintained at the facility and is available to EPA or Virginia Department of Environmental Quality (DEQ) personnel for on-site review during normal working hours.

3.6 EXTENSIONS OF TIME [40 CFR 112.3(f)]

Not applicable.

4. AMENDMENT OF PLAN BY REGIONAL ADMINISTRATOR [40 CFR 112.4]

4.1 SUBMISSION TO EPA [40 CFR 112.4(a)]

DMA will submit the information required by 40 CFR 112.4(a) within 60 days to the EPA Regional Administrator for review whenever the facility has:

- discharged more than 1,000 gallons of oil into or upon navigable waters or adjoining shorelines in a single spill event; or
- discharged more than 42 gallons of oil in each of two spill events within any 12-month period.

The information required on Form C.1 in **Appendix C** will be submitted to the EPA Regional Administrator at EPA Region III. The Regional Administrator will review the information and the Plan and may require further amendments to the Plan.

4.2 TIME EXEMPTION FOR AMENDMENT [40 CFR 112.4(b)]

Not applicable.

4.3 SUBMIT INFORMATION TO STATE AGENCIES [40 CFR 112.4(c)]

At the same time, DMA will submit a complete copy of the information noted in Section 4.1 to the DEQ Tidewater Regional Office. DEQ may conduct a review and make recommendations to the EPA.

4.4 EPA REVIEW [40 CFR 112.4(d-f)]

Instructions from the Regional Administrator, received after the review in Section 4.1 above, will be implemented within 30 days of receipt unless otherwise specified in writing by the Regional Administrator.

5. AMENDMENT OF PLAN BY OWNER/OPERATOR [40 CFR 112.5]

5.1 AMENDMENT OF THE PLAN [40 CFR 112.5(a-b)]

DMA will review this Plan:

- whenever there is a change in facility design, construction, operation, or maintenance that affects the facility's potential for the discharge of oil or hazardous substances;
- at least once every five (5) years from the date of certification of the Plan.

The review will assess whether spill reporting/response contact information has changed, equipment or procedure changes are necessary to prevent or control discharges, more effective, field-proven prevention and control technology has become available, or if revisions are required by EPA or DEQ. Each review will be documented on the signed statement included in **Appendix E**.

The Plan will be amended within six months of the review and the amendment(s) will be fully implemented no later than six months after the amendment has been completed, unless an extension has been requested and granted.

5.2 CERTIFICATION OF PLAN AMENDMENTS [40 CFR 112.5(c)]

Technical amendments to this Plan must be certified by a P.E. Administrative type revisions and deletions to the Plan, which do not materially affect the facility's potential for a discharge of oil, do not require P.E. certification. The record of the reviews and amendments is included in **Appendix E**.

6. RESERVED [40 CFR 112.6]

This section is reserved by the EPA for future use.

7. SPILL PREVENTION, CONTROL, & COUNTERMEASURES PLAN [40 CFR 112.7]

7.1 FACILITY DESCRIPTION [40 CFR 112.7(a)(1-5)]

7.1.1 Facility Conformance [40 CFR 112.7(a)(1-2)]

The SMR facility conforms to all the requirements of 40 CFR 112. The cross reference table in **Appendix D** highlights which sections of this Plan apply to each subpart of 40 CFR 112. This Plan does not deviate from the requirements of 40 CFR 112.

7.1.2 Facility Description [40 CFR 112.7(a)(3)]

The SMR is located between General Booth Boulevard to the northwest, and Birdneck Road to the south in Virginia Beach, Virginia. **Figure 1** shows the general location of the facility. The overall property occupies approximately 250 acres, and was originally established in 1911. The United States Navy Amphibious Base - Dam Neck, is to the south, and the Croatan housing subdivision to the northwest. The SMR provides training areas, offices, and barracks for the Virginia Army National Guard (VAARNG), the United States Army, the Military Sealift Command, and the National Guard Youth Challenge Program, an intervention program for at-risk youth. The Air National Guard-203 Red Horse Squadron is a tenant on the SMR property.

The majority of the area surrounding the SMR is occupied by military installations with light commercial facilities along the main roads. There is a small residential area to the northeast. The Virginia Marine Science Museum is located directly to the west of the SMR on the west side of General Booth Boulevard.

The Air National Guard-203 Red Horse Squadron, operates an administratively separate facility including USTs and ASTs on approximately 45 acres in the northeast portion of the SMR (**Figure 2a**). This SPCC Plan does not include this separate facility because it is operated by a different entity.

The SMR facility includes:

- Training areas;
- Office buildings;
- Barracks;
- Classroom buildings;
- Employee and military vehicle parking areas;
- Perimeter security fence with entrance gate house; and
- Supply by public sanitary sewers and city water.

The activities performed at the SMR facility include:

- Military personnel training;
- At-risk youth education and training; and
- Military administrative activities.

Figures 2a and 2b show the layout of the facility, including building locations, oil storage container and spill equipment locations, potential pollution sources, and storm water flow and spill directions.

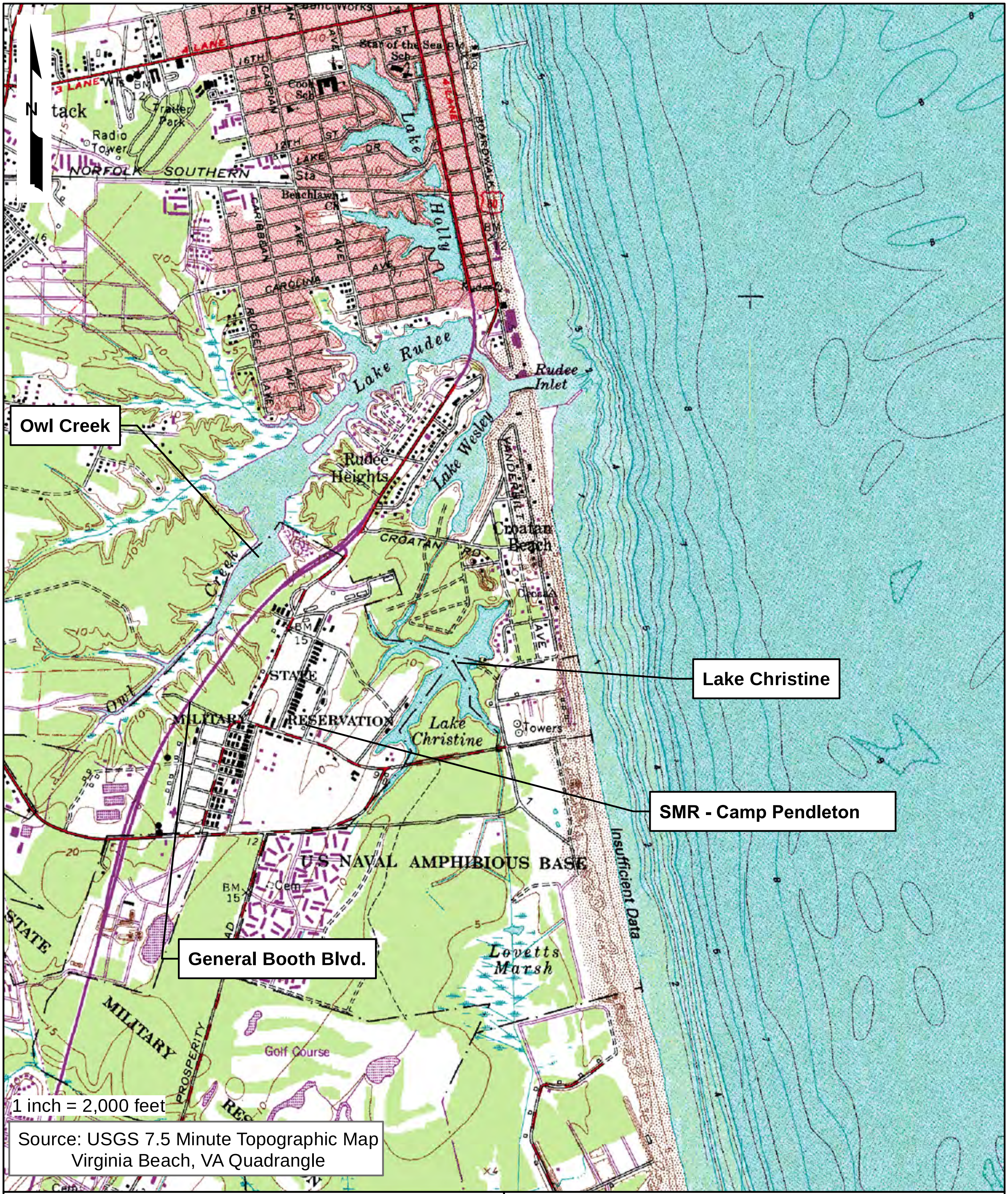

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Figure 1
Site Location Map
Virginia Department of Military Affairs
SMR - Camp Pendleton

16-154

December 2016

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Figure 2a
Stormwater Flow & Spill Direction
SMR - Camp Pendleton North
Virginia Beach, Virginia

January 2017

Source: US Department of State Geographer, 2014 Google, 2009 GeoBasis-DE/BKG, Data S10, NOAA, US Navy, NGA, GEBCO

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16-154

Figure 2b
Stormwater Flow & Spill Direction
SMR - Camp Pendleton South
Virginia Beach, Virginia

December 2016

7.1.3 Materials On-Site and Discharge Response Plan Details [40 CFR 112.7(a)(3)(i-vi)]

Petroleum is stored throughout the facility. Petroleum storage at the SMR facility includes gasoline, diesel fuel, spent kitchen grease, used motor oil, and mineral spirits. There is also one electrical transformer at the facility that may have an oil storage capacity greater than 55 gallons. The transformer is owned and operated by Dominion Virginia Power. A summary of the bulk oil product storage at the facility is listed in **Table 1**.

Table 1. Aboveground Storage Tanks

Container/Tank ID#	Contents	Volume (gallons)
BP EG	Diesel Fuel	966
T-411	Diesel Fuel	300
Challenge	Spent kitchen grease	300
Drum[1]	Spent kitchen grease	55
Drums[1]	Used motor oil	110
Drum[1]	Mineral Spirits	55
G-1	Gasoline	4,000
DF-1	Diesel Fuel	6,000
	TOTAL	**11,786**

[1]Due to the transportability of 55-gallon drums, the total number and their location may vary.

7.1.4 Facility Owner and Address [40 CFR 112.7(a)(4)]

Facility Owner
Commonwealth of Virginia
Department of Military Affairs
Building 316, Fort Pickett
Blackstone, VA 23824-6316
(434) 298-6401

Facility Address
Department of Military Affairs
State Military Reservation
1096 South Birdneck Rd.
Virginia Beach, VA 23451-4804
(757) 491-5110

Owner Contact
Assistant Chief of Staff, Facilities (434) 298-6401
Environmental Program Manager (434) 298-6445

Facility Contact
Post Commander (757) 493-3128
Buildings & Grounds Supervisor (757) 493-3146

7.2 POTENTIAL SPILL PREDICTIONS, VOLUMES, RATES, AND CONTROL [40 CFR 112.7(b)]

7.2.1 Distance to Navigable Waters and Adjoining Shorelines and Flow Path [40 CFR 112.7(b)]

Lake Christine occupies the northeast/central portion of the base and extends northeast of the property. The eastern half of the SMR facility drains directly into Lake Christine, while the western half flows to an on-site ditch or to stormwater ponds via a series of drop inlets and culverts. The ditch and stormwater ponds are equipped with pipes that direct overflow underneath General Booth to Owl Creek. Owl Creek is a tidal creek that flows parallel to General Booth Boulevard about 800 ft west of the SMR facility, which discharges into Lake Rudee, and opens to the Atlantic Ocean through the Rudee Inlet directly north of the SMR.

7.3 SPILL HISTORY

Spills that have occurred at the SMR facility within the past two years are included in the table below. A record of spill response incidents is maintained with this Plan and includes a written description of each spill, corrective actions taken, and plans for preventing recurrences.

SPILL HISTORY			
Date	**Substance**	**Volume (gallons)**	**Incident Description/Corrective Actions/Preventative Measures**
7/8/2015	Hydraulic fluid	32	JCD Loader driver ran into an object at the 203rd Red Horse Squadron vehicle wash point, which damaged the hydraulic line. The driver did not notice the leak at that time. While he was lifting training devices onto the loader, the hydraulic line released, spilling the bulk of the hydraulic fluid. A double barrier of absorbent booms was placed around the perimeter of the spill, and absorbent pads and pillows were placed on the ponding areas of the liquid. Safety cones were placed to prevent vehicle and pedestrian traffic. Sphag Sorb Industrial Absorbent was used for final cleanup. Saturated spill material was properly disposed, and area was cleaned by a cleanup contractor.

7.3.1 Spill Potential

There is a reasonable potential for equipment failure (e.g., tank overflow, rupture, or leakage). **Table 2** includes a prediction of the direction, rate of flow, and total quantity of oil that could be discharged as a result of each major type of equipment failure.

Table 2. Potential Spill Risk Analysis

Discharge Source	Type of Failure	Total Volume (gallons)	Discharge Rate Gallons/Minute	Flow Direction
966-gallon diesel fuel AST (BP EG) and associated piping located on southwest corner of property at Building 260D	Tank Overfill	5 – 20	30 (max. pump rate)	Inside secondary containment. Overflow from the secondary containment would sheetflow to a storm drain and to a culvert passing underneath General Booth Boulevard.
	Tank Rupture	966	1 to instantaneous	Inside secondary containment. Overflow from the secondary containment would sheetflow to a storm drain and to a culvert passing underneath General Booth Boulevard.
	Piping Leak/ Rupture	1 – 5	Trace to 5	Inside secondary containment. Overflow from the secondary containment would sheetflow to a storm drain and to a culvert passing underneath General Booth Boulevard.
300-gallon diesel fuel AST (T-411) and associated piping located at Building 411	Tank Overfill	5 – 20	30 (max. pump rate)	Inside secondary containment. Overflow from the secondary containment would flow to the northwest becoming concentrated in earthen ditches to culverts passing under General Booth Boulevard.
	Tank Rupture	300	1 to instantaneous	Inside secondary containment. Overflow from the secondary containment would flow to the northwest becoming concentrated in earthen ditches to culverts passing under General Booth Boulevard.

Discharge Source	Type of Failure	Total Volume (gallons)	Discharge Rate Gallons/Minute	Flow Direction
	Piping Leak/ Rupture	1 – 5	Trace to 5	Inside secondary containment. Overflow from the secondary containment would flow to the northwest becoming concentrated in earthen ditches to culverts passing under General Booth Boulevard.
300-gallon spent kitchen grease AST (Challenge) located at B and 3rd Streets	Tank Overfill	5 – 20	30 (max. pump rate)	Inside HAZMAT Building containment floor. Overflow from HAZMAT Building containment would flow northwest to ditch and underneath General Booth Blvd.
	Tank Rupture	300	1 to instantaneous	Inside HAZMAT Building containment floor. Overflow from HAZMAT Building containment would flow northwest to ditch and underneath General Booth Blvd.
	Dispenser Hose Leak/ Rupture	1 – 5	Trace to 5	Inside HAZMAT Building containment floor. Overflow from HAZMAT Building containment would flow northwest to ditch and underneath General Booth Blvd.
55-gallon mineral spirits drum in Building 66	Drum Overfill	1-55	1 to instantaneous	To spill pallet, contained on concrete floor of building. Overflow from the building would sheet flow to drainage ditches.
	Drum Rupture	55		To spill pallet, contained on concrete floor. Overflow from the building would sheet flow to drainage ditches.
55-gallon kitchen grease drum at Building 408	Drum Overfill	55	1 to instantaneous	Inside spill containment floor. Overflow from container would flow to drop inlet to drainage ditch.
	Drum Rupture			Inside spill containment floor. Overflow from container would flow to drop inlet to drainage ditch.
55-gallon used oil drums at Building 362	Drum Overfill	110	1 to instantaneous	Inside HAZMAT Storage containment floor. Overflow from HAZMAT Storage containment would flow northwest to ditch and underneath General Booth Blvd.
	Drum Rupture			Inside HAZMAT Storage containment floor. Overflow from HAZMAT Storage containment would flow northwest to ditch and underneath General Booth Blvd.
6,000-gallon diesel fuel (DF-1) and 4,000-gallon gasoline ASTs (G-1) at Building 422	Tank Overfill	5-20	600 (max. pump rate)	Inside secondary containment. Overflow from secondary containment would flow northwest to on-site stormwater pond.
	Tank Rupture	10,000	1 to instantaneous	Inside secondary containment. Overflow from secondary containment would flow northwest to on-site stormwater pond.
	Dispenser Hose Leak/ Rupture	1 – 5	Trace to 5	Inside secondary containment. Overflow from secondary containment would flow northwest to on-site stormwater pond.

7.4 CONTAINMENT AND DIVERSIONARY STRUCTURES - ONSHORE [40 CFR 112.7(c)(1)]

Containment and/or diversionary structures or equipment to prevent discharged oil from reaching a navigable watercourse are provided and described below in **Table 3**. It should be noted that the secondary containment for the 300-gallon spent kitchen grease AST is not sufficient to contain the entire capacity of the AST. In the interim, daily inspections are prescribed for this tank until adequate secondary containment is provided for this AST.

Table 3. Containment and Diversionary Structures

Location	Discharge Source	Structure or Equipment
Building 411	300-gallon diesel fuel emergency generator AST (T-411)	Double walled, Centeron wireless tank monitoring device. Sorbent materials are located in the vicinity of the AST.
Building 260D	966-gallon diesel fuel emergency generator AST (BP EG)	Double walled, Centeron wireless tank monitoring device, and automatic leak alarm. Sorbent materials are located in the vicinity of the AST.
Building 66	55-gallon drum of mineral spirits	Situated on a spill pallet on a concrete floor inside the building with adequate containment capacity. Sorbent materials are located proximate to the drum.
Building 408	55-gallon kitchen grease drum	Situated in a spill containment unit, with adequate containment capacity. Sorbent materials are located in the vicinity of the drum.
Building 362	55-gallon used oil drums	Situated inside a hazmat containment unit equipped with a spill containment floor. The containment unit has adequate containment capacity. Sorbent materials are located proximate to the containment shed.
Building 422	6,000-gallon diesel fuel AST (DF-1) 4,000-gallon gasoline AST (G-1)	Double walled with leak alarms. Fill ports include overfill prevention valves and spill buckets. The ASTs have interstitial monitoring ports that allow the inner tank to be physically gauged for the presence of product. Sorbent materials are staged proximate to the ASTs.
Grass area at B and 3rd Streets	300-gallon spent kitchen grease AST (Challenge)	Inside HAZMAT Building with secondary containment floor. Floor has 224-gallon capacity. Daily inspections will be performed until adequate containment is provided. Sorbent material is located in the vicinity of the AST.

7.5 CONTAINMENT AND DIVERSIONARY STRUCTURES – OFFSHORE [40 CFR 112.7(c)(2)]

Not applicable.

7.6 DEMONSTRATION OF PRACTICABILITY [40 CFR 112.7(d)(1-2)]

Facility management has determined that the use of the containment and diversionary structures or readily available equipment to prevent discharged oil from reaching navigable water is practicable and effective at this facility. As discussed in Section 7.3, adequate secondary containment will be provided for the 300-gallon spent kitchen grease AST to ensure compliance with SPCC Rule.

This SPCC Plan has been carefully reviewed by Management. Management concurs and supports the programs and procedures that are to be implemented, periodically reviewed, and updated in accordance with 40 CFR 109, 40 CFR 112, and AR 200-1. Management approval has been extended at a level with authority to commit the necessary resources. A signed statement of Management approval is included in **Appendix E**.

7.7 INSPECTIONS AND RECORDS [40 CFR 112.7(e)]

Inspections and records are part of the effective spill prevention, containment structures and procedures for the SMR facility. Written records of inspections performed are retained in the Buildings & Grounds Supervisor's office with this Plan. Facility personnel ensure that the inspections listed in **Table 4** are performed as required.

Table 4. Inspections and Records

Area	Inspection	Frequency	Inspected By
6,000-gallon diesel fuel AST; 4,000-gallon gasoline AST; 966-gallon diesel fuel AST; 300-gallon kitchen grease AST; 300-gallon diesel fuel AST; 55-gallon mineral spirits drum; 55-gallon kitchen grease drum; 55-gallon used oil drums	Using the Monthly/Annual Oil Storage Inspection Checklist in Appendix C, check for: a. Obvious leaks, b. Signs of vandalism, c. Condition of security measures, d. Damage or wear of fuel transfer pumps and hoses.	Monthly/Annual	Designated person
Spill Response Material	Ensure: a. Appropriate number of kits, b. Appropriate locations, and c. Contain at least minimum materials.	Monthly/Annual	Designated person
Vehicle Storage Areas, and Equipment Storage Areas	Look for: a. Gasket and fill/drain plug leaks	Continuous	Facility personnel
Hazardous material/hazardous waste containers	Ensure: a. Sufficient capacity Look for: a. Leaks or spills, and Need to schedule removal.	Weekly	Designated person
General work areas	Cursory examination	Continuous	All Facility personnel

7.8 PERSONNEL TRAINING AND SPILL PREVENTION PROCEDURES [40 CFR 112.7(f)]

Personnel training is an effective part of the spill prevention and containment procedures for the SMR facility.

7.8.1 Personnel Training Responsibilities [40 CFR 112.7(f)(1)]

DMA is responsible for properly instructing SMR personnel in the operation and maintenance of equipment to prevent the discharges of oil and applicable pollution prevention control laws, rules, and regulations. The Buildings & Grounds Supervisor at the SMR facility is responsible for the following training:

- New employees - spill prevention equipment and practices;

- Operating personnel - spill prevention briefings at least once a year; and
- All personnel - spill prevention briefings at least annually.

7.8.2 Spill Prevention Personnel [40 CFR 112.7(f)(2)]

The Buildings & Grounds Supervisor is the designated person accountable for oil spill prevention at the SMR.

7.8.3 Spill Prevention Briefings [40 CFR 112.7(f)(3)]

Spill prevention briefings are conducted at intervals frequent enough to assure adequate understanding of the Plan. These briefings and training activities are summarized in **Table 5**.

Training records must be kept on-site for three years (see **Appendix C** for Training Roster form).

Any military or civilian employee having HAZMAT emergency response roles beyond incidental response activities must receive specific training before they can take part in actual HAZMAT incident responses. Local Fire Department personnel also receive specific training in responding to spills or potential spills of oil and hazardous substances.

Table 5. Spill Prevention Briefings

Personnel	Briefing/Training Activity	Frequency
SMR personnel who routinely work with fuel	Spill prevention and response, to include: a. discussion on known spill events or failures, b. malfunctioning components, and c. recently developed precautionary measures.	Annual, or during regular safety meetings
Oversight supervisors and operating personnel directly involved with potential spill situations	Spill prevention training, to include: a. purpose of the SPCC Plan b. spill prevention responsibility c. a review of standard operating procedures relating to spill prevention d. equipment maintenance e. nature of spills f. handling a spill – what to do g. recently developed precautionary measures h. group discussion of spill prevention i) suggestions ii) past experience	Annual, or periodically to assure adequate understanding of the SPCC Plan
SMR personnel involved with the management and handling of oil or hazardous substances	Spill prevention training (see above)	Annual
	Additional spill prevention briefing	Periodic, as needed

7.9 SECURITY [40 CFR 112.7(g)]

Security is an effective part of the spill prevention and containment structures and procedures for the SMR facility. Security measures are summarized in **Table 6**.

Table 6. Security Measures

Security Measure	Facility-Specific Application of Security Measure
Fence and Gate	The SMR facility is fully fenced and the entrance gate is attended at all times. An additional locked chain-link fence surrounds the 300-gallon diesel fuel emergency generator AST.
Starter Controls Locked	The starter controls on fuel pumps at the SMR facility are located within a secure area and are locked when not in use.
Out of Service Pipelines Securely Capped	The loading/unloading connections of fuel piping at the SMR facility are securely capped when not in use.
Facility Lighting	Lighting is sufficient throughout the SMR facility to identify spills or activities that may create the potential for a spill.

7.10 TANK TRUCK LOADING/UNLOADING PROCEDURES [40 CFR 112.7(h)]

Effective spill prevention, containment structures and procedures are in place for tank truck loading and unloading at the SMR facility.

Drivers comply with DOT regulations in 49 CFR 177. Drivers must be authorized and certified to load and unload product. Tank truck loading/unloading procedures meet the minimum requirements and regulation established by the Department of Transportation. DMA's truck loading and unloading procedures are as follows:

FUEL LOADING/UNLOADING PROCEDURE – COMMERCIAL DELIVERY		
Step	**Description**	**Regulatory Requirement**
1.	SMR personnel must measure the capacity of the tank and order the required amount of fuel.	
2.	Tanker truck arrives and checks in with security. Security notifies SMR personnel.	1. Access to area is restricted.
3.	SMR personnel escort tanker truck to fuel loading/ unloading area and supervise unloading procedures.	1. Ground clearance warning signs are in place. 2. At least one portable "B" or "C" type fire extinguisher is readily available.
4.	To set up, the driver must: a. turn off engine, b. set parking brake, c. place wheel chocks around the tanker, and d. attach the grounding wires.	1. Vehicle parking brake is set. 2. Wheel chocks are set in place. 3. Vehicle is grounded. 4. No smoking signs are posted.
5.	Next the driver must: a. visually inspect the hoses for damage before use, b. connect the delivery hoses on the tanker and the dispensing valves, and c. place spill containment devices below the valve-hose fitting.	1. Prevent spills. 2. Absorbent pads, booms, or drip pans are used to absorb or catch any fuel that might leak.
6.	Next the SMR personnel: a. sets and double checks the fuel metering devices, b. starts pump to dispense fuel, and c. continuously monitors tank filling operation.	1. If an automatic metering device is not available, or tank does not have a level-measuring device, additional personnel are used to monitor fuel level and operate pump. 2. Ensure that major leaks do not occur, the tank is not overfilled, and a fire does not occur.
7.	After unloading, the driver must:	1. Prevent spills.

	a. double check the valves to ensure they are closed, b. disconnect, drains, wipes, caps, and locks the hose, c. remove spill containment equipment, d. secure compartment hatches, e. disconnect grounding wires, f. remove wheel chocks, and g. clean any oil that may have spilled on the ground.	

7.10.1 Tank Truck Loading/Unloading Drainage and Containment [40 CFR 112.7(h)(1))]

Tank truck wheels must be chocked before loading/unloading begins and remain chocked until loading/unloading is completed. According to CFR 112.7 (h), the facility's unloading system does not meet the definition of a loading/unloading rack and therefore does not require secondary containment.

7.10.2 Tank Truck Loading/Unloading Warning System [40 CFR 112.7(h)(2)]

A sign is posted requiring the vendor to chock truck wheels to prevent vehicular departure before complete disconnect of transfer line at the fueling loading/unloading area. A trained SMR employee must be present to observe each loading/unloading and refueling operation.

7.10.3 Tank Truck Loading/Unloading Checks [40 CFR 112.7(h)(3)]

The lowermost drain and all outlets of fuel trucks are double-checked to prevent leakage during transit.

7.11 FIELD CONSTRUCTED CONTAINERS [40 CFR 112.7(i)]

Not applicable.

7.12 SPILL PREVENTION AND CONTAINMENT PROCEDURES [40 CFR 112.7(j)]

The SMR is in conformance with applicable guidelines as discussed in the following sections.

8. SPCC PLAN REQUIREMENTS FOR ON-SHORE FACILITIES [40 CFR 112.8]

8.1 GENERAL REQUIREMENTS [40 CFR 112.8(a)]

This Plan meets the general requirements of 40 CFR 112.7, as discussed above, and also meets the requirements of 40 CFR 112.8, as discussed below.

8.2 FACILITY DRAINAGE [40 CFR 112.8(b)]

General drainage patterns for the facility are depicted on Figures 2a and 2b. Drainage from the western portion of the facility sheetflows northwest to drainage ditches and on-site stormwater ponds that lead to culverts flowing underneath General Booth Boulevard to Owl Creek. Owl Creek is a tidal creek that flows parallel to General Booth Boulevard about 800 feet west of the SMR facility and discharges into Lake Rudee. Lake Rudee opens to the Atlantic Ocean through the Rudee Inlet directly north of the SMR. Drainage from the north flows to ditches and culverts to an on-site stormwater pond situated on the northern corner of the property. Drainage from the eastern portion of the facility sheetflows to the southeast becoming concentrated in drainage ditches that lead directly into Lake Christine, approximately 500 feet east of the facility. Drainage or excessive leakage of oil is effectively managed from all oil storage areas at the facility.

8.2.1 Drainage from Diked Storage Areas [40 CFR 112.8(b)(1)]

A concrete containment berm is situated between the fuel delivery tanker truck and fueling ASTs to collect any fuel that could be lost from the tanker hoses during refueling. Accumulation of precipitation in the containment area is controlled with a manual drain valve located on the northwest portion of the berm. The valve remains in the open position when not in use, and is closed during fuel transfer operations. Precipitation collected in the containment area is examined for the presence of product. If no sheen is observed, the rainwater is discharged through the drain valve to a drainage ditch that flows to an on-site stormwater pond. If a petroleum sheen is observed on the water in the secondary containment area, the sheen will be removed and properly disposed. Any remaining water will be drained. Prior to discharging the water, facility personnel complete a Drainage Discharge Report form **(Appendix C)**.

There are no other diked oil storage areas at the SMR.

8.2.2 Drainage Valves Used On Diked Storage Areas [40 CFR 112.8(b)(2)]

The drainage valve for the concrete containment berm remains in the open position when not in use, and is closed during fuel transfer operations. Precipitation collected in the containment area during fuel transfer operations is examined for the presence of product, and a drainage log is maintained for all precipitation released to the environment.

8.2.3 Drainage Systems from Undiked Areas [40 CFR 112.8(b)(3)]

Undiked areas at the SMR facility flow directly into the storm water drainage system. The storm water drainage system consists of a series of earthen drainage ditches, on-site stormwater ponds, drop inlets and concrete pipe culverts. On the west side of C Street and Headquarter Road, this system drains under General Booth Boulevard and into Owl Creek, located approximately 800 feet west of the SMR. On the east side of C Street and Headquarters Road, the drainage systems flow directly into Lake Christine, which occupies the northeast/central portion of the base and extends northeast of the property. Drainage from areas adjacent to Lake Christine flows directly into the lake. The nearest SMR oil storage container is located more than 500 feet from Lake Christine, and more than 800 feet from Owl Creek. Drainage from the west portion of the facility flows to on-site stormwater ponds and a drainage ditches via drop inlets and overland flow. The drainage ditches and overflow from the ponds discharges underneath General Booth Boulevard to Owl Creek. Refer to Table 2 above for detailed drainage at each container location.

Drainage systems from undiked areas are summarized in **Table 7**.

Table 7. Drainage Systems from Undiked Areas

Undiked Area	Drainage System
DF-1/G-1	Directly to stormwater drainage system
BP-EG	Directly to stormwater drainage system
T-411	Directly to stormwater drainage system

Velocities are expected to be low in drainage ditches and for overland flow because of the relatively flat terrain. Due to the length of the AST flow paths, and flat terrain, it is unlikely that even an uncontrolled spill from the largest AST would reach a navigable water.

8.2.4 Final Discharge Diversion Systems [40 CFR 112.8(b)(4)]

Accumulation of precipitation in the containment berm that collects fuel that could be lost from the fuel delivery tanker hoses during refueling is controlled with a manual drain valve located on the northwest portion of the berm. The valve in the open position when not in use, and is closed during fuel transfer operations. Any precipitation collected in the containment area is examined for the presence of product. If no sheen is observed, the rainwater is discharged through the drain valve to a drainage ditch that flows to an on-site stormwater pond. If an oil sheen is observed, the water is pumped and disposed by a certified contractor.

8.2.5 Drainage Water Treatment Systems [40 CFR 112.8(b)(5)]

Facility drainage systems are adequately engineered to prevent oil from reaching navigable waters in the event of equipment failure or human error at the facility. Facility personnel perform regular inspection and maintenance to ensure proper operation

8.3 BULK STORAGE TANKS [40 CFR 112.8(c)]

Effective spill prevention and containment structures and procedures are in place for the bulk storage tanks located at the SMR facility. Bulk storage tank information for the facility is summarized in **Table 8**.

Table 8. Bulk Storage Tank Information

Container/Tank ID#	Product	Maximum Capacity (Gal)	Tank Material	Secondary Containment	Installation Date
T-411	Diesel fuel	300	Steel	Double-walled	2017
BP/EG	Diesel fuel	966	Steel	Double-walled	unknown
Challenge	Spent kitchen grease	300	Steel	HAZMAT Building with integral containment floor and sorbent materials	unknown
DF-1	Diesel fuel	6,000	Steel	Double-walled	2008
G-1	Gasoline	4,000	Steel	Double-walled	2008

Under 40 CFR 112, truck-mounted tanks (i.e. mobile refuelers) are considered bulk storage tanks when stored on-site in a non-transportation mode. The facility does not currently operate or store mobile refuelers on-site. If a mobile refueler is stored on-site in a non-transportation mode, then the following conditions should be met to ensure compliance with the SPCC Rule:

- If a mobile refueler is emptied of its contents while parked on-site, it is not subject to the applicable requirements of the SPCC Rule. The EPA determination for this scenario was addressed in a letter to the Petroleum Marketers Association of America dated February 5, 2001. A copy of this letter on file at the NGVA-FMO-ENV office.
- If a mobile refueler is parked on-site with product, then general secondary containment measures apply to address the most likely discharge scenario. General secondary containment could be implemented by staging a spill kit on or proximate to the regulated container to address the most likely discharge scenario, which is a release from a leaking/faulty valve or fitting.

The applicability of the SPCC Rule to mobile refuelers at military installations was also addressed under guidance from the Departments of the Army and the Air Force (see Memorandum dated July 31, 2001).

There are no mobile refuelers currently stored at the facility.

8.3.1 Tank Compatibility with Stored Fluids [40 CFR 112.8(c)(1)]

The material and construction of the bulk storage tanks and the conditions of storage are compatible with the material stored.

- ASTs are of welded steel construction.
- Many of the ASTs and associated piping have enamel coating on their exteriors to prohibit corrosion.
- AST valves are manually operated.
- ASTs are properly grounded.

8.3.2 Secondary Containment Volume [40 CFR 112.8(c)(2)]

All bulk storage containers located at the SMR have secondary containment sufficient for the entire capacity of the largest container with sufficient freeboard for precipitation with the exception of the 300-gallon kitchen grease AST. The kitchen grease AST is situated inside a HAZMAT Building that has an integral containment floor. The containment floor is capable of holding up to 224 gallons of spilled product.

8.3.3 Drainage of Rainwater from Diked Areas [40 CFR 112.8(c)(3)]

As described in section 8.2.1, the concrete containment berm is inspected prior to the removal of precipitation.

8.3.4 Buried Underground Storage Tanks [40 CFR 112.8(c)(4)]

The SMR has no buried underground petroleum storage tanks.

8.3.5 Partially Buried Metallic Storage Tanks [40 CFR 112.8(c)(5)]

The SMR facility has no partially buried metallic petroleum storage tanks.

8.3.6 Aboveground Storage Tank Testing [40 CFR 112.8(c)(6)]

Periodic integrity testing is performed on the facility's bulk AST. This testing is summarized in **Table 9**.

Table 9. Aboveground Storage Tank Testing

Tank	Type of Testing	Required Documentation	Frequency
G-1 BP-EG T-411 Challenge	Visual observation	None	Daily drive-by or walk around
	Inspection	Yes (Oil Storage Tank and Piping Inspection Checklists in Section C.2)	Monthly/Annually
	Inventory check by manual gauging/wireless tank monitor	Yes	Weekly/As needed
DF-1	Visual observation	None	Daily drive-by or walk around
	Inspection	Yes (Oil Storage Tank and Piping Inspection Checklists in Section C.2)	Monthly/Annually
	Inventory check by manual gauging/wireless tank monitor	Yes	Weekly/As needed
	Formal integrity inspection by a certified STI-SP001 Inspector	Yes	Every 20 years Next Inspection due: October 14, 2028
55-gallon drums	Visual observation	None	Daily
	Inspection	Yes (Oil Storage Tank and Piping Inspection Checklists in Section C.2)	Monthly/Annually

Each aboveground storage container must be tested for integrity on a regular schedule, and whenever material repairs are made. Comparison records must be kept, and container's supports and foundations must be inspected. In addition, the outside of the container must be frequently inspected for signs of deterioration, and discharges. Records of the inspections and tests must be maintained at the facility. The integrity testing requirement of the SPCC rule can be complied with by following an industry standard such as the STI Standard SP001.

The SP001 Standard prescribes a testing procedure involving monthly and annual visual inspections, combined with potential periodic non-destructive testing following a schedule based on tank size, tank age, release detection methods, and presence of a release prevention barrier. In accordance with the STI-SP001, all of the ASTs on-site are considered Category 1 ASTs because they have spill control and continual release detection methods (CRDM). A Category 1 AST that is less than 5,001 gallons can be inspected by authorized SMR personnel on a monthly and annual basis to satisfy the integrity testing requirements of STI-SP001. These tanks include the following:

- G-1: 4,000-gallon gasoline AST;
- BP-EG: 966-gallon diesel fuel AST;
- Challenge: 300-gallon kitchen grease AST; and
- T-411: 300-gallon diesel fuel AST

A Category 1 AST that is 5,001 gallons to 30,000 gallons can also be inspected by authorized SMR personnel on a monthly and annual basis to satisfy the integrity testing requirements of STI-SP001, but must also have a formal external inspection by a certified STI-SP001 Inspector every 20 years.

This would include the 6,000-gallon diesel fuel AST (DF-1). The AST was installed at the facility on October 14, 2008, and will require a formal external inspection by October 14, 2028.

Inspection personnel will be knowledgeable of the SMR's storage operations, the ASTs and their associated components, as well as characteristics of the liquid stored (gasoline and diesel fuel). The monthly and annual inspections must be performed and documented in accordance with Section 6.0 of STI-SP001.

The monthly visual inspections include evaluating the structural integrity of the tank walls and bottom and the integrity of the tank foundation, secondary containment, piping and anchor bolts. In addition to the monthly visual inspections, annual integrity inspections of the ASTs will be performed by facility personnel and/or an outside contractor. Annual inspections will generally focus on similar action items included in the monthly checklist; however, a more rigorous visual inspection will be conducted on the AST and associated appurtenances to ensure the system is suitable for continued service.

A perpetual inventory system is maintained for facility's bulk ASTs to identify losses or gains that may not be accounted for otherwise. Whenever leaks in tanks or plumbing appurtenances are detected, they are corrected as soon as possible. Additional methods for tank integrity testing will be conducted on as as-needed basis. Records of tests will be maintained at the SMR facility.

8.3.7 Internal Heating Coils [40 CFR 112.8(c)(7)]

The SMR facility has no storage tanks with internal heating coils.

8.3.8 Fail-Safe Engineering [40 CFR 112.8(c)(8)]

AST release detection devices and other fail-safe engineering measures are summarized in **Table 10**.

Table 10. Fail-Safe Engineering

Tank	Product	Maximum Capacity (Gal)	Fail-Safe Engineering
T-411	Diesel fuel	300	Double walled, Centeron wireless tank monitoring device.
BP EG	Diesel fuel	966	Double-walled, fuel gauge, automatic leak alarm, and Centeron wireless tank monitoring device.
Challenge	Spent kitchen grease	300	HAZMAT Building containment floor, visual inspections
55-gallon drum	Mineral spirits	55	Situated on spill pallet inside building, visual inspections
55-gallon drums	Kitchen grease	55	Spill containment unit has containment floor, visual inspections
55-gallon drums	Used oil	110	Hazmat storage container has containment floor, visual inspections
DF-1	Diesel fuel	6,000	Double walled, leak alarm, visual inspections, fill port includes overfill prevention valve and spill bucket

Tank	Product	Maximum Capacity (Gal)	Fail-Safe Engineering
G-1	Gasoline	4,000	Double walled, leak alarm, visual inspections, fill port includes overfill prevention valve and spill bucket

8.3.9 Plant Effluent Observation [40 CFR 112.8(C)(9)]

There are no effluent treatment facilities at SMR. Ditches and outfalls of the facility's storm water drainage system are readily visible and inspected daily.

8.3.10 Leak Corrections [40 CFR 112.8(c)(10)]

Facility personnel promptly correct visible oil leaks that result in a loss of oil from tank seams, gaskets, rivets and bolts.

8.3.11 Mobile/Portable Oil Storage Tanks [40 CFR 112.8(c)(11)]

Portable oil storage containers stored at the facility include 55-gallon drums of used motor oil, mineral spirits, and spent kitchen grease. The drums are situated inside secondary containment units or on spill pallets. The pallets and buildings are capable of retaining the entire contents of a 55-gallon drum. All portable storage containers are inspected monthly and annually using the checklist in **Appendix C**.

8.4 FACILITY TRANSFER OPERATIONS [40 CFR 112.8(d)]

Effective spill prevention and containment procedures are in place for aboveground piping used for transferring oil at the SMR facility. These are described in this section.

8.4.1 Buried Piping [40 CFR 112.8(d)(1)]

The 300-gallon diesel fuel emergency generator tank located at Building 411 (T-411) has buried piping associated with it. Any buried piping installed or replaced on or after August 16, 2002 must have a protective wrapping and coating and be cathodically protected. Since the buried piping was installed prior to 2002, this protection is not required. Any future installations or replacements of buried piping must be protected from corrosion and have integrity and leak testing.

8.4.2 Pipeline Out of Service [40 CFR 112.8(d)(2)]

Pipelines not in service or in standby for extended periods are capped or blank flanged and marked as to their origin. AST fill and vent pipes are capped and locked when not in use.

8.4.3 Pipe Supports [40 CFR 112.8(d)(3)]

Pipe supports are properly designed and constructed to minimize abrasion and corrosion and to allow for expansion and contraction.

8.4.4 Aboveground Valves and Pipelines [40 CFR 112.8(d)(4)]

Periodic inspections are performed to ensure the integrity of the aboveground valves and piping.

8.4.5 Aboveground Piping Protection from Vehicular Traffic [40 CFR 112.8(d)(5)]

Fuel dispensers are protected from vehicular traffic by being situated on concrete islands and surrounded by concrete bollards. No other aboveground piping is need of protection from vehicular traffic.

9. OIL PRODUCTION FACILITIES - ONSHORE [40 CFR 112.9]

Not applicable.

10. OIL DRILLING FACILITIES - ONSHORE [40 CFR 112.10]

Not applicable.

11. OIL DRILLING, PRODUCTION - OFFSHORE [40 CFR 112.11]

Not applicable.

12. SUBSTANTIAL HARM CRITERIA APPLICABILITY [40 CFR 112.20]

The DMA has determined that the SMR facility could not, because of its total capacity, reasonably be expected to cause substantial harm to the environment by discharging oil into or on the navigable waters or adjoining shorelines. The attachment C-II of 40 CFR 112.20 is completed and is maintained with this Plan in **Appendix E**. <u>A facility response plan is not required for the SMR facility</u>.

13. OIL SPILL CONTINGENCY PLAN [40 CFR 109.5]

This Spill Contingency Plan provides procedures to respond to oil spills that have the potential to reach inland navigable waters. This Plan is applicable to all spills at the facility.

The control and countermeasure contingencies of the SPCC Plan are implemented when a reportable quantity of oil or a hazardous substance is:

- Released due to activities within the facility; or
- Released outside of the facility and draining onto the facility.

This Plan is stored in a secure location at the SMR facility. This Plan is easily accessible by facility personnel and vendors who may handle or potentially be involved in handling petroleum products and/or hazardous substances. Copies of incidental and major spill flow charts are posted at potential spill sites at the facility.

13.1 AUTHORITIES, RESPONSIBILITIES AND DUTIES [40 CFR 109.5(a)]

The definition of authorities, responsibilities, and duties of persons, organizations, or agencies involved in planning or directing oil removal operations are described in **Table 11**.

Table 11. Responsibilities

Person, Organization, or Agency	Authorities, Responsibilities, and Duties
Discoverer	Primary responsibilities include: • Follow the incidental and major spill response procedures posted on-site. • Notify the appropriate supervisor and Spill Prevention Coordinator of the release. • Assist the Spill Prevention Coordinator in completing spill report forms, as required.
Spill Prevention Coordinator (B&G Supervisor)	Primary responsibilities include: • Immediately notify Post Commander and the State Environmental Specialist (NGVA-FMO-EMV) of any facility spills. NGVA-FMO-EMV will notify the appropriate federal and state agencies of any spills. • Ensure that the On-Scene Commander (OSC) and appropriate agencies are notified if facility personnel cannot adequately respond to a spill. • Coordinate spill response activities with available, trained personnel. Responsibilities to maintain SPCC Plan include: • Report Plan modifications within 6 months of significant facility changes, but no later than three years. • Request Plan modification within 6 months of significant facility changes. • Ensure copies of the Plan are distributed to appropriate personnel at the facility and authorized emergency response agencies who request it. • Ensure facility personnel have been appropriately trained. • Perform inspections. • Review the Plan once every five years.
First Responder, Awareness Level	Primary responsibilities include: • Initiate evacuation, if necessary. Contact response personnel, if necessary. • Assist the Discoverer and Spill Prevention Coordinator in the event of a release. • Stop spill flow when possible without undue risk of personal injury. • Contain the spill using spill response equipment or whatever means is readily available without undue risk of personal injury. • Make spill scene OFF LIMITS to unauthorized personnel. • Restrict all sources of ignition when flammable/combustible substances are involved. • Report to the OSC upon his/her arrival to the scene. • Assist the Spill Prevention Coordinator in completing spill report forms, as required.
On-Scene Commander (OSC)	The senior fire official on the scene will be the initial OSC. The OSC assumes the primary responsibility for actions following a spill and coordinates spill response activities with available, trained personnel. Primary responsibilities include: • Coordinate spill response activities with available, trained personnel. • Request the deployment of spill response team. • Direct the spill response efforts. • Coordinate requirements from the on-scene control group for materials, personnel and equipment.

Person, Organization, or Agency	Authorities, Responsibilities, and Duties
Fire Department	Primary responsibilities include: • Act as the initial OSC until the appointed OSC is on-site. • Immediately respond to spills as necessary to protect life and property with due regard to the environment. • Provide technical assistance to the OSC concerning response to, and handling of, combustible or flammable substances. • Provide personnel as required for the Response Team. • Maintain protective clothing and equipment for response personnel within the Fire Department. • Request the preplanned response operations center to request medical assistance if injuries are reported.
Response Team Members	The Response Team consists of local Fire Department personnel, Regional Emergency Response Team, and/or private spill response contractors. The Response Team will be deployed when requested by the OSC to provide a coordinated effort to contain, control, recover and restore the environment from oil, fuel, or hazardous substance spills. Primary responsibilities include: • Stop spill flow when possible without undue risk of personal injury. • Contain the spill using spill response equipment or whatever means is readily available, without undue risk of personal injury. • Make spill scene OFF LIMITS to unauthorized personnel. • Restrict all sources of ignition when flammable/combustible substances are involved. • Report to the OSC upon his/her arrival to the scene. • Assist the OSC in spill cleanup, area decontamination and restoration efforts.
NGVA-FMO-ENV Personnel	Primary responsibilities include: • Ensure that activities are covered by SPCC Plan. • Ensure that reporting requirements are met. • Coordinate the spill cleanup, area decontamination and restoration efforts.
National Guard Bureau	Primary responsibilities include: • Provide guidance and funds for projects.
DEQ	Primary responsibilities include: • Review the SPCC Plan under conditions specified in 40 CFR 112.4. • Make recommendations to the US EPA Regional Administrator regarding the SPCC Plan and possible modifications.
EPA	Primary responsibilities include: • Review adequacy of the SPCC Plan under conditions specified in 40 CFR 112.4. • Require VAARNG to amend the SPCC Plan if the US EPA feels that the spill might have been prevented or its extent lessened by either physical or procedural changes.

13.2 NOTIFICATION PROCEDURES [40 CFR 109.5(b)]

Notification procedures are established for the purpose of early detection and timely notification of an oil discharge.

13.2.1 Critical Water Use Areas [40 CFR 109.5(b)(1)]

Based on the amount of property and the flow pattern of water through the property, critical water use areas are not considered to be endangered by potential spills of oil or hazardous substances from the facility.

13.2.2 Notification List [40 CFR 109.5(b)(2)]

The current list of responsible persons and alternates on call, organizations and agenies is included below in **Table 12**.

The National Response Center (NRC) should be immediately notified by NGVA-FMO-ENV of a reportable quantity spill. The US EPA Region III should be contacted only if it is impractical to immediately notify the NRC.

13.2.3 Communication System

Facility personnel will be notified of a spill that could pose an immediate threat via telephone, radio system, or word of mouth where practical. NGVA-FMO-ENV will be notified immediately by telephone of all spills or hazardous substances.

The telephone numbers listed in Table 12 are to be used as described in this Plan for federal, state, local, and VAARNG notification of spills or to request additional assistance.

Table 12. Emergency Response Agencies and Telephone Numbers

I. Facility Contact	
Initial Notification (Buildings & Grounds Supervisor)	757-493-3146
Secondary Notification (Post Commander)	757-493-3128
II. Emergency Contact	
Fire, Medical, Police and Emergency	911
NGVA-FMO-ENV (Duty hours)	434-298-6401
Virginia Emergency Operations Center	800-468-8892
Virginia Beach City Manager's Office	757-427-4242
National Response Center[1]	800-424-8802
US EPA Region III (Emergency Response)	800-438-2474
III. Emergency Support	
Virginia Department of State Police	800-553-3144
Virginia Dept. of Environmental Quality (Tidewater Regional Office)	757-518-2000
US Coast Guard	757-686-0851
US EPA Region III (Main Office)	800-438-2474
National Poison Control Center	800-222-1222

[1] The NRC will notify the U.S. Coast Guard and US EPA.

INCIDENTAL
SPILL RESPONSE PROCEDURE

Material released is routine job exposure and there is no immediate threat to life, human health or property (Refer to MSDS)

DISCOVER SPILL

↓

EXERCISE PERSONAL SAFETY

↓

SECURE THE AREA
- **Restrict access**
- **Remove ignition sources**
- **Provide passive ventilation**

↓

NOTIFY SUPERVISOR
AND OTHER AGENCIES AS REQUIRED BELOW

↓

CONTAIN AND CONTROL THE SPILL
1. **STOP THE SOURCE: turn off valve, upright overturned containers**
2. **PROTECT NEARBY STORM OR FLOOR DRAINS: cover with protective mats, lay barrier around drain**
3. **CONTAIN AND PREVENT OVERLAND FLOW OF MATERIAL: surround with absorbent material and place absorbent socks/booms downgradient of spill**

↓

CLEAN UP SPILLED MATERIAL
- **Don personal protective equipment such as gloves or goggles**
- **Inside: sweep up saturated absorbent and spilled materials**
- **Outside: excavate visually contaminated soil/gravel**
- **Place in smallest necessary container**

↓

CONTACT NGVA-FMO-ENV FOR DISPOSAL PROCEDURES,
COMPLETE APPROPRIATE NOTIFICATION FORMS/REPORTS (434) 298-6401

REQUIRED NOTIFICATIONS	
1.Emergency Support Fire, Medical, Police and Emergency ....911 Regional Response Team.................Fire Dept will contact National Poison Control Center 800-222-1222	2.Facility Contact SMR Camp Pendleton.................... 757-493-3146
Quantity Released Greater than 5 gallons: Notify Facility Contact and NGVA-FMO-ENV. Greater than 25 gallons or entering water: Facility Contact or NGVA-FMO-ENV will notify DEQ. Reportable quantity: NGVA-FMO-ENV will immediately notify the NRC. The NRC will notify the US Coast Guard and the USEPA. NGVA-FMO-ENV will contact USEPA Region III only if it is impractical to immediately notify the NRC.	3. Agency Notifications NGVA-FMO-ENV (Duty Hours)................434-298-6401 Virginia Emergency Operations Center..............800-468-8892 DEQ (Tidewater Regional Office)................757-518-2000 National Response Center (NRC)................800-424-8802 US Region III (Main Office)................215-814-5000

MAJOR

SPILL RESPONSE PROCEDURE

Material released is NOT routine job exposure and/or there IS immediate threat to life, human health, or property

(Refer to MSDS)

DISCOVER SPILL

↓

EXERCISE PERSONAL SAFETY

↓

SECURE THE AREA
- **Restrict access**
- **Remove ignition sources**
- **Provide passive ventilation**

↓

STOP THE SOURCE
(if done without endangering personal safety)

↓

NOTIFY SUPERVISOR
AND OTHER AGENCIES AS REQUIRED ON REVERSE

↓

CONTACT RESPONSE PERSONNEL – Call 911
CONTACT AGENCIES LISTED ON REVERSE

↓

MEET RESPONSE PERSONNEL
AT A SAFE DISTANCE FROM SPILL AND DIRECT THEM TO SPILL

↓

SUPERVISOR/RESPONSE TEAM
Coordinate response and cleanup efforts by trained personnel
Properly trained personnel will contain and control the spill
Properly trained personnel will clean up spilled material

↓

CONTACT VAFM-E FOR DISPOSAL PROCEDURES
COMPLETE APPROPRIATE NOTIFICATION FORMS/REPORTS (434) 298-6401

APPENDIX A: GLOSSARY

A.1 ACRONYMS

SMR	State Military Reservation
AR	Army Regulation
AST	Aboveground Storage Tank
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulation
DEQ	Virginia Department of Environmental Quality
DMA	Virginia Department of Military Affairs
DOD	Department of Defense
DOT	Department of Transportation
EPA	United States Environmental Protection Agency
GAL	Gallon
GAL/MIN	Gallons per Minute
HAZMAT	Hazardous Material
LEPC	Local Emergency Planning Committee
MOGAS	Motor Vehicle Gasoline
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
OSC	On-Scene Commander
PAO	Public Affairs Office
PE	Professional Engineer
POL	Petroleum, Oil, and Lubricants
RQ	Reportable Quantity
SDO	Storm Water Discharge Outfall
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
TSCA	Toxic Substances Control Act
TPU	Tank and Pumping Unit
US	United States
UST	Underground Storage Tank
VAARNG	Virginia Army National Guard

A.2 DEFINITIONS [40 CFR 112.2]

Catastrophic spill: A catastrophic spill is a sudden, unexpected release of any hazardous material (including POLs) which poses, due to its quantity, toxicity, flammability, or other chemical or physical property, an immediate and severe threat to human health, property, and/or surrounding environmental conditions. Quantities will vary with the type of hazardous materials released and the location of the release.

Discharges: Includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying or dumping of oil or other hazardous material, or any action that violates applicable water quality standards; causes a film, sheen or discoloration of the surface of the water or adjoining shoreline; causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shoreline; or affects the quality of the groundwater.

Discharge of oil in harmful quantities: Include discharges of oil into or upon the navigable waters of the United States or adjoining shorelines in such quantities that (a) violate applicable water quality standards, or (b) cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

Hazardous Materials: For the purposes of this document, hazardous materials refer to hazardous materials and hazardous wastes.

Hazardous Substance: Any substance designated under section 311 (b)(2)(A) of the Clean Water Act; any CERCLA reportable substance; any hazardous waste; any toxic pollutant listed under section 307 (a) of the Clean Water Act, e.g. National Pollutant Discharge Elimination System (NPDES) effluent limits; and any Toxic Substances Control Act (TSCA) imminently hazardous chemical substance or mixture, e.g., PCBs.

Hazardous Waste: Refer to 40 CFR 261.3.

Incidental spill: An incidental spill is defined as a release of hazardous materials that can be readily and easily handled, with no health or safety risk, by personnel from the immediate vicinity of the release. Quantities will vary with the type of hazardous materials released and the location of the release.

Major spill: A major spill is defined as a release of hazardous materials that cannot be readily and easily handled by facility personnel, may pose health or safety risks, or threatens an environmentally sensitive receptor. Quantities will vary with the type of hazardous materials released and the location of the release.

Navigable Waters: Defined by EPA as all water subject to the ebb and flow of the tide; interstate waters, including interstate wetlands; intrastate lakes, rivers, streams, intermittent streams, mudflats, sandflats and wetlands.

Oil: Oil of any kind or in any form, including but not limited to, petroleum, fuel oil, sludge, oil refuse and oil mixed with waste other than dredged soil.

OSC: The On-Scene Commander is responsible for all spill response activity at the site and for coordinating all response personnel. The senior fire official on the scene will serve as the initial OSC until replaced by the appointed OSC.

Releases: Means any spilling or escaping of oil or hazardous materials into the environment, e.g. navigable waters, any surface water, groundwater, drinking water supply, land surface or subsurface strata, ambient air.

Reportable Spills - Pollution spills must be reported to regulatory authorities if they:

(1) soak into the ground, or enters *"waters of the Commonwealth,"* regardless of size,
(2) are hazardous to human health or detrimental to aquatic or terrestrial species of plants or animals,
(3) are a threat to, or result in, contamination of underground or surface water,
(4) cause a film or sheen upon, or discoloration of, the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines,
(5) violate applicable water quality standards,
(6) exceed quantities listed in 40 CFR 302.4 and amendments, or
(7) are possible causes of unfavorable publicity for the Department of Defense (DOD) or its agencies.

Spill Event: A discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined at 40 CFR part 110.

APPENDIX B:
SPILL MITIGATION ACTION, CONTAINMENT, AND CLEANUP

B.1 SPILL MITIGATION ACTION

WARNING: Spilled fuel constitutes a hazard of fire and explosion with the threat to human life and destruction of property. Petroleum vapors are also hazardous to personnel due to anesthetic and toxic concentrations below explosive levels. Volatile fuel may cause skin irritation if allowed to remain on the skin (e.g., soaked gloves and/or clothing). Personnel safety and protection of life and limb take precedence over environmental protection. If there is a threat to personnel safety, the local fire department should be the first official agency notified. Special precautions should be exercised when handling JP-8 fuel or MOGAS.

SPILL MITIGATION ACTION	
Aboveground Tanks	
Within an area without secondary containment	1. NOTIFY THE Spill Prevention Coordinator and convey the following information: a. Location of spill, b. Extent/quantity of spill, c. Source/cause of spill, d. Whether or not spill flow has been stopped, and e. Action taken to contain the spill. 2. STOP THE SPILL SOURCE if possible. 3. ESTABLISH FIRE PREVENTION measures around the vicinity of the spill. 4. Refer to General Spill Containment/Spill Cleanup Procedures outlined below.
At the Fuel Storage Area	1. STOP THE PUMPS. SPREAD ABSORBENT MATERIALS to retard spread of fuel. If the spill occurs at the commercial tanker truck unloading areas, spread absorbent materials to prevent the spilled products from reaching unpaved surfaces or area drains. 2. NOTIFY THE Spill Prevention Coordinator and convey the following information: a. Location of spill, b. Extent/ quantity of spill, c. Source/ cause of spill, d. Whether or not spill flow has been stopped, and e. Action taken to contain the spill. 3. ESTABLISH FIRE PREVENTION measures around the vicinity of the spill. 4. Refer to General Spill Containment/ Cleanup Procedures outlined below.
From a Tank Truck Rupture while parked	1. SPREAD ABSORBENT MATERIALS to retard the flow of spill. Provide temporary curbing to prevent the spilled materials from reaching any storm drain. 2. NOTIFY THE Spill Prevention Coordinator and convey the following information: a. Location of spill, b. Extent/ quantity of spill, c. Source/ cause of spill, d. Whether or not spill flow has been stopped, and e. Action taken to contain the spill. 3. ESTABLISH FIRE PREVENTION measures around the vicinity of the spill. 4. Refer to General Spill Containment/ Cleanup Procedures outlined below.

B.2 CONTAINMENT/CLEANUP PROCEDURES

NOTE: Containment and cleanup of spill incidents which potentially may expose workers to hazardous materials, health hazards, or safety hazards must be performed by personnel properly trained in accordance with OSHA, hazardous waste operations and emergency response training protocol.

B.2.1 SPECIFIC CONTAINMENT/CLEANUP INFORMATION

Specific spill containment/spill cleanup information is available on the product Material Safety Data Sheets, which are available in the work areas. Refer to this information for emergency response. This information includes:

- Emergency response,
- Spill containment procedures,
- Cleanup procedures,
- Container,
- Personal Protective Equipment, and
- Fire Extinguisher.

B.2.2 GENERAL CONTAINMENT/CLEANUP INFORMATION

B.2.2.1 Equipment and Resources

Disposable equipment and resources are used for containment and cleanup procedures whenever possible, and are disposed of along with the spilled substance. These items are replaced to their prior inventory level as soon as practically possible. Non-disposable equipment used are properly decontaminated and restored to readiness for future use.

B.2.2.2 Guides to Containment Operations

Table B.1 and **Table B.2** below provide information to assist with the containment operations of various types of oil spills.

Table B.1 Guide To Containment Operations On Water Courses

WATERCOURSE	LARGE AMOUNTS OF OIL AND FIRST STAGE OPERATIONS	SMALL AMOUNTS OF OIL AND SECOND STAGE OPERATIONS
Ditches	Improvised Dam	Absorbent
Streams – Shallow, small flow	Underflow Dam	Absorbent
Streams – Shallow, large flow	Overflow and Fixed Dams	Overflow Dam and Fixed Boom and Absorbent
Pond	Boom plus Sweep Boom	Boom and Absorbent

Table B.2 Guide to Containment Operations on Ground Surfaces

GROUND SURFACES	LARGE AMOUNTS OF OIL AND FIRST STAGE OPERATIONS	SMALL AMOUNTS OF OIL AND SECOND STAGE OPERATIONS
Asphalt	Boom or Absorbent Pads	Dry Granular Absorbent
Concrete	Boom or Absorbent Pads	Dry Granular Absorbent
Grass	Earth Fill Barrier/Reservoir	Absorbent Pads
Indoor floors	Absorbent Pads	Dry Granular Absorbent

B.2.2.3 Containment Dams and Barriers

Several approaches to oil spill control are suggested in this section, including dams and barriers.

Earth Fill Dams - An earth fill dam, in one form or another, is commonly used for spill containment. Dams of this type may range from simple, manually constructed fills to more elaborate, controlled-flow structures designed to trap oil on water. Ideally, a spill should be caught in its earliest stage close to the source, thus permitting the simplest means of containment and recovery, and with minimal damage to the surroundings.

Spills that occur on dry land, remote from water, generally provide better prospects for effective containment with an earth fill barrier forming a temporary reservoir. A dry ditch or ravine can be blocked with minimum effort. A shallow holding pond can be formed by trenching and terracing. The options will vary with terrain, spill volume, soil conditions, lead-time, manpower, equipment availability, etc. Lead-time is the most critical factor in an event and dictates where and how containment efforts must proceed.

Dams should be constructed and compacted by whatever means possible. If a track vehicle is available, a width of 6-8 feet is needed at the top. The usual fall angle of the earth will suffice for sloping. The top of the dam should be 3-4 feet higher than the level to which the oil-water layers are expected to rise.

Reservoirs - Construction of a reservoir (dry land) impoundment will buy time to allow removal of the spill material. Complications such as heavy rain washing over the structure, or floating oil over the dam may occur. These hazards must be considered in the initial phases of response and precautions taken.

If surface water drainage is anticipated, preparations should be made to pump or siphon off the water to the downgrade side. Valved pipes of adequate size extended through the dam during construction may offer an alternate solution. If valves are not available, set the intake at an upstream low point (well below oil level) and the discharge at the desired surface level.

This water bypass arrangement is also useful in cases where the spill has already reached a flowing stream or creek. Practical limits depend on flow rate of the stream and being able to provide sufficient water bypass capability. Necessary pipe size for low rates above 30 cu. ft./sec. is in the range of 24 to 30 inches diameter. Multiple pipes can be used; however, it may be more practical to consider some other type of underflow dam.

Sorbent Materials - Commercially supplied sorbent materials may be used if they are available and have the physical characteristics to perform adequately. A boom or barrier must be continuously maintained. At the completion of an emergency, material added to a stream must be removed and disposed of properly.

Placement of a barrier is critical with respect to water velocity. Chances of spill recovery diminish rapidly in water moving faster than 1-1/2 to 2 feet per second. The more quiescent pools of the stream should be selected for containment operations. At least two barriers, and preferably three or more, should be placed in series along the stream leaving work space between barriers for small boats, skimming devices and other necessary equipment. The spill material should be removed before significant seepage occurs.

B.2.2.4 Cleanup

NGVA-FMO-ENV will direct all activity related to the cleanup of a spill site. The restoration of impacted areas of the environment will be conducted after an evaluation of the remedial alternatives and their respective costs. Testing to determine the degree and extent of the environmental impact may be needed during the evaluation process. The Buildings & Grounds Supervisor has the responsibility of approving the course of action chosen and ensuring the action is carried out.

APPENDIX C: MASTER FORMS

C.1 SPILL ACCIDENT REPORT

Complete this information if a spill incident occurs. **BE SPECIFIC**; “unknown’’ is not an acceptable answer. Completed copies of this spill report must be forwarded through normal command channels to arrive at NGVA-FMO-ENV within five (5) working days.

1. Location:

2. Date and Time:

3. Type of Material, Quantity and Duration of Release:

4. Source and Cause:

5. Body of Water Adjacent to Spill (include streams, swamps, and ditches):

6. Injuries (including physical exposure) and Property Damage:

7. Agencies Notified, Contact Person’s Name, and Telephone Number (fire, police, VAARNG, etc.):

8. Responding Agency and Phone (fire, police, DEQ, Emergency Services):

9. Responding Agency Contact Person and Phone:

10. Cleanup Actions Taken:

11. If No Cleanup, Why Not?

12. Name and Work Phone of Person completing this Report:

13. Additional Remarks (attach additional sheets if necessary and copies of any reports generated by responding agencies):

Retain Form for 3 Years

C.2 MONTHLY/ANNUAL OIL STORAGE TANK AND PIPING INSPECTION CHECKLIST

Complete inspection record monthly for each AST and associated piping. Visually inspect tank and piping and place a check or X in the appropriate box for each item. If any item needs elaboration, use the comments space provided. Attach any additional information on a separate sheet of paper if necessary. This form satisfies the requirements for monthly and annual AST inspections.

Building/Area: SMR Camp Pendleton Date:_______________

Inspector:______________________

Tank	**DF-1**	**G-1**	**BP EG**	**Challenge**	**T-411**	**Drum**
Contents	Diesel Fuel	Gasoline	Diesel Fuel	Kitchen Grease	Diesel Fuel	Mineral Spirits
Capacity (gal)	6,000	4,000	966	300	300	55
Location	Building 422	Building 422	Building 260D	B and 3rd Street	Bldg 411	Bldg 66

	YES	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**
Are exterior coatings rusted, cracked, bubbled and/or damaged?																		
Are there noticeable distortions, buckling, denting or bulging of tank/container shell?																		
Are tank supports deteriorated or buckled?																		
Do tank bottoms have accumulated rust, scale, micro-organisms, or foreign material?																		
Are drainage pipes/valves operable?																		
Is tank foundation eroded, settled or cracked?																		
Are bolts, rivets, or seams damaged, cracked, or rusted?																		
Is emergency vent on tank operable?																		
Is leak detection system damaged or not operating properly?																		
Is overfill prevention device in working condition?																		
Are piping external coatings bubbled, cracked, or damaged?																		
Are there visible signs of leakage, dead vegetation or staining near tank and/or piping?																		
Is tank liquid level gauge readable and in good condition?																		
Is spill equipment available and accessible?																		
Is water in primary tank, secondary containment, or spill containment?																		
Is oil accumulation in containment area?																		

COMMENTS:

C.2 MONTHLY/ANNUAL OIL STORAGE TANK AND PIPING INSPECTION CHECKLIST

Complete inspection record monthly for each AST and associated piping. Visually inspect tank and piping and place a check or X in the appropriate box for each item. If any item needs elaboration, use the comments space provided. Attach any additional information on a separate sheet of paper if necessary. This form satisfies the requirements for monthly and annual AST inspections.

Building/Area: SMR Camp Pendleton Date:_______________

Inspector:______________________

Tank	**Drum**			**Drum**														
Contents	Used Oil			Kitchen Grease														
Capacity (gal)	55			55														
Location	Bldg 362			Bldg 408														
	YES	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**	**YES**	**NO**	**N/A**
Are exterior coatings rusted, cracked, bubbled and/or damaged?																		
Are there noticeable distortions, buckling, denting or bulging of tank/container shell?																		
Are tank supports deteriorated or buckled?																		
Do tank bottoms have accumulated rust, scale, micro-organisms, or foreign material?																		
Are drainage pipes/valves operable?																		
Is tank foundation eroded, settled or cracked?																		
Are bolts, rivets, or seams damaged, cracked, or rusted?																		
Is emergency vent on tank operable?																		
Is leak detection system damaged or not operating properly?																		
Is overfill prevention device in working condition?																		
Are piping external coatings bubbled, cracked, or damaged?																		
Are there visible signs of leakage, dead vegetation or staining near tank and/or piping?																		
Is tank liquid level gauge readable and in good condition?																		
Is spill equipment available and accessible?																		
Is water in primary tank, secondary containment, or spill containment?																		
Is oil accumulation in containment area?																		

COMMENTS:

C.3 RELEASE OF SECONDARY CONTAINMENT DRAINAGE

Building/Area: ______________________________ Date: __________

Inspector: ______________________________ Time: __________

Description of Secondary Containment Structure: ______________________________

A. Visual Observation of Accumulation Rainwater:

ITEM	YES	NO	COMMENTS
COLOR			
FOAM			
SUSPENDED SOLIDS			
OUTFALL STAINING			
OIL SHEEN			
DRY WEATHER FLOW			
OTHER INDICATORS:			

If accumulated rainwater appears contaminated, list actions that were taken to remove contaminants:

____

____

B. Release of Accumulated Rainwater:

What was the approximate depth of water released from the containment area?

______________________ ☐ inches

After the release of the accumulated rainwater, was the secondary containment drain valve properly closed and locked? ☐ yes ☐ no

C. Comments:

____

____

Retain Form for 3 Years

C.4 TRAINING ROSTER

The following Training Roster is used to record personnel trained, units assigned, and date of training for the annual spill prevention training, annual spill response exercises, and periodic briefings. These records are maintained with the Plan for at least three years.

TRAINING ROSTER		
Training Topic________________________________ Training Date ________________________________		
Personnel	**Unit/Assignment**	**Phone**

Retain Form for 3 Years

APPENDIX D: APPLICABLE REGULATIONS

APPENDIX D: APPLICABLE REGULATIONS

1. Army Regulation 200-1, Environmental Protection and Enhancement, August 2007.

2. Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972 as amended by Public Law 95-214, Clean Water Act of 1977, 27 December 1977 and Public Law 95-576, Amendments to the Clean Water Act, 14 October 1978.

3. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (Public Law 96-5 10, 11 December 1980).

   Title 29, CFR, Part 1200.

   Title 29, CFR, Part 1910.120(q).

4. Title 40, CFR, Part 109, Criteria for State, Local and Regional Oil Removal Contingency Plans.

5. Title 40, CFR, Part 110, Discharge of Oil.

6. Title 40, CFR, Part 112, Oil Pollution Prevention.

7. Title 40, CFR, Part 116, Designation of Hazardous Substances.

8. Title 40, CFR, Part 117, Determination of Reportable Quantities for Hazardous Substances.

9. National Fire Protection Association, NFPA 329, Underground Leakage of Flammable and Combustible Liquids, 1983.

10. Final Rule, National Oil and Hazardous Substances Contingency Plan, 47 Federal Register 31180, 16 July 1982.

11. 9 VAC 25-91-10 *et seq*., Facility and Aboveground Storage Tank Regulation, June 24, 1998.

Table D.1 CROSS-REFERENCE BETWEEN 40 CFR 112 AND SPCC PLAN	
Regulatory Reference	**SPCC Plan Reference**
40 CFR 112, Subpart A – Applicability, Definitions, and General Requirements for All Facilities and All Types of Oils	
40 CFR 112.1 General applicability.	
(a)	1.1
(b)	1.2
(c)	1.2.1
40 CFR 112.2 Definitions.	2
40 CFR 112.3 Requirement to prepare and implement a Spill Prevention, Control and Countermeasure Plan.	
(a)	3.1
(b)	3.2
(c)	3.3
(d)	3.4
(e)	3.5
(f)	3.6
40 CFR112.4 Amendment of SPCC Plan by Regional Administrator.	
(a)(1-9)	4.1
(b)	4.2
(c)	4.3
(d)	4.4
(e)	4.4
(f)	4.4
40 CFR 112.5 Amendment of SPCC Plan by owners or operators.	
(a)	5.1
(b)	5.1
(c)	5.2
40 CFR 112.6 Reserved.	6
40 CFR 112.7 General requirements for SPCC Plans.	
(a)(1-5)	7.1
(b)	7.2
(c)(1-2)	7.3, 7.4
(d)(1-2)	7.5
(e)	7.6, 7.7
(f)(1-3)	7.8
(g)(1-5)	7.9
(h)(1-3)	7.10
(i)	7.11
(j)	7.12
40 CFR 112, Subpart B – Requirements for Petroleum Oils and Non-Petroleum Oils, Except Animal Fats and Oils and Greases, and Fish and Marine Mammal Oils; and Vegetable Oils (Inlcuding Oils from Seeds, Nuts, Fruits, and Kernels)	
40 CFR 112.8 SPCC Plan requirements for onshore facilities (excluding production facilities).	
(a)	8.1
(b)(1-5)	8.2
(c)(1-11)	8.3
(d)(1-5)	8.4
40 CFR 112.9 SPCC Plan requirements for onshore oil production facilities.	9
40 CFR 112.10 SPCC Plan requirements for onshore oil drilling and workover facilities.	10

Table D.1 CROSS-REFERENCE BETWEEN 40 CFR 112 AND SPCC PLAN	
Regulatory Reference	**SPCC Plan Reference**
40 CFR 112.11 SPCC Plan requirements for offshore drilling, production, or workover facilities.	11
40 CFR 112, Subpart C – Requirements for Animal Fats and Oils and Greases, and Fish and Marine Mammal Oils; and Vegetable Oils, Including Oils from Seeds, Nuts, Fruits, and Kernels.	Not Applicable
40 CFR112, Subpart D – Response Requirements	
40 CFR 112.20 Facility response plans.	12

APPENDIX E: CERTIFICATIONS, REVIEWS AND AMENDMENTS

E.1 PROFESSIONAL ENGINEER CERTIFICATION [40 CFR 112.3(d)]

The Plan has been reviewed and certified by a Registered Professional Engineer as follows:

"I hereby certify that, being familiar with the provisions of Federal Regulation 40 CFR 112 and I or my agent having visited the facility, this Plan has been prepared in accordance with reasonable and prudent engineering practices, this Plan satisfies the current requirements of the aforementioned regulations, this Plan provides for the required inspections and testing, and this Plan is adequate for the facility."

This certification in no way relieves the facility of its duty to prepare and fully implement this SPCC Plan in accordance with the requirements of 40 CFR Part 112. This Plan is valid only to the extent that the SMR facility maintains, tests, and inspects equipment, containment, and other devices as prescribed in this Plan.

Name:	Andrew E. Kassoff, PE, PG
Signature:	
Date:	1/16/2017
Registration No.:	0402043711
State:	Virginia

COMMONWEALTH OF VIRGINIA
ANDREW E. KASSOFF
Lic. No. 43711
1/16/2017
PROFESSIONAL ENGINEER

E.2 MANAGEMENT APPROVAL [40 CFR 112.7(d)(2)]

This SPCC Plan has been carefully reviewed by Management. Management concurs and supports the programs and procedures which are to be implemented, periodically reviewed, and updated in accordance with Federal Regulation 40 CFR 112 (Oil Pollution Prevention) and AR 200-1 (Environmental Protection and Enhancement). Management approval has been extended at a level with authority to commit the necessary resources.

Signature: ____

E.3 RECORD OF REVIEW/REVISION [40 CFR 112.5(c)]

This sheet is used as the Plan record of reviews and amendments. The amended Plan must be certified by a PE. Administrative type revisions and deletions to the Plan, which do not materially affect the facility's potential for a discharge of oil do not require PE re-certification.

DATE	REMARKS	SIGNATURE
Feb. 1998	Revised by HDR Engineering	
Jan. 2002	Revised by Malcolm Pirnie, Inc.	
Mar. 2003	Updated by Malcolm Pirnie, Inc.	
Aug. 2010	Plan Update - EEE	M. Mutuc, P.E.
Jan. 2012	Revised to add 500-gal AST - EEE	R. Ward, P.E.
Sept. 2014	Revised to remove 500-gal AST & add new drainage - EEE	M. Mutuc, P.E.
Jan. 2017	Revised to remove 100-gal AST and add 300-gal AST-EEE	A. Kassoff, P.E., P.G.

For example:

DATE	*REMARKS*	*SIGNATURE*
Feb. 2001	*Revised sections 7.7 and 7.8*	*Daniel J. O'Connor*

E.4 CERTIFICATION OF THE APPLICABILITY OF THE SUBSTANTIAL HARM CRITERIA
(Attachment C-II, 40 CFR 112.20)

Facility Name: State Military Reservation, Department of Military Affairs
Facility Address: General Booth Boulevard, Virginia Beach, VA

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?
   Yes ________ No ___X___

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?
   Yes ________ No ___X___

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response plans: Fish and Wildlife and Sensitive Environments" (See Appendix E to this part, section 10, for availability) and the applicable Area Contingency Plan.
   Yes ________ No ___X___

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake?
   Yes ________ No ___X___

5 Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?
   Yes ________ No ___X___

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Signature: ______________________________

Name (please type or print): ______________________________

Title: ______________________________

Date: ______________________________

Camp Pendleton
203 Red Horse Drive
Virginia Beach, VA 23451

Inquiry Number: 5678861.2s
June 11, 2019

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

203 RED HORSE DRIVE
VIRGINIA BEACH, VA 23451

COORDINATES

Latitude (North):	36.8162220 - 36˚ 48' 58.39''
Longitude (West):	75.9813330 - 75˚ 58' 52.79''
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	412471.8
UTM Y (Meters):	4074732.0
Elevation:	12 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5952437 VIRGINIA BEACH, VA
Version Date:	2013
West Map:	5950981 PRINCESS ANNE, VA
Version Date:	2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20140705
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
203 RED HORSE DRIVE
VIRGINIA BEACH, VA 23451

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
A1	CAMP PENDLETON STATE	203 RED HORSE DR	VA UST, VA AST		TP
A2	203RD RED HORSE SQUA	RED HORSE DR	PA MANIFEST		TP
A3	203RD RED HOURSE SQU	203 RED HORSE DRIVE	RCRA-CESQG, FINDS, ECHO		TP
A4	VIRGINIA AIR NATIONA	203 RED HORSE DR	VA RGA LUST		TP
A5	USN CAMP PENDLETON	BIRDNECK RD S & GEN	SEMS		TP
A6	USN CAMP PENDLETON	BIRDNECK RD S & GEN	FINDS		TP
A7	CAMP PENDLETON	GENERAL BOOTH BLVD,	VA TIER 2		TP
A8	VAARNG-SMR	203 RED HORSE DRIVE	RCRA-CESQG		TP
A9	VIRGINIA ARMY NATION	GENERAL BOOTH BLVD,	VA TIER 2		TP
A10	DMA AIR NATIONAL GUA	203 RED HORSE LN	VA RGA LUST		TP
A11	CAMP PENDLETON ST MI	203 RED HORSE LANE	VA RGA LUST		TP
A12	CAMP PENDLETON ST MI	203 RED HORSE DR	VA LUST, VA LTANKS, VA SPILLS		TP
A13	DMA AIR NATIONAL GUA	203 RED HORSE LANE	VA RGA LUST		TP
A14	STATE MILITARY RESER	GENERAL BOOTH BLVD,	VA TIER 2		TP
A15	US ARMY NATIONAL GUA	203 RED HORSE DRIVE	TRIS		TP
Reg	DAM NECK NAVAL TRAIN		DOD	Same	4363, 0.826, South
Reg	OCEANA NAVAL AIR STA		DOD	Same	2597, 0.492, WNW
16	HISTORIC MORTAR RANG		UXO	Higher	1 ft.
B17	EROSION / DREDGE OPE	701 GENERAL BOOTH BL	VA UST	Lower	1 ft.
B18	VIRGINIA BEACH CITY	701 GENERAL BOOTH BL	VA LUST, VA LTANKS	Lower	1 ft.
19	MID-ATLANTIC MIL. FA	1200 SOUTH BIRDNECK	RCRA-CESQG	Higher	1 ft.
C20	VIRGINIA BEACH ARMOR	1096 SOUTH BIRDNECK	VA UST	Higher	1 ft.
C21	VAARNG-ARMORY-VIRGIN	1096 S BIRDNECK RD	RCRA-CESQG, FINDS, ECHO	Higher	1 ft.
D22	SHELL VA 067	900 GENERAL BOOTH BL	VA UST, VA Financial Assurance	Higher	87, 0.016, SW
D23	CROWN VA 067	900 GENERAL BOOTH BL	VA LUST, VA LTANKS	Higher	87, 0.016, SW
D24	CROWN CENTRAL PETROL	900 GENERAL BOOTH BL	EDR Hist Auto	Higher	87, 0.016, SW
25	VA MARINE SCIENCE MU	717 GENERAL BOOTH BL	RCRA-CESQG, FINDS, ECHO	Lower	102, 0.019, NNW
26	HOLIDAY FOOD MART	909 GENERAL BOOTH BL	VA UST, VA Financial Assurance	Higher	333, 0.063, SW
E27	BIRDNECK ELEMENTARY	957 S BIRDNECK RD	VA UST, VA Financial Assurance	Higher	760, 0.144, WSW
E28	STATE MILITARY RESER	940 S BIRDNECK RD	VA UST	Higher	794, 0.150, WSW
E29	SEATACK FIRE STATION	949 S BIRDNECK RD	VA UST, VA AST	Higher	936, 0.177, WSW
E30	VIRGINIA BEACH CITY	949 S BIRDNECK RD	VA LUST, VA LTANKS, VA SPILLS	Higher	936, 0.177, WSW
31	MATHEWS ACHAMMA PROP	523 GENERAL BOOTH BL	VA LTANKS	Higher	1792, 0.339, NNE
32	REDWING GOLF COURSE	1080 PROSPERITY ROAD	VA LUST, VA LTANKS, VA UST, VA AST, VA SPILLS	Higher	1920, 0.364, SSW

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 8 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
CAMP PENDLETON STATE 203 RED HORSE DR VIRGINIA BEACH, VA 23451	VA UST Tank Status: REM FROM GRD Facility Id: 5008237 CEDS Facility ID: 200000067563 VA AST Facility ID: 5008237 CEDS Facility ID: 200000067563	N/A
203RD RED HORSE SQUA RED HORSE DR VIRGINIA BEACH, VA 23451	PA MANIFEST Generator EPA Id: VAD982364069	N/A
203RD RED HOURSE SQU 203 RED HORSE DRIVE VIRGINIA BEACH, VA 23451	RCRA-CESQG EPA ID:: VAD982364069 FINDS Registry ID:: 110060259955 ECHO Registry ID: 110060259955	VAD982364069
VIRGINIA AIR NATIONA 203 RED HORSE DR VIRGINIA BEACH, VA	VA RGA LUST Facility ID: 200000067563	N/A
USN CAMP PENDLETON BIRDNECK RD S & GEN VIRGINIA BEACH, VA 23453	SEMS Site ID: 0302842 EPA Id: VA1170090012	VA1170090012
USN CAMP PENDLETON BIRDNECK RD S & GEN VIRGINIA BEACH, VA 23453	FINDS Registry ID:: 110009315669	N/A
CAMP PENDLETON GENERAL BOOTH BLVD, VIRGINIA BEACH, VA 23458	VA TIER 2	N/A
VAARNG-SMR 203 RED HORSE DRIVE VIRGINIA BEACH, VA 23451	RCRA-CESQG EPA ID:: VAD982677452	VAD982677452
VIRGINIA ARMY NATION GENERAL BOOTH BLVD, VIRGINIA BEACH, VA 23458	VA TIER 2	N/A

EXECUTIVE SUMMARY

DMA AIR NATIONAL GUA 203 RED HORSE LN VIRGINIA BEACH, VA	VA RGA LUST Facility ID: 200000067563	N/A
CAMP PENDLETON ST MI 203 RED HORSE LANE VIRGINIA BEACH, VA	VA RGA LUST Facility ID: 200000067563	N/A
CAMP PENDLETON ST MI 203 RED HORSE DR VIRGINIA BEACH, VA 23451	VA LUST Database: LUST REG TD, Date of Government Version: 06/30/2013 Facility Status: Closed Facility ID: 200000067563 Pollution Complaint Num: 19982272 Pollution Complaint Num: 20045014 VA LTANKS Facility Status: Closed CEDS Facility Id: 200000067563 Pollution Complaint #: 20045014 Pollution Complaint #: 19982272 VA SPILLS Database: SPILLS, Date of Government Version: 02/04/2019 Facility Status: Closed IR Number: 2015-T-0517	N/A
DMA AIR NATIONAL GUA 203 RED HORSE LANE VIRGINIA BEACH, VA	VA RGA LUST Facility ID: 200000067563	N/A
STATE MILITARY RESER GENERAL BOOTH BLVD, VIRGINIA BEACH, VA 23458	VA TIER 2	N/A
US ARMY NATIONAL GUA 203 RED HORSE DRIVE VIRGINIA BEACH, VA 23451	TRIS TRIS ID: 2345WCTCCM23RED	2345WCTCCM23RED

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR’s search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL - National Priority List

EXECUTIVE SUMMARY

Proposed NPL - - - - - - - - - - - - - - - Proposed National Priority List Sites
NPL LIENS - - - - - - - - - - - - - - - - - Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL - - - - - - - - - - - - - - - - National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY - - - - - - - - - Federal Facility Site Information listing

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE - - - - - - - - - - - - Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS - - - - - - - - - - - - - - - - - Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF - - - - - - - - - - - - - - - - RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG - - - - - - - - - - - - - - - - - RCRA - Large Quantity Generators
RCRA-SQG - - - - - - - - - - - - - - - - - RCRA - Small Quantity Generators

Federal institutional controls / engineering controls registries

LUCIS - Land Use Control Information System
US ENG CONTROLS - - - - - - - - - Engineering Controls Sites List
US INST CONTROL - - - - - - - - - - Sites with Institutional Controls

Federal ERNS list

ERNS - Emergency Response Notification System

State- and tribal - equivalent CERCLIS

VA SHWS - - - - - - - - - - - - - - - - - - - This state does not maintain a SHWS list. See the Federal CERCLIS list and Federal NPL list.

State and tribal landfill and/or solid waste disposal site lists

VA SWF/LF - - - - - - - - - - - - - - - - - Solid Waste Management Facilities

State and tribal leaking storage tank lists

INDIAN LUST - - - - - - - - - - - - - - - Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

FEMA UST - - - - - - - - - - - - - - - - - - Underground Storage Tank Listing
INDIAN UST - - - - - - - - - - - - - - - - Underground Storage Tanks on Indian Land

EXECUTIVE SUMMARY

State and tribal institutional control / engineering control registries

VA ENG CONTROLS _ _ _ _ _ _ _ _ _ Engineering Controls Sites Listing
VA INST CONTROL _ _ _ _ _ _ _ _ _ _ Voluntary Remediation Program Database

State and tribal voluntary cleanup sites

VA VCP _ Voluntary Remediation Program
INDIAN VCP _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

VA BROWNFIELDS _ _ _ _ _ _ _ _ _ _ Brownfields Site Specific Assessments

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS _ _ _ _ _ _ _ _ _ _ A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

INDIAN ODI _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Report on the Status of Open Dumps on Indian Lands
DEBRIS REGION 9 _ _ _ _ _ _ _ _ _ _ Torres Martinez Reservation Illegal Dump Site Locations
ODI _ Open Dump Inventory
IHS OPEN DUMPS _ _ _ _ _ _ _ _ _ _ Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Delisted National Clandestine Laboratory Register
US CDL _ National Clandestine Laboratory Register

Local Land Records

LIENS 2 _ CERCLA Lien Information

Records of Emergency Release Reports

HMIRS _ Hazardous Materials Information Reporting System
VA SPILLS 90 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR _ _ _ _ _ _ _ _ _ RCRA - Non Generators / No Longer Regulated
FUDS _ Formerly Used Defense Sites
SCRD DRYCLEANERS _ _ _ _ _ _ _ State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Financial Assurance Information
EPA WATCH LIST _ _ _ _ _ _ _ _ _ _ _ _ EPA WATCH LIST
2020 COR ACTION _ _ _ _ _ _ _ _ _ _ _ 2020 Corrective Action Program List
TSCA _ Toxic Substances Control Act
SSTS _ Section 7 Tracking Systems
ROD _ Records Of Decision
RMP _ Risk Management Plans

EXECUTIVE SUMMARY

RAATS	RCRA Administrative Action Tracking System
PRP	Potentially Responsible Parties
PADS	PCB Activity Database System
ICIS	Integrated Compliance Information System
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS	Material Licensing Tracking System
COAL ASH DOE	Steam-Electric Plant Operation Data
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER	PCB Transformer Registration Database
RADINFO	Radiation Information Database
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS	Incident and Accident Data
CONSENT	Superfund (CERCLA) Consent Decrees
INDIAN RESERV	Indian Reservations
FUSRAP	Formerly Utilized Sites Remedial Action Program
UMTRA	Uranium Mill Tailings Sites
LEAD SMELTERS	Lead Smelter Sites
US AIRS	Aerometric Information Retrieval System Facility Subsystem
US MINES	Mines Master Index File
ABANDONED MINES	Abandoned Mines
DOCKET HWC	Hazardous Waste Compliance Docket Listing
FUELS PROGRAM	EPA Fuels Program Registered Listing
VA AIRS	Permitted Airs Facility List
VA NPDES	Comprehensive Environmental Data System
VA COAL ASH	Coal Ash Disposal Sites
VA DRYCLEANERS	Drycleaner List
VA ENF	Enforcement Actions Data
VA UIC	Underground Injection Control Wells

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP	EDR Proprietary Manufactured Gas Plants
EDR Hist Cleaner	EDR Exclusive Historical Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

VA RGA LF	Recovered Government Archive Solid Waste Facilities List

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

STANDARD ENVIRONMENTAL RECORDS

Federal RCRA generators list

RCRA-CESQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

A review of the RCRA-CESQG list, as provided by EDR, and dated 03/25/2019 has revealed that there are 3 RCRA-CESQG sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
MID-ATLANTIC MIL. FA EPA ID:: VAR000511899	1200 SOUTH BIRDNECK	0 - 1/8 (0.000 mi.)	19	49
VAARNG-ARMORY-VIRGIN EPA ID:: VAD982677650	***1096 S BIRDNECK RD***	***0 - 1/8 (0.000 mi.)***	***C21***	***53***

Lower Elevation	Address	Direction / Distance	Map ID	Page
VA MARINE SCIENCE MU EPA ID:: VAD988212312	***717 GENERAL BOOTH BL***	***NNW 0 - 1/8 (0.019 mi.)***	***25***	***64***

State and tribal leaking storage tank lists

VA LUST: The Leaking Underground Storage Tank Database.

A review of the VA LUST list, as provided by EDR, has revealed that there are 4 VA LUST sites within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CROWN VA 067 Database: LUST REG TD, Date of Government Version: 06/30/2013 Facility Status: Closed Facility ID: 200000067498 Pollution Complaint Num: 20095068 Pollution Complaint Num: 20045017	***900 GENERAL BOOTH BL***	***SW 0 - 1/8 (0.016 mi.)***	***D23***	***62***
VIRGINIA BEACH CITY Database: LUST REG TD, Date of Government Version: 06/30/2013 Facility Status: Closed Facility ID: 200000091647 Pollution Complaint Num: 19932506 Pollution Complaint Num: 19930359	***949 S BIRDNECK RD***	***WSW 1/8 - 1/4 (0.177 mi.)***	***E30***	***85***
REDWING GOLF COURSE Database: LUST REG TD, Date of Government Version: 06/30/2013 Facility Status: Closed Facility ID: 200000066744	***1080 PROSPERITY ROAD***	***SSW 1/4 - 1/2 (0.364 mi.)***	***32***	***88***

EXECUTIVE SUMMARY

Pollution Complaint Num: 19901059

Lower Elevation	Address	Direction / Distance	Map ID	Page
VIRGINIA BEACH CITY	***701 GENERAL BOOTH BL***	***0 - 1/8 (0.000 mi.)***	***B18***	***47***

Database: LUST REG TD, Date of Government Version: 06/30/2013
Facility Status: Closed
Facility ID: 200000064992
Pollution Complaint Num: 19942920
Pollution Complaint Num: 19901192
Pollution Complaint Num: 19911814

VA LTANKS: The Leaking Tanks Database contains current Leaking petroleum tanks. The data comes from the Department of Environmental Quality.

A review of the VA LTANKS list, as provided by EDR, and dated 02/05/2019 has revealed that there are 5 VA LTANKS sites within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CROWN VA 067	***900 GENERAL BOOTH BL***	***SW 0 - 1/8 (0.016 mi.)***	***D23***	***62***
Facility Status: Closed CEDS Facility Id: 200000067498 Pollution Complaint #: 20095068				
VIRGINIA BEACH CITY	***949 S BIRDNECK RD***	***WSW 1/8 - 1/4 (0.177 mi.)***	***E30***	***85***
Facility Status: Closed CEDS Facility Id: 200000091647 Pollution Complaint #: 19930359				
MATHEWS ACHAMMA PROP	523 GENERAL BOOTH BL	NNE 1/4 - 1/2 (0.339 mi.)	31	88
Facility Status: Closed CEDS Facility Id: 200000885105 Pollution Complaint #: 20175286				
REDWING GOLF COURSE	***1080 PROSPERITY ROAD***	***SSW 1/4 - 1/2 (0.364 mi.)***	***32***	***88***
Facility Status: Closed CEDS Facility Id: 200000066744 Pollution Complaint #: 19901059				

Lower Elevation	Address	Direction / Distance	Map ID	Page
VIRGINIA BEACH CITY	***701 GENERAL BOOTH BL***	***0 - 1/8 (0.000 mi.)***	***B18***	***47***
Facility Status: Closed CEDS Facility Id: 200000064992 Pollution Complaint #: 19911814 Pollution Complaint #: 19901192 Pollution Complaint #: 19942920				

State and tribal registered storage tank lists

VA UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Environmental Quality's Underground Storage Tank Data Notification Information.

A review of the VA UST list, as provided by EDR, and dated 02/04/2019 has revealed that there are 7 VA UST sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
VIRGINIA BEACH ARMOR Tank Status: REM FROM GRD Facility Id: 5008224 CEDS Facility ID: 200000067567	1096 SOUTH BIRDNECK	0 - 1/8 (0.000 mi.)	C20	51
SHELL VA 067 Tank Status: CURR IN USE Tank Status: CLS IN GRD Facility Id: 5006527 CEDS Facility ID: 200000067498	***900 GENERAL BOOTH BL***	***SW 0 - 1/8 (0.016 mi.)***	***D22***	***56***
HOLIDAY FOOD MART Tank Status: CURR IN USE Facility Id: 5039696 CEDS Facility ID: 200000221864	***909 GENERAL BOOTH BL***	***SW 0 - 1/8 (0.063 mi.)***	***26***	***66***
BIRDNECK ELEMENTARY Tank Status: CURR IN USE Tank Status: REM FROM GRD Facility Id: 5013411 CEDS Facility ID: 200000090761	***957 S BIRDNECK RD***	***WSW 1/8 - 1/4 (0.144 mi.)***	***E27***	***72***
STATE MILITARY RESER Tank Status: REM FROM GRD Facility Id: 5040402 CEDS Facility ID: 200000196746	940 S BIRDNECK RD	WSW 1/8 - 1/4 (0.150 mi.)	E28	76
SEATACK FIRE STATION Tank Status: REM FROM GRD Facility Id: 5010651 CEDS Facility ID: 200000091647	***949 S BIRDNECK RD***	***WSW 1/8 - 1/4 (0.177 mi.)***	***E29***	***81***

Lower Elevation	Address	Direction / Distance	Map ID	Page
EROSION / DREDGE OPE Tank Status: REM FROM GRD Facility Id: 5010623 CEDS Facility ID: 200000064992	701 GENERAL BOOTH BL	0 - 1/8 (0.000 mi.)	B17	41

VA AST: The Aboveground Storage Tank database contains registered ASTs. The data come from the Department of Environmental Quality's Aboveground Storage Tank Data Notification Information.

A review of the VA AST list, as provided by EDR, and dated 02/04/2019 has revealed that there is 1 VA AST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
SEATACK FIRE STATION	***949 S BIRDNECK RD***	***WSW 1/8 - 1/4 (0.177 mi.)***	***E29***	***81***

EXECUTIVE SUMMARY

Facility ID: 5010651
CEDS Facility ID: 200000091647

ADDITIONAL ENVIRONMENTAL RECORDS

Other Ascertainable Records

DOD: Consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

A review of the DOD list, as provided by EDR, and dated 12/31/2005 has revealed that there are 2 DOD sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
DAM NECK NAVAL TRAIN		S 1/2 - 1 (0.826 mi.)	0	40
OCEANA NAVAL AIR STA		WNW 1/4 - 1/2 (0.492 mi.)	0	40

UXO: A listing of unexploded ordnance site locations

A review of the UXO list, as provided by EDR, and dated 12/31/2017 has revealed that there is 1 UXO site within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
HISTORIC MORTAR RANG		0 - 1/8 (0.000 mi.)	16	40

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR Hist Auto: EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR Hist Auto list, as provided by EDR, has revealed that there is 1 EDR Hist Auto site within approximately 0.125 miles of the target property.

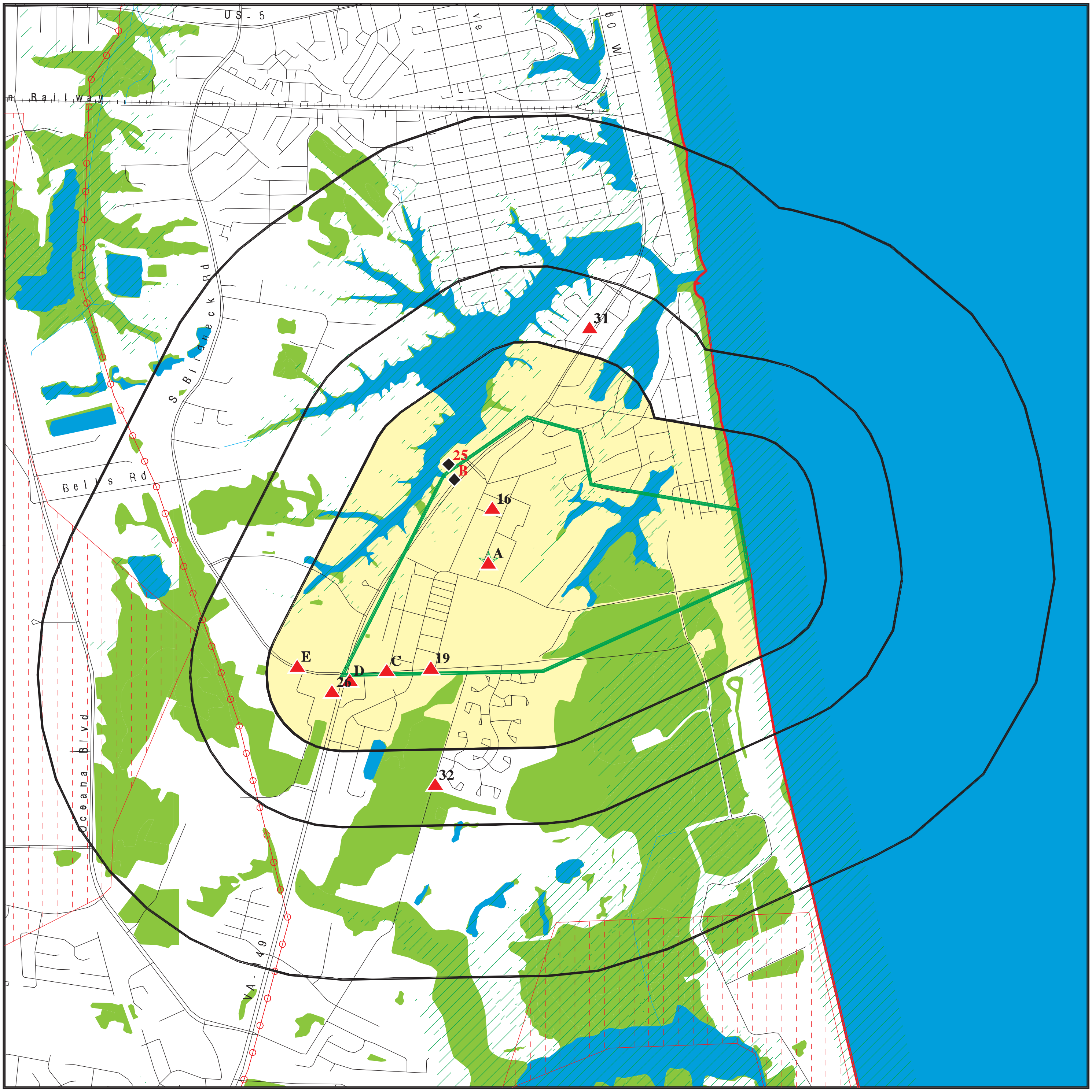
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CROWN CENTRAL PETROL	900 GENERAL BOOTH BL	SW 0 - 1/8 (0.016 mi.)	D24	63

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 3 records.

Site Name	Database(s)
LAPLAYA HOTEL	VA LUST, VA LTANKS
BOLTE BRYAN K PROPERTY	VA LTANKS
CAMP PENDLETON	VA RGA LUST

OVERVIEW MAP - 5678861.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Camp Pendleton	CLIENT: AECOM
ADDRESS: 203 Red Horse Drive	CONTACT: Hans Sund
Virginia Beach VA 23451	INQUIRY #: 5678861.2s
LAT/LONG: 36.816222 / 75.981333	DATE: June 11, 2019 12:47 pm

DETAIL MAP - 5678861.2S

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Camp Pendleton	CLIENT: AECOM
ADDRESS: 203 Red Horse Drive	CONTACT: Hans Sund
Virginia Beach VA 23451	INQUIRY #: 5678861.2s
LAT/LONG: 36.816222 / 75.981333	DATE: June 11, 2019 12:48 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500	1	0	0	0	NR	NR	1
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250	2	3	0	NR	NR	NR	5
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
VA SHWS	N/A		N/A	N/A	N/A	N/A	N/A	N/A
State and tribal landfill and/or solid waste disposal site lists								
VA SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
VA LUST	0.500	1	2	1	1	NR	NR	5
INDIAN LUST	0.500		0	0	0	NR	NR	0
VA LTANKS	0.500	1	2	1	2	NR	NR	6
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
VA UST	0.250	1	4	3	NR	NR	NR	8
VA AST	0.250	1	0	1	NR	NR	NR	2
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
VA ENG CONTROLS	0.500		0	0	0	NR	NR	0
VA INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VA VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
VA BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
INDIAN ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
VA SPILLS	TP	1	NR	NR	NR	NR	NR	1
VA SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	1	1	NR	2
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
TRIS	TP	1	NR	NR	NR	NR	NR	1
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP	2	NR	NR	NR	NR	NR	2
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
UXO	1.000		1	0	0	0	NR	1
ECHO	TP	1	NR	NR	NR	NR	NR	1
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
VA AIRS	TP		NR	NR	NR	NR	NR	0
VA NPDES	TP		NR	NR	NR	NR	NR	0
VA COAL ASH	0.500		0	0	0	NR	NR	0
VA DRYCLEANERS	0.250		0	0	NR	NR	NR	0
VA ENF	TP		NR	NR	NR	NR	NR	0
VA Financial Assurance	TP		NR	NR	NR	NR	NR	0
PA MANIFEST	0.250	1	0	0	NR	NR	NR	1
VA TIER 2	TP	3	NR	NR	NR	NR	NR	3
VA UIC	TP		NR	NR	NR	NR	NR	0

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		1	NR	NR	NR	NR	1
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

VA RGA LF	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
VA RGA LUST	TP	4	NR	NR	NR	NR	NR	4
- Totals --		20	13	6	4	1	0	44

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

N/A = This State does not maintain a SHWS list. See the Federal CERCLIS list.

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number
A1 **Target** **Property**	**CAMP PENDLETON STATE MILITARY RESERVATION** **203 RED HORSE DR** **VIRGINIA BEACH, VA 23451**	**VA UST** **VA AST**	**U003917643** **N/A**

Site 1 of 15 in cluster A

Actual:
12 ft.

Facility:	
Facility Id:	5008237
Facility Type:	FEDERAL: MILITARY
CEDS Facility ID:	200000067563
Owner:	
Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	VAFM-E, PRN 160, BLDG 316, Fort Pickett
Owner Address2:	Not reported
Owner City, State, Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8
Owner Id:	36760
Owner Name:	Virginia Air National Guard
Owner Address:	PO Box 180
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23458
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8
UST:	
Facility ID:	5008237
Federally Regulated:	Yes
Tank Number:	1
Tank Capacity:	6000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST
Tank Material:	
Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes

Tank Number:	2
Tank Capacity:	6000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes

Tank Number:	203-1
Tank Capacity:	2500
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Install Date:	2/1/1991
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	Yes
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	Yes
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	Yes
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	Yes
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	Yes
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	Yes
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	NO VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Number:	203-2
Tank Capacity:	2500
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	2/1/1991
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	Yes
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	Yes
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	Yes
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	Yes
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	Yes
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	Yes
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	NO VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes
Tank Number:	3
Tank Capacity:	1000
Tank Contents:	KEROSENE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes
Tank Number:	4
Tank Capacity:	1000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported
Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported
Facility ID:	5008237
Federally Regulated:	Yes
Tank Number:	R1
Tank Capacity:	6000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/7/1962
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	Yes
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008237
Federally Regulated:	Yes

Tank Number:	R2
Tank Capacity:	6000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/7/1962
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	Yes
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

AST:

Facility ID:	5008237
Facility Type:	FEDERAL: MILITARY
CEDS Facility ID:	200000067563

Tank Info:

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	"VAFM-E, PRN 160, BLDG 316, Fort Pickett"
Owner Address2:	Not reported
Owner City/State/Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Owner Id:	36760
Owner Name:	Virginia Air National Guard

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Owner Address:	PO Box 180
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23458
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8
Fed Regulated:	No
Tank Number:	418
Tank Type:	AST
Tank Capacity:	1000
Tank Contents:	HEATING OIL
Tank Status:	CURR IN USE

Tank Containment:

Install Date:	2/9/1985
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	Yes
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No
Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	Yes
Release Detection: Vapor	No
Release Detection: Interstitial	No
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported
Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	Yes
Release Prevention: Unknown	No
Release Prevention: Other	No
Release Prevention: Other Note	Not reported
Tank Foundation: Steel	No
Tank Foundation: Earthen	Yes
Tank Foundation: Concrete Imp	No
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	Yes
Tank Roof: Other Note	Cylinder

Tank Material:

Tank Materials: Bare Steel	Yes
Tank Materials: Concrete	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N
Tank Type Other Specify:	N

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	"VAFM-E, PRN 160, BLDG 316, Fort Pickett"
Owner Address2:	Not reported
Owner City/State/Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Owner Id:	36760
Owner Name:	Virginia Air National Guard
Owner Address:	PO Box 180
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23458
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Fed Regulated:	No
Tank Number:	AST1
Tank Type:	AST
Tank Capacity:	6000

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Contents:	GASOLINE
Tank Status:	CURR IN USE

Tank Containment:

Install Date:	10/22/2008
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	No
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No
Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	No
Release Detection: Vapor	No
Release Detection: Interstitial	No
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported
Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	No
Release Prevention: Unknown	No
Release Prevention: Other	No
Release Prevention: Other Note	Not reported

Tank Foundation: Steel	No
Tank Foundation: Earthen	No
Tank Foundation: Concrete Imp	Yes
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported
Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	No
Tank Roof: Other Note	Horizontal

Tank Material:

Tank Materials: Bare Steel	No
Tank Materials: Concrete	No
Tank Materials: Insulated Tank Jacket	Yes
Tank Materials: Unknown	No
Tank Materials: Other	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Materials: Other Note	Vaulted Concrete
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N
Tank Type Other Specify:	N

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	"VAFM-E, PRN 160, BLDG 316, Fort Pickett"
Owner Address2:	Not reported
Owner City/State/Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Owner Id:	36760
Owner Name:	Virginia Air National Guard
Owner Address:	PO Box 180
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23458
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Fed Regulated:	No
Tank Number:	AST2
Tank Type:	AST
Tank Capacity:	4000
Tank Contents:	DIESEL
Tank Status:	CURR IN USE

Tank Containment:

Install Date:	10/22/2008
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	No
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	No
Release Detection: Vapor	No
Release Detection: Interstitial	No
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported
Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	No
Release Prevention: Unknown	No
Release Prevention: Other	No
Release Prevention: Other Note	Not reported

Tank Foundation: Steel	No
Tank Foundation: Earthen	No
Tank Foundation: Concrete Imp	Yes
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported
Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	No
Tank Roof: Other Note	Horizontal

Tank Material:

Tank Materials: Bare Steel	No
Tank Materials: Concrete	No
Tank Materials: Insulated Tank Jacket	Yes
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Valted Concrete
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Tank Type Other Specify: N

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	"VAFM-E, PRN 160, BLDG 316, Fort Pickett"
Owner Address2:	Not reported
Owner City/State/Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Owner Id:	36760
Owner Name:	Virginia Air National Guard
Owner Address:	PO Box 180
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23458
Owner Type:	FEDERAL
Number of Active AST:	3
Number of Active UST:	0
Number of Inactive AST:	1
Number of Inactive UST:	8

Fed Regulated:	No
Tank Number:	T 428-1
Tank Type:	AST
Tank Capacity:	1000
Tank Contents:	HEATING OIL
Tank Status:	DISMANTLED

Tank Containment:

Install Date:	12/8/1985
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	Yes
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No
Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	Yes
Release Detection: Vapor	No
Release Detection: Interstitial	No
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported

CAMP PENDLETON STATE MILITARY RESERVATION (Continued) **U003917643**

Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	Yes
Release Prevention: Unknown	No
Release Prevention: Other	No
Release Prevention: Other Note	Not reported
Tank Foundation: Steel	No
Tank Foundation: Earthen	No
Tank Foundation: Concrete Imp	Yes
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported
Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	Yes
Tank Roof: Other Note	Cylinder

Tank Material:

Tank Materials: Bare Steel	Yes
Tank Materials: Concrete	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N
Tank Type Other Specify:	N

A2
Target
Property

203RD RED HORSE SQUADRON VA NATIONAL GUARD
RED HORSE DR
VIRGINIA BEACH, VA 23451

PA MANIFEST **S118068432**
N/A

Site 2 of 15 in cluster A

Actual:
12 ft.

Manifest Details:

Year:	2017
Manifest Number:	016959267JJK
Manifest Type:	TSD Copy

203RD RED HORSE SQUADRON VA NATIONAL GUARD (Continued) **S118068432**

Generator EPA Id:	VAD982364069
Generator Date:	07/18/2017
Mailing Address:	Not reported
Mailing City,St,Zip:	Not reported
Contact Name:	Not reported
Contact Phone:	757-437-4611
TSD EPA Id:	Not reported
TSD Date:	Not reported
TSD Facility Name:	Cycle Chem Inc
TSD Facility Address:	550 Industrial Rd
TSD Facility City:	Lewisberry
TSD Facility State:	PA
Facility Telephone:	Not reported
Page Number:	1
Line Number:	1
Waste Number:	D018
Container Number:	2
Container Type:	Metal drums, barrels, kegs
Waste Quantity:	300
Unit:	Pounds
Handling Code:	Not reported
TSP EPA Id:	PAD067098822
Date TSP Sig:	Not reported

Year:	2015
Manifest Number:	000172829JJK
Manifest Type:	TSD Copy
Generator EPA Id:	VAD982364069
Generator Date:	07/10/2015
Mailing Address:	Not reported
Mailing City,St,Zip:	Not reported
Contact Name:	Not reported
Contact Phone:	757-437-4611
TSD EPA Id:	Not reported
TSD Date:	Not reported
TSD Facility Name:	Cycle Chem Inc
TSD Facility Address:	550 Industrial Rd
TSD Facility City:	Lewisberry
TSD Facility State:	PA
Facility Telephone:	Not reported
Page Number:	1
Line Number:	1
Waste Number:	D001
Container Number:	1
Container Type:	Metal drums, barrels, kegs
Waste Quantity:	20
Unit:	Pounds
Handling Code:	Not reported
TSP EPA Id:	PAD067098822
Date TSP Sig:	Not reported

Year:	2014
Manifest Number:	000172792JJK
Manifest Type:	TSD Copy
Generator EPA Id:	VAD982364069
Generator Date:	10/02/2014
Mailing Address:	Not reported

203RD RED HORSE SQUADRON VA NATIONAL GUARD (Continued) **S118068432**

Mailing City,St,Zip:	Not reported
Contact Name:	Not reported
Contact Phone:	757-437-4611
TSD EPA Id:	Not reported
TSD Date:	Not reported
TSD Facility Name:	Cycle Chem Inc
TSD Facility Address:	550 Industrial Rd
TSD Facility City:	Lewisberry
TSD Facility State:	PA
Facility Telephone:	Not reported
Page Number:	1
Line Number:	1
Waste Number:	D001
Container Number:	1
Container Type:	Metal drums, barrels, kegs
Waste Quantity:	75
Unit:	Pounds
Handling Code:	Not reported
TSP EPA Id:	PAD067098822
Date TSP Sig:	Not reported

A3
Target
Property

203RD RED HOURSE SQUADRON VA NAT'L GUARD
203 RED HORSE DRIVE
VIRGINIA BEACH, VA 23451

RCRA-CESQG
FINDS
ECHO

1000354605
VAD982364069

Site 3 of 15 in cluster A

Actual:
12 ft.

RCRA-CESQG:

Date form received by agency:	08/15/2007
Facility name:	203RD RED HOURSE SQUADRON VA NAT'L GUARD
Facility address:	203 RED HORSE DRIVE VIRGINIA BEACH, VA 23451
EPA ID:	VAD982364069
Mailing address:	RED HORSE DRIVE VIRGINIA BEACH, VA 23451
Contact:	STEVEN L PHILIPS
Contact address:	Not reported Not reported
Contact country:	US
Contact telephone:	757-437-4611
Contact email:	STEVEN.PHILLIPS.1@VARICH.ANG.AF.MIL
EPA Region:	03
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

203RD RED HOURSE SQUADRON VA NAT'L GUARD (Continued) **1000354605**

Owner/Operator Summary:

Owner/operator name:	VIRGINIA NATIONAL GUARD
Owner/operator address:	BLDG 316, FORT PICKETT BLACKSTONE, VA 23824
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Operator
Owner/Op start date:	01/01/1985
Owner/Op end date:	Not reported

Owner/operator name:	VIRGINIA NATIONAL GUARD
Owner/operator address:	BLDG 316, FORT PICKETT BLACKSTONE, VA 23824
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Owner
Owner/Op start date:	01/06/1911
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency:	12/03/1987
Site name:	203RD CIVIL ENGINEERING FLIGHT
Classification:	Small Quantity Generator

Hazardous Waste Summary:

. Waste code:	D001
. Waste name:	IGNITABLE WASTE

. Waste code:	D002

203RD RED HOURSE SQUADRON VA NAT'L GUARD (Continued) **1000354605**

. Waste name: CORROSIVE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: F001
. Waste name: THE FOLLOWING SPENT HALOGENATED SOLVENTS USED IN DEGREASING: TETRACHLOROETHYLENE, TRICHLORETHYLENE, METHYLENE CHLORIDE, 1,1,1-TRICHLOROETHANE, CARBON TETRACHLORIDE AND CHLORINATED FLUOROCARBONS; ALL SPENT SOLVENT MIXTURES/BLENDS USED IN DEGREASING CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

FINDS:

Registry ID: 110060259955

Environmental Interest/Information System

US EPA TRIS (Toxics Release Inventory System) contains information from facilities on the amounts of over 300 listed toxic chemicals that these facilities release directly to air, water, land, or that are transported off-site.

US National Pollutant Discharge Elimination System (NPDES) module of the Compliance Information System (ICIS) tracks surface water permits issued under the Clean Water Act. Under NPDES, all facilities that discharge pollutants from any point source into waters of the United

203RD RED HOURSE SQUADRON VA NAT'L GUARD (Continued) **1000354605**

States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

~~Click this hyperlink~~ while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid:	1000354605
Registry ID:	110060259955
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110060259955

A4
Target
Property

VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU — **VA RGA LUST** — **S115993223**
203 RED HORSE DR — **N/A**
VIRGINIA BEACH, VA

Site 4 of 15 in cluster A

Actual:
12 ft.

RGA LUST:

2012 VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU 203 RED HORSE DR
2011 VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU 203 RED HORSE DR
2010 VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU 203 RED HORSE DR
2009 VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU 203 RED HORSE DR
2008 VIRGINIA AIR NATIONAL GUARD - 203D RHS ROWPU 203 RED HORSE DR

A5
Target
Property

USN CAMP PENDLETON — **SEMS** — **1000106071**
BIRDNECK RD S & GEN BTH BLD — **VA1170090012**
VIRGINIA BEACH, VA 23453

Site 5 of 15 in cluster A

Actual:
12 ft.

SEMS:

Site ID:	0302842
EPA ID:	VA1170090012
Cong District:	02
FIPS Code:	51810
Latitude:	Not reported
Longitude:	Not reported
FF:	Y
NPL:	Not on the NPL
Non NPL Status:	Other Cleanup Activity: Federal Facility-Lead Cleanup

SEMS Detail:

USN CAMP PENDLETON (Continued) **1000106071**

Region:	03
Site ID:	0302842
EPA ID:	VA1170090012
Site Name:	USN CAMP PENDLETON
NPL:	N
FF:	Y
OU:	00
Action Code:	DS
Action Name:	DISCVRY
SEQ:	1
Start Date:	1981-06-01 04:00:00
Finish Date:	6/1/1981 4:00:00 AM
Qual:	Not reported
Current Action Lead:	EPA Perf

Region:	03
Site ID:	0302842
EPA ID:	VA1170090012
Site Name:	USN CAMP PENDLETON
NPL:	N
FF:	Y
OU:	00
Action Code:	PA
Action Name:	PA
SEQ:	1
Start Date:	Not reported
Finish Date:	3/1/1983 5:00:00 AM
Qual:	L
Current Action Lead:	Fed Fac

Region:	03
Site ID:	0302842
EPA ID:	VA1170090012
Site Name:	USN CAMP PENDLETON
NPL:	N
FF:	Y
OU:	00
Action Code:	VA
Action Name:	OTHR CLEANUP
SEQ:	1
Start Date:	2004-09-27 04:00:00
Finish Date:	Not reported
Qual:	L
Current Action Lead:	Fed Fac

A6
Target
Property

USN CAMP PENDLETON
BIRDNECK RD S & GEN BTH BLD
VIRGINIA BEACH, VA 23453

FINDS **1016278789**
N/A

Site 6 of 15 in cluster A

Actual:
12 ft.

FINDS:

Registry ID: 110009315669

Environmental Interest/Information System
SUPERFUND (NON-NPL)

USN CAMP PENDLETON (Continued) **1016278789**

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

A7 **Target** **Property**	**CAMP PENDLETON** **GENERAL BOOTH BLVD, PO BOX 9** **VIRGINIA BEACH, VA 23458**	**VA TIER 2**	**S118191756** **N/A**

Site 7 of 15 in cluster A

Actual: **12 ft.**

TIER 2:

Facility ID:	Not reported
CAS Number:	74986
SIC Code:	Not reported
NAICS:	Not reported
Entered Chemical Name:	Propane
Average Amt Code:	24999.0
Owner Name:	Not reported
Owner Phone:	Not reported
Contact Type:	Not reported

Facility ID:	Not reported
CAS Number:	68476302
SIC Code:	Not reported
NAICS:	Not reported
Entered Chemical Name:	#2 Fuel Oil
Average Amt Code:	999.0
Owner Name:	Not reported
Owner Phone:	Not reported
Contact Type:	Not reported

Facility ID:	Not reported
CAS Number:	68476302
SIC Code:	Not reported
NAICS:	Not reported
Entered Chemical Name:	Diesel Fuel
Average Amt Code:	49999.0
Owner Name:	Not reported
Owner Phone:	Not reported
Contact Type:	Not reported

Facility ID:	Not reported
CAS Number:	8006619
SIC Code:	Not reported
NAICS:	Not reported
Entered Chemical Name:	Gasoline, Unleaded
Average Amt Code:	49999.0
Owner Name:	Not reported
Owner Phone:	Not reported
Contact Type:	Not reported

A8	**VAARNG-SMR**	**RCRA-CESQG**	**1000365334**
Target	**203 RED HORSE DRIVE**		**VAD982677452**
Property	**VIRGINIA BEACH, VA 23451**		

Site 8 of 15 in cluster A

Actual:
12 ft.

RCRA-CESQG:

Date form received by agency:	04/02/2012
Facility name:	VAARNG-SMR
Facility address:	203 RED HORSE DRIVE VIRGINIA BEACH, VA 23451
EPA ID:	VAD982677452
Contact:	PAMELA W COLEMAN
Contact address:	BLDG. 316, FORT PICKETT BLACKSTONE, VA 23824
Contact country:	US
Contact telephone:	443-298-6445
Contact email:	PAM.COLEMAN1@US.ARMY.MIL
EPA Region:	03
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	COMMONWEALTH OF VA
Owner/operator address:	OWNERSTREET OWNERCITY, AK 99999
Owner/operator country:	Not reported
Owner/operator telephone:	215-555-1212
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	OPERNAME
Owner/operator address:	OPERSTREET OPERCITY, AK 99999
Owner/operator country:	Not reported
Owner/operator telephone:	215-555-1212
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Operator

VAARNG-SMR (Continued) **1000365334**

Owner/Op start date:	Not reported
Owner/Op end date:	Not reported
Owner/operator name:	VA DEPARTMENT OF MILITARY AFFAIRS
Owner/operator address:	BLDG. 316, FORT PICKETT
	BLACKSTONE, VA 23824
Owner/operator country:	US
Owner/operator telephone:	434-298-6401
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Owner
Owner/Op start date:	01/01/1912
Owner/Op end date:	Not reported
Owner/operator name:	VA DEPARTMENT OF MILITARY AFFAIRS
Owner/operator address:	Not reported
	Not reported
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Operator
Owner/Op start date:	01/01/1912
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency:	05/14/1990
Site name:	VAARNG-SMR
Classification:	Small Quantity Generator

Hazardous Waste Summary:

. Waste code:	D000
. Waste name:	Not Defined

VAARNG-SMR (Continued) **1000365334**

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D011
. Waste name: SILVER

Violation Status: No violations found

A9 **VIRGINIA ARMY NATIONAL GUARD - CAMP PENDLETON** **VA TIER 2** **S119088727**
Target **GENERAL BOOTH BLVD, PO BOX 9** **N/A**
Property **VIRGINIA BEACH, VA 23458**

Site 9 of 15 in cluster A

Actual:
12 ft.

TIER 2:

Facility ID: 5421773
CAS Number: 8006619
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Gasoline, Unleaded
Average Amt Code: 49999
Owner Name: Not reported
Owner Phone: Not reported
Contact Type: Not reported

Facility ID: 5421773
CAS Number: 74986
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Propane
Average Amt Code: 24999
Owner Name: Not reported
Owner Phone: Not reported
Contact Type: Not reported

Facility ID: 5421773
CAS Number: 68476302
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Diesel Fuel
Average Amt Code: 49999
Owner Name: Not reported
Owner Phone: Not reported
Contact Type: Not reported

Facility ID: 5421773
CAS Number: 68476302
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: #2 Fuel Oil

VIRGINIA ARMY NATIONAL GUARD - CAMP PENDLETON (Continued) **S119088727**

Average Amt Code:	999
Owner Name:	Not reported
Owner Phone:	Not reported
Contact Type:	Not reported

A10
Target
Property

DMA AIR NATIONAL GUARD
203 RED HORSE LN
VIRGINIA BEACH, VA

VA RGA LUST **S115962118**
N/A

Site 10 of 15 in cluster A

Actual:
12 ft.

RGA LUST:

2007	DMA AIR NATIONAL GUARD	203 RED HORSE LN
2006	DMA AIR NATIONAL GUARD	203 RED HORSE LN
2005	DMA AIR NATIONAL GUARD	203 RED HORSE LN
2004	DMA AIR NATIONAL GUARD	203 RED HORSE LN
2003	DMA AIR NATIONAL GUARD	203 RED HORSE LN

A11
Target
Property

CAMP PENDLETON ST MILITARY
203 RED HORSE LANE
VIRGINIA BEACH, VA

VA RGA LUST **S115957555**
N/A

Site 11 of 15 in cluster A

Actual:
12 ft.

RGA LUST:

2000	CAMP PENDLETON ST MILITARY	203 RED HORSE LANE

A12
Target
Property

CAMP PENDLETON ST MILITARY
203 RED HORSE DR
VIRGINIA BEACH, VA 23451

VA LUST **1005487588**
VA LTANKS **N/A**
VA SPILLS

Site 12 of 15 in cluster A

Actual:
12 ft.

LUST REG TD:

Region:	TD
Region Code:	TRO
Facility ID:	200000067563
Facility Status:	**Closed**
Completed Date:	11/12/1997
Pollution Complaint Num:	19982272
Fed Regulated Tank:	No
Phase Code:	RR
Event Description:	Release Reported
Comments:	H.O. TANK UNCOVERED. SHEEN OBSERVED ON GW

Region:	TD
Region Code:	TRO
Facility ID:	200000067563
Facility Status:	**Closed**
Completed Date:	01/14/2000
Pollution Complaint Num:	19982272
Fed Regulated Tank:	No
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent

CAMP PENDLETON ST MILITARY (Continued) **1005487588**

Comments:	Case Closed
Region:	TD
Region Code:	TRO
Facility ID:	200000067563
Facility Status:	**Closed**
Completed Date:	07/16/2003
Pollution Complaint Num:	20045014
Fed Regulated Tank:	No
Phase Code:	RR
Event Description:	Release Reported
Comments:	Release reported
Region:	TD
Region Code:	TRO
Facility ID:	200000067563
Facility Status:	**Closed**
Completed Date:	07/24/2003
Pollution Complaint Num:	20045014
Fed Regulated Tank:	No
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	Case closed, no further corrective action letter sent

LTANKS:

Region:	TRO
CEDS Facility Id:	200000067563
Case Status:	**Closed**
Pollution Complaint #:	20045014
Reported:	07/16/2003
Case Closed Date:	07/24/2003
Program:	RP Lead
Federally Regulated UST (Y/N):	N
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	Y
Other Description:	1
Heating Oil Category:	Not reported
Region:	TRO
CEDS Facility Id:	200000067563
Case Status:	**Closed**
Pollution Complaint #:	19982272
Reported:	11/12/1997
Case Closed Date:	01/14/2000
Program:	RP Lead
Federally Regulated UST (Y/N):	N
Regulated Petroleum UST (1):	N
Excluded UST (1):	N

CAMP PENDLETON ST MILITARY (Continued)   **1005487588**

Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	Y
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Category 3

SPILLS:

Fips City/County:	Virginia Beach City
Status:	Closed
Reference Id:	28841
IR Number:	2015-T-0517
Associated IR:	Not reported
Incident Date:	08/26/2014
Call Received Date:	08/26/2014
Closure Comments:	Unrecoverable amount of gray water released.NFA at this time for PREP.
Threat To:	Ground Water
Terrorism (Y/N):	N
Characterize Incident:	Accidental
Incident Type:	Water
Incident Subtype:	Upset * Water
Materials:	Gray Water (3-5 Gallons)
Effect To Receptor:	Impacted
Water Body:	Retention Pond
Low Quantity To Water:	0
High Quantity To Water:	5
Quantity Units:	Gallons
Other Receptors:	Not reported
RP Company:	Army National Guard
RP Name:	Simple, Scott
Property Owner:	Not reported
Property Company:	Not reported
Duration Of Event (Hrs):	0
Impacts:	Not reported
Other Impacts:	Not reported
Steps Taken:	Not reported
Steps Taken Description:	Not reported
System Components:	Not reported
Other System Components:	Not reported
Cause Of Event:	Not reported
Corrective Action Taken:	Not reported
Weather Status:	N/A
Precipitation (Wet):	0
Discharge Type:	N/A
Discharge Volume:	0
Unknown Discharge (Y/N):	N
Site Name:	WASTE WATER - CAMP PENDLETON
Closure Date:	10/06/2014
Orig. Call Incident Description:	Pam Coleman called to report a power outage causing a pump breaker to cut off. There was a spill (less than 5 gallons) into a manhole, storm drain and then retention pond.
Original Call Material Description:	Waste water

CAMP PENDLETON ST MILITARY (Continued) **1005487588**

Original Call Location Description:	Camp Pendleton 203 Red Horse Drive, Virginia Beach VA, 23451
Incident Ongoing at time of Call:	Not reported
Agencies Notified (Y/N):	Not reported
Other Agencies:	Not reported
Permitted (Y/N):	N
Call Reported By Company Name:	Army National Guard
Call Property Owner Company Name:	Not reported
Call Property Owner Name:	Not reported
Site Summary:	Pam Coleman called to report a power outage causing a pump breaker to cut off. There was a spill (less than 5 gallons) into a manhole, storm drain and then retention pond.

A13 **DMA AIR NATIONAL GUARD** **VA RGA LUST** **S115962117**
Target **203 RED HORSE LANE** **N/A**
Property **VIRGINIA BEACH, VA**

Site 13 of 15 in cluster A

Actual:
12 ft.

RGA LUST:

2002	DMA AIR NATIONAL GUARD	203 RED HORSE LANE

A14 **STATE MILITARY RESERVATION (CAMP PENDLETON)** **VA TIER 2** **S110069249**
Target **GENERAL BOOTH BLVD, PO BOX 9** **N/A**
Property **VIRGINIA BEACH, VA 23458**

Site 14 of 15 in cluster A

Actual:
12 ft.

TIER 2:

Facility ID:	Not reported
CAS Number:	68476-30-2
SIC Code:	92811
NAICS:	Not reported
Entered Chemical Name:	#2 FUEL OIL
Average Amt Code:	5
Owner Name:	DEPT. OF MILITARY AFFAIRS
Owner Phone:	434-298-6455
Contact Type:	Not reported

Facility ID:	Not reported
CAS Number:	8006-61-9
SIC Code:	92811
NAICS:	Not reported
Entered Chemical Name:	GASOLINE, UNLEADED
Average Amt Code:	4
Owner Name:	DEPT. OF MILITARY AFFAIRS
Owner Phone:	434-298-6455
Contact Type:	Not reported

Facility ID:	Not reported
CAS Number:	74-98-6
SIC Code:	92811
NAICS:	Not reported
Entered Chemical Name:	PROPANE
Average Amt Code:	4

STATE MILITARY RESERVATION (CAMP PENDLETON) (Continued) **S110069249**

Owner Name: DEPT. OF MILITARY AFFAIRS
Owner Phone: 434-298-6455
Contact Type: Not reported

Facility ID: Not reported
CAS Number: 68476-30-2
SIC Code: 92811
NAICS: Not reported
Entered Chemical Name: DIESEL FUEL
Average Amt Code: 4
Owner Name: DEPT. OF MILITARY AFFAIRS
Owner Phone: 434-298-6455
Contact Type: Not reported

Facility ID: Not reported
CAS Number: 68476-30-2
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: #2 Fuel Oil
Average Amt Code: Not reported
Owner Name: Department of Military Affairs
Owner Phone: 434-298-6445
Contact Type: Not reported

Facility ID: Not reported
CAS Number: 74-98-6
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Propane
Average Amt Code: Not reported
Owner Name: Department of Military Affairs
Owner Phone: 434-298-6445
Contact Type: Not reported

Facility ID: Not reported
CAS Number: 8006-61-9
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Gasoline, Unleaded
Average Amt Code: Not reported
Owner Name: Department of Military Affairs
Owner Phone: 434-298-6445
Contact Type: Not reported

Facility ID: Not reported
CAS Number: 68476-30-2
SIC Code: Not reported
NAICS: Not reported
Entered Chemical Name: Diesel Fuel
Average Amt Code: Not reported
Owner Name: Department of Military Affairs
Owner Phone: 434-298-6445
Contact Type: Not reported

A15 **Target** **Property**	**US ARMY NATIONAL GUARD CTC CAMP PENDLETON (RANGES)** **203 RED HORSE DRIVE** **VIRGINIA BEACH, VA 23451**	**TRIS**	**1017426792** **2345WCTCCM23RED**

Site 15 of 15 in cluster A

Actual:
12 ft.

TRIS:

Click this hyperlink while viewing on your computer to access
1 additional US_TRIS: record(s) in the EDR Site Report.

DOD **Region** **South** **1/2-1** **4363 ft.**	**DAM NECK NAVAL TRAINING AREA** **DAM NECK NAVAL TRAINING A (County), VA**	**DOD**	**CUSA137269** **N/A**

DOD:

Feature 1:	Navy DOD
Feature 2:	Not reported
Feature 3:	Not reported
URL:	Not reported
Name 1:	Dam Neck Naval Training Area
Name 2:	Not reported
Name 3:	Not reported
State:	VA
DOD Site:	Yes
Tile name:	VAVIRGINIA_BEACH

DOD **Region** **WNW** **1/4-1/2** **2597 ft.**	**OCEANA NAVAL AIR STATION** **OCEANA NAVAL AIR STATION (County), VA**	**DOD**	**CUSA137224** **N/A**

DOD:

Feature 1:	Navy DOD
Feature 2:	Not reported
Feature 3:	Not reported
URL:	Not reported
Name 1:	Oceana Naval Air Station
Name 2:	Not reported
Name 3:	Not reported
State:	VA
DOD Site:	Yes
Tile name:	VAVIRGINIA_BEACH

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16 **< 1/8** **1 ft.**	**HISTORIC MORTAR RANGE** **VIRGINIA BEACH CITY, VA**	**UXO**	**1024717036** **N/A**

Relative:
Higher

Actual:
12 ft.

UXO:

DoD Component:	Air Force
Installation Name:	CAMP PENDLETON MIL RESERVATION
Facility Address 2:	Not reported
Site ID:	MU971
Site Type:	Multi Use Range

HISTORIC MORTAR RANGE (Continued) **1024717036**

Latitude:	36.818815999999998
Longitude:	-75.981106999999994

B17 **EROSION / DREDGE OPERATIONS** **VA UST** **U003690614**
701 GENERAL BOOTH BLVD **N/A**
< 1/8 **VIRGINIA BEACH, VA 23451**
1 ft.

Site 1 of 2 in cluster B

Relative:
Lower
Actual:
5 ft.

Facility:

Facility Id:	5010623
Facility Type:	LOCAL
CEDS Facility ID:	200000064992

Owner:

Owner Id:	37139
Owner Name:	City of Virginia Beach Public Works/Automotive Svc
Owner Address:	2633 Leroy Rd
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23456
Owner Type:	LOCAL
Number of Active AST:	0
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	5

UST:

Facility ID:	5010623
Federally Regulated:	Yes
Tank Number:	1-L
Tank Capacity:	1000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/30/1976
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5010623
Federally Regulated:	Yes

Tank Number:	2-N
Tank Capacity:	2000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/30/1972
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5010623
Federally Regulated:	Yes

Tank Number:	3-D
Tank Capacity:	3000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/30/1976
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5010623
Federally Regulated:	Yes

Tank Number:	4-N
Tank Capacity:	1000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Tank Material:

Install Date:	1/1/1976
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Facility ID:	5010623
Federally Regulated:	Yes
Tank Number:	5-W
Tank Capacity:	1000
Tank Contents:	USED OIL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1985
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported
Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No

EROSION / DREDGE OPERATIONS (Continued) **U003690614**

Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

B18
< 1/8
1 ft.

VIRGINIA BEACH CITY - EROSION DREDGE OPERATIONS
701 GENERAL BOOTH BLVD
VIRGINIA BEACH, VA 23451

VA LUST
VA LTANKS

S105984841
N/A

Site 2 of 2 in cluster B

Relative:
Lower

Actual:
5 ft.

LUST REG TD:

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	03/16/1994
Pollution Complaint Num:	19942920
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	REPORT INDICATES FORMER USTS 3 & 5 LEAKED, HIGH SOIL TPH.

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	08/20/1994
Pollution Complaint Num:	19942920
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED.

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	03/09/1990
Pollution Complaint Num:	19901192
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	UST FAILED TIGHTNESS TEST.

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	08/20/1994
Pollution Complaint Num:	19901192
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED.

VIRGINIA BEACH CITY - EROSION DREDGE OPERATIONS (Continued) **S105984841**

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	06/06/1991
Pollution Complaint Num:	19911814
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	SOIL SAMPLES >100PPM TPH. PREVIOUS PC# 90-1193.

Region:	TD
Region Code:	TRO
Facility ID:	200000064992
Facility Status:	**Closed**
Completed Date:	08/20/1994
Pollution Complaint Num:	19911814
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED.

LTANKS:

Region:	TRO
CEDS Facility Id:	200000064992
Case Status:	**Closed**
Pollution Complaint #:	19911814
Reported:	06/06/1991
Case Closed Date:	08/20/1994
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

Region:	TRO
CEDS Facility Id:	200000064992
Case Status:	**Closed**
Pollution Complaint #:	19901192
Reported:	03/09/1990
Case Closed Date:	08/20/1994
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N

VIRGINIA BEACH CITY - EROSION DREDGE OPERATIONS (Continued) **S105984841**

Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

Region:	TRO
CEDS Facility Id:	200000064992
Case Status:	**Closed**
Pollution Complaint #:	19942920
Reported:	03/16/1994
Case Closed Date:	08/20/1994
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

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19 **MID-ATLANTIC MIL. FAMILY COM. LLC MAMFC** **RCRA-CESQG** **1009312553**
1200 SOUTH BIRDNECK ROAD **VAR000511899**
< 1/8 **VIRGINIA BEACH, VA 23451**
1 ft.

Relative: Higher
Actual: 14 ft.

RCRA-CESQG:

Date form received by agency:	02/06/2006
Facility name:	MID-ATLANTIC MIL. FAMILY COM. LLC MAMFC
Facility address:	1200 SOUTH BIRDNECK ROAD VIRGINIA BEACH, VA 23451
EPA ID:	VAR000511899
Mailing address:	HERNDON PARKWAY SUITE 100 HERNDON, VA 20171
Contact:	R. JARL BLISS
Contact address:	Not reported Not reported
Contact country:	US
Contact telephone:	703-834-1900
Contact email:	Not reported
EPA Region:	03
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or

MID-ATLANTIC MIL. FAMILY COM. LLC MAMFC (Continued) **1009312553**

other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	MAMFC
Owner/operator address:	Not reported Not reported
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	08/01/2005
Owner/Op end date:	Not reported

Owner/operator name:	US DEPT OF NAVY
Owner/operator address:	HAMPTON BLVD NORFOLK, VA 23508
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	Federal
Owner/Operator Type:	Owner
Owner/Op start date:	07/22/1968
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Hazardous Waste Summary:

MID-ATLANTIC MIL. FAMILY COM. LLC MAMFC (Continued) **1009312553**

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D008
. Waste name: LEAD

Violation Status: No violations found

C20 **VIRGINIA BEACH ARMORY** **VA UST** **U003690161**
1096 SOUTH BIRDNECK RD **N/A**
< 1/8 **VIRGINIA BEACH, VA 23451**
1 ft.

Site 1 of 2 in cluster C

Relative: Higher
Actual: 13 ft.

Facility:

Facility Id:	5008224
Facility Type:	STATE
CEDS Facility ID:	200000067567

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	VAFM-E, PRN 160, BLDG 316, Fort Pickett
Owner Address2:	Not reported
Owner City, State, Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	0
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	2

UST:

Facility ID:	5008224
Federally Regulated:	Yes
Tank Number:	R1
Tank Capacity:	2000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1987
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	Yes
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

VIRGINIA BEACH ARMORY (Continued) **U003690161**

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5008224
Federally Regulated:	Yes

Tank Number:	R2
Tank Capacity:	2000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1987
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	Yes
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No

VIRGINIA BEACH ARMORY (Continued) **U003690161**

Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

C21	**VAARNG-ARMORY-VIRGINIA BEACH**	**RCRA-CESQG**	**1004789682**
	1096 S BIRDNECK RD	**FINDS**	**VAD982677650**
< 1/8	**VIRGINIA BEACH, VA 23458**	**ECHO**	
1 ft.			

Site 2 of 2 in cluster C

Relative: Higher

Actual: 13 ft.

RCRA-CESQG:

Date form received by agency:	04/02/2012
Facility name:	VAARNG-ARMORY-VIRGINIA BEACH
Facility address:	1096 S BIRDNECK RD

VAARNG-ARMORY-VIRGINIA BEACH (Continued) **1004789682**

	VIRGINIA BEACH, VA 23458
EPA ID:	VAD982677650
Contact:	PAMELA W COLEMAN
Contact address:	BLDG. 316, FORT PICKETT BLACKSTONE, VA 23824
Contact country:	US
Contact telephone:	434-298-6445
Contact email:	PAM.COLEMAN1@US.ARMY.MIL
EPA Region:	03
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	VA DEPT OF MILITARY AFFAIRS
Owner/operator address:	600 E BROAD ST PRN 160 RICHMOND, VA 23219
Owner/operator country:	Not reported
Owner/operator telephone:	804-775-9401
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	VA DEPARTMENT OF MILITARY AFFAIRS
Owner/operator address:	BLDG. 316, FORT PICKETT BLACKSTONE, VA 23824
Owner/operator country:	US
Owner/operator telephone:	434-298-6401
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Owner
Owner/Op start date:	01/01/1987
Owner/Op end date:	Not reported

Owner/operator name:	OPERNAME
Owner/operator address:	OPERSTREET OPERCITY, AK 99999
Owner/operator country:	Not reported
Owner/operator telephone:	215-555-1212

VAARNG-ARMORY-VIRGINIA BEACH (Continued) **1004789682**

Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	VA DEPARTMENT OF MILITARY AFFAIRS
Owner/operator address:	Not reported Not reported
Owner/operator country:	US
Owner/operator telephone:	Not reported
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	State
Owner/Operator Type:	Operator
Owner/Op start date:	01/01/1987
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Historical Generators:

Date form received by agency:	05/14/1990
Site name:	VAARNG-ARMORY-VIRGINIA BEACH
Classification:	Conditionally Exempt Small Quantity Generator

Hazardous Waste Summary:

. Waste code: D000
. Waste name: Not Defined

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D006
. Waste name: CADMIUM

VAARNG-ARMORY-VIRGINIA BEACH (Continued) **1004789682**

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D011
. Waste name: SILVER

. Waste code: F001
. Waste name: THE FOLLOWING SPENT HALOGENATED SOLVENTS USED IN DEGREASING: TETRACHLOROETHYLENE, TRICHLORETHYLENE, METHYLENE CHLORIDE, 1,1,1-TRICHLOROETHANE, CARBON TETRACHLORIDE AND CHLORINATED FLUOROCARBONS; ALL SPENT SOLVENT MIXTURES/BLENDS USED IN DEGREASING CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

FINDS:

Registry ID: 110005234996

Environmental Interest/Information System
RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:
Envid: 1004789682
Registry ID: 110005234996
DFR URL: http://echo.epa.gov/detailed-facility-report?fid=110005234996

D22 **SHELL VA 067** **VA UST** **U004131504**
SW **900 GENERAL BOOTH BLVD** **VA Financial Assurance** **N/A**
< 1/8 **VIRGINIA BEACH, VA 23451**
0.016 mi.
87 ft. **Site 1 of 3 in cluster D**

Relative:
Higher
Actual:
14 ft.

Facility:
Facility Id: 5006527
Facility Type: GAS STATION
CEDS Facility ID: 200000067498

Owner:
Owner Id: 41888
Owner Name: PMIG 1019 LLC
Owner Address: 2359 Research Ct
Owner Address2: Not reported

SHELL VA 067 (Continued) **U004131504**

Owner City, State, Zip:	Woodbridge, VA 22192
Owner Type:	COMMERCIAL
Number of Active AST:	0
Number of Active UST:	3
Number of Inactive AST:	0
Number of Inactive UST:	1

UST:

Facility ID:	5006527
Federally Regulated:	Yes
Tank Number:	1
Tank Capacity:	12000
Tank Contents:	GASOLINE: REGULAR
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	12/15/1998
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	impressed current

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No

SHELL VA 067 (Continued) **U004131504**

Pipe Release Detection: Other Note	shut-off valves and ball floats
Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Need Piping closure for steel piping removed 1998
Facility ID:	5006527
Federally Regulated:	Yes
Tank Number:	2
Tank Capacity:	12000
Tank Contents:	GASOLINE: PREMIUM
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	12/15/1998
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	impressed current

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported

SHELL VA 067 (Continued) **U004131504**

Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	shut off valves and ball floats

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Need piping closure for steel piping removed 12/15/98

Facility ID:	5006527
Federally Regulated:	Yes

Tank Number:	4
Tank Capacity:	8000
Tank Contents:	DIESEL: ULTRA LOW SULFUR
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	12/15/1998
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	impressed current

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No

SHELL VA 067 (Continued) **U004131504**

Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	shut off valves and ball floats

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	need 12/98 piping closure (steel)

Facility ID:	5006527
Federally Regulated:	Yes

Tank Number:	R-3
Tank Capacity:	12000
Tank Contents:	GASOLINE
Tank Status:	**CLS IN GRD**
Tank Type:	UST

Tank Material:

Install Date:	12/15/1998
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	impressed current

SHELL VA 067 (Continued) **U004131504**

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	Yes
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	Yes
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	shut off valves and ball floats

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	need piping closure for 12/98 steel piping

VA Financial Assurance 1:

Facility ID:	5006527
Owner Name:	PMIG 1019 LLC
ROF Own Id:	41888
Tank Type:	UST
Mechanism:	Insurance
Gallonage:	Not reported
Per Occurence:	2000000
Third Party:	2000000
Annual Aggregate:	10000000
In Compliance:	Not reported
Total Capacity:	12000
CEDS Facility Name:	Shell VA 067
Tank Status:	CURR IN USE
Active Federally Regualted UST:	Y

Facility ID:	5006527

SHELL VA 067 (Continued) **U004131504**

Owner Name:	PMIG 1019 LLC
ROF Own Id:	41888
Tank Type:	UST
Mechanism:	Insurance
Gallonage:	Not reported
Per Occurence:	2000000
Third Party:	2000000
Annual Aggregate:	10000000
In Compliance:	Not reported
Total Capacity:	12000
CEDS Facility Name:	Shell VA 067
Tank Status:	CURR IN USE
Active Federally Regualted UST:	Y

Facility ID:	5006527
Owner Name:	PMIG 1019 LLC
ROF Own Id:	41888
Tank Type:	UST
Mechanism:	Insurance
Gallonage:	Not reported
Per Occurence:	2000000
Third Party:	2000000
Annual Aggregate:	10000000
In Compliance:	Not reported
Total Capacity:	8000
CEDS Facility Name:	Shell VA 067
Tank Status:	CURR IN USE
Active Federally Regualted UST:	Y

D23 **CROWN VA 067** **VA LUST** **U003689926**
SW **900 GENERAL BOOTH BLVD** **VA LTANKS** **N/A**
< 1/8 **VIRGINIA BEACH, VA 23451**
0.016 mi.
87 ft. **Site 2 of 3 in cluster D**

Relative:
Higher

Actual:
14 ft.

LUST REG TD:

Region:	TD
Region Code:	TRO
Facility ID:	200000067498
Facility Status:	**Closed**
Completed Date:	12/03/2008
Pollution Complaint Num:	20095068
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	Release reported

Region:	TD
Region Code:	TRO
Facility ID:	200000067498
Facility Status:	**Closed**
Completed Date:	03/09/2009
Pollution Complaint Num:	20095068
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	Case Closed

CROWN VA 067 (Continued) **U003689926**

Region:	TD
Region Code:	TRO
Facility ID:	200000067498
Facility Status:	**Closed**
Completed Date:	07/29/2003
Pollution Complaint Num:	20045017
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	Release reported

Region:	TD
Region Code:	TRO
Facility ID:	200000067498
Facility Status:	**Closed**
Completed Date:	12/10/2003
Pollution Complaint Num:	20045017
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	Case Closed

LTANKS:

Region:	TRO
CEDS Facility Id:	200000067498
Case Status:	**Closed**
Pollution Complaint #:	20095068
Reported:	12/03/2008
Case Closed Date:	03/09/2009
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	Y
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

D24 **CROWN CENTRAL PETROLEUM CORP** **EDR Hist Auto** **1020705714**
SW **900 GENERAL BOOTH BLVD** **N/A**
< 1/8 **VIRGINIA BEACH, VA 23451**
0.016 mi.
87 ft. **Site 3 of 3 in cluster D**

Relative:
Higher

EDR Hist Auto

Actual:
14 ft.

Year:	Name:	Type:
2000	CROWN CENTRAL PETROLEUM CORP	Petroleum Refining
2001	CROWN CENTRAL PETROLEUM CORP	Petroleum Bulk Stations And Terminals, NEC
2002	CROWN CENTRAL PETROLEUM CORP	Petroleum Bulk Stations And Terminals, NEC

CROWN CENTRAL PETROLEUM CORP (Continued) **1020705714**

2003	CROWN CENTRAL PETROLEUM CORP	Gasoline Service Stations, NEC
2004	CROWN CENTRAL PETROLEUM CORP	Gasoline Service Stations, NEC
2005	CROWN CENTRAL PETROLEUM CORP	Gasoline Service Stations, NEC
2006	CROWN CENTRAL PETROLEUM CORP	Gasoline Service Stations, NEC
2007	E & C ENTERPRISES INCORPORATED	Gasoline Service Stations, NEC
2008	E & C ENTERPRISES INCORPORATED	Gasoline Service Stations, NEC
2009	E & C ENTERPRISES INCORPORATED	Gasoline Service Stations, NEC
2010	E & C ENTERPRISES INCORPORATED	Gasoline Service Stations, NEC
2011	E & C ENTERPRISES INCORPORATED	Gasoline Service Stations, NEC

25
NNW
< 1/8
0.019 mi.
102 ft.

VA MARINE SCIENCE MUSEUM
717 GENERAL BOOTH BLVD
VIRGINIA BEACH, VA 23451

RCRA-CESQG **1004790557**
FINDS **VAD988212312**
ECHO

Relative:
Lower

Actual:
10 ft.

RCRA-CESQG:

Date form received by agency:	02/13/1992
Facility name:	VA MARINE SCIENCE MUSEUM
Facility address:	717 GENERAL BOOTH BLVD VIRGINIA BEACH, VA 23451
EPA ID:	VAD988212312
Mailing address:	SAFETY OFFICE MUNICIPAL BLDG VIRGINIA BEACH, VA 23456
Contact:	MAYLON WHITE
Contact address:	717 GENERAL BOOTH BLVD VIRGINIA BEACH, VA 23451
Contact country:	US
Contact telephone:	804-437-4949
Contact email:	Not reported
EPA Region:	03
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	CITY OF VIRGINIA BEACH
Owner/operator address:	MUNICIPAL CENTER VIRGINIA BEACH, VA 23456
Owner/operator country:	Not reported
Owner/operator telephone:	804-427-8989
Owner/operator email:	Not reported
Owner/operator fax:	Not reported
Owner/operator extension:	Not reported
Legal status:	Municipal

VA MARINE SCIENCE MUSEUM (Continued) **1004790557**

Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

Hazardous Waste Summary:

. Waste code:	D000
. Waste name:	Not Defined
. Waste code:	D009
. Waste name:	MERCURY

Violation Status: No violations found

FINDS:

Registry ID: 110005250511

Environmental Interest/Information System
RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid:	1004790557
Registry ID:	110005250511
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110005250511

26 SW < 1/8 0.063 mi. 333 ft.	**HOLIDAY FOOD MART 909 GENERAL BOOTH BLVD VIRGINIA BEACH, VA 23451**	**VA UST VA Financial Assurance**	**U004010688 N/A**

Relative: Higher
Actual: 19 ft.

Facility:

Facility Id:	5039696
Facility Type:	GAS STATION
CEDS Facility ID:	200000221864

Owner:

Owner Id:	42504
Owner Name:	Holiday Village Inc
Owner Address:	1075 General Booth Blvd.
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23451
Owner Type:	COMMERCIAL
Number of Active AST:	0
Number of Active UST:	4
Number of Inactive AST:	0
Number of Inactive UST:	0

UST:

Facility ID:	5039696
Federally Regulated:	Yes
Tank Number:	1
Tank Capacity:	10000
Tank Contents:	GASOLINE: REGULAR
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	5/1/1982
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	Impressed Current System Steel

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes

HOLIDAY FOOD MART (Continued) **U004010688**

Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Automatic Shutoff

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5039696
Federally Regulated:	Yes

Tank Number:	2
Tank Capacity:	10000
Tank Contents:	GASOLINE: MID
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	5/1/1982
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	Impressed Current System Steel

Release Detection:

HOLIDAY FOOD MART (Continued) **U004010688**

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Automatic Shutoff

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5039696
Federally Regulated:	Yes

Tank Number:	3
Tank Capacity:	10000
Tank Contents:	GASOLINE: PREMIUM
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	5/1/1982
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No

HOLIDAY FOOD MART (Continued) **U004010688**

Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	Impressed Current System Steel

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Automatic Shutoff

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5039696
Federally Regulated:	Yes

Tank Number:	4
Tank Capacity:	10000
Tank Contents:	DIESEL: ULTRA LOW SULFUR
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	5/1/1982
Tank Materials: Bare Steel	No

HOLIDAY FOOD MART (Continued) **U004010688**

Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	Yes
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	Impressed Current System Steel

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Automatic Shutoff

Pipe Type:	PRESSURE
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

VA Financial Assurance 1:

Facility ID:	5039696
Owner Name:	Holiday Village Inc

HOLIDAY FOOD MART (Continued) **U004010688**

ROF Own Id: 42504
Tank Type: UST
Mechanism: Not reported
Gallonage: Not reported
Per Occurence: Not reported
Third Party: Not reported
Annual Aggregate: Not reported
In Compliance: Not reported
Total Capacity: 10000
CEDS Facility Name: Holiday Food Mart
Tank Status: CURR IN USE
Active Federally Regualted UST: Y

Facility ID: 5039696
Owner Name: Holiday Village Inc
ROF Own Id: 42504
Tank Type: UST
Mechanism: Not reported
Gallonage: Not reported
Per Occurence: Not reported
Third Party: Not reported
Annual Aggregate: Not reported
In Compliance: Not reported
Total Capacity: 10000
CEDS Facility Name: Holiday Food Mart
Tank Status: CURR IN USE
Active Federally Regualted UST: Y

Facility ID: 5039696
Owner Name: Holiday Village Inc
ROF Own Id: 42504
Tank Type: UST
Mechanism: Not reported
Gallonage: Not reported
Per Occurence: Not reported
Third Party: Not reported
Annual Aggregate: Not reported
In Compliance: Not reported
Total Capacity: 10000
CEDS Facility Name: Holiday Food Mart
Tank Status: CURR IN USE
Active Federally Regualted UST: Y

Facility ID: 5039696
Owner Name: Holiday Village Inc
ROF Own Id: 42504
Tank Type: UST
Mechanism: Not reported
Gallonage: Not reported
Per Occurence: Not reported
Third Party: Not reported
Annual Aggregate: Not reported
In Compliance: Not reported
Total Capacity: 10000
CEDS Facility Name: Holiday Food Mart
Tank Status: CURR IN USE
Active Federally Regualted UST: Y

E27 | **BIRDNECK ELEMENTARY SCHOOL** | **VA UST** | **U003983337**
WSW | **957 S BIRDNECK RD** | **VA Financial Assurance** | **N/A**
1/8-1/4 | **VIRGINIA BEACH, VA 23451**
0.144 mi.
760 ft. | **Site 1 of 4 in cluster E**

Relative:
Higher

Actual:
16 ft.

Facility:

Facility Id:	5013411
Facility Type:	LOCAL
CEDS Facility ID:	200000090761

Owner:

Owner Id:	33013
Owner Name:	Virginia Beach City Public Schools
Owner Address:	1568 Corporate Landing Parkway, Suite 200
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23462
Owner Type:	LOCAL
Number of Active AST:	0
Number of Active UST:	1
Number of Inactive AST:	0
Number of Inactive UST:	2

UST:

Facility ID:	5013411
Federally Regulated:	Yes
Tank Number:	1
Tank Capacity:	1000
Tank Contents:	DIESEL
Tank Status:	**CURR IN USE**
Tank Type:	UST

Tank Material:

Install Date:	3/1/1998
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	Yes
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	Yes
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	Yes
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No

BIRDNECK ELEMENTARY SCHOOL (Continued) **U003983337**

Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	Yes
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	Yes
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	Yes
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5013411
Federally Regulated:	Yes

Tank Number:	R1
Tank Capacity:	4000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1987
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

BIRDNECK ELEMENTARY SCHOOL (Continued) **U003983337**

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	Yes
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	NO VALVE: SUCTION
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5013411
Federally Regulated:	Yes

Tank Number:	R2
Tank Capacity:	270
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1987
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No

BIRDNECK ELEMENTARY SCHOOL (Continued) **U003983337**

Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	Yes
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	Yes
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	Yes
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	NO VALVE: SUCTION
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

VA Financial Assurance 1:

Facility ID:	5013411
Owner Name:	Virginia Beach City Public Schools
ROF Own Id:	33013
Tank Type:	UST
Mechanism:	LOGO Guar/NO LOGO Stdby
Gallonage:	364884
Per Occurence:	5000
Third Party:	15000
Annual Aggregate:	20000
In Compliance:	Not reported

BIRDNECK ELEMENTARY SCHOOL (Continued) **U003983337**

Total Capacity:	1000
CEDS Facility Name:	Virginia Beach City - Birdneck Elementary School
Tank Status:	CURR IN USE
Active Federally Regualted UST:	Y

E28	**STATE MILITARY RESERVATION CAMP PENDLETON**	**VA UST**	**U004109376**
WSW	**940 S BIRDNECK RD**		**N/A**
1/8-1/4	**VIRGINIA BEACH, VA 23451**		
0.150 mi.			
794 ft.	**Site 2 of 4 in cluster E**		

Relative: **Higher**

Actual: **15 ft.**

Facility:

Facility Id:	5040402
Facility Type:	STATE
CEDS Facility ID:	200000196746

Owner:

Owner Id:	27238
Owner Name:	Virginia Dept Military Affairs
Owner Address:	VAFM-E, PRN 160, BLDG 316, Fort Pickett
Owner Address2:	Not reported
Owner City, State, Zip:	Blackstone, VA 23824
Owner Type:	FEDERAL
Number of Active AST:	0
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	4

UST:

Facility ID:	5040402
Federally Regulated:	No
Tank Number:	1
Tank Capacity:	6000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	STI-P3

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No

STATE MILITARY RESERVATION CAMP PENDLETON (Continued) **U004109376**

Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Alarm

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5040402
Federally Regulated:	No

Tank Number:	2
Tank Capacity:	6000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No

STATE MILITARY RESERVATION CAMP PENDLETON (Continued) **U004109376**

Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	STI-P3

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Alarm

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5040402
Federally Regulated:	No

Tank Number:	3
Tank Capacity:	1000
Tank Contents:	KEROSENE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No

STATE MILITARY RESERVATION CAMP PENDLETON (Continued) **U004109376**

Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	STI-P3

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Alarm

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5040402
Federally Regulated:	No

Tank Number:	4
Tank Capacity:	1000
Tank Contents:	GASOLINE

STATE MILITARY RESERVATION CAMP PENDLETON (Continued) **U004109376**

Tank Status:	**REM FROM GRD**
Tank Type:	UST
Tank Material:	
Install Date:	1/1/1989
Tank Materials: Bare Steel	No
Tank Materials: Cath Protect Steel	Yes
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	STI-P3
Release Detection:	
Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	Yes
Tank Release Detection: Overfill Install	Yes
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	No
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Overfill Alarm
Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	No
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	Yes
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

E29 **WSW** **1/8-1/4** **0.177 mi.** **936 ft.**	**SEATACK FIRE STATION #12** **949 S BIRDNECK RD** **VIRGINIA BEACH, VA 23451** **Site 3 of 4 in cluster E**	**VA UST** **VA AST**	**U003983107** **N/A**

Relative:
Higher

Actual:
16 ft.

Facility:

Facility Id:	5010651
Facility Type:	LOCAL
CEDS Facility ID:	200000091647

Owner:

Owner Id:	37139
Owner Name:	City of Virginia Beach Public Works/Automotive Svc
Owner Address:	2633 Leroy Rd
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23456
Owner Type:	LOCAL
Number of Active AST:	1
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	2

UST:

Facility ID:	5010651
Federally Regulated:	Yes
Tank Number:	R1
Tank Capacity:	2000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/1/1984
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	Yes
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No

SEATACK FIRE STATION #12 (Continued) **U003983107**

Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5010651
Federally Regulated:	Yes

Tank Number:	R2
Tank Capacity:	2000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	4/30/1984
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

SEATACK FIRE STATION #12 (Continued) **U003983107**

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	Yes
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	Yes
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	Yes
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	UNKNOWN
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

AST:

Facility ID:	5010651
Facility Type:	LOCAL
CEDS Facility ID:	200000091647

Tank Info:

Owner:

Owner Id:	37139
Owner Name:	City of Virginia Beach Public Works/Automotive Svc
Owner Address:	2633 Leroy Rd
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23456
Owner Type:	LOCAL
Number of Active AST:	1
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	2

Fed Regulated:	No

SEATACK FIRE STATION #12 (Continued) **U003983107**

Tank Number:	1
Tank Type:	AST
Tank Capacity:	2000
Tank Contents:	DIESEL
Tank Status:	CURR IN USE

Tank Containment:

Install Date:	10/19/1995
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	No
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No
Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	No
Release Detection: Vapor	No
Release Detection: Interstitial	Yes
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported
Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	No
Release Prevention: Unknown	No
Release Prevention: Other	Yes
Release Prevention: Other Note	CONCRETE VAULTED

Tank Foundation: Steel	No
Tank Foundation: Earthen	No
Tank Foundation: Concrete Imp	No
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported
Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	No
Tank Roof: Other Note	Not reported

Tank Material:

Tank Materials: Bare Steel	Yes
Tank Materials: Concrete	No

SEATACK FIRE STATION #12 (Continued) **U003983107**

Tank Materials: Insulated Tank Jacket	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	ENCASED IN CONCRETE
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N
Tank Type Other Specify:	N

E30 **WSW** **1/8-1/4** **0.177 mi.** **936 ft.**	**VIRGINIA BEACH CITY - SEATACK FIRE STATION 12** **949 S BIRDNECK RD** **VIRGINIA BEACH, VA 23451** **Site 4 of 4 in cluster E**	**VA LUST** **VA LTANKS** **VA SPILLS**	**S105949766** **N/A**

Relative: **Higher**

Actual: **16 ft.**

LUST REG TD:

Region:	TD
Region Code:	TRO
Facility ID:	200000091647
Facility Status:	**Closed**
Completed Date:	06/16/1993
Pollution Complaint Num:	19932506
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	WATER FOUND IN UST ON 6-14-93.

Region:	TD
Region Code:	TRO
Facility ID:	200000091647
Facility Status:	**Closed**
Completed Date:	04/08/1994
Pollution Complaint Num:	19932506
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED FOR THIS PC ONLY - NO FURTHER ACTION REQUIRED.

Region:	TD
Region Code:	TRO
Facility ID:	200000091647
Facility Status:	**Closed**
Completed Date:	08/18/1992
Pollution Complaint Num:	19930359
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported

VIRGINIA BEACH CITY - SEATACK FIRE STATION 12 (Continued) **S105949766**

Comments:	WATER IN UST.
Region:	TD
Region Code:	TRO
Facility ID:	200000091647
Facility Status:	**Closed**
Completed Date:	09/18/1995
Pollution Complaint Num:	19930359
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED.

LTANKS:

Region:	TRO
CEDS Facility Id:	200000091647
Case Status:	**Closed**
Pollution Complaint #:	19930359
Reported:	08/18/1992
Case Closed Date:	09/18/1995
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

SPILLS TD:

Region:	TD
PC Number:	93-359
Incident Response:	Not reported
Incident Date:	Not reported
Time In:	Not reported
Facility Permitted:	Not reported
Facility Contact:	Not reported
Facility Phone:	Not reported
Resp Party:	Not reported
RP Company:	Not reported
RP Address:	Not reported
RP City,St,Zip:	Not reported
Resp Party Phone:	Not reported
Owner Name:	Not reported
Owner Address:	Not reported
Owner City,St,Zip:	Not reported
Owner Contact:	Not reported
Owner Phone:	Not reported
Incident Date:	Not reported

VIRGINIA BEACH CITY - SEATACK FIRE STATION 12 (Continued) **S105949766**

Incident Time:	Not reported
Petroleum:	Not reported
Solid Waste:	Not reported
Haz Waste:	Not reported
Water:	Not reported
Air:	Not reported
Sewage:	Not reported
Fish Killed:	Not reported
Medical Waste:	Not reported
Wetland:	Not reported
Terrorism:	Not reported
Material Released:	Not reported
Possible Receptors:	Not reported
Qty Released:	Not reported
Unit:	Not reported
Qty In Water:	Not reported
Receiving Waters:	Not reported
River Basin:	Not reported
Topo Map Id:	Not reported
Inspection Dt:	Not reported
Call Date:	Not reported
Inspector:	Not reported
Response Due:	Not reported
Response Receive:	Not reported
Date Closed:	**Not reported**
Dt Ref Air C/m:	Not reported
Air Reg Permit #:	Not reported
Date Ref Waste C/M:	Not reported
Epa Ir/permit #:	Not reported
Date Ref Water C/m:	Not reported
Water Permit #:	Not reported
Date Ref Remediation:	Not reported
Remediation PC #:	Not reported
Date Ref Enforcement:	Not reported
NOV Number:	Not reported
Date Received:	8/21/1992
Source:	UST
Summary:	Not reported
Comments:	Not reported
Report Notes:	2000 GAL UST. AT FIRE STATION #12. SUSPECTED RELEASE.
Reported By Company:	Not reported
Reported By Address:	Not reported
Reported By Street:	Not reported
Reported By City,St,Zip:	Not reported
Reported By Phone:	Not reported
Report By Name:	Not reported
PI Date:	8/21/1992
Incident Time:	Not reported
Incident Type:	PETROLEUM
Stream:	Not reported
Spill Volume:	Not reported
Spill Unit:	Not reported
Volume To State Water:	Not reported

31 **NNE** **1/4-1/2** **0.339 mi.** **1792 ft.**	**MATHEWS ACHAMMA PROPERTY** **523 GENERAL BOOTH BLVD** **VIRGINIA BEACH, VA 23451**	**VA LTANKS**	**S120835650** **N/A**

Relative: **Higher**

Actual: **14 ft.**

LTANKS:

Region:	TRO
CEDS Facility Id:	200000885105
Case Status:	**Closed**
Pollution Complaint #:	20175286
Reported:	06/05/2017
Case Closed Date:	01/26/2018
Program:	RP Lead
Federally Regulated UST (Y/N):	N
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	Y
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Category 2

32 **SSW** **1/4-1/2** **0.364 mi.** **1920 ft.**	**REDWING GOLF COURSE** **1080 PROSPERITY ROAD** **VIRGINIA BEACH, VA 23451**	**VA LUST** **VA LTANKS** **VA UST** **VA AST** **VA SPILLS**	**U003690637** **N/A**

Relative: **Higher**

Actual: **12 ft.**

LUST REG TD:

Region:	TD
Region Code:	TRO
Facility ID:	200000066744
Facility Status:	**Closed**
Completed Date:	04/21/1989
Pollution Complaint Num:	19901059
Fed Regulated Tank:	Yes
Phase Code:	RR
Event Description:	Release Reported
Comments:	WATER INTRUSION IN UST.

Region:	TD
Region Code:	TRO
Facility ID:	200000066744
Facility Status:	**Closed**
Completed Date:	08/11/1994
Pollution Complaint Num:	19901059
Fed Regulated Tank:	Yes
Phase Code:	CLOSURE
Event Description:	Case Closure Date - Letter Sent
Comments:	CASE CLOSED-NFA REQUIRED.

LTANKS:

REDWING GOLF COURSE (Continued) **U003690637**

Region:	TRO
CEDS Facility Id:	200000066744
Case Status:	**Closed**
Pollution Complaint #:	19901059
Reported:	04/21/1989
Case Closed Date:	08/11/1994
Program:	RP Lead
Federally Regulated UST (Y/N):	Y
Regulated Petroleum UST (1):	N
Excluded UST (1):	N
Deferred UST (1):	N
Partially Deferred UST (1):	N
Exempt 1 UST (2):	N
Exempt 2 Heating Oil UST (2):	N
Small Heating Oil AST (2):	N
Regulated AST (3):	N
Unregulated AST (3):	N
Other Y/N:	N
Unknown Y/N:	N
Other Description:	Not reported
Heating Oil Category:	Not reported

Facility:

Facility Id:	5010647
Facility Type:	LOCAL
CEDS Facility ID:	200000066744

Owner:

Owner Id:	37139
Owner Name:	City of Virginia Beach Public Works/Automotive Svc
Owner Address:	2633 Leroy Rd
Owner Address2:	Not reported
Owner City, State, Zip:	Virginia Beach, VA 23456
Owner Type:	LOCAL
Number of Active AST:	1
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	2

UST:

Facility ID:	5010647
Federally Regulated:	Yes
Tank Number:	1-L
Tank Capacity:	2000
Tank Contents:	GASOLINE
Tank Status:	**REM FROM GRD**
Tank Type:	UST

Tank Material:

Install Date:	1/1/1973
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No

REDWING GOLF COURSE (Continued) **U003690637**

Tank Materials: Double Walled	No
Tank Materials: Lined Interior	Yes
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

Facility ID:	5010647
Federally Regulated:	Yes

Tank Number:	2-D
Tank Capacity:	1000
Tank Contents:	DIESEL
Tank Status:	**REM FROM GRD**
Tank Type:	UST

REDWING GOLF COURSE (Continued) **U003690637**

Tank Material:

Install Date:	1/1/1982
Tank Materials: Bare Steel	Yes
Tank Materials: Cath Protect Steel	No
Tank Materials: Epoxy Steel	No
Tank Materials: Fiberglass	No
Tank Materials: Concrete	No
Tank Materials: Composite	No
Tank Materials: Double Walled	No
Tank Materials: Lined Interior	No
Tank Materials: Excav Liner	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Repaired	No
Tank Materials: Unknown	No
Tank Materials: Other	No
Tank Materials: Other Note	Not reported

Release Detection:

Tank Release Detection: Leak Deferred	No
Tank Release Detection: Manual Gauge	No
Tank Release Detection: Auto Gauge	No
Tank Release Detection:Tank Tightness	No
Tank Release Detection: Vapor Monitor	No
Tank Release Detection: Inventory	No
Tank Release Detection: Stat Invent Recon	No
Tank Release Detection: Spill Install	No
Tank Release Detection: Overfill Install	No
Tank Release Detection: Groundwater	No
Tank Release Detection: Int Sec Containment	No
Tank Release Detection: Int Double Walled	No
Tank Release Detection: Other Method	No
Tank Release Detection: Other Note	Not reported
Pipe Release Detection: Leak Deferred	Not reported
Pipe Release Detection: Autoleak	Not reported
Pipe Release Detection: Line Tightness	No
Pipe Release Detection: Stat Invent Recon	No
Pipe Release Detection: Groundwater	No
Pipe Release Detection: Int Sec Containment	No
Pipe Release Det: Interior Double Walled	No
Pipe Release Detection: Other Method	No
Pipe Release Detection: Other Note	Not reported

Pipe Type:	VALVE: SUCTION
Pipe Materials: Bare Steel	Yes
Pipe Materials: Galvanized Steel	No
Pipe Materials: Copper	No
Pipe Materials: Fiberglass	No
Pipe Materials: Cath Protect	No
Pipe Materials: Double Walled	No
Pipe Materials: Sec Containment	No
Pipe Materials: Repaired	No
Pipe Materials: Unknown	No
Pipe Materials: Other	No
Pipe Materials: Other Note	Not reported

REDWING GOLF COURSE (Continued) **U003690637**

AST:

Facility ID:	5010647
Facility Type:	LOCAL
CEDS Facility ID:	200000066744

Tank Info:

Owner:

Owner Id:	37139
Owner Name:	City of Virginia Beach Public Works/Automotive Svc
Owner Address:	2633 Leroy Rd
Owner Address2:	Not reported
Owner City/State/Zip:	Virginia Beach, VA 23456
Owner Type:	LOCAL
Number of Active AST:	1
Number of Active UST:	0
Number of Inactive AST:	0
Number of Inactive UST:	2

Fed Regulated:	No
Tank Number:	1
Tank Type:	AST
Tank Capacity:	1000
Tank Contents:	GASOLINE
Tank Status:	CURR IN USE

Tank Containment:

Install Date:	10/29/1997
Containment: Curbing	No
Containment: Weirs	No
Containment: Sorbent	No
Containment: Culvert	No
Containment: Diversion	No
Containment: Retention	No
Containment: Dike	No
Containment: Unknown	No
Containment: Other	No
Containment: Other Note	Not reported

Release Detection:

Release Detection: Ground Water	No
Release Detection: Visual	No
Release Detection: Vapor	No
Release Detection: Interstitial	Yes
Release Detection: None	No
Release Detection: Other	No
Release Detection: Other Note	Not reported
Release Prevention: Double Bottom	No
Release Prevention: Double Walled	No
Release Prevention: Lined Interior	Not reported
Release Prevention: Poly Jacket	No
Release Prevention: Exc Liner	No
Release Prevention: None	No
Release Prevention: Unknown	No
Release Prevention: Other	Yes
Release Prevention: Other Note	CONCRETE VAULTED

Tank Foundation: Steel	No

REDWING GOLF COURSE (Continued) **U003690637**

Tank Foundation: Earthen	No
Tank Foundation: Concrete Imp	No
Tank Foundation: Unknown	No
Tank Foundation: Other	No
Tank Foundation: Other Note	Not reported
Tank Roof: Float	No
Tank Roof: Cone	No
Tank Roof: Breather	Not reported
Tank Roof: Dbldeck	Not reported
Tank Roof: Pontoon	Not reported
Tank Roof: Balloon	Not reported
Tank Roof: Lifter	Not reported
Tank Roof: Pan	Not reported
Tank Roof: Other	No
Tank Roof: Other Note	Not reported

Tank Material:

Tank Materials: Bare Steel	No
Tank Materials: Concrete	No
Tank Materials: Insulated Tank Jacket	No
Tank Materials: Unknown	No
Tank Materials: Other	Yes
Tank Materials: Other Note	CONCRETE VAULTED TANK (INNER STEEL TANK ENCASED IN CONCRETE)
Tank Type Cathodic/CP:	N
Tank Type Single Wall:	N
Tank Type Double Wall:	N
Tank Type Lined Interior:	N
Tank Type Double Bottom:	N
Tank Type Potable/Skid:	N
Tank Type Shop Fabricated/Built:	N
Tank Type Vaulted Below Grade:	N
Tank Type Vertical:	N
Tank Type Horizontal:	N
Tank Type Unknown:	N
Tank Type Other:	N
Tank Type Other Specify:	N

SPILLS TD:

Region:	TD
PC Number:	Not reported
Incident Response:	2003-T-0730
Incident Date:	10/17/2002
Time In:	Not reported
Facility Permitted:	False
Facility Contact:	Not reported
Facility Phone:	Not reported
Resp Party:	Not reported
RP Company:	Not reported
RP Address:	Not reported
RP City,St,Zip:	Not reported
Resp Party Phone:	Not reported
Owner Name:	Not reported
Owner Address:	Not reported
Owner City,St,Zip:	Not reported

REDWING GOLF COURSE (Continued) **U003690637**

Owner Contact:	Not reported
Owner Phone:	Not reported
Incident Date:	Not reported
Incident Time:	Not reported
Petroleum:	True
Solid Waste:	False
Haz Waste:	False
Water:	False
Air:	False
Sewage:	False
Fish Killed:	False
Medical Waste:	False
Wetland:	False
Terrorism:	False
Material Released:	FUEL
Possible Receptors:	Not reported
Qty Released:	50
Unit:	GALLONS
Qty In Water:	0
Receiving Waters:	Not reported
River Basin:	Not reported
Topo Map Id:	Not reported
Inspection Dt:	Not reported
Call Date:	Not reported
Inspector:	CGL
Response Due:	Not reported
Response Receive:	Not reported
Date Closed:	**11/20/2002**
Dt Ref Air C/m:	Not reported
Air Reg Permit #:	Not reported
Date Ref Waste C/M:	Not reported
Epa Ir/permit #:	Not reported
Date Ref Water C/m:	Not reported
Water Permit #:	Not reported
Date Ref Remediation:	Not reported
Remediation PC #:	Not reported
Date Ref Enforcement:	Not reported
NOV Number:	Not reported
Date Received:	Not reported
Source:	Not reported
Summary:	SPILL WAS FROM AN ABOVE GROUND FUELING STATION, SOIL SAMPLES WERE TAKEN
Comments:	Not reported
Report Notes:	Not reported
Reported By Company:	Not reported
Reported By Address:	GER
Reported By Street:	Not reported
Reported By City,St,Zip:	Not reported
Reported By Phone:	7574633200
Report By Name:	REMO MASIELLO
PI Date:	Not reported
Incident Time:	Not reported
Incident Type:	Not reported
Stream:	Not reported
Spill Volume:	0
Spill Unit:	Not reported
Volume To State Water:	0

Count: 3 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
VA BEACH	S115957556	CAMP PENDLETON	BLDG 405, BARRACKS -- GENERAL		VA RGA LUST
VIRGINIA BEACH	S106845867	LAPLAYA HOTEL	33RD ST AND ATLANTIC AVE	23451	VA LUST, VA LTANKS
VIRGINIA BEACH	S118866712	BOLTE BRYAN K PROPERTY	217 B 57TH ST	23451	VA LTANKS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/14/2019
Number of Days to Update: 26

Source: EPA
Telephone: N/A
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 07/15/2019
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/14/2019
Number of Days to Update: 26

Source: EPA
Telephone: N/A
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 07/15/2019
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991	Source: EPA
Date Data Arrived at EDR: 02/02/1994	Telephone: 202-564-4267
Date Made Active in Reports: 03/30/1994	Last EDR Contact: 08/15/2011
Number of Days to Update: 56	Next Scheduled EDR Contact: 11/28/2011
	Data Release Frequency: No Update Planned

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 04/11/2019	Source: EPA
Date Data Arrived at EDR: 04/18/2019	Telephone: N/A
Date Made Active in Reports: 05/14/2019	Last EDR Contact: 06/06/2019
Number of Days to Update: 26	Next Scheduled EDR Contact: 07/15/2019
	Data Release Frequency: Quarterly

Federal CERCLIS list

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 04/03/2019	Source: Environmental Protection Agency
Date Data Arrived at EDR: 04/05/2019	Telephone: 703-603-8704
Date Made Active in Reports: 05/14/2019	Last EDR Contact: 04/05/2019
Number of Days to Update: 39	Next Scheduled EDR Contact: 07/15/2019
	Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 04/11/2019	Source: EPA
Date Data Arrived at EDR: 04/18/2019	Telephone: 800-424-9346
Date Made Active in Reports: 05/23/2019	Last EDR Contact: 06/06/2019
Number of Days to Update: 35	Next Scheduled EDR Contact: 07/29/2019
	Data Release Frequency: Quarterly

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 35

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 07/29/2019
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

Federal institutional controls / engineering controls registries

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 02/22/2019
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 41

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 05/10/2019
Next Scheduled EDR Contact: 08/26/2019
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 01/31/2019
Date Data Arrived at EDR: 02/04/2019
Date Made Active in Reports: 03/08/2019
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 05/29/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 01/31/2019
Date Data Arrived at EDR: 02/04/2019
Date Made Active in Reports: 03/08/2019
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 05/29/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/26/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 36

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 03/26/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

SHWS: This state does not maintain a SHWS list. See the Federal CERCLIS list and Federal NPL list.

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: Department of Environmental Quality
Telephone: 804-698-4236
Last EDR Contact: 03/18/2019
Next Scheduled EDR Contact: 07/01/2019
Data Release Frequency: N/A

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Solid Waste Management Facilities

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 03/04/2019
Date Data Arrived at EDR: 03/05/2019
Date Made Active in Reports: 04/10/2019
Number of Days to Update: 36

Source: Department of Environmental Quality
Telephone: 804-698-4238
Last EDR Contact: 06/03/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Semi-Annually

State and tribal leaking storage tank lists

LUST REG SW: Leaking Underground Storage Tank Database

Leaking underground storage tank site locations. Includes: counties of Bland, Buchanan, Carroll, Dickenson, Grayson, Lee, Russell, Scott, Smyth, Tazewell, Washington, Wise, Wythe; cities of Bristol, Galax, Norton.

Date of Government Version: 07/15/2013
Date Data Arrived at EDR: 07/18/2013
Date Made Active in Reports: 09/16/2013
Number of Days to Update: 60

Source: Department of Environmental Quality Southwest Regional Office
Telephone: 276-676-4800
Last EDR Contact: 10/11/2016
Next Scheduled EDR Contact: 01/23/2017
Data Release Frequency: No Update Planned

LUST REG TD: Leaking Underground Storage Tank Sites

Leaking underground storage tank site locations. Includes: counties of Accomack, Isle of Wight, James City, Northampton, Southampton, York; cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg.

Date of Government Version: 06/30/2013
Date Data Arrived at EDR: 07/05/2013
Date Made Active in Reports: 09/16/2013
Number of Days to Update: 73

Source: Department of Environmental Quality Tidewater Regional Office
Telephone: trofoia@deq.vir
Last EDR Contact: 09/26/2016
Next Scheduled EDR Contact: 01/09/2017
Data Release Frequency: Quarterly

LUST REG VA: Leaking Underground Storage Tank List

Leaking underground storage tank site locations. Includes: counties of Albemarle, Augusta, Bath, Clarke, Fluvanna, Frederick, Greene, Highland, Nelson, Page, Rockbridge, Rockingham, Shenandoah, Warren; cities of Buena Vista, Charlottesville, Harrisonburg, Lexington, Staunton, Waynesboro, Winchester.

Date of Government Version: 12/06/2011
Date Data Arrived at EDR: 12/08/2011
Date Made Active in Reports: 01/16/2012
Number of Days to Update: 39

Source: Department of Environmental Quality Valley Regional Office
Telephone: 540-574-7800
Last EDR Contact: 08/29/2016
Next Scheduled EDR Contact: 12/12/2016
Data Release Frequency: No Update Planned

LUST REG WC: Leaking Underground Storage Tank List

Leaking underground storage tank site locations. Includes: counties of Alleghany, Bedford, Botetourt, Craig, Floyd, Franklin, Giles, Henry, Montgomery, Patrick, Pulaski, Roanoke; cities of Bedford, Clifton Forge, Covington, Martinsville, Radford, Roanoke, Salem.

Date of Government Version: 06/04/2015
Date Data Arrived at EDR: 06/05/2015
Date Made Active in Reports: 07/07/2015
Number of Days to Update: 32

Source: Department of Environmental Quality West Central Regional Office
Telephone: 540-562-6700
Last EDR Contact: 08/29/2016
Next Scheduled EDR Contact: 12/12/2016
Data Release Frequency: No Update Planned

LUST REG PD: Leaking Underground Storage Tank Sites

Leaking underground storage tank site locaitons. Includes: counties of Amelia, Brunswick, Charles City, Chesterfield, Dinwiddie, Essex, Gloucester, Goochland, Greensville, Hanover, Henrico, King and Queen, King William, Lancaster, Mathews, Middlesex, New Kent, Northumberland, Powhatan, Prince George, Richmond, Surry, Sussex, Westmoreland; cities of Colonial Heights, Emporia, Hopewell, Petersburg.

Date of Government Version: 12/02/2014
Date Data Arrived at EDR: 12/04/2014
Date Made Active in Reports: 01/16/2015
Number of Days to Update: 43

Source: Department of Environmental Quality Piedmont Regional Office
Telephone: 804-527-5020
Last EDR Contact: 08/29/2016
Next Scheduled EDR Contact: 12/12/2016
Data Release Frequency: Quarterly

LUST REG SC: Leaking Underground Storage Tanks

Leaking underground storage tank site locations. Includes: counties of Amherst, Appomattox, Buckingham, Campbell, Charlotte, Cumberland, Halifax, Lunenburg, Mecklenburg, Nottoway, Pittsylvania, Prince Deward; cities of Danville, Lynchburg.

Date of Government Version: 09/06/2013
Date Data Arrived at EDR: 09/06/2013
Date Made Active in Reports: 09/17/2013
Number of Days to Update: 11

Source: Department of Environmental Quality, South Central Region
Telephone: 434-582-5120
Last EDR Contact: 08/29/2016
Next Scheduled EDR Contact: 12/12/2016
Data Release Frequency: Semi-Annually

LUST REG NO: Leaking Underground Storage Tank Tracking Database

Leaking underground storage tank site locations. Includes: counties of Arlington, Caroline, Culpeper, Fairfax, Fauquier, King George, Loudoun, Louisa, Madison, Orange, Prince William, Rappahannock, Spotsylvania, Stafford; cities of Alexandria, Fairfax, Falls Church, Fredericksburg, Manassas, Manassas Park.

Date of Government Version: 05/18/2004
Date Data Arrived at EDR: 05/22/2004
Date Made Active in Reports: 07/09/2004
Number of Days to Update: 48

Source: Department of Environmental Quality Northern Regional Office
Telephone: 703-583-3800
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 10/17/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 10/10/2018
Date Data Arrived at EDR: 03/08/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 10/12/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 10/13/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 09/24/2018
Date Data Arrived at EDR: 03/12/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 50

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 10/16/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 02/19/2019
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 11/01/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

LTANKS: Leaking Petroleum Storage Tanks
Includes releases of petroleum from underground storage tanks and aboveground storage tanks.

Date of Government Version: 02/05/2019
Date Data Arrived at EDR: 02/28/2019
Date Made Active in Reports: 04/08/2019
Number of Days to Update: 39

Source: Department of Environmental Quality
Telephone: 804-698-4010
Last EDR Contact: 05/30/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 05/15/2017
Date Data Arrived at EDR: 05/30/2017
Date Made Active in Reports: 10/13/2017
Number of Days to Update: 136

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 04/25/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Varies

UST: Registered Petroleum Storage Tanks
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 02/04/2019
Date Data Arrived at EDR: 02/27/2019
Date Made Active in Reports: 04/05/2019
Number of Days to Update: 37

Source: Department of Environmental Quality
Telephone: 804-698-4010
Last EDR Contact: 05/30/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Quarterly

AST: Registered Petroleum Storage Tanks
Registered Aboveground Storage Tanks.

Date of Government Version: 02/04/2019
Date Data Arrived at EDR: 02/27/2019
Date Made Active in Reports: 04/05/2019
Number of Days to Update: 37

Source: Department of Environmental Quality
Telephone: 804-698-4010
Last EDR Contact: 05/30/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 10/17/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 10/10/2018
Date Data Arrived at EDR: 03/08/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 54

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 10/16/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 11/07/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 11/01/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 10/12/2018
Date Data Arrived at EDR: 03/07/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 55

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 09/24/2018
Date Data Arrived at EDR: 03/12/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 50

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 10/03/2018	Source: EPA, Region 1
Date Data Arrived at EDR: 03/07/2019	Telephone: 617-918-1313
Date Made Active in Reports: 05/01/2019	Last EDR Contact: 04/26/2019
Number of Days to Update: 55	Next Scheduled EDR Contact: 08/05/2019
	Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

ENG CONTROLS: Engineering Controls Sites Listing

A listing of sites with Engineering Controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 01/07/2019	Source: Department of Environmental Quality
Date Data Arrived at EDR: 01/08/2019	Telephone: 804-698-4228
Date Made Active in Reports: 02/25/2019	Last EDR Contact: 04/08/2019
Number of Days to Update: 48	Next Scheduled EDR Contact: 07/22/2019
	Data Release Frequency: Quarterly

INST CONTROL: Voluntary Remediation Program Database

Sites included in the Voluntary Remediation Program database that have deed restrictions.

Date of Government Version: 01/07/2019	Source: Department of Environmental Quality
Date Data Arrived at EDR: 01/08/2019	Telephone: 804-698-4228
Date Made Active in Reports: 02/25/2019	Last EDR Contact: 04/08/2019
Number of Days to Update: 48	Next Scheduled EDR Contact: 07/22/2019
	Data Release Frequency: Quarterly

State and tribal voluntary cleanup sites

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008	Source: EPA, Region 7
Date Data Arrived at EDR: 04/22/2008	Telephone: 913-551-7365
Date Made Active in Reports: 05/19/2008	Last EDR Contact: 04/20/2009
Number of Days to Update: 27	Next Scheduled EDR Contact: 07/20/2009
	Data Release Frequency: Varies

VRP: Voluntary Remediation Program

The Voluntary Cleanup Program encourages owners of elected contaminated sites to take the initiative and conduct voluntary cleanups that meet state environmental standards.

Date of Government Version: 01/07/2019	Source: Department of Environmental Quality
Date Data Arrived at EDR: 01/08/2019	Telephone: 804-698-4228
Date Made Active in Reports: 02/25/2019	Last EDR Contact: 04/08/2019
Number of Days to Update: 48	Next Scheduled EDR Contact: 07/22/2019
	Data Release Frequency: Quarterly

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015	Source: EPA, Region 1
Date Data Arrived at EDR: 09/29/2015	Telephone: 617-918-1102
Date Made Active in Reports: 02/18/2016	Last EDR Contact: 03/25/2019
Number of Days to Update: 142	Next Scheduled EDR Contact: 07/08/2019
	Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Site Specific Assessments

To qualify for Brownfields Assessment, the site must meet the Federal definition of a Brownfields and should have contaminant issues that need to be addressed and a redevelopment plan supported by the local government and community. Virginia's Department of Environmental Quality performs brownfields assessments under a cooperative agreement with the U.S. Environmental Protection Agency at no cost to communities, property owners or, prospective purchasers. The assessment is an evaluation of environmental impacts caused by previous site uses similar to a Phase II Environmental Assessment.

Date of Government Version: 01/23/2019
Date Data Arrived at EDR: 01/24/2019
Date Made Active in Reports: 02/22/2019
Number of Days to Update: 29

Source: Department of Environmental Quality
Telephone: 804-698-4207
Last EDR Contact: 04/24/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Quarterly

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/17/2018
Date Data Arrived at EDR: 12/18/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 24

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/04/2019
Next Scheduled EDR Contact: 07/01/2019
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 04/26/2019
Next Scheduled EDR Contact: 08/12/2019
Data Release Frequency: Varies

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009	Source: EPA, Region 9
Date Data Arrived at EDR: 05/07/2009	Telephone: 415-947-4219
Date Made Active in Reports: 09/21/2009	Last EDR Contact: 04/22/2019
Number of Days to Update: 137	Next Scheduled EDR Contact: 08/05/2019
	Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land

A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014	Source: Department of Health & Human Serivces, Indian Health Service
Date Data Arrived at EDR: 08/06/2014	Telephone: 301-443-1452
Date Made Active in Reports: 01/29/2015	Last EDR Contact: 04/23/2019
Number of Days to Update: 176	Next Scheduled EDR Contact: 08/12/2019
	Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 02/24/2019	Source: Drug Enforcement Administration
Date Data Arrived at EDR: 02/26/2019	Telephone: 202-307-1000
Date Made Active in Reports: 04/17/2019	Last EDR Contact: 05/24/2019
Number of Days to Update: 50	Next Scheduled EDR Contact: 09/09/2019
	Data Release Frequency: No Update Planned

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/24/2019	Source: Drug Enforcement Administration
Date Data Arrived at EDR: 02/26/2019	Telephone: 202-307-1000
Date Made Active in Reports: 04/17/2019	Last EDR Contact: 05/24/2019
Number of Days to Update: 50	Next Scheduled EDR Contact: 09/09/2019
	Data Release Frequency: Quarterly

PFAS: Per- and Polyfluoroalkyl Substances

PFOS and PFOA stand for perfluorooctane sulfonate and perfluorooctanoic acid, respectively. Both are fluorinated organic chemicals, part of a larger family of compounds referred to as perfluoroalkyl substances (PFASs).

Date of Government Version: 04/08/2019	Source: Department of Environmental Quality
Date Data Arrived at EDR: 04/10/2019	Telephone: 804-698-4336
Date Made Active in Reports: 05/08/2019	Last EDR Contact: 04/08/2019
Number of Days to Update: 28	Next Scheduled EDR Contact: 07/22/2019
	Data Release Frequency: Varies

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 04/11/2019	Source: Environmental Protection Agency
Date Data Arrived at EDR: 04/18/2019	Telephone: 202-564-6023
Date Made Active in Reports: 05/23/2019	Last EDR Contact: 06/06/2019
Number of Days to Update: 35	Next Scheduled EDR Contact: 08/05/2019
	Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/26/2019
Date Made Active in Reports: 05/14/2019
Number of Days to Update: 49

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 03/26/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

SPILLS BRL: Prep/Spills Database Listing
A listing of spills locations located in the Blue Ridge Regional area, Lynchburg.

Date of Government Version: 09/18/2009
Date Data Arrived at EDR: 09/18/2009
Date Made Active in Reports: 10/06/2009
Number of Days to Update: 18

Source: DEQ, Blue Ridge Regional Office
Telephone: 434-582-6218
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Varies

SPILLS: Prep/Spills Database Listing
The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment. PREP staff often work to assist local emergency responders, other state agencies, federal agencies, and responsible parties, as may be needed, to manage pollution incidents. Oil spills, fish kills, and hazardous materials spills are examples of incidents that may involve the DEQ's PREP Program.

Date of Government Version: 02/04/2019
Date Data Arrived at EDR: 02/27/2019
Date Made Active in Reports: 04/08/2019
Number of Days to Update: 40

Source: Department of Environmental Quality
Telephone: 804-698-4287
Last EDR Contact: 05/30/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Quarterly

SPILLS PC: Pollution Complaint Database
Pollution Complaints Database. The pollution reports contained in the PC database include the initial release reporting of Leaking Underground Storage Tanks and all other releases of petroleum to the environment as well as releases to state waters. The database is current through 12/1/93. Since that time, all spill and pollution reporting information has been collected and tracked through the DEQ regional offices.

Date of Government Version: 06/01/1996
Date Data Arrived at EDR: 10/22/1996
Date Made Active in Reports: 11/21/1996
Number of Days to Update: 30

Source: Department of Environmental Quality
Telephone: 804-698-4287
Last EDR Contact: 03/08/2010
Next Scheduled EDR Contact: 06/21/2010
Data Release Frequency: No Update Planned

SPILLS NO: PREP Database
The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 09/23/2009
Date Data Arrived at EDR: 09/29/2009
Date Made Active in Reports: 10/30/2009
Number of Days to Update: 31

Source: Department of Environmental Quality, Northern Region
Telephone: 703-583-3864
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

SPILLS PD: PREP Database
The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 10/20/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 12/03/2009
Number of Days to Update: 35

Source: Department of Environmental Quality, Piedmont Region
Telephone: 804-527-5020
Last EDR Contact: 02/06/2012
Next Scheduled EDR Contact: 05/21/2012
Data Release Frequency: Quarterly

SPILLS SW: Reportable Spills

The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 01/21/2010
Date Data Arrived at EDR: 01/22/2010
Date Made Active in Reports: 02/16/2010
Number of Days to Update: 25

Source: Department of Environmental Quality, Southwest Region
Telephone: 276-676-4839
Last EDR Contact: 07/13/2012
Next Scheduled EDR Contact: 10/29/2012
Data Release Frequency: No Update Planned

SPILLS TD: PREP Database

The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 09/17/2009
Date Data Arrived at EDR: 09/23/2009
Date Made Active in Reports: 10/06/2009
Number of Days to Update: 13

Source: Department of Environmental Quality, Tidewater Region
Telephone: trofoia@deq.vir
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: Quarterly

SPILLS VA: PREP Database

The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 08/08/2012
Date Data Arrived at EDR: 08/09/2012
Date Made Active in Reports: 10/05/2012
Number of Days to Update: 57

Source: Department of Environmental Quality, Valley Regional Office
Telephone: 540-574-7800
Last EDR Contact: 05/06/2013
Next Scheduled EDR Contact: 08/19/2013
Data Release Frequency: Quarterly

SPILLS WC: Prep Database

The Department of Environmental Quality's POLLUTION RESPONSE PROGRAM, known as PREP, provides for responses to air, water, and waste pollution incidents in order to protect human health and the environment.

Date of Government Version: 09/21/2009
Date Data Arrived at EDR: 09/29/2009
Date Made Active in Reports: 10/30/2009
Number of Days to Update: 31

Source: Department of Environmental Quality, West Central Region
Telephone: 540-562-6700
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 09/01/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 43

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/27/2019
Date Made Active in Reports: 04/17/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 03/27/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 03/07/2019
Date Data Arrived at EDR: 04/03/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 50

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 05/21/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/12/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 04/12/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 01/01/2017
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 05/13/2019
Next Scheduled EDR Contact: 08/26/2019
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 03/25/2019
Date Data Arrived at EDR: 03/26/2019
Date Made Active in Reports: 05/07/2019
Number of Days to Update: 42

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 03/26/2019
Next Scheduled EDR Contact: 07/08/2019
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 05/06/2019
Next Scheduled EDR Contact: 08/19/2019
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 09/30/2017
Date Data Arrived at EDR: 05/08/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 73

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 05/10/2019
Next Scheduled EDR Contact: 08/19/2019
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 06/21/2017
Date Made Active in Reports: 01/05/2018
Number of Days to Update: 198

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/22/2019
Next Scheduled EDR Contact: 07/01/2019
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 01/10/2018
Date Made Active in Reports: 01/12/2018
Number of Days to Update: 2

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 05/24/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/24/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Annually

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 35

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Annually

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 04/25/2019
Date Data Arrived at EDR: 05/02/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 04/22/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 08/19/2019
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB’s who are required to notify the EPA of such activities.

Date of Government Version: 03/20/2019
Date Data Arrived at EDR: 04/10/2019
Date Made Active in Reports: 05/14/2019
Number of Days to Update: 34

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/10/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 04/08/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 08/30/2016
Date Data Arrived at EDR: 09/08/2016
Date Made Active in Reports: 10/21/2016
Number of Days to Update: 43

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 04/22/2019
Next Scheduled EDR Contact: 08/05/2019
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 06/07/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014	Source: Environmental Protection Agency
Date Data Arrived at EDR: 09/10/2014	Telephone: N/A
Date Made Active in Reports: 10/20/2014	Last EDR Contact: 06/07/2019
Number of Days to Update: 40	Next Scheduled EDR Contact: 09/16/2019
	Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database

The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 05/24/2017	Source: Environmental Protection Agency
Date Data Arrived at EDR: 11/30/2017	Telephone: 202-566-0517
Date Made Active in Reports: 12/15/2017	Last EDR Contact: 04/26/2019
Number of Days to Update: 15	Next Scheduled EDR Contact: 08/05/2019
	Data Release Frequency: Varies

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 04/02/2019	Source: Environmental Protection Agency
Date Data Arrived at EDR: 04/02/2019	Telephone: 202-343-9775
Date Made Active in Reports: 05/14/2019	Last EDR Contact: 04/02/2019
Number of Days to Update: 42	Next Scheduled EDR Contact: 07/15/2019
	Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006	Source: Environmental Protection Agency
Date Data Arrived at EDR: 03/01/2007	Telephone: 202-564-2501
Date Made Active in Reports: 04/10/2007	Last EDR Contact: 12/17/2007
Number of Days to Update: 40	Next Scheduled EDR Contact: 03/17/2008
	Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006	Source: Environmental Protection Agency
Date Data Arrived at EDR: 03/01/2007	Telephone: 202-564-2501
Date Made Active in Reports: 04/10/2007	Last EDR Contact: 12/17/2008
Number of Days to Update: 40	Next Scheduled EDR Contact: 03/17/2008
	Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 12/03/2018	Source: Department of Transporation, Office of Pipeline Safety
Date Data Arrived at EDR: 01/29/2019	Telephone: 202-366-4595
Date Made Active in Reports: 03/21/2019	Last EDR Contact: 04/30/2019
Number of Days to Update: 51	Next Scheduled EDR Contact: 08/12/2019
	Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 03/31/2019
Date Data Arrived at EDR: 04/23/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 30

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 04/05/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 09/28/2017
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 05/24/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/11/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 08/08/2017
Date Data Arrived at EDR: 09/11/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 3

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 05/02/2019
Next Scheduled EDR Contact: 08/19/2019
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 06/23/2017
Date Data Arrived at EDR: 10/11/2017
Date Made Active in Reports: 11/03/2017
Number of Days to Update: 23

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 05/24/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 04/11/2019
Date Data Arrived at EDR: 04/18/2019
Date Made Active in Reports: 05/14/2019
Number of Days to Update: 26

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 06/06/2019
Next Scheduled EDR Contact: 07/15/2019
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 11/27/2018
Date Data Arrived at EDR: 02/27/2019
Date Made Active in Reports: 04/01/2019
Number of Days to Update: 33

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 05/29/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Semi-Annually

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 12/05/2005
Date Data Arrived at EDR: 02/29/2008
Date Made Active in Reports: 04/18/2008
Number of Days to Update: 49

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 05/31/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 05/31/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

ABANDONED MINES: Abandoned Mines

An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 03/27/2019
Date Data Arrived at EDR: 03/28/2019
Date Made Active in Reports: 05/01/2019
Number of Days to Update: 34

Source: Department of Interior
Telephone: 202-208-2609
Last EDR Contact: 06/10/2019
Next Scheduled EDR Contact: 09/23/2019
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 02/15/2019
Date Data Arrived at EDR: 03/05/2019
Date Made Active in Reports: 03/15/2019
Number of Days to Update: 10

Source: EPA
Telephone: (215) 814-5000
Last EDR Contact: 06/05/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Quarterly

UXO: Unexploded Ordnance Sites

A listing of unexploded ordnance site locations

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 01/17/2019
Date Made Active in Reports: 04/01/2019
Number of Days to Update: 74

Source: Department of Defense
Telephone: 703-704-1564
Last EDR Contact: 04/15/2019
Next Scheduled EDR Contact: 07/29/2019
Data Release Frequency: Varies

DOCKET HWC: Hazardous Waste Compliance Docket Listing

A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 05/31/2018
Date Data Arrived at EDR: 07/26/2018
Date Made Active in Reports: 10/05/2018
Number of Days to Update: 71

Source: Environmental Protection Agency
Telephone: 202-564-0527
Last EDR Contact: 05/24/2019
Next Scheduled EDR Contact: 09/09/2019
Data Release Frequency: Varies

ECHO: Enforcement & Compliance History Information

ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 04/07/2019
Date Data Arrived at EDR: 04/09/2019
Date Made Active in Reports: 05/23/2019
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 04/09/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Quarterly

FUELS PROGRAM: EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 02/19/2019
Date Data Arrived at EDR: 02/21/2019
Date Made Active in Reports: 04/01/2019
Number of Days to Update: 39

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 05/21/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Quarterly

AIRS: Permitted Airs Facility List
A listing of permitted Airs facilities.

Date of Government Version: 01/14/2019
Date Data Arrived at EDR: 01/17/2019
Date Made Active in Reports: 04/08/2019
Number of Days to Update: 81

Source: Department of Environmental Quality
Telephone: 804-698-4000
Last EDR Contact: 03/18/2019
Next Scheduled EDR Contact: 07/01/2019
Data Release Frequency: Annually

CEDS: Comprehensive Environmental Data System
Virginia Water Protection Permits, Virginia Pollution Discharge System (point discharge) permits and Virginia Pollution Abatement (no point discharge) permits.

Date of Government Version: 03/04/2019
Date Data Arrived at EDR: 03/05/2019
Date Made Active in Reports: 04/08/2019
Number of Days to Update: 34

Source: Department of Environmental Quality
Telephone: 804-698-4077
Last EDR Contact: 06/03/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Quarterly

COAL ASH: Coal Ash Disposal Sites
A listing of facilities with coal ash impoundments.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/30/2019
Number of Days to Update: 49

Source: Department of Environmental Protection
Telephone: 804-698-4285
Last EDR Contact: 06/03/2019
Next Scheduled EDR Contact: 09/16/2019
Data Release Frequency: Varies

DRYCLEANERS: Drycleaner List
A listing of registered drycleaners.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 11/01/2018
Date Made Active in Reports: 12/26/2018
Number of Days to Update: 55

Source: Department of Environmental Quality
Telephone: 804-698-4407
Last EDR Contact: 04/08/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Varies

ENFORCEMENT: Enforcement Actions Data
A listing of enforcement actions.

Date of Government Version: 02/04/2019
Date Data Arrived at EDR: 02/05/2019
Date Made Active in Reports: 04/08/2019
Number of Days to Update: 62

Source: Department of Environmental Quality
Telephone: 804-698-4031
Last EDR Contact: 06/03/2019
Next Scheduled EDR Contact: 07/15/2019
Data Release Frequency: Quarterly

Financial Assurance 1: Financial Assurance Information Listing
A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 01/30/2019
Date Data Arrived at EDR: 01/31/2019
Date Made Active in Reports: 02/22/2019
Number of Days to Update: 22

Source: Department of Environmental Quality
Telephone: 804-698-4205
Last EDR Contact: 04/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Varies

Financial Assurance 2: Financial Assurance Information listing
Solid waste financial assurance information.

Date of Government Version: 01/31/2019	Source: Department of Environmental Quality
Date Data Arrived at EDR: 02/05/2019	Telephone: 804-698-4123
Date Made Active in Reports: 04/08/2019	Last EDR Contact: 04/29/2019
Number of Days to Update: 62	Next Scheduled EDR Contact: 08/12/2019
	Data Release Frequency: Varies

TIER 2: Tier 2 Information Listing
A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report.

Date of Government Version: 12/31/2014	Source: Department of Environmental Quality
Date Data Arrived at EDR: 01/20/2017	Telephone: 804-698-4159
Date Made Active in Reports: 02/14/2017	Last EDR Contact: 03/18/2019
Number of Days to Update: 25	Next Scheduled EDR Contact: 07/01/2019
	Data Release Frequency: Annually

UIC: Underground Injection Control Wells
A listing of underground injection controls wells.

Date of Government Version: 01/29/2019	Source: Department of Mines, Minerals and Energy
Date Data Arrived at EDR: 01/30/2019	Telephone: 276-415-9700
Date Made Active in Reports: 02/25/2019	Last EDR Contact: 05/01/2019
Number of Days to Update: 26	Next Scheduled EDR Contact: 08/12/2019
	Data Release Frequency: Quarterly

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historical Auto Stations
EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historical Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Quality in Virgina.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/20/2014
Number of Days to Update: 203

Source: Department of Environmental Quality
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Quality in Virgina and at the Regional VA Levels.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/15/2014
Number of Days to Update: 198

Source: Department of Environmental Quality
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 02/11/2019
Date Data Arrived at EDR: 02/12/2019
Date Made Active in Reports: 03/04/2019
Number of Days to Update: 20

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 05/14/2019
Next Scheduled EDR Contact: 08/26/2019
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2018
Date Data Arrived at EDR: 04/10/2019
Date Made Active in Reports: 05/16/2019
Number of Days to Update: 36

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 04/10/2019
Next Scheduled EDR Contact: 07/22/2019
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 01/01/2019
Date Data Arrived at EDR: 01/30/2019
Date Made Active in Reports: 02/14/2019
Number of Days to Update: 15

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 05/01/2019
Next Scheduled EDR Contact: 08/12/2019
Data Release Frequency: Quarterly

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/27/2018
Number of Days to Update: 35

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 04/15/2019
Next Scheduled EDR Contact: 07/29/2019
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 02/23/2018
Date Made Active in Reports: 04/09/2018
Number of Days to Update: 45

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 05/17/2019
Next Scheduled EDR Contact: 09/02/2019
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 06/15/2018
Date Made Active in Reports: 07/09/2018
Number of Days to Update: 24

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 06/10/2019
Next Scheduled EDR Contact: 09/23/2019
Data Release Frequency: Annually

Oil/Gas Pipelines
Source: PennWell Corporation
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data
Source: PennWell Corporation
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 804-692-1900

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

STREET AND ADDRESS INFORMATION

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

CAMP PENDLETON
203 RED HORSE DRIVE
VIRGINIA BEACH, VA 23451

TARGET PROPERTY COORDINATES

Latitude (North):	36.816222 - 36˚ 48’ 58.40’’
Longitude (West):	75.981333 - 75˚ 58’ 52.80’’
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	412471.8
UTM Y (Meters):	4074732.0
Elevation:	12 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	5952437 VIRGINIA BEACH, VA
Version Date:	2013
West Map:	5950981 PRINCESS ANNE, VA
Version Date:	2013

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

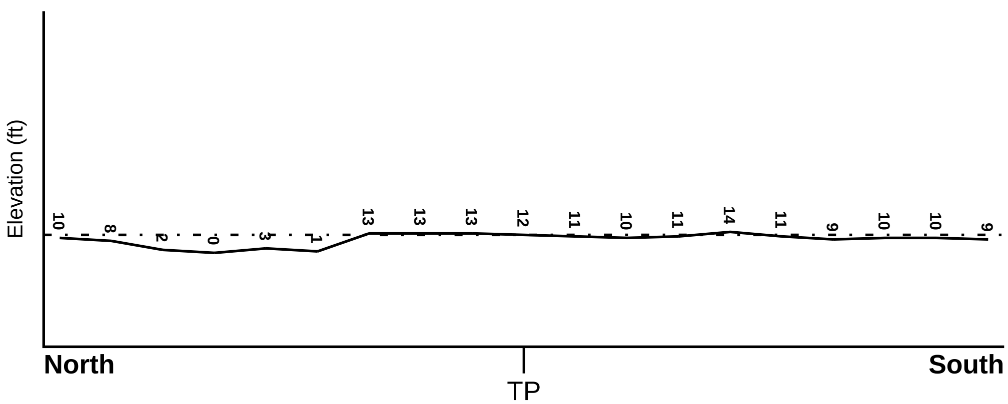
TOPOGRAPHIC INFORMATION

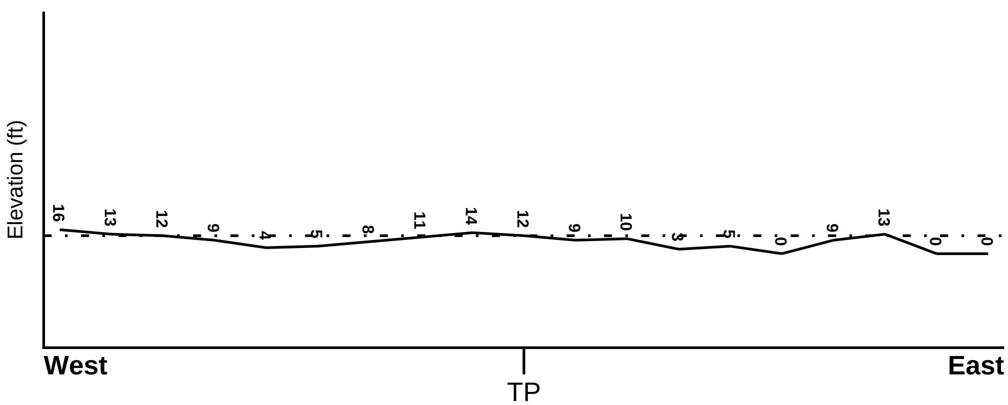
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

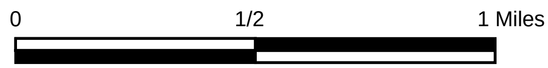
General Topographic Gradient: General SSW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 12 ft.



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Flood Plain Panel at Target Property	FEMA Source Type
5155310128G	FEMA FIRM Flood data

Additional Panels in search area:	FEMA Source Type
5155310129G	FEMA FIRM Flood data
5155310136G	FEMA FIRM Flood data
5155310137G	FEMA FIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
VIRGINIA BEACH	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius: 1.25 miles
Status: Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

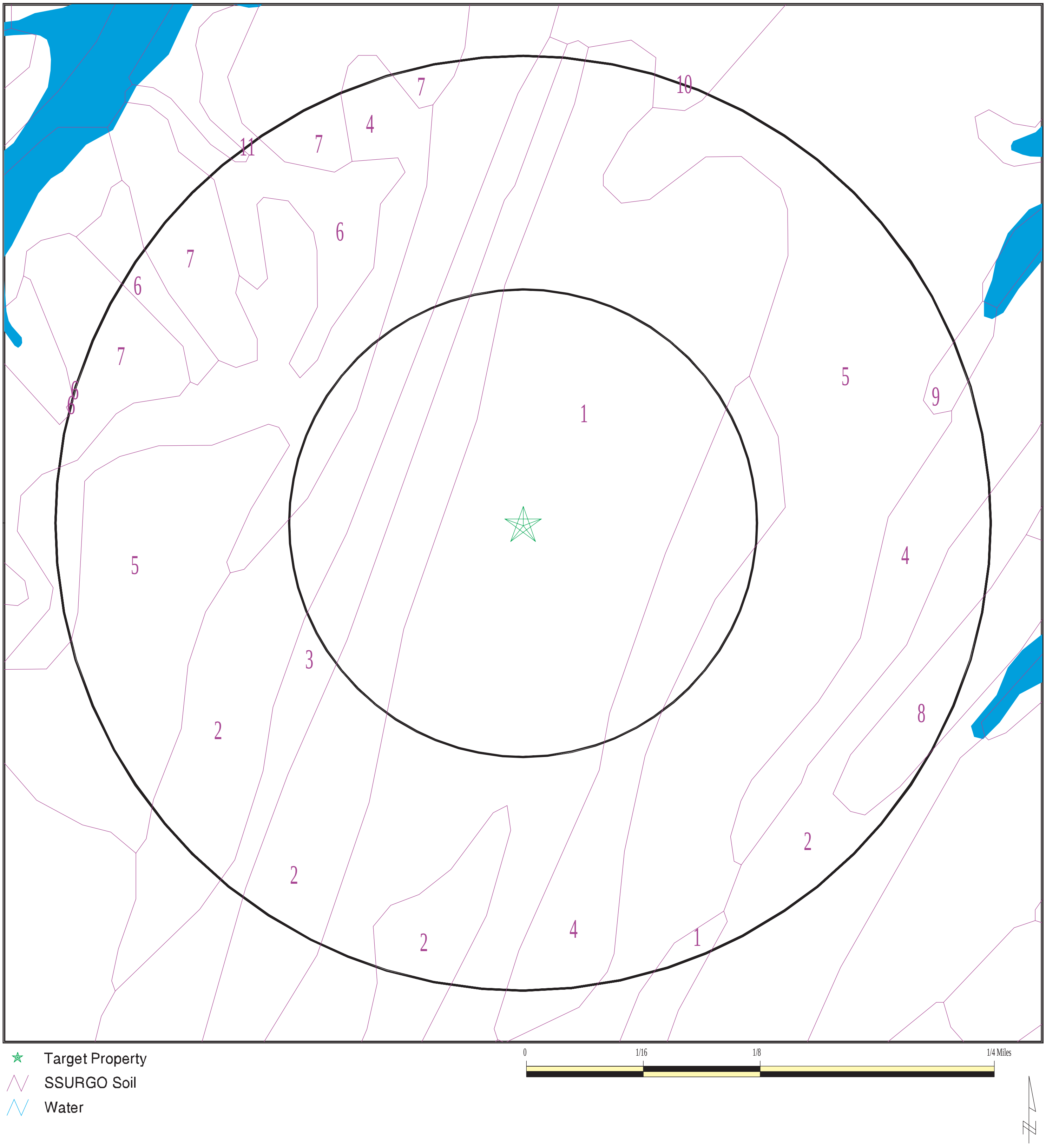
Era:	Cenozoic
System:	Quaternary
Series:	Pleistocene
Code:	Qp *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 5678861.2s



SITE NAME: Camp Pendleton ADDRESS: 203 Red Horse Drive Virginia Beach VA 23451 LAT/LONG: 36.816222 / 75.981333	CLIENT: AECOM CONTACT: Hans Sund INQUIRY #: 5678861.2s DATE: June 11, 2019 12:48 pm

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Augusta

Soil Surface Texture: loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 37 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	7 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 14	Max: 6 Min: 4.5
2	7 inches	44 inches	clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 14	Max: 6 Min: 4.5
3	44 inches	62 inches	loamy sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 14	Max: 6 Min: 4.5

Soil Map ID: 2

Soil Component Name: Tetotum

Soil Surface Texture: loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Moderately well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 61 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 4	Max: 5.5 Min: 3.6
2	9 inches	57 inches	clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 4	Max: 5.5 Min: 3.6
3	57 inches	70 inches	loamy sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 4	Max: 5.5 Min: 3.6

Soil Map ID: 3

Soil Component Name: Bojac

Soil Surface Texture: fine sandy loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 153 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	7 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42	Max: 6 Min: 4.5
2	7 inches	37 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42	Max: 6 Min: 4.5
3	37 inches	61 inches	fine sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42	Max: 6 Min: 4.5

Soil Map ID: 4

Soil Component Name: Chapanoke

Soil Surface Texture: silt loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 38 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 4	Max: 6 Min: 3.6
2	7 inches	53 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 4	Max: 6 Min: 3.6
3	53 inches	72 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 42 Min: 4	Max: 6 Min: 3.6

Soil Map ID: 5

Soil Component Name: Acredale

Soil Surface Texture: silt loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 15 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	7 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 7.3 Min: 4.5
2	7 inches	14 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 7.3 Min: 4.5
3	14 inches	42 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 7.3 Min: 4.5
4	42 inches	66 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 7.3 Min: 4.5

Soil Map ID: 6

Soil Component Name: Rumford

Soil Surface Texture: fine sandy loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 5.5 Min: 3.6
2	9 inches	40 inches	fine sandy loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 5.5 Min: 3.6
3	40 inches	72 inches	fine sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 141 Min: 14	Max: 5.5 Min: 3.6

Soil Map ID: 7

Soil Component Name: Yeopim

Soil Surface Texture: silt loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Moderately well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 61 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 4	Max: 5.5 Min: 3.6
2	7 inches	79 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 4	Max: 5.5 Min: 3.6
3	79 inches	83 inches	loamy sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 4	Max: 5.5 Min: 3.6

Soil Map ID: 8

Soil Component Name: Urban land

Soil Surface Texture: material

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class:
Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	5 inches	material	Not reported	Not reported	Max: 0 Min: 0	Max: Min:

Soil Map ID: 9

Soil Component Name: Nawney

Soil Surface Texture: silt loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Very poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 8 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	3 inches	9 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	Highly organic soils, Peat.	Max: 14 Min: 4	Max: 5.5 Min: 3.6
2	9 inches	46 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	Highly organic soils, Peat.	Max: 14 Min: 4	Max: 5.5 Min: 3.6
3	46 inches	59 inches	loamy sand	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	Highly organic soils, Peat.	Max: 14 Min: 4	Max: 5.5 Min: 3.6

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
4	0 inches	3 inches	mucky peat	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	Highly organic soils, Peat.	Max: 14 Min: 4	Max: 5.5 Min: 3.6

Soil Map ID: 10

Soil Component Name: Udorthents

Soil Surface Texture: silt loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class:
Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 11

Soil Component Name: Rappahannock

Soil Surface Texture: mucky peat

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	mucky peat	A-8	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 0.42	Max: 8.4 Min: 6.5
2	11 inches	37 inches	muck	A-8	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 0.42	Max: 8.4 Min: 6.5
3	37 inches	51 inches	silt loam	A-8	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 0.42	Max: 8.4 Min: 6.5

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	VA3810250	1/2 - 1 Mile SSW

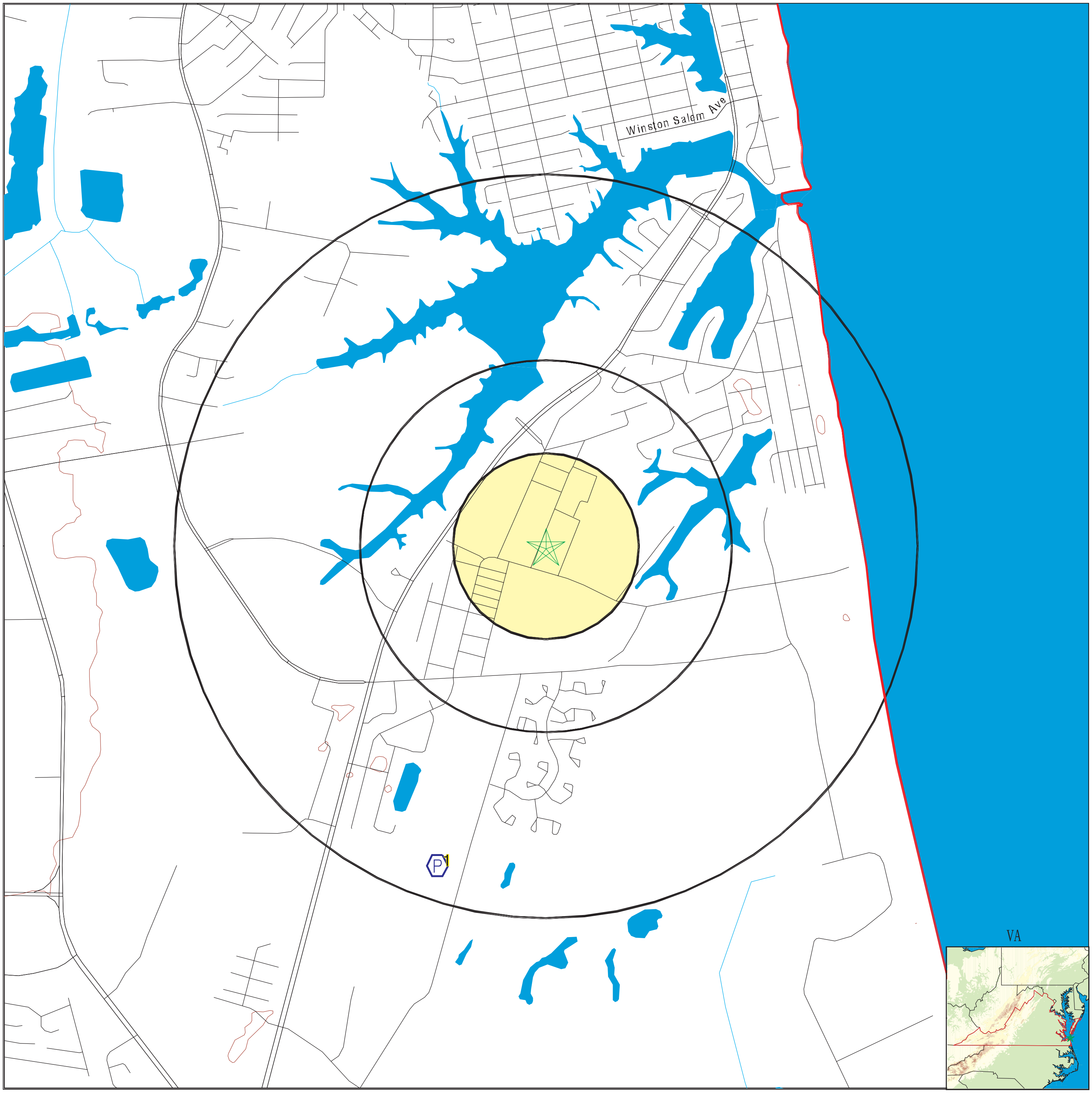
Note: PWS System location is not always the same as well location.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

PHYSICAL SETTING SOURCE MAP - 5678861.2s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- Indeterminate Groundwater Flow at Location
- Groundwater Flow Varies at Location
- Closest Hydrogeological Data
- Oil, gas or related wells

SITE NAME:	Camp Pendleton	CLIENT:	AECOM
ADDRESS:	203 Red Horse Drive	CONTACT:	Hans Sund
	Virginia Beach VA 23451	INQUIRY #:	5678861.2s
LAT/LONG:	36.816222 / 75.981333	DATE:	June 11, 2019 12:48 pm

Map ID Direction Distance Elevation	Database	EDR ID Number
1 **SSW** **1/2 - 1 Mile** **Higher**	**FRDS PWS**	**VA3810250**

Epa region:	03	State:	VA
Pwsid:	VA3810250	Pwsname:	HOLIDAY TRAV-L-PARK
Cityserved:	VIRGINIA BEACH	Stateserved:	VA
Zipserved:	Not Reported	Fipscounty:	Not Reported
Status:	Active	Retpopsrvd:	2195
Pwssvcconn:	40	Psource longname:	Groundwater
Pwstype:	NTNCWS	Owner:	Private
Contact:	BOSHER, RALPH	Contactorgname:	BOSHER, RALPH
Contactphone:	757-425-0249	Contactaddress1:	1075 GENERAL BOOTH BOULEVARD
Contactaddress2:	Not Reported	Contactcity:	VIRGINIA BEACH
Contactstate:	VA	Contactzip:	23451
Pwsactivitycode:	A		

Pwsid:	VA3810250	Facid:	15372
Facname:	SOFTENING UNIT	Factype:	Treatment_plant
Facactivitycode:	I	Trtobjective:	softening (hardness removal)
Trtprocess:	ion exchange	Factypecode:	TP

Pwsid:	VA3810250	Facid:	15373
Facname:	CHLORINATION	Factype:	Treatment_plant
Facactivitycode:	A	Trtobjective:	disinfection
Trtprocess:	hypochlorination, post	Factypecode:	TP

PWS ID:	VA3810250	PWS type:	Not Reported
PWS name:	Not Reported	PWS address:	Not Reported
PWS city:	Not Reported	PWS state:	Not Reported
PWS zip:	Not Reported	PWS name:	HOLIDAY TRAV-L-PARK
PWS type code:	NTNC	Retail population served:	2195
Contact:	BOSHER, RALPH	Contact address:	1075 GENERAL BOOTH BOULEVARD
Contact address:	VIRGINIA BEACH	Contact city:	VA
Contact state:	23	Contact zip:	757-425-02
Contact telephone:	Not Reported		

PWS ID:	VA3810250	Activity status:	Active
Date system activated:	7612	Date system deactivated:	Not Reported
Retail population:	00002181	System name:	HOLIDAY TRAV-L-PARK
System address:	Not Reported	System address:	1075 GENERAL BOOTH BLVD
System city:	VIRGINIA BEACH	System state:	VA
System zip:	23510		

County FIPS:	810	City served:	VIRGINIA BEACH
Population served:	1,001 - 2,500 Persons	Treatment:	Untreated
Latitude:	364813	Longitude:	0755913

Violation id:	100	Orig code:	S
State:	VA	Violation Year:	2000
Contamination code:	3100	Contamination Name:	Coliform (TCR)
Violation code:	22	Violation name:	MCL, Monthly (TCR)
Rule code:	110	Rule name:	TCR
Violation measur:	0	Unit of measure:	Not Reported
State mcl:	0	Cmp bdt:	05/01/2000
Cmp edt:	05/31/2000		

Violation id:	3373303	Orig code:	S
State:	VA	Violation Year:	2002
Contamination code:	3100	Contamination Name:	Coliform (TCR)
Violation code:	23	Violation name:	Monitoring, Routine Major (TCR)
Rule code:	110	Rule name:	TCR
Violation measur:	Not Reported	Unit of measure:	Not Reported
State mcl:	Not Reported	Cmp bdt:	12/01/2002
Cmp edt:	12/31/2002		

Violation id:	3373304	Orig code:	S
State:	VA	Violation Year:	2008
Contamination code:	3100	Contamination Name:	Coliform (TCR)
Violation code:	23	Violation name:	Monitoring, Routine Major (TCR)
Rule code:	110	Rule name:	TCR
Violation measur:	Not Reported	Unit of measure:	Not Reported
State mcl:	Not Reported	Cmp bdt:	07/01/2008
Cmp edt:	07/31/2008		

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/13/2000 0:00:00	Enforcement Action:	SIF

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/9/2000 0:00:00	Enforcement Action:	SFJ

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/9/2000 0:00:00	Enforcement Action:	SIE

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/9/2000 0:00:00	Enforcement Action:	SFJ

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/9/2000 0:00:00	Enforcement Action:	SIE

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	22
Contaminant:	3100	Compliance Begin:	5/1/2000 0:00:00
Compliance End:	5/31/2000 0:00:00	Violation ID:	100
Enforcement Date:	6/13/2000 0:00:00	Enforcement Action:	SIF

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	12/1/2002 0:00:00
Compliance End:	12/31/2002 0:00:00	Violation ID:	3373303
Enforcement Date:	2/10/2003 0:00:00	Enforcement Action:	SFJ

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	12/1/2002 0:00:00
Compliance End:	12/31/2002 0:00:00	Violation ID:	3373303
Enforcement Date:	2/10/2003 0:00:00	Enforcement Action:	SIE

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	12/1/2002 0:00:00
Compliance End:	12/31/2002 0:00:00	Violation ID:	3373303
Enforcement Date:	2/10/2003 0:00:00	Enforcement Action:	SIE

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	12/1/2002 0:00:00
Compliance End:	12/31/2002 0:00:00	Violation ID:	3373303
Enforcement Date:	2/10/2003 0:00:00	Enforcement Action:	SFJ

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	1995-02-01
Compliance End:	1995-02-28	Violation ID:	9533564
Enforcement Date:	Not Reported	Enforcement Action:	Not Reported

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	1998-12-01
Compliance End:	1998-12-31	Violation ID:	98033731
Enforcement Date:	1999-01-28	Enforcement Action:	SIA

System Name:	HOLIDAY TRAV-L-PARK	Violation Type:	23
Contaminant:	3100	Compliance Begin:	1998-12-01
Compliance End:	1998-12-31	Violation ID:	98033731
Enforcement Date:	1999-01-28	Enforcement Action:	SIE

Violation ID:	100	Orig Code:	S
Enforcemnt FY:	2000	Enforcement Action:	06/09/2000
Enforcement Detail:	St Formal NOV issued	Enforcement Category:	Informal

Violation ID:	100	Orig Code:	S
Enforcemnt FY:	2000	Enforcement Action:	06/09/2000
Enforcement Detail:	St Public Notif requested	Enforcement Category:	Informal

Violation ID:	100	Orig Code:	S
Enforcemnt FY:	2000	Enforcement Action:	06/13/2000
Enforcement Detail:	St Public Notif received	Enforcement Category:	Informal

Violation ID:	3373303	Orig Code:	S
Enforcemnt FY:	2003	Enforcement Action:	02/10/2003
Enforcement Detail:	St Public Notif requested	Enforcement Category:	Informal

Violation ID:	3373303	Orig Code:	S
Enforcemnt FY:	2003	Enforcement Action:	02/10/2003
Enforcement Detail:	St Formal NOV issued	Enforcement Category:	Informal

PWS name:	HOLIDAY TRAV-L-PARK	Population served:	2195
PWS type code:	NTNC	Violation ID:	100
Contaminant:	COLIFORM (TCR)		
Violation type:	Max Contaminant Level, Monthly (TCR)		
Compliance start date:	5/1/2000 0:00:00	Compliance end date:	5/31/2000 0:00:00
Enforcement date:	6/13/2000 0:00:00	Enforcement action:	State Public Notif Received
Violation measurement:	0		

PWS name:	HOLIDAY TRAV-L-PARK	Population served:	2195
PWS type code:	NTNC	Violation ID:	100
Contaminant:	COLIFORM (TCR)		
Violation type:	Max Contaminant Level, Monthly (TCR)		
Compliance start date:	5/1/2000 0:00:00	Compliance end date:	5/31/2000 0:00:00
Enforcement date:	6/9/2000 0:00:00	Enforcement action:	State Formal NOV Issued
Violation measurement:	0		

PWS name:	HOLIDAY TRAV-L-PARK	Population served:	2195
PWS type code:	NTNC	Violation ID:	100
Contaminant:	COLIFORM (TCR)		
Violation type:	Max Contaminant Level, Monthly (TCR)		
Compliance start date:	5/1/2000 0:00:00	Compliance end date:	5/31/2000 0:00:00
Enforcement date:	6/9/2000 0:00:00	Enforcement action:	State Public Notif Requested

Violation measurement:	0		
PWS name:	HOLIDAY TRAV-L-PARK	Population served:	2195
PWS type code:	NTNC	Violation ID:	3373303
Contaminant:	COLIFORM (TCR)	Violation type:	Monitoring, Routine Major (TCR)
Compliance start date:	12/1/2002 0:00:00	Compliance end date:	12/31/2002 0:00:00
Enforcement date:	2/10/2003 0:00:00	Enforcement action:	State Formal NOV Issued
Violation measurement:	Not Reported		
PWS name:	HOLIDAY TRAV-L-PARK	Population served:	2195
PWS type code:	NTNC	Violation ID:	3373303
Contaminant:	COLIFORM (TCR)	Violation type:	Monitoring, Routine Major (TCR)
Compliance start date:	12/1/2002 0:00:00	Compliance end date:	12/31/2002 0:00:00
Enforcement date:	2/10/2003 0:00:00	Enforcement action:	State Public Notif Requested
Violation measurement:	Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

EPA Region 3 Statistical Summary Readings for Zip Code: 23451

Number of sites tested: 23.

Maximum Radon Level: 2.7 pCi/L.
Minimum Radon Level: 0.6 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
23 (100.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

Federal EPA Radon Zone for VIRGINIA BEACH CITY County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Virginia Public Water Supplies
Source: Department of Health, Office of Water Programs
Telephone: 804-786-1756

OTHER STATE DATABASE INFORMATION

Virginia Oil and Gas Wells
Source: Department of Mines, Minerals and Energy
Telephone: 804-692-3200
A listing of oil and gas well locations.

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

EPA Region 3 Statistical Summary Readings
Source: Region 3 EPA
Telephone: 215-814-2082
Radon readings for Delaware, D.C., Maryland, Pennsylvania, Virginia and West Virginia.

OTHER

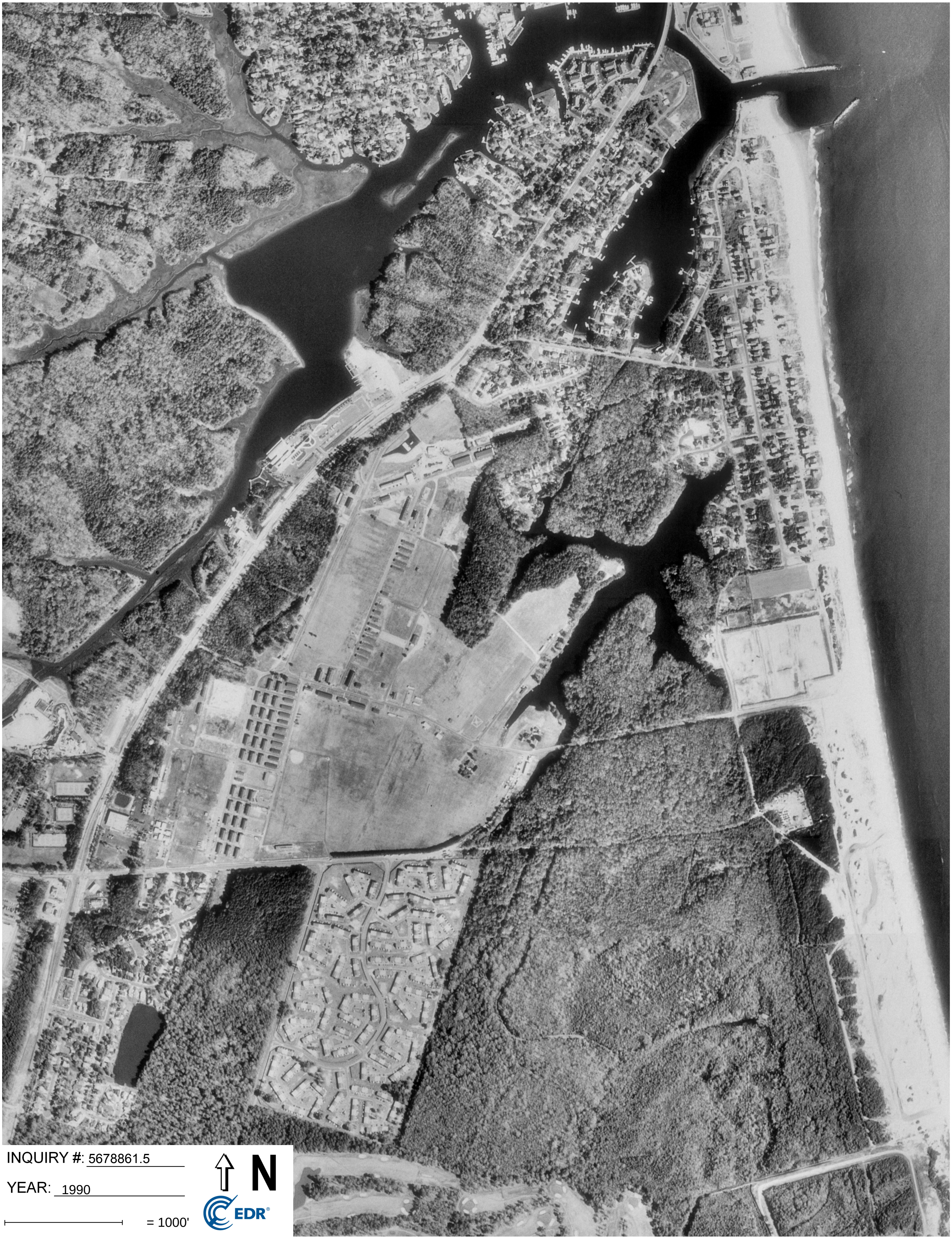
Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR’s Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STREET AND ADDRESS INFORMATION



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EDR

INQUIRY #: 5678861.5

YEAR: 1986

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INQUIRY #: 5678861.5

YEAR: 1982

= 1000'

N

Subject boundary not shown because it e

INQUIRY #: 5678861.5

YEAR: 1977

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EDR

Subject boundary not shown because it e


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INQUIRY #: 5678861.5

YEAR: 1959

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INQUIRY #: 5678861.5

YEAR: 1954

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EDR

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YEAR: 2000

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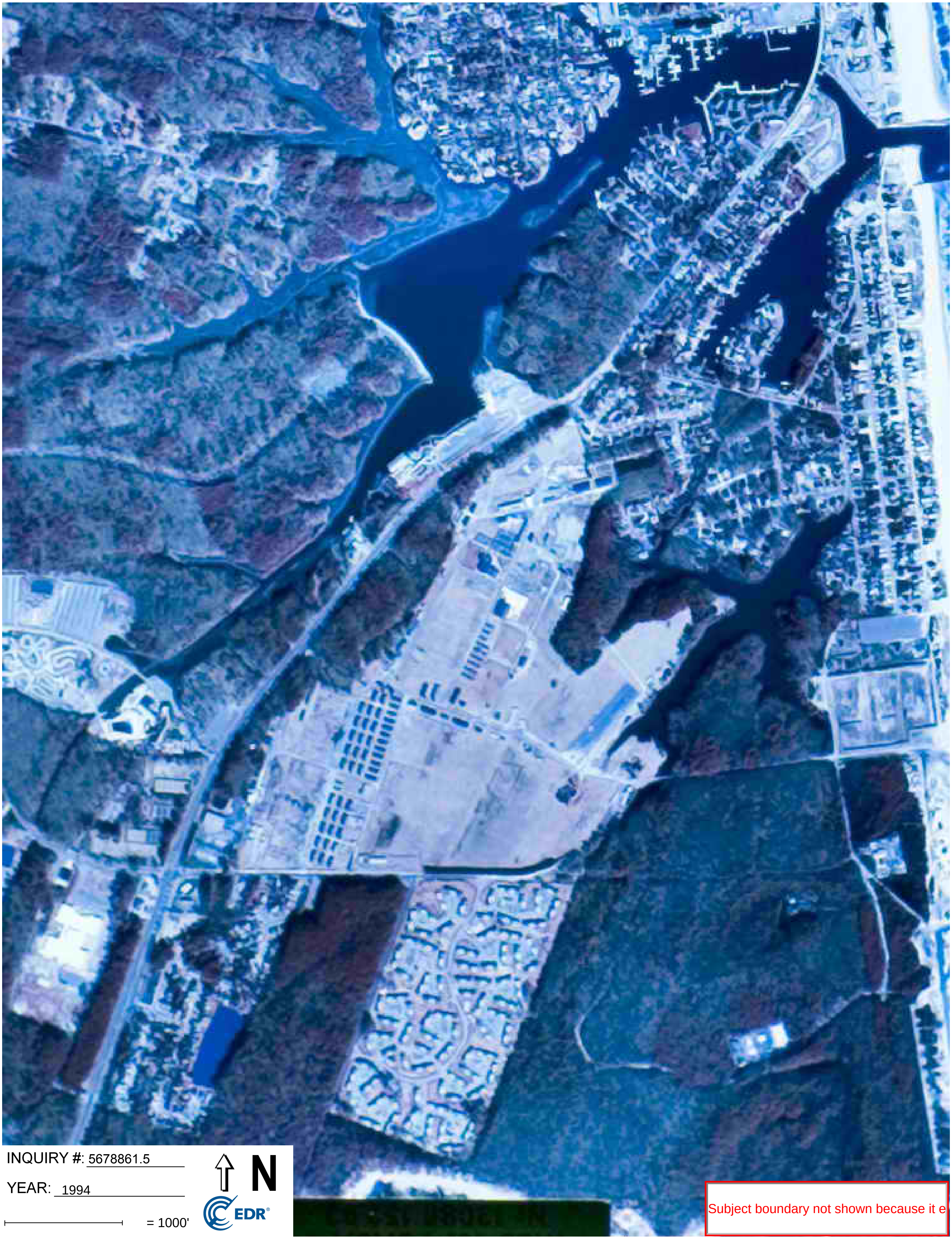

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YEAR: 1994

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EDR

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Camp Pendleton

203 Red Horse Drive

Virginia Beach, VA 23451

Inquiry Number: 5678861.5

June 12, 2019

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EDR Aerial Photo Decade Package

06/12/19

Site Name:	Client Name:
Camp Pendleton	AECOM
203 Red Horse Drive	12120 Shamrock Plaza
Virginia Beach, VA 23451	Omaha, NE 68154
EDR Inquiry # 5678861.5	Contact: Hans Sund

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2016	1"=1000'	Flight Year: 2016	USDA/NAIP
2012	1"=1000'	Flight Year: 2012	USDA/NAIP
2009	1"=1000'	Flight Year: 2009	USDA/NAIP
2006	1"=1000'	Flight Year: 2006	USDA/NAIP
2000	1"=1000'	Flight Date: March 24, 2000	USGS
1994	1"=1000'	Flight Date: March 06, 1994	USGS
1990	1"=1000'	Acquisition Date: April 09, 1990	USGS/DOQQ
1986	1"=1000'	Flight Date: July 05, 1986	USGS
1982	1"=1000'	Flight Date: April 02, 1982	USGS
1977	1"=1000'	Flight Date: December 09, 1977	USGS
1970	1"=1000'	Flight Date: May 07, 1970	USGS
1963	1"=1000'	Flight Date: March 30, 1963	USGS
1961	1"=1000'	Flight Date: September 21, 1961	USGS
1959	1"=1000'	Flight Date: December 08, 1959	USGS
1954	1"=1000'	Flight Date: October 16, 1954	USDA

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INQUIRY #: 5678861.5

YEAR: 2016

= 1000'

N

EDR

INQUIRY #: 5678861.5

YEAR: 2012

= 1000'

N

Camp Pendleton
203 Red Horse Drive
Virginia Beach, VA 23451

Inquiry Number: 5678861.3
June 10, 2019

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06/10/19

Site Name:	Client Name:
Camp Pendleton	AECOM
203 Red Horse Drive	12120 Shamrock Plaza
Virginia Beach, VA 23451	Omaha, NE 68154
EDR Inquiry # 5678861.3	Contact: Hans Sund

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The Sanborn Library is continually enhanced with newly identified map archives. This report accesses all maps in the collection as of the day this report was generated.

Certified Sanborn Results:

Certification # D61C-4339-A753

PO # NA

Project Camp Pendleton

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results

Certification #: D61C-4339-A753

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✔ Library of Congress
- ✔ University Publications of America
- ✔ EDR Private Collection

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Mid-Atlantic
Virginia Beach, Virginia

Final

Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report

Naval Air Station Oceana
Virginia Beach, Virginia

August 2018

Mid-Atlantic
Virginia Beach, Virginia

Final

Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report

Naval Air Station Oceana
Virginia Beach, Virginia

August 2018

Prepared for NAVFAC Mid-Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
Contract N62470-16-D-9000
CTO WE14

Executive Summary

Historical use of aqueous film-forming foam (AFFF) at Naval Air Station (NAS) Oceana during fire and emergency response, testing, and training activities, has prompted the Department of the Navy (the Navy) to conduct a per- and polyfluoroalkyl substances (PFAS) Site Inspection at the installation. The United States Environmental Protection Agency (USEPA) has described PFAS as “emerging contaminants,” and established USEPA lifetime health advisories (L-HAs) for two PFAS compounds (perfluorooctanoic acid [PFOA] and perfluorooctane sulfonate [PFOS]). A Regional Screening Level (RSL) is also published for perfluorobutane sulfonate (PFBS). There are currently no legally enforceable federal or Virginia standards for PFAS constituents.

The objectives of the NAS Oceana Site Inspection for PFAS were identified in *Final Sampling and Analysis Plan, Basewide Site Inspection for Perfluorinated Compounds, Naval Air Station Oceana, Virginia Beach, Virginia* (CH2M, 2017), hereinafter referred to as the “SAP.” Objectives were to:

- Determine if PFAS are present in suspected source areas at NAS Oceana.
- Determine whether PFAS are present at levels posing potentially unacceptable human health risks in groundwater at NAS Oceana.
- Determine whether PFAS have migrated offsite and are present at levels exceeding screening criteria (RSL and L-HAs) in private potable water within 1 mile downgradient of suspected source areas.

Preliminary investigation activities included a desktop study and interviews with Base personnel to determine potential source areas of PFAS. The field investigation was initiated in October of 2016 (Phase I) and consisted of the installation of shallow monitoring wells (screened in the Columbia aquifer) in locations where AFFF may have been used or released; groundwater sampling of newly installed and existing monitoring wells screened in the Columbia aquifer; sampling of potable wells located off-Base; and sampling of a non-potable well located on-Base. Based on the results from Phase I, additional investigation activities were initiated in March 2017 (Phase II), which included the installation of deep monitoring wells (screened in the Yorktown aquifer) and groundwater sampling in the Columbia and Yorktown aquifers. Groundwater sampling was also conducted in February 2017 to evaluate the effect of Oxygen Release Compound (ORC) socks on PFOS/PFOA concentrations in monitoring wells at Solid Waste Management Units (SWMUs) 2C and 2E. In addition, aquifer variable-head testing (slug test) in monitoring wells screened in the Columbia aquifer and measurement of groundwater elevations in the Columbia and Yorktown aquifers were performed to define the hydraulic characteristics of both aquifers. Investigations were performed in accordance with the SAP.

Laboratory analysis of groundwater samples collected in the Columbia aquifer indicate that PFAS are present in the majority of the monitoring wells sampled (31 out of 34 monitoring wells) with concentrations of PFOA and PFOS exceeding the USEPA L-HA of 70 nanograms per liter in the Columbia aquifer at Site 11 (Fire Training Area), Solid Waste Management Unit (SWMU) 26 (Burn Pit), in the vicinity of the aircraft hangars, and the Hush House (Jet Test Cell). One exceedance was also measured in the Yorktown aquifer in the vicinity of Site 11 (OW11-MW10D), which indicates that the contamination has migrated vertically from the Columbia aquifer to the Yorktown aquifer in that area. Results from the Human Health Risk Screening (HHRS) Analysis suggest that potable use of groundwater from the Columbia aquifer at Site 11, SWMU 26, the Aircraft Hangars and Maintenance Buildings site, and the Hush House may result in potential unacceptable human health risks associated with PFOA and PFOS.

There was no detection of PFAS in five of the six groundwater samples collected off-Base from private potable wells. The remaining sample did not exceed screening criteria. In addition, analysis of groundwater in shallow and deep monitoring wells located near the installation boundary (perimeter wells) showed that PFAS were not present or were present at concentrations below the screening standards. The HHRS suggests that potable use of groundwater from potable wells sampled off-Base and the perimeter wells would not result in unacceptable human health risks associated with PFAS at the wells sampled.

This investigation demonstrated that four source areas of PFAS were present at the installation. However, the investigation did not result in the full delineation of the horizontal and vertical extent of the contamination, did not fully assess the fate and transport of the contamination, and did not fully quantify whether PFAS are present at levels posing unacceptable human health risks in groundwater at NAS Oceana.

It is recommended that an Expanded Site Inspection (ESI) for PFAS be conducted at NAS Oceana to assess these data gaps and others (e.g., ecological risk screening, should screening values become available). As part of the ESI, it is recommended that additional monitoring wells be installed in the Columbia and Yorktown aquifers to better define the contamination extent and to monitor the horizontal and vertical migration of the contamination. New monitoring wells will also provide groundwater elevation data which will help better characterize the hydraulic characteristics of the Yorktown aquifer. Based on this data, a preliminary Conceptual Site Model (CSM) should be developed to fully define the fate and transport of the contamination.

Contents

Appendices

Tables

Figures

Acronyms and Abbreviations

°C	degree Celsius
AFFF	aqueous film-forming foam
amsl	above mean sea level
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
COPC	constituent of potential concern
CSM	conceptual site model
DI	deionized
DO	dissolved oxygen
ER	Environmental Restoration
ESI	Expanded Site Inspection
ft/min	foot per minute
HARN	High Accuracy Reference Network
HHRS	Human Health Risk Screening
HI	hazard index
HSA	Hollow Stem Auger
IDW	investigation-derived waste
L-HA	lifetime health advisory
MDC	Maximum Detected Concentration
mg/L	milligram per liter
MS	matrix spike
MSD	matrix spike duplicate
mS/cm	milliSiemen per centimeter
MSA	Miller Stephenson and Associates
mV	millivolt
NAVFAC	Naval Facilities Engineering Command
NAS	Naval Air Station
NAVD	North American Vertical Datum
Navy	Department of the Navy
ng/L	nanogram per liter
NTU	nephelometric turbidity units
ORC	oxygen release compound
ORP	oxidation-reduction potential
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
POL	petroleum, oil, and lubricants

ppm	part per million
ppt	part per trillion
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SI	Site Inspection
SOP	Standard Operating Procedure
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

Introduction

This Site Inspection (SI) Report presents the data and findings obtained from a per- and polyfluoroalkyl substances (PFAS) investigation conducted at Naval Air Station (NAS) Oceana. In October 2014, the Assistant Secretary of the Navy, Energy, Installations and Environment issued a statement requiring evaluation of sites with the potential for PFAS contamination under the Defense Environmental Restoration (ER) Program (Navy, 2014). In January 2015, the Department of the Navy issued a Perfluorinated Compounds (PFCs) Interim Guidance/Frequently Asked Questions which main objective was to "*assist Remedial Project Managers with programmatic and technical issues related to PFCs at Naval ER sites*" (Navy, 2015)[1] PFAS are described as emergent contaminants by the United States Environmental Protection Agency (USEPA) and have not been previously evaluated at Navy sites (USEPA, 2016a).

Overall objectives of the SI were defined in the *Final Sampling and Analysis Plan, Basewide Site Inspection for Perfluorinated Compounds, Naval Air Station Oceana, Virginia Beach, Virginia* (CH2M, 2017), hereinafter referred to as the "SAP." Objectives were to:

- Determine if PFAS are in suspected source areas at the installation.
- Determine whether PFAS are present at levels posing potentially unacceptable human health risks in groundwater at NAS Oceana.
- Determine whether PFAS have migrated offsite and are present at levels exceeding screening criteria in private potable water within 1 mile downgradient of suspected source areas.

This SI Report outlines the approach taken to achieve the listed objectives and provides conclusions of data collected and recommendations for further study. This report was prepared for the Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, under the Comprehensive Long-term Environmental Action— Navy (CLEAN) 9000, Contract N62470-16-D-9000, Contract Task Order WE14, for submittal to NAVFAC Mid-Atlantic, USEPA Region 3, and the Virginia Department of Environmental Quality (VDEQ). The Navy, USEPA, and VDEQ work jointly as the NAS Oceana/Naval Auxiliary Landing Field Fentress Tier 1 Partnering Team (Team).

The SI Report is organized as follows:

- **Section 1** – Introduction
- **Section 2** – Site Background and Physical Setting
- **Section 3** – Investigation Methodology
- **Section 4** – Investigation Results
- **Section 5** – Human Health Risk Screening
- **Section 6** – Conclusions and Recommendations
- **Section 7** – References

Tables and figures are provided at the end of each respective section. Appendices are included at the end of the report.

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[1] In September 2017, the Department of the Navy issued an interim PFAS Site Guidance which assists in "*identifying sampling methodologies, and promoting a consistent approach for dealing with PFAS at Navy ER Sites"* (Navy, 2017). The 2015 guidance was revised and superseded by 2017 guidance. However, since the 2017 guidance was issued after this investigation was complete, the 2015 guidance was followed for this investigation.

Site Background and Physical Setting

This section presents background information on NAS Oceana including site history, potential sources of PFAS, and relevant information on the physical and hydrogeologic setting at the site.

2.1 Site Background

NAS Oceana is located in Virginia Beach, Virginia and was established in 1940 as a small auxiliary airfield. Since 1940, NAS Oceana has grown to more than 16 times its original size and is now a 6,000-acre master jet base supporting a community of more than 9,100 Navy personnel and 11,000 dependents. The primary mission of NAS Oceana is to provide the personnel, operations, maintenance, and training facilities to ensure that fighter and attack squadrons on aircraft carriers of the U.S. Atlantic Fleet are ready for deployment. **Figure 2-1** provides a location map of NAS Oceana.

During the desktop review of historical documents and interviews with the NAS Oceana Fire Department, potential PFAS source areas were identified. **Appendix A** provides the record of these interviews. **Figure 2-1** depicts the locations of potential aqueous film-forming foam (AFFF) release areas evaluated in this SI. Available site histories of these areas are described below.

2.1.1 Site 11 (Fire Training Area)

Site 11 was used for firefighting training twice per week from the 1960s to the 1980s. Initially, training exercises were performed on the abandoned runway. Waste fuel and oil were dumped onto the abandoned runway, ignited, and extinguished with AFFF. In 1969, the annual usage of AFFF was estimated to be 2,000 gallons. In the mid-1970s, the first fire training ring (Solid Waste Management Unit [SWMU] 62, the Old Fire Station Burn Pit) was installed with an earthen berm to contain runoff. After construction of the first ring, training exercises were performed within the earthen berm and runoff would occasionally flow onto surrounding soils. In the early 1980s, a second fire training ring (SWMU 63, the New Burn Pit) was installed on a concrete pad with a concrete berm and an oil/water separator to contain petroleum, oil, and lubricants (POL). In the 1990s, a third training ring was built to the north as a jet mock-up on a concrete pad with runoff collection devices. Historical use does not indicate that AFFF was used at the jet mock-up, but trucks were tested quarterly in the past near this area by spraying AFFF onto the grass near the ring. In 2001, Site 11 (referred to as SWMU 11 in that the 2001 report) was closed (CH2M, 2001). The 2001 Decision Document, which has received USEPA concurrence, establishes No Further Action as the selected remedy for Site 11 (referred to as SWMU 11 in the 2001 report) (CH2M, 2001). Site 11 was identified as requiring evaluation for PFAS due to firefighting training activities historically conducted at the site.

2.1.2 SWMU 26 (Fire Station Burn Pit)

SWMU 26, located southeast of Building 220 (Fire Station), was used for firefighting training activities from the 1960s to the 1980s and consisted of a partially buried tank that was filled with waste fuel and oil, ignited, and extinguished with AFFF. The tank was removed from the ground by 1990. In 2001, SWMU 26 was closed (CH2M, 2001). The 2001 Decision Document, which has received USEPA concurrence, establishes No Further Action as the selected remedy for SWMU 26 (CH2M, 2001). SWMU 26 was identified as requiring evaluation for PFAS due to firefighting training activities historically conducted at the site.

2.1.3 Aircraft Hangars and Maintenance Buildings

Several aircraft hangars and maintenance buildings were identified as potential AFFF release areas during NAS Oceana Fire Department interviews (**Appendix A**). In Building 145, AFFF was accidentally released into the parking lot (**Figure 2-1**). Personnel were advised to cover the storm drains and spray water to wash the AFFF onto the grass. A contractor was brought in to vacuum up any remaining foam. The date of this release is unknown. In Hangar 111, a release occurred during retrofit of the floor nozzles. The date of this release is unknown. In Hangar

500, accidental “activations” (which are technically not considered “spills”) used to occur approximately on a monthly basis due to sensitive sensors. The sensors have been adjusted and there have been no additional activations. The date range of the monthly activations is unknown. In Building 139, there was a spill at the corrosion control facility in 2010. There are no drains in that area and the foam was pushed outside to the grass swale on the southeast side of the building, and then cleaned up with a vacuum truck. In Building 139, there have been multiple releases, but the dates of these releases are unknown. In Hangar 122, a very large storm caused stormwater to back up and fill the overflow tanks in July 2011, releasing AFFF to the environment, including the storm drain and storm ditch. The Hampton Roads Sanitation District was notified of this release.

2.1.4 1986 Crash Site

In 1986, a plane crashed off Oceana Boulevard near the Base boundary. Interviewees indicated that AFFF was probably used for this crash.

2.1.5 1996 Crash Site

Interviewees indicated that a plane crashed in the woods on the installation in 1995. However, a local newspaper article indicated that the crash was in 1996 (Sizemore, 2012). Interviewees could not recall whether there was an associated fire and were uncertain whether AFFF was used for this crash.

2.1.6 2007 Crash Site

In 2007, a civilian plane crashed during an air show practice, right off Runway 5L. Interviewees were not sure whether AFFF was used.

2.1.7 Hush House (Jet Test Cell)

The Hush House (also referred to as the Jet Test Cell) was first investigated in December 2003 as a result of a fuel release on November 24, 2003 (VDEQ, 2004). The Hush House was used for testing jet engines in an enclosed area for the purpose of noise control. It is being evaluated for PFAS due to an accidental AFFF release in that area which occurred at an unknown date. Personnel called Oceana Base Environmental personnel and were told to spray down the concrete area into the grass.

2.1.8 POL Fuel Tank (Site F8-F9)

Trucks carrying AFFF would connect to the fire suppressing system piping adjacent to the POL Fuel Tank area near monitoring well OC-F8F9-MW-4. Releases of AFFF to the ground may have occurred when connecting and disconnecting from the pipes.

2.2 Physical Setting

This section describes the site setting, including geologic features relevant to this investigation.

2.2.1 Climate

NAS Oceana is located in an area where temperature extremes are moderated by the Atlantic Ocean. The average yearly temperature is 60.0 degrees Fahrenheit with an annual precipitation of 45.7 inches. Winds on average blow from a northerly direction from January through March and again in September and October. During the remaining months, winds generally blow from a southerly direction (INRMP, 2017).

2.2.2 Topography and Surface Drainage Features

The topography of the station is generally flat, with elevations ranging from 1 to 31 feet above mean sea level (amsl) (INRMP, 2017). The highest elevations occur in the eastern portion of the station along a relic sand dune, the Punto Ridge. Elevations in the developed area of the station range from 10 to 25 feet amsl. Surface runoff from the station is facilitated by a system of drainage ditches and surface canals that flow south and west to West

Neck Creek, north to London Bridge and Great Neck Creek, and east to Owls Creek and Lake Rudee (**Figure 2-1**). These drainage ditches are engineered, maintained structures and are cleaned periodically. Surface water bodies on the station are limited to these drainage ditches and a number of manmade ponds.

2.2.3 Land Use

More than 40 percent of NAS Oceana is urbanized including commercial, residential, and operations buildings and runways, hangars, and similar structures. The undeveloped areas of NAS Oceana consist of farmland, open land, forest, and wetlands. Approximately 646 acres of land are farmed by private producers under the Navy's agricultural outlease program (INRMP, 2017). The facility is restricted to the general public by a locked, chain-link fence; however, with the exception of the runway and flight line areas, it is unrestricted to Navy personnel. Land use at NAS Oceana is not expected to change in the foreseeable future.

2.2.4 Water Use

Groundwater is not currently used as a potable water supply on NAS Oceana. The Base and most private properties surrounding the Base have access to water provided by the City of Virginia Beach although some private properties are not connected to the municipal water supply and use groundwater as a potable water source. Non-potable wells are also present in private properties in the vicinity of the NAS Oceana and the possibility exists that people will accidentally use the water from these wells for potable purposes or incidentally ingest it during non-potable use.

On-Base non-potable wells are located on the north side of the Base at the Skeet and Trap Range. Multiple irrigation wells are also present at the Base Golf Course. Based on conversations with NAS Oceana personnel, only one well extracts groundwater. Other Golf Course extraction points referred to as "wells" are suspected to pump from irrigation ponds. Two wells, one to the north of the Base and one to the south of the Base, pump water for use in concrete manufacturing operations. In addition, there is a supply well on the east side of the Base at the Natural Resources Building.

Bottled water is provided to the Skeet and Trap Range for reasons unrelated to the potential presence of PFAS in groundwater in that area of the base.

2.2.5 Geologic Setting

NAS Oceana is on the outer edge of the Atlantic Coastal Plain physiographic province. The Atlantic Coastal Plain is a broad wedge of unconsolidated sediments that dip and thicken to the east. In the vicinity of NAS Oceana these sediments consist of several thousand feet of unconsolidated sand, clay, silt, and gravels and are underlain by granite basement rock. The sediments range in age from late Cretaceous to Recent. From oldest to youngest, the five principal geologic units are the Potomac Formation, the Unnamed Upper Cretaceous deposits, the Pamunkey Group, the Chesapeake Group, and the Columbia Group. The Chesapeake Group has been differentiated further into five formations, which are, from oldest to youngest: the Calvert, Choptank, St. Marys, Eastover, and Yorktown Formations. The Columbia Group sediments overlying the Yorktown Formation have also been differentiated into several units.

The geologic units of concern in the environmental investigations at NAS Oceana are the Yorktown Formation and the Columbia Group. The Columbia Group is present at the ground surface in the vicinity of the Base and generally extends to approximately 20 feet bgs. The Yorktown Formation underlies the Columbia Group. The upper Yorktown Formation consists of interbedded layers of shelly, very fine to coarse sands, clayey sands and sandy clay of Tertiary age. Regionally, the uppermost of these silt and clay beds separates the Yorktown Formation from the sediments of the Columbia Group that overlie it. This uppermost bed consists of massive, well-bedded yellow-gray to greenish-gray clays and silty clays, commonly containing shells, fine sand, and mica. This unit is absent across much of NAS Oceana. The clay layers within the confining bed are generally extensive but are a series of coalescing clay beds rather than a single deposited unit. This unit was deposited in a shallow open-marine environment of broad lagoons and quiet bays (Meng and Harsh, 1984). The sediments of the Columbia Group consist of interbedded gravels, sands, silts, and clays of Pleistocene and Holocene age. The Pleistocene and

Holocene sediments were deposited in fluvial-marine terrace and near-shore marine environments such as lagoons, beaches, tidal flats and barrier islands (CH2M, 1991).

2.2.6 Groundwater Flow

Groundwater at NAS Oceana is generally within 4 to 10 feet of the land surface. Aquifer conditions are unconfined in the Columbia Group and unconfined to semiconfined within the upper Yorktown Formation. When the clay confining unit overlying the Yorktown is absent, the upper Yorktown and Columbia aquifers act as a single, unconfined, hydrogeologic unit. Groundwater flow directions in the Columbia aquifer are variable and generally flow to the north at the northern half of the Base, to the south-southwest at the southern half of the Base, and to the west-northwest at the eastern portion of the Base. The Yorktown aquifer appears to follow the flow patterns of the Columbia aquifer at the Base with flow to the north at the northern half of the Base and to the southwest at the southern half of the Base. Groundwater flow data collected as part of this investigation is discussed in more detail in **Sections 3.5 and 3.6**.

2.2.7 Hydrogeologic Setting

The surficial hydrogeologic unit at NAS Oceana consists of the Columbia aquifer, which extends to a depth of approximately 17 to 30 feet bgs at the installation. This unit is underlain by the Yorktown confining unit across much of coastal Virginia; however, this unit is absent across most of NAS Oceana. Where present, the confining unit is underlain by the Yorktown aquifer. No monitoring wells or water supply wells at the Base have been installed to the total depth of the Yorktown aquifer, but the approximate thickness of the unit is 100 feet based on *The Virginia Coastal Plain Hydrogeologic Framework* (USGS, 2006).

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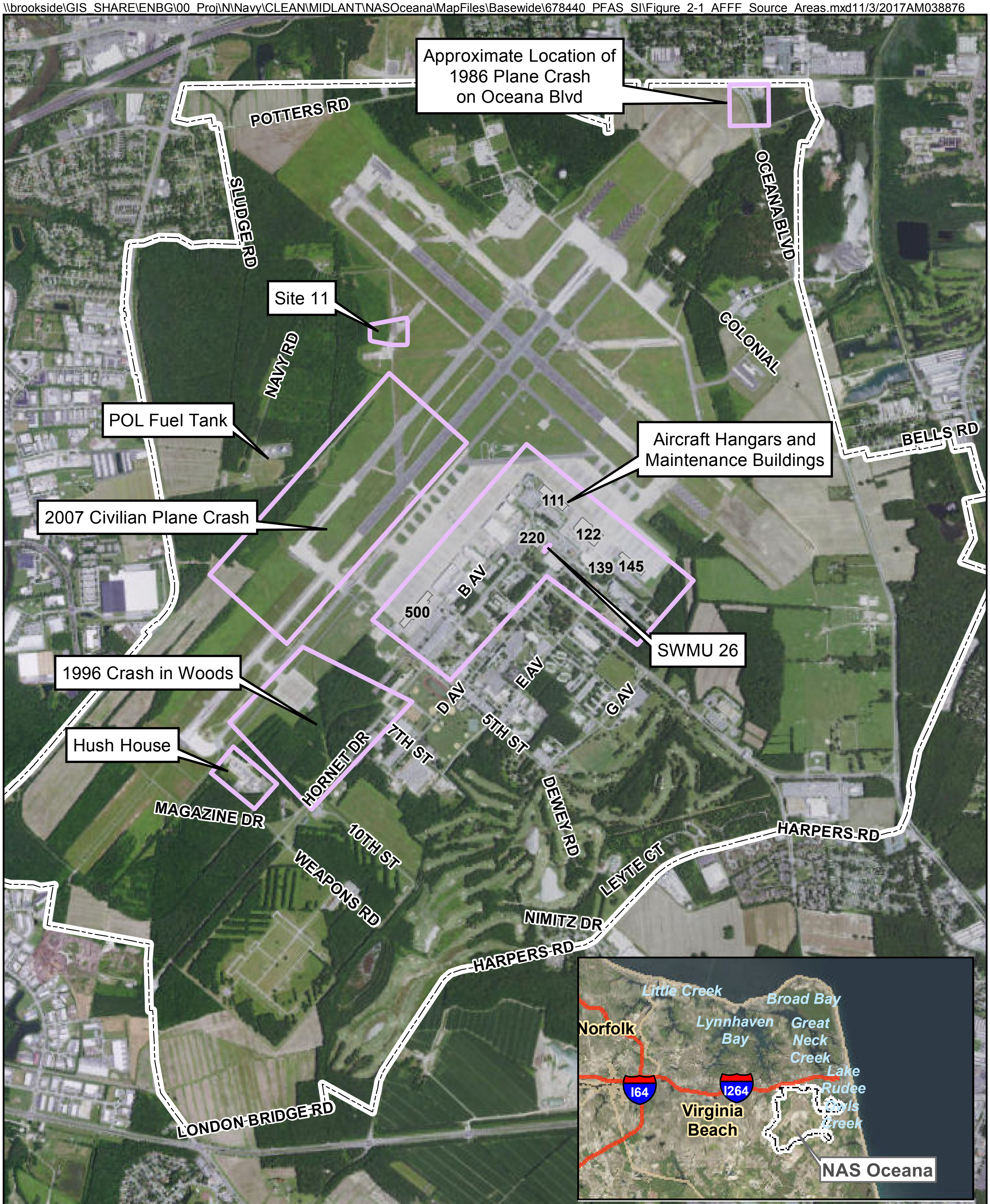

Legend

Potential AFFF Release Areas

Installation Boundary

N W E S

0 1,375 2,750 Feet

Figure 2-1
AFFF Source Areas
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

Imagery and Basemap Source: ©2017 Esri

ch2m

Investigation Methodology

3.1 Objectives and Approach

The field activities discussed in this report were performed in accordance with the SAP. The initial phase of field activities (Phase I) was conducted from October to December of 2016 and included on-Base monitoring well installation in the Columbia aquifer, on-Base groundwater sampling, aquifer variable-head testing (slug test) in monitoring wells screened in the Columbia aquifer, and off-Base private potable well sampling. Based on the results of Phase I, CH2M performed an additional investigation (Phase II) from March to May of 2017, which included the installation of additional monitoring wells in the Columbia and Yorktown aquifers, and associated groundwater sampling. Additional groundwater sampling was conducted in February 2017 to evaluate the effect of oxygen release compound (ORC) socks on PFOS/PFOA concentrations. A summary of the technical approach for conducting these activities is provided below.

3.2 Site Preparation and Utility Location

Prior to installation of new monitoring wells, utilities within 10 feet of proposed well locations were marked by Advanced Infrastructure Mapping, a licensed utility locator. Miss Utility of Virginia was also contacted to clear utilities in the vicinity of borings. While some locations required minor adjustment to account for buried utility lines, no significant changes to locations were necessary.

3.3 Monitoring Well Installation

In October 2016 and May 2017, 12 monitoring wells were installed to depths of approximately 20 feet below ground surface (bgs) and screened within the Columbia aquifer (from 10 to 20 feet bgs) (**Figures 3-1, 3-2, and 3-3**). In addition, in August 2017, 1 monitoring well that had collapsed (MW-BG04) was abandoned and replaced by a new monitoring well (MW-BG04R). Monitoring wells were installed at Site 11, SWMU 26, the Hush House site, and the 1986 and 1996 airplane crash sites. For other potential source areas (**Figure 2-1**) existing wells were present at the site that could be sampled in lieu of installing new monitoring wells. In May 2017, five monitoring wells were installed to depths of 60 feet bgs and screened within the Yorktown aquifer at depths ranging from 50 to 60 feet bgs (**Figure 3-4**) and one additional shallow well was installed in the southern portion of the Base to better assess offsite migration in that area. Monitoring wells were installed near the Base boundary, at Site 11, and south of the 1986 Crash Site.

Each monitoring well was installed in accordance with the standard operation procedures (SOPs) titled *General Guidance for Monitoring Well Installation, Installation of Shallow Monitoring Wells, and Installation of Deep Monitoring Wells*, provided in the SAP (CH2M, 2017).

Parratt-Wolff, Inc., of Hillsborough, North Carolina, provided hollow-stem auger (HSA) well drilling and installation services using a 4.25-inch-inside-diameter HSA. During the lithologic logging of soil cores (collected using 4-foot-long acetate sleeves), soil descriptions were recorded, including grain size, color, moisture content, relative density, consistency, soil structure, mineralogy, and other relevant information, such as possible evidence of contamination. **Appendix B** and **Appendix C** present the construction details and soil boring logs for each Columbia monitoring well and Yorktown monitoring well.

Each new monitoring well was constructed with 2-inch-inside-diameter Schedule 40 polyvinyl chloride (PVC) screen and riser with a 10-foot-long, 0.010-inch machine-slotted screen. A silica filter pack (Industrial Quartz #1 or #1A) was placed around the annular space of the well screen from the bottom of the boring extending to a depth of 2 feet above the top of the screen. The filter pack was installed in a manner that prevents bridging. The depth to the top of the sand filter pack was measured periodically using a weighted measuring tape. A minimum of a 2-foot bentonite layer of pure, additive-free chips was placed at the top of the sand pack. The bentonite was allowed to hydrate for 45 minutes before a cement-bentonite grout was placed in the remaining annular space. All monitoring wells were completed with a bolt down flush-mounted or stick-up cover. A locking, watertight cap was placed on the top of each casing, and the well identification numbers were clearly marked on the well with etched well identification tags. Well construction details are summarized in **Table 3-1**.

3.4 Monitoring Well Development

Prior to sampling, all newly installed monitoring wells were developed in order to restore the permeability of the aquifer material immediately surrounding the well, which may have been reduced by the drilling operations, and to remove fine-grained materials that may have collected inside the well during installation. Monitoring well development was performed after the grout used to construct the new monitoring wells was allowed to adequately set (at least 24 hours or more) to prevent grout contamination of the screened interval. Monitoring wells were developed with a submersible pump using a combination of pumping and surging throughout the length of the well screen.

Between 36 and 78 gallons of water were evacuated from each well, with a total of 850 gallons of water purged during the entire monitoring well development event. During monitoring well development, in accordance with the SOPs provided in the SAP (CH2M, 2017), water quality parameters (pH, oxidation-reduction potential [ORP], temperature, specific conductivity, salinity, turbidity, and dissolved oxygen [DO]) were recorded approximately every 5 minutes using a YSI water-quality meter. The YSI instrument was calibrated daily, and calibration results were recorded in the field notebook.

Generally, development continued until at least three well volumes were removed and the water produced was free of turbidity, sand, and silt (to the maximum extent practicable). The water quality meter was used to determine when the turbidity was low (preferably less than 20 nephelometric turbidity units [NTU]). If turbidity continued to decrease after the removal of three well volumes, development was continued until turbidity readings stabilized (that is, until turbidity readings were within 10 percent of each other for three consecutive readings). In addition, development typically ended once three successive measurements of pH, specific conductivity, and temperature within 10 percent of each other were achieved.

3.5 Groundwater Elevation Measurement

Groundwater elevation surveys were conducted in October of 2016 for 38 monitoring wells (11 new and 27 existing monitoring wells) in the Columbia aquifer (**Table 3-2**). In May of 2017 a survey was conducted for 37 new and existing monitoring wells in the Columbia aquifer (**Table 3-3**) and four new monitoring wells in the Yorktown aquifer (**Table 3-4**). In November 2017, a survey was conducted for 40 monitoring wells in the Columbia aquifer and five (**Table 3-5**) in the Yorktown aquifer (**Table 3-6**) An electronic water-level meter was used to measure the depth to water from the surveyed marking on the top of the well casing to the nearest 0.01 foot. Based on the groundwater elevations measured in October 2016, and May and November 2017, groundwater contour maps for the Columbia aquifer were prepared (**Figures 3-1, 3-2, and 3-3**). Groundwater contour maps based on groundwater elevations measured in May and November 2017 for the Yorktown aquifer (**Figures 3-4 and 3-5**) were also prepared. However, the groundwater contour map for the Yorktown aquifer had to be extrapolated in the southwestern portion of the site and could not be drawn in the southern portion of the site due to the limited number of monitoring wells installed in that aquifer.

Vertical gradients were calculated for paired wells in the Columbia and Yorktown aquifers and are included in Table 3-7. Water elevations were very similar between well pairs in the two aquifers, as expected since a confining unit is not present at the site. Vertical gradient information indicates a weak downward gradient between the Surficial/Columbia and Yorktown aquifer wells (between -0.003 and -0.036 ft/ft with a mean of 0.0132 ft/ft).

3.6 Aquifer Variable-head Testing

On November 10 and 11, 2016, falling- and rising-head slug tests were conducted in monitoring wells OW2B-MW14, OW2C-MW19, OW11-MW04, OW11-MW07, OW11-MW09, and OW26-MW01 to quantify spatial variations of the hydraulic properties of the shallow aquifer unit at the Aircraft Hangars and Maintenance Buildings site, SWMU 26, and Site 11 (**Figure 3-6**).

Three rising-head and three falling-head slug tests were performed in each monitoring well. The static depth to water was manually measured and recorded before each slug test. A digital data logger (Level Troll 700™) was submerged in the monitoring well to a depth of several feet below the static water level. The data logger was programmed to logarithmically record the depth of water above the sensor at 0.25-second intervals. The slug used for all test consisted of a 5-foot-long, 1.5-inch-diameter section of solid PVC.

For each falling-head test the slug was rapidly lowered into the well and held steady while the digital data logger measured the changing depth of water. The slug remained in place until the static water level recovered to 90 percent of the pre-test level.

A rising-head test was conducted by rapidly removing the slug while the digital data logger measured the changing depth of water. The test continued until the water level recovered to 90 percent of the pre-test level.

All equipment that entered the well was decontaminated before testing was started and before the equipment was moved to test a new well. After each test, the data logger was downloaded and the test results were examined.

The slug test data sets were analyzed using the Bouwer-Rice solution method (Bouwer and Rice, 1976). The graphical analysis sheets are presented in **Appendix D**, and the hydraulic conductivity estimates are summarized in **Table 3-8**. The Bouwer-Rice solution was developed to accommodate the analysis of slug tests in unconfined aquifers and is theoretically appropriate for these slug tests. The estimated hydraulic conductivity for the Columbia Aquifer ranged from 4.00×10^{-3} feet per minute (ft/min) to 9.53×10^{-3} ft/min. These values are consistent with moderate to rapid saturated hydraulic conductivity as indicated in the *National Soil Survey Handbook, Part 618* (U.S. Department of Agriculture, 2017). Some uncertainty exists with respect to the validity of the falling-head tests because the static water level in some of the screens were within the well screen interval. However, because falling- and rising-head test results were similar, results are believed to be valid.

For the shallow aquifer at the Aircraft Hangars and Maintenance Buildings site, SWMU 26, and Site 11, the groundwater flow velocity was calculated using the following equation:

$$V=Ki/N_e$$

Where:

V= the estimated groundwater flow velocity
K= the average hydraulic conductivity
i = the groundwater gradient
N_e = the estimated effective porosity, as a decimal fraction

Site specific parameters are as follows:

$K = 6.765 \times 10^{-3}$ ft/min (average of values calculated during slug tests)
i = 0.0008 ft/ft (based on the May 2017 groundwater levels)
$N_e = 0.25$ (estimated effective porosity of silty sand)

In consideration of these parameter, the groundwater velocity at the Aircraft Hangars and Maintenance Buildings site, SWMU 26, and Site 11 is estimated to be 0.0312 ft/day or approximately 11.37 ft/year.

3.7 Groundwater Sampling

Between October 2016 and May 2017, 35 samples from 34 Columbia aquifer wells were collected on-Base. Additionally, five wells in the Yorktown aquifer were sampled.

All samples were collected in accordance with the SOP *Low-Flow Groundwater Sampling from Monitoring Wells – EPA Region I and III* provided in the SAP (CH2M, 2017) in order to minimize drawdown and to obtain samples representative of groundwater conditions in the surrounding geologic formation. Cross-contamination of PFAS was considered during sampling in accordance with the SOP *OPNAV PFC Sampling Policy* provided in the SAP (CH2M, 2017). Prior to groundwater sample collection, monitoring wells were purged in order to remove any stagnant water and to collect a representative sample from the aquifer. Groundwater samples were collected from monitoring wells using a peristaltic pump and disposable tubing. Groundwater quality parameters, including pH, ORP, temperature, specific conductivity, salinity, turbidity, and DO, were measured during the purging of each well using a YSI water-quality meter and a flow-through cell to prevent the purged groundwater from contacting the atmosphere during parameter measurement.

Purging continued until water quality readings collected 5 minutes apart stabilized to within 10 percent of one another. Following parameter stabilization, a CHEMet test kit was used to confirm DO readings measured by the water-quality meter (Model Numbers K-7501 for 0 to 1 part per million [ppm] and K-7512 for 1 to 12 ppm). Once DO confirmation was recorded, the flow-through cell was disconnected and samples were collected directly into laboratory-provided sample bottles. The final set of groundwater quality measurements recorded before sample collection for each monitoring well is presented in **Tables 3-9** through **3-11** for the Columbia aquifer, and in **Table 3-12** for the Yorktown aquifer.

Groundwater samples were analyzed for six PFAS: perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorobutanesulfonic acid (PFBS) in accordance with the USEPA's Third Unregulated Contaminant Monitoring Rule (USEPA, 2012). Groundwater for the analytical samples was pumped through the tubing directly into the appropriate laboratory-provided bottleware. To avoid cross-contamination of PFAS, Teflon tubing was not utilized during sampling. After collection in sampling containers, and at the end of each day, the samples were packed on ice and shipped via overnight service to the laboratory for analysis.

3.8 Off-Base Potable Water Sampling

In accordance with the *Perfluorinated Compounds Interim Guidance and Frequently Asked Questions (*Navy, 2015)[1], all parcels located within 1 mile of potential PFAS source areas were evaluated to determine whether groundwater was used as a potential potable water source. A record search showed that 470 parcels were located within the 1-mile radius, and that only 15 parcels had a potable water well installed. A survey of the parcels' owners/residents with a potable well was performed to determine the actual type and usage of well, and a request to collect a water sample from the well was sent. Six residents/homeowners requested that their well be sampled. Samples were taken in accordance with the SOP *Drinking Water Sampling when Analyzing for Per- and Polyfluoroalklyl Substances (PFASs)* and the SOP *OPNAV PFC Sampling Policy*, both provided in the SAP (CH2M, 2017).

Prior to potable well sample collection, the tap or spigot was opened and water was purged for at least 10 minutes in order to flush the system of stagnant water and collect a sample representative of the aquifer. Homeowner questionnaires were also completed to determine well construction details, if known. Depth and screen interval information of the wells, which was provided by homeowners or residents, could not be obtained for some wells and could not be verified. Potable well samples were collected directly from the tap or spigot, depending on location, from a collection point upstream from any treatment system installed by the homeowner (such as granular activated carbon filter). A field reagent blank was collected at each sampling location. After collection in sampling containers, and at the end of each day, the samples were packed on ice and shipped via overnight service to the laboratory for analysis. The potable water samples were analyzed for the same six PFAS that the groundwater samples were analyzed for: PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFBS.

3.9 Surveying

Miller Stephenson and Associates (MSA), and Pennoni Associates, of Virginia Beach, Virginia (both Virginia-licensed and registered surveyors), conducted a survey of the monitoring wells installed during the Phase I and II investigations, respectively. Each of the monitoring wells was surveyed for vertical and horizontal control to an accuracy of ±0.01 foot and ±0.1 foot, respectively (**Appendix E**). Monitoring wells were surveyed at the top of the PVC casing (where marked) and at the ground surface. The vertical elevations were referenced to National American Vertical Datum of 1988 (NAVD 88) to remain consistent with the coordinate system and datum currently in use on the project site. Horizontal coordinates were referenced to the Virginia State Plane Coordinate System, South Zone, NAD83/94 HARN. Discrepancies were noted in the Pennoni Associates survey report. The wells contained in that report may be resurveyed during additional investigations.

3.10 Quality Assurance and Quality Control

Drinking water samples were collected according to the Navy CLEAN SOP *Drinking Water Sampling when Analyzing for Per-and Polyfluoroalkyl Substances (PFAS)* referenced in the SAP (CH2M, 2017). Groundwater and drinking water samples collected for this field investigation were analyzed using USEPA 537 Modification analytical method as identified in the SAP (CH2M, 2017).

Field quality assurance/quality control (QA/QC) samples were collected during the sampling program. These samples were obtained to:

- Ensure that disposable and reusable sampling equipment were free of contaminants
- Evaluate field methodology
- Establish ambient field background conditions
- Evaluate whether cross-contamination occurred during sampling and/or shipping

Several types of field QA/QC samples that were collected and analyzed are defined as follows:

- **Equipment Rinsate Blank (decontaminated equipment):** Equipment blanks were collected at the frequency of one per day of sampling. These samples were obtained by running laboratory-grade deionized (DI) water over or through sample collection equipment after the decontamination procedures had been conducted. These samples, which were collected during groundwater sampling only, were used to determine whether decontamination procedures for reusable equipment were adequate.

- **Equipment Rinsate Blank (disposable equipment):** Equipment blanks were collected at the frequency of one per lot. These samples were obtained by running laboratory-grade DI water over or through sample collection equipment prior to the equipment's use. These samples, which were collected during groundwater sampling only, were used to determine whether disposable, one-time-use equipment was contaminant-free prior to use.

- **Field Reagent Blank:** Field blanks were collected at the frequency of one per week for groundwater monitoring and one per residence for drinking water sampling. These samples were collected by pouring the laboratory-provided preserved reagent blank water from the preserved bottle into the unpreserved blank container. The purpose of these samples is to assess the potential for field contamination.

- **Duplicate Sample:** Duplicate samples were collected at the same time and under identical conditions as their respective associated sample at the frequency of one per 10 field samples of similar matrix. These samples were collected to evaluate the field and laboratory reproducibility of sample results and are one way to evaluate field methodology.

In addition to samples collected to monitor field QC, samples were also collected to monitor quality within the laboratory. These included the following:

- **Matrix Spike (MS):** An aliquot of a matrix (that is, groundwater) was spiked with known quantities of analytes of interest and subjected to the entire analytical procedure. By measuring the recovery of these spiked quantities, the appropriateness of the method for the matrix was demonstrated.
- **Matrix Spike Duplicate (MSD):** These samples were collected as second aliquots of the same matrix as the MS to determine the precision of the method.

One MS sample and one MSD sample were collected for every 20 environmental samples collected (or greater than or equal to 5 percent of the samples collected) per medium including field duplicates.

3.11 Decontamination Procedures

All decontamination activities were conducted in accordance with the SOPs *Decontamination of Drilling Rigs* and *Equipment* and *Decontamination of Personnel and Equipment* provided in the SAP, as applicable (CH2M, 2017). In addition, cross-contamination of PFAS was considered during decontamination in accordance with the SOP titled *OPNAV PFC Sampling Policy* provided in the SAP (CH2M, 2017).

Nondisposable equipment was decontaminated using the following solutions in this order:

1. Distilled water (laboratory certified PFAS-free) and Liquinox solution
2. Distilled water (laboratory certified PFAS-free) rinse 10 percent isopropanol and distilled water solution (laboratory certified PFAS-free) and air-dried
3. Laboratory grade DI water (laboratory certified PFAS-free)

Water generated during decontamination of sampling equipment was collected and transferred to an approved 55-gallon drum to await characterization and disposal.

No equipment decontamination was required for the drinking water sampling event.

Disposable sampling equipment and personal protective equipment, such as Masterflex tubing and nitrile gloves, were not decontaminated after use and instead were disposed as nonhazardous solid waste. After use, disposable equipment was placed in plastic contractor bags and disposed in an onsite trash dumpster.

Reusable heavy equipment, such as drilling rods and augers, was decontaminated before and in between the collection of each sample using a high-pressure steam cleaner with potable-grade water. Pressure washing was conducted at the temporary decontamination pad, which had been constructed prior to the start of drilling activities. The decontamination pad consisted of a raised wood frame lined with a high-density polyethylene tarp, which acted as a basin to collect fluids. These fluids were then pumped into approved 55-gallon drums to await characterization and disposal. All heavy equipment decontamination procedures were conducted in accordance with the SOP *Decontamination of Drilling Rigs and Equipment* provided in the SAP (CH2M, 2017).

3.12 Investigation-derived Waste Management

Investigation-derived waste (IDW) generated during the SI included soil cuttings, well development groundwater, groundwater sampling purge-water, as well as decontamination rinse-water from all nondisposable sampling equipment and heavy equipment. The IDW was containerized in approved 55-gallon drums that were properly labeled and stored within secondary containment at NAS Oceana. A total of 24 drums of solid IDW (17 drums associated with Phase I and 7 drums associated with Phase II) and 33 drums of aqueous IDW (13 drums associated with the Phase I SI and 20 drums associated with the Phase II SI) were generated during the field activities.

Prior to disposal, CH2M field staff collected three composite samples from all aqueous IDW drums (two associated with Phase I and one associated with Phase II) and eight composite sample from all solid IDW drums (seven associated with Phase I and one associated with Phase II). The IDW samples were analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) analyses (volatile organic compounds [VOCs], semivolatile organic compounds [SVOCs], pesticides, and inorganic constituents), ignitability, reactive cyanide, reactive sulfide, and corrosivity. Phase II aqueous samples were additionally analyzed for PFAS in accordance with a more recent Navy policy. Based on the analytical results, all IDW was identified as nonhazardous and PFAS results for the Phase II aqueous samples were less than the USEPA lifetime health advisory (L-HA) of 70 nanograms per liter (ng/L) for the sum of PFOA and PFOS. As such, waste was disposed as nonhazardous by Clearfield MMG within 90 days of generation at the company's approved disposal facility in Chesapeake, Virginia.

All IDW management activities were conducted in accordance with the SAP (CH2M, 2017). **Tables F-1**, and **F-2** of **Appendix F** provide an analytical summary for the Phase I IDW samples and **Tables F-3** and **F-4** of **Appendix F** provide an analytical summary for the Phase II IDW samples. **Appendix F** also includes all IDW handling and disposal information.

3.13 Data Quality Evaluation

The data quality evaluation and validation is a multitiered approach. The process begins with an internal laboratory review, continues with an independent review by a third-party validator, and ends with an overall review by the CH2M project chemistry team. The data validation reports are included as **Appendix G**.

TABLE 3-1
Well Construction Detail Table
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Monitoring Well	Installation Date	Ground Elevation (feet amsl)	Top of Casing Elevation (feet amsl)	Wellhead protection	Total Well Depth (feet bgs)	Length of Screen (feet)	Elevation of Top of Screen (feet amsl)	Elevation of Bottom Screen (feet amsl)
Columbia Aquifer Monitoring Wells								
OW11-MW4	10/6/2016	15.89	18.89	Aluminum standpipe	19.68	10	25.24	35.24
OW11-MW5	10/6/2016	16.87	20.05	Aluminum standpipe	18.81	10	25.5	35.5
OW11-MW6	10/6/2016	18.2	17.89	Flush mount	20.48	10	28.35	38.35
OW11-MW7	10/6/2016	17.47	17.15	Flush mount	20.56	10	27.7	37.7
OW11-MW8	10/6/2016	15.81	18.88	Aluminum standpipe	19.61	10	25.24	35.24
OW11-MW9	10/6/2016	15.84	18.65	Aluminum standpipe	20.54	10	26.44	36.44
OW26-MW1	10/11/2016	18.33	18.13	Flush mount	19.3	10	27.45	37.45
OC-MW01	10/12/2016	19.22	18.98	Flush mount	20.04	10	28.93	38.93
OC-MW02	10/13/2016	22.43	22.22	Flush mount	20.63	10	32.73	42.73
OC-MW03	10/14/2016	13.91	13.58	Flush mount	20.38	10	23.96	33.96
OC-MW04	10/13/2016	14.26	17.45	Aluminum standpipe	21.11	10	25.04	35.04
W-BG04R	8/8/2017	25.25	24.99	Flush mount	20	10	36.03	46.03
Yorktown Aquifer Monitoring Wells								
OC-MW07D *	3/13/2017	9.6	13.59	Steel standpipe	60	10	20.38	30.38
OC-MW02D *	3/20/2017	22.9	22.79	Flush mount	60	10	33.68	43.68
OC-MW05D *	3/16/2017	16.6	16.28	Steel standpipe	60	10	27.38	37.38
OW11-MW10D *	3/14/2017	17.4	17.11	Flush mount	56	10	28.18	38.18
OW26-MW1D *	3/8/2017	18.6	18.35	Flush mount	60	10	29.38	39.38

Notes:
amsl = above mean sea level
bgs = below ground surface
* Discrepancies were noted in the survey report. These wells may be resurveyed during additional investigations.

TABLE 3-2

Groundwater Elevations in the Columbia Aquifer (October 2016)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Well ID	Total Depth (feet bgs)	Well Screen Interval (feet bgs)	Top of Casing Elevation (feet amsl)	Depth to Water (feet below measuring point)	Groundwater Elevation (feet amsl)
OW11-MW1	18	8-18	19.25	8.12	11.13
OW11-MW4	20	10-20	18.89	7.36	11.53
OW11-MW5	21	10-21	20.05	8.54	11.51
OW11-MW6	22	10-22	17.89	6.54	11.35
OW11-MW7	23	10-23	17.15	6.00	11.15
OW11-MW8	24	10-24	18.88	8.12	10.76
OW11-MW9	25	10-25	18.65	8.13	10.52
DT-03	21	10-21	16.74	5.71	11.03
1-MW06	21	5-20.5	18.18	8.09	10.09
OW26-MW1	20	10-20	18.13	4.46	13.67
OC-MW01	20	10-20	18.98	9.54	9.44
OC-MW03	20	10-20	13.58	4.40	9.18
JTC-MW-B	13	3-13	15.63	5.81	9.82
OC-MW04	23	13-23	17.45	7.35	10.10
OW2C-MW19	20	10-20	20.56	7.90	12.66
OW2C-MW05	16	6-16	20.42	5.27	15.15
OW2C-MW11	23	13-23	18.47	4.75	13.72
OW2C-MW24	23	13-23	18.72	5.17	13.55
OW2E-MW09R	19	4-19	19.88	5.51	14.37
OW2E-MW18	19	4-19	18.36	4.40	13.96
OW2E-MW19	19	9-19	19.67	5.22	14.45
OW2E-MW03	18	8-18	19.61	3.73	15.88
OW2B-MW41	20	10-20	21.59	6.86	14.73
OW2B-MW14	20	10-20	19.47	5.81	13.66
MW-D	14	4-14	17.83	4.39	13.44
203MW-19	20	10-20	18.97	6.01	12.96
MW-C	11	1.7-11.7	17.47	3.07	14.40
TL-D*	12	2-12	19.25	7.52	11.73
OC-MW02	20	10-20	22.22	9.45	12.77
MW-BG01	20	10-20	17.27	6.54	10.73
MW-BG04R**	20	10-20	24.99	NM	NM
MW-BG05	20	10-20	24.79	7.03	17.76
MW-BG06	20	10-20	18.73	6.74	11.99
MW-BG07	20	10-20	17.06	5.51	11.55
MW-BG09	20	10-20	16.00	4.50	11.50
MW-BG10	20	10-20	13.96	3.55	10.41
MW-BG11	20	10-20	15.42	6.2	9.22
MW-BG12	20	10-20	17.82	4.24	13.58
MW-BG13	20	10-20	15.97	3.31	12.66

Notes:

* Approximately 0.04 feet of free product was measured in this monitoring well. This monitoring well was gauged as part of the groundwater level survey and was not analyzed during this investigation. It is currently monitored under the Virginia Department of Environmental Quality's Petroleum Oil and Lubricant program. TL-D is associated with the underground transmission line (T-Line) site and is reported to be sampled annually for TPH-DRO, BTEX and naphthalene.

** Monitoring well was installed after this gauging event
amsl = above mean sea level
bgs = below ground surface
NA = Not available
NM = Not measured
TOC = Top of casing

TABLE 3-3
Groundwater Elevations in the Columbia Aquifer (May 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Well ID	Total Depth (feet bgs)	Well Screen Interval (feet bgs)	TOC Elevation (feet amsl)	Depth to Water (feet below TOC)	Groundwater Elevation (feet amsl)
OW11-MW1	18	8-18	19.25	7.98	11.27
OW11-MW4	20	10-20	18.89	7.03	11.86
OW11-MW5	21	10-21	20.05	8.32	11.73
OW11-MW6	22	10-22	17.89	6.38	11.51
OW11-MW7	23	10-23	17.15	5.82	11.33
OW11-MW8	24	10-24	18.88	8.01	10.87
OW11-MW9	25	10-25	18.65	8.11	10.54
DT-03	21	10-21	16.74	2.11	14.63
1-MW06	21	5-20.5	18.18	8.09	10.09
OW26-MW1	20	10-20	18.13	5.03	13.10
OC-MW01	20	10-20	18.98	6.70	12.28
OC-MW03	20	10-20	13.58	5.34	8.24
JTC-MW-B	13	3-13	15.63	6.32	9.31
OC-MW04	23	13-23	17.45	8.25	9.20
OW2C-MW04	23	13-23	19.56	6.29	13.27
OW2C-MW18	23	13-23	18.23	5.01	13.22
OC-MW07	20	10-20	13.96	7.20	6.76
OW2C-MW19*	20	10-20	20.56	NA	NA
OW2C-MW05*	16	6-16	20.42	NA	NA
OW2C-MW11	23	13-23	18.47	5.24	13.23
OW2C-MW24*	23	13-23	18.72	NA	NA
OW2E-MW09R*	19	4-19	19.88	NA	NA
OW2E-MW18	19	4-19	18.36	4.18	14.18
OW2E-MW19	19	9-19	19.67	5.54	14.13
OW2E-MW03	18	8-18	19.61	5.38	14.23
OW2B-MW41	20	10-20	21.59	6.65	14.94
OW2B-MW14	20	10-20	19.47	5.89	13.58
MW-D	14	4-14	17.83	5.62	12.21
203MW-19	20	10-20	18.97	5.63	13.34
MW-C	11	1.3-11.3	17.47	1.58	15.89
TL-D	12	2-12	19.25	7.89	11.36
OC-MW02	20	10-20	22.22	10.59	11.63
OC-F8F9-MW-F4	30	unknown	17.64	4.90	12.74
MW-BG01	20	10-20	17.27	7.07	10.20
MW-BG04R**	20	10-20	24.99	NM	NM
MW-BG05	20	10-20	24.79	8.18	16.61
MW-BG06	20	10-20	18.73	7.50	11.23
MW-BG07	20	10-20	17.06	6.17	10.89
MW-BG09	20	10-20	16	5.46	10.54
MW-BG10	20	10-20	13.96	3.74	10.22
MW-BG11	20	10-20	15.42	6.68	8.74
MW-BG12	20	10-20	17.82	6.49	11.33
MW-BG13	20	10-20	15.97	4.41	11.56

Notes:
*Could not gauge due to presence of Oxygen Release Compound Socks
** Monitoring well was installed after this gauging event
amsl = above mean sea level
bgs = below ground surface
NA = Not available

TABLE 3-4

Groundwater Elevations in the Yorktown Aquifer (May 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Well ID	Total Depth (feet bgs)	Well Screen Interval (feet bgs)	TOC Elevation (feet amsl)	Depth to Water (feet below TOC)	Groundwater Elevation (feet amsl)
OW11-MW10D *	58.73	50-60	17.11	5.90	11.21
OC-MW05D *	59.30	50-60	16.28	6.45	9.83
OC-MW02D *	58.25	50-60	22.79	12.59	10.20
OW26-MW1D *	59.03	50-60	18.35	5.36	12.99
OC-MW07D *	63.87	50-60	13.59	7.46	6.13

Notes:

amsl = above mean sea level

bgs = below ground surface

TOC = top of casing

* Discrepancies were noted in the survey report. These wells may be resurveyed during additional investigations.

TABLE 3-5
Groundwater Elevations in the Columbia Aquifer (November 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Well ID	Total Depth (feet bgs)	Well Screen Interval (feet bgs)	TOC Elevation (feet amsl)	Depth to Water (feet below TOC)	Groundwater Elevation (feet amsl)
OW11-MW1	18	8-18	19.25	8.12	11.13
OW11-MW4	20	10-20	18.89	7.35	11.54
OW11-MW5	21	10-21	20.05	8.55	11.50
OW11-MW6	22	10-22	17.89	6.61	11.28
OW11-MW7	23	10-23	17.15	6.06	11.09
OW11-MW8	24	10-24	18.88	8.22	10.66
OW11-MW9	25	10-25	18.65	8.27	10.38
DT-03	21	10-21	16.74	2.80	13.94
1-MW06	21	5-20.5	18.18	8.21	9.97
OW26-MW1	20	10-20	18.13	5.53	12.60
OC-MW01	20	10-20	18.98	11.33	7.65
OC-MW03	20	10-20	13.58	6.20	7.38
JTC-MW-B*	13	3-13	15.63	8.10	7.53
OC-MW04	23	13-23	17.45	10.98	6.47
OC-MW07	20	10-20	13.96	10.53	3.43
OW2C-MW19	20	10-20	20.56	9.03	11.53
OW2C-MW05	16	6-16	20.42	6.81	13.61
OW2C-MW11	23	13-23	18.47	5.91	12.56
OW2C-MW24	23	13-23	18.72	6.10	12.62
OW2E-MW09R	19	4-19	19.88	6.31	13.57
OW2E-MW18	19	4-19	18.36	4.81	13.55
OW2E-MW19	19	9-19	19.67	6.11	13.56
OW2E-MW03	18	8-18	19.61	5.88	13.73
OW2B-MW41	20	10-20	21.59	7.05	14.54
OW2B-MW14	20	10-20	19.47	6.52	12.95
MW-D	14	4-14	17.83	7.72	10.11
203MW-19	20	10-20	18.97	8.09	10.88
MW-C	11	1.3-11.3	17.47	2.64	14.83
TL-D**	12	2-12	19.25	NM	NA
TL-7	12	2-12	15.91	4.39	11.52
OC-MW02	20	10-20	22.22	11.11	11.11
OC-MW-F4***	30	unknown	17.64	8.22	9.42
MW-BG01	20	10-20	17.27	7.75	9.52
MW-BG04R	20	10-20	24.99	10.27	14.72
MW-BG05****	20	10-20	24.79	NM	NA
MW-BG06	20	10-20	18.73	7.90	10.83
MW-BG07	20	10-20	17.06	6.40	10.66
MW-BG09	20	10-20	16	7.31	8.69
MW-BG10	20	10-20	13.96	5.59	8.37
MW-BG11	20	10-20	15.42	9.6	5.82
MW-BG12	20	10-20	17.82	8.85	8.97
MW-BG13	20	10-20	15.97	5.15	10.82

Notes:

* Approximately 0.01 feet of free product measured in well. This Monitoring well was gauged and only sampled for PFAS during this investigation. It is currently monitored under the Virginia Department of Environmental Quality's Petroleum Oil and Lubricant program. JTC-MW-B is associated with the Jet Test Cell and is reported to be monitored annually for TPH-DRO and naphthalene.

** Well was locked and could not be measured, TL-7 was collected instead

*** Approximately 0.7 feet of free product measured in well. This monitoring well was gauged and only sampled for PFAS during this investigation. It is currently monitored under the Virginia Department of Environmental Quality's Petroleum Oil and Lubricant program. OC-MW-F4 is associated with the F8/F9 site and is reported to be monitored annually for TPH-DRO and naphthalene.

**** Well is collapsed at 8.65 feet BTOC

amsl = above mean sea level

bgs = below ground surface

NA = Not available

TABLE 3-6

Groundwater Elevations in the Yorktown Aquifer (November 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Well ID	Total Depth (feet bgs)	Well Screen Interval (feet bgs)	TOC Elevation (feet amsl)	Depth to Water (feet below TOC)	Groundwater Elevation (feet amsl)
OW11-MW10D *	58.73	50-60	17.11	5.96	11.15
OC-MW05D *	59.3	50-60	16.28	7.36	8.92
OC-MW02D *	58.25	50-60	22.79	13.00	9.79
OW26-MW1D *	59.03	50-60	18.35	5.49	12.86
OC-MW07D *	63.87	50-60	13.59	9.63	3.96

Notes:

amsl = above mean sea level

bgs = below ground surface

TOC = top of casing

* Discrepancies were noted in the survey report. These wells may be resurveyed during additional investigations.

TABLE 3-7

Vertical Gradient Evaluation

Basewide Per- and Poly-fluoroalkyl Substances Site Inspection Report

NAS Oceana, Virginia Beach, Virginia

Well ID	Reference Point Elevation[1] (ft msl)	Screened Interval (ft bgs)	Aquifer	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)	Vertical Gradient (ft/ft)	Upward or Downward Gradient
OW11-MW7	17.15	10.23-20.23	Columbia/Surficial Aquifer	5.82	11.33	-0.003	Downward
OW11-MW10D[2]	17.11	50 - 60	Yorktown Aquifer	5.90	11.21		
OC-MW02	22.22	10.3-20.3	Columbia/Surficial Aquifer	10.59	11.63	-0.036	Downward
OC-MW02D[2]	22.79	50 - 60	Yorktown Aquifer	12.59	10.20		
OW26-MW1	18.13	9.12-19.12	Columbia/Surficial Aquifer	5.03	13.10	-0.003	Downward
OW26-MW01D[2]	18.35	50 - 60	Yorktown Aquifer	5.36	12.99		
OC-MW07	13.96	10-20	Columbia/Surficial Aquifer	7.20	6.76	-0.016	Downward
OC-MW07D[2]	13.59	50 - 60	Yorktown Aquifer	7.46	6.13		
MW-BG01	17.27	4 - 19	Columbia/Surficial Aquifer	7.07	10.20	-0.009	Downward
OC-MW05D[2]	16.28	50 - 60	Yorktown Aquifer	6.45	9.83		

Notes:

ft bgs - feet below ground surface

ft msl - feet (relative) mean sea level

ft btoc - feet below top of casing

Vertical gradient indicated is between identified and next lowest screen interval. Negative values indicate a downward vertical gradient.

1. Reference Point Elevation = top of casing elevation

2. Discrepancies were noted in the survey report. These wells may be resurveyed during additional investigations.

TABLE 3-8
Hydraulic Conductivity Summary
Basewide PFAS Site Inspection
NAS Oceana. Virginia Beach, VA

Site	Well ID	Test Date	Aquifer	Test Type/ID	Horizontal Hydraulic Conductivity, K (ft/min)	Average Aquifer Hydraulic Conductivity, K (ft/min)
Site 11	OW11-MW04	11/10/2016	Columbia	Falling Head #1	5.76E-03	6.08E-03
				Falling Head #2	6.96E-03	
				Falling Head #3	7.15E-03	
				Rising Head #1	5.59E-03	
				Rising Head #2	5.26E-03	
				Rising Head #3	6.01E-03	
	OW11-MW07	11/10/2016	Columbia	Falling Head #1	8.13E-03	8.72E-03
				Falling Head #2	7.98E-03	
				Falling Head #3	8.68E-03	
				Rising Head #1	9.91E-03	
				Rising Head #2	9.51E-03	
				Rising Head #3	8.30E-03	
	OW11-MW09	11/10/2016	Columbia	Falling Head #1	4.47E-03	4.00E-03
				Falling Head #2	4.48E-03	
				Falling Head #3	4.25E-03	
				Rising Head #1	2.96E-03	
				Rising Head #2	4.92E-03	
				Rising Head #3	3.31E-03	
SWMU 2B	OW2B-MW14	11/11/2016	Columbia	Falling Head #1	9.33E-03	8.95E-03
				Falling Head #2	8.56E-03	
				Falling Head #3	9.10E-03	
				Rising Head #1	8.20E-03	
				Rising Head #2	9.31E-03	
				Rising Head #3	9.24E-03	
SWMU 2C	OW2C-MW19	11/11/2016	Columbia	Falling Head #1	7.45E-03	6.54E-03
				Falling Head #2	7.50E-03	
				Falling Head #3	6.25E-03	
				Rising Head #1	5.19E-03	
				Rising Head #2	7.30E-03	
				Rising Head #3	5.90E-03	

TABLE 3-8
Hydraulic Conductivity Summary
Basewide PFAS Site Inspection
NAS Oceana. Virginia Beach, VA

Site	Well ID	Test Date	Aquifer	Test Type/ID	Horizontal Hydraulic Conductivity, K (ft/min)	Average Aquifer Hydraulic Conductivity, K (ft/min)
SWMU 26	OW26-MW1	11/11/2016	Columbia	Falling Head #1	6.25E-03	9.53E-03
				Falling Head #2	9.36E-03	
				Falling Head #3	9.67E-03	
				Rising Head #1	1.18E-02	
				Rising Head #2	9.23E-03	
				Rising Head #3	1.21E-02	

Notes
ft /min = feet per minute
Average hydraulic conductivity calculated using the geometric mean

TABLE 3-9

Groundwater Quality Parameters in the Columbia Aquifer
(October - November 2016)

Basewide PFAS Site Inspection
NAS Oceana. Virginia Beach, VA

Sample ID **Sample Date**	203MW-19-1116 11/1/16	JTC-MW-B-1116 11/1/16	MW-BG01-1016 10/31/16	MW-BG05-1016 10/28/16	MW-BG06-1016 10/28/16	MW-BG07-1016 10/28/16	MW-BG09-1016 10/31/16	MW-BG10-1116 11/2/16	MW-BG11-1016 10/31/16
Groundwater Quality Parameters									
pH	5.85	6.24	5.65	5.54	4.94	5.12	5.09	5.53	5.50
Oxygen Reduction Potential (mV)	9.6	-55.9	77.6	124.4	204.5	221.0	134.0	97.6	88.5
Temperature (°C)	19.3	23.8	16.1	20.4	18.7	19.8	19.1	19.9	18.7
Specific Conductivity (mS/cm)	0.219	0.63	0.199	0.154	0.107	0.110	0.152	0.057	0.153
Salinity (ppt)	NM	0.31	0.09	0.07	0.05	0.06	0.08	NM	0.07
Turbidity (NTU)	21.7	2.7	18.5	0.93	9.93	20.2	34.4	309	173
Dissolved Oxygen (mg/L) by WQM	0.02	0.03	0.17	1.29	0.10	0.35	0.41	0.62	0.05
Dissolved Oxygen (mg/L) by Chemets®	NM	NM	NM	NM	NM	NM	NM	NM	NM

Notes:
*Monitoring was collapsed at the time of the event and data may not be representative of aquifer parameters
°C = degrees Celsius
mg/L = milligram per liter
mS/cm = millisiemen per centimeter
mV = millivolt
NM = not measured
NTU = nephelometric turbidity unit
ppt = parts per thousand
WQM = water quality meter

TABLE 3-9
Groundwater Quality Parameters in the Columbia Aquifer
(October - November 2016)
Basewide PFAS Site Inspection
NAS Oceana. Virginia Beach, VA

Sample ID	MW-BG12-1016	MW-BG13-1016	OC-MW01-1116	OC-MW02-1116	OC-MW03-1116	OC-MW04-1016	OW2B-MW41-1116	OW2C-MW19-1116	OW2E-MW19-1116
Sample Date	10/26/16	10/26/16	11/1/16	11/1/16	11/1/16	10/31/16	11/1/16	11/1/16	11/1/16
Groundwater Quality Parameters									
pH	5.17	4.46	6.04	5.11	5.91	5.76	5.53	6.55	6.33
Oxygen Reduction Potential (mV)	230.3	293.8	-19.0	192.5	34.9	79.9	51.4	-55.5	-26.0
Temperature (°C)	17.4	18.8	20.6	19.8	18.4	18.2	24.3	23.9	23.0
Specific Conductivity (mS/cm)	0.131	0.188	5.59	0.102	0.404	0.149	0.79	0.65	0.74
Salinity (ppt)	0.06	0.09	3.03	0.05	0.19	0.07	NM	NM	NM
Turbidity (NTU)	15.1	6.94	1.82	0.62	2.91	7.13	14.2	3.55	197
Dissolved Oxygen (mg/L) by WQM	0.14	3.51	0.10	7.67	0.11	0.36	0.06	0.40	0.03
Dissolved Oxygen (mg/L) by Chemets®	NM	3	1	6	1	NM	NM	NM	NM

Notes:
*Monitoring was collapsed at the time of the event and data may not be representative of aquifer parameters
°C = degrees Celsius
mg/L = milligram per liter
mS/cm = millisiemen per centimeter
mV = millivolt
NM = not measured
NTU = nephelometric turbidity unit
ppt = parts per thousand
WQM = water quality meter

TABLE 3-9

Groundwater Quality Parameters in the Columbia Aquifer
(October - November 2016)

Basewide PFAS Site Inspection
NAS Oceana. Virginia Beach, VA

Sample ID **Sample Date**	OW11-MW1-1016 10/25/16	OW11-MW4-1016 10/26/16	OW11-MW5-1016 10/25/16	OW11-MW6-1016 10/26/16	OW11-MW7-1016 10/25/16	OW11-MW8-1016 10/25/16	OW11-MW9-1016 10/25/16	OW26-MW1-1116 11/1/16
Groundwater Quality Parameters								
pH	5.53	5.81	5.99	6.36	5.83	6.73	6.10	5.90
Oxygen Reduction Potential (mV)	132.3	83.2	32.7	-10.7	66.9	-37.8	6.6	18.5
Temperature (°C)	19.5	18.4	19.4	19.9	20.9	19.6	19.0	21.0
Specific Conductivity (mS/cm)	0.179	0.249	0.180	0.522	0.282	0.441	0.331	0.372
Salinity (ppt)	0.08	0.12	0.08	0.25	0.13	0.21	0.16	0.18
Turbidity (NTU)	9.06	2.39	5.52	3.12	1.59	5.34	2.62	5.25
Dissolved Oxygen (mg/L) by WQM	0.08	0.05	0.07	0.12	0.05	0.04	0.08	0.20
Dissolved Oxygen (mg/L) by Chemets®	1	1	1	1	0.6	1	0.4	1.0

Notes:
*Monitoring was collapsed at the time of the event and data may not be representative of aquifer parameters
°C = degrees Celsius
mg/L = milligram per liter
mS/cm = millisiemen per centimeter
mV = millivolt
NM = not measured
NTU = nephelometric turbidity unit
ppt = parts per thousand
WQM = water quality meter

TABLE 3-10

Groundwater Quality Parameters in the Columbia Aquifer (February 2017)

Basewide PFAS Site Inspection

NAS Oceana. Virginia Beach, Virginia

Sample ID **Sample Date**	OW2C-MW05-0217 2/23/17	OW2E-MW09R-0217 2/23/17	OW2C-MW19-0217 2/23/17	OW2C-MW24-0217 2/23/17	OW2C-MW25-0217 2/23/17
Groundwater Quality Parameters					
pH	7.08	7.10	7.66	6.94	7.27
Oxygen Reduction Potential (mV)	-41.9	-89.7	-100.7	-61.4	-83.9
Temperature (°C)	17.7	18.7	19.3	18.1	17.6
Specific Conductivity (mS/cm)	0.41	0.43	0.41	0.58	0.578
Salinity (ppt)	0.20	0.21	0.20	0.28	0.28
Turbidity (NTU)	9.02	3.3	49.3	10.0	12.9
Dissolved Oxygen (mg/L)	0.14	0.19	0.15	0.09	0.11
Dissolved Oxygen (mg/L) by Chemets®	0.6	0.2	0.4	0.6	0.3

Notes:

°C = degrees Celsius

mg/L = milligram per liter

mS/cm = millisiemen per centimeter

mV = millivolt

NM = not measured

NTU = nephelometric turbidity unit

ppt = parts per thousand

TABLE 3-11

Groundwater Quality Parameters in the Columbia Aquifer (April 2017)

Basewide PFAS Site Inspection

NAS Oceana. Virginia Beach, VA

Sample ID **Sample Date**	OC-MW07-0417 4/4/17	OC-F8F9-MW-F4-0417 4/4/17
Groundwater Quality Parameters		
pH	7.01	5.47
Oxygen Reduction Potential (mV)	7.9	72.7
Temperature (°C)	16.9	16.0
Specific Conductivity (mS/cm)	0.94	0.116
Salinity (ppt)	0.46	0.05
Turbidity (NTU)	11.9	27.6
Dissolved Oxygen (mg/L) by WQM	0.15	0.17
Dissolved Oxygen (mg/L) by Chemets®	NM	1

Notes:
°C = degrees Celsius
mg/L = milligram per liter
mS/cm = millisiemen per centimeter
mV = millivolt
NTU = nephelometric turbidity unit
ppt = parts per thousand
WQM = water quality meter

TABLE 3-12

Groundwater Quality Parameters in the Yorktown Aquifer (April 2017)

Basewide PFAS Site Inspection

NAS Oceana. Virginia Beach, VA

Sample ID **Sample Date**	OC-MW02D-0417 4/3/17	OC-MW05D-0417 4/3/17	OC-MW07D-0417 4/4/17	OW11-MW10D-0417 4/4/17	OW26-MW1D-0417 4/3/17
Groundwater Quality Parameters					
pH	6.44	7.57	6.91	7.95	7.22
Oxygen Reduction Potential (mV)	27.6	96.6	16.4	118.3	21.0
Temperature (°C)	17.0	16.6	17.3	17.7	18.9
Specific Conductivity (mS/cm)	0.147	0.564	0.72	0.96	0.473
Salinity (ppt)	0.07	NM	0.35	0.48	0.23
Turbidity (NTU)	46.2	58.3	23.5	22.0	7.19
Dissolved Oxygen (mg/L)	0.17	0.19	0.21	0.26	0.17
Dissolved Oxygen (mg/L) by Chemets®	0.8	0.4	0.6	0.4	0.8

Notes:

°C = degrees Celsius

mg/L = milligram per liter

mS/cm = millisiemen per centimeter

mV = millivolt

NM = not measured

NTU = nephelometric turbidity unit

ppt = parts per thousand

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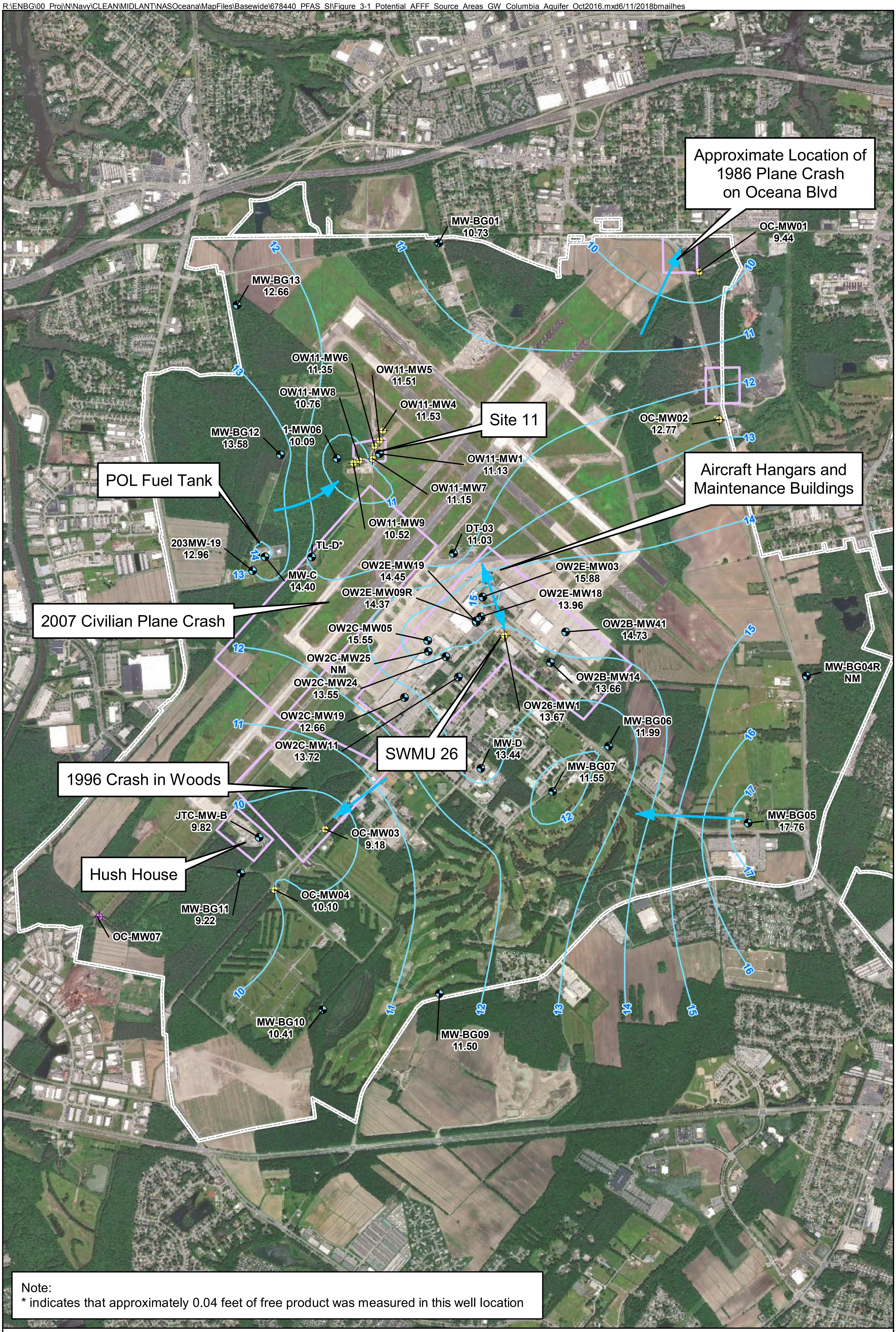

Legend

- Existing Monitoring Well
- Monitoring Well installed during the Phase I activities
- Monitoring Well installed during the Phase II activities
- Groundwater Elevation Contour (dashed where inferred)
- Direction of Groundwater Flow
- Potential AFFF Release Areas
- Installation Boundary

N
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0 1,000 2,000 Feet

1 inch = 2,000 feet

Imagery Source: ©2017 Esri

Figure 3-1
Groundwater Contours Measured in the Columbia Aquifer in October 2016
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

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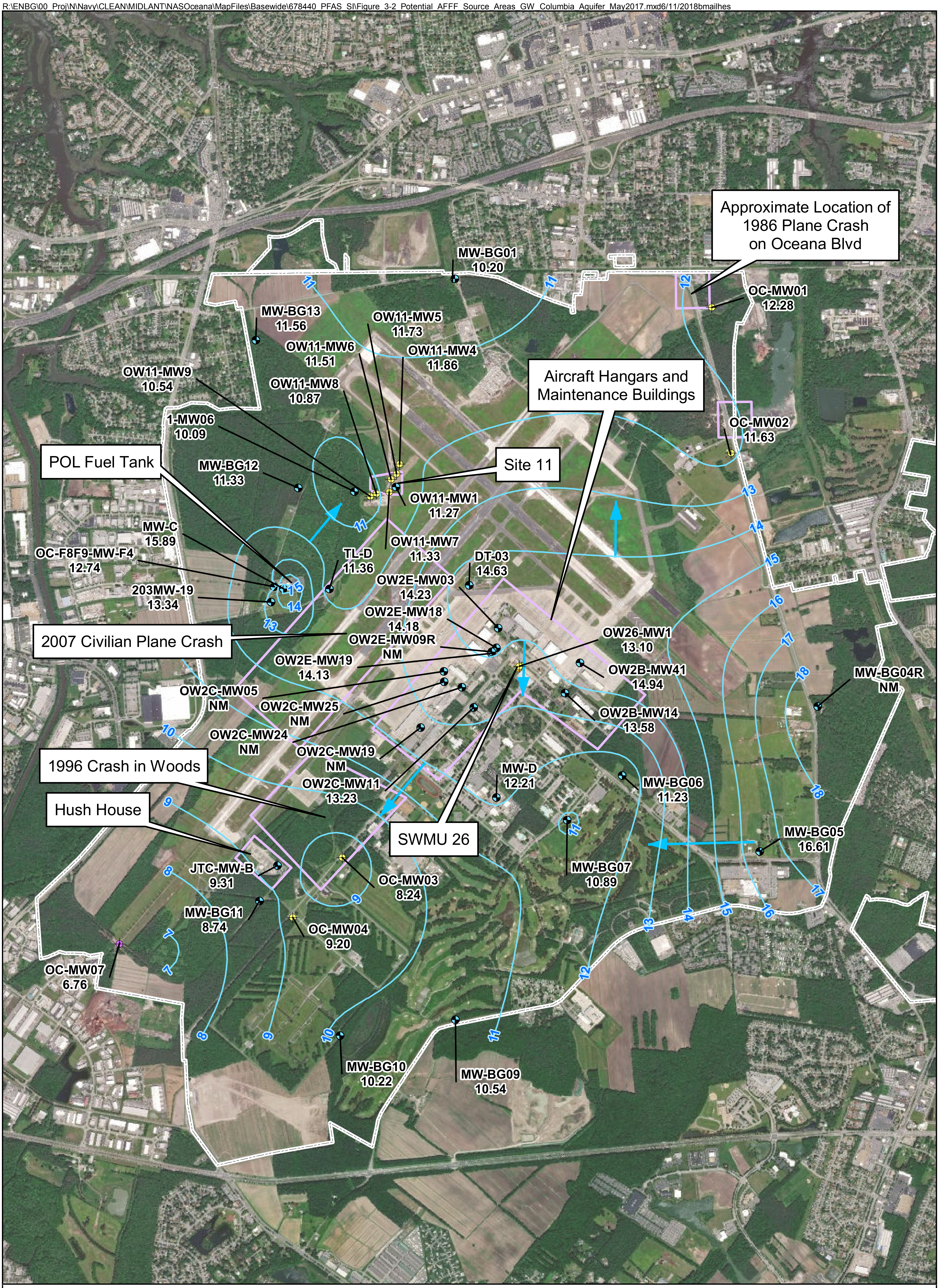

Legend

- Existing Monitoring Wells
- Monitoring Well installed during the Phase I activities
- Monitoring Well installed during the Phase II activities
- Groundwater Elevation Contour - May 2017 (dashed where inferred)
- Direction of Groundwater Flow
- Potential AFFF Release Areas
- Installation Boundary

N W E S

0 1,000 2,000 Feet

1 inch = 2,000 feet

Imagery Source: ©2017 Esri

Figure 3-2
Groundwater Contours Measured in the Columbia Aquifer in May 2017
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

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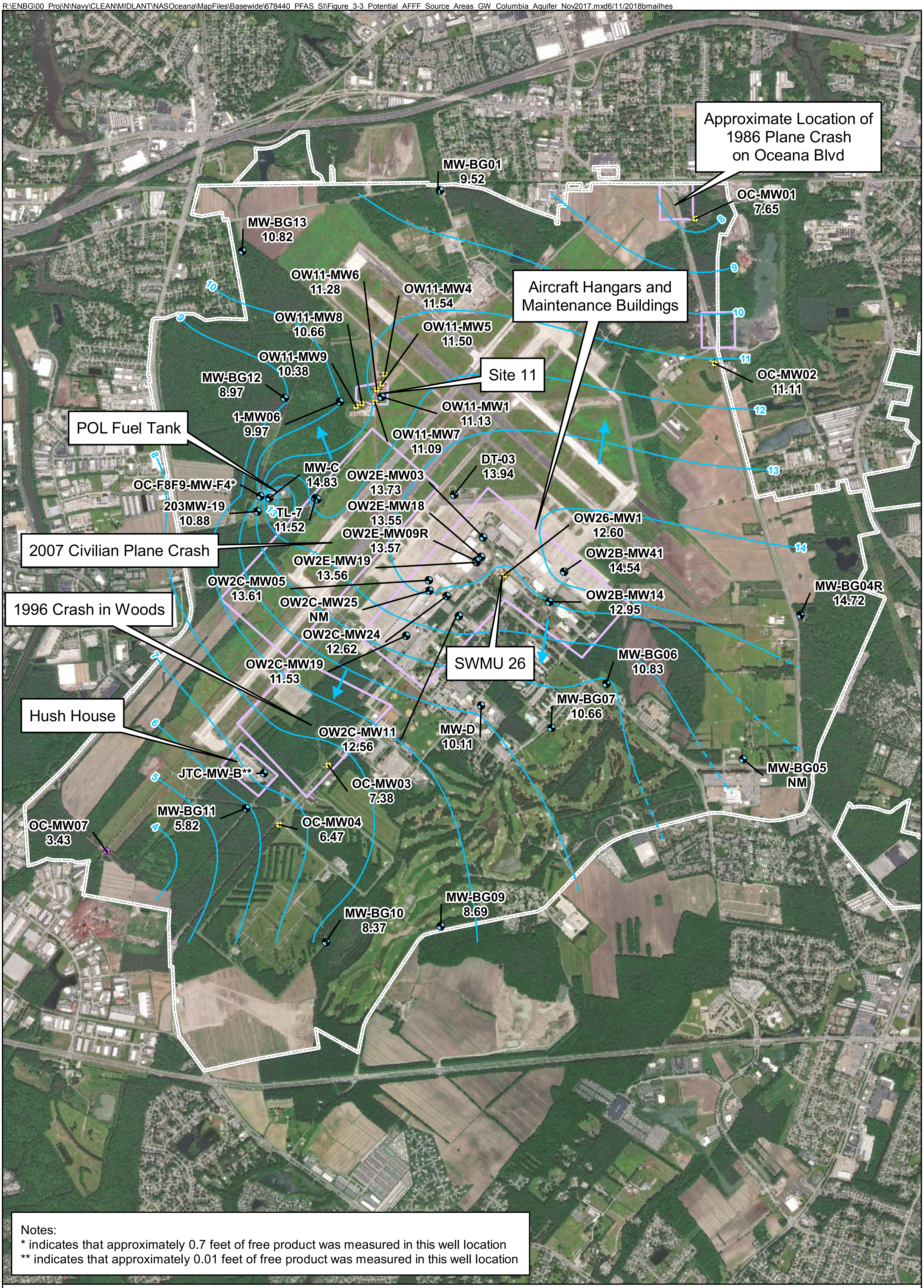

Notes:
* indicates that approximately 0.7 feet of free product was measured in this well location
** indicates that approximately 0.01 feet of free product was measured in this well location

Legend

- Existing Monitoring Well
- Monitoring Well installed during the Phase I activities
- Monitoring Well installed during the Phase II activities
- Groundwater Elevation Contour (dashed where inferred)
- Direction of Groundwater Flow
- Potential AFFF Release Areas
- Installation Boundary

N
W E
S

0 1,000 2,000
Feet

1 inch = 2,000 feet

Imagery Source: ©2017 Esri

Figure 3-3
Groundwater Contours Measured in the Columbia Aquifer (November 2017)
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

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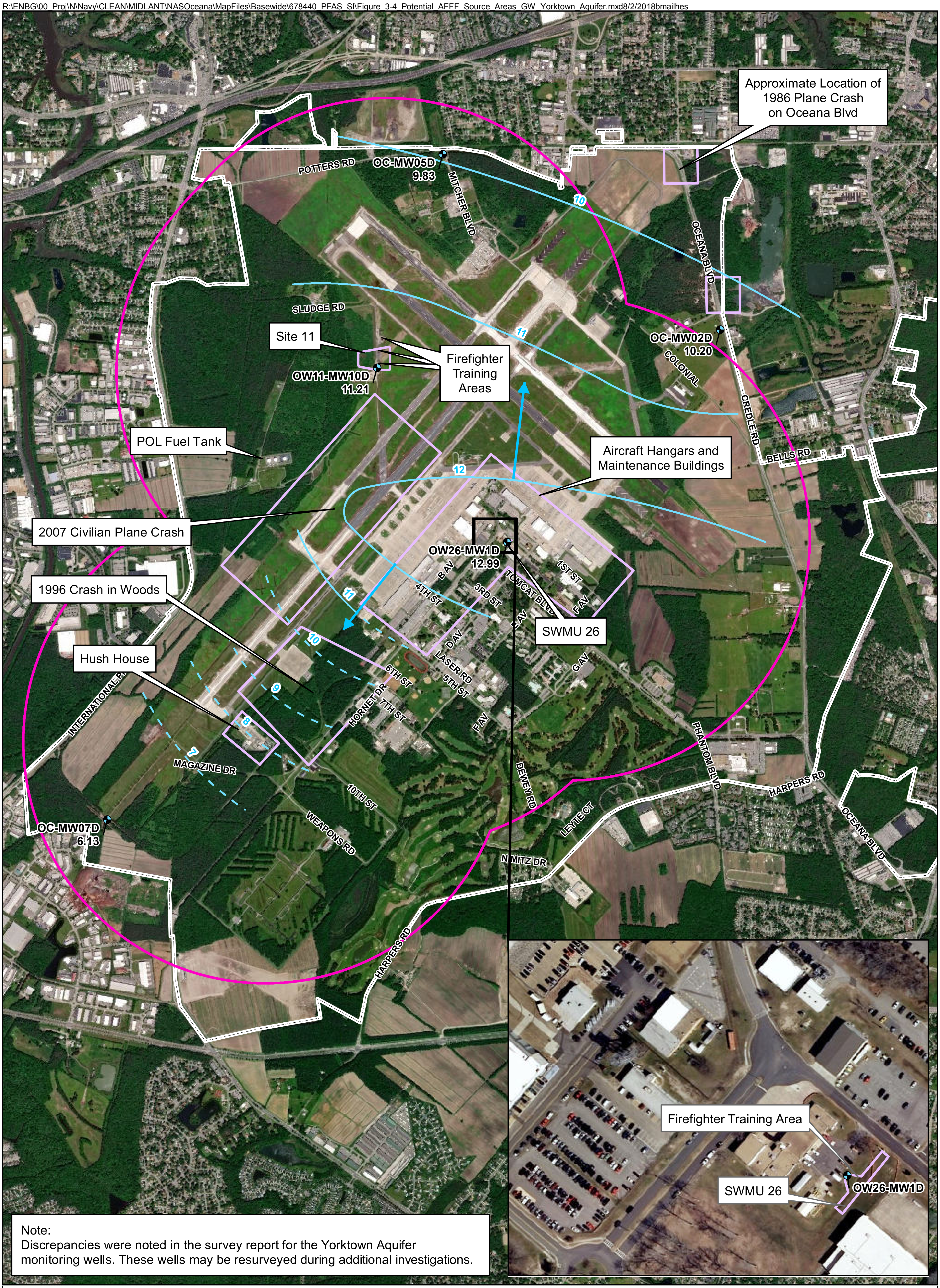

Note:
Discrepancies were noted in the survey report for the Yorktown Aquifer monitoring wells. These wells may be resurveyed during additional investigations.

Legend

- Monitoring Wells Installed in the Yorktown Aquifer during Site Investigation
- Direction of Groundwater Flow
- Groundwater Elevation Contour (dashed where inferred)
- Potential AFFF Release Areas
- Sampling Area
- Installation Boundary

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0 1,000 2,000
Feet

Imagery Source: ©2017 Esri

Figure 3-4
Groundwater Contours Measured in the Yorktown Aquifer (May 2017)
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

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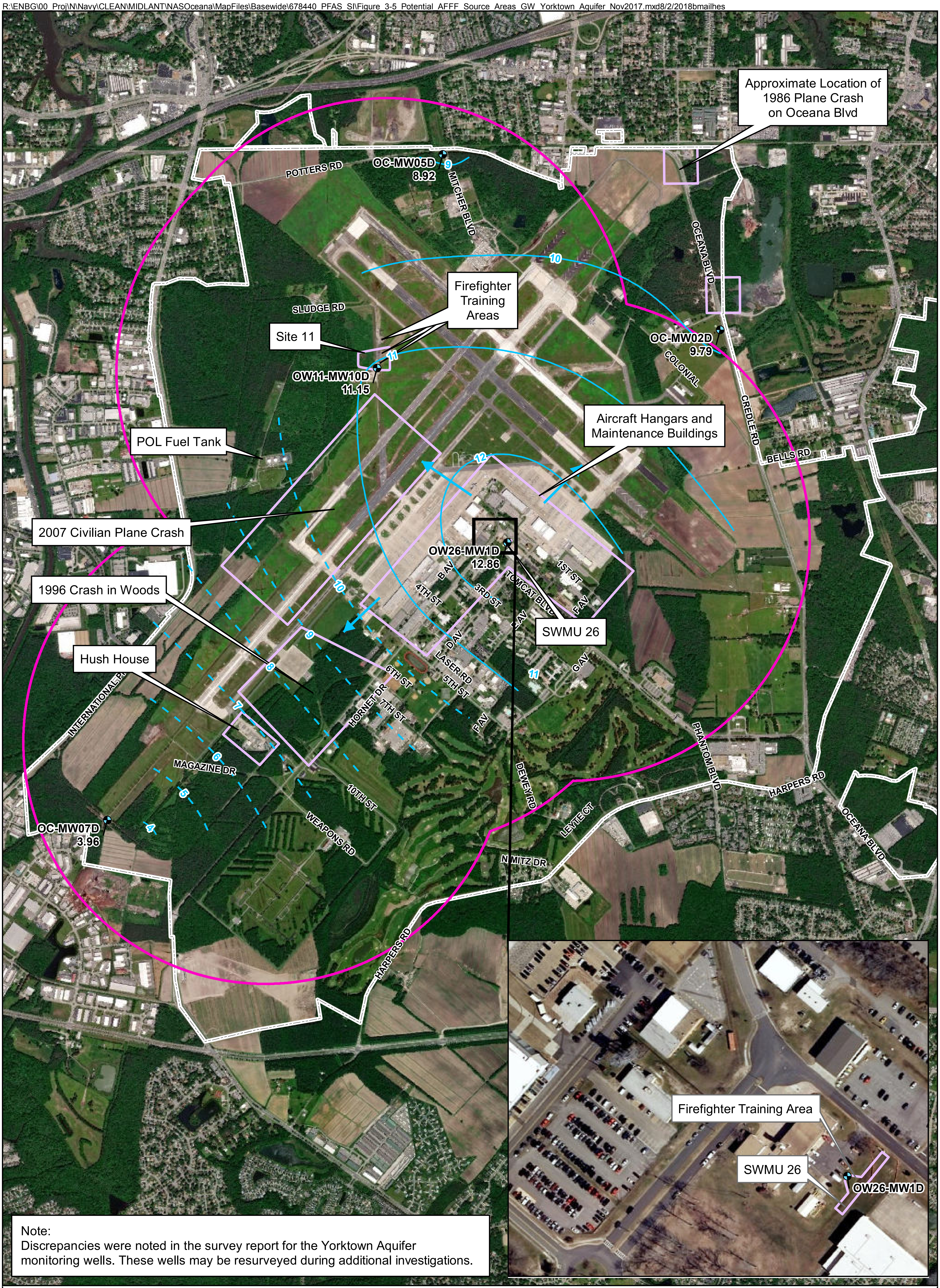

Note:
Discrepancies were noted in the survey report for the Yorktown Aquifer monitoring wells. These wells may be resurveyed during additional investigations.

Legend

- Monitoring Wells Installed in the Yorktown Aquifer during Site Investigation
- Direction of Groundwater Flow
- Groundwater Elevation Contour (dashed where inferred)
- Potential AFFF Release Areas
- Sampling Area
- Installation Boundary

N W E S

0 1,000 2,000 Feet

1 inch = 2,000 feet

Imagery Source: ©2017 Esri

Figure 3-5
Groundwater Contours Measured in the Yorktown Aquifer (November 2017)
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

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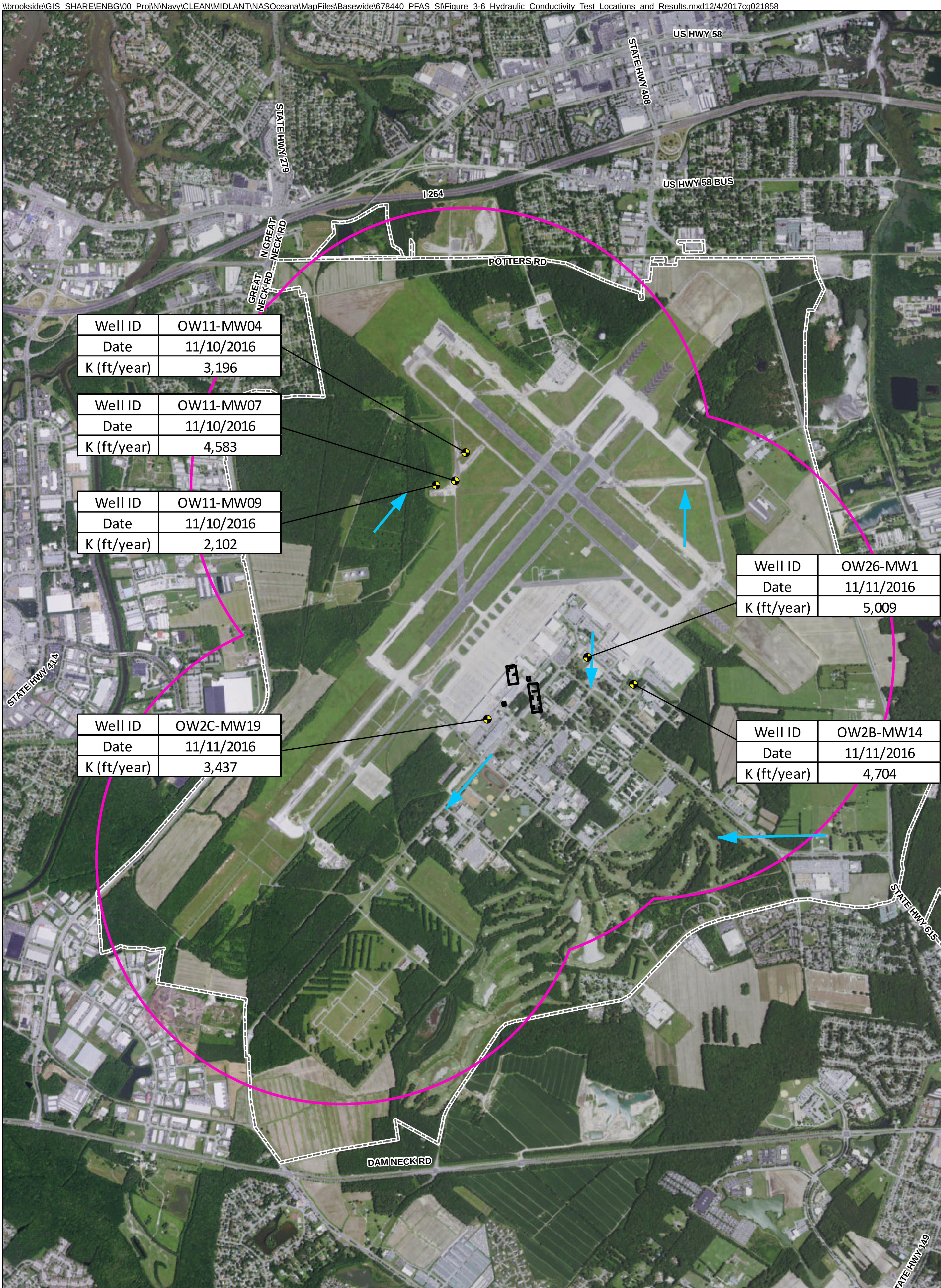

Legend

- Monitoring Well
- Non-Core Target Treatment Area (2004)
- Core Target Treatment Area (2004) (Core)
- Direction of Groundwater Flow
- Sampling Area
- Installation Boundary

N
W E
S

0 1,000 2,000 4,000 Feet

Imagery Source: ©2017 Esri

Figure 3-6
Hydraulic Conductivity Test Locations and Results
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

Investigation Results

This section presents the results of the investigation described in **Section 3**.

To evaluate the extent of contamination, analytical data for PFOS and PFOA were screened against the USEPA L-HA (70 ng/L) and the analytical data for PFBS were screened against the USEPA Regional Screening Levels (RSLs) (400,000 ng/L). Determination of exceedances were only made based on PFAS with screening criteria, which include PFOS, PFOA, and PFBS. Analysis was also conducted for PFAS which do not have screening criteria (PFNA, PFHxS, PFHpA), the results of which may be consulted in the future, if criteria are established.

Laboratory analytical results for groundwater samples collected in the Columbia and Yorktown aquifers are summarized respectively in **Tables 4-1** and **4-2**. Laboratory analytical results for off-Base drinking water samples collected from potable wells and one on-Base water sample collected from a non-potable water supply well are summarized in **Table 4-3**. Per the Interim PFAS Site Guidance established in 2017 by the Navy, Tables 4-1 through 4-3 only present PFOA, PFOS, and PFBS data, while Appendix H presents data for PFHpA, PFHxS, and PFNA (Navy, 2017). **Figures 4-1** and **4-2** show constituents of concern (COC) exceedances respectively in the Columbia and Yorktown aquifers from samples taken on-Base. **Figure 4-3** shows detections in drinking water samples collected off-Base.

4.1 Groundwater

A summary of the results of the water quality parameters and a discussion of the extent of contamination are presented in the following subsections.

4.1.1 General Groundwater Geochemistry

Measurements of DO, ORP, pH, temperature, specific conductivity, salinity, and turbidity were collected at each monitoring well following purging and immediately prior to sampling. **Tables 3-6** through **3-10**, show the groundwater parameters measured in the Columbia and Yorktown aquifers.

Columbia Aquifer

The DO readings collected from samples taken in the Columbia aquifer during purging activities ranged between 0.2 milligram per liter (mg/L) and 1 mg/L (as recorded using the CHEMet test kits), which are indicative of anaerobic conditions. However, two monitoring wells, MW-BG13 and OC-MW02, were showing respective DO concentration of 3 and 6 mg/L, an indication of moderately aerobic to aerobic conditions. The ORP values, which indicate the potential for redox conditions in groundwater, ranged between -100.7 millivolts (mV) and 293 mV, also indicating that conditions at the site vary from moderately reducing to strongly oxidizing. Temperature readings ranged between 16 degrees Celsius (°C) and 24.3°C. pH values were generally slightly acidic to neutral, ranging between 4.28 and 7.66. Specific conductivity values, which provide an indication of the concentration of total dissolved solids within groundwater, ranged between 0.057 millisiemens per centimeter (mS/cm) and 0.79 mS/cm, which are indicative of freshwater conditions. However, specific conductivity in one monitoring well (OC-MW01) was measured at 5.59 mS/cm. Salinity values ranged between 0.05 part per trillion (ppt) and 3.3 ppt, also indicative of freshwater conditions. Turbidity measurements, which indicate the presence of suspended colloidal matter in water, were generally low (below 20 NTU), with the exception of monitoring wells OW2E-MW19, MW-BG11, and MW-BG10 where turbidity was measured at above 100 NTU.

Yorktown Aquifer

The DO readings collected from samples taken in the Yorktown aquifer during purging activities ranged between 0.4 mg/L and 0.8 mg/L (as recorded using the CHEMet test kits), which are indicative of slightly anaerobic conditions. The ORP values ranged between 16.4 millivolts (mV) and 118.3 mV, indicative of mildly oxidizing conditions. Temperature readings ranged between 16.6°C and 18.9°C. pH values were neutral, ranging between 6.44 and 7.95. Specific conductivity values ranged between 0.147 mS/cm and 0.96 mS/cm, which are indicative of freshwater conditions. Salinity values ranging between 0.07 ppt and 0.48 ppt are also indicative of freshwater conditions. Turbidity measurements were generally moderate (below 60 NTU).

4.1.2 Overview of Groundwater Analytical Results

Analytical results from on-Base groundwater samples collected are presented **in Table 4-1** and **Figure 4-1** for the Columbia aquifer, and in **Table 4-2** and **Figure 4-2** for the Yorktown aquifer. A summary is presented below.

Columbia Aquifer

Analysis of the 34 groundwater samples collected in the Columbia aquifer, indicates the following:

- Seventeen samples indicate PFOS or PFOA concentration exceeding the L-HA screening criteria of 70 ng/L.
- Fifteen samples were showing detections for PFOS or PFOA below the L-HA.
- Two samples were showing no detection of PFOS or PFOA.
- Exceedances of the L-HA were observed in the southwestern portion of the Base (Hush House site), in the Aircraft Hangars and Maintenance Buildings area, at SWMU 26, and at Site 11.
- Concentrations were the highest at SWMU 26, with a PFOA concentration of 22,600 ng/L, a PFOS concentration of 471,000 ng/L and a total PFOA and PFOS concentration of 493,600 ng/L at monitoring well OW26-MW1.
- All seven monitoring wells sampled at Site 11 were showing exceedances of the L-HA for PFOS, PFOA, and total PFOS and PFOA.
- None of the samples exceeded the RSL for PFBS.
- Delineation of the COC exceedances in the groundwater indicate the presence of three on-Base COC plumes exceeding the L-HA, located at Site 11, the Aircraft Hangars and Maintenance Buildings site (including SWMU 26), and the Hush House site **(Figure 4-4).**
- The nature, extent, and location of the contamination is consistent with the historical activities at the site that have involved the use of AFFF during firefighting and training activities, and intentional or unintentional AFFF releases.
- Relatively high concentrations of PFAS at SWMU 26, the Aircraft Hangars and Maintenance Buildings, Site 11, and the Hush House site indicate that these four locations are groundwater COC source areas.
- COCs detected below the L-HA in the southern portion of the installation, could indicate a southward dispersion and advective transport of PFAS from the Hush House and the Aircraft Hangars and Maintenance Buildings sites. This observation is consistent with the direction of the Columbia groundwater flow in that portion of the Base.
- Detections of PFAS east and north of Site 11 may indicate migration of the COCs from that source area. However, the monitoring well network does not provide sufficient resolution to fully determine groundwater flow direction in the northwestern quadrant of the installation; therefore, a correlation between the groundwater flow and the detection of PFAS could not be fully established.
- The absence of PFAS detections in samples collected near the eastern boundary of the installation (monitoring wells OC-MW02 and MW-BG04) tends to indicate that the COCs have not migrated off-Base, in the Columbia aquifer in this area. This observation is consistent with the westward and northward groundwater flow in that part of the installation, which places both monitoring wells upgradient from on-Base source areas. As a result, the groundwater flow in the Columbia aquifer may effectively prevent off-Base migration of COCs in the eastern and northeastern portions of the installation.

Yorktown Aquifer

Analysis of the five groundwater samples collected from monitoring wells screened in the Yorktown indicates the following:

- One sample (OW11-MW10D) was showing a total PFOS and PFOA concentration of 639.3 ng/L, exceeding the USEPA L-HA screening criteria of 70 ng/L.
- Three samples were showing detections for PFOS or PFOA but with concentrations below the L-HA.
- One sample was showing no detections of PFOS or PFOA.
- The PFAS exceedance observed at Site 11 is an indication that the COCs have migrated vertically from the Columbia aquifer to the Yorktown aquifer (**Figure 4-5**). The absence of monitoring wells in the vicinity of OW11-MW10D; however, prevents the delineation of the COC plume exceeding the L-HA to its full extent in the Yorktown aquifer.
- COCs detected below the L-HA near the northern (OC-MW05D) and northeastern (OC-MW02D) boundaries of the installation, could indicate a northeastward dispersion and advective transport of PFAS from Site 11 and SWMU 26 source areas. This observation is consistent with the direction of the Yorktown groundwater flow in that portion of the Base. However, because the extent of the contamination at the source areas is not fully defined, it is unclear if these detections can be fully attributed to the source areas, or are just a manifestation of sporadic and localized uses or releases of AFFF in the northern and northeastern portions of the installation.
- COCs detected below the L-HA at SWMU 26 (monitoring well OW26-MW1D) indicate that vertical migration of PFAS from the Columbia to the Yorktown aquifer has been restricted in that area of the installation, possibly due to the 1.5-foot clay layer encountered at 40 feet bgs in the Yorktown aquifer as noted on the boring log for OW26-MW1D.
- The absence of PFAS detection in monitoring well OC-MW07D indicate that PFAS have not migrated from the Hush House PFAS source area to the Yorktown aquifer in the southwestern portion of the Base, even though this monitoring well is located downgradient of the Hush House. The Yorktown confining unit encountered at 25 feet bgs, at a thickness of 2 feet, may restrict vertical migration of PFAS at this location.

4.2 Potable and Non-Potable Water

Analytical results from potable water samples collected off-Base and for the non-potable water sample collected on-Base are presented in **Table 4-3** and **Figure 4-3**. A summary is presented below.

4.2.1 Off-Base Potable Well Results

Six drinking water samples were collected from off-Base potable wells ranging from 30 feet to 140 feet bgs.

Results of tests conducted on the drinking samples indicate the following:

- One potable water sample east of the Base (OC-RW01) detected PFOS (9.24 ng/L) and PFOA (24.6 ng/L), but the concentrations were below the L-HA of 70 ng/L. The homeowner indicated that this well was not used for drinking water. The well was approximately 30 feet deep bgs, which is representative of the Columbia aquifer.
- The other five potable water samples were showing no detections for PFOS or PFOA.
- None of the samples exceeded the RSL for PFBS.

4.2.2 On-Base Non-Potable Well Results

One sample (OCSTR-WL01) was collected from a well which supplies water to the Skeet and Trap Range (**Figure 4-2**). This well is 140 feet deep with an unknown screen interval. Analytical results indicate that PFOS, PFOA, and PFBS were not detected in that well. Although OCSTR-WL01 may be representative of the deeper portion of the Yorktown aquifer and is potentially downgradient of Site 11, further investigation is required to determine if COCs have migrated from the upper to lower portions of the Yorktown aquifer.

TABLE 4-1
Columbia Aquifer Groundwater Analytical Data
(October and November 2016, February, May, and August 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	203MW-19-1116	FTWG-MW-02-1116	JTC-MW-B-1116	MW-BG01-1016	MW-BG04R-0817	MW-BG05-1016	MW-BG05P-1016
Sample Date			11/1/16	11/8/16	11/1/16	10/31/16	8/10/17	10/28/16	10/28/16
Chemical Name									
Semivolatile Organic Compounds (ng/L)									
Perfluorobutanesulfonic acid (PFBS)	400,000	--	4.03 U	7.94 J	4.27 J	4.07 U	8.67	3.94 U	4.03 U
Perfluorooctane Sulfonate (PFOS)	--	70	7.17 J	40.1	**4,020**	20.2	5.39 U	1.36 U	4.27 U
Perfluorooctanoic acid (PFOA)	--	70	5.75 J	**90.3**	12.6	13.5	4.72 J	1.26 J	2.02 J
Total PFOS + PFOA*	--	70	12.92	**130.4**	**4033**	33.7	4.72	1.26	2.02

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-1
Columbia Aquifer Groundwater Analytical Data
(October and November 2016, February, May, and August 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	MW-BG06-1016	MW-BG07-1016	MW-BG09-1016	MW-BG10-1116	MW-BG11-1016	MW-BG12-1016	MW-BG13-1016	MW-BG13P-1016
Sample Date			10/28/16	10/28/16	10/31/16	11/2/16	10/31/16	10/26/16	10/26/16	10/26/16
Chemical Name										
Semivolatile Organic Compounds (ng/L)										
Perfluorobutanesulfonic acid (PFBS)	400,000	--	4.03 U	3.97 U	4 U	4.2 U	4.1 U	6.95 J	4.1 U	3.94 UJ
Perfluorooctane Sulfonate (PFOS)	--	70	11.4	29.2	4.98 U	1.23 J	15.6	46.5	28.7 J	15.6 J
Perfluorooctanoic acid (PFOA)	--	70	2.02 U	1.65 J	3.15 J	2.1 U	2.05 U	10.2	2.6 U	1.97 UJ
Total PFOS + PFOA*	--	70	11.4	30.85	3.15	1.23	15.6	56.7	28.7	15.6

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-1
Columbia Aquifer Groundwater Analytical Data
(October and November 2016, February, May, and August 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID / **Sample Date**	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OC-F8F9-MW-F4-0417	OC-MW01-1116	OC-MW02-1116	OC-MW03-1116	OC-MW04-1016	OC-MW07-0417	OC-MW07D-0417
			4/4/17	11/1/16	11/1/16	11/1/16	10/31/16	4/4/17	4/4/17
Chemical Name									
Semivolatile Organic Compounds (ng/L)									
Perfluorobutanesulfonic acid (PFBS)	400,000	--	4.13 UJ	4.13 J	4.03 U	6.89 J	4.03 J	4.03 U	4.24 U
Perfluorooctane Sulfonate (PFOS)	--	70	20.8 J	8.16 J	0.907 U	33.4	39.6	3.63 J	0.953 U
Perfluorooctanoic acid (PFOA)	--	70	8.35 J	4.92 J	2.02 U	15.6	6.84 J	0.685 J	2.12 U
Total PFOS + PFOA*	--	70	29.15	13.08	2.927 U	49	46.44	4.315	3.073 U

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-1

Columbia Aquifer Groundwater Analytical Data

(October and November 2016, February, May, and August 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OW11-MW1-1016	OW11-MW4-1016	OW11-MW5-1016	OW11-MW6-1016	OW11-MW7-1016	OW11-MW8-1016	OW11-MW9-1016
Sample Date			10/25/16	10/26/16	10/25/16	10/26/16	10/25/16	10/25/16	10/25/16
Chemical Name									
Semivolatile Organic Compounds (ng/L)									
Perfluorobutanesulfonic acid (PFBS)	400,000	--	1,520	5,270	3,330	3,580	2,290	1,700	2,150
Perfluorooctane Sulfonate (PFOS)	--	70	**217,000 J**	**33,200 J**	**69,500 J**	**101,000 J**	**296,000 J**	**18,800**	**91,000 J**
Perfluorooctanoic acid (PFOA)	--	70	**11,600**	**1,540**	**4,100**	**11,300**	**18,700**	**5,360**	**8,550 J**
Total PFOS + PFOA*	--	70	**228600**	**34740**	**73600**	**112300**	**314700**	**24160**	**99550**

Notes:

*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise

ng/L = nanogram per liter

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-1
Columbia Aquifer Groundwater Analytical Data
(October and November 2016, February, May, and August 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OW11-MW9P-1016	OW26-MW1-1116	OW26-MW1P 1116	OW2B-MW41-1116	OW2C-MW05-0217	OW2C-MW19-1116	OW2C-MW19-0217
Sample Date			10/25/16	11/1/16	11/1/16	11/1/16	2/23/17	11/1/16	2/23/17
Chemical Name									
Semivolatile Organic Compounds (ng/L)									
Perfluorobutanesulfonic acid (PFBS)	400,000	--	1,930	4,950	4,740	51.7	9.86	195	97.9
Perfluorooctane Sulfonate (PFOS)	--	70	**116,000 J**	**471,000**	**471,000**	63.1	**249**	**2,430**	**1,340**
Perfluorooctanoic acid (PFOA)	--	70	**10,100**	**22,600**	**21,200 J**	**222**	42.9	**546**	**268**
Total PFOS + PFOA*	--	70	**126100**	**493600**	**492200**	**285.1**	**291.9**	**2976**	**1608**

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-1
Columbia Aquifer Groundwater Analytical Data
(October and November 2016, February, May, and August 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OW2C-MW24-0217	OW2C-MW25-0217	OW2E-MW09R-0217	OW2E-MW09RP-0217	OW2E-MW19-1116	OW2E-MW19-1116	MW-BG04R-0817
Sample Date			2/23/17	2/23/17	2/23/17	2/23/17	11/1/16	11/1/16	8/10/17
Chemical Name									
Semivolatile Organic Compounds (ng/L)									
Perfluorobutanesulfonic acid (PFBS)	400,000	--	16.1	310 J	48.3	48.2	43.4	43.4	8.67
Perfluorooctane Sulfonate (PFOS)	--	70	**78.7**	**44,500 J**	**103**	**95.7**	**263**	**263**	5.39 U
Perfluorooctanoic acid (PFOA)	--	70	**1,540**	**1,100**	**134**	**130**	**413**	**413**	4.72 J
Total PFOS + PFOA*	--	70	**1619**	**45600**	**237**	**226**	**676**	**676**	4.72

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-2
Yorktown Aquifer Groundwater Analytical Data April 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OC-MW02D-0417	OC-MW05D-0417	OC-MW05DP-0417	OC-MW07D-0417	OW11-MW10D-0417	OW26-MW01D-0417
Sample Date			4/3/17	4/3/17	4/3/17	4/4/17	4/4/17	4/3/17
Chemical Name								
Semivolatile Organic Compounds (ng/L)								
Perfluorobutanesulfonic acid (PFBS)	400,000	--	4.1 U	4.24 U	4.1 U	4.24 U	8.13 J	4.2 U
Perfluorooctane Sulfonate (PFOS)	--	70	0.922 U	1.01 J	2.42 J	0.953 U	**578**	10.1
Perfluorooctanoic acid (PFOA)	--	70	8.98	2.12 U	2.05 U	2.12 U	61.3	2.1 U
Total PFOS + PFOA*	--	70	8.98	1.01	2.42	3.073 U	**639.3**	10.1

Notes:
*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
ng/L = nanogram per liter
U = The material was analyzed for, but not detected
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

TABLE 4-3

Production Well Analytical Data (Potable and Non-Potable Supply Wells) (December 2016 and January 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (November 2017)**	**USEPA Lifetime Health Advisory (May 2016)**	OC-RW01-1216	OC-RW03-1216	OC-RW03P-1216	OC-RW04-1216	OC-RW10-0117	OC-RW12-1216	OC-RW13-1216	OCSTR-WL01-1216
Sample Date			12/16/16	12/16/16	12/16/16	12/19/16	1/3/17	12/16/16	12/21/16	12/22/16
Chemical Name										
Semivolatile Organic Compounds (ng/L)										
Perfluorobutanesulfonic acid (PFBS)	400,000	--	2.21 J	3.88 U	3.97 U	3.94 U	3.94 U	3.91 U	4 U	3.91 U
Perfluorooctane Sulfonate (PFOS)	--	70	9.24	0.872 U	0.893 U	0.886 U	0.886 U	0.879 U	0.9 U	0.879 U
Perfluorooctanoic acid (PFOA)	--	70	24.6	0.721 B	0.887 B	1.97 U	1.97 U	1.02 B	2 U	1.95 U
Total PFOS + PFOA*	--	70	33.8	1.593 U	1.78 U	2.856 U	2.856 U	1.899 U	2.9 U	2.829 U

Notes:

*In cases when both PFOA and PFOS are non-detect, non-detect limits of detection were added together to provide the total PFOA + PFOS limit of detection and the total was considered a non-detect. In cases when either PFOA or PFOS was not detected, but the other of the two compounds was detected, only the detection was used to determine the total of PFOA and PFOS. Based on this dataset, there were no instances in which adding a concentration at the limit of detection of the non-detected compound to the detected concentration of the detected compound would have resulted in an exceedance of the L-HA, so there are no impacts to data usability.

B = Analyte not detected above the level reported in blanks

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise

ng/L = nanogram per liter

U = The material was analyzed for, but not detected

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

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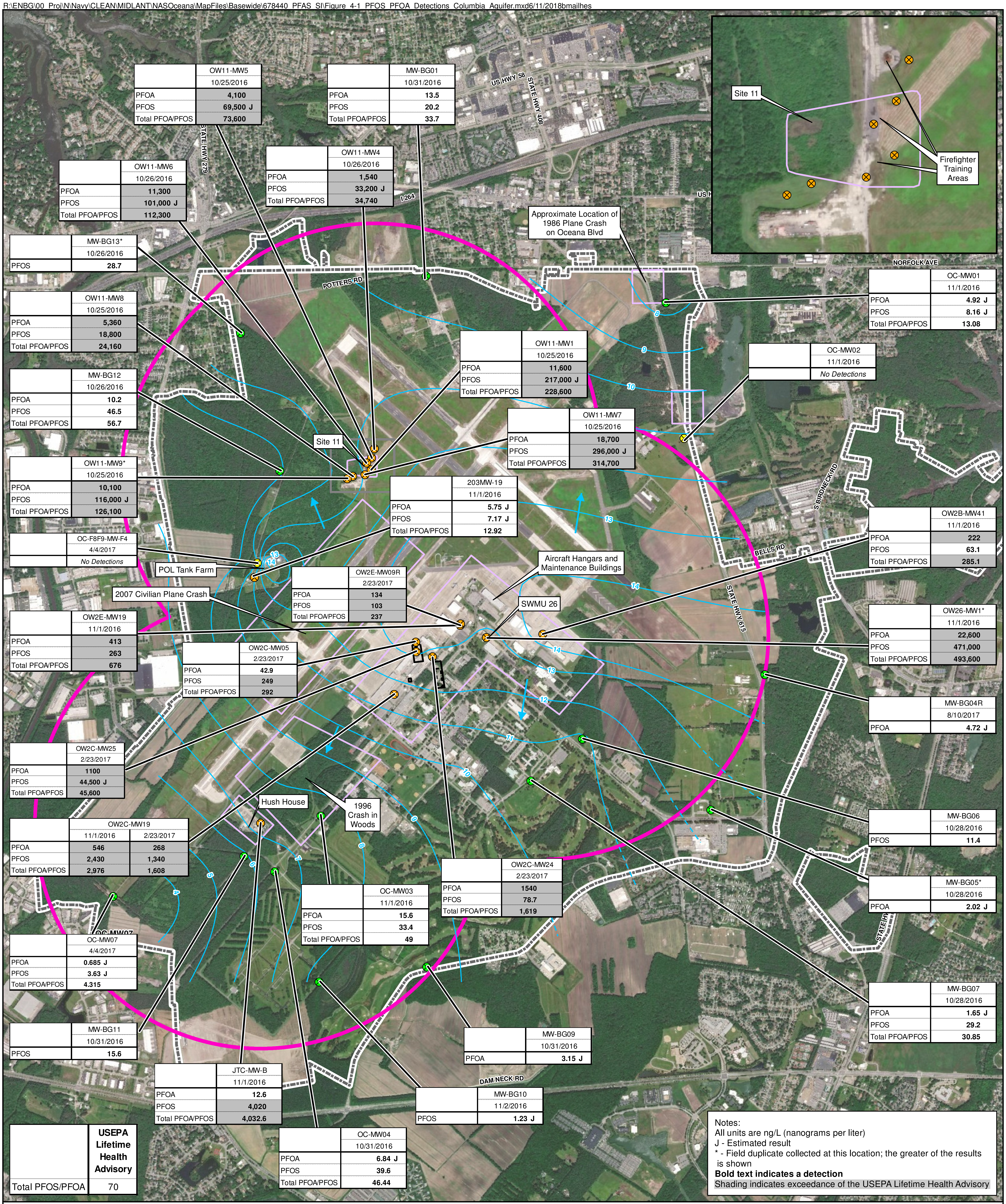

Legend

- Monitoring Wells with PFOS/PFOA Detections
- Monitoring Wells with PFOS/PFOA Exceedances
- Monitoring Wells with No PFOS/PFOA Detections
- Non-Core Target Treatment Area (2004)
- Core Target Treatment Area (2004) (Core)
- Direction of Groundwater Flow
- Groundwater Elevation Contour - November 2017 (dashed where inferred)
- Sampling Area
- Potential AFFF Release Areas
- Installation Boundary

N W E S

0 750 1,500 3,000 Feet

Imagery Source: Esri, 2017

Figure 4-1
COCs Concentrations in the Columbia Aquifer
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

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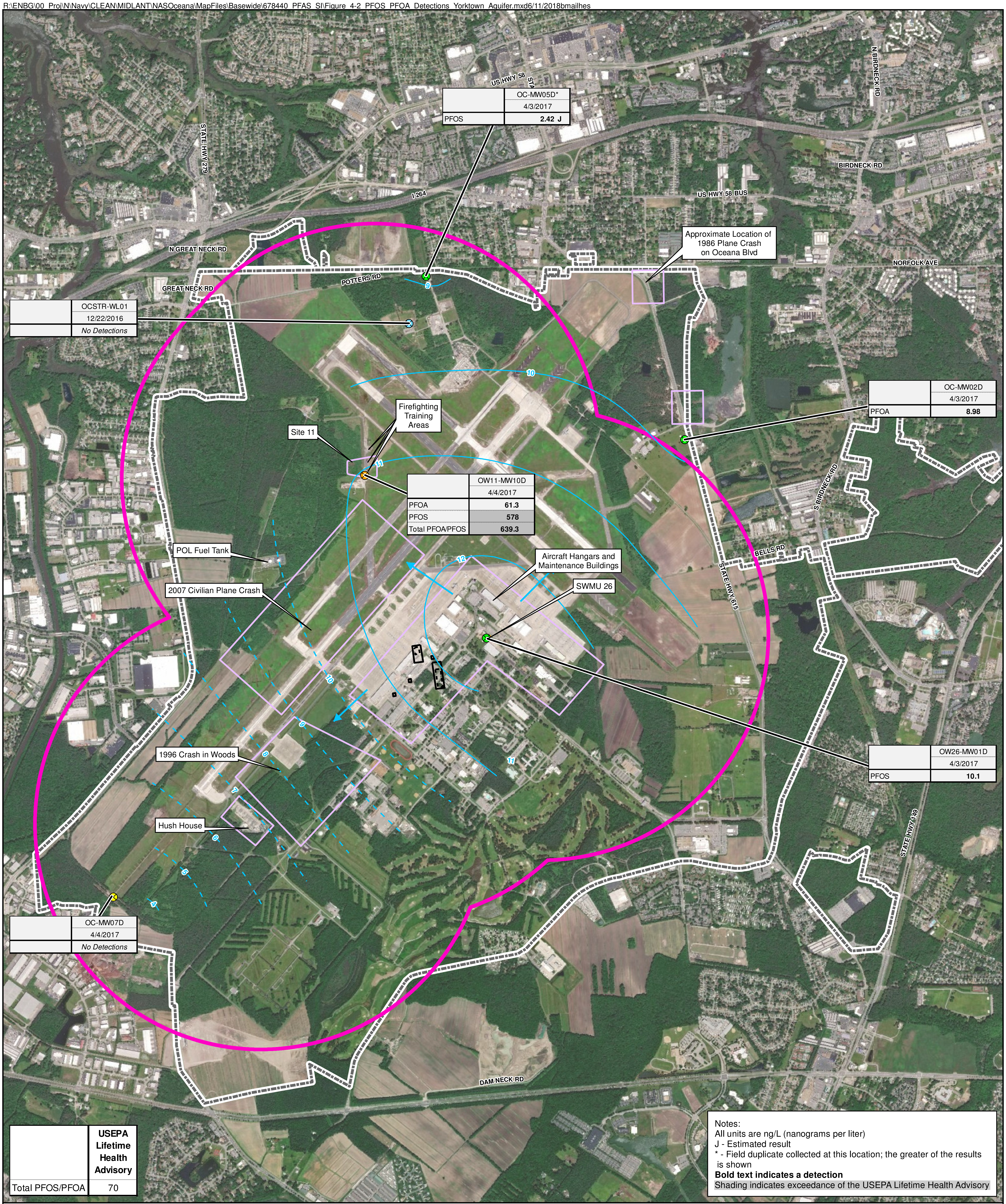

Legend

- On-Base Non-Potable Well
- Monitoring Wells with PFOS/PFOA Detections
- Monitoring Wells with PFOS/PFOA Exceedances
- Monitoring Wells with No PFOS/PFOA Detections
- Non-Core Target Treatment Area (2004)
- Core Target Treatment Area (2004) (Core)
- Direction of Groundwater Flow
- Groundwater Elevation Contour - November 2017 (dashed where inferred)
- Sampling Area
- Potential AFFF Release Areas
- Installation Boundary

N W E S

0 750 1,500 3,000 Feet

Imagery Source: Esri, 2016

Figure 4-2
COCs Concentrations in the Yorktown Aquifer
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

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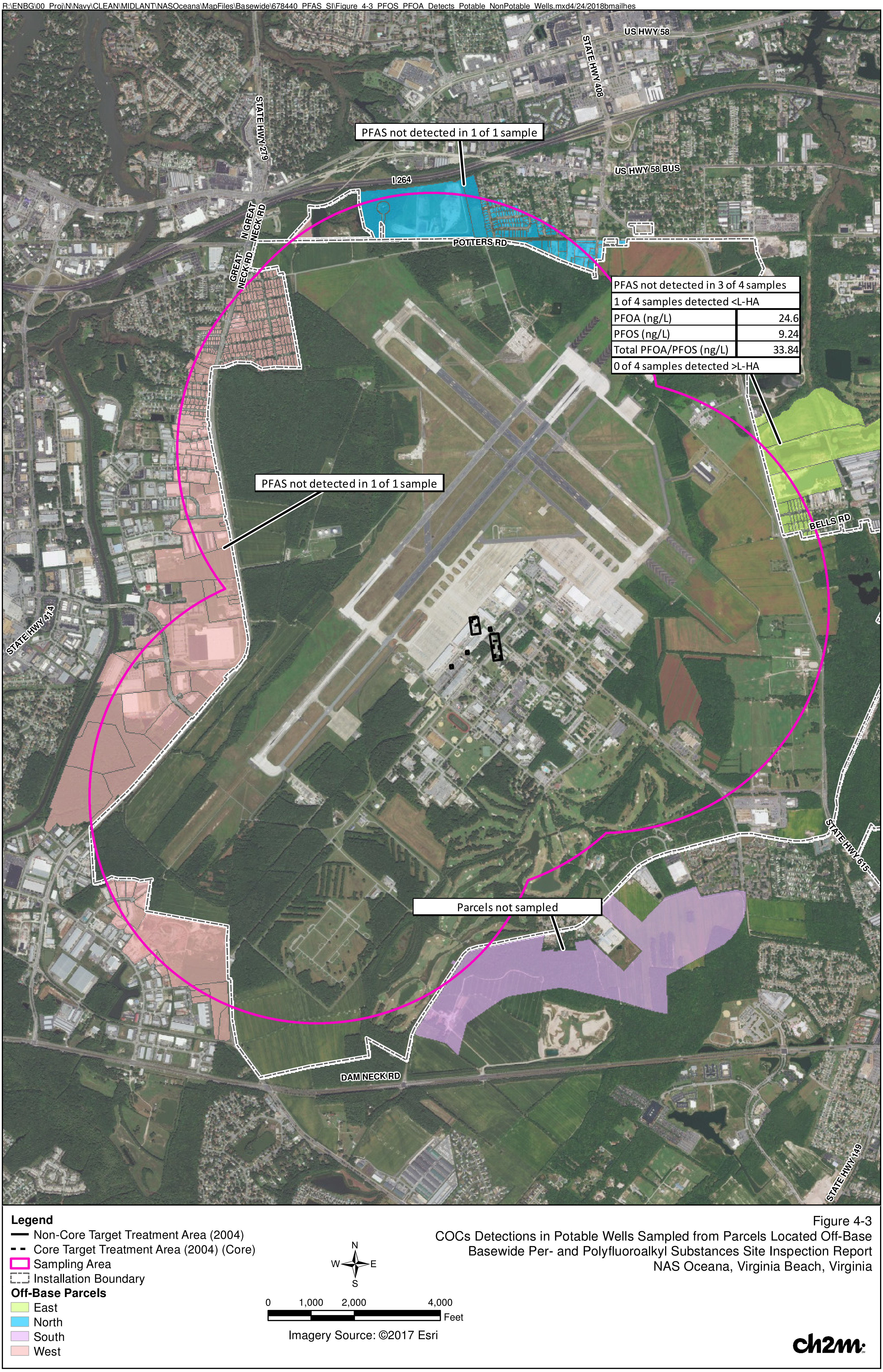

Figure 4-3
COCs Detections in Potable Wells Sampled from Parcels Located Off-Base
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

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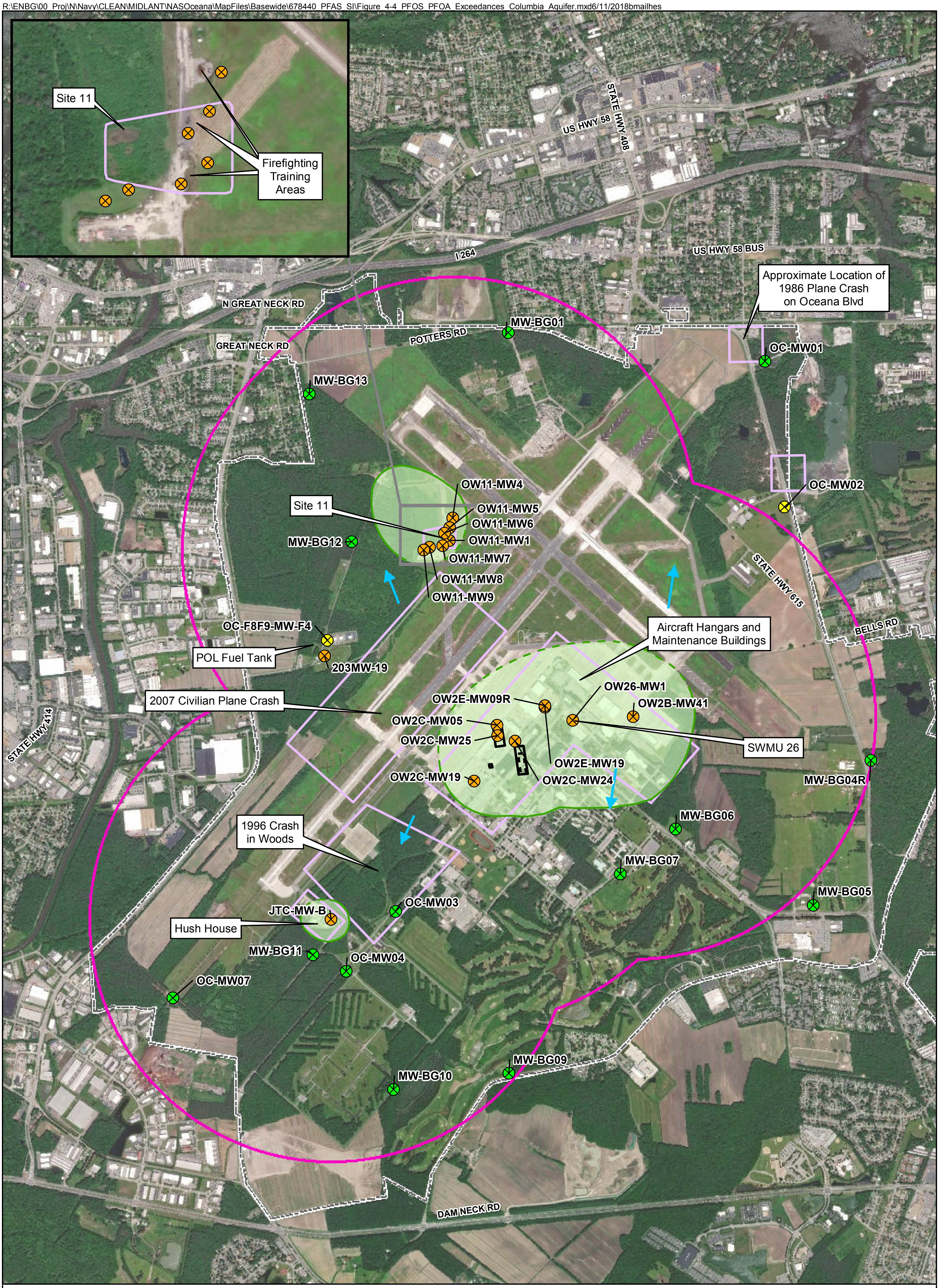

Legend

- Monitoring Wells with PFOS/PFOA Detections
- Monitoring Wells with PFOS/PFOA Exceedances
- Monitoring Wells with No PFOS/PFOA Detections
- Direction of Groundwater Flow
- Non-Core Target Treatment Area (2004)
- Core Target Treatment Area (2004) (Core)
- Total PFOA/PFOS above USEPA Lifetime Health Advisory of 70 ng/L.
- Sampling Area
- Potential AFFF Release Areas
- Installation Boundary

N
W E
S

0 1,000 2,000 4,000
Feet

Imagery Source: ©2017 Esri

Figure 4-4
COCs Plume Delineation in the Columbia Aquifer
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m.

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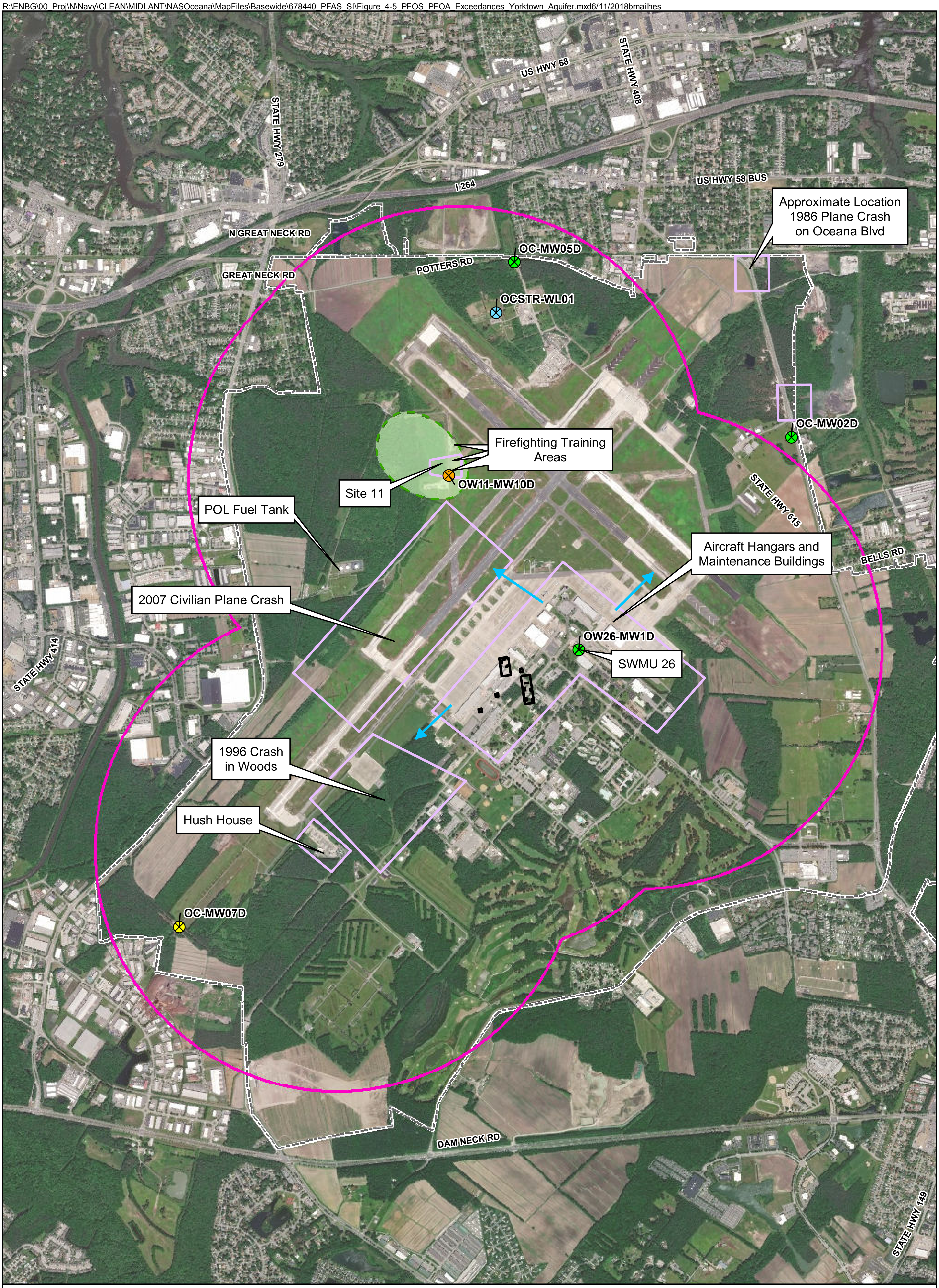

Legend

- On-Base Non-Potable Well
- Monitoring Wells with PFOS/PFOA Detections
- Monitoring Wells with PFOS/PFOA Exceedances
- Monitoring Wells with No PFOS/PFOA Detections
- Direction of Groundwater Flow
- Non-Core Target Treatment Area (2004)
- Core Target Treatment Area (2004) (Core)
- Total PFOA/PFOS above USEPA Lifetime Health Advisory of 70 ng/L.
- Potential AFFF Release Areas
- Sampling Area
- Installation Boundary

N W E S

0 1,000 2,000 4,000 Feet

Imagery Source: ©2017 Esri

Figure 4-5
COCs Plume Delineation in the Yorktown Aquifer
Basewide Per- and Polyfluoroalkyl Substances Site Inspection Report
NAS Oceana, Virginia Beach, Virginia

ch2m

Human Health Risk Screening

A human health risk screening (HHRS) evaluation was performed to assess potential human health risks associated with exposure to PFAS in groundwater at NAS Oceana. The results of the HHRS provide a preliminary indication of potential risks from exposure to PFAS in groundwater, and are used to help evaluate whether future unrestricted use of the site is acceptable (i.e., residential, including potable use of groundwater), or if the site requires further evaluation. Although the groundwater on-Base is not used as a potable water supply, human health risk-based levels based on potable use were used for the screening evaluation.

5.1 Data Evaluation

The groundwater samples collected at each of the potential PFAS source areas were assessed separately in the HHRS. The off-Base residential water supplies were evaluated together as one exposure area. Groundwater samples collected from Columbia aquifer and Yorktown aquifer wells were evaluated separately. The following areas were evaluated in the HHRS:

- Site 11 (Columbia aquifer and Yorktown aquifer)
- SWMU 26 (Columbia aquifer and Yorktown aquifer)
- 1986 Crash Site (Columbia aquifer)
- 1996 Crash Site (Columbia aquifer)
- Hush House (Columbia aquifer)
- Aircraft Hangars and Maintenance Buildings (Columbia aquifer)
- 2007 Crash Site (Columbia aquifer)
- POL Fuel Tank Site (Columbia aquifer)
- Perimeter Wells (Columbia aquifer and Yorktown aquifer)
- Offsite Residential Potable Water and on-Base non-potable water supply wells

The groundwater PFAS data evaluated in the HHRS were validated. Validation of the data identified the following criteria for data usability:

- Estimated values flagged with a J qualifier were treated as unqualified detected concentrations.
- Values flagged with a B qualifier (indicating blank contamination) were considered non-detected values.
- Values flagged with a UJ qualifier indicate an analyte was not detected and the quantitation limit was estimated.
- The maximum concentration between a primary and a duplicate sample was used as the sample concentration. If the analyte was only detected in one of the samples, the detected concentration was used as the sample concentration.

5.2 Human Health Risk Screening Methodology

The HHRS was conducted in two steps using the risk ratio technique described in *Overview of Screening, Risk Ratio, and Toxicological Evaluation. Procedures for Northern Division Human Health Risk Assessments* (Navy, 2000).

Step 1

The maximum detected PFAS concentrations in groundwater within each area were compared to the USEPA tap water RSLs from the current RSL table (USEPA, 2017). RSLs based on noncarcinogenic effects were based on a hazard quotient of 0.1 to account for exposure to multiple constituents with the same target organ/target effect. RSLs based on carcinogenic endpoints were based on a carcinogenic risk of 1×10^{-6}. The tap water RSLs for PFOA and PFOS were calculated using the USEPA Risk Screening Level Calculator (USEPA, 2017) since they are not included in the most recent RSL table (USEPA, 2017). RSL values are included in HHRS screening tables for PFBS, PFOA, and PFOS, the only PFAS with available toxicity values. As discussed in previous sections of the SI Report, three additional PFAS (PFNA, PFHxS, PFHpA) were also analyzedby the laboratory in the groundwater samples; however, as there are no current screening values or toxicity values for these PFAS they are not compared to human health risk-based concentrations. They were analyzed by the laboratory for comparison to screening levels that may be developed in the future.

If the maximum detected concentration (MDC) exceeded the RSL, the constituent was identified as a Step 1 constituent of potential concern (COPC) and carried forward to Step 2. In addition to comparing the MDC of PFOA and PFOS to the RSL, if the sum of the PFOA and PFOS concentrations exceeded the RSL, they were both identified as COPCs. This was done following the PFOA and PFOS drinking water health advisories (USEPA, 2016a, 2016b, 2016c) which indicate that the combined concentration of PFOA and PFOS should be compared to the L-HA.

The drinking water L-HAs for PFOA and PFOS are also included on the Step 1 screening tables. Drinking water L-HAs provide information on pollutants that can affect drinking water quality, but that are not regulated under the Safe Drinking Water Act. The health advisory levels are developed to provide a margin of protection against adverse health effects to the most sensitive population (fetuses during pregnancy and breastfed infants). The health advisory levels for PFOA and PFOS are calculated based on drinking water intake of lactating women and are based on exposure from drinking water ingestion only, and do not consider exposure from dermal contact or inhalation. The L-HA also factors in other sources of exposure (for example, food and soil). The toxicity values presented in the health advisories are those used in the RSL calculator to calculate the drinking water RSL for PFOA and PFOS. The difference between the tap water RSL values and the L-HA values for PFOA and PFOS are due to the different exposure assumptions used to calculate each, and the incorporation of the relative source contribution factor used in the calculation of the health advisory.

Step 2

A risk level was calculated for the constituents identified as COPCs in Step 1 following the approach discussed in *Overview of Screening, Risk Ratio, and Toxicological Evaluation. Procedures for Northern Division Human Health Risk Assessments* (Navy, 2000):

For carcinogenic chemicals identified as COPCs in Step 1, carcinogenic risk was calculated using the following equation:

$$\text{Carcinogenic risk} = \frac{\text{MDC x acceptable risk level}}{\text{RSL}}$$

Where:

MDC = Maximum detected concentration (ng/L)
acceptable risk level = $1x10^{-6}$ (unitless)
RSL = USEPA Regional Screening Level based on carcinogenic risk of $1x10^{-6}$ (ng/L)

For noncarcinogenic chemicals identified as COPCs in Step 1, a hazard index (HI) was calculated using the following equation:

$$HI = \frac{\text{MDC x acceptable HI}}{\text{RSL}}$$

Where:

MDC = Maximum detected concentration (ng/L)
acceptable HI = 1 (unitless)
RSL = USEPA Regional Screening Level based on HI of 1 (ng/L)

Both carcinogenic risk and HI were calculated for COPCs that act through carcinogenic and noncarcinogenic effects. The carcinogenic risks for each chemical within an area were summed to calculate the cumulative carcinogenic risk, and the HIs for each area were summed to calculate the cumulative HI. A cumulative HI was also calculated for each target organ/effect. If the cumulative HI for a target organ/effect was greater than 0.5, or the cumulative carcinogenic risk was greater than 5×10^{-5} (the target hazard and risk levels presented in the Navy risk ratio guidance document [Navy, 2000]), the chemicals contributing to these values were identified as COPCs.

5.3 Human Health Risk Screening Results

The HHRS results are presented in this section for each area evaluated.

5.3.1 Site 11 (Fire Training Area)

Both Columbia aquifer and Yorktown aquifer groundwater samples were collected at Site 11.

Tables 5-1 and **5-2** present the HHRS for Columbia aquifer groundwater. The MDCs of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were identified as COPCs.

Tables 5-3 and **5-4** present the HHRS for the Yorktown aquifer groundwater. The MDCs of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were identified as COPCs.

Potable use of groundwater from the Columbia aquifer or the Yorktown aquifer at Site 11 may result in potential unacceptable human health risks associated with PFOA and PFOS. It should be noted that the concentrations detected in the Columbia aquifer groundwater were two to three orders of magnitude higher than the concentrations detected in the Yorktown aquifer groundwater.

5.3.2 SWMU 26 (Fire Station Burn Pit)

Both Columbia aquifer and Yorktown aquifer groundwater samples were collected at the SWMU 26 site.

Tables 5-5 and **5-6** present the HHRS for Columbia aquifer groundwater. The MDCs of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were identified as COPCs.

Table 5-7 presents the HHRS for the Yorktown aquifer groundwater. The MDCs of the PFAS with RSLs were below the RSLs.

Potable use of groundwater from the Columbia aquifer may result in potential unacceptable human health risks associated with PFOA and PFOS. Potable use of groundwater from the Yorktown aquifer would not result in unacceptable human health risks associated with PFAS.

5.3.3 1986 Crash Site

Columbia aquifer groundwater samples were collected at the 1986 Crash Site.

Table 5-8 presents the HHRS for the 1986 Crash Site groundwater. The MDCs of the PFAS with RSLs were below the RSLs.

Potable use of groundwater from the Columbia aquifer at the 1986 Crash Site would not result in unacceptable human health risks associated with PFAS based on current toxicity data.

5.3.4 1996 Crash Site

Columbia aquifer groundwater samples were collected at the 1996 Crash Site.

Tables 5-9 and **5-10** present the HHRS for the 1996 Crash Site groundwater. The combined detected concentration of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were not identified as COPCs.

Potable use of groundwater from the Columbia aquifer at the 1996 Crash Site would not result in unacceptable human health risks associated with PFAS based on current toxicity data.

5.3.5 Hush House

Columbia aquifer groundwater samples were collected at the Hush House site. **Tables 5-11** and **5-12** present the HHRS for the Hush House site groundwater. The MDC of PFOS and the combined MDC of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were identified as COPCs.

Potable use of groundwater from the Columbia aquifer at the Hush House may result in potential unacceptable human health risks associated with PFOA and PFOS.

5.3.6 Aircraft Hangars and Maintenance Buildings

Columbia aquifer groundwater samples were collected at the Aircraft Hangars and Maintenance Buildings site.

Tables 5-13 and **5-14** present the HHRS for Aircraft Hangars and Maintenance Buildings site groundwater. The MDC of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were identified as COPCs.

Potable use of groundwater from the Columbia aquifer at the Aircraft Hangars and Maintenance Buildings site may result in potential unacceptable human health risks associated with PFOA and PFOS.

5.3.7 2007 Crash Site

Columbia aquifer groundwater samples were collected at the 2007 Crash Site.

Tables 5-15 and **5-16** present the HHRS for 2007 Crash Site groundwater. The detected concentration of PFOA and the combined detected concentration of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were not identified as COPCs.

Potable use of groundwater from the Columbia aquifer at the 2007 Crash Site would not result in unacceptable human health risks associated with PFAS based on current toxicity data.

5.3.8 POL Fuel Tank Site

Columbia aquifer groundwater samples were collected at the POL Fuel Tank site.

Table 5-17 presents the HHRS for the POL Fuel Tank site groundwater. The detected concentrations of the PFAS with RSLs were below the RSLs.

Potable use of groundwater from the Columbia aquifer at the POL Fuel Tank site would not result in unacceptable human health risks associated with PFAS based on current toxicity data.

5.3.9 Perimeter Wells

Both Columbia aquifer and Yorktown aquifer groundwater samples were collected from the perimeter monitoring wells.

Tables 5-18 and **5-19** present the HHRS for Columbia aquifer groundwater. The MDC of PFOS and the combined MDC of PFOA and PFOS exceeded the RSL, and therefore, PFOA and PFOS were evaluated in Step 2. Based on Step 2, PFOA and PFOS were not identified as COPCs.

Table 5-20 presents the HHRS for the Yorktown aquifer groundwater. The MDCs of the PFAS with RSLs were below the RSLs.

Potable use of groundwater from the Columbia aquifer or Yorktown aquifer from the perimeter monitoring wells would not result unacceptable human health risks associated with PFAS based on current toxicity data.

5.3.10 Off-Base Residential Potable Water and on-Base Non-Potable Water Supply Well

Groundwater samples were collected from the tap or spigot (prior to any water treatment system installed by the homeowner) at six off-Base residential properties that do not have access to city water and are located within 1 mile downgradient of potential PFAS source areas and the one on-Base non-potable water supply well at the Skeet and Trap Range.

Table 5-21 presents the HHRS for the residential drinking water samples and on-Base non-potable water supply well sample. The MDCs of all of the PFAS with RSLs were below the RSLs.

Potable use of groundwater at any of these residences and from the on-Base non-potable water supply well would not result in unacceptable human health risks associated with PFAS based on current toxicity data.

5.4 Human Health Risk Screening Findings

The HHRS identified potential unacceptable risks associated with PFAS in groundwater for the following areas:

- Site 11, Columbia aquifer and Yorktown aquifer
- SWMU 26, Columbia aquifer
- Hush House, Columbia aquifer
- Aircraft Hangars and Maintenance Buildings site, Columbia aquifer

TABLE 5-1

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Site 11 Fire Training Area, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 11 Fire Training Area Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	1.5E+03	5.3E+03	NG/L	OW11-MW4-1016	7/7	N/A	5.3E+03	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	2.5E+03	1.0E+04	NG/L	OW11-MW7-1016	7/7	N/A	1.0E+04	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.7E+04	3.9E+04	NG/L	OW11-MW6-1016	7/7	N/A	3.9E+04	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.0E+02	2.7E+03	NG/L	OW11-MW7-1016	7/7	N/A	2.7E+03	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**1.9E+04**	**3.0E+05 J**	**NG/L**	**OW11-MW7-1016**	**7/7**	**N/A**	**3.0E+05**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**1.5E+03**	**1.9E+04**	**NG/L**	**OW11-MW7-1016**	**7/7**	**N/A**	**1.9E+04**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-2

Risk Ratio Screening, Site 11 Fire Training Area, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS	7 / 7	3.0E+05 J	OW11-MW7-1016	N/A			4.0E+02	1	740	Developmental
Perfluorooctanoic acid (PFOA)	7 / 7	1.9E+04	OW11-MW7-1016	1.1E+03	1E-06	2E-05	4.0E+02	1	47	Developmental
Cumulative Hazard Index[c]									**787**	
Cumulative Cancer Risk[d]						**2E-05**				
									Total Developmental HI =	**787**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-3
Occurence, Distribution, and Selection of Constituents of Potential Concern, Site 11 Fire Training Area, Yorktown Aquifer
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 11	375-73-5	Perfluorobutanesulfonic acid (PFBS)	8.1E+00 J	8.1E+00 J	NG/L	OW11-MW10D-0417	1/1	N/A	8.1E+00	N/A	4.0E+04 N	N/A		NO	BSL
Fire Training Area	375-85-9	Perfluoroheptanoic acid (PFHpA)	2.2E+01	2.2E+01	NG/L	OW11-MW10D-0417	1/1	N/A	2.2E+01	N/A	N/A	N/A		NO	NTX
Yorktown Aquifer	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.2E+02	1.2E+02	NG/L	OW11-MW10D-0417	1/1	N/A	1.2E+02	N/A	N/A	N/A		NO	NTX
Groundwater	375-95-1	Perfluorononanoic acid (PFNA)	5.2E+00 J	5.2E+00 J	NG/L	OW11-MW10D-0417	1/1	N/A	5.2E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**5.8E+02**	**5.8E+02**	**NG/L**	**OW11-MW10D-0417**	**1/1**	**N/A**	**5.8E+02**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**6.1E+01**	**6.1E+01**	**NG/L**	**OW11-MW10D-0417**	**1/1**	**N/A**	**6.1E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-4

Risk Ratio Screening, Site 11 Fire Training Area, Yorktown Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	1 / 1	5.8E+02	OW11-MW10D-0417	N/A			4.0E+02	1	1.4	Developmental
Perfluorooctanoic acid (PFOA)	1 / 1	6.1E+01	OW11-MW10D-0417	1.1E+03	1E-06	6E-08	4.0E+02	1	0.2	Developmental
Cumulative Hazard Index[c]									**2**	
Cumulative Cancer Risk[d]						**6E-08**				
									Total Developmental HI =	**2**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-5

Occurrence, Distribution, and Selection of Constituents of Potential Concern, SWMU 26, Fire Station Burn Pit, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 26 Fire Station Burn Pit Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	5.0E+03	5.0E+03	NG/L	OW26-MW1-1116	1/1	N/A	5.0E+03	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	1.4E+04	1.4E+04	NG/L	OW26-MW1-1116	1/1	N/A	1.4E+04	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	5.2E+04 J	5.2E+04 J	NG/L	OW26-MW1-1116	1/1	N/A	5.2E+04	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.7E+03	1.7E+03	NG/L	OW26-MW1-1116	1/1	N/A	1.7E+03	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**4.7E+05**	**4.7E+05**	**NG/L**	**OW26-MW1-1116**	**1/1**	**N/A**	**4.7E+05**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**2.3E+04**	**2.3E+04**	**NG/L**	**OW26-MW1-1116**	**1/1**	**N/A**	**2.3E+04**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-6

Risk Ratio Screening, SWMU 26, Fire Station Burn Pit, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	1 / 1	4.7E+05	OW26-MW1-1116	N/A			4.0E+02	1	1178	Developmental
Perfluorooctanoic acid (PFOA)	1 / 1	2.3E+04	OW26-MW1-1116	1.1E+03	1E-06	2E-05	4.0E+02	1	57	Developmental
Cumulative Hazard Index[c]									**1234**	
Cumulative Cancer Risk[d]						**2E-05**				
									Total Developmental HI =	**1234**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05,
otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-7

Occurrence, Distribution, and Selection of Constituents of Potential Concern, SWMU 26, Fire Station Burn Pit, Yorktown Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future Medium: Groundwater Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
SWMU 26 Fire Station Burn Pit Yorktown Aquifer Groundwater	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	2.4E+00 J	2.4E+00 J	NG/L	OW26-MW01D-0417	1/1	N/A	2.4E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	Perfluorooctane Sulfonate (PFOS)	1.0E+01	1.0E+01	NG/L	OW26-MW01D-0417	1/1	N/A	1.0E+01	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum detected concentration is used for screening,.

[3] Background values not available

[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.

[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-8

Occurrence, Distribution, and Selection of Constituents of Potential Concern, 1986 Crash Site, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
1986 Crash Site Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	4.1E+00 J	4.1E+00 J	NG/L	OC-MW01-1116	1/1	N/A	4.1E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	2.7E+00 J	2.7E+00 J	NG/L	OC-MW01-1116	1/1	N/A	2.7E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.9E+01	1.9E+01	NG/L	OC-MW01-1116	1/1	N/A	1.9E+01	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.8E+00 J	1.8E+00 J	NG/L	OC-MW01-1116	1/1	N/A	1.8E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	Perfluorooctane Sulfonate (PFOS)	8.2E+00 J	8.2E+00 J	NG/L	OC-MW01-1116	1/1	N/A	8.2E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL
	335-67-1	Perfluorooctanoic acid (PFOA)	4.9E+00 J	4.9E+00 J	NG/L	OC-MW01-1116	1/1	N/A	4.9E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

COPC = Constituent of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available
HA = USEPA Lifetime Health Advisory (May 2016)
NG/L = Nanograms/Liter

TABLE 5-9

Occurrence, Distribution, and Selection of Constituents of Potential Concern, 1996 Crash Site, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
1996 Crash Site Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	6.9E+00 J	6.9E+00 J	NG/L	OC-MW03-1116	1/1	N/A	6.9E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	9.6E+00	9.6E+00	NG/L	OC-MW03-1116	1/1	N/A	9.6E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	4.7E+01	4.7E+01	NG/L	OC-MW03-1116	1/1	N/A	4.7E+01	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**3.3E+01**	**3.3E+01**	**NG/L**	**OC-MW03-1116**	**1/1**	**N/A**	**3.3E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**PFOS+PFOA**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**1.6E+01**	**1.6E+01**	**NG/L**	**OC-MW03-1116**	**1/1**	**N/A**	**1.6E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**PFOS+PFOA**

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Combined concentration of PFOS and PFOA exceeds the RSL (PFOS+PFOA)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-10
Risk Ratio Screening, 1996 Crash Site, Columbia Aquifer
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	1 / 1	3.3E+01	OC-MW03-1116	N/A			4.0E+02	1	0.08	Developmental
Perfluorooctanoic acid (PFOA)	1 / 1	1.6E+01	OC-MW03-1116	1.1E+03	1E-06	1E-08	4.0E+02	1	0.04	Developmental
Cumulative Hazard Index[c]									**0.1**	
Cumulative Cancer Risk[d]						**1E-08**				
									Total Developmental HI =	**0.1**

Notes:
[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.
[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.
[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.
[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.
Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.
Constituents selected as COPCs are indicated by shading.
COPC = Constituent of Potential Concern
HI = Hazard Index
N/A = Not available/not applicable
NG/L = nanogram/liter
RSL = Regional Screening Level

TABLE 5-11

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Hush House, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future Medium: Groundwater Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Accidental Release at Hush House Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	4.0E+00 J	4.3E+00 J	NG/L	JTC-MW-B-1116	2/2	N/A	4.3E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	6.3E+00 J	6.4E+00 J	NG/L	OC-MW04-1016	2/2	N/A	6.4E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	4.3E+01	2.1E+02	NG/L	JTC-MW-B-1116	2/2	N/A	2.1E+02	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	6.1E+00 J	6.1E+00 J	NG/L	JTC-MW-B-1116	1/2	N/A	6.1E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**4.0E+01**	**4.0E+03**	**NG/L**	**JTC-MW-B-1116**	**2/2**	**N/A**	**4.0E+03**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**6.8E+00 J**	**1.3E+01**	**NG/L**	**JTC-MW-B-1116**	**2/2**	**N/A**	**1.3E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**PFOS+PFOA**

[1] Minimum/Maximum detected concentrations.

[2] Maximum detected concentration is used for screening,.

[3] Background values not available

[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Combined concentration of PFOS and PFOA exceeds the RSL (PFOS+PFOA)

Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-12

Risk Ratio Screening, Hush House, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	1 / 1	4.0E+03	JTC-MW-B-1116	N/A			4.0E+02	1	10	Developmental
Perfluorooctanoic acid (PFOA)	1 / 1	1.3E+01	JTC-MW-B-1116	1.1E+03	1E-06	1E-08	4.0E+02	1	0.03	Developmental
Cumulative Hazard Index[c]									**10**	
Cumulative Cancer Risk[d]						**1E-08**				
									Total Developmental HI =	**10**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-13

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Aircraft Hangars and Maintenance Buildings, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Aircraft Hangars and Maintenance Buildings Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	9.9E+00	3.1E+02 J	NG/L	OW2C-MW25-0217	8/8	N/A	3.1E+02	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	2.6E+01	5.3E+02	NG/L	OW2C-MW25-0217	8/8	N/A	5.3E+02	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	7.9E+01	3.6E+03	NG/L	OW2C-MW25-0217	8/8	N/A	3.6E+03	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	3.2E+00	2.5E+02	NG/L	OW2C-MW25-0217	8/8	N/A	2.5E+02	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**6.3E+01**	**4.5E+04 J**	**NG/L**	**OW2C-MW25-0217**	**8/8**	**N/A**	**4.5E+04**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**4.3E+01**	**1.5E+03**	**NG/L**	**OW2C-MW24-0217**	**8/8**	**N/A**	**1.5E+03**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-14

Risk Ratio Screening, Aircraft Hangars and Maintenance Buildings, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	8 / 8	4.5E+04 J	OW2C-MW25-0217	N/A			4.0E+02	1	111	Developmental
Perfluorooctanoic acid (PFOA)	8 / 8	1.5E+03	OW2C-MW24-0217	1.1E+03	1E-06	1E-06	4.0E+02	1	3.9	Developmental
Cumulative Hazard Index[c]									**115**	
Cumulative Cancer Risk[d]						**1E-06**				
									Total Developmental HI =	**115**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-15

Occurence, Distribution, and Selection of Constituents of Potential Concern, 2007 Crash Site, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
2007 Crash Site Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	7.9E+00 J	7.9E+00 J	NG/L	FTWG-MW-02-1116	1/1	N/A	7.9E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	8.4E+00 J	8.4E+00 J	NG/L	FTWG-MW-02-1116	1/1	N/A	8.4E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.1E+01	1.1E+01	NG/L	FTWG-MW-02-1116	1/1	N/A	1.1E+01	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**4.0E+01**	**4.0E+01**	**NG/L**	**FTWG-MW-02-1116**	**1/1**	**N/A**	**4.0E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**PFOS+PFOA**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**9.0E+01**	**9.0E+01**	**NG/L**	**FTWG-MW-02-1116**	**1/1**	**N/A**	**9.0E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.

[2] Maximum detected concentration is used for screening,.

[3] Background values not available

[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Combined concentration of PFOS and PFOA exceeds the RSL (PFOS+PFOA)

Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-16

Risk Ratio Screening, 2007 Crash Site, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	1 / 1	4.0E+01	FTWG-MW-02-1116	N/A			4.0E+02	1	0.1	Developmental
Perfluorooctanoic acid (PFOA)	1 / 1	9.0E+01	FTWG-MW-02-1116	1.1E+03	1E-06	8E-08	4.0E+02	1	0.2	Developmental
Cumulative Hazard Index[c]									**0.3**	
Cumulative Cancer Risk[d]						**8E-08**				
									Total Developmental HI =	**0.3**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

TABLE 5-17

Occurrence, Distribution, and Selection of Constituents of Potential Concern, POL Fuel Tank Site, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
POL Fuel Tank Columbia Aquifer Groundwater	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	2.7E+00 J	2.7E+00 J	NG/L	OC-F8F9-MW-F4-0417	1/1	N/A	2.7E+00	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.8E+00 J	1.8E+00 J	NG/L	OC-F8F9-MW-F4-0417	1/1	N/A	1.8E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	Perfluorooctane Sulfonate (PFOS)	2.1E+01 J	2.1E+01 J	NG/L	OC-F8F9-MW-F4-0417	1/1	N/A	2.1E+01	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL
	335-67-1	Perfluorooctanoic acid (PFOA)	8.4E+00 J	8.4E+00 J	NG/L	OC-F8F9-MW-F4-0417	1/1	N/A	8.4E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Combined concentration of PFOS and PFOA exceeds the RSL (PFOS+PFOA)

Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-18

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Perimeter Wells, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Perimeter Wells Columbia Aquifer Groundwater	375-73-5	Perfluorobutanesulfonic acid (PFBS)	7.0E+00 J	7.0E+00 J	NG/L	MW-BG12-1016	1/13	N/A	7.0E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	6.7E-01 J	2.7E+00 J	NG/L	MW-BG12-1016	4/13	N/A	2.7E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.1E+00 J	8.0E+01	NG/L	MW-BG12-1016	10/13	N/A	8.0E+01	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.4E+00 J	1.4E+00 J	NG/L	MW-BG12-1016	1/13	N/A	1.4E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	**Perfluorooctane Sulfonate (PFOS)**	**1.2E+00 J**	**4.7E+01**	**NG/L**	**MW-BG12-1016**	**9/13**	**N/A**	**4.7E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**ASL**
	335-67-1	**Perfluorooctanoic acid (PFOA)**	**6.9E-01 J**	**1.4E+01**	**NG/L**	**MW-BG01-1016**	**7/13**	**N/A**	**1.4E+01**	**N/A**	**4.0E+01 N**	**7.0E+01**	**HA**	**YES**	**PFOS+PFOA**

[1] Minimum/Maximum detected concentrations.

[2] Maximum detected concentration is used for screening,.

[3] Background values not available

[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Combined concentration of PFOS and PFOA exceeds the RSL (PFOS+PFOA)

Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-19

Risk Ratio Screening, Perimeter Wells, Columbia Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier) (NG/L)	Sample Location of Maximum Detected Concentration	Carcinogenic Tap Water RSL (NG/L)	Acceptable Risk Level	Cancer Risk[a]	Non-carcinogenic Tap Water RSL (NG/L)	Acceptable Hazard Level	Hazard Index[b]	Target Organ
Perfluorooctane Sulfonate (PFOS)	9 / 13	4.7E+01	MW-BG12-1016	N/A			4.0E+02	1	0.1	Developmental
Perfluorooctanoic acid (PFOA)	7 / 13	1.4E+01	MW-BG01-1016	1.1E+03	1E-06	1E-08	4.0E+02	1	0.03	Developmental
Cumulative Hazard Index[c]									**0.2**	
Cumulative Cancer Risk[d]						**1E-08**				
									Total Developmental HI =	**0.2**

Notes:

[a] Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable hazard level.

[c] Cumulative Hazard Index equals sum of Hazard Indices for each constituent.

[d] Cumulative Cancer Risk equals sum of Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Cancer Risk greater than 5E-05

otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

N/A = Not available/not applicable

NG/L = Nanograms/Liter

RSL = Regional Screening Level

UG/L = micrograms/liter

TABLE 5-20

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Perimeter Wells, Yorktown Aquifer

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future Medium: Groundwater Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Perimeter Wells Yorktown Aquifer Groundwater	375-85-9	Perfluoroheptanoic acid (PFHpA)	3.4E+00 J	3.4E+00 J	NG/L	OC-MW02D-0417	1/3	N/A	3.4E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	1.0E+01	1.0E+01	NG/L	OC-MW02D-0417	1/3	N/A	1.0E+01	N/A	N/A	N/A		NO	NTX
	1763-23-1	Perfluorooctane Sulfonate (PFOS)	2.4E+00 J	2.4E+00 J	NG/L	OC-MW05D-0417	1/3	N/A	2.4E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL
	335-67-1	Perfluorooctanoic acid (PFOA)	9.0E+00	9.0E+00	NG/L	OC-MW02D-0417	1/3	N/A	9.0E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

TABLE 5-21

Occurrence, Distribution, and Selection of Constituents of Potential Concern, Off-Base Residential Drinking Water and On-Base Non-Potable Water Supply Well

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Off-Base Residential Drinking Water and On-Base Non-Potable Water Supply Well	375-73-5	Perfluorobutanesulfonic acid (PFBS)	2.2E+00 J	2.2E+00 J	NG/L	OC-RW01-1216	1/7	N/A	2.2E+00	N/A	4.0E+04 N	N/A		NO	BSL
	375-85-9	Perfluoroheptanoic acid (PFHpA)	8.5E+00	8.5E+00	NG/L	OC-RW01-1216	1/7	N/A	8.5E+00	N/A	N/A	N/A		NO	NTX
	355-46-4	Perfluorohexanesulfonic acid (PFHxS)	3.3E+01	3.3E+01	NG/L	OC-RW01-1216	1/7	N/A	3.3E+01	N/A	N/A	N/A		NO	NTX
	375-95-1	Perfluorononanoic acid (PFNA)	1.2E+00 J	1.2E+00 J	NG/L	OC-RW01-1216	1/7	N/A	1.2E+00	N/A	N/A	N/A		NO	NTX
	1763-23-1	Perfluorooctane Sulfonate (PFOS)	9.2E+00	9.2E+00	NG/L	OC-RW01-1216	1/7	N/A	9.2E+00	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL
	335-67-1	Perfluorooctanoic acid (PFOA)	2.5E+01	2.5E+01	NG/L	OC-RW01-1216	1/7	N/A	2.5E+01	N/A	4.0E+01 N	7.0E+01	HA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum detected concentration is used for screening,.
[3] Background values not available
[4] Oak Ridge National Laboratory (ORNL). June 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Tap Water RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens).
RSL values were calculated using the RSL calculator tool.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)
No toxicity value (NTX)

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic
COPC = Constituent of Potential Concern
HA = USEPA Lifetime Health Advisory (May 2016)
J = Estimated Value
N = Noncarcinogenic
N/A = Not available
NG/L = Nanograms/Liter

Conclusions and Recommendations

This section summarizes the major conclusions of the Basewide PFAS SI conducted at NAS Oceana. It also presents proposed recommendations to address the PFAS contamination at the installation.

6.1 Conclusions

6.1.1 Hydraulic Characteristics

Groundwater flow in the Columbia aquifer generally radiates from the center of the installation to the north and to the south. In the eastern part of the installation, the flow follows a west-northwestward pattern. Groundwater flow in the Yorktown aquifer generally mimics the flow in the Columbia aquifer (northward and southward from the center of the installation) although the interpretation of the flow is incomplete due to the limited number of data points, especially in the southern and western portions of the installation. Similarly, the flow patterns of the two aquifers indicate that the confining unit may be absent or have a limited effect on the hydrology in some areas of the installation. Vertical gradient calculations indicate a weak downward gradient between the Columbia aquifer and the Yorktown aquifer.

Slug tests conducted in monitoring wells screened in the Columbia aquifer estimated that hydraulic conductivity ranged from 4.00 x 10^{-3} ft/min to 9.53 x 10^{-3} ft/min and a flow velocity of 0.0312 ft/day or approximately 11.37 ft/year.

6.1.2 Contaminant Distribution

Based on total concentrations of PFOA and PFOS exceeding the USEPA L-HA, four main PFAS source areas have been defined: Site 11, SWMU 26, the Aircraft Hangars and Maintenance Buildings, and the Hush House. These findings are consistent with the historical activities reported at each site which involved the use or release of AFFF. Maximum exceedances reached concentrations 7000 times the L-HA at SWMU 26, 4,500 times the L-HA at Site 11, 600 times the L-HA at the Aircraft Hangars and Maintenance Buildings, and 50 times the L-HA at the Hush House. However, the extent of the contamination could not be fully defined due to insufficient monitoring well coverage at each of the plumes.

Groundwater analysis for PFAS in the vicinity of plane crash sites where AFFF was potentially used did not show exceedances above the L-HA. However, PFAS detected below the L-HA in a deep eastern boundary well (OC-MW02D) and in an eastern off-Base potable well sample in the same area do not appear to be downgradient of an identified source area. No PFAS constituents were detected in the shallow boundary well (OC-MW02) in this area.

Exceedances above the USEPA L-HA in the Yorktown aquifer in the vicinity of Site 11 indicate that the contamination has migrated vertically from the Columbia to the Yorktown aquifer in that portion of the installation. However, lack of exceedances in the Yorktown aquifer at SWMU 26 and the Hush House are indicative that clay layers within the aquifers and the confining unit, where present, may be protective of the lower aquifer at these two sites.

There were no exceedances of the USEPA L-HA in water samples collected from off-Base potable water wells and there were detections of PFOA and PFOS below standard at a private potable well located just east of the installation.

6.1.3 Human Health Risk Screening Results

The HHRS which was performed to evaluate potential human health risks associated with exposure to PFAS in groundwater indicated that:

- Potable use of groundwater from the Columbia aquifer at Site 11, SWMU 26, the Aircraft Hangars and Maintenance Buildings site, and the Hush House may result in potential unacceptable human health risks associated with PFOA and PFOS.
- Potable use of groundwater from the Yorktown aquifer at Site 11 may result in potential unacceptable human health risks associated with PFOA and PFOS.
- Potable use of groundwater at any of the residences adjacent to the Base, where a potable well was sampled, would not result in unacceptable human health risks associated with PFAS.
- Potable use of groundwater from the well supplying non-potable water to the Skeet and Trap Range in the northern portion of the installation, and from the perimeter monitoring wells, would not result in unacceptable human health risks associated with PFAS.

6.1.4 Contamination Fate and Transport

Interpretation of analytical results indicates that PFAS contamination has migrated from the Columbia aquifer to the Yorktown aquifer at Site 11, but not at SWMU 26 and the Hush House, which may give an indication that the vertical transport of PFAS is not consistent throughout the installation. The Yorktown confining unit, where present, may slow the vertical transport of PFAS from the Columbia aquifer to the Yorktown aquifer. Downward migration from the upper Yorktown aquifer to the lower Yorktown aquifer has not been investigated as part of this SI and should be explored further. Finally, contamination appears to have dispersed northward and southward from the four PFAS source areas, in a manner consistent with the groundwater flow observed at the site. However, since the plumes' extents have not been fully defined, it is unclear whether the presence of PFAS observed throughout the Base could be attributed in parts to sporadic usage or release of AFFF in non-source areas.

6.2 Proposed Actions

An Expanded Site Inspection is recommended to refine understanding of the hydraulic characteristics at the site and the extent of the contamination, to establish the fate and transport of the COCs, and to further assess risks posed by exposure to contamination for human receptors. Specifically, the following actions are proposed:

1. Install new monitoring wells in the Yorktown aquifer in the eastern, southern, and western portions of the installation to better define the hydraulic characteristics at the site.
2. Install new monitoring wells to better define the extent of the contamination in the Columbia aquifer downgradient of the source areas (Site 11, Aircraft Hangars and Maintenance Buildings, SWMU 26, and the Hush House) and in the Yorktown aquifer downgradient of Site 11.
3. Install additional wells to determine the source of contamination near the 1986 Crash Site, to evaluate downgradient concentrations, and to determine if there are higher concentrations in the area exceeding the L-HA.
4. Install new monitoring wells at Site 11, screened in the lower portion of the Yorktown aquifer (100 feet bgs or deeper) to determine vertical extent of contamination.
5. Perform aquifer variable-head testing in the Yorktown aquifer to define the hydraulic characteristics of this aquifer.
6. Collect additional data on the presence/absence of the Yorktown confining unit beneath NAS Oceana.
7. Establish long-term monitoring of the groundwater to monitor the vertical and horizontal migrations of PFAS in the Columbia and the Yorktown aquifers to ensure long-term protectiveness to potential receptors off-Base.
8. Update the CSM based on new data collected.

9. Perform a supplemental Human Health Risk Screening to further evaluate risks to human health associated with exposure to PFAS detected in groundwater.
10. Perform an Ecological Risk Screening, should ecological toxicity data for PFAS become available.
11. Assess the potential for implementation of land use controls within the boundary of the contaminant plume with concentrations greater than the L-HA to prevent use of groundwater as a drinking water source.
12. Future analysis will include the expanded analyte list of 14 PFAS as per the 2017 Navy Guidance (Navy, 2017).

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Appendix A
Fire Department Interviews

Interview to Evaluate Use of Aqueous Film-Forming Foam Use at NAS Oceana

ATTENDEES:	Capt. Vincent Jackson/NALF Fentress Chief Kenny Russell/NAS Oceana	Angela Jones/NAVFAC Amy Brand/CH2M
COPY TO:	Laura Cook/CH2M	
PREPARED BY:	Amy Brand/CH2M	
MEETING DATE:	November 2, 2015	

In November, 2015, Ms. Jones and Ms. Brand interviewed Captain Vincent Jackson of Naval Auxiliary Landing Field (NALF) Fentress and Assistant Fire Chief Kenny Russell of Naval Air Station (NAS) Oceana about use of Aqueous Film-Forming Foams (AFFFs) in firefighter training and emergency operations at NAFL Fentress and NAS Oceana. This report summarizes the information regarding use of AFFF at NAS Oceana only. A separate memo was generated for NALF Fentress.

AFFF Use at NAS Oceana

Captain Jackson reported that firefighter training activities at NAS Oceana are currently conducted only using water; no AFFF is used in training. AFFF is currently used in crash trucks in preparation for emergency use. In addition, automated fire suppression systems in the aircraft hangars are charged with AFFF; these systems are maintained by a contractor, Kinetix.

AFFF Use by the NAS Oceana Fire Department

AFFF is ordered at NAS Oceana following current military specifications. Only 3-percent AFFF is used. 3M and Ansul brands have been used previously, but headquarters is using primarily Chemguard brand now.

AFFF is stored in Building 118 at NAS Oceana. A total 3350 gallons is stored in 54 five-gallon cans and 28 55-gallon drums. To load the crash trucks, the trucks are brought to Building 118 and AFFF is replenished manually from the 5-gallon cans. Empty AFFF cans are disposed of as Hazardous Materials (at Building 1114 at NAS Oceana.) Occasionally, AFFF is pumped from 55-gallon drums into 5-gallon cans. When that occurs, the pump is not cleaned; but rather, is kept in the can for future use. There is secondary containment in the area in front of Building 118 where the trucks are filled with AFFF.

Four trucks are kept supplied with AFFF at NAS Oceana, with tanks ranging from 200 to 405 gallons each. Spray tests are performed quarterly at Site 11 (Figure 1). This site has been approved for spray testing. The spray test involves checking the roof turret, pumper turret, and hand lines under the truck nozzles to ensure the foam is the right consistency and to test the distance and width of the spray pattern. Plans for spray testing are coordinated in advance, and spray testing is not conducted if it is raining or if rain is predicted within the new few days. Old foam is flushed at the site where spray testing is done – in the grassy area near Site 11, with care to avoid any storm drains or ditches. Valves are only cleaned if there is a problem with the metering valve; this maintenance, which is rare, is performed by the Public Works and Transportation Department at NAS Oceana.

All current firefighter training areas are mobile, using water only. Firefighter training is conducted quarterly, using propane to create the fire.

AFFF Use in Fire Suppression Systems in the Hangars

AFFF storage for fire suppression in the hangars is handled by a contractor, Kinetix. The automated fire suppression systems in the hangars are currently charged with AFFF. Kinetix brings in 55-gallon drums of AFFF and pumps it into plastic holding tanks, located within the mechanical rooms in the hangars. The tanks are not leak-tested. There is concentrated AFFF in the pipes up to the mixing valve. Interviewees reported never having seen the system flushed; however, flushing the line is part of the cleanup process if there is an activation. When the system is flushed, there is a holding tank, which is checked for adequate capacity. The holding tank has an overflow to the storm sewer system.

If AFFF gets on airplane parts, the parts are discarded (rather than washed) because AFFF is very corrosive.

AFFF Releases

AFFF was reportedly used or presumed to have been used during several emergency response incidents (Figure 1):

- In 1986, a plane crashed off Oceana Boulevard, killing a pregnant woman on the ground. Interviewees indicated that AFFF was probably used for this crash.
- In 1995, a plane crashed in the woods on the installation, but interviewees could not recall whether there was an associated fire.
- 1n 2007, a civilian plane crashed during an air show practice, right off runway 5L. Interviewees were not sure whether AFFF was used.
- In April, 2012, an F18 crashed into the Mayview Apartments. Interviewees believed that AFFF was used on the subsequent fire.

An accidental release has occurred once during firefighter training activities (Figure 1):

- During training in the 1100 area near the Hush House, a person accidentally pressed the wrong button, releasing AFFF. Personnel called Environmental and were told to spray down the concrete area into the grass. There is an underground storage tank at Hush House that acts as a holding tank if there is a discharge.

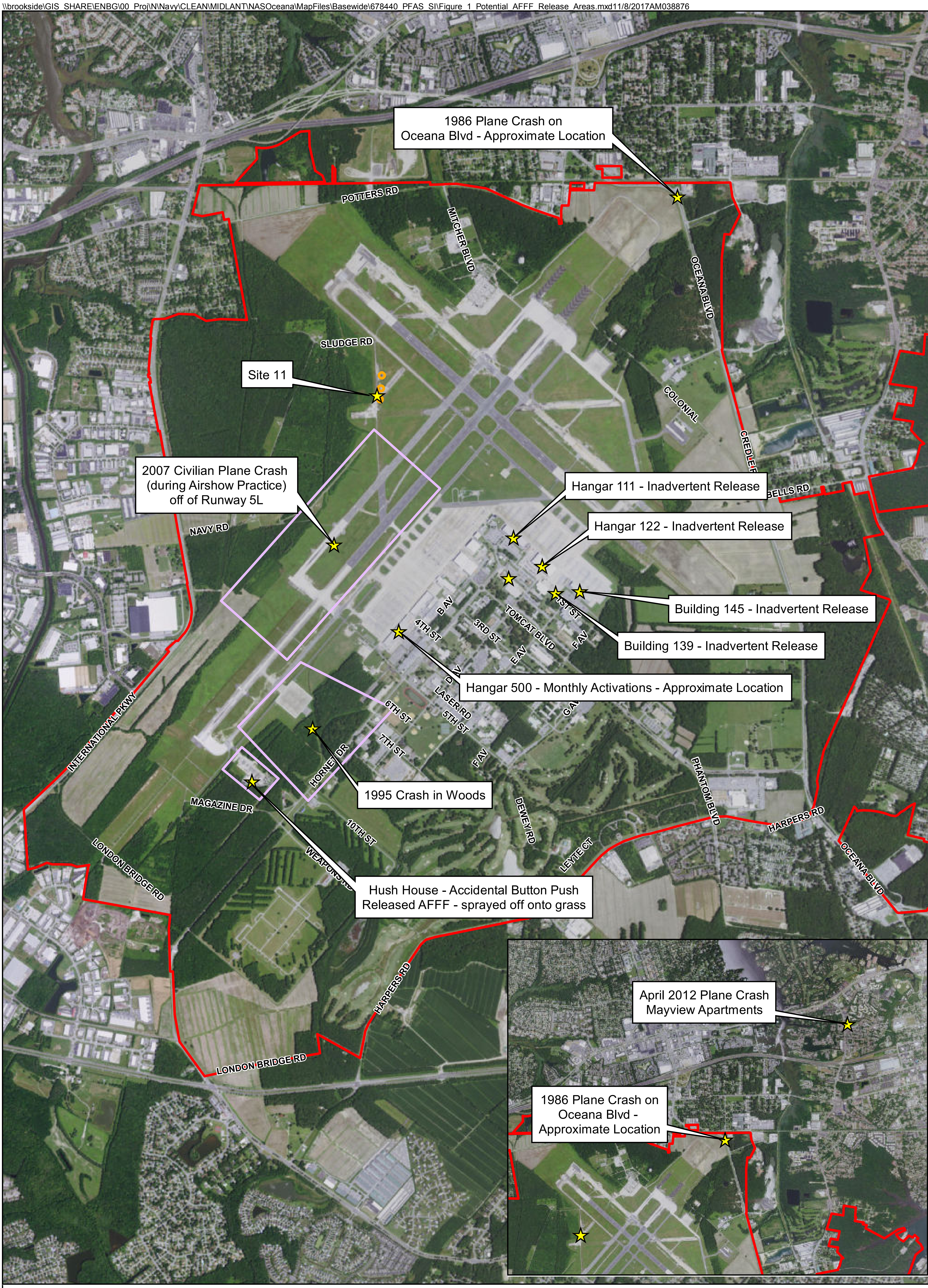
While AFFF has not been used in the hangars for a fire, there have also been several inadvertent releases (Figure 1):

- In Building 145, a worker accidentally pushed the wrong button, releasing AFFF which went into the parking lot. Personnel were advised to cover the storm drains as well as they could, and then spray water to wash the AFFF onto the grass. A contractor was brought in to vacuum up any remaining foam. The buttons have now been covered with plastic to avoid similar accidents.
- A release reportedly occurred in Hangar 111 during retrofit of the floor nozzles.
- An “activation” (which is technically not considered a “spill”) used to occur monthly in Hangar 500 due to sensitive sensors. The sensors have been adjusted and there have been no additional activations.
- In 2010, there was a spill at the corrosion control facility (Building 139). There are no drains in that area. The foam was pushed outside to the grass swale on the southeast side of the building, and then cleaned up with a vacuum truck. An interviewee noted that there have been multiple previous releases at Building 139.
- In July, 2011, a very large storm caused stormwater to back up and fill the overflow tanks in Hangar 122, releasing AFFF to the environment, including the storm drain and storm ditch.

Information about this release is well-documented in the spill log, and the Hampton Roads Sanitation District was notified.

When AFFF releases have occurred, the cleanup has been focused on avoiding any release into water or storm drains. Releases of AFFF into the environment have been documented in spill logs for the past 6-7 years.

\\brookside\GIS_SHARE\ENBG\00_Proj\N\Navy\CLEAN\MIDLANT\NASOceana\MapFiles\Basewide\678440_PFAS_SI\Figure_1_Potential_AFFF_Release_Areas.mxd11/8/2017AM038876



Legend

- AFFF Release Locations
- Potential AFFF Release Areas
- Firefighting Areas
- Installation Boundary

N W E S

0 1,000 2,000 Feet

Imagery Source: ©2016 Esri

Figure 1
Potential AFFF Release Areas
NAS Oceana, Virginia Beach, Virginia

ch2m

Appendix B
Columbia Monitoring Well Completion Diagrams and Soil Boring Logs

PROJECT NUMBER	WELL NUMBER	
678440	OW11-MW4	SHEET 1 OF 1

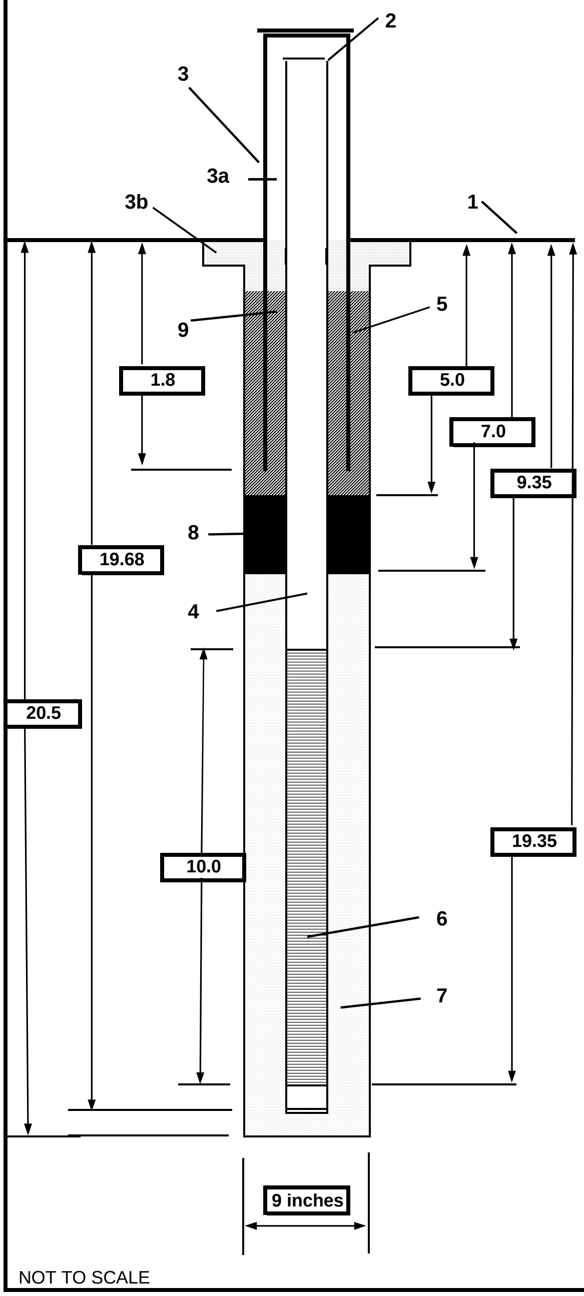
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 3.37 ft BGS (10/6/16) START : 10/4/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well	15.89
2- Top of casing elevation	18.89
3- Wellhead protection cover type	4.5-inch square Aluminum Standpipe
a) drain tube?	No
b) concrete pad dimensions	2.5 ft diameter x 0.3 ft
4- Dia./type of well casing	2.0-inch I.D. / 2.375-inch O.D.
	Sched 40 PVC, flush thread w/ o-rings
5- Dia./type surface casing	4.5-inch x 5-ft square Aluminum
6- Type/slot/size of screen	0.010-inch (10-slot) x 10 ft length
	Sched 40 PVC, flush thread w/ o-rings
7- Type screen filter	DSI Well Gravel #1A Silica Sand
a) Quantity used	6 Bags 300 Lbs.
8- Type of seal	Holeplug 3/8-inch WY Bentonite Chips
a) Quantity used	1.5 Bags 75 Lbs.
9- Grout	
a) Grout mix used	Portland Cement/Bentonite
b) Method of placement	Tremie Pump
c) Quantity used	15 Gallons
d) Vol. of well casing grout	1.7 Cubic ft
Development method	Submersible Pump
Development time	10/12/2016 9:50
Estimated purge volume	50 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OW11-MW5 SHEET 1 OF 1

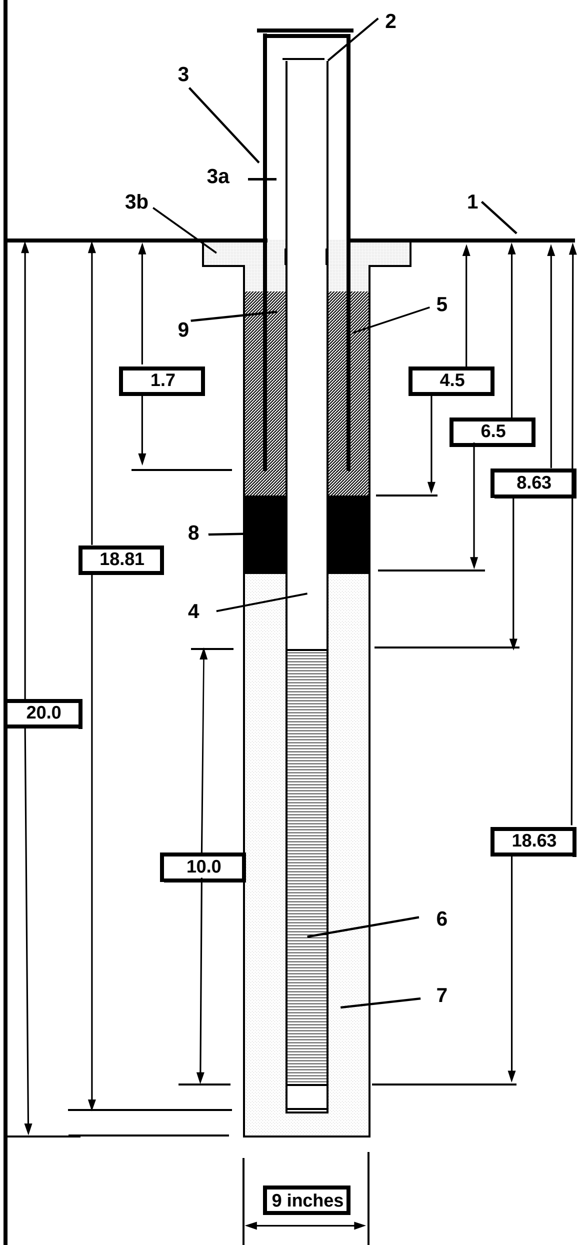
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 4.38 ft BGS (10/6/16) START : 10/4/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 16.87

2- Top of casing elevation: 20.05

3- Wellhead protection cover type: 4.5-inch square Aluminum Standpipe
- a) drain tube?: No
- b) concrete pad dimensions: 2.5 ft diameter x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.; Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 4.5-inch x 5-ft square Aluminum

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length; Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 6 Bags 300 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 14 Gallons
- d) Vol. of well casing grout: 1.5 Cubic ft

Development method: Submersible Pump

Development time: 10/12/2016 10:50

Estimated purge volume: 50 gallons

Comments

PROJECT NUMBER	WELL NUMBER
678440	OW11-MW6 SHEET 1 OF 1

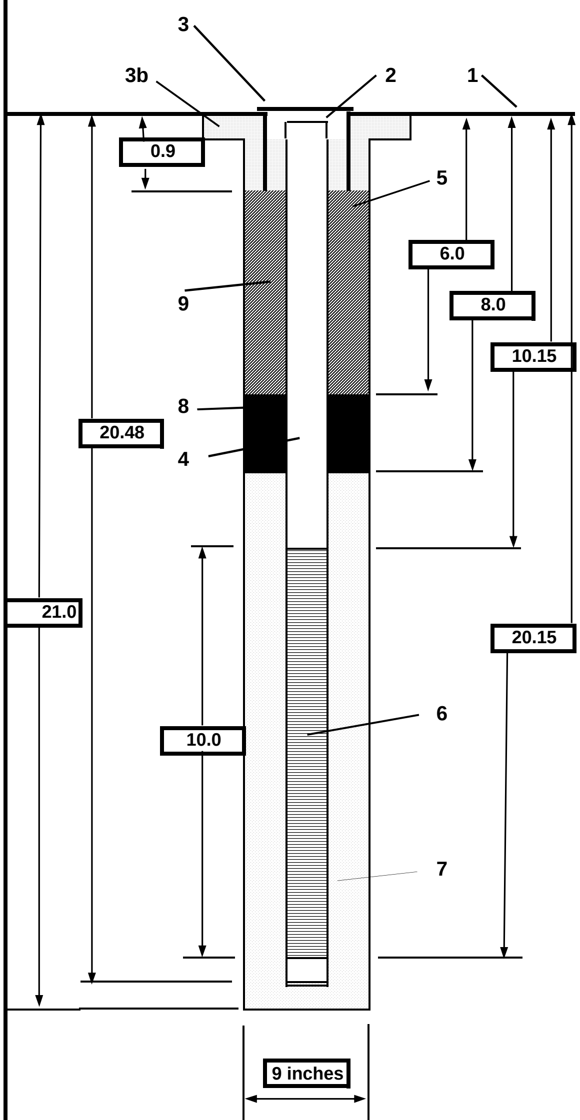
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 5.85 ft BGS (10/6/16) START : 10/6/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well	18.2
2- Top of casing elevation	17.89
3- Wellhead protection cover type	Flush Mount Steel Bolt-Down Roadbox
a) drain tube?	No
b) concrete pad dimensions	1 ft diameter x 0.3 ft in pavement
4- Dia./type of well casing	2.0-inch I.D. / 2.375-inch O.D.
	Sched 40 PVC, flush thread w/ o-rings
5- Dia./type surface casing	8.0-inch I.D. Steel
6- Type/slot/size of screen	0.010-inch (10-slot) x 10 ft length
	Sched 40 PVC, flush thread w/ o-rings
7- Type screen filter	DSI Well Gravel #1A Silica Sand
a) Quantity used	6 Bags 300 Lbs.
8- Type of seal	Holeplug 3/8-inch WY Bentonite Chips
a) Quantity used	1.5 Bags 75 Lbs.
9- Grout	
a) Grout mix used	Portland Cement/Bentonite
b) Method of placement	Tremie Pump
c) Quantity used	22 Gallons
d) Vol. of well casing grout	2.9 Cubic ft
Development method	Submersible Pump
Development time	10/12/2016 12:00
Estimated purge volume	50 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OW11-MW7 SHEET 1 OF 1

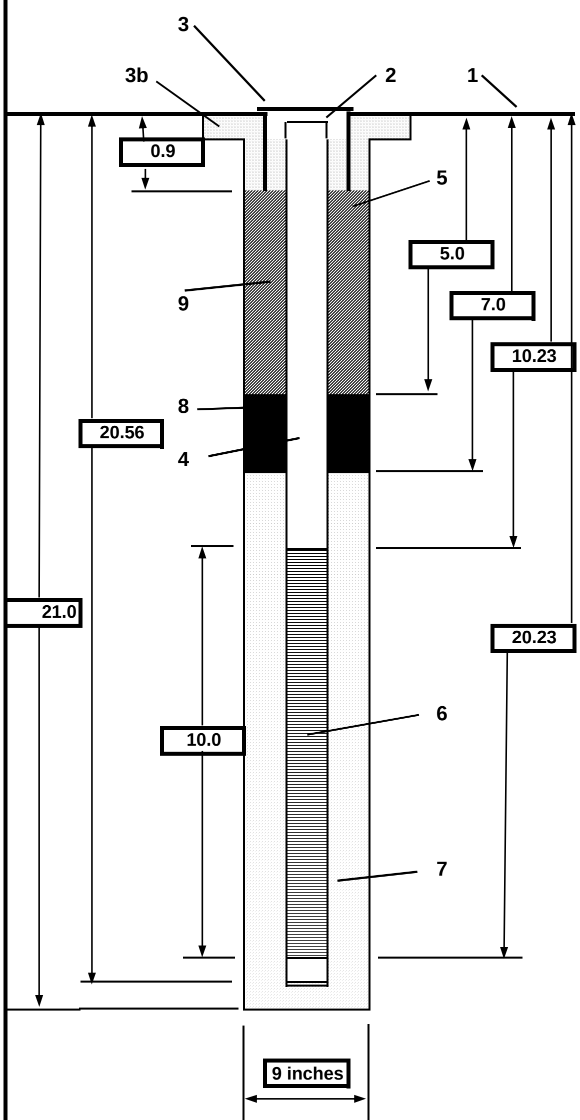
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 5.59 ft BGS (10/6/16) START : 10/5/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 17.47

2- Top of casing elevation: 17.15

3- Wellhead protection cover type: Flush Mount Steel Bolt-Down Roadbox
- a) drain tube?: No
- b) concrete pad dimensions: 1 ft diameter x 0.3 ft in pavement

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.; Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 8.0-inch I.D. Steel

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length; Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 6 Bags 300 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.0 50 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 15 Gallons
- d) Vol. of well casing grout: 1.7 Cubic ft

Development method: Submersible Pump

Development time: 10/12/2016 12:30

Estimated purge volume: 58 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OW11-MW8 SHEET 1 OF 1

ch2m

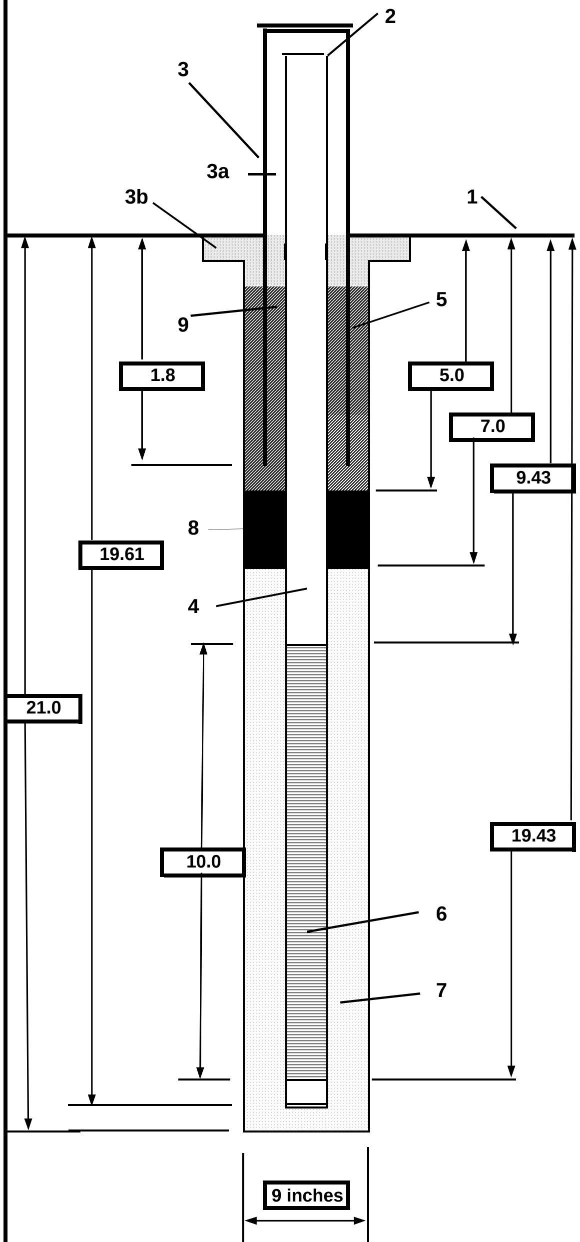
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 4.40 ft BGS (10/6/16) START : 10/5/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 15.81

2- Top of casing elevation: 18.88

3- Wellhead protection cover type: 4.5-inch square Aluminum Standpipe
- a) drain tube?: No
- b) concrete pad dimensions: 2.5 ft diameter x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.
Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 4.5-inch x 5-ft square Aluminum

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length
Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 5 Bags 250 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 15 Gallons
- d) Vol. of well casing grout: 1.7 Cubic ft

Development method: Submersible Pump

Development time: 10/12/2016 10:48

Estimated purge volume: 76 gallons

Comments

PROJECT NUMBER	WELL NUMBER
678440	OW11-MW9 SHEET 1 OF 1

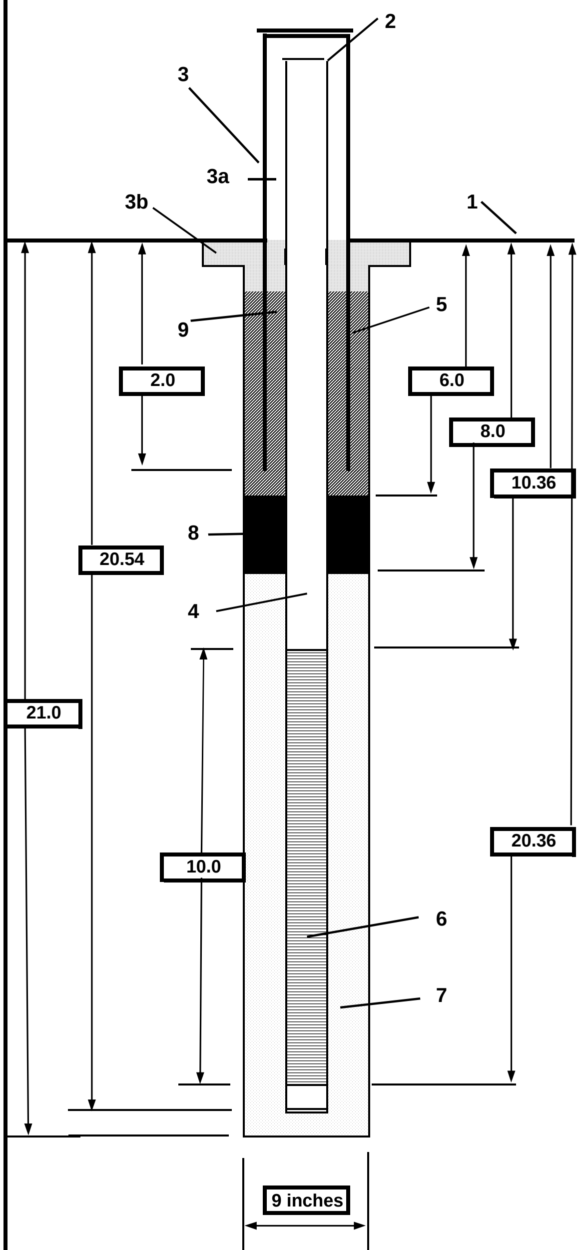
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 4.84 ft BGS (10/6/16) START : 10/4/2016 END : 10/6/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 15.84

2- Top of casing elevation: 18.65

3- Wellhead protection cover type: 4.5-inch square Aluminum Standpipe
- a) drain tube?: No
- b) concrete pad dimensions: 2.5 ft diameter x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.; Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 4.5-inch x 5-ft square Aluminum

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length; Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 4 Bags 200 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 22 Gallons
- d) Vol. of well casing grout: 2.9 Cubic ft

Development method: Submersible Pump

Development time: 10/12/2016 10:00

Estimated purge volume: 40 gallons

Comments

PROJECT NUMBER	WELL NUMBER
678440	OW26-MW1 SHEET 1 OF 1

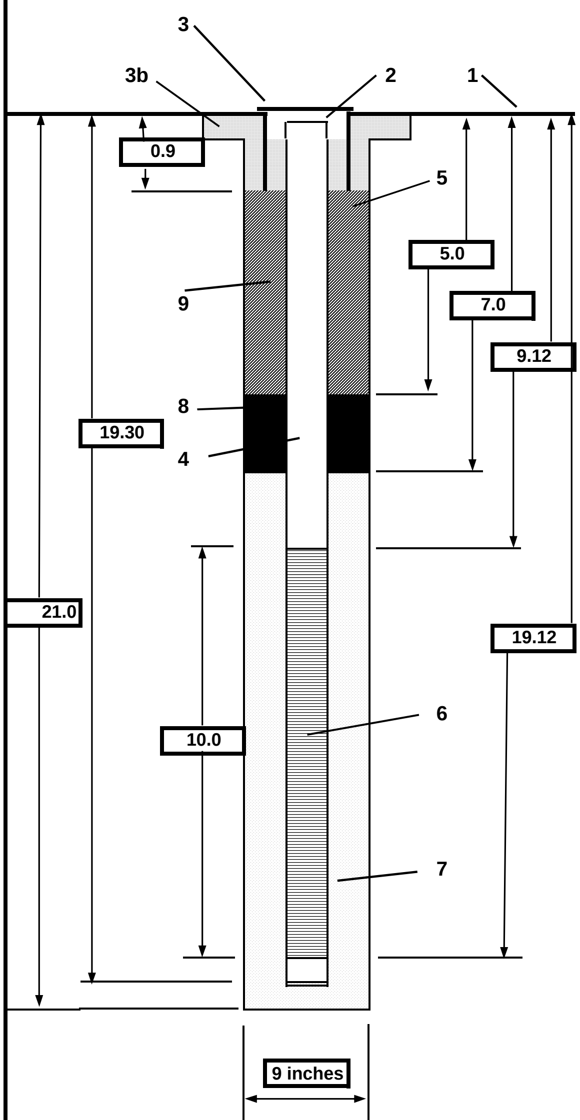
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 3.33 ft BGS (10/11/16) START : 10/11/2016 END : 10/11/2016 LOGGER : **L. Baerga**



1- Ground elevation at well	18.33
2- Top of casing elevation	18.13
3- Wellhead protection cover type	Flush Mount Steel Bolt-Down Roadbox
a) drain tube?	No
b) concrete pad dimensions	2.5 ft diameter x 0.3 ft
4- Dia./type of well casing	2.0-inch I.D. / 2.375-inch O.D.
	Sched 40 PVC, flush thread w/ o-rings
5- Dia./type surface casing	8.0-inch I.D. Steel
6- Type/slot/size of screen	0.010-inch (10-slot) x 10 ft length
	Sched 40 PVC, flush thread w/ o-rings
7- Type screen filter	DSI Well Gravel #1A Silica Sand
a) Quantity used	7 Bags 350 Lbs.
8- Type of seal	Holeplug 3/8-inch WY Bentonite Chips
a) Quantity used	1 Bag 50 Lbs.
9- Grout	
a) Grout mix used	Portland Cement/Bentonite
b) Method of placement	Tremie Pump
c) Quantity used	15 Gallons
d) Vol. of well casing grout	1.7 Cubic ft
Development method	Submersible Pump
Development time	10/13/2016 10:35
Estimated purge volume	58 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OC-MW01 SHEET 1 OF 1

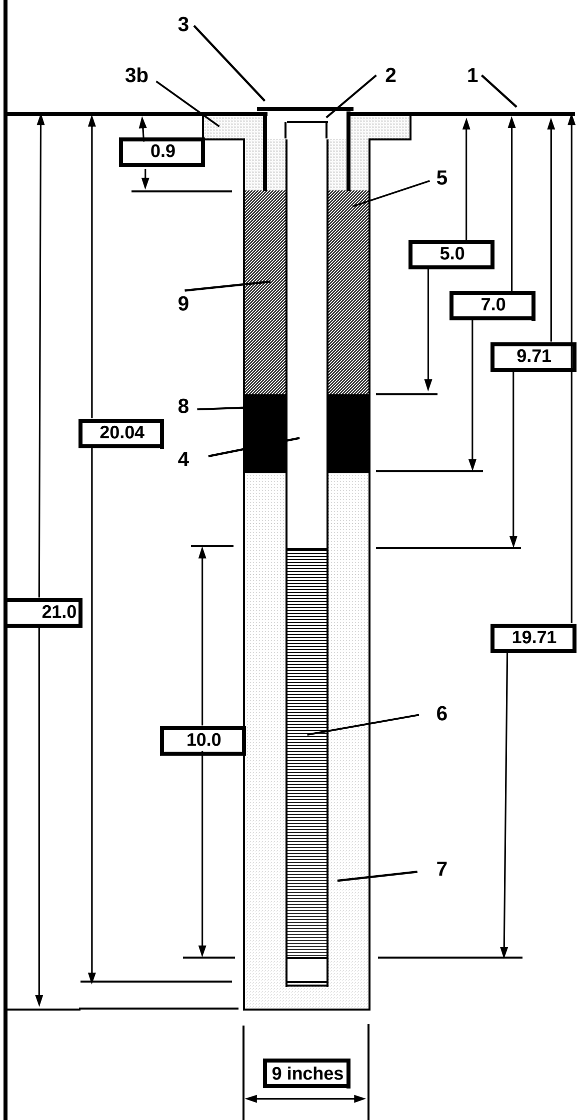
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 9.15 ft BGS (10/13/16) START : 10/11/2016 END : 10/11/2016 LOGGER : **L. Baerga**



1- Ground elevation at well	19.22
2- Top of casing elevation	18.98
3- Wellhead protection cover type	Flush Mount Steel Bolt-Down Roadbox
a) drain tube?	No
b) concrete pad dimensions	2 ft x 2 ft x 0.3 ft
4- Dia./type of well casing	2.0-inch I.D. / 2.375-inch O.D.
	Sched 40 PVC, flush thread w/ o-rings
5- Dia./type surface casing	8.0-inch I.D. Steel
6- Type/slot/size of screen	0.010-inch (10-slot) x 10 ft length
	Sched 40 PVC, flush thread w/ o-rings
7- Type screen filter	DSI Well Gravel #1A Silica Sand
a) Quantity used	6 Bags 300 Lbs.
8- Type of seal	Holeplug 3/8-inch WY Bentonite Chips
a) Quantity used	1.5 Bags 75 Lbs.
9- Grout	
a) Grout mix used	Portland Cement/Bentonite
b) Method of placement	Tremie Pump
c) Quantity used	15 Gallons
d) Vol. of well casing grout	1.7 Cubic ft
Development method	Submersible Pump
Development time	10/13/2016 8:25
Estimated purge volume	52 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OC-MW02 SHEET 1 OF 1

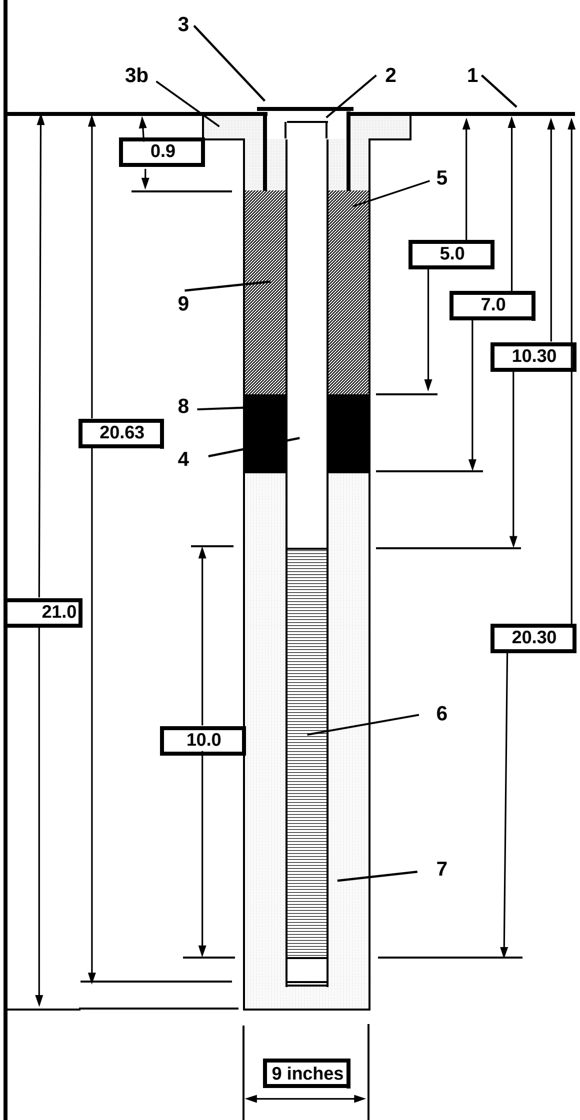
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 6.79 ft BGS (10/13/16) START : 10/12/2016 END : 10/12/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 22.43

2- Top of casing elevation: 22.22

3- Wellhead protection cover type: Flush Mount Steel Bolt-Down Roadbox
- a) drain tube? No
- b) concrete pad dimensions: 2 ft x 2 ft x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D. Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 8.0-inch I.D. Steel

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 6 Bags 300 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 15 Gallons
- d) Vol. of well casing grout: 1.7 Cubic ft

Development method: Submersible Pump

Development time: 10/13/2016 9:15

Estimated purge volume: 54 gallons

Comments

NOT TO SCALE

PROJECT NUMBER	WELL NUMBER
678440	OC-MW03 SHEET 1 OF 1

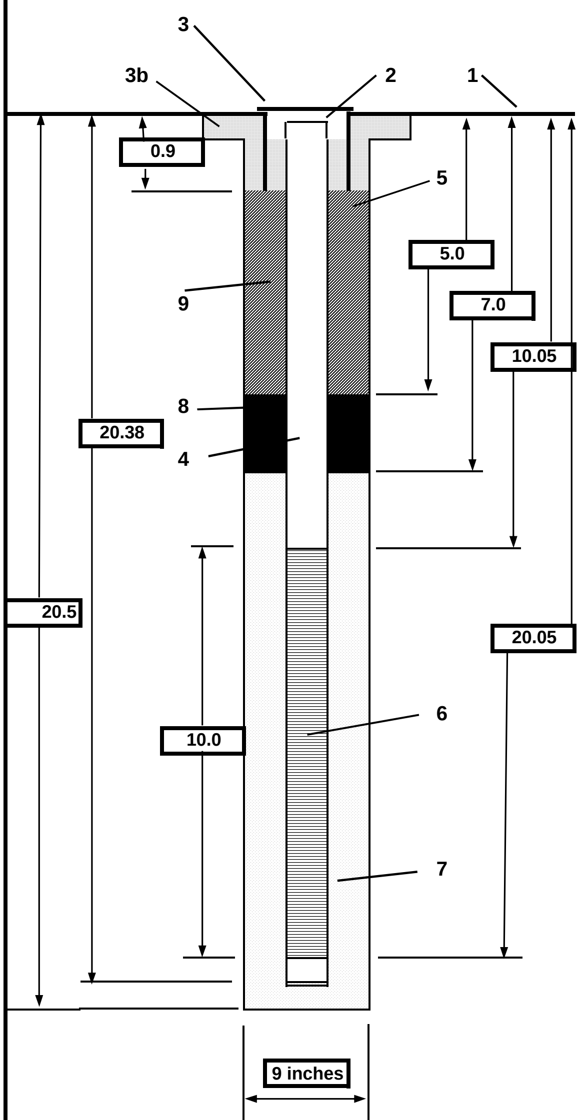
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 3.05 ft BGS (10/14/16) START : 10/13/2016 END : 10/13/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 13.91

2- Top of casing elevation: 13.58

3- Wellhead protection cover type: Flush Mount Steel Bolt-Down Roadbox
a) drain tube?: No
b) concrete pad dimensions: 2 ft x 2 ft x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.
Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 8.0-inch I.D. Steel

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length
Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
a) Quantity used: 6 Bags 300 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
a) Grout mix used: Portland Cement/Bentonite
b) Method of placement: Tremie Pump
c) Quantity used: 15 Gallons
d) Vol. of well casing grout: 1.7 Cubic ft

Development method: Submersible Pump

Development time: 10/14/2016 7:55

Estimated purge volume: 58 gallons

Comments

NOT TO SCALE

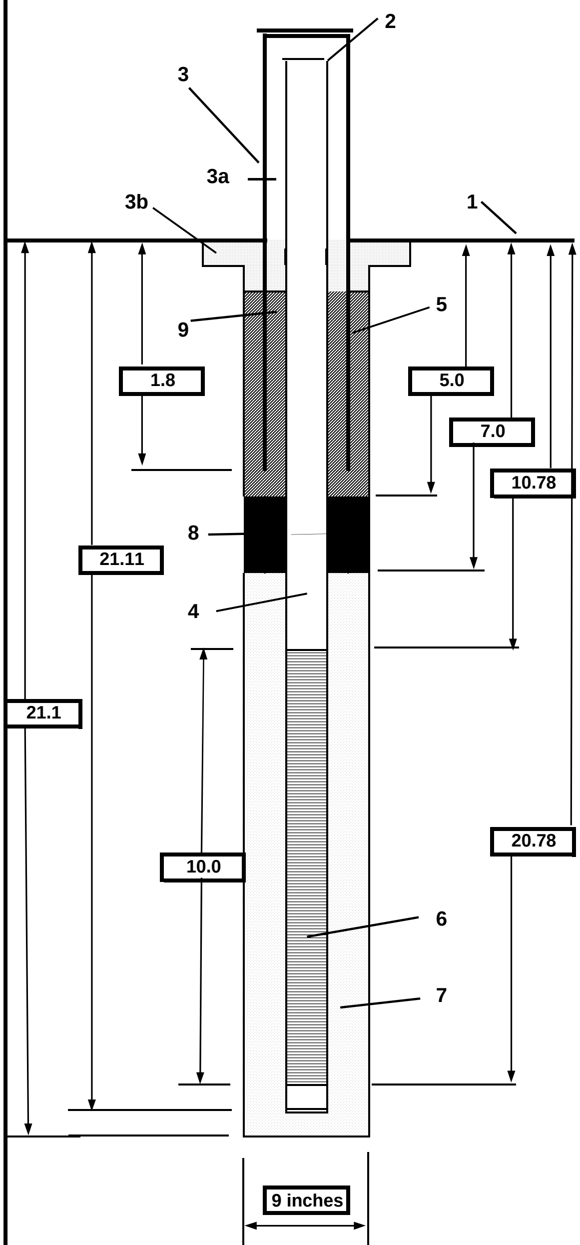
ch2m	PROJECT NUMBER 678440	WELL NUMBER OC-MW04 SHEET 1 OF 1
	WELL COMPLETION DIAGRAM	

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 1.83 ft BGS (10/13/16) START : 10/12/2016 END : 10/12/2016 LOGGER : **L. Baerga**



1- Ground elevation at well: 14.26

2- Top of casing elevation: 17.45

3- Wellhead protection cover type: 4.5-inch square Aluminum Standpipe
- a) drain tube?: No
- b) concrete pad dimensions: 2.5 ft diameter x 0.3 ft

4- Dia./type of well casing: 2.0-inch I.D. / 2.375-inch O.D.; Sched 40 PVC, flush thread w/ o-rings

5- Dia./type surface casing: 4.5-inch x 5-ft square Aluminum

6- Type/slot/size of screen: 0.010-inch (10-slot) x 10 ft length; Sched 40 PVC, flush thread w/ o-rings

7- Type screen filter: DSI Well Gravel #1A Silica Sand
- a) Quantity used: 6 Bags 300 Lbs.

8- Type of seal: Holeplug 3/8-inch WY Bentonite Chips
- a) Quantity used: 1.5 Bags 75 Lbs.

9- Grout
- a) Grout mix used: Portland Cement/Bentonite
- b) Method of placement: Tremie Pump
- c) Quantity used: 15 Gallons
- d) Vol. of well casing grout: 1.7 Cubic ft

Development method: Submersible Pump

Development time: 10/13/2016 11:45

Estimated purge volume: 58 gallons

Comments

PROJECT NUMBER	WELL NUMBER
678440.SI.SI	OC-MW07 SHEET 1 OF 1

ch2m

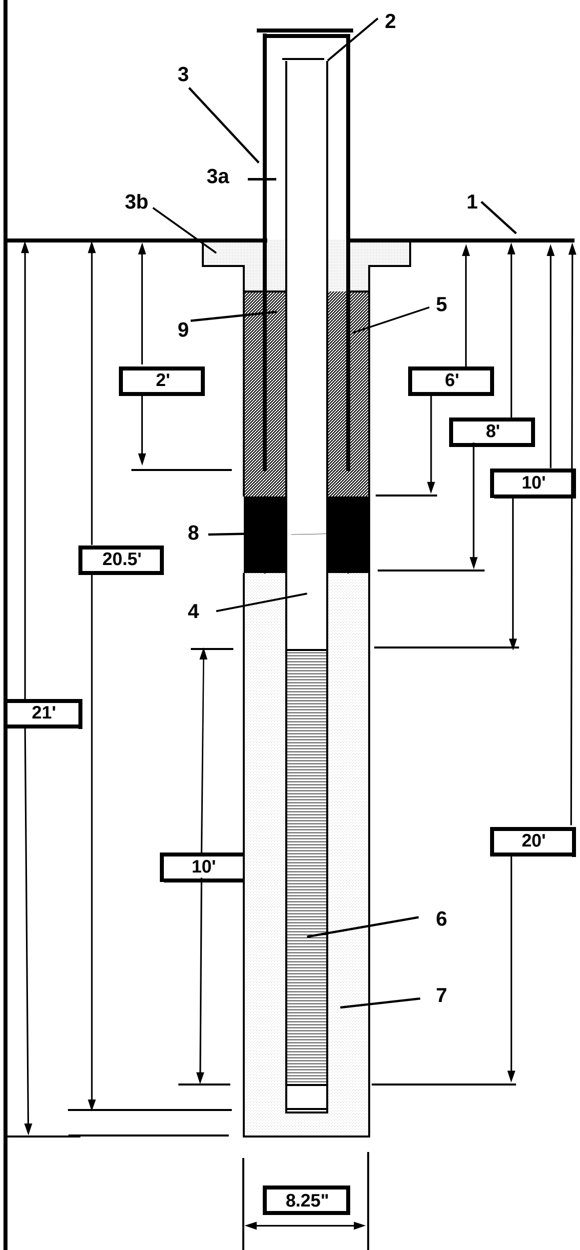
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC Investigation** LOCATION : **Virginia Beach, VA**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell**

WATER LEVELS : 6.0' bgs START : 3/13/2017 END : 3/13/2017 LOGGER : **M. Ost**



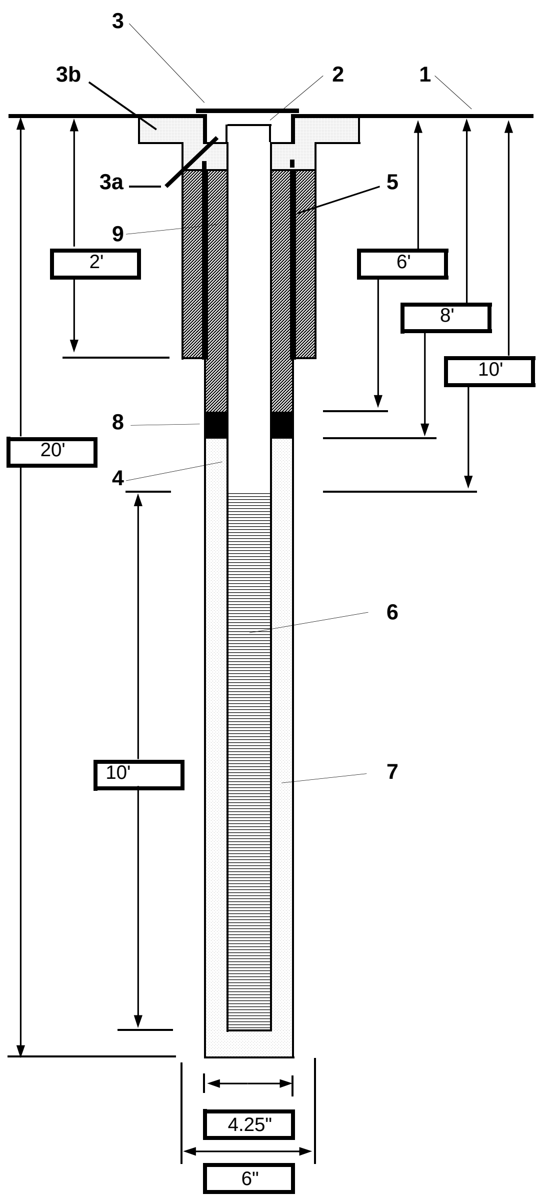
1-	Ground elevation at well	TBD
2-	Top of casing elevation	TBD
3-	Wellhead protection cover type	4" steel square
	a) drain tube?	No
	b) concrete pad dimensions	2' x 2' square
4-	Dia./type of well casing	2.0-inch I.D. / 2.375-inch O.D.
		Sched 40 PVC, flush thread w/ o-rings
5-	Dia./type surface casing	4" steel square cover, 3' stickup
6-	Type/slot/size of screen	0.010-inch (10-slot) x 10 ft length
		Sched 40 PVC, flush thread w/ o-rings
7-	Type screen filter	DSI Well Gravel #1A Silica Sand
	a) Quantity used	5 Bags 250 Lbs.
8-	Type of seal	Holeplug 3/8-inch WY Bentonite Chips
	a) Quantity used	1/2 Bag 25 Lbs.
9-	Grout	
	a) Grout mix used	Portland Cement/Bentonite
	b) Method of placement	Tremie Pump
	c) Quantity used	10 Gallons
	d) Vol. of well casing grout	1.33 Cubic ft
	Development method	Submersible Pump
	Development time	3/16/2017 8:55
	Estimated purge volume	50 gallons

Comments

PROJECT NUMBER	WELL NUMBER		
678440.SI.SI.02	MW-BG04R	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : NAS Oceana NRB Source Investigation   LOCATION : NAS Oceana
DRILLING CONTRACTOR : Geo Explorations
DRILLING METHOD AND EQUIPMENT USED : 4.25" HAS
WATER LEVELS : 9.8'   START : 8/8/17 1310   END : 8/8/17 1500   LOGGER : M.L.Ost



1-	Ground elevation at well	25.25
2-	Top of casing elevation	24.99
3-	Wellhead protection cover type	Flush Mount
	a) drain tube?	NA
	b) concrete pad dimensions	2x2" Concrete
4-	Dia./type of well casing	2" Schedule 40 PVC
5-	Dia./type surface casing	NA
6-	Type/slot/size of screen	0.010 Machine Slot Schedule 40 PVC
7-	Type screen filter	#1 Drillers Sand
	a) Quantity used	2 50# Bags
8-	Type of seal	3/8" Bentonite Chips
	a) Quantity used	1 Bag
9-	Grout	
	a) Grout mix used	Portland Cemet Bentonite Mixture
	b) Method of placement	Tremie
	c) Vol.of surface casing grout	NA
	d) Vol. of well casing grout	20 Gallons
	Development method	Whale Pump
	Development time	1 Hour
	Estimated purge volume	55 Gallons
	Comments	Replacement Well for BG04.

PROJECT NUMBER	BORING NUMBER	
678440	OC-MW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana

ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell

WATER LEVELS: 9.15 ft BGS (10/12/16) **START :** 10/11/2016 **END:** 10/11/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
0	0	C1	2.8	FILL	0.0 - 0.6 Sandy SILT (ML-SM), slightly damp, crumbly, roots 7.5YR 6/6 reddish yellow	
1				FILL	0.6 - 1.8 Asphalt mixed with coarse to fine gravel and sand (GW) dry, crumbly	
2				CL	1.8 - 2.8 CLAY with fine sand, silt (CL), crumbly, damp, mottled 10YR 5/2 grayish brown to 4/1 dark gray	
3				NR	2.8 - 5.0 NO RECOVERY	
4						
5	5					
	5	C2	2.0	MH	5.0 - 7.0 SILT, little fine sand, clay (MH), cohesive, dry crumbly to malleable, cohesive, mottled 5Y 4/1 dark gray with 5/1 gray	
6						
7					7.0 - 10.0 NO RECOVERY	
8						
9						
10	10					
	10	C3	3.0	SP	10.0 - 10.6 Fine SAND, trace silt, poorly graded (SP), damp 2.5Y 6/2 light brownish gray	
					10.6 - 13.0 Fine SAND, trace coarse to medium sand (SP), moist medium dense, 2.5Y 7/2 light gray	
11						
12						
13					13.0 -15.0 NO RECOVERY	
14						
15	15					
	15	C4	4.3		15.0 - 17.3 Fine SAND, trace coarse to medium sand (SP), moist medium dense, faint layering and oxidation staining 10YR 6/4 light yellowish brown	
16						
17				MH	17.3 - 18.6 Clayey SILT, little fine sand (MH), soft, cohesive, wet 10YR 5/4 yellowish brown	
18						
19				SM	18.6 - 19.3 Fine SAND, some silt, trace medium sand (SM), loose, wet 10YR 6/4 light yellowish brown to 6/6 brownish yellow	
					19.3 - 20.0 NO RECOVERY	Heaving fine sands
20	20				Bottom of Exploration: 20.0 ft	

ch2m

PROJECT NUMBER	BORING NUMBER	
678440	OC-MW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 6.79 ft BGS (10/12/16) **START :** 10/12/2016 **END:** 10/12/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION (Depth)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	3.7	SM	0.0 - 0.2	Fine SAND, silt loam topsoil (SM), damp, 7.5YR 4/3 brown	
				ML-MH	0.2 - 1.2	SILT, trace to little clay (ML-MH), soft, cohesive, damp dry, crumbly, 7.5YR 5/4 brown	
1					1.2 - 3.2	SILT, trace to little clay (ML-MH), soft, cohesive, damp dry, crumbly, 7.5YR 5/6 strong brown	
2							
3							
				SP	3.7 - 5.0	NO RECOVERY	
4							
5	5						
	5	C2	3.6		5.0 - 5.5	Fine SAND, trace silt (SP), loose, damp, faint layering 7.5YR 7/6 reddish yellow	
					5.5 - 6.1	Fine SAND, trace medium sand (SP), damp 7.5YR 7/6 reddish yellow	
6					6.1 - 7.0	Medium SAND, little fine sand, poorly graded (SP), wet 7.5YR 5/3 brown	
7					7.0 - 7.7	Medium SAND, little fine sand, poorly graded (SP), wet faint 2-inch layering, 10YR 5/3 brown	
8					7.7 - 8.6	Medium SAND, trace fine sand, poorly graded (SP), wet 10YR 6/4 light yellowish brown	
					8.6 - 10.0	NO RECOVERY	
9							
10	10						
	10	C3	3.0	SW	10.0 - 12.3	Coarse SAND, little medium sand, trace fine sand (SW) dense, wet 10YR 6/4 light yellowish brown	
11							
12							
				SP	12.3 - 13.0	Fine SAND, trace medium sand, poorly graded (SP), wet medium dense, 10YR 8/4 very pale brown	
13					13.0 -15.0	NO RECOVERY	
14							
15	15						
	15	C4	4.8		15.0 - 16.8	Fine SAND (SP), medium dense, wet oxidation staining, 10YR 7/3 very pale brown	
16							
17				SW	16.8 - 17.6	Medium SAND, trace coarse, fine sand and gravel (SW) wet, mottled with strong oxidation staining 7.5YR 6/6 reddish yellow	
18				CL	17.6 - 18.8	CLAY (CL), little silt, soft, wet, finely laminated 10YR 6/3 pale brown with 10YR 6/6 brownish yellow	
19				SW	18.8 - 19.8	Medium SAND, little coarse, trace fine sand (SW) wet, faint layering, strong oxidation staining 7.5YR 6/4 light brown with 6/8 reddish yellow	
					19.8 - 20.0	NO RECOVERY	
20	20					Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OC-MW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 3.05 ft BGS (10/14/16) **START :** 10/13/2016 **END:** 10/13/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	3.7	ML-SM	0.0 - 0.2 SILT, fine SAND topsoil (ML-SM), damp, 5YR 3/2 brown	
				ML	0.2 - 1.1 SILT, trace fine sand (ML), soft, crumbly, dry, mottled 7.5YR 5/1 gray with 5/2 brown and 5/6 strong brown	
1				MH	1.1 - 1.7 Clayey SILT (MH), crumbly, hard, cohesive, damp mottled, 7.5YR 6/1 gray with 5/2 brown and 5/6 strong brown	
2				MH	1.7 - 3.0 SILT, little clay (MH), soft, crumbly damp, mottled 7.5YR 5/2 to 4/2 brown	
3				ML	3.0 - 3.7 SILT, little fine sand, trace clay (ML), crumbly, soft, damp mottled, 10YR 5/3 brown to 5/6 yellowish brown	
4					3.7 - 5.0 NO RECOVERY	
5	5					
	5	C2	3.7	SM	5.0 - 7.0 Fine sand, little silt (SM), loose, wet 5Y 4/1 dark gray	
6						
7				SP	7.0 - 7.5 Fine sand, trace silt (SP), loose, wet 5Y 4/1 to 5/1 dark gray to gray	
				SP	7.5 - 8.3 Fine sand, trace silt (SP), loose, wet 10YR 6/8 brownish yellow	
8				SM	8.3 - 8.7 Fine sandy SILT (SM), soft, crumbly, wet, mottled 10YR 5/3 brown with 5/6 yellowish brown	
9					8.7 - 10.0 NO RECOVERY	Auger cuttings, liquified fine gray sands
10	10					
	10	C3	2.8	SP	10.0 - 12.8 Fine SAND, poorly graded (SP), loose, wet no structure, 10YR 5/1 gray	
11						
12					12.8 -15.0 NO RECOVERY	Auger cuttings, liquified fine gray sands
13						
14						
15	15					
	15	C4	0.3	SP	15.0 - 15.3 Fine SAND (SP), loose, wet, 10YR 5/1 gray	Auger cuttings, liquified fine gray sands
16					15.3 - 20.0 NO RECOVERY	
17						
18						
19						
20	20				Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OC-MW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 1.83 ft BGS (10/14/16) **START :** 10/12/2016 **END:** 10/12/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	5.0	ML	0.0 - 1.1	SILT, trace clay (ML), soft, crumbly, damp 10YR 6/3 pale brown	
1				MH	1.1 - 3.1	SILT, little clay (MH), medium stiff, malleable, damp 10YR 6/2 light brownish gray slightly oxidized from 1.6 to 1.7 ft	
2							
3				CL	3.1 - 3.9	CLAY (CL), little silt, dry-damp, stiff, crumbly 10YR 5/2 grayish brown	
4					3.9 - 5.0	CLAY (CL), trace silt, dry-damp, stiff, crumbly, cohesive mottled, 2.5Y 7/2 light gray with 10YR 6/6 brownish yellow	
5	5						
	5	C2	2.5		5.0 - 5.6	CLAY (CL), trace silt, dry-damp, stiff, crumbly, cohesive mottled, 2.5Y 7/2 light gray with 10YR 6/6 brownish yellow	
6				ML	5.6 - 6.2	SILT, trace fine sand (ML), moist, heavily oxidized, mottled faint seams, 10YR 7/2 light gray with 6/6 brownish yellow	
7				SP-SM	6.2 - 7.5	Fine SAND, trace to little silt (SP-SM), wet 10YR 5/1 gray	
8					7.5 - 10.0	NO RECOVERY	
9							
10	10						
	10	C3	4.7	SP	10.0 - 10.7	Fine SAND, trace silt (SP), loose, wet no structure, 2.5Y 5/1 gray	
11					10.7 - 14.7	Fine SAND, poorly graded (SP), wet no structure, 2.5Y 6/1 gray	
12							
13							Auger cuttings, liquified fine gray sands
14					14.7 -15.0	NO RECOVERY	
15	15						
	15	C4	4.4		15.0 - 15.9	Fine SAND, trace silt (SP), loose, wet no structure, 2.5Y 5/1 gray	
16				SP-SM	15.9 - 19.4	Fine SAND, trace to little silt (SP-SM), wet interbedded with 1-2 inch layers of soft silt 10YR 4/1 dark gray	
17							
18							
19					19.4 - 20.0	NO RECOVERY	
20	20					Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	OC-MW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation Phase II **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 6' bgs **START :** 3/13/2017 **END** 3/13/2017 **LOGGER :** M. Ost

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	2.0	ML	0.0 - 2.0 SILT (ML), reddish brown (5YR 5/3), dry, loose	
1						
2				NR	2.0 - 5.0 NO RECOVERY	
3						
4						
5	5					
	5	C2	2.0	ML	5.0 - 6.0 SILT (ML), reddish brown (5YR 5/3), dry, loose	
6				SM	6.0 - 7.0 SANDY SILT (SM), wet at 6.0' bgs, dark gray (10YR 4/1) loose, fine grain	
7				NR	7.0 - 10.0 NO RECOVERY	
8						
9						
10	10					
	10	C3	2.0	CL	10.0 - 12.0 SILTY LEAN CLAY (CL), wet, gray (10YR 5/1), soft, plastic	
11						
12				NR	12.0-15.0 NO RECOVERY	
13						
14						
15	15					
	15	C4	3.0	SM	15.0 - 18.0 SILTY SAND (SM), wet, dark greenishe gray (GLEY 2 4/10BG), loose, fine grain	
16						
17						
18				NR	18.0 - 20.0 NO RECOVERY	
19						
20	20				Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW4	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 3.37 ft BGS (10/6/16) **START :** 10/4/2016 **END:** 10/4/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
0	0	C1	4.3	FILL	0.0 - 0.3	Silt loam topsoil (OL), dry, crumbly, 10YR 4/2 dark grayish brown	Cored through buried asphalt to 0.6 ft with 12-inch diameter cutting bit, then advanced soil core barrel to 5 ft
				FILL	0.3 - 0.6	Black asphalt fragments	
1				CH	0.6 - 1.8	CLAY (CH), stiff, dry, crumbly, 5Y 5/2 olive gray	
2				CH	1.8 - 2.8	CLAY (CH), stiff, slightly damp, massive structure, mottled 10YR 4/2 dark grayish brown with 10YR 6/6 brownish yellow	
3				CL	2.8 - 3.9	CLAY (CL), medium stiff, faint lamination, dry/damp, mottled 10YR 7/1 light gray with 10 YR 6/6 brownish yellow	
4				ML	3.9 - 4.3	SILT (ML), soft, wet, laminated 10YR 5/6 yellowish brown	
					4.3 - 5.0	NO RECOVERY	
5	5 / 5	C2	3.9	ML	5.0 - 6.1	SILT (ML), trace fine sand, soft, wet, laminated, mottled 10 YR 5/6 yellowish brown with 10 YR 7/1 light gray	
6				SM	6.1 - 6.8	Fine SAND, some silt (SM), loose, wet, faint seams, mottled 10 YR 7/1 light gray with 10 YR 7/6 yellow	
7				SP	6.8 - 7.9	Fine SAND, trace medium sand, trace silt, poorly graded (SP) medium dense, wet, faint layering, 10 YR 7/4 very pale brown	
8				SP	7.9 - 8.9	Fine SAND, trace medium sand, poorly graded (SP), medium dense wet, 10 YR 7/1 light gray	
9					8.9 - 10.0	NO RECOVERY	
10	10 / 10	C3	3.8	SP	10.0 - 13.3	Fine SAND, trace silt, poorly graded (SP), medium dense, wet massive structure, 10 YR 6/1 gray	
11							
12							
13				SM	13.3 - 13.8	Fine SAND, little-some silt (SM), loose, wet 2.5 YR 5/1 gray	
14					13.8 - 15.0	NO RECOVERY	
15	15 / 15	C4	5.0	SM-ML	15.0 - 17.2	Fine SAND, little-some silt, interbedded with seams of silt (SM-ML) loose/soft, wet, 2.5 YR 5/1 gray	
16							
17				ML	17.2 - 20.0	SILT, trace clay, trace fine sand (ML), soft, wet seamed/laminated, 2.5 YR 5/1 gray	
18							
19							
20	20					Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW5	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NAS Oceana PFC Investigation** **LOCATION :** **NAS Oceana**

ELEVATION : **DRILLING CONTRACTOR :** **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell

WATER LEVELS: 4.38 ft BGS (10/6/16) **START :** 10/4/2016 **END:** 10/4/2016 **LOGGER :** **L. Baerga**

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	3.9	FILL	0.0 - 0.5 ORGANIC SILT, little fine sand (OL), damp, 5YR 3/1 very dark gray	
1					0.5 - 0.8 Dense Black asphalt layer	
					0.8 - 1.5 Medium SAND, little coarse sand, trace fine sand (SW) dense, dry, 2.5Y 5/4 light olive brown	
					1.5 - 1.6 coarse gravel (GP)	
2				MH	1.6 - 2.8 SILT (MH), crumbly, slightly cohesive, medium stiff, damp mottled, 7.5YR 5/2 brown	
3				CL	2.8 - 3.3 CLAY (CL), medium stiff, cohesive, dry/damp, mottled 7.5YR 5/2 brown with 7.5YR 6/6 reddish yellow	
4					3.3 - 3.9 CLAY (CL), medium stiff, cohesive, dry/damp, mottled 7.5YR 6/1 gray with 7.5YR 6/6 reddish yellow	
				ML	3.9 - 5.0 NO RECOVERY	
5	5					
	5	C2	3.3		5.0 - 5.2 SILT (ML), elastic and lean Clay (CL),damp, mottled 7.5YR 6/1 gray with 7.5YR 6/6 reddish yellow	
6					5.2 - 6.5 SILT (ML),little fine sand, moist, 7.5YR 6/4 light brown	
				SP	6.5 - 7.6 Fine SAND, poorly graded (SP) loose, moist 2.5YR 7/2 light gray	
7					7.6 - 8.3 Fine SAND, poorly graded (SP), trace silt, moist 2.5Y 5/1 gray	
8					8.3 - 10.0 NO RECOVERY	
9						
10	10					
	10	C3	4.2		10.0 - 14.2 Fine SAND, trace medium sand, poorly graded (SP), wet 2.5Y 7/1 light gray	
11						
12						
13						
14					14.2 - 15.0 NO RECOVERY	
15	15					
	15	C4	4.3		15.0 - 16.2 Fine SAND, trace silt, poorly graded (SP), faintly laminated wet, 2.5Y 5/1 gray	
16				SM	16.2 - 18.3 SILT, some fine sand (SM), laminated, soft, wet 5Y 4/1 dark gray	
17				ML-MH	18.3 - 19.3 SILT, increasing clay content (ML-MH), very soft, wet some cohesivenss, laminated, 5Y 4/1 dark gray	
18						
19					19.3 - 20.0 NO RECOVERY	
20	20				Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW6	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 5.85 ft BGS (10/6/16) **START :** 10/6/2016 **END:** 10/6/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	3.4	FILL	0.0 - 0.6 Asphalt gravel, cobbles, coarse to fine sand (GW) 0.6 - 1.6 12 inch concrete slab	Cored through 12-inch concrete slab to 1.6 ft with 12-inch diameter cutting bit then advanced soil core barrell to 5 ft
1					1.6 - 1.9 SAND, coarse to fine grained, trace fine gravel (SW) black dry crumbly	
2				CL	1.9 - 3.4 CLAY, trace silt (CL), damp, medium stiff 10YR 5/2 grayish brown	
3					3.4 - 5.0 NO RECOVERY	
4						
5	5				5.0 - 5.1 CLAY (CH), damp, malleable, cohesive, medium stiff 10YR 5/2 grayish brown	
	5	C2	3.2		5.1 - 6.1 CLAY, trace silt (CL), damp, malleable, crumbly, mottled 10Y 5/2 grayish olive with 2.5Y 6/4 light yellowish brown	
6				ML	6.1 - 7.2 SILT, trace clay, trace fine sand (ML), moist, soft to medium dense, GLEY 1 5/1 greenish gray	
7				SM	7.2 - 8.1 Fine SAND, little silt (SM), wet, loose to medium dense GLEY 1 5/1 greenish gray	
8				SP	8.1 - 8.2 Fine SAND, poorly graded (SP), wet 2.5Y 5/1 gray 8.2 - 10.0 NO RECOVERY	
9						
10	10					
	10	C3	3.5		10.0 - 13.5 Fine SAND, trace coarse to medium sand (SP), wet massive structure, medium dense, 2.5Y 5/1 to 6/1 gray	
11						
12						
13					13.5 - 15.0 NO RECOVERY	Auger cuttings are gray, liquified fine sand
14						
15	15					
	15	C4	4.9		15.0 - 17.8 Fine SAND, trace silt, poorly graded (SP), wet loose to medium dense, 5Y 5/1 gray	
16						
17				SM	17.8 - 18.8 Fine SILTY SAND (SM), laminated, soft, wet, liquified 5Y 4/1 dark gray	
18				ML	18.8 - 19.9 SILT, trace fine sand (ML), inclusions of red-brown peat very soft, wet	
19					19.9 - 20.0 NO RECOVERY Bottom of Exploration: 20.0 ft	Auger cuttings are gray, liquified fine sand, silt
20	20					

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW7	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana

ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell

WATER LEVELS: 5.59 ft BGS (10/6/16) **START :** 10/5/2016 **END:** 10/5/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	2.0	FILL	0.0 - 1.2 Cobbles, coarse to fine gravel, coarse to fine sand (GW)	
1				CL	1.2 - 1.5 CLAY (CL), trace silt, fine sand, crumbly, dry, hard 2.5Y 5/2 grayish brown	
2				MH	1.5 - 2.0 SILT (ML), trace clay, crumbly, hard, dry 10YR 3/1 very dark gray	
3				CH	2.0 - 5.0 NO RECOVERY	Auger cuttings from 2.0 to 5.0 ft: CLAY (CH), moist, cuttings are cohesive, soft clumps 10YR 4/2 dark grayish brown to 3/1 very dark gray
4						
5	5					
	5	C2	3.0	ML-SM	5.0 - 7.3 SILT, trace to little fine sand (ML-SM), medium dense, wet, 10Y 5/2 grayish olive grading to fine sand by 7.3 ft	
6						
7						
				SP	7.3 - 8.0 Fine SAND, poorly graded (SP), loose, wet no bedding structure, 5Y 7/1 light gray	
8					8.0 - 10.0 NO RECOVERY	Auger cuttings are gray, wet fine sand
9						
10	10					
	10	C3	4.0		10.0 - 14.0 Fine SAND, trace medium sand, poorly graded (SP), wet dense, 2.5Y 6/1 gray	
11						
12						
13						
14				ML-SM	14.0- 15.0 NO RECOVERY	
15	15					
	15	C4	0.0		15.0- 20.0 NO RECOVERY	Auger cuttings are liquified dark gray silt and fine sand, consistency of slurry
16						
17						
18						
19						
20	20				Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW8	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana

ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell

WATER LEVELS: 4.40 ft BGS (10/6/16) **START :** 10/5/2016 **END:** 10/5/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
0	0	C1	4.8	OL	0.0 - 0.3 SILT topsoil (OL), slightly damp, crumbly 7.5YR 3/2 dark brown	
				ML	0.3 - 0.9 SILT, trace clay (ML), dry, crumbly 7.5YR 5/2 brown	
1				CL	0.9 - 3.4 CLAY (CL), damp, medium stiff, cohesive, mottled 7.5YR 5/2 brown with 7.5YR 6/6 reddish yellow	
3					3.4 - 4.6 CLAY (CL), damp, medium stiff, cohesive, mottled 10YR 7/1 light gray with 10YR 6/6 brownish yellow occassional lenses of dark brown silt	
4				ML	4.6 - 4.8 SILT (ML), trace fine sand, damp, crumbly 10YR 5/3 brown	
5	5				4.8 - 5.0 NO RECOVERY	
	5	C2	3.0	ML-SM	5.0 - 5.4 SILT, little very fine sand (ML-SM), damp 10YR 5/2 grayish brown	
				SP	5.4 - 6.6 Fine SAND, poorly graded (SP), damp, medium dense 10YR 7/3 very pale brown	
6					6.6 - 6.9 Fine SAND, poorly graded (SP), damp, medium dense 10YR 6/6 brownish yellow	
7					6.9 - 8.0 Fine SAND, trace medium sand, poorly graded (SP), moist medium dense, 10YR 5/1 gray	
8					8.0 - 10.0 NO RECOVERY	Auger cuttings are gray, wet fine sand
9						
10	10					
	10	C3	3.9		10.0 - 13.9 Fine SAND, trace medium sand, trace silt (SP), wet medium dense, no bedding structure 10YR 6/1 gray	
11						
12						
13						Auger duttings are gray, wet fine sand, silt liquified to a slurry consistency
14					13.9 - 15.0 NO RECOVERY	
15	15					
	15	C4	4.8	SP-SM	15.0 - 16.6 Fine SAND, trace to little silt (SP-SM), wet loose, no bedding structure 2.5Y 5/1 gray	
16				ML-SM	16.6 - 19.8 SILT, little very fine sand (ML-SM), soft, weak, wet, 2.5Y 4/1 dark gray	
17						
18						
19					19.8 - 20.0 NO RECOVERY	
20	20				Bottom of Exploration: 20.0 ft	

ch2m

PROJECT NUMBER	BORING NUMBER	
678440	OW11-MW9	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : **NAS Oceana PFC Investigation** **LOCATION :** **NAS Oceana**
ELEVATION : **DRILLING CONTRACTOR :** **Parratt Wolff**
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 4.84 ft BGS (10/6/16) **START :** 10/4/2016 **END:** 10/4/2016 **LOGGER :** **L. Baerga**

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: NUMBER AND TYPE	SAMPLE: RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	C1	4.1	OL-OH	0.0 - 0.4 SILT, clay topsoil (OL), slightly damp, crumbly, medium hard 10YR 4/2 dark grayish brown	
1					0.4 - 4.1 CLAY (CL), damp, medium to stiff, cohesive, mottled 10YR 5/2 grayish brown with 10YR 6/6 brownish yellow	
2				CL		
3						
4					4.1 - 5.0 NO RECOVERY	
5	5					
	5	C2	2.8		5.0 - 6.5 Medium SAND, trace fine sand and silt, poorly graded (SP) moist, medium dense, color changes with depth from 10YR 7/4 very pale brown to 10YR 7/6 yellow	
6					6.5 - 7.8 Medium SAND, poorly graded (SP), wet, medium dense no bedding structure, 2.5Y 6/1 gray	
7						
8					7.8 - 10.0 NO RECOVERY	Auger cuttings are gray, wet fine sand
9				SP		
10	10					
	10	C3	3.8		10.0 - 13.8 Medium SAND, poorly graded (SP), wet, grading to fine sand from 12.3 ft, no bedding structure 2.5Y 6/1 gray	
11						
12						
13						
14					13.8 - 15.0 NO RECOVERY	Auger duttings are gray, wet fine sand, silt liquified to a slurry consistency
15	15					
	15	C4	2.7	SM	15.0 - 17.2 Fine SAND, little silt (SM), wet, loose, no bedding structure 2.5Y 4/1 dark gray	
16						
17					17.2 - 17.7 SILT, some fine sand (ML-SM), soft, weak, wet, 2.5Y 4/1 dark gray	
18					17.7 - 20.0 NO RECOVERY	Auger duttings are gray, wet fine sand, silt liquified to a slurry consistency
19				ML-SM		
20	20				Bottom of Exploration: 20.0 ft	

ch2m

PROJECT NUMBER	BORING NUMBER	
678440	OW26-MW1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana PFC Investigation **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 9.0-in OD/4.25-in ID Augers, 2-inch x 5-ft sealed soil core barrell
WATER LEVELS: 3.32 ft BGS (10/12/16) **START :** 10/11/2016 **END:** 10/11/2016 **LOGGER :** L. Baerga

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Headspace
	0	H1	N/A	SM	0.0 - 0.3 Sandy loam topsoil (SM), slightly damp, crumbly, roots 5YR 3/2 dark reddish brown	Hand auger to 5 ft. Difficult to cut through soils from 0.3 to 4.0 ft (dense soils) Wet soil at 4.0 ft
1					0.3 - 3.3 Medium SAND, little fine sand, trace silt (SP), dense, wet 2.5Y 4/3 reddish brown	
2				SP		
3					3.3 - 4.0 Medium SAND, little fine sand, trace silt (SP), dense, wet 7.5YR 6/4 light brown	
4				MH	4.0 - 5.0 SILT, little clay (MH),wet, soft 5YR 4/2 dark reddish gray	
5	5					
	5	C2	3.1	SP	5.0 - 5.6 Fine SAND, trace medium sand, poorly graded (SP), wet medium dense, 7.5YR 5/2 brown	
6				CL	5.6 - 5.9 CLAY, trace silt (CL), damp, soft, cohesive 7.5YR 3/1 very dark gray 5.9 - 6.4 CLAY (CL), medium stiff, cohesive, damp, laminated Gley 1 8/1 light greenish gray and 2.5Y 6/6 olive yellow	
7					6.4 - 7.1 Fine SAND, trace to little silt (SP-SM), loose, wet 2.5Y 5/1 gray 7.1 - 8.1 Fine SAND, trace silt (SP), loose, wet 2.5Y 7/2 light gray	
8					8.1 - 10.0 NO RECOVERY	Auger cuttings are liquified fine gray sand
9						
10	10					
	10	C3	0.0		10.0 - 15.0 NO RECOVERY	Auger cuttings are liquified fine gray sand
11						
12						
13				SP		
14						
15	15					
	15	C4	4.3		15.0 - 16.0 Medium SAND, little fine sand (SP), wet, loose 2.5Y 6/1 gray	Auger duttings are gray, wet fine sand liquified to a slurry consistency
16					16.0 - 19.3 Fine SAND (SP), wet, loose 2.5Y 6/1 gray	
17						
18						
19					19.3 - 20.0 NO RECOVERY	
20	20				Bottom of Exploration: 20.0 ft	

PROJECT NUMBER	BORING NUMBER	
678440	OC-MW-BG04R	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAS Oceana Natural Resources Building **LOCATION :** NAS Oceana
ELEVATION : **DRILLING CONTRACTOR :** Geologic Exploration
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger Drilling 6.0-in OD/4.25-in ID Augers
WATER LEVELS: 7.0 ft BGS (8/2/17) **START :** 8/2/2017 **END:** 8/2/2017 **LOGGER : M.Ost**

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (FT)	USCS Code	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)		COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): 3reathing Zon Headspace)
	0	1	N/A		0.0 - 1.0	soil/dry wood material	
1				ML	1.0-4.0	Silt, ML, reddish gray, dry, medium dense, some iron matte 5yr/5/2	
2							
3							
4				SP	4.0-5.0	SAND, SP, very pale brown, moist, loose 10yr/7/3	
5	5						
	5	2		SP	5.0-8.0	SAND, SP, very pale brown, water table at 7.0 ft bgs 10yr/7/3	
6							
7							
8					8.0-10.0	SAND, SP, light red, saturated, organic stain at bottom 2.5y/6/6	
9							
10	10						
	10	3			10.0-14.0	SAND, SP, light red, saturated, organic stain at bottom 2.5y/6/6	
11							
12							
13							
14				CL	14.0-14.5	Clay, CL, light greenish gray, saturated Gley 1 7/5G soft	
				SP	14.5-15.0	SAND, SP, light greenish gray, saturated, loose, mediium grain Gley 1 7/5G soft	
15	15						
	15	4		SP	15.0-17.0	SAND, SP, pink, saturated, loose, mediium grain 7.5yr/7/4	
16							
17				CL	17.0-19.0	Clay, CL, bluish gray, saturated, soft Gley 2/5/10B	
18							
19				SP	19.0-20.0	SAND, SP, bluish gray, saturated Gley 2/6/10B	
20	20						
	20	5			20.0-22.0	SAND, SP, bluish gray, saturated, coarse Gley 2/6/10B	
21							
22				CL	22.0-24.0	SAND, SP, bluish gray, saturated, very soft Gley 2/6/10B	
23							
24					24.0-25.0	SAND, SP, saturated, loose, medium grain	
25	25					Bottom of Exploration: 25.0 ft	

Appendix C
Yorktown Monitoring Well Completion Diagrams and Soil Boring Logs

	PROJECT NUMBER	WELL NUMBER
ch2m	678440.SI.SI.01	OW11-MW10D SHEET 1 OF 1

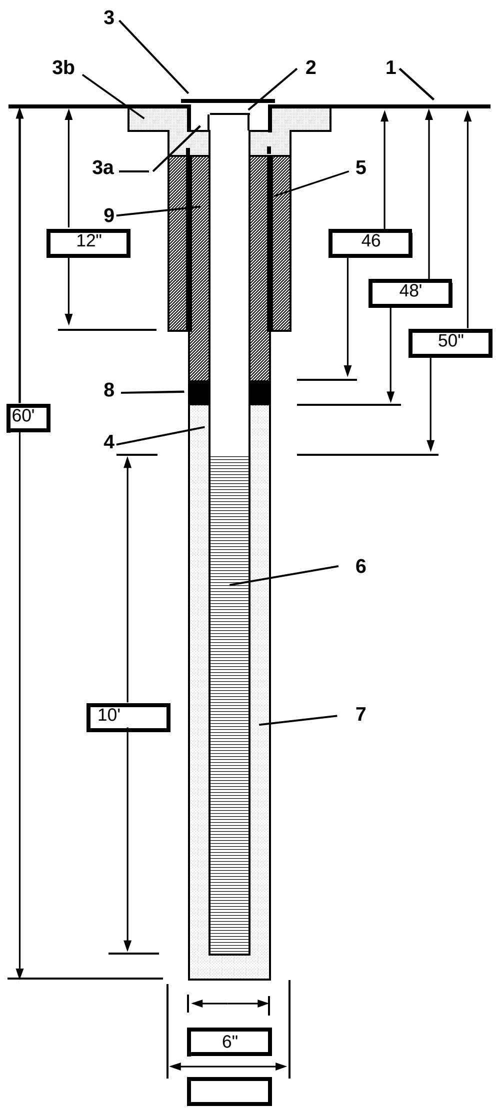
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC** LOCATION : **NAS Oceana**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **4.25" Hollow Stem Auger**

WATER LEVELS : 7 START : 1300 3/14/17 END : 1845 3/14/17 LOGGER : **M.L. Ost**



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type Flush Mount
- a) drain tube? NA
- b) concrete pad dimensions 2x2 Concrete

4- Dia./type of well casing 2" Schedule 40 PVC

5- Dia./type surface casing NA

6- Type/slot/size of screen 0.010 Machine Slot PVC. Schedule 40

7- Type screen filter # 1 Drillers Sand
- a) Quantity used 8. 50lbs. Bags

8- Type of seal 3/8" Bentonite Chips
- a) Quantity used 1 Bag

9- Grout
- a) Grout mix used Portland and Bentonite
- b) Method of placement Tremie
- c) Vol.of surface casing grout
- d) Vol. of well casing grout 75 Gallons

Development method Whale Pump

Development time 1 Hour

Estimated purge volume 55 Gallons

Comments

	PROJECT NUMBER	WELL NUMBER
ch2m	678440.SI.SI.01	**OW26-MW1D** SHEET 1 OF 1

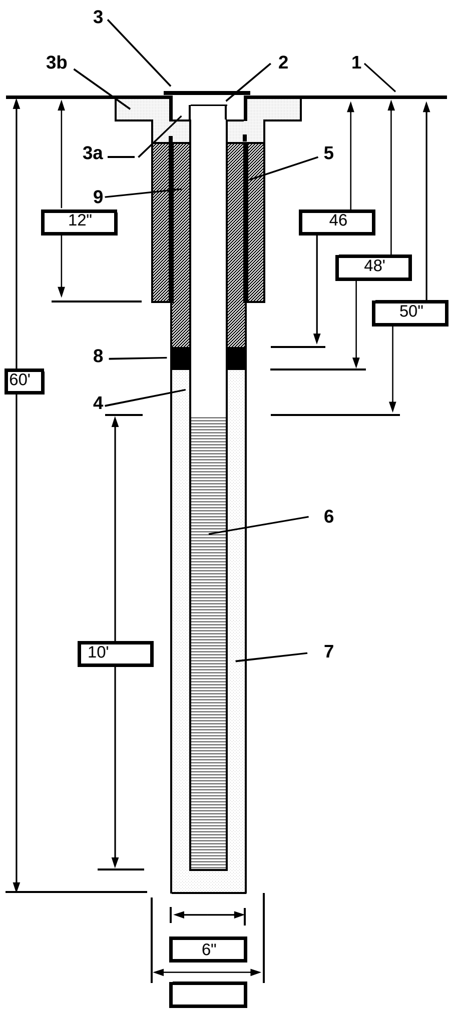
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC** LOCATION : **NAS Oceana**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **4.25" Hollow Stem Auger**

WATER LEVELS : 7 START : 0740 3/08/17 END : 1720 3/08/17 LOGGER : M.L. Ost



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: Flush Mount
- a) drain tube?: NA
- b) concrete pad dimensions: 2x2 Concrete

4- Dia./type of well casing: 2" Schedule 40 PVC

5- Dia./type surface casing: NA

6- Type/slot/size of screen: 0.010 Machine Slot PVC. Schedule 40

7- Type screen filter: # 1 Drillers Sand
- a) Quantity used: 8. 50lbs. Bags

8- Type of seal: 3/8" Bentonite Chips
- a) Quantity used: 1 Bag

9- Grout
- a) Grout mix used: Portland and Bentonite
- b) Method of placement: Tremie
- c) Vol.of surface casing grout:
- d) Vol. of well casing grout: 55 Gallons

Development method: Whale Pump

Development time: 1 Hour

Estimated purge volume: 55 Gallons

Comments: Fire Station Deep Well

ch2m	PROJECT NUMBER 678440.SI.SI.01	WELL NUMBER OC-MW02D	SHEET 1 OF 1

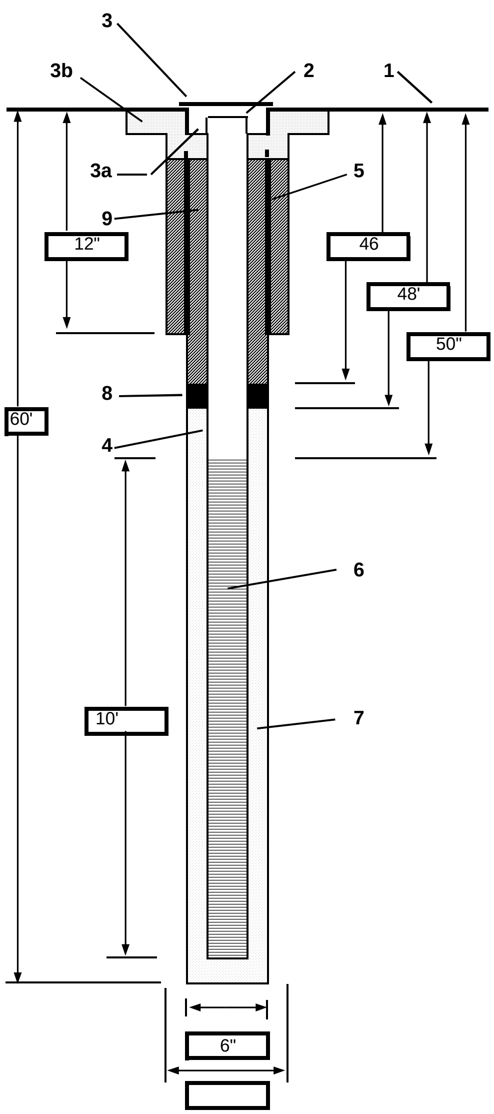
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC** LOCATION : **NAS Oceana**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : 4.25" **Hollow Stem Auger**

WATER LEVELS : 7 START : 1234 3/20/17 END : 0904 3/21/17 LOGGER : M.L. Ost



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Flush Mount
a) drain tube?	NA
b) concrete pad dimensions	2x2 Concrete
4- Dia./type of well casing	2" Schedule 40 PVC
5- Dia./type surface casing	NA
6- Type/slot/size of screen	0.010 Machine Slot PVC. Schedule 40
7- Type screen filter	# 1 Drillers Sand
a) Quantity used	7. 50lbs. Bags
8- Type of seal	3/8" Bentonite Chips
a) Quantity used	1 Bag
9- Grout	
a) Grout mix used	Portland and Bentonite
b) Method of placement	Tremie
c) Vol.of surface casing grout	
d) Vol. of well casing grout	70 Gallons
Development method	Whale Pump
Development time	1 Hour
Estimated purge volume	55 Gallons
Comments	Vacapes

PROJECT NUMBER	WELL NUMBER		
678440.SI.SI.01	OC-MW05D	SHEET 1	OF 1

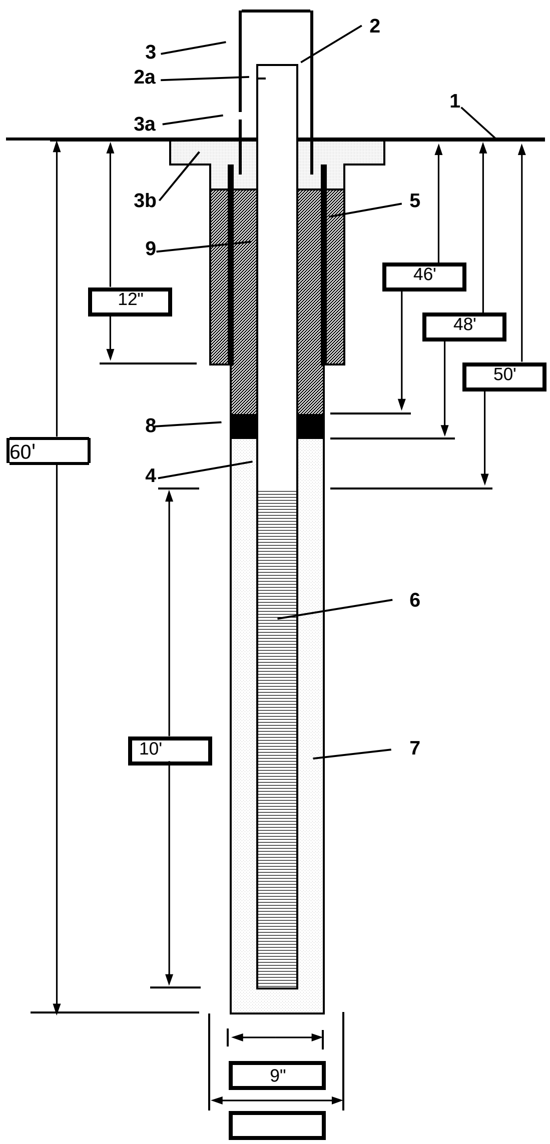
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC** LOCATION : **NAS Oceana - Potters Road**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **4.25" Hollow Stem Auger**

WATER LEVELS : 7 START : 1215 3/16/17 END : 1650 3/16/17 LOGGER : M.L. Ost



1- Ground elevation at well

2- Top of casing elevation
a) vent hole?

3- Wellhead protection cover type: Steel
a) weep hole? No
b) concrete pad dimensions: 2x2

4- Dia./type of well casing: 2" schedule 40 PVC

5- Dia./type of surface casing: 4" Square

6- Type/slot size of screen: 0.010 machine slot schedule 40 PVC

7- Type screen filter: #1 Drillers Sand
a) Quantity used: 6 bags

8- Type of seal: 3/8" Bentonite Chip
a) Quantity used: 1 bag

9- Grout
a) Grout mix used: Portland/Bentonite High Yield Powder
b) Method of placement: Tremie
c) Vol. of surface casing grout
d) Vol. of well casing grout: 55 gallons

Development method: Whale pump

Development time: 1 hour

Estimated purge volume: 55 gallons

Comments: Potters Road

PROJECT NUMBER	WELL NUMBER		
678440.SI.SI.01	OC-MW07D	SHEET 1	OF 1

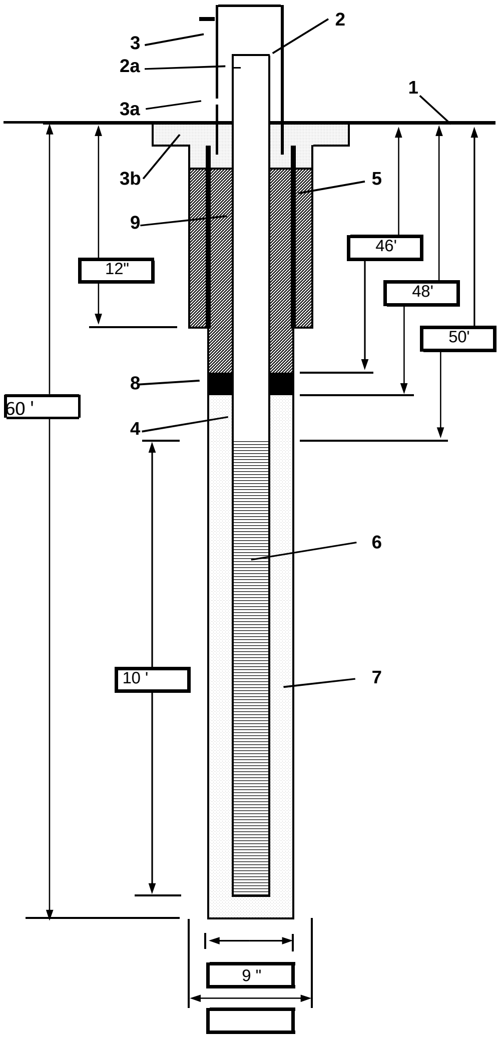
WELL COMPLETION DIAGRAM

PROJECT : **NAS Oceana PFC** LOCATION : **NAS Oceana - End of Runway**

DRILLING CONTRACTOR : **Parratt Wolff**

DRILLING METHOD AND EQUIPMENT USED : **4.25" Hollow Stem Auger**

WATER LEVELS : 7 START : 1145 3/13/17 END : 0930 3/14/17 LOGGER : M.L. Ost



1- Ground elevation at well ______

2- Top of casing elevation ______
a) vent hole? ______

3- Wellhead protection cover type Steel
a) weep hole? No
b) concrete pad dimensions 2x2

4- Dia./type of well casing 2" schedule 40 PVC

5- Dia./type of surface casing 4" Square

6- Type/slot size of screen 0.010 machine slot schedule 40 PVC

7- Type screen filter #1 Drillers Sand
a) Quantity used 6 bags

8- Type of seal 3/8" Bentonite Chip
a) Quantity used 1 bag

9- Grout
a) Grout mix used Portland/Bentonite High Yield Powder
b) Method of placement Tremie
c) Vol. of surface casing grout ______
d) Vol. of well casing grout 55 gallons

Development method Whale pump

Development time 1 hour

Estimated purge volume 55 gallons

Comments End of Runway

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	OW26-MW01D	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Oceana PTC MW Install

LOCATION : Fire Station Well (Near OW26-MW1)

ELEVATION :

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : NA START : 3/8/17 END : 3/8/17 LOGGER : M. Ost/VBO

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENISTY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0-20					Boring initiated at depth of paired shallow well	PID=0.0 ppm
20-25	20-25'	2'			**20.0 - 25.0':** SAND (SP), light gray (10YR 7/1), saturated, loose, fine	
25-30	25-30'	2.5'			**25.0-25.5':** SAND (SP), gray (10YR 5/1), saturated, fine, loose, thin layer clay **25.5-30':** Silty SAND (SM), dark grey (GLEY 4/N), saturated, fine, slightly plastic	
30-35	30-35'	0.5'			**30.0-30.5':** Silty SAND (SM), dark grey (GLEY 4/N), saturated, fine, not plastic **30.5-35.0':** no recovery	
35-40	35-40'	2'			**35.0-37.0':** Sandy SILT (ML), dark grey (GLEY 4/N), saturated, fine, loose, shelly material **38-40':** no recovery	

45	40-45'	1.5'			**40.0-41.5':** Silty CLAY (CL), dark grey (GLEY 4/N), saturated, fine, slightly plastic, shelly material **41.5-45.0':** no recovery	
50	45-50'	1			**45.0-46.0':** Sandy SILT (ML), dark gray (GLEY 4/N), saturated, very fine, loose **46.0-50.0':** no recovery	

Bottom of boring at 50.0 ft bgs

Notes:

bgs - below ground surface

PID - photoionization detector

NA - not applicable

HA - hand auger

MC - macrocore sample

ppm - parts per million

NM - not measured

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	OW11-MW10D	SHEET 1 OF 2

SOIL BORING LOG

PROJECT : Oceana PTC MW Install | LOCATION : NW Site 11 Deep

ELEVATION : | DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : NA | START : 3/14/17 | END : 3/14/17 | LOGGER : M. Ost/VBO

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENISTY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
					Boring initiated at depth of paired shallow well	PID=0.0 ppm
5						
10						
15						
20	20-25'	2'			**20.0 - 21.0':** SAND (SP), yellow (10YR 8/5), saturated, loose	
					21.0 - 22.0': SAND (SP), very dark gray (10YR 3/1), loose, medium sand	
					22.0-25.0': no recovery	
25	25-30'	1'			**25.0-26.0':** SILT (ML), very dark greenish gray	
					26.0-30.0': No recovery	
30	30-35'	2'			**30.0-32.0':** SILT (ML), dark grey (5YR 4/1), saturated, loose, lens of very fine sand	
					32.0-35.0': no recovery	
35	35-40'	2'			**35.0-36.0':** SAND (SP), greenish gray (GLEY2 5/10GB), saturated, loose, fine	
					36.0-37.0': SILT (ML), gray (GLEY2 5/10GB), saturated, loose	
					37.0-40.0': no recovery	
40						

45	40-45'	1'			**40.0-41.0':** Sandy SILT (ML), greenish gray (GLEY2 5/10GB), loose, fine, shell	
					41.0-45.0': no recovery	
50	45-50'	1'			**45.0-46.0':** Sandy SILT (ML), greenish gray (GLEY2 5/10GB), loose, fine, shell	
					46.0-50.0': no recovery	
55	50-55'	1'			**50.0-51.0'**: Sandy silt (ML), greenish gray (GLEY2 5/10GB), loose, fine, shell	
					51.0-55.0': no recovery	
60	55-60'	1'			**55.0-56.0'**: Sandy SILT (ML), greenish gray (GLEY2 5/10GB), loose, fine, shell	
					Bottom of boring at 56.0 ft bgs	

Notes:

bgs - below ground surface

PID - photoionization detector

NA - not applicable

HA - hand auger

MC - macrocore sample

ppm - parts per million

NM - not measured

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	OC-MW02D	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Oceana PTC MW Install
LOCATION :
ELEVATION :
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED :
WATER LEVELS : NA
START : 3/20/17
END : 3/20/17
LOGGER : M. Ost/VBO

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENISTY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
0-20					Boring initiated at depth of paired shallow well	PID=0.0 ppm
20-25	20-25'	5'			**20.0-25.0':** SAND (SP), redddish yellow (7.5YR 8/6), saturated, loose, coarse sand, iron stain	
25-30	25-30'	5'			**25.0-30.0':** SAND (SP), redddish yellow (7.5YR 8/6), saturated, loose, very coarse sand, iron stain, thins lens of find sand	
30-35	30-35'	3'			**30.0-33.0':** SILT (ML), dark greenish grey (GLEY2 4/10BG), saturated, soft, some fine sand	
					33.0-35.0': no recovery	
35-40	35-40'	3'			**35.0-38.0':** Clayey SILT (ML), gray (10YR 5/1), saturated, soft, slight clay, not plastic	
					38.0-40.0': no recovery	

Depth (ft bgs)	Sample Interval	Recovery			Description	
45	40-45'	5'			**40.0-45.0':** Silty SAND (SM), dark gray (10YR 4/1), saturated, fine sand, no plasticity	
	45-50'	2'			**45.0-46.0':** SAND (SP), yellow (10YR 7/6), saturated, loose, fine	
					46.0-47.0': Silty SAND (SM), gray (10YR 6/3), saturated, soft, non-plastic, slight clay at bottom 1"	
50					**47.0-50.0':** no recovery	
	50-55'	2'			**50.0-51.0'**: SILT (ML), gray (10YR 5/1), saturated, some fine sand, not plastic	
					51.0-52.0': SAND (SP), gray, (10YR 5/1), saturated, loose, very fine	
55					**52.0-55.0':** no recovery	
	55-60'	2'			**55.0-56.0'**: SAND (SP), gray (10YR 5/1), saturated, loose, fine	
					56.0-57.0': Silty SAND (SM), gray (10YR 5/1), saturated, loose, fine sand, no plasticity	
60					**57.0-60.0':** no recovery	

Bottom of boring at 60.0 ft bgs

Notes:

bgs - below ground surface

PID - photoionization detector

NA - not applicable

HA - hand auger

MC - macrocore sample

ppm - parts per million

NM - not measured

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	**OC-MW05D**	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Oceana PTC MW Install

LOCATION : Potters Road

ELEVATION :

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : NA

START : 3/16/17

END : 3/16/17

LOGGER : M. Ost/VBO

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENISTY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	0-5'	5'			**0.0-1.0':** SOIL AND GRAVEL, dark brown (10YR 3/3), dry, loose	PID=0.0 ppm
5					**1.0-5.0':** SILT (ML), light gray (10YR 7/1), dry, dense, compacted, iron stain, mottles	
	5-10'	5'			**5.0-6.0':** SILT(ML), light gray (10YR 7/1), dry dense, compacted, iron stain, mottles	
					6.0-7.0': SILT (ML), very pale brown (10YR 7/4), saturated, loose	
10					**7.0-10.0':** SAND (SP), yellow (10YR 7/8), saturated, loose, fine	
	10-15'	4'			**10.0-10.5':** SAND (SP), gray (10YR 6/1), saturated, loose, medium sand and gravel	
					10.5-14.0': SAND (SP), ? Color, loose, fine	
15					**14.0-15.0':** no recovery	
20	15-20'	5'			**15.0-20.0':** SAND (SP), ? Color, loose, fine	
25	20-25'	1'			**20.0-21.0':** SAND (SP), gray (10YR 6/1), saturated, loose, fine, some silt at bottom **21.0-25.0':** no recovery	
30	25-30'	1'			**25.0-26.0':** SILT (ML), greenish gray (GLEY2 6/5GB), saturated, loose **26.0-30.0':** no recovery	
35	30-35'	5'			**30.0-35.0':** SAND (SP), gray (10YR 6/1), saturated, loose, very fine	
40	35-40'	5'			**35.0-40.0':** Clayey SILT (ML), greenish gray (GLEY2 6/5GB), saturated, soft, slightly plastic, shell material	

45	40-45'	5'			**40.0-45.0':** Clayey SILT (ML), greensish gray (GLEY2 6/5GB, saturated, soft, plastic, shell material	
	45-50'	2'			**45.0-47.0':** SILT (ML), greenish gray (GLEY2 6/5GB), saturated, fine, no clay, no plasticity	
50					**47.0-50.0':** no recovery	
	50-55'	1'			**50.0-51.0'**: SILT (ML), greenish gray (GLEY2 6/5GB), saturated, fine, no clay, no plasticity	
55					**51.0-55.0':** no recovery	
	55-60'	1'			**55.0-56.0'**: SILT (ML), greenish gray (GLEY2 6/5GB), saturated, fine, no clay, no plasticity	
60					**56.0-60.0':** no recovery	

Bottom of boring at 60.0 ft bgs

Notes:

bgs - below ground surface

PID - photoionization detector

NA - not applicable

HA - hand auger

MC - macrocore sample

ppm - parts per million

NM - not measured

PROJECT NUMBER	BORING NUMBER	
678440.SI.SI.01	OC-MW07D	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : Oceana PTC MW Install
LOCATION : End of Runway
ELEVATION :
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED :
WATER LEVELS : NA
START : 3/13/17
END : 3/13/17
LOGGER : M. Ost/VBO

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENISTY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	0-5'	2'			**0.0-2.0':** SILT (ML), brown (10YR 4/3), dry, loose	PID=0.0 ppm
					2.0-5.0': no recovery	
5	5-10'	2'			**5.0-6.0':** SILT (ML), brown (10YR 4/3), dry, loose	Water level at 6'
					6.0-7.0': Sandy SILT (SM), dark gray (10YR 4/1), saturated, loose, fine	
					7.0-10.0': no recovery	
10	10-15'	2'			**10.0-12':** Silty CLAY (CL), gray (10YR 5/1), saturated, lean, plastic, soft	
					12.0-15.0': no recovery	
15	15-20'	3'			**15.0-18.0':** Silty SAND (SM), dark green gray (GLEY1 4/10GB), saturated, soft, plastic	
					18.0-20.0': no recovery	
20	20-25'	3'			**20.0-23.0':** Silty SAND (SM), greenish gray (GLEY2 6/10G), saturated, soft, plant material	
					23.0-25.0': no recovery	
25	25-30'	2'			**25.0-27.0':** Silty CLAY (CL), gray (7.5YR 5/1), saturated, fat, plastic	
					27.0-30.0': no recovery	
30	30-35'	1'			**30.0-31.0':** SILT (ML), bluish gray (GLEY2 5/5BG), saturated, no plastic, medium dense	
					31.0-35.0': no recovery	
35	35-40'	1'			**35.0-36.0':** SILT (ML), bluish gray (GLEY2 5/5BG), saturated, no plastic, medium dense	
					36.0-40.0': no recovery	
40						

45	40-45'	1'			**40.0-41.0':** Clayey SILT (ML), bluish gray (GLEY2 5/5GB, saturated, plastic **41.0-45.0':** no recovery	
50	45-50'	5'			**45.0-50.0':** SAND (SP), gray (10YR 6/1) some gravel tightly packed, thin 1" clay lens at 47'	
55	50-55'	2'			**50.0-51.0'**: SAND (SP), gray (10YR 6/1) some gravel tightly packed **51.0-51.5':** CLAY (CL), dark yellow brown (10YR 3/6), saturated, soft **51.5-52.0':** SAND (SP), gray (10YR 6/1)some gravel tightly packed **52.0-55.0':** no recovery	
60	55-60'	3'			**55.0-58.0'**: SAND (SP), gray (10YR 5/1), loose, trace gravel **58.0-60.0':** no recovery	

Bottom of boring at 60.0 ft bgs

Notes:

bgs - below ground surface

PID - photoionization detector

NA - not applicable

HA - hand auger

MC - macrocore sample

ppm - parts per million

NM - not measured

Appendix D
Aquifer Variable-Head Testing Charts

Oceana PFC Investigation 11/10/16

0925 A. Wanebrenner arrives at London Bridge gate
Weather - low 50s, mostly cloudy, light NW wind
Objective - Slug testing at site 11 wells
Equipment - LevelTroll 700 # C102586 ; cable # C102981
using 5' long 1.5" diameter PVC slug
Rugged reader # C102728

1005 R. McElhinny onsite

1020 H+S meeting - ~~slip~~ footing with puddles

1025 Setup on OW11-MW4
DTW 6.97' DTB 22.79' Depth of probe reading 14.76', set 1' above bottom of well

1041 Start OW11 MW04 Slug in 1

1043 Stop OW11 MW04 Slug in 1 - DTW 6.96

1046 Start OW11 MW04 Slug out 1 DTW 6.97

1048 Stop OW11 MW04 Slug Out 1 DTW 6.97

1050 Start OW11 MW04 Slug In 2 DTW 6.97

1051 Stop OW11 MW04 Slug In 2 DTW 6.95

1055 Start OW11 MW04 Slug out 2 DTW 6.96

1056 Stop OW11 MW04 Slug out 2 DTW 6.97

1058 Start OW11 MW04 Slug In 3 DTW 6.97

1059 Stop OW11 MW04 Slug In 3 DTW 6.95

1100 Start OW11 MW04 Slug out 3 DTW 6.97

1101 Stop " " DTW 6.99

Setup on OW11-MW07 DTW - 5.92' DTB 20.12'
Sensor set 1' above bottom - Probe reading 12.86'

1118 Start OW11 MW07 Slug In 1 5.92

1119 Stop OW11 MW07 Slug In 1 5.91

1122 Start OW11 MW07 Slug ~~In 2~~ out 1 DTW 5.92
1123 Stop " " DTW 5.93
1125 Start OW11 MW07 Slug In 2 DTW 5.92
1126 Stop OW11 MW07 Slug In 2 DTW 5.92
1128 Start OW11 MW07 Slug out 2 DTW 5.92
1129 Stop " " DTW 5.93
1130 Start OW11 MW07 Slug in 3 DTW 5.92
1131 Stop " " DTW 5.93
1132 Start OW11 MW07 Slug out 3 DTW 5.92
1133 Stop " " DTW 5.93

Setup on OW11-MW9 DTW 7.95' DTB 23.27'

Probe set 1' above bottom, reading 14.53'

1148 Start OW11 MW09 Slug In 1 DTW 7.95'
1150 Stop " " DTW 7.95'
1151 Start OW11 MW09 Slug out 1 DTW 7.98'
1153 Stop OW11 MW09 Slug out 1 DTW 7.98'
1155 Start OW11 MW09 Slug In 2 DTW 7.95'
1157 Stop " " DTW 7.93'
1159 Start OW11 MW09 Slug out 2 DTW 7.95'
1201 Stop " " DTW 7.96'
1202 Start OW11 MW09 Slug In 3 DTW 7.95'
1205 Stop OW11 MW09 Slug In 3 DTW 7.92'
1207 Start OW11 MW09 Slug out 3 DTW 7.95'
1209 Stop OW11 MW09 Slug out 3 DTW 7.97'
1225 Offsite

Oceana PFC Investigation 11/1/16

0840 A. Winebrenner onsite
Weather - Clear, Mid 50s, light NW wind
Objective - Slug testing at 3 wells
Equipment - Level troll 700 #C102728, cable # C102981
5' long × 1.5" diameter PVC slug
0850 Sign PTSP
0855 Setup on OW26-MW1 DTW 4.83' DTB 18.80'
sensor reading depth of probe 13.00', ~1' off bottom
0908 Start OW26-MW1 Slug in 1 DTW 4.83
0910 Stop " " DTW 4.82
0912 Start OW26-MW1 Slug out 1 DTW 4.83
0913 Stop " " DTW 4.84
0915 Start OW26-MW1 Slug in 2 DTW 4.83
0916 Stop OW26-MW1 Slug in 2 DTW 4.82
0918 Start OW26-MW1 Slug out 2 DTW 4.83
0919 Stop " " DTW 4.84
0920 Start " Slug In 3 DTW 4.83
0921 Stop " " DTW 4.83
0922 Start " Slug out 3 DTW 4.83
0923 Stop " " DTW 4.84
0945 Setup on OW2B-MW14 DTW 5.87 DTB 22.35
Sensor reading 15.58', ~1' off bottom
0950 R. McElhinny onsite
1010 Start OW2B-MW14 Slug in 1 DTW 5.87
1012 Stop " " DTW 5.87
1015 Start " Slug out 1 DTW 5.87
1016 Stop " " DTW 5.88

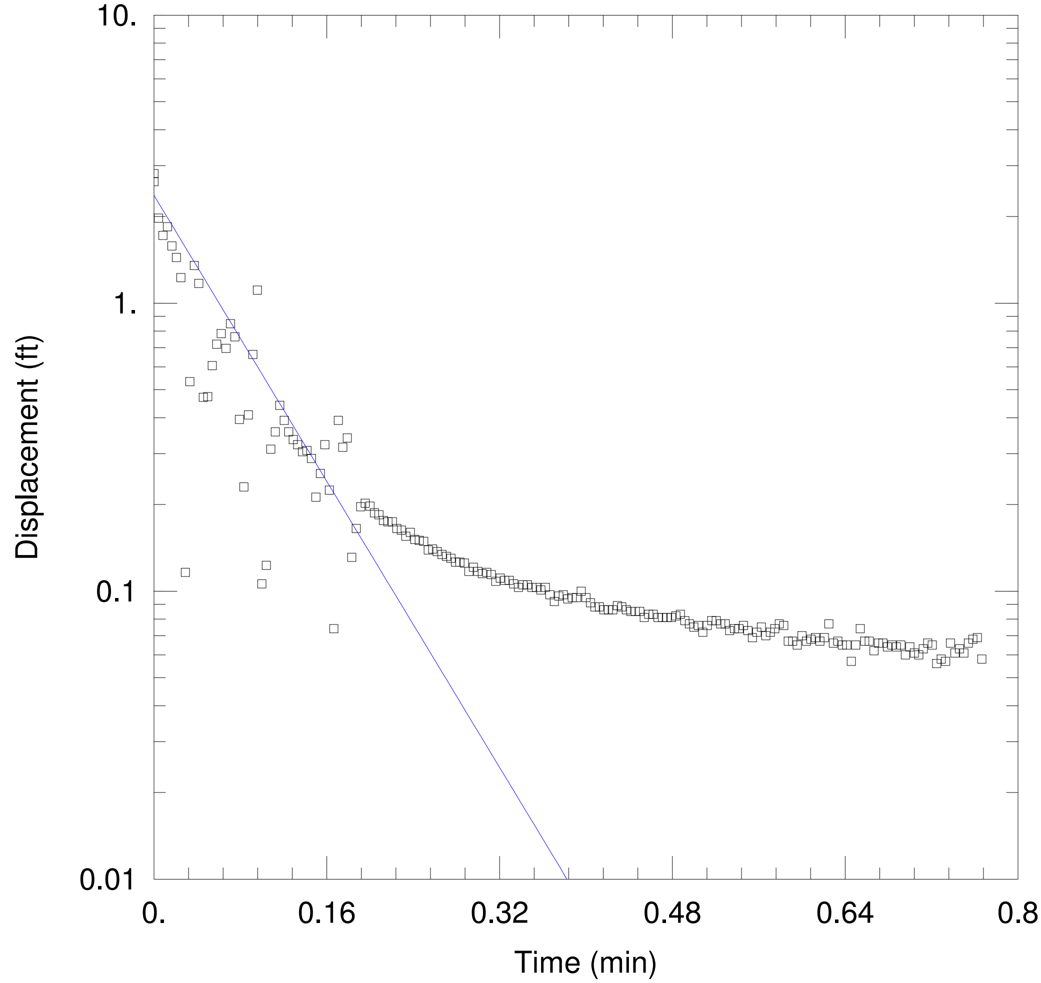
1020	Start	OW2B-MW14	Slug In 2	DTW	5.87
1020	Stop	"	"	DTW	5.87
1022	Start	"	Slug Out 2	DTW	5.87
1023	Stop	"	"	DTW	5.88
1025	Start	"	Slug In 3	DTW	5.87
1026	Stop	"	"	DTW	5.87
1030	Start	"	Slug Out 3	DTW	5.87
1031	Stop	"	"	DTW	5.90
1033	Start	"	Slug In 4	DTW	5.87
1034	Stop	"	"	DTW	5.87

1048 Setup on OW2C-MW19. DTW 8.33' DTB 19.22

Sensor reading 9.54' about 1' above bottom

1055	Start	OW2C-MW19	Slug In 1	DTW	8.33
1056	Stop	"	"		8.30
1057	Start	"	Slug Out 1		8.33
1059	Stop	"	"		8.33
1100	Start	"	Slug In 2		8.33
1101	Stop	"	"		8.32
1103	Start	"	Slug Out 2		8.33
1104	Stop	"	"		8.35
1105	Start	"	Slug In 3		8.33
1106	Stop	"	"		8.33
1108	Start	"	Slug Out 3		8.33
1109	Stop	"	"		8.35

1120 Offbase



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug in 2.aqt
Date: 06/02/17 Time: 13:57:14

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 16.48 ft Anisotropy Ratio (Kz/Kr): 1.

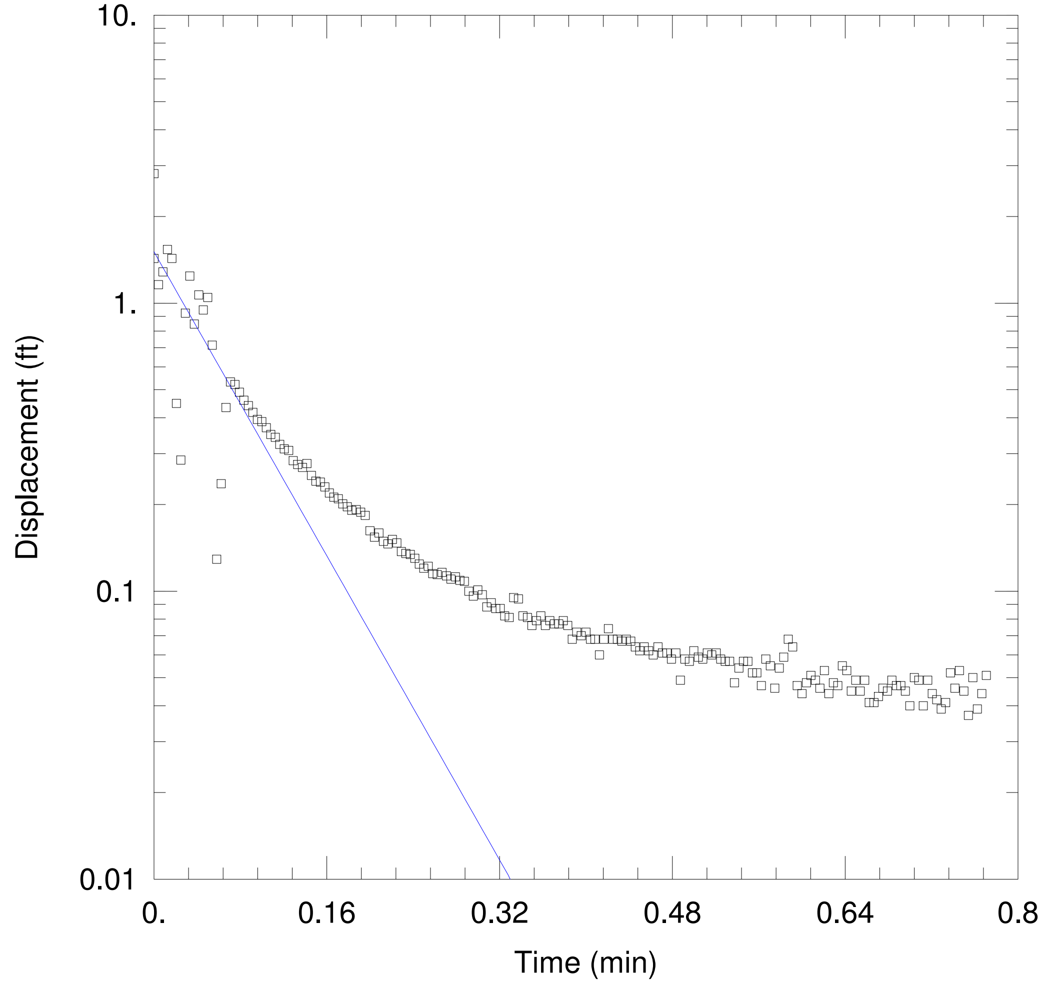
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 16.48 ft
Total Well Penetration Depth: 16.48 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008562 ft/min y0 = 2.365 ft



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug in 3.aqt
Date: 06/02/17 Time: 13:58:23

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 16.48 ft Anisotropy Ratio (Kz/Kr): 1.

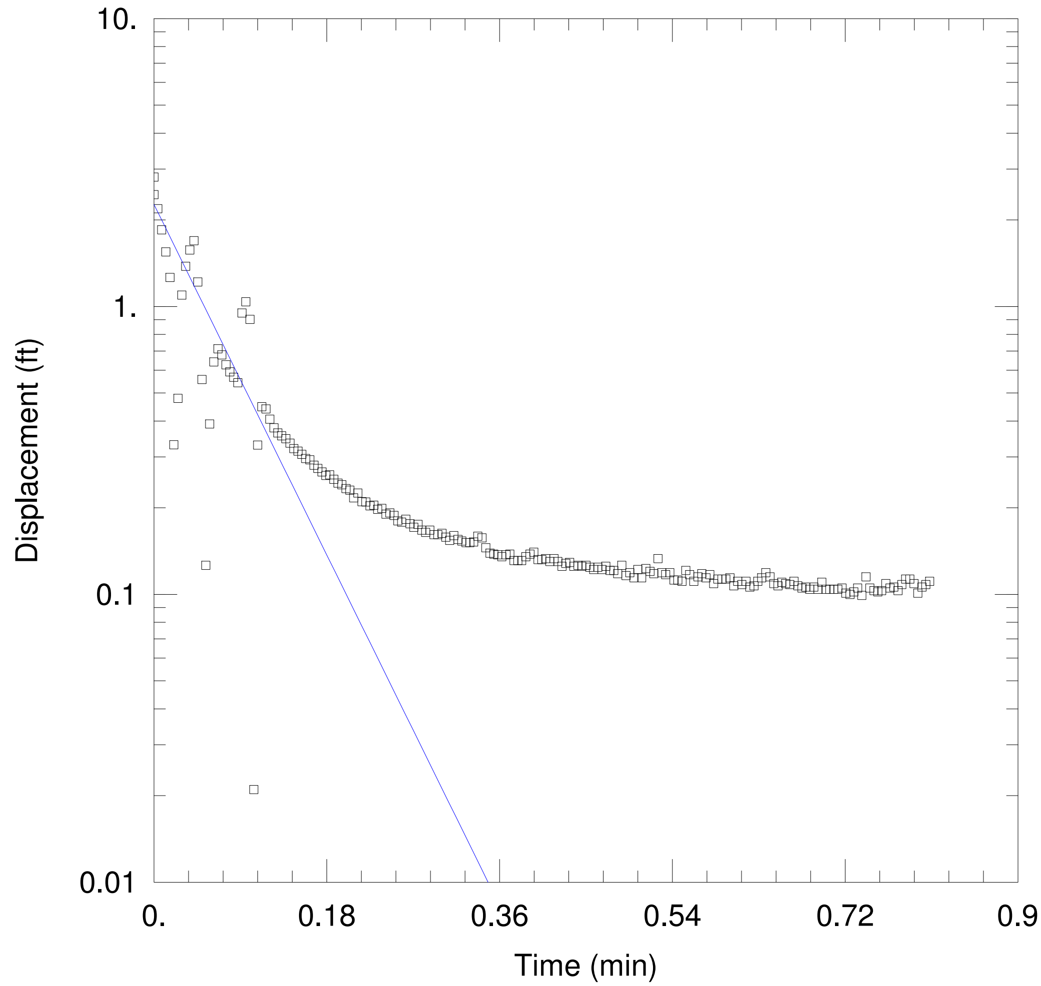
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 16.48 ft
Total Well Penetration Depth: 16.48 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009103 ft/min y0 = 1.508 ft



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug in 4.aqt
Date: 06/02/17 Time: 13:58:44

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 16.48 ft Anisotropy Ratio (Kz/Kr): 1.

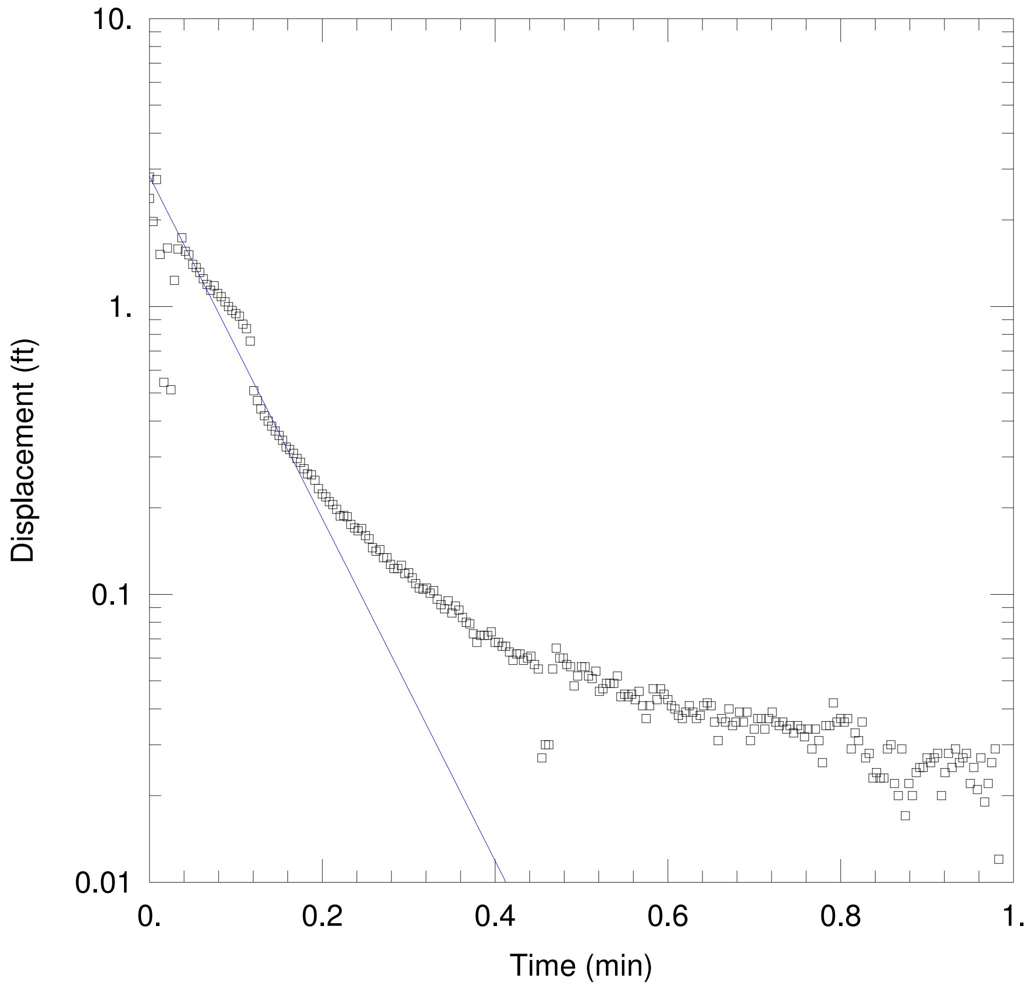
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 16.48 ft
Casing Radius: 0.083 ft
Static Water Column Height: 16.48 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009331 ft/min y0 = 2.261 ft



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug out 1.aqt
Date: 06/02/17 Time: 13:59:17

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 16.48 ft Anisotropy Ratio (Kz/Kr): 1.

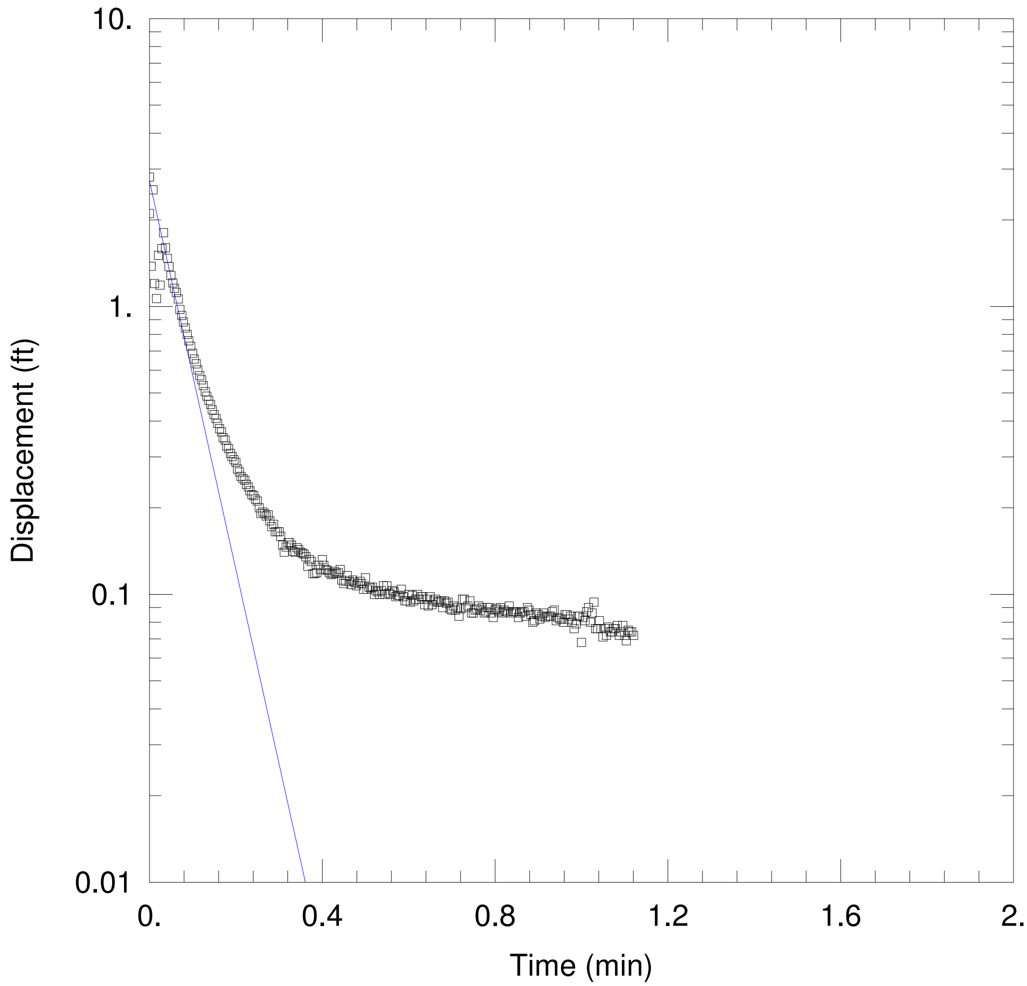
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 16.48 ft
Total Well Penetration Depth: 16.48 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008199 ft/min y0 = 2.83 ft



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug out 2.aqt
Date: 06/02/17 Time: 13:59:38

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 16.48 ft Anisotropy Ratio (Kz/Kr): 1.

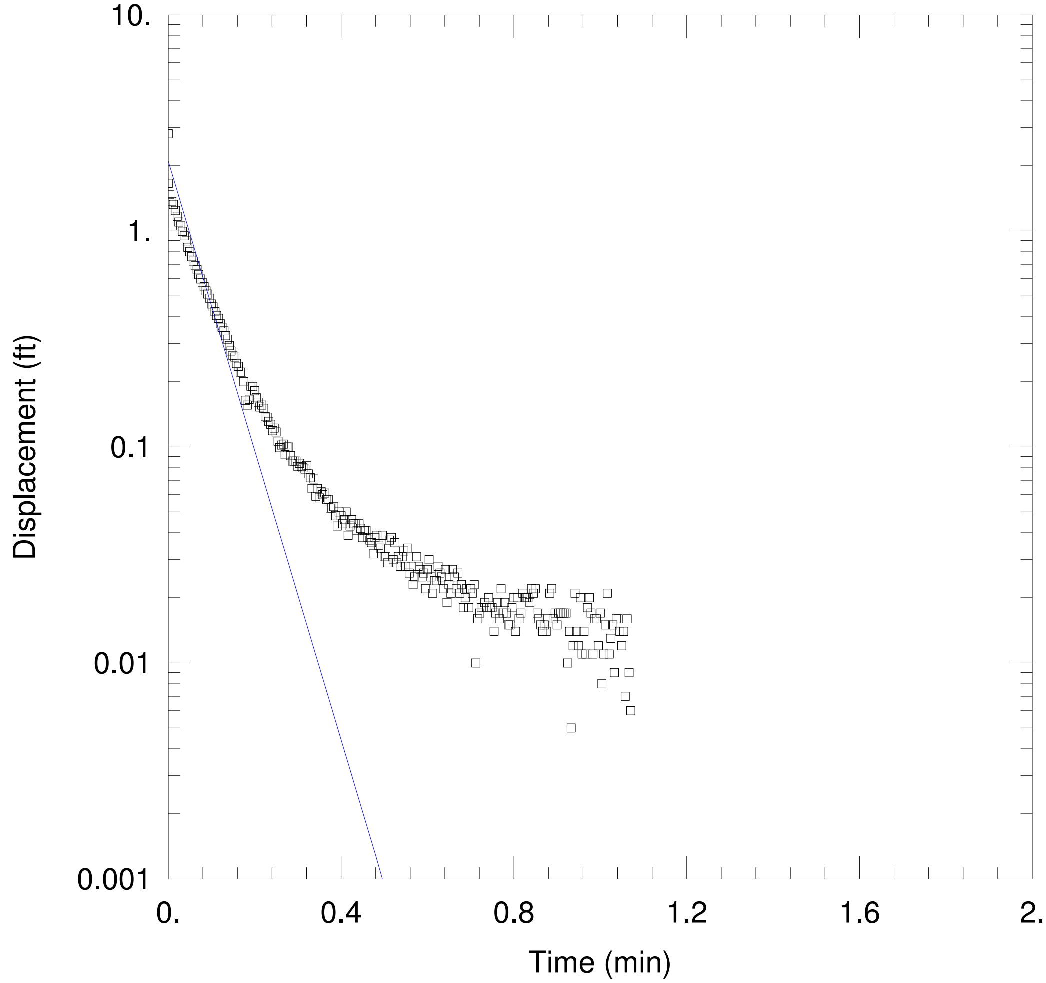
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 16.48 ft
Casing Radius: 0.083 ft
Static Water Column Height: 16.48 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009312 ft/min y0 = 2.728 ft



WELL TEST ANALYSIS

Data Set: \...\OW2B-MW14-Slug out 3.aqt
Date: 06/02/17 Time: 13:59:51

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

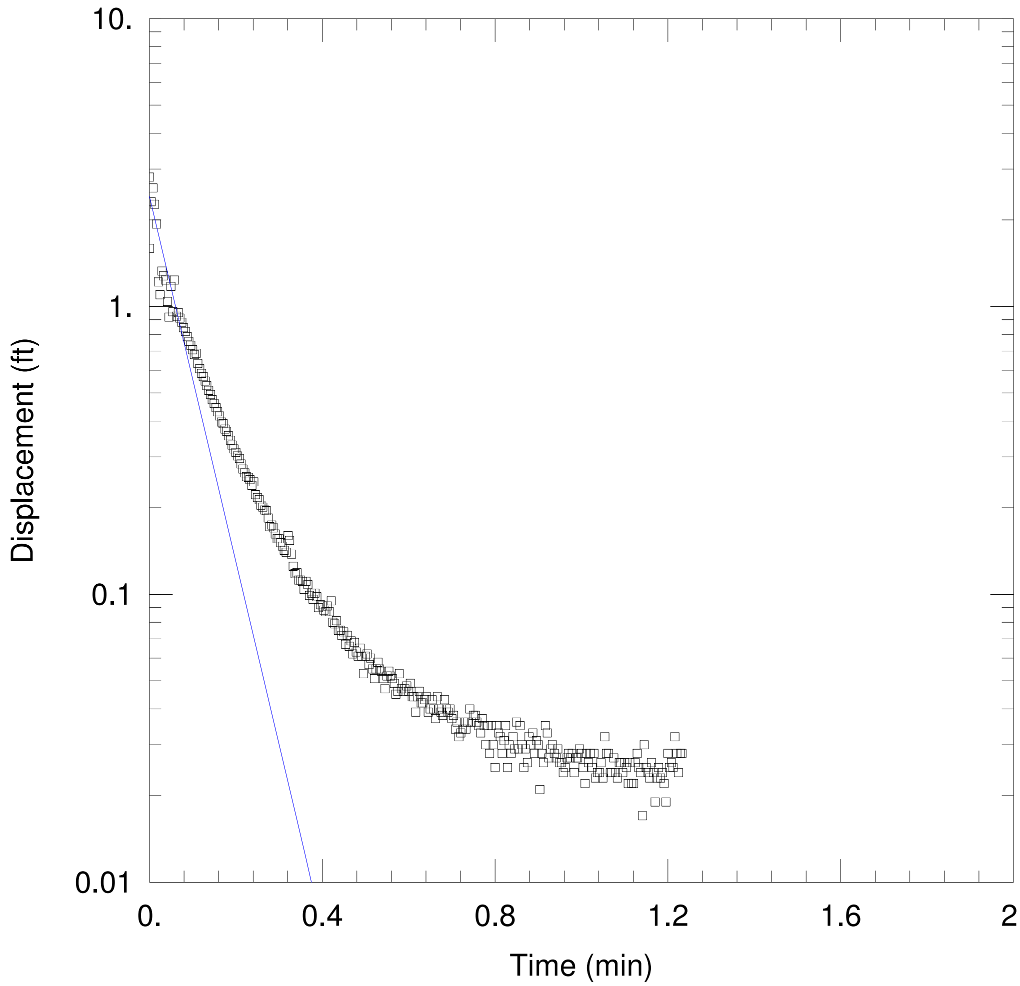
Saturated Thickness: 16.48 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 16.48 ft
Casing Radius: 0.083 ft
Static Water Column Height: 16.48 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.009235 ft/min
y0 = 2.099 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug in 1.aqt
Date: 06/02/17 Time: 14:00:09

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft
Anisotropy Ratio (Kz/Kr): 1.

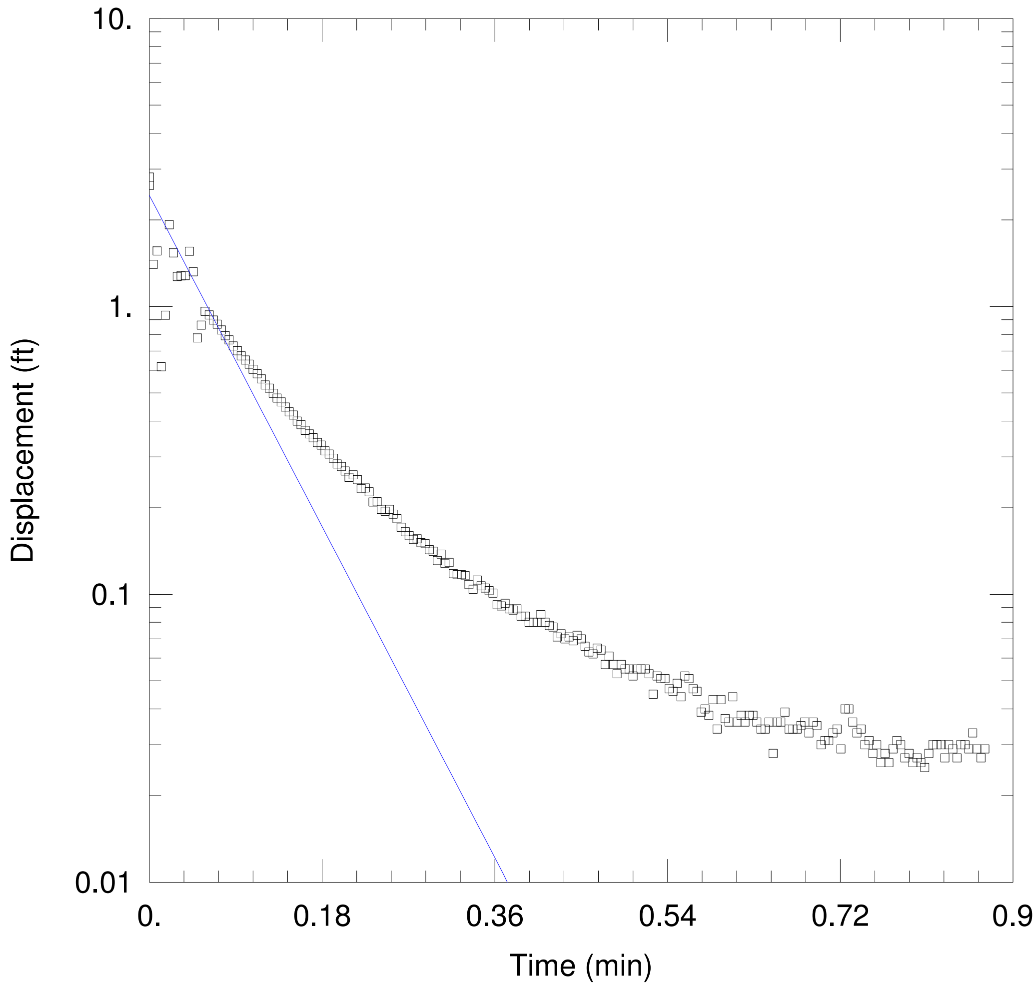
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.007445 ft/min
y0 = 2.41 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug in 2.aqt
Date: 06/02/17 Time: 14:00:28

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

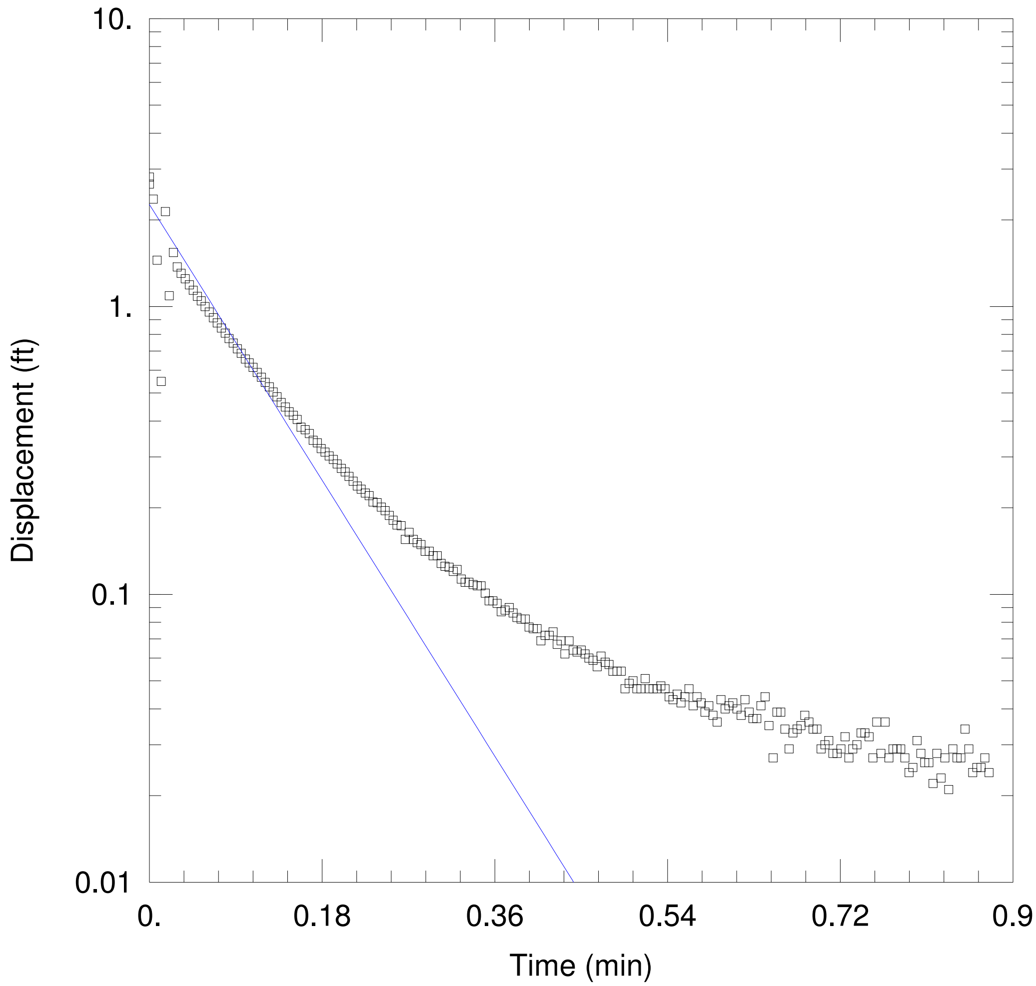
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.007498 ft/min
y0 = 2.428 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug in 3.aqt
Date: 06/02/17 Time: 14:00:50

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

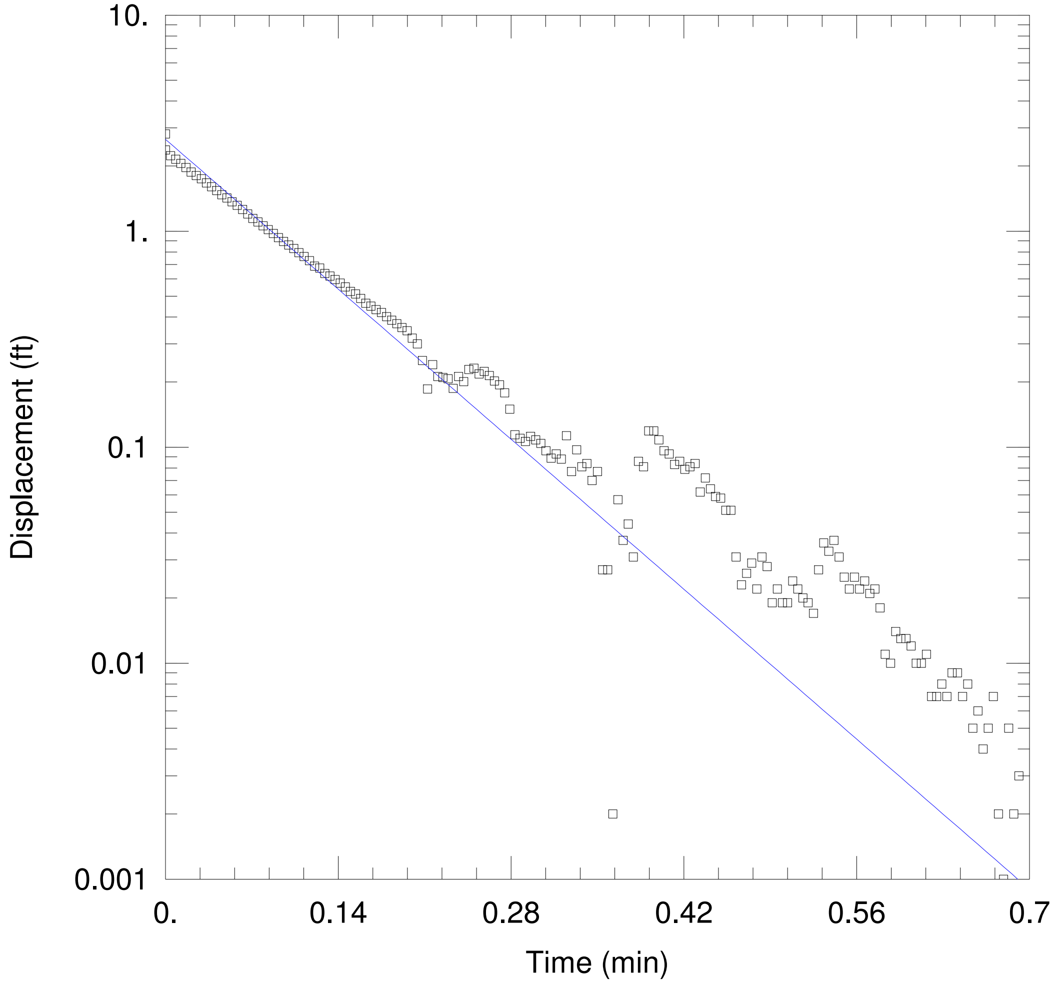
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.006248 ft/min y0 = 2.261 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug out 1.aqt
Date: 06/02/17 Time: 14:01:39

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

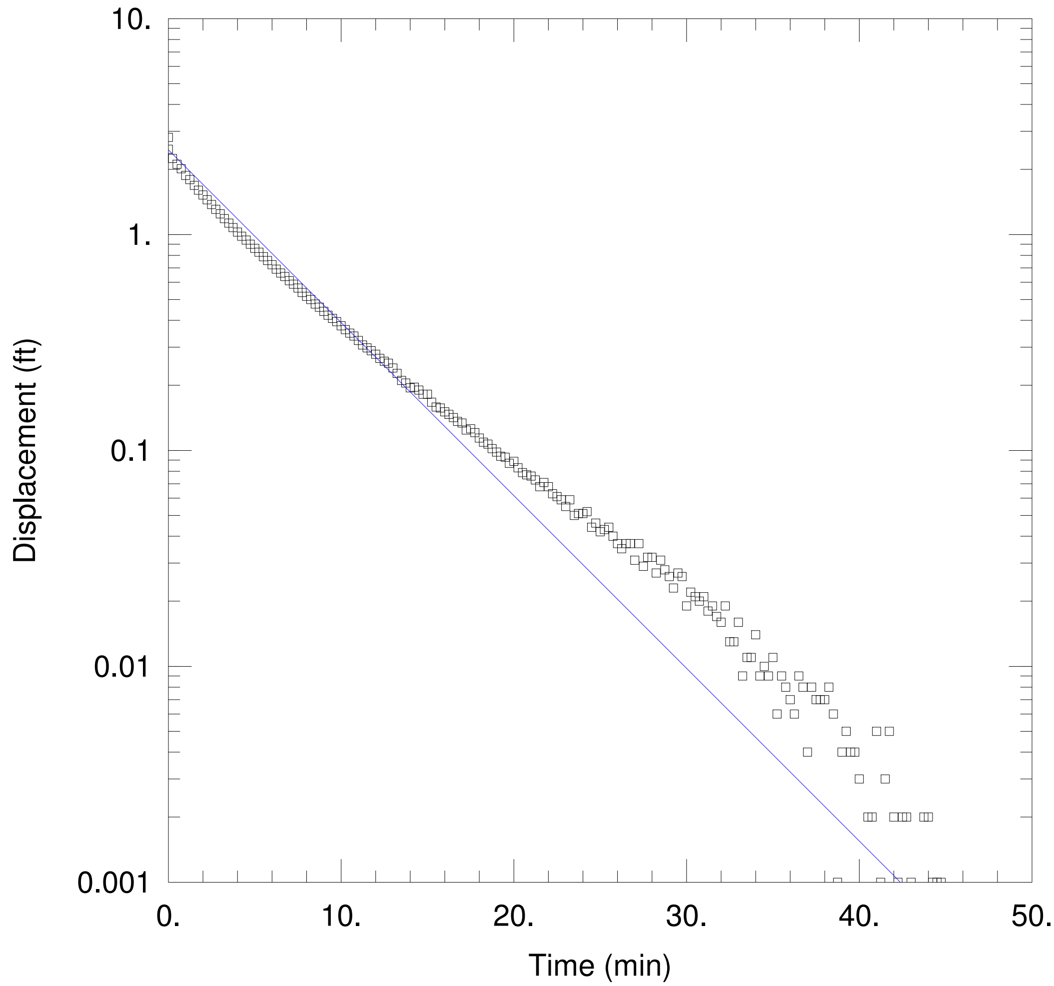
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005819 ft/min y0 = 2.66 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug out 2.aqt
Date: 06/02/17 Time: 14:01:55

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

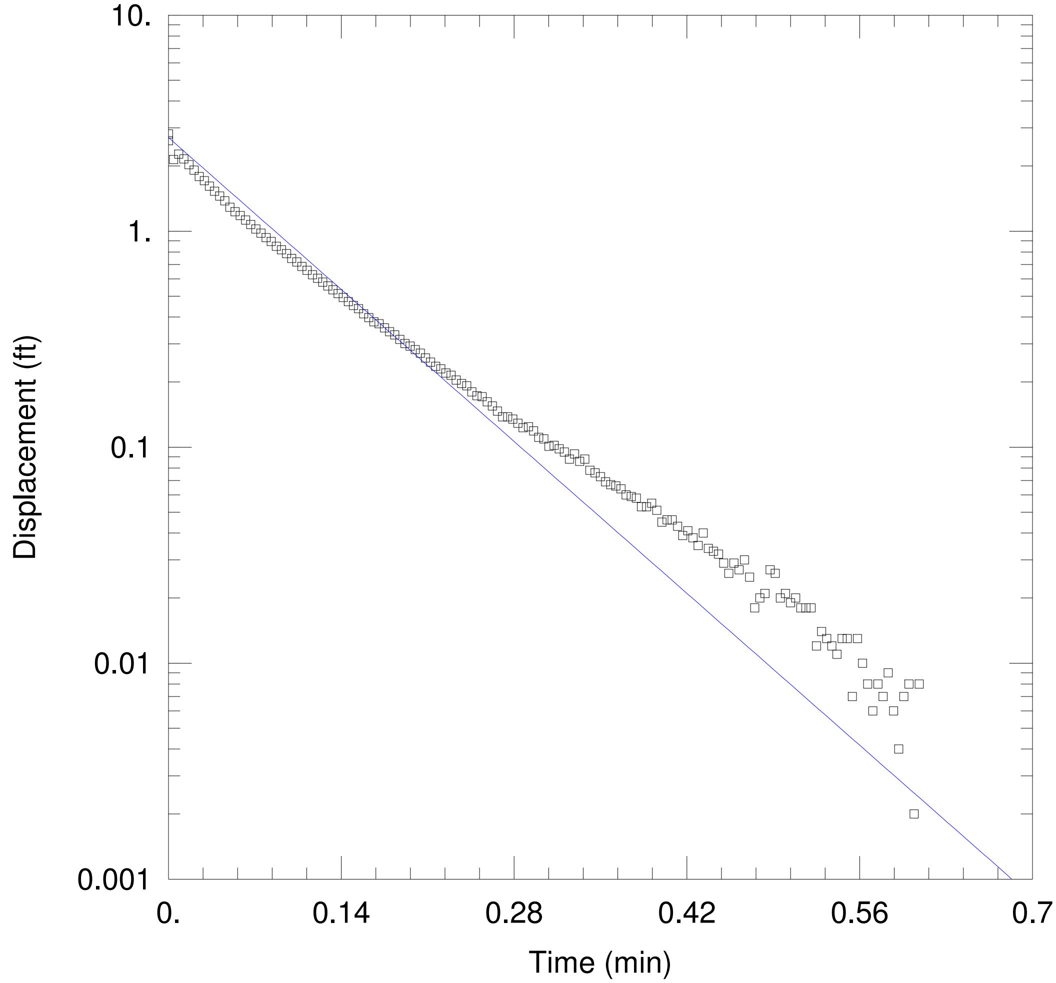
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.389E-5 ft/min y0 = 2.462 ft



WELL TEST ANALYSIS

Data Set: \...\OW2C-MW19-Slug out 3.aqt
Date: 06/02/17 Time: 14:02:13

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

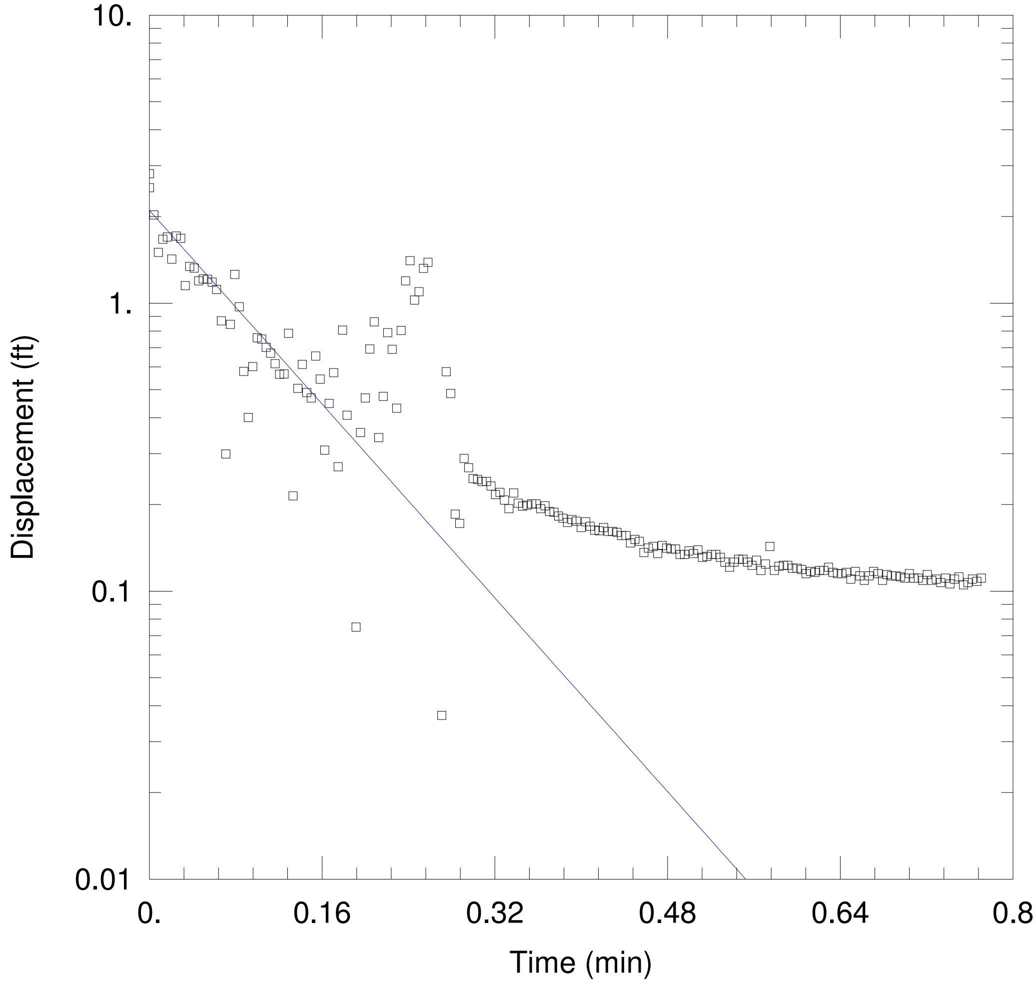
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 10.89 ft
Total Well Penetration Depth: 10.89 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005895 ft/min y0 = 2.708 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug In 1.aqt
Date: 06/02/17 Time: 14:02:29

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft
Anisotropy Ratio (Kz/Kr): 1.

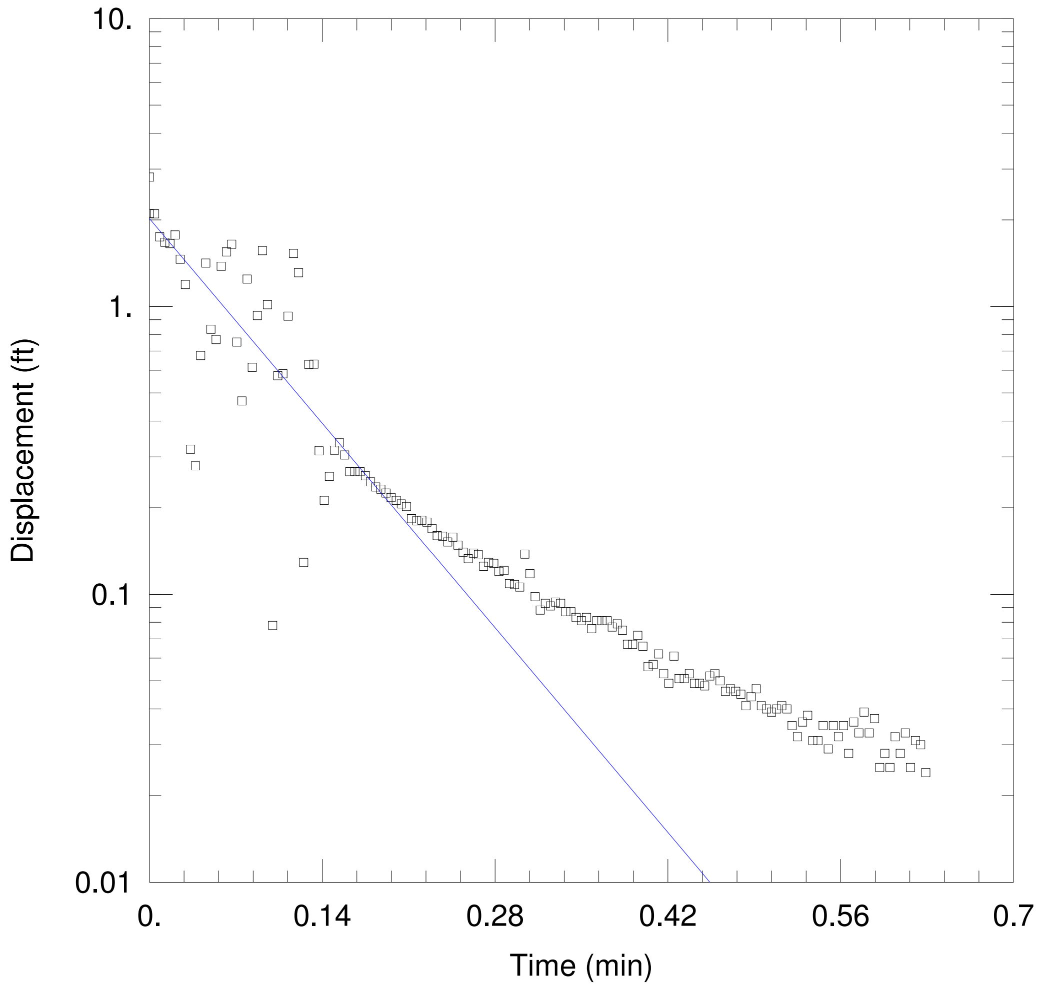
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 15.82 ft
Total Well Penetration Depth: 15.82 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.005761 ft/min
y0 = 2.098 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug in 2.aqt
Date: 06/02/17 | Time: 14:03:11

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft | Anisotropy Ratio (Kz/Kr): 1.

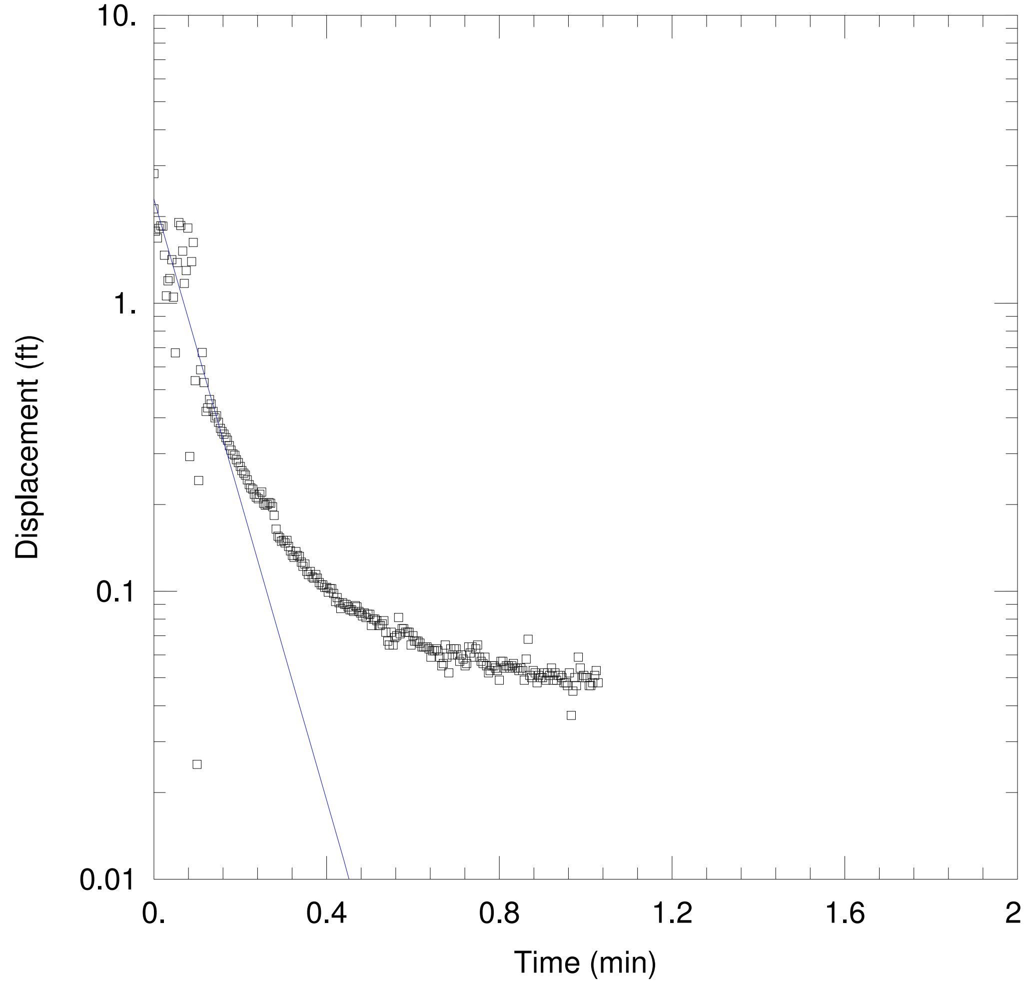
WELL DATA (New Well)

Initial Displacement: 2.813 ft | Static Water Column Height: 15.82 ft
Total Well Penetration Depth: 15.82 ft | Screen Length: 10. ft
Casing Radius: 0.083 ft | Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined | Solution Method: Bouwer-Rice

K = 0.006955 ft/min | y0 = 2.016 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug in 3.aqt
Date: 06/02/17 Time: 14:03:22

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft Anisotropy Ratio (Kz/Kr): 1.

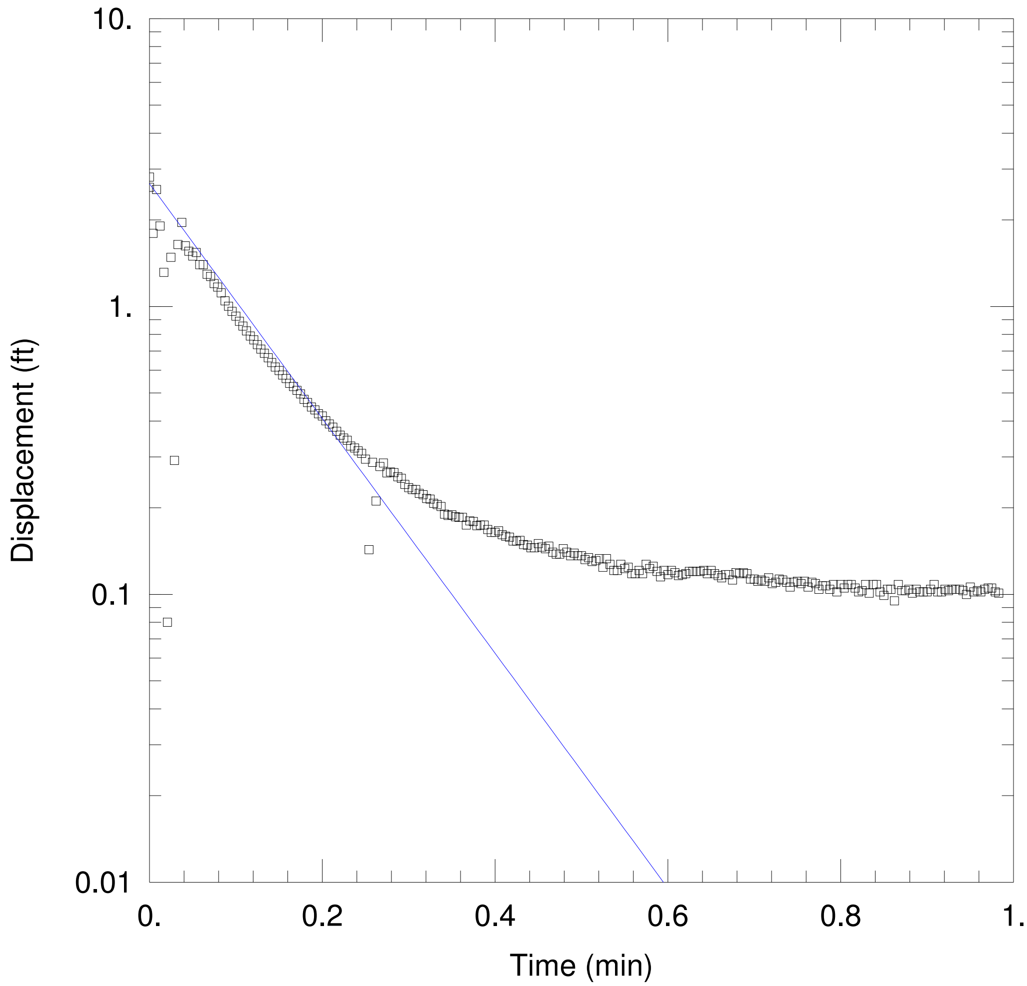
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 15.82 ft
Total Well Penetration Depth: 15.82 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007151 ft/min y0 = 2.295 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug out 1.aqt
Date: 06/02/17 Time: 14:03:33

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft Anisotropy Ratio (Kz/Kr): 1.

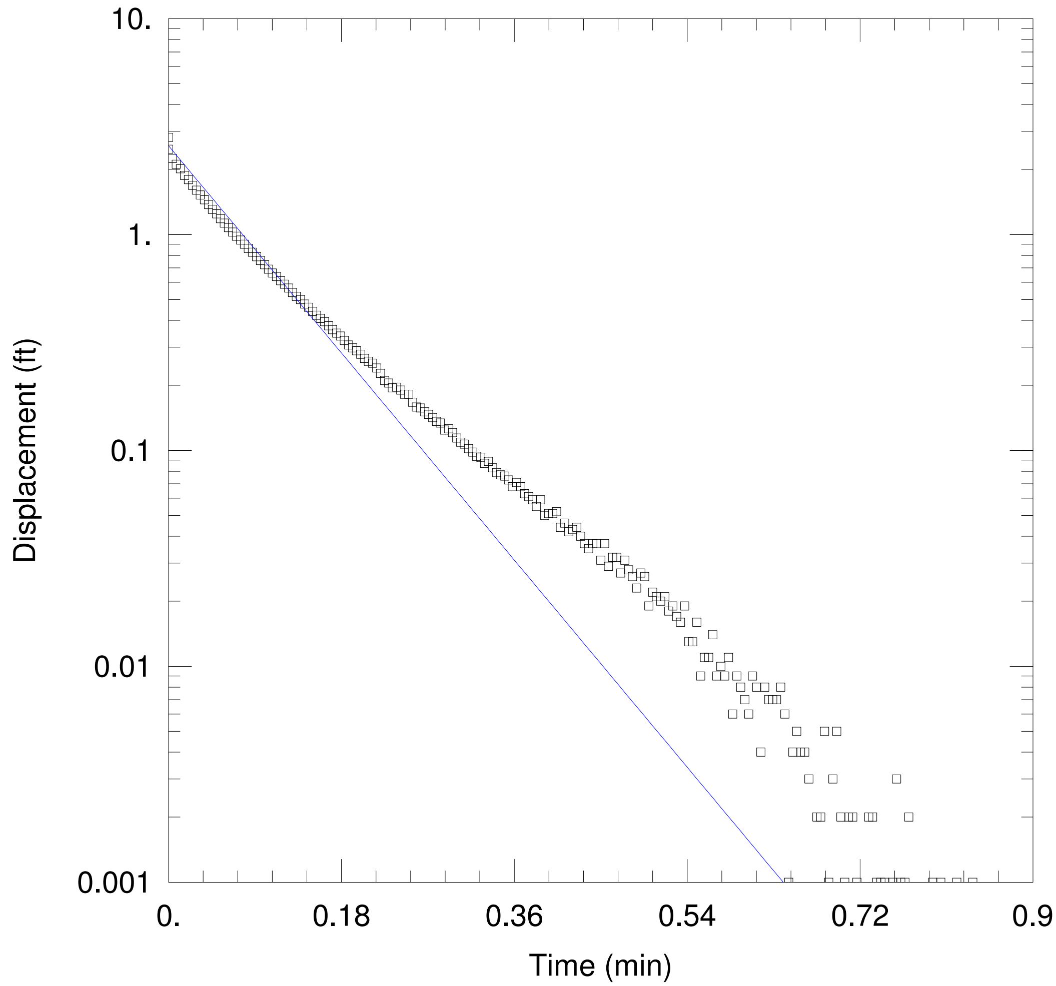
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 15.82 ft
Total Well Penetration Depth: 15.82 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00559 ft/min y0 = 2.671 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug out 2.aqt
Date: 06/02/17 Time: 14:03:48

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

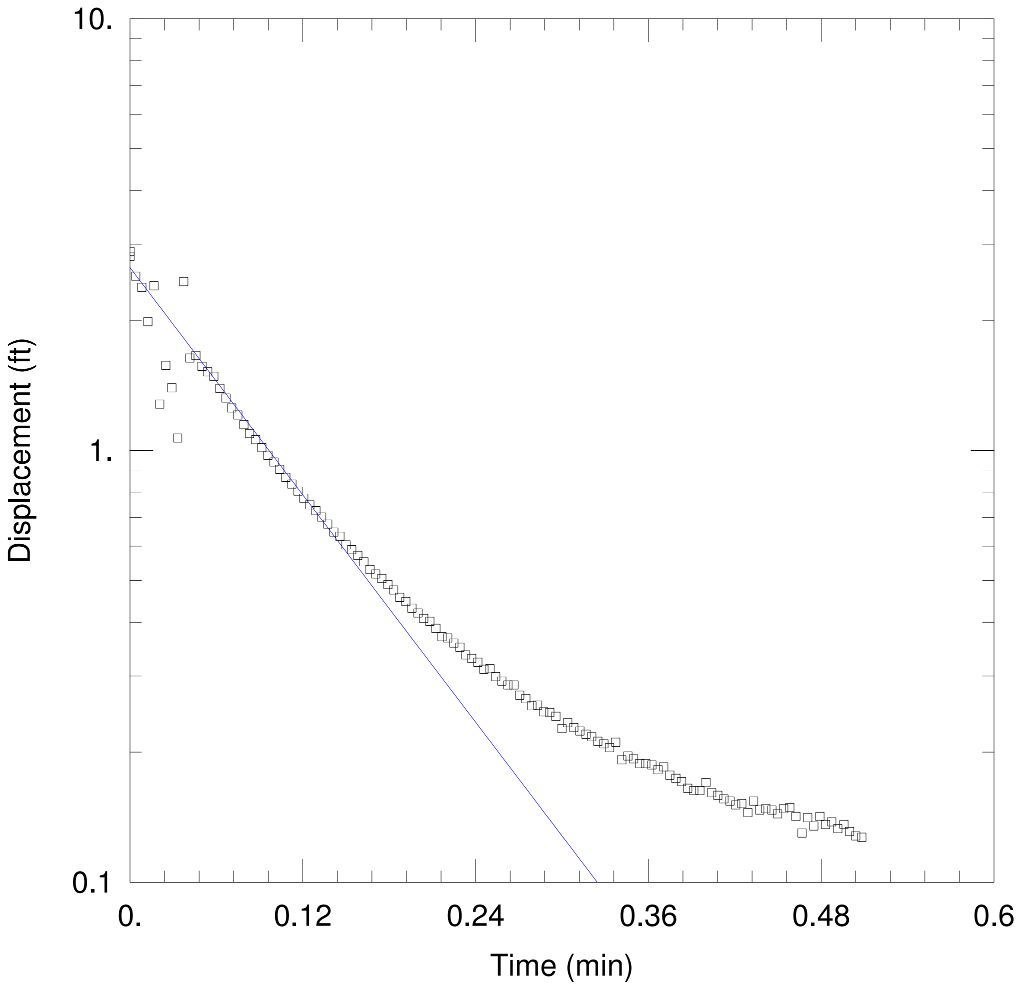
Initial Displacement: 2.813 ft
Total Well Penetration Depth: 15.82 ft
Casing Radius: 0.083 ft

Static Water Column Height: 15.82 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007304 ft/min y0 = 2.573 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW04-Slug out 3.aqt
Date: 06/02/17 Time: 14:04:12

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.82 ft Anisotropy Ratio (Kz/Kr): 1.

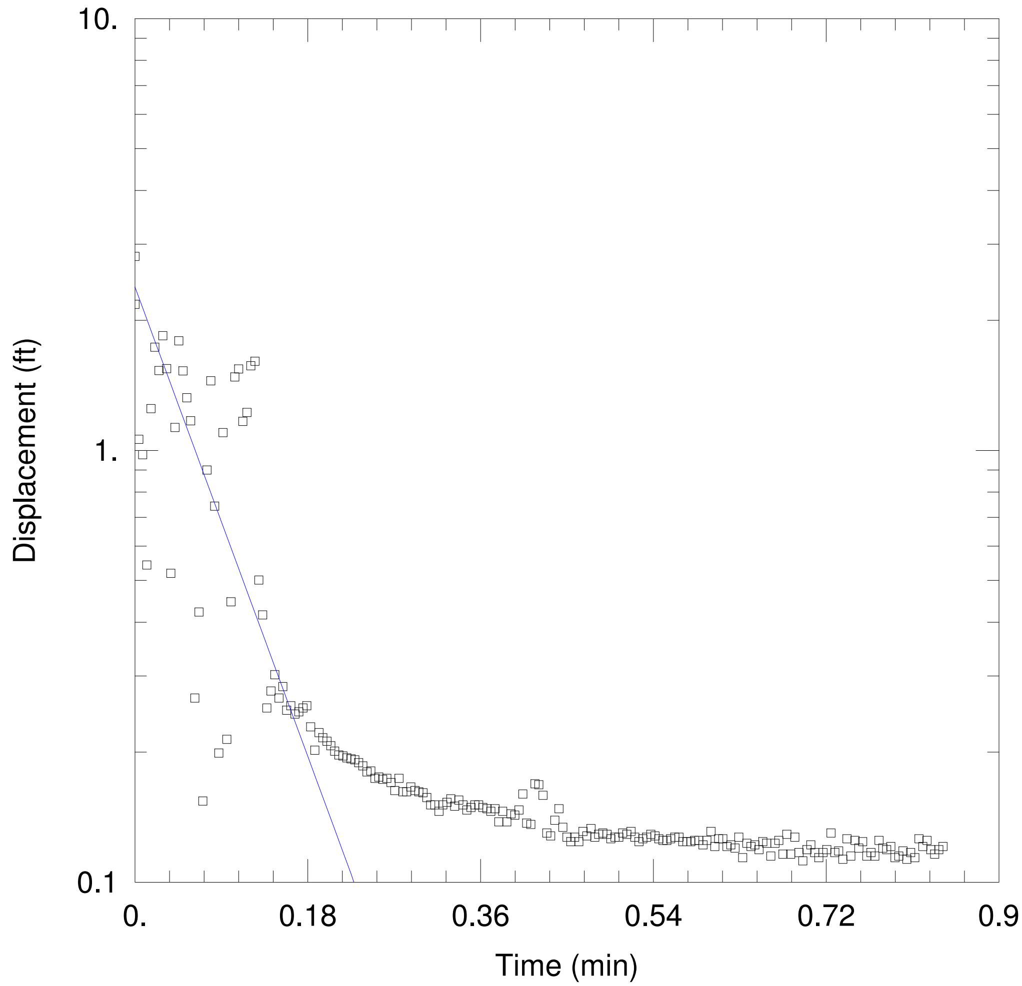
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 15.82 ft
Total Well Penetration Depth: 15.82 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00601 ft/min y0 = 2.649 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug in 1.aqt
Date: 06/02/17 Time: 14:05:02

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

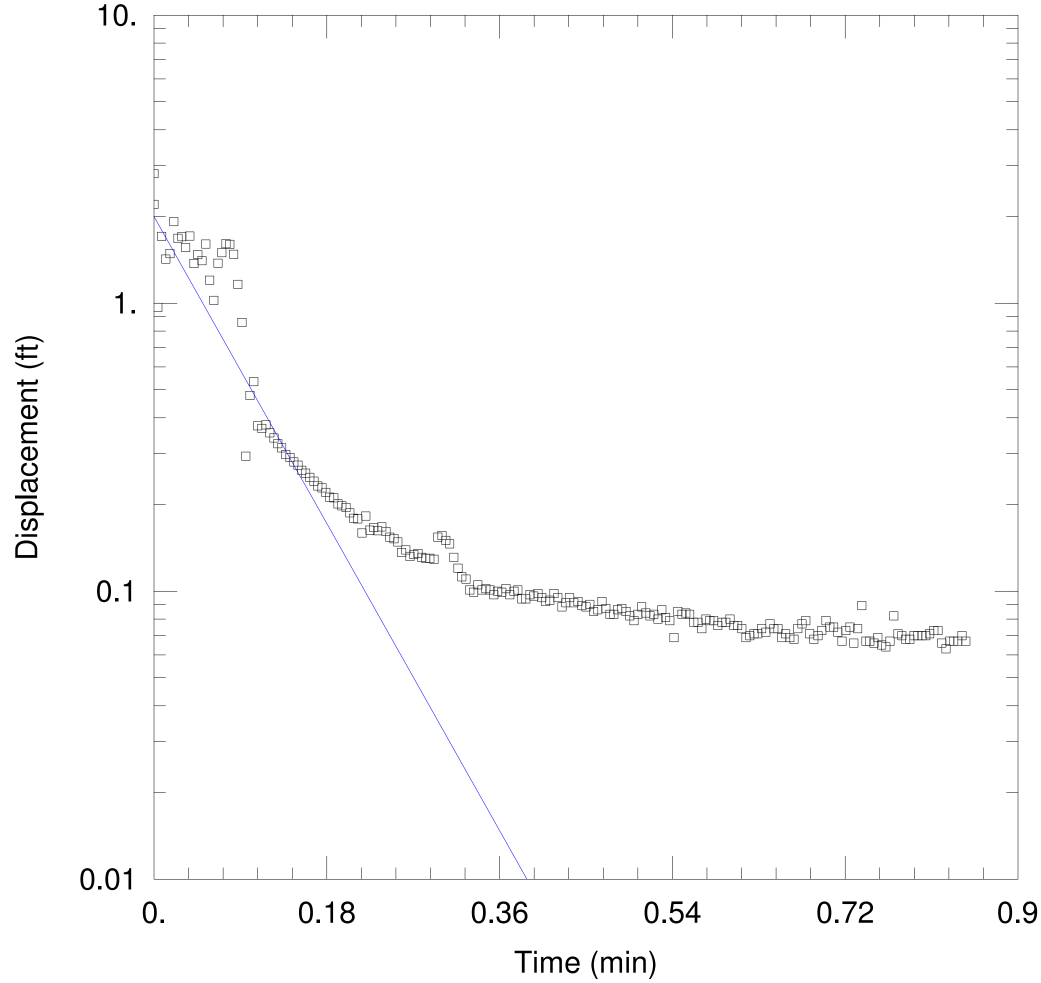
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 14.2 ft
Total Well Penetration Depth: 14.2 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008133 ft/min y0 = 2.389 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug in 2.aqt
Date: 06/02/17 Time: 14:05:23

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

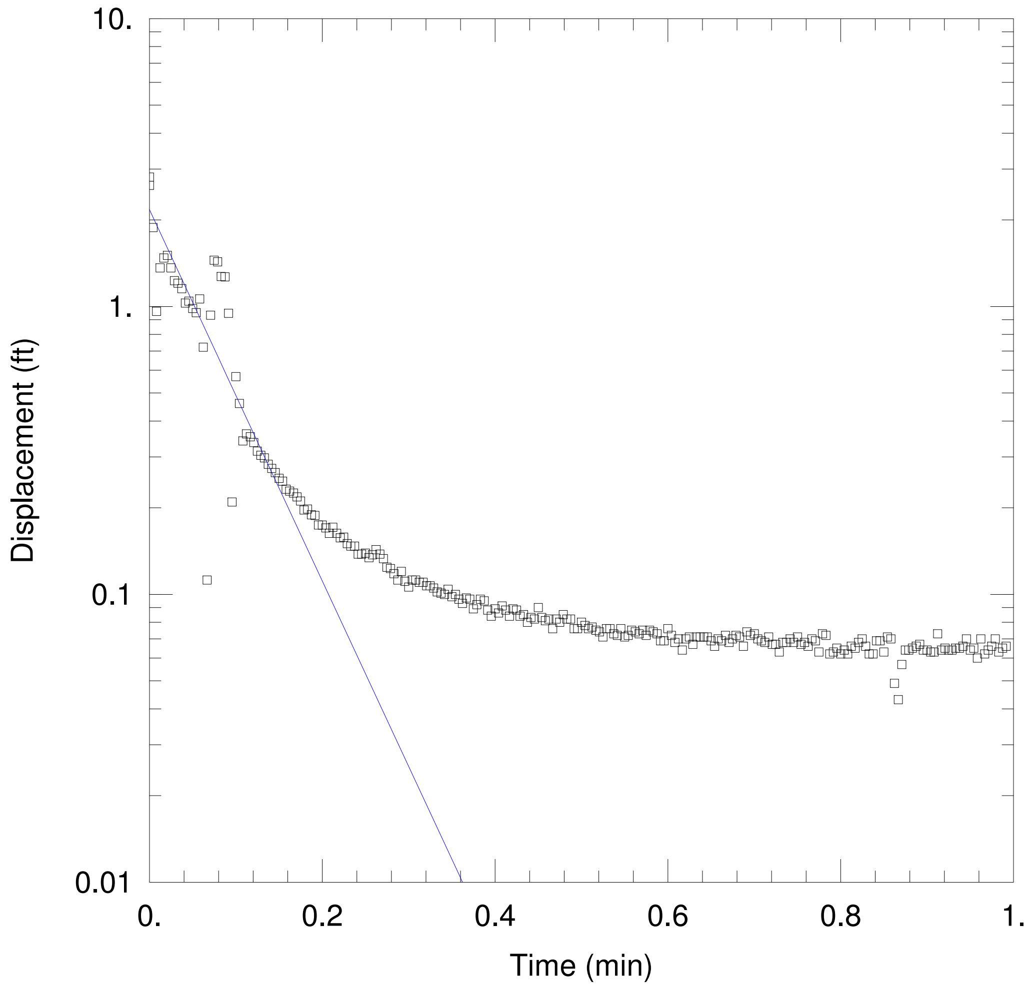
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 14.2 ft
Total Well Penetration Depth: 14.2 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007977 ft/min y0 = 1.999 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug in 3.aqt
Date: 06/02/17 Time: 14:05:32

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

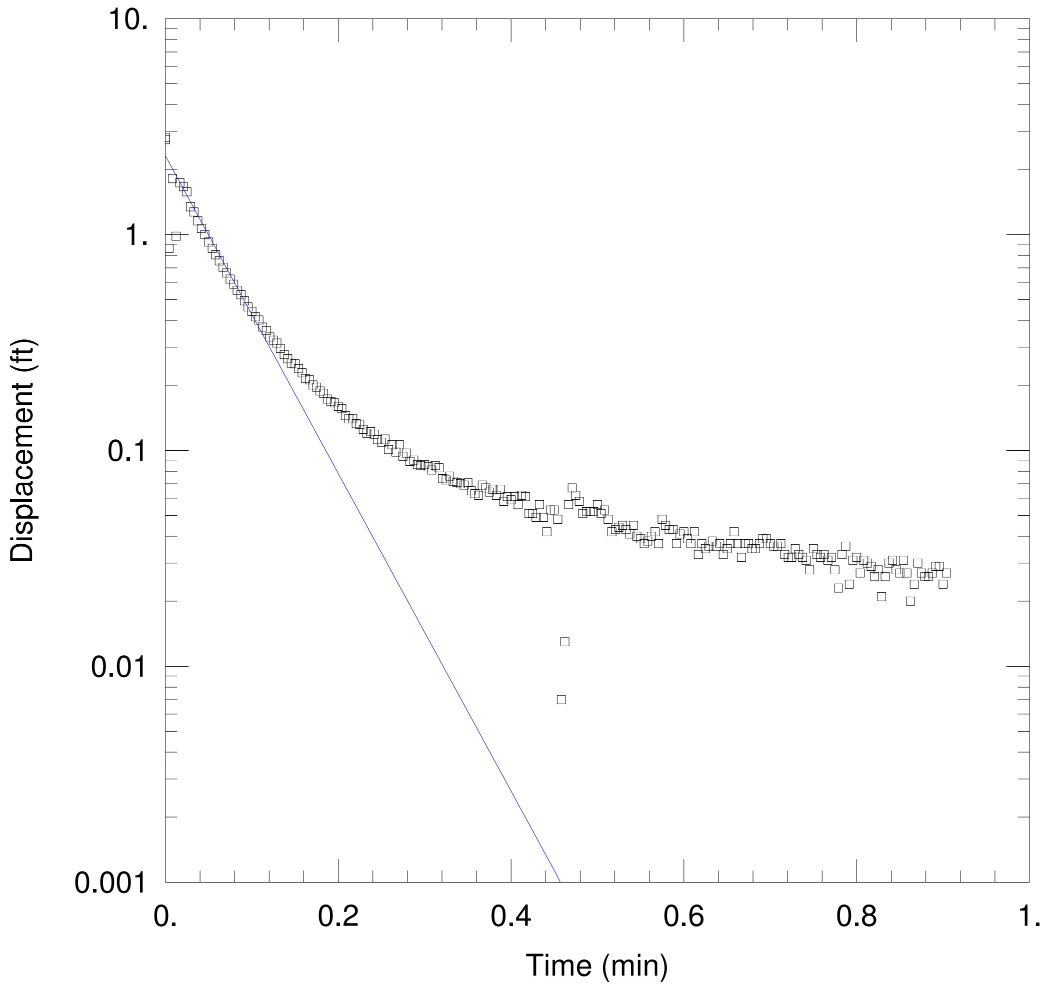
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 14.2 ft
Total Well Penetration Depth: 14.2 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008682 ft/min y0 = 2.166 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug out 1.aqt
Date: 06/02/17 Time: 14:05:43

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

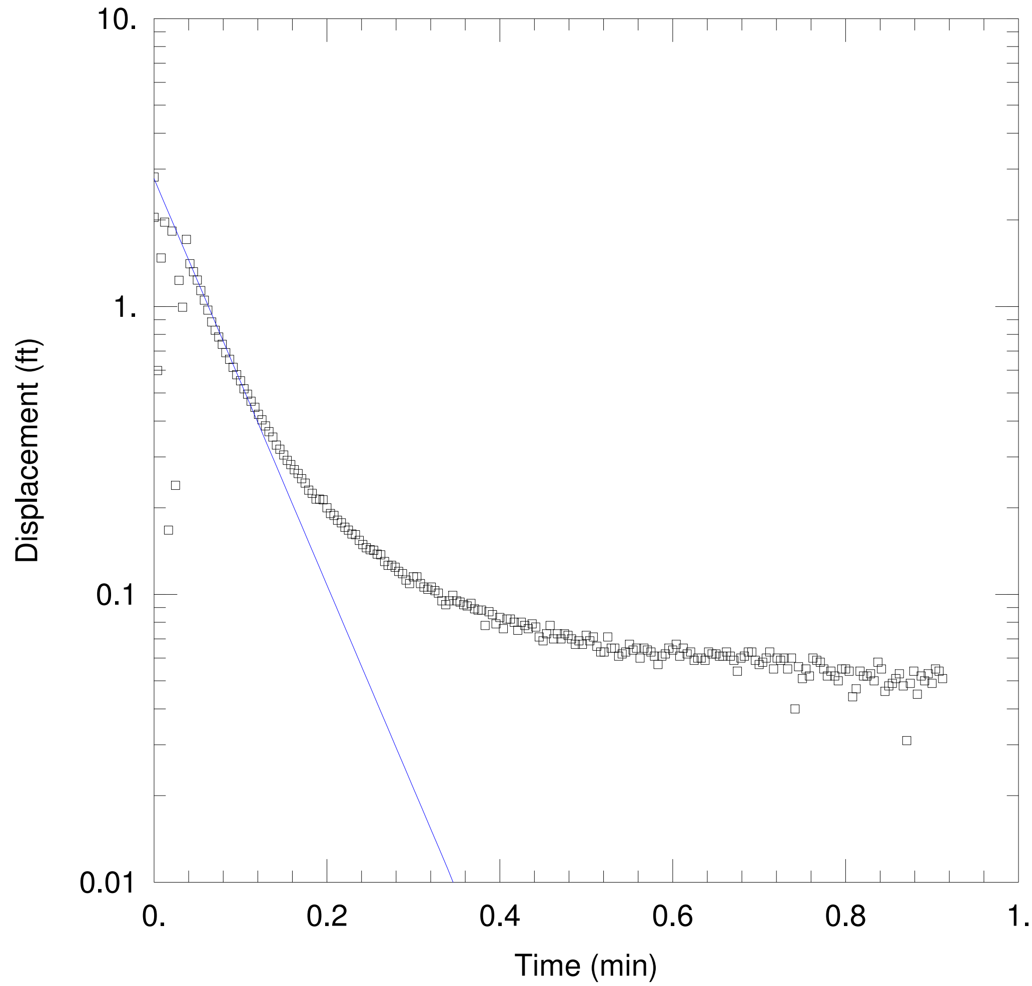
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 14.2 ft
Total Well Penetration Depth: 14.2 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009907 ft/min y0 = 2.311 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug out 2.aqt
Date: 06/02/17 Time: 14:05:52

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

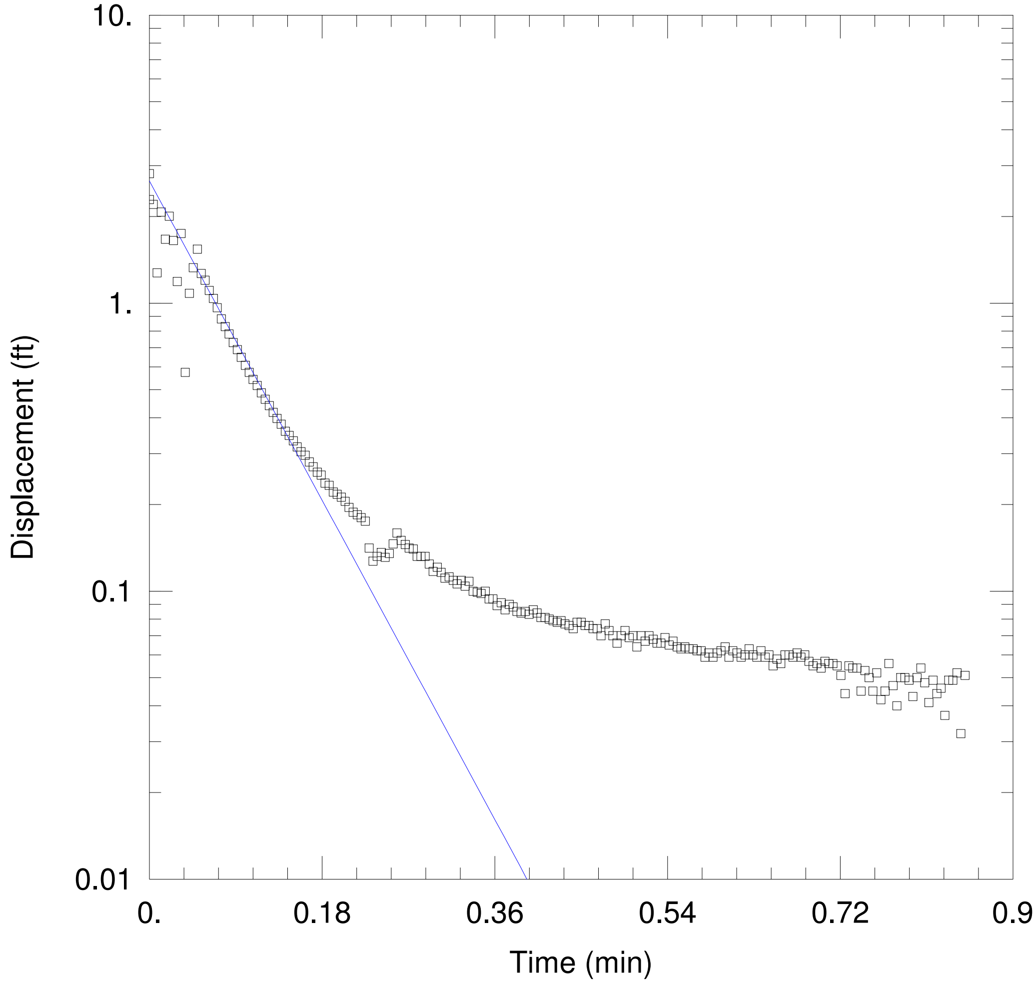
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 14.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 14.2 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009506 ft/min y0 = 2.778 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW07-Slug out 3.aqt
Date: 06/02/17 Time: 14:06:06

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 14.2 ft Anisotropy Ratio (Kz/Kr): 1.

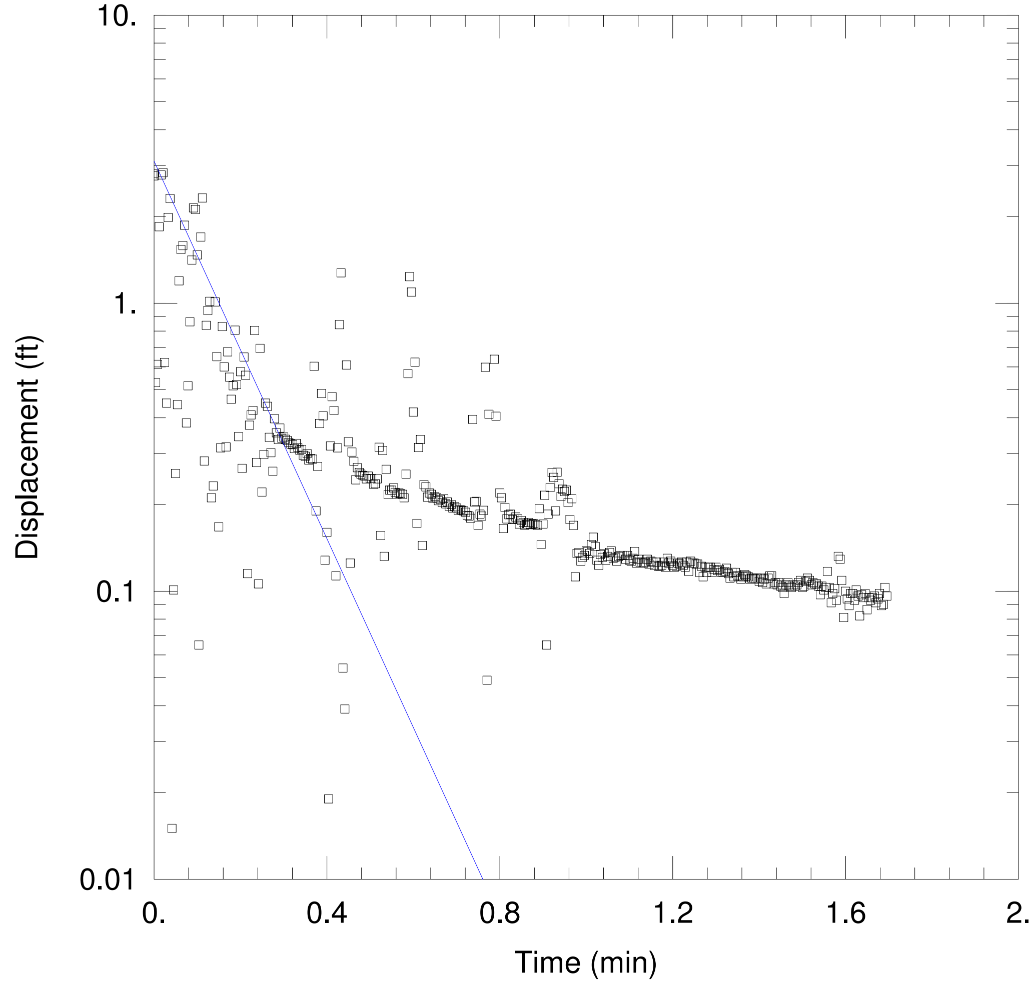
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 14.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 14.2 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008296 ft/min y0 = 2.655 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug in 1.aqt
Date: 06/02/17 Time: 14:06:21

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

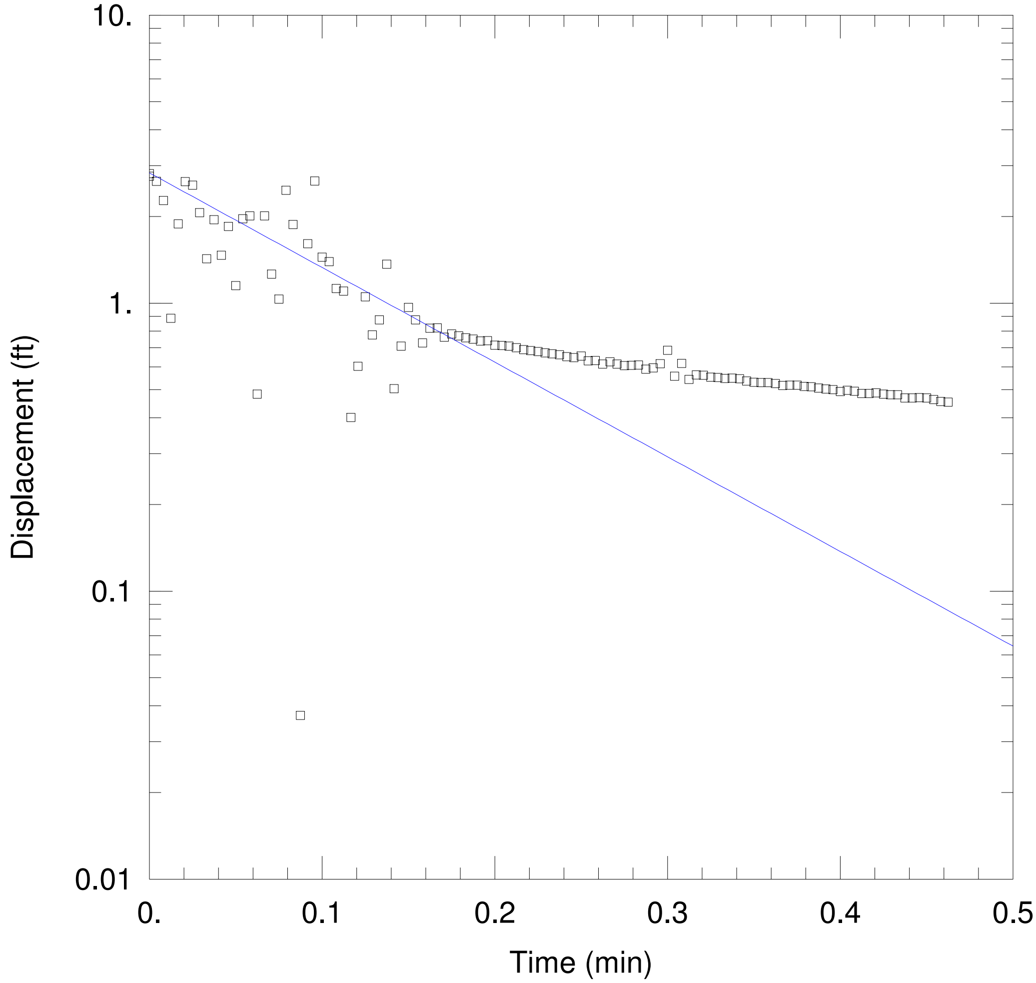
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 15.32 ft
Total Well Penetration Depth: 15.32 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004468 ft/min y0 = 3.108 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug in 2.aqt
Date: 06/02/17 Time: 14:06:49

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

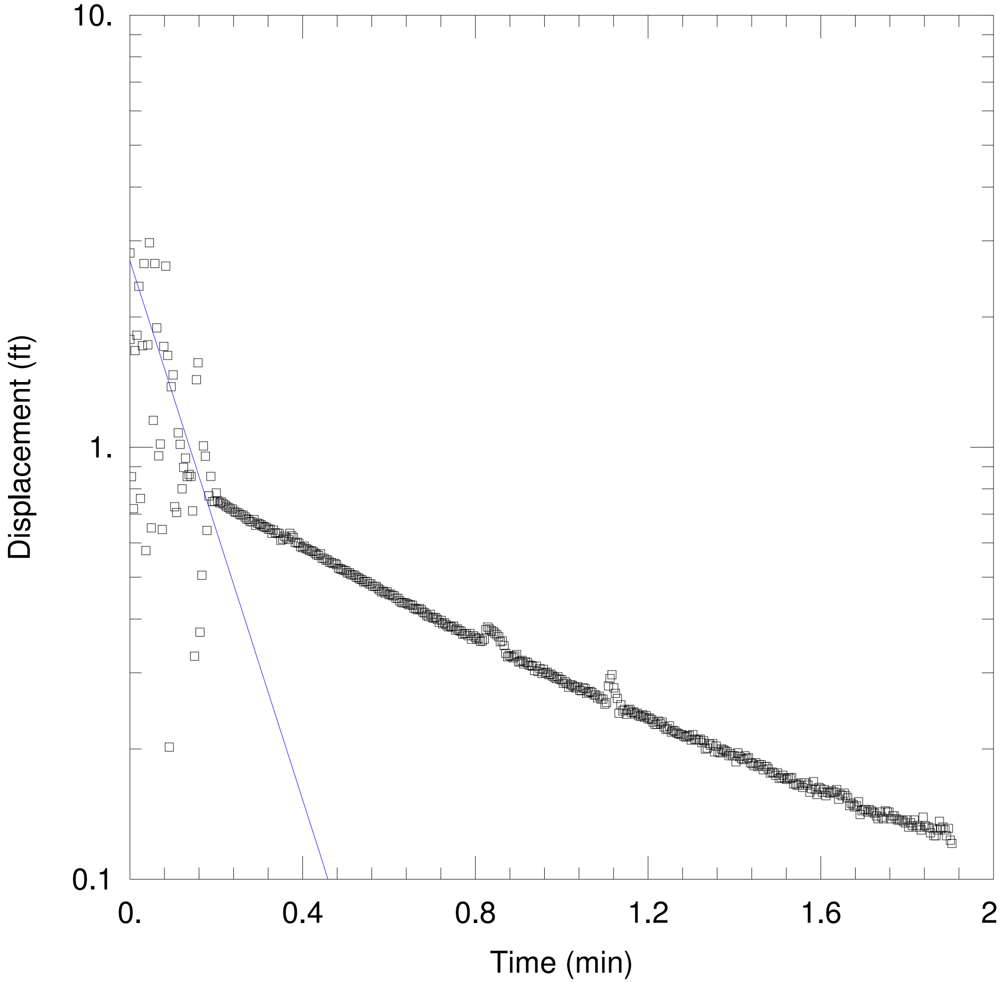
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 15.32 ft
Total Well Penetration Depth: 15.32 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004481 ft/min y0 = 2.833 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug in 3.aqt
Date: 06/02/17 Time: 14:07:02

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

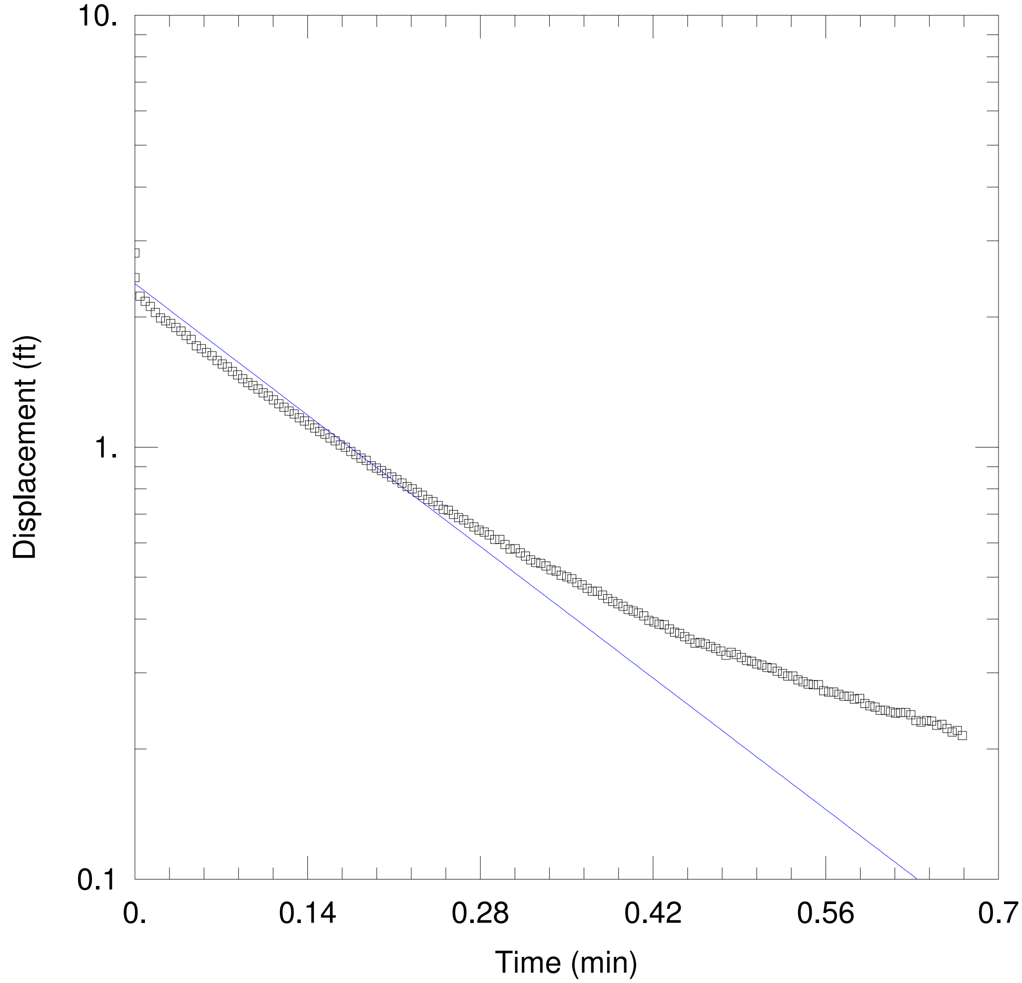
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 15.32 ft
Total Well Penetration Depth: 15.32 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004251 ft/min y0 = 2.697 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug out 1.aqt
Date: 06/02/17 Time: 14:07:18

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

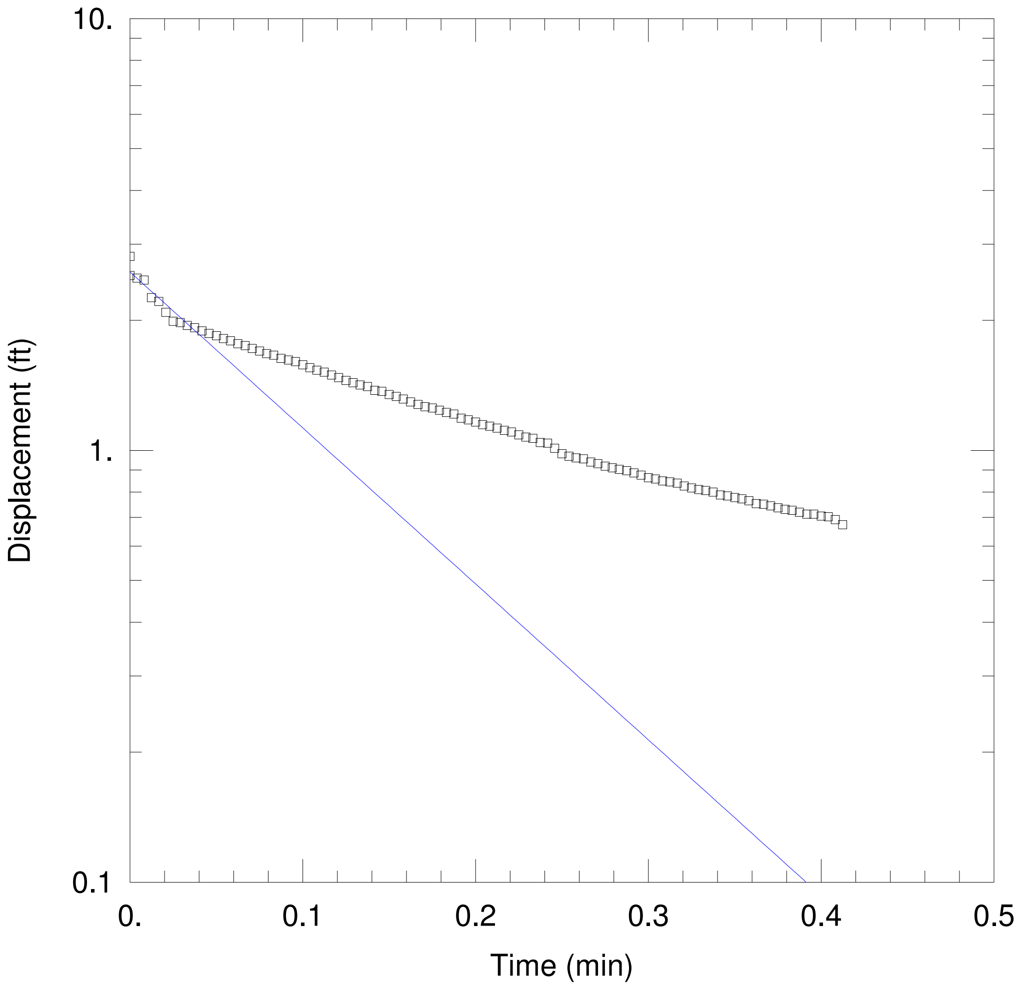
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 15.32 ft
Casing Radius: 0.083 ft
Static Water Column Height: 15.32 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002963 ft/min y0 = 2.389 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug out 2.aqt
Date: 06/02/17 Time: 14:07:30

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

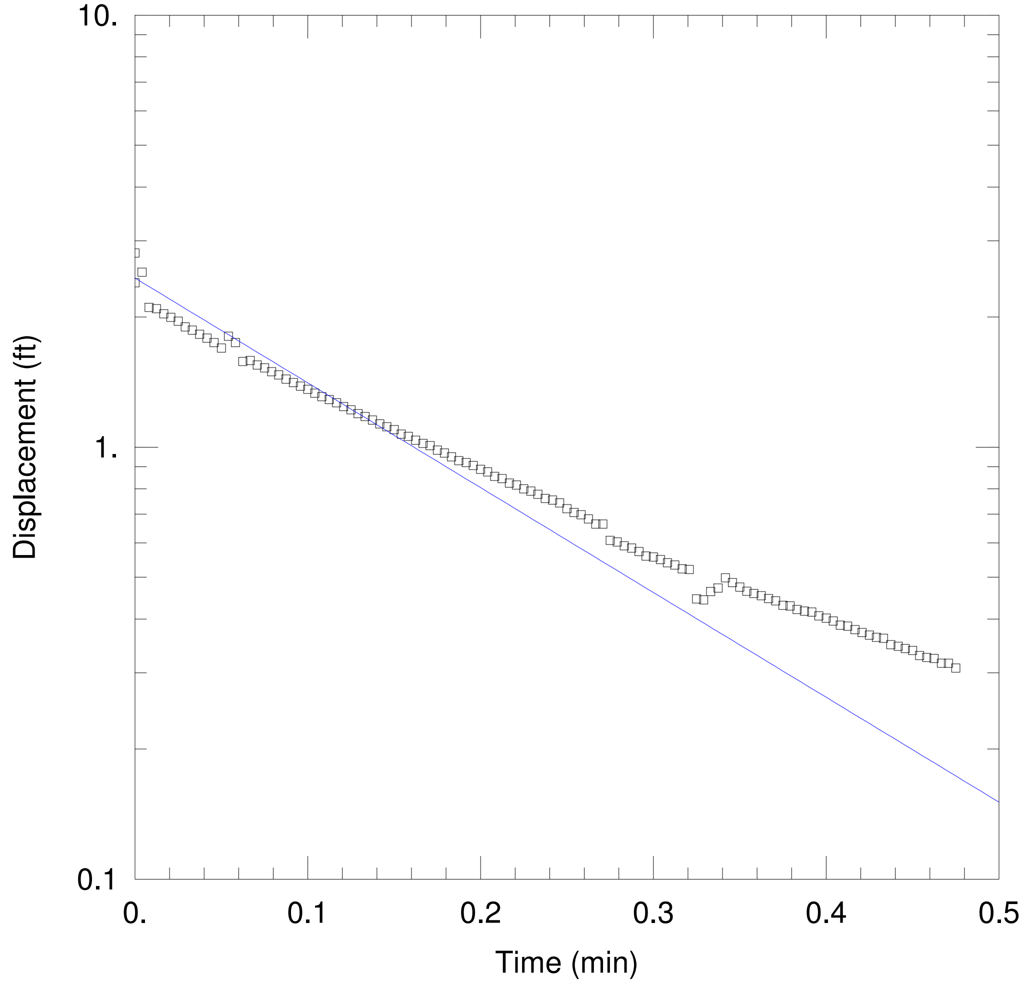
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 15.32 ft
Total Well Penetration Depth: 15.32 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004924 ft/min y0 = 2.588 ft



WELL TEST ANALYSIS

Data Set: \...\OW11-MW09-Slug out 3.aqt
Date: 06/02/17 Time: 14:08:40

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 15.32 ft Anisotropy Ratio (Kz/Kr): 1.

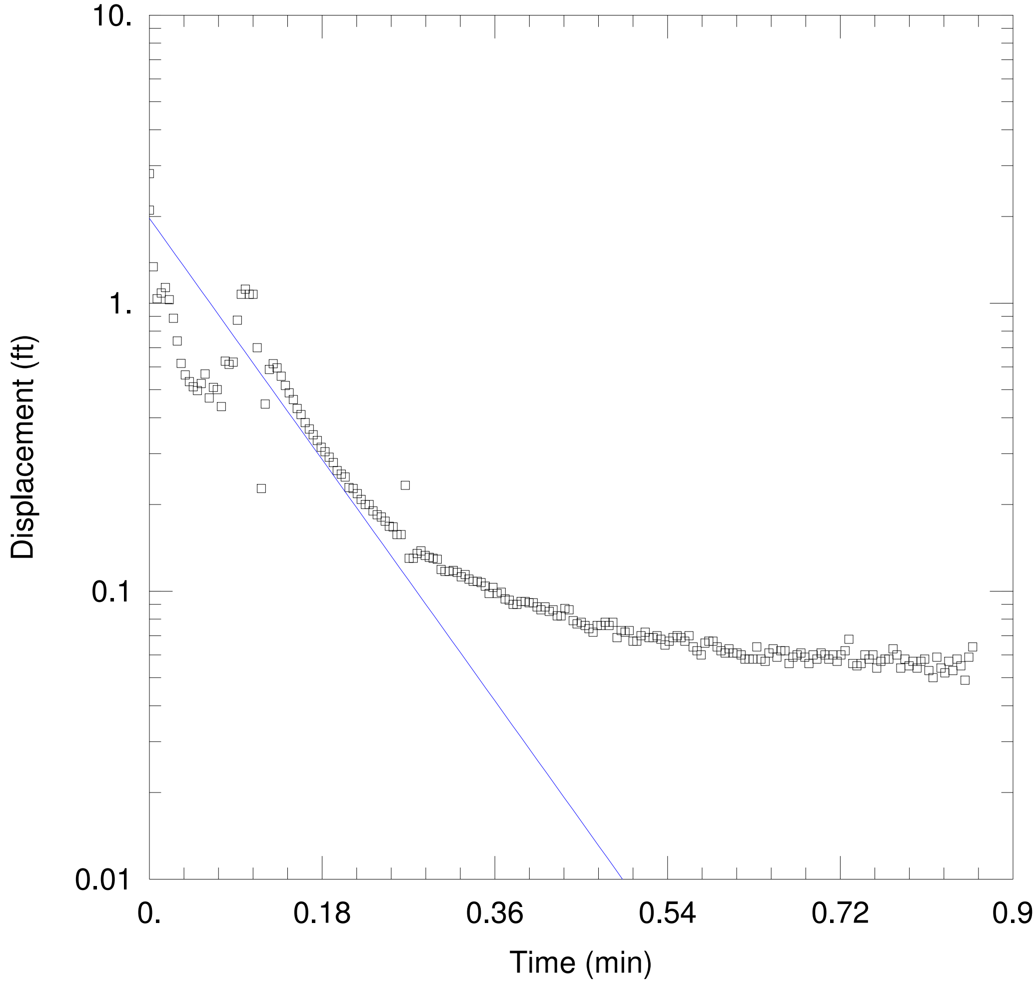
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Static Water Column Height: 15.32 ft
Total Well Penetration Depth: 15.32 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.003308 ft/min y0 = 2.462 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug in 1.aqt
Date: 06/02/17 Time: 14:08:55

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft Anisotropy Ratio (Kz/Kr): 1.

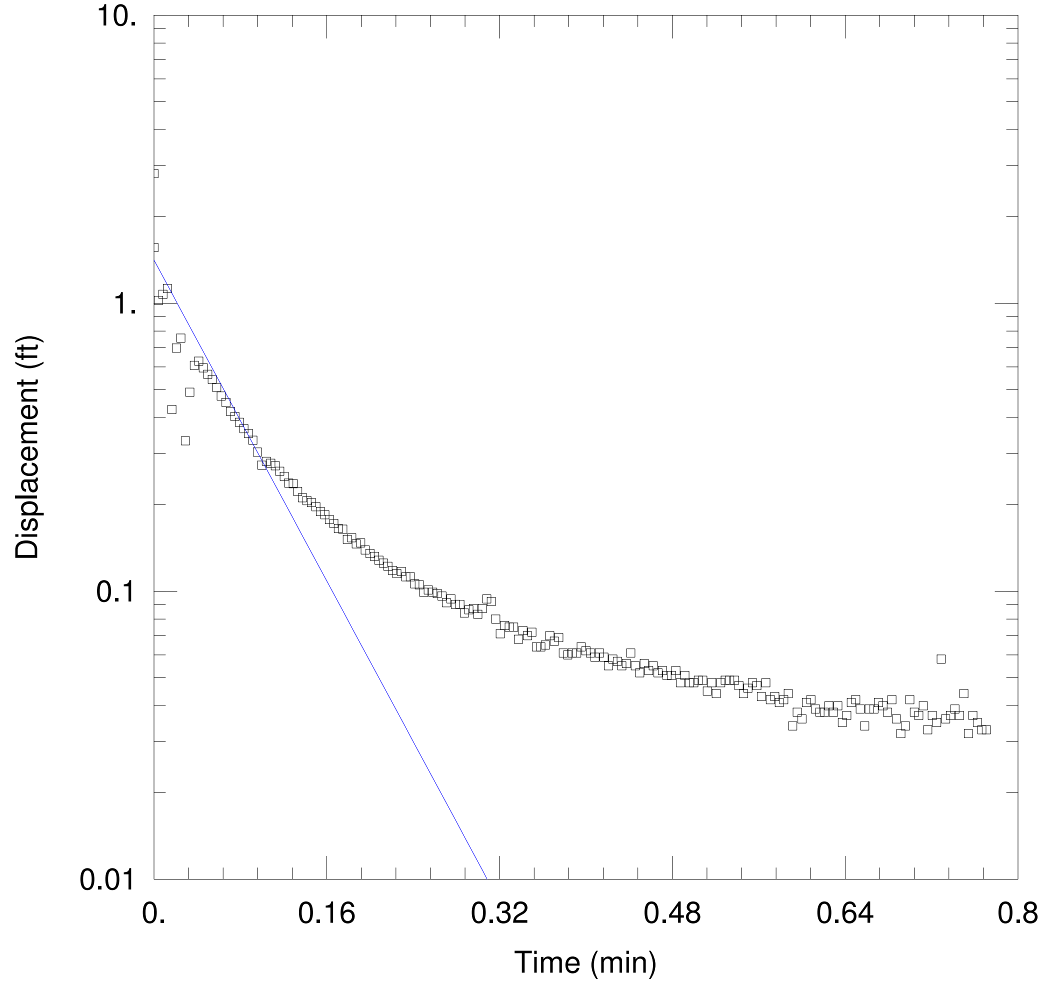
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 13.97 ft
Total Well Penetration Depth: 13.97 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00625 ft/min y0 = 1.969 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug in 2.aqt
Date: 06/02/17 Time: 14:09:10

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft Anisotropy Ratio (Kz/Kr): 1.

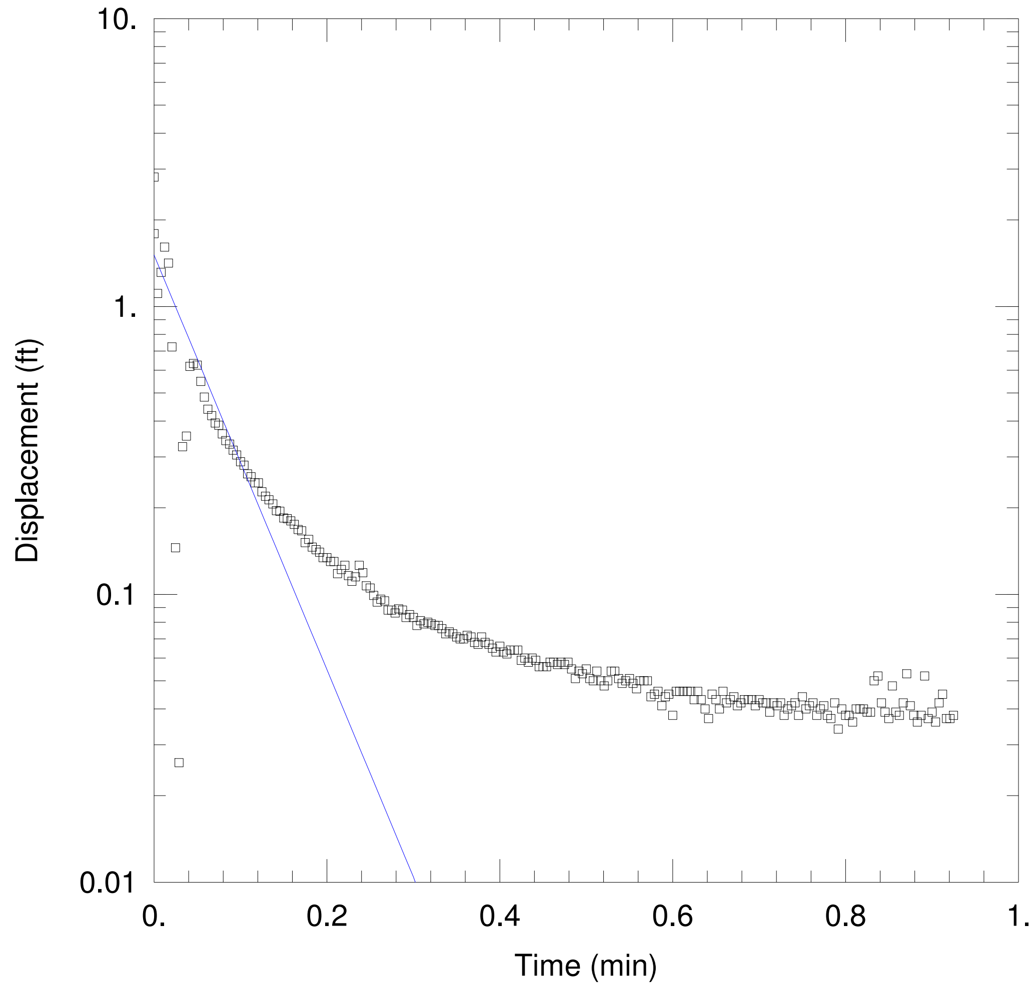
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 13.97 ft
Total Well Penetration Depth: 13.97 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009356 ft/min y0 = 1.411 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug in 3.aqt
Date: 06/02/17 Time: 14:09:26

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft
Anisotropy Ratio (Kz/Kr): 1.

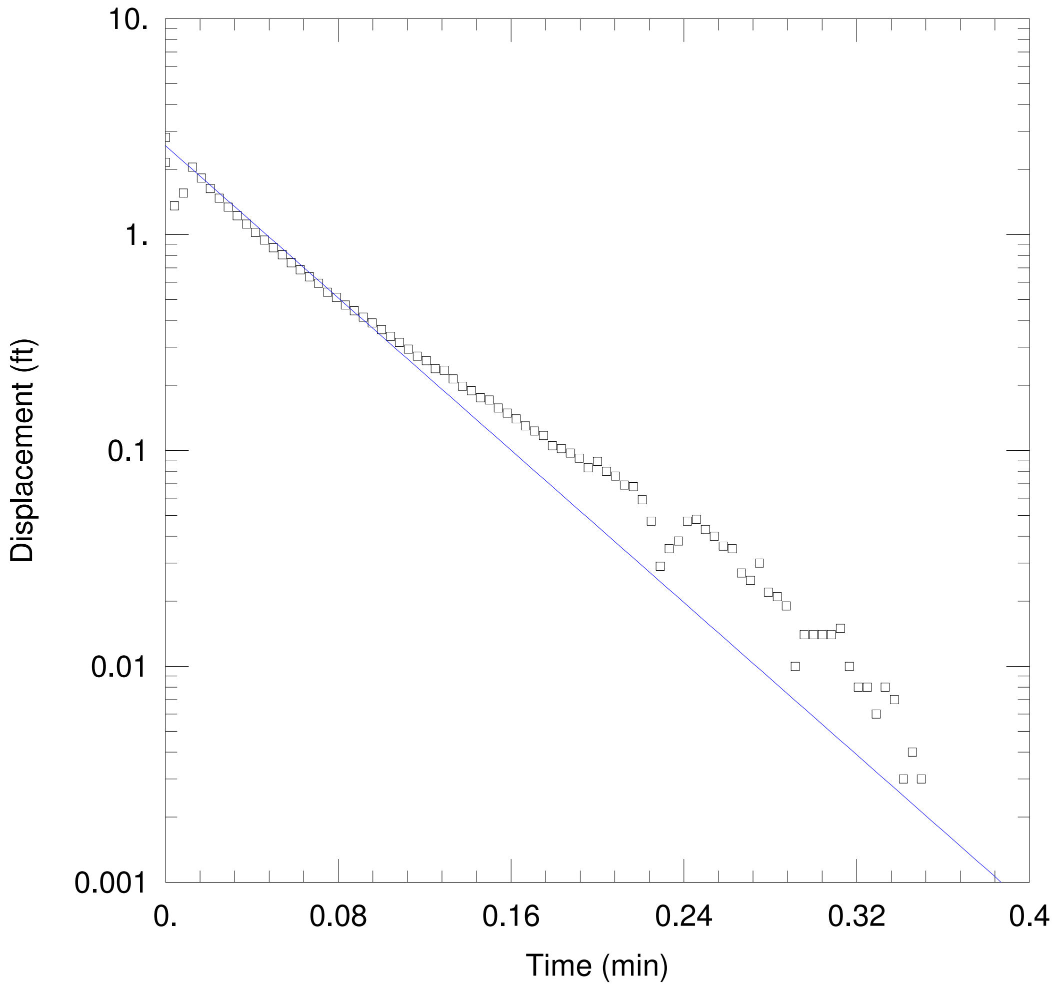
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 13.97 ft
Casing Radius: 0.083 ft
Static Water Column Height: 13.97 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.009673 ft/min
y0 = 1.508 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug out 1.aqt
Date: 06/02/17 Time: 14:09:38

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft Anisotropy Ratio (Kz/Kr): 1.

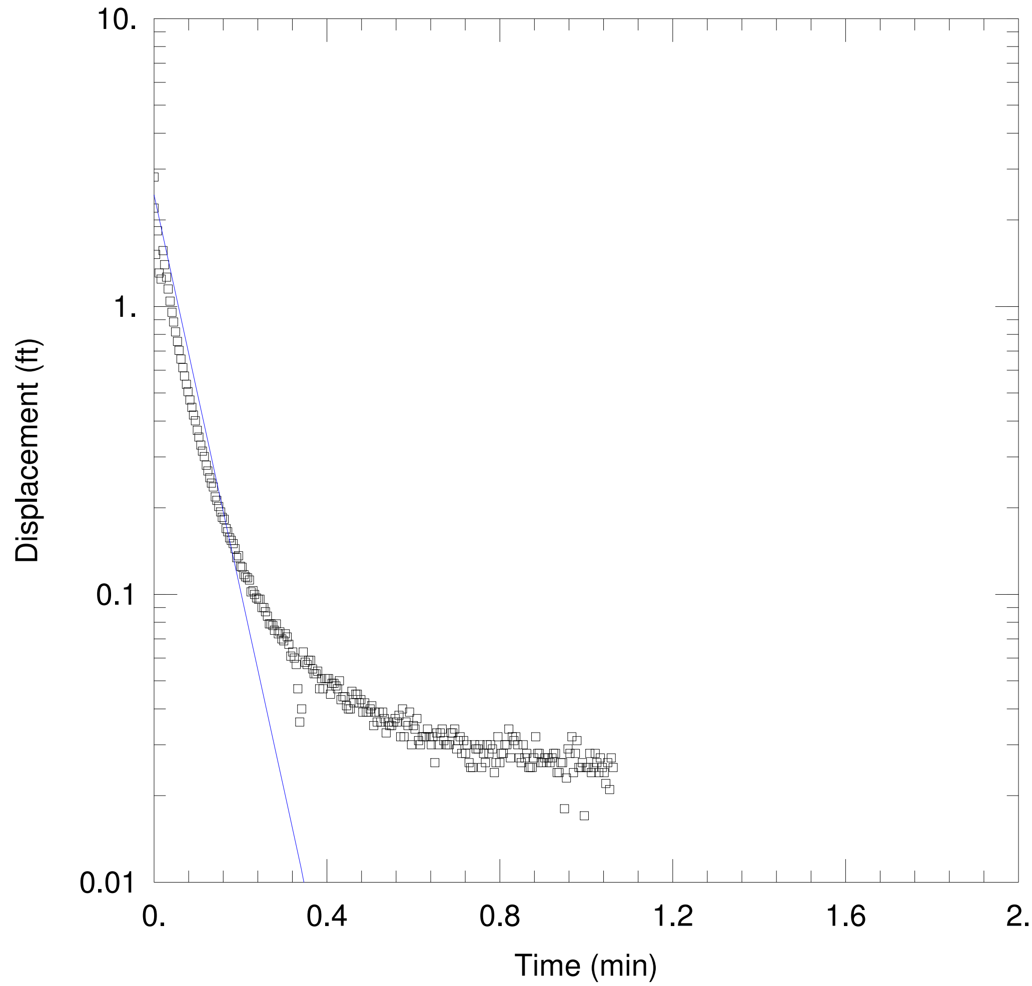
WELL DATA (New Well)

Initial Displacement: 2.813 ft Static Water Column Height: 13.97 ft
Total Well Penetration Depth: 13.97 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01184 ft/min y0 = 2.578 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug out 2.aqt
Date: 06/02/17 Time: 14:09:50

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft
Anisotropy Ratio (Kz/Kr): 1.

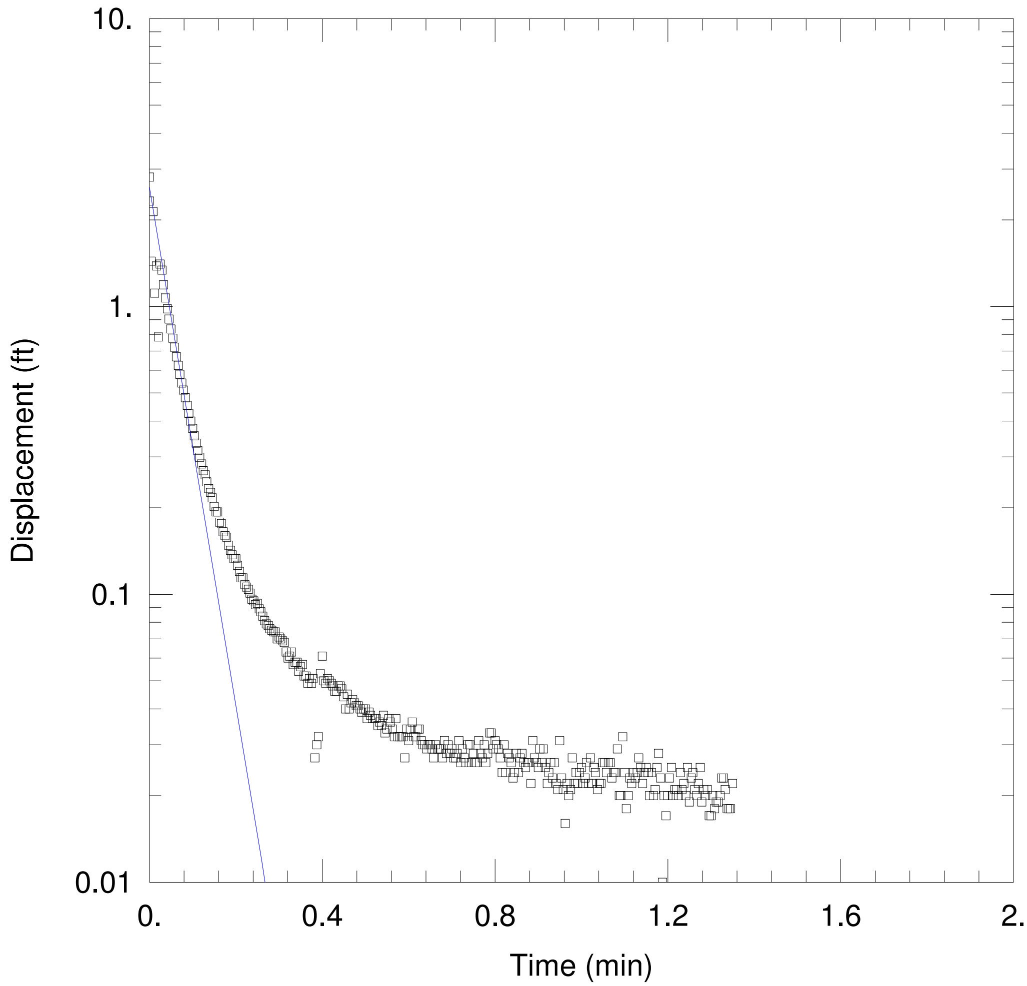
WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 13.97 ft
Casing Radius: 0.083 ft
Static Water Column Height: 13.97 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.009229 ft/min
y0 = 2.438 ft



WELL TEST ANALYSIS

Data Set: \...\OW26-MW01-Slug out 3.aqt
Date: 06/02/17 Time: 14:10:06

PROJECT INFORMATION

Company: CH2M
Client: NAVY CLEAN
Location: OCEANA
Test Well: OW11-MW04
Test Date: 11-10-2016

AQUIFER DATA

Saturated Thickness: 13.97 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 2.813 ft
Total Well Penetration Depth: 13.97 ft
Casing Radius: 0.083 ft

Static Water Column Height: 13.97 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01209 ft/min y0 = 2.588 ft

Appendix E
Survey Reports

CLEAN 8012 CTO WE14

Site 11, Oceana Crash Site Areas, SWMU 26

Virginia Beach, Virginia

MSA Project #16127B

COMMONWEALTH OF VIRGINIA
GREGORY M. ZOBY
Lic. No. 2991
4.8.2017
LAND SURVEYOR

Survey Report

MSA, P.C. provided surveying support for activities associated with the base wide perfluorinated compound investigation being performed at Site 11, SWMU 26, and locations around a 1986 crash near Oceana Boulevard located a Naval Air Station (NAS) Oceana in Virginia Beach, Virginia.

HORIZONTAL CONTROL

In order to establish on-site horizontal control, MSA, P.C. verified City of Virginia Beach Stations 711903, and C306 using GPS. After verification, on-site points #50, #51, #74 and #75 were set using GPS and multiple observations were made to ensure their accuracy. Horizontal control work complies with Third Order (1:10,000). The relative precision of the on-site traverse was as follows

Site 11 (1,857.51'/0.0065' = 1:285,771) Closed Traverse point #'s 50, 51, 53 and 54

SWMU 26 (11,243.59'/.004 = 1:2,810,898) Closed Traverse point #'s 74, 75, 76, 77, 78, 80, 81 and 82

VERTICAL CONTROL

Vertical control was established through GPS by verifying the known published elevations of City of Virginia Beach Control Stations PS540 andC306. Elevations were then applied to on-site control points #50, #51, #74 and #75 and a level loop was run through the traverse points, control points, and PVC casings of the monitoring wells. Vertical control work complies with Third Order (0.05 √m) and the maximum vertical error for the City of Virginia Beach Stations C306 and PS540 was 0.030'.

FIELD OPERATION DATES

The surveying took place beginning on October 17, 2016, and following the scope of work, the field crew field located twenty-one (21) monitoring wells throughout the Oceana NAS. Weather conditions on the first date of the field work was temperatures in the low 70's and clear.

CONTROL POINTS SET

MSA, P.C. set points #50, #51, #74 and #75 using GPS. Once these were in place, a traverse was run around the sites and permanent control points were put in place. Points #50, #51, #74 and #75 are 5/8" rebar set at ground level. Horizontal control points are referenced to the Virginia State Plane Coordinate System, South Zone, NAD 83/94 HARN. Vertical datum is based upon NAVD 88 and the US Survey Foot.

GPS OBSERVATIONS

A Leica 1200GPS was used with the ATX1230 SmartAntenna. All antenna heights were 6.562' to the bottom of the antenna mount. The RTK system utilizes the Leica SpiderNet CORS system with the base station being located in Virginia Beach, Virginia and named LS03.

CERTIFICATION

This survey was completed under the direct and responsible charge of Gregory M. Zoby, LS #2991, from an actual ground survey made under my supervision. The imagery and/or original data was obtained on October 17, 2016; and that this plat, map, or digital geospatial data including metadata complies with the accuracy requirements and with federal, state codes, ordinances, rules and regulations.


MW05D
MW02D
MW10D
MWF4
MW1D
MW07
MW07D

MONITORING WELLS	COORDINATES		ELEVATIONS			
	NORTHING	EASTING	GROUND	RIM	PVC	CONCRETE
OC-MW05D	3474053.93	12205440.12	16.6	16.53	16.28	
OC-MW02D	3470248.68	12211475.87	22.9	22.95	22.79	
OW26-MW1D	3465586.92	12206848.06	18.6	18.65	18.35	
OC-MW07D	3459527.53	12198113.53	9.6	13.64	13.59	9.87
OC-MW07	3459532.08	12198118.00	9.7	13.93	13.96	10.28
OC-MW-F4	3467331.72	12201491.29	15.2	17.68	17.64	15.35
OW11-MW10D	3469397.72	12204008.22	17.4	17.38	17.11	

Appendix F
Investigation-derived Waste Profiles and Disposal Manifests

TABLE F-1

Aqueous Investigation-Derived Waste Analytical Data (October 2016)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	TCLP Regulatory Level	AQ-IDW01-1116	AQ-IDW02-1116
Sample Date		11/2/16	11/2/16
Chemical Name			
TCLP Volatile Organic Compounds (UG/L)			
No Detections			
TCLP Semivolatile Organic Compounds (UG/L)			
No Detections			
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)			
No Detections			
TCLP Herbicides (UG/L)			
No Detections			
TCLP Metals (UG/L)			
Barium	100,000	133	240
Mercury	200	0.1 U	0.735
Wet Chemistry			
pH	2 - 12.5	7.4	7.2

Notes:

PH = pH units

TCLP = Toxicity Characteristic Leaching Procedure

U - The material was analyzed for, but not detected

UG/L = microgram per liter

Shading indicates detection

TABLE F-2

Soil Investigation-Derived Waste Analytical Data (October 2016)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	TCLP Regulatory Level	IDW-SO-01-1016	IDW-SO-02-1016	IDW-SO-03-1016	IDW-SO-04-1016	IDW-SO-05-1016	IDW-SO-06-1016	IDW-SO-07-1016
Sample Date		10/14/16	10/14/16	10/14/16	10/14/16	10/14/16	10/14/16	10/14/16
Chemical Name								
TCLP Volatile Organic Compounds (UG/L)								
Tetrachloroethene	700	10 U	10 U	12 J	11 J	10 U	10 U	10 U
TCLP Semivolatile Organic Compounds (UG/L)								
No Detections								
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)								
No Detections								
TCLP Herbicides (UG/L)								
No Detections								
TCLP Metals (UG/L)								
Barium	100,000	364	579	544	592	794	674	470
Cadmium	1,000	0.76 J	15 U	15 U	0.7 J	0.52 J	0.3 J	15 U
Chromium	5,000	3 J	2 J	3.7 J	3.1 J	20 U	3.4 J	20 U
Lead	5,000	180	11 J	14 J	30	19 J	16 J	11 J
Mercury	200	0.1 U	0.1 U	0.1 U	0.022 J	0.022 J	0.1 U	0.1 U
Selenium	1,000	35 U	35 U	14 J	35 U	35 U	12 J	35 U
Silver	5,000	20 U	20 U	20 U	20 U	20 U	20 U	2.5 J
Wet Chemistry								
pH	2 - 12.5	7	6.3	5	5.6	5.4	5.7	6.2

Notes:

J = Analyte present. Value may or may not be accurate or precise.

TCLP = Toxicity Characteristic Leaching Procedure

U = The material was analyzed for, but not detected.

UG/L = micrograms per liter

Shading indicates detection

TABLE F-3

Aqueous Investigation-Derived Waste Analytical Data (May 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	**TCLP Regulatory Level**	IDW-AQ-01-0417
Sample Date		4/4/17
Chemical Name		
TCLP Volatile Organic Compounds (UG/L)		
No Detections		
Semivolatile Organic Compounds (NG/L)		
Perfluoroheptanoic acid (PFHpA)		4.22 J
Perfluorohexanesulfonic acid (PFHxS)		21.4
Perfluorooctane Sulfonate (PFOS)		56.5
Perfluorooctanoic acid (PFOA)		11.5
Total PFOS + PFOA		68.0
TCLP Semivolatile Organic Compounds (UG/L)		
No Detections		
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)		
No Detections		
TCLP Herbicides (UG/L)		
No Detections		
TCLP Metals (UG/L)		
Barium	100,000	213
Mercury	200	0.014 J
Wet Chemistry		
pH	2 - 12.5	7.5

Notes:

J - Analyte present. Value may or may not be accurate or precise
NG/L - Nanograms per liter
NS - Not sampled
PH - pH units
TCLP = Toxicity Characteristic Leaching Procedure
UG/L - Micrograms per liter
Shading indicates detection

TABLE F-4

Soil Investigation-Derived Waste Analytical Data (May 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	**TCLP Regulatory Level**	IDW-SO-01-0417
Sample Date		4/4/17
Chemical Name		
TCLP Volatile Organic Compounds (UG/L)		
No Detections		
TCLP Semivolatile Organic Compounds (UG/L)		
No Detections		
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)		
No Detections		
TCLP Herbicides (UG/L)		
No Detections		
TCLP Metals (UG/L)		
Barium	100,000	277
Cadmium	1,000	0.47 J
Wet Chemistry		
pH	2 - 12.5	8

Notes:

J - Analyte present. Value may or may not be accurate or precise

PH - pH units

TCLP = Toxicity Characteristic Leaching Procedure

UG/L - Micrograms per liter

Shading indicates detection

Appendix G
Data Validation Reports

ENVIRONMENTAL
Data Services, Inc.

DATA VALIDATION SUMMARY REPORT
NAS OCEANA, VIRGINIA BEACH, VIRGINIA

Client: CH2M HILL, Inc., Virginia Beach, Virginia
SDG: 1700417
Laboratory: Vista Analytical Laboratory, El Dorado Hills, California
Site: NAS Oceania, Virginia Beach, Virginia, CTO-WE14
Date: May 22, 2017

PFCs			
EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	OC-MW05D-0417	1700417-01	Water
2	OC-MW05DP-0417	1700417-02	Water
3	OC-MW02D-0417	1700417-03	Water
4	OW26-MW01D-0417	1700417-04	Water
5	OW11-MW10D-0417	1700417-05	Water
6	OC-F8F9-MW-F4-0417	1700417-06	Water
7	OC-MW07D-0417	1700417-07	Water
8	OC-MW07-0417	1700417-08	Water
8MS	OC-MW07-0417MS	1700417-08MS	Water
8MSD	OC-MW07-0417MSD	1700417-08MSD	Water
9	OC-EB040417	1700417-09	Water
10	OC-FB040417	1700417-10	Water

A full data validation was performed on the analytical data for eight water samples, one aqueous equipment blank sample, and one aqueous field blank sample collected on April 3-4, 2017 by CH2M HILL at the NAS Oceana site in Virginia Beach, Virginia. The samples were analyzed under the EPA Method "Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)".

Specific method references are as follows:

Analysis	*Method References*
PFCs	USEPA Method 537 Modified

The data have been validated according to the protocols and quality control (QC) requirements of the analytical method, and the U.S. Department of Defense (DoD) Quality Systems Manual (QSM), Version 5.0 (July 2013) and the USEPA National Functional Guidelines for Organic Data Review as follows:

- The USEPA "Contract Laboratories Program National Functional Guidelines for Superfund Organic Methods Data Review," August 2014;
- and the reviewer's professional judgment.

The following data quality indicators were reviewed for this report:

Organics

- Date Completeness, Case Narrative & Custody Documentation
- Holding times
- Initial and continuing calibration summaries
- Method blank and field QC blank contamination
- Surrogate recoveries (%R)
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) recoveries
- Target Compound Identification
- Compound Quantitation
- Field Duplicate sample precision

A full (Level IV) data validation was performed with this review including a recalculation of 10% of the detected results in the samples.

Data Usability Assessment

There were no rejections of data.

Overall the data is acceptable for the intended purposes. There were no qualifications.

Perfluorinated Compounds (PFCs)

Data Completeness, Case Narrative & Custody Documentation

- The case narrative and chain-of-custody documentation were included in the data package as required. All criteria were met.

Holding Times

- All samples were extracted within 14 days for water samples and analyzed within 28 days.

Initial Calibration

- All percent difference (%D) and/or correlation coefficients criteria were met.

Continuing Calibration

- All percent recovery (%R) criteria were met.

Method Blank

- The method blanks were free of contamination.

Field QC Blank

- The field blank samples were free of contamination.

Blank ID	Compound	Conc. ng/L	Qualifier	Affected Samples
OC-EB040417	None - ND	-	-	-
OC-FB040417	None - ND	-	-	-

Surrogate Spike Recoveries

- All samples exhibited acceptable surrogate %R values.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries

- The MS/MSD sample exhibited acceptable percent recoveries (%R) and RPD values.

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

- The LCS/LCSD samples exhibited acceptable percent recoveries (%R) and RPD values.

Target Compound Identification

- All mass spectra and quantitation criteria were met.

Compound Quantitation

- All criteria were met.

Field Duplicate Sample Precision

- Field duplicate results are summarized below. The precision was acceptable.

Compound	OC-MW05D-0417 ng/L	OC-MW05DP-0417 ng/L	RPD	Qualifier
PFOS	1.01	2.42	82%	None - <5X LOQ

Please contact the undersigned at (757) 564-0090 if you have any questions or need further information.

Signed: Nancy Weaver Dated: 5/23/17

Nancy Weaver
Senior Chemist

Data Qualifier	Definition
U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The analyte is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis has been "tentatively identified" or “presumptively” as present and the associated numerical value is the estimated concentration in the samples.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the samples.

Sample ID: OC-MW05D-0417 | **Modified EPA Method 537**

Client Data
Name: CH2M Hill
Project: 678440.51.51.01
Date Collected: 03-Apr-2017 9:45
Location:

Sample Data
Matrix: Aqueous
Sample Size: 0.118 L

Laboratory Data
Lab Sample: 1700417-01
QC Batch: B7D0026
Date Analyzed: 15-Apr-17 13:03 Column: BEH C18
Date Received: 05-Apr-2017 9:50
Date Extracted: 06-Apr-2017 10:58

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers
PFBS	ND	1.89	4.24	8.45	
PFHpA	ND	0.624	2.12	8.45	
PFHxS	ND	1.00	2.12	8.45	
PFOA	ND	0.687	2.12	8.45	
PFOS	1.01	0.852	0.953	8.45	J
PFNA	ND	0.855	2.12	8.45	

	Labeled Standard	%R	LCL-UCL	Qualifiers
IS	13C3-PFBS	98.5	60 - 150	
IS	13C4-PFHpA	97.0	60 - 150	
IS	18O2-PFHxS	90.0	60 - 150	
IS	13C2-PFOA	87.0	60 - 150	
IS	13C8-PFOS	97.5	60 - 150	
IS	13C5-PFNA	91.9	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

NW 5/22/17

2

Sample ID: OC-MW05DP-0417 — Modified EPA Method 537

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-02	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.122 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	03-Apr-2017 9:50			Date Analyzed:	15-Apr-17 13:16 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.83	4.10	8.18		IS	13C3-PFBS	94.4	60 - 150	
PFHpA	ND	0.604	2.05	8.18		IS	13C4-PFHpA	94.3	60 - 150	
PFHxS	ND	0.968	2.05	8.18		IS	18O2-PFHxS	97.9	60 - 150	
PFOA	ND	0.666	2.05	8.18		IS	13C2-PFOA	86.5	60 - 150	
PFOS	2.42	0.825	0.922	8.18	J	IS	13C8-PFOS	99.6	60 - 150	
PFNA	ND	0.828	2.05	8.18		IS	13C5-PFNA	95.8	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL.
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

Sample ID: OC-MW02D-0417 | **Modified EPA Method 537**

Client Data		**Sample Data**		**Laboratory Data**			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-03	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.122 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	03-Apr-2017 11:40			Date Analyzed:	15-Apr-17 13:29 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.84	4.10	8.22		IS	13C3-PFBS	103	60 - 150	
PFHpA	3.41	0.608	2.05	8.22	J	IS	13C4-PFHpA	99.7	60 - 150	
PFHxS	10.0	0.973	2.05	8.22		IS	18O2-PFHxS	94.3	60 - 150	
PFOA	8.98	0.669	2.05	8.22		IS	13C2-PFOA	85.1	60 - 150	
PFOS	ND	0.830	0.922	8.22		IS	13C8-PFOS	89.3	60 - 150	
PFNA	ND	0.833	2.05	8.22		IS	13C5-PFNA	96.0	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL.
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

NW 5/22/17

1D ~~2~~ NW 4

Sample ID: OW26-MW~~2~~-0417 | **Modified EPA Method 537**

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-04	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.119 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	03-Apr-2017 13:05			Date Analyzed:	15-Apr-17 13:41 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.87	4.20	8.38		IS	13C3-PFBS	92.3	60 - 150	
PFHpA	ND	0.619	2.10	8.38		IS	13C4-PFHpA	89.5	60 - 150	
PFHxS	2.37	0.991	2.10	8.38	J	IS	18O2-PFHxS	91.9	60 - 150	
PFOA	ND	0.682	2.10	8.38		IS	13C2-PFOA	80.9	60 - 150	
PFOS	10.1	0.845	0.945	8.38		IS	13C8-PFOS	86.5	60 - 150	
PFNA	ND	0.848	2.10	8.38		IS	13C5-PFNA	87.6	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

NW 5/22/17

Sample ID: OW11-MW10D-0417

Modified EPA Method 537

Client Data		**Sample Data**		**Laboratory Data**			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-05	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.122 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 8:45			Date Analyzed:	15-Apr-17 13:54 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	8.13	1.84	4.10	8.20	J	IS	13C3-PFBS	101	60 - 150	
PFHpA	22.4	0.606	2.05	8.20		IS	13C4-PFHpA	101	60 - 150	
PFHxS	124	0.971	2.05	8.20		IS	18O2-PFHxS	96.4	60 - 150	
PFOA	61.3	0.668	2.05	8.20		IS	13C2-PFOA	83.7	60 - 150	
PFOS	578	0.828	0.922	8.20		IS	13C8-PFOS	99.5	60 - 150	
PFNA	5.19	0.831	2.05	8.20	J	IS	13C5-PFNA	96.1	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

6

Sample ID: OC-F8F9-MW-F4-0417 — Modified EPA Method 537

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-06	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.00110 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 9:55			Date Analyzed:	15-Apr-17 14:06 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	203	455	909		IS	13C3-PFBS	108	60 - 150	
PFHpA	ND	67.2	227	909		IS	13C4-PFHpA	104	60 - 150	
PFHxS	ND	108	227	909		IS	18O2-PFHxS	89.0	60 - 150	
PFOA	ND	74.0	227	909		IS	13C2-PFOA	81.3	60 - 150	
PFOS	ND	91.7	102	909		IS	13C8-PFOS	93.2	60 - 150	
PFNA	ND	92.0	227	909		IS	13C5-PFNA	98.1	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL.
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

7

Sample ID: OC-MW07D-0417 — Modified EPA Method 537

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-07	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.118 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 11:05			Date Analyzed:	15-Apr-17 14:19 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.90	4.24	8.50		IS	13C3-PFBS	99.5	60 - 150	
PFHpA	ND	0.628	2.12	8.50		IS	13C4-PFHpA	91.0	60 - 150	
PFHxS	ND	1.01	2.12	8.50		IS	18O2-PFHxS	90.2	60 - 150	
PFOA	ND	0.691	2.12	8.50		IS	13C2-PFOA	85.7	60 - 150	
PFOS	ND	0.857	0.953	8.50		IS	13C8-PFOS	83.2	60 - 150	
PFNA	ND	0.860	2.12	8.50		IS	13C5-PFNA	86.6	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers.
Only the linear isomer is reported for all other analytes

NW 5/22/17

Sample ID: OC-MW07-0417 **Modified EPA Method 537**

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-08	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.124 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 11:45			Date Analyzed:	15-Apr-17 14:31 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.81	4.03	8.08		IS	13C3-PFBS	91.4	60 - 150	
PFHpA	ND	0.597	2.02	8.08		IS	13C4-PFHpA	87.5	60 - 150	
PFHxS	ND	0.957	2.02	8.08		IS	18O2-PFHxS	95.5	60 - 150	
PFOA	0.685	0.658	2.02	8.08	J	IS	13C2-PFOA	86.8	60 - 150	
PFOS	3.63	0.815	0.907	8.08	J	IS	13C8-PFOS	91.7	60 - 150	
PFNA	ND	0.818	2.02	8.08		IS	13C5-PFNA	93.2	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

9

Sample ID: OC-EB040417 **Modified EPA Method 537**

Client Data		Sample Data		Laboratory Data			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-09	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.117 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 11:50			Date Analyzed:	15-Apr-17 14:44 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.92	4.27	8.56		IS	13C3-PFBS	96.5	60 - 150	
PFHpA	ND	0.632	2.14	8.56		IS	13C4-PFHpA	93.9	60 - 150	
PFHxS	ND	1.01	2.14	8.56		IS	18O2-PFHxS	93.6	60 - 150	
PFOA	ND	0.696	2.14	8.56		IS	13C2-PFOA	83.7	60 - 150	
PFOS	ND	0.863	0.962	8.56		IS	13C8-PFOS	95.5	60 - 150	
PFNA	ND	0.867	2.14	8.56		IS	13C5-PFNA	91.5	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

10

Sample ID: OC-FB040417 — **Modified EPA Method 537**

Client Data		**Sample Data**		**Laboratory Data**			
Name:	CH2M Hill	Matrix:	Aqueous	Lab Sample:	1700417-10	Date Received:	05-Apr-2017 9:50
Project:	678440.51.51.01	Sample Size:	0.122 L	QC Batch:	B7D0026	Date Extracted:	06-Apr-2017 10:58
Date Collected:	04-Apr-2017 11:55			Date Analyzed:	15-Apr-17 14:57 Column: BEH C18		
Location:							

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers		Labeled Standard	%R	LCL-UCL	Qualifiers
PFBS	ND	1.84	4.10	8.22		IS	13C3-PFBS	105	60 - 150	
PFHpA	ND	0.607	2.05	8.22		IS	13C4-PFHpA	93.5	60 - 150	
PFHxS	ND	0.973	2.05	8.22		IS	18O2-PFHxS	84.1	60 - 150	
PFOA	ND	0.669	2.05	8.22		IS	13C2-PFOA	84.7	60 - 150	
PFOS	ND	0.829	0.922	8.22		IS	13C8-PFOS	89.2	60 - 150	
PFNA	ND	0.833	2.05	8.22		IS	13C5-PFNA	93.3	50 - 150	

LCL-UCL - Lower control limit - upper control limit
Results reported to DL
When reported, PFBS, PFHxS, PFOA and PFOS include both linear and branched isomers
Only the linear isomer is reported for all other analytes

MW 5/22/17

Oceana CTO-WE14 Oceana PFC
Attachment 1 Change Qual. Table

SDG	Sample ID	Compound	Q Flag	Qual Code
1601420	FTWG-MW-02-1116	Perfluorononanoic acid (PFNA)	U	FBL
1601388	MW-BG01-1016	Perfluorononanoic acid (PFNA)	U	MBL
1601388	MW-BG04-1016	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601388	MW-BG05-1016	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601388	MW-BG05P-1016	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601388	MW-BG07-1016	Perfluorononanoic acid (PFNA)	U	MBL
1601388	MW-BG09-1016	Perfluorononanoic acid (PFNA)	U	MBL
1601388	MW-BG09-1016	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601401	MW-BG10-1116	Perfluorooctanoic acid (PFOA)	U	EBL
1601388	MW-BG11-1016	Perfluorononanoic acid (PFNA)	U	MBL
1601370	MW-BG13-1016	Perfluorohexanesulfonic acid (PFHxS)	J	FD
1601370	MW-BG13-1016	Perfluorooctanoic acid (PFOA)	U	MBL
1601370	MW-BG13-1016	Perfluorooctane Sulfonate (PFOS)	J	FD
1601370	MW-BG13P-1016	Perfluorobutanesulfonic acid (PFBS)	UJ	ISL
1601370	MW-BG13P-1016	Perfluoroheptanoic acid (PFHpA)	UJ	ISL
1601370	MW-BG13P-1016	Perfluorohexanesulfonic acid (PFHxS)	UJ	ISL
1601370	MW-BG13P-1016	Perfluorooctanoic acid (PFOA)	UJ	ISL
1601370	MW-BG13P-1016	Perfluorooctane Sulfonate (PFOS)	J	FD
1601420	OC-EB110816	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601420	OC-EB110816	Perfluoroheptanoic acid (PFHpA)	U	MBL
1601388	OC-FB-102816	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601420	OC-FB110816	Perfluorooctane Sulfonate (PFOS)	U	MBL
1601420	OC-FB110816	Perfluoroheptanoic acid (PFHpA)	U	MBL
1601401	OC-MW02-1116	Perfluorooctanoic acid (PFOA)	U	EBL
1601388	OC-MW04-1016	Perfluorononanoic acid (PFNA)	U	MBL
1601437	OW11-MW1-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW4-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW5-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW6-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW7-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW9-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601437	OW11-MW9P-1016	Perfluorooctane Sulfonate (PFOS)	J	HT
1601401	OW26-MW1-1116	Perfluorohexanesulfonic acid (PFHxS)	J	ISH
1601401	OW26-MW1P 1116	Perfluorohexanesulfonic acid (PFHxS)	J	ISH
1601401	OW26-MW1P 1116	Perfluorooctanoic acid (PFOA)	J	ISH

MEMORANDUM CH2MHILL

Data Validation Summary

Oceana CTO-WE14, NAS Oceana

TO: Tiffany Hill/CVO
Anita Dodson/VBO

FROM: Tiffany McGlynn/GNV

CC: Herb Kelly/GNV

DATE: December 9, 2016

Introduction

The following data validation report discusses the data validation process and findings for Vista Analytical in the Sample Delivery Groups (SDGs) listed in the table below.

Samples were analyzed using the following analytical methods:

- 537 MOD Perfluorinated Hydrocarbons

The samples included in these SDGs are listed in the table below.

SDG	Sample Name	Matrix
1601370	OW11-MW9-1016	Water
1601370	OW11-MW9P-1016	Water
1601370	OW11-MW8-1016	Water
1601370	OW11-MW1-1016	Water
1601370	OW11-MW7-1016	Water
1601370	OW11-MW5-1016	Water
1601370	OW11-MW6-1016	Water
1601370	OW11-MW4-1016	Water
1601370	MW-BG13-1016	Water
1601370	MW-BG13P-1016	Water
1601370	MW-BG12-1016	Water
1601388	MW-BG07-1016	Water

SDG	Sample Name	Matrix
1601388	MW-BG06-1016	Water
1601388	MW-BG05-1016	Water
1601388	MW-BG05P-1016	Water
1601388	MW-BG04-1016	Water
1601388	OC-FB-102816	Water
1601388	MW-BG01-1016	Water
1601388	MW-BG09-1016	Water
1601388	OC-MW04-1016	Water
1601388	MW-BG11-1016	Water
1601401	203MW-19-1116	Water
1601401	JTC-MW-B-1116	Water
1601401	MW-BG10-1116	Water
1601401	OW2C-MW19-1116	Water
1601401	OW2E-MW19-1116	Water
1601401	OW2B-MW41-1116	Water
1601401	OC-EB-110216	Water
1601401	OC-MW03-1116	Water
1601401	OC-MW01-1116	Water
1601401	OC-FB-110216	Water
1601401	OC-MW02-1116	Water
1601401	OW26-MW1-1116	Water
1601401	OW26-MW1P 1116	Water
1601420	FTWG-MW-02-1116	Water
1601420	OC-EB110816	Water
1601420	OC-FB110816	Water
1601437	OW11-MW1-1016	Water
1601437	OW11-MW4-1016	Water
1601437	OW11-MW5-1016	Water
1601437	OW11-MW6-1016	Water
1601437	OW11-MW7-1016	Water
1601437	OW11-MW9-1016	Water
1601437	OW11-MW9P-1016	Water

Data Evaluation

Data was evaluated in accordance with the analytical methods and with the criteria found in the following guidance documents: Sampling and Analysis Plan Basewide Site Inspection for Perfluorinated Compounds Naval Air Station Oceana Virginia Beach, Virginia CTO-WE14 (October 2016) and National Functional Guidelines for Superfund Organic Methods Data Review (September 2016), as applicable. The samples were evaluated based on the following criteria:

- Data Completeness
- Technical Holding Times
- Tuning Instrument
- Initial/Continuing Calibrations
- Blanks
- Internal Standards
- Laboratory Control Samples
- Isotope Dilution Analyte
- Field Duplicates
- Identification/Quantitation
- Reporting Limits

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the sections below. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte, the validator has chosen the qualifier that best indicates possible bias in the results and qualified these data accordingly.

Data Completeness

The SDG was received complete and intact.

Technical Holding Times

According to the chain of custody records, sampling was performed on 10/25/16 through 11/8/16. Samples were received at the laboratory 10/27/16 through 11/9/16. All sample preparation and analyses were originally performed within holding time requirements with the exception of selected samples in SDG 1601437, which were re-extracted 15 days out of holding time. These samples were reanalyzed for Perfluorooctane Sulfonate (PFOS) only due to the high concentration detected in the original sample analysis. Affected data are summarized in **Attachment 1**.

Blanks

Target compounds were detected in the method blanks, equipment blanks, and field blanks as listed in the table below. Affected data are summarized in **Attachment 1**.

Blank ID	Compound	Conc.	Units
B6K0053-BLK1	Perfluorooctane Sulfonate (PFOS)	1.48	NG_L
B6K0124-BLK1	Perfluorooctane Sulfonate (PFOS)	1.71	NG_L
B6K0001-BLK1	Perfluorooctanoic acid (PFOA)	0.818	NG_L
B6K0053-BLK1	Perfluorononanoic acid (PFNA)	0.933	NG_L
OC-FB-110216	Perfluorooctanoic acid (PFOA)	0.691	NG_L
OC-EB-110216	Perfluorooctanoic acid (PFOA)	0.731	NG_L
OC-FB110816	Perfluorononanoic acid (PFNA)	0.866	NG_L
B6K0124-BLK1	Perfluoroheptanoic acid (PFHpA)	0.802	NG_L

Field Duplicate Precision

Native sample MW-BG13-1016 and field duplicate MW-BG13P-1016 did not meet precision criteria for perfluorohexanesulfonic acid (PFHxS) and PFOS. Affected data are summarized in **Attachment 1**.

Internal Standards

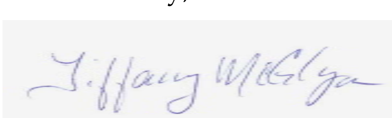
Sample MW-BG13P-1016 exhibited low recoveries in the internal standards. Samples OW26-MW1-1116 and OW26-MW1P 1116 exhibited high recoveries in the internal standards. Affected data are summarized in **Attachment 1**.

Conclusion

These data can be used in the project decision-making process as qualified by the data quality evaluation process.

Please do not hesitate to contact us about this validation report.

Sincerely,



Tiffany McGlynn

Qualification Flags

Exclude	More appropriate data exist for this analyte.
R	Data were rejected for use.
UL	Analyte not detected, quantitation limit is potentially biased low.
UJ	Analyte not detected, estimated quantitation limit.
U	Analyte not detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
L	Analyte present, estimated value potentially biased low.
K	Analyte present, estimated value potentially biased high.
N	Analyte identification presumptive; no second column analysis performed or GC/MS tentative identification.
J	Analyte present, estimated value.
NJ	Analysis indicates the presence of an analyte that was "tentatively identified" and the associated value represents its approximate concentration.
None	Placeholder for calculating quality control issues that do not require flagging.
=	Analyte was detected at a concentration greater than the quantitation limit.

Qualifier Code Reference

Value	Description
%SOL	High Moisture content
2C	Second Column – Poor Dual Column Reproducibility
2S	Second Source – Bad reproducibility between tandem detectors
BD	Blank Spike/Blank Spike Duplicate(LCS/LCSD) Precision
BRL	Below Reporting Limit
BSH	Blank Spike/LCS – High Recovery
BSL	Blank Spike/LCS – Low Recovery
CC	Continuing Calibration
CCBL	Continuing Calibration Blank Contamination
CCH	Continuing Calibration Verification – High Recovery
CCL	Continuing Calibration Verification – Low Recovery
DL	Redundant Result – due to Dilution
EBL	Equipment Blank Contamination
EMPC	Estimated Possible Maximum Concentration
ESH	Extraction Standard - High Recovery
ESL	Extraction Standard - Low Recovery
FBL	Field Blank Contamination
FD	Field Duplicate
HT	Holding Time
ICB	Initial Calibration – Bad Linearity or Curve Function
ICH	Initial Calibration – High Relative Response Factors
ICL	Initial Calibration – Low Relative Response Factors
IR15	Ion ratio exceeds +/- 15% difference
ISH	Internal Standard – High Recovery
ISL	Internal Standard – Low Recovery
LD	Lab Duplicate Reproducibility
LR	Concentration Exceeds Linear Range
MBL	Method Blank Contamination
MDP	Matrix Spike/Matrix Spike Duplicate Precision
MI	Matrix interference obscuring the raw data

Value	Description
MSH	Matrix Spike and/or Matrix Spike Duplicate – High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate – Low Recovery
OT	Other
PD	Pesticide Degradation
RE	Redundant Result - due to Reanalysis or Re-extraction
SD	Serial Dilution Reproducibility
SSH	Spiked Surrogate – High Recovery
SSL	Spiked Surrogate – Low Recovery
TBL	Trip Blank Contamination
TN	Tune

Appendix H
Analytical data (PFHpA, PFHxS, and PFNA) for the Columbia and Yorktown aquifers, and Potable and Non-Potable Water

TABLE H-1
Columbia Aquifer Groundwater Analytical Data (October 2016, February and April 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID		**USEPA Lifetime**	203MW-19-1116	FTWG-MW-02-1116	JTC-MW-B-1116	MW-BG01-1016	MW-BG04-1016	MW-BG05-1016	MW-BG05P-1016	MW-BG06-1016	MW-BG07-1016
Sample Date	**RSLs Tapwater HQ = 1.0 (June 2016)**	**Health Advisory (May 2016)**	11/1/16	11/8/16	11/1/16	10/31/16	10/28/16	10/28/16	10/28/16	10/28/16	10/28/16
Chemical Name											
Semivolatile Organic Compounds (ng/L)											
Perfluoroheptanoic acid (PFHpA)	--	--	1.85 J	8.36 J	6.29 J	2.03 U	1.91 U	0.665 J	0.598 J	2.02 U	1.98 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	16.9	11	212	3.81 J	1.1 J	3.02 J	2.78 J	2.02 U	5.48 J
Perfluorononanoic acid (PFNA)	--	--	2.02 U	3.59 U	6.08 J	2.03 U	1.91 U	1.97 U	2.02 U	2.02 U	1.98 U

Notes:
* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.
B = Analyte not detected above the level reported in blanks
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise.
ng/L = nanogram per liter
RSL = Regional Screening Level
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)
Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-1

Columbia Aquifer Groundwater Analytical Data (October 2016, February and April 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	RSLs Tapwater HQ = 1.0 (June 2016)	USEPA Lifetime Health Advisory (May 2016)	MW-BG09-1016	MW-BG10-1116	MW-BG11-1016	MW-BG12-1016	MW-BG13-1016	MW-BG13P-1016	OC-F8F9-MW-F4-0417	OC-MW01-1116	OC-MW02-1116
Sample Date			10/31/16	11/2/16	10/31/16	10/26/16	10/26/16	10/26/16	4/4/17	11/1/16	11/1/16
Chemical Name											
Semivolatile Organic Compounds (ng/L)											
Perfluoroheptanoic acid (PFHpA)	--	--	2 U	2.1 U	2.05 U	2.7 J	0.997 J	1.97 UJ	0.611 UJ	2.7 J	2.02 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	10.1	2.9 J	19.3	79.7	12.3 J	1.97 UJ	2.71 J	19.4	2.02 U
Perfluorononanoic acid (PFNA)	--	--	2 U	2.1 U	2.05 U	1.37 J	2.05 U	1.97 U	1.81 J	1.76 J	2.02 U

Notes:

* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.

B = Analyte not detected above the level reported in blanks

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise.

ng/L = nanogram per liter

RSL = Regional Screening Level

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-1
Columbia Aquifer Groundwater Analytical Data (October 2016, February and April 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID		**USEPA Lifetime**	OC-MW03-1116	OC-MW04-1016	OC-MW07-0417	OC-MW07D-0417	OW11-MW1-1016	OW11-MW4-1016	OW11-MW5-1016	OW11-MW6-1016	OW11-MW7-1016
Sample Date	**RSLs Tapwater HQ = 1.0 (June 2016)**	**Health Advisory (May 2016)**	11/1/16	10/31/16	4/4/17	4/4/17	10/25/16	10/26/16	10/25/16	10/26/16	10/25/16
Chemical Name											
Semivolatile Organic Compounds (ng/L)											
Perfluoroheptanoic acid (PFHpA)	--	--	9.62	6.37 J	2.02 U	2.12 U	9,820	2,630	2,480	4,360	10,100
Perfluorohexanesulfonic acid (PFHxS)	--	--	46.7	42.8	2.02 U	2.12 U	30,500	33,100	25,500	38,900	37,100
Perfluorononanoic acid (PFNA)	--	--	1.98 U	1.98 U	2.02 U	2.12 U	1,970	99.5	596	1,080	2,660

Notes:
* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.
B = Analyte not detected above the level reported in blanks
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise.
ng/L = nanogram per liter
RSL = Regional Screening Level
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)
Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-1

Columbia Aquifer Groundwater Analytical Data (October 2016, February and April 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	RSLs Tapwater HQ = 1.0 (June 2016)	USEPA Lifetime Health Advisory (May 2016)	OW11-MW8-1016	OW11-MW9-1016	OW11-MW9P-1016	OW26-MW1-1116	OW26-MW1P 1116	OW2B-MW41-1116	OW2C-MW05-0217	OW2C-MW19-1116
Sample Date			10/25/16	10/25/16	10/25/16	11/1/16	11/1/16	11/1/16	2/23/17	11/1/16
Chemical Name										
Semivolatile Organic Compounds (ng/L)										
Perfluoroheptanoic acid (PFHpA)	--	--	2,630	4,570	3,940	13,900	12,900	275	26.3	113
Perfluorohexanesulfonic acid (PFHxS)	--	--	16,900	22,200	24,200	52,400 J	51,300 J	473	78.8	881
Perfluorononanoic acid (PFNA)	--	--	151	956	978	1,530	1,650	6.59 J	108	23.1

Notes:

* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.

B = Analyte not detected above the level reported in blanks

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise.

ng/L = nanogram per liter

RSL = Regional Screening Level

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-1

Columbia Aquifer Groundwater Analytical Data (October 2016, February and April 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	RSLs Tapwater HQ = 1.0 (June 2016)	USEPA Lifetime Health Advisory (May 2016)	OW2C-MW19-0217	OW2C-MW24-0217	OW2C-MW25-0217	OW2E-MW09R-0217	OW2E-MW09RP-0217	OW2E-MW19-1116
Sample Date			2/23/17	2/23/17	2/23/17	2/23/17	2/23/17	11/1/16
Chemical Name								
Semivolatile Organic Compounds (ng/L)								
Perfluoroheptanoic acid (PFHpA)	--	--	52.8	40.3	531	41.5	39.1	493
Perfluorohexanesulfonic acid (PFHxS)	--	--	489	87.1	3,580	406	389	290
Perfluorononanoic acid (PFNA)	--	--	29.2	9.82	248	4.66 U	3.16 U	93.6

Notes:

* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.

B = Analyte not detected above the level reported in blanks

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise.

ng/L = nanogram per liter

RSL = Regional Screening Level

U = The material was analyzed for, but not detected

UJ = Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-2

Yorktown Aquifer Groundwater Analytical Data April 2017)

Basewide PFAS Site Inspection

NAS Oceana, Virginia Beach, Virginia

Sample ID	**RSLs Tapwater HQ = 1.0 (June 2016)**	**USEPA Lifetime Health Advisory (May 2016)**	OC-MW02D-0417	OC-MW05D-0417	OC-MW05DP-0417	OC-MW07D-0417	OW11-MW10D-0417	OW26-MW01D-0417
Sample Date			4/3/17	4/3/17	4/3/17	4/4/17	4/4/17	4/3/17
Chemical Name								
Semivolatile Organic Compounds (ng/L)								
Perfluoroheptanoic acid (PFHpA)	--	--	3.41 J	2.12 U	2.05 U	2.12 U	22.4	2.1 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	10	2.12 U	2.05 U	2.12 U	124	2.37 J
Perfluorononanoic acid (PFNA)	--	--	2.05 U	2.12 U	2.05 U	2.12 U	5.19 J	2.1 U

Notes:

* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.

B - Analyte not detected above the level reported in blanks

HQ = hazard quotient

J = Analyte present. Value may or may not be accurate or precise

ng/L = nanogram per liter

U = The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)

Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

TABLE H-3
Potable and Non-Potable Water Analytical Data (December 2016 and January 2017)
Basewide PFAS Site Inspection
NAS Oceana, Virginia Beach, Virginia

Sample ID Sample Date	RSLs Tapwater HQ = 1.0 (June 2016)	USEPA Lifetime Health Advisory (May 2016)	OC-RW01-1216 12/16/16	OC-RW03-1216 12/16/16	OC-RW03P-1216 12/16/16	OC-RW04-1216 12/19/16	OC-RW10-0117 1/3/17	OC-RW12-1216 12/16/16	OC-RW13-1216 12/21/16	OCSTR-WL01-1216 12/22/16
Chemical Name										
Semivolatile Organic Compounds (NG/L)										
Perfluoroheptanoic acid (PFHpA)	--	--	8.52	1.94 U	1.98 U	1.97 U	1.97 U	1.95 U	2 U	1.95 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	32.5	1.94 U	1.98 U	1.97 U	1.97 U	1.95 U	2 U	1.95 U
Perfluorononanoic acid (PFNA)	--	--	1.16 J	1.94 U	1.98 U	1.97 U	1.97 U	1.95 U	2 U	1.95 U

Notes:
* In cases when both PFOS and PFOA are non-detect, non-detect values are added together to equal Total PFOS + PFOA. In cases when a detect and non-detect of PFOS and PFOA exist, only the detect value is used to determine Total PFOS + PFOA.
B = Analyte not detected above the level reported in blanks
HQ = hazard quotient
J = Analyte present. Value may or may not be accurate or precise
NG/L = nanogram per liter
U = The material was analyzed for, but not detected
UJ = Analyte not detected, quantitation limit may be inaccurate
Shading indicates detection
Bolded text indicates exceedance of USEPA Lifetime Health Advisory (May 2016)
Italicized text indicates exceedance of RSLs Tapwater HQ = 1.0 (June 2016)

9111

Statewide
Fire Protection

2314 60th Street Hampton, VA 23661

Phone (757) 723-9111 Fax # (757) 827-8697

Tax ID # 201164187

Charges

☐ BILL ACCOUNT ☐ CASH

☐ CHECK # ______

☐ CREDIT CARD # ______

EXP. DATE ______ ☐ M/C ☐ VISA ☐ OTHER____

WORK ORDER #

DATE 7/17/12 ACCOUNT # ______ CS ACCOUNT # ______

CUSTOMER VA Army National Guard State Military Reservation

ADDRESS 203 Red Horse Dr

CITY Virginia Beach STATE VA ZIP 23451

PHONE (757) 613-5013 cell ALT. PHONE ( )

WORK REQUESTED Wheel Unit / Pick-up

ARRIVAL TIME ______ ☐ AM ☐ PM

DEPARTURE TIME ______ ☐ AM ☐ PM

TOTAL TIME ______

DESCRIPTION OF WORK COMPLETED

QTY	DESCRIPTION	UNIT PRICE	AMOUNT
	HALON		
	Halon Wheel		
	Unit		

TECHNICIAN [signature]

Frederick S. Tenght
CUSTOMER PRINTED NAME

[signature]
CUSTOMER SIGNATURE

TOTAL PARTS $

TAX $

TOTAL LABOR $

TOTAL AMOUNT DUE $

* A Fee of $45 will be charged for returned checks

BY SIGNING ABOVE, THE CUSTOMER UNDERSTANDS AND AGREES THAT IF THE COMPANY IS EVER FOUND LIABLE FOR ANY LOSS OR DAMAGE DUE TO OUR NEGLIGENCE OR FAILURE TO PERFORM OUR OBLIGATIONS, INCLUDING INSPECTING, SERVICING AND/OR REPAIRING YOUR FIRE SUPPRESSION AND/OR ALARM EQUIPMENT, OUR MAXIMUM LIABILITY WILL NOT EXCEED $500.00. WE EXPRESSLY DISCLAIM ANY AND ALL LIABILITY FOR ANY OTHER LOSS OR DAMAGE.

White - File Yellow - Billing Pink-Customer

SAFETY DATA SHEET – NMS#700
KnockDown®
Class "A" Foam Concentrate

1. IDENTIFICATION

Product Name	KnockDown® Class "A" Foam Concentrate
Recommended use of the chemical and restrictions on use	
Identified uses	Firefighting Foam Concentrate
Restrictions on Use	Consult applicable fire protection codes
Company Identification	National Foam 350 East Union Street West Chester, PA 19382
Customer Information Number	(610) 363-1400
Emergency Telephone Number	Infotrac at (800) 535-5053
Issue Date	July 27, 2018
Supersedes Date	December 8, 2016

Safety Data Sheet prepared in accordance with OSHA's Hazard Communication Standard (29 CFR 1910.1200, the Canadian Hazardous Products Regulations (HPR) and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

2. HAZARD IDENTIFICATION

Hazard Classification
Eye Damage/Irritation – Category 1

Label Elements
Hazard Symbols

Signal Word: Danger

Hazard Statements
Causes serious eye damage.

Precautionary Statements

Prevention
Wear eye protection and face protection.
Response
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a poison center or doctor.
Storage
None
Disposal
None

Other Hazards
None identified.

2. HAZARD IDENTIFICATION

Specific Concentration Limits
The values listed below represent the percentages of ingredients of unknown toxicity.

Acute oral toxicity	10 - 20%
Acute dermal toxicity	20 - 30%
Acute inhalation toxicity	35 - 45%
Acute aquatic toxicity	25 - 35%

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CAS Number	Concentration
Sodium decyl sulfate	142-87-0	10 - 20%*****
Sodium alkyl ether sulfate	68585-34-2	7 - 13%*****
Dipropylene Glycol Monomethyl Ether	34590-94-8	1 - 5%*****
Methanol	67-56-1	0.05 – <0.12%

*Exact concentration withheld as trade secret.

4. FIRST- AID MEASURES

Description of necessary first-aid measures
Eyes
Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.
Skin
Wash skin thoroughly with soap and water. Obtain medical attention if irritation persists.
Ingestion
Dilute by drinking large quantities of water and obtain medical attention.
Inhalation
Move victim to fresh air. Obtain medical attention immediately for any breathing difficulty.

Most important symptoms/effects, acute and delayed
Aside from the information found under Description of necessary first aid measures (above) and Indication of immediate medical attention and special treatment needed, no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed
Notes to Physicians
Treat symptomatically.

5. FIRE - FIGHTING MEASURES

Suitable Extinguishing Media
This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a fire. Use extinguishing agent appropriate to other materials involved.

Specific hazards arising from the chemical
None known

5. FIRE - FIGHTING MEASURES

Special Protective Actions for Fire-Fighters
Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
Wear appropriate protective clothing. Prevent skin and eye contact.

Environmental Precautions
Prevent large quantities of the material from entering drains or watercourses.

Methods and materials for containment and cleaning up
Contain and absorb using appropriate inert material and transfer into suitable containers for recovery or disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Wear appropriate protective clothing. Prevent skin and eye contact.

Conditions for safe storage
Store in original containers between 20°F and 120°F (-7°C and 49°C). Storage area should be: - cool - dry - well ventilated - under cover - out of direct sunlight

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.
Dipropylene Glycol Monomethyl Ether
ACGIH: TLV 100 ppm, 8hr; 15 min STEL 150 ppm; Skin Designation: air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required.
OSHA Z-1 PEL: 100 ppm (600 mg/m3) Limit applies to skin.
Sodium decyl sulfate
None established
Sodium alkyl ether sulfate
None established
Methanol
ACGIH: 200ppm 8h TWA; 250ppm 15-minute STEL.
OSHA: 200ppm (260 mg/m3) 8h TWA.

Appropriate engineering controls
Use with adequate ventilation. If this product is used in a pressurized system, there should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Individual protection measures
Respiratory Protection
Wear respiratory protection if there is a risk of exposure to high vapor concentrations, aerosols or if applied to hot surfaces. A NIOSH approved full face respirator may be worn. The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.
Skin Protection
Gloves
Eye/Face Protection
Chemical goggles or safety glasses with side shields.
Body Protection
Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical State	Liquid
Color	Pale green
Odor	Mild, pleasant
Odor Threshold	No data available
pH	9.0
Specific Gravity	1.05
Boiling Range/Point (°C/F)	No data available
Melting Point (°C/F)	No data available
Flash Point (°C/F)	>200°F
Vapor Pressure	No data available
Evaporation Rate (BuAc=1)	No data available
Solubility in Water	Soluble
Vapor Density (Air = 1)	Not applicable
VOC (%)	No data available
Partition coefficient (n-octanol/water)	No data available
Viscosity	No data available
Auto-ignition Temperature	Not applicable
Decomposition Temperature	No data available
Upper explosive limit	Not applicable
Lower explosive limit	Not applicable
Flammability (solid, gas)	Not applicable

10. STABILITY AND REACTIVITY

Reactivity
No data available.

Chemical Stability
Stable under normal conditions.

Possibility of hazardous reactions
Hazardous polymerization will not occur.

Conditions to Avoid
Contact with incompatible materials

10. STABILITY AND REACTIVITY

Incompatible Materials
Water reactive materials – burning metals – electronically energized equipment

Hazardous Decomposition Products
Oxides of carbon – alkyl mercaptans – sulfides – sulfur oxides – sodium oxides

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
KnockDown® Concentrate
Oral LD50 (rat) >5000 mg/kg
Dermal LD50 (rabbit) >2000 mg/kg
KnockDown® Mixed Fire Chemical
Oral LD50 (rat) >5000 mg/kg
Dermal LD50 (rabbit) >2000 mg/kg

Specific Target Organ Toxicity (STOT) – single exposure
No relevant studies identified.

Specific Target Organ Toxicity (STOT) – repeat exposure
No relevant studies identified.

Serious Eye damage/Irritation
KnockDown®
Primary Eye Irritation (rabbit, unwashed eyes): EPA Toxicity Category I - Corrosive
Primary Eye Irritation (rabbit, washed eyes): EPA Toxicity Category III - Moderately irritating
KnockDown® Mixed Fire Chemical
Primary Eye Irritation (rabbit, unwashed eyes): EPA Toxicity Category IV - Minimally irritating
Primary Eye Irritation (rabbit, washed eyes): EPA Toxicity Category IV - Practically non-irritating

Skin Corrosion/Irritation
KnockDown® Concentrate
Primary Dermal Irritation (rabbit): EPA Toxicity Category IV – Slightly Irritating
KnockDown® Mixed Fire Chemical
Primary Dermal Irritation (rabbit): EPA Toxicity Category IV – Non-irritating

Respiratory or Skin Sensitization
No relevant studies identified.

Carcinogenicity
Not considered carcinogenic by NTP, IARC, and OSHA.

Germ Cell Mutagenicity
No relevant studies identified.

Reproductive Toxicity
Methanol: Some teratogenic and fetotoxic effects were observed in animal studies but are inconclusive.

Aspiration Hazard
Not an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity
KnockDown® Concentrate: LC50 Rainbow trout 28 mg/l 96h

Mobility in soil
No relevant studies identified.

Persistence/Degradability
KnockDown® Concentrate
BOD_5: 389,000 mg/kg
COD: 782,000 mg/kg
KnockDown® - 0.5% Solution
BOD_5: 2,140 mg/kg
COD: 3,900 mg/kg
KnockDown® - 1% Solution
BOD_5: 4,220 mg/kg
COD: 7,960 mg/kg
This product meets the criteria for Readily Biodegradable when tested in accordance to EPA OPPTS 835-3110, Section 0, Ready Biodegradability (greater than 60% biodegradation in 28 days)

Bioaccumulative Potential
No relevant studies identified.

Other adverse effects
No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Disposal Methods
This product, as sold, is not a RCRA-listed waste or hazardous waste as characterized by 40 CFR 261. However, state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Therefore, applicable local and state regulatory agencies should be contacted regarding disposal of waste foam concentrate or foam/foam solution.
Concentrate
Prevent foam concentrate from entering ground water, surface water or storm drains. Small quantities of foam concentrate may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations.
Foam/Foam Solution
Prevent foam/foam solution from entering ground water, surface water or storm drains. Small quantities of foam solution may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations.
NOTE: Please consult National Foam for additional information regarding the disposal of foam concentrates and foam solutions.

14. TRANSPORT INFORMATION

Shipping Information

Shipping Description	Fire Extinguisher Charges or Compounds N.O.I., Class 70
National Motor Freight Code	69160 Sub 0

This information is not intended to convey all transportation classifications that may apply to this product. Classifications may vary by container volume and by regional regulations. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules when transporting this material.

15. REGULATORY INFORMATION

United States TSCA Inventory
All components of this product are in compliance with the inventory listing requirements of the US Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Canada DSL Inventory
All ingredients in this product have been verified for listing on the Domestic Substance List (DSL) or the Non-Domestic Substance List (NDSL).

SARA Title III Sect. 311/312 Categorization
Serious eye damage

SARA Title III Sect. 313
This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
None

16. OTHER INFORMATION

NFPA Ratings
NFPA Code for Health - 2
NFPA Code for Flammability - 0
NFPA Code for Reactivity - 0
NFPA Code for Special Hazards - None

Legend
ACGIH: American Conference of Governmental Industrial Hygienists
BOD_5: Biochemical Oxygen Demand (5 day)
CAS#: Chemical Abstracts Service Number
COD: Chemical Oxygen Demand
EC50: Effect Concentration 50%
IARC: International Agency for Research on Cancer
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
TLV: Threshold Limit Value
TSCA: Toxic Substance Control Act

Revision Date: July 27, 2018
Replaces: December 8, 2016
Changes made: Changes to sections 3, 8, 11 and 15.

16. OTHER INFORMATION

Information Source and References
This SDS is prepared by Hazard Communication Specialists based on information provided by internal company references.

Prepared By: EnviroNet LLC.

KnockDown is a trademark of Angus International.

The information and recommendations presented in this SDS are based on sources believed to be accurate. National Foam assumes no liability for the accuracy or completeness of this information. It is the user's responsibility to determine the suitability of the material for their particular purposes. In particular, we make NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, with respect to such information, and we assume no liability resulting from its use. Users should ensure that any use or disposal of the material is in accordance with applicable Federal, State, and local laws and regulations.

Quality is Behind the Diamond.

SAFETY DATA SHEET

Section 1. PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Halon 1211
Other Identifiers:	Freon 12B1, BCF, Fluorocarbon 1211, Bromochlorodifluoromethane
Product Code(s):	1211
Model Codes for Extinguishers:	344, 352, 354, 355, 361, 369, 371, 372, 600, 695
Recommended Use:	Fire extinguisher material
Manufacturer:	AMEREX CORPORATION
Internet Address:	www.amerex-fire.com
Address:	7595 Gadsden Highway, P.O. Box 81 Trussville, AL 35173-0081
Company Telephone:	(205) 655-3271
E-mail Address:	info@amerex-fire.com
Emergency Contacts:	Chemtrec 1(800) 424-9300 or (703) 527–3887
Issued:	March 7, 2019

Section 2. HAZARDS IDENTIFICATION

GHS – Classification

Health	Environmental	Physical
Acute Toxicity: None	None	Warning
Skin Corrosion/Irritation: Category 2	None	None
Skin Sensitization: None	None	None
Eye: Category 2A	None	None
STOT SE: Cat 1 (heart), Cat 2 (CNS, blood system), Cat 2 (narcotic effects, respiratory system)	None	Danger Warning
Carcinogen: None	None	None
Hazardous to Ozone Layer- Category 1	Danger	None

GHS – Label Symbol(s): 

If Pressurized: Gas Under Pressure 

GHS – Signal Word(s): **Warning**
Danger (STOT Single Exposure; Heart)

Other Hazards Not Resulting in Classification: Halon 1211 is a simple asphyxiate. May displace oxygen and cause rapid suffocation.

May cause frostbite in contact with skin or eyes.

GHS – Hazard Phrases

GHS Hazard	GHS Codes(s)	Code Phrase(s)
Physical	H280 281	*- Contains gas under pressure; may explode if heated. Contains refrigerated gas; may cause cryogenic burns or injury.
Health	H313 332 335 336 370 371	May be harmful in contact with skin. Harmful if inhaled. May cause respiratory irritation. May cause drowsiness or dizziness. Causes damage to organs (heart). May cause damage to organs.
Environmental	None	
Precautionary:		
General	P101	If medical advice is needed, have product container or label at hand.
Prevention	P251 260 264 270 280	Do not pierce or burn, even after use. Do not breathe gas/mist/vapors/spray. Wash skin thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.
Response	P312 321 336 304+340 305+310 313+333	Call a POISON CENTER/doctor if you feel unwell. Specific treatment (see Section 4. First Aid Measures) Thaw frosted parts with lukewarm water. Do not rub affected areas. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Immediately call a doctor. May be harmful in contact with skin or if inhaled.
Storage	410+403	*- Protect from sunlight. Store in well-ventilated place.
Disposal	P501	Dispose of contents through a licensed disposal company. Contaminated container should be disposed of as unused product.

*- If under pressure

Section 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	EC No.	REACH Reg. No.	CAS-No.	Weight %
Bromochlorodifluoromethane	206-537-9	NA	353-59-3	100

Adverse health effects and symptoms:

Halon 1211 is a simple asphyxiate. The gas is heavier than air and may accumulate in low spaces causing a deficiency of oxygen and cause rapid suffocation. Symptoms include drowsiness and unconsciousness.

If people are intoxicated with fluorocarbons, strenuous exercise can result in arrhythmia.

May cause frostbite in contact with skin or eyes.

Section 4. FIRST AID MEASURES

Eye Exposure:	Liquid or cold gas can cause freezing injury to eyes. Flush eyes with cool water for 15 minutes. Seek medical attention immediately.
Skin Exposure:	May cause cold burns or frostbite. Remove contaminated clothing and flush affected areas with lukewarm (NOT HOT) water. Seek medical attention immediately if blistering of the dermal surface or if deep tissue freezing occurs
Inhalation:	Halon 1211 is a simple asphyxiate. May cause coughing, dizziness, headache, dyspnea, unconsciousness and death. If symptoms appear or respiratory distress occurs, remove victim to fresh air. Seek medical attention immediately.
Ingestion:	None under normal conditions
Medical conditions possibly aggravated by exposure:	Because of the possibility of cardiac arrythmia, sympathomimetic drugs such as epinephrine should not be administered.

Section 5. FIRE-FIGHTING MEASURES

Flammable Properties:	Not flammable
Flash Point:	None
Suitable Extinguishing Media:	Non-combustible. Use extinguishing media suitable for surrounding conditions. Cool fire-exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.
Hazardous Combustion Products:	Under certain conditions, fluorocarbon vapors may decompose on contact with flames or hot surfaces, creating the potential hazard of inhalation of toxic decompostion products such as hydrogen bromide, hydrogen fluoride, and hydrogen chloride.
Explosion Data:	
Sensitivity to Mechanical Impact:	Not sensitive
Sensitivity to Static Discharge:	Not sensitive
Unusual fire/explosion hazards:	Cylinders could rupture under heat of fire.
Protective Equipment and Precautions for Firefighters:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

Section 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. If safe, move leaking cylinders to a safe place. Ventilate the area.
Personal Protective Equipment:	Wear self-contained breathing apparatus when entering a potentially oxygen deficinet area unless atmosphere is proved safe.
Emergency Procedures:	Handle in accordance with good health and safety practices.
Methods for Containment:	Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest supplier location.
Methods for Clean Up:	Return cylinder to authorized distributor.
Environmental Precautions:	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
Other:	None

Section 7. HANDLING AND STORAGE

Personal Precautions:	Only experienced and properly instructed persons should handle gases under pressure.
Conditions for Safe Storage/Handling:	If under pressure - Protect from sunlight and store in a well-ventilated place. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.
Incompatible Products:	Alkali and alkaline earth metals – certain reactive metals such as powdered zinc and aluminum.

Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	OSHA PEL	ACGIH TLV	NIOSH IDLH	EU BLV
Bromochlorodifluoromethane	NR	NR	NR	NR

NR = Not Regulated.

Engineering Controls:	Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages.
Personal Protective Equipment	Safety glasses




Eye/Face Protection:	Tightly fitting safety goggles or face shield
Skin and Body Protection:	Wear protective gloves, safety shoes.
Respiratory Protection:	If oxygen levels fall below 19.5%, use positive pressure respirator with escape cylinder or self-contained breathing apparatus for oxygen-deficient atmospheres. Positive-pressure supplied air respirators may be required for high airborne concentrations. Respiratory protection must be provided in accordance with current local regulations.
Hygiene Measures:	Good personal hygiene practice is essential, such as avoiding food, tobacco products, or other hand-to-mouth contact when handling. Do not get in eyes, on skin, or on clothing.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Colorless liquified gas under pressure
Molecular Weight:	165.362 g/mole
Odor:	Sweet
Odor Threshold:	No information available
Decomposition Temperature °C:	No information available
Freezing Point °C:	No information available
Initial Boiling Point °C:	-3.7
Physical State:	Compressed liquefied gas
pH:	Not applicable
Flash Point °C:	None
Auto-ignition Temperature °C:	No information available

Boiling Point/Range ^oC:	-3.7
Melting Point/Range ^oC:	-159.5
Flammability:	Not Flammable
Flammability Limits in Air ^oC:	Upper – Not Flammable; Lower-Not Flammable
Explosive Properties:	None
Oxidizing Properties:	Not Applicable
Volatile Component (%vol)	Not Applicable
Evaporation Rate:	Not Applicable
Vapor Density:	5.7 (air=1)
Vapor Pressure:	$2.07x10^3$ Hg (at 25^{o}C)
Density at 25 C:	1.850
Solubility:	None

Section 10. STABILITY AND REACTIVITY

Reactivity:	Not Applicable
Chemical Stability:	Stable under recommended storage and handling conditions.
Incompatibles:	Alkali and alkaline earth metals – certain reactive metals such as powdered zinc and aluminum.
Conditions to Avoid:	Extremely high temperatures.
Hazardous Decomposition Products:	Under certain conditions, fluorocarbon vapors may decompose on contact with flames or hot surfaces, creating the potential hazard of inhalation of toxic decompostion products such as hydrogen bromide, hydrogen fluoride, and hydrogen chloride.
Possibility of Hazardous Reactions:	None
Hazardous Polymerization	Does not occur

Section 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:	Inhalation, skin, and eye contact.
Symptoms:	
Immediate:	
Inhalation:	Increased respiration, headache, mild narcotic effects, drowsiness, unconsciousness, death.
Eyes:	Contact with liquid/gas may cause burns/frostbite.
Skin:	Contact with liquid/gas may cause burns/frostbite.
Delayed:	Possible arrythmia after several minutes.
Acute Toxicity:	Simple asphyxiant.
Chronic Toxicity:	
Short-term Exposure:	May displace oxygen and cause rapid suffocation.

Long-term Exposure: Possible arrythmia until concentrations of fluorocarbon can be removed from the body.

Acute Toxicity Values - Health

Chemical Name	LD50		LC50 (Inhalation)
	Oral	Dermal	
Bromochlorodifluoromethane	No information available	No information available	85000-100000 ppm (rat) 4h

Reproductive Toxicity: This product’s ingredients are not known to have reproductive or teratogenic effects.

Target Organs and Effects (TOST- Single Exposure): Category 1 (heart), Category 2 (CNS, blood system; Category 3 (narcotic effects, respiratory tract irritation).

Other Toxicity Categories

Chemical Name	Germ Cell Mutagenicity	Carcino-genicity	Repro-ductive	TOST Single Exp	TOST Repeated Exp	Aspiration
Bromochlorodifluoromethane	None	None	None	Central Nervous System, Respiratory System Heart, Blood System	None	None

Section 12. ECOLOGICAL INFORMATION

Ecotoxicity:
Persistence/Degradability: Slowly degrades in atmosphere
Probability of rapid biodegradation (BIOWIN): 0.3273 (Slow)
Anaerobic biodegradation probability (BIOWIN):0.8463 (Fast)
Bioconcentration factor: 8.393 L/kg (Low)
Bioaccummulation factor: 8.439
Mobility in soil: Very high
Log Kow: 1.9
Log Koc (Kow Method): 44.53 L/kg
Log Koa: 1.315
Log Kaw: 0.585
*Level III Fugacity Model:
1.11% soil, 47% water, 0.188% sediment, 51.7% air

Other Adverse Ecological Effects: Harmful to the ozone layer

Aquatic Toxicity Values – Environment – Research

Chemical Name	Acute (LC50)	Chronic (EC50)
Bromochlorodifluoromethane	Not available	Not available

Aquatic Toxicity Values – Environment – Estimates

Chemical Name	Acute (LC50)	EC50
Bromochlorodifluoromethane	85.2 mg/L (fathead minnow) 152.21 mg/L (fish)	44.6 mg/L (daphnia)

Section 13. DISPOSAL CONSIDERATIONS

Safe Handling	None.
Waste Disposal Considerations	Dispose in accordance with federal, state, and local regulations.
Contaminated Packaging	Dispose in accordance with federal, state, and local regulations.

NOTES:
This product is not a RCRA characteristically hazardous or listed hazardous waste. Dispose of according to state or local laws, which may be more restrictive than federal laws or regulations. Used product may be altered or contaminated, creating different disposal considerations.

Section 14. TRANSPORT INFORMATION

UN Number:	1974
UN Proper Shipping Name:	Compressed gas, N.O.S, (Bromochlorodifluoromethane)
DOT Transport Hazard Class:	2.2
Packing Group:	NA
Marine Pollutant?:	NO
IATA	Not regulated

NOTES:
This product is not defined as a hazardous material under U.S. Department of Transportation (DOT) 49 CFR 172, or by Transport Canada "Transportation of Dangerous Goods" regulations.

Special Precautions for Shipping:
If shipped in a stored pressure-type fire extinguisher, carbon dioxide in a pressurized container is considered a hazardous material by the US Department of Transportation and Transport Canada. The proper shipping name shall be HALON 1211 and the UN designation is UN 1044. The DOT hazard class/division is LIMITED QUANTITY when pressurized to less than 241 psig and when shipped via highway or rail. UN Class 2.2. Non-Flammable Gas, when shipping via air. Packing Group – N/A

Section 15. REGULATORY INFORMATION

International Inventory Status: All ingredients are on the following inventories

Country(ies)	Agency	Status
United States of America	TSCA	Yes
Canada	WHMIS	Yes
Australia	AICS	Yes
Europe	EINECS/ELINCS	Tes

REACH Title VII Restrictions: No information available

Chemical Name	Dangerous Substances	Organic Solvents	Harmful Substances Whose Names Are to be Indicated on Label	Pollution Release and Transfer Registry (Class II)	Pollution Release and Transfer Registry (Class I)	Poison and Deleterious Substances Control Law
Bromochloro-difluoromethane	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Component	ISHA – Harmful Substances Prohibited for Manufacturing, Importing, Transferring, or Supplying	ISHA – Harmful Substances Requiring Permission	Toxic Chemical Classification Listing (TCCL) – Toxic Chemicals	Toxic Release Inventory (TRI) – Group I	Toxic Release Inventory (TRI) – Group II
Bromochloro-difluoromethane	Not Applicable	Not Applicable	Not Applicable	Yes	Not Applicable

European Risk and Safety phrases:

EU Classification: Xi - Irritant

R Phrases: 36/37/38 Irritating to eyes, respiratory system and skin

S Phrases: 23 Do not breathe gas/fumes/vapour/spray

36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

U.S. Federal Regulatory Information:

SARA 313:

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) - This product is subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 **Hazard Categories**:

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard-*	Yes
Reactive Hazard	No

* - Only applicable if material is in a pressurized extinguisher.

Clean Water/Clean Air Acts:
This product does not contain any substance regulated as a pollutant pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42). This product is regulated be the Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs), Class 1 – Group II (see 40 CFR 61) and Section 112 of the Clean Air Act Amendments of 1990.

U.S. State Regulatory Information:

Chemicals in this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: None
California – Permissible Exposure Limits for Chemical Contaminants: None
Florida – Substance List: None
Illinois – Toxic Substance List: None
Kansas – Section 302/303 List: None
Massachusetts – Substance List: None
Minnesota – List of Hazardous Substances: None
Missouri – Employer Information/Toxic Substance List: None
New Jersey – Right to Know Hazardous Substance List: None
New York - Listed
North Dakota – List of Hazardous Chemicals, Reportable Quantities: None
Pennsylvania – Hazardous Substance List: None
Rhode Island – Hazardous Substance List: None
Texas – Hazardous Substance List: None
West Virginia – Hazardous Substance List: None
Wisconsin – Toxic and Hazardous Substances: None

California Proposition 65: No component is listed on the California Proposition 65 list.

Section 16. OTHER INFORMATION

This SDS conforms to requirements under U.S., U.K., Canadian, Australian, and EU regulations or standards, and conforms to the proposed 2003 ANSI Z400.1 format. No modifications of this SDS are authorized by AMEREX Corporation. Questions or comments should be directed to AMEREX Corporation (See Section 1).

Issuing Date	4-February-2019
Revision Date	7-March-2019; Revision C
Revision Notes	None

The information herein is given in good faith but no warranty, expressed or implied, is made.
Updated by William F. Garvin, CIH.

SAFETY DATA SHEET – NMS#420
Universal Gold®C6 1%/3% Alcohol Resistant Aqueous Film Forming Foam Concentrate (AR-AFFF)

1. IDENTIFICATION

Product Name — Universal Gold®C6 1%/3% Alcohol Resistant Aqueous Film Forming Foam Concentrate (AR-AFFF)

Recommended use of the chemical and restrictions on use

- **Identified uses** — Firefighting Foam Concentrate
- **Restrictions on Use** — See Section 15

Company Identification — National Foam
350 East Union Street
West Chester, PA 19382

Customer Information Number — (610) 363-1400

Emergency Telephone Number — Infotrac at (800) 535-5053

Issue Date — August 21, 2019

Supersedes Date — February 7, 2019

Safety Data Sheet prepared in accordance with OSHA's Hazard Communication Standard (29 CFR 1910.1200, the Canadian Hazardous Products Regulations (HPR) and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

2. HAZARD IDENTIFICATION

Hazard Classification
Eye Damage/Irritation – Category 2A

Label Elements
Hazard Symbols

Signal Word: Warning

Hazard Statements
Causes serious eye irritation.

Precautionary Statements
Prevention
Wash hands thoroughly after handling.
Wear eye protection and face protection.
Response
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/attention.
Storage
None
Disposal
None

Other Hazards
This product contains fluoroalkyl surfactants and is required to be disposed of by high temperature incineration. See Sections 13 and 15 for additional information.

2. HAZARD IDENTIFICATION

Specific Concentration Limits
The values listed below represent the percentages of ingredients of unknown toxicity.

Acute oral toxicity	<5%
Acute dermal toxicity	5 - 15%
Acute inhalation toxicity	15 - 25%
Acute aquatic toxicity	15 - 25%

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CAS Number	Concentration*
Sodium decyl sulfate	142-87-0	1 - 5%
Alkylpolyglycoside	132778-08-6	1 - 5%
Dipropylene Glycol Monomethyl Ether	34590-94-8	1 - 5%

*Exact concentration withheld as trade secret.

4. FIRST- AID MEASURES

Description of necessary first-aid measures
Eyes
Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.
Skin
Wash skin thoroughly with soap and water. Obtain medical attention if irritation persists.
Ingestion
Dilute by drinking large quantities of water and obtain medical attention.
Inhalation
Move victim to fresh air. Obtain medical attention immediately for any breathing difficulty.

Most important symptoms/effects, acute and delayed
Aside from the information found under Description of necessary first aid measures (above) and Indication of immediate medical attention and special treatment needed, no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed
Notes to Physicians
Treat symptomatically.

5. FIRE - FIGHTING MEASURES

Suitable Extinguishing Media
This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a fire. Use extinguishing agent appropriate to other materials involved.

Specific hazards arising from the chemical
None known

5. FIRE - FIGHTING MEASURES

Special Protective Actions for Fire-Fighters
Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
Wear appropriate protective clothing. Prevent skin and eye contact.

Environmental Precautions
Prevent foam concentrate or foam solution from entering ground water, surface water, or storm drains. Discharge and disposal of concentrate or foam solution should be made in accordance with federal, state, and local regulations. See Section 13 for disposal requirements.

Methods and materials for containment and cleaning up
Contain and absorb using appropriate inert material and transfer into suitable containers for recovery or disposal. See Section 13 for disposal requirements.

7. HANDLING AND STORAGE

Precautions for safe handling
Wear appropriate protective clothing. Prevent skin and eye contact.

Conditions for safe storage
Store in original containers between 35°F and 120°F (2°C and 49°C). Storage area should be: - cool - dry - well ventilated - under cover - out of direct sunlight

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

Dipropylene Glycol Monomethyl Ether
ACGIH TLV: 100 ppm (606 mg/m^3) 8hr TWA; 15 min STEL 150 ppm (909 mg/m^3); Danger of cutaneous absorption.
OSHA PEL: 100 ppm (600 mg/m3) Danger of cutaneous absorption.

Appropriate engineering controls
Use with adequate ventilation. If this product is used in a pressurized system, there should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

Individual protection measures
Respiratory Protection
Wear respiratory protection if there is a risk of exposure to high vapor concentrations, aerosols or if applied to hot surfaces. A NIOSH approved full face respirator may be worn. The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.
Skin Protection
Gloves

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye/Face Protection
Chemical goggles or safety glasses with side shields.
Body Protection
Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical State	Liquid
Color	Amber
Odor	Mild, pleasant
Odor Threshold	No data available
pH	8.2
Specific Gravity	1.03
Boiling Range/Point (°C/F)	No data available
Melting Point (°C/F)	No data available
Flash Point (°C/F)	>200°F
Vapor Pressure	No data available
Evaporation Rate (BuAc=1)	No data available
Solubility in Water	Soluble
Vapor Density (Air = 1)	Not applicable
VOC (%)	No data available
Partition coefficient (n-octanol/water)	No data available
Viscosity	No data available
Auto-ignition Temperature	Not applicable
Decomposition Temperature	No data available
Upper explosive limit	Not applicable
Lower explosive limit	Not applicable
Flammability (solid, gas)	Not applicable

10. STABILITY AND REACTIVITY

Reactivity
No data available.

Chemical Stability
Stable under normal conditions.

Possibility of hazardous reactions
Hazardous polymerization will not occur.

Conditions to Avoid
Contact with incompatible materials

Incompatible Materials
Water reactive materials – burning metals – electronically energized equipment

Hazardous Decomposition Products
Oxides of carbon – hydrogen fluoride – aldehydes – ketones – organic acids

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
Product
Oral LD50 (rat) >5000mg/kg
Alkylpolyglycoside
Oral LD50 (rat) >5000mg/kg
Dipropylene Glycol Monomethyl Ether
Oral LD50 (rat) >5000 mg/kg
Dermal LD5 (rabbit) >9510 mg/kg
Inhalation LC50 (rat) > 3.35 mg/l,7h, vapour, no deaths occurred at this concentration

Specific Target Organ Toxicity (STOT) – single exposure
Available data indicates this product is not expected to cause target organ effects after a single exposure.

Specific Target Organ Toxicity (STOT) – repeat exposure
Available data indicates this component not expected to cause target organ effects after repeated exposure.

Serious Eye damage/Irritation
Product: Primary irritant (rabbit) (tested on a similar product)
Sodium decyl sulfate: Severe eye irritant (based on similar material)
Alkylpolyglycoside: Severely irritating (rabbit) (50% solution)

Skin Corrosion/Irritation
Product: Not a primary irritant (rabbit) (tested on a similar product)

Respiratory or Skin Sensitization
Available data indicates this product is not expected to cause skin sensitization.

Carcinogenicity
Not considered carcinogenic by NTP, IARC, and OSHA.

Germ Cell Mutagenicity
Available data indicates this product is is not expected to be mutagenic.

Reproductive Toxicity
Available data indicates this product is not expected to cause reproductive toxicity or birth defects.

Aspiration Hazard
Not an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity
No relevant studies identified.

Mobility in soil
No relevant studies identified.

Persistence/Degradability
No relevant studies identified.

12. ECOLOGICAL INFORMATION

Bioaccumulative Potential
No relevant studies identified.

Other adverse effects
No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Disposal Methods
This product, as sold, is not a RCRA-listed waste or hazardous waste as characterized by 40 CFR 261. However, state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Therefore, applicable local and state regulatory agencies should be contacted regarding disposal of waste foam concentrate or foam/foam solution.
Concentrate
Prevent foam concentrate from entering ground water, surface water or storm drains. Small quantities of foam concentrate may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations. High temperature incineration is required at a minimum of 1000°C with a minimum residence time of 2 seconds.
Foam/Foam Solution
Prevent foam/foam solution from entering ground water, surface water or storm drains. Small quantities of foam solution may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations. High temperature incineration is required at a minimum of 1000°C with a minimum residence time of 2 seconds.
NOTE: Please consult National Foam for additional information regarding the disposal of foam concentrates and foam solutions or visit http://nationalfoam.com/use-discharge-and-disposal-of-firefighting-foam-products/

14. TRANSPORT INFORMATION

Shipping Information

Shipping Description	Fire Extinguisher Charges or Compounds N.O.I., Class 70
National Motor Freight Code	69160 Sub 0

This information is not intended to convey all transportation classifications that may apply to this product. Classifications may vary by container volume and by regional regulations. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules when transporting this material.

15. REGULATORY INFORMATION

United States TSCA Inventory
This product contains an ingredient that has restricted use under the EPA Toxic Substance Control Act. This product may only be used as a fire fighting foam. Any other use of this product is strictly prohibited. Disposal of this product must be done by incineration at a minimum of 1000°C with a minimum residence time of 2 seconds.

Canada DSL Inventory
This product contains an ingredient that is not listed on the Domestic Substance List (DSL) or the Non-Domestic Substance List (NDSL).

15. REGULATORY INFORMATION

SARA Title III Sect. 311/312 Categorization
Eye irritation

SARA Title III Sect. 313
This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

California Proposition 65
WARNING: This product can expose you to chemicals including diethanolamine and formaldehyde, which are known to the State of California to cause cancer, and perfluorooctanoic acid and methanol, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov/

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
None

16. OTHER INFORMATION

NFPA Ratings
NFPA Code for Health - 0
NFPA Code for Flammability - 0
NFPA Code for Reactivity - 0
NFPA Code for Special Hazards - None

Legend
ACGIH: American Conference of Governmental Industrial Hygienists
CAS#: Chemical Abstracts Service Number
EC50: Effect Concentration 50%
IARC: International Agency for Research on Cancer
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
TLV: Threshold Limit Value
TSCA: Toxic Substance Control Act

Revision Date: August 21, 2019
Replaces: February 7, 2019
Changes made: Changes to Sections 2, 6, 8, 13 and 15.

Information Source and References
This SDS is prepared by Hazard Communication Specialists based on information provided by internal company references.

16. OTHER INFORMATION

Prepared By: EnviroNet LLC.

Universal Gold is a registered trademark of Angus International.

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