MORIN BUILDING
8570 EXECUTIVE PARK AVENUE
FAIRFAX, VIRGINIA 22116-0815

August 23, 2023

To: All Prospective Bidders

Issued by: Torry Huff, CPPO, CPPB, VCCO, Procurement Program Supervisor

Subject: Addendum # 1 to IFB #23-042, Rehabilitation and Repainting of Fox Mill Tank No. 1

The purpose of this addendum is to make revisions to the IFB.

I. Additions, Deletions, Corrections, and Revisions to the IFB

1. ***The attached "Geotechnical Engineering Report – Fox Mill Storage and Pumping Facilities." is being provided for information only. Please note that this report was published prior to the construction of the facilities.***
2. ***The following paint systems shall be considered in lieu the specified paint system for <u>only</u> the piping and valves within the three (3) vaults. Requirements for application and other requirements specified in the contract documents shall remain in effect.***

Sherwin Williams Company, Cleveland, OH 44115

(1) Corothane I GalvaPac	***2.5 - 3.5 mils***
(2) Macropoxy 646 or SherPlate 600	***4.0 - 6.0 mils***
(3) Macropoxy 646 or SherPlate 600	***4.0 - 6.0 mils***
Total System Dry Thickness	***10.5 - 15.5 mils***

Tnemec Company, Inc., Kansas City, MO 64141

(1) Series 94-H2O Hydro-Zinc	***2.5 - 3.5 mils***
(2) Series 27 Typoxy or Series 21 Epoxoline	***4.0 - 6.0 mils***
(3) Series 27 Typoxy or Series 21 Epoxoline	***4.0 - 6.0 mils***
Total System Dry Thickness	***10.5 - 15.5mils***

Or approved equal.

II. Questions. Fairfax Water official responses are provided in *Italics*:

1. The specification calls for the valve vault piping to be coated the same as the interior coating system. I would just like to make sure that this is the cast as the application of a 100% solid product at that high of mils would not be ideal for piping in a valve vault?

a. ***See Item 2 above under "Additions, Deletions, Corrections, and Revisions to the IFB".***

2. Do you have mil readings of the current interior and exterior coat?

   a. ***For general information only, measurements taken during a 2020 inspection of this tank were as follows:***

      Exterior:
      Shell: 12 mils to 23 mils
      Roof: 14 mils to 25 mils
      Interior:
      Shell: 10.4 mils to 17 mils
      Roof: 9.5 mils to 14 mils

   b. ***Contractor will not be permitted to receive additional compensation if the contractor's mil readings exceed the values listed above.***

3. Do you have a geological report of the tank site?

   a. ***See Item 1 above under "Additions, Deletions, Corrections, and Revisions to the IFB".***

4. Do you have a specific attachment detail for the rafter reattachment?

   a. ***Refer to the "Chicago Bridge & Iron Drawings Regarding Existing Tank (for general information only)," which were attached to the specifications.***

5. Do you have a wiring diagram that indicates what wiring goes in what conduit, and what conduit is to remain empty for future wiring?

   a. ***If the wiring is not specified for a conduit, the Contractor is not responsible for installing wiring within the conduit.***

6. Is the contractor responsible for all repair items such as new ladder, platform, hand rail vent replacement? If so, where does contractor get paid?

   a. ***The Contractor is responsible for these items. These items shall be included in the Contractor's bid price under Contract Item No. 1 in Section 00400 - Bid Form***

   b. ***Refer to Section 01200 - Measurement and Payment, Section 01330 Submittals, and other applicable sections of the Project Manual/Technical Specifications.***

7. Is the tank bottom flat? If sloped, to what degree?

   a. ***Refer to "Chicago Bridge & Iron Drawings Regarding Existing Tank (for general information only)," which were attached to the Project Manual/Technical Specifications.***

8. What are the beam sizes?

    a. ***Refer to "Chicago Bridge & Iron Drawings Regarding Existing Tank (for general information only)," which were attached to the Project Manual/Technical Specifications. The size of the rafters shall be field verified by the Contractor, prior to fabrication.***

9. Is the ground ring shown on the electrical, site grounding, and lighting plan the responsibility of the contractor? If so, how does the contractor get paid for this work?

    a. ***The Contractor is responsible for these items. These items shall be included in the Contractor's bid price under Contract Item No. 1 in Section 00400 - Bid Form***

    b. ***Refer to Section 01200 - Measurement and Payment, Section 01330 Submittals, and other applicable sections of the Project Manual/Technical Specifications.***

10. Is the conduit installation and electrical work the responsibility of the contractor? If so, how does the contractor get paid for this work?

    a. ***The Contractor is responsible for these items. These items shall be included in the Contractor's bid price under Contract Item No. 1 in Section 00400 - Bid Form.***

    b. ***Refer to Section 01200 - Measurement and Payment, Section 01330 Submittals, and other applicable sections of the Project Manual/Technical Specifications.***

11. Will weather delays be added to and extend the December 15th deadline and overall completion date?

    a. ***There will be no extensions for the work specified to be completed by December 15, 2023.***

    b. ***For overall completion date, refer to Section 01250 – Contractor Modification Procedures, and other applicable sections of the Project Manual/Technical Specifications.***

12. Is there an engineer's estimate for this project?

    a. ***Fairfax Water does not disclose internal, engineer's, or third-party estimates during the bidding process.***

13. Is there a budget for this project?

    a. ***Fairfax Water can confirm this project is fully funded.***

14. Does owner anticipate a full-time, on-site 3rd party inspector?

a. Yes

15. Will owner consider extending the bid date?

    a. No

16. Is there a size limit to the door sheet we can cut in? We need one large enough for a man lift.

    a. Refer to Section 13200 – Fox Mill Tank No. 1 Rehabilitation, 3.1, P. of the Project Manual/Technical Specifications.

17. Can additional manufacturers of lightning protection equipment and materials be permitted to provide the lightning protection on this project?

    a. Specification Section 16770, Article 2.01, I. specifies the approved manufacturers, and allows for an approved equal. Determination of approved equal will not be performed until a contract is awarded and shop drawings are submitted to Engineer to determine if materials and equipment meet the requirements of the Project Manual's specifications.

III. Acknowledgement

Acknowledge your receipt of, and compliance with, this Addendum by either signing the attached acknowledgement, or referencing its receipt and your compliance, in your bid.

END OF ADDENDUM NO. 1

SCHNABEL ENGINEERING ASSOCIATES

4909 CORDELL AVENUE • BETHESDA, MARYLAND 20814 • 301-652-8922

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J. A. PADGETT

July 19, 1988

Project: Geotechnical Engineering Report, Fox Mill Storage and Pumping Facilities, Coronation Road, Fairfax County, VA Fairfax County Water Authority Project 1426 (Our V870159)

Black and Veatch Inc.
2401 Research Blvd. Suite 200
Rockville, MD 20850

Attn: Mr. R. A. Foster

Gentlemen:

Submitted herewith are six copies of our report for the above referenced project. This report has been prepared in accordance with our agreement dated March 11, 1987, as modified by our supplemental agreement dated May 9, 1988.

Scope of Services

Our scope of services for this project included a review and evaluation of previously made test borings, making twelve additional test borings and the evaluation of these and other geotechnical data to develop the following:

1. Our evaluation of estimated subsurface conditions within the proposed pump station and storage tank areas.

2. Recommended foundation requirements for support for

the proposed storage tanks and pump station. Estimates of settlement are included.

3. Recommended lateral pressure diagrams for use in design of pump station and storage tank walls below grade including recommended backfill requirements for walls below grade.

4. Recommendations regarding handling of groundwater in design.

5. Comments regarding geotechnical construction considerations that should be considered both in the design and in the construction plans and specifications.

Services with respect to specific construction dewatering recommendations, temporary slopes, paving design, erosion control, cost or quantity estimates, plans, specifications, and construction observation and testing are not included in the scope of services.

Soil samples obtained from the test borings will be retained until September 15, 1988, and then discarded, unless other disposition is requested.

We appreciate the opportunity to be of service for this project. Please do not hesitate to call either of the undersigned who are familiar with this study if you have any questions regarding this report.

Very truly yours,

SCHNABEL ENGINEERING ASSOCIATES, P.C.

Brian W. Beard, C.P.G.
Senior Associate

James J. Schnabel, P.E.
Commonwealth of Virginia

BWB/JJS/evm

GEOTECHNICAL ENGINEERING REPORT
FOX MILL STORAGE AND PUMPING FACILITIES
CORONATION ROAD
FAIRFAX COUNTY, VIRGINIA

1. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The following is a summary of the conclusions and recommendations contained in this report.

a. The site is underlain by a shallow profile of residual, interbedded silts, clays and sand, overlying disintegrated siltstone and sandstone bedrock. The site appears to have a high potential to develop a seasonal perched water table.

b. We recommend supporting the two storage tanks on conventional reinforced concrete ring walls with steel bottom plates supported on compacted structural fill. Some undercutting and replacement of the relatively soft near-surface soils will be necessary for support of the tanks. Settlements of the tanks are expected to be less than one inch.

c. The pump station may be supported on a mat foundation bearing on bedrock, or alternatively on spread footings. Soil bearing pressures for design of up to 5000 psf may be used. We recommend that the wing walls for screening be supported on piers and spread footings with grade beams.

d. A perimeter subdrainage system around the pump station is recommended to maintain ground water below the mat invert elevations. Drainage panels are recommended up to 2 feet below final grades against the below grade walls.

e. Below grade walls for the pump station should be designed for an equivalent fluid pressure of 60H (psf) when drainage is provided. Backfill should consist of low plastic SM or better soil per ASTM D-2487 compacted to at least 95 percent per ASTM D-698.

f. Considerable rock excavation is anticipated for the pump station and some yard piping. Appropriate precautions for blasting work are outlined herein.

g. Field observations and testing of foundations and earthwork during construction by the geotechnical engineer are considered essential for successful construction. These observations and testing should include: mat and footing subgrades, subdrainage and compaction testing of structured fill and backfill.

This report has been based on the design concept of the proposed project as was furnished to us for preparation of this study. We should review the final foundation plans and specifications in order to determine whether any change in concept may have had any effect on the validity of our recommendations and whether those recommendations have been implemented in the construction documents.

The geotechnical engineering report should be made available to prospective bidders and/or contractors.

We have prepared this report for the use of the design professional for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than those named or for uses other than enumerated above. It may not contain sufficient information for purposes of other parties or other uses.

2. DESCRIPTION OF SITE AND PROPOSED DEVELOPMENT

a. Description of Site

The Fox Mill Storage and Pumping Facilities are to be located between New Parkland Drive and Coronation Road, adjacent to the proposed alignment of the Springfield Bypass, Reston, Virginia. The 5.36 acre site is relatively level with a topographic high in the southwestern portion of the property at about El 409 and a topographic low at about El 392 situated in the northern property corner. The site is mostly comprised of cleared fields with localized tree groves and brush situated on the eastern portion of the property. A network of dirt roads and trails access most of the northern and eastern portions of the site. Localized construction and miscellaneous debris were found around the site.

b. Proposed Construction

The proposed storage and pumping facilities will include two - 5 million gallon storage tanks and a 115 million gallon per day (mgd) pumping station. Yard piping will include 66 inch diameter connecting pipes into the tanks from the existing transmission main and 72 inch diameter lines from tanks to the pumping station. The locations of the tanks and the pumping station are illustrated on Drawing V870159-4 included in Appendix B.

The two tanks will be 146 feet in diameter, 49 ft in height with a maximum water height of 40 ft. The tanks will be circular steel tanks with a conical roof. The tanks will supported on perimeter ring wall foundations,

but the base of the tanks and most of the water load will be earth supported. The tanks will develop a pressure of about 2500 psf at the base when full. The top of the ring walls and base of the tanks are planned at El 403, or about 3 to 5 feet above existing grades. We understand that the bearing pressure for the ring wall will be adjusted to equal the effective stress at the footing depths from the tank bottom, by adjusting the wall thickness. The tank roof will be supported by the exterior walls and by interior columns extending and attached to the bottom steel plate.

The proposed pumping station will be reinforced, cast-in-place concrete below grade with a steel frame superstructure. The lowest level will have a floor grade at El 381 which steps up to El 390. Several wing walls for screening will extend from the north end of the building. The below grade portions of the building are planned to be founded on concrete mat foundation, while the wing walls were planned to have shallow strip footing foundations. Loads at the foundation levels were not provided to us but should not exceed 5000 pounds per square foot (psf).

3. SUBSURFACE CONDITIONS

Eighteen test borings were drilled with the proposed water tank and pump house areas under our supervision by our subsidiary, Foundation Test Service, Inc., in April, 1987 and May, 1988. Test boring logs and water level data are provided by Drawing No. V870159-1, 2, 3 in Appendix B. The boring locations are indicated on Drawing No. V870159-4.

a. Stratification

The test borings indicate the following generalized subsurface stratification underlie the site to the depths investigated.

Stratum A: (PROBABLE FILL)	From the ground surface to 2.5 feet in boring No. 5	Brown CLAY with sand, PROBABLE FILL; very soft consistency (N= 1 to 2)
Stratum B: (Residual)	From the ground surface and interlayered with Strata C and D to depths of 2.0 to 9.5 feet	Brown LEAN CLAY (CL) with sand, sandy LEAN CLAY (CL) and SILT (ML) with sand; very soft to medium stiff consistency (N=2 to 16)
Stratum C: (Residual)	Below the ground surface and interlayered with Stratum B to depths of 5.0 to 7.5 feet	Reddish brown and gray FAT CLAY (CH) and sandy FAT CLAY (CH) soft to stiff consistency (N=8 to 31)
Stratum D: (Residual)	Below Strata B and C at some locations to depths of 2.0 to 10.5 feet	Brown to gray silty SAND (SM), clayey SAND (SC) and poorly graded SAND (SP) with silt; firm to very compact (N=10 to 85)

Stratum E: (Residual)	Below Strata B, C or D to the maximum depths penetrated	Purple to brown DISINTEGRATED SILTSTONE, SANDSTONE and baked sandstone rock; compact to hard density (N=62 to 100/2"+)

Topsoil ranged in thickness from 0.3 to 1.0 feet at the test boring locations, but probably extends deeper at other locations. Topsoil thicknesses are shown on the test boring logs in Appendix B.

Numbers after description of the soil strata indicate the maximum and minimum penetration resistances, or N values, recorded in each stratum. N values indicate the penetration resistance in blows per foot of a standard 2 inch O.D., 1-3/8 inch I.D. sampling spoon driven with a 140 pound hammer falling 30 inches per ASTM D-1586. The number of blows required to drive the sampler the final 12 inches has been taken as the N value after driving the initial 6 inches to assure the sampler is in undisturbed material.

In cases where 30 or more blows were required to drive the sampler the initial 6 inch interval, the sampler is driven to a total penetration resistance of 100 blows or 18 inches, whichever occurred first. The sampling operation was terminated after a total of 100 hammer blows and the depth of penetration recorded.

Disintegrated rock has been arbitrarily defined as residual earth material with a standard penetration resistance between 60 blows per foot and refusal. It may

exhibit certain rock-like qualities. The denser portions of this material possess characteristics of soft rock and will require rock excavation methods for removal. Refusal is defined as a penetration resistance of 100 blows per 2 inches or less was recorded in all of the test borings at levels varying from about 3 to 14.5 feet below grade.

The group symbols indicated on the boring logs and in the generalized subsurface stratification represent the Unified Classification symbols. These are based on visual observations of the samples and the criteria given in Appendix A of this report and may differ somewhat from soil laboratory testing.

b. Geology

The site is situated in the Piedmont physiographic province of Northern Virginia within Triassic geologic age lowlands referred to as the Culpeper Basin. The bedrock underlying the site is believed to be composed of arkosic sandstones interbedded with siltstone and sandy shale of the Manassas formation. Field observations indicate that the bedrock has been thermally metamorphosed (baked) generally making the rock denser and more rigid.

Fairfax County soil maps indicate the proposed water tank and pumping station is underlain by the Bucks loam, Calverton loam and Manassas silt loam. The Bucks and Calverton series are residual soils which developed from the in place weathering of the parent bedrock. The Manassas silt loam is alluvial developing from the reworking of residual soils by stream action. The Fairfax

County soil survey indicates that the soils to be encountered generally rate from poor to good for foundation support. A summary of the soil groups represented and their respective rating are provided as follows:

Symbol	Group Name	Shrink/ Swell Potential	Foundation Support	Limitations
14 B+	Manassas Silt Loam	Low	Fair	Shallow rock seasonal, high water table
72 B2	Bucks Loam	Low	Good	Shallow rock
76 B1	Calverton Loam	Medium to high	Poor	Shallow to moderate rock, seasonal high water table

Fairfax County notes problems with a seasonal high water table in all soils and reuse of excavated rock as controlled fill for all the on site soils. The Calverton Loam has also been found to have clays of moderate plasticity.

These problems are not considered to be severe by the County, however, Fairfax County places limitations on the reuse of these materials. The sedimentary Triassic age (red shale and sandstone) bedrock may weather rapidly which may lead to settlement in rock fills that have not been properly constructed. Therefore Fairfax County requires that excavated rock in this area, when reused as fill, be constructed so as to reduce the voids in the fill.

Our experience and Fairfax County soil survey data indicate that the Calverton silt loam is a low to

moderately plastic material with classifications ranging from CH to SM, according to the Unified Soil Classification system. This soil is anticipated in the southern end of the site based on the Fairfax County soil map.

c. Groundwater

Groundwater observations made in the test borings are shown on the logs in Appendix B. Groundwater readings were obtained in the test borings upon completion and up to 24 hours after completion. Groundwater was encountered at shallow depth ranging from 2 to about 4 feet below ground surface in four of the test borings. Fourteen of the borings were caved and dry at depths of about 7 to 15 feet.

It should be noted that groundwater observations made in April, 1987 showed no groundwater while borings completed in May, 1988 recorded shallow groundwater levels. Borings completed in May, 1988 were drilled after a prolonged period of rain. We interpret these groundwater level fluctuations as seasonal events such that perched groundwater conditions may occur during periods of rain.

Groundwater should be anticipated at shallow depths for most of the project area. Fluctuations in the groundwater levels should be expected with variations in precipitation, runoff, pumping and similar factors occurring throughout the year.

4. FOUNDATION ENGINEERING RECOMMENDATIONS

a. Water Tanks

We understand that the proposed water tanks will consist of welded steel plate with flat bottoms at El 403. Conventional ring wall foundations are planned. A compacted earth berm is also planned outside the tank perimeter. Based upon a review of the test borings in the vicinity of the tank, this foundation system is considered feasible.

The ring walls should be proportioned to match the effective stress at the founding depths from the tank pressure, which is about 2500 psf. Footings should be placed at least 3 feet below final exterior grade for shear considerations. We have estimated the highest elevation of suitable bearing material at the boring locations in the vicinity of the tanks as follows:

Boring No.	Estimated Highest Bearing Elevation
1	El 399
3	398
4	400
5	396
6	396
14	394.5
15	395
16	395.5
17	398

Founding the ring walls at or below these grades will generally place the footings within the soils of Strata B, D or E. Linear extrapolation between borings may be used for design purposes. Final bearing soils should be observed by a qualified geotechnical engineer or

engineering geologist to verify that foundations are placed on suitable material as recommended herein.

We estimate that total settlement of the tank should not exceed one inch, and differential settlement within the tank should be less than this value.

The tank bottom plates should be founded on a minimum 4 inch thick layer of concrete sand. The test borings indicate the presence of relatively soft soils near the existing surface at some locations. In addition shallow fills are present at some locations. We recommend that all loose or soft soils and all existing fill be removed before developing a subgrade for support of the tanks. We believe this will involve an undercut averaging about 2 feet deep. After undercutting, the subgrade should be proofrolled with a loaded dump truck or heavy compaction equipment to identify areas that pump or rut and additional undercutting performed to develop a firm subgrade.

Structural fill required to raise the subgrade to tank subgrade elevations should consist of granular fill classifying SC or better per ASTM D-2487 with a maximum rock size of 3 inches in diameter. These soils should be placed in level lifts not exceeding 8 inches in loose thickness and compacted to at least 95% of maximum dry density per ASTM D-698. Alternately, the fill may consist of crushed stone, such as VDHT No. 57 or DGA. If uniform stone such as No. 57 is used, the stone should be rolled for compaction but density testing is

unnecessary.

b. Pump Station

The proposed pump station will have a lowest floor level at El 381, which steps up to El 390 on the south side. Several wing walls are planned on the north side to support screening walls. Initial cross sections provided to us by your office indicate that the pump station will be supported on mat foundations.

A review of the boring data indicates that the lower floor levels at about EL 381 and EL 390 will be entirely within bedrock. Considering these conditions and the structural grades, the planned mat foundations are considered feasible and are recommended. Alternatively, spread footing foundations might be used. A design bearing capacity of up to 5000 psf may be used for the bedrock. Higher bearing capacity is not required due to the light loads. Settlements on the rock should be negligible.

The proposed wing walls for screening on the north end of the building will probably overlie backfill placed above an underground pipe vault as well as backfill adjacent to the below grade walls. We recommend that these walls be supported on piers and grade beams. Based upon the section provided to us, it appears that one column can be extended from the roof of the pipe vault and one pier may be supported on a spread footing extended to suitable natural soils. The spread footing on natural soil may be designed for a bearing pressure of 5000 psf if

founded on bedrock or the hard disintegrated rock of Stratum E.

An alternative to the pier and grade beam approach would be to place all backfill as compacted structural fill and found the walls on normal strip footings. However, due to the limited availability of high quality fill material on site, the difficulties in achieving proper compaction in a confined space, and the potential for differential settlement, we do not recommend this alternative.

Excavation for the pump station will encounter hard disintegrated rock and rock below about El 395, which will require rock excavation methods for removal. Precautions should be exercised if blasting is used to avoid damage to foundation rock.

The design should also consider the potential for flotation of the pump station, especially during wet seasons. Although the borings did not indicate the presence of groundwater, the soils on the site do have the potential to develop a seasonal high water table. A worst case, considering the excavation filled with water, should be checked for buoyancy. Uplift forces can be resisted by extending the mat slab outside the building walls to take advantage of the weight of soil above the extended slab. The submerged unit weight of the soil backfill should be taken as 50 pcf.

5. SUBDRAINAGE REQUIREMENTS

Groundwater levels observed in test boring made in April, 1987 showed no groundwater, while borings completed in May, 1988 recorded water at shallow depths, after a period of heavy rainfall. We believe this demonstrates the potential for seasonal perched water levels to develop. Subdrainage is not required for the water tanks as they are founded above the existing grades. We do recommend, however, that a perimeter subdrainage system be provided for the pump station.

We have shown on Sheet 1 herein a layout and a typical section to illustrate our recommendations. The subdrainage system should consist of 4 inch diameter slotted corrugated polyethylene tubing per ASTM F-405. The tubing may be placed essentially level on the top of the foundations with slots down. Maximum slot width should be 1/8 inch. The tubing should be surrounded by at least 6 inches of filter material on the top and side and the soil filter should be wrapped in a geotextile filter fabric to limit infiltration of fines. Water stops should be provided at the juncture of the walls and the mat slabs. The layout shown considers pumped discharge. Drainage panels should also be installed outside the walls to facilitate drainage.

We anticipate the groundwater flow to this tubing will be through that backfill behind the walls. A design flow of 15 gallons per minute for the entire system should be adequate for initial selection of pump capacities. Flow quantities encountered during construction should be measured after groundwater flow is stabilized, prior to final selection of a

specific capacity pump, to verify this estimated flow quantity. Note that it is anticipated that significant periods of no flow can be expected.

The soil filter to be placed around the tubing should consist of a uniformly graded coarse aggregate satisfying gradation requirements of size designation No. 78 according to the Virginia Department of Highways and Transportation (VDHT) Specifications.

The filter fabric to be placed around the soil filter should be a woven geotextile manufactured specifically for drainage applications. The fabric should have equivalent open size (EOS) no larger than the opening for the U.S. Standard Sieve Size No. 40 (0.42 mm). The fabric should have a permeability greater than 1×10^{-2} cm/sec. These filter fabric requirements are satisfied by Carthage Mills Polyfilter GB, and Amoco Propex 1198.

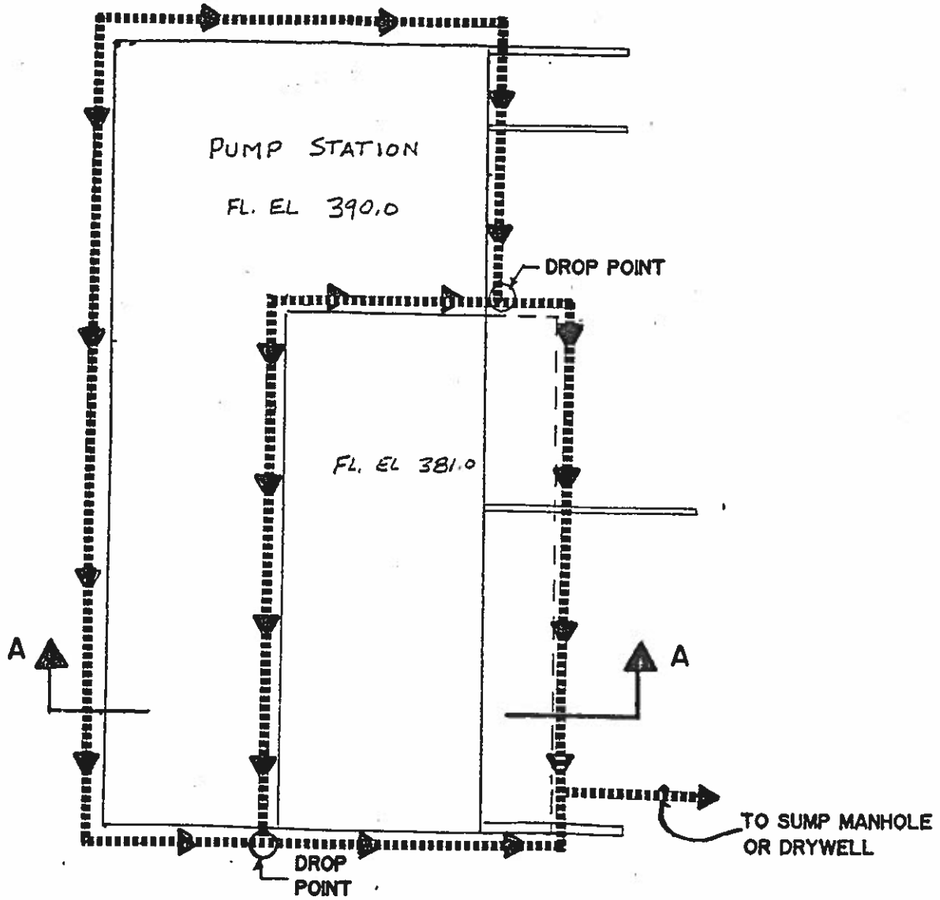
Drainage panels such as Geotech Drainage Boards, or Enkadrains should be placed against the outside of the walls to about 2 ft below final exterior grade to facilitate drainage at the pump station. If Geotech Drainage Boards are used, a minimum 2 inch thickness should be maintained. The drainage panels can be attached to the outside face of the walls in areas where open excavation is used. A layer of filter fabric equivalent to the fabrics recommended for the subdrainage system should also be used between the drainage panel and backfilled soil.

Pits or portions of the structures extending below the subdrainage system should be waterproofed and designed to

resist hydrostatic pressures below the subdrainage system. Cleanouts should be spaced for efficient maintenance with one cleanout after each right angle bend. The system may require flushing at periodic intervals if silt particles penetrate into the perforated pipe. A plan should be prepared to indicate the subdrainage systems, location of cleanouts, invert grades, sump pits, pumps and standby pumps for disposal of collected groundwater. The layout given on Sheet 1 should not be considered a working drawing.

The foregoing recommendations are intended to assist your office in the general design of a subdrainage system for this project. Note that if foundations different than a mat are considered, we should provide alternate recommendations for subdrainage. If substantially different groundwater flow quantities are encountered in the construction or if the lowest floor levels are changed, we should be informed so that we may determine any effect on our conclusions and recommendations given herein.

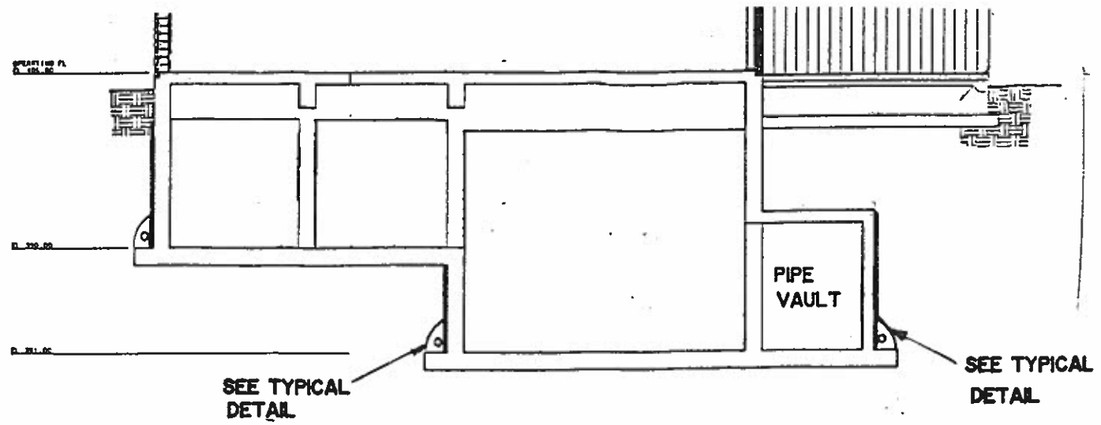
TYPICAL SUBDRAINAGE LAYOUT



SCALE 1"= 20'

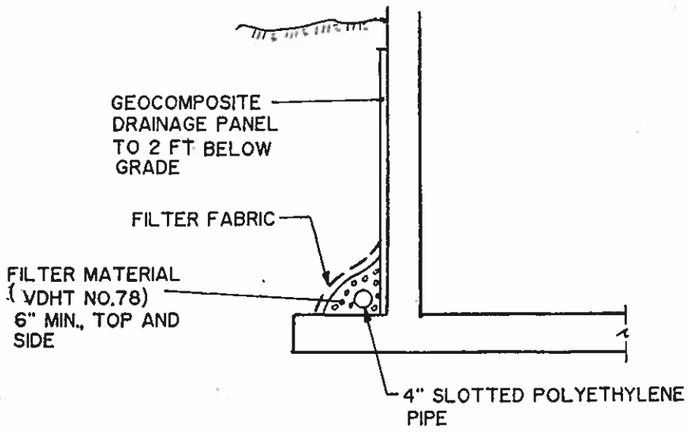
LEGEND

SUBDRAINAGE LINE
ARROWS INDICATE DIRECTION OF FLOW



SECTION A-A

NOT TO SCALE



TYPICAL DETAIL

NOT TO SCALE

SCHNABEL ENGINEERING ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS
BETHESDA, MD · WEST CHESTER, PA · RICHMOND, VA · NEWPORT NEWS, VA · BALTIMORE, MD

FOX MILL STORAGE AND PUMPING FACILITIES
FAIRFAX COUNTY, VIRGINIA

SUBDRAINAGE REQUIREMENTS

SCALE	DATE	REV BY	DATE
AS SHOWN	JULY 19, 1988		
DRAWN BY: Y.S.	CHECKED BY: BWB		
DRAWING NO: V870159	SHEET NO: 1		

6. LATERAL PRESSURES ON WALLS BELOW GRADE

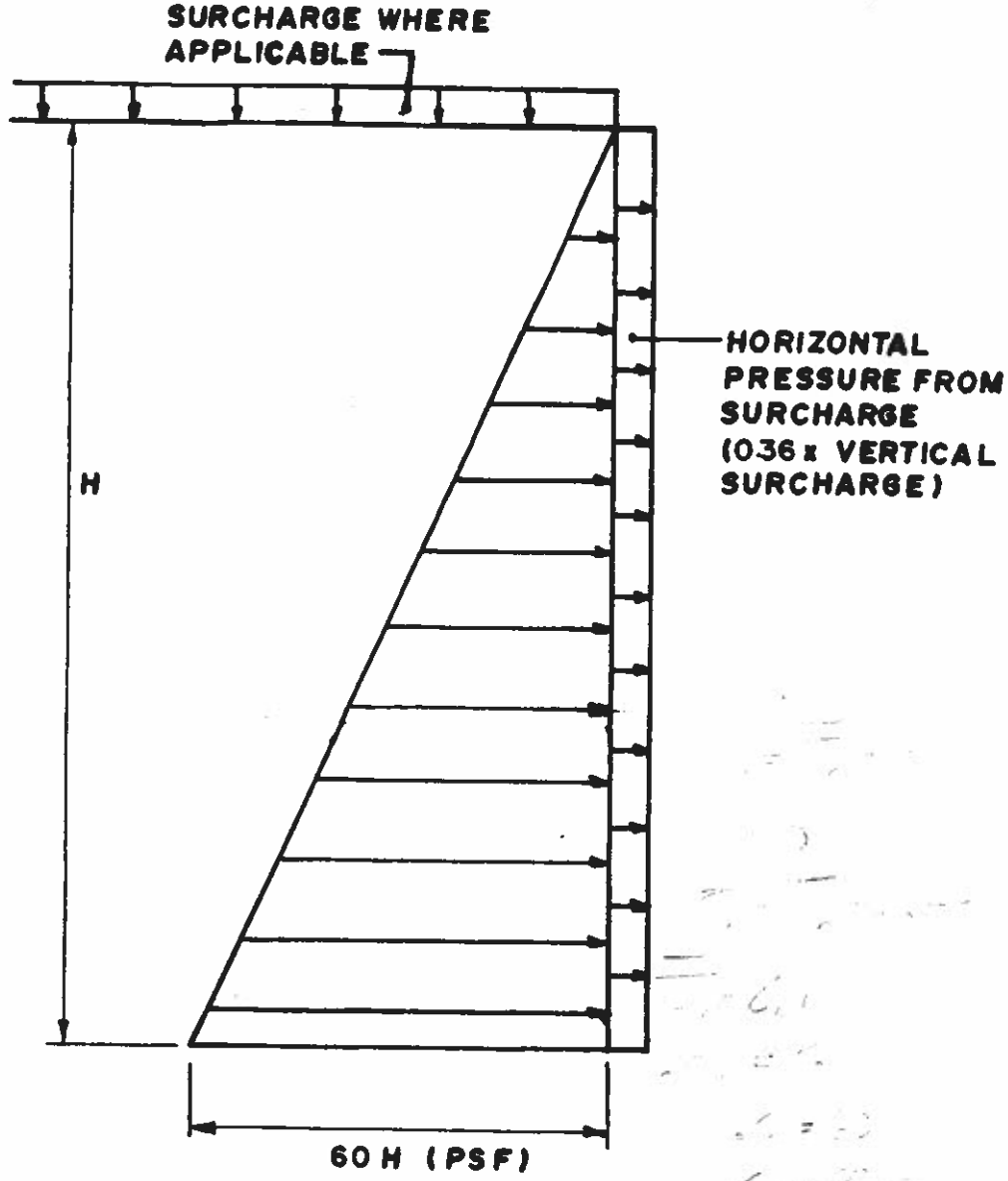
Perimeter walls of the pump station will be constructed up to 24 feet below the existing grade. These walls below grade must be designed to resist lateral earth pressures. A recommended lateral earth pressure distribution is shown on Sheet 2 for design for walls below grade. Since the structure will be basically a rigid box, the at-rest earth pressure case will be approached and the relatively high earth pressure described on Sheet 2 will develop. We recommend using a lateral pressure of 60 H (psf) for design of walls below grade.

The earth pressures shown are for backfill consisting of on-site excavated soils classified as type SM or better of Stratum D. Backfill adjacent to structures should be placed in 8 inch lifts and compacted to at least 90% of maximum dry density per ASTM D-698. Surcharge load effect should also be added to the lateral earth pressure as shown on Sheet 2 if roads or driveways are located adjacent to the walls.

Hydrostatic pressures may be ignored if subdrainage is provided as recommended in Section 5.

DESIGN EARTH PRESSURE FOR RIGID FOUNDATION WALLS BELOW GRADE

FOX MILL STORAGE AND PUMPING FACILITIES
FAIRFAX COUNTY, VA.



EARTH PRESSURES

NOTE
PRESSURE DIAGRAM SHOWN ASSUMES FULL DRAINAGE OF HYDROSTATIC PRESSURE

7. CONSTRUCTION CONSIDERATIONS

a. Tank Foundations

Final bearing surface and subgrades for tank bottoms should be observed by a qualified geotechnical engineer or geologist who is familiar with the recommendations in this report to verify that foundations are placed on suitable bearing material as recommended herein. The inspection of the bearing surfaces should include probing of selected locations or where density of bearing materials is questionable.

Care should be taken during excavation for spread footings to minimize disturbance of the natural soils. We recommend that footings be excavated and poured the same day in order to avoid ponding of surface runoff water within footing excavations. Disturbed, frozen or softened soils should be removed prior to placement of concrete.

b. Compacted Fill and Backfill

All topsoil, soft surface soils and other unsuitable materials encountered should be removed prior to placement of compacted fill for tank support. We believe the depth of stripping will depend upon the time when this work is accomplished. We recommend the contractor be required to determine stripping depths necessary to achieve compaction of fill. Test borings taken for this project indicate stripping depths of about 2 feet will be necessary in some areas. The excavation should be proofrolled after stripping with a 10 ton truck or similar weight excavation equipment and observed by an engineer from our office to

delineate any soft areas where additional excavation may be required. It is advisable to establish unit fees for removal of unsuitable materials which may be disclosed by the proofrolling.

c. Subdrainage

Construction and installation of the subdrainage system for the pump station should be carefully observed to verify that the materials used are in accordance with the recommendations in this report.

d. Rock Excavation

Considerable rock excavation is anticipated to be necessary to excavate to the lowest floor levels of the pump station as well as yard piping. Materials requiring rock excavation methods be removal are anticipated to be encountered within Stratum E as discussed previously. Blasting is anticipated to be necessary to remove the rock. Requirements for blasting rock shall be determined by a contractor experienced in this work. Consideration must be given to vibrations transmitted to nearby buildings in determining the size of charges that may be detonated at one time. The specifications should require the making of seismograph readings on nearby structures to develop an acceptable level of charges. Peak particle velocity as measured by an engineering seismograph is the governing criteria for control of blast vibrations, with a maximum velocity of 2 inches-per-second commonly being used to minimize damage. Each blast should be contained or covered with wire rope mats to minimize air blast and

flyrock. A crack survey of nearby structures should also be made prior to the start of construction to document the existing conditions.

We recommend the following definition of rock be included in the specifications related to confined trench excavations:

> Rock is defined as any material which cannot be dislodged by a CAT 235 hydraulic backhoe or equivalent without the use of drilling and blasting. This classification should not include material such as loose rock, concrete or other material that can be removed by means other than drilling and blasting, but which for reasons of economy in excavating the Contractor chooses to remove by drilling and blasting.

For mass excavation, we recommend using the same definition but substitute a CAT D-8 tractor equipped with a single-tooth ripper for the CAT 235 backhoe.

e. Observation During Construction

There is the possibility that variations in soil conditions will be encountered during construction. In order to permit correlation between the subsurface investigation data and actual soil conditions encountered during construction, it is recommended that the geotechnical engineer be retained to perform observations of footing subgrades, subdrainage installation, and fill placement and compaction. This is necessary in order to verify adequate bearing in footing subgrades, that suitable fill materials reused, and proper placement and compaction are obtained.

f. General and Limitations

The spacing and layout of borings used in our investigation is considered adequate for a general description of the subsoil profile for the foundation engineering analysis herein. However, some variations in the soil conditions between boring locations should be anticipated. An allowance should be established to account for additional costs that may be required for construction of foundations and/or earthwork as recommended in this report. Additional costs may be incurred for various reasons including unsuitable subgrades, insufficient fill quantities, removal and replacement of unsuitable soils, unanticipated rock excavation, etc.

SCHNABEL ENGINEERING ASSOCIATES

Consulting Geotechnical Engineers

IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES ASTM D-2487-83

			Symbol	Group Name
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, 3/4" to 3" Fine, No. 4 to 3/4"	Clean Gravels Less than 5% fines	GW	Well graded gravel
			GP	Poorly graded gravel
		Gravels with Fines More than 12% fines	GM	Silty gravel
			GC	Clayey gravel
	Sands – 50% or more of coarse fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	Well-graded sand
			SP	Poorly graded sand
		Sands with Fines More than 12% fines	SM	Silty sand
			SC	Clayey sand
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL	Lean clay
			ML	Silt
		Organic	OL	Organic clay / Organic silt
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH	Fat clay
			MH	Elastic silt
		Organic	OH	Organic clay / Organic silt
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor		PT	Peat

II. DEFINITION OF MINOR COMPONENT PROPORTIONS

Minor Component	Approximate Percentage of Fraction by Weight
Adjective Form	
Gravelly, Sandy	30% or more coarse grained
With	
Sand, Gravel	15% or more coarse grained
Silt, Clay	5% to 12% fine grained
Trace	
Sand, Gravel	Less than 15% coarse grained
Silt, Clay	Less than 5% fine grained

III. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS – Unified Soil Classification Symbols are shown above as group symbols. Use A Line Chart for laboratory identification. Dual symbols are used for borderline classifications.

BOULDERS & COBBLES – Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12 inch size.

DISINTEGRATED ROCK – Residual rock material with a standard penetration resistance (SPT) of more than 60 blows per foot, and less than refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.

ROCK FRAGMENTS – Angular pieces of rock, distinguished from transported gravel, which have separated from original vein or strata and are present in a soil matrix.

QUARTZ – A hard silica mineral often found in residual soils

IRONITE – Iron oxide deposited within a soil layer forming cemented deposits

CEMENTED SAND – Usually localized rock-like deposits within a soil stratum composed of sand grains cemented by calcium carbonate or other materials.

MICA – A soft plate of silica mineral found in many rocks, and in residual or transported soil derived therefrom.

ORGANIC MATERIALS (Excluding Peat):
Topsoil - Surface soils that support plant life and which contain considerable amounts of organic matter:
Organic Matter - Soil containing organic colloids throughout its structure;
Lignite - Hard, brittle decomposed organic matter with low fixed carbon content (a low grade of coal).

FILL – Man made deposit containing soil, rock and often foreign matter.

PROBABLE FILL – Soils which contain no visually detected foreign matter but which are suspect with regard to origin

LENSES – 0 to 1/2 inch seam of minor soil component.

LAYERS – 1/2 to 12 inch seam of minor soil component.

POCKET – Discontinuous body of minor soil component

COLOR SHADES – Light to dark to indicate substantial difference in color.

MOISTURE CONDITIONS – Wet, moist, or dry to indicate visual appearance of specimen.

SUBSURFACE INVESTIGATION REPORT

Test Boring Report
Test Boring Report, Drawing Nos. V870159-1, -2 and -3
Test Boring Location Plan, Drawing No. V870159-4

Descriptions of Subsurface Investigation Procedures:

1. Test Borings - Hollow Stem Augers

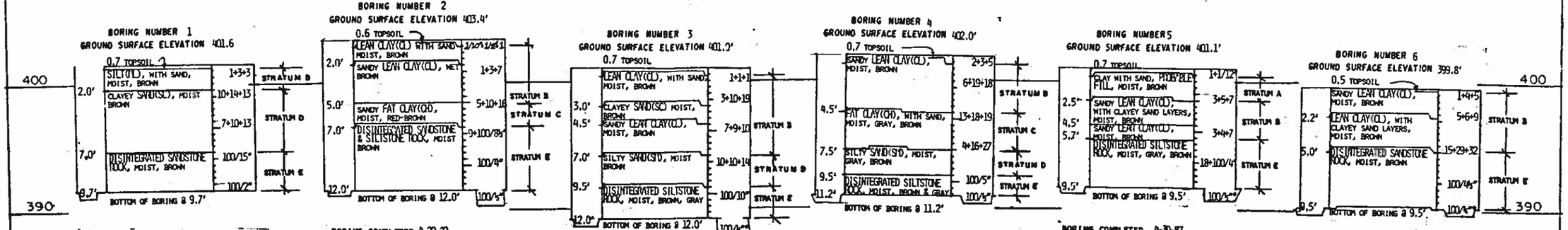
The borings are advanced by turning an auger with a center opening of 2-1/4 to 3-1/4 inches. A plug device blocks off the center opening while augers are advanced. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hollow stem auger, by standard methods, after removal of the plug. Usually, no water is introduced into the boring using this procedure.

2. Standard Penetration Tests

Testing is performed by driving a 2 inch O.D., 1-3/8 inch I.D. sampling spoon through three 6 inch intervals or as indicated, using a 140 pound hammer falling 30 inches, according to ASTM D-1586.

3. Boring Locations and Grades

Test boring layout and ground surface elevations were provided to us by Black & Veatch, Inc.



GENERAL NOTES

1. Numbers in right hand column indicate the number of blows required to drive a 2 inch O.D., 1-3/8 inch I.D. sampling spoon through three 6 inch intervals or as indicated, using a 140 pound hammer falling 30 inches, according to ASTM D-1586.
2. Classification of soil is by visual inspection and is in accordance with the Unified Soil Classification System.
3. Estimated groundwater levels indicated by ▽ these are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, etc.
4. Refusal at the surface of rock, boulder, or obstruction is defined as a penetration resistance of 100 blows for 2 inches penetration or less.
5. Boring foreman: R. Stanley
6. Key to abbreviations and symbols:
   - ☑ P-24" = 3 inch tube sample pressed 24 inches
   - R-20" = 20 inch sample recovery
   - (A) = Augers Pulled
   - • = No sample recovery
7. Disintegrated rock is defined as residual earth material with a standard penetration resistance between 60 blows per foot and refusal. It may exhibit certain rock-like qualities. Some denser portion of this material could possess characteristics of soft rock and may require rock excavation techniques for removal.
9. The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and groundwater conditions at these boring locations.
9. The stratification lines represent the approximate boundary between soil and rock types as determined in the drilling and sampling operation. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on this drawing have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.

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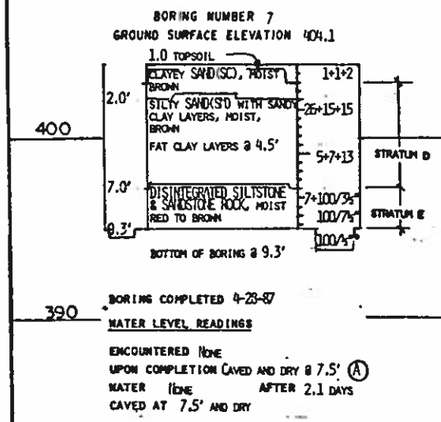
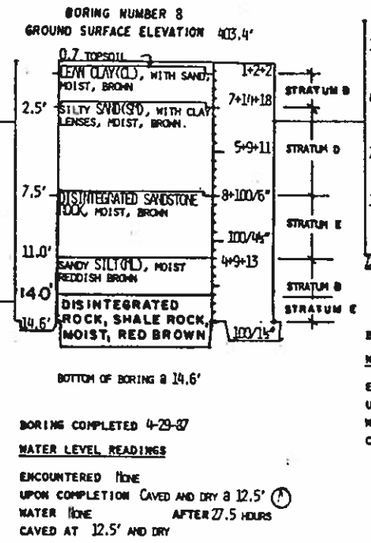
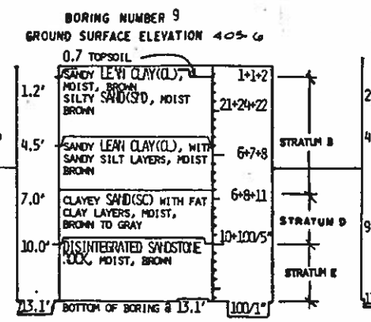
Fox Hill Pumping Station and Ground Storage Tanks
Fox Hill Road, Fairfax County, VA

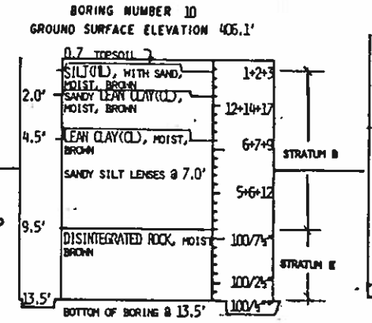
Test Boring Report

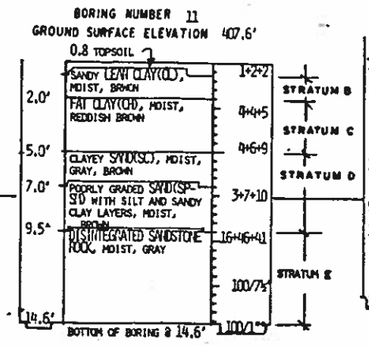
Scale 1/16" = 1'-0"	Date July 19, 1988	Rev By	Date
Drawn By V S	Checked By RWB		
Drawing No. 870159-7	Sheet No.		

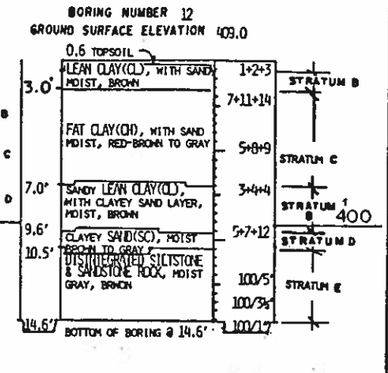


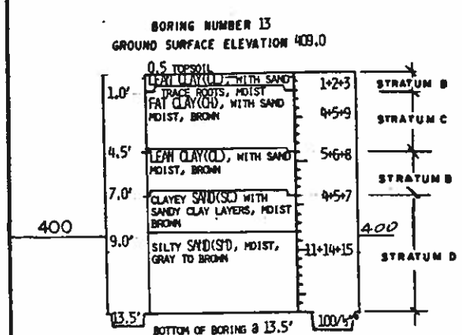












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FOX MILL PUMPING STATION AND GROUND STORAGE TANKS

FOX MILL ROAD, FAIRFAX COUNTY, VA.

TEST BORING REPORT

SCALE	DATE	REV BY	DATE
1/16"=1'-0"	JULY 19, 1988		
DRAWN BY: Y S	CHECKED BY: BWB		
DRAWING NO: V 870159-2	SHEET NO.		

ELEVATION
400.0
395.0
390.0

BORING NUMBER : 14
Ground Surface Elevation : 396.5

Depth	Description	St	Sampling
0.3	topsoil		1+2+2
1.2	clayey SAND(SC), some rock fragments, moist, brown		
2.0			87+13/⅓"
3.8	silty SAND(SM), w/ rock fragment moist, brown		
	DISINTEGRATED SANDSTONE ROCK, wet, brown		100/1⅓"

REFUSAL, BOTTOM OF BORING @ 3.8 FT.

B
D
E

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Enc	05-25	12:25	1.8'	2.0'	
Com	05-25	12:40	3.7'	3.7'	
ACP	05-25	12:50	3.7'	NONE	3.7'
	05-26	6:03	2.0'	NONE	3.3'

BORING NUMBER : 14-A
Ground Surface Elevation : 396.9

Depth	Description	St	Sampling
	Augered to 4.1' without sampling		
4.1	REFUSAL, BOTTOM OF BORING @ 4.1 FT.		

OFFSET 8.0' TOWARDS BORING 15

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Enc	05-25		NONE		
Com	05-25	1:00	NONE	4.1'	4.1'
ACP	05-25	1:10	NONE	NONE	4.0'
	05-26	6:05	2.0'	NONE	2.0'

BORING NUMBER : 15
Ground Surface Elevation : 398.5

Depth	Description	St	Sampling
0.7	topsoil		1+2+3
	LEAN CLAY(CL), with sand, moist, brown		7+8+8
6.0	silty SAND(SM), moist, brown	OS	5+5+15
7.5	DISINTEGRATED SANDSTONE ROCK, moist, brown		45+55/5"
10.1	REFUSAL, BOTTOM OF BORING @ 10.1 FT.		100/1⅓"

B
D
E

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Enc	05-25		NONE		
Com	05-25	12:10	NONE	10.0'	10.0'
ACP	05-25	12:20	NONE	NONE	9.2'
	05-26	6:08	4.0'	NONE	6.8'

BORING NUMBER : 16
Ground Surface Elevation : 398.5

Depth	Description	St	Sampling
0.8	topsoil		1+3+4
2.5	LEAN CLAY(CL), with sand, moist, brown		6+9+10
5.5	sandy LEAN CLAY (CL), moist, brown	OS	5+13+30
7.0	silty SAND(SM), moist, brown		
9.3	DISINTEGRATED SANDSTONE ROCK, moist, brown		58+42/⅓"
	REFUSAL, BOTTOM OF BORING @ 9.3 FT.		100/2"

B
D
E

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Enc	05-25		NONE		
Com	05-25	8:55	NONE	9.1'	9.1'
ACP	05-25	9:10	NONE	NONE	8.8'
	05-26	6:12	2.8'	NONE	4.8'

BORING NUMBER : 17
Ground Surface Elevation : 399.9

Depth	Description	St	Sampling
1.0	topsoil		1/12"+2
	LEAN CLAY(CL), some sand, moist, brown with sand lenses below 4.5'		9+14+18
7.5	DISINTEGRATED BAKED SANDSTONE ROCK, moist,purple	OS	5+8+11
9.6	REFUSAL, BOTTOM OF BORING @ 9.6 FT.		6+59+51/4"
			100/1"@

@ NO REC. @ 9.5'
BACKFILLED UPON COMPLETION

400.0
395.0
390.0

B
E

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Enc			NONE		
Com	12-19	1:10	NONE	44.5	
ACP	12-19	1:25	NONE	NONE	44.5

SCHNABEL ENGINEERING ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Checked By:
BRIAN BEARD

Project Name:
FOX MILL PUMPING STATION

DATE
7-19-88

Drawing No:
U870159-3

#6 396/399.8

#14 394.5/396.5

#13

TB-1

396/401.1

#5

#12

#4 400/402

#15 395/398.5

#11

398/401.0 #3

#2

#10

375.5/392.5 #16

#9

TB-4

#1 399/401.6

#8

#7

#17 398/399.9

El. of Highest Suitable Bearing Material Ground Surface Bottom of ringwall El. 398

LEGEND

TEST BORING LOCATIONS

SCHNABEL ENGINEERING ASSOCIATES

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FOX MILL PUMPING STATION AND GROUND STORAGE TANKS

FOX MILL ROAD, FAIRFAX COUNTY, VIRGINIA

TEST BORING LOCATION PLAN

SCALE 1" = 60'

DATE JULY 19, 1988

DRAWN BY Y.S.

CHECKED BWB

DRAWING NO. V870159-4

SHEET NO.

REV BY | DATE

134203

J&J COLUMBIA, MD.