Section : 02.03
Site 20903-5640 (White Oak)
Doc. #: 0003

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NSWC WHITE OAK
5090.3a

TETRA TECH NUS, INC.
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(412) 921-7090 ▪ FAX (412) 921-4040 ▪ www.tetratech.com

C-49-8-8-185

August 31, 1998

Project Number 7612

Ms. Kim Bellis
Department of the Navy
Engineering Field Activity Chesapeake
Washington Navy Yard, Building 212
901 M Street, SE
Washington, District of Columbia 20374-5018

Reference: Clean Contract No. N62472-90-D-1298
Contract Task Order (CTO) No. 284

Subject: Site 46 - Engineering Evaluation
Site W Swale Treatment System
Naval Surface Warfare Center, White Oak, Maryland

Dear Ms. Bellis:

Attached is an engineering evaluation of potential methods to provide 24-hour containment of water discharged to the Site W Swale sump, in the event of a short-term breakdown of the pumping system. This analysis is in response to the comments on the Basis of Design Report for the Site W Swale provided by Blue Ridge Environmental, Inc., and our subsequent telecon.

If you have any comments or questions regarding the information submitted please feel free to contact me at (412) 921-8778.

Very truly yours,

Jeffrey P. Orient, PG
Project Manager

JPO/sic

Attachment

c: Mr. Roger Boucher, NORTHDIV (w/o attachment)
Ms. Armalia Berry, EFACHES
Mr. John Trepanowski, TtNUS
Mr. Matt Bartman, TtNUS (w/o attachment)
Mr. Scott Nesbit, TtNUS
Ms. Yazmine Yap-Deffler, NAVY
Mr. Phil Tully, OHM
Mr. Steve Hughes, TtNUS
Mr. Steve Richard, GSA
Mr. Jeff Thornburg, MDE
Mr. Gary Westermeyer, EFACHES
Mr. Bob Craig, ARL

MEMORANDUM

Date: August 28, 1998

To: Jeff Orient (Tetra Tech NUS)

From: Bob Mertz (Tetra Tech NUS) RCM

REF: Contract Number N62472-90-D-1298
Contract Task Order 0284

RE: Seepage Retention Options
Site W Swale Treatment System
Aurora Facility
Army Adelphi Research Laboratory
Naval Surface Warfare Center
White Oak, Maryland

This memorandum has been prepared to summarize and evaluate options for 24 hour containment of seepage into the portion of the Site W swale located north of Floral Drive in the event that the collection/treatment system is temporarily inoperable. Options for retention (containment) of collected seepage include the following:

- Increase Collection Sump Size
- Install Retention Structure Across Swale
- Install Riser Section on RCP Culvert

The three options are described and evaluated below.

Increase Collection Sump Size

The size of the currently proposed collection sump would be increased to provide storage for collected seepage in the event that the treatment system is temporarily inoperable. The currently proposed collection sump is a 4 feet diameter precast concrete manhole with a depth below ground surface of approximately four feet. The containment volume of the proposed collection sump, below ground surface, is approximately 375 gallons.

The treatment system design flow is 10 gpm. Assuming the treatment system is temporarily inoperable for a 24 hour period and 100% containment of seepage is desired, the collection sump must have capacity of 14,400 gallons or 1,925 ft^3 [10 gpm (60 min/hr)(24 hr/day) = 14,400 gallons]. (It should be noted that the anticipated seepage discharge rate is approximately 7 gpm.) A collection sump with a depth of 4 feet, width of 10 feet and length

of 50 feet would be required to provide the desired storage capacity (4 feet x 10 feet x 50 feet = 2,000 ft^3 > 1,925 ft^3).

This option would effectively satisfy the 24 hour storage goal; O&M activities and O&M cost would not increase significantly; and the capital cost would increase by approximately $50,000.

Install Retention Structure Across Swale

A retention structure would be constructed across the Site W swale. The retention structure would impound seepage and surface water run-off. The retention structure would be located north of the culvert entrance invert/Floral Drive and downstream of the collection sump. The retention structure would be constructed of cast-in-place reinforced concrete with either a steel, V-notch weir or cut concrete weir installed in the top center portion of the retention structure as a low-volume overflow discharge point.

As calculated above, containment of 14,400 gallons or 1,925 ft^3 is desired. A retention structure with an exit invert elevation (at the weir location) established to contain at least 1,925 ft^3 of water/seepage upstream of the structure would be required. It is estimated that the weir exit invert be located approximately 1 foot above the swale bottom to achieve the seepage containment volume. The top of the retention structure would be approximately one foot higher than the weir invert to provide freeboard and storage for minor precipitation events. Seepage under normal flow conditions would flow into the upstream sump, as currently proposed, for subsequent treatment. Surface water run-off in excess of the collection sump pumping capacity would pass through the weir, and during a major precipitation event may pass over the retention structure as sheet flow.

This option would effectively satisfy the 24 hour storage goal; O&M activities and cost would not increase significantly; installation of the retention wall would be concurrent with the gravel drain installation; and the capital cost would increase by less than $5,000.

Install Riser Section on RCP Culvert

A riser section would be installed on the existing RCP culvert to impound seepage and surface water run-off. The riser section would be constructed of precast concrete or corrugated metal pipe.

As calculated above, containment of 14,400 gallons or 1,925 ft^3 is desired. The riser invert (perforations) would be established to contain at least 1,925 ft^3 of water/seepage upstream of the riser structure. The top of the riser would be established at least one foot higher than the

perforations to provide freeboard and storage for minor precipitation events. It is estimated that the initial riser perforations would be located 1 foot above the swale bottom to achieve the seepage containment volume. Seepage under normal flow conditions would flow into the collection sump, as currently proposed, for subsequent treatment. Surface water run-off conveyed in the swale which exceeds the capacity of the riser perforations would flow into the top of the riser.

This option would effectively satisfy the 24 hour storage goal; O&M activities and cost would increase slightly; the riser section would reduce the flow capacity of the RCP drainage system; and the capital cost would increase by less than $2,000.

Conclusions/Recommendation

All three option will satisfy the 100% containment of seepage over a 24 hour period goal.

The capital cost associated with increasing the collection sump size is at least an order of magnitude greater than the other two options. As all options are effective, the Increase Collection Sump Size option is eliminated.

The installation of a Riser Section on the RCP Culvert option will decrease the flow capacity of the drainage system, require modification of the existing RCP, require replacement over its service life, and result in an increase in maintenance of the RCP (debris removal and cleaning) compared to the Retention Structure option. Due to increased maintenance requirements and a shorter service life than the Retention Structure option, the Riser Section option is eliminated.

The Retention Structure option is recommended as it achieves the containment goal, insignificantly increases capital cost, and has little to no impact on O&M cost. Details of the retention structure are provided on pages 5 and 6 of this memorandum.

The following design criteria are recommended:

- locate retention wall at least 5 feet from the culvert entrance;
- provide rip rap erosion protection in the swale between the RCP culvert entrance and the retention structure;
- locate retention wall such that seepage collection trench drain flows to upstream side of retention wall (e.g. hydraulically isolate the upstream side portion of the retention structure from the downstream side at and below the 2,000 ft^3 pool elevation);
- **establish weir invert elevation to provide approximately 2,000 ft^3 of upstream storage;**
- install low permeability soil on downstream side of retention wall and channel sideslopes to prevent seepage under or around retention wall;

- install coarse aggregate infiltration zone upstream of retention structure; provide geotextile separation layer with overlying riprap on top of coarse aggregate infiltration zone;
- retention wall footing depth should be at least 2 feet below grade;
- collection sump should be founded on compacted coarse aggregate to allow seepage inflow from bottom; subsurface drainage piping should be placed in the coarse aggregate to improve drainage to the collection sump; subsurface weep holes should be provided in the collection sump walls to enhance inflow; and
- the top of the collection sump should be set at least 1 foot above the top of the retention wall to minimize the potential of debris entry.

Site W Swale Retention / Containment
Aurora Facility
White Oak, MD

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PREPARED BY RCM	REVIEWED BY	PAGE 5 OF 6
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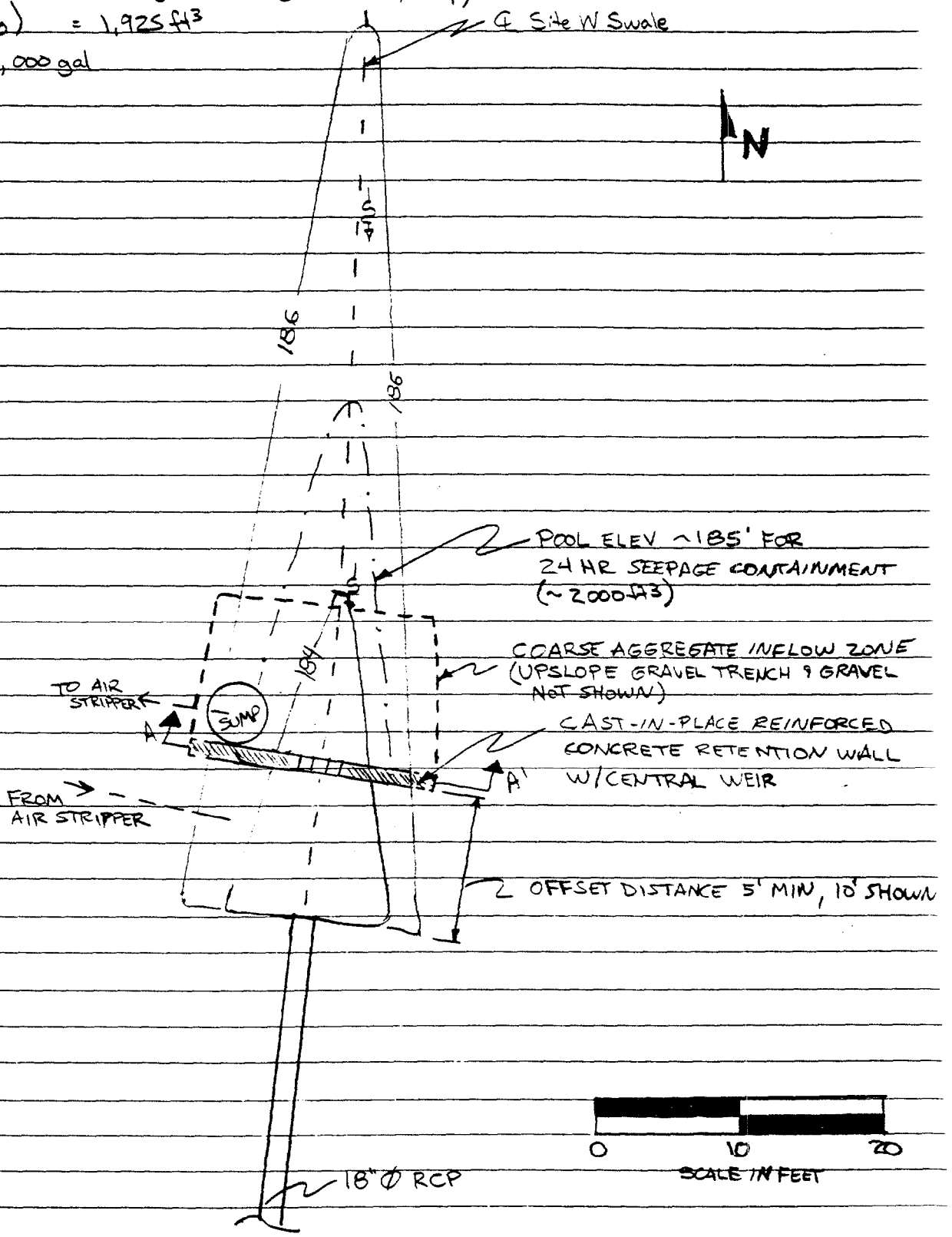
$7\ gpm\left(\frac{60m}{h}\right)\left(\frac{24h}{d}\right) = 10080\ gal$ seepage, 24h

$10\ gpm\left(\frac{60m}{h}\right)\left(\frac{24h}{d}\right) = 14400\ gal$ design flow capacity, 24h

$14400\ g\left(\frac{ft^3}{7.48\ g}\right) = 1,925\ ft^3$

$V_{184-186} \approx 7,000\ gal$



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COLUMNAR MEMO SHEET

Site W Swale Retention
Aurora Facility
White Oak, MD

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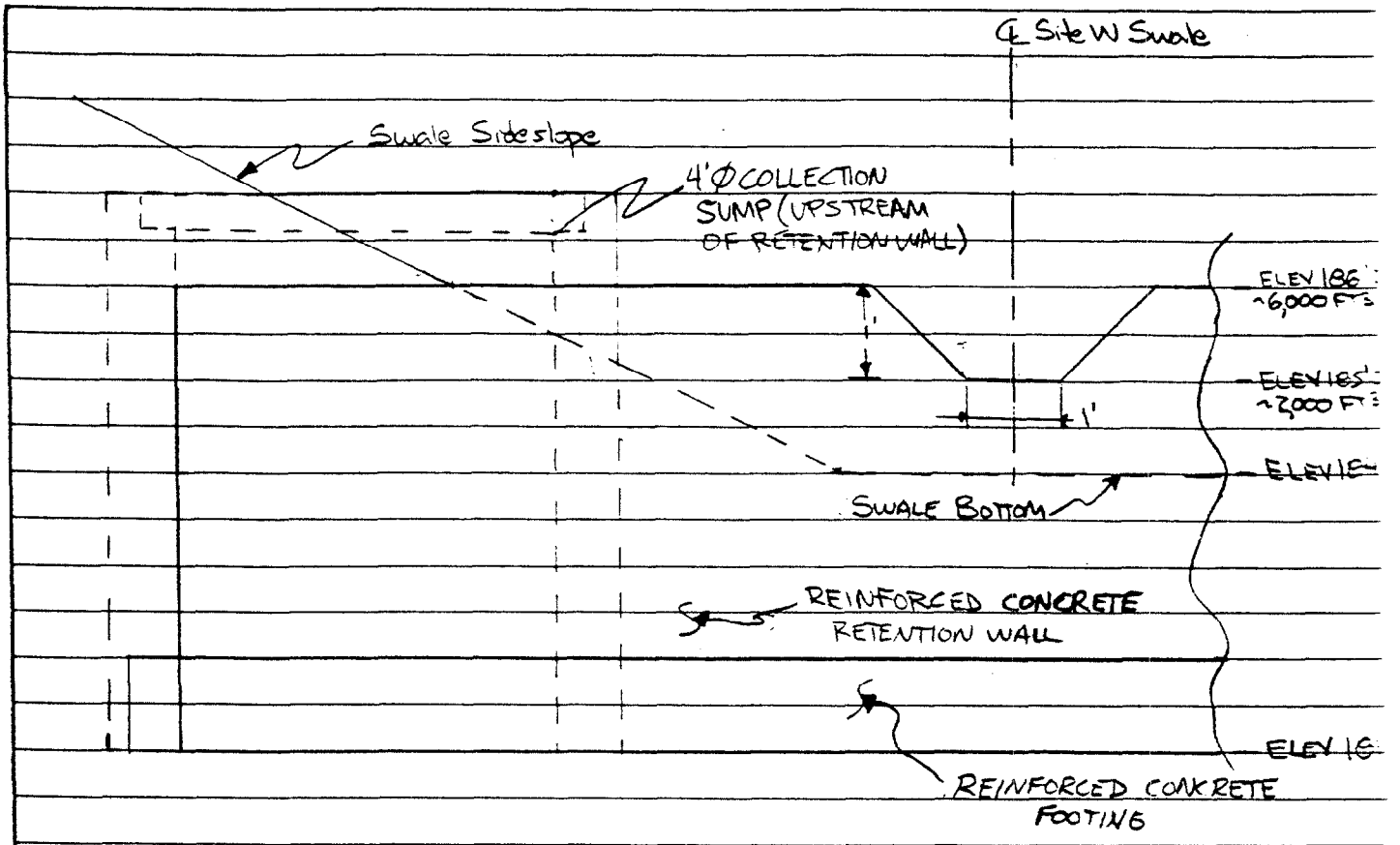
PREPARED BY [illegible]	REVIEWED BY	PAGE 6 OF 6
DATE 01/27/98	DATE	



SECTION A-A'

0 2 4
SCALE IN FEET

NOTES

1) ELEVATIONS SHOWN ARE APPROXIMATE (± 1').
2) PROVIDE AT LEAST 2,000 FT³ OF STORAGE TO THE WEIR INVERT.

AA&Co., S.C. Form CD-20 (3/79) Printed in U.S.A.
COLUMNAR MEMO SHEET