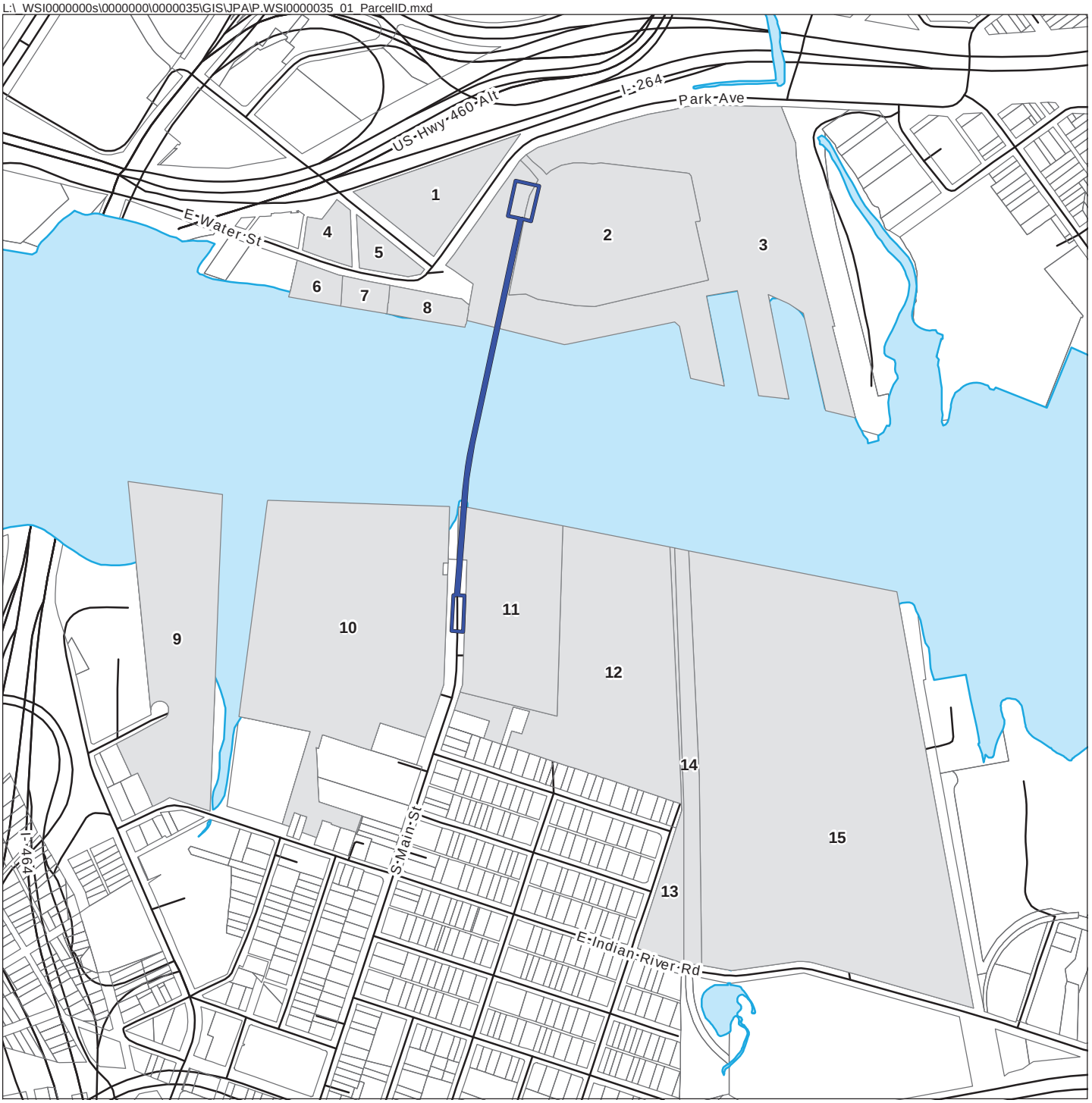
L:\ WSI0000000s\0000000\0000035\GIS\JPA\P.WSI0000035_01_ParcelID.mxd




LOD
Parcel ID
Waterbody

**Parcel ID Map**
**Verizon Elizabeth River HDD**
**WSSI #P.WSI0000035**

NORTH
0 600
Feet
Original Scale:
1 " = 600 '

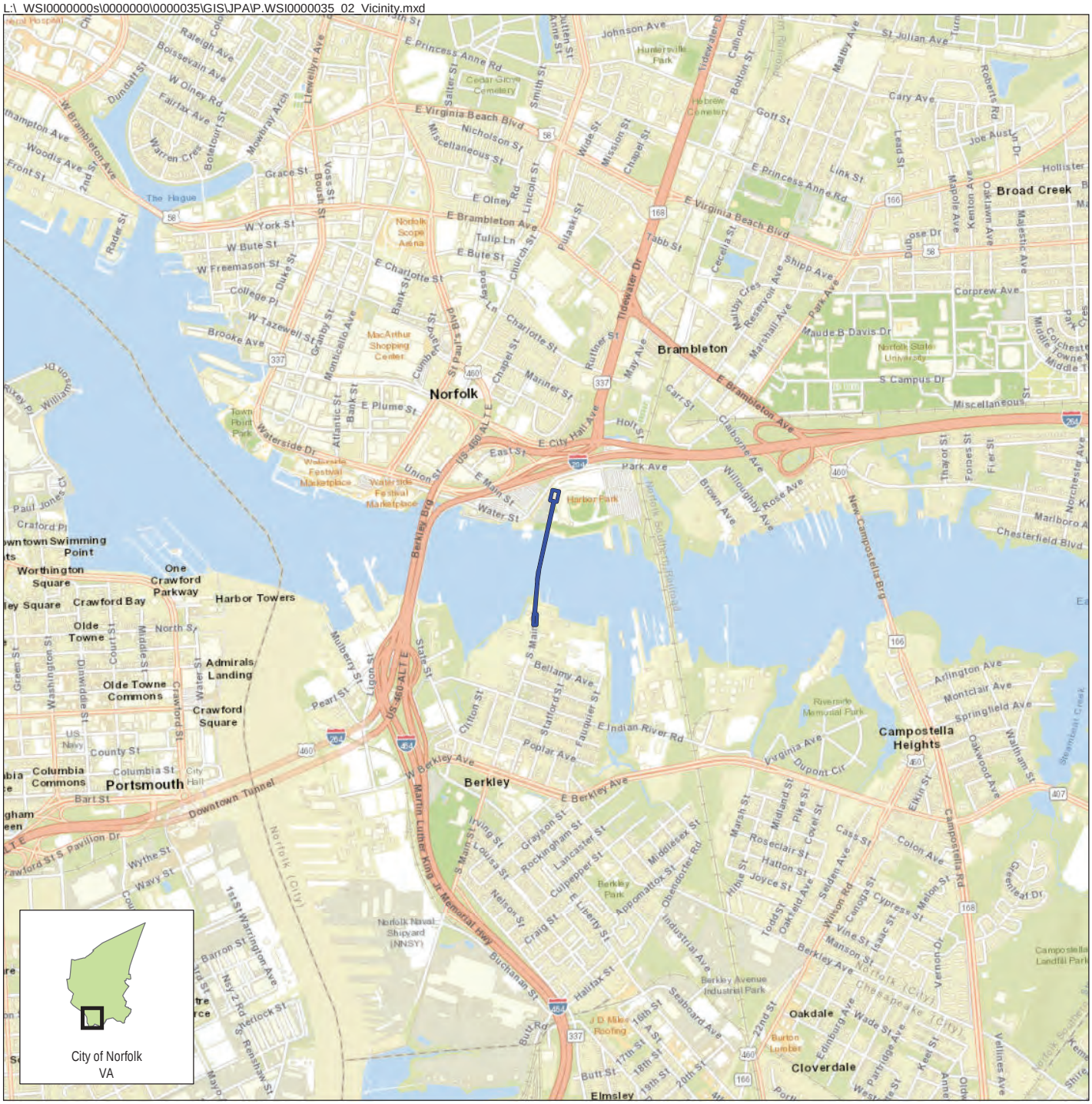
Source: City of Norfolk Digital Data

**Wetland Studies and Solutions, Inc.**
a DAVEY company

***Exhibit 3***

Received by USACE PB 10/09/2023

L:_WSI0000000s\0000000\0000035\GIS\JPA\P.WSI0000035_02_Vicinity.mxd




LOD

## Vicinity Map
## Verizon - Elizabeth River HDD
## WSSI #P.WSI0000035

NORTH

0 2,000

Feet

Original Scale:
1 " = 2,000 '

Source: World Street Map - ESRI

**Wetland Studies and Solutions, Inc.**
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***Exhibit 4***

Received by VMRC September 29, 2023 /blh

Received by USACE PB 10/09/2023

L:_WSI0000000s\0000000\0000035\GIS\JPA\P.WSI0000035_03_USGS.mxd


LOD: ±0.9 acres

**USGS 7.5' Quadrangle Map**
**Verizon - Elizabeth River HDD**
**WSSI #P.WSI0000035**

NORTH
0 2,000
Feet
Original Scale:
1 " = 2,000 '

Norfolk South, VA 2000
Latitude: 36°50'29"N (36.84149)
Longitude: 76°16'49"W (-76.2803)
Hydrologic Unit Code (HUC): 020802080204
HUC12 Name: Eastern Branch Elizabeth River
COE Region: Atlantic and Gulf Coastal Plain

**Wetland Studies and Solutions, Inc.**
a DAVEY company

***Exhibit 5***

Received by VMRC September 29, 2023 /blh

L:_WSI0000000s\0000000\0000035\GIS\JPA\P.WSI0000035_04_Nearmap.mxd

LOD

**May 2023 Natural Color Imagery**
**Verizon - Elizabeth River HDD**
**WSSI #P.WSI0000035**

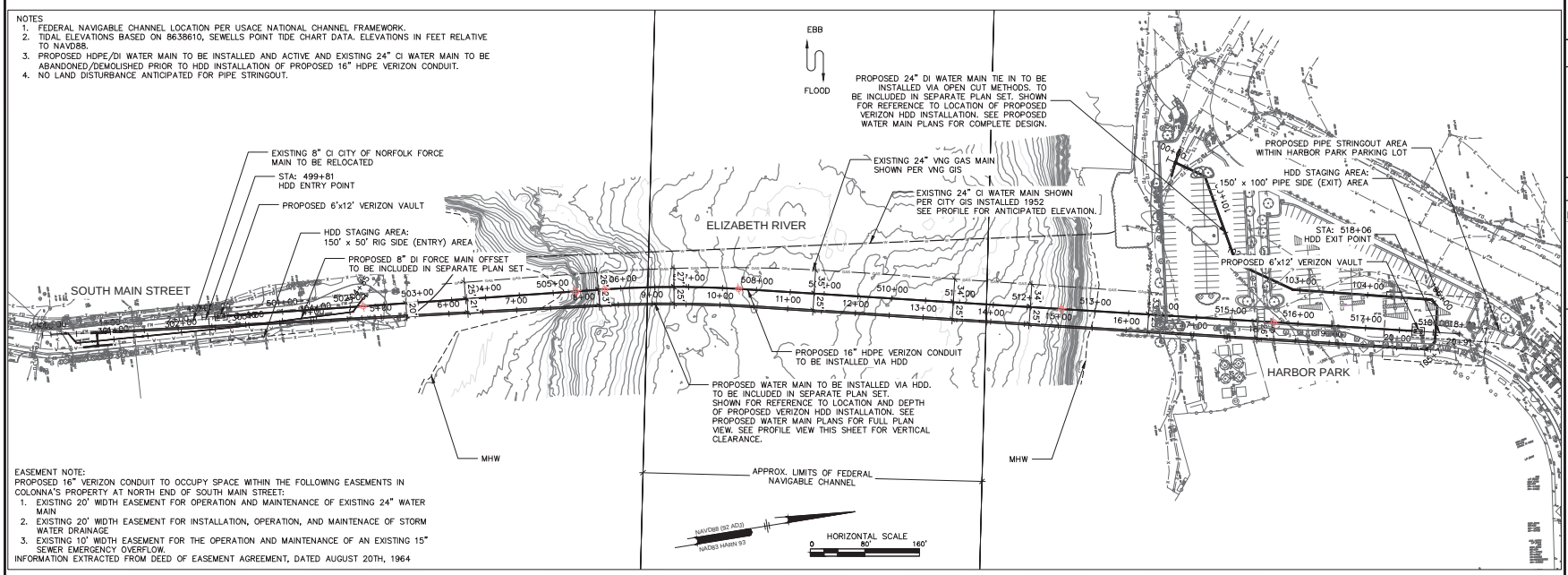
NORTH
0 400
Feet
Original Scale:
1 " = 400 '

Source: Nearmap®

***Exhibit 6***

a DAVEY company

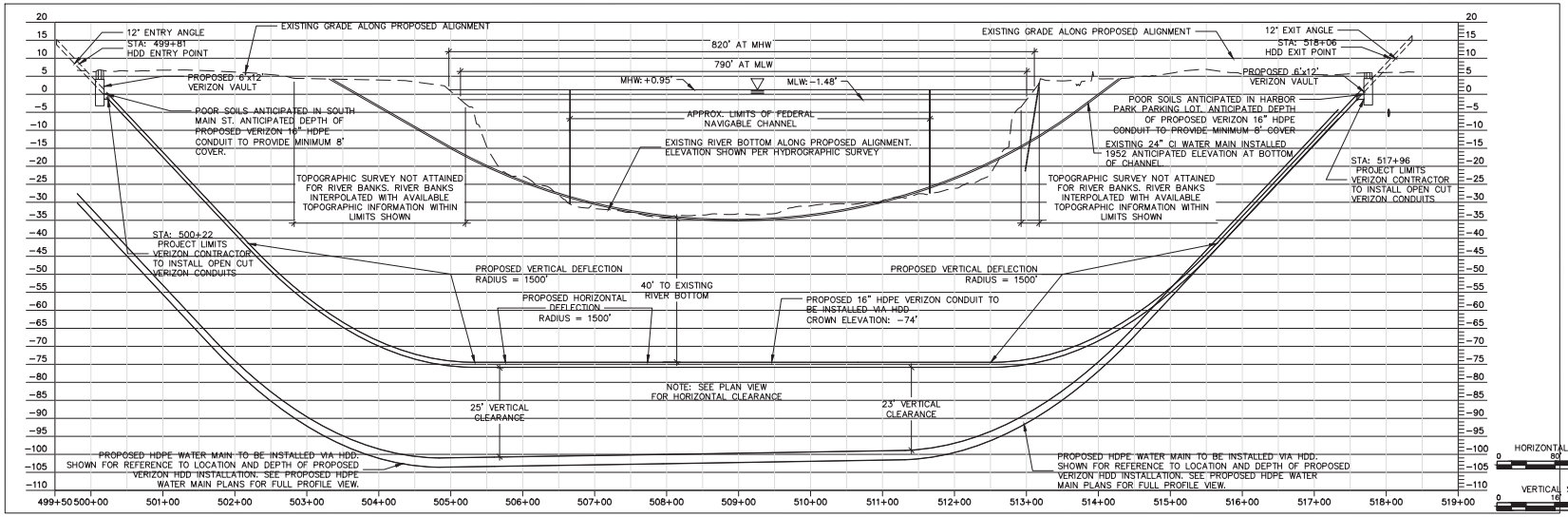
NOTES
1. FEDERAL NAVIGABLE CHANNEL LOCATION PER USACE NATIONAL CHANNEL FRAMEWORK.
2. TIDAL ELEVATIONS BASED ON 8638610, SEWELLS POINT TIDE CHART DATA. ELEVATIONS IN FEET RELATIVE TO NAVD88.
3. PROPOSED HDPE/DI WATER MAIN TO BE INSTALLED AND ACTIVE AND EXISTING 24" CI WATER MAIN TO BE ABANDONED/DEMOLISHED PRIOR TO HDD INSTALLATION OF PROPOSED 16" HDPE VERIZON CONDUIT.
4. NO LAND DISTURBANCE ANTICIPATED FOR PIPE STRINGOUT.




EASEMENT NOTE:
PROPOSED 16" VERIZON CONDUIT TO OCCUPY SPACE WITHIN THE FOLLOWING EASEMENTS IN COLONNA'S PROPERTY AT NORTH END OF SOUTH MAIN STREET:
1. EXISTING 20' WIDTH EASEMENT FOR OPERATION AND MAINTENANCE OF EXISTING 24" WATER MAIN
2. EXISTING 20' WIDTH EASEMENT FOR INSTALLATION, OPERATION, AND MAINTENACE OF STORM WATER DRAINAGE
3. EXISTING 10' WIDTH EASEMENT FOR THE OPERATION AND MAINTENANCE OF AN EXISTING 15" SEWER EMERGENCY OVERFLOW.

INFORMATION EXTRACTED FROM DEED OF EASEMENT AGREEMENT, DATED AUGUST 20TH, 1964

## HDD OVERVIEW




| BY | DATE | DESCRIPTION | REV. |
|---|---|---|---|

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.
295 BENDIX ROAD, SUITE 240
VIRGINIA BEACH, VA 23452

PROPOSED 16" VERIZON CONDUIT HDD

VERIZON HDD AND WATER MAIN HDD OVERVIEW

DESIGNED BY: J. ROBERTS
DRAWN BY: J. HOOPER
CHECKED BY: M. MULL
APPROVED BY:
DATE: SEPT 2023

OFFICE OF RESILIENCE
501 BOUSH STREET
NORFOLK, VA 23510

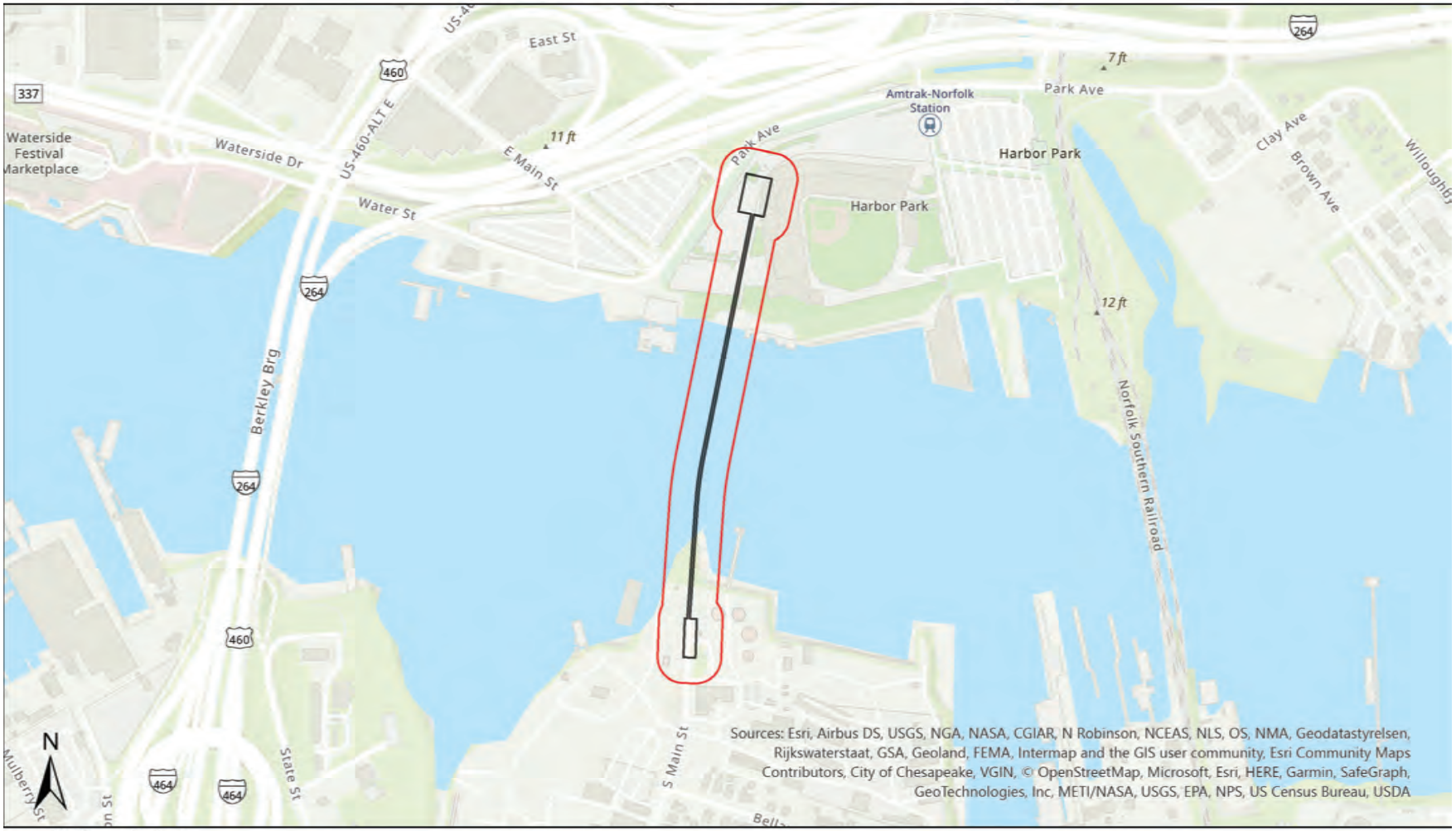
SEALS

NOT FOR CONSTRUCTION

ER No: PCTS No:
FILE NAME: C_VERIZONHDD_PLAN
DATE: SEPT 2023 SCALE: AS SHOWN

SHEET C-300

# Verizon Elizabeth River HDD Permitting




Buffered Project Boundary

Project Boundary

0 0.05 0.1 0.2 Miles

Scale: 1:6,119

Quads: Norfolk South

Counties: City of Norfolk

Company: Wetland Studies and Solutions, Inc.

Lat/Long: 365029 / -761649

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DIRECTIONAL DRILLING

**Drilling Fluid Contingency and Disposal Plan for Directional Drilling Elizabeth River Crossing**

**Location: See Plan and Profile sheet: XXX**

**See attached: Fluid Pressure Curve and Soil Borings: XXX**

**Background**

Prior to the commencement of a Horizontal Directional Drilling (HDD) installation, a thorough review of site information including but not limited to geotechnical information, core samples, and utilities profiles is performed. This ensures that the risk of drilling fluid seepage is minimized. Some degree of drill fluid seepage (escape of drill fluid from the bore to surround formation) is common. Significant drill fluid loss may result in appearance of fluid at the ground surface, which is known as an Inadvertent Return (IR, or "frac-out"). This is generally the result of pressurization of the drill hole beyond the containment capability of the surrounding geologic material. Providing adequate boring depth or targeting geologic materials with significant strength for the installation may reduces this potential. In some cases, an IR can be caused by pre-existing fractures or porous layers in the geologic formation, even if the down-hole fluid pressures are low.

The ability to detect the early stages of an IR prior to an occurrence is dependent upon the skills and experience of the drilling crew, and the detection methods available. Each drilling situation is unique, and the behavior of subsurface material is highly variable, making IRs difficult to predict. The most obvious signs are loss of fluid circulation in the entry or exit pits, visible bulges in the surface material and visible surface seepage.

One of the functions of the drilling fluid is to seal the hole to maintain the down-hole pressure. The pressure keeps the hole from collapsing, while the drill fluid removes cuttings, and cools the drill tools. The loss of returning drilling fluid is a sign that pressure is not being contained in the drill hole and seepage is occurring as the fluid migrates outside of the hole. As noted, some loss of drilling fluid is normal in the drilling process particularly of the surrounding materials are porous (e.g., sand and gravel).

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DIRECTIONAL DRILLING

**Construction Procedures – Elizabeth River Crossing**

The following construction procedures have been developed for the **Elizabeth River Crossing of a 30-inch water main and Verizon conduit package** installation. These procedures (i) identify conditions that may precede an IR and the monitoring procedures that will be used to detect these; (ii) set forth and implement design and construction procedures to mitigate those conditions; and, (iii) set forth procedures to contain a potential IR.

Procedures have been developed for five (5) drilling Scenarios and are described in detail below. For each Scenario, the Contractor's required response to the condition, a discussion of reasons why the condition may be occurring, and remedial steps proposed to regain normal drilling conditions are provided.

If at any point during the Project an IR is identified, the Contractor will implement the IR Response Plan detailed under Scenario 5.

**Scenario 1 – Normal Drilling Conditions**

Scenario 1 involves normal drilling conditions. In this situation, drilling is progressing under industry good practices and with routine monitoring of drill fluid returns at the HDD entry and exit pits (as applicable). Drill fluid is being used to remove the cuttings from the hole and is being pumped from the entry (and or exit) pit to the recycling system to remove the cuttings. The drill fluid is then being pumped back into the hole for reuse.

Visual observations indicate full returns of the drill fluid (minus the fluid volume needed to fill the hole and to form the "filter cake"). Pump pressures are within acceptable limits. Under Scenario 1 the downhole annular pressures are within acceptable limits. A representative of Spring is travelling the alignment with concentration on the area within 100 feet of the

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drill bit and is not observing any changes in the ground surface or drill fluid emitting from the ground.

The remainder of the examinations will be made periodically on a time interval not to exceed one hour. The individual inspecting, time of inspection and observations will be recorded in the daily drill log and will be made available for review.

Under Scenario 1 Spring will maintain a drilling log with the following minimum recorded information:

- While advancing the pilot hole, the location of the drill bit.
- The approximate drill fluid pump rate and pressure, and relative drill fluid return percentage during drilling of each drill rod.
- Start/stop times and dates for each rod.
- Approximate thrust and rotation hydraulic pressures for each drill rod.
- Drill string configuration, including measurements of the length of all components and each drill rod, including bits and reamers.
- Equipment breakdowns including a log of the time, date, duration, and cause of breakdown.

The Drill Fluid Specialist will monitor and record the drill fluid properties such as density, viscosity, and chemistry of the drill fluid. A log of the readings will be maintained at the drill rig site and will become part of the construction record.

Scenario 2 – Elevated Annular Pressures **– No IR Dectected**

For the purpose of this plan, elevated pressures are considered to be those that exceed the established threshold for a period of greater than 3 minutes, as measured by pump pressure gauge on the drill rig. Under normal operating circumstances, an increased annular pressure may be due to the following:

- Borehole annulus blockage, preventing circulation.
- Increased drill fluid density

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- Increased pump rate

If Scenario 2 occurs, Spring will implement the following:

- Complete partial hole swab to remove potential blockage. This may range from a one to three-rod swab.
- If considered necessary, complete a full-hole swab.
- Adjust pumping rates.
- Adjust drill fluid properties.
- Adjust advance rates.
- Restart drilling and monitor circulation. If drill fluid annular pressures cannot be reduced, then assess conditions with the Engineer and determine if drilling can continue.
- Once the drill fluid pressures are within desired limits, return to Scenario 1.

**Scenario 3 – Loss of Drill Fluid Returns - No IR Detected**

Potential causes for loss of drill fluid returns may include the following:

- Encountering a void or pocket in the soil.
- Encountering underground obstacles such as a pile or utility.
- Drill fluid density increasing to an extent that it cannot be pumped from the hole.
- Borehole annulus blockage, preventing circulation.

Criteria for implementation of Scenario 3 include complete loss of drill fluid returns to the entrance/exit pit or a loss of more than 25% returns for a period of at least 15 minutes. These criteria are consistent with industry practices.

A 25% reduction in fluid returns is significant, demonstrating normal drilling conditions may have changed. The 15-minute window allows the Contractor enough time to evaluate if a fluid loss is actually occurring and what corrective measures should be utilized. If at any point during the 15-minute window an IR is observed, the Contractor will move to Scenario 5.

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If Scenario 3 occurs, Spring will implement the following:

- Stop drilling and pumping drill fluid immediately.
- Assess the cause of the drill fluid loss.
- Visually inspect the ground surface along the drill path between the drill rig and a distance of 100 feet past the drill head for signs of drill fluid release. In addition, the inspection will include the entire width of the R-O-W along the drill path as well as LOD's at the HDD entry and exit points. Inspections will be increased to every 30 minutes under this scenario.
- Implement one or more of the following procedures to restore circulation:
  - opening the hole mechanically.
  - removal of drill tools without drill fluid circulation and re-drilling with drill fluid circulation.
  - adjusting the drill fluid properties.
  - adding additional conductor casing to provide a seal; and/or
  - Use of an LCM (loss control material).
- Restart drilling and attempt to restore drill fluid circulation. If drill fluid circulation is reestablished and no drill fluid release is visibly detected, return to Scenario 1. If drill fluid loss continues, then assess conditions with the Engineer and determine if drilling can continue.

**Scenario 4 – Drill Fluid Properties Not Within Intended Properties - No IR Detected**

During drilling, Spring representatives will measure and record the drill fluid properties at least every 4 hours, and when the geologic materials encountered change (e.g. from clay to sand, etc.). Criteria for implementation of Scenario 4 involve detection of sudden or gradual unanticipated changes in design drill fluid properties, as established by Spring's Drill Fluid Specialist. These include the following:

- Viscosity.
- Sand Content.

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- Gel Strength and density.

A fluctuation (up or down) of 10% or more for a given drill fluid parameter will require that Spring take corrective action. This criteria is consistent with industry practices. While drill fluid properties will fluctuate during the Project, more than 10% fluctuation may be indicative of a problem.

If there is a fluctuation of 10% or more in any drill fluid property, Spring will implement the following:

- Assess the deviation history of the drill fluid properties.
  - Situation 1. The drill fluid monitoring demonstrates gradual parameter variability. Spring will adjust drill fluid to desired parameters and continue drilling.
  - Situation 2. Sudden change in drill fluid properties. Spring will **stop drilling immediately**, clean hole, and adjust drill fluid until desired drill fluid properties are restored.
- If the physical and chemical properties of the drilling fluid cannot be adjusted to meet the desired properties (i.e., elevated density or viscosity suggests drill cuttings are not being effectively removed), Spring will change the drill fluid. If the issue continues, Spring and the Engineer will determine what changes to the drilling fluid parameters are acceptable to continue the Project.
- Once the drill fluid parameters are within desired limits, return to Scenario 1.

**Scenario 5 – An IR is Detected (IR Response Plan)**

If an IR is observed, the Spring will implement the following sequence of operations:

1. **Shut down the drilling operations and contain the release.**
   a. As soon as possible after detection of a drilling fluid release to ground surface or the wetlands Spring will shut down drilling operations (subject only to safety considerations).
   b. Spring will locate and mark the origin of the release, and place IR containment measures.

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DIRECTIONAL DRILLING

c. Place containment around the IR area by installing silt fence and sandbags to act as a primary containment with a secondary containment consisting of additional sandbags with a silt fence acting as a liner.

2. Implement the following **IR Response Actions**.

a. Immediately notify the following:

b. On Site Inspector
c. Crofton Industries Field Superintendent:
d. Inspector:
e. Contractor shall notify Wetland Monitor immediately after the detection of an IR.

- Name and telephone number of person reporting
- Description of the location of the IR
- Date and Time of the IR
- Type and quantity, estimated size of IR
- Type of activity that was occurring around the IR
- Description of any sensitive areas and their location in relation to IR
- Description of methods used to clean up and/ or secure the site

f. Employ pumps (6-inch Godwin dry-prime and/ or 4" Hyrdra-Tech submersible pumps) to remove drill fluid within IR containment measures. Drill fluid will be pumped to containment tank.

g. Where possible use wooden handle 3' wide rubber squeegees, 16 and 24 tine steel garden rakes and flat square point shovels to clean area especially in vegetated areas.

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DIRECTIONAL DRILLING

h. Where it is feasible employ on site vacuum trucks 800 gallon to 2500 gallon) to clean area particularly in vegetated areas. Employ silt curtains/ booms if possible.

i. Monitor the release area and the remaining drill path and determine the boundaries of the release area.

j. Spring will maintain records of the quantity of drill fluid materials removed from either the stream bottom or land surface, transferal of the material to other containment, and daily status of cleanup operations as applicable. Spring will be responsible for disposing of the released material in accordance with all local, state, and federal regulations. Records or manifests of the disposal material will be available upon completion of the work.

3. Spring, Drill Fluid Specialist, Engineer, and other appropriate Project team members will assess the conditions and develop a procedure for additional clean up, restoration, and Project recommencement. **A plan to restart drilling will be submitted to Crofton Industries Project Manager with in 24 hours of the IR event.** The restart of the drilling activities will depend on the location of the drill, the extent of the IR, and the activity being completed (pilot bore, reaming, product installation, etc.). **Drilling operations will not recommence without prior approval**.

   Options to restart drilling will be situation specific but may include:

   a. Introduce bore loss control materials (LCM) into the bore in accordance with the manufacturer's recommendations. Pull the drill head away from the bottom of the hole or remove from the hole. Let the bore sit until the bore seal has activated in accordance with the manufacturer's recommendations. These products are most effective when introduced soon after the drill fluid loss has occurred. If deemed appropriate by the Engineer, these products will be introduced as soon as an IR is

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discovered. Restart the drilling operations and assess for drill fluid returns. If full returns are observed, continue drilling under Scenario 1.

b. Advance steel conductor casing to the end of the drill path and embed casing into the formation for a seal. Restart the drilling operations and assess for drill fluid returns. If full returns are observed, continue drilling under Scenario 1.

c. Assess drill fluid parameters and adjust if necessary. Mechanically swab the drill hole with low fluid pump rate while pulling rods back until drill fluid returns restart. Continue the swabbing process until the bore is clean and fully contains reconditioned drill fluid. Re-drill the hole to the bottom while monitoring for drill fluid returns. If full returns are observed, then return to Scenario 1 and continue drilling.

**Scenario 6 – Continued Drill Fluid Release to an Existing Containment Location**

If drill fluid returns appear within a previously established containment area, then Spring will implement the following sequence of operations:

1. Spring will maintain a pump of equal or greater capacity to the pump used to return drill fluid to the recycler. This pump will be placed in the containment area for use if drill fluid release to the containment area is detected.
2. If Spring is able to contain and control the release within the previously installed primary containment, then drilling may continue under Scenario 1 conditions.
3. If at any time, the amount of material being released exceeds the rate of removal being achieved by the primary containment system, then the drilling operations will be suspended until the release can be brought under control by Spring.

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DIRECTIONAL DRILLING

## Materials

The material and equipment for containing inadvertent returns and restoration will include onsite at the drill site entrance pit:

a. Silt fence and super silt fence: 300 feet
b. Sandbags (standard and bulk 2000 lbs.)
c. Straw bales w/ post: 15 bales
d. Dirt berms
e. Standpipe: 10 feet of 20-inch steel casing
f. Portable diesel pump with hose: 1 six Godwin pump w/ hose
g. 2500-gallon vacuum tank truck
h. Containment tank
i. 10-45 metric ton CAT excavators and tracked loaders and skid steers
j. Small boat

The staffing of our drilling crews is 6 full time personnel and 2 part-time personnel. In the event of an IR all hands will be available and will be used to contain and clean the IR location. No drilling will resume until the cleanup has taken place and observed by onsite inspectors. Should an IR occur dedicated employees would be identified to observe the location and maintain the pumps within the cleanup site.

## Post Mitigation Inspection:

- Upon completion of the bore the contractor will walk the area of the IR with the inspector to ensure that all the drilling fluid has been removed from the area and that no additional clean up is needed. Areas that have damaged vegetation from the clean up process will be seeded or replanted with native plants. The contractor will ensure the localized plants/seeds take and the soil is stabilized to meet the requirements of local county and state sediment and erosion policies and procedures. The area of the IR will be inspected weekly until the

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DIRECTIONAL DRILLING

inspector is satisfied that new seeds, plants and or native grasses have germinated and will provide adequate cover for the disturbed area.

**Drill Superintendents and Consultants:**

- Todd Brandow and Lewis Holloway (both act as the driller and superintendent)
- Robert D. Taylor – General Manager and Rodney V. R. Spring -owner
- Drill Fluid on call Engineer: John Day consultant
- Brierley Associates: Nick Strater – Design consultant

**Disposal of Excess Drilling Fluids**

During the normal course of drilling operations Spring and Associates Inc. plans to re-use and recycle our drilling fluid. There may be times where excess mud will need to be disposed of and during the day of pipe installation the mud displaced by the pipe will be vacuumed and removed from the site. Our drilling mud will be disposed off-site in an authorized facility.

**HDD Equipment Description (submittal sheet available if requested)** Additional equipment may be used during construction as needed based on adverse ground conditions, anomalies or maintenance at the contractor's discretion.

- American Augers DD 440 Directional Drill
- American Augers MP 500/ Tulsa MCM 100 Mud Recycler and mud pump
- Jetting Assembly HDD capability for alluvial soils
- Reamers: fly cutter/ barrel reamers in sizes from 24 –inches to 42 inches may be used based on ground conditions.

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DIRECTIONAL DRILLING

Horizontal Technology

**HDD additives horizontal directional drilling (submittal sheet available)**

- Mi Swaco: Max-Gel
- Mi Swaco: Rod ease
- Mi Swaco: Poly Plus LV
- Mi Swaco: Platnium DD
- Baroid: Quik-Gel
- DMD: Bara-kade Plus
- DMD: Soda Ash
- DMD: Power Pac L
- DMD: Lubra Star
- DMD: Clay Star