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July 2, 2021

**VIA EMAIL AND PRIVATE CARRIER**

Gary Schold, Project Manager  
Land Restoration Program  
Land and Materials Administration  
Maryland Department of the Environment  
1800 Washington Boulevard, Suite 625  
Baltimore, Maryland 21230

Subject: Transmittal of Bulkhead Outfall-Sealing Completion Report  
Lockheed Martin Corporation – Middle River Complex  
2323 Eastern Boulevard, Middle River, Baltimore County, Maryland

Dear Mr. Schold,

For your information, please find enclosed two hard copies of the above-referenced document. This report was prepared summarizing the sealing of the annular space around two outfalls (OF-005W and OF-00X) that penetrate through the bulkhead along Dark Head Cove in Blocks D and F at the Lockheed Martin Corporation Middle River Complex, Maryland.

Please let me know if you have any questions. My office phone is (301) 548-2209.

Sincerely,

A handwritten signature in dark ink, appearing to read "Tom D. Blackman", with a long horizontal flourish extending to the right.

Thomas D. Blackman  
Project Lead, Environmental Remediation

cc: (via email without enclosure)  
Mark Mank, MDE  
Christine Kline, Lockheed Martin  
Mary Morningstar, Lockheed Martin  
Tom Green, LMCPI  
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Jann Richardson, Lockheed Martin  
Scott Heinlein, LMCPI  
Christopher Keller, LMCPI  
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Rina Scales, LMCPI

cc: (via mail with enclosure)

**BULKHEAD OUTFALL-SEALING  
COMPLETION REPORT  
MIDDLE RIVER COMPLEX  
2323 EASTERN BOULEVARD  
MIDDLE RIVER, MARYLAND**

Prepared for:  
Lockheed Martin Corporation

Prepared by:  
Tetra Tech, Inc.

June 2021

Approved by:  
Lockheed Martin, Inc.

Revision: \_\_\_\_\_



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Michael Martin, P.G.  
Regional Manager



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Michael Byle, P.E.  
Project Manager

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## ACRONYMS AND ABBREVIATIONS

EESH	energy, environment, safety, and health
Elite	Elite Environmental
HASP	health and safety plan
HDPE	high-density polyethylene
Lockheed Martin	Lockheed Martin Corporation
MDE	Maryland Department of the Environment
MRC	Middle River Complex
RETTEW	RETTEW Associates, Inc.
Tetra Tech	Tetra Tech, Inc.

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# SECTION 1 INTRODUCTION

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc., (Tetra Tech) has prepared this *Bulkhead Outfall–Sealing Post Construction Report* summarizing the sealing of the annular space around two outfalls (OF-005W and OF-00X) that penetrate through the bulkhead along Dark Head Cove in Blocks D and F at the Lockheed Martin Middle River Complex (MRC) in Baltimore County, Middle River, Maryland (Figure 1). The report also describes the replenishment of backfill between the newer steel sheet piling and the older portion of the bulkhead, which was highly degraded steel piling at the time the outer sheeting was installed. The work was completed based on the *Bulkhead Outfall Sealing Work Plan* (Tetra Tech, 2020).

## 1.1 BACKGROUND

The two outfalls penetrate through the steel closure pieces in the sheet-pile bulkhead walls, as shown in Figure 2. The closure pieces are attached to the sheet pile walls with a steel sill plate. The area above the outfall pipe consists of concrete. The concrete surrounding the corrugated high-density polyethylene (HDPE) pipe appears to be displaced and cracked (Tetra Tech, 2019). Tidal action appears to have flushed granular fill through openings around the circumference of the outfall pipes and around the openings present on the steel plate. These openings are likely the result of concrete fracturing and displacement where it adjoins the steel wall components (i.e., at the concrete-steel interface).

## 1.2 OBJECTIVES

The objective of this project was to immobilize granular fill around each outfall by injecting a urethane grout to cement the soil particles together and seal openings in the annular space surrounding the outfall pipe. After sealing, the granular fill along the entire length of the bulkhead was replenished.

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## **1.3 REPORT ORGANIZATION**

This work plan is organized as follows: (1) Introduction, (2) Field Work, (3) Summary, (4) References. Tables and figures are at the end of the report body following Section 3.

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## SECTION 2 FIELD WORK

This section describes the repair work completed to seal two outfalls (OF-0005W and OF-00X) that penetrate the bulkhead along Dark Head Cove, as well as the work completed to replenish the granular fill that was either lost through annular spaces or underwent settlement over time.

### 2.1 MOBILIZATION

Tetra Tech, Inc. (Tetra Tech) procured CJ Geo, a grouting specialty contractor, and began mobilization in July 2020. Mobilization included: 1) coordinating site access with Lockheed Martin Corporation (Lockheed Martin) and facilities personnel, 2) utility clearance, 3) mobilizing subcontractors, equipment, personnel, and materials to the site, and 4) implementing a site-specific health and safety plan (HASP).

Before beginning work, Tetra Tech coordinated access arrangements through Lockheed Martin security to gain access to the site. Tetra Tech performed all required notifications, including tasks and schedule, before mobilization. Tetra Tech also obtained required utility clearance permits and approvals needed to advance the grouting pipes, including the following:

- Notifying the underground utility location center (Miss Utility; 1-800-257-7777; [www.missutility.net](http://www.missutility.net))
- Surveying for utilities by RETTEW Associates, Inc. (RETTEW)
- Obtaining an approved dig permit from Lockheed Martin

The utility survey by RETTEW indicated that an electric line is adjacent to Outfall OF-005-W. However, it was located outside of the proposed work area and did not prevent completion of the work. The subsurface utility engineering report prepared by RETTEW and the dig permit are in

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Attachment A. No utilities other than the existing outfalls are present at the work location in Block D.

Tetra Tech complied with federal, state, and local laws, regulations, and ordinances relating to the performance of this work. Tetra Tech also made email notifications to the Maryland Department of the Environment (MDE) Land and Materials Administration, MDE Tidal Wetlands Division, and United States Army Corps of Engineers.

The grouting repair work was started on July 29, 2020 and completed on July 30, 2020. The field team consisted of a field operations leader who also served as the health and safety lead, a Tetra Tech geotechnical engineer experienced in grouting for overseeing all field grouting activities, and CJ Geo's three-person grouting crew. Replenishing the granular fill behind the bulkhead walls began on August 24, 2020 and was completed on August 25, 2020, and was performed by Elite Environmental with a representative from Tetra Tech serving as oversight and the health and safety lead.

Before starting field activities, the Tetra Tech health and safety lead provided the field team with an overview of the HASP and respective safe work permits included in the HASP. Tetra Tech conducted a mandatory health and safety tailgate meeting before each day's field events.

## **2.2 GROUTING**

Specialty subcontractor CJ Geo installed ½-inch external-diameter grout-injection pipes into the gap between the pre-existing concrete deck and the sheet piling using a hammer drill. The deepest grout pipes were extended a minimum 12 inches below the invert of the outfall to seal the pipe from below. Polyurethane grout (B24-042-NSFTT) was injected by connecting the injection gun to the grout pipe. The grout was pumped from the tank using a PH-2 hydraulic series pump manufactured by Polyurethane Machinery Corporation, which was located approximately 50 feet upland from the injection point. The pump was operated at the rate of 83 strokes per minute for an injection rate of about 30 pounds per minute. The grout was injected at a pressure of 1400 pounds per square inch until the grout extruded from the openings, or until surface movement was observed. In general, grouting proceeded from deeper injection points to shallower points. As grout was extruded from openings around the outfall pipe, the resulting foam floated on the water

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and was collected using a fishing net. A floating boom was placed around the outfall to contain any grout that was extruded within easy reach for recovery. The time of injection in each location was recorded, and the quantity of injected grout was estimated based on the injection rate of 30 pounds per minute.

The details of the grout injection for outfalls OF-0005W and OF-00X are discussed below and summarized in the daily reports included in the Attachment B.

### **Outfall OF-005W (Block F)**

Grout injection at outfall OF-0005W started on July 29, 2020 and was completed on the same day. Polyurethane grout was injected at five locations through the grout pipes inserted between the wall and concrete (see Figure 3). The initial grout injection (at locations 1 and 2) resulted in grout extrusion from the bottom sill plate that is located at the interface of the sheet pile wall and closure piece (see Figure 2 for an illustration of the closure piece). Extrusion at this location (beneath the sill plate) likely indicated an opening at the interface of the sheet pile wall and closure piece. In order to seal that opening, grout was also injected at locations 4 and 5, after injecting grout through locations 2 and 3 (Figure 3). The grout pipe was extended one foot below the level of the sill plate at locations 4 and 5.

Approximately 165 pounds of grout were injected through the five locations. Grouting at location 1 was terminated after grout extrusion through the bottom of the closure piece. Grout that was released into Dark Head Cove was contained through the use of a floating boom that was installed around the outfall prior to the start of grout injections. All grout that was released to Dark Head Cove was removed with a fishing net. Similarly, grouting at locations 2 and 3 was terminated after the grout extruded through the annular space between the pipe and closure piece, and into the gap between the concrete and the wall. The grouting at locations 4 and 5 was terminated after movement of the wall was observed. Grouting at these five locations is summarized in Table 1.

As stated earlier and indicated on Table 1, the initial grout injection at location 1 resulted in grout extrusion beneath the outfall at the level of the sill plate, which indicated that the grout sealed the openings on the sill plate. Subsequent grouting at location 2 resulted in extrusion through the annular space between the outfall and closure pieces at the top and bottom of the outfall, indicating

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that the cavity at the bottom of the outfall was completely sealed, and the gap between the concrete and the closure piece was also completely sealed.

Similarly, while grouting at location 3, extrusion through the annular space between the outfall and the closure piece at the top of the outfall was observed. Subsequent grout injections at locations 4 and 5 resulted in sheet pile deflection toward the river after 30 seconds; grouting was then stopped, and the wall reverted to its original position. This wall movement indicated that the openings around the outfall were sealed, leaving no further outlet for the grout. Closure was also visually verified by observing extruded grout in the annulus during low tide on July 30, 2020.

**Table 1. Summary of Grouting at Outfall OF-005W (Block F)**

<b>Grout injection location</b>	<b>Depth to the bottom of the injection pipe (feet)</b>	<b>Angle with horizontal</b>	<b>Remarks</b>
1	4	Vertical	After injecting approximately 60 pounds of grout over two minutes, grout extruded beneath the bottom sill plate.
2	4	Vertical	After injecting approximately 60 pounds of grout over two minutes, grout extruded through the annular space between the pipe and closure piece at the bottom of the outfall, and from the top of the wall through the gap between the sheet pile wall and the concrete.
3	0.83	Vertical	After injecting approximately 15 pounds of grout over 30 seconds, grout extruded through the annular space between the pipe and closure piece at the top of the outfall.
4	5.3	Approximately 80 degrees	After injecting approximately 15 pounds of grout over 30 seconds, the sheet pile wall deflected approximately 0.25-inch toward the river. Grouting was then terminated, and the sheet pile recovered to its previous location.
5	5.3	Approximately 80 degrees	After injecting approximately 15 pounds of grout over 30 seconds, the sheet pile wall deflected approximately 0.25-inch toward the river. Grouting was then terminated, and the sheet pile recovered to its previous location.

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## **Outfall OF-00X (Block D)**

Grout injection at Outfall OF-00X started on July 30, 2020 and was completed on the same day. Injecting polyurethane grout at six locations was originally planned, but the pipe or its tip was damaged at three of the six original locations, preventing grout injection. The pipes at those locations were extracted and re-inserted at adjacent locations. The original locations and the re-inserted locations are designated as A and B (respectively), so (in total) grouting was attempted through nine locations (Figure 4). Eight grout pipes (locations 1, 3, 4A, 4B, 6A, 6B, 7, and 9) were driven through the gap between the concrete and wall, and grout pipes at locations 2, 5 and 8 were driven diagonally through the backfill behind the wall. The bottom of the pipes at locations 1, 2, 4, 5, 6 and 7 extended six inches below the sill plate. Grout could not be injected at locations 1, 4A, and 6A during the first attempt. The grout pipes were extracted, and grout injection was performed by relocating the injection point (identified as different designation, as shown in Table 2). Grouting was terminated after grout extruded through the annular space between the pipe outfall and closure piece at locations 3, 4B and 9. Similarly, grouting at location 6B was terminated after grout extruded through the void located beneath the concrete slab. Grouting at locations 2, 5 and 7 was terminated after wall movement occurred; the wall recovered to its original position once grouting was stopped. Approximately 340 pounds of grout were successfully injected through six locations. Grouting details for all nine locations are presented in Table 2, in order of the grout injection.

As presented in Table 2, approximately 150 pounds of the grout were injected at locations 2, 5 and 6B. These locations were located at the eastern side of the outfall and were intended to seal the void at the sill plate, as well as annular space at the bottom of the outfall. Grouting at location 2 was terminated after the grout started to lift the concrete. Grouting at location 5 resulted in grout extrusion through the lower portion of the annular space between outfall and closure piece on the eastern side. Further grouting at location 6B resulted in grout extrusion through the openings underneath the concrete slab on the upland side, confirming that the voids, and the annular space between the outfall and closure piece at the bottom of the outfall, were completely sealed on the eastern side.



**Table 2. Summary of Grouting at Outfall OF-00X (Block D)**

Grout injection location	Depth to the bottom of the injection pipe (feet)	Angle with horizontal	Remarks
1	8	Vertical	The tip of the grout pipe could not be released; therefore, no grout was injected at this location. The grout pipe was extracted, and injection was attempted at location 2. Re-attempt locations (adjacent to location 1) were later designated as 6A and 6B.
2	8	Inclined (45- 60 degrees with horizontal)	The grout started to lift the concrete above the outfall after approximately 90 pounds of grout was injected over three minutes; grouting was then terminated.
3	6	Vertical	Grout extruded through the annular space between the pipe and closure piece after approximately 60 pounds of grout were injected over two minutes.
4A	8	Vertical	Grout could not be injected at this location, and the pipe tip could not be released. The pipe was extracted and again grouting was re-attempted (see discussion for location 4B).
5	8	Inclined (45- 60 degrees with horizontal)	An air bubble was released through the lower portion of the annular space between the pipe and closure piece while grouting, and grout then started to lift the concrete after approximately 30 pounds of grout were injected over one minute. Grouting was then terminated.
4B	6	Vertical	Grout extruded through the upper portion of the annular space between the closure piece and outfall after approximately 60 pounds of grout were injected over two minutes.
6A	8	Vertical	Grout could not be injected at this location, likely due to damage of the pipe tip. The pipe was extracted and grouting was re-attempted (see 6B discussion).
7	8	Vertical	After approximately 30 pounds of grout were injected, movement (~0.25 inches) of the wall was observed. Grouting was then terminated, and the wall returned to its original position.
6B	7	Vertical	After approximately 30 pounds of grout were injected over one minute, grout extruded through the openings underneath the slab on the upland side. Grouting was terminated.
8	11.3	Inclined (45 degrees with horizontal)	Wall movement occurred after approximately 30 pounds of grout were injected over one minute; grout injection was then terminated, and wall returned to its original position.
9	4	Vertical	Approximately 11 pounds of grout were injected at this location, after which grout extruded through the upper portion of the annular space between the pipe and closure piece. Wall movement occurred and grouting was terminated.

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Grouting at locations 3, 4, 7 and 8 was intended to seal voids around the sill plate and annular space between the outfall and closure piece on the western side of the outfall. Approximately 60 pounds of grout was injected through location 3, after which grout extruded through bottom and side of the annular space. Subsequent grout injection at locations 4B and 7 resulted in grout extrusion through the upper annular space (between the outfall and closure piece), and resulted in sheet pile wall movement that recovered after injection was stopped, confirming that the annular space between the outfall and pipe in the western side of the outfall was completely sealed. Grout injection at location 8 also resulted in wall movement towards the cove, confirming that the injected grout had completely sealed the opening on the western side of the outfall. Injection at location 4 sealed the annular space between the outfall and closure piece at the top.

## **2.3 GRANULAR FILL REPLENISHMENT**

### **Bulkhead Walls**

After the annular spaces around outfalls OF-005W and OF-00X were sealed, construction subcontractor Elite Environmental (Elite) replaced granular fill throughout the entire length of the bulkhead walls in Blocks D and F (under Tetra Tech supervision). Elite used a skid steer with a flat bucket attachment to move granular fill from two existing stockpiles near OF-005W and OF-00X to the areas along the bulkhead walls where granular fill had been lost or settled over time. Where practicable, a mini-excavator was used to place bulk granular fill along the bulkhead. In areas not accessible to the mini-excavator, bulk granular fill was transferred from the skid steer into wheelbarrows and then placed along the bulkhead.

Shovels and hand rakes were used to fill in all voids along the bulkhead and bring the level of granular fill up to match the existing grade of the bulkhead cap and sheet pile wall. After replacing fill to grade, a push broom was used to clean spilled material on the bulkhead cap, which was swept into settlement areas. Care was taken to avoid spilling granular fill into Dark Head Cove when placing, grading, and cleaning it off the concrete portion of the bulkhead.

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## **Sink Holes**

The loss of fill at two locations along the stormwater pipe, upgradient of outfall OF-00X in Block D, has caused the formation of sink holes. Elite used the skid steer and mini-excavator to place granular fill (to grade) within these two sink holes. The granular fill was compacted using the bucket of the mini-excavator in approximate 12-inch lifts. The larger of the sink holes had formed immediately behind the bulkhead, and had exposed the underside of the concrete bulkhead cap, and the bucket of the mini-excavator was used to push granular into this void.

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## SECTION 3 SUMMARY

Polyurethane grout was injected through grout pipes around the outfalls OF-005W and OF-00X to immobilize granular fill and cement soil particles together so that the openings in the annular space surrounding the outfalls were sealed. Field observations and reduced injection noted in the final holes indicate that the grouting has effectively sealed the affected zones around these two outfall pipes. Sealing of these outfalls will limit further migration of backfill and loss of material into the cove through the annuli surrounding the pipes.

The granular fill behind the bulkhead sheet-pile wall has also been replenished to grade (to the top of the wall and bulkhead cap) along its entire length in Blocks D and F. In addition, granular fill was used to backfill two sink holes that had formed behind the bulkhead near outfall OF-00X in Block D.

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## SECTION 4 REFERENCES

Tetra Tech, Inc. (Tetra Tech), 2016. Lockheed Martin Middle River Complex Bulkhead Soil Retention Dark Head Cove Record Drawing.

Tetra Tech, Inc. (Tetra Tech), 2019. *Memorandum: Outfall Sealing East End of Block D* June.

Tetra Tech, Inc. (Tetra Tech), 2020. Bulkhead Outfall Sealing Work Plan Middle River Complex 2323 Eastern Boulevard Middle River, Maryland.

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## FIGURES

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**Figure 1 Bulkhead Outfall Grouting Location Plan**

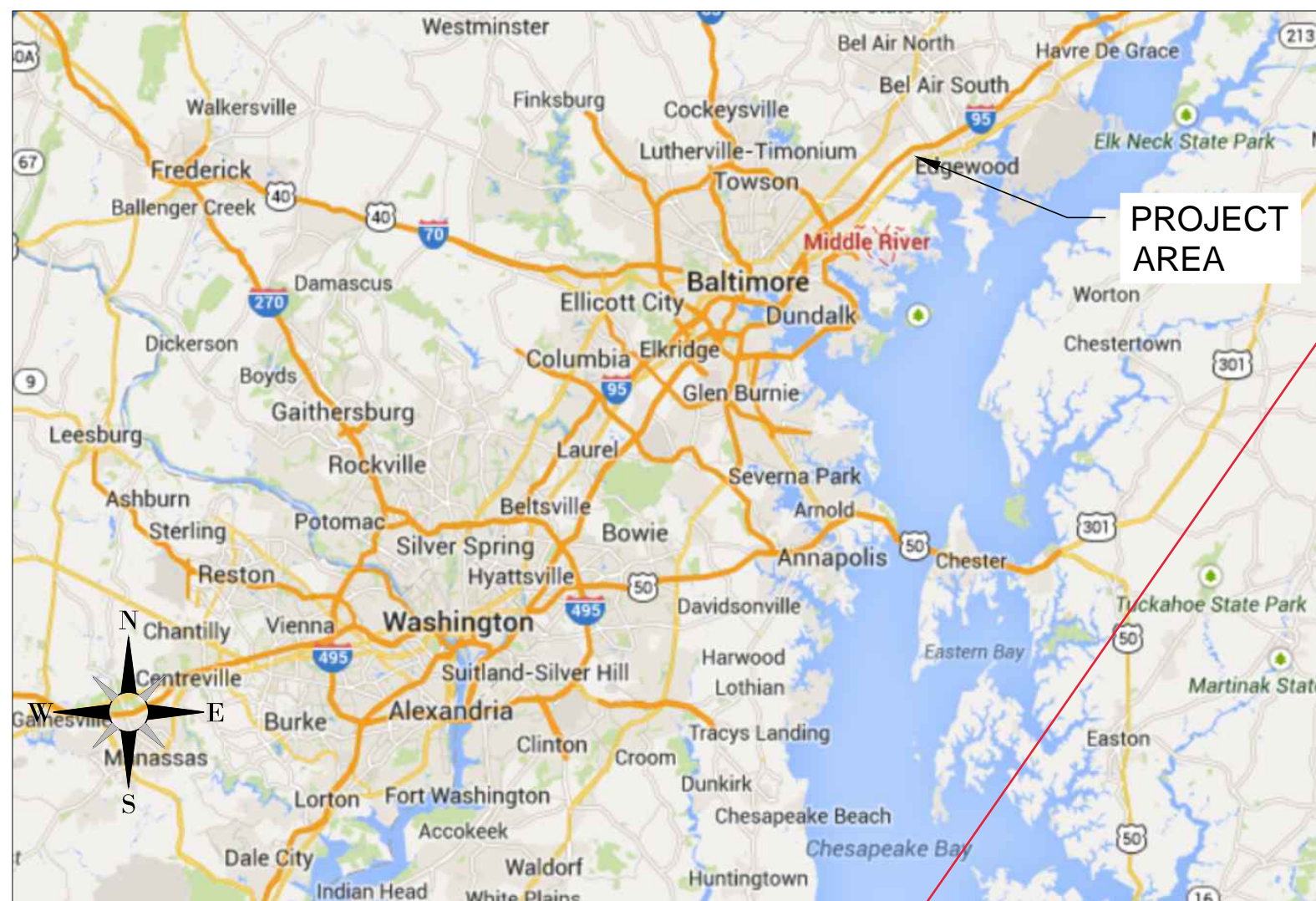
**Figure 2 Transverse Section of the Outfall**

**Figure 3 Profile View of Grout Pipe Location at OF-005-W Block F**

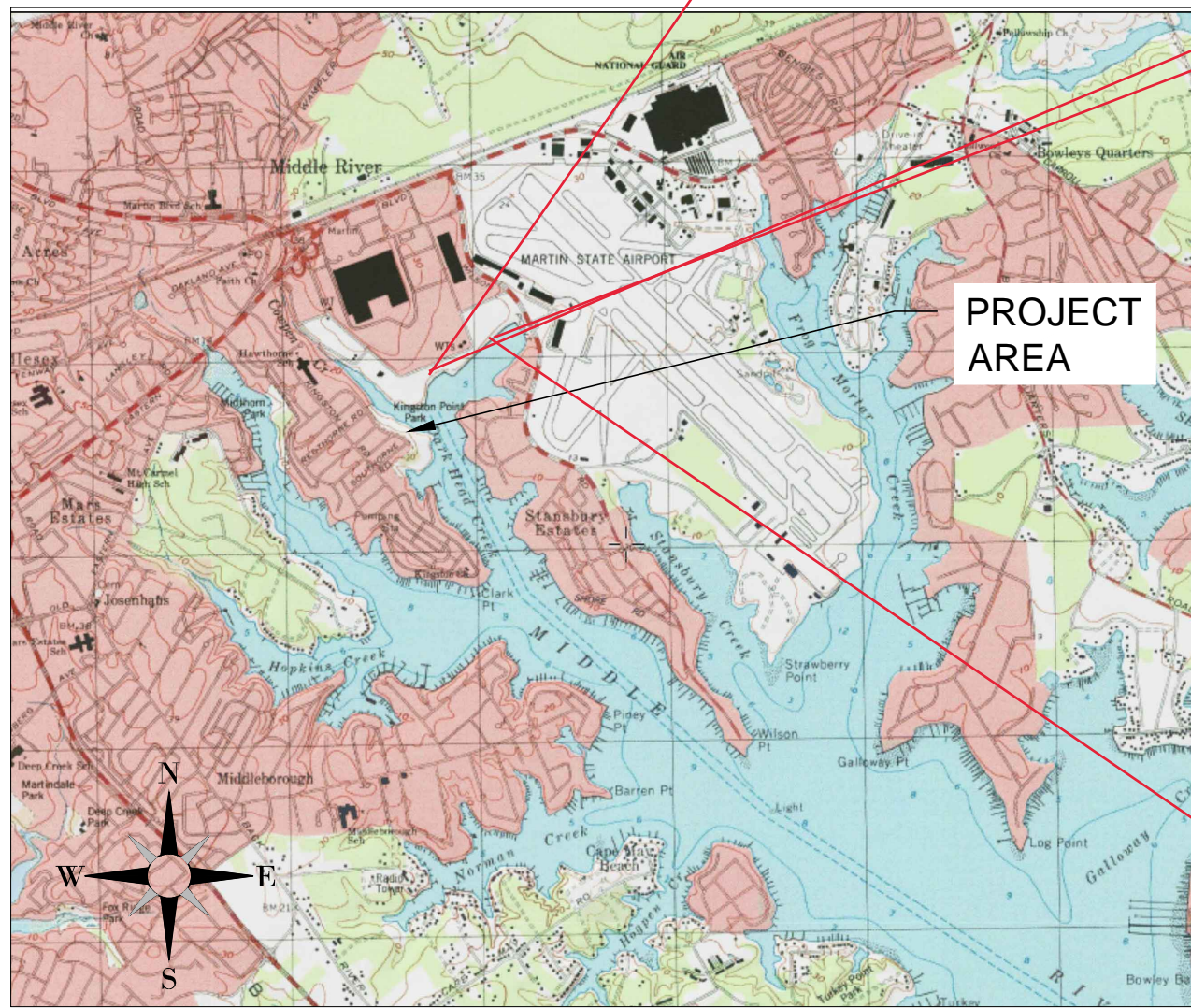
**Figure 4 Profile View of Grout Pipe Location at OF-00X Block D**



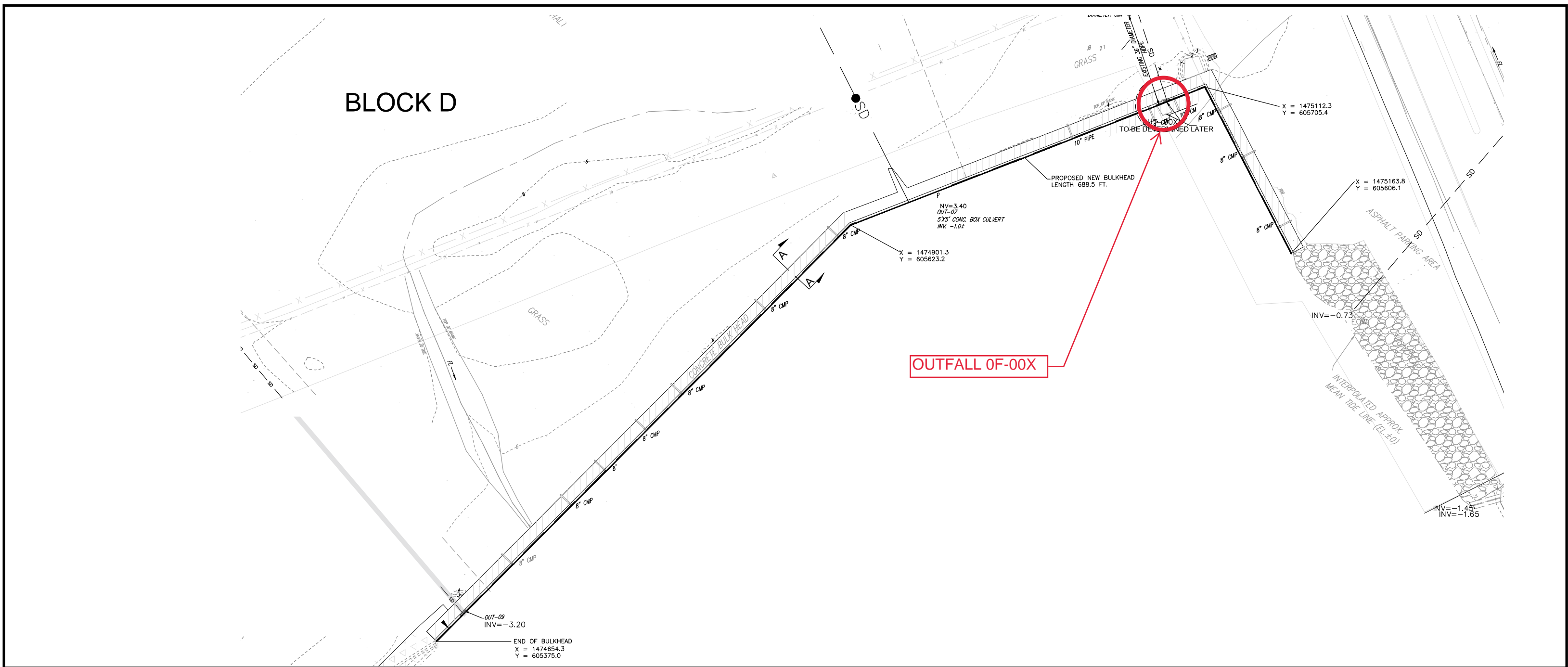
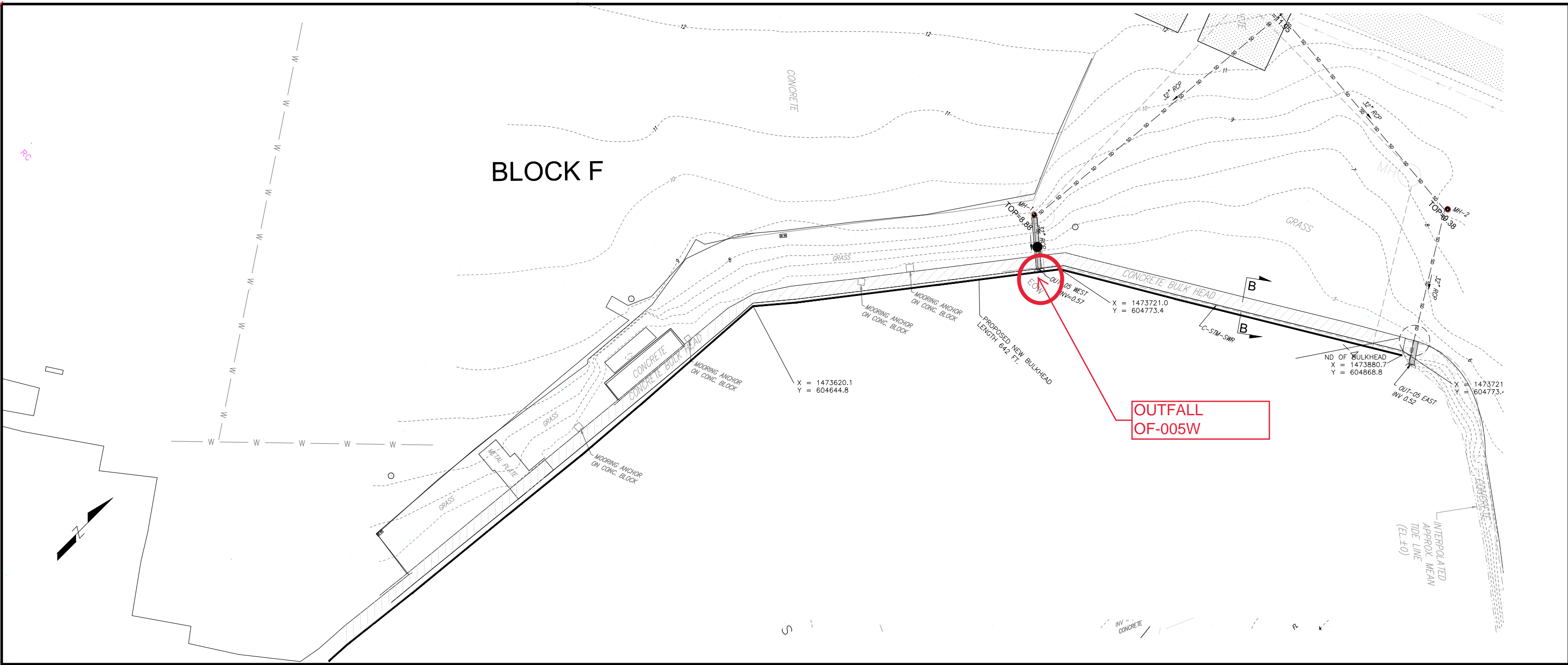
# LOCKHEED MARTIN MIDDLE RIVER COMPLEX BULKHEAD OUTFALL GROUTING DARK HEAD COVE



LOCATION MAP  
SCALE: 1" = 100,000



VICINITY MAP  
SCALE: 1" = check



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LOCKHEED MARTIN  
MIDDLE RIVER COMPLEX

BULKHEAD OUTFALL GROUTING

LOCATION PLAN

DWG. NO.: DWG. NO.:

Figure 1

CREATED: SHEET: OF

SCALE: AS NOTED  
PLOTTED 22" X 34"



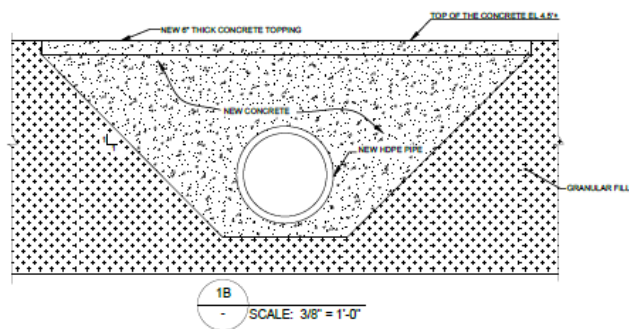
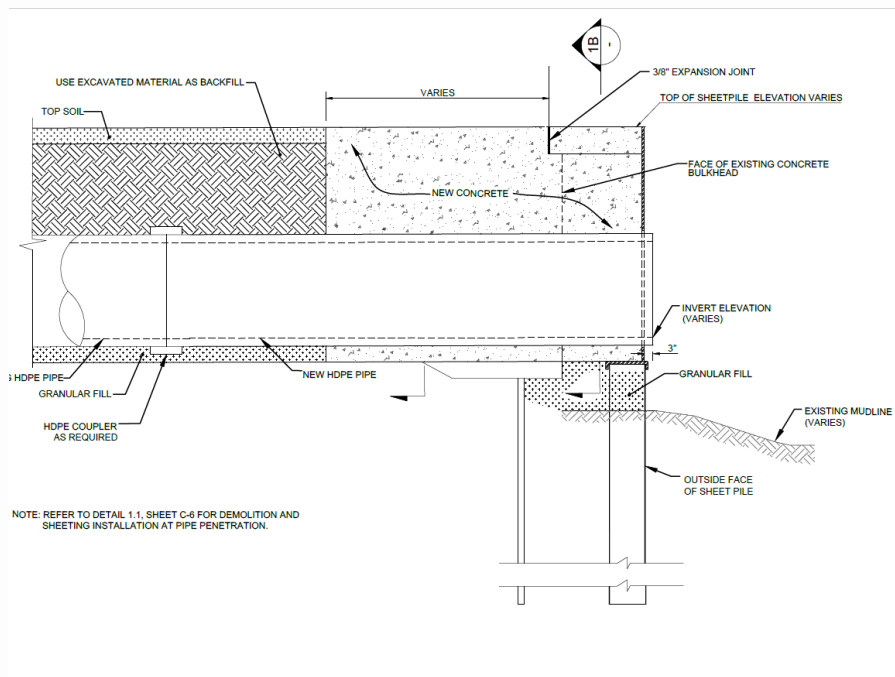


Figure 2: Transverse section of the outfall (Tetra Tech, 2018)

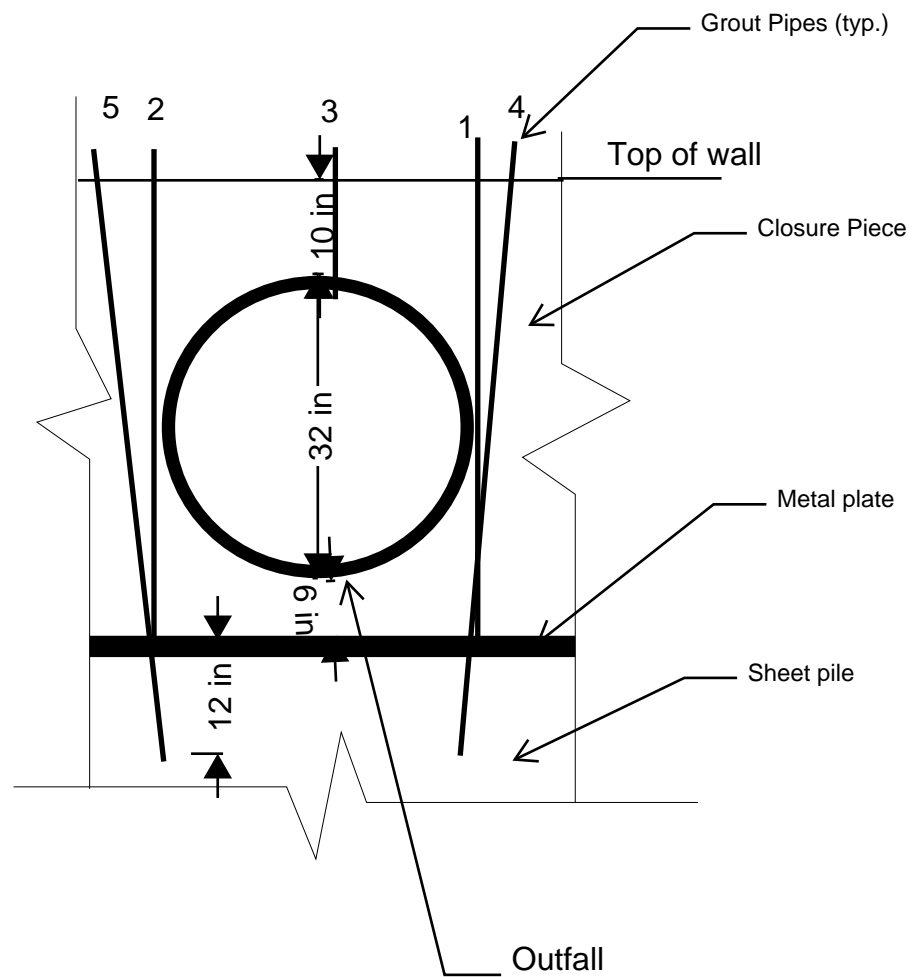


Figure 3: Profile View of Grout Pipe Location at OF-005-W, Block F (view towards the land)



Figure 4: Profile View of Grout Pipe Location at OF-00X, Block D  
(view towards the land)

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# TABLES

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**Tables are located in Section 2 of this Report**

**Table 1 Summary of Grouting at Outfall OF-005W (Block F)**

**Table 2 Summary of Grouting at Outfall OF-00X (Block D)**

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## ATTACHMENTS

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**Attachment A— Subsurface Utility Clearance Report and Dig Permit**  
**Attachment B— Daily Reports**

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## **ATTACHMENT A—SUBSURFACE UTILITY CLEARANCE REPORT AND DIG PERMIT**





## Dig Permit

See Enterprise Operations Procedure [EO-28](#), Digging Projects, for instructions.


Date July 13, 2020		Project Manager Tom Blackman (Lockheed Martin EESH) Michael Martin (Tetra Tech)	
Building/Location Tax Block D and F, storm drain outfalls			
Purpose of excavation Repairs are necessary to prevent stone backfill from moving from the landward deposition behind the steel sheet piling into Dark Head Cove around the seal of two outfalls. Injection pipes will be driven into the backfill in order to pressure grout around the outfall seals.			
Company/LM organization performing dig Tetra Tech overseeing CJ Geo			
Planned dig date July 28, 2020		Duration 1 or 2 days	Start time 0700
Expected depth 8 feet		Width Up to 1 inch diameter pipes	Length NA
Underground utilities identified? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Overhead utilities? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Electrical lines? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Gas lines? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Sewer? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Water? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Telecommunications? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Other? Specify: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Site-specific or customer utility locating requirements completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			
Sketch of dig project (or attach drawing) See Attached outfall location figure.  A third part utility locating contractor (Rettew) will be used to mark utilities within a 20 foot radius of the outfalls. Confirmation letter and report will be attached when completed.  Miss Utility Tickets 20455389 and 20455400 completed by Josh Mullis (Tetra Tech)			
Project Manager 	Date July 13, 2020	Customer	Date
Telecommunications Remote Approved by Trevor Alexander	Date July 14, 2020	Customer	Date
ESH	Date	Customer Remote Approved by A. R. Califano	Date July 14, 2020
Building/Facility Manager			Date



## Risk Handling Checklist

Project Manager: Use this checklist to develop risk handling plans before the dig starts. You must also review Enterprise Operations Procedure [EO-28](#), Digging Projects.

General Questions	<input checked="" type="checkbox"/> What Lockheed Martin processes could be affected by the dig? No Lockheed Martin Operations are expected to be impacted as all work is along the bulkhead off Dark Head Cove and thus remote from site operations.
	<input checked="" type="checkbox"/> What are the safety hazards? Utilities, working near the water, mechanical injection equipment
	<input checked="" type="checkbox"/> What could fail? Equipment failure
	<input checked="" type="checkbox"/> How could it fail? Equipment failure such as injection line breakage. All equipment will be inspected on arrival at the site. Project being conducted in accordance with EESH approved Health and Safety Plan and project-specific addendum for polyurethane grouting and replacement of lost backfill. In addition a project specific workplan was developed.
	<input checked="" type="checkbox"/> Does the area need to be returned to its normal state when the work is complete? After completion, the stone backfill will be replenished to the top grade of the sheet piling
	<input type="checkbox"/> How could the dig affect operations/test/production? No operations are expected to be affected
	<input type="checkbox"/> Have potential risks been addressed with area management? No risks identified that require area management
	<input type="checkbox"/> Am I comfortable with any risk handling plans, understanding the potential impact? Yes, all work being conducted in accordance with approved health and safety plan
Traffic Control	<input checked="" type="checkbox"/> Ensure proper signage and communication. Existing security fencing separates public roadways from work area.
	<input type="checkbox"/> Coordinate road or access closures through Industrial Security before starting the dig.
	<input checked="" type="checkbox"/> Ensure the work area is isolated from foot traffic by placing barriers and warning lights as required by <a href="#">EO-28</a> . Tetra Tech site oversight will control access and stop any personal that may try and access the area. The area is inside parameter fencing. Any persons attempting access will be warned of the hazards.
	<input checked="" type="checkbox"/> Ensure that vehicle traffic will be safe. All vehicles will be parked at least 50 feet from the work area.
Excavation	<input type="checkbox"/> Ensure that product transport will be safe.
	<input checked="" type="checkbox"/> Review facility drawings to identify utilities. Research old drawings as necessary. There is older electric that was associated with the bulkhead in Block F. This electric is still in place although not active. The borings will be completed in the backfill that was placed as part of the 2015/2016 remediation and thus should be clear of utilities.
	<input checked="" type="checkbox"/> Discuss the project with Facility Engineering/Maintenance staff who may have unique knowledge about the construction area not documented in facility drawings. Work has been completed in this area before, the borings are actually in 'made land' when backfilling for the new bulkhead was completed.
	<input checked="" type="checkbox"/> Process form <a href="#">EO-28-1</a> , Dig Permit. Use this opportunity to explain the process and relate expectations to the contractor/LM organization that will perform the dig.
	<input checked="" type="checkbox"/> Have LM Telecommunications and the local utility identification service locate and mark utilities/underground obstacles. LM telecommunications should confirm not present
	<input checked="" type="checkbox"/> Coordinate with other ongoing projects in the affected area. Tetra Tech will coordinate with Aecom (EESH contractor) to be sure there is no conflicting activities.
	<input checked="" type="checkbox"/> Make every effort not to excavate around live utilities in service. Schedule an outage in advance or have Maintenance temporarily shut down and isolate the utilities while excavating. Identified electric will be avoided.
	<input type="checkbox"/> If live utilities cannot be shut down while excavating, know where to isolate or shut them down if they are damaged while excavating.
	<input checked="" type="checkbox"/> Have a spotter(s) work with the equipment operator. Hand dig when necessary. Spotter will be present when borings are conducted
	<input type="checkbox"/> Excavate along the side of the utility; not on top.
	<input type="checkbox"/> Weather may affect the dig. Ensure water pipes are protected during freezing weather, especially if the trench will be left open over night. Rain may cause the side of the trench to slough, which can undermine and break pipes/conduit.
	<input type="checkbox"/> Ensure care when moving trench boxes in and out of trenches so pipes/conduit aren't damaged by the boxes.
	<input checked="" type="checkbox"/> Ensure surface drainage is controlled so that water doesn't get into the excavation and undermine soil supporting utilities. Work is being conducted around existing storm sewer piping, but that piping is visible just a few feet away from the work area.
	<input checked="" type="checkbox"/> Ensure stocked material is kept far enough back (minimum 2 feet) so that material and rocks don't fall on utilities in the open hole. Stone backfill is currently stored about 75 feet from the boring locations.
	<input checked="" type="checkbox"/> Ensure backfilling is done carefully: Re-bed utilities with proper material, filling all voids below. Keep inappropriate material from falling on or being placed in the trench. Be careful when compacting backfill in the two feet directly above the utility. Stone backfill will be hand placed.
	<input checked="" type="checkbox"/> Keep the as-built utility drawing in the field while the excavation site is open. Take pictures if possible (horizontal alignment and elevations), if known utilities deviate from facility drawings or if utilities are found that are not on facility drawings. Give the modified as-

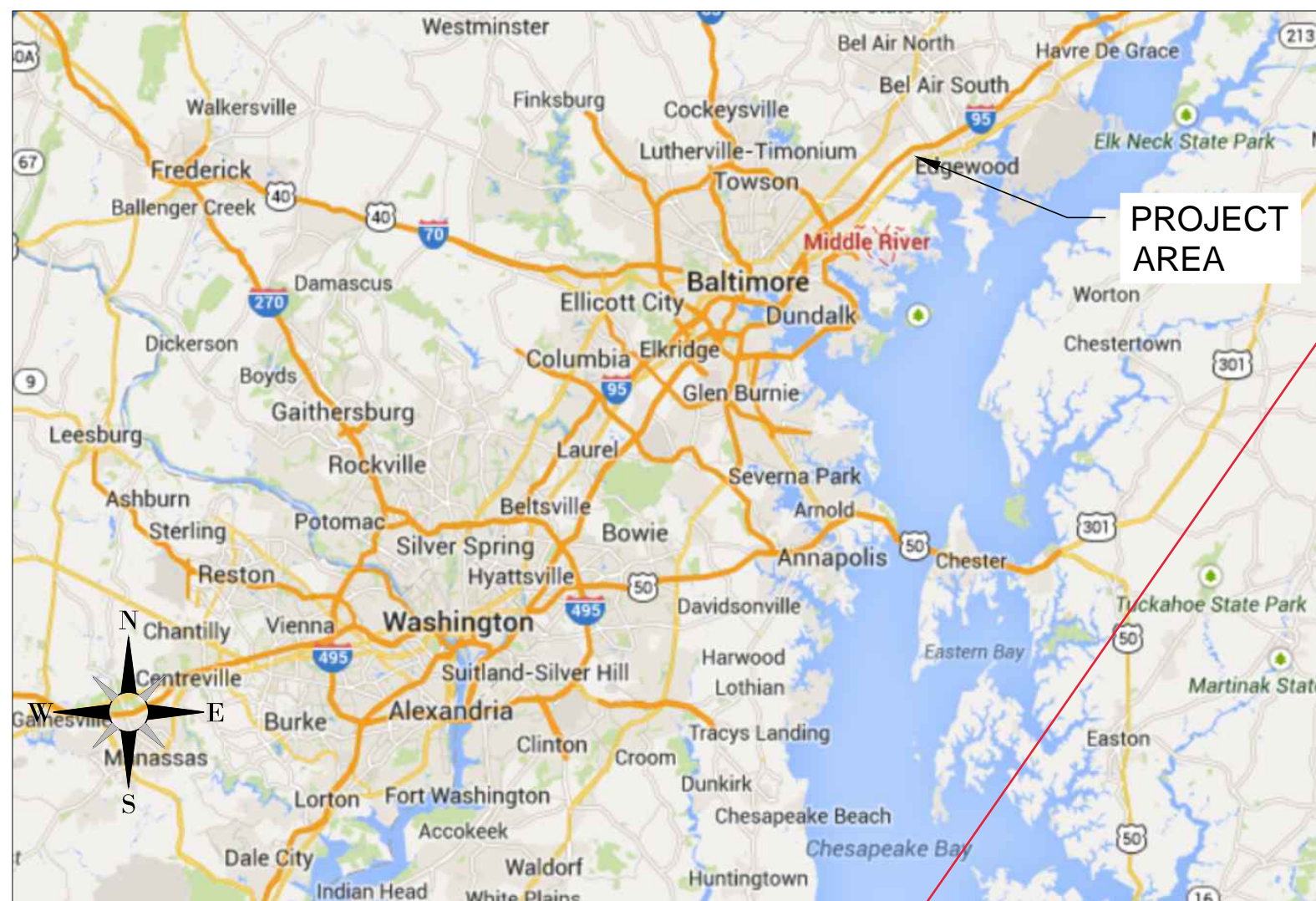
	built drawings to the Building/Facility Manager, who will update the drawing database. All site operations will be monitored and documented by Tetra Tech.
	<input checked="" type="checkbox"/> Ensure that the equipment operator digs slowly and remains in control. Equipment operators will be briefed and sign off on the health and safety plan and safe work activities. Daily tailgate meetings will be conducted.
Personal Safety	<input type="checkbox"/> Ensure that trenching and shoring methods comply with the applicable OSHA regulations and are overseen by a "Competent Person," as defined in those regulations.
	<input checked="" type="checkbox"/> Regularly inspect methods to prevent violations. All work is being conducted in accordance with approved Health and Safety Plan and project work plan.
	<input checked="" type="checkbox"/> Ensure LM employees do not dig or enter any excavation that is more than four feet deep. All work is being overseen and performed by Tetra Tech and their subcontractors.
Project Manager signature indicating completion of checklist review	
	
Date	
July 13, 2020	



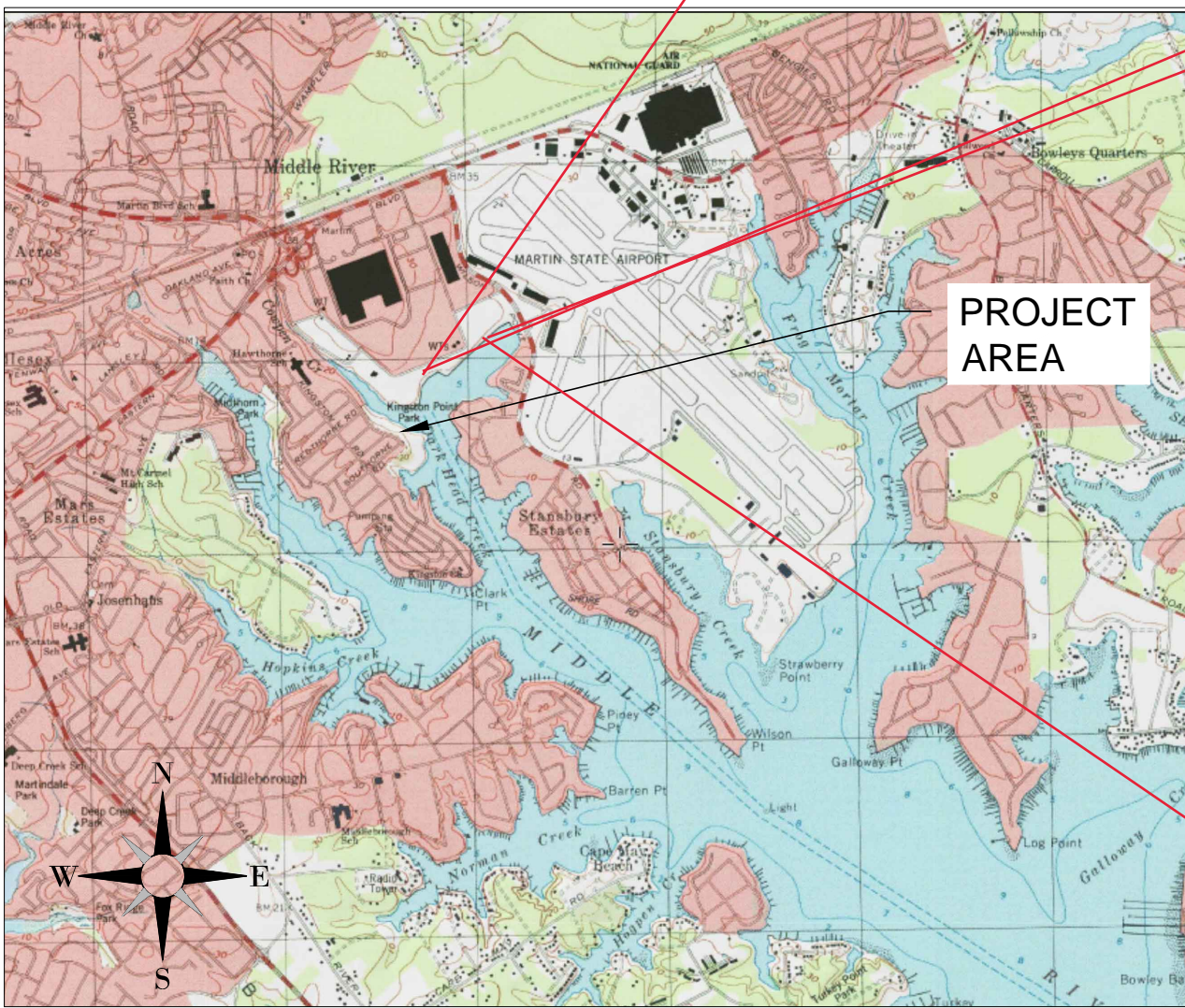
# LOCKHEED MARTIN MIDDLE RIVER COMPLEX

## BULKHEAD OUTFALL GROUTING

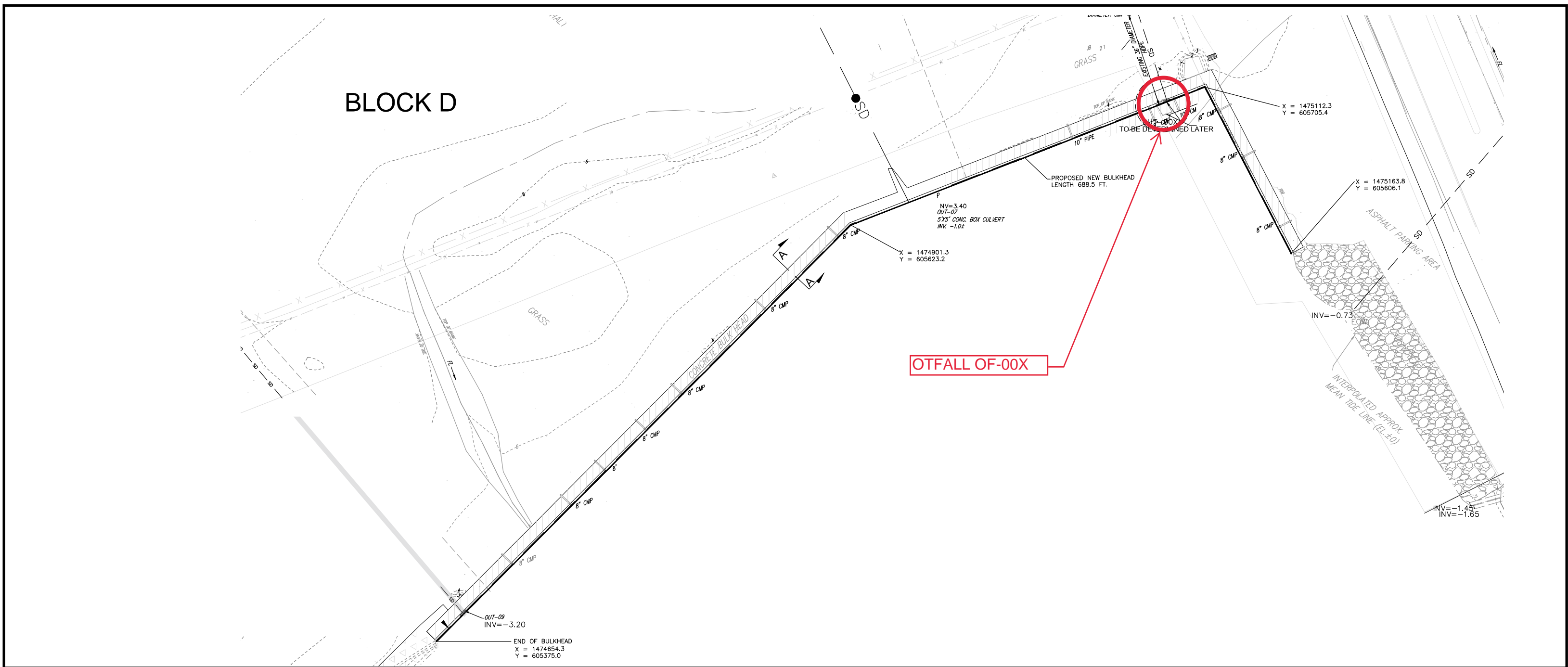
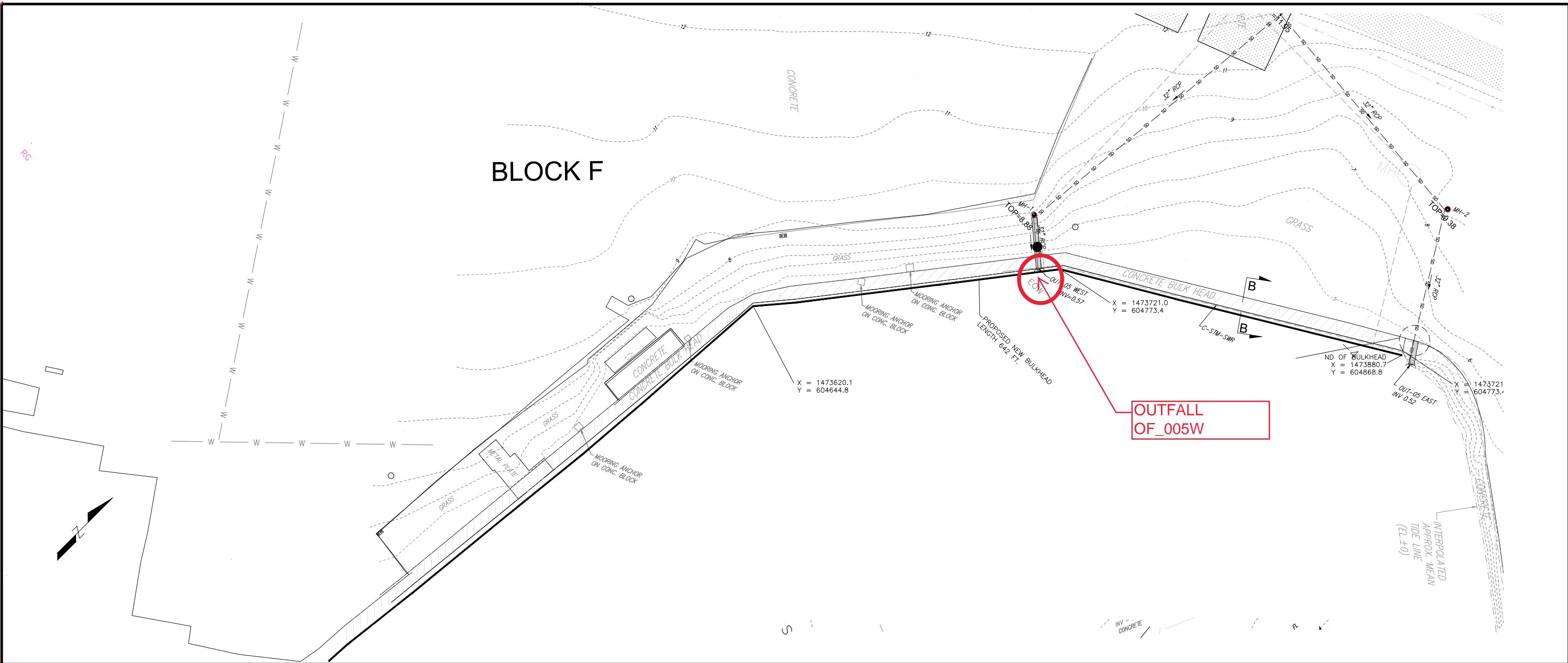
### DARK HEAD COVE



LOCATION MAP  
SCALE: 1" = 100,000



VICINITY MAP  
SCALE: 1" = check



**TETRA TECH**  
www.tetrattech.com  
One Oxford Valley, Suite 200  
Langhorne, PA 19047  
Phone: 215-702-4000

LOCKHEED MARTIN  
MIDDLE RIVER COMPLEX

BULKHEAD OUTFALL GROUTING

LOCATION PLAN

DWG. NO.: DWG. NO.:

Figure 1

CREATED: SHEET: OF

SCALE: AS NOTED  
PLOTTED 22" X 34"



# Utility Ticket

## Excavator Responsibilities

\* EXCAVATORS MUST ENSURE ACCURACY OF TICKET AND MAPPING BY CLICKING ON [THIS LINK](#)

### NOTICE OF INTENT TO EXCAVATE

STANDARD

Ticket No:	20455389		
Transmit Date:	7/10/20	Time:	8:26 AM
Release Date:	7/10/20	Time:	8:21 AM
Response Due By:	7/14/20	Time:	11:59 PM
Expiration Date:	7/28/20	Time:	11:59 PM
		Type:	WEB

### Caller Information

Company:	TETRA TECH, INC	Type:	NON-MEMBER
Contact Name:	JOSHUA MULLIS	Fax:	
Phone:	(410) 279-2700		
Caller Address:	20251 CENTURY BLVD SUITE 200 GERMANTOWN, MD 20874		
Email Address:	<a href="mailto:josh.mullis@tetrattech.com">josh.mullis@tetrattech.com</a>		
Job Site Contact:	JOSH MULLIS	Phone:	(410) 279-2700

### Dig Site Information

Type of Work:	OUTFALL REPAIR		
Work Done For:	LOCKHEED MARTIN		
Permit #:		Explosives:	N
Contract Job#:		Trenchless:	YES

### Dig Site Location

State:	MD	County:	BALTIMORE
Place:	MIDDLE RIVER		
Subdivision:			
Address / Street:	MARTIN BOULEVARD		
Nearest Intersecting Street:	CHESAPEAKE PARK PLAZA		

#### Extent of Work:

LOCATE/MARK: OUTFALL REPAIR BEING COMPLETED ON EDGE OF BULKHEAD NEAR WATER. NEED TO ACCESS GATE THROUGH CALLING JOSH MULLIS AT 410-279-2700. MEET AT JOHNSON AND TOWERS AT INTERSECTION OF CHESAPEAKE PARK PLAZA AND DARK HEAD COVE ROAD.

#### Comments:

#### Excavation Coordinates for # Polygons: 1

Poly 1: NW Lat: 39.3284334 Lon: -76.4246919 SE Lat: 39.3283606 Lon: -76.4245980

### Members Notified

District	Company Name	Phone Number
BGEBA	BGE ELECTRIC-USIC	(800) 778-9140
BGEBAG	BGE GAS-USIC	(800) 778-9140
CBW04	BALTIMORE CITY DPW - PRO COMM	(443) 456-6686
MAA02	MD AVIATION ADMIN/OCCLS	(410) 712-0202
TDEX01	TERRADEX	(650) 227-3254

# Utility Ticket

## NOTICE OF INTENT TO EXCAVATE

STANDARD

Ticket No:	20455400			
Transmit Date:	7/10/20	Time:	8:26 AM	
Release Date:	7/10/20	Time:	8:26 AM	Type: WEB
Response Due By:	7/14/20	Time:	11:59 PM	
Expiration Date:	7/28/20	Time:	11:59 PM	

### Caller Information

Company:	TETRA TECH, INC	Type:	NON-MEMBER
Contact Name:	JOSHUA MULLIS	Fax:	
Phone:	(410) 279-2700		
Caller Address:	20251 CENTURY BLVD SUITE 200 GERMANTOWN, MD 20874		
Email Address:	<a href="mailto:josh.mullis@tetrattech.com">josh.mullis@tetrattech.com</a>		
Job Site Contact:	JOSH MULLIS	Phone:	(410) 279-2700

### Dig Site Information

Type of Work:	OUTFALL REPAIR (OF-005)		
Work Done For:	LOCKHEED MARTIN		
Permit #:		Explosives:	N
Contract Job#:		Trenchless:	YES

### Dig Site Location

State:	MD	County:	BALTIMORE
Place:	MIDDLE RIVER		
Subdivision:			
Address / Street:	MARTIN BOULEVARD		
Nearest Intersecting Street:	CHESAPEAKE PARK PLAZA		
Extent of Work:			

LOCATE/MARK: OUTFALL REPAIR BEING CONDUCTED AT EDGE OF BULKHEAD AND WATER. NEED ACCESS THROUGH GATE BY CALLING JOSH MULLIS 410-279-2700. REPAIRS BEING COMPLETED ALONG BULKHEAD NEAR OF-005. MEET AT JOHNSON & TOWERS AT INTERSECTION OF CHESAPEAKE PARK PLAZA AND MARTIN BLVD.

### Comments:

### Excavation Coordinates for # Polygons: 1

Poly 1: NW Lat: 39.3259300 Lon: -76.4294534 SE Lat: 39.3258801 Lon: -76.4293944

### Members Notified

District	Company Name	Phone Number
BGEBA	BGE ELECTRIC-USIC	(800) 778-9140
BGEBAG	BGE GAS-USIC	(800) 778-9140
CBW04	BALTIMORE CITY DPW - PRO COMM	(443) 456-6686
MAA02	MD AVIATION ADMIN/OCCLS	(410) 712-0202
TDEX01	TERRADEX	(650) 227-3254

### Excavator Responsibilities

\* EXCAVATORS MUST ENSURE ACCURACY OF TICKET AND MAPPING BY CLICKING ON [THIS LINK](#)

# SUBSURFACE UTILITY ENGINEERING PROJECT COMPLETION REPORT



TO: Michael Martin, Tetra Tech

FROM: Bill Steinhart, RETTEW Field Services, Inc.

CC: John B. Stipe III, RETTEW Associates, Inc.

DATE: July 15, 2020

CLIENT: Tetra Tech

PROJECT NO: 019872021

PROJECT NAME: Middle River Block F Storm Outfall

TECHNICIAN: Bill Steinhart

PROJECT LOCATION:

Middle River Complex

Block F

Middle River, MD

## UTILITIES LOCATED:

- Storm Sewer
- Electric Lines

## EQUIPMENT:

- ☒ EM Locator (RD8000/Metrotech)
- ☒ Ground Penetrating Radar (GPR)
- ☒ TW-6 (metal detector)
- ☒ C.A.T. Passive Locator
- ☐ Acoustic Leak Detector
- ☐ Magnetometer
- ☐ Integrity Assessment Camera
- ☐ Traceable Rodder
- ☐ Concrete GPR

## SCOPE OF WORK

RETTEW completed a subsurface utility survey to mark-out subsurface utilities at two storm water outfall locations in need of repairs in Block F at the Middle River Complex (**Figure 1**).

## METHODOLOGIES

RETTEW first traced utilities with visible surface features (i.e. manhole covers, valves, utility poles, hydrants) utilizing the EM locator. RETTEW then searched the site for unknown utilities with GPR, the M-scope, and the passive utility locator.

## RESULTS/CONCLUSIONS

On July 9, 2020, Mr. Steinhart scanned a 40-foot area around each storm outfall location for utilities. One electric line was present at the western outfall. The results of the survey are depicted on **Figure 1**.

Enclosures: Annotated map is provided on **Figure 1**.

RETTEW strives to provide quality and accurate locating services to all of its clients, but due to the nature of underground facilities, RETTEW will not be held liable for any damaged facilities. All clients are advised that they are required to follow their state's One-Call-Law before beginning excavation. The marks placed during this investigation are temporary markings for utility mapping purposes. The marks are not intended, nor should they be used, for construction; legal and/or recommended construction tolerance zones associated with the identified utilities were not marked by RETTEW. Prior to construction activities, RETTEW should be contacted for re-marking of the utilities and construction tolerance zones.

RETTEW will not guarantee the longevity of utility markings, due to activities on site that may destroy, or otherwise alter, the markings that were placed on the ground by RETTEW. If the marks have been altered or destroyed, the client is advised to contact RETTEW for re-markings. Any electronically determined depths provided to the client are estimates only, and due to equipment limitations, cannot be guaranteed. The client acknowledges that due to the limitations of the equipment used, safe exposure and measurements are the only methods which can precisely determine location and depth of structures marked.

**PREPARED BY:**

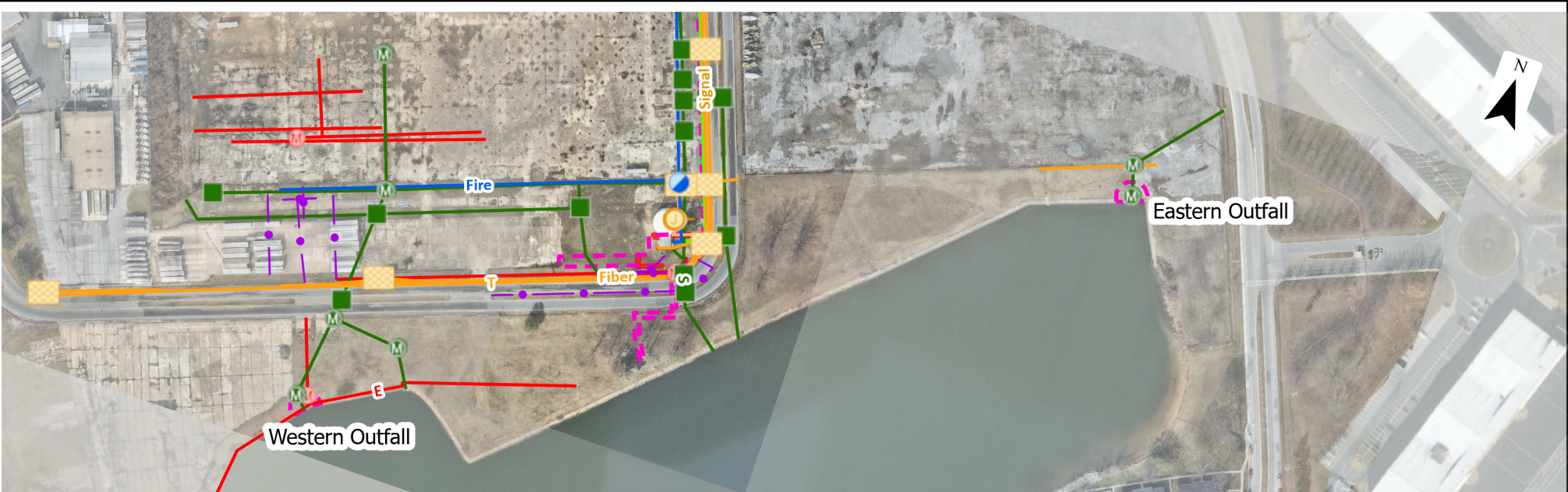
William E. Steinhart III, PG – Senior Geophysicist



**RECEIVED BY:**

\_\_\_\_\_  
(Name and Title)





Path: Z:\Shared\Projects\01987\019872021 - Tetra Tech Locating for trenching project Middle River\SUE\GIS\019872021\_Figure 1.aprx

**Figure 1: Subsurface Utility Survey Results**  
**Storm Outfall Locations**  
Middle River Complex  
Middle River, MD

**RETTEW**<sup>SM</sup>  
RETTEW Associates, Inc.  
3020 Columbia Avenue, Lancaster, PA 17603  
Phone (717) 394-3721 Fax (717) 395-1063

SURVEY DATE:	07/09/2020
PROJECT No:	028992013
REVIEWED BY:	JBS
DRAWN BY:	WES
DATE:	07/15/2020
FIGURE No:	1 of 1



---

## **ATTACHMENT B— DAILY REPORTS**



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 1 of 7

**Duration of Site Activities**

Report #:

Date:

On-Site:

Off-Site:

Superintendent :

AM Weather:

PM Weather:

**Tailgate Health & Safety Topic Discussed**

**Summary of Work/Major Activities Completed Today**

**Inspections Completed Today**

**Delays/Problems Encountered Today**

**Planned Week Schedule**

**Proposed Schedule for Next Week**



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 2 of 7

**Safety Actions Taken Today / Safety Inspections Conducted:**

**Was a job safety meeting held this date?**  
**(See attached daily tailgate content and sign in)**

☐ YES  
☐ NO

**Were there any lost time accidents this date?**  
**(If yes, attach a copy of completed OSHA report)**

☐ YES  
☐ NO

**Were there any near misses on this date?**  
**(If yes, attach a copy of completed TOTAL report)**

☐ YES  
☐ NO

**Was trenching/scaffolding/HV electrical/confined space work completed this date?**  
**(If yes, attach appropriate specific forms)**

☐ YES  
☐ NO

**Was hazardous material/waste released to the environment?**  
**(If yes, attach description of events and proposed action)**

☐ YES  
☐ NO

**Daily Site Checklist**

☐ All personnel onsite signed entry/exit form?

☐ Safe Work Procedures discussed before intrusive activities?

☐ Field site gates locked at end of work day?

**Noted Deficiencies & Corrective Actions Taken**

Construction Superintendent Signature:

---

Comments:

Comments:

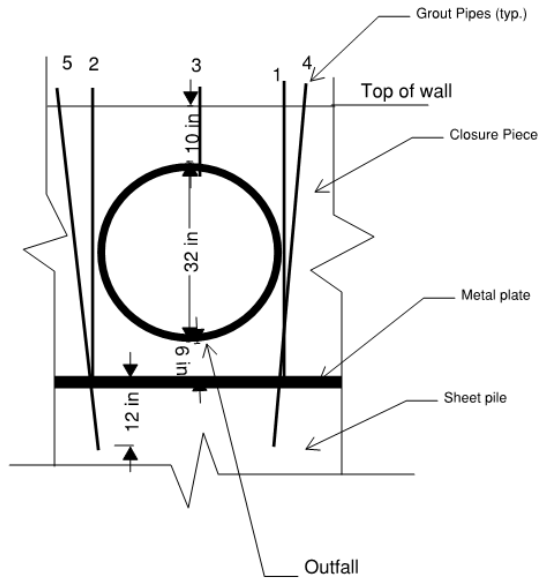
Comments:

Comments:

Comments:

Comments:

# DAILY PROGRESS REPORT



**Figure 8 Profile View of Grouting Location at Outfall OF-005-W (Looking Landside)**





**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 7 of 7

## Personnel On-Site

Date:

--

Time In

## Time Out

[illegible]



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 1 of 5

**Duration of Site Activities**

Report #:

Date:

On-Site:

Off-Site:

Superintendent :

AM Weather:

PM Weather:

**Tailgate Health & Safety Topic Discussed**

**Summary of Work/Major Activities Completed Today**

**Inspections Completed Today**

**Delays/Problems Encountered Today**

**Planned Week Schedule**

**Proposed Schedule for Next Week**



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 2 of 5

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**Noted Deficiencies & Corrective Actions Taken**

Construction Superintendent Signature:

---

Comments:

Comments:

Comments:

Comments:



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 5 of 5

## Personnel On-Site

Date:

--

Time In

## Time Out

[illegible]



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 1 of 5

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Off-Site:

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PM Weather:

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LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

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Construction Superintendent Signature:

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Comments:

Comments:

Comments:

Comments:



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 5 of 5

## Personnel On-Site

Date:

--

Time In

## Time Out

[illegible]



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 1 of 5

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MIDDLE RIVER, MD**

Page 2 of 5

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Construction Superintendent Signature:

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Comments:

Comments:

Comments:



**DAILY ACTIVITIES REPORT  
LOCKHEED MARTIN OUTFALL REPAIR  
MIDDLE RIVER, MD**

Page 5 of 5

## Personnel On-Site

Date:

--

Time In

## Time Out

[illegible]