



# Memorandum

January 8, 2016

|         |                                     |                   |
|---------|-------------------------------------|-------------------|
| To      | City of Rehoboth Beach              |                   |
| Copy to | GHD Project Team                    |                   |
| From    | Jason Marshall                      | Tel               |
| Subject | Rehoboth Beach Force Main Alignment | Job no. 86/18690/ |

## 1 Final Alignment

This memorandum provides an update to the City of Rehoboth Beach Force Main Alignment Study, completed December 2011. From this study, Alternative A was the recommended alignment and that same corridor has been used to define the final alignment with minor shifts in locations where the original alignment was not feasible due to private easements and tree protection. The project is now in the design phase and the final alignment has been established based on existing utility locations, minimal land clearing activity, and input by City and local residents. See Figure 1 Force main Alignment for the final overall alignment map.

### 1.1 Alignment Description – Rehoboth Beach WWTP to State Road

The force main starts at the proposed effluent pump station, exits west to the canal bank and will continue north, parallel Lewes-Rehoboth Canal, just outside the fence to Roosevelt Street, see Figure 2. Coordination and an easement may be required as an approximate 20' wide section of land at the top of the canal bank is within the Army Corps of Engineers jurisdiction. The fence in this area will require removal and relocation as needed to construct and maintain the alignment corridor. Trees will be removed as needed to complete construction and the contractor will be instructed to minimize clearing along the canal bank. At the entrance to the WWTP, the force main alignment will follow Roosevelt Street north, running parallel to the Lewes-Rehoboth Canal to the intersection at State Road., The pipe will be installed in the center to right of center, east side of roadway within a 9-ft spacing between an existing 12-inch force main and 10-inch water main. The contractor will be required to maintain one lane of traffic around the construction zone at all times for plant traffic.

### 1.2 Alignment Description – State Road

From Roosevelt Street, the alignment will continue north within the State Road right-of way on the right side northbound lane, running under the Highway One overpass (Coastal Highway) before passing the Main Pump Station and Old Bay Road. The alignment will continue past Park Place north, within State Road right-of way, to Canal Street. The alignment will then cross State Road to Canal Street. It should be noted that State Road is owned by DelDOT and is considered a state road. Discussions are ongoing and will continue with DelDOT.

**Park Place HDD** - The original City of Rehoboth Beach Force Main Alignment Study called for either HDD (Horizontal Directional Drill) or open-cut trench installation between the Park Place townhomes and the Lewes-Rehoboth Canal. Several factors have rendered this option undesirable that include the following:

- Tree clearing and top of bank disturbance along the canal would be required and was deemed undesirable by the Park Place residents.
- An easement from Park Place would be required.
- Existing utilities locations would require tree clearing on top of bank between canal and Canal Street to make installation. This area is also used by residents as a park / dog walking area.
- Potential for canal embankment instability and/or HDD frac-out and hydro fracture issues.

### **1.3 Alignment Description – Canal Street**

On Canal Street, the alignment will be located within the Canal Street right-of-way between an existing 8-inch sanitary sewer and water main along the right side of the road up to where Canal Street turns north parallel to Rehoboth Canal. At this point the alignment changes to the left side of the road heading north along the edge of pavement and parallel to the existing force main. This section will stop just before Rehoboth Avenue.

### **1.4 Rehoboth Avenue Crossing**

A trenchless crossing is proposed under Rehoboth Avenue from Canal Street and running between the Lewes-Rehoboth Canal and Rehoboth Beach Museum into Grove Park. The installation will include a steel casing pipe installed by horizontal auger bore through a sending and receiving pit with the carrier pipe threaded through the casing. Refer to Section 2 for a more detailed discussion of the proposed construction methods. Installation will be installed below existing utilities to avoid conflicts, see Figures 3 and 4.

### **1.5 Alignment Description – Grove Park**

The force main will continue through Grove Park with the alignment constructed around the northwest boundary and into Grove Street. This alignment will require minimal tree removal by working around the outside edge of the park while avoiding the central playground areas and trees. See Figure 5 for Grove Park Alignment.

### **1.6 Alignment Description – Grove Street and Henlopen Avenue**

From Grove Park the force main will continue for a short distance within the Grove Street right-of-way turning left onto Henlopen Avenue, within the right-of-way, along the left north side to just beyond North Surf Avenue. The alignment along Henlopen Avenue will be installed between the existing storm and sanitary sewer pipes, see Figure 6 in Appendix A. At Ocean Drive the alignment crosses the road to the Deauville Beach parking area.

## **1.7 Alignment Description – Deauville Beach parking area**

A vault will be installed for the connection of the force main to the ocean outfall to house valves for operation of the force main. Further determinations on vault size and location relative to the parking area will be considered during design.

The total alignment is approximately 11,000 feet in length from the Rehoboth Beach WWTP to the connection point at the Deauville Beach parking area.

## **2 Construction Methods and Considerations**

### **2.1 Utility Conflicts**

Existing utilities within the alignment corridor pose considerable challenges for alignment location and construction of the force main. Plans will be developed to minimize disturbances on existing utilities while maintaining service with limited interruptions to the public. Utilities include water, sanitary sewer, telephone, electric, fiber optic, and storm sewer.

### **2.2 Road Repair**

The majority of the alignment will require pavement repair over the trench. Pavement repair details will be developed based on the geotechnical investigation, existing pavement, traffic conditions and input from the City of Rehoboth Beach and Delaware DOT. It is recommended that any repaving or major road repair projects along the corridor not be scheduled until completion of the force main construction. The force main will be predominately constructed by open cut installation with the exception of the Rehoboth Avenue crossing, which will be installed by horizontal auger bore and jack, see Figures 3 and 4. Following installation of the force main, the contractor will provide a patch for the open-cut trench.

### **2.3 Additional Considerations**

The following considerations were used to develop the alignment and select the proposed construction methods:

- A minimum horizontal offset of 10 feet from existing water mains. This is required per the Recommended Standards for Wastewater Facilities (10 States Standards) 2004 Edition, Sections 38.31 and 49.5. A smaller offset may be allowable during detailed design if the sewer can be placed 18 inches below the water main or if concrete encasement is utilized. Sections of State Road and Canal Street have locations where there is not enough room to maintain the minimum horizontal offset distance recommended. The design will also incorporate vertical separation requirements.
- A minimum offset of 3 feet horizontally from utility poles.
- Pipe installation rates will be dependent on many factors including weather and work around existing utilities. Force main construction is anticipated at 80 to 200 linear feet per day.
- Horizontal auger bore and jack will require installation pits at depths deep enough to install under existing utilities. A launching pit of 15 to 20 feet wide by 40 feet long is to be constructed south of Rehoboth Avenue next to Canal Street. A smaller receiving pit will be excavated inside the park. See

Figures 3 and 4. This installation will also require the intersection closure of Rehoboth Avenue and Canal Street during construction; access to Canal Street from Rehoboth Avenue will be closed.

- Minimal disturbance of private property (easements). This will minimize the cost, time, and effort required to obtain temporary and permanent easements.
- Minimal disturbance of pavement outside work areas. This will minimize repaving and traffic control costs, as well as minimize disturbance to residents.

Existing utilities have been located in the field by Master Locators, Inc. Record drawings and sketches provided from the City of Rehoboth, and County GIS data are also being incorporated. Survey of existing utilities, parcels, structures, topology, etc. has been obtained by Axiom Engineering, LLC.

### **3 Anticipated Permits and Easements**

#### **3.1 Permits**

The Following permits will be required:

- Stormwater Management and Erosion and Sedimentation Control
- City of Rehoboth Street Excavation
- Delaware DOT (DelDOT)
- Delaware NPDES
- Delaware DNREC Division of Water
- Delaware Construction of Wastewater Collection and Conveyance System Permit
- Delaware DNREC Division of Watershed Stewardships' Coastal Construction Permit
- United States Army Corps of Engineers Permit

#### **3.2 Easements**

Existing right-of-way will be utilized for most of the alignment from the WWTP to the Deauville Beach parking area. Parcels owned by the City of Rehoboth Beach, State of Delaware and USACE will require some form of notice or plated alignment for record to be determined. No private parcels will be crossed or require acquisition.

### **4 Design Criteria**

The following force main design criteria have been established:

- Pipe Material – PVC
- Pipe Fittings – DIP
- Pipe Diameter – 24" (minimum inside diameter)
- Minimum Velocity – 2 fps



- Max velocity – 10 fps

## **5 Project Impacts**

Impacts to area residents will be most evident during construction due to the alignment location and associated traffic. Planning to mitigate impacts will be addressed through seasonal restrictions, traffic control plans or other restrictions. Notifications to those impacted will be necessary prior to construction to inform those affected during construction. Some locations will have temporary road closures with limited access and single lane access around construction in other areas. The following list incorporates those impacted and to whom communication is needed.

- Neighborhood – Residential areas to be notified of construction schedule and work in their neighborhood
- Emergency – First responders include the Rehoboth Beach Police Department and Fire Department
- Schools – Cape Henlopen School District

### **5.1 Noise Considerations**

After construction, there will not be any noise associated with the pipeline. During construction, there will be typical construction noises associated with trucks and excavation equipment. To mitigate these disturbances, construction activity is scheduled to take place during non-peak season times of the year and then only during normal business hours.

## **6 Probable Cost Estimate Update**

A preliminary design cost estimate was completed using a preliminary Bid Form for individual items identified for construction of the force main. The quantities provided are based on the current alignment proposed in Figure 1 with unit prices broken out for each item and total extend prices shown. The estimate also has Contingent Bid Items listed for possible work required during construction. An estimate of these quantities will be better defined as design plan development continues.

- A contingency of 20% is being used at this time and will be lowered when estimates are updated for 90% and 100% bid plans. See included Engineer's Opinion of Probable Construction Cost at the end on the memo;
- Force main alignment is located within the existing landfill boundary;
- Landfill trash will be excavated, hauled to a landfill and replaced with select backfill;

The opinion of probable cost is presented in

Table 1. Detailed opinion of probable cost are included in Appendix B. Landfill material removal cost assumed a volume based on 600 ft long, 5 ft wide and 5 ft deep.

Table 1 Probable Project Cost

| Description  | Probable Cost <sup>1</sup> |
|--|----------------------------|
| Force Main from WWTP to Deauville Beach                  | \$3,920,000                |
| Mobilization (2%)  | \$78,400                   |
| <b>Subtotal</b>  | <b>\$4,000,000</b>         |
| Contingency (20%)  | \$800,000                  |
| Testing Allowance  | \$40,000                   |
| <b>Estimated Construction Project Cost<sup>2,3</sup></b> | <b>\$4,840,000</b>         |

Notes:

1. Probable Cost includes 20% contingency.
2. 20% administration, legal, and engineering fees are not included.
3. Cost to obtain easements is not included.

## 7 Appendices

### Appendix A – Force Main Alignment Figures

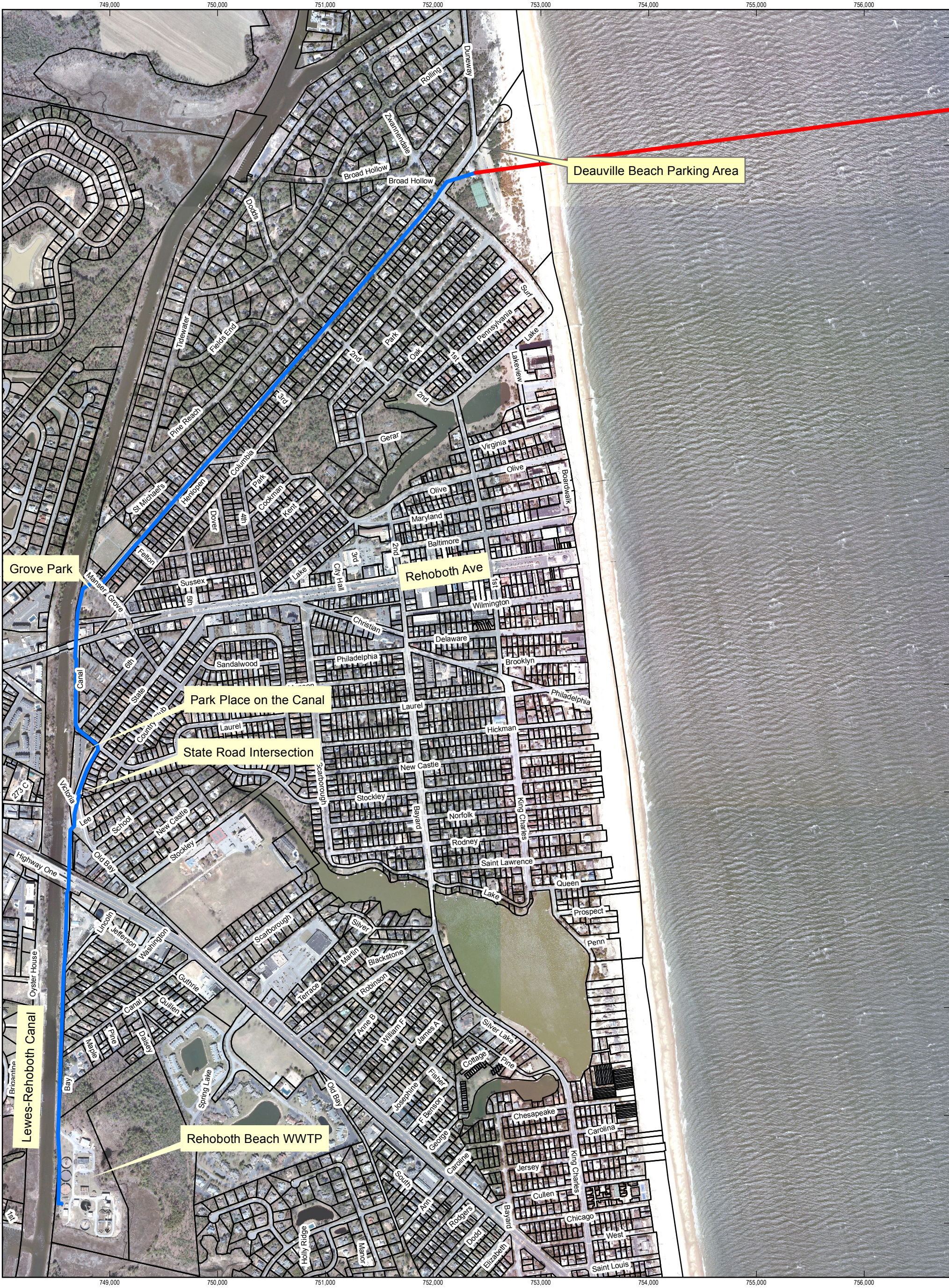
- Figure 1
- Figure 2
- Figure 3
- Figure 4
- Figure 5
- Figure 6

### Appendix B – Opinion of Probable Construction Cost

Appendix A

## Force Main Alignment Figures





# Legend

Force Main Alignment

Outfall Pipe

Paper Size ANSI B

0 225 450 900 1,350 1,800

Feet

Map Projection: Transverse Mercator

Horizontal Datum: North American 1983

Grid: NAD 1983 StatePlane Delaware FIPS 0700 Feet

N

CLIENTS | PEOPLE | PERFORMANCE

City of Rehoboth Beach

Ocean Outfall Project

Forcemain Alignment

Job Number 86-18690

Revision A

Date November 12, 2015

Figure 1

N:\US\Bowie\Projects\86\18690\GIS\Rehoboth - FM Alignment Fig 1.mxd

16701 Melford Blvd Ste 330 Bowie MD 20715 USA T 240 206 6810 F 240 206 6811 E bowmail@ghd.com W www.ghd.com

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jemarshall

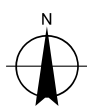




## Legend

— Force Main Alignment

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Map Projection: Transverse Mercator  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane Delaware FIPS 0700 Feet



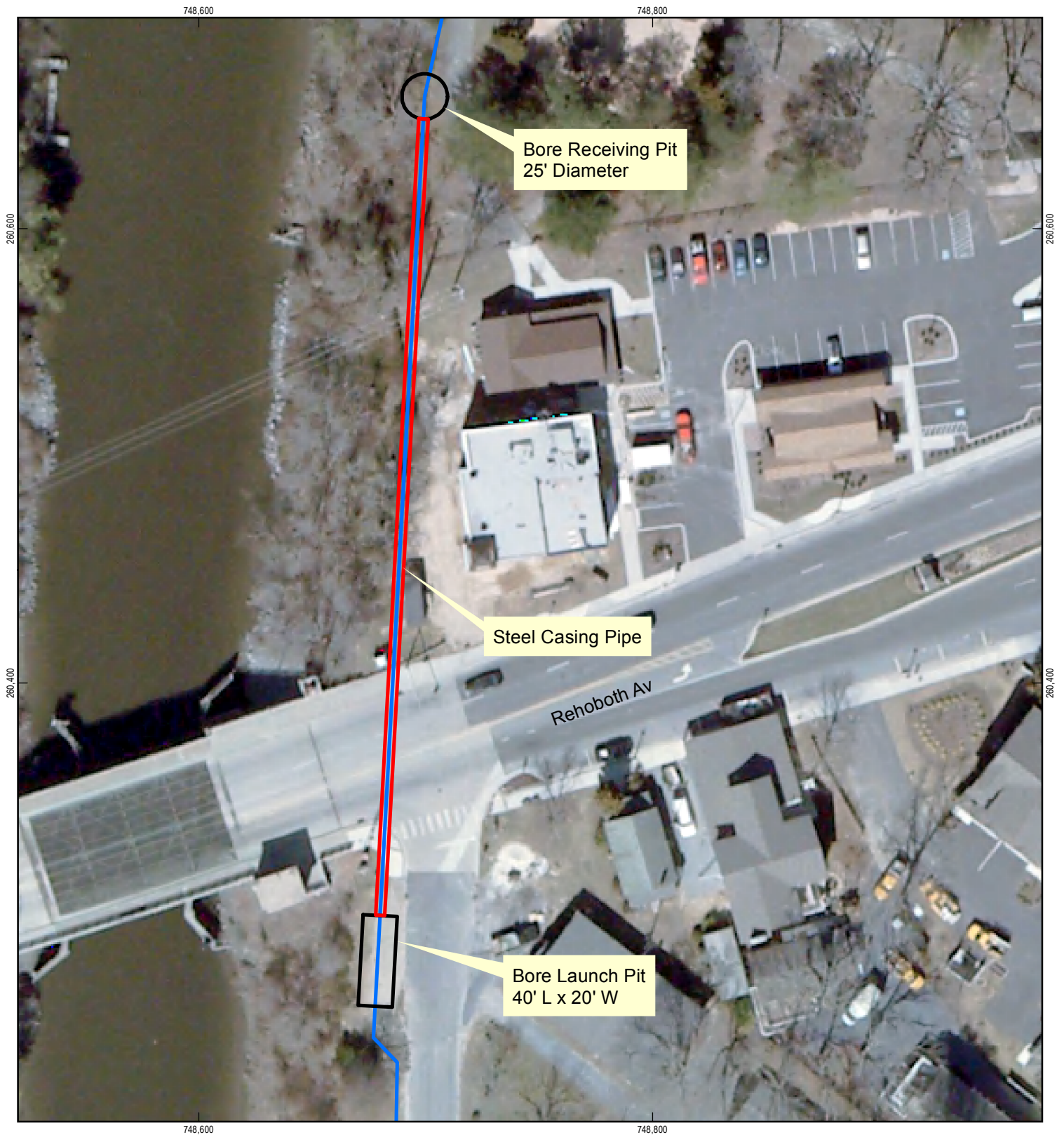
City of Rehoboth Beach  
Ocean Outfall Project

Force Main Location

Job Number 86-14327  
Revision B  
Date September 27, 2011

Figure 2

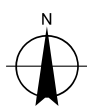




## Legend

— Steel Casing Pipe — Bore Pits — Force Main Alignment

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Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane Delaware FIPS 0700 Feet

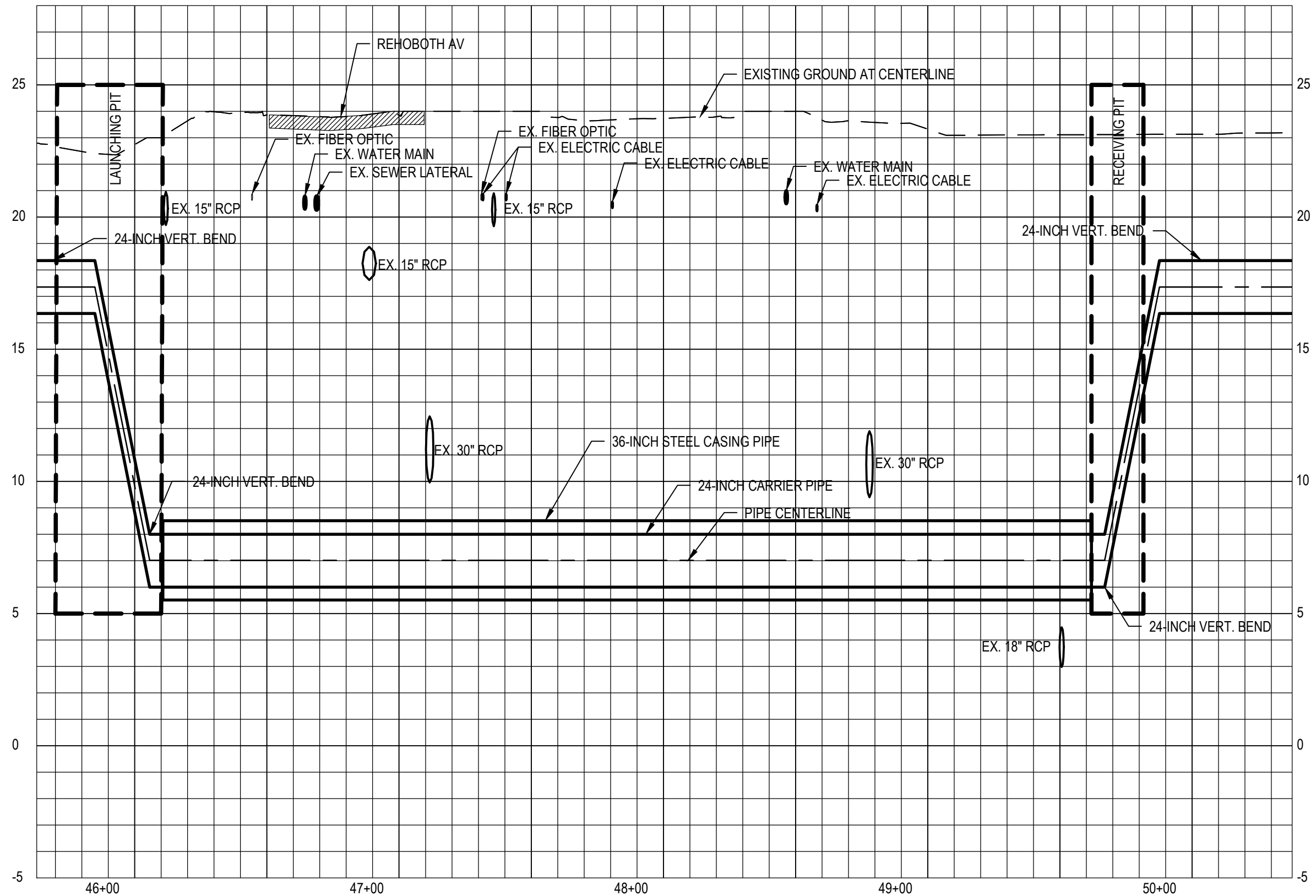


City of Rehoboth Beach  
Ocean Outfall Project

Rehoboth Avenue Crossing

Job Number 86-14327  
Revision B  
Date September 27, 2011

Figure 3



City Of Rehoboth Beach  
Force Main Alignment

Auger Bore and Jack  
Section View

Job Number 8618690

Revision A

Date Nov 2015

Figure 4

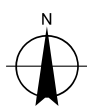




## Legend

— Steel Casing Pipe   
 — Bore Pits   
 — Force Main Alignment

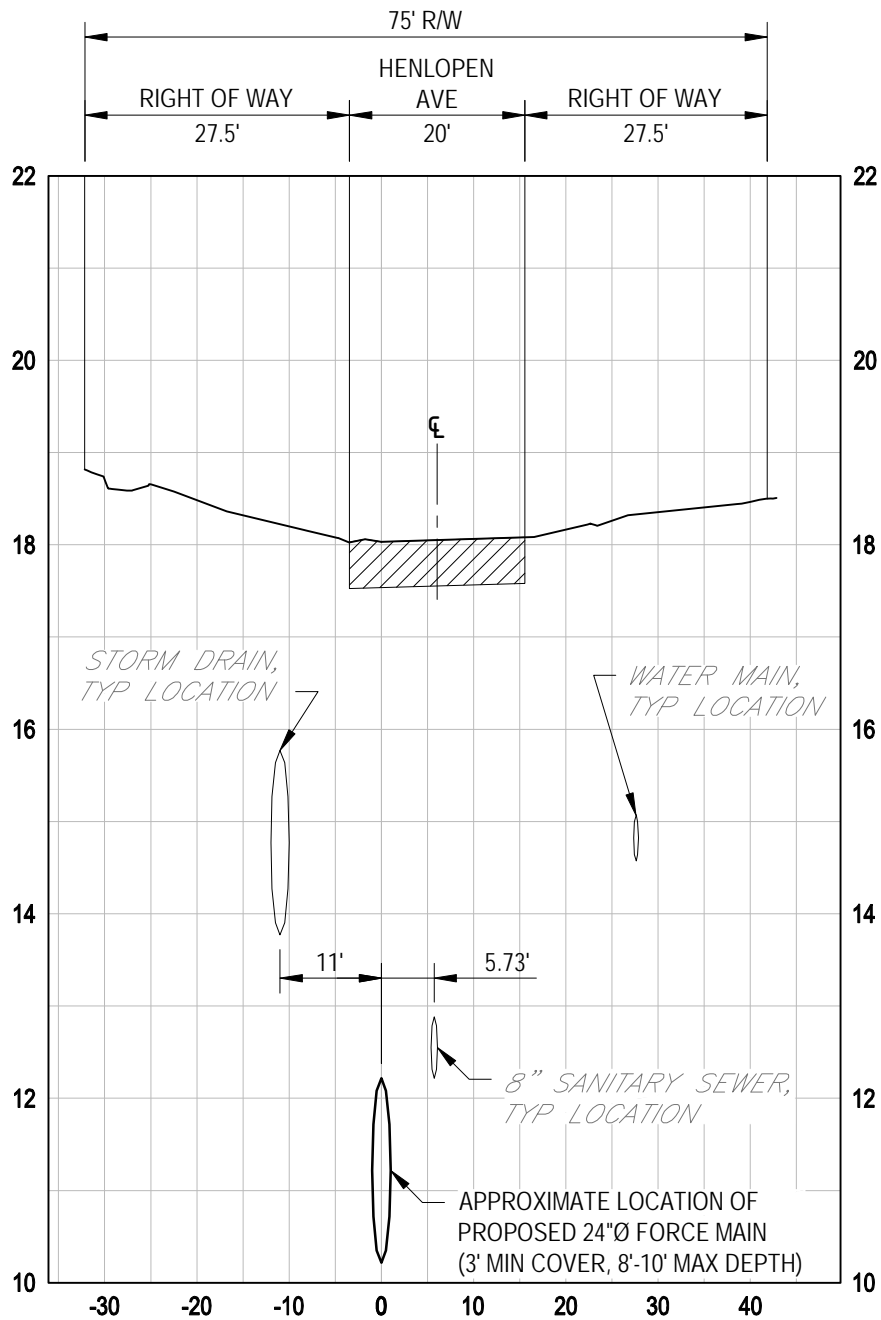
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 Grid: NAD 1983 StatePlane Delaware FIPS 0700 Feet



City of Rehoboth Beach  
 Ocean Outfall Project  
 Grove Park

Job Number 86-14327  
 Revision B  
 Date September 27, 2011

**Figure 5**



## CROSS SECTION

VERT SCALE: 1"=2'-0"  
 HORZ SCALE: 1"=20'-0"

### NOTE:

1. FORCE MAIN DEPTH LOCATION WILL BE DETERMINED BY UTILITY LATERAL LOCATIONS.



CITY OF REHOBOTH BEACH, DELAWARE  
 FORCE MAIN PROJECT

PROPOSED HENLOPEN AVE  
 TYPICAL CROSS SECTION

Job Number | 86-18690

Revision | A

Date | 12/15

Figure 06

## Appendix B

# Opinion of Probable Construction Cost

**ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST**

City of Rehoboth Beach Force Main

GHD Project No. 8618690

Dec-15

| ITEM | DESCRIPTION  | QUANTITY |     | UNIT PRICE | TOTAL       |
|------|--|----------|-----|------------|-------------|
| 1    | FOR FURNISHING AND INSTALLING <b>PVC FORCE MAIN</b> WITH PUSH-ON JOINTS AS SPECIFIED, COMPLETE IN PLACE  |          |     |            |             |
| A    | 24-INCH PIPE   | 11,300   | LF  | \$150      | \$1,695,000 |
| B    | FOR INSTALLING 24-INCH PVC JOINT RESTRAINT, AS SPECIFIED, COMPLETE IN PLACE.   | 20       | EA  | \$1,500    | \$30,000    |
| 2    | FOR FURNISHING AND INSTALLING ADDITIONAL FITTINGS NOT SHOWN ON DRAWINGS  | 500      | LBS | \$5        | \$2,550     |
| 3    | FOR MANHOLES, AS SPECIFIED, BACKFILLED, FRAME & COVER, COMPLETE IN PLACE   | 4        | EA  | \$8,000    | \$32,000    |
| 4    | FOR FURNISHING & INSTALLING AIR RELEASE VALVE, AS SPECIFIED, COMPLETE IN PLACE   |          |     |            |             |
| A    | 2-INCH MANUAL AIR RELEASE VALVE  | 2        | EA  | \$2,000    | \$4,000     |
| B    | 2-INCH AUTOMATIC AIR RELEASE VALVE   | 2        | EA  | \$5,000    | \$10,000    |
| 5    | FOR FURNISHING, FORMING, AND PLACING PLAIN CONCRETE BLOCKING AND ENCASMENT, AS SPECIFIED, COMPLETE IN PLACE.   | 100      | CY  | \$250      | \$25,000    |
| 6    | FOR GUARANTEED BORE INSTALLATION, AS SPECIFIED, COMPLETE IN PLACE  |          |     |            |             |
| A    | 36" DIAMETER CASING (t=0.375") WITH 24-INCH PVC (PRESSURE CLASS 250) CARRIER PIPE  | 352      | LF  | \$1,100    | \$387,200   |
| B    | ADDITIONAL LENGTH (EXCLUDING FIRST 352 LF PER BORE SITE)   | 10       | LF  | \$1,400    | \$14,000    |
| C    | CONCRETE BARRIER   | 400      | LF  | \$5        | \$2,000     |
| 7    | FOR USING #467 STABILIZATION STONE FOR TRENCH STABILIZATION MATERIAL, AS SPECIFIED, COMPLETE IN PLACE.   | 1,200    | TN  | \$50       | \$60,000    |
| 8    | FOR SELECT BACKFILL MATERIAL AS SPECIFIED, SHAPED AND COMPACTED IN PLACE.  | 3,600    | CY  | \$30       | \$108,000   |
| 9    | FOR CUTTING (SAWING) AND REPLACING ALL ASPHALT PAVEMENT, AS SPECIFIED, COMPLETE IN PLACE. (ALSO INCLUDING ANY CONCRETE ENCOUNTERED UNDER AN ASPHALT SURFACE TREATMENT) |          |     |            |             |
| A    | BINDER   | 5,000    | SY  | \$40       | \$200,000   |
| B    | SURFACE COURSE   | 31,260   | SY  | \$30       | \$937,800   |
| 10   | CURB AND GUTTER  | 40       | LF  | \$15       | \$600       |
| 11   | FOR CONSTRUCTION AND MAINTAINING VARIOUS EROSION CONTROL DEVICES, AS SPECIFIED, COMPLETE IN PLACE.   |          |     |            |             |
| A    | SILT FENCE PER E.C. DETAIL X   | 1,000    | LF  | \$5        | \$5,000     |
| B    | DROP INLET PROTECTION PER E.C. DETAIL X  | 20       | EA  | \$100      | \$2,000     |
| C    | TEMPORARY INLET PROTECTION   | 2        | EA  | \$100      | \$200       |
| D    | SEEDING  | 2        | LS  | \$5,000    | \$10,000    |
| E    | CONSTRUCTION ENTRANCE  | 3        | EA  | \$1,500    | \$4,500     |
| 12   | FOR LOCATING UNDERGROUND UTILITIES, AS SPECIFIED, COMPLETE IN PLACE.   | 20       | EA  | \$100      | \$2,000     |

|    |  |        |    |             |                |
|----|--|--------|----|-------------|----------------|
| 13 | FOR REMOVAL AND REPLACEMENT OF EXISTING FENCE TO A CONDITION AS EQUAL OR BETTER, AS DIRECTED BY THE ENGINEER.  | 550    | LF | \$20        | \$11,000       |
| 14 | FURNISH AND INSTALL TRAFFIC CONTROL DEVICES, AS SPECIFIED, COMPLETE IN PLACE   | 1      | LS | \$40,000    | \$40,000       |
| 15 | GROVE PARK RESTORATION   | 1      | LS | \$20,000    | \$20,000       |
| 16 | <b>CONTINGENCY WORK</b>  |        |    |             |                |
| A  | FOR REMOVING AND RECONSTRUCTING EXISTING STORM SEWERS, AS SPECIFIED, COMPLETE IN PLACE   |        |    |             |                |
| 1  | 36-INCH RCP  | 40     | LF | \$175       | \$7,000        |
| 2  | 30-INCH RCP  | 40     | LF | \$150       | \$6,000        |
| 3  | 18-INCH RCP  | 40     | LF | \$90        | \$3,600        |
| 4  | 15-INCH RCP  | 40     | LF | \$75        | \$3,000        |
| B  | FOR REMOVING AND RECONSTRUCTING EXISTING STORM INLETS, AS SPECIFIED, COMPLETE IN PLACE   | 10     | EA | \$5,000     | \$50,000       |
| C  | FOR MILLING EXISTING ASPHALT PAVEMENT  | 31,260 | SY | \$5         | \$156,300      |
| D  | GEOTEXTILE TRENCH STABILIZATION FABRIC (MUST BID MIN. \$5)   | 1,000  | SY | \$8         | \$8,000        |
| E  | FOR RELOCATING UNDERGROUND UTILITIES, AS SPECIFIED, COMPLETE IN PLACE.   |        |    |             |                |
| 1  | UNDERGROUND TELEPHONE CABLES   | 10     | LF | \$5         | \$50           |
| 2  | UNDERGROUND ELECTRIC POWER CABLES  | 10     | LF | \$5         | \$50           |
| 3  | UNDERGROUND TV CABLES  | 10     | LF | \$5         | \$50           |
| 4  | UNDERGROUND PLASTIC GAS LINES  | 10     | LF | \$5         | \$50           |
| 5  | WATER SERVICES   | 5      | EA | \$2,000     | \$10,000       |
| 6  | SEWER SERVICES   | 5      | EA | \$2,000     | \$10,000       |
| 7  | FOR STORM DRAIN REPLACEMENT, AS SPECIFIED, COMPLETE IN PLACE.  |        |    |             |                |
| F  | EXCAVATION, HAULING AND DISPOSE OF "LANDFILL" TYPE MATERIALS TO COUNTY'S LANDFILL  | 900    | TN | \$60        | \$54,000       |
|    | <b>SUBTOTAL</b>  |        |    |             | \$3,920,000    |
| 17 | FOR MOBILIZATION TO THE PROJECT SITE, AS SPECIFIED (PLEASE ENTER A NUMBER TO REPRESENT A PERCENTAGE OF SUBTOTAL LESS THAN OR EQUAL TO 2%) (i.e. ENTER "2" TO REPRESENT "2%") | 2      |    | \$78,400    |                |
|    | <b>SUB-SUBTOTAL</b>  |        |    |             | \$4,000,000    |
| 18 | CONTINGENCY ALLOWANCE, AS SPECIFIED, COMPLETE IN PLACE 20% OF SUB-SUBTOTAL   |        |    | \$800,000   |                |
| 19 | <b>Allowance for Testing Services</b>  |        |    | \$40,000.00 |                |
|    | <b>TOTAL BID</b>   |        |    |             | \$4,840,000.00 |