Village of Estral Beach
7194 Lakeview Boulevard,
Newport, MI 48166
(734) 586-8380

SHEET PILE RETAINING WALL
TECHNICAL REQUIREMENTS FOR INSTALLATION

PART 1 – GENERAL

101. SCOPE

101.1 Specify the requirements for the installation of a permanent sheet pile retaining wall on the canal side of the dike running parallel with Lakeshore Drive, near the south pump house (7323 Lakeshore Drive). Also for installation of a retaining wall on the suction side of the south pump house and dredging of the pond area underneath of the suction line. See Attachment 5, photographs.

102. DEFINITIONS

102.1 Purchaser: Village of Estral Beach, from hereafter referred to as "The Village"

102.2 Engineering Firms: TBD - Services to be provided as needed

102.3 Contractor: TBD, from hereafter referred to as "The Contractor"

103. DETAILED TASKS

103.1 Arrange for removal or movement of DTE electrical services as needed to support the work.

103.2 Installation of 100' to 400' of carbon steel sheet pile retaining wall along the east side of the dike running parallel with Lakeshore Drive, to be bid in 100' increments (see Attachment 4).

a. Obtain the required USACE and/or DEQ permits for installation of the canal side retaining wall. Note that the Village may assist with this line item as needed.

b. Install 8 gauge lightweight sheet piling, or heavier gauge (see Attachment 3, Shoreline Steel Lightweight Sheet Piling Specification). Provide justification if a different gauge of sheet is being recommended.

c. Provide the cost difference and benefits of using galvanized or other material (e.g., vinyl) sheet piling.

d. Install 20' lengths such that sufficient length is buried to prevent kick out of the bottom into a dredged canal. It is anticipated that the canal will be dredged to 6' deep, and that 14' to 16' of the sheet will be buried in muck and clay (8' to 10' below the dredge depth of the canal), leaving 4' to 6' above the water level. Provide justification if a different length of sheet is being recommended.

e. Install end wings.

f. Install tie-backs every 6' to 8'.

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g. Provide justification if a wale system is being recommended.

h. Encase the all thread or rebar used for the tie back in PVC pipe, rubberize, or otherwise coat to extend the life of the tie back while in the buried condition.

i. Sufficiently cap the wall with angle steel welded to the top of the retaining wall.

j. Transport donated clay for backfill between the dike and retaining wall from either behind the Village hall or from StoneCo Quarry. Bid this as a separate line item since the Village has the capability to perform this task.

k. Install and compact of the backfill. Include with the line item for transporting of clay above.

103.3 Installation of an approximately 40’ length of carbon steel sheet pile retaining wall on the suction side of the south pump house. This work shall include:

a. After pump has been de-energized, temporarily remove the flanged pump suction pipe.

b. Remove degraded wooden wall and wooden support structure from retention pond.

c. Dredging of the retention pond in the area around the pump suction inlet to a depth of approximately 8 feet below the water line and approximately 10 foot diameter.

d. Transport excavated materials to an on-site location as directed by The Village.

e. Install 8 gauge lightweight sheet piling, or heavier gauge (see Attachment 3, Shoreline Steel Lightweight Sheet Piling Specification). Provide justification if a different gauge of sheet is being recommended.

f. Provide the cost difference and benefits of using galvanized or other material sheet pile (e.g., vinyl).

g. Install 25’ lengths such that sufficient length is buried to prevent kick out of the bottom into a dredged retention pond. Provide justification if a shorter length of sheet is being recommended.

h. Install end wings.

i. Install tie-backs every 6’ to 8’.

j. Provide justification if a wale system is being recommended.

k. Encase the all thread or rebar used for the tie back in PVC pipe, rubberize, or otherwise coat to extend the life of the tie back while in the buried condition.

l. Sufficiently cap the wall with angle steel welded to the top of the retaining wall.

m. Install drainage system to prevent hydraulic pressure buildup on the dike side of the retaining wall.

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n. Install and compact backfill material to increase the grade to approximately 1' below the top of pump house foundation.

o. Install a support for the pump suction pipe at the retention pond wall.

p. Reinstall pump suction piping with new gasket and adequately support at the new retaining wall.

103.4 Related Work Not Included in this bid:

a. De-energizing of the pump.

b. Removal and replacement of the pump float control system.

c. Seeding of backfill.

d. Addition of an angled diffuser to the end of the suction pipe.

e. Providing portable diesel driven pump.

104. SUBMITTALS

104.1 Documentation to be submitted with the **SEALED** Bid Proposal:

a. Evidence of successful installation of sheet pile wall systems performed under similar conditions including a description of the project and contact information for the project Owners.

b. Proof that the Contractor is Licensed, Bonded, and Insured.

c. Concur with recommended lengths, or provide the length of sheet pile to be used for each wall, and the justification of why that length is sufficient to prevent kick-out at the bottom.

d. Concur with recommended gauge, or provide the gauge of sheet pile to be used for each wall, and the justification of why that gauge is sufficient to prevent buckling of the wall.

e. Concur with the use of carbon steel, or provide the recommended sheet pile material and coating to be used for each wall, and the justification of why that material is sufficient for the application.

f. Provide the design (e.g., sketch) of the proposed tie-back, and wale system (if required), to be installed.

g. Provide the design (e.g., sketch) of the proposed drainage system to be installed along the retention pond retaining wall.

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105. REFERENCE DOCUMENTS

105.1 Documents used in writing this specification are referenced in this Section. The design of the retaining wall system to be installed shall follow proven methodologies, unless another design can be justified, and comply with Federal, State or Local codes having jurisdiction.

a. USACE, EM 1110-2-2504, 31 March 1994, "Design of Sheet Pile Walls"

b. United States Steel, Steel Sheet Piling Design Manual, July 1984

c. FHWA NHI-00-043 – Mechanically Stabilized Earth Walls and Reinforced Soil Slope Design and Construction Guidelines.

d. Shoreline Steel Lightweight Sheet Piling Specification Sheet (ShorelineSteel.com)

105.2 Drawings/Sketches:

a. See Attachments 1 and 2

106. ENVIRONMENTAL CONDITIONS

106.1 The dikes are made of clay and have issues with sloughing. Work from the top of the dike shall be performed when there is no chance for compromising the integrity of the dikes due to the weight of the equipment being used, or the saturated condition of the dike.

106.2 The pump house foundation is located on the side of the clay dike, with the area between the foundation and the retention pond sloped and narrow.

106.3 Access to the work site and laydown area around the work site is limited.

106.4 There are electrical power lines routed to the pump house.

107. QUALITY ASSURANCE

107.1 Pre-Construction Meeting: As directed by The Village, prior to the start of construction, The Village, Engineering Firms (as needed), and Contractor may be requested to participate in a meeting at the site to review the wall construction requirements.

107.2 The Contractor shall examine the areas and conditions under which the retaining wall construction is to be performed and notify The Village in writing of conditions detrimental to the proper and timely completion of the Work.

107.3 Work shall be performed in accordance with this specification, construction drawings, design information provided to the Village by the Contractor, and approved by the Village, and installation requirements provided by the Village and/or Engineering Firm.

107.4 Materials and installation shall meet the requirements of this specification unless approval to deviate is obtained from the Village in advance and in writing.

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107.5 The Village reserves the right to stop work at any time if it is determined that the Contractor is not working in a safe manner, or is in violation of Federal, State, or Local laws.

107.6 The Contractor shall promptly correct all deficiencies in retaining wall construction not found to be in compliance with this specification.

108. WORK ISSUES

108.1 Prior to performing any Work, during any part of the Project, and prior to use of heavy equipment in the area of Work, the Contractor shall make a thorough field check at the job Site for the purposes of verifying existing conditions that may affect the Work. The Contractor's Work shall include a thorough investigation of the potential interferences and difficulties that it may encounter in the proper and complete execution of the Work, including the field location and identification of underground and above-ground utilities within and adjacent to the limits of the construction. The Installer shall advise The Village immediately of the discovery of any previously unknown conditions, including the existence of underground or above-ground utilities that may affect the timely and safe execution of the Work.

108.2 The Contractor further acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials and obstacles, including underground or above-ground utilities, to be encountered insofar as this information is reasonably ascertainable from an inspection of the site (including field location and identification of the underground or above-ground utilities), as well as from information presented by the drawings and specifications made a part of the contract, the character and extent of existing work thereto, and any other work being performed thereon at the time of the submission of bids.

108.3 Should the Contractor fail to perform any of the obligations set forth above, Contractor's later plea of ignorance of existing or foreseeable conditions which create difficulties or hindrances in the execution of the Work will not be considered as an excuse for any failure on the part of the Contractor to fulfill in every detail the requirements of the Project Specification and the drawings, nor will such a plea be acceptable as the basis of a claim for additional compensation.

108.4 Utilities and structures within and adjacent to the Work area that cannot be relocated and are in operation during construction shall be protected and monitored in a method acceptable to The Village and the Utility provider.

108.5 While installing the retention pond wall, the pump motor will be de-energized and fuses pulled to prevent inadvertent start while the pump suction pipe is not installed. Should rain fall warrant, the suction pipe may have to be reinstalled to allow pump down of the retention pond which could impact the Contractor's work. This action will be required to minimize flooding of the lower lying areas of the Village. If this is a burdensome request, the Village will arrange to stage a portable diesel driven pump to mitigate this concern.

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109. DELIVERY, STORAGE, AND HANDLING

109.1 Storage and handling of construction materials and equipment shall be in accordance with Contractor's instructions and MIOSHA standards in a location designated by The Village.

109.2 The Village is not liable for any damage to, or theft of, construction equipment or material left at the job site or staging area(s).

109.3 Prevent excessive dredge materials from draining onto the Village roads during transport. Clean up as necessary.

110. PROJECT CONDITIONS

110.1 Contractor is responsible for controlling their equipment and performing their work in such a manner that it does not jeopardize the existing pump house foundation or structure, pump, or pump related equipment during construction.

110.2 Contractor is responsible for maintaining their equipment in good working order. Any fluids released shall be cleaned up immediately to prevent them entering the surrounding waters.

110.3 Work is being performed in a residential area in close proximity to private residences. In addition, there is limited access and staging area in the immediate vicinity of the pump house and dike.

110.4 Work will not be allowed during weather conditions that could result in excessive damage to the dike system.

110.5 Any determination of the electrical power to the flood control pump must be temporary, and able to be reconnected in an expeditious manner should operation of the pump be needed, unless other arrangements have been made to stage a portable pump.

111. DESIGN CRITERIA

111.1 The retaining wall sections shall be able to withstand the loads and moments imposed upon the wall due to earthen loads, hydraulic loads, and live loads (i.e., truck, small crane, etc.) without buckling, kick out, or other type of failure.

111.2 The design shall include sufficient ground penetration to prevent kick-out of the bottom of the wall due to the imposed loading based on the type of soil.

PART 2 – PRODUCTS

201. MATERIALS

201.1 The sections shall have a sufficient section modulus to prevent buckling, and is estimated to be equivalent to 8 gauge lightweight steel sheet piling or heavier. Provide justification if a less stiff sheet is being recommended.

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201.2 The sections shall be of sufficient length to prevent kick-out, and is estimated to be 25' lengths or longer for the pump house pond retaining wall and 20' for the canal side retaining wall. Provide justification if other lengths are being recommended.

201.3 Backfill material shall be provided by Contractor and support the function of the drainage system to be installed.

201.4 Base backfill material shall be clay, topped with 6" of sand/gravel to support proper drainage from the dike side of the retention pond wall. Provide sketch of proposed drainage system.

201.5 In addition, the backfill shall conform to all of the following requirements:

a. Clean sand and gravel shall be used as backfill.

b. The backfill material shall be compacted.

201.6 Backfill material not conforming to the requirements of this Section shall not be used without the written consent of both The Village and/or the Engineer Firm.

PART 3 – EXECUTION

301. PREPARATION

301.1 Prepare an execution plan to which all parties will agree (i.e. The Village, The Contractor, Engineering Firms(s), and the residents that are directly impacted).

301.2 Include in the execution plan the method to be employed for driving the sheet pilings in place (e.g., vibrating hammer, impact hammer, etc.). Identify expected noise levels to which residents in the vicinity will be subjected.

301.3 Also include in the execution plan how the pump will be returned to operable status in a timely manner should weather conditions warrant. Note that this assumes a portable pump is not to be staged.

301.4 Equipment:

a. Ensure the ground is stable in the area where the dredging or pile driving equipment will be placed.

b. Minimize disruption to traffic flow as much as possible, operate all equipment in a safe manner, and install road barriers and signs as needed to protect the residents and Contractor employees.

c. Clean any debris from the roads along the transportation route to the onsite storage area.

302. SAFETY

302.1 Do not begin installation until all parties have agreed to the execution plan.

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302.2 Comply with MIOSHA standards.

302.3 Since the work is being performed along a live canal, and water from the retention pond is pumped into the live canal which is connected to Lake Erie via Swan Creek, no substances or materials detrimental to the environment shall be allowed to enter the waterways. Should a spill of such materials occur (e.g., hydraulic oil, fuel, etc.). Contractor shall have materials staged at the work site necessary to prevent entrance of such materials into the waterways and to perform an effective clean up.

302.4 The pump motor will be de-energized while the suction pipe is removed to prevent potential damage to the pump.

303. CONTRACTOR'S RESPONSIBILITY

303.1 Construct the retaining wall in accordance with the approved design drawings, sketches, and instructions.

303.2 Notify the Village prior to beginning work (i.e., bringing of equipment onto the Village roads), if total road blockage will be required, or if there will be an extended interruption in work (e.g., weather related stoppage).

303.3 Minimize disruption to traffic flow as much as possible, operate all equipment in a safe manner, and install road barriers and signs as needed to protect the residents and Village Maintenance employees. Parking on privately owned property is not allowed unless permission is obtained prior to the use of such property (Village will help with obtaining this permission if needed).

303.4 Perform the work only between the hours of 7:00 am and 9:00 pm to minimize disruption to the Village residents in compliance with Village Ordinance 1042.

303.5 Repair any damage to the clay dike, or other Village or Residential property impacted during work under this specification

303.6 Pass final inspection by the Village representative following completion of each phase of the specified work prior to receipt of payment requested.

304. CONSTRUCTION

304.1 Placement of Panels:

a. Sheet pile panels shall be placed in a vertical orientation. Panels shall be handled in a safe manner during installation.

b. As backfill material is placed behind the panels, the vertical panel joints shall be maintained in a plumb position by means of tie-backs, wale system (if installed), and a wall cap.

c. Sheet piling should not be driven more than 1/8 inch per foot out of plumb either in the plane of the wall or perpendicular to the plane of the wall.

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d. The top of the wall for the retention pond should be approximately 12” below the top of the pump house foundation.

e. The top of the wall for the dike should at least 12” above the grade of Lakeshore Drive at that point.

f. Cap the sheet pile walls.

304.2 Retention Pond Wall Drainage System

a. Site grading shall be designed to route surface water around and away from the wall as much as possible.

b. Drain piping, toe drain, should be located at the back of the rock drain field behind the retention pond wall as close to the bottom of the wall as allowed while still maintaining a positive gradient for drainage to daylight.

c. The internal drainage system of the retaining wall is designed to remove incidental water that infiltrates into the soil behind the wall. Adequate storm water drainage systems are required to completely drain the area around the retaining wall structure.

304.3 Placement of tie-backs and wale system:

a. At no time shall tie-backs be anchored to the pump house foundation.

b. Tie-backs and wale system (if installed) design shall be as designed by the Contractor and approved by The Village or Engineering Firm.

c. Tie-back rods shall be encased in PVC, rubber coated, etc. to protect from corrosion of the buried portions.

304.4 Backfill Placement:

a. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing panels. Typically, granular fill is placed in thin lifts, with each lift compacted before the next is placed.

b. Any wall elements which become damaged or disturbed during backfill placement shall be either repaired or replaced by the Installer at no additional cost to The Village.

c. Care shall be exercised in the compaction process to avoid misalignment of the panels or damage to the attachment devices.

305. CLEANUP

305.1 Contractor shall remove all of its equipment, spoils, and debris from the site. Disposal of all material shall be in accordance with state and federal regulations at an off-site location approved by The Village.

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305.2 Contractor shall repair any damage to the clay dike, equipment laydown areas, or surrounding equipment caused by their construction activities.

305.3 Repair or compensate the Village, or Resident, for any damage incurred to Village or Private property during the performance of this work.

END OF SPECIFICATION

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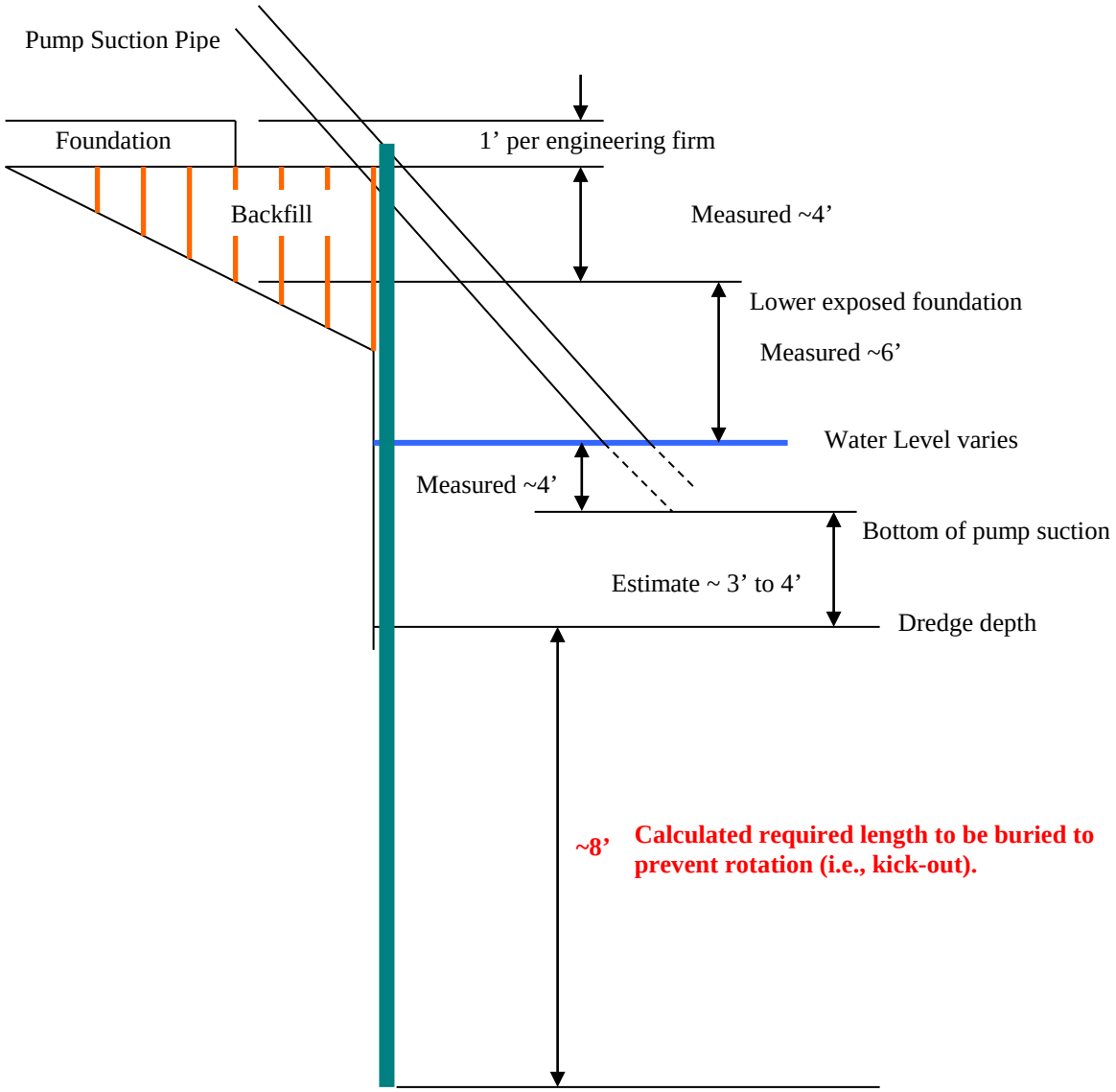
Attachment 1

Retention Pond Retaining Wall Field Measurements

(To be confirmed by Contractor)



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Attachment 2

GoogleEarth Plan View

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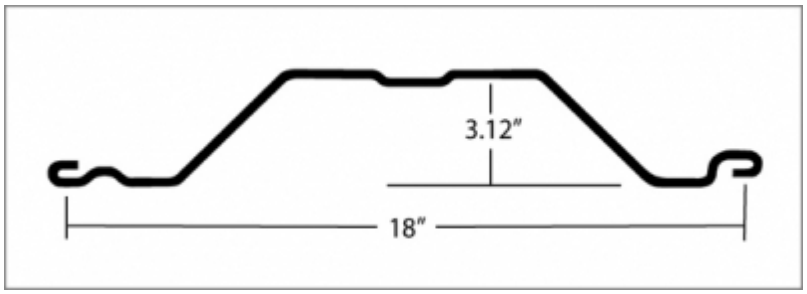
Attachment 3

Shoreline Steel Lightweight Sheet Piling Specifications

Lightweight Sheet Piling

Shoreline Steel offers these lightweight steel materials available in ASTM-A-857 / GR.33 & 36 / Bare or Galvanized finish. All of the listed lightweight sheet pilings are fully manufactured in the USA. All the lightweight sheet piling can be cut to the length you need it. The lightweight sheet piling can be used to prevent erosion to protect shores.



Lightweight Sheeting Cross Section

Central Section	Thickness	Weight	Weight	Sec. Mod.	Moment of Inertia	Coating Area
Gauge	Nominal	Lb/Square Ft.	Lb/Lineal Ft.	$Inch^3$ (Ft.Wall)	$Inch^4$(Ft.Wall)	Sq.Ft/LF
10 - 10	.134	7.2	10.8	2.2	3.5	3.7
8 - 8	.164	8.8	13.2	2.62	4.2	3.7
7 - 7	.179	9.6	14.4	2.8	4.4	3.7
6 - 6	.194	10.5	15.8	3.0	4.9	3.7
5 - 5	.209	11.3	16.9	3.4	5.4	3.7

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Attachment 4

Bid Sheet

Item	Task Description	Cost
	Dike Retaining Wall Parallel to Lakeshore Drive	
1	Obtain required USACE and/or DEQ permits, and install 100 feet of sheet pile retaining wall, wale system (if needed), tie-backs, and cap.	
2	Install second 100 feet of sheet pile retaining wall, wale system (if needed), tie-backs, and cap (200 feet total).	
3	Install third 100 feet of sheet pile retaining wall, wale system (if needed), tie-backs, and cap (300 feet total).	
4	Install fourth 100 feet of sheet pile retaining wall, wale system (if needed), tie-backs, and cap (400 feet total).	
5	Transport, install, and compact backfill between the dike and the retaining wall	
	Pump House Retention Pond Retaining Wall	
6	Remove pump suction line; install approximately 40 feet of sheet pile retaining wall, wale system (if needed), tie-backs, and cap; and re-install and support the pump suction line.	
7	Dredge under and around bottom of pump suction pipe to approximately 8’ below the water line, approximately 10 feet in diameter, and transport spoils to a location within the Village to be determined.	
8	Install a drain system on the pump house side of the retaining wall.	
9	Transport, install, and compact backfill in the area between the pump house foundation and the retaining wall.	

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Attachment 5

Photographs

Dike Picture Looking North

100’ to 400’ wall to be installed on right side of picture

Looking Down into Retention Pond

Note: Larger pipe (closer) has been removed

Pump House Looking South along Dike

40’ wall to be installed on right side of picture

Looking Down into Retention Pond

Note: Larger pipe has been removed.