Pequot Pond Sewer Project
Hampton Ponds Area, Southampton
Validation / Assessment of the 2000 Design

TO: Select Board

FROM: David J. Partridge, PE & William Hardy, PE

COPY: Ed Gibson, Town Administrator / Chief Financial Officer
Gerri Swanson, Public Health Director

DATE: April 29, 2022

1.1 Purpose and Background

In 2000, the Town of Southampton was pursuing the construction and implementation of a sewer collection system to serve the neighborhoods in the Hampton Ponds area of Town. This project, known as the Pequot Pond Sewer Project, was being designed by SEA Consultants, Inc. (SEA), an engineering firm then based in Cambridge, Massachusetts. The project was halted when funding for the project was rejected by Town Meeting. It is our understanding that the design effort for the project was subsequently shelved, although a Sewer Use Charge study was submitted to the Massachusetts Department of Environmental Protection on November 5, 2003 to finalize the work remaining in SEA's design contract with the Town.

With the anticipation that funding may become available for infrastructure projects through the American Rescue Plan Act (ARPA) and other federal and state funding programs, the Town hired Tighe & Bond to assess and validate whether the 2000 sewer design drawings prepared by SEA (hereinafter referenced as the 2000 SEA Design) could be constructed based on current (2022) conditions. This technical memorandum is the deliverable providing that assessment as described in Tighe & Bond's January 26, 2022 proposal, as authorized by the Select Board on March 1, 2022.

The 2000 SEA Design for the Pequot Pond Sewer Project would involve the installation of approximately: 18,200 feet of gravity pipe; 2 pump stations; 3,400 feet of force main; and 1,200 feet of low-pressure force main. Please refer to Figure 1 - Proposed Sewer Layout that which shows the pump station locations, as well as the pipes by type and alignment, and approximate depth of bury for gravity pipes specifically. Based on our review of the drawings in comparison with publicly available GIS mapping, aerial photography, and our March 22 field reconnaissance, the proposed system would provide service along the frontage of approximately 250 parcels, of which approximately 180 have existing buildings upon (predominately residential).

Ultimately the collected sewer flows would discharge to the City of Westfield sewer collection system at its existing New Broadway Street sewer pump station which serves the existing residential neighborhood at the southwest corner of Pequot Pond in Westfield. From there, sewage is pumped into a gravity pipe system which flows to the Long Pond Road Pump Station which pumps flows to the greater City of Westfield sewer collection system which eventually conveys flow to the Westfield Wastewater Treatment Plant located on Neck Road.

1.2 Sewer Design Approach

The 2000 SEA Design took a traditional approach for providing sewer service to a residential neighborhood that has varying topography using gravity sewer pipes along most streets, but still incorporating pump stations and force mains as needed to avoid excessively deep sewers or traverse low points such as depressions or wetlands. For background, the following paragraphs provide a description of the types of sewer conveyances, when they are typically used, and the relative costs for construction as well as operation and maintenance.

Gravity Pipes

Gravity pipe systems are the most common collection method type and are often supplemented by sewer pump stations located at system low points to pump flows to a desired discharge point, such as another gravity system.

Gravity pipes generally flow in the direction of the surface grade. They can be as shallow as 5 feet below grade (to deter against seasonal frost) but can also be more than 20 feet below grade to overcome topography changes, or to reach distant service connections over flat terrain. Construction costs increase as the depth below grade increases. The presence of high groundwater, poor soils, and shallow ledge may be also increase costs. Another significant costs impact is surface restoration (e.g. asphalt, gravel, loam). Operation and maintenance of gravity pipe systems is relatively low, needing only periodic inspections and cleaning.

Service connections from existing buildings served by septic systems would typically be achieved by intercepting the service pipe just outside the building and upstream of the existing septic tank (which could then be abandoned along with the disposal field). From the interception point, the gravity sewer service is installed at a minimum 2% slope (2' vertical/100' horizontal) to the gravity sewer main pipe, at or above the pipe spring line (mid-point). If an existing building's septic system is located below the invert of the fronting gravity line, a grinder pump will be necessary to overcome the grade difference.

Pump Stations

Pump stations are typically located in low spot within a collection system and is used to convey flows to another location that cannot achieved by a gravity pipe. The discharge point of the force main is typically at another gravity collection system at a distance and higher elevation than the pump station. Pump stations are expensive to construct, so they are typically used sparingly. Pump station operation and maintenance is also relatively high with the need for electricity to power the pumps and controls, regular inspections, and maintenance/cleanings as necessary. Mechanical and electrical equipment also need periodic refurbishment or replacement to avoid potential failures. A standby power generator may also be needed to avoid backups within the collection system in the case of an electrical outage.

Force Mains

Force main pipes are used to convey flows from the pump station to the designated discharge points, but do not need to follow surface grades and are used to convey flows over high points or across low-lying areas. They are typically installed at a 5-foot depth (below seasonal frost lines). Instead of manholes, force mains may be accessed and maintained at junction and air-release vaults. Because of their relative shallow depths and smaller diameter pipe sizes, force main construction costs are lower than gravity pipe per linear foot and are correspondingly less likely to be influenced by high groundwater, poor soils, and shallow ledge. Operation and maintenance of force mains are relatively low, needing only periodic inspections and cleaning.

Low Pressure Force Mains

Low pressure force main systems are used where gravity pipe systems may not be feasible due to excessive depths or avoid the need for multiple pump stations which would otherwise drive-up costs for both construction and operation/maintenance. For low pressure systems, each customer would have its own grinder pump to overcome grade changes, with the low-pressure force mains typically discharging to a gravity pipe system.

Similar to force mains associated with pump stations, low pressure force mains do not need to flow in the direction of surface grades and are typically installed at 5-foot depth below grade. Operation and maintenance of low-pressure force mains are also relatively low, needing only periodic (monthly or less frequent) inspections and cleaning.

The cost of individual grinder pumps, with one required at each parcel or building being served, can be a major cumulative cost. Similarly, the operation and maintenance costs for grinder pumps individually may be relatively low, but collectively (system-wide) is very high with the need for electric power for every pump. Individual grinder pumps do not need daily inspections or regular cleanings but will need alarms for emergency service and still need periodic refurbishment or replacement to avoid potential failures. During electrical outages, the grinder pumps will not function, except for those property owners that have emergency standby power.

1.3 Findings

General Layout

The 2000 SEA Design proposed most sewer alignments to be within public rights-of-ways collecting flows along the frontage of each parcel. However, the alignment of some pipes were designed to be "cross-country" across private properties to interconnect the various dead-end roads and neighborhoods.

On March 22, we conducted a field reconnaissance of the entire proposed sewer alignment to determine if there we any impediments to the 2000 SEA Design. Accordingly, we did not find any current conditions that would negatively impact or require change to the 2000 SEA Design alignment (e.g., new buildings constructed at pump station locations or would conflict with the proposed pipe).

Although the City of Westfield has installed a gravity sewer pipe along County Road to flow southward toward Route 202 presumably to service the neighborhood southeast of Pequot Pond, it remains "dry" (not connected to their overall collection system). Although the direction of the force main discharges shown in the 2000 SEA Design could be reversed to pump southward (from the Bluemer Road pump station to the Camp Jahn/Freyer pump station; and then from the Camp Jahn/Freyer Road pump station to the existing County Road "dry" sewer), it would not be viable unless the City of Westfield constructs an additional sewer pump station and approximately 3,600 feet of new force main. Therefore, the 2000 SEA Design approach that would connect into the New Broadway Pump Station is deemed the most viable approach to discharge sewer flows to the City of Westfield sewer collection system.

Gravity Sewer

The 2000 SEA Design generally avoided the use of deep sewer pipes, with approximately 15,000 linear feet of the total 18,200 linear feet (82% of total) at a depth of less than 12 feet. Moderately deep sewers (12 to 16 feet below grade) were designed for approximately 2,700 linear feet (15% of total), and deep sewers (greater than 16 feet below grade) were designed sparingly for approximately 500 linear feet (3% of total). Tighe & Bond concurs this to be a viable approach for incorporating gravity sewers.

Low Pressure Sewer

The 2000 SEA Design depended on the use of low-pressure sewer pipe systems for four segments (two at the end of Freyer Road, one on Belanger Road, and one along Bull Head Pond off Bluemer Road). Tighe & Bond concurs this that providing service for these low-lying areas (especially along waterfront properties) using low pressure sewer force mains is a viable approach to avoid deeper gravity sewers or require additional pump stations.

Pump Stations

The 2000 SEA Design included two pump stations: one in local depression between Camp Jahn Road and Freyer Road that would pump sewage through a force main northward to the gravity system in Bluemer Road, and the other at the low point of Bluemer Road that would pump sewage through a force main westward around the north end of Pequot Pond beneath a swampy area. Tighe & Bond concurs that these pump stations and force main alignments to be the most viable approach to convey sewage collected from the east side of Pequot Pond to the west side which has the closest available connection point to the City of Westfield's sewer collection system at New Broadway Street.

Of note, the proposed pump stations are of packaged dry pit / wet pit type with a drum scrubber with a blower (to deter accumulation of sulfur dioxide and odors) but with no emergency generator (in the case of power outages). Since the wet well storage at each station is approximately only 900 gallons (equivalent to the daily flow of 3 houses), it is recommended if this project moves forth that an emergency generator with sufficient fuel for 72 hours and an automatic power transfer switch is added to each pump stations. This will result in increased cost since an above-ground structure would likely be needed to house these components and controls, as well as additional land space for spacing and access.

Also, human access to the pumps and valves on the dry side of the pump station is subject to OSHA confined space requirements, which would result in more expensive costs for maintenance and emergencies. Therefore, if this project moves forward, Tighe & Bond suggests that the dry pit / wet pit pump type station be replaced with a submersible pump station that does not require human access into the pump station for most maintenance and emergency situations.

Connection to Westfield

Since the Pequot Pond Sewer Project will send sewage to Westfield's sewer collection system for treatment at its wastewater treatment plan, the Town of Southampton would need to have the City of Westfield agree to enter into an Inter-Municipal Agreement (IMA) to establish terms of use for not only of the collection system (pipes and pump stations) but also the wastewater treatment plant. Such terms would include flow volume limits and concentration (residential/commercial/industrial), responsibilities for operation/maintenance, buy-in costs, connection fees, and usage rates.

We contacted the City of Westfield Department of Public Works (Fran Cain, Interim DPW Director and Jeff Gamelli, Deputy Superintendent Water Recovery Division) to inquire if Westfield's sewer collection system and wastewater treatment facility have available capacity to accept additional flows from the Pequot Pond sewer project. We estimated the average daily volume to be 75,000 gallons/day (based on 250 customers each generating an estimated 300 gallons/day). They responded that the New Broadway Pump Station is 32 years old and does not have currently have sufficient capacity to accept the increased flow without significant upgrades, which they roughly estimated would cost $1,000,000. Also, although the downstream Long Pond Road Pump Station and force main may have sufficient pumping capacity for these additional flows, they too are 32 years old would likely need to be upgraded. The City would also need to evaluate the sewer capacity of the gravity system to which it discharges on Buck Pond Road, the cost of which would be determined by the City of Westfield.

Based on their previous experience with providing sewers to a portion of the Town of Southwick into the Westfield system, they acknowledged that negotiating an IMA with the Town of Southampton will be complicated and that the up-front capital and connection costs, as well as continuing fees and usage rates, are difficult to estimate at this time.

With regard to the existing County Road "dry" sewer and connecting to the overall Westfield sewer system, they had no information as to if (or when) the City of Westfield would consider moving forth with that project.

Permitting

Portions of the proposed sewer improvements will occur within areas subject to protection and jurisdiction under the Massachusetts Wetlands Protection Act (MAWPA; M.G.L. Chapter 131, Section 40). While the work to construct utilities (e.g., sewers) within paved or unpaved roadways and driveways is considered an exempt minor activity in Buffer Zone (and Riverfront Area), work within wetland resource areas and Buffer Zones outside paved or unpaved roadways and driveways is not exempt and requires a permit application to the Conservation Commission. Given the extent of work to construct sewer via horizontal directional drilling (HDD) and related temporary and/or permanent land alteration to accommodate construction, we anticipate a Notice of Intent (NOI) will be required.

Though these wetlands and streams are also considered Waters of the United States (WOTUS) and subject to further jurisdiction under the Clean Water Act, we have assumed the use of HDD to span a wetland and that the work will not result in the direct impacts and/or the discharge of dredged and/or fill material to that wetland. As such, the work is not required to obtain authorization under Sections 401 and 404 of the Clean Water Act.

If the project is funded, in part or in whole, by a state agency or program (e.g., State Revolving Fund), and/or will receive a permit from a state agency, and will exceed one or more review thresholds, then it is subject to review under the Massachusetts Environmental Policy Act (MEPA). MEPA provides an overarching consistency review and is not a permit. That said, the MEPA process must conclude before final permits and/or funding from state agencies can be issued.

Since none of the sewer segments in the 2000 SEA design are within state-maintained roads, a MassDOT Access Permit will not be needed for this project.

Since this project would result in the ground disturbance of more than 1 acre, a Construction General Permit for Stormwater Discharges will need to be applied for through the U.S. Environmental Protection Agency.

1.4 Costs

For anticipating the total project cost, we at first escalated the cost estimate for the 2000 SEA Design to account for inflation and increased construction costs that have occurred in the 20-plus years since. Then we provided a separate cost estimate based on Tighe & Bond's own recent experience for similar sewer pipeline and pump station projects.

Original 2000 SEA Design – Adjusted Using Construction Cost Indices

A detailed breakdown of SEA's opinion of probable construction cost was not available for this validation effort. However, in SEA's November 5, 2003 Sewer User Charge Study to MassDEP, the projected costs for the Pequot Pond Sewer Project (referenced as the Phase 1 project) was presented as follows:

TABLE 1
Summary of Total Project Costs per SEA (2003 Sewer Use Charge Study)

Construction	$2,975,000
Contingency (15%)	$445,000
Legal and Administration	$275,000
Land Acquisition	$150,000
Design Engineering	$340,000
Construction Phase Engineering	$405,000
TOTAL	**$4,590,000**

SEA's costs were based on values as of January 2001. Using Engineering News Record (ENR) published Construction Cost Indices (CCI) to update these costs, the current April 2022 ENR-CCI of 12,899 is divided by the origin January 2001 ENR-CCI of 6,281. The resulting factor, 2.054 is then multiplied to the January 2001 SEA total cost ($4,590,000) to yield an updated April 2022 cost of $9,430,000. Although the ENR-CCI is typically just applied to construction, we have applied it to the total original SEA cost (including legal, land, design and construction phase engineering) since at this level of budgetary planning, those values are typically applied as a ratio to construction cost and would therefore increase by the ENR-CCI value correspondingly.

Cost Comparison by Tighe & Bond

For comparison to SEA's updated construction cost using ENR-CCI, we have developed a separate opinion of probable construction cost (OPCC) using quantity take-off or major components of the SEA 2000 Design, primarily pipes (by length, type and depth), restoration of surfaces (paved, gravel, or grass/loam), and pump stations.

- For gravity pipe, the unit cost per linear feet includes the pipe, manholes, services stubs, and trench excavation/backfill/compaction including all labor, materials, equipment, and incidentals (except for surface restoration). The unit costs increase due to depth of pipe, and the resulting slower production rates.

- For force mains (standard and low-pressure), the unit cost per linear feet includes the pipe, services stubs, and trench excavation/backfill/compaction including all labor, materials, equipment, and incidentals (except for surface restoration). Since most force mains are at a typical 5-foot depth there is no adjustments in unit cost based on depth. However, in the case of installation using horizontal directional drilling methods, a premium unit cost was applied due to the specialty equipment and the need to provide access and receiving pits for the drilling equipment and fluids.

- For the two pump stations we provided lump sum costs based on similar sized stations that have emergency generator, transfer switches, and equipment housing.

The detailed breakdown of these quantities and applied unit costs, based on Tighe & Bond's experience on similar sewer pipeline and pump station projects, were used to develop our OPCC is provided in Appendix A. Using the construction cost, we then applied similar percentages that SEA used for contingencies and the other items which are essential for delivering the project (legal, land, design, and construction phase engineering). Table 2 provides that summary of cost.

TABLE 2
Summary of Total Project Costs – Tighe & Bond Opinion (April 2022)

Construction	$9,310,000
Contingency (15%)	$1,400,000
Legal and Administration	$960,000
Land Acquisition	$540,000
Design Engineering	$1,070,000
Construction Phase Engineering	$1,290,000
TOTAL	**$14,570,000**

The total project costs difference between the April 2022 ENR-CCI adjusted SEA cost ($9,430,000) and Tighe & Bond's opinion of cost ($14,570,000) is $5,140,000, or about 55% more than the SEA adjusted cost. Despite the disparity between these two estimates, more defined construction cost would not be ascertained until the project advances through design, permitting, land acquisition, and legal. Furthermore, future trends to both local and global economies may have larger impacts to cost include material and equipment supply chain issues, fuel costs, availability of skilled labor, as well as competition for low-bid construction projects, as is required for municipal projects such as this.

We believe using the Tighe & Bond total project cost of $14,570,000 is more reflective of the current bidding and construction status. Based on this value, the cost per customer would be approximately $58,300 each based on 250 fronting lots, or $80,900 if based on just the 180 occupied lots. This cost is just for the Pequot Pond Sewer System constructed within public right-of-ways and easements and does not include the following:

- Construction costs for individual lots to connect the collection system (pipe laterals, grinder pumps and force mains, abandonment of septic tanks and absorption systems)
- Design and construction costs for upgrades to the receiving City of Westfield system (pump station, pipes, and force mains)
- Connection fees that will be charged directly from the City of Westfield.

Potential Funding Sources

It is understood that the Town is interested in knowing the funding sources that may provide relief in the form or low-interest loans or grants. The following paragraphs provide a list of potentially applicable programs.

American Rescue Plan Act (ARPA) - ARPA was established in 2021 to bring about economic and public health recovery from COVID-19 by creating state and local fiscal recovery funds. In addition to funds that be designated by the Town of Southampton, some projects may be eligible for additional grants directly from the federal government. There are four categories, one of which is to make necessary improvements in water, sewer, or broadband infrastructure for which this project should qualify. Projects must be obligated by December 31, 2024 and completed by December 31, 2026.

Clean Water State Revolving Fund (CWSRF)– The Massachusetts Department of Environmental Protection administers CWSRF loans on behalf Massachusetts Water Pollution Abatement Trust. Of note, ARPA funds were also directed into the CWSRF program to bolster the number of projects to be funded by this project statewide. Traditionally, this competitive program provides funding in the form of low-interest loans (typically 2%) with additional principal forgiveness, typically ranging between 3-20% depending on project type and aspects, socioeconomic status of the population served, and the number of federal contributions to the SRF program that year. In recent years, the SRF program has funded projects exceeding $30,000,000. Sewer extension projects that serve existing neighborhoods with septic system failures are typically receive moderately high priority of the competitive list for projects to be funded each year.

Municipal Vulnerability Preparedness (MVP) Program - The Town of Southampton is a community eligible for MVP program action grants administered by the Massachusetts Office of Energy and Environmental Affairs. The competitive grant program seeks projects to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts. The maximum value of the grant is $3,000,000 per project and requires a 25% participating contribution from the grant-receiving municipality. In the Town of Southampton's MVP proposal submitted in June 2021, two of the "top recommendations" to improve resilience was conduct a risk assessment to identify vulnerable septic systems and to educate owners of private septic systems about operation and maintenance (both categorized as "low priority"). By default, the Pequot Pond Sewer Project would address these issues by construction of a new sewer that would eliminate septic system. The Town should consider re-prioritizing their MVP program to shift these two recommendations in the "high priority" category, so if the Pequot Pond Sewer Project moves forth it, EOEA would rank it higher amongst the competitive list for projects funded each year.

Tighe&Bond
www.tighebond.com

Hampton Ponds Sewer Routing Validation Assessment

Southampton, Massachusetts

LEGEND

GRAVITY SEWER:
- 0'-12' DEEP
- 12'-16' DEEP
- 16'-20' DEEP

L.P. SEWER

FORCE MAIN

PUMP STATION

NOTE:
PROPOSED SEWER PIPE ALIGNMENTS AND PUMP STATION LOCATIONS TAKEN FROM DRAWINGS TITLED "PEQUOT POND SEWER PROJECT" DATED AUGUST 22, 2000 BY SEA CONSULTANTS, INC.

Figure 1

PROPOSED SEWER LAYOUT

PLOT DATE: 4/19/2022 8:33 AM
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Pequot Pond Sewer Project
Southampton, MA

Tighe&Bond

Appendix A
Opinion of Probable Construction Cost
Based on SEA 2000 Design

Street	Station Begin	Station End	Length (ft)	Average Depth	Length	Unit Cost ($/LF)	Extended Cost	Pipe Type	Length	Unit Cost ($/LF)	Extended Cost	Surface Restoration	Unit Cost ($/LF)	Extended Cost	Total Cost ($)
West Side															
New Broadway to PS	263+61	261+82	179	< 12 ft	179	$ 325	$ 58,000					Gravel	$ 40	$ 7,000	$ 65,000
	261+82	260+00	182	12 ft - 16 ft	182	$ 400	$ 73,000					Gravel	$ 40	$ 7,000	$ 80,000
Cottage Avenue	240+00	240+84	84	< 12 ft	84	$ 325	$ 27,000					Gravel	$ 40	$ 3,000	$ 30,000
	240+84	242+20	136	< 12 ft	136	$ 325	$ 44,000					Gravel	$ 40	$ 5,000	$ 49,000
	242+20	243+43	123	12 ft - 16 ft	123	$ 400	$ 49,000					Asphalt	$ 80	$ 10,000	$ 59,000
	243+43	244+27	84	< 12 ft	84	$ 325	$ 27,000					Asphalt	$ 80	$ 7,000	$ 34,000
	244+27	244+85	58	< 12 ft	58	$ 325	$ 19,000					Asphalt	$ 80	$ 5,000	$ 24,000
	244+85	245+61	76	< 12 ft	76	$ 325	$ 25,000					Asphalt	$ 80	$ 6,000	$ 31,000
	245+61	251+36	575	< 12 ft	575	$ 325	$ 187,000					Asphalt	$ 80	$ 46,000	$ 233,000
Bass Cove Road	220+00	221+68	168	12 ft - 16 ft	168	$ 400	$ 67,000					Gravel	$ 40	$ 7,000	$ 74,000
	221+68	226+88	520	> 16 ft	520	$ 500	$ 260,000					Gravel	$ 40	$ 21,000	$ 281,000
	226+88	228+90	202	12 ft - 16 ft	202	$ 400	$ 81,000					Gravel	$ 40	$ 8,000	$ 89,000
	228+90	230+21	131	< 12 ft	131	$ 325	$ 43,000					Gravel	$ 40	$ 5,000	$ 48,000
	230+21	232+26	205	< 12 ft	205	$ 325	$ 67,000					Gravel	$ 40	$ 8,000	$ 75,000
	232+26	232+43	17	< 12 ft	17	$ 325	$ 6,000					Gravel	$ 40	$ 1,000	$ 7,000
Pequot Road	196+62	196+16	46	< 12 ft	46	$ 325	$ 15,000					Asphalt	$ 80	$ 4,000	$ 19,000
	196+16	193+11	305	< 12 ft	305	$ 325	$ 99,000					Asphalt	$ 80	$ 24,000	$ 123,000
	193+11	190+41	270	< 12 ft	270	$ 325	$ 88,000					Asphalt	$ 80	$ 22,000	$ 110,000
	190+41	186+49	392	< 12 ft	392	$ 325	$ 127,000					Asphalt	$ 80	$ 31,000	$ 158,000
	186+49	185+84	65	< 12 ft	65	$ 325	$ 21,000					Asphalt	$ 80	$ 5,000	$ 26,000
	185+84	170+00	1584	< 12 ft	1584	$ 325	$ 515,000					Asphalt	$ 80	$ 127,000	$ 642,000
Cross Country W to E	22+92	18+00	492	< 12 ft	492	$ 325	$ 160,000					Gravel	$ 40	$ 20,000	$ 180,000
	18+00	16+50	150				$ -	FM	150	$ 150	$ 23,000	Gravel	$ 40	$ 6,000	$ 29,000
	16+50	13+53	297				$ -	HDD-FM	297	$ 1,500	$ 446,000	None			$ 446,000
	13+53	8+13	540				$ -	FM	540	$ 150	$ 81,000	Gravel	$ 40	$ 22,000	$ 103,000
	8+13	7+11	102	< 12 ft	102	$ 325	$ 33,000	FM	102	$ 250	$ 26,000	Gravel	$ 40	$ 4,000	$ 63,000
Subtotal Pipe			**6,983**		**5,996**		**$ 2,091,000**		**1,089**		**$ 576,000**			**$ 411,000**	**$ 3,078,000**
Total West Side															**$ 3,078,000**
East Side															
Bluemer Road	160+87	159+13	174				$ -	LPFM	174	$ 120	$ 21,000	Asphalt	$ 80	$ 14,000	$ 35,000
	159+13	158+42	71	< 12 ft	71	$ 325	$ 23,000				$ -	Asphalt	$ 80	$ 6,000	$ 29,000
	158+42	157+93	49	< 12 ft	49	$ 325	$ 16,000	FM	49	$ 150	$ 7,000	Asphalt	$ 80	$ 4,000	$ 27,000
	157+93	156+05	188	< 12 ft	188	$ 325	$ 61,000	FM	188	$ 150	$ 28,000	Asphalt	$ 80	$ 15,000	$ 104,000
	156+05	154+30	175	12 ft - 16 ft	175	$ 400	$ 70,000	FM	175	$ 150	$ 26,000	Asphalt	$ 80	$ 14,000	$ 110,000
	154+30	151+10	320	< 12 ft	320	$ 325	$ 104,000	FM	320	$ 150	$ 48,000	Asphalt	$ 80	$ 26,000	$ 178,000
	151+10	149+67	143	< 12 ft	143	$ 325	$ 46,000					Asphalt	$ 80	$ 11,000	$ 57,000
	149+67	148+21	146	< 12 ft	146	$ 325	$ 47,000					Asphalt	$ 80	$ 12,000	$ 59,000
	148+21	145+17	304	12 ft - 16 ft	304	$ 400	$ 122,000					Asphalt	$ 80	$ 24,000	$ 146,000
	145+17	143+31	186	< 12 ft	186	$ 325	$ 60,000					Asphalt	$ 80	$ 15,000	$ 75,000
	143+31	140+27	304	< 12 ft	304	$ 325	$ 99,000					Asphalt	$ 80	$ 24,000	$ 123,000
	140+27	140+00	27	< 12 ft	27	$ 325	$ 9,000					Asphalt	$ 80	$ 2,000	$ 11,000
Bull Head Road	160+00	160+40	40	12 ft - 16 ft	40	$ 400	$ 16,000					Asphalt	$ 80	$ 3,000	$ 19,000
	160+40	163+59	319	< 12 ft	319	$ 325	$ 104,000					Asphalt	$ 80	$ 26,000	$ 130,000
Force Main	17+52	15+50	202	< 12 ft	202	$ 325	$ 66,000					Gravel	$ 40	$ 8,000	$ 74,000
	15+50	11+50	400				$ -	LPFM	400	$ 150	$ 60,000	Loam	$ 20	$ 8,000	$ 68,000
	15+50	9+75	575				$ -	FM	575	$ 150	$ 86,000	Loam	$ 20	$ 12,000	$ 98,000
Camp Jahn Road	121+45	120+80	65	< 12 ft	65	$ 325	$ 21,000					Asphalt	$ 80	$ 5,000	$ 26,000
	120+80	120+22	58	< 12 ft	58	$ 325	$ 19,000					Asphalt	$ 80	$ 5,000	$ 24,000
	120+22	119+76	46	< 12 ft	46	$ 325	$ 15,000					Asphalt	$ 80	$ 4,000	$ 19,000
	119+76	117+78	198	< 12 ft	198	$ 325	$ 64,000	FM	198	$ 150	$ 30,000	Asphalt	$ 80	$ 16,000	$ 110,000
	117+78	114+94	284	12 ft - 16 ft	284	$ 400	$ 114,000	FM	284	$ 150	$ 43,000	Asphalt	$ 80	$ 23,000	$ 180,000
	114+94	113+61	133	< 12 ft	133	$ 325	$ 43,000	FM	133	$ 150	$ 20,000	Asphalt	$ 80	$ 11,000	$ 74,000
	113+61	112+81	80	12 ft - 16 ft	80	$ 400	$ 32,000					Asphalt	$ 80	$ 6,000	$ 38,000
	112+81	110+00	281	< 12 ft	281	$ 325	$ 91,000					Asphalt	$ 80	$ 22,000	$ 113,000
Camp Jahn Road Ext	135+08	131+69	339	< 12 ft	339	$ 325	$ 110,000					Gravel	$ 40	$ 14,000	$ 124,000
	131+69	130+00	169	< 12 ft	169	$ 325	$ 55,000					Gravel	$ 40	$ 7,000	$ 62,000
Easement	108+68	107+63	105	12 ft - 16 ft	105	$ 400	$ 42,000	FM	105	$ 150	$ 16,000	Gravel	$ 40	$ 4,000	$ 62,000
	107+63	107+30	33	< 12 ft	33	$ 325	$ 11,000	FM	33	$ 150	$ 5,000	Gravel	$ 40	$ 1,000	$ 17,000
	107+30	105+17	213	< 12 ft	213	$ 325	$ 69,000	FM	213	$ 150	$ 32,000	Gravel	$ 40	$ 9,000	$ 110,000
	105+17	101+93	324	< 12 ft	324	$ 325	$ 105,000					Loam	$ 20	$ 6,000	$ 111,000
	101+93	100+00	193	< 12 ft	193	$ 325	$ 63,000					Loam	$ 20	$ 4,000	$ 67,000
Freyer Road	94+95	92+93	202				$ -	LPFM	202	$ 120	$ 24,000	Asphalt	$ 80	$ 16,000	$ 40,000
	92+93	91+38	155	< 12 ft	155	$ 325	$ 50,000					Asphalt	$ 80	$ 12,000	$ 62,000
	91+38	89+46	192	< 12 ft	192	$ 325	$ 62,000					Asphalt	$ 80	$ 15,000	$ 77,000
	89+46	84+05	541	12 ft - 16 ft	541	$ 400	$ 216,000					Asphalt	$ 80	$ 43,000	$ 259,000
	84+05	81+38	267	< 12 ft	267	$ 325	$ 87,000					Asphalt	$ 80	$ 21,000	$ 108,000
	81+38	80+00	138	< 12 ft	138	$ 325	$ 45,000					Asphalt	$ 80	$ 11,000	$ 56,000
Beccarri Lane	60+00	61+59	159	12 ft - 16 ft	159	$ 400	$ 64,000					Loam	$ 20	$ 3,000	$ 67,000
	61+59	62+55	96	12 ft - 16 ft	96	$ 400	$ 38,000					Asphalt	$ 80	$ 8,000	$ 46,000
	62+55	66+43	388	< 12 ft	388	$ 325	$ 126,000					Asphalt	$ 80	$ 31,000	$ 157,000
	66+43	67+00	57	12 ft - 16 ft	57	$ 400	$ 23,000					Asphalt	$ 80	$ 5,000	$ 28,000
Couture Road	67+00	68+69	169	12 ft - 16 ft	169	$ 400	$ 68,000					Asphalt	$ 80	$ 14,000	$ 82,000
	68+69	74+06	537	< 12 ft	537	$ 325	$ 175,000					Asphalt	$ 80	$ 43,000	$ 218,000
	74+06	74+49	43	< 12 ft	43	$ 325	$ 14,000					Asphalt	$ 80	$ 3,000	$ 17,000
Aimee Ave (Belanger?)	40+00	43+23	323	< 12 ft	323	$ 325	$ 105,000					Asphalt	$ 80	$ 26,000	$ 131,000
	43+23	43+82	59	12 ft - 16 ft	59	$ 400	$ 24,000					Asphalt	$ 80	$ 5,000	$ 29,000
Aimee Rd	50+00	54+10	410	< 12 ft	410	$ 325	$ 133,000					Asphalt	$ 80	$ 33,000	$ 166,000
	54+10	54+87	77	< 12 ft	77	$ 325	$ 25,000					Asphalt	$ 80	$ 6,000	$ 31,000
Belanger Rd	30+00	34+30	430				$ -	LPFM	430	$ 120	$ 52,000	Asphalt	$ 80	$ 34,000	$ 86,000
	34+30	35+37	107	< 12 ft	107	$ 325	$ 35,000					Asphalt	$ 80	$ 9,000	$ 44,000
	35+37	36+00	63	< 12 ft	63	$ 325	$ 20,000					Asphalt	$ 80	$ 5,000	$ 25,000
	36+00	37+80	180	< 12 ft	180	$ 325	$ 59,000					Asphalt	$ 80	$ 14,000	$ 73,000
County Road	+	3+43	343	< 12 ft	343	$ 325	$ 111,000					Asphalt	$ 80	$ 27,000	$ 138,000
	4+89	6+55	166	< 12 ft	166	$ 325	$ 54,000					Asphalt	$ 80	$ 13,000	$ 67,000
	9+04	11+00	196	< 12 ft	196	$ 325	$ 64,000					Asphalt	$ 80	$ 16,000	$ 80,000
	11+00	13+10	210	< 12 ft	210	$ 325	$ 68,000					Asphalt	$ 80	$ 17,000	$ 85,000
	13+10	14+08	98	< 12 ft	98	$ 325	$ 32,000					Asphalt	$ 80	$ 8,000	$ 40,000
	14+08	16+72	264	< 12 ft	264	$ 325	$ 86,000					Asphalt	$ 80	$ 21,000	$ 107,000
	16+72	18+67	195	< 12 ft	195	$ 325	$ 63,000					Asphalt	$ 80	$ 16,000	$ 79,000
	18+67	18+87	20	< 12 ft	20	$ 325	$ 7,000					Asphalt	$ 80	$ 2,000	$ 9,000
Subtotal Pipe - East Side			**12,229**		**10,448**		**$ 3,551,000**		**3,479**		**$ 498,000**			**$ 838,000**	**$ 4,887,000**
Grinder Pumps			12			$ 12,000	$ 144,000								$ 144,000
Pump Stations			2			$ 600,000	$ 1,200,000								$ 1,200,000
Total East Side															**$ 6,231,000**
TOTAL CONSTRUCTION			**19,212**		**16,444**		**$ 2,091,000**		**4,568**		**$ 576,000**			**$ 411,000**	**$ 9,310,000**

Gravity Pipe Cost by Depth	
Range	Unit Cost
< 12 ft	$325
12 ft - 16 ft	$400
> 16 ft	$500

Force Main Pipe Cost by Type		
Type	Range	Unit Cost
LPFM	Low Press	$120
FM	Force Main	$150
FM-HDD	Hor. Dir. Dr.	$1,500

Restoration Cost	
Material	Unit Cost
Loam	$20
Gravel	$40
Asphalt	$80

Contingency (15%)	**$ 1,400,000**
Total with Contingency	**$ 10,710,000**
Legal and Administration (9%)	$ 960,000
Land Acquisition (5%)	$ 540,000
Survey, Design and Permitting (10%)	$ 1,070,000
Construction Admin. and Observ. (12%)	$ 1,290,000
Total Legal/Land/ Engineering/Admin	**$ 3,860,000**
GRAND TOTAL	**$ 14,570,000**

Note: Quantity take-off for pipe type, depths were taken from drawings titled Pequot Pond Sewer Project, dated August 22, 2000 by SEA Consultants Inc. Restoration costs based on surface type observed by Tighe & Bond field reconnaissance March 2022.