HALIFAX TOWNSHIP
ACT 537 OFFICIAL SEWAGE FACILITIES PLAN
Dauphin County, Pennsylvania

ENVIRONMENTAL REPORT

1.0 PROJECT DESCRIPTION AND NEED

1.1 Purpose of and Need for Project

Enacted by Pennsylvania Legislature in 1966, The Pennsylvania Sewage Facilities Act (Act 537) requires every municipality within the Commonwealth to develop and maintain an up-to-date Sewage Facilities Plan. Halifax Township, Dauphin County, Pennsylvania, has not previously adopted a Sewage Facilities Plan and has authorized the preparation of this Environmental Report as a portion of the Act 537 Official Sewage Facilities Plan (Act 537 Plan) for the Township of Halifax (Township). This authorization was a voluntary decision primarily based on mandated requirements, but also due to growth patterns, increasing sewage disposal needs of the Township and to be consistent with other municipal planning objectives set forth by the Township. The Act 537 Plan examines options for extending public sanitary sewer to areas of the Township currently served by OLDS. The Planning Area for this Act 537 Plan (Planning Area) consists of Halifax Township in its entirety, a map of which is provided in Section 6.0 of this Report.

A majority of the properties in Halifax Township are served by private On-Lot Sewage Disposal Systems (OLDS). Some of these systems were installed prior to the enactment of Title 25 and are not permitted systems. A majority of the systems appear to be functioning properly; however, a few systems installed after permitting regulations appear to be malfunctioning. The ability for a system to function properly depends on the construction techniques used during the installation of the system and subsequently the preventative maintenance applied to the system throughout its life. As further described below, there are also five (5) additional sewerage system and wastewater treatment facilities that are located within the Township.

This Report has been prepared in accordance with the *Guidelines for the Uniform Environmental Review Process in Pennsylvania* published by the Pennsylvania Department of Environmental Protection (PA DEP). Section 1.0 of the Report summarizes activities and analyses completed during preparation of the Halifax Township Act 537 Plan. A summary of alternatives considered by the Act 537 Plan is included as Section 2.0 of this Report. Environmental consequences of the alternatives selected for implementation by the Act 537 Plan are included in Section 3.0 of this Report.

1.1.1 Existing Community Wastewater Facilities

There are currently five (5) community sewage systems and wastewater treatment facilities located within Halifax Township, both municipal and non-municipal. Maps containing the locations of these areas are provided in Section 6.0 of this Report. The majority of the Township utilizes on-lot disposal systems as further described in Section 1.1.4.

The sewerage systems and facilities consist of the following:

1. Lenker Estates

   a. The Lenker Estates sewage system is located within the Lenker Estates Subdivision between Peters Mountain Road (SR 225) and South River Road (SR 147). The Lenker Estates facility is currently owned by Lenker Estates Homeowners Assoc. This is a non-municipal system that consists of a collection system serving a subdivision with a planned capacity of 105 individual residential lots and 4 townhouses consisting of 6 units each. The subdivision currently contains 53-58 EDUs and when fully developed will contain approximately 150 EDUs. The collection system consists of 8-inch gravity sewer piping, manholes, and approximately 4 grinder pumps. All of the flows are collected and conveyed to a non-municipal wastewater treatment facility with a designed capacity of 0.046MGD. The treated sewage is discharged into an Unnamed Tributary to Susquehanna River located at 40°26'41.00"N 76°56'22.00"W.

   b. The wastewater treatment facility (PA0246816) utilizes an activated sludge process for wastewater treatment and chlorination/de-chlorination methods for disinfection. NPDES effluent limits for this facility are provided in Table 1-1. The components of this facility include:

      i. Four Cromaglass CA-150 modules
      ii. A two-inch Netafim filter system,
      iii. Sludge Holding tank
      iv. Chlorine disinfection and dechlorination
      v. Aerated sample tank

   c. A Notice of Violation was issued by PADEP on July 21, 2016 for the Lenker Estates Facility. During an inspection conducted on July 6, 2016, the following violations were noted: plant records were not available for review, Outfall 001 was inaccessible, the Netafim filters were taken offline without notification to PADEP. Through the review of the DMRs, there were additional discharge violations including: TSS exceeded monthly average permit limit (February 2016 and March 2016), Fecal Coliform exceeded geo. mean permit limit (February 2016), TRC exceeded monthly average permit limit (March 2016, April 2016, and May 2016). It is unknown at this time if further discharge violations were observed to date.

   d. There are plans in place to expand the current WWTP to meet the capacity for all potential users, but the expansion schedule is unknown at this time.

Table 1-1 NPDES Effluent Limits and Discharge Characteristics for the Lenker Estates WWTP

Parameter	NPDES Effluent Limits[1]
pH (standard units)	6.0 (minimum) 9.0 (Daily Max)
DO, mg/L	5.0 (minimum)
CBOD, mg/L	10 (monthly) [1] 20 (IMAX)
TSS, mg/L	10 (monthly) [1] 20 (IMAX)
Fecal Coliform, #/100 ml (summer) [2]	200 (geo mean) 1,000 (IMAX)
Fecal Coliform, #/100 ml (winter) [2]	2,000 (geo mean) 10,000 (IMAX)
Ammonia-Nitrogen, mg/L (summer) [3]	2.0 (monthly) [1] 4.0 (IMAX)
Ammonia-Nitrogen, mg/L (winter) [3]	6.0 (monthly) [1] 12 (IMAX)
TRC, mg/L	0.03 (monthly) [1] 0.1 (IMAX)

Notes:

[1] NPDES Permit Discharge Limits, average monthly values.
[2] Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.
[3] Summer limits from May 1 to October 31. Winter limits from November 1 through April 30.

2. Camp Hebron

a. Camp Hebron is located along Powell Creek in the southeastern corner of Halifax Township. The Camp Hebron sewage collection, conveyance and treatment facilities, which serve Camp Hebron (a camping facility). The collection system is comprised of 8-inch PVC gravity piping and manholes. The treatment plant has an annual capacity of 0.0194MGD and a monthly max. capacity of 0.0249MGD. The treated sewage is discharged into Powell Creek located at 40°26'3.13"N 76°53'57.93"W.

b. The wastewater treatment facility (PA0088536) utilizes an activated sludge process for wastewater treatment and chlorination/de-chlorination methods for disinfection. NPDES effluent limits for this facility are provided in Table 1-2.

c. There are no existing problems or planned expansions at this facility that are known at this time.

Table 1-2 NPDES Effluent Limits and Discharge Characteristics for the Camp Hebron WWTP

Parameter	NPDES Effluent Limits[1]
pH (standard units)	6.0 (minimum) 9.0 (Daily Max)
DO, mg/L	5.0 (minimum)
CBOD, mg/L	25 (monthly) [1] 50 (IMAX)
TSS, mg/L	30 (monthly) [1] 60 (IMAX)
Fecal Coliform, #/100 ml (summer) [2]	200 (geo mean) 1,000 (IMAX)
Fecal Coliform, #/100 ml (winter) [2]	2,000 (geo mean) 10,000 (IMAX)
TRC, mg/L	0.5 (monthly) [1] 1.6 (IMAX)

Notes:

[1] NPDES Permit Discharge Limits, average monthly values.

[2] Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.

3. The Alex Acres Mobile Home Park

a. Sewage collection and conveyance system conveys wastewater from the Alex Acres Mobile Home Park to the Alex Acres Mobile Home Park WWTP. The Alex Acres Mobile Home Park WWTP has a design capacity of 0.040MGD. The size of the force main and collection system piping is unknown. This WWTP discharges to Gurdy Run located at 40°29'41.25"N 76°56'15.20"W.

b. The wastewater treatment facility (PA0034754) utilizes an activated sludge process for wastewater treatment and chlorination/de-chlorination methods for disinfection. NPDES effluent limits for this facility are provided in Table 1-3. The components of this facility include:

i. Screening
ii. Three (3) Cromaglass CA-150 modules
iii. Sludge Holding tank

iv. 5,000 Gallon chlorine Contact Tank for Chlorine disinfection and dechlorination

c. There are no existing problems or planned expansions at this facility that are known at this time. An inspection completed by PADEP on June 9, 2016 concluded that there were no violations evident at the time of inspection.

Table 1-3 NPDES Effluent Limits and Discharge Characteristics for the Alex Acres WWTP

Parameter	NPDES Effluent Limits[1]
pH (standard units)	6.0 (minimum) 9.0 (Daily Max)
DO, mg/L	5.0 (minimum)
CBOD, mg/L	25 (monthly) [1] 50 (IMAX)
TSS, mg/L	30 (monthly) [1] 60 (IMAX)
Fecal Coliform, #/100 ml (summer) [2]	200 (geo mean) 1,000 (IMAX)
Fecal Coliform, #/100 ml (winter) [2]	2,000 (geo mean) 10,000 (IMAX)
TRC, mg/L	0.5 (monthly) [1] 1.0 (IMAX)

Notes:

[1] NPDES Permit Discharge Limits, average monthly values.

[2] Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.

4. Strohecker MHP (Halifax Village LLC)

a. The Strohecker MHP is located on South Elmer road off of Route 147 and is currently owned by John and Zonya Stoltzfus of Halifax Village LLC. The Strohhecker MHP is a non-municpal facility that consists of a collection system serving a 50-unit mobile home pack and a motel. The motel has a pumping station that utilized two – 3HP submersible grinder pumps capable of pumping at a rate of 80gpm at 60 feet of TDH and has a design flow of 0.004915MGD and a maximum design flow rate of 0.009830MGD. All of the flows collected for this facility are conveyed to a non-municipal wastewater treatment facility with designed for 0.062MGD. The size of the force main and collection system piping is unknown. The treated sewage is discharged into an Unnamed Tributary to Susquehanna River located at 40°30'27.00"N 76°57'12.00"W.

b. The wastewater treatment facility (PA0084492) utilizes an activated sludge

process for wastewater treatment and chlorination/de-chlorination methods for disinfection. NPDES effluent limits for this facility are provided in Table 1-4. The components of this facility include:

i. A screening unit
ii. A 10,470-gallon non-aerated equalization tank
iii. A 31,239-gallon aeration tank that utilizes diffused air
iv. A 10,772-gallon clarifier
v. A tablet type chlorinator and de-chlorination feeder
vi. A 628-gallon chlorine contact tank
vii. Equalization tank
viii. Aerobic sludge digester

c. There are no existing problems at this facility that are known at this time. An inspection conduct by PADEP concluded that there were no violations observed at the time of inspection.

Table 1-4 NPDES Effluent Limits and Discharge Characteristics for the Strohecker's WWTP

Parameter	NPDES Effluent Limits[1]
pH (standard units)	6.0 (minimum) 9.0 (IMAX)
DO, mg/L	5.0 (minimum)
CBOD, mg/L	25 (monthly) [1] 50 (IMAX)
TSS, mg/L	30 (monthly) [1] 60 (IMAX)
Fecal Coliform, #/100 ml (summer) [2]	200 (geo mean) 1,000 (IMAX)
Fecal Coliform, #/100 ml (winter) [2]	2,000 (geo mean) 10,000 (IMAX)
Ammonia-Nitrogen, mg/L (summer) [3]	2.5 (monthly) [1] 5.0 (IMAX)
Ammonia-Nitrogen, mg/L (winter) [3]	7.5 (monthly) [1] 15 (IMAX)
TRC, mg/L	0.06 (monthly) [1] 0.21 (IMAX)

Notes:

[1] NPDES Permit Discharge Limits, average monthly values.

[2] Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.

(3) Summer limits from May 1 to October 31. Winter limits from November 1 through April 30.

5. The Halifax Area Water and Sewer Authority (HAWSA)

   a. The HAWSA sewage collection and conveyance system conveys wastewater to the Authority's wastewater treatment plant that discharges to the Susquehanna River. The Authority's system serves the entire Borough of Halifax and areas in Halifax Township immediately surrounding the Borough including the developed area along Route 147 extending north from the Borough, the Halifax School District facilities located immediately south of the Borough, and Routes 147 and 225 corridor extending south to the Sheetz convenience store.

      i. The HAWSA collection and conveyance system predominantly consists of 8-inch gravity sewer main and two (2) interceptors each comprised of 10-inch gravity sewer main. The main interceptor/north interceptor is located on Front Street and conveys all of the flows from the Borough and the northern Halifax Township service area to the Main Pumping Station. The south interceptor/south sewer extension conveys flows from the southern Halifax Township service area directly to the HAWSA wastewater treatment plant and is located along Peters Mountain Road.

   b. HAWSA utilizes two (2) pump stations throughout the sanitary sewer system. The pump stations are maintained and inspected by the operators on a regular basis. Cleaning, repairs, and routine maintenance items are performed as needed.

      i. **The Boyer Street Pump Station** was upgraded to submersible pumps at the end of 2014 and began operations in 2015. The single phase pumps run full speed. Attached runtime records indicate total runtime for the station is typically around 2 hours per week, usually divided equally between the pumps. There are no known future connections to the pump station in the next 2-year planning period. The Boyer Street Pump station has a 50 gpm design capacity and a 4-inch force main.

      ii. **Main Pumping Station** located at the HAWSA WWTP, conveys all flow from the Borough and the northern Halifax Township service area (including flows from Boyer Street Pumping Station). There are two (2) suction lift pumps with separate 4-inch suction lines, discharging into a single 4-inch force main. The pumps are variable speed based on use of variable frequency drives, so only maximum flows can be estimated based on runtime. Due to the small size of the force main, 2 pumps on represents a much lower flow rate than twice one-pump flow. The Main Pumping Station is currently in an overloaded condition. In accordance with the existing Corrective Action Plan (CAP) and Consent Order and Agreement (COA) developed for the WWTP, improvements to the Main Pumping Station are currently being evaluated, design, and will be addressed as

part of the WWTP Upgrade Project. The design capacity of the Main Pumping Station is currently 175 gpm and the pumping station's peak hourly flow is approximately 240 gpm.

c. The HAWASA WWTP (PA0024457) is located near 307 S Front Street within the Borough of Halifax. The plant utilizes an activated sludge process for wastewater treatment and chlorination/de-chlorination methods for disinfection. The treated sewage is discharged into the Susquehanna River located at 40°27'50.41"N 76°56'12.00"W.

i. The WWTP is rated at 0.21MGD and is composed of an influent wet well and pumping station, a comminutor and bar screen, two (2) reactor tanks (each with a central clarifier and ringed by aerated zones and an aerobic sludge digester for biological treatment), control building connected to the chlorine contact tank, and sludge beds.

ii. A Consent Order and Agreement (COA) was issued by PA DEP on January 10, 2018 for WWTP effluent violations occurring between March 2013 and September 2017, HAWASA submitted a formal comment letter dated January 31, 2018 requesting revisions to the draft COA. The Authority's engineering consultant is currently preparing the draft Design Engineer's Report and Uniform Environmental Report for the WWTP Upgrade project and has met with equipment manufacturers to review process treatment alternatives for the project. Alternatives under review for the new WWTP process include Main Pumping Station improvements, Screenings addition, Biological Nutrient Removal (BNR) process improvements, Ultraviolet Light (UV) Disinfection, and solids processing – aerobic sludge digestion improvements. For purposes of obtaining a thorough understanding of the Halifax Township planning efforts, the upgrades to the WWTP are on hold until the Halifax Township's Act 537 Plan is adopted.

Table 1-5 NPDES Effluent Limits and Discharge Characteristics for HAWSA's WWTP

Parameter	NPDES Effluent Limits
pH (standard units)	6.0 (minimum) 9.0 (IMAX)
DO, mg/L	5.0 (minimum)
CBOD, mg/L	25.0 (monthly) (1) 40.0 (weekly) (2) 50 (IMAX)
TSS, mg/L	30 (monthly) (1)

	45.0 (weekly) **(2)** 60 (IMAX)
Fecal Coliform, #/100 ml (summer) (3)	200 (geo mean) 1,000 (IMAX)
Fecal Coliform, #/100 ml (winter) (3)	2,000 (geo mean) 10,000 (IMAX)
TRC, mg/L	0.5 (monthly) **(1)** 1.6 (IMAX)

Notes:

(1) NPDES Permit Discharge Limits, average monthly values.

(2) NPDES Permit Discharge Limits, average weekly values.

(3) Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.

1.1.3 Existing Individual On-Lot Systems

Based on the well water and sewage survey performed for the preparation of this Plan, there are several types of on-lot sewage disposal systems in use within the Township, including septic tank with conventional trench or bed system, elevated sand mound, cesspool, and seepage pit. In addition, there are gray water disposal systems in use in the Township, including conventional bed systems, seepage pits, bore holes and pipe to surface or ditch.

1.1.4 Types of On-lot Disposal Systems in Use

Halifax Township utilizes on-lot disposal systems (OLDS) for treatment and disposal of domestic wastewater. The type of system implemented varies, but is classified as one of the following:

- **In-Ground** – Systems consisting of absorption areas, trenches and other disposal systems that rely solely on the surrounding soil for treatment.

- **Elevated Sand Mound** – Systems utilizing a bed of sand, elevated above the existing surface, to enhance the treatment provided by the underlying soil.

- **Holding Tanks** – Holding tanks and privies that require periodic pumping for removal of waste and residual solids.

- **Aerobic Treatment Tanks** – Systems that use either mechanical or diffused aeration to increase the level of effluent treatment by encouraging aerobic bacteria growth prior to treatment provided by the underlying soil of a drainage field.

Types of systems observed during the sanitary survey (as described in Section 1.1.5) included:

1. Standard in-ground systems (septic tank with below-grade seepage bed).
2. Elevated sand mounds (septic tank with above-grade seepage bed).

3. Packaged wastewater treatment facility.
4. Greywater discharge directed to boreholes or surface.
5. Holding tanks.
6. Cesspools.

Current regulations regarding on-lot disposal systems began in 1966, and most systems that were installed before 1972 did not use best available technologies or methods that would be acceptable today.

As previously noted, the soil limitations within the Township for the on-lot disposal of effluent from septic tanks is moderate to severe. In addition, based on the limitations of slope and useable soil depth, many of the newer on-lot disposal sites within the Township required elevated sand mound installations.

The Township has ordinances for the periodic maintenance of holding tanks and privies; however, the Township does not have ordinances for the periodic maintenance requirements for the on-lot sewage disposal systems.

1.1.5 Public Health Needs

The DEP has designated "public health needs" as a general needs category relating to sewage disposal that must be considered. The definitions and requirements stated in this section are taken from the DEP's SDNIG document. Public health needs are considered to be those health hazards and water pollution problems that involve discharging untreated or inadequately treated sewage to the surface of the ground or waters of the Commonwealth, including groundwater. Most commonly, these needs are found to be malfunctioning OLDS and malfunctioning community on-lot disposal systems (COLDS). On-lot disposal system malfunctions are classified into three categories: confirmed, suspected, and potential. When determining the public health needs of an area using OLDS/COLDS, all systems inventoried, mapped, and analyzed must be placed into one of four categories:

1. Confirmed Malfunctions are malfunctions documented by dye testing, laboratory test results, observation by a Sewage Enforcement Officer (SEO) or a professional with experience in OLDS, "Best Technical Guidance" repair permits, and seasonally wet absorption areas. Also included are piped discharges from a single structure with direct evidence of sewage (i.e. direct observation of soap suds, food residue, solids, odors, etc.), reported system backups, malfunctions with photographic documentation, or other similar evidence.

2. Suspected Malfunctions are systems exhibiting some malfunction characteristics such as abnormally green grass in the vicinity of an absorption area, piped discharges from a dwelling without direct evidence of sewage (i.e. no observation of soap suds, food residue, solids, odors, etc.), absorption areas located in known unsuitable soils (observed wetlands, rock outcropping, etc.), cesspools in high-density development areas, and pit

privies.

3. Potential Malfunctions are systems that appear to be operating satisfactorily but were constructed prior to system permitting requirements, systems located in areas extremely unlikely to receive permitting by current standards, systems constructed in areas having soils mapped as unsuitable or with severe limitations for OLDS and systems located on exceptionally steep slopes greater than 25 percent. Included as potential malfunctions are permits issued for OLDS repairs that meet Chapter 73 standards. While this needs category does not represent "stand alone" existing needs, the information may be utilized in a needs analysis to locate areas affected by poorly defined adverse circumstances. For example, clusters of legitimate repairs will often indicate areas requiring closer scrutiny.

4. No Malfunction are those systems that appear to be operating satisfactorily, were constructed since the implementation of system permitting requirements, and appear to have been constructed in accordance with the permitting requirements in effect at the time of construction. For the purpose of needs identification, OLDS permitting under Act 537 became effective on May 15, 1972.

Several other situations exist that must be inventoried, mapped, and analyzed when identifying public health needs for an Act 537 Official Plan or Plan Update Revision. These include wildcat sewers, borehole disposal, holding tanks, public complaints, and sanitation-related illnesses.

1. Wildcat Sewers are collection systems (community sewers) serving more than one equivalent dwelling unit (EDU) and discharging untreated or partially treated sewage to the surface of the ground, storm sewers, or other waters of the Commonwealth.

2. Borehole Disposal is an individual or community system that discharges to a borehole, abandoned water well, dry well, ventilation shaft, or other subterranean structure.

3. Holding Tanks are watertight receptacles designed to retain sewage for disposal at another location. All holding tanks installed as repairs are counted as "needs." Specifically excluded are holding tanks installed to serve new land development or low flow commercial facilities. While not actually discharging sewage into the environment, properly maintained holding tanks, when used in OLDS repair situations, are included in the confirmed malfunction category.

4. Public Complaints are legitimate complaints received by the PA DEP or the municipality concerning improper sewage disposal. The number, nature, and location of public complaints concerning improper sewage disposal are important, yet often overlooked indicators of sewage disposal problem areas.

5. Sanitation Related Illness is any reported illness, either resulting from or suspected to be resulting from improper sewage disposal. Records and incidents in which polluted water

supplies have been suspected or confirmed as the cause of disease is documentation establishing a community's wastewater treatment needs. Confirmed or suspected vector-borne disease that may be attributed to surface ponding of sewage should also be considered.

1.1.6 Sanitary Survey

As part of the planning work for this Act 537 Plan, sanitary surveys were conducted throughout Halifax Township in order to determine the extent of the conditions as stated above in Halifax Township that could endanger public health, sanitary sewage surveys were completed in the areas within the Township that are utilizing OLDS. There are approximately 1,002 homes in Township currently served by OLDS. OLDS sanitary surveys of 575 (308 door-to-door) individual properties within the Township were conducted during the original Act 537 planning effort by Kurowski & Wilson, LLC. In accordance with the SDNID, a Tier 1 survey was conducted for the entire Borough and more than 50% of the OLDS were surveyed 308 door-to-door OLDS surveys were conducted to exceed the minimum acceptable survey rate set by DEP (15%) as shown in Table 1-6. According to the SDNIG document, a recommended minimum number of properties with OLDS within each Sewage Management Area (SMA) should be surveyed in order to conduct a "representative", or "valid" door-to-door sanitary sewage survey of the SMA. The minimum percentage of the properties that should be surveyed varies with the total number of properties in the SMA in accordance with the requirements published in the SDNIG (Table 1-6).

Herbert, Rowland, and Grubic Inc. (HRG) re-evaluated approximately 10% of the sanitary sewage surveys to confirm the data gathered by Kurowski & Wilson, LLC. The Act 537 Sewage Disposal Needs Identification Guidance (SDNIG) document published by the DEP (latest edition) was utilized as the basis for performing the Sanitary Surveys. A map representing the results of the Surveys is presented in Section 6.0 of this Report, a summary of the results is presented in Table 1-7 and Table 1-8, and a detailed tabulation of the results is presented in Section 6.0 of this Report.

Table 1-6 Minimum OLDS Requirements for Door-To-Door Sanitary Survey – Tier 2

OLDS in the SMA	Minimum Percentage of OLDS to Survey
Up to 50	50%
51 to 100	35%
101 to 500	25%
501 to 1,000	20%
Greater than 1,000	15%

For preparation of this Plan, 32 OLDS door-to-door surveys were conducted again to confirm the results of the original planning effort and to further identify the possible influence of the malfunctioning on-lot sewage disposal systems on the water supply. A summarization of the

original OLDS surveys is presented in Table 1-7. A summarization of the door-to-door surveys completed by HRG is presented in Table 1-8. Detailed spreadsheets containing survey data and a map showing the survey results is included in Section 6.0 of this Report.

Table 1-7 Original OLDS Survey Data

SFPA (Original)	Developed Lots	Surveys Sent	% of Total Lots	Surveys Received		*Approximate # of Sewer Customers		Lots with OLDS	# of Door-to-Door Surveys Needed		# of Site Visit Made		Ave. Age of OLDS (years)	Grey Water	No Malfunction	Potential Malfunction	Suspected Malfunction	Confirmed Malfunction
Matamoras	131	126	96%	42	33%	7	17%	109	25%	27	43	158%	33	4	34	15	11	5
Triangle and Lenker Estates	69	69	100%	29	42%	2	7%	64	35%	22	23	102%	32	1	23	5	3	2
Routes 147 and 225	114	105	92%	47	45%	20	43%	65	35%	23	26	113%	27	1	34	5	5	2
Dusty Trail	18	18	100%	1	6%	0	0%	18	50%	9	9	100%	15	0	8	0	1	0
Fetterhoff Church	74	74	100%	29	39%	1	3%	71	35%	25	26	104%	15	0	43	1	3	2
Hill Top - Round Top	35	35	100%	11	31%	0	0%	35	50%	16	18	113%	16	0	25	0	0	0
Tourist Park	125	125	100%	31	25%	64	51%	61	25%	15	15	100%	15	0	26	5	4	1
147-McClelland Road	58	58	100%	12	21%	2	17%	56	35%	20	20	100%	20	2	20	3	1	2
General	747	747	100%	232	31%	70	30%	522	20%	104	128	123%	104	10	194	29	16	14
		1357		434	32%			1002										
Total	**1371**								**Total**	**262**	308	117%		**18**	**407**	**63**	**44**	**28**

*The approximate number of sewer customers was calculated by using the survey results

Table 1-8 Original OLDS HRG Survey Data vs Original Data

SFPA (Original)	Surveys	Confirmed Malfunction (Original)	Confirmed Malfunction	Suspected Malfunction (Original)	Suspected Malfunction	Potential Malfunction (Original)	Potential Malfunction	No Malfunction (Original)	No Malfunction
Matamoras	10	0	0	1	1	0	0	9	9
Triangle and Lenker Estates	3	0	0	0	0	0	0	3	3
Routes 147 and 225	6	0	1	1	1	0	1	5	3
Dusty Trail	0	0	0	0	0	0	0	0	0
Fetterhoff Church	5	0	0	0	0	0	1	5	4
Hill Top - Round Top	0	0	0	0	0	0	0	0	0
Tourist Park	0	0	0	0	0	0	0	0	0
147-McClelland Road	1	0	0	0	0	0	0	1	1
General	7	0	0	2	0	0	0	7	5
Total	32	0	1	4	2	0	2	30	25

1.1.7 Soil Suitability for On-Lot Sewage Disposal

The characteristics of the soils located in the Township were compiled using information presented in GIS mapping provided by Dauphin County and the United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS), and the NRCS's online Soil Data Mart and the Pennsylvania State University's Soil Map. These characteristics were used to determine the areas of the Township suitable for the use of OLDS. Factors taken into consideration for OLDS suitability include the following:

1. Depth to limiting zone (bedrock or water table).

2. Percent slope.

3. Hydric soils (soils with hydric components or inclusions of hydric components).

The criteria used to determine areas suitable for the use of either elevated sand mound OLDS or in-ground OLDS, are presented in Table 1-9. Using these criteria, in combination with the soil characteristics presented in the USDA's Soil Survey, a determination was made regarding the suitability of areas of the Township for the use of elevated sand mound OLDS, or in-ground OLDS. (See Table 1-9 and Section 6.0).

Table 1-9 Suitability Criteria for On-Lot Sewage Disposal Systems

System	Hydric Soils	Depth To Bedrock	Depth to Seasonal High Water Table	Slope
Unsuitable for Any System	Yes	< 16 Inches	< 10 Inches	> 25%
Suitable for Elevated Sand Mound	No	20 Inches or Greater	20 Inches or Greater	<12%
Suitable for Conventional In-Ground System	No	60 Inches or Greater	60 Inches or Greater	<25% for Standard Trenches <8% for Seepage Beds

Note: In addition to limitations relating to soils, subsurface conditions, and slopes, absorption areas shall not be located within 100-year floodways.

As previously noted, the soil limitations within the Township for the on-lot disposal of effluent from septic tanks is moderate to severe. In addition, based on the limitations of slope and useable soil depth, many of the newer on-lot disposal sites within the Township required elevated sand mound installations.

1.1.8 Well Water Survey

According to the guidelines for well water surveys published in the SDNIG document, well water surveys may be completed in two tiers (or steps). In tier one, a minimum of 15 percent of the wells in the study area must be sampled. For the second tier, representative sampling must be completed with percentages the same as for the Door-to-Door Survey (see Table 1-6). Each well water sample was analyzed for total coliform bacteria, fecal coliform bacteria and nitrate-nitrogen concentration.

The Sewage Disposal Needs Identification Guidance requires representative sampling, or second tier sampling in any SMA, if:

1. The total coliform bacteria contamination rate is 10 percent or greater in the first tier well water samples; and
2. The fecal coliform bacteria contamination rate is 20 percent or greater in the first tier well water samples that had total coliform bacteria contamination.

A total of two hundred and fifty three (253) water samples were collected during the original Tier 1 analysis of Halifax Township and the results are summarized in Table 1-9. A total of 26 wells were re-sampled and analyzed as part of this planning effort to confirm that the original sampling results are reliable for this planning effort. The results of the well water surveys conducted by HRG are summarized in Table 1-10. Detailed water sampling results and mapping showing the results of the sampling are attached in Section 6.0 of this Report. There are several clusters of ¼ mile radii around where Nitrates exceeded 5mg/L throughout the Township. Any proposed future development in these areas will require preliminary hydrogeologic studies.

Table 1-10 Original Act 537 Plan Well Survey Results

SFPA (Original)	Approximate # of Developed Lots	# of Surveys Sent	% of Total Lots	Surveys Received		*Approximate # of Water Customers		Approximate # of Lots with Wells	# of Water Samples Needed		# of Water Sample Taken		Nitrate Test Results				Total Coliform	Fecal Coliform
													Non-Detectable <1	0-5 mg/l	5-10 mg/l	10+ mg/l	Detectable >1	Detectable >1
Matamoras	131	126	96%	42	33%	30	71%	37	50%	19	23	123%	8	10	5	0	15	4
Triangle and Lenker Estates	69	69	100%	31	45%	67	97%	2	50%	1	1	100%	0	1	0	0	1	0
Routes 147 and 225	114	105	92%	47	45%	25	53%	53	35%	19	20	107%	0	6	11	3	10	1
Dusty Trail	18	18	100%	1	6%	0	0%	18	50%	9	9	100%	7	2	0	0	6	0
Fetterhoff Church	74	74	100%	29	39%	0	0%	74	35%	26	27	104%	15	11	1	0	10	1
Hill Top – Round Top	35	35	100%	11	31%	0	0%	35	50%	18	18	103%	9	8	1	0	9	1
Tourist Park	125	125	100%	31	25%	64	51%	52	25%	13	13	100%	11	0	2	0	4	0
147-McClelland Road	58	58	100%	12	21%	0	0%	58	35%	20	20	100%	3	8	7	2	6	1
General	747	747	100%	232	31%	48	21%	592	20%	118	122	103%	46	56	18	2	65	8
		1357		436	32%													
Total	**1371**								**Total**	**243**	253	104%	**99**	**102**	**45**	**7**	**126**	**16**

*The approximate number of sewer customers was calculated by using the survey results

Table 1-11 Original OLDS HRG Survey Data vs Original Data

SFPA (Original)	# of Water Sample Taken	Nitrate Test Results								Total Coliform	Total Coliform	Fecal Coliform	Fecal Coliform
		Non-Detectable <1 (Original)	Non-Detectable <1	0-5 mg/l (Original)	0-5 mg/l	5-10 mg/l (Original)	5-10 mg/l	10+ mg/l (Original)	10+ mg/l	Detectable >1 (Original)	Detectable >1	Detectable >1 (Original)	Detectable >1
Matamoras	**5**	2	0	2	4	1	1	0	0	3	4	0	1
Triangle and Lenker Estates	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Routes 147 and 225	**3**	0	0	0	0	2	1	1	2	0	1	0	0
Dusty Trail	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Fetterhoff Church	**14**	9	4	4	8	1	1	0	1	4	9	0	1
Hill Top - Round Top	**2**	2	1	0	1	0	0	0	0	1	1	0	0
Tourist Park	**0**	0	0	0	0	0	0	0	0	0	0	0	0
147-McClelland Road	**2**	0	0	1	0	1	1	0	1	1	1	0	0
General	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Total	**26**	**13**	**5**	**7**	**13**	**5**	**4**	**1**	**4**	**9**	**16**	**1**	**2**

1.1.9 Summary and Conclusions

The original OLDS sanitary survey of the randomly selected 308 individual properties is based on an OLDS sanitary survey questionnaire sent to 1,357 property owners, which requested information on water supply source, water treatment systems, testing and results, property description, and septic system description, location, malfunctions, maintenance and repairs. A summary of the results of the original OLDS sanitary surveys and water sampling surveys are shown in Section 6.0 of this Report. HRG completed a survey of 32 OLDS that were originally inspected and completed water sampling for 40 wells (26 resampled from the original surveys) based on responses to the letter and survey sent out to 175 property owners throughout the Township, with the majority of the focus on the potential sewerage areas identified in the Draft Plan. A summary of the results of the HRG completed OLDS surveys and water sampling surveys are provided in Section 6.0 of this Report next to the results of the original surveys. A map presenting the results of both surveys is provided as Section 6.0 of this Report.

The original OLDS sanitary surveys were conducted by initially mailing surveys to all property owners. Once the completed surveys were received by the Township, door-to-door visits were performed and water samples were collected. Representatives from K&W Engineers collected the water samples and also conducted an inspection of the OLDS and interviewed the property owners to determine the accuracy of the OLDS sanitary surveys. The OLDS sanitary surveys were revised to reflect these findings when appropriate and new surveys were prepared for homes (where inspections were performed) that did not respond to the mailed survey. The updated surveys were conducted in the same manner as the original surveys, but 175 letters and surveys were sent to residents and HRG conducted door-to-door visits and collected water samples in locations where residents responded to the survey and/or letter.

The original OLDS sanitary surveys revealed that the type and quantity of on-lot disposal systems within the Township are approximately 63% conventional in-ground bed or trench systems, approximately 29% elevated sand mound systems, and approximately 8% seepage pit / cesspool and holding tanks (non-standard) systems. The surveys also showed that a majority of the newer, approved by permit on-lot disposal systems are elevated sand mounds, ranging in age from 12 to 26 years old, with a small amount of in-ground bed systems as well. The majority of the older on-lot disposal systems are conventional in-ground bed or trench systems, ranging in age from 13 to 70+ years old, with an average of 35-years. The remaining older on-lot disposal systems are cesspools and septic tanks with unknown on-lot disposal systems, ranging in age from unknown to 100+ years old.

The original OLDS sanitary survey revealed system malfunctions in 5.2% (including door-to-door and mailed surveys) of the on-lot disposal systems, including odors, water ponding, slow drains and grey water discharges. A majority of these malfunctions are associated with conventional in-ground bed or trench on-lot disposal systems. Similar results were found during the updated inspections, there was only one (1), 2.1%, confirmed malfunction that was observed, but there were approximately six (6), 12.7% of the total surveys conducted that were potential or suspected malfunctions. This was expected, as the areas where most of the surveys were conducted included areas already identified as being potential sewerage needs areas in the Draft Plan.

In conjunction with the OLDS sanitary survey, water supply sampling and laboratory testing was

originally performed on 253 water supplies for nitrate-nitrogen (NO3-N), total coliform, and fecal. The purpose of performing water supply sampling is to determine what effects the existing on-lot septic systems are having on the underlying water supply. The renovation of sewage effluent within the soil can be greatly reduced when underlying geology exists that can cause effluent to discharge directly into underlying fissures and caverns. Fecal contamination can also arise from sources such as combined sewer overflows, leaking septic tanks, sewer malfunctions, contaminated storm drains, animal feedlots, and other sources. During rainfalls, snow melts, or other types of precipitation, fecal contamination may be washed into creeks, rivers, streams, lakes, or ground water. When these waters are used as sources of drinking water and the water is not treated or inadequately treated, contamination may end up in drinking water. Therefore, the sampling of well water for nitrates (chemical), total coliform, and fecal coliform is performed.

Nitrates are nitrogen-oxygen chemical units that combine with various organic and inorganic compounds. They are essential nutrients for plants, which absorb them from soil. The excess nitrates not used by the plants are carried through the soil to ground water in a process called "leaching." Once in water, they remain there until used by plants or another organism, or removed by water treatment techniques. The greatest source of nitrates is fertilizers that are used to provide nitrates to crops. Animal and human waste also contains nitrogen in the form of ammonia. Decomposing plant and animal materials also generate nitrates. Nitrate is present in runoff from fertilizer use, leaking septic tanks, or from erosion of natural deposits. Infants below the age of six months who drink water containing nitrate in excess of 10 mg/L could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome. Nitrates are very soluble, and do not bind with soil so the potential is high for them to migrate to ground water. This is especially true if your water well system is near agricultural land or animal feed lots. Incidents such as heavy rains, flooding, chemical spills, or failed sewage systems can cause nitrates to enter soil near a private water well.

Total Coliform are bacteria that are naturally present in the environment. They are used as an indicator that other, potentially harmful, bacteria may be present. Because total coliforms are common inhabitants of ambient water and may be injured by environmental stresses (e.g., lack of nutrients) and water treatment (e.g., chlorine disinfection) in a manner similar to most bacterial pathogens and many viral enteric pathogens, EPA considers them a useful indicator of these pathogens. The absence of total coliforms minimizes the likelihood that fecal pathogens (such as fecal coliform or E. *Coli*) are present. Thus, total coliforms are used to determine the vulnerability of a water supply to fecal contamination. Coliforms are bacteria that live in the intestines of warm-blooded animals (humans, pets, farm animals, and wildlife). Fecal coliform bacteria are a kind of coliform associated with human or animal wastes and Escherichia coli (E. coli) is part of the group of fecal coliforms. Fecal Coliform and Escherichia Coli (E. Coli) are bacteria whose presence indicate that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, the elderly, and people with severely compromised immune systems.

As shown in Table 3-9, 39% of the water supplies had non-detectable nitrate-nitrogen, 40% ranged from 1.0 to 4.9-milligrams per liter, 18% ranged from 5.0 to 9.9-milligrams, and 3% exceeded 10.0 milligrams per liter. As also shown in Table 3-9, 49% of the water supplies sampled, tested positive for total coliform, but only 6% (16 samples) of the water supplies tested

positive for fecal. Two (2) of the resampled locations tested positive for fecal (7.7%), 50% of the resampled locations showed 0-4.9 mg/L of nitrate-nitrogen, 15.38% of the resampled locations had 5.0 to 9.9 mg/L of nitrate-nitrogen detected, and 15.38% of the resampled locations showed an exceedance of 10.0 mg/L nitrate-nitrogen.

Water supply locations on lots with OLDS that had positive total coliform and fecal test results were detected in several areas the Township. The areas that tested positive for fecal occurred at locations where conventional in-ground bed/trench systems as well as sand mounds with system ages ranging from 18-years to +60 years were installed. These contaminated samples could be caused due to failing OLDS and due to the severe soil limitation in the respective areas.

Nitrate-nitrogen levels above 5 milligrams per liter were observed throughout the Township, as shown on the Map presented in Section 6.0. These areas are also interspersed with some other non-contaminated water supply locations, which could indicate that the nitrate-nitrogen contamination is not in widespread particular areas of the Township. Of the seven (7) wells that originally showed nitrate-nitrogen levels above 10 milligrams per liter and only one (1) sample tested positive for fecal. This could indicate that a majority of the elevated nitrate levels are caused by surface water run-off (agricultural). The updated results showed a similar trend with one (1) of the reinspected wells testing positive for both fecal and having a nitrate-nitrogen level about 10 mg/L.

1.2 Project Description

The Planning Area for the Act 537 Plan consists of Halifax Township in its entirety. The total area studied is the entire Halifax Township which comprises approximately 20,339 acres and is bordered by Upper Paxton Township, Jackson Township, Wayne Township, Middle Paxton Township, Reed Township, Watts Township (Perry County), and Buffalo Township (Perry County).

An evaluation of existing on-lot disposal systems and testing of well water throughout the Township (Originally completed by K&W Engineers with approximately 10% reinspected by HRG, Inc.) indicated that there is a need for improved wastewater disposal in Matamoras, Triangle & Lenker Estates, Route 147 & 225, Tourist Park, and Fetterhoff Church Plan Areas of the Township. The results of the sanitary survey are summarized in Section 1.1.6. The maps summarizing the results of the surveys and a complete summary of the results of the sanitary survey are presented in Section 6.0 of this Report.

The needs areas were identified based on needs derived from the number of on-lot malfunctions, well water sample results, soil suitability (high groundwater table, slow permeability, flooding, steep slopes or shallow depth to bedrock), and planned and projected growth. Structural alternatives for providing improved sewage facilities to these study areas were evaluated on the basis of environmental soundness, cost-effectiveness, and structural feasibility. Other study areas included as part of this Plan include: Dusty Trail, Hill Top - Round Top, Route147-McClelland Road, and General Study Areas. No structural alternatives were identified or evaluated for these other areas as part of this Plan. Descriptions of the each respective study area are presented in this Report.

1.2.1 Potential Wastewater Treatment Alternatives

Rules and regulations pertaining to the content of Act 537 plans are contained in Title 25 Pennsylvania Code Chapter 71. These rules and regulations require that each Act 537 plan present and evaluate alternatives for sewage service within the project area. The following sections present several alternatives available to the Region for meeting the wastewater planning needs identified above. The topics covered in this section include the following:

1. Conventional collection, conveyance and treatment systems.
2. Community On-lot Disposal Systems (COLDS).
3. Continued use of on-lot disposal systems.
4. Small flow or package treatment facilities.
5. Holding tanks.
6. Sewage management programs.
7. Non-structural/Planning activities.
8. No action alternative.

These general wastewater alternatives have been considered for areas within the Township currently served by OLDS. Initially, many alternatives were considered, however some were dismissed immediately and eliminated from further consideration in the Plan due to cost and technical feasibility. Twelve (12) sewer extension alternatives to provide public sewer service to these areas of the Township currently served by OLDS have been evaluated to determine whether they are cost-effective, environmentally sound, and structurally feasible. These alternatives are listed below:

1A. Low pressure sewer collection system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in combination with a gravity sewer collection system in the Triangle & Lenker Estates Area for connection to the existing HAWASA gravity sewer collection system.

1B. Gravity sewer collection system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in combination with three (3) pump stations and force mains and low pressure sewer in Matamoras and Route 147 & 225 Areas for connection to the existing HAWASA gravity sewer collection system.

1C. Gravity sewer collection system to serve the Matamoras and Triangle & Lenker Estates Areas in combination with a pump station and force main and low pressure sewer in Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas for connection to the existing HAWASA gravity sewer collection system.

1D. Combination of gravity sewer collection system and low pressure sewer system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in concert with a pump station and force main for connection to the existing HAWASA gravity sewer collection system.

2A. Low pressure sewer collection system to serve the Tourist Park Area for connection to the existing HAWASA gravity sewer collection system.

2B. Combination of gravity sewer collection system and low pressure sewer system to serve the Tourist Park Area in concert with a pump station and force main for connection to the existing HAWASA gravity sewer collection system.

3. Combination of gravity sewer collection system and low pressure sewer system to serve the Fetterhoff Church Area in concert with a pump station and force main for connection to the existing HAWASA gravity sewer collection system.

4A. Low pressure sewer collection system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in combination with a gravity sewer collection system in the Triangle & Lenker Estates Area for connection to the existing HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area to the exiting HAWASA gravity sewer collection system.

4B. Gravity sewer collection system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in combination with three (3) pump stations and force mains and low pressure sewer in Matamoras and Route 147 & 225 Areas for connection to the existing HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area to the exiting HAWASA gravity sewer collection system.

4C. Gravity sewer collection system to serve the Matamoras and Triangle & Lenker Estates Areas in combination with a pump station and force main and low pressure sewer in Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas for connection to the existing HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area to the exiting HAWASA gravity sewer collection system.

4D. Combination of gravity sewer collection system and low pressure sewer system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in concert with a pump station and force main for connection to the existing HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area to the exiting HAWASA gravity sewer collection system.

4E. Combination of gravity sewer collection system and low pressure sewer system to serve the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas in concert with a pump station and force main for connection to the existing HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area to the exiting HAWASA gravity sewer collection system. Pump station and force main for conveyance of Lenker Estates subdivision Area, Matamoras Area, and a portion of the Triangle & Lenker Estates Areas to the exiting HAWASA gravity sewer collection system.

All of the alternative extensions presented above are proposed to be conveyed to the HAWASA's wastewater treatment plant and system as described in Section 1.0. The flows conveyed in Alternatives 1 (A-D) and 4 (A-E) are proposed to be conveyed through HAWASA's southern interceptor that discharges directly into the WWTP.

The flows from Alternatives 2 (A-B) and 3 are proposed to be discharged into HAWASA's sanitary sewer system located within the Borough of Halifax and conveyed to HAWASA's northern interceptor that discharges into the Main Pumping Station. As previously described in Section 1.0, the WWTP is in the preliminary design phase for an upgrade (currently being performed by HAWASA's Engineers). The upgrade relies on the projection of flows presented in this Plan, therefore WWTP alternatives will be considered by HAWASA after the submission and adoption

of this Plan. Due to this effort by HAWASA and as the Township does not own or operate an existing WWTP, WWTP alternatives were not considered as part of this Plan.

A hydraulic analysis (included in this section) was performed to confirm that the south interceptor has enough capacity to accept flows from the proposed extensions. In the most conservative calculations with a peaking factor of 4, the interceptor would still maintain an average reserve capacity of approximately 52.5%. No upgrades to the south interceptor were considered as part of this Plan. The northern interceptor sanitary sewer mains are assumed have the capacity to service the proposed connections, however, the Main Pumping Station is over capacity and will need to be upgraded to accept the additional flows. As part of the WWTP upgrades, the capacity of the Main Pump Station is proposed to be increased, however due to financial infeasibility of Alternatives 2 (A-B) and Alterative 3, as further detailed in this section, these sewer extensions are not recommended at this time.

Presently, public sewer only exists within the Borough of Halifax and extends south to the Sheetz located on Parmer Drive. The majority of the Township is served by OLDS.

1.2.2 Conveyance Alternatives

New collection and conveyance facilities were evaluated to extend public sewer and are required to serve the sewer service areas identified within this report. The apparent immediate needs areas include Matamoras, Triangle & Lenker Estates, and Route 147 & 225 Areas and the proposed extensions are presented as Alternatives 1 (A-D) and 4 (A-E). These extensions are proposed for the 5-10 year planning window, where the remaining proposed alternatives are assumed for the 10+ year planning timeframe and will depend on available funding, developer assistance, and upgrades to the Main Pumping Station.

Conventional Gravity Sewers

Conventional gravity sewers convey wastewater by using gravity or the differential elevations between the upstream and downstream points in the system. The sewers must be set deep enough to receive flows from individual buildings. The building sewer or lateral is typically comprised of 4-inch or 6-inch diameter pipe laid at a minimum slope of 1%. Building sewers connect directly to the collecting sewers. Where financially feasible, the collecting sewer is set at a depth that is capable of receiving basement flows. Conventional gravity sewers are constructed to meet minimum state and local requirements. Generally, they are constructed of 8-inch diameter or larger pipe with access manholes spaced a maximum of 400 feet apart and at each change of direction. Conventional systems are connected directly to existing or proposed conveyance and treatment systems. The feasibility of conventional gravity sewers is dependent on factors such as topography, presence of rock, high groundwater tables, and density of homes. The costs of a conventional gravity system can vary dramatically depending on the above noted factors.

Low-pressure Systems

Low-pressure systems including Grinder Pump (GP) systems are an alternative to conventional gravity systems. GP systems shred or reduce the size of raw wastewater solids, producing pumpable slurry which is conveyed to the treatment plant through low-pressure sewer lines. Pressure sewers are most cost-effective in areas where the terrain is rolling, or the line needs to

be close to the surface due to low depth to bedrock or a high water table. Pressure sewers have the disadvantage that the material is highly septic and odor problems may arise.

When discussing GP systems, it is necessary to consider both the on-lot element as well as the collection system elements. The on-lot elements of a GP system consist of 4-inch or 6-inch building sewer that conveys household sewage to an on-lot pump station. On existing homes, either a new connection is made to the existing plumbing system or the existing building sewer is intercepted by the new building sewer and directed to the pump station. The on-lot pump station typically consists of a fiberglass basin with a minimum capacity of 50 gallons. The pumps are either centrifugal or semi-positive displacement units with 1-2 HP motors. The basin includes appropriate valves for isolation of the pumps. Each basin package is provided with a pump control panel, which can either be located remotely at the house or locally at the pump station.

The second component of any GP system is the collection system. A typical low-pressure sewer system consists of small diameter, plastic, pressure piping. All piping downstream of the grinder pump is under low pressure, usually 60 psi or less. The low-pressure collection system is arranged as a branch network with no loops in the system. Appurtenances of a low-pressure system consist of in-line and terminal clean-outs located at 400'-600' intervals, at changes in direction or at changes in pipe size. Air release valves are located within the system at all high points. Isolation valves are installed strategically throughout the system to facilitate maintenance. Discharge from the low-pressure system can be directly routed to a treatment plant provided the difference in elevation is not significant, or to a conventional collection or conveyance system. GP systems have been most applicable in areas where the topography is very flat, has rolling hills, significant rock may be present, high groundwater table is present, or where the system outfall is at a higher elevation than the service area.

Collection System Construction Costs

Typically, an authority or municipality would be responsible for the construction and funding of an extension of public facilities to a previously developed area. In the case of a new development, sewage facilities are generally extended by the developer at their cost and dedicated to the authority or municipality under a written agreement. Estimates of construction cost, overall project costs are included in the focused assessment of the needs areas in Section 2.1.

1.2.3 Repair or Replacement of Existing Collection and Conveyance System Components

No alternatives are anticipated which would facilitate the need for repair or replacement of existing collection or conveyance system mains or interceptors. As the Township does not own or operate a collection and conveyance system, it is owned and operated by HAWSA.

As presented on the next page, a hydrologic analysis was completed to evaluate the downstream capacity of the south interceptor if all potential flows assumed for this plan are introduced to the system. Utilizing the most conservative figures and a peaking factor of 4, the most limiting section was calculated to have a reserve capacity of approximately 11.6%. The average reserve capacity of the interceptor was calculated at approximately 52.5% under the described conditions. As indicated through the analysis, no upgrades are required due to potential flows considered for this Plan.

Figure 1-1 South Interceptor Reserve Capacity Analysis (588 additional EDUs)

Upstream Manhole No.	Downstream Manhole No.	Diameter (Inches)	Length (Feet)	Upstream Manhole Invert	Downstream Manhole Invert	Pipe Slope (feet/feet)	Pipe Material	Manning N	Pipe Capacity (MGD)	Cumulative EDU Count	Flow Per EDU (GPD)	Peaking Factor	Existing Peak Flow (MGD)	New Cumulative EDU Count	New Peak Flow (MGD)	Existing + New Flow (MGD)	Does Pipe Have Capacity?	Reserve Capacity	Reserve % of Capacity
330	329	10	342.00	620.88	619.92	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.14	19.1%
329	328	10	78.00	619.82	619.60	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.14	19.3%
328	327	10	64.00	619.50	619.32	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.14	19.2%
327	326	10	95.00	619.22	618.95	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.15	19.6%
326	325	10	201.00	618.85	618.29	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.14	18.8%
325	324	10	379.00	618.19	617.13	0.0028	PVC	0.013	0.74	10	250	4	0.010	588	0.588	0.598	Yes	0.14	19.0%
324	323	10	390.00	617.62	615.63	0.0051	PVC	0.013	1.00	18	250	4	0.018	588	0.588	0.606	Yes	0.39	39.2%
323	322	10	176.00	615.63	615.20	0.0024	PVC	0.013	0.69	22	250	4	0.022	588	0.588	0.610	Yes	0.08	11.6%
322	321A	10	159.00	615.20	614.46	0.0047	PVC	0.013	0.95	23	250	4	0.023	588	0.588	0.611	Yes	0.34	35.8%
321A	321	10	252.00	614.46	608.11	0.0252	PVC	0.013	2.22	27	250	4	0.027	588	0.588	0.615	Yes	1.60	72.2%
321	320	10	228.00	608.11	599.11	0.0395	PVC	0.013	2.77	30	250	4	0.030	588	0.588	0.618	Yes	2.15	77.7%
320	319	10	206.00	599.11	593.53	0.0271	PVC	0.013	2.30	35	250	4	0.035	588	0.588	0.623	Yes	1.67	72.9%
319	318	10	396.00	588.29	580.27	0.0203	PVC	0.013	1.99	39	250	4	0.039	588	0.588	0.627	Yes	1.36	68.4%
318	317	10	400.00	580.27	565.00	0.0382	PVC	0.013	2.73	40	250	4	0.040	588	0.588	0.628	Yes	2.10	77.0%
317	316	10	348.25	565.87	563.00	0.0082	PVC	0.013	1.27	50	250	4	0.050	588	0.588	0.638	Yes	0.63	49.6%
316	315	10	177.80	563.00	560.95	0.0115	PVC	0.013	1.50	50	250	4	0.050	588	0.588	0.638	Yes	0.86	57.4%
315	314	10	213.93	560.95	557.73	0.0151	PVC	0.013	1.71	52	250	4	0.052	588	0.588	0.640	Yes	1.07	62.6%
314	313A	10	175.36	557.73	548.97	0.0500	DIP	0.013	3.12	53	250	4	0.053	588	0.588	0.641	Yes	2.48	79.4%
313A	313	10	223.38	546.97	532.98	0.0626	DIP	0.013	3.49	53	250	4	0.053	588	0.588	0.641	Yes	2.85	81.6%
313	312	10	400.00	532.98	530.74	0.0056	PVC	0.013	1.04	53	250	4	0.053	588	0.588	0.641	Yes	0.40	38.6%
312	311	10	237.84	530.74	528.76	0.0083	PVC	0.013	1.27	56	250	4	0.056	588	0.588	0.644	Yes	0.63	49.4%
311	310	10	300.58	528.76	527.10	0.0055	PVC	0.013	1.04	57	250	4	0.057	588	0.588	0.645	Yes	0.39	37.8%
310	309	10	400.00	527.10	521.13	0.0149	PVC	0.013	1.70	58	250	4	0.058	588	0.588	0.646	Yes	1.06	62.1%
309	308	10	398.52	521.13	506.53	0.0366	PVC	0.013	2.67	58	250	4	0.058	588	0.588	0.646	Yes	2.03	75.8%
308	307	10	400.00	506.53	486.20	0.0508	PVC	0.013	3.15	58	250	4	0.058	588	0.588	0.646	Yes	2.50	79.5%
307	306	10	210.50	486.20	482.47	0.0177	PVC	0.013	1.86	58	250	4	0.058	588	0.588	0.646	Yes	1.21	65.2%
306	305	10	208.93	482.47	443.25	0.1877	DIP	0.013	6.05	58	250	4	0.058	588	0.588	0.646	Yes	5.40	89.3%
305	304	10	355.66	443.25	396.22	0.1322	DIP	0.013	5.07	58	250	4	0.058	588	0.588	0.646	Yes	4.43	87.3%
304	303	10	54.31	396.22	395.01	0.0223	PVC	0.013	2.08	58	250	4	0.058	588	0.588	0.646	Yes	1.44	69.0%
303	302	10	393.55	395.01	393.33	0.0043	PVC	0.013	0.91	58	250	4	0.058	588	0.588	0.646	Yes	0.27	29.2%
302	301	10	340.34	393.33	391.10	0.0066	PVC	0.013	1.13	58	250	4	0.058	588	0.588	0.646	Yes	0.48	42.8%

1.2.4 Upgrade of Existing Wastewater Treatment Plant

As stated above, the upgrade of the HAWASA WWTP is currently in preliminary design and will rely on flow projections originally identified within the Act 537 Plan which are included in this report (Table 1-13). As part of the preparation for the Halifax Township Act 537 Plan, the flow projections were based on providing public sanitary sewer facilities to existing properties within the three (3) potential sewer service areas currently served by OLDS, adjacent developments currently served by private wastewater treatment facilities (Alex Acres Mobile Home Park and Lenker Estates), projected future growth, and build-out of all existing or proposed subdivision and land development plans known by the Township at the time that the Halifax Township Act 537 Plan was prepared. These potential sewer service areas were delineated based on the results of the sanitary sewage and water surveys (Section 1) within the Planning Area.

The wastewater flow projections developed for the Act 537 Plan were based on the following conditions and assumptions:

- Wastewater flows generated for all Structural Alternatives are based on a 5-year annual average daily flow of 144.2 gallons per day (gpd) per equivalent dwelling unit (EDU) as identified in the Halifax Area Water and Sewer Authority's Chapter 94 Wasteload Management Report for Calendar Year 2017.

- Alex Acres Mobile Home Park (MHP) connections are based on an annual average flow of 78 gpd from existing flow records.

- Future growth within the three (3) potential sewer service areas is based on 20% of non-MHP EDUs.

- Lenker Estates estimated existing and projected EDUs are based on existing aerial imagery and final subdivision/land development plans received by the Halifax Township dated May 2002 through October 2013 for Phases I-III.

As presented in Tables 1-12 and 1-13 below, a steady population growth is projected within the Township through 2040 and projected flows collected by any proposed extension of the existing public sewer are tributary to the Halifax Area Water and Sewer Authority's (HAWASA) Wastewater Treatment Plant (WWTP). The Main Pumping Station located at the HAWASA WWTP is – at the time of this Plan – considered to be hydraulically overloaded in accordance with 25 Pa. Code § 94.12. In addition, a Draft Consent Order and Agreement (COA) was issued to HAWASA by the Pennsylvania Department of Environmental Protection (PA DEP) on January 10, 2018 for WWTP effluent violations occurring between March 2013 and September 2017. WWTP Upgrades are currently being evaluated by HAWASA and are in some capacity dependent on the sewage facilities recommended as part of this Halifax Township Act 537 Official Sewage Facilities Plan. Coordination of this Plan with HAWASA is critical to establish a successful and practical implementation schedule, determine funding, and ensure that all facilities are installed in a manner that is both environmentally responsible and economically feasible.

Table 1-12 Population History and Projections

Actual Population					Projected Population		
1970	1980	1990	2000	2010	2020	2030	2040
2,038	2,943	3,449	3,329	3,483	3,671	3,830	3,956
	44.4%	17.2%	(3.5%)	4.6%	5.4%	4.3%	3.3%

Table 1-13 Estimated Wastewater Flow Scenarios By Alternative

Potential Service Area	Initial EDUs	Initial Flow (GPD)	Build-out EDUs	Build-out Flow (GPD)
Alternative 1	347	50,037	347	50,037
- Misc. Future Growth @ 20%			70	10,094
TOTAL	***347***	***50,037***	***417***	***60,131***
Alternative 2	111	16,006	111	16,006
- Alex Acres MHP	14	2,019	14	2,019
- Misc. Future Growth @ 20%			25	3,605
TOTAL	***125***	***18,025***	***150***	***21,630***
Alternative 3	46	6,633	46	6,633
- Ambulance Building	4	577	4	577
- Misc. Future Growth @ 20%			10	1,442
TOTAL	***50***	***7,210***	***60***	***8,652***
Alternative 4	347	50,037	347	50,037
- Lenker Estates	58	8,364	160	23,072
- Misc. Future Growth @ 20%			81	11,680
TOTAL	***405***	***58,401***	***588***	***84,790***

1.2.5 Continued Use of On-Lot Disposal Systems

Additional On-lot disposal systems (OLDS) are not being considered as an option in this Act 537 Planning Effort for areas where public sewer is not currently available. Therefore, no additional soil, slope and/or hydrogeological evaluations are assumed. As discussed in Section 1.1.7, the majority of the soil within the Township is not suitable for OLDS due to high groundwater table, slow permeability, flooding, steep slopes, and shallow depth to bedrock. It is anticipated that the existing OLDS will remain in use while non-failing and permissible in Areas where sewer extensions are not proposed.

1.2.6 Repair, Replacement or Upgrade of Existing Malfunctioning Systems

The Township's certified SEO is authorized to require the repair of any on-lot malfunction by the following methods approved by Title 25, Chapter 73 of the Pennsylvania Code: cleaning, repair or replacement of components of the existing system, adding capacity or otherwise altering or replacing the system's treatment tank, expanding the existing disposal area, replacing the existing disposal area, replacing the gravity distribution system with a pressurized system, replacing the system with a holding tank, or other alternatives as appropriate for the specific

site.

It is recommended that the confirmed malfunctions be rehabilitated and/or repaired by providing a suitably sized drainage bed or replaced. The suspected and potential malfunctions are recommended to be further investigated by the SEO to determine the needs for rehabilitation, replacement, or upgrades.

1.2.7 Water Conservation

Another method for improving the operation of on-lot systems is to encourage the use of water conservation devices. In lieu of repair by methods mentioned above, the SEO may require the installation of water conservation equipment and the institution of water conservation practices in structures served. Water using devices and appliances in the structure may be required to be retrofitted with water saving appurtenances or they may be required to be replaced by water conserving devices and appliances. Wastewater generation in the structure may also be reduced by requiring changes in water use patterns in the structure served. The use of laundry facilities may be limited to one load per day or discontinued altogether.

1.2.8 Community On-Lot, Small Flow or Package Treatment

There are no Community On-Lot Disposal Systems within the Township. Community On-lot Disposal Systems, or COLDS, are essentially small, centralized collection systems that serve isolated developed areas and involve the discharge of treated effluent to the subsurface. Many COLDS simply consist of a large septic tank followed by an absorption bed, while others consist of a conventional treatment plant with effluent discharged into the subsurface. COLDS commonly service relatively small, isolated communities (i.e. less than 50 EDU's); however, there are some large COLDS that service larger communities of several hundred households. A majority of the Township contains severely limited soil and slopes that may be unsuitable for such a system and several areas within each planning area where contaminated water samples have been collected, therefore no further evaluations were completed and no COLDS were proposed.

There are four (4) non-municipal package or small flow treatment facilities located within the Township as described in Section 1.0. Expansion and upgrades to these facilities are not being considered as part of this planning effort. Alternative 4 (A-E) considers the abandonment of the Lenker Estates WWTP and connection to the HAWASA sanitary sewer system through the proposed gravity sewer extension. Alternatives 2 (A-B) considers the discharge of flows from the Alex Acres Facility to the proposed collection system. No other alternatives consider Strohecker WWTP or Camp Hebron WWTP due to needs and financial feasibility. No costs associated with the abandonment and acceptance of flows from existing wastewater treatment facilities are assumed due to the existing Township SALDO which indicates, where public sanitary sewer systems exist within 1,000 feet of the development site, the deployment is required to connect to the available sanitary sewer system. Additionally, each of the NPDES permits for these respective facilities indicates the following within Paragraph D, under "Other Requirements," "If, after the issuance of this permit, DEP approves a municipal sewage facilities official plan or an amendment to an official plan under Act537 (Pennsylvania Sewage Facilities Act, the Act of January 24, 1966, P.L. 1535 as amended) in which sewage from the herein approved facilities will be treated and disposed of at other planned facilities, the permittee shall, upon notification from the municipality or DEP, provide for the conveyance of its sewage to the planned facilities,

abandon use and decommission the herein approved facilities including the proper disposal of solids, and notify DEP accordingly."

1.2.9 Holding Tanks

Holding tanks are vessels designed and constructed to store sewage prior to ultimate disposal at another site. Pumper trucks are the preferred method of conveyance of holding tank wastes. Due to the high maintenance costs resulting from frequent pumping, holding tanks are not considered to be a viable long-term alternative for typical residential demands. However, they may be viable solutions for transient residential, commercial or industrial sites with minimal wastewater flow.

Installation of a holding tank may be required by the Township's certified SEO as a rehabilitative measure to repair an OLDS. In the event that rehabilitative or replacement measures are not feasible or do not prove effective, the Township may require the owner to apply for a permit to construct a holding tank. It is recommended that the Township should issue holding tank permits only as required for the temporary repair of malfunctioning OLDS. The issuance of holding tank permits shall continue in accordance with DEP regulations and requirements of the Township's Ordinances. The Township's existing Holding Tank Ordinance is provided in Section 6.0.

1.2.10 Sewage Management Programs

To ensure the proper operation and maintenance of OLDS within the Township currently not proposed to be served by public sewer systems, Halifax Township will evaluate the implementation of an Ordinance governing municipal management of OLDS to provide management of the Township's OLDS systems. A draft Ordinance will be developed during the initial two (2) years of the Plan and a template for the draft Ordinance is included as Appendix H. The Ordinance will be completed and finalized by year 4 ensuing the adoption of the Act 537 Plan. This Ordinance intends to provide requirements for the permitting, inspection, operation, maintenance, and rehabilitation of OLDS within the Township. Select items from the Ordinance may include the following:

- No person shall install, construct, or request bid proposals for construction, or alter an individual sewage system or community sewage system or construct or request bid proposals for construction or install or occupy any building or structure for which an individual sewage system or community sewage system is to be installed without first obtaining a permit from the Township's Sewage Enforcement Officer, which permit shall indicate that the site and the plans and specifications of such system are in compliance with the provisions of the Clean Streams Law and the Pennsylvania Sewage Facilities Act and the regulations adopted pursuant to those Acts.
- Applicants for sewage permits may be required to notify the Sewage Enforcement Officer of the schedule for construction of the permitted On-lot Sewage Disposal System so that inspection(s) in addition to the final inspection required by the Sewage Facilities Act may be scheduled and performed by the Sewage Enforcement Officer.
- Any On-lot Sewage Disposal System may be inspected by an authorized agent at any reasonable time as of the effective date of the Ordinance. Such inspection may include a physical tour of the property, the taking of samples from surface water, wells, other groundwater sources, the sampling of the contents of the sewage disposal system itself

and/or the introduction of a traceable substance into the interior plumbing of the structure served to ascertain the path and ultimate destination of wastewater generated in the structure.

- An authorized agent shall inspect systems known to be, or alleged to be, malfunctioning. Should said inspections reveal that the system is indeed malfunctioning; the authorized agent shall order action to be taken to correct the malfunction.
- Each person owning a building served by an On-lot Sewage Disposal System which contains a septic tank shall have the septic tank pumped by an authorized pumper/hauler within three years of the effective date of the Ordinance. Thereafter that person shall have the tank pumped at least once every five years or whenever an inspection reveals that the septic tank is filled with solids or scum in excess of 1/3 of the liquid depth of the tank. Justification, including sufficient evidence that the septic tank does not require pumping every five years, may be submitted to the SEO for review and approval. Receipts from the authorized pumper/hauler shall be submitted to the Township within the prescribed one and five year pumping periods.
- The required pumping frequency may be increased or decreased at the discretion of the Township if the septic tank is undersized, if solids buildup in the tank is above average, if the hydraulic load on the system increases significantly above average, if a garbage grinder is used in the building, if the system malfunctions or for other good cause shown.
- Within seven (7) days of notification by the Township that a malfunction has been identified, the property owner shall make application to the Sewage Enforcement Officer for a permit to repair or replace the malfunctioning system. Within 30 days of initial notification by the Township, construction of the permitted repair or replacement shall commence.

Please refer to the template Ordinance – included in Section 6.0 of this Report – that will be considered for the preparation of Township's Draft On-Lot Sewage Management Ordinance.

1.2.11 Public Education

The Township will publically educate residents on the potential requirements of a proposed OLDS Management Ordinance and provide resources to the Township's residents as necessary.

The Township will publically advertise and make the Plan available at both the Township Office and on the Township's Website, where the public will have an opportunity to review and comment on the Plan during a 30-day public comment period. The Plan is also proposed to be posted on the Township's website. Following adoption of the Plan by the Township, a copy will remain on file at the Township Office.

1.2.12 Non-Structural/Planning Activities

The existing Township rules, regulations and planning activities appear sufficient to sustain the anticipated level of development in the Township as long as sufficient public sewage facilities are provided to handle anticipated growth rates within the Growth Area as described above. In addition, the Township's development and adoption of the On-lot Sewage Management Program will recommend regular maintenance of on-lot systems in the Township thereby reducing the frequency of malfunctioning systems. It does not appear that new non-structural planning activities are needed at this time.

1.2.13 No Action Alternative

The no action alternative is the continued use of residential on-lot systems. The impacts of no action to address existing, short-term, and long-term sewage facilities include several considerations. Most of the discussion within this Plan has focused on the environmental and public health and safety concerns associated with the functioning of the existing on-lot sewage. The obvious impacts of no action to improve any adverse conditions encountered include degradation of public water supplies, disease, loss of recreational use of waterways, environmental hazards, such as fish kills, and other tragedies. Economically, the no action alternative could result in substantial fines and/or penalties and restrict or prohibit growth to the Township's potential growth and development areas. The No Action Alternative was briefly considered and rejected.

2.0 SUMMARY OF REASONABLE ALTERNATIVES CONSIDERED

2.1 Structural Alternatives for Un-Sewered Areas

Alternatives to provide public sewer service to the Matamoras, Route 147 & 225, Triangle & Lenker Estates, Tourist Park, and Fetterhoff Church Plan Areas are provided in the sections below. These Areas are all needs Areas due to the density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth.

The twelve (12) focused alternatives for providing public sewer service to the areas defined above are presented below and are evaluated on the basis of cost-effectiveness, environmental soundness, and structural feasibility. Cost estimates for the alternatives are provided in the tables provided below. Maps of each of the structural alternatives which identified proposed facilities are presented in Section 6.0 Cost estimates are presented for comparative purposes when applicable and are detailed in the tables provided. Present worth, annual debt service, annual O&M and total annual cost per EDU for each alternative are also presented in the tables provided. Annual debt service is estimated based on a 20-year, 2.063% term as provided by PENNVEST cap rate funding for Dauphin County, a 40-year, 3.25% term as provided by USDA, and a 20-year, 4.5% term as assumed by tax exempt (Bond) financing. Actual debt service will depend on the financing scheme chosen and the actual finances of the project when completed. Present worth is estimated based on a 20-year, 4.25% term.

An analysis of the funding methods available to finance the alternatives evaluated later in this section. It is important to note that the preparation of detailed funding scenarios, analyses of financial service charges, cash flow analyses based on anticipated revenues, a user service charge system, administrative costs, and personnel costs would require additional information beyond the scope of this report and similarly of the prepared Act 537 Plan. Please refer to the funding analysis later in this section.

2.1.1 Alternatives for the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas

As mentioned previously in this report, the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas are considered needs areas and are suggested for implementation of public sewer service. These Areas are considered to be of the highest need with the largest concentration of issues observed from the vicinity of Roadcap Lane to the vicinity of Matamoras Road. This Needs Area shares a southern border with the Powell Creek, a tributary to the Susquehanna River.

Providing public sewer to areas with elevated density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth --- such as this area – enhances local ground and surface water quality in areas where OLDS are removed from service. Collection system alternatives for this area will be placed largely within existing State, Township and private roads/right-of-ways in order to minimize ground disturbance in undisturbed areas. All alternatives evaluated for inclusion in this report and replicated in the Act 537 Plan have the flexibility for a future extension to serve this area if the need arises.

Alternative 1A provides public sewer service to the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas. A combination of gravity sewer and low-pressure sewer is proposed to collect the wastewater and convey flows to existing HAWASA manholes. For this alternative it is anticipated that that 327 properties would require a grinder pump and low pressure sewer lateral to connect to the proposed sanitary sewers. However, a final determination of the number of grinder pumps needed requires additional topographical survey and design-level efforts beyond the scope of this report and similarly the prepared Act 537 Plan. All flows would then be conveyed via gravity to HAWASA's WWTP through the south interceptor.

Alternative 1B provides public sewer service to the Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas. A combination of gravity sewer and low-pressure sewer is proposed to collect the wastewater and convey it to new pump stations (Pump Station 1, Pump Station 2, and Pump Station 3). Pump Station 1 is proposed south of Camp Hebron on the east side of Route 147 with a force main conveying flows to a proposed 8-inch gravity sewer located in Route 147. Pump Station 2 is proposed west of Lauren Lane and east of Route 147 with a short force main conveying flows to a proposed 8-inch gravity sewer located in Route 147 and east of Elm Street. Pump Station 3 is proposed east of Route 147 and on the north side of Powells Valley Road with a force main conveying flows to an existing HAWASA manhole located in Route 147. It is anticipated that 27 properties would require a grinder pump and low pressure sewer lateral to connect to the proposed sanitary sewers in Alternative 1B. However, a final determination of the number of grinder pumps needed requires additional topographical survey and design-level efforts beyond the scope of this report and similarly of the prepared Act 537 Plan. All flows would then be conveyed via gravity to HAWASA's WWTP through the south interceptor.

Alternative 1C modifies Alternative 1B by replacing the gravity sewers and Pump Stations 2 and 3 with grinder pumps and low pressure sewer conveyance lines. 127 additional grinder pumps are proposed in this alternative. Low pressure sewers are often a favored alternative to gravity sewers in areas of undulating topography or in areas that require minimum excavation such as state roads, and may result in lower construction costs due to shallow line depth compared to traditional gravity sewers.

Alternative 1D modifies Alternative 1C by replacing the grinder pumps and low pressure sewer conveyance lines with gravity lines in downward sloping areas. This alternative would reduce the amount of grinder pumps by 13.

Alternative 4A modifies Alternative 1A by introducing flows from the Lenker Estates Subdivision via force main and pump station assumed to be funded by the developer.

Alternative 4B modifies Alternative 1B by introducing flows from the Lenker Estates Subdivision via

force main and pump station assumed to be funded by the developer.

Alternative 4C modifies Alternative 1C by introducing flows from the Lenker Estates Subdivision via force main and pump station assumed to be funded by the developer.

Alternative 4D modifies Alternative 1D by introducing flows from the Lenker Estates Subdivision via force main and pump station assumed to be funded by the developer.

Alternative 4E modifies Alternative 4D by conveying flows from the Matamoras and Triangle & Lenker Estates via a gravity sanitary sewer main to a proposed Pump Station 2 located at the existing site of the Lenker Estates WWTP. The costs are assumed to be shared between the Township and the developer in this Alternative based on planned EDUs conveyed to the proposed pump station. In this alternative, the Township would assume the cost of approximately 57.45% of the pump station and force main for conveyance to a proposed gravity sewer located on Elm Street based on proposed EDUs.

2.1.2 Alternatives for the Tourist Park Area

The Tourist Park Area is considered a needs area due to the density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth and is suggested for implementation of public sewer service. Providing public sewer to areas with elevated density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth --- such as this area – enhances local ground and surface water quality in areas where OLDS are removed from service. Collection system alternatives for this area will be placed largely within existing State, Township and private roads/right-of-ways in order to minimize ground disturbance in undisturbed areas. All alternatives evaluated for inclusion in this report and replicated in the Act 537 Plan have the flexibility for a future extension to serve this area if the need arises.

Alternative 2A provides public sewer service to the Tourist Park Area. A low-pressure sewer is proposed to collect the wastewater and convey flows to an existing HAWASA manhole on North River Road (Route 147). For this alternative, it is anticipated that that 111 properties would require a grinder pump and low pressure sewer lateral to connect to the proposed sanitary sewers. However, a final determination of the number of grinder pumps needed requires additional topographical survey and design-level efforts beyond the scope of this report and similarly of the prepared Act 537 Plan. All flows would then be conveyed via gravity to HAWASA's WWTP through the north interceptor to the Main Pumping Station.

Alternative 2B modifies Alternative 2A by utilizing a combination of gravity sewer and low-pressure sewer to collect the wastewater and convey it to a new pump station (Pump Station 1). Pump Station 1 is proposed south of Grand View Drive on the west side of Route 147 with a force main conveying flows to an existing HAWASA manhole located in Route 147. It is anticipated that the amount of properties that would require a grinder pump and low pressure sewer lateral would reduce by 33 with this alternative. A final determination of the number of grinder pumps needed requires additional topographical survey and design-level efforts beyond the scope of this report and similarly of the prepared Act 537 Plan. All flows would then be conveyed via gravity to HAWASA's WWTP through the north interceptor to the Main Pumping Station.

2.1.3 Alternative for the Fetterhoff Church Area

The Fetterhoff Church Area is considered a needs area due to the density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth and is suggested for implementation of public sewer service. Providing public sewer to areas with elevated density of potential, suspected, and confirmed OLDS malfunctions, well contamination, severe soil limitations, and potential growth --- such as this area – enhances local ground and surface water quality in areas where OLDS are removed from service. Collection system alternatives for this area will be placed largely within existing State, Township and private roads/right-of-ways in order to minimize ground disturbance in undisturbed areas. All alternatives evaluated for inclusion in this report and replicated in the Act 537 Plan have the flexibility for a future extension to serve this area if the need arises.

Alternative 3 provides public sewer service to the Fetterhoff Church Area. A combination of gravity sewer and low-pressure sewer is proposed to collect the wastewater and convey it to a new pump station (Pump Station 1). Pump Station 1 is proposed next to Armstrong Creek and north of Armstrong Valley Road (Route 225) with a force main conveying flows to an existing HAWASA manhole located in Route 225. It is anticipated that 10 properties would require a grinder pump and low pressure sewer lateral to connect to the proposed sanitary sewers in Alternative 1A. However, a final determination of the number of grinder pumps needed requires additional topographical survey and design-level efforts beyond the scope of this report and similarly of the prepared Act 537 Plan. All flows would then be conveyed via gravity to HAWASA's WWTP through the north interceptor to the Main Pumping Station.

2.1.4 Alternative for Future Flow Capacity

These alternatives do not consider any growth or expansion that the Township may experience in the future, but future flow capacity can be addressed during the design phase of these alternatives. It is unknown at this time whether the HAWASA WWTP upgrade will consider future growth and expansion that the Township may experience beyond the recommended alternatives presented in this report and replicated in the Act 537 Plan.

2.1.5 No Action Alternative

The No Action structural alternative represents the status quo. It proposes the continued repair and construction of on-lot facilities in compliance with Chapter 72 Standards and under the guidance and permitting of the Township's SEO. In some cases these systems will not be feasible based on the site limitations, including unsuitable soil, slope, and space restrictions.

This option represents the least upset to the community and status quo; however, it does not address the issues raised in the sanitary survey – those of greywater discharges, malfunctioning systems, and fecal contamination of wells in the Plan Areas. Greywater discharge malfunctions could be alleviated by connecting them to existing on-lot treatment systems, however it is likely that the systems will fail under the increased loading.

Costs for repair and replacement of systems will vary greatly from property to property; therefore, a realistic cost estimate for comparison purposes could not be prepared for this alternative.

2.2 COMPARISON OF ALTERNATIVES

2.2.1 Comparative Cost Estimates of Study Area Structural Alternatives

The following assumptions were used to develop the cost estimates presented in this report and were replicated in the Act 537 Plan:

1. LPS Main - Aggregate Backfill 25% of total length.
2. LPS Main - Suitable Backfill 75% of total length.
3. Length of LPL connections: 20' per connection; Aggregate Backfill 50% of total length and Suitable Backfill 50% of total length.
4. Assume 1 ARV per 5,280 feet.
5. LPS cleanout required every 500-feet
6. Depth of sewer is 10 - 12-feet
7. Depth of manholes are 11-feet
8. Manhole is required every 350-feet
9. Service lateral connection includes 20-feet of 6" PVC pipe, wye, and cleanout per connection
10. Municipal Paving is assumed to be 3" 25mm base and 1.5" 9.5mm wearing trench restoration.
11. PennDOT Paving is assumed to be 5" 37.5mm base and 2" 12.5mm wearing mill and overlay wearing (approximately one-lane width).
12. Pump station estimates do not include control building, acquisition of land.
13. Pump station does not include emergency generator.
14. Estimates do not include permitting fees.

Using the assumptions outlined above, several cost opinions were prepared to use as a basis to compare the cost effectiveness of each structural alternative. Where applicable, a direct cost comparison of alternatives has been provided. Annual costs per EDU are based on these project costs and an assumed loan on the full project cost. It should be noted that the cost estimates prepared in this report and replicated in the Act 537 Plan are first level cost estimates appropriate for planning level detail and should not be considered as final costs for financing purposes. The estimated tapping fees (based on the current HAWASA tapping fees and estimated EDUs) have been subtracted from the estimated project costs for the financial alternative comparisons.

Tables 2-1 through 2-12 present the cost estimates for the structural alternatives and Tables 2-13 through 2-21 provides a summarization of the estimates. Tables 2-13 through 2-21 include the estimated annual cost and payment of annual debt service for each alternative. As a means of comparison, the Halifax Area Water and Sewer Authority currently charges residential users $115 per quarter (per EDU) and commercial users $140 per quarter (per EDU).

The structural alternatives providing public sewer service to the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas were found to be the most costly of all the structural alternatives evaluated in this report and replicated in the Act 537 Plan, but Alternative 3 (Fetterhoff Church Area) resulted in the greatest monthly cost per user based on projected EDUs. The estimated monthly cost per user for Alternative 3 is approximately $405/month (Based on 100% PENNVEST

Financing). Alternative 3 was also found to be the least expensive structural alternative evaluated for this report and similarly of the prepared Act 537 Plan.

Alternative 1B was estimated to be the most costly out of all the structural alternatives and resulted in the greatest annual cost per user based on projected EDUs for the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas. Estimated monthly cost per user for construction of Alternative 1B is approximately $168/month (Based 100% PENNVEST Financing). Alternative 1A was estimated to be the least expensive structural alternative serving the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas with an estimated monthly cost per existing user for construction of approximately $126/month (Based 100% PENNVEST Financing). Alternative 4A was estimated to be the structural alternative with the lowest monthly cost per user in the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas and in all planning areas. The estimated monthly cost per user for Alternative 4A is approximately $82/month (Based 100% PENNVEST Financing and assuming connection of the Lenker Estates subdivision).

Alternative 2B was estimated to be the most costly out of all the structural alternatives resulted in the greatest annual cost per user based on projected EDUs for the Tourist Park Area. The estimated monthly cost per use for construction of Alternative 2B is approximately $159/month (Based on 100% PENNVEST Financing).

All estimated monthly costs shown here for comparison purposes do not include any grant money or financial contributions from developers.

Table 2-1 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 1A

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 1A: COMBINATION OF GRAVITY SEWER AND LOW PRESSURE SEWER
SEWER EXTENSION

ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 311,200.00	$ 311,200.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 155,600.00	$ 155,600.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 155,600.00	$ 155,600.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	6,305	L.F.	$ 60.00	$ 378,300.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	20,495	L.F.	$ 55.00	$ 1,127,225.00
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	3,270	L.F.	$ 50.00	$ 163,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	3,270	L.F.	$ 40.00	$ 130,800.00
8	LOW PRESSURE LATERAL CONNECTION	327	EA.	$ 1,500.00	$ 490,500.00
9	AIR/VACUUM RELEASE VALVES	3	EA.	$ 7,750.00	$ 23,250.00
10	INLINE CLEANOUT	54	EA.	$ 2,700.00	$ 145,800.00
11	TERMINAL CLEANOUT	10	EA.	$ 2,500.00	$ 25,000.00
12	GRINDER PUMP - SIMPLEX	327	EA.	$ 6,500.00	$ 2,125,500.00
13	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,250.00	$ 2,500.00
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	2,372	L.F.	$ 160.00	$ 379,520.00
15	8" PVC MAIN - SUITABLE BACKFILL	593	L.F.	$ 120.00	$ 71,160.00
16	8" X 6" WYE	20	L.F.	$ 250.00	$ 5,000.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	200	L.F.	$ 75.00	$ 15,000.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	200	L.F.	$ 55.00	$ 11,000.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	20	L.F.	$ 525.00	$ 10,500.00
20	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,350.00	$ 2,700.00
21	CLAY DIKE	4	EA.	$ 350.00	$ 1,400.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	12	EA.	$ 5,000.00	$ 60,000.00
23	MANHOLE FRAME AND COVER	12	EA.	$ 500.00	$ 6,000.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	6	L.S.	$ 9,000.00	$ 54,000.00
PUMP STATION					
27	PUMP STATION	0	L.S.	$ 300,000.00	$ -
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	0	L.F.	$ 75.00	$ -
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	0	L.F.	$ 70.00	$ -
SURFACING					
30	TEMPORARY PAVING	12,147	L.F.	$ 10.00	$ 121,470.00
31	PENNDOT PAVING RESTORATION (BASE)	5,777	L.F.	$ 35.00	$ 202,202.19
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	6,419	S.Y.	$ 20.00	$ 128,382.34
33	MUNICIPAL PAVING RESTORATION	6,370	L.F.	$ 55.00	$ 350,338.70
34	VEGETATIVE RESTORATION	24,558	L.F.	$ 5.00	$ 122,790.00
				ESTIMATED CONSTRUCTION COSTS	$ 6,846,300.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,027,000.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 1,968,400.00
				TOTAL ESTIMATED PROJECT COSTS	$ 9,841,700.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	347
				ESTIMATED CAPITAL COST PER EDU	$ 28,400.00

Table 2-2 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 1B

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 1B: COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER SEWER EXTENSION

ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 465,400.00	$ 465,400.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 232,700.00	$ 232,700.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 232,700.00	$ 232,700.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	684	L.F.	$ 60.00	$ 41,025.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	3,151	L.F.	$ 55.00	$ 173,318.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	270	L.F.	$ 50.00	$ 13,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	270	L.F.	$ 40.00	$ 10,800.00
8	LOW PRESSURE LATERAL CONNECTION	27	EA.	$ 1,500.00	$ 40,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	8	EA.	$ 2,700.00	$ 21,600.00
11	TERMINAL CLEANOUT	3	EA.	$ 2,500.00	$ 7,500.00
12	GRINDER PUMP - SIMPLEX	27	EA.	$ 6,500.00	$ 175,500.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	20,112	L.F.	$ 160.00	$ 3,217,920.00
15	8" PVC MAIN - SUITABLE BACKFILL	6,318	L.F.	$ 120.00	$ 758,160.00
16	8" X 6" WYE	320	L.F.	$ 250.00	$ 80,000.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	3,200	L.F.	$ 75.00	$ 240,000.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	3,200	L.F.	$ 55.00	$ 176,000.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	320	L.F.	$ 525.00	$ 168,000.00
20	CONNECTION TO EXISTING MANHOLE	4	EA.	$ 1,350.00	$ 5,400.00
21	CLAY DIKE	39	EA.	$ 350.00	$ 13,650.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	95	EA.	$ 5,000.00	$ 475,000.00
23	MANHOLE FRAME AND COVER	95	EA.	$ 500.00	$ 47,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	3	L.S.	$ 300,000.00	$ 900,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,444	L.F.	$ 75.00	$ 408,300.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	2,106	L.F.	$ 70.00	$ 147,420.00
SURFACING					
30	TEMPORARY PAVING	29,710	L.F.	$ 10.00	$ 297,097.50
31	PENNDOT PAVING RESTORATION (BASE)	17,271	L.F.	$ 35.00	$ 604,475.19
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	19,190	S.Y.	$ 20.00	$ 383,793.77
33	MUNICIPAL PAVING RESTORATION	12,439	L.F.	$ 55.00	$ 684,146.67
34	VEGETATIVE RESTORATION	15,045	L.F.	$ 5.00	$ 75,226.25

ESTIMATED CONSTRUCTION COSTS	$	10,237,400.00
CONSTRUCTION CONTINGENCY @ 15%	$	1,535,700.00
ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$	2,943,300.00
TOTAL ESTIMATED PROJECT COSTS	$	14,716,400.00
ESTIMATED NUMBER OF EDUs TO BE SERVED		347
ESTIMATED CAPITAL COST PER EDU	$	42,500.00

Table 2-3 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 1C

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 1C: COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER SEWER EXTENSION

ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 394,800.00	$ 394,800.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 197,400.00	$ 197,400.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 197,400.00	$ 197,400.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	2,494	L.F.	$ 60.00	$ 149,625.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	9,321	L.F.	$ 55.00	$ 512,668.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,540	L.F.	$ 50.00	$ 77,000.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,540	L.F.	$ 40.00	$ 61,600.00
8	LOW PRESSURE LATERAL CONNECTION	154	EA.	$ 1,500.00	$ 231,000.00
9	AIR/VACUUM RELEASE VALVES	2	EA.	$ 7,750.00	$ 15,500.00
10	INLINE CLEANOUT	24	EA.	$ 2,700.00	$ 64,800.00
11	TERMINAL CLEANOUT	4	EA.	$ 2,500.00	$ 10,000.00
12	GRINDER PUMP - SIMPLEX	154	EA.	$ 6,500.00	$ 1,001,000.00
13	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,250.00	$ 2,500.00
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	12,160	L.F.	$ 160.00	$ 1,945,600.00
15	8" PVC MAIN - SUITABLE BACKFILL	3,585	L.F.	$ 120.00	$ 430,200.00
16	8" X 6" WYE	193	L.F.	$ 250.00	$ 48,250.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	1,930	L.F.	$ 75.00	$ 144,750.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	1,930	L.F.	$ 55.00	$ 106,150.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	193	L.F.	$ 525.00	$ 101,325.00
20	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,350.00	$ 2,700.00
21	CLAY DIKE	24	EA.	$ 350.00	$ 8,400.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	55	EA.	$ 5,000.00	$ 275,000.00
23	MANHOLE FRAME AND COVER	55	EA.	$ 500.00	$ 27,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,968	L.F.	$ 75.00	$ 447,600.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,612	L.F.	$ 70.00	$ 112,840.00
SURFACING					
30	TEMPORARY PAVING	24,092	L.F.	$ 10.00	$ 240,917.50
31	PENNDOT PAVING RESTORATION (BASE)	13,236	L.F.	$ 35.00	$ 463,268.81
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	14,707	S.Y.	$ 20.00	$ 294,138.93
33	MUNICIPAL PAVING RESTORATION	10,855	L.F.	$ 55.00	$ 597,052.40
34	VEGETATIVE RESTORATION	17,988	L.F.	$ 5.00	$ 89,941.25
				ESTIMATED CONSTRUCTION COSTS	$ 8,684,000.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,302,600.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,496,700.00
				TOTAL ESTIMATED PROJECT COSTS	$ 12,483,300.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	347
				ESTIMATED CAPITAL COST PER EDU	$ 36,000.00

Table 2-4 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 1D

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 1D: COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER
SEWER EXTENSION

ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 403,100.00	$ 403,100.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 201,600.00	$ 201,600.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 201,600.00	$ 201,600.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	2,039	L.F.	$ 60.00	$ 122,325.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	7,956	L.F.	$ 55.00	$ 437,593.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,410	L.F.	$ 50.00	$ 70,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,410	L.F.	$ 40.00	$ 56,400.00
8	LOW PRESSURE LATERAL CONNECTION	141	EA.	$ 1,500.00	$ 211,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	20	EA.	$ 2,700.00	$ 54,000.00
11	TERMINAL CLEANOUT	4	EA.	$ 2,500.00	$ 10,000.00
12	GRINDER PUMP - SIMPLEX	141	EA.	$ 6,500.00	$ 916,500.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	13,544	L.F.	$ 160.00	$ 2,167,040.00
15	8" PVC MAIN - SUITABLE BACKFILL	4,021	L.F.	$ 120.00	$ 482,520.00
16	8" X 6" WYE	206	L.F.	$ 250.00	$ 51,500.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	2,060	L.F.	$ 75.00	$ 154,500.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	2,060	L.F.	$ 55.00	$ 113,300.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	206	L.F.	$ 525.00	$ 108,150.00
20	CONNECTION TO EXISTING MANHOLE	4	EA.	$ 1,350.00	$ 5,400.00
21	CLAY DIKE	29	EA.	$ 350.00	$ 10,150.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	63	EA.	$ 5,000.00	$ 315,000.00
23	MANHOLE FRAME AND COVER	63	EA.	$ 500.00	$ 31,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,968	L.F.	$ 75.00	$ 447,600.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,612	L.F.	$ 70.00	$ 112,840.00
SURFACING					
30	TEMPORARY PAVING	25,021	L.F.	$ 10.00	$ 250,207.50
31	PENNDOT PAVING RESTORATION (BASE)	13,785	L.F.	$ 35.00	$ 482,463.41
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	15,316	S.Y.	$ 20.00	$ 306,325.97
33	MUNICIPAL PAVING RESTORATION	11,236	L.F.	$ 55.00	$ 617,984.46
34	VEGETATIVE RESTORATION	17,059	L.F.	$ 5.00	$ 85,296.25
				ESTIMATED CONSTRUCTION COSTS	$ 8,867,700.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,330,200.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,549,500.00
				TOTAL ESTIMATED PROJECT COSTS	$ 12,747,400.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	347
				ESTIMATED CAPITAL COST PER EDU	$ 36,800.00

Table 2-5 Cost Opinion for Tourist Park Area Alternative 2A

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 2 - TOUREST PARK AND ALEX ACRES MOBILE HOME PARK
ALTERNATIVE 2A
LOW PRESSURE SEWER
SEWER EXTENSION

ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 109,300.00	$ 109,300.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 54,700.00	$ 54,700.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 54,700.00	$ 54,700.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	3,179	L.F.	$ 60.00	$ 190,725.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	9,536	L.F.	$ 55.00	$ 524,493.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,110	L.F.	$ 50.00	$ 55,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,110	L.F.	$ 40.00	$ 44,400.00
8	LOW PRESSURE LATERAL CONNECTION	111	EA.	$ 1,500.00	$ 166,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	26	EA.	$ 2,700.00	$ 70,200.00
11	TERMINAL CLEANOUT	2	EA.	$ 2,500.00	$ 5,000.00
12	GRINDER PUMP - SIMPLEX	111	EA.	$ 6,500.00	$ 721,500.00
13	CONNECTION TO EXISTING MANHOLE	1	EA.	$ 1,250.00	$ 1,250.00
CROSSING					
14	PENNDOT CROSSING	1	L.S.	$ 30,000.00	$ 30,000.00
15	STREAM CROSSING	3	L.S.	$ 9,000.00	$ 27,000.00
SURFACING					
16	TEMPORARY PAVING	4,289	L.F.	$ 10.00	$ 42,887.50
17	PENNDOT PAVING RESTORATION (BASE)	3,710	L.F.	$ 35.00	$ 129,859.91
18	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	4,123	S.Y.	$ 20.00	$ 82,450.74
19	MUNICIPAL PAVING RESTORATION	578	L.F.	$ 55.00	$ 31,815.68
20	VEGETATIVE RESTORATION	10,646	L.F.	$ 5.00	$ 53,231.25
				ESTIMATED CONSTRUCTION COSTS	$ 2,403,300.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 360,500.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 691,000.00
				TOTAL ESTIMATED PROJECT COSTS	$ 3,454,800.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	125
				ESTIMATED CAPITAL COST PER EDU	$ 27,700.00

Table 2-6 Cost Opinion for Tourist Park Area Alternative 2B

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 2 - TOUREST PARK AND ALEX ACRES MOBILE HOME PARK
ALTERNATIVE 2B
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER
SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 147,600.00	$ 147,600.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 73,800.00	$ 73,800.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 73,800.00	$ 73,800.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	1,461	L.F.	$ 60.00	$ 87,675.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	4,384	L.F.	$ 55.00	$ 241,106.25
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	780	L.F.	$ 50.00	$ 39,000.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	780	L.F.	$ 40.00	$ 31,200.00
8	LOW PRESSURE LATERAL CONNECTION	78	EA.	$ 1,500.00	$ 117,000.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	12	EA.	$ 2,700.00	$ 32,400.00
11	TERMINAL CLEANOUT	2	EA.	$ 2,500.00	$ 5,000.00
12	GRINDER PUMP - SIMPLEX	78	EA.	$ 6,500.00	$ 507,000.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	2,440	L.F.	$ 160.00	$ 390,400.00
15	8" PVC MAIN - SUITABLE BACKFILL	740	L.F.	$ 120.00	$ 88,800.00
16	8" X 6" WYE	33	L.F.	$ 250.00	$ 8,250.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	330	L.F.	$ 75.00	$ 24,750.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	330	L.F.	$ 55.00	$ 18,150.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	33	L.F.	$ 525.00	$ 17,325.00
20	CONNECTION TO EXISTING MANHOLE	1	EA.	$ 1,350.00	$ 1,350.00
21	CLAY DIKE	0	EA.	$ 350.00	$ -
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	11	EA.	$ 5,000.00	$ 55,000.00
23	MANHOLE FRAME AND COVER	11	EA.	$ 500.00	$ 5,500.00
24	MANHOLE PROTECTIVE LINING	1	EA.	$ 2,500.00	$ 2,500.00
CROSSING					
25	PENNDOT CROSSING	1	L.S.	$ 30,000.00	$ 30,000.00
26	STREAM CROSSING	3	L.S.	$ 9,000.00	$ 27,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	3,056	L.F.	$ 75.00	$ 229,200.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,509	L.F.	$ 70.00	$ 105,630.00
SURFACING					
30	TEMPORARY PAVING	8,067	L.F.	$ 10.00	$ 80,672.50
31	PENNDOT PAVING RESTORATION (BASE)	6,979	L.F.	$ 35.00	$ 244,269.86
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	7,755	S.Y.	$ 20.00	$ 155,091.97
33	MUNICIPAL PAVING RESTORATION	1,088	L.F.	$ 55.00	$ 59,846.12
34	VEGETATIVE RESTORATION	7,743	L.F.	$ 5.00	$ 38,713.75
				ESTIMATED CONSTRUCTION COSTS	$ 3,245,800.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 486,900.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 933,200.00
				TOTAL ESTIMATED PROJECT COSTS	$ 4,665,900.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	125
				ESTIMATED CAPITAL COST PER EDU	$ 37,400.00

Table 2-7 Cost Opinion for Fetterhoff Church Area Alternative 3

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 3 - FETTERHOFF CHURCH
ALTERNATIVE 3
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER
SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 150,000.00	$ 150,000.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 75,000.00	$ 75,000.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 75,000.00	$ 75,000.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	190	L.F.	$ 60.00	$ 11,415.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	571	L.F.	$ 55.00	$ 31,391.25
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	100	L.F.	$ 50.00	$ 5,000.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	100	L.F.	$ 40.00	$ 4,000.00
8	LOW PRESSURE LATERAL CONNECTION	10	EA.	$ 1,500.00	$ 15,000.00
9	AIR/VACUUM RELEASE VALVES	0	EA.	$ 7,750.00	$ -
10	INLINE CLEANOUT	2	EA.	$ 2,700.00	$ 5,400.00
11	TERMINAL CLEANOUT	1	EA.	$ 2,500.00	$ 2,500.00
12	GRINDER PUMP - SIMPLEX	10	EA.	$ 6,500.00	$ 65,000.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	7,904	L.F.	$ 160.00	$ 1,264,640.00
15	8" PVC MAIN - SUITABLE BACKFILL	2,026	L.F.	$ 120.00	$ 243,120.00
16	8" X 6" WYE	40	L.F.	$ 250.00	$ 10,000.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	400	L.F.	$ 75.00	$ 30,000.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	400	L.F.	$ 55.00	$ 22,000.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	40	L.F.	$ 525.00	$ 21,000.00
20	CONNECTION TO EXISTING MANHOLE	1	EA.	$ 1,350.00	$ 1,350.00
21	CLAY DIKE	2	EA.	$ 350.00	$ 700.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	31	EA.	$ 5,000.00	$ 155,000.00
23	MANHOLE FRAME AND COVER	31	EA.	$ 500.00	$ 15,500.00
24	MANHOLE PROTECTIVE LINING	1	EA.	$ 2,500.00	$ 2,500.00
CROSSING					
25	PENNDOT CROSSING	1	L.S.	$ 30,000.00	$ 30,000.00
26	STREAM CROSSING	1	L.S.	$ 9,000.00	$ 9,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	992	L.F.	$ 75.00	$ 74,400.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	298	L.F.	$ 70.00	$ 20,860.00
SURFACING					
30	TEMPORARY PAVING	9,586	L.F.	$ 10.00	$ 95,862.50
31	PENNDOT PAVING RESTORATION (BASE)	9,054	L.F.	$ 35.00	$ 316,880.39
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	10,060	S.Y.	$ 20.00	$ 201,193.90
33	MUNICIPAL PAVING RESTORATION	533	L.F.	$ 55.00	$ 29,288.85
34	VEGETATIVE RESTORATION	3,395	L.F.	$ 5.00	$ 16,973.75

ESTIMATED CONSTRUCTION COSTS	$	3,300,000.00
CONSTRUCTION CONTINGENCY @ 15%	$	495,000.00
ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$	948,800.00
TOTAL ESTIMATED PROJECT COSTS	$	4,743,800.00
ESTIMATED NUMBER OF EDUs TO BE SERVED		50
ESTIMATED CAPITAL COST PER EDU	$	94,900.00

Table 2-8 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 4A

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 4A: COMBINATION OF GRAVITY SEWER AND LOW PRESSURE SEWER PLUS LENKER ESTATES SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 311,200.00	$ 311,200.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 155,600.00	$ 155,600.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 155,600.00	$ 155,600.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	6,305	L.F.	$ 60.00	$ 378,300.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	20,495	L.F.	$ 55.00	$ 1,127,225.00
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	3,270	L.F.	$ 50.00	$ 163,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	3,270	L.F.	$ 40.00	$ 130,800.00
8	LOW PRESSURE LATERAL CONNECTION	327	EA.	$ 1,500.00	$ 490,500.00
9	AIR/VACUUM RELEASE VALVES	3	EA.	$ 7,750.00	$ 23,250.00
10	INLINE CLEANOUT	54	EA.	$ 2,700.00	$ 145,800.00
11	TERMINAL CLEANOUT	10	EA.	$ 2,500.00	$ 25,000.00
12	GRINDER PUMP - SIMPLEX	327	EA.	$ 6,500.00	$ 2,125,500.00
13	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,250.00	$ 2,500.00
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	2,372	L.F.	$ 160.00	$ 379,520.00
15	8" PVC MAIN - SUITABLE BACKFILL	593	L.F.	$ 120.00	$ 71,160.00
16	8" X 6" WYE	20	L.F.	$ 250.00	$ 5,000.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	200	L.F.	$ 75.00	$ 15,000.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	200	L.F.	$ 55.00	$ 11,000.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	20	L.F.	$ 525.00	$ 10,500.00
20	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,350.00	$ 2,700.00
21	CLAY DIKE	4	EA.	$ 350.00	$ 1,400.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	12	EA.	$ 5,000.00	$ 60,000.00
23	MANHOLE FRAME AND COVER	12	EA.	$ 500.00	$ 6,000.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	6	L.S.	$ 9,000.00	$ 54,000.00
PUMP STATION					
27	PUMP STATION	0	L.S.	$ 300,000.00	$ -
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	0	L.F.	$ 75.00	$ -
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	0	L.F.	$ 70.00	$ -
SURFACING					
30	TEMPORARY PAVING	12,147	L.F.	$ 10.00	$ 121,470.00
31	PENNDOT PAVING RESTORATION (BASE)	5,777	L.F.	$ 35.00	$ 202,202.19
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	6,419	S.Y.	$ 20.00	$ 128,382.34
33	MUNICIPAL PAVING RESTORATION	6,370	L.F.	$ 55.00	$ 350,338.70
34	VEGETATIVE RESTORATION	24,558	L.F.	$ 5.00	$ 122,790.00

ESTIMATED CONSTRUCTION COSTS	$ 6,846,300.00
CONSTRUCTION CONTINGENCY @ 15%	$ 1,027,000.00
ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 1,968,400.00
TOTAL ESTIMATED PROJECT COSTS	$ 9,841,700.00
ESTIMATED NUMBER OF EDUs TO BE SERVED	507
ESTIMATED CAPITAL COST PER EDU	$ 19,500.00

Table 2-9 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 4B

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 4B
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER PLUS LENKER ESTATES SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 465,400.00	$ 465,400.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 232,700.00	$ 232,700.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 232,700.00	$ 232,700.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	684	L.F.	$ 60.00	$ 41,025.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	3,151	L.F.	$ 55.00	$ 173,318.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	270	L.F.	$ 50.00	$ 13,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	270	L.F.	$ 40.00	$ 10,800.00
8	LOW PRESSURE LATERAL CONNECTION	27	EA.	$ 1,500.00	$ 40,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	8	EA.	$ 2,700.00	$ 21,600.00
11	TERMINAL CLEANOUT	3	EA.	$ 2,500.00	$ 7,500.00
12	GRINDER PUMP - SIMPLEX	27	EA.	$ 6,500.00	$ 175,500.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	20,112	L.F.	$ 160.00	$ 3,217,920.00
15	8" PVC MAIN - SUITABLE BACKFILL	6,318	L.F.	$ 120.00	$ 758,160.00
16	8" X 6" WYE	320	L.F.	$ 250.00	$ 80,000.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	3,200	L.F.	$ 75.00	$ 240,000.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	3,200	L.F.	$ 55.00	$ 176,000.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	320	L.F.	$ 525.00	$ 168,000.00
20	CONNECTION TO EXISTING MANHOLE	4	EA.	$ 1,350.00	$ 5,400.00
21	CLAY DIKE	39	EA.	$ 350.00	$ 13,650.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	95	EA.	$ 5,000.00	$ 475,000.00
23	MANHOLE FRAME AND COVER	95	EA.	$ 500.00	$ 47,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	3	L.S.	$ 300,000.00	$ 900,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,444	L.F.	$ 75.00	$ 408,300.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	2,106	L.F.	$ 70.00	$ 147,420.00
SURFACING					
30	TEMPORARY PAVING	29,710	L.F.	$ 10.00	$ 297,097.50
31	PENNDOT PAVING RESTORATION (BASE)	17,271	L.F.	$ 35.00	$ 604,475.19
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	19,190	S.Y.	$ 20.00	$ 383,793.77
33	MUNICIPAL PAVING RESTORATION	12,439	L.F.	$ 55.00	$ 684,146.67
34	VEGETATIVE RESTORATION	15,045	L.F.	$ 5.00	$ 75,226.25
				ESTIMATED CONSTRUCTION COSTS	$ 10,237,400.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,535,700.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,943,300.00
				TOTAL ESTIMATED PROJECT COSTS	$ 14,716,400.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	507
				ESTIMATED CAPITAL COST PER EDU	$ 29,100.00

Table 2-10 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 4C

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 4C
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER PLUS LENKER ESTATES SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 394,800.00	$ 394,800.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 197,400.00	$ 197,400.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 197,400.00	$ 197,400.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	2,494	L.F.	$ 60.00	$ 149,625.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	9,321	L.F.	$ 55.00	$ 512,668.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,540	L.F.	$ 50.00	$ 77,000.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,540	L.F.	$ 40.00	$ 61,600.00
8	LOW PRESSURE LATERAL CONNECTION	154	EA.	$ 1,500.00	$ 231,000.00
9	AIR/VACUUM RELEASE VALVES	2	EA.	$ 7,750.00	$ 15,500.00
10	INLINE CLEANOUT	24	EA.	$ 2,700.00	$ 64,800.00
11	TERMINAL CLEANOUT	4	EA.	$ 2,500.00	$ 10,000.00
12	GRINDER PUMP - SIMPLEX	154	EA.	$ 6,500.00	$ 1,001,000.00
13	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,250.00	$ 2,500.00
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	12,160	L.F.	$ 160.00	$ 1,945,600.00
15	8" PVC MAIN - SUITABLE BACKFILL	3,585	L.F.	$ 120.00	$ 430,200.00
16	8" X 6" WYE	193	L.F.	$ 250.00	$ 48,250.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	1,930	L.F.	$ 75.00	$ 144,750.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	1,930	L.F.	$ 55.00	$ 106,150.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	193	L.F.	$ 525.00	$ 101,325.00
20	CONNECTION TO EXISTING MANHOLE	2	EA.	$ 1,350.00	$ 2,700.00
21	CLAY DIKE	24	EA.	$ 350.00	$ 8,400.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	55	EA.	$ 5,000.00	$ 275,000.00
23	MANHOLE FRAME AND COVER	55	EA.	$ 500.00	$ 27,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,968	L.F.	$ 75.00	$ 447,600.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,612	L.F.	$ 70.00	$ 112,840.00
SURFACING					
30	TEMPORARY PAVING	24,092	L.F.	$ 10.00	$ 240,917.50
31	PENNDOT PAVING RESTORATION (BASE)	13,236	L.F.	$ 35.00	$ 463,268.81
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	14,707	S.Y.	$ 20.00	$ 294,138.93
33	MUNICIPAL PAVING RESTORATION	10,855	L.F.	$ 55.00	$ 597,052.40
34	VEGETATIVE RESTORATION	17,988	L.F.	$ 5.00	$ 89,941.25
				ESTIMATED CONSTRUCTION COSTS	$ 8,684,000.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,302,600.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,496,700.00
				TOTAL ESTIMATED PROJECT COSTS	$ 12,483,300.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	507
				ESTIMATED CAPITAL COST PER EDU	$ 24,700.00

Table 2-11 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 4D

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 4D
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER PLUS LENKER ESTATES SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 403,100.00	$ 403,100.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 201,600.00	$ 201,600.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 201,600.00	$ 201,600.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	2,039	L.F.	$ 60.00	$ 122,325.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	7,956	L.F.	$ 55.00	$ 437,593.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,410	L.F.	$ 50.00	$ 70,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,410	L.F.	$ 40.00	$ 56,400.00
8	LOW PRESSURE LATERAL CONNECTION	141	EA.	$ 1,500.00	$ 211,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	20	EA.	$ 2,700.00	$ 54,000.00
11	TERMINAL CLEANOUT	4	EA.	$ 2,500.00	$ 10,000.00
12	GRINDER PUMP - SIMPLEX	141	EA.	$ 6,500.00	$ 916,500.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	13,544	L.F.	$ 160.00	$ 2,167,040.00
15	8" PVC MAIN - SUITABLE BACKFILL	4,021	L.F.	$ 120.00	$ 482,520.00
16	8" X 6" WYE	206	L.F.	$ 250.00	$ 51,500.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	2,060	L.F.	$ 75.00	$ 154,500.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	2,060	L.F.	$ 55.00	$ 113,300.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	206	L.F.	$ 525.00	$ 108,150.00
20	CONNECTION TO EXISTING MANHOLE	4	EA.	$ 1,350.00	$ 5,400.00
21	CLAY DIKE	29	EA.	$ 350.00	$ 10,150.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	63	EA.	$ 5,000.00	$ 315,000.00
23	MANHOLE FRAME AND COVER	63	EA.	$ 500.00	$ 31,500.00
24	MANHOLE PROTECTIVE LINING	4	EA.	$ 2,500.00	$ 10,000.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,968	L.F.	$ 75.00	$ 447,600.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,612	L.F.	$ 70.00	$ 112,840.00
SURFACING					
30	TEMPORARY PAVING	25,021	L.F.	$ 10.00	$ 250,207.50
31	PENNDOT PAVING RESTORATION (BASE)	13,785	L.F.	$ 35.00	$ 482,463.41
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	15,316	S.Y.	$ 20.00	$ 306,325.97
33	MUNICIPAL PAVING RESTORATION	11,236	L.F.	$ 55.00	$ 617,984.46
34	VEGETATIVE RESTORATION	17,059	L.F.	$ 5.00	$ 85,296.25
				ESTIMATED CONSTRUCTION COSTS	$ 8,867,700.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,330,200.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,549,500.00
				TOTAL ESTIMATED PROJECT COSTS	$ 12,747,400.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	507
				ESTIMATED CAPITAL COST PER EDU	$ 25,200.00

Table 2-12 Cost Opinion for Matamoras, Route 147 & 225, and Triangle & Lenker Estates Areas Alternative 4E

OPINION OF PROBABLE PROJECT COST
FOR
HALIFAX TOWNSHIP ACT 537 SEWAGE FACILITIES PLAN
SEWER DISTRICT NO. 1 - MATAMORAS, TRIANGLE & LENKER ESTATES, ROUTES 147 & 225
ALTERNATIVE 4E
COMBINATION OF PUMP STATION AND FORCE MAIN, GRAVITY SEWER, AND LOW PRESSURE SEWER PLUS LENKER ESTATES (SHARED) SEWER EXTENSION

ITEM NO.	DESCRIPTION		UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION @ 5%	1	L.S.	$ 423,300.00	$ 423,300.00
2	TRAFFIC MAINTENANCE & PROTECTION @ 2.5%	1	L.S.	$ 211,700.00	$ 211,700.00
3	EROSION AND SEDIMENTATION CONTROL @ 2.5%	1	L.S.	$ 211,700.00	$ 211,700.00
LOW PRESSURE SEWER					
4	2" HDPE LOW PRESSURE SEWER - AGGREGATE BACKFILL	2,039	L.F.	$ 60.00	$ 122,325.00
5	2" HDPE LOW PRESSURE SEWER - SUITABLE BACKFILL	7,956	L.F.	$ 55.00	$ 437,593.75
6	1.25" HDPE LOW PRESSURE LATERAL - AGGREGATE BACKFILL	1,410	L.F.	$ 50.00	$ 70,500.00
7	1.25" HDPE LOW PRESSURE LATERAL - SUITABLE BACKFILL	1,410	L.F.	$ 40.00	$ 56,400.00
8	LOW PRESSURE LATERAL CONNECTION	141	EA.	$ 1,500.00	$ 211,500.00
9	AIR/VACUUM RELEASE VALVES	1	EA.	$ 7,750.00	$ 7,750.00
10	INLINE CLEANOUT	20	EA.	$ 2,700.00	$ 54,000.00
11	TERMINAL CLEANOUT	4	EA.	$ 2,500.00	$ 10,000.00
12	GRINDER PUMP - SIMPLEX	141	EA.	$ 6,500.00	$ 916,500.00
13	CONNECTION TO EXISTING MANHOLE	0	EA.	$ 1,250.00	$ -
GRAVITY SEWER					
14	8" PVC MAIN - AGGREGATE BACKFILL	13,688	L.F.	$ 160.00	$ 2,190,080.00
15	8" PVC MAIN - SUITABLE BACKFILL	4,487	L.F.	$ 120.00	$ 538,440.00
16	8" X 6" WYE	206	L.F.	$ 250.00	$ 51,500.00
17	6" SERVICE LATERAL - AGGREGATE BACKFILL	2,060	L.F.	$ 75.00	$ 154,500.00
18	6" SERVICE LATERAL - SUITABLE BACKFILL	2,060	L.F.	$ 55.00	$ 113,300.00
19	6" SERVICE LATERAL CLEANOUT - SUITABLE BACKFILL	206	L.F.	$ 525.00	$ 108,150.00
20	CONNECTION TO EXISTING MANHOLE	5	EA.	$ 1,350.00	$ 6,750.00
21	CLAY DIKE	30	EA.	$ 350.00	$ 10,500.00
MANHOLE					
22	MANHOLE - 4 FT DIAMETER	64	EA.	$ 5,000.00	$ 320,000.00
23	MANHOLE FRAME AND COVER	64	EA.	$ 500.00	$ 32,000.00
24	MANHOLE PROTECTIVE LINING	5	EA.	$ 2,500.00	$ 12,500.00
CROSSING					
25	PENNDOT CROSSING	2	L.S.	$ 30,000.00	$ 60,000.00
26	STREAM CROSSING	7	L.S.	$ 9,000.00	$ 63,000.00
PUMP STATION					
27	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN					
28	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	5,968	L.F.	$ 75.00	$ 447,600.00
29	4" HDPE FORCE MAIN - SUITABLE BACKFILL	1,612	L.F.	$ 70.00	$ 112,840.00
SURFACING					
30	TEMPORARY PAVING	25,165	L.F.	$ 10.00	$ 251,647.50
31	PENNDOT PAVING RESTORATION (BASE)	13,788	L.F.	$ 35.00	$ 482,571.09
32	PENNDOT PAVING RESTORATION (MILL AND OVERLAY)	15,320	S.Y.	$ 20.00	$ 306,394.34
33	MUNICIPAL PAVING RESTORATION	11,377	L.F.	$ 55.00	$ 625,735.25
34	VEGETATIVE RESTORATION	17,525	L.F.	$ 5.00	$ 87,626.25
PUMP STATION (SHARED WITH LENKER ESTATES)					
35	PUMP STATION	1	L.S.	$ 300,000.00	$ 300,000.00
FORCE MAIN (SHARED WITH LENKER ESTATES)					
36	4" HDPE FORCE MAIN - AGGREGATE BACKFILL	1,830	L.F.	$ 75.00	$ 137,250.00
37	4" HDPE FORCE MAIN - SUITABLE BACKFILL	230	L.F.	$ 70.00	$ 16,100.00
SURFACING (SHARED WITH LENKER ESTATES)					
38	TEMPORARY PAVING	1,830	L.F.	$ 10.00	$ 18,300.00
39	MUNICIPAL PAVING RESTORATION	827	L.F.	$ 55.00	$ 45,503.95
40	VEGETATIVE RESTORATION	1,830	L.F.	$ 5.00	$ 9,150.00
				Subtotal of Costs Shared with Lenker Estates	$ 526,304.00
				Subtotal of Costs Assumed for Township (57.45%)	$ 302,350.00
				ESTIMATED CONSTRUCTION COSTS	$ 9,310,800.00
				CONSTRUCTION CONTINGENCY @ 15%	$ 1,396,700.00
				ENGINEERING, ADMIN, & LEGAL FEES @ 25%	$ 2,676,900.00
				TOTAL ESTIMATED PROJECT COSTS	$ 13,384,400.00
				ESTIMATED NUMBER OF EDUs TO BE SERVED	507
				ESTIMATED CAPITAL COST PER EDU	$ 26,400.00

Table 2-13 Summary of PENNVEST Financing (2.063%, 20 yrs)

Summary of Cost Opinions for Structural Alternatives - PENNVEST Financing (2.063%, 20yrs)														
Study Area	**Alternative**	**Estimated Project Cost**	**Estimated Annual Debt Service**	**Estimated Annual O&M Cost**	**Estimated Annual Cost**	**Present Worth of Annual O&M**	**Total Present Worth**	**Number of EDUs**	**Number of Projected EDUs**	**Estimated Present Worth Per EDU**	**Estimated Annual Cost Per EDU**	**Estimated Annual Cost Per Projected EDU**	**Estimated Monthly Cost Per EDU**	**Estimated Monthly Cost Per Projected EDU**
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$8,124,700	$496,132	$133,000	$629,132	$1,768,151	$9,892,851	347	417	$28,509.66	$1,813.06	$1,508.71	$151	$126
	Alternative 1B	$12,999,400	$793,804	$47,900	$841,704	$636,800	$13,636,200	347	417	$39,297	$2,426	$2,018	$202	$168
	Altternative 1C	$10,766,300	$657,441	$78,600	$736,041	$1,044,937	$11,811,237	347	417	$34,038	$2,121	$1,765	$177	$147
	Alternative 1D	$11,030,400	$673,568	$74,400	$747,968	$989,101	$12,019,501	347	417	$34,638	$2,156	$1,794	$180	$149
Tourist Park	Alternative 2A	$2,836,300	$173,198	$46,500	$219,698	$618,188	$3,454,488	125	150	$27,636	$1,758	$1,465	$146	$122
	Alternative 2B	$4,047,400	$247,153	$38,400	$285,553	$510,504	$4,557,904	125	150	$36,463	$2,284	$1,904	$190	$159
Fetterhoff Church	Alternative 3	$4,496,400	$274,571	$17,000	$291,571	$226,004	$4,722,404	50	60	$94,448	$5,831	$4,860	$486	$405
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$7,333,100	$447,793	$133,000	$580,793	$1,768,151	$9,101,251	507	588	$17,951	$1,146	$988	$95	$82
	Alternative 4B	$12,207,800	$745,465	$47,900	$793,365	$636,800	$12,844,600	507	588	$25,335	$1,565	$1,349	$130	$112
	Altternative 4C	$9,974,700	$609,102	$78,600	$687,702	$1,044,937	$11,019,637	507	588	$21,735	$1,356	$1,170	$113	$97
	Alternative 4D	$10,238,800	$625,229	$74,400	$699,629	$989,101	$11,227,901	507	588	$22,146	$1,380	$1,190	$115	$99
	Alternative 4E	$10,875,800	$664,127	$79,900	$744,027	$1,062,220	$11,938,020	507	588	$23,546	$1,468	$1,265	$122	$105
Notes:														
1. Annual Debt Service Calculations Assume PENNVEST Financing of 2.063% for 20 Years														
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9														
3. Present Worth Calculations Assume 4.25% for 20 Years														
4. Annual O&M Estimated based on typical common useage														

Table 2-14 Summary of PENNVEST Financing (25% Grant, 75% Loan @ 2.063%, 20 yrs)

Summary of Cost Opinions for Structural Alternatives - PENNVEST Financing (25% Grant; 75% Loan @2.063%, 20yrs)														
Study Area	Alternative	Estimated Project Cost Less Grant	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$6,093,525	$372,099	$133,000	$505,099	$1,768,151	$7,861,676	347	417	$22,656	$1,456	$1,211	$121	$101
	Alternative 1B	$9,749,550	$595,353	$47,900	$643,253	$636,800	$10,386,350	347	417	$29,932	$1,854	$1,543	$154	$129
	Altternative 1C	$8,074,725	$493,081	$78,600	$571,681	$1,044,937	$9,119,662	347	417	$26,281	$1,647	$1,371	$137	$114
	Alternative 1D	$8,272,800	$505,176	$74,400	$579,576	$989,101	$9,261,901	347	417	$26,691	$1,670	$1,390	$139	$116
Tourist Park	Alternative 2A	$2,127,225	$129,898	$46,500	$176,398	$618,188	$2,745,413	125	150	$21,963	$1,411	$1,176	$118	$98
	Alternative 2B	$3,035,550	$185,365	$38,400	$223,765	$510,504	$3,546,054	125	150	$28,368	$1,790	$1,492	$149	$124
Fetterhoff Church	Alternative 3	$3,372,300	$205,928	$17,000	$222,928	$226,004	$3,598,304	50	60	$71,966	$4,459	$3,715	$372	$310
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$5,499,825	$335,845	$133,000	$468,845	$1,768,151	$7,267,976	507	588	$14,335	$925	$797	$77	$66
	Alternative 4B	$9,155,850	$559,099	$47,900	$606,999	$636,800	$9,792,650	507	588	$19,315	$1,197	$1,032	$100	$86
	Altternative 4C	$7,481,025	$456,826	$78,600	$535,426	$1,044,937	$8,525,962	507	588	$16,816	$1,056	$911	$88	$76
	Alternative 4D	$7,679,100	$468,922	$74,400	$543,322	$989,101	$8,668,201	507	588	$17,097	$1,072	$924	$89	$77
	Alternative 4E	$8,156,850	$498,095	$79,900	$577,995	$1,062,220	$9,219,070	507	588	$18,184	$1,140	$983	$95	$82

Notes:

1. Annual Debt Service Calculations Assume PENNVEST Financing of 2.063% for 20 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-15 Summary of PENNVEST Financing (50% Grant 50% Loan @ 2.063%,@ 2.063%, 20 yrs)

Summary of Cost Opinions for Structural Alternatives - PENNVEST Financing (50% Grant; 50% Loan @2.063%, 20yrs)														
Study Area	Alternative	Estimated Project Cost Less Grant	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$4,062,350	$248,066	$133,000	$381,066	$1,768,151	$5,830,501	347	417	$16,803	$1,098	$914	$92	$76
	Alternative 1B	$6,499,700	$396,902	$47,900	$444,802	$636,800	$7,136,500	347	417	$20,566	$1,282	$1,067	$107	$89
	Altternative 1C	$5,383,150	$328,720	$78,600	$407,320	$1,044,937	$6,428,087	347	417	$18,525	$1,174	$977	$98	$81
	Alternative 1D	$5,515,200	$336,784	$74,400	$411,184	$989,101	$6,504,301	347	417	$18,744	$1,185	$986	$99	$82
Tourist Park	Alternative 2A	$1,418,150	$86,599	$46,500	$133,099	$618,188	$2,036,338	125	150	$16,291	$1,065	$887	$89	$74
	Alternative 2B	$2,023,700	$123,577	$38,400	$161,977	$510,504	$2,534,204	125	150	$20,274	$1,296	$1,080	$108	$90
Fetterhoff Church	Alternative 3	$2,248,200	$137,286	$17,000	$154,286	$226,004	$2,474,204	50	60	$49,484	$3,086	$2,571	$257	$214
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$3,666,550	$223,897	$133,000	$356,897	$1,768,151	$5,434,701	507	588	$10,719	$704	$607	$59	$51
	Alternative 4B	$6,103,900	$372,733	$47,900	$420,633	$636,800	$6,740,700	507	588	$13,295	$830	$715	$69	$60
	Altternative 4C	$4,987,350	$304,551	$78,600	$383,151	$1,044,937	$6,032,287	507	588	$11,898	$756	$652	$63	$54
	Alternative 4D	$5,119,400	$312,615	$74,400	$387,015	$989,101	$6,108,501	507	588	$12,048	$763	$658	$64	$55
	Alternative 4E	$5,437,900	$332,064	$79,900	$411,964	$1,062,220	$6,500,120	507	588	$12,821	$813	$701	$68	$58
Notes:														
1. Annual Debt Service Calculations Assume PENNVEST Financing of 2.063% for 20 Years														
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9														
3. Present Worth Calculations Assume 4.25% for 20 Years														
4. Annual O&M Estimated based on typical common useage														

Table 2-16 Summary of PENNVEST Financing (75% Grant 25% Loan @ 2.063%, 20 yrs)

Summary of Cost Opinions for Structural Alternatives - PENNVEST Financing (75% Grant; 25% Loan @2.063%, 20yrs)														
Study Area	**Alternative**	**Estimated Project Cost Less Grant**	**Estimated Annual Debt Service**	**Estimated Annual O&M Cost**	**Estimated Annual Cost**	**Present Worth of Annual O&M**	**Total Present Worth**	**Number of EDUs**	**Number of Projected EDUs**	**Estimated Present Worth Per EDU**	**Estimated Annual Cost Per EDU**	**Estimated Annual Cost Per Projected EDU**	**Estimated Monthly Cost Per EDU**	**Estimated Monthly Cost Per Projected EDU**
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$2,031,175	$124,033	$133,000	$257,033	$1,768,151	$3,799,326	347	417	$10,949	$741	$616	$62	$51
	Alternative 1B	$3,249,850	$198,451	$47,900	$246,351	$636,800	$3,886,650	347	417	$11,201	$710	$591	$59	$49
	Altternative 1C	$2,691,575	$164,360	$78,600	$242,960	$1,044,937	$3,736,512	347	417	$10,768	$700	$583	$58	$49
	Alternative 1D	$2,757,600	$168,392	$74,400	$242,792	$989,101	$3,746,701	347	417	$10,797	$700	$582	$58	$49
Tourist Park	Alternative 2A	$709,075	$43,299	$46,500	$89,799	$618,188	$1,327,263	125	150	$10,618	$718	$599	$60	$50
	Alternative 2B	$1,011,850	$61,788	$38,400	$100,188	$510,504	$1,522,354	125	150	$12,179	$802	$668	$67	$56
Fetterhoff Church	Alternative 3	$1,124,100	$68,643	$17,000	$85,643	$226,004	$1,350,104	50	60	$27,002	$1,713	$1,427	$143	$119
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$1,833,275	$111,948	$133,000	$244,948	$1,768,151	$3,601,426	507	588	$7,103	$483	$417	$40	$35
	Alternative 4B	$3,051,950	$186,366	$47,900	$234,266	$636,800	$3,688,750	507	588	$7,276	$462	$398	$39	$33
	Altternative 4C	$2,493,675	$152,275	$78,600	$230,875	$1,044,937	$3,538,612	507	588	$6,980	$455	$393	$38	$33
	Alternative 4D	$2,559,700	$156,307	$74,400	$230,707	$989,101	$3,548,801	507	588	$7,000	$455	$392	$38	$33
	Alternative 4E	$2,718,950	$166,032	$79,900	$245,932	$1,062,220	$3,781,170	507	588	$7,458	$485	$418	$40	$35

Notes:

1. Annual Debt Service Calculations Assume PENNVEST Financing of 2.063% for 20 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-17 Summary of USDA RUS Financing (3.25%, 40 yrs)

Summary of Cost Opinions for Structural Alternatives - USDA RUS Financing (3.25%, 40yrs)														
Study Area	**Alternative**	**Estimated Project Cost**	**Estimated Annual Debt Service**	**Estimated Annual O&M Cost**	**Estimated Annual Cost**	**Present Worth of Annual O&M**	**Total Present Worth**	**Number of EDUs**	**Number of Projected EDUs**	**Estimated Present Worth Per EDU**	**Estimated Annual Cost Per EDU**	**Estimated Annual Cost Per Projected EDU**	**Estimated Monthly Cost Per EDU**	**Estimated Monthly Cost Per Projected EDU**
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$8,124,700	$363,214	$133,000	$496,214	$1,768,151	$9,892,851	347	417	$28,510	$1,430	$1,190	$119	$99
	Alternative 1B	$12,999,400	$581,137	$47,900	$629,037	$636,800	$13,636,200	347	417	$39,297	$1,813	$1,508	$151	$126
	Altternative 1C	$10,766,300	$481,307	$78,600	$559,907	$1,044,937	$11,811,237	347	417	$34,038	$1,614	$1,343	$134	$112
	Alternative 1D	$11,030,400	$493,113	$74,400	$567,513	$989,101	$12,019,501	347	417	$34,638	$1,635	$1,361	$136	$113
Tourist Park	Alternative 2A	$2,836,300	$126,797	$46,500	$173,297	$618,188	$3,454,488	125	150	$27,636	$1,386	$1,155	$116	$96
	Alternative 2B	$4,047,400	$180,939	$38,400	$219,339	$510,504	$4,557,904	125	150	$36,463	$1,755	$1,462	$146	$122
Fetterhoff Church	Alternative 3	$4,496,400	$201,011	$17,000	$218,011	$226,004	$4,722,404	50	60	$94,448	$4,360	$3,634	$363	$303
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$7,333,100	$327,826	$133,000	$460,826	$1,768,151	$9,101,251	507	588	$17,951	$909	$784	$76	$65
	Alternative 4B	$12,207,800	$545,749	$47,900	$593,649	$636,800	$12,844,600	507	588	$25,335	$1,171	$1,010	$98	$84
	Altternative 4C	$9,974,700	$445,918	$78,600	$524,518	$1,044,937	$11,019,637	507	588	$21,735	$1,035	$892	$86	$74
	Alternative 4D	$10,238,800	$457,725	$74,400	$532,125	$989,101	$11,227,901	507	588	$22,146	$1,050	$905	$87	$75
	Alternative 4E	$10,875,800	$486,202	$79,900	$566,102	$1,062,220	$11,938,020	507	588	$23,546	$1,117	$963	$93	$80

Notes:

1. Annual Debt Service Calculations Assume USDA RUS Financing of 3.25% for 40 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-18 Summary of USDA RUS Financing (25% Grant, 75% Loan @ 3.25%, 40 yrs)

Summary of Cost Opinions for Structural Alternatives - USDA RUS Financing (25% Grant; 75% Loan @ 3.25%, 40yrs)														
Study Area	Alternative	Estimated Project Cost Less Grant	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$6,093,525	$272,411	$133,000	$405,411	$1,768,151	$7,861,676	347	417	$22,656	$1,168	$972	$97	$81
	Alternative 1B	$9,749,550	$435,853	$47,900	$483,753	$636,800	$10,386,350	347	417	$29,932	$1,394	$1,160	$116	$97
	Altternative 1C	$8,074,725	$360,980	$78,600	$439,580	$1,044,937	$9,119,662	347	417	$26,281	$1,267	$1,054	$106	$88
	Alternative 1D	$8,272,800	$369,835	$74,400	$444,235	$989,101	$9,261,901	347	417	$26,691	$1,280	$1,065	$107	$89
Tourist Park	Alternative 2A	$2,127,225	$95,097	$46,500	$141,597	$618,188	$2,745,413	125	150	$21,963	$1,133	$944	$94	$79
	Alternative 2B	$3,035,550	$135,704	$38,400	$174,104	$510,504	$3,546,054	125	150	$28,368	$1,393	$1,161	$116	$97
Fetterhoff Church	Alternative 3	$3,372,300	$150,758	$17,000	$167,758	$226,004	$3,598,304	50	60	$71,966	$3,355	$2,796	$280	$233
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$5,499,825	$245,869	$133,000	$378,869	$1,768,151	$7,267,976	507	588	$14,335	$747	$644	$62	$54
	Alternative 4B	$9,155,850	$409,312	$47,900	$457,212	$636,800	$9,792,650	507	588	$19,315	$902	$778	$75	$65
	Altternative 4C	$7,481,025	$334,439	$78,600	$413,039	$1,044,937	$8,525,962	507	588	$16,816	$815	$702	$68	$59
	Alternative 4D	$7,679,100	$343,294	$74,400	$417,694	$989,101	$8,668,201	507	588	$17,097	$824	$710	$69	$59
	Alternative 4E	$8,156,850	$364,652	$79,900	$444,552	$1,062,220	$9,219,070	507	588	$18,184	$877	$756	$73	$63

Notes:

1. Annual Debt Service Calculations Assume USDA RUS Financing of 3.25% for 40 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-19 Summary of USDA RUS Financing (50% Grant, 50% Loan @ 3.25%, 40 yrs)

Summary of Cost Opinions for Structural Alternatives - USDA Financing (50% Grant; 50% Loan @3.25%, 40yrs)														
Study Area	Alternative	Estimated Project Cost Less Grant	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$4,062,350	$181,607	$133,000	$314,607	$1,768,151	$5,830,501	347	417	$16,803	$907	$754	$76	$63
	Alternative 1B	$6,499,700	$290,569	$47,900	$338,469	$636,800	$7,136,500	347	417	$20,566	$975	$812	$81	$68
	Altternative 1C	$5,383,150	$240,653	$78,600	$319,253	$1,044,937	$6,428,087	347	417	$18,525	$920	$766	$77	$64
	Alternative 1D	$5,515,200	$246,557	$74,400	$320,957	$989,101	$6,504,301	347	417	$18,744	$925	$770	$77	$64
Tourist Park	Alternative 2A	$1,418,150	$63,398	$46,500	$109,898	$618,188	$2,036,338	125	150	$16,291	$879	$733	$73	$61
	Alternative 2B	$2,023,700	$90,469	$38,400	$128,869	$510,504	$2,534,204	125	150	$20,274	$1,031	$859	$86	$72
Fetterhoff Church	Alternative 3	$2,248,200	$100,506	$17,000	$117,506	$226,004	$2,474,204	50	60	$49,484	$2,350	$1,958	$196	$163
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$3,666,550	$163,913	$133,000	$296,913	$1,768,151	$5,434,701	507	588	$10,719	$586	$505	$49	$42
	Alternative 4B	$6,103,900	$272,875	$47,900	$320,775	$636,800	$6,740,700	507	588	$13,295	$633	$546	$53	$45
	Altternative 4C	$4,987,350	$222,959	$78,600	$301,559	$1,044,937	$6,032,287	507	588	$11,898	$595	$513	$50	$43
	Alternative 4D	$5,119,400	$228,863	$74,400	$303,263	$989,101	$6,108,501	507	588	$12,048	$598	$516	$50	$43
	Alternative 4E	$5,437,900	$243,101	$79,900	$323,001	$1,062,220	$6,500,120	507	588	$12,821	$637	$549	$53	$46

Notes:

1. Annual Debt Service Calculations Assume USDA RUS Financing of 3.25% for 40 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-20 Summary of USDA RUS Financing (75% Grant, 25% Loan @ 3.25%, 40 yrs)

Summary of Cost Opinions for Structural Alternatives - USDA Financing (75% Grant; 25% Loan @3.25%, 40yrs)														
Study Area	Alternative	Estimated Project Cost Less Grant	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$2,031,175	$90,804	$133,000	$223,804	$1,768,151	$3,799,326	347	417	$10,949	$645	$537	$54	$45
	Alternative 1B	$3,249,850	$145,284	$47,900	$193,184	$636,800	$3,886,650	347	417	$11,201	$557	$463	$46	$39
	Altternative 1C	$2,691,575	$120,327	$78,600	$198,927	$1,044,937	$3,736,512	347	417	$10,768	$573	$477	$48	$40
	Alternative 1D	$2,757,600	$123,278	$74,400	$197,678	$989,101	$3,746,701	347	417	$10,797	$570	$474	$47	$40
Tourist Park	Alternative 2A	$709,075	$31,699	$46,500	$78,199	$618,188	$1,327,263	125	150	$10,618	$626	$521	$52	$43
	Alternative 2B	$1,011,850	$45,235	$38,400	$83,635	$510,504	$1,522,354	125	150	$12,179	$669	$558	$56	$46
Fetterhoff Church	Alternative 3	$1,124,100	$50,253	$17,000	$67,253	$226,004	$1,350,104	50	60	$27,002	$1,345	$1,121	$112	$93
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$1,833,275	$81,956	$133,000	$214,956	$1,768,151	$3,601,426	507	588	$7,103	$424	$366	$35	$30
	Alternative 4B	$3,051,950	$136,437	$47,900	$184,337	$636,800	$3,688,750	507	588	$7,276	$364	$313	$30	$26
	Altternative 4C	$2,493,675	$111,480	$78,600	$190,080	$1,044,937	$3,538,612	507	588	$6,980	$375	$323	$31	$27
	Alternative 4D	$2,559,700	$114,431	$74,400	$188,831	$989,101	$3,548,801	507	588	$7,000	$372	$321	$31	$27
	Alternative 4E	$2,718,950	$121,551	$79,900	$201,451	$1,062,220	$3,781,170	507	588	$7,458	$397	$343	$33	$29

Notes:

1. Annual Debt Service Calculations Assume USDA RUS Financing of 3.25% for 40 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

Table 2-21 Summary of Bond Financing (@ 4.5%, 20yrs)

Summary of Cost Opinions for Structural Alternatives - Bond Financing (4.5%, 20yrs)														
Study Area	Alternative	Estimated Project Cost	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Present Worth of Annual O&M	Total Present Worth	Number of EDUs	Number of Projected EDUs	Estimated Present Worth Per EDU	Estimated Annual Cost Per EDU	Estimated Annual Cost Per Projected EDU	Estimated Monthly Cost Per EDU	Estimated Monthly Cost Per Projected EDU
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 1A	$8,124,700	$616,810	$133,000	$749,810	$1,768,151	$9,892,851	347	417	$28,510	$2,160.84	$1,798.11	$180	$150
	Alternative 1B	$12,999,400	$986,887	$47,900	$1,034,787	$636,800	$13,636,200	347	417	$39,297	$2,982	$2,481.50	$249	$207
	Altternative 1C	$10,766,300	$817,355	$78,600	$895,955	$1,044,937	$11,811,237	347	417	$34,038	$2,582	$2,148.57	$215	$179.05
	Alternative 1D	$11,030,400	$837,405	$74,400	$911,805	$989,101	$12,019,501	347	417	$34,638	$2,628	$2,186.58	$219	$182
Tourist Park	Alternative 2A	$2,836,300	$215,326	$46,500	$261,826	$618,188	$3,454,488	125	150	$27,636	$2,095	$1,745.51	$175	$145
	Alternative 2B	$4,047,400	$307,270	$38,400	$345,670	$510,504	$4,557,904	125	150	$36,463	$2,765	$2,304	$230	$192
Fetterhoff Church	Alternative 3	$4,496,400	$341,357	$17,000	$358,357	$226,004	$4,722,404	50	60	$94,448	$7,167	$5,973	$597	$498
Matamoras, Route 147 & 225, and Triangle & Lenker Estates	Alternative 4A	$7,333,100	$556,714	$133,000	$689,714	$1,768,151	$9,101,251	507	588	$17,951	$1,360	$1,173	$113	$98
	Alternative 4B	$12,207,800	$926,791	$47,900	$974,691	$636,800	$12,844,600	507	588	$25,335	$1,922	$1,658	$160	$138
	Altternative 4C	$9,974,700	$757,259	$78,600	$835,859	$1,044,937	$11,019,637	507	588	$21,735	$1,649	$1,422	$137	$118
	Alternative 4D	$10,238,800	$777,308	$74,400	$851,708	$989,101	$11,227,901	507	588	$22,146	$1,680	$1,448	$140	$121
	Alternative 4E	$10,875,800	$825,668	$79,900	$905,568	$1,062,220	$11,938,020	507	588	$23,546	$1,786	$1,540	$149	$128

Notes:

1. Annual Debt Service Calculations Assume Bond Financing of 4.5% for 20 Years
2. Tapping Fees have been subtracted from Estimated Project Cost based on the existing HAWASA tapping fee of $4,948.02/EDU and the number of EDUs presented in Column 9
3. Present Worth Calculations Assume 4.25% for 20 Years
4. Annual O&M Estimated based on typical common useage

As discussed throughout this report and similarly throughout the Act 537 Plan, there is adequate documentation available and reasoning to justify the provision of public to sewer to the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas. As detailed in Section 2.0, the most advantageous alternative for these areas is Alternative 4D.

Alternative 4D is dependent upon an updated inter-municipal agreement with the Halifax Area Water and Sewer Authority (HAWSA), availability of public (grant) funding, and the potential contributions made by land developers or private entities at the time of implementation. Alternative 4D provides public sewer to the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas, with consideration for a Lenker Estates Sub-division connection. These areas are proposed to be collected through a combination of gravity sewer and low-pressure sewer which is either directly conveyed to the existing HAWASA South Interceptor or conveyed to a proposed Pump Station (Pump Station 1) where the flows would be fed to the HAWAWSA gravity sewer system via force main and gravity sewer main. The pump station is recommended to be sized to handle any projected flows in the Matamoras and portions of the Triangle & Lenker Estates Route areas. Final conveyance of flows will occur through the HAWASA South Interceptor which conveys flows to the HAWASA WWTP.

The HAWASA WWTP is currently in the design phase of an upgrade project pending the recommendations presented in this report and replicated in the Act 537 Plan. Through preliminary coordination with HAWASA, the preliminary opinion of construction cost estimate was obtained and was utilized to analyze the impact of the plant upgrade on the estimated cost per EDU. The estimated cost per EDU for both the plant and the combination of the plant and the proposed structural alternative are presented in tables 3-1 and 3-2, below.

Table 3-1 Summary of Financing for HAWASA WWTP

Financial Alternatives for HAWASA WWTP								
Financial Assumption	**Alternative**	**Estimated Project Cost**	**Estimated Annual Debt Service**	**Estimated Annual O&M Cost**	**Estimated Annual Cost**	**Number of EDUs**	**Estimated Annual Cost Per EDU**	**Estimated Monthly Cost Per EDU**
0% Grant (PENNVEST)	HAWASA WWTP	$5,500,000	$335,856	$339,020	$674,876	1,244	$542.50	$45
25% Grant (PENNVEST)	HAWASA WWTP	$4,125,000	$251,892	$339,020	$590,912	1,244	$475	$40
50% Grant (PENNVEST)	HAWASA WWTP	$2,750,000	$167,928	$339,020	$506,948	1,244	$408	$34
75% Grant (PENNVEST)	HAWASA WWTP	$1,375,000	$83,964	$339,020	$422,984	1,244	$340	$28
0% Grant (USDA-RUS)	HAWASA WWTP	$5,500,000	$245,877	$339,020	$584,897	1,244	$470	$39
25% Grant (USDA-RUS)	HAWASA WWTP	$4,125,000	$184,408	$339,020	$523,428	1,244	$421	$35
50% Grant (USDA-RUS)	HAWASA WWTP	$2,750,000	$122,939	$339,020	$461,959	1,244	$371	$31
75% Grant (USDA-RUS)	HAWASA WWTP	$1,375,000	$61,469	$339,020	$400,489	1,244	$322	$27
Bond	HAWASA WWTP	$5,500,000	$417,549	$339,020	$756,569	1,244	$608	$51

Table 3-2 Summary of Financing for HAWASA WWTP and Alternative 4D

Financial Alternatives for Alternative 4D Plus HAWASA WWTP								
Financial Assumption	Alternative	Estimated Project Cost	Estimated Annual Debt Service	Estimated Annual O&M Cost	Estimated Annual Cost	Number of EDUs	Estimated Annual Cost Per EDU	Estimated Monthly Cost Per EDU
0% Grant (PENNVEST)	Alternative 4D + HAWASA WWTP	$15,738,800	$961,085	$413,420	$1,374,505	1,244	$1,104.91	$92
25% Grant (PENNVEST)	Alternative 4D + HAWASA WWTP	$11,804,100	$720,814	$413,420	$1,134,234	1,244	$912	$76
50% Grant (PENNVEST)	Alternative 4D + HAWASA WWTP	$7,869,400	$480,542	$413,420	$893,962	1,244	$719	$60
75% Grant (PENNVEST)	Alternative 4D + HAWASA WWTP	$3,934,700	$240,271	$413,420	$653,691	1,244	$525	$44
0% Grant (USDA-RUS)	Alternative 4D + HAWASA WWTP	$15,738,800	$703,602	$413,420	$1,117,022	1,244	$898	$75
25% Grant (USDA-RUS)	Alternative 4D + HAWASA WWTP	$11,804,100	$527,702	$413,420	$941,122	1,244	$757	$63
50% Grant (USDA-RUS)	Alternative 4D + HAWASA WWTP	$7,869,400	$351,801	$413,420	$765,221	1,244	$615	$51
75% Grant (USDA-RUS)	Alternative 4D + HAWASA WWTP	$3,934,700	$175,901	$413,420	$589,321	1,244	$474	$39
Bond	Alternative 4D + HAWASA WWTP	$15,738,800	$1,194,857	$413,420	$1,608,277	1,244	$1,293	$108

The implementation of Alternative 4D is anticipated to be completed in accordance with the projected implementation schedule provided below (see Table 3-3) assuming that an updated inter-municipal agreement with HAWASA is negotiated and funding is secured. Without the updated inter-municipal agreement, development agreement(s), and favorable funding (public and private) this alternative is not considered to be feasible and will not be implemented. The facilities proposed in Alternative 4D shall be constructed, owned, operated, maintained, and administered by the Halifax Area Water and Sewer Authority.

Table 3-3 Implementation Schedule (Selected Alternative)

Years	Activity
0 to 2	Negotiate Updated Inter-municipal Agreement with HAWSA
	Pursue Funding Opportunities for Construction of Alternative 4D Facilities
2 to 5 (1)	Design and Permit Alternative 4D Facilities
5 to 9 (1)	Construct Alternative 4D Facilities (Assumed to Be Completed in Phases)
6 to10 (1)	Complete Connections to Alternative 4D Facilities

Note (1): Without an updated inter-municipal agreement (including updates to the HAWSA rules and regulations), development agreement(s), and favorable funding (public and private) this alternative is not feasible and will not be implemented.

Alternatives formulated to provide public sewer service to the Tourist Park and Fetterhoff Church Study Areas as presented in Section 2.0 of this report and replicated in the Act 537 Plan, were also evaluated due to malfunctioning OLDS and the presence fecal bacteria in water samples taken as well as the potential development and growth of these areas. The structural alternatives for Tourist Park and Fetterhoff Church Study Areas are not economically feasible due

to lack of residential density and projected development. As grant monies or other capital contributions become available and the selected structural alternative is completed, the provision of public sewer service to these may be re-evaluated to determine cost effectiveness.

2.2.2 Conclusions

Based on the discussion above, the following are recommendations for the wastewater planning needs enumerated earlier in this Report.

1. Halifax Township shall develop and adopt an Ordinance governing the management of on-lot disposal systems (OLDS) within the Township.

As mentioned above, through further development, evaluation, and public education, an OLDS Management Ordinance should be developed and adopted by the Township to ensure that proper operation and maintenance of OLDS is conducted by the Township's residents. Repairs to the malfunctioning systems should be made a priority as part of the Township's Act 537 Plan development to protect the existing OLDS against future failure by the fourth year after this Plan's adoption.

This Ordinance should provide requirements for the permitting, inspection, operation, maintenance, and rehabilitation of OLDS within the Township. Recommended periodic pumping of OLDS should be included within the Ordinance. Successful implementation of such an Ordinance is expected to have a positive impact on surface water and drinking water supplies in areas of the Township where OLDS systems are utilized. Periodic pumping of the tanks will provide for improved operation of the systems and will help to eliminate the occurrence of OLDS malfunctions. Currently, Halifax Township does not have any ordinances or regulations requiring mandatory OLDS pumping. The implementation of an OLDS Management Ordinance will allow the Township to further evaluate the need for improved sewage facilities after tank pumping activities have commenced for some period of time.

2. Public sewer service should be provided for the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas.

As shown in the cost analyses of the proposed structural alternatives presented above, the provision of public sewer service to the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas is not economically feasible as a standalone project. However, the provision of public sewer to these areas becomes more feasible when including additional EDUs and with favorable funding and/or additional contributions.

The structural alternatives evaluated in this report and replicated in the prepared Act 537 Plan to provide public sewer service to the Matamoras, Route 147 & 225, Triangle & Lenker Estates Areas represent technically feasible solutions for wastewater management in these areas, but not all of the solutions are cost effective as presented. Of the alternatives evaluated for these areas, it is recommended that the Township pursue Alternative 4D. This alternative provides the lowest estimated amount of low pressure sewer (and grinders) for these areas without utilizing multiple pump stations, this alternative makes it feasible for future growth and collection of future flows,

and this alternative has the lowest estimated cost per user (excluding a full low-pressure system) based on projected EDUs and assumptions.

This alternative should be implemented when an updated inter-municipal agreement is negotiated with the Halifax Area Water and Sewer Authority (HAWASA) and funding is secured. Without an updated inter-municipal agreement, development agreements, and favorable funding (public and private) this alternative is not feasible and should not be implemented. This alternative is environmentally favorable, resulting in the abandonment of malfunctioning OLDS in the study area, and the potential abandonment of an existing packaged wastewater treatment facility that had some issues as noted by PADEP. This alternative also provides proper planning for potential future growth in the Township.

Alternatives formulated to provide public sewer service to the Tourist Park and Fetterhoff Church Areas are some of the most costly structural alternatives per user identified in this report and similarly of the prepared Act 537 Plan due to the amount of infrastructure that must be built to serve the small number of properties currently located in these areas of the Township. It is recommended that public sewer service not be provided to the Tourist Park and Fetterhoff Church Areas at this time; however, the Township may consider providing public sewer service in these areas if the projected user base increases to a point where the project would become economically feasible, when upgrades to the Main Pumping Station upgrades are completed, and/or if funding becomes available through developers or private entities.

2.2.3 Sources of Up-Front Revenue

For smaller communities, it is important to obtain as much up-front revenue as reasonably possible for public sewer projects in order to reduce the total amount of the project that must be financed. In the past, there were several federal programs that provided grants for these types of projects. Over the years, these programs have been gradually eliminated as the federal government has transferred most of the financial responsibility for these programs to the state and local level. Consequently, competition for these funds is strong and the majority of available grant money is generally funneled to the most economically distressed communities. As a result, most up-front revenue is now generated locally through tapping fees and contributions by land developers. A summary of the various sources of up-front revenue for public sewer projects is provided as follows:

A. Pennsylvania Infrastructure Investment Authority (PENNVEST)

The PENNVEST program was established by the Pennsylvania State Legislature to address the health risks posed by inadequate water and wastewater facilities within the Commonwealth. The principle mission of the PENNVEST program is to provide financial assistance for projects that protect the public health and promote economic development in Pennsylvania. Since its inception, this program has developed into primarily a low cost revolving loan program. Grants are rare and are only made when PENNVEST has determined that the financial condition of the recipient is so poor that the repayment of a loan is unlikely, and that the project will not be able to proceed without a direct grant. The recent Growing Greener Initiative has allowed PENNVEST to allocate greater amounts of loans and grants for infrastructure development projects making them more affordable for the users who ultimately must pay for them.

Recent initiatives by the current administration have indicated a priority of funding toward infrastructure projects tied to economic development. As such, the future of funding for projects not involving economic development is uncertain.

B. Developer Contributions

Contributions by land developers are becoming a relatively common source for up-front revenue. The funds provided by the developer are directly related to the benefits that the development will derive from the use of the public facilities. In some cases, the developer may actually construct the necessary improvements at his expense and then transfer ownership of the improvements to the local municipality. In other cases, in lieu of actually constructing the improvements, the developer may make a cash payment to the municipality to offset a portion of the costs for the improvements. As previously stated, no land development plans are proposed within the planning area.

C. Capital Charges Fees

Capital charges fees, or tapping fees, are an equitable means by which a system can assess a portion of the capital costs of constructing the new facilities to all users of the proposed system. The imposition of these fees is based upon the concept that all users of the system derive a benefit from this use, and that the costs of this benefit should be allocated among all users without prejudice or penalty. For this reason, tapping fees are usually based on a measure of the total flow contributed by the service connection or lateral.

PA Act 57 of 2003 contains extensive provisions regarding calculation and types of fees that may be charged by municipalities and authorities. Each community must establish its own fee criteria in accordance with this Act. Capital charges fees are an established method for raising up-front revenue and would be an appropriate part of the community's financing plan for the proposed project.

Connection and tapping fees have the greatest financial impact on residents of existing homes. Unlike new residential development, where the connection and tapping fee costs are included in total construction costs and financed accordingly, existing residents must pay these fees from their own resources or by securing a loan from a local bank. In addition to these fees, the residents must also pay the costs to extend a sewer lateral from the lateral stub provided to the point of interconnection with the building sewer.

2.2.4 Sources of Financing

After all sources of up-front revenue have been identified, a reasonable forecast of the amount of the project that must be financed can be determined. There are several alternatives for financing a public sewer project. Not all of these alternatives are equally suitable for application to the project. The choice of financing method varies from project to project, and is dependent upon the financial specifics of each situation and the amount to be borrowed. A summary of the various means of financing public sewer projects follows.

A. Pennsylvania Infrastructure Investment Authority (PENNVEST)

The PENNVEST program offers grants and below market interest financing for financing public sewer projects in the Commonwealth of Pennsylvania. The PENNVEST Authority may receive funds from the following sources:

1. State funds appropriated to the Municipality;

2. Federal funds appropriated to or granted to the State or Municipality; and

3. Proceeds from the sale of bonds.

PENNVEST is also required to establish a Water Pollution Control Revolving Fund, which is administered in accordance with the requirements of the Water Quality Act of 1987. PENNVEST's Board may also establish non-revolving funds and accounts. The monies deposited with PENNVEST as repayment of the principal and interest due on loans issued from the program are used to pay PENNVEST's indebtedness. The criteria considered by the PENNVEST Board when evaluating applications are summarized as follows:

1. The project's ability to improve the health, safety, welfare, or economic well-being of the citizens of the Commonwealth.

2. The project's ability to lead to an effective or complete solution to the problems of the system and bring it into compliance with state and federal regulations.

3. The cost-effectiveness of the proposed project when compared with other alternatives.

4. The consistency of the project with state and regional resource management and economic development plans.

5. Demonstration of the applicant's ability to operate and maintain the project in the proper manner.

6. The ability to promote consolidation of water and wastewater systems where consolidation would provide more effective service of the customers.

7. The availability of other sources of funds at reasonable rates to finance all or portions of the project.

During the preparation of this report and similarly of the prepared Act 537 Plan, Cap Interest Rates for PENNVEST loans in Dauphin County were listed at 1.512% for years 1 to 5 and 2.063% for years 6 to 20 on the PENNVEST Website. This loan may cover the entire project costs or only a portion of the total costs at the discretion of PENNVEST, and based on community need. Applications are received, and funding granted four times per year.

PENNVEST financing offers several advantages in addition to below-market interest rates and possible grants. For example, PENNVEST funding is available to pay for engineering and planning costs prior to the completion of the final design under their advance loan procedure. Construction inspection costs are also eligible under the PENNVEST program. Participation in this program does, however, impose additional responsibilities upon the municipality. Good accounting and administrative procedures must be followed and the use of funds from this program is subject to audit at any time by the State Comptroller's office. Additionally, PENNVEST

relies on DEP to evaluate the cost effectiveness of the proposed project and verify that PENNVEST funds are being utilized in the appropriate manner. DEP will conduct occasional site visits on PENNVEST's behalf and they also provide input to PENNVEST on whether or not to approve payment for changes made during construction.

In order for PENNVEST to maximize the use of its funds, public sewerage projects must meet federal requirements as well as state requirements since PENNVEST receives funds from the federal government to capitalize the Water Pollution Control Revolving Loan Fund. In addition to an approved Act 537 Plan, the following additional planning assessments and investigations must be completed:

1. Assessment of innovative and alternative technologies.

2. Investigation of open space and recreational opportunities in conjunction with the public sewer project.

3. Alternative evaluation that provides thorough justification for the selected alternative.

4. Environmental assessment to assure that the project complies with the Water Quality Act and will undergo a review in accordance with the National Environmental Policy Act (NEPA).

5. Public participation.

Other special requirements of the PENNVEST program include the following:

1. A value engineering review of all projects having an estimated treatment works construction cost exceeding $10 million to verify that the proposed work is cost-effective.

2. The applicant must have an adequate user charge system, sewer use ordinance, and financial capability. The applicant must demonstrate sufficient legal, institutional, managerial, and financial capability to construct, operate, and maintain the proposed project.

3. The applicant must comply with the federal Davis-Bacon Act regarding labor wage rates.

4. The applicant must comply with MBE/WBE/DBE affirmative action steps.

5. One (1) year after the completion of construction and the initiation of operation, the applicant must certify that the treatment facility meets all design specifications and effluent limitations stipulated in its operation permit.

To initiate a request for PENNVEST financial assistance, an application form must be completed. The information provided in this application would be the basis by which PENNVEST makes its decision on whether the project is eligible for funding.

The decision to seek PENNVEST funding must be analyzed on an individual basis depending on the terms and interest rate of the loan. If a decision is made to seek PENNVEST funding, the implementing party must be prepared to comply with the regulatory requirements that are inherent to the program. Delays in the application review and loan approval process are common and the documentation requirements are quite extensive.

Rural Utility Service (RUS) – U.S. Department of Agriculture

The R.U.S. Loan Program makes funding available for the development of water and waste disposal systems in rural areas and towns with populations not in excess of 10,000. The funds are available to public entities such as municipalities, counties, special-purpose districts, Indian tribes, and corporations not operated for profit. R.U.S. also guarantees water and waste disposal loans made by banks and other eligible lenders.

Three interest rates are used. They are set periodically based on an index of current market yields for municipal obligations. The rates are as follows:

1. The *Poverty Rate* interest rate applies when:

    a. The primary purpose of the loan is to upgrade existing facilities or construct new facilities required to meet applicable health or sanitary standards; and
    b. The median household income (MHI) of the service area is below the poverty line for a family of four or below 80 percent of the Statewide Nonmetropolitan MHI (SNMHI).

2. The *Market Rate* is set quarterly based on the average of the "Bond Buyer" 1-Bond Index over a four week period prior to the beginning of the quarter. It applies to loans for projects where the MHI of the service area exceeds the SNMHI.

3. The *Intermediate Rate* is the poverty rate plus half of the difference between the poverty rate and the market rate, but not to exceed 7 percent. It applies to loans that do not meet the criteria for either the poverty rate or the market rate.

The law authorizing the R.U.S. program allows a maximum repayment period of 40 years. However, the repayment period cannot exceed the useful life of the facilities financed or any statutory limitation on the applicants borrowing authority.

To initiate a request for R.U.S. financial assistance, an application form must be completed and filed with the USDA Rural Development office serving the applicant's area. The information provided in this application would be the basis by which R.U.S. makes its decision on whether the project is eligible for funding.

Municipal Bond Issue

There are several types of bonds, some are taxable and some are tax-exempt. The general classification of municipal bonds usually refers to tax-exempt bonds. There are three (3) types of municipal bonds generally used to finance public works projects:

1. *General Obligation Bonds* are tax-free bonds that are secured by the pledge of the full

faith, credit, and taxing power of the issuing municipality. This means that this type of bond is backed by all of the taxes on real estate and personal property within the jurisdiction of the issuing municipality. It involves minimum risk to the investor and, therefore, can be issued at a lower rate of interest than other types of bonds.

2. *Dedicated Tax Bonds* are payable only from the proceeds from a special tax and they are not guaranteed by the full faith, credit, and taxing power of the issuing agency. An example of a special dedicated tax is the special assessment against property, which is adjacent to, and the principal beneficiary of the improvement. The gasoline tax used to finance highway construction is another example.

3. *Revenue Bonds* are payable from revenues derived from the use of the improvement such as tolls, sewer bills, or rent paid by users of the improvement and do not otherwise represent an obligation of the issuing municipality. Revenue Bonds are not ordinarily subject to statutory or constitutional debt limitations. They are often issued by commissions, authorities, and other public agencies created for the specific purpose of financing, constructing, and operating essential public projects.

Typically, municipal bonds are sold to an investment-banking firm, which then resells the bonds to individual investors. The advantage of municipal bonds to the investor is their tax-free status. A bond discount (a percentage of the total bond issue) serves as the investment banker's commission. Before bonds are sold, they must be rated on the basis of the risk to the investor by a rating agency such as Standard and Poor's or Moody's. The higher the rating, the lower the risk to the investor and, consequently, the lower the interest rate that must be paid on the bond. The legal instrument that sets forth the rules that must be observed by the issuing agency is the Trust Indenture. The Trust Indenture is prepared by the Bond Counsel and must be printed along with the bonds. Due to specific requirements as to the denominations of the bonds and the methods and materials used to print the bonds and Trust Indenture, the printing costs can be substantial. A Trustee is required to administer the bond issue and ensure the terms of the Trust Indenture are observed. For these services, the Authority will incur an annual Trustee fee.

Interest rates on bond issues vary depending upon market trends, the rating of the issuing agency, and other factors. The longer the repayment period is extended the lower the annual debt service and the higher the total amount of interest that must be paid.

A municipal bond issue offers the advantage of long-term fixed rate financing and the opportunity for local investment. The financing arrangement and approval period is shorter than what it is with the PENNVEST program and the Authority would retain more flexibility for future borrowing. The disadvantage of a municipal bond issue is that the interest rates are often higher than the maximum PENNVEST interest rates. Since there are no grants involved, the cost of the bond issue is 100% locally funded. The additional costs incurred to prepare the Trust Indenture, pay the Trustee Fees, fund the cover percentage, and to establish a Debt Service Reserve Fund must also be considered. The financial services costs associated with the issuance of a municipal bond issue are also much higher than the costs for PENNVEST funding.

Bank Loan
Because of favorable interest rates, bank loans can be a viable source for funding small to medium sized public works projects. As a general rule, they are not available for projects $10 million or greater, and the attractiveness of the terms of the loan may vary depending upon the bank and the amount of money to be borrowed. The interest rate available from banks varies depending upon market conditions; however, the rate available to municipalities will generally be at a discount due to the tax advantages received by the bank. Terms and conditions of bank loans vary in a manner similar to personal loans and home mortgages.

The principle advantage of a bank loan is that it can usually be obtained at a favorable interest rate without the cumbersome requirements of a bond issue. The financial service costs associated with obtaining the loan are also much less than for a similar bond issue. Since these financial service costs are generally included in the total project costs, the impact of these charges on the overall project costs can be minimized. Another advantage of the bank loan is that it does not have restrictive coverage requirements, trustee fees, and Trust Indenture preparation charges, as does a bond issue.

2.2.5 Funding Considerations
The funding options available to finance the proposed structural alternative have been briefly examined in this section; however, Halifax Township and HAWASA should involve their solicitors and financial advisor(s) to determine the most viable method of financing the project.

The estimated project cost for the selected alternative for Matamoras, Route 147 & 225, Triangle & Lenker Estates Study Areas (Alternative 4D) is approximately $12,747,400.00. After the assumed tapping fees, approximately $2,508,600 total ($4,948.02/EDU), are subtracted from the estimated project cost, the total remaining estimated cost is approximately $10,238,800.00. To implement this structural alternative while maintaining a reasonable user rate, a financing plan consisting of the payment of tapping fees from new connections, grant money, capital contributions from developers, and a low interest (PENNVEST, R.U.S., County Grants, RCAP, etc.) loan or any combination is required. The funding and project schedule would also need to be coordinated with HAWASA and their funding effort and schedule. Prior to preliminary design, a detailed financial and funding analysis should be undertaken to examine all funding and financing options available. Funding scenarios studied should include (1) the use of grant monies to offset the capital costs of the project; (2) the use of potential developer capital contributions to offset the capital costs of the project; (3) the ability to combine debt service and operation and maintenance costs into a reasonable rate structure (both tapping fees and user rates), and (4) combinations of funding options.

3.0 ENVIRONMENTAL CONSEQUENCES OF THE PROJECTS

Selected Sanitary Sewer Collection and Conveyance Alternative
The sanitary survey and well water sampling conducted as part of this report and replicated in the Act 537 Plan indicated the existence of malfunctioning OLDS and the presence fecal bacteria was detected in several well water samples taken throughout the Township, however the greatest areas of concern are the Matamoras, Route 147 & 225, Triangle & Lenker Estates Study Areas due to, not only malfunctioning OLDS and contaminated wells, but also soil

suitability (high groundwater table, slow permeability, flooding, steep slopes or shallow depth to bedrock), close proximity to the Susquehanna River, and potential development and growth.

Sewage Management Program
As previously stated, the Township has proposed to develop and eventually adopt an On-lot Sewage Management Ordinance as a method to prevent further malfunction of OLDS and degradation of drinking water supplies in throughout the Township. The OLDS Sewage Management Ordinance is proposed to be implemented in accordance with the schedule provided in Table 3-4 (below) as replicated in the Act 537 Plan.

Table 3-4 Implementation Schedule (OLDS Sewage Management Ordinance)

Years	Activity
2018 - 2020	Develop Draft On-lot Disposal System Management Ordinance
	Provide Public Education for On-lot Disposal System Management Ordinance
2020 - 2021	Finalize and Adopt On-lot Disposal System Management Ordinance
2021 - 2022	Implement On-lot Disposal System Management Ordinance, Begin Pumping Cycles

Description of the Affected Area
The majority of the properties within the Alternative 4D sewer service area are residential. The collection system portion of the proposed projects will be placed within the State, Township and private rights-of-way. A portion of the private rights-of-way will be along managed lawns.

Environmental Consequences of the Reasonable Alternatives
The potential environmental consequences of the reasonable alternatives include direct, indirect, and cumulative effects. Direct effects are consequences directly related to project activity. These typically include vegetation clearing, earth disturbance, and stream crossings. Indirect effects occur later in time or removed in distance from the project area and include community growth, population density changes, altered land use practices, and other changes in the natural environment. Cumulative effects are the total changes to the environment resulting from the selected alternative when added to other past, present, and future actions.

An Erosion and Sedimentation (E&S) Plan will be established and submitted to the Dauphin County Conservation District to ensure the preservation of surrounding natural environments. In order to minimize the potential for soil erosion and resulting sediment pollution from leaving the construction site, a construction sequence will be outlined in the E&S Plan. The contractor shall minimize the area of disturbed soil at any one time by following the construction sequence, and shall prevent sediment pollution by installing pollution control measures as detailed in the E&S Plan.

3.1 Land Use/Important Farmland/Formally Classified Lands

3.1.1 Land Use
The Halifax Township Land Use Plan formally establishes the desired land uses, real estate orientations, and development design guidelines for Halifax Township. The Land Use Plan also

outlines in more detail the location of land use planning districts and describes how the Township should be developed in the future. Parallel to County and Regional population and economic growth, the Comprehensive Plan anticipates continued increases in population, housing units, and other economic activity within Halifax Township. After experiencing significant increases in population from 1950 to 1980, the 1990 Census reflected continued increases in Halifax Township's population over the following decades (17.2 percent).

A generalized classification of the Township's land base was determined following a review and analysis of the physical features maps, environmental limitations maps, Dauphin County Sewage Plan text and maps, basic studies, Planning Commission input and other community input. Six generalized regions were delineated representing the core physical descriptions of the Township Land Use Plan included in the 1996 Halifax Township Comprehensive Plan. In essence, this map provides a graphic representation of areas currently developed, suitable for development, suitable for future development, rural core agriculture lands to be managed and land with the most obvious environmental limitations.

The Township's future Land Use planning areas provide a more detailed delineation and description of the types of land uses and real estate orientations proposed in Halifax Township. It is important that the community identify and organize the Township's proposed land patterns and articulate the Township's expectations for these areas. Based on public review and endorsement, these areas will represent the optimal and reasonable range of land uses for Halifax Township. Following final adoption, these land use districts will be translated and applied to zoning ordinances or other land management ordinances.

GENERALIZED LAND CLASSIFICATIONS
Halifax Township - 1995

Land Classification	Estimated % of Twp. Land Area	Estimated Total Acreage
Developed Land	8.4	1683.6
Land Available for Development	3.5	702.1
Land for Future Development	4.1	822.2
Rural Residential Lands for Development	6.4	1273.9
Agricultural Core Lands	37.3	7431.1
Land to be Preserved	32.1	6383.6

SOURCE: Halifax Township Planning Commission, Tri-County Regional Planning Commission, Atlas GIS, 1995

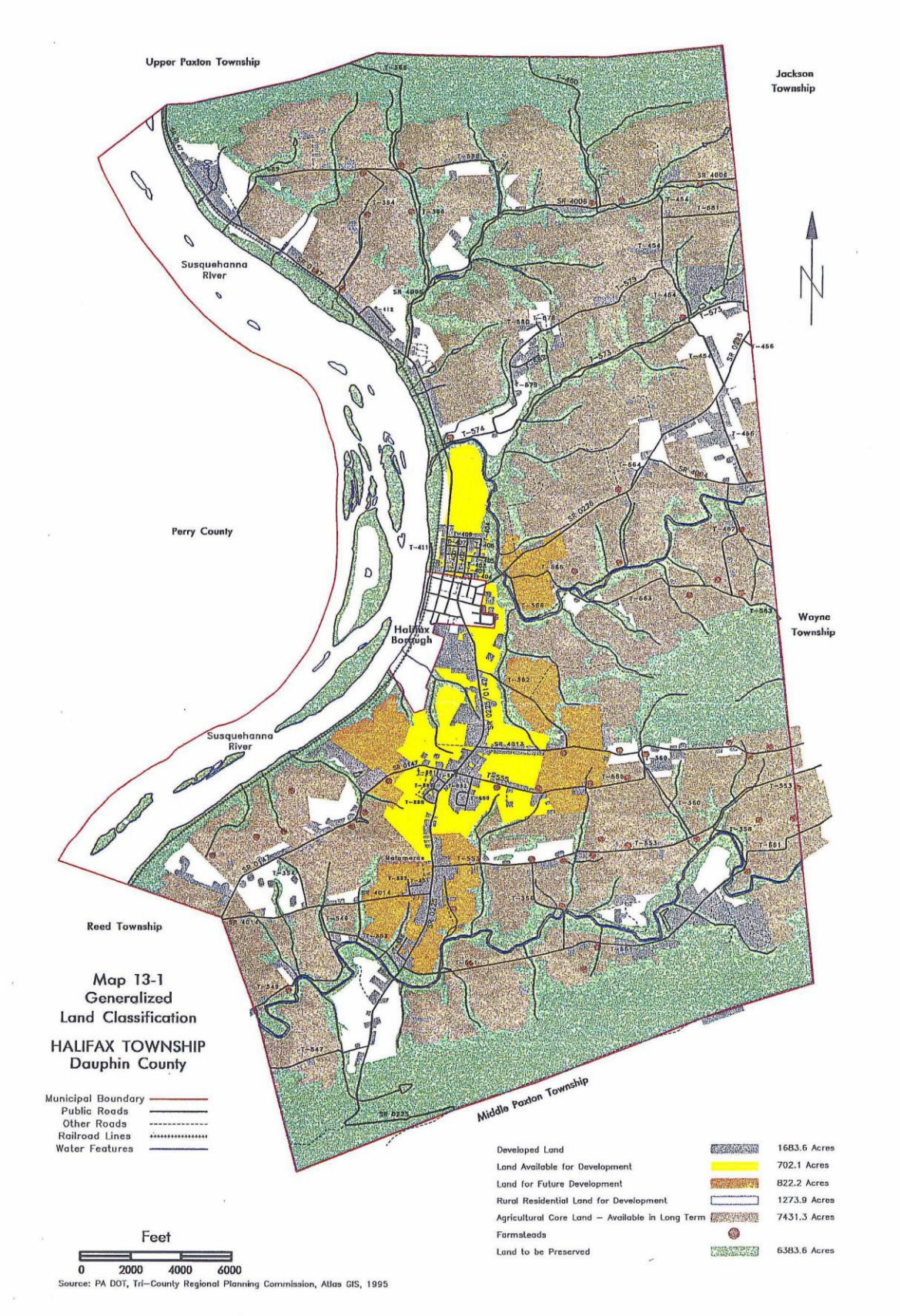
LAND USE PLANNING DISTRICTS
Halifax Township

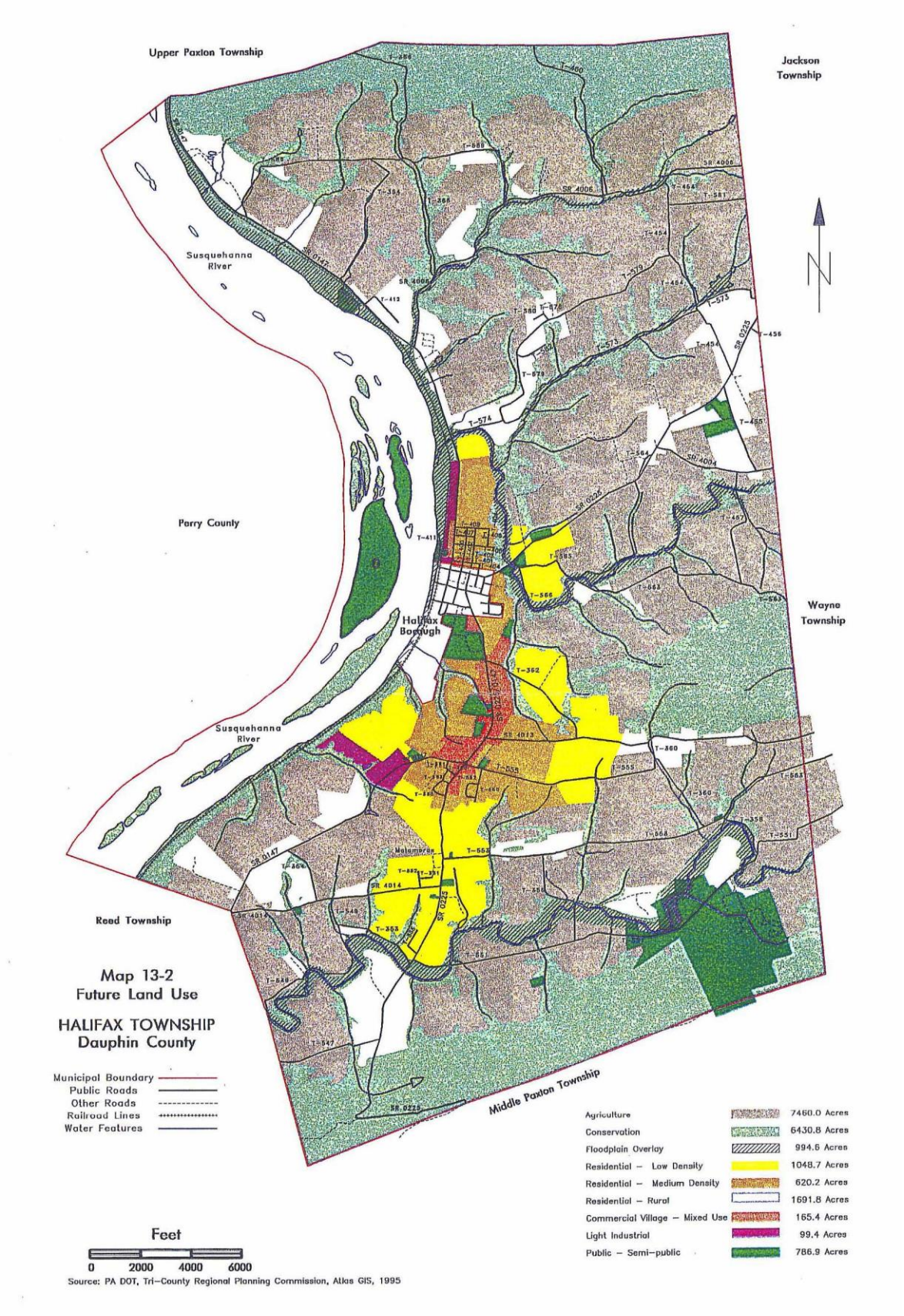
Planning Area	Estimated % of Total Twp. Area*	Estimated Total Acreage**
Agriculture	37.2	7460.0
Conservation	33.0	6430.8
Floodplain Overlay	5.0	994.6
Residential - Low Density	5.3	1048.7
Residential - Medium Density	3.1	620.2
Residential - Rural	8.5	1691.8
Commercial Village - Mixed Use	0.8	165.4
Light Industrial	0.5	99.4
Public - Semi-Public	3.9	786.9

* - Total Area of the Township, including the Susquehanna River is 19,904 acres or approximately 31.1 square miles.

** - This number represents the total acreage for each planning area. Because of overlap between the Floodplain and Conservation planning areas and the some Public - Semi/Public and Conservation, a total planned area cannot be generated.

SOURCE: Halifax Township Planning Commission, Tri-County Regional Planning Commission, Atlas GIS, 1995


Upper Paxton Township
Jackson Township
Susquehanna River
Perry County
Halifax Borough
Wayne Township
Susquehanna River
Reed Township
Middle Paxton Township
N
Map 13-1
Generalized
Land Classification
HALIFAX TOWNSHIP
Dauphin County
Municipal Boundary
Public Roads
Other Roads
Railroad Lines
Water Features
Developed Land 1683.6 Acres
Land Available for Development 702.1 Acres
Land for Future Development 822.2 Acres
Rural Residential Land for Development 1273.9 Acres
Agricultural Core Land – Available in Long Term 7431.3 Acres
Farmsteads
Land to be Preserved 6383.6 Acres
Feet
0 2000 4000 6000
Source: PA DOT, Tri-County Regional Planning Commission, Atlas GIS, 1995


Upper Paxton Township
Jackson Township
Susquehanna River
Perry County
Halifax Borough
Wayne Township
Susquehanna River
Reed Township
Middle Paxton Township
Map 13-2
Future Land Use
HALIFAX TOWNSHIP
Dauphin County
Municipal Boundary
Public Roads
Other Roads
Railroad Lines
Water Features
Agriculture 7460.0 Acres
Conservation 6430.8 Acres
Floodplain Overlay 994.6 Acres
Residential – Low Density 1048.7 Acres
Residential – Medium Density 620.2 Acres
Residential – Rural 1691.8 Acres
Commercial Village – Mixed Use 165.4 Acres
Light Industrial 99.4 Acres
Public – Semi-public 786.9 Acres
Feet
0 2000 4000 6000
Source: PA DOT, Tri-County Regional Planning Commission, Atlas GIS, 1995

More recently, in June of 2011 the Halifax Township joined forces with four local municipalities to create the Valleys Regional Comprehensive Plan. For the Valleys Region it is not the intent to substantially change the region's existing development patterns but rather build upon those patterns and investments as well as to protect and enhance important and unique manmade and natural features.

This approach, coupled with the input received from the residents of the region and the Keystone Principles, forms the foundation of this plan. The background information, mission and vision statements, and the community development goals set the direction of this Plan through the future land use plan. Unique to this region, the future land use plan will be developed around Character Areas and not traditional land use categories.

Character Areas are areas of the community that have achieved a unique, recognizable character that is different from neighboring areas. These differences may be the result of topography, age and style of housing, built environment, land use patterns, landscaping, street patterns, open space, or streetscapes.

The following Character Areas have been developed for the Valleys Region:

- Conservation
- Linear (Appalachian Train, Mountain Ridges, and Susquehanna River)
- Rural Resource
- Agriculture
- Rural Area – Developing
- In-Town Core Corridor
- Traditional Neighborhood – Stable
- Traditional Neighborhood – New
- Neighborhood Center (Downtown)

A selection from the map identifying the location of these Character Areas within the VRCP planning area is included later in this section and has been included in full in Section 6.0. The following is a description of the Character Areas along with supporting information, such as description, suggested development strategy, density of development, and community facilities and utilities needs.

Conservation Area

- **Description:** Primarily undeveloped natural lands and environmentally sensitive areas such as heavily wooded forests, steep slopes, wetlands, floodplains, streams and surface waters, important watersheds, and the islands located in the Susquehanna River. These areas are typically not suitable for intense development, but very low density residential

development, recreational uses, and conservation areas may be suitable.

- **Suggested Development Strategy:** Maintain the natural and rural character of the region by allowing development to occur on lots ranging between five (5) to twenty (20) acres, and require the use of best management practices, such as stormwater infiltration, for development that is permitted, develop single purpose timbering, natural gas and mineral extraction ordinances that support both uses but also protects the natural beauty of the area. Recreation and tourism should also be promoted in this area.

- **Suggested Density of Development:** A range of five (5) to twenty (20) acres per unit. Each municipality will determine the best density factor when developing appropriate ordinances to implement this Plan.

- **Community Facilities and Utilities:** Communication towers, electric supply improvements, public potable water supply sources, and on-lot wells and septic systems.

Linear Area (Appalachian Trail, Mountain Ridges, and Susquehanna River)

- **Description:** Area of protected open space that follows natural linear features for recreation, conservation, and ecological and cultural amenities.

- **Suggested Development Strategy:** Very limited development. Mountain ridge tops are reserved primarily for trails, greenways, conservation areas, bird watching, and other ecological and cultural amenities. Development occurring on the mountain ridges should be done in such a way as not to adversely impact scenic views. Best management practices, such as stormwater infiltration, shall be used for development that is permitted. Implementation of Act 24 of 2008, which requires municipalities within which the Appalachian Trail passes to adopt and enforce zoning ordinances that preserve the "natural, scenic, historic and esthetic values of the trail and to conserve and maintain it as a public resource"

- **Suggested Density of Development:** Twenty (20) acres minimum lot area for all uses.

- **Community Facilities and Utilities:** Community and municipal services, electric supply improvements, and on-lot wells and septic systems.

Rural Resource Area

- **Description:** Rural, undeveloped land likely to face development pressures for lower density residential development. Development in this Character Area will typically have low pedestrian orientation and access, larger lots, open space, pastoral views, and high degree of building separation. This Character Area also includes areas of existing concentrations of single-family residential homes.

- **Suggested Development Strategy:** Maintain the region's rural character, while accommodating new residential development, by:

    1. Where appropriate encourage rural conservation subdivision design that incorporates open space.
    2. Wherever possible connect to a regional network of green space available to pedestrians, bicyclists, and equestrians for both tourism and recreational purposes.
    3. Require extensive use of landscaping and buffer yards, and other performance standards to soften conflicts between residential and non-residential uses.
    4. Require the use of best management practices, such as stormwater infiltration for development that is permitted.

- **Suggested Density of Development:** Two (2) acres minimum lot area for all uses.

- **Community Facilities and Utilities:** Community and municipal services, communication towers, electric supply improvements, public water supply sources, on-lot wells and septic systems, community water and sewage systems, green energy uses, high speed internet service, and churches and schools.

Agriculture Area

- **Description:** Lands in open or cultivated state or sparsely settled, including concentrated animal feeding operations.

- **Suggested Development Strategy:** Maintain the region's agricultural character by:

    1. Strictly limit new non-agricultural related development.
    2. Protect farmland by maintaining large lot sizes through effective agricultural land use regulations.
    3. Encourage development on non-tillable land or on soils not classified as prime agricultural soils.
    4. Support the use of agricultural security areas and conservation easements (public and private).
    5. Require the use of best management practices, such as stormwater infiltration, for development that is permitted.

- **Suggested Density of Development:** A minimum of ten (10) acres for all uses, except when a single-family residential dwelling is not part of a farm a minimum lot size of two (2) acres with a maximum of three (3) acres is suggested.

- **Community Facilities and Utilities:** Community and municipal services, communication towers, electric supply improvements, public water supply resources, on-lot wells and

septic systems, green energy uses, reliable internet service, churches and schools, and cemeteries.

Rural Area – Developing Area

- **Description:** Areas of the region where pressures for the typical types of rural/suburban development are the greatest and most likely will occur in the future due to availability of public water and future access to public sewer. Without intervention this area is likely to evolve with low pedestrian orientation, variety of lot sizes, accessibility issues, high to moderate degree of building separation, and scattered public/semi-public uses.

- **Suggested Development Strategy:** Maintain the rural, but developing, atmosphere while accommodating new residential development by:

    1. This area should not be developed until the In-Town Core Corridor area is built out.
    2. Promote moderate density, conservation subdivisions.
    3. New development should be master-planned with mixed uses, blending residential
       development with parks, retail businesses and services, compact pattern that encourages walking.
    4. Encouraging a strong connectivity between this area and the In-Town Core Corridor, by connecting both by sidewalk, trails, or a combination of both.
    5. Developing a regional network of greenspace and trails, available to pedestrians, bicyclists, and equestrians for both tourism and recreational purposes.
    6. Requiring the use of landscaping and buffer yards, and other performance standards to soften conflicts between residential and non-residential uses.
    7. Require the use of best management practices, such as stormwater infiltration, for development that is permitted.

- **Suggested Density of Development:** Two (2) acres minimum lot area for all uses utilizing both on-lot water and septic systems, or on-lot septic system and public water. If public water and public sewer are both available, or a community water and sewer system is utilized the minimum lot area for residential uses is recommended at 15,000 square feet per unit. The minimum lot area for non-residential uses where both public water and sewer, or community water and sewer are available is the minimum area needed to meet site development requirements such as building setback, off-street parking, impervious coverage, etc.

- **Community Facilities and Utilities:** Community and municipal services, on-lot wells and septic systems, public water and/or public sewage system, community water and sewage systems, green energy uses, high speed internet service, and churches and

schools.

In-Town Core Corridor Area

- **Description:** Developed or undeveloped land on both sides of designated high-volume transportation corridor. It acts as the main commercial corridor and uses include a mix of residential, commercial, and light industrial uses.

- **Suggested Development Strategy:**

    1. Primary growth area of the region.
    2. Promote higher density subdivisions and land development.
    3. New development should be master-planned with mixed uses, blending residential development with parks, retail businesses and services, compact pattern that encourages walking.
    4. There should be a strong connectivity between this area and the Rural Area - Developing, Traditional Neighborhood – New, Traditional – Stable, and Halifax Neighborhood Center by connecting both by sidewalk, trails, or a combination of both.
    5. Should be connected to a regional network of greenspace and trails, available to pedestrians, bicyclists, and equestrians for both tourism and recreational purposes.
    6. Extensive use of landscaping and buffer yards, and other performance standards to soften conflicts between residential and non-residential uses.
    7. Require the use of best management practices, such as stormwater infiltration, for development that is permitted.

- **Suggested Density of Development:** Uses within this area are required to be connected to public water and sewer. The minimum lot area for a single-family detached dwelling is 15,000 square feet. The minimum lot area for all other residential uses is 7,500 square feet per unit. The minimum lot area for non-residential uses where both public water and sewer is the minimum area needed to meet site development requirements such as building setback, off-street parking, impervious coverage, etc.

- **Community Facilities and Utilities:** Community and municipal services, public water and public sewage systems, green energy uses, high speed internet service, churches and schools, and medical clinics and pharmacies.

Traditional Neighborhood – Stable Area

- **Description:** Residential areas located in mature developed areas of the community. Characteristics include high pedestrian orientation, sidewalks, street trees, on street

parking, small, regular lots, limited open space, buildings are close to the front property line, predominance of alleys, low degree of building separation, and neighborhood-scale businesses scattered throughout the area.

- **Suggested Development Strategy:** Maintain the Traditional Neighborhood character by:

    1. Focus on reinforcing stability by encouraging more homeownership and maintenance of or upgrade of existing properties.
    2. Vacant properties offer an opportunity for infill development of new, architecturally compatible housing.
    3. Strong pedestrian and bicycle connections should be provided to encourage residents to walk or bike to the In-Town Core Corridor, school, parks, and other destinations in the immediate area.
    4. Require the use of best management practices, such as stormwater infiltration, for development that is permitted.

- **Suggested Density of Development:** Uses within this area are required to be connected to public water and sewer. The minimum lot area for a single-family detached dwelling is 15,000 square feet. The minimum lot area for all other residential uses is 7,500 square feet per unit. The minimum lot area for non-residential uses where both public water and sewer is the minimum area needed to meet site development requirements such as building setback, off-street parking, impervious coverage, etc.

- **Community Facilities and Utilities:** Community and municipal services, public water and public sewage systems, library, public/semi-public uses, green energy uses, high speed internet service, and churches and schools.

Traditional Neighborhood – New Area

- **Description:** An area where pressures for the typical types of rural/suburban development are the greatest and most likely will occur in the future due to availability of public water and public sewer.

- **Suggested Development Strategy:** Maintain the atmosphere by:

    1. Develop in unison with the uses in the In-Town Core Corridor.
    2. Must be master-planned with mixed uses, blending residential development with retail businesses and services, and compact pattern that encourages walking.
    3. Have a strong connectivity between this area and the In-Town Core Corridor and Neighborhood Center by sidewalk, trails, or a combination of both.
    4. Connect to a regional network of greenspace and trails, available to pedestrians, bicyclists, and equestrians for both tourism and recreational purposes.
    5. Use landscaping and buffer yards, and other performance standards to soften

conflicts between residential and non-residential uses.

6. Require the use of best management practices, such as stormwater infiltration, for development that is permitted.

- **Suggested Density of Development:** Uses within this area are required to be connected to public water and sewer. The minimum lot area for a single-detached dwelling is 15,000 square feet. The minimum lot area for all other residential uses is 7,500 square feet per unit. The minimum lot area for non-residential uses where both public water and sewer is the minimum area needed to meet site development requirements such as building setback, off-street parking, impervious coverage, etc.

- **Community Facilities and Utilities:** Community and municipal services, public water and public sewage system, library, public/semi-public uses, green energy uses, high speed internet service, and churches.

Halifax Neighborhood Center (Downtown) Area

- **Description:** A neighborhood focal point with a concentration of activities such as general retail, service commercial, professional office, higher density housing, and appropriate public and open space uses easily accessible by pedestrians.

- **Suggested Development Strategy:** Maintain the atmosphere by:

1. Include a mix of retail, office, service uses to serve the immediate region of Halifax Borough and surrounding Halifax Township.
2. Design should be very pedestrian-oriented, with strong walkable connections between different uses.
3. Enhance the pedestrian friendly environment by adding sidewalks and creating other pedestrian friendly trail/bike routes linking to major destinations such as libraries, health facilities, parks, and schools.
4. Period signage.
5. Building façade improvements.
6. Cross walks.
7. Rain gardens and other best management practices to control stormwater.

- **Suggested Density of Development:** Uses within this area are required to be connected to public water and sewer. The minimum lot area for a single-family detached dwelling is 7,500 square feet. The minimum lot area for all other residential uses is 2,500 square feet per unit. The minimum lot area for non-residential uses where both public water and sewer is the minimum area needed to meet site development requirements such as building setback, off-street parking, impervious coverage, etc.

- **Community Facilities and Utilities:** Community and municipal services, public water and

public sewage system, library, public/semi-public uses, green energy uses, high speed internet service, and churches and schools.

The following two pages are selections of the Existing Land Use Plan and the Character Areas Plan provided in the Valleys Regional Comprehensive Plan. These maps have been included in their entirety in Section 6.0.

As you will notice, conflicts between proposed land use exist. In general, future development will be managed to more closely reflect the Valleys Regional Comprehensive Plan's Character Map; however, location of future development will also be in part determined by availability of community facilities and utilities, environmental needs and constraints, and ability to sustain projected growth while being mindful of those principles important to the residents of the Township.

The Valleys Regional Comprehensive Plan: Existing Land Use Map (Halifax Township)

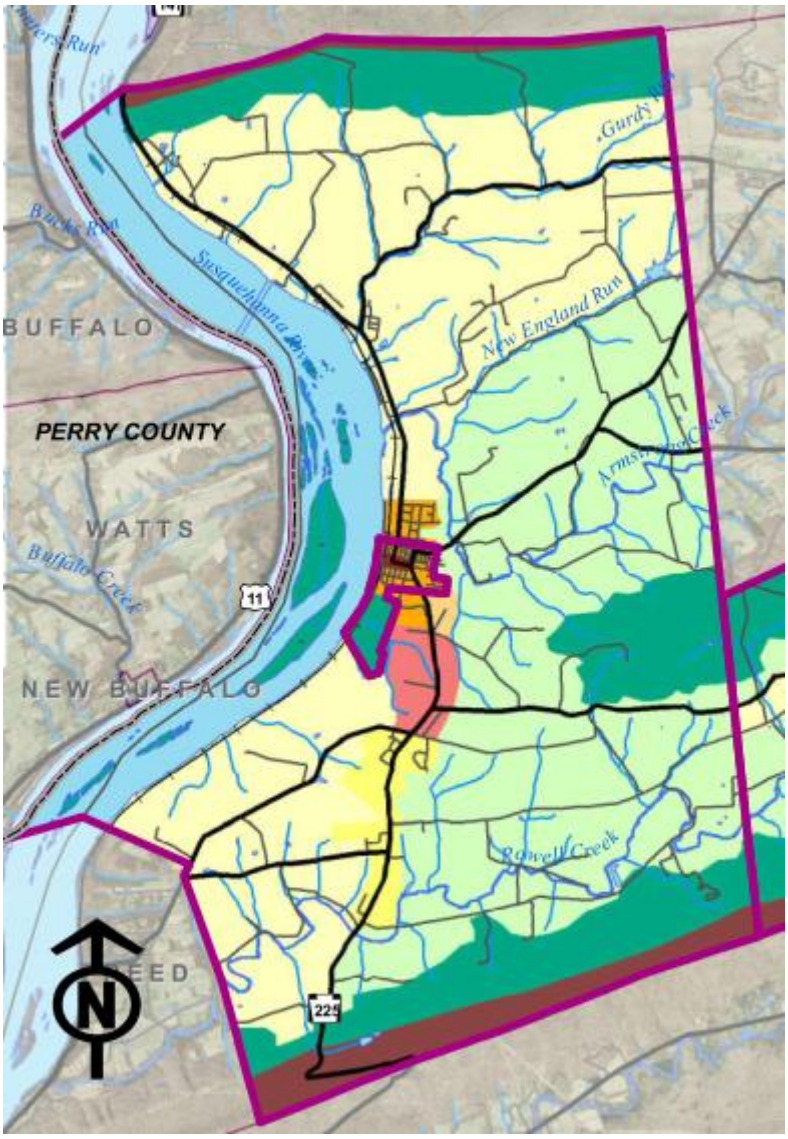
Legend

- County Boundary
- Municipal Boundary
- State Road/Highway
- Local Road
- Railroad
- Water Feature
- Stream
- Parcel

Anderson Land Use and Land Cover

- Residential - less than 2 units per acre
- Residential - 2.1 to 7 units per acre
- Residential - more than 7 units per acre
- Farmsteads
- Commercial and services
- Industrial
- Transportation and utilities
- Mixed urban or built-up land
- Institutional
- Recreational
- Agriculture: cropland
- Agriculture: pasture
- Agriculture: other unclassified agriculture land
- Orchards/groves/vineyards/nurseries/other
- Large Confined Feeding Operations
- Herbaceous - Open, grassy areas with few trees or shrubs
- Shrub/brush
- Mixed cover
- Deciduous forest
- Coniferous forest
- Mixed forest
- Open water
- Forested wetlands
- Mines/quarries/pits and junk yards/land fills
- Transitional (under construction)

The Valleys Regional Comprehensive Plan: Character Areas Map (Halifax Township)



Legend

- County Boundary
- Municipal Boundary
- State Road/Highway
- Local Road
- Railroad
- Water Feature
- Stream

Character Area

- Linear Feature (Including Susquehanna River)
- Conservation
- Agricultural
- Rural Resource
- Rural Area - Developing
- In-Town Corridor
- Neighborhood Center
- Traditional Neighborhood - Stable
- Traditional Neighborhood - New

3.1.2 Important Farmland

Prime farmland, as defined by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS), is the land that is best suited for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and water supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. According to the NRCS, prime farmlands generally include Class I and II soils, which produce the highest yields with minimal inputs of energy and economic resources. Qualities that characterize prime agricultural soils include high permeability to water and air, few or no rocks, optimum levels of acidity and alkalinity, 0 to 8 percent slopes, and the absence of flooding during the growing season. These soils may currently be utilized for crops, pasture, woodland, or land covers other than urban land or water areas.

Soil Associations – The Township is located within three (3) general soil associations, the Dekalb-Lehew, Calvin-Leck Kill-Klinesville, and Berks-Bedington-Weikert Associations. For general planning purposes, the characteristics of these soils associations, as defined by the Dauphin County Soil Survey are described below:

- *Dekalb-Lehew Association*: Moderately deep, well drained, gently sloping to very steep soils that have channery sandy loam to channery loam subsoil; on upper mountain slopes and ridges.
- *Calvin-Leck Kill-Klinesville Association:* Deep to shallow, dominantly well drained, gently sloping and sloping that has a shaly silt loam subsoil; in upland areas between mountains.
- *Berks-Bedington-Weikert*: Deep to shallow, nearly level to steep soils that have a shaly silt loam to shaly silty clay loam subsoil; on uplands.

Soil Series – Presented in Table 3–5 Soil Limitations for On-Lot Sewage Disposal Systems, is a listing from the Dauphin County Soil Survey for each soil series located within the Township, plus a summary of important soil qualities and characteristics. Under the column heading "On-Lot Disposal of Effluent from Septic Tanks", the soils are rated as follows:

- *Slight* – Soils with few or no limitations for use as drainage fields.
- *Moderate* – Soil has one or more properties that limit its use for drainage fields.
- *Severe* – Soil has one or more properties that seriously limit its use as a drainage field.

Table 3-5 – Soil Limitations for On-Lot Sewage Disposal Systems

Soil Series	Map Symbol	Hydrologic Group	Soil Limitation	Limiting Factor(s)
Albrights	AbA	C	Severe	Moderately slow permeability, seasonal high water table
	AbB2	C	Severe	Moderately slow permeability, seasonal high water table
Andover	AoB	D	Severe	High water table, slow permeability
Atkins	At	D	Severe	Flooding, high water table
Barbour	Bb	B	Severe	Flooding
Basher	Bc	B	Severe	Flooding, seasonal high water table
Berks	BhB2,	C	Severe	2 to 3.5 feet to bedrock
	BhC2,	C	Severe	2 to 3.5 feet to bedrock
	Bkd2	C	Severe	Slope condition
Brinkerton/Armaugh	BtA,	D	Severe	High water table
	BtB2	D	Severe	High water table
Buchanon	BuB,	C	Severe	Seasonal high water table, slow permeability
	BvB	C	Severe	Seasonal high water table, slow permeability
Calvin	CaD	C	Severe	2 to 3.5 feet to bedrock
Calvin-Leck Kill	CaF,	C/D	Severe	Slope condition
	ClA,	C/D	Severe	2 to 3.5 feet to bedrock
	ClB2,	C/D	Severe	2 to 3.5 feet to bedrock
	ClC2	C/D	Severe	2 to 3.5 feet to bedrock
Calvin Klinesville	CkC2,	C/D	Severe	1 to 1.5 feet to bedrock
	CkD2	C/D	Severe	1 to 1.5 feet to bedrock
Captina	CmB2	C	Severe	Seasonal high water table, slow permeability
Chavies	CnA,	B	Slight	Ground water contamination hazard
	CnB2,	B	Slight	Ground water contamination hazard
Comly	CoB2	C	Severe	Moderately slow permeability
Dekalb-Lehew	DcB2,	B	Severe	2 to 3.5 feet to bedrock
	DcC2,	B	Severe	2 to 3.5 feet to bedrock
	DlF	B	Severe	Slope condition
Duncannon	DvA,	B	Slight	
	DvB2	B	Slight	
Klinesville	KaB2,	C	Moderate	Flooding, ground water contamination hazard
	KaC2,	C	Severe	1 to 1.5 feet to bedrock
	KaD2,	C	Severe	Slope condition, 1 to 1.5 feet to bedrock
	KaE2	C	Severe	Slope Condition
Laidig	LaB2,	C	Severe	Moderately slow permeability
	LaC2,	C	Severe	Moderately slow permeability, slope condition
	LdB,	C	Severe	Moderately slow permeability
	LdD	C	Severe	Moderately slow permeability, slope condition
Lawerence	LeB2	C	Severe	Moderately slow permeability, seasonal high water table
Lindside	Lt,	C	Severe	Flooding
	Lw	C	Severe	Flooding

Philo	Ph	B	Severe	Flooding, seasonal high water table
Riverwash	Rv	A	Severe	Flooding
Tioga	Ta,	B	Severe	Flooding
	Tg	B	Severe	Flooding
Urban Land	Us	N/A	N/A	N/A
Very Stony Land	VsF	A	Severe	Stoniness, slope condition
Weikert	WeD2,	C	Severe	Slope condition, 1 to 1.5 feet to bedrock
	WeE2	C	Severe	Slope condition

The soil limitations presented in Table 3-1 are graphically shown in the On-Lot Septic Suitability Map included in Section 6.0 of this Report. As shown on the On-Lot Septic Suitability Map, many of the soils identified within the Township have severe limitations for the on-lot disposal of effluent from septic tanks due to a high groundwater table, slow permeability, flooding, steep slopes or shallow depth to bedrock. Soil probe tests and percolation tests must be performed to determine soil suitability for any proposed disposal field site within the Township.

Hydrologic Soil Groups – The U.S. Department of Agriculture (USDA), Soil Conservation Service has developed a hydrologic soil grouping system for indicating the infiltration rate for most soil series found in the United States. A description of the four hydrologic soil groups is as follows:

Group A – Soils having high infiltration rates even when thoroughly wetted, consisting of deep, well to excessively drained sands and/or gravels. These soils have a high rate of water transmission through the soil and have a low runoff potential.

Group B – Soils having moderate infiltration rates when thoroughly wetted, consisting of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission through the soil and have a moderate runoff potential.

Group C – Soils have a slow infiltration when thoroughly wetted, consisting of soils with a layer that impedes the downward movement of water, or soils with moderately fine to fine texture and slow infiltration rate. These soils have a slow rate of water transmission through the soil and have a high runoff potential.

Group D – Soils having very slow infiltration rates when thoroughly wetted, consisting of clay soils with a high swelling potential, a high permanent groundwater table, a fragipan or clay layer near the surface, and shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission through the soil and have a very high runoff potential.

It is important to note that the USDA Soil Conservation Service hydrologic soil groups were developed for soils in normal natural conditions. When using these hydrologic soil groups for planning, planners and developers should realize that other natural phenomenon and human related activities will affect the soil infiltration rates and runoff characteristics.

As shown in Table 3-1 Soil Limitations for On-Lot Sewage Disposal Systems, the predominant hydrologic soil groups are Soil Groups C and D, which require proper investigative procedures at

each disposal site to determine the capability of the soil to treat the sewage from an on-lot disposal system.

Prime Agricultural Soils – The prime agricultural soils are best suited for producing food, feed, forage and oilseed crops. This class of soil is also suitable for cropland, pastureland, rangeland and forestland. In general, prime agricultural soil has the quality, growing season and moisture supply needed to produce and sustain high yields of crops economically, when treated and managed, including water management, according to modern farming methods. The prime agricultural soil and the agricultural security areas within the Township are shown in the Prime Agricultural Soils Map included in Section 6.0 of this Report.

Agriculture and Land Preservation Initiatives

Agriculture has historically been, and continues to be a key industry in much of the Valleys Region. There are several tools available to municipalities and farmers to encourage the continuance and sustainability of farming in the region.

Agricultural Security Areas

Act 43 of 1981 allows any owner or owners of land used for agricultural production totaling at least 500 acres to submit a petition to the municipal governing body for the creation of an Agricultural Security Area. If the petition is approved, the participating land owners agree to keep their lands in agriculture in return for certain benefits that the municipality will give. Benefits of an Agricultural Security Area are:

- Local governments are not to pass ordinances that unreasonably restrict farm structures or properties.
- Prevents local governments from prohibiting agricultural activities and operations within the security area as a public nuisance.
- Protects farm operations by discouraging condemnation of agricultural land through eminent domain.
- Acreage in the security area can participate in the Agricultural Easement Program. Participation in the Agricultural Security Area is purely voluntary. There are no penalty provisions for an individual who changes land use while in a security area. The term of an Agricultural Security Area is seven years, followed by a recertification process. According to the Tri-County Regional Planning Commission's GIS data, in December of 2008, there were 407 parcels or portions of parcels in the Valleys Region enrolled in an Agricultural Security Area. This amounts to approximately 13,470 acres of land. A map identifying the Properties in the Valleys Region that are included in an Agricultural Security Area is included in Section 6.0.

Agricultural Easements

The Agricultural Conservation Easement Purchase Program was developed to strengthen Pennsylvania's agricultural economy and to protect prime farmland through the purchase of agricultural conservation easements, i.e. development rights, on prime agricultural land from willing land owners with the use of federal, state, county, and local funds. The program is administered by the State Agricultural Land Preservation Board and the Pennsylvania

Department of Agriculture, Bureau of Farmland Preservation. The Dauphin County Conservation District administers Dauphin County's Agricultural Land Preservation (ALP) Program. The program is voluntary and there are several requirements that must be met to participate in the program including a minimum size of 50 acres and enrollment in an Agricultural Security Area. The farm is then given a numerical score through a land evaluation and site assessment and is ranked against other eligible farms. The numerical score determines which properties will be granted easements, based on available funds. Farms are ranked based on the following criteria:

- Quality of farmland – size of the farm and type of soil
- Stewardship – the use of conservation practices and best management practices of nutrient management and control of soil erosion and sedimentation
- Likelihood of conservation
- Potential for development – extent of non-agricultural land use in an area; road frontage; availability of public water and public sewer
- Cluster potential – proximity to other preserved farms; proximity to Agricultural Security Areas

Farmers that enroll their land in the program receive a stipend for agreeing to place certain restrictions upon the land to maintain and permanently preserve high quality, functional farmland. In Dauphin County, the maximum payment that a land owner may receive through the program is $1,500 per acre. The land continues to be the farmer's private property and the farmer retains all privileges of land ownership, except the ability to sell the land for non-agricultural development or to develop the land for non-agricultural purposes. An agricultural conservation easement is permanent and transferable; if the landowner sells the property, the new landowner is subject to the same restrictions and must continue to use the property exclusively for agriculture.

Conservation Easements

A conservation easement is a legal agreement between a land owner and a nonprofit land trust or government agency that permanently limits uses of the land in order to protect important conservation values. Property owners may receive federal tax incentives to conserve land. There is one conservation easement in Halifax Township. The Central Pennsylvania Conservancy holds a conservation easement of approximately 142 acres on the property that is the future site of Fort Halifax Park in Halifax Township. A map showing this property is included in Section 6.0.

Environmental Limitations

The Valleys Region is fortunate in that it has an abundance of natural resources, as described in detail in Section 3.0. Information presented in Section 3.0 may be helpful in making future decisions regarding the location of development, to ensure that these vital resources are not compromised. Identification of sensitive natural features is the first step in identifying areas for preservation and limited development. A map depicting environmental constraints, that is to say, sensitive natural features that may pose constraints to development is included in Section

6.0. Such features include steep slopes, floodplains, wetlands, prime agricultural soils, farmland of statewide importance, forest cover, and water features. The areas shown on this map to be covered with one or more environmental constraints should be avoided when considering future locations for development.

3.1.3 Formally Classified Lands

The proposed projects will have no impact within one mile of any national or state parks, forests, or trails. Furthermore, the proposed structural alternatives will have no impact within one mile of any registered and/or eligible national monuments and landmarks. Refer to Section 3.4 of this Report in reference to the Cultural Resource Notice request sent to the Bureau of Historic Preservation for identification of potential impacts within the Planning Area.

3.2 Floodplains

Within the Township, most of the existing development is outside the limits of the floodplain. Most of the land in the floodplain along the Susquehanna River, Powell Creek, Armstrong Creek, and Gurdy Run is undeveloped. The Township is currently in compliance with the Federal Flood Insurance Program, and the State Flood Plain Management Act. The 100-year Flood Elevation hazard areas in the Township are based on the November 23 1982 Flood Insurance Rate Map (FIRM) from the Federal Emergency Management Agency, and are shown on the Hydrology Map provided in Section 6.0 of this Report.

3.3 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support a prevalence of vegetation typically adapted for life in saturated soils. Wetlands generally include swamps, marshes, bogs, and other areas that exhibit the three criteria for defining a wetland area: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology.

As more information has become available about the beneficial aspects of wetland habitats, scientists, engineers, environmental interest groups, and governmental agencies have worked to protect and maintain the unique environments. Along with the traditional uses of wetlands as fish and wildlife habitat, wetlands are now being used for stormwater management and wastewater treatment.

Wetlands are a critical component in many ecological processes and are consequently protected by the federal government. Wetlands provide the following benefits or functions:

- Fish and Wildlife Habitat
- Water Quality Maintenance
- Pollution Filter
- Oxygen Production
- Nutrient Recycling
- Chemical and Nutrient Absorption
- Aquatic Productivity
- Flood Control

- Recreational Land Preservation
- Educational Opportunities
- Microclimate Regulation
- World Climate Regulation
- Sediment Removal
- Energy Source (Peat)
- Open Space Preservation

The National Wetlands Inventory (NWI) mapping, as compiled by the U.S. Fish and Wildlife Service, is useful as a background source of information regarding wetland locations. The maps are prepared through the use of color infrared aerial photographs, and the quality of the maps varies dependent upon the time of year that the photos were taken and other factors. Field investigation, conducted by a trained scientist or engineer, is necessary to determine the actual presence or absence of wetland areas.

The known wetlands within the Township, based on the National Wetlands Inventory Map, are shown on the Hydrology Map provided in Section 6.0 of this Report.

The hydric soils are associated with the Albright, Andover, Atkins, Barbour, Brinkerton, Buchanon, Comly, Klinesville, Lindside, Philo, Riverwash, and Weikert Soil Series, and are shown in the Hydric Soils Map included in Section 6.0 of this Report. As previously noted, these soils are severely limited and may not be suitable for currently available on-lot disposal systems.

Some wetlands identified above may be encountered during construction of the selected alternative(s) in the Planning Area. A formal wetlands survey and delineation will be done prior to the commencement of design activities to minimize wetland encroachments.

Wetlands will be avoided to the maximum extent possible. If wetland impacts are unavoidable during construction, these areas will be restored to preconstruction conditions once construction of the sewer facilities is complete. The wetland soil will be stockpiled during any excavation and restored to the appropriate seed mix for the surrounding native vegetation. If permanent impacts to wetlands are proposed and mitigation is necessary, a full mitigation plan will be developed in accordance with the latest PA DEP and United States Army Corps of Engineers (USACE) guidelines. All required permits will be obtained prior to the start of construction.

3.4 Historic Resources

A community's history is contained in its historic resources. These resources may take many forms, including architecturally and historically significant buildings, sites, structures, objects, and districts. A comprehensive historic preservation program begins with the identification and evaluation of historic resources. Once this step is performed, programs can be developed for their preservation and enhancement. Halifax Township is home to several properties either eligible or listed on the National Register of Historic Places, as listed below:

National Register Listed and Eligible Properties

Property Name	Municipality	Address	Status	Date
Clemson Island Prehistoric District	Halifax Township	Listed	09/17/1981	
John Meech House	Halifax Township	3059 Peter's Mountain Road	Eligible	09/18/1989
Legislative Route 1 Sycamore Allee	Halifax Township	Listed	02/07/2007	

Source: Pennsylvania Historical and Museum Commission, Bureau for Historic Preservation, 2007; Halifax Township

In addition, the following local cultural and historic resources were identified:

- ***Fort Halifax -*** A historic marker is located in Halifax Township on PA 147, approximately 0.5 miles north of Halifax Borough. The marker contains the following text, "Just west of this point stood Fort Halifax. It was built in 1756 by Col. William Clapham, and was one of the chain of frontier forts built to protect settlers in this region during French and Indian War days."

- ***Sycamore Trees along SR 147 -*** Planted in the early 1920s as a living memorial to the World War I veterans, these trees remain as a reminder of people who served in the United States in wartime.

The Pennsylvania Historic and Museum Commission (PHMC) was consulted to identify the potential impacts of the alternative(s) evaluated in this Act 537 Plan. A Cultural Resource Notice request and supporting documentation was sent to the Bureau of Historic Preservation for a list of known historical sites and identification of potential impacts on known archaeological and historic sites in the Planning Area within the Township by implementation of the recommended alternative. Copies of the request and PHMC correspondence are included in Section 6.0 of this Report.

3.5 Sensitive Biological Resources

The Pennsylvania Natural Diversity Inventory (PNDI) was evaluated for adverse effects resulting from the implementation of the alternative(s) proposed in this Act 537 Plan. Requests to the Pennsylvania Department of Conservation and Natural Resources (DCNR), Bureau of Forestry, Pennsylvania Fish and Boat Commission, US Fish and Wildlife Services, and Pennsylvania Game Commission were submitted for the Planning Area in the Township. Copies of this request and the appropriate responses are included in Section 6.0 of this Report. Mitigation measures include as follows:

- PA Department of Conservation and Natural Resources
    - No adverse impacts are anticipated; therefore, no mitigation is necessary.
- PA Game Commission
    - Potential Impact; therefore, further review is required. Copies of the request for further review by the PA Game Commission are included in Section 6.0 of this Report.
- PA Fish and Boat Commission
    - No adverse impacts are anticipated; therefore, no mitigation is necessary.
- U.S. Fish and Wildlife Service

- No adverse impacts are anticipated; therefore, no mitigation is necessary.

3.6 Water Quality Issues

Implementation of the structural alternatives will not require new public wastewater treatment facilities or stream discharges as wastewater from these areas will be conveyed to the existing HAWASA WWTP.

No permanent, deleterious water quality issues are anticipated to occur as a result of implementation of the selected alternative(s) in the Planning Area. During construction activities, sedimentation to surface waters will be controlled by accepted erosion and sedimentation control methods outlined in an approved E&S Control Plan. Once completed, the proposed project may enhance water quality in the Planning Area by reducing the number of active, improperly functioning septic systems in the Township.

Water supplies, both public and private, will not be negatively impacted by the selected alternatives proposed in this report and replicated in the Act 537 Plan. In fact, water supplies may be positively impacted through elimination of pollution entering the groundwater from existing malfunctioning on-lot systems.

3.7 Coastal Resources

There are no coastal areas within Halifax Township; therefore, no impacts to coastal resources are expected.

3.8 Socio-Economic Issues

The proposed alternative is anticipated to promote community viability, improve public health, and to protect property investments.

The locations of the proposed collection facilities are based entirely upon the topography of the land with no consideration given to race or household income. The proposed projects will have no unjust impacts on minorities or disadvantaged populations.

3.9 Recreation and Open Space

The alternatives recommended by this report and replicated in the Act 537 Plan will not themselves create any new recreational or open space opportunities.

3.10 Air Quality

With the exception of the minimal dust and exhaust during the construction of new sewer lines and pumping stations, the proposed projects will not create any significant impacts on air quality.

3.11 Transportation

There will be no permanent impact on transportation. There will be minimal disruption of traffic patterns during construction of the recommended structural alternative. All traffic control and construction methods will be permitted as required by the Pennsylvania Department of Transportation and Londonderry Township.

3.12 Noise Abatement and Control

Noise will only be an issue during construction activities. Noise will be controlled by best management practices and engineering controls outlined in the construction contract. Construction noise is of a fixed duration and ceases at the completion of the construction phase of the project. Noise from construction vehicles differs from normal vehicular traffic noise in that it is usually limited to normal working hours (8 a.m. to 5 p.m.), whereas traffic noise is usually continuous.

3.13 Wild and Scenic Rivers

There are no Pennsylvania or Federally designated Scenic Rivers in Halifax Township according to the Pennsylvania Scenic Rivers Program.

3.14 Miscellaneous Environmental Considerations

There are no other environmental issues, such as biosolids generation, treatment, and disposal; impacts on or from local landfills; impacts on or from Superfund/HSCA sites; and generation of hazardous, explosive, flammable, toxic, radioactive materials which pertain to the projects proposed by this report and were replicated in the Township's Act 537 Plan.

Appropriate state and federal permits, where required, will be obtained prior to the construction of the proposed projects.

4.0 SUMMARY OF MITIGATION

Due to the temporary nature of all environmental disturbances associated with the construction of the alternatives proposed by this report and replicated in the Act 537 Plan, mitigation is not necessary.

5.0 PUBLIC PARTICIPATION

As part of the Act 537 Planning process, a 30-day public comment period was advertised and held. During this time, the public can review and submit written comments in regard to the Act 537 Plan. Additionally, public meetings were held to allow the public to participate in the planning process.

6.0 EXHIBITS

The following exhibits have been included in this Environmental Report:

EXHIBIT A – TOWNSHIP ORDINANCES AND COMPREHENSIVE PLAN
EXHIBIT B – TOWNSHIP MAPPING
EXHIBIT C – SURVEY RESULT MAP
EXHIBIT D – SUMMARY OF SURVEYS
EXHIBIT E – HAWASA AGREEMENTS
EXHIBIT F – HAWASA INFORMATION
EXHIBIT G – DRAFT SEWAGE MANAGEMENT ORDINANCE TEMPLATE
EXHIBIT H – ALTERNATIVE EXHIBITS
EXHIBIT I – CORRESPONDENCE