3.1 EXISTING MUNICIPAL WASTEWATER TREATMENT SYSTEMS

As presented in the Physical and Demographic Analysis, the majority of Halifax Township is rural and agricultural in nature and use, therefore, a majority of the properties 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 and the majority of these systems appear functioning properly. There are, however, systems installed after permitting regulations appear to be malfunctioning. The ability for a system to function properly depends 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.

3.1.1 Description of Existing Sewerage Systems

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 Appendix C (Public Sewer Service Area). The majority of the Township utilizes on-lot disposal systems as further described in Section 3.2.1.

3.1.2 Municipal and Non-Municipal Collection, Conveyance, and Wastewater Treatment Facilities

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 3-1. 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 DEP's 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 3-1 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:

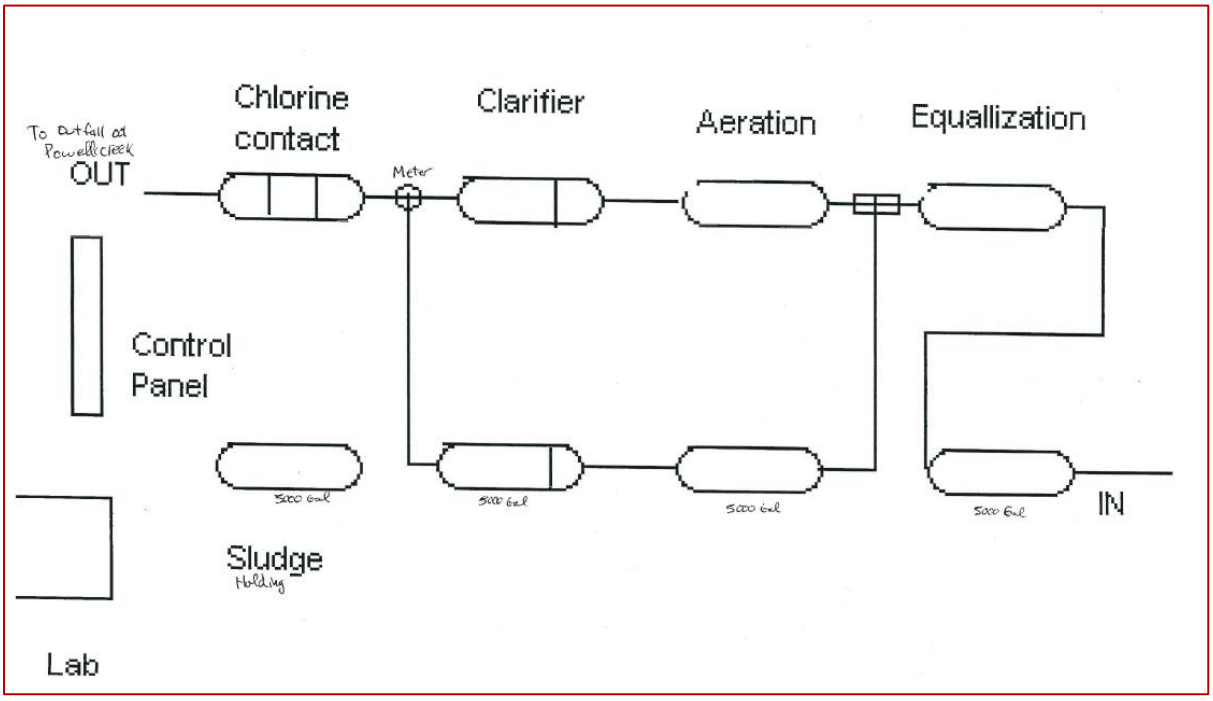
(1) NPDES Permit Discharge Limits, average monthly values.
(2) Summer limits from May 1 to September 30. Winter limits from October 1 through April 30.
(3) Summer limits from May 1 to October 31. Winter limits from November 1 through April 30.

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 3-2. The components of this facility are shown the schematic below.

Figure 3-1 Camp Hebron WWTP Components and Schematic



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

Table 3-2 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.

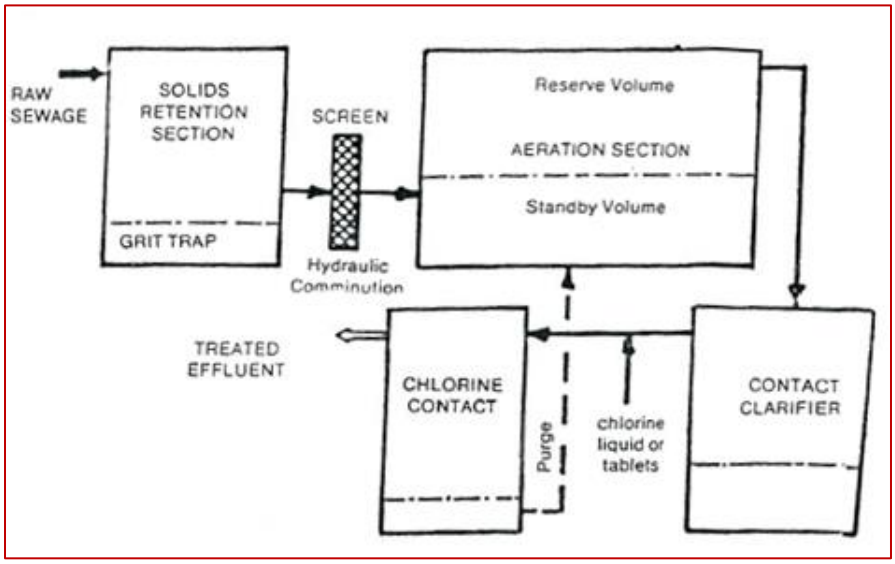
3. The Alex Acres Mobile Home Park

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 3-3. 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

Figure 3-2 Alex Acres Mobile Home Park WWTP components and schematic



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 3-3 NPDES Effluent Limits and Discharge Characteristics for the Alex Acres MHP 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 Strohecker 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 a designed capacity of 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 3-4. 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 3-4 NPDES Effluent Limits and Discharge Characteristics for the Strohecker MHP 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 which 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 South 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 in to 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 comminuter 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 this Plan is adopted by the Township.

Table 3-5 NPDES Effluent Limits and Discharge Characteristics for the HAWSA 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)

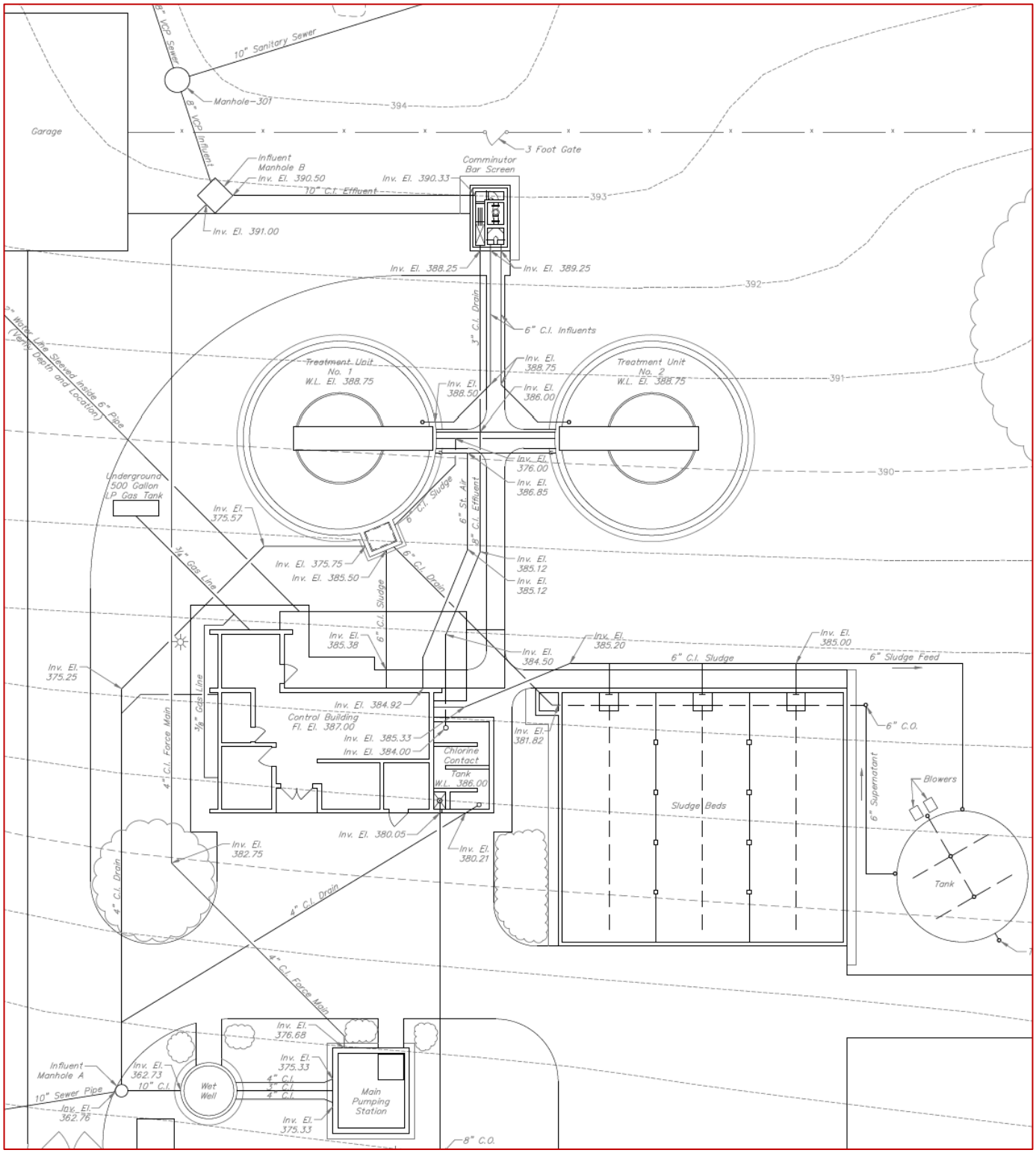
Notes:

(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.

Figure 3-3 HAWSA WWTP Existing Site Plan



3.2 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 system, seepage pit, bore hole and pipe to surface or ditch.

3.2.1 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:

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

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

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

4. **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 3.2.2) 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.

3.2.2 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 vectorborne disease that may be attributed to surface ponding of sewage should also be considered.

3.2.3 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 Township and more than 50% of the OLDS were surveyed and 308 door-to-door OLDS surveys were conducted to exceed the minimum acceptable survey rate set by DEP (15%) as shown in Table 3-6. 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 3-6).

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 Appendix D, a summary of the results is presented in table 3-7 and table 3-8, and a detailed tabulation of the results is presented in Appendix E.

Table 3-6 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 3-7. A summarization of the door-to-door surveys completed by HRG is presented in Table 3-8. Detailed spreadsheets containing survey data included as Appendix E of this Plan and a map showing the survey results is included as Appendix D of this Plan

Table 3-7 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 3-8 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

3.2.4 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 2-2. Using these criteria, in combination with the soil characteristics presented in the USDA's Soil Survey and Section 2.3, 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 2-2 and Appendix C).

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.

3.2.5 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 3-6). 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 3-9. 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 3-10. Detailed water sampling results are provided in Appendix E. Mapping showing the results of the sampling is attached as Appendix D. 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 3-9 Original Well Survey Data

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: Non-Detectable <1	Nitrate Test Results: 0-5 mg/l	Nitrate Test Results: 5-10 mg/l	Nitrate Test Results: 10+ mg/l	Total Coliform: Detectable >1	Fecal Coliform: 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 3-8 HRG Well Survey Data vs Original Data

SFPA (Original)	# of Water Sample Taken	Nitrate Test Results: Non-Detectable <1 (Original)	Nitrate Test Results: Non-Detectable <1	Nitrate Test Results: 0-5 mg/l (Original)	Nitrate Test Results: 0-5 mg/l	Nitrate Test Results: 5-10 mg/l (Original)	Nitrate Test Results: 5-10 mg/l	Nitrate Test Results: 10+ mg/l (Original)	Nitrate Test Results: 10+ mg/l	Total Coliform: Detectable >1 (Original)	Total Coliform: Detectable >1	Fecal Coliform: Detectable >1 (Original)	Fecal Coliform: 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**

3.2.6 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 Appendix E. 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 Appendix E next to the results of the original surveys. A map presenting the results of both surveys is provided as Appendix D.

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. As shown in Appendix E, 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.

As shown on the Map presented in Appendix D, 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 sandmounds 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 Appendix D. 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.

3.3 WASTEWATER SLUDGE AND SEPTAGE GENERATION

Upon treatment of domestic and industrial wastewater, the entrained solids are removed and often require special consideration for ultimate disposal. Solids from wastewater are created in two forms, sewage sludge and septage. Sludge is generated at wastewater treatment facilities and is generally disposed by landfilling or land application. The remaining homes not served by public sewers generate septage. Septage is the decomposed remains of the separated solids from domestic wastewater. As this sludge ages within a septic tank or similar treatment system, partial treatment is provided. Septage is a concentrated form of sludge.

3.4.1 Sources of Sludge or Septage in the Planning Area

The five (5) WWTPS generate wastewater sludge within the planning area. Septage is generated by the on-lot systems described in Section 3.2.

3.4.2 Quantities of Sludge and Septage Generated

The HAWSA WWTP generated approximately 166,552 gallons of sludge in 2017 or approximately 6.857 dry tons. The HAWSA digester generates approximately 1.9% solids of outgoing sludge.

3.4.3 Present Methods of Disposal

Sewage which is conveyed to the five (5) public/non-public wastewater treatment facilities located throughout the Township is treated and then discharged to the local waterways in accordance with the facilities NPDES permit. Sludge generated at each facility is disposed of off-site in accordance with DEP's rules and regulations. OLDS through the Township are emptied periodically and hauled by truck, by local septic pumping companies, to Wastewater Treatment Facilities permitted to accept and treat septage.