

**HONEY BROOK TOWNSHIP ACT 537 SEWAGE
FACILITIES PLAN UPDATE**

FOR

HONEY BROOK TOWNSHIP

LOCATED IN

**HONEY BROOK TOWNSHIP,
CHESTER COUNTY, PENNSYLVANIA**

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EXECUTIVE SUMMARY

HONEY BROOK TOWNSHIP, CHESTER COUNTY

2018 ACT 537 PLAN UPDATE

EXECUTIVE SUMMARY

Honey Brook Township is at the northwestern edge of Chester County adjacent to Lancaster County. Agriculture is the dominant land use in the Township and is characterized by gently rolling topography with several steeper areas in the northern and southern portions of the Township, along with relatively flat areas including Struble Lake. The current Township 537 Plan identifies three areas of the Township to be serviced by public sanitary sewer, including the West, Suplee, and Cupola sewer districts. All wastewater generated in the Township is conveyed and treated at the Northwestern Chester County Municipal Authority (NCCMA) Wastewater Treatment Plant (WWTP), located at 37 Dampman Road for treatment and disposal via stream discharge.

The Township is currently administering its 2018 Act 537 Plan Update to further define the areas of public sewer and to address the existing WWTP upgrade requirements. The WWTP is not meeting the required ammonia effluent discharge limits during the winter months. As part of the evaluation to upgrade the WWTP to meet permit discharge requirements, the Township took this opportunity to review its existing and proposed public sanitary sewer service areas, existing and future needs, resolve zoning inconsistencies, and to provide guidance on future wastewater disposal policies and procedures. Through these analyses, Honey Brook Township has identified alternatives that will best serve its needs now and into the future.

Two alternatives were evaluated for the upgrade to the existing NCCMA WWTP to handle the projected average daily design flow of 0.74 MGD and maintain compliance with anticipated NPDES effluent permit limits. The two (2) major alternative options that were considered as part of this Act 537 study include:

1. Alternative No. 1- Lagoon Retrofits.
2. Alternative No. 2 - Conventional Systems

Alternative No. 1 considered the option of retrofitting the existing lagoons with proven technologies that would allow for the continued use of the lagoon system for biological treatment. Alternative 2 considered the option of abandoning the existing lagoon treatment processes and replacing them with a conventional activated sludge system for biological treatment. The selected Alternative is no. 1, retrofitting the existing lagoon. The evaluation of this alternative is outlined in more detail in Chapter VI.

In this Act 537 Plan update, the Township was divided into four Study Areas to facilitate the analysis of potential improved wastewater alternatives. The Study Areas were chosen based partially upon existing land use, existing wastewater disposal methods, and potential needs. The four Study Areas are identified as follows:

- Suplee Study Area: This study area is located on Suplee Road near the intersection of Talbotsville Road and consists of mostly residential homes. The current residents/occupants are serviced by Individual On-Lot Sewage Disposal Systems. In the 2010 Act 537 the sanitary survey and well sampling, identified this area to potential and suspected of septic systems malfunctions. The 2010 Act 537 Plan defined the limits of the Suplee Service Area and this 537 Plan will expand this service area to include two additional areas as future areas to be serviced and the proposed flow projections have been taken into account for the wastewater treatment plant upgrade.

The first area is located along the corridor of Dampman Road leading down to the WWTP and the second area is located north and south sides of Morgantown Road near the intersection of Chestnut Tree Road. Based on a review of lot size of these areas and the previous on-lot and well survey conducted by HRG, Inc. in the 2010 Act 537 Plan, these areas will be added to the Suplee Sewer District. These areas are projected to be provided public sanitary sewer within the next 20 years and will continue to utilize their individual on-lot sewage disposal systems until the systems reportedly malfunctioning.

This service area will also continue to utilize their existing septic system and will be required to participate in the Sewage Management Ordinance.

- West Study Area: This Study Area is located at the far western portion of the Township along Route 322, which stretches from Cambridge Road to Mill Road and consists of residential, commercial, industrial and farm residential properties. The current residents/occupants are serviced by Honey Brook Township public sanitary sewer system, which is conveyed to the NCCMA for treatment and stream discharge.

There are two areas evaluated as part of this Act 537 Plan identified as Map ID no. 55 and 56 of the Overall Honey Brook Township Act 537 Plan, which are both currently located beyond the limits of the existing public sanitary sewer service area. The first area is located just southeast from the existing public sanitary sewer service area on Horseshoe Pike adjacent to Cambridge Road and the second area is located on Cambridge Road near the intersection of Augusta Drive. This area is zoned as agriculture. Based on the previous on-lot and well survey conducted by HRG, Inc. in the prior Act 537 Plan, there is a known on-lot system failure within the area. The two properties are also planned for redevelopment and will be included in the West Sewer District. Until these properties are connected to the public sewer system, they will continue to utilize individual on-lot systems as an interim method of sewage disposal.

It should be noted, the wastewater generated by Honey Brook Borough flows to the West Sewer District.

- Cupola Study Area: This Study Area is located at the eastern portion of the Township along Route 322, stretching from Pleasant View Road to Chestnut Tree Road and consists of farm residential, mixed residential and commercial properties. The current residents/occupants are serviced by Honey Brook Township public sanitary sewer system, which is conveyed to the NCCMA for

treatment and stream discharge. Some of the residential homes within this study area are being serviced by on-lot sewage disposal systems and will continue to utilize their existing systems. A proposed industrial park, known as the Hammell O'Donnell Industrial Park, is located beyond the Municipal limits of Honey Brook Township along Chestnut Tree Road. The proposed industrial park is located within West Nantmeal and West Brandywine Townships and will be serviced by the Cupola sewer service district in accordance with the executed Intermunicipal Agreements attached in Appendix A.

- On-Lot Sewage Disposal Study Area: Consistent with the majority of the existing and proposed agricultural land use in the Township, this study area comprises the remainder of the total area of Honey Brook Township. Most of the existing parcels are relatively large, exceeding well over 5 acres in size, consisting of farms, parks or preserved farm land. These areas will continue to utilize the on-lot systems to service their sewage disposal needs.

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The phasing of the upgrades is outlined below:

Phase	Description
Phase 1(Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none"> 1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells 2. Installing lagoon covers 3. Replacing the mechanical aerators with diffused aerators 4. Replacing the bio-blocs with a new nitrification reactor 5. Replacing the existing headworks bar screen
Phase 2 (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD. Construct modifications to existing process equipment to handle new ADF.

	Work to include: <ol style="list-style-type: none"> 1. Modifications to DAF tanks 2. Modifications to sand filters 3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

The upgraded NCCMA WWTP will adequately service Honey Brook Township and Honey Brook Borough sewer needs, without creating a projected organic or hydraulic overload in the system within the next 20 year planning horizon.

The summary of the costs for the alternatives are outlined below:

Alternative	Amount Financed by Loan	Interest Rate % 1	Term (years)	Annual O&M Cost per EDU	Annual Financing Debt Service per EDU	Total Annual User Fee per EDU	Total Interest Over Term of Loan
PENN VEST FINANCING							
IA	\$7,269,000	1.743	20	\$535	\$224	\$759	\$2,153,249
IB	\$7,643,000	1.743	20	\$535	\$235	\$770	\$2,264,037
USDA FINANCING							
IA	\$7,319,000	3.5	40	\$535	\$177	\$712	\$7,111,690
IB	\$7,693,000	3.5	40	\$535	\$186	\$721	\$7,475,096
* Blended rate at 1.743% for years 0-5 / 2.197% for year 6-20							

The upgraded WWTP will continue to be operated by NCCMA, and no new administrative departments will be created. The costs are further outlined in Chapter VII.

Implementation schedule for the selected alternative 1A or 1B is as follows:

Years	Activity
0-1	<ul style="list-style-type: none"> • Research up-front funding sources and establish a financing plan • Meet with Financing Agency for Initial Project Planning Meeting • Perform site visits of Alternative 1A and Alternative 1B WWTP installations • Obtain new WWTP NPDES permit. The new permit will establish effluent limits for future improvements. Revise Alternatives based on any changes to the existing permit. • Receive PADEP WQM Permit for Cupola Pump Station Upgrade (Permit Application was Submitted to PADEP on June 30, 2017) • Final Design of Cupola Pump Station Upgrade • Bid and Construct Cupola Pump Station Upgrade • Final selection of Lagoon Retrofit Treatment Alternative (Alternative 1A or 1B)
1-2	<ul style="list-style-type: none"> • Preliminary Design of Phase 1 Project (Nitrification Upgrade) • Final Design of Phase 1 Project (Nitrification Upgrade) • Obtain required Permits for Phase 1 Project (Nitrification Upgrade) • Implementation of Headworks Improvement Project (Maintenance Replacement)
2-3	<ul style="list-style-type: none"> • Bid Phase 1 Project (Nitrification Upgrade) • Construction of Phase 1 Project (Nitrification Upgrade) • Substantial completion of Phase 1 Project (Nitrification Upgrade)
3-5	<ul style="list-style-type: none"> • Preliminary Design of Phase 2 Project (Hydraulic Capacity Upgrade) - Once current ADF reaches 0.50 MGD (approx. 85% of current design capacity)

CHAPTER I
PREVIOUS SEWAGE FACILITIES PLANNING

CHAPTER I
PREVIOUS SEWAGE FACILITIES PLANNING

The prior Honey Brook Township Act 537 planning documents were consulted for portions of information in this Chapter. Honey Brook Township completed an Official Sewage Facilities Plan in 1995, which was updated in 1996. The most recent plan, approved by PADEP via written correspondence in 2010, referred to below as the 2010 Act 537 Plan, was adopted by Honey Brook Township under Resolution #9-2010 on November 10, 2010.

A. July 2010 Honey Brook Township 537 Sewage Facility Plan

The July 2010 Plan was initiated to address the wastewater disposal needs of Honey Brook Township and bring sewage facilities planning in-line with the planning effort put forth by the Township. The 2010 537 Plan identified the boundaries of the existing service area adjacent to the Borough (the existing 'West' District) to include only areas designated and zoned for mixed-use development, and identified the boundaries of the existing 'Cupola/Route 322' District (in the east end of the Township) to be expanded to match the Rocklyn Station Strategic Development Planning area and the area immediately northwest that is zoned for higher intensity uses to ensure that all development in this growth area will be served by public sewer. The 2010 Plan also identified the 'Cupola/Route 322' service area to be extended to allow for service to neighboring West Nantmeal Township's Light Industrial (LI) District. This Act 537 Plan will include this area (identified by numbers 34 to 44 on the Overall 537 Plan) through an Intermunicipal Agreement with West Nantmeal Township and Honey Brook Township which was executed September 21, 2017 to be service by the Cupola Sewer Service Area which ultimately flows to the NCCMA WWTP for treatment and disposal. A copy of this Intermunicipal Agreement is attached in Appendix A.

The development area near the far north-eastern portion of the Township, adjacent to Caernarvon Township, was slated to be service by the Caernarvon Township sewer service area in the 2010 Act 537 Plan. This was completed and a copy of the Caernarvon

Township and Honey Brook Township Intermunicipal Agreement is attached in Appendix B.

The development area on the southern border of the Township, adjacent to West Caln Township, proposed to be included in the Coatesville Authority's sewer service area in the 2010 Act 537 Plan. This tax parcel number 22-10-33 consisting of 41.3 acres located east of Route 10 and south of Beaver Dam Road is located within Coatesville Authority public sanitary sewer service area. This parcel of land was purchased by Natural Lands Trust in May of 2018. As this property will be preserved, the development potential is remove and will not require public sanitary sewer. Map No. 1 identifies the area serviced by CTSA and Coatesville Authority.

Finally the 2010 Act 537 Plan identified Chester County Solid Waste Authority (CCSWA) to be included in the public sewer service area to allow for discharge of residential wastewater from their office and weigh station heads. Treated Leachate may also be accepted, contingent upon NCCMA approval of the quality and quantity proposed to be discharged. This Act 537 Plan removes the CCSWA from the public sewer service area as the NCCMA WWTP does not have the capacity to treat leache from the landfill.

The Northwestern Chester County Municipal Authority (NCCMA), a joint municipal authority with Honey Brook Borough, was evaluated for its ability to continue to service the Township and Borough sewage disposal needs.

In summary, the implementation of the updated July 2010 Act 537 Sewage Facilities Plan was to bring the Township 537 Plan in-line with other recent Township planning efforts. However the NCCMA WWTP continues to not meet the discharge limits for nitrogen during the winter months. The primary goal of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and implement the proposed upgrades to the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements

at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP.

B. Implementation Schedule Contained in 2010 537 Sewage Facility Plan

In the 2010 Honey Brook Township 537 Plan, it indicates the following:

“NCCMA’s treatment facility has enough capacity to handle flows from the Townships “worst-case scenario” projected growth for the next five years. However, somewhere between years 5 through 10, the demand for disposal will exceed the facility’s capacity. Therefore, the NCCMA wastewater treatment plant (WWTP) will need to be upgraded to provide additional wastewater treatment capacity for the 20 year planning period. Due to the establishment of TMDLs and HQ designations to the West Branch Brandywine Creek, non-discharge alternatives must be identified and pursued to increase the capacity of NCCMA’s treatment plant to accommodate projected development.”

The NCCMA’s treatment plant continuously measures the flows at the plant and utilize MeterGuy’s, LLC field engineering to make repairs and service all the influent and effluent Eastech meters, including an annual calibration check. In 2014, the Authority concentrated their efforts concerning the repair of Inflow & Infiltration (I&I) issues in the Cupola Basin to private I&I issues. The Authority has updated their rules and regulations concerning private I&I and sought out the cooperation from property owners to make the repairs.

The 2010 Act 537 Plan suggested the NCCMA move forward in determining the most cost effective and beneficial combination of alternatives to provide increased wastewater treatment capacity to the Township and Honey Brook Borough. The NCCMA installed the BioBlocs and in June of 2014, it was found that 20 of the 80 BioBlocs aluminum material had deteriorated and leaked their media. All the BioBlocs were removed from the lagoons and replaced with stainless steel BioBlocs by the fall of 2014.

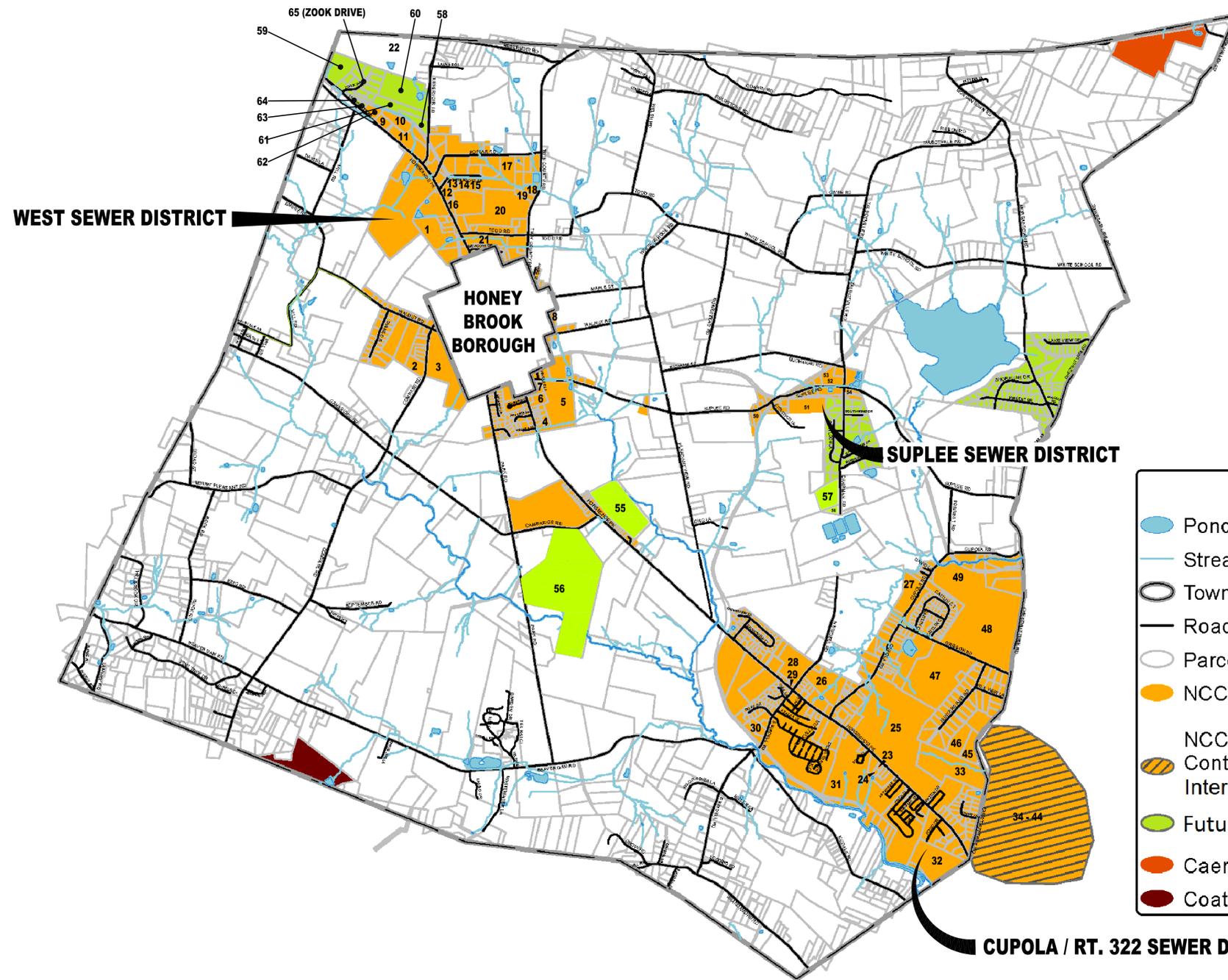
The sewer collection lines and manholes are inspected on a routine basis and repaired as needed. The Authority continues to perform flow monitoring to determine the average dry and peak wet weather flows to identify the area that needs to be investigated.

C. Anticipated or Planned by Applicable Sewer Authorities under Chapter 94 or CMP

The Northwestern Chester County Municipal Authority (NCCMA) was organized in 1975 and has equally represented Honey Brook Borough and Honey Brook Township since the date of organization. The NCCMA's WWTP is located at 37 Dampman Road and discharges into the West Branch of the Brandywine Creek, which services the Township and Borough public sewer system. The treatment plant was designed as an aerated lagoon system, followed by tertiary filtration for BNR and removal of phosphorous and algae. The NPDES Permit Number is PA0044776, and the Water Quality Permit Number is 1506402. The entire system contains more than twenty five miles of gravity and pressure pipes with eight pumping stations for the collection system. The attached Map No. 1 entitled "Existing and Future Sewer Service Areas" illustrates the current and proposed sewage facilities and service areas for Honey Brook Township.

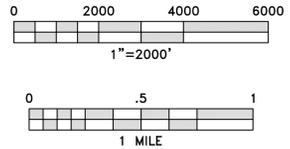
MAP NO. 1

EXISTING AND FUTURE SEWER SERVICE AREAS



Legend

- Ponds and Lakes
- Streams
- Township Boundary
- Roadways
- Parcel Outlines
- NCCMA Sewer Service Area
- NCCMA Sewer Service Area Contingent Upon Approval of Intermunicipal Agreements
- Future NCCMA Sewer Service Area
- Caernarvon Sewer Service Area
- Coatesville Sewer Service Area



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Number	Description	Date
4		
3	REVISED FUTURE SEWER SERVICE AREA	03/04/19
4	REVISED FUTURE SEWER SERVICE AREA	10/04/18
2	REVISED TO ADD FUTURE SEWER SERVICE AREA	09/06/18
1	REVISED TO ADD FUTURE SEWER SERVICE AREA	05/08/17

Drawn By	Project Engr.	Checked By	Scale	Job No.	Date	Drawing No.
EMK	FEE	FEE	AS NOTED	041-012	10/09/15	1 of 1

EXISTING AND FUTURE SEWER SERVICE AREAS
 FOR THE
HONEYBROOK ACT 537 PLAN
 PREPARED FOR
TECHNICON ENTERPRISES II
Ebert Engineering, Inc.
 Water and Wastewater Engineering
 PO Box 540 Phone (610) 584 6701
 4092 Skippack Pike, Suite 202 Fax (610) 584 6704
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The NCCMA has accounted for projects that were summarized in the 2010 Act 537 Plan under the Projected Development or Re-Development in Honey Brook Township in Table 1 (provided below), which estimated the number of EDUs the proposed developments may require.

Table 1. Projected Development or Re-Development In Honey Brook Township Per 2010 Act 537 Plan

Map ID	Parcel Description	Total Development Redevelopment Potential (EDUS)	Existing Development (EDUS)	Existing Flow to NCCM A (GPD)	0-5 Year		5-10 Year		10-15 Year		15-20 Year		
					EDUS	Flows (GPD)	ED US	Flows (GPD)	ED US	Flows (GPD)	ED US	Flows (GPD)	
Projected Development Previously identified In 537 Plan													
Tabas Tract	128 Unit Single Family Homes	180-360	0	0	0	216	54,000	216	54,000	216	54,000	216	54,000
Rockly Station	Zoning Overlay - to be removed	700	2	1,000	2	300	75,000	700	175,000	700	175,000	700	175,000
Lazy Acres	Mobile Home Park	51-255	45	12,000	45	45	12,000	100	25,000	100	25,000	100	25,000
Keystone Court	Mobile Home Park	47-285	43	11,000	43	43	11,000	115	29,000	115	29,000	115	29,000
Deer Run/Icedale/Rockville	Phase I through 4 is constructed	167	150	38,000	160	167	42,000	167	42,000	167	42,000	167	42,000
Whitehorse Glen	Development	29	0	0	29	29	8,000	29	8,000	29	8,000	29	8,000
McConnell Park	Industrial Park, connected to sewer system	7	1	1,000	2	2	1,000	2	1,000	2	1,000	2	1,000

Table 1. Projected Development or Re-Development In Honey Brook Township Per 2010 Act 537 Plan

Map ID	Parcel Description	Total Development Redevelopment Potential (EDUS)	Existing Development (EDUS)	Existing Flow to NCCM A (GPD)	0-5 Year		5-10 Year		10-15 Year		15-20 Year	
					EDUS	Flows (GPD)	EDUS	Flows (GPD)	EDUS	Flows (GPD)	EDUS	Flows (GPD)
Projected Development Previously identified In 537 Plan												
Village Green	Approved Residential Development - under construction	67	0	0	25	7,000	67	17,000	67	17,000	67	17,000
Frame Tract	Vacant Land	220	0	0	0	0	100	25,000	220	55,000	220	55,000
Meadows	Serviced by Coatesville Public Sewer Service	5	0	0	0	0	5	2,000	5	2,000	5	2,000
Waynebrook (Borough)	Serviced by the Borough Public Sewer Service	46	33	9,000	46	12,000	46	12,000	46	12,000	46	12,000
Badis Property (Borough)	Serviced by the Borough Public Sewer Service	35	0	0	35	9,000	35	9,000	35	9,000	35	9,000
WNT LI District		200	0	0	48	12,000	112	28,000	176	44,000	200	50,000

Table 1. Projected Development or Re-Development In Honey Brook Township Per 2010 Act 537 Plan

Map ID	Parcel Description	Total Development Redevelopment Potential (EDUS)	Existing Development (EDUS)	Existing Flow to NCCMA (GPD)	0-5 Year		5-10 Year		10-15 Year		15-20 Year		
					EDUS	Flows (GPD)	EDUS	Flows (GPD)	EDUS	Flows (GPD)	EDUS	Flows (GPD)	
Projected Development Previously Identified In 537 Plan													
Suplee Village	Outside of the Public Sewer Service Area	25	25	0	0	25	7,000	25	7,000	25	7,000	25	7,000
Hammell (Phase I & II)	Residential Development	137	0	0	12	3,000	12	3,000	12	3,000	137	35,000	
Tel-Hai	Residential Development	400	204	0	0	204	51,000	244	61,000	400	100,000		
Totals for All New Potential Flows to NCCMA WWTP					116,000	357,000	544,000	621,000					
Totals for All Potential Flows to NCCMA WWTP (Including Existing)					458,000	574,000	815,000	1,002,000	1,079,000				

*. Table from the 2010 537 Plan Dated July 2010

This 537 Plan Update performed a detailed study of the existing and projected flows was performed on the sewer service districts to evaluate the projected sewage flows and determine if the projects listed in the previous 537 Plan were current. Each sewer district was evaluated based on the available acreage that was potentially developable, taking the following criteria into consideration for the study which takes into account the new Zoning of September 2018:

1. No Redevelopment was considered in the Service Area.
2. Only undeveloped and under developed lots were considered.
3. 75% of "Gross" acreage was considered as "Net" Acreage.
4. 65% of "Gross" acreage was considered as "Net" acreage on properties bisected by Streams.
5. 80% of "Net" acreage was considered available for residential building lots.
6. Only Single Family Detached dwellings Bulk and Area requirements were evaluated for non commercial lands.
7. FR District was assumed 1acre/dwelling unit and $\frac{3}{4}$ acre / dwelling unit w/TDR.
8. MUR District was considered 8,500sf/ dwelling unit and 5,500 sf/ dwelling unit w/ TDR.
9. Commercial was evaluated at 50% impervious cover and 60% impervious cover w/ TDR.

Utilizing these criteria allowed the Township to determine the potential flows that could be generated from the undeveloped land. If there was once a proposed development listed for a parcel which didn't obtain final plan approval, the criteria allowed for potential sewage flows to be calculated for that parcel. During this process, to remain consistent with the September 2018 Township Zoning and planning efforts, the Rocklyn Station zoning overlay, the WNT LI District and Tel Hai were removed from the public sanitary sewer service area. The Rocklyn Station was a conceptual zoning overlay outlined in the 2010 537 Plan which was not implemented therefore removed. The WNT LI District is the landfill located outside the Township boundaries and the landfill has approached the NCCMA Treatment Plant if they could process leachate from the land

fill. The NCCMA Treatment Plant would not be able to process leachate due to the high levels and it was determined by NCCMA not to service the landfill. This parcel is identified at No. 22 on Map No. 1, Honey Brook Act 537 Plan. Therefore, the WNT LI District was removed Honeybrook Township Public Sanitary Sewer Service Area. The Hammell (Phase I & II) is also located outside the Township boundaries; however the developer has worked with the Township to set up an intermunicipal agreement to service this project's sewer needs of 30,000 gpd. The Tel Hai is currently being serviced by a functioning wastewater treatment with stream discharge. As the system is operational and functioning, the Township will not provide public sewer to this development. This will be further discussed in Chapter IV.

D. Planning Modules

Table No. 2 comprises available records regarding PA DEP approved Sewage Facilities Planning Modules in Honey Brook Township. This Table documents historic Honey Brook Township efforts to properly administer proposals for various types of land development with respect to sewage facilities planning.

Table 2 – Planning Modules					
Developer/ Subdivision Name	TPN	PA DEP Code No.	No. of EDUs	DEP Approval Date	Nature of Project
Fisher Prop	22-10-35	1-15932-497-1	1	1/28/2011	land development
Plewa Subdivision	22-4-58.2	1-15932-494-1	1	2/9/2012	subdivision
Mark Stoltzfus Subdivision	22-4-45.5	1-15932-505-1	SFTF	3/14/2013	1-lot subdivision
Mark Stoltzfus Subdivision	22-4-45.5	1-15932-505A-1	SFTF	10/1/2013	1-lot subdivision
Elam Stoltzfus	22-6-3	1-15932-515-1A	1	12/3/2013	secondary dwelling
Fisher Tract	22-3-46	1-15932-522-1	1	12/17/2014	secondary dwelling

Table 2 – Planning Modules					
Developer/ Subdivision Name	TPN	PA DEP Code No.	No. of EDUs	DEP Approval Date	Nature of Project
Gideon E Stoltzfus Jr Subdivision	22-4-3.4	1-15932- 158-1	1	12/4/2014	1-lot subdivision
1235 Beaver Dam Rd (Omar)	22-10-9	1-15932- 532-1	1.25	11/13/2015	new home construction
Marlin King Subdivision	22-9-27.3	1-15932- 491-2L	1	7/19/2010	1-lot subdivision
Carl L Martin Property	22-3-59	1-15932- 500-2L	1	10/19/2011	new home construction
Margaret Faulkner Subdivision	22-8-8.4	1-15932- 513-2L	1.5 per lot	5/30/2014	4-lot subdivision
Levi King Residence	22-6-7	1-15932- 524-2L	3	3/13/2015	secondary dwelling
Riemar Real Estate LP	22-6-8	1-15932- 517-3J	1	4/10/2015	new commercial bldg.
The King Tract (Horseshoe Pk)	22-6-8.4	1-15932- 527-3J	1	4/10/2015	new home construction
Poplar Realty LP	22-8-52	1-15932- 519-3J	128	9/1/2015	128-unit subdivision
Pleasant View Welding	22-3- 11.1A	1-15932- 504-E	n/a	exempted 9/21/2011	new commercial bldg.
Westbrook IP LLC	22-3-69	1-15932- 525-3J	1 additio nal	8/19/2014	new commercial bldg.
Swampy Hollow Mfg	22-3-64	1-15932- 528-3J	1.75	11/14/2014	new commercial bldg.
Ivan & Anna Mae Stoltzfus	22-3-73	1-15932- 531-X	n/a	waived 6/22/2015	lot line change
96 & 136 Westbrooke Dr	22-3-79 & 22-3- 80	1-15932- 530-X	n/a	waived 5/22/2015	lot line change
Honey Brook Community Church	22-7-72	1-15931- 045-E		2/12/2016	
3041 Horseshoe Pk	22-8-31	1-15932- 536-E		Exempted 6/28/2016	new commercial bldg.
Fieldstone	22-4-14	1-15932-		Waived	New school

Developer/ Subdivision Name	TPN	PA DEP Code No.	No. of EDUs	DEP Approval Date	Nature of Project
Amish School		535-X		6/7/2016	
96 & 136 Westbrooke Dr	22-3-79 & 22-3- 80	1-15932- 543-X		waived 12/20/2016	
779 Talbotville Rd	22-4-33.1	1-15932- 533-1		3/22/2017	New home
434 Beaver Dam Rd	22-11-73	1-15932- 545-X	2.8	Waived 3/17/2017	New home
96 & 136 Westbrooke Dr	22-3- 75.5A	1-15932- 544-3J		6/30/2017	4-lot subdivision
Melvin S. Stoltzfus	22-3-50	1-15932- 450-2		pending	Secondary dwelling
Elmer Beiler	22-9- 19.TBA	1-15932- 548-2L	2	4/9/2018	1-lot subdivision
Greg & Patricia Lukas	22-8-10	1-15932- 550-X	1.6	Waived 8/11/2017	Secondary dwelling
Reuben Stoltzfus	22-8-94	1-15932- 541-1	2.4	5/15/2018	New home

G. Summary of Previous Planning

The overall Honey Brook Township 2010 Act 537 Plan was to address the wastewater disposal needs of the Township in order to bring the sewage facilities planning in-line with recent Township planning efforts, the implementation of redefining the public sewer service areas, the continued use of on-lot sewage disposal for areas located outside the public sewer service area, and upgrades to the NCCMA WWTP with the installation of BioBlocs to increase the treatment capacity of the plant.

The Township has implemented the items outlined in the 2010 Act 537 plan for the NCCMA WWTP. The NCCMA WWTP continues to be a challenge to meet the discharge permit limits for nitrogen. Therefore, this 537 Plan Update will address the

NCCMA WWTP upgrade and determine projected flows from the public sewer service area to ensure the WWTP will have enough capacity for the existing flows as well as future growth while meeting the discharge criteria.

CHAPTER II
PHYSICAL AND DEMOGRAPHIC ANALYSIS

CHAPTER II
PHYSICAL AND DEMOGRAPHIC ANALYSIS

Honey Brook Township is at the northwestern edge of Chester County adjacent to Lancaster County (see Map No. 2, "Location Map"). Agriculture is the dominant land use in the Township and is characterized by gently rolling topography with several steeper areas in the northern and southern portions of the Township, along with relatively flat areas including Struble Lake. Honey Brook Township is also known as "the headwaters of the Brandywine" with no shortage of water within the Township, especially after the 146-acre Struble Lake was constructed in 1950 as a flood impoundment and a source of water. The Township's role as the source of the Brandywine River is important not only for the Honey Brook area but also for our neighbors as far as the Delaware River to the south and east and to the southwest as far as the Chesapeake Bay. The Township's unique blend of family farms and subdivisions are a reminder of what Chester County as a whole is – beautiful countryside and inviting neighborhoods. Approximately half of the Township's population is plain sect Amish, as evidenced by horse-drawn buggies frequenting the roads. In 2006, the people of Honey Brook Township voted by referendum their desire to preserve agricultural land, and since that time 0.5% of the Earned Income Tax collected is dedicated to the Land Preservation program. To date, more than 3,250 acres of land has been preserved through easements. Other municipalities and conservation groups recognize Honey Brook Township's importance and have committed resources towards agricultural easement efforts as well.

A. Delineation of Study Areas

For purposes of this Act 537 Base Plan update, Honey Brook Township is divided into four Study Areas, as shown on Map No. 1 entitled "Existing and Future Sewer Service Areas". These Study Areas are the basis for further analysis throughout portions of this Plan, including an evaluation of problems, the establishment of policies for areas of similar wastewater facility needs, and the development of strategies for managing existing or proposed facilities.

The four study areas were established in consideration of multiple factors, such as existing infrastructure, physical features, zoning, existing and proposed land use, and the results of the sewage disposal needs identification, as discussed in Chapters III and IV. The Study Areas are further identified as follows:

1. Suplee Study Area

This study area is located on Suplee Road near the intersection of Talbotsville Road and consists of mostly residential homes. The current residents/occupants are serviced by Individual On-Lot Sewage Disposal Systems. In the 2010 Act 537 the sanitary survey and well sampling, identified this area to potential and suspected of septic systems malfunctions. The 2010 Act 537 Plan defined the limits of the Suplee Service Area and this 537 Plan will expand this service area to include two additional areas.

There are two areas that were evaluated as part of this Act 537 Plan, which are currently located beyond the limits of the existing public sanitary sewer service area. Based on a review of lot size and the previous on-lot and well survey conducted by HRG, Inc. in the 2010 Act 537 Plan, these areas will be added to the existing public sanitary sewer service area. These areas are further described below.

- Area one is located just east of Struble Lake, where the lots are small in size and identified in green on the Map No. 1. Based on the previous on-lot and well survey conducted by HRG, Inc. in the 2010 Act 537 Plan, there were a number of reported on-lot system malfunctions and failures. Map No. 11 identifies the well locations with nitrate results and elevated values.
- The second area is located just south of the existing identified Suplee sanitary sewer service area on Dampman Road between Windswept Lane and Southwind Drive. This area consists of residential homes and is

zoned as agricultural. The current residences are serviced by individual on-lot systems, and based on the previous well survey that was conducted by HRG, Inc. in the 2010 Act 537 Plan, there is a well with elevated nitrate results between 5 mg/l and 9.99 mg/l.

The potential sewage flows from the two new delineated areas within this study area have been calculated, and will be accommodated into the design of the NCCMA WWTP Upgrade. It should be noted, with the adoption of the new September 2018 Township Zoning, the areas identified as Future Service Areas (in green) near the Suplee Sewer Service Area was zoned from Farm Residential to Agricultural District. The change in zoning designation in these areas does not affect the flow projections. This service area will also continue to utilize their existing septic system and will be required to participate in the Sewage Management Ordinance.

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP.

2. West Study Area

This Study Area is located at the far western portion of the Township along Route 322, which stretches from Cambridge Road to Mill Road and consists of residential, commercial, industrial and farm residential properties. The current residents/occupants are serviced by Honey Brook Township public sanitary sewer system, which is conveyed to the NCCMA for treatment and stream discharge. Honey Brook Borough is also located within this study area and the wastewater generated by the Borough also flows to NCCMA WWTP.

There are two areas evaluated as part of this Act 537 Plan identified as Map ID no. 55 and 56 of the Overall Honey Brook Township Act 537 Plan, which are both currently located beyond the limits of the existing public sanitary sewer service area. The first area is located just southeast from the existing public sanitary sewer service area on Horseshoe Pike adjacent to Cambridge Road and the second area is located on Cambridge Road near the intersection of Augusta Drive. This area is zoned as agriculture. Based on the previous on-lot and well survey conducted by HRG, Inc. in the prior Act 537 Plan, there is a known on-lot system failure within the area. The two properties are also planned for redevelopment and will be included in the West Sewer District. Until these properties are connected to the public sewer system, they will continue to utilize individual on-lot systems as an interim method of sewage disposal. The projected flows for this service area have been accounted for in the WWTP upgrade.

3. Cupola Study Area

This Study Area is located at the eastern portion of the Township along Route 322, stretching from Pleasant View Road to Chestnut Tree Road and consists of farm residential, mixed residential and commercial properties. The current residents/occupants are serviced by Honey Brook Township public sanitary sewer system, which is conveyed to the NCCMA for treatment and stream discharge. Some of the residential homes within this study area are being serviced by on-lot sewage disposal systems. Based on the previous on-lot and well survey conducted by HRG, Inc. in the 2010 Act 537 Plan, there are a few lots with septic system failures and septic certification failures, along with on-lot wells with nitrate results ranging between 0 mg/l and 9.99 mg/l.

A proposed industrial park, known as the Hammell O'Donnell Industrial Park, is located beyond the Municipal limits of Honey Brook Township along Chestnut Tree Road. The proposed industrial park is located within West Nantmeal and West Brandywine Townships and will be serviced by the Cupola sewer service

district contingent upon the execution of Intermunicipal Agreements between each municipality.

This study area has been carefully considered and incorporates areas of projected growth within the public sanitary sewer in the Township and also conforms to the updated Zoning districts. The design of the NCCMA WWTP upgrade will accommodate these projected flows. Chapter V will discuss in detail the existing NCCMA WWTP will be upgraded to meet the PA DEP's Chesapeake Bay Tributary Strategy (CBTS), accommodate the existing sewage flows to the plant and will be sized to accommodate the projected sewage flows from this Study Area.

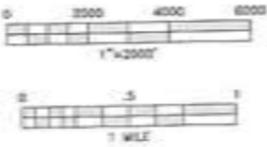
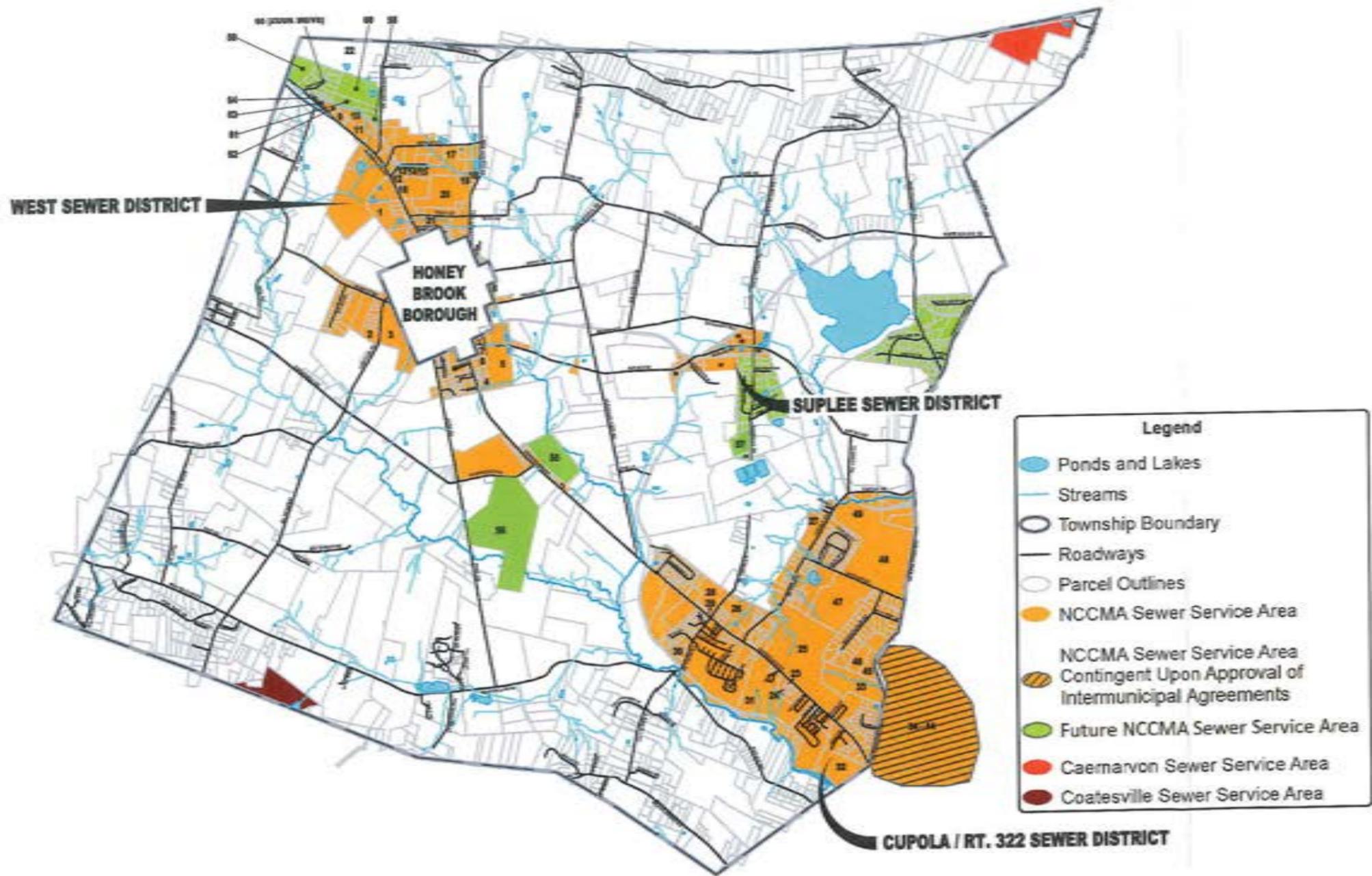
4. On-Lot Systems Study Area

Consistent with the majority of the existing and proposed agricultural land use in the Township, this study area comprises the remainder of the total area of Honey Brook Township. Most of the existing parcels are relatively large, exceeding well over 5 acres in size, consisting of farms, parks or preserved farm land. These areas will continue to utilize the on-lot systems to service their sewage disposal needs.

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP.

MAP NO. 1

GENERAL PLAN OF SANITARY SEWERS WITH SERVICES AREA



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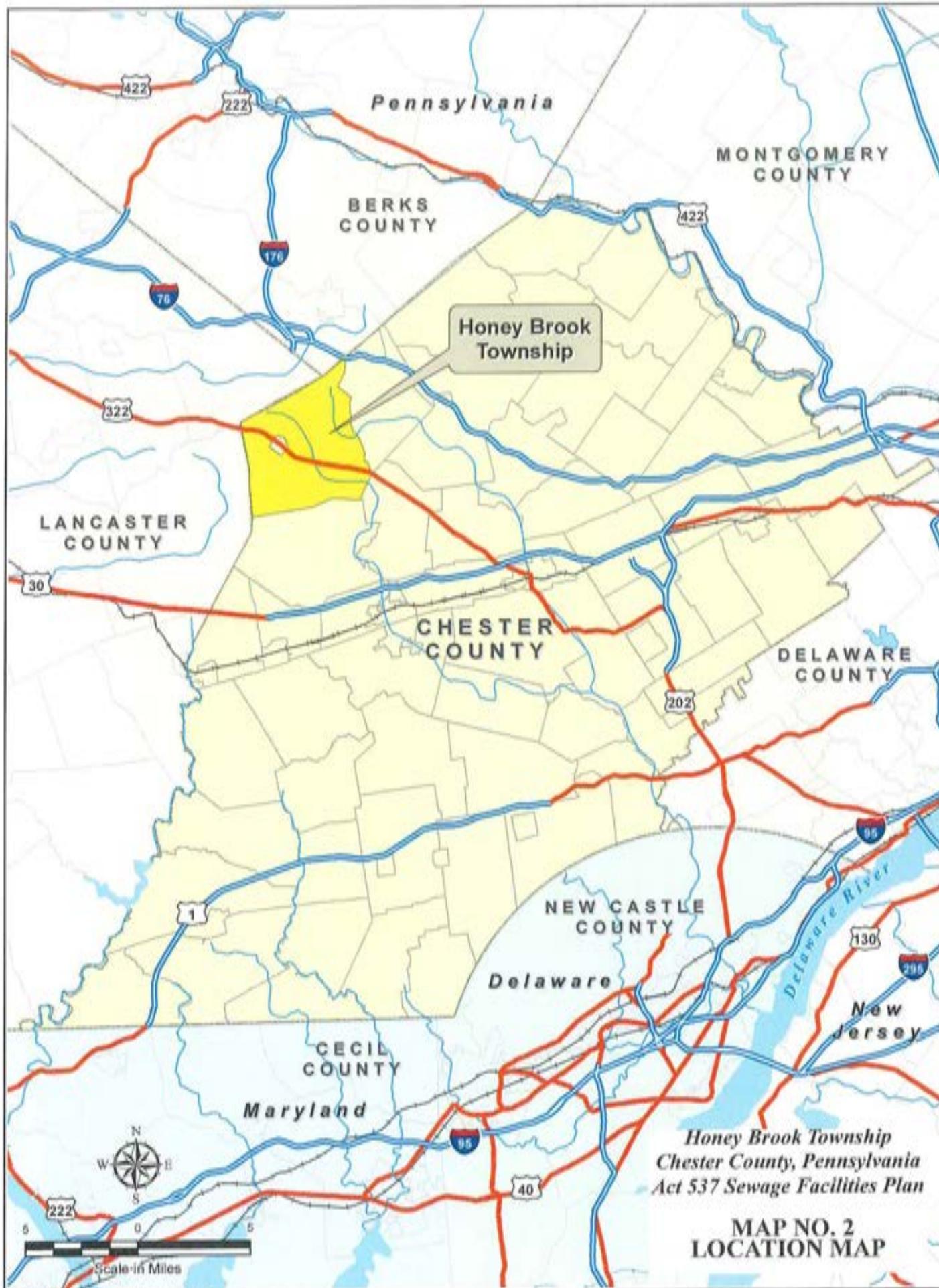
Number	Description	Date
4	REVISED FUTURE SEWER SERVICE AREA	05/04/19
3	REVISED FUTURE SEWER SERVICE AREA	10/04/18
2	REVISED TO ADD FUTURE SEWER SERVICE AREA	09/06/18
1	REVISED TO ADD FUTURE SEWER SERVICE AREA	05/08/17

EXISTING AND FUTURE SEWER SERVICE AREAS FOR THE HONEYBROOK ACT 537 PLAN
 PREPARED FOR TECHNICON ENTERPRISES II
Ebert Engineering, Inc.
 Water and Wastewater Engineering
 PO Box 190
 4320 Dropkick Pike, Suite 202
 Getzville, PA 15457
 Phone: (610) 584-1771
 Fax: (610) 584-1704
 E-mail: eebert@eberteng.com

Drawn By	Project Engr.	Checked By	Scale	Job No.	Date	Drawing No.
EM	FE	FE	AS NOTED	041-012	10/08/13	1 of 1

MAP NO. 2

LOCATION MAP



B. Hydrologic Features

Honey Brook Township is known as “the headwaters of the Brandywine”, and the Township’s role as the source of the Brandywine River is important not only for the Honey Brook area but also for our neighbors as far as the Delaware River to the south and east and to the southwest as far as the Chesapeake Bay. The boundaries of Honey Brook Township encompass two main watersheds:

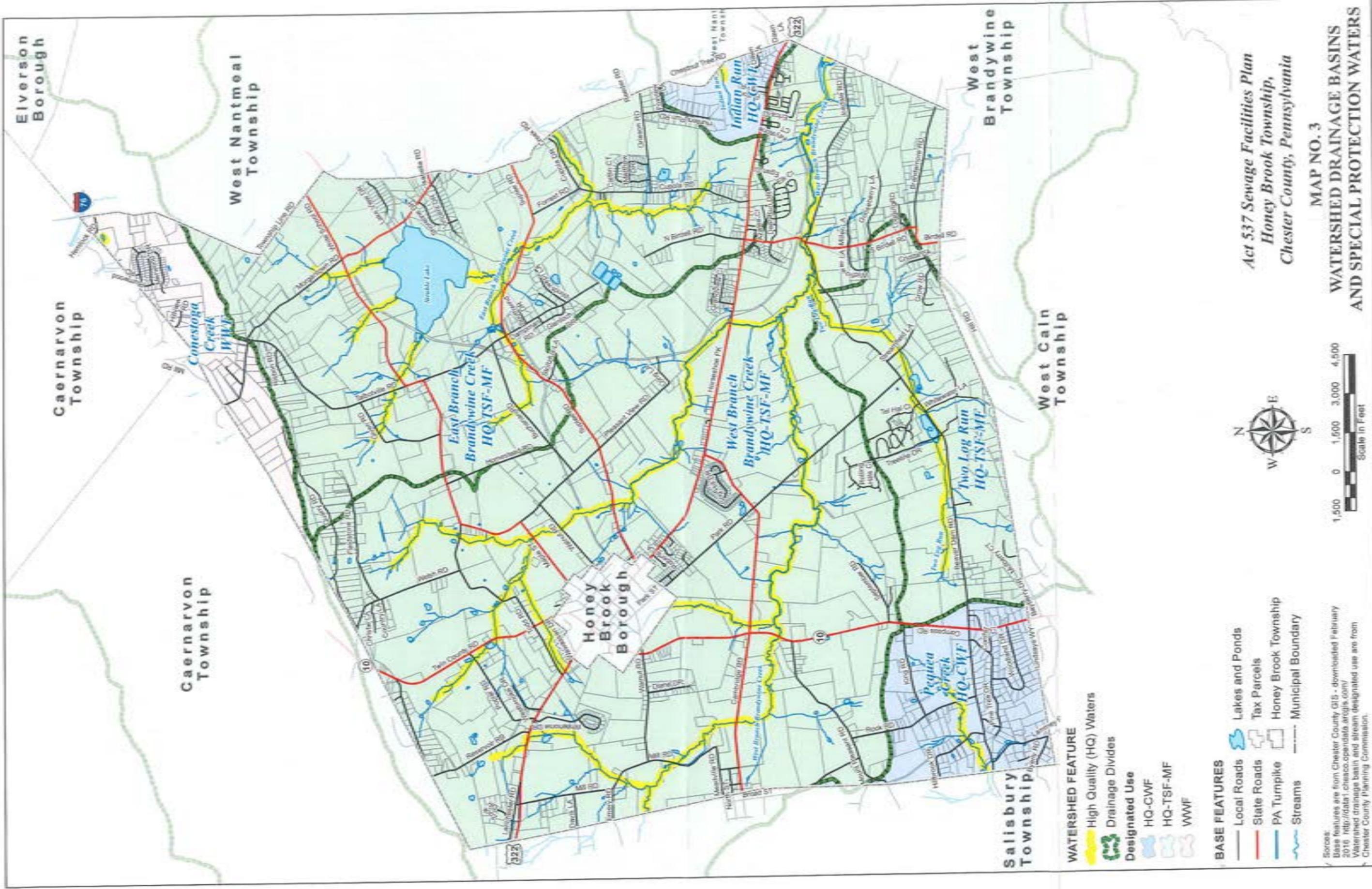
- Two Log Run, which feeds into the West Branch – Brandywine Creek
- East Branch – Brandywine Creek

The Brandywine is a part of a larger network of streams, creeks, and rivers that empty into the Christina River as part of the Delaware River Basin. The Pequea Creek is a minor watershed within the Township. The Pequea is part of the larger network of streams, creeks, and rivers that empty into the Susquehanna River as part of the Chesapeake Bay Basin. Refer to Map No. 3, “Watershed Drainage Basins and Special Protection Waters” and Map No. 4, “Water Features Map”.

Incorporated herein for reference is the “Hydrologic Resources” map contained within the Honey Brook Comprehensive Plan, and this map contains a broad identification of floodplains, wetlands, watershed boundaries and creeks and streams.

MAP NO. 3

WATERSHED DRAINAGE BASINS AND
SPECIAL PROTECTION WATERS



*Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania*

MAP NO. 3

**WATERSHED DRAINAGE BASINS
AND SPECIAL PROTECTION WATERS**



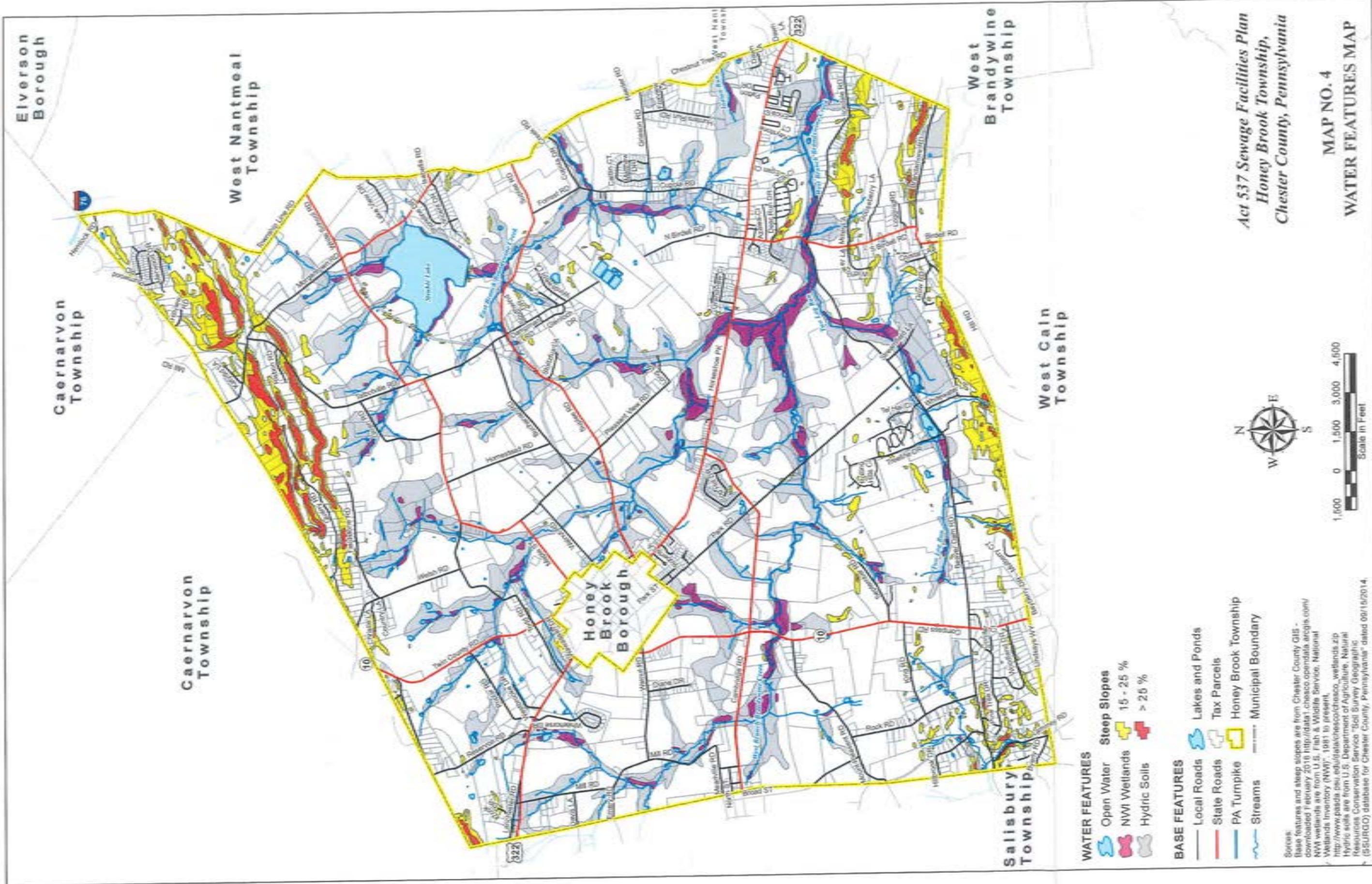
Source:
Base features are from Chester County GIS - downloaded February
2016 <http://data1.chesco.opendata.arcgis.com/>
Watershed drainage basin and stream designated use are from
Chester County Planning Commission.

MAP NO. 4

WATER FEATURES MAP

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EE, Inc.



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 4
WATER FEATURES MAP

- WATER FEATURES**
- Open Water
 - Steep Slopes
 - NWI Wetlands
 - 15 - 25 %
 - Hydric Soils
 - > 25 %

- BASE FEATURES**
- Local Roads
 - Lakes and Ponds
 - State Roads
 - Tax Parcels
 - PA Turnpike
 - Honey Brook Township
 - Streams
 - Municipal Boundary

Sources:
 Base features and steep slopes are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 NWI wetlands are from U.S. Fish & Wildlife Service, National Wetlands Inventory (NWI), 1981 to present, http://www.pasda.psu.edu/data/chesco/chesco_wetlands.zip
 Hydric soils are from U.S. Department of Agriculture, National Resources Conservation Service "Soil Survey Geographic (SSURGO)" database for Chester County, Pennsylvania" dated 09/16/2014.



C. Soils

In order to present the most current information relative to soils, Map No. 5, entitled "Soils Map" has been prepared to show the soils mapped within the Township. The official USDA-NRCS on-line database was queried to determine soil types and descriptions for soils located within the Study Areas. The following soil types were located within the Study Areas:

Baile

The Baile series consists of very deep, poorly drained, moderately low to moderately high saturated hydraulic conductivity, soils on upland depressions and footslopes. They formed in local alluvium over residuum from acid crystalline rocks, chiefly mica schist and granitized schist and gneiss. Slope ranges from 0 to 8 percent.

Califon

Califon series consists of very deep, moderately well or somewhat poorly drained soils formed either in old till or on driftless landscapes in the Northern Piedmont in colluvium from granitic gneiss on upland flats or concave slope positions. Saturated hydraulic conductivity is moderately low. Slope ranges from 0 to 15 percent.

Clarksburg

Clarksburg series consists of moderately well drained soils formed on limestone valley flats or uplands. These soils consist of residuum weathered from schist. Slope ranges from 3 to 8 percent. Saturated hydraulic conductivity is moderately low or moderately high.

Codorus

The Codorus series consists of very deep, moderately well drained and somewhat poorly drained soils. These soils formed in recently deposited alluvial materials derived from upland soils materials weathered from mostly metamorphic and crystalline rocks. They are on floodplains with smooth, nearly level slopes of 0 to

3 percent. Saturated hydraulic conductivity is moderately high to high. Mean annual precipitation is 42 inches, and mean annual temperature is 52 degrees F.

Cokesbury

The Cokesbury series consists of deep or very deep, poorly drained soils formed either in old till or on driftless landscapes of the Northern Piedmont in colluvium from granitic gneiss on upland depressions, headslopes or concave footslope and toeslope positions. Saturated hydraulic conductivity is moderately low. Slope ranges from 0 to 8 percent.

Edgemont

The Edgemont series consists of deep and very deep, well drained soils formed in the weathered residuum of quartzitic rocks. They have moderately high to high saturated hydraulic conductivity. Slope ranges from 0 to 70 percent.

Gladstone

The Gladstone series consists of very deep, well drained soils formed in residuum and colluvium from granitic gneiss. Saturated hydraulic conductivity is moderately high to high. They occur on upland divides and rolling foothills of the Highlands section of Appalachian province, the Reading Prong section of the New England province and the Gettysburg-Newark Lowland and the Piedmont Upland sections of the Northern Piedmont province. Slopes range from 0 to 65 percent.

Glenelg

The Glenelg series consists of very deep, well drained soils formed in residuum weathered from micaceous schist on uplands of the Blue Ridge and the Northern Piedmont. Slopes range from 0 to 55 percent. Saturated hydraulic conductivity is moderately high in the subsoil and moderately high to high in the substratum. Mean annual temperature is 53 degrees F., and mean annual precipitation is 40 inches.

Glenville

The Glenville series consist of consists of very deep moderately well drained or somewhat poorly drained soils. They formed primarily in colluvium or residuum affected by soil creep that is weathered from phyllite, micaceous schist, granitic gneiss and other acid crystalline rocks. Slopes range from 0 to 15 percent. Saturated hydraulic conductivity is moderately low to moderately high.

Hatboro

The Hatboro series consists of very deep and poorly drained soils formed in alluvium derived from metamorphic and crystalline rock. They are on flood plains. Slopes range from 0 to 3 percent.

Legore

The Legore Series consists of very deep, well drained soils on uplands. They formed in material weathered from diabase, diorite, and related rocks. Saturated hydraulic conductivity is moderately high to high. Slopes range from 0 to 50 percent.

Mount Lucas

The Mount Lucas series consists of deep and very deep, moderately well and somewhat poorly drained soils formed in material weathered from diabase and other dark colored basic rocks. Slopes range from 0 to 25 percent. Saturated hydraulic conductivity is low.

Neshaminy

The Neshaminy series consists of deep and very deep, well drained soils formed in materials weathered from diabase and other dark colored basic rocks. Saturated hydraulic conductivity is moderately high. Slopes range from 0 to 70 percent.

Parker

The Parker series consists of very deep, somewhat excessively drained soils that formed in residuum derived from granitic gneiss bedrock. They occur on gently sloping to very steep slopes of ridges and hills. Slopes range from 3 to 70 percent.

Thorndale

The Thorndale series consists of very deep, poorly drained soils formed in medium textured colluvium derived from limestone, calcareous shale, and siltstone. Slopes range from 0 to 8 percent. Saturated hydraulic conductivity is moderately low to moderately high.

Towhee

The Towhee series consist of deep and very deep, poorly drained soils formed in colluvium from diabase, diorite or gabbro. Slopes range from 0 to 8 percent. Saturated hydraulic conductivity is moderately low to moderately high.

Udorthents

This complex consists of moderately well drained to excessively drained soils that have been disturbed by culling or filling, and areas that are covered by buildings and pavement. The areas are mostly larger than 5 acres. The complex is about 70 percent Udorthents, 20 percent urban land, and 10 percent other soils. Most areas of these components are so intermingled that it was not practical to map them separately.

Urban

Urban land is land mostly covered by streets, parking lots, buildings, and other structures of urban areas.

Watchung

The Watchung series consists of very deep, poorly drained soils on upland flats and depressions. Saturated hydraulic conductivity is moderately high in the A and C horizons and moderately low in B horizons. They formed in residuum from basic rocks. Slope ranges from 0 to 8 percent.

Map No. 5a through 5d contain the various soil characteristics, such as slopes and depth to seasonal wetness, in the context of current PADEP requirements. According to this information, most of the soils are designated as "well drained, moderately well drained and somewhat poorly drained". According to the Natural Resource Conservation Services (NRCS) defines the drainage below:

Well Drained

Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons. The soils are mainly free of the deep to redoximorphic features that are related to wetness.

Moderately Well Drained

Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a moderately low or lower saturated hydraulic conductivity in a layer within the upper 1m, periodically receive high rainfall, or both.

Somewhat Poorly Drained

Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.

Above all, these designations should be recognized as general guidelines based on typical soil and landscape composition, and should not be interpreted as areas where on-lot

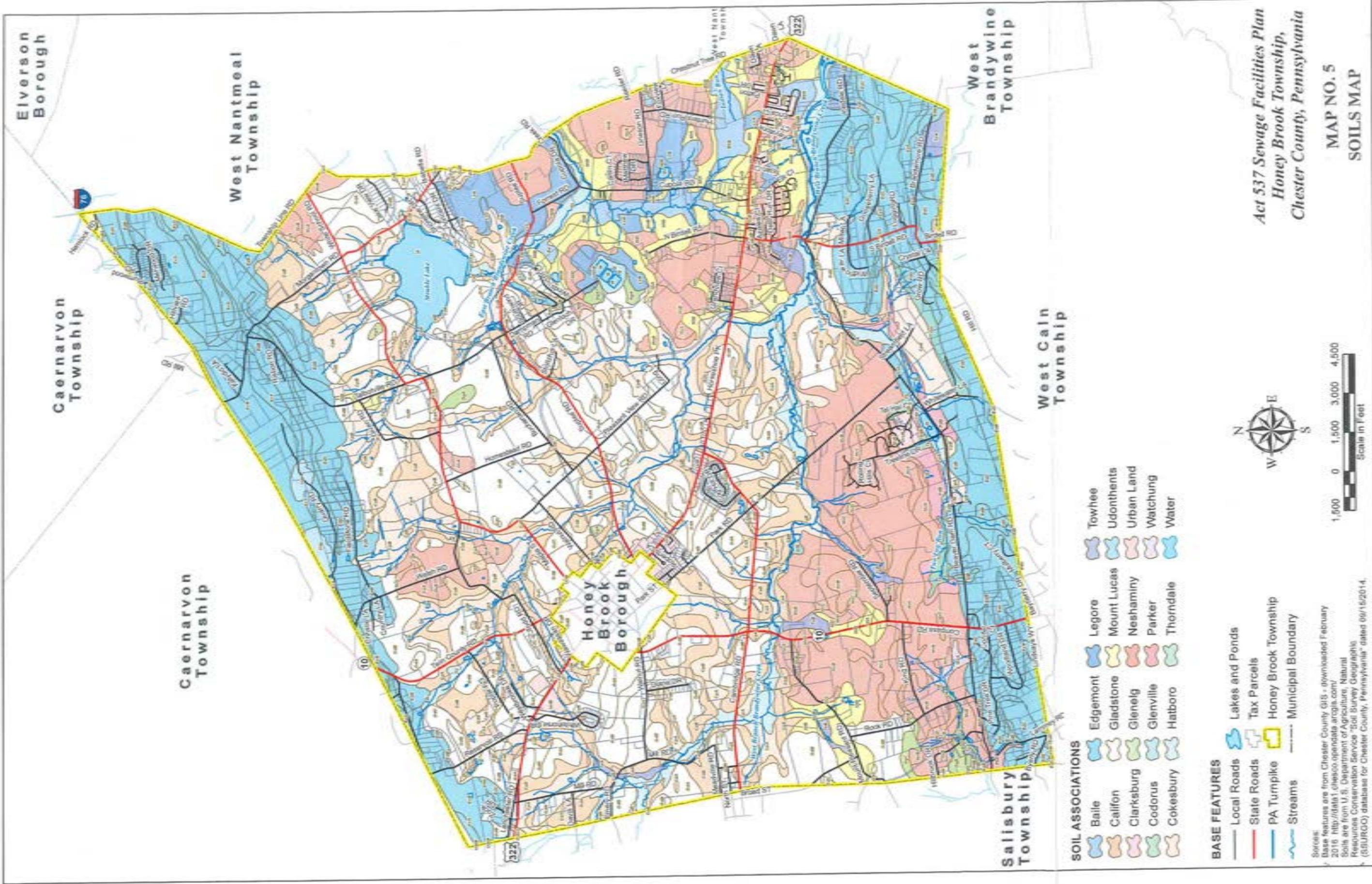
sewage disposal systems are not permitted. Site-specific soil testing performed by the Sewage Enforcement Officer (SEO) may result in the approval of on-lot disposal within these soil types, particularly in consideration of the on-going development of new alternate technologies by PADEP for more restrictive soils.

MAP NO. 5

SOILS MAP

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EE, Inc.



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 5
 SOILS MAP

Caernarvon Township

Caernarvon Township

West Nantmeal Township

West Brandywine Township

West Cain Township

Salisbury Township

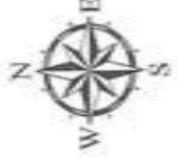
Honey Brook Borough

SOIL ASSOCIATIONS

- | | | | |
|------------|------------|-------------|------------|
| Baile | Edgemont | Legore | Towhee |
| Callion | Gladstone | Mount Lucas | Udonthents |
| Clarksburg | Glenelg | Neshaminy | Urban Land |
| Codorus | Glennville | Parker | Watching |
| Cokesbury | Hatboro | Thorndale | Water |

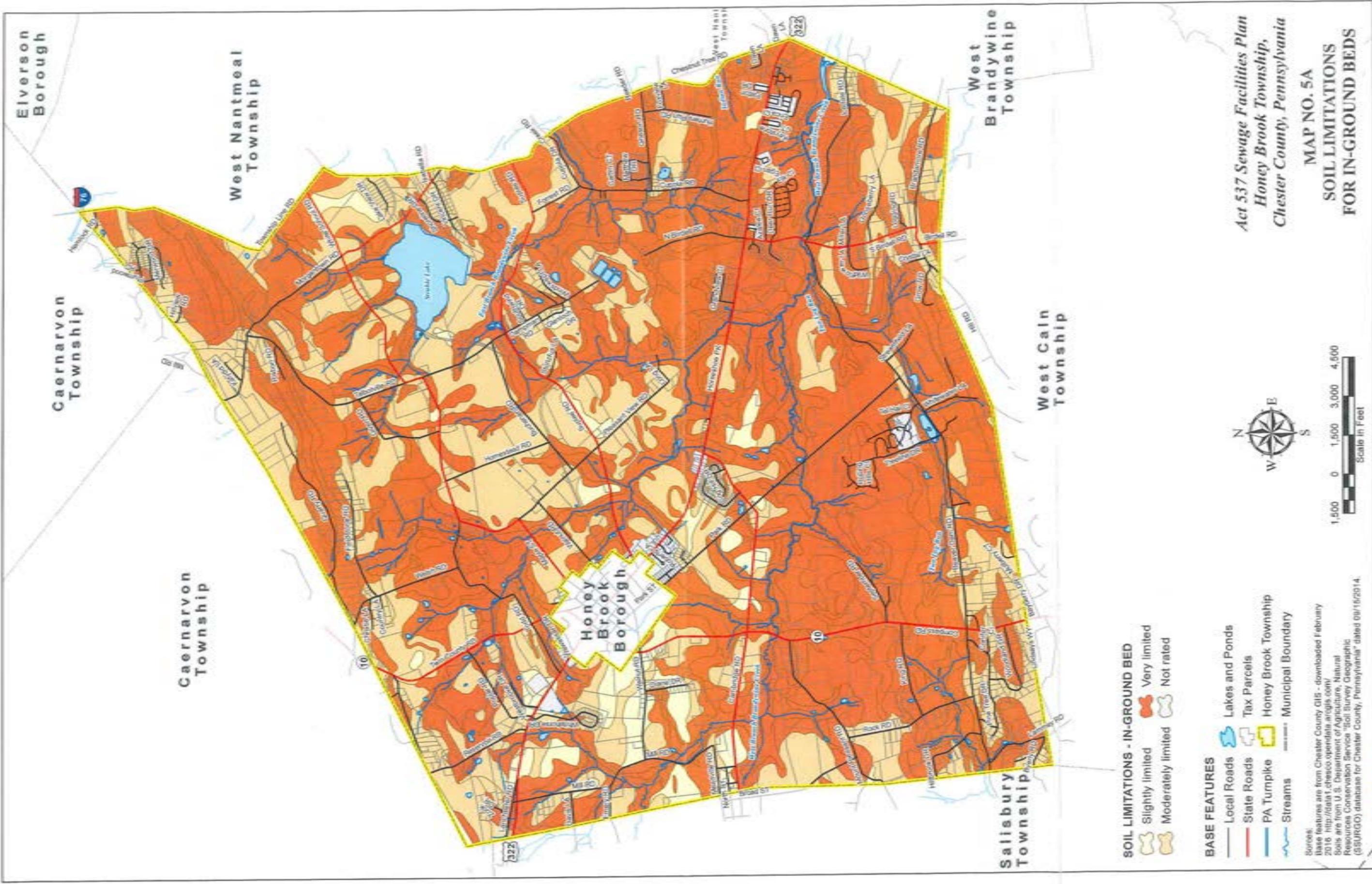
BASE FEATURES

- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
- Tax Parcels
- Honey Brook Township
- Municipal Boundary



Sources:
 Base features are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 Soils are from U.S. Department of Agriculture, Natural Resources Conservation Service "Soil Survey Geographic (SSURGO)" database for Chester County, Pennsylvania" dated 09/16/2014.

MAP NO. 5A, 5B, 5C, AND 5D
SOIL LIMITATIONS FOR ON-LOT SEWAGE DISPOSAL SYSTEMS

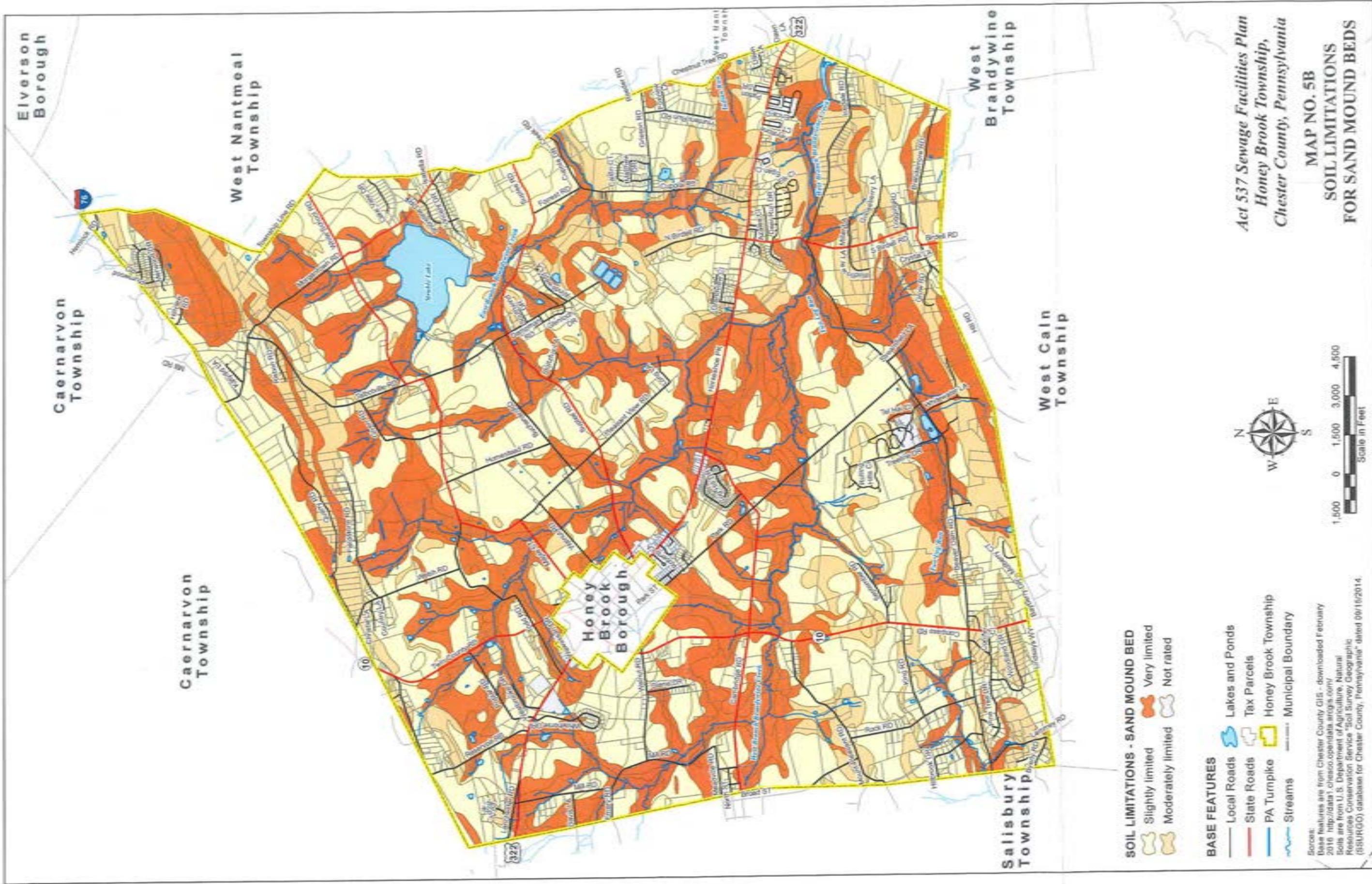


Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania
MAP NO. 5A
SOIL LIMITATIONS
FOR IN-GROUND BEDS

- SOIL LIMITATIONS - IN-GROUND BED**
- Slightly limited
 - Moderately limited
 - Very limited
 - Not rated
- BASE FEATURES**
- Local Roads
 - State Roads
 - PA Turnpike
 - Streams
 - Lakes and Ponds
 - Tax Parcels
 - Honey Brook Township
 - Municipal Boundary



Sources:
 Base features are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 Soils are from U.S. Department of Agriculture, Natural Resources Conservation Service "Soil Survey Geographic (SSURGO) database for Chester County, Pennsylvania" dated 09/16/2014.



SOIL LIMITATIONS - SAND MOUND BED

- Slightly limited
- Very limited
- Moderately limited
- Not rated

BASE FEATURES

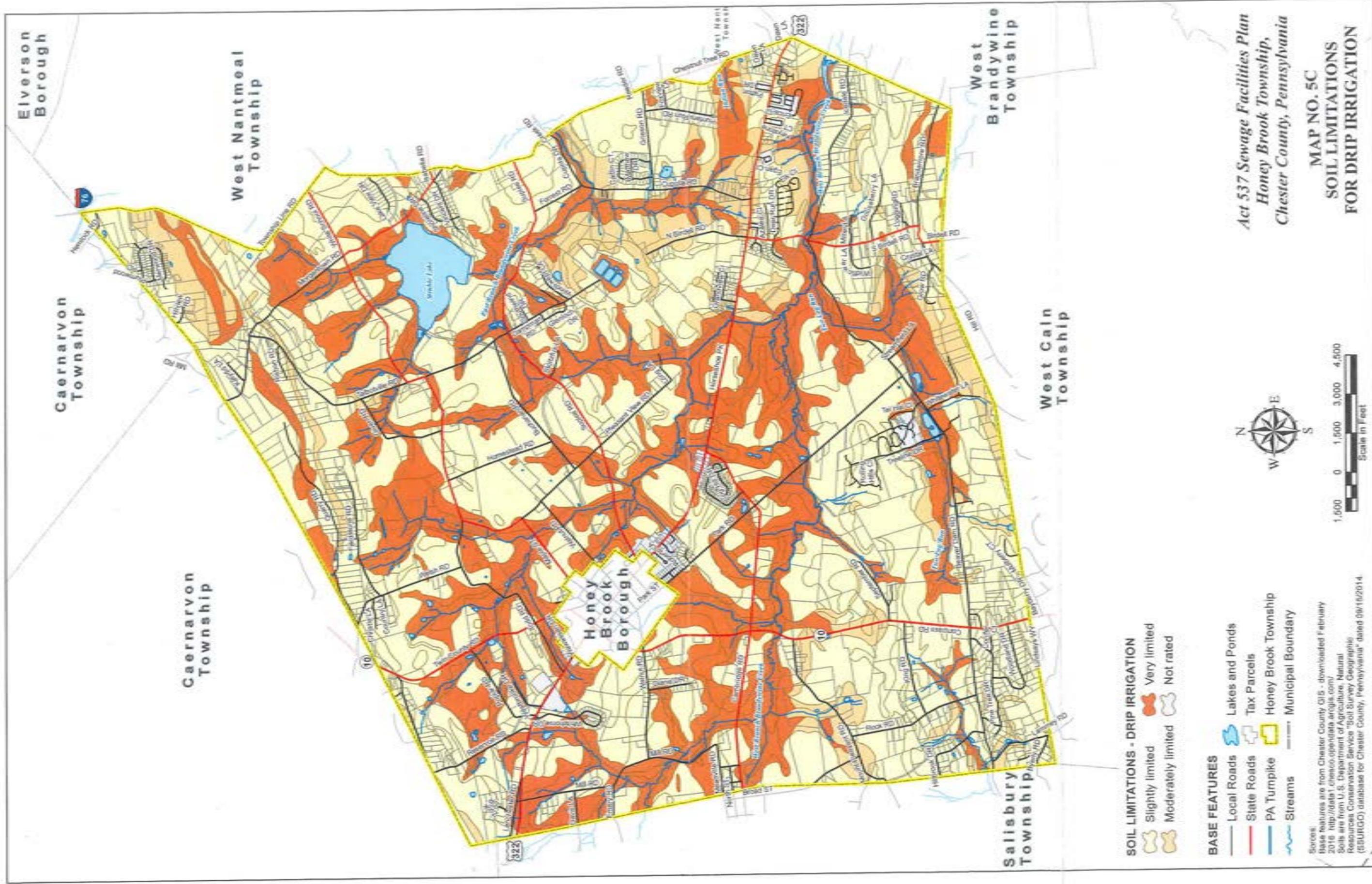
- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
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Sources:
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 Soils are from U.S. Department of Agriculture, Natural Resources Conservation Service "Soil Survey Geographic (SSURGO) database for Chester County, Pennsylvania" dated 09/16/2014.



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 5B
SOIL LIMITATIONS
FOR SAND MOUND BEDS



SOIL LIMITATIONS - DRIP IRRIGATION

- Slightly limited
- Moderately limited
- Very limited
- Not rated

BASE FEATURES

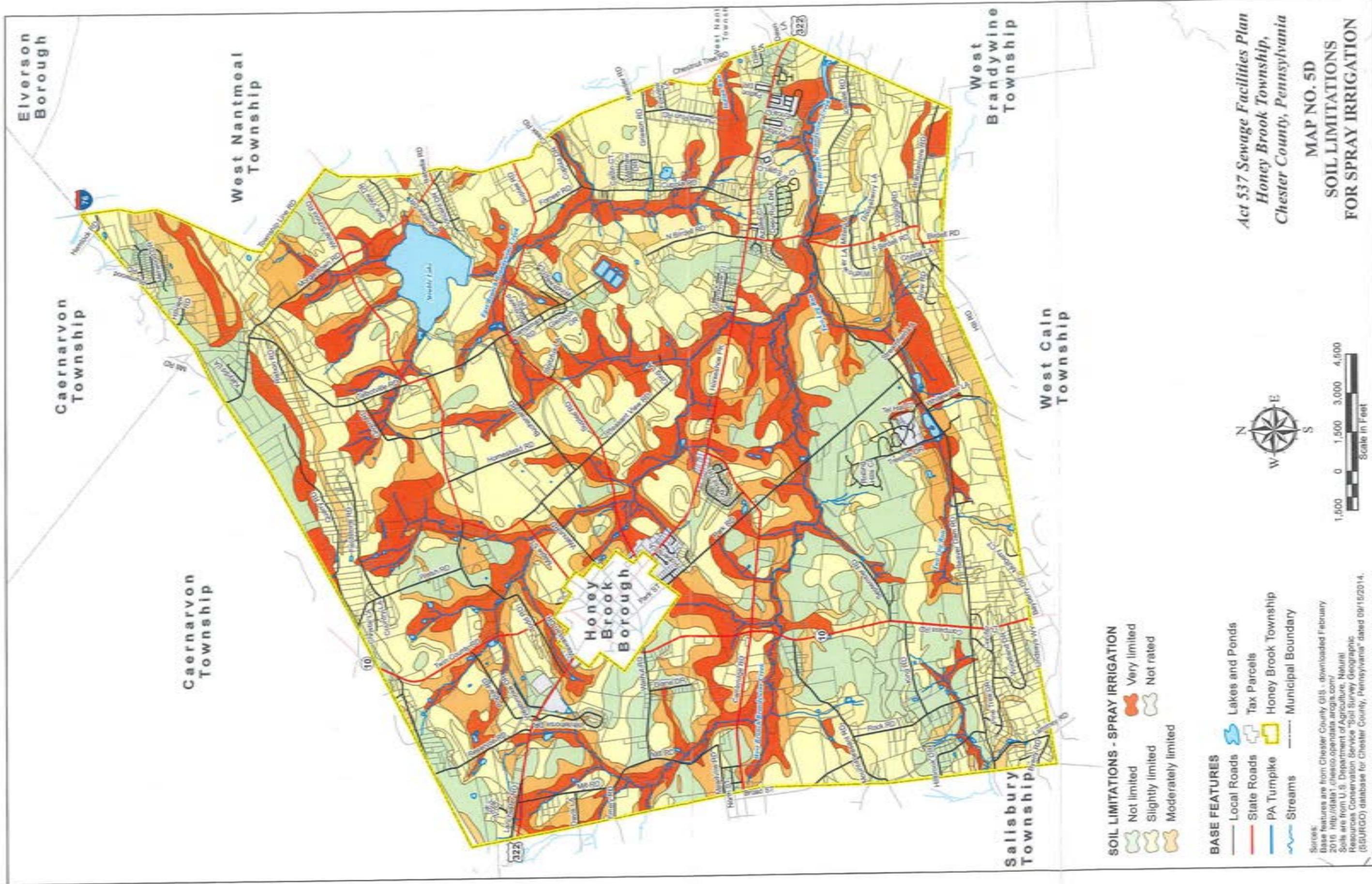
- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
- Tax Parcels
- Honey Brook Township
- Municipal Boundary

Sources:
 Base features are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 Soils are from U.S. Department of Agriculture, Natural Resources Conservation Service "Soil Survey Geographic (SSURGO)" database for Chester County, Pennsylvania" dated 09/16/2014



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 5C
SOIL LIMITATIONS
FOR DRIP IRRIGATION



SOIL LIMITATIONS - SPRAY IRRIGATION

- Not limited
- Slightly limited
- Moderately limited
- Very limited
- Not rated

BASE FEATURES

- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
- Tax Parcels
- Honey Brook Township
- Municipal Boundary

Sources:
 Base features are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 Soils are from U.S. Department of Agriculture, Natural Resources Conservation Service "Soil Survey Geographic (SSURGO) database for Chester County, Pennsylvania" dated 09/15/2014.



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 5D
SOIL LIMITATIONS
FOR SPRAY IRRIGATION

**Elverson
Borough**

**Caernarvon
Township**

**Caernarvon
Township**

**West Nantmeal
Township**

**Honey
Brook
Borough**

**West Brandywine
Township**

**West Cain
Township**

**Salisbury
Township**

D. Prime Farmland

Prime Farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

Table 3 below lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance defined by the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the

production of the Nation's food supply. Prime farmland is also illustrated on Map No. 6, entitled "Prime Ag Farmlands".

Table below summarizes the prime farmland classifications within the study areas:

Map Symbol	Map Unit Name	Farmland Classification
Ba	Baile silt loam	Not prime farmland
BbB	Baile silt loam, 0 to 8 percent slopes, very stony	Not prime farmland
CaA	Califon loam, 0 to 3 percent slopes	All areas are prime farmland
CaB	Califon loam, 3 to 8 percent slopes	All areas are prime farmland
CaC	Califon loam, 8 to 15 percent slopes	Farmland of statewide importance
CbB	Califon loam, 0 to 8 percent slopes, extremely stony	Not prime farmland
CpA	Cokesbury silt loam, 0 to 3 percent slopes	Not prime farmland
CpB	Cokesbury silt loam, 3 to 8 percent slopes	Not prime farmland
DAM	Dams	Not prime farmland
EdB	Edgemont channery loam, 3 to 8 percent slopes	All areas are prime farmland
EdC	Edgemont channery loam, 8 to 15 percent slopes	Farmland of statewide importance
EdD	Edgemont channery loam, 15 to 25 percent slopes	Not prime farmland
ExD	Edgemont channery sandy loam, 8 to 25 percent slopes, extremely stony	Not prime farmland
GdA	Gladstone gravelly loam, 0 to 3 percent slopes	All areas are prime farmland
GdB	Gladstone gravelly loam, 3 to 8 percent slopes	All areas are prime farmland
GdC	Gladstone gravelly loam, 8 to 15 percent slopes	Farmland of statewide importance
GeD	Gladstone-Parker gravelly loams, 15 to 25 percent slopes	Not prime farmland

Map Symbol	Map Unit Name	Farmland Classification
GfB	Gladstone gravelly loam, 0 to 8 percent slopes, very bouldery	Not prime farmland
GgA	Glenelg silt loam, 0 to 3 percent slopes	All areas are prime farmland
GgB	Glenelg silt loam, 3 to 8 percent slopes	All areas are prime farmland
GgC	Glenelg silt loam, 8 to 15 percent slopes	Farmland of statewide importance
GgD	Glenelg silt loam, 15 to 25 percent slopes	Not prime farmland
GI A	Glenville silt loam, 0 to 3 percent slopes	All areas are prime farmland
GIB	Glenville silt loam, 3 to 8 percent slopes	All areas are prime farmland
GIC	Glenville silt loam, 8 to 15 percent slopes	Farmland of statewide importance
Ha	Hatboro silt loam	Not prime farmland
LeB	Legore silt loam, 3 to 8 percent slopes	All areas are prime farmland
LeC	Legore silt loam, 8 to 15 percent slopes	Farmland of statewide importance
MIA	Mount Lucas silt loam, 0 to 3 percent slopes	All areas are prime farmland
MIB	Mount Lucas silt loam, 3 to 8 percent slopes	All areas are prime farmland
MIC	Mount Lucas silt loam, 8 to 15 percent slopes	Farmland of statewide importance
MnB	Mount Lucas silt loam, 0 to 8 percent slopes, extremely stony	Not prime farmland
NeA	Neshaminy silt loam, 0 to 3 percent slopes	All areas are prime farmland
NeB	Neshaminy silt loam, 3 to 8 percent slopes	All areas are prime farmland
NeC	Neshaminy silt loam, 8 to 15 percent slopes	Farmland of statewide importance
NeD	Neshaminy silt loam, 15 to 25 percent slopes	Not prime farmland
NfB	Neshaminy gravelly silt loam, 0 to 8 percent slopes, extremely bouldery	Not prime farmland

Map Symbol	Map Unit Name	Farmland Classification
NfD	Neshaminy gravelly silt loam, 8 to 25 percent slopes, extremely bouldery	Not prime farmland
NvA	Neshaminy silt loam, very deep over mafic gneiss, 0 to 3 percent slopes	All areas are prime farmland
NvB	Neshaminy silt loam, very deep over mafic gneiss, 3 to 8 percent slopes	All areas are prime farmland
NvC	Neshaminy silt loam, very deep over mafic gneiss, 8 to 15 percent slopes	Farmland of statewide importance
NvD	Neshaminy silt loam, very deep over mafic gneiss, 15 to 25 percent slopes	Not prime farmland
NxB	Neshaminy silt loam, very deep over mafic gneiss, 0 to 8 percent slopes, very stony	Not prime farmland
NxD	Neshaminy silt loam, very deep over mafic gneiss, 8 to 25 percent slopes, very stony	Not prime farmland
PbB	Parker loam, 0 to 8 percent slopes, extremely stony	Not prime farmland
PbD	Parker loam, 8 to 25 percent slopes, extremely stony	Not prime farmland
Th	Thorndale silt loam	Not prime farmland
ToB	Towhee silt loam, 3 to 8 percent slopes	Not prime farmland
WaA	Watchung silt loam, 0 to 3 percent slopes	Not prime farmland

*-Table taken from the Websoil Survey

MAP NO. 6
PRIME AG FARMLANDS



Elverson
Borough

Caernarvon
Township

Caernarvon
Township

West Nantmeal
Township

Honey
Brook
Borough

Salisbury
Township

West Cain
Township

West
Brandywine
Township

FARMLAND FEATURES

-  Prime Farmland
-  Farmland of Statewide Importance

BASE FEATURES

- Local Roads
- State Roads
- PA Turnpike
- Streams
-  Lakes and Ponds
-  Tax Parcels
-  Honey Brook Township
-  Municipal Boundary



Sources:
 Base features are from Chester County GIS - downloaded February
 2016 <http://data1.chesco.opendata.arcgis.com/>
 Prime farmlands are from U.S. Department of Agriculture, Natural
 Resources Conservation Service "Soil Survey Geographic
 (SSURGO) database for Chester County, Pennsylvania" dated 09/15/2014.

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 Honey Brook Township,
 Chester County, Pennsylvania

MAP NO. 6
 PRIME AG FARMLANDS

E. Geologic Features

The geology of an area can dictate important groundwater characteristics and other limitations with regard to land use. Groundwater quality can be affected by the manner in which the soil unit and geological formation process the infiltration of water from the surface to any aquifer. Typical contaminants which enter the groundwater in this fashion include nitrate-nitrogen and bacteria. Map No. 7 entitled "Geology Map" illustrates the Township's geological features, which consist of the following Triassic formations: Antietam, Antietam and Harpers undivided, Chickies, Harpers, Vintage, Pegmatite, Anorthosite, Graphitic felsic gneiss, Banded mafic gneiss, Felsic and intermediate gneiss, and Graphitic Felsic Gneiss. The following generalized descriptions of these units are provided by the United States Geological Survey (USGS):

Antietam Formation (ca)

The Antietam Formation is chiefly coarse-grained, quartzose sandstone; the lower part is dense, resistant quartzite.

Antietam and Harpers Formations, undivided (Cab)

The Antietam and Harpers Formations, undivided includes both the Antietam (Ca) and Harpers (Ch) Formations.

Chickies Formation (Cch)

The Chickies Formation is light-gray to white hard, massive quartzite and quartz schist with thin, interbedded dark slate at its top and conglomerate at its base.

Harpers Formation (Ch)

The Harpers Formation is dark-greenish-gray phyllite and schist containing thin quartzite layers. It includes Montalto member (Chm) which consists of gray quartzite.

Vintage Formation (Cy)

The Vintage Formation is dark grayish-blue, fine to medium grained, knotty dolomite with pods of coarse grained dolomite.

Pegmatite (Xpg)

Pegmatite is coarse to medium grained and granitic. Contacts range from sharp to narrowly gradational with some zoning in places.

Anorthosite (a)

Anorthosite is a medium to coarse-grained igneous rock made largely of plagioclase feldspar, with small amounts of pyroxene, olivine, and iron oxides.

Graphitic felsic gneiss (gg)

Graphitic felsic gneiss includes Pickering Gneiss and small areas of marble. It is dominantly quartz and feldspar with varying amounts of graphite and various metamorphic minerals. It is medium grained, light to dark gray and greenish gray with a sedimentary origin.

Banded mafic gneiss (gga)

Banded mafic gneiss is dark gray, fine to medium grained. It includes rocks of probable sedimentary origin.

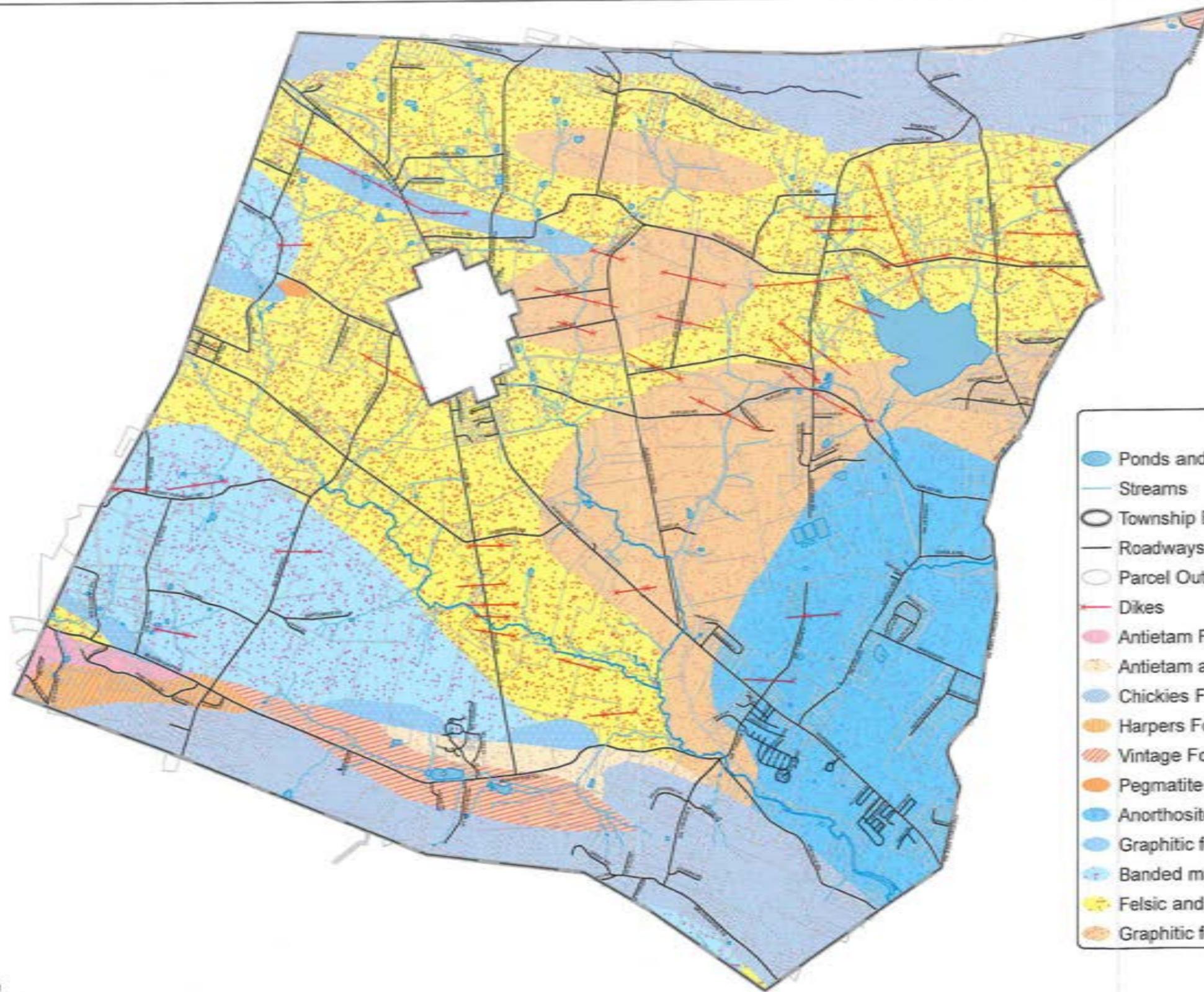
Felsic and intermediate gneiss (ggd)

Felsic and Intermediate gneiss is medium grained, light pink to greenish gray. It is largely quartz, feldspar, and mica. It is commonly gneissic, containing alteration minerals; interfingers with gabbroic gneiss.

Graphitic Felsic Gneiss (ggm)

Graphitic felsic gneiss is medium grained, medium to dark gray: locally gneissic, predominantly feldspar and quartz plus dark accessories and various alteration minerals.

MAP NO. 7
GEOLOGY MAP



- Legend**
- Ponds and Lakes
 - Streams
 - Township Boundary
 - Roadways
 - Parcel Outlines
 - Dikes
 - Antietam Formation (ca)
 - Antietam and Harpers Formations, undivided (Cah)
 - Chickies Formation (Cch)
 - Harpers Formation (Ch)
 - Vintage Formation (Cv)
 - Pegmatite (Xpg)
 - Anorthosite (a)
 - Graphitic felsic gneiss (gg)
 - Banded mafic gneiss (gga)
 - Felsic and intermediate gneiss (ggd)
 - Graphitic felsic gneiss(gqm)

3,500 1,750 0 3,500
Feet

Note: Mapping derived from data provided by Brand Conservancy, PAMAP, and Chester County GIS.

Act 537 Plan
Honey Brook Township

Geologic Formations
of
Bedrock

Map No.
7

F. Topographic Features

According to the U.S. Geological Survey (USGS), the highest elevation in the Township is approximately 1,075 feet above sea level in the Welsh Mountains in the northeastern portion of the Township. The lowest elevation is found along the East Branch Brandywine Creek at approximately 600 feet above sea level. Slopes are presented on Map No. 8, entitled "Topography Map". Gently rolling hills and some flat areas characterize the north eastern-central near Struble Lake and central portions close to the location of the Borough. The southern portion of the Township contains Baron Hills which are rolling hills, and some steep slope areas. Map No. 5a through 5d depict areas where traditional inground, sand mound, drip, or spray irrigation systems are feasible based on soil type and topography.

MAP NO. 8
TOPOGRAPHY MAP



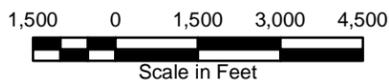
TOPOGRAPHIC CONTOURS (5-FT INTERVAL)

555 - 600	750 - 800	950 - 1000
600 - 650	800 - 850	1000 - 1050
650 - 700	850 - 900	1050 - 1100
700 - 750	900 - 950	

Note: Vertical Datum - NADV 1988, elevations in feet.

BASE FEATURES

— Local Roads	☪ Lakes and Ponds
— State Roads	☐ Tax Parcels
— PA Turnpike	☐ Honey Brook Township
~ Streams	--- Municipal Boundary



Sources:
 Base features are from Chester County GIS - downloaded February 2016 <http://data1.chesco.opendata.arcgis.com/>
 5-Ft topographic contours are from DVRPC - "2005 Topographic Contours" http://www.pasda.psu.edu/data/dvrpc/DVRPCChester_Co_contours.zip

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 Chester County, Pennsylvania*

**FIGURE 2
 TOPOGRAPHY MAP**

keep them clean by acting as natural filters, removing pollutants such as bacteria and sediment.

Water features, including wetlands and hydric soils which are closely related, are shown on Map No. 4 entitled "Water Features". Honey Brook Township lies almost entirely within the watershed of the Chesapeake. The Chesapeake consists of 64,000 square miles in it and encompasses parts of six states including Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and District of Columbia. Within Honey Brook Township, there are three designated sub-watersheds as follows: East Branch Brandywine Creek, Two Log Run feeds into West Branch of Brandywine Creek and Pequea Creek. Woodlands and floodplains in the Township are depicted on Map No. 9 entitled "Woodlands and Floodplains".

MAP NO. 9

WOODLANDS AND FLOODPLAINS

II - 31

EE, Inc.



Elverson
Borough

Caernarvon
Township

Caernarvon
Township

West Nantmeal
Township

Honey
Brook
Borough

West
Brandywine
Township

West Cain
Township

Salisbury
Township

WOODLAND/FLOOD FEATURES

- Woodlands
- FEMA Flood Zone**
- Zone A
- Zone AE
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
- FLOODWAY

BASE FEATURES

- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
- Tax Parcels
- Honey Brook Township
- Municipal Boundary

Sources:
 Base features are from Chester County GIS - downloaded February
 2010 <http://data1.chesco.opendata.arcgis.com/>
 Woodlands are from DVRPC "2010 Land Use" http://www.dvrpc.org/mapping/zip/DVRPC_2010_LandUse.zip
 Floodplains are from FEMA "National Flood Hazard Layer" dated 04/17/2015.
http://www.floods.fema.gov/data/fema/NFHL_42_PA_20150417.zip



MAP NO. 9

WOODLANDS AND FLOODPLAINS

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 Honey Brook Township,
 Chester County, Pennsylvania*

CHAPTER III
EXISTING SEWAGE FACILITIES

CHAPTER III

EXISTING SEWAGE FACILITIES

A. Municipal Sewage Facilities

A portion of Honey Brook Township is serviced by a public sanitary sewer system owned and operated by the Northwestern Chester County Municipal Authority (NCCMA). The public sanitary system includes one wastewater treatment plant and eight pump stations. Below lists the pump stations:

- West Pump Station
- Conestoga Pump Station
- Cambridge Run Pump Station
- Brandywine Preserve Pump Station (Formally known as White Horse Glen)
- Cupola Pump Station
- Autumn Ridge Pump Station
- Grandstaff Pump Station
- Village Green Pump Station

The Authority's current public sanitary sewer service area includes the Suplee, West, and Cupola/Rt. 322 Sewer Districts. The Suplee Area is located on Suplee Road near the intersection of Talbotsville Road consisting mostly of residential homes. The West Area is located at the far western portion of the Township along Route 322, which stretches from Cambridge Road to Mill Road and consists of residential, commercial, industrial and farm residential properties. The Cupola Area is located at the eastern portion of the Township along Route 322, stretching from Pleasant View Road to Chestnut Tree Road and consists of farm residential, mixed residential and commercial properties. These base sewer service areas were identified in the Honey Brook Township 2010 Act 537 Plan. The current sewer service area is illustrated on Map No. 1, entitled "Existing and Proposed Sewer Service Areas". For the purposes of consolidation and ease of review, Map No. 1 also contains the noted proposed service areas, as an outcome of the information presented in this Plan update.

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The projected growth is further discussed in Chapter IV. The scheduling of the upgrades, in conjunction with the remainder of the implementation, is presented in Chapter VIII.

The NCCMA WWTP only services Honey Brook Township and Honey Brook Borough. There are two neighboring municipalities which provide public sanitary sewer service to residents/occupants in Honey Brook Township. The Caernarvon Township Sewer Authority (CTSA) provides public sewer service in the northeast corner of the Township. This area will continue to be serviced by the Caernarvon Township Sewer Authority and there is no growth potential within this area. A copy of the Intermunicipal Agreement is attached in Appendix B.

Honey Brook Township will be receiving wastewater from West Nantmeal Township. This Act 537 Plan will include this area (identified by numbers 34 to 44 on the Overall 537 Plan) through an Intermunicipal Agreement with West Nantmeal Township and Honey Brook Township which was executed September 21, 2017 to be service by the Cupola Sewer Service Area which ultimately flows to the NCCMA WWTP for treatment and disposal. A copy of this Intermunicipal Agreement is attached in Appendix A.

The Coatesville Authority included parcel number 22-10-33 consisting of 41.3 acres located east of Route 10 and south of Beaver Dam Road within their public sanitary sewer service area. This parcel of land was purchased by Natural Lands Trust in May of 2018. As this property will be preserved, the development potential is remove and will

not require public sanitary sewer. Map No. 1 identifies the area serviced by CTSA and Coatesville Authority.

NCCMA WWTP

The Northwestern Chester County Municipal Authority was organized in 1975 and equally represents Honey Brook Borough and Honey Brook Township. NCCMA's WWTP is located at 37 Dampman Road and the treatment plant was designed as an aerated lagoon system, followed by tertiary filtration, BNR and the removal of phosphorous, algae. Below provides the details of the Water Quality Management Permit:

- NPDES Permit No. PA0080438
- Water Quality Permit No. 1506402
- Location: 37 Dampman Road, Honey Brook Township, Chester County
- Capacity: 0.600 mgd
- Receiving Stream: West Branch of the Brandywine Creek

Existing NCCMA WWTP Effluent discharge requirements (30 day average):

Parameter	Concentration (mg/L)
D.O	6.0
Total Residual Chlorine	0.5
Total Suspended Solids	30
CBOD5 (May 1 to October 31)	14
CBOD5 (November 1 to April 30)	25
NH3N (May 1 to October 31)	2.7
NH3N (November 1 to April 30)	8.1
Total Phosphorus	1.8
Fecal Coliform (May 1 to September 30)	200 colonies/100 ml
Fecal Coliform (October 1 to April 30)	2,000 colonies/100 ml (based on geometric mean)

The existing NCCMA WWTP consists of an aerated lagoon system, followed by tertiary filtration for BNR and the removal of phosphorous and algae. A schematic of the existing treatment plant is provided at the end of this section. Per the 2010 Act 537 Plan, the NCCMA installed the BioBloes to help increase treatment. During a routine inspection in June of 2014, it was found that 20 of the 80 BioBloes aluminum material had deteriorated and leaked their media. All the BioBloes were removed from the lagoons and replaced with stainless steel BioBloes by the fall of 2014. During the winter months, the plant experiences difficulties meeting the permit discharge limits for nitrogen.

According to the Chapter 94 Reports, NCCMA WWTP does not have three consecutive months where the monthly average flow exceeds the hydraulic design capacity of the WWTF. There were no issues experienced at the WWTP during high flow conditions, because they have holding capacity during high flow conditions.

Pump Stations

The Township utilizes eight pump stations to service the public sewer service area which connects to the NCCMA WWTP. The West Pump Station receives the flows from Brandywine Preserve (formally known as White Horse Glen), Cambridge Run, and Conestoga. The Cupola Pump Station receives the flows from Grandstaff, Autumn Ridge, and Village Green pump stations.

Following is a detailed description of the existing Pump Stations that are within the NCCMA WWTP service area:

1. **West Pumping Station**

The West Pumping Station is located to the north of Route 322 and began operation in the fall of 1978 utilizing a Smith and Loveless duplex station, with two 60 hp pumps rated at 698 gpm. The pumping level is controlled by a pressure

transducer. An automatic dialer monitors all the alarms, and will notify the staff of a high influent or system failure. A pump station monitor records inflow and instantaneous peak flow. An Onan 155 kW diesel generator, through a Dayton 400 amp automatic transfer switch, provides emergency power in the event of a main power failure.

The pumping capacity of the pump station with the largest pump out of service is 698 gpm. The PADEP requires a peak factor of 3.5 for pump stations servicing flows less than 300,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

Peak Pumping Capacity	=	698 gpm
	=	698 gpm x 1,440 min/day
	=	1,005,120 gpd
PADEP Peak Factor	=	3.5
Annual Average (AA) Flow	=	1,005,120 gpd / 3.5 (peak factor)
	=	287,177 gpd
Existing Flows	=	169,000 gpd
Projected Flows	=	69,457 gpd
Total Flows	=	238,457 gpd
Available AA Capacity	=	287,177 gpd - 238,457 gpd
	=	48,720 gpd

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station.

The Honey Brook Golf Course is proposed to connect to Honey Brook Township public sanitary sewer system through the connection to a gravity main which will flow to the West Pumping Station. The projected flows for the Golf Course expansion of the grill and barn for events will be approximately 4,160 gpd. A Sewage Facilities Planning Module will be required to be submitted to PADEP

and obtain approval from PADEP for the connection of this project to the sanitary sewer system.

Based on the twenty year planning projections and the golf course, there is 48,720 gpd of capacity remaining at this pump station.

2. Conestoga Pumping Station

The Conestoga Pumping Station is located just outside of Honey brook Borough on the west side of Route 10 and began operation in the spring of 1979 utilizing a Smith and Loveless duplex station with two 15 hp pumps rated at 317 gpm. The pumping level is controlled by a bubbler system. An automatic dialer monitors the alarms, and will notify the staff of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. An Onan generator, through a Westinghouse automatic transfer switch, provides emergency power in the event of a power failure.

The pumping capacity of the pump station with the largest pump out of service is 317 gpm. The PADEP requires a peak factor of 3.5 for pump stations servicing flows less than 300,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

Peak Pumping Capacity	=	317 gpm
	=	317 gpm x 1,440 min/day
	=	456,480 gpd
PADEP Peak Factor	=	3.5
Annual Average (AA) Flow	=	456,480 gpd / 3.5 (peak factor)
	=	130,423 gpd
Existing Flows	=	36,200 gpd
Projected Flows	=	0

$$\begin{aligned}
 \text{Total Flows} &= 130,423 \text{ gpd} \\
 \text{Available AA Capacity} &= 130,423 \text{ gpd} - 36,200 \text{ gpd} \\
 &= 94,223 \text{ gpd}
 \end{aligned}$$

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

3. Cambridge Run Pumping Station

Cambridge Run Pump Station is located west of Route 10 near the dead-end of Diane Drive and began operation in September of 1995 utilizing a Hydromatic duplex station servicing a development of 22 homes with two 3 hp pumps rated at 15 gpm and controlled by float level switches. An automatic dialer monitors the alarms, and will notify the staff in the event of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. An Onan 20 kW generator, through an automatic Onan transfer switch, provides emergency power in the event of a power failure.

The pumping capacity of the pump station with the largest pump out of service is 23 gpm. The PADEP requires a peak factor of 4 for pump stations servicing flows less than 10,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

$$\begin{aligned}
 \text{Peak Pumping Capacity} &= 23 \text{ gpm} \\
 &= 23 \text{ gpm} \times 1,440 \text{ min/day} \\
 &= 33,120 \text{ gpd}
 \end{aligned}$$

$$\text{PADEP Peak Factor} = 4.0$$

$$\begin{aligned}
 \text{Annual Average (AA) Flow} &= 33,120 \text{ gpd} / 4.0 \text{ (peak factor)} \\
 &= 8,280 \text{ gpd}
 \end{aligned}$$

$$\text{Existing Flows} = 3,100 \text{ gpd}$$

Projected Flows	=	0
Total Flows	=	3,100 gpd
Available AA Capacity	=	8,280 gpd - 3,100 gpd
	=	5,180 gpd

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

4. Brandywine Preserve Pumping Station (Formerly White Horse Glen)

Brandywine Preserve Pumping Station is located just south of Route 322 within the Brandywine Preserve residential development and began operation in January of 2010 homes utilizing a Hydromatic duplex station servicing a development of 29 homes with two 7.5 hp pumps rated at 70 gpm and controlled by float level switches. An automatic dialer monitors the alarms, and will notify the staff in the event of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. An Onan 35 kW generator, through an automatic Onan transfer switch, provides emergency power in the event of a power failure.

The pumping capacity of the pump station with the largest pump out of service is 80 gpm. The PADEP requires a peak factor of 3.8 for pump stations servicing flows less than 100,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

Peak Pumping Capacity	=	80 gpm
	=	80 gpm x 1,440 min/day
	=	115,200 gpd
PADEP Peak Factor	=	3.8
Annual Average (AA) Flow	=	115,200 gpd / 3.8 (peak factor)
	=	30,315 gpd

Existing Flows	=	5,000 gpd
Projected Flows	=	0
Total Flows	=	5,000 gpd
Available AA Capacity	=	30,315 gpd - 5,000 gpd
	=	25,316 gpd

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

5. Cupola Pumping Station

Cupola Pumping Station is located at the intersection of the East Branch of Brandywine Creek at Cupola Road and began operation in the fall of 1978 utilizing a Smith and Loveless duplex station serving with two 60 hp pumps rated at 691 gpm. The pumping level is controlled by a bubbler system. An automatic dialer monitors the alarms, and will notify the staff of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. A 155 kW Onan diesel generator, through a Cutler-Hammer automatic transfer switch, provides emergency power in the event of a main power failure. The pumping capacity of the pump station with the largest pump out of service is 691 gpm. The PADEP requires a peak factor of 3.5 for pump stations servicing flows less than 1,000,000 gpd. The pump station has to be upgraded to meet both the existing and projected flows. The following are the calculations of the required pumping capacity:

Existing Annual Average (AA) Flow	=	119,000 gpd
Projected Future AA Flows	=	271,007 gpd
Total AA Flows	=	390,007 gpd
PADEP Peak Factor	=	3.5
Required Pumping Capacity	=	390,007 gpd x 3.5 (peak factor)
	=	1,365,025 gpd
	=	1,365,025 gpd / 1,440 min/day
	=	947.93 gpm
Design	=	950 gpm

The Authority is currently in the process of obtaining approvals from PADEP to upgrade this pump station due to age of the pump station, increased development anticipated in this area and due to past SSO's at this pump station. The NCCMA is waiting for the Water Quality Part II Permit approval from the Department of Environmental Protections to start construction of the upgrades to this pump station. The NCCMA will be paying for the pump station upgrades.

6. Autumn Ridge Pumping Station

Autumn Ridge Pumping Station is located south of Route 322 near the dead-end of Dove Drive and began operation in August of 1993 utilizing a Hydromantic duplex grinder station servicing a development of 28 homes with two 5 hp pumps rated at 20 gpm and controlled by float level switches. An automatic dialer monitors the alarms, and will notify the staff of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. An Onan 25 kW generator, through an Onan automatic transfer switch, provides emergency power in the event of a power failure.

The pumping capacity of the pump station with the largest pump out of service is 25 gpm. The PADEP requires a peak factor of 4.0 for pump stations servicing flows less than 60,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

Peak Pumping Capacity	=	25 gpm
	=	25 gpm x 1,440 min/day
	=	36,000 gpd
PADEP Peak Factor	=	4.0
Annual Average (AA) Flow	=	36,000 gpd / 4.0 (peak factor)
	=	9,000 gpd
Existing Flows	=	3,900 gpd
Projected Flows	=	0
Total Flows	=	3,900 gpd
Available AA Capacity	=	9,000 gpd - 3,900 gpd

= 5,100 gpd

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

7. Grandstaff Pumping Station

Grandstaff Pumping Station is located on the north side of Route 322 at Rocklyn Station Road and began operation in the spring of 1992 utilizing a Hydromatic duplex grinder pumping station servicing a development of 49 homes with two 5 hp motors rated a 20 gpm controlled by a float level switch system. An automatic dialer monitors the alarms, and will notify the staff of a high water influent or station failure. A Pump station monitor records inflow and instantaneous peak flow. An Onan 25 kW generator, through an Onan automatic transfer switch, provides emergency power in the event of a power failure. The hydraulic design capacity is 35 gpm. The annual average flow for 2017 was 8,700 gpd, therefore this pump station is not in a hydraulic overload condition.

The pumping capacity of the pump station with the largest pump out of service is 35 gpm. The PADEP requires a peak factor of 4.0 for pump stations servicing flows less than 60,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

Peak Pumping Capacity	=	35 gpm
	=	35 gpm x 1,440 min/day
	=	50,400 gpd
PADEP Peak Factor	=	4.0
Annual Average (AA) Flow	=	50,400 gpd / 4.0 (peak factor)
	=	12,600 gpd
Existing Flows	=	8,700 gpd
Projected Flows	=	0

$$\begin{aligned}
 \text{Total Flows} &= 8,700 \text{ gpd} \\
 \text{Available AA Capacity} &= 12,600 \text{ gpd} - 8,700 \text{ gpd} \\
 &= 3,900 \text{ gpd}
 \end{aligned}$$

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

8. Village Green Pumping Station

Village Green Pumping Station is located on the south side of Route 322 within the Village Greene residential development and began operating in January of 2013 utilizing a Hydromatic duplex pumping station with two 5 hp pumps rated at 97 gpm and controlled by a sigma control with a submersible pressure transducer, with back up floats. An automatic dialer monitors the alarms, and will notify the staff of a high water influent or station failure. A pump station monitor records inflow and instantaneous peak flow. A Cummins 35 kw generator, through an automatic Cummins transfer switch provides emergency power in the event of a power failure. The hydraulic design capacity is 100 gpm. The annual average flow for 2017 was 2,300 gpd, therefore this pump station is not in a hydraulic overload condition.

The pumping capacity of the pump station with the largest pump out of service is 100 gpm. The PADEP requires a peak factor of 3.8 for pump stations servicing flows less than 100,000 gpd. The annual average flow capacity of the existing pump station has been calculated below:

$$\begin{aligned}
 \text{Peak Pumping Capacity} &= 100 \text{ gpm} \\
 &= 100 \text{ gpm} \times 1,440 \text{ min/day} \\
 &= 144,000 \text{ gpd} \\
 \text{PADEP Peak Factor} &= 3.8 \\
 \text{Annual Average (AA) Flow} &= 144,000 \text{ gpd} / 3.8 \text{ (peak factor)} \\
 &= 37,895 \text{ gpd}
 \end{aligned}$$

Existing Flows	=	2,300 gpd
Projected Flows	=	0
Total Flows	=	2,300 gpd
Available AA Capacity	=	37,895 gpd - 2,300 gpd
	=	35,595 gpd

The annual average flow rate does not exceed the annual average flow capacity of the pump station, and there are no reported overload conditions at this pump station. There are no anticipated connections to this pump station over the next five years.

Evaluation of Existing NCCMA WWTP

Herbert, Rowland & Grubic, Inc. (HRG) is the consulting engineers for the NCCMA prepared an evaluation of the existing NCCMA WWTP. This analysis was conducted to determine the existing conditions of the WWTP and evaluate increasing the permitted hydraulic capacity from 0.600 MGD to 0.740 MGD.

The original WWTP was permitted for an average daily flow (ADF) of 0.600 MGD and currently operates under this design hydraulic capacity. The treatment plant was designed as an aerated lagoon system followed by tertiary filtration (dissolved air flotation and sand filters). Disinfection is provided by gas chlorination. As originally designed, the WWTP relied solely upon the lagoons biological processes for removal of ammonia nitrogen. Due to the inability to adequately maintain biological treatment in cold weather, previous upgrades to the WWTP included the installation of 80 fixed film contactors, trade named "Bio₂ Blocs", and the required ancillary equipment within the tertiary lagoons in an effort to address this issue. Since their installation, the plant has had success in reducing their ammonia nitrogen limits for the majority of the year. Despite this success, the WWTP still has some difficulties in January and February due to

the higher flows and colder water temperatures that occur during these months resulting in cold weather nitrification issues.

The current NPDES Permit has established effluent nutrient limits for Ammonia-Nitrogen, Total Nitrogen, and Total Phosphorus. These effluent limits are provided in Table below:

NCCMA NPDES Effluent Nutrient Limits						
Parameter	Mass Units (lbs/day)		Concentration (mg/L)			
	Avg Month	Weekly Avg	Inst. Max	Avg Month	Weekly Avg	Inst Max
Ammonia-Nitrogen May 1- Oct 31	13.5	XXX	XXX	2.7	XXX	5.4
Ammonia-Nitrogen Nov 1- Apr 30	40.5	XXX	XXX	8.1	XXX	16.2
Total Nitrogen	144.1	XXX	XXX	28.8	XXX	57.6
Total Phosphorus Apr 1- Oct 31	9.0	XXX	XXX	1.8	XXX	3.6
Total Phosphorus Nov 1 - Mar 31	10.0	XXX	XXX	2.0	XXX	4.0

HRG reviewed the Discharge Monitoring Report (DMR) data from July, 2014 through August, 2017 to establish the performance of the lagoons with respect to nitrogen and phosphorus removal. Phosphorus removal through the system appears to be stable and the plant is able to consistently achieve permit compliance throughout the year. On average, the effluent total phosphorus discharge is 75% of the permitted capacity.

Nitrogen removal throughout the WWTP is variable and is highly dependent on seasonal temperature conditions. Extrapolation of the DMR data (from 2013-2017) indicates the

WWTP achieves an effluent ammonia concentration (mg/L) that is below half of the permitted limit greater than 66% of the time. The effluent ammonia mass loading (lbs) is below half of the permitted limit greater than 72% of the time. Permit exceedance for ammonia have historically occurred during the winter months, when the water temperature drops below 5 degrees Celsius and thereby inhibiting the nitrification process.

Two alternatives were evaluated for the upgrade to the existing NCCMA WWTP to handle the projected average daily design flow of 0.74 MGD and maintain compliance with anticipated NPDES effluent permit limits. The two (2) major alternative options that were considered as part of this Act 537 study include:

1. Alternative No. 1- Lagoon Retrofits.
2. Alternative No. 2 - Conventional Systems

Alternative No. 1 considered the option of retrofitting the existing lagoons with proven technologies that would allow for the continued use of the lagoon system for biological treatment. Alternative 2 considered the option of abandoning the existing lagoon treatment processes and replacing them with a conventional activated sludge system for biological treatment. The selected Alternative is No. 1, retrofitting the existing lagoon. The evaluation of this alternative is outlined in more detail in Chapter VI and the HRG Act 537 WWTP Evaluation is attached in Appendix C.

Retrofitting the existing lagoon will allow the plant to continue to operate during the construction process, as well as complete the upgrades in phases. The proposed upgrades would then get the plant back into compliance with PA DEP for the nitrogen requirements.

Details of Schedule of Upgrading or Expansion

The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The phasing of the upgrades is outlined below:

Phase	Description
Phase 1 (Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none"> 1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells 2. Installing lagoon covers 3. Replacing the mechanical aerators with diffused aerators 4. Replacing the bio-blocs with a new nitrification reactor 5. Replacing the existing headworks bar screen
Phase 2 (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD, Construct modifications to existing process equipment to handle new ADF. Work to include: <ol style="list-style-type: none"> 1. Modifications to DAF tanks 2. Modifications to sand filters 3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

The upgraded NCCMA WWTP will adequately service Honey Brook Township and Honey Brook Borough sewer needs, without creating a projected organic or hydraulic overload in the system within the next 20 year planning horizon.

To ensure the next 20 year planning horizon, each of the tax parcels in the sewer service areas were evaluated to determine projected future flows based on potential development consistent with zoning uses. Table below summarizes the projected future flows for each sewer service area, along with the existing reported flows. This evaluation is further discussed in Chapter IV.

Existing Flows	
2013 Annual Average	397,000 gpd

2014 Annual Average	384,000	gpd					
2015 Annual Average	324,000	gpd					
2016 Annual Average	291,000	gpd					
2017 Annual Average	273,000	gpd					
Five Year Annual Average Flow (2013-2017)	333,800	gpd					
Highest Annual Average 2017	397,000	gpd					
Max Three Consecutive Monthly 2017	311,000	gpd					
Current Permitted Capacity	600,000	gpd					
Future Flows	0% TDR(s)		100% TDR(s)		75% TDR(s)		
Suplee Service Area (New) - Green on overall plan	45,556	gpd	46,325	gpd	46,133	gpd	
Suplee Service Area (Existing)	9,634	gpd	12,846	gpd	12,043	gpd	
West Service Area	46,422	gpd	53,084	gpd	51,419	gpd	
Honey Brook Borough (West Service Area)	12,214	gpd	16,373	gpd	15,333	gpd	
Cupola Service Area (Including The Addition of Donnell-Hammell Business Park)	222,000	gpd	287,343	gpd	271,007	gpd	
Morgantown Road/ Shoreline Drive	23,750	gpd	23,750	gpd	23,750	gpd	
Totals	359,576	gpd	439,720	gpd	399,648	gpd	
WWTP Sizing Range (5)							
Least Conservative (utilizing lowest AA flow) (2017)	273,000	gpd	+	359,576	=	632,576	gpd
Average (utilizing five year AA flow)	333,800	gpd	+	399,648	=	733,448	gpd
Conservative (utilizing five year AA flow)	333,800	gpd	+	439,720	=	773,520	gpd
Most Conservative (utilizing highest AA flow)	397,000	gpd	+	439,720	=	836,720	gpd
Recommended Size	740,000	gpd		Annual Average			

B. Non-Municipal Sewage Facilities

Honey brook Township discourages public water and sewer extensions or improvements within the rural resource areas of the Honey Brook 537 Plan unless such service is required by PADEP for documented health or safety reasons and no other viable on-site alternatives exist in the Township. The Township's goal is to seek more environmentally sustainable alternatives over the continued stream discharge of treated sewage effluent into either the East or West Branches of the Brandywine Creek. Therefore, the areas located outside of the designated public sewer service areas will continue to be serviced

by individual on-lot sewage disposal systems (OLDS). The following non-municipal treatment systems are currently in operation within the Township:

- Tel Hai Retirement Community operates a private WWTP (NPDES permit number PA0036412) located on its premises along Beaver Dam Road west of Park Road. Tel Hai's WWTP utilizes a biological continuous activated sludge process and is currently permitted to discharge 55,000 gpd to Two Log Run. Tel Hai Retirement Community will continue to utilize the WWTP with stream discharge as the system continues to properly function.
- There are multiple community on-lot small flow systems, or package treatment facilities in the Township, including tax parcels: 22-10-21, 22-9-14.1A, 22-3-73.1, 22-7-15, 22-7-51, 22-10-42-E, 22-10-43.2, 22-5-16.37, 22-8-85, 22-8-81 and 22-7-81.1. The Township uses the service of the Chester County Health Department's Sewage Enforcement Officer (SEO) and the DEP Sanitarian to assist with recommending and enforcing any operation and maintenance compliance requirements for these systems. All of these systems are expected to perform to compliance standards set forth by DEP.

Honey Brook Township currently does not have a Sewage Management Ordinance to address operations and maintenance requirements for individual on-lot systems. However, the Township has been actively working on a draft ordinance. In the interim, the Township's Board of Supervisors held an educational meeting on December 12, 2013, to provide information to homeowners with on-lot sewage systems. All the information that was presented at the educational meeting is provided on the Township's website and available at the Township building.

The Chester County Health Department will ensure all systems area tested, designed and permitted in accordance with Pa Code Title 25, Chapters 71, 72, and 73.

C. Sewage Disposal Needs Identification

In accordance with Act 537 guidelines and DEP's publication titled *Act 537 Sewage Disposal Needs Identification* (guidance document 3800-BK-DEP1949 revised 4/2004), Honey Brook Township performed a well sampling and septic system survey as a part of the 2010 Act 537 Update. The scope of work was to acquire updated information on the general condition of a random selection of properties located in the Village of Suplee and the West Sewer District to assess potential needs based on the resulting data.

Sanitary Well Survey

Per the previous 2010 Act 537 Plan, Herbert Rowland & Grubic (HRG) contacted the Chester County Health Department to obtain data on known Septic System Failures, Certification Failures, and Bacteriological testing results within the Township boundaries. An exhibit which presents the Chester County Health Department-provided data is provided in Appendix A. HRG Engineering and Technicon Enterprises also conducted a door-to-door sanitary sewage survey in 2008 and a supplemental survey in 2010 for the Village of Suplee and portions of the existing West Sewer District. Based on sanitary survey forms completed by Technicon Enterprises, Inc. and Herbert, Rowland & Grubic, Inc., the types of systems observed during the sanitary survey include:

- Holding Tanks
- Cesspools
- Elevated sand mounds (septic tank with above-grade seepage bed)
- Elevated sand mount trenches
- In-ground trenches
- Greywater discharge directed to boreholes or surfaces

Based on the survey conducted by HRG, a total of 12 properties responded to the initial mail-survey. In the West Sewer District, there were five surveys completed. Of the five surveys, one of the on-lot systems was suspected to be malfunctioning, while the other four were reported as unknown or not malfunctioning. In the Suplee Sewer District, a total of seven surveys were completed with two suspected malfunctions and five with potential malfunctioning systems.

Technicon Enterprises conducted a second survey in 2010 on seven additional properties to achieve the minimum requirements for a representative sampling. In the West Sewer District, there was one survey that had been completed, and the on-lot system was suspected to be malfunctioning. In the Suplee Sewer District, a total of six surveys were completed with two confirmed malfunctions, two suspected malfunctions, one potential malfunction, and one functioning system. The complete results for the surveys conducted by HRG and Technicon Enterprises are attached in Appendix B. A map illustrating locations of septic system malfunctions is included as Map No. 10, entitled "Septic System Malfunctions". The results of the survey are summarized in table below:

Number and Percentage of Properties Surveyed using OLDS			
Study Area	Properties with OLDS	Number of OLDS Surveyed (% of properties with Wells)	
		No.	Percentage
Village Of Suplee	25	13	52%
Existing West District	11	6	55%

Study Area	OLDS Surveyed	Malfunction (% of OLDS Surveyed)							
		Confirmed		Suspected		Potential		None	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Village of Suplee	13	2	15%	4	31%	6	46%	1	8%
Existing West District	6	0	0%	2	33%	0	0%	4	67%

An area of documented septic system failures is located in a residential area just east of Struble Lake. According to the Chester County Health Department records, seven septic system failures have been documented in the area, along the north and south sides of Morgantown Road.

Another area was identified just southeast from the West study area on Cambridge Road near the intersection of Mill Road and consists of a farmstead. This area is zoned as commercial and farm residential. The on-lot survey conducted by HRG, Inc. identified a

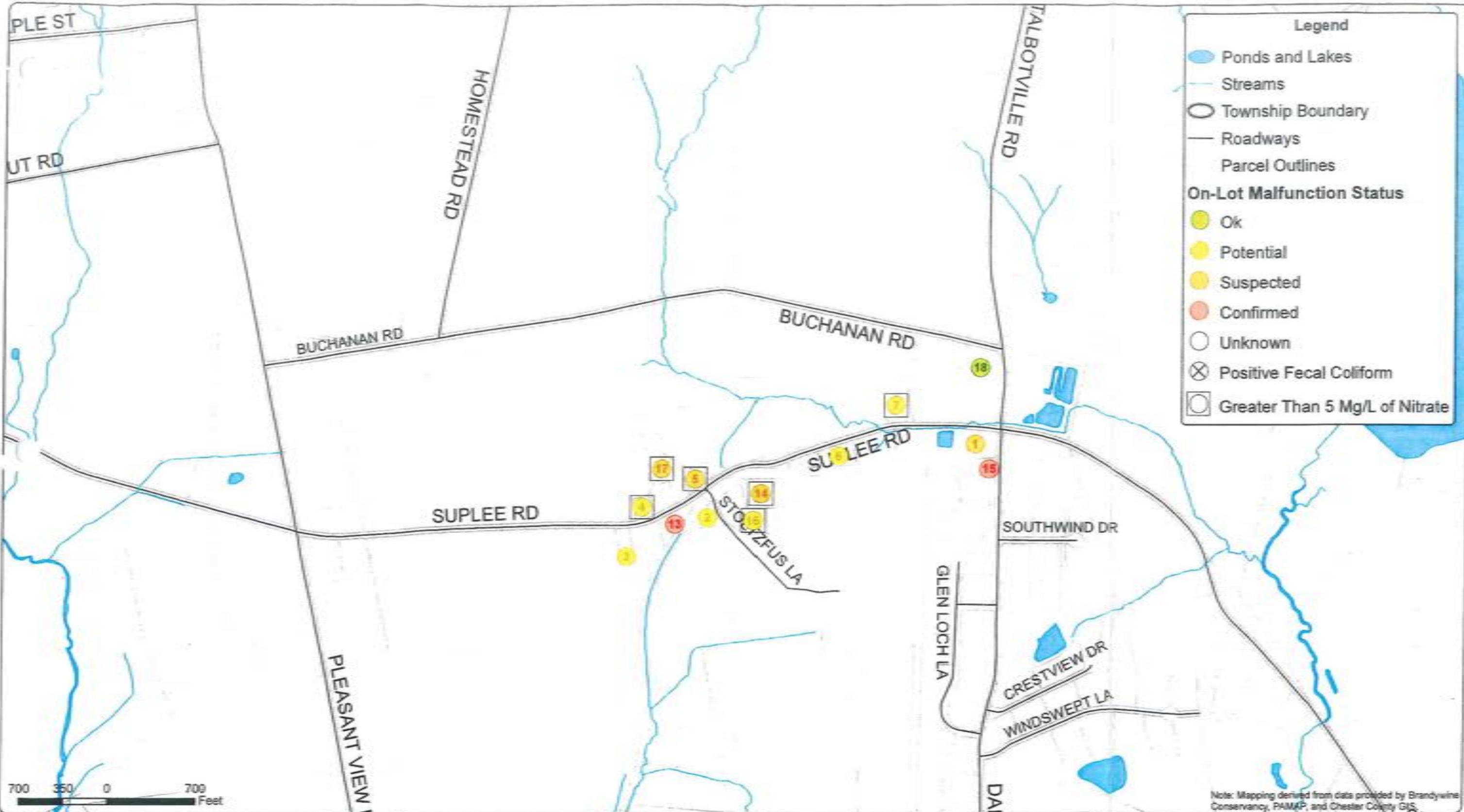
known on-lot system failure. Along Dampman Road and Windswept Lane, 15 wells were reported on the Chester County Health Department well database with nitrate-nitrogen concentrations greater than 10 mg/l. In the same area, 7 wells were reported with nitrate-nitrogen concentrations between 5 and 9.99 mg/l.

The Suplee Sewer District is expanding to include these areas into the public sewer service areas in the future. These areas are projected to be provided public sanitary sewer within the next 20 years or through a Special Study evaluating the area. The proposed flow projections from these areas have been taken into account for the wastewater treatment plant upgrade. The properties in Suplee Sewer District will continue to utilize their individual on-lot sewage disposal systems until the systems report malfunctioning. These systems will be maintained in accordance with the Sewage Management Ordinance until such time that these systems are connected to the public sanitary sewer system.

MAP NO. 10
SEPTIC SYSTEM MALFUNCTIONS

III - 23
Revised February 11, 2019

EE, Inc.



Legend

- Ponds and Lakes
- Streams
- Township Boundary
- Roadways
- Parcel Outlines

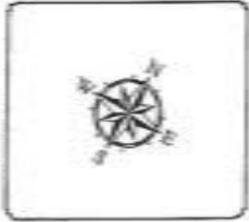
On-Lot Malfunction Status

- Ok
- Potential
- Suspected
- Confirmed
- Unknown
- X Positive Fecal Coliform
- Greater Than 5 Mg/L of Nitrate



Note: Mapping derived from data provided by Brandywine Conservancy, PAMAP, and Chester County GIS.

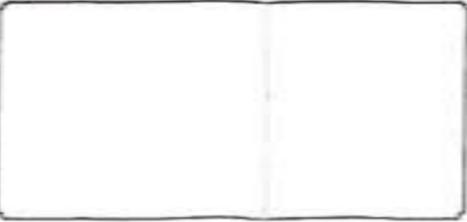
NO.	Revision	Date	By



HRG
 Harbert, Rowland & Gruber, Inc.
 Engineering & Related Services

138 Buffalo Road
 Suite 103
 Lewisburg, PA 17837
 570.524.6744
 Fax 570.524.6779
 www.hrg-inc.com
 Offices Statewide

**Act 537 Plan
 Honey Brook Township**



Project Manager:	BWT
Design:	BWT
GIS:	BWS
Checked:	
Scale:	1" = 700'
Date:	June 2010

Map No.
E1
 Project: 020904.002

Well Survey

A well survey was conducted by HRG and Technicon Enterprises for the 2010 Act 537 Plan. The survey followed the guidelines for well water surveys published in the Sewage Disposal Needs Identification Guidance, well water surveys may be completed in two tiers (or steps). The first tier requires that a minimum of 15% of the wells in the study area must be sampled. For the second tier, representative sampling must be completed with participation percentages the same as the Door-to-Door Survey. Each well is sampled and analyzed for total coliform bacteria, fecal coliform bacteria, and nitrate-nitrogen. The table below summarizes the well survey results:

Number and Percentage of Properties Surveyed using Private Wells			
Study Area	Properties with Private Wells	Number of Wells Surveyed (% of properties with Wells)	
		Village Of Suplee	25
Existing West District	11	7	64%

Study Area	Well Surveyed	Malfunction (% of OLDS Surveyed)							
		Total Coliform Present (% of surveyed)		Fecal Coliform Present (% of Total Coliform)		Nitrate > 5mg/L, but < 10 mg/L (% of Surveyed)		Nitrate >10 mg/L MCL (% of Surveyed)	
		No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Village of Suplee	13	7	54%	0	0%	1	8%	6	46%
Existing West District	7	2	29%	0	0%	1	14%	4	57%

The complete results for the surveys conducted by HRG and Technicon Enterprises are attached in Appendix B. A map illustrating locations of wells is included as Map No. 11, entitled "Well Locations with Nitrate Results and Elevated Values".

MAP NO. 11

WELL LOCATIONS WITH NITRATE RESULTS
AND ELEVATED VALUES

Legend

-  Ponds and Lakes
-  Streams
-  Township Boundary
-  Roadways
-  Parcel Outlines

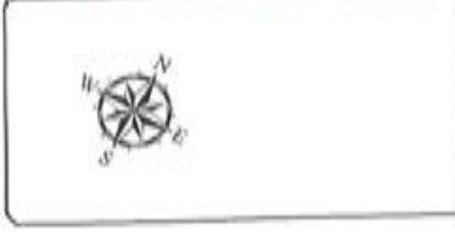
On-Lot Malfunction Status

-  Ok
-  Potential
-  Suspected
-  Confirmed
-  Unknown
-  Positive Fecal Coliform
-  Greater Than 5 Mg/L of Nitrate



Note: Mapping derived from data provided by Brandywine Conservancy, PAMAP, and Chester County GIS.

NO.	Revision	Date	By



Project Manager:	ENT
Design:	ENT
GIS:	MS
Checked:	
Scale:	1" = 2000'
Date:	June 2016

Map No.

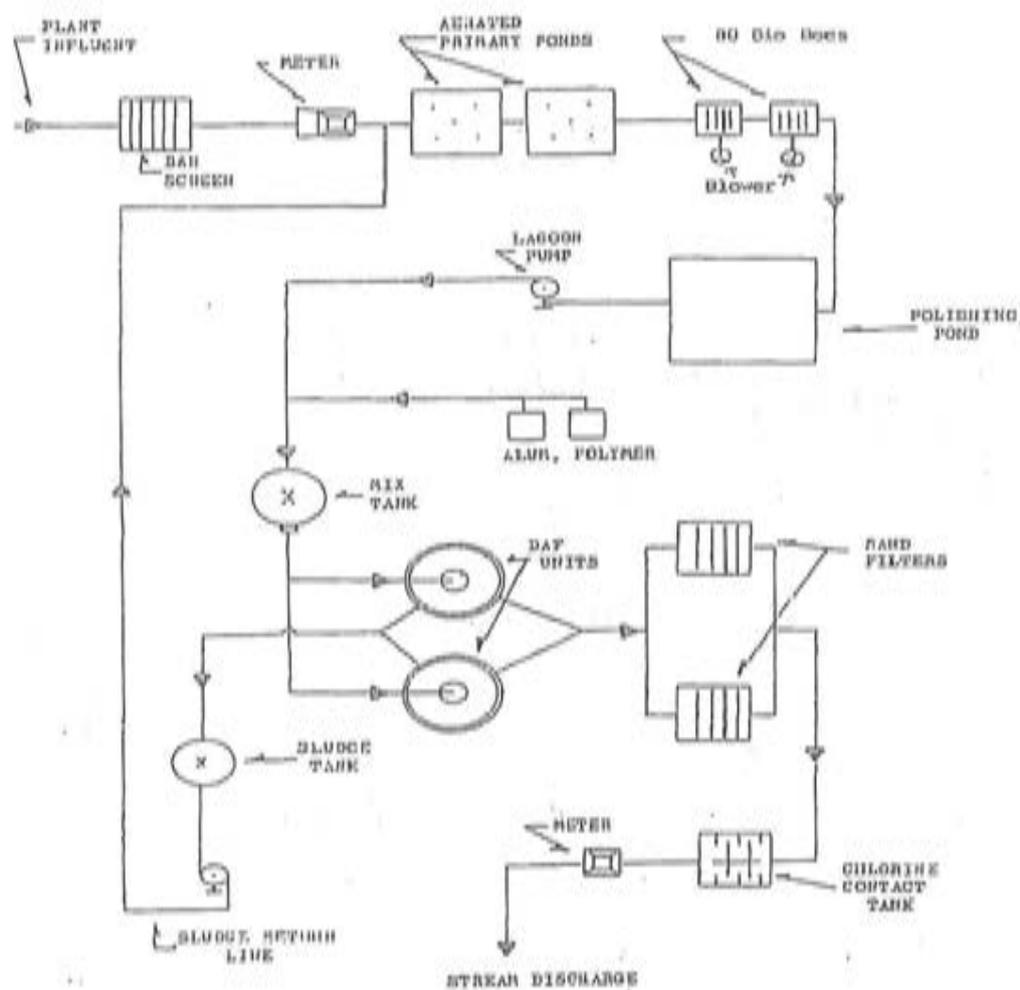
E2

Project: 00396.0002

D. Septage Generation

Individual homeowners' contract with private, PA DEP approved haulers to pump and dispose of septage generated from the on-lot septic systems. As noted above, there are seven (7) sewage holding tanks currently within the Township and these owners also contract with private approved haulers as noted. As per the previous Act 537 Plan update, the amount of septage generated is estimated at 2,000 gallons per home every three to five years. This figure is based upon the frequency of pumping and average liquid capacities of septic tanks throughout Honey Brook Township under current PA DEP regulation.

Waste Water Treatment Plant Process Flow Schematic



CHAPTER IV
FUTURE GROWTH AND LAND DEVELOPMENT

CHAPTER IV

FUTURE GROWTH AND LAND DEVELOPMENT

This Chapter is dedicated to an analysis of all existing and planned development in Honey Brook Township. Such an analysis is critical to understanding both near and long-term future needs of the Township. Additionally, the impact of PADEP's Chesapeake Bay Tributary Strategy is also likely to have a profound impact on the future needs of the Township. As with other Chapters in this Act 537 Base Plan update, the discussion will generally follow PADEP's *Plan Content and Environmental Assessment Checklist*.

A. Honey Brook Township Existing Land Use

The 2015 Honey Brook Township and Borough Multi-Municipal Comprehensive Plan serves as an update of the Borough's portion of the 1993 Honey Brook Township/ Honey Brook Borough Joint Comprehensive Plan, and as an update of the Township's 2006 Comprehensive Plan.

Honey Brook Township officials have been working hard over the past ten years to carry out many of the goals adopted in their 2006 Comprehensive Plan. These efforts included helping farmers and other landowners permanently protect productive crop and dairy farms and maintain an agrarian way of life for many township residents, including a significant Plain Sect community. In addition to supporting the Township's agricultural industry, these officials also accommodated new residential, commercial, and non-agricultural industrial land uses primarily within their Township's non-farming areas. During this same time, the Borough officials focused on revitalizing Horseshoe Pike (PA Route 322), our "Main Street", through extensive street, intersection, and sidewalk improvements, and accommodated new homes, businesses, and other uses within town that support local and regional needs.

The Community Goals and Objectives set forth in the Honey Brook Joint Comprehensive Plan, the land use policies of the Chester County Landscapes Policy Plan, and with consideration for the character of the Township, its various parts, and the suitability of

the various parts for particular uses and structures, and with the view to conserving the value thereof and encouraging the most appropriate use of land throughout the Township.

Nearly 80 percent of the Township is covered with the most productive, prime agricultural soils in the nation, and is used for crop-farming, small dairies and animal production, produce farming, and wholesale plant nurseries. The 40+ mile-long Brandywine River forms in the Township, with meandering headwater streams from the East and West Branches of the Brandywine River. The Township shall remain a predominantly agricultural community that surrounds a population hub offering various commercial and social activities with the establishment of a land preservation program, concentration of non-agricultural uses along specific portions of major arterials, betterment of current low-income housing areas, upgrading of all governmental and quasi-governmental facilities, reduction of non-local traffic in congested areas, and exploration of Township and Borough integration. Existing land use designations within the Township are presented on Map No. 12.

Outlined in the 2015 Comprehensive plan, the minimum area required for protected open space requirements in different zoning districts are demonstrated below:

Land Use	Percentage
RC- Resource Conservation District	50
FR – Farm Residential District	
Single-family detached dwelling without TDR	60
Single-family detached dwelling with TDR	40
R- Residential District	
Single-family detached dwelling without TDR	50
Single-family detached dwelling with TDR	35
Two-family detached dwelling without TDR	55
Two-family detached dwelling with TDR	40

MAP NO. 12
EXISTING LAND USE DESIGNATIONS



Elverson
Borough

Caernarvon
Township

Caernarvon
Township

West Nantmeal
Township

Honey
Brook
Borough

Salisbury
Township

West Cain
Township

West
Brandywine
Township

LAND USE DESIGNATION

- Agricultural
- Commercial
- Recreational
- Light Industrial
- Mining
- Residential Single-Family
- Residential Multi-Family
- Residential MHP
- Community Services
- Utility
- Parking
- Transportation
- Vacant
- Water
- Woodland

BASE FEATURES

- Local Roads
- State Roads
- PA Turnpike
- Streams
- Lakes and Ponds
- Tax Parcels
- Honey Brook Township
- Municipal Boundary



Act 537 Sewage Facilities Plan
Honey Brook Township,
Chester County, Pennsylvania

MAP NO. 12
**EXISTING LAND USE
 DESIGNATIONS**

Source:
 Base features are from Chester County GIS - downloaded February
 2016 <http://data1.chesco.opendata.arcgis.com/>
 Land Use Designations are from Delaware Valley Regional Planning
 Commission (DVRPC) "DVRPC's 2010 Land Use"
http://www.dvrpc.org/mapping/rp/DVRPC_2010_LandUse.zip

B. Honey Brook Township Zoning Ordinance

The current Township Zoning Ordinance recognizes specific types of land use, including resource conservation, agricultural, commercial, industrial, farm residential, residential and mixed residential. The Zoning Ordinance contains specific requirements for the use of certain types of sewage facilities depending on the zoning district. Factors such as lot size, slopes, proposed land use and density, and floodplains are noted in consideration of the requirements. The current Township Zoning Map is included as Map No. 13, entitled "Zoning District Map".

The following Zoning Districts are represented in the Ordinance:

Zoning District	Selected By-Right Uses	Minimum Lot Size	Intended Purpose
RC	Resource Conservation District	minimum gross lot size of greater than 10 acres	In providing opportunities for rural occupation uses, it is the Township's intent that any rural occupation shall be compatible with other existing and permitted uses on the property and within the surrounding neighborhood and zoning district(s)
A	Agricultural District	a minimum gross lot size of greater than 10 acres	Agricultural District is to encourage the preservation of large rural areas for agricultural, forest, and conservation purposes. In this district, which includes much of the Township's Class I, Class II, and Class III agriculturally productive soils, the purpose is to minimize incompatible land uses and manage their potential impacts on the district's agricultural and open lands.
MUD	Mixed Use Commercial District	a minimum lot size of 20,000 square feet	Commercial District provides reasonable standards for the orderly development of commercial and business uses and compatible residential uses, with the intent to assure that new or changed uses reflect and relate to the traditional, compact neighborhood commercial character and complementary residential uses adjacent to Honey Brook Borough and the Rockville area.
BID	Business Industrial District	a minimum lot size of 2 acres	Industrial District provides adequate sites for selected industrial, highway-oriented commercial, and office uses which are designed to prevent environmental problems and assure compatibility with other permitted uses within the Township

Zoning District	Selected By-Right Uses	Minimum Lot Size	Intended Purpose
NR	Neighborhood Residential District	a minimum lot size of 60,000 square feet	Farm Residential District is characterized by a mixture of low density residential and agricultural uses. It seeks to promote a continuation of the rural character and agricultural economy of the area, providing for the integration of compatible low density single-family residential development
MUR	Mixed Use Residential District	Minimum lot size without TDR 8,500 square feet and 5,500 square feet with TDR	Mixed Use Residential District seeks to provide for all types and densities of residential development, including various single-family and multi-family dwellings. Its location reflects suitable access, compatible existing residential development, proximity to neighborhood commercial uses, and the planned availability of public sewer and water facilities necessary for high-density development. Through these provisions, the Township's intent is to recognize and build upon the settlement patterns in the Rockville area.

C. **Limitations and Plans Related to Flood Plain, Stormwater Management and Special Protection**

Outlined in the 2015 Comprehensive plan, the minimum area required for protected open space requirements are demonstrated below:

- Wetlands
 - Consistent with the delineation requirements in Subsection 2 above, a wetland margin a minimum of 25 feet in width extending from the edge of the wetland boundary shall be required. Such margin shall be drawn on any subdivision or land development plan where required under Chapter 22 of zoning ordinance. No more than 20% of a wetland margin shall be regraded, filled, built upon, or otherwise altered or disturbed.
 - Wetland Margin and shall not be counted towards the 20% disturbance allowance:

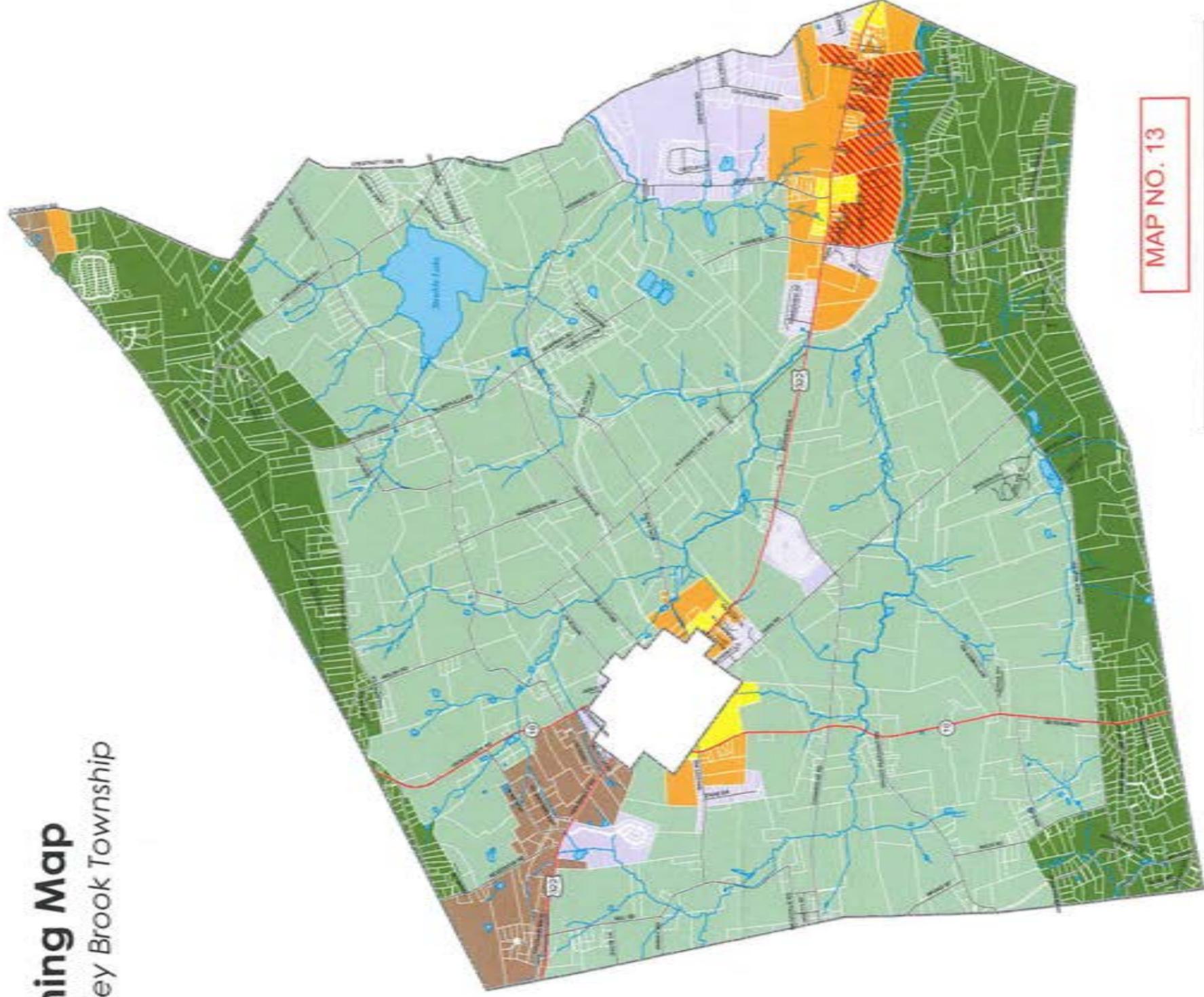
- Regulated activities permitted by the commonwealth (e.g., permitted stream or wetland crossing).
 - Unpaved trail access.
 - Selective removal of hazardous or invasive vegetative species.
 - Vegetation management in accordance with an approved landscape plan or open space management plan.
 - A soil or water conservation project approved by the Chester County Conservation District.
 - Timber harvesting shall only be permitted within the allowable 20% disturbance limitation and shall be restricted to selective cutting. Clear cutting or grubbing of trees is prohibited within the wetlands margin. Permitted timber harvesting shall be undertaken in accordance with the requirements in § 27-1306.
- Stormwater
 - The following shall be provided for all BMPs and conveyances (including any to be located on any property other than the property being developed by the applicant) by an O&M or other agreement or by otherwise establishing covenants, easements, deed restrictions, or by dedication to the municipality:
 - Permanent protection of the BMP or conveyance from disturbance or alteration.
 - Right of entry and access for the municipality for inspection and enforcement of this chapter (including § 20-903, Subsection 7) and any applicable O&M plan or O&M agreement.
 - Right of entry and access for the person owning the BMP or conveyance and responsible for fulfilling the O&M requirements when that person is not the municipality and is different from the owner of the property on which the BMP or conveyance is located.
- Open Space

- No individual segment of protected open space shall have an area less than one acre or 10% of the gross tract area, whichever is less, nor a width less than 150 feet at any point, except that the minimum area may be reduced to not less than 22,500 square feet and/or the minimum width may be reduced to not less than 15 feet where:
 - The land is being used solely as a trail connector between areas of open space and/or residential development; either on or adjacent to the tract.
 - The Board of Supervisors determines that, in specific locations, smaller and/or more narrow segments of open space better accommodate site design objectives and do not detract from the functional, recreational, and/or resource protection values of the overall open space area.

MAP NO. 13
ZONING DISTRICT MAP

Zoning Map

Honey Brook Township



MAP NO. 13

Legend

	Major roads		Agricultural District
	Roads		Business Industrial District
	Streams		Mixed Use - Residential District
	Water Bodies		Mixed Use - Commercial District
			Neighborhood Residential District
			Resource Conservation District
			Mobile Home Park Overlay District



Map prepared by: Marc D'Amico, Planning Consultant, Inc.
 Date: February 2018

D. Evaluation of Land-Use and Zoning VS. Public Sewer Service Areas

Implicit within the preparation of any Act 537 Plan is the review of public sanitary sewer service areas, whether that service is provided by a publicly owned system or by private facilities. As also discussed in other areas of this current Act 537 update, Honey Brook Township has devised public sewer service areas to incorporate existing and planned land use and development, and in consideration of the existing Township planning documents discussed above. The table below outlines the sanitary sewer service area and the zoning designations within the service areas:

Sanitary Sewer Service Area	Zoning Designation
West	MUR, NRD, BID
Suplee	A
Cupola	MUR, MCD, NRD, MHPOD
On-Lot Systems	RC, A

The current zoning designation areas are consistent with the Township's 537 planning. The future flow projections presented in this Chapter have been developed in consideration of the zoning designations and sanitary sewer service area designations.

E. Water Quality Designations

According to PA Code Title 25 Chapter 93, the current water quality designations for the receiving streams in Honey Brook Township as are follows:

Waterway	Segment	Chapter 93 Designation
Brandywine Creek	West Branch	HQ-TSF, MF
Two Log Run	Feeds into the west branch of the Brandywine creek	HQ-TSF, MF
Pequea Creek	Brandywine Creek	No designation for Pequea Creek.

TSF = Trout Stocking; MF = Migratory Fishes; WWF = Warm Water Fishes; HQ-WWF = High Quality Waters - Warm Water Fishes; Source: Chapter 93, Source: Water Quality Standards, PA Code Title 25, Chapter 93. PA Dept. of Environmental Protection

F. Existing Development and Sewage Usage

Honey Brook Township Public Service Area in 2017 had a total of 2,168 edus connected to the system of which approximately 760 edus are located in the Honey Brook Borough and 1,409 edus for Honey Brook Township. The annual average flow to the NCCMA Plant was 0.273 mgd with the three month maximum average flow was 0.311 mgd, which is below the rated capacity of 0.60 mgd.

The Approved Developments in the public sanitary sewer areas are as follows:

TPN	Name	Address	Type of Module	Proposed Development	DEP Code	Date Approved
22-10-35	Fisher Prop	95 Three Jos Lane	New LDP App Component 1	land development	1-15932-497-1	1/28/2011
22-4-58.2	Plewa Subdiv	1112 Talbotville Rd	New LDP App Component 1	subdivision	1-15932-494-1	12/28/2011
22-4-58.2	Plewa Subdiv	1112 Talbotville Rd	New LDP App Component 1	subdivision	1-15932-494-1	2/9/2011
22-4-45.5	Mark Stoltzfus Sbdv	530 Fieldstone	New LDP App Component 1	1-lot subdivision	1-15932-505-1	11/5/2012
22-4-45.5	Mark Stoltzfus Sbdv	530 Fieldstone	New LDP App Component 1	1-lot subdivision	1-15932-505-1	3/14/2013
22-4-45.5	Mark Stoltzfus Sbdv	530 Fieldstone	New LDP App Component 1	1-lot subdivision	1-15932-505A-1	10/1/2013
22-6-3	Elam Stoltzfus	6351 Emery Rd Narvon 17555	New LDP App Component 1	secondary dwelling	1-15932-515-1A	12/3/2013
22-3-46	Fisher Tract	803 Twin County Rd (for 651)	New LDP App Component 1	secondary dwelling	1-15932-522-1	12/17/2014
22-4-3.4	Gideon E Stoltzfus Jr Subdiv	723 Welsh Rd	New LDP App Component 1	1-lot subdivision	1-15932-158-1	12/4/2014
22-10-9	1235 Beaver Dam Rd (Omar)	1235 Beaver Dam Rd	New LDP App Component 1	new home construction	1-15932-532-1	10/26/2015
22-9-27.3	Marlin King Subdiv	40 King Rd	New LDP App Component 2 - Res	1-lot subdivision	1-15932-491-2L	7/19/2010
22-3-59	Carl L Martin Property	5224 Horseshoe Pk	New LDP App Component 2 - Res	new home construction	1-15932-500-2L	9/20/2011
22-8-8.4	Margaret Faulkner Subdiv	58 Dampman	New LDP App Component 2 - Res	4-lot subdivision	1-15932-513-2L	5/30/2014
22-6-7	Levi King Residence	295 Old Pequena La	New LDP App Component 2 -	secondary dwelling	1-15932-524-2L	3/13/2015

TPN	Name	Address	Type of Module	Proposed Development	DEP Code	Date Approved
			Res			
22-6-8	Riemar Real Estate LP	5010 Horseshoe Pk	New LDP App Component 3 - Com	new commercial bldg.	1-15932-517-3J	4/10/2015
22-6-8.4	The King Tract (Horseshoe Pk)	5002 Horseshoe Pk	New LDP App Component 3 - Res	new home construction	1-15932-527-3J	4/10/2015
22-8-52	Poplar Realty LP	Grieson & Chestnut Tree Rds	New LDP App Component 3 - Res	128-unit subdivision	1-15932-519-3J	9/1/2015
22-3-64.2	Sweetwater Properties	5051 Horseshoe Pk	Exemption Request	commercial Land Devel	1-15932-498-3J	denied 1/10/2011
22-3-59	Carl L Martin Property	5224 Horseshoe Pk	Exemption Request	new home construction	1-15932-500-2L	denied 3/16/2011
22-3-11.1A	Pleasant View Welding	5177 Horseshoe Pk	Exemption Request	new commercial bldg.	1-15932-504-E	exempted 9/21/2011
22-3-11.1B	September Farm	5287 Horseshoe Pk	Exemption Request	new commercial bldg.	1-15932-510-3J	denied 4/5/2012
22-8-52	Poplar Realty LP	Grieson & Chestnut Tree Rds	Exemption Request	128-unit subdivision	1-15932-519-3J	9/1/2015
22-3-69	Westbrook IP LLC	176 Westbrooke Dr	Exemption Request	new commercial bldg.	1-15932-525-3J	8/19/2014
22-3-64	Swampy Hollow Mfg	16 Westbrooke Dr	Exemption Request	new commercial bldg.	1-15932-528-3J	1/20/2015
22-3-73	Ivan & Anna Mae Stoltzfus	1094 Twin County Rd	Exemption Request	lot line change	1-15932-531-X	waived 6/22/2015
22-3-79 & 22-3-80	Riehl Land LP	96 & 136 Westbrooke Dr	Exemption Request	lot line change	1-15932-530-X	waived 5/22/2015
22-4-14	Fieldstone Amish School	800 Welsh Rd	Exemption Request	new school	1-15932-535-X	waived 6/7/2016
22-3-79 & 22-3-80	Riehl Land LP	96 & 136 Westbrooke Dr	Exemption Request		1-15932-543-X	waived 12/20/2016
22-4-33.1	Daniel Stoltzfus	779 Talbotville Rd	New LDP App Component 1	new home construction	1-15932-533-1	3/22/2017
22-3-79 & 22-3-80	Riehl Land LP	96 & 136 Westbrooke Dr	New LDP App Component 3 - Com		1-15932-544-3J	6/30/2017

TPN	Name	Address	Type of Module	Proposed Development	DEP Code	Date Approved
22-8-31	Ford/Olsen land development	3041 Horseshoe Pk	Exemption Request	new commercial bldg.	1-15932-536-E	exempted 6/28/2016
22-3-75.5A	Westbrook IP LLC (Westbrooke Drive Extension)	170, 174, 178, & 182 Westbrooke Dr	New LDP App Component 3 - Com	4-lot subdivision	1-15932-544-3J	6/30/2017
22-11-35	Stacey RV Park	308 Gooseberry La	New LDP App Component 2 - Com	RV Park	1-15932-554-2LN	pending submittal
22-10-10.1	Tel Hai Cherry Drive	14-33 Cherry Dr	Exemption Request	minor redevelopment	1-15932-546-X	waived 3/24/2017
22-8-7	Mike France/Karyn Jones subdivision	265 North Birdell/339 Grandview Ci	Exemption Request	1-lot subdivision	1-15932-547-X	waived 5/23/2017
22-3-50	Melvin S. Stoltzfus	1063 Twin County Road	Exemption Request	secondary dwelling	1-15932-540-2	pending
22-11-73	Sam King	434 Beaver Dam Rd	Exemption Request	new home placement	1-15932-545-X	waived 3/17/2017
22-9-19.TB A	Elmer Beiler	2025 Compass Rd	New LDP App Component 2 - Res	1-lot subdivision	1-15932-548-2L	4/9/2018
22-8-10	Greg & Patricia Lukas	310 Dampman Rd	Exemption Request	secondary dwelling	1-15932-550-X	waived 8/11/2017
22-2-10.1A	Fay Wolverson	330 Township Line Rd	Exemption Request	secondary dwelling		pending submittal
22-8-94	Reuben Stoltzfus	582 Icedale Rd	New LDP App Component 1	new home construction	1-15932-541-1	5/15/2018
22-10-14.4	Stevie Lapp	2840 Compass Rd	New LDP App Component 1	new home construction	1-15932-549-1	pending

G. Projected Capacity Requirements (EDU's) for Undeveloped Lands within Proposed Sewer Service Areas

This 537 Plan Update performed a detailed study of the existing and projected flows was performed on the sewer service districts to evaluate the projected sewage flows and determine if the projects listed in the previous 537 Plan were current. Each sewer district was evaluated based on the available acreage that was potentially developable, taking the following criteria into consideration for the study which takes into account the new Zoning of September 2018:

1. No Redevelopment was considered in the Service Area.
2. Only undeveloped and under developed lots were considered.
3. 75% of "Gross" acreage was considered as "Net" Acreage.
4. 65% of "Gross" acreage was considered as "Net" acreage on properties bisected by Streams.
5. 80% of "Net" acreage was considered available for residential building lots.
6. Only Single Family Detached dwellings Bulk and Area requirements were evaluated for non commercial lands.
7. FR District was assumed 1 acre/dwelling unit and $\frac{3}{4}$ acre / dwelling unit w/TDR.
8. R District was considered $\frac{3}{4}$ acre/ dwelling unit and $\frac{1}{2}$ acre / dwelling unit w/TDR.
9. MUR District was considered 8,500 sf/ dwelling unit and 5,500 sf/ dwelling unit w/ TDR.
10. Commercial was evaluated at 50% impervious cover and 60% impervious cover w/ TDR.

The following table outlines each sewer service district flow projections based on the above outline criteria.

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (65% OF GROSS AREA BIASECTED BY STREAM)	ZONING DISTRICT	PROJECTED EDU(S) (WITHOUT TDR)	PROJECTED EDU(S) (WITH TDR)	PROJECTED FLOWS (1EDU= 250 GPD; WITHOUT TDR)	PROJECTED FLOWS (1EDU= 250 GPD; WITH TDR)
SUPLLEE SEWER DISTRICT										
50	22-7-57	Vacant- Limited Potential	2.8	2.1	-	A	2	2	394	525
51	22-7-60	Vacant	65.71	49.2825	-	A	37	49	9,240	12,321
52	22-4-101.4	Developed	2.31	1.7325	-	A	-	-	-	-
53	22-4-101.3	Developed	1.74	1.305	-	A	-	-	-	-
54	22-4-116	Developed	1.94	1.455	-	A	-	-	-	-
Identified in Green on Overall Plan	-	Suplee Village - Existing Residences	-	-	-	A	29	-	7,250	7,250
Identified in Green on Overall Plan	-	Dumpman Road - Existing Residences	-	-	-	A	49	-	12,250	12,250
57	22-8-8.2	New Office for Sewer Authority	2.8	2.1	-	A	2	2	394	525
	22-8-9		13.6	10.2	-	A	8	10	1,913	2,550
Shore Line Area - Identified in Green on Overall Plan	-	Shore Line & Lake View Drive - Existing Residences	-	-	-	A	95	95	23,750	23,750
Totals			90.9	68	0	-	126	159	55,190	59,171

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (65% OF GROSS AREA BISECTED BY STREAM)	ZONING DISTRICT	PROJECTED EDU(S) (WITHOUT TDR)	PROJECTED EDU(S) (WITH TDR)	PROJECTED FLOWS (1EDU= 250 GPD IMPERVIOUS COVER; WITHOUT TDR)	PROJECTED FLOWS (1EDU= 250 GPD IMPERVIOUS COVER; WITH TDR)
WEST SEWER DISTRICT										
1	22-6-8	Ricmar Real Estate LP, Hoover - Under construction, approved 9 Edus/ connected	17.67	-	11.5	BI	-	-	-	-
2	22-6-40	Vacant Land	6.7	5.025	-	MUC	3	4	754	905
3	22-7-65	Frame - Vacant Land	38.1	28.575	-	MUC	17	21	4,286	5,144
4	22-7-33.1	Vacant Land	1.8	1.35	-	MUC	1	1	203	243
5	22-7-45	Vacant Land	29.7	22.275	-	MUC	13	16	3,341	4,010
6	22-7-38	Vacant Land	4	3	-	MUC	2	2	450	540
7	12-4-71.1	Vacant Land	1.54	1.155	-	MUC	1	1	173	208
8	22-4-183	Borough handles the sewage flow	2.43	1.8225	-	A	-	-	-	-
9	22-3-11.2	Vacant Land	3.8	2.85	-	BI	2	3	556	684
10	22-3-11.3	Vacant Land	9.04	6.78	-	BI	5	7	1,322	1,627
11	22-3-11.1B	September Farm Restaurant - developed	8.75	6.5625	-	BI	-	-	-	-
12	22-3-64	Swampy Hallow Manufacturing - under construction	3.5	2.625	-	BI	2	3	512	630

13	22-3-78	Swampy Hollow Manufacturing - under construction	3.1	2,325	-	BI	2	2	453	558
14	22-3-79	Riehl Land - Proposed Development	3	2,25	-	BI	2	2	439	540
15	22-3-80	Vacant Land	3.22	2,415	-	BI	2	2	471	580
16	22-3-64.2	Sweet Water Diner - developed	2.2	1.65	-	BI	-	-	-	-
17	22-3-69.6	Vacant Land	9.3	-	6.045	BI	5	6	1,179	1,451
18	22-3-73.2	Vacant Land	6.8	-	4.42	A	3	4	829	1,105
19	22-3-73	Vacant Land	3.3	2,475	-	A	2	2	464	619
20	22-3-75.5	Benco - No Development Planned	38.01	28,5075	-	BI	22	27	5,559	6,842
21	22-6-15	Flood Plain - No Development	12.14	9,105	-	A	-	-	-	-
22	22-3-6	Landfill	75.6	56.7	-	BI	-	-	-	-
55	22-7-49.1	Honeybrook Estates - 37 Single Family Homes	12.0	9.0	-	A	37	37.0	9,250	9,250
Honey Brook Borough Boundary	12-1-19 and 12-1- 20	Vacant Land / Portion of 12-1- 20 has been developed as apart of HBT	2.5	1,875	-		2	3	469	625
Honey Brook Borough Boundary	12-2-29 and 12-2- 30.1	Badis, Undeveloped	0.58	0,455	-		0.4	1	109	145
Honey Brook Borough	12-2- 127.2	Partially Developed / Limited	6.9	5,175	-		5	7	1,294	1,725

Boundary	Potential												
Honey Brook Borough Boundary	12-4-71.1	Vacant Land	1.54	1.155	-			1	2	289		385	
Honey Brook Borough Boundary	12-2-138	Hardware Store, burned down, potential redevelopment	2.29	1.7175	-			2	2	429		573	
Honey Brook Borough Boundary	12-2-177.2	Vacant Land	0.36	0.27	-			0.27	0.36	68		90	
Honey Brook Borough Boundary	12-1-18	Farm Land, same owner as 22-6-7	2.3	1.725	-			2	2	431		575	
Honey Brook Borough Boundary	12-3-1	Farm House, Ag Land, Same Owner as 22-6-6	9.8	7.35	-			7	10	1,838		2,450	
Honey Brook Borough Boundary	12-3-32	Parking Lot/Storage	11.1	8.325	-			8	11	2,081		2,775	
Honey Brook Borough Boundary	12-4-3	Vacant Land	24.23	18.1725	-			18	24	4,543		6,058	
Honey Brook Borough Boundary	12-4-4	Waynebrook, 20 homes remaining to be constructed	2.49	1.8675	-			2	2	467		623	

Honey Brook Borough Boundary	12-4-51	Vacant Land	1.4	1.05	-		1	1	197	350
56	22-7-92	Golf Course	139.3	-	90,545	A	9	-	2,250	2,250
58	22-3-9	Agricultural Fields	4.77	3,5775	-	A	3	2	671	503
59	22-3-1	Agricultural Fields	30	-	19.5	BI	15	19	3,803	4,680
60	22-3-9.1	Agricultural Fields and Pond	30	-	19.5	BI	15	19	3,803	4,680
61	22-3-9.11	Existing Building And Agricultural Fields	11.33	8.49	-	BI	7	8	1,656	2,038
62	22-3-12	No Potential Development	4.5	-	-	BI	1	1	250	250
63	22-3-14	Residential House, No Potential Development	1.07	-	-	BI	1	1	250	250
64	22-3-15	Residential House, No Potential Development	1.77	-	-	BI	1	1	250	250
65 - Zook Drive	23-3-19.1	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
	23-3-19.1b	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
	23-3-19.1a	Residential House, No Potential Development	-	-	-	BI	1	1	250	250

22-3-19	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-19.2	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.2	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.3	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.4	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.5	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.6	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.8	Residential House, No Potential Development	-	-	-	BI	1	1	250	250
22-3-9.9	Residential House, No Potential Development	-	-	-	BI	1	1	250	250

22-3-9-10	Residential House, No Potential Development	-	-	BI	1	1	250	250	
Totals		583.93	258	151	-	235	269	58,635	69,457

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (65% OF GROSS AREA BISECTED BY STREAM)	ZONING DISTRICT	PROJECTED EDU(S) (WITHOUT TDR)	PROJECTED EDU(S) (WITH TDR)	PROJECTED FLOWS (1EDU= 250 GPD IMPERVIOUS COVER; WITHOUT TDR)	PROJECTED FLOWS (1EDU= 250 GPD IMPERVIOUS COVER; WITH TDR)
CUPOLA SEWER DISTRICT										
23	22-8-83.1	Vacant- limited potential	0.9	0.7	-	MUR	-	-	-	-
24	22-8-83.1A	Vacant- limited potential	1.2	0.9	-	MR	-	-	-	-
		Development potential	133.8	-	87.0	MUR	87.0	65.0	21,750	16,250
25	22-8-53					MUR	252.0	378.0	63,000	94,500
26	22-8-33	Vacant- Flood hazard, limited potential	21.7	16.2	-	MUR	62.4	96.5	15,602	24,113
	22-8-16	Vacant	15.8	11.9	-	NR	8.9	6.7	2,222	1,666
28	22-8-6	Vacant	19.7	14.8	-	MUR	56.8	87.8	14,197	21,941
29	22-8-5	Vacant	1.0	0.8	-	MUR	-	-	-	-
30	22-8-71	Stormwater basin - limited potential	3.8	2.9	-	NR	-	-	-	-
	22-8-81	Egan Mobile Home Park	56.5	42.4	-	MUR	162.9	251.7	40,717	62,927

32	22-8-87	Wooded - owned by Sunoco, no development	28.6	21.5	-	MUR	-	-	-	
33	22-8-68.5	2351 Chestnut Tree Road - Proposed 154 dwelling units	43.0	-	-	MUR	154.0	154.0	5,250	
34	23-6-16.3	Hammell-O'Donnell Business Park (Projected Sewage Flows were provided by Hammell-O'Donnell)	12.2	9.1	-	An Industrial Park is Proposed	-	-	-	
35	23-6-16		109.3	82.0	-					
36	23-6-16.2		7.7	5.8	-					
37	23-6-16.4		5.1	3.9	-					
38	23-6-16.5		4.4	3.3	-					
39	29-1-1		3.6	2.7	-					
40	29-1-1.2		2.6	2.0	-					
41	29-1-1.3		1.1	0.9	-					
42	29-1-1.4		2.0	1.5	-					
43	23-6-14.1		7.7	5.8	-					
44	23-6-14	86.9	65.2	-	-	-	-	-	-	
45	22-8-65.1F	Vacant	8.3	6.2	-	FR	4.7	3.5	1,167	875
46	22-8-65.1	Vacant	10.0	7.5	-	FR	5.6	4.2	1,406	1,055
47	22-8-64.1	Vacant	60.9	-	39.6	FR	29.7	22.3	7,422	5,567
48	22-8-52	Tabas Track - 128 Single Family Home Development	125.0	93.8	-	FR	70.3	52.7	17,578	13,184
49	22-8-52.1	Vacant - limited potential	12.0	9.0	-	FR	6.8	5.1	1,688	1,266
Totals			784.82	410.34	126.56	-	901.00	1,127.37	222,000	287,343

Utilizing these criteria allowed the Township to determine the potential flows that could be generated from the undeveloped land. If there was once a proposed development listed for a parcel which didn't obtain final plan approval, the criteria allowed for potential sewage flows to be calculated for that parcel. During this process, to remain consistent with the current Township Zoning and planning efforts, the Rocklyn Station zoning overlay, the WNT LI District, Hammell (Phase I & II) and Tel Hai were removed from the public sanitary sewer service area. The Rocklyn Station was a conceptual zoning overlay outlined in the 2010 537 Plan which was not implemented therefore removed. The WNT LI District is the landfill located outside the Township boundaries and the landfill has approached the NCCMA Treatment Plant if they could process leachate from the land fill. The NCCMA Treatment Plant would not be able to process leachate due to the high levels and it was determined by NCCMA not to service the landfill. Therefore, the WNT LI District was removed Honeybrook Township Public Sanitary Sewer Service Area. The Hammell (Phase I & II) is also located outside the Township boundaries; however the developer has worked with the Township to set up an intermunicipal agreement to service this project's sewer needs of 30,000 gpd. The Tel Hai is currently being serviced by a functioning wastewater treatment with stream discharge. As the system is operational and functioning, the Township will not provide public sewer to this development.

The following table provides a schedule of connections for the projects listed above within each of the sewer districts:

SCHEDULE OF CONNECTIONS				
SERVICE AREA	FUTURE			
	0 TO 5 YEARS	5 TO 10 YEARS	10 TO 15 YEARS	15 TO 20 YEARS
West Sewer District	68	67	67	67
Cupola Sewer District	282	282	282	281
Suplee District	40	40	40	39
TOTAL CONNECTIONS	390	389	389	387

Based on a flow projection analysis, the NCCMA WWTP has sufficient disposal capacity to service the expansion of Honey Brook Township public sanitary sewer areas without creating an organic or hydraulic overload to the system within the next ten years.

E. Future Growth and Population Projections

According to the most recent Census, Honey Brook Township had a population of 1,746 persons in 2010, which represents an increase of 73.7% in population from 1,287 persons in 2000. According to the 2010 Census, the median age is 37.6 years, with 49.3% of the population between the ages of 25 to 64 years.

CHAPTER V
IDENTIFICATION OF ALTERNATIVES

CHAPTER V

ALTERNATIVES FOR IMPROVED WASTEWATER FACILITIES

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient discharge requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP.

Herbert, Rowland & Grubic, Inc. (HRG) is the consulting engineers for the NCCMA prepared an evaluation of the existing NCCMA WWTP. This analysis was conducted to determine the existing conditions of the WWTP and evaluate increasing the permitted hydraulic capacity from 0.600 MGD to 0.740 MGD. HRG Act 537 WWTP Evaluation is attached in Appendix C and the alternatives are summarized below.

The original WWTP was permitted for an average daily flow (ADF) of 0.600 MGD and currently operates under this design hydraulic capacity. The treatment plant was designed as an aerated lagoon system followed by tertiary filtration (dissolved air flotation and sand filters). Disinfection is provided by gas chlorination. As originally designed, the WWTP relied solely upon the lagoons biological processes for removal of ammonia nitrogen. Due to the inability to adequately maintain biological treatment in cold weather, previous upgrades to the WWTP included the installation of 80 fixed film contactors, trade named "Bio₂ Bloes", and the required ancillary equipment within the tertiary lagoons in an effort to address this issue. Since their installation, the plant has had success in reducing their ammonia nitrogen limits for the majority of the year. Despite this success, the WWTP still has some difficulties in January and February due to the higher flows and colder water temperatures that occur during these months resulting in cold weather nitrification issues.

The current NPDES Permit has established effluent nutrient limits for Ammonia-Nitrogen, Total Nitrogen, and Total Phosphorus. These effluent limits are provided in Table below:

NCCMA NPDES Effluent Nutrient Limits						
Parameter	Mass Units (lbs/day)		Concentration (mg/L)			
	Avg Month	Weekly Avg	Inst. Max	Avg Month	Weekly Avg	Inst Max
Ammonia-Nitrogen May 1- Oct 31	13.5	XXX	XXX	2.7	XXX	5.4
Ammonia-Nitrogen Nov 1- Apr 30	40.5	XXX	XXX	8.1	XXX	16.2
Total Nitrogen	144.1	XXX	XXX	28.8	XXX	57.6
Total Phosphorus Apr 1- Oct 31	9.0	XXX	XXX	1.8	XXX	3.6
Total Phosphorus Nov 1 - Mar 31	10.0	XXX	XXX	2.0	XXX	4.0

HRG reviewed the Discharge Monitoring Report (DMR) data from July, 2014 through August, 2017 to establish the performance of the lagoons with respect to nitrogen and phosphorus removal. Phosphorus removal through the system appears to be stable and the plant is able to consistently achieve permit compliance throughout the year. On average, the effluent total phosphorus discharge is 75% of the permitted capacity.

Nitrogen removal throughout the WWTP is variable and is highly dependent on seasonal temperature conditions. Extrapolation of the DMR data (from 2013-2017) indicates the WWTP achieves an effluent ammonia concentration (mg/L) that is below half of the permitted limit greater than 66% of the time. The effluent ammonia mass loading (lbs) is below half of the permitted limit greater than 72% of the time. Permit exceedance for ammonia have historically occurred during the winter months, when the water temperature drops below 5 degrees Celsius and thereby inhibiting the nitrification process.

Two alternatives were evaluated for the upgrade to the existing NCCMA WWTP to handle the projected average daily design flow of 0.74 MGD and maintain compliance with anticipated NPDES effluent permit limits. The two (2) major alternative options that were considered as part of this Act 537 study include:

1. Alternative No. 1- Lagoon Retrofits.
2. Alternative No. 2 - Conventional Systems

Alternative No. 1 considered the option of retrofitting the existing lagoons with proven technologies that would allow for the continued use of the lagoon system for biological treatment. Alternative 2 considered the option of abandoning the existing lagoon treatment processes and replacing them with a conventional activated sludge system for biological treatment.

For each specific alternative, multiple options/processes were considered based on current available technologies. These options were reviewed based on the following merit: system performance, process flexibility, familiarity with regional and national installations, and project cost. The table below summarizes the alternatives considered as part of this evaluation:

Alternative	Description	Manufacturer	Process
Alternative 1A	Lagoon Retrofit	LEMNA Technologies	Aerated Lagoon/Fixed Film
Alternative 1B	Lagoon Retrofit	Triple Point Environmental	Aerated Lagoon/Fixed Film
Alternative 1C	Lagoon Retrofit	Krugar	Aerated Lagoon/Fixed Film
Alternative 1D	Lagoon Retrofit	Nelson Environmental	Aerated Lagoon/Fixed Film
Alternative 1E	Lagoon Retrofit	ADS	Aerated Lagoon/Fixed Film
Alternative 2A	Conventional System	Krugar	Activated Sludge (Sequencing Batch Reactor-SBR)

Alternative	Description	Manufacturer	Process
Alternative 2B	Conventional System	Sanitaire	Activated Sludge (Continuous Flow SBR - CSBR)
Alternative 2C	Conventional System	Dutchland Inc.	Activated Sludge (Oxidation Ditch)
Alternative 2D	Conventional System	Biolac	Activated Sludge

A detailed summary of the analysis for each alternative is included in the sections below.

ALTERNATIVE 1 - LAGOON RETROFITS

The following items should be considered as part of any lagoon retrofit alternative:

1. Headworks screening of less than (1/8) inch may be required for fixed film systems.
2. The existing polishing lagoon shall remain in service and continue to function as flow equalization.
3. The WWTP can still remain in operation 5 days a week.
4. The ability to maintain the lagoons at the minimal temperature required to achieve complete nitrification and the ability to control the kinetics of the nitrification reactor.
5. The existing tertiary process (DAF tanks and sand filters) would remain in operation to provide total phosphorus (TP) and total suspended solids (TSS) removal.
6. Due to the age of the dissolved air flotation (DAF) tanks, refurbishing of these DAF tanks should be considered.
7. Additional sludge removal may be required from the existing lagoons prior to any new work.
8. It is recommended that submerged diffusers be inspected and cleaned on an annual basis.

9. Upgrading the size of the existing generator may be required.
10. Prior to the final selection and preliminary design of a lagoon treatment technology, it is recommended to schedule site visits to existing installation(s) of comparable size and treatment performance to gather information from plant operators on the performance and ease of operation of each system being considered. This is a critical step to compare the performance and operation data that is typically provided by the manufacturer during the conceptual design phase.
11. The consideration of a phased approach to retrofitting the lagoons shall be part of the selection process of any lagoon based treatment technology. This is critical to determine if there is more cost effective way to retrofit the lagoons to address the current cold weather nitrification issues.

Each Alternative 1 option was evaluated based on the consideration of the following parameters; Construction; Treatment; and Operation and summarized below:

Alternative 1A – LEMNA System (BOD Removal and Nitrification)

Construction

In this alternative, the existing primary lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. Baffles would be installed in the primary lagoon to create a new high rate biological treatment zone, minimize short circuiting and improve contact time. The tertiary lagoon would be converted to settling ponds prior to the installation of a new polishing reactor (for nitrification). The primary and tertiary lagoons would be covered to reduce the heat loss of the wastewater. This design would allow for 1 primary and 1 tertiary lagoon to be taken off line. A new fixed film polishing reactor would be constructed for nitrification.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).
- c. Converting the tertiary lagoon into a settling pond.
- d. Modifications to the current lagoon system flow path and process piping.

Nitrification - This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Installing covers on the primary and tertiary lagoons for improved heat retention.
- b. Installation of a new fixed film polishing pond reactor. The polishing reactor is an up-flow, attached-growth reactor that provides supplemental BOD and ammonia nitrogen removal. Using attached-growth media technology, the polishing reactor enhances the growth of nitrification bacteria that biologically oxidize ammonia in an aerobic environment. This new reactor shall be installed in a precast, concrete tank and include a diffused aeration system.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warrant a process guarantee.
- c. Operators will need to work around the covers when servicing diffusers or removing sludge from the lagoons.
- d. The settling pond would be constructed to accumulate the sludge generated in the aerated lagoon treatment process. The cover on this lagoon would need to be removed when removing sludge.

Alternative 1A Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
1A	Lemna	\$7,269,000	\$84,000	\$1,117,000	\$8,386,000	2040	\$4,110.78

Based on the funding analysis for Alternative 1A, the total annual user fee per edu would be \$759 for a PENN VEST. The table below summarized the analysis.

Alternative	Amount Financed by Loan	Interest Rate % ¹	Term (years)	Annual O&M Cost per EDU	Annual Financing Debt Service per EDU	Total Annual User Fee per EDU	Total Interest Over Term of Loan
PENN VEST FINANCING							
1A	\$7,269,000	1.743	20	\$535	\$224	\$759	\$2,153,249
USDA FINANCING							
1A	\$7,319,000	3.5	40	\$535	\$177	\$712	\$7,111,690

¹ Blended rate at 1.743% for years 0-5 / 2.197% for year 6-20

Based on the results of the preliminary funding analysis, NCCMA would consider moving forward with applying for PENN VEST financing, as this option would significantly reduce the total interest over the term of the loan as compared to the USDA Financing option.

Alternative 1B – Triple Point Environmental (BOD Removal and Nitrification)

Construction

In this alternative, the existing primary lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The tertiary lagoons could be abandoned in lieu of the construction of a new MBBR reactor for nitrogen removal. Effluent from the new reactor will flow to the polishing pond for further clarification.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).

Nitrification - This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Installation of new fixed film polishing pond reactor. The polishing reactor is an up-flow, attached-growth reactor that provides supplemental BOD removal and ammonia nitrogen. Using attached-growth media technology, the polishing reactor enhances the growth of nitrification bacteria that biologically oxidize ammonia in an aerobic environment. This new reactor shall be installed in a precast, concrete tank and include a diffused aeration system.
- b. The reactors are covered with floating insulated covers to mitigate heat loss and the media is kept in the tank with stainless steel sieves.
- c. The reactor also contains a thermal system to provide supplemental heat (energy provided by electricity, propane or natural gas) to keep the reactor above 5 degrees centigrade.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warrant a process guarantee.

- c. Operators will need to work around the covers when servicing diffusers or removing sludge from the lagoons.

Cost

The cost for Alternative 1B is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
1B	Triple Point Environmental	\$7,643,000	\$89,000	\$1,184,000	\$8,827,000	2040	\$4,326.96

Based on the funding analysis for Alternative 1B, the total annual user fee per edu would be \$770 for a PENN VEST. The table below summarized the analysis.

Alternative	Amount Financed by Loan	Interest Rate % ¹	Term (years)	Annual O&M Cost per EDU	Annual Financing Debt Service per EDU	Total Annual User Fee per EDU	Total Interest Over Term of Loan
PENN VEST FINANCING							
1B	\$7,643,000	1.743	20	\$535	\$235	\$770	\$2,264,037
USDA FINANCING							
1B	\$7,693,000	3.5	40	\$535	\$186	\$721	\$7,475,096

¹ Blended rate at 1.743% for years 0-5 / 2.197% for year 6-20

Based on the results of the preliminary funding analysis, NCCMA would consider moving forward with applying for PENN VEST financing, as this option would significantly reduce the total interest over the term of the loan as compared to the USDA Financing option.

Alternative 1C – Krugar (Nitrification Only)

Construction

In this alternative, the existing NCCMA lagoons would remain in service and be used for BOD and TSS removal. No modifications to the existing lagoon aeration system would be required. This alternative would include the construction of one (1) new process train composed of one (1)

MBBR reactor with media for nitrification. Suspended solids in the MBBR reactor effluent will require removal by clarification or filtration to meet effluent BOD and TSS limits. The existing DAF tanks and sand filter would remain on line to ensure adequate TP and TSS removal.

Treatment

BOD Removal – This alternative does not consider modifications to the existing lagoon BOD and TSS removal process. This alternative assumes that the existing lagoon system has the ability to reduce BOD and TSS to 40-50 mg/L prior to entering the new MBBR reactor.

Nitrification - This alternative is designed to provide nitrification only, and will be designed to achieve permit compliance with the current seasonal ammonia limits. If in the future it becomes necessary to achieve full nitrification (effluent ammonia less than 1.0 mg/L), a second MBBR nitrification reactor will need to be added downstream of the first reactor. Full nitrification would be required in achieving a future effluent TN limit of 6.0 mg/L.

Operation

This alternative will require influent screening with a maximum of 3 mm (1/8 inch) openings. This MBBR processes is a continuous flow through, non-clogging biofilm reactor containing media with a high specific surface area. The media does not require backwashing or cleaning. The mixing of the MBBR media within the reactor is provided by a medium bubble aeration system in aerobic applications. Mixers are used in anoxic environments for denitrification.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
IC	Krugar ¹	NA	NA	NA	NA	2040	NA

Alternative 1D – NELSON (BOD Removal and Nitrification)

Construction

In this alternative, the existing primaries and polishing pond lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The first primary lagoon would be baffled to improve nitrogen removal by including an anoxic zone. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warranty a process guarantee. The 2 tertiary lagoons would stay on-line. Following the existing polishing pond, four (4) new submerged attached growth rock filters would be constructed for nitrification and BOD/TSS polishing. A new pumping station would likely be required to transfer effluent from the new submerged rock filter back to the exiting tertiary treatment process and chlorine contact basin.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon surface aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).
- c. Modifications of the current lagoon system flow path and process piping will be required.

Nitrification - This alternative would require upgrading the existing lagoon system with the following components:

- a. Baffling the first primary lagoon and creating a new anoxic zone.
- b. Installation of new surface mixer in the anoxic zone.
- c. Installation of 4 new submerged attached growth rock filters with a diffused air system. The submerged attached growth rock filter would include a direct burial diffused aeration system to provide the oxygen required for nitrification and ensure that wastewater channeling cannot occur in the gravel layer.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. Addition of a pumping station required to transfer effluent from the new submerged rock filter back to the exiting tertiary treatment process.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
ID	Nelson	\$7,797,000	\$79,000	\$1,051,000	\$8,848,000	2040	\$4,337.25

Alternative 1E – ADS (BOD Removal and Nitrification)

Construction

In this alternative, the existing primaries and polishing pond lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The polishing pond lagoon would be baffled to maximize treatment performance. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warranty a process guarantee. The two (2) tertiary lagoons would need to be taken off line and dredged to allow for the installation of the new rock filters.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon surface aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with 132 ADS submerged disk modules.

- b. Atmospheric air shall be provided to the diffused aeration system by two (2) blowers and two (2) compressors (1 running, 1 standby).
- c. Modifications of the current lagoon system flow path and process piping will be required.

Nitrification - This alternative would require upgrading the existing lagoon system with the following components:

- a. Converting the existing tertiary lagoons 1 and 2 into aerated rock filters.

Operation

The following recommendation shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. Addition of a floating cover over the second half of cell 3 (in polishing Lagoon) to block sunlight and minimize algal growth, which will further reduce TSS concentrations.
- c. Addition of a recirculation system to bring treated effluent water back to inlet (this system is already in place).
- d. Implementation of a 6 month sludge reducing bacteria program prior to the lagoons being upgraded.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
1E	ADS	\$7,736,000	\$84,000	\$1,117,000	\$8,853,000	2040	\$4,339.71

ALTERNATIVE 2 - CONVENTIONAL SYSTEMS

The following items described below should be considered as part of the evaluation for Alternative 2 - conventional activated sludge treatment systems:

1. Alternative 2 systems rely on a conventional activated sludge process to provide biological treatment. As a result of this process, the generation of sludge will require the construction of a new solids handling facility to process and store the additional sludge generated from this treatment process.
2. It is anticipated that a new headworks facility, including influent screening and grit removal will be required to improve the operational performance of these systems.
3. A new generator would be required to handle the additional power demands of the activated sludge systems.
4. Any conventional system shall be designed to handle the anticipated peak daily flows.
5. These alternatives would allow for the existing DAF tanks and sand filter to be taken off line.
6. Additional chemical feed systems may be required for improved settability and phosphorus removal.
7. These alternatives would likely require the WWTP to operate 7 days a week.

Each Alternative 2 option was evaluated based on the consideration of the following parameters; Construction; Treatment; and Operation and summarized below:

Alternative 2A - Sequencing Batch Reactor (SBR)

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new sequencing batch reactor (SBR). SBR's provide all phases of wastewater treatment in a single basin. This alternative would require the construction of two SBR tanks to allow for the continuous treatment of the influent wastewater due to the intermittent phasing of the SBR processes. A common wall construction between all tanks (SBR, digester, EQ) could result in a system with a smaller foot print.

Treatment

SBR's have the ability to nitrify, denitrify, and achieve biological phosphorus removal within a single basin. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of two SBR tanks to allow for the continuous treatment of the influent wastewater due to the intermittent phasing of the SBR processes.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
2A	SBR	\$13,414,000	\$219,000	\$2,912,000	\$16,326,000	2040	\$8,002.94

Alternative 2B – Continuous Flow Sequencing Batch Reactor (CSBR)

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new continuous flow sequencing batch reactor. Continuous flows SBR's provide all phases of wastewater treatment in a single basin. This alternative would require the construction of two tanks to allow for the continuous treatment of the influent wastewater during peak flow conditions. A common wall construction between all tanks (CSBR, digester, EQ) could result in a smaller foot print.

Treatment

The continuous flow SBR is designed to continuously distribute the variations in flows and loads evenly across all basins - simplifying day to day operations and operational changes as well as accommodating single basin operation for low flow and maintenance conditions. Continuous flow SBR's have the ability to nitrify, denitrify and achieve biological phosphorus removal within a single basin. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of two continuous flow SBR's, each designed to receive half of the design flow.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
2B	CSBR	\$13,399,000	\$219,000	\$2,912,000	\$16,311,000	2040	\$7,995.59

Alternative 2C – Oxidation Basin

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new oxidation basin. This alternative would require the construction of an oxidation basin and secondary clarifiers. Due to the separate structures required for each process (biological treatment and clarification), this alternative may require a larger foot print and additional civil work.

Treatment

Oxidation ditches have the ability to nitrify, denitrify, and achieve biological phosphorus removal. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of an oxidation basin and two secondary clarifiers in order to provide redundancy and treatment under peak flow conditions.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
2C	Oxidation Ditch	\$13,221,000	\$219,000	\$2,912,000	\$16,133,000	2040	\$7,908.33

Alternative 2D – Biolac System

Construction

In this alternative, one of the existing lagoons could be modified and lined to provide the “tankage” required for a Biolac Wave Oxidation System.

Treatment

This system is an activated sludge process which utilizes a longer sludge age to reduce BOD and provide nitrification. This system has the ability to denitrify and achieve biological phosphorus removal. This alternative may allow for the existing DAF and sand filters to be decommissioned.

Operation

Fine bubble diffuser assemblies are suspended above the basin floor by moving aeration chains which create a moving wave of multiple oxic and anoxic zones to nitrify and denitrify the wastewater.

Cost

The cost for this Alternative is outlined below and a detailed construction cost analysis is attached within the Appendix C, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018.

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
2D	Biolac System	\$10,686,000	\$189,000	\$2,513,000	\$13,199,000	2040	\$6,470.10

SUMMARY OF WWTP ALTERNATIVES EVALUATION

The analysis for evaluating the potential NCCMA WWTP modifications (Alternatives 1 and Alternatives 2) included a review of the following components:

1. A review of Manufacturer's design criteria included in their preliminary proposals.
2. Completion of a Matrix Evaluation based on the Manufacturer's preliminary designs.
3. A review of NCCMA's historic and current sampling data.
4. A review of process calculations for nitrifications.
5. A review of preliminary layout drawings.
6. Completion of a Present Worth Analysis.
7. Evaluation of a Phased Approach for upgrading the existing NCCMA WWTP.

A matrix evaluation was completed to assist in ranking the Alternatives from best to least viable option. Based on the Matrix Evaluation, the following conclusions were made:

Alternatives 1A – 1E (Lagoon Retrofits)

1. The majority of the lagoon retrofit alternatives relied on the use of a fixed film process to improve nitrification.
2. Based on the similarity of the various Manufacturer's treatment approaches, the results of the Matrix evaluation were very comparable.
3. The consideration of a phased approach to retrofitting the lagoons shall be part of the selection process of any lagoon based treatment technology.
4. Alternatives 1A and 1B appear to provide the most flexibility with regulating the water temperature and kinetics within the nitrification reactor.
5. Prior to the final selection of a lagoon treatment technology, it is recommended to schedule site visits to the top 2 ranking systems (Alternatives 1A and 1B) as identified in the matrix evaluation to gather information from plant operators on the performance and ease of operation of each system being considered.

Alternatives 2A – 2D (Conventional Systems)

1. All of the conventional system alternatives relied on an activated sludge process for biological treatment of the wastewater.
2. The oxidation basin and SBR alternatives out-ranked the Biolac alternative.
3. The additional cost savings to phase upgrades for conventional systems were insignificant to the total project cost.
4. All conventional systems will require the construction of new solids handling facilities.
5. The ability to operate a new conventional WWTP with respect to the current operators familiarity and preference to local WWTP facilities, additional staffing needs, and input from operators from other regional activated sludge plants shall be considered prior to the final selection of a new conventional system.

The selected Alternative is No. 1, retrofitting the existing lagoon. Retrofitting the existing lagoon will allow the plant allows for continued operation during the construction process, as well as complete the upgrades in phases. The proposed upgrades would then get the plant back into compliance with PA DEP for the nitrogen requirements.

Details of Schedule of Upgrading or Expansion

The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The phasing of the upgrades is outlined below:

Phase	Description
Phase 1 (Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none">1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells2. Installing lagoon covers3. Replacing the mechanical aerators with diffused aerators4. Replacing the bio-blocs with a new nitrification reactor5. Replacing the existing headworks bar screen
Phase 2 (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD. Construct modifications to existing process equipment to handle new ADF. Work to include: <ol style="list-style-type: none">1. Modifications to DAF tanks2. Modifications to sand filters3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

The upgraded NCCMA WWTP will adequately service Honey Brook Township and Honey Brook Borough sewer needs, without creating a projected organic or hydraulic overload in the system within the next 20 year planning horizon.

To ensure the next 20 year planning horizon, each of the tax parcels in the sewer service areas were evaluated to determine projected future flows based on potential development consistent with zoning uses. Table below summarizes the projected future flows for each sewer service area, along with the existing reported flows. This evaluation was provided in Chapter IV.

Existing Flows			
2013 Annual Average	397,000	gpd	
2014 Annual Average	384,000	gpd	
2015 Annual Average	324,000	gpd	
2016 Annual Average	291,000	gpd	
2017 Annual Average	273,000	gpd	
Five Year Annual Average Flow (2013-2017)	333,800	gpd	
Highest Annual Average 2017	397,000	gpd	
Max Three Consecutive Monthly 2017	311,000	gpd	
Current Permitted Capacity	600,000	gpd	
Future Flows			
	0% TDR(s)	100% TDR(s)	75% TDR(s)
Suplee Service Area (New) - Green on overall plan	45,556	46,325	46,133
Suplee Service Area (Existing)	9,634	12,846	12,043
West Service Area	46,422	53,084	51,419
Honey Brook Borough (West Service Area)	12,214	16,373	15,333
Cupola Service Area (Including The Addition of Donnell-Hammell Business Park)	222,000	287,343	271,007
Morgantown Road/ Shoreline Drive	23,750	23,750	23,750
Totals	359,576	439,720	399,648
WWTP Sizing Range (5)			
Least Conservative (utilizing lowest AA flow) (2017)	273,000	gpd + 359,576	= 632,576 gpd
Average (utilizing five year AA flow)	333,800	gpd + 399,648	= 733,448 gpd
Conservative (utilizing five year AA flow)	333,800	gpd + 439,720	= 773,520 gpd
Most Conservative (utilizing highest AA flow)	397,000	gpd + 439,720	= 836,720 gpd
Recommended Size	740,000	gpd	Annual Average

Pump Stations within Public Sewer Service Study Area

There is one pump station in the public sewer service areas which has been identified as hydraulically overloaded in 2017. The Authority is currently in the process of obtaining approval from PADEP to upgrade this pump station due to age of the pump station, increased development anticipated in this area and due to past SSO's at this pump station.

The following outlines the evaluation, remediation and timing of the remediation of the pump station:

Cupola Pumping Station

The pumping capacity of the pump station with the largest pump out of service is 691 gpm. The PADEP requires a peak factor of 3.5 for pump stations servicing flows less than 1,000,000 gpd. The pump station has to be upgraded to meet both the existing and projected flows. The following are the calculations of the required pumping capacity:

Existing Annual Average (AA) Flow	=	119,000 gpd
Projected Future AA Flows	=	271,007 gpd
Total AA Flows	=	390,007 gpd
PADEP Peak Factor	=	3.5
Required Pumping Capacity	=	390,007 gpd x 3.5 (peak factor)
	=	1,365,025 gpd
	=	1,365,025 gpd / 1,440 min/day
	=	947.93 gpm
Design	=	950 gpm

The NCCMA is waiting for the Water Quality Part II Permit approval from the Department of Environmental Protections to start construction of the upgrades to this pump station. The NCCMA will be paying for the pump station upgrades.

CHAPTER VI
EVALUATION OF ALTERNATIVES

CHAPTER VI

ALTERNATIVES EVALUATION

The purpose of this Chapter is to refine the alternatives identified in Chapter V for the WWTP upgrades to the existing NCCMA WWTP to maintain compliance with anticipated NPDES effluent permit limits and to handle the existing and projected sewage flows. This is accomplished by measuring and comparing feasible alternatives against the additional regional and local environmental, financial, and planning policy documents listed below. This process seeks to identify potential conflicts between feasible alternatives provided and the goals of the other documents and programs. Any identified inconsistencies must be resolved prior to Plan approval.

A. Consistency Evaluation

1. Comprehensive Water Quality Management Plans (COWAMP)

Originally developed in 1982, under Sections 4 and 5 of the Clean Streams Law and 208 of the Clean Water Act, COWAMPs have not been subjected to continuing updates, unlike some of the other planning documents listed below. In fact, the COWAMP is generally considered obsolete as it is out of print, and copies are no longer readily available. Due to its early development, there was a lack of specificity, and regional wastewater treatment was recommended to address public health or pollution problems.

The Northwestern Chester County Municipal Authority (NCCMA) was organized in 1975 and equally represents Honey Brook Borough and Honey Brook Township. The Authority maintains the sewer collection system and the NCCMA Wastewater Treatment Plant.

Since the COWAMP is generally obsolete, the consistency analysis of the wastewater management alternatives required by Title 25, Chapter 71.21 of the Pennsylvania Code will be evaluated through Chapter 93 and the newly adopted State Water Plan, as described below.

2. **Chapter 94 Municipal Wasteload Management Plans**

As presented in Chapter III, the NCCMA WWTP has solely relied upon the lagoons biological processes for removal of ammonia nitrogen. Due to the inability to adequately maintain biological treatment in cold weather, previous upgrades to the WWTP included the installation of 80 fixed film contactors, trade named "Bio₂ Blocs", and the required ancillary equipment within the tertiary lagoons in an effort to address this issue. Since their installation, the plant has had success in reducing their ammonia nitrogen limits for the majority of the year. Despite this success, the WWTP still has some difficulties in January and February due to the higher flows and colder water temperatures that occur during these months resulting in cold weather nitrification issues.

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP.

According to the 2017 Chapter 94, the treatment plant did not have three consecutive months, where the monthly average flow exceeded the hydraulic design capacity of the WWTF. There were no issues experienced at the WWTF during high flow conditions, as the plant has holding capacity during high flow conditions.

3. **State Water Plan**

The State Water Plan was recently updated to replace the previous version from 1983, and received final approval on January 28, 2009. Honey Brook Township is located within the Water Plan's Brandywine Creek West Branch Basin. A section entitled "Water Supply and Treatment" contains a broad regional overview that includes public water supply resources such as groundwater, lakes,

reservoirs, rivers, and streams. Drinking water is discussed, including an overview of private well water treatment methods. Source water protection is also presented, and the Plan notes that "counties and municipalities have the greatest opportunity to influence the future of Pennsylvania's water supply by identifying areas of concern". Chester County contains a large amount of agricultural land use, which requires attention to surface water quality. Forested areas are highlighted as beneficial to the protection of water supplies through establishment of riparian buffers and carbon sequestration. Finally, a basic overview of private wastewater treatment through on lot septic systems is presented. The West Branch of Brandywine Creek is noted as a Special Protection Watershed with a High Quality (HQ) designation.

Within the scope of this broad assessment, there are no inconsistencies between the State Water Plan and the evaluated alternatives.

4. **Honey Brook Township Comprehensive Plan**

The 2015 Honey Brook Township and Borough Multi-municipal Comprehensive Plan serves as an update of the Borough's portion of the 1993 Honey Brook Township/ Honey Brook Borough Joint Comprehensive Plan, and as an update of the Township's 2006 Comprehensive Plan. The 2015 Comprehensive Plan helps farmers and other landowners permanently protect productive crop and dairy farms and maintain an agrarian way of life for many township residents, including a significant Plain Sect community. In addition to supporting the Township's agricultural industry, the plan also accommodated new residential, commercial, and non-agricultural industrial land uses primarily within the Township's non-farming areas.

The evaluated alternatives do not present any inconsistencies.

5. **Anti-degradation Requirements of Pa Code Title 25 Chapters 93, 95, and 102**

These chapters are primarily concerned with water quality issues as they relate to point discharges (Chapter 93 and 95) and erosion and sedimentation control

regulations (Chapter 102). They are particularly concerned with maintaining existing water quality standards, which are typically enforced via NPDES discharge permits. West Branch Brandywine Creek, East Branch Brandywine Creek and Two Log Run are High Quality (HQ) and would fall under the anti-degradation requirements. The upgrade to the NCCMA WWTP, no new point source discharges is proposed to the West Branch Brandywine Creek, and the treatment plant will meet all anti-degradation requirements. Chapter V provides extensive detail about the retrofit options of the treatment plant and the selected alternative to service the Township.

The Township will keep abreast of any changes to PA DEP's existing anti-degradation policies, particularly as they relate to the NCCMA WWTP and on-lot systems in an HQ or EV watershed. Any changes to the existing policies may require the implementation of new policies and procedures on a local level by the Township.

Chapter 102 states that an erosion and sedimentation control plan shall be developed for any "disturbance activity that will result in a total earth disturbance of 5,000 square feet (464.5 square meters) or more." This amount of disturbance could occur within the scope of the alternatives discussed. In such an event, Honey Brook Township (or the appropriate entity) will be responsible for ensuring full compliance with the requirements of this part.

6. **Pennsylvania Prime Agricultural Land Policy**

Pennsylvania's Prime Agricultural Land Policy states that "it is the policy of the Commonwealth to protect through the administration of all agency programs and regulations, the Commonwealth's 'prime agricultural land' from irreversible conversion to uses that result in its loss as an environmental and essential food and fiber resource." As evidenced by the correlation between Map No. 6, "Prime Farmland" and Map No. 12, "Existing Land Use Designations", Honey Brook Township has committed significant efforts to the recognition and protection of these areas.

As there are no alternatives that would cause an immediate or irreversible loss of any of these areas, no inconsistencies exist.

7. **County Stormwater Management Plan**

County stormwater management plans are an extension of Act 167 of 1978, and facilitate more localized provisions to address issues such as existing and future hydrologic conditions, land development patterns, floodplain issues, existing stormwater management issues, and provide for periodic updates to identified concerns and needed improvements. Stormwater in Honey Brook Township is dictated by the Honey Brook Township *Stormwater Ordinance* and the *Subdivision and Land Development Ordinance*. Since there are no alternatives which would cause a conflict with this Plan, no inconsistencies exist.

8. **Wetland Protection under Chapter 105**

Honey Brook Township recognizes the importance of protecting wetlands, as evidenced by its existing code, which prohibits any development in these areas. No alternatives have been identified which will have a direct impact on any wetlands, so no inconsistencies exist.

Regardless, it is acknowledged that any future activities within any wetland areas will be in full compliance with all applicable Federal and Local regulations.

9. **Pennsylvania Natural Diversity Inventory (PNDI)**

Appendix H contains the results of a PNDI search conducted on May 30, 2018 relative to the proposed upgrade of the NCCMA WWTP. No impacts were identified.

It is noted that any future projects, wastewater alternatives, or changes that fall under the jurisdiction of the Pennsylvania Natural Diversity Inventory Program will be required to document consistency.

10. **Pennsylvania Historic Preservation Act of 1978**

The only alternative selected by this Act 537 Plan that involves construction is the expansion / upgrade of the NCCMA WWTP. The proposed upgrades will be conducted on existing components and structures in/or adjacent to the existing WWTP. A Cultural Resource Notice was submitted to Pennsylvania Historic Preservation and a copy is attached in Appendix I.

It is noted that any future projects, wastewater alternatives, or changes that fall under the jurisdiction of Pennsylvania's Historic Preservation Act will be required to document consistency.

B. **Resolution of Inconsistencies**

Based on the above information and within the scope of the identified alternatives, no inconsistencies are noted and no resolutions are necessary.

C. **Costs**

A summary of the estimated costs for the combined West, Cupola, and Suplee Study Areas alternatives is presented below. For each of these Study Areas, the selected alternative is to upgrade the existing NCCMA WWTP, and costs to perform the upgrades are provided in detail within the WWTP Evaluation Report in Appendix C. Additional private costs such as septic system abandonment and grinder pump installations that may be required on an individual basis have not been included in these cost estimates.

Option 1A – LEMNA System

Lagoon retrofit upgrade for BOD removal and nitrification to meet wintertime ammonia limit of 6.5 mg/L and future expansion to 0.740 MGD:

- Estimated Project Cost = \$7,269,000
- Estimated Yearly O&M Cost = \$84,000
- O&M Present Worth = \$1,117,000
- Total Present Worth = \$8,386,000
- Total Number of EDUs = 2,200

- Estimated Present Worth per EDU = \$4,110.78/EDU

Option 1B – Triplepoint Environmental

Lagoon retrofit upgrade for BOD removal and nitrification to meet wintertime ammonia limit of 6.5 mg/L and future expansion to 0.740 MGD:

- Estimated Project Cost \$7,643,000
- Estimated Yearly O&M Cost = \$89,900
- O&M Present Worth = \$1,184,000
- Total Present Worth = \$8,827,000
- Total Number of EDUs = 2,200
- Estimated Present Worth per EDU = \$4,326.96/EDU

Detailed spreadsheets that illustrate the above cost estimates are included in the HRG Act 537 WWTP Evaluation report attached in Appendix C.

D. Funding

It is well documented that the Commonwealth is facing a financing shortfall for all the wastewater infrastructure improvement projects that will be required as a result of the treatment plant upgrade. The following presents a broad listing of the available methods and programs that may be utilized to address the funding needs of the selected alternative.

Assessment of Taxes, Fees, and Special Charges

Local governments can generate revenue through the assessment of taxes, fees, special charges and fines. The typical example is the determination of debt service as a function of the cost of capital improvements and the number of users. These costs are occasionally passed on to the existing users to repay the debt. For systems that are proposing a significant number of additional users, new fees and rates can be estimated for the purposes of debt repayment. Funds for capital improvements must first be obtained by one or more of the methods listed below.

Grant Programs

Grants are transfers of money that do not need to be repaid. Municipalities and authorities can apply for grants with federal, state, corporate and non-profit organizations by submitting proposals or funding requests. Two of the more common grant programs currently being administered in the Commonwealth are H2O PA Grants and the Pennworks program.

The Pennworks program is similar but adds the requirements that:

"Projects are those which involve the acquisition of land, easements or rights-of-way and the construction, improvement, expansion, extension, repair or rehabilitation of either (1) a system for the supply, treatment, storage or distribution of water not used solely for residential purposes, or (2) a system for the collection, treatment or disposal of wastewater (including industrial waste and the separation of sanitary sewers and storm sewers) not used solely for residential purposes. In addition, the project must involve the investment of capital in Pennsylvania enterprises and communities or result in the creation of new or the preservation of existing jobs in this Commonwealth."

Loans

A loan is the temporary transfer of a specific amount of money that must be repaid in a predetermined amount of time, typically with specified interest rate. It is helpful to evaluate loan options as loan terms can vary by rate, time and reporting requirements. If the project costs will be less than \$5 million dollars it is usually prudent to use loans rather than bonds.

There are several types of loans including governmental and commercial programs. Government loans have consistently lower than market interest rates but may require significant application procedures and requirements. Some examples of government environmental loan programs include the EPA Clean Water State Revolving Fund, and the EPA Safe Drinking Water State Revolving Funds (SRF), and the United States Department of Agriculture (USDA) Rural Development Program. Communities who

have entered into a binding enforcement agreement have priority for SRF funding. The Commonwealth's PENNVEST program is one such example, and represents one of the most common financing instruments used for large scale capital investment projects. PENNVEST loans can also be used to finance individual on-lot sewage disposal system projects by private homeowners.

Bonds

A bond is a written promise to repay borrowed money on a definite schedule, usually at a fixed rate of interest for the life of the bond. It is the largest source of environmental infrastructure financing. It is the most complex and expensive way to acquire funds, but money is available for immediate capital needs. Legal and administrative fees can be costly and voter approval may be required. This Tool is usually more cost effective for projects costing more than \$5 million because the fees are the same for large or small bond issue.

The bond market matches governments and corporations that need to borrow money with investors who have funds to lend. Bond dealers at securities firms and banks act as intermediaries, buying from issuers and selling to investors in the primary market.

Expanding upon the broad overview of financing alternatives listed above, the financial analysis included in the HRG Act 537 WWTP Evaluation Report presents that the preferred option for the NCCMA WWTP upgrade is a PENN VEST loan. The PENN VEST loan is will result in an overall reduced cost when compared to the USDA Finance Option. The following is a summary of the total investment over the term of the loan:

PENN VEST Financing (Interest Rate 1.743%)

- Option 1A - \$2,153,249
- Option 1B - \$2,264,037

USDA Financing (Interest Rate 3.5%)

- Option 1A - \$7,111,690
- Option 1B - \$7,475,096

The preferred alternative to finance the proposed treatment plant upgrades outlined in this 537 Plan is a 20 year PENN VEST loan, as this option would significantly reduce the total interest over the term of the load as compared to the USDA Financing option with a 40 year term.

E. Phasing

The primary goals of this current Act 537 Base Plan update is to evaluate the existing public sewer service areas and the proposed upgrade of the wastewater treatment plant. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The phasing of the upgrades is outlined below:

Phase	Description
Phase 1 (Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none"> 1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells 2. Installing lagoon covers 3. Replacing the mechanical aerators with diffused aerators 4. Replacing the bio-blocs with a new nitrification reactor 5. Replacing the existing headworks bar screen
Phase 2 (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD. Construct modifications to existing process equipment to handle new ADF. Work to include: <ol style="list-style-type: none"> 1. Modifications to DAF tanks 2. Modifications to sand filters 3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

F. Administrative and Legal Authority

The administrative and legal authority to effect the alternatives discussed in this report include, but are not limited to, the provisions of Pa Code Title 25 Chapter 71.

CHAPTER VII
INSTITUTIONAL EVALUATION

CHAPTER VII

INSTITUTIONAL EVALUATION

A. Existing Authorities

The Northwestern Chester County Municipal Authority (NCCMA) is the only municipal authority in Honey Brook Township. The Authority was incorporated in 1975 under the provisions of the Municipal Authorities Act of the Commonwealth of Pennsylvania for the purpose of providing sewage collection and treatment facilities to residents and commercial, industrial, and institutional organizations of Honey Brook Borough and Honey Brook Township. The Authority's engineer presented the following description:

"The NCCMA is a corporate body created pursuant to an ordinance of the Board of Supervisors of Honey Brook Township under an Act of the General Assembly of the Commonwealth of PA known as the Municipal Authorities Act. The Authority was organized to acquire, construct, improve, maintain and operate a sewage collection and treatment system and provides sewer service to approximate total of 2,156 EDUs in the Honey Brook Township area. The governing body of the sewer Authority is a Board consisting of three members appointed by the Honey Brook Township Board of Supervisors. The Authority Board controls the employment of personnel. There are 2 employees."

B. Institutional Alternatives

The existing municipal and authority departments are capable of implementing the selected alternatives. No new municipal departments are expected to be created for the implementation of the selected alternatives.

C. Selected Institutional Alternative

The selected method of Act 537 Plan implementation is the continued administration by the respective powers and duties of Northwestern Chester County Municipal Authority (NCCMA).

CHAPTER VIII
SELECTED ALTERNATIVE AND IMPLEMENTATION SCHEDULE

CHAPTER VIII

SELECTED ALTERNATIVES, JUSTIFICATION, AND IMPLEMENTATION SCHEDULE

Two alternatives were evaluated for the upgrade to the existing NCCMA WWTP to handle the projected average daily design flow of 0.74 MGD and maintain compliance with anticipated NPDES effluent permit limits. The two (2) major alternative options that were considered as part of this Act 537 study include:

1. Alternative No. 1- Lagoon Retrofits.
2. Alternative No. 2 - Conventional Systems

Alternative No. 1 considered the option of retrofitting the existing lagoons with proven technologies that would allow for the continued use of the lagoon system for biological treatment. Alternative No. 2 considered the option of abandoning the existing lagoon treatment processes and replacing them with a conventional activated sludge system for biological treatment. The selected Alternative is No. 1, retrofitting the existing lagoon. The evaluation of this alternative is outlined in more detail in Chapter VI.

For the Study Areas identified in Chapter II, the following wastewater alternatives have been selected that best meet the needs of the Township:

A. West Study Area

This Study Area encompasses Honey Brook Borough and Honey Brook Township and is located at the far western portion of the Township along Route 322, which stretches from Cambridge Road to Mill Road. The Study Area consists of residential, commercial, industrial, and farm residential properties that are serviced by Honey Brook Township public sanitary sewer system which is conveyed to the NCCMA for treatment and stream discharge.

As discussed throughout this 537 Plan, an area located just southeast from the West study area on Cambridge Road near the intersection of Mill Road was identified as an area of sewage disposal need. The property consists of a farmstead and is zoned as commercial

and farm residential. Based on the previous on-lot and well survey conducted by HRG, Inc. in the prior Act 537 Plan, there is a known on-lot system failure. Connection to the existing public sewer system has been selected as the long-term sewage disposal option. Therefore, the existing and projected sewage flows for this area is accommodated in the WWTP upgrade.

Any new development or redevelopment located in this Study Area will connect to the existing public sewer. Justification for the selected technical alternative for this Study Area follows:

- The NCCMA has serviced this study area since the authority was established in 1975, and the treatment plant has capacity for the existing sewage flows from the Study Area. With the upgrade of the NCCMA WWTP, the projected sewage volumes from new development or re-development within this area will be incorporated into the sizing of the treatment plant upgrades.
- The existing infrastructure in the high density area within the Borough area and surrounding parcels, are in working order with no reports of inflow and infiltration in the conveyance system. Therefore, connection to the existing public sewer provides long-term sewage disposal needs for current and future users.
- The selected alternative is the only identified cost-effective means of ensuring adequate sewage facilities. As discussed in Chapter V, the cost for the upgrade of the existing WWTP will be dispersed amongst all the users in the network, which will disperse and lessen the financial obligations to individual users.
- Existing Township administration is sufficient to implement the selected alternative.

B. Cupola Study Areas

The Cupola Study Area is located in the eastern portion of the Township, consisting of farm residential, mixed residential and commercial properties. The current

residents/tenants are serviced by Honey Brook Township public sanitary sewer system, which is conveyed to the NCCMA for treatment and stream discharge. There are some residential homes within this study area which are being serviced by on-lot sewage disposal systems. A proposed industrial park, known as the Hammell O'Donnell Industrial Park, is located beyond the Municipal limits of Honey Brook Township along Chestnut Tree Road. The proposed industrial park is located within West Nantmeal and West Brandywine Townships and will be serviced by the Cupola sewer service district through the executed Intermunicipal Agreement dated September 21, 2017. A copy is attached in Appendix A.

There is one pump station within this public sewer service area which has been identified as hydraulically overloaded in 2017. The Authority is currently in the process of obtaining approval from PADEP to upgrade this pump station due to age of the pump station, increased development anticipated in this area and due to past SSO's at this pump station. The following outlines the evaluation, remediation and timing of the remediation of the pump station:

Cupola Pumping Station

The pumping capacity of the pump station with the largest pump out of service is 691 gpm. The PADEP requires a peak factor of 3.5 for pump stations servicing flows less than 1,000,000 gpd. The pump station has to be upgraded to meet both the existing and projected flows. The following are the calculations of the required pumping capacity:

Existing Annual Average (AA) Flow	=	119,000 gpd
Projected Future AA Flows	=	271,007 gpd
Total AA Flows	=	390,007 gpd
PADEP Peak Factor	=	3.5
Required Pumping Capacity	=	390,007 gpd x 3.5 (peak factor)
	=	1,365,025 gpd
	=	1,365,025 gpd / 1,440 min/day
	=	947.93 gpm
Design	=	950 gpm

The NCCMA is waiting for the Water Quality Part II Permit approval from the Department of Environmental Protections to start construction of the upgrades to this pump station. The NCCMA will be paying for the pump station upgrades.

C. Suplee Sewer District

The Suplee Sewer District is located in the eastern portion of the Township, consisting of farm residential, mixed residential and commercial properties and currently serviced by Individual On-Lot Sewage Disposal Systems. In the 2010 Act 537 the sanitary survey and well sampling, identified this area to potential and suspected of septic systems malfunctions.

Based on the 2010 Act 537 Plan on-lot and well survey, conducted by HRG, Inc., a few parcels were identified with malfunctions and with on-lot wells with nitrate results ranging between 0 mg/l and 9.99 mg/l. As discussed throughout this 537 Plan, there are two areas located just outside the public sanitary sewer service area, where sewage disposal needs were identified. One of the areas is located just east of Struble Lake, where the lots are small in size and based on the previous on-lot and well survey conducted by HRG, Inc. in the previous Act 537 Plan, there have been reported on-lot system malfunctions and failures, along with elevated nitrate concentrations in wells.

Based on the 2010 Act 537 Plan on-lot and well survey, conducted by HRG, Inc., a few parcels were identified with malfunctions and with on-lot wells with nitrate results ranging between 0 mg/l and 9.99 mg/l. As discussed throughout this 537 Plan, there are two areas located just outside the Suplee public sanitary sewer service district, where sewage disposal needs were identified. The second area is located just south of the Suplee study area on Dampman Road between Windswept Lane and Southwind Drive and consists of residential homes. These areas will be added to the Suplee Sewer District and projected to be provided public sanitary sewer within the next 20 years or through a Special Study for this area. These systems will be continued to be monitored under the Sewage Management Ordinance. Should this not resolve the malfunction, then connection to public sewer will be required.

D. Designation of Capital Financing Plan

A detailed construction cost analysis for the selected Alternative is attached within the Appendix E, Act 537 WWTP Evaluation for NCCMA prepared by Herbert, Rowland & Grubic, Inc. dated March 2018 Revised October 3, 2018. Based on the results of the preliminary funding analysis, NCCMA would consider moving forward with applying for PENN VEST financing, as this option would significantly reduce the total interest over the term of the loan as compared to the USDA Financing option.

E. Implementation Schedule

The Implementation schedules for the phasing of the upgrades and schedule for the selected alternative are outlined below:

1. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PADEP nutrient loading requirements at the current permitted capacity and secondly accommodating the projected growth volume of wastewater at the existing WWTP. The Implementation Schedule for the phasing of the upgrades is as follows:

Phase	Description
Phase 1 (Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none">1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells2. Installing lagoon covers3. Replacing the mechanical aerators with diffused aerators4. Replacing the bio-blocs with a new nitrification reactor5. Replacing the existing headworks bar screen
Phase 2 (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD. Construct modifications to existing process equipment to handle new ADF. Work to include: <ol style="list-style-type: none">1. Modifications to DAF tanks2. Modifications to sand filters3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

2. The Implementation Schedule for the selected alternative for the plan upgrade is as follows:

Upgrades	Year
<ul style="list-style-type: none"> • Research up-front funding sources and establish financing plan • Meet with Financing Agency for Initial Project Planning Meeting • Perform Site visits of Alternative 1A and Alternative 1B WWTP installations • Obtain new WWTP NPDES Permit. New permit will establish effluent limits for future improvements. Revise alternatives based on any changes to the existing permit. • Receive PADEP WQM Permit for Cupola Pump Station Upgrade (Permit application was submitted to PADEP on June 30, 2017) • Final Design of Cupola Pump Station Upgrade • Bid and Construct Cupola Pump Station Upgrade • Final Selection of Lagoon Retrofit Treatment Alternative (1A or 1B) • Preliminary Design of Phase 1 Project (Nitrification Upgrade) • Authority submission of Part II Permit Application to PA DEP • Final Design of Phase 1 Project (Nitrification Upgrade) 	0-1 year
<ul style="list-style-type: none"> • Obtain required Permits for Phase 1 Project (Nitrification Upgrade) • Implementation of Headworks Improvement Project (Maintenance Replacement) • Bid Phase 1 Project (Nitrification Upgrade) 	1-2 year
<ul style="list-style-type: none"> • Construction of Phase 1 Project (Nitrification Upgrade) • Substantial Completion of Phase 1 Project (Nitrification Upgrade) • Preliminary Design of Phase 2 Project (Hydraulic Capacity Upgrade) 	2 – 3 year
<ul style="list-style-type: none"> • Once current ADF reaches 0.5 MGD (approx. 85% of current design Capacity) 	3 – 5 year

APPENDIX A
WEST NANTMEAL TOWNSHIP INTERMUNICIPAL AGREEMENT

Prepared by/Return to:

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West Chester, PA 19382 ✓ ✓ ✓ ✓ ✓



UPI Nos. 23-6-16, 23-6-16.4, 23-6-16.5, 29-1-1.3, 29-1-1.4., 29-1-1
✓

INTERMUNICIPAL SEWER AGREEMENT

This Intermunicipal Sewer Agreement (the "Agreement") is made the 21st day of September, 2017, by and between **NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY**, a municipal authority organized in the Commonwealth of Pennsylvania pursuant to the Municipality Authorities Act, 53 Pa.C S §5601 et seq., with offices located at 5277 Horseshoe Pike, Suite 103, Honey Brook, Pennsylvania 19344 (hereinafter referred to as the "Authority"), the **TOWNSHIP OF WEST NANTMEAL, CHESTER COUNTY, PENNSYLVANIA**, a political subdivision organized in the Commonwealth of Pennsylvania with offices located at 455 N. Manor Road, Elverson, Pennsylvania 19520 (hereinafter known as "West Nantmeal"), the **TOWNSHIP OF HONEY BROOK, CHESTER COUNTY, PENNSYLVANIA**, a political subdivision organized in the Commonwealth of Pennsylvania, with offices located at 500 Suplee Road, Honey Brook, Pennsylvania, 19344 (hereinafter known as "Honey Brook"), and **HAMMELL-O'DONNELL PROPERTIES, LLC**, a Pennsylvania limited liability company with its registered office at 3362 Conestoga Road, Glenmoore, Pennsylvania 19343 (hereinafter known as "Owner") (collectively referred to as the "Parties").

WITNESSETH:

WHEREAS, the Authority maintains a public sewer system (the "Sewer System") that currently provides public sewer service to certain properties in Honey Brook Township and Honey Brook Borough; and

WHEREAS, West Nantmeal does not own or operate a public sewer system; and

WHEREAS, Owner is the owner of approximately 119.483 acres located on the east side of Chestnut Tree Road, north of Horseshoe Pike in West Nantmeal and West Brandywine Townships, Chester County, Pennsylvania, which property is identified as Chester County Tax Parcel Nos. 23-6-16, 23-6-16.4, 23-6-16.5, 29-1-1.3, 29-1-1.4 and 29-1-1 (collectively the "Property"); and

WHEREAS, Owner filed with West Nantmeal Township a preliminary subdivision and land development application seeking to subdivide and develop the Property into an industrial park with fifteen (15) lots referred to as the "Hammell-O'Donnell Business Park" (the "Proposed Development") pursuant to subdivision and land development plans titled, "Hammell O'Donnell Business Park", prepared by Commonwealth Engineers, Inc., dated May 11, 2009, last revised May 29, 2017 (the "Plans"); and

WHEREAS, Owner has requested that Honey Brook, West Nantmeal and the Authority agree to allow the Proposed Development to be serviced by public sewer from the Authority; and

WHEREAS, Honey Brook maintains an Official Sewage Facilities Plan pursuant to the Pennsylvania Sewage Facilities Act, as amended (Section 5 of the Act of January 24, 1966, P.L. 1535 No. 537), and the Rules and Regulations of the Pennsylvania Department of Environmental Protection ("PaDEP"); and

WHEREAS, the Property is currently included in Honey Brook's existing Official Sewage Facilities Plan (the "Act 537 Plan"); and

WHEREAS, Honey Brook is currently updating its Official Sewage Facilities Plan (the "Act 537 Plan Update"); and

WHEREAS, Honey Brook is willing to include the Property in the Act 537 Plan Update; and

WHEREAS, the Authority is willing to provide public sewer service to the Proposed Development consistent with the terms of this Agreement; and

WHEREAS, this Agreement is authorized by, and conforms to, the Pennsylvania Intergovernmental Cooperation Act, 53 Pa. C.S.A. §2301 et seq. (the "Act"), which provides that two or more municipalities may jointly cooperate in the exercise or performance of their respective governmental functions, powers or responsibilities; and

WHEREAS, Honey Brook and West Nantmeal shall pass an Ordinance and the Authority shall enact a Resolution in accordance with the Act in order to give full force and legal effect to this Agreement (the "Enabling Ordinance"); and

WHEREAS, under and pursuant to the terms, conditions, and provisions set forth in this Agreement, the Parties are mutually desirous of memorializing their agreement with regard to providing public sewer service to the Proposed Development.

NOW, THEREFORE, IN CONSIDERATION OF THE MUTUAL PROMISES HEREIN CONTAINED, AND INTENDING TO BE LEGALLY BOUND, IN ACCORDANCE WITH THE UNIFORM WRITTEN OBLIGATIONS ACT OF PENNSYLVANIA, AND IN

CONSIDERATION OF OTHER GOOD AND VALUABLE CONSIDERATION, THE PARTIES HEREBY PROMISE, COVENANT AND AGREE AS FOLLOWS:

1. Incorporation of Recitals and Exhibits. The recitals set forth in the Background Section of this Agreement are incorporated herein as if here set forth in their entirety. All Exhibits attached to this Agreement are incorporated herein by reference.

2. Obligations of Honey Brook Township.

A. Honey Brook shall include the Property in its Act 537 Plan Update and seek PaDEP approval of same. A plan of the Property is attached hereto as Exhibit "A". The Property shall be located in the Cupola Sewer District as identified and described in the Act 537 Plan, and Act 537 Plan Update.

B. Honey Brook shall promptly process the planning module that Owner prepares and files with West Nantmeal and PaDEP in conjunction with the Plans which are filed for the Proposed Development of the Property.

C. After submission of the necessary applications and payment of all applicable fees by Owner, Honey Brook shall issue any necessary building, earth disturbance or grading permits necessary to allow Owner to construct the sewer facilities that are necessary to provide public sewer to the Proposed Development.

D. Honey Brook shall enact an ordinance authorizing it to enter this Agreement consistent with the Act.

3. Obligations of the Authority,

A. Subject to the terms of this Agreement, approval by the PaDEP of the Act 537 Plan Update, and final land development approval by West Nantmeal of the Proposed Development of the Property and the Plans, the Authority agrees to supply public sewer service to the Property consistent with the Plans and all applicable Rules and Regulations of the Authority as of the date that Owner submits an application to connect to the Authority's Sewer System.

B. The Authority agrees to reserve a maximum of 30,000 gallons per day (gpd) of sewer capacity to be used by Owner for the discharge of "Sewage", as defined in the Pennsylvania Sewage Facilities Act, from the lots and buildings in the Proposed Development as proposed on the Plans, conditioned upon the Owner, or the Owner's successors or assigns, executing a Reservation of Capacity Agreement with the Authority in substantially the same form as the agreement which is attached hereto as Exhibit "B" and pay the Authority the reservation of capacity fee that is in effect as of the date such reservation agreement is approved by the Authority. Owner agrees that nothing in this Agreement shall be construed or interpreted to allow for, or mandate, any increase in sewer capacity allocation beyond 30,000 gallons per day as set forth above, regardless of the uses that are made at the Proposed Development or any demand for such increase. Owner shall only be permitted to discharge Sewage into the Sewer System and nothing in this Agreement shall be interpreted or construed to allow Owner to discharge industrial waste into the Sewer System.

C. The Authority shall promptly process the planning module that Owner prepares and files with West Nantmeal and PaDEP in conjunction with the Plans which are filed for the Proposed Development of the Property.

D. The Authority shall approve the design of the sewer facilities that Owner must construct or cause to be constructed on the Property to provide sewer service to the lots in the Proposed Development. Such facilities have not been designed yet by Owner but Owner shall be required to install, at a minimum, a gravity flow pump station and flow monitoring device as specified by the Authority in order to convey and accurately record the sewage flows from the Proposed Development.

E. The Authority shall inspect all sewer facilities that are constructed for the Property in accordance with the Authority's Rules and Regulations.

F. The Authority shall accept dedication of the sewer facilities constructed by Owner and the Authority has the right, in its sole discretion, to decide which facilities (such as grinder pumps and laterals) shall remain privately owned.

G. As soon as any of the buildings or lots within the Proposed Development are connected to the Sewer System, as to each such connected building or lot, the Authority shall bill and collect all charges for service, including tapping fees, connection fees, and sewer rents from Owner or Owner's successors and assigns in title to the lot(s) in the Proposed Development that are subdivided from the Property.

H. The Authority shall enact a resolution authorizing it to enter the Agreement.

4. Obligations of West Nantmeal Township.

A. West Nantmeal Township shall process the Plans in accordance with the West Nantmeal Subdivision and Land Development Ordinance, Stormwater Management

Ordinance and all relevant ordinances and regulations of West Nantmeal Township applicable to subdivisions and land developments.

B. West Nantmeal shall promptly process the planning module that Owner submits with the Plans and approve the provision of public sewer service to the Proposed Development pursuant to the terms of this Agreement.

C. West Nantmeal shall amend its Act 537 Plan, if necessary, to include the parcels of the Property that are located in West Nantmeal to be in Honey Brook's Cupola Sewer District.

D. West Nantmeal shall enact and keep in full force and effect for as long as any lots in the Proposed Development are connected to the Authority's Sewer System ordinances, resolutions and regulations that require the Owner and its successors and assigns in title to the Property to comply with and be bound by all ordinances, resolutions, rules and regulations of the Authority and Honey Brook related to sewage, including but not limited to an ordinance prohibiting the discharge into the Sewer System of storm water, roof downspouts, surface or subsurface drainage from storm water inlets, sump pumps and floor drains from other direct or indirect sources.

E. West Nantmeal shall enact an ordinance authorizing it to enter this Agreement consistent with the Act.

5. Obligations of Owner.

A. Owner shall obtain all necessary governmental and quasi-governmental approvals to subdivide and develop the Property for the Proposed Development in accordance with the Plans.

B. As part of the subdivision and land development application for the Proposed Development of the Property, Owner shall prepare and submit to all Parties a planning module for the Proposed Development, which shall provide that the Property shall be connected to the Sewer System and the Authority shall provide a maximum of 30,000 gpd of sewer capacity to the Property.

C. Subject to approval by the Authority, Owner shall prepare plans and specifications that identify the sewer facilities and any extensions, upgrades or improvements that must be made to the Sewer System in order to collect and treat the effluent from the Proposed Development at the Authority's Sewer Treatment Plant. It is anticipated that Owner will have to install one or more grinder pumps and/or pump station on the Lots in the Proposed Development which will then be connected via force main to the Authority's existing collection system at manhole no. 637. The design and specifications for the collection system that Owner must install to provide public sewer service to the lots and buildings within the Proposed Development shall be consistent with the Authority's Rules and Regulations and Technical Specifications that are in full force and effect as of the date the Owner files an application for connection.

D. Owner shall provide corrosion protection linings in the vicinity of the Proposed Development's connection point to the Authority's existing sewer facilities to prevent corrosion damage in accordance with the Authority's Rules and Regulations and Technical Specifications that are in full force and effect as of the date the Owner files an application for connection. This work shall include the lining of manhole 637 and manhole 636 and the slip lining of approximately 400 feet of 8 inch transit pipe between manhole 636 and manhole 635.

E. Owner, or its successors and/or assigns, shall sign a Non-Industrial User Agreement for each lot within the Proposed Development. The discharge of any non-domestic waste shall be subjected to the Authority's rules and regulations pertaining to non-domestic waste discharges.

F. Subject to approval and inspection by the Authority, Owner shall construct or cause to be constructed all sewer improvements and facilities and any extensions, upgrades or improvements that must be made to the Sewer System in order to collect and treat the effluent from the Proposed Development at the Authority's Sewer Treatment Plant (the "Owner Facilities"). If Owner is required to construct any extensions, upgrades or improvements to the Sewer System in order to provide sewer service to the Proposed Development that provide additional sewer capacity that may be utilized by other property owners in the Authority's service territory, Owner may be entitled to reimbursement from the Authority pursuant to the provisions in Section 5607 of the Municipality Authorities Act, 53 P.S. § 5607. Nothing set forth in this Agreement or elsewhere is intended to be, or shall be construed as, a waiver of Owner's right to reimbursement pursuant to Section 5607 of the Municipality Authorities Act, 53 P.S. § 5607, it being the express intention of the parties that Owner shall be entitled to such reimbursement in accordance with applicable law.

G. Owner shall enter an Extender Agreement and Financial Security Agreement with the Authority and post financial security in an amount of 110% of the estimated cost of the Owner Facilities with the Authority.

H. Owner shall obtain all necessary permits and approvals from the Authority to connect any buildings which are constructed on the Property pursuant to the Plans to the Sewer System.

I. Owner shall pay to the Authority for each lot or building connected to the Sewer System: (i) a non-refundable tapping fee in an amount as set forth by resolution of the Authority; (ii) a connection fee in an amount set forth by resolution of the Authority; (iii) inspection fees incurred in the inspection of the sewer facilities installed by Owner; and (iv) rental rates for each building or lot connected to the Sewer System in accordance with the rates as set forth by resolution of the Authority.

J. Following completion of construction of the Owner's Facilities, Owner shall dedicate to the Authority such facilities provided however that if Owner installs grinder pumps on individual lots within the Proposed Development, the Authority may decide that the grinder pumps shall remain privately owned.

6. **Term of Agreement.** This Agreement shall remain valid for a period of ten (10) years (the "Term") which shall commence on the Effective Date of this Agreement. The Effective Date of this Agreement shall be the date when the last municipal party approves the same. In the event that Owner has not connected any lots within the Proposed Development to the Sewer System as permitted herein upon the expiration of the Term, this Agreement shall terminate and the Authority, shall no longer be obligated to supply public sewer service to the Property.

7. **Dispute Resolution.** In the event the Parties are unable to resolve by informal discussion any dispute that arises out of or relates to this Agreement or the breach thereof, any party may commence an appropriate action in the Court of Common Pleas of Chester County,

Pennsylvania; PROVIDED, HOWEVER, all Parties HEREBY KNOWINGLY, INTELLIGENTLY AND IRREVOCABLY WAIVE TRIAL BY JURY IN ANY ACTION, SUIT OR PROCEEDING BROUGHT IN CONNECTION WITH ANY SUCH DISPUTE, AND EACH PARTY WILL PAY ITS OWN LEGAL FEES, COSTS AND EXPENSES.

8. Miscellaneous.

A. **Independent Counsel.** The Parties acknowledge and agree that each has been represented by independent counsel of their choosing and the terms of this Agreement are the product of arms-length negotiation between the Parties. Each Party shall bear its own counsel fees and any other professional expenses incurred in the negotiation and execution of this Agreement.

B. **Notices.** Any notice required or permitted by this Agreement shall be in writing, shall be given to all parties simultaneously, and shall be delivered by either (a) a nationally recognized overnight courier service (such as FedEx or UPS) with proof of delivery or (b) United States Postal Service certified mail, return receipt requested, postage prepaid, addressed as follows:

If to Authority: Northwestern Chester County Municipal Authority
5277 Horseshoe Pike, Suite 103
Post Office Box 308
Honey Brook, PA 19344

With a Copy to: Kimberly P. Venzie, Esquire
Buckley, Brion, McGuire & Morris LLP
118 W. Market Street, Suite 300
West Chester, PA 19382

If to West Nantmeal: West Nantmeal Township
Post Office Box 234
Elverson, PA 19380

With a Copy to: Kristin S. Camp, Esquire
Buckley, Brion, McGuire & Morris LLP
118 W. Market Street, Suite 300
West Chester, PA 19382

If to Honey Brook: Honey Brook Township
500 Suplee Road
Honey Brook, PA 19344

With a Copy to: Christopher J. Hartman, Esquire
Hartman, Valeriano, Magovern & Lutz
1100 Berkshire Blvd., Suite 301
Post Office Box 5823
Wyomissing, PA 19610

If to Owner: Hammell-O'Donnell Properties, LLC
3362 Conestoga Road
Glenmoore, PA 19343

With a Copy to: Michael T. Shiring, Esquire
Riley, Riper, Hollin & Colagreco
717 Constitution Drive, Suite 201
Post Office Box 1265
Exton, Pennsylvania 19341-1265

Notice shall be deemed given and received on the first to occur of actual delivery or three (3) business days following confirmed deposit with a carrier.

C. **No Relation of Principal and Agent.** Neither anything contained in this Agreement nor any act of the Parties shall be deemed or construed by any party or by any third party to create the relationship of principal and agent, partnership, of joint venture, or of any association between the parties hereto. Nothing contained in this Agreement, and no act of the parties, shall be construed to render any of the parties liable for the debts or obligations of the other, except to the extent expressly set forth in this Agreement.

D. **Recording.** This Agreement shall be recorded in the Office of the Recorder of Deeds for Chester County, Pennsylvania at Owner's expense.

E. **Assignment.** This Agreement may be assigned by Owner to a successor in title to the Property. Owner shall provide written notice to the Parties if it sells the Property or any portion thereof and assigns this Agreement to a successor in title.

F. **Captions.** The captions of the sections and paragraphs of this Agreement are for convenience of reference only and shall not be considered or referred to in resolving questions of interpretation and construction.

G. **No Third-Party Beneficiary.** The terms of this Agreement are not intended to confer any legal benefit or right to any person not a party to this Agreement. In determining the intent of the parties to this Agreement, any fact finder may accept as dispositive the parties' intent as expressed in this paragraph that no third-party rights were intended to be granted and no third-party remedies should be permitted with respect to this Agreement under any theory of third party beneficiary.

H. **Severability.** If any terms or conditions hereof shall be held to be invalid, illegal or unenforceable in any respect and for any reason, such invalidity, illegality or unenforceability shall not affect any other of the remaining terms and conditions hereof, and the terms and conditions hereof shall thereafter be construed as if such invalid, illegal or unenforceable terms and conditions had never been contained herein.

I. **Counterparts.** This Agreement may be executed in duplicate counterparts, each of which when fully signed shall be deemed an original, and taken together shall constitute one agreement.

J. **Governing Law.** This Agreement has been entered into under and shall be construed and interpreted in accordance with the laws of the Commonwealth of Pennsylvania.

K. **Integration; Amendment.** This Agreement constitutes the entire agreement of the Parties hereto with respect to the subject matter hereof, and may not be varied by any prior or contemporaneous covenant, representation, warranty or agreement relating thereto. This Agreement may not be modified, amended, varied, renewed, or terminated except in a writing signed by all of the Parties.

L. **Binding Nature.** This Agreement is binding upon the Parties and their respective successors and permitted assigns.

M. **Waiver of Breach.** Failure by any party to insist upon compliance with any term or provision of this Agreement at any time or under any set of circumstances shall not operate to waive or modify the provision or render it unenforceable at any other time, whether the circumstances are or are not the same.

N. **Contingent Nature of Agreement.** Notwithstanding anything to the contrary set forth in this Agreement or elsewhere, this Agreement and each of the rights and responsibilities granted and assumed hereunder are and shall be contingent upon (A) the issuance of all final, unappealed, and unappealable necessary approvals, certificates, licenses, and permits with regard to the Proposed Development, (including, without limitation, PaDEP approval of the Act 537 Plan Update) from any and all governmental or quasi-governmental agencies, authorities, or entities having jurisdiction over the same and (B) each party's performance of their respective obligations under and pursuant to this Agreement.

REMAINDER OF PAGE INTENTIONALLY LEFT BLANK – SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, each of the parties hereto has caused these presents to be duly executed by an authorized officer and to be sealed with its corporate seal duly attested to by an authorized officer.

ATTEST:

TOWNSHIP OF WEST NANTMEAL

Deborah M. Topal

BY:

Gary C. Elton
Chairman, Board of Supervisors

ATTEST:

TOWNSHIP OF HONEY BROOK

BY:

Chairman, Board of Supervisors

ATTEST:

**NORTHWESTERN CHESTER COUNTY
MUNICIPAL AUTHORITY**

Eileen M. Dillow

BY:

William H. Ford III
Chairman

ATTEST:

HAMMELL-O'DONNELL PROPERTIES, LLC

BY:

Managing Member

IN WITNESS WHEREOF, each of the parties hereto has caused these presents to be duly executed by an authorized officer and to be sealed with its corporate seal duly attested to by an authorized officer.

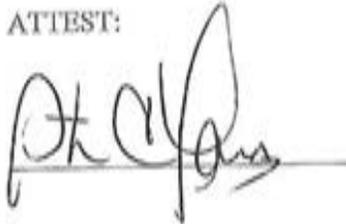
ATTEST:

TOWNSHIP OF WEST NANTMEAL

BY:

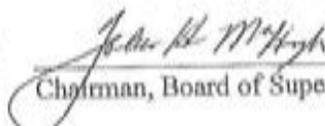
Chairman, Board of Supervisors

ATTEST:



TOWNSHIP OF HONEY BROOK

BY:



Chairman, Board of Supervisors

ATTEST:

**NORTHWESTERN CHESTER COUNTY
MUNICIPAL AUTHORITY**

BY:

Chairman

ATTEST:

HAMMELL-O'DONNELL PROPERTIES, LLC

BY:

Managing Member

IN WITNESS WHEREOF, each of the parties hereto has caused these presents to be duly executed by an authorized officer and to be sealed with its corporate seal duly attested to by an authorized officer.

ATTEST: TOWNSHIP OF WEST NANTMEAL

BY: _____
Chairman, Board of Supervisors

ATTEST: TOWNSHIP OF HONEY BROOK

BY: _____
Chairman, Board of Supervisors

ATTEST: NORTHWESTERN CHESTER COUNTY
MUNICIPAL AUTHORITY

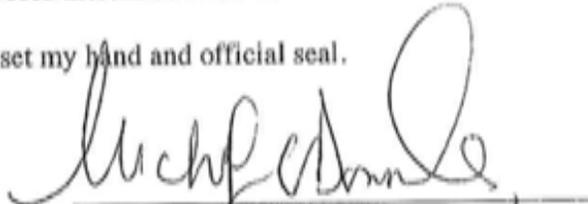
Eden M. Dillow
BY: William H Ford IV
Chairman

-ATTEST-
Witness:
Eric Hammell
BY: [Signature] MANAGING MEMBER
Managing Member

COMMONWEALTH OF PENNSYLVANIA :
88
COUNTY OF CHESTER :

On this, the 3rd day of October, 2017, before me, the undersigned officer, personally appeared JORDAN H. HAMMELL who acknowledged himself to be the Managing Member of Hammell-O'Donnell Properties, LLC, and that he, being authorized to do so, executed the within instrument for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.



NOTARY PUBLIC

MY COMMISSION EXPIRES:

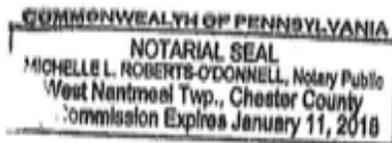
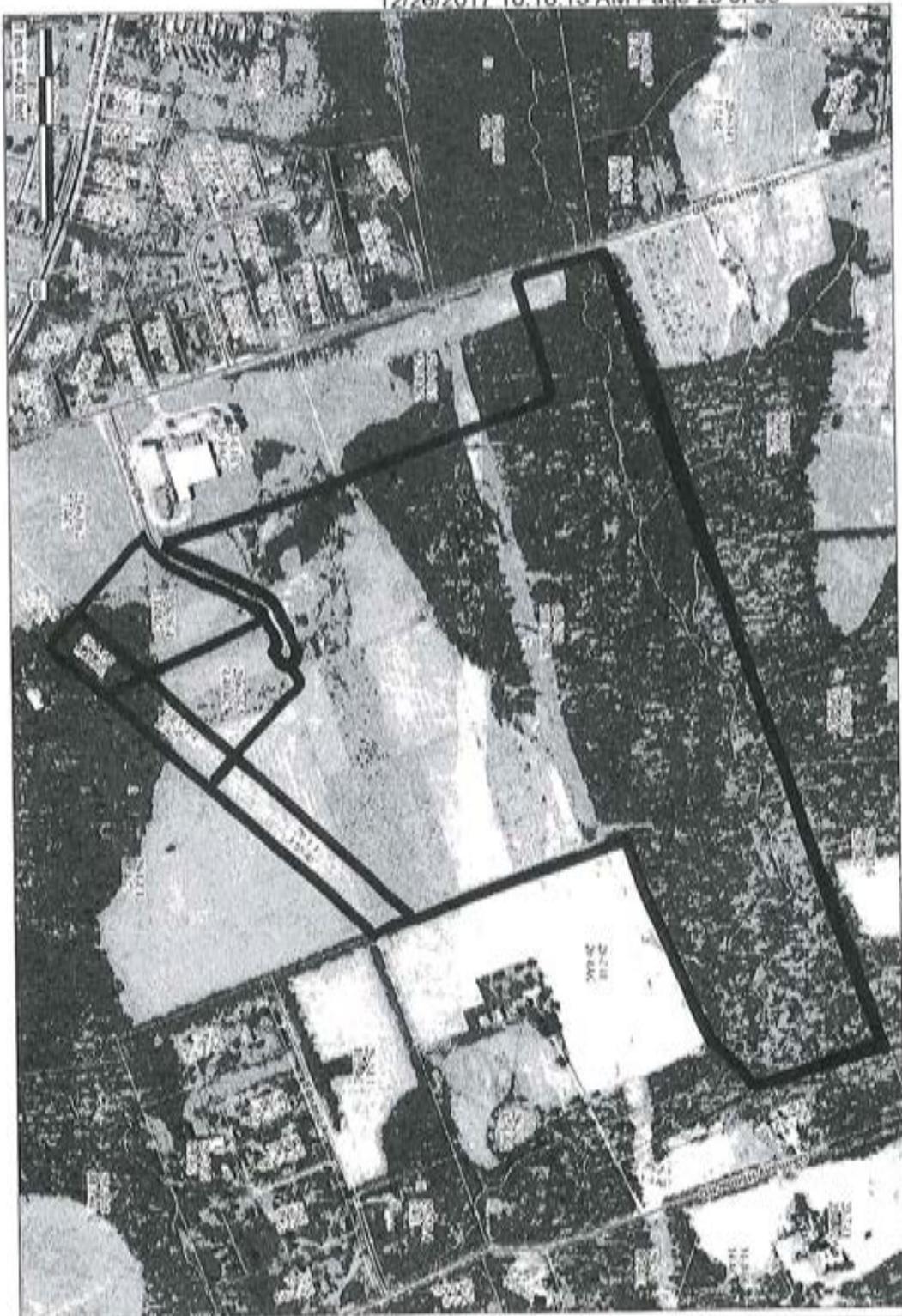


EXHIBIT "A"

Plan of the Property

EXHIBIT "A" - INTERMUNICIPAL SEWER AGREEMENT
HAMMELL-O'DONNELL PROPERTIES, LLC



Map



COUNTY OF CHESTER
PENNSYLVANIA

Legend

- Parcels
- Major Roads
- Interstate
- US Rt
- State Rt
- Local Road
- Rivers & Streams
- Lakes

Map Date: 12/26/2017 10:18:13 AM
Map Scale: 1 inch = 400 feet
Map Author: [illegible]
Map User: [illegible]
Map Title: [illegible]

EXHIBIT "B"

Northwestern Chester County Municipal Authority Reservation of Capacity Agreement form

Prepare by/Return to:

Kristin S. Camp, Esquire
BUCKLEY, BRION, McGUIRE & MORRIS LLP
118 W. Market Street, Suite 300
West Chester, PA 19382

UPI: _____

**AGREEMENT FOR RESERVATION OF SEWER CAPACITY FROM
NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY**

THIS AGREEMENT made this _____ day of _____, 20____
(Execution Date") by and between the NORTHWESTERN CHESTER COUNTY
MUNICIPAL AUTHORITY (the "Authority") and
_____, the applicant and developer of the
Development defined below (herein referred to as the "Developer") as follows:

I. BACKGROUND

A. The Authority owns and operates wastewater facilities (the "Sewer System") which provide public sewer service to properties in the Township of Honey Brook and in the Borough of Honey Brook, Chester County, Pennsylvania, (jointly the "Municipalities").

B. In recent years, there has been increasing development pressure in the Municipalities served by the Authority.

C. The Authority and Developer recognize that the Authority must regulate the reserve capacity at its wastewater facilities to maintain a satisfactory reserve to fairly provide for growth in the Municipalities.

D. Developer requests the Authority to reserve capacity in the wastewater facilities for its development located at : _____
and described in a deed recorded in the Office for the Recorder of Deeds in and for

Chester County, Pennsylvania in Deed Book _____, Page _____ (the "Property") and known as " _____," (the "Development").

II. AGREEMENT

Therefore, in consideration of the mutual promises contained herein and intending to be legally bound hereby the Authority and Developer hereby agree that:

1. The recitals contained in item I, above, entitled "Background," are incorporated herein as fully as though set forth at length.
2. Developer has submitted to the Authority an Application to Request Reservation of Sewer Capacity dated _____, 20____ (the "Application"), and represents to the Authority that Developer has paid all fees required to be submitted with such Application. The Application is hereby incorporated into and made a part of this Agreement as though set forth herein at length. Developer understands and agrees that capacity in the Sewer System shall not be reserved until such time as a preliminary land development plan or preliminary subdivision plan approved by the appropriate municipality is delivered to the Authority.
3. The Authority hereby reserves capacity in its Sewer System for Developer as follows (the "Reserve"): _____ EDUS
4. The Reserve for Developer shall remain in effect until: (i) connection of all units of the Developer's Development is made to the Authority's Sewer System, or (ii) this Agreement is terminated by the Authority pursuant to paragraph 7, below, or (iii) a period of five years from the date of preliminary plan approval for the Development, whichever shall first occur. Developer shall pay all fees due as follows: A sum of money shall accompany all applications which shall be equal to \$235.20 per EDU of requested

capacity but not to exceed 60% of the average sanitary sewer bill for one year for the units to be served. Annually during the term of this Agreement, a sum of money equal to 60% of the then average sanitary sewer bill for the units to be served and not yet connected to the Authority's Sewer System for a one year period shall be paid to the Authority within thirty (30) days of the annual anniversary date of this Agreement.

5. The Authority shall not create the Reserve until all fees then due, including but not necessarily limited to reservation of capacity fees, have been paid as set forth in the instructions to the Application.

6. The fees paid by Developer in connection with the Application and this Agreement shall be retained by the Authority for use at its sole discretion and are not refundable.

7. (A) It shall be a default under this Agreement if any of the following occur: (i) the failure of Developer to pay any sewer charges required to maintain the Reserve when due; or (ii) the failure of Developer to comply with the Rules and Regulations of the Authority.

(B) In the event of a default, the Authority shall provide Developer at least thirty (30) days advance written notice and a reasonable opportunity to cure. In the event the default has not been cured by Developer: (a) this Agreement may be terminated by written notice to Developer to the address set forth in Developer's application for the Reserve and the unused portion of the Reserve shall immediately revert to the Authority, or (b) Developer shall not be permitted to connect the Development to the Authority's Sewer System until: (i) all Rules and Regulations have been complied with; (ii) all sewer charges in arrears (including, but not limited to, all reservation of capacity fees) have been paid

together with interest at the legal rate, and (iii) all charges necessary to connect to the Sewer System have been paid in full.

(C) In the event the Authority shall have terminated this Agreement, to regain the Reserve which reverted to the Authority, Developer shall initiate the formal application procedure as provided in paragraph 4 hereinabove. The Authority shall have the sole discretion as to whether to grant the Reserve in connection with such application to regain the Reserve based upon the then existing capacity of the system. There is no guarantee that the Reserve or any portion thereof will be available to Developer and Developer shall have no prior rights in connection with the Reserve.

8. Developer acknowledges and agrees that the purpose of this Agreement and the Application is for the reservation of capacity in the Authority's Sewer System only and does not entitle Developer to utilize the tapping fee amount established at the time of reservation of capacity. Developer acknowledges that tapping fees may be increased due to a variety of circumstances.

The Authority makes no representation that: (i) Developer has physical access to the Authority's sewage system, (ii) Developer's plans are adequate to provide the Development with sewage facilities, or (iii) Developer's plans have been or will be approved by the Authority. It is Developer's responsibility to comply with the Rules and Regulations of the Authority and to obtain sufficient and lawful access to the Authority's Sewage System which shall include the obligation to pay the tapping fee amount effective at the time of connection.

9. Developer acknowledges and agrees that in the event that (i) the Reserve or any part thereof shall not be available for Developer's use due to unforeseen circumstances beyond the control of the Authority, or (ii) the unavailability of the Reserve or any part thereof due to the imposition of a moratorium by the Department of Environmental Protection or similar circumstances and, in such event, the Authority shall not be liable to Developer for any damages suffered by the Developer whether foreseen or unforeseen, except for the return of fees paid in connection with this Agreement.

10. The Reserve is for the benefit of the Property and Development covered by this Agreement only. This Agreement is not assignable or transferable to any other real property in any manner.

11. This Agreement is intended to bind the Applicant, the Developer and their heirs, executors, administrators, successors and assigns. This Agreement shall be promptly recorded in the Office for the Recording of Deeds in and for Chester County, Pennsylvania. This Agreement is also intended to bind all future owners of the Development and shall run with the land.

SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, the parties have executed this Agreement on the date first above written.

ATTEST:

Secretary

NORTHWESTERN CHESTER
COUNTY MUNICIPAL AUTHORITY

By: _____
Chairman

WITNESS/ATTEST

DEVELOPER:

By: _____

CORPORATE ACKNOWLEDGMENT

COMMONWEALTH OF PENNSYLVANIA :
:SS
COUNTY OF CHESTER :

On this, the _____ day of _____, 2016, before me _____
_____, the undersigned officer personally appeared _____
_____ who acknowledged himself (herself) to be the
_____ of a corporation, and that (s)he as such
_____, being authorized to do so,
executed the foregoing instrument for the purposes therein contained by signing the name
of the corporation by himself (herself) as _____.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public

MUNICIPAL AUTHORITY ACKNOWLEDGMENT

COMMONWEALTH OF PENNSYLVANIA :
 :SS
COUNTY OF CHESTER :

On this, the _____ day of _____, 20_____, before me _____
_____, the undersigned officer personally appeared _____
_____ who acknowledged himself (herself) to be the of Northwestern
Chester County Municipal Authority, a municipal authority of the Commonwealth of
Pennsylvania and that (s)he as such _____, being
authorized to do so, executed the foregoing instrument for the purposes therein contained
by signing the name of the Northwestern Chester County Municipal Authority by himself
(herself) as _____.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public

APPENDIX B
CAERNARVON TOWNSHIP INTERMUNICIPAL AGREEMENT

SV

**INTERMUNICIPAL SEWER SERVICE
AGREEMENT**

BETWEEN

**THE TOWNSHIP OF HONEY BROOK,
CHESTER COUNTY, PENNSYLVANIA**

AND

**THE CAERNARVON TOWNSHIP MUNICIPAL
SEWER AUTHORITY
BERKS COUNTY, PENNSYLVANIA**

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INTERMUNICIPAL SEWER SERVICE AGREEMENT

THIS INTERMUNICIPAL SEWER SERVICE AGREEMENT (hereinafter the "Agreement"), dated the 13 day of April, 2005, by and between the Township of Honey Brook, Chester County, Pennsylvania ("Honey Brook Township"), a municipal corporation and body politic incorporated under the 2nd Class Township Code, 53 P.S. §65101, *et seq.*, as amended, with its principal place of business at 495 Supplee Road, P.O. Box 1281, Honey Brook, Pennsylvania 19344, and,

The Caernarvon Township Municipal Sewer Authority (the "Authority"), a municipal authority of Caernarvon Township, Berks County, Pennsylvania incorporated and existing under the Pennsylvania Municipality Authorities Act of 1945, *as amended* (the "Act"), 53 P.S. §301, *et seq.*, *as amended*, with its principal place of business at 3226 Main Street, PO Box 291, Morgantown, PA 19543.

PREAMBLE

The purpose of this Agreement, by and between the parties stated hereinabove, is to authorize the Authority to provide sewer services to users situated in Honey Brook Township in the area identified as the "Caernarvon/Honey Brook Joint Sewer Service Area", more fully described at Exhibit "A" to this Agreement, and further prescribe the rights, duties, and obligations of the parties with respect to providing such sewer services for the benefit of users in the Caernarvon/Honey Brook Joint Sewer Service Area.

RECITALS

WHEREAS, the Authority owns a sewage collection, conveyance, treatment, storage, and disposal system (the "System" as hereinafter defined in Section 1) that provides sewer service to users in the area, and such other areas as are approved by the Authority.

WHEREAS, the Authority retains ownership of the System and responsibility to inspect, operate, maintain, and repair the System for the benefit of its users.

WHEREAS, Honey Brook Township requires facilities for the collection, conveyance, treatment, storage and disposal of sewage for residential units proposed to be situated in Honey Brook Township, known as the "Caernarvon/Honey Brook Joint Sewer Service Area" as defined herein and more specifically described on a Plan entitled the "Caernarvon/Honey Brook Joint Sewer Service Area", prepared by EB Wals & Associates, Inc., dated April 13, 2005, (the "Plan"), which is attached hereto as Exhibit "A" and incorporated by reference as if set forth in full herein.

WHEREAS, Honey Brook Township has determined by official action that it shall be advantageous to cooperate with and authorize the Authority to provide sewage

treatment facilities and sewer services for the benefit of those users within the Caernarvon/Honey Brook Joint Sewer Service Area.

WHEREAS, the Authority, upon receipt of the appropriate governmental approvals is willing to provide sewer services to the Caernarvon/Honey Brook Joint Sewer Service Area, subject to and in accordance with the terms and conditions of this Agreement.

WHEREAS, the parties to this Agreement desire to establish certain promises, covenants, conditions, and restrictions with respect to the providing sewage treatment facilities and sewer services for the benefit of users in the Caernarvon/Honey Brook Joint Sewer Service Area via the System, as well as, the inspection, operation, maintenance and repair of that portion of the System that will be situated within Honey Brook Township.

AGREEMENTS

NOW THEREFORE, in consideration of the mutual promises, covenants and agreements contained herein, and intending to be legally bound, the parties do hereby agree as follows:

§ 1. Definitions

(a) **Authority** – as used in this Agreement shall mean the Caernarvon Township Municipal Sewer Authority.

(b) **Developer** – as used in this Agreement shall mean any landowner, agent of such landowner, or tenant with the permission of such landowner, who makes or causes to be made a subdivision of land or a land development that will require sewer services from the System for property situated in the area known as the "Caernarvon/Honey Brook Joint Sewer Service Area".

(c) **Facilities** - That portion of the Authority sewage collection, conveyance, treatment, storage, and disposal system that will provide sewer service to users in the Caernarvon/Honey Brook Joint Sewer Service Area.

(d) **Parcel** – Any portion of a property or properties situated in Honey Brook Township and the Conestoga Creek Watershed and located in the Caernarvon/Honey Brook Joint Sewer Service Area, whose boundaries shall be defined in a duly recorded deed or deeds in the Chester County Recorder of Deeds Office.

(e) **System** - The Authority sewage collection, conveyance, treatment, and storage system, wherever situated, that will provide sewer service to users in Caernarvon/Honey Brook Joint Sewer Service Area.

(f) **User Rate** - The user-rate established by the Authority, in its sole discretion, to cover the cost of collection, conveyance, treatment, storage and disposal of sewage, throughout areas served by the System, including, but not limited to the Caernarvon/Honey Brook Joint Sewer Service Area as defined herein. Such user-rate shall reflect the actual cost of service including reserves and such other items as are permitted by law to the various classes of users and different geographic areas, and which are consistent with the requirements of the rules and regulations binding the Authority.

(f) **Caernarvon/Honey Brook Joint Sewer Service Area** - Parcels situated in Honey Brook Township and the Conestoga Creek Watershed to be served by the System and Facilities, and described more specifically in the Plan consisting of approximately 140 EDU's.

§ 2. Obligations of Honey Brook Township

By execution of this Agreement, Honey Brook Township acknowledges the following:

(a) By execution of this document, Honey Brook Township shall appoint and recognize the Authority as the exclusive agency that will own all sewage collection, conveyance, treatment, and storage facilities in the area designated as the Caernarvon/Honey Brook Joint Sewer Service Area, as defined herein.

(b) The Authority shall be the sole agency responsible to inspect, operate, maintain, and repair the System, including Facilities situated in the Caernarvon/Honey Brook Joint Sewer Service Area in order to keep it in good working order and operating condition.

(c) The Authority shall have the power to establish a uniform system for billing, enforcement, collections, liens and penalties for users in the Caernarvon/Honey Brook Joint Sewer Service Area.

(d) By execution of this document, Honey Brook Township shall authorize the Township Manager to execute all documents necessary to give full force and effect to the terms and conditions of this agreement.

(e) Honey Brook Township shall, promptly after the date of this Agreement, enact and enforce such ordinances as are necessary to fulfill its obligations. Such ordinances that may have to be adopted may include: (1) a plumbing ordinance or code, and (2) a mandatory connection ordinance for all properties in the Caernarvon/Honey Brook Joint Sewer Service Area regulating the connection, service, and enforcement, of the Authority's rules and regulations and including the right to file municipal liens.

§3. Obligations of the Authority

(a) By execution of this Agreement, the Authority shall ensure users in the Caernarvon/Honey Brook Joint Sewer Service Area receive sewer service in accordance with the terms of this Agreement, applicable law, and regulation, equal to sewer service provided to other customers in Caernarvon Township.

(b) By execution of this document, the Authority shall authorize the Chairman or the Vice Chairman of the Authority to execute all documents necessary to give full force and effect to the terms and conditions of this agreement.

§ 4. Inspection, Maintenance and Repair of the System

Each Developer or Developers of property situated in the Caernarvon/Honey Brook Joint Sewer Service Area, as defined herein, shall be responsible for the initial design, construction and installation of the Facilities that will service their parcel or parcels. Such Facilities shall be designed, constructed and installed in accordance with Authority design standards then in effect, and in accordance with all government laws, codes, ordinances, and regulations.

(a) From and after satisfactory completion of the design, construction and installation of the Facilities that will service a property in the Caernarvon/Honey Brook Joint Sewer Service Area, and upon acceptance of dedication of the same by the Authority, the Authority shall be responsible for inspection, operation, maintenance, and repair of the Facilities and shall maintain or cause the same to be maintained in good working order and operating condition in accordance with all laws, codes, ordinances, and regulations then in effect.

(b) As used in this Agreement, maintenance and repair shall mean all costs and expenses incurred for the inspection, maintenance or repair of the System and Facilities, including routine maintenance and shall include without limitation, the costs associated with and attributed to any and all activities required to keep the System in good working order and operating condition, in accordance with all laws, codes, ordinances, rules and regulations then in effect. Except as otherwise specifically provided herein, the Authority shall be wholly responsible for all inspection, maintenance and repair costs arising out of the construction, installation and operation of the System.

(c) Where the Authority is notified of the need for emergency repairs by Honey Brook Township or another party, a schedule of such repairs shall be prepared as soon as is practicable. However, in no event shall the development of a schedule be cause for delay in making emergency repairs and the Authority shall commence and complete or cause to be completed, the necessary repairs immediately where in the judgment of the Authority failure to make such repairs would endanger the public's health safety or welfare. "Emergency repairs" are defined as those circumstances where the public health, safety and welfare may be put at peril by a failure to complete such repairs in a timely manner. In no

event shall acceleration of any repairs create any liability for Honey Brook Township or Caernarvon Township. All expenses and costs of accelerated repairs shall be borne by the Authority.

§5. Cost Recovery

The Authority may recover all or any portion of the costs of all of its capital facilities, to the extent permitted by the law, from the collection of tapping fees and connection charges. In its sole discretion, the Authority may elect to establish uniform tapping fees and connection charges for its users or it may prorate these charges among users, based upon the construction costs in different areas, all as it deems appropriate.

§6. Developer Escrow Requirements

At or prior to release of final subdivision and/or land development plans for recording by Honey Brook Township for a proposed development established in the Caernarvon/Honey Brook Joint Sewer Service Area, Honey Brook Township shall require the Developer or Developers proposing such development to enter into an agreement that provides for the construction of adequate collection, conveyance, treatment, storage, and disposal facilities that may be necessary to service the proposed development. In addition to other terms and conditions, such agreement shall require the Developer or Developers to pay any other fees as directed by the Authority related to the construction of such facilities, as established from time to time. Moreover, the Developer or Developers of a specific property in the Caernarvon/Honey Brook Joint Sewer Service Area shall be required to establish an escrow in a form approved by and in such sums as are typically required for such improvements. The Authority shall provide construction and engineering standards that shall be followed by a Developer or Developers in the design and construction of any sewage collection, conveyance, treatment, storage, and disposal facilities.

§7. Revisions to Act 537 Plans

Promptly after the execution of this Agreement, or as appropriate during the subdivision and land development of such property in the Caernarvon/Honey Brook Joint Sewer Service Area, Caernarvon Township and Honey Brook Township shall revise their Act 537 Plans, as necessary, to reflect the proposed use of the System by the users in the Caernarvon/Honey Brook Joint Sewer Service Area pursuant to this Agreement. In its Act 537 Sewage Facilities Plan, Honey Brook Township has designated, or shall designate, the Authority as the official agent to implement a "Sewage Facilities Plan" for the Caernarvon/Honey Brook Joint Sewer Service Area as defined herein. The Authority shall make or cause to be made by a designated Developer, or Developers, extensions to the System pursuant to the Plan, but only within the Caernarvon/Honey Brook Joint Sewer Service Area as defined herein and to the extent deemed feasible by the Authority. The Authority shall not make any extensions or improvements that are inconsistent with the applicable Act 537 Plan, unless ordered to do so by a final court order or an unappealed order of the

Pennsylvania Department of Environmental Protection. The parties hereto acknowledge that the Developer or Developers of the Caernarvon/Honey Brook Joint Sewer Service Area shall be responsible for any costs incurred in amending the Caernarvon Township or Honey Brook Township Act 537 Plans and sewer use ordinances.

§8. Grant of Easement for Facilities in Honey Brook

Subject to the terms and conditions of this Agreement, Honey Brook Township for itself, its successors and assigns, does hereby grant to the Authority perpetual rights and non-exclusive easements appurtenant to use the subsurface of public streets, roads, lands, easements and rights-of-way within the Caernarvon/Honey Brook Joint Sewer Service Area for the construction, inspection, maintenance and repair of any facilities of the System situated in the Caernarvon/Honey Brook Joint Sewer Service Area and subject to the covenants and restrictions stated herein. The Authority, its employees, agents, and licensees shall have the right to enter these areas to perform, carry out and complete any requirements as referenced herein in this Agreement related to the construction, inspection, maintenance and repair of the System.

§9. Notice

Any notice, report or demand required, permitted or desired to be given under this Agreement shall be in writing and shall be deemed to have been sufficiently given or served for all purposes if it is delivered (i) by overnight courier prepaid by the sender or, (ii) mailed by First Class mail, postage prepaid to the parties at the addresses shown below or at such other address as the respective parties from time to time designate by like notice. Each such notice shall be effective upon being so delivered. Such addresses shall be as follows:

Honey Brook Township
Attn: Township Manager
P.O. Box 1281
Honey Brook, PA 19344

The Caernarvon Township Municipal Sewer Authority
3226 Main Street, P.O. Box 291
Morgantown, PA 19543

Notwithstanding the "Notice" requirements stated herein, Honey Brook Township shall be authorized to give and Authority deemed to have accepted any form of notice including facsimile or telephone or voicemail in such instances where, in the judgment of the Township, emergency maintenance or repairs on the System are required to protect the public's health, welfare or safety.

§10. Term

This Agreement and the easements, rights, obligations, and liabilities created hereby shall be for the longer of ninety-nine (99) years or perpetual to the extent permitted by law.

§11. Running with the Land

The rights, easements, covenants and restrictions herein established for the benefit of a Parcel (and any portion thereof) shall run with, and be appurtenant to, title to the Parcels (and any portion thereof) and shall be a burden upon each parcel (and any portion thereof) and shall run with the title to each parcel (and any portion thereof) and shall bind and inure to the benefit of each Owner and the Owner's successors-in-title to each Parcel (and any portion thereof).

§12. Miscellaneous

(a) **Intergovernmental Cooperation Act.** This Agreement is made and authorized by the Pennsylvania Intergovernmental Cooperation Act, 63 Pa.C.S.A. § 2301et.seq.

(b) **Modifications.** This Agreement shall not be modified except by a written instrument signed by authorized representatives of the parties hereto. Each of the parties to this Agreement agree, for themselves and for their successors and assigns, that they will not unreasonably withhold or delay its consent to any future modification proposed by the other party if requested to comply with requirements of this agreement or another governmental authority.

(c) **Force Majeure.** The providing of services by the Authority pursuant to the terms and conditions of this Agreement shall be subject to events and conditions beyond the Authority's reasonable control, including, but without limitation, events of casualty, acts of God, the operation of public agencies and financial feasibility.

(d) **Duty of Cooperation.** The parties agree that they shall cooperate with each other in implementing the terms of this Agreement, shall promptly respond to inquiries and requests from the other, and shall share information concerning the construction and operation of the collection, conveyance, treatment, storage, and disposal System as each may reasonably need in order to be kept advised of those matters.

(e) **Severable Provisions.** If any provision of this Agreement, or portion thereof; or the application thereof to any person or circumstances, shall, to any extent be held invalid, inoperative or unenforceable, the remainder of this Agreement, or the application of such provision or portion thereof to any other persons or circumstances, shall not be affected thereby. It shall not be deemed that any such invalid provision affects the consideration for this Agreement and

each provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law.

(f) **Successors and Assigns.** All rights and obligations given herein to or imposed upon the respective parties hereto shall extend to and bind the several and respective successors and assigns, of the parties.

(g) **Captions.** The paragraph and subparagraph headings in this Agreement are for convenience only, shall in no way define or limit the scope of content of this Agreement, and shall not be considered in any construction or interpretation of this Agreement or any part thereof.

(h) **Execution in Counterparts.** This Agreement may be executed in multiple counterparts, each of which shall be regarded as an original and all of which together shall constitute one and the same instrument.

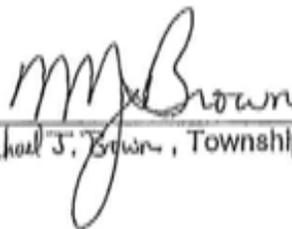
IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their respective duly authorized officers as of the date first written above.

HONEY BROOK TOWNSHIP

Attest:



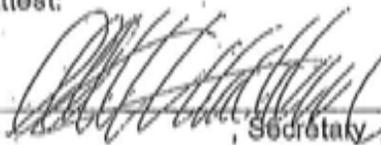
By:



Michael J. Brown, Township Manager

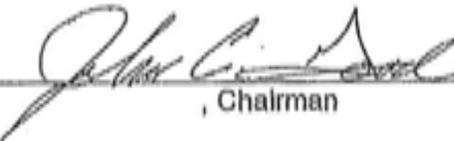
**CAERNARVON TOWNSHIP MUNICIPAL
SEWER AUTHORITY**

Attest:



Secretary

By:



Chairman

(Seal)

EXHIBIT A

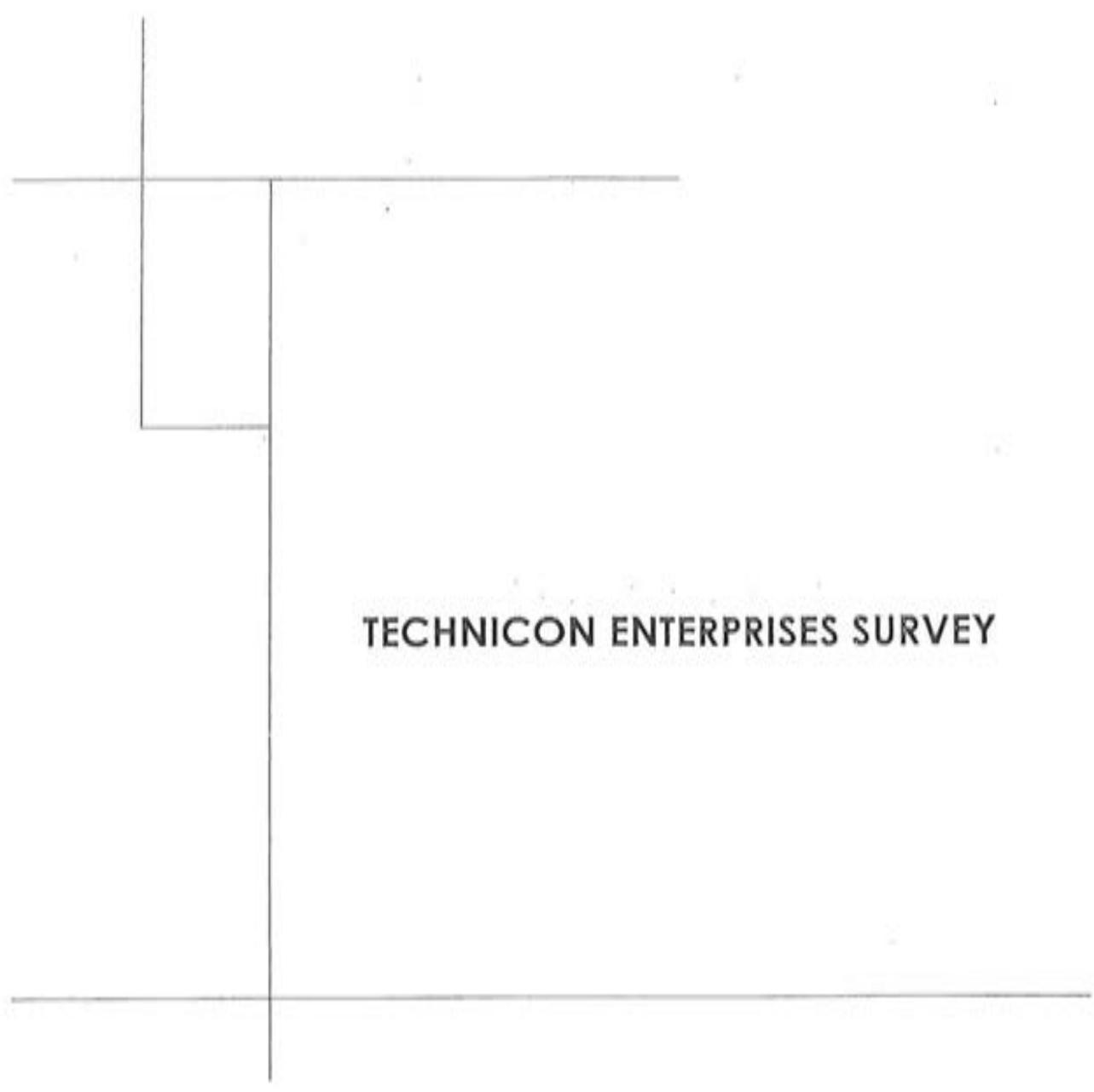
CAERNARVON/HONEY BROOK JOINT SEWER SERVICE AREA

APPENDIX C
CHESTER COUNTY HEALTH DEPARTMENT PROVIDED DATA

HONEYBROOK TOWNSHIP SEPTIC FAILURES

Failure Type	Permit Number	Date	Uniform Parcel Identifier (UPI)
System	R14964	2/12/2001	22-5-7
System	Z011560	n/a	22-1-13
Certification	R36245	5/2/2001	22-1-13.1C
System	T008803A	10/28/2004	22-1-11.3A
System	R68229	n/a	22-3-5
System	W002996	n/a	22-3-38.1
System	Q15239	8/19/1999	22-3-43
System	R02187	6/20/2005	22-4-32.9
System	Z011517	n/a	22-4-32.4
System	Z056259	n/a	22-4-11
System	T018131	6/7/2004	22-5-12.4
Certification	R68230	5/14/2001	22-5-26.5
System	W004111	7/10/2006	22-5-26.6
System	Q15580	6/23/1999	22-5-26.15
System	Z062569	1/10/2008	22-5-26.11
System	T015012	5/25/2004	22-3-48
System	R36128	11/29/2000	22-5-29.3
System	T018511	7/1/2003	22-5-16.5
System	W003476	6/16/2006	22-5-92
System	R20100	11/12/2002	22-5-18.2
System	Z82313	n/a	22-7-59
System	Z011480	n/a	22-7-13.1
System	Z014646	n/a	22-4-74.1
System	Z056283	5/30/2008	22-4-78.1
System	T022539	11/1/2004	22-4-78
System	R36364	1/31/2003	22-3-66
System	T078087	5/24/2005	22-6-2
System	Z057272	n/a	22-7-8-E
System	R14138	4/26/2002	22-8-8
Certification	R35072	n/a	22-8-64.2
Certification	Z063553	n/a	22-8-65.2
System	T015032	n/a	22-8-68.6E
System	U001745	6/15/2006	22-8-65.1
Certification	Z011531	n/a	22-8-65.23
Certification	R09562	4/24/2003	22-8-65.16
System	W018698	n/a	22-7-64
System	R19271	4/15/2004	22-9-2
System	Z014452	10/5/2007	22-9-8
System	T018921	9/10/2004	22-6-62
System	W004717	6/22/2006	22-9-16
Certification	Z063628	n/a	22-11-38.1
System	R09434	12/1/2000	22-11-52.3
System	T023500	n/a	22-11-22.1
System	T078461	4/1/2005	22-11-10.8
System	W002484	n/a	22-10-10.2
System	R01665	6/7/2000	22-9-12.1A
Certification	R38205	12/24/2002	22-9-48.3
Certification	W002486	5/24/2005	22-9-45
System	Z008473	7/31/2006	22-10-41

APPENDIX D
PRIOR SURVEY RESULTS BY HRG AND
TECHNICON ENTERPRISES



TECHNICON ENTERPRISES SURVEY

Sewerage Survey Results:

ID #	Address	Tax Parcel ID #	# of OLDS	Malfunction Category			Explanation
				Confirmed	Suspected	Potential	
1	871 Deerpont Road	2294-01112000	1				
2	30 Sullista Lane, P.O. Box 37	2207-0059000	1	x			sewer problem, constructed prior to 1971, unsuitable soils as mapped
3	870 Sullista Lane, P.O. Box 16	2207-0059000	1		x		unsuitable soils as mapped
4	391 Supter Road	2207-0012010	1		x		constructed prior to 1971, unsuitable soils as mapped
5	912-915 Supter Road	2207-0014000	1	x			unsuitable soils as mapped
6	973 Supter Road	2204-0109000	1		x		possible discharge observed, no direct evidence of sewage, unsuitable soils as mapped
7	1015 Supter Road	2204-0109100	1		x		possibly constructed prior to 1971, unsuitable soils as mapped
8	3726 Horseshoe Pike	2207-0017000	1	unk.	unk.	unk.	unsuitable soils as mapped
9	5224 Horseshoe Pike	2203-0009000	1		x		W fill and septic location unknown (Rural Property)
10	295 Pegasus Avenue	2206-0017000	1		x		constructed after 1971, suitable soils as mapped
11	297 Pegasus Avenue	2206-0006000	1		x		constructed after 1971, suitable soils as mapped
12	1040 Twin County Road	2205-0015010	1	x			sewer problem, unsuitable soils as mapped

Street	Wet District
1	5
6	6
7	1
5	0
6	0
3	2
25	11
20.7%	20.8%
8%	8%
29%	28%
71%	65%

OLDS Surveyed:
 Total Confirmed Malfunctions:
 Total Suspected Malfunctions:
 Total Potential Malfunctions:
 No Malfunctions:
 Total OLDS:
 % Sampled:
 % of OLDS Surveyed w/Confirmed Malfunctions:
 % of OLDS Surveyed w/Suspected Malfunctions:
 % of OLDS Surveyed w/Potential Malfunctions:

Well Water Sampling Results:

	ID #	Address	Tax Parcel ID #	Wells	Fecal Coliform (mpn/100mL)	Total Coliform (mpn/100mL)	Nitrate (mg/L)
Suplee Study Area	1	971 Dampman Road	2204-01110000	1	n.d.	n.d.	n.d.
	2	30 Storzfus Lane	2207-0059000	1	n.d.	120	n.d.
	3	870 Suplee Road	2207-00560000	1	n.d.	n.d.	1.89
	4	891 Suplee Road	2207-0013010	1	n.d.	10	16.70
	5	913-915 Suplee Road	2207-00140000	1	n.d.	40	14.34
	6	972 Suplee Road	2204-01090000	1	n.d.	n.d.	n.d.
	7	1015 Suplee Road	2204-01010100	1	n.d.	>2,400	9.72
Existing 'West' District Area	8	3726 Horsehoe Pike	2207-0077000	1	n.d.	8	12.73
	9	5224 Horsehoe Pike	2203-00590000	1	n.d.	n.d.	4.80
	10	295 Pequea Avenue	2206-00070000	1	n.d.	57	12.77
	11	297 Pequea Avenue	2206-00060800	1	n.d.	n.d.	17.06
	12	1040 Twin County Road	2203-0073010	1	n.d.	n.d.	6.18

	Suplee	'West' District
Total Wells Sampled:	7	5
Fecal Coliform Present:	0	0
Total Coliform Present:	4	2
Nitrate-Nitrogen > 10 mg/L:	2	3
5 mg/L < Nitrate-Nitrogen < 10 mg/L:	1	1
Nitrate-Nitrogen < 5 mg/L:	1	1
Total Wells:	25	11
% Sampled:	28.0%	45.5%
% of Wells Surveyed w/Fecal Coliform Present:	0.0%	0.0%
% of Wells Surveyed w/Total Coliform Present:	57.1%	40.0%
% of Positive Total Coliforms containing Fecal Coliforms:	0.0%	0.0%
% of Wells Surveyed w/Nitrate-Nitrogen > 10 mg/L:	28.6%	60.0%
% of Wells Surveyed w/Nitrate-Nitrogen < 5 & < 10 mg/L:	14.3%	20.0%
% of Wells Surveyed w/Nitrate-Nitrogen < 5 mg/L:	14.3%	20.0%



Herbert, Rowland & Grubic, Inc.
Engineering & Related Services

HONEY BROOK TOWNSHIP On-Lot Inspection Form

Name: _____

Address: _____

Type of Treatment System: (please check all that apply)

- _____ Anaerobic Septic Tank(s)
- _____ Aerobic Septic Tank
- _____ Cesspool
- _____ Dosing Tank
- _____ Grease Trap
- _____ Small Flow Treatment Facility
- _____ Privy
- _____ Other

Type of Absorption System: (please check all that apply)

- _____ Underground Seepage Bed
- _____ Elevated Sand Mound Bed
- _____ Elevated Sand Mound Trench
- _____ Inground Trenches
- _____ Other _____

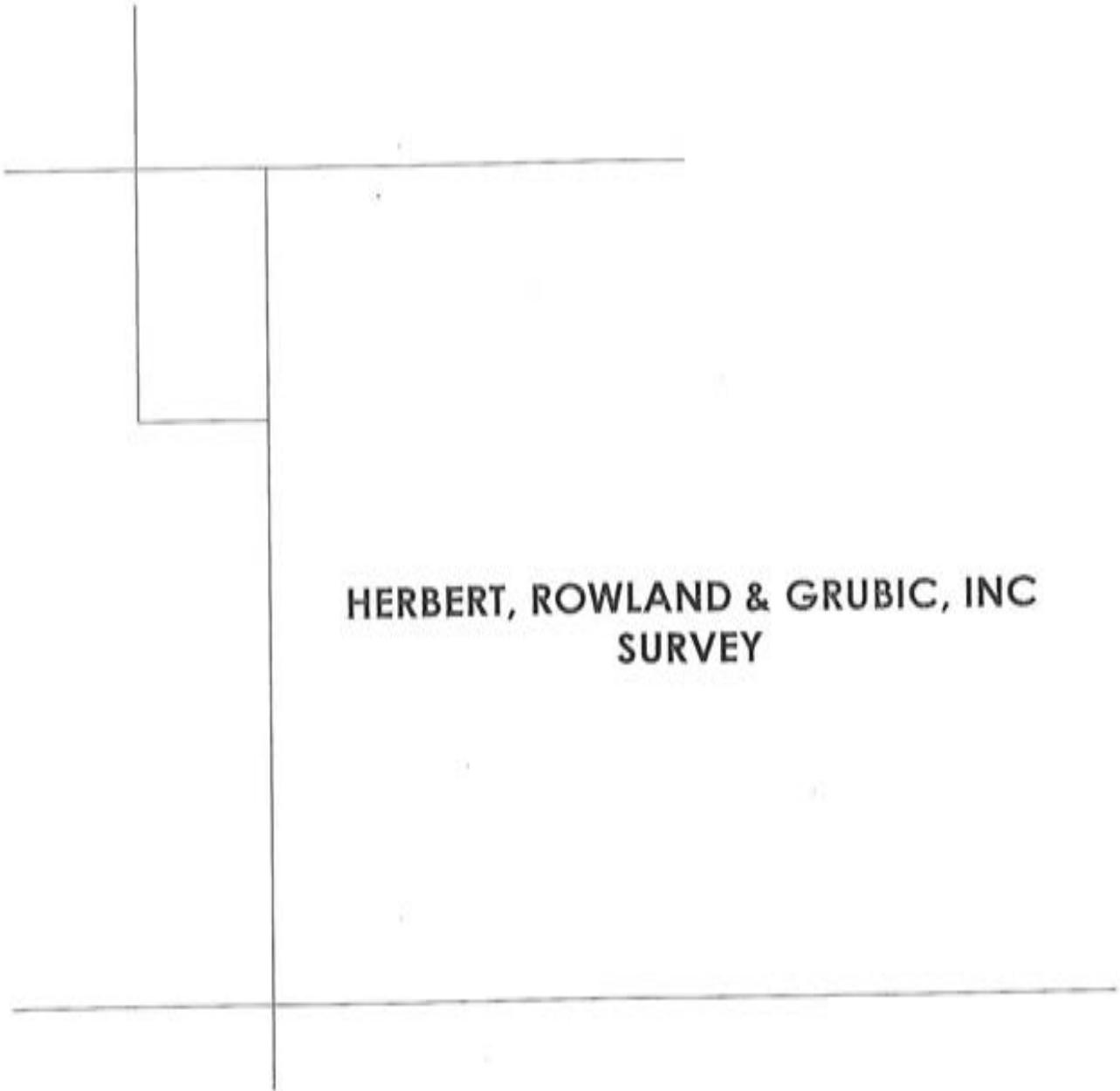
Condition of On-Lot System: (check all that apply)

- _____ Ponded effluent found on or around the absorption area.
- _____ Odors present.
- _____ Vegetation on top or side of absorption area is unusually lush or cannot be maintained.
- _____ Wetness or spongy areas around the absorption area.

Name of Inspector _____

Date _____

Weather Conditions on Date of Inspection: _____



**HERBERT, ROWLAND & GRUBIC, INC
SURVEY**

Mr. _____

Parcel ID No. _____

Dear Mr. _____:

On Thursday, May 20, 2010, Herbert, Rowland and Grubic (HRG) will be in your area to perform visual surveys of on-lot sewage disposal systems and collect well water samples on behalf of Honey Brook Township as part of our Act 537 Sewage Facilities Planning effort.

The results of the study will enable the Township to make a determination as to the need, or absence of need, to improve current sewage disposal practices.

We hope that the following question and answer section will answer some of your questions regarding this matter.

Why is the Township completing this survey?

The identification of sewage disposal needs is a key component of the Act 537 Sewage Facilities Plan being completed by Honey Brook Township. The Plan, which is required by the Pennsylvania Department of Environmental Protection, will enable the Township to identify and correct any current sewage or water supply related problems and facilitate planning for the future.

Why do they need to come back again?

Previous surveys were not sufficient for the Township to use as a basis for their planning decisions. The results of the preliminary analysis have not been discarded; this survey is simply meant to supplement the information which has already been gathered so that the Township has as much information as possible at their disposal.

What will the survey entail?

During this survey, the HRG representative (Mr. Jeff Bowra) will visit Township residences to look for visible signs of septic system function and collect well water samples for evaluation. Ideally, you will call Mr. Bowra to schedule a time for the survey that is convenient for your schedule. You will be asked a few questions about your wastewater disposal methods and be asked to fill a small sample container with well water (prior to any treatment you may have in your home). In total, the survey and water sample collection should take 20-30 minutes at the most.

Mr. Bowra will provide identification upon request. In performing his survey, he will need to enter your land to gather information (it is not necessary that he enter your home). This entry will include a visual assessment only. The surveys will be performed as courteously and as quickly as possible.

Please contact Mr. Bowra at your earliest convenience to schedule your preferred survey time. He is available at (717) 564-1121 (HRG's office) between 8:00 a.m. and 5:00 p.m.

We greatly appreciate your cooperation and assistance as we work to complete this planning effort.

Sincerely,

Michael J. Brown, Manager
Honey Brook Township



Herbert, Rowland & Grubic, Inc.
Engineering & Related Services

HONEY BROOK TOWNSHIP On-Lot Inspection Form

Name: _____

Address: _____

Type of Treatment System: (please check all that apply)

- _____ Anaerobic Septic Tank(s)
- _____ Aerobic Septic Tank
- _____ Cesspool
- _____ Dosing Tank
- _____ Grease Trap
- _____ Small Flow Treatment Facility
- _____ Privy
- _____ Other

Type of Absorption System: (please check all that apply)

- _____ Underground Seepage Bed
- _____ Elevated Sand Mound Bed
- _____ Elevated Sand Mound Trench
- _____ Inground Trenches
- _____ Other _____

Condition of On-Lot System: (check all that apply)

- _____ Ponded effluent found on or around the absorption area.
- _____ Odors present.
- _____ Vegetation on top or side of absorption area is unusually lush or cannot be maintained.
- _____ Wetness or spongy areas around the absorption area.

Name of Inspector _____

Date _____

Weather Conditions on Date of Inspection: _____

Auxiliary Survey Results:

ID #	Address	Tax Parcel ID #	# of OLDS	Malfunction Category			Explanation
				Confirmed	Suspected	Potential	
13	910 Suplee Road	2207-00379100	1	x			soggy grass areas near bottom of sand mound (constructed in 2007). Septic tank about 15' tank is buried in basement of house, 50+ years old, no known drainfield, possible soggy soil in drainfield area, water surfacing, 50+ years old constructed prior to 1972 owner reports that tank floods during wet weather events constructed in 1993, permitted
14	952 Suplee Road	2204-01050000	1		x		
15	931 Dumpson Road	2204-01140000	1	x			
16	57 Swobofus Road	2204-01200000	1		x		
17	913 Suplee Road	2207-00140000	1	x			
18	590 Buchanan Road	2204-01010200	1			x	
19	3470 Horseshoe Pike	2207-00940000	1		x		
Existing 'West' District Area							

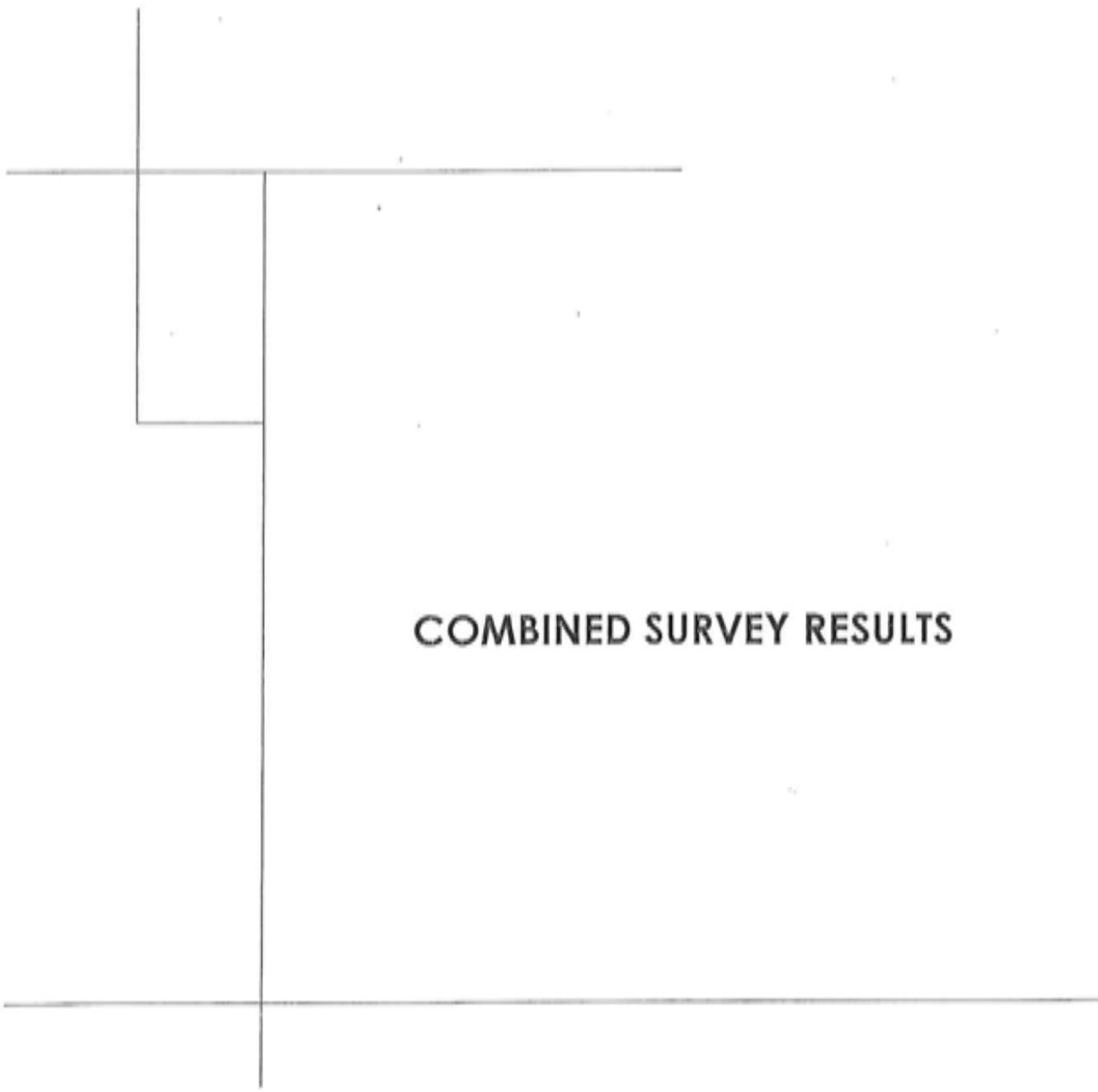
Suplee	'West' District
6	1
2	0
2	1
1	0
1	0
25	11
24.0%	9.1%
33%	0%
33%	100%
17%	0%

OLDS Surveyed:
 Total Confirmed Malfunctions:
 Total Suspected Malfunctions:
 Total Potential Malfunctions:
 No Malfunctions:
 Total OLDS:
 % Sampled:
 % of OLDS Surveyed w/Confirmed Malfunctions:
 % of OLDS Surveyed w/Suspected Malfunctions:
 % of OLDS Surveyed w/Potential Malfunctions:

Well Water Sampling Results:

	ID #	Address	Tax Parcel ID #	Wells	Fecal Coliform (mpn/100mL)	Total Coliform (mpn/100mL)	Nitrate (mg/L)
Suplee Study Area	13	910 Suplee Road	2207-00570100	1	n.d.	2	n.d.
	14	952 Suplee Road	2204-01050000	1	n.d.	n.d.	14.9
	15	951 Dampman Road	2204-01140000	1	n.d.	n.d.	n.d.
	16	67 Stoltzfus Road	2204-01200000	1	n.d.	1	11.00
	17	913 Suplee Road	2207-00140000	1	n.d.	8	15.10
	18	590 Buchanan Road	2204-01010200	1	n.d.	n.d.	11.90
Existing 'West' District Area	19a	3470 Horseshoe Pike - Well #1	2207-00940000	1	n.d.	n.d.	17.50
	19b	3470 Horseshoe Pike - Well #2	2207-00940000	1	n.d.	n.d.	1.30

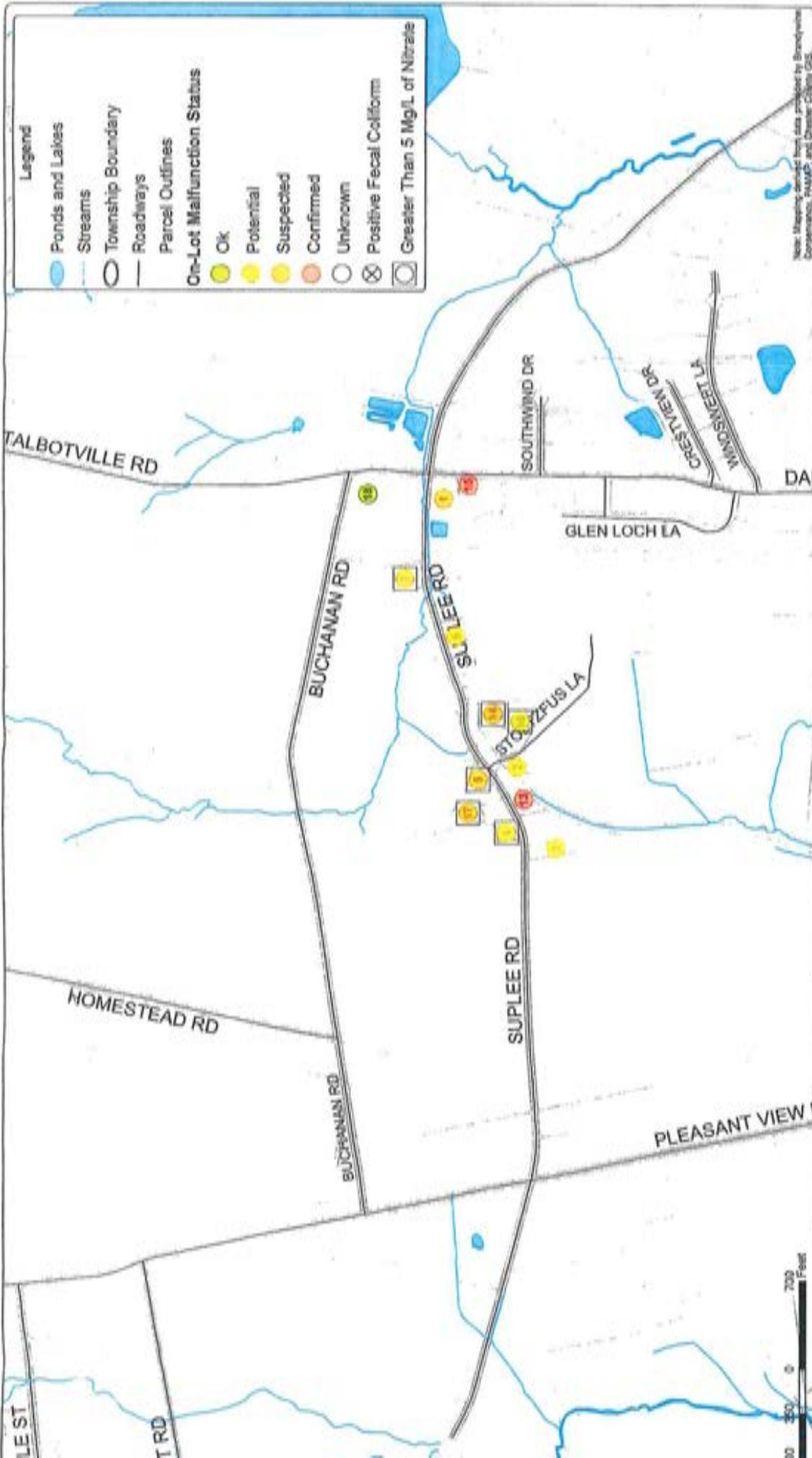
	Suplee	'West' District
Total Wells Sampled:	6	2
Fecal Coliform Present:	0	0
Total Coliform Present:	3	0
Nitrate-Nitrogen > 10 mg/L:	4	1
5 mg/L < Nitrate-Nitrogen < 10 mg/L:	0	0
Nitrate-Nitrogen < 5 mg/L:	0	1
Total Wells:	25	11
% Sampled:	24.0%	18.2%
% of Wells Surveyed w/Fecal Coliform Present:	0.0%	0.0%
% of Wells Surveyed w/Total Coliform Present:	50.0%	0.0%
% of Positive Total Coliforms containing Fecal Coliforms:	0.0%	#DIV/0!
% of Wells Surveyed w/Nitrate-Nitrogen > 10 mg/L:	66.7%	50.0%
% of Wells Surveyed w/Nitrate-Nitrogen < 5 & < 10 mg/L:	0.0%	0.0%
% of Wells Surveyed w/Nitrate-Nitrogen < 5 mg/L:	0.0%	50.0%



COMBINED SURVEY RESULTS

Study Area	OLDS Surveyed	Malfunction (% of OLDS Surveyed)							
		Confirmed		Suspected		Potential		None	
		<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>
Village of Suplee	13	2	15%	4	31%	6	46%	1	8%
Existing 'West' District	6	0	0%	2	33%	0	0%	4	67%

Study Area	Wells Surveyed	Total Coliform Present (% of Surveyed)		Fecal Coliform Present (% of Total Coliform)		Nitrate > 5 mg/L, but < 10 mg/L (% of Surveyed)		Nitrate > 10 mg/L MCL* (% of Surveyed)	
		<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>	<i>No.</i>	<i>Percent</i>
Village of Suplee	13	7	54%	0	0%	1	8%	6	46%
Existing 'West' District	7	2	29%	0	0%	1	14%	4	57%



Legend

- Ponds and Lakes
- Streams
- Township Boundary
- Roadways
- Parcel Outlines

On-Lot Malfunction Status

- OK
- Potential
- Suspected
- Confirmed
- Unknown
- Positive Fecal Coliform
- Greater Than 5 Mg/L of Nitrate

Note: Mapping and data were provided by Berwynville Community, PAWP, and Chester County GIS.

Project Name:	Act 537
Date:	10/20/2023
Scale:	1" = 100'
Author:	HRG
Checker:	HRG
Scale:	1" = 100'
Sheet:	E1

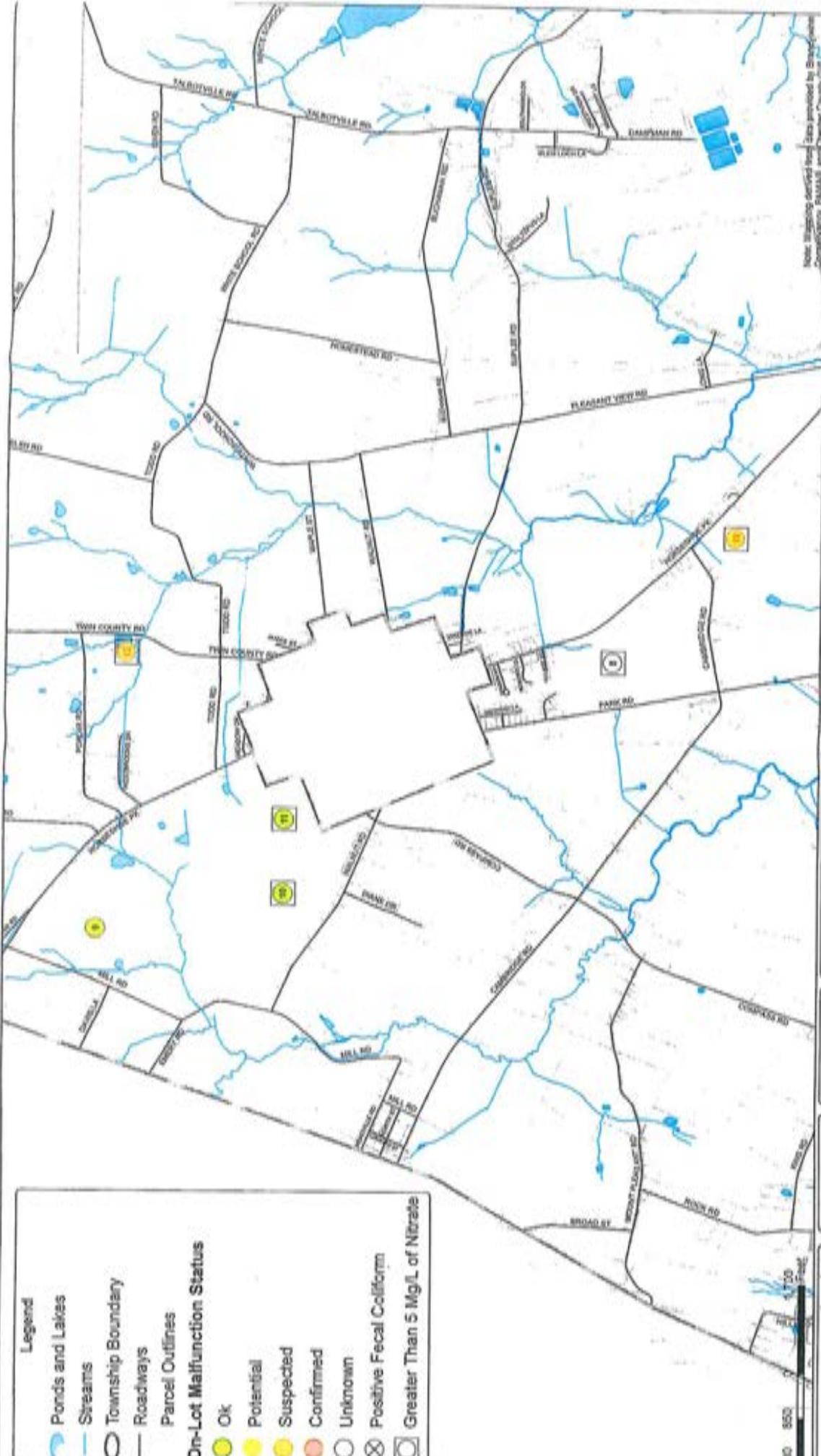
Act 537 Plan
Honey Brook Township

HRG
Engineering & Construction Services

128 Middle Road
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Project:	Act 537
Sheet:	E1
Date:	10/20/2023
Scale:	1" = 100'



Legend

- Ponds and Lakes
- Streams
- Township Boundary
- Roadways
- Parcel Outlines

On-Lot Malfunction Status

- Ok
- Potential
- Suspected
- Confirmed
- Unknown
- Positive Fecal Coliform
- Greater Than 5 Mg/L of Nitrate

Note: Imagery derived from data provided by Earthstar Consultants, PAWSI and Chester County GIS.

Project Manager:	John
Client:	HRG
City:	HRG
County:	HRG
Date:	1-1-2008
Scale:	1" = 100'

E2

Act 537 Plan
Honey Brook Township

HRG
Engineering & Technical Services

1000 Building Road
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Phone: 717.333.3333
www.hrginc.com
Office: 717.333.3333



Revision	Date	By

0' 500' 1000'

APPENDIX E
ACT 537 WWTP EVALUATION FOR NWCCMA

ACT 537 WWTP EVALUATION

FOR

NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY

**HONEY BROOK TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA**

**MARCH 2018
(REVISED 10/3/18)**

ENGINEER'S PROJECT NO. R000483.0433



369 East Park Drive
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**NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY
ACT 537 WWTP EVALUATION**

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**NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY
ACT 537 WWTP EVALUATION**

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1.0 INTRODUCTION

An alternatives analysis was completed for the Northwestern Chester County Municipal Authorities (NCCMA) wastewater treatment plant (WWTP) as part of the most recent Honey Brook Township Act 537 planning effort. This analysis was conducted to determine the existing conditions of the WWTP and evaluate possible options to increase the current permitted hydraulic capacity from 0.600 MGD to 0.740 MGD. Honey Brook Township developed the anticipated flow projections for the NCCMA sewer service area and provided them to NCCMA for use in competing the alternatives analysis. A copy of the anticipated flow projections is included in Appendix A.

2.0 SUMMARY OF EXISTING NCCMA WASTEWATER TREATMENT PLANT OPERATION AND PERFORMANCE

The NCCMA wastewater treatment facilities (collection system and WWTP) were originally constructed in the 1970's and were designed to service both the Honey Brook Borough and Honey Brook Township. The WWTP is located at 37 Dampen Road, Chester County, PA and discharges into the west branch of the Brandywine Creek.

2.1 SUMMARY OF EXISTING WWTP OPERATIONS

The original WWTP was permitted for an average daily flow (ADF) of 0.600 MGD and currently operates under this design hydraulic capacity. The treatment plant was designed as an aerated lagoon system followed by tertiary filtration (dissolved air flotation and sand filters). Disinfection is provide by gas chlorination.

As originally designed, the WWTP relied solely upon the lagoons biological processes for removal of ammonia nitrogen. Due to the inability to adequately maintain biological treatment in cold weather, previous upgrades to the WWTP included the installation of 80 fixed film contactors, trade named "Bio₂ Blocs", and the required ancillary equipment within the tertiary lagoons in an effort to address this issue. Since their installation, the plant has had success in reducing their ammonia nitrogen limits for the majority of the year. Despite this success, the WWTP still has some difficulties in January and February due to the higher flows and colder water temperatures that occur during these months resulting in cold weather nitrification issues.

2.2 SUMMARY OF EXISTING WWTP PERFORMANCE

The WWTP currently operates under NPDES Permit No. 0044776. The current permit is scheduled to expire on June 30, 2018 and the Authority has submitted the required NPDES permit renewal application. The required submission date for the renewal application was January 1, 2018. A copy of the NCCMA's most recent NPDES permit limits is included in Appendix B. In addition, a copy of PADEP's response letter to the most recent Preliminary Treatment Request (PTR) is included in Appendix B for reference.

2.2.1 Hydraulic Loading

The current permitted hydraulic capacity for the WWTP is 0.600 MGD. A review of the 2016 NCCMA Chapter 94 report indicates that the average annual daily flow from 2012-2016 was calculated to be 0.356 MGD (approximately 60% of the current design capacity). A summary of the 2016 NCCMA Chapter 94 Hydraulic Data is included in Table 2.1 below.

Northwestern Chester County Municipal Authority
Act 537 WWTP Evaluation

Table 2.1 2016 NCCMA Chapter 94 Hydraulic Loading Data

Parameter	2012	2013	2014	2015	2016	AVG
Annual Average (MGD)	0.382	0.397	0.384	0.324	0.291	0.356
3 Month Max Average (MGD)	0.432	0.434	0.509	0.366	0.389	0.426
Ratio (3 month MAX to AA)	1.13	1.09	1.33	1.13	1.34	1.24
Permitted Hydraulic Capacity (MGD)						0.600
Act 537 Projected Annual Average Design Flows (MGD)						0.740

The anticipated Act 537 flow projections provided by the Honey Brook Township recommended the use of an annual average flow of 740,000 gpd (0.740 MGD) for sizing any proposed WWTP upgrades.

2.2.2 Organic Loading

The current permitted organic capacity for the WWTP is 1201 lbs/day BOD. A review of the 2016 NCCMA Chapter 94 report indicates that the average annual daily BOD loading from 2012-2016 was calculated to be 543 lbs/day BOD (approximately 45% of the current design capacity). A summary of the 2016 NCCMA Chapter 94 Organic Loading Data is included in Table 2.2 below.

Table 2.2 2016 NCCMA Chapter 94 Organic Loading Data

Parameter	2012	2013	2014	2015	2016	AVG
Annual Average (lb/day BOD)	628	597	531	497	462	543
Ratio (MAX month to AA)	1.21	1.34	1.23	1.37	1.18	1.27
Permitted Organic Capacity (lb/day BOD)						1201

2.2.3 Nutrient Removal

The current NPDES Permit has established effluent nutrient limits for Ammonia-Nitrogen, Total Nitrogen, and Total Phosphorus. These effluent limits are provided in Table 2.3 below.

Table 2.3 NCCMA NPDES Effluent Nutrient Limits

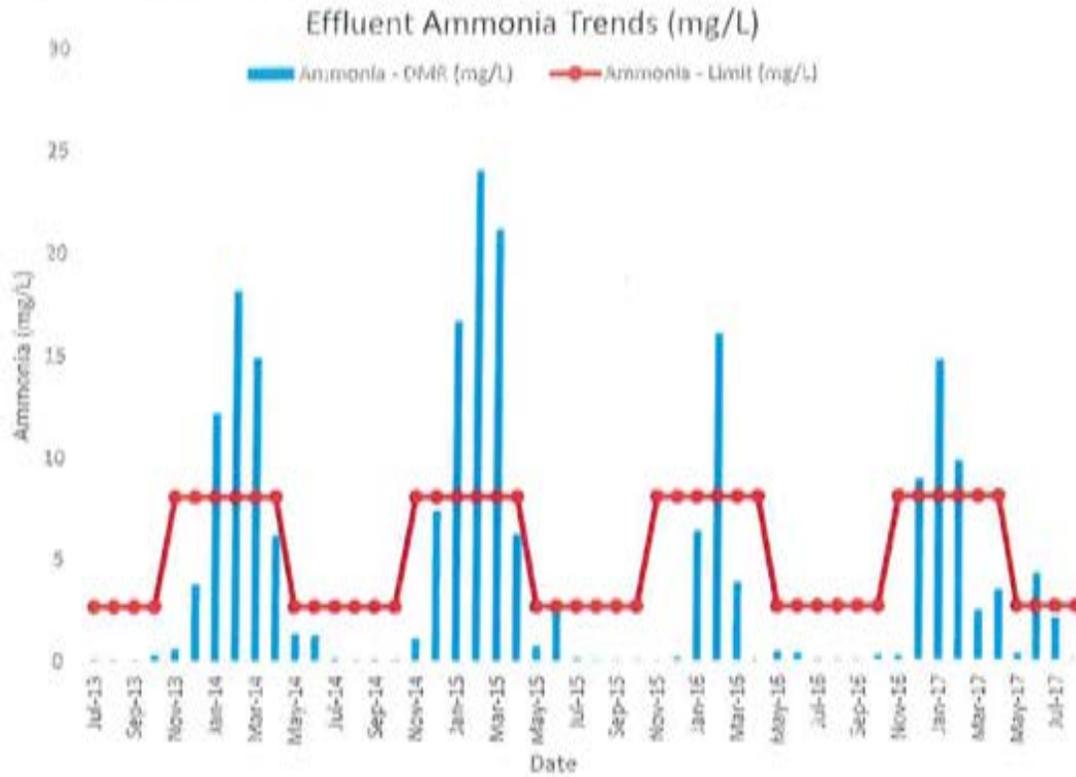
Parameter	Mass Units (lbs/day)		Concentration (mg/L)			
	Avg Month	Weekly Avg	Inst. Max	Avg Month	Weekly Avg	Inst Max
Ammonia-Nitrogen May 1- Oct 31	13.5	XXX	XXX	2.7	XXX	5.4
Ammonia-Nitrogen Nov 1- Apr 30	40.5	XXX	XXX	8.1	XXX	16.2
Total Nitrogen	144.1	XXX	XXX	28.8	XXX	57.6
Total Phosphorus Apr 1- Oct 31	9.0	XXX	XXX	1.8	XXX	3.6
Total Phosphorus Nov 1 – Mar 31	10.0	XXX	XXX	2.0	XXX	4.0

A review of the Discharge Monitoring Report (DMR) data from July, 2014 through August, 2017 was conducted to establish the performance of the lagoons with respect to nitrogen and phosphorus removal. Phosphorus removal through the system appears to be stable and the plant is able to consistently achieve permit compliance throughout the year. On average, the effluent total phosphorus discharge is 75% of the permitted capacity.

Northwestern Chester County Municipal Authority
Act 537 WWTP Evaluation

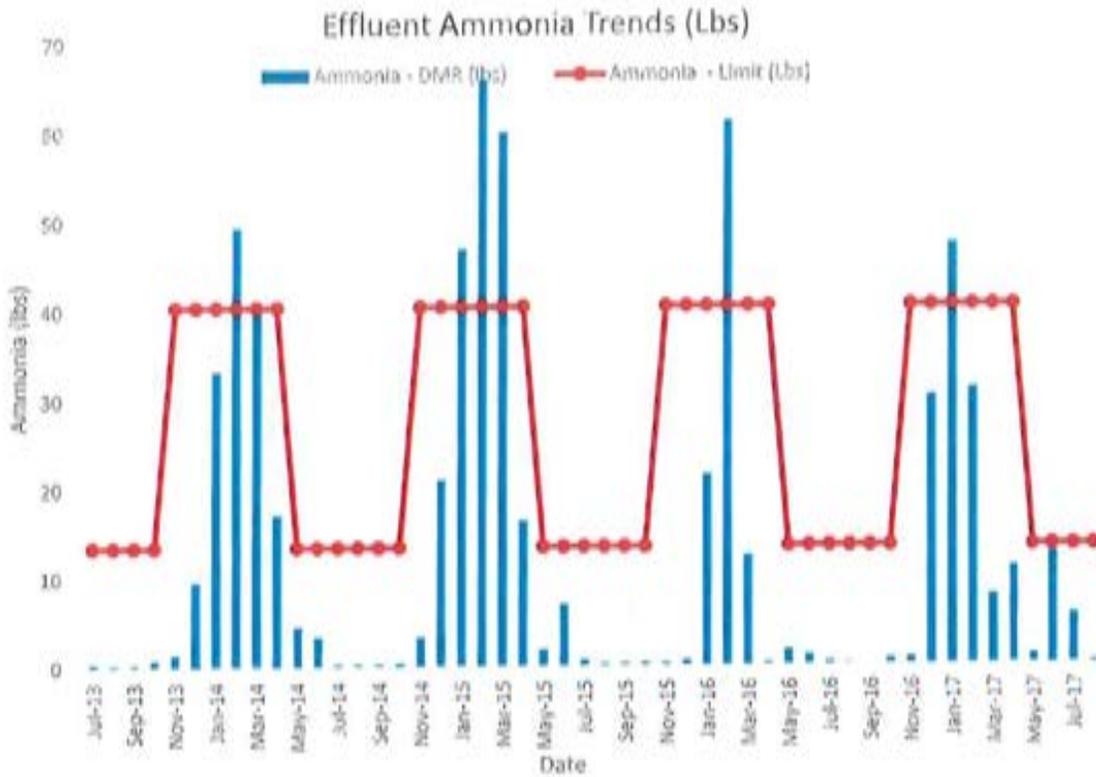
Nitrogen removal throughout the WWTP is variable and is highly dependent on seasonal temperature conditions. Figures 2.1, 2.2 and 2.3 illustrate the fluctuation in effluent ammonia (mg/L and lbs) over a 4 year period.

Figure 2.1 Effluent Ammonia Trends (mg/L)



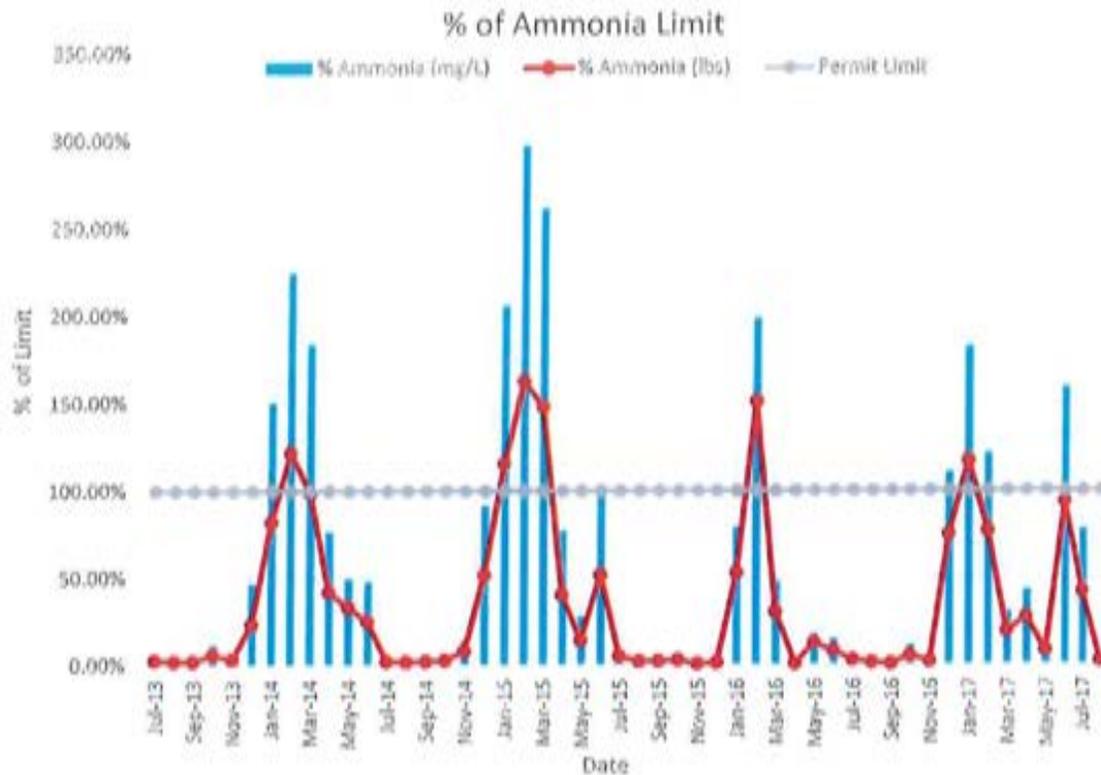
Northwestern Chester County Municipal Authority
Act 537 WWTP Evaluation

Figure 2.2 Effluent Ammonia Trends (lbs)



Northwestern Chester County Municipal Authority
Act 537 WWTP Evaluation

Figure 2.3 % of Effluent Ammonia vs Permit Limit (lbs)



Extrapolation of the DMR data (from 2013-2017) indicates the WWTP achieves an effluent ammonia concentration (mg/L) that is below half of the permitted limit greater than 66% of the time. The effluent ammonia mass loading (lbs) is below half of the permitted limit greater than 72% of the time. Permit exceedances for ammonia have historically occurred during the winter months, when the water temperature drops below 5 degrees Celsius and thereby inhibiting the nitrification process.

3.0 WASTEWATER TREATMENT PLANT ALTERNATIVES ANALYSIS

This alternatives analysis included an evaluation for two (2) major alternative options to upgrade the existing NCCMA WWTP to handle the projected average daily design flow of 0.74 MGD and maintain compliance with anticipated NPDES effluent permit limits. The two (2) major alternative options that were considered as part of this Act 537 study include:

1. ALTERNATIVE 1 - Lagoon Retrofits.
2. ALTERNATIVE 2 - Conventional Systems

Alternative 1 considered the option of retrofitting the existing lagoons with proven technologies that would allow for the continued use of the lagoon system for biological treatment. Alternative 2 considered the option of abandoning the existing lagoon treatment processes and replacing them with a conventional activated sludge system for biological treatment.

Northwestern Chester County Municipal Authority
Act 537 WWTP Evaluation

For each specific alternative, multiple options/processes were considered based on current available technologies. These options were reviewed based on the following considerations: system performance, process flexibility, familiarity with regional and national installations, and project cost. A summary of the alternatives considered as part of this evaluation is include in [Table 3.1](#) below.

Table 3.1 Summary of Alternatives

Alternative	Description	Manufacturer	Process
Alternative 1A	Lagoon Retrofit	LEMNA Technologies	Aerated Lagoon/Fixed Film
Alternative 1B	Lagoon Retrofit	Triple Point Environmental	Aerated Lagoon/Fixed Film
Alternative 1C	Lagoon Retrofit	Krugar	Aerated Lagoon/Fixed Film
Alternative 1D	Lagoon Retrofit	Nelson Environmental	Aerated Lagoon/Fixed Film
Alternative 1E	Lagoon Retrofit	ADS	Aerated Lagoon/Fixed Film
Alternative 2A	Conventional System	Krugar	Activated Sludge (Sequencing Batch Reactor-SBR)
Alternative 2B	Conventional System	Sanitaire	Activated Sludge (Continuous Flow SBR -CSBR)
Alternative 2C	Conventional System	Dutchland Inc.	Activated Sludge (Oxidation Ditch)
Alternative 2D	Conventional System	Biolac	Activated Sludge

A detailed summary of the analysis for each alternative is included in the sections below.

3.1 ALTERNATIVE 1 - LAGOON RETROFITS

The following items should be considered as part of any lagoon retrofit alternative:

1. Headworks screening of less than (1/8) inch may be required for fixed film systems.
2. The existing polishing lagoon shall remain in service and continue to function as flow equalization.
3. The WWTP can still remain in operation 5 days a week.
4. The ability to maintain the lagoons at the minimal temperature required to achieve complete nitrification and the ability to control the kinetics of the nitrification reactor.
5. The existing tertiary process (DAF tanks and sand filters) would remain in operation to provide total phosphorus (TP) and total suspended solids (TSS) removal.
6. Due to the age of the dissolved air flotation (DAF) tanks, refurbishing of these DAF tanks should be considered.
7. Additional sludge removal may be required from the existing lagoons prior to any new work.
8. It is recommended that submerged diffusers be inspected and cleaned on an annual basis.
9. Upgrading the size of the existing generator may be required.
10. Prior to the final selection and preliminary design of a lagoon treatment technology, it is recommended to schedule site visits to existing installation(s) of comparable size and treatment performance to gather information from plant operators on the performance and ease of operation of each system being considered. This is a critical step to compare the performance and operation data that is typically provided by the manufacturer during the conceptual design phase.

11. The consideration of a phased approach to retrofitting the lagoons shall be part of the selection process of any lagoon based treatment technology. This is critical to determine if there is more cost effective way to retrofit the lagoons to address the current cold weather nitrification issues.

Each specific Alternative 1 option was evaluated based on consideration of the following parameters; Construction; Treatment; and Operation. A summary of the Alternative 1 evaluation is included in the sections below.

3.1.1 Alternative 1A – LEMNA System (BOD Removal and Nitrification)

Construction

In this alternative, the existing primary lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. Baffles would be installed in the primary lagoon to create a new high rate biological treatment zone, minimize short circuiting and improve contact time. The tertiary lagoon would be converted to settling ponds prior to the installation of a new polishing reactor (for nitrification). The primary and tertiary lagoons would be covered to reduce the heat loss of the wastewater. This design would allow for 1 primary and 1 tertiary lagoon to be taken off line. A new fixed film polishing reactor would be constructed for nitrification.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).
- c. Converting the tertiary lagoon into a settling pond.
- d. Modifications to the current lagoon system flow path and process piping.

Nitrification - This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Installing covers on the primary and tertiary lagoons for improved heat retention.
- b. Installation of a new fixed film polishing pond reactor. The polishing reactor is an up-flow, attached-growth reactor that provides supplemental BOD and ammonia nitrogen removal. Using attached-growth media technology, the polishing reactor enhances the growth of nitrification bacteria that biologically oxidize ammonia in an aerobic environment. This new reactor shall be installed in a precast, concrete tank and include a diffused aeration system.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warrant a process guarantee.
- c. Operators will need to work around the covers when servicing diffusers or removing sludge from the lagoons.

- d. The settling pond would be constructed to accumulate the sludge generated in the aerated lagoon treatment process. The cover on this lagoon would need to be removed when removing sludge.

3.1.2 Alternative 1B – Triple Point Environmental (BOD Removal and Nitrification)

Construction

In this alternative, the existing primary lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The tertiary lagoons could be abandoned in lieu of the construction of a new MBBR reactor for nitrogen removal. Effluent from the new reactor will flow to the polishing pond for further clarification.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).

Nitrification - This alternative would require upgrading the existing lagoon aeration system with the following components:

- a. Installation of new fixed film polishing pond reactor. The polishing reactor is an up-flow, attached-growth reactor that provides supplemental BOD removal and ammonia nitrogen. Using attached-growth media technology, the polishing reactor enhances the growth of nitrification bacteria that biologically oxidize ammonia in an aerobic environment. This new reactor shall be installed in a precast, concrete tank and include a diffused aeration system.
- b. The reactors are covered with floating insulated covers to mitigate heat loss and the media is kept in the tank with stainless steel sieves.
- c. The reactor also contains a thermal system to provide supplemental heat (energy provided by electricity, propane or natural gas) to keep the reactor above 5 degrees centigrade.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warrant a process guarantee.
- c. Operators will need to work around the covers when servicing diffusers or removing sludge from the lagoons.

3.1.3 Alternative 1C – Krugar (Nitrification Only)

Construction

In this alternative, the existing NCCMA lagoons would remain in service and be used for BOD and TSS removal. No modifications to the existing lagoon aeration system would be required. This alternative would include the construction of one (1) new process train composed of one (1) MBBR reactor with media for nitrification. Suspended solids in the MBBR reactor effluent will require removal by clarification or filtration to meet effluent BOD and TSS limits. The existing DAF tanks and sand filter would remain on line to ensure adequate TP and TSS removal.

Treatment

BOD Removal – This alternative does not consider modifications to the existing lagoon BOD and TSS removal process. This alternative assumes that the existing lagoon system has the ability to reduce BOD and TSS to 40-50 mg/L prior to entering the new MBBR reactor.

Nitrification - This alternative is designed to provide nitrification only, and will be designed to achieve permit compliance with the current seasonal ammonia limits. If in the future it becomes necessary to achieve full nitrification (effluent ammonia less than 1.0 mg/L), a second MBBR nitrification reactor will need to be added downstream of the first reactor. Full nitrification would be required in achieving a future effluent TN limit of 6.0 mg/L.

Operation

This alternative will require influent screening with a maximum of 3 mm (1/8 inch) openings. This MBBR processes is a continuous flow through, non-clogging biofilm reactor containing media with a high specific surface area. The media does not require backwashing or cleaning. The mixing of the MBBR media within the reactor is provided by a medium bubble aeration system in aerobic applications. Mixers are used in anoxic environments for denitrification.

3.1.4 Alternative 1D – NELSON (BOD Removal and Nitrification)

Construction

In this alternative, the existing primaries and polishing pond lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The first primary lagoon would be baffled to improve nitrogen removal by including an anoxic zone. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warranty a process guarantee. The 2 tertiary lagoons would stay on-line. Following the existing polishing pond, four (4) new submerged attached growth rock filters would be constructed for nitrification and BOD/TSS polishing. A new pumping station would likely be required to transfer effluent from the new submerged rock filter back to the exiting tertiary treatment process and chlorine contact basin.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon surface aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with a new diffused aeration system. Diffused aeration systems are typically more efficient than surface aerators.
- b. Atmospheric air shall be provided to the diffused aeration system by 3 blowers (2 running, 1 standby).

- c. Modifications of the current lagoon system flow path and process piping will be required.

Nitrification - This alternative would require upgrading the existing lagoon system with the following components:

- a. Baffling the first primary lagoon and creating a new anoxic zone.
- b. Installation of new surface mixer in the anoxic zone.
- c. Installation of 4 new submerged attached growth rock filters with a diffused air system. The submerged attached growth rock filter would include a direct burial diffused aeration system to provide the oxygen required for nitrification and ensure that wastewater channeling cannot occur in the gravel layer.

Operation

The following recommendations shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. Addition of a pumping station required to transfer effluent from the new submerged rock filter back to the exiting tertiary treatment process.

3.1.5 Alternative 1E – ADS (BOD Removal and Nitrification)

Construction

In this alternative, the existing primaries and polishing pond lagoons would be retrofitted with a diffused aeration system to improve the performance of BOD and TSS removal. The polishing pond lagoon would be baffled to maximize treatment performance. The existing lagoons may require sludge removal in accordance with the manufacturer's recommendations in order to warranty a process guarantee. The two (2) tertiary lagoons would need to be taken off line and dredged to allow for the installation of the new rock filters.

Treatment

BOD Removal – This alternative would require upgrading the existing lagoon surface aeration system with the following components:

- a. Upgrading the existing lagoon surface aeration system with 132 ADS submerged disk modules.
- b. Atmospheric air shall be provided to the diffused aeration system by two (2) blowers and two (2) compressors (1 running, 1 standby).
- c. Modifications of the current lagoon system flow path and process piping will be required.

Nitrification - This alternative would require upgrading the existing lagoon system with the following components:

- a. Converting the existing tertiary lagoons 1 and 2 into aerated rock filters.

Operation

The following recommendation shall be considered with this alternative:

- a. Addition of an influent screening system to prevent fine inorganics (< 1/4 to 1/8 inch) from entering the lagoons.
- b. Addition of a floating cover over the second half of cell 3 (in polishing Lagoon) to block sunlight and minimize algal growth, which will further reduce TSS concentrations.

- c. Addition of a recirculation system to bring treated effluent water back to inlet (this system is already in place).
- d. Implementation of a 6 month sludge reducing bacteria program prior to the lagoons being upgraded.

3.2 ALTERNATIVE 2 - CONVENTIONAL SYSTEMS

The following items described below should be considered as part of the evaluation for Alternative 2 - conventional activated sludge treatment systems:

1. Alternative 2 systems rely on a conventional activated sludge process to provide biological treatment. As a result of this process, the generation of sludge will require the construction of a new solids handling facility to process and store the additional sludge generated from this treatment process.
2. It is anticipated that a new headworks facility, including influent screening and grit removal will be required to improve the operational performance of these systems.
3. A new generator would be required to handle the additional power demands of the activated sludge systems.
4. Any conventional system shall be designed to handle the anticipated peak daily flows.
5. These alternatives would allow for the existing DAF tanks and sand filter to be taken off line.
6. Additional chemical feed systems may be required for improved settability and phosphorus removal.
7. These alternatives would likely require the WWTP to operate 7 days a week.

Each Alternative 2 option was evaluated based on the consideration of the following parameters; Construction; Treatment; and Operation. A summary of the Alternative 2 evaluation is included in the sections below.

3.2.1 Alternative 2A - Sequencing Batch Reactor (SBR)

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new sequencing batch reactor (SBR). SBR's provide all phases of wastewater treatment in a single basin. This alternative would require the construction of two SBR tanks to allow for the continuous treatment of the influent wastewater due to the intermittent phasing of the SBR processes. A common wall construction between all tanks (SBR, digester, EQ) could result in a system with a smaller footprint.

Treatment

SBR's have the ability to nitrify, denitrify, and achieve biological phosphorus removal within a single basin. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of two SBR tanks to allow for the continuous treatment of the influent wastewater due to the intermittent phasing of the SBR processes.

3.2.2 Alternative 2B – Continuous Flow Sequencing Batch Reactor (CSBR)

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new continuous flow sequencing batch reactor. Continuous flows SBR's provide all phases of wastewater treatment in a single basin. This alternative would require the construction of two tanks to allow for the continuous treatment of the influent wastewater during peak flow conditions. A common wall construction between all tanks (CSBR, digester, EQ) could result in a smaller foot print.

Treatment

The continuous flow SBR is designed to continuously distribute the variations in flows and loads evenly across all basins - simplifying day to day operations and operational changes as well as accommodating single basin operation for low flow and maintenance conditions. Continuous flow SBR's have the ability to nitrify, denitrify and achieve biological phosphorus removal within a single basin. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of two continuous flow SBR's, each designed to receive half of the design flow.

3.2.3 Alternative 2C – Oxidation Basin

Construction

In this alternative, the existing NCCMA lagoons would be abandoned for the construction of a new oxidation basin. This alternative would require the construction of an oxidation basin and secondary clarifiers. Due to the separate structures required for each process (biological treatment and clarification), this alternative may require a larger foot print and additional civil work.

Treatment

Oxidation ditches have the ability to nitrify, denitrify, and achieve biological phosphorus removal. This alternative would allow for the existing DAF and sand filters to be decommissioned.

Operation

This alternative would require the construction of an oxidation basin and two secondary clarifiers in order to provide redundancy and treatment under peak flow conditions.

3.2.4 Alternative 2D – Biolac System

Construction

In this alternative, one of the existing lagoons could be modified and lined to provide the "tankage" required for a Biolac Wave Oxidation System.

Treatment

This system is an activated sludge process which utilizes a longer sludge age to reduce BOD and provide nitrification. This system has the ability to denitrify and achieve biological phosphorus removal. This alternative may allow for the existing DAF and sand filters to be decommissioned.

Operation

Fine bubble diffuser assemblies are suspended above the basin floor by moving aeration chains which create a moving wave of multiple oxic and anoxic zones to nitrify and denitrify the wastewater.

4.0 SUMMARY OF WWTP ALTERNATIVES EVALUATION

The analysis for evaluating the potential NCCMA WWTP modifications (Alternatives 1 and Alternatives 2) included a review of the following components:

1. A review of Manufacturer's design criteria included in their preliminary proposals.
2. Completion of a Matrix Evaluation based on the Manufacturer's preliminary designs.
3. A review of NCCMA's historic and current sampling data.
4. A review of process calculations for nitrifications.
5. A review of preliminary layout drawings.
6. Completion of a Present Worth Analysis.
7. Evaluation of a Phased Approach for upgrading the existing NCCMA WWTP.

A summary of the evaluation for each of these components is included in the following sections.

4.1 MATRIX EVALUATION

A matrix evaluation was completed to assist in ranking the Alternatives from best to least viable option. A summary of the Matrix Evaluation is include in [Appendix C](#) for reference. Based on the Matrix Evaluation, the following conclusions were made:

Alternatives 1A – 1E (Lagoon Retrofits)

1. The majority of the lagoon retrofit alternatives relied on the use of a fixed film process to improve nitrification.
2. Based on the similarity of the various Manufacturer's treatment approaches, the results of the Matrix evaluation were very comparable.
3. The consideration of a phased approach to retrofitting the lagoons shall be part of the selection process of any lagoon based treatment technology.
4. Alternatives 1A and 1B appear to provide the most flexibility with regulating the water temperature and kinetics within the nitrification reactor.
5. Prior to the final selection of a lagoon treatment technology, it is recommended to schedule site visits to the top 2 ranking systems (Alternatives 1A and 1B) as identified in the matrix evaluation to gather information from plant operators on the performance and ease of operation of each system being considered.

Alternatives 2A – 2D (Conventional Systems)

1. All of the conventional system alternatives relied on an activated sludge process for biological treatment of the wastewater.
2. The oxidation basin and SBR alternatives out-ranked the Biolac alternative.

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3. The additional cost savings to phase upgrades for conventional systems were insignificant to the total project cost.
4. All conventional systems will require the construction of new solids handling facilities.
5. The ability to operate a new conventional WWTP with respect to the current operators familiarity and preference to local WWTP facilities, additional staffing needs, and input from operators from other regional activated sludge plants shall be considered prior to the final selection of a new conventional system.

4.2 SUMMARY OF SAMPLING DATA

A review of historical and recent sampling data (from 2003 and 2016) was conducted to determine if the existing lagoons treatment performance was adequate to recommend a lagoon retrofit option as a long term, viable solution for upgrading the WWTP.

1. The results of the sampling data indicated the primary lagoon is capable of achieving 63% to 78% TSS removal. A lagoon effluent of less than 60 mg/L is typically required prior to any nitrification reactor.
2. The results of the sampling data indicated the primary lagoon is capable of achieving 73% to 80% BOD removal. A lagoon effluent of less than 50 mg/L is typically required prior to any nitrification reactor.
3. Generally, the first primary lagoon is able to achieve the required TSS and BOD effluent values of less than 50 mg/L as required for a process warranty for most fixed film nitrification reactors.
4. The majority of the wastewater temperature loss occurs after the first primary lagoon. During the colder months, the majority of the ammonia (NH₄) removal occurs in the first tertiary lagoon.

Based on the results of the sampling data and discussion with the various lagoon system manufactures being considered as part of this evaluation, it was determined that the existing lagoons were sized appropriately to be compatible with proposed lagoon retrofit options.

A summary if the sampling data is include in Appendix D for reference.

4.3 NITROGEN REMOVAL CALCULATIONS

Alternatives 1A and 1B were evaluated on their ability to provide adequate wintertime ammonia removal based on an anticipated winter ammonia limit of 6.5 mg/l. This concentration was determined based on maintaining the current mass loading of 40.5 lbs at the anticipated flow of 0.74 MGD. Most conventional activated sludge systems are capable of achieving an effluent TN and TP concentration of 6.0 mg/L and 0.8 mg/L respectively, as is typical of most plants within the Chesapeake Bay Watershed. Therefore, it was assumed that activated sludge plants would be able to achieve adequate TN and TP removal year round. Alternative 1 systems were required to provide nitrogen removal based on the following parameters:

1. The design NH₄ removal is 176 lb/day [(35 mg/L (primary lagoon effluent – 6.5 mg/l (permit) x 0.74 MGD x 8.34]

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2. The current nitrification system is designed for 33.7 lb/day NH-4 removal (assumes cold weather kinetics).

A summary of the process calculations for Alternative's 1A and 1B are included in Appendix E for reference. These calculations were provided by the Manufacturers and demonstrate how each system is capable of achieving compliance with the anticipated permit limits.

4.4 LAYOUT DRAWINGS

Existing NCCMA WWTP layout drawings and proposed WWTP layout drawings for Alternatives 1A and 1B are included in Appendix F.

4.5 COST ANALYSIS

Estimates of probable construction costs and overall project costs for the WWTP alternatives are summarized in the Table 4.1. These costs as well as estimated O&M costs and present worth costs were used in Section 6.0 to evaluate funding alternatives and estimate user rates for the recommended Alternatives 1A and 1B. It should be noted that the present worth cost estimates prepared in this Report are conceptual level cost estimates appropriate for planning level detail and should not be considered as final costs for financing purposes. Detailed present worth cost estimates are included in Appendix G for reference.

Table 4.1 Summary of Present Worth Costs (Complete Project)

Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	O&M Present Worth	Total Present Worth	No. of EDUs	Estimated Present Worth per EDU
Lagoon Retrofits							
1A	Lemna	\$7,269,000	\$84,000	\$1,117,000	\$8,386,000	2040	\$4,110.78
1B	Triple Point Environmental	\$7,643,000	\$89,000	\$1,184,000	\$8,827,000	2040	\$4,326.96
1C	Kruger ¹	NA	NA	NA	NA	2040	NA
1D	Nelson	\$7,797,000	\$79,000	\$1,051,000	\$8,848,000	2040	\$4,337.25
1E	ADS	\$7,736,000	\$84,000	\$1,117,000	\$8,853,000	2040	\$4,339.71
Conventional Systems							
2A	SBR	\$13,414,000	\$219,000	\$2,912,000	\$16,326,000	2040	\$8,002.94
2B	CSBR	\$13,399,000	\$219,000	\$2,912,000	\$16,311,000	2040	\$7,995.59
2C	Oxidation Ditch	\$13,221,000	\$219,000	\$2,912,000	\$16,133,000	2040	\$7,908.33
2D	Biolac System	\$10,686,000	\$189,000	\$2,513,000	\$13,199,000	2040	\$6,470.10

¹ The Kruger system was only evaluated for providing nitrification. As a result, the costs for this system does not reflect the costs for a total Lagoon Retrofit upgrade and therefor are not comparative to the other Alternatives.

The following summary is based on the analysis of the present worth cost evaluation.

1. The Cost to construct a new conventional WWTP is roughly twice as much as a Lagoon retrofit upgrade.
2. The lagoon retrofit alternatives have a better potential to be phased during construction.
3. While more expensive, conventional activated sludge systems are generally more reliable with respect to cold weather treatment plant performance than traditional lagoon systems.

5.0 EVALUATION OF PHASED APPROACH FOR UPGRADING THE NCCMA WWTP

The existing NCCMA WWTP currently achieves effluent compliance with all permit criteria expect for wintertime ammonia limits. In addition, the capacity of the lagoons allow for considerable equalization of peak flows, resulting in the WWTP operating on 5-day a week schedule. Therefore, it seems reasonable for NCCMA to consider a phased approach to upgrading their current WWTP based on the following parameters.

1. The existing WWTP is well under its design capacity for hydraulic and organic loading.
2. Currently, the only treatment compliance issue is with meeting wintertime ammonia limits.
3. A phased approach to upgrading the WWTP (for nitrogen removal) is possible for most of the lagoon modification alternatives evaluated.
4. Alternatives 1A and 1B appear to provide the most flexibility with regulating the wastewater temperature and kinetics within the nitrification reactor and were identified as the most likely options for consideration of a phased approach for upgrading the NCCMA WWTP.
5. The additional cost to phase upgrades for conventional systems were insignificant to the total project cost, therefore these alternatives are not likely to be considered for a phased WWTP expansion project.

A general summary of the phasing options is included in Table 5.1 and 5.2

Table 5.1 Phasing Options (Lagoon Modifications)

Phase	Description
Phase 1 (Nitrification Upgrade)	Construct new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Work to include: <ol style="list-style-type: none"> 1. Installing baffle curtains in the primary lagoons to create both complete mix and partial mix cells 2. Installing lagoon covers 3. Replacing the mechanical aerators with diffused aerators 4. Replacing the bio-blocs with a new nitrification reactor 5. Replacing the existing headworks bar screen
Phase 2 ¹ (Hydraulic Capacity Upgrade)	Rerate existing WWTP from 0.60 MGD to 0.74 MGD. Construct modifications to existing process equipment to handle new ADF. Work to include: <ol style="list-style-type: none"> 1. Modifications to DAF tanks 2. Modifications to sand filters 3. Modifications to disinfection system.
Phase 3 (Denitrification Upgrade)	Construct new facilities required for denitrification (if required).

¹ Phase 2 to occur when ADF reaches 0.50 MGD (approx. 85% of current design capacity)

Table 5.2 Phasing Options (Conventional System)

Phase	Description
Phase 1 (Nitrification/Hydraulic Capacity Upgrade)	Construct a new conventional activated sludge WWTP designed for 0.74 MGD and capable of achieving full nitrification.
Phase 2 (Denitrification Upgrade)	Construct modifications to achieve full denitrification.

5.1 DESCRIPTION OF PHASED APPROACH FOR LAGOON MODIFICATIONS

As previously discussed, Alternatives 1A and 1B both rely on a concrete fabricated nitrification reactor tank (which includes fixed-film media and diffuse aeration) to support the nitrification process. The major difference between the two Alternative is in how heat retention is maintained. Alternative 1A relies on insulated covers to reduce the heat loss from the lagoons and will require only one primary lagoon to be maintained in service. Alternative 2A does not require covers on the primary lagoons and instead relies on heating the reactor tank with emersion heaters to maintain the critical temperature required for complete nitrification. Alternative 2A would require both primary lagoons in be maintained in service.

A detailed description for each of the activities associated with the phasing of the lagoon modifications (for Alternative 1A and Alternative 1B) is included in the sections below. Layout drawings showing the proposed work for Phase 1 and 2 are include in Appendix F for reference.

5.1.1 Alternative 1A –Description of Work

Phase 1 (Nitrification Upgrade)

1. Baffle curtains will be installed in the existing primary lagoon to create both complete mix and partial mix cells. The curtains will be installed to minimize short-circuiting between the cells. The complete mix cell will use high rate diffusers to establish a suitable environment for rapid removal of BOD. The partial mix cell will use low rate diffusers to maintain partial suspension of the solids in order to achieve both BOD and ammonia reduction. A settling zone will be created to establish a quiescent zone for solids to settle in an effort to improve clarification. The settling zone will be the primary area in which solids will deposit.
2. Modular lagoon covers with an insulating rating of R8 will be installed on the primary lagoon and settling pond to reduce the amount of heat loss from the wastewater and minimize the growth of algae by eliminating sunlight below the cover. The insulated modular lagoon covers will minimize seasonal and diurnal temperature fluctuations, thereby reducing stirring by thermal currents. The covers will improve TSS removal, reduce the growth of algae, and promote nitrification by regulating temperatures within the lagoons. The module lagoon cover are designed to be buoyant and allow for foot access across the cover surface.
3. The existing mechanical surface aerators in the primary lagoons will be replaced with submerged diffusers. High rate diffusers will be used in the complete mix cells and low rate diffusers will be used in the partial mix cells. All submerged diffuser will be connected to a common air header pipe (HDPE) and will be accessible from a removal section of the cover to allow access to the diffusers for maintenance and inspection.

4. To improve nitrification, the existing bio-blocs will be replaced with a dedicated nitrification reactor zone (approx. 300,000 gallons) that will provide additional BOD removal and ammonia treatment. The nitrification reactor will consist of submerged attached-growth media modules used for maintaining an adequate population of nitrifying bacteria. Aeration is provided by a rack mounted coarse bubble diffuser located under the media which evenly distributes the air and shears coarse bubbles into very fine bubbles.
5. Due to the age of the existing influent mechanical bar screen, the existing mechanical bar screen will be removed and replaced with a new unit, sized to match the existing units peak design flow of 4.0 MGD. This new screen will likely be installed in a new influent channel to minimize construction issues associated with the new screen. The new screen will improve the removal efficiency of the solid debris (rags, paper, etc.), and thereby reduce the amount of this material from entering the lagoons.

Phase 2 (Hydraulic Capacity Upgrade)

1. The existing DAF tanks and tertiary pumping system will be evaluated to determine if there is adequate capacity to handle a re-rate of the WWTP design ADF from 0.60 MGD to 0.74 MGD. Design parameters to be evaluated will include; tank conditions, detention times, DAF waste pumps, polymer and alum feed systems, and DAF tank influent pumping capacities. Modifications will be made as necessary to ensure the system is cable of handle the new design flow.
2. The sand filter will be evaluated to determine the peak design flows each train (2 total) are capable of handling. Design parameters to be evaluated will include; media depth, tank conditions, and backwash system. Modifications will be made as necessary to ensure the system is cable of handle the new design flow.

Phase 3 (Denitrification Upgrade)

1. To achieve full denitrification, the installation of a carbon feed system will be required. The carbon feed system will include carbon storage tanks, feed pumps and control instrumentation. Tertiary lagoon No 2 will be converted to an additional settling pond (located prior to the polishing lagoon) to settle out the additional sludge that will generated from this process.

5.1.2 Alternative 1B –Description of Work

Phase 1 (Nitrification Upgrade)

1. The existing mechanical surface aerators in both primary lagoons will be replaced with positive displacement blowers and submerged diffusers with EPDM membranes. All submerged diffusers will be connected to a common stainless steel aeration manifold and will be accessible via a boat.
2. To improve nitrification, the existing bio-blocs will be replaced with a dedicated two-compartment nitrification reactor tank (approx. 300,000 gallons total) that will provide additional BOD removal and ammonia treatment. The nitrification reactor will consist of MBBR media, aeration grids, positive displacement blowers, media retention sieves, an integrated heating unit operating off of natural gas or propane, and an integrated control system. The primary design of

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this reactor is to maintain the minimum required temperature necessary for complete nitrification.

3. Due to the age of the existing influent mechanical bar screen, the existing mechanical bar screen will be removed and replaced with a new unit, sized to match the existing units peak design flow of 4.0 MGD. This new screen will likely be installed in a new influent channel to minimize construction issues associated with the new screen. The new screen will improve the removal efficiency of the solid debris (rags, paper, etc.), and thereby reduce the amount of this material from entering the lagoons

Phase 2 (Hydraulic Capacity Upgrade)

1. The existing DAF tanks and tertiary pumping system will be evaluated to determine if there is adequate capacity to handle a rerate of the WWTP design ADF from 0.60 MGD to 0.74 MGD. Design parameters to be evaluated will include; tank conditions, detention times, DAF waste pumps, polymer and alum feed systems, and DAF tank influent pumping capacities. Modifications will be made as necessary to ensure the system is cable of handle the new design flow.
2. The sand filter will be evaluated to determine the peak design flows each train (2 total) are capable of handling. Design parameters to be evaluated will include; media depth, tank conditions, and backwash system. Modifications will be made as necessary to ensure the system is cable of handle the new design flow.

Phase 3 (Denitrification Upgrade)

1. To achieve full denitrification, the installation of a carbon feed system will be required. The carbon feed system will include carbon storage tanks, feed pumps and control instrumentation. Tertiary lagoon No 2 will be converted to an additional post anoxic tank (located prior to the polishing lagoon) to promote denitrification.

6.0 FINANCIAL ANALYSIS

Based upon the present worth per EDU analysis conducted in Chapter 4.5, it is more economical to make the necessary improvements to the NCCMA WWTP through implementation of Alternatives 1A or 1B. However, it is assumed that end user economics will be greatly influenced by project financing, especially grant dollars.

As identified in the capital cost and present worth analysis, wastewater treatment plant projects of this magnitude can be very costly. In an effort to help offset the costs of such facilities, two (2) funding options have been considered for financing the recommended alternatives; PENNVEST Financing and USDA Financing. Funding analyses for Alternatives 1A and 1B are included in Appendix H and summarized in Table 6.1 below. Each financing option mentioned above calculates the anticipated annual cost per EDU based upon debt service and O&M costs.

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Table 6.1 Funding Analysis Summary

Alternative	Amount Financed by Loan	Interest Rate % ¹	Term (years)	Annual O&M Cost per EDU	Annual Financing Debt Service per EDU	Total Annual User Fee per EDU	Total Interest Over Term of Loan
PENNVEST FINANCING							
1A	\$7,269,000	1.743	20	\$535	\$224	\$759	\$2,153,249
1B	\$7,643,000	1.743	20	\$535	\$235	\$770	\$2,264,037
USDA FINANCING							
1A	\$7,319,000	3.5	40	\$535	\$177	\$712	\$7,111,690
1B	\$7,693,000	3.5	40	\$535	\$186	\$721	\$7,475,096

¹ Blended rate at 1.743% for years 0-5 / 2.197% for year 6-20

Based on the results of the preliminary funding analysis, NCCMA would consider moving forward with applying for PENNVEST financing, as this option would significantly reduce the total interest over the term of the loan as compared to the USDA Financing option.

7.0 CONCLUSIONS AND RECOMMENDATIONS

This alternatives analysis was completed for the Northwestern Chester County Municipal Authorities (NCCMA) wastewater treatment plant (WWTP) as part of the most recent Honey Brook Township Act 537 planning effort. The analysis was conducted to determine the existing conditions of the WWTP and evaluate possible options to increase the current permitted hydraulic capacity from 0.60 MGD to 0.74 MGD.

The results of the WWTP evaluation indicated that the existing plant is generally at 50% design capacity for design flow and organic loading and appears to have sufficient capacity to handle projected flows within the next 5 years. Due to the biological process associated with the aerated lagoons, the treatment process experiences issues achieving adequate nitrification during the winter time months. Permit exceedances for ammonia have historically occurred during the winter months, when the water temperature drops below 5 degrees Celsius and thereby inhibiting the nitrification process.

Alternatives to provide increased wastewater treatment for the projected average daily design flow of 0.74 MGD and maintain seasonal compliance with NPDES effluent permit limits were identified and were based on retrofitting the existing lagoon process (Alternative 1) and abandoning the existing lagoon treatment process in lieu of a new conventional activated sludge process (Alternative 2). The 10-year projected cost estimates ranged from 8.3 to 8.8 million dollars (for Alternative 1 options) and 13.2 to 16.3 million dollars (for Alternative 2 options). In addition, the option for a phased approach for implementing the WWTP improvements was considered as a way to address the current cold weather nitrification issues and reduce project costs. It was determined that a phased approach for implementing cold weather nitrification improvements was feasible with the lagoon retrofit options (Alternative 1).

Based on the result of this alternatives analysis, the Authority has selected the following design criteria be considered as the basis of design for implementing improvement to the existing WWTP to ensure compliance with permit limits and provide treatment for the project flow of 0.74 MGD.

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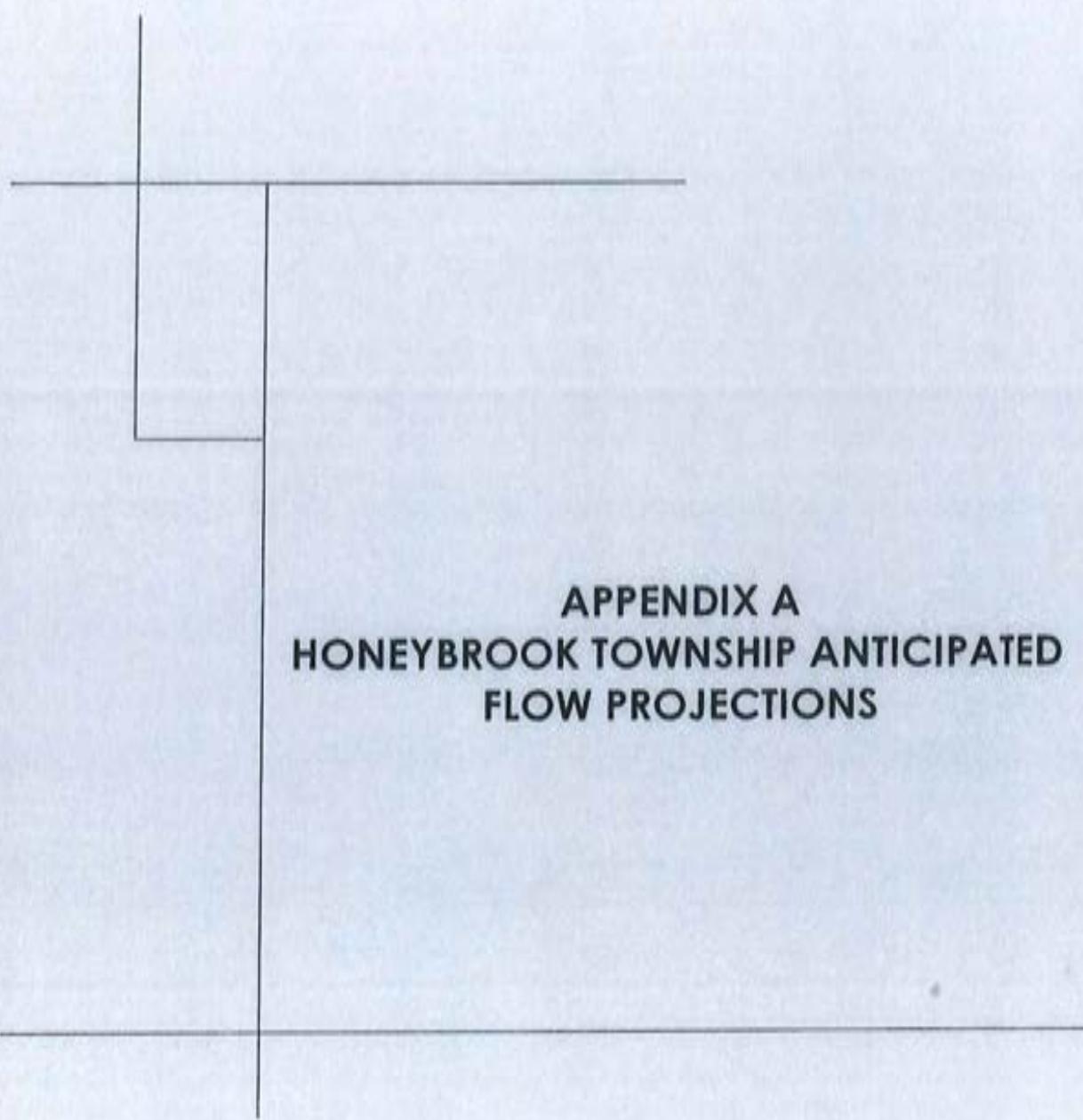
1. Alternative 1 (Lagoon retrofit option) shall be consider as the basis of design for any future WWTP modifications/expansions. Abandonment of the lagoons for a conventional activated sludge process is not being considered due to the higher capital cost.
2. Final selection of the lagoon retrofit treatment alterative shall be based around Alternative 1A or Alternative 1B.
3. The Authority will likely consider moving forward with applying for PENNVEST financing, as this option would significantly reduce the total interest over the term of the loan as compared to the USDA Financing option. Additional funding options may be considered during the project planning meeting with the financing agency.
4. The Authority intends to move forward with the implementation of the WWTP Improvements based on the proposed implementation schedule outlined in Section 8.0

8.0 PROPOSED IMPLEMENTATION SCHEDULE

The proposed implementation schedule is included in Table 8.1 below.

Table 8.1 Implementation Schedule

Years	Activity
0-1	Research up-front funding sources and establish a financing plan
	Meet with Financing Agency for Initial Project Planning Meeting
	Perform site visits of Alternative 1A and Alternative 1B WWTP installations
	Obtain new WWTP NPDES permit. The new permit will establish effluent limits for future improvements. Revise Alternatives based on any changes to the existing permit.
	Receive PADEP WQM Permit for Cupola Pump Station Upgrade (Permit Application was Submitted to PADEP on June 30, 2017)
	Final Design of Cupola Pump Station Upgrade
	Bid and Construct Cupola Pump Station Upgrade
	Final selection of Lagoon Retrofit Treatment Alternative (Alternative 1A or 1B)
	Preliminary Design of Phase 1 Project (Nitrification Upgrade)
1-2	Final Design of Phase 1 Project (Nitrification Upgrade)
	Obtain required Permits for Phase 1 Project (Nitrification Upgrade)
	Implementation of Headworks Improvement Project (Maintenance Replacement)
2-3	Bid Phase 1 Project (Nitrification Upgrade)
	Construction of Phase 1 Project (Nitrification Upgrade)
	Substantial completion of Phase 1 Project (Nitrification Upgrade)
3-5	Preliminary Design of Phase 2 Project (Hydraulic Capacity Upgrade) – <i>once current ADF reaches 0.50 MGD (approx. 85% of current design capacity)</i>



**APPENDIX A
HONEYBROOK TOWNSHIP ANTICIPATED
FLOW PROJECTIONS**

HONEY BROOK TOWNSHIP ACT 537 EVALUATION OF SEWER SERVICE AREAS FLOWS

Revised September 7, 2017

Existing Flows			
2010 Annual Average	465,000 gpd		
2011 Annual Average	479,000 gpd		
2012 Annual Average	382,000 gpd		
2013 Annual Average	397,000 gpd		
2014 Annual Average	384,000 gpd		
2015 Annual Average	324,000 gpd		
2016 Annual Average	291,000 gpd		
Five Year Annual Average Flow (2012-2016)	355,600 gpd		
Highest Annual Average	397,000 gpd		
Max Three Consecutive Monthly 2016	389,000 gpd		
Current Permitted Capacity	600,000 gpd		
Future Flows *	w/o TDR(s) gpd	w/ TDR(s) gpd	Avg gpd
Suplee Service Area (New) - Green on overall plan	22,575 gpd	23,600 gpd	23,088 gpd
Suplee Service Area (Existing)	12,846 gpd	17,128 gpd	14,987 gpd
West Service Area	36,699 gpd	44,212 gpd	40,456 gpd
Honey Brook Borough ** (West Service Area)	12,279 gpd	16,373 gpd	14,326 gpd
Cupola Service Area (Including The Addition of Donnell-Hammell Business Park)	201,840 gpd	254,562 gpd	228,201 gpd
Morgantown Road/ Shoreline Drive	23,750 gpd	23,750 gpd	23,750 gpd
Totals	309,989 gpd	379,624 gpd	344,806 gpd
WWTP Sizing Range ***			
Least Conservative (utilizing 2012 AA flow)	382,000 gpd	+	309,989 = 691,989 gpd
Average (utilizing five year AA flow)	355,600 gpd	+	344,806 = 700,406 gpd
Conservative (utilizing five year AA flow)	355,600 gpd	+	379,624 = 735,224 gpd
Most Conservative (utilizing highest AA flow) ****	397,000 gpd	+	379,624 = 776,624 gpd
Recommended Size	740,000 gpd Annual Average		

* - To determine the future projected flows for Honey Brook Township, each parcel was evaluated for development potential based on zoning designations. Based on this information, the number of edus were calculated for each developable parcel within each sewer district utilizing Transfer Development Rights (TDR) and without TDRs.

** - When evaluating the development potential of parcels within the West Sewer District, Honeybrook Borough's Sewer Engineering was contacted to determine what proposed developments, redevelopments were within the Borough's boundaries. The future flows have been for the Borough have been included in the overall flows for the West Sewer District.

*** - The five year annual average flow for the existing flows to the WWTP was utilized along with the future flows that were projected from each sewer district in order to determine the recommended size the treatment plant would need to be to service the Township's needs. The NCCMA have been heavily involved during this process.

****- The five year annual average flow was updated to include flows from 2015 and 2016. The recommended size 740,000 gpd will remain as accommodate any potential I/I in the system

HONEY BROOK TOWNSHIP ACT 537
EVALUATION OF SEWER SERVICE AREAS FLOWS
Revised September 7, 2027

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (80% OF GROSS AREA BISECTED BY STREAM)	ZONING DISTRICT	PROJECTED EDU(S) (WITHOUT TOR)	PROJECTED EDU(S) (WITH TOR)	PROJECTED FLOWS (MGD): 200 GPD IMPERVIOUS COVER, WITHOUT TOR	PROJECTED FLOWS (MGD): 200 GPD IMPERVIOUS COVER, WITH TOR
WEST SEWER DISTRICT										
1	21-6-8	River Road Estate LP, Home - Under construction, approved 5 Edus	17.67	-	11.5	I	-	-	-	-
2	21-6-49	Vacant Land	6.7	5.025	-	C	4	5	1,805	1,306
3	21-7-45	Farm - Vacant Land	28.1	21.075	-	C	23	27	5,715	6,058
4	21-7-31.1	Vacant Land	3.8	2.85	-	C	1	1	279	324
5	21-7-40	Vacant Land	29.7	22.275	-	C	28	31	4,455	5,146
6	21-7-38	Vacant Land	4	3	-	C	2	2	600	700
7	21-6-71.1	Vacant Land	1.54	1.155	-	C	1	1	291	377
8	21-4-283	Borough handles the sewage flow	2.43	1.8225	-	A	-	-	-	-
9	21-3-11.2	Vacant Land	3.8	2.85	-	I	3	4	703	900
10	21-3-11.3	Vacant Land	8.94	6.705	-	I	7	9	1,695	2,262
11	21-3-11.3B	September Farm Rezone - developed	8.75	6.5625	-	I	-	-	-	-
12	21-3-64	Sweeney Hollow Manufacturing - under construction	3.5	2.625	-	I	3	4	656	875
13	21-3-78	Sweeney Hollow Manufacturing - under construction	3.1	2.325	-	I	2	3	340	475
14	21-3-79	Both Land - Proposed Development	3	2.25	-	I	2	3	343	470
15	21-3-80	Vacant Land	3.22	2.415	-	I	2	3	364	495
16	21-3-64.2	Street "Water" Drive - developed	2.2	1.65	-	I	-	-	-	-
17	21-3-80.5	Vacant Land	9.3	-	6.945	I	6	8	1,513	2,003
18	21-3-75.2	Vacant Land	6.8	-	4.42	A	4	6	1,305	1,473
19	21-3-75	Vacant Land	3.3	2.475	-	A	2	3	624	825
20	21-3-75.5	Blanco - No Development Planned	38.02	28.5075	-	I	29	38	7,537	9,503
21	21-6-15	Flood Plain - No Development	12.14	9.105	-	A	-	-	-	-
22	21-3-6	Landsill	75.8	56.7	-	I	-	-	-	-
23	21-7-48.1	Honeybrook Estates - 20 Single Family Homes	11.0	8.25	-	RB	37	37.0	9,205	9,300

Honey Brook Borough Boundary	12-3-19 and 12-3-20	Vacant Land / Portion of 12-3-20 has been developed as apart of RPT	2.5	1,875	-	-	2	3	489	625
Honey Brook Borough Boundary	12-3-29 and 12-3-30.1	Builds, Undeveloped	0.58	0,435	-	-	0.4	1	205	345
Honey Brook Borough Boundary	12-3-117.2	Partially Developed / Limited Potential	6.9	5,175	-	-	5	7	1,294	1,715
Honey Brook Borough Boundary	12-4-71.1	Vacant Land	1.54	1,155	-	-	1	2	389	385
Honey Brook Borough Boundary	12-3-128	Hardwood Stems, Burned down, potential redevelopment	2.29	1,725	-	-	2	2	429	573
Honey Brook Borough Boundary	12-3-177.2	Vacant Land	0.16	0.27	-	-	0.17	0.16	58	90
Honey Brook Borough Boundary	12-3-18	Farm Land, some timber at 12-6-7	2.3	1,725	-	-	2	2	431	575
Honey Brook Borough Boundary	12-3-6	Farm House, Ag Land, Some Owner at 12-4-6	9.8	7,26	-	-	7	10	1,818	2,450
Honey Brook Borough Boundary	12-3-31	Parking Lot/Storage	11.1	8,325	-	-	8	11	2,041	2,775
Honey Brook Borough Boundary	12-4-3	Vacant Land	24.23	18,175	-	-	15	24	4,343	6,055
Honey Brook Borough Boundary	12-4-4	Waybrook, 20 homes remaining to be constructed	2.49	1,875	-	-	2	2	487	628
Honey Brook Borough Boundary	12-4-51	Vacant Land	1.4	1,26	-	-	1	1	260	350
Totals			161.39	126	22	-	206	242	48,079	68,585

zoning
 BC- Resource Conservation, A- Agricultural, C- Commercial, I- Industrial, JH- Farm Residential, B- Residential, MH- Mixed Residential

HONEY BROOK TOWNSHIP ACT 537
EVALUATION OF SEWER SERVICE AREAS FLOWS

Revised September 7, 2017

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (50% OF GROSS AREA ADJACENT BY STREAM)	ZONING DISTRICT	PROJECTED EDUS (WITHOUT TDR)	PROJECTED EDUS (WITH TDR)	PROJECTED FLOWS (150% IMPERVIOUS COVER, WITHOUT TDR)	PROJECTED FLOWS (150% IMPERVIOUS COVER, WITH TDR)
CUPOOLA SEWER DISTRICT										
23	22-8-83.1	Vacant - limited potential	0.9	0.7	-	MR	2.0	3.1	512	788
24	22-8-83.5A	Vacant - limited potential Development	1.2	0.9	-	MR	2.6	3.9	653	980
					FR	87.0	65.2	21,743	16,307	
25	22-8-53	potential	131.6	-	87.0	MR	252.00	378.0	63,000	94,500
26	22-8-23	Vacant - Flood hazard, limited potential	21.7	16.2	-	FR	16.2	12.2	4,009	3,045
27	22-8-26	Vacant	15.8	11.9	-	FR	11.9	8.9	2,963	2,222
28	22-8-6	Vacant	19.7	14.8	-	FR	14.8	11.1	3,694	2,770
29	22-8-5	Vacant	1.0	0.8	-	FR	0.8	0.6	188	141
30	22-8-71	Stormwater basin - limited potential	3.8	1.9	-	FR	-	-	-	-
31	22-8-81	Esper Mobile Home Park	56.5	42.4	-	MR	123.1	184.6	30,764	46,146
32	22-8-87	Wooded - owned by Sumner, no development	28.5	21.5	-	MR	-	-	-	-
		2351 Chestnut Tree Road - Proposed 154 dwelling units	43.0	-	-	R	154.0	154.0	5,250	14,000
33	22-8-68.3		12.2	9.1						
34	22-8-16.3		108.3	82.0						
35	22-8-16		7.7	5.8						
36	22-8-18.2		5.1	3.9						
37	22-8-26.4		4.4	3.3						
38	22-8-26.5		3.6	2.7						
39	25-1-1		2.6	2.0						
40	25-1-1.1		1.1	0.9						
41	25-1-1.3		2.0	1.5						
42	25-1-1.4		7.7	5.8						
43	22-8-14.1		86.9	65.2						
44	22-8-14		8.3	6.2						
45	22-8-65.1P	Vacant	30.0	7.5	-	FR	6.2	4.7	1,556	1,167
46	22-8-65.1	Vacant	80.9	-	30.5	FR	7.5	5.6	1,875	1,406
47	22-8-64.1	Vacant	125.0	-	-	FR	30.6	25.7	9,896	7,402
48	22-8-52	Table Track - 128 Single Family Home Development	125.0	93.8	-	FR	93.8	126.0	23,438	32,000
49	22-8-52.1	Vacant - limited potential	12.0	9.0	-	FR	9.0	6.8	2,350	1,828
Totals			784.82	620.34	234.56		820.26	306.25	261,840	254,362

zoning

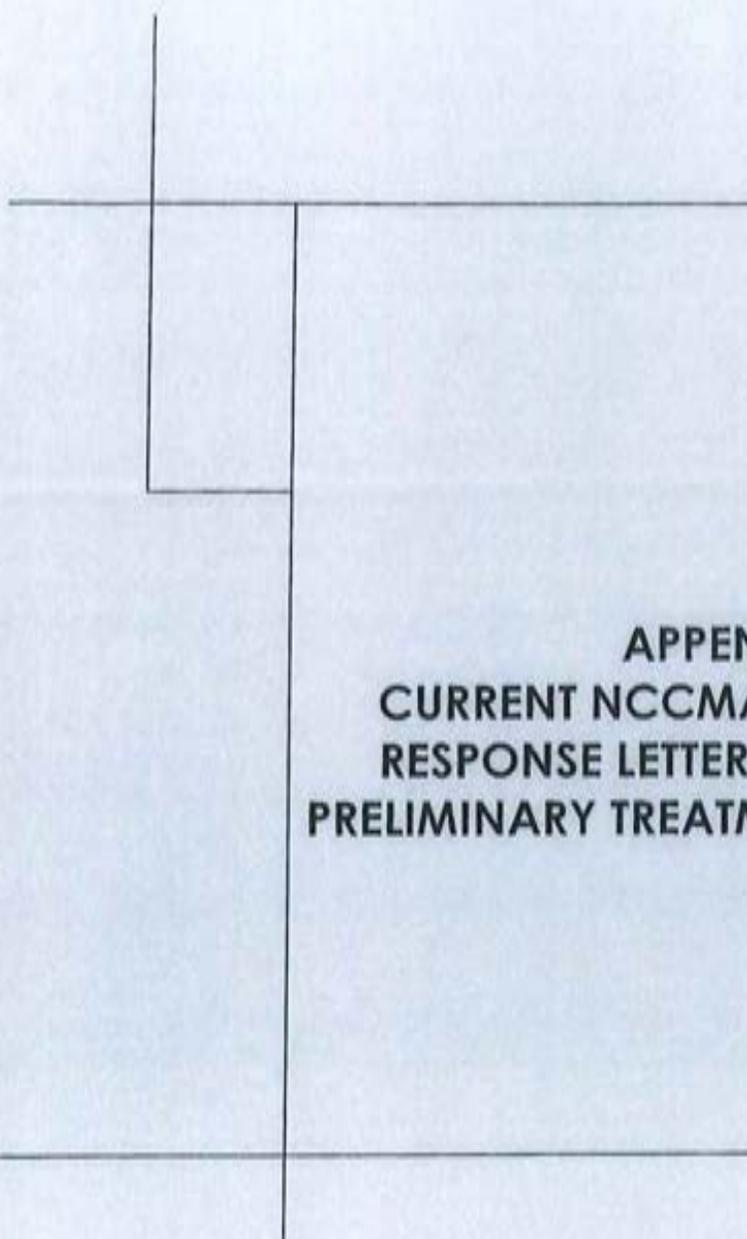
RC - Resource Conservation, R - Agricultural, C - Commercial, I - Industrial, FR - Farm Residential, B - Residential, MR - Mixed Residential

HONEY BROOK TOWNSHIP ACT 537
EVALUATION OF SEWER SERVICE AREAS FLOWS

Revised September 7, 2017

MAP ID	PARCEL NO.	PARCEL DESCRIPTION	GROSS ACRES	NET ACREAGE (75% OF GROSS AREA)	NET ACREAGE (25% OF GROSS AREA DEDUCTED BY STREAM)	ZONING DISTRICT	PROJECTED EDU(S) (WITHOUT TDR)	PROJECTED EDU(S) (WITH TDR)	PROJECTED FLOWS (1 EDU = 250 GPD; WITHOUT TDR)	PROJECTED FLOWS (1 EDU = 250 GPD; WITH TDR)
SUPPLY SEWER DISTRICT										
50	22-3-57	Vacant - Limited Potential	2.8	2.1	-	FR	1	3	525	300
51	22-7-60	Vacant	65.71	49.2825	-	FR	49	66	12,375	16,425
52	22-4-101.4	Developed	2.32	1.7325	-	FR	-	-	-	-
53	22-4-101.3	Developed	1.74	1.305	-	FR	-	-	-	-
54	22-4-105	Developed	1.94	1.455	-	FR	-	-	-	-
Identified in Green on Overall Plan	-	Supplies Villages - Existing Residences	-	-	-	FR	29	-	7,250	7,250
Identified in Green on Overall Plan	-	Dunsmuir Road - Existing Residences	-	-	-	A	49	-	12,250	12,250
56	22-4-6.2	New Office for Sewer Authority	2.8	2.1	-	A	2	3	525	300
57	22-8-9	Shore Line & Lake View Drive - Existing Residences	13.5	10.2	-	A	10	14	2,500	3,400
Shore Line Area - Identified in Green on Overall Plan	-	View Drive - Existing Residences	-	-	-	A	95	95	23,750	23,750
Totals:			96.9	68	0	-	142	85	35,425	46,728

Zoning
RC: Resource Conservation, A: Agricultural, C: Commercial, I: Industrial, FR: Farm Residential, R: Residential, MB: Mixed Residential



**APPENDIX B
CURRENT NCCMA NPDES PERMIT /
RESPONSE LETTER TO REQUEST FOR
PRELIMINARY TREATMENT REQUIREMENTS**



**AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
DISCHARGE REQUIREMENTS FOR PUBLICLY OWNED
TREATMENT WORKS (POTWs)**

NPDES PERMIT NO: PA0044776

In compliance with the provisions of the Clean Water Act, 33 U.S.C. Section 1251 *et seq.* ("the Act") and Pennsylvania's Clean Streams Law, as amended, 35 P.S. Section 691.1 *et seq.*,

**Northwestern Chester County Municipal Authority
5277 Horseshoe Pike
P.O. Box 308
Honey Brook, PA 19344**

is authorized to discharge from a facility known as Honey Brook Township STP, located in Honey Brook Township, Chester County, to West Branch Brandywine Creek in Watershed(s) 3-H in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts A, B and C hereof.

THIS PERMIT SHALL BECOME EFFECTIVE ON JULY 1, 2013

THIS PERMIT SHALL EXPIRE AT MIDNIGHT ON JUNE 30, 2018

The authority granted by this permit is subject to the following further qualifications:

1. If there is a conflict between the application, its supporting documents and/or amendments and the terms and conditions of this permit, the terms and conditions shall apply.
2. Failure to comply with the terms, conditions or effluent limitations of this permit is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. (40 CFR 122.41(a))
3. A complete application for renewal of this permit, or notice of intent to cease discharging by the expiration date, must be submitted to DEP at least 180 days prior to the above expiration date (unless permission has been granted by DEP for submission at a later date), using the appropriate NPDES permit application form. (40 CFR 122.41(b), 122.21(d))

In the event that a timely and complete application for renewal has been submitted and DEP is unable, through no fault of the permittee, to reissue the permit before the above expiration date, the terms and conditions of this permit, including submission of the Discharge Monitoring Reports (DMRs), will be automatically continued and will remain fully effective and enforceable against the discharger until DEP takes final action on the pending permit application. (25 Pa. Code 92a.7(b), (c))

4. This NPDES permit does not constitute authorization to construct or make modifications to wastewater treatment facilities necessary to meet the terms and conditions of this permit.

DATE PERMIT ISSUED June 11, 2013

ISSUED BY _____

Jenifer L. Fields, P.E.
Clean Water Program Manager
Southeast Regional Office

Outfall 001, Continued (from July 1, 2013 through June 30, 2018)

Parameter	Effluent Limitations					Monitoring Requirements	
	Mass Units (lbs/day)		Concentrations (mg/L)			Minimum Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Instant. Minimum	Average Monthly	Weekly Average		
Total Suspended Solids Raw Sewage Influent	Report	XXX	XXX	Report	XXX	1/week	24-Hr Composite
Total Suspended Solids	150	225	XXX	30	45	1/week	24-Hr Composite
Fecal Coliform (No./100 ml) May 1 - Sep 30	XXX	XXX	XXX	XXX	200 Geo Mean	1/week	Grab
Fecal Coliform (No./100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	XXX	200 Geo Mean	1/week	Grab
Total Nitrogen	144.1	XXX	XXX	28.8	XXX	1/week	24-Hr Composite
Ammonia-Nitrogen Instream Monitoring	XXX	XXX	XXX	XXX	XXX	See Permit Footnote**	Grab
Ammonia-Nitrogen May 1 - Oct 31	13.5	XXX	XXX	2.7	XXX	1/week	24-Hr Composite
Ammonia-Nitrogen Nov 1 - Apr 30	40.5	XXX	XXX	8.1	XXX	1/week	24-Hr Composite
Total Phosphorus Apr 1 - Oct 31	9.0	XXX	XXX	1.8	XXX	1/week	24-Hr Composite
Total Phosphorus Nov 1 - Mar 31	10.0	XXX	XXX	2.0	XXX	1/week	24-Hr Composite
Stream Flow at Birdell Gauge (MGD)	Report	Report	XXX	XXX	XXX	1/week	Measured

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):

at Outfall 001 *Not to exceed 1,000/100 ml as an instantaneous maximum from May 1 through September 30 . Not to exceed 1,000/100 ml in greater than 10 percent of the samples tested from October 1st through April 30th. See Part C.I. Other Requirement F. **Instream Ammonia-Nitrogen samples shall be taken 1/week when the weekly average stream flow is less than 5.5 MGD (8.5 cfs) at the Birdell gauge and at the same time the plant is discharging.

PART A - EFFLUENT LIMITATIONS, MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS

L.A. For Outfall 001, Latitude 40° 04' 20", Longitude 75° 51' 50", River Mile Index 29.2, Stream Code 00085

Receiving Waters: West Branch Brandywine Creek

Type of Effluent: Treated sewage effluent from Honey Brook Township STP

1. The permittee is authorized to discharge during the period from July 1, 2013 through June 30, 2018.
2. Based on the anticipated wastewater characteristics and flows described in the permit application and its supporting documents and/or amendments, the following effluent limitations and monitoring requirements apply (see also Additional Requirements and Footnotes).

Parameter	Mass Units (lbs/day)				Effluent Limitations			Concentrations (mg/L)			Monitoring Requirements	
	Average Monthly	Weekly Average Report	Instant. Minimum	Instant. Maximum	Average Monthly	Weekly Average	Instant. Maximum	Minimum Frequency	Required Sample Type	Minimum Frequency	Required Sample Type	
	Report	Daily Max	6.0 Inst Min	6.0 Inst Min	Report	Report	Report	Report	Report	Report	Report	
Flow (MGD)	Report	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Continuous	Metered	
pH (S.U.)	XXX	XXX	6.0 Inst Min	6.0 Inst Min	XXX	XXX	XXX	9.0	XXX	1/day	Grab	
Dissolved Oxygen	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1/day	Grab	
Total Residual Chlorine	XXX	XXX	XXX	XXX	0.5	XXX	XXX	1.7	XXX	1/day	Grab	
Color (Pt-Co Units)	XXX	XXX	XXX	XXX	XXX	XXX	XXX	75	XXX	1/week	Grab	
CBOD5	Report	XXX	XXX	XXX	Report	XXX	XXX	XXX	XXX	1/week	24-Hr Composite	
Raw Sewage Influent	Report	XXX	XXX	XXX	Report	XXX	XXX	XXX	XXX	1/week	24-Hr Composite	
CBOD5 May 1 - Oct 31	68	102	XXX	XXX	14	21	28	28	XXX	1/week	Composite	
CBOD5 Nov 1 - Apr 30	125	187	XXX	XXX	25	38	50	50	XXX	1/week	Composite	
BCOD5 Raw Sewage Influent	Report	XXX	XXX	XXX	Report	XXX	XXX	XXX	XXX	1/week	24-Hr Composite	



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

Southeast Regional Office

December 29, 2015

Ms. Tara Bernard
Ebert Engineering, Inc.
P.O. Box 540
4092 Skippack Pike, Suite 202
Skippack, PA 19474

Re: Preliminary Treatment Requirements
Honey Brook Township 537 Plan
Honey Brook Township STP (aka NCCMA WWTP)
NPDES Permit No. PA0044776
Honey Brook Township
Chester County

Dear Ms. Bernard:

This is in reply to your December 8, 2015, request for Preliminary Treatment Requirements for an expansion of Honey Brook Township STP from 0.6 mgd to 0.7 mgd average annual design flow. The discharge is to West Branch Brandywine Creek, which is designated as High Quality Trout Stocking Fishery. Preliminary effluent limitations as monthly average values, except where noted, are listed below:

CBOD5 (May 1 st – October 31 st)	10 mg/l
CBOD5 (November 1 st – April 30 th)	20 mg/l
Total Suspended Solids	20 mg/l
NH3-N (May 1 st – October 31 st)*	2.3 mg/l
NH3-N (November 1 st – April 30 th)*	6.9 mg/l
(NO2+NO3)-N	18.2 mg/l
Dissolved Oxygen, Inst. min.	7.0 – 8.0 mg/l
Total Phosphorus (April 1 st – October 31 st)	1.5 mg/l
Total Phosphorus (November 1 st – March 31 st)	1.7 mg/l
Total Nitrogen	24.6 mg/l
Total Residual Chlorine	0.4 mg/l
pH, min-max	6 – 9 S.U.
Fecal Coliform, geometric mean	170 col/100 ml
Color, Inst. maximum	60 Pt – Co units
Total Dissolved Solids	350 - 400 mg/l
Lead	4.9µg/l
Copper	11.5 µg/l
Total Iron	670 µg/l
Sulfate	106 µg/l

Ms. Tara Berused

2

Aluminum	1,118 µg/l
Zinc	19.2 µg/l

* Instream NH₃-N = 0.5 mg/l as an instantaneous maximum instream

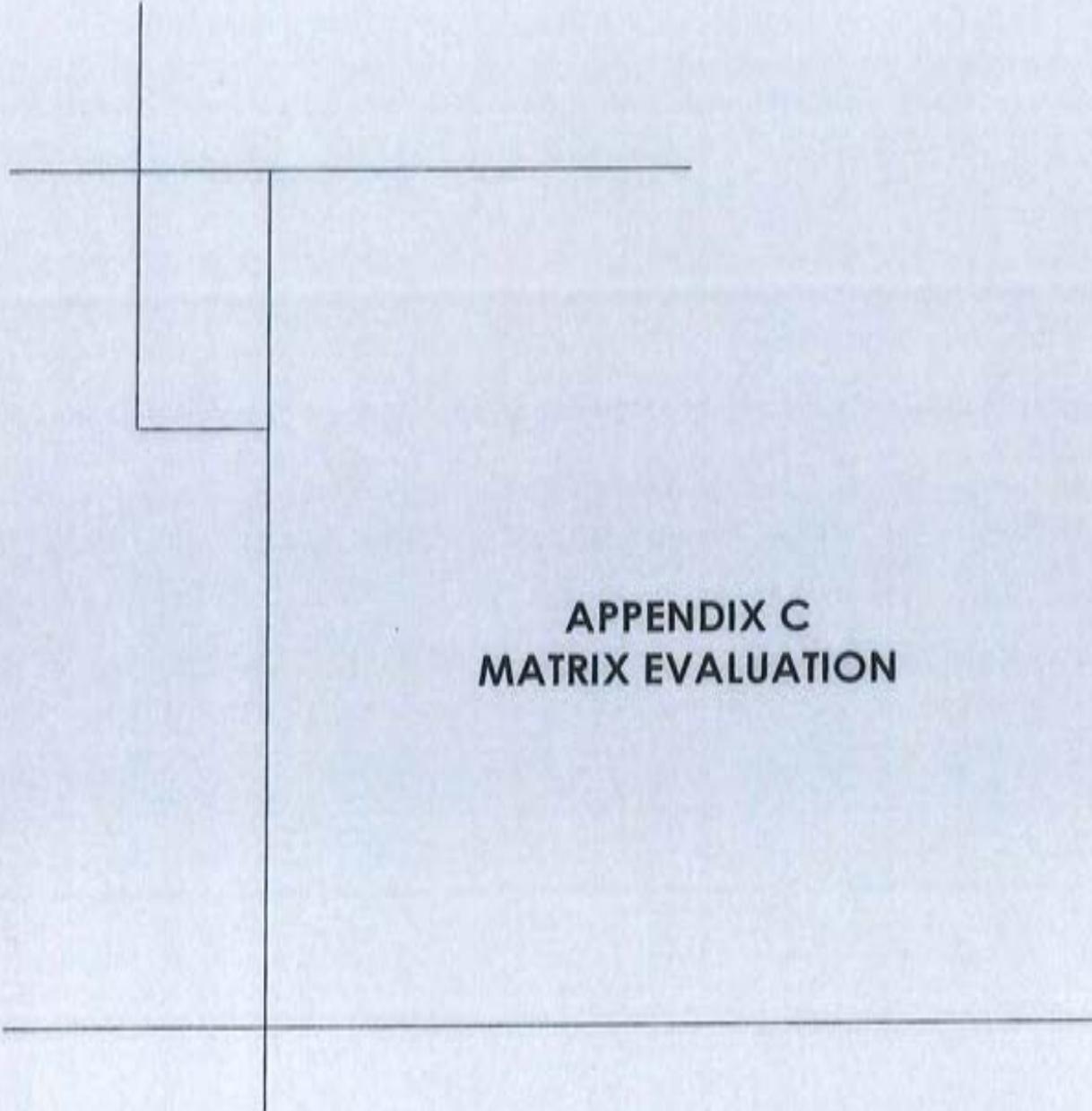
These limits are preliminary and may be further refined. The applicant has the option to provide additional site specific stream and effluent data for the Department's consideration in developing treatment requirements.

If you have any questions on the effluent limits, please call Ms. Laurel Ateyeh at 484.250.5198. Please contact the Sewage Planning Specialist for information on Act 537 sewage facilities planning requirements and alternative analysis requirements for this project.

Sincerely,


Pravin Patel, P.E.
Environmental Engineer Manager
NPDES Permits Section
Clean Water Program

cc: Honey Brook Township
Chester County Health Department
Mr. Hayes - Northwestern Chester County Municipal Authority
Mr. Dudley, P.E. - Chief, Planning and Finance
Ms. Mahoney - Sewage Planning Supervisor
Ms. Ateyeh
File
Rs

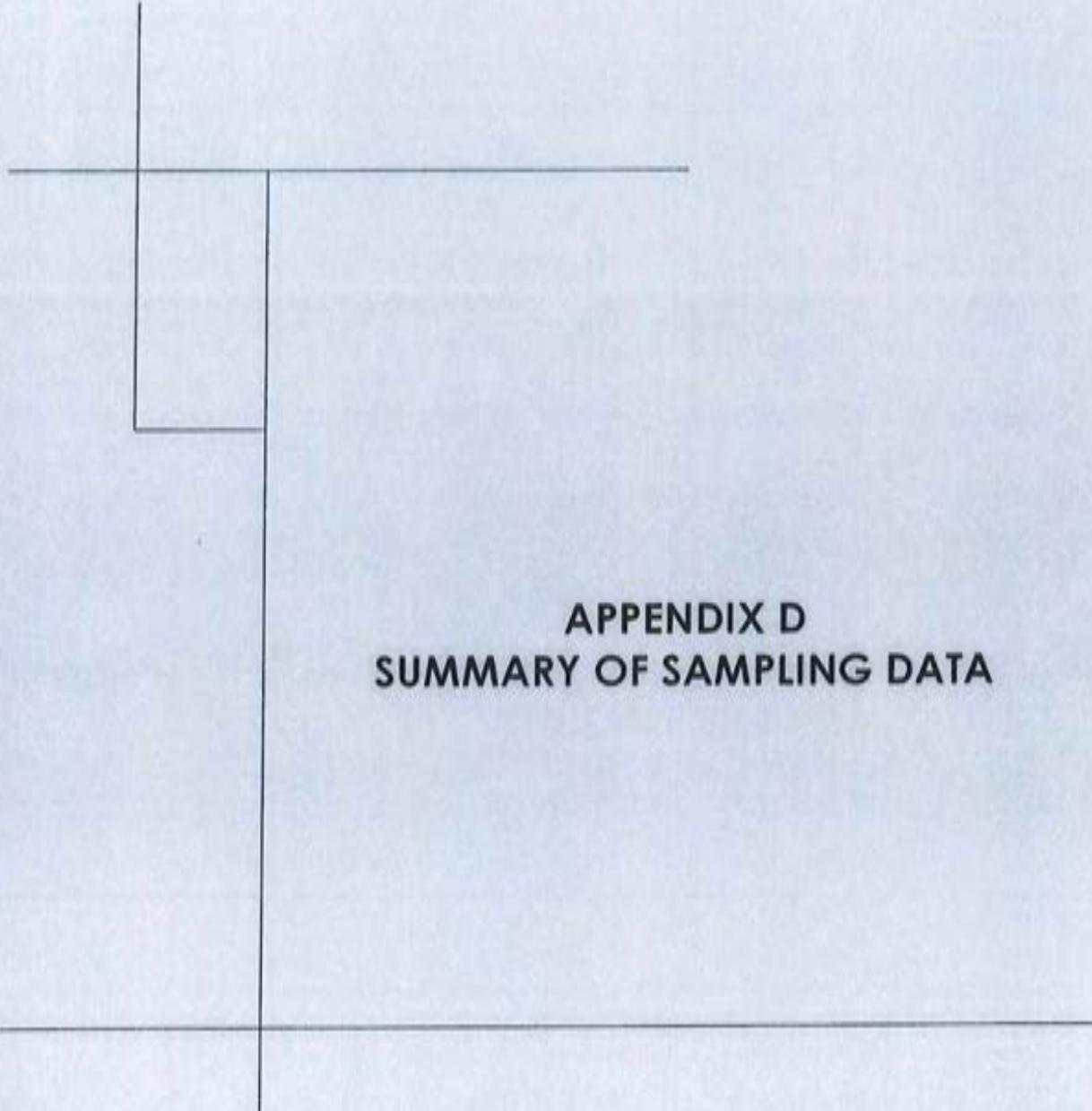


**APPENDIX C
MATRIX EVALUATION**

Table 1.1 Matrix Summary for Lagoon Upgrades

Parameter	Alternative 1A Lemmina	Alternative 1B Triplepoint Env.	Alternative 1C Krugar	Alternative 1D Nelson	Alternative 1E ADS	Alternative 2A SBR	Alternative 2B CSBR	Alternative 2C Oxidation Ditch	Alternative 2D Bio-lac
Installation	Retrofit	Retrofit	Retrofit	Retrofit	Retrofit	New	New	New	New/Retrofit
Reliability	3	3	2	2	2	3	3	4	2
Expandability	3	3	3	2	2	2	2	2	3
References	4	2	2	3	2	4	4	4	3
Process Guarantee	2	2	1	1	1	4	4	4	3
Complexity	3	3	3	3	3	3	3	4	2
O&M	2	3	3	3	3	1	1	2	2
Civil Constraints	3	3	3	2	2	3	3	3	3
Power	3	2	3	3	3	1	1	1	2
TOTAL	23	21	20	19	18	21	21	24	20
Ranking	1	2	3	4	5	2	2	1	3

The matrix evaluation was based on a ranking from 1 (least) to 4 (best). Systems with the highest total have the best ranking.

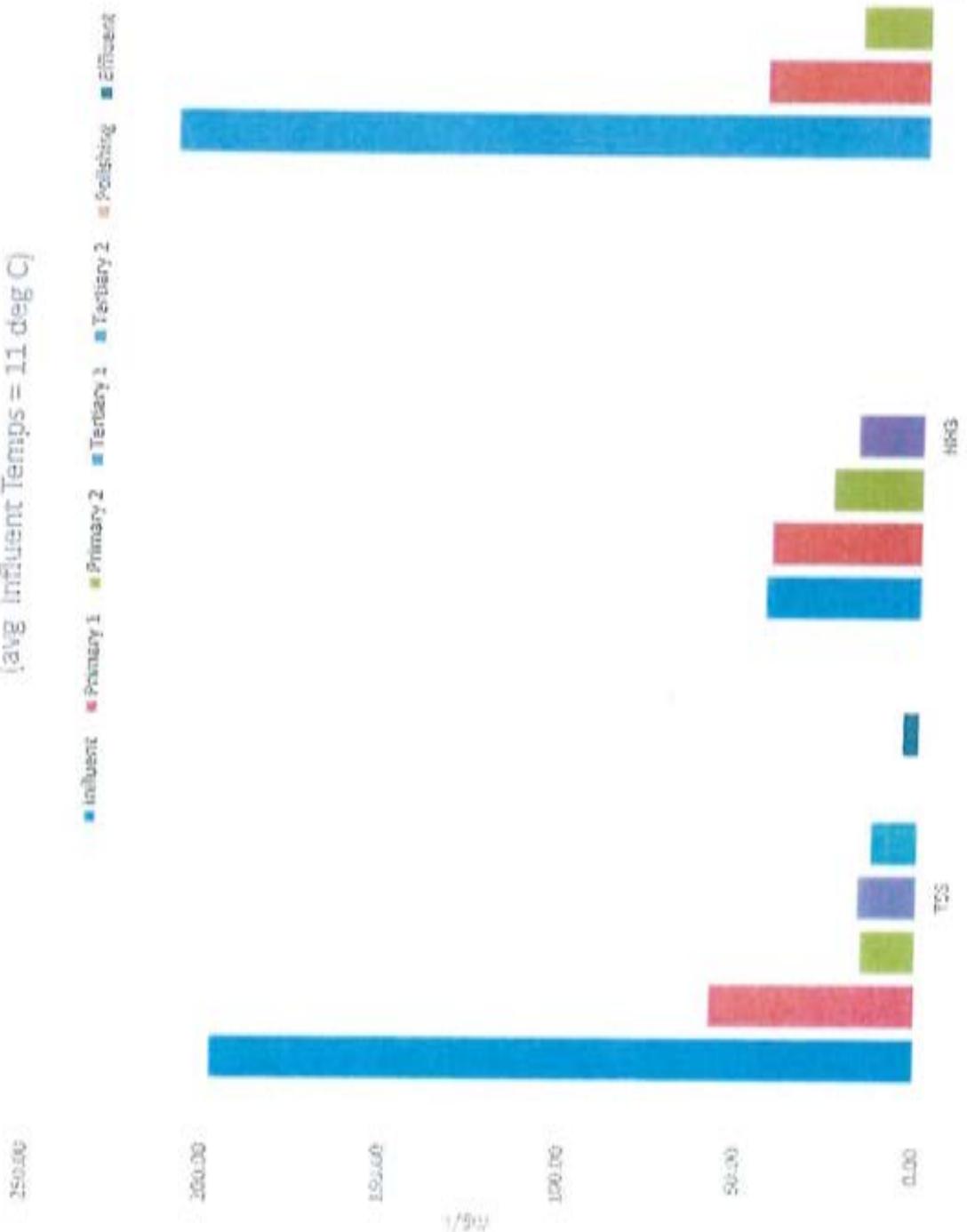


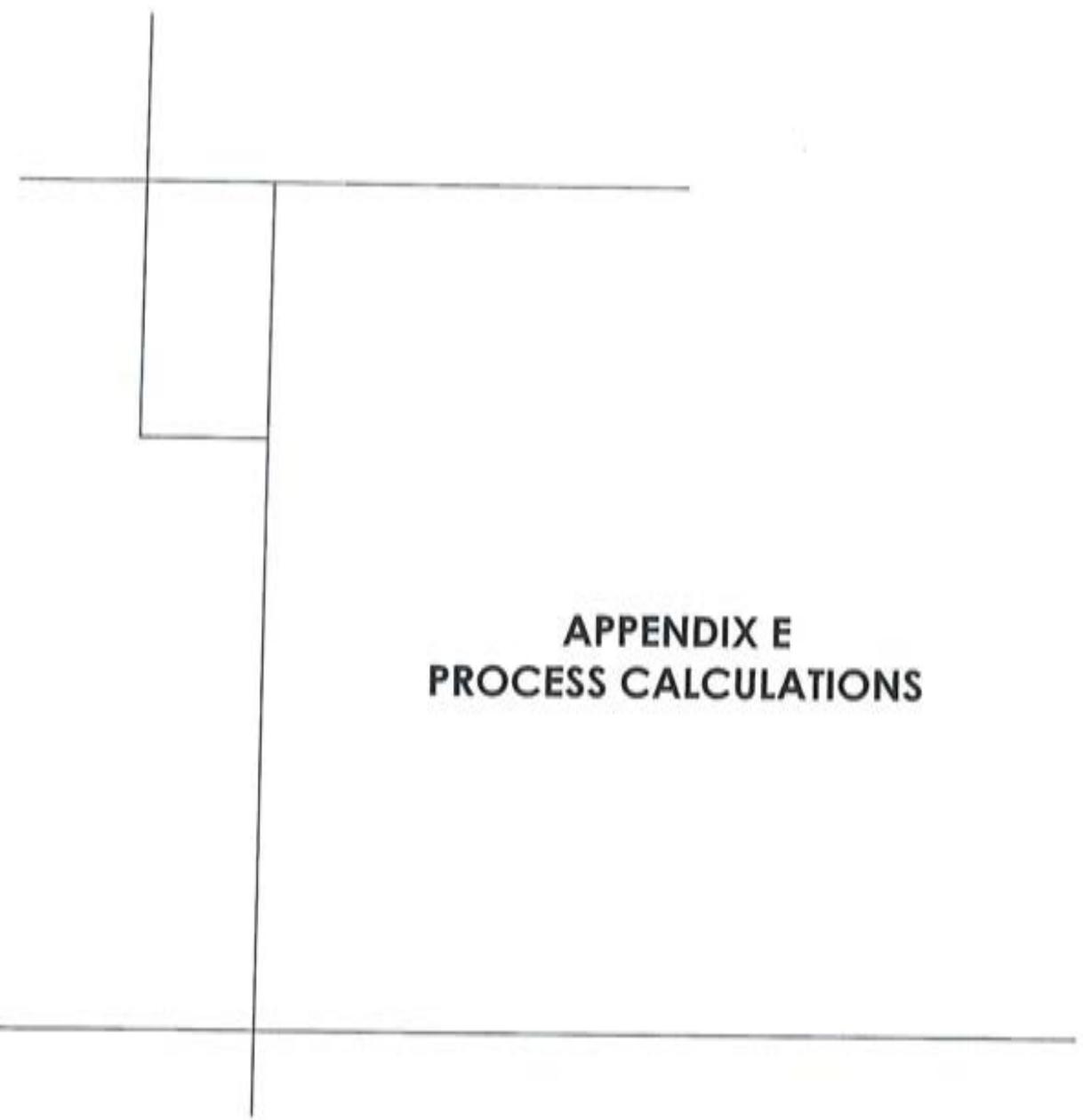
**APPENDIX D
SUMMARY OF SAMPLING DATA**

Summary of Sampling Data (Jan-Mar 2003)



Summary of May 2016 Results
 (avg Influent Temps = 11 deg C)





**APPENDIX E
PROCESS CALCULATIONS**

NCCMA,

PA



February 2018

DESIGN REVIEW – OPTION 1



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 - D. Settling Zone
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I. INTRODUCTION

This detailed review is designed to provide the client, the consulting engineer and the Pennsylvania DNR with sufficient technical information required to evaluate and approve the LemTec™ Biological Treatment Process (LBTP) for the NCCMA Lagoon, PA Project. Although the LemTec™ process is similar in some aspects to traditional aerated pond systems, the overall system is significantly different, therefore this evaluation will establish that the process is a reliable, effective and acceptable wastewater treatment solution.

II. GENERAL PROCESS DESCRIPTION

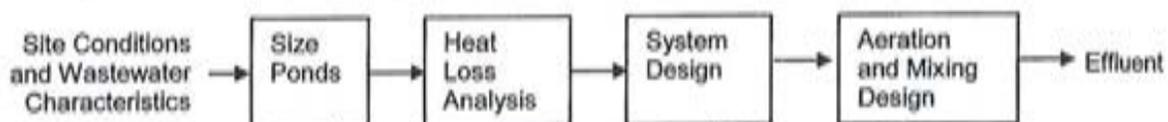
The Lemna Technologies, Inc. LBTP is composed of an aerobic treatment cell followed by a low-loaded anaerobic settling zone. A fixed film reactor immediately follows the settling zone providing BOD and ammonia polishing. The aerobic and anaerobic cells are covered by the LemTec™ Modular Cover System, a patented floating modular cover that provides an insulated environment for heat retention and prevents algae growth by shielding sunlight. This warmer environment, along with the other components of the aerobic and anaerobic cells, provides conditions conducive to the removal of biochemical oxygen demand (BOD₅), total suspended solids (TSS) and ammonia nitrogen (NH₃).

The LemTec™ Modular Cover System is a unique floating cover system used for insulation, odor elimination and algae control on ponds and tanks. This cover system is composed of individual casings of closed-cell insulation sealed between two sheets of durable geomembrane. The cover easily adapts to varying water levels. When secured, the cover system can support the weight of several people, making installation easy as compared to other covers. In addition, in-pond equipment can be easily accessed for routine maintenance from the surface of the cover.

By integrating the LemTec™ cover into the process, the LBTP provides an accelerated means of treatment in simple, operator-friendly ponds that require little system maintenance and require a fraction of the space of conventional pond systems.

III. DESIGN PROCESS

In designing an LBTP, a number of related factors are evaluated to arrive at the most cost-efficient design. The system is designed comparing detention time, mixing, and aeration requirements with capital and operating costs. The design process follows the following simplified steps:



Design calculations for each of these steps are included in Section VII of this Review.

IV. PROCESS FLOW DESCRIPTION

A. Overview of Process Flow

In general, the LBTP is similar in design to conventional flow-through, aerated lagoons: the initial complete mix aeration zone is designed for the removal of BOD₅, while the settling zone promotes TSS removal and stores biosolids. The difference in design lies in the use of the LemTec™ cover. The insulated cover prevents atmospheric cooling of the wastewater during cold weather, which results in higher operating temperatures/reaction rates, thus increased bacterial growth rates. The increased bacterial growth rates relate to more efficient BOD₅ and NH₃ removal rates, which allow for the system to be designed with a smaller footprint. In addition, the use of the cover on the settling cell prevents the growth of algae, which is typically the cause of elevated TSS concentrations in aerated lagoon effluents. In both cases, it is the use of the LemTec™ cover that makes the LBTP unique compared to typical aerated lagoons.

Finally, the LPR is included in the LBTP design when a facility must meet lower BOD₅ and NH₃ effluent limits. The LPR is designed to promote a submerged environment ideal for attached-growth bacteria that remove residual concentrations of BOD₅ and NH₃ from the wastewater.

The LemTec™ Biological Treatment Process (LBTP) proposed for the NCCMA Lagoon, PA WWTP utilizes one pond sized to handle the referenced design flow. The treatment pond is 10.0 ft deep with a detention time of 14.9 days.

For this proposal, the treatment pond is divided into two cells by using Lemna's Reverse Miter Hydraulic Baffle, which is custom design to minimize short-circuiting between each cell. The first cell is a 3.0 day complete mix cell, followed by 11.9 day settling cell. The entire treatment pond is covered by Lemna's LemTec™ Insulated Modular Cover rated at R8.

The Lemna Polishing Reactor follows the treatment pond.

B. Preliminary Treatment

Prior to the first aeration cell, Lemna Technologies recommends that the raw influent to the plant be pretreated with a bar screen and/or grit removal process. This preliminary stage of treatment is typically not provided as part of the LBTP, however its inclusion in the design is often times required to comply with various state regulations.

C. Complete Mix Aeration Zone

The initial complete mix cell of the LBTP process is an aerated, aggressively mixed cell that establishes an environment suitable for the rapid removal of BOD₅ and NH₃ by bacteria. Complete mix is defined as the condition when settleable solids are maintained in suspension. Fine bubble diffusers, floating mechanical aspirators/mixers, or in some cases, a combination of both, are used to maintain the aeration and mixing required to achieve complete mix conditions. How much equipment is needed to meet complete mix requirements is difficult to quantify – EPA states "There is no rational method available to predict the power input necessary to keep solids in suspension." For this reason, Lemna Technologies, Inc. uses the recommendations of manufacturers and research conducted by experts in the field. For this application, aeration and mixing is accomplished through the use of fine bubble diffusers. For the purpose of sizing aeration to achieve complete mix conditions, an airflow rate of over 6 SCFM/1000 cubic feet is maintained (a dissipated energy of 13.5 HP/MG).

E. Settling Zone

The LBTP aeration cell is followed by the settling cell, which is designed for TSS removal and storage of biosolids (sludge).

1) TSS Removal in the Settling Zone

A settling cell, covered with the LemTec™ cover, creates an effective zone for clarification of biosolids. The cover prevents algae growth by eliminating sunlight below the cover and improves clarification in two ways: 1) it prevents wind action on the water surface thereby establishing a quiescent zone for solids to settle, and 2) the insulation minimizes seasonal and diurnal temperature fluctuation thereby reducing stirring by thermal currents.

2) Storage of Biosolids in the Settling Zone

The LemTec solids management program confines long-term sludge removal efforts to the settling cell. Due to the relatively long detention times used in the LBTP (as compared to high rate activated sludge), the LBTP generates fewer biosolids than comparable systems.

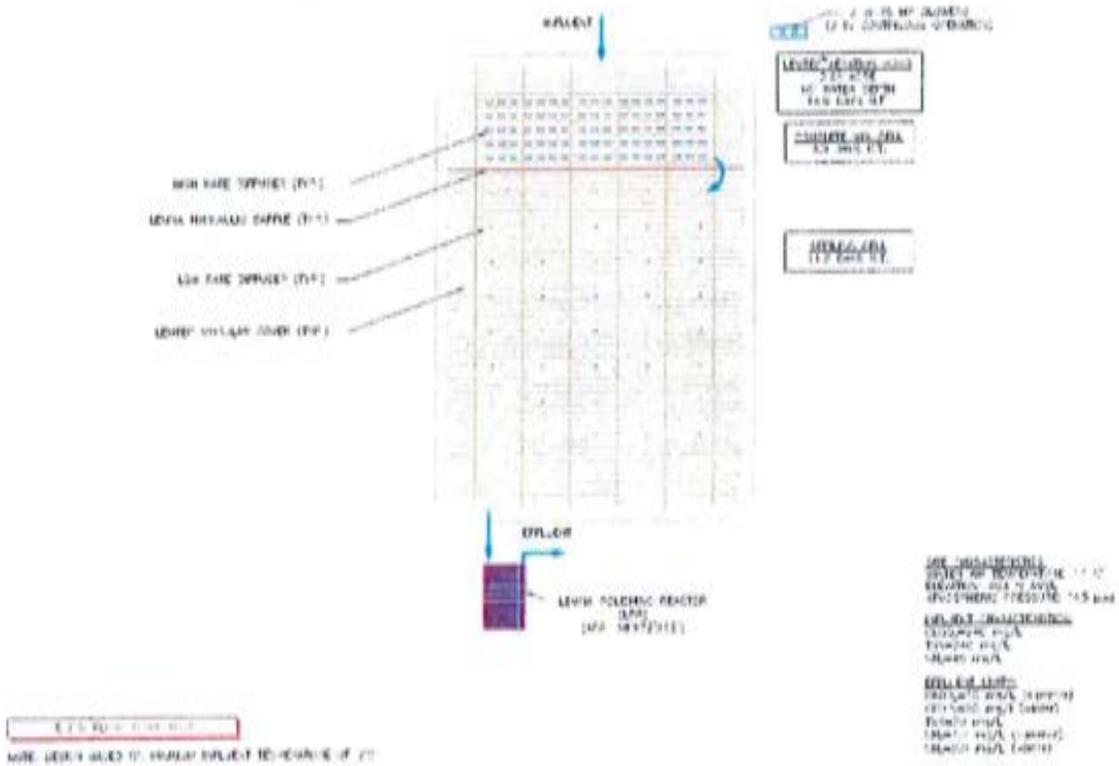
F. Lemna Polishing Reactor (LPR)

The LPR is included in the LBTP design to meet low BOD₅ and NH₃ limits. The LPR utilizes fixed media to promote an environment for submerged attached-growth bacteria. For influent BOD₅ concentrations

above 20 mg/l, heterotrophs flourish and effectively reduce BOD₅ to below 10 mg/l. At BOD₅ levels below 20 mg/l, nitrifiers begin to thrive and are capable of lowering ammonia levels to below 1 mg/l.

V. DESIGN LAYOUT/DRAWINGS

The layout for the NCCMA Lagoon facility design consists of one pond as shown below. The treatment pond consists of two cells separated by hydraulic baffles. Submerged diffusers are placed on the pond floor for aeration and mixing. The Lemna Polishing Reactor follows the treatment pond.



VI. NCCMA LAGOON PROJECT DATA (REFERENCE APPENDIX A SPREADSHEET)

A. Site Conditions

The site conditions at NCCMA Lagoon are established based on information obtained from the National Weather Service. These conditions are summarized on the Engineering Spreadsheet and are used to calculate heat loss.

B. Wastewater Characteristics

The wastewater characteristics at NCCMA Lagoon are established based on anticipated loading characteristics. Influent values are based on data provided by the consulting engineer while effluent values and flow are based on NPDES permit requirements. The influent/effluent values are used in subsequent design calculations.

C. Pond Dimensions

The physical pond dimensions represent dimensions of the existing pond at NCCMA Lagoon that will serve as the treatment pond. Areas, volumes, and detention times are established based on the proposed infrastructure at NCCMA Lagoon.

D. Heat Loss Analysis

The heat loss analysis for the treatment pond uses an iterative calculation to balance the heat in the influent against the heat lost through the insulated cover. In brief, an estimated heat loss rate from the proposed pond is used to determine an effective R-value. The heat loss rate is adjusted until the effective R-value equals the R-value of the insulated cover. Given this convergence, the heat loss rate for the proposed pond is known and can be used to determine the heat in the effluent, which is used to determine the effluent temperature.

The calculation requires site-specific data with respect to influent temperature, cold weather ambient air temperatures, pond surface area, and the proposed R-value for the insulated cover. Given these values, the design engineer performs the iterative calculation that provides the effluent temperature. Temperature drop through the proposed pond is expected to be linear with respect to detention time; temperature in each cell is interpolated based on cumulative cell detention time and the difference between influent and calculated effluent temperatures.

VII. NCCMA LAGOON PROCESS CALCULATIONS (REFERENCE APPENDIX A SPREADSHEET)

A. System Design

The overall LemTec™ Biological Treatment Process calculations are summarized in Appendix A. In these calculations, BOD₅ and NH₃ removal are calculated (by each cell through the process) for both summer and winter operation.

1. BOD

The removal of BOD₅ in the complete mix cell is calculated using state-of-the-art "mechanistic" models that relate to the growth of bacteria and removal of BOD₅ in relation to detention time and wastewater temperature. The equation used in L.Rich's High Performance Aerated Lagoon Systems (1990) is provided below:

$$S_e = \frac{K_s(1 + k_d \times DT)}{DT(\mu_m - k_d) - 1}$$

Where: S_e = concentration of effluent BOD₅, mg/l

k_d = bacterial decay rate, d⁻¹

DT = detention time, d

K_s = half-saturation constant, 120 mg/l

μ_m = maximum heterotrophic specific growth rate, d⁻¹

Maximum heterotrophic growth rate is adjusted for temperature using the following equations:

$$\mu_m = \mu_{m20} \times 1.026^{T-20} \text{ (for T between } 10^\circ\text{C and } 30^\circ\text{C)}$$

$$\mu_m = 0.774 \times \mu_{m20} \times 1.058^{T-20} \text{ (for T between } 2^\circ\text{C and } 10^\circ\text{C)}$$

Where: $\mu_{m20} = 6.0 \text{ d}^{-1}$

The following equations are used to calculate bacterial decay rate:

$$k_{d20} = 0.48 \times DT^{-0.415}$$

$$k_d = k_{d20} \times 1.05^{T-20}$$

For summer, complete mix cell 1A, $T=20^{\circ}\text{C}$

$$\mu_m = 6.0 \times 1.026^{20-20} = 6 \text{ d}^{-1}$$

$$k_{d20} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$k_d = 0.30 \times 1.05^{20-20} = 0.30 \text{ d}^{-1}$$

BOD summer effluent from the complete mix cell 1A

$$S_e = \frac{120(1 + 0.30 \times 3.0)}{3.0(6.0 - 0.30) - 1} = 14 \text{ mg/l}$$

For winter, complete mix cell 1A, $T=8.9^{\circ}\text{C}$

$$\mu_m = 0.774 \times 6.0 \times 1.058^{8.9-20} = 4.4 \text{ d}^{-1}$$

$$k_{d20} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$k_d = 0.30 \times 1.05^{8.9-20} = 0.18 \text{ d}^{-1}$$

BOD winter effluent from the complete mix cell 1A

$$S_e = \frac{120(1 + 0.19 \times 3.0)}{3.0(4.4 - 0.18) - 1} = 16 \text{ mg/l}$$

2. NH_3

The removal of NH_3 in the complete mix cell is calculated using an equation that relates the removal of NH_3 to the growth of bacteria and dissolved oxygen concentration.

The equation is provided below (L. Rich, 1999):

$$N = \frac{K_N}{DT \times \left(\mu_m \frac{O_2}{K_{O_2} + O_2} [1 - 0.83(7.2 - \text{pH})] \right) - 1}$$

Where: N = concentration of effluent ammonia, mg/l

μ_m = maximum nitrifier specific growth rate, d^{-1}

O_2 = concentration of dissolved oxygen, mg/l

K_N = half-saturation constant for ammonium nitrogen, mg/l
 K_{O_2} = half-saturation constant for dissolved oxygen, 1.2 mg/l
 DT = detention time, d

K_N and μ_m are adjusted for temperature using the following equation:

$$\mu_m = 10^{0.0413T - 0.944}$$

and

$$K_N = 10^{0.051T - 1.158}$$

For summer complete mix cell 1A, $T=20^\circ\text{C}$

$$\mu_m = 10^{0.0413 \times 20 - 0.944} = 0.762 \text{ d}^{-1}$$

$$K_N = 10^{0.051 \times 20 - 1.158} = 0.728 \text{ d}^{-1}$$

NH_3 summer effluent from the complete mix cell 1A

$$N = \frac{0.728}{3.0 \times \left(0.762 - \frac{3}{1.2 + 3} [1 - 0.83(7.2 - 7.2)] \right) - 1} = 1.1 \text{ mg/l}$$

There is not enough detention time for nitrifier growth to occur during winter months. Removal of ammonia in CM cell in winter is partially accounted for by the uptake of nitrogen by heterotrophic bacteria to meet stoichiometric demands for cell synthesis.

3. TSS

The removal of TSS is achieved in the settling cell. The quantity of solids accumulated in the settling cell is best estimated using a mass balance calculation. Such a balance considers the quantities of biodegradable and non-biodegradable solids introduced to the settling cell, the rate at which the solids are degraded and the extent of compaction experienced by the solids. An explanation of the calculations is provided in Appendix B.

4. LEMNA POLISHING REACTOR (LPR)

The removal of NH_3 is achieved in the Lemna Polishing Reactor TM (LPR).

The LPR is a submerged attached growth reactor that is engineered to optimize the growth of biofilm. Empirically derived "areal" loading rates are used for reactor sizing. In general, the sizing of an LPR reactor is controlled by influent ammonia concentrations and the loading rates ($< 1 \text{ g-N/m}^2/\text{d}$) are consistent with rates for moving bed biological reactors used for tertiary treatment.

The LPR influent loading is divided by the temperature-corrected areal loading rates to determine the required biofilm surface areas in the reactor. This area is divided by the surface area per volume ratio of LPR media to determine the number of LPR "cubes" required. LPR cubes have a 6' x 6' footprint with media height adjusted based on project constraints.

LPR media requirements for NH_3 removal are calculated according to the following equation:

$$A = \frac{\Delta\text{NH}_3 \times Q \times 8.34}{G_T}$$

Where: A = media surface area (ft^2)
 ΔNH_3 = NH_3 to be polished (mg/L)
Q = flow rate (MGD)
 G_T = NH_3 removal rate ($\text{lb NH}_3/\text{ft}^2\text{-media/day}$)

LPR NH_3 removal rate, G_{22} at 22 degrees Celsius is $0.00055 \text{ lbs/ft}^2\text{-media/day}$. The removal rate is adjusted for wastewater temperature using the following equation:

$$G_T = G_{22} (1.09)^{T-22}$$

Where: G_{22} = reaction rate at 22°C
T = design wastewater temperature, $^\circ\text{C}$

For influent wastewater temperature of 8.3°C

$$G_T = 0.00055(1.09)^{8.3-22} = 0.00017 \text{ lbs/ft}^2/\text{day}$$

For the ammonia concentration to the LPR in the winter of 35 mg-N/L

$$A = \frac{(35-2) \times 0.60 \times 8.34}{0.00017} = 958824 \text{ft}^2$$

For media cubes of 6' x 6' x 8' at 68 ft²/ft³ density

NH₃ cubes required = 49.3 cubes

Total modules provided = 54 cubes

B. Aeration and Mixing Requirements

A summary of the aeration and mixing requirements are summarized in Appendix A. Estimated BOD and Ammonia removal for each cell are used to calculate expected oxygen requirements. In these calculations, 1.0 pounds of oxygen is provided for each pound of BOD removed and 4.6 pounds of oxygen for each pound of ammonia removed.

After calculation, the mixing and aeration requirements are compared and the larger of the two values is selected as the controlling condition.

C. Mechanical Equipment Sizing (Appendix A)

The designer must select equipment that meets the aeration and mixing requirements provided above. The aeration system must provide effective and uniform mixing and aeration of the pond, paying particular attention to pond configuration and eliminating potentials for short circuiting and/or dead zones within the pond.

D. Equipment Summary (Appendix A)

The last step of the design is the equipment summary. The designer makes an accounting of the equipment selected for the design and summarizes the number and size of the equipment in the appropriate cells.

VIII. SYSTEMS OPERATION AND MAINTENANCE

The following items comprise the routine operation and maintenance for the LBTP:

A. Aeration Equipment

Routine maintenance of the aeration equipment will be required to maintain the operating efficiency. Diffused air systems require routine maintenance of blowers and diffusers.

B. Lemna Polishing Reactor™

Periodic (annual) cleaning of the LPR modules is required to ensure optimum performance. This is easily performed with an air-scouring procedure that is described in the LPR O&M manual. Proper maintenance of the LPR blowers and diffusers is also required.

C. Solids

As calculated (reference Appendix B), the solids accumulated in the settling cell will require periodic removal estimated at every 17 years. Desludging of the settling cell requires removal of the LemTec™ cover and the use of dredging equipment. One significant advantage of the LBTP is the minimal sludge handling required. As with most lagoon systems, sludge removal is required only periodically.

IX. SYSTEM ADVANTAGES

The LBTP offers the following advantages over other pond-based or activated sludge systems.

- A. Low Capital Costs: The LBTP most often represents the lowest capital cost option, within certain size and effluent ranges, of any other technology for new construction or upgrades.
- B. Low Operational Costs: Due to the absence of sophisticated systems, equipment, and daily sludge disposal, the LBTP represents the lowest operational cost option on the market.
- C. High Quality Effluent: The LBTP is a proven technology capable of achieving the most stringent effluent standards (comparable to activated sludge).
- D. Ease of Operation: Since there are no complex operating parameters to monitor and adjust and no complicated sludge processing, lower skilled operators are sufficient for effective operations.

- E. Reduced Footprint: Due to the accelerated nature of the LBTP, the area required for effective treatment is dramatically reduced. This results in reduction of land use, basin sizes and overall capital cost.
- F. Covered System Advantages: The covered LBTP offers many advantages over other systems including accelerated treatment kinetics due to the maintenance of higher temperature, the ability to nitrify and reduce ammonia year-round, algae reduction, evaporation control and odor reduction.
- G. Reduced Sludge Handling: Since all LBTP systems are designed to accommodate the accumulated sludge, actual sludge disposal is only necessary every five to twelve years (actual time depending upon client requirements). Compared to other systems where daily sludge handling is required, the LBTP is easier and less costly to operate.
- H. Flexibility: The LBTP offers a competitive solution for most municipal, industrial, new construction or retrofit applications. The reliability and stability of the process allows for hydraulic loading variations, temperature fluctuations and organic surges more effectively than other technologies.
- I. Expandability: Often times, existing LBTP systems can be expanded in the future to allow for additional population growth (increased flow) or stricter effluent standards with a minimal amount of capital cost. Other systems typically cannot expand without major capital outlays.

X. REFERENCES

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APPENDIX A
LBTP PROCESS CALCULATIONS

Wastewater Data	Winter		Summer		Summer		Winter		Site Data	
	Flow	Temp	Flow	Temp	Flow	Temp	Flow	Temp	Winter Air Temperature	Summer Air Temperature
BOD	30	10	30	20	30	20	30	20	35	75
TSS	30	10	30	20	30	20	30	20	1.1	1.1
Ammonia	20	10	20	20	20	20	20	20	14.5	14.5
Total Nitrogen									13.0	13.0
Phosphorus										

Lagoon Design	
Basin # 1	
Included?	10
Influent Temperature	9.5 °C
Flow	0.0000 MGD
Covered?	0
Water Depth	10.0 ft
Freeboard	1.0 ft
Slope	1:1
Length (waterline)	300 ft
Width (waterline)	300 ft
Length (bottom)	400 ft
Width (bottom)	300 ft
Length (at top of basin)	472 ft
Width (at top of basin)	312 ft
Cover Area	147,600 sq ft
Floor Area	100,000 sq ft
Volume	1,188,000 cu ft
Volume	3.0 MGD
Detention Time	11.9 days
Selected R (Nominal)	8.0 °F for sq/WTU
Covered Basin Temp.	8.1 °C
Uncovered Basin Temp.	8.1 °C

Cell	Mining	Det Time (d)	Depth (ft)	Water Temp	Flow (gpd)	CBOD ₅ In	CBOD ₅ Out	DO ₂ In	DO ₂ Out	Stabilization?
1A	10	3.0	10.0	9.5	4.4	100	0	25	35	75
1B	10	11.9	10.0	8.1	16	16	16	35	35	75

Cell	Mining	Det Time (d)	Depth (ft)	Water Temp	Flow (gpd)	CBOD ₅ In	CBOD ₅ Out	DO ₂ In	DO ₂ Out	Stabilization?
1A	10	3.0	10.0	9.5	6.0	200	14	45	1.1	75
1B	10	11.9	10.0	8.1	14	14	14	1.1	1.1	75

Cell	Mining	CBOD ₅ (gpd)	DO ₂ (gpd)	CBOD ₅ (SCFM)	DO ₂ (SCFM)	Mixing (SCFM)	Barotail Air (SCFM)	App. Air (HP)	Sup. Water (HP)	Stabilization Air?	Barotail Air (ft)
1A	10	1,120	225	828	874	1,448	9	101	11	215	25
1B	10	9	9	9	9	9	314	38		25	25

Cell	Diffuser Type	Air per Diffuser (SCFM)	No. of Diffusers	No. of Laterals	Lateral Length (ft)	No. of Units	Aspirator - Hp	No. of Units	Misc. - Hp	Air Flow (SCFM)
1A	10	18	31	3	30	3	3.11	3	11	153
1B	10	9	31	3	30	3	3.11	3	11	143
Total			124	13		9		9		300

Stabilization	
Estimated Stabilization Area	150 sq ft
Biodegradable Solids	1.00 lb/d
Nonbiodegradable Solids	240 lb/d
Stabilization Loading Rate	33 g solids/m ² /d
Sludge Density	85
Rate of Sludge Accumulation	0.31 MGD/year
Desludging Volume	3.37 MG
Desludging Interval	17.8 years

LFR Design		LFR Aeration	
Cube Length	5 ft	Minimum Cubes	83 Cubes
Cube Width	5 ft	Supplemental Cubes	7 Cubes
Cube Depth	5 ft	Total Cubes	90 Cubes
Temperature	8.1 deg. C	Water Depth	10 ft
Influent CBOD ₅	16 mg/L	BOD Oxygen Requirement	0 lb/day
Effluent CBOD ₅	0 mg/L	NH ₃ Oxygen Requirement	763 lb/day
BOD Load	0 lb/d	Total Oxygen Requirement	763 lb/day
BOD Cube Density	28 lb/ft ³	Diffuser SOTR	4.4
Loading Rate	0.00108 lb-CBOD ₅ /ft ² /d	Transfer Efficiency	11.3%
BOD Cubes Required	0.8 Cubes	LFR Aeration	450 SCFM
BOD Cube Loading Rate	0.8 lb-CBOD ₅ /ft ² /d	LFR Mixing	240 SCFM
Influent Ammonia	11 mg/L	Channels	0 Channels
Effluent Ammonia	0 mg/L	Spaces per Channel	0 Spaces
Ammonia Load	160 lb/day	Unused Spaces	0 Spaces
NH ₃ Cube Density	68 lb/ft ³	Detention Time	8.1 Hours
Loading Rate	0.00017 lb-NH ₃ /ft ² /d		
NH ₃ Cubes Required	88.1 Cubes		

Blower Sizing			
Maximum Water Depth	16 Feet	Blower Efficiency	44.8 %
Aeration Req.	3374 SCFM	Blower Motor Power Req.	34.8 HP
Mass Air Flow	3.0 lbs	Number of Blowers	1 Units
Outlet Blower Pressure	8.81 psig	Suggested Blower Size	7.5 HP

APPENDIX B
LBTP SETTLING POND MASS BALANCE EQUATIONS

Appendix B:

LBTP Settling Pond Biosolids Mass Balance Equations

Both the quantity and characteristics of incoming suspended solids will vary from one waste stream to another and will vary in the same waste stream from time to time. However, in all cases the solids will be composed of a degradable and non-degradable fraction. The degradable fraction consists primarily of bacteria generated in the aeration zone of the treatment process, while the non-degradable fraction consists of inorganic solids such as grit, silt and non-degradable organics.

1) Biodegradable Solids (S_{bio})

The removal of $CBOD_5$ in the aeration cells will result in the generation of solids in the form of bacterial biomass. The amount of bacterial growth in the aeration cells can be calculated via the following equation:

$$S_{bio} = 8.34 \times Q \times CBOD_5 \times \frac{Y}{1 + (k_{d20} \times \Theta^{T-20} \times DT)}$$

Where:

Q =	Wastewater flow rate (0.60 MGD)
$CBOD_5$ =	Influent $CBOD_5$ (mg/L)
Y =	Growth Yield (generally assumed to be 0.5 mg / mg)
Θ =	Decay Temperature correction factor (generally assumed to be 1.05)
T =	Aeration cell water temperature (8.9°C)
DT =	Aeration cell detention time (3.0 days)
k_{d20} =	Decay Coefficient at 20°C

$$k_{d20} = 0.48 \times DT^{-0.415} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$S_{bio} = 8.34 \times 0.60 \times 240 \times \frac{0.5}{1 + (0.30 \times 1.05^{8.9-20} \times 3.0)} = 510 \text{ lb/d}$$

2) Nonbiodegradable Solids (S_{non})

The biodegradable organic solids will undergo further degradation in the settling cell while the non-biodegradable solids will not. The amount of solids remaining in the settling cell is assumed at 20 % of incoming solids. The nonbiodegradable solids are calculated via the following equation:

$$S_{non} = 8.34 \times Q \times TSS \times 0.20$$

Where:

Q =	Design flow (0.60 MGD)
TSS_{in} =	Influent TSS (240 mg/l)

$$S_{non} = 8.34 \times 0.60 \times 240 \times 0.20 = 218 \text{ lb/d}$$

3) Solids Compaction

Usually, sludge accumulation is measured volumetrically. The above discussion, based on mass balance, ignores sludge density. Over time, settled solids will compact on the pond floor. A typical sludge profile in an old pond will include solid matter on the floor with up to 30% solids. Sludge will typically have a density gradient over the sludge layer from dense sludge at the bottom to solids at the water interface of 0.5% solids. The gradient may be so gradual that a clear interface between the sludge and pond water is not well defined.

In order to quantify the volume of deposited sludge in a year, a compaction density of 5% solids is used in converting the mass of sludge to its volume.

$$V_{\text{sludge}} = \frac{218 \text{ lb/d} \times 7.48 \times 365}{62.4 \text{ lb/cuft} \times 0.05 \times 1000000} = 0.21 \text{ MG/year}$$

Assuming that desludging will be performed at half of the settling cell volume filled

$$\text{Desludging Interval} = \frac{V_{\text{settling cell}} \times \frac{1}{2}}{V_{\text{sludge}}} = \frac{7.15 \text{ MG} \times \frac{1}{2}}{0.21 \text{ MG/year}} = 17 \text{ years}$$

APPENDIX C
LBTP AERATION CALCULATIONS

Appendix C: LemTec Biological Treatment Process

Typical LBTP Aeration Calculations

1) Mass of BOD₅ and NH₃ Removed

The first step in assessing aeration requirements is to calculate the pounds per day of BOD₅ or NH₃ removed by the process under the worst-case conditions for aeration. This simply requires accounting for the flow and concentration of each parameter entering and leaving the aeration pond cell or LPR during operational extremes.

$$L_{BOD_5} = 8.34 \times Q \times \Delta BOD_5$$

$$L_{NH_3} = 8.34 \times Q \times \Delta NH_3$$

Where:

L_{BOD_5} =	BOD ₅ removed (lb-BOD ₅ / day)
L_{NH_3} =	NH ₃ removed (lb-NH ₃ / day)
ΔBOD_5 =	Difference in BOD ₅ entering and leaving the process (mg-BOD ₅ /L)
ΔNH_3 =	Difference in NH ₃ entering and leaving the process (mg-NH ₃ /L)
Q =	Flow entering the process (MGD)

Cell #1A: $8.34 \times 0.60 \times (240 - 14) \cong 1130$ lb-BOD₅ / day
 $8.34 \times 0.60 \times 45 \cong 225$ lb-NH₃ / day

2) Actual Oxygen Requirements for BOD₅ and NH₃ Removal

The next step is to determine the amount of oxygen that must be supplied to support the removal of BOD₅ and NH₃ in the aeration pond cell and LPR as calculated in step 1. It is assumed that it is necessary to supply 1.0 pound of oxygen (O₂) per pound of BOD₅ and 4.6 pounds of O₂ per pound of NH₃ to be removed. The amount of oxygen required to support the removal of BOD₅ and NH₃ as calculated above can be calculated by the following equations:

$$AOR_{BOD_5} = 1.0 \times L_{BOD_5}$$

$$AOR_{NH_3} = 4.6 \times L_{NH_3}$$

Where:

AOR_{BOD_5} =	Required oxygen for BOD ₅ removal (lb-O ₂ /day)
AOR_{NH_3} =	Required oxygen for NH ₃ removal (lb-O ₂ /day)
1.0 =	lb-O ₂ required / lb BOD ₅ removed
4.6 =	lb-O ₂ required / lb NH ₃ removed

Cell # 1A: 1130 lb BOD/d x 1.0 lb-O₂/lb BOD₅ + 225 lb NH₃/d x 4.6 lb-O₂/lb NH₃ = 2165 lb-O₂/d

3) Standardized Oxygen Requirements for BOD₅ and NH₃ Removal

When O₂ is supplied to wastewater in the aeration pond and LPR, transfer of the oxygen to the water is not perfect due to characteristics of the wastewater. For this reason, it is necessary to adjust (increase) the actual oxygen requirement (AOR) as calculated above to a standardized oxygen requirement (SOR) which accounts for the conditions of the stream to which the oxygen is being transferred. This standard oxygen requirement (SOR) can be calculated as

$$SOR = \frac{AOR}{CF}$$

Where:

SOR = Standardized oxygen requirement (lb-O₂ / day)
 AOR = Actual oxygen requirement (lb-O₂ / day)
 CF = Correction Factor

$$CF = \alpha \times \left(\frac{(\beta \times C_s \times \delta) - RO}{C_{s20}} \right) \times F \times \Theta_{MT}^{T-20}$$

$$CF = 0.75 \times \left(\frac{(0.95 \times 8.9 \times 16.7/14.5 - 3.0)}{9.09} \right) \times 0.9 \times 1.024^{20-20} = 0.50$$

Where:

α = Surface tension correction factor (0.75)
 β = Solubility correction factor (0.95)
 C_{s20} = O₂ saturation concentration in water at standard conditions (9.09 mg / L)
 C_s = Oxygen saturation concentration at the water surface (8.9 mg / L)
 RO = Residual oxygen in basin (3.0 mg / L)
 Θ_{MT} = Temperature – Mass transfer correction factor, 1.024 (generally accepted value)
 T = Design water temperature (°C)
 F = Diffuser factor (0.9)
 δ = P_{eff} / P = Pressure correction factor
 P_{eff} = Effective pressure of aeration (psia)

$$P_{eff} = P + \left(0.433 \times \frac{WD}{2} \right)$$

$$P_{eff} = 14.5 \text{ psi} + (0.433 \times 10/2) = 16.7 \text{ psi}$$

Where:

P = Site barometric pressure (psia) (14.5)
 WD = Water depth (10.0 ft)
 0.433 = Conversion factor for depth in feet to psia

Cell # 1A: SOR = 2165/0.50 = 4330 lb/d

The diffusers used for aeration are generally placed on the pond or LPR floor. Since oxygen solubility in water is directly related to pressure, a correction factor is included to attempt to account for the difference in solubility at the basin bottom and the water surface. For this correction factor, the mid-depth of the basin is used to estimate the pressure since this is the average pressure that the oxygen is exposed to.

Solubility and conversion factor data and values for these formulas are generally found in standard tables or determined from site conditions and laboratory studies.

4) Required Air Flow to Meet Bacterial Oxygen Demand

Finally, the SOR is used in combination with manufacturer supplied aeration efficiencies to compute the required air flow to meet the bacterial oxygen demand.

The following equation is used for calculating air flow requirement:

$$Q_{air} = f \times \frac{SOR}{SOTE}$$

Where:

Q_{air} = Air requirement in standard cubic feet per minute (SCFM)

SOTE = Manufacturer's standard oxygen transfer efficiency for the diffusers (%)

$$1.44\%/ft \times 10 ft = 14.4\%$$

f = Conversion factor from lbs-O₂ /day to SCFM of air

$$\text{Cell \# 1A: } \frac{4313 \text{ lb/d} \times 4.025}{14.4\%} = 1204 \text{ SCFM}$$

5) Required Air Flow to Meet Mixing Requirement for Complete Mix Aeration Basin Cell

For the purpose of sizing aeration to achieve complete mix conditions, a dissipated energy of 13.5 HP/MG is used. This value is multiplied by the complete mix cell volume to determine the power dissipated, P.

$$\text{Cell \#1A: } P_{CM} = 13.5 \text{ HP/MG} \times Q \times \text{D.T.}$$

$$P_{CM} = 13.5 \text{ HP/MG} \times 0.60 \text{ MGD} \times 3.0 \text{ d} = 24.3 \text{ HP} = 13365 \text{ ft-lb/s}$$

Where:

P_{CM} = Dissipated power (HP)

Q = Flow (MGD)

DT = Detention time (d)

Given a desired amount of energy dissipation into a volume of water, the following equation is used to determine an equivalent air flow.

$$Q_{air} = \frac{P_{CM}}{K \times \ln\left(\frac{h + 33.9}{33.9}\right)}$$

Where:

- Q_{air} = air flow rate at atmospheric pressure, ft³/min (CFM)
 P = power dissipated, ft-lb/s
 K = constant (35.28, U.S. customary units)
 h = air pressure at the point of discharge in feet of water, ft

$$Q_{air} = \frac{13365}{35.28 \times \ln\left(\frac{10+33.9}{33.9}\right)} = 1465 \text{ CFM}$$

6) Equipment Selection

Equipment selection is based on aeration and/or mixing, whichever requires the highest horsepower.

Cell # 1A: 85 diffusers x 18 SCFM = 1530 SCFM

Cell # 1B: 40 diffusers x 9 SCFM = 360 SCFM

LPR: 486 SCFM

Total air requirement equals:

$$Q_{air} = 1530 \text{ SCFM} + 360 \text{ SCFM} + 486 \text{ SCFM} = 2376 \text{ SCFM}$$

The blower power motor requirement is calculated using the following equation:

$$\text{BHP} = \frac{Q_{air} \times f_2}{E_{blow}} \times \left(\left(\frac{P + P_{blow}}{P} \right)^{0.283} - 1 \right)$$

Where:

- BHP = Blower power motor requirement (HP, horsepower)
 f_2 = Conversion factor for air volume to air mass
 E_{blow} = Blower efficiency (%)
 P_{blow} = Pressure at Blower outlet
 Q_{air} = 2376 SCFM

$$P_{blow} = 62.4/144 \times (\text{WD} + 3.0) = 62.4/144 \times (10+3.0) = 5.63 \text{ psig}$$
$$E_{blow} = 78.7 - (2.11 \times P_{blow}) = 78.7 - (2.11 \times 5.63) = 66.8 \%$$

$$\text{BHP} = (((2376 \times 0.068)/60) \times 53.3 \times 595) / (550 \times 0.283 \times 0.668) \times (((5.63+14.5)/14.5)^{0.283} - 1)$$
$$= 98.9 \text{ BHP}$$

Suggested Blower Size: 3 @ 75 HP (two operating, one stand by)

NCCMA,

PA



February 2018

DESIGN REVIEW – OPTION 2



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I. INTRODUCTION

This detailed review is designed to provide the client, the consulting engineer and the Pennsylvania DNR with sufficient technical information required to evaluate and approve the LemTec™ Biological Treatment Process (LBTP) for the NCCMA Lagoon, PA Project. Although the LemTec™ process is similar in some aspects to traditional aerated pond systems, the overall system is significantly different, therefore this evaluation will establish that the process is a reliable, effective and acceptable wastewater treatment solution.

II. GENERAL PROCESS DESCRIPTION

The Lemna Technologies, Inc. LBTP is composed of an aerobic treatment cell followed by a low-loaded anaerobic settling zone. A fixed film reactor immediately follows the settling zone providing BOD and ammonia polishing. The aerobic and anaerobic cells are covered by the LemTec™ Modular Cover System, a patented floating modular cover that provides an insulated environment for heat retention and prevents algae growth by shielding sunlight. This warmer environment, along with the other components of the aerobic and anaerobic cells, provides conditions conducive to the removal of biochemical oxygen demand (BOD₅), total suspended solids (TSS) and ammonia nitrogen (NH₃).

The LemTec™ Modular Cover System is a unique floating cover system used for insulation, odor elimination and algae control on ponds and tanks. This cover system is composed of individual casings of closed-cell insulation sealed between two sheets of durable geomembrane. The cover easily adapts to varying water levels. When secured, the cover system can support the weight of several people, making installation easy as compared to other covers. In addition, in-pond equipment can be easily accessed for routine maintenance from the surface of the cover.

By integrating the LemTec™ cover into the process, the LBTP provides an accelerated means of treatment in simple, operator-friendly ponds that require little system maintenance and require a fraction of the space of conventional pond systems.

III. DESIGN PROCESS

In designing an LBTP, a number of related factors are evaluated to arrive at the most cost-efficient design. The system is designed comparing detention time, mixing, and aeration requirements with capital and operating costs. The design process follows the following simplified steps:



Design calculations for each of these steps are included in Section VII of this Review.

IV. PROCESS FLOW DESCRIPTION

A. Overview of Process Flow

In general, the LBTP is similar in design to conventional flow-through, aerated lagoons: the initial complete mix aeration zone is designed for the removal of BOD₅, while the settling zone promotes TSS removal and stores biosolids. The difference in design lies in the use of the LemTec™ cover. The insulated cover prevents atmospheric cooling of the wastewater during cold weather, which results in higher operating temperatures/reaction rates, thus increased bacterial growth rates. The increased bacterial growth rates relate to more efficient BOD₅ and NH₃ removal rates, which allow for the system to be designed with a smaller footprint. In addition, the use of the cover on the settling cell prevents the growth of algae, which is typically the cause of elevated TSS concentrations in aerated lagoon effluents. In both cases, it is the use of the LemTec™ cover that makes the LBTP unique compared to typical aerated lagoons.

Finally, the LPR is included in the LBTP design when a facility must meet lower BOD₅ and NH₃ effluent limits. The LPR is designed to promote a submerged environment ideal for attached-growth bacteria that remove residual concentrations of BOD₅ and NH₃ from the wastewater.

The LemTec™ Biological Treatment Process (LBTP) proposed for the NCCMA Lagoon, PA WWTP utilizes one pond sized to handle the referenced design flow. The treatment pond is 10.0 ft deep with a detention time of 12.1 days.

For this proposal, the treatment pond is divided into two cells by using Lemna's Reverse Miter Hydraulic Baffle, which is custom design to minimize short-circuiting between each cell. The first cell is a 3.0 day complete mix cell, followed by 9.1 day settling cell. The entire treatment pond is covered by Lemna's LemTec™ Insulated Modular Cover rated at R8.

The Lemna Polishing Reactor follows the treatment pond.

B. Preliminary Treatment

Prior to the first aeration cell, Lemna Technologies recommends that the raw influent to the plant be pretreated with a bar screen and/or grit removal process. This preliminary stage of treatment is typically not provided as part of the LBTP, however its inclusion in the design is often times required to comply with various state regulations.

C. Complete Mix Aeration Zone

The initial complete mix cell of the LBTP process is an aerated, aggressively mixed cell that establishes an environment suitable for the rapid removal of BOD₅ and NH₃ by bacteria. Complete mix is defined as the condition when settleable solids are maintained in suspension. Fine bubble diffusers, floating mechanical aspirators/mixers, or in some cases, a combination of both, are used to maintain the aeration and mixing required to achieve complete mix conditions. How much equipment is needed to meet complete mix requirements is difficult to quantify – EPA states "There is no rational method available to predict the power input necessary to keep solids in suspension." For this reason, Lemna Technologies, Inc. uses the recommendations of manufacturers and research conducted by experts in the field. For this application, aeration and mixing is accomplished through the use of fine bubble diffusers. For the purpose of sizing aeration to achieve complete mix conditions, an airflow rate of over 6 SCFM/1000 cubic feet is maintained (a dissipated energy of 13.5 HP/MG).

E. Settling Zone

The LBTP aeration cell is followed by the settling cell, which is designed for TSS removal and storage of biosolids (sludge).

1) TSS Removal in the Settling Zone

A settling cell, covered with the LemTec™ cover, creates an effective zone for clarification of biosolids. The cover prevents algae growth by eliminating sunlight below the cover and improves clarification in two ways: 1) it prevents wind action on the water surface thereby establishing a quiescent zone for solids to settle, and 2) the insulation minimizes seasonal and diurnal temperature fluctuation thereby reducing stirring by thermal currents.

2) Storage of Biosolids in the Settling Zone

The LemTec solids management program confines long-term sludge removal efforts to the settling cell. Due to the relatively long detention times used in the LBTP (as compared to high rate activated sludge), the LBTP generates fewer biosolids than comparable systems.

F. Lemna Polishing Reactor (LPR)

The LPR is included in the LBTP design to meet low BOD₅ and NH₃ limits. The LPR utilizes fixed media to promote an environment for submerged attached-growth bacteria. For influent BOD₅ concentrations

VI. NCCMA LAGOON PROJECT DATA (REFERENCE APPENDIX A SPREADSHEET)

A. Site Conditions

The site conditions at NCCMA Lagoon are established based on information obtained from the National Weather Service. These conditions are summarized on the Engineering Spreadsheet and are used to calculate heat loss.

B. Wastewater Characteristics

The wastewater characteristics at NCCMA Lagoon are established based on anticipated loading characteristics. Influent values are based on data provided by the consulting engineer while effluent values and flow are based on NPDES permit requirements. The influent/effluent values are used in subsequent design calculations.

C. Pond Dimensions

The physical pond dimensions represent dimensions of the existing pond at NCCMA Lagoon that will serve as the treatment pond. Areas, volumes, and detention times are established based on the proposed infrastructure at NCCMA Lagoon.

D. Heat Loss Analysis

The heat loss analysis for the treatment pond uses an iterative calculation to balance the heat in the influent against the heat lost through the insulated cover. In brief, an estimated heat loss rate from the proposed pond is used to determine an effective R-value. The heat loss rate is adjusted until the effective R-value equals the R-value of the insulated cover. Given this convergence, the heat loss rate for the proposed pond is known and can be used to determine the heat in the effluent, which is used to determine the effluent temperature.

The calculation requires site-specific data with respect to influent temperature, cold weather ambient air temperatures, pond surface area, and the proposed R-value for the insulated cover. Given these values, the design engineer performs the iterative calculation that provides the effluent temperature. Temperature drop through the proposed pond is expected to be linear with respect to detention time; temperature in each cell is interpolated based on cumulative cell detention time and the difference between influent and calculated effluent temperatures.

VII. NCCMA LAGOON PROCESS CALCULATIONS (REFERENCE APPENDIX A SPREADSHEET)

A. System Design

The overall LemTec™ Biological Treatment Process calculations are summarized in Appendix A. In these calculations, BOD₅ and NH₃ removal are calculated (by each cell through the process) for both summer and winter operation.

1. BOD

The removal of BOD₅ in the complete mix cell is calculated using state-of-the-art "mechanistic" models that relate to the growth of bacteria and removal of BOD₅ in relation to detention time and wastewater temperature. The equation used in L.Rich's High Performance Aerated Lagoon Systems (1990) is provided below:

$$S_e = \frac{K_s(1 + k_d \times DT)}{DT(\mu_m - k_d) - 1}$$

Where: S_e = concentration of effluent BOD₅, mg/l

k_d = bacterial decay rate, d⁻¹

DT = detention time, d

K_s = half-saturation constant, 120 mg/l

μ_m = maximum heterotrophic specific growth rate, d⁻¹

Maximum heterotrophic growth rate is adjusted for temperature using the following equations:

$$\mu_m = \mu_{m20} \times 1.026^{T-20} \quad (\text{for } T \text{ between } 10^\circ\text{C and } 30^\circ\text{C})$$

$$\mu_m = 0.774 \times \mu_{m20} \times 1.058^{T-20} \quad (\text{for } T \text{ between } 2^\circ\text{C and } 10^\circ\text{C})$$

Where: $\mu_{m20} = 6.0 \text{ d}^{-1}$

The following equations are used to calculate bacterial decay rate:

$$k_{d20} = 0.48 \times DT^{-0.415}$$

$$k_d = k_{d20} \times 1.05^{T-20}$$

For summer, complete mix cell 1A, T=20 °C

$$\mu_m = 6.0 \times 1.026^{20-20} = 6 \text{ d}^{-1}$$

$$k_{d20} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$k_d = 0.30 \times 1.05^{20-20} = 0.30 \text{ d}^{-1}$$

BOD summer effluent from the complete mix cell 1A

$$S_e = \frac{120(1 + 0.30 \times 3.0)}{3.0(6.0 - 0.30) - 1} = 14 \text{ mg/l}$$

For winter, complete mix cell 1A, T=8.9 °C

$$\mu_m = 0.774 \times 6.0 \times 1.058^{8.9-20} = 4.4 \text{ d}^{-1}$$

$$k_{d20} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$k_d = 0.30 \times 1.05^{8.9-20} = 0.18 \text{ d}^{-1}$$

BOD winter effluent from the complete mix cell 1A

$$S_e = \frac{120(1 + 0.19 \times 3.0)}{3.0(4.4 - 0.18) - 1} = 16 \text{ mg/l}$$

2. NH_3

The removal of NH_3 in the complete mix cell is calculated using an equation that relates the removal of NH_3 to the growth of bacteria and dissolved oxygen concentration.

The equation is provided below (L. Rich, 1999):

$$N = \frac{K_N}{DT \times \left(\mu_m \frac{O_2}{K_{O_2} + O_2} [1 - 0.83(7.2 - \text{pH})] \right) - 1}$$

Where: N = concentration of effluent ammonia, mg/l

μ_m = maximum nitrifier specific growth rate, d^{-1}

O_2 = concentration of dissolved oxygen, mg/l

K_N = half-saturation constant for ammonium nitrogen, mg/l
 K_{O_2} = half-saturation constant for dissolved oxygen, 1.2 mg/l
 DT = detention time, d

K_N and μ_m are adjusted for temperature using the following equation:

$$\mu_m = 10^{0.0413T - 0.944}$$

and

$$K_N = 10^{0.051T - 1.158}$$

For summer complete mix cell 1A, $T=20$ °C

$$\mu_m = 10^{0.0413 \times 20 - 0.944} = 0.762 \text{ d}^{-1}$$

$$K_N = 10^{0.051 \times 20 - 1.158} = 0.728 \text{ d}^{-1}$$

NH_3 summer effluent from the complete mix cell 1A

$$N = \frac{0.728}{3.0 \times \left(\frac{0.762 \times 3}{1.2 + 3} [1 - 0.83(7.2 - 7.2)] \right) - 1} = 1.1 \text{ mg/l}$$

There is not enough detention time for nitrifier growth to occur during winter months. Removal of ammonia in CM cell in winter is partially accounted for by the uptake of nitrogen by heterotrophic bacteria to meet stoichiometric demands for cell synthesis.

3. TSS

The removal of TSS is achieved in the settling cell. The quantity of solids accumulated in the settling cell is best estimated using a mass balance calculation. Such a balance considers the quantities of biodegradable and non-biodegradable solids introduced to the settling cell, the rate at which the solids are degraded and the extent of compaction experienced by the solids. An explanation of the calculations is provided in Appendix B.

4. LEMNA POLISHING REACTOR (LPR)

The removal of NH_3 is achieved in the Lemna Polishing Reactor™ (LPR).

The LPR is a submerged attached growth reactor that is engineered to optimize the growth of biofilm. Empirically derived "areal" loading rates are used for reactor sizing. In general, the sizing of an LPR reactor is controlled by influent ammonia concentrations and the loading rates ($< 1 \text{ g-N/m}^2/\text{d}$) are consistent with rates for moving bed biological reactors used for tertiary treatment.

The LPR influent loading is divided by the temperature-corrected areal loading rates to determine the required biofilm surface areas in the reactor. This area is divided by the surface area per volume ratio of LPR media to determine the number of LPR "cubes" required. LPR cubes have a 6' x 6' footprint with media height adjusted based on project constraints.

LPR media requirements for NH_3 removal are calculated according to the following equation:

$$A = \frac{\Delta\text{NH}_3 \times Q \times 8.34}{G_T}$$

Where: A = media surface area (ft^2)
 ΔNH_3 = NH_3 to be polished (mg/L)
Q = flow rate (MGD)
 G_T = NH_3 removal rate ($\text{lb NH}_3/\text{ft}^2\text{-media/day}$)

LPR NH_3 removal rate, G_{22} at 22 degrees Celsius is $0.00055 \text{ lbs/ft}^2\text{-media/day}$. The removal rate is adjusted for wastewater temperature using the following equation:

$$G_T = G_{22} (1.09)^{T-22}$$

Where: G_{22} = reaction rate at 22°C
T = design wastewater temperature, $^\circ\text{C}$

For influent wastewater temperature of 8.4°C

$$G_T = 0.00055(1.09)^{8.4-22} = 0.00017 \text{ lbs/ft}^2/\text{day}$$

For the ammonia concentration to the LPR in the winter of 35 mg-N/L

$$A = \frac{(35 - 6.5) \times 0.74 \times 8.34}{0.00017} = 103465 \text{ ft}^2$$

For media cubes of 6' x 6' x 8' at 68 ft²/ft³ density

NH₃ cubes required = 53.1 cubes

Total modules provided = 54 cubes

B. Aeration and Mixing Requirements

A summary of the aeration and mixing requirements are summarized in Appendix A. Estimated BOD and Ammonia removal for each cell are used to calculate expected oxygen requirements. In these calculations, 1.0 pounds of oxygen is provided for each pound of BOD removed and 4.6 pounds of oxygen for each pound of ammonia removed.

After calculation, the mixing and aeration requirements are compared and the larger of the two values is selected as the controlling condition.

C. Mechanical Equipment Sizing (Appendix A)

The designer must select equipment that meets the aeration and mixing requirements provided above. The aeration system must provide effective and uniform mixing and aeration of the pond, paying particular attention to pond configuration and eliminating potentials for short circuiting and/or dead zones within the pond.

D. Equipment Summary (Appendix A)

The last step of the design is the equipment summary. The designer makes an accounting of the equipment selected for the design and summarizes the number and size of the equipment in the appropriate cells.

VIII. SYSTEMS OPERATION AND MAINTENANCE

The following items comprise the routine operation and maintenance for the LBTP:

A. Aeration Equipment

Routine maintenance of the aeration equipment will be required to maintain the operating efficiency. Diffused air systems require routine maintenance of blowers and diffusers.

B. Lemna Polishing Reactor™

Periodic (annual) cleaning of the LPR modules is required to ensure optimum performance. This is easily performed with an air-scouring procedure that is described in the LPR O&M manual. Proper maintenance of the LPR blowers and diffusers is also required.

C. Solids

As calculated (reference Appendix B), the solids accumulated in the settling cell will require periodic removal estimated at every 13 years. Desludging of the settling cell requires removal of the LemTec™ cover and the use of dredging equipment. One significant advantage of the LBTP is the minimal sludge handling required. As with most lagoon systems, sludge removal is required only periodically.

IX. SYSTEM ADVANTAGES

The LBTP offers the following advantages over other pond-based or activated sludge systems.

- A. Low Capital Costs:** The LBTP most often represents the lowest capital cost option, within certain size and effluent ranges, of any other technology for new construction or upgrades.
- B. Low Operational Costs:** Due to the absence of sophisticated systems, equipment, and daily sludge disposal, the LBTP represents the lowest operational cost option on the market.
- C. High Quality Effluent:** The LBTP is a proven technology capable of achieving the most stringent effluent standards (comparable to activated sludge).
- D. Ease of Operation:** Since there are no complex operating parameters to monitor and adjust and no complicated sludge processing, lower skilled operators are sufficient for effective operations.

- E. Reduced Footprint: Due to the accelerated nature of the LBTP, the area required for effective treatment is dramatically reduced. This results in reduction of land use, basin sizes and overall capital cost.
- F. Covered System Advantages: The covered LBTP offers many advantages over other systems including accelerated treatment kinetics due to the maintenance of higher temperature, the ability to nitrify and reduce ammonia year-round, algae reduction, evaporation control and odor reduction.
- G. Reduced Sludge Handling: Since all LBTP systems are designed to accommodate the accumulated sludge, actual sludge disposal is only necessary every five to twelve years (actual time depending upon client requirements). Compared to other systems where daily sludge handling is required, the LBTP is easier and less costly to operate.
- H. Flexibility: The LBTP offers a competitive solution for most municipal, industrial, new construction or retrofit applications. The reliability and stability of the process allows for hydraulic loading variations, temperature fluctuations and organic surges more effectively than other technologies.
- I. Expandability: Often times, existing LBTP systems can be expanded in the future to allow for additional population growth (increased flow) or stricter effluent standards with a minimal amount of capital cost. Other systems typically cannot expand without major capital outlays.

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APPENDIX A
LBTP PROCESS CALCULATIONS

Wastewater Data	Winter		Summer	Winter	Site Data		
	W	S					
Flow	172	172			Winter Air Temperature	32	°F
BOD ₅	120	120	18	18	Winter Air Temperature	1.1	°C
TSS	120	120	25	25	Elevation	201	ft AMSL
Ammonia	48	48	2.8	2.8	Atmospheric Pressure	14.7	psia
Total Nitrogen					Distance to Site	2112	feet
Phosphorus							

Lagoon Design	
Basin # 1	
Influent?	Yes
Influent Temperature	8.0 °C
Flow	8.7400 MGD
Overflow?	Yes
Water Depth	2.0 ft
Freeboard	2.0 ft
Slope	2:1 to 1
Length (waterline)	200 ft
Width (waterline)	110 ft
Length (bottom)	200 ft
Width (bottom)	250 ft
Length (at top of basin)	212 ft
Width (at top of basin)	222 ft
Cover Area	112,000 sq ft
Floor Area	100,000 sq ft
Volume	1,120,000 cu ft
Volume	4.0 MG
Detention Time	13.1 days
Selected R (Detention)	2.0 °F to eq/80TU
Covered Basin Temp.	8.4 °C
Uncovered Basin Temp.	5.8 °C

Cell	Mixing	Det. Time (d)	Depth (ft)	Summer Temp.	Rate (F)	CO ₂ , In	CO ₂ , Out	HR, In	HR, Out	Refract/ft
1A	CM	3.0	10.0	8.0	4.4	100	0	45	20	0.0
1B	CM	3.1	10.0	2.4		10	10	20	20	0.0

Cell	Mixing	Det. Time (d)	Depth (ft)	Summer Temp.	Rate (F)	CO ₂ , In	CO ₂ , Out	HR, In	HR, Out	Refract/ft
1A	CM	3.0	10.0	10.0	6.0	100	14	45	1.1	0.0
1B	CM	3.1	10.0	10.0		14	14	1.1	1.1	0.0

Aeration and Mixing Requirements											
Cell	Mixing	CO ₂ , (lb/d)	HR, (lb/d)	CO ₂ , (SCFM)	HR, (SCFM)	Mixing (SCFM)	Blower Air (SCFM)	Air, Air (HP)	Sup. Motor (HP)	Refract/ft	Blower Air (cu)
1A	CM	1,380	278	778	711	1,407	0	124	0	0.0	0.0
1B	CM	0	0	0	0	0	387	34	0	0.0	10.0

Equipment Selection										
Cell	Diffuser Type	Air per Diffuser (SCFM)	No. of Diffusers	No. of Lateral	Lateral Length (ft)	No. of Units	Applicator - Hp	No. of Units	Motor - Hp	Air Flow (SCFM)
1A	CM	18	107	0	200	0	0.0	0	0.0	1838
1B	CM	0	0	0	200	0	0.0	0	0.0	0.0
Total			107	0		0				1838

Stabilization			
Estimated Stabilization Area	10,817 sq ft	Solids Density	3%
Wasteprecipitable Solids	679 lbs/d	Rate of Solids Accumulation	0.24 MG/year
Nonprecipitable Solids	226 lbs/d	Discharging Volume	1.2 MG
Stabilization Loading Rate	29 g solids/m ² /d	Discharging Interval	11.0 years

LPR Design				LPR Aeration			
Cube Length	3 ft	Minimum Cubes	52	Water Depth	3 ft	Supplemental Cubes	0
Cube Width	3 ft	Total Cubes	52	BOD Oxygen Requirement	0	Total Cubes	52
Cube Depth	3 ft	Water Depth	3 ft	HR, Oxygen Requirement	0.18	Water Depth	3 ft
Temperature	8.0 deg. C	BOD Cube Density	48	Total Oxygen Requirement	0.18	HR, Oxygen Requirement	0.18
Influent CO ₂	18 mg/L	Loading Rate	0.0018 lb-CO ₂ /yd ³ /d	Transfer Efficiency	12.5%	Diffuser SOTB	1.2%
BOD Load	0	LPR Aeration	501	LPR Mixing	288	Channels	0
BOD Cube Density	48	Spaces per Channel	0	Uncovered Spaces	0	Detention Time	7.4
Loading Rate	0.0018 lb-CO ₂ /yd ³ /d	Uncovered Spaces	0				
BOD Cubes Required	0.0	Detention Time	7.4				
BOD Cube Loading Rate	0.0						
Influent Ammonia	48 mg/L						
Ammonia Load	177						
HR Cube Density	48						
Loading Rate	0.0017 lb-NH ₃ /yd ³ /d						
HR Cubes Required	0.0						

Blower Sizing			
Maximum Water Depth	10 Feet	Blower Efficiency	65.8 %
Aeration Req.	1,737 SCFM	Blower Motor Power Req.	115.8 HP
Mass Air Flow	3.4 lbs	Number of Blowers	1
Outlet Blower Pressure	8.83 psig	Suggested Blower Size	75 HP

APPENDIX B
LBTP SETTLING POND MASS BALANCE EQUATIONS

Appendix B:

LBTP Settling Pond Biosolids Mass Balance Equations

Both the quantity and characteristics of incoming suspended solids will vary from one waste stream to another and will vary in the same waste stream from time to time. However, in all cases the solids will be composed of a degradable and non-degradable fraction. The degradable fraction consists primarily of bacteria generated in the aeration zone of the treatment process, while the non-degradable fraction consists of inorganic solids such as grit, silt and non-degradable organics.

1) Biodegradable Solids (S_{bio})

The removal of CBOD₅ in the aeration cells will result in the generation of solids in the form of bacterial biomass. The amount of bacterial growth in the aeration cells can be calculated via the following equation:

$$S_{bio} = 8.34 \times Q \times CBOD_5 \times \frac{Y}{1 + (k_{d20} \times \Theta^{T-20} \times DT)}$$

Where:

Q =	Wastewater flow rate (0.60 MGD)
CBOD ₅ =	Influent CBOD ₅ (mg/L)
Y =	Growth Yield (generally assumed to be 0.5 mg / mg)
Θ =	Decay Temperature correction factor (generally assumed to be 1.05)
T =	Aeration cell water temperature (8.9°C)
DT =	Aeration cell detention time (3.0 days)
k _{d20} =	Decay Coefficient at 20°C

$$k_{d20} = 0.48 \times DT^{-0.415} = 0.48 \times 3.0^{-0.415} = 0.30 \text{ d}^{-1}$$

$$S_{bio} = 8.34 \times 0.74 \times 240 \times \frac{0.5}{1 + (0.30 \times 1.05^{8.9-20} \times 3.0)} = 629 \text{ lb/d}$$

2) Nonbiodegradable Solids (S_{non})

The biodegradable organic solids will undergo further degradation in the settling cell while the non-biodegradable solids will not. The amount of solids remaining in the settling cell is assumed at 20 % of incoming solids. The nonbiodegradable solids are calculated via the following equation:

$$S_{non} = 8.34 \times Q \times TSS \times 0.20$$

Where:

Q =	Design flow (0.74 MGD)
TSS _{in} =	Influent TSS (240 mg/l)

$$S_{non} = 8.34 \times 0.74 \times 240 \times 0.20 = 296 \text{ lb/d}$$

3) Solids Compaction

Usually, sludge accumulation is measured volumetrically. The above discussion, based on mass balance, ignores sludge density. Over time, settled solids will compact on the pond floor. A typical sludge profile in an old pond will include solid matter on the floor with up to 30% solids. Sludge will typically have a density gradient over the sludge layer from dense sludge at the bottom to solids at the water interface of 0.5% solids. The gradient may be so gradual that a clear interface between the sludge and pond water is not well defined.

In order to quantify the volume of deposited sludge in a year, a compaction density of 5% solids is used in converting the mass of sludge to its volume.

$$V_{\text{sludge}} = \frac{296 \text{ lb/d} \times 7.48 \times 365}{62.4 \text{ lb/cuft} \times 0.05 \times 1000000} = 0.26 \text{ MG/year}$$

Assuming that desludging will be performed at half of the settling cell volume filled

$$\text{Desludging Interval} = \frac{V_{\text{settling cell}} \times \frac{1}{2}}{V_{\text{sludge}}} = \frac{6.75 \text{ MG} \times \frac{1}{2}}{0.216 \text{ MG/year}} = 13 \text{ years}$$

APPENDIX C
LBTP AERATION CALCULATIONS

Appendix C: LemTec Biological Treatment Process

Typical LBTP Aeration Calculations

1) Mass of BOD₅ and NH₃ Removed

The first step in assessing aeration requirements is to calculate the pounds per day of BOD₅ or NH₃ removed by the process under the worst-case conditions for aeration. This simply requires accounting for the flow and concentration of each parameter entering and leaving the aeration pond cell or LPR during operational extremes.

$$L_{BOD} = 8.34 \times Q \times \Delta BOD_5$$

$$L_{NH_3} = 8.34 \times Q \times \Delta NH_3$$

Where:

L_{BOD} =	BOD ₅ removed (lb-BOD ₅ / day)
L_{NH_3} =	NH ₃ removed (lb-NH ₃ / day)
ΔBOD_5 =	Difference in BOD ₅ entering and leaving the process (mg-BOD ₅ / L)
ΔNH_3 =	Difference in NH ₃ entering and leaving the process (mg-NH ₃ / L)
Q =	Flow entering the process (MGD)

Cell #1A: $8.34 \times 0.74 \times (240 - 14) \approx 1393$ lb-BOD₅ / day
 $8.34 \times 0.74 \times 45 \approx 278$ lb-NH₃ / day

2) Actual Oxygen Requirements for BOD₅ and NH₃ Removal

The next step is to determine the amount of oxygen that must be supplied to support the removal of BOD₅ and NH₃ in the aeration pond cell and LPR as calculated in step 1. It is assumed that it is necessary to supply 1.0 pound of oxygen (O₂) per pound of BOD₅ and 4.6 pounds of O₂ per pound of NH₃ to be removed. The amount of oxygen required to support the removal of BOD₅ and NH₃ as calculated above can be calculated by the following equations:

$$AOR_{BOD} = 1.0 \times L_{BOD}$$

$$AOR_{NH_3} = 4.6 \times L_{NH_3}$$

Where:

AOR_{BOD} =	Required oxygen for BOD ₅ removal (lb-O ₂ / day)
AOR_{NH_3} =	Required oxygen for NH ₃ removal (lb-O ₂ / day)
1.0 =	lb-O ₂ required / lb BOD ₅ removed
4.6 =	lb-O ₂ required / lb NH ₃ removed

Cell # 1A: 1393 lb BOD/d \times 1.0 lb-O₂/lb BOD₅ + 278 lb NH₃/d \times 4.6 lb-O₂/lb NH₃ = 2672 lb-O₂/d

3) Standardized Oxygen Requirements for BOD₅ and NH₃ Removal

When O₂ is supplied to wastewater in the aeration pond and LPR, transfer of the oxygen to the water is not perfect due to characteristics of the wastewater. For this reason, it is necessary to adjust (increase) the actual oxygen requirement (AOR) as calculated above to a standardized oxygen requirement (SOR) which accounts for the conditions of the stream to which the oxygen is being transferred. This standard oxygen requirement (SOR) can be calculated as

$$SOR = \frac{AOR}{CF}$$

Where:

SOR = Standardized oxygen requirement (lb-O₂ / day)
 AOR = Actual oxygen requirement (lb-O₂ / day)
 CF = Correction Factor

$$CF = \alpha \times \left(\frac{(\beta \times C_s \times \delta) - RO}{C_{s20}} \right) \times F \times \Theta_{MT}^{T-20}$$

$$CF = 0.75 \times \left(\frac{(0.95 \times 8.9 \times 16.7/14.5 - 3.0)}{9.09} \right) \times 0.9 \times 1.024^{20-20} = 0.50$$

Where:

α = Surface tension correction factor (0.75)
 β = Solubility correction factor (0.95)
 C_{s20} = O₂ saturation concentration in water at standard conditions (9.09 mg / L)
 C_s = Oxygen saturation concentration at the water surface (8.9 mg / L)
 RO = Residual oxygen in basin (3.0 mg / L)
 Θ_{MT} = Temperature – Mass transfer correction factor, 1.024 (generally accepted value)
 T = Design water temperature (°C)
 F = Diffuser factor (0.9)
 δ = P_{eff} / P = Pressure correction factor
 P_{eff} = Effective pressure of aeration (psia)

$$P_{eff} = P + \left(0.433 \times \frac{WD}{2} \right)$$

$$P_{eff} = 14.5 \text{ psi} + (0.433 \times 10/2) = 16.7 \text{ psi}$$

Where:

P = Site barometric pressure (psia) (14.5)
 WD = Water depth (10.0 ft)
 0.433 = Conversion factor for depth in feet to psia

Cell # 1A: SOR = 2672/0.50 = 5322 lb/d

The diffusers used for aeration are generally placed on the pond or LPR floor. Since oxygen solubility in water is directly related to pressure, a correction factor is included to attempt to account for the difference in solubility at the basin bottom and the water surface. For this correction factor, the mid-depth of the basin is used to estimate the pressure since this is the average pressure that the oxygen is exposed to.

Solubility and conversion factor data and values for these formulas are generally found in standard tables or determined from site conditions and laboratory studies.

4) Required Air Flow to Meet Bacterial Oxygen Demand

Finally, the SOR is used in combination with manufacturer supplied aeration efficiencies to compute the required air flow to meet the bacterial oxygen demand.

The following equation is used for calculating air flow requirement:

$$Q_{air} = f \times \frac{SOR}{SOTE}$$

Where:

Q_{air} = Air requirement in standard cubic feet per minute (SCFM)

SOTE = Manufacturer's standard oxygen transfer efficiency for the diffusers (%)

$$1.44\%/ft \times 10 ft = 14.4\%$$

f = Conversion factor from lbs-O₂ /day to SCFM of air

Cell # 1A: $\frac{5322 \text{ lb/d} \times 4.025}{14.4\%} = 1486 \text{ SCFM}$

5) Required Air Flow to Meet Mixing Requirement for Complete Mix Aeration Basin Cell

For the purpose of sizing aeration to achieve complete mix conditions, a dissipated energy of 13.5 HP/MG is used. This value is multiplied by the complete mix cell volume to determine the power dissipated, P.

Cell #1A: $P_{CM} = 13.5 \text{ HP/MG} \times Q \times D.T.$

$$P_{CM} = 13.5 \text{ HP/MG} \times 0.74 \text{ MGD} \times 3.0 \text{ d} = 30.0 \text{ HP} = 16500 \text{ ft-lb/s}$$

Where:

P_{CM} = Dissipated power (HP)

Q = Flow (MGD)

DT = Detention time (d)

Given a desired amount of energy dissipation into a volume of water, the following equation is used to determine an equivalent air flow.

$$Q_{air} = \frac{P_{CM}}{K \times \ln\left(\frac{h + 33.9}{33.9}\right)}$$

Where:

Q_{air} = air flow rate at atmospheric pressure, ft³/min (CFM)
 P = power dissipated, ft-lb/s
 K = constant (35.28, U.S. customary units)
 h = air pressure at the point of discharge in feet of water, ft

$$Q_{air} = \frac{16500}{35.28 \times \ln\left(\frac{10+33.9}{33.9}\right)} = 1807 \text{ CFM}$$

6) Equipment Selection

Equipment selection is based on aeration and/or mixing, whichever requires the highest horsepower.

Cell # 1A: 102 diffusers x 18 SCFM = 1836 SCFM

Cell # 1B: 45 diffusers x 9 SCFM = 405 SCFM

LPR: 486 SCFM

Total air requirement equals:

$$Q_{air} = 1836 \text{ SCFM} + 405 \text{ SCFM} + 486 \text{ SCFM} = 2727 \text{ SCFM}$$

The blower power motor requirement is calculated using the following equation:

$$\text{BHP} = \frac{Q_{air} \times f_2}{E_{blow}} \times \left(\left(\frac{P + P_{blow}}{P} \right)^{0.283} - 1 \right)$$

Where:

BHP = Blower power motor requirement (HP, horsepower)
 f_2 = Conversion factor for air volume to air mass
 E_{blow} = Blower efficiency (%)
 P_{blow} = Pressure at Blower outlet
 Q_{air} = 2727 SCFM

$$P_{blow} = 62.4/144 \times (\text{WD} + 3.0) = 62.4/144 \times (10+3.0) = 5.63 \text{ psig}$$

$$E_{blow} = 78.7 - (2.11 \times P_{blow}) = 78.7 - (2.11 \times 5.63) = 66.8 \%$$

$$\text{BHP} = \left(\frac{(2727 \times 0.068)/60}{53.3 \times 595} \right) \times \left(\frac{550 \times 0.283 \times 0.668}{((5.63+14.5)/14.5)^{0.283} - 1} \right) = 113.5 \text{ BHP}$$

Suggested Blower Size: 3 @ 75 HP (two operating, one stand by)

MARS & NitrOx+D Aeration Basis of Design

Date: 2/12/2018

Project Name: Honey Brook, PA

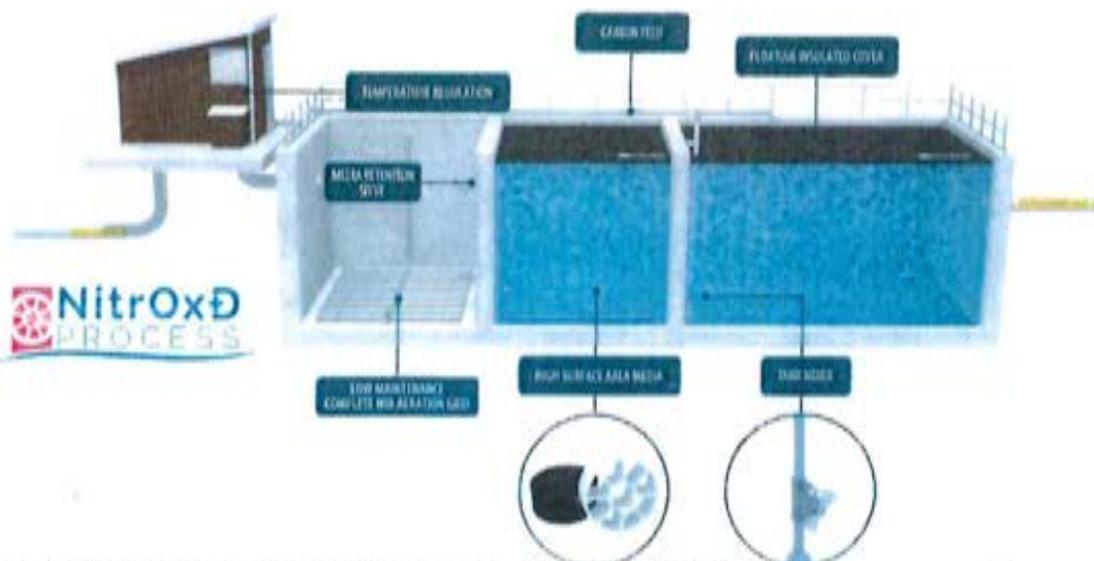
Project Number: 2801

The NitrOx+D™ Process

The patent pending NitrOx+D Process was developed based on the principle that nitrification will reliably occur when the proper conditions are created. For wastewater lagoon systems that receive primarily domestic waste, the critical conditions required for nitrification include:

1. **COD** of 20-30 mg/L
2. **Dissolved oxygen** of 4.6 lb/O₂ per pound of NH₃-N (Metcalf & Eddy)
3. **Sufficient Population of Nitrifying bacteria**
4. Given sufficient Nitrifying bacteria, a **water temperature of 4-5 °C**

NitrOx+D Process utilizes the existing lagoon infrastructure for 90% BOD removal, after which nitrifying bacteria begin to nitrify. The effluent from the lagoons then flows hydraulically or is pumped into a two-stage nitrification reactor, followed by a single stage denitrification reactor. In colder climates where the water temperature drops below 4 °C, thermal regulation is added in order to increase the water temperature; only a few degrees during the coldest months of the year. In the three NitrOx+D reactor cells, millions of individual biofilm carriers provide a habitat for nitrifying and denitrifying bacteria –ensuring sufficient biomass for year-round performance. Each NitrOx+D nitrifying cell has a stainless-steel aeration grid to provide the necessary oxygen, as well as to create a complete mix environment to keep the biofilm carriers in constant motion. The denitrification reactor cell is anoxic, therefore having no aeration grid and instead incorporating a tank mixer. All cells include floating insulated covers to mitigate heat loss, and media is retained with stainless steel sieves. Effluent from the NitrOx+D reactors is discharged into a final polishing/clarification lagoon prior to the discharge from the lagoon system.



The MARS Process

Biological Oxygen (BOD) Calculations

Removal of BOD (and CBOD) takes place naturally in an aerated lagoon. The Characteristic Equation for treatment efficiency of 5-Day Biological Oxygen Demand is given in Equations 1 through 3, at bottom of report. These calculations are used to size the lagoons. They are independent of the aeration calculations and assume that sufficient dissolved oxygen levels are maintained in the water. The equation is dependent on time and temperature. For lagoons operated in series, the equation is applied separately to each cell and the results are combined.

Aeration Requirement Calculations

Aeration calculations are more complicated than biological calculations as they depend on several factors. These include:

- Site conditions, such as treatment depth, elevation, and temperature.
- Design parameters, such as minimum dissolved oxygen (DO) level and oxygen supply rate.
- Actual Oxygen Requirement (AOR) which is based on the nutrient loading rates (these can include BOD/CBOD and TKN/NH₃-N and are based on the product of nutrient concentrations and the wastewater flow-rate).
- Type of aerator
- Oxygen transfer efficiency (OTE) of the aerator, which should be measured by an independent lab.
- Field condition adjustments (see Equation 2, below).
- Mixing requirements, such as complete or partial mix. The former is generally only required for activated sludge basins (ASB) or other high strength processes with short detention times.

Aerated Lagoons - Long Treatment Times

Aerated lagoons are typified by their comparatively large size and long treatment times (usually greater than 10 days). Influent concentrations are low to moderate (usually less than 300 mg/L of BOD). The bulk of the treatment takes place aerobically with additional anaerobic respiration taking place on the lagoon floor. Aerated lagoons do not generally have a mixed liquor suspended solids (MLSS) or return activated sludge (RAS) component. Partial mixing is required to prevent stratification and eliminate dead-zones; however, complete mix is not necessary.

Aerated lagoons are typically designed to operate at a minimum DO level of 2 mg/L. Oxygen is usually supplied at a rate of 1.5 times the BOD demand. If nitrification/denitrification takes place, the oxygen supply rate is designed for 4.6 times the nitrogenous oxygen demand (NBOD).

Activated Sludge Basins (ASB)

Activated sludge basins (ASB) and other related wastewater tanks and lagoons are characterized by short treatment times (usually from 1 to 5 days), high wastewater strengths, and an active biomass that must be maintained in suspension to prevent rapid sludge accumulation. A high strength (greater than 2,000 mg/L) return activated sludge (RAS) component is usually fed back into the basin from a downstream clarifier. Biological nutrient removal is much faster in these basins.

ASBs are typically designed to operate at a minimum DO level of 1 to 2 mg/L. Oxygen is supplied at a rate of 1.0 to 1.5 times the BOD demand. If nitrification/denitrification takes place, the oxygen supply rate is designed for 4.0 to 4.6 times the nitrogenous oxygen demand (NBOD). Aeration system is based on both oxygenation requirements and complete mix requirements, whichever is greater.

TRIPLEPOINT ENVIRONMENTAL
Detailed Design Calculations: MARS
 Consolidated Koshkonong, WI

SUMMARY - General Design Parameters

V3.4.0	Design Scenario Name		Future
1	Influent Flowrate	MGD	0.740
2	Influent Concentration	mg/L	240.0
3	Effluent Concentration (summer)	mg/L	4.3
4	Effluent Concentration (winter)	mg/L	23.8
5	Actual Oxygen Supplied	lb/day	2179.1
6	Number of Aerators		32
7	Estimated Tubing Length	ft	5200
8	Airflow	scfm	1149
9	Design Pressure (includes cushion)	psig	6.95
10	Brake Horsepower	bhp	38.79
11	Min. Design Horsepower	hp	54

1. $FTE = \alpha (SOTE) \theta^{(T-20)} (\beta C^*_{-T} - DO) + C^*_{-20}$ *field transfer efficiency*

Where,

α contaminant factor (contaminants, depth, bubble-size) (range: 0.40 – 0.70)

β TDS factor (total dissolved solids) (range: 0.90-1.00)

$\theta = 1.024$ temperature factor

DO target dissolved oxygen level (mg/L)

C^*_{-T} saturation oxygen concentration at site – adjusted for water depth

C^*_{-20} sat. oxygen concentration at STP conditions – adjusted for water depth

T water temperature (Celsius)

2. Airflow = AOR / (25.056 * FTE)

3. $E = 2.3 * k * t / (1 + 2.3 * k * t)$ *biological treatment efficiency*

Where,

k = varies kinetic coefficient (related to temperature) (range: 0.06 to 0.12)

t = time treatment time in days

SUMMARY - Biological Treatment Calculations

Item	Description	Units	Future	
	Number of Treatment Cells			4
	Flow Regime		Series	
	Site Elevation - HWL	MSL - ft		724
Cell 1				
1	Wastewater Flowrate	MGD		0.740
2	Treatment Volume	M-Gal		9.0
3	Treatment Time	days		12.2
4	Design Water Temp	°C		26
5	Treatment Type	-	Partial Mix	
6	Standard Reaction Rate, k_{20}	days ⁻¹		0.28
7	Design Reaction Rate, k_T	days ⁻¹		0.151
8	Biological Treatment Efficiency	%		80.8%
9	Influent BOD Loading	lb/day		1,479
10	Influent BOD Concentration	mg/L		240.0
11	BOD Removed	lb/day		934
12	Effluent BOD Loading	lb/day		284
13	Effluent BOD Concentration	mg/L		46.0
14	Influent NBOD Loading	lb/day		277
15	Influent NBOD Concentration	mg/L		44.9
16	NBOD Removed* (Assumed)	lb/day		-
17	Effluent NBOD Loading*	lb/day		277
18	Effluent NBOD Concentration*	mg/L		45
Cell 2				
19	Wastewater Flowrate	MGD		0.740
20	Treatment Volume	M-Gal		8.7
21	Treatment Time	days		11.8
22	Design Water Temp	°C		26
23	Treatment Type	-	Partial Mix	
24	Standard Reaction Rate, k_{20}	days ⁻¹		0.28
25	Design Reaction Rate, k_T	days ⁻¹		0.151
26	Biological Treatment Efficiency	%		80.3%
27	Influent BOD Loading	lb/day		284
28	Influent BOD Concentration	mg/L		46.0
29	BOD Removed	lb/day		228
30	Effluent BOD Loading	lb/day		56
31	Effluent BOD Concentration	mg/L		9.1
32	Influent NBOD Loading	lb/day		277
33	Influent NBOD Concentration	mg/L		44.9
34	NBOD Removed* (Assumed)	lb/day		-
35	Effluent NBOD Loading*	lb/day		277
36	Effluent NBOD Concentration*	mg/L		45

Cell 3				
37	Wastewater Flowrate	MGD		0.740
38	Treatment Volume	M-Gal		1.0
39	Treatment Time	days		1.3
40	Design Water Temp	°C		26
41	Treatment Type	-	Partial Mix	
42	Standard Reaction Rate, k_{20}	days ⁻¹		0.28
43	Design Reaction Rate, k_T	days ⁻¹		0.151
44	Biological Treatment Efficiency	%		31.6%
45	Influent BOD Loading	lb/day		55.9
46	Influent BOD Concentration	mg/L		9.1
47	BOD Removed	lb/day		18
48	Effluent BOD Loading	lb/day		38.25
49	Effluent BOD Concentration	mg/L		6.2
50	Influent NBOD Loading	lb/day		277
51	Influent NBOD Concentration	mg/L		44.9
52	NBOD Removed* (Assumed)	lb/day		-
53	Effluent NBOD Loading*	lb/day		277
54	Effluent NBOD Concentration*	mg/L		45
Cell 4				
55	Wastewater Flowrate	MGD		0.740
56	Treatment Volume	M-Gal		0.9
57	Treatment Time	days		1.3
58	Design Water Temp	°C		26
59	Treatment Type	-	Partial Mix	
60	Standard Reaction Rate, k_{20}	days ⁻¹		0.28
61	Design Reaction Rate, k_T	days ⁻¹		0.151
62	Biological Treatment Efficiency	%		30.6%
63	Influent BOD Loading	lb/day		38
64	Influent BOD Concentration	mg/L		6.2
65	BOD Removed	lb/day		12
66	Effluent BOD Loading	lb/day		27
67	Effluent BOD Concentration	mg/L		4.3
68	Influent NBOD Loading	lb/day		277
69	Influent NBOD Concentration	mg/L		44.9
70	NBOD Removed* (Assumed)	lb/day		-
71	Effluent NBOD Loading*	lb/day		277
72	Effluent NBOD Concentration*	mg/L		45

SUMMARY - Aeration Calculations

Item	Description	Units	Future
Cell 1			
1	Lagoon Elevation	ft, MSL	724
2	Lagoon Side Water Depth	ft	10
3	Air Release Depth	ft	9.25
4	O ₂ Loading Factor (BOD ₅)	lb-O ₂ /lb-BOD	1.5
5	O ₂ Loading Factor (NBOD ₅)	lb-O ₂ /lb-NBOD	4.6
6	AOR	lb/day	1793
7	SOTE/ft	%/ft	1.91%
8	SOTE	%	17.69%
9	Design DO Concentration	mg/L	2.0
10	Alpha-value, α		0.60
11	Beta-value, β		0.95
12	Theta-value, θ		1.02
13	FTE		7.55%
14	Air requirement	scfm	948
15	Airflow per aeration unit	scfm/unit	37.9
16	Number of aeration units	units	25
17	Water Pressure	psi	4.01
18	Aerator Pressure Loss	psi	0.75
19	Header/Feeder Pressure Allowance	psi	1.20
20	Total Operating Pressure	psig	5.95
21	Design Motor Pressure	psig	6.95
Cell 2			
22	Lagoon Elevation	ft, MSL	724
23	Lagoon Side Water Depth	ft	9.72
24	Air Release Depth	ft	8.97
25	O ₂ Loading Factor (BOD ₅)	lb-O ₂ /lb-BOD	1.5
26	O ₂ Loading Factor (NBOD ₅)	lb-O ₂ /lb-NBOD	4.6
27	AOR	lb/day	342
28	SOTE/ft	%/ft	1.93%
29	SOTE	%	17.32%
30	Design DO Concentration	mg/L	2.0
31	Alpha-value, α		0.60
32	Beta-value, β		0.95
33	Theta-value, θ		1.02
34	FTE		7.38%
35	Air requirement	cfm	185
36	Airflow per aeration unit	cfm	37.0
37	Number of aeration units	units	5
38	Water Pressure	psi	3.88
39	Aerator Pressure Loss	psi	0.75
40	Header/Feeder Pressure Allowance	psi	1.16
41	Total Operating Pressure	psig	5.79
42	Design Motor Pressure	psig	6.79

Cell 3			
43	Lagoon Elevation	ft, MSL	724
44	Lagoon Side Water Depth	ft	10.37
45	Air Release Depth	ft	9.62
46	O ₂ Loading Factor (BOD ₅)	lb-O ₂ /lb-BOD	1.5
47	O ₂ Loading Factor (NBOD ₅)	lb-O ₂ /lb-NBOD	4.6
48	AOR	lb/day	26
49	SOTE/ft	%/ft	2.61%
50	SOTE	%	25.15%
51	Design DO Concentration	mg/L	2.0
52	Alpha-value, α		0.60
53	Beta-value, β		0.95
54	Theta-value, θ		1.02
55	FTE		10.75%
56	Air requirement	cfm	10
57	Airflow per aeration unit	cfm	9.8
58	Number of aeration units	units	1
59	Water Pressure	psi	4.17
60	Aerator Pressure Loss	psi	0.68
61	Header/Feeder Pressure Allowance	psi	0.42
62	Total Operating Pressure	psig	5.26
63	Design Motor Pressure	psig	6.26
Cell 4			
64	Lagoon Elevation	ft, MSL	724
65	Lagoon Side Water Depth	ft	10.09
66	Air Release Depth	ft	9.34
67	O ₂ Loading Factor (BOD ₅)	lb-O ₂ /lb-BOD	1.5
68	O ₂ Loading Factor (NBOD ₅)	lb-O ₂ /lb-NBOD	4.6
69	AOR	lb/day	18
70	SOTE/ft	%/ft	2.96%
71	SOTE	%	27.68%
72	Design DO Concentration	mg/L	2.0
73	Alpha-value, α		0.60
74	Beta-value, β		0.95
75	Theta-value, θ		1.02
76	FTE		11.62%
77	Air requirement	cfm	6
78	Airflow per aeration unit	cfm	5.9
79	Number of aeration units	units	1
80	Water Pressure	psi	4.04
81	Aerator Pressure Loss	psi	0.67
82	Header/Feeder Pressure Allowance	psi	0.41
83	Total Operating Pressure	psig	5.12
84	Design Motor Pressure	psig	6.12

TRIPLEPOINT ENVIRONMENTAL
Detailed Design Calculations: NitrOx+D
 Consolidated Koshkonong, WI

Plant Influent Characteristics

1	Annual Average Daily Flow	740,000	gpd
2	Maximum Monthly Average Daily Flow	1,350,000	gpd
3	Peak Daily Flow	2,590,000	gpd
4	Peak Hourly Flow	3,700,000	gpd
5	Influent BOD	240	mg/L
6	Influent BOD	2,702.2	lbs/day
7	Influent TSS	240	mg/L
8	Influent TSS	2,702.2	lbs/day
9	Influent NH3-N	45.0	mg/L
10	Influent NH3-N	506.7	lbs/day
11	Influent TKN	50.0	mg/L
12	Influent TKN	563.0	lbs/day
A1	Influent NOx-N	0.0	mg/L
A2	Influent NOx-N	0.0	lbs/day
13	Influent pH	7	
14	Water Temperature	12	deg-C

NitrOx Influent Characteristics

15	Annual Average Daily Flow	740,000	gpd
16	Maximum Monthly Average Daily Flow	1,350,000	gpd
17	Peak Daily Flow	2,590,000	gpd
18	Peak Hourly Flow	3,700,000	gpd
19	Influent BOD	24	mg/L
20	Influent TSS	24	mg/L
21	Influent NH3-N	41.4	mg/L
22	Influent TKN	46.4	mg/L
23	Design Influent TKN	46.4	mg/L
A3	Design Influent NOx-N	0	mg/L
24	Influent pH	7	
25	NitrOx Water Temperature	5	deg-C

NitrOx Tank Sizing Summary

26	Number of Treatment Trains Proposed	1	
27	Number of Tanks Proposed	2	
28	Length of Each	35.0	ft
29	Width of Each	35.0	ft
30	Side Water Depth of Each	16	ft
31	Tank Height of Each	19	ft
32	Volume of Each	146,608	gallons
33	Volume Total (per treatment train)	293,216	gallons
34	Hydraulic Retention Time at Average Flow	5.2	hours
35	Hydraulic Retention Time at Peak Daily Flow	1.9	hours

NitrOx Aeration Requirement Summary - Per Treatment Train

	<u>Stage 1</u>	<u>Stage 2</u>	
38	AOR (lbs/day)	1,503	1,196
39	Assumed Diffuser Subm. at AWL (ft.)	15.25	15.25
40	Elevation (ft.)	724	724
41	Alpha	0.70	0.70
42	Beta	0.9	0.9
43	Target DO Residual (MBBR Process) (mg/L)	5.0	6.0
44	SOR (lbs/day)	4,949	4,971
45	Target Diffuser Efficiency/ft. Submergence	1.1	1.1
46	Airflow (scfm)	1,171	1,176

Post-Anoxic Tank Sizing Summary

A4	Total No. of Tanks Proposed	1	
A5	Width of Each	35.0	ft
A6	Length of Each	35.0	ft
A7	Side Water Depth of Each	16.0	ft
A8	Volume of Each	146,608	gallons
A9	Volume Total	146,608	gallons
A10	Hydraulic Retention Time at Max Monthly Ave Daily Flow	2.6	hours
A11	Hydraulic Retention Time at Peak Daily Flow	1.4	hours
A14	Mixing Energy Required	30	bhp/MG
A15	Minimum BHP for Mixing in Each Tank	4.4	bhp

Chemical Quantity Estimates

A16	Estimated MicroC per NOx-N Removed	11	lbs/lb.
A17	Estimated MicroC Dosage	5,744	lbs/day
A18	Estimated MicroC Dosage	594	gpd
A19	Assumed Storage Tank Size (to Receive Totes)	330	gallons
A20	Estimated HRT in Storage Tank	1	days
A21	Estimated Chemical Feed Pump Max. Capacity Rqmt	49.5	gph
A22	Estimated Chemical Feed Pump Min. Rt. Rqmt	6.2	gph

MBBR Blower Requirement Summary

47	No. of Blowers	3	
48	Airflow Requirement per Blower	1,173	scfm
49	Airflow per 1,000 scfm	60	scfm/1,000 cf
50	Discharge Pressure	7.90	psig
51	Assumed Overall Efficiency	0.62	
52	Approximate BHP Requirement/Blower	62.0	bhp
53	Approximate BHP Requirement Total	123.9	bhp
54	Estimated Nameplate HP / Blower	75	hp
55	Blower Type	Tri-Lobe PD	

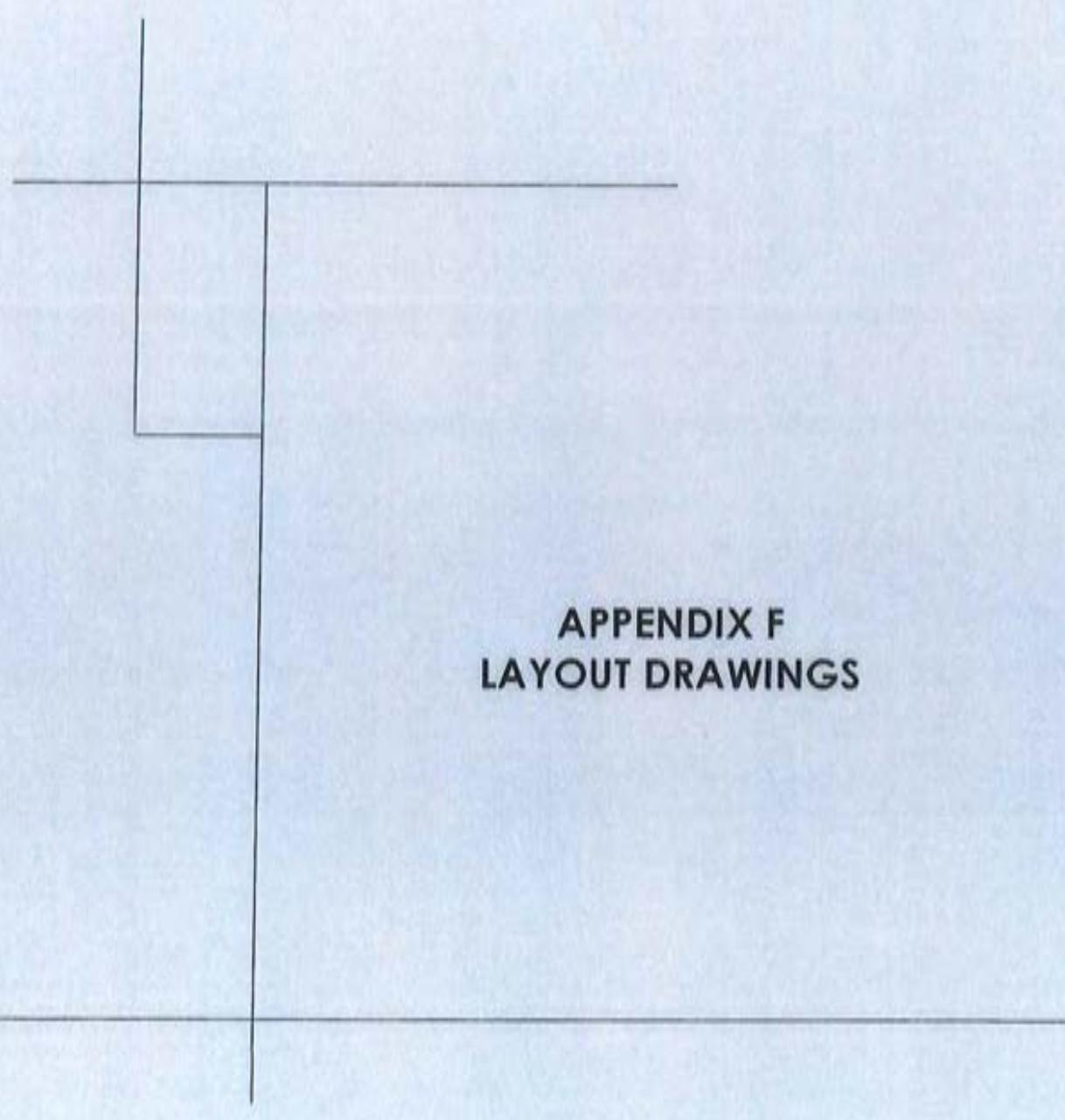
Effluent Parameters

56	Effluent SBOD	10.0	mg/L
57	Effluent SBOD	112.6	lbs/day
58	Effluent TSS	20.0	mg/L
59	Effluent TSS	225.2	lbs/day
60	Effluent NH3-N in Winter (Monthly Average)	6.5	mg/L
61	Effluent NH3-N in Winter (Monthly Average)	73.2	lbs/day
62	Effluent NH3-N in Summer (Monthly Average)	2.8	mg/L
63	Effluent NH3-N in Summer (Monthly Average)	31.5	lbs/day
A23	Effluent Total N (Winter)	6.0	mg/L
A24	Effluent Total N (Winter)	67.6	lbs/day

4. $FTE = \alpha (SOTE) \theta^{(T-20)} (\beta C^*_{-T} - DO) + C^*_{-20}$ *field transfer efficiency*

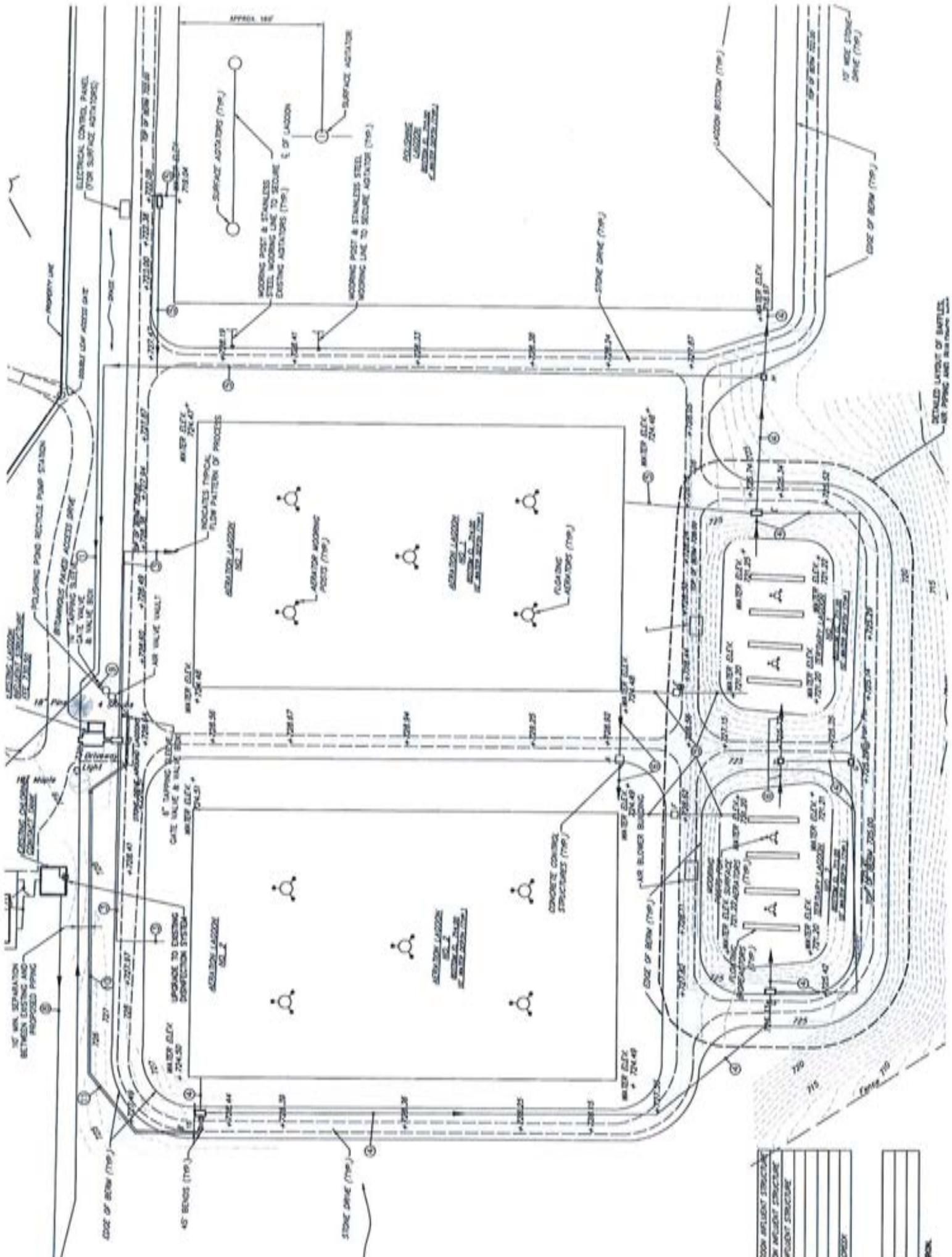
Where,

- α contaminant factor (contaminants, depth, bubble-size) (range: 0.40 – 0.70)
- β TDS factor (total dissolved solids) (range: 0.90-1.00)
- $\theta = 1.024$ temperature factor
- DO target dissolved oxygen level (mg/L)
- C^*_{-T} saturation oxygen concentration at site – adjusted for water depth
- C^*_{-20} sat. oxygen concentration at STP conditions – adjusted for water depth
- T water temperature (Celsius)

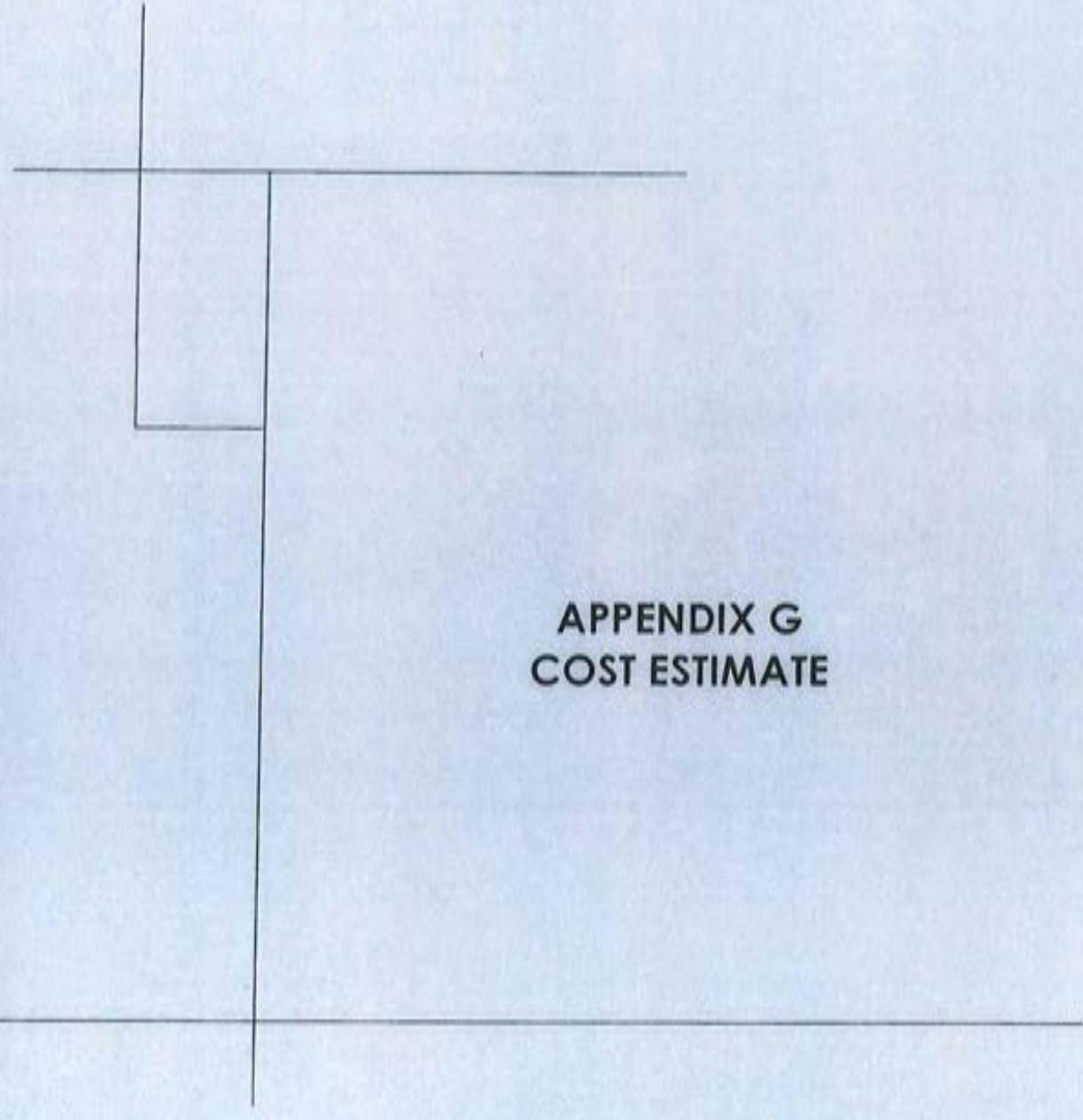


**APPENDIX F
LAYOUT DRAWINGS**





WOOD APPLICANT STRUCTURE	
BY APPLICANT STRUCTURE	
APPLICANT STRUCTURE	
OWNER	
DATE	
BY	



**APPENDIX G
COST ESTIMATE**

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 1A: Lemna System - Lagoon Retrofit					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$94,000	\$94,000
2	PHASING TREATMENT DURING CONSTRUCTION	1	L.S.	\$81,000	\$81,000
PHASE 1 (NITRIFICATION UPGRADE)					
3	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
4	LAGOON REHAB	1	L.S.	\$125,000	\$125,000
5	TREATMENT PLANT UPGRADE EQUIPMENT	1	L.S.	\$1,716,000	\$1,716,000
6	CONCRETE FOR FIXED FILM REACTOR	1	L.S.	\$273,000	\$273,000
7	LAGOON BLOWER BUILDING	1	L.S.	\$50,000	\$50,000
8	SITWORK (Lagoon)	1	L.S.	\$306,000	\$306,000
9	PIPING (Lagoon)	1	L.S.	\$225,000	\$225,000
10	ELECTRICAL (Lagoon)	1	L.S.	\$306,000	\$306,000
11	HEADWORKS UPGRADES	1	L.S.	\$457,200	\$457,200
12	SITWORK (Headworks)	1	L.S.	\$69,000	\$69,000
13	ELECTRICAL (Headworks)	1	L.S.	\$69,000	\$69,000
				SUBTOTAL	\$3,796,200
PHASE 2 (HYDRAULIC CAPACITY UPGRADE)					
14	DAF TANK UPGRADES	1	L.S.	\$400,000	\$400,000
15	SAND FILTER UPGRADES	1	L.S.	\$75,000	\$75,000
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
17	GENERATOR	1	L.S.	\$0	\$0
				SUBTOTAL	\$500,000
PHASE 3 (DENITRIFICATION UPGRADE)					
18	SLUDGE REMOVAL	1	L.S.	\$0	\$0
19	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
20	CONCRETE FOR DENITRIFICATION REACTOR	1	L.S.	\$273,000	\$273,000
21	PIPING	1	L.S.	\$9,000	\$9,000
22	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$369,000
COLLECTION/CONVEYANCE					
23	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$5,590,200
 Contingency (15%): \$839,000
 Engineering/Admin/Legal Fees (15%): \$839,000
ESTIMATED PROJECT COSTS: \$7,269,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	650,000	EA	\$ 0.10	\$ 65,000
2	CHEMICALS	1	L.S.	\$ 18,721	\$ 18,721
2	SLUDGE REMOVAL	1	L.S.	\$ 30,000	\$ 30,000

ESTIMATED YEARLY O&M COST: \$94,000

PRESENT WORTH OF O&M: \$1,117,000

TOTAL PRESENT WORTH: \$8,386,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 1B: Triplepoint System - Lagoon Retrofit					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$99,000	\$99,000
2	PHASING TREATMENT DURING CONSTRUCTION	1	L.S.	\$87,000	\$87,000
PHASE 1 (NITRIFICATION UPGRADE)					
3	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
4	LAGOON REHAB	1	L.S.	\$125,000	\$125,000
5	TREATMENT PLANT UPGRADE EQUIPMENT	1	L.S.	\$2,197,440	\$2,197,440
10	CONCRETE FOR FIXED FILM REACTOR	1	L.S.	\$273,000	\$273,000
6	LAGOON BLOWER BUILDING	1	L.S.	\$50,000	\$50,000
7	SITWORK (Lagoon)	1	L.S.	\$127,000	\$127,000
8	PIPING (Lagoon)	1	L.S.	\$127,000	\$127,000
9	ELECTRICAL (Lagoon)	1	L.S.	\$379,000	\$379,000
11	HEADWORKS UPGRADES	1	L.S.	\$457,200	\$457,200
12	SITWORK (Headworks)	1	L.S.	\$69,000	\$69,000
13	ELECTRICAL (Headworks)	1	L.S.	\$69,000	\$69,000
				SUBTOTAL	\$4,073,640
PHASE 2 (HYDRAULIC CAPACITY UPGRADE)					
14	DAF TANK UPGRADES	1	L.S.	\$400,000	\$400,000
15	SAND FILTER UPGRADES	1	L.S.	\$75,000	\$75,000
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
17	GENERATOR	1	L.S.	\$0	\$0
				SUBTOTAL	\$500,000
PHASE 3 (DENITRIFICATION UPGRADE)					
18	SLUDGE REMOVAL	1	L.S.	\$0	\$0
19	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
20	CONCRETE FOR DENITRIFICATION REACTOR	1	L.S.	\$273,000	\$273,000
21	PIPING	1	L.S.	\$9,000	\$9,000
22	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$369,000
COLLECTION/CONVEYANCE					
23	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$5,878,640
 Contingency (15%): \$881,000
 Engineering/Admin/Legal Fees (15%): \$882,000
ESTIMATED PROJECT COSTS: \$7,643,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	700,000	EA.	\$ 0.10	\$ 70,000
2	CHEMICALS	1	L.S.	\$ 18,721	\$ 18,721
2	SLUDGE REMOVAL	1	L.S.	\$ 30,000	\$ 30,000

ESTIMATED YEARLY O&M COST: \$89,000

PRESENT WORTH OF O&M: \$1,184,000

TOTAL PRESENT WORTH: \$8,827,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 1C: Krugar System - Lagoon Retrofit					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT PRICE	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$65,000	\$65,000
2	PHASING TREATMENT DURING CONSTRUCTION	1	L.S.	\$53,000	\$53,000
PHASE 1 (NITRIFICATION UPGRADE)					
3	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
4	LAGOON REHAB	1	L.S.	\$125,000	\$125,000
5	TREATMENT PLANT UPGRADE EQUIPMENT	1	L.S.	\$705,900	\$705,900
6	CONCRETE FOR FIXED FILM REACTOR	1	L.S.	\$273,000	\$273,000
7	LAGOON BLOWER BUILDING	1	L.S.	\$50,000	\$50,000
8	SITWORK (Lagoon)	1	L.S.	\$155,000	\$155,000
9	PIPING (Lagoon)	1	L.S.	\$114,000	\$114,000
10	ELECTRICAL (Lagoon)	1	L.S.	\$155,000	\$155,000
11	HEADWORKS UPGRADES	1	L.S.	\$457,200	\$457,200
12	SITWORK (Headworks)	1	L.S.	\$69,000	\$69,000
13	ELECTRICAL (Headworks)	1	L.S.	\$69,000	\$69,000
				SUBTOTAL	\$2,373,100
PHASE 2 (HYDRAULIC CAPACITY UPGRADE)					
14	DAF TANK UPGRADES	1	L.S.	\$400,000	\$400,000
15	SAND FILTER UPGRADES	1	L.S.	\$75,000	\$75,000
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
17	GENERATOR	1	L.S.	\$0	\$0
				SUBTOTAL	\$500,000
PHASE 3 (DENITRIFICATION UPGRADE)					
18	SLUDGE REMOVAL	1	L.S.	\$0	\$0
19	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
20	CONCRETE FOR DENITRIFICATION REACTOR	1	L.S.	\$273,000	\$273,000
21	PIPING	1	L.S.	\$9,000	\$9,000
22	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$369,000
COLLECTION/CONVEYANCE					
23	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$4,110,100
 Contingency (15%): \$617,000
 Engineering/Admin/Legal Fees (15%): \$617,000
ESTIMATED PROJECT COSTS: \$5,344,100

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	600,000	EA	\$ 0.10	\$ 60,000
2	CHEMICALS	1	L.S.	\$ 18,721	\$ 18,721
2	SLUDGE REMOVAL	1	L.S.	\$ 30,000	\$ 30,000

ESTIMATED YEARLY O&M COST: \$79,000

PRESENT WORTH OF O&M : \$1,051,000

TOTAL PRESENT WORTH : \$6,396,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 1D: Nelson System - Lagoon Retrofit					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$102,000	\$102,000
2	PHASING TREATMENT DURING CONSTRUCTION	1	L.S.	\$88,000	\$88,000
PHASE 1 (NITRIFICATION UPGRADE)					
3	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
4	LAGOON REHAB	2	L.S.	\$125,000	\$250,000
5	TREATMENT PLANT UPGRADE EQUIPMENT	1	L.S.	\$1,992,505	\$1,992,505
6	LAGOON BLOWER BUILDING	1	L.S.	\$50,000	\$50,000
7	SITWORK (Lagoon)	1	L.S.	\$409,000	\$409,000
8	PIPING (Lagoon)	1	L.S.	\$307,000	\$307,000
9	ELECTRICAL (Lagoon)	1	L.S.	\$307,000	\$307,000
10	HEADWORKS UPGRADES	1	L.S.	\$457,200	\$457,200
11	SITWORK (Headworks)	1	L.S.	\$69,000	\$69,000
12	ELECTRICAL (Headworks)	1	L.S.	\$69,000	\$69,000
SUBTOTAL					\$4,110,705
PHASE 2 (HYDRAULIC CAPACITY UPGRADE)					
13	DAF TANK UPGRADES	1	L.S.	\$400,000	\$400,000
14	SAND FILTER UPGRADES	1	L.S.	\$75,000	\$75,000
15	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
16	GENERATOR	1	L.S.	\$0	\$0
SUBTOTAL					\$500,000
PHASE 3 (DENITRIFICATION UPGRADE)					
17	SLUDGE REMOVAL	1	L.S.	\$0	\$0
18	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
19	DENITRIFICATION FILTERS	1	L.S.	\$350,000	\$350,000
19	PIPING	1	L.S.	\$9,000	\$9,000
20	ELECTRICAL	1	L.S.	\$12,000	\$12,000
SUBTOTAL					\$446,000
COLLECTION/CONVEYANCE					
21	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
SUBTOTAL					\$750,000

ESTIMATED CONSTRUCTION COSTS: \$8,996,705
 Contingency (15%): \$900,000
 Engineering/Admin/Legal Fees (15%): \$900,000
ESTIMATED PROJECT COSTS: \$7,797,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	600,000	EA.	\$ 0.10	\$ 60,000
2	CHEMICALS	1	LS	\$ 18,721	\$ 18,721
2	SLUDGE REMOVAL	1	LS	\$ 30,000	\$ 30,000

ESTIMATED YEARLY O&M COST: \$79,000

PRESENT WORTH OF O&M : \$1,051,000

TOTAL PRESENT WORTH : \$8,848,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 1E: ADS System - Lagoon Retrofit					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$101,000	\$101,000
2	PHASING TREATMENT DURING CONSTRUCTION	1	L.S.	\$87,000	\$87,000
PHASE 1 (NUTRIFICATION UPGRADE)					
3	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
4	LAGOON REHAB	2	L.S.	\$125,000	\$250,000
5	TREATMENT PLANT UPGRADE EQUIPMENT	1	L.S.	\$1,866,959	\$1,866,959
10	TERTIARY LAGOON MODIFICATIONS	1	L.S.	\$150,000	\$150,000
6	LAGOON BLOWER BUILDING	1	L.S.	\$50,000	\$50,000
7	SITWORK (Lagoon)	1	L.S.	\$414,000	\$414,000
8	PIPING (Lagoon)	1	L.S.	\$228,000	\$228,000
9	ELECTRICAL (Lagoon)	1	L.S.	\$311,000	\$311,000
11	HEADWORKS UPGRADES	1	L.S.	\$457,200	\$457,200
12	SITWORK (Headworks)	1	L.S.	\$69,000	\$69,000
13	ELECTRICAL (Headworks)	1	L.S.	\$69,000	\$69,000
				SUBTOTAL	\$4,065,159
PHASE 2 (HYDRAULIC CAPACITY UPGRADE)					
14	DAF TANK UPGRADES	1	L.S.	\$400,000	\$400,000
15	SAND FILTER UPGRADES	1	L.S.	\$75,000	\$75,000
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
17	GENERATOR	1	L.S.	\$0	\$0
				SUBTOTAL	\$500,000
PHASE 3 (DENITRIFICATION UPGRADE)					
18	SLUDGE REMOVAL	1	L.S.	\$0	\$0
19	CARBON FIBER SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
20	DENITRIFICATION FILTERS	1	L.S.	\$350,000	\$350,000
20	PIPING	1	L.S.	\$9,000	\$9,000
21	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$446,000
COLLECTION/CONVEYANCE					
22	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$5,949,159
 Contingency (15%): \$893,000
 Engineering/Admin/Legal Fees (15%): \$893,000
ESTIMATED PROJECT COSTS: \$7,736,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	650,000	EA.	\$ 0.10	\$ 65,000
2	CHEMICALS	1	L.S.	\$ 18,721	\$ 18,721
2	SLUDGE REMOVAL	1	L.S.	\$ 30,000	\$ 30,000

ESTIMATED YEARLY O&M COST: \$84,000

PRESENT WORTH OF O&M: \$1,117,000

TOTAL PRESENT WORTH: \$8,853,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 2A: Sequencing Batch Reactor						
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT PRICE	EXTENSION	
GENERAL						
1	MOBILIZATION	1	L.S.	\$307,000	\$307,000	
PHASE 1 AND 2 (NITRIFICATION AND HYDRAULIC UPGRADE)						
2	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000	
3	SITWORK	1	L.S.	\$1,214,000	\$1,214,000	
4	PIPING	1	L.S.	\$668,000	\$668,000	
5	ELECTRICAL	1	L.S.	\$1,214,000	\$1,214,000	
6	SBR WWTP- EQUIPMENT	1	L.S.	\$1,464,000	\$1,464,000	
7	CONCRETE FOR SBR TANKS	1	L.S.	\$1,638,000	\$1,638,000	
8	HEADWORKS UPGRADES/BUILDING	1	L.S.	\$965,400	\$965,400	
9	CHEMICAL FEED BUILDING	1	L.S.	\$69,700	\$70,000	
10	SOLIDS/BLOWER/BUILDING	1	L.S.	\$374,500	\$375,000	
11	CHEMICAL FEED EQUIPMENT	1	L.S.	\$75,000	\$75,000	
12	SLUDGE HANDLING- DIGESTER	1	L.S.	\$620,800	\$620,800	
13	SLUDGE HANDLING- CENTRIFUGE	1	L.S.	\$435,000	\$435,000	
14	GENERATOR	1	L.S.	\$150,000	\$150,000	
15	LAGOON REHAB (TO USE FOR STORAGE)	1	L.S.	\$250,000	\$250,000	
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000	
					SUBTOTAL	\$9,164,200
PHASE 3 (DENITRIFICATION UPGRADE)						
17	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000	
18	PIPING	1	L.S.	\$9,000	\$9,000	
19	ELECTRICAL	1	L.S.	\$12,000	\$12,000	
					SUBTOTAL	\$96,000
COLLECTION/CONVEYANCE						
20	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000	
					SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$10,317,200
 Contingency (15%): \$1,548,000
 Engineering/Admin/Legal Fees (15%): \$1,548,000
ESTIMATED PROJECT COSTS: \$13,414,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kwh)	999,487	EA.	\$ 0.10	\$ 99,949
2	SLUDGE REMOVAL	1	L.S.	\$ 55,000	\$ 55,000
3	CHEMICALS	1	L.S.	\$ 28,000	\$ 28,000
4	LABOR	1	L.S.	\$ 45,000	\$ 45,000

ESTIMATED YEARLY O&M COST: \$219,000

PRESENT WORTH OF O&M : \$2,912,000

TOTAL PRESENT WORTH : \$16,326,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 2B: Continuous Flow Sequencing Batch Reactor					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$307,000	\$307,000
PHASE 1 AND 2 (NITRIFICATION AND HYDRAULIC UPGRADE)					
2	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
3	SITING	1	L.S.	\$1,213,000	\$1,213,000
4	PIPING	1	L.S.	\$667,000	\$667,000
5	ELECTRICAL	1	L.S.	\$1,213,000	\$1,213,000
6	CSBR WWTP EQUIPMENT	1	L.S.	\$1,456,000	\$1,456,000
7	CONCRETE FOR CSBR TANKS	1	L.S.	\$1,638,000	\$1,638,000
8	HEADWORKS UPGRADES/BUILDING	1	L.S.	\$265,400	\$265,400
9	CHEMICAL FEED BUILDING	1	L.S.	\$69,700	\$70,000
10	SOLIDS BLOWER/BUILDING	1	L.S.	\$374,500	\$375,000
11	CHEMICAL FEED EQUIPMENT	1	L.S.	\$75,000	\$75,000
12	SLUDGE HANDLING: DIGESTER	1	L.S.	\$620,800	\$620,800
13	SLUDGE HANDLING: CENTRIFUGE	1	L.S.	\$435,000	\$435,000
14	GENERATOR	1	L.S.	\$150,000	\$150,000
13	LAGOON REHAB (TO USE FOR STORAGE)	1	L.S.	\$250,000	\$250,000
14	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
				SUBTOTAL	\$9,153,200
PHASE 3 (DENITRIFICATION UPGRADE)					
15	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
16	PIPING	1	L.S.	\$9,000	\$9,000
17	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$96,000
COLLECTION/CONVEYANCE					
18	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$10,306,200
 Contingency (15%): \$1,546,000
 Engineering/Admin/Legal Fees (15%): \$1,546,000
 ESTIMATED PROJECT COSTS: \$13,398,200

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	909,487	EA.	\$ 0.10	\$ 91,000
2	SLUDGE REMOVAL	1	L.S.	\$ 55,000	\$ 55,000
3	CHEMICALS	1	L.S.	\$ 28,000	\$ 28,000
4	LABOR	1	L.S.	\$ 45,000	\$ 45,000
ESTIMATED YEARLY O&M COST:					\$219,000

PRESENT WORTH OF O&M: \$2,912,000

TOTAL PRESENT WORTH: \$16,311,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township 537 Plan; NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 2C: Oxidation Ditch					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$302,000	\$302,000
PHASE 1 AND 2 (NITRIFICATION AND HYDRAULIC UPGRADE)					
2	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
3	SITWORK	1	L.S.	\$1,195,000	\$1,195,000
4	PIPING	1	L.S.	\$658,000	\$658,000
5	ELECTRICAL	1	L.S.	\$1,195,000	\$1,195,000
6	OXIDATION DITCH WWTP- EQUIPMENT	1	L.S.	\$1,222,000	\$1,222,000
7	CONCRETE FOR OXIDATION DITCH	985	C.Y.	\$950	\$936,000
8	CLARIFIER WWTP- EQUIPMENT	1	L.S.	\$468,800	\$468,800
9	CONCRETE FOR CLARIFIER	400	C.Y.	\$950	\$380,000
10	HEADWORKS UPGRADES/BUILDING	1	L.S.	\$965,400	\$965,400
11	CHEMICAL FEED BUILDING	1	L.S.	\$69,700	\$70,000
11	SOLIDS/BLOWER/BUILDING	1	L.S.	\$374,500	\$375,000
12	CHEMICAL FEED EQUIPMENT	1	L.S.	\$75,000	\$75,000
13	SLUDGE HANDLING: DIGESTER	1	L.S.	\$620,800	\$620,800
14	SLUDGE HANDLING: CENTRIFUGE	1	L.S.	\$435,000	\$435,000
15	GENERATOR	1	L.S.	\$150,000	\$150,000
14	LAGOON REHAB (TO USE FOR STORAGE)	1	L.S.	\$230,000	\$230,000
15	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
				SUBTOTAL	\$9,021,000
PHASE 3 (DENITRIFICATION UPGRADE)					
16	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
17	PIPING	1	L.S.	\$9,000	\$9,000
18	ELECTRICAL	1	L.S.	\$12,000	\$12,000
				SUBTOTAL	\$96,000
COLLECTION/CONVEYANCE					
19	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
				SUBTOTAL	\$750,000

ESTIMATED CONSTRUCTION COSTS: \$10,169,000
 Contingency (15%): \$1,526,000
 Engineering/Admin/Legal Fees (15%): \$1,526,000
 ESTIMATED PROJECT COSTS: \$13,221,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	909,487	EA.	\$ 0.10	\$ 91,000
2	SLUDGE REMOVAL	1	L.S.	\$ 55,000	\$ 55,000
3	CHEMICALS	1	L.S.	\$ 28,000	\$ 28,000
4	LABOR	1	L.S.	\$ 45,000	\$ 45,000

ESTIMATED YEARLY O&M COST: \$219,000

PRESENT WORTH OF O&M : \$2,912,000

TOTAL PRESENT WORTH : \$16,133,000

Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

ALTERNATIVE 2D: Biolac System					
ITEM NO.	DESCRIPTION	EST.	UNIT	UNIT	EXTENSION
GENERAL					
1	MOBILIZATION	1	L.S.	\$237,000	\$237,000
PHASE 1 AND 2 (NITRIFICATION AND HYDRAULIC UPGRADE)					
2	SLUDGE REMOVAL	1	L.S.	\$200,000	\$200,000
3	SITWORK	1	L.S.	\$919,000	\$919,000
4	PIPING	1	L.S.	\$506,000	\$506,000
5	ELECTRICAL	1	L.S.	\$919,000	\$919,000
5	BASIN MODIFICATIONS & LINING	1	L.S.	\$200,000	\$200,000
6	BIOLAC WWTP- EQUIPMENT	1	L.S.	\$1,284,000	\$1,284,000
7	CONCRETE FOR FOUNDATION PAD AND CLARIFIERS	360	C.Y.	\$950	\$342,000
8	HEADWORKS UPGRADES/BUILDING	1	L.S.	\$965,400	\$965,400
9	CHEMICAL FEED BUILDING	1	L.S.	\$69,700	\$70,000
10	SOLIDS/BLOWER/BUILDING	1	L.S.	\$374,500	\$375,000
11	CHEMICAL FEED EQUIPMENT	1	L.S.	\$75,000	\$75,000
12	SLUDGE HANDLING: DIGESTER	1	L.S.	\$620,800	\$620,800
13	SLUDGE HANDLING: CENTRIFUGE	1	L.S.	\$435,000	\$435,000
14	GENERATOR	1	L.S.	\$150,000	\$150,000
15	LAGOON REHAB (TO USE FOR STORAGE)	1	L.S.	\$250,000	\$250,000
16	DISINFECTION SYSTEM UPGRADES	1	L.S.	\$25,000	\$25,000
SUBTOTAL					\$7,136,700
PHASE 3 (DENITRIFICATION UPGRADE)					
17	CARBON FEED SYSTEM EQUIPMENT	1	L.S.	\$75,000	\$75,000
18	PIPING	1	L.S.	\$9,000	\$9,000
19	ELECTRICAL	1	L.S.	\$12,000	\$12,000
SUBTOTAL					\$96,000
COLLECTION/CONVEYANCE					
20	WEST PUMP STATION UPGRADE	1	L.S.	\$750,000	\$750,000
SUBTOTAL					\$750,000

ESTIMATED CONSTRUCTION COSTS: \$8,219,200
 Contingency (15%): \$1,233,000
 Engineering/Admin/Legal Fees (15%): \$1,233,000
ESTIMATED PROJECT COSTS: \$10,686,000

O&M COST ESTIMATE					
ITEM NO.	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	ELECTRICITY (kWh)	604,334	EA.	\$ 0.10	\$ 61,000
2	SLUDGE REMOVAL	1	L.S.	\$ 55,000	\$ 55,000
3	CHEMICALS	1	L.S.	\$ 20,000	\$ 20,000
4	LABOR	1	L.S.	\$ 45,000	\$ 45,000

ESTIMATED YEARLY O&M COST: \$189,000

PRESENT WORTH OF O&M : \$2,513,000

TOTAL PRESENT WORTH : \$13,199,000

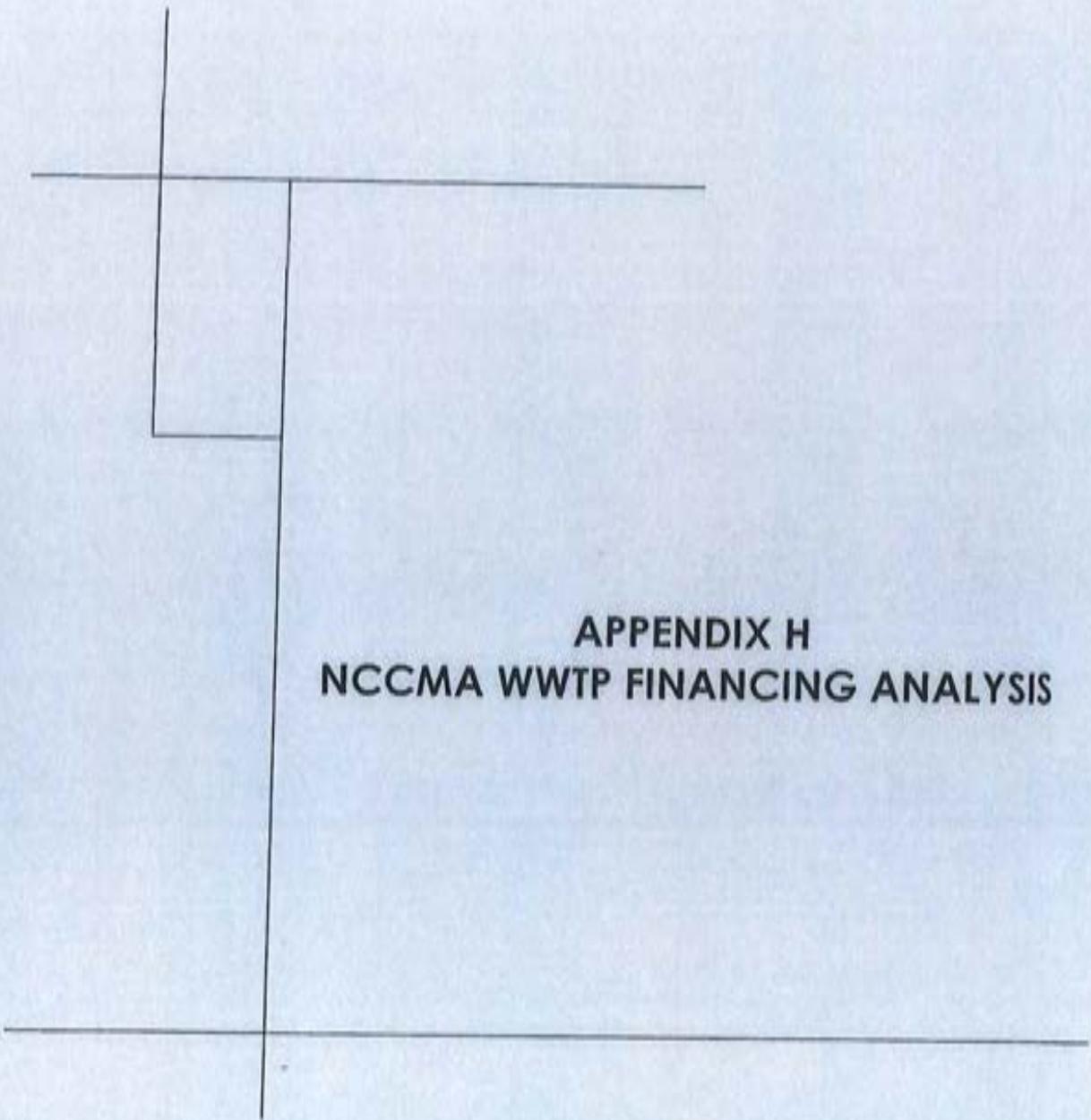
Present Worth Calculations Assume 4.25% for 20 Years

Honey Brook Township Act 537 Plan: NCCMA 10 Year Projected Cost Analysis

Preliminary Summary of Cost Estimates:

	Alternative	Description	Estimated Project Cost	Estimated Yearly O&M	Present Worth of O&M	Total Present Worth	Total Present Worth/EDU
Lagoon Retrofits	1A	Lemna	\$7,269,000	\$84,000	\$1,117,000	\$8,386,000	\$4,110.78
	1B	Triple Point Environmental	\$7,643,000	\$89,000	\$1,184,000	\$8,827,000	\$4,326.96
	1C	Krugar	\$5,345,000	\$79,000	\$1,051,000	\$6,396,000	\$3,135.29
	1D	Nelson	\$7,797,000	\$79,000	\$1,051,000	\$8,848,000	\$4,337.25
	1E	ADS	\$7,736,000	\$84,000	\$1,117,000	\$8,853,000	\$4,339.71
Conventional Systems	2A	SBR	\$13,414,000	\$219,000	\$2,912,000	\$16,326,000	\$8,002.94
	2B	CSBR	\$13,399,000	\$219,000	\$2,912,000	\$16,311,000	\$7,995.59
	2C	Oxidation Ditch	\$13,221,000	\$219,000	\$2,912,000	\$16,133,000	\$7,908.33
	2D	Biolac	\$10,686,000	\$189,000	\$2,513,000	\$13,199,000	\$6,470.10

Number of EDU's = 2040



**APPENDIX H
NCCMA WWTP FINANCING ANALYSIS**

NCCMA WWTP Improvements

Alternative 1A - PENNVEST Financing

Total Project Cost:	\$	7,269,000
Less Other Grant Contributions:	\$	-
Amount to be financed by PENNVEST	\$	7,269,000
Total Number of EDUs		2040
Annual Operation & Maintenance Costs:	\$	834,862
Additional Project Related O&M:	\$	16,800
Existing Debt Service Cost:	\$	-
subtotal Ex. Expenditures:	\$	851,662
subtotal Existing Costs per EDU: ⁽¹⁾	\$	439
PENNVEST Annual Affordability Rate for Service Area		
Less Existing Annual Costs	\$	1,194
Remaining Annual Debt Service Factored into PENNVEST Offer	\$	439
	\$	754

PENNVEST Funding:

Total PENNVEST Funding Need:	\$	7,269,000
Total PENNVEST Grant Award	\$	-
Amount Financed by Loan:	\$	7,269,000
Interest Rate ²		1.743%
Term (years)		20.00
Assumed Grant to get down to Affordability Limit	\$	-
Yearly Debt Service per EDU:	\$	224

Total Annual Cost Per User

Annual O&M Cost	\$	439
Annual PENNVEST Debt Service	\$	224
Total Annual User Fee	\$	663

Total Interest Over Term of Loan

\$2,153,249

(1) Assumes 5% delinquency rate on monthly user fees.

(2) Debt service to increase Years 6-20 to 2.197%.

NCCMA WWTP Improvements
Alternative 1A - USDA Funding

Total Project Cost:		\$7,319,000
Less Other Grant Contributions:	\$ -	
Amount to be financed by USDA		\$7,319,000
Total Number of EDUs		2040
Annual Collection Operation & Maintenance Costs:	\$ 834,852	
Additional Project Related O&M:	\$ 15,800	
Existing Debt Service Cost:	\$ -	
subtotal Ex. Expenditures:	\$ 851,652	
subtotal Existing Costs per EDU: ⁽¹⁾	\$ 439	
USDA Funding: 40 Year Loan @ 3.500%:		
Amount Financed by Loan:	\$ 7,319,000	
Interest Rate	3.500%	
Term (years)	40.00	
Assumed Grant to get down to Affordability Limit	\$ -	
Yearly Debt Service per EDU:	\$ 177	

Total Annual Cost Per EDU		
Annual O&M Cost	\$ 439	
Annual USDA Debt Service	\$ 177	
Total Annual User Fee/EDU	\$ 616	

Total Interest Over Term of Loan **\$7,111,690**

[1] Assumes 5% deficiency rate on monthly user fees

NCCMA WWTP Improvements
Alternative 1B - PENNVEST Financing

Total Project Cost:	\$	7,643,000
Less Other Grant Contributions:	\$	-
Amount to be financed by PENNVEST	\$	7,643,000
Total Number of EDUs		2040
Annual Operation & Maintenance Costs:	\$	834,862
Additional Project Related O&M:	\$	16,800
Existing Debt Service Cost:	\$	-
subtotal Ex. Expenditures:	\$	851,662
subtotal Existing Costs per EDU: ⁽¹⁾	\$	439
PENNVEST Annual Affordability Rate for Service Area	\$	1,194
Less Existing Annual Costs	\$	439
Remaining Annual Debt Service Factored into PENNVEST Offer	\$	754
PENNVEST Funding:		
Total PENNVEST Funding Need:	\$	7,643,000
Total PENNVEST Grant Award	\$	-
Amount Financed by Loan:	\$	7,643,000
Interest Rate ²		1.743%
Term (years)		20.00
Assumed Grant to get down to Affordability Limit	\$	-
Yearly Debt Service per EDU:	\$	235
Total Annual Cost Per User	\$	439
Annual O&M Cost:	\$	235
Annual PENNVEST Debt Service:	\$	204
Total Annual User Fee	\$	675
Total Interest Over Term of Loan		\$2,264,037

(1) Assumes 5% delinquency rate on monthly user fees.

NCCMA WWTP Improvements

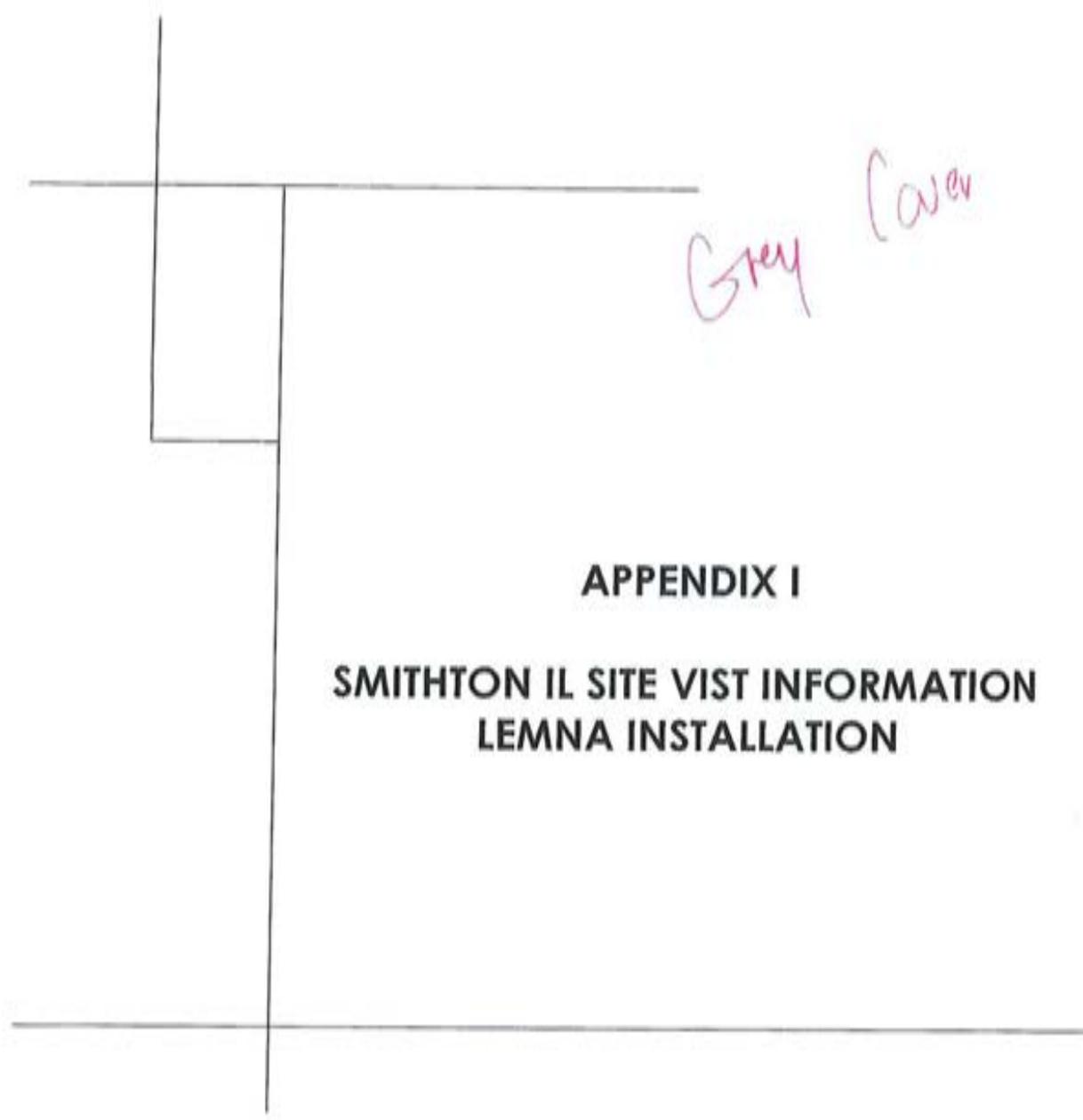
Alternative 1B - USDA Financing

Total Project Cost:		\$7,693,000
Less Other Grant Contributions:		-
Amount to be financed by USDA	\$	\$7,693,000
Total Number of EDUs		2040
Annual Collection Operation & Maintenance Costs:	\$	834,862
Additional Project Related O&M:	\$	16,800
Existing Debt Service Cost:	\$	-
subtotal Ex. Expenditures:	\$	851,662
subtotal Existing Costs per EDU: ⁽¹⁾	\$	439
USDA Funding: 40 Year Loan @ 3.500%:		
Amount Financed by Loan:	\$	7,693,000
Interest Rate		3.500%
Term (years)		40.00
Assumed Grant to get down to Affordability Limit	\$	-
Yearly Debt Service per EDU:	\$	186

Total Annual Cost Per EDU		
Annual O&M Cost	\$	439
Annual USDA Debt Service	\$	186
Total Annual User Fee/EDU	\$	625

Total Interest Over Term of Loan \$7,475,096

(1) Assumes 5% deficiency rate on monthly user fees



Grey Cover

APPENDIX I

**SMITHTON IL SITE VIST INFORMATION
LEMNA INSTALLATION**

VILLAGE OF SMITHTON
3-CELL WASTE STABILIZATION FACILITY

MONTH JANUARY YEAR 2016

DATE	CELL 1			CELL 2			CELL 3			INFLUENT			EFFLUENT											
	FLOW MGD	TEMP °C	D.O. mg/L	pH S.L.	TEMP °C	D.O. mg/L	pH S.L.	TEMP °C	D.O. mg/L	pH S.L.	TEMP °C	500 mg/L	100 mg/L	TSS mg/L	pH S.L.	TEMP °C	D.O. mg/L	NH3 mg/L	P mg/L					
1	0.440	0.458																						
2	0.440	0.458																						
3	0.440	0.458																						
4	0.293	0.302																						
5	0.364	0.361																						
6	0.259	0.303	14.1	7.0	5.82	14.8	7.1	10.33	14.2	6.9	10.48	11.1	7.5	185	200	3	2	14.4	7.3	11.25	0.12	1.00		
7	0.373	0.342																						
8	0.458	0.433																						
9	0.419	0.433																						
10	0.419	0.433																						
11	0.304	0.343																						
12	0.215	0.328																						
13	0.340	0.326	12.9	7.1	8.45	13.5	7.2	10.55	12.8	7.0	10.62	7.9	7.5	158	244	3	1	12.8	7.2	11.60	0.08	1.71		
14	0.322	0.303																						
15	0.332	0.337																						
16	0.332	0.337																						
17	0.332	0.337																						
18	0.325	0.319																						
19	0.319	0.352																						
20	0.278	0.289	12.9	7.0	6.50	13.0	7.3	10.80	12.6	7.2	11.30	8.6	7.5	220	236	3	1	13.0	7.5	12.00	0.08	0.53		
21	0.271	0.282																						
22	0.315	0.305																						
23	0.315	0.305																						
24	0.315	0.305																						
25	0.285	0.342																						
26	0.258	0.288																						
27	0.321	0.312	12.9	7.0	6.28	13.1	7.2	10.85	12.8	7.0	11.27	8.5	7.5	187	192	3	1	12.8	7.3	11.50	0.06	0.89		
28	0.298	0.294																						
29	0.317	0.303																						
30	0.317	0.303																						
31	0.317	0.303																						
TOTAL	10.521	10.623	52.8	28.1	25.05	54.4	28.8	42.7	52.4	28.1	43.86	36.1	30.0	785	832	12	5	23.1	28.3	30.24	0.33	8.41		
AVG	0.339	0.343	13.2	7.0	5.26	13.8	7.2	10.7	13.1	7.0	10.87	9.0	7.5	186	208	3	1	13.3	7.3	11.86	0.08	1.06		
MAX	0.440	0.458	14.1	7.1	8.50	14.8	7.3	13.8	14.2	7.2	13.33	11.1	7.5	220	244	3	2	14.4	7.5	12.00	0.12	1.71		
MIN	0.255	0.282	12.9	7.0	5.82	13.0	7.1	10.3	12.6	6.9	10.40	7.9	7.5	150	192	3	1	12.8	7.2	11.15	0.06	0.53		

VILLAGE OF SMITHTON

5 CELL WASTE STABILIZATION FACILITY

MONTH FEBRUARY

YEAR 2016

DATE	CELL 1			CELL 2			CELL 3			INFLUENT			EFFLUENT								
	INF FLOW MGD	TEMP °C	pH	D.O. mg/l	TEMP °C	pH	D.O. mg/l	TEMP °C	pH	D.O. mg/l	BOC mg/l	TSS mg/l	BOC mg/l	TSS mg/l	TEMP °C	pH	D.O. mg/l	NH3 mg/l	P mg/l		
1	0.227	12.40													14.5		11.82		0.61		
2	0.285	0.281																			
3	0.249	0.272	7.2	5.95	12.8	7.2	10.83	12.2	7.1	11.30	8.5	7.5	206	580	3	1	12.6	7.3	11.89	0.08	0.85
4	0.289	0.285																			
5	0.256	0.246																			
6	0.266	0.246																			
7	0.266	0.246																			
8	0.333	0.333																			
9	0.262	0.271																			
10	0.257	0.277	6.9	6.82	11.5	7.1	11.51	10.4	6.9	11.40	8.8	7.5	228	212	3	1	10.3	7.5	12.15	0.07	0.82
11	0.264	0.275																			
12	0.267	0.211																			
13	0.267	0.211																			
14	0.267	0.211																			
15	0.244	0.252																			
16	0.228	0.207																			
17	0.235	0.254	6.8	5.43	13.4	6.9	10.79	13.2	6.9	11.21	11.8	7.4	258	244	3	2	13.1	7.2	12.10	0.06	0.51
18	0.286	0.271																			
19	0.217	0.207																			
20	0.217	0.207																			
21	0.217	0.207																			
22	0.401	0.208																			
23	0.498	0.225																			
24	0.572	0.285	7.2	6.79	12.4	6.9	10.51	11.5	6.8	11.14	8.4	7.5	277	128	3	4	12.2	7.2	11.75	0.14	1.43
25	0.452	0.297																			
26	0.432	0.285																			
27	0.432	0.285																			
28	0.432	0.285																			
29	0.240	0.240																			
30																					
31																					
TOTAL	10.186	12.088	47.5	37.8	24.79	28.1	43.2	47.4	27.7	45.15	37.3	29.9	548	744	12	8	62.7	78.7	107.38	0.37	8.99
AVG	0.325	0.432	11.8	7.0	6.18	12.5	13.8	11.9	6.9	11.28	8.3	7.5	227	244	3	2	19.5	7.2	11.83	0.29	0.78
MAX	0.692	0.287	13.6	7.2	6.79	13.4	13.2	13.2	7.1	11.40	11.8	7.5	277	244	3	4	14.5	7.3	12.24	0.14	1.05
MIN	0.227	0.240	10.1	6.8	5.43	6.9	10.5	10.4	6.8	11.14	8.4	7.4	206	128	3	1	10.3	7.0	11.74	0.07	0.25

VILLAGE OF SMITHTON

3 CELL WASTE STABILIZATION FACILITY

MONTH DECEMBER YEAR 2016

INF	CELL 1			CELL 2			CELL 3			INFLUENT			EFFLUENT							
	FLOW	TEMP	D.O.	PH	TEMP	D.O.	PH	TEMP	D.O.	PH	TEMP	TSS	BOD	TSS	BOD	PH	D.O.	NH3	P	
	MGD	°C	mg/L	S.U.	°C	mg/L	S.U.	°C	mg/L	S.U.	°C	mg/L	mg/L	mg/L	mg/L	S.U.	mg/L	mg/L	mg/L	
0.273	0.344																			
0.302	0.357																			
0.318	0.366																			
0.318	0.368																			
0.318	0.368																			
0.265	0.337																			
0.321	0.387	15.7	6.9	5.33	15.1	9.87	7.0	15.1	8.7	7.2	17.8	220	3	1	15.2	7.4	10.83	5.15	0.76	
0.318	0.387																			
0.280	0.334																			
0.285	0.344																			
0.285	0.344																			
0.320	0.290																			
0.282	0.222	13.2	6.9	5.79	13.9	10.26	6.9	13.2	10.45	7.4	7.2	209	304	3	1	12.1	7.1	11.25	0.58	0.63
0.245	0.309																			
0.283	0.214																			
0.261	0.248																			
0.261	0.248																			
0.251	0.248																			
0.274	0.298																			
0.281	0.234																			
0.268	0.220																			
0.279	0.226	14.9	6.9	5.68	14.6	10.71	7.0	13.6	6.9	7.6	268	228	3	1	13.7	7.3	11.62	0.09	0.54	
0.334	0.305																			
0.334	0.305																			
0.334	0.305																			
0.334	0.305																			
0.334	0.305																			
0.257	0.237																			
0.258	0.251	14.7	6.8	5.47	14.5	10.59	7.1	13.5	7.0	7.2	305	290	3	1	13.5	7.2	11.63	0.57	1.06	
0.254	0.255																			
0.265	0.293	14.4	6.9	5.57	14.8	10.26	7.0	13.6	6.9	7.3	260	228	3	1	14.1	7.3	11.27	0.22	0.65	
0.254	0.307	15.7	6.9	5.79	15.1	10.71	7.1	15.71	7.2	7.6	265	220	3	1	15.8	7.4	11.63	0.52	1.06	
0.276	0.290	12.2	6.9	5.33	13.9	8.87	6.9	12.3	6.8	7.4	178	200	3	1	12.5	7.5	10.71	0.08	0.38	

VILLAGE OF SMITHTON

3 CELL WASTE STABILIZATION FACILITY

DATE	INF FLOW MGD	CELL 1				CELL 2				CELL 3				EFFLUENT								
		TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	PH 3	P	
1	0.272	14.4	6.8	4.84	14.0	6.8	9.77	12.3	6.7	10.28	6.7	7.2	210	320	3	1	12.4	6.2	10.34	0.12	0.28	
2	0.284	0.284																				
3	0.202	0.202																				
4	0.279	0.252																				
5	0.279	0.252																				
6	0.279	0.252																				
7	0.258	0.280																				
8	0.255	0.254	12.6	6.8	6.00	13.0	6.8	10.95	11.8	6.9	11.57	6.8	7.1	218	152	3	3	12.2	7.2	12.04	0.11	0.18
9	0.278	0.285																				
10	0.248	0.243																				
11	0.255	0.241																				
12	0.255	0.241																				
13	0.255	0.241																				
14	0.237	0.240																				
15	0.285	0.228	12.5	7.1	8.12	13.2	7.2	10.54	12.3	7.1	11.20	10.3	7.5	210	184	3	3	12.7	7.3	12.04	0.16	0.22
16	0.264	0.245																				
17	0.248	0.237																				
18	0.265	0.252																				
19	0.265	0.252																				
20	0.265	0.252																				
21	0.259	0.250																				
22	0.285	0.228	18.1	6.8	4.00	15.4	6.8	10.00	16.5	6.8	10.83	14.2	7.2	285	285	2	4	14.8	7.1	11.54	0.08	1.15
23	0.243	0.263																				
24	0.250	0.260																				
25	0.242	0.265																				
26	0.252	0.265																				
27	0.252	0.265																				
28	0.261	0.267																				
29																						
30																						
31																						
TOTAL	7.572																					
AVG	0.270	0.258	14.4	6.8	5.09	14.2	6.8	10.86	13.5	6.8	11.02	11.0	7.2	220	209	3	2	13.8	6.1	11.62	0.30	0.75
MAX	0.282	0.267	18.1	7.1	6.12	15.4	7.2	10.85	16.5	7.1	11.20	14.2	7.5	285	285	3	4	14.8	7.5	12.04	0.11	1.15
MIN	0.231	0.228	12.5	6.8	4.89	13.0	6.8	9.77	11.8	6.7	10.83	9.6	7.1	210	164	3	1	12.2	6.6	10.28	0.08	0.18

VILLAGE OF SMITHTON

3 CELL WASTE STABILIZATION FACILITY MONTH JANUARY YEAR 2017

DATE	INF FLOW		CELL 1			CELL 2			CELL 3			INFLUENT			EFFLUENT											
	FLOW MGD	MOD	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	TEMP °C	pH	D.O. mg/L	BOC mg/L	TSS mg/L	BOC mg/L	TSS mg/L	BOC mg/L	TSS mg/L	PH	TEMP °C	RM 1 mg/L	P mg/L		
1	0.294	0.255																								
2	0.294	0.255																								
3	0.294	0.255																								
4	0.305	0.205	12.6	7.5	5.0	12.4	7.1	11.90	11.7	7.0	7.4	8.8	7.4	202	200	3	1	13.7	7.5	11.86	0.12	0.78				
5	0.210	0.250																								
6	0.329	0.255																								
7	0.255	0.253																								
8	0.208	0.253																								
9	0.265	0.253																								
10	0.251	0.228																								
11	0.294	0.207	13.3	6.9	6.45	13.3	7.1	10.90	11.8	7.1	11.57	10.4	7.2	215	184	3	4	13.2	7.2	12.70	0.09	1.22				
12	0.273	0.225																								
13	0.208	0.225																								
14	0.473	0.351																								
15	0.473	0.351																								
16	0.473	0.355																								
17	0.482	0.328	15.4	6.7	6.08	14.3	6.8	12.57	13.5	6.9	10.80	11.5	7.2	180	144	3	4	13.5	7.0	11.85	0.11	0.74				
18	0.350	0.325																								
19	0.654	0.609																								
20	0.482	0.601																								
21	0.482	0.601																								
22	0.482	0.601																								
23	0.482	0.601																								
24	0.328	0.286																								
25	0.389	0.318	15.4	6.7	5.78	14.5	6.6	10.80	14.1	6.8	10.72	13.8	7.1	141	152	3	2	14.4	7.2	11.82	0.19	1.14				
26	0.250	0.275																								
27	0.360	0.278																								
28	0.305	0.264																								
29	0.305	0.264																								
30	0.356	0.264																								
31	0.281	0.245																								
TOTAL	10.957																									
Avg	0.353	0.273	14.2	6.6	6.08	13.7	7.0	10.75	13.8	7.0	11.67	10.4	7.2	189	170	3	3	13.1	7.2	11.90	0.13	0.80				
MAX	0.654	0.601	15.4	7.0	6.45	14.5	7.1	10.90	14.5	7.1	11.57	11.5	7.4	220	200	3	4	14.4	7.5	12.70	0.19	1.22				
MIN	0.208	0.225	12.8	6.2	5.78	12.4	6.8	10.27	11.7	6.6	10.72	8.8	7.1	120	144	3	1	11.7	7.0	11.85	0.09	0.48				



01/29/2018

APPENDIX F
DRAFT ON-LOT SEWAGE MANAGEMENT ORDINANCE

ORDINANCE #166

AN ORDINANCE ESTABLISHING REGULATIONS FOR THE INSTALLATION, INSPECTION AND ON-GOING MAINTENANCE OF ON-LOT SEWAGE DISPOSAL SYSTEMS, REQUIRING REGISTRATION OF SEPTAGE PUMPER/HAULER BUSINESSES WITH THE TOWNSHIP AND COUNTY HEALTH DEPARTMENT, AND FURTHER, ESTABLISHING APPLICATION AND PERMITTING PROCESSES AND FINANCIAL AND/OR PERFORMANCE ASSURANCES FOR INDIVIDUAL RESIDENTIAL SPRAY IRRIGATION SYSTEMS (IRSIS), AND PROVIDING FOR IMPOSITION OF PENALTIES FOR NONCOMPLIANCE AND APPEALS FOR HARDSHIP SITUATIONS.

WHEREAS, the Board of Supervisors of Honey Brook Township has adopted a Sewage Facilities Plan pursuant to such statutory authority granted the municipality in the Pennsylvania Sewage Facilities Act, 35 P.S. 750.1, et seq., ("the Act"), as implemented by and through the regulations issued by the Pennsylvania Department of Environmental Protection, Title 25, Chapters 71, 72 and 73; and

WHEREAS, the Board of Supervisors is authorized pursuant to such statutory authority to take actions necessary to assure continued compliance of individual on-lot sewage facilities with the Act, the Clean Streams Law and regulations promulgated thereunder; and

WHEREAS, the Sewage Facilities Plan of Honey Brook Township provides that a permitted means of sewage disposal within the Township is on-lot soil based sewage disposal systems, requiring that sufficient land area be provided for each lot to provide adequately for both current and future sewage disposal needs, including a provision for replacement area for each lot; and

WHEREAS, as mandated by the Second Class Township Code, the Clean Streams Law (35 P.S. § 691.1 - 691.1001), Title 25 of the Pennsylvania Code, and the Pennsylvania Sewage Facilities Act (Act of January 24, 1966. P.L. 1535 as amended, 35 P.S. § 750.1 et seq., known as Act 537), municipalities have the power and the duty to provide for adequate sewage treatment facilities and for protection of the public health by preventing the discharge of untreated or inadequately

treated sewage; and

NOW THEREFORE, the Board of Supervisors of Honey Brook Township, Chester County, Pennsylvania do hereby ordain and enact as follows:

This Ordinance shall be known as and may be referred to as the Honey Brook Township Sewage System Management Ordinance.

SECTION I. Purpose - The purposes of this Ordinance include:

- A. The regulation of the installation, inspection, operation, rehabilitation, replacement and timely on-going maintenance of on-lot systems within the Township; and,
- B. The establishment of provisions and safeguards for the Township which enable the issuance of permits for Bonded Disposal Systems and Individual Residential Spray Irrigation Systems (IRSIS) by and through the Sewage Enforcement Officer (SEO); and,
- C. Establishment of minimum standards for the periodic pumping of treatment, dosing and lift-pump tanks which are components of on-lot systems permitted by the SEO; and,
- D. Adoption, by reference, of standards for initial and subsequent pumping of systems and tanks.

SECTION II. Terms and Definitions

The following words and terms when used in the Ordinance shall have the following meanings:

ABSORPTION AREA - a component of an individual or community sewage system where liquid from a treatment tank seeps into the soil; it consists of an aggregate-filled area containing piping for the distribution of liquid and the soil or sand/soil combination located beneath the aggregate.

ACT - The Pennsylvania Sewage Facilities Act, Act of January 24, 1966, P.L. 1535, No. 537, as amended, 35 P.S. Section 750.1 et. seq.

AUTHORIZED AGENT - A Certified Sewage Enforcement Officer (SEO), professional engineer or sanitarian, plumbing inspector, soils scientist, water quality coordinator, or any other person who is designated to carry out the provisions of this Ordinance as an agent of the Board.

BOARD - The Board of Supervisors of Honey Brook Township, Chester County, Pennsylvania.

BONDED DISPOSAL SYSTEM - An individual sewage system located on a single lot serving a single family residence, where soil mottling is within 20 inches of the mineral soil surface, and the installation, operation and replacement of which is guaranteed by the property owner.

CHESTER COUNTY HEALTH DEPARTMENT (CCHD) – The designated Sewage Enforcement Officer (SEO) for Honey Brook Township.

COMMUNITY SEWAGE SYSTEM - A system, whether publicly or privately owned, for the collection of sewage of a liquid nature from two or more lots, and for the treatment or disposal of the sewage on one or more of the lots or at any other site.

DEP/THE DEPARTMENT - The Department of Environmental Protection of the Commonwealth of Pennsylvania.

DEVELOPER - Any person, partnership or corporation which erects or contracts to erect a building on property owned by it, with the intent to sell the building to some other party upon its full or partial completion, or upon the conveyance of property on which the building is to be built.

EQUIVALENT DWELLING UNIT (EDU) - For the purpose of determining the number of lots in a subdivision or land development, that part of a multiple-family dwelling, commercial, industrial, or institutional establishment with sewage flows equal to four hundred (400) gallons per day.

INDIVIDUAL ON-LOT SEWAGE SYSTEM – A sewage disposal system which uses a system of piping, tanks and an absorption area for soil absorption of sewage effluent either on the lot being served or in an easement onto another lot.

INDIVIDUAL RESIDENTIAL SPRAY IRRIGATION SYSTEM (IRSIS) – An individual sewage system which serves a single dwelling and which treats and disposes of sewage using a system of piping, treatment tanks and soil renovation through spray irrigation.

INDIVIDUAL SEWERAGE SYSTEM - An individual sewage system, which uses a method of sewage collection, conveyance, treatment and disposal other than renovation in a soil absorption area, or retention in a retaining tank.

MALFUNCTION - The condition that occurs when an on-lot system causes pollution to the ground or surface waters, contamination of private or public drinking water supplies, nuisance problems or a hazard to public health.

OWNER - Any person, corporation, partnership, etc. holding deed or title to lands within the Township.

PLANNING MODULE FOR LAND DEVELOPMENT - A revision to, or exception to the Official Plan, submitted in accordance with DEP regulations and in connection with the request for approval of a subdivision or land development plan.

PRIMARY AREA - An area on a lot, tract or parcel of land that has been tested by the SEO and found suitable, based upon the then current DEP site requirements for the installation of an on-lot sewage disposal system, and which will be preserved and protected from alteration for installation of the initial on-lot sewage disposal system for sewage generated on that lot, tract, or parcel. (see Replacement Area)

PUMPER/HAULER BUSINESS - Any sole proprietor, company, partnership or corporation which engages in cleaning any or all components of a community or individual on-lot system and evacuates and transports the septage cleaned therefrom, whether for a fee or free of charge. For the purposes of this Article, pumper/hauler business which shall operate within Honey Brook Township shall be required to register with the Township.

PUMPER/HAULER TRUCK OPERATOR - A natural person who engages in cleaning any or all components of a community or individual on-lot sewage system and evacuates and transports the septage cleaned therefrom, whether for a fee or free of charge. For the purposes of this Article, all pumper/hauler truck operators shall be employed with a business registered with the Township.

REGULATIONS - The Pennsylvania Code, Title 25, Chapters 71, 72 and 73.

REPAIR - Work done to modify, alter, rehabilitate or enlarge an existing on-lot system.

REPLACEMENT AREA - An area on a lot, tract or parcel of land, separate from the Primary Area, that has been tested by the SEO and found suitable, based upon the then current DEP site requirements, for the installation of an on-lot system and which will be preserved and protected from alteration for potential future use if the Primary Area on the same lot, tract, or parcel shall fail for any reason. (see Primary Area)

RETAINING TANK - A watertight receptacle, which receives and retains sewage and is designed and constructed to facilitate ultimate disposal of the sewage at another site. The term includes, but is not limited to, the following:

CHEMICAL TOILET - A permanent or portable nonflushing toilet using chemical treatment in the retaining tank for odor control.

HOLDING TANK - A tank, whether permanent or temporary, to which sewage is conveyed by a water-carrying system.

PRIVY - A tank designed to receive sewage where no piped water under pressure and no piped wastewater is available.

INCINERATING TOILET - A device capable of reducing waste materials to ashes.

COMPOSTING TOILET - A device for holding and processing human and organic kitchen waste, employing the process of biological degradation through the action of micro-organisms to produce a stable, humus-like material.

RECYCLING TOILET - A device in which the flushing medium is restored to a condition suitable for reuse in flushing.

SEPTAGE - The residual scum, sludge and other materials pumped from septic or aerobic treatment tanks and the systems they serve.

SEWAGE - Any substance that contains any waste products, or excrement, or other discharge from the bodies of human beings or animals; a substance harmful to the public health, animal or aquatic life, or the use of water for domestic water supply or for recreation, or a substance which constitutes pollution to the waters of the Commonwealth under the Clean Streams Law (35 P.S. 691.1 - 691.1001).

SEWAGE ENFORCEMENT OFFICER (SEO) - Any person certified by the State Board for the Certification of Sewage Enforcement Officers. As applicable to the permitting of on-lot sewage disposal systems, such definition shall include any person certified as above and who is employed by the Chester County Health Department (CCHD) to administer the provisions of this Ordinance, the provisions of the Act, and the regulations in PA Code Title 25, Chapters 71, 72, and 73.

SEWAGE FACILITIES - Any method of sewage collection, conveyance, treatment, and disposal, which will prevent the discharge of untreated or inadequately treated sewage into the waters of this Commonwealth, or otherwise provide for the safe treatment and disposal of sewage or other waste.

SEWAGE MANAGEMENT PROGRAM - A comprehensive set of legal and administrative requirements encompassing the requirements of this Article and other administrative requirements adopted by the Township to effectively enforce and administer this Article.

SINGLE AND SEPARATE OWNERSHIP - The ownership of a lot by one or more persons, which ownership is separate and distinct from that of any abutting or adjoining lot.

SOIL ABSORPTION SYSTEM - An on-lot system that uses the renovative capacity of the soil for final treatment of the effluent. All SEO permitted systems, except retention tank systems, are soil absorption systems.

SUBDIVISION - The division or redivision of a lot, tract or other parcel of land into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines. The

enumerating of lots shall include as a lot that portion of the original tract or tracts remaining after other lots have been subdivided therefrom.

TOWNSHIP - Honey Brook Township, Chester County, Pennsylvania.

TREATMENT TANK - A watertight tank designed to retain sewage long enough for satisfactory bacterial decomposition of the solids to take place. The term includes the following:

SEPTIC TANK - A treatment tank that provides for anaerobic decomposition of sewage prior to its discharge to an absorption area.

AEROBIC SEWAGE TREATMENT TANK - A mechanically aerated treatment tank that provides aerobic biochemical stabilization of sewage prior to its discharge to an absorption area.

SECTION III. Applicability; Permits Required

- A. The provisions of this Article shall apply to all existing on-lot sewage disposal systems, as well as all new systems proposed and permitted by the SEO within the Township.
- B. All individual or community on-lot systems, regardless of the size of the lot, tract, or parcel on which they are proposed to be constructed, are subject to issuance of a permit by the SEO pursuant to the requirements of this Ordinance, the Act and Regulations.
- C. Building or zoning permits shall not be issued for any building, or improvement to real property to be serviced by an on-lot system, prior to receiving a permit for the installation of the on-lot system from the SEO.
- D. All system components including absorption areas shall be located on the same lot, tract, or parcel as the structure they will serve. Systems or components cannot be located on a separately deeded parcel, regardless of the parcel's ownership, or through means of an easement, right-of-way or other instrument, unless approved by the SEO and the Township.
- E. All planning modules proposing individual or community sewage systems which require a DEP permit shall include a provision granting the Township and its agents the right to enter the premises to inspect the construction and/ or operation of the DEP permitted system, and if the system is not being constructed or operated according to the permitted design, issue a stop work order or revoke the occupancy permit until construction or operation is brought into compliance with the permit.
- F. No on-lot system shall be altered, extended, augmented, modified or repaired without the issuance of a repair permit by the SEO.

- G. No on-lot system shall be used or loaded in a manner which is inconsistent with the permit that was issued to authorize that system's installation.
- H. Permit applications for on-lot systems which include electronically, mechanically, hydraulically or pneumatically operated or controlled devices shall be accompanied by the respective manufacturer's recommended maintenance schedule and product specifications.
- I. Permit applications for which the provisions of Section V. A. apply shall include a fully executed maintenance contract indicating the person or company responsible to carry out the required maintenance, the maintenance schedule, and a provision that if the contract is terminated the owner shall provide the Township with the new maintenance contract within thirty (30) days.

SECTION IV. Replacement Areas

- A. A replacement area shall be required for all proposed or existing lots on which a dwelling or structure providing sanitary facilities is proposed to be constructed which are intended to be serviced by a soil absorption system, except an IRSIS. All replacement areas shall be subject to testing and confirmation by soils testing that the replacement area meets the minimum standards established in the PADEP regulations for soil absorption systems. When required, the testing for a replacement area shall be conducted and the results provided to the Township prior to the approval of any plan of subdivision or land development. No replacement area shall be required for any application involving the replacement of an existing malfunctioning system unless required by the SEO.
- B. Allowance of open land for the replacement area, without performance of appropriate soil testing to verify suitability of the land for a replacement area, shall not constitute compliance with the requirements of this Section.
- C. The location of the primary and replacement areas shall be delineated and identified as an absorption area on the plot plans, maps or diagrams submitted as part of the permit application and subdivision or land development plan.
- D. When requested by the Township as part of a building or zoning permit application or subdivision/land development application, the owner shall provide sufficient documentation to the Township to validate that a suitable replacement area exists on the property. If a suitable replacement area cannot be demonstrated by the owner, the Township may request the owner to conduct replacement area testing as described in this Section.

- E. A landowner wishing to alter the use of the primary or replacement absorption area shall document, through a site evaluation by the SEO, that an additional area suitable for the installation of an on-lot system exists.

SECTION V. Individual Residential Spray Irrigation and Advance Technology Systems

A. Individual Residential Spray Irrigation Systems.

1. All applications for on-lot systems, which propose to use an Individual Residential Spray Irrigation System as the treatment method, shall be accompanied by one of the following:
 - a. A maintenance agreement between the landowner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.
 - b. A maintenance agreement between the landowner and an individual, firm, association, trust or other entity, which is structured to accept responsibility for the system, and is experienced in the proper operation and maintenance of the system.
2. Applications for Individual Residential Spray Irrigation Systems shall be accompanied by a financial guarantee in the amount of \$2,500 to be held by the Township, to assure that sufficient funds are in place to operate, maintain, repair or replace any component of the Individual Residential Spray Irrigation System in the event that the owner:
 - a. Fails to maintain the system or any of the system's components according to the manufacturer's specifications; or,
 - b. Fails to service, clean, inspect and/or pump the treatment tank(s) according to the other applicable standards of this Ordinance; or,
 - c. Fails to conduct testing and monitoring at least annually, or more frequently if required by DEP regulation, and report the results of any laboratory analysis to the Township; or,
 - d. Voids, cancels, or terminates and fails to replace in a manner approved by the Township, the agreement required by Subsection A of this Section.
3. The financial guarantee shall be forfeited by the landowner and the Township shall apply the funds to the repair, operation or maintenance of the system when:

- a. The system is not maintained according to the standards of this Ordinance, applicable DEP regulations, or the manufacturer's specifications; or,
- b. The treatment tank(s) are not serviced, cleaned, inspected and/or pumped according to the applicable standards of this Ordinance; or,
- c. The testing and monitoring are not conducted according to the standards of this Ordinance, applicable DEP regulations, or the manufacturer's specifications; or,
- d. The agreement required by Subsection A of this Section is voided, canceled, or terminated and is not replaced in a manner approved by the Township.

B. Advance Technology Systems

1. This term shall be defined as including any onlot sewage disposal system that requires an operation and maintenance agreement as specified by the latest version of the PADEP Alternate & Experimental technical guidance manual.
2. All applications for advance technology systems shall be accompanied by one of the following:
 - a. A maintenance agreement between the landowner and an individual, firm or corporation experienced in the operation and maintenance of sewage treatment systems.
 - b. A maintenance agreement between the landowner and an individual, firm, association, trust or other entity, which is structured to accept responsibility for the system, and is experienced in the proper operation and maintenance of the system.
3. Applications for advance technology systems shall be accompanied by a financial guarantee of the same type and character that is required for public improvements by the Township's Subdivision and Land Development Ordinance. The landowner shall deposit with the Township the sum of \$2,500.00 or such amount as has been established by the Township by resolution, whichever is greater. Depending on the intensity of the application, the Township shall have the discretion to waive this requirement.

SECTION VI. Maintenance of Systems

- A. The owner of a property upon which an on-lot system is constructed shall at all times operate and maintain the on-lot system in such condition as will permit it to function in the manner in which it was designed and to prevent the unlawful discharge of sewage.
- B. The owner of a property upon which an on-lot system is constructed shall maintain the area around such system so as to provide convenient access for inspection, maintenance and pumping, and divert surface water and downspouts away from the absorption area and system components.
- C. In the event a landowner or authorized inspection entity detects conditions that indicate or could reasonably be interpreted to indicate a malfunction, the landowner shall contact the SEO and if repair or replacement is necessary, apply for a permit to repair or replace the malfunctioning system.
- D. Every aerobic or septic treatment tank which discharges effluent to a soil absorption area or to an individual residential spray irrigation system shall be pumped out according to the schedule in Section X of this Ordinance. If a component's manufacturer requires a more frequent pumping interval than contained in this ordinance, that interval shall be deemed the minimum interval for pumping.
- E. When an on-lot system's treatment tank is pumped out, all dosing tanks, lift tanks and other tanks associated with the system shall also be pumped out.
- F. Retaining tanks and privies shall be pumped out at such intervals as will prevent overflow, leakage, backup, other malfunction, or a public health hazard or nuisance, but no less frequently than one time per year in accordance with the Honey Brook Township Holding Tank Ordinance.
- G. Upon completion of each required pumping, the pumper/hauler business shall provide a pumping receipt plus any required information to the Township. All pumping should be conducted by a liquid waste hauler who is licensed by the Chester County Health Department. As applicable, the required information shall also be provided in accordance with the pumping license requirements of the Chester County Health Department and Chester County Septage Management Data System.
- H. Initial and periodic tank pumping shall be performed to these minimum standards unless other standards are specified by an equipment manufacturer:
 - 1. Tanks shall ONLY be pumped from/through the manhole/access port, i.e., the largest tank opening.
 - 2. Tanks shall NOT be pumped from/through the observation port.

3. Every pump-out shall include a visual inspection of the interior of the tank. The inspection shall include a determination regarding the presence of baffles and their condition, as well as the physical condition of the treatment tank. Presence and condition of observation port(s) shall also be reported.
 4. At all times, and in all phases of operations, pumper businesses and equipment operators shall comply with all laws and regulations regarding the activities associated with on-lot wastewater system maintenance and disposal of materials removed therefrom.
 5. The pumper/hauler business shall provide a pumping receipt to the landowner.
- I. Any person owning a building served by an aerobic treatment tank or an on-lot system, which includes any electrically, mechanically, hydraulically or pneumatically operated or controlled device shall follow the maintenance recommendations of the equipment's manufacturer.
 - J. The SEO may require additional maintenance activities including, but not limited to, cleaning or unclogging of piping, servicing or repair of mechanical equipment, leveling of distribution boxes, tanks and lines, removal of obstructing roots or trees, and diversion of surface water away from soil absorption areas.

SECTION VII. Operation of Systems

- A. All systems shall be operated by the user in a manner that is in full compliance with the terms of this Ordinance, the Act and Regulations, and the system's permit.
- B. Only sewage and normal domestic wastes shall be discharged into any sewage facilities.
- C. The following shall not be discharged into the sewage facilities:
 1. Industrial waste
 2. Fats and grease
 3. Motor oil
 4. Hazardous waste
 5. Chemicals including, but not limited to:
 - a. Pesticides and herbicides

- b. Acids
 - c. Paint, paint thinner and solvents, including latex or water based paints
 - d. Wallpaper pastes and adhesives
 - e. Photo processing chemicals
- 6. Down spout and/or roof drain discharges
 - 7. Sump pump and basement drain discharges
- D. All water used within a residence, including kitchen and laundry wastes and water softener backwash, and all sewage shall be discharged into a treatment tank.
 - E. The Township may require the on-site pretreatment of effluents prior to their discharge to any sewage facilities operated or owned by the Township or any other entity, to assure that the effluent's chemical or biological constituents are compatible with the renovative methods employed by the receiving facilities.
 - F. No sewage system shall discharge untreated or partially treated sewage to the surface of the ground, or into the waters of the Commonwealth of Pennsylvania, unless a permit to discharge has been obtained from the DEP.

SECTION VIII. Registration

All pumper/hauler businesses shall be registered with Honey Brook Township and no pumper/hauler business shall conduct business or perform services within Honey Brook Township without first being registered with the Township. A pumper/hauler business registering with the Township shall be obligated to provide a copy of its current, valid license from the PADEP, a current, valid hauling license with the Chester County Health Department, a list of treatment facilities to which waste is transported for treatment and a Certificate of Insurance. If required by Chester County Health Department, the pumper/hauler business shall also be registered with the Chester County Septage Management Data System.

SECTION IX. Fees

The Board may, by resolution, establish a fee schedule and collect fees to cover the Township's actual costs of administering this Ordinance.

SECTION X. Maintenance Districts Created

A. The Township is hereby divided into three (3) districts, designated District 1, 2, and 3 as illustrated on the Management District Map, which is incorporated by reference into this Ordinance as Appendix B.

B. Every on-lot system in the Township shall comply with Section VI of this Ordinance by December 31, 2022.

C. The requirements of this section shall become effective in a sequential manner:

<u>Area</u>	<u>Compliance with Section VI Shall Be Completed By:</u>
1	12/31/2020
2	12/31/2021
3	12/31/2022

D. Compliance with the first year pumping requirement should occur during the calendar year listed above for each applicable area (i.e. Area 1 resident pumps system in 2020). The only exception for this requirement is if the property owner can provide proof to the Township that their system was pumped during the previous calendar year (i.e. Area 1 resident had system pumped in 2019). Any owner that exceeds this one year grace period shall have their system pumped during the listed cycle year. No grace periods will be granted after the initial compliance year.

E. After the initial pumping, all tanks in all systems shall be pumped out at a minimum regular interval of once every three (3) years from the year of either the initial pumping or a subsequent pumping (i.e. Area 1 resident is required to pump tanks during calendar years 2020, 2023 and so on, Area 2 during years 2021, 2024 and so on, Area 3 during years 2022, 2025 and so on). Tanks that have been subjected to more frequent pumping, by the nature of their size, loading rate or other system characteristics, should continue to receive that frequency of pumping. This Ordinance is NOT an instruction to reduce the frequency of pumping and should not be construed as such. This Ordinance establishes the minimum pump out requirement for all treatment tanks that do not exhibit characteristics that indicate more frequent pumping is required. In the event that on-lot sewage disposal is no longer used to serve a property, whether on that property or on an easement established on another lot, the right to enter under this ordinance shall cease.

F. Landowners may choose to have tanks pumped out more frequently. When more frequent pump-outs are undertaken in a manner consistent with Section VI of this ordinance, the date of the subsequent regular pump-out shall be deemed to be the last day of the last month three years following the year of the voluntary pump-out.

- G. The Township reserves the right to modify this operation and maintenance program as the Township, in its exercise of its authority under applicable law, shall determine appropriate. In the event that a report of a failure or malfunction of an on-lot sewage disposal system is received by the Township, the Township shall be authorized to refer the alleged malfunction to the Chester County Health Department and/or conduct an inspection of any on-lot system. The Township shall not be obligated to investigate anonymous reports of failure or malfunction.
- H. Prior to entry for any purpose in connection with the enforcement of the provisions of this Ordinance, the Township shall give advance written notice to the occupant of a property to enable the occupant to be personally present or be represented by an agent at the time of such entry. Any adult occupant present on the property at the time a request to enter is made by an Authorized Agent may waive their right of advance notice. Advance notice shall be given at least twenty-four hours prior to entry, unless waived, and shall be by telephone, First Class mail or posting of the property. If notice is provided by mail, the date of the proposed entry shall not be less than three (3) days from the date of the postmark of the letter.

SECTION XI. - Abating Health Hazards – Liens

- A. Upon written notice from the SEO that an imminent health hazard exists due to failure of a property owner to properly operate, maintain, repair or replace an on-lot system as provided under the terms of this Ordinance, the Board shall have the authority but not the obligation to perform, or contract to have performed, any repairs as may be directed by the SEO to abate the health hazard.
- B. The costs for the actual repair, repair permit and site investigations in support of the permit shall be borne by the property owner.
- C. The Township may take whatever action necessary to recover these costs in accordance with law, including entering a lien against the property.
- D. The Township may seek injunctive relief to prevent continued use of a malfunctioning on-lot system.

SECTION XII. - System Rehabilitation

The Township shall be authorized to refer to the SEO any conditions of an on-lot sewage disposal system which, in the opinion of the Township represent an imminent public health hazard or environmental threat.

SECTION XIII. Hearing Procedures for Appeals and Variances

- A. A party may request a hearing to appeal the decision and/or interpretation of a provision of this Ordinance by the Authorized Agent or to seek a variance from the strict provisions of this Ordinance due to hardship. Hearing applications shall be on forms prescribed by the Township, and shall be accompanied by a fee set from time to time by resolution of the Board of Supervisors.
1. Hearing applications shall be reviewed by the Township Secretary for completeness. Incomplete applications shall be returned to the applicant without action.
 2. Hearings shall be held in accordance with the Local Agency Law.
 3. The initial hearing shall be scheduled within ten (10) business days of a perfected application.
 4. The Board of Supervisors may conduct the hearing and shall have the right to appoint a Board of Appeals or Hearing Officer to conduct the hearing in lieu of conducting the hearing before the Board of Supervisors.
 5. A written decision shall be issued within twenty (20) business days of closing the record.
 6. Applicants may be represented by counsel.
 7. The Township Secretary shall provide necessary administrative assistance to the Board of Supervisors, Board of Appeals or Hearing Officer. The Board of Supervisors, Board of Appeals or Hearing Officer may appoint counsel to provide legal assistance.
- B. Applications for an appeal shall not be accepted after thirty (30) days from a written decision by the Authorized Agent. Appeals shall be granted only where an appellant establishes by clear and convincing evidence that the Purpose contained in section I of this Ordinance is met, and there is no adverse impact on the health, safety and welfare of the community.
- C. Applications for a variance shall not be accepted after thirty (30) days from the date of required compliance. The applicant shall bear the burden of proof that a hardship exists which warrants the grant of a variance. When, in the opinion of the Board of Supervisors, Board of Appeals or Hearing Officer, it is necessary to meet the purposes of this Ordinance, the variance may be conditioned upon measures not specified in this

Ordinance. A claimed inability to pay shall not be the sole basis for determining a hardship.

1. Relief from replacement area testing required under Article IV may be granted if the applicant presents credible evidence of the following;
 - a. The lot was held in single and separate ownership on the effective date of this Ordinance;
 - b. Lot size of at least one acre.
2. The Board of Supervisors, Board of Appeals or Hearing Officer may condition relief on a more frequent pumping schedule, use of water conservation measures or other appropriate management techniques.
3. No lot shall be completely exempted from the requirements of this Ordinance regarding periodic tank pumping.
4. The required pump out frequency may be shortened to assure proper operation of the system based on loading rates greater than described in the permit for the system or for other good cause.
5. The required pump out frequency may be lengthened where the owner can demonstrate the system can operate properly without the need for pump-out every three years, provided the applicant presents credible evidence supporting:
 - A. Reduced system loading;
 - B. Accumulation of sludge, scum or other residual materials to a level less than one-third (1/3) the liquid capacity of the tank since the last pump out;
 - C. For aerobic tanks, the manufacturer's recommendations indicating a greater interval is appropriate;
 - D. A site investigation report from a qualified SEO indicating no malfunction appears on the lot;
 - E. The system is pumped out consistently with a permit issued for the lot.
6. An applicant requesting a decreased tank pumping frequency shall bear the cost of any inspection undertaken by the Township to verify information.

7. In no case shall the cumulative pump-out interval exceed five (5) years.
8. Any pumping frequency other than three (3) years shall automatically end when the factors predicated on the interval are no longer applicable.
9. No variance shall be available for any lot created after the effective date of this Ordinance.

SECTION XIV. - Violations - Penalties – Suspensions

- A. It shall be illegal to commence construction of a structure which will be served by an on-lot system without first obtaining a permit for the system.
- B. It shall be illegal to construct, alter or repair an on-lot system without first obtaining a permit for the installation or repair from the SEO.
- C. It shall be illegal to fail to maintain the components of an on-lot system at the intervals specified in this ordinance, or those specified by the equipment manufacturer.
- D. It shall be illegal for a pumper/hauler business or property owner to fail to file the necessary reports in a timely manner.
- E. Any person who commits a summary offense and violates any of the provisions of this Ordinance shall be subject to prosecution by the Township and, upon conviction before a District Justice, shall be subject to a fine of not less than three hundred dollars (\$300) nor more than one thousand dollars (\$1,000), plus costs of prosecution.
- F. Each day of a continuing violation shall be considered a new and separate violation of this Ordinance and shall be subject to separate penalty.
- G. In addition to any other actions to obtain compliance, the Township may assess civil penalties as described in the PA Sewage Facilities Act.

SECTION XVI. - Severability

The provisions of this Ordinance shall be severable, and if any of its provisions shall be held to be unconstitutional, illegal, or invalid, such unconstitutionality, illegality, or invalidity shall not affect the validity of any of the remaining provisions of the Ordinance.

SECTION XVII. – Repealer

All other ordinances or parts of ordinances inconsistent herewith are hereby repealed.

ORDAINED AND ENACTED into an Ordinance this _____ day of _____, 2019.

BOARD OF SUPERVISORS
HONEY BROOK TOWNSHIP
CHESTER COUNTY, PA

ATTEST:

HONEY BROOK TOWNSHIP
BOARD OF SUPERVISORS

Steve Landes, Township Manager

Travis Stacey, Chairman

John McHugh, Vice Chairman

Tracy Olsen, Member

APPENDIX G
HONEY BROOK TOWNSHIP AND HONEY BROOK BOROUGH
PLANNING COMMISSION

HONEY BROOK TOWNSHIP PLANNING COMMISSION

January 24, 2019

Mr. Steven C. Landes, Township Manager
Honey Brook Township
P O Box 1281
500 Suplee Road
Honey Brook, PA 19344

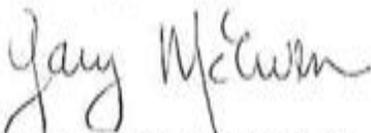
Subject: Honey Brook Township Act 537 Plan Update
Re: Act 537 Plan Review
EE, Inc. No.: 041-012

Dear Mr. Landes,

The Honey Brook Township Planning Commission met on December 13, 2018 to discuss the Act 537 Plan update for Honey Brook Township. The Commission reviewed the plan and found it to be consistent resulting in a recommendation of approval to be considered by the Board of Supervisors.

If you need any additional information or have any questions concerning the matter, please feel free to contact our office.

Very truly yours,



Jay McCune
Planning Commission Chair

CC: Michael Reinert, P.E., Technicon Enterprises, Inc. II
Tara Bernard, Ebert Engineering, Inc.

HONEY BROOK BOROUGH PLANNING COMMISSION



KIMBERLY P. VENZIE
p: 610.436.4400 Ext# 1650
f: 610.436.8305
e: kvenzie@buckleyllp.com
118 W. Market Street, Suite 300
West Chester, PA 19382-2928

February 12, 2019

VIA ELECTRONIC MAIL ONLY (*tbernard@ebertengineering.com*)

Tara Bernard
Ebert Engineering, Inc.
P.O. Box 540
4092 Skippack Pike, Suite 202
Skippack, PA 19474

RE: Honey Brook Township Act 537 Plan

Dear Tara:

As Solicitor to Honey Brook Borough, I can confirm that Honey Brook Borough Council and Honey Brook Borough Planning Commission are in receipt of a copy of Honey Brook Township's Act 537 Plan. Members of Honey Brook Borough Council and Borough Staff also serve as board members of the Northwestern Chester County Municipal Authority, and are familiar with the Act 537 Plan pursuant to their service upon the Authority Board.

My understanding is that Borough Council and the Planning Commission do not object to the Act 537 Plan as drafted with the understanding that it is a very fluid document which will need to be adjusted if certain developments come into fruition. I have also reviewed the Act 537 Plan. As you know, it is expected that DEP will have comments to the Act 537 Plan which will require additional revisions. We would appreciate any revisions being shared with us as the process continues.

Thank you.

Very truly yours,

A handwritten signature in black ink, appearing to read "K. Venzie", written over a horizontal line.

Kimberly P. Venzie

KPV/mm

cc: Honey Brook Borough Council
Honey Brook Borough Planning Commission
Janis Rambo, Borough Secretary

APPENDIX H
CHESTER COUNTY PLANNING COMMISSION



HONEY BROOK TOWNSHIP BOARD OF SUPERVISORS

COUNTY OF CHESTER

500 Suplee Road • P.O. Box 1281 • Honey Brook, PA 19344-1281

610-273-3970 • Fax 610-273-3909

www.honeybrooktwp.com

February 6, 2019

Attn: Carrie Conwell, AICP
Chester County Planning Commission
Government Services Center, Suite 270
601 Westtown Road,
West Chester, PA 19380-0990

Subject: Honey Brook Township Act 537 Sewage Facilities Plan Update
Honey Brook Township, Chester County
Re: Response to CCPC Act 537 Review

Dear Ms. Conwell,

Ebert Engineering, Inc. (EE, Inc.) is in receipt of Chester County Planning Commission (CCPC) review letter dated December 6, 2018 on the Honey Brook Township Act 537 Plan. Each review comment has been outlined below along with a response to each comment:

CCPC Comment A: Consistency of the Act 537 Plan Update with Landscapes3:

- We find the proposed areas to be served by sewer service to be generally consistent with the Landscapes Maps of Landscapes3 (2018). Honey Brook Township is primarily located within the Agricultural and Rural Landscapes, with portions located within the Rural Center, Urban Center and Suburban Landscapes. The Agricultural and Rural landscapes are locations in which Landscapes3 promotes the preservation of the County's rural character and agricultural industry. The extension of public sewer or water lines into the Rural and Agricultural Landscape is generally inconsistent with the Vision for the Rural and Agricultural landscapes according to Landscapes3.*

Specifically, the vision for the Rural Landscape is the preservation of significant areas of open space, critical natural areas, and cultural resources with a limited amount of content sensitive development permitted to accommodate residential and farm needs. On-lot sewage disposal, or very limited public or community sewer to serve cluster development or concentrations of failing on-lot sewage systems, is supported in this landscape. The vision for the Agricultural landscape is very limited development occurring at very low densities to preserve prime agricultural soils and farm operations. On-lot sewage disposal is supported in this landscape, except where public health requires alternatives.

The extension of the Northwestern Chester County Authority's (NWCCA) service area extensions are generally to accommodate existing developments with a high rate of on-lot system malfunctions, or high groundwater nitrates, rather than supporting new suburban-type development. Further, the Plan Update also addresses the NWCCA's wastewater treatment plant upgrade requirements. As proposed, the overall goals of this Act 537 Plan Update are generally consistent with the Visions, Goals and Objectives of Landscapes3.

EE, Inc. Response No. A1: No response is necessary.

- 2. Watersheds (2002), the water resources element of the County comprehensive plan, identifies Objective 7.2 of Goal 7, "concentrate planned utility service areas to support designated growth areas," to be achieved through key strategies such as restricting the extension of community and public water and wastewater facilities in the Rural Landscapes, and supporting the use of satellite systems and service to meet the needs of Rural Centers, Villages and cluster developments. Honey Brook Township, through its Act 537 Plan Update, intends to expand the public services areas of the NWCCA where necessary, as consistent with local land use planning, and maintain the use of on-lot systems whenever possible, which is consistent with this Objective and generally consistent with the goals of Watersheds.*

EE, Inc. Response No. A2: No response is necessary.

CCPC Comment No. B: *Consistency of the Alternative with Landscapes3:*

The selected alternatives for Honey Brook Township are presented in the Plan as the following Study Areas: The Suplee Study Area, the West Study Area, the Cupola Road Study Area, and the On-lot Systems Study Area. Most of the areas proposed to be served by the NCCMA were also proposed in the 2010 Act 537 Plan, or surveyed at that time for potential inclusion in a public sewer service area due to malfunctions or nitrate issues.

The Supple Study area includes two areas, one east of Struble Lake and one south of the existing Suplee service area. Both of these areas were surveyed in the 2010 Act 537 Plan and showed elevated nitrates. The West Study Area includes two additional parcels that, though zoned Agricultural, have on-lot failures, and are both proposed for redevelopment. The Cupola Study Area plans to add the Hammell O'Donnell Industrial Park, which is part of an Intermunicipal Agreement between Honey Brook Township, West Nantmeal Township and West Brandywine Township. The remainder of the Township will continue to utilize on-lot sewage systems.

As presented, the alternative is generally consistent with Landscape3 Connect Objective F, which states, "Coordinate water and sewage facilities planning with land use planning so that development is directed toward designated growth areas with adequate and well maintained infrastructure," and Connect Recommendation 10, which states: "Explore methods to improve coordination of long range planning goals for water and sewer infrastructure with land use planning."

EE, Inc. Response No. B: No comment is necessary.

CCPC Comment No. C: General Comments:

1. *The Planning Commission supports the comments presented by the Chester County Health Department in their letter, specifically the potential need of the Brandywine Terrace Mobile Home Park, located in the Cupola Study Area, to connect to the NWCCA system.*

EE, Inc. Response No. C1: The Brandywine Terrace property was included in the approved sewer service area with the HBT 537 plan in 2011. However it continues to have its own onlot community system. The property should continue to be included in the sewer service area and connected to public sewer once the redevelopment project occurs. Until that time, the Sewage Management Ordinance oversight will be implemented for the property.

2. *Honey Brook Township is to be commended for working to bring their planning documents into consistency with the necessary upgrades to the NWCCA wastewater treatment plant through the update of this plan. The Planning Commission also supports the ongoing efforts of the Township in the creation of the Septage Management Ordinance that is under development.*

EE, Inc. Response No. C2: No comment is necessary.

3. *Landscapes3, the Chester County Comprehensive Plan was adopted by the Chester County Commissioners on November 29, 2018. For consistency, please update documentation to include updated references to Landscapes3.*

EE, Inc. Response No. C3: Chapter IV page 1 of the Act 537 Plan was revised to incorporate this comment into the Plan.

4. *Page III-25, Septage Generation. The text states that there are five sewage holding tanks within within the Township. According to two 2018 Act 537 Planning Modules entitled Elmer Beiler, PA DEP Code #1-15932-548-2L and Baron Hill Storage, PA DEP CODE #1-15932-554-2LN, there will be seven holding tanks in the Township. For consistency, please update the text to include this project.*

EE, Inc. Response No. C4: Chapter III page 25 has been revised to identify seven septage located within Honey Brook Township.

5. *Page IV-4, Honey Brook Township Zoning Ordinance. The text references the current zoning ordinance, but does not include the adoption date. According to our records, Honey Brook Township adopted zoning amendments in September 12, 2018. This document may include an updated map, as well. For consistency, please update the text and map, as needed.*

EE, Inc. Response No. C5: Chapter IV page 4 has been revised to include a reference as to when the zoning was adopted.

- 6. Page IV-6. Stormwater. In addition to including information for stormwater provisions, please include for clarity the adoption date of the Township's stormwater ordinance. Our records indicate an adoption date of May 14, 2014.*

EE, Inc. Response No. C6: Chapter IV page 6 has been revised to include a reference as to when the Stormwater Ordinance was adopted.

- 7. Page IV-14. Projected Capacity Requirements within Proposed Sewer Service Areas. On the listing of Approved Developments in the public sewer areas, please include approved developments from 2018, including Elmer Beiler, Baron Hill Storage, and the Honey Brook Golf Club, if they are not listed under another name already.*

EE, Inc. Response No. C7: The list of developments provided in Chapter IV page 14, identifies developments within the public sewer service area. Both Elmer Beiler and Barron Hill Storage area not located within the public sewer service areas. The Honey Brook Golf Club will not be connecting to public sewer, they proposed to remain utilizing the existing permitted system to service their sewage disposal needs.

- 8. Page IV-23. Future Growth and Population Projections. The 2010 Census information that the Planning Commission utilizes shows the median age of 40.8 with 45.6% of the population begin between the ages of 25-64. Please revise the text for clarity.*

EE, Inc. Response No. C8: Chapter IV page 23 to 24 has been revised to utilize the median age of 40.8 with 45.6% of the population begin between the ages of 25-64.

- 9. Page VI-5. County Stormwater Management Plan. This paragraph includes information on the County and Township stormwater ordinance regulation. Please include the date of the Township stormwater ordinance's adoption, for reference.*

EE, Inc. Response No. C9: Chapter IV page 5 has been revised to include a reference as to when the Stormwater Ordinance was adopted.

- 10. Appendix G. Draft On-lot Sewage Management Ordinance. The Township should consider adopting a final version of a septage management ordinance that will require scheduled inspections, pump-outs, etc.*

EE, Inc. Response No. C10: The Township is working on adoption of the On-Lot Sewage Management Ordinance.

Honey Brook Township – Act 537 Sewage Facilities Plan

February 6, 2019

Page 5 of 5

If you need any additional information or have any questions concerning the matter, please feel free to contact our office.

Sincerely,

A handwritten signature in blue ink, appearing to read "Steve Landes".

Steve Landes
Township Manager

Enclosure

CC: Michael Reinert, Technicon Enterprises Inc. II
Frederick E. Ebert, Ebert Engineering, Inc.
File



THE COUNTY OF CHESTER

COMMISSIONERS

Michelle Kichline
Kathi Cozzone
Terence Farrell

Brian N. O'Leary, AICP
Executive Director

PLANNING COMMISSION

Government Services Center, Suite 270
601 Westtown Road
P. O. Box 2747
West Chester, PA 19380-0990
(610) 344-6285 Fax (610) 344-6515



December 6, 2018

Tracy Olsen, Chairman
Honey Brook Township
Board of Supervisors
PO Box 1281
Honey Brook, PA 19344

Re: Official Sewage Facilities Act 537 Plan Update for Honey Brook Township

Dear Ms. Olsen:

The Chester County Planning Commission (CCPC) has reviewed the Draft 537 Plan Update dated October 2018 as required by Section 71.53(a)(2) of the Pennsylvania Sewage Facilities Act (Act 537). The Plan was prepared by Ebert Engineering, Inc. and was received in our office on October 16, 2018.

This plan was prepared to further define areas of public sewer service and to address the existing Northern Chester County Municipal Authority (NCCMA) Waste Water Treatment Plant (WWTP) upgrade requirements. The upgrade of the plant will be a two phased approach in order for the NCCMA WWTP to meet PA DEP nutrient loading requirements at the permitted capacity. The other goal of the plan is to accommodate the projected growth within the Township and Borough by the existing NCCMA WWTP.

The plan proposes to address the disposal needs of the remainder of the Township through the continued use of individual on-lot sewage systems. The plan also discourages the use of stream discharge systems into the east or west branches of the Brandywine Creek. While the Township indicates that they currently do not have a Sewage Management Ordinance, they have been in the process of developing one, and provide information to homeowners with on-lot disposal systems at the Township building and on their website. The Chester County Planning Commission recommends the Plan be adopted after addressing comments in this letter.

The following comments are offered based on review of the document:

A. Consistency of the Act 537 Plan Update with *Landscapes3*:

1. We find the proposed areas to be served by sewer service to be generally consistent with the Landscapes Map of Ladsapes3 (2018). Honey Brook Township is primarily located within the Agricultural and Rural Landscapes, with portions

located within the Rural Center, Urban Center and Suburban Landscapes. The Agricultural and Rural landscapes are locations in which *Landscapes3* promotes the preservation of the County's rural character and agricultural industry. The extension of public sewer or water lines into the Rural and Agricultural Landscape is generally inconsistent with the Vision for the Rural and Agricultural landscapes according to *Landscapes3*.

Specifically, the vision for the Rural Landscape is the preservation of significant areas of open space, critical natural areas, and cultural resources with a limited amount of context sensitive development permitted to accommodate residential and farm needs. On-lot sewage disposal, or very limited public or community sewer to serve cluster development or concentrations of failing on-lot sewage systems, is supported in this landscape. The vision for the Agricultural landscape is very limited development occurring at very low densities to preserve prime agricultural soils and farm operations. On-lot sewage disposal is supported in this landscape, except where public health requires alternatives.

The extension of the Northwestern Chester County Authority's (NWCCA) service area extensions are generally to accommodate existing developments with a high rate of on-lot system malfunctions, or high groundwater nitrates, rather than supporting new suburban-type development. Further, the Plan Update also addresses the NWCCA's wastewater treatment plant upgrade requirements. As proposed, the overall goals of this Act 537 Plan Update are generally consistent with the Visions, Goals and Objectives of *Landscapes3*.

2. *Watersheds* (2002), the water resources element of the County comprehensive plan, identifies Objective 7.2 of Goal 7, "concentrate planned utility service areas to support designated growth areas," to be achieved through key strategies such as restricting the extension of community and public water and wastewater facilities in the Rural Landscape, and supporting the use of satellite systems and service areas to meet the needs of Rural Centers, Villages and cluster developments. Honey Brook Township, through its Act 537 Plan Update, intends to expand the public service areas of the NWCCA where necessary, as consistent with local land use planning, and maintain the use of on-lot systems whenever possible, which is consistent with this Objective and generally consistent with the goals of *Watersheds*.

B. Consistency of the Alternative with *Landscapes3*:

The selected alternatives for Honey Brook Township are presented in the Plan as the following Study Areas: The Supplee Study Area, the West Study Area, the Cupola Road Study Area, and the On-lot Systems Study Area. Most of the areas proposed to be served by the NCCMA were also proposed in the 2010 Act 537 Plan, or surveyed at that time for potential inclusion in a public sewer service area due to malfunctions or nitrate issues.

The Supplee Study area includes two areas, one east of Struble Lake and one south of the existing Supplee service area. Both of these areas were surveyed in the 2010 Act 537 Plan and showed elevated nitrates. The West Study Area includes two additional

parcels that, though zoned Agricultural, have on-lot failures, and are both proposed for redevelopment. The Cupola Study Area plans to add the Hammell O'Donnell Industrial Park, which is part of an Intermunicipal Agreement between Honey Brook Township, West Nantmeal Township and West Brandywine Township. The remainder of the Township will continue to utilize on-lot sewage systems.

As presented, the alternative is generally consistent with *Landscapes3* Connect Objective F, which states, "Coordinate water and sewage facilities planning with land use planning so that development is directed toward designated growth areas with adequate and well maintained infrastructure," and Connect Recommendation 10, which states: "Explore methods to improve coordination of long range planning goals for water and sewer infrastructure with land use planning."

C. General Comments:

1. The Planning Commission supports the comments presented by the Chester County Health Department in their letter, specifically the potential need of the Brandywine Terrace Mobile Home Park, located in the Cupola Study Area, to connect to the NWCCA system.
2. Honey Brook Township is to be commended for working to bring their planning documents into consistency with the necessary upgrades to the NWCCA wastewater treatment plant through the update of this plan. The Planning Commission also supports the ongoing efforts of the Township in the creation of the Septage Management Ordinance that is under development.
3. *Landscapes3*, the Chester County Comprehensive Plan was adopted by the Chester County Commissioners on November 29, 2018. For consistency, please update documentation to include updated references to *Landscapes3*.
4. Page III-25. Septage Generation. The text states that there are five sewage holding tanks within the Township. According to two 2018 Act 537 Planning Modules entitled Elmer Beiler, PA DEP Code # 1-15932-548-2L and Baron Hill Storage, PA DEP Code # 1-15932-554-2LN, there will be seven holding tanks in the Township. For consistency, please update the text to include this project.
5. Page IV-4. Honey Brook Township Zoning Ordinance. The text references the current zoning ordinance, but does not include the adoption date. According to our records, Honey Brook Township adopted zoning amendments in September 12, 2018. This document may include an updated map, as well. For consistency, please update the text and map, as needed.
6. Page IV-6. Stormwater. In addition to including information for stormwater provisions, please include for clarity the adoption date of the Township's stormwater ordinance. Our records indicate an adoption date of May 14, 2014.
7. Page IV-14. Projected Capacity Requirements within Proposed Sewer Service Areas. On the listing of Approved Developments in the public sewer areas, please

include approved developments from 2018, including Elmer Beiler, Baron Hill Storage, and the Honey Brook Golf Club, if they are not listed under another name already.

8. Page IV-23. Future Growth and Population Projections. The 2010 Census information that the Planning Commission utilizes shows the median age of 40.8 with 45.6% of the population being between the ages of 25-64. Please revise the text for clarity.
9. Page VI-5. County Stormwater Management Plan. This paragraph includes information on the County and Township stormwater ordinance regulations. Please include the date of the Township stormwater ordinance's adoption, for reference.
10. Appendix G. Draft On-Lot Sewage Management Ordinance. The Township should consider adopting a final version of a septage management ordinance that will require scheduled inspections, pump-outs, etc.

Thank you for the opportunity to offer comments on this plan. We trust that these comments will be of assistance to you as you prepare the final document for submission to PA DEP. The CCPC recommends approval of the plan after all comments have been addressed. If you have any questions, please contact me at 610-344-6285.

Sincerely,



Carrie Conwell, AICP
Senior Environmental Planner

cc: Elizabeth Mahoney, PA DEP
Tom Quinn, Chester County Health Department
Steve Landes, Honey Brook Township Manager
Tara Bernard, Ebert Engineering

APPENDIX I
CHESTER COUNTY HEALTH DEPARTMENT



HONEY BROOK TOWNSHIP BOARD OF SUPERVISORS

COUNTY OF CHESTER

500 Suplee Road • P.O. Box 1281 • Honey Brook, PA 19344-1281

610-273-3970 • Fax 610-273-3909

www.honeybrooktwp.com

February 6, 2019

Chester County Health Department
Water and Sewage Division
601 Westtown Road, Suite 288
West Chester, PA 19380-0990

Subject: Honey Brook Township
Act 537 Sewage Facilities Plan Update

Re: Response to CCHD Review

Dear Mr. Thomas S. Quinn,

Ebert Engineering, Inc. (EE, Inc.) is in receipt of Chester County Health Department. (CCHD) review letter dated November 9, 2018 for the Honey Brook Township Sewage Facilities Plan. Each review comment has been outlined below along with a response to each comment:

CCHD Comment No. 1: *It appears the Caernarvon Sewer Area should be expanded to include the eleven properties along Hillview Road*

Response No. 1: This Development is service by individual on-lot sewage disposal systems. The eleven properties are ^{NOT} connected to Caernarvon Public Sewer.

CCHD Comment No. 2: *In the Cupola Sewer area CCHD has identified the Brandywine Terrace Mobile Home Park as a property with sewage facilities needs which should be connected to public sewer in this service area. There have been documented sewage violations at his mobile home park.*

Response No. 2: – The Brandywine Terrace property was included in the approved sewer service area with the HBT 537 plan in 2011. However it continues to have its own onlot community system. The property should continue to be included in the sewer service area and connected to public sewer once the redevelopment project occurs. Until that time, the Sewage Management Ordinance Oversight will be implemented for the property.

CCHD Comment No. 3: From the well survey results it appears Honey Brook Township's ground water quality is being degraded by elevated nitrate levels found in a high percentage of the existing wells in the surveyed areas. Honey Brook Township should take steps to help preserve the ground water, particularly since it is noted in the plan that 98% of the township is identified as a High Quality watershed.

Response No. 3: The Township is enacting a Sewage Management Ordinance which will help educate property owners and ensure maintenance is being performed on the existing septic systems and necessary repairs are occurring.

CCHD Comment No. 4: Comments pertaining to Appendix F (Draft Sewage Management Ordinance)

- a. *Section IV. Replacement Areas, CCHD recommends the Township not require recording of replacement areas on the deed of properties. As this can become confusing as some properties go through the permitting process multiple time with absorption areas locations changing from time to time. CCHD would suggest the applicant provide sufficient documentation to the municipality to validate that a suitable replacement area exists on the property.*

Response No. 4a: The Township has taken the Health Department's suggestion and the Draft Sewage Management Ordinance has been revised to not require recording of the replacement areas. A copy of the revised Draft Ordinance is attached.

- b. *Section XIII. Hearing Procedures for Appeals and Variances, (C.1)*

CCHD recommends removing items "c" and "d" from this section as neither supports the long range sewage facilities goals of the municipality. If the municipality chooses to leave this section in place, CCHD would recommend adding clause giving the municipality the ability to impose additional requirements, thus ensuring the long range sewage facilities when and if a variance is granted. The additional requirements could include over sizing of the sewage disposal system, secondary treatment or a site specific operation and maintenance agreement for the property involved.

Response No. 4b: The Township has taken the Health Department's suggestion and the Draft Sewage Management Ordinance has been revised to remove items C and D from Section XIII. A copy of the revised Draft Ordinance is attached.

- c. *The ordinance document should specify that all pumping should be conducted by a liquid waste hauler who is licensed by the Chester County Health Department.*

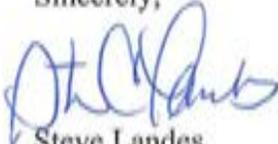
Response No. 4c: The Township has taken the Health Department's suggestion and the Draft Sewage Management Ordinance has been revised to specify that all pumping should be conducted by a liquid water hauler who is licensed by CCHD. A copy of the revised Draft Ordinance is attached.

d. CCHD would recommend Honey Brook Township update the On-Lot Sewage Management Ordinance document and approve it at its earliest convenience in order to ensure the long-term sewage facilities of the on-lot sewage disposal systems within the municipality.

Response No. 4d: The On-Lot Sewage Management Ordinance has been revised to include the Health Department suggestions. The Township intends on approving the revised Ordinance as soon as possible and adopting the Ordinance.

If you need any additional information or have any questions concerning the matter, please feel free to contact our office.

Sincerely,



Steve Landes
Township Manager

Enclosure

CC: Michael Reinert, Technicon Enterprises Inc. II
Frederick E. Ebert, Ebert Engineering, Inc.
File



THE COUNTY OF CHESTER



COMMISSIONERS

Michelle Kichline
Kathi Cozzone
Terence Farrell

JEANNE E. CASNER, MPH, PMP
County Health Director

CHESTER COUNTY HEALTH DEPARTMENT

Water and Sewage Division
Chester County Government Services Center
601 Westtown Road, Suite 288
West Chester, PA 19380-0990
610-344-6526 FAX: 610-344-5934
www.chesco.org/health

Date: November 9, 2018

Tracy Olsen, Chairperson
Honey Brook Township Board of Supervisors
P.O. Box 1281, Honey Brook, Pa 19344

RE: Honey Brook Township
Act 537 Sewage Facilities Plan Update

Dear Ms. Olsen:

The Chester County Health Department (CCHD) received the above noted Act 537 Sewage Facilities Plan Update on October 17, 2018; this Sewage Facilities Plan was prepared by Ebert Engineering, Inc. and dated October 4, 2018, and has been reviewed in accordance with Title 25, Environmental Protection, Chapter 71, Administration of Sewage Facilities Planning Program, Chapter 71 § 71.31.(b.).

The intent of this plan is to update Honey Brook Township's current Act 537 plan to account for current and future public sewage facility needs within the township. The plan proposes to accomplish this by upgrading the Northern Chester County Municipal Authority wastewater treatment plant (NCCMA) to address current PA DEP permit requirements, and increasing treatment capacity of the treatment plant to support future growth within the municipality. We offer the following comments:

- 1) It appears the Caernarvon Sewer Area should be expanded to include the eleven properties along Hillview Road.
- 2) In the Copula Sewer area CCHD has identified the Brandywine Terrace Mobile Home Park as a property with sewage facilities needs which should be connected to public sewer in this service area. There have been documented sewage violations at this mobile home park.
- 3) From the well survey results it appears Honey Brook Township's ground water quality is being degraded by elevated nitrate levels found in a high percentage of the existing wells in the surveyed areas. Honey Brook Township should take steps

to help preserve the ground water quality, particularly since it is noted in the plan that 98 % of the township is identified as a High Quality watershed.

4) Comments pertaining to Appendix F (Draft Sewage Management Ordinance)

- a. Section IV. Replacement Areas, CCHD recommends the Township not require recording of replacement areas on the deed of properties. As this can become confusing as some properties go through the permitting process multiple times with absorption area locations changing from time to time. CCHD would suggest the applicant provide sufficient documentation to the municipality to validate that a suitable replacement area exists on the property.
- b. Section XIII. Hearing Procedures for Appeals and Variances, (C. 1)

CCHD recommends removing items "c" and "d" from this section as neither supports the long range sewage facilities goals of the municipality. If the municipality chooses to leave this section in place, CCHD would recommend adding clause giving the municipality the ability to impose additional requirements, thus ensuring the long range sewage facilities when and if a variance is granted. The additional requirements could include oversizing of the sewage disposal system, secondary treatment or a site specific operation and maintenance agreement for the property involved.
- c. The ordinance document should specify that all pumping should be conducted by a liquid waste hauler who is licensed by the Chester County Health Department.
- d. CCHD would recommend Honey Brook Township update the On-Lot Sewage Management Ordinance document and approve it at its earliest convenience in order to ensure the long-term sewage facilities of the on-lot sewage disposal systems within the municipality.

Upon completing the review of the Sewage Facilities Plan Update the Chester County Health Department finds the overall plan to be very detailed and precise in detailing the updated sewage facilities for correcting and expanding the public sewage facilities within Honey Brook Township. Other than the items noted above, CCHD has no objections to this update.

Thank you for the opportunity to review this draft. Please contact me if you have any questions or concerns in reference to my comments. I can be reached at 610-344-5276 or Tquinn@chesco.org. Also, upon approval of the Special Study, please send us a completed and approved copy of the Special Study Plan.

Respectfully,

A handwritten signature in black ink, appearing to read 'Thomas S. Quinn', with a long horizontal line extending to the right.

Thomas S. Quinn
Environmental Health Supervisor
Chester County Health Department

CC: Carrie Conwell, Chester County Planning Commission
Elizabeth Mahoney, PA DEP
Tara Bernard, Ebert Engineering, Inc.
Steve Landes, Honey Brook Township Manager
File

APPENDIX J
PENNSYLVANIA NATURAL DIVERSITY INDEX (PNDI)
CORRESPONDENCE

1. PROJECT INFORMATION

Project Name: **NCCMA WWTP Upgrade**

Date of Review: **5/30/2018 01:52:08 PM**

Project Category: **Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant (construction, expansion or modification)**

Project Area: **18.07 acres**

County(s): **Chester**

Township/Municipality(s): **HONEY BROOK**

ZIP Code: **19344**

Quadrangle Name(s): **WAGONTOWN**

Watersheds HUC 8: **Brandywine-Christina**

Watersheds HUC 12: **Upper East Branch Brandywine Creek; Upper West Branch Brandywine Creek**

Decimal Degrees: **40.093152, -75.865118**

Degrees Minutes Seconds: **40° 5' 35.3474" N, 75° 51' 54.4243" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 must comply with the bog turtle habitat screening requirements of the PASPGP.

NCCMA WWTP Upgrade

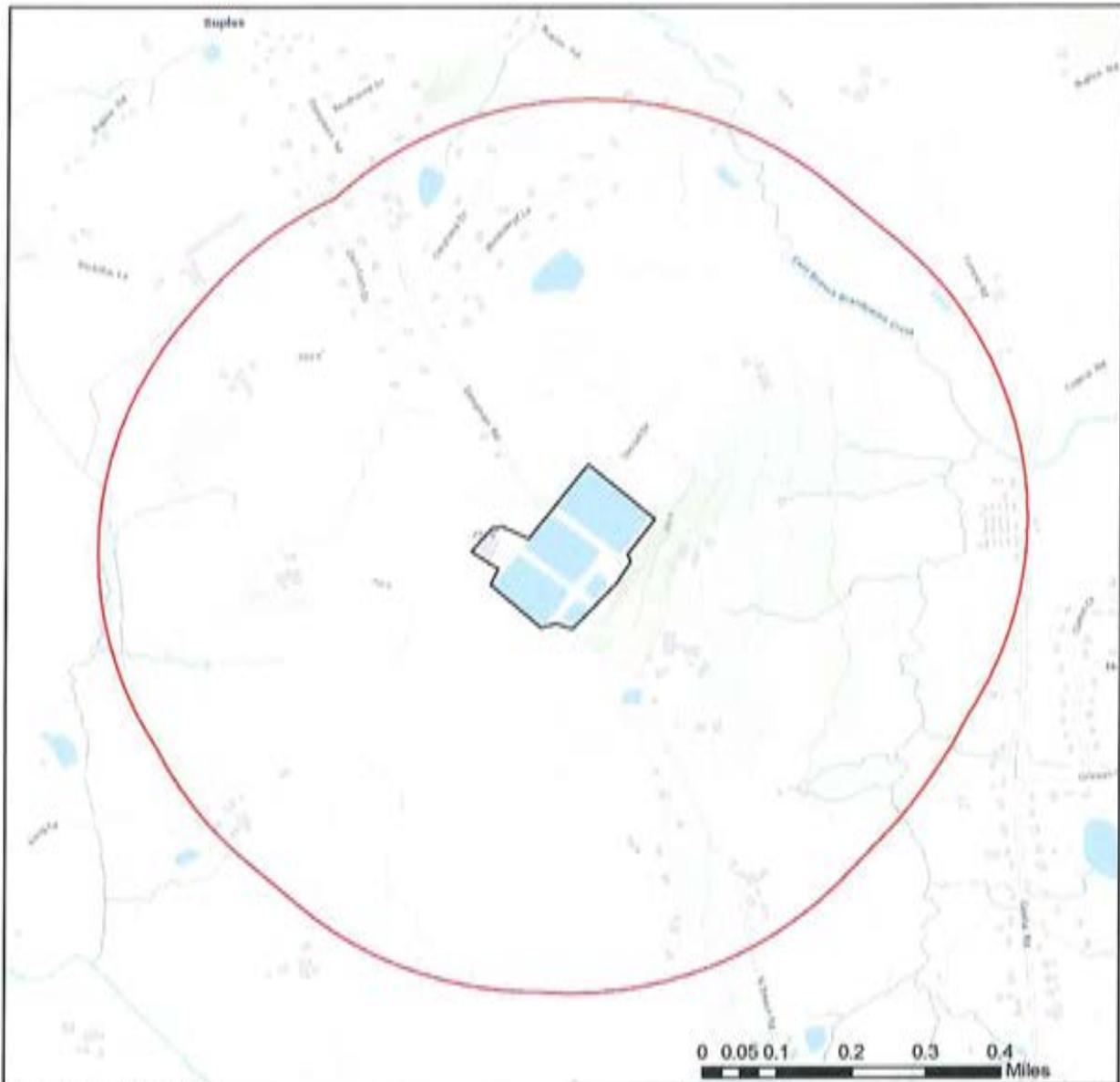


- Project Boundary
- Buffered Project Boundary



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Geobase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

NCCMA WWTP Upgrade



- Project Boundary
- Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Geobase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,



RESPONSE TO QUESTION(S) ASKED

Q1: Are there any perennial or intermittent waterways (rivers, streams, creeks, tributaries) in or near the project area, or on the land parcel?

Your answer is: No

Q2: Describe how wastewater (effluent) will be handled (select one). For the purpose of this question, wastewater/effluent does not include stormwater runoff. If the project involves solely the renewal or modification of an existing discharge permit (e.g., NPDES permit), select from options 3, 4, 5, or 6 below.

Your answer is: Some or all wastewater/effluent from this project/activity will be discharged to a waterway (river or stream), and the discharge (including the existing discharge, plus any additional discharge) will exceed 5000 gallons/day.

Q3: Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected – either directly or indirectly – by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur.

Your answer is: Someone qualified to identify and delineate wetlands has investigated the site, and determined that NO wetlands are located in or within 300 feet of the project area. (A written report from the wetland specialist, and detailed project maps should document this.)

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE:

No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE:

No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE:

No impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE:

No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at <https://conservationexplorer.dcnr.pa.gov/content/resources>.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

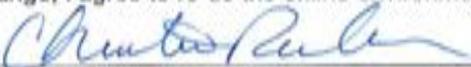
PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Christina Ruble
Company/Business Name: Ebert Engineering, Inc.
Address: PO Box 540, 4092 Skippack Pike, Suite 202
City, State, Zip: Skippack, PA 19474
Phone: (610) 584-6701 Fax: (610) 584-6704
Email: cruble@ebertengineering.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.



applicant/project proponent signature

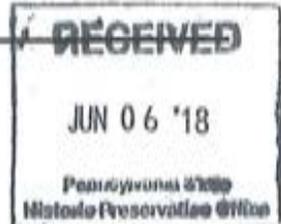
5/30/2018

date

APPENDIX K
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION (PHMC)
CORRESPONDENCE

Ebert Engineering, Inc.

Water and Wastewater Engineering



June 1, 2018

Pennsylvania Historical & Museum Commission
Bureau of Historic Preservation
400 North Street, Second Floor
Harrisburg, PA 17120-0093

Certified Mail No. 7015 0640 0004 2281 6206 – Return Receipt Requested

Subject: Northwestern Chester County Municipal Authority WWTP Upgrade
Act 537 Sewage Facilities Plan Update
Honey Brook Township, Chester County, PA
EEI Project No. 041-012

Dear Sir or Madam,

Enclosed is the Cultural Resource Notice for the Act 537 Sewage Facilities Planning for the Northwestern Chester County Municipal Authority Wastewater Treatment Plant (WWTP) Upgrade located in Honey Brook Township, Chester County, Pennsylvania. The following information is enclosed to assist you in your evaluation of the referenced project which includes the following:

- Cultural Resource Notice
- USGS Location Map, Wagontown Quadrangle
- Project Narrative
- Aerial Photograph and Existing Features Site Plan
- Site Plans with Proposed Modifications to the WWTP

All site work associated with the WWTP Upgrade will be located within or immediately adjacent to the existing buildings and lagoon areas. Given that the only buildings located on the property are structures related to the treatment plant, photographs of these buildings are not included in this submission and will remain intact. Total land disturbance will be less than 1 acre. Should you have any questions or require any additional information, please feel free to contact our office.

Sincerely,

Christina Ruble
Planning Specialist

Enclosure

ER No. <u>2018-1659-029-A</u>	
The project will have NO EFFECT on historic properties	
Date <u>06/07/18</u>	Reviewer <u>[Signature]</u>

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

PA Historical & Museum
Commission
Bureau of Historic Preservation
400 North Street, 2nd Floor
Harrisburg PA 17120-0093



9590 9403 0179 5120 4987 95

2. Article Number (Transfer from service label)

7015 0640 0004 2281 6206

PS Form 3811, April 2015 PSN 7530-02-000-9053

COMPLETE THIS SECTION ON DELIVERY

A. Signature

[Handwritten Signature]

- Agent
- Addressee

B. Received by (Printed Name) JUN 06 2018 C. Date of Delivery

D. Is delivery address different from item 1? Yes
If YES, enter delivery address below: No

3. Service Type

- Adult Signature
- Adult Signature Restricted Delivery
- Certified Mail®
- Certified Mail Restricted Delivery
- Collect on Delivery
- Collect on Delivery Restricted Delivery
- Insured Mail
- Insured Mail Restricted Delivery (over \$500)
- Priority Mail Express®
- Registered Mail™
- Registered Mail Restricted Delivery
- Return Receipt for Merchandise
- Signature Confirmation™
- Signature Confirmation Restricted Delivery

Domestic Return Receipt

Ebert Engineering, Inc.

Water and Wastewater Engineering

June 1, 2018

Pennsylvania Historical & Museum Commission
Bureau of Historic Preservation
400 North Street, Second Floor
Harrisburg, PA 17120-0093

Certified Mail No. 7015 0640 0004 2281 6206 – Return Receipt Requested

Subject: Northwestern Chester County Municipal Authority WWTP Upgrade
Act 537 Sewage Facilities Plan Update
Honey Brook Township, Chester County, PA
EEI Project No. 041-012

Dear Sir or Madam,

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All site work associated with the WWTP Upgrade will be located within or immediately adjacent to the existing buildings and lagoon areas. Given that the only buildings located on the property are structures related to the treatment plant, photographs of these buildings are not included in this submission and will remain intact. Total land disturbance will be less than 1 acre. Should you have any questions or require any additional information, please feel free to contact our office.

Sincerely,



Christina Ruble
Planning Specialist

Enclosure

Project Narrative

Honey Brook Township and Honey Brook Borough has three public sanitary sewer service areas which service portions of Honey Brook Township and Honey Brook Borough. Wastewater generated in the West, Suplee, and Cupola Sewer Districts is conveyed and treated at the Northwestern Chester County Municipal Authority (NCCMA) Wastewater Treatment plant (WWTP) located at 37 Dampman Road in Chester County, Pennsylvania. The WWTP was originally constructed in the 1970s and has remained in operation since it was constructed.

The Township is currently administering an Act 537 Plan Update to further define the areas of public sewer, address required upgrades to the existing WWTP to meet ammonia effluent discharge limits during winter months, and to accommodate flow projections to the WWTP as a result of new connections to the sewer system. The existing WWTP is permitted for treatment of an average daily flow of 0.6 MGD and will be upgraded to a treatment capacity of 0.74 MGD in order to accommodate future growth in the Honey Brook Township and Honey Brook Borough.

The existing treatment plant was designed as an aerated lagoon system followed by tertiary filtration. Disinfection is provided by gas chlorination. The proposed upgrades to the WWTP will include retrofitting the existing lagoon system by upgrading the existing aeration system, adding covers to the lagoons, adding a polishing reactor, modifications to the existing headworks, and modifications to tanks, sand filters, and disinfection within the treatment plant building. The majority of the upgrade modifications will be done to the existing lagoon with minimal to no earth disturbance. The only proposed construction activities resulting in land disturbance is the addition of the polishing reactor which would be housed in a structure adjacent to the existing lagoons. The attached plans identify the proposed upgrades and work to be completed.

The total land disturbance is less than 1 acre. The attached site plans identify the existing WWTP layout and the proposed modifications.

DEP USE ONLY
Date Received



CULTURAL RESOURCE NOTICE

Read the instructions before completing this form.

SECTION A. APPLICANT IDENTIFIER					
Applicant Name	Northwestern Chester County Municipal Authority				
Street Address	PO Box 308, 5277 Horseshoe Pike, Suite 103				
City	Honey Brook	State	PA	Zip	19344
Telephone Number	610-273-2265				
Project Title	Northwestern Chester County Municipal Authority WWTP Upgrade				
SECTION B. LOCATION OF PROJECT					
Municipality	Honey Brook Township	County Name	Chester	DEP County Code	15
SECTION C. PERMITS OR APPROVALS					
Name of Specific DEP Permit or Approval Requested:	Township Act 537 Plan Update				
Anticipated federal permits:					
<input type="checkbox"/>	Surface Mining	<input type="checkbox"/>	404 Water Quality Permit		
<input type="checkbox"/>	Army Corps of Engineers	<input type="checkbox"/>	Federal Energy Regulatory Commission		
<input type="checkbox"/>	401 Water Quality Certification	<input type="checkbox"/>	Other: _____		
SECTION D. GOVERNMENT FUNDING SOURCES					
<input type="checkbox"/>	State: (Name) _____	<input type="checkbox"/>	Local: (Name) _____		
<input type="checkbox"/>	Federal: (Name) _____	<input type="checkbox"/>	Other: (Name) _____		
SECTION E. RESPONSIBLE DEP REGIONAL, CENTRAL, DISTRICT MINING or OIL & GAS MGMT OFFICE					
DEP Regional Office Responsible for Review of Permit Application		<input type="checkbox"/>	Central Office (Harrisburg)		
<input checked="" type="checkbox"/>	Southeast Regional Office (Norristown)	<input type="checkbox"/>	Northeast Regional Office (Wilkes-Barre)		
<input type="checkbox"/>	Southcentral Regional Office (Harrisburg)	<input type="checkbox"/>	Northcentral Regional Office (Williamsport)		
<input type="checkbox"/>	Southwest Regional Office (Pittsburgh)	<input type="checkbox"/>	Northwest Regional Office (Meadville)		
<input type="checkbox"/>	District Mining Office: _____	<input type="checkbox"/>	Oil & Gas Office: _____		
SECTION F. RESPONSIBLE COUNTY CONSERVATION DISTRICT, if applicable.					
County Conservation District	Telephone Number, if known				
Chester County Conservation District	610-925-4920				
SECTION G. CONSULTANT					
Consultant, if applicable	Ebert Engineering, Inc.				
Street Address	4092 Skippack Pike, Suite 202, P.O. Box 540				
City	Skippack	State	PA	Zip	19474
Telephone Number	610-584-6701				

SECTION H. PROJECT BOUNDARIES AND DESCRIPTION

REQUIRED

Indicate the total acres in the property under review. Of this acreage, indicate the total acres of earth disturbance for the proposed activity.

Attach a 7.5' U.S.G.S. Map indicating the defined boundary of the proposed activity.

Attach photographs of any building over 50 years old. Indicate what is to be done to all buildings in the project area.

Attach a narrative description of the proposed activity.

Attach the return receipt of delivery of this notice to the Pennsylvania Historical and Museum Commission.

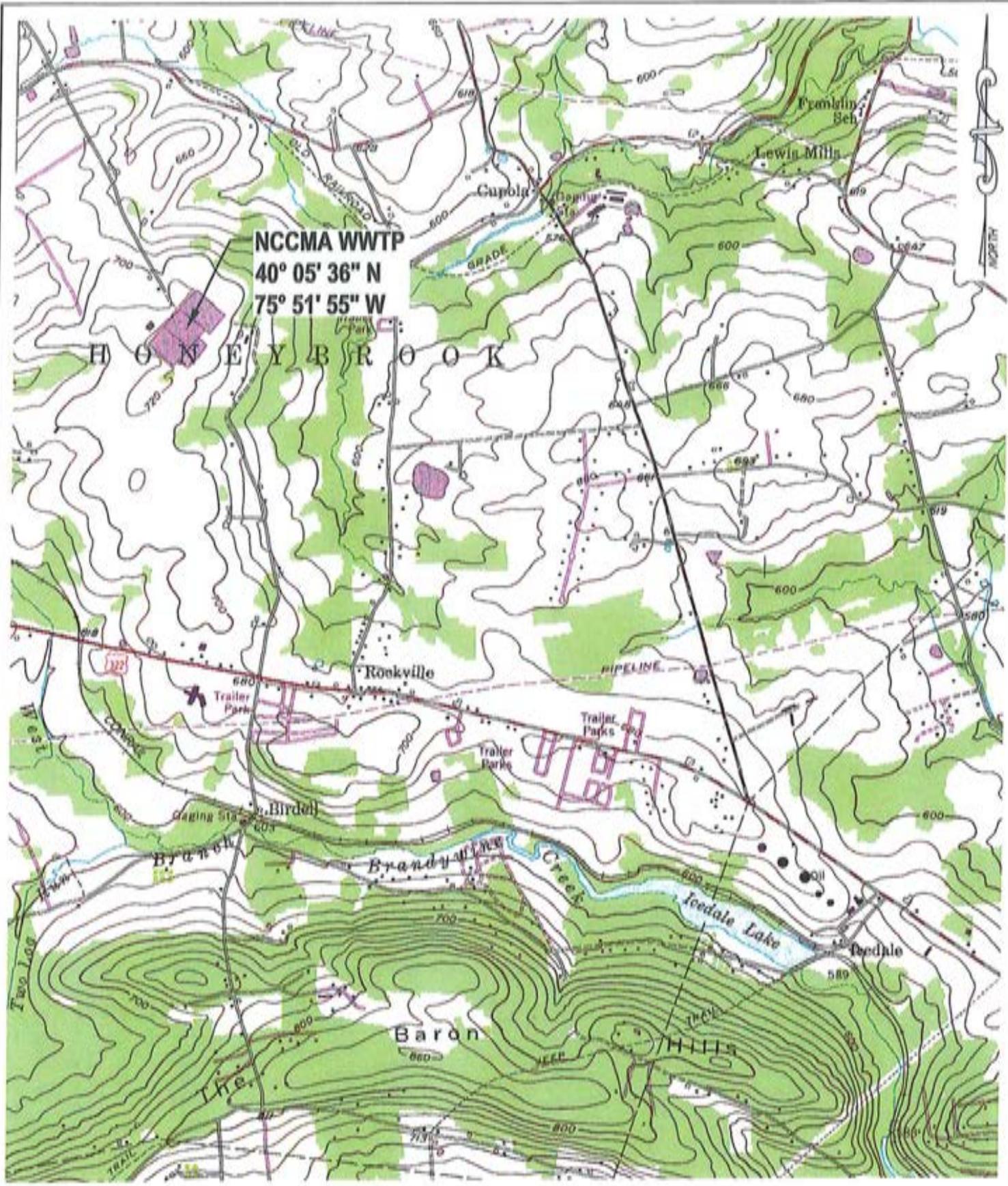
REQUESTED

Attach photographs of any building over 40 years old.

Attach site map, if available.

SECTION I. SIGNATURE BLOCK

 Applicant's Signature	<u>6/1/2018</u> Date of Submission of Notice to PHMC
--	---



NCCMA WWTP
 40° 05' 36" N
 75° 51' 55" W

H O N E Y B R O O K

Rookville

Birdell

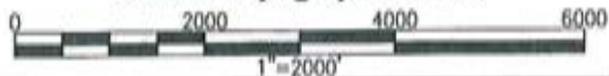
Brandywine Creek

Icedale Lake

Baron

HILLS

Honey Brook Twp., Chester Co., PA
Wagontown Quadrangle
7.5 Min. Topographic Series



Ebert Engineering, Inc.

Water and Wastewater Engineering

PO Box 540
 4092 Skippack Pike, Suite 202
 Skippack, PA 19474

Phone (610) 584 6701
 Fax (610) 584 6704

E-mail febert@ebertengineering.com



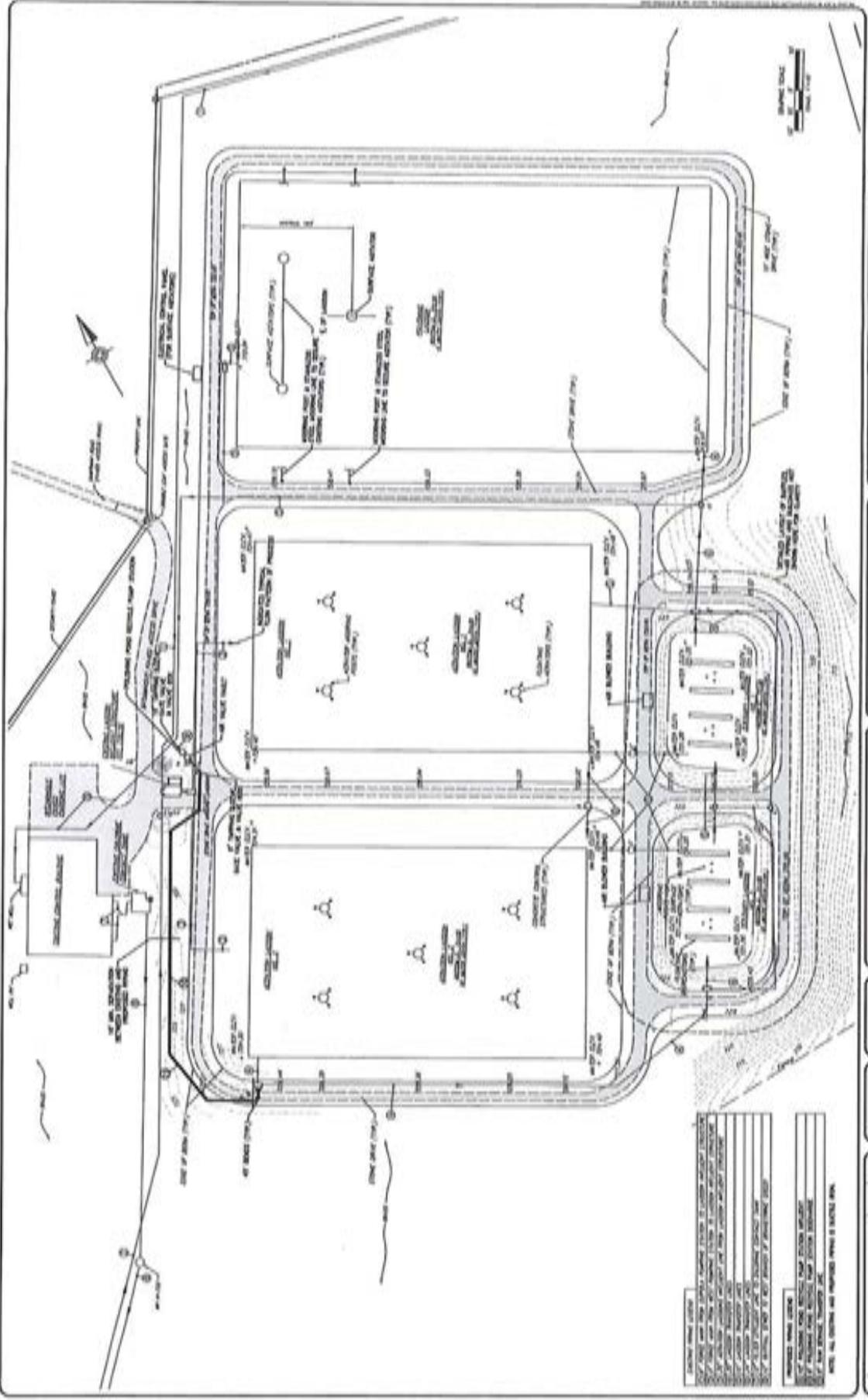
DATE	NOV 14 2012
SCALE	AS SHOWN
PROJECT	EXISTING ROOMA WWTTP LAYOUT
CLIENT	NORTHWESTERN CHESTER COUNTY MUNICIPAL AUTHORITY
LOCATION	2381 ST DAMPIAN ROAD, HONEYBROOK, PA 19344
PROJECT NO.	12-001
DATE	NOV 14 2012

EXISTING ROOMA WWTTP LAYOUT
FOR
ACT SET WWTTP EVALUATION

NORTHWESTERN CHESTER COUNTY
MUNICIPAL AUTHORITY
P.O. BOX 2381, ST DAMPIAN ROAD
HONEYBROOK, PA 19344

HRG
 CONSULTANTS
 ENGINEERING & ARCHITECTURE
 1000 PENNSYLVANIA AVENUE, SUITE 1000
 PHILADELPHIA, PA 19106
 TEL: 215.583.8000
 WWW.HRGCONSULTANTS.COM

NO	REVISION	DATE	BY



THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF HARGREAVES & ASSOCIATES, INC. (HARGREAVES & ASSOCIATES, INC.) AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF HARGREAVES & ASSOCIATES, INC.

DATE	NOV 14 2014
BY	HRG
PROJECT NO.	14-002
PROJECT NAME	ACT 327 WWTPL EVALUATION
SCALE	AS SHOWN

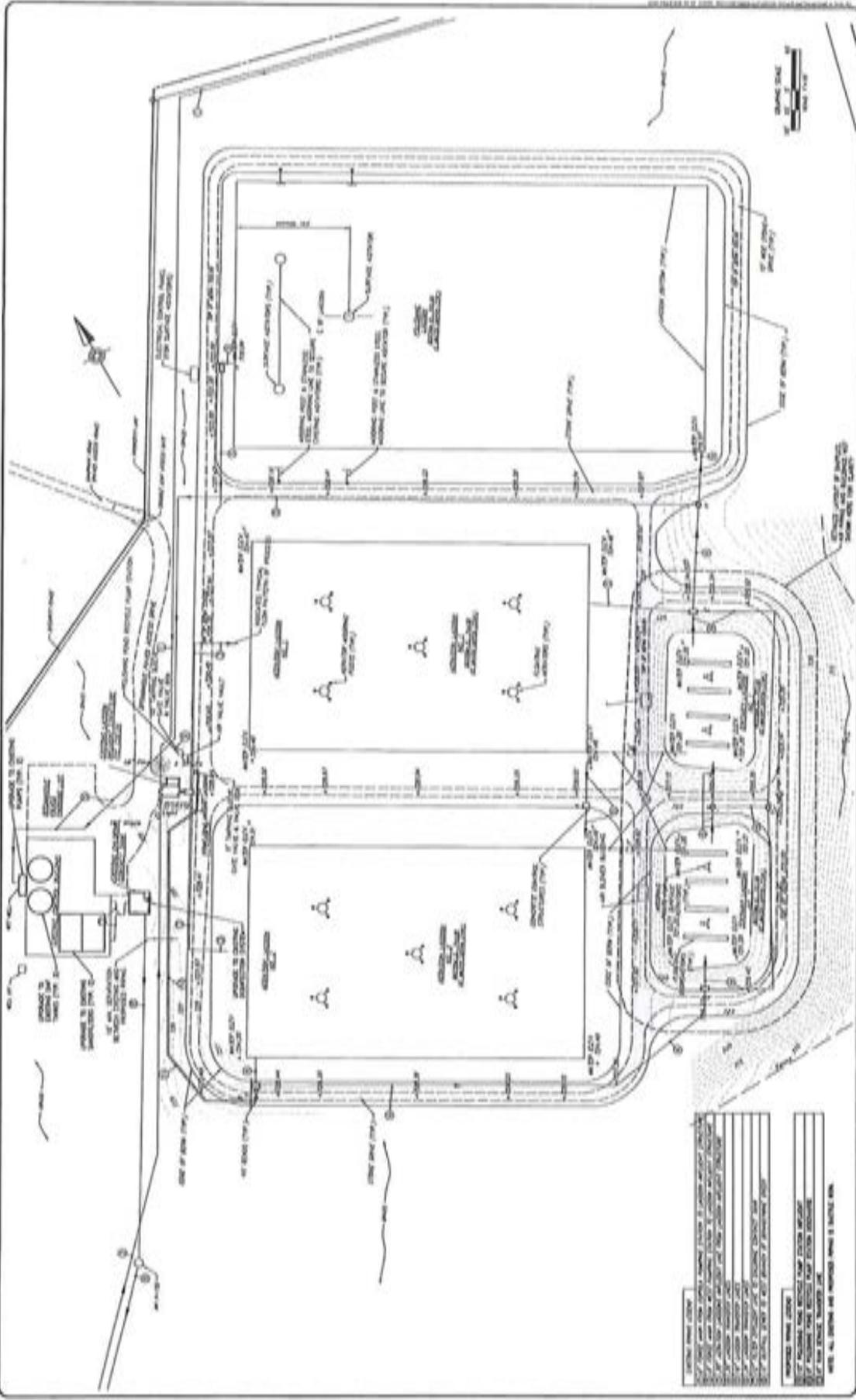
NORTHWESTERN CHESTER COUNTY
 MUNICIPAL AUTHORITY
 P.O. BOX 304, ST DAMPSON ROAD
 HONEYBROOK, PA 19344

HRG
 HARGREAVES & ASSOCIATES, INC.
 1000 W. MARKET STREET, SUITE 200
 PHILADELPHIA, PA 19106
 (215) 563-1000
 WWW.HRG-PA.COM

EXISTING NORMA WWTPL LAYOUT
 FOR
 ACT 327 WWTPL EVALUATION

NO.	REVISION	DATE	BY

DATE	NOV 14 2014
BY	HRG
PROJECT NO.	14-002
PROJECT NAME	ACT 327 WWTPL EVALUATION
SCALE	AS SHOWN



SHEET NO. **1A-2**
 OF **10**
 DATE: **10/1/2011**

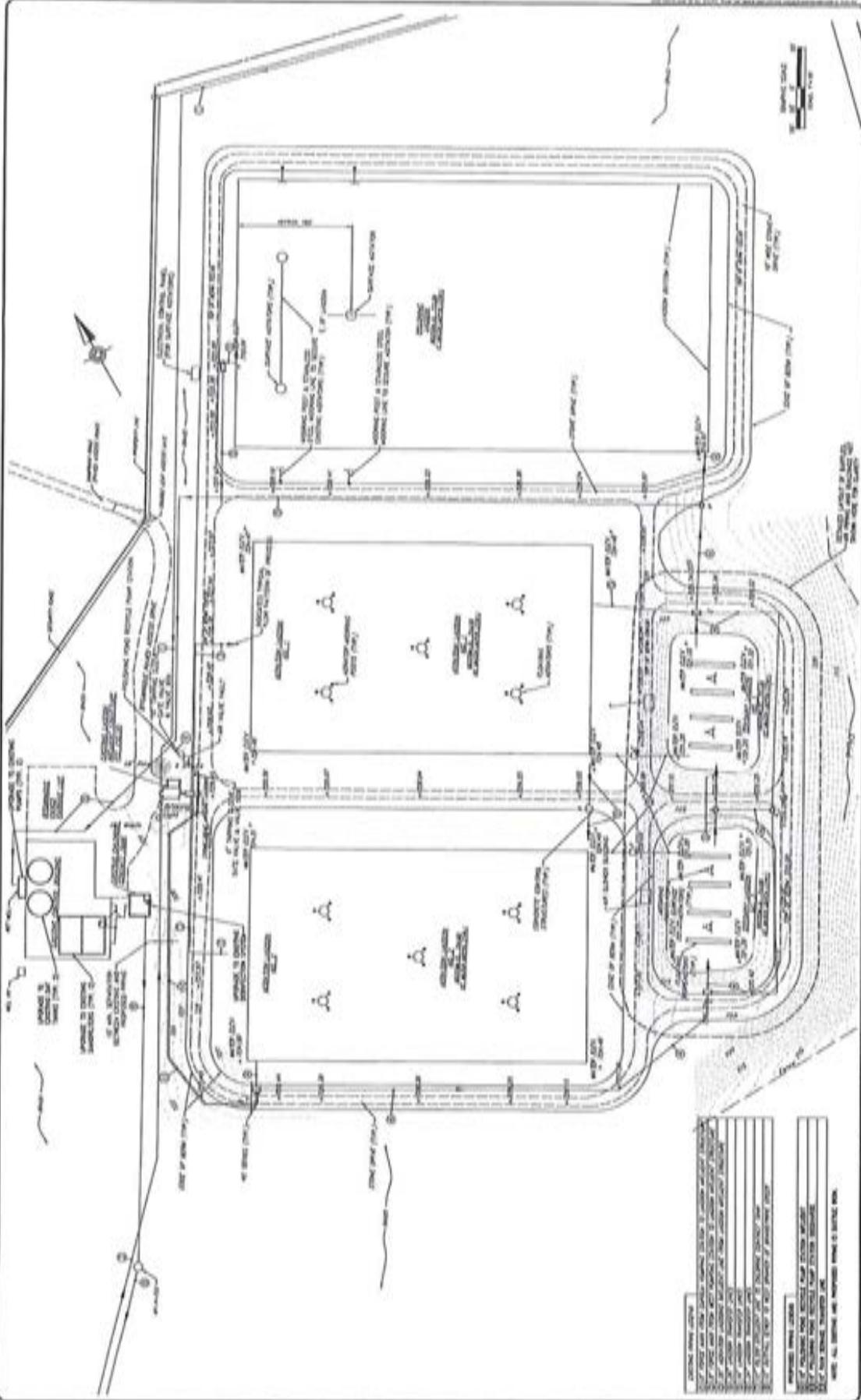
ALTERNATIVE 1A - PROPOSED WWTP LAYOUT
 PHASE 1 - HYDRAULIC CAPACITY UPGRADE
 FOR
 ACT 527 WWTP EVALUATION

NORTHWESTERN CHESTER COUNTY
 MUNICIPAL AUTHORITY
 P.O. BOX 308, 37 DARTMAN ROAD
 HONEYBROOK, PA 19044



NO.	REVISION	DATE	BY

PREPARED BY: **JOHN J. BROWN**
 CHECKED BY: **JOHN J. BROWN**
 DATE: **10/1/2011**



PROJECT NO.	18-2
DATE	10/1/18
SCALE	AS SHOWN
DESIGNER	HRG
CHECKED	
APPROVED	

ALTERNATIVE 18 - PROPOSED WWTP LAYOUT
 PHASE 2 - HYDRAULIC CAPACITY UPGRADE
 FOR
 ACT 507 WWTP EVALUATION

NORTHEASTERN CHESTER COUNTY
 MUNICIPAL AUTHORITY
 P.O. BOX 301, ST DAVIDS ROAD
 HONEYBROOK, PA 17344

HRG
 Engineering & Construction Services
 1000 N. 10th Street, Suite 100
 York, PA 17404
 Phone: 717.761.1000
 Fax: 717.761.1001
 www.hrginc.com

NO.	DESCRIPTION	DATE	BY

DATE: 10/1/18
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 APPROVED BY: [Name]

APPENDIX L
PUBLIC NOTICE

PUBLIC COMMENT
HONEY BROOK TOWNSHIP ADOPTION
OF
HONEY BROOK TOWNSHIP ACT 537 PLAN

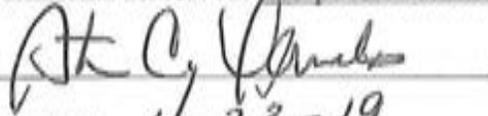
Public Comment Period:

First Day: March 11, 2019

Last Day: April 11, 2019

Number of Comments Received: No public comments were received.

Certified By



Date of Certification:

4-23-19

PHILADELPHIA GROUP

AFFIDAVIT OF PUBLICATION
307 Derstine Avenue • Lansdale, PA 19446

HONEY BROOK TOWNSHIP
PO BOX 1281
HONEY BROOK, PA 19344
Attention:

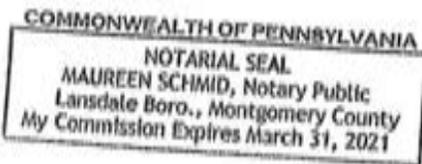
STATE OF PENNSYLVANIA,
"COUNTY OF MONTGOMERY

The undersigned Jacqueline A. Kelly, being duly sworn the he/she is the principal clerk of Daily Local News, Daily Local News Digital, published in the English language for the dissemination of local or transmitted news and intelligence of a general character, which are duly qualified newspapers, and the annexed hereto is a copy of certain order, notice, publication or advertisement of:

HONEY BROOK TOWNSHIP

Published in the following edition(s):

Daily Local News 03/11/19
Daily Local News Digital 03/11/19



Sworn to the subscribed before me this 3/11/2019.

Maureen Schmid
Notary Public, State of Pennsylvania
Acting in County of Montgomery

PUBLIC NOTICE

In accordance with the requirements of Title 25, Chapter 71 of the Pennsylvania Code, Honey Brook Township is accepting written comments over the next 30 days on the proposed adoption of the Official Sewage Facilities (Act 537) Plan for Honey Brook Township. This Act 537 Plan provides for improved wastewater facilities in accordance with the township's local and regional goals. The selected alternatives identified in the Act 537 Plan include to the retrofits of the lagoon to meet effluent discharge limits. Phase I (Nitrification Upgrade), consist of the construction of new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Phase II (Hydraulic Capacity Upgrade) is the rerate of the existing treatment plant from 0.60 mgd to 0.74 mgd and construction modifications to existing process equipment to accommodate future planning flows. Phase III (Denitrification Upgrade) construct new facilities required for denitrification if needed. The plan will also add two areas to the Suplee public sanitary sewer service district (Dampman Road between Windswept Lane and Southwind Drive), minor revision to the West and Cupola Service Areas, execution of intermunicipal agreement with West Hartman Township to service Hannell O'Donnell property and the upgrade of the Cupola Pumping Station from 691 gpm pumping capacity to 950 gpm pumping capacity. The proposed upgrades and additional capacity gained from these alternatives is expected to be adequate for the 20 year planning period. There is a 30-day period during which the Act 537 Plan is available to be viewed at the Honey Brook Township building at 500 Suplee Road, Honey Brook, PA 19344 between the normal hours of operation. The review period shall extend until the close of business on the thirtieth day after the date of this public notice. Written comments may be submitted to Steve Landes, Township Manager, at PO Box 1281, 500 Suplee Road, Honey Brook, PA 19344. DL-Mar 11-1a

Advertisement Information

Client Id: 884445 **Ad Id:** 1764357 **PO:** **Sales Person:** 093304

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DL-Mar 11-1a

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This Act 537 Plan provides for improved wastewater facilities in accordance with the Township's local and regional goals. The selected alternatives identified in the Act 537 Plan include the retrofits of the lagoon to meet effluent discharge limits. Phase I (Nitrification Upgrade), consist of the construction of new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Phase II (Hydraulic Capacity Upgrade) is the rerate of the existing treatment plant from 0.60 mgd to 0.74 mgd and construction modifications to existing process equipment to accommodate future planning flows. Phase III (Denitrification Upgrade) construct new facilities required for denitrification if needed. The plan will also add two areas to the Suplee public sanitary sewer service district (Dampman Road between Windswept Lane and Southwind Drive), minor revision to the West and Cupola Service Areas, execution of intermunicipal agreement with West Nantmeal Township to service Hammell O'Donnell property and the upgrade of the Cupola Pumping Station from 691 gpm pumping capacity to 950 gpm pumping capacity. The proposed upgrades and additional capacity gained from these alternatives is expected to be adequate for the 20 year planning period.

There is a 30-day period during which the Act 537 Plan is available to be viewed at the Honey Brook Township building at 500 Suplee Road, Honey Brook, PA 19344 between the normal hours of operation. The review period shall extend until the close of business on the thirtieth day after the date of this public notice. Written comments may be submitted to Steve Landes, Township Manager, at PO Box 1281, 500 Suplee Road, Honey Brook, PA 19344.

APPENDIX M
HONEY BROOK TOWNSHIP AND HONEY BROOK BOROUGH
RESOLUTION FOR PLAN REVISION

HONEY BROOK TOWNSHIP RESOLUTION FOR PLAN REVISION

HONEY BROOK TOWNSHIP, CHESTER COUNTY
RESOLUTION NO. 2019-10
OFFICIAL ACT 537 SEWAGE FACILITIES PLAN

Resolution of the Supervisors of Honey Brook Township, Chester County, Pennsylvania (herein after the Municipality).

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires the municipality to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of the municipality, and Borough.

WHEREAS, Honey Brook Township, has prepared said Official Act 537 Sewage Facilities Plan which provides for sewage facilities in Honey Brook Township, and the alternative of choice to be implemented is the retrofits of the lagoon to meet effluent discharge limits. Phase I (Nitrification Upgrade), consist of the construction of new facilities capable of achieving full nitrification at current design flow of 0.60 MGD. Phase II (Hydraulic Capacity Upgrade) is the rerate of the existing treatment plant from 0.60 mgd to 0.74 mgd and construction modifications to existing process equipment to accommodate future planning flows. The plan will also add two areas to the Suplee public sanitary sewer service district (Dampman Road between Windswept Lane and Southwind Drive) and the upgrade of the Cupola Pumping Station from 691 gpm pumping capacity to 950 gpm pumping capacity.

WHEREAS, Honey Brook Township finds that the Official Act 537 Plan described above conforms to applicable zoning, subdivision, other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management.

NOW, THEREFORE, BE IT RESOLVED that the Township of Honey Brook hereby adopts and submits to the Department of Environmental Protection for its approval as a revision to the "Official Plan" of the Municipality, the above referenced Facility Plan. The Municipality hereby assures the Department of the complete and timely implementation of the said plan as required by law. (Section 5, Pennsylvania Sewage Facilities Act as amended).

I, Steven C. Landes, Secretary, Honey Brook Township Board of Supervisors, hereby certify that the foregoing is a true copy of the Township's Resolution No. 2019-10, adopted this 8th day of May, 2019.

Attest:

Honey Brook Township Board of Supervisors



Steven C. Landes



HONEY BROOK BOROUGH RESOLUTION FOR PLAN REVISION

HONEY BROOK BOROUGH, CHESTER COUNTY
RESOLUTION NO. 2019 - 07

A Resolution of the Borough Council of Honey Brook Borough, Chester County, Pennsylvania with regard to review of Honey Brook Township's Official Act 537 Sewage Facilities Plan.

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires municipalities to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of municipalities. Honey Brook Township has revised its plan and submitted such plan to the Department of Environmental Protection for review and approval.

WHEREAS, Honey Brook Borough has reviewed Honey Brook Township's Official Act 537 Sewage Facilities Plan which provides for sewage facilities in the Township, and the alternative of choice to be implemented is the retrofits of the lagoon to meet effluent discharge limits. The plan will also add two areas to the Suplec public sanitary sewer service district and an upgrade of the Cupola Pumping Station. The 30-day public comment period ended on April 11, 2019 in which no public comments were received by the Township. Therefore the Borough has not changed its position on the Official Act 537 Plan.

WHEREAS, Honey Brook Borough has no objection to the Official Act 537 Plan as summarized above provided it complies with applicable zoning, subdivision, other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management. Honey Brook Borough does note the Borough residents should not be financially impacted by sewage facility improvements costs that have a direct correlation to increased development within Honey Brook Township.

NOW, THEREFORE, BE IT RESOLVED that the Borough of Honey Brook has no objection to the Act 537 Plan as proposed by Honey Brook Township.

Approved this 6th day of May 2019.

Attest:


Secretary

HONEY BROOK BOROUGH

By: 
President

Approved?


Mayor

HONEY BROOK BOROUGH, CHESTER COUNTY
RESOLUTION NO. 2019-06

A Resolution of the Borough Council of Honey Brook Borough, Chester County, Pennsylvania with regard to review of Honey Brook Township's Official Act 537 Sewage Facilities Plan.

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, requires municipalities to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of municipalities. Honey Brook Township has revised its plan and submitted such plan to the Department of Environmental Protection for review and approval.

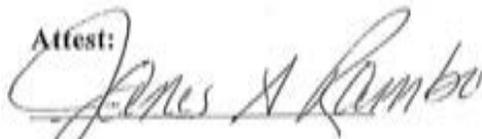
WHEREAS, Honey Brook Borough has reviewed Honey Brook Township's Official Act 537 Sewage Facilities Plan which provides for sewage facilities in the Township, and the alternative of choice to be implemented is the retrofits of the lagoon to meet effluent discharge limits. The plan will also add two areas to the Suplee public sanitary sewer service district and an upgrade of the Cupola Pumping Station.

WHEREAS, Honey Brook Borough has no objection to the Official Act 537 Plan as summarized above provided it complies with applicable zoning, subdivision, other municipal ordinances and plans and to a comprehensive program of pollution control and water quality management. Honey Brook Borough does note the Borough residents should not be financially impacted by sewage facility improvements costs that have a direct correlation to increased development within Honey Brook Township.

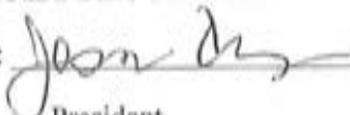
NOW, THEREFORE, BE IT RESOLVED that the Borough of Honey Brook has no objection to the Act 537 Plan as proposed by Honey Brook Township.

Approved this 1st day of April 2019.

Attest:


Secretary

HONEY BROOK BOROUGH

By: 
President

Approved:



Mayor

APPENDIX N
ACT 537 PLAN CONTENT AND ENVIRONMENTAL ASSESSMENT
CHECKLIST


ACT 537 PLAN CONTENT AND ENVIRONMENTAL ASSESSMENT CHECKLIST
PART 1 GENERAL INFORMATION
A. Project Information

- Project Name Honey Brook Township
- Brief Project Description 537 PPlan Update - Township Wide

B. Client (Municipality) Information

Municipality Name	County	City	Boro	Twp
Honey Brook	Chester	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Landes	Steve		Mr.	Township Manager
Additional Individual Last Name	First Name	MI	Suffix	Title
Municipality Mailing Address Line 1	Mailing Address Line 2			
PO Box 1281	500 Suplee Road			
Address Last Line -- City	State	ZIP+4		
Honey Brook	PA	19344		
Phone + Ext.	FAX (optional)	Email (optional)		
610-273-3970		manager@honeybrooktwp.org		

C. Site Information

Site (or Project) Name	(Municipal Name) Act 537 Plan
Honey Brook Township	
Site Location Line 1	Site Location Line 2

D. Project Consultant Information

Last Name	First Name	MI	Suffix
Ebert	Frederick	E	Mr.
Title	Consulting Firm Name		
President	Ebert Engineering, Inc.		
Mailing Address Line 1	Mailing Address Line 2		
PO Box 540	4092 Skippack Pike		
Address Last Line -- City	State	ZIP+4	Country
Skippack	PA	19474	USA
Email	Phone + Ext.	FAX	
febert@ebertengineering.com	610-584-6701		

PART 2 ADMINISTRATIVE COMPLETENESS CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	In addition to the main body of the plan, the plan must include items one through eight listed below to be accepted for formal review by DEP. Incomplete plans may be <i>denied</i> unless the municipality is clearly requesting an advisory review.
_____	<u>TOC-1</u>	<ol style="list-style-type: none"> 1. Table of Contents 2. Plan Summary
_____	<u>ES-1</u>	A. Identify the proposed service areas and major problems evaluated in the plan. (Reference - 25 Pa. Code §71.21(a)(7)(i)).
_____	<u>ES-1</u>	B. Identify the alternative(s) chosen to solve the problems and serve the areas of need identified in the plan. Also, include any institutional arrangements necessary to implement the chosen alternative(s). (Reference - 25 Pa. Code §71.21(a)(7)(ii)).
_____	<u>ES-3</u>	C. Present the estimated cost of implementing the proposed alternative (including the user fees) and the proposed funding method to be used. (Reference - 25 Pa. Code §71.21(a)(7)(ii)).
_____	<u>ES-3</u>	D. Identify the municipal commitments necessary to implement the Plan. (Reference - 25 Pa. Code §71.21(a)(7)(iii)).
_____	<u>ES-3</u>	E. Provide a schedule of implementation for the project that identifies the <i>major</i> milestones with dates necessary to accomplish the project to the point of operational status. (Reference - 25 Pa. Code §71.21(a)(7)(iv)).
_____	<u>Apx I</u>	3. Municipal Adoption: <i>Original</i> , signed and sealed Resolution of Adoption by the municipality which contains, at a minimum, alternatives chosen and a commitment to implement the Plan in accordance with the implementation schedule. (Reference - 25 Pa. Code §71.31(f)) Section V.F. of the Planning Guide.
_____	<u>Apx E, F, G</u>	4. Planning Commission / County Health Department Comments: Evidence that the municipality has requested, reviewed and considered comments by appropriate official planning agencies of the municipality, planning agencies of the county, planning agencies with area wide jurisdiction (where applicable), and any existing county or joint county departments of health. (Reference - 25 Pa. Code §71.31(b)) Section V.E.1 of the Planning Guide.
_____	<u>Apx H</u>	5. Publication: Proof of Public Notice which documents the proposed plan adoption, plan summary, and the establishment and conduct of a 30-day comment period. (Reference - 25 Pa. Code §71.31(c)) Section V.E.2 of the Planning Guide.
_____	<u>Apx H</u>	6. Comments and Responses: Copies of <i>all</i> written comments received and municipal response to <i>each</i> comment in relation to the proposed plan. (Reference - 25 Pa. Code §71.31(c)) Section V.E.2 of the Planning Guide.
_____	<u>ES-5</u>	7. Implementation Schedule: A complete project implementation schedule with milestone dates specific for each existing and future area of need. Other activities in the project implementation schedule should be indicated as occurring a finite number of days from a major milestone. (Reference - 25 Pa. Code §71.31(d)) Section V.F. of the Planning Guide. Include dates for the future initiation of feasibility evaluations in the project's implementation schedule for areas proposing completion of sewage facilities for planning periods in excess of five years. (Reference - 25 Pa. Code §71.21(c)).
_____	<u>Apx E, F, G</u>	8. Consistency Documentation: Documentation indicating that the appropriate agencies have received, reviewed and concurred with the method proposed to resolve identified inconsistencies within the proposed alternative and consistency requirements in 25 Pa. Code §71.21.(a)(5)(i-iii). (Reference - 25 Pa. Code §71.31(e)). Appendix B of the Planning Guide.

PART 3 GENERAL PLAN CONTENT CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	Item Required
_____	<u>I</u>	I. Previous Wastewater Planning
_____	<u>I-1</u>	A. Identify, describe and briefly analyze all past wastewater planning for its impact on the current planning effort:
_____	<u>I-2</u>	1. Previously undertaken under the Pennsylvania Sewage Facilities Act (Act). (Reference - Act 537, 35 P.S. §750.5(d)(1)).
_____	<u>I-3</u>	2. Has not been carried out according to an approved implementation schedule contained in the plans. (Reference - 25 Pa. Code §71.21(a)(5)(i)(A-D)), Section V.F of the Planning Guide.
_____	<u>I-10 to I-12</u>	3. Is anticipated or planned by applicable sewer authorities or approved under a Chapter 94 Corrective Action Plan. (Reference - 25 Pa. Code §71.21(a)(5)(i)(A&B)). Section V.D. of the Planning Guide.
_____	<u>I-10 to I-12</u>	4. Through planning modules for new land development, planning "exemptions" and addenda. (Reference - 25 Pa. Code §71.21(a)(5)(i)(A)).
_____	<u>II</u>	II. Physical and Demographic Analysis utilizing written description and mapping (All items listed below require maps, and all maps should show all current lots and structures and be of appropriate scale to clearly show significant information).
_____	<u>II-1 to II-4</u>	A. Identification of planning area(s), municipal boundaries, Sewer Authority/Management Agency service area boundaries. (Reference - 25 Pa. Code §71.21(a)(1)(i)).
_____	<u>II-8</u>	B. Identification of physical characteristics (streams, lakes, impoundments, natural conveyance, channels, drainage basins in the planning area). (Reference - 25 Pa. Code §71.21(a)(1)(ii)).
_____	<u>II-11 to II-22</u>	C. Soils - Analysis with description by soil type and soils mapping for areas not presently served by sanitary sewer service. Show areas suitable for in-ground onlot systems, elevated sand mounds, individual residential spray irrigation systems (IRSIS), and areas unsuitable for soil dependent systems. (Reference - 25 Pa. Code §71.21(a)(1)(iii)). Show Prime Agricultural Soils and any locally protected agricultural soils. (Reference - 25 Pa. Code §71.21(a)(1)(iii)).
_____	<u>II-24 to II-26</u>	D. Geologic Features - (1) Identification through analysis, (2) mapping and (3) their relation to existing or potential nitrate-nitrogen pollution and drinking water sources. Include areas where existing nitrate-nitrogen levels are in excess of 5 mg/L. (Reference - 25 Pa. Code §71.21(a)(1)(iii)).
_____	<u>II-27</u>	E. Topography - Depict areas with slopes that are suitable for conventional systems; slopes that are suitable for elevated sand mounds and slopes that are unsuitable for onlot systems. (Reference - 25 Pa. Code §71.21(a)(1)(ii)).
_____	<u>II-29</u>	F. Potable Water Supplies - Identification through mapping, description and analysis. Include public water supply service areas and available public water supply capacity and aquifer yield for groundwater supplies. (Reference - 25 Pa. Code §71.21(a)(1)(vi)). Section V.C. of the Planning Guide.
_____	<u>II-29 to II-30</u>	G. Wetlands-Identify wetlands as defined in 25 Pa. Code Chapter 105 by description, analysis and mapping. Include National Wetland Inventory mapping and potential wetland areas per the United States Department of Agricultural (USDA) Natural Resources Conservation Service (NRCS) mapped hydric soils. Proposed collection, conveyance and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. (Reference - 25 Pa. Code §71.21(a)(1)(v)). Appendix B, Section II.I of the Planning Guide.

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| _____ | <u>III</u> | III. Existing Sewage Facilities in the Planning Area - Identifying the Existing Needs |
| _____ | | A. Identify, map and describe municipal and non-municipal, individual and community sewerage systems in the planning area including: |
| _____ | <u>III-1 to III-12</u> | 1. Location, size and ownership of treatment facilities, main intercepting lines, pumping stations and force mains including their size, capacity, point of discharge. Also include the name of the receiving stream, drainage basin, and the facility's effluent discharge requirements. (Reference - 25 Pa. Code §71.21(a)(2)(i)(A)). |
| _____ | <u>III-12 to III-15</u> | 2. A narrative and schematic diagram of the facility's basic treatment processes including the facility's National Pollutant Discharge Elimination System (NPDES) permitted capacity, and the Clean Streams Law permit number. (Reference - 25 Pa. Code §71.21(a)(2)(i)(A)). |
| _____ | <u>III-12 to III-15</u> | 3. A description of problems with existing facilities (collection, conveyance and/or treatment), including existing or projected overload under 25 Pa. Code Chapter 94 (relating to municipal wasteload management) or violations of the NPDES permit, Clean Streams Law permit, or other permit, rule or regulation of DEP. (Reference - 25 Pa. Code §71.21(a)(2)(i)(B)). |
| _____ | <u>III-12 to III-15</u> | 4. Details of scheduled or in-progress upgrading or expansion of treatment facilities and the anticipated completion date of the improvements. Discuss any remaining reserve capacity and the policy concerning the allocation of reserve capacity. Also discuss the compatibility of the rate of growth to existing and proposed wastewater treatment facilities. (Reference - 25 Pa. Code §71.21(a)(4)(i & ii)). |
| _____ | <u>III-16 to III-18</u> | 5. A detailed description of the municipality's operation and maintenance (O & M) requirements for small flow treatment facility systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs (SMPs). (Reference - 25 Pa. Code §71.21(a)(2)(i)(C)). |
| _____ | <u>III-19</u> | 6. Disposal areas, if other than stream discharge, and any applicable groundwater limitations. (Reference - 25 Pa. Code §71.21(a)(4)(i & ii)). |
| _____ | <u>III-19</u> | B. Using DEP's publication titled <i>Act 537 Sewage Disposal Needs Identification</i> (3800-BK-DEP1949), identify, map and describe areas that utilize individual and community onlot sewage disposal and, unpermitted collection and disposal systems ("wildcat" sewers, borehole disposal, etc.) and retaining tank systems in the planning area including: |
| _____ | <u>III-19</u> | 1. The types of onlot systems in use. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(A)). |
| _____ | <u>III-21</u> | 2. A sanitary survey complete with description, map and tabulation of documented and potential public health, pollution, and operational problems (including malfunctioning systems) with the systems, including violations of local ordinances, the Act, the Clean Stream Law or regulations promulgated thereunder. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(B)). |
| _____ | <u>III-19 to III-21</u> | 3. A comparison of the types of onlot sewage systems installed in an area with the types of systems which are appropriate for the area according to soil, geologic conditions, topographic limitations sewage flows, and 25 Pa. Code Chapter 73 (relating to standards for sewage disposal facilities). (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)). |
| _____ | <u>III-23</u> | 4. An individual water supply survey to identify possible contamination by malfunctioning onlot sewage disposal systems consistent with DEP's <i>Act 537 Sewage Disposal Needs Identification</i> publication. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(B)). |

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| _____ | <u>III-16 to III-18</u> | 5. Detailed description of O & M requirements of the municipality for individual and small volume community onlot systems, including the status of past and present compliance with these requirements and any other requirements relating to SMPs. (Reference - 25 Pa. Code §71.21(a)(2)(i)(C)). |
| _____ | <u>III-25</u> | C. Identify wastewater sludge and septage generation, transport and disposal methods. Include this information in the sewage facilities alternative analysis including: |
| _____ | <u>III-25</u> | 1. Location of sources of wastewater sludge or septage (Septic tanks, holding tanks, wastewater treatment facilities). (Reference - 25 Pa. Code §71.71). |
| _____ | <u>III-25</u> | 2. Quantities of the types of sludges or septage generated. (Reference - 25 Pa. Code §71.71). |
| _____ | <u>III-25</u> | 3. Present disposal methods, locations, capacities and transportation methods. (Reference - 25 Pa. Code §71.71). |
| _____ | <u>IV</u> | IV. Future Growth and Land Development |
| _____ | | A. Identify and briefly summarize all municipal and county planning documents adopted pursuant to the Pennsylvania Municipalities Planning Code (Act 247) including: |
| _____ | <u>IV-1 to IV-2</u> | 1. All land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational and open space areas. (Reference - 25 Pa. Code §71.21(a)(3)(iv)). |
| _____ | <u>IV-4 to IV-5</u> | 2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods. (Reference - 25 Pa. Code §71.21(a)(3)(iv)). |
| _____ | <u>IV-5 to IV-7</u> | 3. All limitations and plans related to floodplain and stormwater management and special protection (25 Pa. Code Chapter 93) areas. (Reference - 25 Pa. Code §71.21(a)(3)(iv)) Appendix B, Section II.F of the Planning Guide. |
| _____ | <u>IV-7</u> | B. Delineate and describe the following through map, text and analysis. |
| _____ | <u>IV-10 to Map 1</u> | 1. Areas with existing development or plotted subdivisions. Include the name, location, description, total number of equivalent dwelling units (EDUs) in development, total number of EDUs currently developed and total number of EDUs remaining to be developed (include time schedule for EDUs remaining to be developed). (Reference - 25 Pa. Code §71.21(a)(3)(i)). |
| _____ | <u>IV-9 to Map 12</u> | 2. Land use designations established under the Pennsylvania Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial and industrial areas. (Reference - 25 Pa. Code §71.21(a)(3)(ii)). Include a comparison of proposed land use as allowed by zoning and existing sewage facility planning. (Reference - 25 Pa. Code §71.21(a)(3)(iv)). |
| _____ | <u>IV-10 to IV-21</u> | 3. Future growth areas with population and EDU projections for these areas using historical, current and future population figures and projections of the municipality. Discuss and evaluate discrepancies between local, county, state and federal projections as they relate to sewage facilities. (Reference - 25 Pa. Code §71.21(a)(1)(iv) and (a)(3)(iii)). |
| _____ | <u>IV-4 to Map 13</u> | 4. Zoning, and/or subdivision regulations; local, county or regional comprehensive plans; and existing plans of any other agency relating to the development, use and protection of land and water resources with special attention to: (Reference - 25 Pa. Code §71.21(a)(3)(iv)).
--public ground/surface water supplies
--recreational water use areas
--groundwater recharge areas
--industrial water use
--wetlands |

____ IV-20 5. Sewage planning necessary to provide adequate wastewater treatment for 5 and 10-year future planning periods based on projected growth of existing and proposed wastewater collection and treatment facilities. (Reference - 25 Pa. Code §71.21(a)(3)(v)).

____ V **V. Identify Alternatives to Provide New or Improved Wastewater Disposal Facilities**

____ V-1 to V-14 A. Conventional collection, conveyance, treatment and discharge alternatives including:

____ V-1 to V-14 1. The potential for regional wastewater treatment. (Reference - 25 Pa. Code §71.21(a)(4)).

____ V-1 to V-14 2. The potential for extension of existing municipal or non-municipal sewage facilities to areas in need of new or improved sewage facilities. (Reference - 25 Pa. Code §71.21(a)(4)(i)).

____ V-1 to V-14 3. The potential for the continued use of existing municipal or non-municipal sewage facilities through one or more of the following: (Reference - 25 Pa. Code §71.21(a)(4)(ii)).

____ V-1 to V-14 a. Repair. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(A)).

____ V-1 to V-14 b. Upgrading. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(B)).

____ V-1 to V-14 c. Reduction of hydraulic or organic loading to existing facilities. (Reference - 25 Pa. Code §71.71).

____ V-1 to V-14 d. Improved O & M. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(C)).

____ V-1 to V-14 e. Other applicable actions that will resolve or abate the identified problems. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(D)).

____ V-1 to V-14 4. Repair or replacement of existing collection and conveyance system components. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(A)).

____ V-1 to V-14 5. The need for construction of new community sewage systems including sewer systems and/or treatment facilities. (Reference - 25 Pa. Code §71.21(a)(4)(iii)).

____ V-1 to V-14 6. Use of innovative/alternative methods of collection/conveyance to serve needs areas using existing wastewater treatment facilities. (Reference - 25 Pa. Code §71.21(a)(4)(ii)(B)).

____ N/A B. The use of individual sewage disposal systems including IRSIS systems based on:

____ N/A 1. Soil and slope suitability. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)).

____ N/A 2. Preliminary hydrogeologic evaluation. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)).

____ N/A 3. The establishment of a SMP. (Reference - 25 Pa. Code §71.21(a)(4)(iv)). See also Part "F" below.

____ N/A 4. The repair, replacement or upgrading of existing malfunctioning systems in areas suitable for onlot disposal considering: (Reference - 25 Pa. Code §71.21(a)(4)).

____ N/A a. Existing technology and sizing requirements of 25 Pa. Code Chapter 73. (Reference - 25 Pa. Code §73.31-§73.72).

____ N/A b. Use of expanded absorption areas or alternating absorption areas. (Reference - 25 Pa. Code §73.16).

____ N/A c. Use of water conservation devices. (Reference - 25 Pa. Code §71.73(b)(2)(iii)).

- _____ N/A C. The use of small flow sewage treatment facilities or package treatment facilities to serve individual homes or clusters of homes with consideration of: (Reference - 25 Pa. Code §71.64(d)).
- _____ N/A 1. Treatment and discharge requirements. (Reference - 25 Pa. Code §71.64(d)).
- _____ N/A 2. Soil suitability. (Reference - 25 Pa. Code §71.64(c)(1)).
- _____ N/A 3. Preliminary hydrogeologic evaluation. (Reference - 25 Pa. Code §71.64(c)(2)).
- _____ N/A 4. Municipal, Local Agency or other controls over O & M requirements through a SMP. (Reference - 25 Pa. Code §71.64(d)). See Part "F" below.
- _____ N/A D. The use of community land disposal alternatives including:
- _____ N/A 1. Soil and site suitability. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)).
- _____ N/A 2. Preliminary hydrogeologic evaluation. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)).
- _____ N/A 3. Municipality, Local Agency or other controls over O & M requirements through a SMP. (Reference - 25 Pa. Code §71.21(a)(2)(ii)(C)). See Part "F" below.
- _____ N/A 4. The rehabilitation or replacement of existing malfunctioning community land disposal systems. (See Part "V", B, 4, a, b, c above). See also Part "F" below.
- _____ N/A E. The use of retaining tank alternatives on a temporary or permanent basis including: (Reference - 25 Pa. Code §71.21(a)(4)).
- _____ N/A 1. Commercial, residential and industrial use. (Reference - 25 Pa. Code §71.63(e)).
- _____ N/A 2. Designated conveyance facilities (pumper trucks). (Reference - 25 Pa. Code §71.63(b)(2)).
- _____ N/A 3. Designated treatment facilities or disposal site. (Reference - 25 Pa. Code §71.63(b)(2)).
- _____ N/A 4. Implementation of a retaining tank ordinance by the municipality. (Reference - 25 Pa. Code §71.63(c)(3)). See Part "F" below.
- _____ N/A 5. Financial guarantees when retaining tanks are used as an interim sewage disposal measure. (Reference - 25 Pa. Code §71.63(c)(2)).
- _____ N/A F. SMPs to assure the future O & M of existing and proposed sewage facilities through:
- _____ N/A 1. Municipal ownership or control over the O & M of individual onlot sewage disposal systems, small flow treatment facilities, or other traditionally non-municipal treatment facilities. (Reference - 25 Pa. Code §71.21(a)(4)(iv)).
- _____ N/A 2. Required inspection of sewage disposal systems on a schedule established by the municipality. (Reference - 25 Pa. Code §71.73(b)(1)).
- _____ N/A 3. Required maintenance of sewage disposal systems including septic and aerobic treatment tanks and other system components on a schedule established by the municipality. (Reference - 25 Pa. Code §71.73(b)(2)).
- _____ N/A 4. Repair, replacement or upgrading of malfunctioning onlot sewage systems. (Reference - 25 Pa. Code §71.21(a)(4)(iv) and §71.73(b)(5)) through:
- _____ N/A a. Aggressive pro-active enforcement of ordinances that require O & M and prohibit malfunctioning systems. (Reference - 25 Pa. Code §71.73(b)(5)).
- _____ N/A b. Public education programs to encourage proper O & M and repair of sewage disposal systems.
- _____ N/A 5. Establishment of joint municipal SMPs. (Reference - 25 Pa. Code

Code §71.21(a)(5)(i)(B)). The municipality's recent Wasteload Management (25 Pa. Code Chapter 94) Reports should be examined to determine if the proposed alternative is consistent with the recommendations and findings of the report. Appendix B, Section II.B of the Planning Guide.

- _____ VI-3 3. Plans developed under **Title II of the Clean Water Act** (33 U.S.C.A. 1281-1299) or **Titles II and VI of the Water Quality Act of 1987** (33 U.S.C.A. 1251-1376). (Reference - 25 Pa. Code §71.21(a)(5)(i)(C)). Appendix B, Section II.E of the Planning Guide.
- _____ VI-3 4. **Comprehensive plans** developed under the Pennsylvania Municipalities Planning Code. (Reference - 25 Pa. Code §71.21(a)(5)(i)(D)). The municipality's comprehensive plan must be examined to assure that the proposed wastewater disposal alternative is consistent with land use and all other requirements stated in the comprehensive plan. Appendix B, Section II.D of the Planning Guide.
- _____ VI-2 5. **Antidegradation requirements** as contained in 25 Pa. Code Chapters 93, 95 and 102 (relating to water quality standards, wastewater treatment requirements and erosion control) and the Clean Water Act. (Reference - 25 Pa. Code §71.21(a)(5)(i)(E)). Appendix B, Section II.F of the Planning Guide.
- _____ VI-4 6. **State Water Plans** developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference - 25 Pa. Code §71.21(a)(5)(i)(F)). Appendix B, Section II.C of the Planning Guide.
- _____ VI-5 7. **Pennsylvania Prime Agricultural Land Policy** contained in Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W. Provide narrative on local municipal policy and an overlay map on prime agricultural soils. (Reference - 25 Pa. Code §71.21(a)(5)(i)(G)). Appendix B, Section II.G of the Planning Guide.
- _____ VI-5 8. **County Stormwater Management Plans** approved by DEP under the Storm Water Management Act (32 P.S. 680.1-680.17). (Reference - 25 Pa. Code §71.21(a)(5)(i)(H)). Conflicts created by the implementation of the proposed wastewater alternative and the existing recommendations for the management of stormwater in the county Stormwater Management Plan must be evaluated and mitigated. If no plan exists, no conflict exists. Appendix B, Section II.H of the Planning Guide.
- _____ VI-5 9. **Wetland Protection.** Using wetland mapping developed under Checklist Section II.G, identify and discuss mitigative measures including the need to obtain permits for any encroachments on wetlands from the construction or operation of any proposed wastewater facilities. (Reference - 25 Pa. Code §71.21(a)(5)(i)(I)) Appendix B, Section II.I of the Planning Guide.
- _____ VI-5 10. **Protection of rare, endangered or threatened plant and animal species** as identified by the Pennsylvania Natural Diversity Inventory (PNDI). (Reference - 25 Pa. Code §71.21(a)(5)(i)(J)). Provide DEP with a copy of the completed *PNDI Manual Project Submission Form*. Also provide a copy of the response letters from the 4 jurisdictional agencies regarding the findings of the PNDI search. Appendix B, Section II.J of the Planning Guide.
- _____ VI-6 11. **Historical and archaeological resource protection** under P.C.S. Title 37, Section 507 relating to cooperation by public officials with the Pennsylvania Historical and Museum Commission (PHMC). (Reference - 25 Pa. Code §71.21(a)(5)(i)(K)). Provide DEP with a completed copy of a *Cultural Resource Notice* and a return receipt for its submission to PHMC. Provide a copy of the response letter or review stamp from the Bureau of Historic Preservation (BHP) indicating the project will have no effect on, or that there may be potential impacts on, known archaeological and historical sites and any avoidance and mitigation measures required. Appendix B, Section II.K of the Planning Guide.

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| _____ | <u>VI-1 to VI-6</u> | B. Provide for the resolution of any inconsistencies in any of the points identified in Section VI.A. of this checklist by submitting a letter from the appropriate agency stating that the agency has received, reviewed and concurred with the resolution of identified inconsistencies. (Reference - 25 Pa. Code §71.21(a)(5)(ii)). Appendix B of the Planning Guide. |
| _____ | <u>VI-1 to VI-6</u> | C. Evaluate alternatives identified in Section V of this checklist with respect to applicable water quality standards, effluent limitations or other technical, legislative or legal requirements. (Reference - 25 Pa. Code §71.21(a)(5)(iii)). |
| _____ | <u>VI-1 to VI-7</u> | D. Provide cost estimates using present worth analysis for construction, financing, ongoing administration, O & M and user fees for alternatives identified in Section V of this checklist. Estimates shall be limited to areas identified in the plan as needing improved sewage facilities within 5 years from the date of plan submission. (Reference - 25 Pa. Code §71.21(a)(5)(iv)). |
| _____ | <u>VI-7 to VI-10</u> | E. Provide an analysis of the funding methods available to finance the proposed alternatives evaluated in Section V of this checklist. Also provide documentation to demonstrate which alternative and financing scheme combination is the most cost-effective; and a contingency financial plan to be used if the preferred method of financing cannot be implemented. The funding analysis shall be limited to areas identified in the plan as needing improved sewage facilities within 5 years from the date of the plan submission. (Reference - 25 Pa. Code §71.21(a)(5)(v)). |
| _____ | <u>VI-10</u> | F. Analyze the need for immediate or phased implementation of each alternative proposed in Section V of this checklist including: (Reference - 25 Pa. Code §71.21(a)(5)(vi)). |
| _____ | <u>VI-10</u> | 1. A description of any activities necessary to abate critical public health hazards pending completion of sewage facilities or implementation of SMPs. (Reference - 25 Pa. Code §71.21(a)(5)(vi)(A)). |
| _____ | <u>VI-10</u> | 2. A description of the advantages, if any, in phasing construction of the facilities or implementation of a SMP justifying time schedules for each phase. (Reference - 25 Pa. Code §71.21(a)(5)(vi)(B)). |
| _____ | <u>VI-10</u> | G. Evaluate administrative organizations and legal authority necessary for plan implementation. (Reference - 25 Pa. Code §71.21(a)(5)(vi)(D)). |
| _____ | <u>VII</u> | VII. Institutional Evaluation |
| _____ | <u>VII-1</u> | A. Provide an analysis of all existing wastewater treatment authorities, their past actions and present performance including: |
| _____ | <u>VII-1</u> | 1. Financial and debt status. (Reference - 25 Pa. Code §71.61(d)(2)). |
| _____ | <u>VII-1</u> | 2. Available staff and administrative resources. (Reference - 25 Pa. Code §71.61(d)(2)) |
| _____ | <u>VII-1</u> | 3. Existing legal authority to: |
| _____ | <u>VII-1</u> | a. Implement wastewater planning recommendations. (Reference - 25 Pa. Code §71.61(d)(2)). |
| _____ | <u>VII-1</u> | b. Implement system-wide O & M activities. (Reference - 25 Pa. Code §71.61(d)(2)). |
| _____ | <u>VII-1</u> | c. Set user fees and take purchasing actions. (Reference - 25 Pa. Code §71.61(d)(2)). |
| _____ | <u>VII-1</u> | d. Take enforcement actions against ordinance violators. (Reference - 25 Pa. Code §71.61(d)(2)). |
| _____ | <u>VII-1</u> | e. Negotiate agreements with other parties. (Reference - 25 Pa. Code §71.61(d)(2)). |

VII-1

VIII

VIII-1 to VIII-4

f. Raise capital for construction and O & M of facilities. (Reference - 25 Pa. Code §71.61(d)(2)).

B. Provide an analysis and description of the various institutional alternatives necessary to implement the proposed technical alternatives including:

1. Need for new municipal departments or municipal authorities. (Reference - 25 Pa. Code §71.61(d)(2)).
2. Functions of existing and proposed organizations (sewer authorities, onlot maintenance agencies, etc.). (Reference - 25 Pa. Code §71.61(d)(2)).
3. Cost of administration, implementability, and the capability of the authority/agency to react to future needs. (Reference - 25 Pa. Code §71.61(d)(2)).

C. Describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative including:

1. Incorporation of authorities or agencies. (Reference - 25 Pa. Code §71.61(d)(2)).
2. Development of all required ordinances, regulations, standards and inter-municipal agreements. (Reference - 25 Pa. Code §71.61(d)(2)).
3. Description of activities to provide rights-of-way, easements and land transfers. (Reference - 25 Pa. Code §71.61(d)(2)).
4. Adoption of other municipal sewage facilities plans. (Reference - 25 Pa. Code §71.61(d)(2)).
5. Any other legal documents. (Reference - 25 Pa. Code §71.61(d)(2)).
6. Dates or timeframes for items 1-5 above on the project's implementation schedule.

D. Identify the proposed institutional alternative for implementing the chosen technical wastewater disposal alternative. Provide justification for choosing the specific institutional alternative considering administrative issues, organizational needs and enabling legal authority. (Reference - 25 Pa. Code §71.61(d)(2)).

VIII. Implementation Schedule and Justification for Selected Technical & Institutional Alternatives

A. Identify the technical wastewater disposal alternative which best meets the wastewater treatment needs of each study area of the municipality. Justify the choice by providing documentation which shows that it is the best alternative based on:

1. Existing wastewater disposal needs. (Reference - 25 Pa. Code §71.21(a)(6)).
2. Future wastewater disposal needs. (5 and 10 year growth areas). (Reference - 25 Pa. Code §71.21(a)(6)).
3. O & M considerations. (Reference - 25 Pa. Code §71.21(a)(6)).
4. Cost-effectiveness. (Reference - 25 Pa. Code §71.21(a)(6)).
5. Available management and administrative systems. (Reference - 25 Pa. Code §71.21(a)(6)).
6. Available financing methods. (Reference - 25 Pa. Code §71.21(a)(6)).
7. Environmental soundness and compliance with natural resource planning and preservation programs. (Reference - 25 Pa. Code §71.21(a)(6)).

I/A TECHNOLOGIES

PARTIAL LISTING OF INNOVATIVE AND ALTERNATIVE TECHNOLOGIES

TREATMENT TECHNOLOGIES

Aquaculture
Aquifer Recharge
Biological Aerated Filters
Constructed Wetlands
Direct Reuse (NON-POTABLE)
Horticulture
Overland Flow
Rapid Infiltration
Silviculture
Microscreens
Controlled Release Lagoons
Swirl Concentrator

SLUDGE TREATMENT TECHNOLOGIES

Aerated Static Pile Composting
Enclosed Mechanical Composting (In vessel)
Revegetation of Disturbed Land
Aerated Windrow Composting

ENERGY RECOVERY TECHNOLOGIES

Anaerobic Digestion with more than 90 percent
Methane Recovery
Cogeneration of Electricity
Self-Sustaining Incineration

INDIVIDUAL & SYSTEM-WIDE COLLECTION TECHNOLOGIES

Cluster Systems
Septage Treatment
Small Diameter Gravity Sewers
Step Pressure Sewers
Vacuum Sewers
Variable Grade Sewers
Septic Tank Effluent Pump with
Pressure Sewers

ADDITIONAL REQUIREMENTS FOR PENNVEST PROJECTS

Municipalities that propose to implement their official sewage facilities plan updates with PENNVEST funds must meet 6 additional requirements to be eligible for such funds. See *A Guide for Preparing Act 537 Update Revisions* (362-0300-003), Appendix N for greater detail or contact the DEP regional office serving your county listed in Appendix J of the same publication.

DEP Use Only	Indicate Page #(s) in Plan	Item Required
_____	N/A	1. Environmental Impact Assessment. (Planning Phase) The UER replaces the Environmental Impact Assessment that was a previous requirement for PENNVEST projects.
_____	N/A	2. Cost Effectiveness (Planning Phase) The cost-effectiveness analysis should be a present-worth (or equivalent uniform annual) cost evaluation of the principle alternatives using the interest rate that is published annually by the Water Resources Council. Normally, for PENNVEST projects the applicant should select the most cost-effective alternative based upon the above analysis. Once the alternative has been selected the user fee estimates should be developed based upon interest rates and loan terms of the selected funding method.
_____		3. Second Opinion Project Review. (Design Phase)
_____		4. Minority Business Enterprise/Women's Business Enterprise (Construction Phase)
_____		5. Civil Rights. (Construction Phase)
_____		6. Initiation of Operation/Performance Certification. (Post-construction Phase)