



3010/24

February 15, 2024

Via Electronic Mail

Department of Natural Resources
and Environmental Control
Kevin Bronson
Division of Water, SWDS
89 Kings Highway
Dover, DE 19901



RE: Project No. 11373BB
Town of Millsboro – Sewage Pumping Station No.4 Improvements

Dear Mr. Bronson:

On behalf of The Town of Millsboro, we are submitting an *Application for the Construction of Wastewater Collection and Conveyance Systems* for the referenced project.

This package includes the following items:

1. Completed Application for the Construction of Wastewater Collection and Conveyance Systems.
2. Narrative summary.
3. One set of final construction plans and technical specifications signed and sealed by a Delaware Registered Professional Engineer.
4. Calculations and pump/performance curves for the proposed pumping station.
5. A check made payable to the State of Delaware for \$825.00 for the permit review fee.
6. A check made payable to the State of Delaware for \$300.00 for the public notice fee.
7. Letter of capacity from The Town of Millsboro.

We trust this information is sufficient for your review of the project application. If you need further information, please contact me at 267-603-3926.

Very truly yours,

VERDANTAS LLC

Ryan K. Minnick, P.E.
Engineer

RKM:shl

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Department of Natural Resources
and Environmental Control

89 Kings Hwy
Dover, DE 19901
dnrec.delaware.gov

Division of Water
Commercial and Government Services Section

Phone: (302) 739-9946
Fax: (302) 739-8369

INSTRUCTIONS FOR COMPLETING THE PERMIT APPLICATION FOR THE CONSTRUCTION OF WASTEWATER COLLECTION AND CONVEYANCE SYSTEMS

The following items must accompany the application. **Please note that incomplete application packages will be returned in their entirety and not reviewed until such time as all required information is received.**

- 1. A narrative summary of the intended purpose and design of the proposed facilities.
- 2. One (1) set of final construction plans and specifications, if applicable, signed and sealed by a Delaware-registered Professional Engineer, or a Delaware-registered Professional Land Surveyor for gravity systems only. One (1) electronic copy of final Plans.
- 3. One (1) electronic copy of final Plans.
- 4. The final plans must be drawn to scale showing slopes, inverts, pipe types and sizes, existing and proposed ground surfaces, tops of manholes, water lines, stormwater and stream crossings, encasements shown in plan and profile, and other information if pertinent or requested.
- 5. For pump/lift stations and force mains, include all calculations and pump/performance curves.
- 6. A check made payable to the State of Delaware for eight hundred twenty-five dollars (\$825.00), the non-refundable permit review fee. This fee covers the initial review and one follow-up review of any corrections or changes made to address the Division's comments. An additional eight hundred twenty-five dollars (\$825.00) non-refundable review fee must be submitted for resubmission of the plans if changes are made to the project which trigger a complete review of the permit application.
- 7. Your permit will have a public notice requirement if your system includes force mains or pump/lift stations. Include a check made payable to the State of Delaware for three hundred dollars (\$300.00) for the reimbursement of legal notices if the system has a force main connection or a pump/lift station.
- Please submit the completed application package, as outlined above, to DE DNREC, Division of Water, Commercial and Government Services Section, 89 Kings Highway, Dover, DE 19901. Please note, a new application, including the review fee, must be submitted if the Division's comments are not addressed or if requested supplemental information is not provided within one (1) year of the comment or request date.
- The following items must be submitted prior to permit issuance:
- 8. Verification from the appropriate county or municipal planning authority that the project has the proper zoning approval.
- 9. A letter from the owner/operator of the wastewater facilities to which the proposed collection and conveyance facilities connect. The letter must include confirmation that the owner/operator has approved the project, that the owner/operator will take responsibility for treating and disposing of the wastewater to be conveyed and that the downstream facilities have the capacity to manage the additional flows without causing or contributing to violations of Delaware's Environmental Protection Act (7 Del. C., Chapter 60) and the regulations promulgated thereafter. This includes, but is not limited to, unauthorized discharges such as overflows at manholes and violations of the treatment system's operating permit (for example, the National Pollutant Discharge Elimination System (NPDES) permit).

- Visit us on the web at: <https://dnrec.alpha.delaware.gov/water/surface-water/>

**APPLICATION FOR THE CONSTRUCTION OF
WASTEWATER COLLECTION AND CONVEYANCE SYSTEMS**
Application must be complete, typewritten or clearly printed

Date Application Submitted _____

PROJECT INFORMATION			
Project Name and Location/ Address Sewage Pumping Station No. 4 Improvements 499 Mitchell St, Millsboro, DE 19966			
Tax Parcel Number(s) 233-5.00-11.00, 233-5.00-12.01, 133-17.00-184.00, 133-17.00-61.00, 133-21.00-5.00, 133-17.00-75.00			
County <input type="checkbox"/> Kent <input type="checkbox"/> New Castle <input checked="" type="checkbox"/> Sussex	Watershed (www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessment.aspx) <input type="checkbox"/> Chesapeake Bay <input type="checkbox"/> DE Bay/Estuary <input checked="" type="checkbox"/> Inland Bays/Atl Ocean <input type="checkbox"/> Piedmont		
Sewer District or Interceptor Town of Millsboro	Wastewater Treatment/Disposal Facility Name Town of Millsboro Wastewater Treatment Facility		
Anticipated Construction Start Date	Treatment/Disposal Facility Owner and Operating Permit Number Town of Millsboro; 528516-06 & 528516-05		
Please note, construction permits expire three (3) years from the date of permit issuance.			
Are you requesting plan review and comment or <u>WPCC Construction Permit issuance?</u> (circle one)			
Design Flow (gallons/day) Average 699,600	Peak 2,184,741	Peak Factor 3.12	Basis of Design 10 State Standards
Description Wastewater collection, pumping and conveyance system for proposed commercial and residential construction. Refer to project narrative			
OWNER/DEVELOPER			
Company Name Town of Millsboro			
Mailing Address 322 Wilson Highway			
City Millsboro	State DE	Zip 19966	
Contact Name Richard Plack			
E-Mail Address richp@millsboro.org			
Telephone 302-430-2825	Cell	Fax	

ENGINEER					
Company Name Verdantas LLC					
Mailing Address 1060 S. Governors Ave, Suite 101					
City Dover			State DE		Zip 19904
Contact Name Steven Lewandowski					
E-Mail Address slewandowski@verdantas.com					
Telephone 302-489-2354		Cell		Fax	
GRAVITY SEWER INFORMATION					
Ownership <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	Type of Sewer System <input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other?			If Other, list below	
Type of Pipe SDR35 PVC	Length (ft) 892	Diameter (in) 15	Joint Specification Bell/spigot	Min. Slope (ft/ft) 0.0025	Min. Velocity (ft/sec)
SDR26 PVC	376	15	Bell/spigot	0.0025	
SDR35 PVC	327	8	Bell/spigot	0.0030	
Minimum Pipe Cover (ft) 3.5	Number of Manholes 10	Drop manholes provided? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Maximum Distance Between Manholes (ft) 349	
Minimum ten foot (10') horizontal & eighteen inch (18") vertical separation from water lines maintained? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			If not, explain provisions to prevent cross-contamination:		
Explain any special challenges (for example, stream, highway and/or railroad crossings, directional drilling, elevated sewers, etc.) See project narrative					
Comments					

PUMP/LIFT STATION INFORMATION				
Ownership <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private		Type of Wastewater <input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other?		If Other, list below
Pump Station Flows (gallons/day) Design 2,187,360			Average 699,600	Peak 2,184,741
				Peak Factor 3.12
Basis of Design 10 State Standards			Pump Type Submersible	
Will peak flows be accommodated if largest unit fails? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Pump calc's and pump curves attached? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Cycle Time (minutes) 1 Pump 9.35 min 2 Pumps 5.12 min	Wet Well Detention Time (minutes) 8.39 min 3.48 min
Check valves provided on discharge line? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Gate valves provided on discharge line? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
If not, explain alternate procedure:				
Ventilation provided in wet well? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Dry Well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is an alarm system included? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Alternate source of power? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
What other provisions for emergency operations? Bypass pumping connection				
Height of Influent Above Pump (suction head) (ft) 1.5		Height of Effluent Above Pump (discharge head) (ft) 22.7		Friction Loss (ft) 6.8
Pump Design Point 1 Pump 2 Pumps	Pump Operating Point 978 gpm 1519 gpm	Static Head (ft) 22.7 ft	Total Head (ft) 29.5 TDH 35.5 TDH	Required Motor Horsepower (hp) 15 HP
FORCE MAIN INFORMATION				
Type of Pipe DIP CL 52 and HDPE DR11		Length (ft) 100 900		Diameter (in) 10 DIP 12 HDPE
Hazen-Williams "C" Design Factor 110 140	Type of Joints Bell and spigot Fused	Velocity Under Design Conditions (ft/sec) 978 gpm = 3.77 ft/s 1519 gpm = 5.86 ft/s		Minimum Pipe Cover (ft) 3 ft
Air relief valves specified? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Clean-outs provided? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Maximum distance between clean-outs (ft) NA		
Minimum ten foot (10') horizontal & eighteen inch (18") vertical separation from water lines maintained? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		If not, explain provisions to prevent cross-contamination:		
Comments				

PUMPING STATION NO. 4 IMPROVEMENTS NARRATIVE SUMMARY OF PROPOSED FACILITIES

Introduction

The Pump Station No.4 Improvements project aims to enhance the efficiency and resilience of the existing wastewater collection and conveyance system for the Town of Millsboro. Currently the existing pumping station is located within the 100-year flood plain, causing damage and access issues during large rain events. The proposed improvements are generally described below:

- Replacement of the existing pumping station located on the M&T Bank site with a new submersible, triplex pumping station located outside of the 100-year flood plain. Two pumps will be installed initially capable of handling the current flows. As development increases, the Town will have the ability to install a third pump.
- A new force main connected to the terminal manhole on White Street.
- Replacement of the “Irons Branch Interceptor” gravity sewer main between Mitchell Street and PS4.
- Site improvements including Access driveway, security fencing, standby generator, and control building.
- Abandonment of the existing pumping station and force main.

The existing and proposed pump stations will be owned and maintained by the Town of Millsboro.

Design Standards

The wastewater pumping and conveyance system is designed in conformance with the following standards:

- The Town of Millsboro Delaware Standard Specifications and Details for Utilities Design and Construction.
- Recommended Standards for Wastewater Facilities (“Ten State Standards”), 2014 edition.

Irons Branch Interceptor

1. Existing conditions

The existing Irons Branch Interceptor includes a 10” gravity sewer that serves Drainage Basin 4. Some manholes have been noted to be in poor condition.

2. Proposed Improvements

The drainage basins, current and projected EDUs, and average and peak flows are presented in the following table. The projected future wastewater flow to PS4 is approximately 1,517 GPM. The existing 10” diameter interceptor does not have capacity for the projected flow. The interceptor will be replaced with a new 15” sewer.

Table 1 – Existing and Projected EDUs					
Drainage Basin	Current EDUs	Projected EDUs	Total EDUs	Avg Flow, GPM	Peak Flow, GPM
4	605	525	1130	188	588
9	0	1249	1249	208	650
10	0	422	422	70	220
18A	0	114	114	19	59
TOTAL	605	2310	2915	486	1,517

Pumping Station and Force Main Improvements

1. Existing Conditions

The existing M&T Bank Pumping Station consists of a separated dry well and wet well with three (3) pumps located in the dry well. The existing pumps discharge to the terminal manhole on White Street through a 6” cast iron force main. The existing pump station is located withing approximately 25 ft of Iron Branch within the 100 year flood plain and is subject to flooding.

2. Proposed Improvements

Proposed PS4 improvements include abandonment in place of the pump station, construction of a new pumping station with concrete masonry unit (CMU) building to house VFDs and controls, and a backup generator. The new pumping station will be located on higher ground, above the 100 year flood plain

The proposed design basis for the new pumping station is as follows:

a. Flow rate design basis

1 Duty, 1 Spare = 978 GPM @ 29.48’ TDH (with this project)

2 Duty, 1 Spare = 1,519 GPM @ 35.52’ TDH (future)

b. Pumping system

- i. Triplex configuration (three automatic pumps in lead - lag 1 – lag 2 operation)
- ii. Three (3) new electric pumps
 1. Type: Self priming submersible lift pump
 2. Flygt NP 3153 MT 3~ 437, 6” discharge
 3. Operating condition: 978 GPM @ 29.48’ TDH.
 4. Power: 15 HP, 460 V, 3 phase
 5. Controls: Ultrasonic level transducer and back-up float switches
- iii. Backup power will be provided using a Cummins Power genset
- iv. VFDs will be provided.

c. Force Main

- i. Install new 10” dia DIP CL52 force main via trenching and 12” dia. HDPE DR 11 force main via directional drill;
- ii. Velocity @ 978 GPM design basis is approximately 3.8 ft/s
Velocity @ 1,519 GPM design basis is approximately 5.9 ft/s
- iii. The existing 6” force main will be capped on each end and abandon in place.

Table 2 – Pump Station Design Flow		
Projected EDUs	2,915	EDUs
Flow Rate	240	GPD/EDU
Average Daily Flow	699,600	GPD
Peaking Factor	3.12	10 states peaking factor
Peak Daily Flow	2,184,741	GPD
Pump Station Min. Design Flow Rate	1,517	GPM

NP 3153 MT 3~ 437

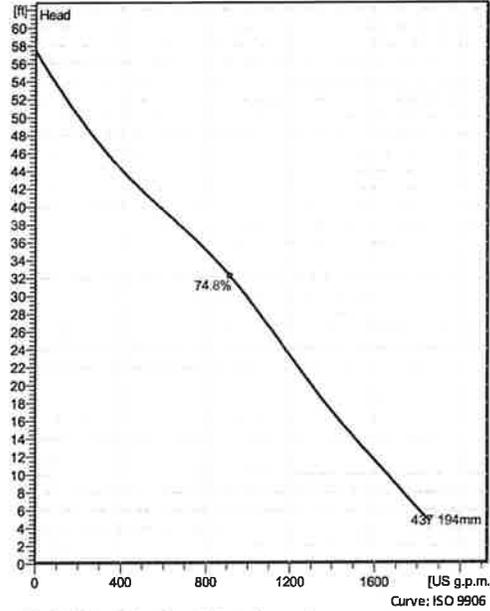
Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.



Technical specification



Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6899E-5 ft²/s



Nominal (mean) data shown. Under and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number N3153.095 21-15-4AA-W 15hp	Installation type P - Semi permanent, Wet
Impeller diameter 194 mm	Discharge diameter 6 inch

Pump information

Impeller diameter 194 mm
Discharge diameter 6 inch
Inlet diameter 150 mm
Maximum operating speed 1755 rpm
Number of blades 2
Max. fluid temperature 40 °C

Material

Impeller
Hard-Iron™

Project Xylect-21710374
Block

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NP 3153 MT 3~ 437

Technical specification



Motor - General

Motor number N3153.095 21-15-4AA-W 15hp	Phases 3~	Rated speed 1755 rpm	Rated power 15 hp
ATEX approved FM	Number of poles 4	Rated current 19 A	Stator variant 5
Frequency 60 Hz	Rated voltage 460 V	Insulation class H	Type of Duty S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.82	Motor efficiency - 1/1 Load 87.8 %	Total moment of inertia 1.53 lb ft ²	Starts per hour max. 30
Power factor - 3/4 Load 0.77	Motor efficiency - 3/4 Load 88.7 %	Starting current, direct starting 114 A	
Power factor - 1/2 Load 0.65	Motor efficiency - 1/2 Load 88.3 %	Starting current, star-delta 38 A	

Project Xylect-21710374
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Created on 1/17/2024 **Last update** 1/17/2024

NP 3153 MT 3~ 437

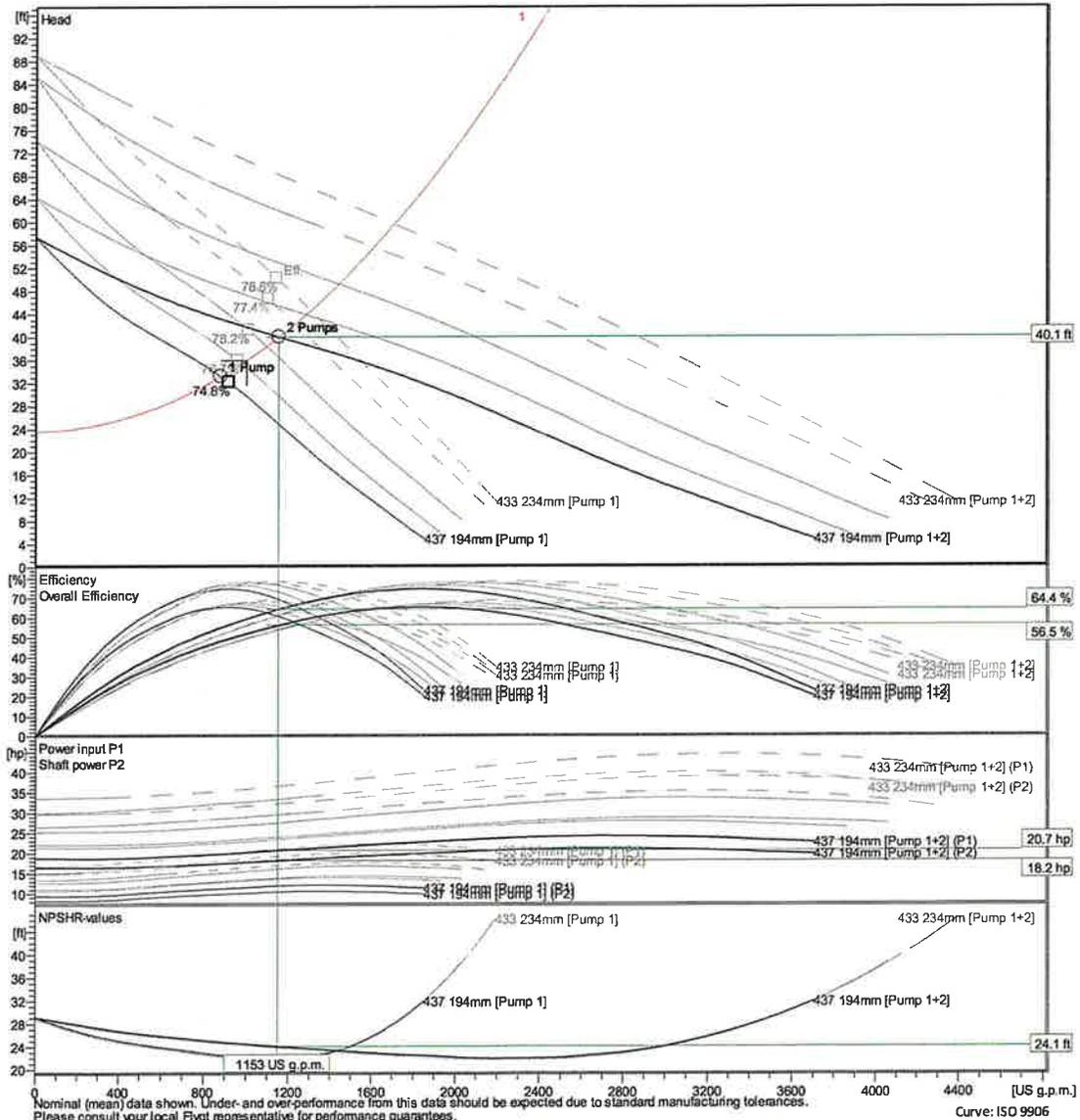
Performance curve



Duty point

Flow: 577 US g.p.m. Head: 40.1 ft

Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6899E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

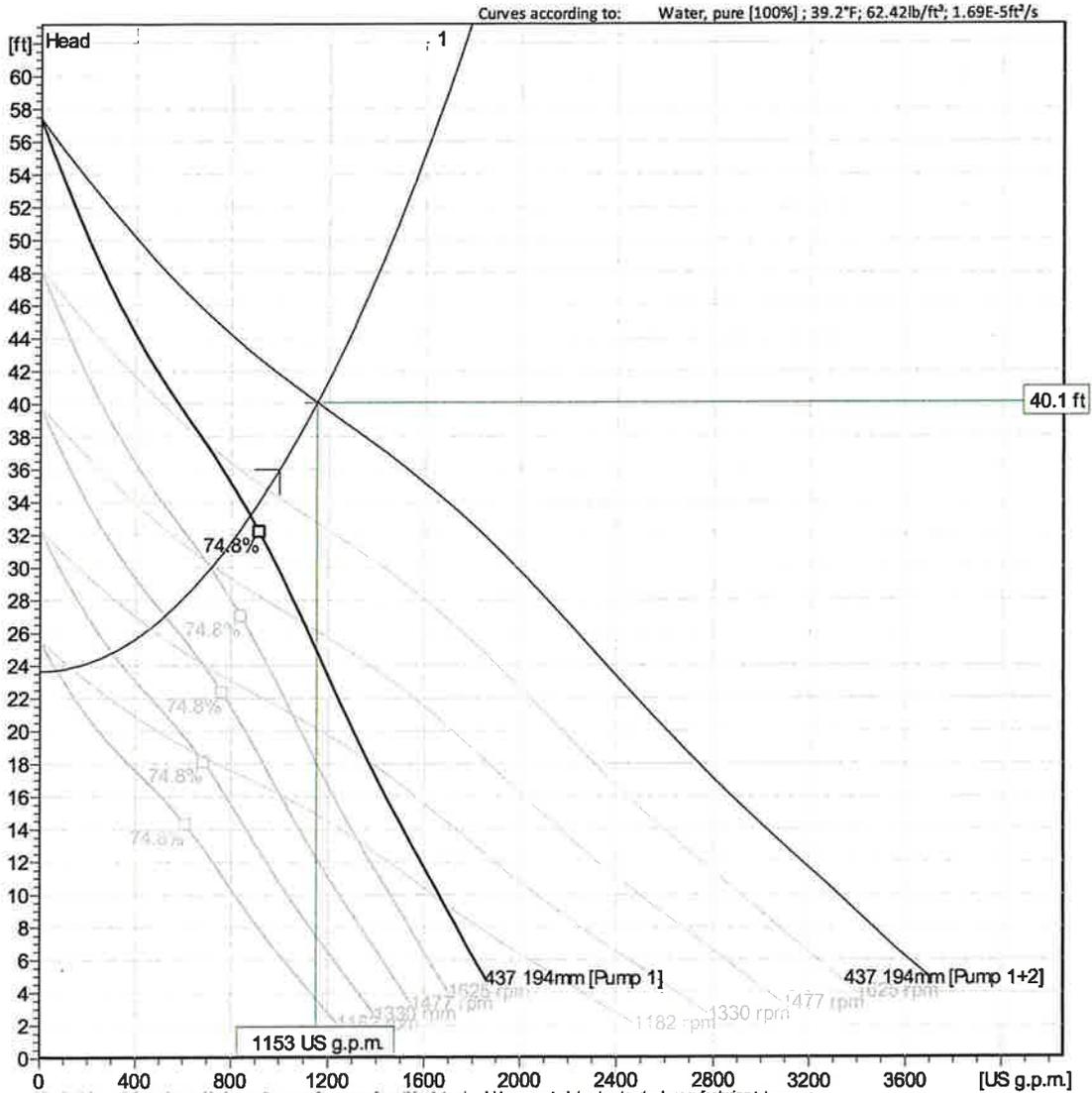
Xylect-21710374

AJ Wilson

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NP 3153 MT 3~ 437

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Operating Characteristics

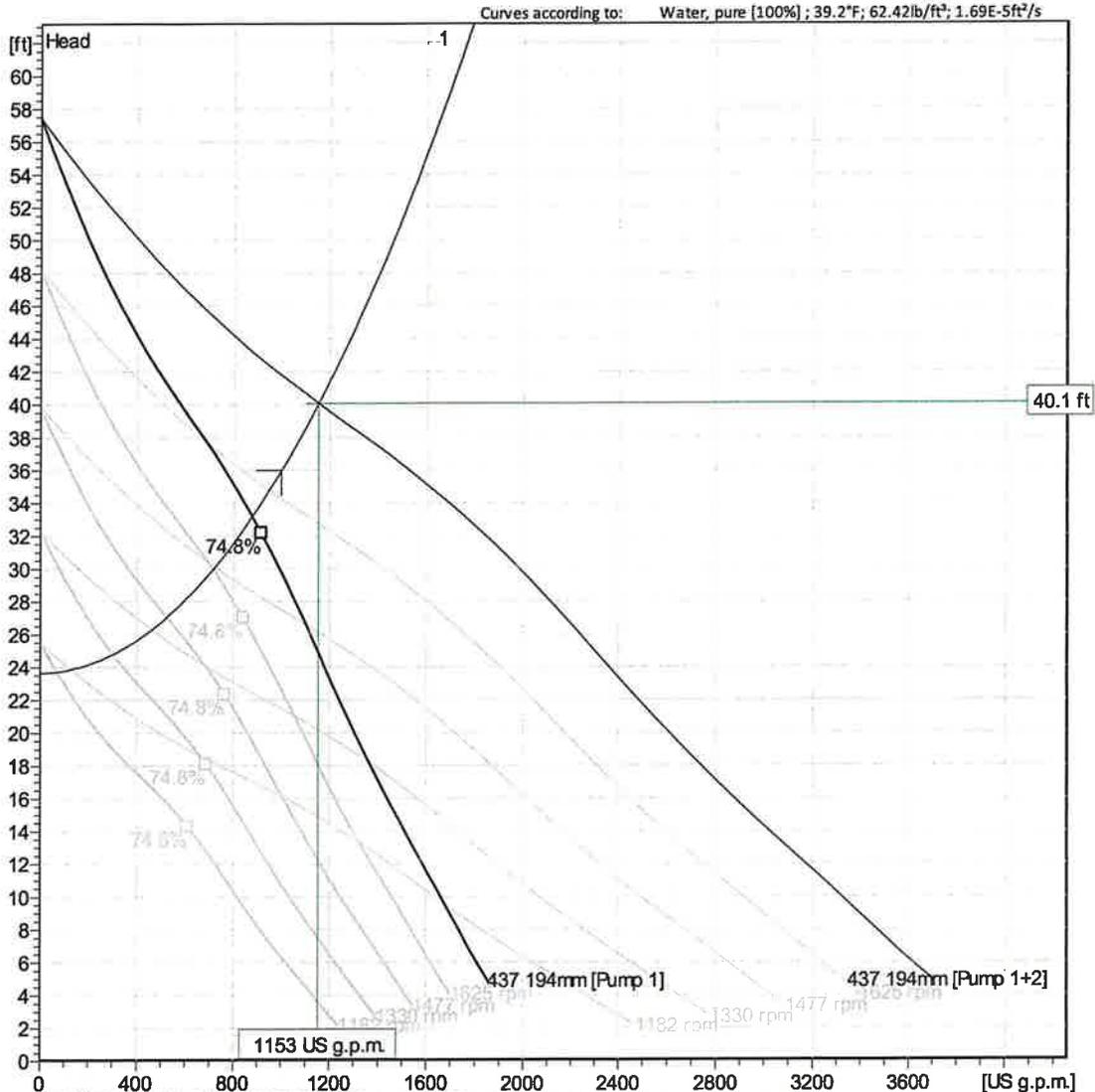
Pumps / Systems	Frequency	Flow		Head		Shaft power		Hydr. eff.	Specific energy		NPSH _{req}
		US g.p.m.	ft	US g.p.m.	ft	hp	hp		kWh/US MG	ft	
2 / 1	60 Hz	577	40.1	1150	40.1	9.08	18.2	64.4 %	223	24.1	
2 / 1	55 Hz	474	34.8	949	34.8	6.87	13.7	60.7 %	205	21.2	
2 / 1	50 Hz	361	30.1	722	30.1	5.03	10.1	54.7 %	201	18.6	
2 / 1	45 Hz	231	26.3	461	26.3	3.54	7.08	43.3 %	231	16.3	

Project: Xylect-21710374
Block:

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Created on: 1/17/2024
Last update: 1/17/2024

NP 3153 MT 3~ 437

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr. eff.	Specific energy	NPSH _{re}
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	
1 / 1	45 Hz	303	24.8	3.63	303	24.8	3.63	52.3 %	180	15.9
1 / 1	40 Hz	71.2	23.7	2.43	71.2	23.7	2.43	17.5 %	549	14.5

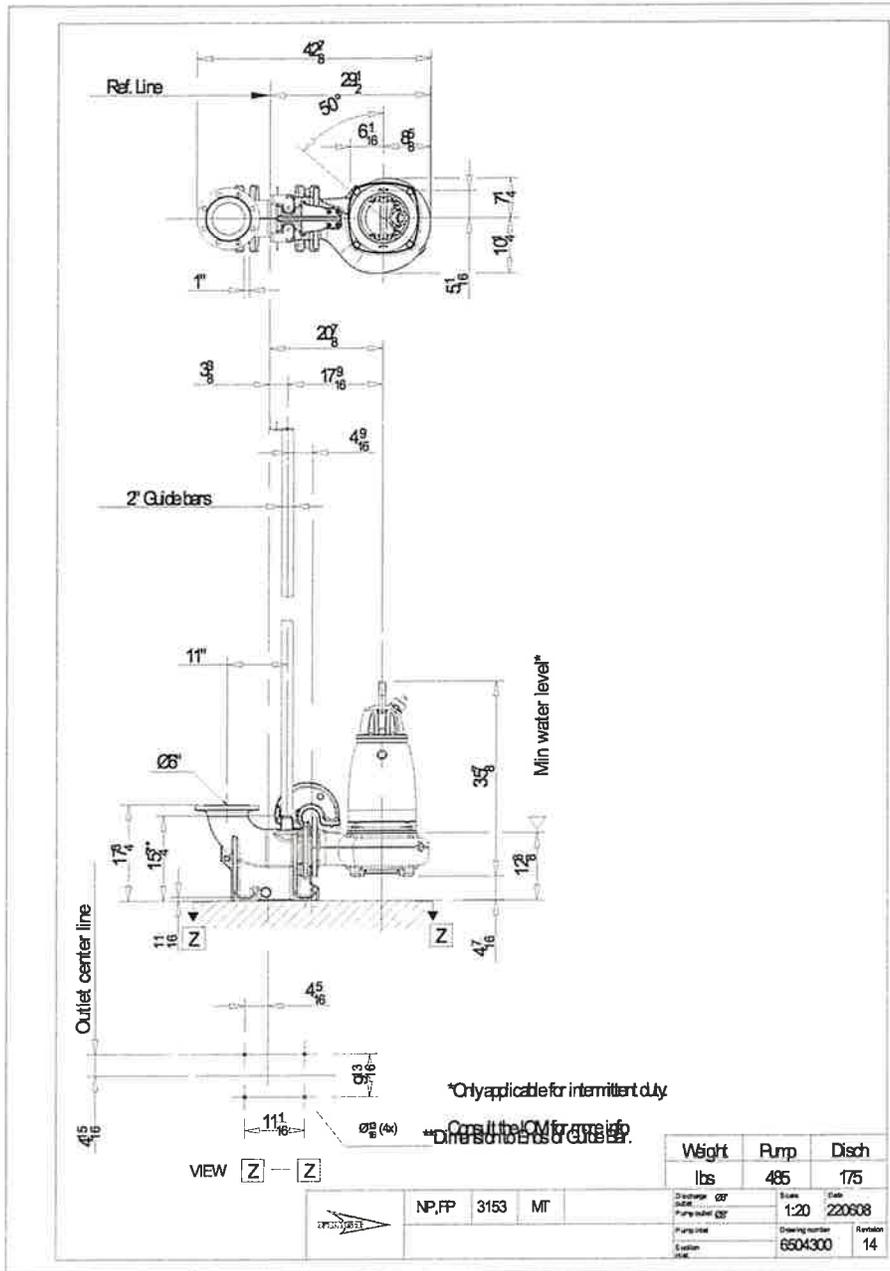
Project Xylect-21710374
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Created on 1/17/2024

Last update 1/17/2024

NP 3153 MT 3~ 437

Dimensional drawing



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Created on 1/17/2024 Last update

1/17/2024

Weight	Pump	Disch
lbs	485	175
Discharge	Ø2"	Size
Model		Date
Pump model		1:20 220608
Pump inlet		Drawing number
Custom	6504300	Revision
Part		14

**SYSTEM HEAD CALCULATIONS
FOR PUMPING STATION DESIGN**

**THE TOWN OF MILLSBORO
SEWAGE PUMPING STATION NO.4 IMPROVEMENTS
ONE PUMP ANALYSIS**

PROJECT NO. 11373.BB

BY: RKM, 02-14-2024

Design Flow

Existing EDUs	=	605 EDUs
Future EDUs	=	0 EDUs
Total EDUs	=	605 Units
Average Daily Flow per EDU	=	240 GPD/EDU
Peaking Factor	=	3.12 10 States
Average Daily Flow	=	145,200 GPD
Peak Hourly Flow	=	453,024 GPD
Average Daily Flow	=	101 GPM
Peak Hourly Flow	=	315 GPM

Pump Station Design Flow Rate

Flow	=	978 GPM
Static Head	=	22.7 ft
Friction Head	=	6.8 ft
Total Dynamic Head	=	29.5 ft
Hydraulic HP	=	7.3 HP
hp= (Q*TDH)/3960		
Brake HP efficiency 50%	=	12.0 HP

Wet Well

Diameter	=	12 FT
Capacity per Vertical foot	=	845.97 Gal/ft
Fill Time at Average Flow	=	8.39 Min/ft
Influent	=	101 GPM
Pump Design Flow	=	978 GPM
Pump Down Rate	=	877 GPM
Pump Operating Range	=	1 ft
Pump Run Time	=	0.96 Min
Fill Time	=	8.39 Min
Starts per Hour	=	7 #

Force Main

Nominal Pipe Size	=	10 in
Actual Pipe Size	=	10.29 in
Velocity	=	3.77 ft/s

**SYSTEM HEAD CALCULATIONS
FOR PUMPING STATION DESIGN**

**THE TOWN OF MILLSBORO
SEWAGE PUMPING STATION NO.4 IMPROVEMENTS
ONE PUMP ANALYSIS**

PROJECT NO. 11373.BB

BY: RKM, 02-14-2024

<u>PIPE DATA</u>	<u>10-INCH D.I. PIPE</u>	<u>12-INCH HDPE PIPE</u>	<u>16-INCH D.I. PIPE</u>	<u>10-INCH PVC DR18</u>
PIPE ID (IN)	10.29	10.29	16.41	9.79
PIPE LENGTH (FT)	100	900		
HAZEN & WILLIAMS "C"	110	140	110	140
FLOW MULTIPLIER	1.00	1.00	1.00	1.00
<u>VALVES/FITTINGS DATA</u>	<u>Equiv Len</u>	<u>QUAN.</u>	<u>QUAN.</u>	<u>QUAN.</u>
90 DEGREE BENDS	30	2		
45 DEGREE BENDS	16	2		
TEES THROUGH RUN	20	1	2	
TEES THROUGH BRANCH	60	2		
GATE VALVES	13	2		
SWING CHECK VALVES	135	1		
PLUG VALVES	3			
REDUCER 6X10	33	1		
REDUCER 10x16	20			
<u>VALVE/FITTING EQ. LNTH.</u>		365	34	0
<u>RUN EQUIVALENT LENGTH</u>		465	934	0
<u>SYSTEM CURVE DATA</u>	$H=(4.73L*Q^{1.852})/(C^{1.852}*D^{4.87})$			
STATIC HEAD (FEET)	22.7			
STARTING FLOW (GPM)	100			
FLOW INTERVAL (GPM)	100			

<u>FLOW (GPM)</u>	<u>10-INCH D.I. PIPE</u>	<u>12-INCH HDPE PIPE</u>	<u>16-INCH D.I. PIPE</u>	<u>10-INCH PVC DR18</u>	<u>TOTAL DYNAMIC HEAD (FT)</u>
100	0.0	0.1	0.0	0.0	22.8
200	0.2	0.2	0.0	0.0	23.1
300	0.4	0.5	0.0	0.0	23.5
400	0.6	0.8	0.0	0.0	24.1
500	0.9	1.2	0.0	0.0	24.8
600	1.3	1.7	0.0	0.0	25.7
700	1.8	2.3	0.0	0.0	26.7
800	2.2	2.9	0.0	0.0	27.8
900	2.8	3.6	0.0	0.0	29.0
1000	3.4	4.4	0.0	0.0	30.4
1100	4.1	5.2	0.0	0.0	31.9
1200	4.8	6.1	0.0	0.0	33.5
1300	5.5	7.1	0.0	0.0	35.3

**SYSTEM HEAD CALCULATIONS
FOR PUMPING STATION DESIGN**

**THE TOWN OF MILLSBORO
SEWAGE PUMPING STATION NO.4 IMPROVEMENTS
TWO PUMP ANALYSIS**

PROJECT NO. 11373.BB

BY: RKM, 02-14-2024

Design Flow

Existing EDUs	=	605 EDUs
Future EDUs	=	2310 EDUs
Total EDUs	=	2915 Units
Average Daily Flow per EDU	=	240 GPD/EDU
Peaking Factor	=	3.12 10 States
Average Daily Flow	=	699,600 GPD
Peak Hourly Flow	=	2,182,752 GPD
Average Daily Flow	=	486 GPM
Peak Hourly Flow	=	1516 GPM

Pump Station Design Flow Rate

Flow	=	1519 GPM
Static Head	=	22.7 ft
Friction Head	=	6.8 ft
Total Dynamic Head	=	29.5 ft
Hydraulic HP	=	11.3 HP
hp= (Q*TDH)/3960		
Brake HP efficiency 50%	=	18.6 HP

Wet Well

Diameter	=	12 FT
Capacity per Vertical foot	=	845.97 Gal/ft
Fill Time at Average Flow	=	1.74 Min/ft
Influent	=	486 GPM
Pump Design Flow	=	1519 GPM
Pump Down Rate	=	1033 GPM
Pump Operating Range	=	2 ft
Pump Run Time	=	1.64 Min
Fill Time	=	3.48 Min
Starts per Hour	=	12 #

Force Main

Nominal Pipe Size	=	10 in
Actual Pipe Size	=	10.29 in
Velocity	=	5.86 ft/s

**SYSTEM HEAD CALCULATIONS
FOR PUMPING STATION DESIGN**

**THE TOWN OF MILLSBORO
SEWAGE PUMPING STATION NO.4 IMPROVEMENTS
TWO PUMP ANALYSIS**

PROJECT NO. 11373.BB

BY: RKM, 02-14-2024

<u>PIPE DATA</u>		<u>10-INCH D.I. PIPE</u>	<u>10-INCH D.I. PIPE</u>	<u>12-INCH HDPE PIPE</u>	<u>16-INCH D.I. PIPE</u>
PIPE ID (IN)		10.29	10.29	10.29	16.41
PIPE LENGTH (FT)		35	65	900	30
HAZEN & WILLIAMS "C"		110	110	140	110
FLOW MULTIPLIER		1.00	2.00	2.00	2.00
<u>VALVES/FITTINGS DATA</u>	<u>Equiv Len</u>	<u>QUAN.</u>	<u>QUAN.</u>	<u>QUAN.</u>	<u>QUAN.</u>
90 DEGREE BENDS	30	2			
45 DEGREE BENDS	16		2		
TEES THROUGH RUN	20		1	2	
TEES THROUGH BRANCH	60	2			
GATE VALVES	13	1	1		
SWING CHECK VALVES	135	1			
PLUG VALVES	3				
REDUCER 6X10	33	1			
REDUCER 10x16	20				1
<u>VALVE/FITTING EQ. LNTH.</u>		310	56	34	27
<u>RUN EQUIVALENT LENGTH</u>		345	121	934	57
<u>SYSTEM CURVE DATA</u>		$H=(4.73L*Q^{1.852})/(C^{1.852}*D^{4.87})$			
STATIC HEAD (FEET)	22.7				
STARTING FLOW (GPM)	100				
FLOW INTERVAL (GPM)	100				

<u>FLOW (GPM)</u>	<u>10-INCH D.I. PIPE</u>	<u>10-INCH D.I. PIPE</u>	<u>12-INCH HDPE PIPE</u>	<u>16-INCH D.I. PIPE</u>	<u>TOTAL DYNAMIC HEAD (FT)</u>
100	0.0	0.0	0.2	0.0	23.0
200	0.1	0.2	0.8	0.0	23.8
300	0.3	0.3	1.7	0.0	25.0
400	0.5	0.6	2.9	0.0	26.6
500	0.7	0.9	4.4	0.0	28.6
600	1.0	1.2	6.1	0.1	31.1
700	1.3	1.6	8.1	0.1	33.8
800	1.7	2.1	10.4	0.1	37.0
900	2.1	2.6	13.0	0.1	40.5
1000	2.5	3.2	15.8	0.2	44.3
1100	3.0	3.8	18.8	0.2	48.5
1200	3.5	4.5	22.1	0.2	53.0
1300	4.1	5.2	25.6	0.3	57.8

**BOUYANCY CALCULATION
FOR PUMPING STATION DESIGN**

**THE TOWN OF MILLSBORO
SEWAGE PUMPING STATION NO.4 IMPROVEMENTS**

PROJECT NO. 11373.BB

BY: RKM, 02-15-2024

Inside diameter	12.00 feet
Wall thickness	10.00 inches
Outside diameter	13.67 feet
Top of barrel elevation	22.30 feet
Bottom of barrel elevation	-11.00 feet
Barrel Height	33.30 feet
Top slab length	0.00 feet
Top slab width	0.00 feet
Top slab thickness	0.00 inches
	0.00 feet
Top slab top elevation	22.30 feet
Hatch length	0.00 feet
Hatch width	0.00 feet
Base slab thickness	12.00 inches
	1.00 feet
Base slab diameter	14.00 feet
Ground Elevation	22.80 feet
Density of soil	53 lb/cf
Volume of Soil normal to shelve	241 cu. Ft
Soil friction angle 26-36	26
R1 (large base, top of wet well)	23 feet
R2 (small base, bottom of wet well)	7 feet
Volume of Soil at angle to shelve	21,095 cu. ft
Total volume acting on shelve	21,336 cu. ft
Concrete weight	150 lbs/cu ft
Top slab volume	- cubic feet
Top slab weight	- lbs
Barrel weight	671,280 lbs
Base slab weight	23,091 lbs
Soil weight	1,130,812 lbs
Total weight	1,825,182 lbs
Water table elevation ¹	16.80 feet
Water displaced by barrel	1,017,898 lbs
Water displaced by base	9,606 lbs
Total bouyanacy	1,027,504 lbs

Safety factor

1.78

Notes: 1 Geotech report prepared by Duffield, water level is 15.4 feet below grade. However, seasonal wet is 6 feet below grade.



Office of the Town Manager
Town of Millsboro

322 Wilson Highway
Millsboro, Delaware 19966
(302) 934-8171
(302) 934-7682 (Fax)
town@millsboro.org

Sheldon P. Hudson, Town Manager

Jamie Burk, Assistant Town Manager
Brian Calloway, Chief of Police
George ("Kenny") Niblett, Director of Public Works
Matthew Hall, Director of Finance and Technology

Joanne Dorey, Town Clerk

November 20, 2020

Department of Natural Resources
and Environmental Control
Division of Water, SWDS
89 Kings Highway
Dover, DE 19901

Re: Sewage Pumping Station No. 4 Improvements
The Town of Millsboro

Dear DNREC Representative:

The Town of Millsboro owns and operates an existing regional pumping station on the property of Allfirst Bank (Sussex parcel 233-5.00-11.00) in Millsboro, Delaware. The pumping station was built circa 1964, is located contiguous to Iron Branch, and is within the 100-year floodplain. During significant rain events, the pumping station is prone to damage due to flooding.

The Town has approved the subject project to replace and upgrade the capacity of the existing pumping station. A new, duplex submersible pumping station will be constructed in accordance with the latest edition of the Recommended Standards for Wastewater Facilities. The pumping station will be constructed at a higher elevation, above the 100-year floodplain. The new pumping station will be sized for a peak flow of 2,000 gallons per minute (gpm) to accommodate current and future growth in Millsboro's southern service area. The new pumping station will be situated on Sussex parcel 233-5.00-11.00, which is properly zoned for this use.

Applications for future development in the southern service area will be reviewed by The Town of Millsboro separately. The Town is currently planning upgrades to its wastewater treatment plant (WWTP) and disposal capacity to accommodate future growth. These upgrades include expansions to accommodate wastewater flows to the WWTP up to 3 million gallons per day. The new pumping station will be equipped with VFDs, which will enable the pumps to operate over a wide range to match incoming flow. The collection system downstream of the pumping station and the existing WWTP thus have adequate capacity to handle flows from the new pumping station.



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Jamie Burk, Assistant Town Manager
Brian Calloway, Chief of Police
George ("Kenny") Niblett, Director of Public Works
Matthew Hall, Director of Finance and Technology

Joanne Dorey, Town Clerk

If we may answer any questions, please call.

Sincerely,

THE TOWN OF MILLSBORO

A handwritten signature in black ink, appearing to read "Carrie A. Kruger".

Carrie A. Kruger, P.E.
Town Engineer

RECEIPT

February 15, 2024

14

RCVD FROM Town of Millsboro \$825.00
FOR Eight Hundred twenty-five dollars and 00/100 DOLLARS
Plan review fee WPC 3010/24 Sewage Pumping Station No 4

ACCT	\$	825.00
PAYMENT	\$	825.00
	\$	-

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

CHECK # 23393
CASH
OTHER BY

Kevin Bronson

DNREC, Surface Water Discharges Section, 89 Kings Hwy, Dover, DE 19901

RECEIPT

February 15, 2024

15

RCVD FROM Town of Millsboro \$300.00
FOR Three Hundred Dollars and 00/100 DOLLARS
WPC Legal Notice Reimbursement 3010/24

ACCT	\$	300.00
PAYMENT	\$	300.00
	\$	-

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

CHECK # 23394
CASH
OTHER BY

Kevin Bronson

DNREC, Surface Water Discharges Section, 89 Kings Hwy, Dover, DE 19901