



Department of Natural Resources
and Environmental Control

Division of Water
Commercial and Government Services Section

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

Phone: (302) 739-9946
Fax: (302) 739-2296

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 (paper copy), if applicable, signed and sealed by a Delaware-registered Professional Engineer, or a Delaware-registered Professional Land Surveyor for gravity systems only.
- 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.delaware.gov/water/commercial-government/>

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

Date Application Submitted 09/30/2025

PROJECT INFORMATION			
<p>Project Name and Location/ Address</p> <p>Joy Beach Sewer Collection System Phase II Lewes, Sussex County, DE</p>			
<p>Tax Parcel Number(s) 234-12.00-74.00, 234-12.00-64.00, 234-12.00-34.00, 234-12.00-31.00, 234-12.00-74.00</p>			
<p>County <input type="checkbox"/> Kent <input type="checkbox"/> New Castle <input checked="" type="checkbox"/> Sussex</p>	<p>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</p>		
<p>Sewer District or Interceptor Interceptor</p>	<p>Wastewater Treatment/Disposal Facility Name Inland Bay WWTP</p>		
<p>Anticipated Construction Start Date Spring 2026</p>	<p>Treatment/Disposal Facility Owner and Operating Permit Number LTS 5004-90-12 DEN No. 359141-05</p>		
<p>Please note, construction permits expire three (3) years from the date of permit issuance.</p>			
<p>Are you requesting plan review and comment or WPCC Construction Permit issuance (circle one)</p>			
<p>Design Flow (gallons/day) Average 30,000 gpd</p>	<p>Peak 158,400 gpd (to meet scour velocity)</p>	<p>Peak Factor 5.25</p>	<p>Basis of Design Sussex County Standards and Specifications</p>
<p>Description An 8" gravity sewer is proposed to be installed to serve the Cherry Creek Valley and Happy Go Lucky communities. The gravity sewer will flow to a proposed pump station. The proposed pump station will convey flow via a 4" force main and tie into the existing 4" FM along Camp Arrowhead Road just north of the intersection with Waterview Road.</p>			
OWNER/DEVELOPER			
<p>Company Name Sussex County</p>			
<p>Mailing Address 2 The Circle, PO Box 589</p>			
<p>City Georgetown</p>	<p>State DE</p>	<p>Zip 19947</p>	
<p>Contact Name Paul Mauser, PE, County Engineer</p>			
<p>E-Mail Address paul.mauser@sussexcountyde.gov</p>			
<p>Telephone (302)855-7370</p>	<p>Cell -</p>	<p>Fax (302)855-7799</p>	

ENGINEER					
Company Name KCI Technologies, Inc.					
Mailing Address 614 N Dupont Highway					
City Dover			State DE	Zip 19901	
Contact Name Daniel String, PE					
E-Mail Address Daniel.String@kci.com					
Telephone (302) 318-1124		Cell (302) 747-5999		Fax None	
GRAVITY SEWER INFORMATION					
Ownership <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	Type of Sewer System <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other?			If Other, list below	
Type of Pipe PVC	Length (ft) 7,043	Diameter (in) 8	Joint Specification MJ	Min. Slope (ft/ft) .0028	Min. Velocity (ft/sec) 2.0
PVC	7	10	MJ	0.004	2.0
Minimum Pipe Cover (ft) 3.5	Number of Manholes 41	Drop manholes provided? Yes		Maximum Distance Between Manholes (ft) 400	
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.) High water table anticipated in portions of the gravity sewer installation.					
Comments					

PUMP/LIFT STATION INFORMATION				
Ownership <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	Type of Wastewater <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Other?			If Other, list below None
Pump Station Flows (gallons/day) Design 158,400 gpd	Average 30,000 gpd	Peak 158,400 gpd	Peak Factor 5.25	
Basis of Design Sussex County Standard and Specifications		Pump Type Submersible Pump		
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) 6	Wet Well Detention Time (minutes) 15	
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 type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
What other provisions for emergency operations? Emergency Bypass connection provided				
Height of Influent Above Pump (suction head) (ft) -4.73	Height of Effluent Above Pump (discharge head) (ft) -2.8	Friction Loss (ft) 23		
Pump Design Point 110 GPM @ 66' TDH	Pump Operating Point 112 GPM @ 67' TDH	Static Head (ft) 43	Total Head (ft) 66	Required Motor Horsepower (hp) 4.0
FORCE MAIN INFORMATION				
Type of Pipe PVC DR-18 & HDPE DR-11		Length (ft) 1920	Diameter (in) 4"	
Hazen-Williams "C" Design Factor 140	Type of Joints PVC - Bell & Spigot HDPE - Butt fusion	Velocity Under Design Conditions (ft/sec) 2.99	Minimum Pipe Cover (ft) 3.5	
Air relief valves specified? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Clean-outs provided? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Maximum distance between clean-outs (ft) 1,000		
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: N/A			
Comments				

JOY BEACH PHASE 2

PUMPING STATION & FORCE MAIN CALCULATION SHEET

A. Calculate Peak Design Flow:

120	# of EDU's	250	GPD/EDU
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Qavg =	
30,000	gpd
20.83	gpm

Peak Factor	2.42	Calculated	PF = (20+2[EDU/10]^0.5)/(5+2[EDU/1]^0.45)
Peak Factor	5.25	Used*	

Qpeak =	72,656	gpd	Minimum FM Size Per Sussex County Guidelines
	50.46	gpm	D = 0.175 √ (Qp × 0.1334 × C / 2.5)

Min FM Dia. 3.40 inches

110.00	Flow Rate (gpm)	*Peak Flow is 50.46	but increased to	110.0
0.25	Flow Rate (cfs)		to reach min scour velocity of 2.5 ft/s IN 4" PIPE	

140	C -factor	*PVC pipe for FM and gravity
100	C-factor	*Ductile iron for PS

Analyze Pipe Diameters: HDPE DR-11 Pipe (DIPS) & PVC Pipe

Pipe Diameter (in)	Actual Inside Pipe Diameter (in)	X - Sectional Area (sqft)	Flow Rate (cfs)	Velocity (fps)	hL (ft/100ft)
2.00	1.91	0.02	0.25	12.28	28.461
3.00	2.86	0.04	0.25	5.48	3.995
4.00	3.88	0.08	0.25	2.99	0.917
4.00	4.23	0.10	0.25	2.51	0.599
6.00	5.57	0.17	0.25	1.45	0.157
8.00	7.31	0.29	0.25	0.84	0.042
10.00	8.96	0.44	0.25	0.56	0.016
12.00	10.66	0.62	0.25	0.40	0.007
14.00	12.35	0.83	0.25	0.29	0.003
16.00	14.05	1.08	0.25	0.23	0.002

Design Flow (gpm) 110.00

Choose Pipe Diameter (in)

3.88

for a

Velocity (fps) = 2.99

*Velocity should be between 2.5 and 5.0 feet per second

C. Pump Station Friction Losses

4.100	Actual Diameter of Piping within Pump Station (inches)
2.67	Velocity

Fittings

Reducer 3/4
Plug Valve
Entrance Losses
90 deg. Elbow
22.5 deg Elbow
Check valve
45 deg bends
T (flow thru)
Pipe Length

Size (inch)	Leq (ft)	Qty.	Leq (ft)
4.1	5	1	5
4.1	1.75	2	3.5
4.100	4.5	1	4.5
4.1	8	2	16
4.10	2.5	0	0
4.1	19	1	19
4.1	5.5	0	0
4.1	6	2	12
4.1	1	30	30
Total Leq (ft)			90

Force Main Friction Losses (DR11 HDPE)

PS to Camp Arrowhead

3.876	Diameter of Force Main Piping (inches)
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Fittings

Reducer 2/3
Plug Valve
Entrance Losses
90 deg. Elbow
Check valve
Gate Valve
45 deg bends
22.5 deg bends
Wye (flow thru)
Pipe Length

Size (inch)	Leq (ft)	Qty.	Leq (ft)
3.876	5		0
3.876	2.3	1	2.3
3.876	4.5		0
3.876	11		0
3.876	19		0
3.876			0
3.876	5	2	10
3.876	2.5	2	5
3.876	6		0
3.876	1	675	675
Total Leq (ft)			692.3

Force Main Friction Losses (4" DR18 PVC Pipe)

Camp Arrowhead to Waterview & Joy Beach 1 FM

4.230	Diameter of Force Main Piping (inches)
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Fittings

Reducer 2/3
Plug Valve
Entrance Losses
90 deg. Elbow
Check valve
Gate Valve
45 deg bends
22.5 deg bends
Wye (flow thru)
Pipe Length

Size (inch)	Leq (ft)	Qty.	Leq (ft)
4.230	5		0
4.230	2.3	1	2.3
4.230	4.5		0
4.230	11		0
4.230	19		0
4.230			0
4.230	5	9	45
4.230	2.5	2	5
4.230	6	1	6
4.230	1	2562	2562
Total Leq (ft)			2620.3

Static Head Loss:

23.50	High Point in System (ft)
-9.23	"Pump Off" Elevation (ft)

10	Joy Beach 1 Pump
32.73	Static Head

Calculate Total Dynamic Head:

* Summation of PS Friction Losses, Force Main Friction Losses, and Static Head

1.17	Pump Station Friction Losses (ft)
6.35	4" PVC Force Main Friction Losses (ft)
15.70	4" HDPE Force Main Friction Losses (ft)

Design Point:

65.94	TDH (ft)
110.00	Design Flow Rate (gpm)

SYSTEM CURVE:

GPM	Static Loss	Loss in PS Pipe (ft)	Loss in FM Pipe (ft)	Total
0	42.73	0.00	0.00	42.73
10	42.73	0.01	0.08	42.82
20	42.73	0.05	0.27	43.05
30	42.73	0.11	0.57	43.41
40	42.73	0.18	0.98	43.89
50	42.73	0.27	1.48	44.48
60	42.73	0.38	2.07	45.18
70	42.73	0.51	2.75	45.99
80	42.73	0.65	3.52	46.90
90	42.73	0.81	4.38	47.91
100	42.73	0.98	5.32	49.03
110	42.73	1.17	6.35	50.24
120	42.73	1.37	7.45	51.56
130	42.73	1.59	8.64	52.97
140	42.73	1.83	9.91	54.47
160	42.73	2.34	12.69	57.76
180	42.73	2.91	15.78	61.42
200	42.73	3.53	19.18	65.44
220	42.73	4.22	22.87	69.82
240	42.73	4.95	26.87	74.55
260	42.73	5.74	31.16	79.63

B. Wet Well Volume

General Guideline Equation: $V_{min} = (T_{min} \times Q_p) / 4$; Use $T_{min} = 10$ minutes
Use Manufacturer's recommendations for on/off cycle times to confirm sizing

T _{min}	10
Q _p	110

V _{min} =	275.00	gallons
	36.76	cuft

Alternate Wet Well Volume Calcs:

* change to size wetwell for minimum pump run time ->
when $Q_i = 1/2 Q_o$

Tmin	10
Qin	55.00
Qout	110.00

* Qin is Q_{out} (Q_{peak}) divided by 2, simulating best
* Q_{out} is Q_{peak} because Q_{peak} is output of

Vmin =	275.00	gallons
	36.76	cuft

6 Choose Wet Well Diameter, in feet 4 foot works, for duplex pump spacing assume 6 foot

1.30 Required Operating Depth normal 2 ft or smaller
Round up to nearest 0.25 feet

1.50 Selected Operating Depth

C. Ventilation * Ventilation fans must be positive pressure feeds per MD, Smyrna & NCC Standards

Fan Type (Intermittent(0)/Constant(1))
Volume of wet well =

1.00
515.44

Cu. Ft

Ten States/Sussex County flow rates =
NCC flow rate changes/hr variable =
Intermittent Flow

257.72	CFM	Costant
51.54	CFM	
103.09	CFM	Intermittent

C Factor
Pipe Dia:

140.00
4.00

Net Positive Suction Head (NPSH) & Cavitation:

**Barometric Pressure of water column =
**Vapor Pressure of Liquid =
**Entrance Losses =
Transport Friction Losses =
Static Head=

33.90	ft
0.21	ft
1.00	ft
0.00	ft
1.00	ft

Design NPSHr = 17.36 ft
Actual NPSHa = 33.69 ft

* Actual NPSH should be no lower than 20.83 ft

** Change for high elevations
* Manufacturer's NPSH
* 20% > than NPSH Req'd
(See safety factor below.)

Buoyancy Calculations

Density Table:

Water	62.4	LB/CF
Dry Soil	110	LB/CF
Wet Soil	70	LB/CF
Concrete	150	LB/CF

Wetwell Dimension Table:

	Concrete	Wet Soil	Dry Soil	
Height	19.7	18.2	18.2	FT
Width	0.58	1	1	FT
Avg Perimeter	22.49	25.13	25.13	FT

Base Height	1	0	0	FT
Base Diameter	9	0	0	FT

Wetwell Volume(inc. lip) = 718 CF
 Total Buoyant Force = 44,823 LBS. (1)
 Weight of Pump Station = 5000 LBS. (2)

Vol. (Concrete Barrel) = 259
 Wt of Wetwell Concrete Barrel = 38,833 LBS. (3)

Vol. (Concrete Base) = 63.62 CF
 Wt of Concrete Base = 9,543 LBS. (4)

Vol. (Wet Soil) = 458 CF
 Wt of Wet Soil = 32,072 LBS. (5)

Vol. (Dry Soil) = 458 CF
 Wt of Dry Soil = 50,399 LBS. (6)
 Wt of Wet Soil = 32,072 LBS.

Resisting Force= 80,447 LBS

Force Balance = 40,624
 (2)+(4)+(7)-(1)

Safety Factor = 1.8 SF of > 1.2 is Required

Water Hammer

K, For Water = 45792000 psf
 K, For Water = 318000.00 psi
 Density of Water = 1.936 slug/cu ft AKA (ft lbs s-1) / cu ft
 Initial Acoustic Velocity = 4863.42 fps
 Gravity = 32.17 ft/s²
 Pipe Internal Diameter = 3.88 in
 Pipe Wall Thickness = 0.69 in
 Young's Modulus (E) = 700000 psi
 Acoustic Velocity = 2580.55 fps

Change in Pressure due to Waterhammer 73.52 psi
169.10 ft of water

PVC Approved to 185 psi

D. Electrical Load Calculations

Horsepower sizing

Qpeak = 110.00 gpm
 TDH = 65.94 ft
 Specific g = 1.00 (dimensionless)
 Horsepower = 1.83 HP

EQUIPMENT

Odor Control (Heat Trace)
Odor Control (Ctrl panel)
4 Floor Lights
Ext. Light
Wet Well Light
Hoist
Heater #1
Heater #2
Battery Charger
Generator Wat. J. Heater
Supply Fan & Mtr. Dmpr.
Exhaust Fan
2 Louver Motors
Telemetry
Receptacle
2 - 25HP Motor

	WATTS	VOLTS	AMPS.
	1800	120	15
	1800	120	15
	640	120	5.33
	200	120	1.67
	200	120	1.67
	748	120	6.23
	3600	240	15.00
	3600	240	15.00
	500	120	4.17
	1500	120	12.50
	230	120	1.92
	190	120	1.58
	200	120	1.67
	100	120	0.83
	1500	120	12.50
	37285	240	155.35
	TOTAL		265.42

Pump Curve and System Curve

