

Revolutionizing Stormwater Management:

The First Dune Infiltration System in South Carolina

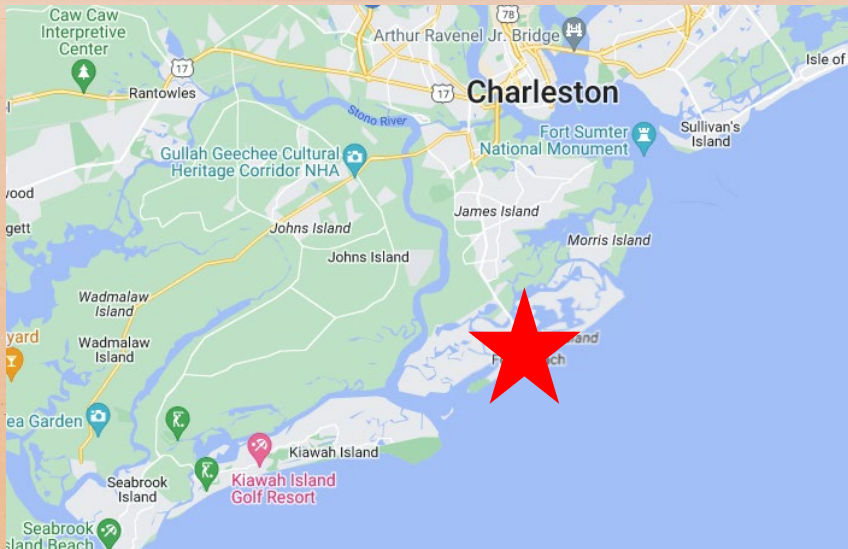
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Senior Project Manager





Population:

2,660 people; 489
families
2020 US Census



Sections of Folly Beach underwater after downpour



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EMERGENCY ACCESS ISSUES



6"

loss of vehicle control
and stalling

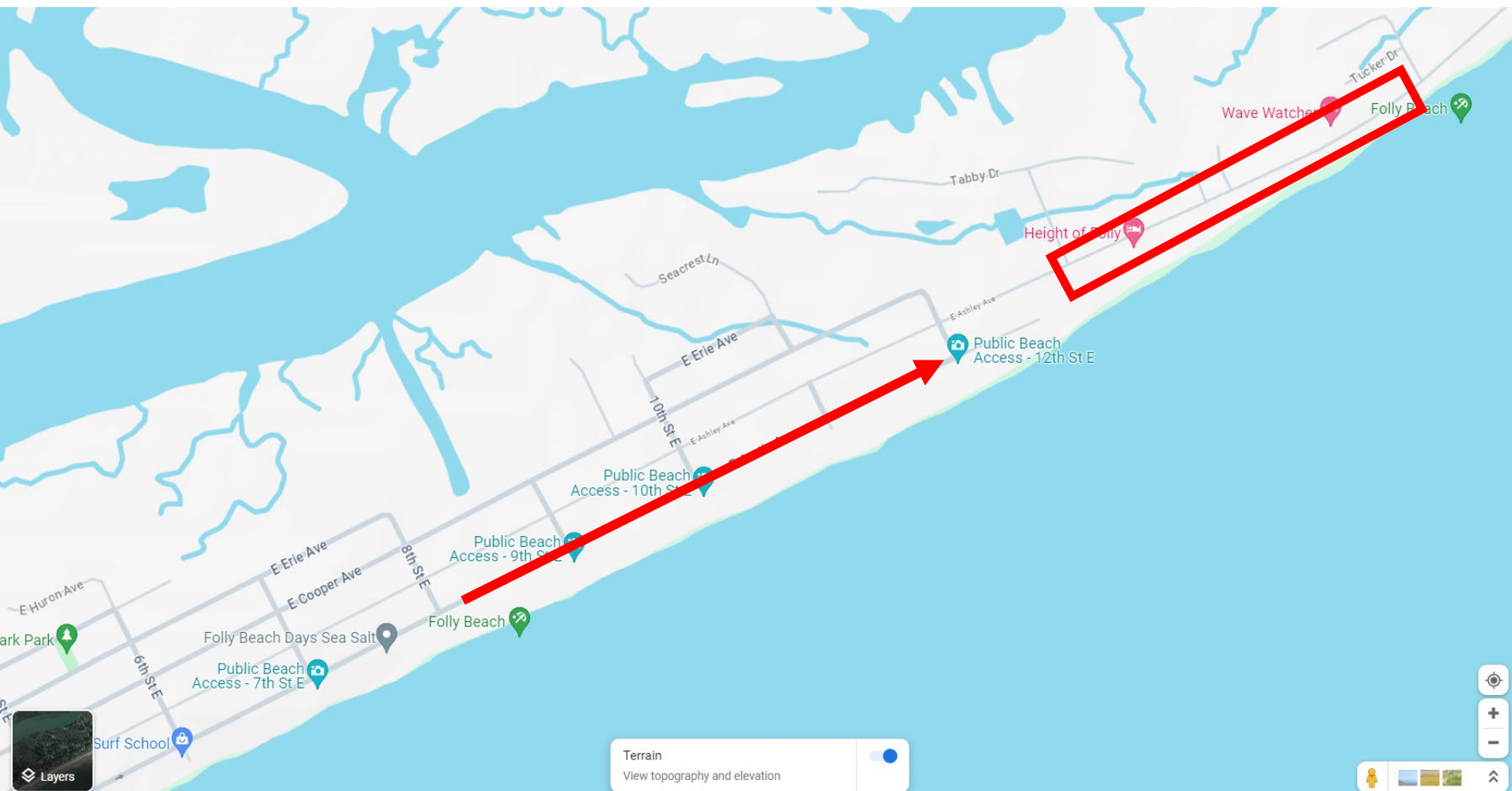
12"

vehicle floats

Severe storm events >6"

Moderate storm events <6"







NC STATE

EXTENSION

STUDY

Dune Infiltration Systems for Reducing Stormwater Discharge to Coastal Recreational Beaches

Flow

Site M
96%

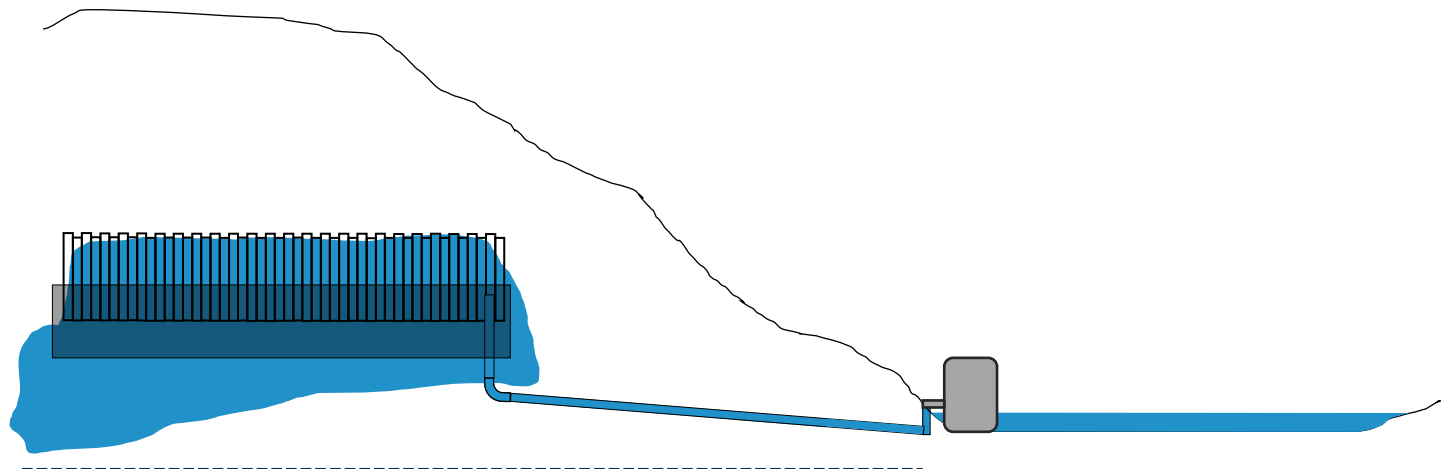
Site K
80%

Bacteria Concentration

98%

HOW IT WORKS

Underground Dune Infiltration System



Seasonally high water table





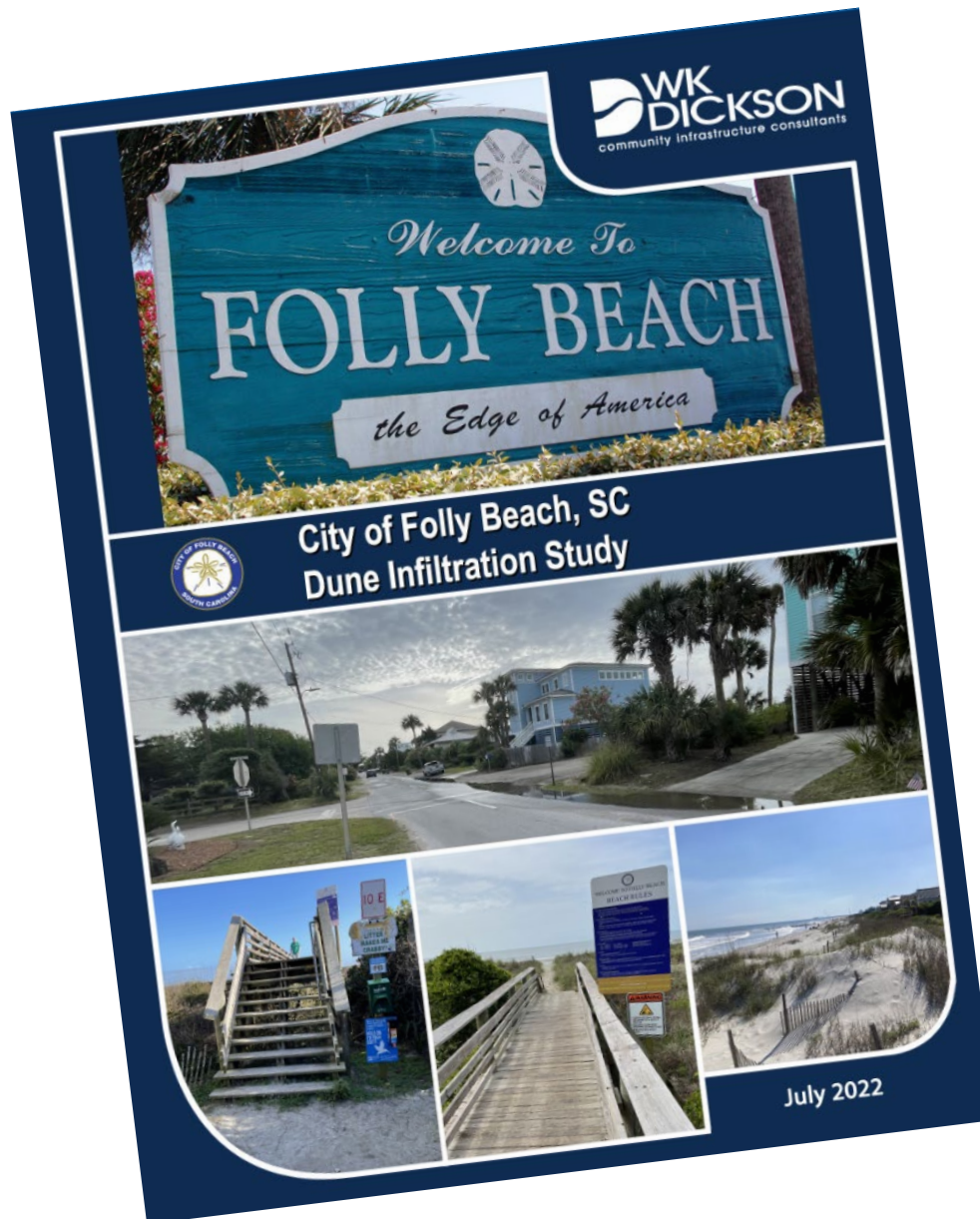
WATER & SEWER
INC. & SC License
HICKMAN
UTILITIES
STORM WATER CLEARING
Bladenboro, NC







FIRST STEP: FEASIBILITY STUDY





Site #1 (Public Beach Access)
4th St. and E. Arctic Ave.
Provided Area: 400 sf

Site #2 (Public Beach Access)
10th St. and E. Arctic Ave.
Provided Area: 460 sf

Legend

-  Flooded Areas
-  Infiltration Areas







WELCOME TO FOLLY BEACH BEACH RULES

WALKING ON DUNES PROHIBITED

- Go only at designated walkways stay off vegetation and dunes.
- Unleashed or untamed animals plus, avoid or remove anything on or in dunes.
- Do not disturb turtle nesting areas - FEDERAL LAW PROTECTS NESTING AREAS

NO LITTERING & NO ALCOHOL

- No glass is allowed on the beach.
- No person shall possess an alcoholic beverage on the streets, beach, or other public place.
- Personal property not allowed on beach overnight - subject to removal by beach patrol.
- No plastic carry-out bags, styrofoam, or balloons allowed on beach. (Ord # 111.06)

PETS ON BEACH

- PETS MUST BE HANDLED BY LEASH AT ALL TIMES.
- Owner is responsible for picking up animal waste & disposing of properly.
- Animals are not to be left unattended and confined in any vehicle.
- Dogs are not allowed at any time on the east end of the Island (4th Coast Guard Station).
- Members of FIDO may have unleashed dogs per FIDO membership regulations only.

DOG HOURS

- Day 1 - April 30
- May 1 - Sept 30
- May 1 - Sept 30

ALL HOURS

- Between 10am - 4pm
- Between 4pm - 12am

LEASHED DOGS ON BEACH

- NO DOGS ON BEACH
- LEASHED DOGS ON BEACH

VEHICLES

- No local storage on the beach.
- No recreational vehicles of any type allowed on the beach.

SURFING/TOPPING

- Surfing without a beach is prohibited. Surfing and surf fishing are also prohibited from 10am - 4pm from 3rd Street east to 3rd Street west, known as the ocean zone.

CAMPING

- It is unlawful to camp, sleep or stay overnight on the beach or in a vehicle anywhere within the Folly Beach City Limits.

FIRE & FIREWORKS PROHIBITED

- No open fires allowed on the beach - portable V.C. listed propane grills are allowed.
- Fireworks are not allowed within the Folly Beach City Limits.

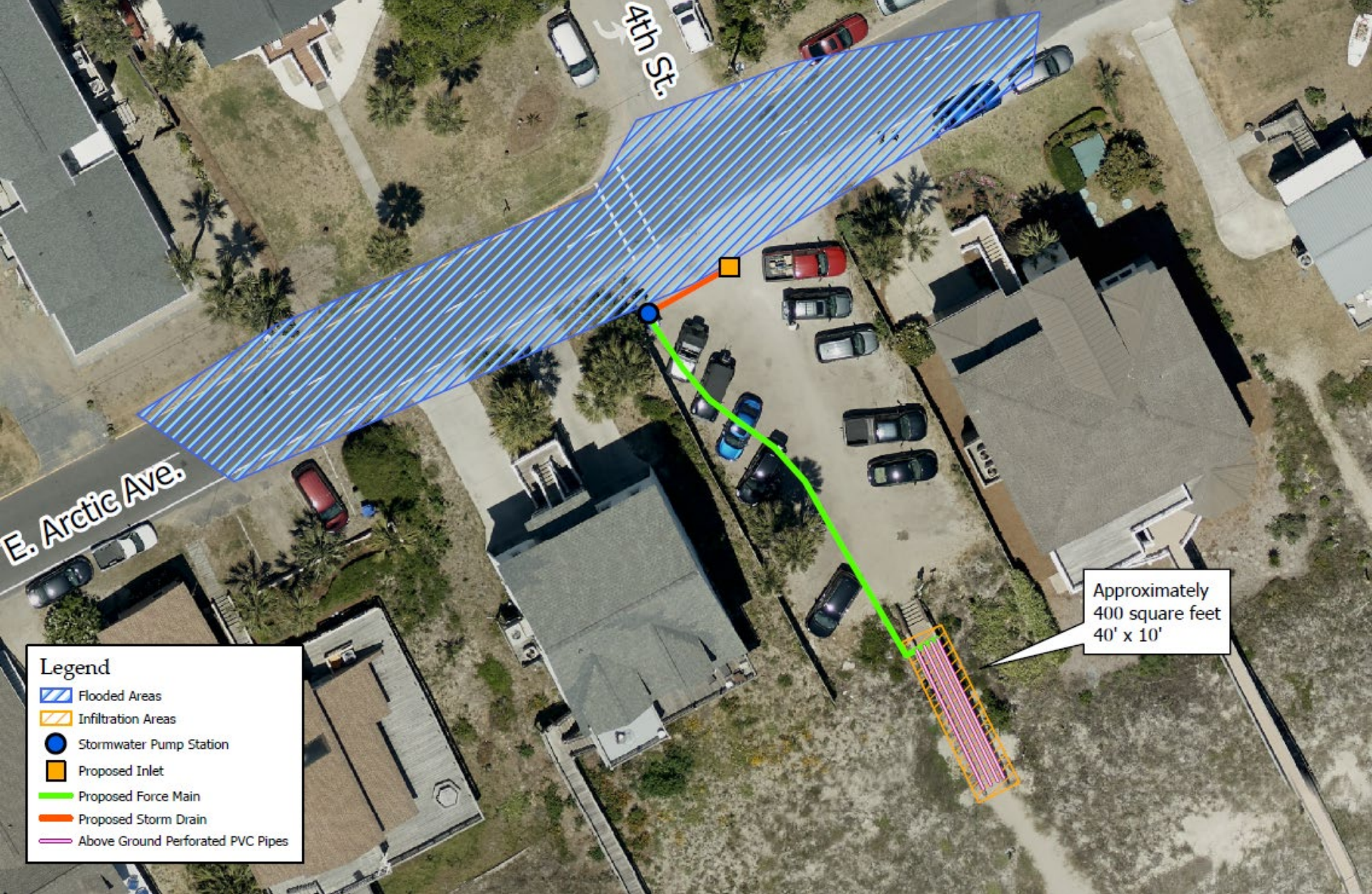
FOR FURTHER INFORMATION: Call Public Safety (843) 598 - 2433

www.cityoffollybeach.com

MAXIMUM FINE \$1087/per violation with court costs



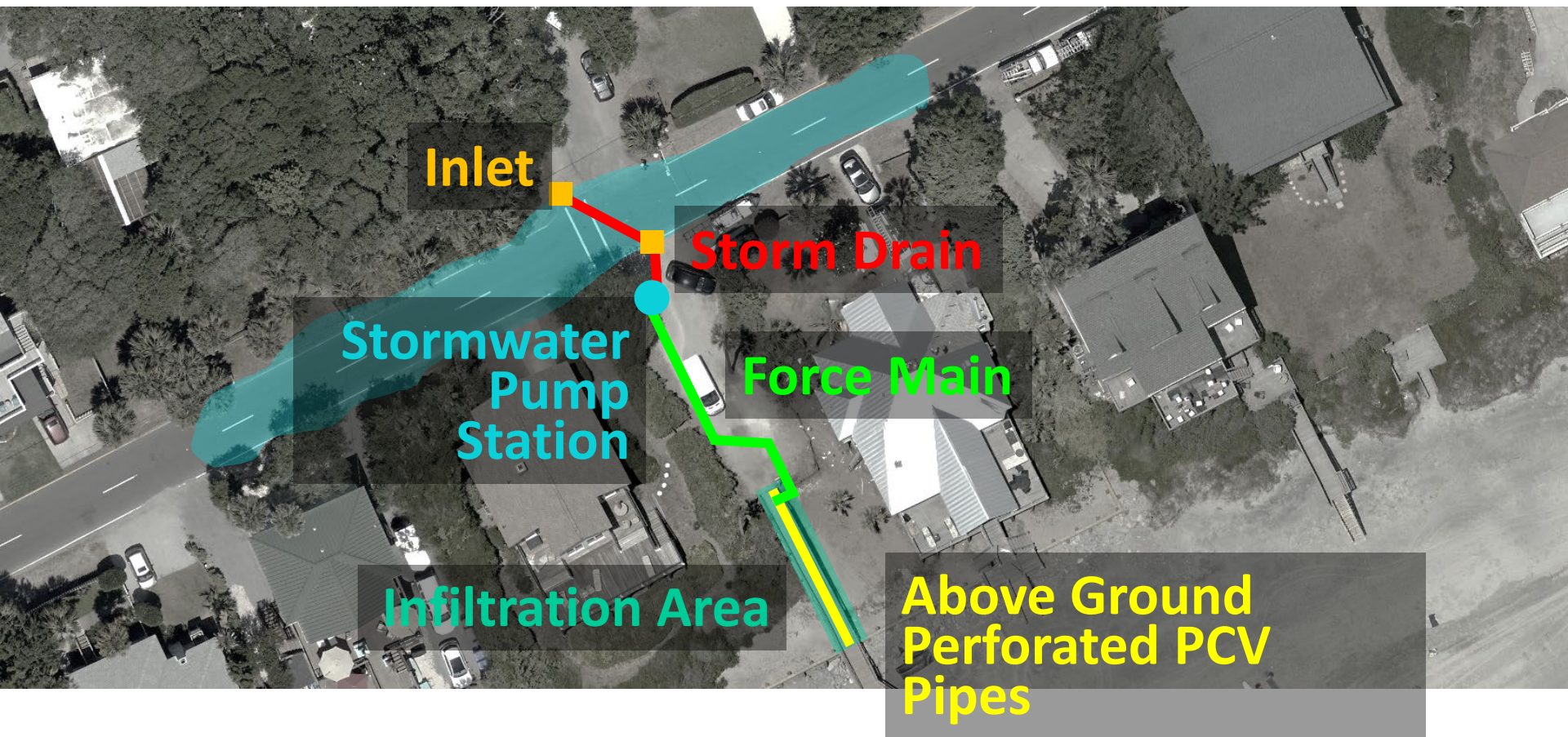


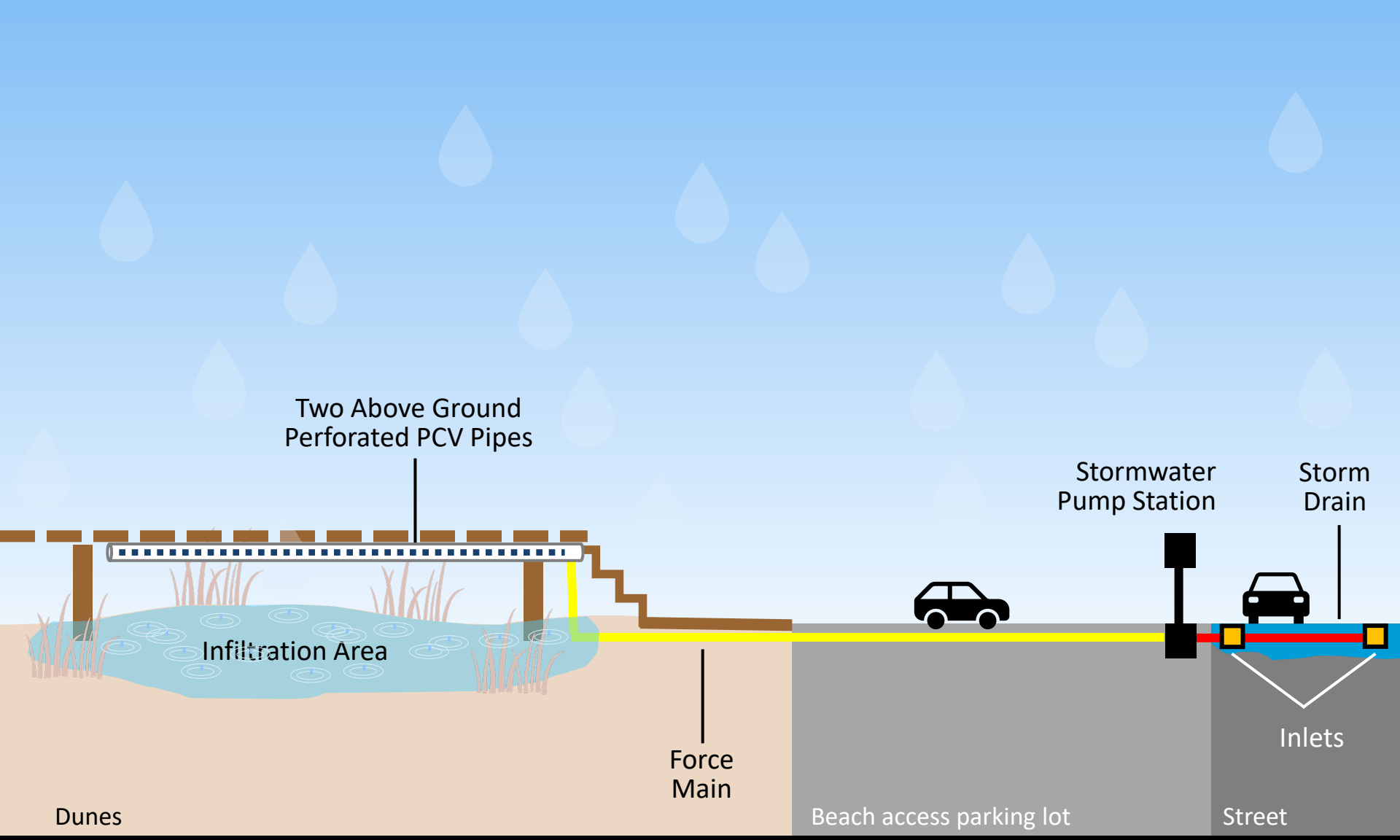


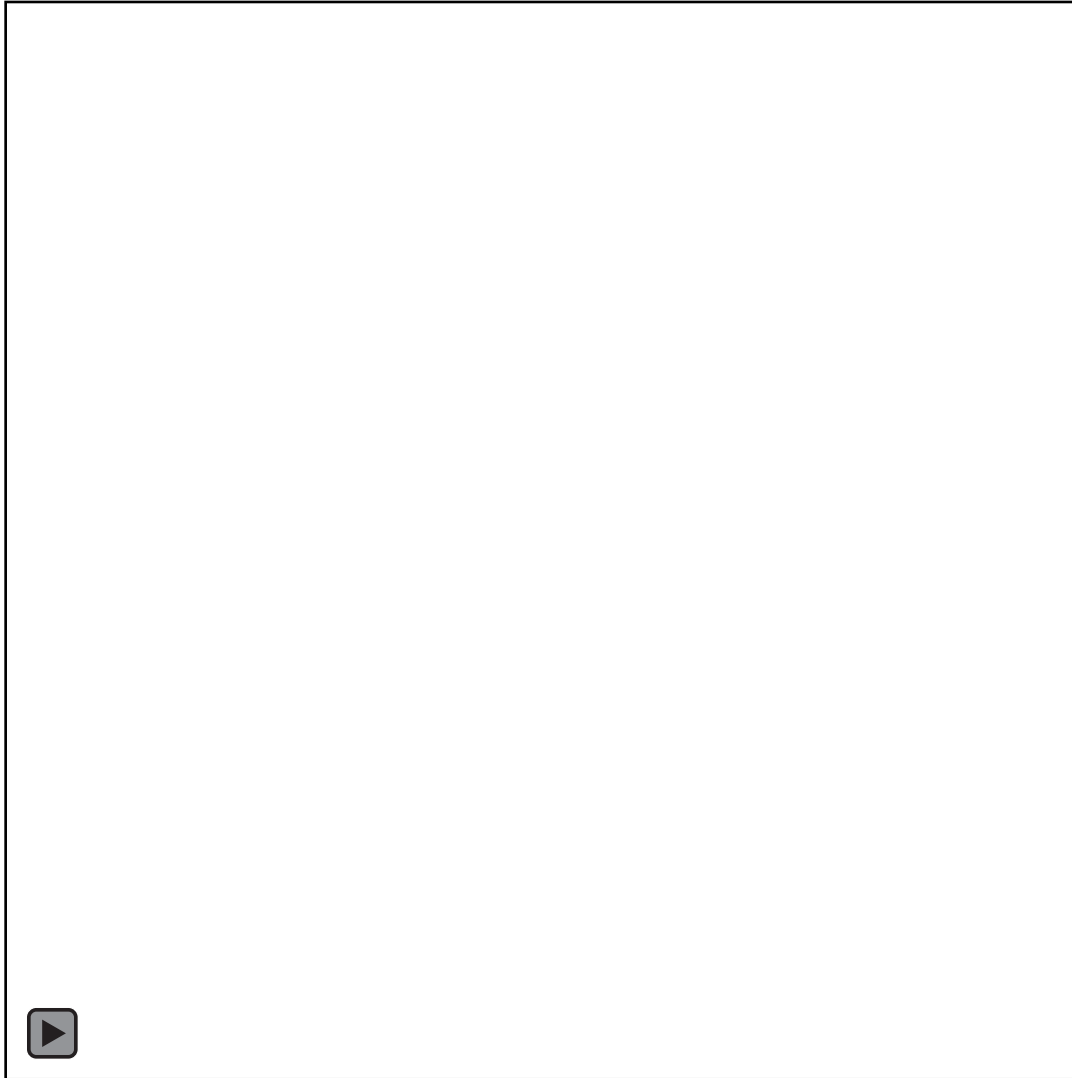
Site #1



Site #2















SOIL ANALYSIS

Table 1. Seasonal High-Water Table (SHWT)

Location	SHWT Below Existing Grade (inches)	Approximate Groundwater Depth Below Existing Grade (inches)
I-1	36	60
I-2	32	60
I-3	24	45
I-4	32	48
I-5	35	48
I-6	48	67
I-7	29	54

Table 2. Infiltration Test Results

Location	Description	Test Depth (inches)	Rate (in/hr)
I-1	Brown, tan, and white sand	30	22.62
I-2	Brown, tan, and white sand	26	20.11
I-3	Light brown, tan, and white sand	18	26.39
I-4	Brown, tan, and light brown sand	48	18.85
I-5	Brown, light brown, and tan sand	29	21.36
I-6	Brown and tan sand	42	11.71
I-7	Brown and tan sand	23	28.90

So, what
about the
Cost?

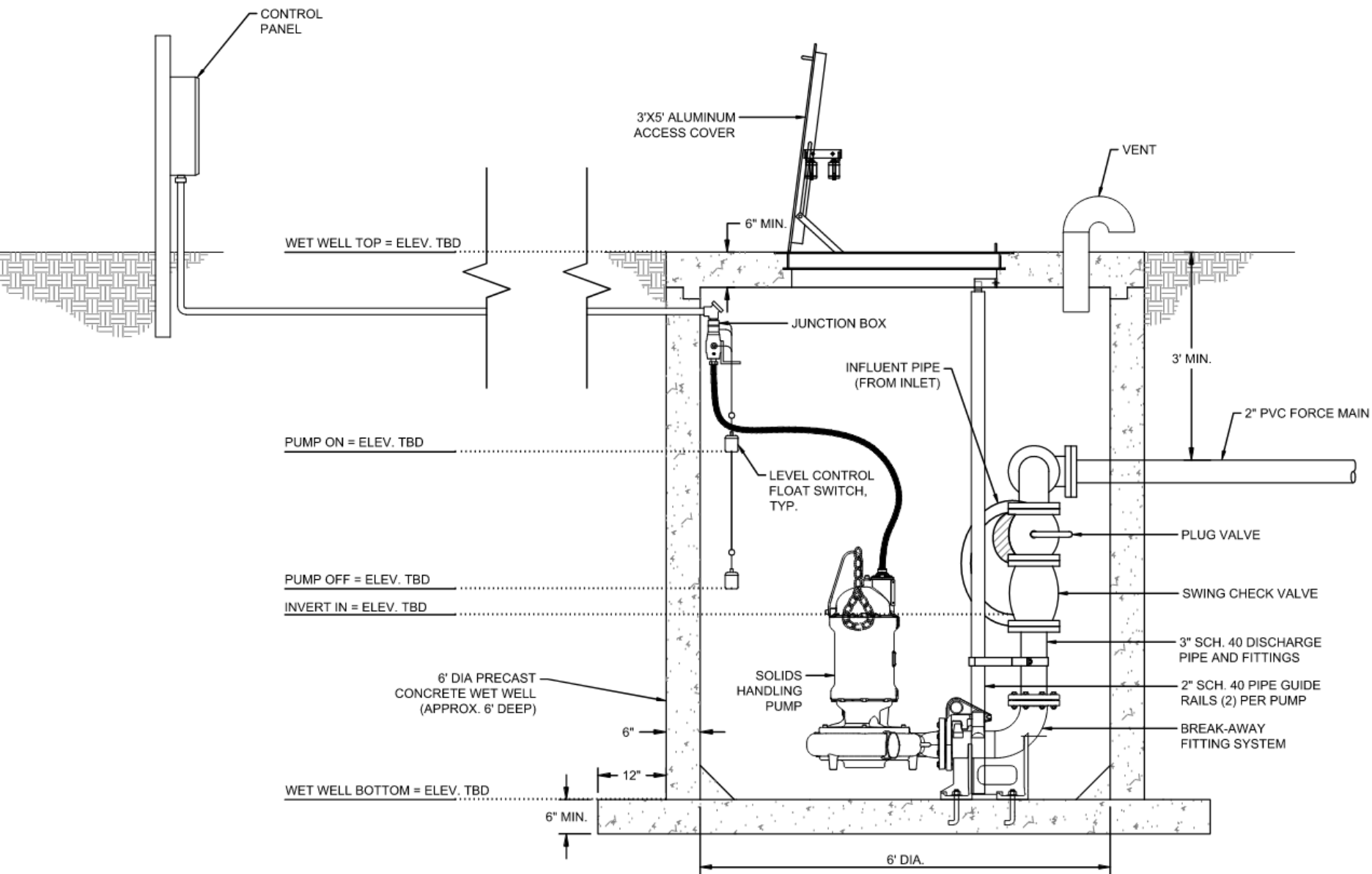


~\$164,000

Date: 11/21/2022

ind E. Arctic Ave

ITEM	ITEM	SCHEDULED	UNIT	UNIT	TOTAL
NO.	DESCRIPTION	QUANTITIES		PRICE	AMOUNT
1	Mobilization (5% of Total Cost)	1	LS	\$7,800.00	\$7,800.00
2	Clearing and Grubbing (Including shrub removal)	1	LS	\$1,000.00	\$1,000.00
3	Site Stabilization with Grass, Shrub, and Dune Replanting	1	LS	\$3,000.00	\$3,000.00
4	15"-18" RCP Storm Drain Pipe	24	LF	\$110.00	\$2,640.00
5	Storm Drain Inlet	1	EA	\$5,000.00	\$5,000.00
6	Permanent Inlet Filter Protection	1	EA	\$1,500.00	\$1,500.00
7	Pump Station Complete with 6' Dia. Concrete Wet Well, Electric Equipment, Ground Rod, Light Fixture, Pumps, Check Valve, Testing, etc.	1	LS	\$120,000.00	\$120,000.00
8	2" PVC Force Main	100	LF	\$20.00	\$2,000.00
9	Gravel Parking Lot Removal and Replacement	0	SY	\$50.00	\$0.00
10	Asphalt Pavement Removal and Replacement	0	SY	\$75.00	\$0.00
11	4" Perforated PVC Pipe	180	LF	\$80.00	\$14,400.00
12	Bollards	2	EA	\$1,000.00	\$2,000.00
13	Traffic Control	1	LS	\$2,000.00	\$2,000.00
14	Erosion Control	1	LS	\$2,000.00	\$2,000.00
				Project Subtotal	\$163,340.00



PUMP STATION WET WELL
TYPICAL DETAIL - SECTION

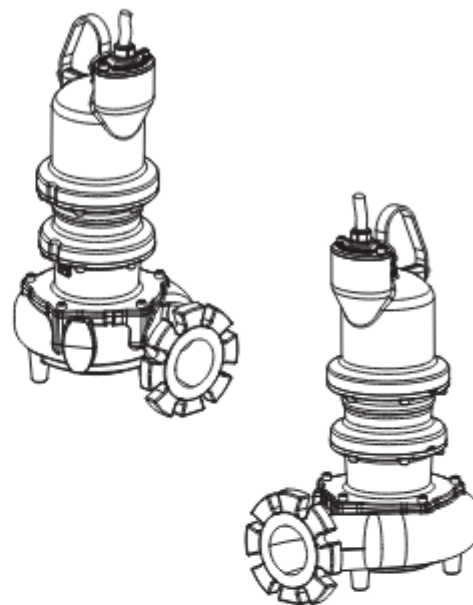
SCALE: NOT TO SCALE





Specifications:

DISCHARGE	4", 125 lb. Horizontal Flange Slotted to accommodate 100mm ISO Flanges
LIQUID TEMPERATURE	104°F (40°C) Continuous
VOLUTE	Cast Iron ASTM A-48, Class 30
WEAR RING	C954 Lead-Free Bronze
MOTOR HOUSING	Cast Iron ASTM A-48, Class 30
SEAL PLATE	Cast Iron ASTM A-48, Class 30
IMPELLER:	
<i>Design</i>	Enclosed Dual Vane, With Pump Out Vaness on Back Side. Dynamically Balanced ISO G6.3
<i>Material</i>	Ductile Iron ASTM A-536, 65-45-12
SHAFT	416 Stainless Steel
"O" RINGS	Buna-N
HARDWARE	300 Series Stainless Steel
LIFTING BAIL	300 Series Stainless Steel
PAINT	Axalta™ Corlar® Epoxy, Two Coats
SEAL:	<i>Design</i> Tandem Mechanical, Oil Filled Reservoir.
	<i>Material: Inboard</i> Rotating Faces - Carbon Stationary Faces - Ceramic
	<i>Material: Outboard</i> Rotating Faces - Silicon Carbide Stationary Faces - Silicon Carbide Elastomer - Buna-N
	Hardware - 300 Series Stainless
CORD ENTRY	Custom Molded, Quick Connected for Sealing and Strain Relief
POWER CORD	CSA Certified Submersible Power Cable 2000V - Ordered Separately
SPEED	1750 RPM
UPPER BEARING:	
<i>Design</i>	Single Row, Ball, Oil Lubricated
<i>Load</i>	Radial
LOWER BEARING:	
<i>Design</i>	Double Row, Ball, Oil Lubricated
<i>Load</i>	Radial & Thrust
MOTOR:	<i>Design</i> NEMA B - Three Phase Torque Curve NEMA L - Single Phase Torque Curve Oil-Filled, Squirrel Cage Induction, Inverter Duty rated per NEMA MG1
	<i>Insulation</i> Class H Varnish & Magnet Wire
SINGLE PHASE	Requires overload protection to be included in control panel. Requires start components to be included in panel. Provided with pump.
THREE PHASE	Requires overload protection to be included in control panel.
MOISTURE SENSOR	Normally Open (N/O), Requires Relay in Control Panel
TEMPERATURE SENSOR	Three Normally Closed (N/C). To be wired in series with control circuit.
OPTIONAL EQUIPMENT	White Iron Impeller, Seal Material, Impeller Trims, Cord Length
MARKINGS	CSA
WEIGHT	228 lbs (104 Kg)
NOISE EMISSION MAX	In-Air 65 dB-A
SUBMERGENCE	Max Depth 66ft (20m)
RECOMMENDED:	
<i>Accessories</i>	Break Away Fitting (BAF) Check Valve



Series: 4XSHD

3 - 10HP, 1750RPM, 60Hz

**Explosion Proof, Class I,
Division 1, Groups C & D, T4**

Sample Specifications: Section 0.1D Page H.

This product may be covered by one or more of the
following patents and other patent(s) pending:
US Patent 7,931,473

DESCRIPTION:

SUBMERSIBLE NON-CLOG PUMP
DESIGNED FOR RAW SEWAGE
APPLICATIONS.

Site Specifications

Provided Surface Area (SA)	460 sf
Provided Length	46 ft
Provided Width	10 ft
Boring # from Geotechnical Report	Avg I-4 to I-7
Hydraulic Conductivity (K)	20.21 in/hr
Max Poned Street Water Volume	1,175 cf

Infiltration and Pumping System

Infiltration Rate (Within Infiltration System Surface Area)	0.22 cfs 96.56 gpm
Above Ground Pipe Length	42.00 ft
Boardwalk Width	5.00 ft
Inside Pipe Diameter	0.33 ft
Outside Pipe Diameter	0.38 ft
Separation between Pipe Rows	1.00 ft
Distance from Bottom of Boardwalk to Ex. Dunes	6.00 ft
Number of Rows of Perforated Pipe	4
Total Length of Perforated Pipe	168
Storage Volume Provided by Perforated Pipe System	14.7 cf
Pipe Perforations Hole Size	0.5 inches
Area of One Perforation	0.001 sf
Orifice Coeff.	0.6
Height (h) for Orifice Discharge calc	0.17 ft
# Perforations per 1' Pipe Length	4.0 holes
Discharge rate through perforated pipe	1.8 cfs

Infiltration System

Required Surface Area for 8 Hour Draw Down Time	174 sf	
Provided Surface Area	460 sf	Good
Required Discharge Rate through Perforated Pipe	0.22 cfs	
Provided Discharge Rate through Perforated Pipe	1.80 cfs	Good
Maximum Time to Pump Street free of Water	8.0 hours	
Time to Pump Street free of Water (Rounded & No Factor Safety)	1.6 hours 100 minutes	Good

ADDITIONAL RESOURCES

- Storm water Solutions: “Addressing Increasing Coastal Flooding with Dune Infiltration” ([Addressing Increasing Coastal Flooding with Dune Infiltration | SWS \(estormwater.com\)](#))
- How Does It Work? Dune Infiltration Systems ([Dune Infiltration Systems: How does it work? – YouTube](#))



Existing Assets

DIS

Environmental
Stewardship

Infrastructure
Resilience

SHARED VISION:

ENTELECHY -> PRACTICAL USEFULNESS COMPARED TO THEORETICAL ELEGANCE.



Thank You!

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