



# MEMO

**PROFESSIONAL SERVICES**

TRANSPORTATION • MUNICIPAL  
DEVELOPMENT • ENVIRONMENTAL

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**To:** City of Milton / Wisconsin DNR  
**From:** Uriah Monday, PE, CFM, MSA Professional Services  
**Subject:** Pastorius Mini-Warehouse Development – Storm Water Management  
**Date:** May 10, 2016

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The project site located westerly of the intersection of N. Henke Road and Arthur Drive is proposed to be developed into mini-warehouses and associated driving/loading areas. A total of 1.77 acres is proposed to be disturbed. As this is greater than one (1) acre, storm water runoff from the site must be controlled to meet the City's storm water management ordinance and Wisconsin Administrative Code Chapter 151.

This site can be considered "in-fill" development of less than 5 acres. In-fill is defined in NR 151 as "an undeveloped area of land located within an existing urban sewer service area surrounded by development or development and natural or man-made features where development cannot occur." The proposed development parcel is 3.36 acres and contains approximately 1.0 acres of existing development, leaving 2.36 acres undeveloped. A 1.44-acre vacant parcel is immediately to the south. Surrounding these two undeveloped parcel areas, there is an existing industrial development to the north, existing residential development to the west, existing roads to the east, an existing commercial development to the south. All of these features meet the criteria in the definition.

For in-fill development, NR 151 and the City ordinance exempt developments from meeting the following storm water management requirements:

- Rate control (detention) is not required (NR 151.123(2)(c) and Ordinance 10-417(c)(2)b3)
- Infiltration is not required (NR 151.124(3)(b)4 and Ordinance 10-417(c)(3)f4)
- Protective area standards are not required (NR 151.125(4)(b) and Ordinance 10-417(c)(4)d2)

Infill development is required to meet an 80% total suspended solids (TSS) reduction to meet Wisconsin DNR standards per NR 151.122(1) Table 1 and City Ordinance 10-

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417(c)(1)d. This site has been designed to achieve greater than 80% TSS reduction by use of a bioretention basin conforming to the design practices outlined in WDNR Conservation Practice Standard 1004.

A WinSLAMM model was constructed to calculate TSS removal from the bioretention basin as shown on the plan. The proposed development area consists of sloped roofs directly running onto asphalt driveway pavement and graded lawn areas and is located on areas currently undeveloped. Some existing development on the site contributes runoff to the basin; these areas consist of sloped roofs directly running onto gravel areas (note these areas will be paved – total area currently graveled and to be converted to pavement is approximately 0.582 acres), plus some small landscaped areas. An area of off-site roadway right-of-way to the east of the site contributes runoff to the basin as well. All of the above-described areas are accounted for and routed to the basin, and a copy of the site plan with a summary of area measurements that contribute runoff to the basin is attached to this memo.

The basin itself consists of a two-foot-thick layer of engineered soil, underlain with a one-foot-thick layer of clear stone. The stone layer has a 6" diameter underdrain within it. At an elevation 12" above the engineered soil, there is an overflow section which would allow large flows to pass through the system. The WinSLAMM model was set to allocate an 80% removal to all runoff filtering through the engineered soil layer.

Model results indicate TSS is reduced by **83.5%** as compared to no controls. This meets the requirements of NR 151 and City ordinance. A copy of the model input and output is attached to this memo.

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Data file name: P:\6500s\6570s\6577\06577024\Calculations\SLAMM\Pastorius\_SLAMM\_051016.mdb  
WinSLAMM Version 10.0.1

Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN

Particulate Solids Concentration file name: C:\WinSLAMM Files\WI\_AVG01.pscx

Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI\_SL06 Dec06.rsv

Residential Street Delivery file name: C:\WinSLAMM Files\WI\_Res and Other Urban Dec06.std

Institutional Street Delivery file name: C:\WinSLAMM Files\WI\_Com Inst Indust Dec06.std

Commercial Street Delivery file name: C:\WinSLAMM Files\WI\_Com Inst Indust Dec06.std

Industrial Street Delivery file name: C:\WinSLAMM Files\WI\_Com Inst Indust Dec06.std

Other Urban Street Delivery file name: C:\WinSLAMM Files\WI\_Res and Other Urban Dec06.std

Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std

Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False

Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI\_GEO02.ppdx

Cost Data file name:

Seed for random number generator: -42

Study period starting date: 01/01/81 Study period ending date: 12/31/81

Start of Winter Season: 12/02 End of Winter Season: 03/12

Date: 05-10-2016 Time: 10:57:37

Site information:

LU# 1 - Commercial: Commercial 1 Total area (ac): 2.780

- 1 - Roofs 1: 0.589 ac. Pitched Connected
- 2 - Roofs 2: 0.084 ac. Pitched Connected
- 13 - Paved Parking 1: 0.870 ac. Connected
- 14 - Paved Parking 2: 0.126 ac. Connected
- 45 - Large Landscaped Areas 1: 0.987 ac. Silty
- 51 - Small Landscaped Areas 1: 0.103 ac. Silty
- 52 - Small Landscaped Areas 2: 0.021 ac. Silty

Control Practice 1: Biofilter CP# 1 (DS) - DS Biofilters # 1

1. Top area (square feet) = 5347
2. Bottom area (square feet) = 3615
3. Depth (ft): 4.5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.13
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 1
10. Fraction of rock filled volume as voids = 0.33
11. Engineered soil infiltration rate: 3.94
12. Engineered soil depth (ft) = 2
13. Engineered soil void ratio = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: C:\WinSLAMM Files\NURP.CPZ
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

User-Defined Soil Type 1.000

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**Biofilter Outlet/Discharge Characteristics:**

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 12
3. Height of datum to bottom of weir opening: 4

Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0.5
3. Number of underdrain outlets: 1

WinSLAMM v 10 Data File: [P:\6500s\6570s\6577\06577024\Calculations\SLAMM\Pastorius\_SLAMM\_051016.mdb] - [Land Use Model]

File Current File Data Pollutants Tools Run Utilities Help

RES INS COP IND OU FRE GS CB WWP BF MF HD OD FS

**Land Use:**

Source Area #	Source Area	Area (acres)	Source Area Parameters	First Control Practice	Second Control Practice
33	Sidewalks 3				
34	Sidewalks 4				
35	Sidewalks 5				
36	Sidewalks 6				
<b>Streets</b>		0.000			
37	Streets 1				
38	Streets 2				
39	Streets 3				
40	Streets 4				
41	Streets 5				
42	Streets 6				
43	Streets 7				
44	Streets 8				
<b>Landscaped Areas</b>		1.111			
45	Large Landscaped Areas 1	0.987	Entered	--	--
46	Large Landscaped Areas 2				
47	Large Landscaped Areas 3				
48	Large Landscaped Areas 4				
49	Large Landscaped Areas 5				
50	Large Landscaped Areas 6				
51	Small Landscaped Areas 1	0.103	Entered	--	--
52	Small Landscaped Areas 2	0.021	Entered	--	--
53	Small Landscaped Areas 3				
54	Small Landscaped Areas 4				
55	Small Landscaped Areas 5				
56	Small Landscaped Areas 6				
57	Undeveloped Areas 1				

Land Use #	Land Use Type	Land Use Label	Land Use Area (acres)
1	Commercial	Commercial 1	2.780

CP #	Control Practice Type	Control Practice Name or Location
1	Biofilter	DS Biofilters # 1

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**Biofiltration Control Device**

**Drainage System Control Practice**

**Device Properties**

Top Area (sf)	5347
Bottom Area (sf)	3615
Total Depth (ft)	4.50
Typical Width (ft) (Cost est. only)	10.00
Native Soil Infiltration Rate (in/hr)	0.130
Native Soil Infiltration Rate COV	N/A
Infil. Rate Fraction-Bottom (0-1)	1.00
Infil. Rate Fraction-Sides (0-1)	1.00
Rock Filled Depth (ft)	1.00
Rock Fill Porosity (0-1)	0.33
Engineered Media Type	Media Data
Engineered Media Infiltration Rate	3.94
Engineered Media Infiltration Rate COV	N/A
Engineered Media Depth (ft)	2.00
Engineered Media Porosity (0-1)	0.27
Percent solids reduction due to Engineered Media (0 -100)	80.00
Inflow Hydrograph Peak to Average Flow Ratio	3.80
Number of Devices in Source Area or Upstream Drainage System	1

**Bioreactor Number 1**

**Add Sharp Crested Weir**

Weir Length (ft)	
Height from datum to bottom of weir opening (ft)	

**Remove Broad Crested Weir**

Weir crest length (ft)	10.00
Weir crest width (ft)	12.00
Height from datum to bottom of weir opening (ft)	4.00

**Add Vertical Stand Pipe**

Pipe diameter (ft)	
Height above datum (ft)	

**Add Surface Discharge Pipe**

Pipe Diameter (ft)	
Invert elevation above datum (ft)	
Number of pipes at invert elev.	

**Remove Drain Tile/Underdrain**

Pipe Diameter (ft)	0.50
Invert elevation above datum (ft)	0.50
Number of pipes at invert elev.	1

**Add Other Outlet**

Stage Number	Stage (ft)	Other Outflow Rate (cfs)
1		
2		
3		
4		
5		

**Add Evapotranspiration**

Soil porosity (saturation moisture content, 0-1)	
Soil field moisture capacity (0-1)	
Permanent wilting point (0-1)	
Supplemental irrigation used?	<input type="checkbox"/>
Fraction of available capacity when irrigation starts (0-1)	
Fraction of available capacity when irrigation stops (0-1)	
Fraction of biofilter that is vegetated	
Plant type	
Root depth (ft)	
ET Crop Adjustment Factor	

**Evaporation**

Month	Evapotranspiration (in/day)	Evaporation (in/day)
Jan		
Feb		
Mar		
Apr		
May		
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

**Plant Types**

1	2	3	4

**Activate Pipe or Box Storage**  **Pipe**  **Box**

Diameter (ft) \_\_\_\_\_  
 Length (ft) \_\_\_\_\_  
 Within Biofilter (check if Yes)   
 Perforated (check if Yes)   
 Bottom Elevation (ft above datum) \_\_\_\_\_  
 Discharge Orifice Diameter (ft) \_\_\_\_\_

**Select Native Soil Infiltration Rate**

Sand - 8 in/hr       Clay loam - 0.1 in/hr  
 Loamy sand - 2.5 in/hr       Silty clay loam - 0.05 in/hr  
 Sandy loam - 1.0 in/hr       Sandy clay - 0.05 in/hr  
 Loam - 0.5 in/hr       Silty clay - 0.04 in/hr  
 Silt loam - 0.3 in/hr       Clay - 0.02 in/hr  
 Sandy silt loam - 0.2 in/hr       Rain Barrel/Cistern - 0.00 in/hr

**Change Geometry**  
 Use Random Number Generation to Account for Infiltration Rate Uncertainty  
 Initial Water Surface Elevation (ft) 0.00

**Biofilter Geometry Schematic** Refresh Schematic

**Select Particle Size File** C:\W\inSLAMM Files\NURP.CPZ

Control Practice #: 1 CP Index #: 1

Delete Cancel Continue

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File Name:

P:\6500s\6570s\6577\06577024\Calculations\SLAMM\Pastorius\_SLAMM\_051016.mdb

### Outfall Output Summary

	Runoff Volume (cu. ft.)	Percent Runoff Reduction	Runoff Coefficient (Rv)	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of All Land Uses without Controls	147086		0.45	92.06	845.3	
Outfall Total with Controls	105834	28.05 %	0.33	21.08	139.3	83.52 %
Current File Output: Annualized Total After Outfall Controls	106125		Years in Model Run: 1.00		139.6	

Print Output  
Summary to Text  
File

Print Output  
Summary to .csv  
File

Total Area Modeled (ac)

2.780

### Total Control Practice Costs

Capital Cost	N/A
Land Cost	N/A
Annual Maintenance Cost	N/A
Present Value of All Costs	N/A
Annualized Value of All Costs	N/A

Perform Outfall  
Flow Duration  
Curve Calculations

### Receiving Water Impacts Due To Stormwater Runoff (CWP Impervious Cover Model)

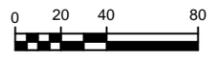
	Calculated Rv	Approximate Urban Stream Classification
Without Controls	0.45	Poor
With Controls	0.33	Poor

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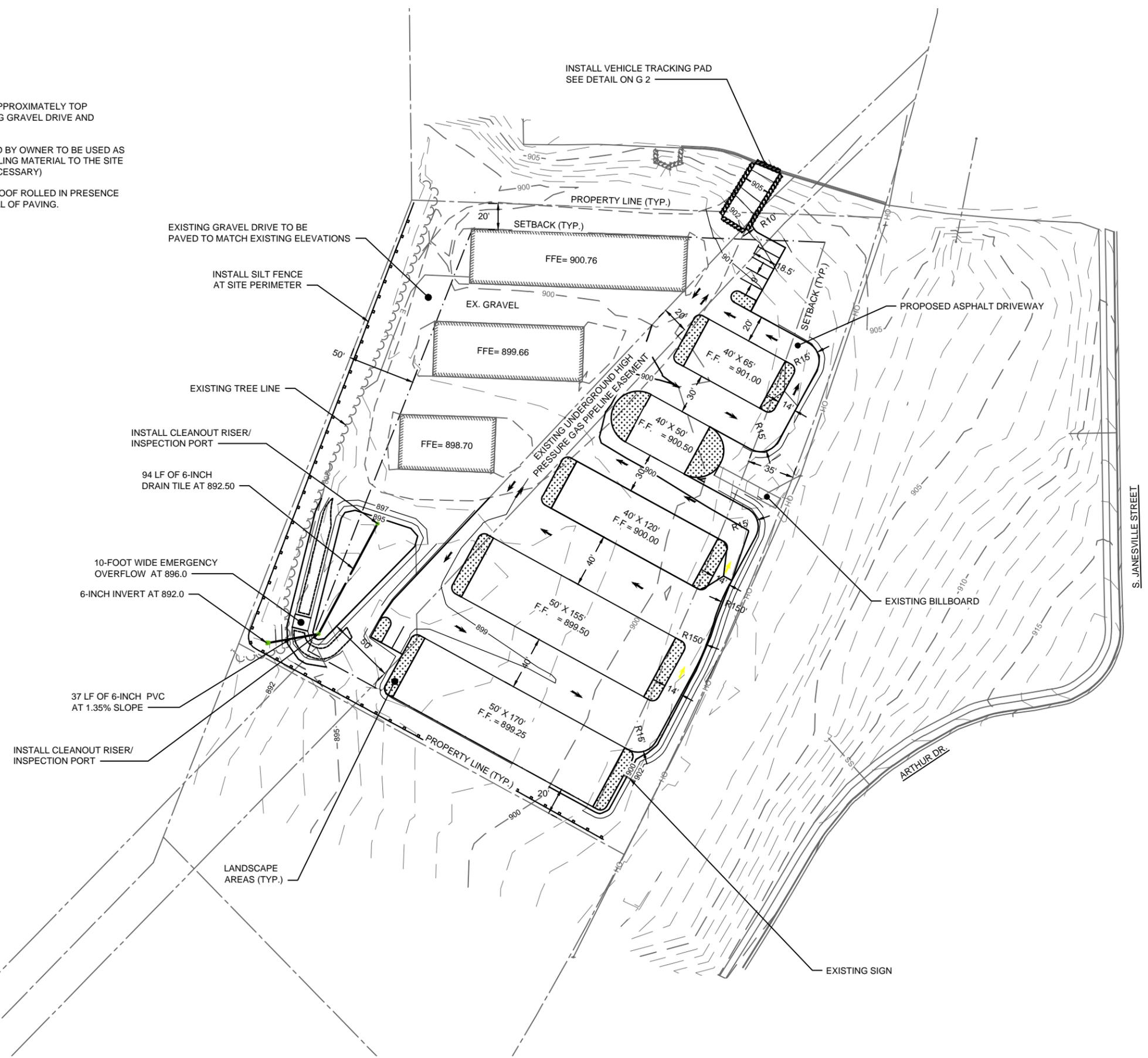


**NOTES:**

- 1. CONTRACTOR TO REMOVE APPROXIMATELY TOP 4-INCHES OF CABC ON EXISTING GRAVEL DRIVE AND GRADE TO DRAIN.
- 2. EXISTING GRAVEL APPROVED BY OWNER TO BE USED AS BASE MATERIAL PRIOR TO HAULING MATERIAL TO THE SITE (ADDITIONAL CABC WILL BE NECESSARY)
- 3. ENTIRE AREA SHOULD BE PROOF ROLLED IN PRESENCE OF OWNER PRIOR TO APPROVAL OF PAVING.

**NOTES:**

- PARKING REQUIREMENTS FOR MINI WAREHOUSES:**  
 1 PARKING STALL PER 10 STORAGE UNITS  
 APPROX. 68 STORAGE UNITS = APPROX. 7 STALLS
- ALL PARKING STALLS ARE TO BE MARKED.
- ALL DRIVEWAY AND PARKING AREAS EXISTING AND PROPOSED ARE TO BE ASPHALT.
- AREAS CONTRIBUTING TO THE BASIN:**
- PROPOSED ROOF: 25,650 SF  
 PROPOSED ASPHALT: 30,730 SF  
 PROPOSED LANDSCAPE AREAS: 4,996 SF
- EXISTING ROOF: 3,649 SF  
 EXISTING GRAVEL TO ASPHALT: 12,652 SF  
 EXISTING LANDSCAPE: 2,005 SF
- OPEN SPACE: 42,981 SF
- SITE AREAS:**
- PROPOSED ROOF: 25,650 SF  
 PROPOSED ASPHALT: 30,730 SF  
 PROPOSED LANDSCAPE: 4,996 SF
- EXISTING ROOF: 14,078 SF  
 EXISTING GRAVEL TO ASPHALT: 25,089 SF  
 EXISTING LANDSCAPE: 3,578 SF  
 DRIVEWAY OUTSIDE OF PROPERTY BNDY: 900 SF
- OPEN SPACE (EXCLUDING LANDSCAPE AREAS): 42,685 SF
- TOTAL LOT AREA: 145,906 SF
- PERCENT OPEN SPACE: 35.1%



PROJECT NO.	SCALE	AS SHOWN	NO.	DATE	REVISION	BY
06577024	AS SHOWN					
PROJECT DATE:	05/11/16	DRAWN BY:	KNN			
F.B.:		CHECKED BY:	KCL			
PLOT DATE:	5/11/16	P:\65008\65708\657706577024\CADD\C3D\06577024 Design.dwg				

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**PASTORIUS WAREHOUSES**  
 BOS DESIGN BUILDERS  
 ROCK COUNTY, WISCONSIN

**PROPOSED SITE LAYOUT**

FILE NO.	06577024
SHEET	ST 2