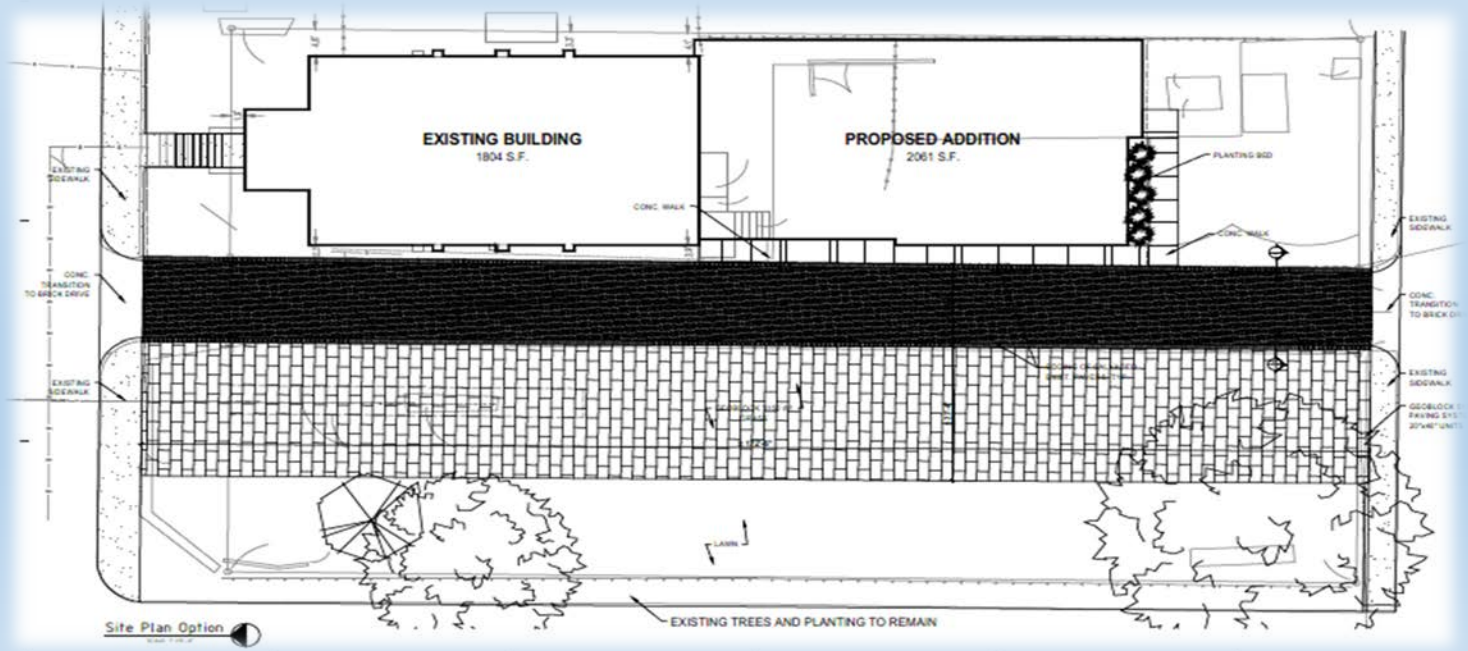
Stormwater Capture and Reuse: Passive Irrigation for Pervious Grass Parking

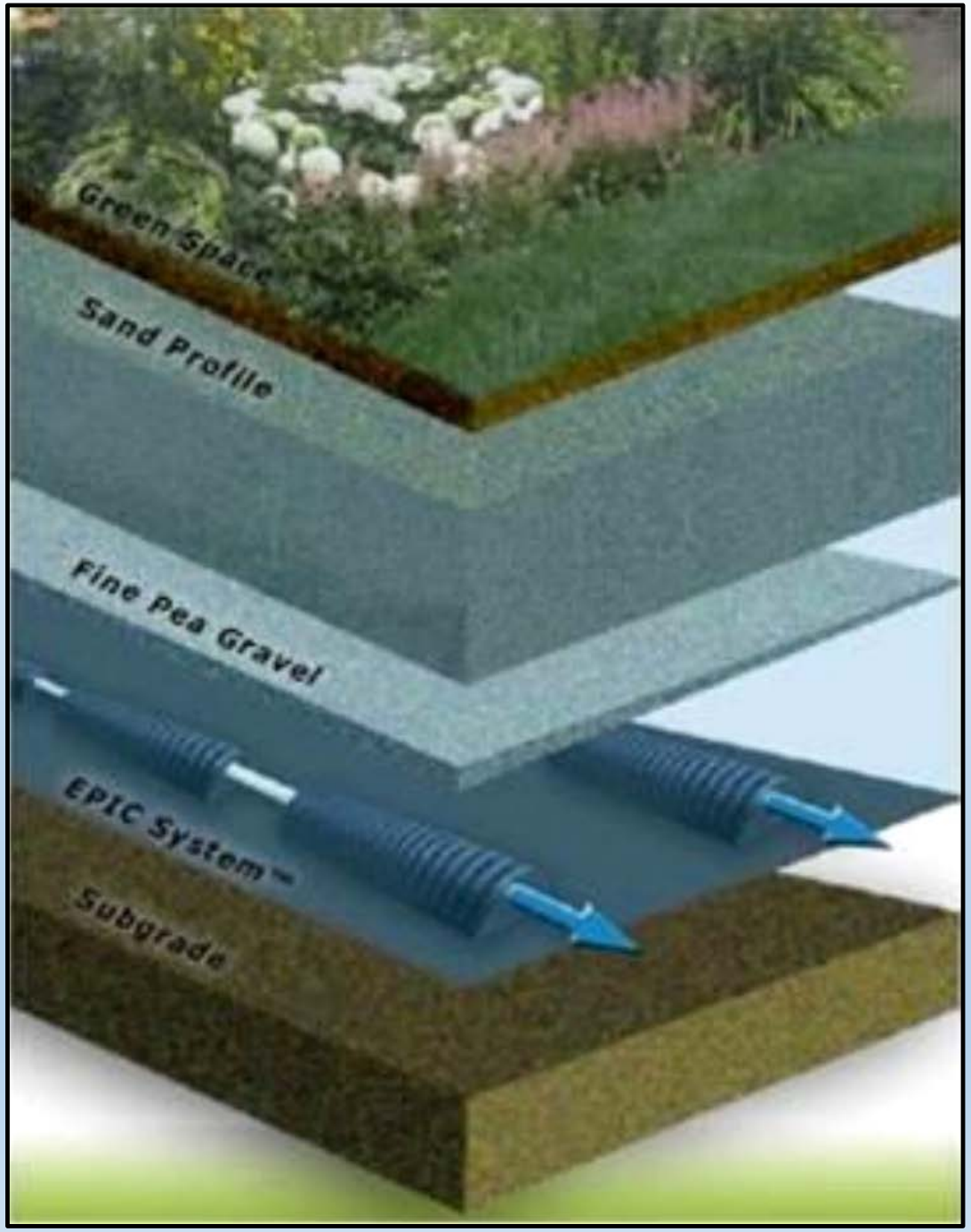
Jim Blazek, CPESC - D2 Land & Water Resource, Inc.

Christa Petzke, PE, MBA - D2 Land & Water Resource, Inc.

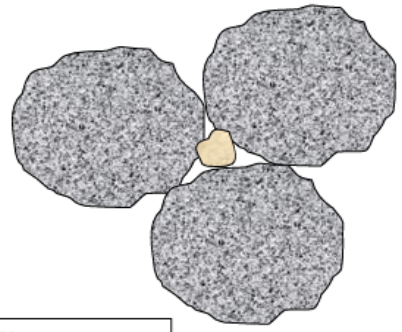

iNDYfRINGE
719
719


TRAILHEAD

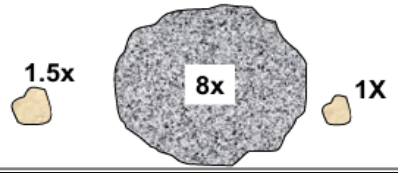

EXISTING BUILDING
1804 S.F.
PROPOSED ADDITION
2061 S.F.
EXISTING TREES AND PLANTING TO REMAIN
Site Plan Option



GRAVEL BRIDGING PRINCIPLE



The average diameter of the larger aggregate has to be less than 8X the diameter of the smaller aggregate.




Turf
Topsoil
Interlocking
Tabular Joint
Geoblock®5150
Unit
Aggregate/Topsoil
Engineered Base (if required)
Natural Ground

RUNOFF CALCULATIONS

The Rational Equation was used to determine Peak Discharge Q in Cubic Feet Per Second (see Rational Equation below).

Rational Equation: Q=ciA where

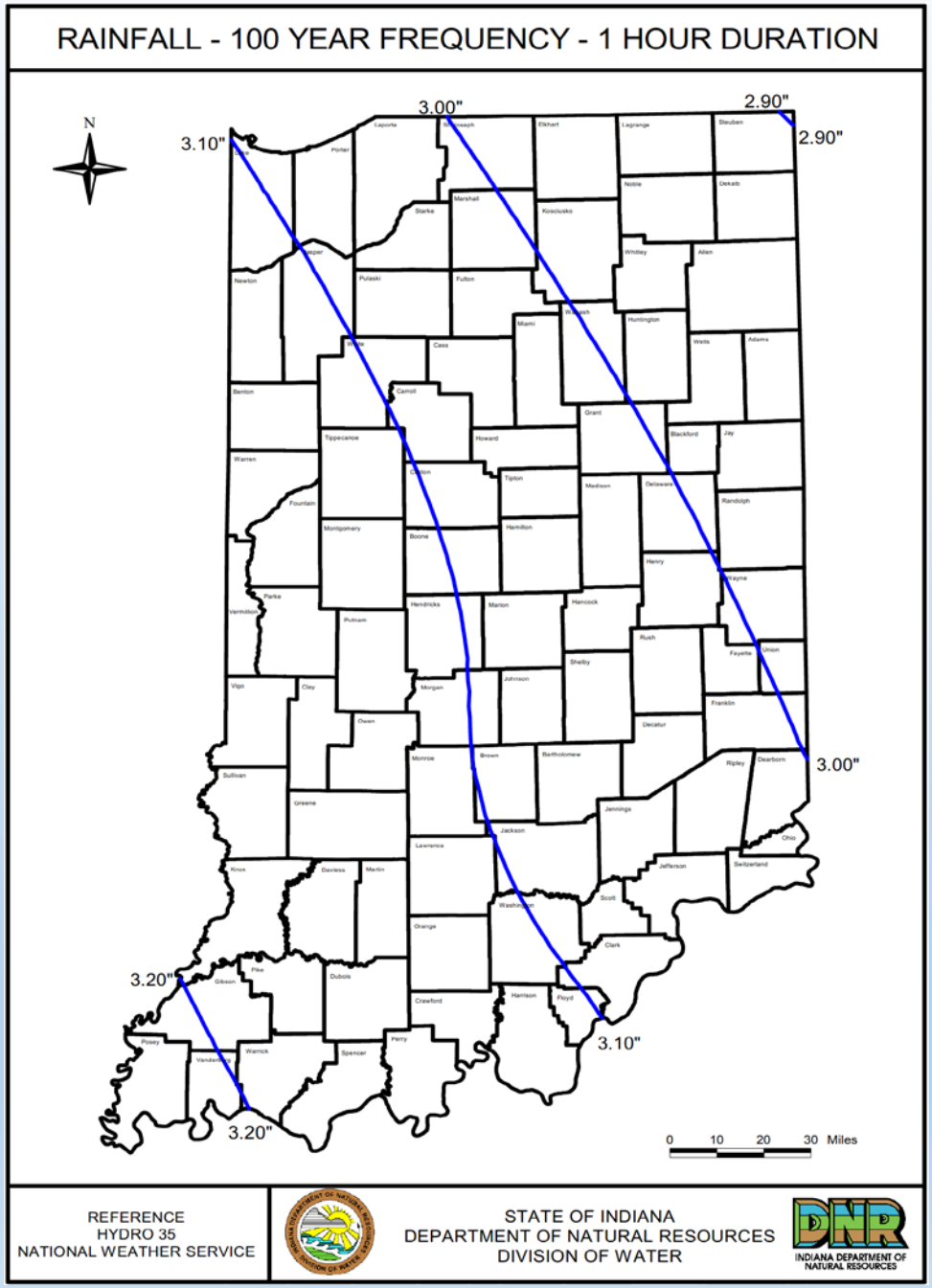
The Rational equation requires the following units:

Q = Peak discharge, cfs

c = Rational method runoff coefficient

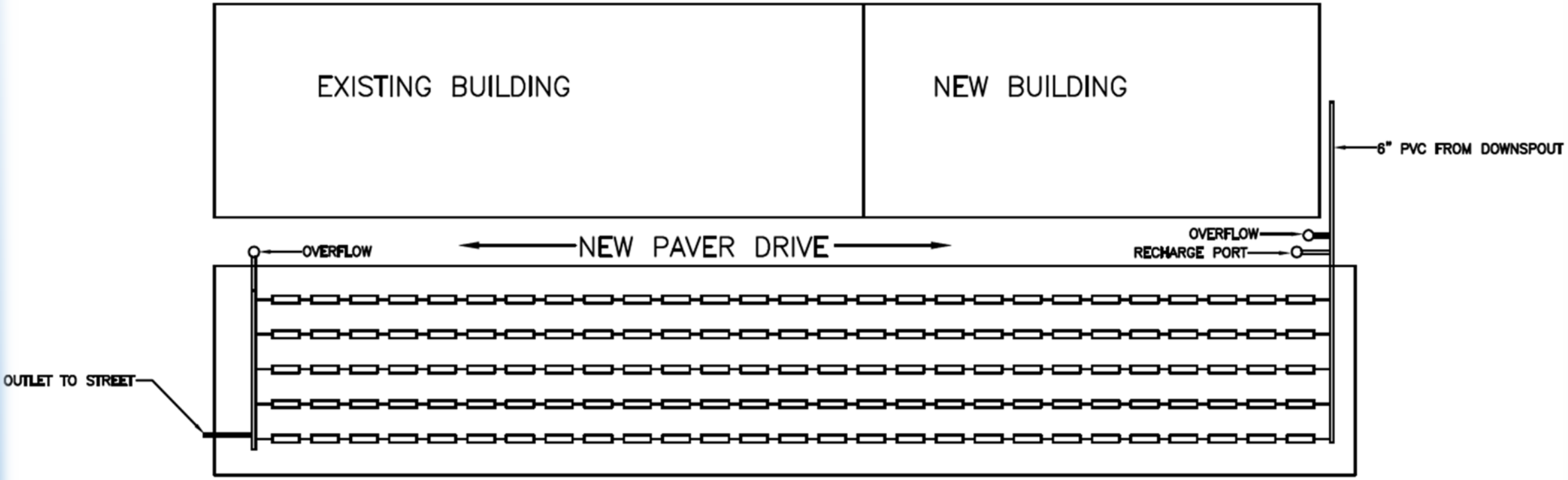
i = Rainfall intensity, inch/hour

A = Drainage area, acre



Ground Cover	Runoff Coefficient, C
Lawns	0.05 - 0.35
Forest	0.05 - 0.25
Cultivated land	0.08-0.41
Meadow	0.1 - 0.5
Parks, cemeteries	0.1 - 0.25
Unimproved areas	0.1 - 0.3
Pasture	0.12 - 0.62
Residential areas	0.3 - 0.75
Business areas	0.5 - 0.95
Industrial areas	0.5 - 0.9
Asphalt streets	0.7 - 0.95
Brick streets	0.7 - 0.85
Roofs	0.75 - 0.95
Concrete streets	0.7 - 0.95

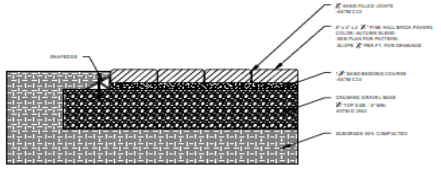
Existing Roof	Rain Inches/Hour	GPM	GPH	TOTAL AREA GPH
1804 SF	1	17.5	1050	5010
	2	35	2100	10020
	3	52.5	3150	15030
	4	70	4200	20040
New Roof				
2061 SF	1	20	1200	
	2	40	2400	
	3	60	3600	
	4	80	4800	
Grass Lawn				
6884 SF	1	25	1500	
	2	50	3000	
	3	75	4500	
	4	100	6000	
Alley				
2458 SF	1	21	1260	
	2	42	2520	
	3	63	3780	
	4	84	5040	


EXISTING BUILDING
NEW BUILDING
6" PVC FROM DOWNSPOUT
OVERFLOW
NEW PAVER DRIVE
OVERFLOW
RECHARGE PORT
OUTLET TO STREET

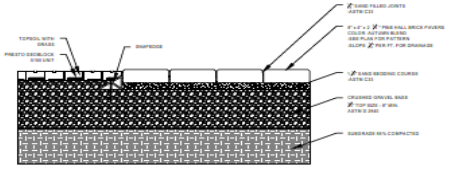
NOTE: FIELD VERIFY ALL DIMENSIONS & CONDITIONS PRIOR TO CONSTRUCTION. PRELIM. SPOT ELEVATIONS ARE TO THE TOP OF PAVERS OR GRADE – FIELD VERIFY.

HOLEY MOLEY SAYS
"DIG SAFELY"

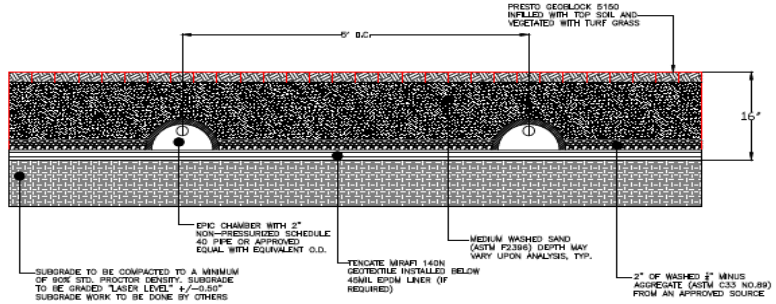
"IT'S THE LAW"
CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-382-5544
CALL TOLL FREE
PER INDIANA STATE LAW IC8-1-26,
IT IS AGAINST THE LAW TO EXCAVATE
WITHOUT NOTIFYING THE UNDERGROUND
LOCATION SERVICE TWO (2) WORKING
DAYS BEFORE COMMENCING WORK.



PAVER EDGE @ LAWN



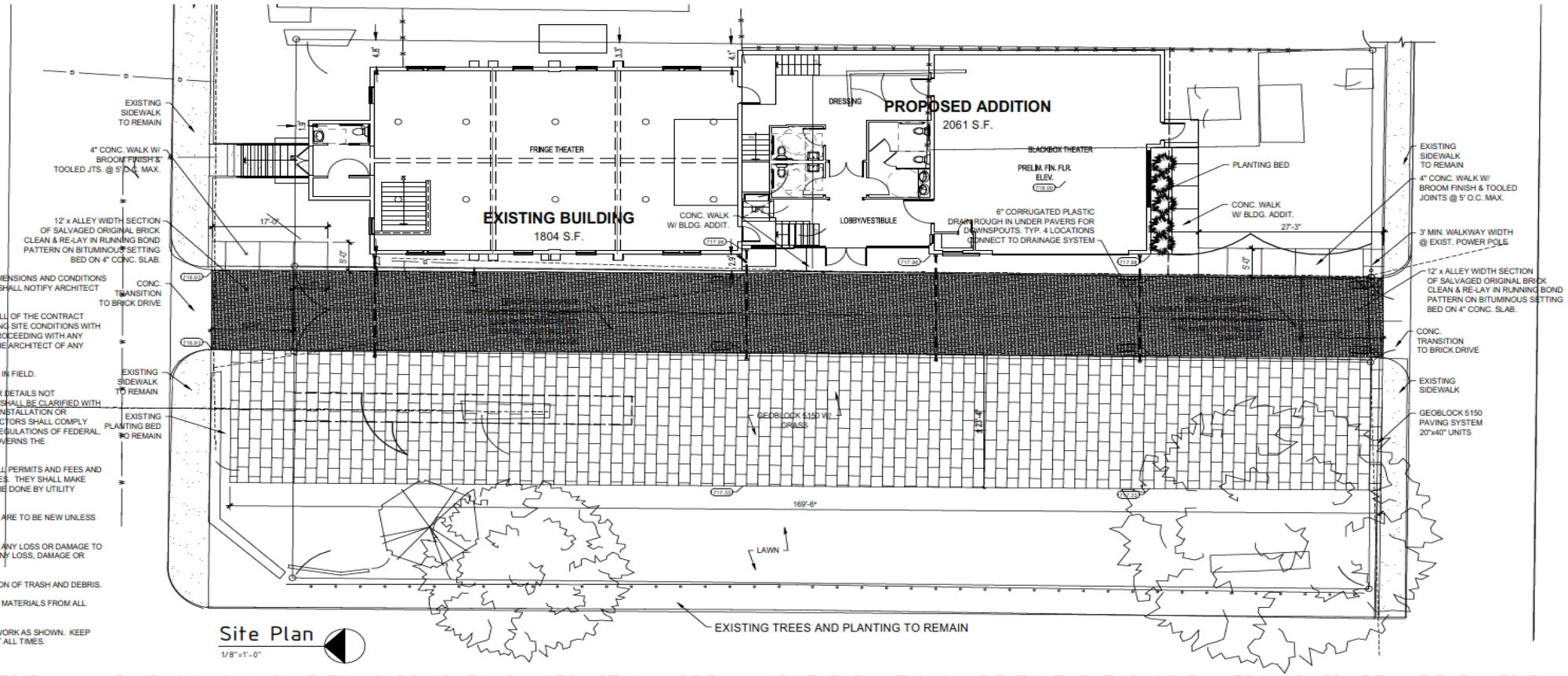
PAVER EDGE @ GEOBLOCK CONNECTION



Paver Edge @ Lawn
1"=1'-0"

Paver Edge @ Geoblock
1"=1'-0"

Section @ EPIC Drainage System
1"=1'-0"



Site Plan
1/8"=1'-0"

GENERAL NOTES

A. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO START OF CONSTRUCTION AND SHALL NOTIFY ARCHITECT OF ANY DISCREPANCIES IMMEDIATELY.

B. CONTRACTOR SHALL CAREFULLY STUDY ALL OF THE CONTRACT DOCUMENTS AND SHALL VERIFY ALL EXITING SITE CONDITIONS WITH CONSTRUCTION DOCUMENTS PRIOR TO PROCEEDING WITH ANY PORTION OF THE WORK AND TO NOTIFY THE ARCHITECT OF ANY VARIANCES.

C. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD.

D. ANY CONDITIONS, MATERIALS, DEVICES OR DETAILS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL BE CLARIFIED WITH THE ARCHITECT BEFORE CONSTRUCTION INSTALLATION OR APPLICATION. GENERAL AND SUBCONTRACTORS SHALL COMPLY WITH ALL GOVERNING CODES, BUILDING REGULATIONS OF FEDERAL, STATE, CITY AND COUNTY, WHICHEVER GOVERNS THE CONSTRUCTION WORK.

E. GENERAL AND/OR SUBS SHALL PAY FOR ALL PERMITS AND FEES AND ARRANGE FOR INSPECTION BY AUTHORITIES. THEY SHALL MAKE ARRANGEMENTS AND PAY FOR WORK TO BE DONE BY UTILITY COMPANIES PERTAINING TO THIS WORK.

F. ALL MATERIAL CALLED OUT ON DRAWINGS ARE TO BE NEW UNLESS NOTED OTHERWISE OR "EXISTING".

G. EACH TRADE SHALL BE RESPONSIBLE FOR ANY LOSS OR DAMAGE TO THE OWNER OR THE WORK, MAKE GOOD ANY LOSS, DAMAGE OR INJURY WITHOUT COST TO THE OWNER.

H. KEEP PREMISES FREE FROM ACCUMULATION OF TRASH AND DEBRIS.

I. UPON COMPLETION REMOVE ALL FOREIGN MATERIALS FROM ALL EXPOSED SURFACES.

J. CONFINE ALL OPERATIONS TO AREAS OF WORK AS SHOWN. KEEP AREAS ADJACENT TO THE WORK CLEAR AT ALL TIMES.

NOTE: FIELD VERIFY ALL DIMENSIONS & CONDITIONS PRIOR TO CONSTRUCTION. PRELIM. SPOT ELEVATIONS ARE TO THE TOP OF PAVERS OR GRADE – FIELD VERIFY.

blackline
ARCHITECTURE
1043 Virginia Avenue, Studio 311 Indianapolis, Indiana 46203
phone/fax 317.653.7000
www.blacklinestudio.com

INDY FRINGE TRAILHEAD & BLACK BOX THEATER
719 E. ST. CLAIR STREER
INDIANAPOLIS, IN 46202

CERTIFICATION

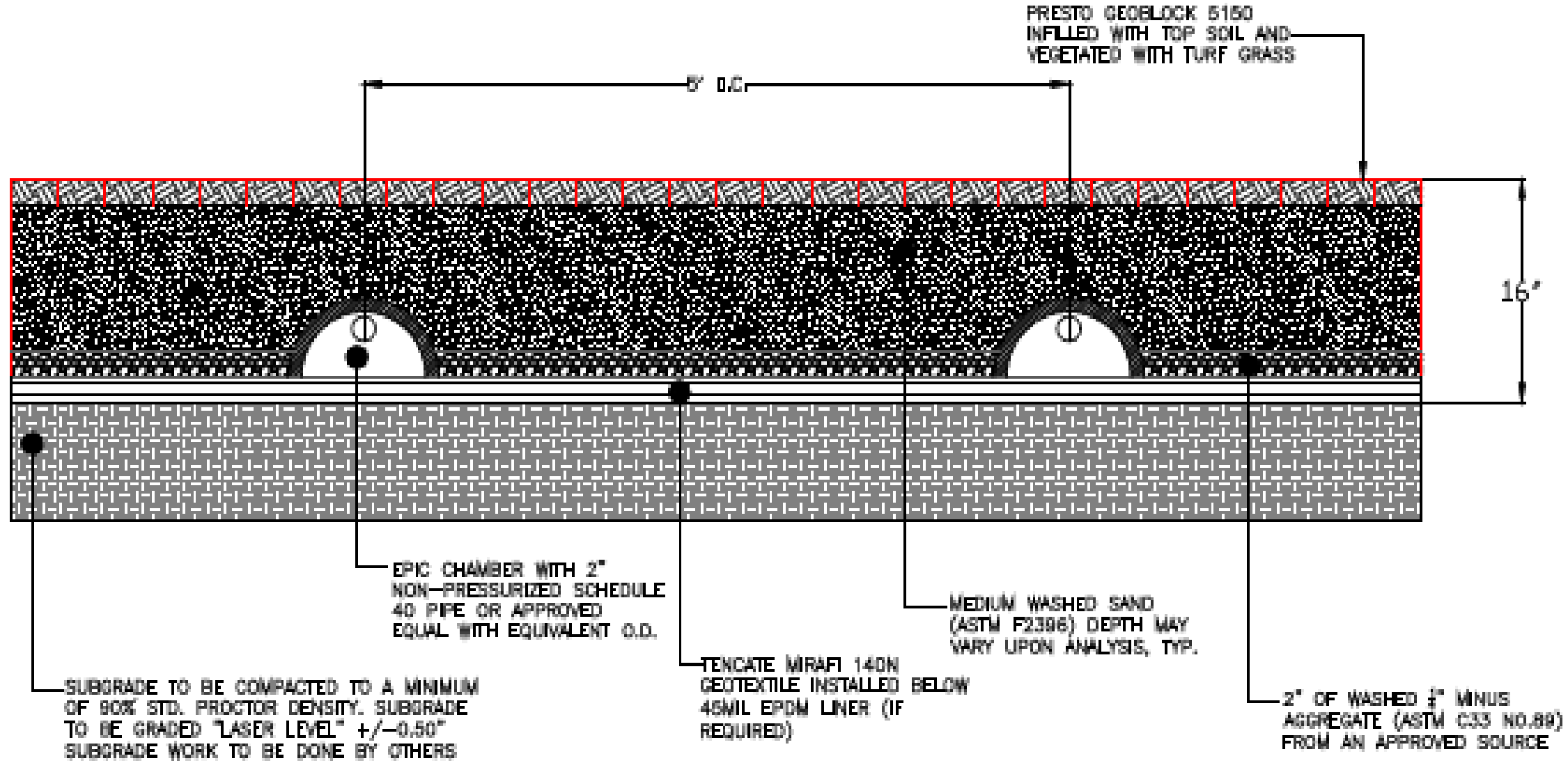
DRAWN BY

CHECKED BY

REVISIONS

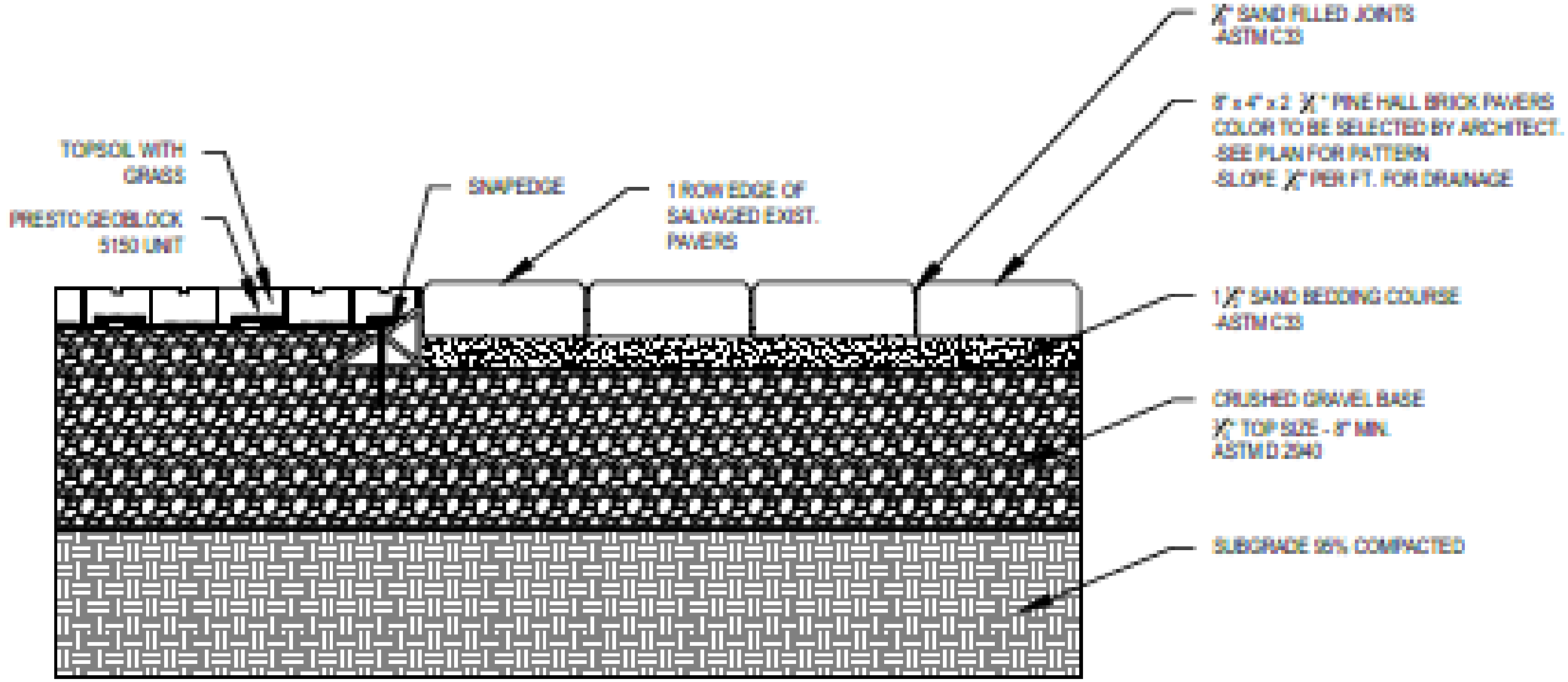
SITE PLAN
SITE DETAILS
10.17.2012

SHEET NUMBER
C1



Section @ EPIC Drainage System

1"=1'-0"



2
A1

Paver Edge @ Geoblock

SCALE: 1-1/2" = 1'-0"

GALLONS/CHAMBER	QUANTITY OF CHAMBERS	STORAGE CAPACITY GALLONS	TOTAL STORAGE CAPACITY GALLONS
9.67	135	1305.45	**28256**
SAND VOID RATIO = 0.4	**FT^3 SAND IN THE REINFORCED GRASS/CHAMBER AREA**	**STORAGE CAPACITY GALLONS**	
	5616	16803.07	
AGGREGATE VOID RATIO = 0.35	**FT^3 OPEN GRADED AGGREGATE PAVER BASE COURSE**	**STORAGE CAPACITY GALLONS**	
	3391.5	10147.37	

Planners and the owners asked a local vendor to work with the contracted installer to discuss the alternate design and installation. The original plan called for a 20000-gallon cistern, associated plumbing, and irrigation system. The material budget for these components was $31,800. The material budget for the alternate system was $32,225. The contractor agreed to install the LID driven design for the same cost.

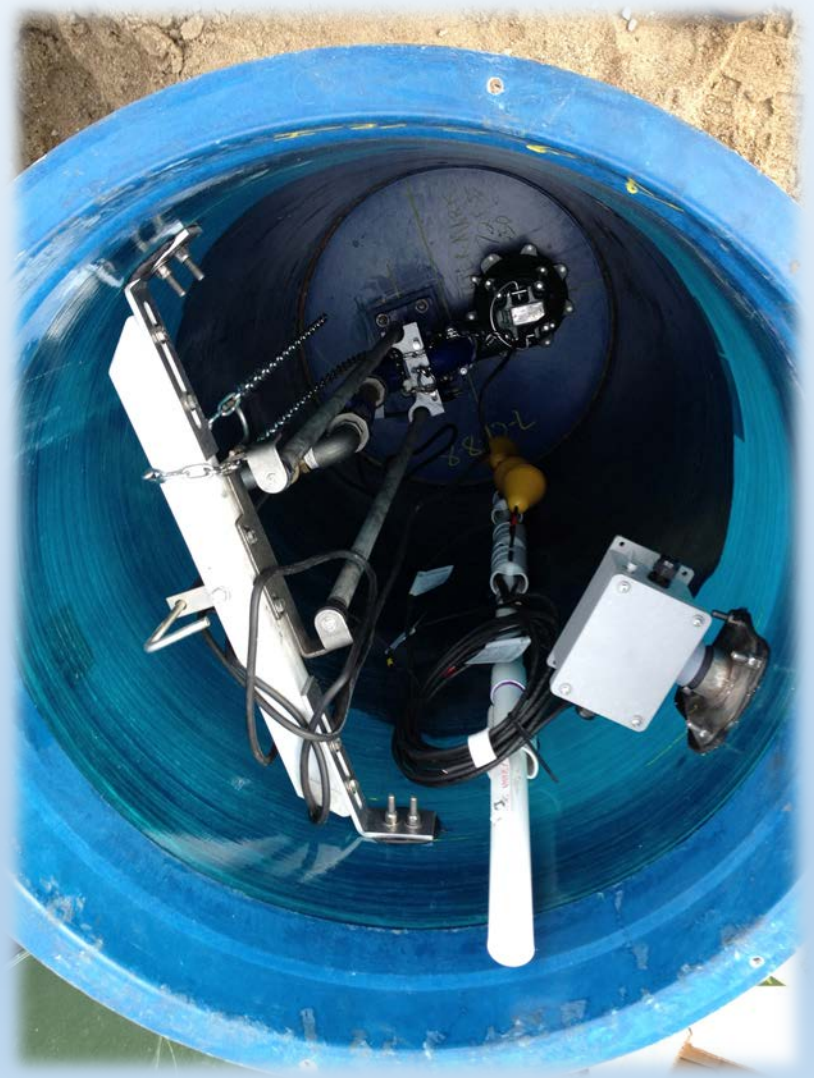

November 2012

CLASSIFICATION	PARTICLE SIZE (mm)	SIEVE #	ACCEPTABLE RANGE (%)
Fine Gravel	*2.00 and up*	*10*	*0-10*
Very Course Sand	*1.00 - 2.00*	*18*	
Course sand	*0.50 - 1.00*	*35*	
Medium Sand	**0.25 - 0.50**	**60**	**82 - 100**
Fine Sand	*0.10 - 0.25*	*140*	
Very Fine sand	*0.05 - 0.10*	*270*	*0 - 8*
Silt and Clay	*under 0.05*	*-*	


719
INDYFRINGE
BASiLe
THEATRE


Bobcat
331
Bobcat


719
BASIL
BREATHE




November 2012


November 2012


April 2013


April 2013


May 2013


June 2013


August 2013

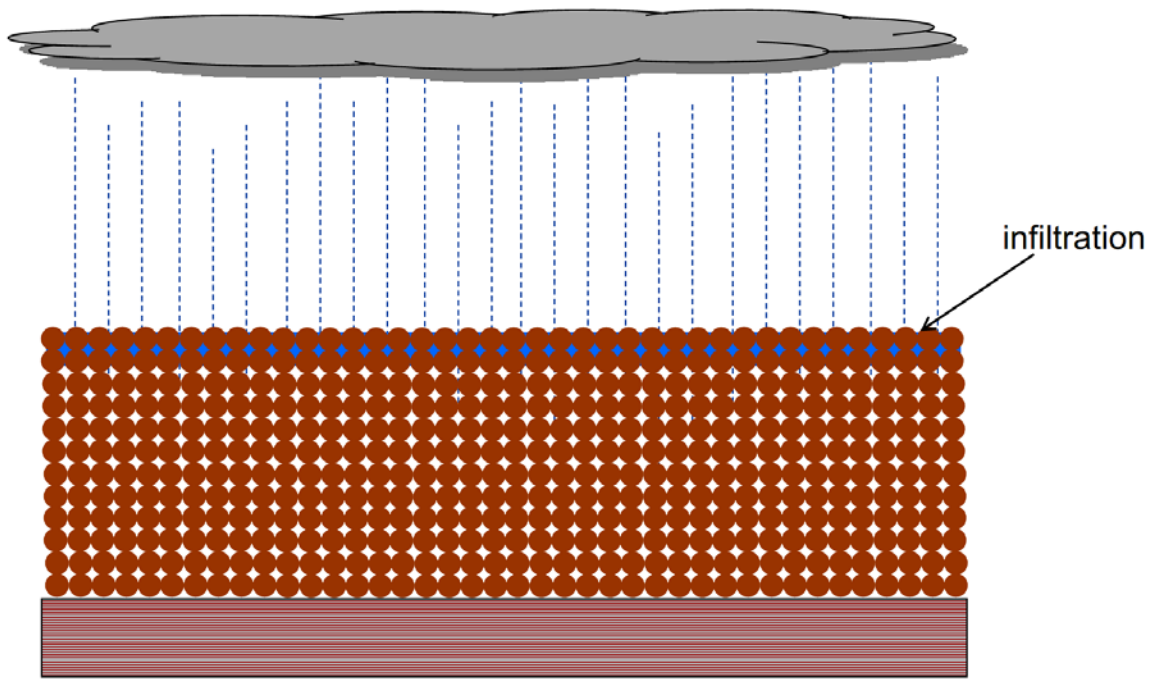

August 2013


August 2013


November 2014

November 2014

Infiltration is the movement of water INTO the soil surface



Percolation is the movement of water WITHIN the soil matrix.

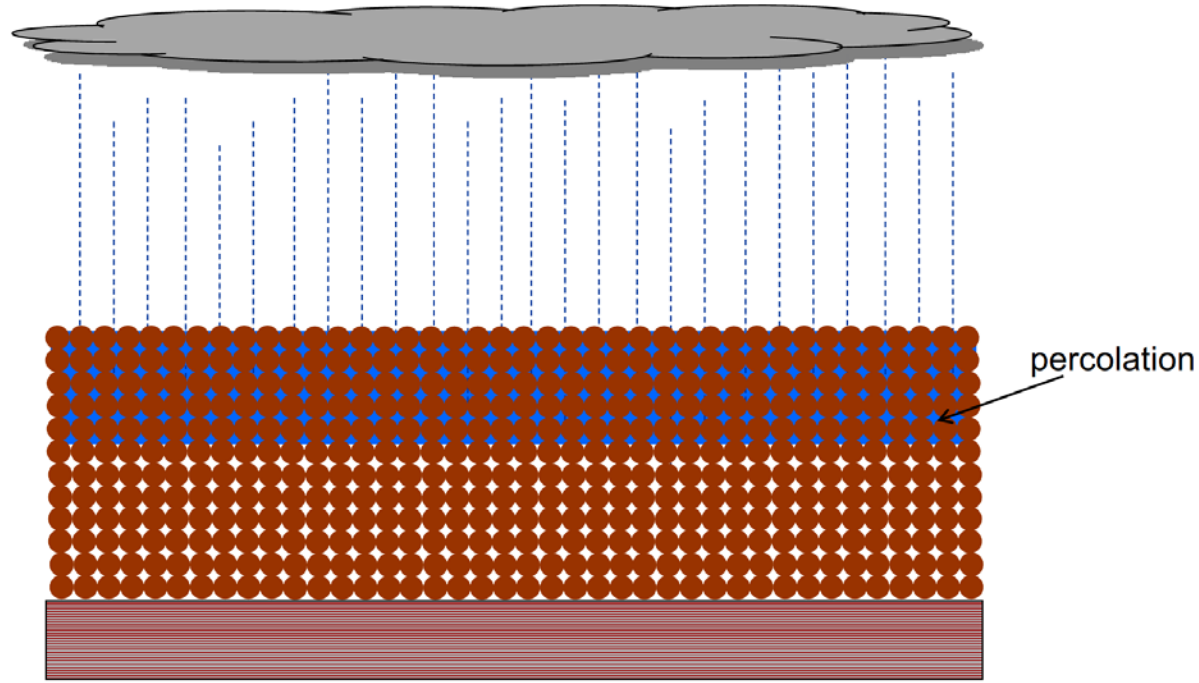


Figure 3: Hammering Pipe Into Media

Figure 4: Pipe Installed Into Media

Figure 5: Oil Application

Figure 6: Dissipater Stones

Figure 7: Infiltrometer Placement

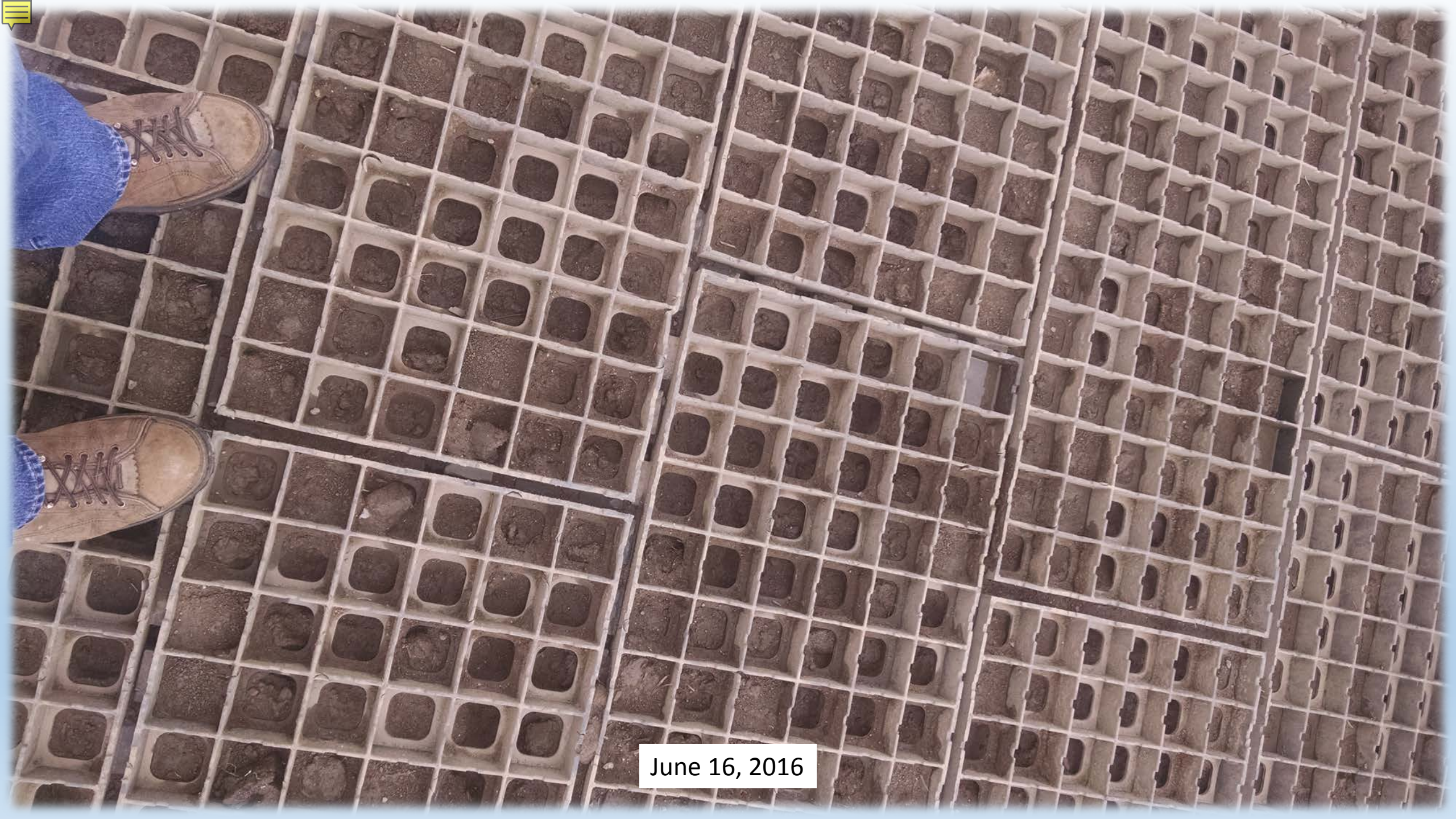
Figure 8: Gradation of Clear Pipe

Figure 9: Filling Infiltrometer with Water

INDY FRINGE INFILTRATION & PERCOLATION TEST RESULTS

Date: 5/23/2016		SW Corner of Property	
Infiltration Test (wet):		IN/MIN	IN/HR
12"	00:28:00 Hr:Min:Sec	0.429	25.714
19"	00:58:21 Hr:Min:Sec	0.326	19.544
24"	01:43:21 Hr:Min:Sec	0.232	13.936
36"	02:30:45 Hr:Min:Sec	0.239	14.328
Date: 5/27/2016		Center of Property	
Percolation Test (wet - Clay Infill):		IN/MIN	IN/HR
8.19"	28:09:59 Hr:Min:Sec	0.005	0.292
Date: 5/27/2016		North End of Property	
Percolation Test (wet - Validated Soil Infill):		IN/MIN	IN/HR
8.19"	00:07:03 Hr:Min:Sec	1.162	69.702

June 16, 2016


June 16, 2016

Composition and Characteristics	
INDOT #23	35% by Volume
*Clay Loam	25% by Volume
Biotic Earth Black	2.5% by Volume
Bio Solids	7.5% by Volume
Compost	30% by Volume
Compost Quality	Solvita Test Passing
pH	7.0 to 7.8

*NOTE: Screened Clay Loam shall be according to USDA Textural Soil Classification 27% to 40% Clay and 20% to 45% Sand


June 22, 2016


June 23, 2016


June 24, 2016


June 24, 2016


June 24, 2016


July 19, 2016

August 15, 2016

August 15, 2016

August 15, 2016

Thank You!
CONCLUSIONS? QUESTIONS?

- Jim Blazek, CPESC - D2 Land & Water Resource, Inc.
- Christa Petzke, PE, MBA - D2 Land & Water Resource, Inc.