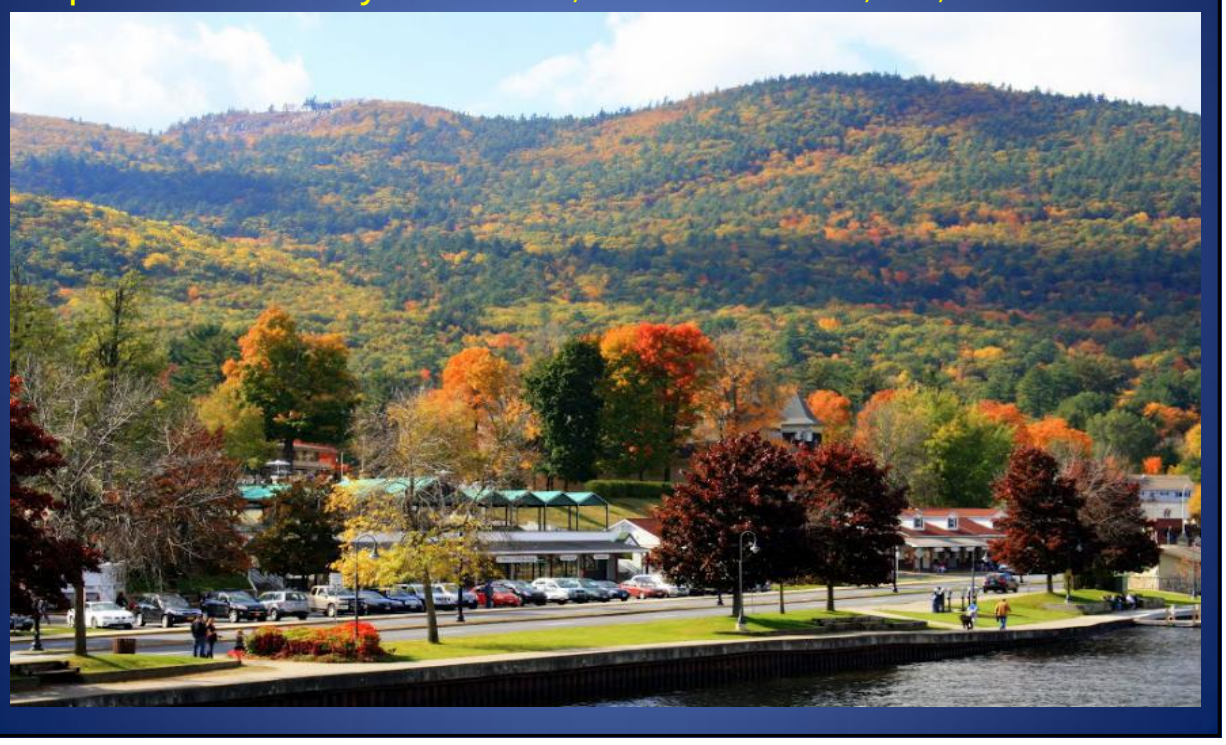

Lake George
NYSDEC Porous Pavement, Pot-hole Proof Pavement and Advancing the Technology
12th Annual North Country Stormwater Conference & Tradeshow
October 20, 2016
CHAMPLAIN WATERSHED
IMPROVEMENT COALITION OF NEW YORK
B&L


Beach Road and the NYSDEC Lake George Beach

Roadway & Parking Facility Previously Drained Directly to the Lake

Impaired Waterbody– Chlorides, Road Pollutants, Silt, Urban Runoff



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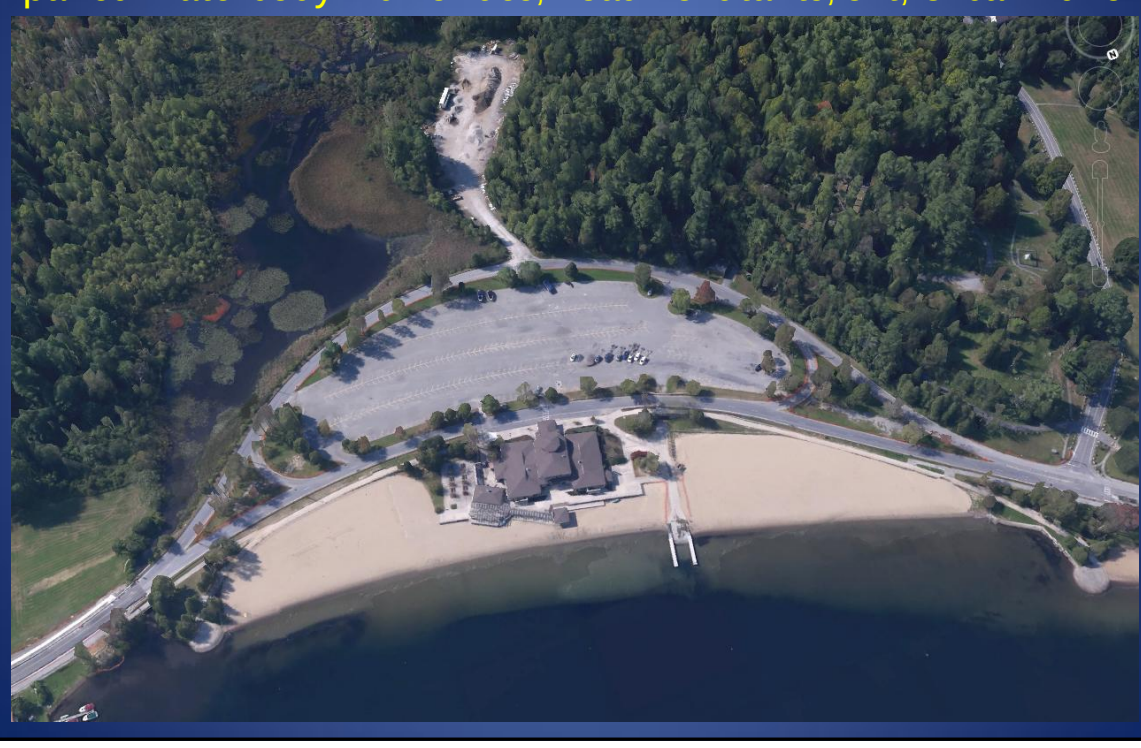


Targeted Pollutants and Their Sources

Automobile By-Products
Chlorides - Salt

Sediment

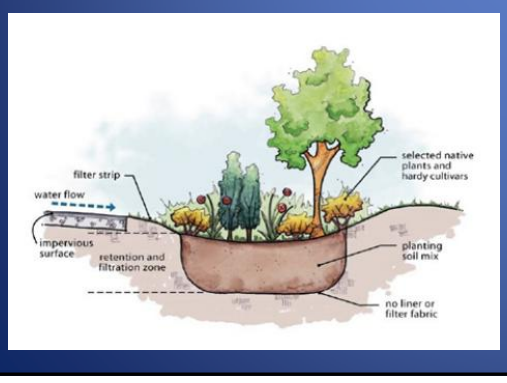
Three Segments of the Corridor

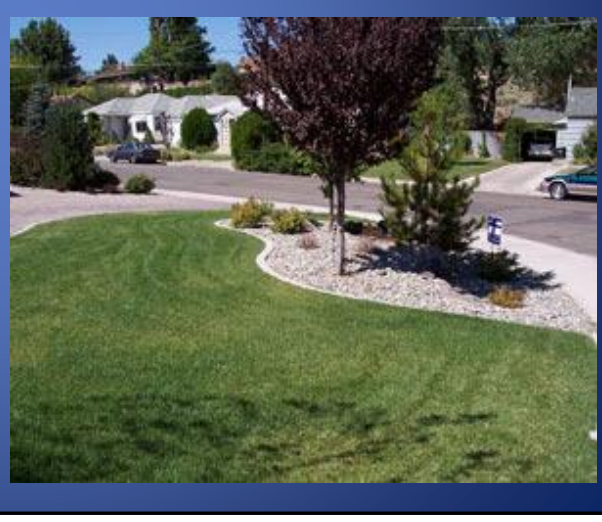
Vegetated Swales

Pre-Treatment
Helps Preserve Primary System
Turf Lined or Planted

Rain Gardens

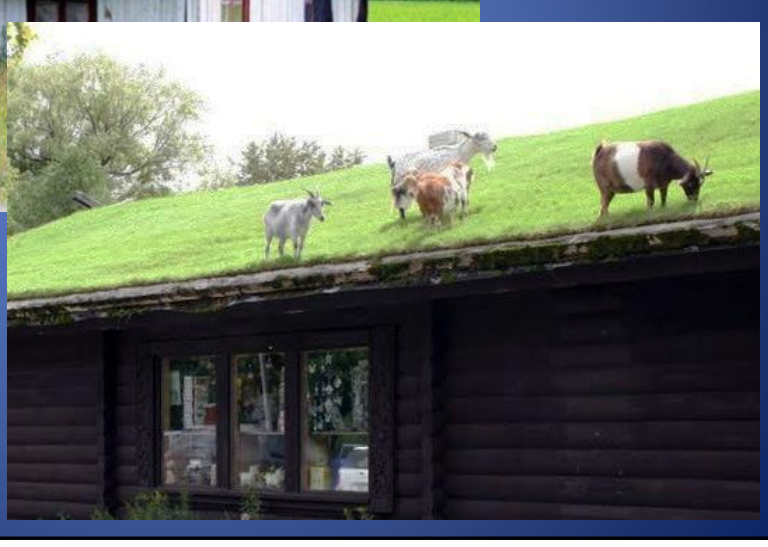
Provide Filtration
Reduce Runoff Volumes
Aesthetically Pleasing





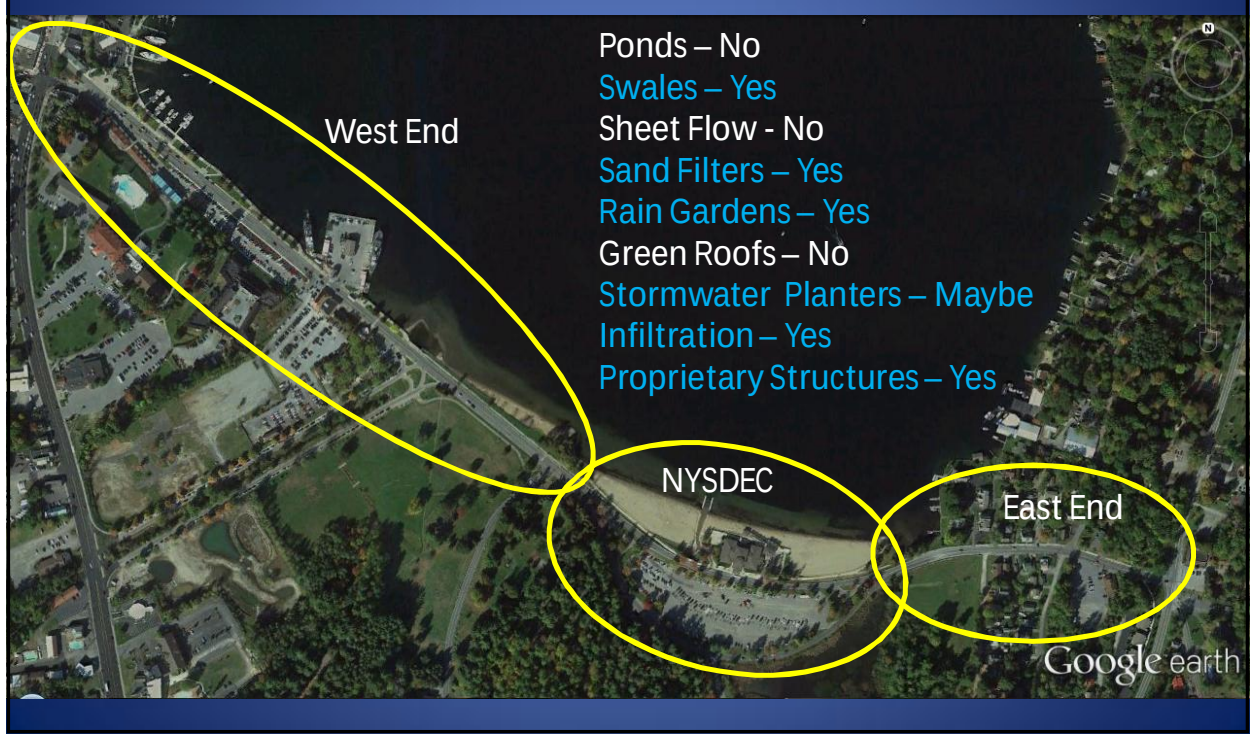
Stormwater Planters

Green Roofs



Maintenance

Three Segments of the Corridor



Porous Pavements

- Parking areas, access roads, walkways, driveways, cul-de-sacs, urban and suburban Lower Speed roads (30 mph), …….No Contaminated sites

Porous Asphalt

Porous Asphalt

Porous Pavements

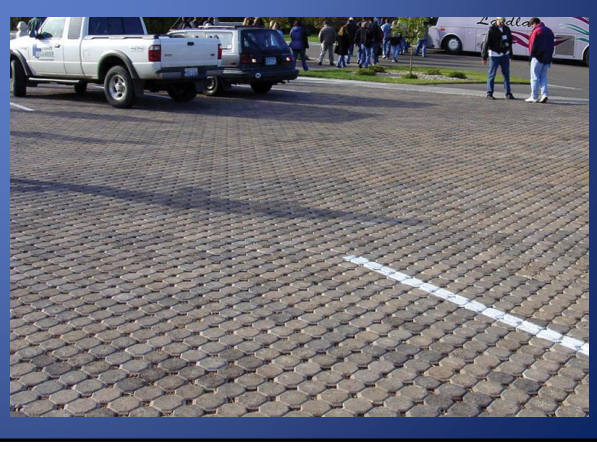
- Parking areas, access roads, walkways, driveways, cul-de-sacs, urban and suburban Lower Speed roads
  No Contaminated sites

Pre-Cast Porous Concrete

Poured in Place Porous Concrete

Precast Porous Paver Systems

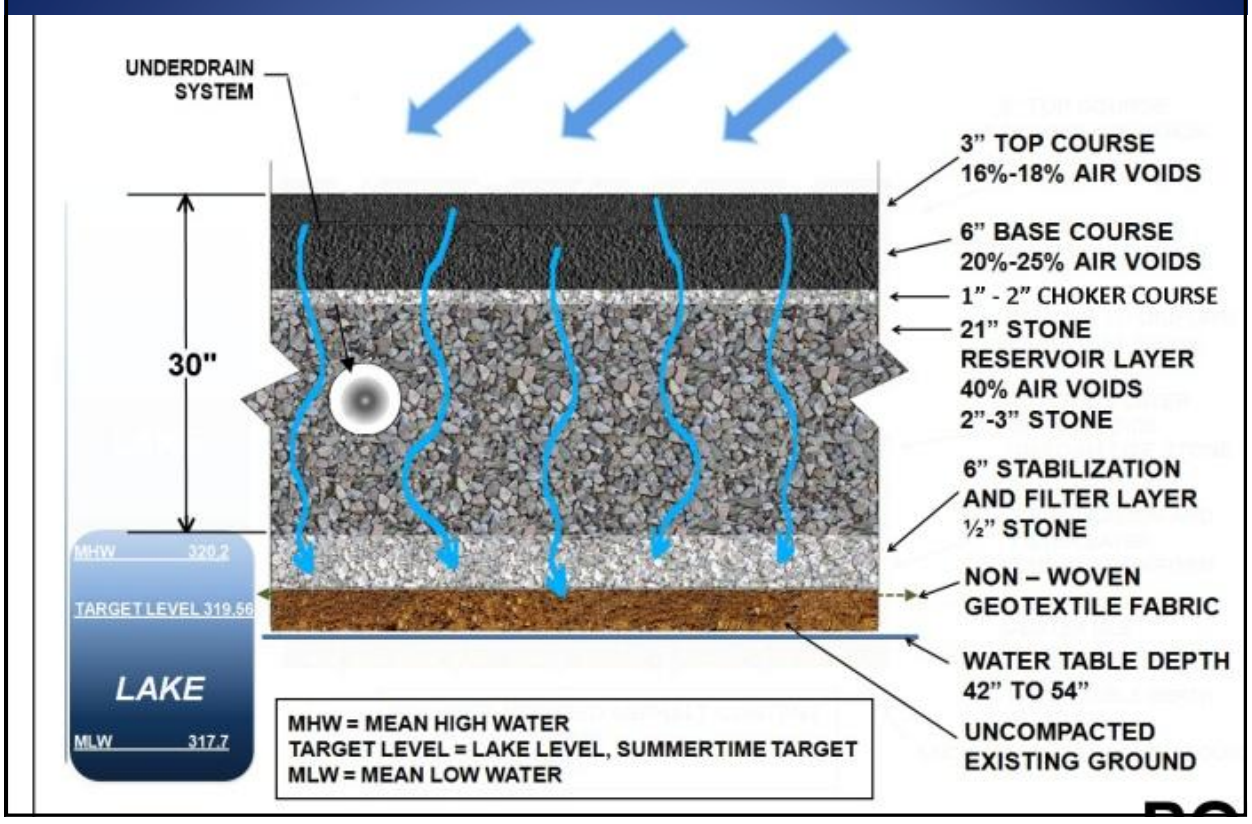
Rennselaer City Hall
Pave Drain



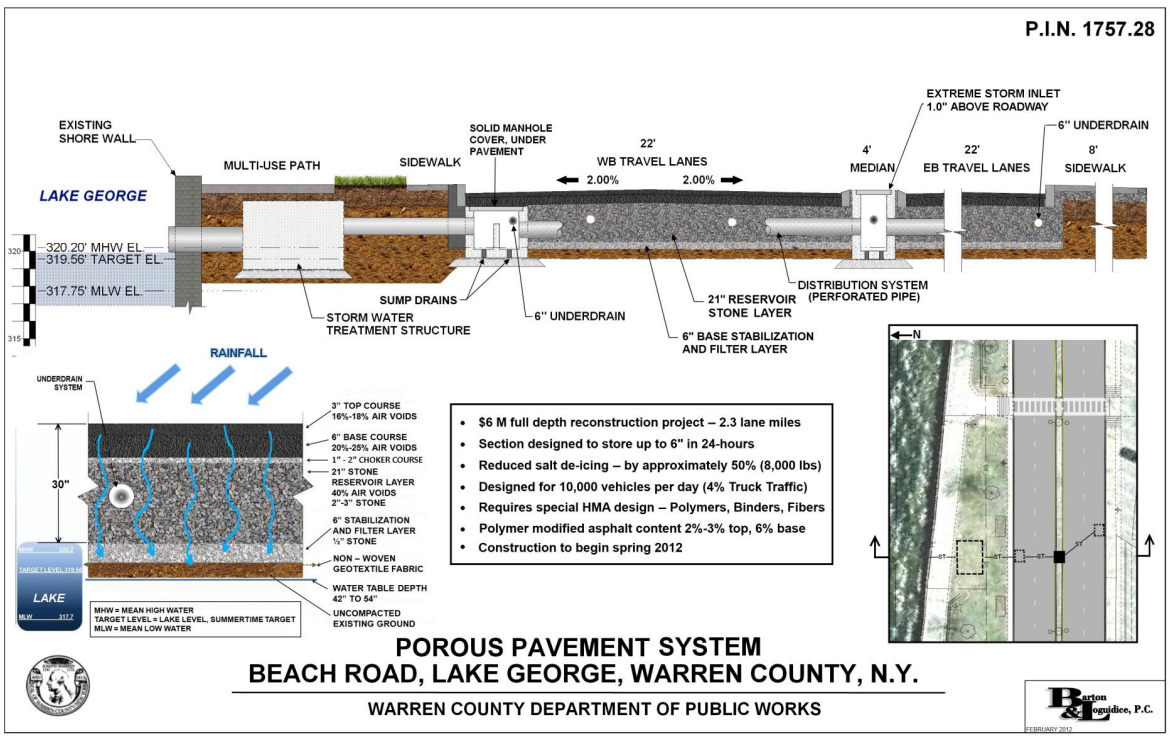
Porous Asphalt Pavement - Why ??

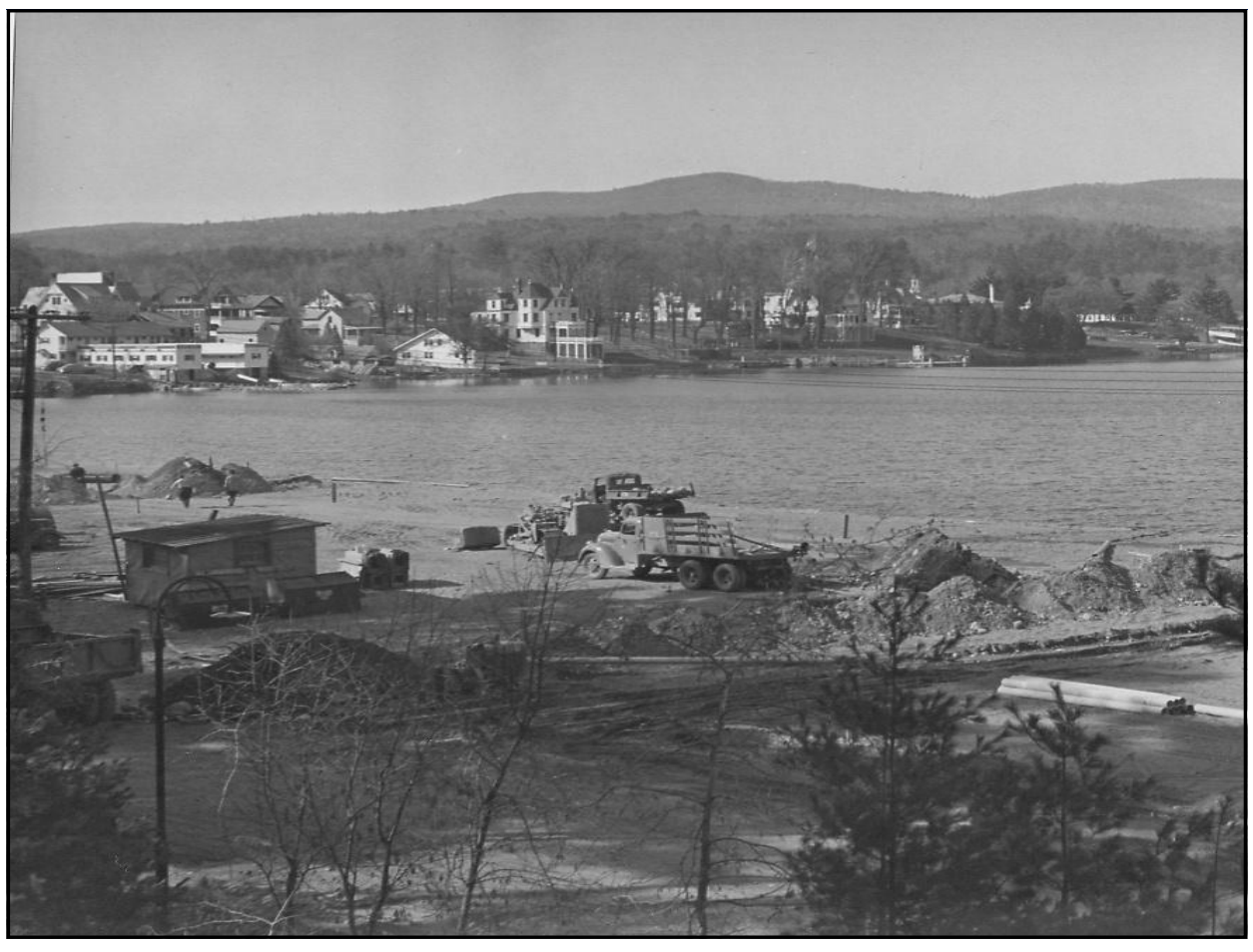
- Groundwater recharge augmentation
- Runoff Reduction
- Effective pollutant treatment for solids, metals, nutrients, and hydrocarbons
- Little to No Closed Drainage System Needed
- Safety Improvements – Glare, Road Spray
- Reduced Hydroplaning – ⇧ Friction When wet
- Reduced de-icing Materials – Reduced Black Ice
- Less Susceptible to Frost – No Capillary Action
- Noise Reduction

Beach Road / DEC Facility Section

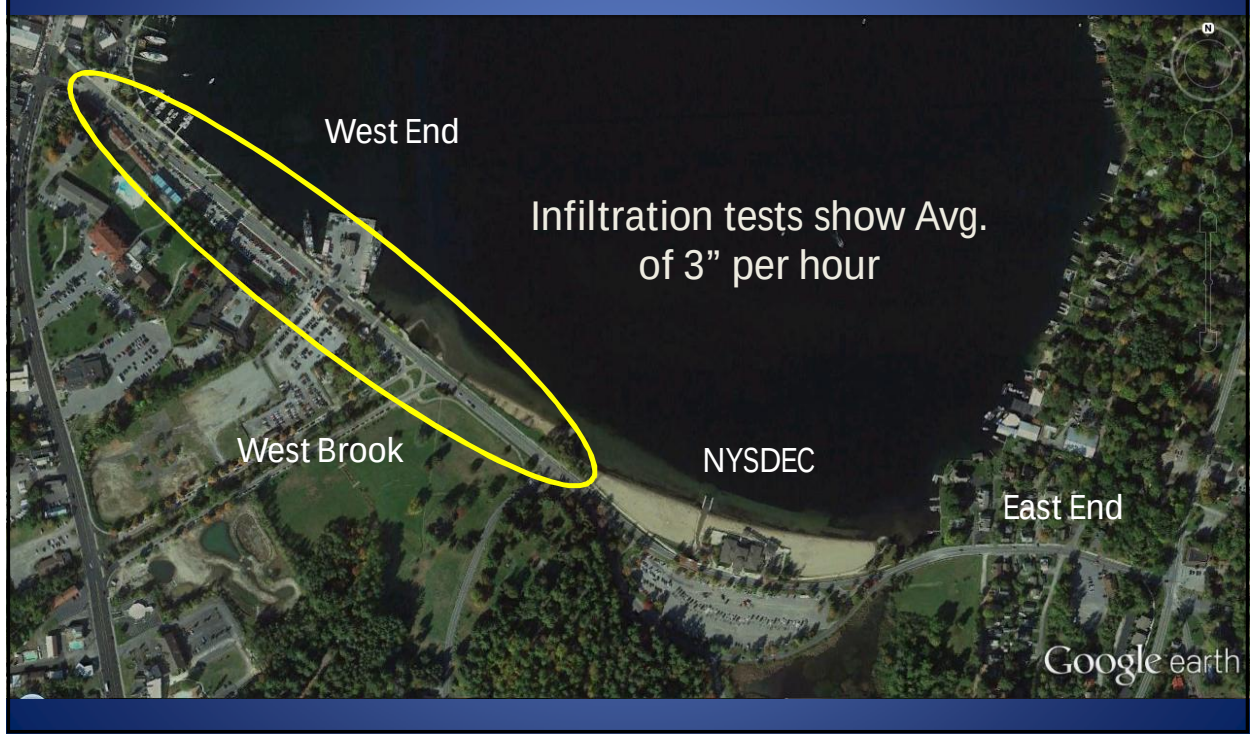


Beach Road System





West End - Porous Pavement



Beach Road Section

Stone Courses

Begin with the Foundation

Specifications

ITEM 623.120100WR – POROUS ASPHALT CRUSHED STONE STABILIZATION COURSE (CY)
ITEM 623.120200WR – POROUS ASPHALT CRUSHED STONE RESERVOIR COURSE (CY)

GRADATION:

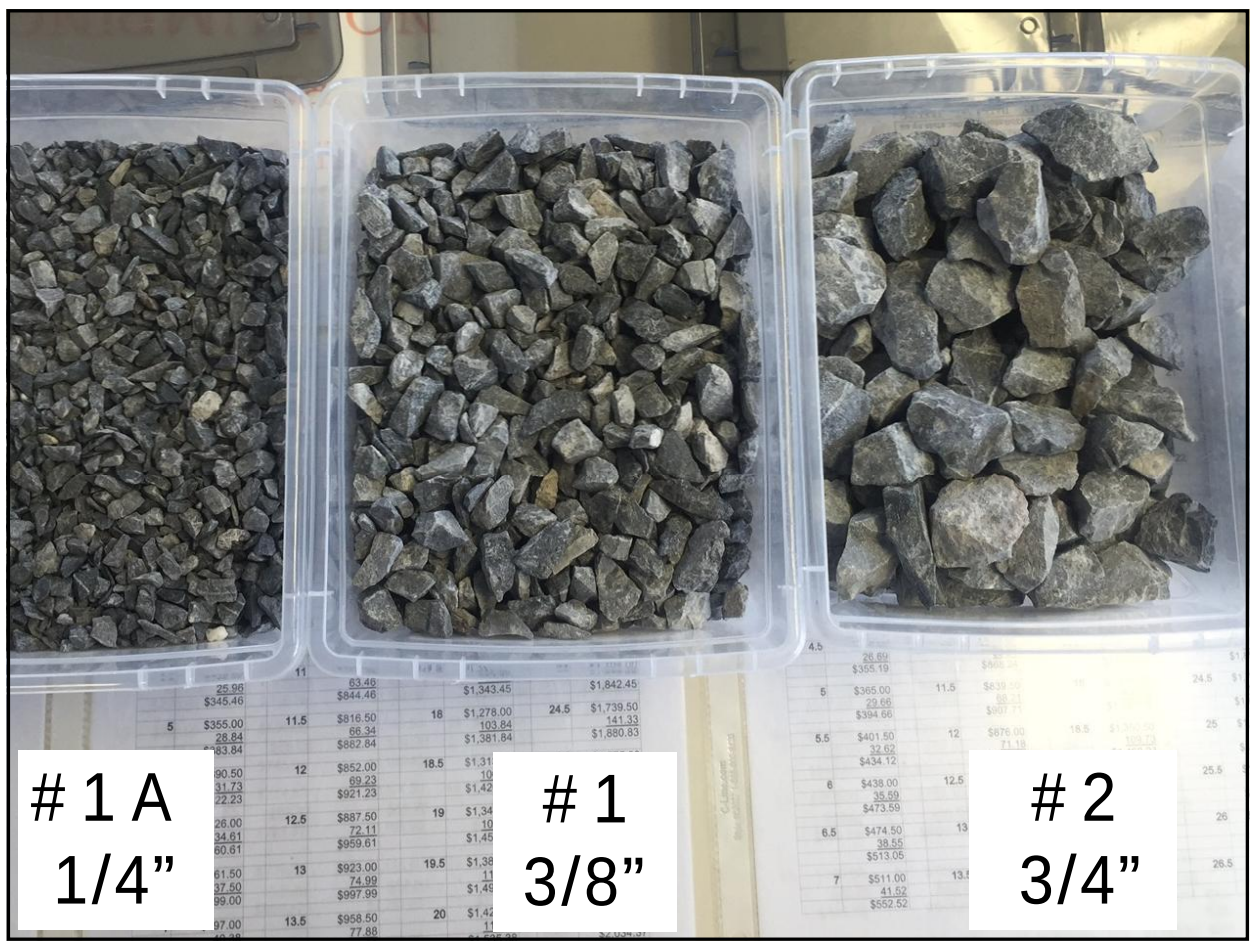
Material shall be graded in accordance with size designations shown in Table 703-4 from the NYSDOT Standard Specifications.

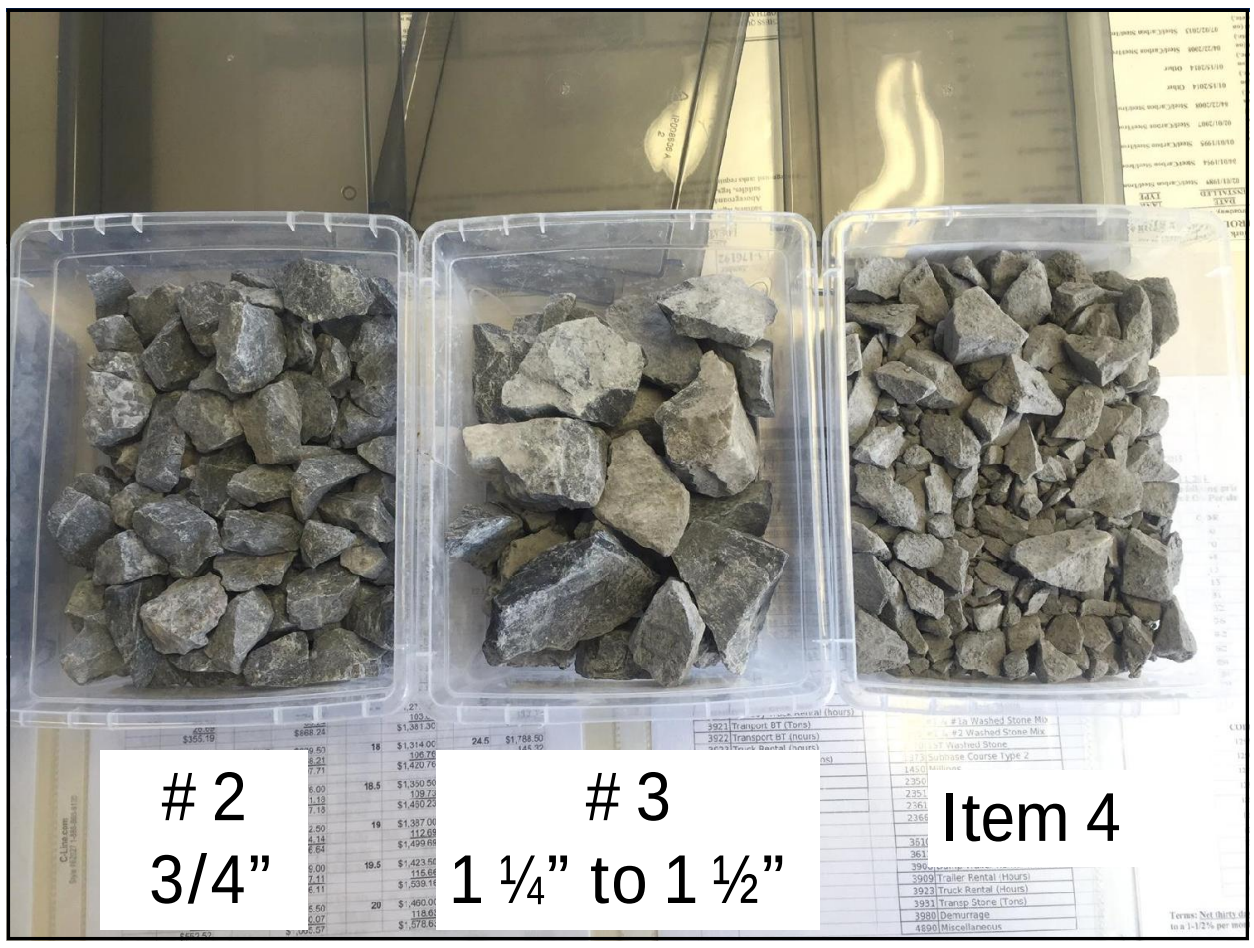
Stabilization Course – Size Designation No. 2

Reservoir Course - Size Designation No. 4A

TABLE 703-4[1] SIZES OF STONE, GRAVEL AND SLAG

	Screen Sizes										
Size Designation	**4 in**	**3 in**	**2 1/2 in**	**2 in**	**1 1/2 in**	**1 in**	**1/2 in**	**1/4 in**	**1/8 in**	**# 80**	**#200[3]**
Screenings[2]	-	-	-	-	-	-	100	90-100	-	-	0-1.0
1B	-	-	-	-	-	-	-	100	90-100	0-15	0-1.0
1A	-	-	-	-	-	-	100	90-100	0-15	-	0-1.0
1ST	-	-	-	-	-	-	100	0-15	-	-	0-1.0
1	-	-	-	-	-	100	90-100	0-15	-	-	0-1.0
2	-	-	-	-	100	90-100	0-15	-	-	-	0-1.0
3A	-	-	-	100	90-100	0-15	-	-	-	-	0-0.7
3	-	-	100	90-100	35-70	0-15	-	-	-	-	0-0.7
4A	-	100	90-100	-	0-20	-	-	-	-	-	0-0.7
4	100	90-100	-	0-15 ~~0-15~~	-	-	-	-	-	-	0-0.7
5	90-100	0-15	-	-	-	-	-	-	-	-	0-0.7





Stone Courses

Test Panel #1 - August 2012

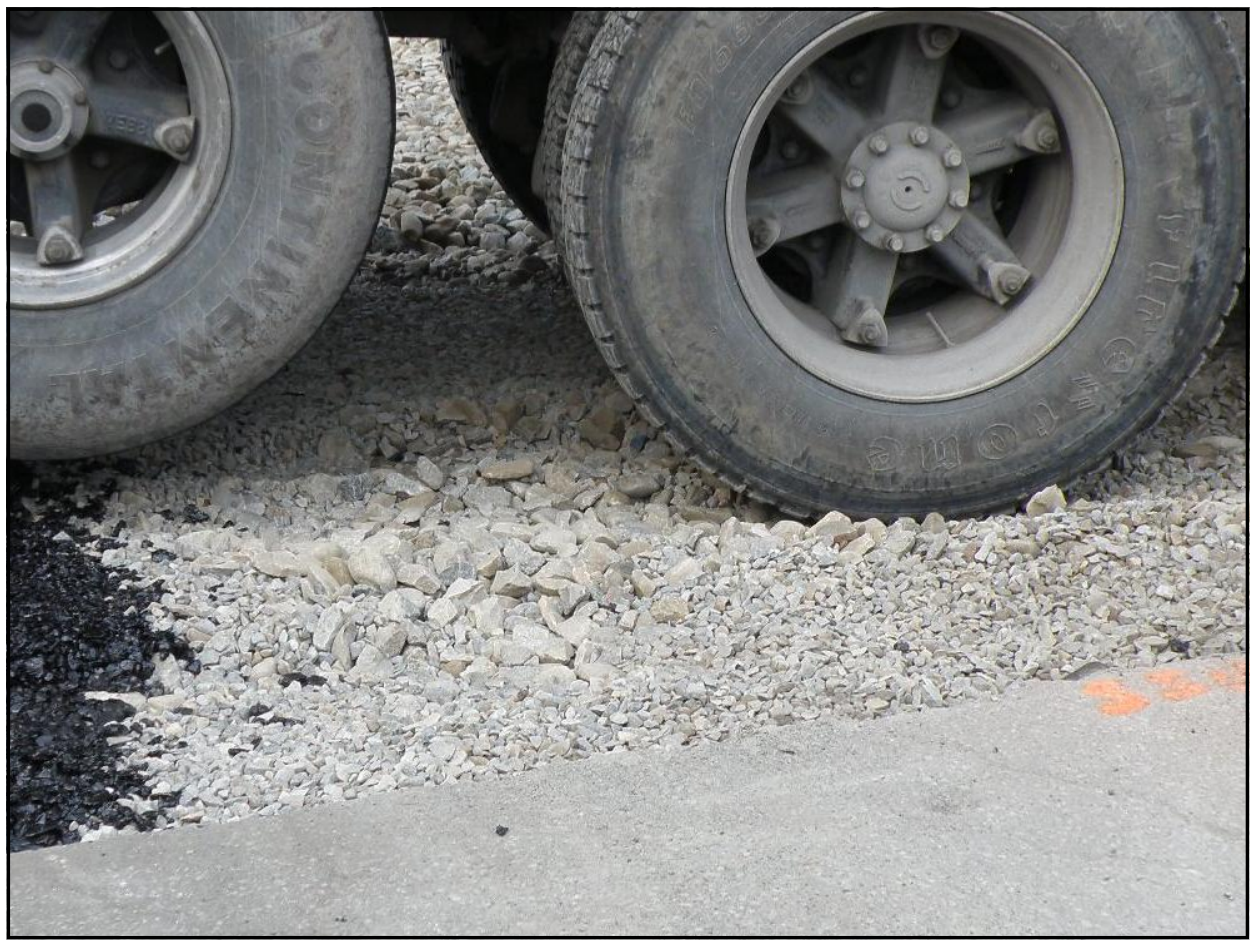
4A Gradation - OK

Since a Test Section.. the Gravel was Allowed to Remain

Placed Choker Course on One Half

Stone Courses

Test Panel #1 - August 2012



Test Panel #2 - April 2013

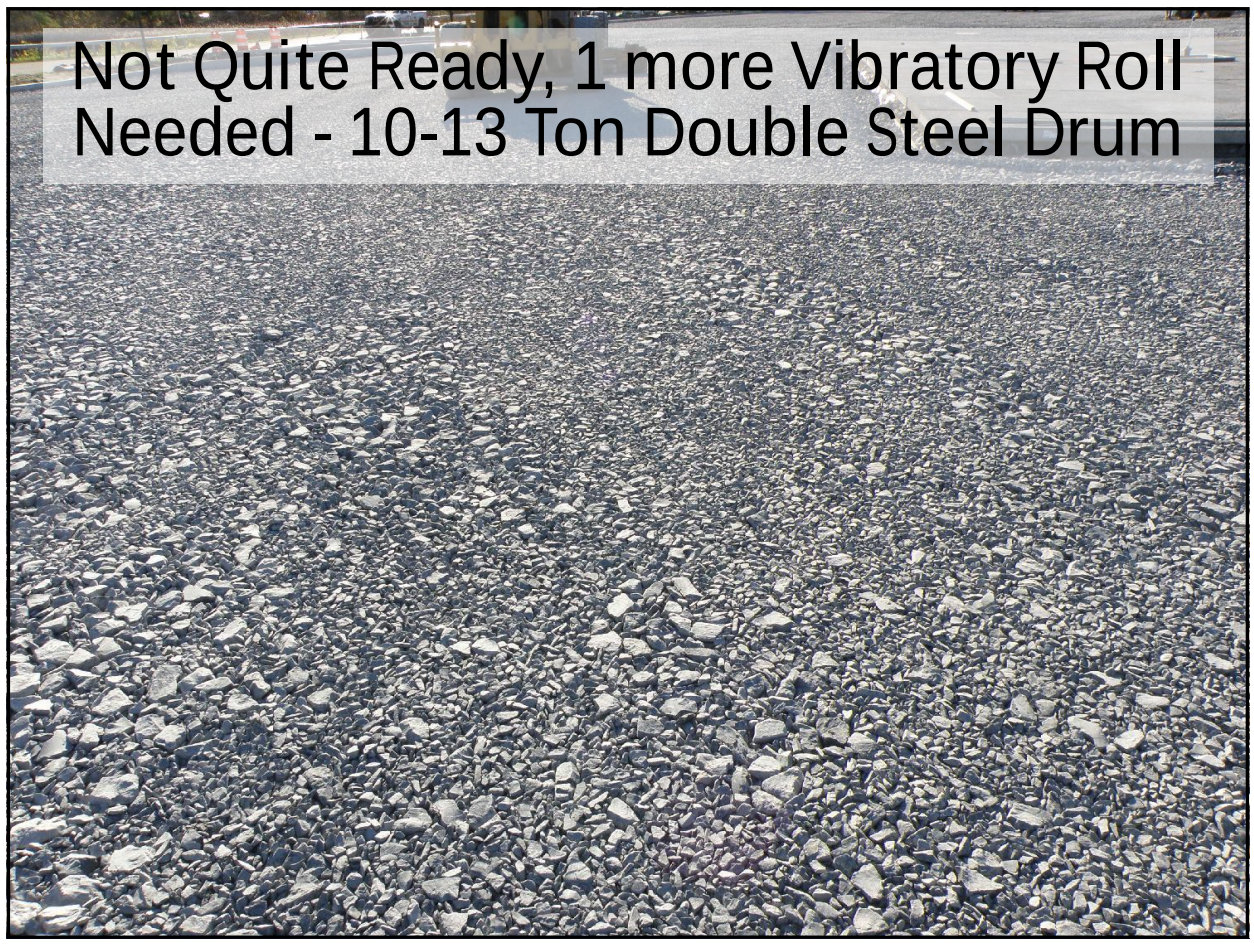
No Choker Course – Contractors Option

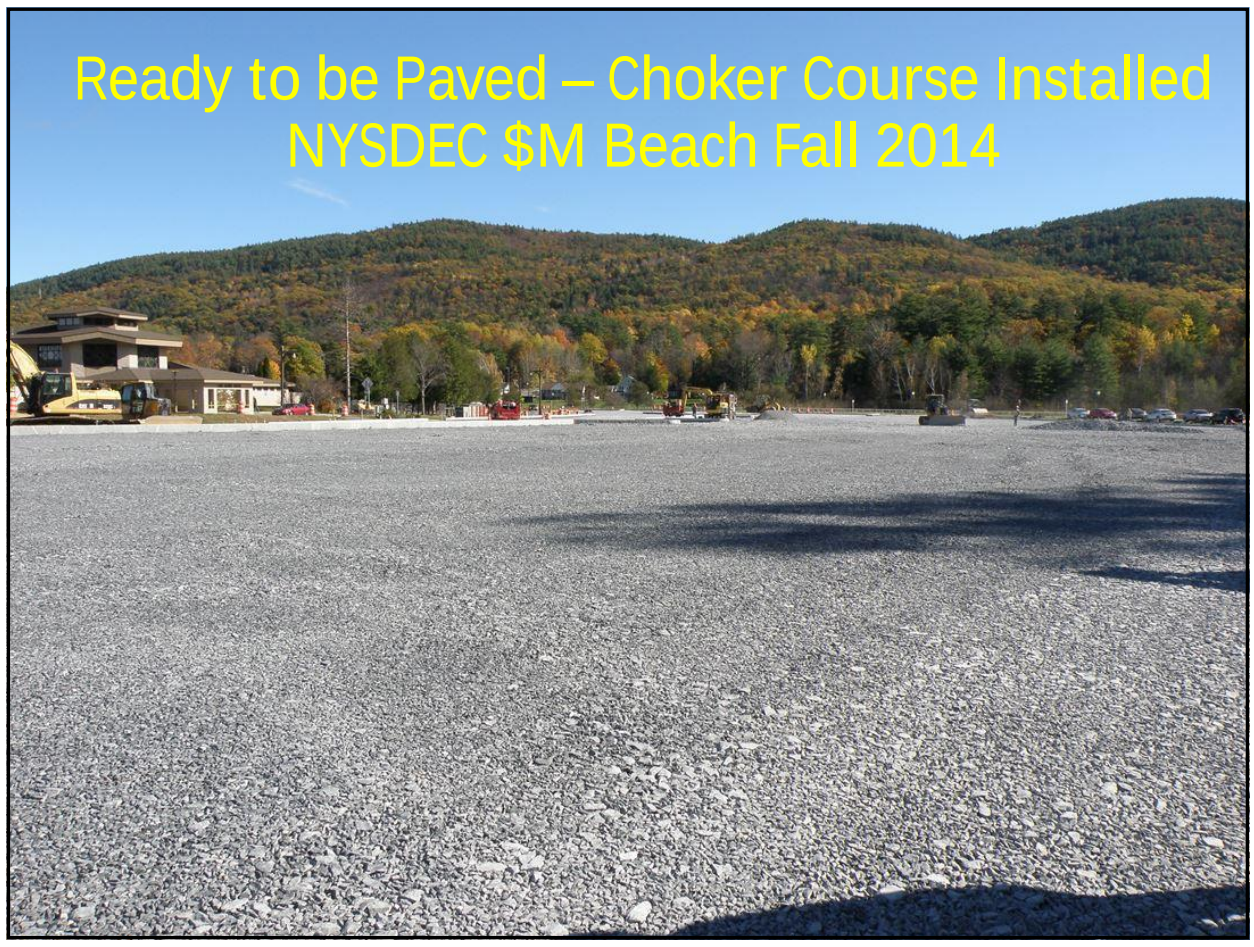
Test Panel #2 - April 2013

No Choker Course – Contractors Option

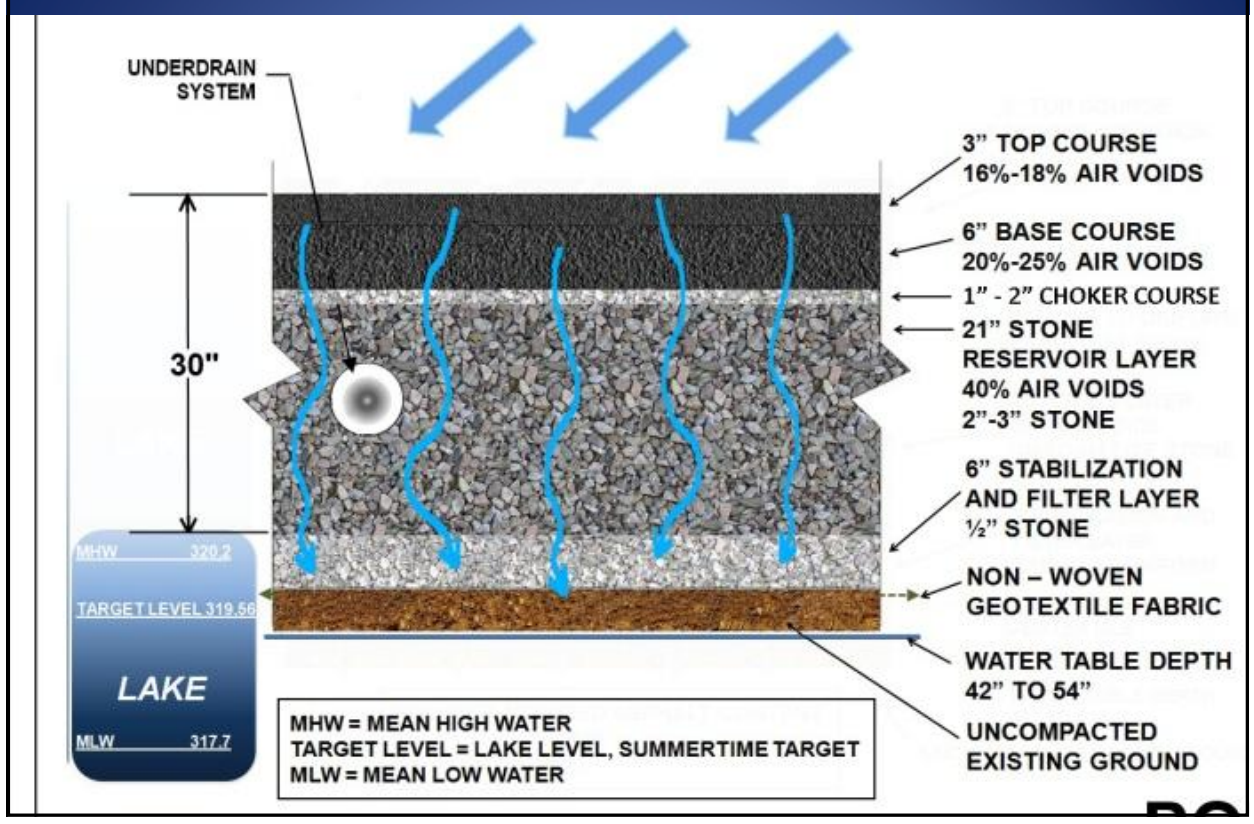
NYSDEC $M Beach Facility Reservoir Course - October 2014

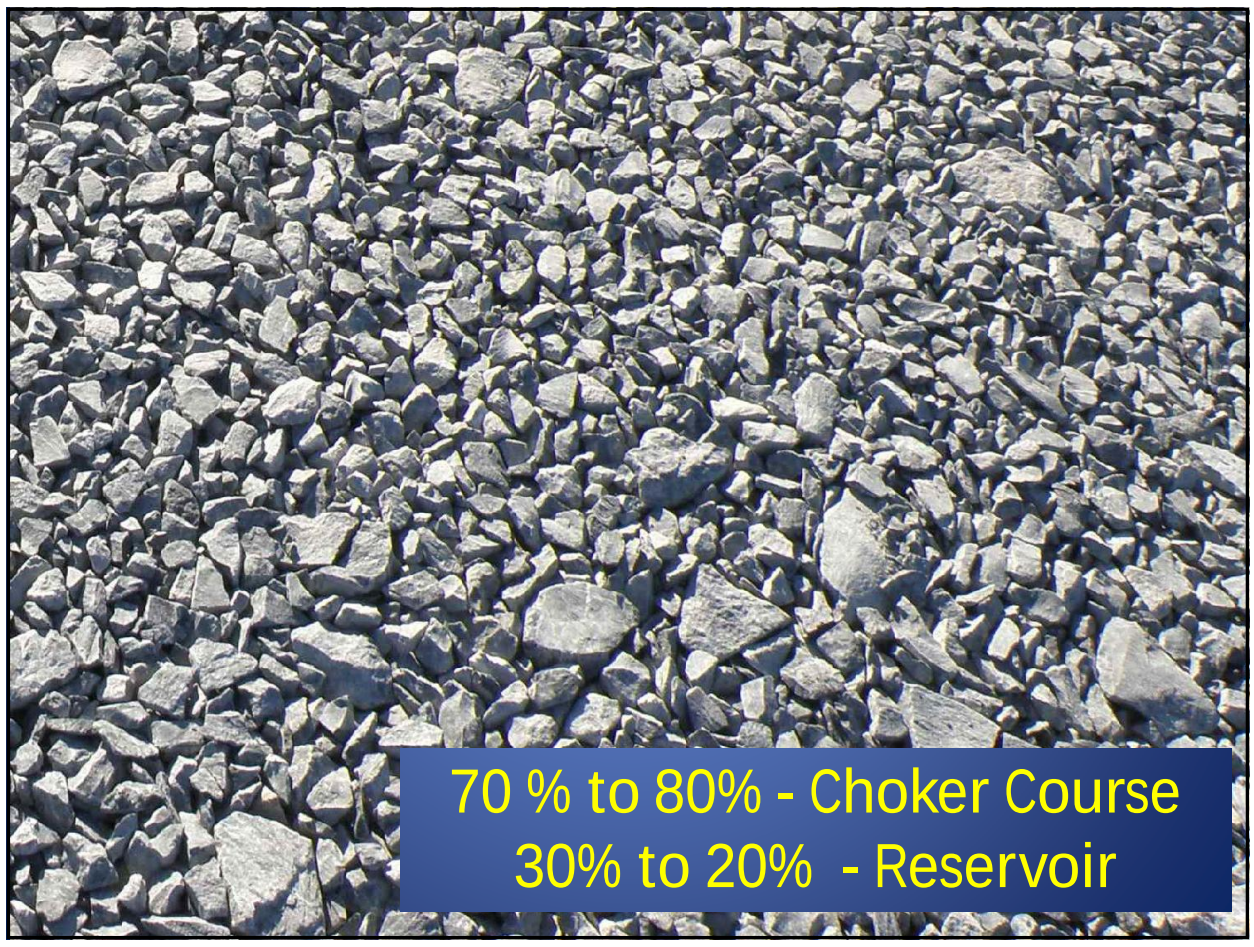

CHOKER Course Installed
Ready to be paved


Not Quite Ready, 1 more Vibratory Roll
Needed - 10-13 Ton Double Steel Drum



Choker Course / Reservoir Stone Change




70 % to 80% - Choker Course
30% to 20% - Reservoir


Choker Course Too Thick

Rutting of Choker Course Installed Too Thick (i.e. 4”)

ITEM 623.12010070 –CRUSHED STONE STABILIZATION COURSE (CY)
ITEM 623.12020070 –CRUSHED STONE RESERVOIR COURSE (CY)

DESCRIPTION:

The work shall consist of providing and placing, in accordance with the contract documents, clean, washed, uniformly graded crushed stone.

MATERIALS:

Materials shall consist of Crushed Stone that meets the requirements for crushed stone in Section 703-02 COARSE AGGREGATE in the NYSDOT Standard Specifications. The source must be listed under "stone" on the current Approved List of Fine and Coarse Aggregates, which is published on the NYSDOT web site. Material shall consist of clean, washed, durable, sharp-angled fragments of rock of uniform quality and size. Granite, Crushed gravel, screened gravel, or crushed air-cooled blast furnace slag is not acceptable. Material must be washed and clean.

In addition to the testing and acceptance criteria of Section 703-02:

Washed is defined as the removal of materials from the surface and crevices of the stone including soil, dust, organic materials or anything else that is not part of the base material, in this case the crushed stone. Washing procedure shall be completed by pressurized spray washing of the stone while under mechanical agitation and/or on a conveyor belt with sufficient volume and pressure to remove all debris, soil, stone dust, etc… and fall away from the clean stone, unless otherwise approved by the Engineer. The soiled wash water must not re-contact the clean stone.

Clean is defined as: The material shall not include more than 0.20% by weight of material passing the #200 sieve, following the washing procedure.

Air void ratio of the reservoir course shall be no less than 38% and typically no greater than 42%. Air void ratio of the stabilization course shall be in the range of 38% to 42%.

The stabilization course can be either the bottom layer that the reservoir course is founded on and/or the top layer that sits between the reservoir course and the asphalt layer (aka "choker course").

At least two weeks prior to placement of material, the contractor shall submit to the engineer for approval the proposed method of washing, material source, stockpile location, and five (5) gallon samples. A minimum of three (3) samples from each stockpile shall be taken at random sections within the pile as ordered by the engineer. At least one sample will come from the bottom of the stockpile. The engineer reserves the right to reject stockpiles, require re-washing, and/or approve a portion of a stockpile (such as the top two-thirds).

GRADATION:

Material shall be graded in accordance with size designations shown in Table 703-4 from the NYSDOT Standard Specifications. The following gradations apply to the material prior to the washing procedures.

Stabilization Courses - Size Designation 2

Reservoir Course - Size Designation 4A

TABLE 703-6[1] SIZES OF STONE, GRAVEL AND SLAG

Size Designation	Sieves (Square Openings), Percentages Passing[2]									
	4 in	3 in	2 1/2 in	2 in	1 1/2 in	1 in	1/2 in	1/4 in	8/16 in	#50
1	-	-	-	-	-	-	100	90-100	-	-
1R	-	-	-	-	-	-	100	90-100	0-15	-
1A	-	-	-	-	-	-	100	90-100	0-15	-
1NF	-	-	-	-	-	-	100	0-15	-	-
1	-	-	-	-	-	100	90-100	0-15	-	-
2	-	-	-	-	100	90-100	0-15	-	-	-
3A	-	-	-	100	90-100	0-15	-	-	-	-
3	-	-	100	90-100	35-70	0-15	-	-	-	-
4A	-	100	90-100	-	0-20	-	-	-	-	-
4	100	90-100	-	0-15	-	-	-	-	-	-
5	90-100	0-15	-	-	-	-	-	-	-	-

(1) Percentages by weight passing for the following square openings.
(2) Percentages shall include all of the fine materials passing a 1/4 in. screen.

CONSTRUCTION DETAILS:

The approved clean and washed material shall be placed in locations and thicknesses identified in the plans, uniformly leveled and moderately compacted in lifts not greater than 6" with a "dirt roller" only to properly orientate the stone. Minor vibratory compaction will be required after a minimum of 8" of stone is placed and when approved by the engineer. Vibratory actions shall not cause fracturing of the stone and shall only be utilized to orientate the stone in a locked up stable mass.

The reservoir course layer should be installed to within 1" below the bottom of asphalt layer or as modified on the plans and or typical sections.

The crushed stone stabilization course (aka "choker course") shall be no more than 2" thick prior to rolling with a 10-13 ton steel drum roller on low vibrate. The finish of the stabilization course

is to provide a stable base for construction vehicles, specifically loaded asphalt trucks to traverse without rutting the stone. The finished surface, after 2 passes with the roller, should show approximately 20-30% of the reservoir course and 70-80% of the stabilization course stone randomly appearing across the paving surface. When installed properly, the stone courses will not rut under the load of the finished paver or the fully loaded asphalt trucks.

Excess stone stabilization course shall be removed, at no cost to the owner, if rutting is deemed excessive as determined by the Owner or the Owners designee.

Material must be smooth and level prior to asphalt course installation. If the stone layer becomes displaced or rutted, a vibratory roller may be used to re-orientate or level the stone layer prior to asphalt placement or re-smooth out that may be made by asphalt delivery vehicles loading the paver or other construction vehicles.

Placed and stockpiled material must be protected from contamination and any potential of introduction of unwanted materials such as those described under the washing definition in the Materials section above. Contaminated material shall be removed and replaced at no cost to the Owner at the direction of the Engineer.

METHOD OF MEASUREMENT:

The quantity will be the number of cubic yards (CY) of material, placed and compacted in its final position, computed from payment lines shown on the plans, or where changes from payment lines have been ordered and established in writing by the Engineer.

BASIS OF PAYMENT:

The unit price bid for this work shall include the cost of furnishing all labor, material and equipment necessary to complete the work as described above and maintain the smooth and level surface.

ASPHALT

PG 76-22ER (64E-22) with Fibers

ASPHALT

NYSDEC Beach Porous Asphalt

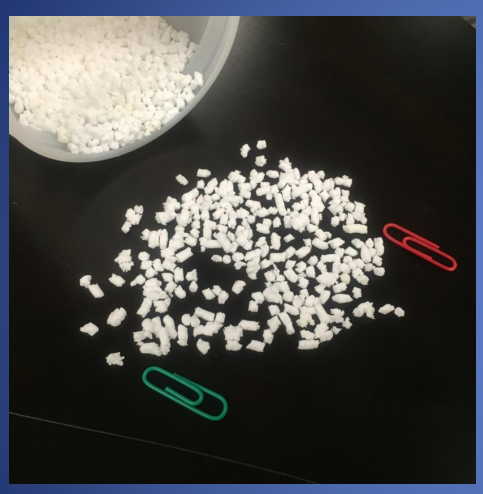
2,500 Tons Top
4,700 Tons Binder (Base)

Beach Road Porous Asphalt

2,100 Tons Top
3,800 Tons Binder (Base)

Polymer Additive / Fibers

Styrene – Butadiene – Styrene (SBS)

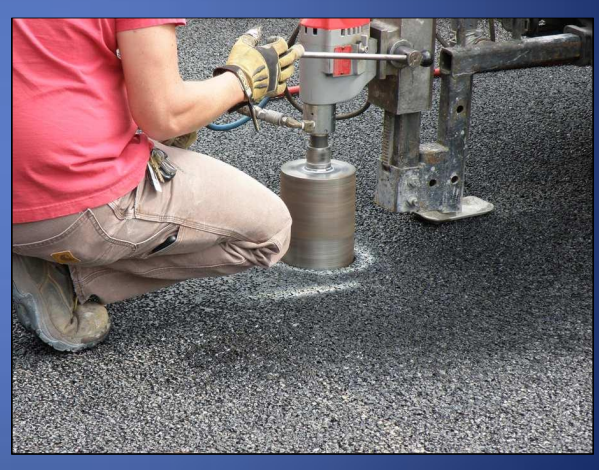


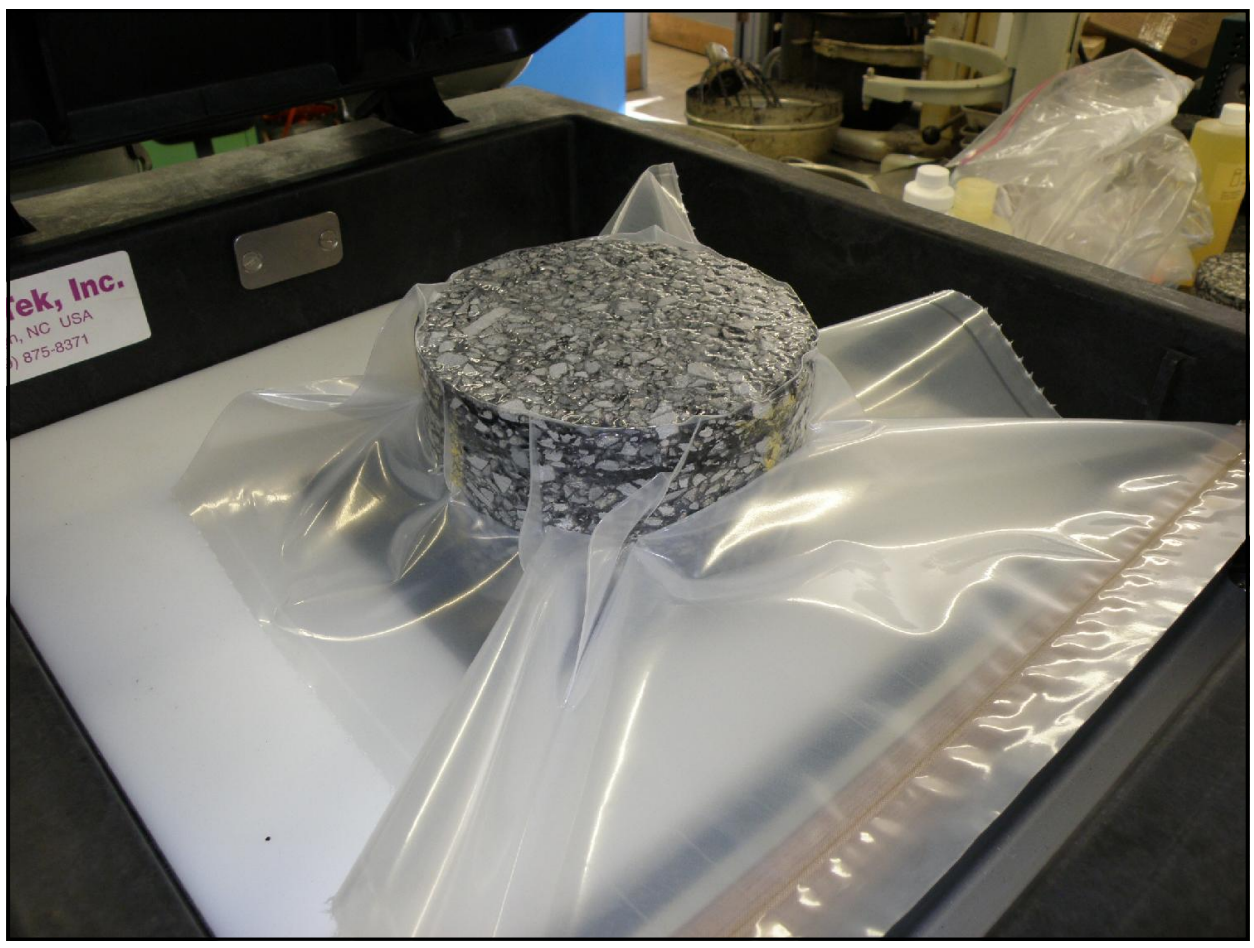
2 - 6% by Weight Added to Asphalt Binder

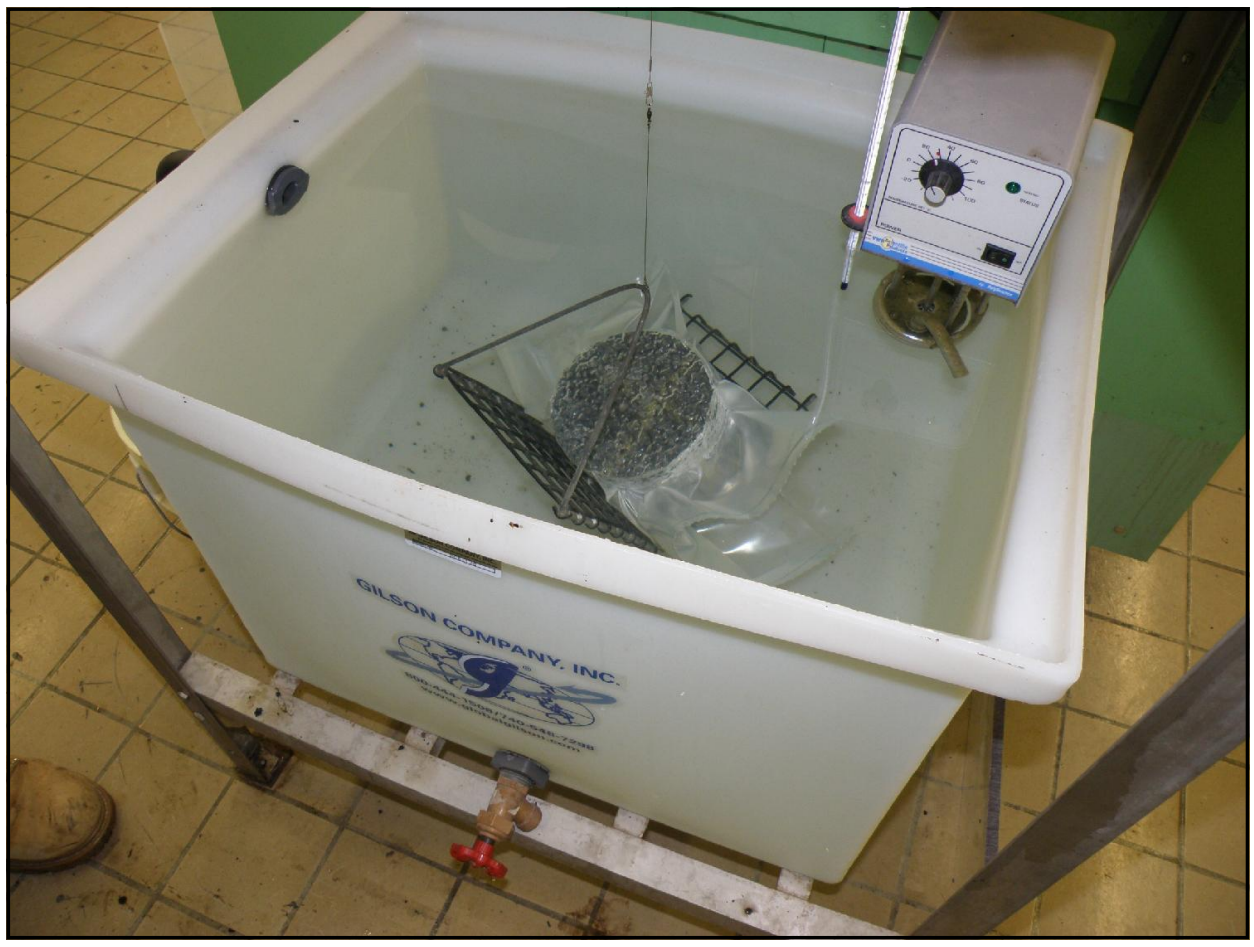
Mineral Fibers – basalt, sometimes Cellulose is used. Control Drain Down – 0.3% to 0.6% by Weight Added at Dry Mix Stage


Initial Testing

Sample Cores




tek, Inc.
n, NC USA
) 875-8371



Specific Gravity

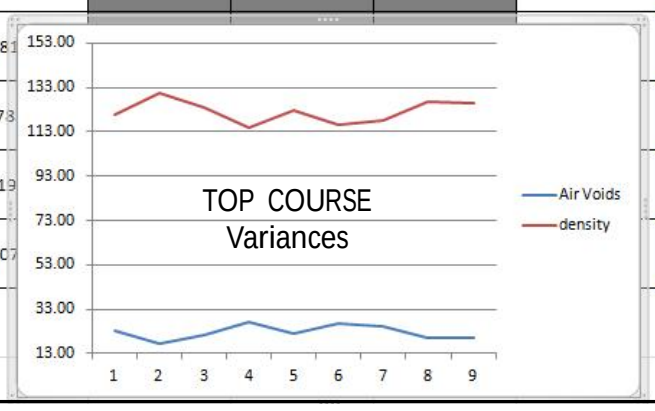
Air Void % = (G_{max} - G_{test}) / G_{max}

G_{max} = Theoretical Maximum Specific Gravity
- Based on Laboratory Test of Mix – Max Density
- Rice Number (named after James Rice)

G_{test} = Test Specimen Specific Gravity
- Lab test of Cores

Used to Verify In-place Mix and Calibrate Density Meters

mass of ecimen emoval aled bag, g	E - Mass of the sealed specimen underwater, g	Ratio of mass of dry to to the mass of the bag	F - Apparent specific gravity of the plastic bag, provided by the manufacturer	Specimen bulk specific gravity, Gmb Gtest	RICE # Maximum specfic gravity of the mixture, Gmm Gmax	Specimen air voids, %	Comments	Density pounds/cf divided by factor of 1
41.4	1403.7	52.2451	0.7729	1.9337	2.529	23.54	None	120.7
01.6	1602	119.2885	0.6616	2.0867	2.529	17.49	None	130.2
53.7	1694.3	60.2740	0.7595	1.9834	2.529	21.57	None	123.8
73.6	937.6	79.4444	0.7277	1.8411	2.529	27.20	None	114.9
87.6	1571.1	57.1996	0.7646	1.9632	2.529	22.37	None	122.5
66.8	181					26.33	None	116.3
86.8	78					25.29	None	117.9
69.6	19					19.88	None	126.4
61.1	207					20.36	None	125.7



TOP COURSE

Air Voids = (Gmax-Gtest) / Gmax

Specific Gravity

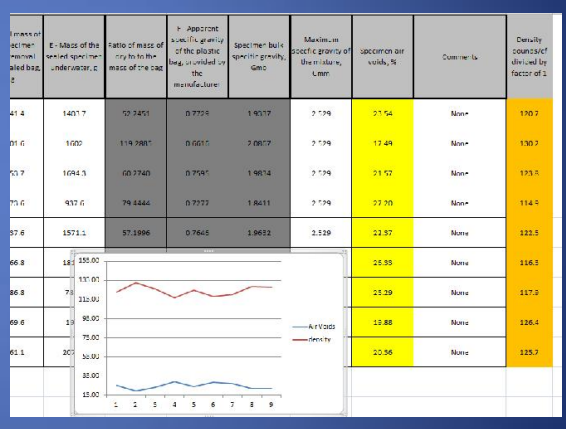
Results of First Test Panel

Inconsistency in Asphalt Content

15.5%, 10.1%, 7.6%, 8.6%
Others Correct at 5.9% - 6.2%

Aggregate Gradation Variations

Data = Unreliable



Solution - Increase Dry Mix Time by 10 to 15 seconds during Production to Avoid Asphalt Clumping on Fibers

Improperly Mixed Fibers

Improperly Mixed Fibers

2nd Test Panel - Gauge Calibration

Specimen number	Lab Results: Specimen bulk specific gravity, Gtest	Specimen Density, lbs/ft³	Troxler Model 3430 Serial Number 23531 — Field Tests: Gauge Reading, lbs/ft³	Correction Factors: Correction Factor, lbs/ft³
Core 1 - Top	1.9535	121.90	117.7	4.20
Core 2 - Top	2.0140	125.67	122.3	3.37
Core 3 - Top	1.9616	122.40	117.5	4.90
Core 4 - Top	1.9358	120.80	117.2	3.60
Core 5 - Top	1.9849	123.86	121.2	2.66
Core 6 - Top	1.9443	121.33	116.8	4.53
Core 7 - Top	2.0032	125.00	122.4	2.60
Core 8 - Top	1.9914	124.26	120.8	3.46
Core 9 - Top	1.9779	123.42	117.5	5.92
			Ave Correction Factor	3.91
			Project Target Density, lbs/ft³	**123.5**

1 x 62.4 = Minus Gauge =

Gmax = 2.52 for Mix (from Plant)

Gtarget = 2.52 – (19% x 2.52) x 62.4
Minus the Correction Factor =

Asphalt Drain Down


Production, Transit and Placement Temperature
°C/°F
MAX 408


Production, Transit and Placement Temperature
°C/°F
MAX 408

Asphalt Drain Down

Video Asphalt Drain Down

Production, Transit and Placement Temperature

Asphalt Drain Down

PG 64-22 P
w/ ER 60%

4/8/2013
LOT 1-A
TEST STRIP

POROUS BINDER FOR BEACH ROAD

BINDER

	@ 290 DEG. F	@ 327 DEG F.
wt of sample =	1051.3	1447.2
tare wt of pan =	395.4	395.2
end wt of pan =	396.4	397.5
$\frac{\text{end wt of pan - start wt of pan}}{\text{wt of sample}}$ =	0.10	0.20

AVE DRAINDOWN 0.15

BLEND 1 - POROUS TOP TOP

TEST STRIP FOR BEACH ROAD (#2)
4/9/2013

0.6% FIBERS

Fibers Spec
=0.4% +/-

DRAIN DOWN TEST

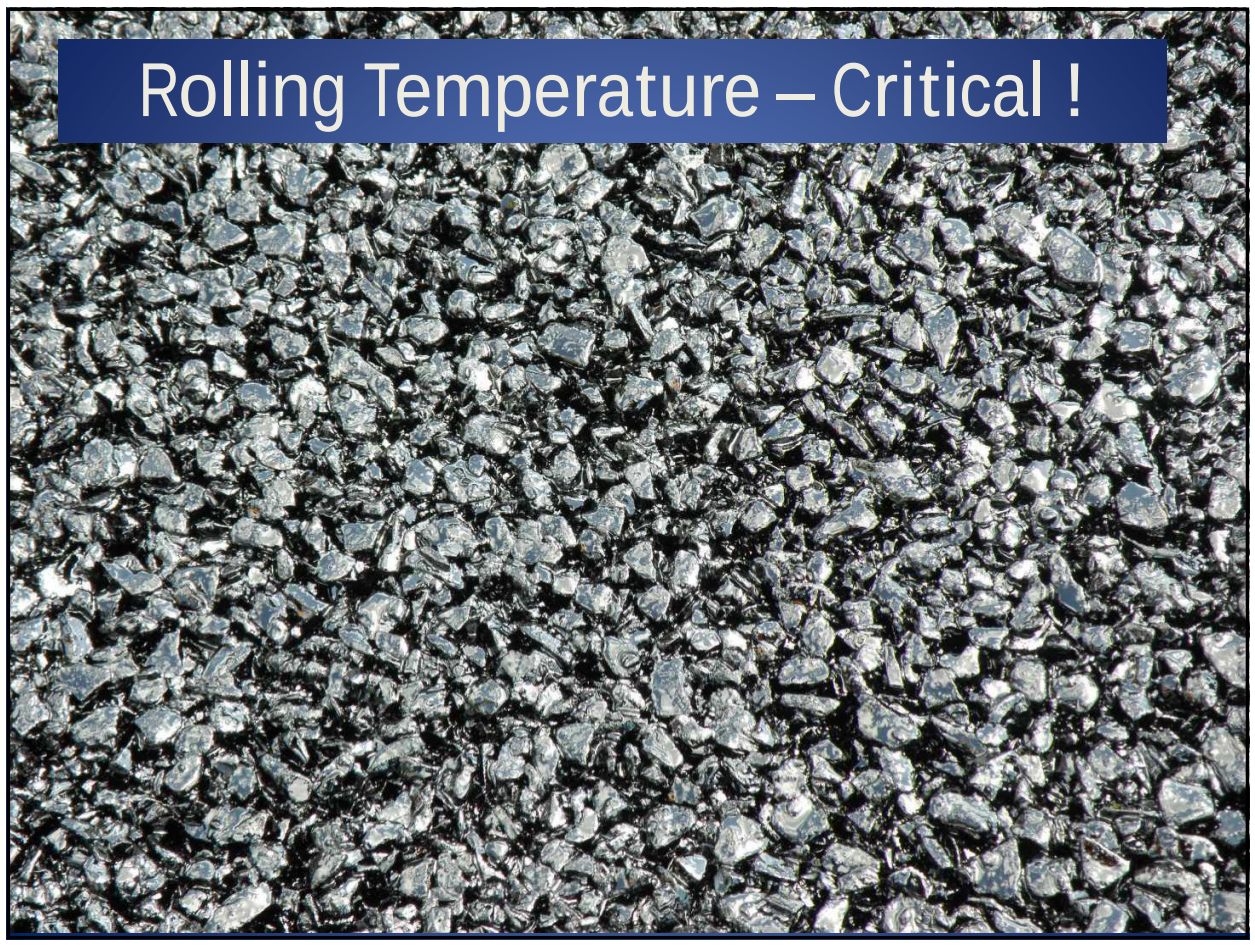
PG 76-22 P
w/ ER 60%

	@290deg f	@ 327 deg f
wt of sample =	1113.7	1108.1
tare wt of pan =	395.2	395.4
end wt of pan =	395.5	396.3
$\frac{\text{end wt of pan - start wt of pan}}{\text{wt of sample}}$ =	0.03	0.08

0.05


Production, Transit and Placement Temperature
282
Laser ON/OFF
°F / °C


Compaction
CATERPILLAR
05/01/2013 09:54



Rolling Temperature – Critical !

- Ambient Temperature 50 to 70 degrees F.
- Ideally - Wind – 0 to 3 mph
- Beware - Asphalt surface cooling to quick
- No Paving Top Course under 50 degrees F.
- Cooling time to Finish Rolling = Approx. 2 hours

Rolling Temperature – Critical !

- Binder Course – 200 - 245 F.
- Top Course – 200 - 220 F.
- Finish Rolling - 110 - 140 F. - Top,
  - 140 – 150 F. - Binder
- 4 to 6 Passes with 10 to 13 Ton Roller OK (Static)
- Increases in Density of 1 to 2 lbs/CF up to 5 passes
  - Density Spike of 4 to 5 lbs/CF at 140 F.
- 1 to 3 Passes with 3.5 to 5 Ton Roller to Finish

Rolling Temperature – Critical !

Rolling Temperature – Critical !

Quality Control

BEACH ROAD PAVING INFORMATION SHEET

Revised April 26, 2013

- Binder Course - 40* to 70* F. - Ambient Temp **(must have 50* Min Surface Temp)**
- Top Course - 50* to 70* F. **No Paving Top Course w/ Ambient Temp under 50* F.**
- Wind – up to 10 mph Pave @ 50* F. - Up to 20 mph pave @ above 60* F.
- In-Truck as delivered Temps – 250*-300* Binder, 240*- 280* for Top
- Contact Tom Baird - If temps over 300* F. in Truck

NO VIBRATORY Rolling – Only STATIC Rolling

- Roll Binder Course – 200 to 245* F.... Six (6) Passes 10 -13 Ton
- **Binder Course Finish Rolling -> 10 - 13 Ton, 140* – 150* F. to Target Density**
- Roll Top Course – 200 to 220*F. – Expect Three (3) Passes 10 -13 Ton
- **Top Course Finish Rolling -> 110* to 140* F. to achieve Target Density**
- Centerline Joint – Meet previously paved edge with Hot Asphalt
  Wait until temps on edges equalize (min. 140*) Roll to Pinch Joint
- Item 402.7903WR (GlasGrid #8512) over Culvert and Transverse Joints

Project Target, Gauge Read, Densities per Meter – Note Serial Numbers

Gauge	TOP	BINDER	
	Batch Plant Only Top Course Project Target Density (PTD), lbs/ft^3	DRUM Plant Binder Course Project Target Density (PTD), lbs/ft^3	BATCH Plant Binder Course Project Target Density (PTD), lbs/ft^3
Troxler Model 3430 Serial Number 23531	123.5	122.5	124.1
Instrotek Xplorer Serial Number 720	122.8	122.0	123.5
PQI Model 301 Serial Number 002792, Programmed Offset Value 16.0	139.6	138.9	140.4

B&L_REV1_ 4/26/2013, TCB

BEACH ROAD PAVING INFORMATION SHEET

Revised April 26, 2013

- Binder Course - 40* to 70* F. - Ambient Temp **(must have 50* Min Surface Temp)**
- Top Course - 50* to 70* F. **No Paving Top Course w/ Ambient Temp under 50* F.**
- Wind – up to 10 mph Pave @ 50* F. - Up to 20 mph pave @ above 60* F.
- In-Truck as delivered Temps – 250*-300* Binder, 240*- 280* for Top
- Contact Tom Baird - If temps over 300* F. in Truck

NO VIBRATORY Rolling – Only STATIC Rolling

- Roll Binder Course – 200 to 245* F…. Six (6) Passes 10 -13 Ton
- **Binder Course Finish Rolling -> 10 - 13 Ton, 140* – 150* F. to Target Density**
- Roll Top Course – 200 to 220*F. – Expect Three (3) Passes 10 -13 Ton
- **Top Course Finish Rolling -> 110* to 140* F. to achieve Target Density**
- Centerline Joint – Meet previously paved edge with Hot Asphalt
  Wait until temps on edges equalize (min. 140*) Roll to Pinch Joint
- Item 402.7903WR (GlasGrid #8512) over Culvert and Transverse Joints

Project Target, Gauge Read, Densities per Meter – Note Serial Numbers

Gauge	TOP	BINDER	
	Batch Plant Only Top Course Project Target Density (PTD), lbs/ft^3	DRUM Plant Binder Course Project Target Density (PTD), lbs/ft^3	BATCH Plant Binder Course Project Target Density (PTD), lbs/ft^3
Troxler Model 3430 Serial Number 23531	123.5	122.5	124.1
Instrotek Xplorer Serial Number 720	122.8	122.0	123.5
PQI Model 301 Serial Number 002792, Programmed Offset Value 16.0	139.6	138.9	140.4

B&L_REV1_ 4/26/2013, TCB

G_{max} = 2.xx for Mix (From Plant each day)

G_{target} = 2.xx – (19% x 2.xx) x 62.4 lb/cf - Correction Factor for Each Meter

Porous Paving Information Sheet

Revised March 27, 2016

- Binder Course - 40* to 70* F. - Ambient Temp **(Must have 45* Min Surface Temp)**
- Top Course - 50* to 70* F. **No Paving Top Course w/ Ambient or Surface under 50* F.**
- Wind – up to 10 mph Pave @ 50* F. - Up to 20 mph pave @ above 60* F.
- In-Truck as delivered Temps ---- Binder = 250*-290*, TOP = 260*- 280*
- Contact _____ - **If Temps over 300* F.** in Truck or After exiting the Screed –

Use Internal Temperature Probe if Surface Temps Are At Limit to Verify

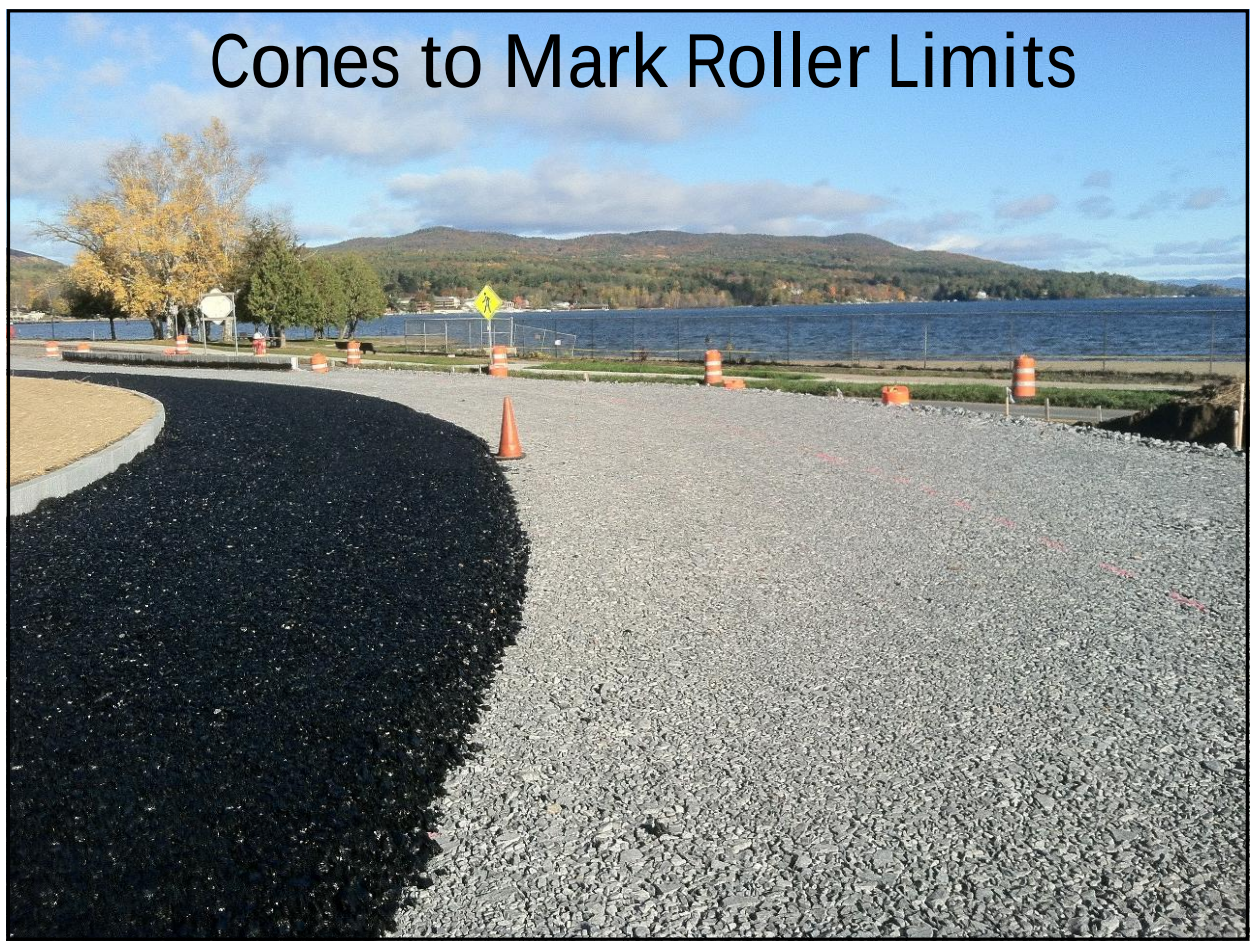
NO VIBRATORY Rolling – Only STATIC Rolling

- Roll Binder Course – 200 to 245* F…. Six (6) Passes 10 -13 Ton
- **Binder Course Finish Rolling -> 10 - 13 Ton – Roll 120* – 150* F. to Target Density**
- Roll Top Course – 200 to 220*F. – Expect Three (3) Passes 10 -13 Ton
- **Top Course Finish Rolling -> Surface Temperature - 120* to 150* F. to Target Density**
- **Top Course Must Be Rolled with 10 – 13 Ton BETWEEN 120* and 140* F**
- Centerline or Cold Joint – Meet previously paved edge with Fresh Hot Asphalt. Roll to Pinch Joint when Temps Equalize.

Project Target Density (PTD), Gauge Read, Densities Shall Be per Specific Meter

Pavement Density Gauge	TOP Batch Plant Only Top Course Project Target Density (PTD), lbs/ft^3	BINDER DRUM Plant Binder Course Project Target Density (PTD), lbs/ft^3	BINDER BATCH Plant Binder Course Project Target Density (PTD), lbs/ft^3
Rice Number from Plant	**2._____**	**2._____**	**2._____**
Model_____ SN_____ Correction Factor _____	Target	Target	Target
Model_____ SN_____ Correction Factor _____	Target	Target	Target

B&L_REVISION_ 03/27/2016, TCB



Permeability

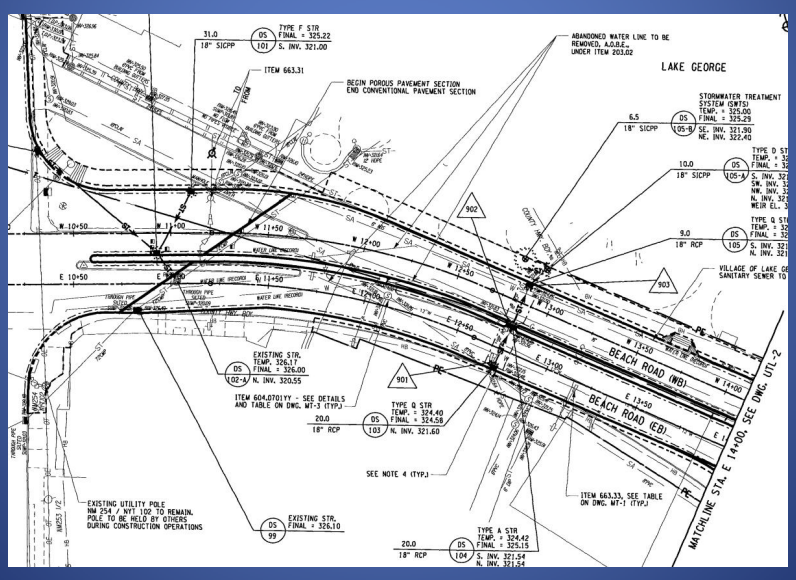
Protect your Investment

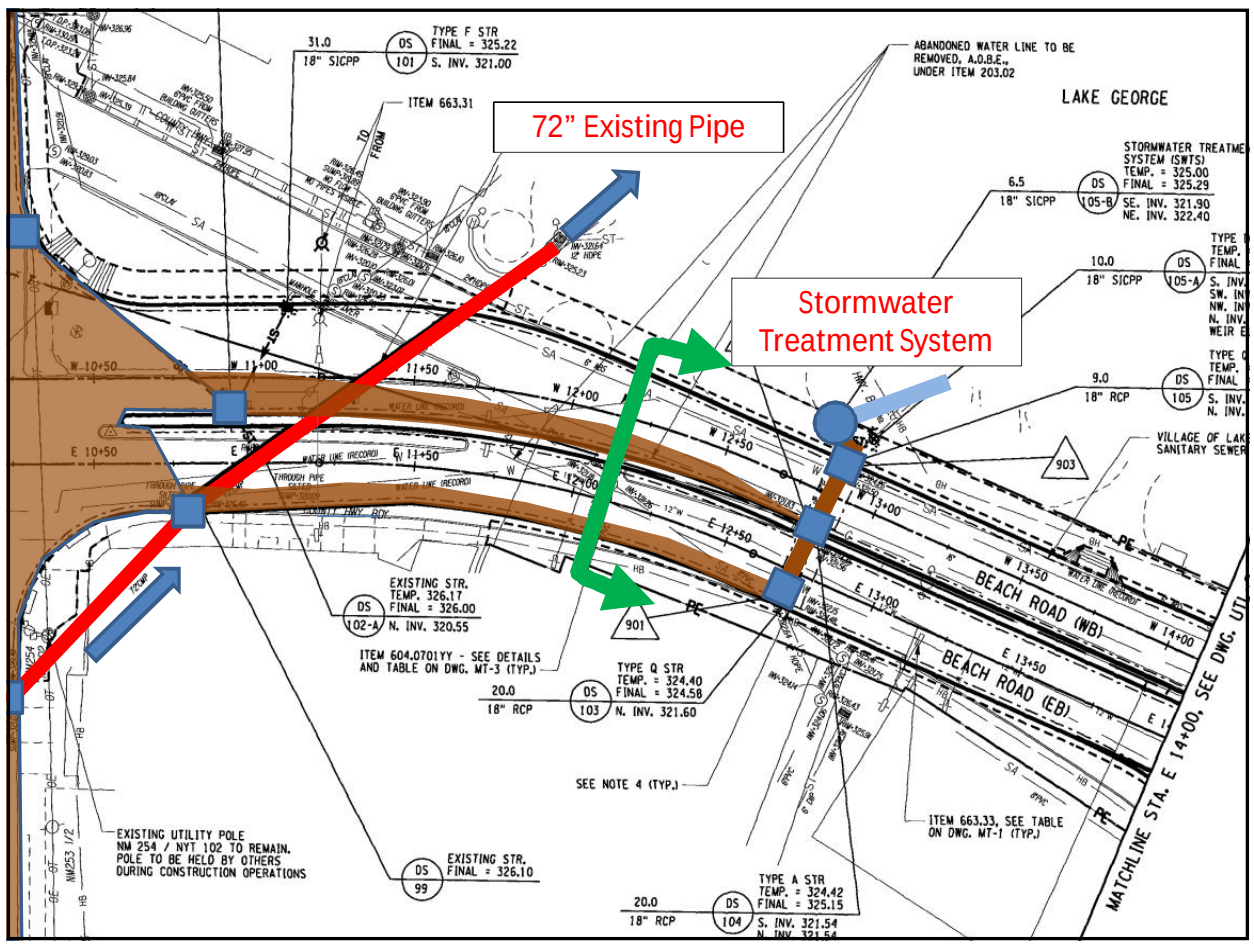
Beach Road System Safeguards

Beach Road System Safeguards

Beach Road System Safeguards

Offsite Contamination Protection
Flanking Structures




72” Existing Pipe
Stormwater Treatment System
LAKE GEORGE
BEACH ROAD (WB)
BEACH ROAD (EB)
ABANDONED WATER LINE TO BE REMOVED, A.O.B.E., UNDER ITEM 203.02
ITEM 663.31
EXISTING STR. TEMP. 326.17 FINAL = 326.00 N. INV. 320.55
ITEM 604.0701YY - SEE DETAILS AND TABLE ON DWG. MT-3 (TYP.)
TYPE Q STR TEMP. = 324.40 FINAL = 324.58 N. INV. 321.60
SEE NOTE 4 (TYP.)
EXISTING UTILITY POLE NM 254 / NYT 102 TO REMAIN. POLE TO BE HELD BY OTHERS DURING CONSTRUCTION OPERATIONS
EXISTING STR. FINAL = 326.10
TYPE A STR TEMP. = 324.42 FINAL = 325.15 S. INV. 321.54
ITEM 663.33, SEE TABLE ON DWG. MT-1 (TYP.)
MATCHLINE STA. E 14+00, SEE DWG. UT
VILLAGE OF LAK SANITARY SEWER


SPEED LIMIT 15
Lateral “Support”


LAKE GEORGE
MILLION DOLLAR BEACH
DAY USE AREA
State of New York
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
STOP


Protection
Walls, Buffers, Windbreaks
Limit Access to Beach
“Sand Break”
Aesthetics
Limit Access to Lake


Protection
Walls, Buffers, Windbreaks

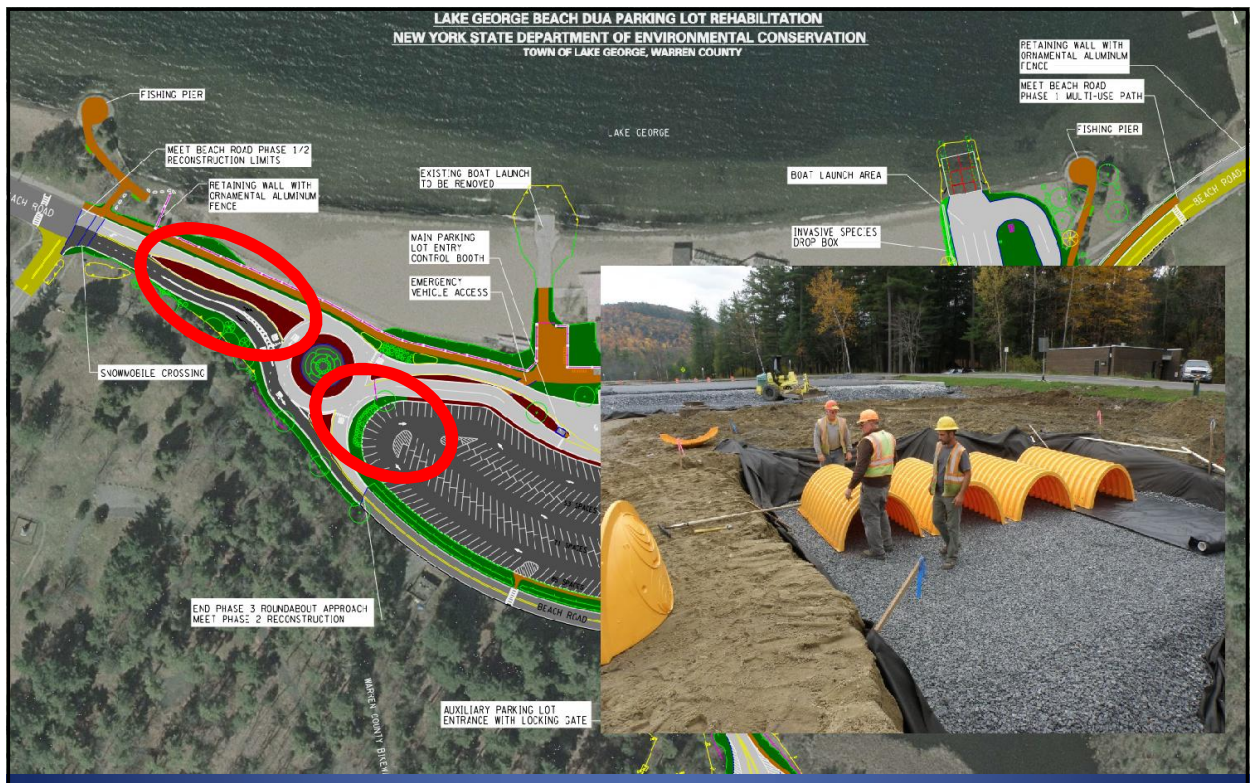

Coatings

Stormwater Treatment

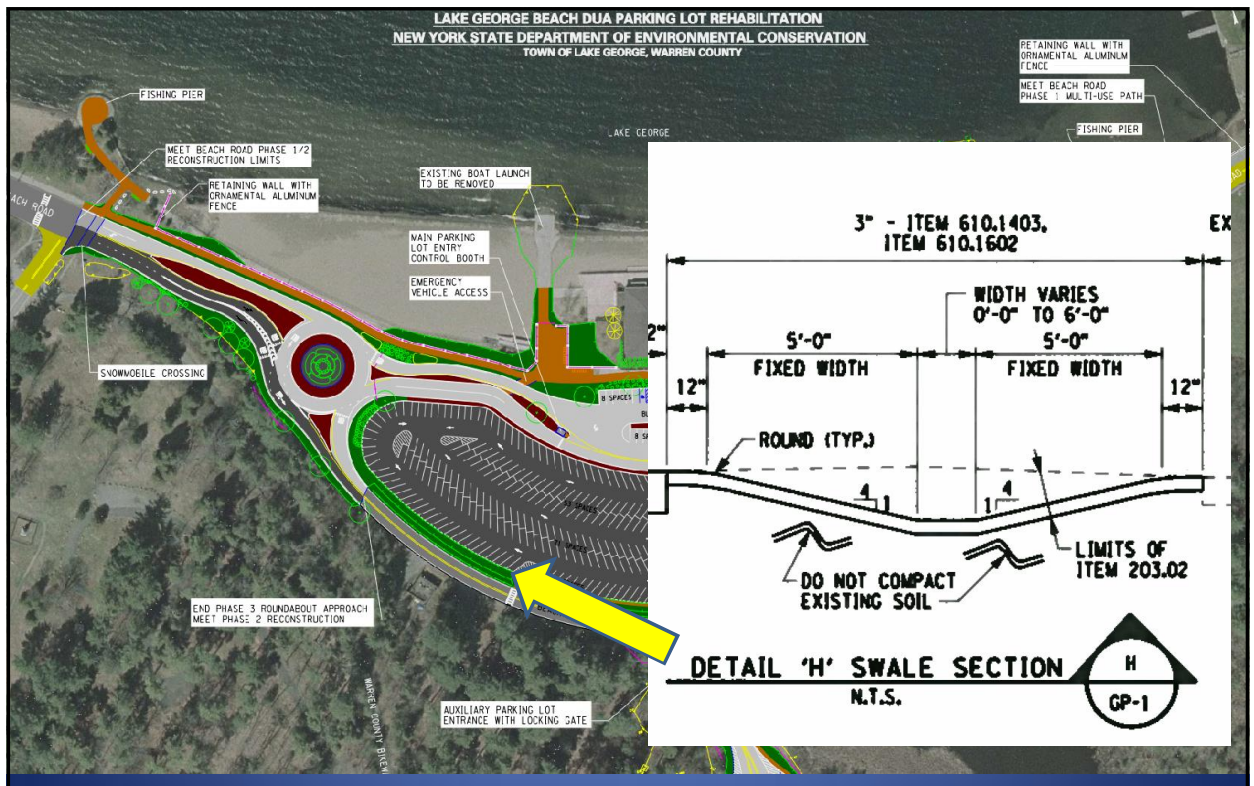
- Infiltration Chambers
- Rain Gardens
- Bio-retention
- Vegetated Infiltration Swales
- Porous Asphalt (3 Acres)
- Pre-cast Porous Concrete
- Hydro-dynamic Separator
- Underdrain Infiltration System

$M Beach Lake George – October 2014

Drain from Impervious Areas to Linear Raingardens and Infiltration Chambers



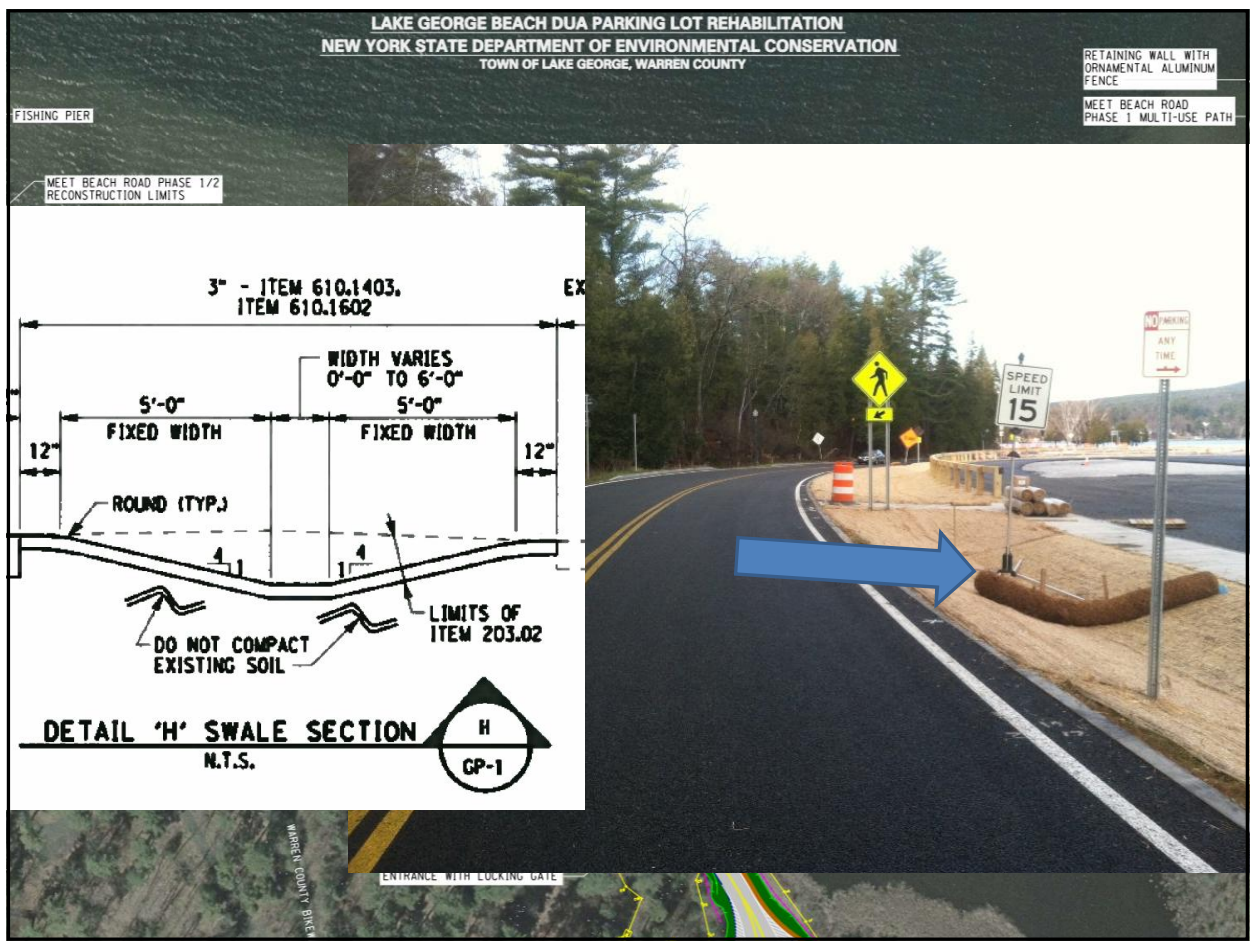
Primary Treatment to Underground Infiltration → Overflow goes to Reservoir Layer Under Pavement

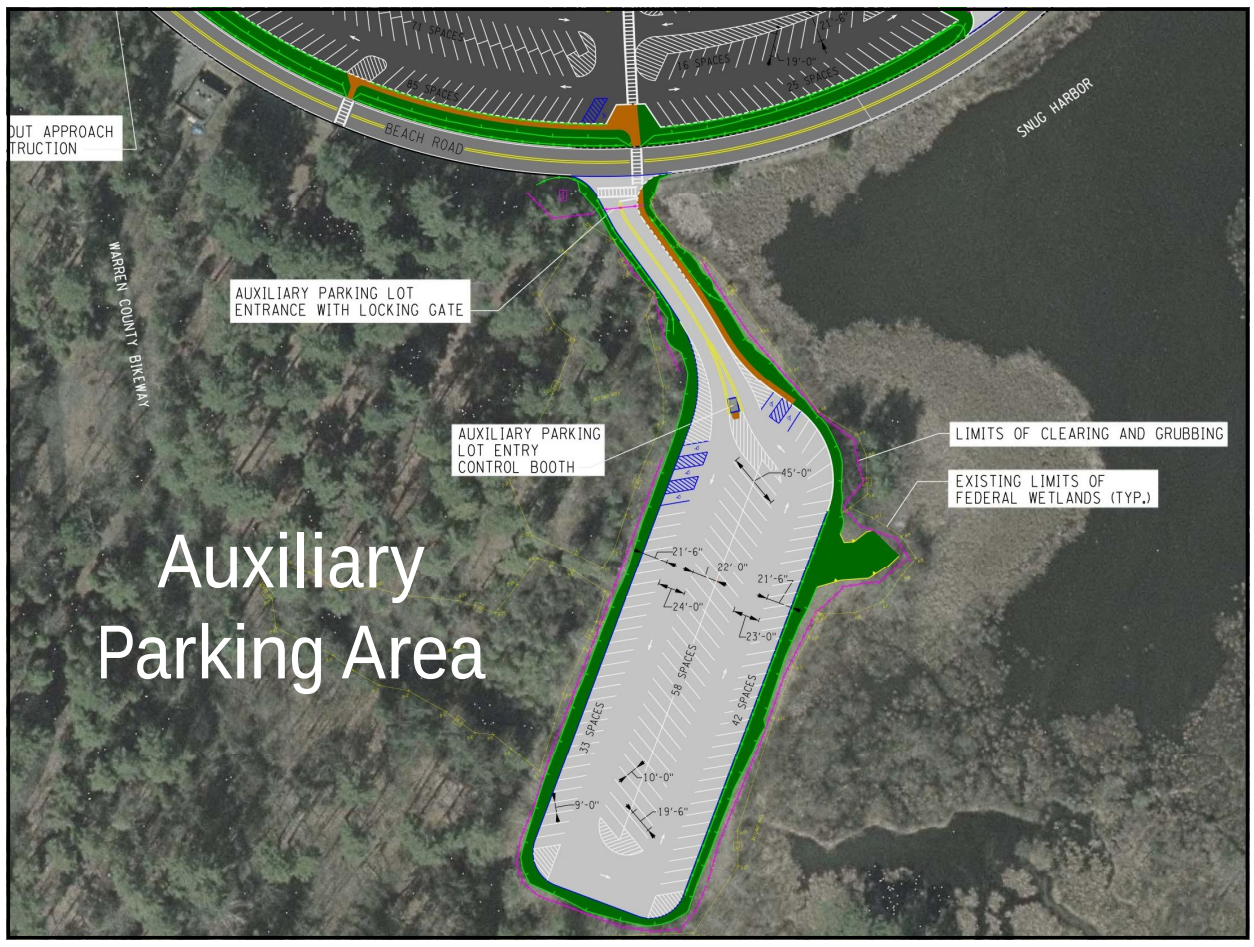


"Vegetated Infiltration Swale"

"Existing Soil" was placed a year earlier – Sandy Organic Mixture


Backup Systems to
Porous Asphalt


LAKE GEORGE BEACH DUA PARKING LOT REHABILITATION
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TOWN OF LAKE GEORGE, WARREN COUNTY
RETAINING WALL WITH ORNAMENTAL ALUMINUM FENCE
MEET BEACH ROAD PHASE 1 MULTI-USE PATH
FISHING PIER
MEET BEACH ROAD PHASE 1/2 RECONSTRUCTION LIMITS
3" - ITEM 610.1403, ITEM 610.1602
WIDTH VARIES 0'-0" TO 6'-0"
5'-0" FIXED WIDTH
5'-0" FIXED WIDTH
12"
12"
ROUND (TYP.)
4
1
4
1
LIMITS OF ITEM 203.02
DO NOT COMPACT EXISTING SOIL
DETAIL 'H' SWALE SECTION
N.T.S.
H
GP-1
SPEED LIMIT 15
ANY TIME
ENTRANCE WITH LOCKING GATE
WARREN COUNTY BIKE



Auxiliary Parking Area

Auxiliary Parking Area

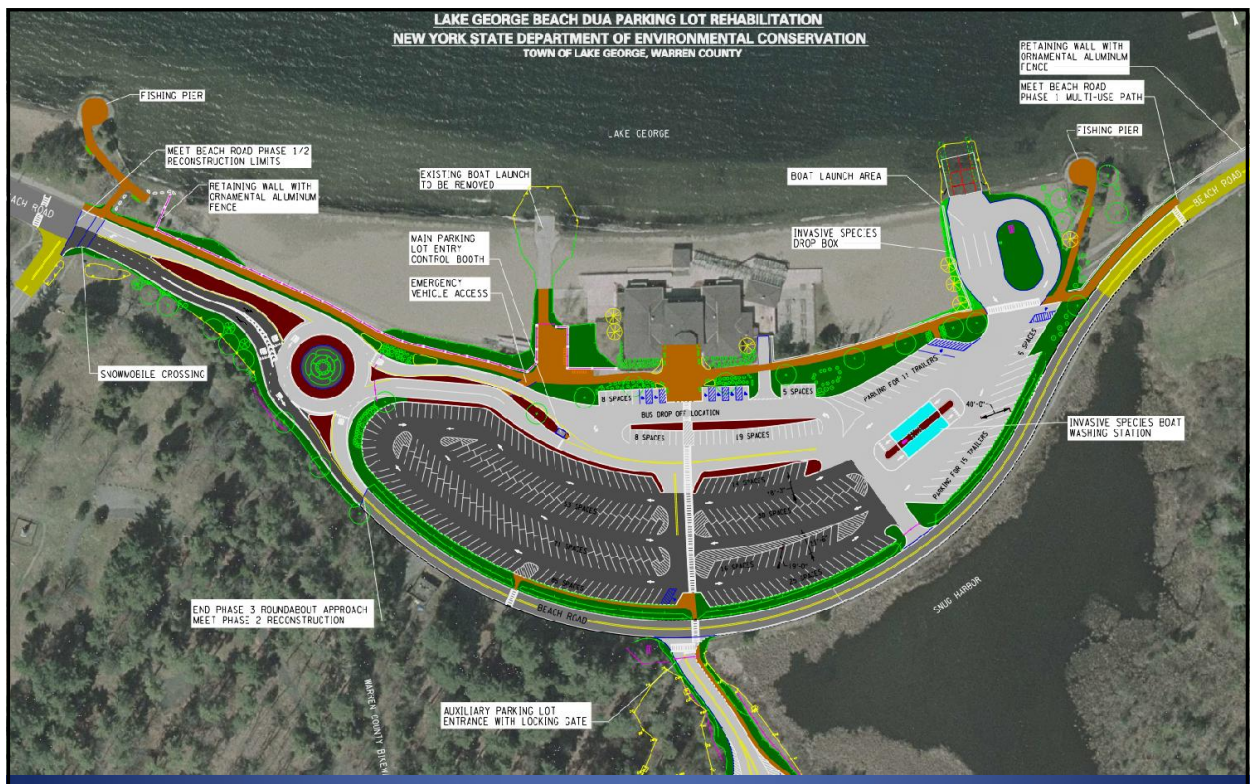
Auxiliary Parking Area

NYSDEC Project Total Crushed Stone

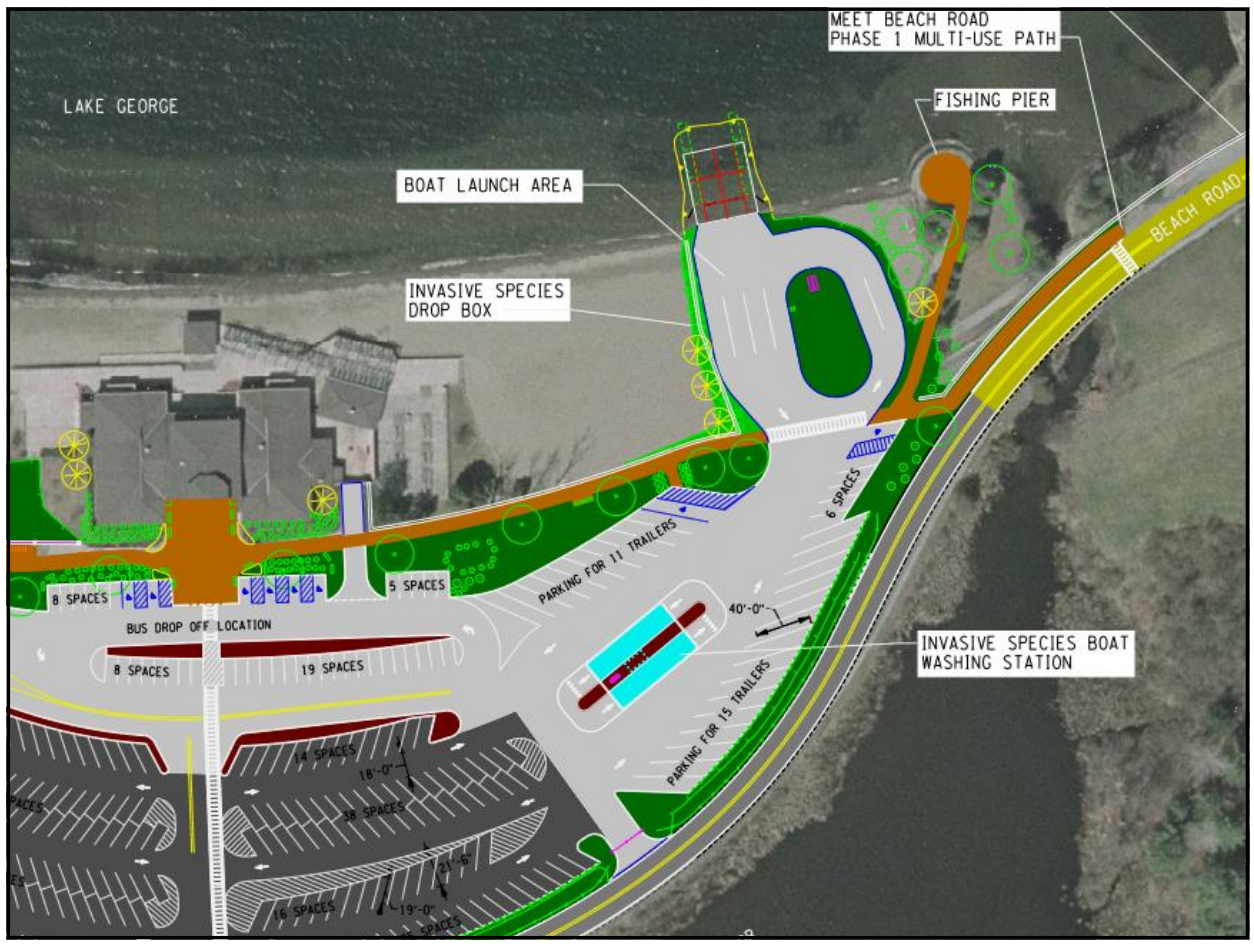
15,000 CY Crushed Stone
405,000 CF
30,375,000 pounds (40% Air Voids)

Compare to
45,562,500 pounds (10% Air Voids)

Savings of 7,600 Tons = 380 truck loads
Savings in Trucking Fuel = 4,500 gal. of Diesel
Savings in Mining, Crushing, Handling =



Invasive Species Washing &
Inspection Station



Invasive Species

Zebra Mussels

Also:

Chinese Mystery Snail
Spiny Water Flea

Courtesy Lake George Association

A34 STATE

Fighting a clam threat

Environmentalists trying to stop growth of polluting Asian mollusks

BY MARY ESCH
The Associated Press

ALBANY — Dive teams that spread underwater mats to smother invasive Asian clams in an Adirondack lake this spring are now sifting the sandy bottom of a lake in New York's Finger Lakes wine country to determine how widely the water-befouling mollusks have spread there.

An interim report released last week on a $475,000 effort to eradicate Asian clams in Lake George said plastic mats spread on five acres of lake bottom have killed more than 97 percent of the clams. But it recommended additional work, such as suction harvesting, that could bring the cost to nearly $1 million.

A plan also is being developed to eradicate a new 5-acre colony of Asian clams discovered last month in another bay of 32-mile-long Lake George, where the clear, cold water, sandy beaches and mountain scenery have long made it popular for vacations and second homes.

The Asian clam, Corbicula fluminea, is known as the "good luck clam" in its native Southeast Asia. The thumbnail-size clams multiply rapidly because of their ability to self-fertilize and release up to 2,000 juveniles a day during breeding seasons in May and August.

Infestations of the clams usually occur when someone dumps a bait bucket or aquarium into a body of water. The mollusk's excretions feed algal blooms and the sharp shells from dead clams wash up on beaches in large numbers.

The tiny clams multiply rapidly because they can self-fertilize.

In Lake Tahoe, where a $1.4-million eradication effort was launched last summer, they have been blamed for algal blooms that have turned clear, blue bays a murky green.

Albany-based InnerSpace Scientific Diving, which is involved in the Lake George clam project, is now working to determine the extent of an infestation in Owasco Lake, about 25 miles southwest of Syracuse.

Divers plot their findings on a map, using GPS to pinpoint the location of clams. Populations also have been discovered in Cayuga and Seneca lakes.

In April, divers unrolled 825 50-foot-long plastic mats to cover the bottom of a five-acre bay of Lake George where the clams were discovered last fall.

Sandra Nierzwicki-Bauer, director of the Rensselaer Polytechnic Institute Darrin Fresh Water Institute on Lake George, said last week that more than 97 percent of clams were dead in areas where mats had been removed.

It is estimated than an additional $200,000 to $400,000 will be needed to finish work and pay for suctioning clams out of areas where mats can't be used.

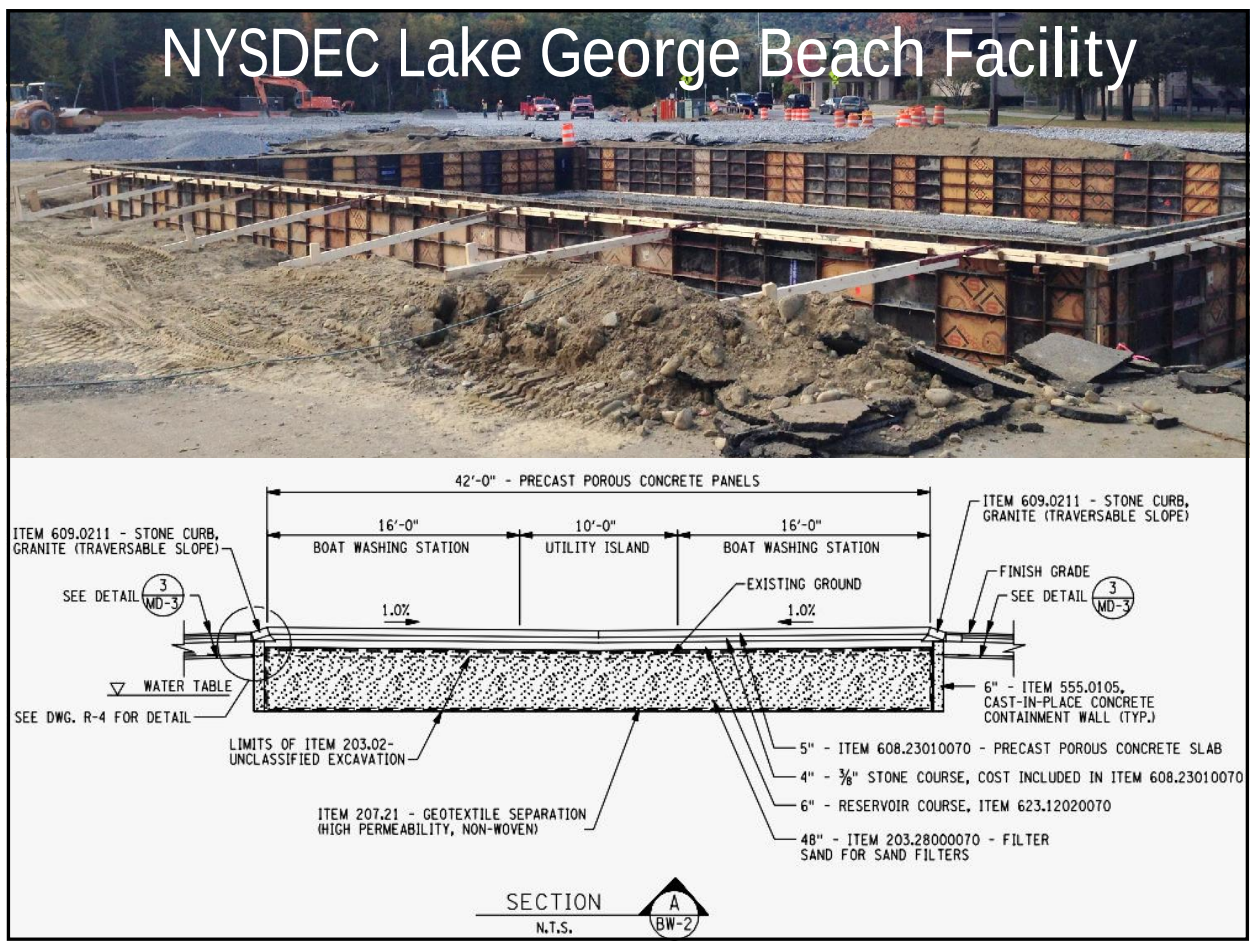
In April, divers plastered the bottom of a 5-acre bay area of Lake George to kill the invasive clams.

Asian Clams


NYSDEC Lake George Beach Facility
Invasive Species Washing / Inspection Station


NYSDEC Lake George Beach Facility
Invasive Species Washing / Inspection Station
LANDA


NYSDEC Lake George Beach Facility
Invasive Species Washing / Inspection Station
STOP


NYSDEC Lake George Beach Facility
42'-0" - PRECAST POROUS CONCRETE PANELS
16'-0"
BOAT WASHING STATION
10'-0"
UTILITY ISLAND
16'-0"
BOAT WASHING STATION
ITEM 609.0211 - STONE CURB, GRANITE (TRAVERSABLE SLOPE)
SEE DETAIL 3 MD-3
1.0%
1.0%
EXISTING GROUND
FINISH GRADE
SEE DETAIL 3 MD-3
WATER TABLE
SEE DWG. R-4 FOR DETAIL
LIMITS OF ITEM 203.02- UNCLASSIFIED EXCAVATION
ITEM 207.21 - GEOTEXTILE SEPARATION (HIGH PERMEABILITY, NON-WOVEN)
6" - ITEM 555.0105, CAST-IN-PLACE CONCRETE CONTAINMENT WALL (TYP.)
5" - ITEM 608.23010070 - PRECAST POROUS CONCRETE SLAB
4" - 3/8" STONE COURSE, COST INCLUDED IN ITEM 608.23010070
6" - RESERVOIR COURSE, ITEM 623.12020070
48" - ITEM 203.28000070 - FILTER SAND FOR SAND FILTERS
SECTION A BW-2
N.T.S.

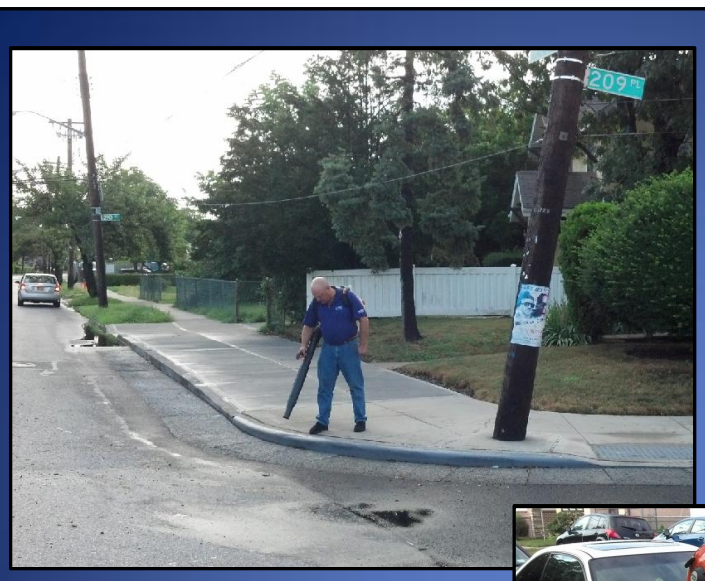
NYSDEC Lake George Beach Facility

NYSDEC Lake George Beach Facility

NYSDEC Lake George Beach Facility

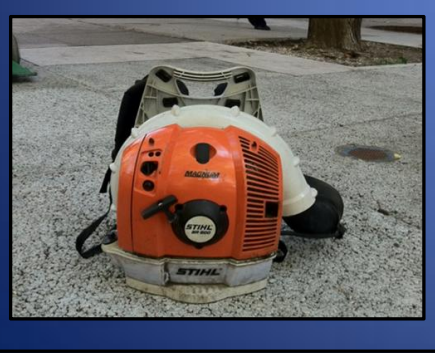
NYSDEC Lake George Beach Facility

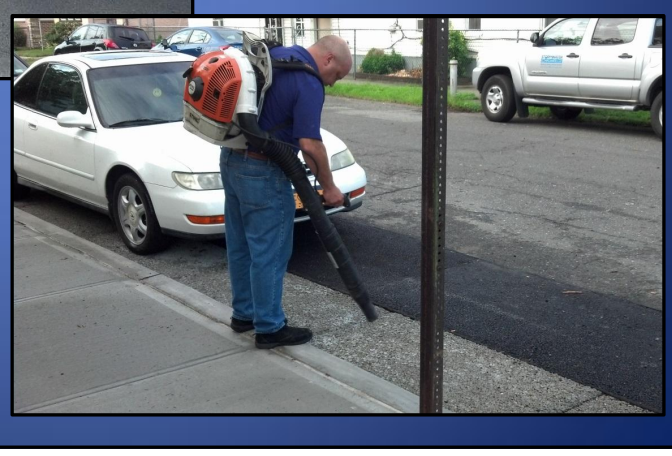
NYC Sanitation Department



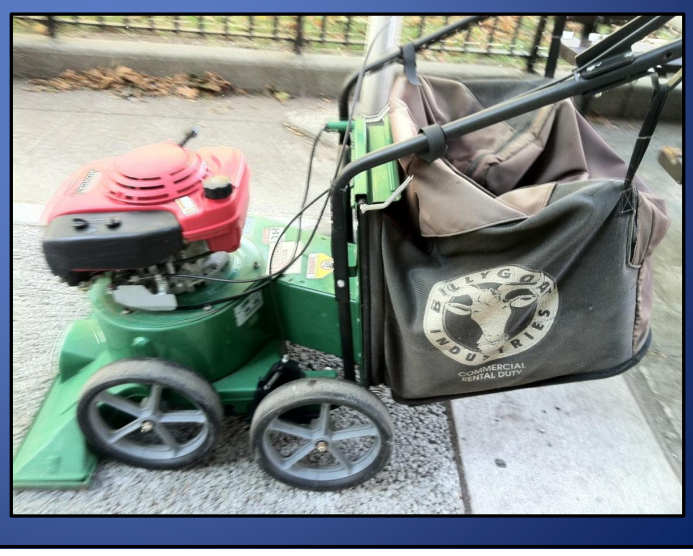
Back Pack Blower

Effective during construction



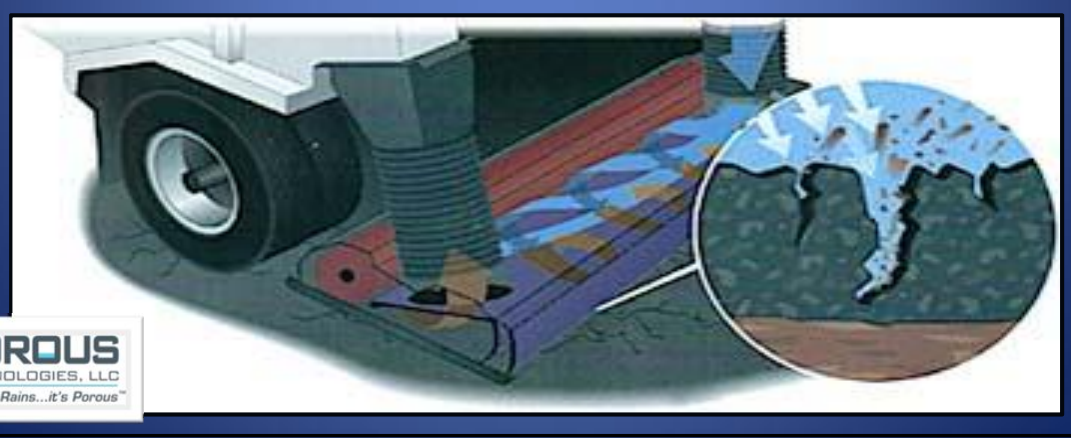


Billy Goat Walk Behind



All Terrain Maintenance Vacuum Equipment

Regenerative Air VACUUM Sweeper



POROUS TECHNOLOGIES, LLC
When it Rains...it's Porous™

Gutter Broom's are Inappropriate for porous pavement and act to drive sediment into pores

All Terrain Litter Vacuum

Mechanical Broom Sweepers

Sweeper Types

Mechanical Sweepers

They effectively remove gross pollutants and large debris (i.e. appropriate for spring clean-up), dirt and fine particles are actually forced into cracks by the broom head. The broom also tends to "push" the finer particles creating large amounts of dust. Mechanical broom sweepers are not typically recommended for porous surfaces.

Vacuum Sweepers

Vacuum sweepers utilize a windrow broom to push debris over to a vacuum suction nozzle. Only a small area is actually vacuumed, the majority of the pass is swept with a broom (creating the potential for dust). Vacuum sweepers are acceptable for use on porous surfaces.

Regenerative Air Vacuums / Sweepers

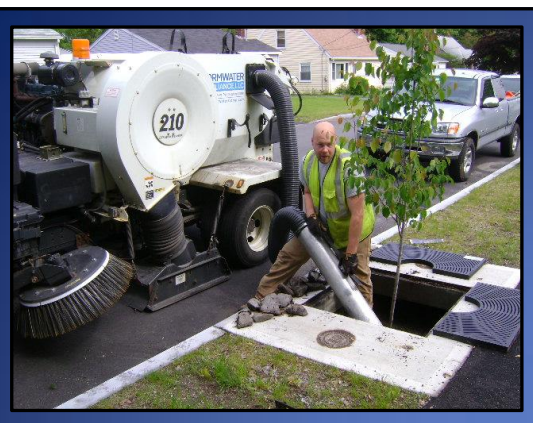
A controlled jet of air is directed into the cracks to dislodge dirt and fine particles. At the same time, a debris pick-up head vacuums particle across the entire length of the pass. Because there are no internal brooms and they utilize a closed loop system, dust is minimized. Regenerative Air sweepers are an acceptable method for maintaining porous surfaces.

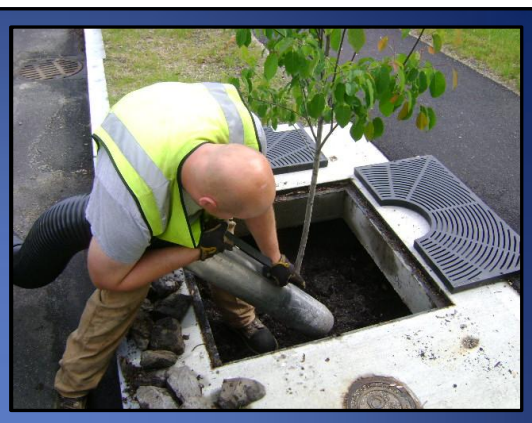

ISUZU
BMP
MAINTENANCE

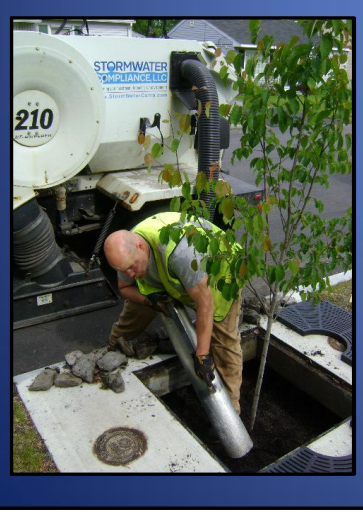

“Spring
Clean-up”

Regenerative Air Sweepers

- Effective at removing trash, dirt and fine particles from surface.
- Closed loop, brushless system reduces dust.
- A controlled blast of air dislodges debris and fines from the porous surface while the pick-up head vacuums the material.
- Recommended for use on porous pavement.

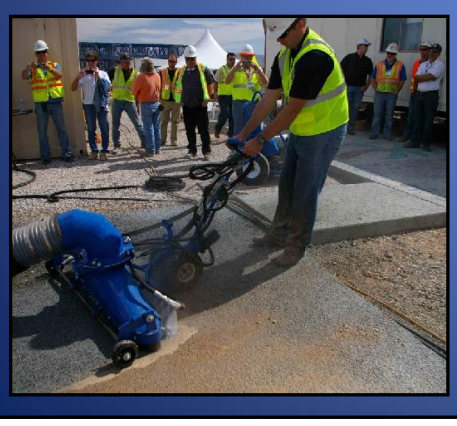






B.I.R.D.

Bunyan Infiltration Restoration Device

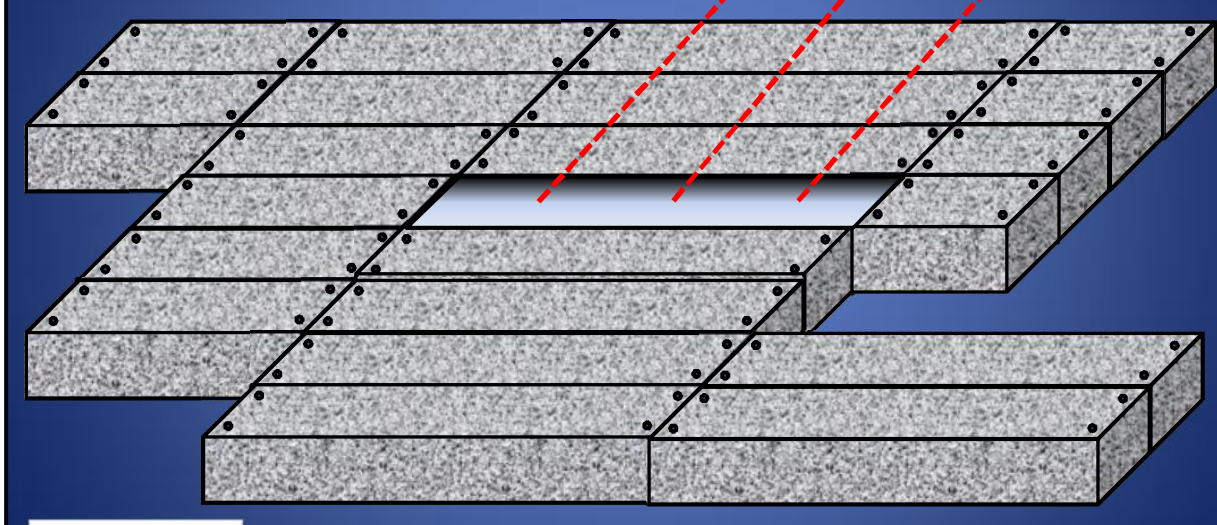


STORMCRETE®

Can be removed and backwashed to "regenerate" and <u>REUSE</u>

POROUS TECHNOLOGIES, LLC
When it Rains...it's Porous™

Each precast porous segment is REMOVABLE and REUSABLE



POROUS TECHNOLOGIES, LLC
When it Rains...it's Porous™

Modular Precast Porous Concrete Stormwater System


Boat Launch


VOLVO


SPECIES
YOUR BOAT

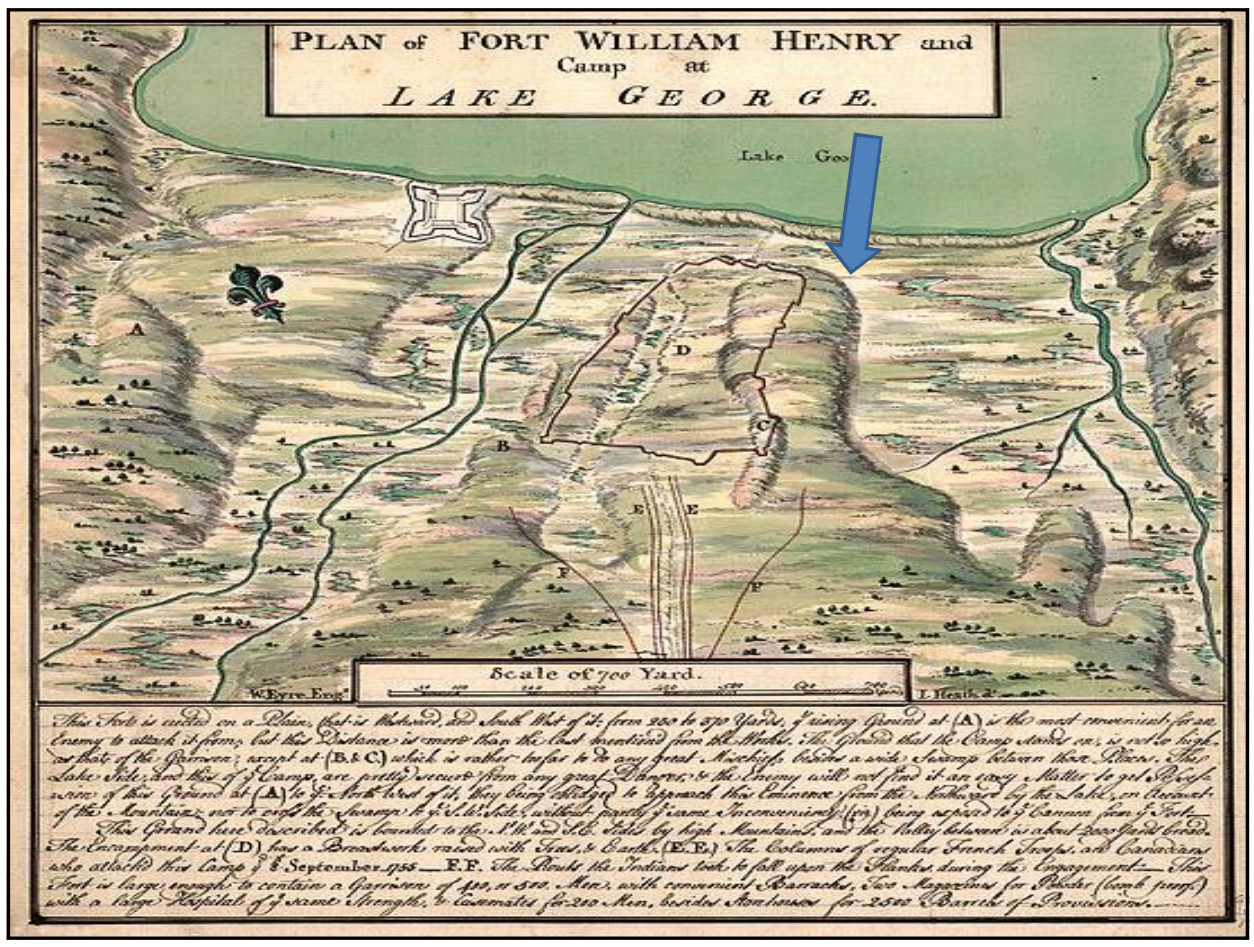
Environmental Challenges

Historic and Cultural Resources

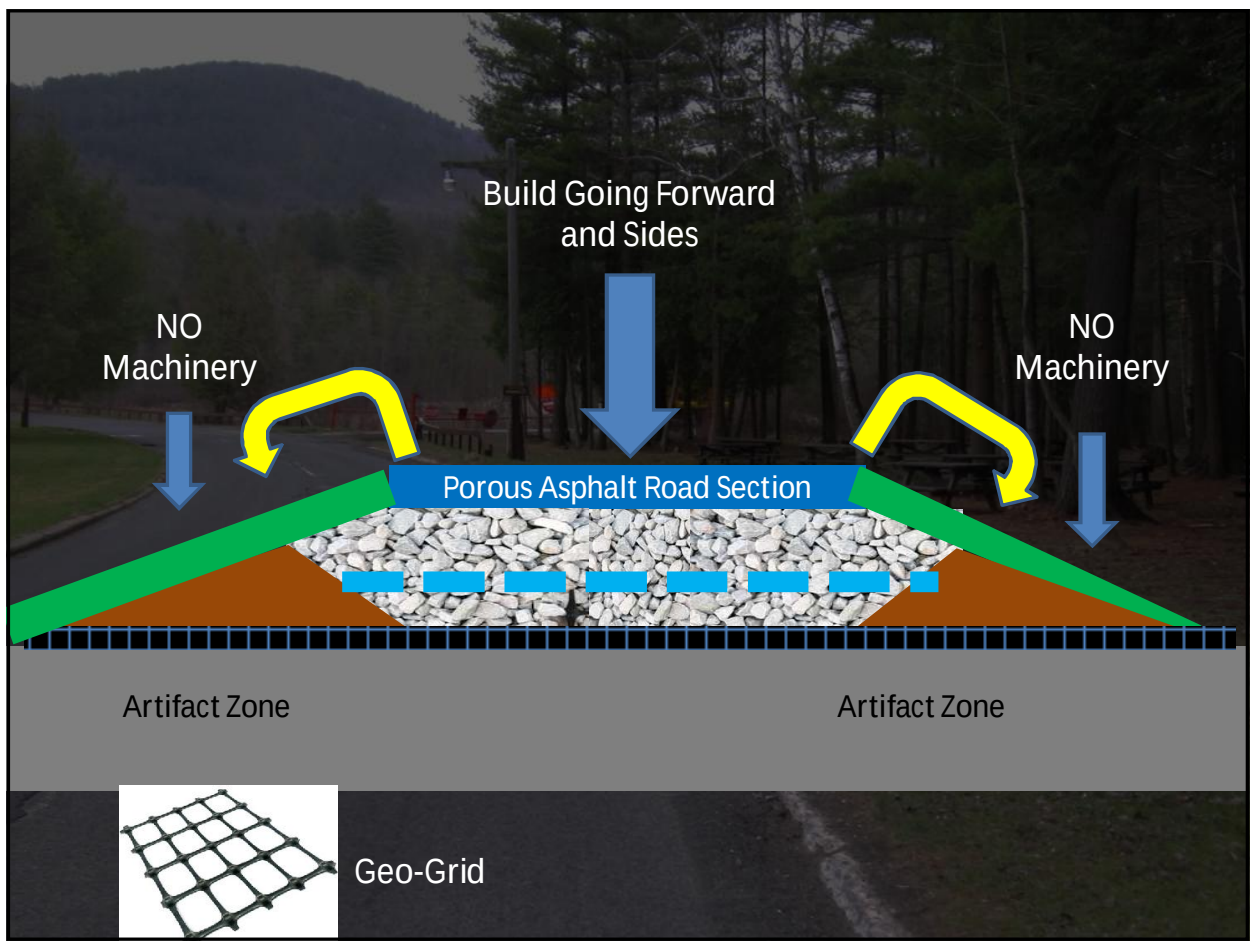
Impact Avoidance – Spanning the Resource

A spear Point displayed at New York State Museum where some of the dozens of findings are displayed with some dating back to approximately 8,000 B.C.

According to museum officials, this Spear Point artifact is estimated to be 8,000 years old.


PLAN of FORT WILLIAM HENRY and
Camp at
LAKE GEORGE.
Lake Geo
A
B
C
D
E
E
F
F
Scale of 700 Yard.
W.Byrne.Engr
This Fort is situated on a Plain, that is Eastward, and South West of it, from 200 to 370 Yards, & rising Ground at (A) is the most convenient for an Enemy to attack it from, but this Distance is more than the Cant mentioned from the Works. The Ground that the Camp stands on, is not so high as that of the Fort even; except at (B. & C.) which is rather too far to do any great Mischief, besides a wide Swamp between those Places. The Lake Side, and that of the Camp, are pretty secure from any great Danger, & the Enemy will not find it an easy Matter to get Possession of this Ground at (A) to the North West of it, they being obliged to Approach this Eminence from the Northward by the Lake, on Account of the Mountains not to cross the Swamp to the S.E. Side, without greatly incommoding (F.F.) being exposed to the Cannon from the Fort.
This Ground here described is bounded to the N.W. and S.E. Side by high Mountains, and the Valley between is about 300 Yards broad.
The Encampment at (D) has a Breastwork raised with Fast, & Earth. (E.E.) The Columns of regular French Troops, and Canadians who attacked this Camp the 8 September 1755 — F.F. The Roads the Indians took to fall upon the Flanks during the Engagement — This Fort is large enough to contain a Garrison of 400, or 500 Men, with convenient Barracks, Two Magazines for Powder (bomb proof) with a large Hospital of the same Strength, to contain 600 Men, besides Storehouses for 2500 Barrels of Provisions.


Environmental Challenges
Historic and Cultural Resources
Impact Avoidance – Spanning the Resource
Existing Road Section
Artifact Zone

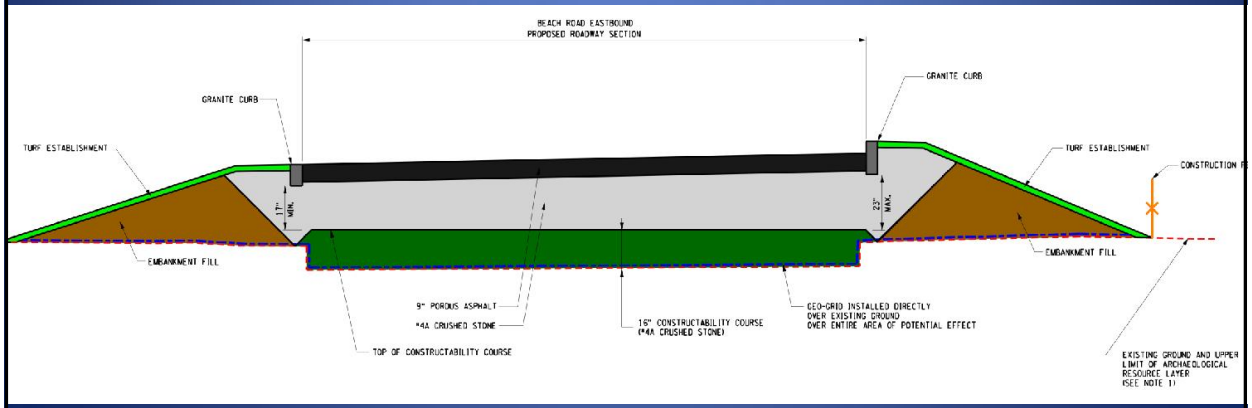

Build Going Forward
and Sides
NO
Machinery
NO
Machinery
Porous Asphalt Road Section
Artifact Zone
Artifact Zone
Geo-Grid

Environmental Challenges

Historic and Cultural Resources

Impact Avoidance – Spanning the Resource

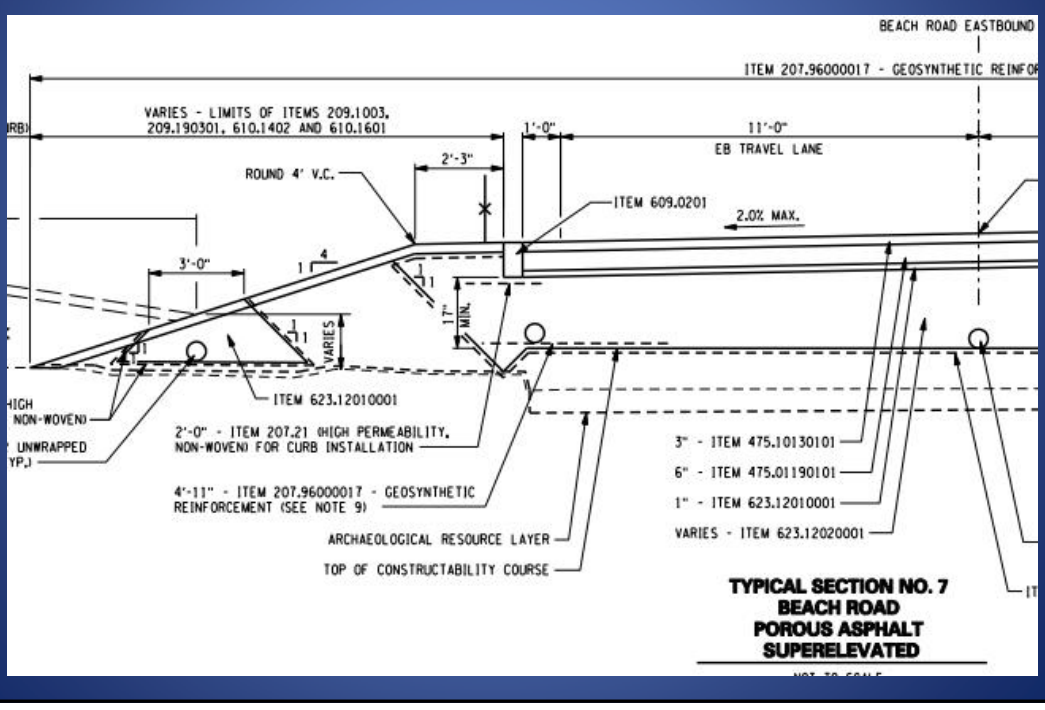
Federal Highway Administration – Section 106
SHPO, Native American Resources, NYS Museum



Environmental Challenges

Historic and Cultural Resources

Impact Avoidance – Spanning the Resource



Use of Synthetic Materials

Use of Synthetic Materials

Use of Geotextiles

Frost Heave - 03/05/ 2015 – Project Specifics Unknown

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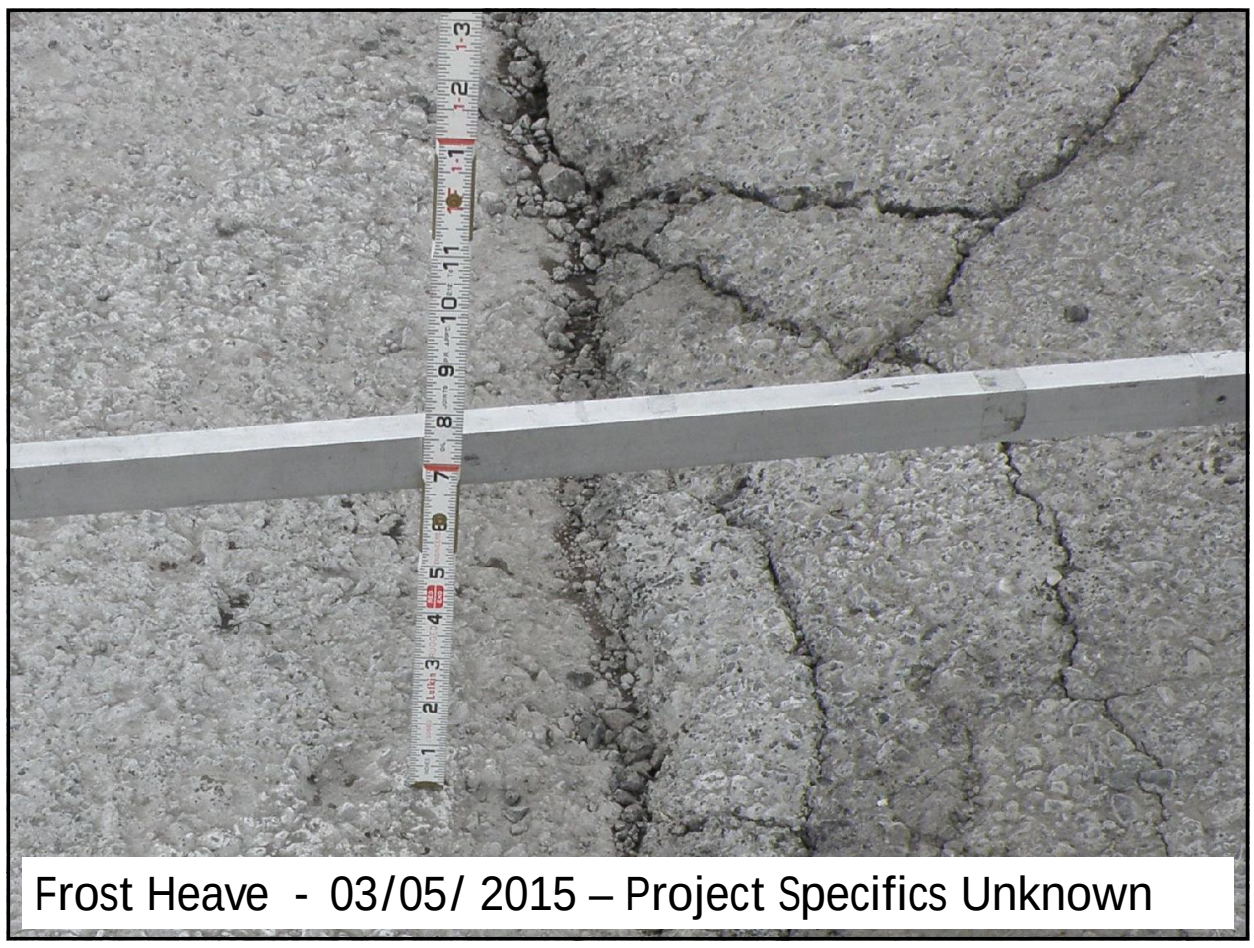

Frost Heave - 03/05/ 2015 – Project Specifics Unknown

Moving Forward
Frost Resistance

Beach Road – March 2015

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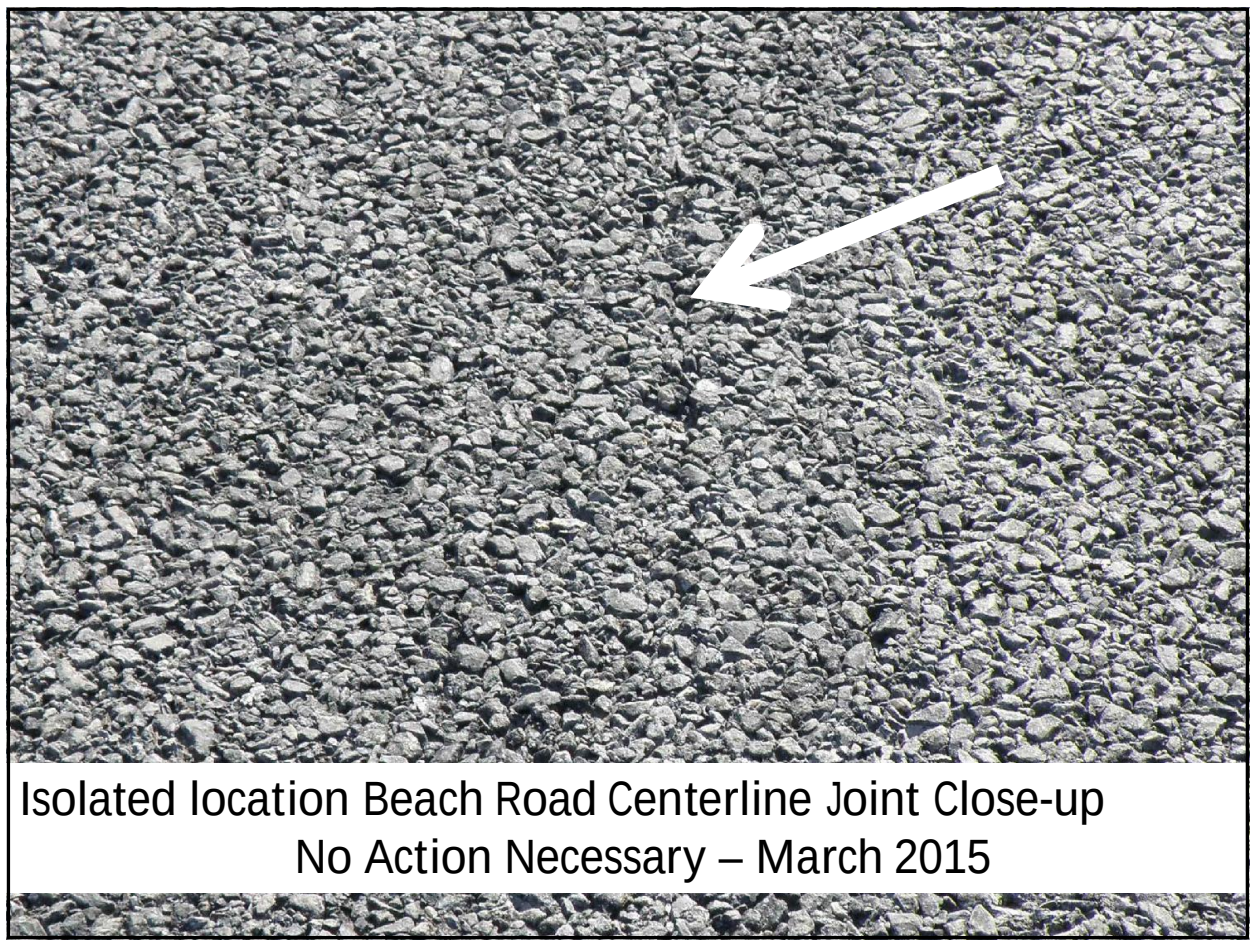
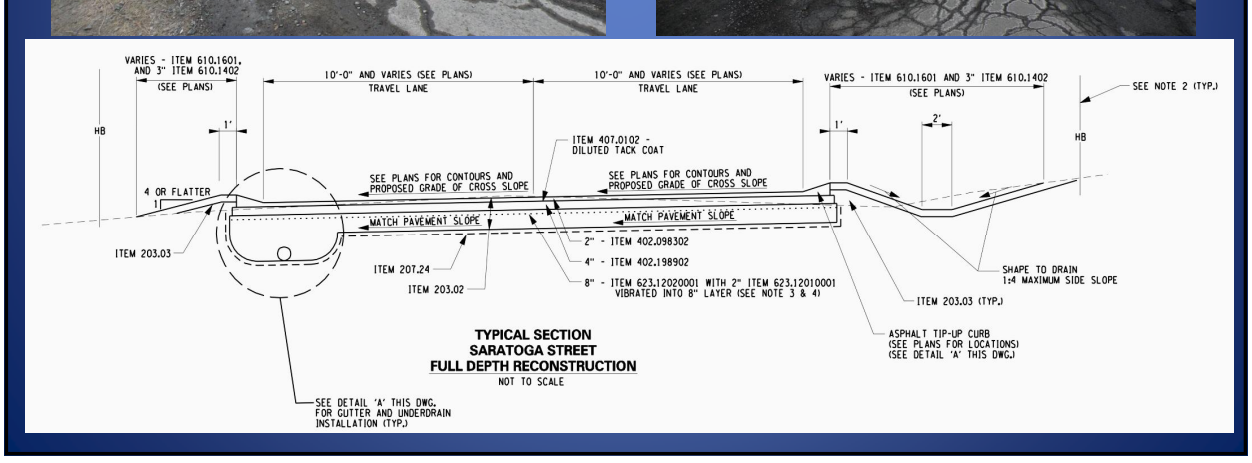


Isolated location Beach Road Centerline Joint Close-up
No Action Necessary – March 2015

Conventional Pavement Section - East Side Beach Road
Frost depth = 5'+ (March 2015)

NYSDEC - $M Beach Reservoir Stone beneath both Porous & Conventional Pavement – October 2014

Village of Green Island



Village of Green Island

Green Island – November 17, 2015


11/24/2015
Village of Green Island

Village of Green Island

Maintenance

Vacuum ~~Sweeping~~

Porous Pavement

Research demonstrates that vacuum sweepers are the best option when sweeping porous pavement

The use of porous pavement surfaces for parking lots, driveways, alleys, and footpaths as an effective best management practice to control stormwater runoff has been growing at a double digit rate in the United States in recent years. The long-term success of porous pavement systems to promote maximum water flow depends on proper installation, maintenance and cleaning practices – including regular sweeping with a pure vacuum sweeper.

Brian Giles, sweeper products manager at Elgin Sweeper, says Elgin has participated in various research programs with major universities and municipalities across the United States to develop a better understanding of the maintenance requirements of porous pavement.

"This research has helped clarify the role vacuum sweepers and regenerative air sweepers play in maintaining and cleaning porous pavement surfaces," Giles says.

Types of Permeable Surfaces

There are three types of permeable surfaces in use in the United States for stormwater remediation purposes – porous asphalt, porous concrete, and interlocking paver blocks.

Porous asphalt and concrete tend to be multiple-layer construction. Water runs through the layers to a sub-layer, which allows general or directed drainage. Cleaning the pores of porous asphalt or concrete is somewhat challenging.

"When high-pressure sprayers are used for cleaning, pollution is actually driven into the pores," Giles says.

Interlocking, permeable paver blocks are non-porous blocks arranged on a porous subsurface. The blocks have a gap between them filled with loose, sandy filler which allows water to percolate through the gaps. Giles says the use of interlocking pavers is growing in the United States, especially in low-speed (under 45 mph) traffic and parking areas and in high-pedestrian areas.

Plugging

Porous asphalt, porous concrete, and interlocking paver block surfaces can all become plugged with fine debris – mixtures of silt and oils – that can stop the percolating action and negate the purpose of the system. The first step in retaining the porous nature of the surfaces should be to install signs to inform the casual passersby that the surface is porous and that certain activities – such as depositing landscape material – should be avoided.

If pavers are routinely cleaned, the depth of plugging can generally be limited to half an inch. The most effective way to restore the percolation of paver surfaces is to remove the top layer of granular filler that is contaminated. Clean filler is then reapplied.

Several industry studies have shown that both surface types will plug, to varying degrees, with silt, fine clay, cement derivatives, and decomposed plant material. Maintaining and cleaning porous pavement surfaces to prevent the buildup of these sediments requires a different approach than the one used for traditional pavement.

Regenerative Air Sweepers

Regenerative air sweepers are the second most common type of street sweeper in the United States. They account for about 30% of all sweepers sold. In gen-

Contractors need to understand the mechanics of street sweepers and their effects on porous surfaces before using a sweeper to clean the surface in order to prevent further clogging.

- Design Offsite Protection Systems into your project
- Maintain Vegetated Areas
- Vacuum 2 - 3 X / Year
- Slope Vegetated Areas Away from Roadway
- Use Sod to Establish Turf
- Education – Public and Municipal
- Deep Clean Promptly if Accident Occurs

Expect Continued Improvements in Maintenance Options and Equipment

Maintenance

SWEEPING
"How to"
By Mark Kinter

Sweeping Porous Pavement

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Questions ?

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CHAMPLAIN WATERSHED
IMPROVEMENT COALITION OF NEW YORK

PDH Questions

- A Porous Pavement systems may NOT be advisable when:

  a. It is Adjacent to a Contaminated soil site
  b. Operating Speeds are over 45 mph
  c. Proposed for use at a fueling station
  d. Installed adjacent to a Desert
  e. All of the Above

PDH Questions

- How many Acres of Porous Asphalt was Installed at the NYSDEC Lake George Beach

a. 11.0
b. 26.0
c. 3.0
d. 0.0

PDH Questions

- At what ambient air temperature range is it recommended to place and finish Porous Asphalt?

a. 85 to 100 degrees Fahrenheit
b. 30 to 40 degrees Fahrenheit
c. 867 5309 Call Lorenzo
d. 98.6 degrees Celsius
e. 50 to 70 degrees Fahrenheit

PDH Questions

- Applying a Choker Course Can help you accomplish which of the following:
  - Get Arrested
  - Seal off the Lower layers
  - Win a Cage Fight
  - Stabilize the larger stone course or courses

PDH Questions

- True or False

  Geotextiles and other Geosynthetics require careful Attention to Detail for proper performance

PDH Questions

- The Pre-cast Porous Concrete Used was Cured for how many days before arriving on-site

  a. 7 days
  b. 2 days
  c. 6 months
  d. 28 days

PDH Questions

- True or False

- The lower the Asphalt Mix Temperature, The likelihood the project will have a higher quality Porous Asphalt.

PDH Questions

Name Two (2) Invasive Species Threatening Lake George

Zebra Mussel

Asian Clam

Chinese Mystery Snail

Spiny Water Flea