URBAN STORMWATER BMP IMPLEMENTATION IN THE BOROUGH OF ETNA

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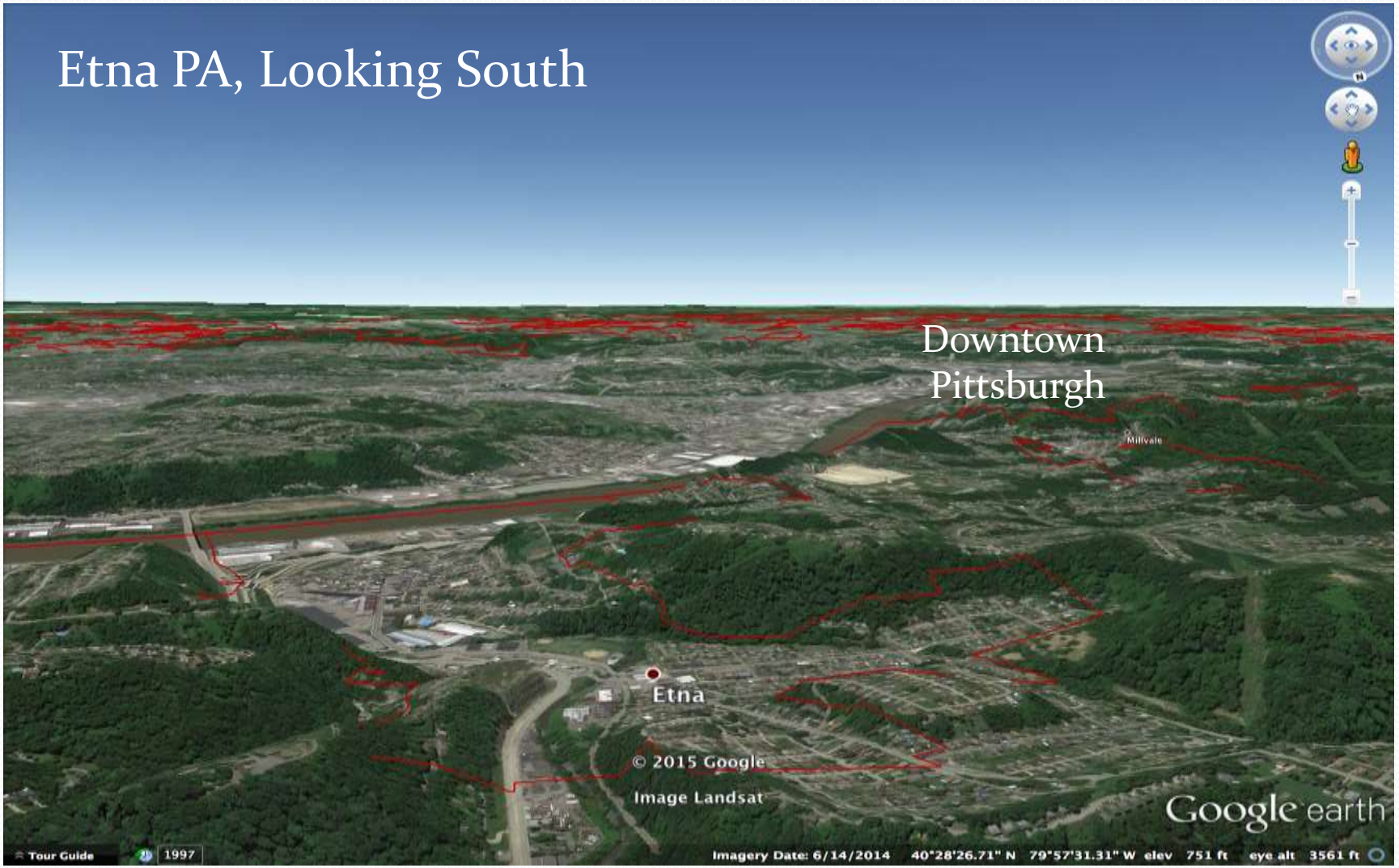

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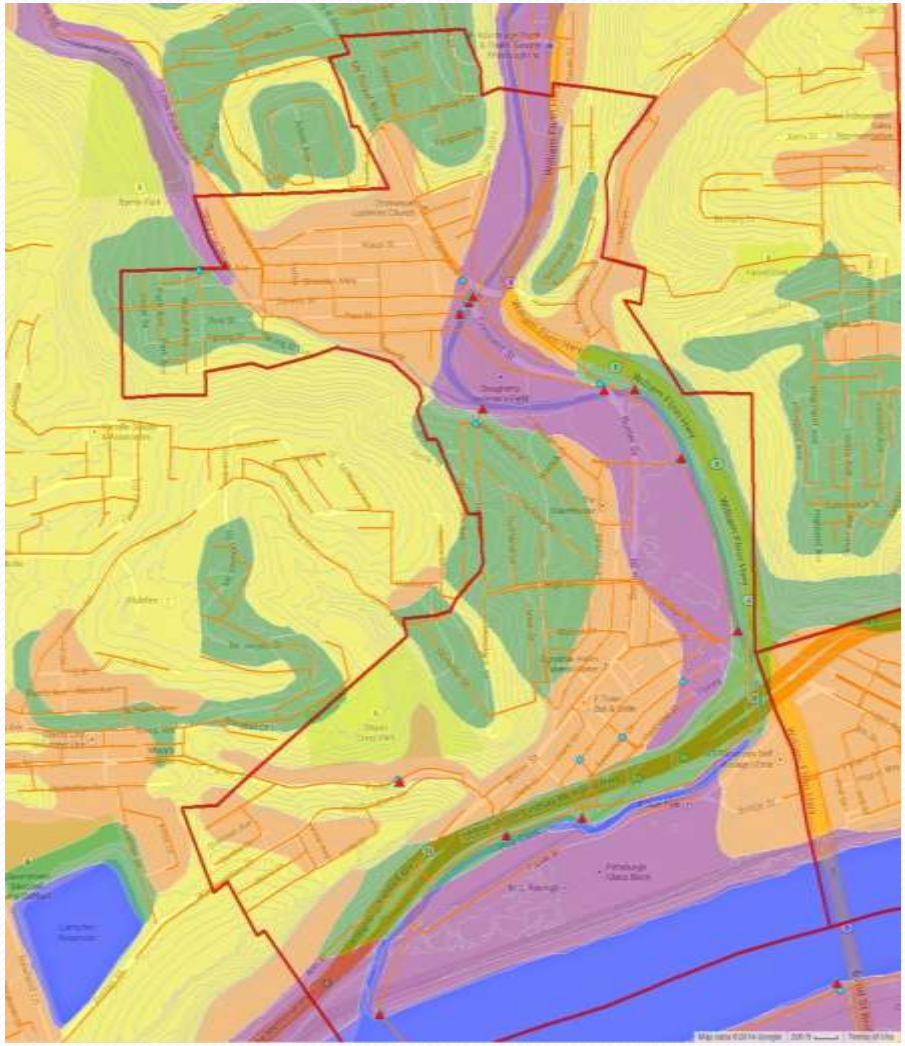

Etna represents a challenge for BMPs!

Hydrological soil group B (the green areas in the figure) are amenable to GSI installations. The remainder of the Borough is mapped as either group C (purple or orange) or C/D (yellow).

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Etna represents a challenge for BMPS!

Dense development:

Overall 3% of total area is mapped as open space.

The median parcel size ranges from 2500 square feet to 5800 square feet.

Suggests source reduction technologies that are not as space consumptive as other techniques be examined closely for potential use in planning GSI in Etna.

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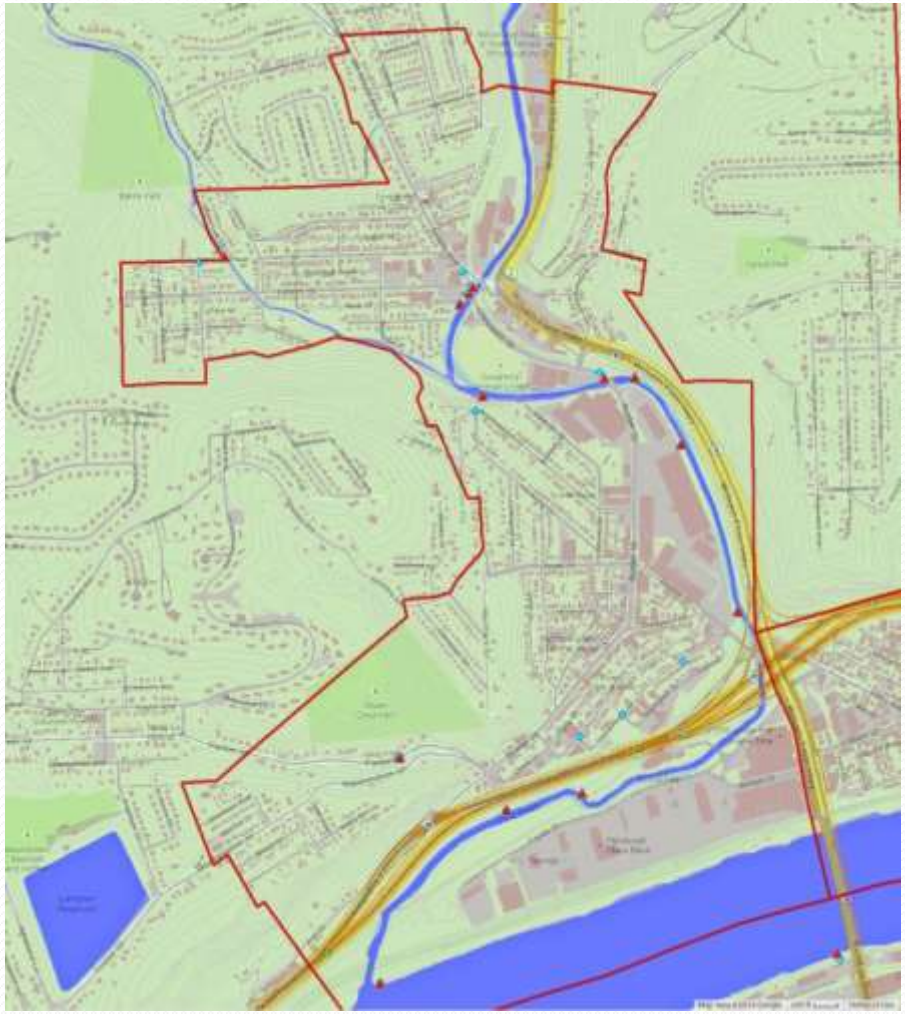

Etna represents a challenge for BMPs!

Steep slopes:

Etna's topography is dominated by areas with steep slopes-more than 75% of the tributary areas have slopes greater than 5%.

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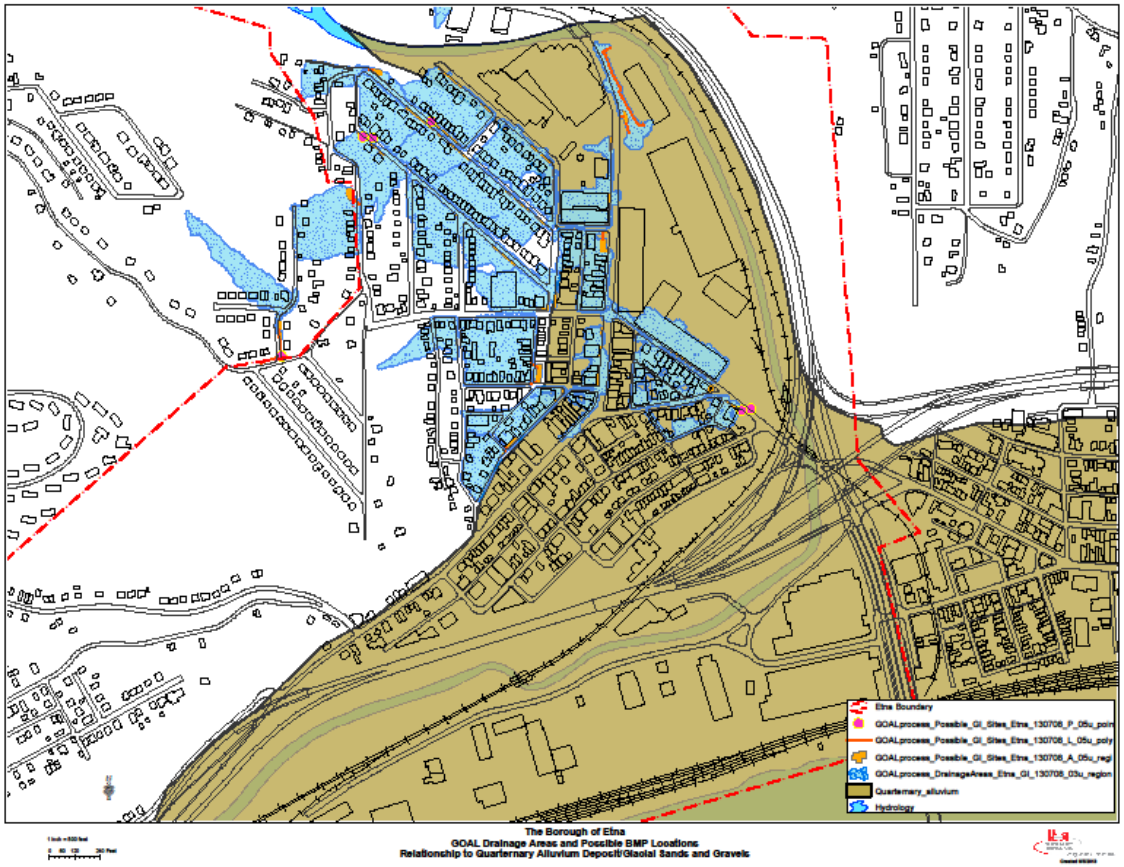

A GSI strategy of 'Filter, Infiltrate, and Remove' (FIRm) is proposed for high flow sites on the lower and main streets of Etna that are close to Pine Creek or in locations that have been mapped as being in the Valley Fill (Quaternary) sands and gravel formation

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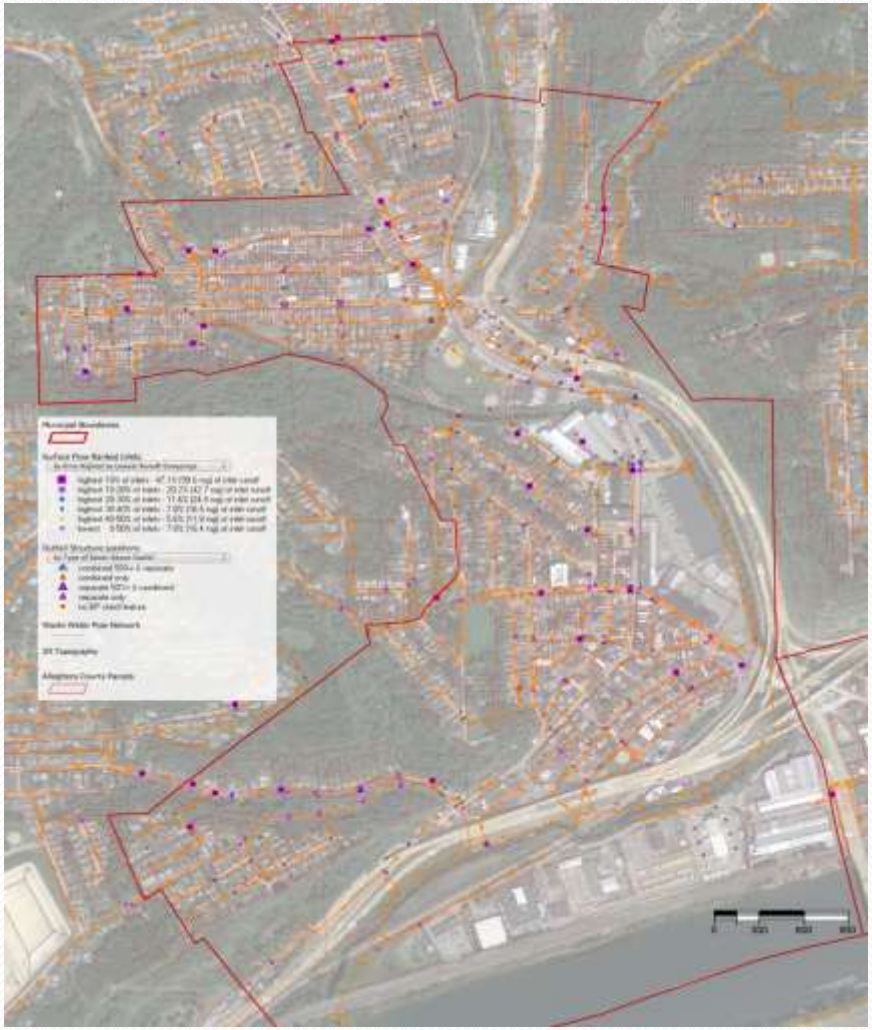

The GOALprocess uses detailed 3D landform shape with curbs, gutters, buildings, surface cover, low points, and puddles to model how and where rain water flows through the landscape and into the subsurface pipe network.

67.3 % of the runoff or 142.3 million gallons (mg) during the Typical Year 2003 would expected to reach 20% of the inlets identified as the two top ranked groups of inlets.

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SurfaceTrace™

Realistic and Reliable Drainage Areas and Flow Paths

Standard Technical Method

Inconsistent Drainage Area and Flow Path Results

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Landbase Systems

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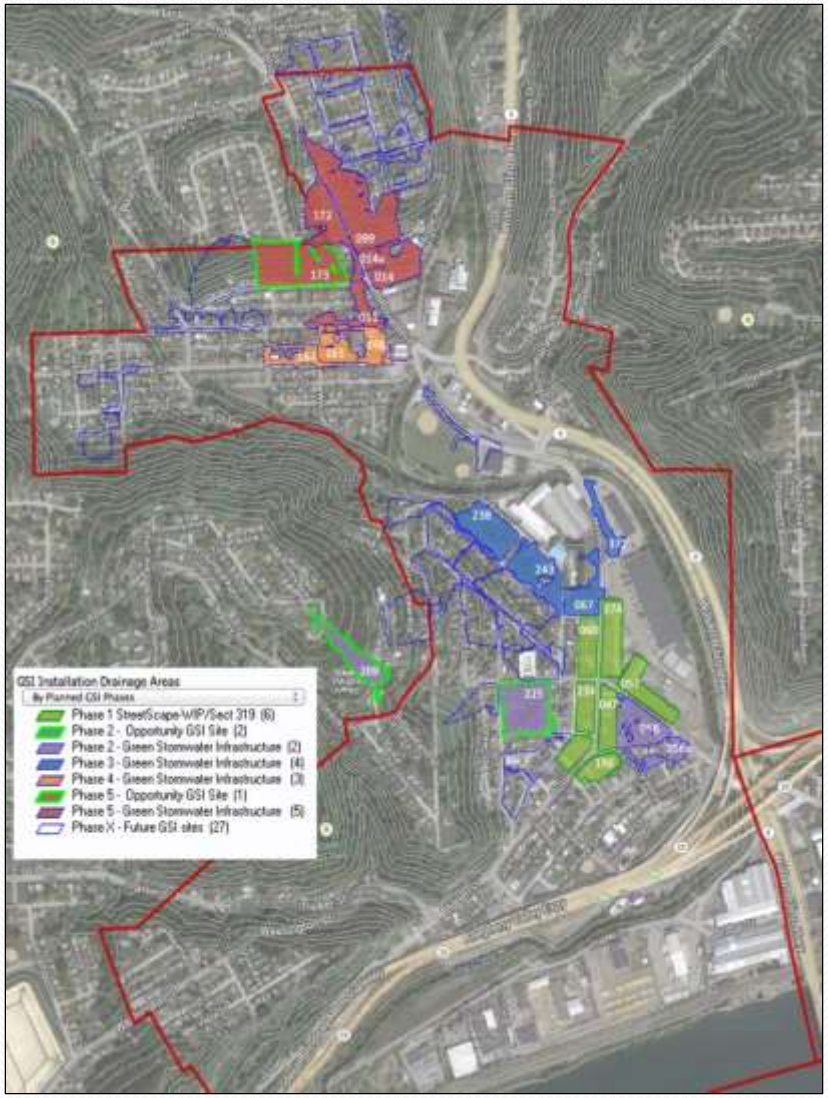

Based upon Municipal priorities, available funds, and GSI opportunities, the team established 5 phases for primary GSI projects (including 23 sites) and a future phase with up to 26 GSI sites.

The work done for this master plan estimates it is feasible to manage a total of 39.4 mg of runoff per year if all GSI sites are implemented.

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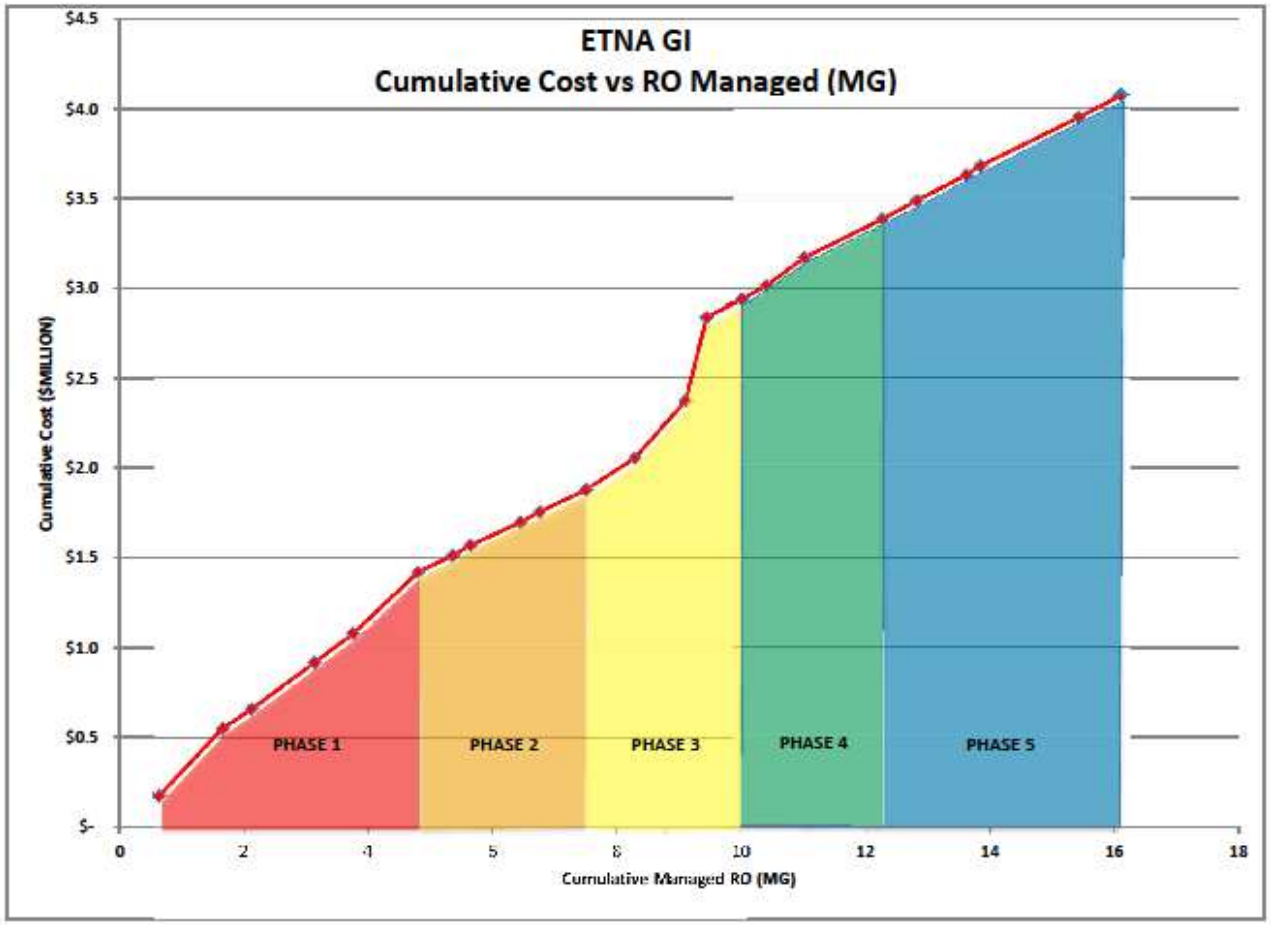

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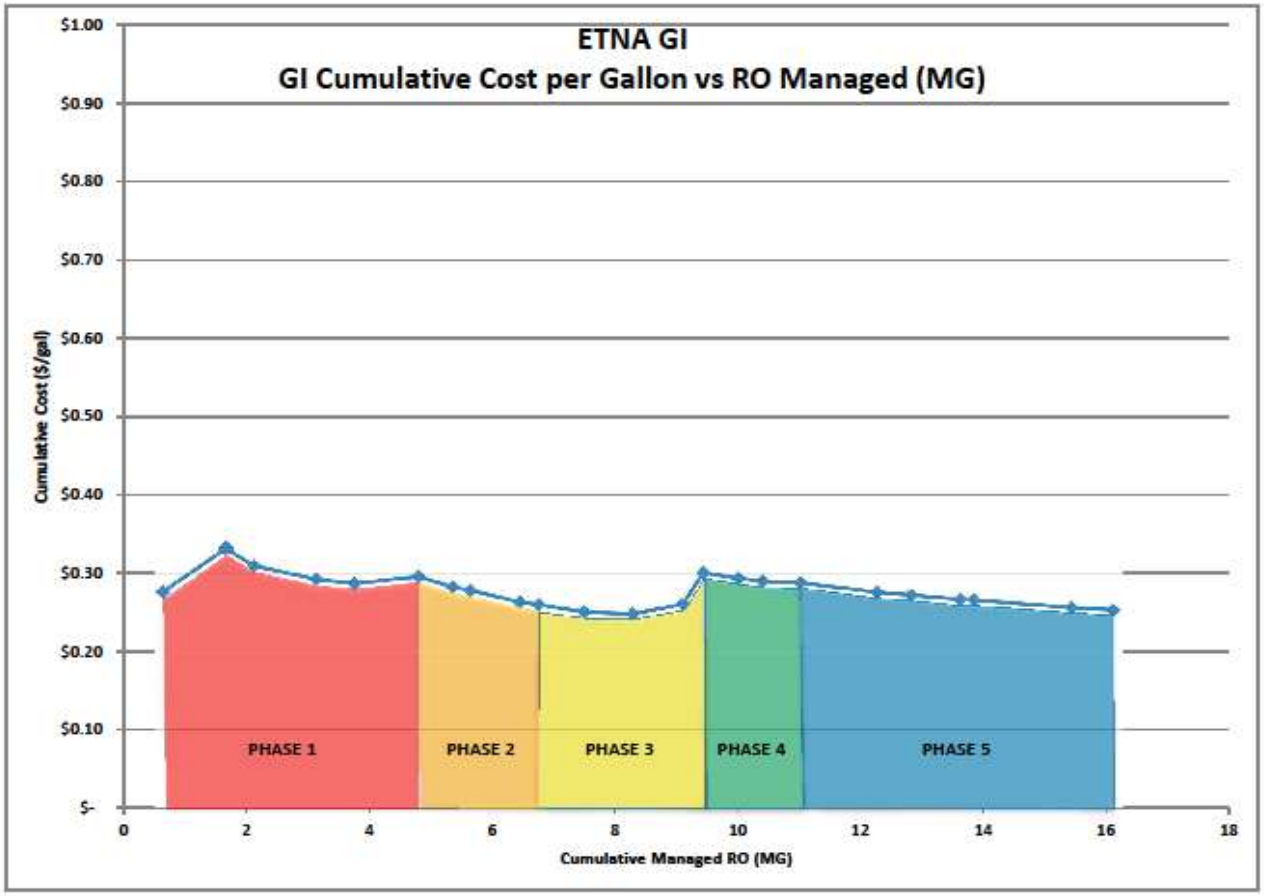

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Implementing all 23 projects detailed under the Master Plan will manage a total of 16.1 mg annually at an estimated cost of $6.1 million. This translates into a cost of $0.38/gal.

This includes the Streetscape components not directly related to RO management. When these components are backed out of the total, the estimated cost for the GSI elements becomes $4.1 mil and $0.25/gal of RO managed.

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The Borough is currently engaged in five Green Infrastructure (GSI) initiatives:

- Residential Downspout Disconnection Program
- Green Streetscape Phase I, IA and Phase II Projects currently funded by Section 319 Grants
- Green Infrastructure Specific projects: Community Pool Bioswale and School Street Municipal Parking Lot.
- Street Tree Planting

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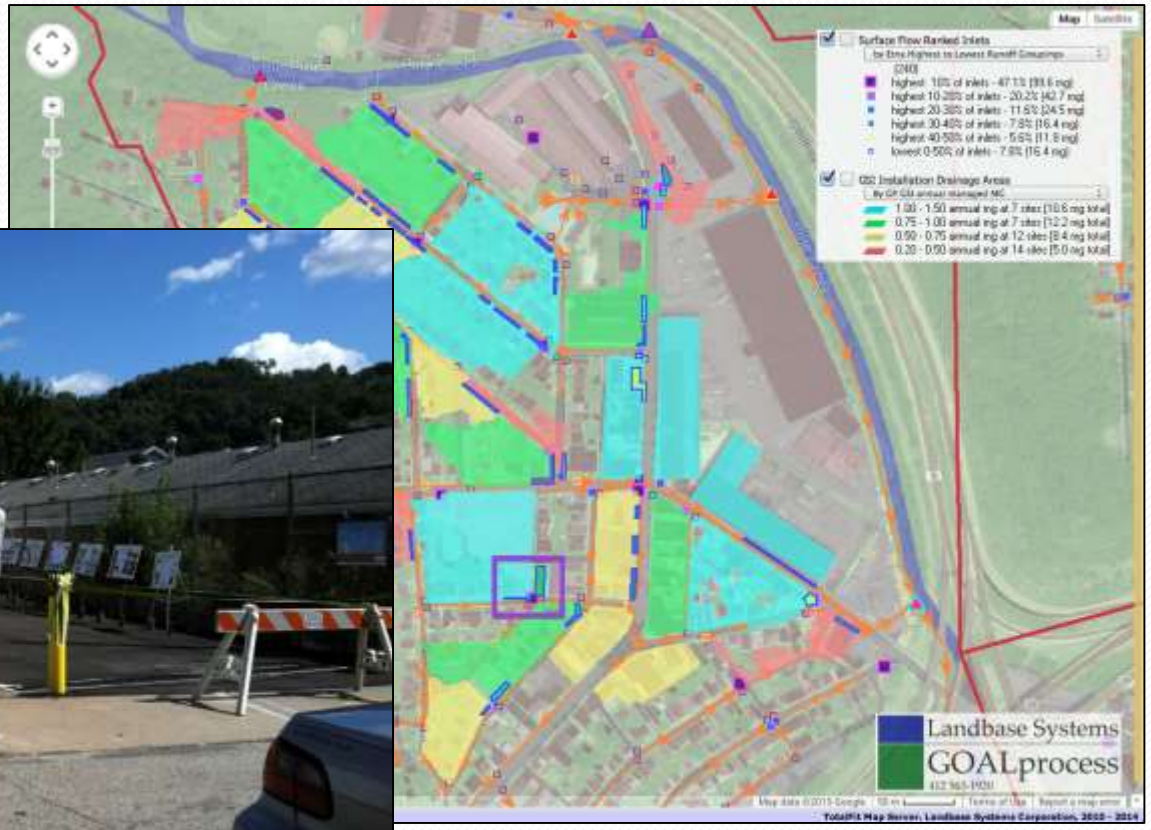

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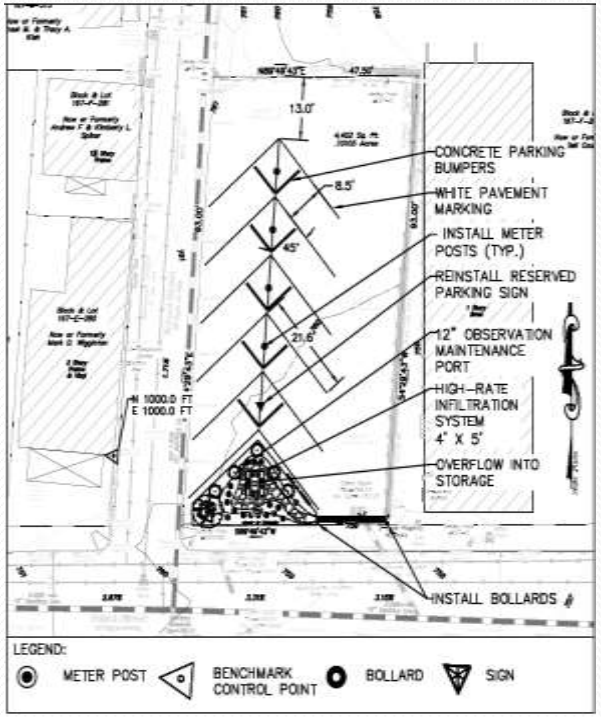

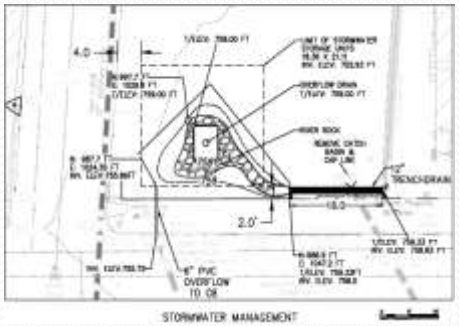

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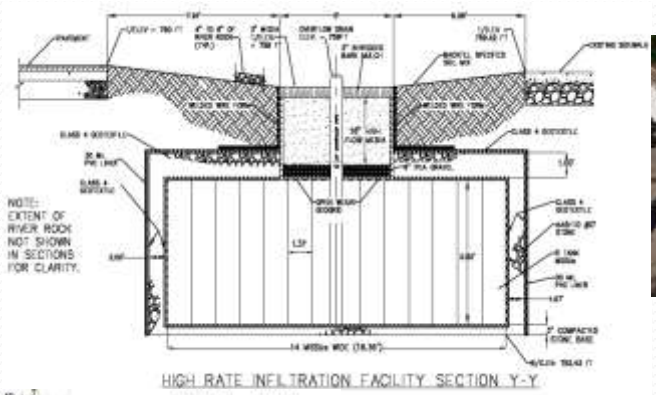
June 6th the soil mix , much and plantings were completed.

Installing the decorative river rock that slows the water and filters larger floatables.



HIGH RATE INFILTRATION FACILITY SECTION Y-Y

High Flow Media

Overcomes the challenges of clogging & flooding and large space requirements associated with 1st generation systems

- Flows at 100" Per Hour
- Flows Faster with age as roots create pathways through media that changes over time
- Resistant To Clogging

Picture of the plantings next to the plan.

6/12/2014 Thunderstorm Event (0.56" of rain in the Pittsburgh Region National Weather Service website)

1:00 PM

Approximately 10-15 minutes later

Finished garden with soil mix, plantings and Focal Point.

Testing and certification of the Focal Point High Rate Biofiltration unit

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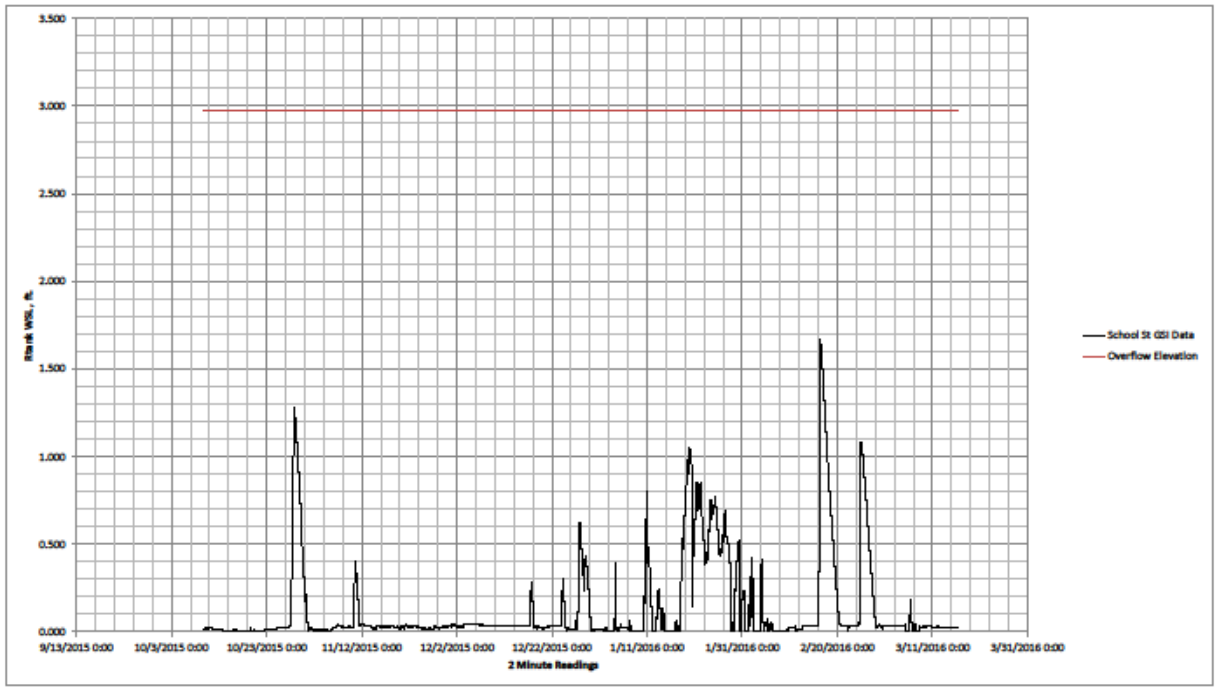

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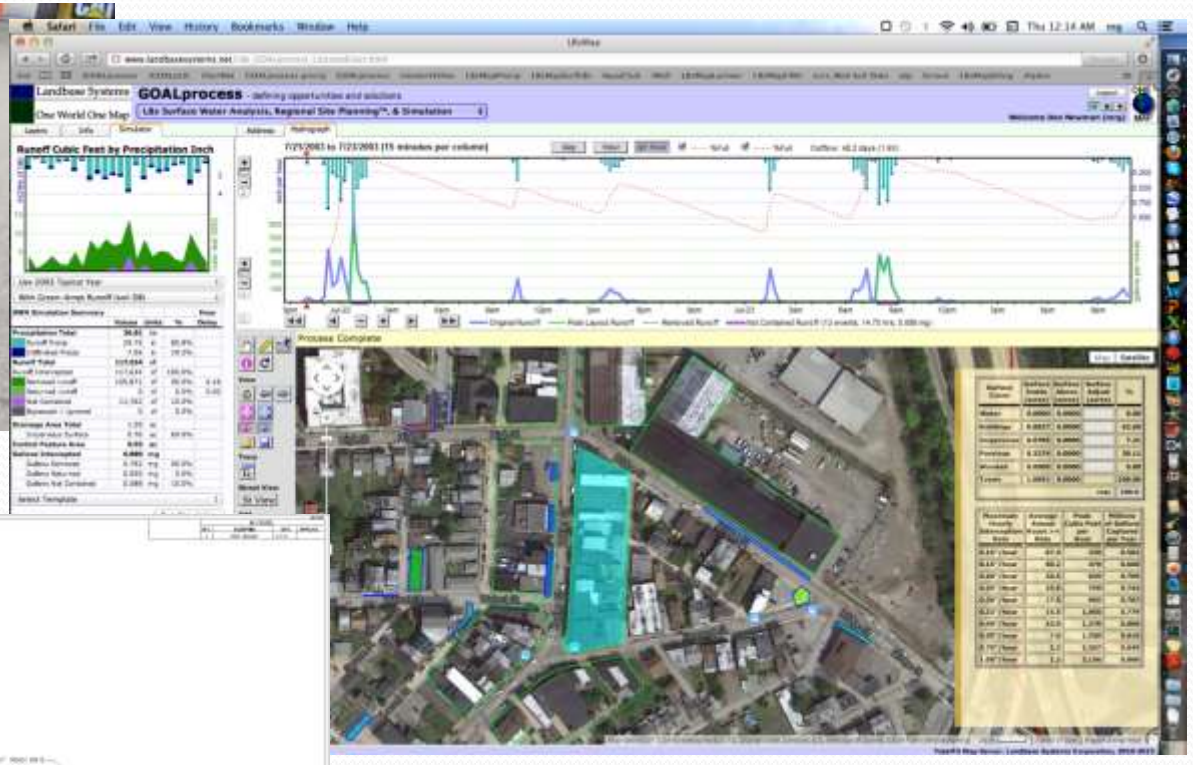

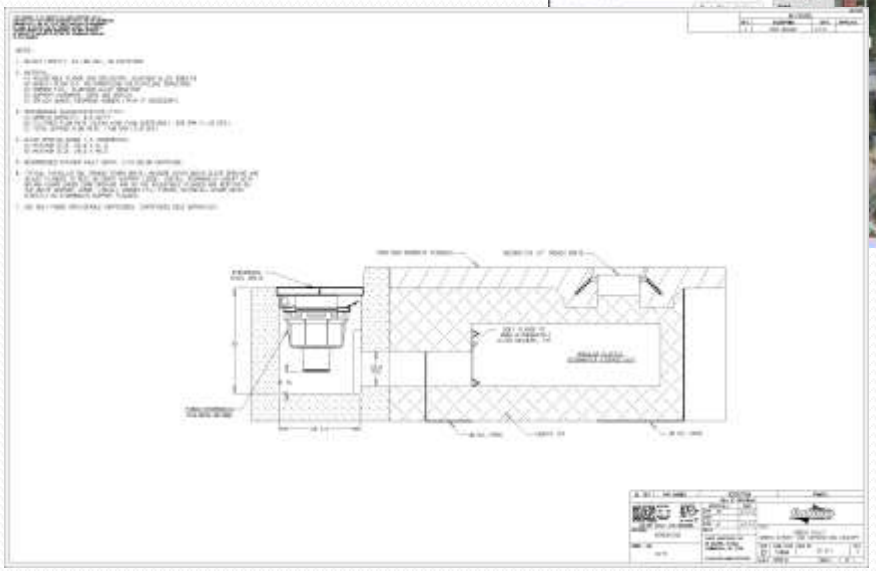

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Urban BMPs Lessons Learned:

- Community Outreach
- Bidding
- Costs
- Deicing
- Winter Issues
- Value Engineering
- Back-Up Solutions
- Pre-Construction Soils Testing
- GSI Master Planning
- Expect the Unexpected

URBAN STORMWATER BMP IMPLEMENTATION IN THE BOROUGH OF ETNA

Cost Estimation	Units	Unit Costs
Project		
Design, Engineering, & Construction Mgmt	%	15.00
Outflow End Treatment	lump sum	$8,000
Each installation (23 installations total)		
Interception Structure	each	$6,500
Cubic Foot Volume Price	/cuft	$25.00
Square Foot Volume Price	/sqft	$10.00
Outflow Structure	each	$3,000
Outflow Pipe Length	/ft	$100
PADOT Bond (HOP ROW)	$/1000	$30.25
Contingency	%	25.00
Streetscape Portion		
Pavement	SF	$13.00
Curbing	/ft	$32.00
Grate	/ft	$300.00
Pervious Pavers	SF	$14.00
Trees	each	$520.00

PennDOT Street Restoration and Maintenance Bonds reflect actual costs for HOP security.

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What's Next for Etna?

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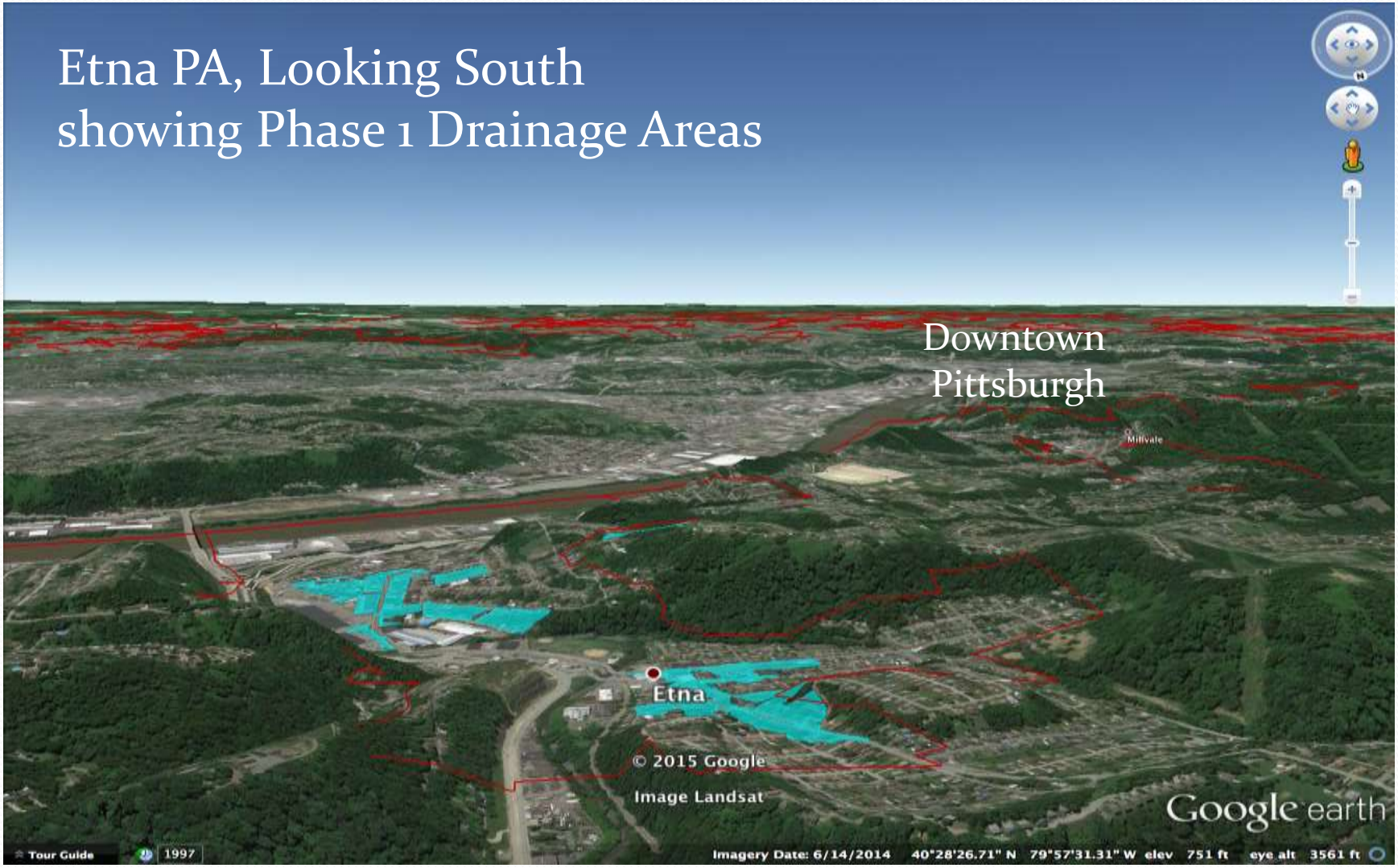

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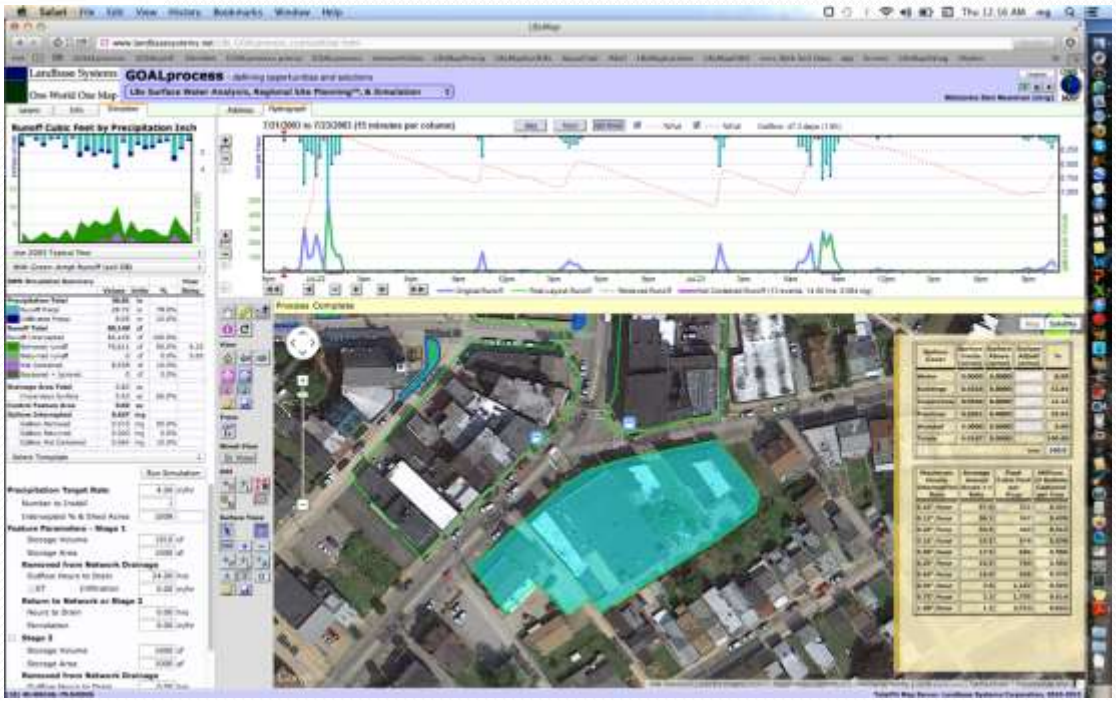

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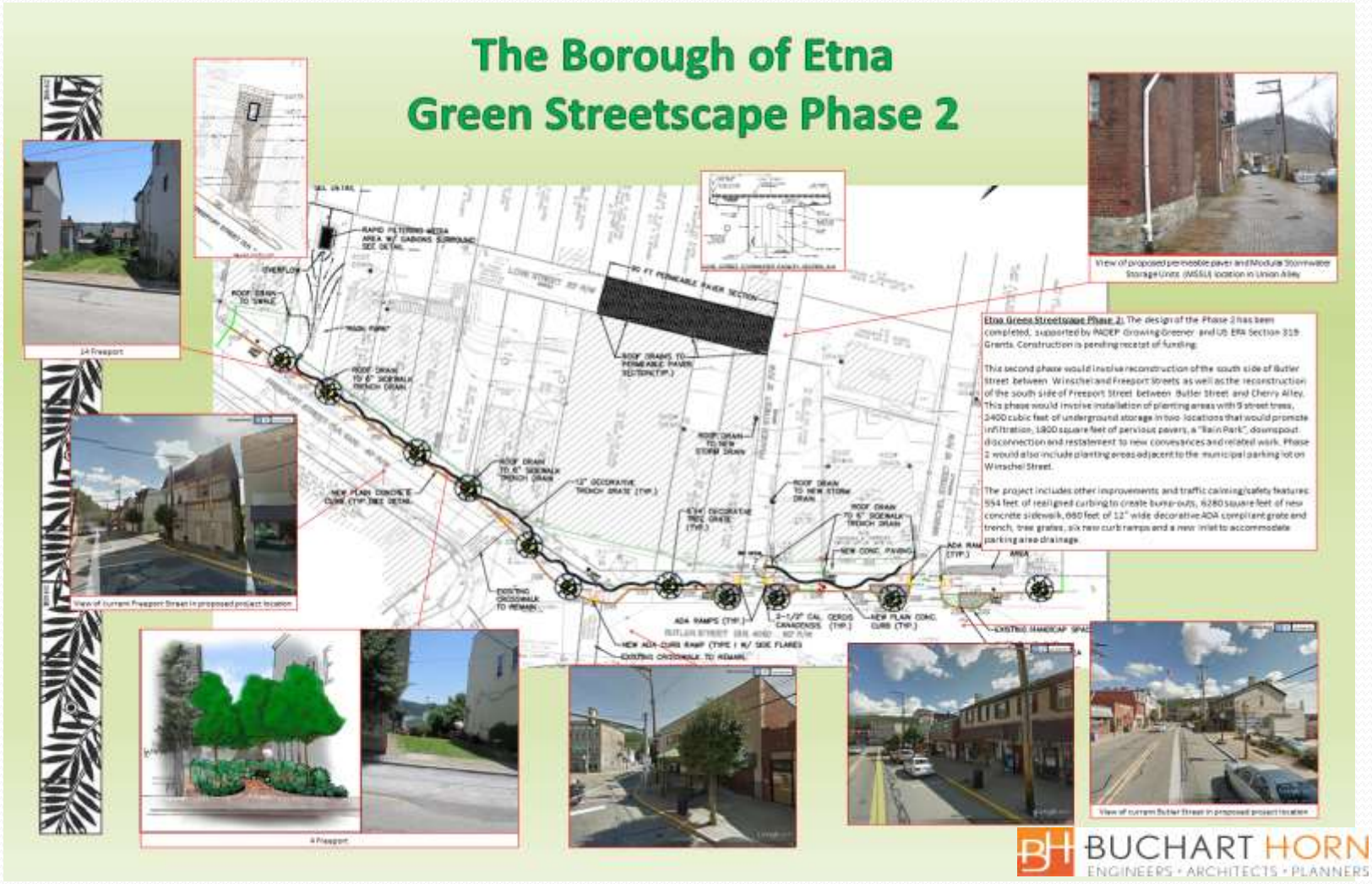

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Etna GSI Master Plan can be downloaded from the Borough's Website:

http://www.etnaborough.org/storm-water-management.html

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