

PLANNING LARGE GI PROGRAMS USING AUTOMATED ARCGIS TOOL

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Ohio Water Environment Association



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Agenda

- ❑ Why Siting Tool for Green Infrastructure program?
- ❑ GI Siting Tool on City Level Planning
- ❑ GI Siting Tool in Design Stage
- ❑ Integrating Siting Tool with H/H Modeling

Benefits of Green Infrastructures

Runoff Reduction

- Mitigate CSO (EPA and CD driven)
- Mitigate street flooding
- Reduce velocities to protect stream banks
- Groundwater recharge

Social and Public Health

- Reduce pollution to streams, protect habitat life
- Increase green space, reduce air pollution and urban heat island
- Reduce stress and increase neighborhood interaction
- Increase property values
- New jobs (installation and maintenance)



GI Siting Consideration

- Disruption to public
 - Pedestrian walkways, bus stops, parking spots, mature tree, etc.

- Surface and subsurface infrastructure
 - Fire hydrants, electric poles, electric structures, etc.
 - Sewer lines, water pipes,, gas lines, etc.



Oversized GI Units Example

Larger footprint than needed.



Almost no flow is arriving at the site.



Undersized GI Unit Example

Placed within meadow area, no street flooding



Finding Good Sites

Comprehensive planning in advance of the design phase

Minimum disruption to public activities and utilities requires evaluation of several factors

Impact of the factors could be simplified by using the available wealth of remote sensing and digital data at the planning level

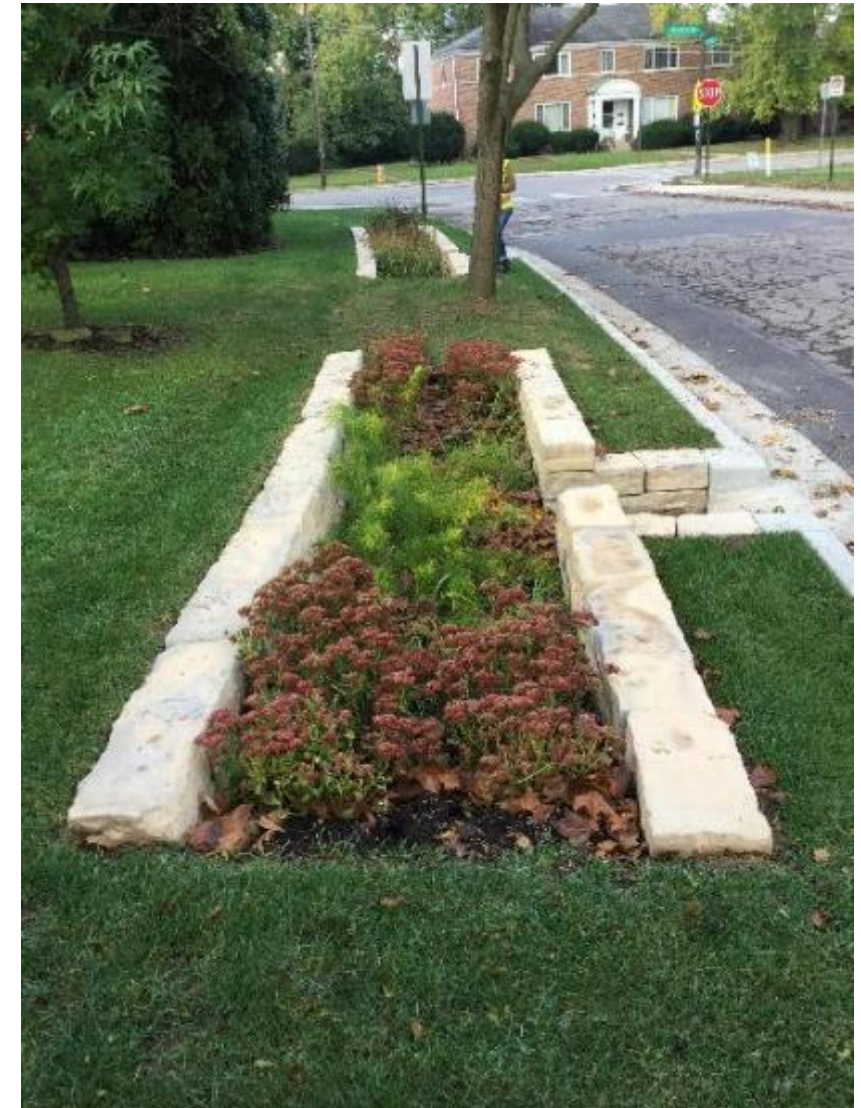
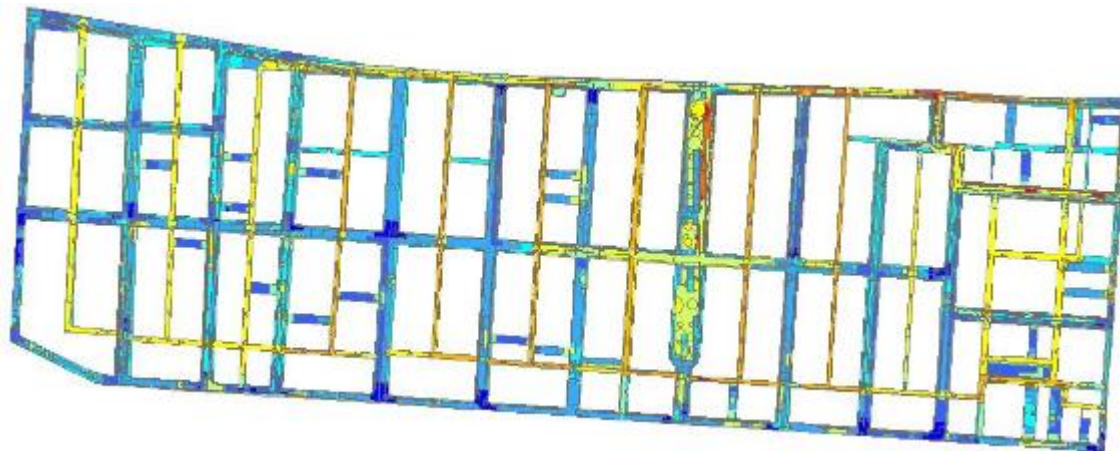


The Approach

Narrow number of sites for the design team before performing field activities

Use digital data to develop a continuum map ranging from more-favorable to less-favorable sites

Use ArcGIS as a platform to cross the information and assign a score for each factor



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- ❑ Why GI Siting Tool?
- ❑ GI Siting Tool at City Level Planning
 - ❑ Case Study and Tool Approach
 - ❑ Analysis Results
- ❑ GI Siting Tool in Design Stage
- ❑ Integrating Siting Tool with H/H Modeling

Background

- Current study with The National Conservancy in Los Angeles County, California
- Need for efficient way to identify areas to prioritize nature-based solutions



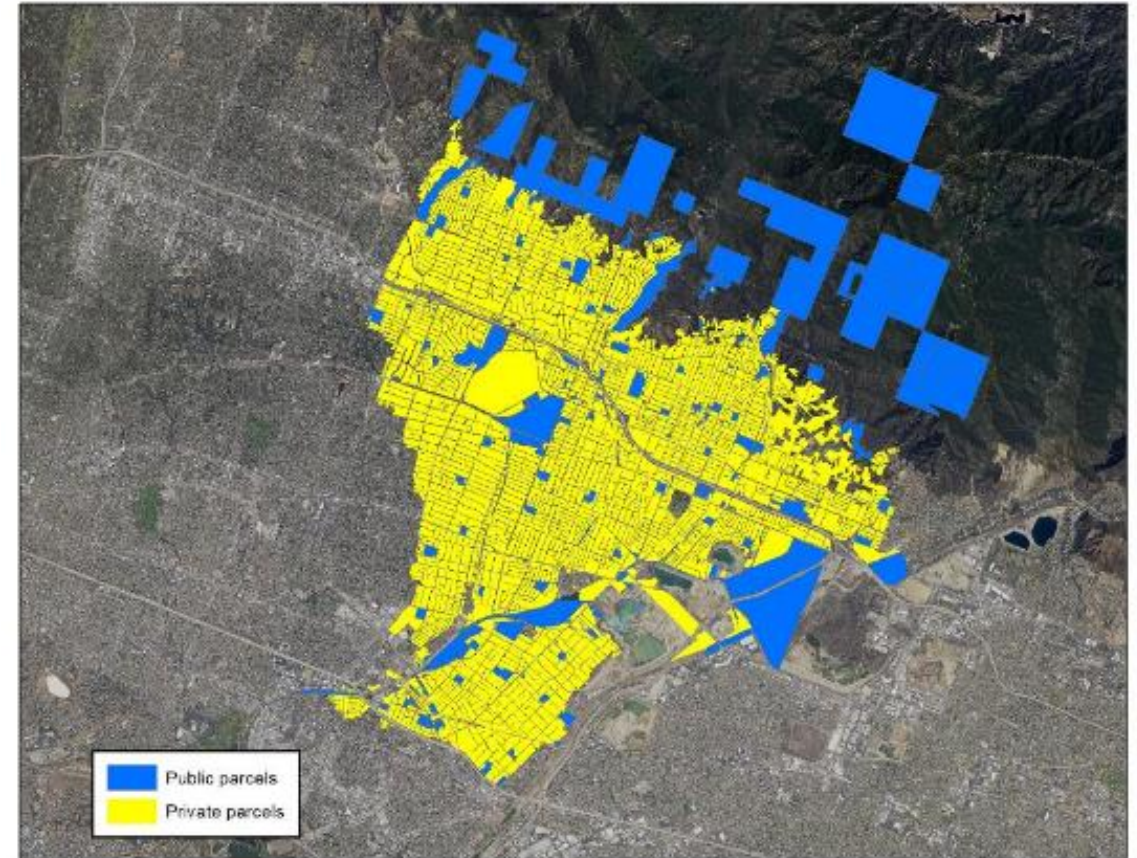
Tool Design Driving Factors

- Easy to use by diverse users
- Reduces processing and analysis time
- Easy to adjust input parameters
- Flexibility
- Produces output that is easy to translate to decision making

Tool Analysis

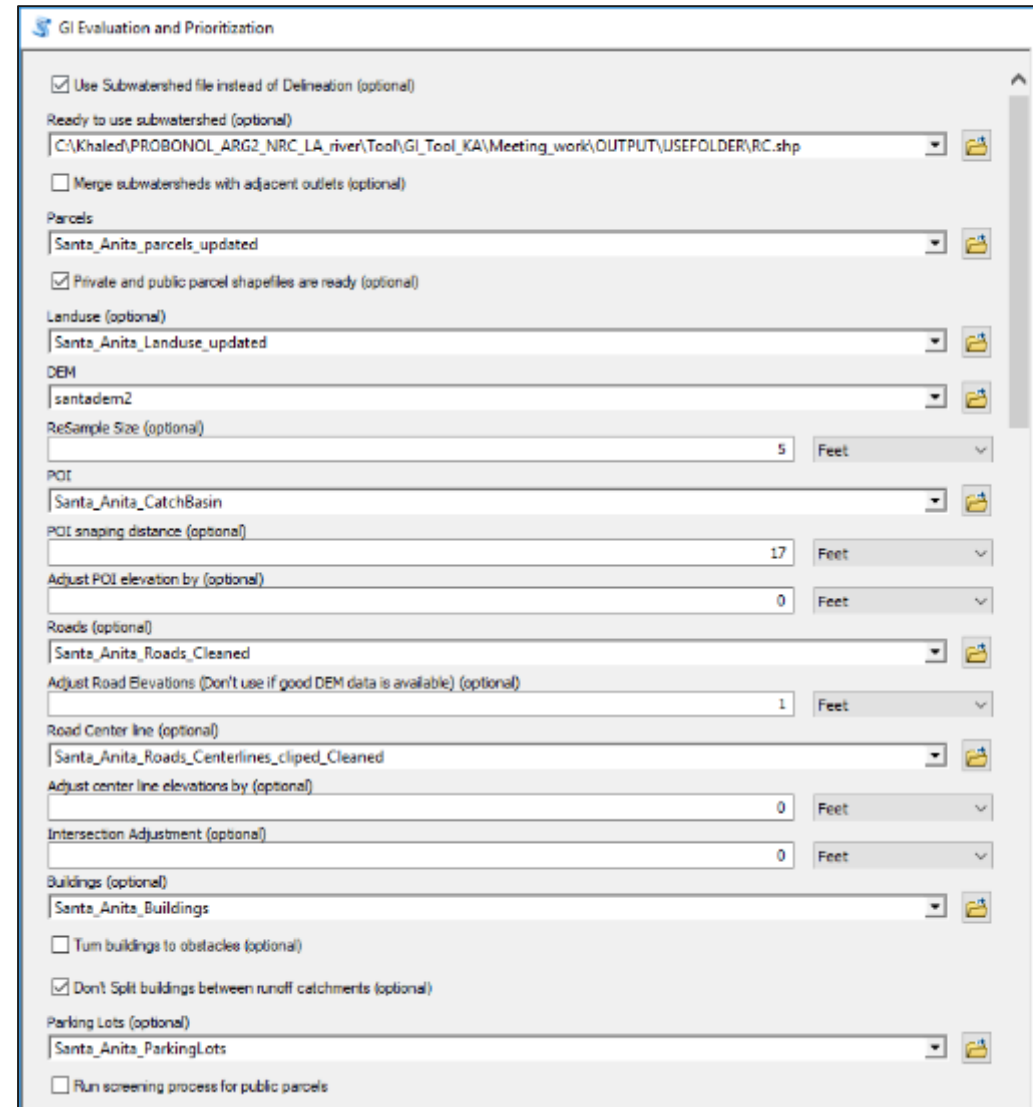
- Public parcels evaluation
- Private parcels evaluation
- Roads evaluation

Metric	Public Parcels	Private Parcels	Roads
Volume Capture	✓	✓	✓
Road Slope	✓		✓
Parcel elevation	✓		
Soil Contamination	✓	✓	✓
Soil Infiltration	✓	✓	✓



Tool Interface

- Preprocessing
- Public parcels evaluation
- Private parcels evaluation
- Roads evaluation



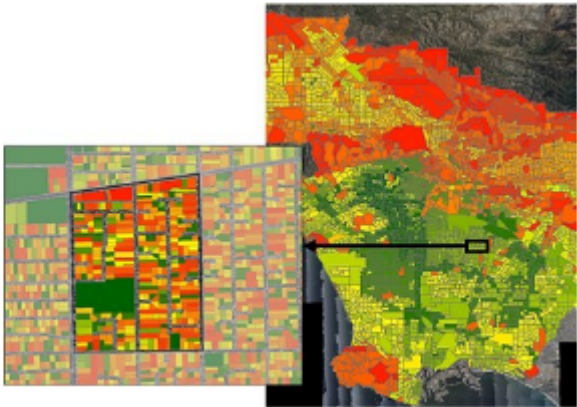
GI Evaluation and Prioritization

Script to evaluate, locate and prioritize opportunities within study area based on predefined criteria.

- After Completing the analysis, score calibration will be done and introduced scores might be adjusted.
- Scores for the whole study area will be normalized from 0 to 100 then will be divided into 5 categories (Best, very good, Good, better to avoid, not suitable) based on the score.
- Negative scores will be used with factors that has major effect on how the BMP may perform like street slopes. negative scores should be enough to lower evaluation to lower category.

Cutoff maximum area estimation: Most of the used metrics are area proportional. To avoid screening results deviation because of one or two locations with huge area compared to the rest of the study area, a cutoff value equivalent to the 90thpercentile of the areas will be used. All areas above the maximum area will get the maximum score.

Minimum area: the used minimum area represents the minimum area required for a BMP. The minimum area will vary based on the type of screening. Public parcels and nonresidential BMPs are assumed to be more like a regional BMP while private residential parcels are with smaller footprint. As initial assumption we will us 0.002 ac.



Preprocessing

- Parcels ownership (public and private parcels)
- Subwatershed delineation
- Flow accumulation raster
- Flow accumulation raster per subwatershed

GI Evaluation and Prioritization

Use Subwatershed file instead of Delineation (optional)

Ready to use subwatershed (optional)

Merge subwatersheds with adjacent outlets (optional)

Parcels

Private and public parcel shapefiles are ready (optional)

Landuse (optional)

DEM

ReSample Size (optional)
 Feet

POI

POI snapping distance (optional)
 Feet

Adjust POI elevation by (optional)
 Feet

Roads (optional)

Adjust Road Elevations (Don't use if good DEM data is available) (optional)
 Feet

Road Center line (optional)

Adjust center line elevations by (optional)
 Feet

Intersection Adjustment (optional)
 Feet

Buildings (optional)

Turn buildings to obstacles (optional)

Don't Split buildings between runoff catchments (optional)

Parking Lots (optional)

Run screening process for public parcels

Sub-Watershed Delineation

- Inputs
 - Topology (DEM)
 - Point of interest (Storm inlets)
 - Road shapefile
 - Street centerline
 - Building shapefile
 - Parking lots
 - Other user inputs



Sub-Watershed Delineation Results

- Most time consuming if done by hand
- The tool delineate to the storm inlet level, or any point of interest layer defined by the user
- Some cleaning at the boundary might be needed, but this step reduces engineering time by 80%



Public Parcel Screening Factors

- Volume capture
- Road slope
- Parcel elevation
- Soil contamination
- Soil infiltration

Run screening process for public parcels

Min. Pervious Area (Public Parcels) (optional) 0.01 Acres

Cutoff Pervious Area Percentile (Public Parcels) (optional) 90

Min Pervious area score (Public Parcels) (optional) 1

Max Pervious area score (Public Parcels) (optional) 5

Water quantity Min. Impervious area (Public Parcels) (optional) 0.1 Acres

Cutoff Impervious Area Percentile (Public Parcels) (optional) 90

Min. Impervious area score (Public Parcels) (optional) 1

Max. Impervious area score (Public Parcels) (optional) 15

Provide prepared flow accumulation per subcatchment (optional)
C:\Khaled\PROBONOL_ARG2_NRC_LA_river\Tool\GI_Tool_KA\Meeting_work\OUTPUT\U:\

Water Volume Search Circle (Public Parcels) (optional) 15 Feet

Max Road Slope (Public Parcels)(%) (optional) 5

Min Road Slope (Public Parcels) (%) (optional) 2

Max. Road Slope Score (Public Parcels) (optional) 10

Min Road Slope Score (Public Parcels) (optional) -15

Max. Elevation Difference between the Parcel and The Adjacent Road (Public Parcels) (optional) 2 Feet

Min. Elevation Difference between the Parcel and The Adjacent Road (Public Parcels) (optional) -4 Feet

Max. Parcel Elevation Score (Public Parcels) (optional) 10

Min. Parcel Elevation Score (Public Parcels) (optional) 0

Liquefaction Zones (Public Parcels) (optional)
Liquefaction_zones

Exclude all Locations within Liquefaction Zone from Screening. That option will be applied to all Enabled score

Score within Liquefaction Zones (Public Parcels) (optional) -15

Score outside Liquefaction zones (Public Parcels) (optional) 10

Soil Contamination (That Factor will be applied to all Enabled screening Levels) (Public Parcels) (optional)
DRP_SIGNIFICANT_ECOLOGICAL_AREAS

Soil Hydrologic Group (That option will be applied to all Enabled screening Levels) (Public Parcels) (optional)
Soils_sample

HSG A or B score (Public Parcels) (optional) 5

HSG C score (Public Parcels) (optional) 0

HSG D Score (Public Parcels) (optional) -5

Water Quality data (That option will be applied to all Enabled screening Levels) (Public Parcels) (optional)

Water Quality Max. Score (Public Parcels) 10

Water Quality Min. Score (Public Parcels) (optional) 0

Volume Capture

- Input Layers
 - Buildings
 - Parking lots
 - Roads
 - Sub-watersheds
 - Points of interest (storm inlets)
 - Sub-watershed flow accumulation raster
 - Public parcels

GI Evaluation and Prioritization

Run screening process for public parcels

Min. Pervious Area (Public Parcels) (optional)
 Acres

Cutoff Pervious Area Percentile (Public Parcels) (optional)

Min Pervious area score (Public Parcels) (optional)


Max Pervious area score (Public Parcels) (optional)

Water quantity Min. Impervious area (Public Parcels) (optional)
 Acres

Cutoff Impervious Area Percentile (Public Parcels) (optional)

Min. Impervious area score (Public Parcels) (optional)

Max. Impervious area score (Public Parcels) (optional)

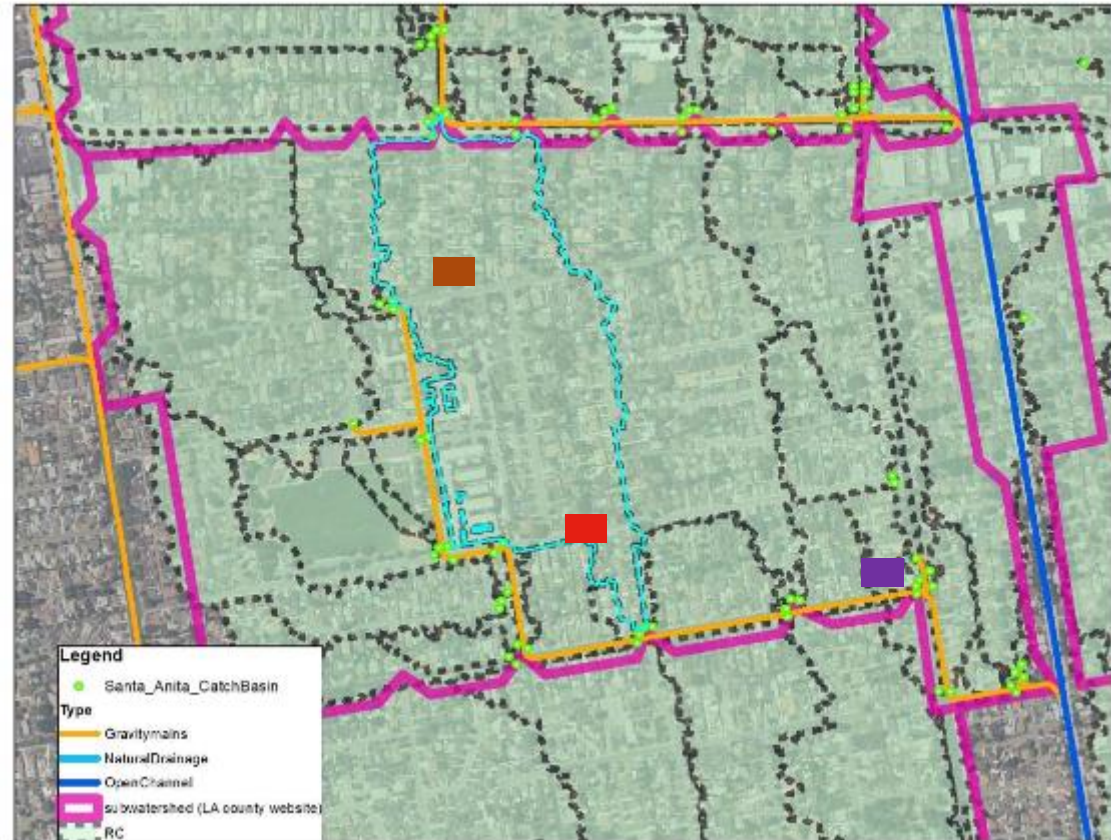
Provide prepared flow accumulation per subcatchment (optional)
 

Water Volume Search Circle (Public Parcels) (optional)
 Feet

Volume Capture

- Available area
- Impervious area in the watershed.
- Parcel proximity to the watershed outlet

- Parcel 1 ■
- Parcel 2 ■
- Parcel 3 ■



Volume Capture

Total score = $a + b * c$

a: Available Area Score

b: Sub-watershed Water Volume Score.

c: % of subwatershed runoff that can be captured by the parcel



Parcel	a	b	c	Total score
Parcel 1	4/5	15/15	85%	16.75
Parcel 2	4/5	4/15	100%	8
Parcel 3	4/5	15/15	35%	9.25

- Parcel 1
- Parcel 2
- Parcel 3

Road Slope

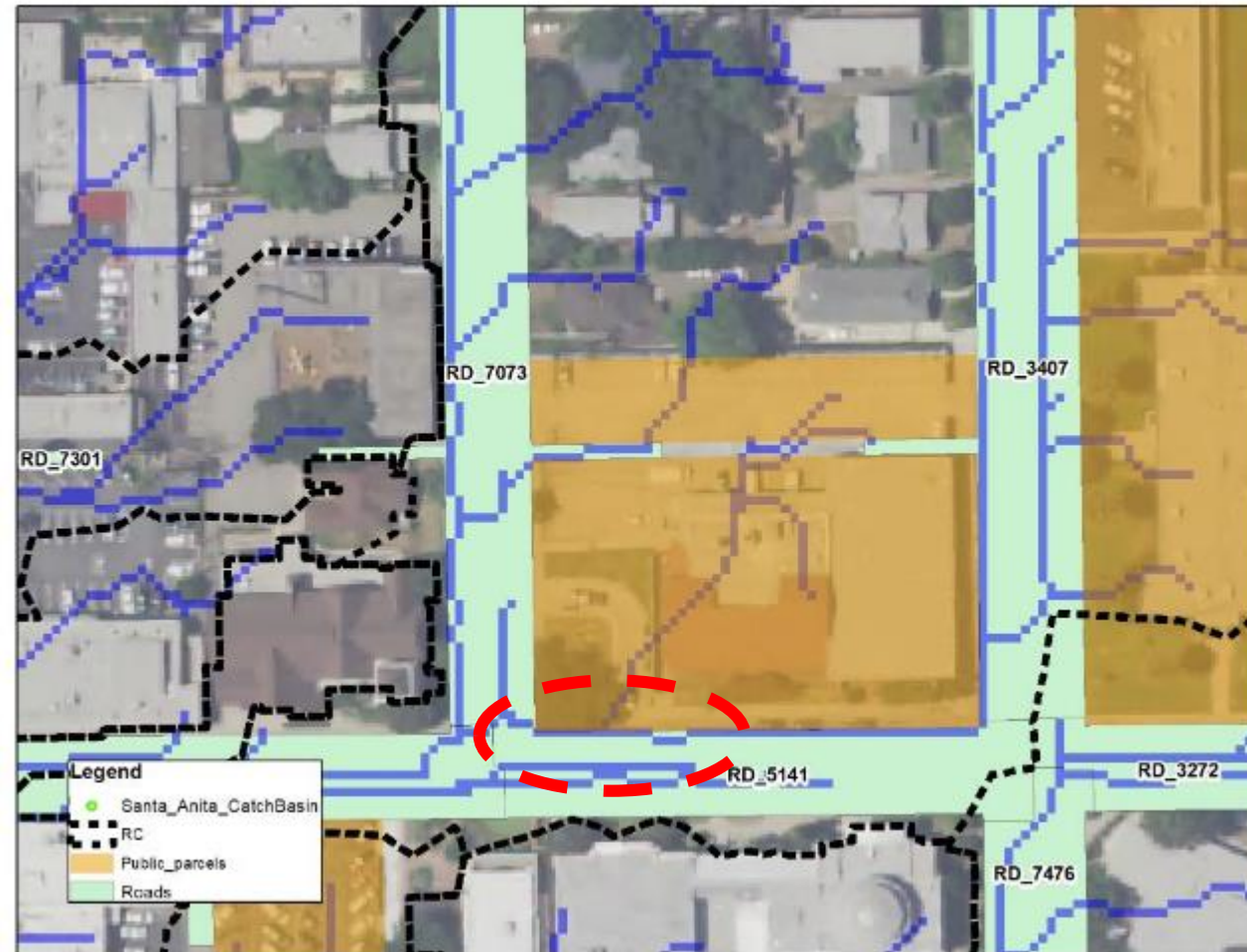
- Input Layers
 - Public parcels
 - Road shapefile
 - DEM

Water Volume Search Circle (Public Parcels) (optional)
 Feet

Max Road Slope (Public Parcels)(%) (optional)

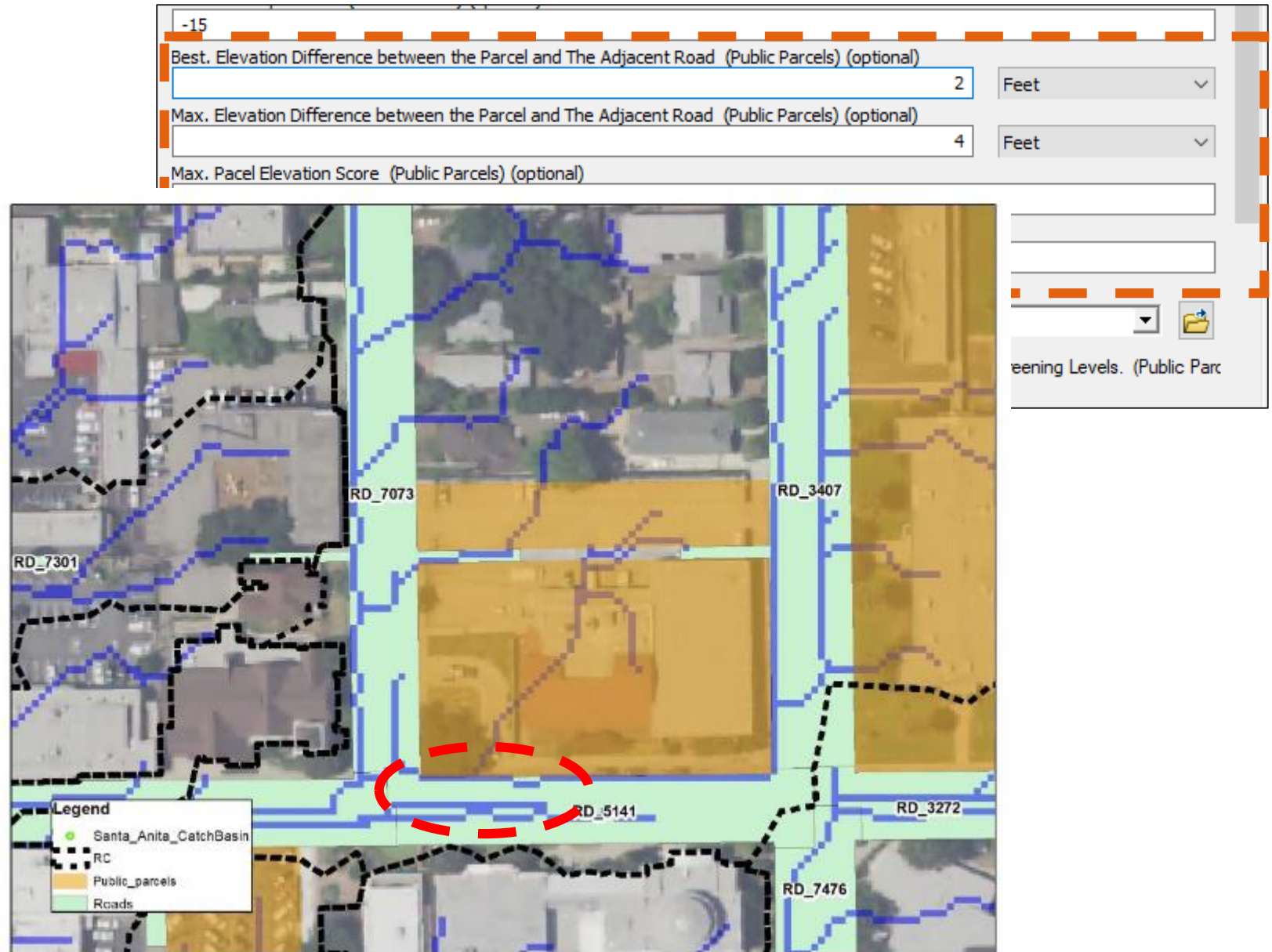
Best Road Slope <= (Public Parcels) (%) (optional)

Max. Road Slope Score (Public Parcels) (optional)
 Feet



Parcel Elevation

- Input Layers
 - Public parcels
 - Road shapefile
 - Street Centerline
 - DEM



Contaminated Soils

- Input Layers
 - Public parcels
 - Contaminated Soils.



0

Liquefaction Zones (Public Parcels) (optional)

Liquefaction_zones

Exclude all Locations within Liquefaction Zone from Screening. That option will be applied to all Enabled s

Score within Liquefaction Zones (Public Parcels) (optional)

-15

Score outside Liquefaction zones (Public Parcels) (optional)

10

Soil Contamination (That Factor will be applied to all Enabled screening Levels) (Public Parcels) (optional)

Soil Infiltration

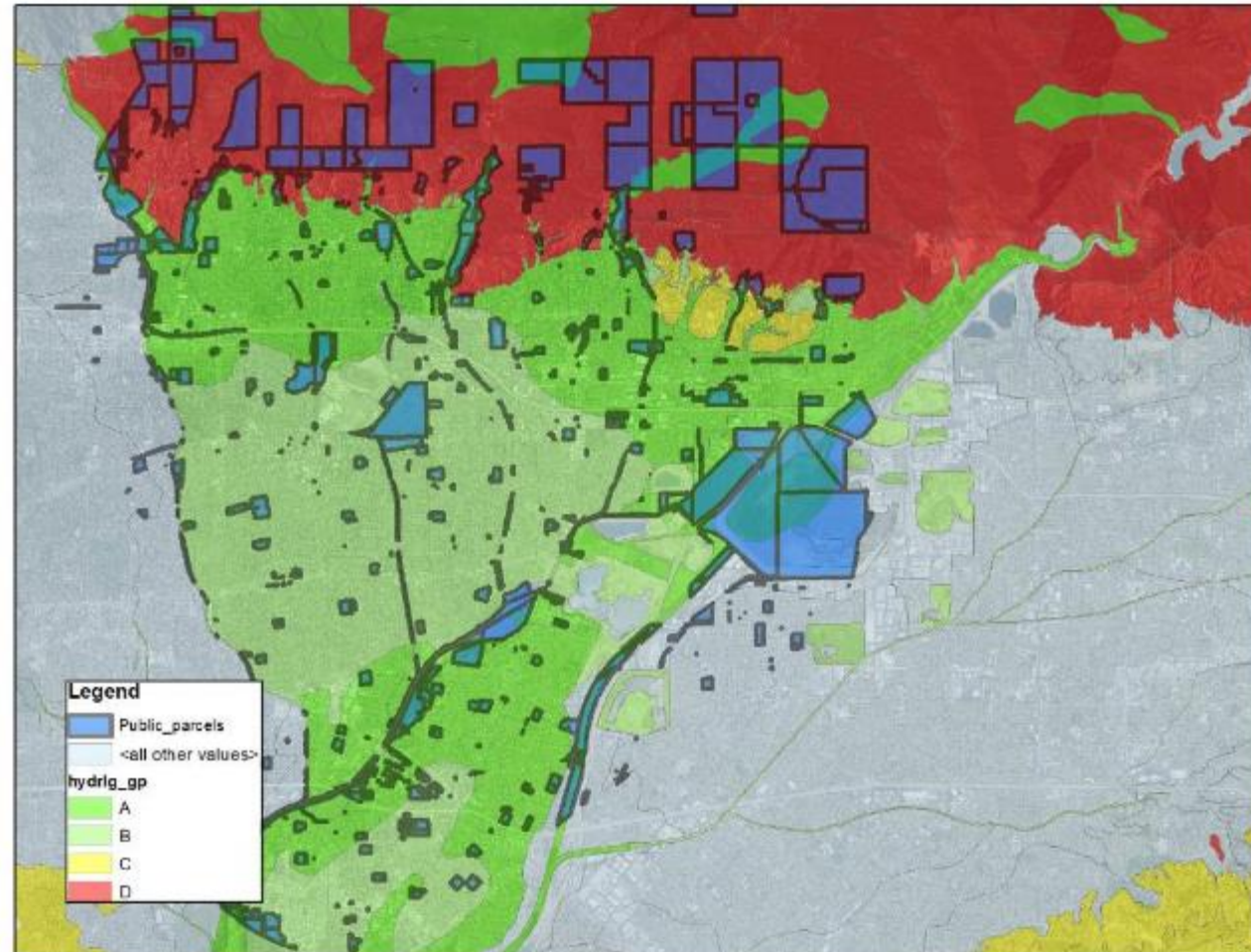
- Input Layers
 - Public parcels
 - Soil layer (HSG)

Soil Hydrologic Group (That option will be applied to all Enabled screening Levels) (Public Parcels) (optional)

Soils_sample

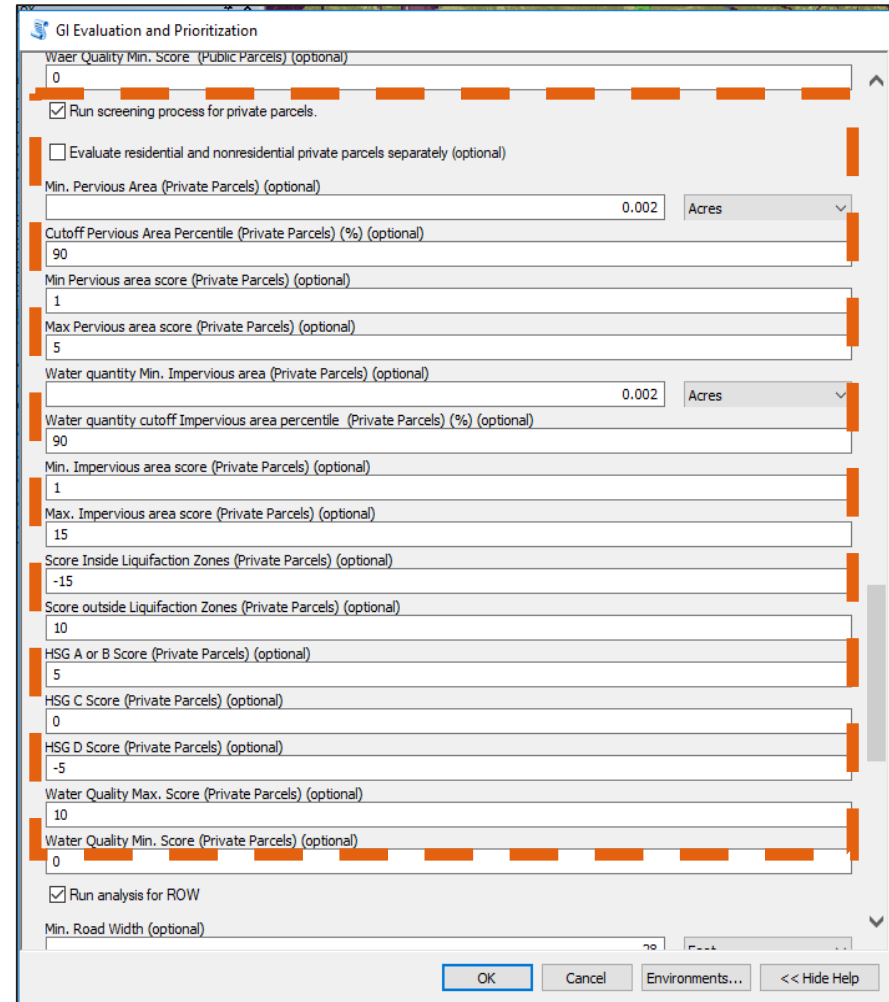
HSG A or B score (Public Parcels) (optional)
5

HSG C score (Public Parcels) (optional)
0



Private Parcel Screening

- Screening Factors
 - volume capture
 - Soil Contamination.
 - Soil Infiltration.



The screenshot shows a software window titled "GI Evaluation and Prioritization" with the following settings:

- Water Quality Min. Score (Public Parcels) (optional): 0
- Run screening process for private parcels.
- Evaluate residential and nonresidential private parcels separately (optional)
- Min. Pervious Area (Private Parcels) (optional): 0.002 Acres
- Cutoff Pervious Area Percentile (Private Parcels) (%) (optional): 90
- Min Pervious area score (Private Parcels) (optional): 1
- Max Pervious area score (Private Parcels) (optional): 5
- Water quantity Min. Impervious area (Private Parcels) (optional): 0.002 Acres
- Water quantity cutoff Impervious area percentile (Private Parcels) (%) (optional): 90
- Min. Impervious area score (Private Parcels) (optional): 1
- Max. Impervious area score (Private Parcels) (optional): 15
- Score Inside Liquifaction Zones (Private Parcels) (optional): -15
- Score outside Liquifaction Zones (Private Parcels) (optional): 10
- HSG A or B Score (Private Parcels) (optional): 5
- HSG C Score (Private Parcels) (optional): 0
- HSG D Score (Private Parcels) (optional): -5
- Water Quality Max. Score (Private Parcels) (optional): 10
- Water Quality Min. Score (Private Parcels) (optional): 0
- Run analysis for ROW
- Min. Road Width (optional):

Buttons at the bottom: OK, Cancel, Environments..., << Hide Help

Road Screening

- Screening Factors
 - Volume capture
 - Road slope
 - Soil contamination
 - Soil infiltration

Run analysis for ROW

Min. Road Width (optional)
 Feet

Max. Water Score (ROW) (optional)

Min. Water Score (ROW) (optional)

Max. Road Slope Score (ROW) (optional)

Min. Road Slope Score (ROW) (optional)

Score inside Liquifaction Zones (ROW) (optional)

Score outside Liquifaction Zones (ROW) (optional)

HSG A or B (ROW) (optional)

HSG C (ROW)

HSG D (ROW) (optional)

Water Quality Max Score (ROW) (optional)

Water Quality Min. Score (ROW) (optional)

Run Social Benefits Analysis (optional)

Run Biodiversity Analysis (optional)

Final Map Study Unit (optional)

OK Cancel Environments... << Hide Help

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- ❑ **GI Siting Tool at City Level**
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Processing Time

- Analysis for more than 64,000 ac was done in 24 minutes

```

GI Evaluation and Prioritization
Completed
Close
<< Details
 Close this dialog when completed successfully

Private Parcels Total score normalization
-18.985839963
35
Private Parcel Screening Completed...
Starting Road Screening Process
Calculating average road width
47
Split Roads using street centerline layer
1- Water quantity (Roads)
Getting Maximum Pixel value for each Road segment
321
  2- Road Slope evaluation
  3- Road Liquefaction screening
  4-Excluding contaminated sites
  5-Soil type evaluation (Private Parcels)
    - Ignoring locations with missing soil information
Final Roads analysis score.....
Roads Total score normalization
-35
40
Roads Screening has Completed !!
Starting averaging water quality and quantity scores per each study unit
Dissolving scores per Study unit
Adding up scores
Public parcels...
Private parcels...
Roads...
Completed script GI-Evaluation-Prioritization...
Succeeded at Fri Mar 29 10:19:02 2019 (Elapsed Time: 24 minutes 45 seconds)
  
```


Public Parcels Screening Results

Identify

Identify from: <Top-most layer>

Total scoring

Location: -8,560,018.490 678,096.944 Feet

Field	Value
FID	244
Shape	Polygon
Pub_ID	Par_322
WQperv_scr	4.94514
MAX_WQV_sc	15
PP_WQScr	19.94514
Pub_slpScr	10
PubElv_Scr	10
Lqu_Scr	10
Commnt_Scr	0
soil_scr	5
Pub_total	54.94514
Total_Nor	0.999364



Identify

Identify from: <Top-most layer>

Total scoring

Location: -8,551,680.923 667,572.215 Feet

Field	Value
FID	87
Shape	Polygon
Pub_ID	Par_1145
WQperv_scr	3.15395
MAX_WQV_sc	0.968662
PP_WQScr	4.122612
Pub_slpScr	10
PubElv_Scr	0
Lqu_Scr	-15
Commnt_Scr	0
soil_scr	5
Pub_total	4.122612
Total_Nor	0.410161

Private Parcels Screening Results



Location: -8,546,545.782 691,960.474 Feet	
Field	Value
FID	10674
Shape	Polygon
Priv_ID	Priv_40719
WQperv_scr	1.20411
WQ_scr	15
Lqu_Scr	10
Commnt_Scr	0
soil_scr	5
Priv_total	31.204109
Total_Nor	0.929687
Prv_tempID	Priv_10674

Location: -8,544,245.771 692,850.645 Feet	
Field	Value
FID	1508
Shape	Polygon
Priv_ID	Priv_14351
WQperv_scr	2.18454
WQ_scr	2.94824
Lqu_Scr	-15
Commnt_Scr	0
soil_scr	0.976161
Priv_total	-8.891058
Total_Nor	0.186989
Prv_tempID	Priv_1508

Roads Screening

Location: 6,556,048.385 1,876,900.804 Feet

Field	Value
FID	12735
Shape	Polygon
CL_ID	RD_4201
Area_ac	2.6987
Width	59.4287
GRIDCODE	1310
WQ_scr	15
RCQ_pixl	26331
RD_RC_ID	RD_4201_1310_15725
MAX	26331
RD_WQ_scr	14.99943
Avg_Slope	1.068479
RD_slpScr	10
In_Liqu	
RD_Lqu_Scr	10
Contamnt	
RDCont_Scr	0
RDSoil_scr	5
RD_total	39.99943
Total_Nor	0.999992
RD_tempID	RD_12735



identify

identify from: <Top-most layer>

Final_Road_scores_cleaned

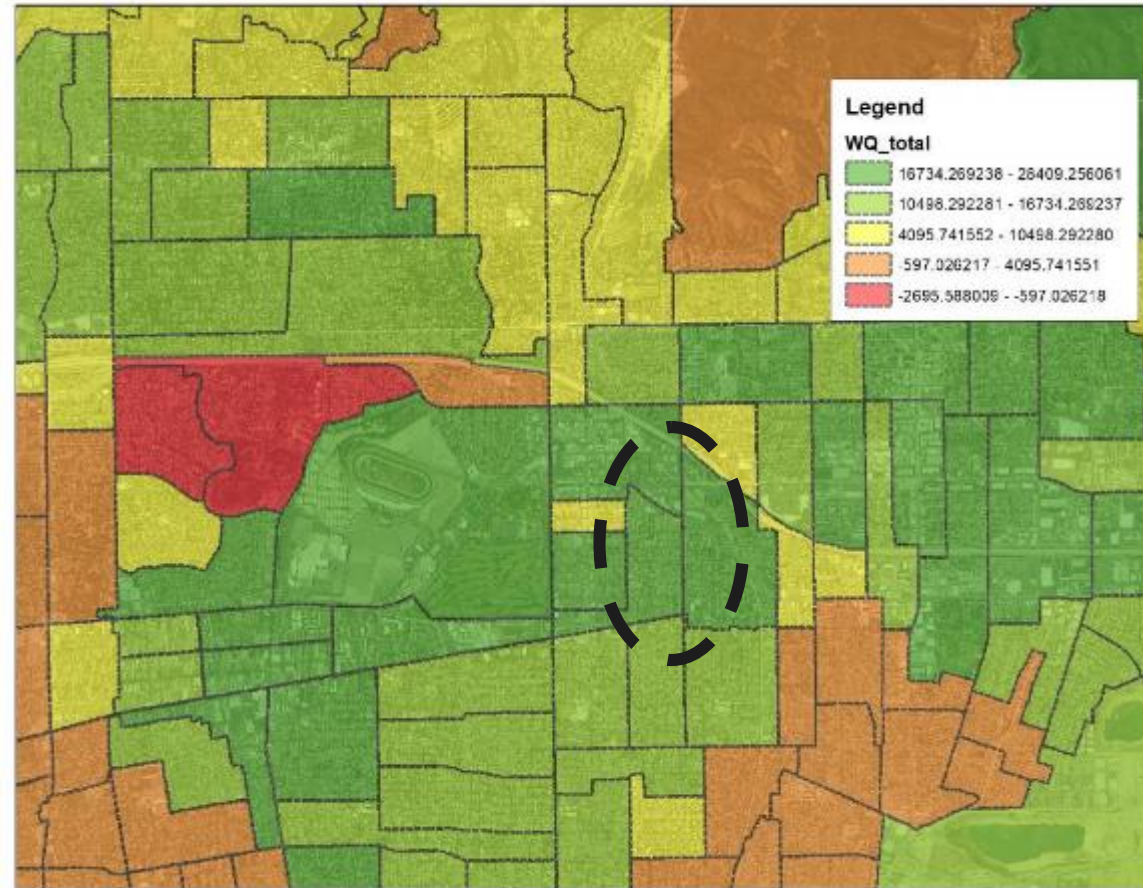
RD_7168

Location: 6,556,248.760 1,879,065.375 Feet

Field	Value
FID	21702
Shape	Polygon
CL_ID	RD_7168
Area_ac	0.467648
Width	51.2528
GRIDCODE	1711
WQ_scr	14.0151
RCQ_pixl	24582
RD_RC_ID	RD_7168_1711_26936
MAX	6411
RD_WQ_scr	3.654997
Avg_Slope	4.430019
RD_slpScr	-10.25016
In_Liqu	In
RD_Lqu_Scr	-15
Contamnt	
RDCont_Scr	0
RDSoil_scr	5
RD_total	-16.595162
Total_Nor	0.245398
RD_tempID	RD_21702

Averaging the Scores

- Tool can be used to average the analysis results city wide using
 - Watersheds
 - Flowmeter basins
 - School districts
 - census blocks
 - Any other user preferred boundary



Identify	
Identify from:	<Top-most layer>
	60374309021
Location:	6,557,095.515 1,871,544.179
Field	Value
FID	95
Shape	Polygon
bg_id	60374309021
bg_id_1	60374309021
SUM_WQperv	19.3095
SUM_MAX_WQ	45.092586
SUM_Pub_sl	148.80074
SUM_PubElv	70
SUM_Lqu_Sc	180
SUM_Conmnt	0
SUM_soil_s	90
SUM_Pub_to	553.202826
SUM_WQpe_1	1507.677638
SUM_WQ_scr	3175.695346
SUM_Lqu__1	6750
SUM_Conm_1	0
SUM_soil_1	3375
SUM_Priv_t	14808.372998
SUM_RD_WQ_	615.313327
SUM_RD_slp	2042.565129
SUM_RD_Lqu	2700
SUM_RDCont	0
SUM_RDSoil	1350
SUM_RD_tot	6707.878456
WQ_total	22069.45428
Identified 1 feature	

Social/Public Health Indicators

- Air Quality Pollution Burden
- Water Quality Pollution Burden
- Economic Hardship Index
- Connect Green Spaces
- Reduce Effect of Urban Heat Island
- Provide Equitable Access to Greenspace
- Race/Ethnicity
- Population Density

Summary

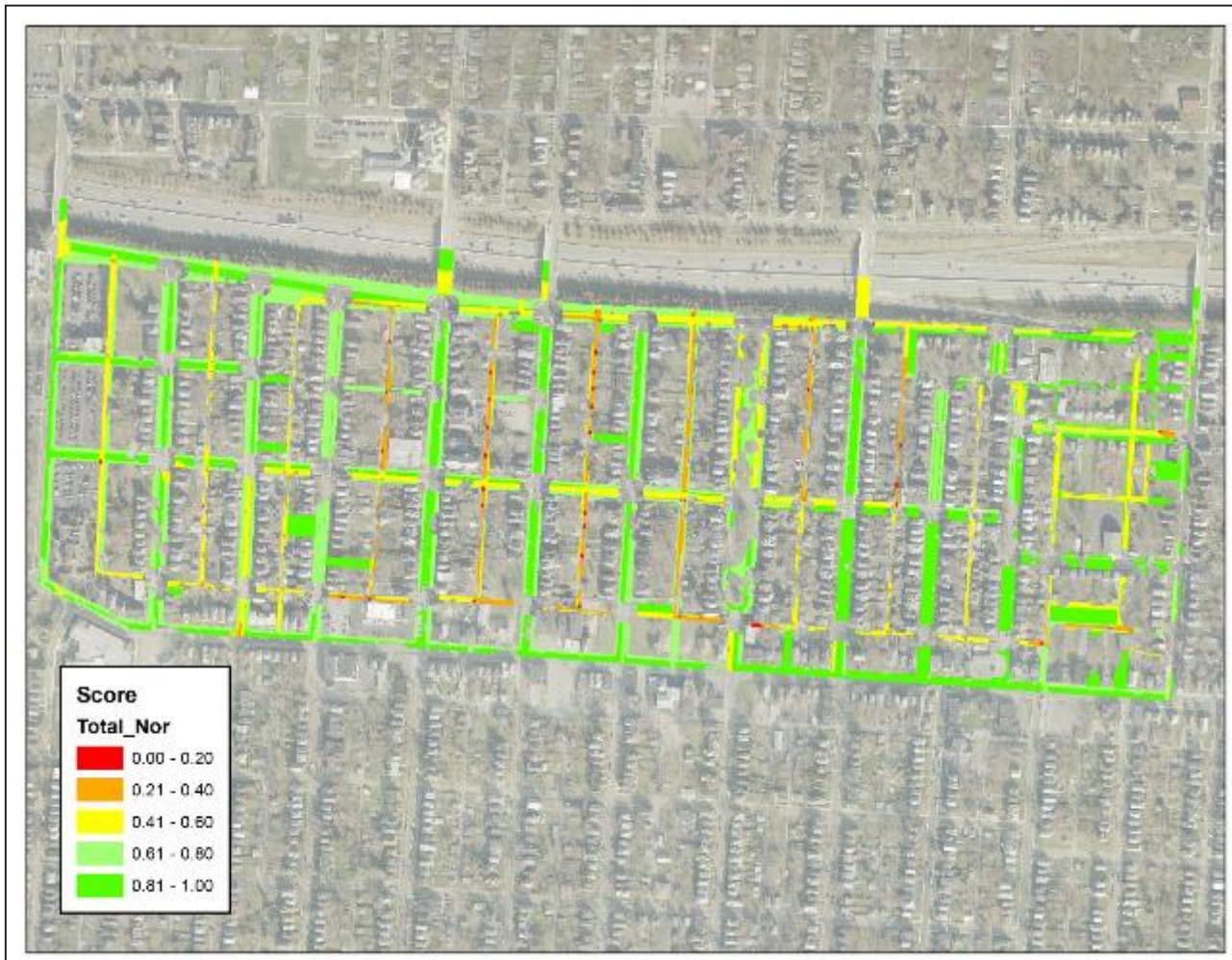
- User-friendly Tool developed to identify potential locations for nature-based solutions
- Screen potential public, private and road ROW parcels
- Tool is based in ArcGIS and scalable across block, subwatershed, watershed and county level



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Newton/Bedford, City of Columbus



- Different Version of the tool was used in one of the areas in the City of Columbus Blueprint program
- Tool output was used as a support for the design and modeling teams
- The tool focuses on utility conflicts

Tool Methodology

Buffer width



- Scoring based on the impact area

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Runoff catchments • Sewer lines • HSTS • Area lighting • Miscellaneous electrical equipment • Electrical surface structure • Electrical Pole • Fire hydrant • Parcels | <ul style="list-style-type: none"> • Bus stops • Tree • Water network • Gas lines • Impervious area • Vacant parcels • Roads • Street centerline • Intersections • Contours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Tool Methodology

- Scoring based on the feature properties



- Runoff catchments
- Sewer lines
- HSTS
- Area lighting
- Miscellaneous electrical equipment
- Electrical surface structure
- Electrical Pole
- Fire hydrant
- Parcels
- Bus stops
- Tree
- Water network
- Gas lines
- Impervious area
- Vacant parcels
- Roads
- Street centerline
- Intersections
- Contours

Tool Methodology



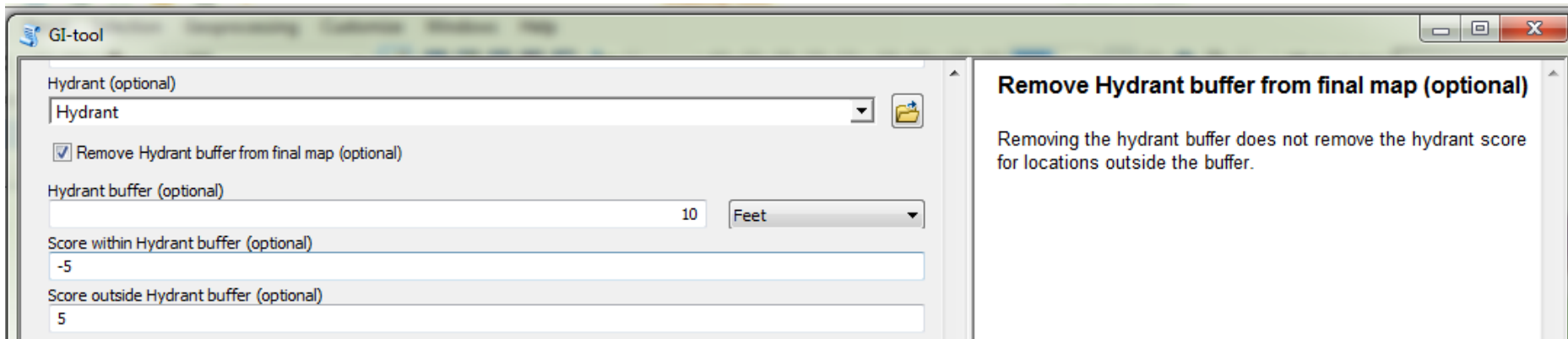
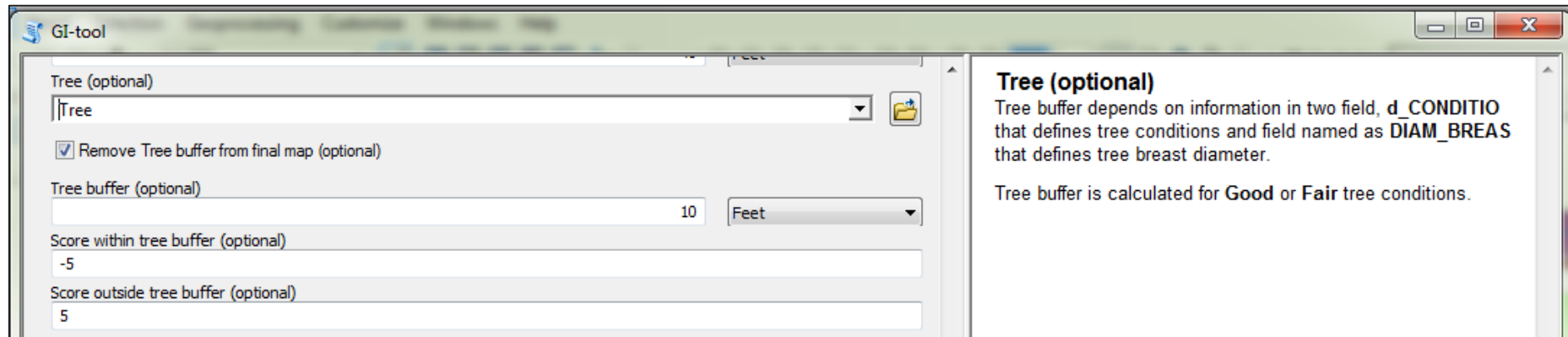
- Removing undesired locations

- Runoff catchments
- Sewer lines
- HSTS
- Area lighting
- Miscellaneous electrical equipment
- Electrical surface structure
- Electrical Pole
- Fire hydrant
- Parcels

- Bus stops
- Tree
- Water network
- Gas lines
- Impervious area
- Vacant parcels
- Roads
- Street centerline
- Intersections
- Contours

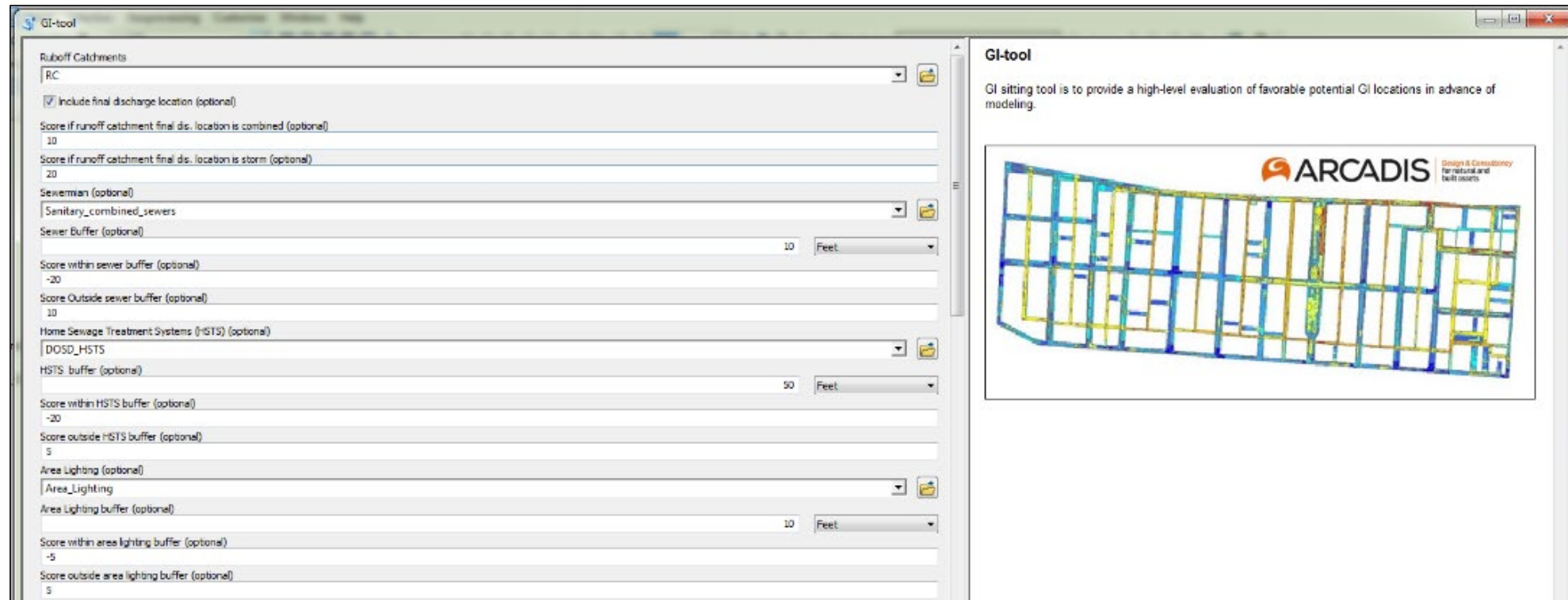
GI Siting Tool Interface

- Layer requirements or clarifications on how the selected option will impact the calculation are shown in the side description panel.



GI Siting Tool Interface

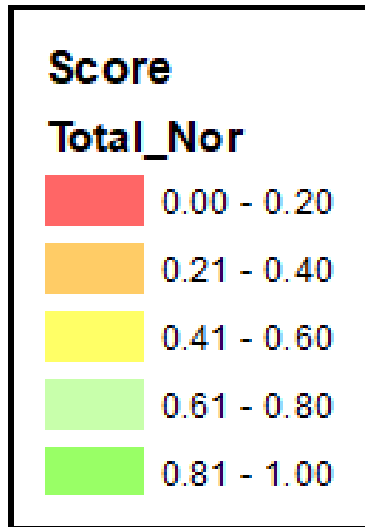
- User can define buffer size and scores within and outside the buffer.
- User can ignore any layer by not providing any input



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Tool Output



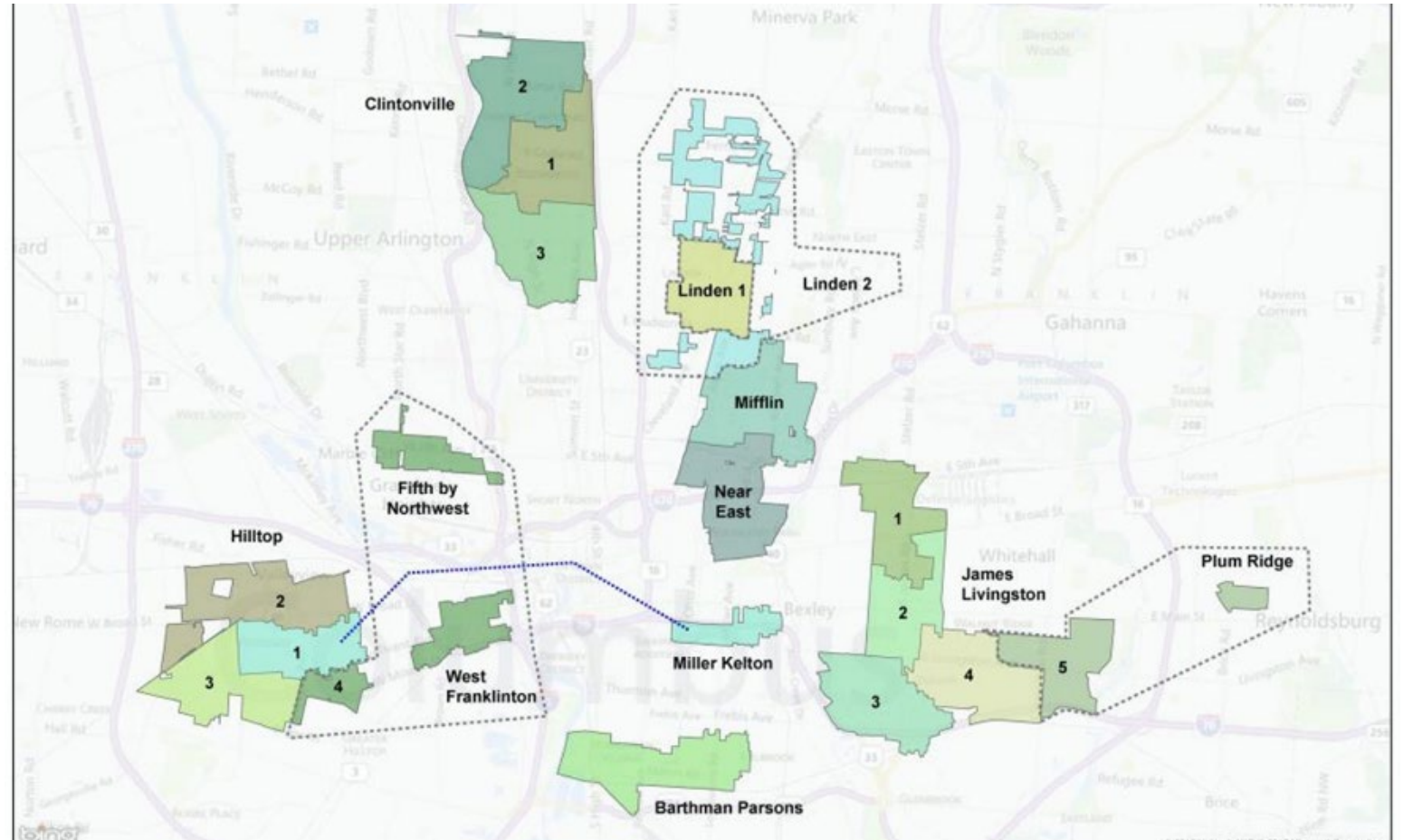
Tool Output



Field	Value
FID	19
Shape	Polygon
San_Scor	-20
Light_Scor	5
mELEC_Scor	5
eSurf_Scor	5
Pole_Scor	5
Hyd_Scor	5
WM_Scor	-5
ImpA_scr	0
Tree_scr	5
LBP_scr	0
Slope_scr	0
HSTS_Score	5
Total	25
Gas_Scr	5
Q_scr	10
Id	0
Total_Nor	0.294118

Consistency for All Blueprint Projects

City of Columbus distributed the tool to all Blueprint consultants to reduce siting effort and to ensure consistency of product

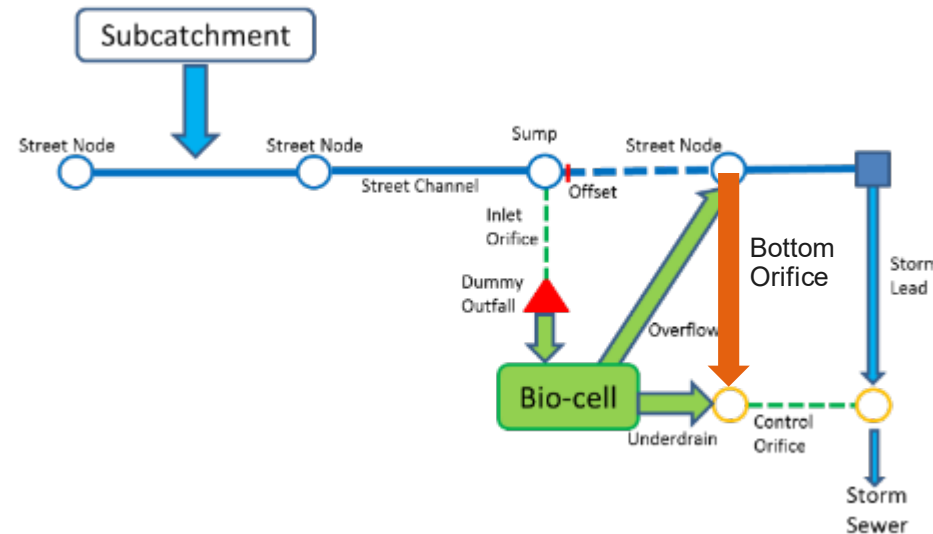


Agenda

- ❑ Why GI Siting Tool?
- ❑ GI Siting Tool at City Level Planning
- ❑ GI Siting Tool in Design Stage
- ❑ Integrating Siting Tool with H/H Modeling

GI Units Representation in H/H Model

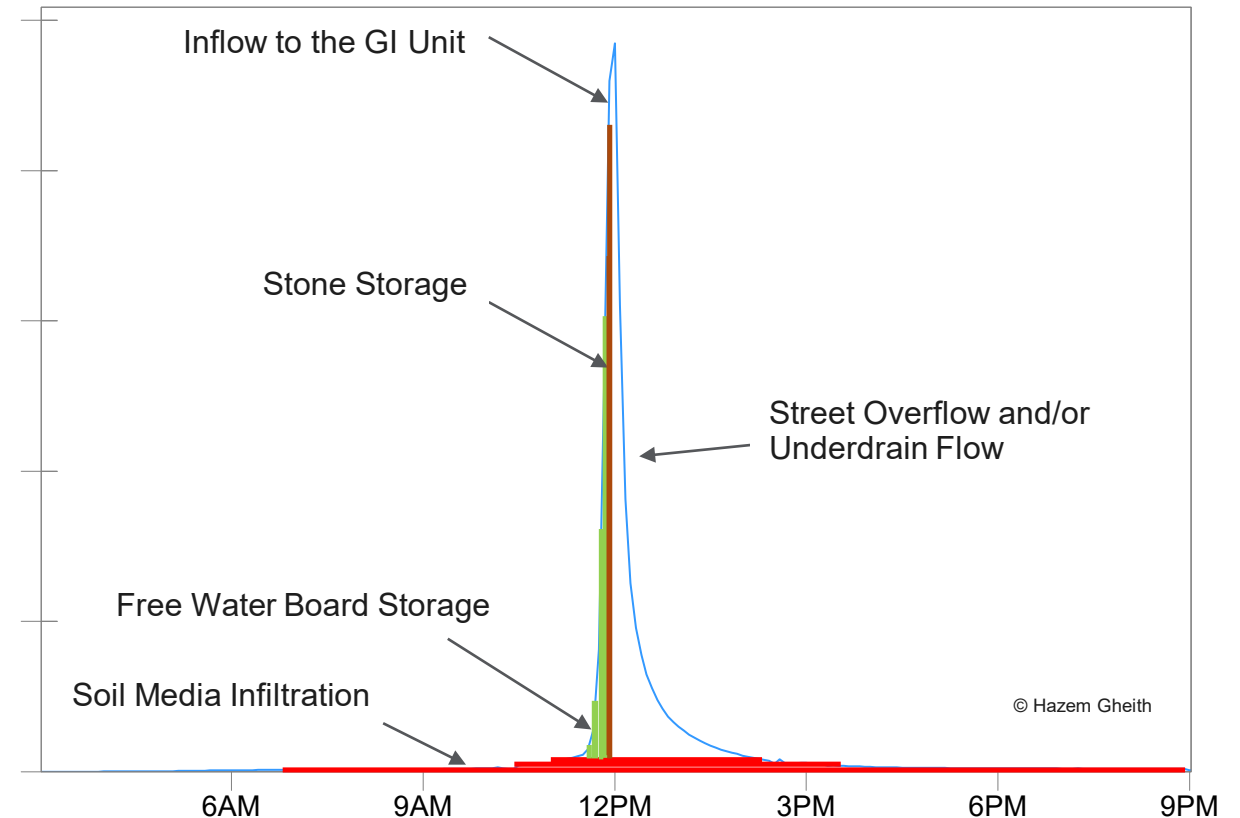
- GI unit in a catchment receives flow from the directly connected impervious area (not the catchment generated flow!)
- Inlet configuration requires its own evaluation to understand its effectiveness
- Engineered soil permeability has an important role, including potential degradation due to maintenance



Surface Layer		Soil Layer		Storage Layer		Underdrain	
Berm Height (in)	6 - 12	Thickness (in)	18 - 24	Thickness (in)	12 - 18	Drain Coef. (in/hr)	1.5
Vegetation Vol.(fraction)	0.05	Porosity (Vol. Fraction)	0.26	Void Ratio	0.7	Drain Exponent	0.5
Surface Roughness	0.25	Field Capacity (Vol. Fraction)	0.09	Seepage Rate (in/hr)	0.01	Drain Offset (in)	3 - 6
Surface Slope (%)	1.0	Wilting Point (Vol. Fraction)	0.035	Clogging factor	0		
		Conductivity (in/hr)	2.1				
		Conductivity Slope	8				
		Suction Head	3.5				

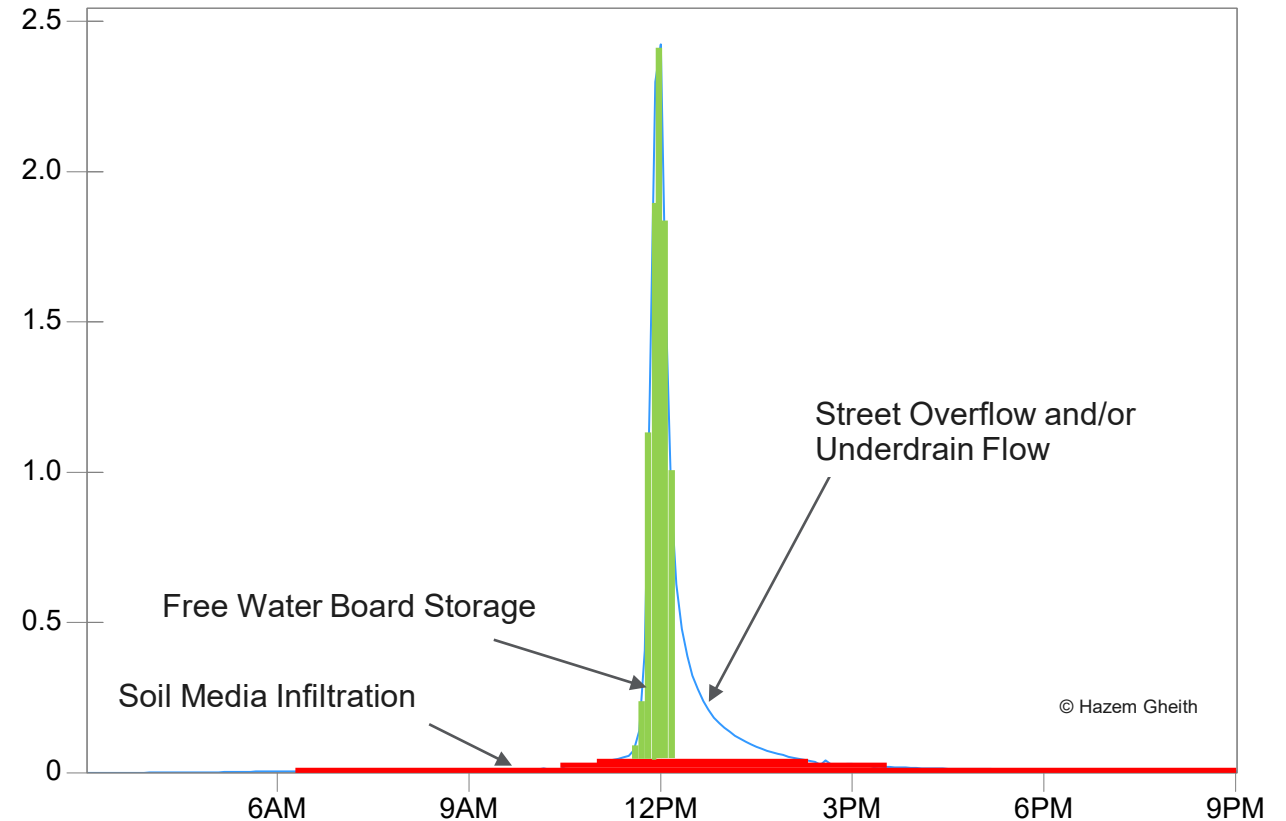
How GI Units Capture Flow

- Footprint infiltration (engineered soil conductivity)
- Free waterboard storage (flow > infiltration capacity)
- Stone layer storage (vertical pipe/stone column)
- This GI unit does not control the target storm peak flow
- It has about 50% impact on volume control



Capture Flow Hydrographs – Deeper Pond

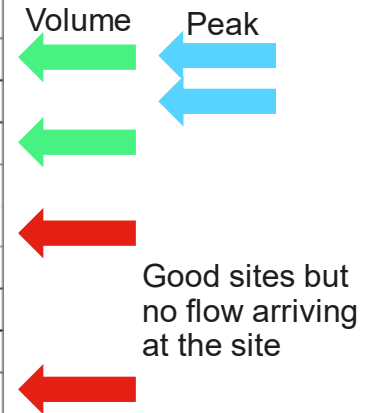
- Increase storage on the surface or stone layer
- This GI unit shaves the target storm peak flow by 75%
- It has about 75% impact on volume control



Combining Sites Score and Flow Levels

- Sort sites by area-weighted score
- Add information on predicted flow peak and volume
 - Water quality: Locate high score sites with high water volume
 - Flood control: Locate high score sites with high peak flow

Inlet Catchment	Site Score (area weighted)	Total volume (mg) TY	Peak flow (mgd) 5yr DS
0035T0806-A	0.933	0.316	2.746
0035T1125-A	0.926	0.127	2.403
0035T0943-A	0.900	0.226	1.686
0016T0840-A	0.894	0.281	3.060
0035T1123-A	0.869	0.895	6.847
0016T0822-A	0.833	0.152	3.768
0016T0837-A	0.833	0.601	1.663
0015T1044-A	0.826	0.337	1.015
0015T0872-A	0.819	0.000	0.005
0015T0886-A	0.801	0.189	1.380
0015T0866-A	0.800	0.322	2.392
0016T1167-A	0.796	0.038	1.001
0015T0446-A	0.792	0.003	0.126
0015T0865-A	0.790	0.147	1.971
0015T0447-A	0.790	0.002	0.514
0034T1415-A	0.786	0.189	0.815
0034T0015-A	0.786	0.122	1.961
0015T0445-A	0.785	0.125	0.995
0015T0870-A	0.778	0.212	1.619
0015T0867-A	0.774	0.177	0.756
0015T1047-A	0.773	0.260	2.833
0015T1043-A	0.772	0.393	1.689
0015T0117-A	0.771	0.118	1.133



Conclusions

- The user-friendly GI Siting Tool is easy to use serves different stakeholders
- It identifies sites that provide the highest benefit based on available space, enough flow, good soil properties, etc.
- Enhanced modeling platform provides accurate flow prediction at the GI unit

Conclusions

- User friendly tool that can support decision making by different stakeholders during planning, outreach and design stage
- Defensible approach vs “Best Engineering Judgment”
- The tool saves time during both planning and design stages
- It identifies sites that provide the highest benefit based on available space, enough flow, good soil properties, etc.
- Modeling step provides accurate flow prediction at the GI unit



Thank You

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Imagine the result

