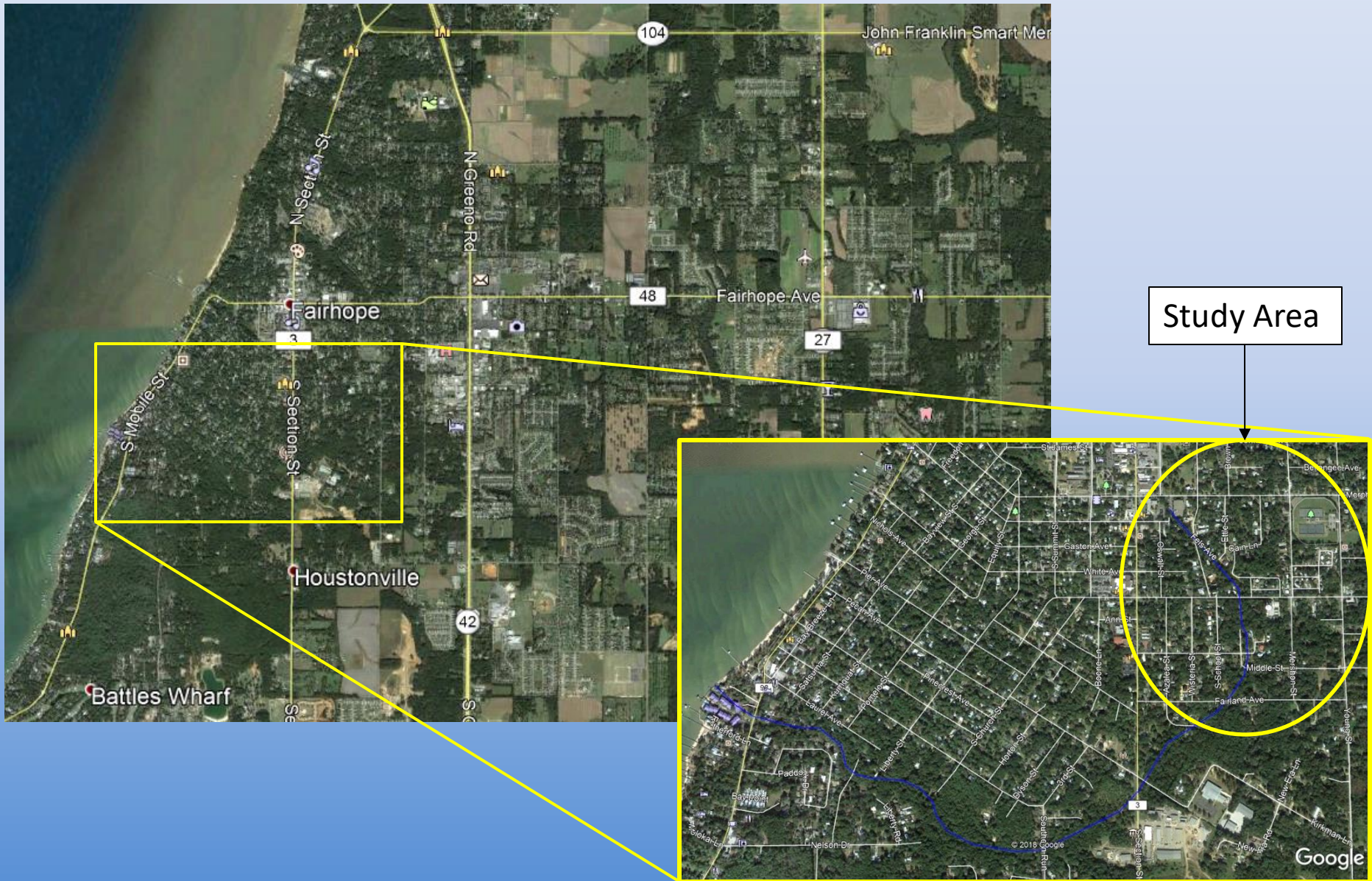


# Location Map – Tatumville Gully



# GSSHA Hydrologic Model

What is GSSHA?

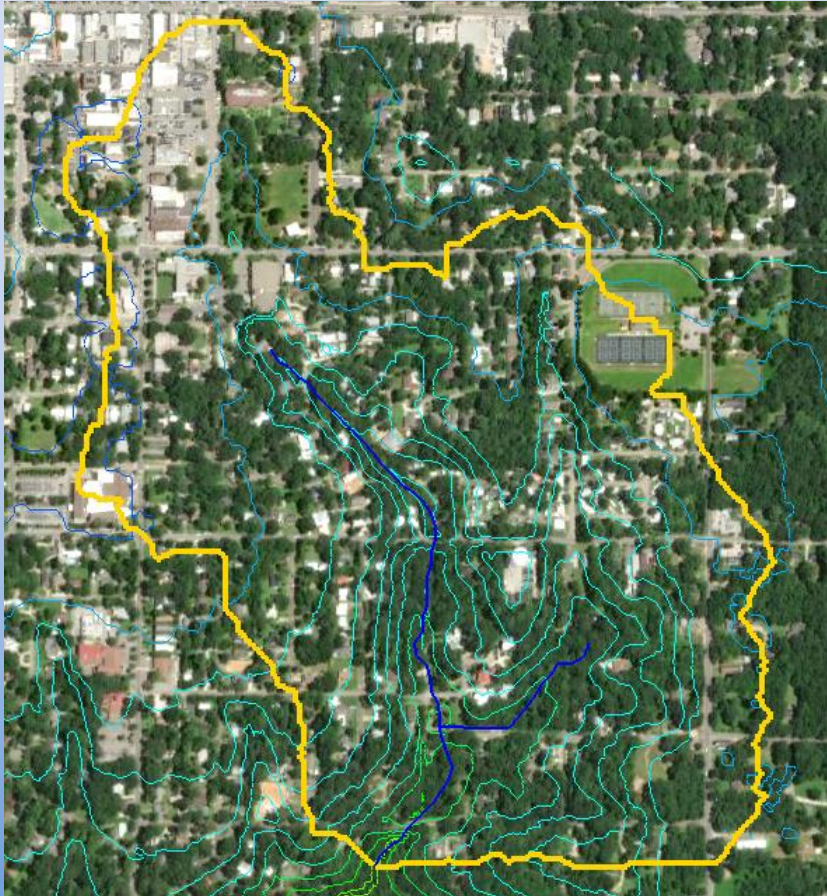
Gridded Surface Subsurface Hydrologic Analysis (GSSHA) is a physics-based, distributed, hydrologic, sediment and constituent fate and transport model.

Features include two dimensional (2-D) overland flow, 1-D stream flow, 1-D infiltration, 2-D groundwater, and full coupling between the groundwater, shallow soils, streams, and overland flow.

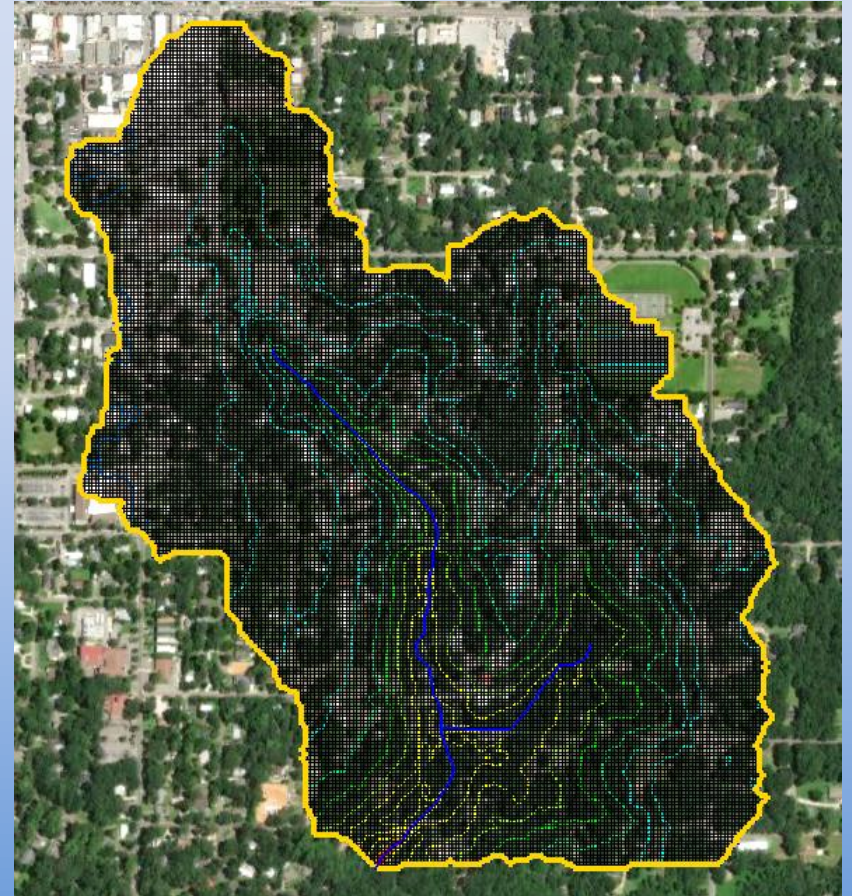
GSSHA was used for determining the timing and discharge down to Mershon Street, Middle Street and Fairland Avenue.



# GSSHA Hydrologic Model



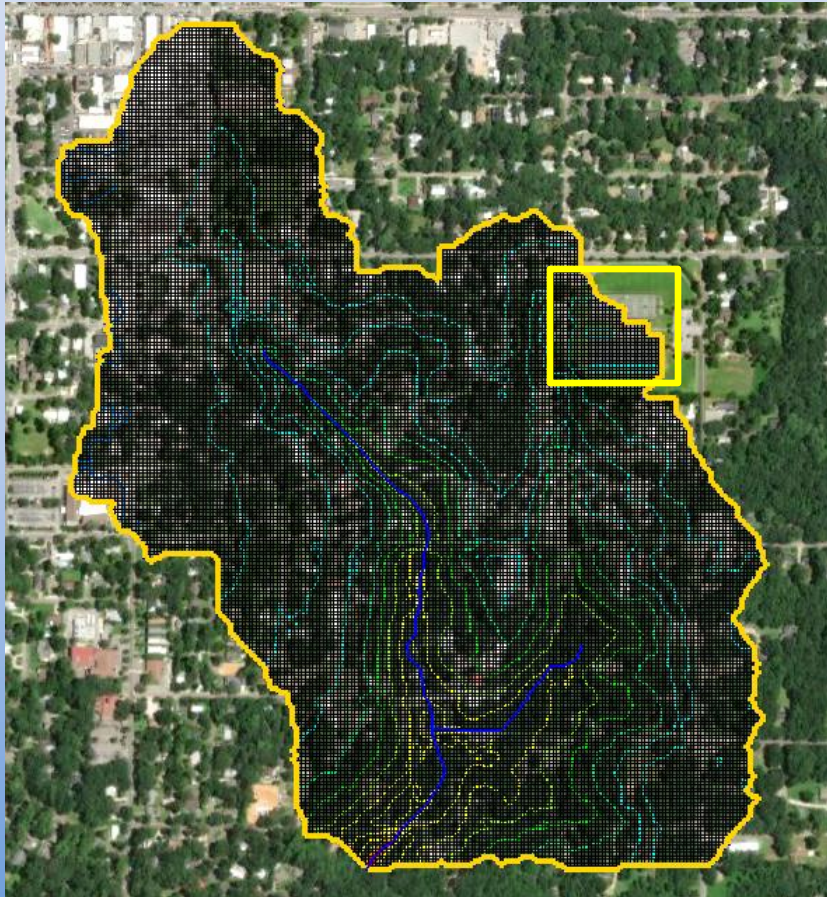
DRAINAGE AREA



GRIDDED GSSHA MODEL



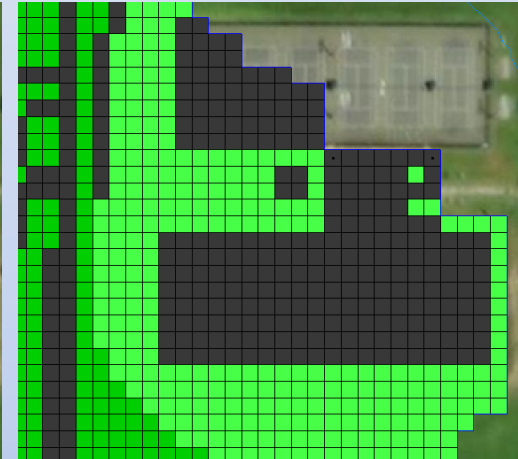
# GSSHA Hydrologic Model Gridded Components



GRIDDED GSSHA MODEL



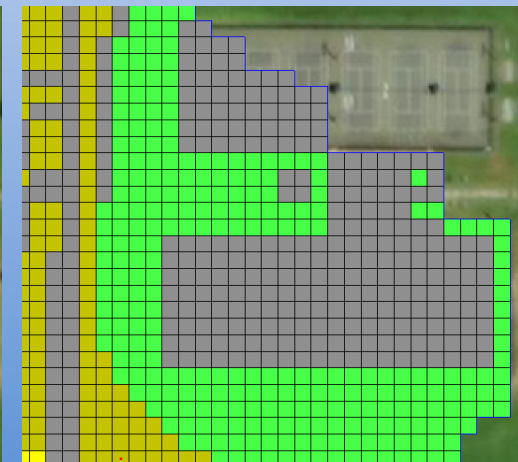
Gridded Model



Gridded Land Use



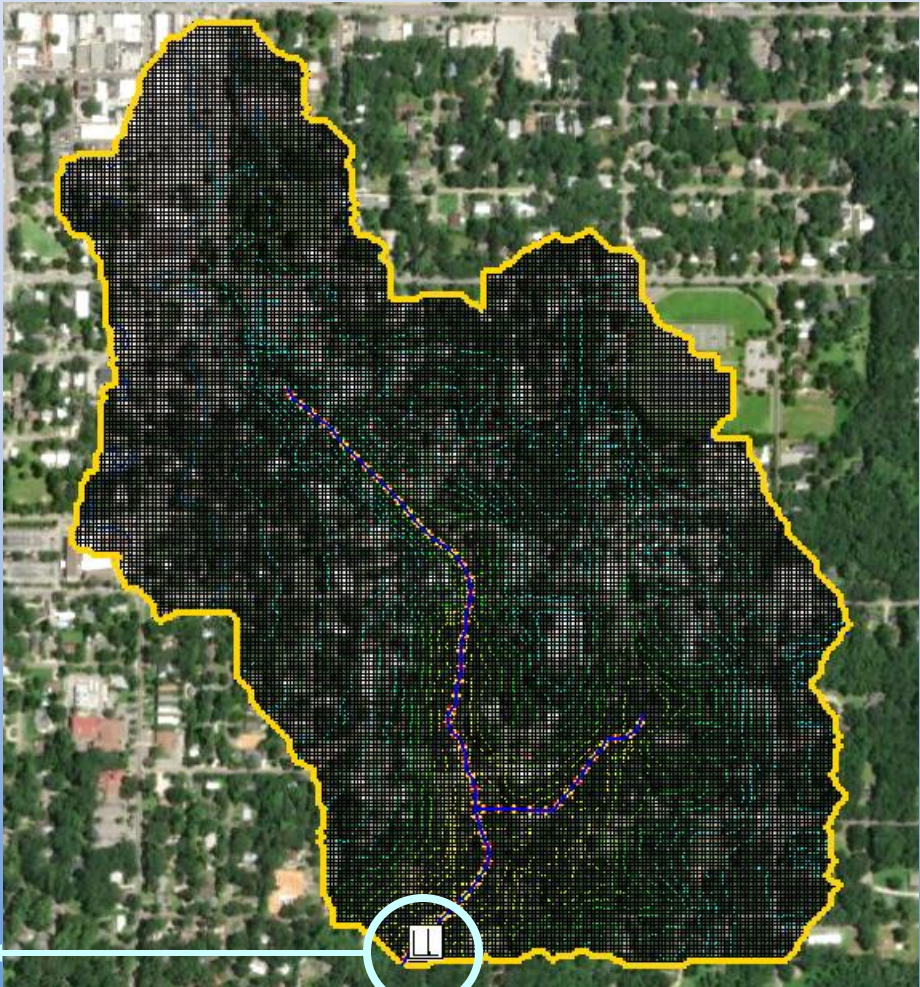
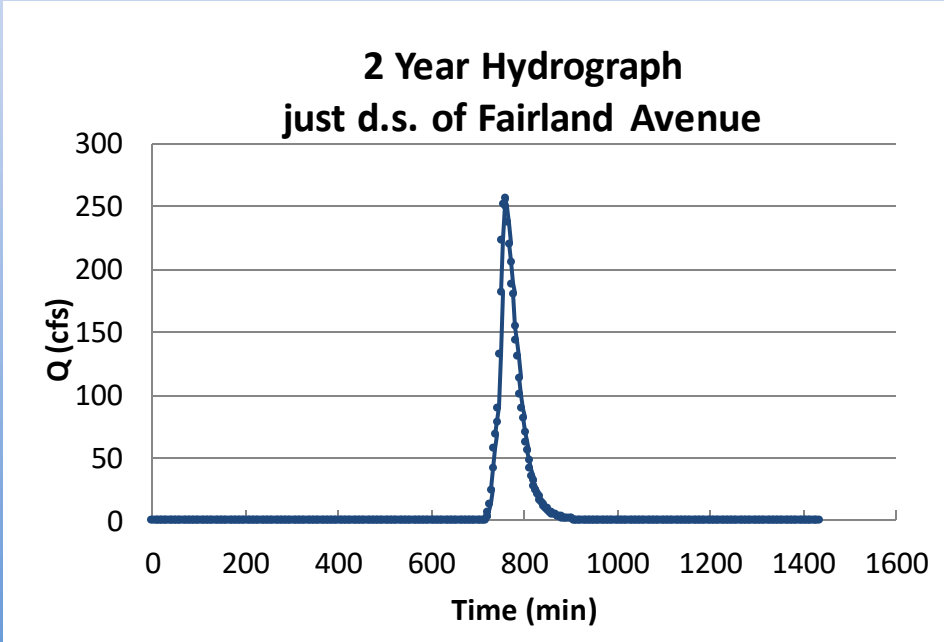
Gridded Soil Type



Gridded LU/ST Combined



# 2-Year Hydrograph (just downstream of Fairland Avenue)



# Land Use Changes Since 2009



Gridded Land Use 2009



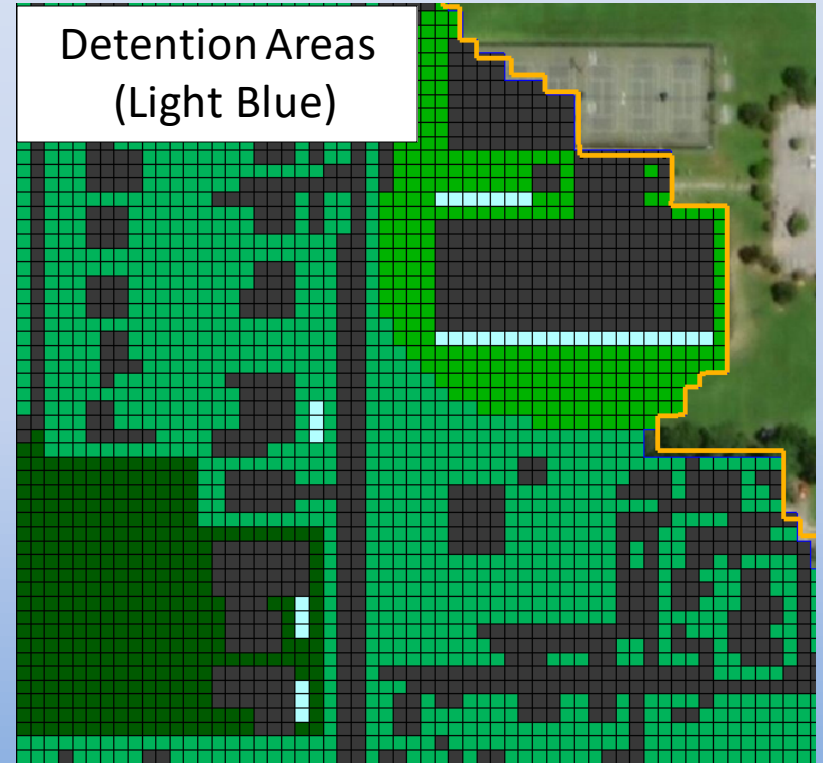
Gridded Land Use 2019

Changes in land use since 2009, indicated by modified land use grid cells

# Individual Home Detention Swales



Gridded Land Use 2019



Gridded Land Use 2019 with Graded Swales

Home detention swales (Approx 15' wide x 50' long x 3' deep)

North Tennis court detention swale (Approx 15' wide x 115' long x 3' deep)

South Tennis court detention swale (Approx 15' wide x 300' long x 3' deep)



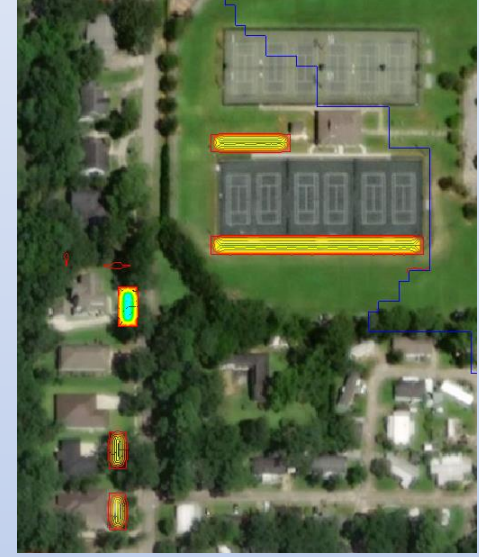
# Water Depth from 24 Hour Rain Event



11:00 am



12:00 pm



2:00 pm



5:00 pm



8:00 pm



11:00 pm

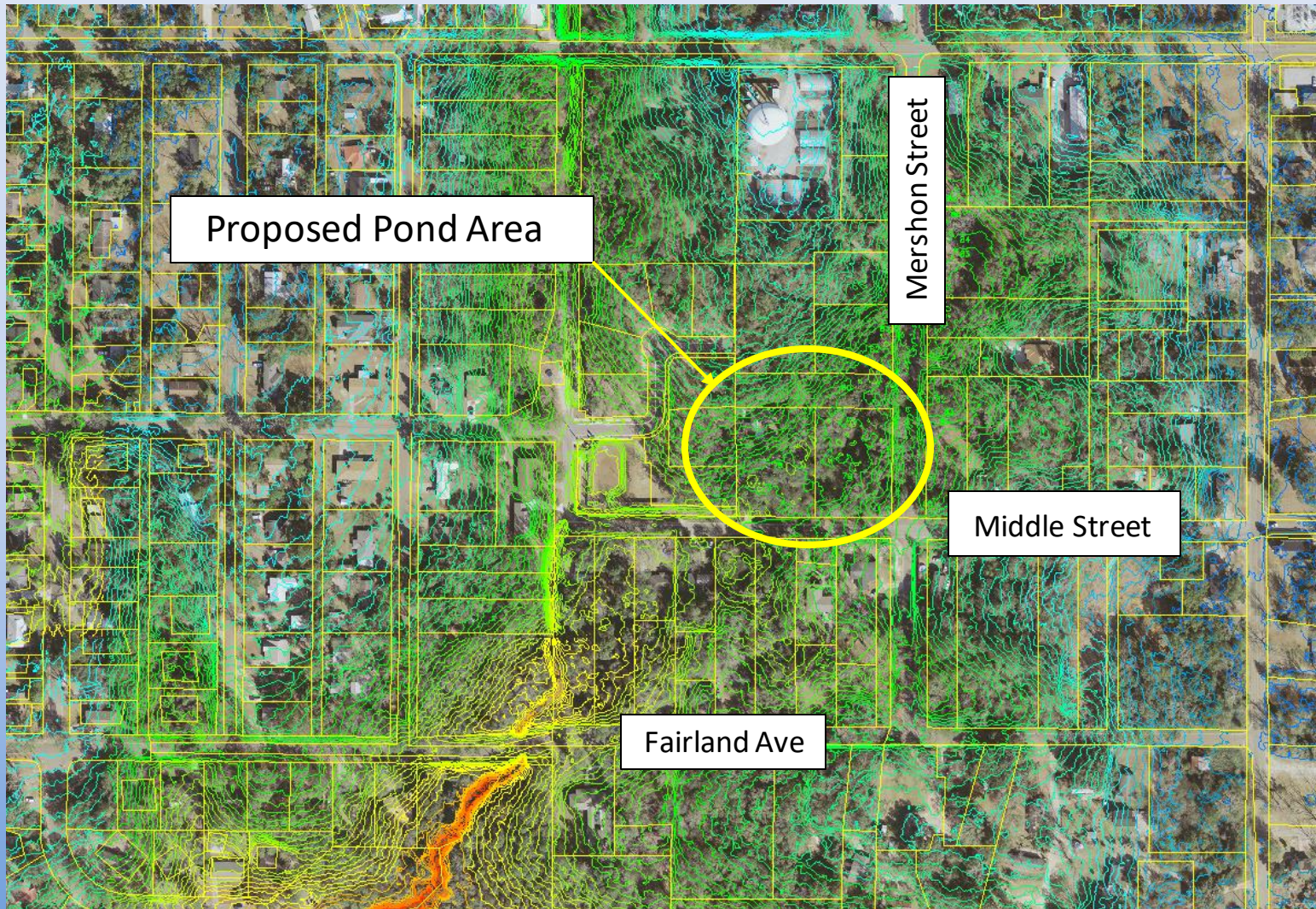


# Results from Implementing Detention Swales

Location	2009	2019	Detention Swales		
			3' Deep	2' Deep	1' Deep
	Q2 (cfs)	Q2 (cfs)	Q2 (cfs)	Q2 (cfs)	Q2 (cfs)
Mershon St	116.1	128.1	117.3	117.9	119.2
D.S of Fairfield Ave	248.9	258.6	251.2	252.1	252.7
	Q25 (cfs)	Q25 (cfs)	Q25 (cfs)	Q25 (cfs)	Q25 (cfs)
Mershon St	344.1	353.0	341.5	345.2	349.3
D.S of Fairfield Ave	716.0	727.3	719.3	721.7	724.8
	Q100 (cfs)	Q100 (cfs)	Q100 (cfs)	Q100 (cfs)	Q100 (cfs)
Mershon St	522.1	533.2	522.3	527.3	531.6
D.S of Fairfield Ave	1211.9	1219.5	1210.6	1215.4	1218.0

The addition of detention swales helps reduce peak discharges by holding water and letting the water infiltrate back into the ground

# Local stream erosion in watershed



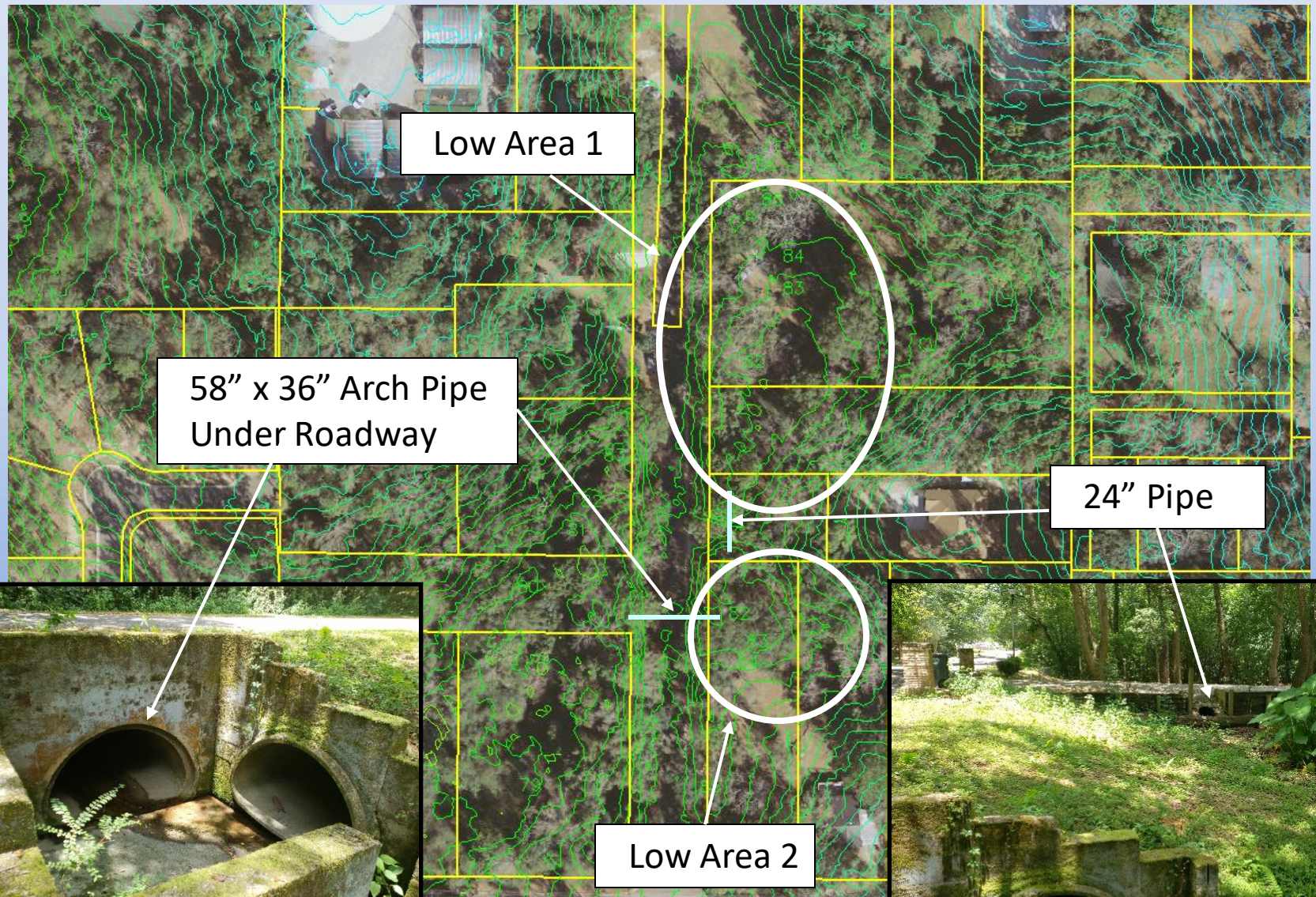
Stream erosion occurs in various areas throughout the watershed.

A detention pond at the corner of Mershon St and Middle St has been proposed to determine if it could provided any benefit.



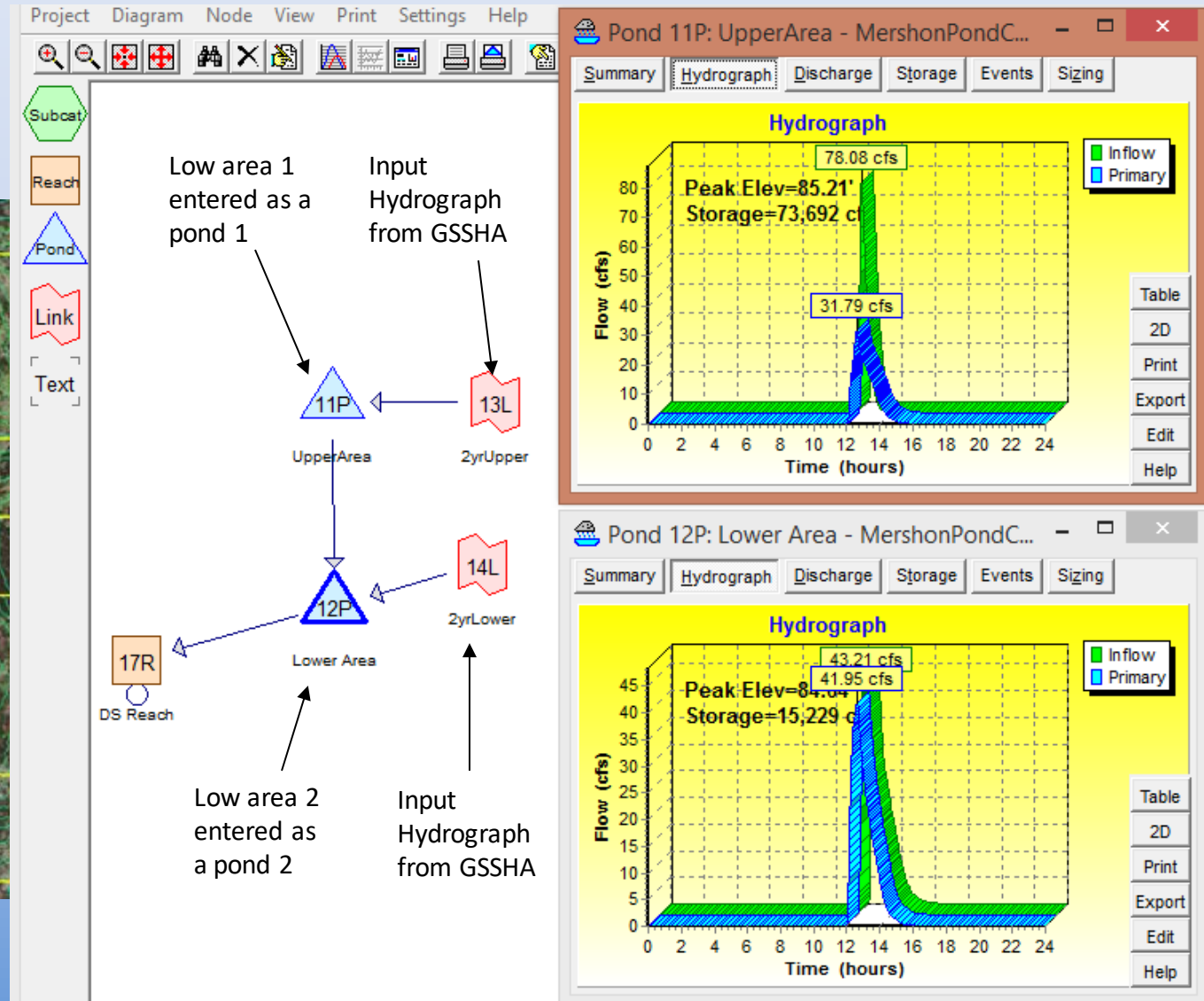
# Low Areas Providing Detention Upstream of Proposed Pond

An initial HydroCAD model of the existing conditions was created to incorporate two low areas upstream





# HydroCAD Model for Existing Conditions

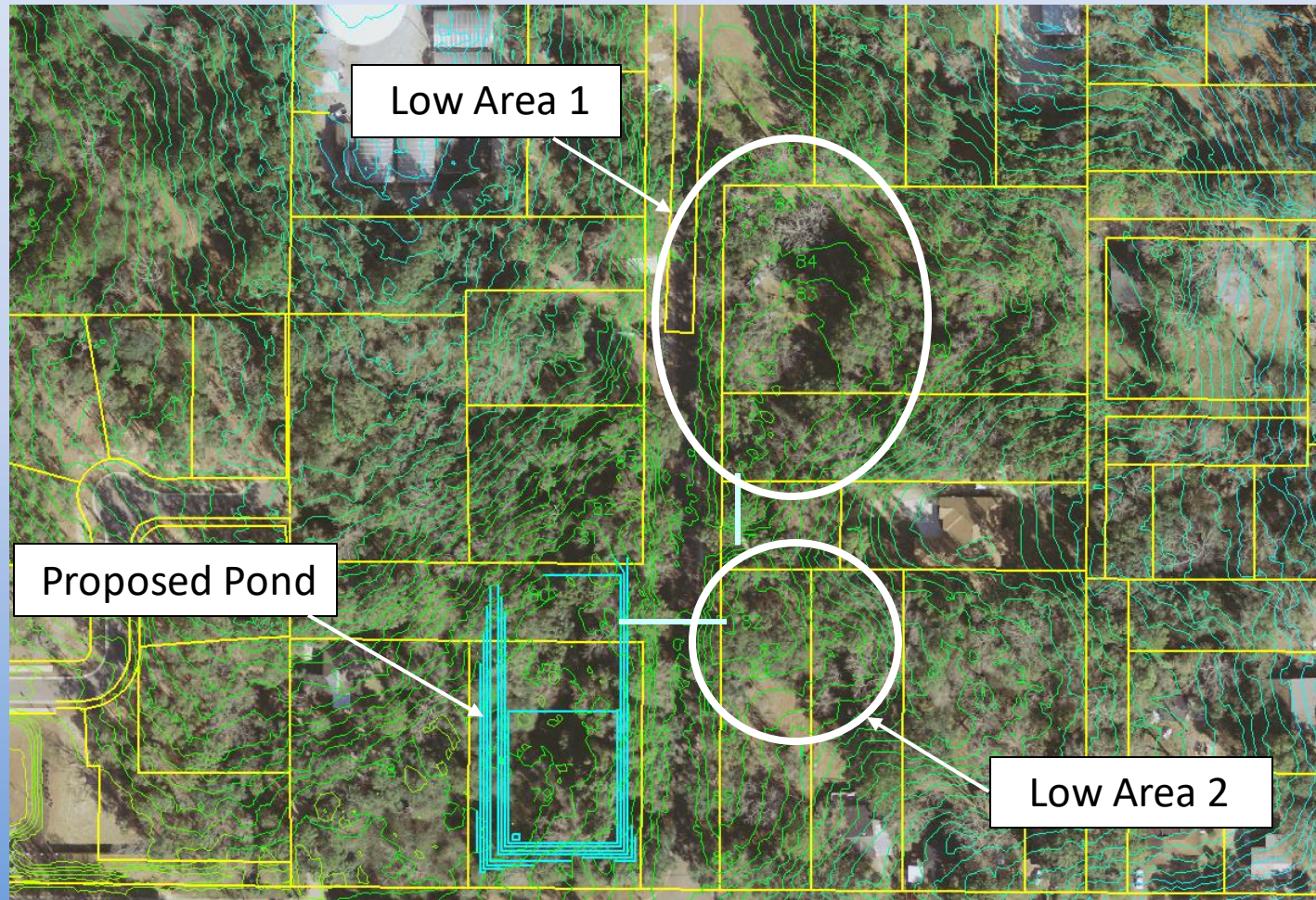


HydroCAD was used to model the low areas as detention areas in series

Inflow hydrographs were taken from the GSSHA hydrologic model

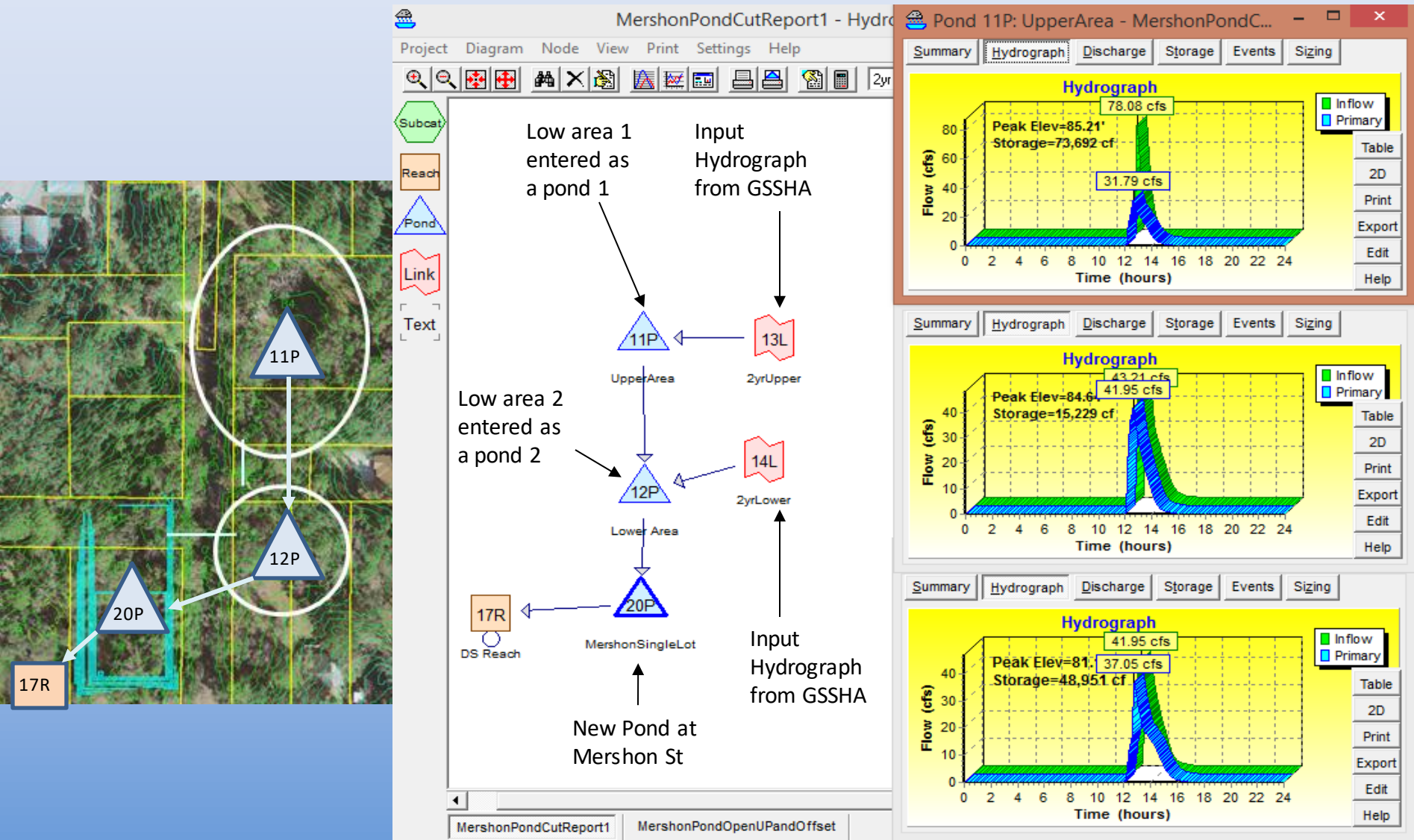


# Proposed Pond at Mershon St & Middle St



The initial proposed pond was contained mostly in the empty corner lot with some grading occurring within the property of the city

# HydroCAD Model for Initial Pond



HydroCAD was used to model the low areas as detention areas, along with the new pond  
Inflow hydrographs were taken from the GSSHA hydrologic model



# Results from Initial Mershon St Pond

## Existing Conditions

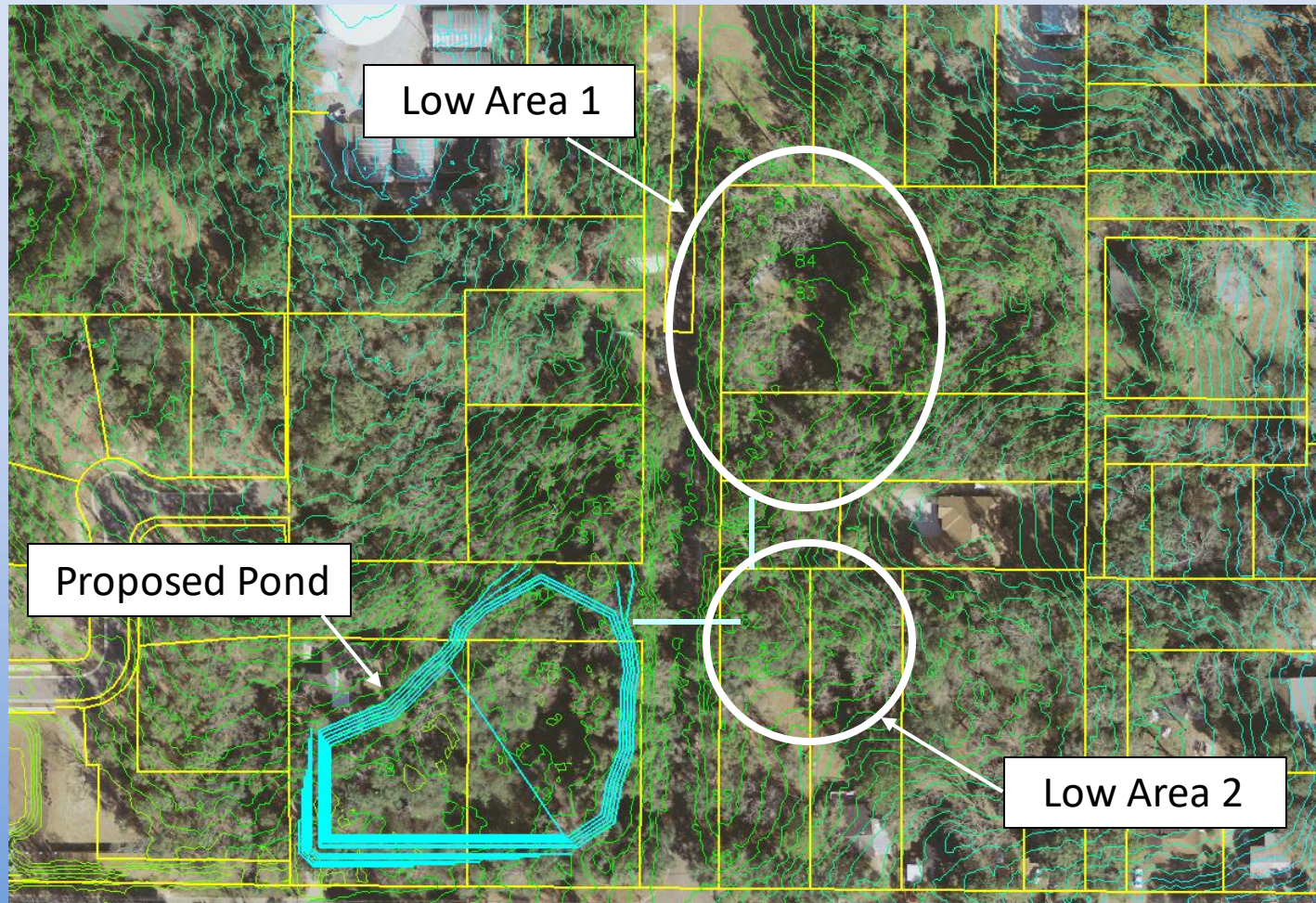
	LOW AREA 1				LOW AREA 2				D.S. Reach Flow Q (cfs)
	Pipe Size (in)	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	Pipe Size (in)	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	
2 year	24	78.1	33.4	85.36	58 x 36	45.6	42.3	84.65	42.2
25 year	24	163.9	133.9	86.35	58 x 36	190.5	189.5	86.29	189.4
100 year	24	209.8	201.0	86.55	58 x 36	318.0	317.5	86.47	317.5

The conceptual detention pond placed at the corner lot at Mershon St and Middle St provides very little reduction in peak discharges

## Single Lot Pond

Pipe (in)	MERSHON ST POND GRADED (SINGLE LOT)			D.S. Reach Flow Q (cfs)
	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	
24	42.3	34.6	81.15	34.5
24	189.5	186.2	81.71	186.1
24	317.5	313.7	82.03	313.6

# 2<sup>nd</sup> Proposed Pond at Mershon St & Middle St



The second proposed pond utilizes two lots and city property in order to provide more storage volume



# Results from Second Mershon St Pond

## Existing Conditions

	LOW AREA 1				LOW AREA 2				D.S. Reach Flow Q (cfs)
	Pipe Size (in)	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	Pipe Size (in)	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	
2 year	24	78.1	33.4	85.36	58 x 36	45.6	42.3	84.65	42.2
25 year	24	163.9	133.9	86.35	58 x 36	190.5	189.5	86.29	189.4
100 year	24	209.8	201.0	86.55	58 x 36	318.0	317.5	86.47	317.5

## Double Lot Pond

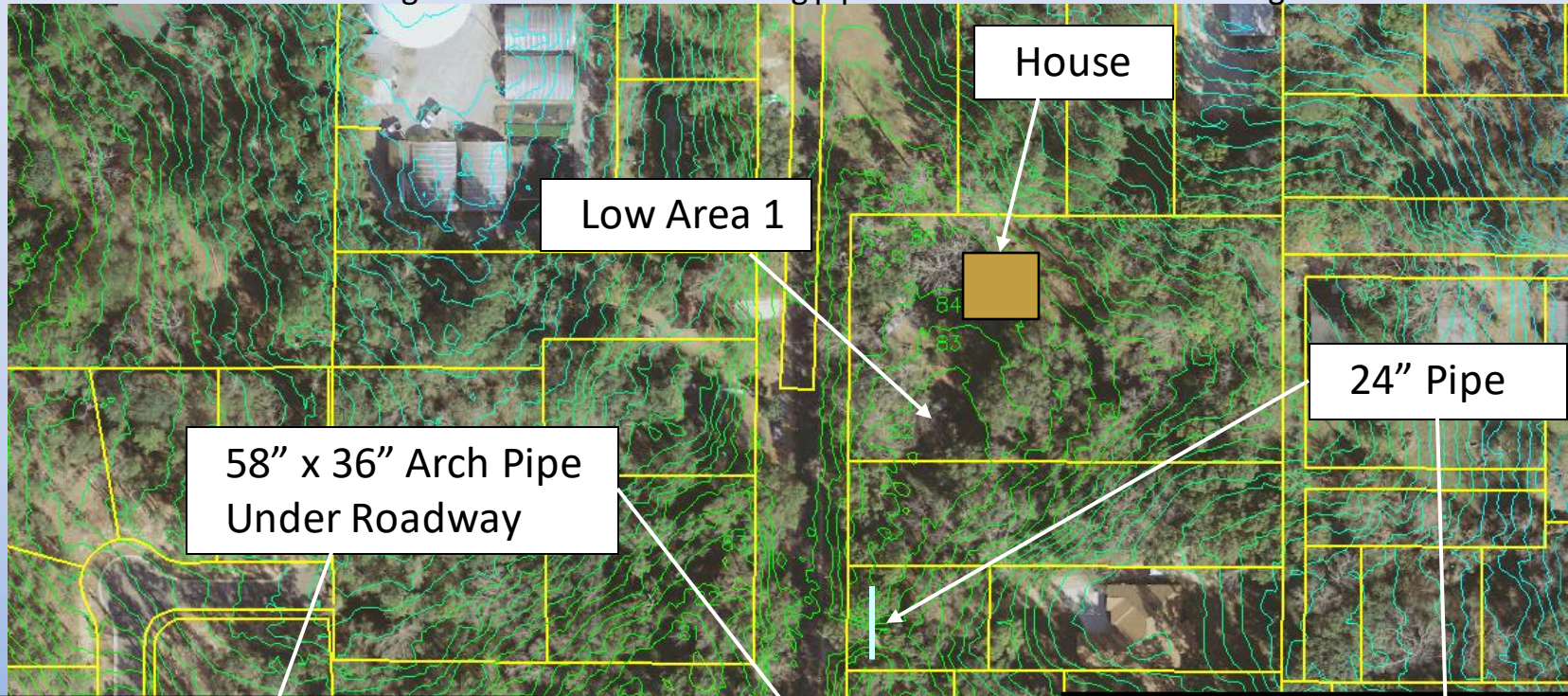
Pipe (in)	MERSHON ST POND GRADED (TWO LOTS)			D.S. Reach Flow Q (cfs)
	Inflow Q (cfs)	Routed Outflow Q (cfs)	Stage (ft)	
24	42.2	18.3	79.02	18.3
24	189.5	127.9	81.51	127.8
24	317.5	265.2	81.91	265.1

The second conceptual detention pond placed at the corner lot at Mershon St and Middle St provides reduction in peak discharges



# Possible Stage Reduction by Increasing Pipe Sizes

Due to the benefit of the second conceptual pond, it could possibly offset discharge increases from increasing pipe sizes in order to reduce stages





# Results from Second Mershon St Pond and increasing pipe sizes

## Existing Conditions

	LOW AREA 1				LOW AREA 2				D.S. Reach		NO POND				D.S. Reach
	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	Pipe (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	
2 yr	24	78.1	33.4	85.36	58 x 36	45.6	42.3	84.65	42.2	---	---	---	---	42.2	
25 yr	24	163.9	133.9	86.35	58 x 36	190.5	189.5	86.29	189.4	---	---	---	---	189.4	
100 yr	24	209.8	201.0	86.55	58 x 36	318.0	317.5	86.47	317.5	---	---	---	---	317.5	

## Increase Pipe Size under the Driveway

	LOW AREA 1 (INCREASE PIPE SIZE)				LOW AREA 2				D.S. Reach		MERSHON ST POND GRADED (TWO LOTS)				D.S. Reach
	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	Pipe (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	
2 yr	58 x 36	78.1	34.2	85.09	58 x 36	46.9	45.9	84.74	45.9	24	45.9	21.2	79.39	21.2	
25 yr	58 x 36	163.9	132.1	86.34	58 x 36	187.6	186.6	86.28	186.5	24	186.6	127.7	81.51	127.6	
100 yr	58 x 36	209.8	200.0	86.54	58 x 36	316.0	315.2	86.46	315.1	24	315.2	264.2	81.90	264.2	

## Increase Pipe Size under the Driveway and Mershon Street

	LOW AREA 1 (INCREASE PIPE SIZE)				LOW AREA 2 (INCREASE PIPE SIZE)				D.S. Reach		MERSHON ST POND GRADED (TWO LOTS)				D.S. Reach
	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Pipe Size (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	Pipe (in)	Inflow Q(cfs)	Routed Outflow Q(cfs)	Stage (ft)	Flow Q(cfs)	
2 yr	58 x 36	78.1	42.2	84.66	(2) 58 x 36	58.0	57.0	84.07	57.0	24	57.0	23.7	79.78	23.7	
25 yr	58 x 36	163.9	128.8	85.98	(2) 58 x 36	190.6	180.9	85.8	180.9	24	180.9	155.6	81.6	155.6	
100 yr	58 x 36	209.8	191.0	86.40	(2) 58 x 36	297.1	295.4	86.29	295.2	24	295.4	265.4	81.91	265.4	

The second conceptual pond placed at the corner lot at Mershon St and Middle St can offset increases in discharge