Urban Hydrology Modeling Using GIS

Victor de Loza

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Santa Clara Valley Water District

Thursday, July 11, 2013

ABOUT ME

Education :
B.S. Civil Engineering and Environmental Design,
San Jose State University (May 2013)

Professional Experience:
Civil Engineering Intern,
The Santa Clara Valley Water District (01/2013 – Present)

Environmental Engineering Intern,
Life Technologies - Applied Biosystems (05/2009 – 05/2011)

Career Interests:
Hydraulic Modeling, Flood Protection, Applications of GIS tools to Engineering problems.

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OVERVIEW

- SYSTEM WORKFLOW
- URBAN VS RURAL HYDROLOGY
- PROJECT LOCATION
- APPLICATION OF GIS TOOLS
- HYDROLOGIC MODELING SYSTEM (HEC-HMS)
- Storm Water Management Model (SWMM)
- PRELIMINARY RESULTS

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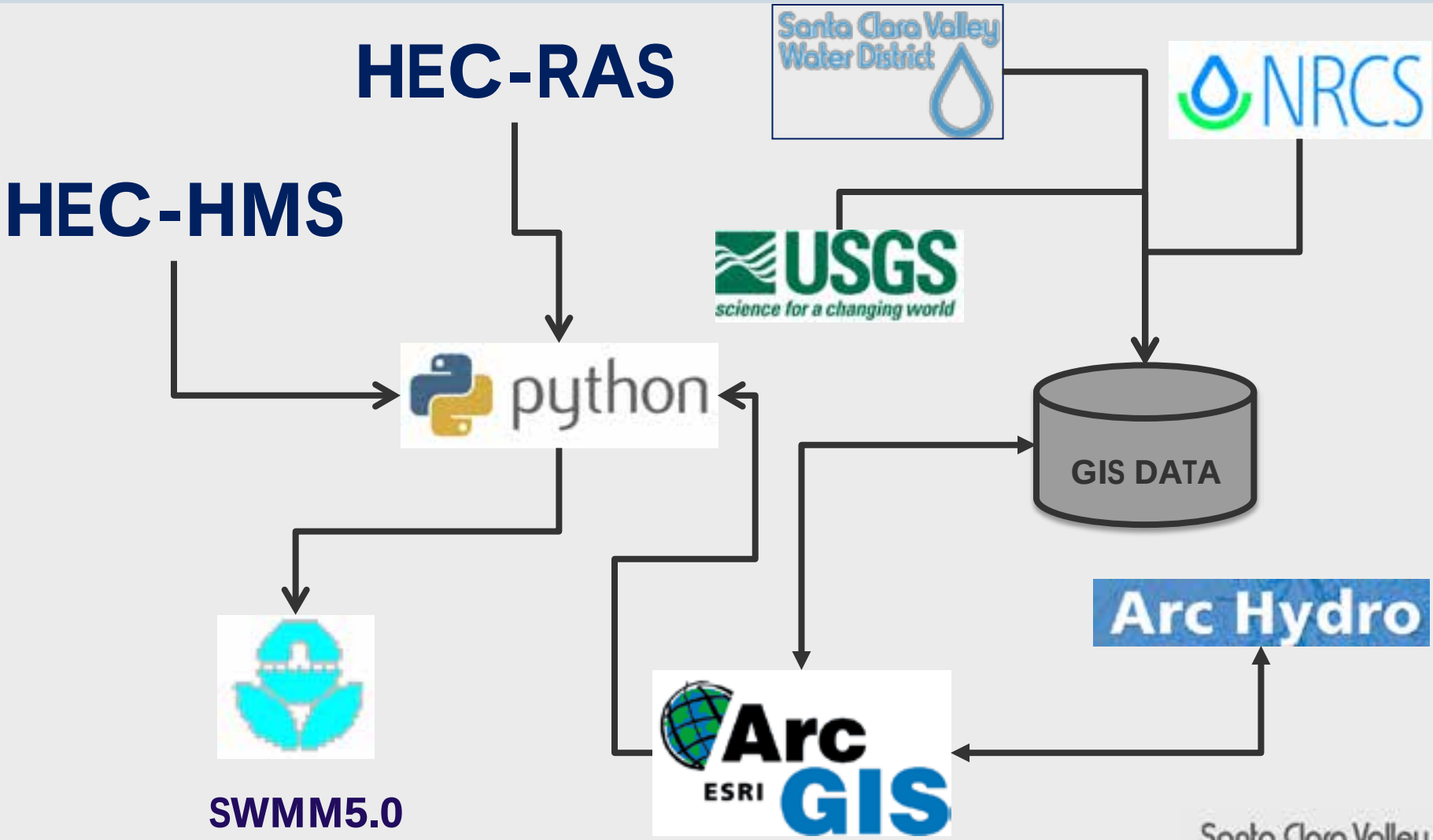
SYSTEM WORKFLOW



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URBAN VS RURAL HYDROLOGY

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URBAN VS RURAL HYDROLOGY

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PROJECT LOCATION

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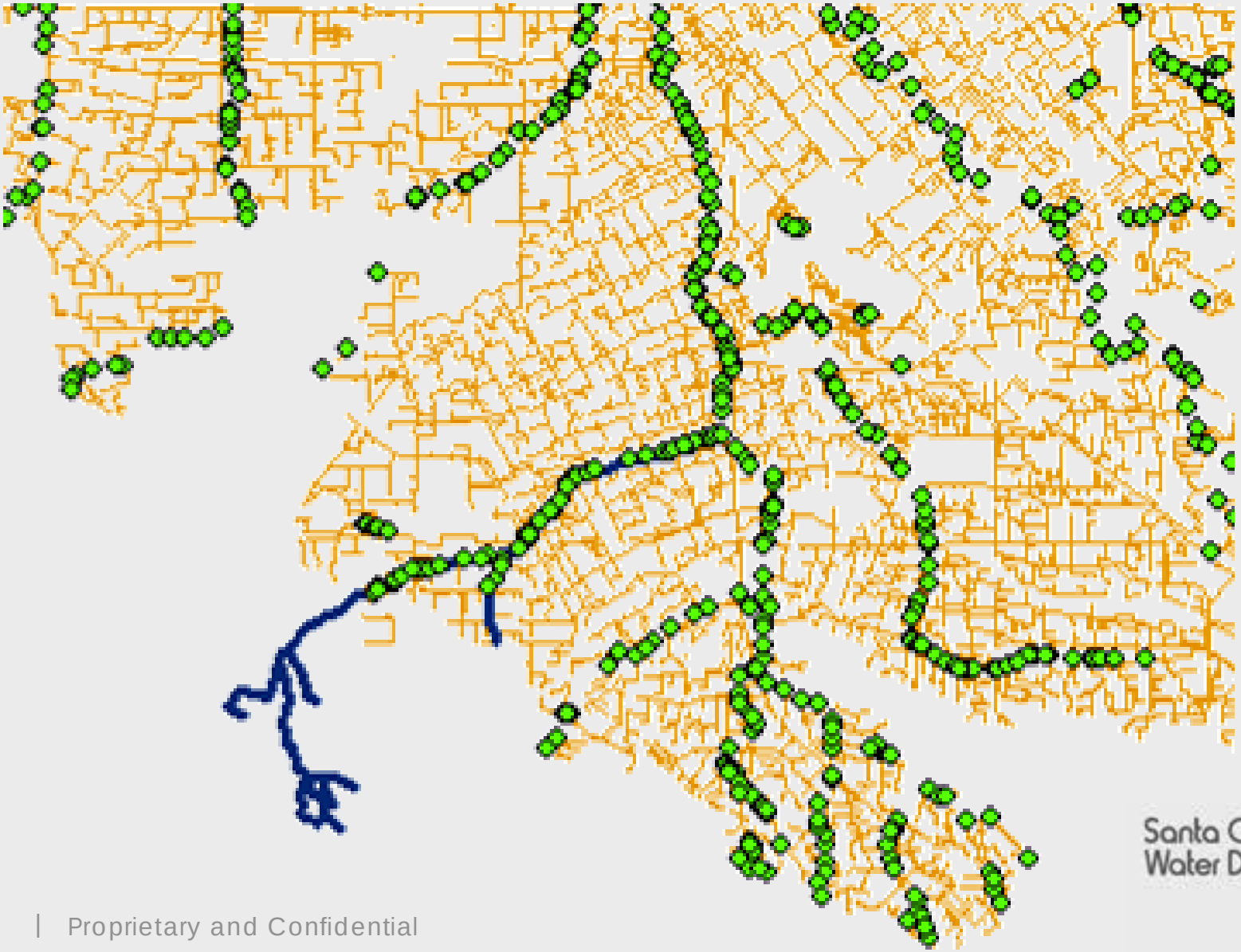
APPLICATION OF GIS TOOLS

SUBCATCHMENT FOOTPRINT



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APPLICATION OF GIS TOOLS

SUBCATCHMENT FOOTPRINT

Table

STM_OUTFALL

FID	Shape *	STM_OUTFAL	COMPKEY	COMPTYPE	PCD_TYPE	PCD_MANUFA	STATUS	FLAPGATE_B	AGENCY	OWNER	WATERWAY	MAJOR_WATE
55	Point ZM	405	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
56	Point ZM	408	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
609	Point ZM	244	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
610	Point ZM	245	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
611	Point ZM	246	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
614	Point ZM	252	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
615	Point ZM	253	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
616	Point ZM	254	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
617	Point ZM	257	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
687	Point ZM	1004	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
748	Point ZM	420	0	67			EXISTING			San Jose	Ross Creek	Guadalupe River
888	Point ZM	280	0	67			EXISTING	Waterman		San Jose	Ross Creek	Guadalupe River

882 (1 out of 1212 Selected)

STM_OUTFALL STM_MAIN_VW

Table

STM_MAIN_VW

FID	Shape	STM_MAIN_B	STM_MAIN_D	COMPKEY	COMPTYPE	OUTFALL_ID	OUTFALL_GR	UPSTR_ASSE	UPSTR_ASS1	UPSTR_INVE	UPSTR_INV1	DOWNSTR_AS	DO
1287	Polyline	14465	14465	0	31	245	0	Manhole	17838	169.8	0	Manhole	
1287	Polyline	14466	14466	0	31	245	0	Manhole	17839	169.17	0	Manhole	
1288	Polyline	14467	14467	0	31	245	0	Manhole	17836	171.36	0	Manhole	
1288	Polyline	14469	14469	0	31	245	0	Manhole	17841	176.11	0	Manhole	
1288	Polyline	14470	14470	0	31	245	0	Manhole	17842	177.3	0	Manhole	
1288	Polyline	14471	14471	0	31	245	0	Manhole	17843	175.15	0	Manhole	
1288	Polyline	14472	14472	0	31	245	0	Manhole	17844	176.61	0	Manhole	
1288	Polyline	14473	14473	0	31	287	0	Manhole	17845	178.17	0	Manhole	
1288	Polyline	14474	14474	0	31	287	0	Manhole	17846	178.95	0	Manhole	
1288	Polyline	14475	14475	0	31	287	0	Manhole	17847	179.84	0	Manhole	
1288	Polyline	14476	14476	0	31	287	0	Manhole	17848	180.57	0	Manhole	
1288	Polyline	14477	14477	0	31	287	0	Manhole	17849	180.98	0	Manhole	

0 (7 out of 30714 Selected)

STM_OUTFALL STM_MAIN_VW

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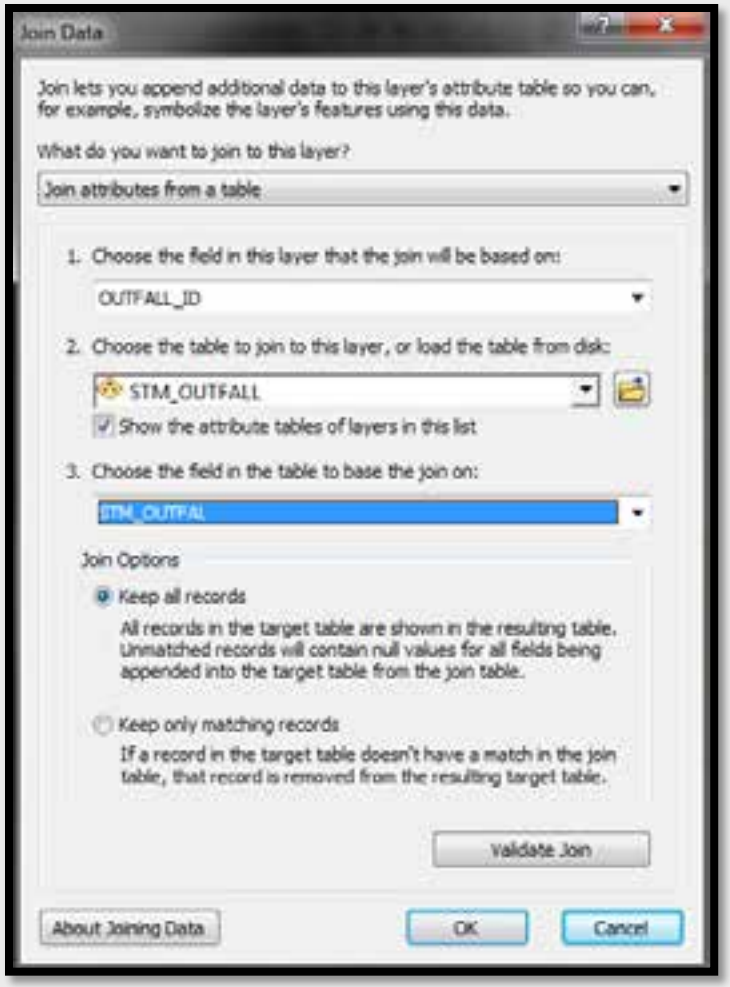
APPLICATION OF GIS TOOLS

SUBCATCHMENT FOOTPRINT



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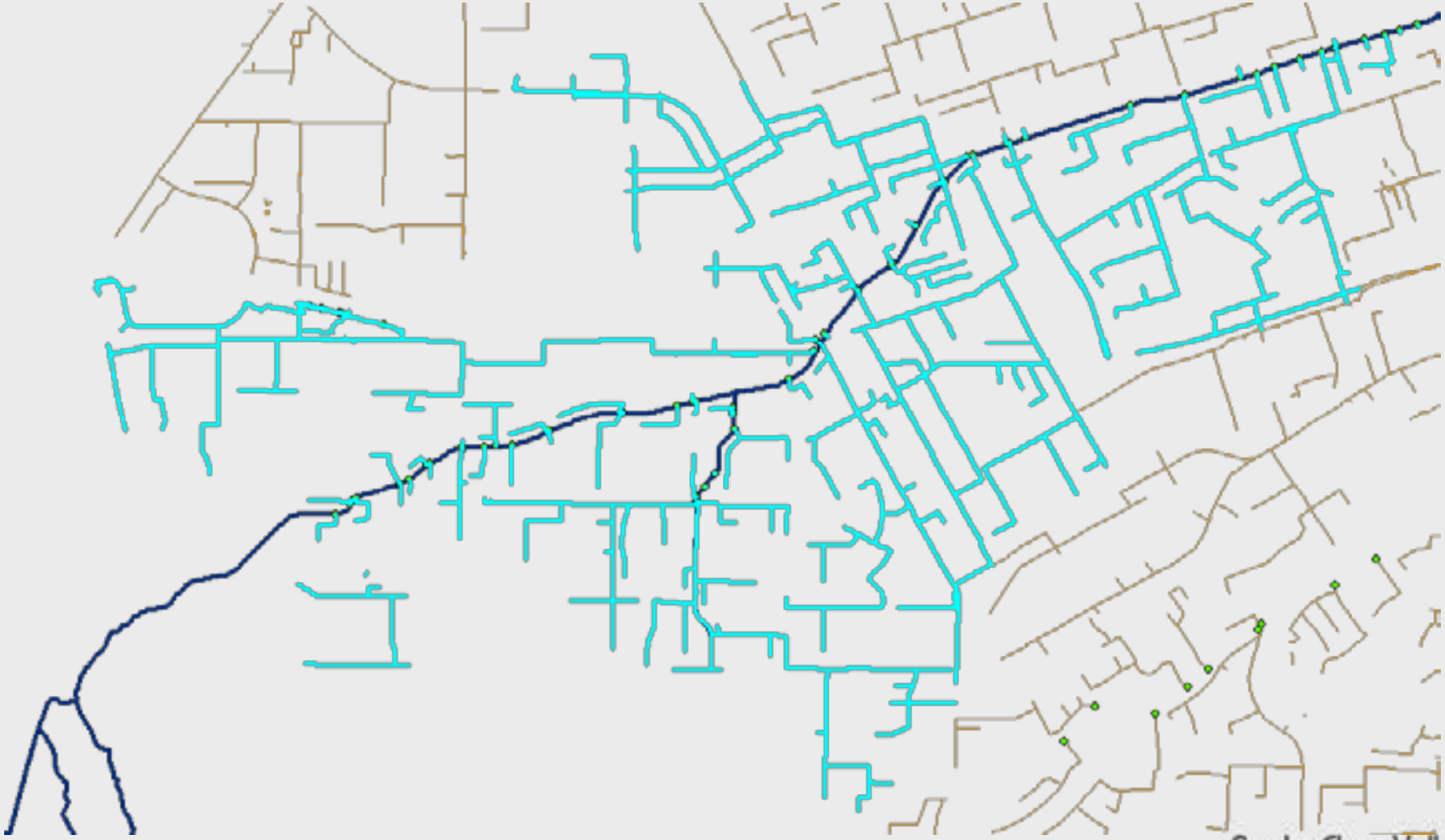
SUBCATCHMENT FOOTPRINT



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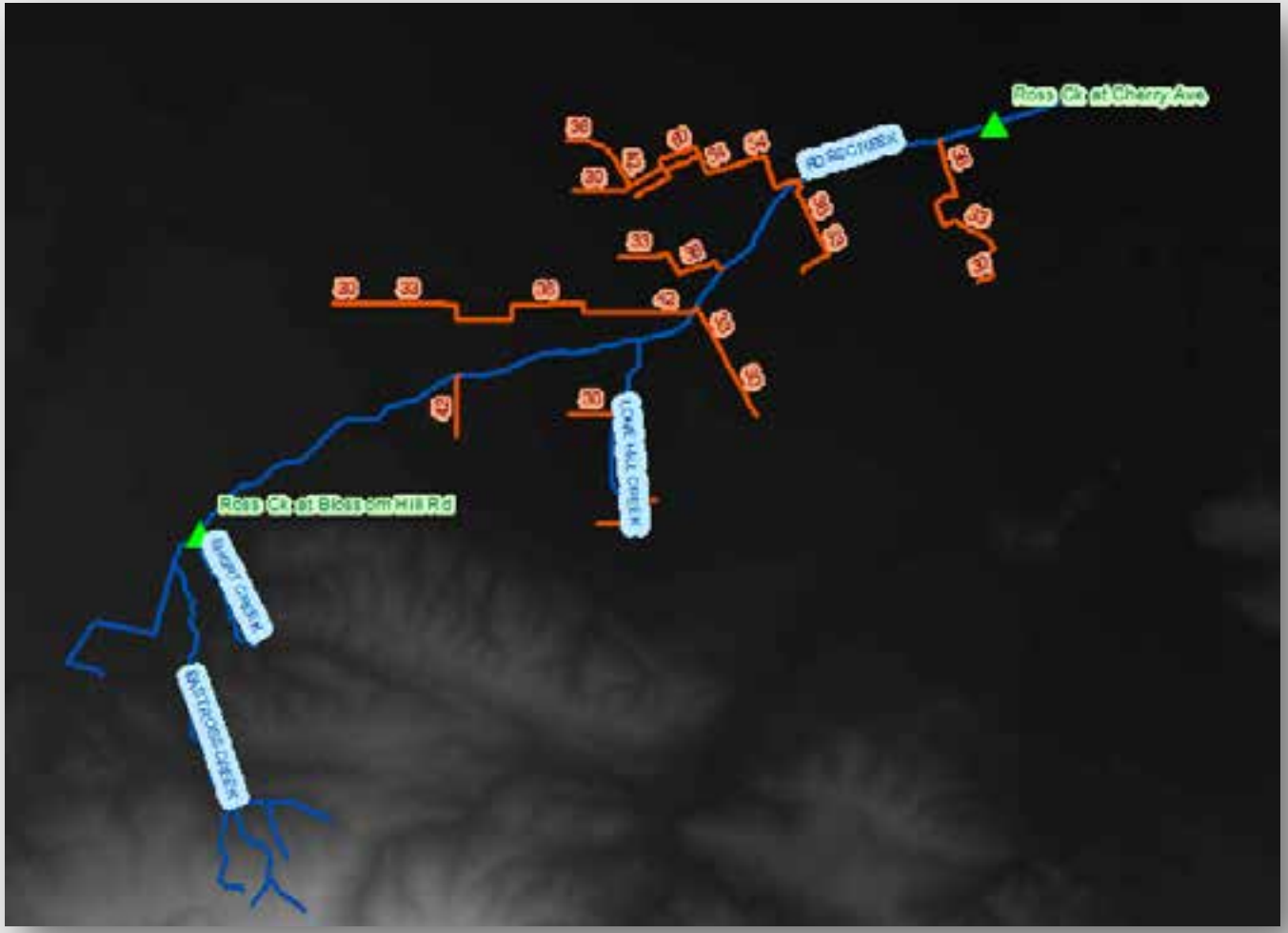
APPLICATION OF GIS TOOLS

ARCHYDRO – AGREE DEM



APPLICATION OF GIS TOOLS

ARCHYDRO – AGREE DEM

Original DEM

Reconditioned DEM

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APPLICATION OF GIS TOOLS

ARCHYDRO – SUBCATCHMENT DELINEATION

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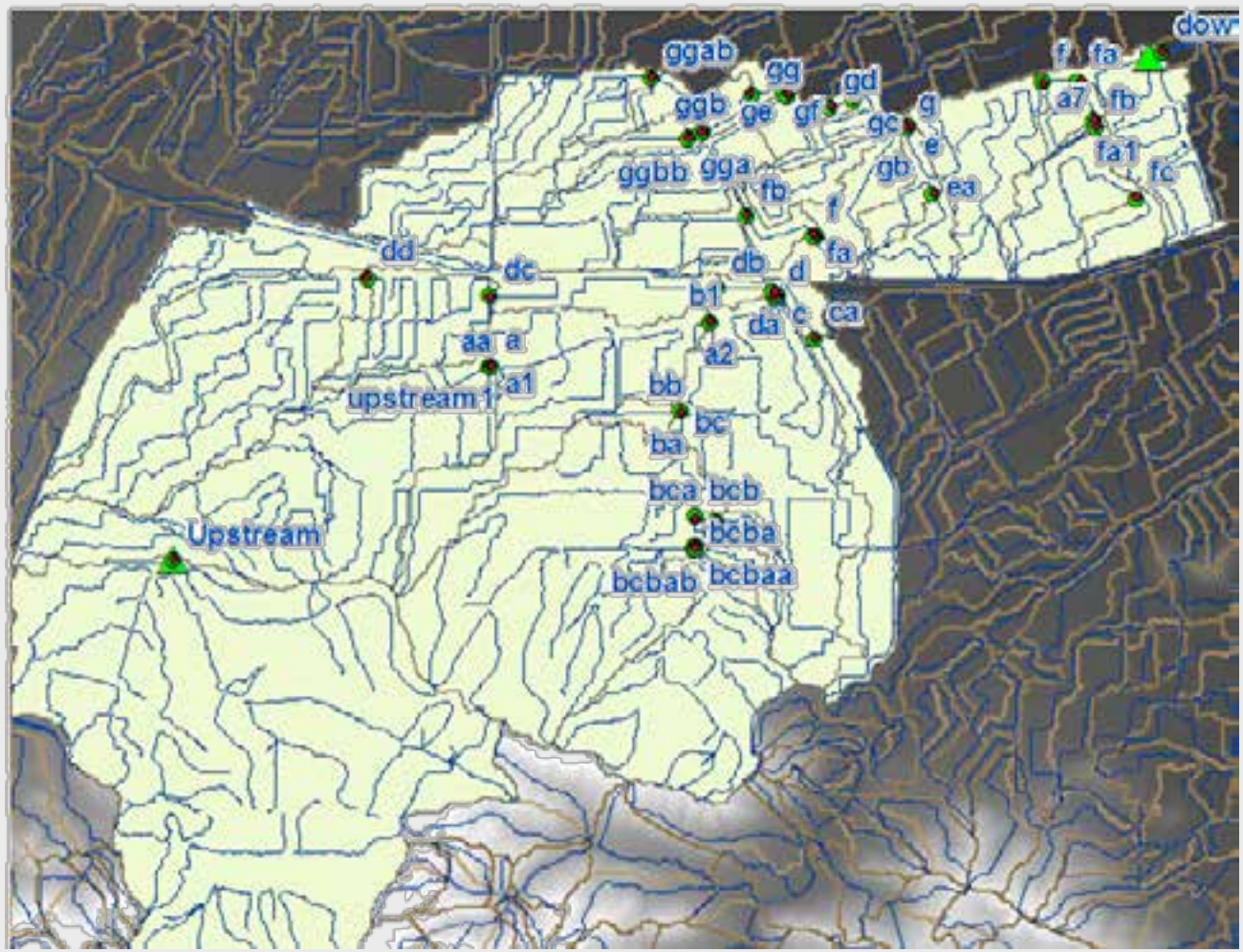
APPLICATION OF GIS TOOLS

ARCHYDRO – SUBCATCHMENT DELINEATION



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APPLICATION OF GIS TOOLS

ARCHYDRO – SUBCATCHMENT DELINEATION

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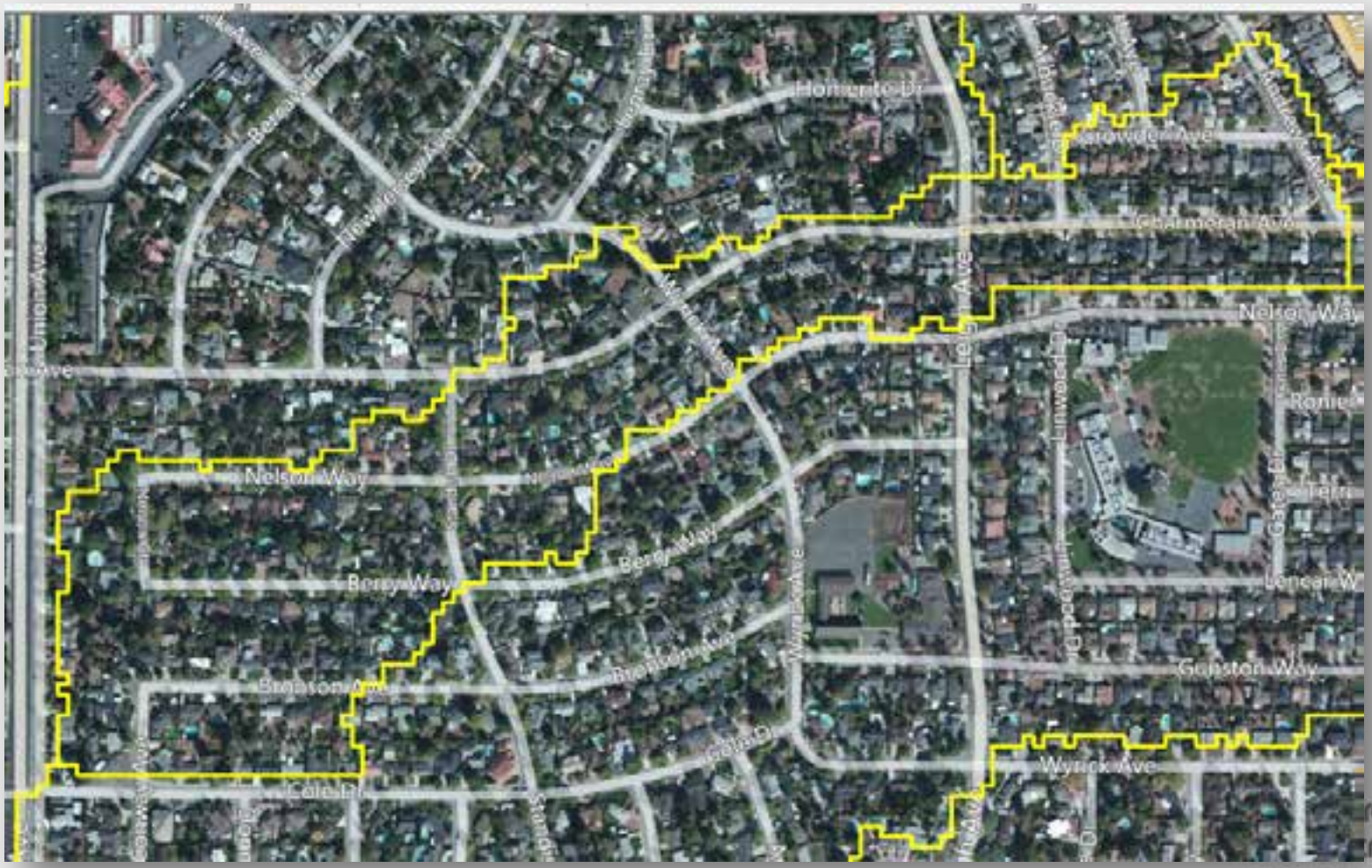
APPLICATION OF GIS TOOLS

TOPOLOGY



APPLICATION OF GIS TOOLS

ARCHYDRO – AGREE DEM

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APPLICATION OF GIS TOOLS

ARCHYDRO – AGREE DEM

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APPLICATION OF GIS TOOLS

TOPOLOGY

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APPLICATION OF GIS TOOLS

SPATIAL ANALYST

Soil Data (NRCS)

Land Coverage 2006 (USGS)

Impervious Areas 2006 (USGS)

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APPLICATION OF GIS TOOLS

SPATIAL ANALYST

IMP2006 (USGS)

LULC2006 (USGS)

Soil Data (NRCS)

AOI

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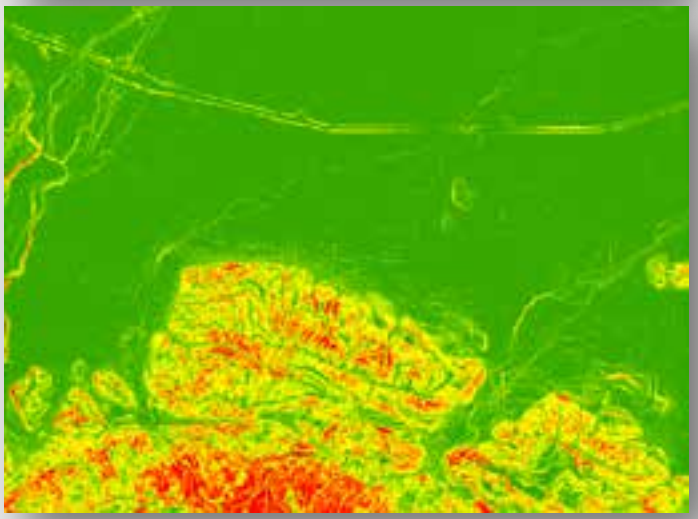
APPLICATION OF GIS TOOLS

SPATIAL ANALYST

Area of Interest as *Zone*

Percent Slope Raster as *Value Raster*



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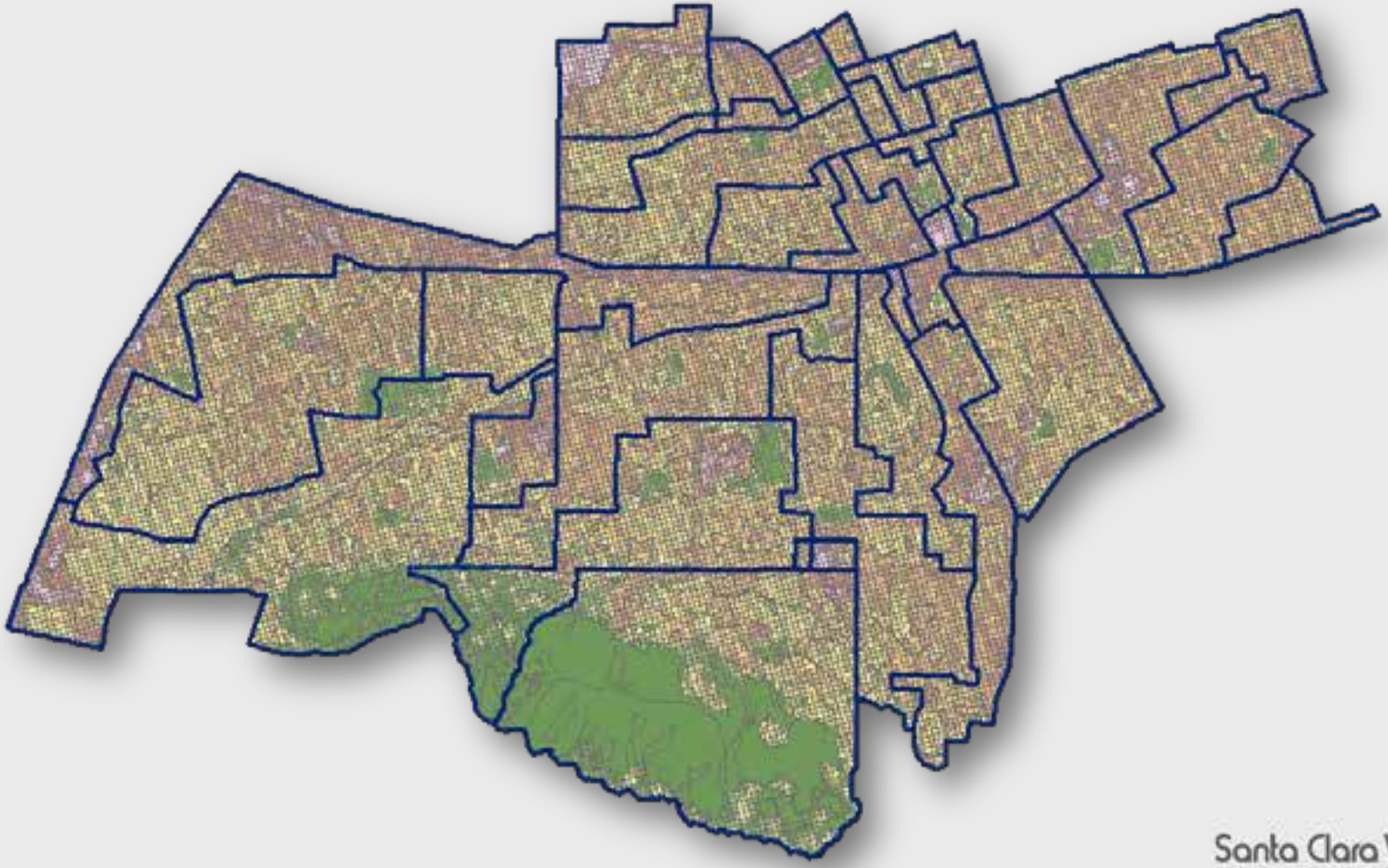
APPLICATION OF GIS TOOLS

RESULT



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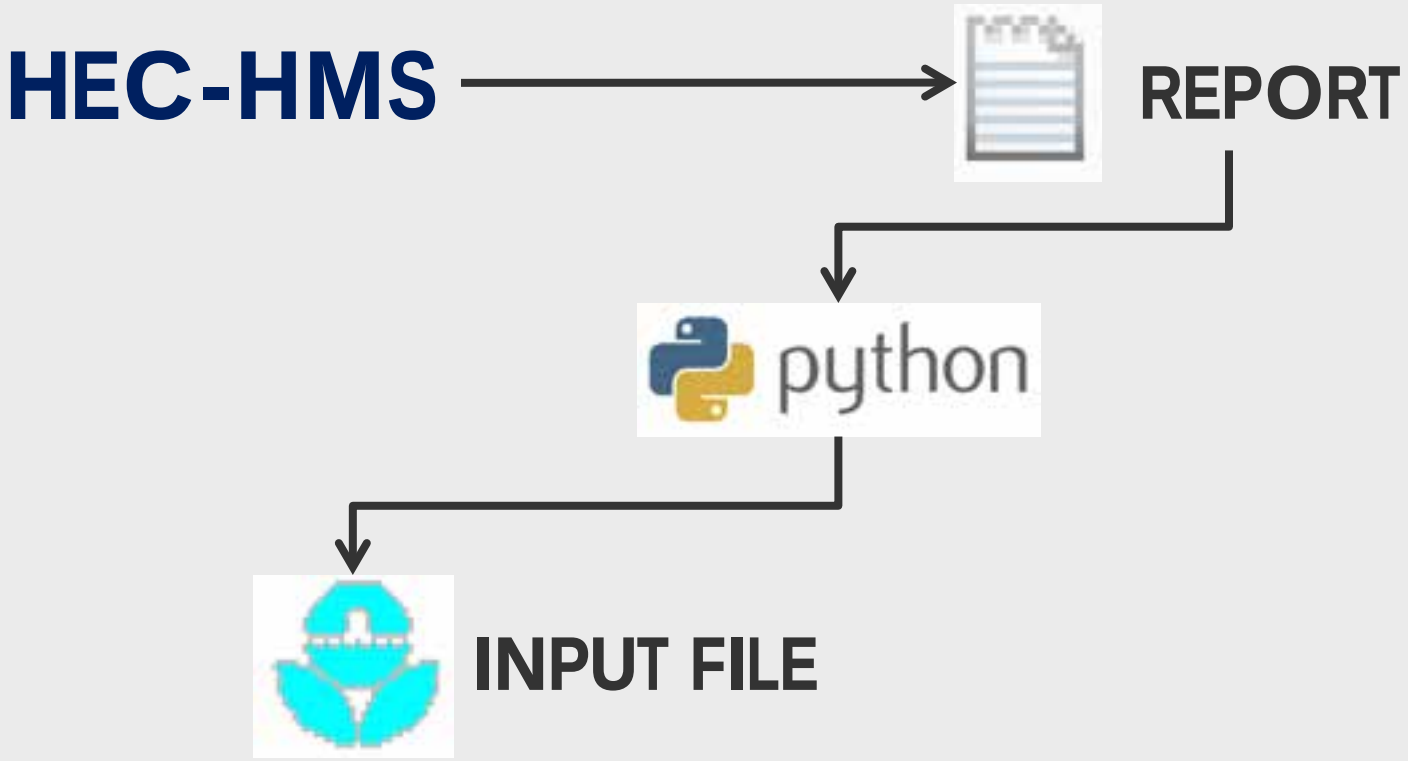
HEC-HMS to SWMM INTEGRATION



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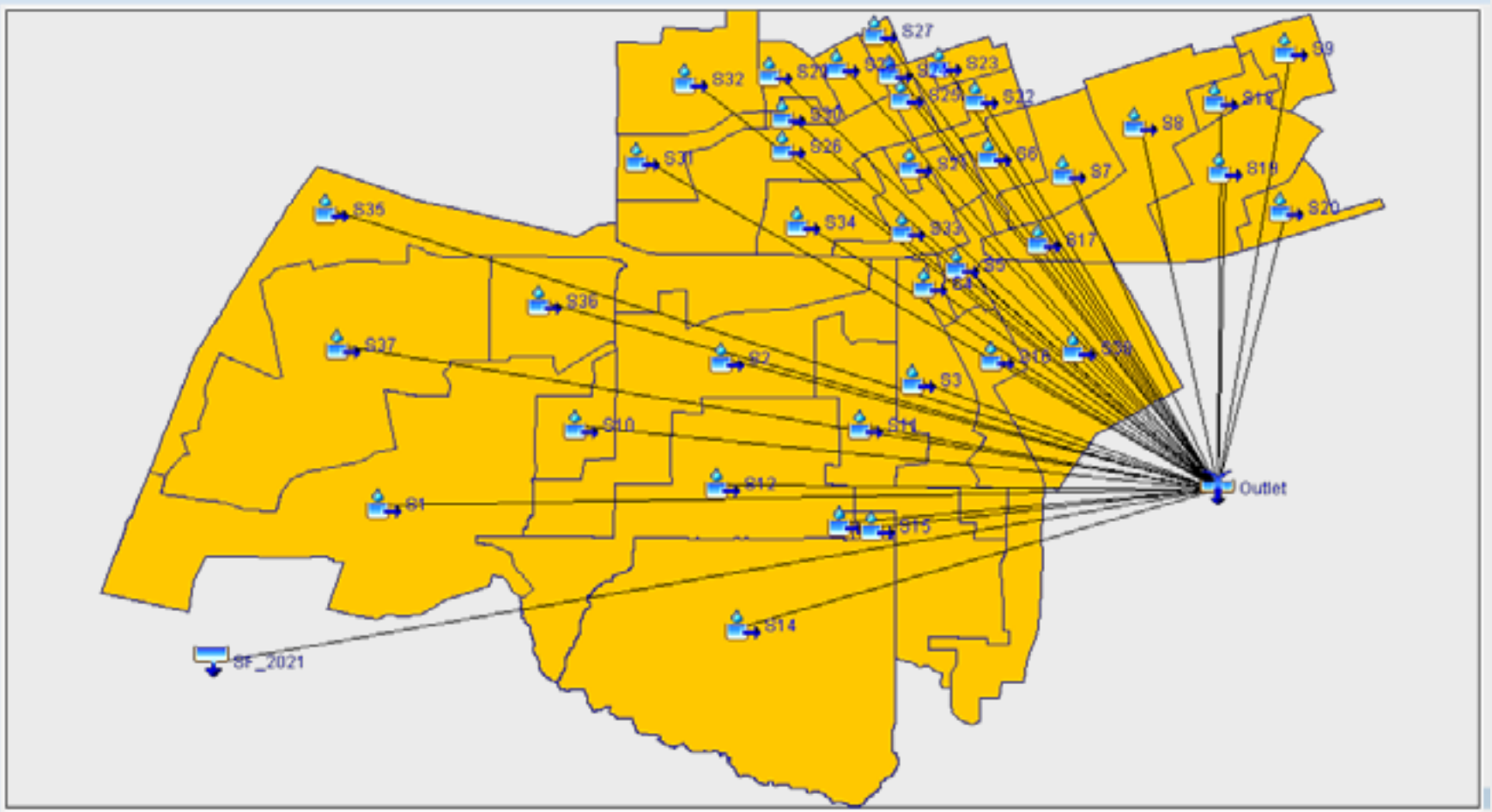
HEC - HMS



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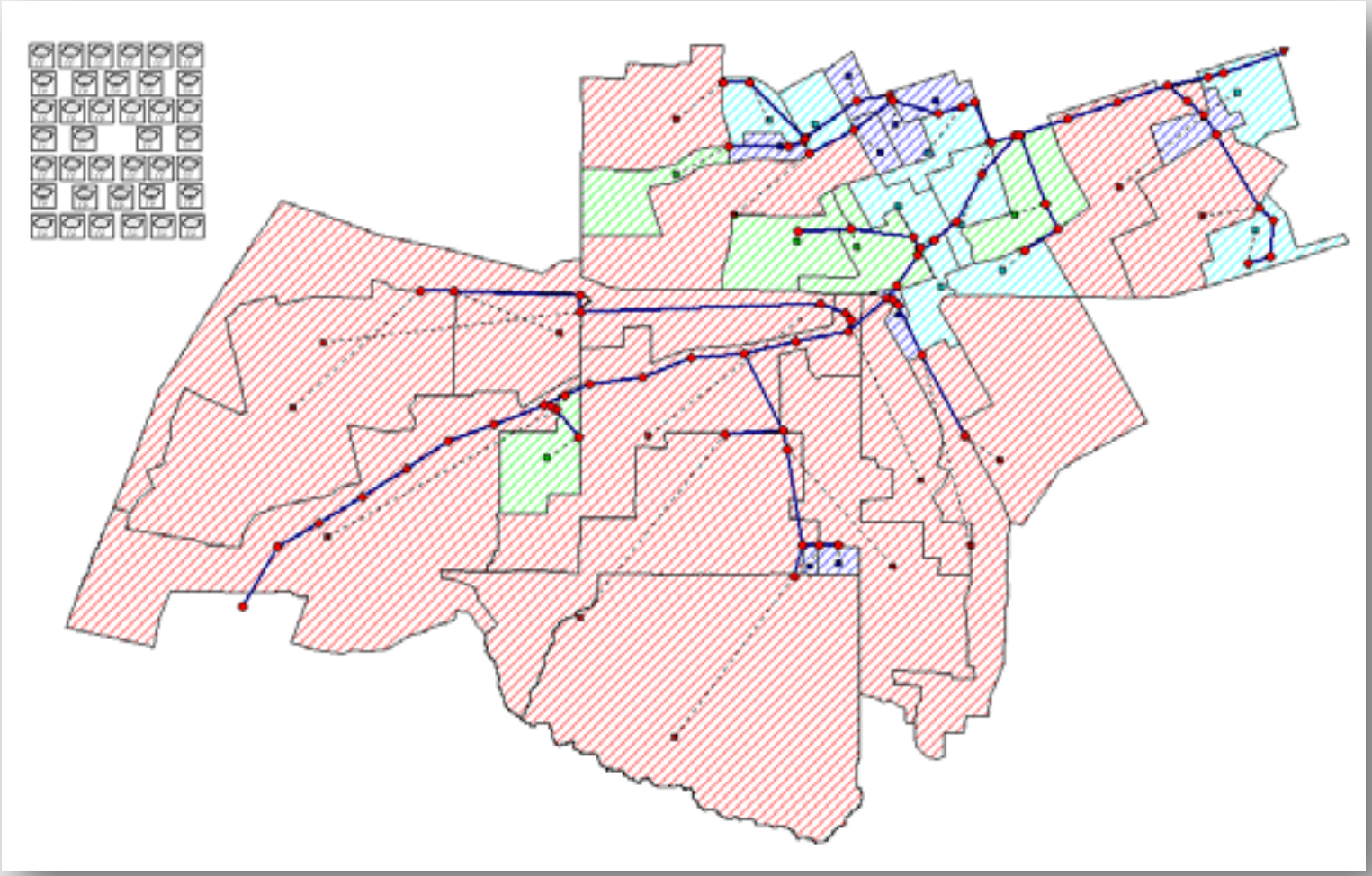
SWMM5.0



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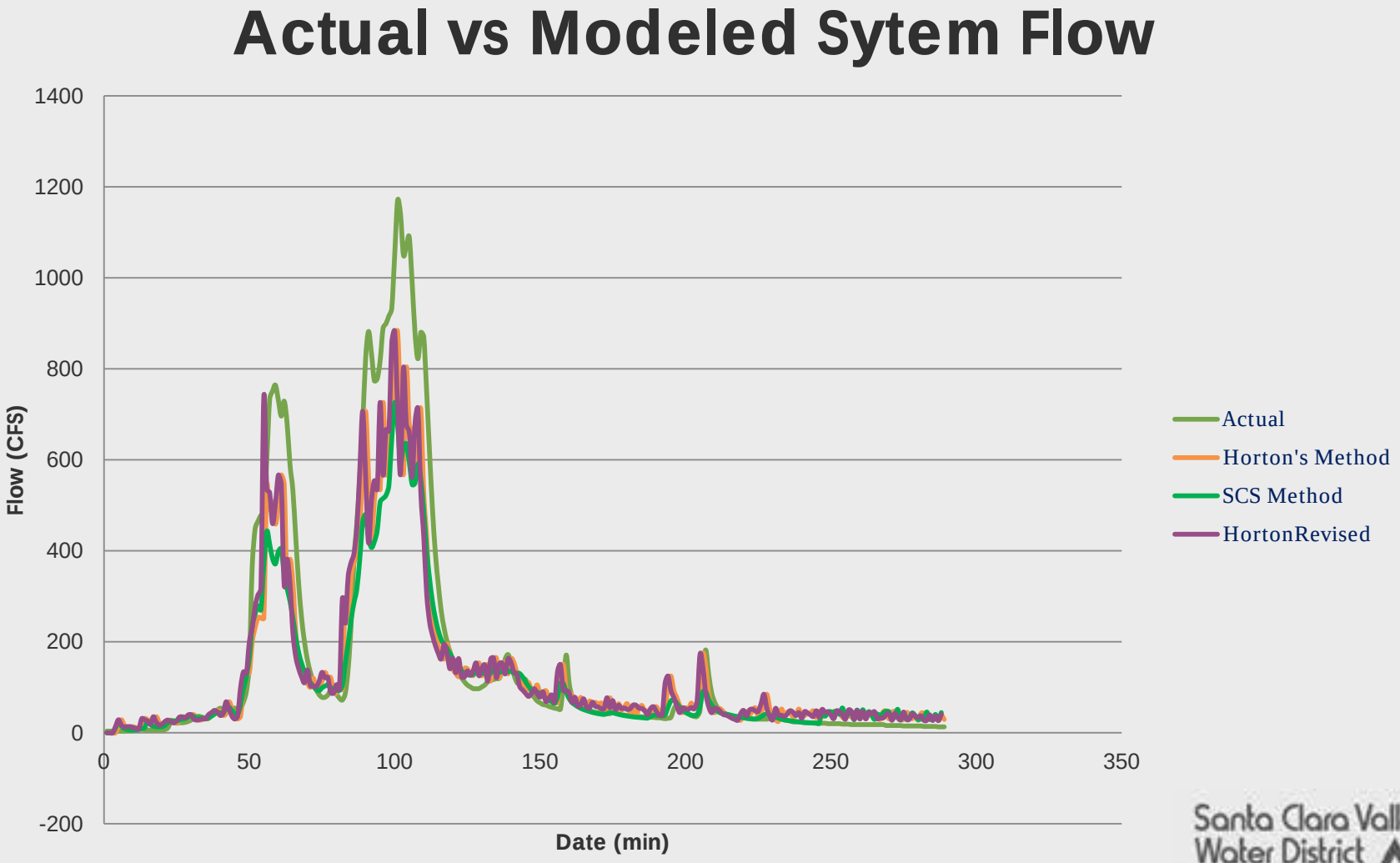
PRELIMINARY RESULTS



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