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### CEEn-2018CPST-007

### CITYWIDE DRAINAGE ANALYSIS

**SHOF Engineers** 

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## Introduction

### What?

- Drainage Analysis of Woodland Hills
- Culvert and Channel Design

### Why?

 Help mitigate negative effects of snow and rain run-off





# **Project Tasks and Deliverables**

## **Project Tasks:**

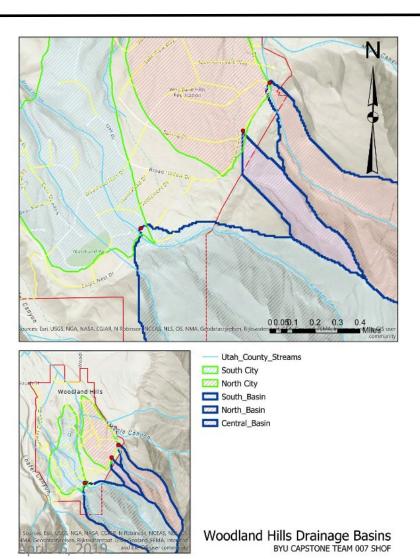
- Task 1: Data Collection
  - Flow, Elevation, and Watershed data
- Task 2: System Analysis
  - HY-8 and Hydraulic Toolbox Programs
- Task 3: Recommendations



April 26, 2019



## **Design and Analysis**



### **Task 1: Data Collection**

- What data is on the map?
  - Stream network, city limits, outlet points
  - Three major watersheds that effect the City of Woodland Hills:
    - **≻**North, Central, South
- Where it came from?
  - StreamStats to find mountainous drainage flow
  - Estimate city drainage flow
  - Find total drainage flow for each basin

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# Design and Analysis Cont'd

### **Task 2: System Analysis**

- Hydraulic Toolbox (Channels)
- HY-8 (Culverts)
- Design flows

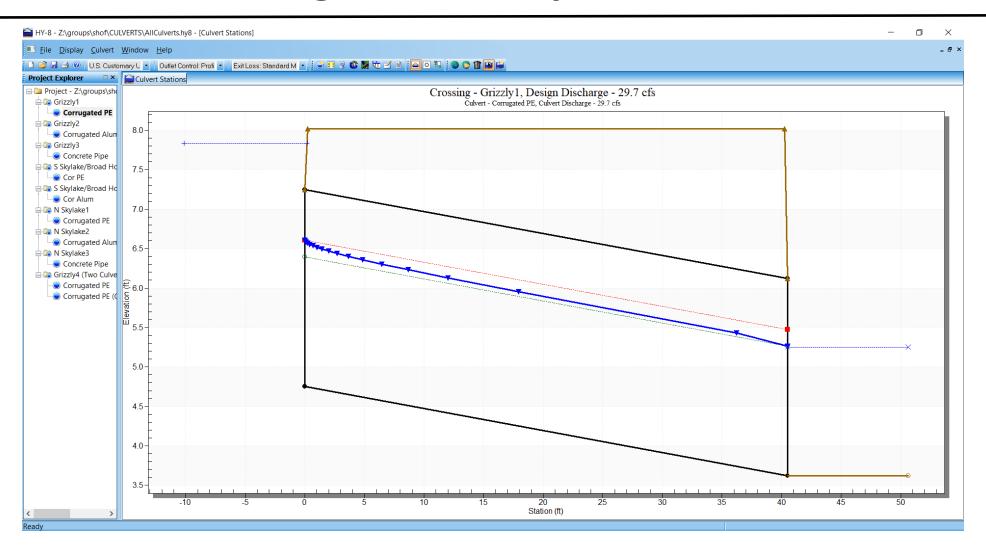
	Culvert S	tations									
:\groups\sh	Crossing - Grizzly4 (Two Culverts), Design Discharge - 29.7 cfs Culvert - Corrugated PE, Culvert Discharge - 10.0 cfs										
ugated PE	Curvert - Lorrigated PV, Curvert Discharge - 100 cts										
guicu i E	F										
ugated Alun	8.0-		=	*				- 0 ×			
	E		Crossing Data - Grizzly	y4 (Iwo Culverts)				- 0 ×		l l	
rete Pipe ke/Broad Ho			Crossing Properties			Culvert Properties					
PE	7.5-		Name: Grizzly4 (Two Culv	verts)		Corrugated PE	Add Culvert				
ce/Broad Ho	-					Corrugated PE (Copy)				1	
Alum	F		Parameter	Value	Units		Duplicate Culvert				
ke1	7.0-	+-	DISCHARGE DATA				Delete Culvert				
ugated PE ke2	-		Discharge Method	Minimum, Design, and Maximum						1	
ugated Alun	-		Minimum Flow	4.000	cfs	Parameter	Value	Units			
ke3	6.5		Design Flow Maximum Flow	50.000	cfs	CULVERT DATA					
rete Pipe	-		TAILWATER DATA	30.000	CIS	Name	Corrugated PE			1	
(Two Culve	, [		Channel Type	Triangular Channel	~	Shape Material	Circular Corrugated PE	-			
ugated PE (	6.0		Side Slope (H:V)	2.000	_:1	Diameter	1.500	ft			
igaled PE (U ic	F		Channel Slope	0.0262	ft/ft	@ Embedment Depth	0.000	in			
gated PE (C			Manning's n (channel)	0.035		Manning's n	0.024				
l L	5.5-		Channel Invert Elevation	3.620	ft	Culvert Type	Straight	-			
	F		Rating Curve	View		☑ Inlet Configuration	Square Edge with Headwall	Ţ I		1	
	Ė		@ ROADWAY DATA			inlet Depression?	No	<b>▼</b>			
	5.0-		Roadway Profile Shape	Constant Roadway Elevation	▼	SITE DATA			The same of the sa	T	
			First Roadway Station	0.000	ft	Site Data Input Option	Culvert Invert Data	▼		***************************************	
	-		Crest Length Crest Elevation	40.000 8.020	ft	Inlet Station	0.000	ft			
	4.5-		Crest Elevation Roadway Surface	8.020 Paved	π ▼	Inlet Elevation	4.750	ft			
	Ł		Top Width	40.000	ft	Outlet Station	40.500	ft			
	-		Top Widei	40.000	II.	Outlet Elevation	3.620	ft V			
	4.0										
	-		Help Click on any	icon for help on a specific	Low Flow	AOP Energy Dissipation	Analyze Crossing 0	K Cancel			
										_	

Field Location	10-year Peak Flow (cfs)	Tailwater Channel Slope	Culvert Type	Culvert Size (in)	Overtop Flow (cfs)
N. C11-1	17.7	0.0000	Corr. PE	24	22.38
N Skylake (North)		0.0890 (max 0.110)	Corr. Al	24	22.38
(Ivorui)		(max 0.110)	Concrete Pipe	24	22.20
Broad Hollow	4.82	0.0705	Corr. PE	18	8.34
(Central)	4.62	0.0703	Corr. Al	18	8.33
G: 1			Corr. PE	30	31.6
Grizzly (South)	29.7	0.0262	Corr. Al	30	30.92
(South)			Concrete Pipe	30	31.40





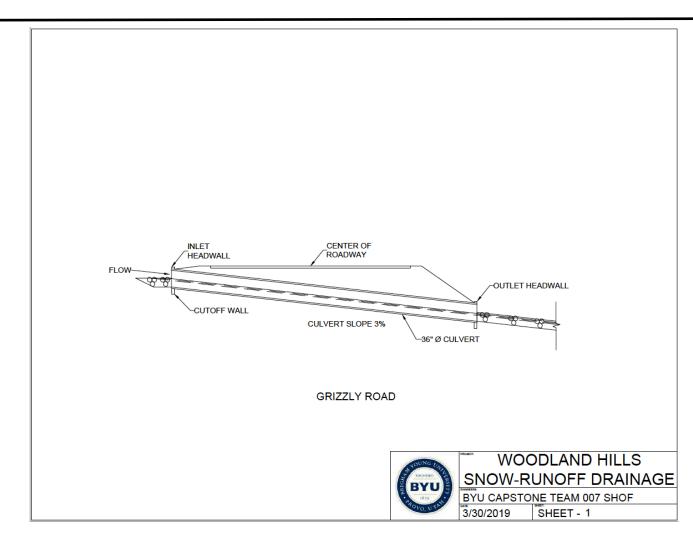
# Design and Analysis Cont'd



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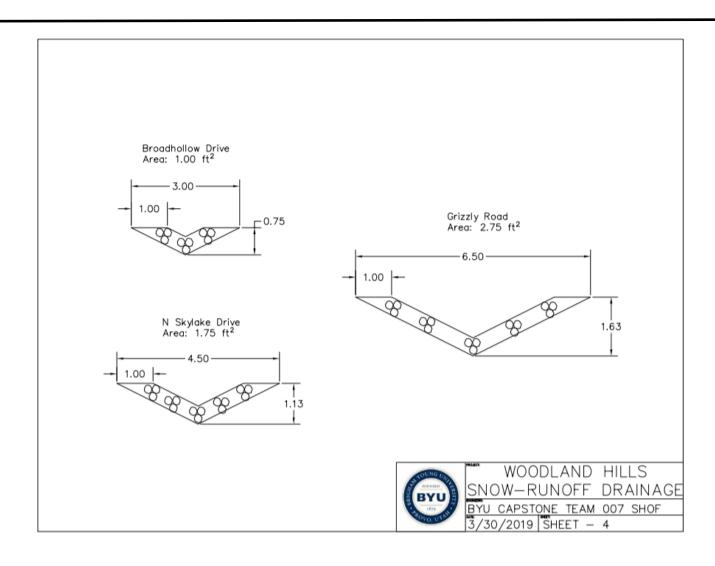


## **Discussion of Results**





### Discussion of Results Cont'd



# CAPSTONE

### **Conclusions**



Location	Item	Size	Price Estimate	Unit	Quantity	Probable Total Cost
	Corrugated Polyethylene	24in	\$ 25.43	linear foot	18ft	\$ 457.74
N Skylake	Corrugated Aluminum	24in	\$ 64.00	linear foot	18ft	\$ 1,152.00
	Concrete Pipe (Class V)	24in	\$ 68.50	linear foot	18ft	\$ 1,233.00
Broad Hollow	Corrugated Polyethylene	18in	\$ 16.34	linear foot	24ft	\$ 392.16
Broad Hollow	Corrugated Aluminum	18in	\$ 44.00	linear foot	24ft	\$ 1,056.00
	Corrugated Polyethylene	30in	\$ 41.56	linear foot	40ft	\$ 1,662.40
Grizzly	Corrugated Aluminum	30in	\$ 86.00	linear foot	40ft	\$ 3,440.00
	Concrete Pipe (Class V)	30in	\$ 94.00	linear foot	40ft	\$ 3,760.00

Corrugated PE, Corrugated Aluminum, or Concrete culverts will be the most efficient options for balancing cost and size of upgrades.



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## **Conclusions Cont'd**

#### **Deliverables**

- Final report summarizing design, analysis, and results
- GIS Map including delineated drainage basins and outlet points
- Culvert and channel design files (HY-8 and Hydraulic Toolbox)
- Drawings showing roadway cross-sections



### Recommendations

#### **Channels**

- Triangular
- Class I riprap
- Divide flow into two channels in Southern Basin (Grizzly Road)

### **Culverts**

- Corrugated plastic most economical
- Inlet configuration: mitered or square edge with headwall
- Consider wingwalls and debris mitigation on culverts at outlet points indicated on GIS Map
- Develop mitigation plan for 25- and 50-year storm events







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## The End

