Sinclair Wash Restoration Project

CENE 476 NOVEMBER 13, 2020

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Client & Background







Mark Lamer

- Construction plan set for stream revitalization
- Healthy, restored section of the wash



BACKGROUND

Site features multiple low points not on the thalweg

Large volume of vegetation and debris (garbage)



Site Location

- Flagstaff, AZ 0
- Northern Arizona University campus and I-17 overpass



Figure 2: Site Location With Respect to Flagstaff Boundary [2]

Walnut Canyon National Monument

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Figure 3: Site Location With Respect to NAU's Boundary [2]

NAU Campus Boundary





Figure 4: Site Location With Respect to I-17



Task 1: Site Investigation

Task 2: Previous Studies

Task 3: Geomorphic Assessment

- Task 3.1 Identify and Catalogue Instability Areas
- Task 3.2 Channel Conditions
- Task 3.3 Restoration Targets/Priorities

Task 4: Geotechnical Analysis

- Task 4.1 Field Sampling Plan
- Task 4.2 Data Collection
- Task 4.3 Sample Testing
- Task 4.3.1 Sieve Analysis: ASTM C136 [3]
- Task 4.3.2 Soil Classification
 - ASTM 2487 USCS Method [4]
 - ASTM 3282 AASHTO Method [5]
- Task 4.4 Analysis



Figure 5: Image of Site Channel Westbound

Task 5: Biological and Ecological Assessment

- Task 5.1 Identify Surrounding Interactions with Site
- Task 5.2 Existing Flora Identification
- Task 5.3 Existing Fauna Identification
- Task 5.4 Invasive Species Abatement
- Task 5.5 Native Species Re-Vegetation Plan

Task 6: Open Channel Design

- Task 6.1 Materials
- Task 6.2 Geomorphic Stability
- Task 6.3 Hydraulics
 - Task 6.3.1 Flowmaster/Culvertmaster Analysis
 - Task 6.3.2 HEC-RAS Analysis



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Task 7: Plan Set

- Task 7.1 Template
- Task 7.2 Cover Page
- Task 7.3 Construction Notes
- Task 7.4 Channel Plan, Profile, and Cross-Sections
- Task 7.5 Re-Vegetation Plan
- Task 7.6 Construction Details

Task 8: Project Impacts

- Task 8.1 Regulatory
- Task 8.2 Health
- Task 8.3 Environmental
- Task 8.4 Economic
- Task 8.5 Social



Figure 6: Sinclair Wash Trail to the Right of the Site

Task 9: Project Deliverables

- Task 9.1 Client Deliverables
 - Tasks 9.1.1 30% Plan Set
 - Tasks 9.1.2 60% Plan Set
 - Tasks 9.1.3 90% Plan Set
 - Tasks 9.1.1 Final Plan Set

Task 9.2 Course Deliverables

- Task 9.2.1 30% Deliverables
- Task 9.2.1 60% Deliverables
- Task 9.2.1 90% Deliverables
- Task 9.2.1 Final Deliverables

Task 10: Project Management

- Task 10.1 Client Meetings
- Task 10.2 Team Meetings
- Task 10.3 Technical Advisor Meetings
- Task 10.4 Grading Instructor Meetings
- Task 10.5 Correspondence
- Task 10.6 Schedule Management
- Task 10.7 Resource Management

Exclusions

- Surveying
- Permitting
- Traffic Assessment
- Aggradation and Degradation Rates

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1	Site Investigation	Н	- <u>-</u>		1											-			Ī
2	Previous Studies		-																
2.1	Feasibility Study																		
2.2	Surveying													_		-h			
2.3	Hydrologic												_	_					
2.4	Hydraulic																		
2.5	Modeling																		
2.6	Geomorphologic Design														_				
3	Geomorphic Assessment					_													
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2.2	Channel Conditions																		
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42.1	Self Classification												-	Ĩ					
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433 4	Analysis															.1			
	Biological and Ecological Assessment		1													1			
51	Surrounding Interactions		G.																
34	Existing Flora Identification		1																
23	Exsisting Fauna Identification																		
5.4	Invasive species Abatement															E			
22	Native Species Re-Vegitation Plan																		
6	Open Channel Design																		
6.1	Materials													-	1				
6.2	Geomorphic Stability															1			
6.3	Hydraulics																		
6.3.1	Flowmaster and Culvertmaster Analysis															• 1			
6.3.2	HEC-RAS Analysis															N	/ X		
7	Plan Set																		
7.1	Template													<u> </u>					
7.2	Cover Page													4		h			
7.3	Construction Notes																		
7.4	Channel Plan, Profile, and Cross-Sections																<u> </u>	-	
7.5	Re-Vegitation Plan																_ _ _		
7.6	Construction Details																		-
8	Project Impacts																1		
9	Project Deliverables																		-
9.1	Client Deliverables																		
9.1.1	30% Plan Set														1	- ا		_1	
9.1.2	60% Plan Set																	d'	
9.1.3	90% Plan Set																		
9.1.4	Final Plan Set															11			
9.2	Course Deliverables																		-
9.2.1	30% Deliverables															Ψ –			
9.2.2	60% Deliverables																	ų r	
9.2.3	90% Deliverables																		
9.2.4	Final Deliverables																		
10	Project Management	L •																	-
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Proje	tt Capstone Schedule - N Solt			Project Summ			Inactive Summary			Manual Summa	ny Rollup		Finith-only		-	Deadline	+		
Date	inu 11/12/20	•		Interflue Tarle			Manual Tark	-	_	Margari Garren			Esternal Tex			Cottical			

Figure 6: Project Schedule



Table 1: Staffing Matrix

POSITION	SENIOR EGR	PROJ EGR	LAB TECH	INTERN	
HOURLY WAGE (218.79	141.68	98.01	32.13	
Σ DURATION (hou	95	182	79	146	
$\Sigma \text{ COST } (\$)$	\$20,839.75	\$25,785.76	\$7,742.79	\$4,690.98	
TASK	SCHEDULED DURATION (day) B		ABLE DURA		
Task 1 – Site Investigation	2		4		
Task 2 – Previous Studies			2		24
Task 2.1 – Feasibility Study	1		0.25		4
Task 2.2 – Surveying	1		0.25		4
Task 2.3 – Hydrologic	1		0.25		4
Task 2.4 – Hydraulic	1		0.5		4
Task 2.5 – Modeling	1		0.5		4
Task 2.6 – Geomorphologic Design	1		0.25		4
Task 3 – Geomorphic Assessment		2	21	0	4
Task 3.1 – Identify and Catalogue Instability Areas	3		10		
Task 3.2 – Channel Conditions	3		10		
Task 3.3 – Restoration Targets and Priorities	1	2	1		4
Task 4 – Geotechnical		2	0	44	5
Task 4.1 – Field Sampling Plan	1	2			5
Task 4.2 – Sample Testing					
Task 4.2.1 – Sieve Analysis	4			25	
Task 4.2.2 – Soil Classification	3			15	
Task 4.3 – Analysis	3			4	
Task 5 – Biological and Ecological Assessment		2	18	0	6
Task 5.1 – Identify Surrounding Site Interactions	1				
Task 5.2 – Existing Flora Identification	4		10		
Task 5.3 – Existing Fauna Identification	4				2
Task 5.4 – Invasive Species Abatement	4		4		2
Task 5.5 – Native Species Re-Vegetation Plan	4	2	4		2

Table 1: Staffing Matrix

POSITION		SENIOR EGR	PROJEGR	LAB TECH	INTERN
Task 6 – Open Channel Design		2	57	0	0
Task 6.1 – Materials	3		5		
Task 6.2 – Geomorphic Stability	4		20		
Task 6.3 – Hydraulics					
Task 6.3.1 - Channel Analysis	4	1	20		
Task 6.3.2 - Culvert Analysis	3	1	12		
Task 7 – Plan Set		3	17	1	10
Task 7.1 – Template	2		0.5		2
Task 7.2 – Cover Page	1		0.5		2
Task 7.4 – Construction Notes	1		0.5		2
Task 7.5 – Channel Plan, Profile, and Cross-Sections	4	1	10		0.5
Task 7.6 – Re-Vegetation Plan	2	1	5		0.5
Task 7.7 – Construction Details	2	1	0.5	1	3
Task 8 – Project Impacts		1.25	0	0	20
Task 8.1 – Regulatory	2	0.25			4
Task 8.2 – Health	2	0.25			4
Task 8.3 – Environmental	2	0.25			4
Task 8.4 – Economic	2	0.25			4
Task 8.5 – Social	2	0.25			4
Task 9 – Project Deliverables		23	33	4	47
Task 10 – Project Management		60	30	30	30

Cost of Services

Table 2: Cost of Engineering Services Summary

Cost of Engineering Services Summary										
	Classification	Hours	Rate (\$/Hour)		Cost					
	Senior Engineer	95.25	\$	218.79	\$	20,840				
Personnel	Project Engineer	182	\$	141.68	\$	25,786				
	Lab Technician	79	\$	98.01	\$	7,743				
	Intern	146	\$	32.13	\$	4,691				
	\$	59,059								
	Classification	Days	Rate	Rate (\$/Days)		Cost				
Lab Facilities	Geotechnical Lab	3	\$	100.00	\$	300				
	\$	300								
	Classification	tion Quantity Rate (\$/Quantity)				Cost				
Supplies	Shovel	4	\$	50.00	\$	200				
	Gallon Ziplock Bags	25	\$	0.13	\$	3				
	\$	203								
	\$	59,563								

References

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[2] Google. Maps Data. 2020 [Online]. [Accessed: 02- Nov- 2020].

[3] "Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis," [Online]. Available: https://compass-astm-org.libproxy.nau.edu/EDIT/html_annot.cgi?D6913+17. [Accessed: 02- Nov- 2020].

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