



Sinclair Wash Restoration Project

CENE 476

NOVEMBER 13, 2020

JAKOB BRISCHKE

HANNAH FISCHER

KYLIE HEMMELE

STEPHANIE SEYMOUR

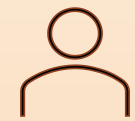


RED ROCK ENGINEERING

Client & Background



Figure 1: Sinclair Wash



CLIENT

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
- Northern Arizona University campus and I-17 overpass

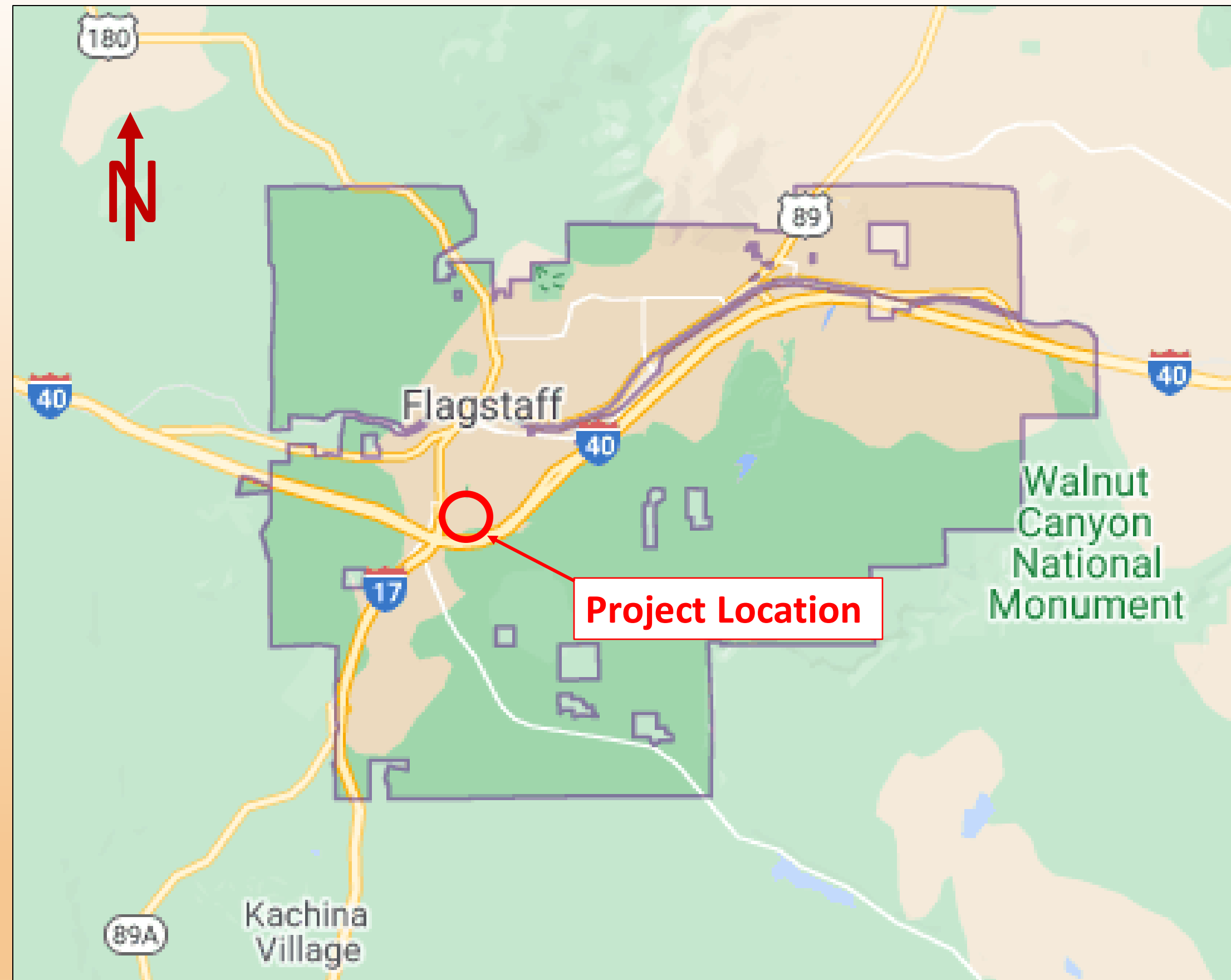


Figure 2: Site Location With Respect to Flagstaff Boundary [2]

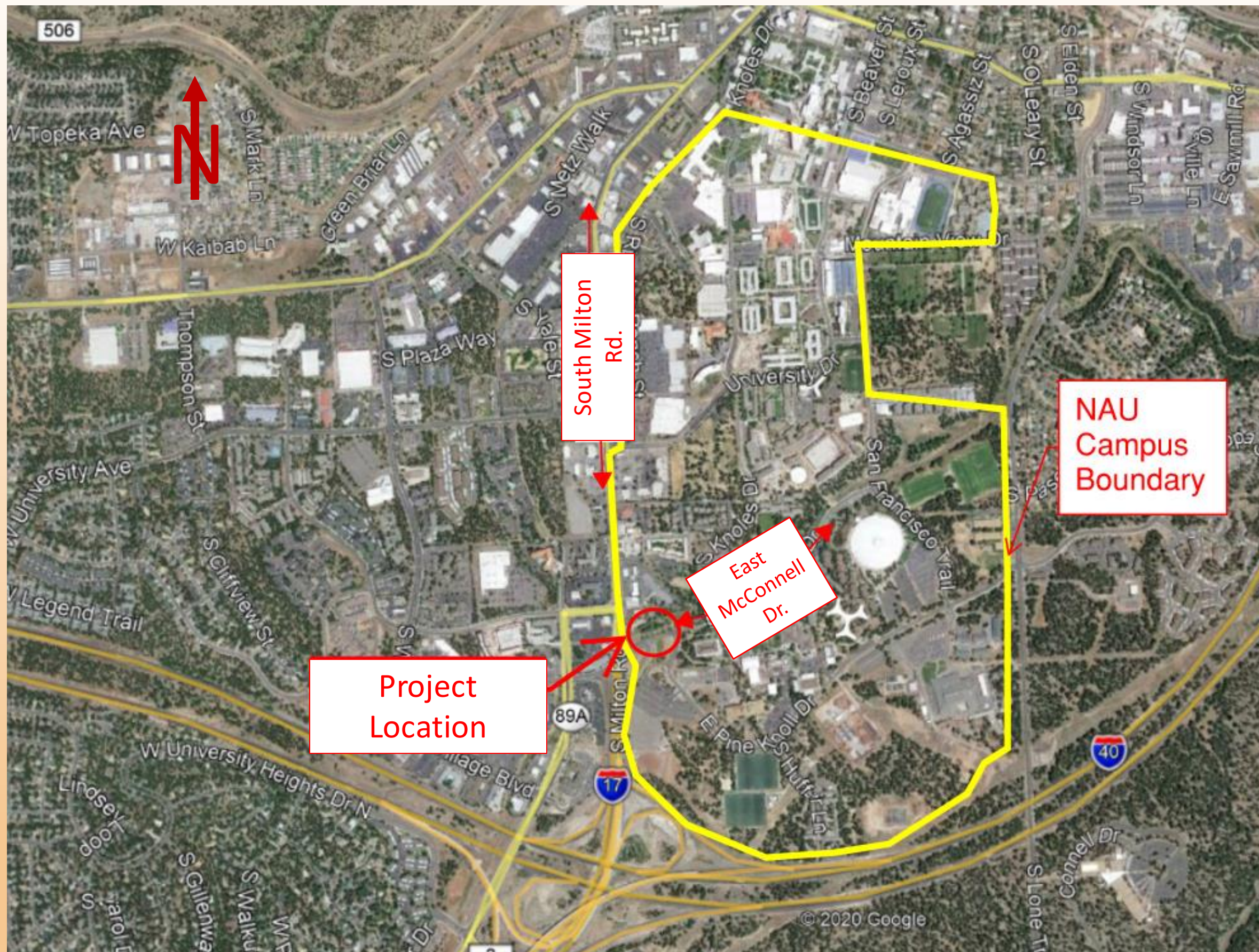


Figure 3: Site Location With Respect to NAU's Boundary [2]

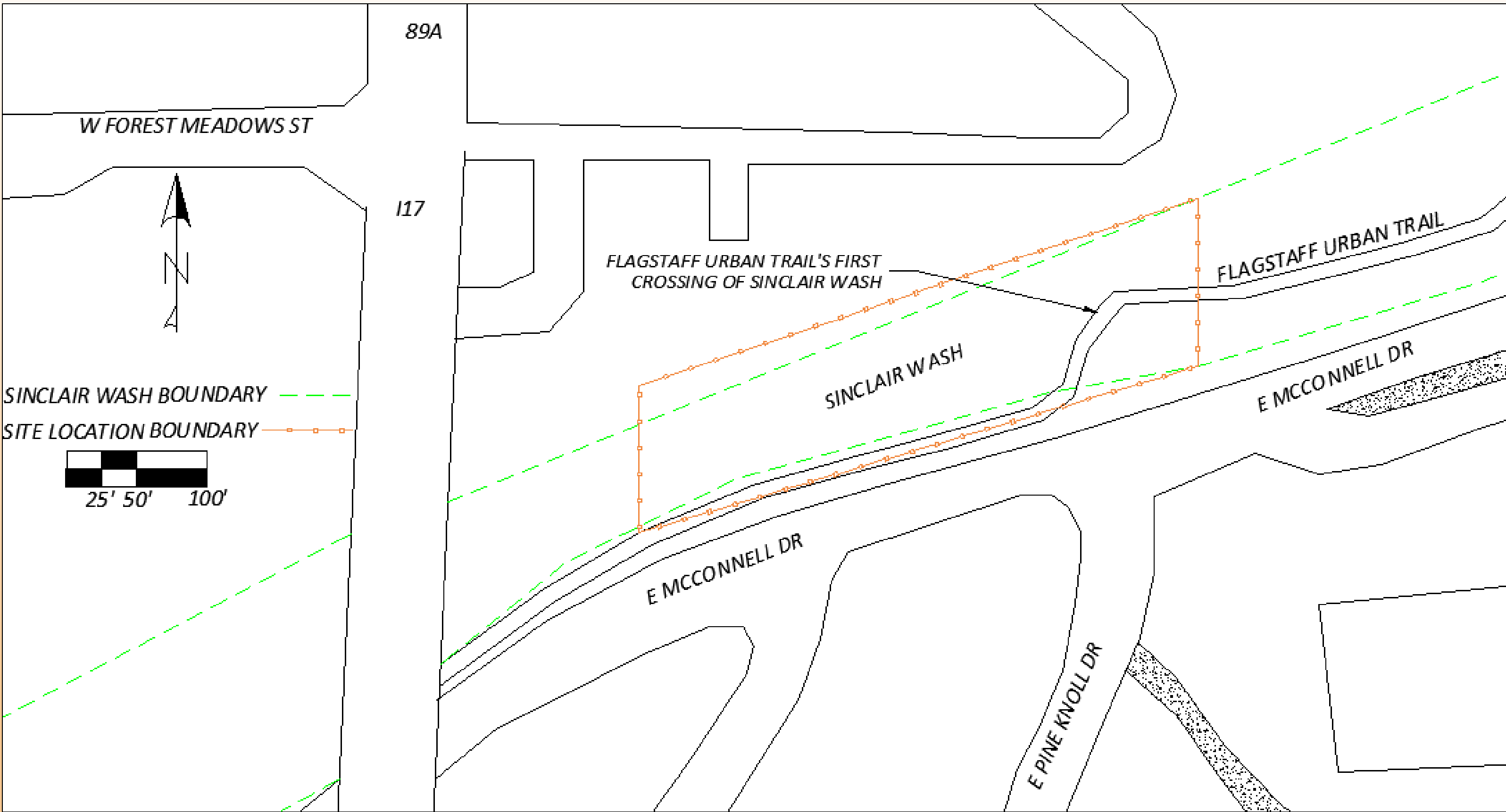


Figure 4: Site Location With Respect to I-17

Scope of Services

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

Scope of Services

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



Scope of Services

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

Scope of Services

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

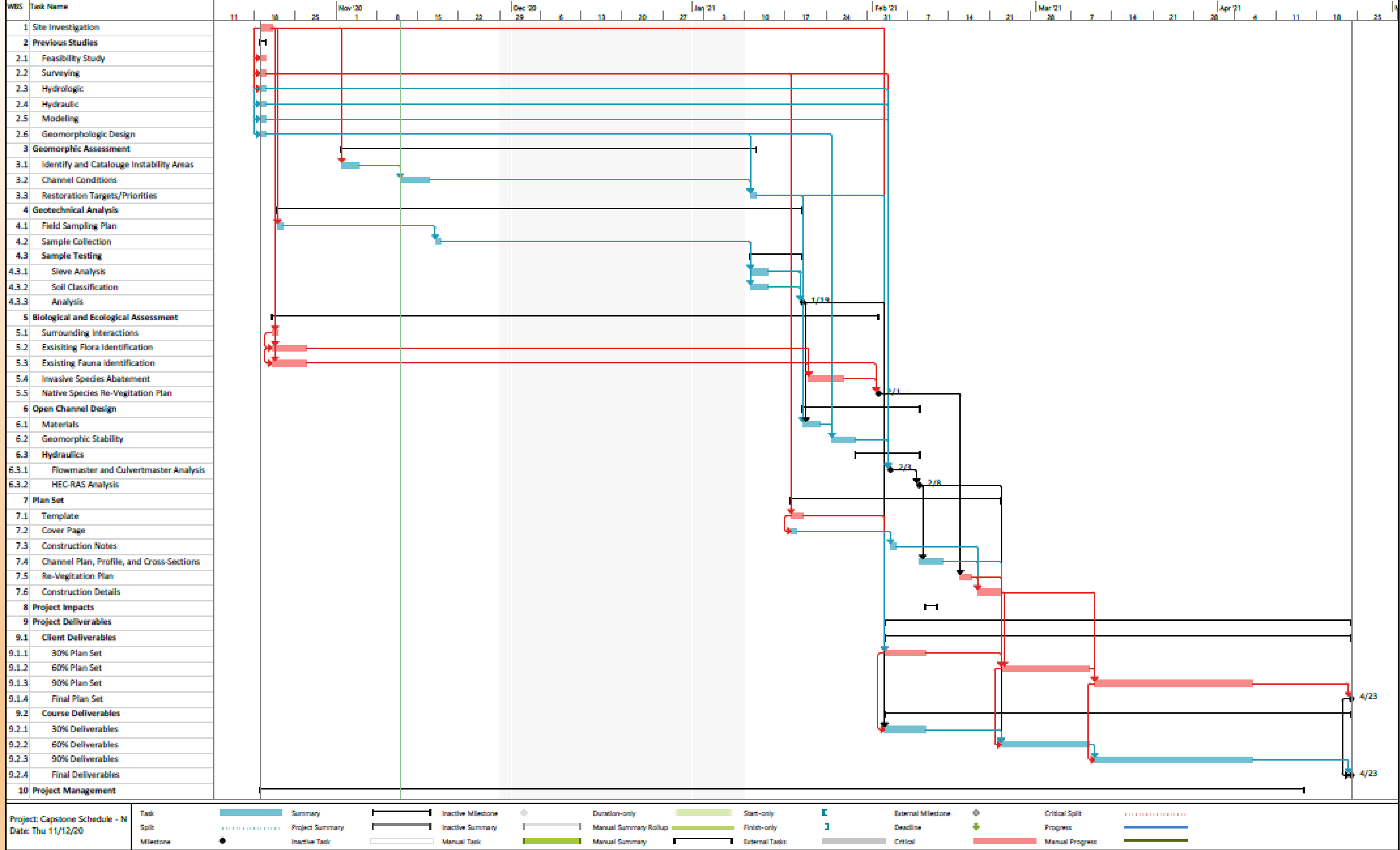


Figure 6: Project Schedule

Table 1: Staffing Matrix

POSITION		SENIOR EGR	PROJ EGR	LAB TECH	INTERN
HOURLY WAGE (\$)		218.79	141.68	98.01	32.13
Σ DURATION (hour)		95	182	79	146
Σ COST (\$)		\$20,839.75	\$25,785.76	\$7,742.79	\$4,690.98
TASK	SCHEDULED DURATION (day)	BILLABLE DURATION (hours)			
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					
<i>Task 4.2.1 – Sieve Analysis</i>	4			25	
<i>Task 4.2.2 – Soil Classification</i>	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	PROJ EGR	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				
Personnel	Classification	Hours	Rate (\$/Hour)	Cost
	Senior Engineer	95.25	\$ 218.79	\$ 20,840
	Project Engineer	182	\$ 141.68	\$ 25,786
	Lab Technician	79	\$ 98.01	\$ 7,743
	Intern	146	\$ 32.13	\$ 4,691
Sub-total				\$ 59,059
Lab Facilities	Classification	Days	Rate (\$/Days)	Cost
	Geotechnical Lab	3	\$ 100.00	\$ 300
Sub-total				\$ 300
Supplies	Classification	Quantity	Rate (\$/Quantity)	Cost
	Shovel	4	\$ 50.00	\$ 200
	Gallon Ziplock Bags	25	\$ 0.13	\$ 3
Sub-total				\$ 203
Total Cost				\$ 59,563

References

- [1] "Vector Clipart - Silhouette of mountain with red background. Vector Illustration gg84974504 - GoGraph", *Gograph.com*, 2020. [Online]. Available: <https://www.gograph.com/clipart/silhouette-of-mountain-with-red-background-gg84974504.html>. [Accessed: 02- Nov- 2020].
- [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].
- [4] "Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes," [Online]. Available: https://compass-astm-org.libproxy.nau.edu/EDIT/html_annot.cgi?D3282+15. [Accessed: 02- Nov- 2020].
- [5] "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)," [Online]. Available: https://compass-astm-org.libproxy.nau.edu/EDIT/html_annot.cgi?D2487+17e1. [Accessed: 02- Nov- 2020].