NAU Stormwater Runoff Quality and Quantity Mitigation

Draft: 5

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CENE 476: Capstone Preparation

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Abbreviations

ADA: American Disabilities Act
ADEQ: Arizona Department of Environmental Quality
ASTM: American Society for Testing and Materials
BOD: Biochemical Oxygen Demand
COD: Chemical Oxygen Demand
COF: City of Flagstaff
EIT: Engineer In-Training
FE: Fundamentals of Engineering
FOG: Fats, Oils, and Grease
LID: Low Impact Development
LT: Lab Technician
NAU: Northern Arizona University
PE: Professional Engineer
SENG: Senior Civil Engineer
SWT: Stormwater Technician
USDA: United States Department of Agriculture

1.0 Project Understanding Section

1.1 Project Purpose

The Northern Arizona University (NAU) Stormwater Project is intended to improve stormwater management on the NAU Mountain campus using low impact development (LID). Traditional stormwater systems are often designed to move water off site as quickly as possible, which can result in negative environmental impacts such as increased downstream runoff, reduced groundwater recharge, and the transport of sediments and pollutants that impair water quality. This project seeks to address these challenges by slowing, filtering, and infiltrating stormwater as it moves through campus. This will improve sustainability across the campus, reduce the volume and velocity of runoff leaving the site, limit pollutant loading, protect water quality, and enhance groundwater recharge.

1.2 Project Background

The project encompasses all of NAU's Mountain campus located in Flagstaff, Arizona. The area is well maintained for students and faculty. There are existing low-impact designs for stormwater management on campus; however, not enough to create a noticeable impact.

Figure 1-1 displays the extents of Flagstaff, Arizona with a marker for the project location.

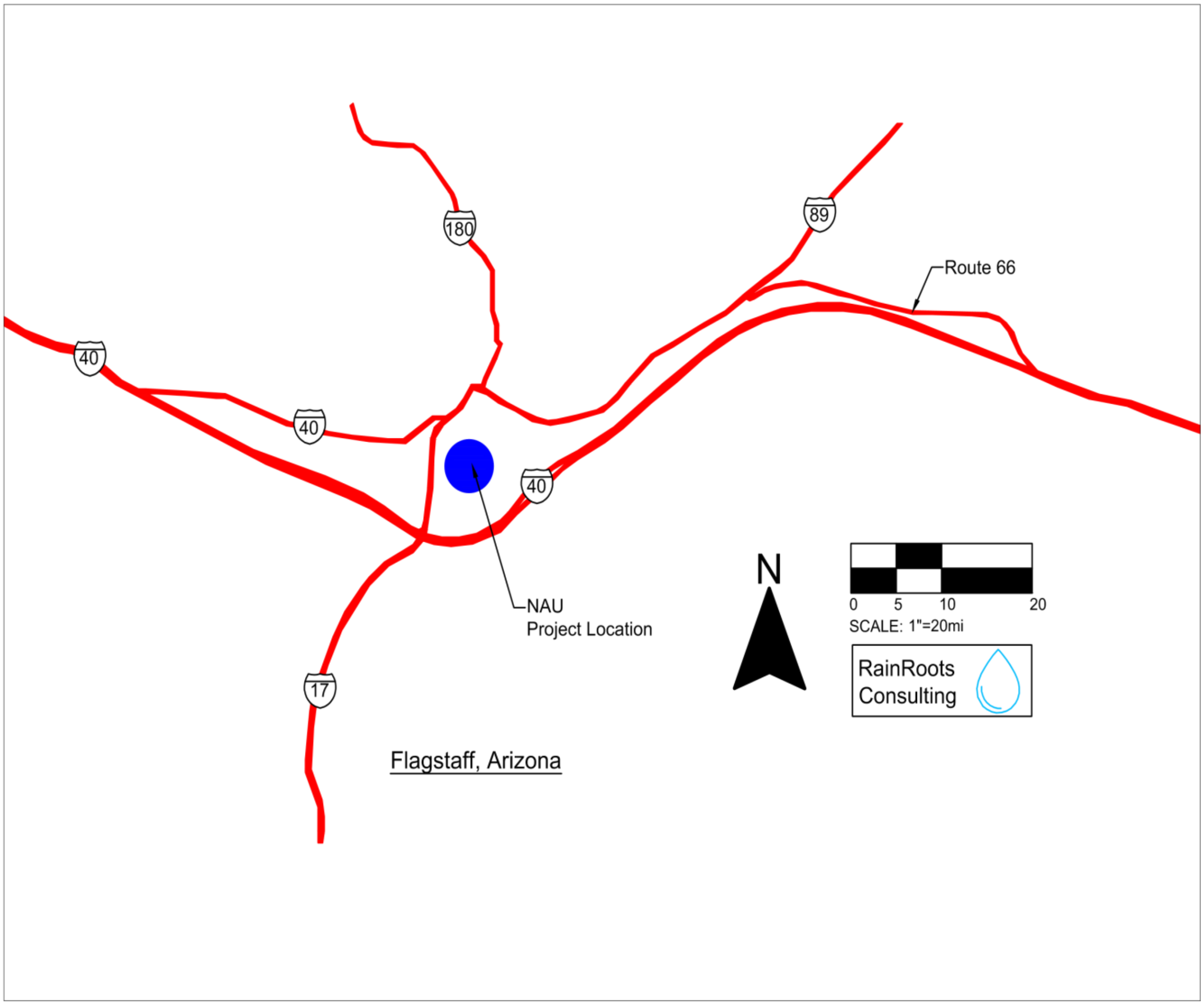


Figure 1: Location Map

Figure 1-2 displays an aerial photo of the project location derived from Google Earth [1].

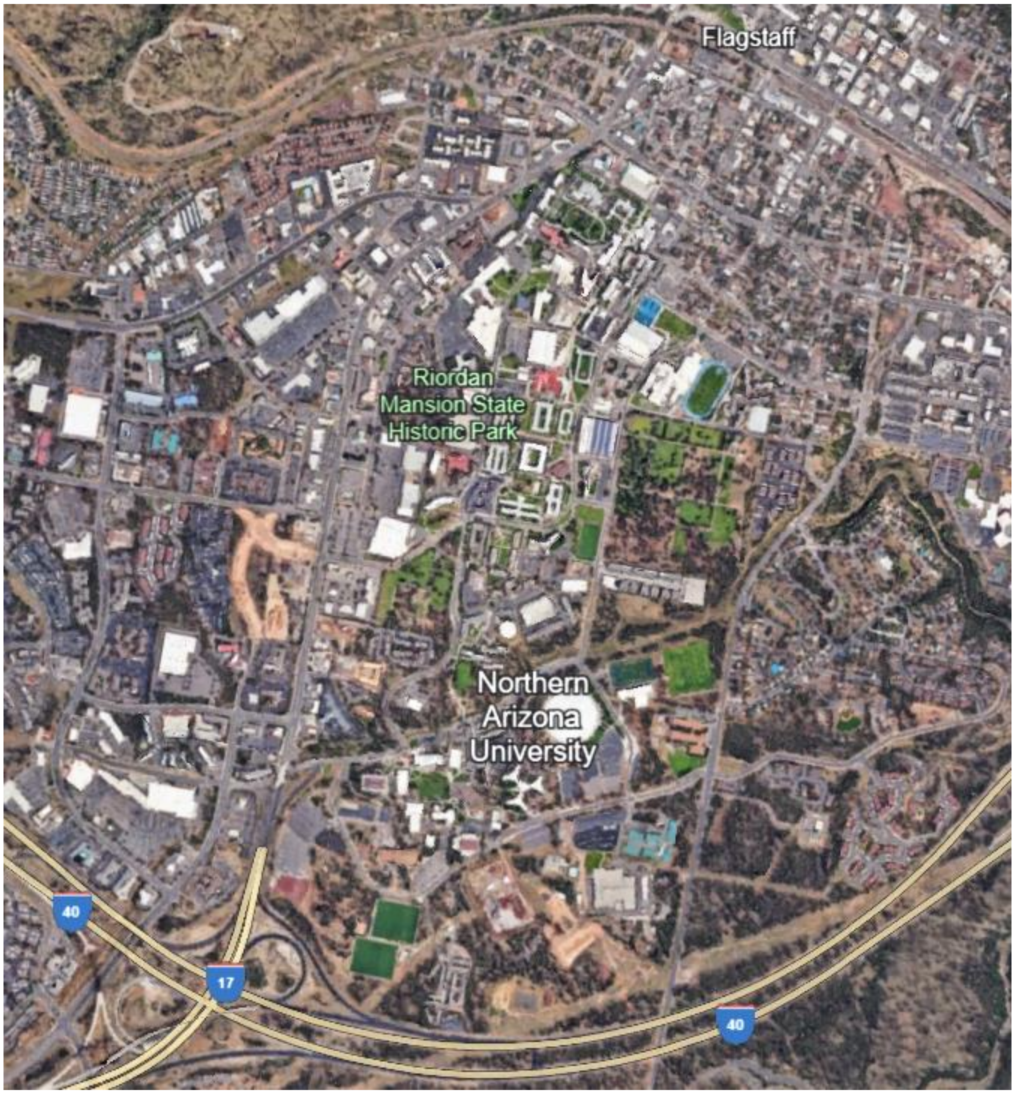


Figure 1-2: Aerial Vicinity Map

Shown below, Figure 1-3 displays a closer look at NAU's north campus. Figure 1-4 displays NAU's south campus, and Figure 1-5 shows NAU's central campus. Included in these maps are a legend with the building numbers and a key.

Figure 1-3: NAU North Campus

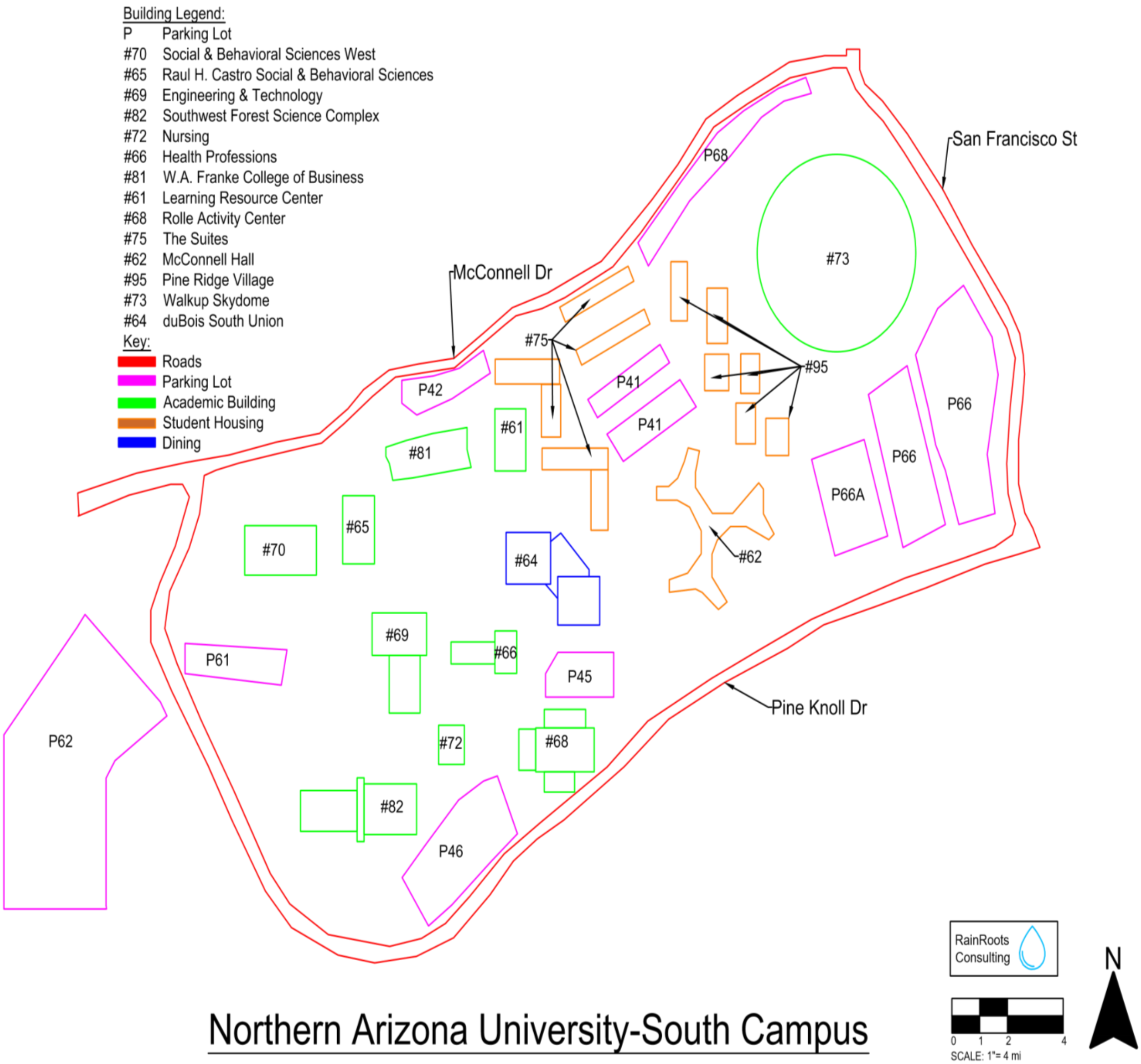


Figure 1-4: NAU South Campus

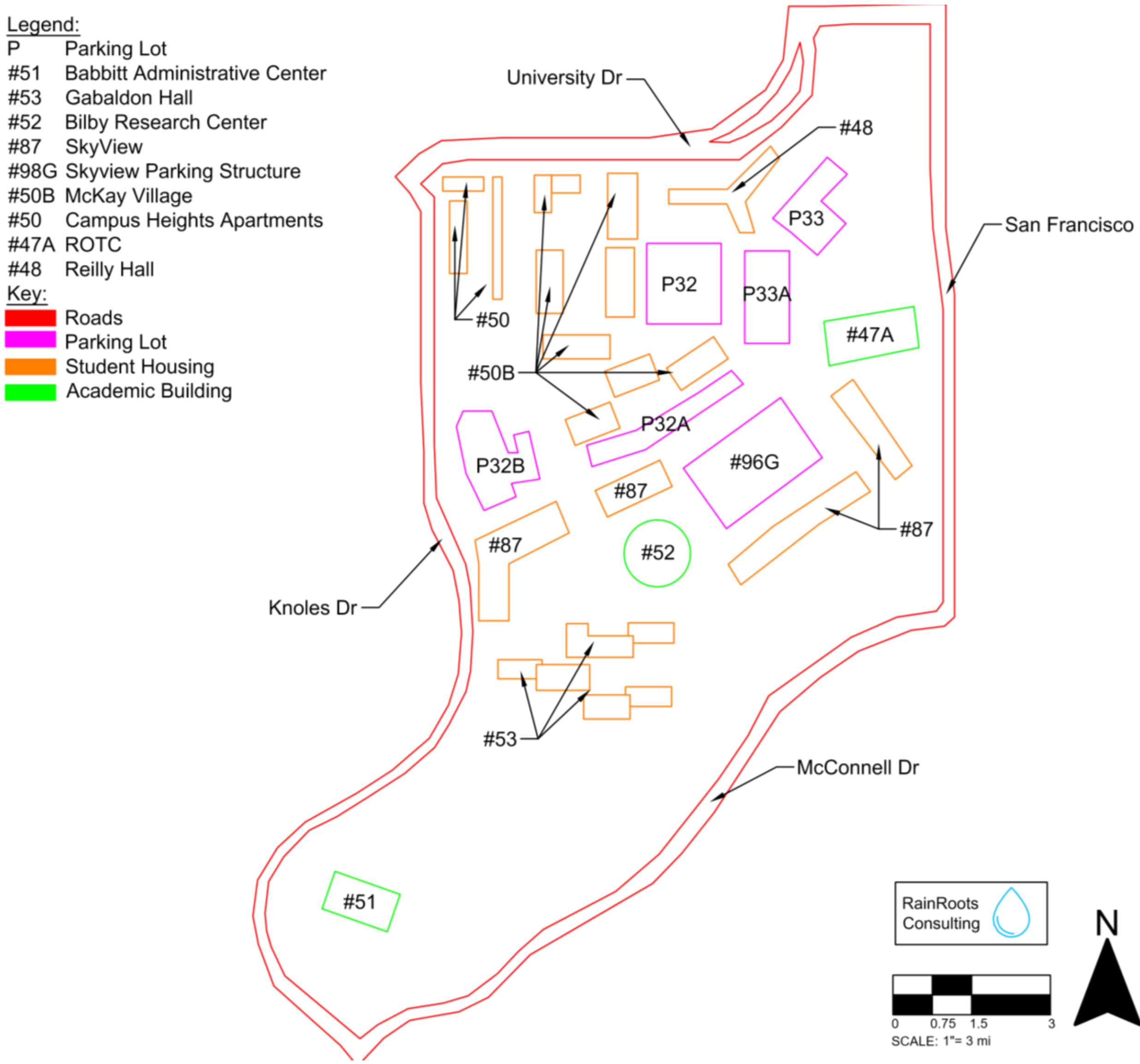


Figure 1-5: NAU Central Campus

1.3 Technical Considerations

The technical work for this project will be structured using the rules and parameters provided, the City of Flagstaff 2025 Stormwater Management Design Manual [2], the Low Impact Development Guidance Manual for Site Design and Implementation [3], and the Northern Arizona University Environmental Health and Safety Stormwater Operations & Maintenance Plan [4].

The technical work that is expected for this project will include the utilization of surveying technologies to assess suitable areas of improvement on NAU campus. The project will also need to be visualized in software such as Civil3D and AutoCAD. To assess the hydrological work of the project areas using CulvertMaster and FlowMaster to determine how much water the newly developed bioswales can hold. The primary mathematical equation that will be used for the project will be the rational method to determine the flow of a two-year rain event. Additional technical work that will be done is the calculation of void space for the proposed bioswales to create an accurate estimate for the water capacity of the bioswales.

Lab work for this project will include water analysis for coliforms, fat oil and grease, and particulates. Soil analysis will not be conducted in the lab. It will be determined based on published USDA data from Web Soil Survey [5].

1.4 Potential Challenges

The timing of this project limits the ability to gather and analyze stormwater samples as Flagstaff's rainy season typically ends in September. Instead, stormwater sample data from a previous project will be used alongside research data to inform decisions regarding stormwater quality. Additionally, snowmelt will be used to supplement our runoff data.

Flagstaff has heavy winter weather, as early as October, which could hinder the team's ability to thoroughly inventory the NAU campus for site selection. Because of this, the team is prioritizing site data collection.

1.5 Stakeholders

The stakeholders in this project vary from those directly affected by stormwater management on campus to those invested in broader sustainability initiatives. At the institutional level, the NAU Sustainability Department is a co-client, with a strong interest in the project's success because it advances the university's sustainability goals and contributes to long term improvements in campus design. Faculty member and co-client Adam Bringhurst also has a direct stake, as he provides guidance on expectations and project standards while addressing his concerns about NAU's stormwater challenges.

Beyond these primary clients, the wider NAU community, including students, staff, and visitors, will also be impacted. The project's outcomes, such as reducing flooding, improving stormwater capture, and enhancing campus aesthetics through the implementation of bioswales, directly affect their daily experiences. Finally, the City of Flagstaff will be affected because any runoff from NAU will join the local watershed. They have a stake in the outcome since managing on-campus stormwater will contribute to helping with flood control citywide. They are stakeholders because this project supports Flagstaff's sustainability goals.

2.0 Scope of Services/Research Plan

The scope of services section provides a list of tasks that will be completed by RainRoots Consulting. The tasks described will outline the process of how the team will provide an inventory of best locations to implement bioswales on NAU's campus.

2.1 Task 1: Preliminary Laboratory Research & Organization

This section will outline background research and preparatory work to complete laboratory analysis.

2.1.1 Task 1.1: Laboratory Research

The team will research specific stormwater testing and analysis procedures. These procedures must test COF stormwater quality regulations and standards. Additionally, the team will research stormwater sampling methods associated with HACH procedures. The purpose of this task is to collect all relevant laboratory procedures, the necessary equipment needed to complete them, and the analysis that will be completed for every lab test.

2.1.2 Task 1.2: Laboratory Testing Organization

The team will generate the project plan documentation required for lab access and laboratory testing. A laboratory binder will be kept by the team with all laboratory procedures, waste management practices, and health and safety practices needed for any laboratory work. This will ensure that the team is prepared for stormwater testing in the case of a rainfall event.

2.2 Task 2: Site Investigation Plan

This section will outline the work that will be done prior to site investigation, to ensure all data is organized and complete.

2.2.1 Task 2.1: Create Field Assessment Form

The team will draft a form to use in the field to log all relevant measurements and descriptions of the area. Specifically, the form must address if the area is vegetated, any existing infrastructure, if it is accessible for maintenance/construction, and any other general notes. This form will ensure standardized data collection for all candidate LID sites. The purpose of this form to keep information about the locations organized to ensure the team can look back at them when these locations need to be analyzed further.

2.2.2 Task 2.2: Geolocate Areas of Interest

Using MapItFast, the team will be able to take photos of each area on a singular platform to export as needed. MapItFast will provide the team with coordinates of each area, and each photo will be tagged with its identification name.

2.3 Task 3: Creating the Location Inventory

This section will outline the steps taken to gather data for the campus inventory. This inventory will be made by creating a field assessment followed by an analysis of the watershed of NAU campus. The inventory will serve as a means to determine which locations will be later evaluated for LID.

2.3.1 Task 3.1: Field Assessment

The team will implement the site investigation plan to gather information on all locations on NAU's mountain campus except for those excluded by our client (large fields, native landscaping, extensive infrastructure, and historic north quad). The team expects to identify around 100 locations, as requested by the client.

2.3.2 Task 3.2: Field Results Analysis

While completing field assessment, the analysis of this includes using the field assessment form and MapItFast. Smaller locations can be expected to take a few minutes to assess, while larger locations can be expected to take 5-10 minutes to assess. The team will use the polygon tool on MapItFast to find the approximate area of the location and the coordinates. The team aims to be very thorough while assessing these areas to ensure there is sufficient information on every relevant location.

2.3.3 Task 3.3: Watershed Analysis

NAU's watershed conditions will be analyzed for the team to understand how stormwater flows across the areas of interest found from inventory.

2.3.3.1 Task 3.3.1: Delineate Watershed

Using topographic contour maps of NAU the watershed boundaries will be identified to see the contributing drainage area for stormwater. By identifying the contributing drainage area, the team can determine the significance of implementing any LID infrastructure at these locations. The soil type for each location will be classified using USDA Web Soil Survey. Identifying the soil type is necessary because there are soil requirements that need to be met as explained in the LID Design Manual [3].

2.3.3.2 Task 3.3.2: Find Storm Event Flow

Using rainfall data from National Oceanic and Atmospheric Administration (NOAA) and the rational method, design storm events will be identified, and peak runoff flows will be determined for each location. This information will be used to determine what LID infrastructure would best fit in each location.

2.4 Task 4: Stormwater Quality Analysis

This section will outline the sampling and laboratory work to be completed for this project in order to identify the contaminants of concern for our chosen locations.

2.4.1 Task 4.1: Sampling

The team will collect stormwater runoff samples from a roof, parking lot, field, and road to understand the source impacts on the water quality. This task is dependent on capturing samples from a storm event. If there is not a stormwater event, the team will simulate one for each of these sources to generate samples.

2.4.2 Task 4.2: Laboratory Work

This section outlines the laboratory methods and work to be completed for this project to determine the contaminants of concern.

2.4.2.1 Task 4.2.1: Biochemical Oxygen Demand, BOD5

The stormwater runoff samples will be tested for five-day biochemical oxygen demand in accordance with the method outlined by the USGS to determine any possible detrimental effects to downstream ecosystems.

2.4.2.1 Task 4.2.2: Coliform

Using HACH Method 8074, stormwater runoff samples will be tested for the presence and concentration of coliform bacteria. The results of this testing will indicate if pathogens are present in the stormwater runoff and how it will affect any downstream areas.

2.4.2.3 Task 4.2.3: Chemical Oxygen Demand, COD

The stormwater runoff samples will be tested for chemical oxygen demand in accordance with method 410.3 from the EPA to determine any possible detrimental effects to downstream ecosystems.

2.4.2.4 Task 4.2.4: pH

ASTM D1293-12, Standard Test Methods for pH of Water, will be used to determine the pH of the stormwater runoff samples. Understanding the pH of the stormwater runoff will help the team determine how acidic or basic the water is and how it will affect any downstream areas.

2.4.2.5 Task 4.2.5 Fats, Oils, & Grease, FOG

The presence of fat, oil, and grease in the stormwater runoff samples will be determined following ASTM D7575. The results of this testing will identify the presence of these contaminants which can affect the amount of maintenance an area may require.

2.5 Task 5: Identify Locations for LID Implementation

Using a decision matrix and the criteria given by our clients, we will determine the best locations for LID implementation on NAU's campus. The decision matrix for this project will evaluate which items from the inventory of the campus will benefit the most and serve as implementation locations. Additionally, the team will weigh what specific LID infrastructure could be applied in each location and if it would provide a significant impact.

2.6 Task 6: Design

This section will outline the design work to be completed for this project. The work will be done using CAD, FlowMaster, and CulvertMaster to create an accurate model of the proposed LID and determine project impacts and inform construction.

2.6.1 Task 6.1: Hydraulic Analysis

Stormwater flow modeling will be completed using CulvertMaster and FlowMaster to provide supportive data for our design. Using data from WSS, NOAA, and field work, the flood events will be modeled to see what infrastructure could be created to mitigate flooding and retain water. CulvertMaster and FlowMaster will be used to calculate flows over existing and proposed designs.

2.6.1.1 Task 6.1.1: Existing

The existing hydraulic conditions will be determined for the locations determined by the decision matrix. Understanding the existing hydraulic conditions will help the team determine what hydraulic conditions need to be met for the proposed plans.

2.6.1.2 Task 6.1.2: Proposed

The hydraulic conditions will be analyzed for the proposed designs and used to inform design modifications to maximize stormwater control. The purpose of this task is to model the proposed hydraulic conditions to understand what design requirements need to be met in the design plan sets.

2.6.2 Task 6.2: Plan Set Design

Following the calculations generated from the FlowMaster and CulvertMaster program, plan sets will be drafted using AutoCAD for selected designs. The plan sets will include proposed alternatives for LID stormwater infrastructure solutions for the selected locations. This task will be completed to assist the client in options they have for implementing LID infrastructure at the locations selected.

2.7 Task 7: Project Impacts

This task will highlight all the impacts this project will have on the stakeholders and existing conditions at the project location.

2.7.1 Task 7.1: Regulatory Impacts

Assess the impacts that regulations will have by implementing bioswales across NAU's campus. Regulations to consider are NAU, COF, ADEQ, ADA, and other regulations researched. The purpose of this task is to ensure this project meets all relevant regulations to be implemented by the client.

2.7.2 Task 7.2: Health & Environment Impacts

The team will assess the impacts of stormwater runoff to the environment and existing watershed. Additionally, how the quality of stormwater runoff affects the public health. The purpose of this task is to ensure the project will not negatively impact the environment or public health.

2.7.3 Task 7.3: Economic Impacts

The team will assess the economic sustainability impacts of implementing this project. The cost of this project will also be considered to understand its impact. The purpose of this task is to ensure this project will be economically sustainable as requested by the client.

2.7.4 Task 7.4: Societal Impacts

The team will assess how this project will impact the stakeholders of this project. Ethical impacts of this project will also be assessed. The purpose of this task is to ensure this project will positively impact the stakeholders and that the project provides ethical solutions to the client's requests.

2.8 Task 8: Deliverables

All deliverables will focus on the progress of this project to meet the client's expectations. These deliverables will also ensure that the project stays on schedule.

2.8.1 Task 8.1: 30% Submittal

This submittal includes the 30% report and presentation. At this time, Tasks 1.0, 2.0, and 3.0 will be completed. Completing this deliverable will allow for initial feedback and the 60% deliverable to be started.

2.8.2 Task 8.2: 60% Submittal

This submittal includes the 60% report and presentation. At this time, Tasks 4.0 and 5.0 will be completed. Completing this deliverable will allow for further feedback and the 90% deliverable to be started.

2.8.3 Task 8.3: 90% Submittal

This submittal includes the 90% report, draft website, and presentation. At this time, all tasks will be completed. Completing this deliverable will allow for final feedback and the final deliverable to be started.

2.8.4: Task 8.4: Final Submittal

This submittal includes the final report, presentation, and website. All tasks and fine tuning of the project will be done.

2.9 Task 9: Project Management

This task outlines the facilitation of meeting locations and times to complete project submittals. This ensures that our project stays on task and meets our clients' needs.

2.9.1 Task 9.1: Schedule Management & Resource Management

The team will log all working hours to ensure the project is on schedule for completion and within budget. The hours of every team member will be logged in an Excel document.

2.9.2 Task 9.2: Meetings

All meetings will be scheduled in advance with an agenda sent to the recipient. Following all meetings, a meetings minutes will be sent to the recipient with action items to be completed. A binder will be kept documenting all agendas and meeting minutes completed for meetings with the team, client, technical advisor, and grading instructor. By keeping a binder with all meeting documents, the team will be able to access all comments at any time.

2.10 Project Exclusions

This project does not include soil sampling. The site investigation will not include large fields or large recreation areas on NAU campus. The final design will not include any analysis of a constructed bioswale. The lab work for this project does not include stormwater quality analysis to the standards of ADEQ.

3.0 Schedule

3.1 Schedule Discussion

In Appendix A, the Gantt chart created can be found. The estimated duration of the project is 178 days to complete all tasks. Major tasks within the Gantt chart include creating the location inventory, determining LID implementation locations, conducting stormwater quality analysis, completing the design, and identifying project impacts. The Gantt chart also includes project deliverables such as the 30%, 60%, 90%, and final deliverables.

3.2 Critical Path

The major tasks within the critical path include Task 1 and its subtasks, Task 2 and its subtasks, Task 3, Task 4, Task 6, and Task 8 and its subtasks. The reason that these tasks are on the critical path is that each depends on the completion of the previous critical task before the next one can be started. We intend to maintain the timing of the Gantt chart by sticking to the start and finish dates that were predetermined when constructing the Gantt chart. Additionally, starting tasks this semester to stay on track such as the location inventory to ensure there is time to complete the project.

4.0 Staffing Plan

4.1 Staffing Roles

Project staffing is composed of four separate staff positions: Senior Civil Engineer (SENG), Engineer In-Training (EIT), Lab Technician (LT), and Stormwater Technician (SWT). Each position's qualifications and responsibilities are summarized below:

- SENG: The qualifications of senior civil engineer include a bachelor's degree in civil engineering, a professional engineer (PE) license in the state of Arizona, and around 5-10 years of prior civil engineering experience. The senior engineers' primary duties for the project include general supervision over the course of the project, working on the LID design, and giving final corrections to documents before a submittal.
- EIT: The qualifications of engineer in-training include a bachelor's degree in civil or environmental engineering and have passed the Fundamentals of Engineering (FE) exam. An engineer in-training must have at least 4 years of engineering experience in the form of education or in work experience. The primary objectives of this role are assisting with field assessment and watershed analysis, assisting with design, and writing the deliverables.
- LT: The qualifications of a lab technician at a minimum are a high school diploma or equivalent. The preferred qualifications for this role include an associate or bachelor's degree in environmental science or a related field, as well as at least one to two years of prior experience in a laboratory. The lab technician's primary objectives are stormwater sampling, analysis, and the associated reports.
- SWT: The qualifications of a stormwater technician at the minimum are a high school diploma and preferably an associate's degree in environmental-science or related field. Additionally, the stormwater technician should have prior experience in environmental data collection/sampling. The stormwater technicians' primary objectives are field assessment and watershed analysis.

4.2 Staffing Matrix

Table 1 below shows the expected staffing hours per task for the senior engineer, lab technician, stormwater technician, and engineer in training. The table contains the total amount of hours for each major task, which includes their subtask. See Appendix B for the breakdown by task and subtask.

Table 1: Staffing Matrix

Tasks	Senior Engineer	Lab Technician	Stormwater Technician	EIT
Task 1: Preliminary Laboratory Research & Organization	4	24	10	8
Task 2: Site Investigation Plan	4	0	8	4
Task 3: Creating the Location Inventory	6	0	92	70
Task 4: Stormwater Quality Analysis	10	51	14	4
Task 5: Identify Locations for LID Implementation	8	4	8	4
Task 6: Design	24	14	4	25
Task 7: Project Impacts	6	4	0	8
Task 8: Deliverables	38	23	8	54
Task 9: Project Management	50	33	30	25
Total Hours	150	153	174	202
	679			

5.0 Cost of Engineering Services

5.1 Billing Rates

Table 2 below shows the billing rate for each position. Benefits were budgeted at 20% of payrate to accommodate 401k matching, health insurance, and PTO. Overhead budgets are $332,000/yr for rent, utilities, legal, taxes, and administrative salaries.

Table 2: Billing Rates

Employee	**Billing Rate**
SENG	**$136/hr**
EIT	**$84/hr**
LT	**$69/hr**
SWT	**$69/hr**

5.2 Total Cost for Billable Services

Table 3 below shows the total costs for each task and the total cost for billable services.

Table 3:Cost Breakdown for Billable Services

Tasks	Senior Engineer	Lab Technician	Stormwater Technician	EIT	Cost
Task 1: Preliminary Laboratory Research & Organization	4	24	10	8	**$3,563**
Task 2: Site Investigation Plan	4	0	8	4	**$1,433**
Task 3: Creating the Location Inventory	6	0	92	70	**$13,026**
Task 4: Stormwater Quality Analysis	10	51	14	4	**$6,189**
Task 5: Identify Locations for LID Implementation	8	4	8	4	**$2,255**
Task 6: Design	24	14	4	25	**$6,607**
Task 7: Project Impacts	6	4	0	8	**$1,764**
Task 8: Deliverables	38	23	8	54	**$11,839**
Task 9: Project Management	50	33	30	25	**$13,262**
	150	**153**	**174**	**202**	**$59,936**
Total Hours	**679**				**$59,936**

5.3 Total Cost of Engineering Services

Table 4 below shows the total cost of engineering services including the billable services and resources costs.

Table 4: Total Cost of Engineering Services

Subsection	Classification	Quantity	Rate	Unit	Cost
1.0 Personnel	SENG	150 hours	$136	$/hr	$20,460
	EIT	202 hours	$84	$/hr	$16,887
	LT	153 hours	$69	$/hr	$10,569
	SWT	174 hours	$69	$/hr	$12,020
Subtotal					**$59,936**
2.0 Resources	Software	10 days	$100	$/day	$1,000
	Lab Work	5 days	$100	$/day	$500
	Lab Supplies	1	$500/LS	LS	$500
Subtotal					**$2,000**
Total					**$61,936**

The total cost of engineering services will be $61,936. For subsection one, we have the costs of personnel work hours of our project with the senior engineer and engineer in training making up about half of the personnel costs. We do not have any eligible reimbursables for our project since all activity will be conducted on NAU campus and does not require any long-distance travel. The primary resources needed for the project are software such as AutoCAD and FlowMaster and laboratory supplies for the testing that will be conducted.

6.0 References

[1] "Google Earth," Google , [Online]. Available: https://earth.google.com/web/@35.18451701,-111.6541728,2104.23257321a,6137.83846127d,35y,-10.61483695h,0.0991213t,0r/data=CgRCAggBQgIIAEoNCP___________wEQAA.

[2] F. W. Services, "2025 Stormwater Management Design Manual," City of Flagstaff, Flagstaff, 2025.

[3] C. o. F. U. Divsion, "Low Impact Development Guidance Manual for Site Design and Implementation," City of Flagstaff, Flagstaff, 2009.

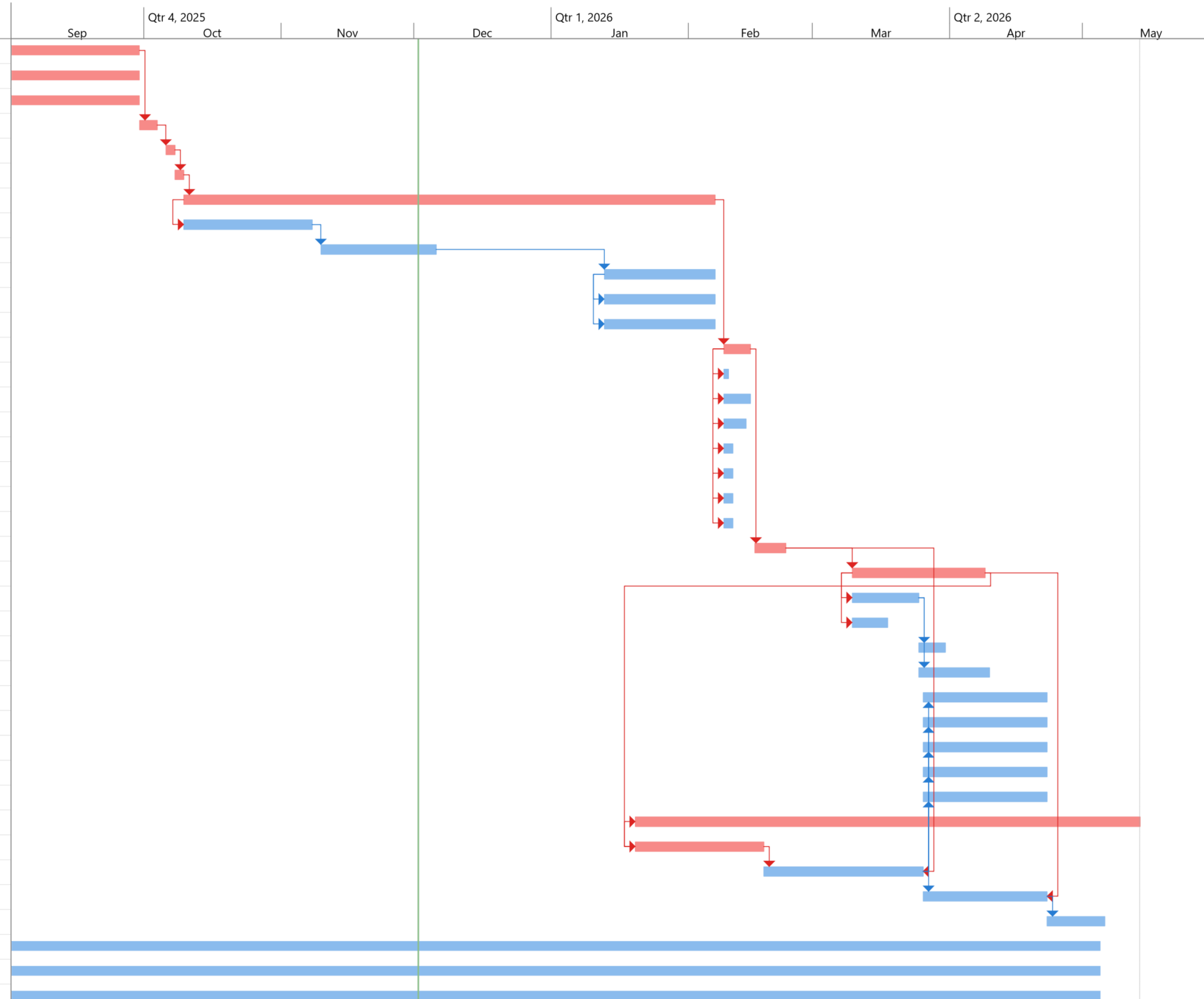
[4] H. &. S. Department of Environmental, "Stormwater Operations & Maintenance Plan," Northern Arizona University, Flagstaff, 2022.

[5] N. R. C. S. U.S. Department of Agriculture, "Web Soil Survey," [Online]. Available: https://websoilsurvey.nrcs.usda.gov/app.

Appendices

Appendix A - Gantt Chart

ID	Task Mode	Task Name	Duration
1		**Task 1: Preliminary Laboratory Research & Organization**	21 days
2		Task 1.1: Laboratory Research	21 days
3		Task 1.2: Laboratory Testing Organization	21 days
4		**Task 2: Site Investigation Plan**	4 days
5		Task 2.1: Create Field Assessment Form	2 days
6		Task 2.2: Geolocate Areas of Interest	2 days
7		**Task 3: Creating the Location Inventory**	86 days
8		Task 3.1: Field Assessment	21 days
9		Task 3.2: Field Results Analysis	20 days
10		Task 3.3: Watershed Analysis	19 days
11		Task 3.2.1: Delineate Watershed	19 days
12		Task 3.2.2: Find Storm Event Flow	19 days
13		**Task 4: Stormwater Quality Analysis**	6 days
14		Task 4.1: Sampling	1 day
15		Task 4.2: Laboratory Work	6 days
16		Task 4.2.1: BOD5	5 days
17		Task 4.2.2: Coliform	2 days
18		Task 4.2.3: COD	2 days
19		Task 4.2.4: pH	2 days
20		Task 4.2.5: FOG	2 days
21		**Task 5: Identify Locations for LID Implementation**	6 days
22		**Task 6: Design**	22 days
23		Task 6.1: Hydraulic Analysis	11 days
24		Task 6.1.1: Existing	6 days
25		Task 6.1.2: Proposed	4 days
26		Task 6.2: Plan Set Design	12 days
27		**Task 7: Project Impacts**	20 days
28		Task 7.1: Regulatory	20 days
29		Task 7.2: Health & Environment	20 days
30		Task 7.3: Economic	20 days
31		Task 7.4: Societal Impacts	20 days
32		**Task 8: Deliverables**	84 days
33		Task 8.1: 30% Submittal	22 days
34		Task 8.2: 60% Submittal	27 days
35		Task 8.3: 90% Submittal	20 days
36		Task 8.4: Final Submittal	9 days
37		**Task 9: Project Management**	178 days
38		Task 9.1: Schedule Management & Resource Management	178 days
39		Task 9.2: Meetings	178 days



Project: Project1
Date: Tue 12/2/25

Task	Project Summary	Manual Task	Start-only	Deadline	Manual Progress
Split	Inactive Task	Duration-only	Finish-only	Critical	
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Critical Split	
Summary	Inactive Summary	Manual Summary	External Milestone	Progress	

Appendix B - Staffing Matrix

Tasks	Senior Engineer	Lab Technician	Stormwater Technician	EIT
Task 1: Preliminary Labortory Reseach & Organization	**4**	**24**	**10**	**8**
Task 1.1 Laboratory Research	2	12	5	4
Task 1.2 Laboratory Testing Organization	2	12	5	4
Task 2: Site Investigation Plan	**4**	**0**	**8**	**4**
Task 2.1: Create Field Assessment Form	2	0	4	2
Task 2.2: Geolocate Areas of Interest	2	0	4	2
Task 3: Creating the Location Inventory	**6**	**0**	**92**	**70**
Task 3.1: Field Assessment	1	0	15	10
Task 3.2: Field Results Analysis	1	0	15	10
Task 3.3: Watershed Analysis	2	0	31	25
Task 3.2.1: Delineate Watershed	1	0	18	15
Task 3.2.2: Find Storm Event Flow	1	0	13	10
Task 4: Stormwater Quality Analysis	**10**	**51**	**14**	**4**
Task 4.1: Sampling	2	8	4	4
Task 4.2: Laboratory Work	8	43	10	0
Task 4.2.1: BOD5	2	11	2	0
Task 4.2.2: Coliform	1.5	8	2	0
Task 4.2.3: COD	1.5	8	2	0
Task 4.2.4: pH	1.5	8	2	0
Task 4.2.5: FOG	1.5	8	2	0
Task 5: Identify Locations for LID Implementation	**8**	**4**	**8**	**4**
Task 6: Design	**24**	**14**	**4**	**25**
Task 6.1: Hydraulic Analysis	4	6	4	10
Task: 6.1.1: Existing	2	3	2	5
Task: 6.1.2: Proposed	2	3	2	5

Task 6.2: Plan Set Design	20	8	0	15
Task 7: Project Impacts	**6**	**4**	**0**	**8**
Task 7.1: Regulatory	1.5	2	0	2
Task 7.2: Health & Environment	1.5	2	0	2
Task 7.3: Economic	1.5	0	0	2
Task 7.4: Societal Impacts	1.5	0	0	2
Task 8: Deliverables	**38**	**23**	**8**	**54**
Task 8.1: 30% Submittal	10	5	2	12
Task 8.2: 60% Submittal	10	8	2	14
Task 8.3: 90% Submittal	10	5	2	14
Task 8.4: Final Submittal	8	5	2	14
Task 9: Project Management	**50**	**33**	**30**	**25**
Task 9.1: Schedule Management & Resource Management	25	8	5	0
Task 9.2: Meetings	25	25	25	25
Total Hours	**150**	**153**	**174**	**202**
	679			