GREENGREY
ENGINEERING

Museum of Northern Arizona Meadow Riparian Habitat Enhancement Project

Client: Dr. Larry Stevens, Director of Springs at MNA

Project Team:
Noor Alsadi
Matthew Sorenson
Jasem Alrumaidheen
Khaled Alazmi

Project Location

- **Location**
  - Northwest of Flagstaff, between the Museum of Northern Arizona's research campus and the Peaks Senior Living Community
- **Population**
  - Flagstaff: 70,000 people
  - The Peaks Senior Living Community has 92 apartments, 39 bungalows and 59 beds total in the Healthcare Center

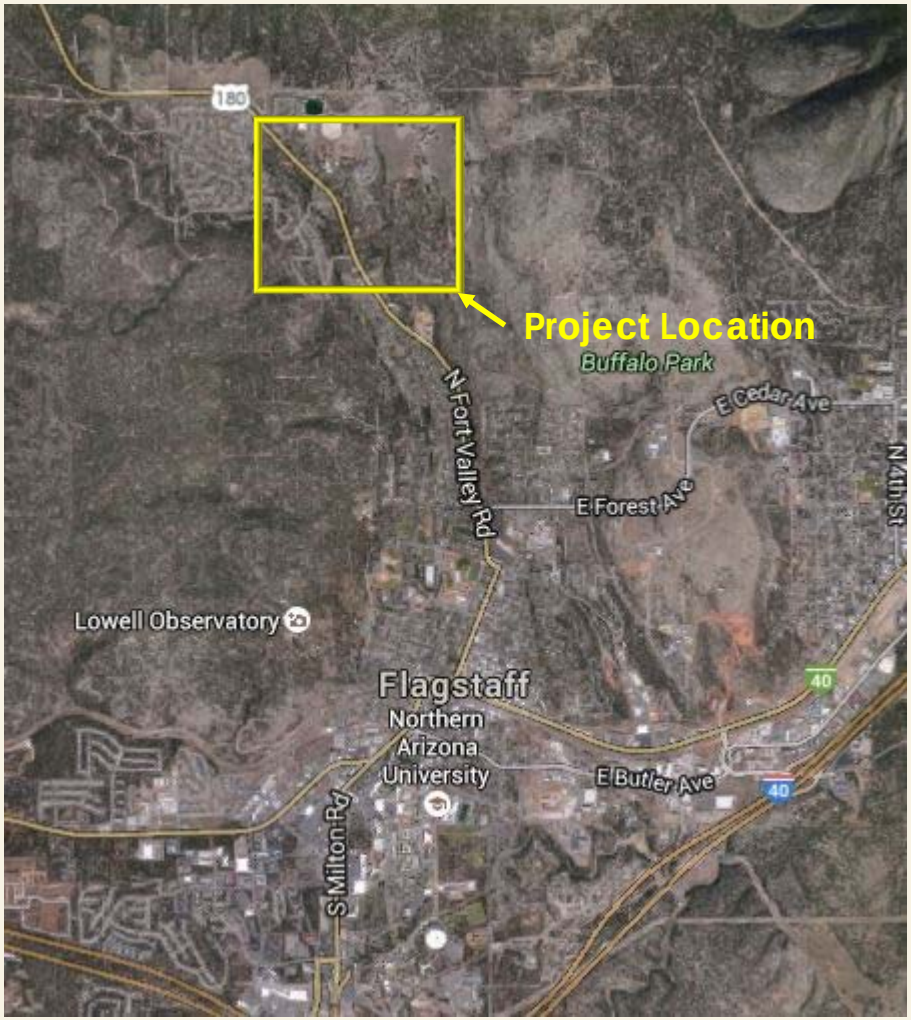


Figure 1-Google earth map site location

Project Site Top Reach

Figure 2 – Project site flow starts from the well house, through the concrete structure downhill. The arrow illustrates the elevation difference.

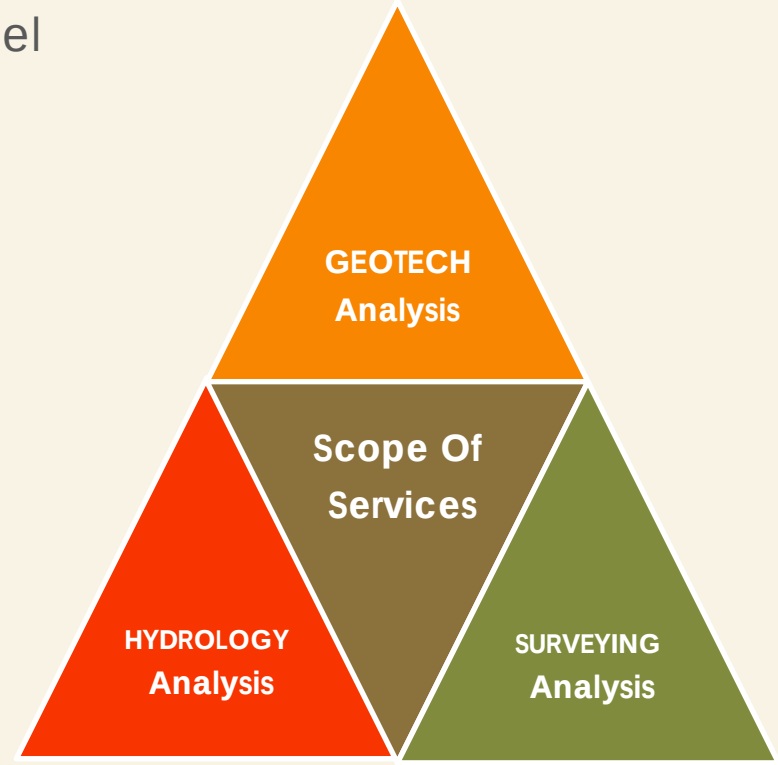
Project Site Bottom Reach

Figure 3 – Project site from below looking upstream from the bottom. The arrow illustrates the elevation difference.

Project Overview

- **Project Purpose**
  - The Museum of Northern Arizona would like to have a riparian area assessed and design alternatives provided that:
    - Promote proper function of the channel
    - Promote plant & wildlife diversity
    - Preserve cultural heritage
    - Add educational experiences

- **Stakeholders**
  - The Museum Of Northern Arizona
  - The residents & staff of The Peaks Senior Living Community
  - The City of Flagstaff



Geotechnical Aspects

- **Sources of Geotechnical Analysis**
  - Previous information
  - Past project analysis
  - Identification sources
- **USGS Soil Data Survey**
  - Stony Clay Loam

*Note:
GreenGrey Engineering will NOT conduct geotechnical testing.

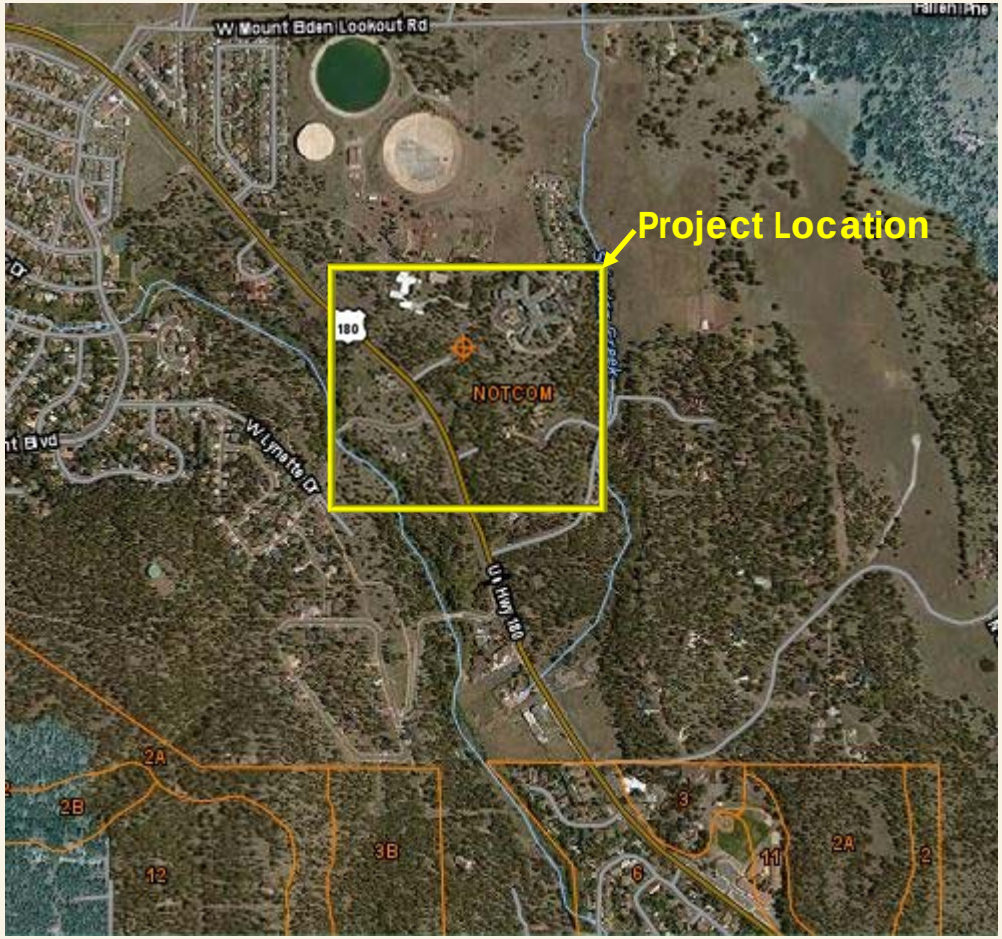


Figure 4 – USGS Area of Interest

Hydrology Analysis

- **Water Quality Test On the "Pure Water"**
  - Biological Test
    - Example: Coliform
    - Method: (USEPA Membrane Filtration)
  - Chemical Test
    - Example: Total Hardness
    - Method: (Method # 2540C. Titration)

Figure 5- Spring Box

- **Water Flow Analysis On Channel**
  - Pre-existing study – Dr. Stevens MNA
  - Flow measurements

Site Surveying

- **Surveying Analysis**
  - Site surveying
    - Well house downstream to sidewalk adjacent to Highway 180
  - Topographic map
  - Pre existing data
    - Build on previous data points
    - Expand data points

Figure 6 - Cooperative NAU Students

Important Design Elements

- **Water Distribution**
  - Options:
    - Rerouting stream channel to expand area of vegetation
    - Gravity fed fountain
    - Small ponds

Figure 7 - Example possibility of water distribution

- **Educational Component**
  - Options:
    - Educational signs
    - Educational brochures
    - Educational websites

Figure 8 - Example educational signs

Important Design Elements

- **Access Pathway**
  - ADA compliant, possibly paved
  - Options:
    - Full access
    - Limited access

- **Re-vegetation**
  - Options:
    - Use data from other Coyote Springs group
      - Evaluate native vs. non native plants

Figure 9 – Pathway Alternative Example

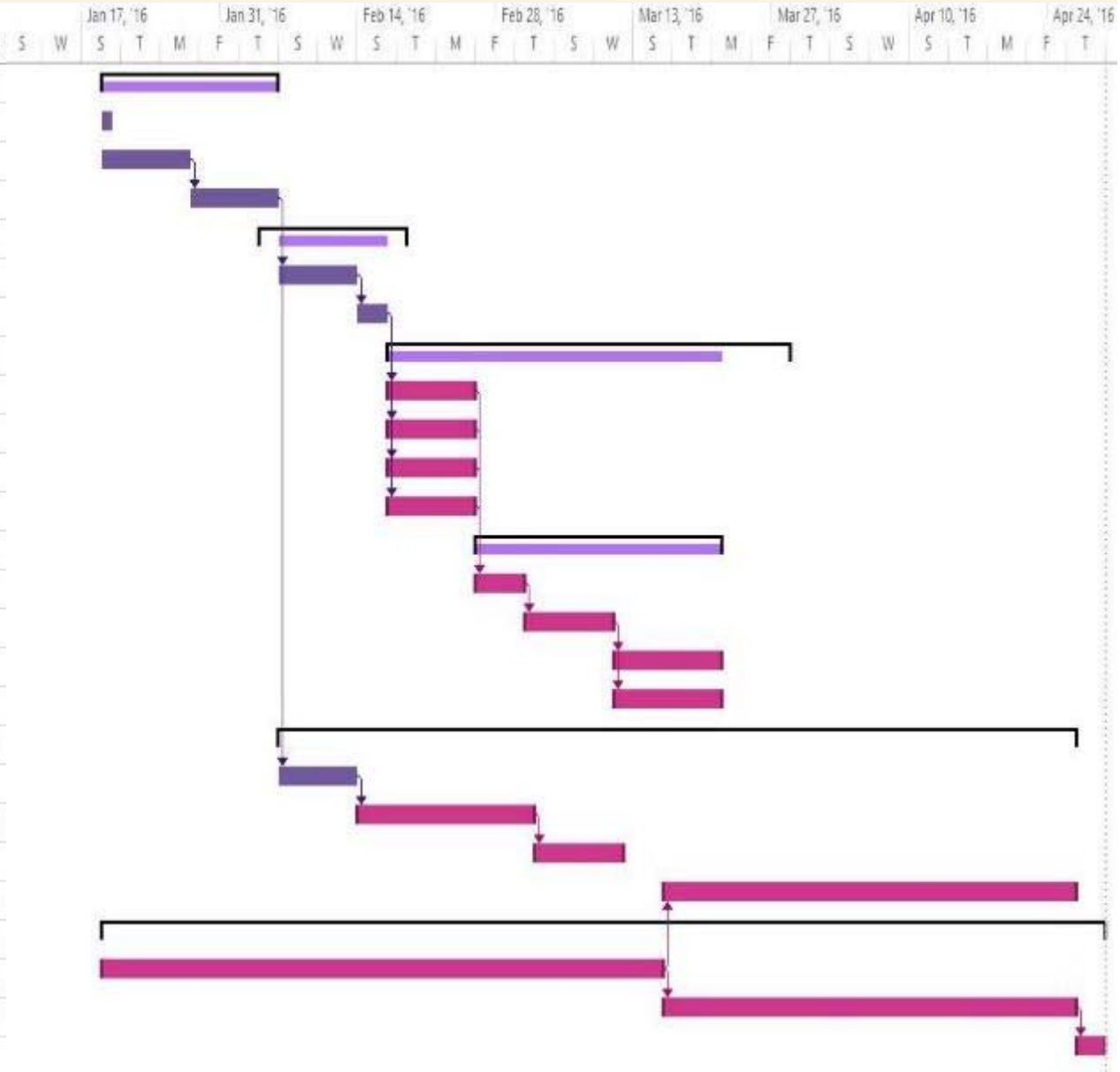
Figure 10 - Native plants vs. non native plants

Green Grey Engineering Exclusions

- **Green Grey Engineering services do <u>NOT</u> include the following:**
  - No new geotechnical studies
  - Will not conduct new vegetation survey
  - No hydraulic models will be designed

Scope of Services & Schedule

WBS	Task Name	Duration
1	**Data Collection**	**14 days**
1.1	Geotechnical Info	1 day
1.2	Site Hydrology	7 days
1.3	Site Surveying	7 days
2	**Preparation for Testing**	**14 days**
2.1	Gathering Materials	7 days
2.2	Sample Gathering	3 days
3	**Laboratory Testing**	**29 days**
3.1	Alkalinity Test	7 days
3.2	Nutrients Test	7 days
3.3	Hardness Test	7 days
3.4	Coliform Test	7 days
3.5	**Analysis**	**17 days**
3.5.1	Results	3 days
3.5.2	Limitations	7 days
3.5.3	Recommendations	7 days
3.5.4	Impacts	7 days
4	**Design Modeling**	**60 days**
4.1	Calculations	7 days
4.2	Design	14 days
4.3	Design Analysis	7 days
4.4	Professional Report Review	30 days
5	**Final Deliverables**	**77 days**
5.1	50% Submittal Report	44 days
5.2	100% Submittal Report	30 days
5.3	Final Presentation	3 days



Staffing & Cost Engineering Services

Classification	Billing Rate $/hr	Hours	Cost ($)
Project Manager	114	172	19,677
Software Engineer	91	380	34,485
Lab Technician	48	120	5,775
Design Specialist	31	40	1,254
Personnel Total	284.625	712	**61,191**
Lab			3,500
Final Total			**64,691**

Questions?

- **Acknowledgement: we are very appreciative towards…**
  - Dr. Odem Willbert, Technical Advisor & Grader
  - AARK STREAM RESTORATIONS, LLC , NAU Students
  - Sat Best, Faculties Manager of MNA
  - Pat Baca, Marketing Director Of The Peaks
  - Larry Stevens, Director of Springs Investigation, MNA

GreenGrey