

# **Scope of Services Agreement**

**Fanning Wash & Soliere Avenue Culvert Design  
AAMP Engineering**

## **Scope of Work**

### **2.0 Scope of Services**

#### **2.1 Task 1.0 Preliminary Site Research**

This task will focus specifically on doing preliminary research necessary for the site. This research will help aid in the development of the design as the project moves forward.

##### **2.1.1 Task 1.1 Existing I-40 Culvert Research**

Previous plan-sets, drawings, and models about the existing culvert beneath I-40 will be reviewed to ascertain the design flow conditions into the site.

##### **2.1.2 Task 1.2 Standards and Codes Research**

The standards and codes applicable to this project will be researched to ensure that the no violations occur. Documents such as the Coconino Drainage Design Manual specified by the City of Flagstaff and the NRCS Manual will be identified and consulted.

#### **2.2 Task 2.0 Field and Lab Work**

This task focuses on obtaining site specific information to be able model the topography, flow and understand soil characteristics for strength and hydraulic conductivity.

##### **2.2.1 Task 2.1 Site Mapping**

###### **2.2.1.1 Task 2.1.1 Site Inventory**

An inventory of all geographical landforms will be noted for modeling purposes. This will include any vegetation or anything that could potentially disrupt the flow path in any way.

#### **2.2.1.2 Task 2.1.2 Survey Site**

Surveying techniques and equipment such as a total station, levels and rods will be used to determine the elevations and distances of the site. Elevations will be measured to the nearest 1' interval and used to model the topography of the site.

#### **2.2.1.3 Task 2.1.3 Topographic Map**

AutoCAD will be used to create a detailed topographic model of the site using 1' elevation intervals. This map will include all geological features such as plants and contour intervals.

### **2.2.2 Task 2.2 Geotechnical Analysis**

A geotechnical analysis will be performed by collecting soil samples. Samples will be tested in the NAU Civil Engineering Soils Laboratory.

#### **2.2.2.1 Task 2.2.1 Sampling Plan**

Prior to sampling, a Sampling Plan will be created defining the location and number of samples, and the sampling techniques to be used.

An NAU Field Safety Checklist form will be prepared containing details on all lab procedures to be conducted. The lab binder must be approved by the NAU CENE Lab Manager prior to accessing the lab.

#### **2.2.2.2 Task 2.2.2 Sampling**

Soil samples will be collected in accordance with the Sampling Plan document.

#### **2.2.2.3 Task 2.2.3 Particle Size Distribution and Sieve Analysis Test**

ASTM D6913 "Standard Test Methods for Particle-Size Distribution of Soils Using Sieve Analysis" will be used to classify the soils at the site.

#### **2.2.2.4 Task 2.2.4 Soil Limits Testing**

ASTM 4318, "Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils" will be used to determine the strength limits of the soil under wet and dry conditions.

### **2.3 Task 3.0: HEC-RAS Hydraulic Analysis of Existing Crossing**

A HEC-RAS model will be created to model flow from the I40 culvert across Soliere Ave to the Rio de Flag under current conditions. This will help determine the flow rates at the low water crossing, normal depths of the water and characteristics of the flow that will inform culvert design.

### **2.4 Task 4.0: Design Alternatives & Selection of Final Design**

Alternative culvert designs at the crossing will be developed, assessed and a final design will be selected.

#### **2.4.1 Task 4.1 Develop Alternatives**

Three alternative designs will be developed and a preliminary design will be made. The preliminary design will include culvert type, material, size based upon the flow requirements. Preliminary drawings will be created in AutoCAD.

#### **2.4.2 Task 4.2 Analyze Alternatives**

Alternatives will be analyzed to aid in the selection of the best alternative.

##### **2.4.2.1 Task 4.2.1 Preliminary Hydraulic Models**

HEC-RAS will be used to model the flow through each alternative to ascertain its ability to handle the required flow volumes. Alternatives will be revised until three acceptable designs are created.

##### **2.4.2.2 Task 4.2.2 Decision Matrix**

A decision matrix will be developed based on selected criteria such as cost, effectiveness, maintainability, and ease of construction.

##### **2.4.2.3 Task 4.2.3 Select Final Design**

The final design will be selected based on the results from the decision matrix.

### **2.5 Task 5.0: Final Design**

The selected design will be fully designed in this step.

### **2.5.1 Task 5.1 Plan Set Development**

A Plan Set for the selected design will be created using AutoCAD and will be created with sufficient detail for construction, including annotations specifying dimensions, spacing, materials of construction, and slopes.

### **2.5.2 Task 5.2 Construction Cost Estimate**

A construction cost estimate will be developed for the selected design based on labor and materials.

## **2.6 Task 6.0: Impacts**

The impacts of the project on the area will be evaluated.

## **2.7 Task 7.0: FEMA Floodplain Analysis**

A floodplain analysis post-construction will be discussed. LIDAR data of the existing downstream area will be collected and used to map a new floodplain of the area of the low water crossing.

## **2.8 Task 8.0: Deliverables**

This task involves all the deliverables for the project. Impacts will address the associated social, environmental and economic issues of the project.

### **2.8.1 Task 8.1 30% Submittal**

#### **2.8.1.1 Task 8.1.1 30% Design Report**

A design report at 30% completion will be prepared. It is expected that work through "*Task 3.0; Existing HEC RAS Model*" will be completed. Completing everything up to this task will be considered the 30% milestone.

#### **2.8.1.2 Task 8.1.2 30% Presentation**

A professional presentation at 30% project completion will be created.

#### **2.8.1.3 Task 8.1.3 30% Plan Set**

A Plan Set will be started and will include title pages and data found from geotechnical sampling, an existing topographic map, and an existing HEC-RAS model.

## **2.8.2 Task 8.2 60% Submittal**

### **2.8.2.1 8.2.1 60% Design Report**

A design report at 60% completion will be prepared. It is expected that work through “*Task 5.0; Final Design Selection*” will be completed. Completing everything up to this task will be considered the 60% milestone.

### **2.8.2.2 Task 8.2.2 60% Presentation**

A professional presentation at 60% project completion will be created.

### **2.8.2.3 Task 8.2.3 60% Plan Set**

A Plan Set will be continued including everything from the 30% plan set and a basic design in AutoCAD. The design will include only some materials and dimensions.

## **2.8.3 Task 8.3 90% Submittal**

### **2.8.3.1 Task 8.3.1 90% Design Report**

A design report at 90% completion will be prepared. It is expected that work through “*Task 7; FEMA Floodplain Analysis*” will be completed. Final edits will be the only work needed. Completion of all work up to this task will be considered the 90% milestone.

### **2.8.3.2 Task 8.3.2 90% Presentation**

A professional presentation at 90% project completion will be created.

### **2.8.3.3 Task 8.3.3 90% Plan Set**

A Plan Set will be continued including everything from the 30% and 60% Plan Sets and ultimately finished. This will include all dimensions, spacing, gradient, and materials.

### **2.8.3.4 Task 8.3.4 90% Website**

A professional website will be created based on the final design. This website submission will include all work done up to the 90% milestone.

## **2.8.4 Task 8.4 Final Submittal**

### **2.8.4.1 Task 8.4.1 Final Report**

A final report at 100% completion will be completed. It is expected that all work will be completed. This will be considered the final milestone at 100%.

### **2.8.4.2 Task 8.4.2 Final Presentation**

A professional final presentation at 100% project completion will be created.

### **2.8.4.3 Task 8.4.3 Final Plan Set**

A final plan set will be developed with everything needed for construction. This entails dimensions, gradients, materials, and schedules.

### **2.8.4.4 Task 8.4.4 Final Website**

A final website will be created with all the project's information and documents.

## **2.9 Task 9.0: Project Management**

This task entails the management of the schedule, materials, financial resources, and human resources.

### **2.9.1 Task 9.1 Resource Management**

This task entails the proper organization of time, finances, labor, and other materials needed to complete the project. Staff time will be tracked, and the project schedule will be regularly evaluated to assure the project is on track. The complexity and scope of this project require an analysis to identify and manage the inevitable challenges and potential risks. The task will enable the team to avoid or mitigate the risk impacts.

### **2.9.2 Task 9.2 Team Management and Meetings**

A meeting binder will be created to document all client, technical advisor, grading instructors, and team meetings. Agenda and minutes will be recorded for each of these meetings.