Fanning Wash at Soliere Ave

AAMP ENGINEERING INC.

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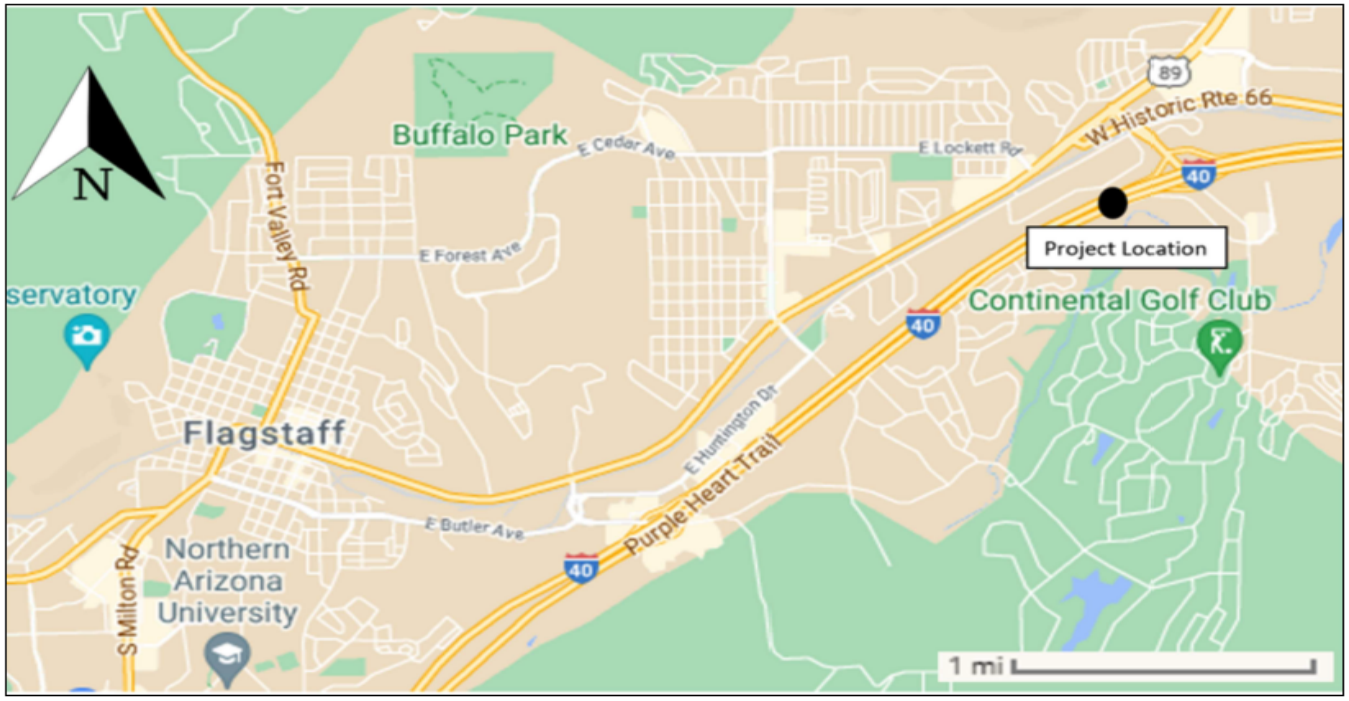
PROJECT VICINITY MAP



DRAWING: Cover

PAGE: 1 OF: 1

BY: AAMP Engineering Inc.

SCALE: 0 1.5" 3" 6"

DATE: 11/28/2021

DUE: 11/30/2021

REVISION: 0

PROJECT: Fanning Wash

LAB: Capstone

COF Drainage Design Manual Codes

5.2.1. Design Storm Criteria

Roadway culverts shall be designed to convey the following frequency flows without roadway overtopping
Collector/Arterial Streets..... 50-year

5.2.3.1. Allowable Headwater

The allowable headwater (HW) is the depth of water that can be ponded at the upstream end of a culvert and shall be limited to one or more of the following parameters:

1. No damage or inundation to upstream property; 2. No greater than the low point in the road grade; 3. Equal to the elevation where flow diverts around the culvert;

5.2.3.1. Tailwater Relationship

A submerged outlet occurs where the tailwater elevation is higher than the crown of the culvert. For design purposes, downstream conditions which result in high tailwater should be avoided if possible. A free outlet has a tailwater equal to or lower than critical depth. For culverts having free outlets, lowering the tailwater has no effect on the discharge or the backwater profile upstream of the tailwater. The tailwater depth may be computed as the highest value of the following criteria:

1. The normal depth in the downstream channel for subcritical flow regimes; 2. The critical depth and equivalent hydraulic grade line if the outlet is operating with a free outfall; 3. The high water elevation that has the same design frequency if outlet is a detention basin, channel, or other body of water; or 4. The quantity (dc + D)/2; where dc = critical depth (ft.), and D = pipe diameter (ft.)

5.2.4.1. Outlets

The maximum velocity at the culvert outlet shall be consistent with the velocity in the natural channel. Appropriate protection shall be considered when outlet velocities are between 4.0 and 15 ft/sec. Recommended outlet treatments are shown in Table 5-2
4 to 10 fps Dumped rock riprap apron

5.2.4.2. Riprap Apron Design Procedure

Typical riprap aprons, as illustrated in Figure 5-3, are suitable for use with outlet velocities not exceeding ten (10) feet per second.

La = (3Q / D1.5) + 7D for TW > 0.5D
Wa = 3D + 0.4La for TW > 0.5D
D50 = [0.02 (Q)4/3] / [TW (D)]

5.2.4.3. Safety Considerations

During design and construction, culvert entrances may require safety precautions to protect life, health, traffic, and adjacent property. This may include the use of safety measures such as fencing, handrails, guard rails, warning signs, and safety/trash racks to limit or deter access by the public.

c. Shielded with a guard rail if the culvert is very large, cannot be extended, has a channel which cannot be safely traversed by a vehicle, has significant flooding hazard with a grate, or has headwalls which protrude 6" or higher above driving surface within the "clear zone"

5.2.5.1. Material Selection

The material selected for culverts should be based on service life, durability, structural strength, hydraulic efficiency, bedding conditions, abrasion and corrosion resistance, and joint tightness. Acceptable materials for culverts intended to be public are:

Corrugated Metal Pipe (CMP). Helical Corrugated or Spiral Rib Metal Pipe per MAG Section 760.3. Rubber Gasket Reinforced Concrete Pipe (RGRCP) - bell or groove and spigot or tongue. 5-14 Reinforced Concrete Box Culvert (RCBC) per Section 5.2.5.2

5.2.5.3. Culvert Sizes and Shape

Circular cross-sections are preferred, however, the use of arch or oval shapes is permitted only if dictated by hydraulic limitations, site characteristics, structural criteria, or environmental concerns.

5.2.5.4. Cover Requirements

The minimum allowable cover for culverts 18 to 36 inches in diameter shall be one (1) foot from top of pipe to top of subgade or top of finish grade if no subgrade is present. For culverts greater than 36 inches in diameter, minimum cover should be 30% of the culvert diameter, if possible. The top of any culvert should never extend above the roadway subgrade into the roadway street section.

Flagstaff Municipal Code

13-08-001-0001 Stormwater Management

The design and construction of all public and private stormwater management facilities shall be in accordance with these regulations and with the City of Flagstaff Stormwater Management Design Manual and these standards. In the event of a conflict, the more stringent regulation shall apply. (Ord. 2017-22, Rep&ReEn, 07/05/2017

DRAWING: Codes
PAGE: 1
OF: 1
BY: AAMP Engineering Inc.
SCALE: 6"=1'
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PROJECT: Fanning Wash
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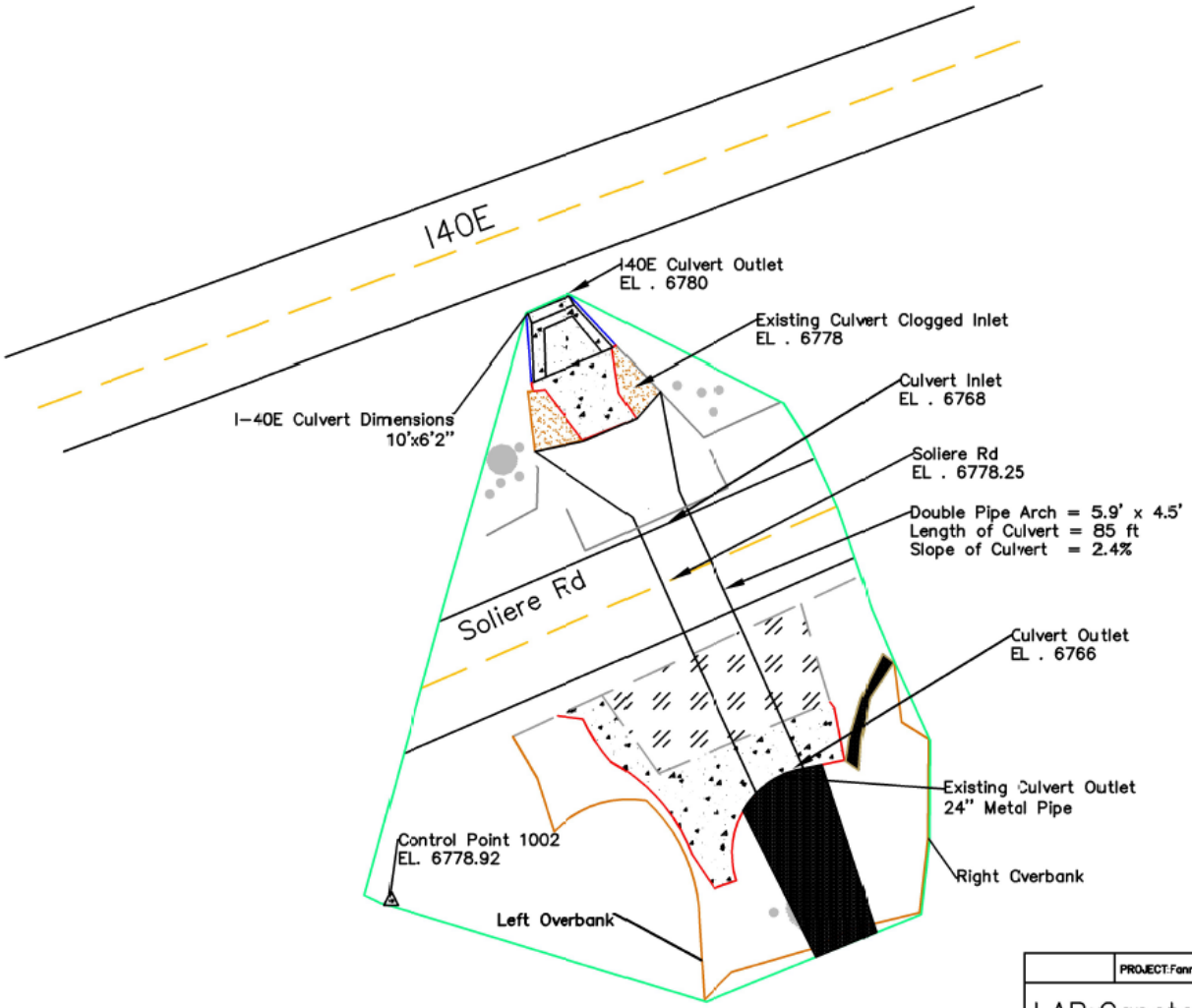
PROJECT: Fanning Wash	DATE: 11/28/2021	BY: AAMP Engineering Inc.	DRAWING: Site Location Map
LAB: Capstone	DUE: 11/30/2021	0 1.5" 3" 6" SCALE: 6"=1'	
	REVISION: 0		PAGE: 1 OF: 1

Proposed double pipe arch
Plan view



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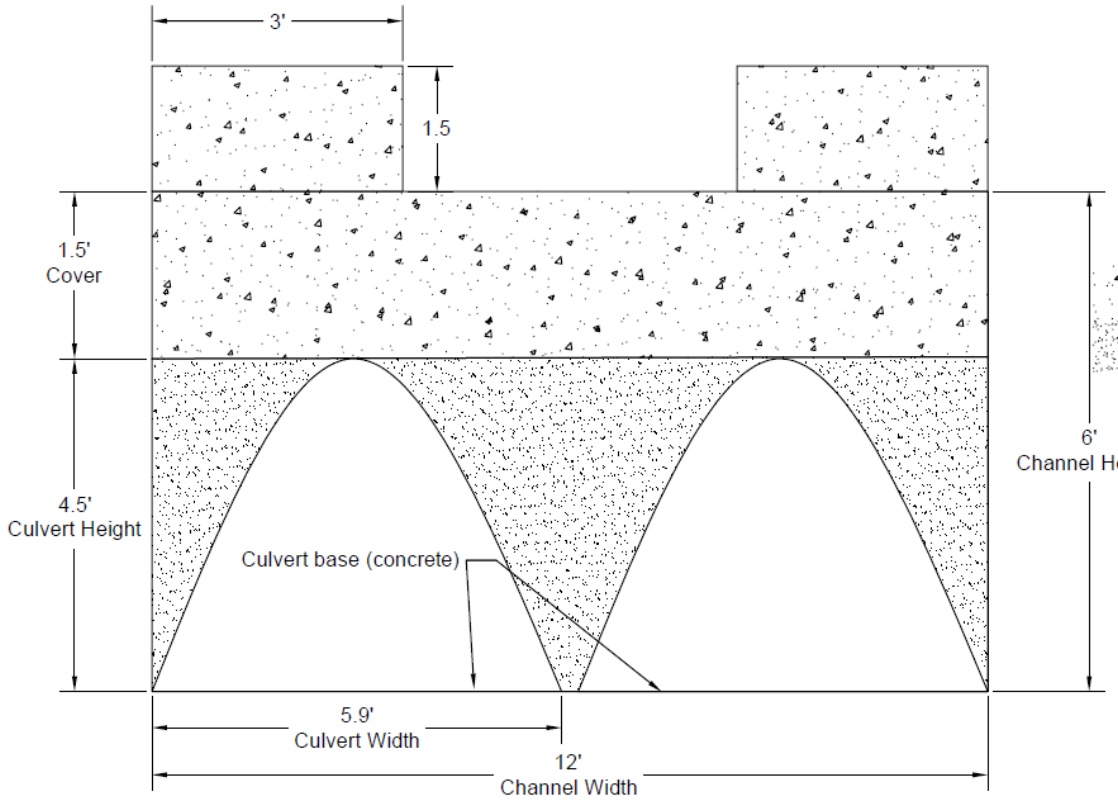
Legend	
	Clogged Existing Culvert Inlet
	Concrete Pad
	Paved Pull-Off
	Rip Rap
	Vegetation
	I-40E Culvert
	Rocks
	Fencing
	Street
	Control Point

	PROJECT:Fanning Wash and Soliere Ave	DATE:9/20/202'	BY: AAMP Engineering Inc.	DRAWING: Site Map
LAB:Capstone		DUE:9/21/2021	0 1/16in/80 1/40 SCALE:1"/40'	PAGE:1 OF:1
		REVISION:0		

Culvert entrance-upstream



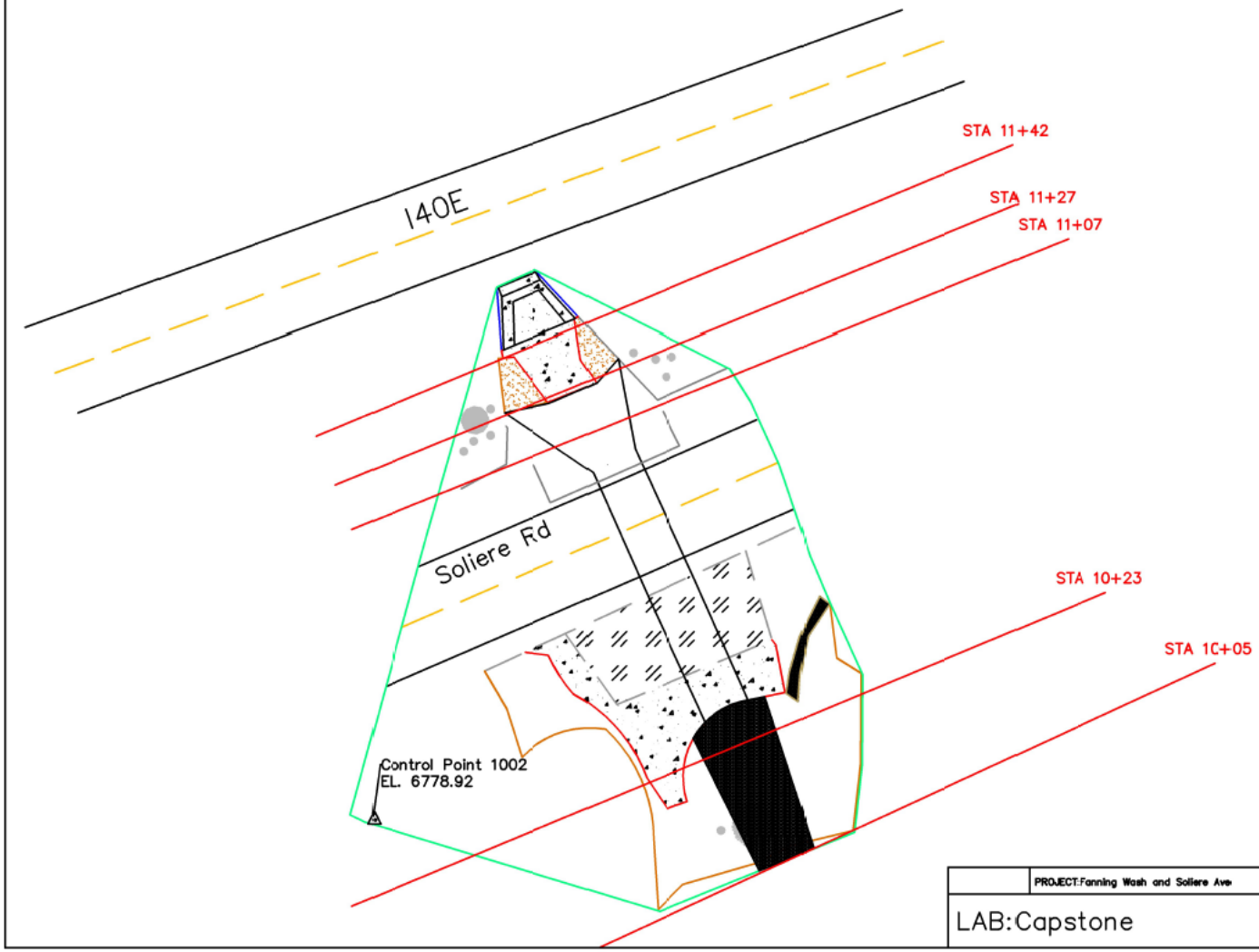
Legend

Concrete Pad

Dirt

PROJECT: Fanning Wash and Soliere Ave	DATE: 9/20/2021	BY: AAMP Engineering Inc.	DRAWING: Site Map
LAB: Capstone	DUE: 9/21/2021	0 1/8 1/4 1/2 SCALE: 1"/2"	PAGE: 1 OF: 1
	REVISION: 0		

Proposed double pipe arch
Plan view



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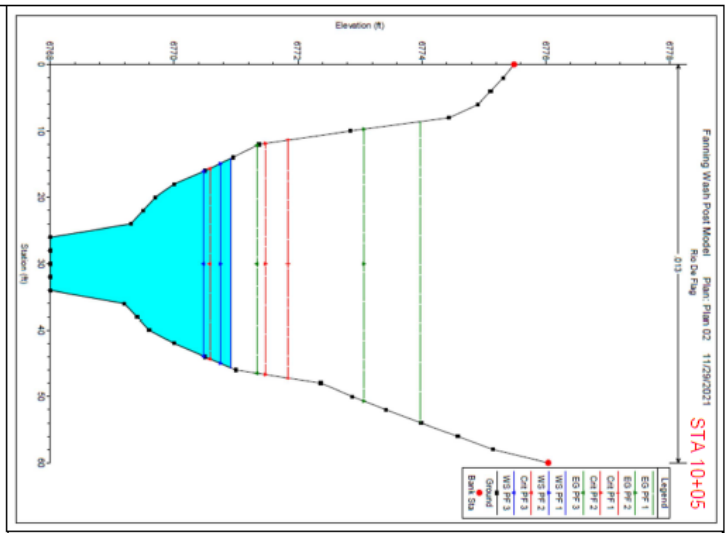
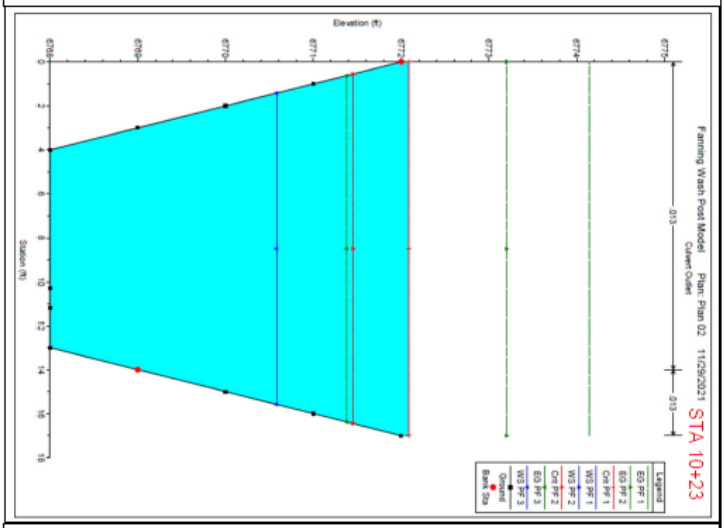
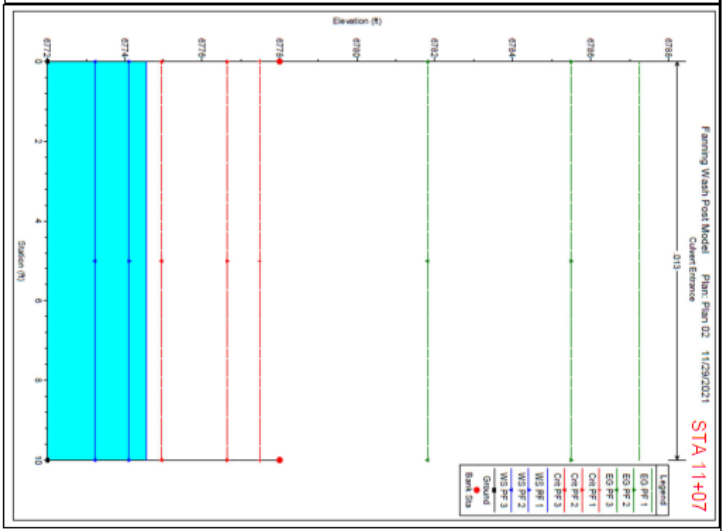
Legend

- Clogged Existing Culvert Inlet
- Concrete Pad
- Paved Pull-Off
- Rip Rap
- Vegetation
- I-40E Culvert
- Rocks
- Fencing
- Street
- Control Point

	PROJECT: Fanning Wash and Soliere Ave	DATE: 9/20/202'	BY: AAMP Engineering Inc.
LAB: Capstone		DUE: 9/21/2021	DRAWING: Site Map
		REVISION: 0	SCALE: 1" /40' 0 1/160 1/80 1/40
			PAGE: 1 OF: 1







	PROJECT: Fanning Wash	DATE: 11/28/2021	BY: AAMP Engineering Inc.	DRAWING: STA Cross-Section
LAB: Capstone		DUE: 11/30/2021	0 0 0 0	
		REVISION: 0	SCALE: 0	PAGE: 1 OF: 1