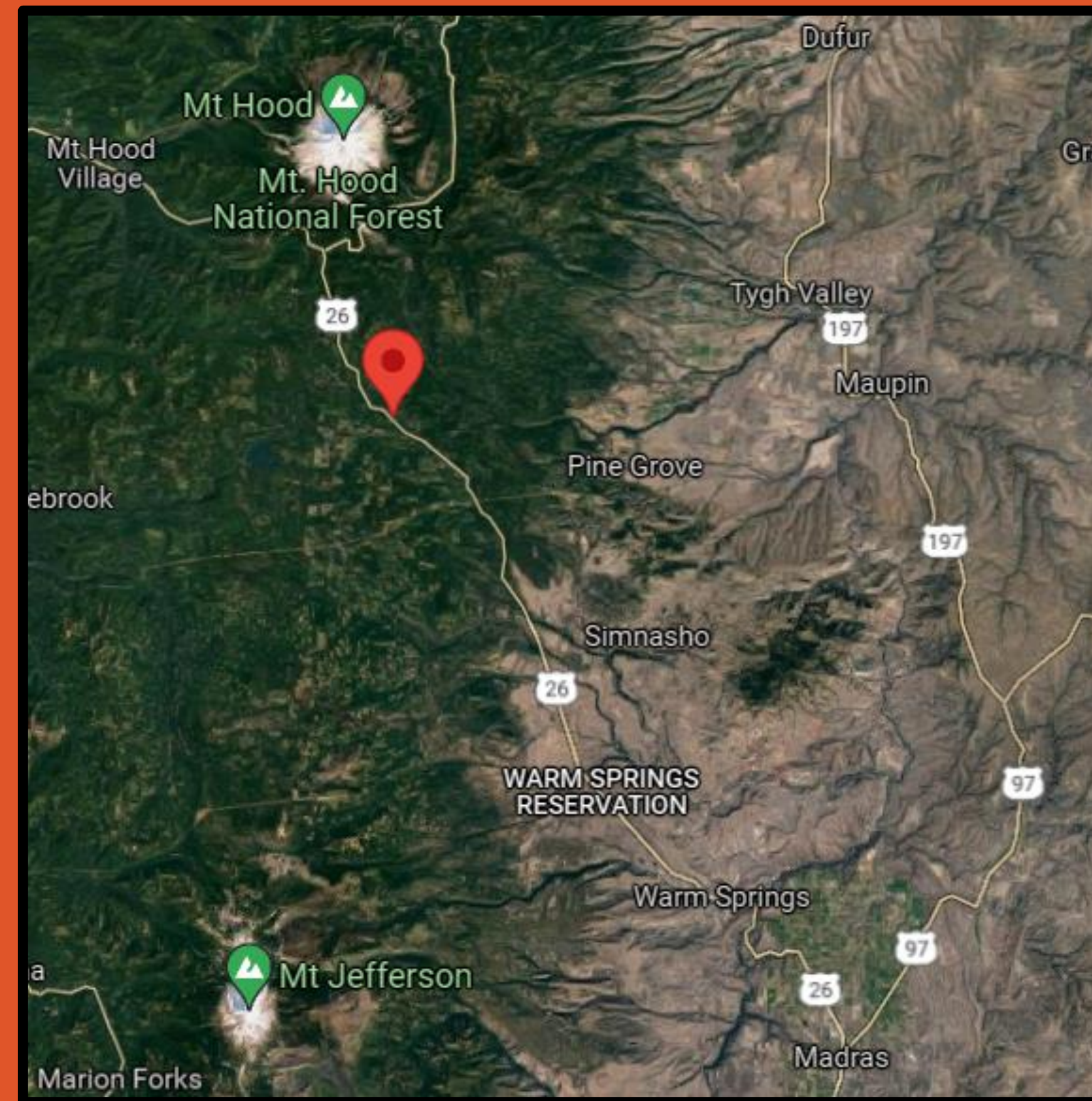


Project Scope & Goals

- Client: Oregon Department of Transportation (ODOT).
- Location: Northwest of Madras, OR.



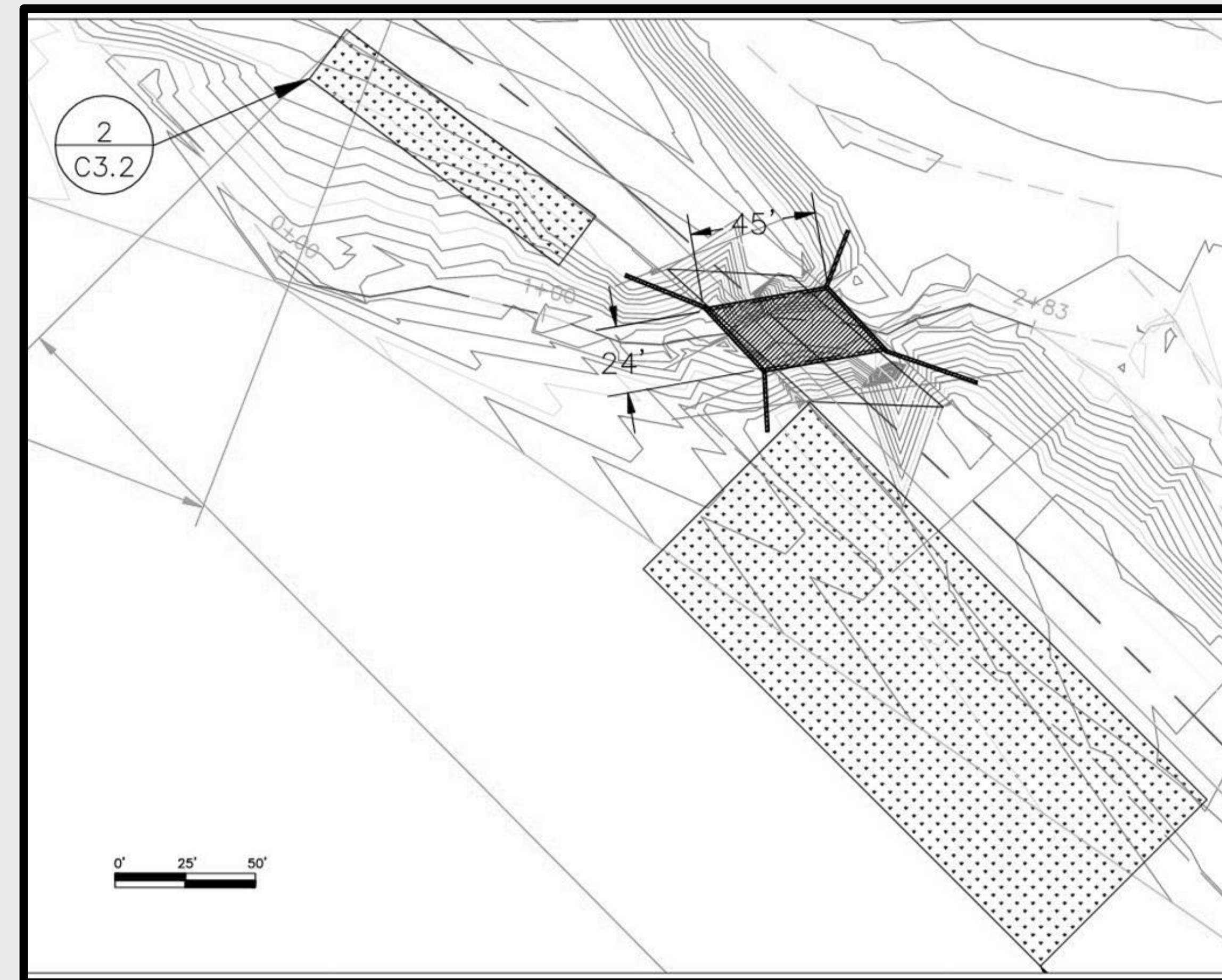
Site Location (adapted from Google Maps, 2022)

- Problem: An old existing bridge structure crossing over Clear Creek has a poor load rating and scour issues.
- Solution: The old bridge will be replaced with a culvert and a section of US Highway 26 will be retrofitted.
- Goals: The main objective was to develop an environmentally responsible design, to protect the creek, and to maintain two lanes of traffic open during construction.



CLEAR CREEK CULVERT REPLACEMENT

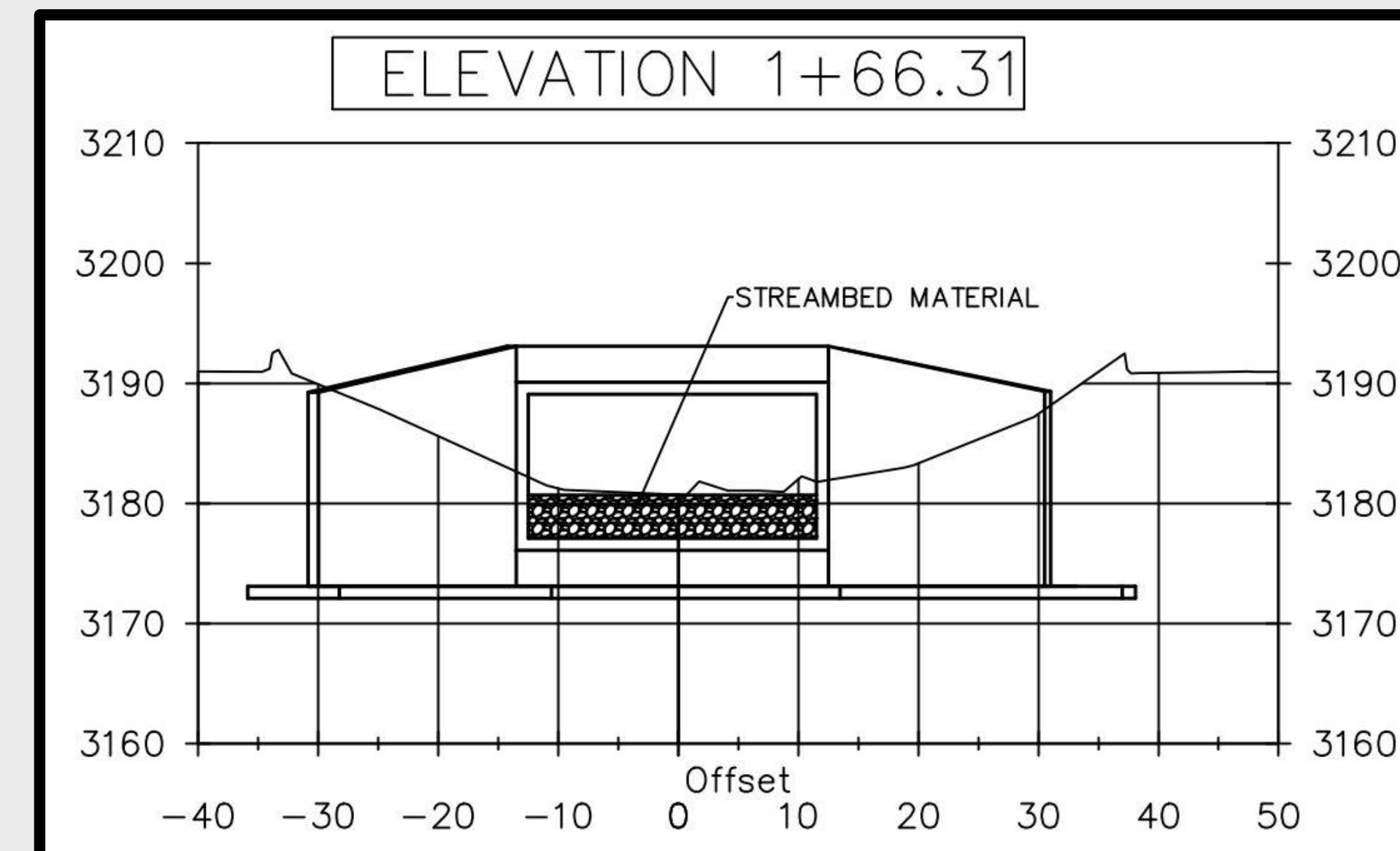
Proposed Design Solutions



Site Plan

Water Resources Engineering - Culvert Design

A 24'x12' reinforced concrete box culvert with 30°-70° wingwalls, 3' headwall, 3' cutoff wall, 3.6' deep streambed, and a 1% slope was placed where the existing bridge was.



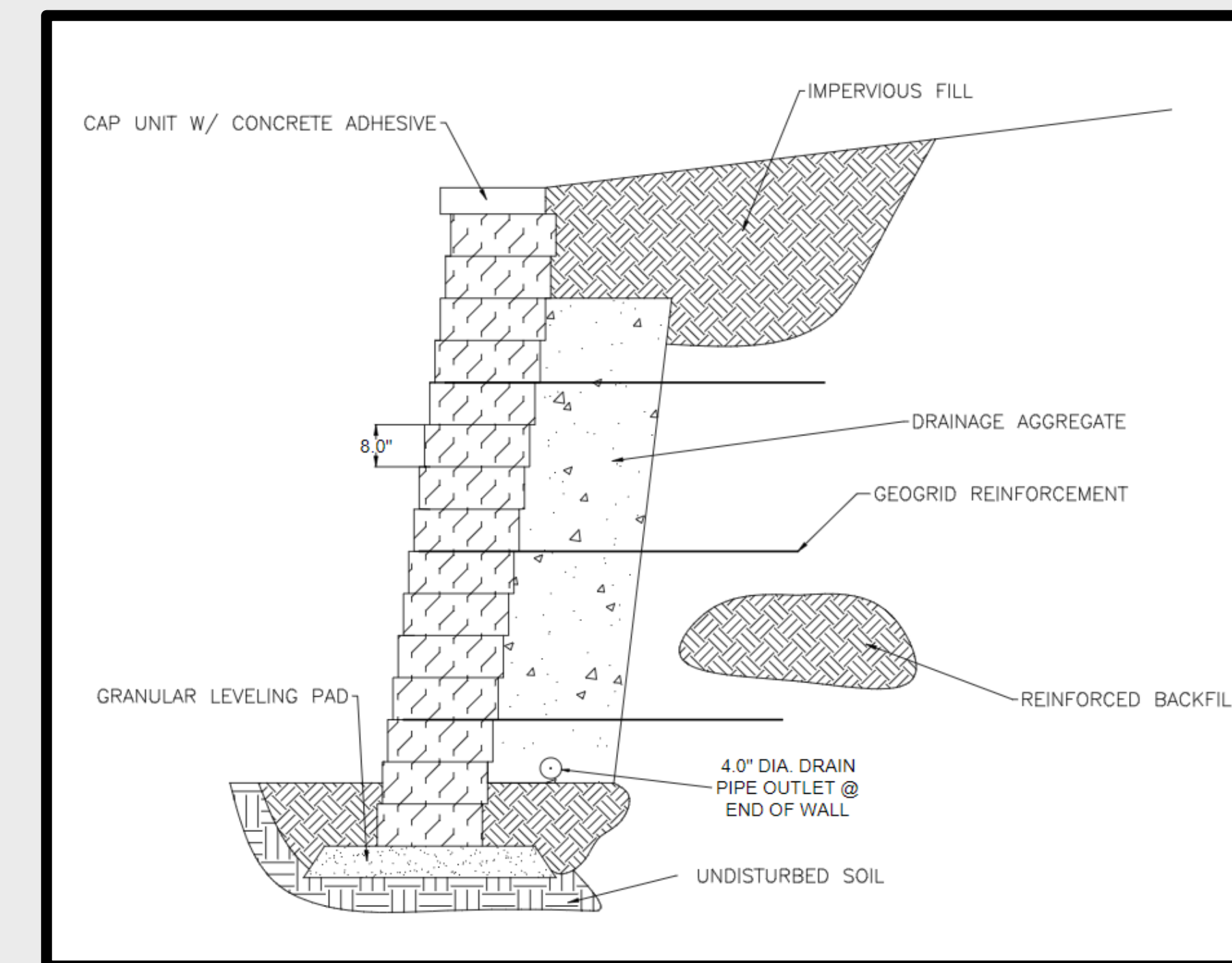
Culvert Elevation

Transportation Engineering - Traffic Control Design

One lane, two way taper method - consists of the advanced warning area, the transition area, the activity area and the termination area.

Geotechnical Engineering - Retainment Systems Design

US26 retaining wall - Geogrid reinforced embankment
Clear Creek scour protection - Rip rap based support structure.



Embankment Design

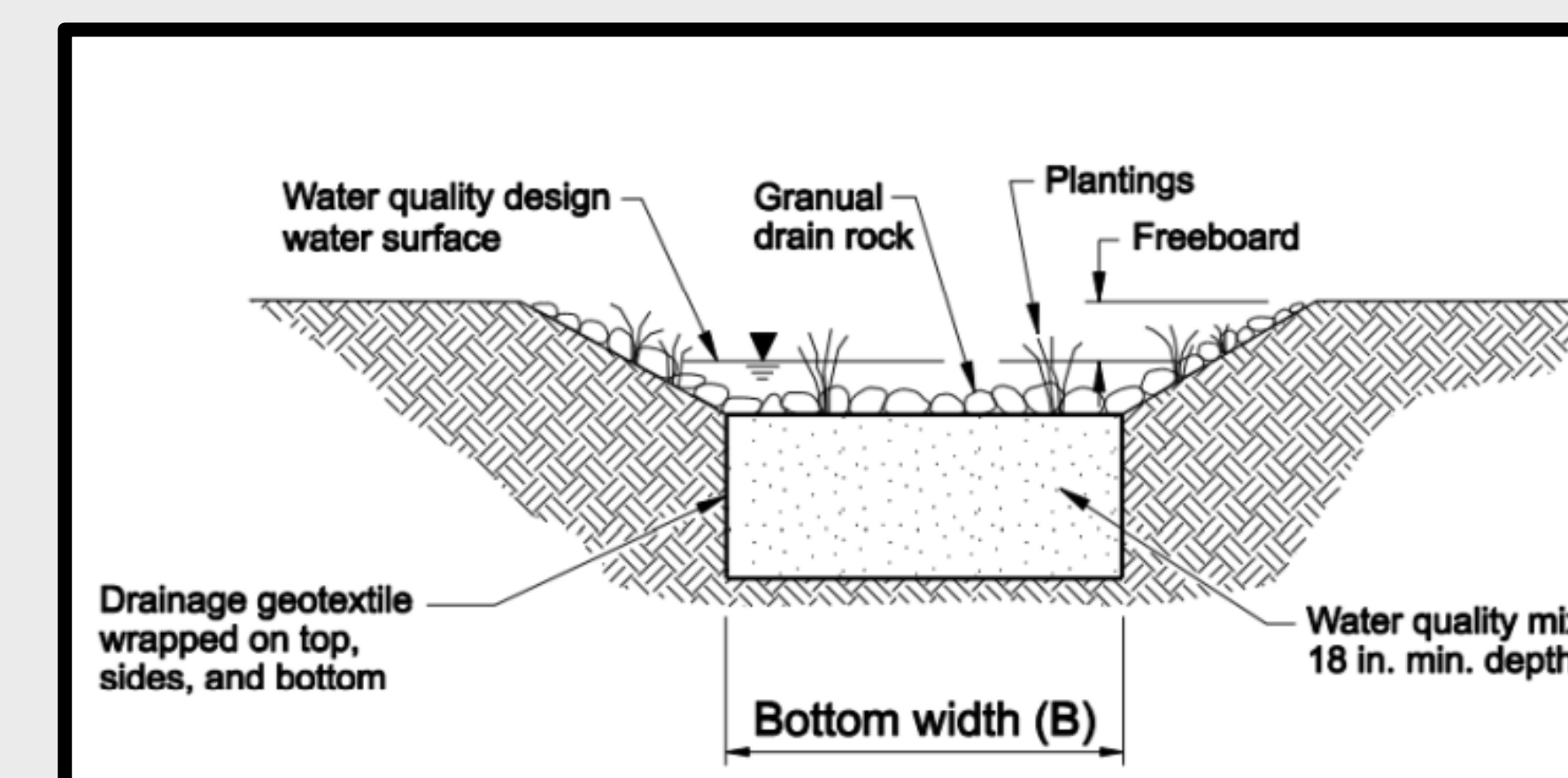
Transportation Engineering - Realignment Design

The new alignment utilizes a degree of curvature of 2.75 degrees. A straight-line decision sight distance of 865ft was achieved. The alignment was shifted where the existing shoulder width exceeded 3ft.

Water Resources - Stormwater Management Design

The vegetated swale has a bottom width of 73 feet and a maximum water depth of 4 inches. The side slopes are 1V:4H and the longitudinal slope is 4.0%. The total length of the swale is 200 feet.

The filter strip has a width of 10 feet, a slope of 2%, and a total length of 111 feet.



Vegetated Swale (adapted from ODOT, 2014)



Design Alternatives

Geotechnical Engineering - Retainment Systems Design

- Rock Filled Gabions - Not viable in wet areas
- Crib Walls - Expensive, long construction period, Short service life
- Steel Bin Walls - Smaller, requires considerable care for installation, clogging may occur

Water Resources Engineering - Culvert Design

- Two 150" reinforced concrete pipe culverts with headwalls and streambed depths of 3.75'.
- One 20'5"x13'0" structural plate steel pipe-arch with headwall and streambed depth of 2.6'.
- One 24'x12' reinforced concrete box culvert with headwall, wingwalls, cutoff wall, and 3.6' streambed depth.

Transportation Engineering - Realignment Design

- Raising Design speed to 60mph
- Moving the alignment in other spots
- using a lower degree of curvature

Water Resources - Stormwater Management Design

- A vegetated swale
- A pipe drainage system

Transportation Engineering - Traffic Control Design

- Diversion structure
- Full road closure



Existing Bridge and Creek