

# Alternative Technical Concept

## CULVERT REHABILITATION

ATC No.: 5  
Type: Alternative design  
Date: 2/11/2025

**1. Description:** The following conduits/culverts shall be replaced or corrected due to them being in fair or poor condition:

- CFN 1858223, 292ft in length of 48"x60"elliptical CMP- traverses under IR-70.
- CFN 1858224, 102ft in length of 54" CMP – traverses under Ramp A.
- CFN 1836941, 120ft in length of 36" CMP – traverses under SR-149.

The DBT shall replace the conduits/culverts in their entirety, utilize the process of a close-fit pipe liner, or utilize a process or an applied structural liner for the specific drainage structure(s) noted immediately above. If a close-fit pipe liner or an applied structural liner is performed, all work shall comply with ODOT specifications SS899 (CLOSE-FIT PIPE LINER) or SS833 (CONDUIT RENEWAL USING SPRAY APPLIED STRUCTURAL LINER), respectively. The DBT shall ensure the drainage structures meet final design hydraulic capacity requirements

**2. Deviation:** This ATC proposes to rehabilitate the three existing culverts that have been identified for replacement. Proposed rehabilitation options include cure-in-place pipes and spray applied structural liners.

Current discussions with local lining manufacturers determined lining thicknesses vary depending on the type and design criteria. A conservative liner

thickness of approximately 2x the minimum requirement was used to preliminarily analyze the culverts for this ATC.

While thickness of the liner reduces the inner diameter of the culverts, the liner surface provides a reduction in friction, represented in the calculations by the Manning's N coefficient:

- Existing CMP Manning's N = 0.024
- Lined Pipe Manning's N = 0.015 (this is an industry average but may vary depending on the specific application and constructability method specified)

The existing culverts and their respective lined conditions were analyzed using the FHWA's HY-8 Culvert Hydraulic Analysis Program. The resulting headwater elevations for the existing and lined conditions were measured against the ODOT L&D Volume 2 Culvert Headwater Controls found in Section 1006.2. Based on our preliminary analysis lining the culverts would provide equivalent or minor deviations from the existing hydraulic performance. In all scenarios the proposed headwater elevations of the lined culverts will provide the required freeboard to protect nearby roadways and buildings.

Below are specific sections of the Scope of Services which are inconsistent with the proposed ATC, as well as proposed language for the referenced section:

Scope of Services Section 15 – Drainage – General – Paragraph 9:

Inconsistent Language: "The following conduits/culverts shall be replaced due to them being in fair or poor condition:"

Proposed Language: "The following conduits/culverts shall be replaced or rehabilitated due to them being

in fair or poor condition. Only structural liners will be considered for use in rehabilitation."

Scope of Services Section 15 – Drainage – General – Paragraph 10:

Inconsistent Language: "The DBT will replace the culverts in their entirety."

Proposed Language: "The DBT will utilize complete replacement and/or structural liner rehabilitations of the existing culverts."

**3. Usage:** The DBT intends to use culvert lining only at the three identified locations.

**4. Maintenance of Traffic Impacts:** Culvert lining in lieu of replacement will reduce negative impacts during construction and allow Interstate lanes, Ramps, and SR-149 to remain unaffected. Lining requires minimal excavation significantly reducing the scope and time impacts of MOT zones for this work.

**5. Environmental Impacts:** The culverts are located along Streams 1 and 2 as identified in the ecological report provided by ODOT. Culvert replacement using jack and bore, or open cut methods will require significant impacts to the Stream and a potential update to the 404/401 permit. Pipe rehabilitation with a liner will result in significantly less impacts on Streams 1 and 2. Furthermore, the disturbance required to construct a liner are already covered in the existing permit application. Lining the pipes is significantly less invasive, minimizing any impact on the environment with regards to runoff, sedimentation, restoration period required or impacts to wetlands or the existing pump house.

**6. Utilities:** Rehabilitation of the existing 36" CMP (CFN 1836941) will remove the potential need to relocate known water and gas utilities in the area.

**7. Maintenance:** The installation of culvert lining will require at least a 50-year design life per the supplemental specification requirements. Pipe liners provide maintenance benefits, long term durability and structural integrity equal to a full culvert replacement.

**8. History:** Culvert lining is an effective method to provide infrastructure improvements and will provide these culverts with a significant extension of their useful life.

**9. Inspection:** The proposed ATC does not require any atypical testing or inspection during construction or proposed design life.

**10. Calculations:**

The results of the preliminary hydraulic analysis of the culverts are included on the table in the next sheet. These calculations are conceptual, and purposely conservative, and subject to change, likely for the better. Headwater elevations between the existing and lined condition are improved, equal or slightly higher than existing. All design and check storm controls meet or exceed the existing condition. As demonstrated below, the pipe liner provides adequate capacity and meets design criteria.



Culvert	Scenario	Headwater Elevation		Low Edge of Pavement	Headwater Controls Per ODOT L&D Volume 2 Section 1006.2								
		Design	Check		1006.2.1 Design Storm Controls				1006.2.2 Check Storm Controls				
					A	B	C	D	A	B	C	D	E
36" CMP (CFN 1836941)	Existing	1159.87	1165.47	1170.89	Pass	N/A	Pass	N/A	Pass	Fail	N/A	N/A	N/A
	Lined	1160.41	1165.62		Pass	N/A	Pass	N/A	Pass	Fail	N/A	N/A	N/A
48"x60" Vertical Elliptical CMP (CFN 1858223)	Existing	1195.67	1206.19	1202.50	Pass	N/A	Fail	N/A	N/A	Fail	N/A	N/A	N/A
	Lined	1190.85	1202.24		Pass	N/A	Fail	N/A	N/A	Fail	N/A	N/A	N/A
54" CMP (CFN 1858224)	Existing	1180.90	1189.07	1193.77	Pass	N/A	Fail	N/A	N/A	Fail	N/A	N/A	N/A
	Lined	1180.48	1188.65		Pass	N/A	Pass	N/A	N/A	Fail	N/A	N/A	N/A

