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Chapter 25 - Culvert Matrix

25.1 Decision Aid Introduction

This chapter presents a decision aid matrix that can be used to quickly look up common defects and the feasible actions available to address the defects. Feasible actions reference previous chapters where detailed discussion or repair procedures can be found.

Table 25.1 Condition Based Decision Making Matrix for Culverts (Part 1)

Common Deficiency	Feasible Treatments
Leaking Joints	<ul style="list-style-type: none"> • Install internal bands. (Section 14.6.3) • Install internal joint seals. (Section 14.6.3) • Grout injection into soil around leaking joints. (Section 14.6.3) • Construct concrete collar around leaking joints. (Section 14.6.3) <p><i>The following options are only likely to be economically feasible if the majority of the joints have failed:</i></p> <ul style="list-style-type: none"> • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Waterway Opening: Vegetation	<ul style="list-style-type: none"> • Cut brush/trees. (Section 14.5.1.3) • Clear vegetation and grub roots. (Section 14.5.1.3)
Waterway Opening: Silt/Debris	<ul style="list-style-type: none"> • Mechanical removal. (Section 14.5.1.2) • Vacuum truck. (Section 14.5.1.2) • Water jet/Sewer jet. (Section 14.5.1.2) • Fire hose flush. (Section 14.5.1.2) • Bucket line. (Section 14.5.1.2)
Inlet/Outlet Scour	<ul style="list-style-type: none"> • Rip Rap. (Section 14.5.2) • Grout Injection. (Section 14.5.2) (Note: This treatment is only likely to be necessary if scour has advanced beneath, and has undermined the culvert.) • Construct Toe Wall. (Section 14.6.4)
Masonry Culverts: Loss of Mortar	<ul style="list-style-type: none"> • Repoint. (Sections 14.6.4, 16.3.1)
Masonry Culverts: Cracks	<ul style="list-style-type: none"> • Repoint. (Sections 14.6.4, 16.3.1) • Replace or Repair Masonry Units. (Sections 16.3.4, 16.3.6)
Bottomless Culverts: Footing Undermined	<ul style="list-style-type: none"> • Grout injection. (Section 14.5.2) • Footing Repair. (Section 14.6.6)

Table 25.2 Decision Making Matrix for Culverts (Part 2)

Common Deficiency	Feasible Treatments
Barrel: Damaged Invert	<ul style="list-style-type: none"> • Pave invert with concrete. (Section 14.6.1.1) • Install saddle plates. (Section 14.6.1.2) • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Barrel: Damaged Coatings	<ul style="list-style-type: none"> • Repair Coating in accordance with ASTM A780 (not economically feasible if there is general failure of the coatings over a majority of the surface area) • Pave invert with concrete. (Section 14.6.1.1) • Install saddle plates. (Section 14.6.1.2) <p><i>The following options are only likely to be appropriate if there are other issues like corrosion or joint failure:</i></p> <ul style="list-style-type: none"> • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Barrel: Corrosion	<ul style="list-style-type: none"> • Pave invert with concrete. (Section 14.6.1.1) • Install saddle plates. (Section 14.6.1.2) • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Barrel: Cracks	<ul style="list-style-type: none"> • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Barrel: Deformation	<ul style="list-style-type: none"> • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)
Barrel: Concrete Spalls	<ul style="list-style-type: none"> • Patch Spalls. (Section 5.7.6) • Repair Concrete Surface. (Section 13.4.1) • Slip line culvert with Corrugated Metal Pipe (CMP). (Section 14.6.2.1) • Slip line culvert with polyethylene pipe. (Section 14.6.2.1) • Slip line culvert with smooth interior metal pipe. (Section 14.6.2.1) • Line pipe with inversion liner. (Section 14.6.2.3) • Line pipe with shotcrete/spin cast concrete. (Section 14.6.2.2)

25.2 Chapter 25 Reference List

1. American Society for Testing and Materials. *Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings*. ASTM A780, 2009.
2. Chapters 5, 13, 14, and 16, this manual.