Chapter 9

DRAINAGE

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9-1.0 GENERAL

The main purposes of the drainage systems constructed and maintained by the Department are:

- To properly manage and treat water that would accumulate from drainage areas created by highway construction.
- To manage water which is shed onto the highway right-of-way from adjacent drainage areas.
- Under normal circumstances, manage and route stream and channel flow and runoff safely within drainage structures as to maintain traffic flow.

Water is the greatest natural destructive force affecting the highway system. Therefore, drainage facilities must be maintained in normal operating conditions to ensure that they will handle the maximum flows for which they were designed.

9-1.01 GLOSSARY

Apron: The end section of a culvert which is designed to channel and contain water flow from upstream to downstream.

Catch Basin: See “Inlet”

Culvert: A structure constructed entirely below the elevation of the roadway surface and not a part of the roadway surface, which provides an opening under the roadway for the passage of water or traffic. A culvert is any structure not classified as a bridge which provides an opening under a roadway.

Ditch: A depression, natural or man-made, that is normally used to channel water.

Drainage Tile: Pipe that is usually underground that conveys runoff primarily from agricultural lands. The location of pipe is typically less than six feet from the existing ground surface and can cross within MnDOT right of way.

Drainage Facility: Drainage facilities include cattle passes, shoulder drains, under drains, contour ditches, collection ditches, side ditches, off-take ditches, culverts, storm drains, and catch basins.

Edge Drain: A drainage inlet consisting of an opening in the roadway gutter area.

Easement: A right acquired by public authority to use or control property for a designated highway purpose.

Gutter: That portion of the roadway section adjacent to the curb which is utilized to convey storm water runoff. A composite gutter section consists of the section immediately adjacent to the curb, usually 2.0' at a cross-slope of approximately 0.06 ft/ft, and the parking lane, shoulder, or pavement at a cross-slope of a lesser amount, roughly 0.02 ft/ft.

Inlet: The term "inlet" refers to all types of inlets such as apron inlets, grate inlets, curb inlets, catch basins and slotted inlets.

Manhole: Structure that is included in a storm drain system to provide access to storm drain pipes for inspection and cleanout. Manhole structures are the same as inlet structures except for the castings and cover. Manhole structures are also referred to as access holes.

MS4: Acronym for Municipal Separate Storm Sewer System. A municipal separate storm sewer system is a conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains):

- Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage districts, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges to waters of the United States.
- Designed or used for collecting or conveying storm water, but is not a combined sewer nor part of a publicly owned treatment works.

NPDES Permit: The general permit issued by the Minnesota Pollution Control Agency (MPCA) that authorized the discharge of storm water associated with construction activity under the National Pollutant Discharge Elimination System (NPDES) Program.

Structural Pollution Control Device: A device, usually man-made or engineered for the specific purpose of filtering or treating urbanized storm runoff. These devices are typically found within man-made ponds, basins or depressed areas and can be above ground or underground.

Wetlands: Transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. In general terms, the land within the wetland is saturated for a minimum period of 14 days every other year during the growing season.

9-1.02 INSPECTION OF DRAINAGE FACILITIES (HYDINFRA)

HYDINFRA is the standard tool MnDOT uses to perform drainage structure and culvert inspections. Items that are inspected using HYDINFRA include:

- Pipe
- Structures (catch basins, manholes, drop inlets)
- Special Structures (i.e. aprons, weirs, special storm and hydraulic management devices)
- Structural Pollution Control Devices (settler, skimmer, filter, underground storm water treatment devices)
- Ditches

HYDINFRA was first instituted in 2006 and is the primary data clearinghouse for culvert and storm structure inspection data. HYDINFRA allows MnDOT personnel to record inspections, access data, schedule cleanings and maintenance for culverts and other storm drainage structures and contains a recommended inspection cycle. The MnDOT Bridge Hydraulics Unit manages the system. Contact and additional information regarding the HYDINFRA program can be found on the MnDOT HYDINFRA website.

A sample database containing data for drainage structures within the MnDOT HYDINFRA system is found below:

TABLE 1: SAMPLE HYDINFRA TABLE

7952	169	175.71	Concrete	Mainline	Arch	28	20	Inches	48	Feet	2 - 6 Feet	2.333	4	Y	Y	N	N	N	Y	Y	N			Y	N	Y	Y	N	Y	Y	Y	Y	7/16/2009		Verify	07/16/2009	CIPL
480533	19	28.9	Concrete	Mainline	Round	24	24	Inches	48	Feet	2 - 6 Feet	2	4	Y	Y	N	N	N	Y	Y	N	N	N	Y	N	N	Y	N	N	N	Y	Y	9/9/2009		Verify	09/09/2009	CIPL
551310	225	3.89	Corg. Mtl (CMP)	Mainline	Round	15	15	Inches	48	Feet	0 - 2 Feet	1.25	4	N		N	N	N	N	N			N	Y	N	N	N	N	N	N	N	Y	7/28/2005		Discover	07/28/2005	CIPL
594523	76	17.729	Corg. Mtl (CMP)	Mainline	Round	24	24	Inches	48	Feet	0 - 2 Feet	2.00	4	N	N	N	N	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	N	Y	Y	N	7/18/2006		Discover	07/18/2006	CIPL
389064	75	0.000	Concrete	Mainline	Round	12	12	Inches	49	Feet	2 - 6 Feet	1.00	4	Y		N	N	N	N	N		N	N		N	N	N	N	N	Y	Y	N	8/22/2001		Discover	08/22/2001	CIPL
644483	108	57.082	Concrete	Centerline	Round	24	24	Inches	50	Feet	2 - 6 Feet	2.00	4	Y			N	Y	Y	Y	N	N		Y		Y		N	N	N	Y	Y	9/16/2008	PIPE COND 4	Discover	09/16/2008	CIPL
683345	11	209.601	Corg. Mtl (CMP)	Centerline	Round	12	12	Inches	50	Feet	0 - 2 Feet	1.00	4	Y	Y	N	Y	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	Y	N	8/11/2009		Discover	08/11/2009	CIPL
705536	14	174.978	Corg. Mtl (CMP)	Centerline	Round	12	12	Inches	50	Feet	2 - 6 Feet	1.00	4	Y	N	N	N	N	N	Y	N	N	N	Y	N	N	Y	N	N	N	N	N	10/1/2009		Discover	10/01/2009	CIPL
666823	19	79.839	Concrete	Centerline	Round	24	24	Inches	50	Feet	2 - 6 Feet	2.00	4	Y	Y	N	N	N	Y	Y	Y	Y	N	Y		N	N	N	Y	N	Y	N	5/19/2010	CLEAN & EXT	Verify	05/19/2010	CIPL
9051643	244	6.755	Corg. Mtl (CMP)	Mainline	Round	12	12	Inches	50	Feet	2 - 6 Feet	1.00	4	Y		N	Y	N	N	N		N	N		Y	Y	N	N	N	N	N	N	10/10/2000	This pipe was	Discover	10/10/2000	CIPL
666174	257	1.683	Concrete	Centerline	Round	24	24	Inches	50	Feet	2 - 6 Feet	2.00	4	Y	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	4/22/2009	hole in road	Discover	04/22/2009	CIPL
50336	30	0.000	Concrete	Mainline	Round	18	18	Inches	50	Feet	2 - 6 Feet	1.50	4	Y		N	Y	Y	Y	N		N	N		N	N	N	N	N	N	N	Y	6/24/1999		Discover	05/13/1999	CIPL
690895	35	39.682	Corg. Mtl (CMP)	Centerline	Round	15	15	Inches	50	Feet	6 - 10 Feet	1.25	4	Y	N	N	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	8/10/2009		Discover	08/10/2009	CIPL
205074	494	8.004	Corg. Mtl (CMP)	Ramp/Loop	Round	15	15	Inches	50	Feet	2 - 6 Feet	1.25	4	Y				N							N	N	N	N	N	Y	Y	Y	8/1/2001		Discover	08/01/2001	CIPL
482373	60	168.83	Concrete	Mainline	Round	24	24	Inches	50	Feet	2 - 6 Feet	2	4	Y		N	N	N	Y	Y		Y	N	Y	N	N	N	Y	N	N	N	N	9/2/2003		Discover	09/02/2003	CIPL
624379	61	47.452	Corg. Mtl (CMP)	Mainline	Round	12	12	Inches	50	Feet	2 - 6 Feet	1.00	4	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	Y	6/13/2006		Discover	06/13/2006	CIPL
56121	7	185.106	Concrete	Mainline	Round	15	15	Inches	50	Feet	2 - 6 Feet	1.25	4	Y					N						N	N	N		Y	Y	Y	Y	6/23/1999		Discover	06/23/1999	CIPL
594482	76	14.753	Concrete	Mainline	Round	30	30	Inches	50	Feet	0 - 2 Feet	2.50	4	N	Y	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	Y	N	N	Y	N	7/17/2006		Discover	07/17/2006	CIPL
485047	89	54.303	Corg. Mtl (CMP)	Mainline	Round	15	15	Inches	50	Feet	2 - 6 Feet	1.25	4	Y															N	Y		Y	6/4/2003		Discover	06/04/2003	CIPL
405676	96	13.122	Concrete	Mainline	Round	15	15	Inches	50	Feet	2 - 6 Feet	1.25	4	Y		N	N	N	N	Y	Y	N	N	Y			N					N	10/23/2008	replace with la	Change	10/23/2008	CIPL
411807	13	105.985	Corg. Mtl (CMP)	Ramp/Loop	Round	15	15	Inches	51	Feet	2 - 6 Feet	1.25	4	Y		N	N	Y	Y	Y		N	N	Y	N	N	Y	N	N	N	N	N	8/22/2002		Change	05/13/2010	CIPL
483345	16	280.190	Concrete	Mainline	Box	24	24	Inches	52	Feet	Over 20 Feet	2.00	4	Y		N	N	N	N	N		N	N	N	N	Y	N	N	N	Y	Y	Y	10/28/2003		Discover	10/28/2003	CIPL
692800	29	52.594	Concrete	Centerline	Round	24	24	Inches	52	Feet	2 - 6 Feet	2.00	4	Y	Y	N	N	N	Y	Y	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	10/19/2009		Discover	10/19/2009	CIPL
149640	61	80.400	Concrete	Mainline	Round	12	12	Inches	52	Feet	0 - 2 Feet	1.00	4	N		N	N	N	N	Y		Y	N		N	N	N	N	Y	N	Y	N	6/21/2000		Discover	06/21/2000	CIPL
700201	61	97.362	Corg. Mtl (CMP)	Centerline	Round	15	15	Inches	52	Feet	10 - 20 Feet	1.25	4	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	8/10/2009		Discover	08/10/2009	CIPL
703379	74	43.291	Concrete	Centerline	Round	12	12	Inches	52	Feet	2 - 6 Feet	1.00	4	Y	Y	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	10/27/2009		Discover	10/27/2009	CIPL
145026	14	217.03	Concrete	Mainline	Round	15	15	Inches	54	Feet	2 - 6 Feet	1.25	4	N		N	N	N	N	N		N	N		N	N	N	N	Y	Y	Y	Y	6/6/2000		Discover	06/06/2000	CIPL
268057	14	245.001	Concrete	Mainline	Round	30	30	Inches	54	Feet	6 - 10 Feet	2.5	4	Y		N	N	N	Y	Y		N	N		N	N	Y	N	Y	N	Y	Y	8/7/2001		Discover	08/07/2001	CIPL
480450	19	14.8	Concrete	Mainline	Round	24	24	Inches	54	Feet	2 - 6 Feet	2	4	Y	Y	N	N	N	Y	Y	N	N	N	Y		Y	N		N	N	N	N	9/8/2009	possible liner	Verify	09/08/2009	CIPL
412810	218	30.2	Concrete	Mainline	Round	24	24	Inches	54	Feet	2 - 6 Feet	2	4	N		N	N	N	Y	Y		N	N	Y	N	N	N	N	N	N	Y	Y	6/11/2002		Discover	06/11/2002	CIPL
666697	29	113.045	Concrete	Centerline	Round	24	24	Inches	54	Feet	2 - 6 Feet	2.00	4	Y		N		Y	Y	Y				Y		Y	Y		Y	N	N	Y	4/30/2009	LINER SIZE 2(	Discover	04/30/2009	CIPL
623570	30	205.349	Concrete	Centerline	Round	24	24	Inches	54	Feet	2 - 6 Feet	2	4	Y	Y	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N	N	Y	N	8/2/2007		Discover	08/02/2007	CIPL
42222	36	10.313	Corg. Mtl (CMP)	Mainline	Round	15	15	Inches	54	Feet	2 - 6 Feet	1.25	4	Y		N	Y						Y		N	N	N				Y		8/25/1998		Discover	08/25/1998	CIPL
175684	55	37.200	Concrete	Mainline	Round	24	24	Inches	54	Feet	2 - 6 Feet	2.00	4	Y		N	N	N	Y	Y			N		N		N	N	N	N	Y		8/8/2000		Replace	08/08/2000	CIPL
645139	61	31.413	Corg. Mtl (CMP)	Centerline	Arch	20	14	Inches	54	Feet	2 - 6 Feet	1.67	4	Y	N	N	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	7/15/2008		Discover	07/15/2008	CIPL
645138	61	31.505	Corg. Mtl (CMP)	Centerline	Arch	20	14	Inches	54	Feet	2 - 6 Feet	1.667	4	Y	N	N	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	7/15/2008		Discover	07/15/2008	CIPL

HYDINFRA is tied to a Geographic Information System database, where physical location of identified structures is linked to a map. The database combined with the map can be accessed by field personnel, hydraulic engineers, and maintenance professionals.

9-1.03 Overview of Drainage System Maintenance Operations

9-1.03.01 Culvert Cleaning

Culverts are checked either visually or with a remote camera, if available (see Figure 1 for typical field camera setup), for any obstructions that may restrict the free flow of water. Debris and silt (sediment) deposits should be removed as necessary.

FIGURE 1: CULVERT CAMERA

FIGURE 2: SILT/DIRT-FILLED CULVERT

9-1.03.01.01 Culvert Flushing

When culverts cannot be cleaned by hand or machine methods, flushing with water may do the job. In most cases, it is only necessary to remove sufficient material to expose the original flow line and allow the natural flow of water to remove the remaining material.

9-1.03.01.02 Steam Thawing of Ice-Filled Culverts

Alternating thaw and freeze cycles in slow runoff areas may cause culverts to build up with ice and block the flow of water which will require high pressure steam thawing.

The outlet end of the culvert and channel should be cleared of snow and ice to insure free flow of water away from the culvert after thawing operations.

9-1.03.02 Culvert Markers

Culvert Markers are a standard installation practice where markers are placed at centerline culvert locations. Marker posts are generally placed at the extreme end of the culvert (not apron) on the side of the culvert nearest the approaching traffic as shown in the Standard Plates Manual, Standard Plate Number 8150. Missing

markers are flagged within the HYDINFRA program and are scheduled to be (re)placed as soon as possible.

9-1.03.03 RIPRAP

Riprap is inspected for unusual erosion or scour around or under a culvert. Replacement riprap can be hand-placed or random, either with sorted field stone or other durable material conforming to Standard Specification 3601. Standard Plates 3133 , 3134, 3135 and 3139 provide guidance on placement. Pictures of placed riprap are shown below.

FIGURE 3: RIPRAP DETAILS

FIGURE 4: RIPRAP DETAILS

9-1.03.04 CONCRETE CATTLE PASS

Cattle passes should be checked for appropriate culvert marking. It is Department policy to remove only the dirt and debris washed into these structures due to inadequate drainage. All other deposits should be removed by the property owner. Office of Right-of-Way and Survey's files should be checked for special cattle pass agreements with adjacent landowners. A sample cattle pass is shown in Figure 5. New installations are typically made of concrete pipe.

FIGURE 5: CONCRETE CATTLE PASS

9-1.03.05 CULVERT JOINT REPAIR

Typical joint repairs involve tying the two adjacent pipe joints in accordance with Standard Plate Number 3145. Figure 6 illustrates Portland Cement Concrete (PCC) culvert joint failure.

FIGURE 6: PCC CULVERT JOINT FAILURE

FIGURE 7: CORRUGATED METAL PIPE (CMP) RUSTED AND BENT IN NEED OF REPAIR OR REPLACEMENT

FIGURE 8: SEVERE PCC CULVERT DAMAGE

FIGURE 9: TYPICAL SLIP-LINING OPERATION TO REPAIR A CULVERT

9-1.03.06 MAJOR CULVERT REPAIRS

Major culvert repairs are required for issues such as cracked or broken out concrete and severely deteriorated metal pipe as shown in Figure 7 and 8. The district hydraulics engineer should be contacted prior to performing major repairs/replacing any centerline culverts since adjacent land development, drainage area characteristics and flow amounts may have changed since the original culvert installation. Typical repair procedures may include:

Slip-Lining, for pipes generally less than 48” in diameter, where a polyethylene culvert of slightly smaller size is inserted into the damaged culvert. Once inserted, cement grout is placed between the old and new culverts to seal it off against water intrusion and provide support for the liner. A typical slip lining operation is shown in Figure 9. Where access is permitted, cracks and small damaged areas may not need to be repaired until the reinforcing steel is exposed unless the damage may create more problems.

Culvert Reconstruction generally is for concrete pipes greater than 48” in diameter where the interior of the pipe is accessible. Exposed reinforcing steel should be cleaned to solid concrete and then patched with concrete or other suitable material. It is generally impractical to patch metal culverts. These should be replaced if the cross section is sufficiently reduced to impede required water flow or if it is showing substantial section loss which could ultimately affect the integrity of the overlying road bed. See Chapter 3 of the MnDOT Maintenance Manual for guidance on entrance culvert replacement.

9-1.03.07 MANHOLE OR CATCH BASIN CLEANING

Catch basins and manholes are checked and inventoried within HYDINFRA for damage and/or debris build-up (see Figure 10 for a damaged manhole and Figure 11 for a typical manhole repair). When these structures require cleaning, the grate casting and pipe inlet should be cleaned of all debris or obstructions so as to maintain hydraulic capacity. Debris removed from the structure should be disposed of in a manner that will not create a nuisance and be in accordance with applicable laws. Debris capture bags and "balloons" to seal off pipe flows may need to be employed during manhole repair or cleaning.

Catch basins and manholes, as well as the storm sewer lines which are constructed on trunk highways in towns and villages, are generally cleaned and maintained by the municipality under a cooperative maintenance agreement made in conjunction with the construction of the system. Under these circumstances, the Department maintenance crews are not responsible for storm sewer maintenance. The Maintenance Superintendent, Area Supervisor and workers should be aware of and informed of any cooperative agreements for maintenance of storm sewer systems. Contact the district hydraulics office for additional culvert repair options.

FIGURE 10: DAMAGED MANHOLE IN NEED OF REPAIR

FIGURE 11: MANHOLE REPAIR OPERATION

9-1.03.08 Manhole or Catch Basin Cover Replacement

Grates or manhole covers within the HYDINFRA inventory are inspected damage (see Figure 12 for an example of severe grate damage) at the same time they are inspected for cleanout. The covers are considered in satisfactory condition if the seat is clean and free from pebbles or dirt which would cause the cover to move and become a hazard to pedestrians or vehicular traffic. If the grate or cover is broken or damaged, it is flagged for repair or upgrade. Square catch basin grates shall be installed at the proper angle in relation to the flow of water in the gutter.

FIGURE 12: SEVERE GRATE DAMAGE

9-1.03.09 Adjustment and Reconstruction of Manholes or Catch Basin Structures

Manholes and catch basin structures within the HYDINFRA database are inspected for significant deterioration. Catch basins located in the traveled area of the road surface are programmed to be adjusted when settlement becomes potentially hazardous to traffic or roadway safety. Catch basins or manholes are typically raised by adding brick and mortar masonry and reset using pre-cast concrete adjusting rings.

Significant deterioration or settlement of the unit requires it to be reconstructed.

9-1.03.10 Drainage Tiles and Inspection Tees

Blocked or damaged tile, drop inlets or inspection tees located within the right-of-way should be scheduled for repair or replacements. Before making repairs, it should be determined why the structure failed, and the necessary corrections should be made during the repair work. If a tile failure is under or through the road bed area, it may

be necessary to block off drainage at the inslopes and bore or jack a new tile line or pipe.

Tile line repair may not, in all cases, be the responsibility of the Department. The Area Maintenance Engineer should contact the responsible private, county, or judicial authorities to make necessary repairs if agreements show it is their responsibility.

9-1.03.11 MAINTENANCE OF HIGHWAY EDGE DRAINS

Maintenance of edge drains is required to keep pavement subsurface drainage open so that the pavement structure will drain. Proper subsurface drainage is recognized as a major factor in extending pavement life. Subsurface drainage typically consists of perforated pipe placed in a highly permeable layer of granular material where high groundwater or seepage inflow occurs. Vegetative growth around pipe outlets, rodent nests, mowing clippings, sediment collected at end screens and crushing of the drain outlet are common maintenance problems. An example of a concealed edge drain outlet requiring field maintenance is shown in Figure 13. “Daylighted” edge drains should be periodically checked for missing rodent screens, nests, roadside debris, sediment build-up, crushed outlets, and excessive vegetation at the outlet. Roadside mowing operations should ensure that “daylighted” edge drains are not damaged or blocked with grass clippings, etc. Information on edge drain maintenance is found in Section 8-3.06 of Chapter 8 of the MnDOT Road Design Manual. Additional related information on Maintenance of Highway Edge Drains can be found on the FHWA website.

Highway edge drain markers (if provided) should be regularly inspected and replaced or reinserted if found to be deficient. Notes within HYDINFRA should also disclose marking locations and condition of the markings.

FIGURE 13: CONCEALED EDGE DRAIN

9-1.03.12 PERFORATED PIPE

In general, most perforated steel pipe will not fail structurally unless most of the invert, or flow line area, is completely rusted out. Perforated pipe should be cleaned, with replacement of new pipe being done only when structural failure appears imminent. Replacement should not be undertaken without checking whether a change in material or pipe size is required and whether the pipe is scheduled for replacement under an upgrading project.

9-1.03.13 CURB AND GUTTER

Gutters are typically kept free of all debris so that the water may flow unimpeded to the nearest drainage structure. As a general best management practice, MnDOT maintenance crews sweep to clean gutters in the spring to remove accumulations of winter sand and debris. Grates within curb and gutters, if present, are evaluated to ensure grate openings are of proper size and orientation in the interests of bicycle and pedestrian safety. Damaged or deteriorated areas of curb and gutter (see Figure 14) are scheduled for repair within HYDINFRA when drainage or bicyclist and pedestrian safety has been seriously affected.

FIGURE 14: CURB DAMAGE AT INLET GRATE

9-1.03.14 ELECTRIC WATER PUMPS

Automatic pumps, sumps and pipe at underpass structures or depressed sections of highway should be kept in good operating condition. Each installation should be inspected periodically. Inspection should include electrical gear, control levels, ventilation and drainage system. In the case of a malfunction, the Area Maintenance Engineer should be notified.

9-1.03.15 DRAINAGE DITCHES

Drainage ditches are constructed along and parallel to a trunk highway or as off-take ditches to carry water away from the highway. Drainage ditches (see Figure 15) are monitored to ensure sufficient hydraulic capacity. If vegetation, brush or debris compromise hydraulic capacity, the ditches are scheduled for cleaning. Care should be taken not to excavate beyond the original dimensions and grade of the ditch. Some ditches may have special features such as clay lining that should not be removed. Measures to perform the cleanings follow weed and brush control guidelines (Sections 5-4.02.03 and 5-4.03 respectively in the Maintenance Manual Roadsides Chapter).

If substantial erosion or large washouts are observed or appear imminent, Maintenance staff will consult with the District Hydraulics Engineer to schedule and provide ditch repair procedures.

FIGURE 15: TYPICAL ROADSIDE DRAINAGE DITCH

9-2.0 DRAINAGE FACILITY REPAIR ENVIRONMENTAL GUIDANCE

Drainage facility repairs have the potential to impact adjacent water bodies so care should be taken in conducting repairs and restoring the site. Maintenance staff should consult with the MnDOT District Hydraulic Engineer before performing repair or maintenance operations that involve land disturbance. Any permitting that is required should be placed within the HYDINFRA database for future reference.

The Maintenance for Stormwater Guide posted on the Office of Environmental Stewardship Website contains guidance on minimizing erosion impacts. The Office of Environmental Stewardship may be contacted regarding proper site restoration measures.

Ditch repairs or stormwater facility repairs are potentially subject to additional environmental review by state and national agencies. The following agencies may have permitting authority depending on location and scope of work. Those agencies include:

- MN Board of Water and Soil Resources
- US Army Corps of Engineers and the USEPA (wetlands permitted under Section 404 of the Clean Water Act)
- MN Department of Natural Resources Public Waters (for work in or near public bodies of water)
- Stormwater Program for Construction Activity on the MPCA website.
- MPCA MS4 Municipal Storm Water Program (outside of MnDOT jurisdiction)

Work within a majority of these drainage facilities may be subject to the Occupational Safety and Health Administration (OSHA) “Confined Space” requirements. Before repairs are scheduled, the repair crew should obtain the required permit(s) per MN Rules 5207 as part of their normal work activities.

INDEX OF LINKS

Chapter 8
http://dotapp7.dot.state.mn.us/edms/download?docId=1062361

Culvert Repair Best Practices Specifications and Special Provisions
http://www.lrrb.org/media/reports/TRS1209.pdf

Maintenance of Highway Edge Drains
http://www.fhwa.dot.gov/pavement/concrete/edge.cfm

MN Board of Water and Soil Resources and Wetland Conservation Act
http://www.bwsr.state.mn.us/wetlands/index.html

MN Department of Natural Resources Public Waters Program
http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html

MN Rules 5207
https://www.revisor.mn.gov/rules/?id=5207

MnDOT HYDINFRA
http://www.dot.state.mn.us/bridge/hydraulics/hydinfra.html

MnDOT Road Design Manual
http://roaddesign.dot.state.mn.us/

MPCA MS4
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