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# City of Norcross

## Stormwater Inventory

### Field Manual



August 15, 2014

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## Purpose

The purpose of this document is to assist the field technician in understanding the various data attributes that will be collected as part of the infrastructure field inspection effort. The infrastructure assets have been divided into two separate types of assets, point features and linear features. Point features consist of those structures that have a singular location and can be mapped through the use of a single set of coordinates such as drainage inlets and manholes. Linear features consist of pipes and are represented by a line segment between two point features. This document outlines the types of point features and linear features that compose the City's stormwater drainage system. A structure condition assessment will also be conducted as part of the inspection, which will be used for maintenance and prioritizing Capital Improvement Program (CIP) projects as well as supporting the City's compliance efforts with the federal Clean Water Act (NPDES Phase I MS4 Permit).

## Point Features Terms & Definitions

The “Stormwater Structures” feature class represents all point features in the drainage system inventory. The following twenty attributes describe each structure inventoried as part of the inspection program:

- Structure Type
- Structure Collection Status
- Structure Material
- Structure Damage
- Sediment
- Debris
- Water
- Scour
- Structure Lid
- ID/IC
- Depth
- Inspection Date
- Notes
- Structure ID
- Photo
- Odor
- Color
- Floatables
- Vegetation
- Outfall Damage

### Structure Type

The “Structure Type” attribute describes the type of structure inventoried. Allowable entries to this field include the following:

- Catch Basin
- End of Pipe
- Flared End Section
- Flume
- Grated Inlet
- Headwall
- Hooded Grate Inlet
- Junction Box
- Median Drop Inlet
- Outlet Structure
- Pedestal Inlet
- Safety End Section

A detailed description of these types of structures as well as a photograph of a typical structure has been included at the end of this manual in Appendix A.

### Collection Status

The “Collection Status” attribute describes whether the structure collects stormwater runoff or discharges stormwater runoff. Allowable entries to this field include the following:

- Inlet
- Outlet
- N/A

Please note that stormwater is typically only collected (i.e. inlet) by catch basins, drop inlets, hooded grate inlets, outlet structures, yard inlets and flumes. Headwalls, flared end sections and end of pipe structures can either collect stormwater runoff (i.e. inlet) when water flows into the pipe or discharge stormwater runoff (i.e. outlet) when water flows out of the pipe. Finally, junction boxes do not collect or discharge stormwater runoff and should be marked as “N/A”.

## Structure Material

The “Structure Material” attribute describes what the base of the structure is made of. Allowable entries to this field include the following:

- Metal
- Brick
- Cinder Block
- Concrete
- Grouted Stone
- High Density Polyethylene (HDPE)
- Other
- N/A

This attribute defines the material of the structure and not necessarily the feature on top. For example, Structure Material should describe the material of the “manhole” structure under the drop inlet grate or hooded grate inlet and not the metal grate itself. In the case of headwalls and flared end sections, the field describes the structure itself.

## Structure Damage

The “Structure Damage” attribute describes the level of damage to the structure and the structure’s ability to function properly or as designed. Allowable entries to this field include the following:

- None
- Minor
- Moderate
- Severe
- Safety Hazard
- N/A

For pipe directions, the field should be set to “N/A”. A detailed description of these condition assessments has been included at the end of this manual in Appendix B.

## Structure Sediment

The “Structure Sediment” attribute describes the amount of sediment observed in the structure, stated as a percentage of the total structure capacity. Allowable entries to this field include the following:

- 1% – 25% of Pipe Diameter / Structure Capacity
- 26% – 75% of Pipe Diameter / Structure Capacity
- None
- 76% – 99% of Pipe Diameter / Structure Capacity
- Buried
- N/A

## Structure Debris

The “Structure Debris” attribute describes the amount of debris (leaf matter, woody debris, trash or other material) observed in the structure that may limit the structure’s ability to function properly. Allowable entries to this field include the following:

- Minor
- Moderate
- Significant
- Buried
- None
- N/A

## Water

The “Water” attribute describes if water is observed in the structure. Allowable entries to this field include the following:

- Standing
- Flowing
- Submerged
- Inundated
- None
- N/A

## Scour

The “Scour” attribute describes the erosive action water has on the structure. Scouring may occur along the sides and underneath the structure. Allowable entries to this field include the following:

- Minor
- Moderate
- Severe
- None
- N/A

Minor scour means some scour was noted but no immediate attention is warranted, moderate denotes Public Works crews should begin to move to repair the system. Severe denotes the structure may be structurally compromised and should result in a work order being generated.

Photos showing an example of each entry has been included at the end of this manual in Appendix D.

## Structure Lid

The “Structure Lid” attribute describes the condition of the lid, if any, on the structure. Allowable entries to this field include the following:

- Good
- Missing
- Sealed
- No Opening
- N/A

## ID/IC

The “ID/IC” field denotes whether there is an illicit discharge or illegal connection at the storm structure. An illicit discharge is any discharge that is not composed entirely of storm water. Examples of these include oil, sewage, gasoline, paint, etc. An illegal connection is a private pipe connected to a public structure. Examples of these include pool drains, down spouts, sump pumps, etc. Allowable entries to this field include the following:

- Illicit Discharge
- Illegal Connection
- Both
- None
- N/A

## **Depth**

The ‘Depth’ attribute identifies the depth of a particular structure. The measurement is taken from the base of the structure to the top of the lid. Structures measured for depth are: catch basins, grated inlets, hooded grate inlets, median drop inlets, junction boxes, pedestal inlets, and outlet structures.

## **Inspection Date**

The date the structure was inspected in the field.

## **Notes**

The ‘Notes’ attribute is available for any special field observations that are not covered by the attributes listed and can include information such as vegetative cover around the structure, additional condition assessment information on structure elements or details on the structure location. Any important, unique or special circumstances that will help describe the assessment of the structure that cannot be determined by the other attributes listed should be noted in the ‘Notes’ attribute column. This can also include notes about evidence of illicit discharges (odors, appearances, illegal dumping), or any types of illegal connections into the structure.

## **Structure ID**

The ‘Structure ID’ attribute describes the ID of the structure for tracking purposes. This field will typically be represented by a numeric entry that is unique to that structure.

## **Structure Photo**

These fields allow the user to identify digital photos taken in the field of the structure. The ID should be numerical and identical to the photo name that it corresponds to. For example if you take a photo of a structure and the ID is 23, the IDs should correspond to the photo 23.jpg.

## Linear Features Terms & Definitions

The “Stormwater Pipes” feature class represents all linear features in the drainage system inventory. The following twenty attributes describe each drainage structure inventoried as part of the inspection program:

- Pipe Type
- Pipe Material
- Pipe Height
- Pipe Width
- Sediment Upstream
- Sediment Downstream
- Corrosion Upstream
- Corrosion Downstream
- Pipe Damage
- Driveway Pipe
- Cross Drain Pipe
- Inspection Date
- Notes
- ID
- Photo
- Odor
- Color
- Floatables
- Outfall Damage
- Vegetation

### Pipe Type

The “Pipe Type” attribute describes the type of stormwater pipe inspected. Allowable entries to this field include the following:

- Circular Pipe
- Elliptical Pipe
- Box Culvert
- Arch Culvert
- Other
- N/A

A picture of each type of pipe is shown below.



Circular Pipe



Elliptical Pipe



Box Culvert

Arch Culvert

### Pipe Material

The “Pipe Material” attribute describes the structural material of the pipe. Allowable entries to this field include the following:

- Corrugated Metal
- Concrete
- Ductile Iron
- High Density Polyethylene (HDPE)
- PVC
- Smooth Steel
- Terra Cotta
- Other

### Pipe Height

The height of the pipe or box culvert provided in inches. Please note standard pipe sizes come in increments of 6-inches (example: 18-inch, 24-inch, 30-inch, etc.).

### Pipe Width

The width of the pipe or box culvert provided in inches. Please note in the case of circular pipes, the pipe width should match the pipe height.

### Sediment Upstream / Sediment Downstream

The “Sediment Upstream” attribute indicates the amount of sediment observed in the pipe, stated as a percentage of total pipe capacity, on the upstream side of the pipe. The “Sediment Downstream” attribute indicates the amount of sediment observed in the pipe, stated as a percentage of total pipe capacity, on the downstream side of the pipe. Allowable entries to these fields include the following:

- 1% – 25% of the Pipe Diameter
- 26% – 75% of the Pipe Diameter
- 76% – 99% of the Pipe Diameter
- Buried
- None
- N/A

### Corrosion Upstream /Corrosion Downstream

The “Corrosion Upstream” attribute indicates the amount of corrosion observed in the pipe, stated as a percentage of total pipe condition, on the upstream side of the pipe. The “Corrosion Downstream” attribute indicates the amount of corrosion observed in the pipe, stated as a percentage of total pipe condition, on the downstream side of the pipe. Allowable entries to these fields include the following:

- Minor
- Moderate
- Severe
- None
- N/A

A more detailed description of these condition assessments has been included at the end of this manual in Appendix C.

## Pipe Damage

The “Pipe Damage” attribute describes the type of pipe damage present. Allowable entries to this field include the following:

- Bending
- Entire Bottom Missing
- Flattened
- Inlet/Outlet Invert Missing
- Joint Separation
- Penetration
- Pipe Cracking
- Shape Deformation
- Sinkhole
- Multiple
- None
- N/A

## Driveway Pipe

The “Driveway Pipe” attribute indicates whether or not the pipe is a driveway pipe. Allowable entries to this field include the following:

- Yes
- No
- N/A

## Cross Drain Pipe

The “Cross Drain Pipe” attribute indicates whether or not the pipe is one in which water is being conveyed from one side of the road to the other. Allowable entries to this field include the following:

- Yes
- No

## Inspection Date

The date the pipe was inspected in the field.

## Notes

This attribute is available for any special field observations excluded from the available attributes and can include information such as vegetative cover around the pipe, additional condition assessment information on pipe elements, or details on pipe location.

## ID

The “ID” attribute describes the ID of the drainage structure for tracking purposes. This field will typically be represented by a numeric entry that is unique to each drainage structure.

### **Upstream Photo / Downstream Photo**

These fields allow identification of digital photos taken of the pipe while in the field. The upstream photo is taken from the downstream end of the pipe looking upstream. The downstream photo is taken from the upstream end of the pipe looking downstream. The ID should be numerical and identical to the photo name with which it corresponds. For example a photo taken from the downstream end of pipe ID 23 looking upstream will be labeled Pipe23\_upstream.

## Appendix A – Structure Type Descriptions

1. **Catch Basin** – A structure by which water is collected through the use of a vertical opening known as a hood to aid in the conveyance of stormwater runoff to the storm drainage pipe network. Typically located along the street curb and gutter.
2. **End of Pipe** – A fixed structure through which water is collected directly by the pipe opening with no inlet / outlet protection to aid in the conveyance of stormwater runoff to the storm drainage pipe network.
3. **Flared End Section** – A fixed structure through which water is collected directly by the pipe opening and protected by a reinforced wall against erosion and designed to aid in the conveyance of stormwater runoff to the storm drainage pipe network.
4. **Flume** – A structure typically constructed of concrete or asphalt, a flume conveys water from low areas in a road to a nearby ditch. Flumes assist in scour and erosion prevention.
5. **Grated Inlet** – A structure by which water is collected through the use of a grate (normally metal) set flush with the existing grade to aid in the conveyance of stormwater runoff to the storm drainage pipe network.
6. **Headwall** – A fixed structure through which water is collected directly by the pipe opening and protected by a reinforced wall against erosion and designed to aid in the conveyance of stormwater runoff to the storm drainage pipe network.
7. **Hooded Grate Inlet** – A structure by which water is collected through the use of a grate (normally metal) in conjunction with a vertical opening known as a hood to aid in the conveyance of stormwater runoff to the storm drainage pipe network.
8. **Junction Box** – A “manhole” type structure that is used to change the direction or depth of a storm drainage pipe network.safety end section
9. **Median Drop Inlet** – A structure set in the bottom of a ditch where water is collected to convey stormwater runoff to the storm drainage pipe network.
10. **Outlet Structure** – A complex structure designed to restrict the flow of water in such a way as to minimize the effects of urbanization of upstream developments upon downstream structures and drainage systems through the use of such devices as weirs, circular orifices or other similar devices.
11. **Pedestal Inlet** – A structure similar in nature to a catch basin by which water is collected through the use of a vertical opening to aid in the conveyance of stormwater runoff to the storm drainage pipe network. Typically located within a yard.

12. **Safety End Section** – An addition to a culvert end that aids scour reduction and undermining while providing a means to blend into the sloping embankment.



Catch Basin



End of Pipe



Flared End Section



Flume



Grated Inlet



Headwall



Hooded Grate Inlet



Junction Box



Median Drop Inlet



Outlet Structure



Pedestal Inlet



Safety End Section

## Appendix B – Structure Damage Terms & Definitions

**None** – This condition assessment indicates that the structure is structurally sound and no issues with the structure exist. For the purposes of the inventory, the structure should be in “excellent” condition.

**Minor** – This condition assessment indicates that the structure is structurally sound but is beginning to show signs of wear. Examples of this type of wear include minor cracks and defects that will not affect the operation of the structure but could begin to affect the structure in the future if left unchecked. This condition assessment will essentially put the structure on a more frequent inspection basis than those shown with “none”.

**Moderate** – This condition assessment indicates that the structure is damaged and requires maintenance in the near future. The moderate condition should be utilized when the damage is causing the structure to operate in such a manner that a failure may occur. Examples of such damage could include holes in the structure that are causing or will likely result in erosion or structural collapse. This condition should not be utilized if the damage is such that the whole structure would need to be replaced.

**Severe** – This condition assessment indicates that the structure has been significantly damaged and the structure needs to be replaced. Examples of such damage include headwalls that have separated from the pipe, catch basins where the lid has been crushed and water cannot effectively drain from the road, etc.

**Public Safety Hazard** – This condition assessment is the same type of damage as shown in the “severe” category; however, a significant danger exists to cause injury or heavy property damage. Examples of such situations could include: (1) a junction box where the lid is missing resulting in a hole someone could fall into or (2) a pipe completely blocked due to a headwall failing such that a home could flood.

## Appendix C – Pipe Corrosion

**None** – This condition assessment indicates that no corrosion is present inside the pipe.

**Minor** – This condition assessment indicates that only superficial corrosion is present inside the pipe.

**Moderate** – This condition assessment indicates that some rusting is present in small areas of the pipe.

**Severe** – This condition assessment indicates that rusting is present throughout the circumference of the pipe. Holes and pipe de-formation may exist as well.



Minor Corrosion



Moderate Corrosion



Severe Corrosion

## Appendix D – Scour



Minor Scour



Moderate Scour



Severe Scour