# Metro Stormwater Geodata Project

## Public Comments Received: April – Dec 2020

**Published:** January 8, 2021
**Expanded:** February 16, 2021

**Introduction and context.** On Friday, April 17, 2020, the first release of the Metro Stormwater Geodata Project (MSWGP) draft Stormwater Geodata Transfer Standard and accompanying materials was published out to the statewide stakeholder community. The publication of the first draft of the standard represented the results of two years of consistent, focus, creativity, attention to detail of the MSWGP Steering Team. This material was released to the public with the specific purpose of enabling stakeholders to review the material, assess its relationship and fitness for their stormwater GIS data needs, to test and review a set of sample data and to provide feedback, suggestions, revisions and improvements to the draft data standard for its on-going improvement.

The draft release included the following materials:

- *The draft Stormwater Geodata Transfer Standard (v. 0.5) in both Word and Excel Spreadsheet format;*
- *The draft Inlet, Outlet and Pond Inspection Schema (v. 0.2) in both Word and Excel Spreadsheet format;*
- *A spreadsheet listing the way the draft standard aligned with known asset management needs;*
- *A sample dataset of stormwater system data in the v. 0.5 format for reviewers to download and test;*

These materials were published from the MSWGP's page on the MetroGIS website which is hosted and maintained by the Metropolitan Council.

**Public Review Period.** Originally, the public review period was intended to be a fixed 90-day period (from April 17 through mid-July of 2020), however with the impact and

changing priorities of the COVID-19 outbreak, the formal public release period was extended out through December 31, 2020. For the convenience to the professional community and to keep the standard development process as open and flexible as possible, the 'informal' public review remains open and on-going through 2021. The MSWGP Steering Team will welcome and continue to accept, review, and incorporate recommendations, input, suggestions and improvements from the stakeholder community as the next iteration of the standard continues to evolve.

**Purpose of this document.** This document is a organized collection of the comments received by the stakeholder community between April 17, 2020 and December 31, 2020 on the draft stormwater standard material. The MSWGP Steering Team will use this input to improve and shape its next iteration of the standard. The Steering Team membership is grateful to the members of the professional community who took time to download and review the materials and to provide their comments, suggestions, feedback, insights and input. The next version of the standard will be better for their contributions.

**Summary of the themes and concepts from the stakeholder input:**
Recurring themes and concepts which emerged from the comments received include the following:

- *Addition of a glossary for clearer definitions of stormwater terminology;*
- *Additional of examples of fixtures and features to explain them to GIS professionals who are not stormwater experts;*
- *Addition of terms and expansion of domains from the v. 0.5 set of domains;*
- *Integration and inclusion of agricultural drainage systems and data;*
- *Consideration of the ability to accommodate non-structural stormwater elements*
- *Strengthen the ability to accommodate asset management activity with GIS data;*
- *Concern for the costs of data development or transition to using a standard of this type;*

The following pages contain the actual comments received during the review period.
**Molly Churchich**
***Ramsey County Public Works***

**In the Draft Inspections Schemas v. 0.2 document on page 16:**
You could ***better define outlet versus outfall.*** County outfalls are non-traditionally defined because outlet could leave a system but technically be defined as an outfall due to agreement ownership. Generally, Ramsey County owns the catch basin and leads of the storm sewer while the cities and township own the storm mains and manholes. Outfalls outside county right-of-way are the responsibility of the city and outfalls inside the county right-of-way are the responsibility of the county, unless explicitly stated in the agreement. Depending on the project, ponds and associated elements are assigned to different parties.

**In the Draft Inspections Schemas v. 0.2 document on page 40:**
Pond inspection does not have fields for ***capacity gauging and sediment sampling results.***

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 17:**
Could there be ***multiple fields for pipe maintenance agreements***?
We often have multiple agreements for multi-partner projects.

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 25**
Do people use the CTU ID TXT field? We've always identified the County Road Number associated with the road.

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 99**
We won't use outlet tide chambers; this does not apply to our infrastructure.

**In the Stormwater Geodata Standard v. 0.5 Domains:**
Pipe diameters: are the units of ***pipe diameter in inches or feet?***

Currently, Ramsey County has the following storm sewer infrastructure inventoried:

**INFILTRATION BASINS**

| | | |
|---|---|---|
| Types: | Biofiltration basin | Filtration basin |
| | Filtration trench | Infiltration basin |
| | Infiltration trench | Other |
| | Permeable pavement | Stormwater reuse |
| | Tree trench (Subtypes: CCLRT Type 1; CCLRT Type 2; None) | |

**TREE TRENCH**
Types: *(types and subtypes are linked in* **INFILTRATION BASINS***)*

**OUTFALLS**

| | | |
|---|---|---|
| Types: | Pipe | Ditch |

| | | |
|---|---|---|
| | Lake | Pond |
| | Wetland | Channel |
| | Curbcut | Culvert |
| | Other | |

**STORM INLETS**

| | | |
|---|---|---|
| Types: | Catch basin | Manhole |
| | Catch basin manhole | |

**SPECIAL STRUCTURES**

| | | |
|---|---|---|
| Types: | Access manhole | Berm |
| | Berm weir | Bit_channel |
| | Box culvert | Channel |
| | Control manhole | Dam |
| | Deep manhole | Diversion box |
| | Diversion manhole | Diversion MH *(duplicate of diversion manhole?)* |
| | Diversion weir | Drop inlet |
| | Drop structure | Energy dissipater |
| | First flush diversion | Flapgate |
| | Floatable skimmer | Flume |
| | Gabions | Headwall |
| | Inlet manhole | Junction manhole |
| | Keepfill line | Land bridge |
| | Lined channel | Lock_dam |
| | Manhole | Multi-outfall MH |
| | Ob_well | Other |
| | Outfall baffle | Outlet control |
| | Pump | Riprap still basin |
| | Riprap channel | Sediment sump |
| | Siphon | Splitter manhole |
| | Stabil_mat | Stilling well |
| | Sump | Timber weir |
| | Trash weir | Triangular weir |
| | Turtle barrier | Ultra urban |
| | Valve vault | Weir |

**OUTLETS**

| | | |
|---|---|---|
| Types: | Assess | Emergency overflow |

| | | |
|---|---|---|
| | Primary | Secondary |
| | Compound | Concrete pipe |
| | Culvert | Horiz. Pipe |
| | Horizontal pipe | Lift station |
| | Pipe | Riprap berm |
| | Submerged outlet | Submerged pipe |
| | Trash rack | Vert pipe |
| | Vertical pipe | Weir |
| | Weir orifice | Weir_channel |
| Subtypes: | Berm | |
| | Berm riprap | |
| | Channel | |
| | ? | |

**AERATORS LIFTSTATIONS PUMPS**

| | | |
|---|---|---|
| Types: | Aerator | Compressor |
| | Control panel | Keepfill pipe |
| | Lift station | Obs well |
| | Pump | Well |

We have some cleaning up to do of the locally stored data, but the intention is to get it all migrated to the network and available to others. The main constraint preventing this is time- it's incredibly time consuming to go through each of these features.

***Where would Tree Trenches fall in the standard?*** We currently are symbolizing them with both a point and line feature. If they are incorporated in the ***line feature of Pipes*** in the standard, their subtype would be slotted, as this best describes their composition. But as Mike Goodnature pointed out, ***they are technically a BMP***, so perhaps would be suited for the Best Management Practice category.

The problem with identifying them as a point feature, is that placing the point midline of the feature is deceiving. Some of these trenches exceed 500 feet and I want to make sure inspectors inspect the entire facility. I'm concerned about placing the Tree Trench inventory into a database, such as pipes, because it would get lost in the inspection schedule.

Pipes are not mandated to be inspected on any regularity but are required to be mapped. Tree trenches are required to be inspected annually per the MS4 permit guidelines.

Ramsey County are in the process of consolidating condition ratings for all of its stormwater assets. Previously, we had used both text and numeric ratings for stormwater outfalls and inlets.  Our new proposed rating scale is numeric 5-1 and U for unknown.

**5 New**
**4 Good**
**3 Fair**
**2 Poor**
**1 Extremely Poor/Replace**
**U Unknown**

The County's system is opposite of how the MSWGP rates conditions, as theirs generally follows MnDOT's scale. I didn't see any other comments of condition rating on the public comment period results. I just wanted to mention it if others use a different condition scale.

**Lanya Ross**
***Metropolitan Council Water Supply Planning***

Overall, I was reviewing the document to see how the resulting data could be useful to help in groundwater modeling or other analyses of infiltration/recharge. I saw what I needed; whether this can be implemented remains to be seen, but I appreciate the goal of attempting this.

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 27:**
Why is there no elevation data for the channels?

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 69:**
How is the example provided in the Pollution Control Structure Type different than that provided in the Hydraulic Control Structure description?

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 100**
How would you describe the Outlet Type for an underground structure, as an example?

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 101**
In the Outlet Height or Mean Depth, does height refer to elevation or length?

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 138**
Does the definition of structure include landscaped areas (For example: land graded in a way to capture water, even if no physical, constructed structure is present)? I assume so, but not entirely clear.

**In the Draft Stormwater Geodata Standard, v.0.5 document on page 139**
Some elevation data for BMPs could be useful to support modeling (defining head and flow)

### Devon Savage
***Swift County***

We perform GIS work for Swift County in west central Minnesota, giving a more rural perspective to this project. Being a large farming community, our area has many drainage ditch systems that include open ditches and tile lines to move water. **Is it the intent of the standard to place ditches and tile lines into the "channels" and "pipes" layers?**

**Would private ditches, tile, and lift station information be beneficial to collect?** We only have the systems maintained by the county and the open ditches and tile lines are together in one layer. I think this project will be helpful for rural areas by **gaining access to the culvert and drainage data that the DNR/BWSR possess** since we have some systems that are on or near protected land. Having the ability to access a vast amount of drainage information in one location would be valuable when working with those entities on projects as well.

### Duane Anderson
***City of Woodbury***

Like many in this business, we think it's a good idea to **document date/time-oriented information on our assets** whether they're related to Stormwater, Sanitary Sewer, or Water Main.

Unfortunately, that sets one up to either continually add date/time fields to accommodate the latest event, or one accepts that the only date/time information available is the last event. When the City of Woodbury opted to go with Beehive as its asset management package, we ran headlong into this concept and have since "come to Jesus" on **the more flexible concept of 'top level events,' i.e. a related table to accommodate events.**

**Ben West**
***City of Inver Grove Heights***

Over the last three years the City of Inver Grove Heights GIS Team has conducted a comprehensive database restructure – with a focus on key City infrastructure (Water, Storm, Sanitary). This was done with key contributions from our Engineering department, Public Works, and the help of an outside consultant (Bolton and Menk). This restructure focused on what our City staff view as key components to the different City assets while also **trying to improve: structure, logical groupings of assets, and overall completeness of data stored** (both adding fields and removing vestigial fields).

The type of guidance from a document such as the Stormwater Data Standard would have been an invaluable tool to use in that process and would have saved the City significant time (and money) in the reorganization of our GIS infrastructure. If nothing else, it would have served to provide helpful way posts to help guide internal discussions on the topic.

In part because we have so recently undergone our own data reorganization, in addition to providing feedback to MetroGIS, we as a City wanted to compare our data choices to the proposed recommendations found within the Stormwater Data Standard – and provide comments where possible. This process was done with our GIS staff and a Senior Engineering Technician – all who were the primary participants in the City's data reorganization.

**P_BASN.6 – Basin Name**
Have this **differentiated between dry or wet** depending the majority seasonal type of wet most of the time or dry most of the time. It might make sense to not include culvert here or rename it as something else;

**P_BASN.10 – Basin Design Volume**
**Does this encapsulate the live or the dead volume?** Our engineers have defined this as an important differentiation and asked that both be included in our information.

**P_BASN.12 – Basin Design Flood Stage Elevation**
Is this the critical water level? You already have the overflow elevation defined, so this is something different? There are almost too many different terms being used in storm water for the same thing. It would be helpful to have this defined with qualifiers, i.e. Elevation resulting from a 100 Year Storm or elevation resulting from back to back 100-year storms.

**P_BASN.29 – Basin Maintenance Agreement Number**
Type of maintenance agreement is more important to us than the actual maintenance agreement number.

**Note:** *Discuss adding a field for Basin Maintenance Agreement Type and establishing a set of domains for agreement types;*

**P_BASN.40 – Basin Date Data Modified**
When we've redone the schema for features, we have found it's easier to keep the standard ESRI naming conventions rather than creating a new one. However, I realize not every participating entity is using ESRI.

**Additional values/attributes to consider adding or making use of:**

- Dry/Wet Pond
- Low Floor Elevation
- Natural Overflow Elevation
- Drain Tile Present (Y/N)
- Landlocked basin (Y/N)
- DNR Pond (Y/N)

**L_PIPE.12 – Pipe Depth**
Where on the pipe are you going to measure this?
If the pipe is 15 feet below surface on one end and 6 feet below surface on the other which value is entered?

**Note:** *Discuss renaming as 'average depth of pipe' or establishing depth a the beginning/end of pipe. (More specifics are needed)*

**L_PIPE.13 – Pipe Depth**
This will have to be field determined and would not be useful for maintenance at the city level.

**L_PIPE.22 – Pipe General Location**
Too difficult to enter in Lat and Long for a line to make that useful. Too much inconsistency with what address would be used across length of pipe.

**L_PIPE.30 – Pipe Condition**
*Mislabeled, should be **L_PIPE.29***

**Additional pipe attributes to consider:**

- Seepage collar (Y/N)
- Restrained (Y/N)

**Channels:**
*Our channel/overland flow feature class was not part of our major redesign of features (this is a comparatively minor component of our storm water system). However, it does need to be revised and we will be leaning heavily on the MetroGIS final standard to rebuild the schema for this feature class.*

**Artificial Path:**
*We do not currently have Artificial Paths, but this is something we are highly interested in as a City and will be leaning heavily on the MetroGIS final standard to build the schema for this feature class.*

**Artificial Point:**
*We do not currently have Artificial Points, but this is something we are highly interested in as a City and will be leaning heavily on the MetroGIS final standard to build the schema for this feature class.*

**Additional BMP, Hydraulic Control and Pollution Control attributes to consider**

- High water elevation – High water elevation the structure controls to
- Normal water elevation – Normal water elevation the structure controls to
- Sump (Y/N) – Sump present in the structure (very valuable to know this!)
- Sump Depth – Depth of sump
- Control structure both: fixture could be both a hydraulic and pollution control fixture
- Value (Y/N) – Valve present in the structure
- Weir (Y/N) – Weir present in the structure
- Weir High Water – What is the high-water level of the weir
- Weir Low Water – What is the low-water level of the weir

**P_IN.3 through P_IN12**
*We understand separating yes/no for all the 3-12 field options, however, we as a management entity, would still find it valuable to retain a "type" field;*

**P_OUT.10 – Outlet Type**
*Would prefer to have flapgate, ditch underground in the Type field*

**Additional P_OUT attributes to consider**

- Apron Material (Material of apron)
- Riser (Y/N)
- Submerged (Y/N)
- Trash Guard (Y/N)
- Erosion Control Method *(Denotes what type of erosion control method (if any) has been installed with the outlet: e.g. riprap or cabled concrete.)*
- System Flow *(Potential to maintain all of our aprons in one Feature Class and then designate in a field if those aprons are inlets or outlets)*

**P_MH.6 – Manhole Control**
*We place these in the control structure Feature Class. No matter if they're a manhole or something else. We don't see value in having it in our system twice.*

**P_MH.7 – Manhole Trap**
*We place these in the Pollution Control structures Feature Class. No matter if they're a manhole or something else. We don't see value in having it in our system twice;*

**P_MH.8 – Manhole Split**
*We would place these in the control structure Feature Class. No matter if they're a manhole or something else. We don't see value in having it in our system twice;*

**P_MH.40 – Manhole Ownership Name**
*Ensure "Private" in included in this Ownership field*

**Additional Manhole attributes to consider:**
- Manhole type (establish a domain of values)
- Manhole diameter (diameter of manhole)
- Restrained cover (Y/N)
- In Street (denotes if manhole is in the street or not)

**P_LS.3 – Lift Station Type**
*Maintain a LS type called "Emergency Lift Station" for temporary/emergency pumping stations*

**Additional Lift Station attributes to consider**
- High alarm level (level where alarm sounds)
- Low alarm level (level where alarm sounds)
- Wet well diameter
- Pump gallons per minute
- Total dynamic head of the lift station
- Emergency pump station suction size
- Emergency pump station discharge size
- Generator back up present (Y/N)

**BMPS:**
*We will not have a separate BMP feature class; we view this term (BMP) as being too nebulous as it too broadly encompasses features. Technically the pollution control structures are BMPs, Hydraulic Control Structures are BMPs, as well as encompassing education or other outreach or training to the public or staff. Internally, as a whole we find the term BMP to be poorly understood despite years of recurring education within the City.*

*Our path forward as a city is going to be encompassing these features within the specific structures/assets they most closely resemble - most notable including a dry ponds field within our Ponds Feature Class - or Basins as referred to in this document).*

*We also view the area for many of these features as being just as important as the location – i.e. we want to know the total square footage of permeable pavement in the City.*

*When viewing asset data, we as a City, prefer to view the associated data on the polygon and will move forward with that as our standard. Any points needed will be solely artificial points instead of as a BMP or Basin as point - we would consider adding a more comprehensive list of point types within the artificial points feature class for clarity; but want to avoid duplication of data as much as possible.*

**Monitoring Components**

*We do not currently have any representative assets of this feature type.*
*We would consider this standard monitor format if the City ever acquired any of this asset type.*

**Jon Røstum**
***Chief Strategist, Powel Environment, Oslo, Norway***

In Norway we have worked on a related project on documentation tool of nature-based storm water solutions as a part of a national research program in Norway. I am especially interested in how far you have come ***to develop a standard for documentation and asset management of different blue-, green- and grey-stormwater solutions such as green roofs, swales and infiltration systems.***

**Kim Soulliere**
***City of Golden, Colorado***

Did your group discuss MS4 requirements such as the ***number of BMPs and which construction site they serve?*** We are having trouble modeling the issue of one BMP serving several sites, causing a one-to-many relationship. Another piece we are challenged by is the one-to-many in translating the GIS model to Cartegraph where data collection takes place.

**Kellie Thom**
***Minnesota Department of Transportation***

- Pipe Width – should be the interior width;
- Pipe Equivalent Diameter – should match MnDOT specs;
- Pipe Length – Add disclaimer that entities might measure length differently (including or not including end sections);
- Pipe Condition – I asked that the inspection information not be included as we all inspect our features differently;
- Pipe Consequence of Failure Rating, Probability of Failure rating, Pipe Criticality to the system – These should not be included in the standard as how do we measure;
- Channels – open flume would be our most similar but not something we'd typically collect unless it was constructed. Most cities have a network of both designed and natural features which they depict how everything works together. I do not have enough experience to comment;
- Artificial Paths – Again used to create a water flow network by most cities but not something we use so cannot comment on;
- Basin Components – these include both our ponds and basins. Again, same comments about condition and failure rating and criticality;
- Hydraulic control Structures - same comments about condition and failure rating and criticality;

- Pollution Control Structures – The types were hard to pin down and I think need to be re-visited. Again, same comments about condition and failure rating and criticality;
- Artificial Points – Not something we use and cannot comment on;
- Inlets and Outlets – MnDOT does it by type not if it is an inlet or outlet like most cities and counties do. This will be the hardest for us to get our data into for sharing as it is something we do not check. For end sections we do have upstream and downstream but for structures it will be hard. Same comments about condition and failure rating and criticality;
- Manhole – this is another difference between us and others. Manholes are not inlets or outlets so would be separated out. Same comments about condition and failure rating and criticality;
- Lift Stations – These currently fall under special features for MnDOT and would not be able to fill out most of the information that is asked for. Same comments about condition and failure rating and criticality;
- Best Management Components – To me this is a repeat of the basins for some and we would not be using this;
- Monitoring – We do not collect this information so cannot comment;
- Basins – polygons – same comments as before;
- BMP – polygons – same comments as before;

**Lisa Sayler**
***Minnesota Department of Transportation***
***Hydraulic Engineering***

Thank you for the opportunity to review the standard. A lot of thought and effort have been put into it. The documentation is well done for adding clarify to the standard and having the sample data set is very helpful for starting to understand how the data works together.

As with any collaborative product, there will be parts of the standard that MnDOT will be able to meet for transferring data to other agencies, and other parts of the standard will be infeasible for MnDOT provide data. I've included some specific comments and suggestions in the attached document.

My primary concern overall is that regulatory agencies may have the expectation that MnDOT will have data in this format to transfer and there will be an expectation that the owner does have this data for the data attribute fields listed available. The documentation is very careful to repeat multiple times that this is a data transfer standard and not a requirement for individual

agencies, but if this is adopted as a statewide standard, regulatory agencies may choose to require.

Another concern is the potential cost to develop data conversion tools so that we can convert our data to transfer. I think it would be helpful to address data conversion in the discussion, especially if there may be any tools or resources planned to be available. At a minimum, this discussion may be helpful for us to lobby within the agency to commit resources to develop the conversion tools.

## Overall Concerns with the Standard

### Mandatory vs Optional/Available:

We have concerns on potential impacts of adoption of this as a statewide data standard. The documentation is very careful to repeat multiple times that this is a data transfer standard and not a requirement for individual agencies. The data definitions are clear on what data is mandatory vs. not. However, once adopted there may be agencies that we work with or get permits from that try to require some of the parts of the standard that it may be difficult and costly for MnDOT to conform to.

The data field included in the standard are extensive and it is unlikely that MnDOT would either have all of them or be able to fully populate them. Also, because of the attribute definitions/domains, there will not be a direct conversion for some of the data that MnDOT does collect.

### Data Conversion Costs

MnDOT has an "in place" database for storm drain features and inspections that it has been using for over 20 years. It will take resources and expertise from MnDOT beyond what our unit has available to develop the necessary "cross-walk" and processes to transfer are data into this standard (if requested) and to be able to use other agencies data. There will be some data fields where it may not be able to transfer data because definitions/schema don't match exactly.

I recommend some content be added to the Overview, Context and FAQ section on what resources may be necessary to export/import data from the standard and if there are/will be any tools developed. If potential grant money becomes available as suggested in EQP State Water Plan, would be nice if could be directed to conversion development as well as data digitization as suggested.

## Inlet, Outlet, Pond Inspection Schemas

I have concerns about including the inspection schema as part of an overall package for a standard. This would be very difficult to use as a transfer standard because of the different ways that agencies describe potential condition/problems. A lot of inspection data that MnDOT

collects could not be transferred because we use Yes/No flag ratings that don't transfer to the domains in the standard.

With regards to adopting this as the data standard, MnDOT already has an inspection schema that does not match this, and it would require a lot of time, training and expense to change as well as making historical data much less useful. If this is approved as a standard, then there may be requirements and expectations on the part of other regulatory agencies that everyone they regulate must provide data in this format.

If this is intended to be used as a data transfer standard as well as an inspection data collection standard, need to plan for data fields where agency does not collect and store data by have null or unknown as options.

- Recommend against including a suggested condition rating – many agencies may have their own or be using PACP – difficult to translate between rating codes and gets confusing since may have different scheme for numbers;

- As applicable, domains/attribute fields should be options for None and Unknown. If this is used to transfer data, agency may not have collected that data, or may not have collected it in a way to allow transfer;

- What should be input for rainfall amounts if unknown – field should not default to zero, null should be allowed

## Stormwater Standard - Components

### Component Overlap – multiple records for individual features required?

Is it intended that an agency's stormwater feature needs to have a record for each component type that it might be part of? It is common that stormwater ponds and infiltration features will be both basins and BMPs. Less common but possible is that an inlet may have a sump/SAFL baffle and so also be a pollution control structure. If an agency only tracks these as one type of feature, do they needed to be included in both data sets, or is this only for when the data owner tracks them separately (appears in sample data set there are different IDs when a pond vs a BMP). Recommend more explanation on how to include where matches multiple component definitions.

### Component Definitions

I think it would be helpful to add some more discussion on what defines whether a feature is a BMP vs a Pollution Control Structure. I think the domain list is helpful, but it would also be helpful to have a descriptive comparison. I also think it would be helpful to go into more detail in this overall description of components of where different types of underground detention/retention/filtration structures fit into rather than making people search through the domains.

Are stormwater tunnels pipes? If so, recommend that tunnel be added as a pipe type. Otherwise, need to define how/where they are included. Also, would be helpful to address in general component definition at beginning of documentation.

### Component types common data

**Federated ID** – Not sure how this ensures a unique ID if only prefix only based on location/CTU where located. Other agencies/entities will be supplying data and have their own way of naming but could have a convention – such as just a number – which matches another agency with features within same CTU unit. Unlikely but possible that MnDOT *feature*_ORID will match a local agency *feature*_ORID for different features when they are in the same jurisdiction.
**Ownership Name/Maintenance Authority Name**

**AgencyOwnName** domain should include MnDOT/Minnesota Department of Transportation rather than lumping in with State of Minnesota, seems likely that there are other state agencies that also own or are responsible for maintenance of stormwater features that should be included specifically. Some of the sample data uses MnDOT for attribute data that standard shows used AgencyOwnName.

**Data Producer/Source Name** is listed as attribute name twice for each component. One based on using AgencyOwnName and the other a text field without domain. Having the same attribute name is confusing and the definitions are not real clear as to what is the difference between the two fields.

**Consequences of Failure, Probability of Failure and Criticality to the System.** The rating domain for these fields is very subjective and not well defined. Will be difficult for those that do rate these attributes to be able to combine data from other agencies that may use a different definition.

### Pipe Components Field Definitions

**Pipe Diameter** – what is expectation if the fixture is not circular – null, 0?

**Pipe Equivalent** – in order to get consistency, recommend more precise definition. Suggest following MnDOT standard plates since many agencies use. MnDOT standard plate definition for equivalent diameter (if that is intention) as: EQUIVALENT DIAMETER EQUALS DIAMETER OF CIRCULAR PIPE WITH APPROXIMATELY EQUIVALENT CROSS-SECTION AREA. Figure 1 definition for Pipe Equivalent Diameter is what MnDOT Standard Plates call out as Span.
Why is ***pipe height*** the inside, and ***pipe width*** the outside? More consistent to see both as inside dimension and then add pipe thickness as attribute. For utility conflict, probably want to be able to get both outside width/height. For hydraulic modelling, want to be able to get shape, inside width, inside height in order to figure out hydraulic properties.

**Pipe Type –** because domain values so specific, may lose some data in transfer. For instance, we may not always know if drain tile is perforated or not because may be lumped together. Given the list of attribute values, would need to transfer as other type. I don't know if this is national standard or not but may have been better to have perforated as own attribute field where values are perforated, nonperforated or unknown.

**Pipe_Mat** domain should consider additional value and/or more description. Most **Corrugated Metal** pipe used is **Galvanized** – which is preferred? For asset management purposes, important to know if metal pipe has Aluminized or Polymeric Coatings.

Vertical accuracy value included for structures but not for pipes – this seems inconsistent.

### Basin Components Field Definitions

**Basin Type –** confusing to include Culvert (centroid) as a basin type. A general definition of a culvert is an open-ended pipe that conveys water from one side of an embankment to another. Is this meant to be used for underground storage consisting of pipe segments?

### Hydraulic Structure Components Field Definitions

**Hydraulic Control Structure Type –** not clear why Deck Drain listed under HCS when it also a data field in inlets. Confusing to me, needs for description to understand when a deck drain is a HCS and is it either an inlet or HCS, or is it both. With Detention and Retention tanks listed as HCS, does this mean underground storage? If so, would be helpful to include that in the overall description.

### Pollution Control Structure Components Field Definitions

**Pollution Control Structure Type –** Definition includes example types and description for hydraulic control structure

### Outlet Components Field Definitions

**Outlet Type:** Since outlet type includes culvert, is it expectation that there will be an outlet created for every culvert?