

Standard for Digital Stormwater System Data Exchange

Date Issued: Approved for public review by the MnGeo Standards Committee standard on July 19, 2010, this standard will remain “provisional” for not less than one year to allow thorough implementation testing. During the provisional period, comments about the standard can be sent to the MnGeo Standards Committee. See page 9 of this document for details.

Introduction

Many cities, townships, and other entities collect data on geographic features that comprise their [stormwater system](#). The following standard defines a set of specifications for the exchange of digital stormwater system data. The standard was created to increase the ease and efficiency with which stormwater system data can be compiled for multiple organizations into a single system, or shared by adjacent owners of stormwater systems. While there is no requirement that any entity in Minnesota comply with this standard, it is offered to provide a single, sanctioned output format that will facilitate efficient data handling and integration.

An extensive support document accompanies this standard and provides explanations and definitions for features and attributes as well as specifications for encoding the attribute data.

Applicability

Who cares about this standard?

This [standard](#) is important to [entities](#) that collect, use or exchange digital stormwater system data in Minnesota.

When does it apply? When does it not apply?

This standard is intended to improve sharing and exchange of information about stormwater systems in Minnesota. Information about stormwater systems supports a wide range of potential uses such as stormwater system inspections and maintenance, emergency response, water quality management, mosquito control, project scoping and design (e.g., road expansions), permit compliance, and drainage permit requests.

Use of this standard is recommended when entities exchange stormwater system data. Organizations involved in data transfer are not required to include all features and attributes in the standard and may select appropriate features and attributes. This standard only applies to data that are being transferred and does not apply to how data are stored internally in any organization.

44 This standard is not meant to mandate which geographic [features](#) any particular entity
45 should collect in a database. The standard describes how those features should be
46 encoded in a data transfer file if they are collected.
47

48 **Purpose of this standard**

49 The purpose of this standard is to create a framework for [geospatial](#) information for
50 stormwater systems that allows data transfer and linkage of data developed by different
51 entities. The standard specifies the names and definitions for stormwater system
52 components that can be geospatially depicted as [feature types](#) (points and lines) with
53 [attributes](#).
54

55 **The Stormwater System Data Model**

56 This standard applies to data that depict the locations and characteristics of stormwater
57 systems, such as pipes, channels, pollution control devices, wetlands, etc. The focus of
58 this standard is on connectivity of stormwater systems and, therefore, the standard depicts
59 the features making up a typical stormwater system as points and lines. No features in
60 this standard are depicted as polygons.
61

62 **Specifications**

63 This standard is composed of four parts:

- 64 1. Feature representation
 - 65 2. Feature descriptions and domains
 - 66 3. Geographic coordinate system requirement
 - 67 4. Documentation (metadata)
- 68

69 **Part 1. Feature Representation Specifications**

70

71 **Separation of Feature Types**

72 Closed pipes and open channels are described as **line features** in this standard. Line
73 features will be represented as a single line (two-dimensional). Line features digitized as
74 a single line, and associated annotation, will be exported as a single data layer or feature
75 class dataset separate from other types of features. Line features will be broken into
76 segments where needed to assign appropriate attribute values. Line features must be
77 encoded in the direction of predominant flow starting at the upstream point and ending
78 with the downstream point.¹ Line features must have a terminus. Line features must be
79 snapped to the endpoint of other line or point features.
80

81 A connector is an artificial line feature (a feature that does not exist in reality) that
82 connects other features (e.g., a line illustrating the flow through lakes, ponds and
83 wetlands). Connector features will be exported as a single data layer or feature class
84 dataset separate from other types of features or cartographic elements. Connectors will
85 be represented as single lines and must be encoded in the direction of predominant flow
86 starting at the upstream point and ending with the downstream point. These features may
87 be symbolized as desired for cartographic production.
88

¹ In most cases, data will already be digitized in the direction of predominant flow.

89 Other features are represented as points. These consist of surface water features that are
90 either constructed (e.g., manholes, treatment devices, etc.) or natural (e.g. lakes,
91 wetlands, etc.).
92

93 **Separation of Additional Cartographic Elements**

94 Additional cartographic flourishes, such as arrows or flared end sections as sometimes
95 found in CAD drawing files, will not be included in the export file with the geographic
96 features.
97

98 **Existing Drainage Datasets**

99 Existing associated drainage datasets may be used to avoid duplicating these features in
100 an existing stormwater system GIS. Examples of other datasets include Minnesota
101 Department of Natural Resources 24K Streams
102 (<http://deli.dnr.state.mn.us/metadata.html?id=L260000072102>) and National
103 Hydrography Data (<http://nhd.usgs.gov/index.html>). Including explicit connections
104 between the stormwater system and other associated hydrography datasets is encouraged,
105 whenever possible. Entities should ensure that their stormwater system spatial features
106 align with the associated dataset and they should document the relationship between these
107 datasets in their metadata.
108

109 **Part 2. Feature Descriptions**

110
111 A support document accompanies this standard and provides further explanations and
112 definitions for features and attributes.
113 (http://www.mngeo.state.mn.us/committee/standards/standards_adopded_devel.html).
114 Not all feature and attributes described below are required to be included in a transfer file
115 to comply with this standard. Organizations involved in a transfer of data can determine
116 which of these features and attributes are appropriate to include. Those features and
117 attributes that are included must match these specifications to be considered in
118 compliance with this standard.
119

120 **FEATURE TYPE: Line**

121 **FEATURE: Pipe**

122 **DEFINITION:** A closed manmade conveyance device used to transport stormwater from
123 location to location. This includes any pipe feature, such as mains and catch basin inlets.

124 **ATTRIBUTES:**

125 ID: unique identifier

126 Data Type: CHARACTER

127 Shape: cross-sectional shape of the pipe

128 Data Type: CHARACTER

129 Domain: round, arch, box, elliptical, tunnel, other, unknown

130 Material: material of which a pipe is constructed

131 Data Type: CHARACTER

132 Domain: concrete, plastic, steel, aluminum, brick/masonry, other, unknown

133 Height: pipe height, in units of inches

134 Data Type: NUMBER

135 Width: pipe width, in units of inches
 136 Data Type: NUMBER
 137 Length: pipe length, in units of feet
 138 Data Type: NUMBER
 139 Upstream Invert: the elevation of the bottom of the inside portion of the pipe, at the
 140 upstream point, in units of feet above mean sea level
 141 Data Type: NUMBER
 142 Downstream Invert: the elevation of the bottom of the inside portion of the pipe, at
 143 the downstream point, in units of feet above mean sea level
 144 Date type: NUMBER
 145 Horizontal Position Accuracy: spatial accuracy of the method used to locate the pipe,
 146 in units of meters
 147 Data Type: CHARACTER
 148 Domain: < 0.5, 0.5-1.9, 2-4.9, 5-9.9, > 10, other, unknown
 149 Ownership Type: type of entity that owns the pipe
 150 Data Type: CHARACTER
 151 Domain: city, state, county, watershed district, township, university, other,
 152 unknown
 153 Ownership Name: name of entity that owns the pipe
 154 Data Type: CHARACTER
 155 Maintenance Authority Type: type of entity that maintains the pipe
 156 Data Type: CHARACTER
 157 Domain: city, state, county, watershed district, township, university, other,
 158 unknown
 159 Maintenance Authority Name: name of entity that maintains the pipe
 160 Data Type: CHARACTER
 161
 162 **FEATURE: Channel**
 163 **DEFINITION:** An open conveyance that transports water from location to location.
 164 **ATTRIBUTES:**
 165 ID: unique identifier
 166 Data Type: CHARACTER
 167 Type: type of open channel
 168 Data Type: CHARACTER
 169 Domain: ditch, swale, stream, lined channel, other, unknown
 170 AUID: Assessment Unit ID², a water body identifier that is the eight digit sub-basin
 171 code and the three digit reach number. The AUID constitutes a unique identifier
 172 for open channel reaches. Not all open channels have AUIDs.
 173 Data Type: CHARACTER
 174 Height: channel height or depth, in units of feet
 175 Data Type: NUMBER
 176 Width: channel width, in units of feet
 177 Data type: NUMBER

² For information on AUIDs, see Chapter V of Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List (http://www.pca.state.mn.us/index.php?option=com_k2&view=item&id=879&Itemid=252)

178 Length: channel length, in units of feet
179 Data type: NUMBER
180 Channel Shape: configuration of channel
181 Data Type: CHARACTER
182 Domain: triangular, trapezoidal, segmental, other, unknown
183 Horizontal Position Accuracy: spatial accuracy of the method used to locate the pipe,
184 in units of meters
185 Data Type: CHARACTER
186 Domain: < 0.5, 0.5-1.9, 2-4.9, 5-9.9, > 10, other, unknown
187 Ownership Type: type of entity that owns the pipe
188 Data Type: CHARACTER
189 Domain: city, state, county, watershed district, township, university, other,
190 unknown
191 Ownership Name: name of entity that owns the pipe
192 Data Type: CHARACTER
193 Maintenance Authority Type: type of entity that maintains the pipe
194 Data Type: CHARACTER
195 Domain: city, state, county, watershed district, township, university, other,
196 unknown
197 Maintenance Authority Name: name of entity that maintains the pipe
198 Data Type: CHARACTER
199

200 FEATURE: **Artificial Path**

201 DEFINITION: An artificial feature that connects other features. Artificial paths are often
202 used to illustrate flow through lakes, ponds and wetlands. Typically line connectors have
203 a horizontal flow component but not a significant vertical flow component. Connectors
204 have directionality and must be encoded in the direction of predominant flow
205 starting at the upstream point and ending with the downstream point.

206 ATTRIBUTES:

207 ID: unique identifier
208 Data type: CHARACTER
209

210 FEATURE TYPE: **Point**

211 FEATURE: **Constructed Basin**

212 DEFINITION: A feature constructed for detention, retention or infiltration of
213 stormwater³. Constructed ponds and wetlands have a small horizontal flow component.
214 Ponds can have a significant vertical flow component if constructed for temporary
215 storage. Infiltration basins have a significant vertical component.

216 ATTRIBUTES:

217 ID: Unique identifier
218 Data Type: CHARACTER
219 Type: type of constructed basin
220 Data Type: CHARACTER

³ Wetlands may be constructed for other purposes, such as wildlife management.

221 Domain: wet pond, dry pond, constructed wetland, infiltration trench, infiltration
 222 basin, rain garden, other, unknown
 223 Area: surface area of constructed basin, in units of acres
 224 Data Type: NUMBER
 225 Mean Design Depth: average design depth of constructed basin, in units of feet
 226 Data Type: NUMBER
 227 Contributing Drainage Area: area of land surface that discharges to constructed basin,
 228 in units of acres
 229 Data Type: NUMBER
 230 Infiltration rate: rate of infiltration through the bottom of an infiltration device, in
 231 units of inches per hour
 232 Data Type: NUMBER
 233 Treatment Device: indication of whether the device treats water
 234 Data Type: BOOLEAN
 235 Domain: Yes, No
 236 Horizontal Position Accuracy: spatial accuracy of the method used to locate the pipe,
 237 in units of meters
 238 Data Type: CHARACTER
 239 Domain: < 0.5, 0.5-1.9, 2-4.9, 5-9.9, > 10, other, unknown
 240 Ownership Type: type of entity that owns the pipe
 241 Data Type: CHARACTER
 242 Domain: city, state, county, watershed district, township, university, other,
 243 unknown
 244 Ownership Name: name of entity that owns the pipe
 245 Data Type: CHARACTER
 246 Maintenance Authority Type: type of entity that maintains the pipe
 247 Data Type: CHARACTER
 248 Domain: city, state, county, watershed district, township, university, other,
 249 unknown
 250 Maintenance Authority Name: name of entity that maintains the pipe
 251 Data Type: CHARACTER
 252
 253 **FEATURE: Stormwater device**
 254 **DEFINITION:** A constructed stormwater device.
 255 **ATTRIBUTES:**
 256 ID: unique identifier
 257 Data type: CHARACTER
 258 Type: type of device
 259 Data Type: CHARACTER
 260 Domain: grit chamber, sump, trap manhole, skimmer, swirl separator, filter,
 261 settling device, filtering device, oil and grease separator, stormwater inlet
 262 trap, leaky well, seepage pipe, manhole, catch basin, drop inlet, lift station,
 263 pipe outfall, ditch outfall, apron outfall, splitter, other
 264 Length: length of device, in units of feet
 265 Data type: NUMBER
 266 Width: width of device, in units of feet

267 Data type: NUMBER
 268 Height: height of stormwater system component, in units of feet
 269 Data type: NUMBER
 270 Invert Elevation of Outlet: the elevation of the bottom of the inside portion of the
 271 outlet, in units of feet above mean sea level
 272 Data Type: NUMBER
 273 Treatment Device: indication of whether the device treats water
 274 Data Type: BOOLEAN
 275 Domain: Yes, No
 276 Bottom Elevation of Device: the elevation of the bottom of the water treatment
 277 device, in units of feet above mean sea level
 278 Data Type: NUMBER
 279 Contributing Drainage Area: applies only to water treatment devices - land surface
 280 area that discharges to the water treatment device, in units of acres
 281 Data Type: NUMBER
 282 Holds Water: a determination of whether the bottom elevation of the device is below
 283 the invert elevation, in which case the device would be considered to hold water.
 284 Data type: CHARACTER
 285 Domain: wet, dry, unknown
 286 Design Infiltration Rate: rate of infiltration through the bottom of an infiltration
 287 device, in units of inches per hour
 288 Data Type: NUMBER
 289 Horizontal Position Accuracy: spatial accuracy of the method used to locate the pipe,
 290 in units of meters
 291 Data Type: CHARACTER
 292 Domain: < 0.5, 0.5-1.9, 2-4.9, 5-9.9, > 10, other, unknown n
 293 Ownership Type: type of entity that owns the pipe
 294 Data Type: CHARACTER
 295 Domain: city, state, county, watershed district, township, university, other,
 296 unknown
 297 Ownership Name: name of entity that owns the pipe
 298 Data Type: CHARACTER
 299 Maintenance Authority Type: type of entity that maintains the pipe
 300 Data Type: CHARACTER
 301 Domain: city, state, county, watershed district, township, university, other,
 302 unknown
 303 Maintenance Authority Name: name of entity that maintains the pipe
 304 Data Type: CHARACTER
 305
 306 **FEATURE: Natural Surface Water Feature**
 307 **DEFINITION:** a natural feature that temporarily or permanently stores and/or conveys
 308 water. This feature includes natural waters that have been modified.
 309 **ATTRIBUTES:**
 310 ID: Unique identifier
 311 Data type: CHARACTER
 312 Type: type of water feature

313 Data Type: CHARACTER
314 Domain: Lake, Wetland, Other
315 DNR Lake ID: A unique 8-digit identifier for each lake polygon. The value of this
316 field is the DNR Division of Waters lake identification number if one has been
317 assigned. Otherwise, the Lake ID is a unique sequential number.
318 Data Type: CHARACTER
319 PWI Number: A unique ID for public waters that have been mapped under Statute
320 103G.201
321 Data Type: CHARACTER
322 Height or depth: mean depth of water feature, in units of feet
323 Data type: NUMBER
324 Width: mean width of water feature, in units of feet
325 Data type: NUMBER
326 Length: mean length of water feature, in units of feet
327 Data type: NUMBER
328 Horizontal Position Accuracy: spatial accuracy of the method used to locate the pipe,
329 in units of meters
330 Data Type: CHARACTER
331 Domain: < 0.5, 0.5-1.9, 2-4.9, 5-9.9, > 10, other, unknown n
332 Ownership Type: type of entity that owns the pipe
333 Data Type: CHARACTER
334 Domain: city, state, county, watershed district, township, university, other,
335 unknown
336 Ownership Name: name of entity that owns the pipe
337 Data Type: CHARACTER
338 Maintenance Authority Type: type of entity that maintains the pipe
339 Data Type: CHARACTER
340 Domain: city, state, county, watershed district, township, university, other,
341 unknown
342 Maintenance Authority Name: name of entity that maintains the pipe
343 Data Type: CHARACTER
344

345 **Part 3. Geographic Coordinate System Requirement**

346 Digital data for stormwater drainage systems is to be provided in Universal Transverse
347 Mercator (UTM) Zone 15N, extended to cover the entire land surface of the State of
348 Minnesota, in the NAD83 datum and horizontal units of meters.
349

350 **Part 4. Documentation (Metadata)**

351 Stormwater system data transfer files must be accompanied by clear documentation in the
352 form of a metadata record that complies with the Minnesota Geographic Metadata
353 Guidelines (<http://www.mngeo.state.mn.us/chouse/meta.html>) or the Federal Geographic
354 Data Committee metadata standard (<http://www.fgdc.gov/metadata>). The metadata
355 record should include information about data accuracy, data collection methods and
356 attribute values. See the support document for specific information.

357 **Compliance:**

358 *What constitutes compliance?*
359 Organizations that manage stormwater system data, store such data in a wide variety of
360 systems and formats. To meet this standard, an organization must output its data into a
361 transfer format that complies with these specifications. Not all feature and attributes
362 described above are required to be included in a transfer file to comply with this standard.
363 Organizations involved in a transfer of data can determine which of these features and
364 attributes are appropriate to include. Those features and attributes that are included must
365 match these specifications to be considered in compliance with this standard.

366
367 Complying with this standard is purely optional. No organization is mandated to do so. It
368 is recommended that state agencies integrate the format described in this standard into
369 new system designs and, where possible, when redeveloping existing systems.

370
371 *How will compliance be measured?*
372 No direct monitoring of compliance will be conducted. Evidence of compliance will be
373 based on reports of satisfactory data transfers among entities.

374

375 **Comments during this standard’s provisional period:**

376 This standard will be in a provisional status until January 1, 2012. Comments and
377 recommendations for improvement are encouraged. To provide feedback, please supply
378 your comments to:

379 Standards Committee
380 MnGeo
381 658 Cedar Street, Room 300
382 St. Paul, MN 55155
383 mn.geo@state.mn.us

384

DEFINITIONS

385

386 **Attribute** - a defined characteristic of a feature. Examples are the length of a pipe or
387 drainage area of a pond.

388

389 **Entity** - an organization, agency, etc. that maps one or more features of its stormwater
390 system.

391

392 **Feature** - real-world spatial phenomenon about which data is collected. Features are
393 geospatial objects that are graphically delineated in a spatial database. Examples include
394 pipes and ponds.

395

396 **Feature type** - definition and description of a set (class of real world phenomena) into
397 which similar features are classified. A feature type can be a point, a line, or a polygon.
398 Polygons are represented as points in this Standard.

399

400 **Geospatial information (data)** - data with implicit or explicit reference to a location
401 relative to the earth.

402

403 **Standard** - that which is established as a model by authority, custom, or general consent.

404

405 **Stormwater** – water from precipitation that does not soak into the ground and therefore
406 becomes surface runoff. This standard considers runoff that is channeled into a
407 stormwater system. Other flows, such as combined sewer overflows (CSOs), may occur
408 within a stormwater system.

409

410 **Stormwater System** - a system that conveys, stores, or treats [stormwater](#), such as pipes,
411 channels, pollution control devices, wetlands, etc.