Project No. 10022676.00

City of Beavercreek Drainage Master Plan

City of Beavercreek

October 13, 2025

WOOLPERT

ARCHITECTURE | ENGINEERING | GEOSPATIAL

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List of Abbreviations and Acronyms

Abbreviation	Definition
CCTV	Closed-Circuit Television
CMP	Corrugated Metal Pipe
CONUS	Continental United States
DEM	Digital Elevation Model
ESRI	Environmental Systems Research Institute, Inc.
FEMA	Federal Emergency Management Agency
FT	Foot / Feet
GIS	Geographic Information System
GPS	Global Positioning System
H&H	Hydrologic and Hydraulic
HEC-RAS	Hydrologic Engineering Center River Analysis System
HSG	Hydrologic Soil Group
HUC	Hydrologic Unit Codes
IN	Inch
IN/HR	Inch Per Hour
LF	Linear Foot / Feet
LiDAR	Light Detection and Ranging
MI	Mile
NAVD 88	North American Vertical Datum of 1988
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
ODOT	Ohio Department of Transportation
RCP	Reinforced Concrete Pipe
SFHA	Special Flood Hazard Area
SLHDPE	Smooth Lined High-Density Polyethylene
SQ MI	Square Mile
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WSE	Water Surface Elevation
YR	Year

1 Executive Summary

The City of Beavercreek has been experiencing flooding and erosion issues throughout the storm infrastructure network over the years and has not undergone a citywide study since 1983 when the last master plan was developed and identified $30 million in improvements. Woolpert was chosen to develop a new drainage master plan report to assist the City with stormwater needs. The purpose of this project was to study culverts and streams throughout the City that have been previously identified as trouble areas, are considered public streams, or are 24-inch and larger diameter culverts. Culverts smaller than 24-inch diameter are routinely addressed by City maintenance crews as part of ongoing activities with their available equipment and resources.

Woolpert met with the City to gain an understanding of known drainage issues throughout the City, which included reviewing work orders, first-hand accounts by City staff, and historical projects. These areas were used as a baseline to validate certain hydraulic modeling efforts and later overlaid with model results. All trouble areas were digitally logged in GIS and summarized by grid area in this report. Certain conveyance areas were omitted as part of the study area due to state or federal jurisdiction, including ODOT and USACE corridors, as well as the storm sewer system and privately attributed drainage concerns.

A field data collection manual was developed to inventory and inspect all culverts and streams identified to be included as part of this analysis. The field data collection manual outlined what attributes to collect and how ratings would be assigned during the condition assessment portion. All of the attributes and pictures were collected using ESRI Field Maps and stored on Woolpert's ArcGIS Online server. The study area was broken down into 20 grid areas to help identify where each culvert and stream segment is located, asset IDs were then assigned to each asset based on the grid numbering system.

There were 120 culverts inventoried and inspected as part of this study. Structurally the culverts were generally observed to be in good or fair condition, where only 13/120 (11%) received a rating of poor. Operationally the culverts did have maintenance concerns throughout, where 31/120 (26%) of the culverts received a maintenance rating of poor. There were 33/120 (28%) of culverts observed as primarily corrugated metal pipe, a distinction at the direction of the City to identify for replacement.

There were 15.12 miles of streams inventoried and inspected as part of this study. At the conclusion of the field work activities, the streams were broken up into 200 LF or less stream segments, depending on the entire inspected length, for a total of 438 stream segments. Structurally there were 44/438 (10%) stream segments to receive a rating of poor. Operationally there were 63/438 (14%) stream segments to receive a maintenance rating of poor. There were also 54/438 (12%) of stream segments that had an existing threat located within approximately 25 feet. Of the 15.12 miles of stream segments, ownership and maintenance responsibility is split with 10.72 miles considered public and 4.40 miles considered private.

Hydrologic and hydraulic analysis included a 2D HEC-RAS model comprised of NOAA rainfall data, USGS LiDAR, NRCS soil data, USGS land use classification, and collected field data. 24-hour rainfall depths for the 2-, 10-, 25-, and 100-year recurrence intervals were used with the rainfall distribution to simulate meteorological conditions during the rain storm events after delineating drainage areas and flow paths throughout the study area. No future land use considerations were included as part of the study. The model simulation results for the desired 25-year storm event level of service guided the alternatives analysis to indicate which culverts were not meeting conveyance standards. Proposed culvert sizes in these areas were then included in a proposed model run to verify the proper increase in size. Culverts that

were found to be corrugated metal were also proposed to be replaced with RCP at the City's request, therefore lowering the Manning's value in the model and improving hydraulics conveyance.

Utilizing ODOT, City of Beavercreek, and other project resources, a cost table was developed to identify approximate costs to replace structural or hydraulic deficient culverts, maintenance of culverts, stabilize stream banks, and maintain stream banks. There were 61 culverts identified for replacement at a cost of $10,417,558 and 31 culverts identified for maintenance at a cost of $136,296. There were 44 stream segments identified for bank stabilization at a cost of $3,880,945 and 63 stream segments identified for maintenance at a cost of $524,661, both values include public and private owned areas. Additional survey and engineering will be required to fully determine the limits and types of improvements to be made.

Prioritization ratings were developed and attributed to every culvert and stream segment to help the City determine which areas should receive the most attention. Ratings were assigned on a scale of 1 (low) to 3 (high) and then averaged together. Factors included in the culvert prioritization were structural condition, maintenance condition, trouble area identification, material, hydraulic capacity, and existing pipe size. Factors included in the stream segment prioritization were structural condition, maintenance condition, trouble area identification, ownership, and existing threats. A key consideration in the stream segment project implementation will be the public vs. private ownership attribute, as the City typically prioritizes areas in public land and needs permission from private landowners. Although the City maintains a database of network assets, gaps in available records limit the ability to definitively assign responsibility for ownership and maintenance obligations. The City may need to pursue easement acquisitions to establish legal authority, secure necessary permits, and ensure appropriate use of public funds prior to starting work on privately owned and/or maintained stream segments.

Appendices for storm event inundation maps, culvert model scenario results, field data collection manual, culvert inspection grid sheets, individualized culvert cutsheets, stream inspection grid sheets, grid summary tables, and cost estimates are included at the end of the report.

2 Introduction

The City of Beavercreek, like many other cities across the country, is experiencing increased flood events. Particularly, the City is experiencing flooding associated with its open channel system (ditches) on a more frequent basis. The City contracted Woolpert to prepare an assessment of the open channel system and associated culverts for flooding issues. The assessment included an evaluation of system capacity, erosion points, sediment deposits and blockages, and channel and culvert constrictions. The result of this assessment is described in this report which also identifies conceptual level, prioritized maintenance and capital improvement projects.

Woolpert reviewed the 1983 Stormwater Management Study and the more recent Willowcrest and Vineland area drainage studies, conducted a field assessment and prepared limited hydrologic and hydraulic (H&H) modeling to provide a comprehensive evaluation of the current system. H&H modeling of potential future buildout of identified watersheds is also provided.

3 Study Purpose and Goals

Due to increased runoff and more frequent flooding, bank erosion is occurring at an accelerated rate. To better understand the causes of the increased flooding and potential solutions to both flooding and bank erosion, the City evaluated the open channel system and associated culverts. The assessment included an evaluation of system capacity, erosion points, sediment deposits and blockages, and channel and culvert constrictions.

The City contracted Woolpert to collect drainage system inventory and condition assessment. This data was utilized in a HEC-RAS 2D, rain on grid model to identify drainage issues and further determine potential solutions.

The project involved the following main tasks:

- Reviewing historical documents and trouble areas identified by the City.
- Inventory and mapping of the existing storm drainage infrastructure systems.
- Condition assessment of streams and culverts.
- Preparation of a geodatabase for developing a 2D HEC-RAS hydrologic and hydraulic model.
- Performing modeling of the existing system against various storm events to determine functional level of service.
- Preparation of a watershed report including conceptual level, prioritized maintenance and capital improvement projects.
- Presentation of field work and modeling findings to the City.

4 Description of Watershed

The study area is located in the City of Beavercreek, Ohio. It is approximately 27.36 square miles and is generally bound by Interstate 675 to both the north and west. State highway 35 bisects the City from east to west. The City of Beavercreek is sandwiched between two Hydrological Unit Codes (HUC) 8 watersheds namely Little Miami (HUC8: 05090202) and Upper Great Miami, Indiana, Ohio (HUC8: 05080001). Runoff from the northwestern part of the City drains into the Mad River which lies within the Upper Great Miami, Indiana, Ohio watershed. The other portions of the City lie within the Little Miami watershed which drain into several rivers, tributaries and creeks. Little Beaver Creek, which flows through the middle section of the City parallel to the US-35 road from west to east, drains majority to the areas south of Kemp Road and north of Indian Ripple Road. On the other hand, areas south of the Indian Ripple Road drains into the Little Sugar Creek towards the southwest and the Little Miami River towards the southeast. Beaver Creek, which flows from north to south and ultimately into the Little Miami River along the Eastern boundary of the City, serves as the waterbody that drains majority of the eastern section of the City.

See *Figure **1*** for a map of the study area. While predominantly suburban development, the area is characterized by a mix of suburban, agricultural and natural land use. There is a significant commercial district in the north-central portion of the City. Rapid growth of urban areas has led to increased runoff quantity and velocities.

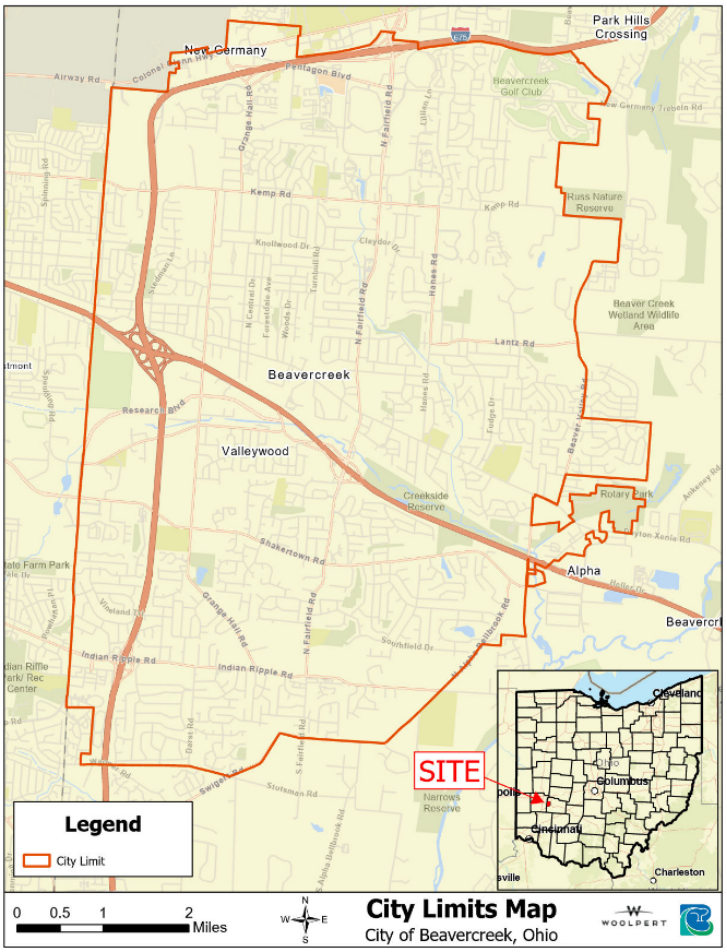

Figure 1. City of Beavercreek - City Limits Map

5 System Inventory

Woolpert's condition assessment crew accessed local streams and channels and performed condition assessments of the watershed's streams and channels. Field crews investigated the selected study reaches, as agreed upon with the City using field reconnaissance techniques. The City was broken into a grid for classification, see *Figure **2*** and *Figure **3*** for culvert and stream assessment assignments. The crew walked the channels or streams and documented observations using ESRI field maps and a Trimble R2 to accurately collect the mapping grade position of the feature observations.

Each feature in the data file has a unique numeric identifier, a brief descriptor defining the observation, and general horizontal coordinates associated with the structure. Woolpert field crews also took photographs of critical feature observations within ESRI field maps.

This study prioritized culverts that are 24-inch diameter and larger due to their operational and hydraulic significance. Smaller culverts are routinely addressed by City maintenance crews as part of ongoing activities with their available equipment and experience. In contrast, larger culverts typically require formal design, budgeting, and contracted construction efforts. Additionally, due to the absence of a comprehensive field survey and reliance on LiDAR data to supplement the topographic data the field crews did collect, detailed hydraulic modeling of smaller diameter pipes was deemed less justifiable for this City-wide stormwater analysis.

5.1 Field Survey General Guidelines

Culvert conditions and attributes were collected for storm water drainage system features including 24-inch diameter pipes and larger (no driveway culverts), open channels, and other associated features within the defined study reaches. The stormwater drainage system collected consists of both open channels and culverts. The following storm water feature information was collected:

- Horizontal (X, Y) coordinates using Trimble GPS modules or an overlay to orthophotography or other GIS source data
- Feature subtype codes (Stream Inspection and Culvert Condition)
- Attributes (see data dictionary)

For more detailed information, refer to Field Manual, Appendix C.

To gather this information, field crews accessed each feature that was readily accessible. It should be noted that no confined-space entry of structures was performed**.** If an area was deemed inaccessible, the point was marked in ESRI Field Maps, and a note was provided describing the obstruction. For structures that could not be directly located, the best possible placement of the structure was used.

The following procedures guided the field data collection process:

- Woolpert investigated selected study reaches, as agreed upon with the City, used field reconnaissance techniques for stream assessments. The crew walked the channel or stream and made observations as described herein within the GIS map.
- Field observations included a visual summary of the channel conditions by stream reach (photographs and GIS mapped locations based on mapping grade GPS coordinates gathered in the field). A basic understanding of the existing conditions of the stream was established and further assessment of their potential for stabilization or degradation.

- Locations of current and possible bank failures including erosion and incision, areas of channel aggradation and degradation, and debris dams were documented.
- During the stream assessment threatened infrastructure (public infrastructure, private homes, fences, etc.) was attributed and documented. All locations were snapped to the approximate location and photographed.
- All culverts (24” or larger) carrying the USGS stream were attributed, inspected for any defects or blockages and a photograph was taken.

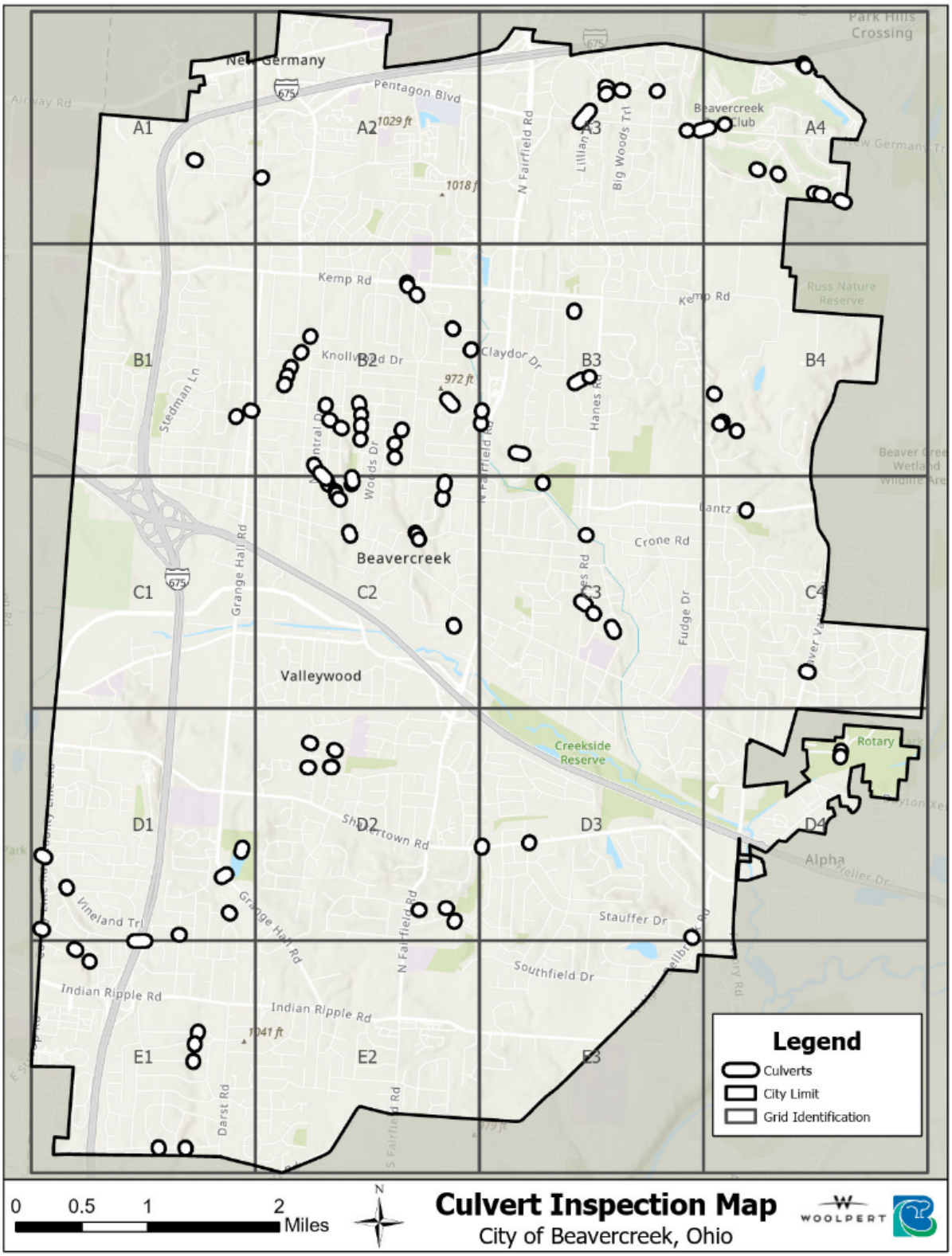

Figure 2. City of Beavercreek - Culvert Inspection Map

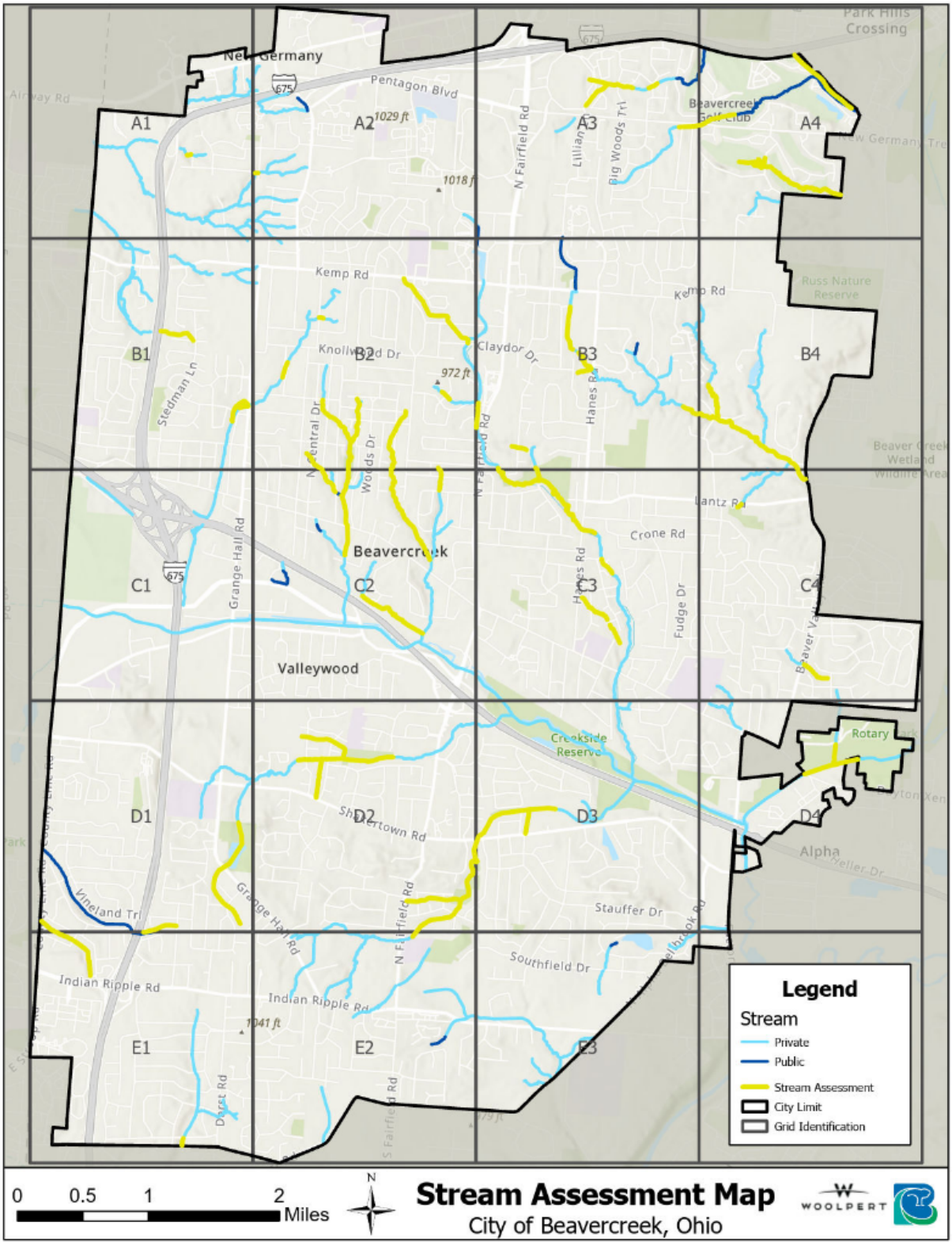

Figure 3. City of Beavercreek - Stream Assessment Map

5.2 Condition Assessment

5.2.1 Culvert Assessment Procedures

A preliminary condition assessment on culverts to determine if the culvert needs immediate repairs or maintenance course of action in that area.

The following scoring criteria was used:

Culvert Assessment Scores			
Score	**Accessibility for Assessment Score**	**Structural Condition Score**	**Maintenance Condition Score**
1	Structure is fully accessible and visible	No visible signs of deterioration	Culvert end does not need maintenance
2		Some signs of deterioration	Culvert end exhibits issues and routine maintenance may be needed
3	Structure is not accessible or is not fully visible, follow up assessment is required	Failure has already occurred or is imminent	Culvert end needs immediate maintenance to restore functionality of the system

Accessibility for Assessment: A score of **1** indicated that the culvert was fully viewed (e.g., the full length of pipe was clearly seen) and a **3** indicated all other cases. A score of **3** indicated "tag" that culvert for condition assessment via other methods. There is not an accessibility score of **2**.

Structural Condition Score: A score of **1** indicated that there are no visible signs of deterioration, and the culvert should be re-inspected according to the City's inspection schedule. A score of **2** indicated that some deterioration was evident, and that further assessment is needed to determine the appropriate corrective action. This additional assessment may be conducted via CCTV or the inspector may indicate that an engineer needs to visit the site (e.g., CCTV may not be necessary for a culvert, if an engineer can see the issues). A score of **3** indicated that failure of the culvert has either already occurred or is imminent. Woolpert recommends that City personnel inspect the asset immediately.

Maintenance Condition Score: A score of **1** indicated that the asset does not need maintenance attention. The asset will be re-inspected according to the City's inspection schedule. A score of **2** indicated that the asset exhibits issues requiring "routine maintenance" (e.g., concrete top is displaced) or sediment accumulation inhibits flow (e.g., accumulation is greater than 25% of the pipe diameter or debris is trapped at pipe mouth) and should be revisited to determine appropriate action. A score of **3** indicated that maintenance activities are needed immediately to restore the functionality of the system.

For more detailed information, refer to Field Manual, Appendix C.

5.2.2 Condition Assessment Results

There were 120 culverts inventoried and inspected as part of this study. Structurally the culverts were generally observed to be in good {1} or fair {2} condition, where only 13/120 (11%) received a rating of poor {3}. Operationally the culverts did have maintenance concerns throughout, where 31/120 (26%) of the culverts received a maintenance rating of poor {3}. There were 33/120 (28%) of culverts observed as primarily corrugated metal pipe, a distinction at the direction of the City to identify for replacement. *Table **1*** below provides a condition assessment summary based on the structural and maintenance ratings. *Table 2* provides a summary of the primary materials observed.

Maps of each grid were created to display the structural and maintenance conditions throughout an area. See *Figure **4*** for a typical grid index map with structural and maintenance conditions, all 20 grid maps are included in Appendix D. *Figure **5*** shows the structural conditions and *Figure **6*** shows the maintenance conditions respectively for all culverts throughout the City.

Culvert cutsheets were created to summarize pertinent details for all 120 culverts, including attributes and photos collected during the field efforts. See *Figure **7*** for a typical culvert cutsheet, all 120 culvert cutsheets are included in Appendix E

Table 1. Culvert Condition Assessment Summary

Grid	Segments (120 Total)	Length (ft)	Structural			Maintenance		
			3	2	1	3	2	1
A1	1	80	-	-	80	-	-	80
A2	1	44	-	44	-	-	44	-
A3	6	811	37	-	774	37	-	774
A4	10	924	-	523	401	112	388	424
B1	2	117	-	47	71	71	-	47
B2	27	1,765	501	783	481	722	603	440
B3	7	698	-	276	423	-	77	621
B4	11	320	-	76	244	44	62	214
C1	0	-	-	-	-	-	-	-
C2	14	980	185	538	257	208	537	235
C3	6	691	54	410	227	54	596	41
C4	2	153	101	-	52	101	-	52
D1	9	896	-	431	466	120	311	466
D2	9	598	54	262	283	270	256	72
D3	3	179	-	103	77	60	-	119
D4	2	105	-	105	-	-	105	-
E1	10	884	56	554	274	145	640	99
E2	0	-	-	-	-	-	-	-
E3	0	-	-	-	-	-	-	-
E4	0	-	-	-	-	-	-	-
Total (ft)		9,247	988	4,151	4,108	1,943	3,620	3,684
Total (mi)		1.75	0.19	0.79	0.78	0.37	0.69	0.70

Table 2. Culvert Material Summary

Type	Quantity	Length (ft)	Length (mi)
CMP	33	2,425	0.46
RCP	74	6,013	1.14
SLHDPE	13	809	0.15
Total	120	9,247	1.75

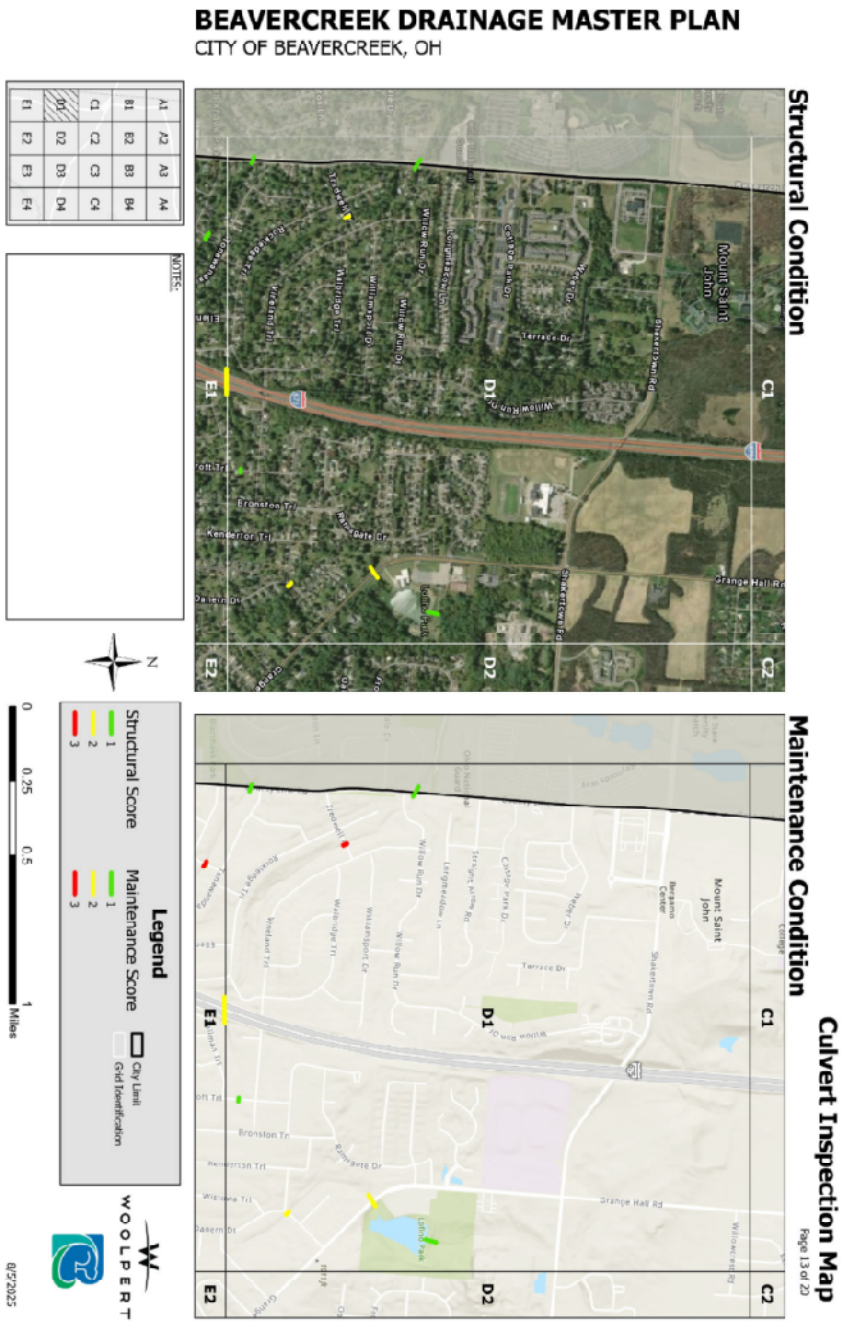

Figure 4. Typical Culvert Inspection Grid

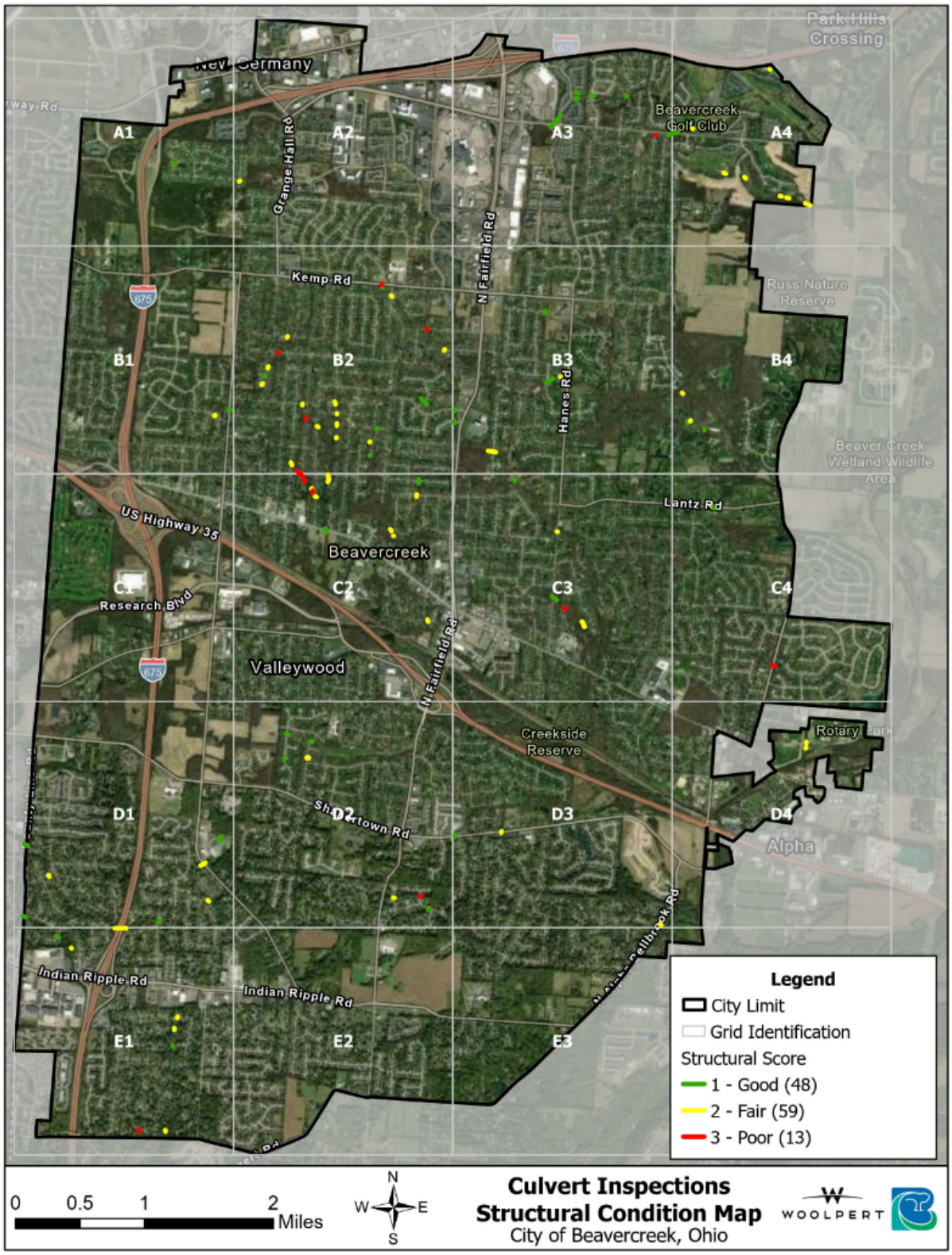

Figure 5. Culvert Inspections Structural Condition Map

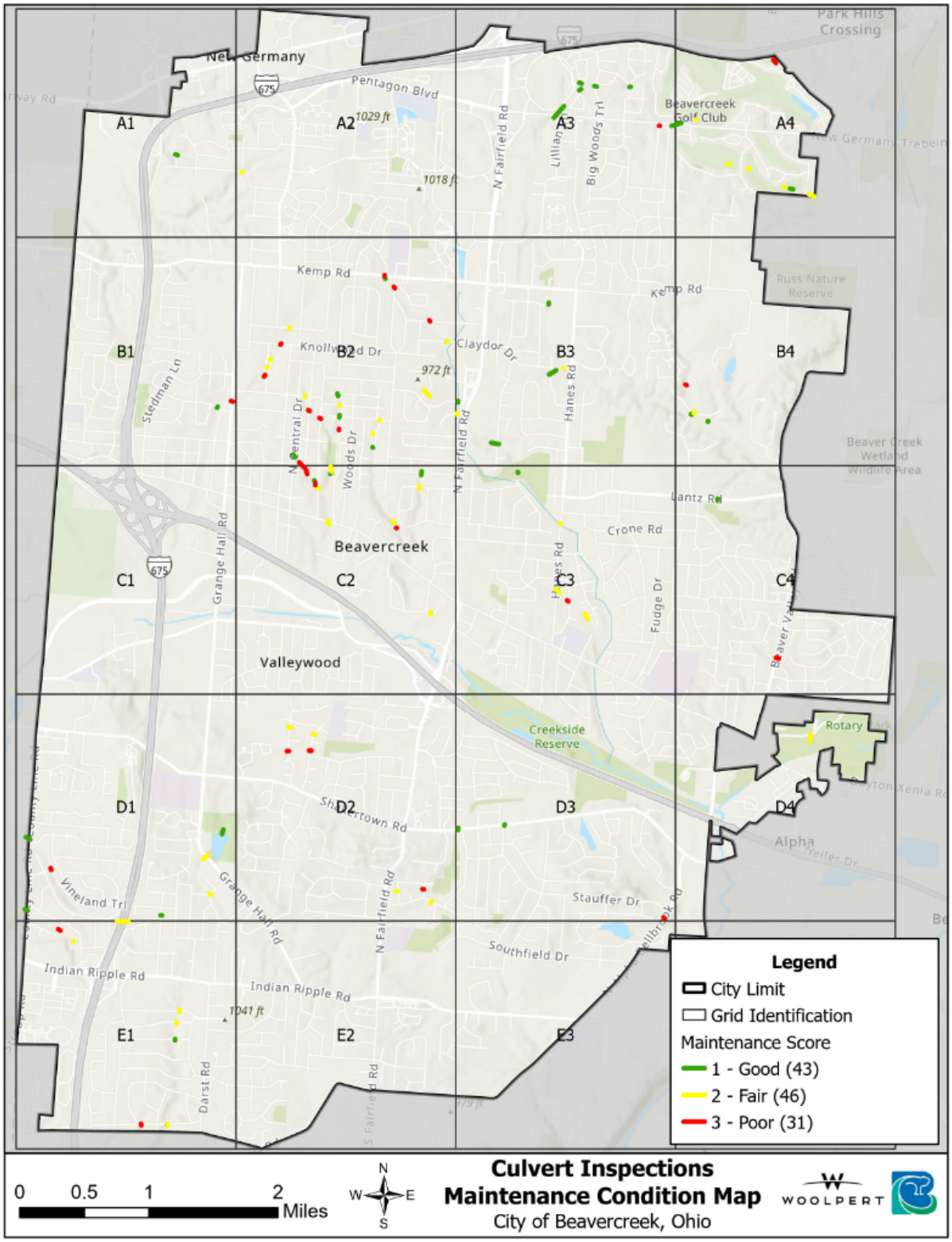

Figure 6. Culvert Inspections Maintenance Condition Map

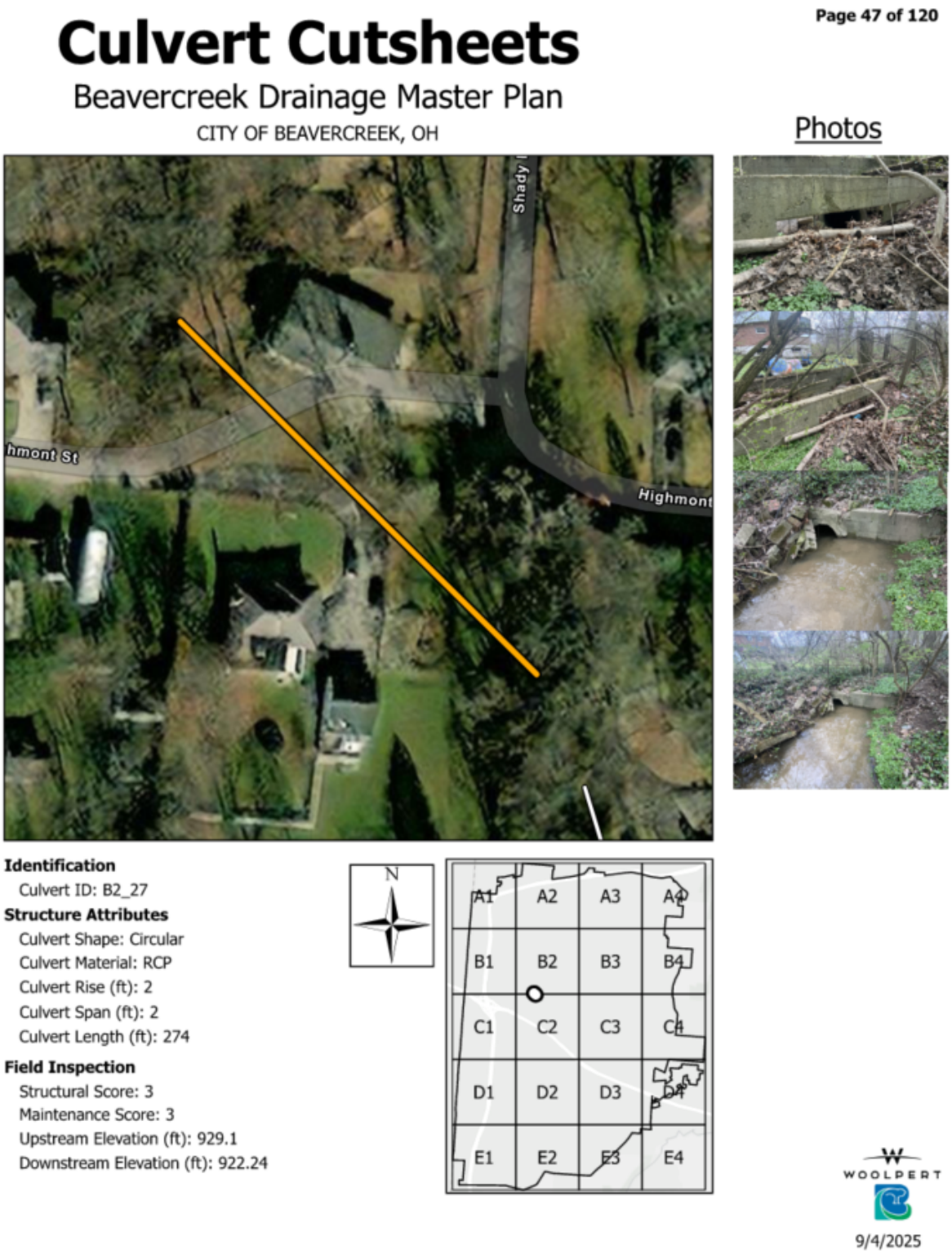

Figure 7. Typical Culvert Cutsheet

5.2.3 Stream Assessment

A preliminary condition assessment on streams to determine if the stream segment needs immediate repairs or maintenance course of action in that area.

The following scoring criteria was used:

Stream Assessment Scores			
Score	**Maintenance Condition Score**	**Structural Condition Score**	**Percent Stream Blockage**
1	Channel or stream does not need maintenance	No visible signs of erosion	0% 25% 50% 75% Completely Blocked
2	Channel or stream requires routine maintenance	Some bank erosion	
3	Bank failure has occurred or is imminent	Channel or stream requires immediate maintenance to restore functionality	

Structural Condition Score: A score of **1** indicates that there are no visible signs of erosion, and the ditch/channel should be re-inspected according to the City's inspection schedule. A score of **2** indicates that some bank erosion was evident, and that further assessment is needed to determine the appropriate corrective action. A score of **3** indicates that failure of the bank has either occurred or is imminent. Woolpert recommends that City personnel inspect the asset immediately.

Maintenance Condition Score: A score of **1** indicates that the ditch/channel does not need maintenance attention. The asset will be re-inspected according to the City's inspection schedule. A score of **2** indicates that the ditch/channel exhibits issues requiring "routine maintenance" (e.g., some sediment deposition or debris blockage of the channel and should be revisited to determine appropriate action. A score of **3** indicates that maintenance activities are needed immediately to restore the functionality of the system.

Percent Stream Blockage: A score of 0%, 25%, 50%, 75% and completely blocked was determined to categorize the severity of the stream obstruction by debris, sediment, vegetation or other materials that impede water flow. 0% was given when there were no visible obstructions, water flows freely, 25% was given when there were minor obstructions and water flow is slightly impeded, 50% was given for moderate blockage and water flow is noticeably restricted. 75% was given when severe blockage was present and water is significantly backed up or diverted, and completely blocked was given when water ditch was severely damaged and water flow was obstructed.

For more detailed information, refer to Field Manual, Appendix C.

5.2.4 Stream Assessment Results

There were 15.12 miles of streams inventoried and inspected as part of this study. The field crews walked each stream segment identifying the beginning and end of their inspection, with any intermediate points of interest based on the Field Data Collection Manual criteria. At the conclusion of the field work activities, the streams were broken up into 200 LF or less stream segments, depending on the entire inspected length, for a total of 438 stream segments. Data points with structural, maintenance, blockage, and threat information were then correlated to the nearest stream segment with the worst score taking precedence of overall scores assigned to that stream segment. Structurally there were 44/438 (10%) stream segments to receive a rating of poor {3}. Operationally there were 63/438 (14%) stream segments to receive a maintenance rating of poor {3}. There were also 54/438 (12%) of stream segments that had an existing threat located within approximately 25 feet. *Table **3*** below provides a condition assessment summary based on the structural and maintenance ratings.

Maps of each grid were created to display the structural and maintenance conditions throughout an area. See *Figure **8*** for a typical grid index map with structural and maintenance conditions, all 20 grid maps are included in Appendix F. *Figure **9*** shows the structural conditions and *Figure **10*** shows the maintenance conditions respectively for all stream segments throughout the City.

Table 3. Stream Condition Assessment Summary

Grid	Segments (438 Total)	Length (ft)	Structural			Maintenance		
			3	2	1	3	2	1
A1	1	135	-	135	-	135	-	-
A2	1	91	-	91	-	-	91	-
A3	19	3,417	-	1,755	1,662	-	1,555	1,862
A4	44	7,928	1,200	3,299	3,429	1,200	2,945	3,783
B1	13	2,396	200	1,398	798	200	1,398	798
B2	64	11,301	1,600	5,658	4,043	2,798	5,460	3,043
B3	24	4,565	-	2,195	2,370	-	2,880	1,685
B4	27	5,299	400	3,144	1,755	400	3,899	1,000
C1	0	-	-	-	-	-	-	-
C2	56	10,027	1,307	4,880	3,840	1,706	4,481	3,840
C3	40	7,502	1,572	4,825	1,105	1,372	4,825	1,305
C4	8	1,503	149	1,154	200	149	794	560
D1	32	5,443	754	3,216	1,473	1,262	2,047	2,134
D2	63	11,863	1,000	7,991	2,872	2,178	6,613	3,072
D3	21	3,824	-	3,624	200	200	3,024	600
D4	12	2,275	-	1,875	400	-	958	1,317
E1	12	2,088	400	1,288	400	600	1,249	239
E2	1	200	-	-	200	-	200	-
E3	0	-	-	-	-	-	-	-
E4	0	-	-	-	-	-	-	-
Total (ft)		79,857	8,582	46,528	24,747	12,200	42,419	25,238
Total (mi)		15.12	1.63	8.81	4.69	2.31	8.03	4.78

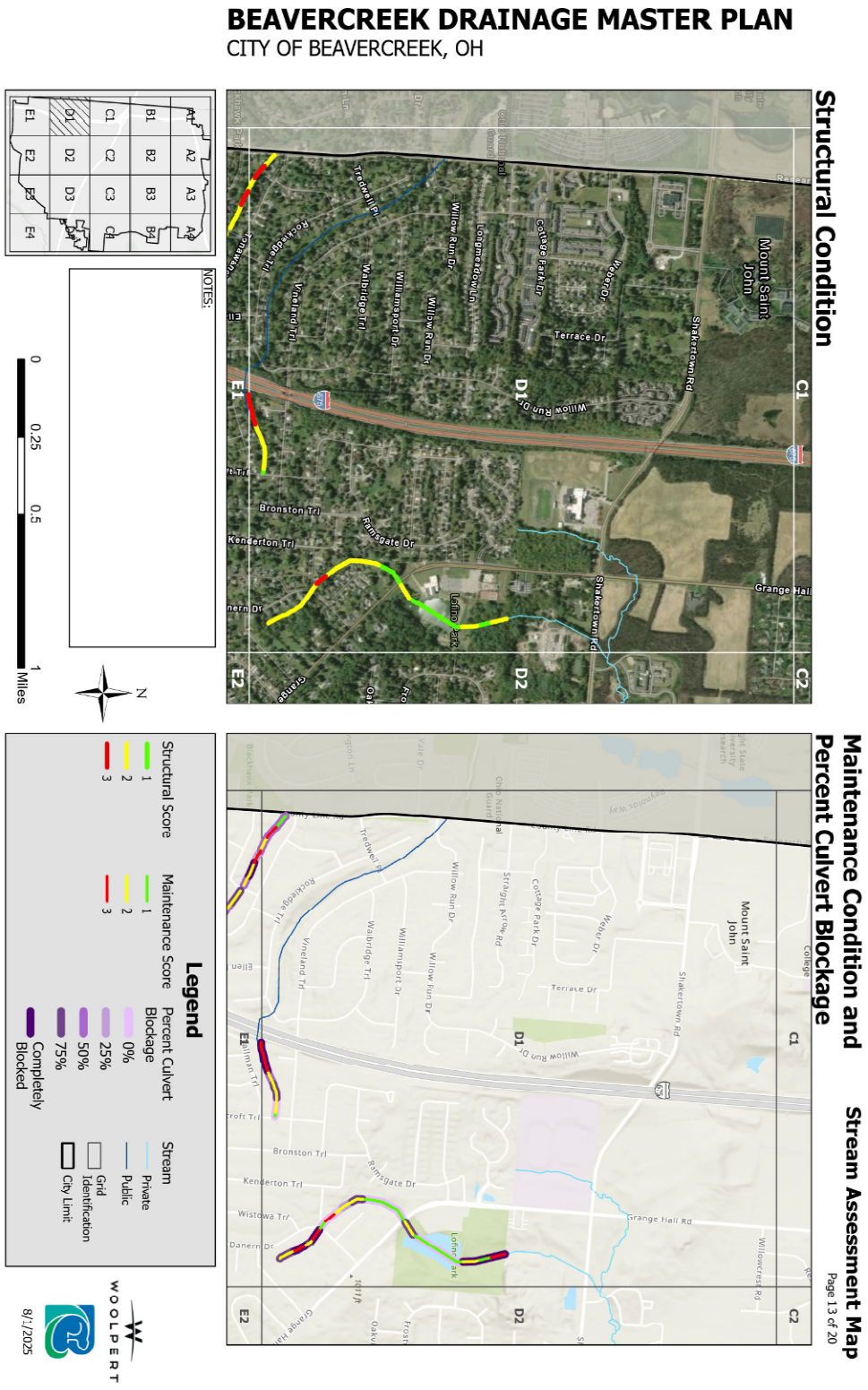

Figure 8. Typical Stream Inspection Grid

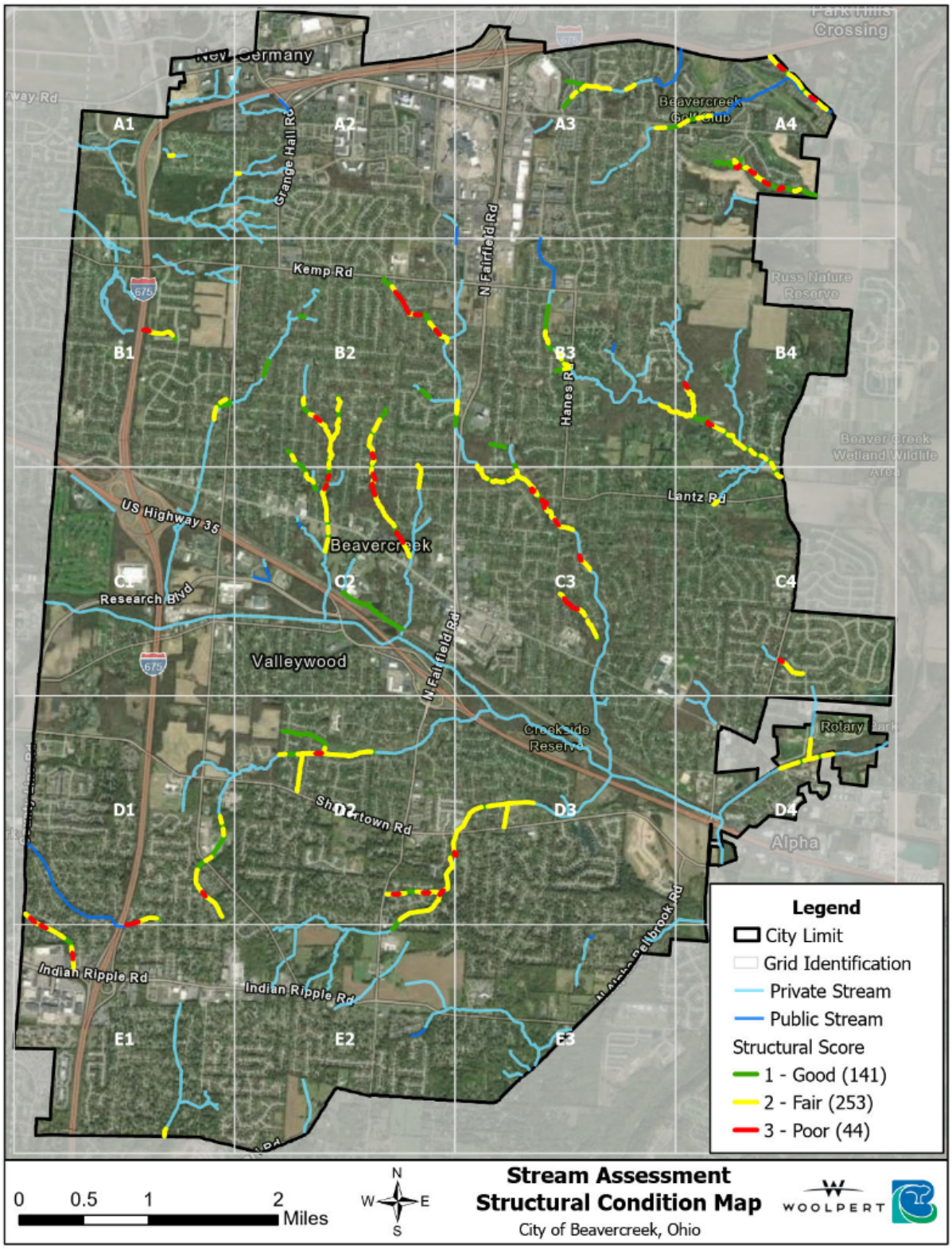

Figure 9. Stream Assessment Structural Condition Map

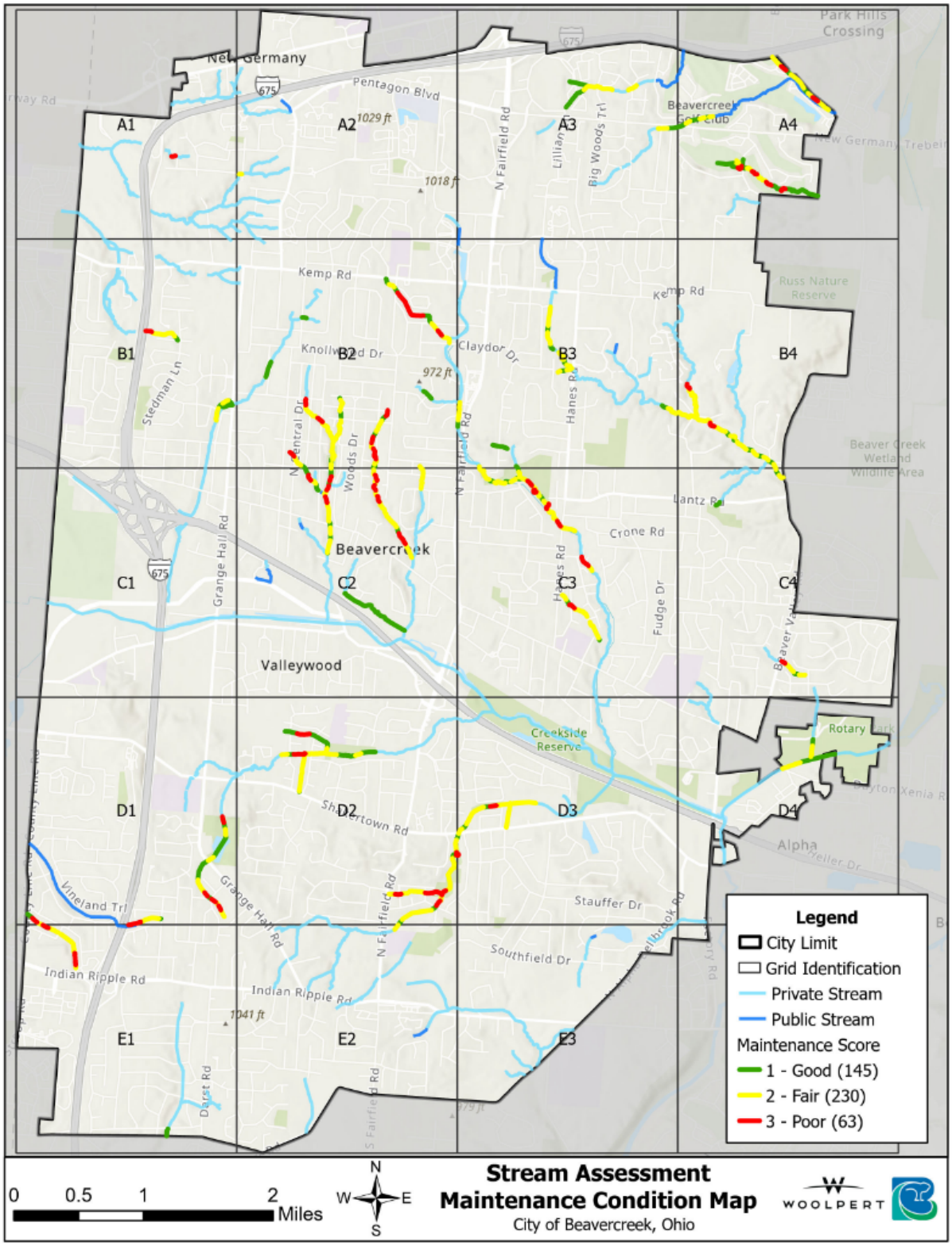

Figure 10. Stream Assessment Maintenance Condition Map

6 Hydrologic and Hydraulic Model Components

This section describes the primary inputs and parameters incorporated into the hydrologic and hydraulic model. The model development utilized rainfall records, digital elevation and topographic data, soil classifications, land use/land cover datasets, and documented flooding locations. These components establish the basis for hydrologic response and hydraulic performance, with further discussion provided in Section 7.

6.1 Rainfall

Rainfall data for the Beavercreek Drainage Study was obtained from the NOAA Atlas-14 Volume 2 Version 3 in Greene County, Ohio. *Table **4*** below shows the precipitation depths in inches for the 2, 10, 25, 50, and 100-year recurrence intervals with durations ranging from 5 minutes to 24 hours that were used for model development.

Table 4. Greene County Rainfall Depth Frequency Estimates (NOAA Atlas 14)

Recurrence Interval	Precipitation Depth (inches)									
	5-min	**10-min**	**15-min**	**30-min**	**60-min**	**2-hr**	**3-hr**	**6-hr**	**12-hr**	**24-hr**
2-Year	0.428	0.668	0.817	1.09	1.34	1.57	1.67	1.98	2.33	2.73
10-Year	0.569	0.878	1.08	1.5	1.91	2.23	2.38	2.82	3.29	3.81
25-Year	0.645	0.987	1.22	1.72	2.23	2.63	2.82	3.34	3.87	4.45
50-Year	0.704	1.07	1.32	1.89	2.49	2.94	3.17	3.76	4.34	4.96
100-Year	0.759	1.14	1.42	2.05	2.74	3.25	3.53	4.19	4.83	5.47

6.2 Topography

The 2024 USGS LiDAR digital elevation model (DEM) within portions of the Little Miami, Upper and Lower Great Miami basins (*Figure **11***) was used to develop the 2D HEC-RAS model of the study area. The LiDAR data was published in August and November 2024 and obtained via the National Oceanic and Atmospheric Administration (NOAA) Digital Coast data access viewer. Elevations within the study area range from 723 to 1104 ft with a mean of 889.5 ft and a standard deviation of 73.8 as referenced from the North American Vertical Datum of 1988 (NAVD 88).

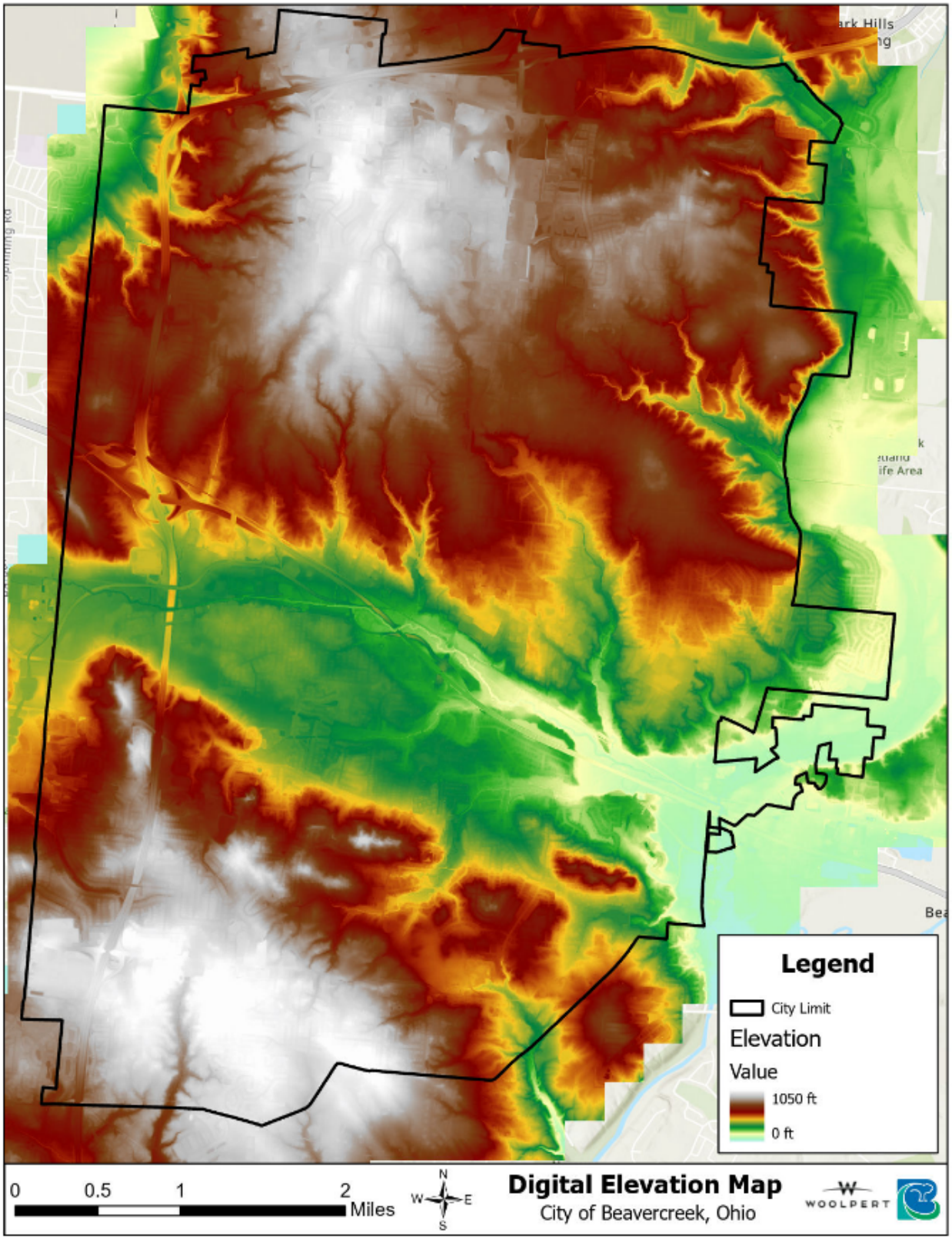

Figure 11. City of Beavercreek - Digital Elevation Map

6.3 Soils and Geology

The soil data used in model development was obtained from the Natural Resources Conversation Service (NRCS) Web Soil Survey. The Beavercreek Drainage Study Area contains mostly clay loam and silt loam type soils. Due to the relatively flat nature of the area characterized by plateaus dissected by river valleys. The soil type from the hydrologic soil groups (HSG) that covers the largest area within the study area is type C. *Table **5*** shows a breakdown of HSGs by area for the Beavercreek Drainage Study Area in *Figure **12***. To maintain a conservative approach in the 2D modeling setup, all NRCS soil entries labeled "Unknown" within the study area, were reclassified as soil type D. The "Unknown" entries account for 31.70 sq mi (17.72%) of the 33.92 sq mi of soil type D.

Table 5. City of Beavercreek Drainage Study Area Soil Summary

HSG	Area (sq mi)	Area (% of total)
A	0.26	0.15%
B	33.11	18.50%
C	77.72	43.44%
D	33.92	18.96%
A/D	0.07	0.04%
B/D	19.45	10.87%
C/D	14.39	8.04%
Total	**178.92**	**100.00%**

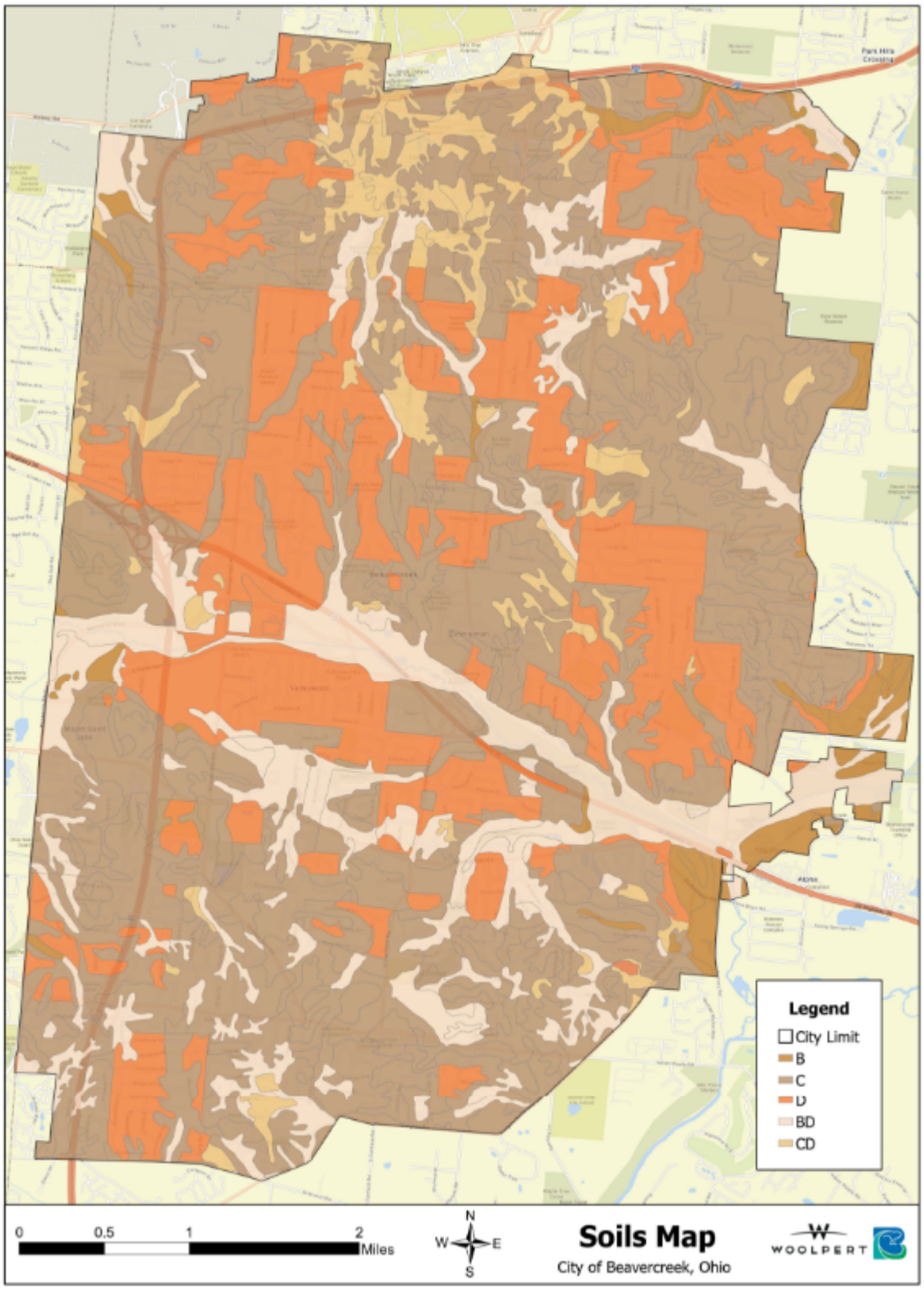

Figure 12. City of Beavercreek - Soils Map

6.4 Land Use

6.4.1 Existing Land Use

Existing land use data for the City of Beavercreek and its environs was obtained from the 2023 US Geological Survey (USGS) National Land Cover Database (NLCD). The majority of the City of Beavercreek drainage study area, especially within the City's limits, is comprised of developed open spaces, low and medium intensity areas. A mix of deciduous forest, pasture-hay, cultivated crop lands and developed open spaces are spread throughout the areas east of Beaver Creek. The western part of the study area towards the City of Dayton is primarily comprised of developed high to low intensity areas due to relatively high urbanization within that vicinity. A summary of the NLCD 2019 land cover data is shown below *Table **6*** and *Figure **13***.

Table 6. City of Beavercreek Drainage Study Existing Land Use (NLCD 2023)

Land Use Classification	Area (sq mi)	Area (% of total)
Open Water	1.47	0.82%
Developed, Open Space	35.12	19.63%
Developed, Low Intensity	44.64	24.95%
Developed, Medium Intensity	30.58	17.09%
Developed, High Intensity	9.35	5.23%
Barren Land Rock-Sand-Clay	1.69	0.95%
Deciduous Forest	18.35	10.26%
Evergreen Forest	0.003	0.002%
Mixed Forest	0.60	0.34%
Shrub-Scrub	0.07	0.04%
Grassland-Herbaceous	0.07	0.04%
Pasture-Hay	16.14	9.02%
Cultivated Crops	19.18	10.72%
Woody Wetlands	0.72	0.40%
Emergent Herbaceous Wetlands	0.94	0.52%
Total	**178.92**	**100.00%**

6.4.2 Future Land Use

The City of Beavercreek is mostly developed and future land use considerations were not incorporated into the modeling efforts of this project.

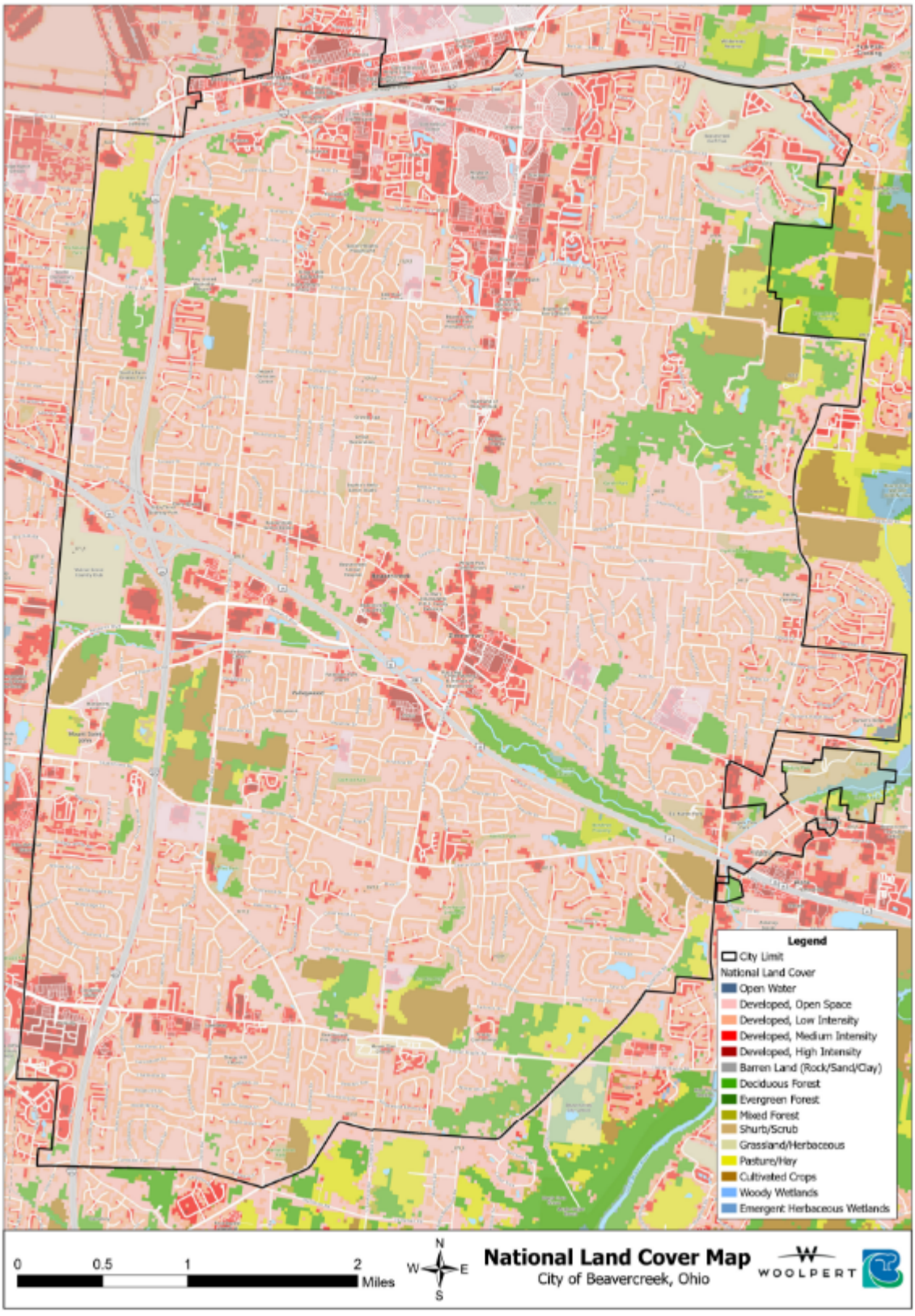

Figure 13. City of Beavercreek - Land Cover Map

6.5 Known Areas of Flooding

FEMA flood zone data was reviewed and considered during model development. As shown in *Figure **14***, the eastern section of the City primarily along Beaver Creek and the middle section primarily along the Little Beaver Creek are largely composed of AE special flood hazard areas (SFHA) in all but the most elevated areas. The area beyond the northern border of the study area is comprised of SFHA A zones along the Mad River.

To identify areas vulnerable to flooding and erosion, the City provided first-hand accounts and maintenance records outlining historically known flood-prone locations based on past events and field observations (*Figure **15***). These known areas were used as a baseline to guide and validate hydraulic modeling efforts. This data was overlaid with results from the HEC-RAS 2D model developed for the study area, which simulated various storm events to generate flood depth and extent across the domain.

The comparison between modeled flood extents and the City's shapefile revealed a strong correlation in many areas, confirming the accuracy of reported flooding hotspots. In some instances, the HEC-RAS results identified additional areas of concern, such as low-lying roadways or overbank areas that were not captured in the City's data, while a few mapped areas did not show inundation under the modeled conditions. These differences may reflect localized drainage issues or events outside the scope of current simulations. Some of these areas were considered to be private property or issues attributed to the storm sewer network, therefore excluded from the assessment and alternatives analysis portions of this project. Overall, combining model results with the City's data allowed for a more comprehensive and reliable identification of flood-prone areas, providing critical input for mitigation planning.

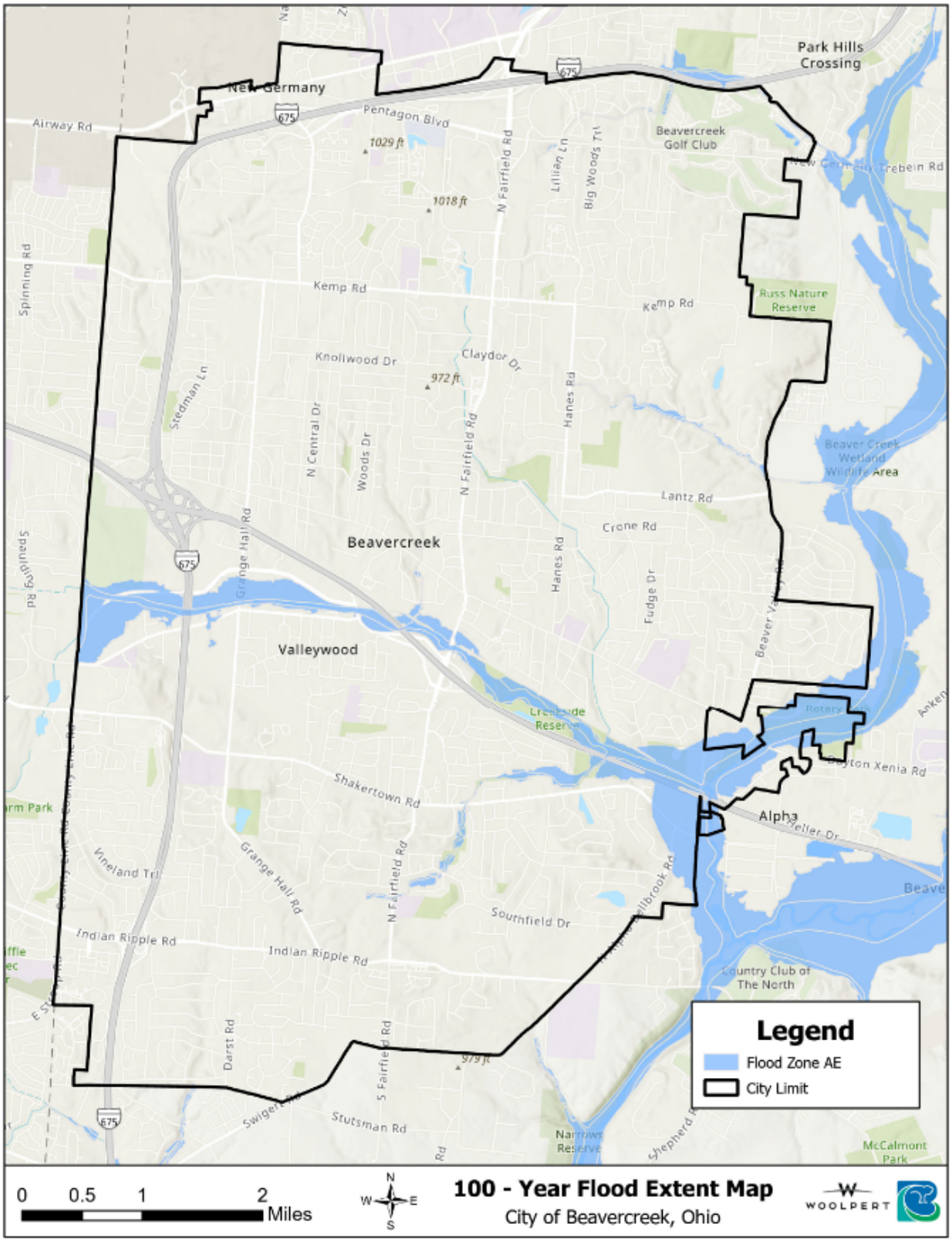

Figure 14. City of Beavercreek - 100-Year Flood Extent Map

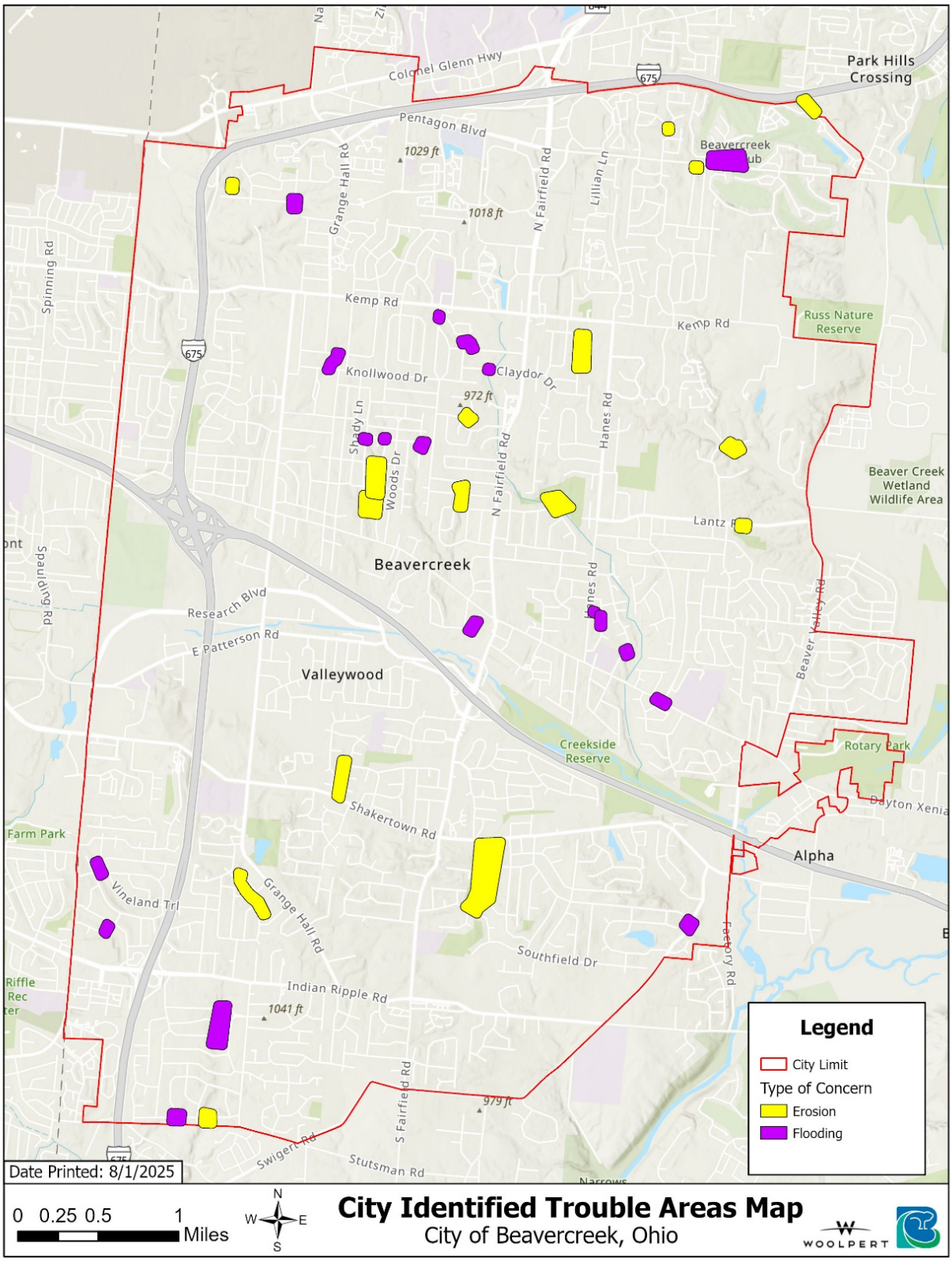

Figure 15. Trouble Areas Identified by City of Beavercreek

7 Hydraulic Model

The hydrologic model for the Beavercreek drainage study area served as the primary tool for decision making, to emulate and evaluate both existing and proposed conditions, and evaluate culvert conveyance capacity under a range of design storm events. For this effort, a rain on grid model was developed using HEC-RAS 2D version 6.7 Beta 3, with the capability to simulate pipe networks. The following sections describe the key portions in the model development.

7.1 Hydrologically Corrected DEM

The 2024 USGS LiDAR DEM described in Section 6.2 was updated to be hydrologically correct so that it could be incorporated into the model. Based on stormwater system inventory collected by our survey field technicians, physical stormwater features specifically culverts, were incorporated into the model with the new Pipe Networks (version Beta 3) tool within RasMapper. A few culvert locations within the flow channels were burnt-in to accommodate any discrepancies between the DEM elevations and culvert invert data that was gathered in the field. Burn-in is a process by which the DEM is altered manually to lower elevation and allow flow at locations where conveyances are present (e.g., bridges, culverts, channels, etc.) that would otherwise not be accounted for in the LiDAR data. Modifications to carve out channels at all bridge locations along the rivers or creeks being analyzed were also done to ensure flow continuity during the modelling process. Additionally, a few of the roadway embankments at the culvert locations were adjusted to smoothen out the rough edges of the DEM to maintain a good level of stability in the 2D model run as well. In total, 322 modifications were made to the DEM with about 39 of these modifications being invert data adjustments which were also incorporated into the model as nodes and conduits using the Pipe Networks (beta) tool.

7.2 2D Flow Area Setup

The 2D flow area is the portion of the model that is used by HEC-RAS's computational algorithms to compute 2D flow within a defined region. The 2D flow area for this study extended beyond the boundaries of the City of Beavercreek limits to account for upstream flow regions draining into the city. The USGS Streamstats tool was used to delineate the general drainage area contributing flow just upstream of the confluence of Beaver Creek and Little Miami River, specifically along Beaver Creek. The final 2D flow area utilized was further modified to capture all areas of the City and the number of vertices was also reduced to avoid stability issues in the model. Components of the 2D flow area are described below.

7.2.1 2D Computational Mesh

HEC-RAS uses a 2D computational mesh to define overland flow within the 2D flow area. The computational mesh is a series of cells with a maximum of eight sides that uses a Finite-Volume solution scheme to move water throughout the bounded area. The mesh was initially constructed by creating 500 feet x 500 feet squares throughout the study area. Break lines were added to further refine the mesh in areas of interest or where more detail was necessary to accurately model the area. These break lines are generally added to locations that act as barriers to flow, such as roadways, and are used to force the mesh to align the computation cell face along the break line and create refined, higher-resolution cells adjacent to the break line. Primary roads, as well as certain secondary roads that were determined to be of value through engineering judgement and drainage infrastructure placement, were included as break lines to refine the computation mesh near these features. Break lines were used to create smaller cells along the lines to refine the model along the break lines and provide more resolution in those areas. Certain streams and channels were also used as break lines to maintain flow within the channel until the water surface

elevation (WSE) overtopped the channel banks. Cells nearest to the road and stream break lines were reduced to approximately 12 feet x 12 feet, with no cell repeats. The next cell was refined to size of 450 feet x 450 feet before transitioning to the 500 feet x 500 feet cells that were created initially. A handful of the stream break lines were adjusted to 8 feet, 10 feet, 15 feet and 18 feet cell sizes in specific areas based on engineering judgements to due to DEM restrictions and flow changes, to ensure high accuracy in the model results. Lastly, Manning's roughness (n) coefficient value of 0.04 for natural streams and major rivers, was applied along the stream break lines to ensure channel characteristics were adequately depicted in the 2D modelling as well. This was done by creating buffers along the stream break lines and importing these buffers into the Calibration Regions, with the appropriate roughness value for the final n value computations.

7.2.2 Pipe Networks (Beta 3)

The Pipe Networks is a relatively new hydraulic tool within HEC-RAS Ras Mapper which enables pipe networks to be imported and modeled directly in the HEC-RAS. This feature allows for the integration of urban stormwater modelling techniques using subsurface pipe networks along with the analysis of 2D surface water approach for a more wholistic analysis relevant to this project. The culverts identified and surveyed for this study were brought in as Nodes and Conduits to complete the respective subsurface hydraulic structures. Point features characterize the Nodes whereas line features characterize the Conduits. The Nodes are largely comprised of upstream and downstream data, which includes pipe invert data mostly for the culverts as well as drop inlet information which is only applicable to the drop inlet structures connecting to some of the outfall pipes identified. The Conduits on the other hand, contain the span and rise of the cross-sectional area of the pipes, the Manning's roughness (n) value of the pipes, the shape of the pipes, pipe lengths and the mesh cell length, which is used in the mesh generation along the length of the pipe structures. Other parameters including the pipe slopes and depths from the terrain are automatically computed with the data imported into HEC-RAS, analyzed and vetted to detect discrepancies in the data set. In order to ensure proper 2D mesh generation within the culvert locations, the pipe lengths in specific locations were extended beyond the limits of the road embankments. This was primarily done in areas that had significant slope changes and rugged DEM edges close to the pipe openings. These adjustments based on proper engineering judgements to guarantee stability in the 2D model runs for the various storm events reviewed for this study.

7.2.3 Existing Land Use

Existing land use coverage was obtained as described in Section 6.4.1. The NLCD 2024 coverage data, along with the NRCS soil survey, were used to define Manning's roughness coefficients, abstraction ratios, and curve numbers throughout the Beavercreek study area extents (*Table **7***). A minimum infiltration rate of 0.01 in/hr was assigned to all land use and soil combinations.

Impervious areas were defined as a separate dataset using the NLCD 2024 Impervious Descriptor (CONUS) raster data which contains the percent impervious areas across the drainage area under review. The two datasets were assigned to the 2D geometric parameters for the simulation runs for all storm events in this drainage study.

Table 7. City of Beavercreek Drainage Manning's Land Use Parameters

ID	Description	Manning's n	Abstraction Ratio	Hydrologic Soil Group						
				A	B	C	D	A/D	B/D	C/D
0	NoData	0.1	0.2	39	61	74	80	60	71	77
11	Open Water	0.035	0.05	100	100	100	100	100	100	100
21	Developed, Open Space	0.04	0.1	39	61	74	80	60	71	77
22	Developed, Low Intensity	0.08	0.1	39	61	74	80	60	71	77
23	Developed, Medium Intensity	0.12	0.05	39	61	74	80	60	71	77
24	Developed, High Intensity	0.15	0.05	39	61	74	80	60	71	77
31	Barren Land Rock-Sand-Clay	0.03	0.2	39	61	74	80	60	71	77
41	Deciduous Forest	0.16	0.2	36	60	73	79	58	70	76
42	Evergreen Forest	0.16	0.2	36	60	73	79	58	70	76
43	Mixed Forest	0.16	0.2	36	60	73	79	58	70	76
52	Shrub-Scrub	0.1	0.2	39	61	74	80	60	71	77
71	Grassland-Herbaceous	0.04	0.2	30	58	71	78	54	68	75
81	Pasture-Hay	0.04	0.2	49	69	79	84	67	77	82
82	Cultivated Crops	0.04	0.2	67	78	85	89	78	84	87
90	Woody Wetlands	0.1	0.2	75	80	85	90	83	85	88
95	Emergent Herbaceous Wetlands	0.07	0.2	80	85	90	95	88	90	93

7.2.4 Future Land Use

As mentioned in Section 6.4.2, future land use was not considered as part of this study.

7.3 Unsteady Flow Data

7.3.1 Boundary Conditions

For this study, normal depth boundary conditions were created around the delineated 2D flow area. These normal depth boundary conditions were computed using separate water surface elevation per face along the boundary condition line. The slope of the channels, which have flows leaving the drainage area, are estimated from the DEM and incorporated into the model as friction slopes for the boundary condition computations. A total of four boundary conditions were specified in the modelling, three of which were placed at the southern extents of the drainage area, capturing flows leaving the drainage area along Beaver Creek, Little Sugar Creek and a tributary of the Little Miami River respectively. The last normal depth boundary condition was placed around the rest of the drainage area to ensure flow easily exits relatively low spots along the drainage area. This was done to avoid water from ponding along the drainage boundary and to improve the accuracy of flow continuity throughout the study area.

7.3.2 Meteorological Data

Rainfall data was obtained as described in Section 6.1. The 24-hour rainfall depths for the 2-, 10-, 25-and 100-year recurrence intervals were used with the NRCS 24-hour synthetic rainfall distributions based on the individual recurrence interval's 1-hour to 24-hour depth ratios. The NOAA-A distribution was used for all 4 storm events as shown in *Table **8***. These rainfall distributions were applied uniformly across the study area to simulate meteorological conditions during the four storms mentioned above.

Table 8. Greene County NRCS Rainfall Distributions

Recurrence Interval	1-hr Depth (in)	24-hr Depth (in)	Depth Ratio	NRCS Distribution used
2-Year	1.34	2.73	0.491	NOAA_A (>0.48)
10-Year	1.91	3.81	0.501	NOAA_A (>0.48)
25-Year	2.23	4.45	0.501	NOAA_A (>0.48)
100-Year	2.74	5.47	0.501	NOAA_A (>0.48)

8 Model Results and Problem Area Identification

8.1 Problem Area Identification

To assess the performance of stormwater infrastructure within the City of Beavercreek, the 25-year design storm was selected as the basis for evaluating the capacity of existing storm pipes and culverts. This design criterion was used to identify conduits that are undersized, surcharged, or inundated during significant rainfall events. The analysis incorporated results from HEC-RAS model simulations, including 2D flow maps and conduit profiles, to determine hydraulic deficiencies across the system.

Culverts identified as inadequate under the 25-year storm condition were prioritized for improvements. Specifically, pipes found to be undersized or were upgraded to larger reinforced concrete pipe (RCP) culverts to enhance flow capacity and reduce the risk of flooding. In addition to hydraulic modeling, field data provided by the city, highlighting locations of observed flooding and erosion were integrated with the 2D model outputs to ensure a comprehensive evaluation of the stormwater network (see Appendix A for details of flooding extent under various stormwater scenarios including 2-, 10-, 25- and 100-yr events). This approach enabled targeted upgrades and informed planning for future drainage improvements.

The level of service for existing culvert structures was evaluated across four distinct rainfall scenarios. This metric serves to assess each culvert's ability to convey stormwater effectively without experiencing surcharge or inundation. By analyzing performance under varying storm intensities, the study identifies which structures maintain adequate hydraulic capacity. The table below summarizes the percentage of total culverts within the study area that successfully convey flow under each rainfall event. *Table **9*** shows the summary of the level of service based on different design rainfall for the 120 culverts that were evaluated. In addition, Appendix B shows the complete list of conduits against every rainfall event and assessing their levels of serviceability.

Table 9. Summary of Pipes Based on Level of Service

	Recurrence Interval			
	2-year	10-year	25-year	100-year
Number of serviceable pipes	110	100	75	45
Percent of serviceable pipes	89%	81%	61%	45%

All culverts within the study area were evaluated for surcharging conditions under four design-storm events. After running the existing hydraulic model, each conduit's water-surface profile was inspected and then every culvert was classified as either surcharged or non-surcharged. This systematic review ensured a consistent basis for comparing performance across progressively severe rainfall scenarios.

The resulting distribution of surcharged pipes shows a clear, monotonic increase with storm intensity. A relatively small share of culverts experienced surcharge during the 2-year event, with that percentage rising through the 5-, 10-, and 25-year storms and reaching its maximum under the 100-year recurrence. This trend highlights specific locations where conveyance capacity is exceeded during extreme rainfall and suggests a prioritized need for upsizing, inlet modifications, or parallel bypasses. A detailed tabulation of the percentage of surcharged culverts at each recurrence interval is in *Table **10***.

Table 10. Summary of Pipes Based on Surcharging Conditions

	Recurrence Interval			
	2-year	10-year	25-year	100-year
Number of surcharged pipes	23	51	67	85
Percentage of surcharged pipes	19%	41%	54%	69%

8.2 Summary of Issues by Grid

The intent of the below sections is to provide a short summary of problems encountered during the field inspection portion of this project. This will include major structural defects, major blockages, utilities exposed due to erosion, and other items that would have caused a condition rating of poor {3}. A complete list of all culverts and stream segments is in Appendix G.

8.2.1 Grid A1

There is 1 culvert (~80 LF) and 1 stream segment (~135 LF) present in this grid. The channel was included as part of the Murwood Court trouble area. Culvert A1_01 is a CMP in good condition proposed to be increased in size to accommodate flooding concerns. The private downstream channel A1_S_01 contained vegetation that should be removed to restore functionality.

8.2.2 Grid A2

There is 1 culvert (~44 LF) and 1 stream segment (~91 LF) present in this grid. Minor maintenance is recommended in this area associated with Vayview Drive trouble area. Culvert A2_02 is a CMP in good condition proposed to be increased in size to accommodate flooding concerns.

8.2.3 Grid A3

There are 6 culverts (~811 LF) and 19 stream segments (~3,417 LF) present in this grid. Five of the six culverts are in good condition, but culvert A3_06 is a CMP in poor condition proposed to be increased in size. This culvert is in the North Emerald Drive trouble area impacting the road, with prior repairs evident and aggregate visibly entering the downstream channel.

Locke Drive trouble area is experiencing erosion on the upstream channel with bank failure impacting private property on the north side of the channel. The majority of the other stream segments require general maintenance for debris removal.

8.2.4 Grid A4

There are 10 culverts (~924 LF) and 44 stream segments (~7,928 LF) present in this grid. Culverts A4_04 and A4_10 are recommended to be replaced by larger box culverts to accommodate flooding concerns. These culverts are in the trouble area near the southwest corner of Beavercreek Golf Club.

Three culverts located along the trouble area of Beaver Valley Road A4_01, A4_02, and A4_03 require sediment and tree removal, specifically near the Old Troon Drive crossing.

The entire channel along Beaver Valley Road has historically experienced erosion issues and been mitigated with armoring under the roadside edge. Additional utilities are still at risk behind the properties of Patrick Boulevard along with the need for sediment removal.

The channel behind Wyndham Drive and Muirfield Drive is experiencing erosion and debris buildup requiring stabilization and debris removal.

8.2.5 Grid B1

There are 2 culverts (~117 LF) and 13 stream segments (~2,396 LF) present in this grid. Culvert B1_03 is an arched CMP that is recommended to be replaced with a larger box culvert to accommodate flooding concerns and material consideration. Culvert B1_02 under Grange Hall Road is recommended for debris removal.

The public stream located behind Isaac Drive is experiencing erosion along the banks with debris buildup and scouring near the inlet structure to the culvert crossing under Interstate 675.

8.2.6 Grid B2

There are 27 culverts (~1,765 LF) and 64 stream segments (~11,301 LF) present in this grid. The City identified trouble areas near Turnbull Road, Homeacres Avenue, Claydor Drive, Winthrop Drive, Forestdale Avenue, Harry Truman Road, C.I. Beaver Park, Sunnyside Drive, and Rich Road. Of the 27 culverts in these trouble areas, 20 culverts are proposed to be replaced for flooding concerns, with an additional four culverts proposed to be replaced based on their CMP material. Ten of these culverts were in poor maintenance condition and require cleaning.

Culvert B2_04 at Turnbull Road is CMP and is being proposed to be replaced at the same size as it was found to be hydraulically sufficient. Sediment buildup in the pipe could have been contributing to the flooding issues in the past.

Stream segments north of the properties on Homeacres Avenue and Brookridge Drive are experiencing erosion while actively threatening private property fence and utility poles. Fence post bases are exposed along the top of bank and debris has built up, requiring both bank stabilization and debris removal. This stream is attributed as private and should be mitigated with property owners.




The stream segments between Homeacres Avenue and Claydor Drive are also experiencing erosion. It is evident that property owners have begun to use their own materials to mitigate the erosion.


There is a dual barrel CMP culvert system at Claydor Drive that is being proposed to increase in size to accommodate flooding concerns.

Culvert B2_15 at Rich Road is being proposed to increase in size to accommodate flooding concerns. Some minor maintenance is needed at the pipe ends to clear up the channel.

Culverts B2_07 at Winthrop Drive and B2_10 at Knollwood Drive are both proposed to increase in size to accommodate flooding concerns along this channel. Culvert B2_10 is an elliptical RCP found to be structurally deficient, this is a potential cause for the historical flooding in the area.


Culvert B2_18 at Forestdale Avenue and the upstream stream segment to the west were both found to need maintenance. The culvert is proposed to be increased in size and the stream bank stabilized after debris removal. There are fences along the bank that have been smashed with fallen trees and other trees blocking the channel. This stream is attributed as private and should be mitigated with property owners.


Culvert B2_21 at Harry Truman Road is in fair condition, but it is being proposed to be increased in size to accommodate flooding concerns. The downstream private stream segments have some sediment across the entire channel cross section.


Culvert B2_23 at Harry Truman Road and Stansberry Road is comprised of two materials and is being proposed to increase in size to accommodate flooding concerns. The downstream private stream segments have trees growing in the channel impeding flow.


C.I. Beaver Park has minor erosion present throughout the entire public stream with fallen trees. The area should be cleaned of debris and observed for stabilization needs.




The trouble area around North Drive, Sunnyside Drive, and Rugby Drive, considered a storm sewer network connectivity problem, was not included as part of this analysis. Additional survey and engineering are required to develop flooding solutions.

8.2.7 Grid B3

There are 7 culverts (~698 LF) and 24 stream segments (~4,565 LF) present in this grid. Crystal Marie Drive was identified as a problem area for both erosion and flooding with an undersized culvert. Culvert B3_01 at Felton Drive crossing is proposed to be increased in size to accommodate flooding concerns, the channel was very active at the time of inspection.

The two channelized areas between King James Drive and Hanes Road have some erosion and maintenance needs due to debris buildup.

8.2.8 Grid B4

There are 11 culverts (~320 LF) and 27 stream segments (~5,299 LF) present in this grid area. Privately attributed Cinnamon Run was the main channel inspected in this grid, identified as a trouble area with several triple- and quad-barrel crossings. Triple barrel B4_02, B4_03, and B4_04 are all CMP and proposed to be replaced due to material. Triple barrel B4_09, B4_10, and B4_11 are all RCP, but are proposed to be replaced with larger elliptical pipes to meet flooding concerns.


North of Cinnamon Run behind Sumac Court there is a large tree that is laying over fencing at an outfall.


As Cinnamon Run continues through the area to Beaver Valley Road there are signs of erosion of the banks that need to be further stabilized. Large rocks from previous stabilization efforts were also observed.


8.2.9 Grid C1

Woolpert did not inspect any culverts or stream segments in this grid area.

8.2.10 Grid C2

There are 14 culverts (~980 LF) and 56 stream segments (~10,027 LF) present in this grid area. Three trouble areas were investigated including Enochs Drive, Beaverbrook Drive, and Mill Run Drive. Culvert C2_14 crossing Enochs Drive had some debris at the inlet opening, but was found to be operating at adequate capacity.

Mill Run Drive culvert C2_09 was found to be in good condition and operating at adequate capacity. The channel upstream of the culvert crossing is experience some erosion that is encroaching on private property. The channel downstream of the culvert crossing has debris buildup and could be cleaned.

The Beaverbrook Drive channel was dry in some areas with pooling in other areas due to debris buildup, and has evidence of erosion to the banks. Several electrical poles line the banks through this area.

Several culverts on the private stream west of Forestdale Avenue were structurally deficient and completely blocked with debris. Replacement and maintenance of these culverts should be coordinated with property owners.


8.2.11 Grid C3

There are 6 culverts (~691 LF) and 40 stream segments (~7,502 LF) present in this grid. Multiple trouble areas were reported near Hillside Side for erosion, Hanes Road for erosion, Hickory Drive for flooding, and Ferguson Drive for flooding with erosion. Little Beaver Creek runs behind Suburban Drive and Hillside Drive that is experiencing erosion to the banks, debris buildup, and threats to several utilities.



The Hickory Drive area has a culvert that is proposed to be increased in size and the outfall area stabilized. This stream is attributed private and needs to be coordinated accordingly with property owners.


The Hanes Road area has a CMP culvert proposed to be replaced due to material and the downstream channel is experiencing some erosion to the banks. In total there are five culverts in this grid that are recommended to be upsized and/or replaced. The Fudge Drive and Dayton Xenia Road area was also reported as a trouble area for undersized storm sewers, but the storm sewer network was not considered part of this analysis and will need further survey and engineering to develop flooding solutions.

Another area of Little Beaver Creek behind private property is eroding away structures near the intersection of Eileen Drive and Forest Glen Court. Stabilization of these structures and banks should be mitigated with the property owners.


8.2.12 Grid C4

There are 2 culverts (~153 LF) and 8 stream segments (~1,503 LF) present in this grid. The trouble area of Lantz Road near Vigallito Park has a culvert that is in good condition. The headwall outlet for culvert C4_02 under Beaver Valley Road is failing and it is recommended for it to be fully inspected to determine if the pipe joints are also failing or just the headwall. Stream segment C4_S_08 is associated with this area and is identified for bank stabilization and debris removal.


8.2.13 Grid D1

There are 9 culverts (~896 LF) and 32 stream segments (~5,443 LF) present in this grid. The City recently completed a stabilization project in the Vineland Trail area upstream/south of the culverts that cross Tredwell Place. The two culverts D1_02 and D1_03 at Tredwell Place were found to be lacking hydraulic capacity and in need of maintenance, with one of them almost completely blocked with debris. These two culverts are proposed to be replaced with larger box culverts to accommodate flooding concerns.

The channel behind Tallman Trail is experiencing erosion and has several existing threats that need to be mitigated with bank stabilization. Private property fencing lines the top of bank for most of the public channel with several portions of the fence in danger of falling.

The trouble area behind Wenlan Court off Danern Drive is experiencing erosion of the public channel, exposing an unknown small diameter cable behind several properties. It should be considered for bank stabilization and coordination with utilities to bury the exposed cables.

8.2.14 Grid D2

There are 9 culverts (~598 LF) and 63 stream segments (~11,863 LF) present in this grid. None of the culverts require replacement, four of them require maintenance. Culvert D2_03 is a very large arch that is almost completely blocked with sediment.

There are five stream segments that require bank stabilization and eleven stream segments that require debris removal. Two trouble areas focused on erosion are in this grid, the channel behind Bridlewood Street and the channel behind Carthage Drive. Erosion present in the Bridlewood Street area was mostly rated fair with no major existing threats. Erosion present in the Carthage Drive area was evident with major existing threats to exposed manhole structures and bank failure in some locations, there was also sediment throughout the cross section and fallen trees.


The culvert outfall and public channel downstream east of Leigh Drive need stabilization to protect the pipe and neighboring private property fences.


8.2.15 Grid D3

There are 3 culverts (~179 LF) and 21 stream segments (~3,824 LF) present in this grid. Two culverts are proposed for replacement and debris removal for stream segments. The trouble area around an outfall of North Alpha Bellbrook Road was inspected and crews found the outlet of the 24” CMP to be completely blocked. This pipe conveys flow from a storm pipe network and was modeled to require a 36” pipe.

The stream through Merrick Park has large trees blocking flow and potentially impacting area storm sewers that discharge into the stream.

Stream segment D3_S_18 has erosion of a public stream affecting a private property fence line that should be mitigated with the property owner.

8.2.16 Grid D4

There are 2 culverts (~105 LF) and 12 stream segments (~2,275 LF) present in this grid. Culvert D4_01 is CMP and proposed to be replaced with a larger 38”x60” elliptical pipe.

It should be noted that the City has identified the possible need for storm sewers to be installed in the Meadow Drive area, but this was not included as part of this study. Further survey and engineering are required to evaluate this area.

A large tree is blocking stream segment D4_S_06 along Beaver Creek east of Dayton Xenia Road that should be removed to maintain the channel.

8.2.17 Grid E1

There are 10 culverts (~884 LF) and 12 stream segments (~2,088 LF) present in this grid. Six of the culverts are proposed to be replaced due to material or hydraulic capacity considerations. Two stream segments require bank stabilization and three stream segments require debris removal.

Stream segment E1_S_01 has several utility threats that need to be mitigated through stabilization and coordinated with the governing utility department.

Stream segments E1_S_07 and E1_S_08 have several utility threats that need to be mitigated through stabilization and coordinated with the governing utility department.

Culverts were checked at the trouble area of Rushmore Place and a significant amount of debris is blocking the inlets that requires cleaning.

Culverts were checked at the trouble area between Chalfonte Drive, Carondelet Drive, and Chalmette Drive. Culvert E1_06 at Chalmette Drive has already been replaced with SLHDPE and does not have any recommendations. E1_10 at Chalfonte Drive is CMP and E1_05 at Carondelet Drive is CMP, both of which are proposed to be replaced.

Culverts were checked at trouble area Sunbeam Avenue and the channel south of Sunbeam Avenue. Three culverts on Sunbeam Avenue are CMP and identified for replacement, E1_07 is proposed to be replaced with a slightly bigger 42" pipe, E1_08 and E1_09 are to be replaced with 43"x68" elliptical pipes, while the channel was experiencing some erosion and minor sediment.

8.2.18 Grid E2

Woolpert did not inspect any culverts in this grid area. There is 1 stream segment (~200 LF) present in this grid off of Arlington Place with tree debris.

8.2.19 Grid E3

Woolpert did not inspect any culverts or stream segments in this grid area.

8.2.20 Grid E4

Woolpert did not inspect any culverts or stream segments in this grid area.

9 Alternatives Analysis

Based on the 2D model simulation results, reinforced concrete culvert sizes and shapes were selected to resolve identified level of service and surcharge deficiencies. In this study, a service level was targeted that ensures all roadway culverts can safely pass the 25-year storm event, and all ditches can convey the 5-year storm. The resulting analysis will guide citywide maintenance schedules for pipes and channels and help mitigate emergency road closures caused by structural pipe failures. In accordance with Ohio Department of Transportation (ODOT) hydraulic specifications, any culvert section requiring less than 24 square feet of cross-sectional area was specified as a circular or elliptical pipe, while all sections exceeding 24 square feet were furnished as reinforced concrete box culverts. Furthermore, to meet the study's objectives and improve long-term performance, every existing corrugated metal pipe over 24 inches in diameter citywide was upgraded to an equivalent reinforced concrete section. There were 47 culverts with proposed pipe size increases to pass the 25-year storm event and another 14 that were proposed to be replaced at the similar size due to material or structure condition.

Several culvert locations within the study area exhibit less than 2 ft of soil cover when evaluating the cross-sectional parameters under the design storm criteria. This insufficient fill depth raises concerns about structural protection, hydraulic performance and long-term durability. Without adequate coverage, culvert barrels become more susceptible to surcharge, deformation, and potential scour at inlet and outlet zones. The primary objective focused on assessing the level of service and surcharge conditions for existing culvert structures across the city. To maintain consistency with the project goals, no extensive re-grading of adjacent channels or ditches was performed near these critically shallow culverts in the model. As a result, the current 2D hydraulic model reflects field conditions without major earthwork modifications. To sustainably resolve the low-cover challenges and improve model fidelity, the following measures are recommended:

- Adjust ditch alignment and invert elevations to enhance fill depth above the culverts where applicable.
- Raise roadway profiles or add pavement sections at culvert crossings to achieve the required cover.
- Install equivalent multiple-barrel culvert systems to distribute flows and increase soil embankment stability.

10 Project Costs

Inventory and condition data collected as part of this project was used to identify culverts for replacement and/or maintenance actions, stream segments have been identified for bank stabilization or debris and sediment removal. Cost data was obtained from several sources including recent projects performed by Woolpert and the Ohio Department of Transportation. Those costs were then applied to all the identified culvert and stream segments. The full cost analysis is contained in Appendix H. Additional survey and engineering will be required to fully determine the limits and types of improvements to be made.

The 1983 study that was performed for the City of Beavercreek was a citywide approach to regionalization and drainage improvements. That study identified $10 million is existing improvements and $20 million in future construction to mitigate the impacts of future land development. The City advocated and required detention facilities with the construction of new developments. Construction of new storage basins was a major portion ($11,120,000) of that study's recommended stormwater needs. At the time of that study, the City was only 45% developed and almost exclusively residential, fast-forward to today where the City is almost fully developed and has installed required detention facilities and storm systems. Installation of detention facilities has also limited the need to increase the size of culverts and channel improvements over the years. A portion of the recommendations from the report have been successfully implemented, reflecting the City's commitment to appropriate stormwater management.

The Public Service Department is developing a routine maintenance schedule to address the replacement of smaller diameter CMP culverts, neighborhood ditch maintenance, catch basin repairs, and other routine storm water system maintenance activities that can be addressed through the existing operations budget. The system improvements listed in this report are typically larger in scope and would require a contractor to complete due to equipment limitations at the Public Service Department.

10.1 Culvert Replacement Summary

Approximately 61 culverts were identified for replacement for either 1) not meeting the desired hydraulic level of service or 2) being constructed with CMP material or 3) structural condition assessment rating of poor {3}.

Table 11. Culvert Replacement Summary of Costs

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Construction Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
61	$23,909	$4,554	$113,853	$28,463	$170,780	Minimum $76,629 Maximum $674,664	$10,417,558

NOTE: This list includes one ODOT owned pipe segment (E1_01) of 357' of 78" pipe with an estimated cost to replace of $633,651.

10.2 Culvert Maintenance Summary

Approximately 31 culverts were identified for inspection and cleaning. These are culverts that received a rating of poor {3} on the maintenance condition assessment index.

Table 12. Culvert Maintenance Summary of Costs

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Maintenance Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Culverts							
31	$257	$128	$3,209	$802	$4,397	Minimum $1,226 Maximum $11,950	$136,296
Culverts not being Identified for Replacement or Upsizing							
16	$293	$146	$3,663	$915	$5,017	Minimum $1,226 Maximum $11,950	$80,269

10.3 Streambank Stabilization Summary

Approximately 44 stream segments were identified for bank stabilization projects. Each segment evaluated was approximately 200' in length and all costs are per segment. Ultimately, multiple segments may be combined to form a single project. The segments targeted for bank work are those that received a structural condition assessment rating of poor {3}.

Table 13. Stream Stabilization Summary of Costs

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Construction Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Segments							
44	$12,348	$2,352	$58,802	$14,701	$88,203	Minimum $71,267 Maximum $90,026	$3,880,945
Public Segments, Only							
25	$12,251	$2,334	$58,340	$14,585	$87,510	Minimum $71,267 Maximum $90,026	$2,187,745

10.4 Streambank Debris & Sediment Removal Summary

Approximately 63 stream segments were identified for debris and sediment removal. Each segment evaluated was approximately 200' in length and all costs are per segment. Ultimately, multiple segments may be combined to form a single project. The segments targeted for debris and/or sediment removal work are those that received a maintenance condition assessment rating of poor {3}.

Table 14. Stream Maintenance Summary of Costs

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Maintenance Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Segments							
63	$486	$243	$6,079	$1,520	$8,328	Minimum $4,358 Maximum $9,495	$524,661
Public Segments, Only							
37	$477	$239	$5,966	$1,492	$8,174	Minimum $4,358 Maximum $9,495	$302,425

11 Project Prioritization

For the City to move forward with recommended improvements to the storm features included as part of this study, there must be a prioritization system assigned to the results. The following sections outline the prioritization ratings calculated throughout the study area.

A key consideration in the cost estimation and prioritization of this study is the ownership status of stream segments, as identified through the City's GIS database. The City maintains a database of stormwater network assets that attributes the corresponding maintenance responsibility and ownership for public versus private. However, gaps in available records limit the City's ability to definitively establish ownership and maintenance obligations for all stream segments, complicating decisions related to capital improvements and ongoing maintenance. As shown in the City identified trouble area map, several stream segments that are attributed as private were added to this analysis because of repeated reports of erosion or flooding occurrences. In situations where privately owned stream segments that are located between public stream segments or directly impact surrounding public property, the City may need to pursue easement acquisition to establish legal authority, secure necessary permits, and ensure appropriate use of public funds. It is important for the City to evaluate these risks before starting work on privately owned and/or maintained stream segments.

11.1 Culvert Improvement Project Prioritization

There are 61 culverts identified for replacement due to material, structural deficiency, or hydraulic capacity and 16 additional culverts that require immediate maintenance needs. To formulate a plan for how the City should best prioritize work on these culverts, there were six prioritization factors applied to all 120 culverts included in this study. These factors include structural condition, maintenance condition, trouble area identification, material, hydraulic capacity, and existing pipe size. Each of these factors are described below, with a rating of 1 representing low priority and rating of 3 representing high priority.

- Structural condition – rating of 1, 2, or 3 as defined in the culvert assessment scoring matrix
- Maintenance condition – rating of 1, 2, or 3 as defined in the culvert assessment scoring matrix
- Trouble area identification – if a culvert is located in a City identified trouble area, then it is assigned a rating of 2, if it is not located in one of these areas then it is assigned a rating of 1; the reason this rating is not on a 1-2-3 scale is because the location of the pipe is not as critical as the condition or capacity
- Material – at the direction of the City for replacing all corrugated metal pipes (CMP), if a culvert is primarily comprised of CMP material, then it is assigned a rating of 3, if it is not CMP then it is assigned a rating of 1
- Hydraulic capacity – through the modeling efforts of this project, if the culvert did not meet the 25-year storm rain event criteria, then it is assigned a rating of 3, if it is modeled at sufficient capacity then it is assigned a rating of 1
- Existing pipe size – based on the largest cross sectional measurement in the field, if that measurement is greater than 8' then it is assigned a rating of 2, if it is between 4' and 8' then it is assigned a rating of 1.5, if it is less than 4' then it is assigned a rating of 1; the reason this rating is not on a 1-2-3 scale is because the factor of having a larger pipe doesn't necessarily mean that is as critical as the condition or capacity

A summary of these prioritization factors is presented in the below *Table **15***.

Table 15. Culvert Prioritization Factors Summary

	1	1.5	2	3	Total
Structural	48	*N/A*	59	13	120
Maintenance	43	*N/A*	46	31	120
Trouble Area (Yes/No)	74	*N/A*	46	*N/A*	120
Material (CMP)	87	*N/A*	*N/A*	33	120
Model Upsize	73	*N/A*	*N/A*	47	120
Size (<4', 4'-8', >8')	45	56	19	*N/A*	120

The six prioritization factors were then averaged together to calculate a priority rating between 1 and 3. A summary of these averages is presented in the below *Table **16***. Priority ratings for each culvert are listed in the Appendix G summary tables.

Table 16. Culvert Priority Summary

Value	Count	Value	Count
1.00	2	1.83	5
1.08	7	1.92	5
1.17	7	2.00	6
1.25	5	2.08	6
1.33	12	2.17	4
1.42	8	2.25	4
1.50	17	2.33	1
1.58	9	2.42	1
1.67	10	2.58	2
1.75	9	-	-
Total			120

11.2 Stream Improvement Project Prioritization

There are 438 stream segments that comprise the 15.12 miles of stream assessed as part of this project. A total of 44 stream segments were identified for stabilization work and 63 stream segments were identified for immediate maintenance needs. To formulate a plan for how the City should best prioritize work in these stream segments, there were five prioritization factors applied to all 438 stream segments. These factors include structural condition, maintenance condition, trouble area identification, ownership, and existing threats. Each of these factors are described below, with a rating of 1 representing low priority and rating of 3 representing high priority.

- Structural condition – rating of 1, 2, or 3 as defined in the stream assessment scoring matrix
- Maintenance condition – rating of 1, 2, or 3 as defined in the stream assessment scoring matrix
- Trouble area identification – if a stream segment is located in a City identified trouble area, then it is assigned a rating of 2, if it is not located in one of these areas then it is assigned a rating of 1; the reason this rating is not on a 1-2-3 scale is because the location of the stream segment is not as critical as the condition or existing threats
- Ownership – based on the City's GIS attributes, if a stream segment was identified as being owned by the City then it is assigned a rating of 2, it was identified as being privately owned then it is

assigned a rating of 1; the reason this rating is not on a 1-2-3 scale is because the ownership is not as critical as the condition or existing threats

- Existing threat – during the stream inspection portion of this project, existing threats were identified by the field crews that included fences, headwalls, houses, pipes, roads and utilities; if a threat is located within 25' of a stream segment then it is assigned a rating of 3, if there are no threats then it is assigned a rating of 1

A summary of these prioritization factors is presented in the below *Table **17***.

Table 17. Stream Prioritization Factors Summary

	1	2	3	Total
Structural	141	253	44	438
Maintenance	145	230	63	438
Trouble Area (Yes/No)	321	117	*N/A*	438
Ownership (Private/Public)	130	308	*N/A*	438
Existing Threat (Within 25')	384	*N/A*	54	438

The 5 prioritization factors were then averaged together to calculate a priority rating between 1 and 3. A summary of these averages is presented in the below *Table **18***. Priority ratings for each stream segment are listed in the Appendix G summary tables.

Table 18. Stream Priority Summary

Value	Count	Length (ft)	Length (mi)
1	18	3,022	0.57
1.2	89	16,396	3.11
1.4	97	17,152	3.25
1.6	114	21,199	4.01
1.8	56	9,940	1.88
2	25	4,793	0.91
2.2	19	3,480	0.66
2.4	18	3,475	0.66
2.6	2	400	0.08
Total	438	79,857	15.12

12 References

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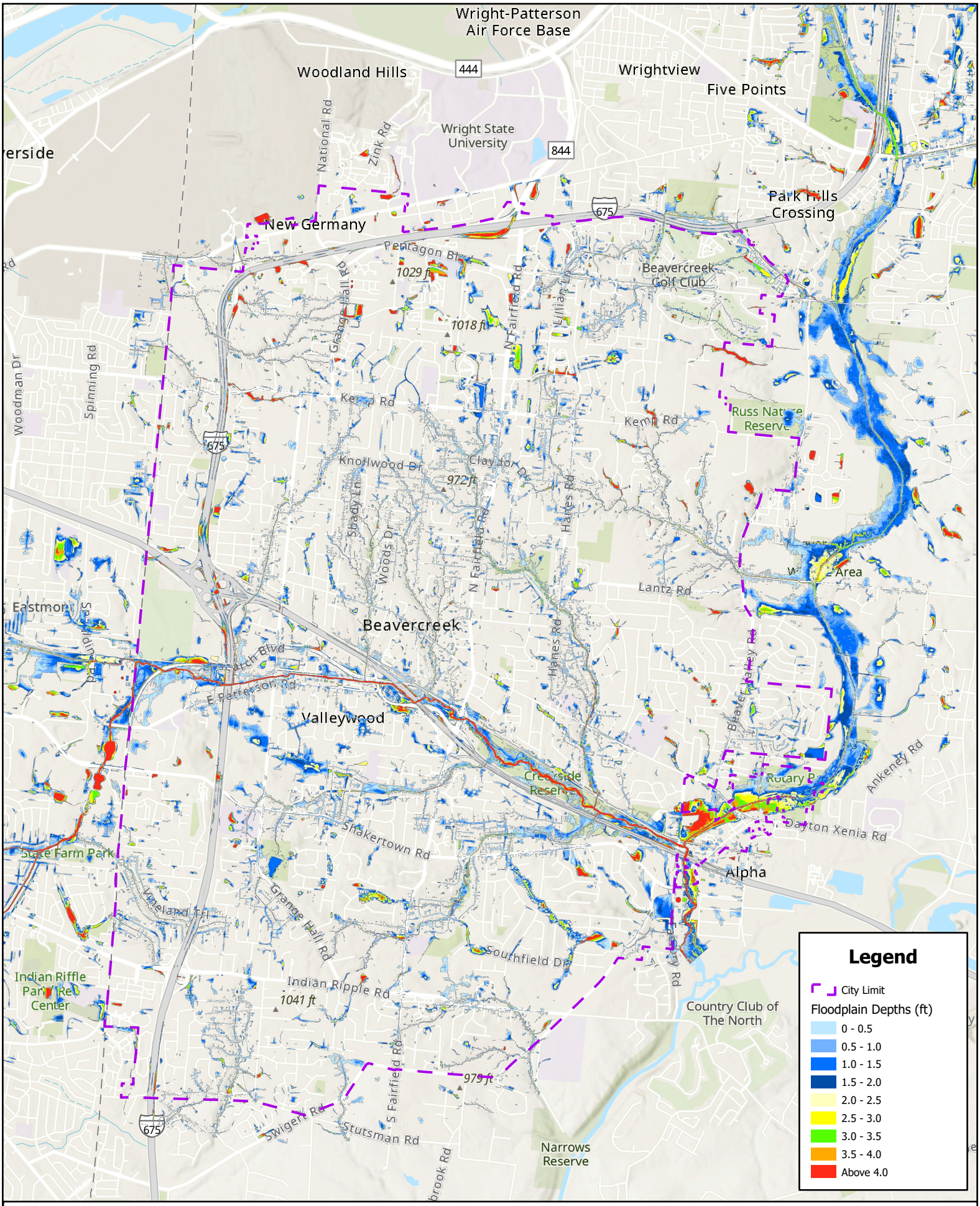
Appendix A

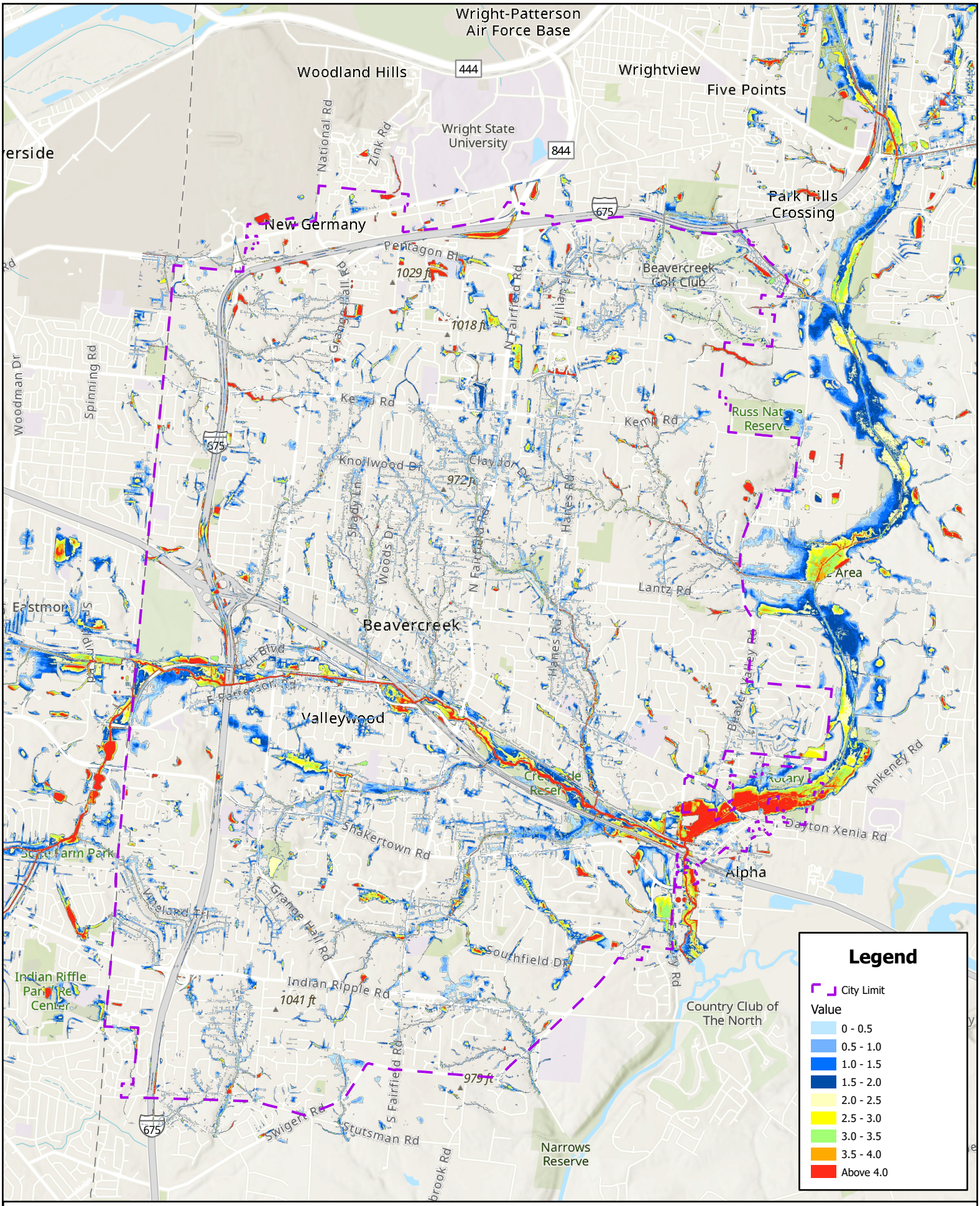
2-, 10-, 25- and 100-Year Inundation Maps



2-Year Max Flood Depths Map

City of Beavercreek, Ohio

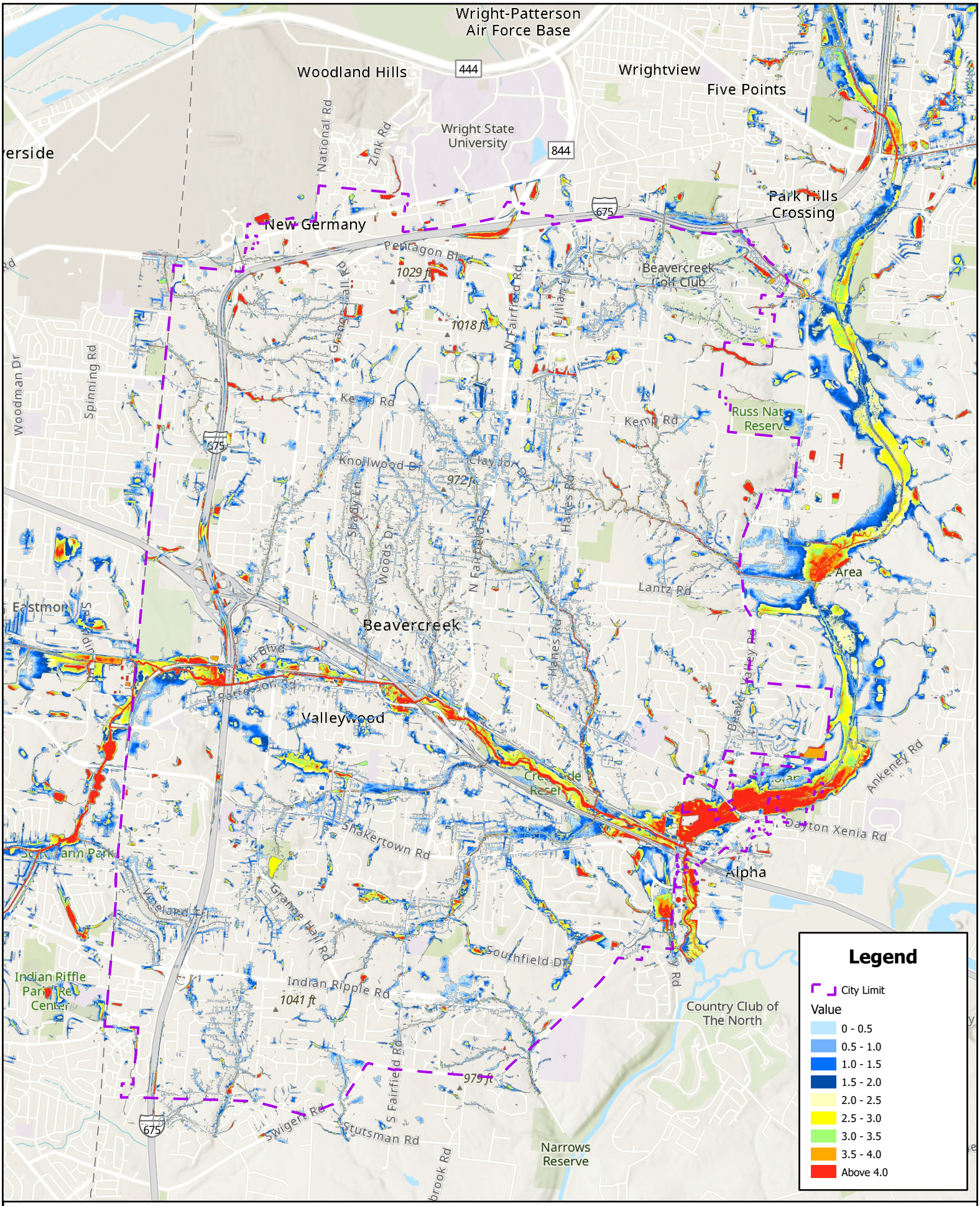
WOOLPERT



10-Year Max Flood Depths Map

City of Beavercreek, Ohio

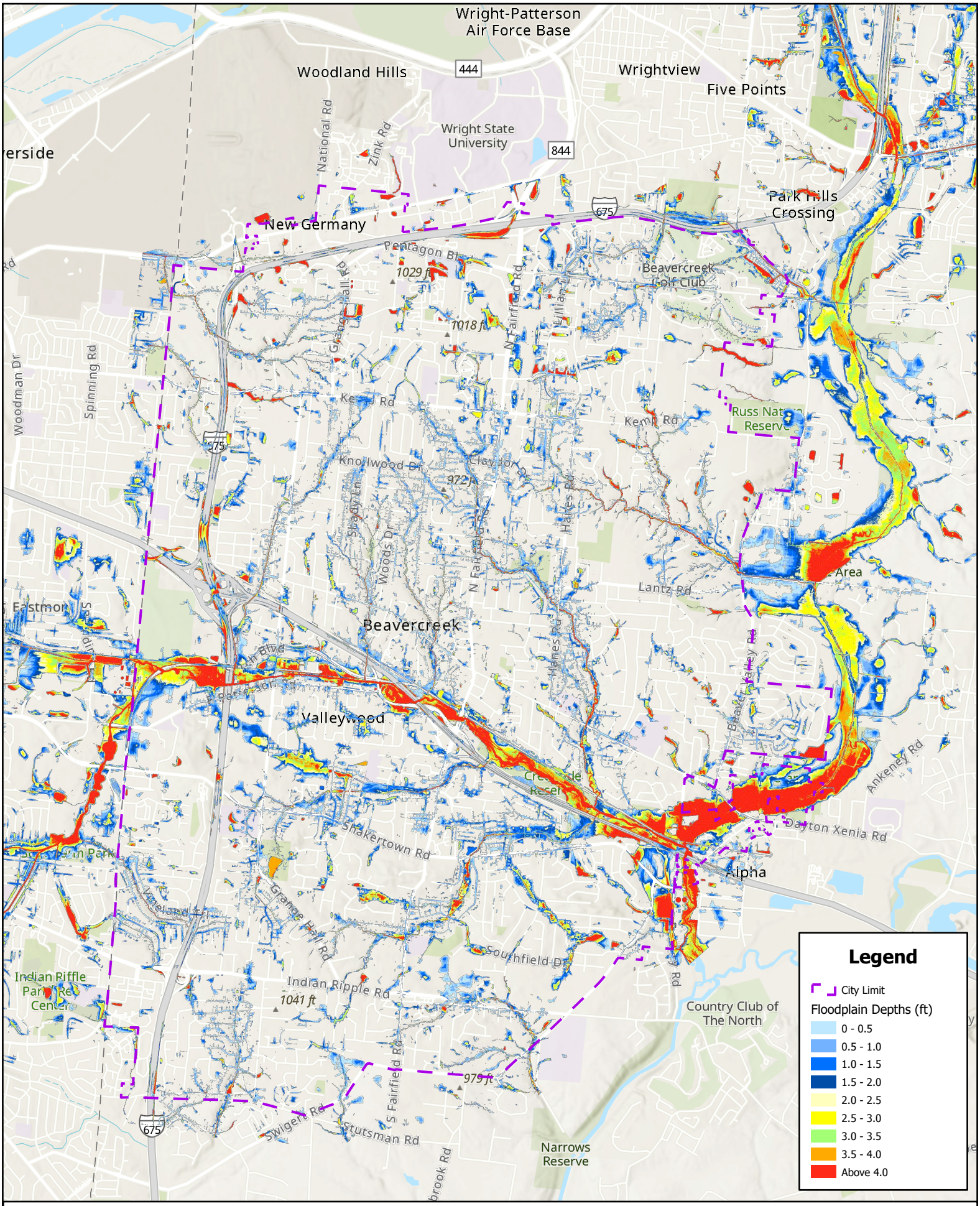
WOOLPERT



25-Year Max Flood Depths Map

City of Beavercreek, Ohio

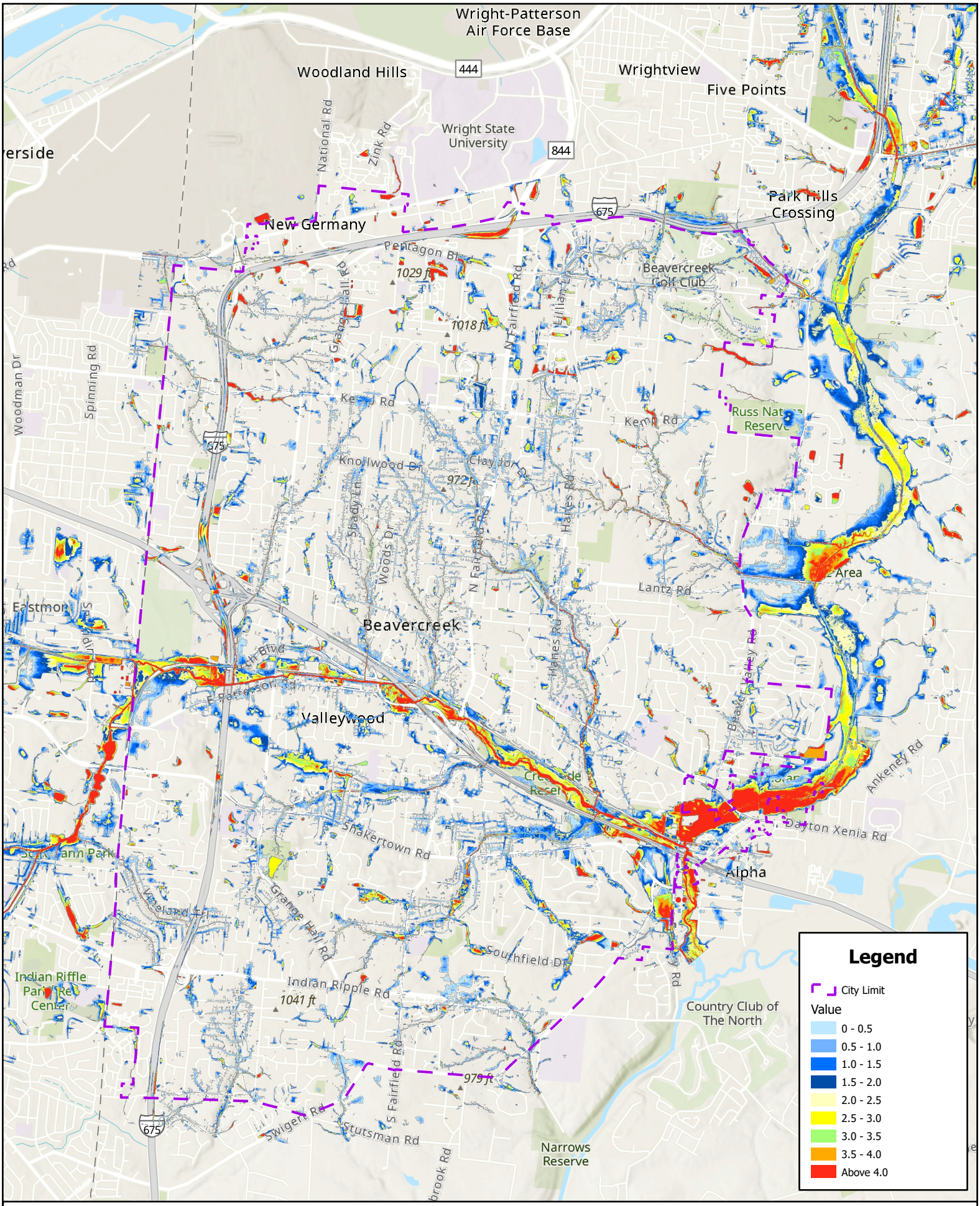
WOOLPERT



100-Year Max Flood Depths Map

City of Beavercreek, Ohio

WOOLPERT



Proposed 25-Year Max Flood Depths Map

City of Beavercreek, Ohio

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Appendix B

Summary Table of Conduits Inundated in Each Modeled Scenario

Conduit Name	2-yr Serviceability	2-yr Surcharged Condition	10-yr Serviceability	10-yr Surcharged Condition	25-yr Serviceability	25-yr Surcharged Condition	100-yr Serviceability	100-yr Surcharged Condition	Upgrade or Replace
D3_03	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
C4_02	Yes		Yes		Yes		Yes		
C4_03	Yes		Yes		Yes		Yes		
C4_04	Yes		Yes		Yes		Yes		
E1_04	Yes		Yes	Yes	Yes	Yes	No	Yes	Yes
D3_02	Yes		Yes		Yes		Yes		
D1_05	Yes		Yes		Yes	Yes	Yes	Yes	
B2_19	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
C3_03	Yes		Yes		Yes		Yes		Yes
B1_01	Yes		Yes		Yes		Yes		
B3_04	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B3_01	No	Yes	No	Yes	No	Yes	No	Yes	Yes
A3_05	Yes		Yes		Yes		Yes		
A4_05	Yes		Yes		No		No	Yes	
B2_02	Yes		Yes		Yes		No	Yes	Yes
B2_01	Yes		Yes		No	Yes	No	Yes	
A4_10	Yes		Yes		No	Yes	No	Yes	Yes
A3_01	Yes		Yes		Yes		Yes		
B3_02	Yes		Yes		Yes		Yes		
B3_03	Yes		Yes		Yes		Yes		
B2_08	Yes		No	Yes	No	Yes	No	Yes	Yes
B2_09	Yes		No	Yes	No	Yes	No	Yes	Yes
B2_05	Yes		Yes	Yes	No	Yes	No	Yes	Yes
B2_06	Yes		Yes		No		No	Yes	Yes
B3_07	Yes		Yes		No		No	Yes	Yes
C3_01	Yes		Yes	Yes	Yes	Yes	No	Yes	Yes
C3_04	Yes		Yes		Yes		No		Yes
C3_05	Yes		Yes		No	Yes	No	Yes	Yes
C3_06	Yes		Yes		No		No	Yes	Yes
D4_02	Yes		No	Yes	No	Yes	No	Yes	
D3_01	Yes		Yes		Yes		Yes		
D2_09	Yes		Yes		Yes		Yes		
D2_08	Yes		Yes		Yes		Yes		
D2_07	Yes		Yes		Yes		Yes		
D1_03	Yes		Yes	Yes	No	Yes	No	Yes	Yes
D1_02	Yes		Yes	Yes	No	Yes	No	Yes	Yes
D1_06	Yes		Yes		Yes	Yes	No	Yes	
D1_07	Yes		Yes		Yes	Yes	No	Yes	
D1_08	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D2_01	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
C2_13	Yes		Yes		Yes	Yes	No	Yes	
C2_12	Yes		Yes		Yes		No	Yes	
C2_11	Yes		No	Yes	No	Yes	No	Yes	Yes
C2_10	No	Yes	No	Yes	No	Yes	No	Yes	Yes
C2_08	Yes		Yes		Yes		Yes		
C2_01	Yes		Yes		Yes	Yes	No	Yes	Yes
C2_02	Yes		Yes	Yes	Yes	Yes	No	Yes	Yes
C2_06	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
C2_05	No	Yes	No	Yes	No	Yes	No	Yes	Yes
C2_04	Yes		Yes		Yes	Yes	No	Yes	
C2_03	No		No		No		No	Yes	Yes
B2_27	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B2_26	No		No	Yes	No	Yes	No	Yes	Yes
B1_03	Yes		Yes	Yes	No	Yes	No	Yes	Yes
B2_17	Yes		Yes	Yes	No	Yes	No	Yes	Yes
B2_18	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
B2_22	Yes		Yes		No		No	Yes	
B2_21	Yes		Yes	Yes	No	Yes	No	Yes	Yes

Conduit Name	2-yr Serviceability	2-yr Surcharged Condition	10-yr Serviceability	10-yr Surcharged Condition	25-yr Serviceability	25-yr Surcharged Condition	100-yr Serviceability	100-yr Surcharged Condition	Upgrade or Replace
B2_20	Yes		Yes		Yes		Yes		
B2_23	Yes		Yes		Yes	Yes	Yes	Yes	Yes
B2_24	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
B2_25	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
B2_15	Yes		No	Yes	No	Yes	No	Yes	Yes
B2_03	Yes		Yes		No		No		
B2_04	Yes		Yes	Yes	No	Yes	No	Yes	Yes
A3_02	Yes		Yes		Yes		Yes		
A3_03	Yes		Yes		Yes		Yes		
A3_04	Yes		Yes		Yes		Yes		
A3_06	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
A4_04	No	Yes	No	Yes	No	Yes	No	Yes	Yes
A4_02	Yes		Yes	Yes	Yes	Yes	No	Yes	
A4_01	Yes		Yes	Yes	Yes	Yes	No	Yes	
A4_03	Yes		Yes		Yes	Yes	No	Yes	
B4_01	Yes		Yes		No	Yes	No	Yes	
B4_04	Yes		Yes		Yes		Yes	Yes	Yes
B4_03	Yes		Yes		Yes		Yes	Yes	Yes
B4_02	Yes		Yes		Yes		Yes	Yes	Yes
B4_08	Yes		Yes	Yes	yes	Yes	No	Yes	
B4_07	Yes		Yes	Yes	Yes	Yes	No	Yes	
B4_06	Yes		Yes	Yes	Yes	Yes	No	Yes	
B4_05	Yes		Yes	Yes	Yes	Yes	No	Yes	
E1_03	Yes		Yes		Yes		Yes		
E1_02	Yes		Yes		Yes		Yes		
E1_04 (1)	Yes		Yes		Yes		Yes		Yes
A4_09	Yes		Yes		Yes		Yes		
A4_08	Yes		Yes		Yes		Yes		
A4_07	Yes		Yes		Yes		Yes	Yes	
A4_06	Yes		Yes		Yes		Yes		
D2_03	Yes		Yes		Yes		Yes		
D2_04	Yes		Yes		Yes		Yes	Yes	
D2_05	Yes		Yes		Yes		Yes	Yes	
D2_06	Yes		Yes		Yes		Yes	Yes	
D2_02	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
E1_06	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
E1_05	Yes		Yes		Yes		Yes		Yes
E1_07	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
E1_09	Yes		Yes		No		No	Yes	Yes
E1_08	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
D4_01	Yes		Yes		No	Yes	No	Yes	Yes
B3_06	Yes		Yes		Yes		Yes	Yes	
B2_07	Yes		Yes	Yes	No	Yes	No	Yes	Yes
B2_10	Yes		Yes		No	Yes	No	Yes	Yes
B2_11	Yes		Yes		No	Yes	No	Yes	Yes
B2_13	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B2_14	No	Yes	No	Yes	No	Yes	No	Yes	Yes
A2_01	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
A1_01	Yes		Yes	Yes	No	Yes	No	Yes	Yes
C4_01	Yes		Yes		Yes		Yes		
B4_08 (1)	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B4_09	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B4_10	No	Yes	No	Yes	No	Yes	No	Yes	Yes
B3_05	Yes		Yes		Yes		Yes	Yes	
D1_04	Yes		Yes		Yes		Yes		
E1_01	Yes		Yes		Yes		Yes		Yes
D1_09	Yes		Yes		Yes		Yes		
D1_01	Yes		Yes		Yes		Yes		

Conduit Name	2-yr Serviceability	2-yr Surcharged Condition	10-yr Serviceability	10-yr Surcharged Condition	25-yr Serviceability	25-yr Surcharged Condition	100-yr Serviceability	100-yr Surcharged Condition	Upgrade or Replace
B2_16	Yes		No	Yes	No	Yes	No	Yes	Yes
C2_14	Yes		Yes		Yes		Yes		
C3_02	Yes		Yes		Yes		Yes		
B2_12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C2_07	Yes		Yes		Yes	Yes	Yes	Yes	
B1_02	Yes		Yes		Yes		Yes		
C2_09	Yes		Yes		Yes		Yes		

Appendix C

Field Data Collection Manual

Field Data Collection Manual

City of Beavercreek, Ohio

February 2025

TABLE OF CONTENTS

1. OVERVIEW

This manual was designed for collecting field data (culvert and stream condition assessments) associated with the 2024 Beavercreek Drainage Master Plan. It was created to provide general procedures to ensure a smooth and timely flow of data between field crews, office staff, and the City.

This document is not intended to be a manual for ArcGIS or any other software. The intent of the manual is to outline the collection process for assessing the condition of culverts and streams and is limited to the field mapping portion of the project. It is organized as follows:

Section 1: Overview: This section provides an overview of the project with City of Beavercreek and Woolpert Inc. contact information.

Section 2: Field Survey Guidelines: This section includes the general field data collection methods for performing system inventory with a pen-based computer and contains an overview of the equipment and the proper settings to be used. It outlines the daily QA processes that occur during field activities and provides guidelines for field crews to perform data collection.

Section 3: Equipment Configuration: This section outlines the proper equipment setup procedures.

Section 4: Field Database Dictionary: This section lists the fields available for each feature subtype and their corresponding domains/picklists.

Section 5: Structure Inventory Procedures: This section provides guidelines and instruction on mapping and attribution procedures. This section also outlines the step-by-step process by which field data is collected.

Section 6: Condition Assessment Procedures: This section provides guidelines and instruction on conducting a structure and pipe condition assessment. It outlines the grading process for ditch and culvert condition assessment.

Section 7: Office and Field Guidelines: This section contains office guidelines for the daily QA procedures, data editing and review, final formatting, and weekly report requirements.

1.1 PROJECT PURPOSE

The City of Beavercreek, like many other cities across the country, is experiencing increased flooding. Particularly, the City is experiencing flooding associated with its open channel system (ditches) on a more frequent basis. Bank erosion is also occurring. The City would like to evaluate the open channel system (and associated culverts) for flooding and erosion issues. The assessment should include an evaluation of system capacity, erosion points, sediment deposits and blockages, and channel and culvert constrictions. The result of the assessment will be a report that identifies conceptual level, prioritized maintenance and capital improvement projects.

This field assessment will supplement the overall effort of reviewing available studies and reports and performing limited hydrologic and hydraulic (H&H) modeling to provide an evaluation of the existing drainage system.

1.2 PROJECT GOALS

The City has contracted Woolpert to collect drainage system inventory and condition assessment to utilize in a HEC-RAS 2D, rain on grid model to determine drainage issues and potential solutions.

The work to be performed within the project's limit shall consist of the following:

- Inventory and mapping of the existing storm drainage infrastructure systems.
- Condition assessment of ditches and culverts. Pipe networks are not included.
- Preparation of a geodatabase for developing a 1D/2D hydrologic and hydraulic model.

1.3 PROJECT APPROACH

This will be a one-pass process wherein Woolpert's condition assessment crew will access local streams and channels to perform a condition assessment of the watershed's streams and channels. Field crews will investigate selected study reaches, as agreed upon with the City using field reconnaissance techniques for stream geomorphic assessments. This will be achieved by walking the channel or stream and documenting observations using ESRI field maps and a Trimble R2 to accurately collect the mapping grade position of feature observations. Each feature in the data file will have a unique numeric identifier as established during the inventory process, a brief descriptor defining the observation, and general horizontal coordinates associated with the structure. Woolpert field crews will photograph critical feature observations within ESRI field maps.

1.4 CITY OF BEAVERCREEK CONTACTS

Jeff Moorman, Director (Primary Contact)
Location: 1368 Research Park Drive, Beavercreek, OH 45432
Office: (937) 427-5513
Cell:
Email: moorman@beavercreekohio.gov

Nick Smith, City Engineer (Secondary Point of Contact)
Location: 1368 Research Park Drive, Beavercreek, OH 45432
Office: (937) 427-5513
Cell:
Email: smith@beavercreekohio.gov

Zane Eneix, GIS Technician (GIS Point of Contact)
Location: 1368 Research Park Drive, Beavercreek, OH 45432
Office: (937) 427-5513
Cell:
Email: eneix@beavercreekohio.gov

1.5 WOOLPERT CONTACTS

David DiCesare, PE, Project Manager
Cell: (440) 865-6093
Office: (216) 273-3681
Email: david.dicesare@woolpert.com

Joel Doughty, Senior Engineer Technician
Cell: (803) 727-4769
Office: (803) 214-5888
Email: joel.doughty@woolpert.com

Steve Godfrey, PE, Modeling Engineer
Cell: (704) 287-2633
Office: (704) 526-3048
Email: steve.godfrey@woolpert.com

Victoria Jenkins, GIS Specialist
Cell: (904) 586-5477
Office: (803) 214-5949
Email: victoria.jenkins@woolpert.com

2. FIELD SURVEY GUIDELINES

This section presents the general field data collection methods for assessing culvert and channel conditions on ESRI field maps and includes information on the equipment and the proper settings to be used. Daily QA procedures that occur during field activities are outlined, and guidelines for field crews to perform data collection are presented.

2.1 GENERAL GUIDELINES

Culvert conditions and attributes will be developed by collecting storm water drainage system features including 24-inch diameter pipes and larger (**no** driveway culverts), open channels, and other associated features within the defined study reaches. The stormwater drainage system to be collected consists of both open channels and culverts. The following storm water feature information will be collected in the field:

- Horizontal (X, Y) coordinates using Trimble GPS modules or an overlay to orthophotography or other GIS source data
- Feature subtype codes (Stream inspection and Culvert Condition)
- Attributes (see data dictionary)

To gather this information, field crews will access each feature that is readily accessible. It should be noted **that no confined-space entry of structures will be performed.**

If an area is inaccessible, the point should be marked in ESRI Field Maps, and a note provided describing the obstruction. For example, car parked on top of the structure, structure is behind a locked gate, etc. This will be included on a map or in a GIS coverage of features to be turned over to the City.

For structures that cannot be located using the Trimble GPS modules, the best possible placement of the structure will be used. Methodology for deriving said placement is described in the equipment and operation procedures section.

2.2 GENERAL DATA COLLECTION APPROACH

The following procedures should guide the field data collection process:

- Woolpert will investigate selected study reaches, as agreed upon with the City, using field reconnaissance techniques for stream assessments. This will be achieved by walking the channel or stream and making observations as described herein, including developing a reach-specific naming protocol and GIS map. The reach naming protocol will be coordinated with, or will utilize, naming protocols

for other portions from the Scope of Services and will be specifically coordinated with the H&H modeling team and the City.

- Field observations will include a visual summary of the channel conditions by stream reach (photographs and GIS mapped locations based on mapping grade GPS coordinates gathered in the field). The intent of this task is to establish a basic understanding of the existing conditions of the stream reaches to assess their potential for stabilization or degradation.

- Locations of current and possible bank failures including erosion and incision, areas of channel aggradation and degradation, and debris dams will be documented with mapping grade GPS.

- During the stream assessment threatened infrastructure (public infrastructure, private homes, fences, etc.) will be attributed and documented. All locations will be snapped to the proper coordinate system and photographed.

- All culverts (24" or larger) carrying the USGS stream will be attributed, inspected for any defects or blockages and a photograph taken.

2.2.1 SOFTWARE

Various software packages will be used to complete the stormwater assessment and modeling project. In addition to Microsoft Windows, the following software will be used during the inventory process and are referenced in the document:

- ESRI Field Maps
- ESRI ArcGIS
- Microsoft Excel

2.2.2 OFFICE PREPARATION

Before beginning any field data collection, sufficient office preparation is necessary to ensure a successful project. For a condition assessment inventory, preparation should include the following elements:

- Installing the necessary software
- Defining project directories
- Designing and building a proper database
- Understanding the database design
- Loading all required background files
- Testing of the geodatabase to make sure everything is functioning as it should

2.2.3 QA/QC FIELD PROCEDURES

At the end of the data collection period (~10 days) an in-depth review of the data will be performed by the Senior Engineering Technician and suspect points will be scheduled for re-observation.

Throughout the inventory process, quality assurance/quality control (QA/QC) checks of the field work will be performed. This QA/QC will ensure the City receives the highest quality feature data. Some of the work elements may include the following:

- Independent field checks and evaluations of the collected data to ensure data is collected as required.
- Periodic meetings with field and office personnel to discuss data collection issues.
- Periodic changes to the data collection procedures and software to reflect conditions found in the field.
- Query checks will be performed after the first three days of data collection and again at the end of the project with potential mistakes investigated in the office, and, if necessary, visited in the field to determine what changes need to be made to the attribute data.
- QA/QC procedures will be periodically revisited to determine the validity and necessity of the procedures in place and to determine whether methods need to be added or eliminated.

2.2.4 EQUIPMENT AND GPS OPERATING PROCEDURES

Field data collection is performed using Apple iPads and Trimble GPS units. Each iPad utilizes ESRI Field Maps to record physical and observable attributes of each feature at their approximate location using GPS. The iPads are equipped with various map coverages (both planimetric and georeferenced imagery). Using an on-screen cursor displaying the location of the GPS module in relation to the georeferenced planimetric layers, field crews can pinpoint feature locations. In areas where dense tree cover produces a weak satellite signal, locations are hand-placed based on the corresponding planimetrics and noted accordingly.

It is important that data collection methods are consistent throughout the inventory process. GPS locations should be collected on the top center of all culvert pipes, and in the middle of any stream/channel defect.

2.2.5 “FLAGGED” FEATURES

Field crews will photograph and mark a feature’s location that meet the criteria listed below. These features will be assessed, and the appropriate steps will be taken to address issues associated with these features. Flags can involve:

- Severe erosion, beaver dams, stream blockages, blocked culverts, etc.

- Health and safety problems (severely damaged infrastructure, severely eroded channels and stream banks, threatened structures or roads, etc.)
- Inaccessible segments of stream and channels due to fences, pets, property owners, swamps, and/or impassable vegetative areas.
- Water quality concerns (broken sewer lines, broken laterals, etc.). Broken sewer lines or sewer infiltration will be immediately reported to the City.

2.2.6 CREW MEETINGS AND CONCERNS

The success of the project is highly dependent upon crew morale and safe working procedures, so crew members are encouraged to communicate openly and often with each other and with office personnel associated with the project.

WEATHER CONDITIONS

Most weather conditions do not directly contribute to work delays. However, rain, cold, ice, and snow events, could affect the condition survey of the system.

PEAK-TRAFFIC CONDITIONS

To avoid hazardous conditions, areas and times of known high traffic volume should be reserved for non-peak conditions. Area inaccessibility and traffic safety problems that exceed survey crew expectations should be immediately reported to the City contact.

2.2.7 SAFETY

Field crews should follow the general protocol for safety outlined by Woolpert and the City. Crews should refer to the OSHA manual for specific safety procedures. The following situations are of particular importance.

HIGH TRAFFIC AREAS

High traffic areas pose a risk to field crew safety. Besides avoiding high traffic areas during peak traffic volume, field crews should follow the traffic control procedures used by OSHA. Also, if lanes or roads need to be closed to perform the feature attribution, then certain procedures must be followed. General precautions may include the use of the following to prevent potential danger:

- Orange vests
- Cones
- Hazard lights

Vehicles should be parked where they will not obstruct local traffic or pose safety hazards to crew members or the public. Landowner permission should be obtained prior to parking vehicles on private property.

2.2.8 DRESS

The work conditions of this project necessitate that field crews dress appropriately. Field crews will be required to work with features that may expose them to unsanitary conditions. To prevent any problems, field crews are encouraged to wear long pants and may wish to wear gloves. Field workers should use common sense when they determine what type of field dress to wear. Particular attention should be paid to protecting oneself from the sun and/or cold.

2.2.9 FIELD EQUIPMENT

A list of recommended field collection equipment is provided in Table 1. All field crews should have these items on hand. If any of the items on the list are not available, field crews should contact Woolpert personnel assigned to manage inventory equipment.

Table 1. Recommended Field Collection Equipment

Attribution Field Tools	Road Safety Gear	Personal Safety Gear	Data Collection Field Tools	Source Materials
Manhole Hook Sledgehammer Flashlight Measuring Rods Measuring Tape Digital Measuring Device Chisel Magnetic Locator Probe Rod Chest Waders Machete	Class 3 Vest Safety Signs Vehicle Flashers 36 “Orange Cones	Work Boots Leather Gloves Eye Protection Muck Boots	Apple iPad Trimble R2 Hal-optic Pole Camera	Virtual Planimetric Maps City of Beaver Creek Letter

2.3. FIELD CREW WORK PLAN

2.3.1 GENERAL PLANNING

Planning for daily field operations may include the following items:

- Using GIS developed maps and orthophotography to identify dense tree canopy, high traffic areas, and any other safety issues

- Using existing source system maps to locate features in each basin, if available
- Devising a preliminary project schedule and modifying it during monthly meetings
- Developing contingency plans to deal with unpredictable situations, such as weather, peak flow times and personnel issues

2.3.2 PERSONNEL

Quality Control Manager –The Quality Control Manager's responsibilities include:

- Reviewing the Draft Database to ensure that the database created for the specific field data collection project is functioning per the scope of work associated with the specific project and checking the collected data to ensure there are no errors or omissions
- Reviewing all databases or digital deliverables before they are sent to the client
- Reviewing GIS source data to be utilized in the field to ensure that all source data is complete and current
- Reviewing the Draft Standard Operating Procedure (SOP) to ensure the SOP for the specific inventory project is consistent with the specific scope of work for the project.
- Reviewing all draft and final SOP's before they are sent to the client

Data Collection Phase Manager – This position should be a senior-level technician with capabilities for troubleshooting, maintaining equipment, and managing field crew personnel. The Data Collection Phase Manager's responsibilities include:

- Coordinating between inventory crews
- Coordinating with City storm water department personnel
- Setting up the project specific draft and final database used for the field data collection
- Creating the project specific draft and final SOP used for field data collection
- Assigning crews to each project segment to ensure that final data is delivered on schedule
- Reporting directly to the Project Manager and being responsible for reporting any problems or complications associated with the project

Primary Field Technician – The position requires familiarity with OSHA traffic safety standards, and responsibilities include:

- Reporting directly to the Data Collection Phase Manager and being responsible for reporting any problems with equipment, safety, or access
- Providing the Data Collection Phase Manager with at least a 24-hour notice that a survey crew member can or cannot be available for work on the project
- Ensuring inventory crews will maintain a production rate established for the project
- Designating areas considered to be "confined spaces" (**crews must not enter confined spaces**)

Field Crew – The Field Crew consists of a Primary Field Technician and one to three technicians (depending on traffic constraints). General responsibilities of the inventory crew include:

- Responsible for the daily acquisition of storm water system data
- Providing the Primary Field Technician with at least a 24-hour notice that a crew member can or cannot be available for work on the project
- Having familiarity with utility system designs and detailed attribution efforts for storm water systems

While it is important that employees that fall into any of these categories fulfill the responsibilities associated with their respective positions, it is also important to remember that each employee is an equally valued member of the project team. All employees are encouraged to communicate with other members of the team and offer input regarding potential improvements to this project.

3. EQUIPMENT CONFIGURATION

Before data is collected, equipment configuration and testing will be performed. Crew leaders will ensure that they have all the necessary GPS hardware. Prior to any data collection, the following system settings and configurations are checked.

3.1 PROJECT COORDINATE SYSTEM

Software will be configured to produce feature positions relative to the North American Datum of 1983, adjustment of 2011 (NAD 83 (Conus) CORS 96), Ohio South Zone, US Survey Foot.

3.2 RTD GPS HARDWARE

Real-Time Differential (RTD) GPS technology will be used for this project. Technicians will use Trimble R2 GPS modules. These units are capable of real-time satellite differential corrections.

The Trimble R2 will be connected to an Apple iPad via a wireless connection for data entry, manipulation, and storage. This setup will consist of the following equipment:

- A Trimble R2 GPS unit and antennae.
- An Apple iPad

4. FIELD DATABASE DICTIONARY

4.1 NODES

Stream Inspection SubType

Stream Inspection	
ObjectID	unique id automatically assigned by data collection software
INSPECTIONDATE	enter date of inspection
OBSERVATION	select from Start, End, Start of Defect, End of Defect or Defect
TYPEOFANALYSIS	select from: Sediment Accumulation, Erosion, Bank Failure, Debris Blockage, Utility Crossings, or Evidence of Illicit
BEDMATERIAL	select from Dirt, Grass, Riprap, Asphalt, Geotextile, Vegetation, or Concrete
BANKMATERIAL	select from Dirt, Grass, Riprap, Asphalt, Geotextile, Vegetation, or Concrete
LOCATIONOFDEFECT	select from Above, Center, Upstream Left, Upstream Right, Entire Width of Stream, or Other
SEDACCUMULATION	select from 0%, 25%, 50%, 75%, or completely blocked
PRESENCEOFEROSION	1-All banks are condition 1 unless otherwise noted 2-Some evidence of erosion 3-Some evidence of failure 4-Existing bank failure impacting public or private property 5-Existing Bank failure impacting roads, utilities, or other infrastructure
THREATINFRASTRUCTURE	select from None, Headwall, Pipe, Road, House, Business, Bridge Abutment, Outfall, Utilities, Sidewalk, Ancillary Structure, Fences, or Other
TYPEOFBLOCKAGE	select from sediment, trees, trash and debris, rocks, beaver dam, or man-made structures
PERCENTSTREAMBLOCK	select from 0%, 25%, 50%, 75%, or completely blocked
Accessibility for Assessment	1-Ditch is fully accessible for assessment 3-Ditch segment is inaccessible

Structural Condition Score	1-No visible signs of erosion 2-Some bank erosion 3-Bank failure has occurred or is imminent
Maintenance Condition Score	1-Ditch does not need maintenance 2-Ditch requires routine maintenance 3-Ditch needs immediate maintenance to restore functionality
STNDRDCOMMENTS	select from Abandoned, Private System, Overgrown, Concrete slab - no manhole lid, Buried, Submerged, Tide backflowing into inlet, Too Heavy to Open, Not Found, Inaccessible, Bolted or Otherwise Sealed Shut, Traffic Control Needed, Under Construction, Filled with Sediment or Debris, No MH Lid, Dog, Fence, Denied Access by Owner, Immovable object on structure, No MH
COMMENTS	enter additional comments
DATASOURCE	select from GPS - Mapping Grade, GPS - Survey Grade, Traditional Survey, As-Built, Plans/Drawing, Other
PHOTO	take photo of inspection

Culvert Inspection Sub Type

Culvert Inspection	
ObjectID	**unique** id automatically assigned by data collection software (marked on each structure using paint or paint pens)
INSPECTIONDATE	select current date (will be populated with date, select "Ok")
ENDTYPE	select from 90° Pipe Cut, Bell, Socket, Beveled, Flared, Headwall, Endwall, Other
ENDMATERIAL	select from RCP, CMP, BCCMP, Brick, Clay, Concrete, DIP, SLHDPE, HDPE, Metal, PVC, Rubble Masonry, Stone, Wood, Other
PIPESHAPE	select from Circular, Rectangular, Elliptical, Arched, Other
ENDDIAMETER	select from 6,8,10,12,15,18,21,24,27,30,36,42,48,54,60,66,72,78,84,90,96,102,108,114,120,126,132,138,144
ENDWIDTH	enter pipe width in inches (for non-circular)

ENDHEIGHT	enter pipe height in inches (for non-circular)
FLOWDIR	select from Upstream or Downstream End of Culvert
SURROUNDINGMAT	select from Asphalt, Concrete, Grass, Gravel, Dirt, Leaves, Pine Straw, Rip Rap, Brick, Water, Sand, Other
INVERTOFFSET	enter depth in feet from bottom of pipe to survey point.
Accessibility for Assessment	1-Culvert is fully accessible for assessment 3-Culvert is inaccessible and cannot be found assessed
Structural Condition Score	1-Culvert shows no visible signs of deterioration, like new condition 2-Culvert shows some signs of deterioration 3-Failure of culvert has already occurred or is imminent
Maintenance Condition Score	1-Indicates that the culvert end does not need maintenance 2-Indicates that the culvert end exhibits issues and routine maintenance may be needed. 3-Culvert end needs immediate maintenance to restore functionality of the system
OVERALLCONDITION	1-Good Condition Overall 2-Moderate Condition (Over 25% blockage to 60%, minor erosion) 3-Severe Condition (60% blockage or above, sinkholes, undermining, headwall failure, etc…)
PERCENTCULBLOCK	select from 0%, 25%, 50%, 75%, or completely blocked
DATASOURCE	select from GPS - Mapping Grade, GPS - Survey Grade, Traditional Survey, As-Built, Plans/Drawing, Other
COMMENTS	input comments if needed
STNDRDCOMMENTS	select from Abandoned, Private System, Overgrown, Concrete slab - no manhole lid, Buried, Submerged, Tide backflowing into inlet, Too Heavy to Open, Not Found, Inaccessible, Bolted or Otherwise Sealed Shut, Traffic Control Needed, Under Construction, Filled with Sediment or Debris, No MH Lid, Dog, Fence, Denied Access by Owner, Immovable object on structure, No MH
PHOTO	take photo of culvert pipe end

5. STRUCTURE INVENTORY PROCEDURES

The following stormwater point feature attributes will be collected in this assessment:

5.1 STREAM ASSESSMENT ATTRIBUTION

OBSERVATION - The starting or ending point of a stream segment, can also select the starting and ending point of a large or long defect or inaccessible area in a channel or stream.

TYPEOFANALYSIS -

STREAMCHANNELBEDMATERIAL – The general lining of the bottom of the channel. See Section 5.1.1 for lining types.

STREAMCHANNELSIDEMATERIAL– The general lining of the banks of the channel. See Section 5.1.1 for lining types.

LOCATIONOFDEFECT - Looking upstream, select the location of the defect in the stream or channel. An example of an above location is below.

SEDACCUMULATION - At normal flow what percent of the stream or channel is blocked by sediment. Choose between 0%, 25%, 50%, 75%, or 100%.

PRESENCEOFEROSION - If a channel or stream bank is failing options 3-5 should be selected:

1-All banks are condition 1 unless otherwise noted
2-Some evidence of erosion
3-Some evidence of failure
4-Existing bank failure impacting public or private property
5-Existing Bank failure impacting roads, utilities, or other infrastructure

THREATINFRASTRUCTURE – The type of infrastructure that is being threatened from erosion.

TYPEOFBLOCKAGE – The material that makes up the blockage. If other, make a comment in the comments field.

PERCENTSTREAMBLOCK – The Percent of the stream or channel that is blocked by the obstruction. Choose between 0%, 25%, 50%, 75%, or 100%.

Accessibility for Assessment – See section 6.1 for stream scoring system

Structural Condition Score – See section 6.1 for stream scoring system

Maintenance Condition Score – See section 6.1 for stream scoring system

STDRDCOMMENTS – group of comments that have been used in prior inventories to speed up comment making.

COMMENTS – Comments section to describe defect or reasons for inaccessibility.

DATASOURCE – Status of the accuracy of the point

5.1.1 LINING TYPES

Examples of some lining types:

Grass Lining

Vegetation Lining

Concrete Lining

Rip Rap Lining

Asphalt Lining

Dirt Lining

5.2 CULVERT ASSESSMENT ATTRIBUTION

Culvert – A pipe that conveys open system drainage under a road via a pipe with no additional surface input.

ENDTYPE – See section 5.2.1 for pipe end types.

ENDMATERIAL – See section 5.2.2 for pipe end materials.

PIPESHAPE – See section 5.2.3 for pipe shapes.

ENDDIAMETER – Measure the internal diameter of the pipe at the observed end. Applicable to circular pipes only. Input - inches

ENDWIDTH – Measure the widest horizontal opening of the observed end of the pipe. Applicable to non-circular pipes only. Input - inches

ENDHEIGHT – Measure the widest vertical opening of the observed end of the pipe. Applicable to non-circular pipes only. Input - inches

FLOWDIR (Flow Direction) – If the pipe receives flow, select "Incoming", if it is an effluent pipe, select "Outgoing".

SURROUNDINGMAT (Surrounding Material) – The surface material over which stormwater flows at the entrance or exit of a pipe end.

Invert Offset – Measure the end of a pipe from the top of the structure/headwall/pipe end to the bottom of the pipe.

Accessibility for Assessment - See section 6.1 for culvert scoring system

Structural Condition Score - See section 6.1 for culvert scoring system

Maintenance Condition Score - See section 6.1 for culvert scoring system

OVERALLCONDITION - Select one of the three options.
1-Good Condition Overall
2-Moderate Condition (Over 25% blockage to 60%, minor erosion)
3-Severe Condition (60% blockage or above, sinkholes, undermining, headwall failure, etc…)

PERCENTCULBLOCK (Percent Culvert is Blocked)- Measure the depth of the sediment or debris in a pipe and record what percentage the pipe is blocked.

DATASOURCE - Status of the accuracy of the point when snapped.

COMMENTS - Comments section to describe defect or reasons for inaccessibility.

STDRDCOMMENTS - group of comments that have been used in prior inventories to speed up comment making.

5.2.1 PIPE END SUBTYPES

PipeEnd Subtypes (Collected in the EndType Field) (with accompanying photo examples) are as follows:

90° Pipe Cut – A pipe that projects from surrounding fill and has a vertical cut at the end but no flares or other geometric changes. You can usually see the rust spots on the face of the pipe due to the cut rebar pieces.

Figure 1: 90° Pipe Cut

Bell – A pipe that projects from the surrounding fill and has a bell-shaped end. This end if laid right is usually the upstream end of a pipe.

Figure 2: Bell Pipe

Socket – A pipe that projects from the surrounding fill and has a pipe segment socketed to the end. This end if laid right, is usually the downstream end of the pipe.

Figure 3: Socket Pipe

Beveled – A pipe that projects from the surrounding fill and has a miter or bevel cut in the end. You can usually see the rust spots on the face of the pipe due to the cut rebar pieces.

Figure 4: Beveled Pipe

Flared – A pipe that projects from the surrounding fill and has a precast flared end section. These sections diameters are usually a little larger than the pipe it is connected too.

Figure 5: Flared Pipe

Headwall – A pipe whose end receives open system flow and which is embedded in a retaining wall. In most, but not all cases, the end of the pipe will be flush with the end of the wall.

Figure 6: Headwall Pipe

Endwall – An effluent pipe which is embedded in a retaining wall. In most, but not all cases, the end of the pipe will be flush with the end of the wall. Endwalls are structurally identical to headwalls.

Pipe Ends not conforming to any of these subtypes should be classified as “Other”.

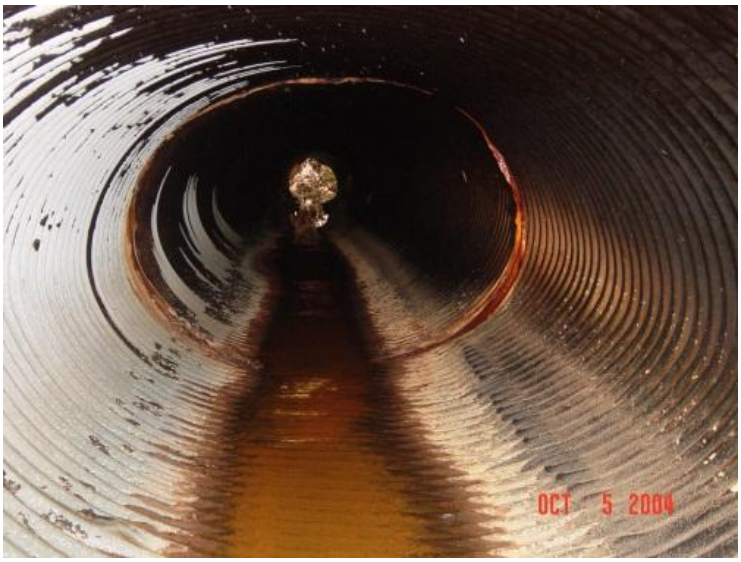
5.2.2 PIPE END MATERIALS

End Material – Select the material of the pipe at the observed end. The composition of the pipe:

RCP (Reinforced Concrete Pipe):

CMP (Corrugated Metal Pipe):

BCCMP (Bituminous Coated Corrugated Metal Pipe:



SLHDPE (Smooth-Lined High-Density Polyethylene):

HDPE (High Density Polyethylene):

PVC (Polyvinylchloride):

DIP (Ductile Iron Pipe):

VCP (Clay Pipe):

5.2.3 PIPE SHAPES

Pipe Shape – Examples:

Figure 7: Circular Pipe

Figure 8: Rectangular Pipes

Figure 9: Elliptical Pipe

Figure 10: Arch Pipe

6. CONDITION ASSESSMENT PROCEDURES

6.1 CULVERT CONDITION AND STREAM ASSESSMENT SCORING PROCEDURES

The following section contains instructions on performing a preliminary condition assessment on culverts to assist in determining if the culvert needs immediate repairs or more detailed condition assessment.

The preliminary condition assessment scoring is noted below. In general, a score of **1** indicates that no action is needed at this time, a **2** indicates that there are signs of deterioration and further assessment may be needed, and a **3** indicates that immediate corrective action is required. The preliminary assessment crew should evaluate and score all three categories: accessibility for assessment, structural condition, and maintenance condition. The action to be taken on any asset is determined by the score in each of the three categories.

Accessibility for Assessment: A score of **1** should only be given if the culvert can be fully viewed (e.g., the full length of pipe can clearly be seen) and a **3** should be given in all other cases. A score of **3** will "tag" that culvert for condition assessment via other methods. There is not an accessibility score of **2**.

Structural Condition Score: A score of **1** indicates that there are no visible signs of deterioration, and the culvert should be re-inspected according to the City's inspection schedule. A score of **2** indicates that there is some deterioration evident, and that further assessment is needed to determine the appropriate corrective action. This additional assessment may be conducted via CCTV or the inspector may indicate that an engineer needs to visit the site (e.g., CCTV may not be necessary for a culvert, if an engineer can see the issues). A score of **3** indicates that failure of the culvert has either occurred or is imminent. Personnel from the City should inspect the asset immediately.

Maintenance Condition Score: A score of **1** indicates that the asset does not need maintenance attention. The asset will be re-inspected according to the City's inspection schedule. A score of **2** should be given when the asset exhibits issues requiring "routine maintenance" (e.g., concrete top is displaced) or sediment accumulation inhibits flow (e.g., accumulation is greater than 25% of the pipe diameter or debris is trapped at pipe mouth) and should be revisited to determine appropriate action. A score of **3** should only be given when maintenance activities are needed immediately to restore the functionality of the system.

Culvert Assessment Scores			
Score	**Accessibility for Assessment Score**	**Structural Condition Score**	**Maintenance Condition Score**
1	Structure is fully accessible and visible	Structure is in "like new" condition, no additional action is needed (Revisit per LOS guidance or upon receipt of complaint)	There is no sediment or debris accumulation and no minor issues requiring routine maintenance. Re-inspect according to LOS guidance
2		Structure has begun to deteriorate and needs further assessment to determine appropriate corrective action	Structure requires routine maintenance and needs further assessment to determine appropriate corrective action
3	Structure is not accessible or is not fully visible, follow up assessment is required	Failure has occurred or is imminent. Immediate action is needed	There are multiple routine maintenance issues and/or sediment or debris accumulation requiring immediate attention

Ditches will be scored similarly using a 1, 2, 3 scoring system. Again, assessment of the accessibility of the ditch / channel segment, structural condition (bank erosion), and maintenance condition (debris / sediment accumulation) will be performed.

Accessibility for Assessment: A score of **1** should only be given if the ditch can be fully viewed (e.g., the full ditch / channel reach can be walked or seen from each end) and a **3** should be given in all other cases. A score of **3** will "tag" that ditch segment as inaccessible. There is not an accessibility score of **2**.

Structural Condition Score: A score of **1** indicates that there are no visible signs of erosion, and the ditch/ channel should be re-inspected according to the City's inspection schedule. A score of **2** indicates that there is some bank erosion evident, and that further assessment is needed to determine the appropriate corrective action. A score of **3** indicates that failure of the bank has either occurred or is imminent. Personnel from the City should inspect the asset immediately.

Maintenance Condition Score: A score of **1** indicates that the ditch / channel does not need maintenance attention. The asset will be re-inspected according to the City's inspection schedule. A score of **2** should be given when the ditch / channel exhibits issues requiring "routine maintenance" (e.g., some sediment deposition or debris blockage of the channel and should be revisited to determine appropriate action. A score of **3** should only be given when maintenance activities are needed immediately to restore the functionality of the system.

Stream Assessment Scores			
Score	**Accessibility for Assessment Score**	**Structural Condition Score**	**Maintenance Condition Score**
1	Channel or stream is fully accessible for assessment	No visible signs of erosion	Channel or stream does not need maintenance
2		Some bank erosion	Channel or stream requires routine maintenance
3	Channel or stream segment is inaccessible	Bank failure has occurred or is imminent	Channel or stream requires immediate maintenance to restore functionality

6.2 ILLICIT DISCHARGES

- A full illicit discharge assessment is not part of this field effort, however, should dry weather flows be noticed during the inspection, discharge locations should be noted and reported to the City. There are two (2) possible situations for picking up illicit points:
  - **Illicit discharge from a pipe or channel outfall** – If a channel or pipe outfall is flowing with a substance that qualifies as a potential illicit discharge, create a stream inspection point and label that point as a potential illicit discharge. Document as needed with photos and notes.
  - **Illicit discharge coming from any source other than a pipe or channel** - Illicit discharges can also occur from sources which do not qualify as an outfall (leaking manhole, questionable substance from a 2" pipe, etc.). Insert a stream assessment point and describe the discharge. Document as needed with photos and notes.
- All illicit points should be immediately reported to the City of Beavercreek project manager.

6.3 GENERAL METHODOLOGY TO STREAM ASSESSMENT MAPPING CHRONOLOGY

- Choose a segment of stream that will be assessed.
- Using two trucks, drop one truck off at the upstream end of the stream or tributary.
- Drive the second truck to start of the assessment area and begin in the USGS blue line stream or on a road close to the assessment area.
- Locate and attribute all of the stream defects and culverts 24" or larger walking upstream.
- A system of defects will be developed and attributed all the way up to the headwaters of each branch of the system or identified stream assessment area.

7. OFFICE AND FIELD GUIDELINES

This section outlines guidelines for the performance of daily QA procedures, data editing and review. This section also outlines the step-by-step process by which field data is processed and delivered (formatted properly) to the City GIS department.

7.1 DAILY FIELD QA PROCEDURES

At the end of each field-collection workday, the field crews will perform a quick QA check of the field data.

Daily Data Review

1. Briefly review data in ESRI Field Maps by activating desired layer and clicking the View Attribute Table button.

7.2 IN-DEPTH REVIEW AND DATA CORRECTION

An in-depth review of the data will be performed before the field staff leaves the project location so that any errors that need to be corrected can be corrected on the 10th day of the assessment.

1. ARC Map will be used access the attributes of structures and select missing attributes and features of concern.
2. Those selected features with errors will be exported and either corrected in the office, or a field visit will be scheduled to correct those errors.

Appendix D

Culvert Inspection Grid Sheets

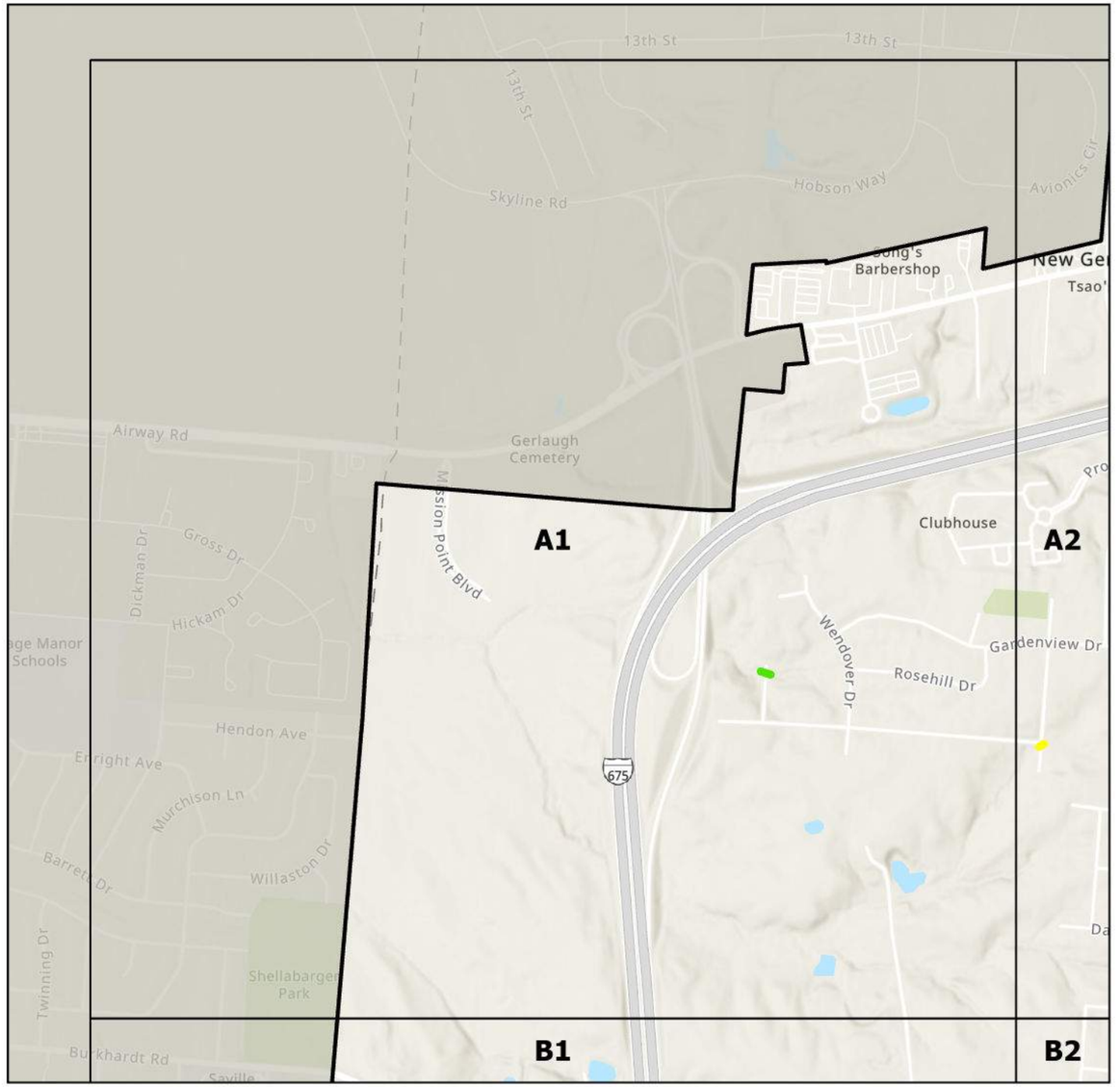
Culvert Inspection Map

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition



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B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
2	2	Grid Identification
3	3	

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

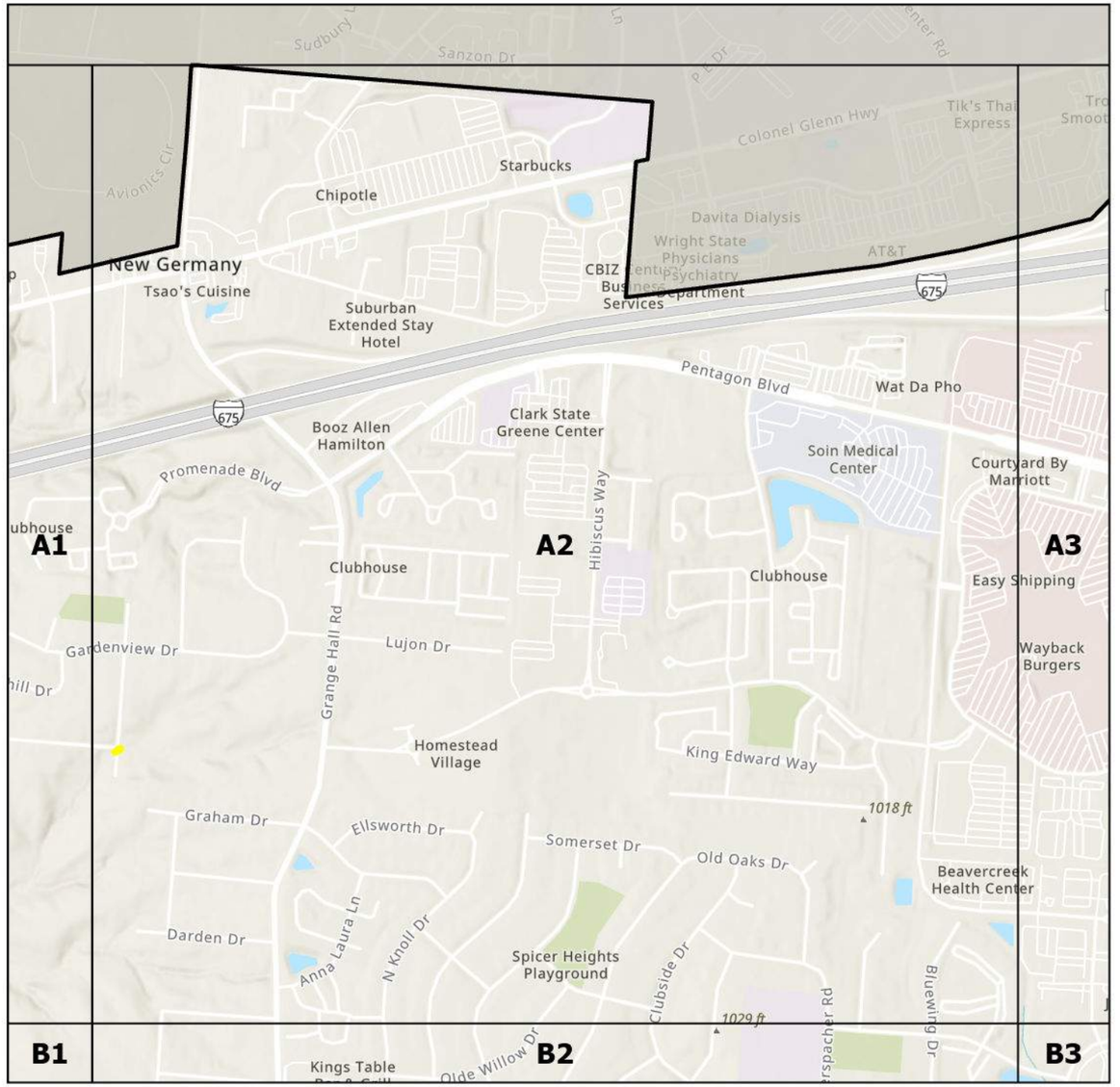
Culvert Inspection Map

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition



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B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
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0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

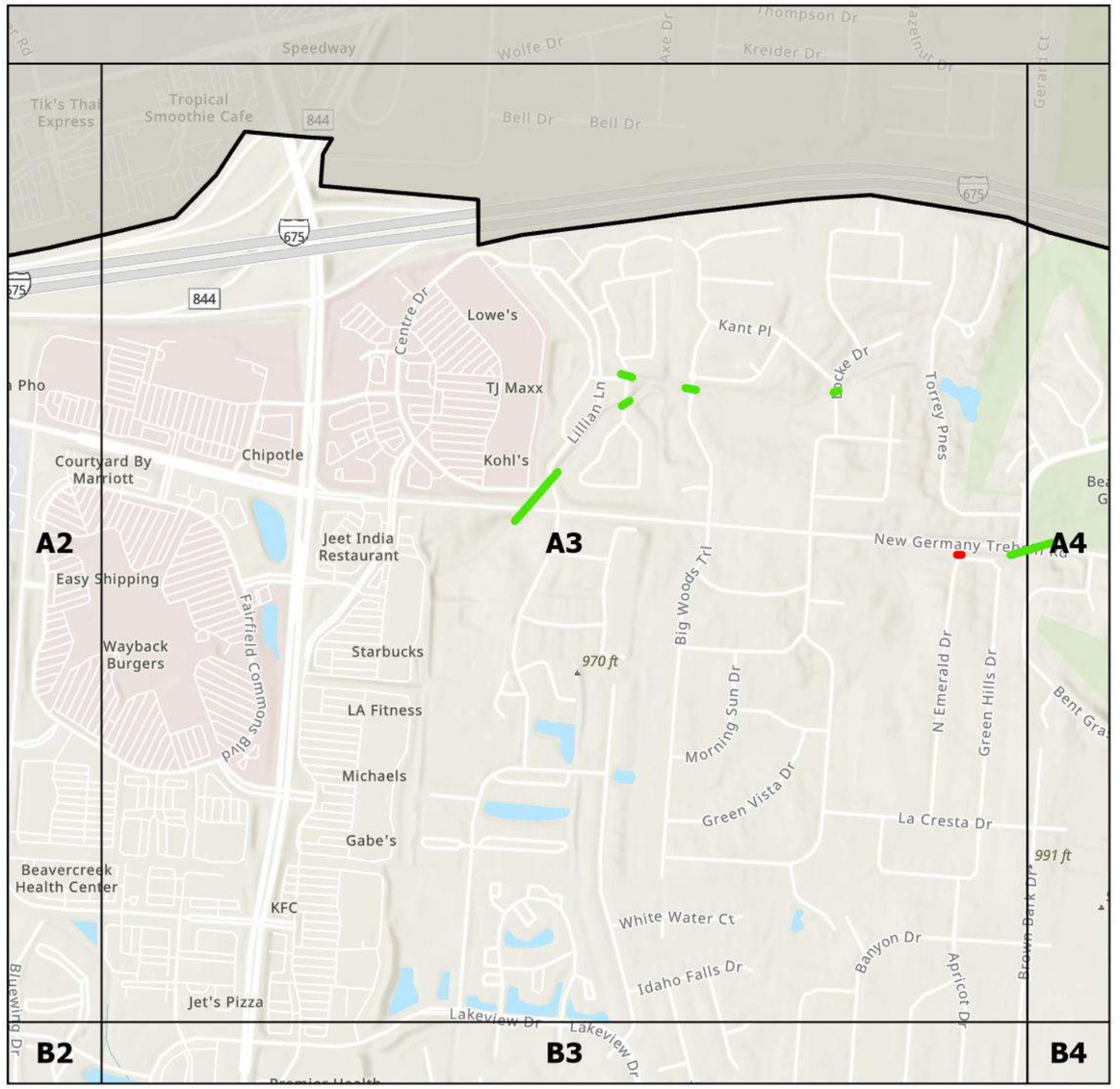
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

Structural Condition

Maintenance Condition



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B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

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WOOLPERT

8/5/2025

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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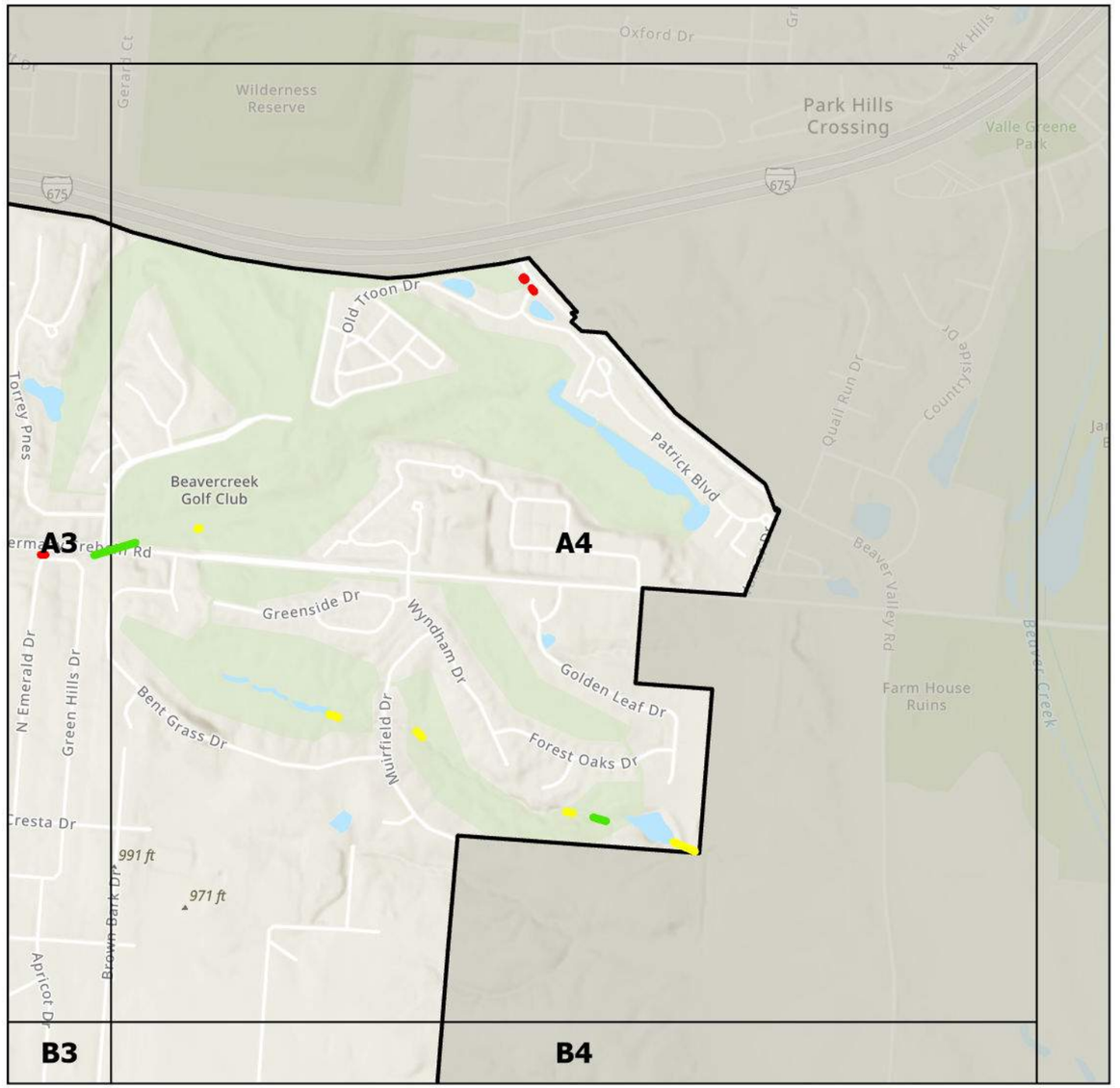

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B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

City Limit

Grid Identification

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

Culvert Inspection Map

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

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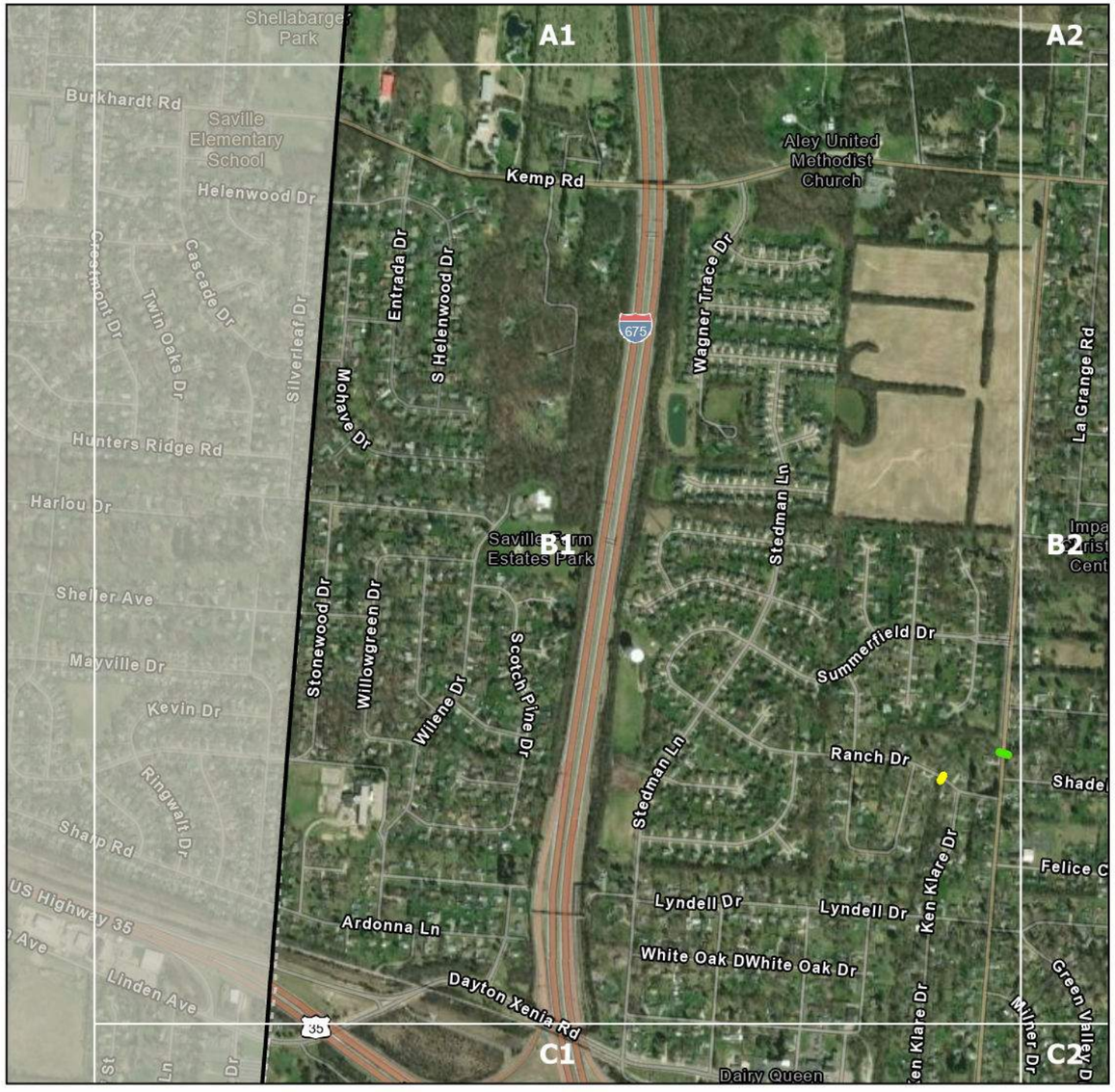

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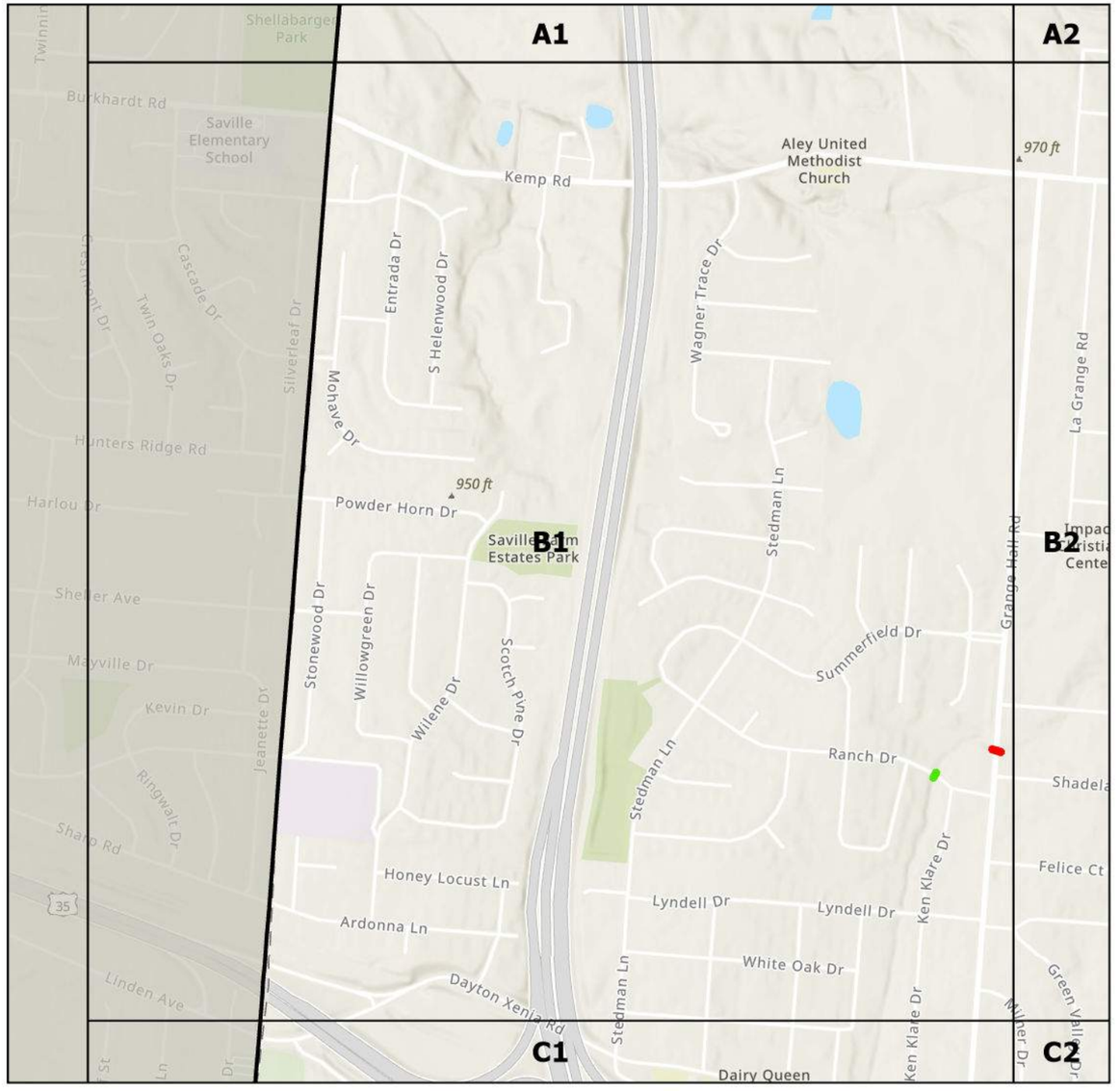

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8/5/2025

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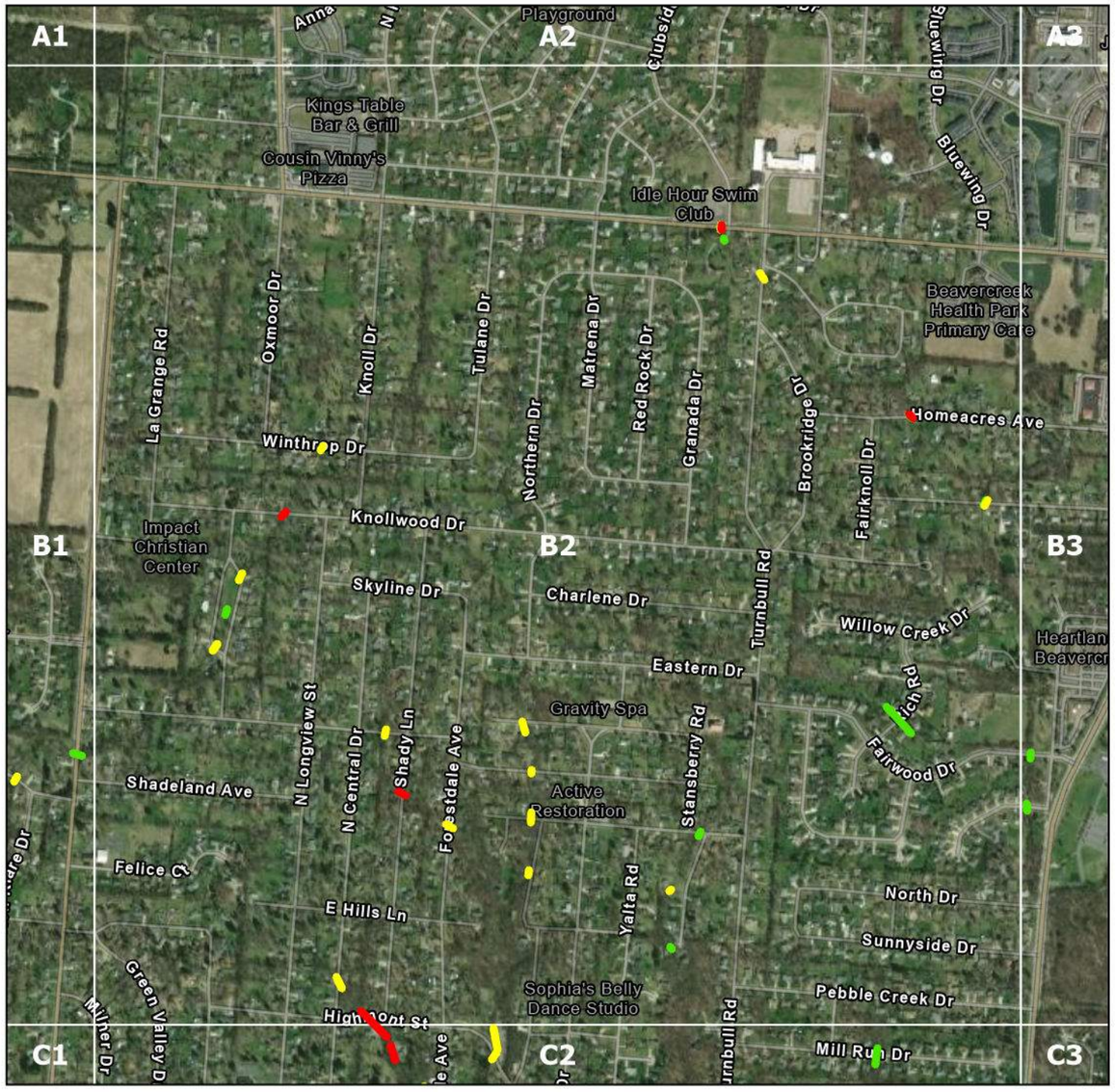

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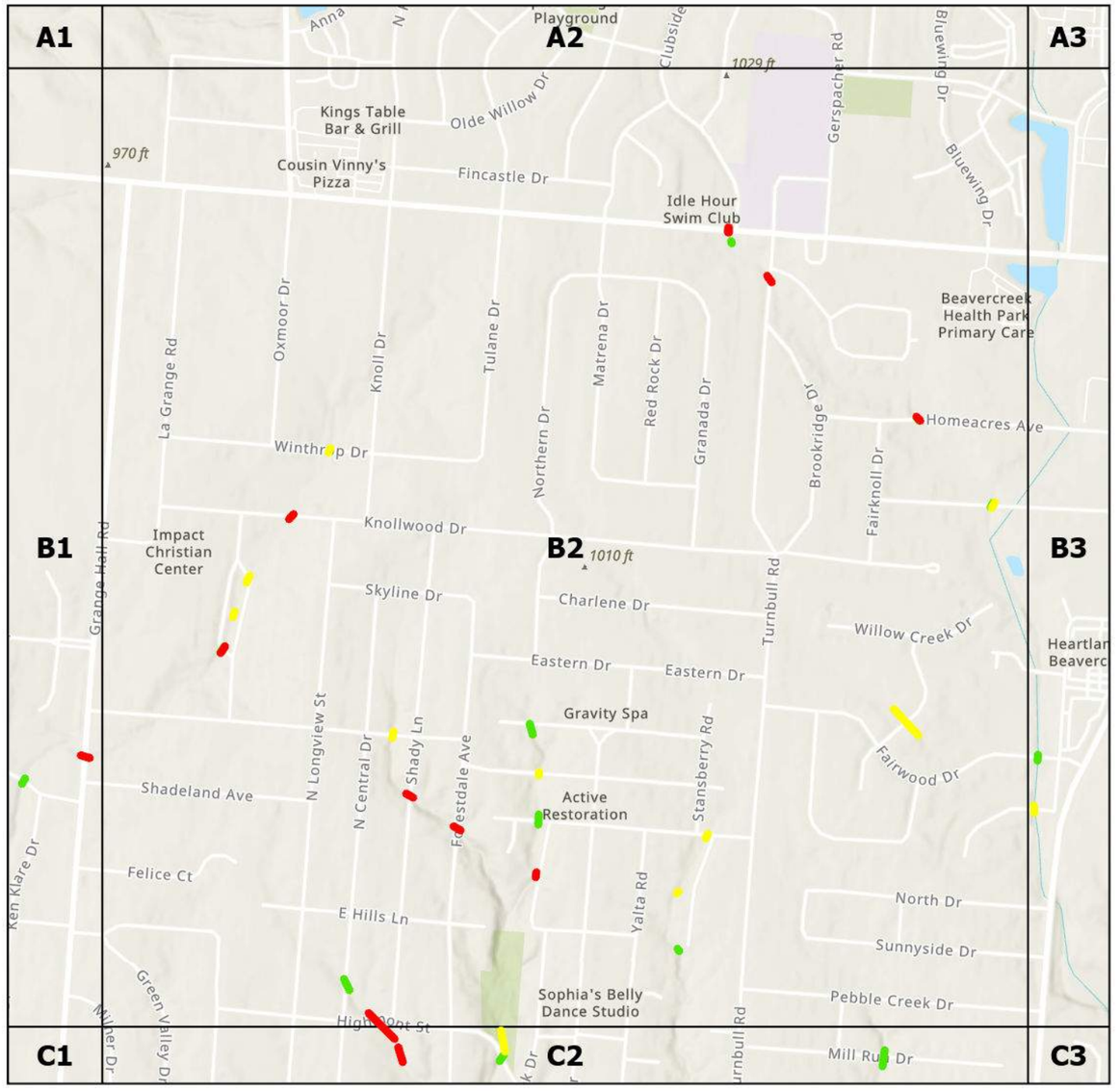

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WOOLPERT

8/5/2025

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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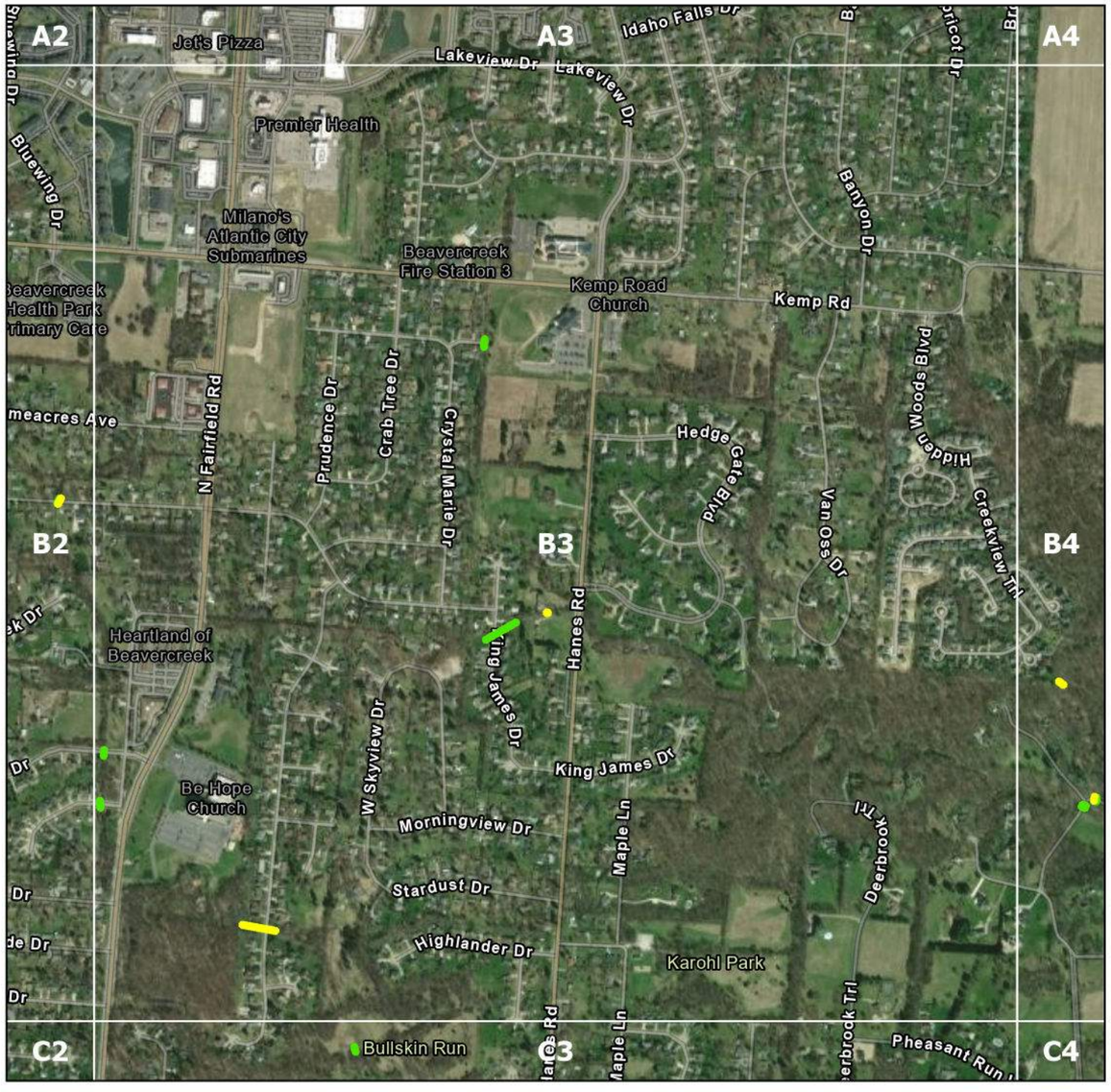

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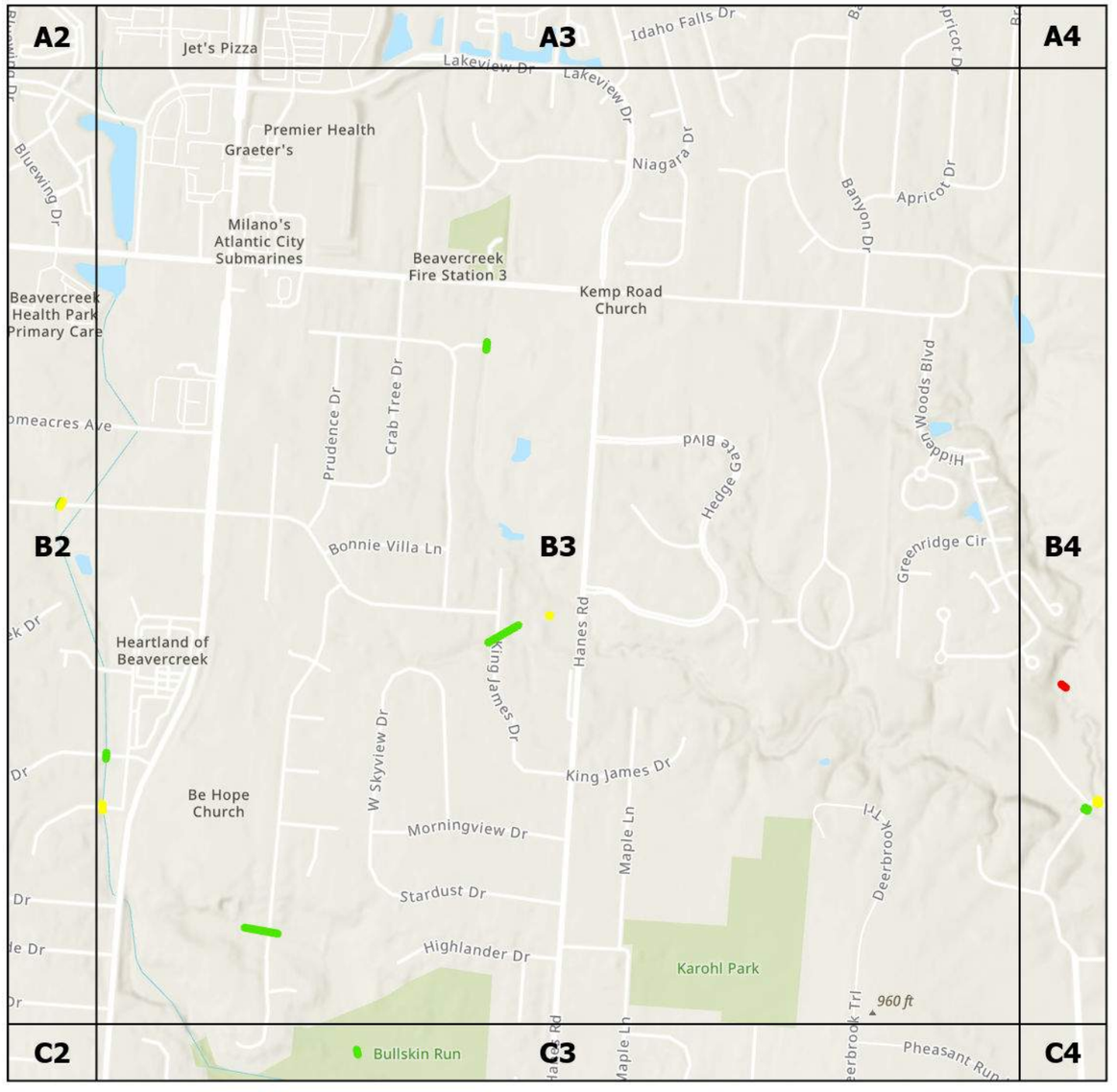

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B1	B2	B3	B4
C1	C2	C3	C4
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8/5/2025

Culvert Inspection Map

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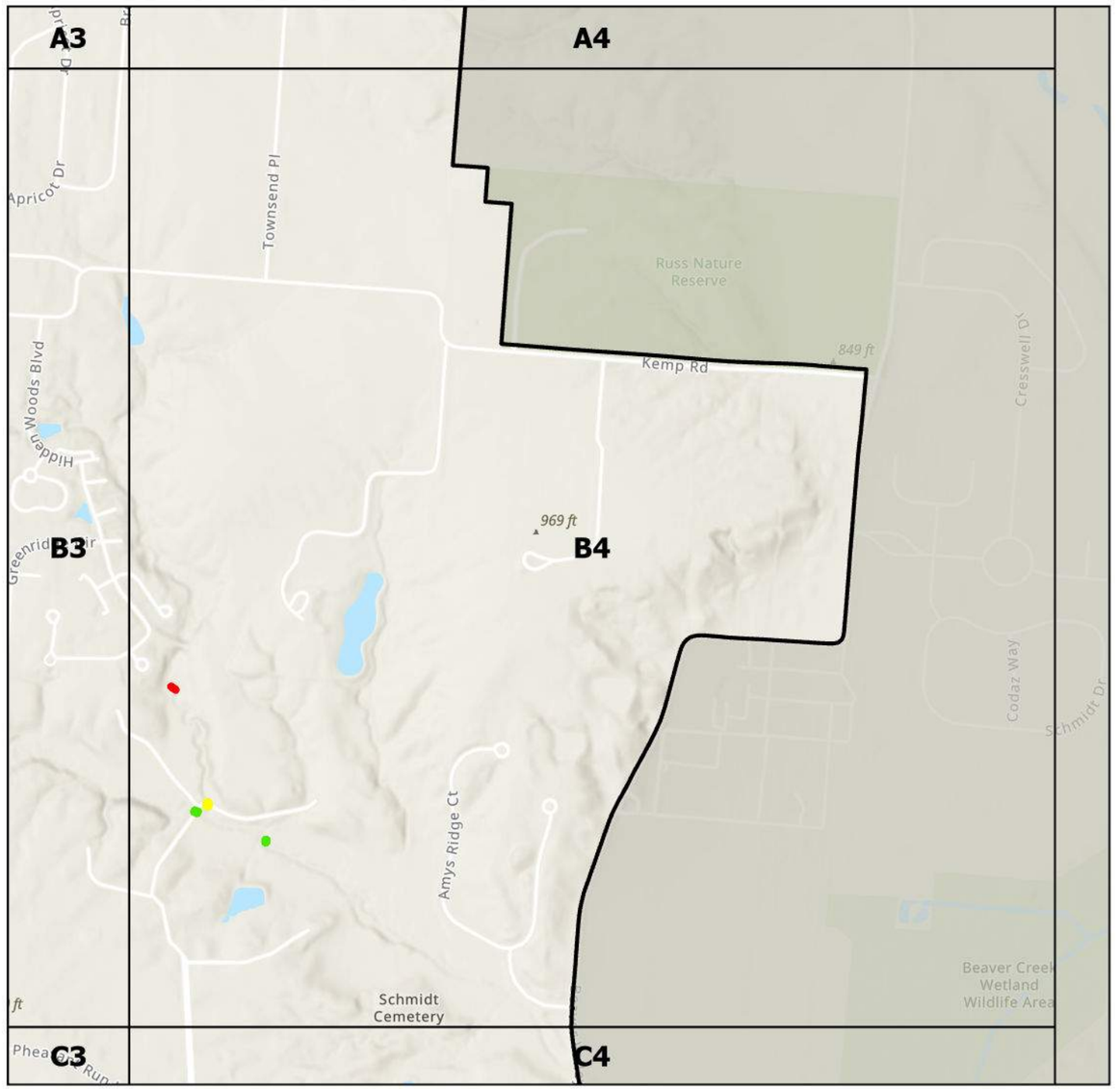
Structural Condition

Maintenance Condition



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8/5/2025

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CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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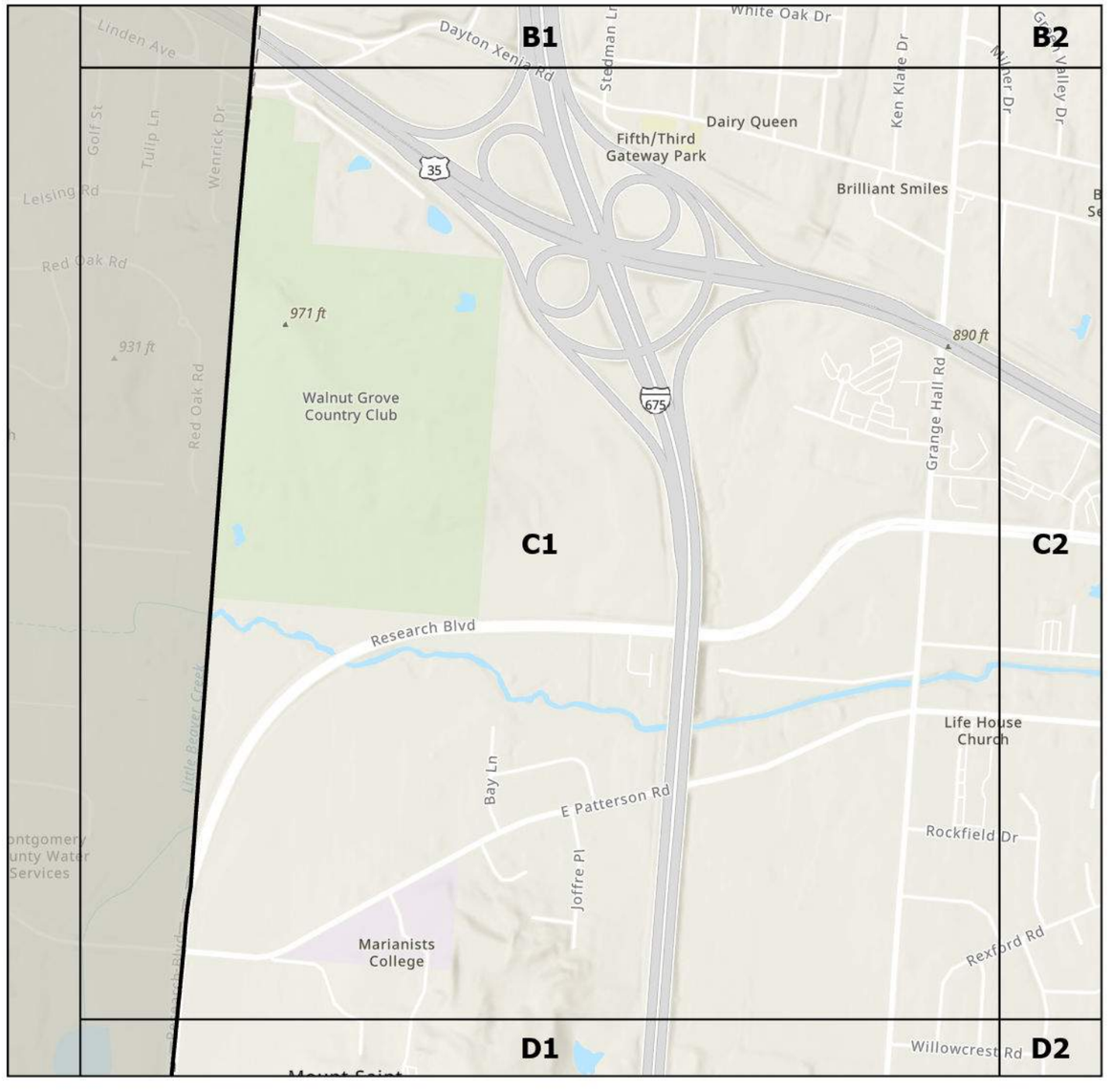

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WOOLPERT

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BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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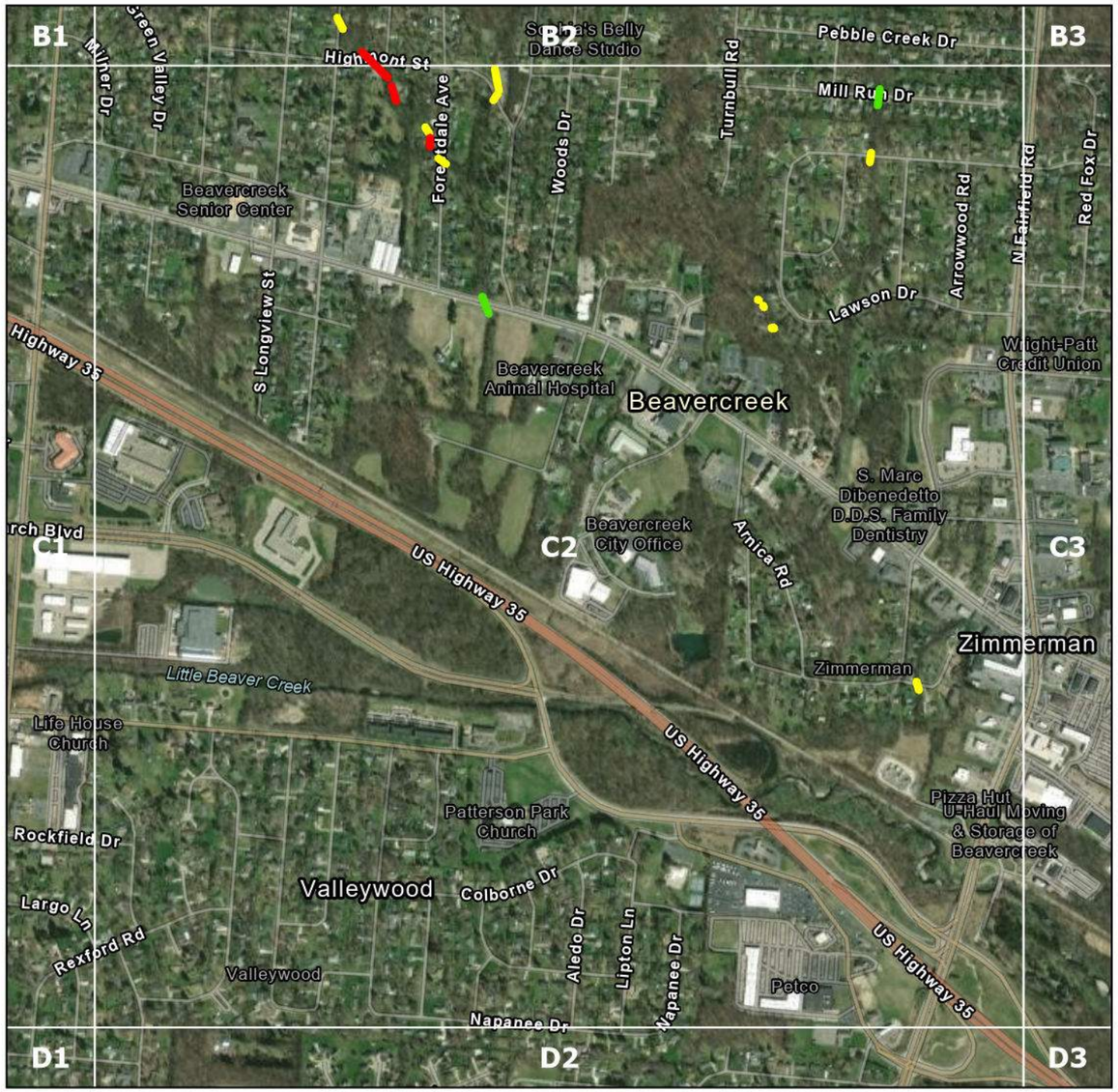

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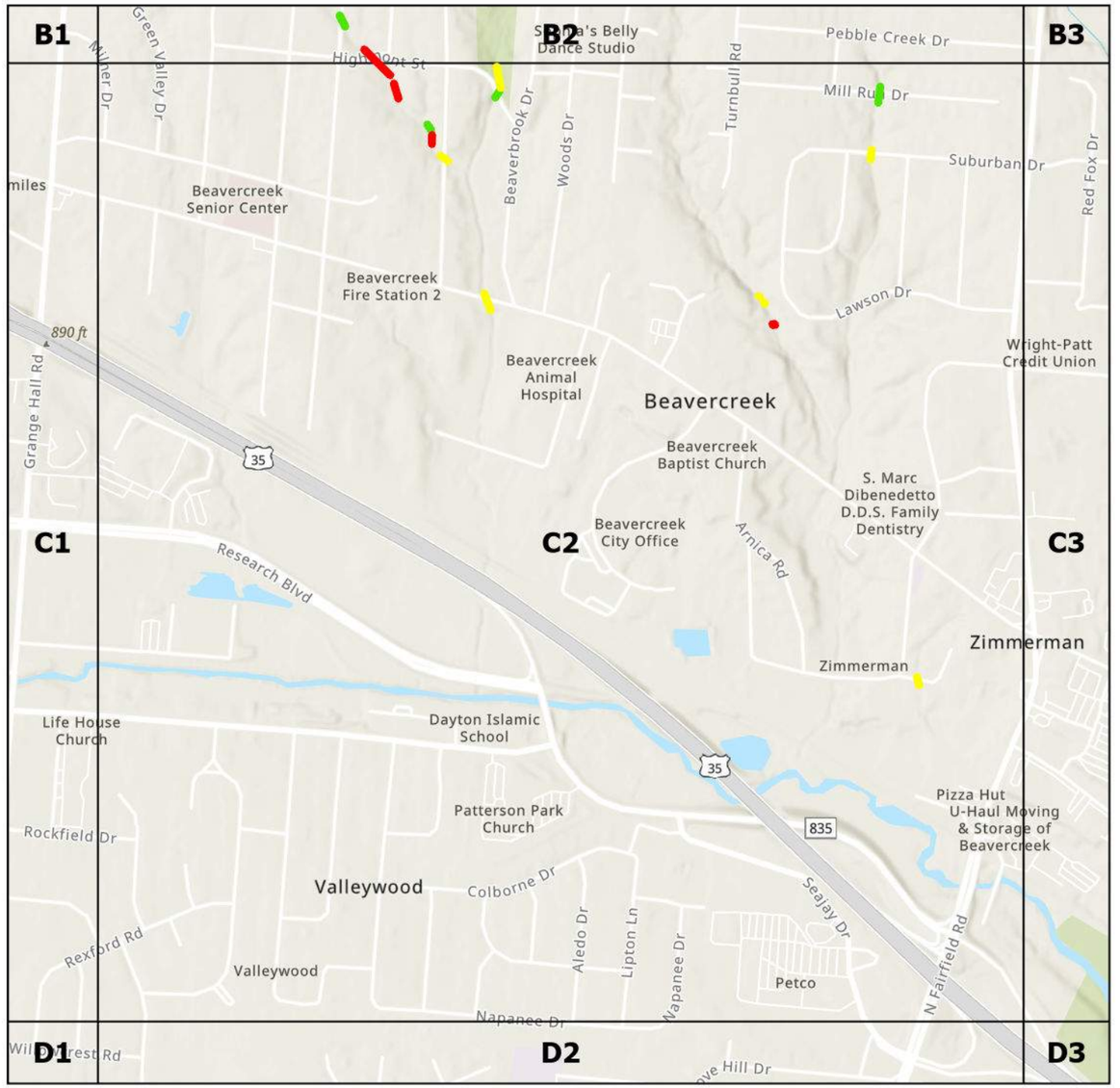

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WOOLPERT

8/5/2025

BEAVERCREEK DRAINAGE MASTER PLAN
CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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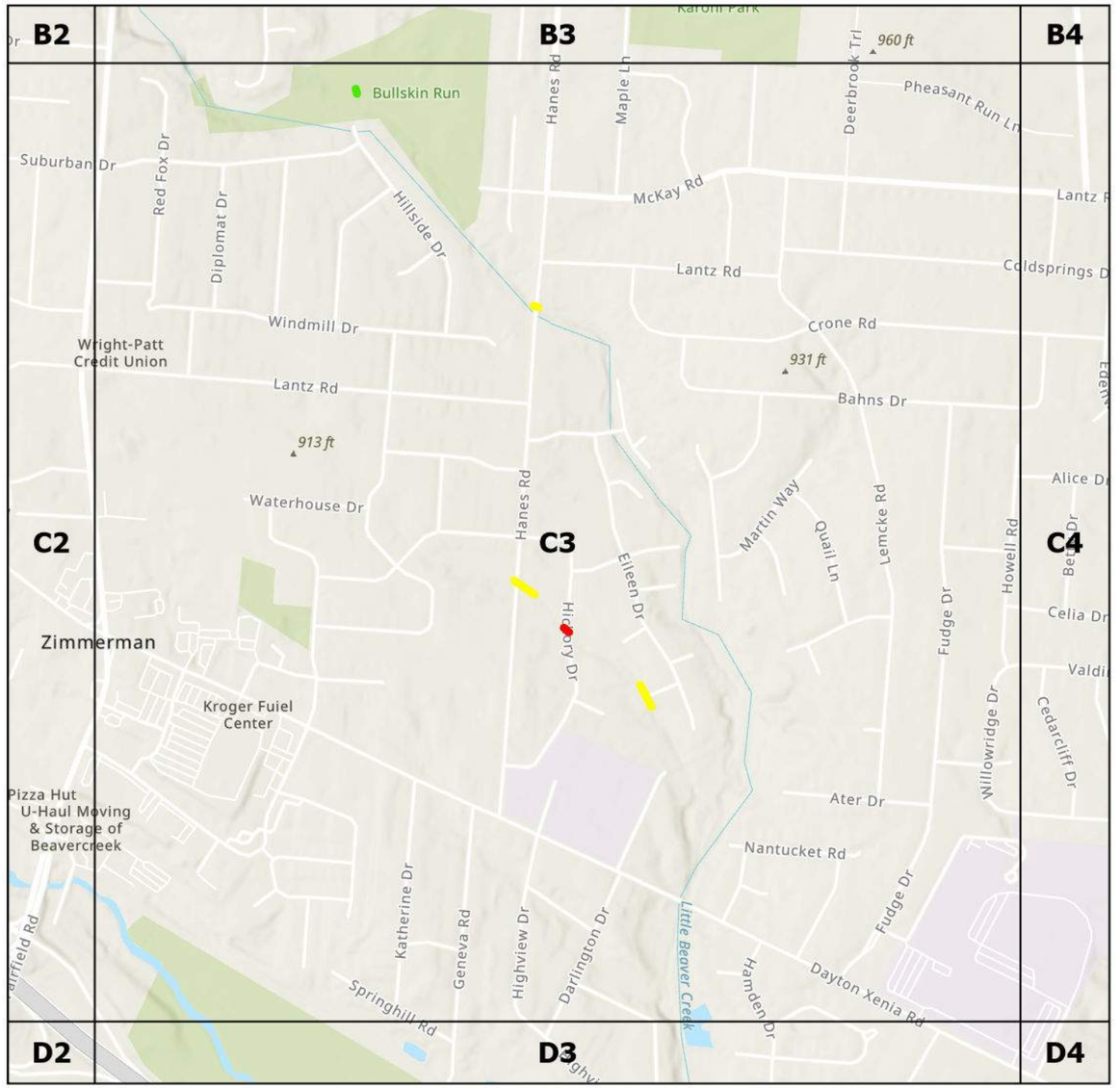
Maintenance Condition



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WOOLPERT

8/5/2025

Culvert Inspection Map

BEAVERCREEK DRAINAGE MASTER PLAN
CITY OF BEAVERCREEK, OH

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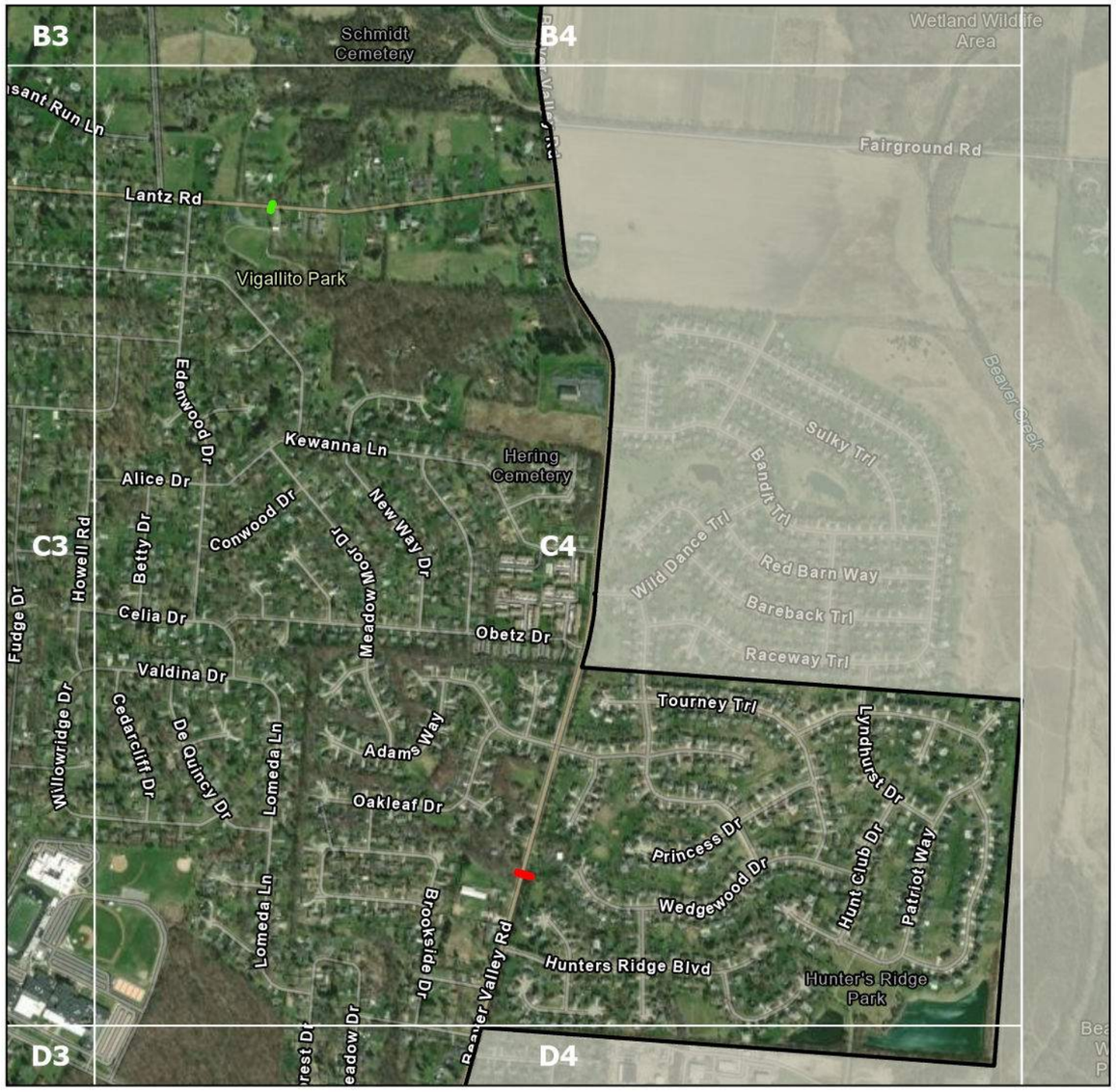

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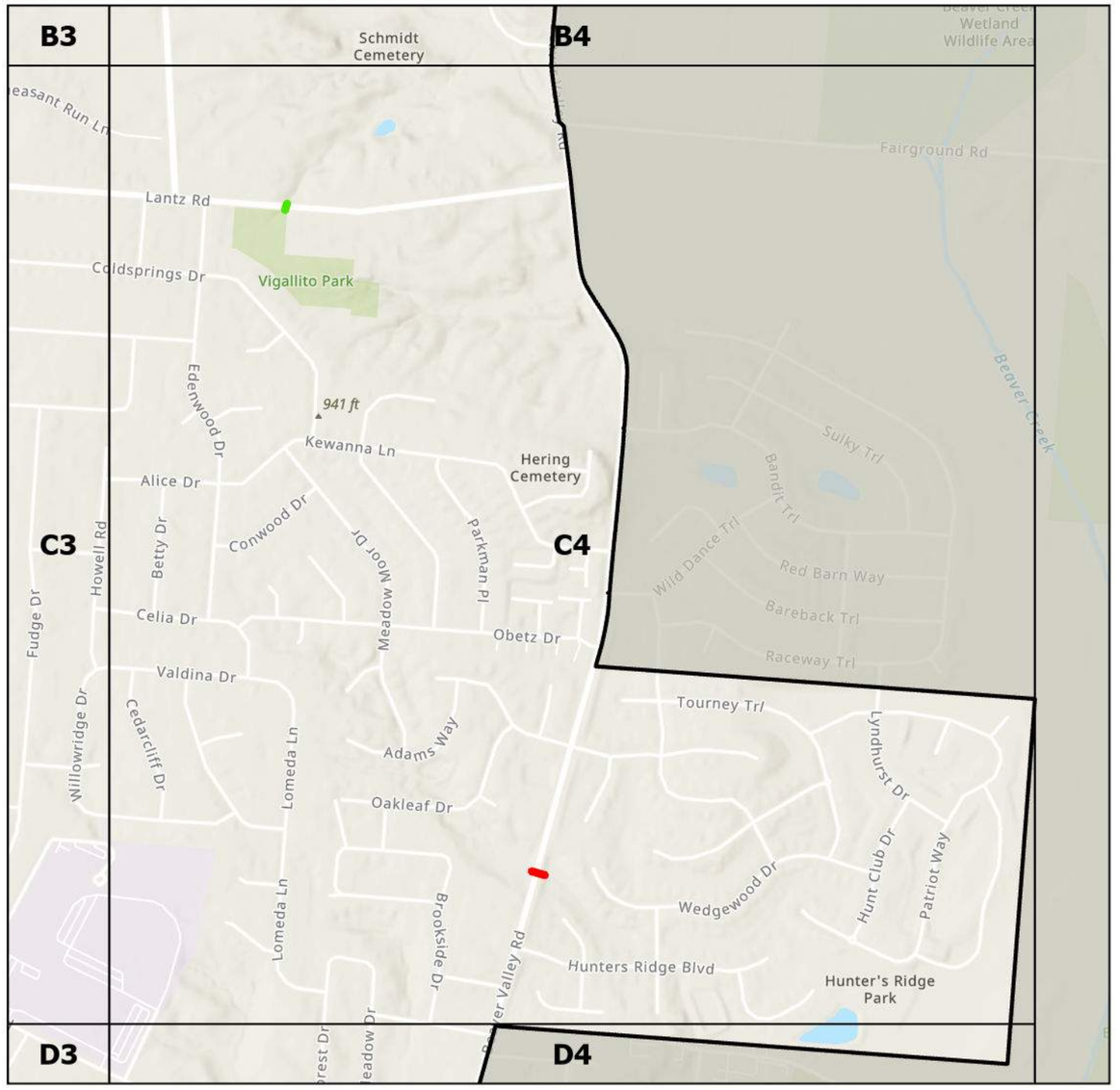

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WOOLPERT

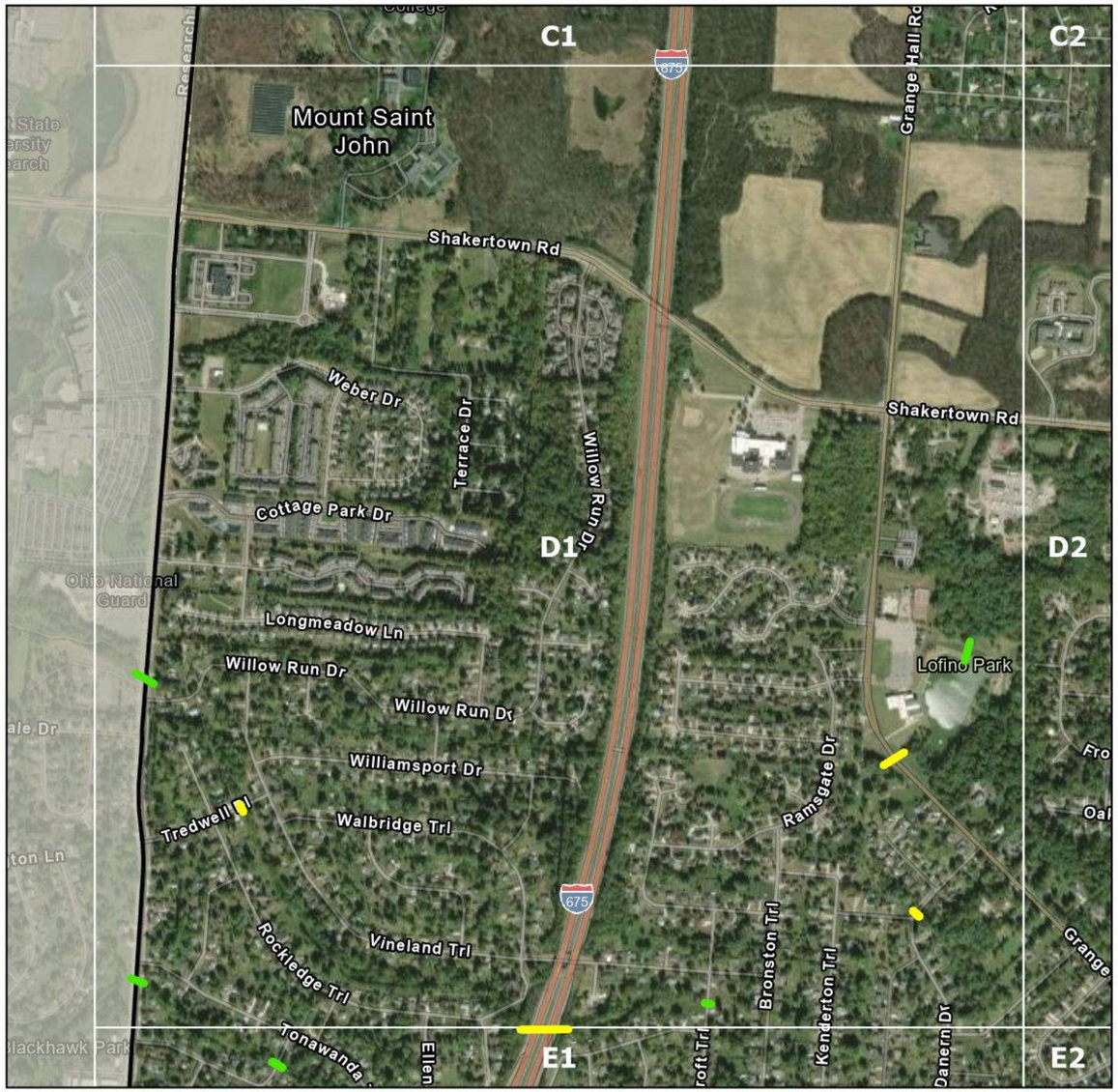
8/5/2025

Culvert Inspection Map

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition



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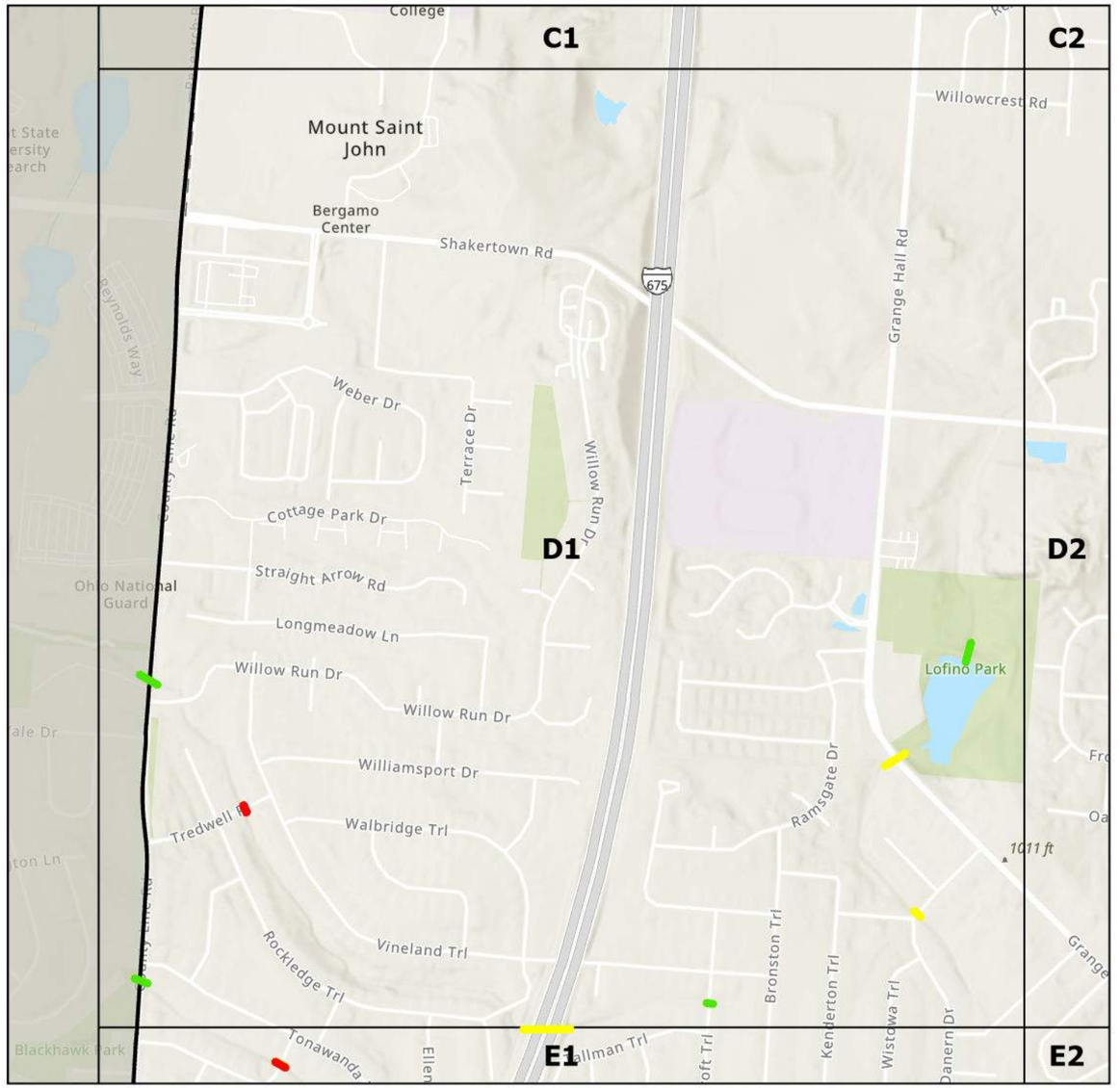

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NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
2	2	Grid Identification
3	3	

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

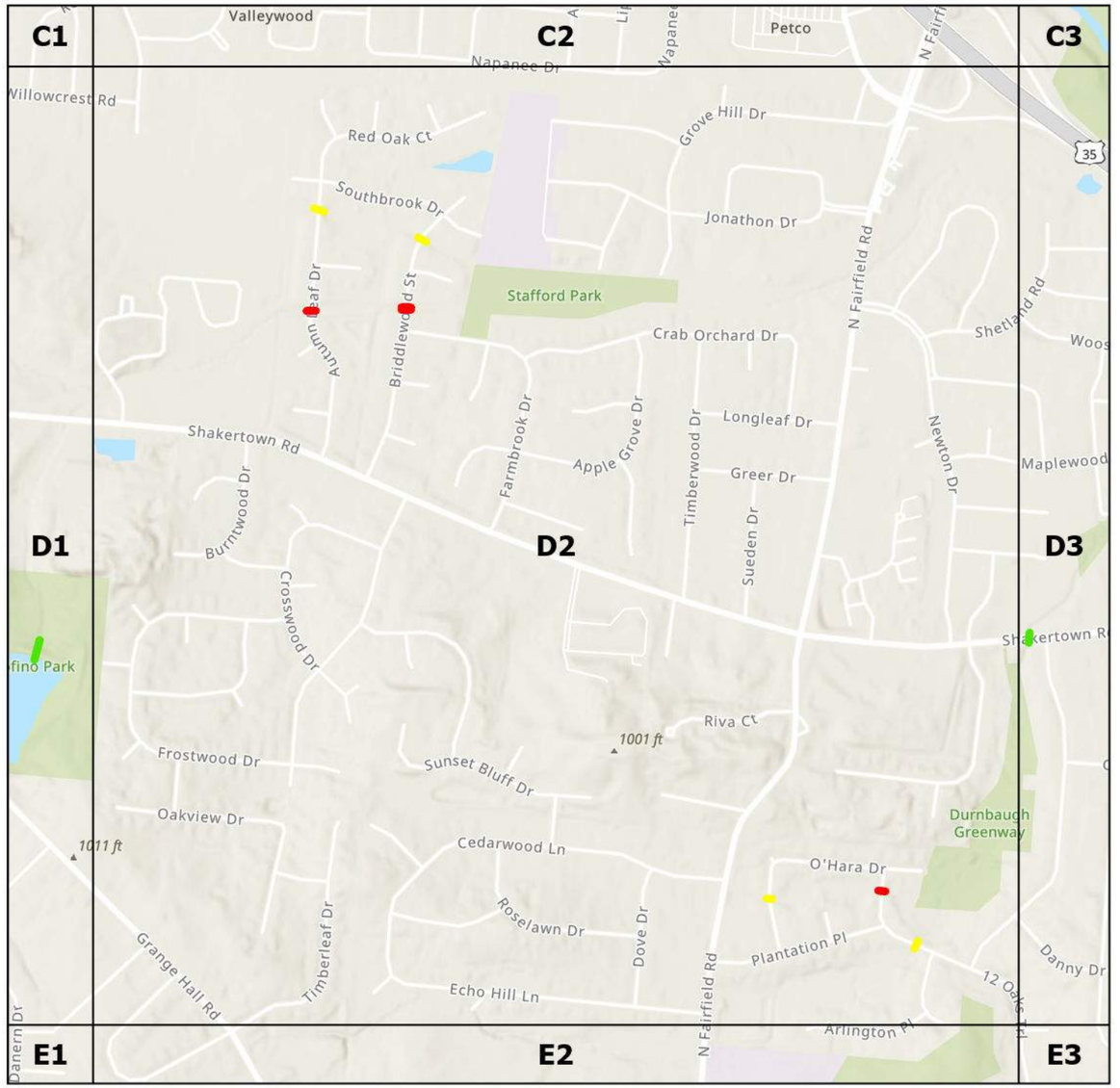
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

Structural Condition

Maintenance Condition



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NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
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3	3	

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

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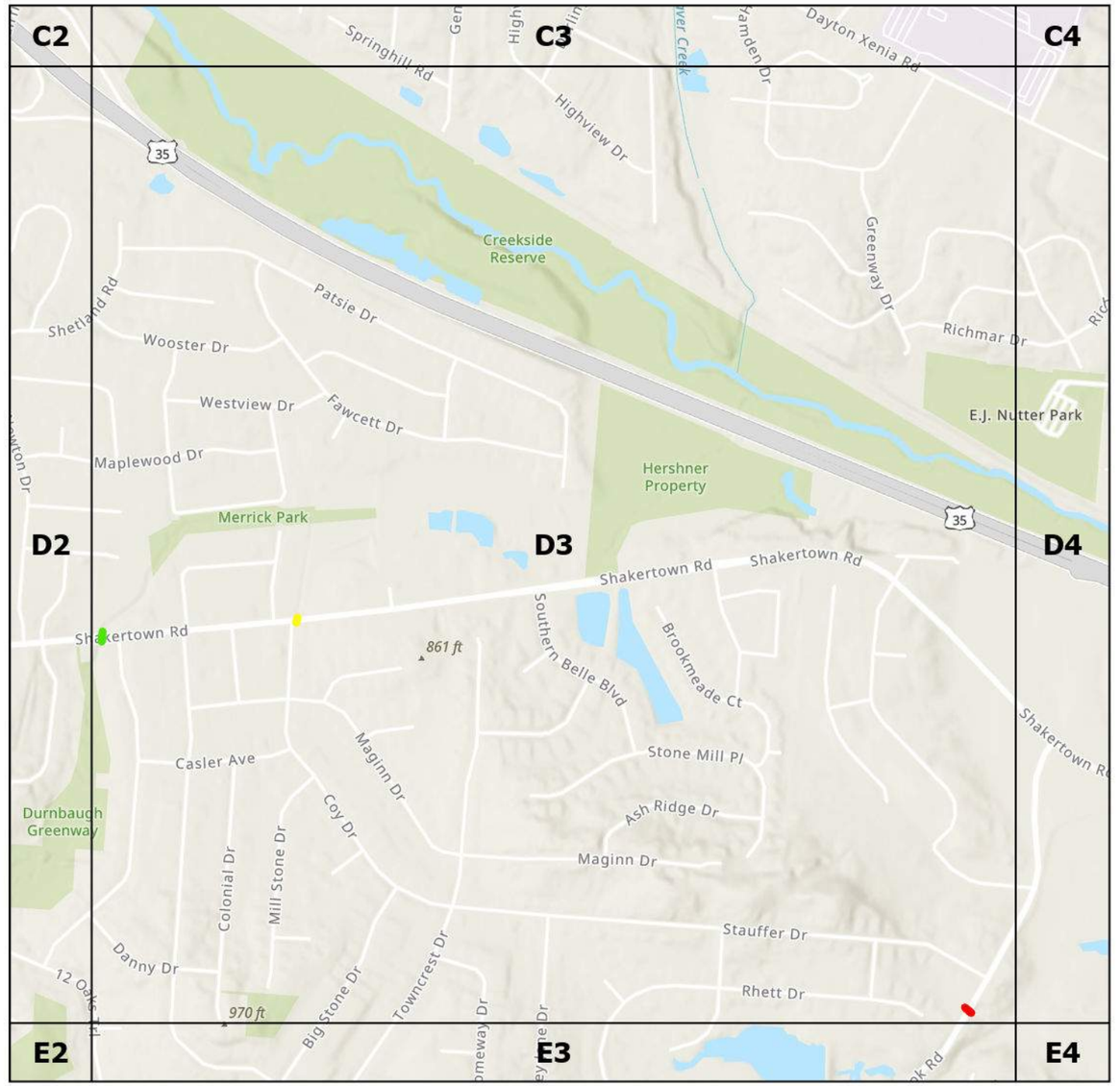

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C1	C2	C3	C4
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WOOLPERT

8/5/2025

Culvert Inspection Map

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CITY OF BEAVERCREEK, OH

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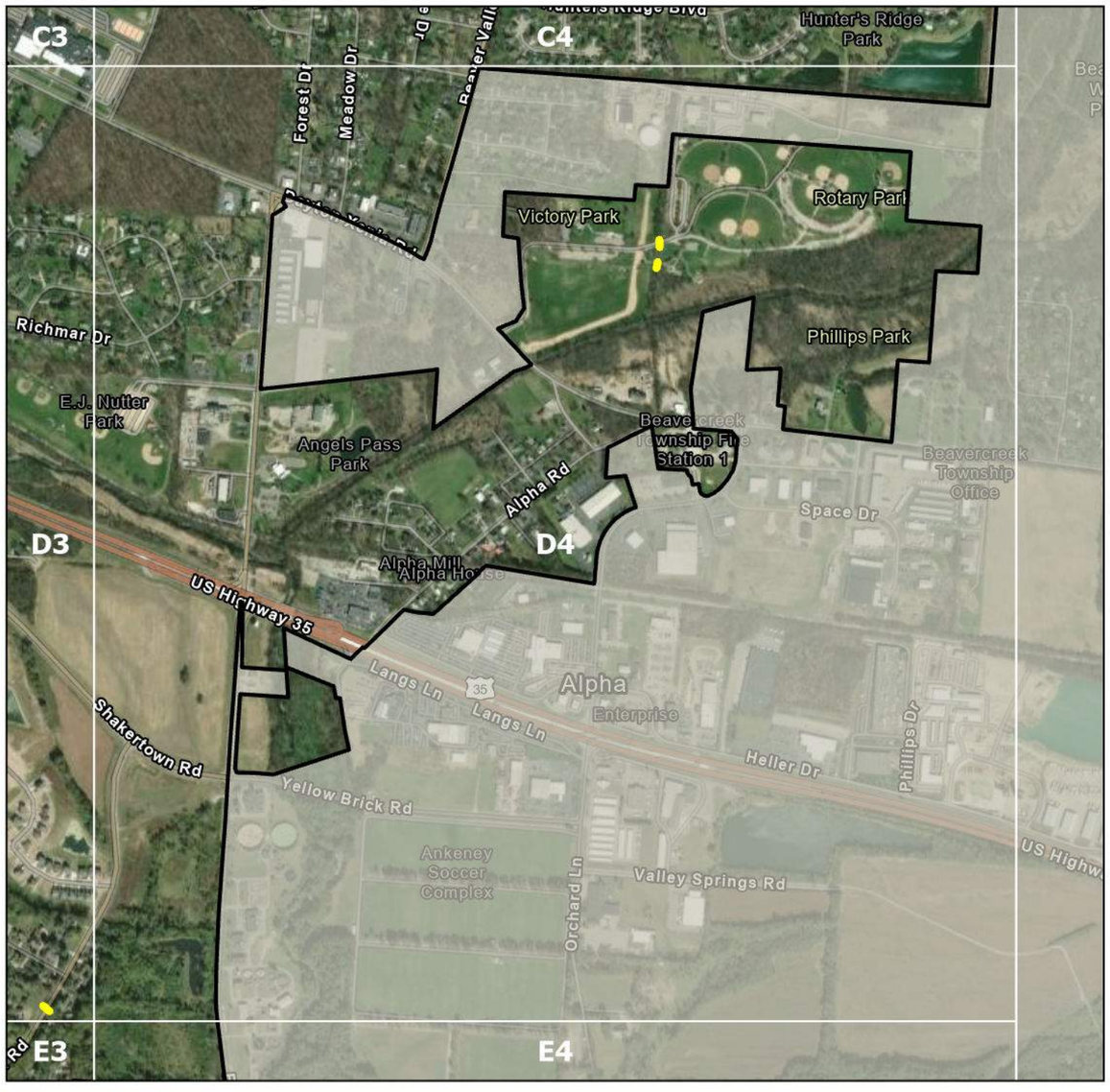

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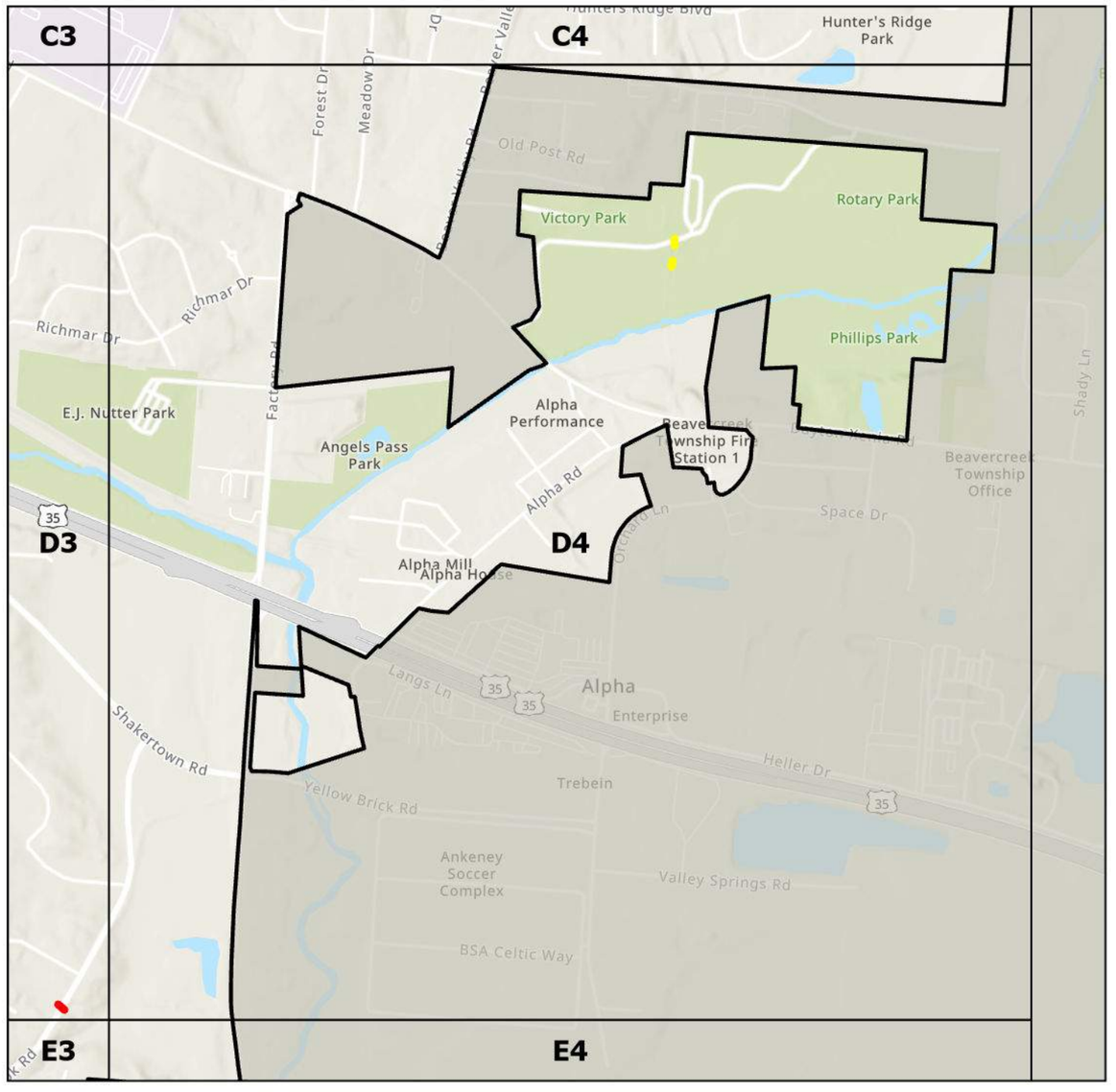

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C1	C2	C3	C4
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NOTES:

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Legend

Structural Score	Maintenance Score	
1	1	City Limit
2	2	Grid Identification
3	3	

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

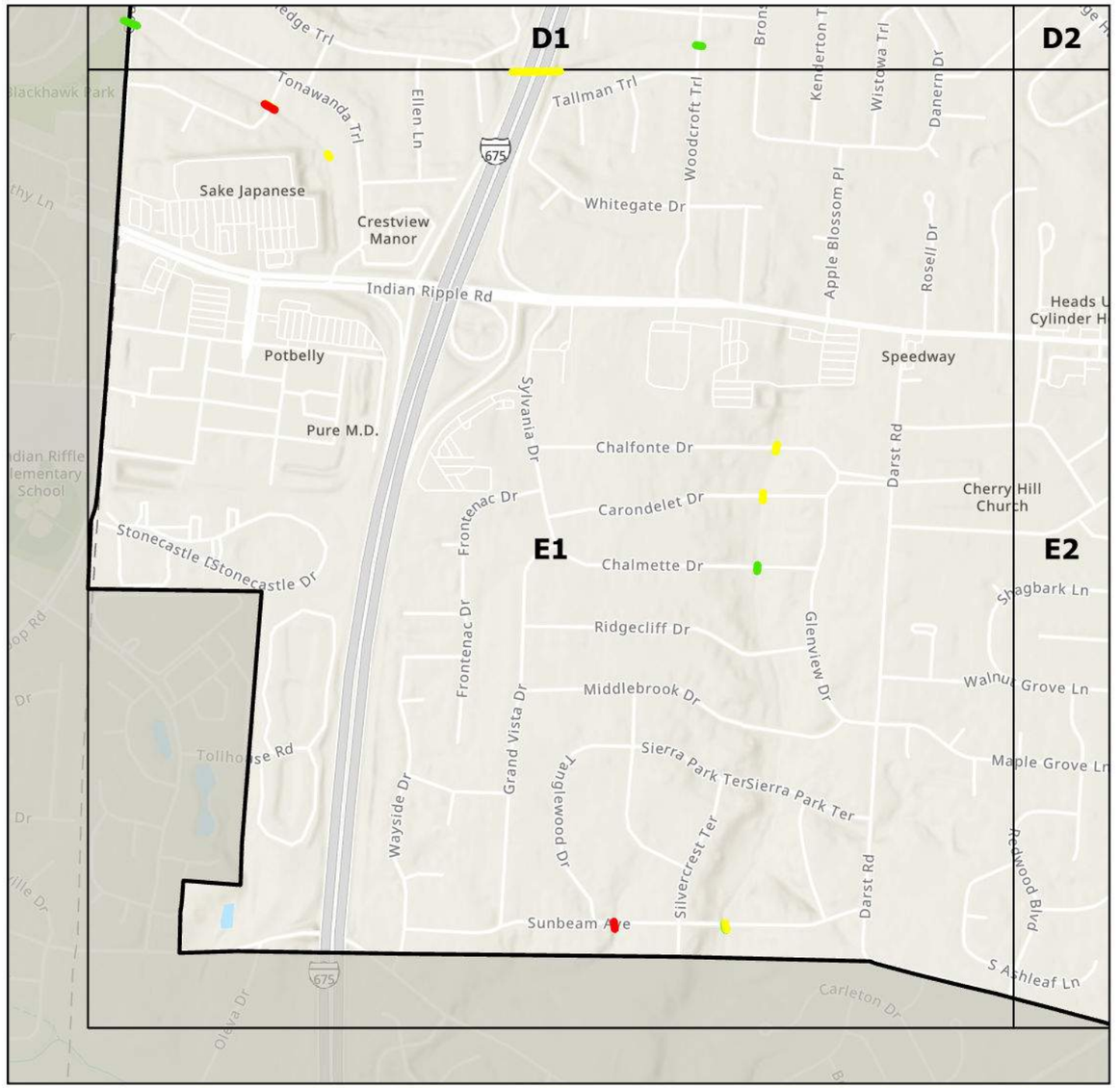
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

Structural Condition

Maintenance Condition



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WOOLPERT

8/5/2025

Culvert Inspection Map

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CITY OF BEAVERCREEK, OH

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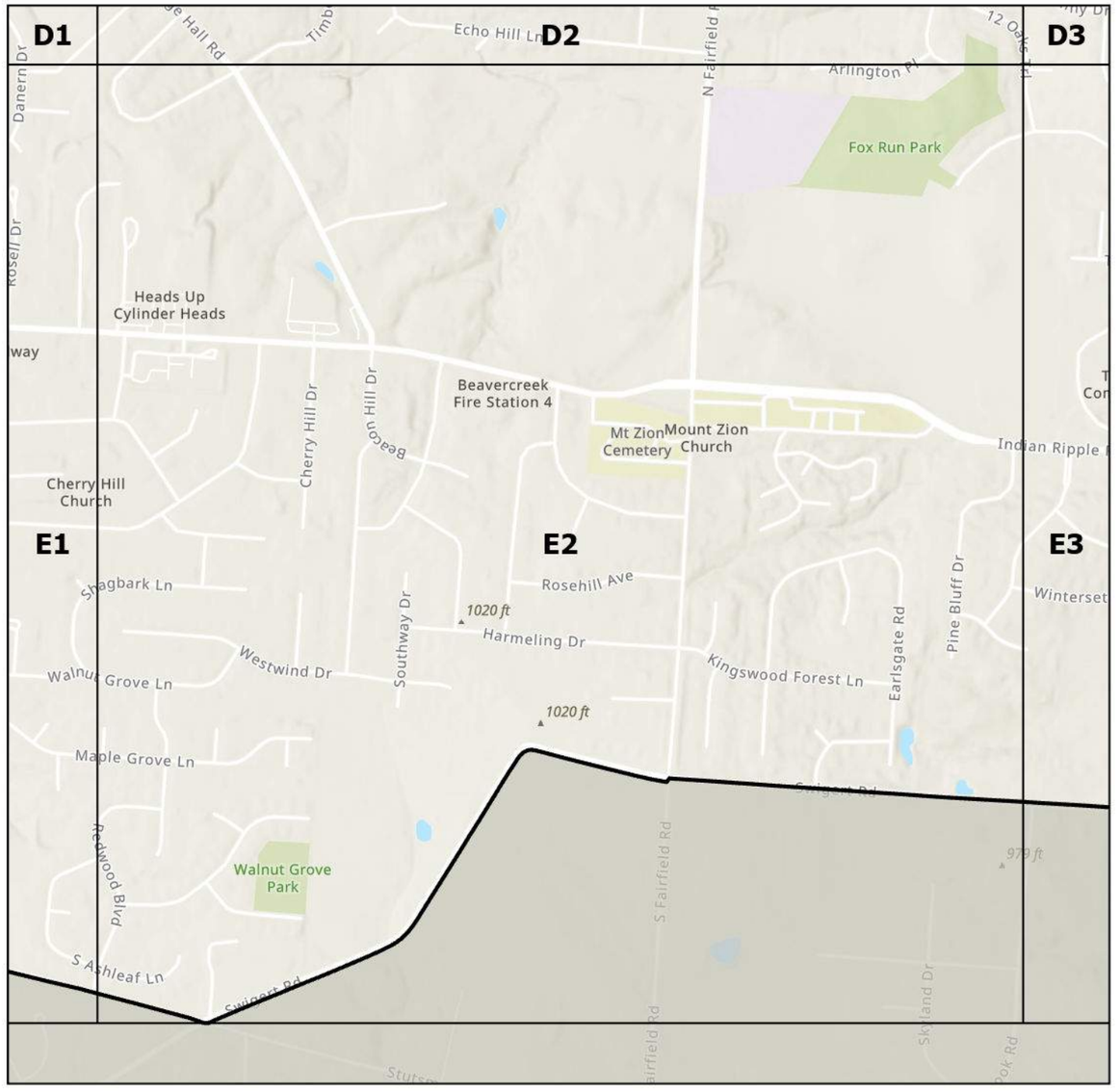

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NOTES:

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Legend

Structural Score	Maintenance Score
1	1
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3	3

City Limit
Grid Identification

0 0.25 0.5 1 Miles

WOOLPERT

8/5/2025

Culvert Inspection Map

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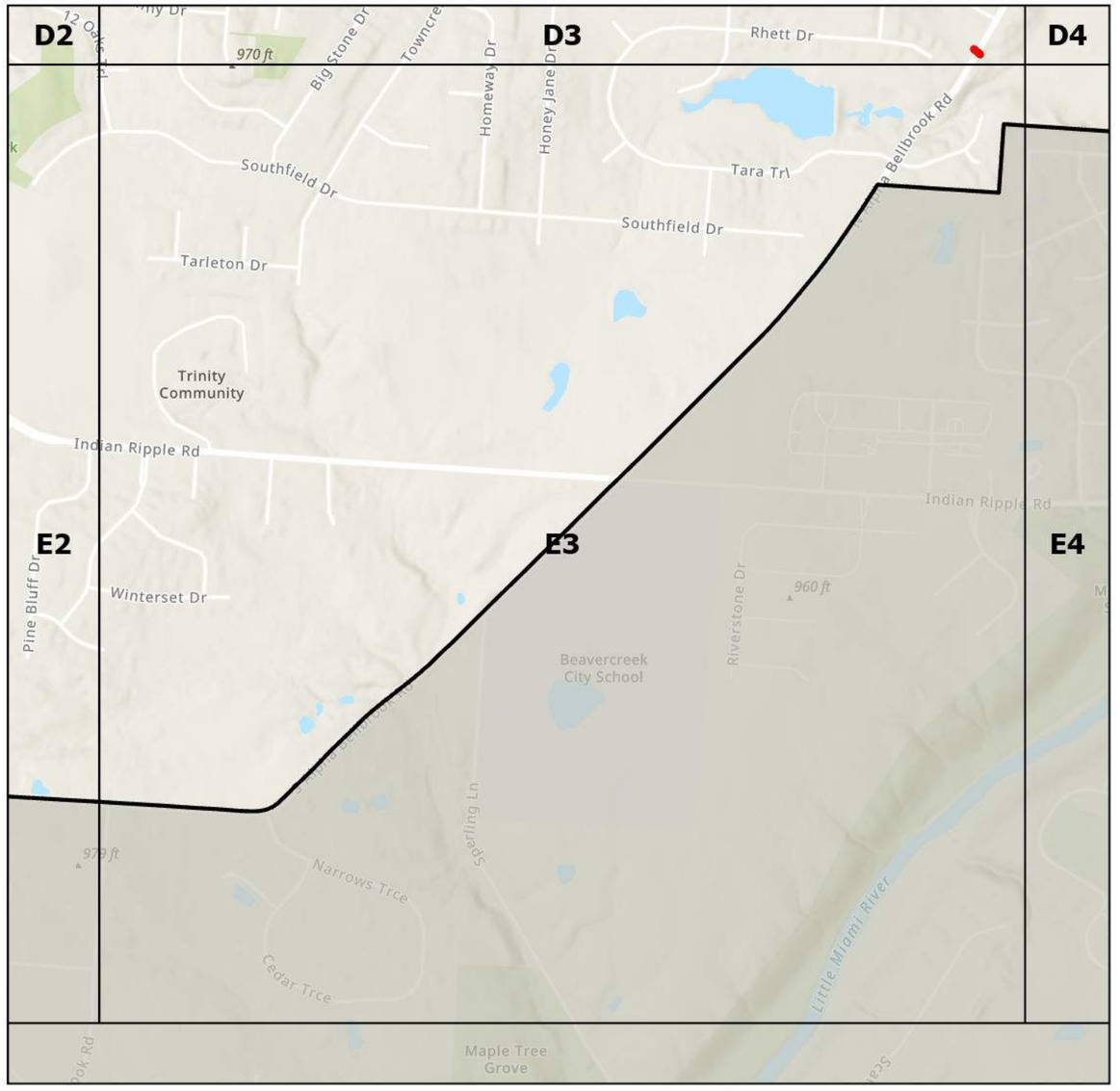

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C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
2	2	Grid Identification
3	3	

0 0.25 0.5 1 Miles

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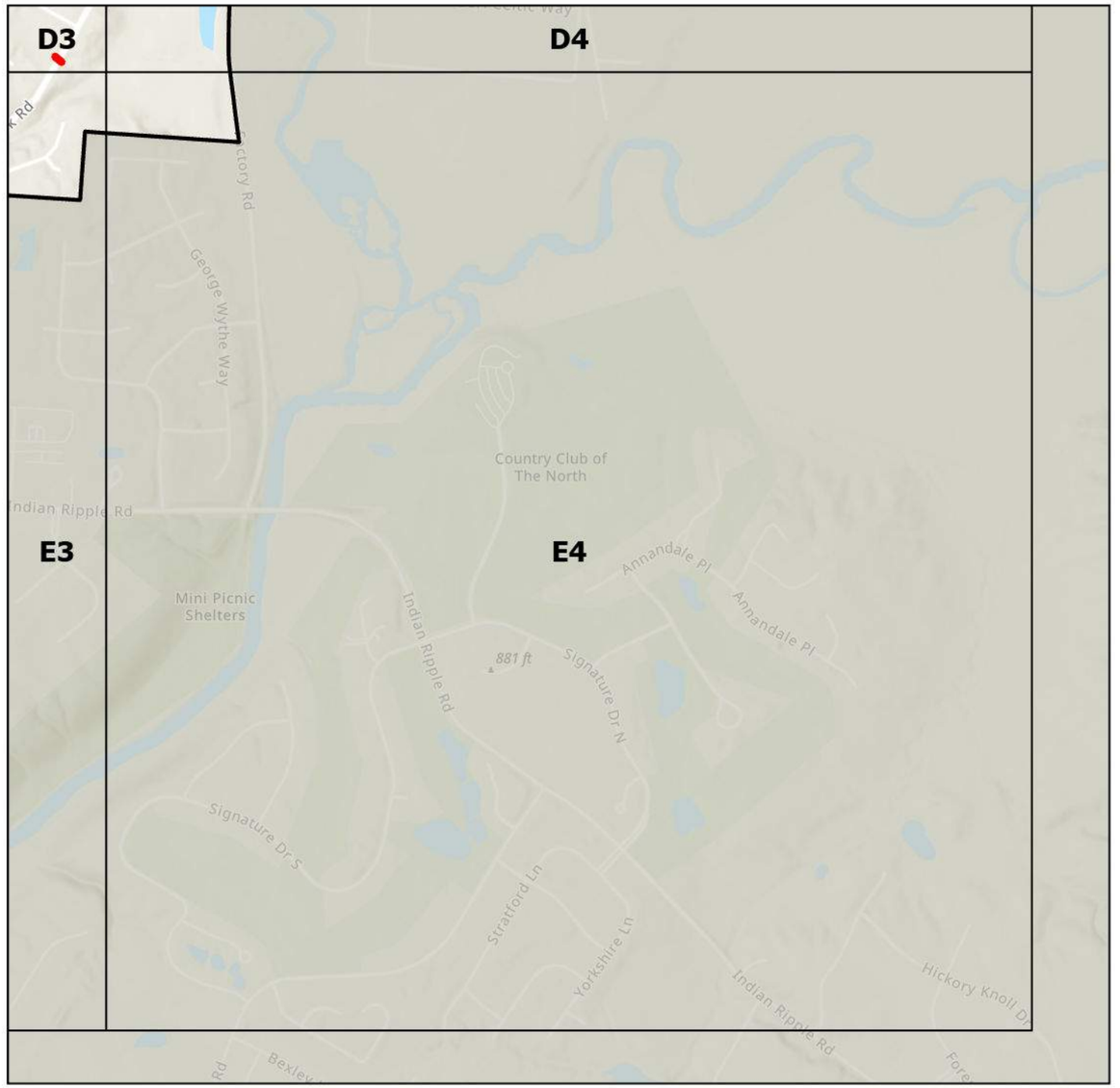
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Culvert Inspection Map

Structural Condition

Maintenance Condition



A1	A2	A3	A4
B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

NOTES:

N

Legend

Structural Score	Maintenance Score	
1	1	City Limit
2	2	Grid Identification
3	3	

0 0.25 0.5 1 Miles

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Appendix E

Culvert Cutsheets

Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A1_01

Structure Attributes

Culvert Shape: Circular

Culvert Material: CMP

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 80

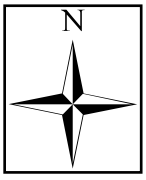
Field Inspection

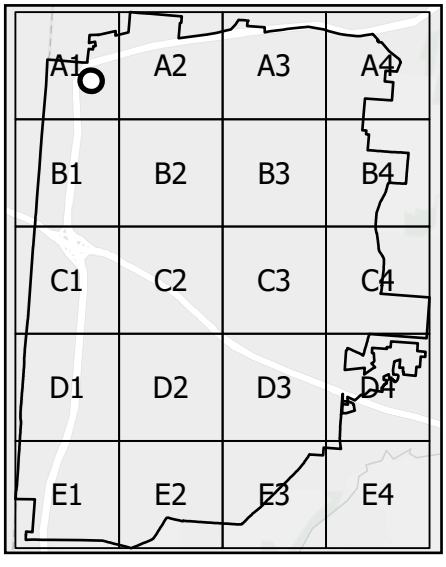
Structural Score: 1

Maintenance Score: 1

Upstream Elevation (ft): 888.07

Downstream Elevation (ft): 883.98





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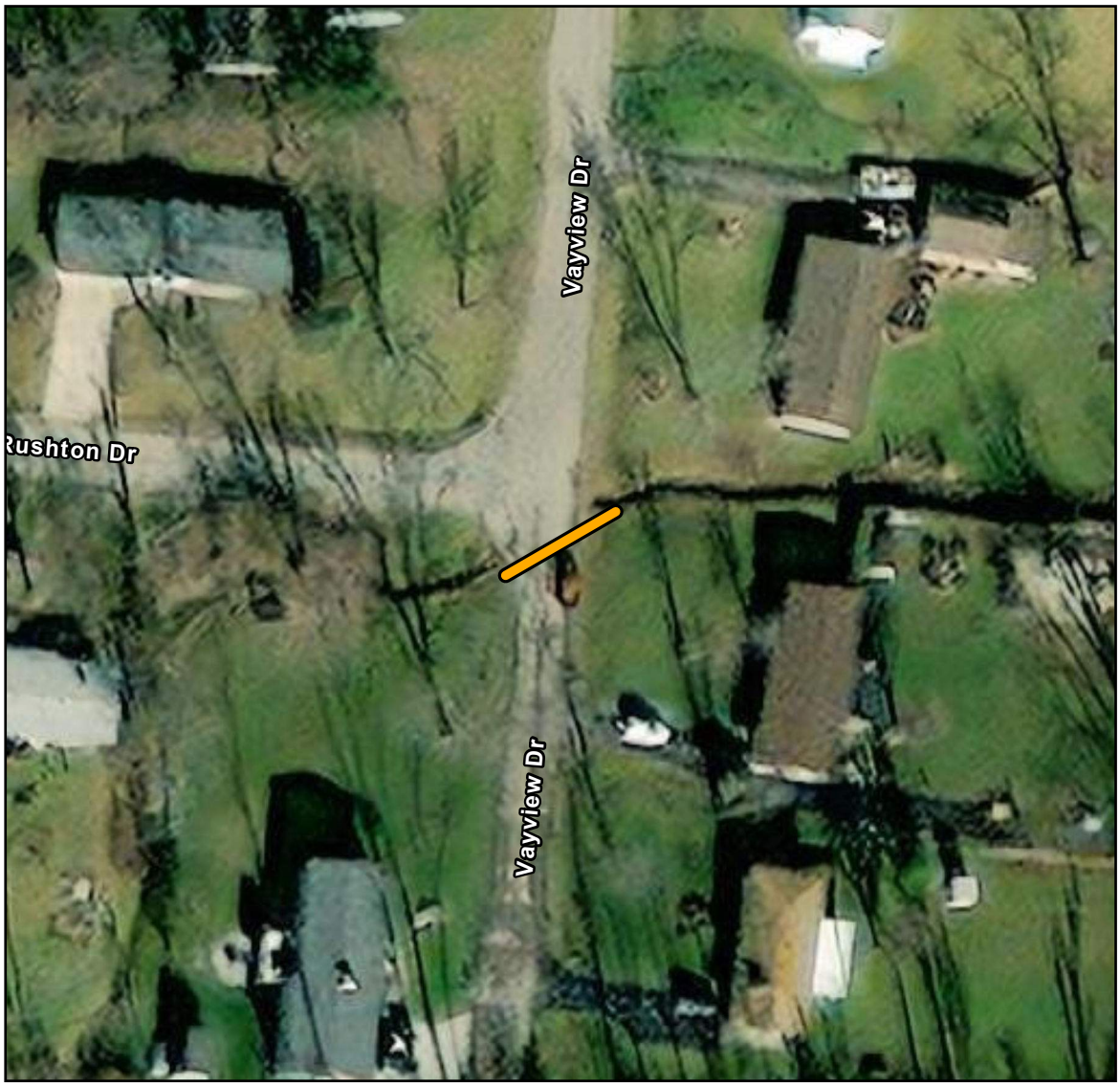
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

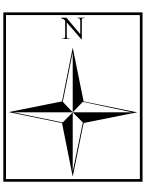
Culvert ID: A2_01

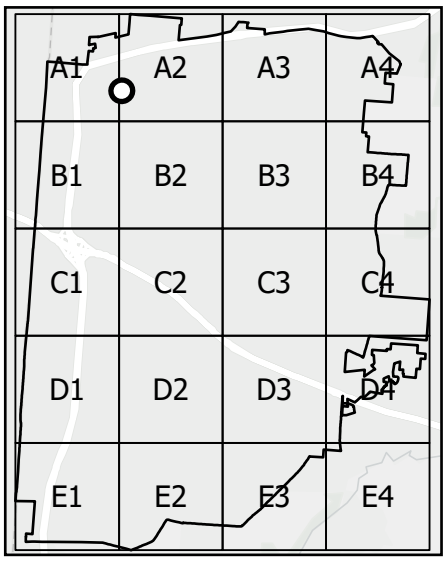
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 44

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 943.7
Downstream Elevation (ft): 943.13





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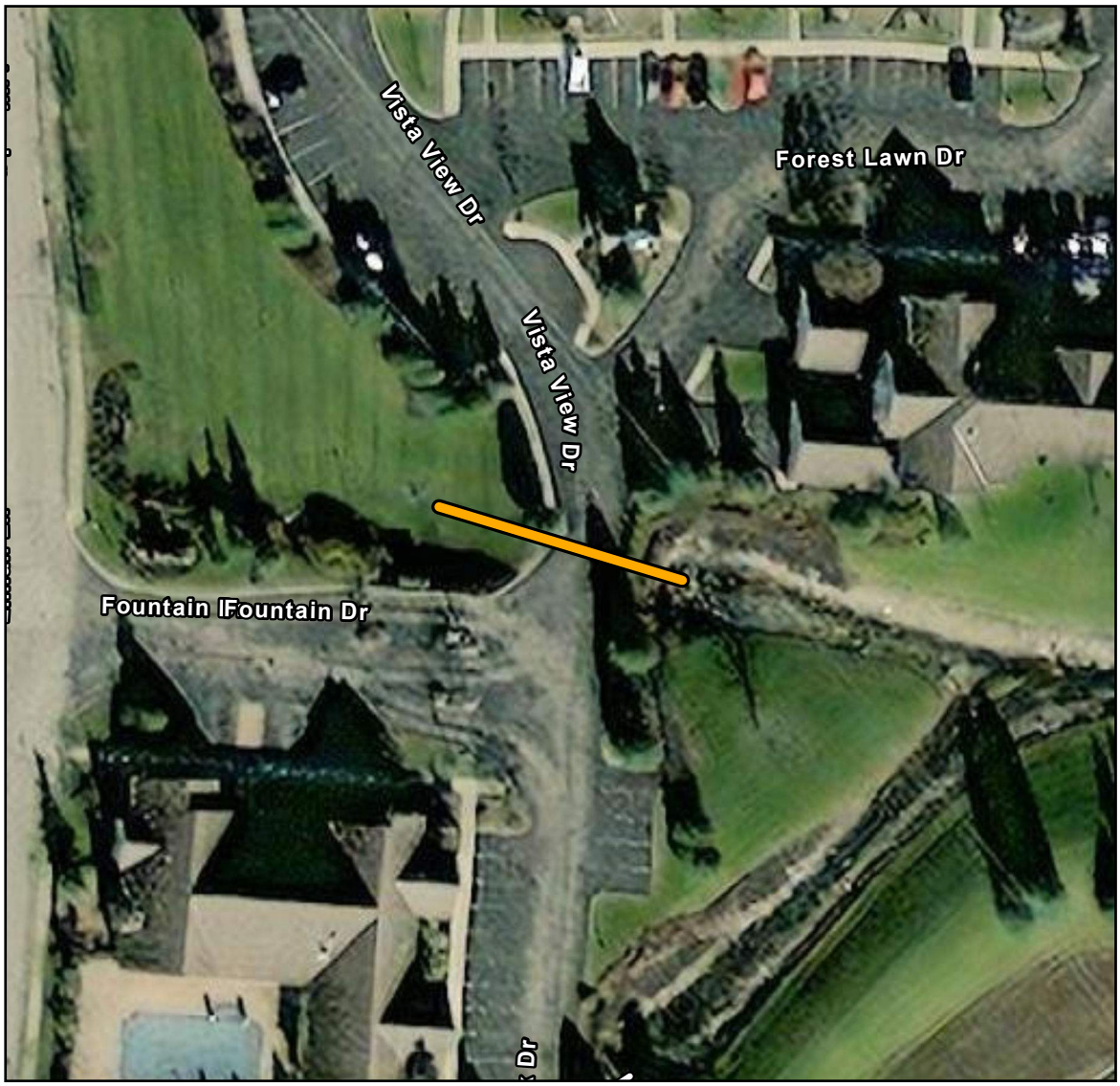
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

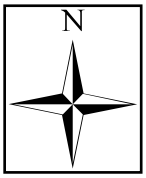
Culvert ID: A3_01

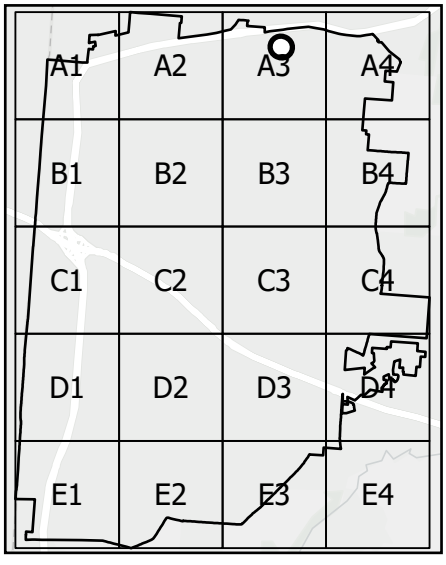
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 87

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 906.37
Downstream Elevation (ft): 903.76





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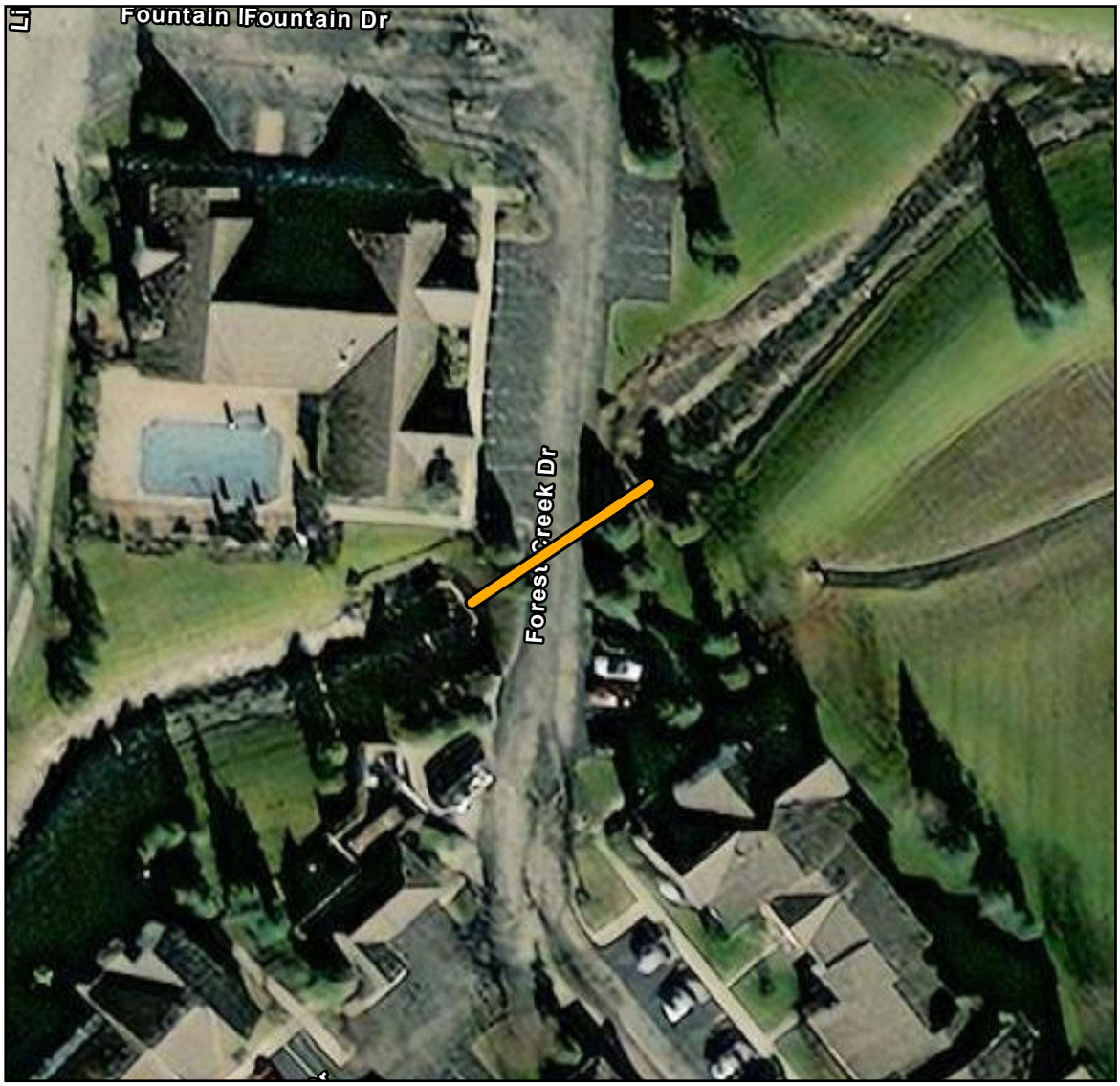
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

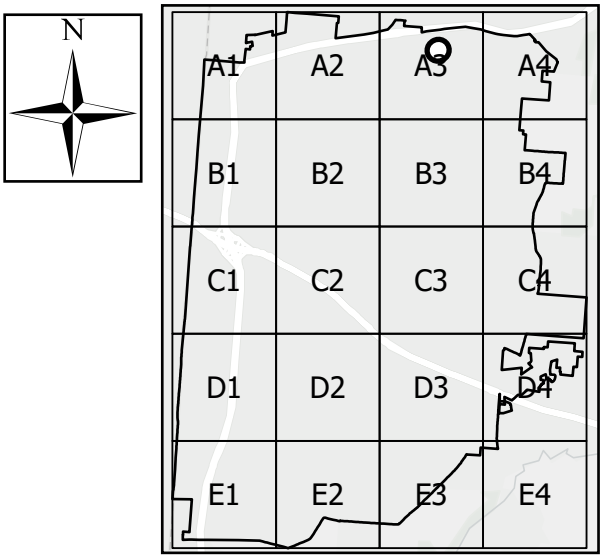
Culvert ID: A3_02

Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 13
Culvert Length (ft): 74

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 905.95
Downstream Elevation (ft): 905.3



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

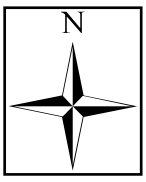
Culvert ID: A3_03

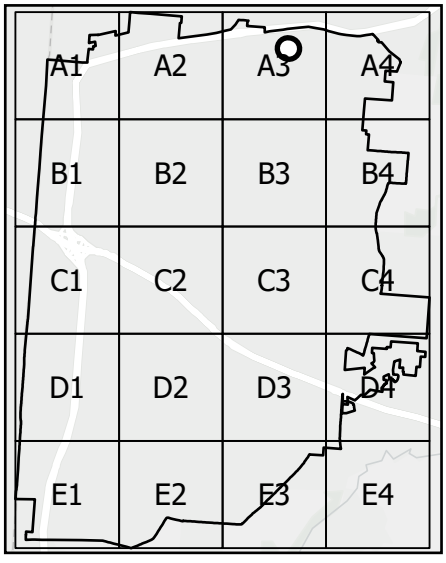
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 5
Culvert Span (ft): 18
Culvert Length (ft): 83

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 898.28
Downstream Elevation (ft): 897.52





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

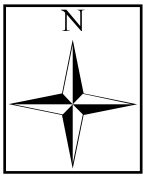
Culvert ID: A3_04

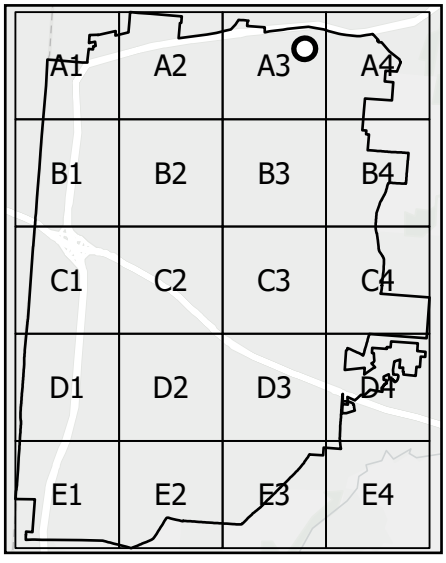
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 5
Culvert Span (ft): 18
Culvert Length (ft): 41

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 885
Downstream Elevation (ft): 884.63





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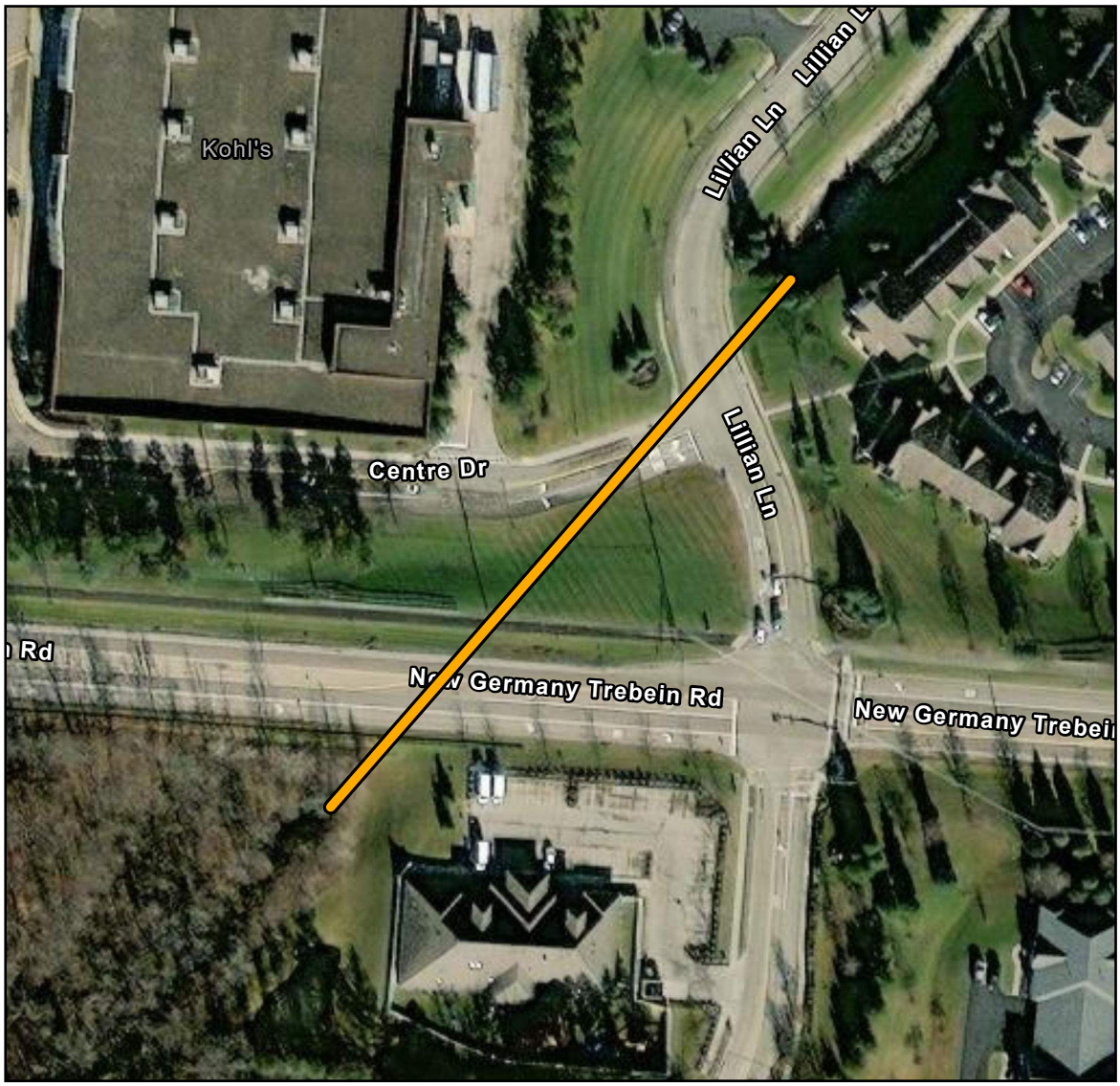
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

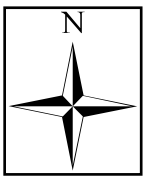
Culvert ID: A3_05

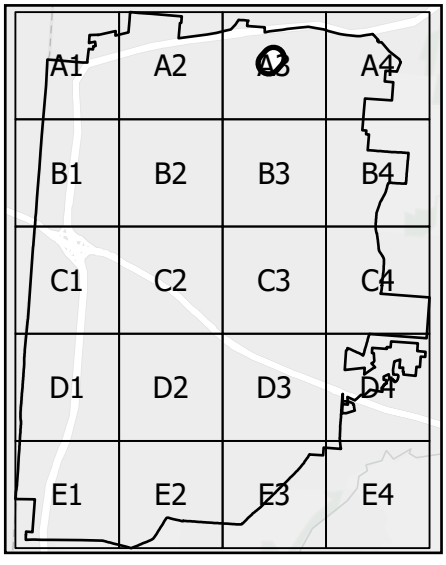
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 489

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 924.98
Downstream Elevation (ft): 913.25





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

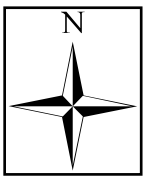
Culvert ID: A3_06

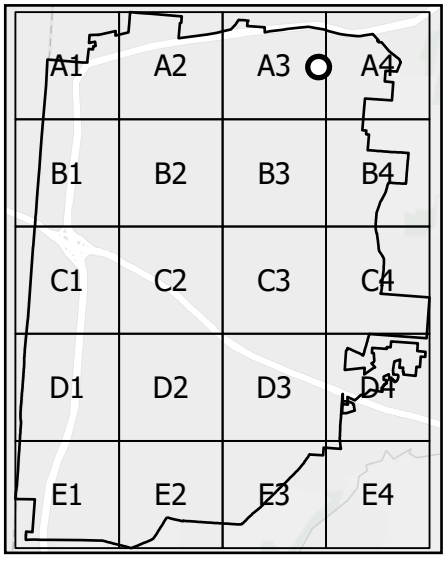
Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 4
Culvert Span (ft): 6
Culvert Length (ft): 37

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 911.96
Downstream Elevation (ft): 911.77





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

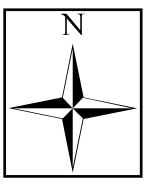
Culvert ID: A4_01

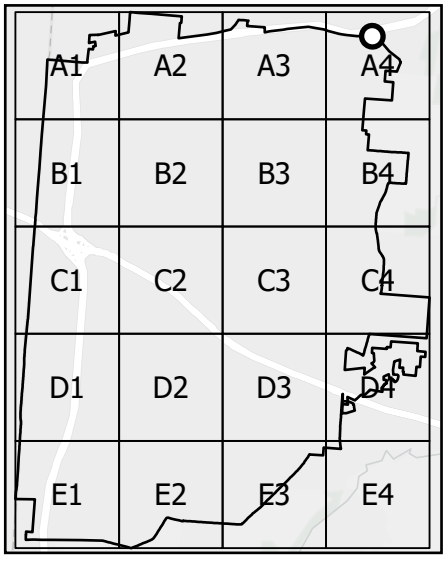
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 12
Culvert Length (ft): 34

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 842.17
Downstream Elevation (ft): 842.21





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

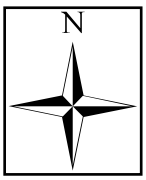
Culvert ID: A4_02

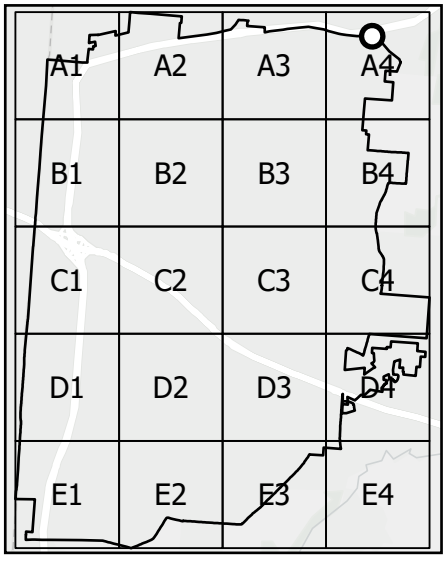
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 12
Culvert Length (ft): 33

Field Inspection

Structural Score: 1
Maintenance Score: 3
Upstream Elevation (ft): 841.93
Downstream Elevation (ft): 841.86





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

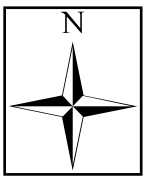
Culvert ID: A4_03

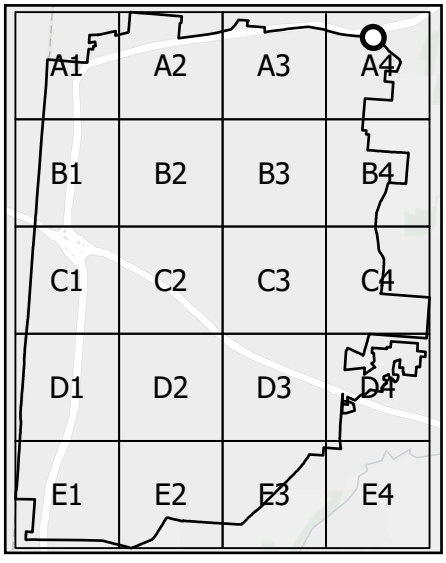
Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 28
Culvert Length (ft): 44

Field Inspection

Structural Score: 1
Maintenance Score: 3
Upstream Elevation (ft): 842.78
Downstream Elevation (ft): 842.72





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

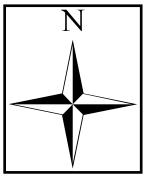
Culvert ID: A4_04

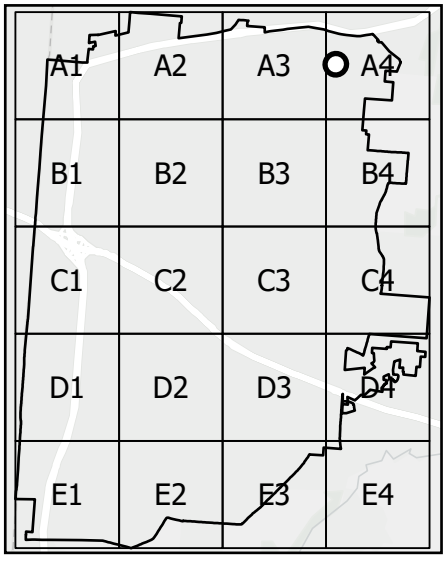
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 5
Culvert Span (ft): 5
Culvert Length (ft): 20

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 890.66
Downstream Elevation (ft): 891.41





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A4_05

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 4

Culvert Span (ft): 4

Culvert Length (ft): 73

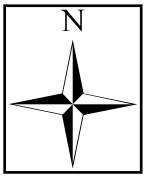
Field Inspection

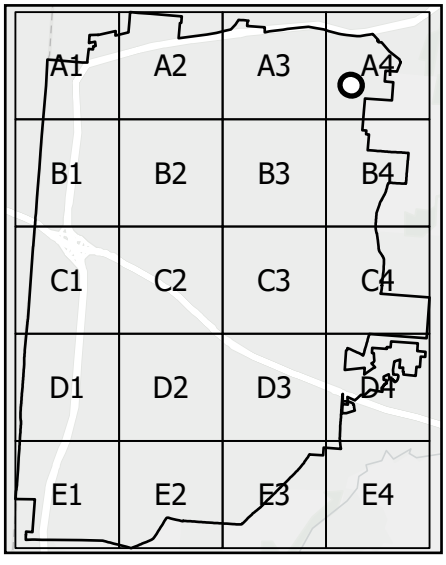
Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 905.81

Downstream Elevation (ft): 905.09





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A4_06

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 4

Culvert Span (ft): 4

Culvert Length (ft): 66

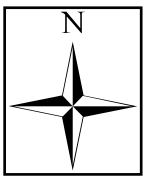
Field Inspection

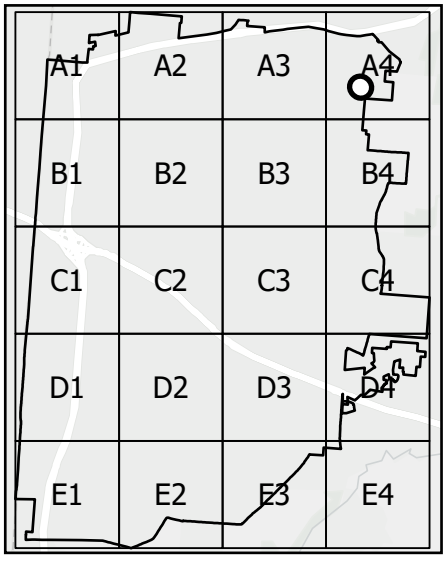
Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 892.7

Downstream Elevation (ft): 890.55





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A4_07

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 4

Culvert Span (ft): 4

Culvert Length (ft): 53

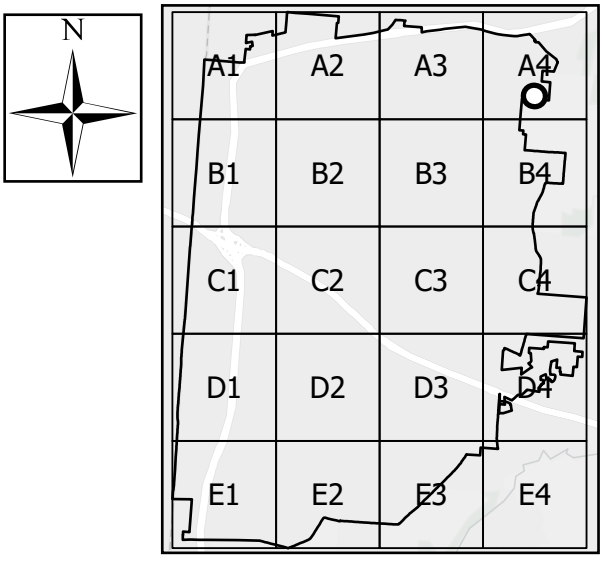
Field Inspection

Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 868

Downstream Elevation (ft): 866.11



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A4_08

Structure Attributes

Culvert Shape: Circular

Culvert Material: SLHDPE

Culvert Rise (ft): 5

Culvert Span (ft): 5

Culvert Length (ft): 101

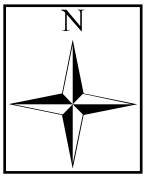
Field Inspection

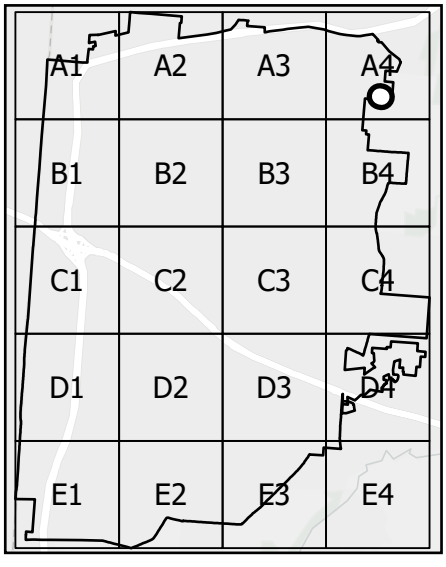
Structural Score: 2

Maintenance Score: 1

Upstream Elevation (ft): 864.5

Downstream Elevation (ft): 861





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: A4_09

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 4.5

Culvert Span (ft): 4.5

Culvert Length (ft): 176

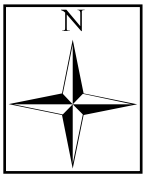
Field Inspection

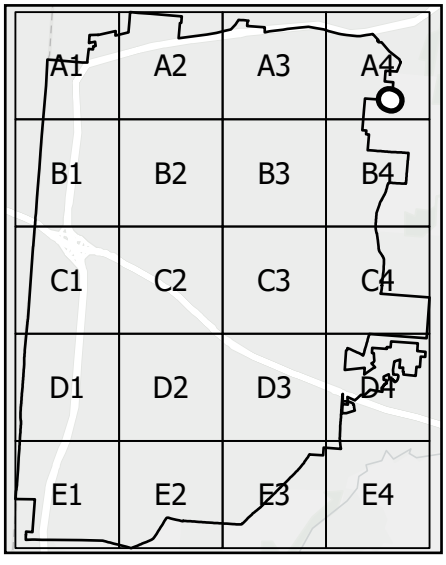
Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 854.15

Downstream Elevation (ft): 848.87





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

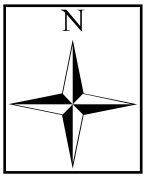
Culvert ID: A4_10

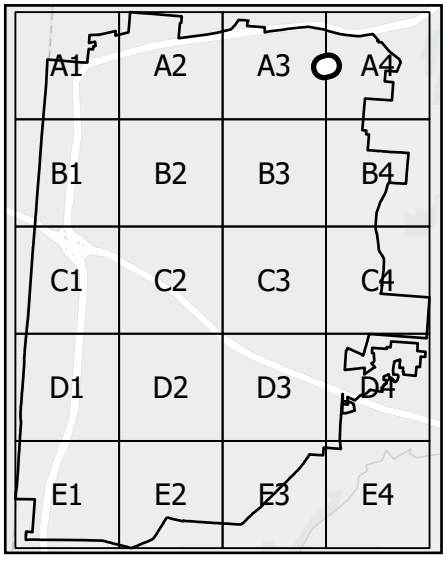
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 5
Culvert Span (ft): 5
Culvert Length (ft): 323

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 902.77
Downstream Elevation (ft): 896.53





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

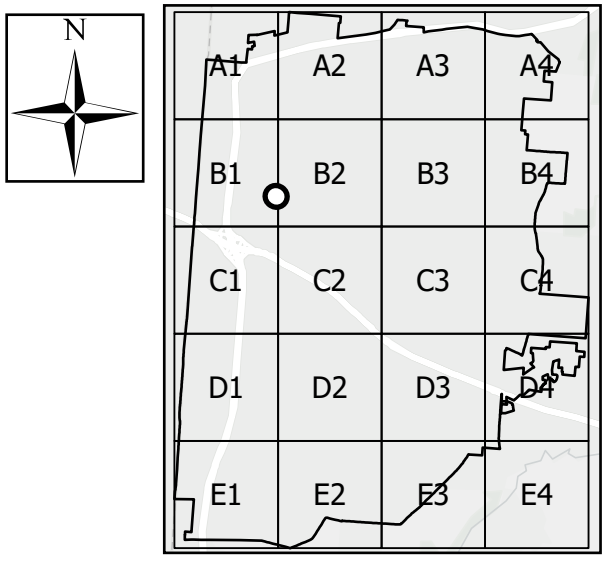
Culvert ID: B1_02

Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 7
Culvert Span (ft): 24
Culvert Length (ft): 71

Field Inspection

Structural Score: 1
Maintenance Score: 3
Upstream Elevation (ft): 932
Downstream Elevation (ft): 931.16



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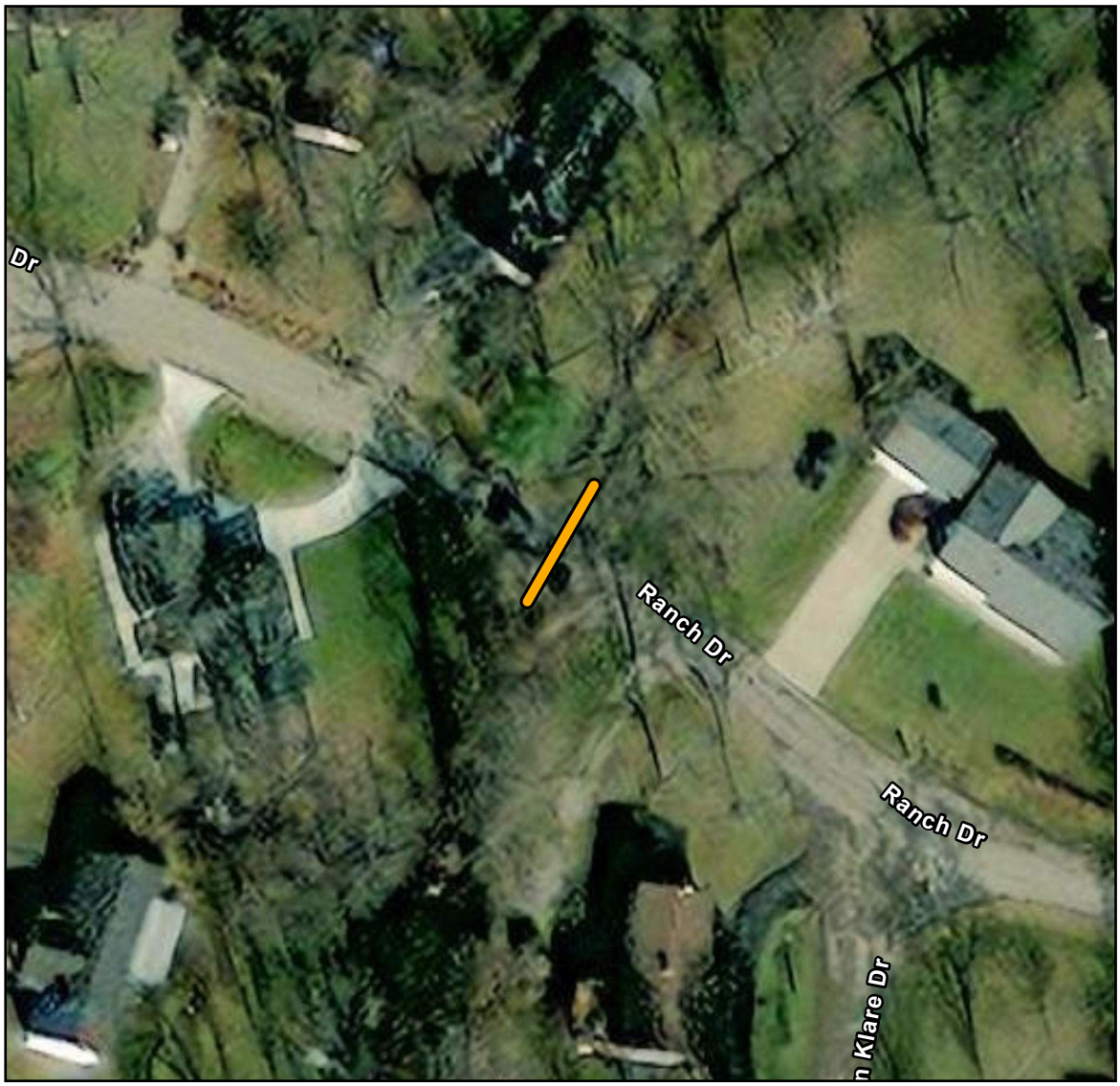
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

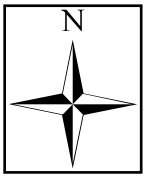
Culvert ID: B1_03

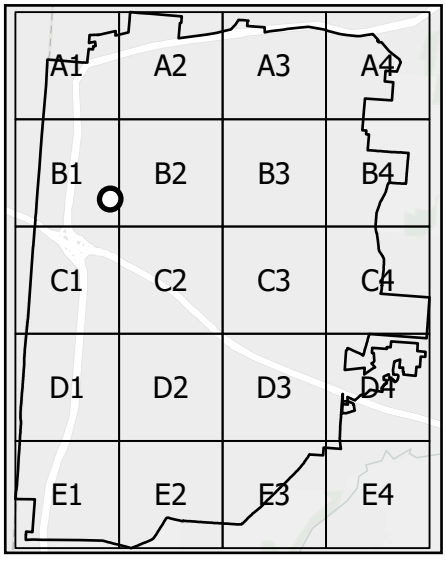
Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 5.5
Culvert Span (ft): 7
Culvert Length (ft): 47

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 926.8
Downstream Elevation (ft): 927.32





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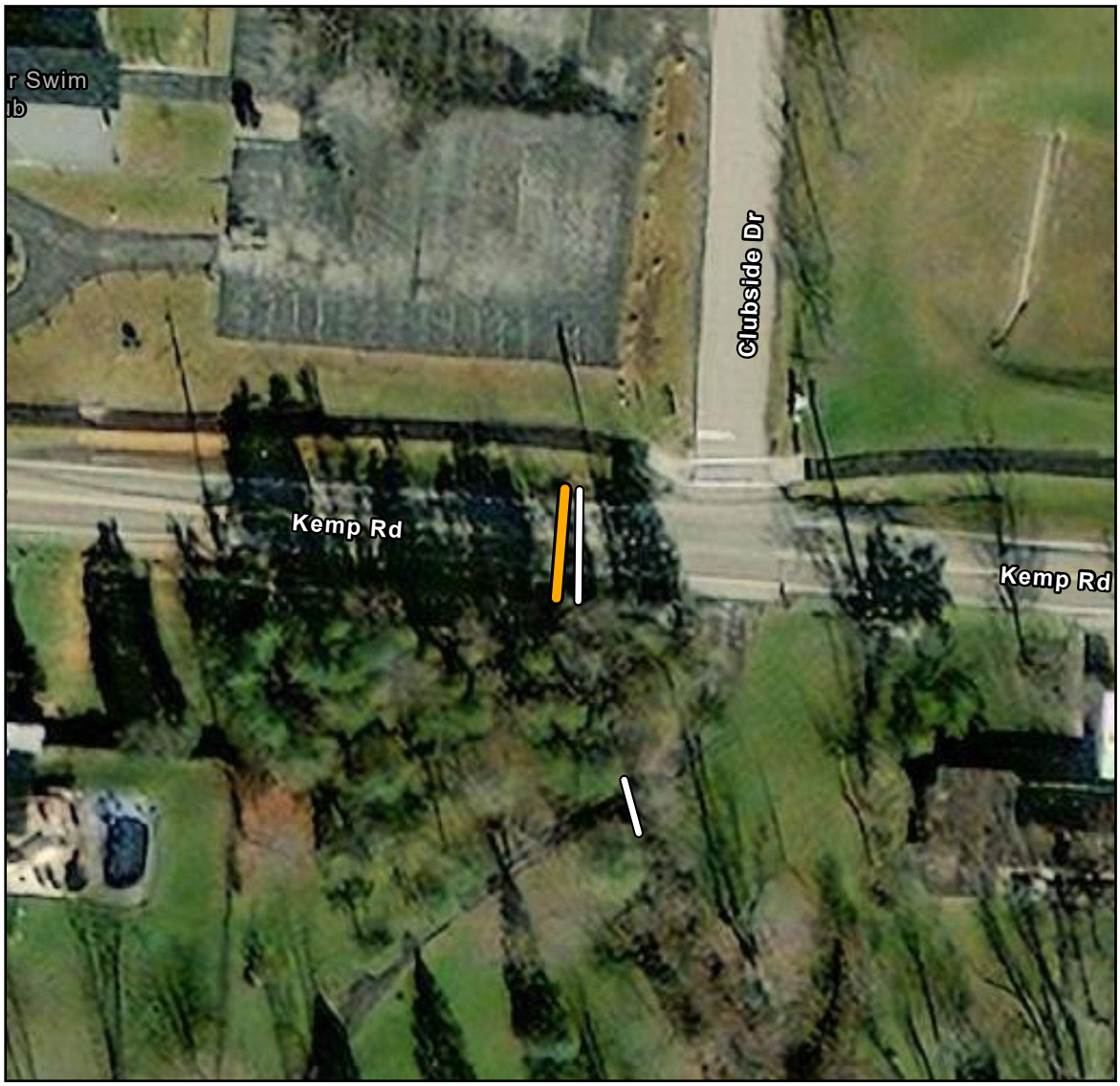
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

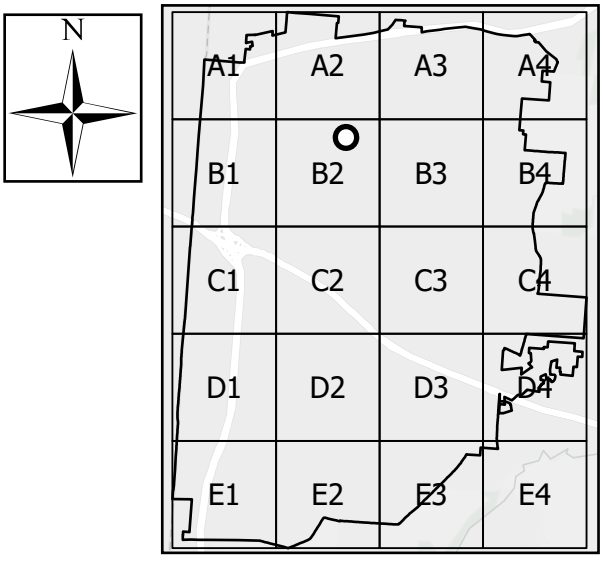
Culvert ID: B2_01

Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 35

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 993.28
Downstream Elevation (ft): 993.28



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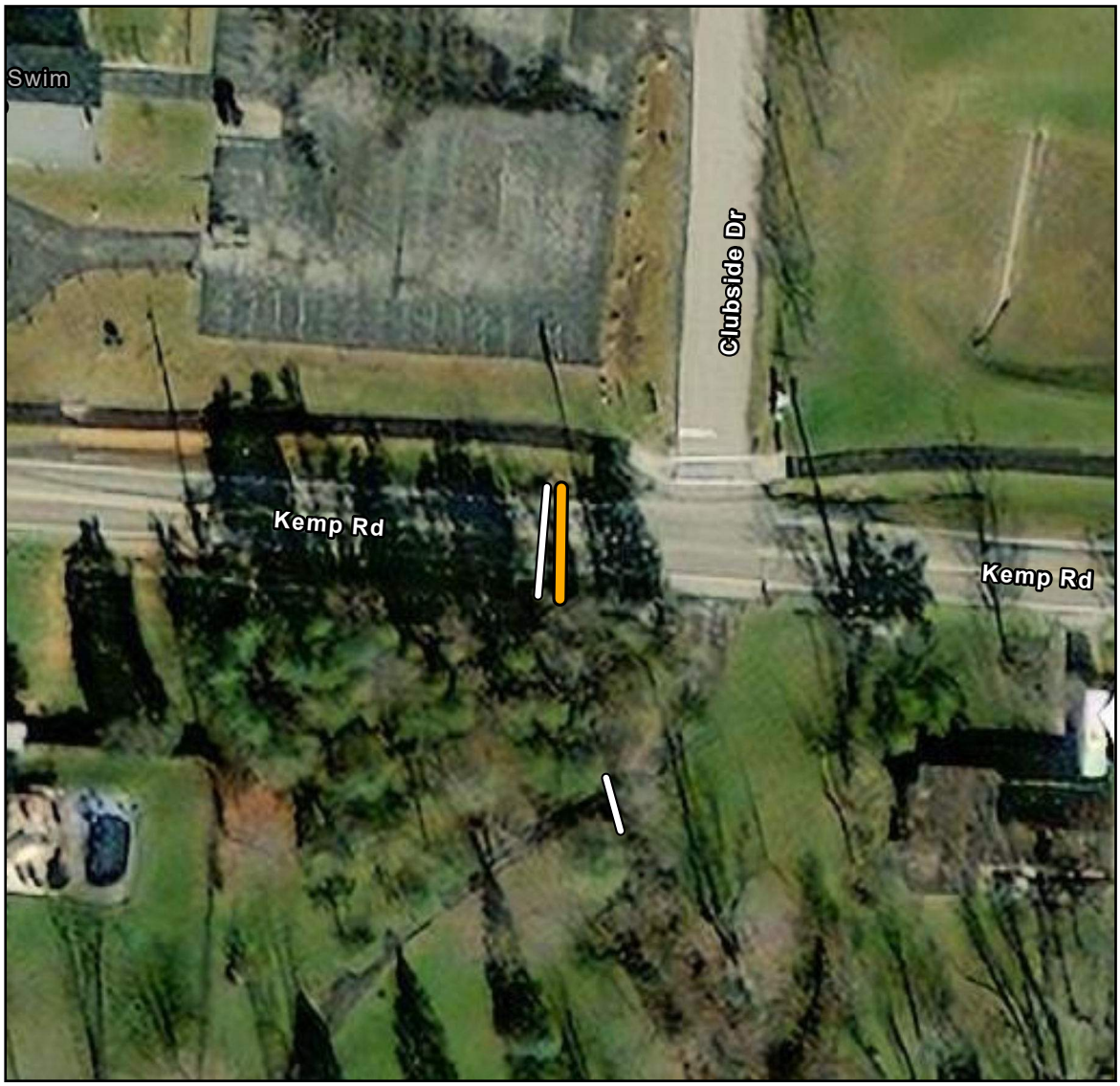
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

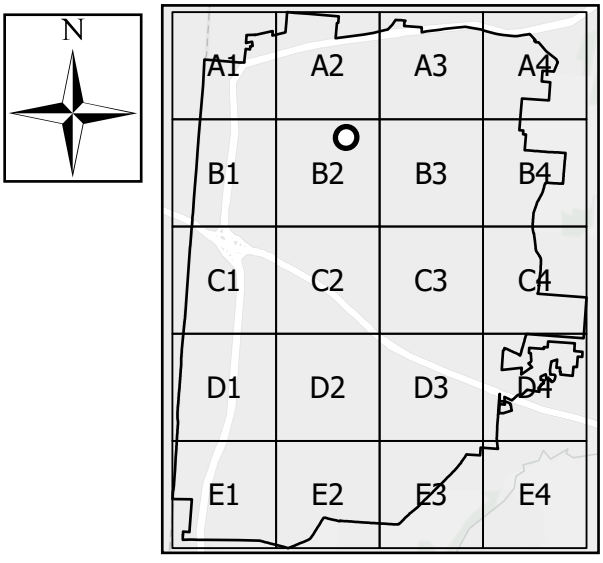
Culvert ID: B2_02

Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 3.5
Culvert Span (ft): 3.5
Culvert Length (ft): 36

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 993.93
Downstream Elevation (ft): 993.4



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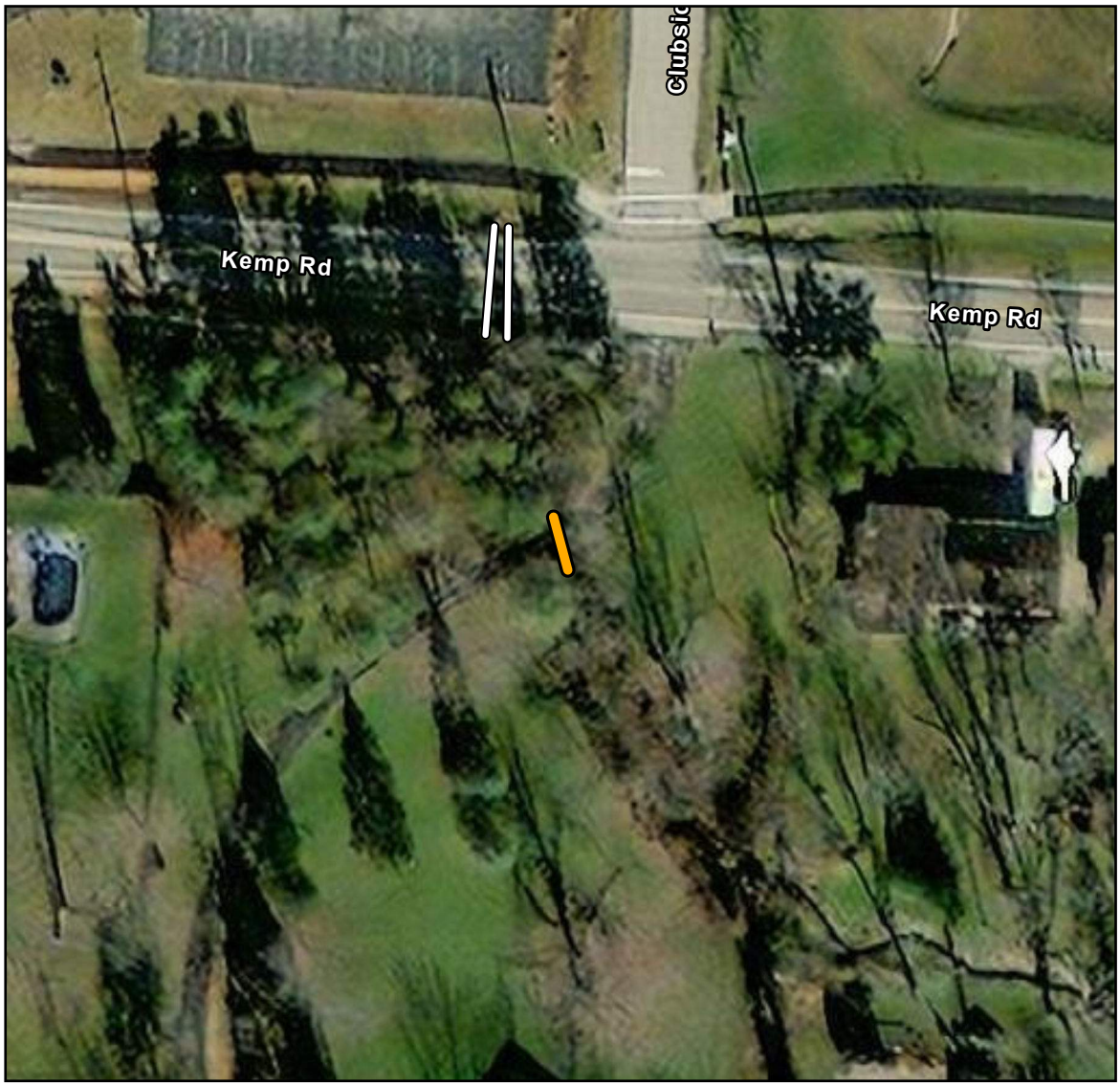
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

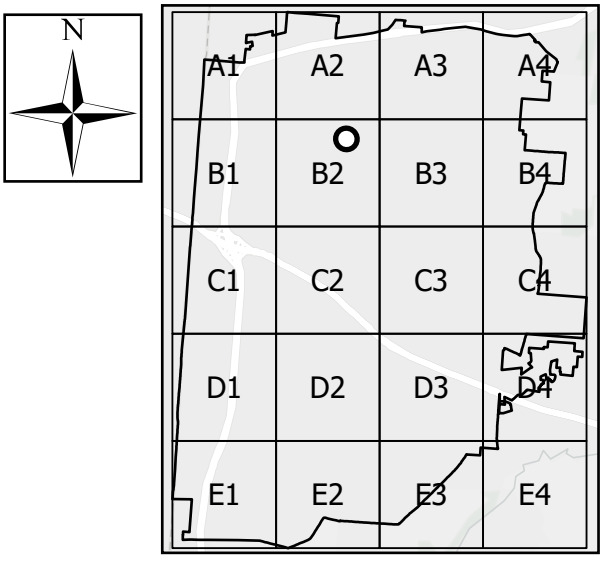
Culvert ID: B2_03

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 19

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 991.4
Downstream Elevation (ft): 991



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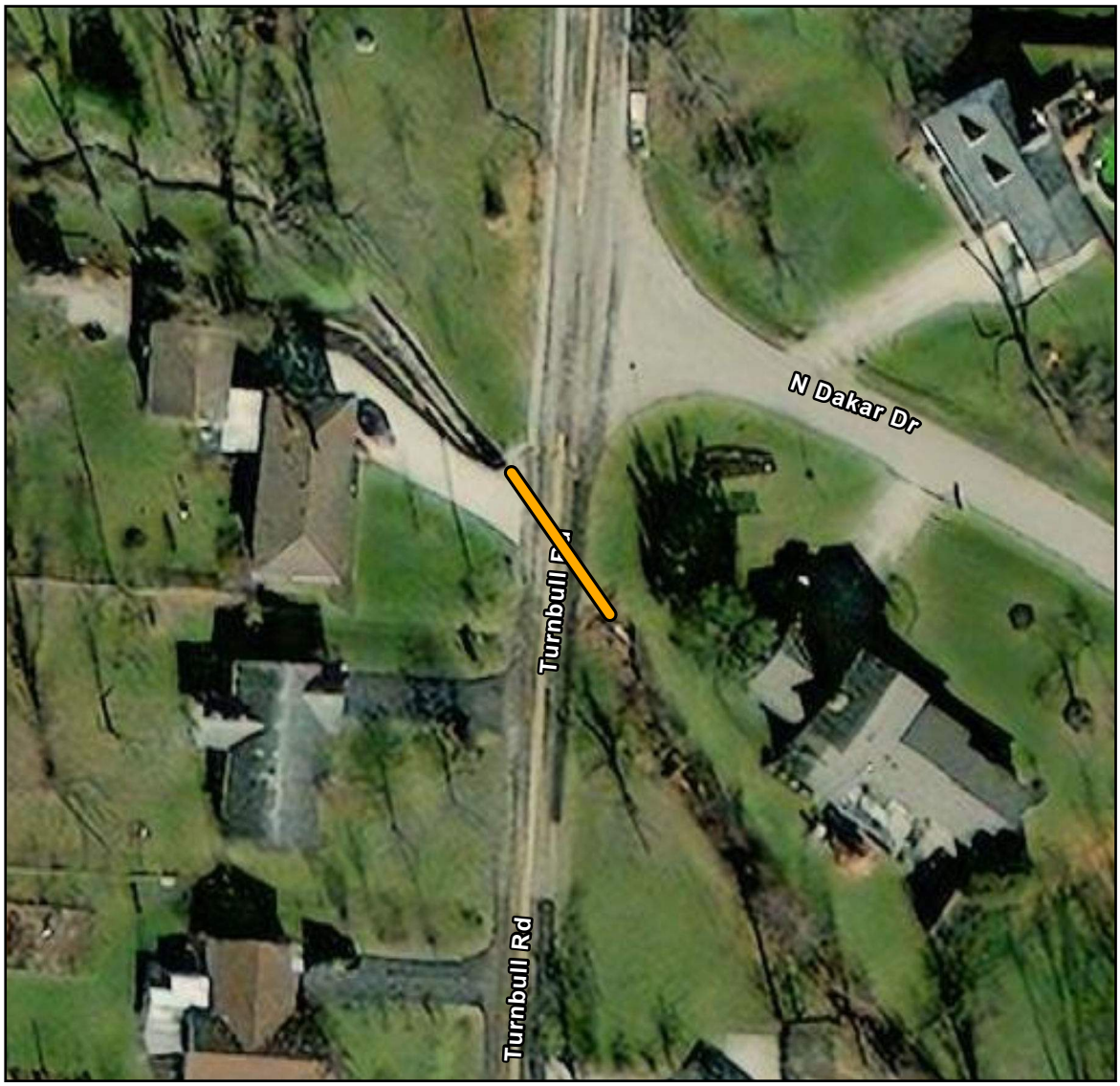
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

Culvert ID: B2_04

Structure Attributes

Culvert Shape: Arch

Culvert Material: CMP

Culvert Rise (ft): 3.6

Culvert Span (ft): 6

Culvert Length (ft): 60

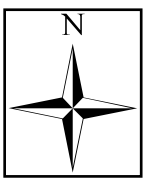
Field Inspection

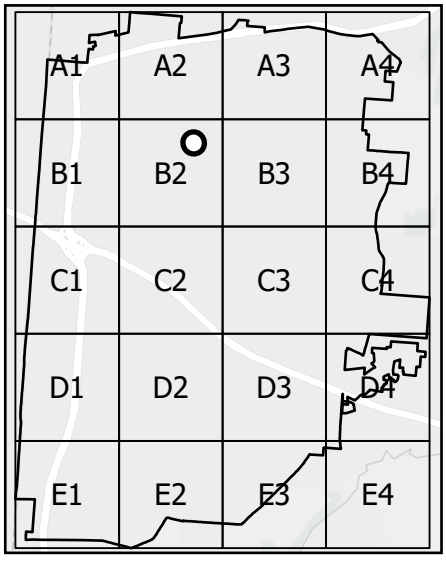
Structural Score: 2

Maintenance Score: 3

Upstream Elevation (ft): 985.55

Downstream Elevation (ft): 984.97





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

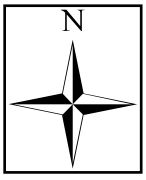
Culvert ID: B2_05

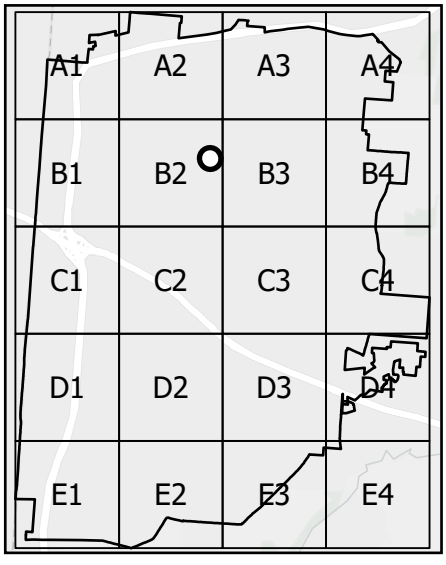
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 40

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 968.48
Downstream Elevation (ft): 967.39





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Culvert Cutsheets

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Photos

Identification

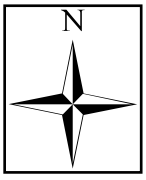
Culvert ID: B2_06

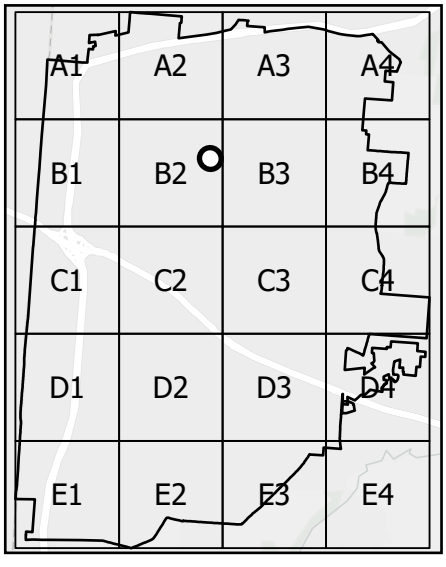
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 43

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 968.15
Downstream Elevation (ft): 966.99





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

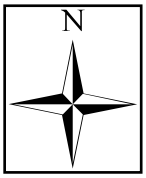
Culvert ID: B2_07

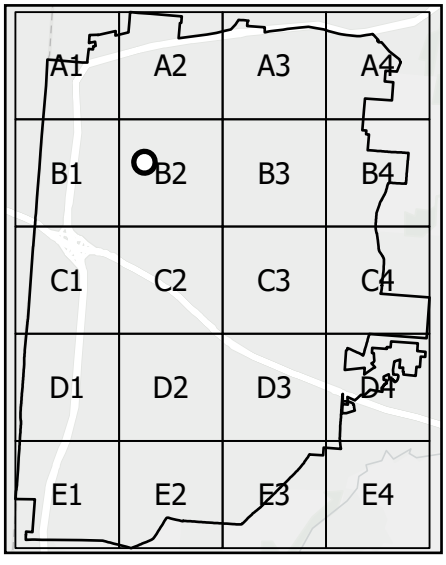
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 3.6
Culvert Span (ft): 5.3
Culvert Length (ft): 38

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 976.93
Downstream Elevation (ft): 976.42





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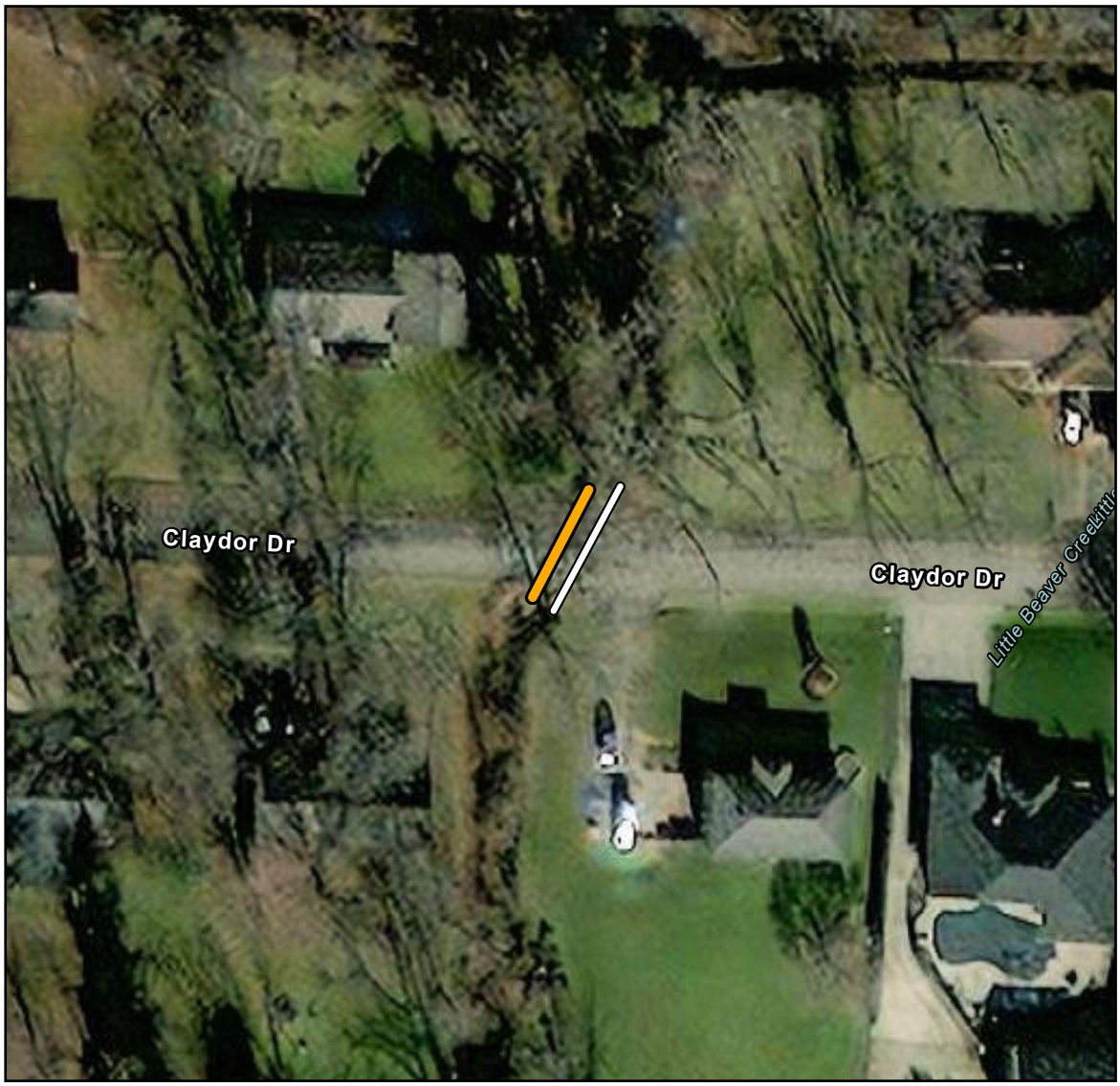
Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

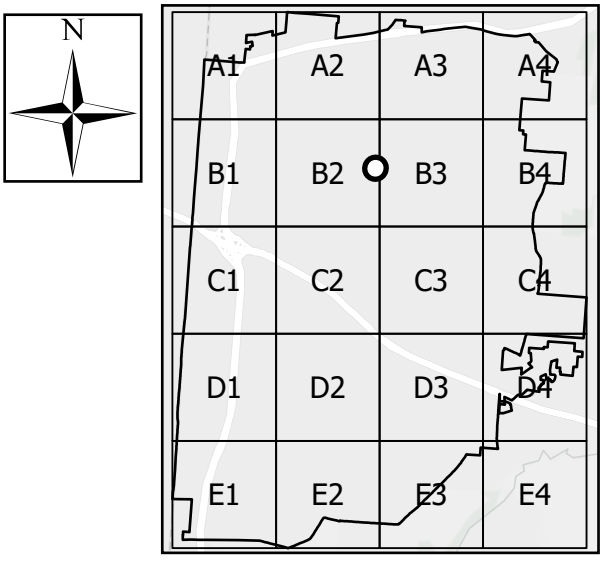
Culvert ID: B2_08

Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 3.8
Culvert Span (ft): 6
Culvert Length (ft): 42

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 960.43
Downstream Elevation (ft): 961.86



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Culvert Cutsheets

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Photos

Identification

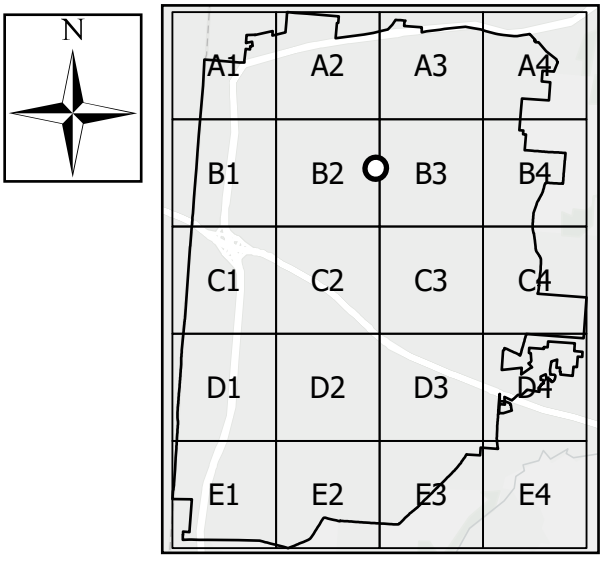
Culvert ID: B2_09

Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 3.8
Culvert Span (ft): 6
Culvert Length (ft): 49

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 959.32
Downstream Elevation (ft): 959.03



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Culvert Cutsheets

Beavercreek Drainage Master Plan

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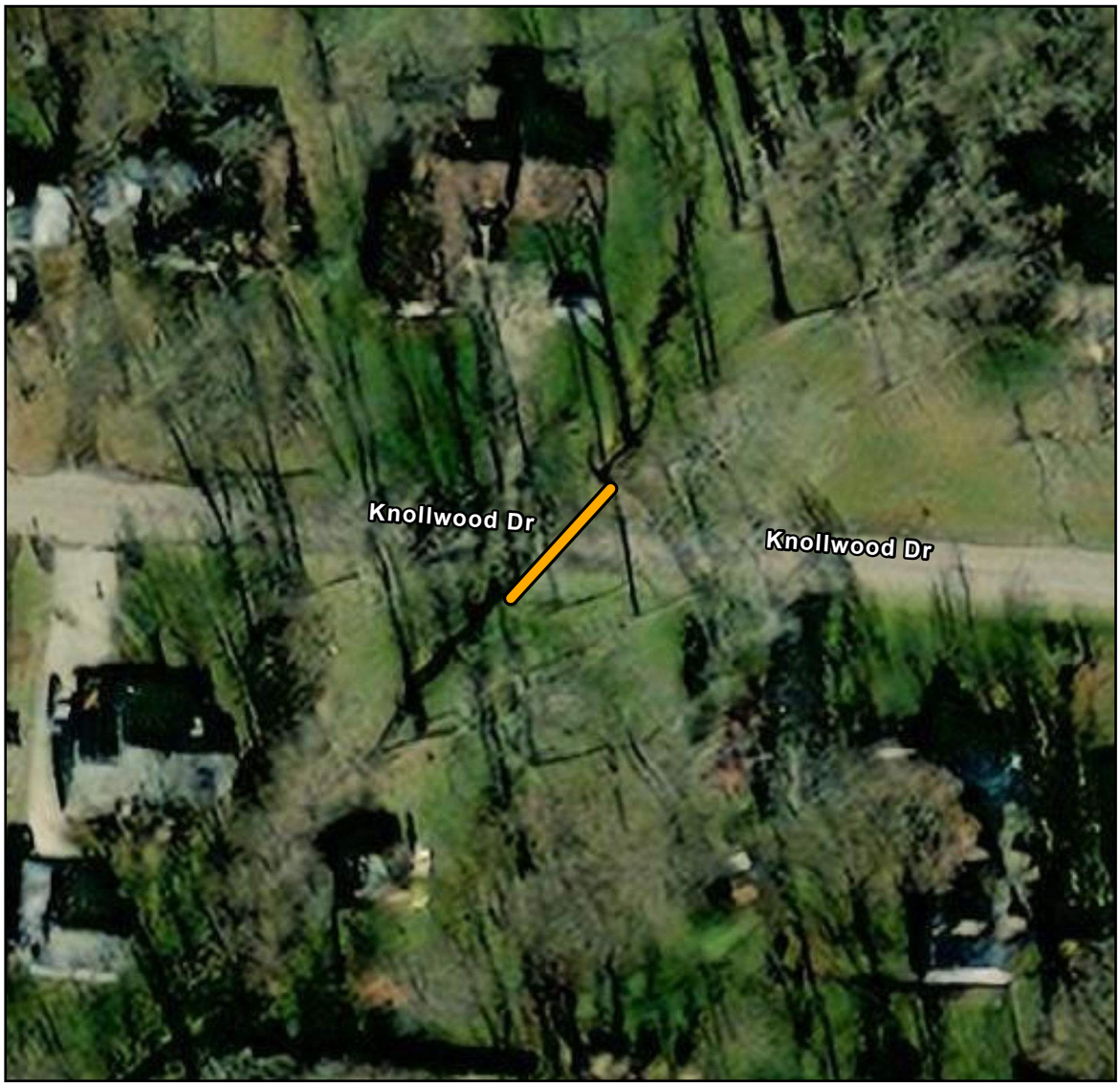


Photos

Identification

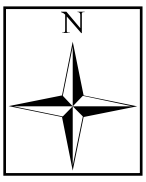
Culvert ID: B2_10

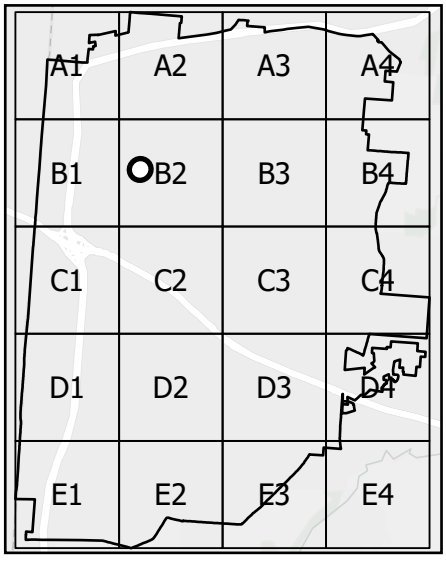
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: RCP
Culvert Rise (ft): 3.33
Culvert Span (ft): 5
Culvert Length (ft): 52

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 970.15
Downstream Elevation (ft): 969.26





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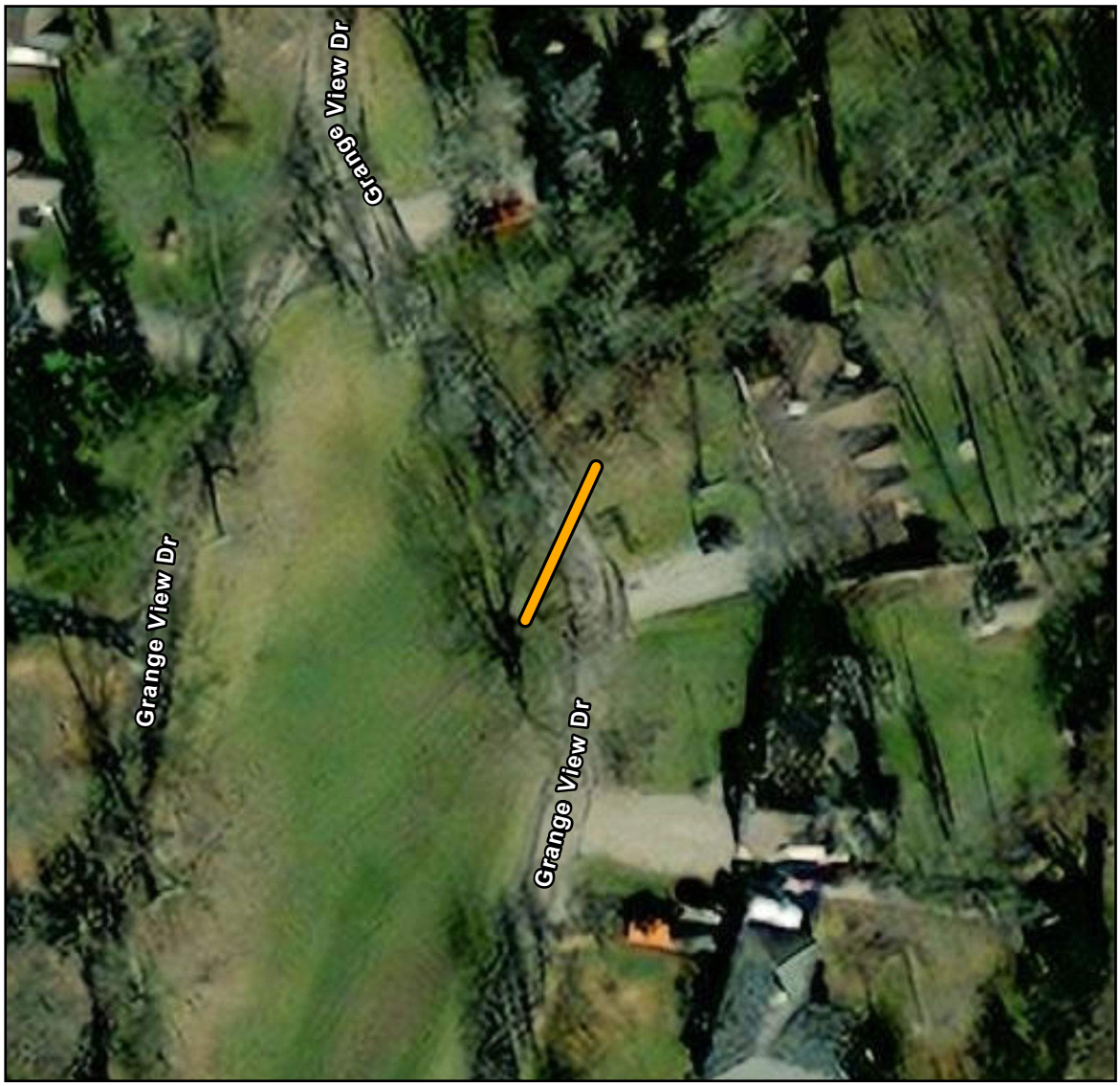


Photos

Identification

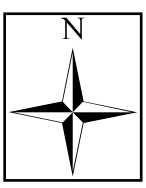
Culvert ID: B2_11

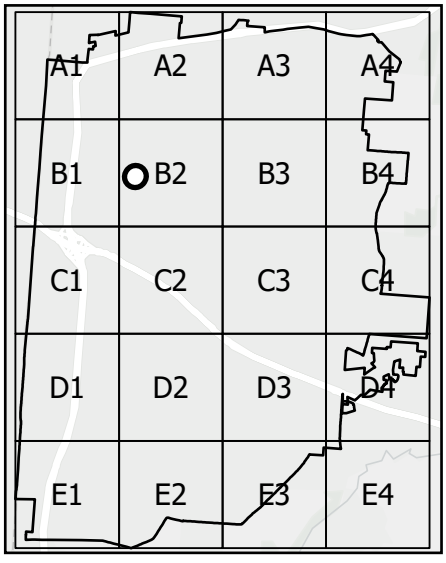
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 4.5
Culvert Span (ft): 6
Culvert Length (ft): 59

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 961.5
Downstream Elevation (ft): 959.41





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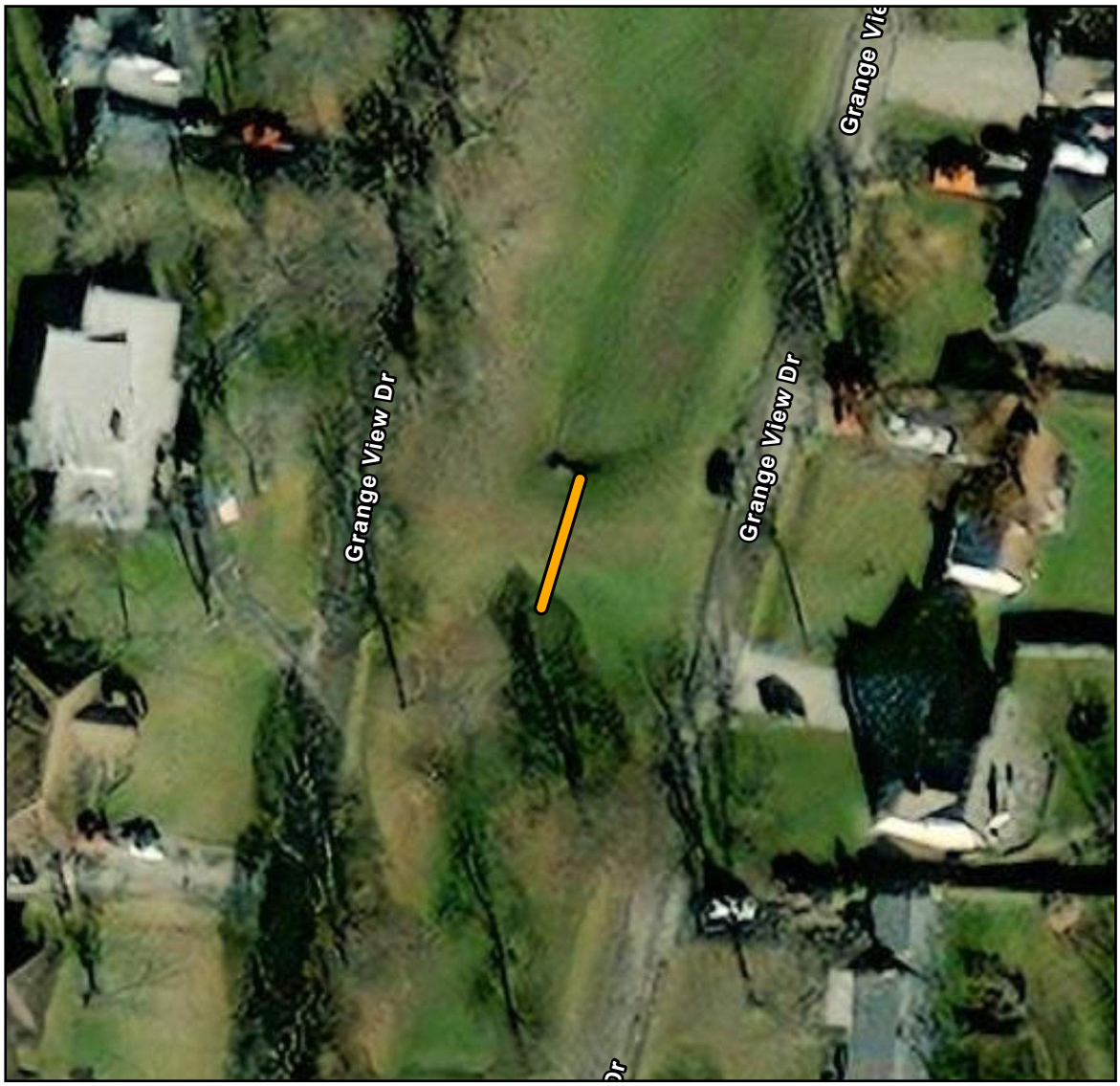
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

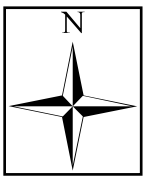
Culvert ID: B2_12

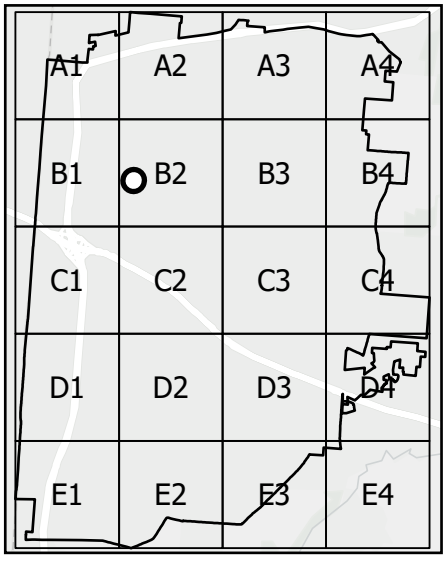
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 47

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 956.52
Downstream Elevation (ft): 955.88





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

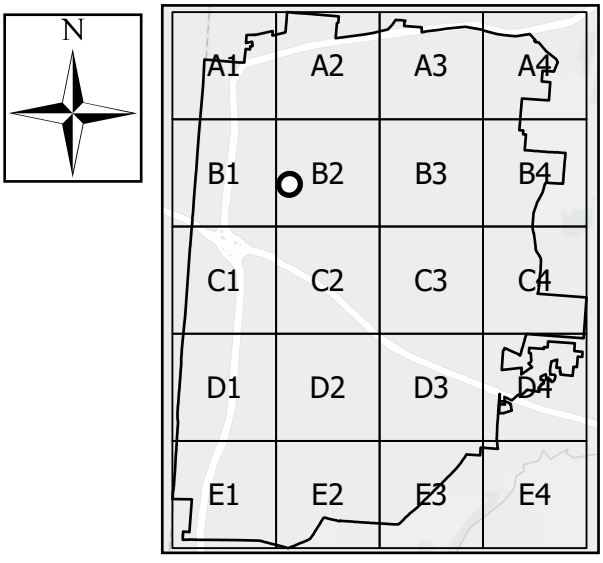
Culvert ID: B2_13

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2.5
Culvert Span (ft): 2.5
Culvert Length (ft): 60

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 952.93
Downstream Elevation (ft): 956.06



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

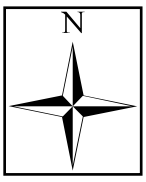
Culvert ID: B2_14

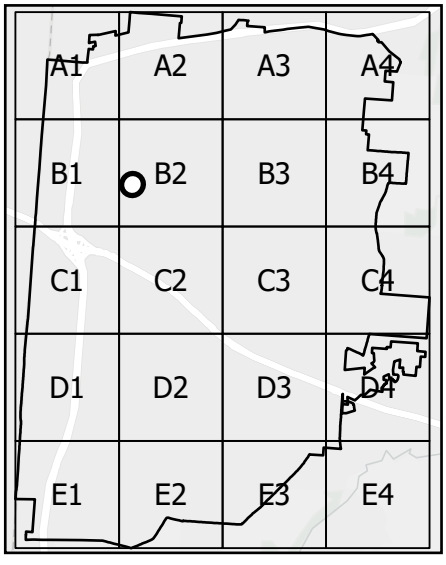
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2.5
Culvert Span (ft): 2.5
Culvert Length (ft): 60

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 952.6
Downstream Elevation (ft): 956.06





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

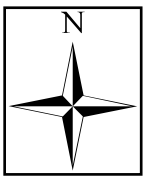
Culvert ID: B2_15

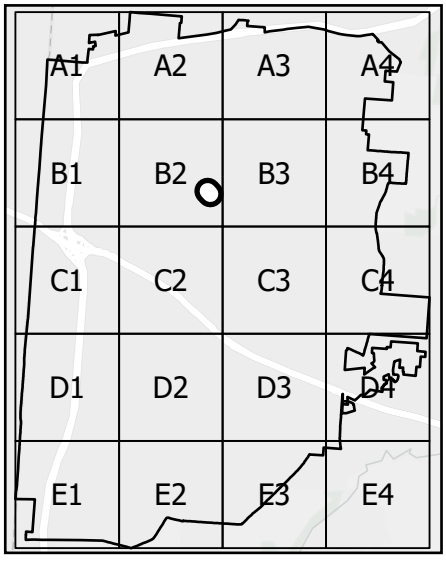
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 271

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 961.28
Downstream Elevation (ft): 963.79





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Culvert Cutsheets

Beavercreek Drainage Master Plan

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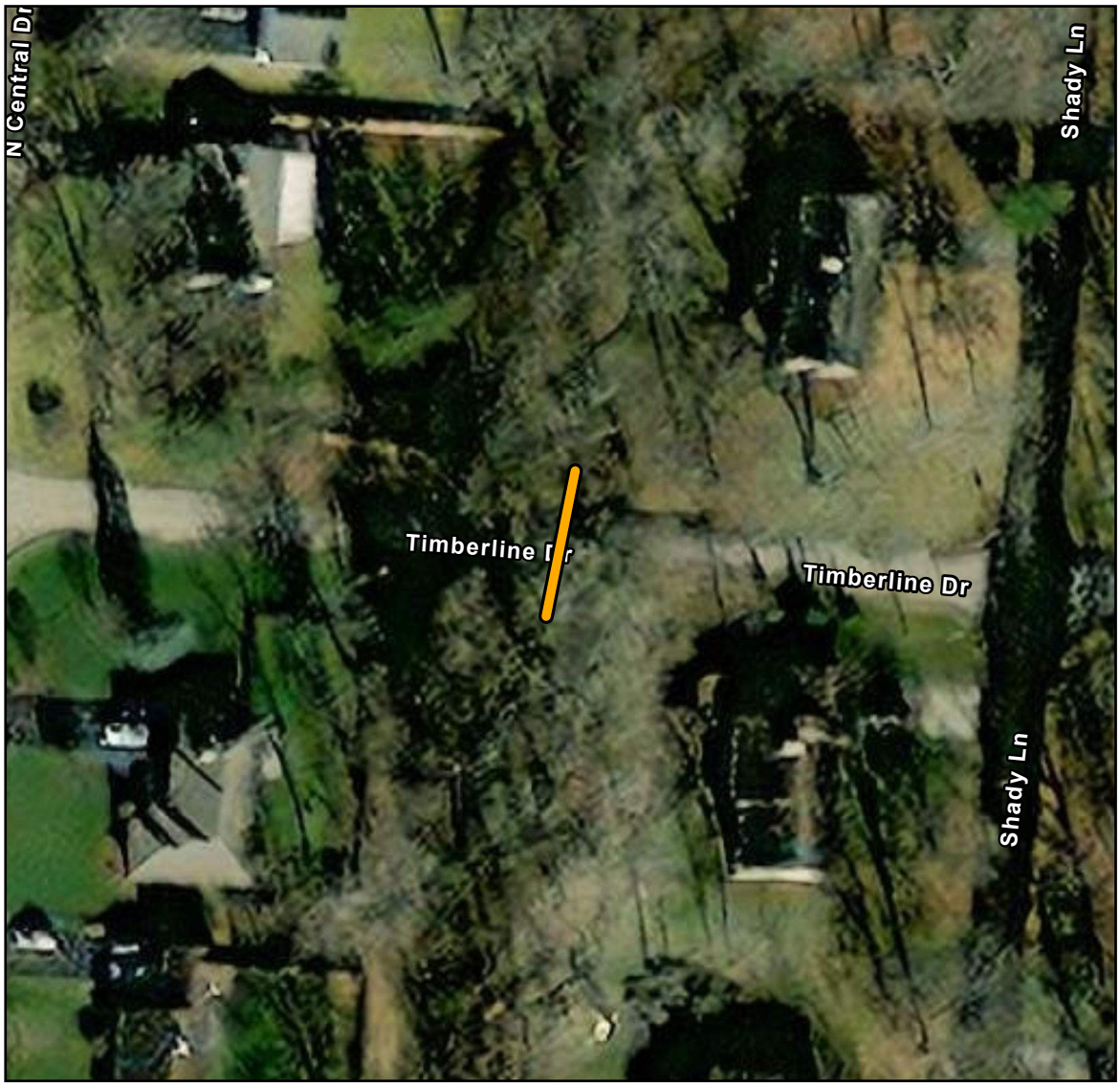


Photos

Identification

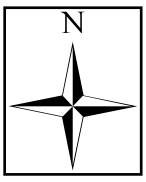
Culvert ID: B2_16

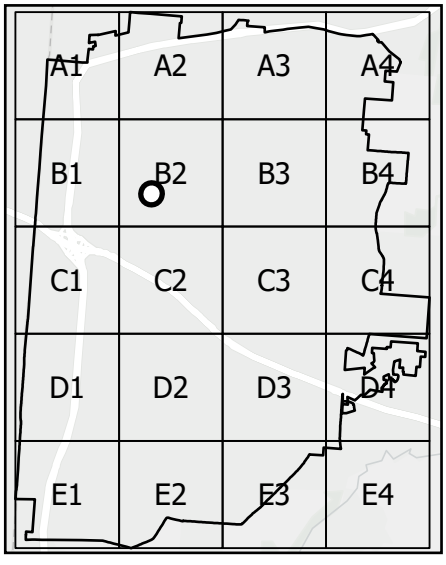
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 3.33
Culvert Span (ft): 4.33
Culvert Length (ft): 52

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 963.5
Downstream Elevation (ft): 962.9





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

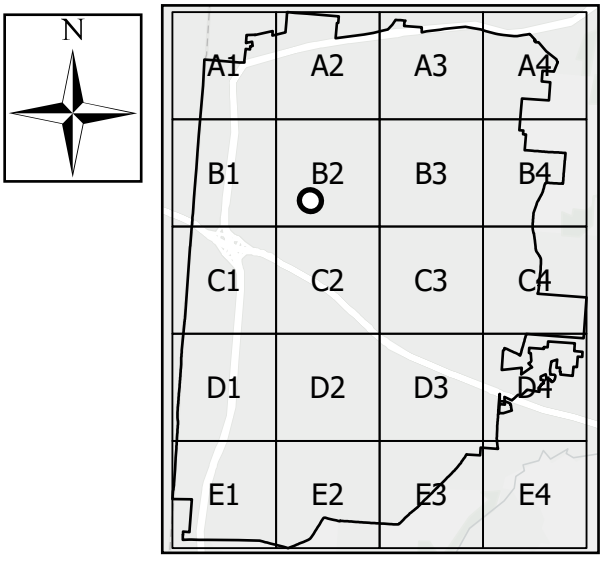
Culvert ID: B2_17

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2.5
Culvert Span (ft): 2.5
Culvert Length (ft): 62

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 953
Downstream Elevation (ft): 951



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

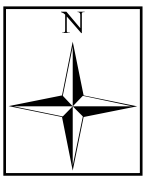
Culvert ID: B2_18

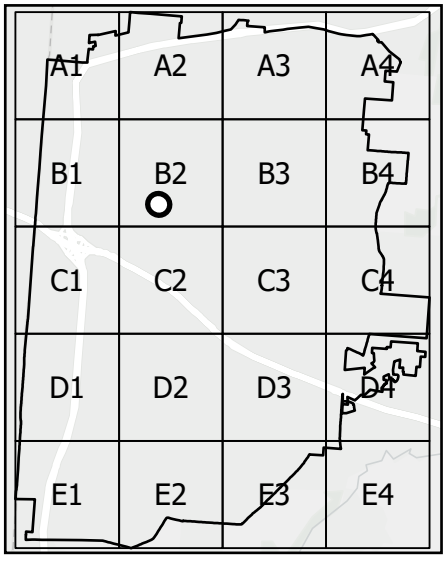
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2.5
Culvert Span (ft): 2.5
Culvert Length (ft): 62

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 946.5
Downstream Elevation (ft): 944.5





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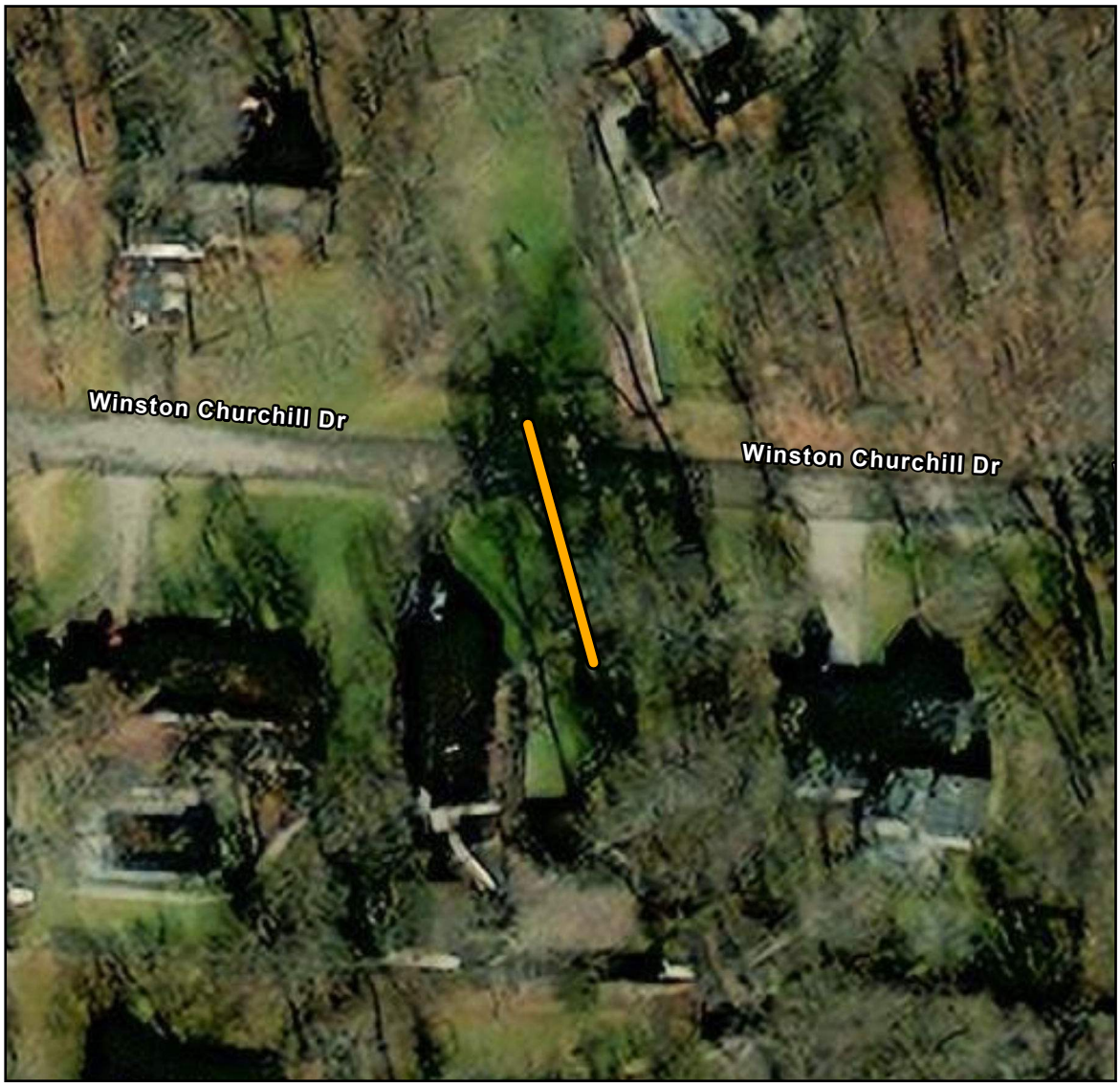
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

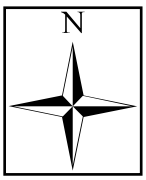
Culvert ID: B2_19

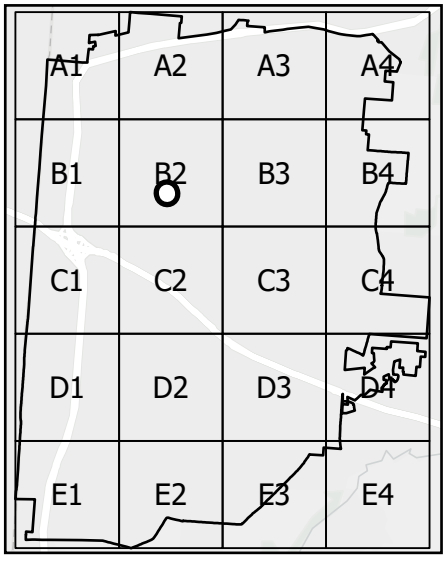
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 83

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 968.64
Downstream Elevation (ft): 966.98





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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Identification

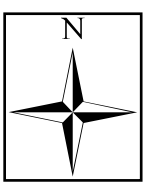
Culvert ID: B2_20

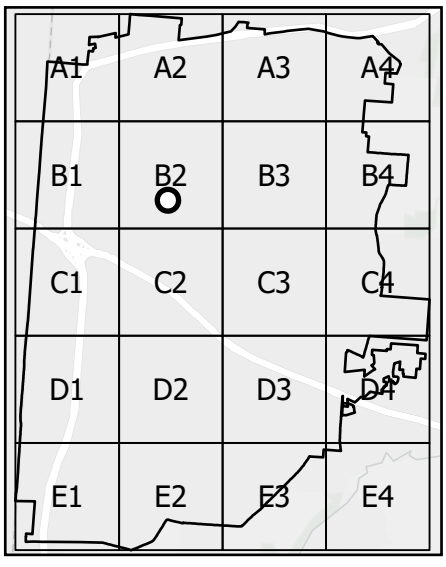
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 27

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 958
Downstream Elevation (ft): 956.5





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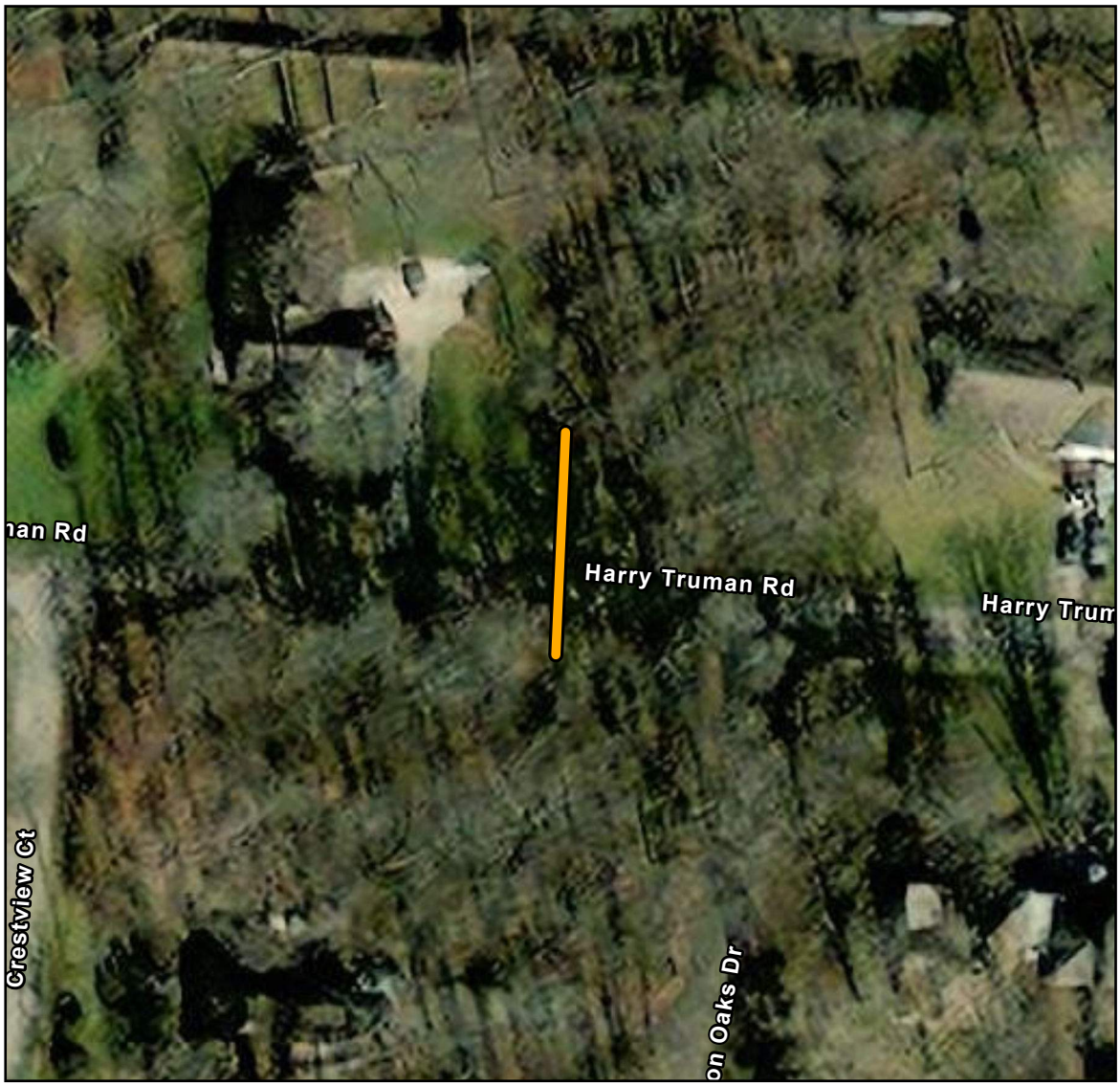
Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

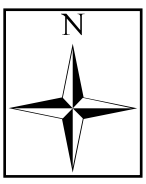
Culvert ID: B2_21

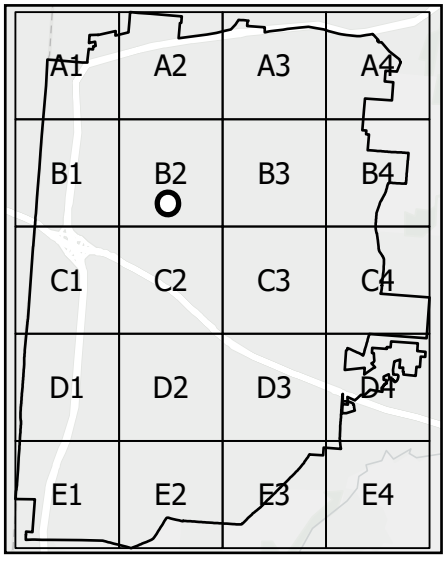
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 77

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 952.51
Downstream Elevation (ft): 952.09





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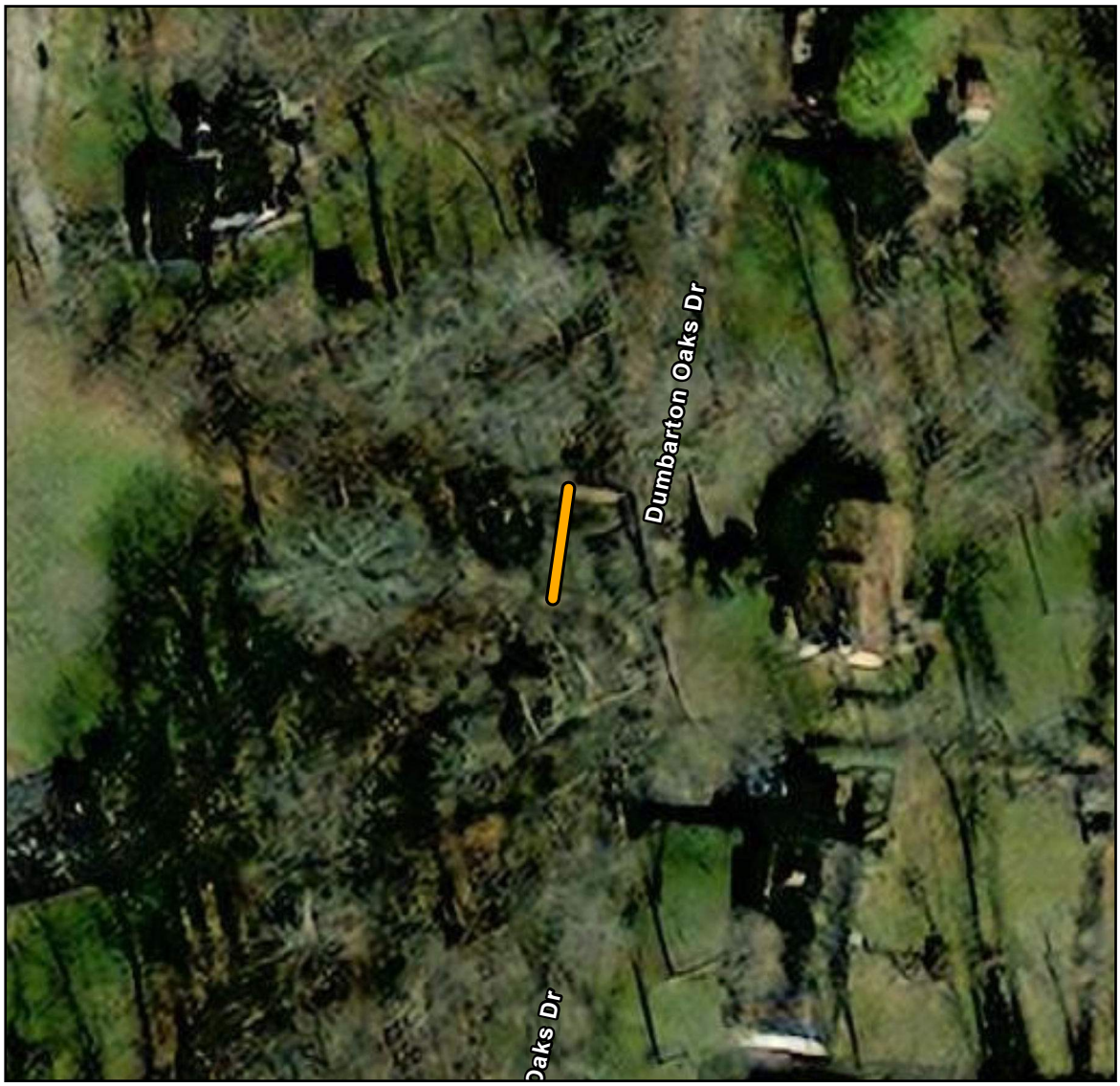


Photos

Identification

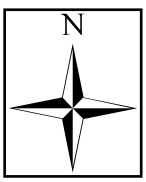
Culvert ID: B2_22

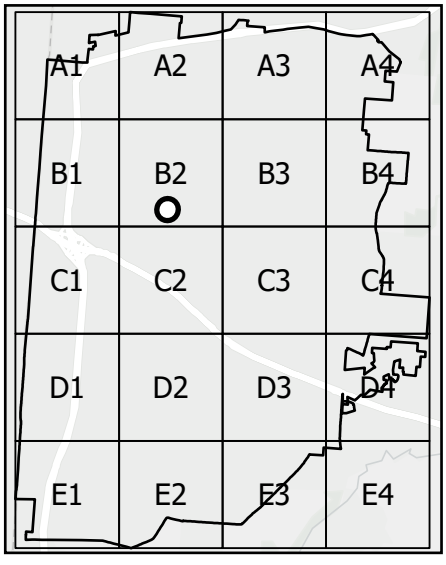
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 39

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 938.93
Downstream Elevation (ft): 936





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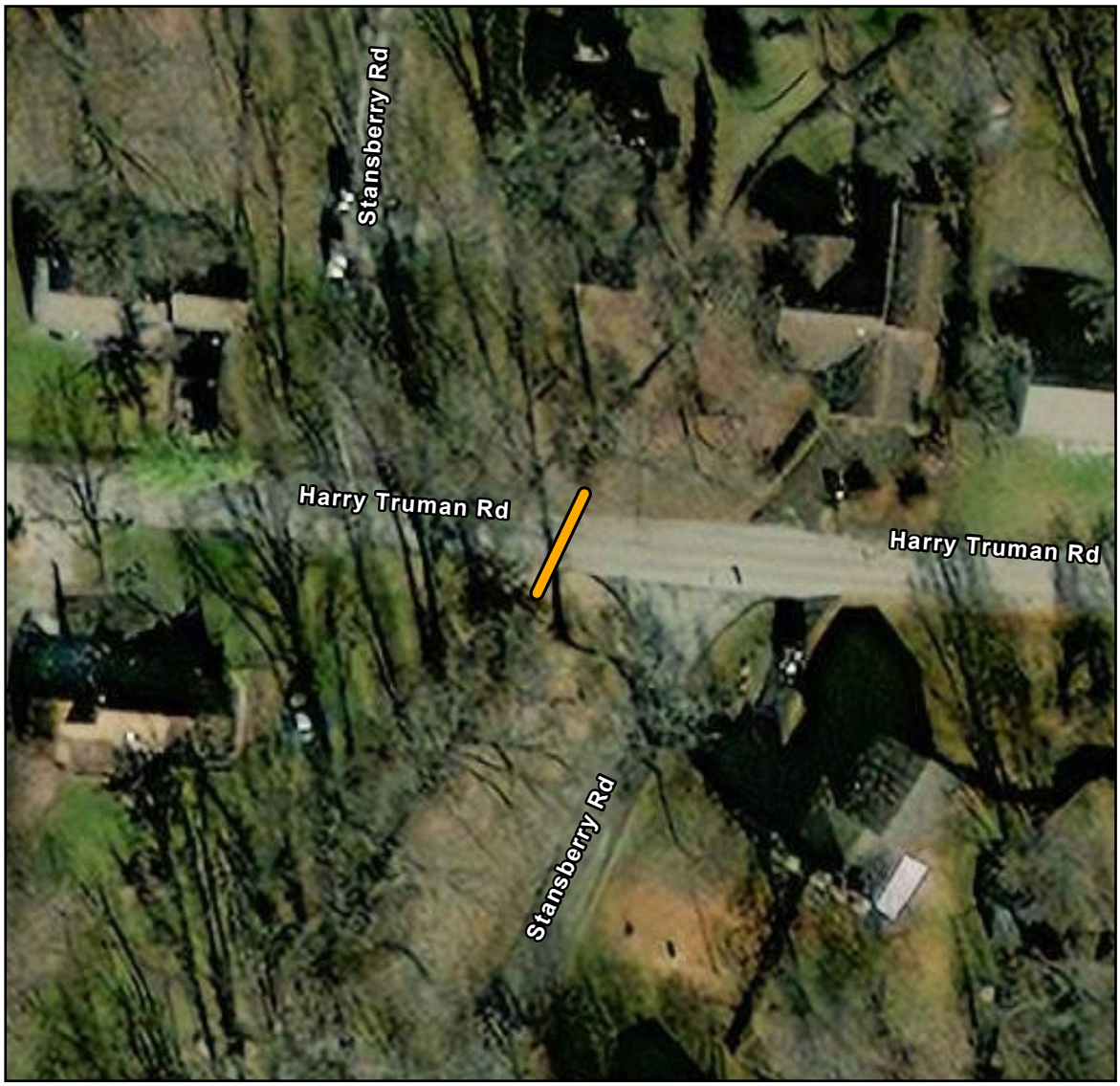


Photos

Identification

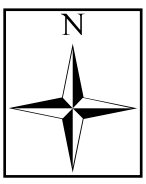
Culvert ID: B2_23

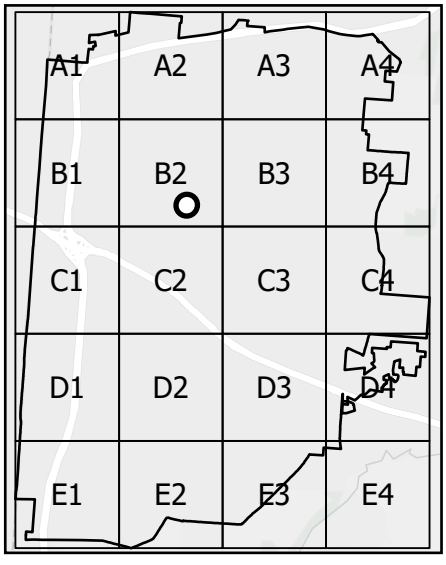
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 38

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 954.64
Downstream Elevation (ft): 953.27





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Identification

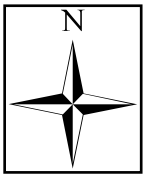
Culvert ID: B2_24

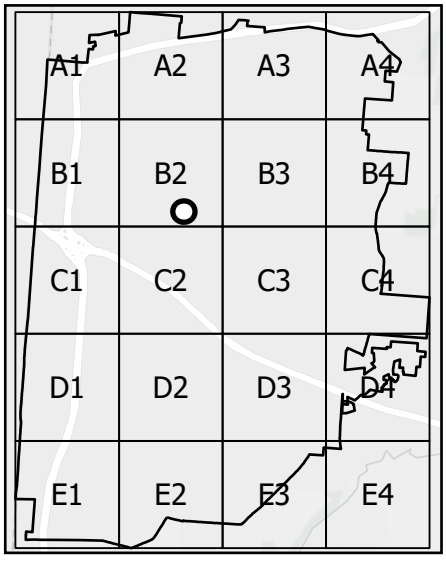
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 21

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 945.49
Downstream Elevation (ft): 944.84





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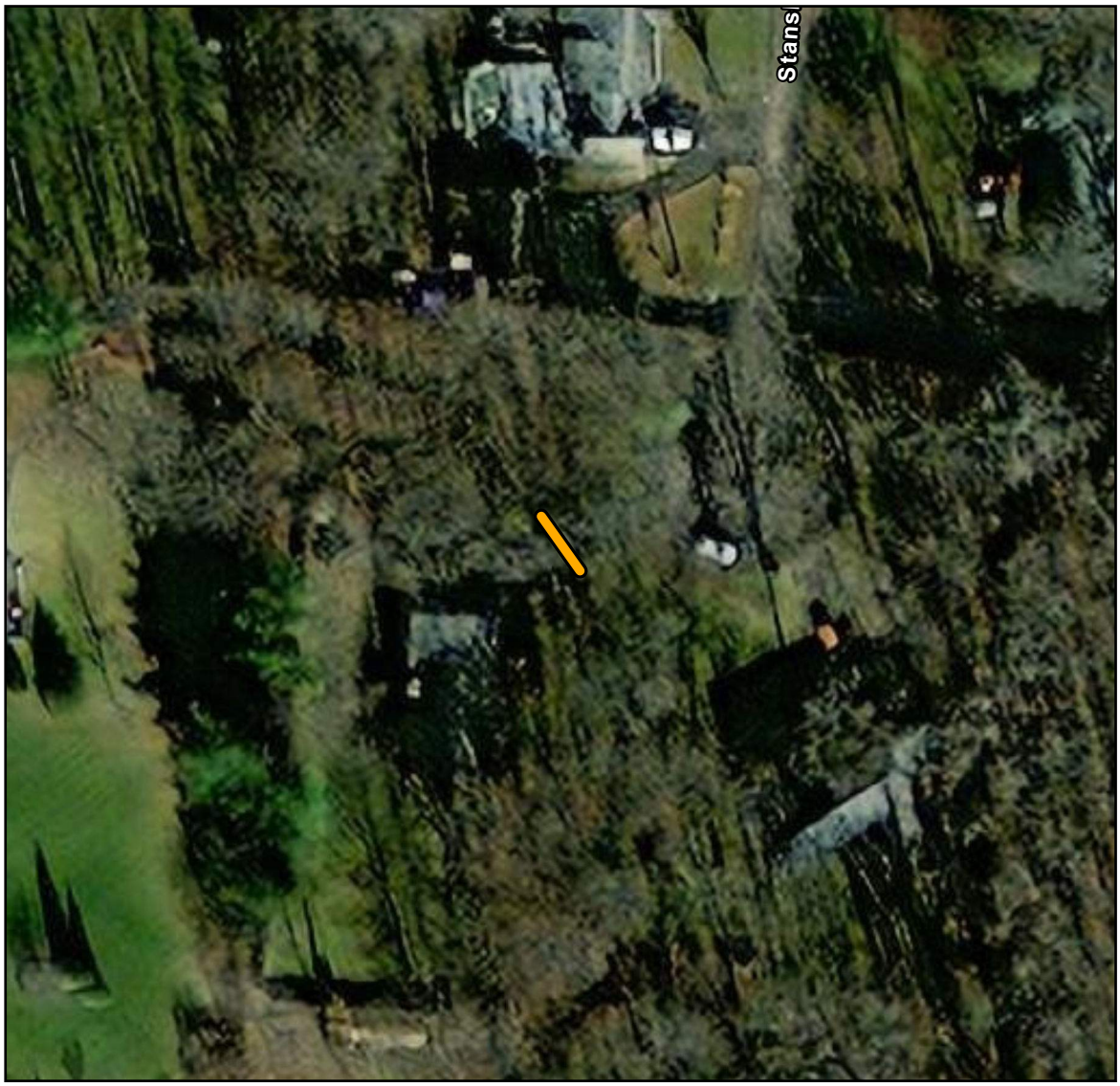
Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

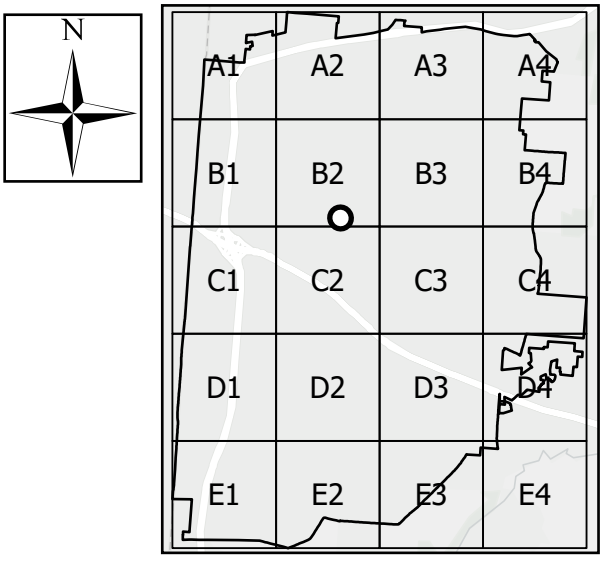
Culvert ID: B2_25

Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 23

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 934.87
Downstream Elevation (ft): 935.63



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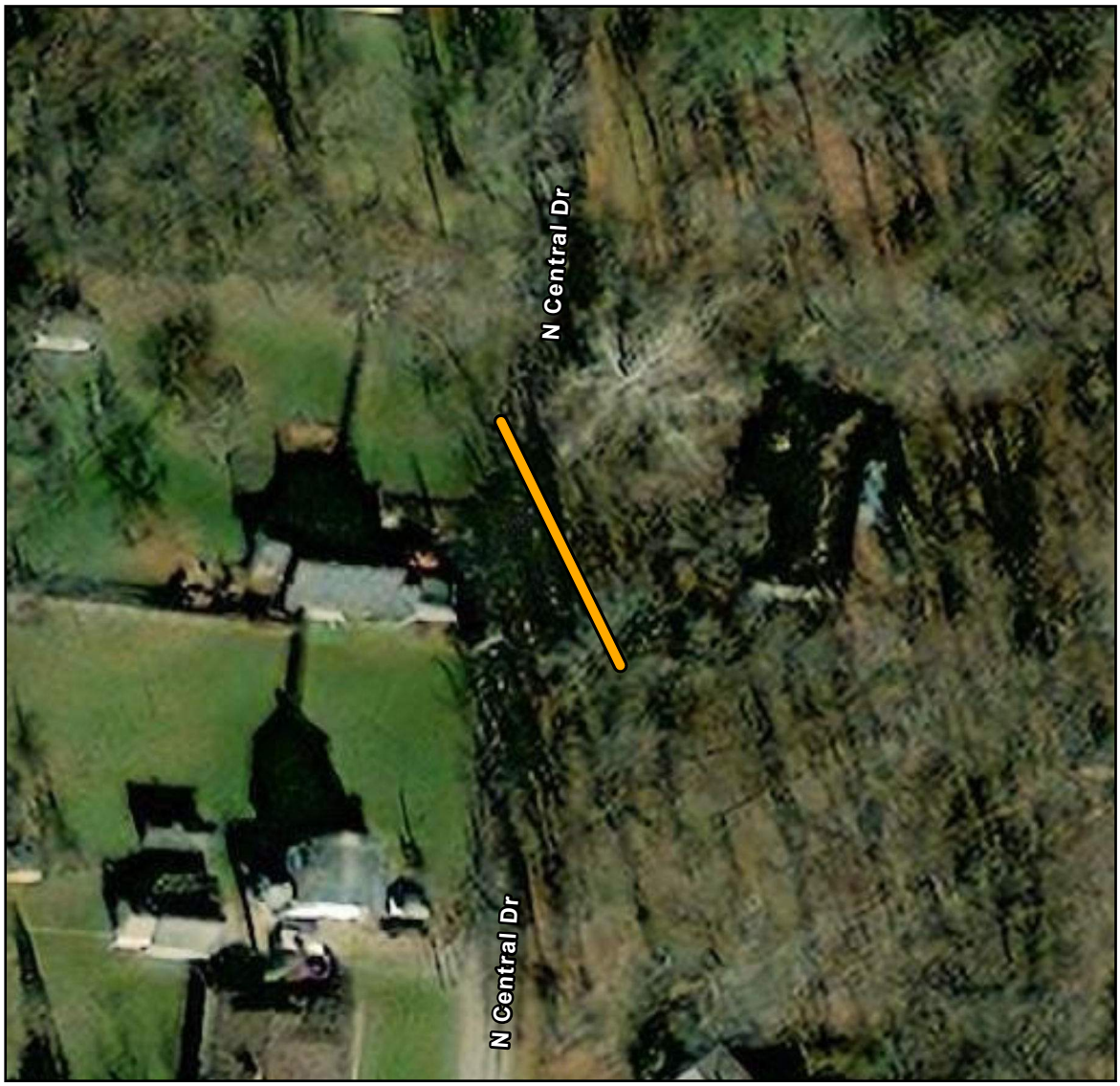


Photos

Identification

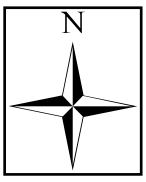
Culvert ID: B2_26

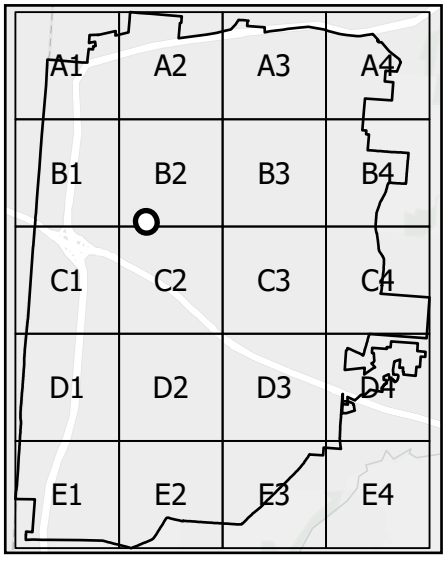
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 1.75
Culvert Span (ft): 1.75
Culvert Length (ft): 95

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 939.25
Downstream Elevation (ft): 939.05





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

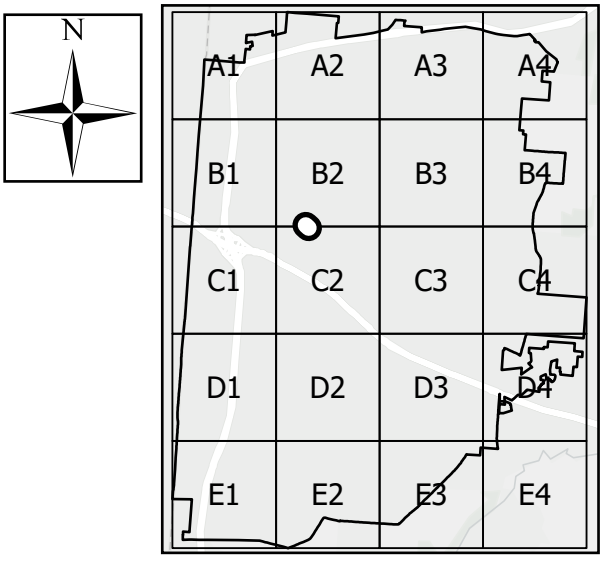
Culvert ID: B2_27

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 274

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 929.1
Downstream Elevation (ft): 922.24



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

Culvert ID: B3_01

Structure Attributes

Culvert Shape: Circular

Culvert Material: CMP

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 58

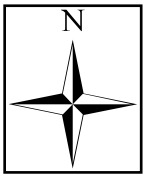
Field Inspection

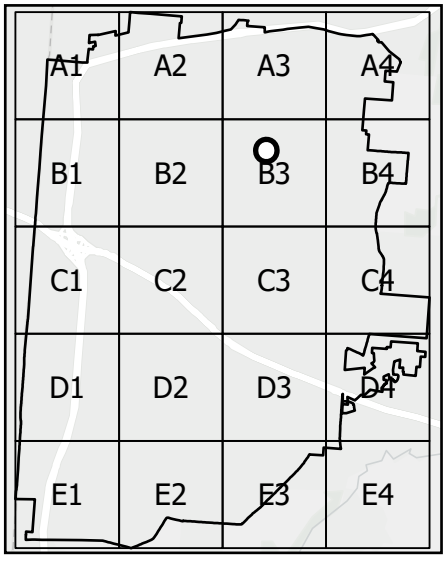
Structural Score: 1

Maintenance Score: 1

Upstream Elevation (ft): 943.02

Downstream Elevation (ft): 941.51





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Beavercreek Drainage Master Plan

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Photos

Identification

Culvert ID: B3_02

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 12

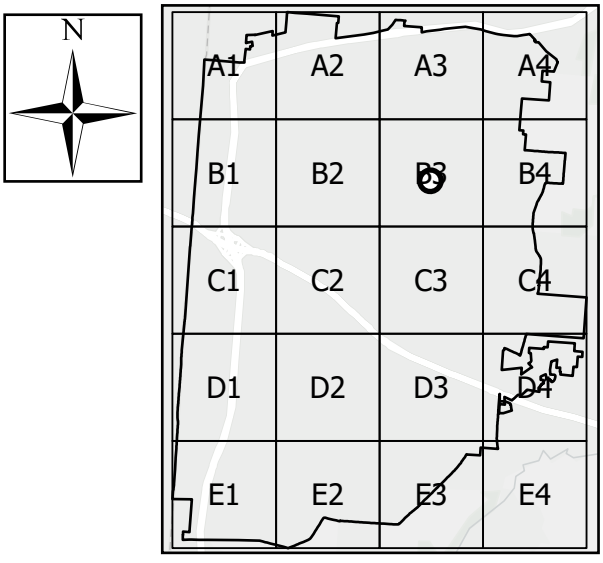
Field Inspection

Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 925.86

Downstream Elevation (ft): 925.1



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

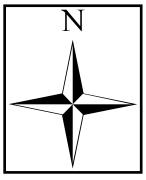
Culvert ID: B3_03

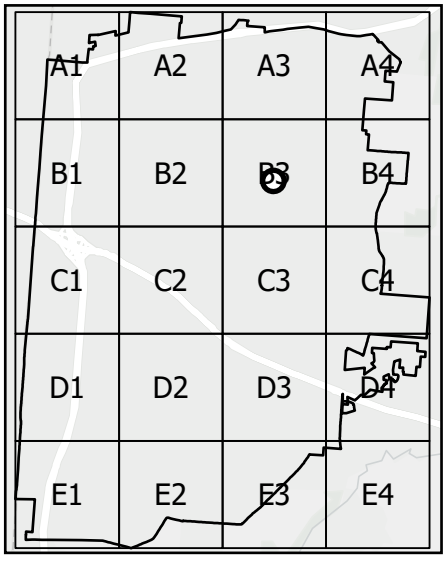
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 11

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 925.18
Downstream Elevation (ft): 924.41





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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Photos

Identification

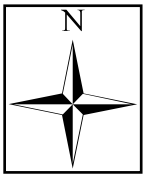
Culvert ID: B3_04

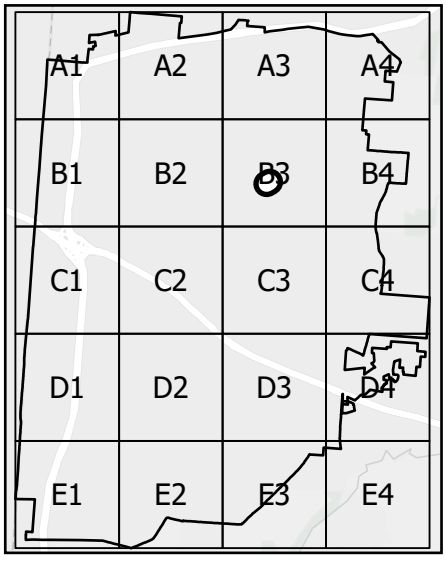
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 1
Culvert Span (ft): 1
Culvert Length (ft): 263

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 935.51
Downstream Elevation (ft): 931.29





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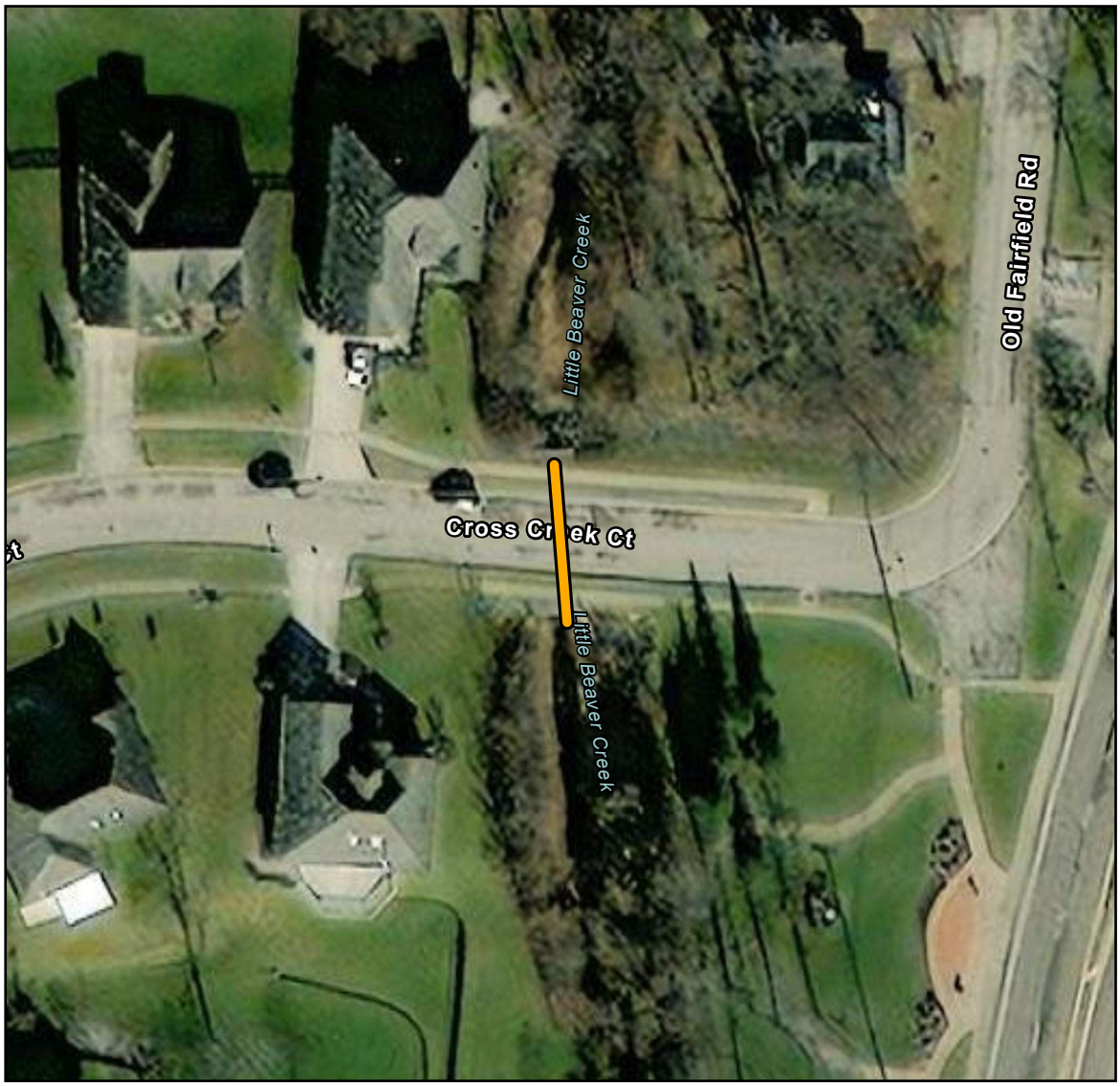


Photos

Identification

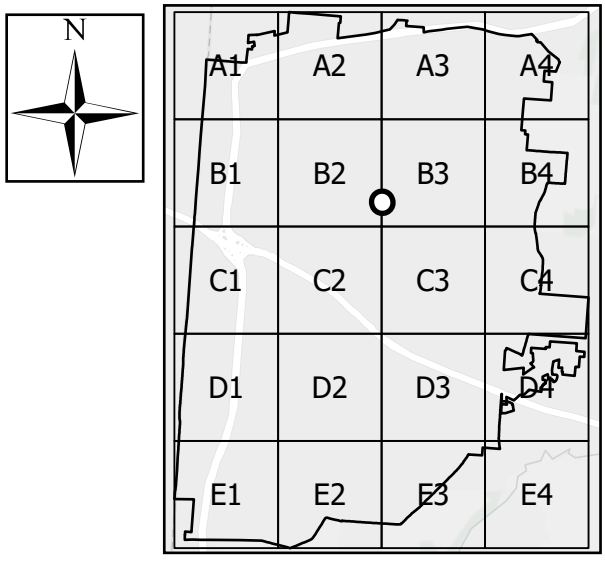
Culvert ID: B3_05

Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 16
Culvert Length (ft): 55

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 936.02
Downstream Elevation (ft): 936.14



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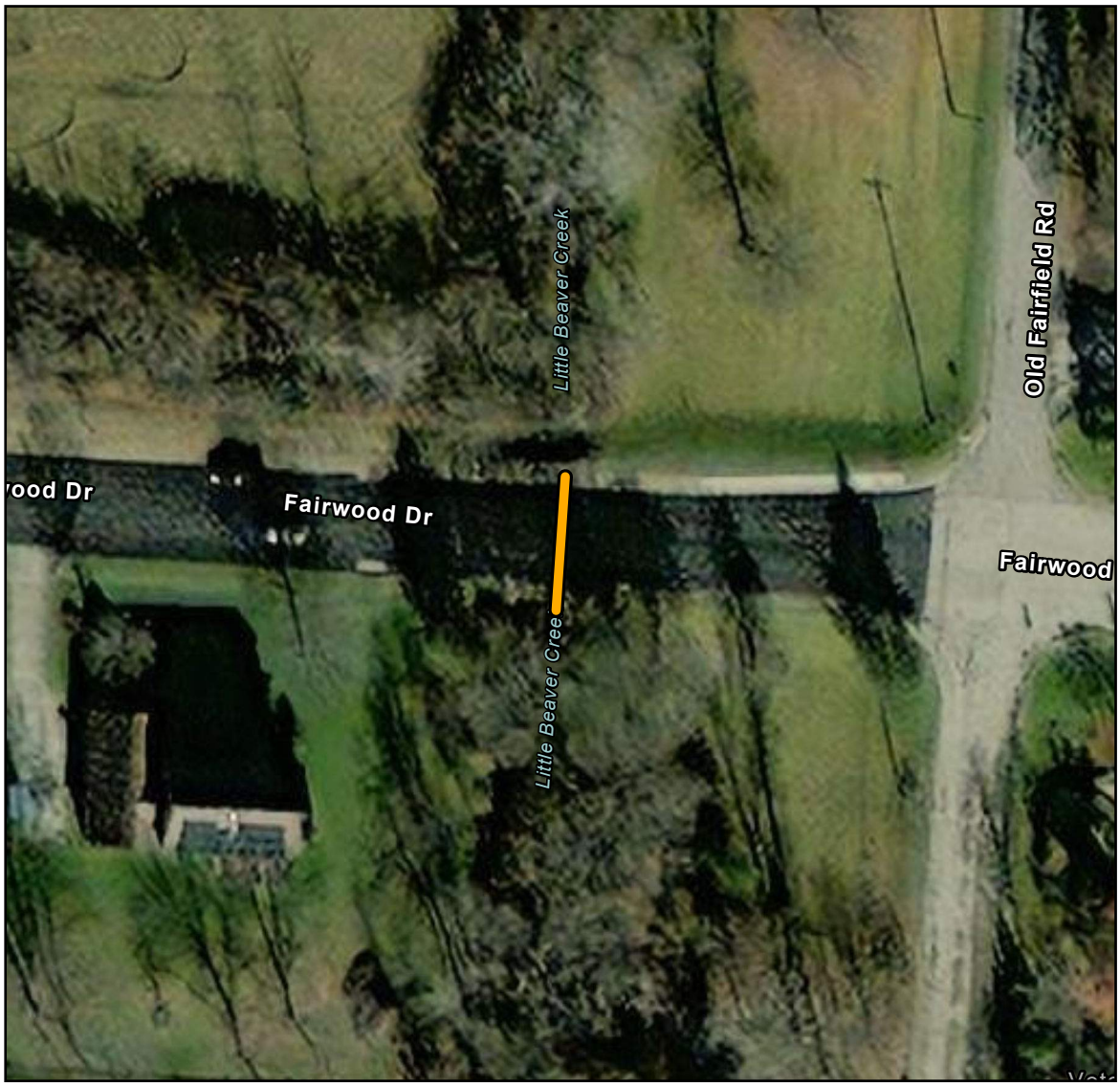


Photos

Identification

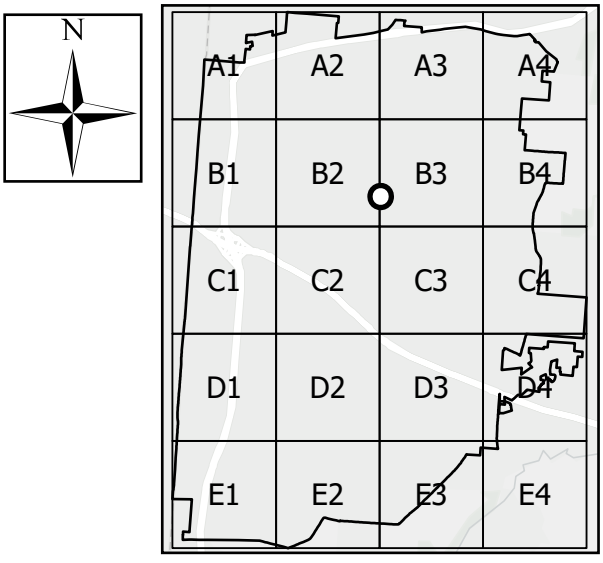
Culvert ID: B3_06

Structure Attributes

Culvert Shape: Ellipse
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 16
Culvert Length (ft): 47

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 939.18
Downstream Elevation (ft): 939.9



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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Photos

Identification

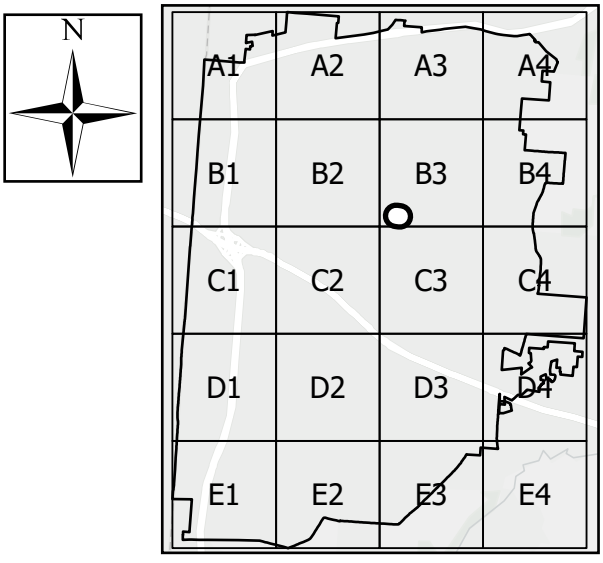
Culvert ID: B3_07

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 253

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 915
Downstream Elevation (ft): 911.14



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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Identification

Culvert ID: B4_01

Structure Attributes

Culvert Shape: Box

Culvert Material: RCP

Culvert Rise (ft): 3

Culvert Span (ft): 5

Culvert Length (ft): 44

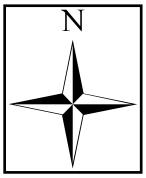
Field Inspection

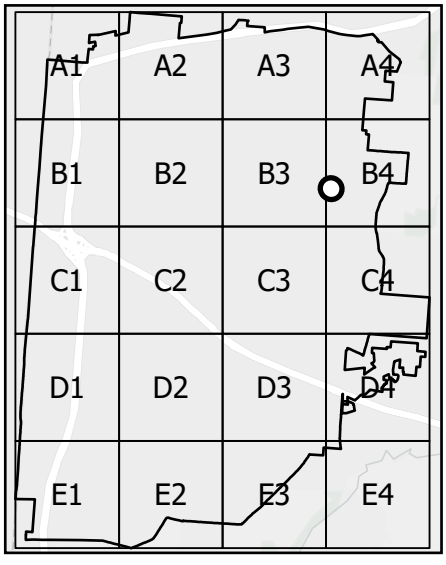
Structural Score: 2

Maintenance Score: 3

Upstream Elevation (ft): 875.5

Downstream Elevation (ft): 873.5





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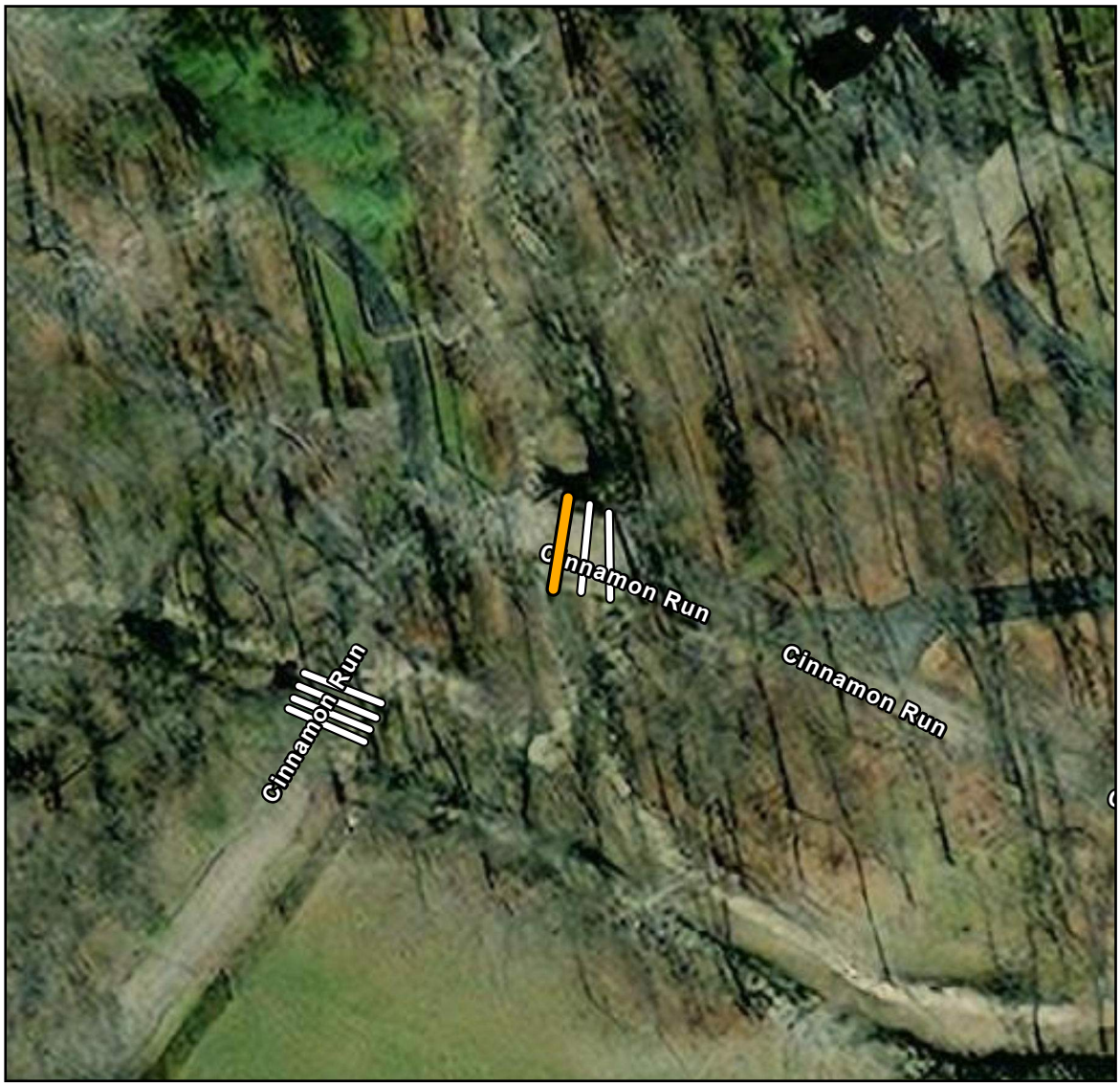
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

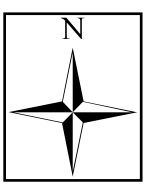
Culvert ID: B4_02

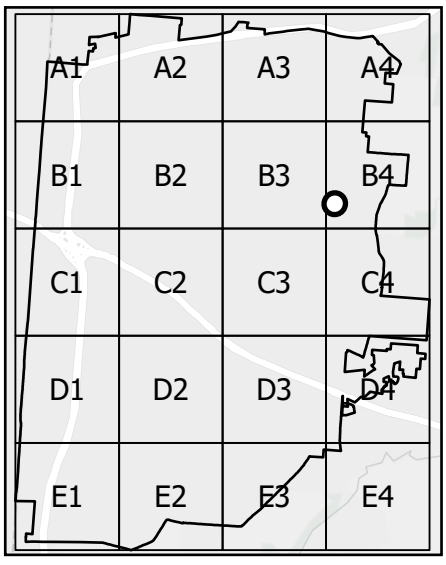
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 32

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 859.31
Downstream Elevation (ft): 858





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Culvert Cutsheets

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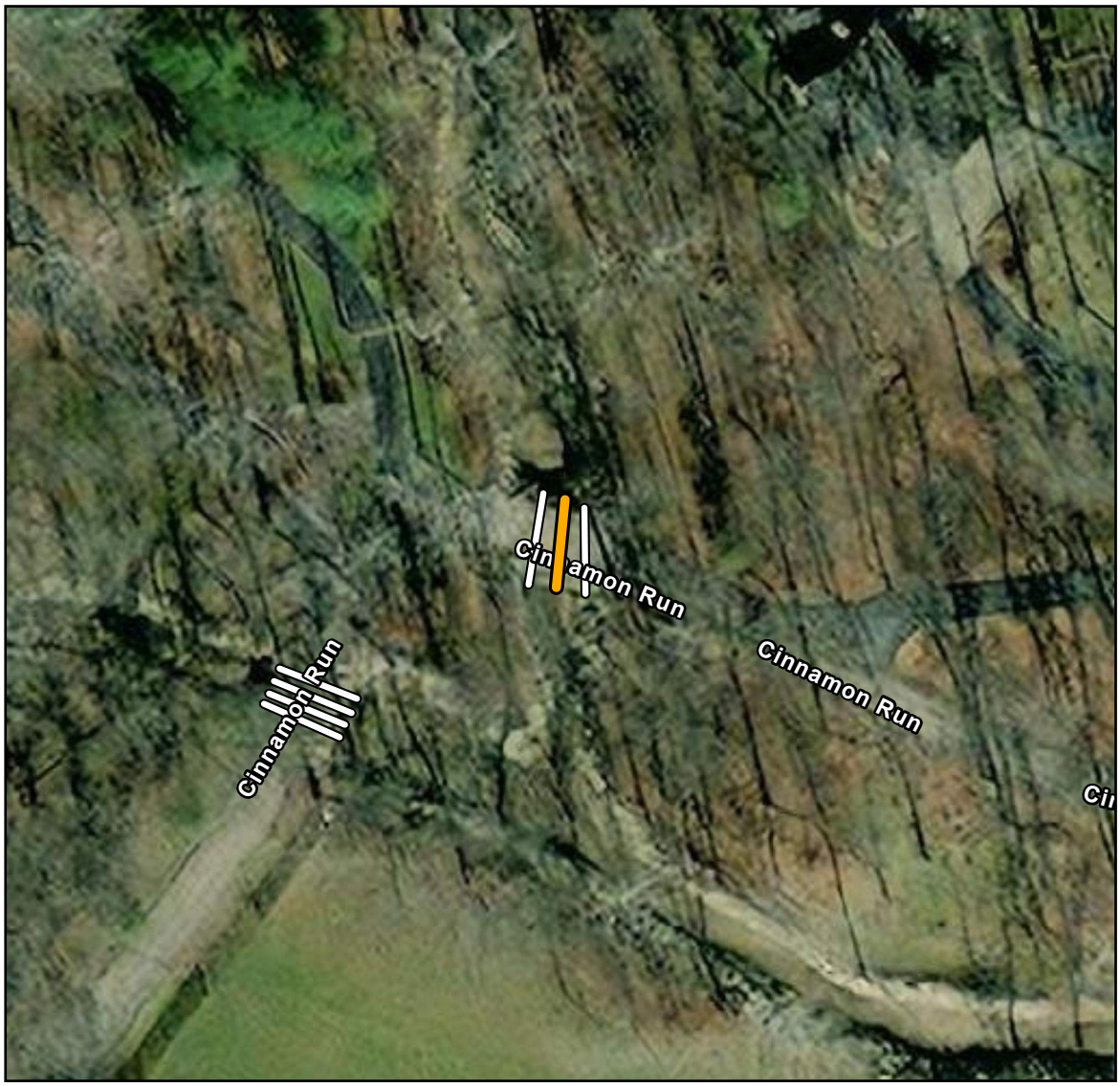


Photos

Identification

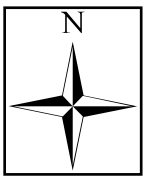
Culvert ID: B4_03

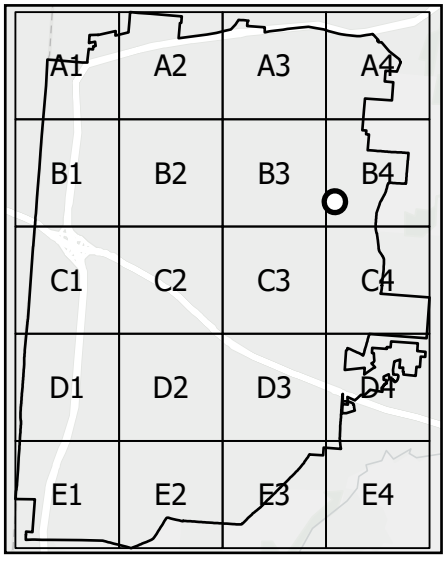
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 31

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 858.9
Downstream Elevation (ft): 860.58





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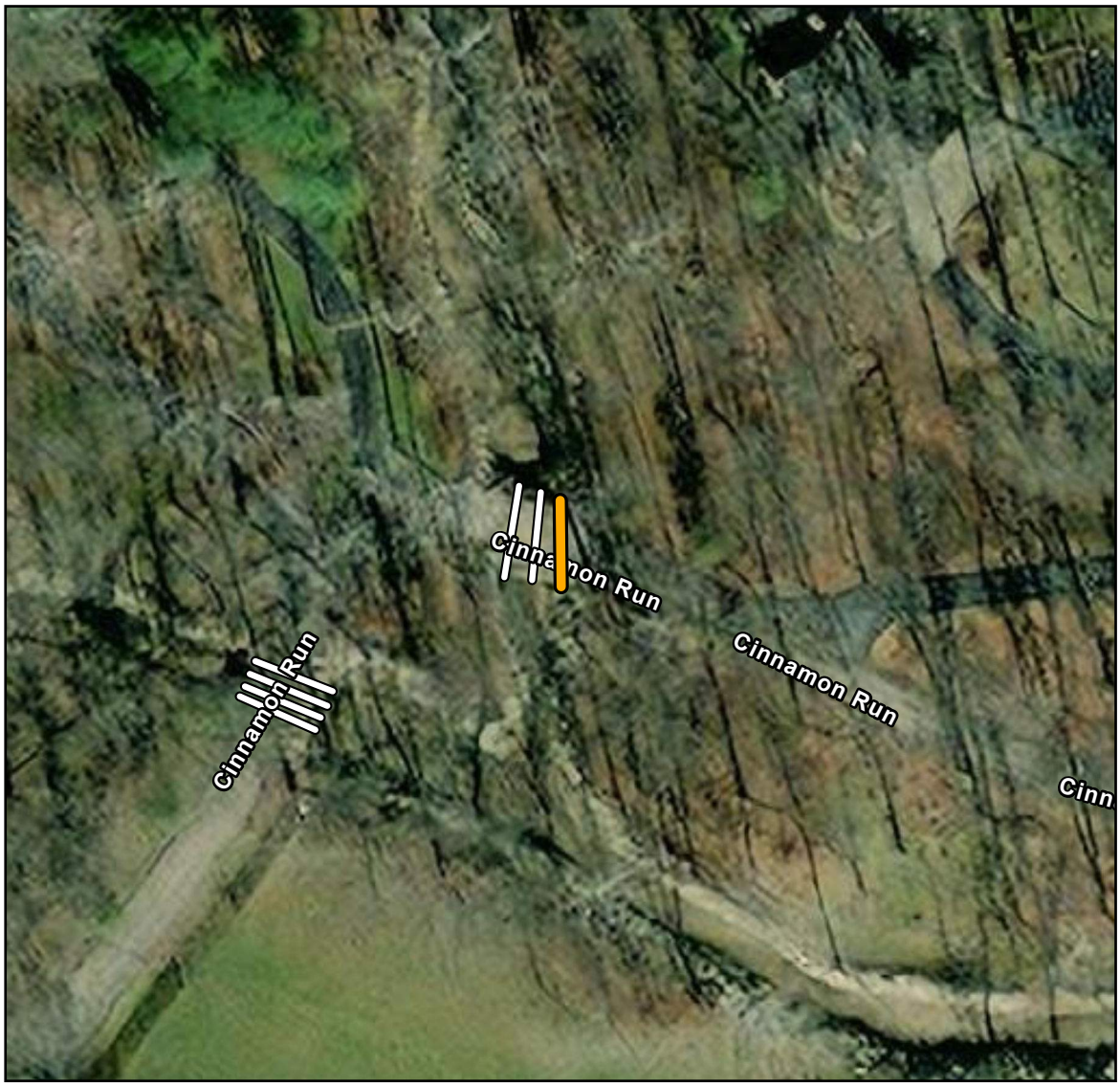


Photos

Identification

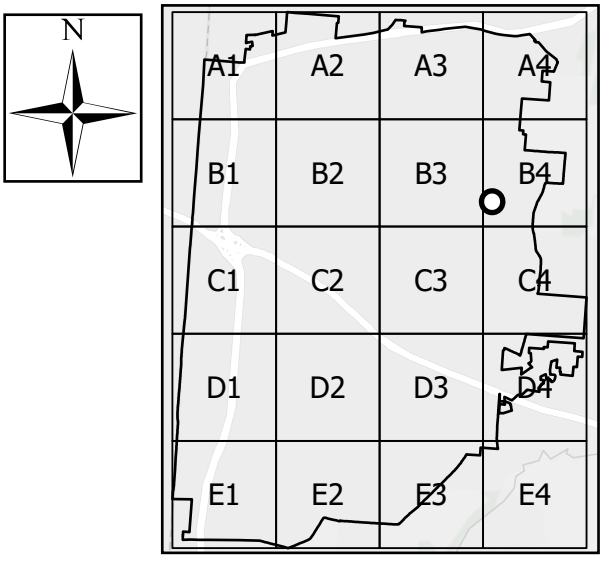
Culvert ID: B4_04

Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 30

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 859.27
Downstream Elevation (ft): 857.5



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Photos

Identification

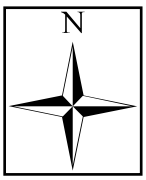
Culvert ID: B4_05

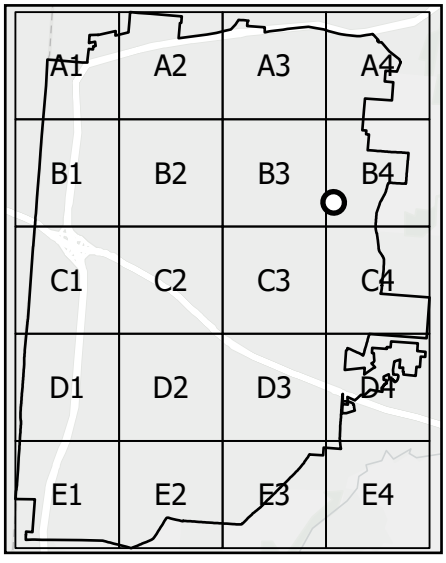
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 29

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 859.38
Downstream Elevation (ft): 860.15





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Photos

Identification

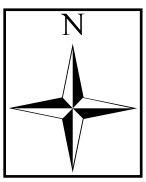
Culvert ID: B4_06

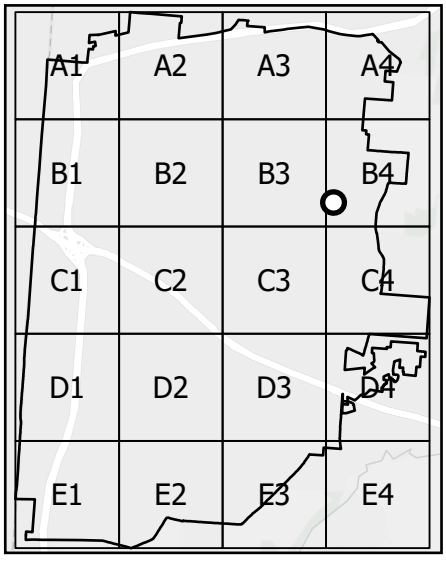
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 29

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 859.75
Downstream Elevation (ft): 860.12





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Photos

Identification

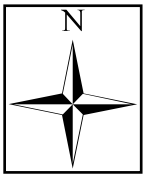
Culvert ID: B4_07

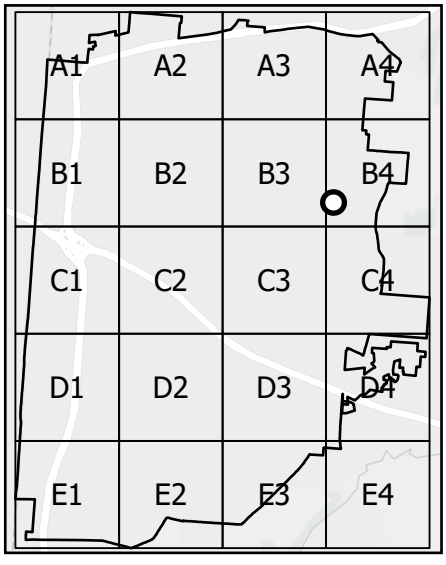
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 29

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 860.12
Downstream Elevation (ft): 860.19





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Photos

Identification

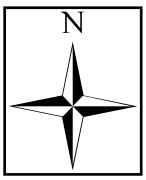
Culvert ID: B4_08

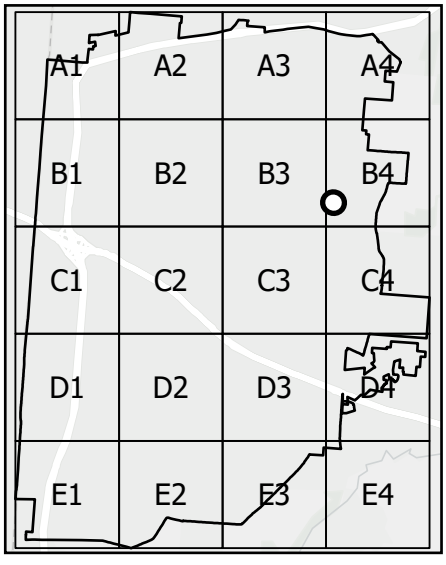
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 29

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 860.2
Downstream Elevation (ft): 859.96





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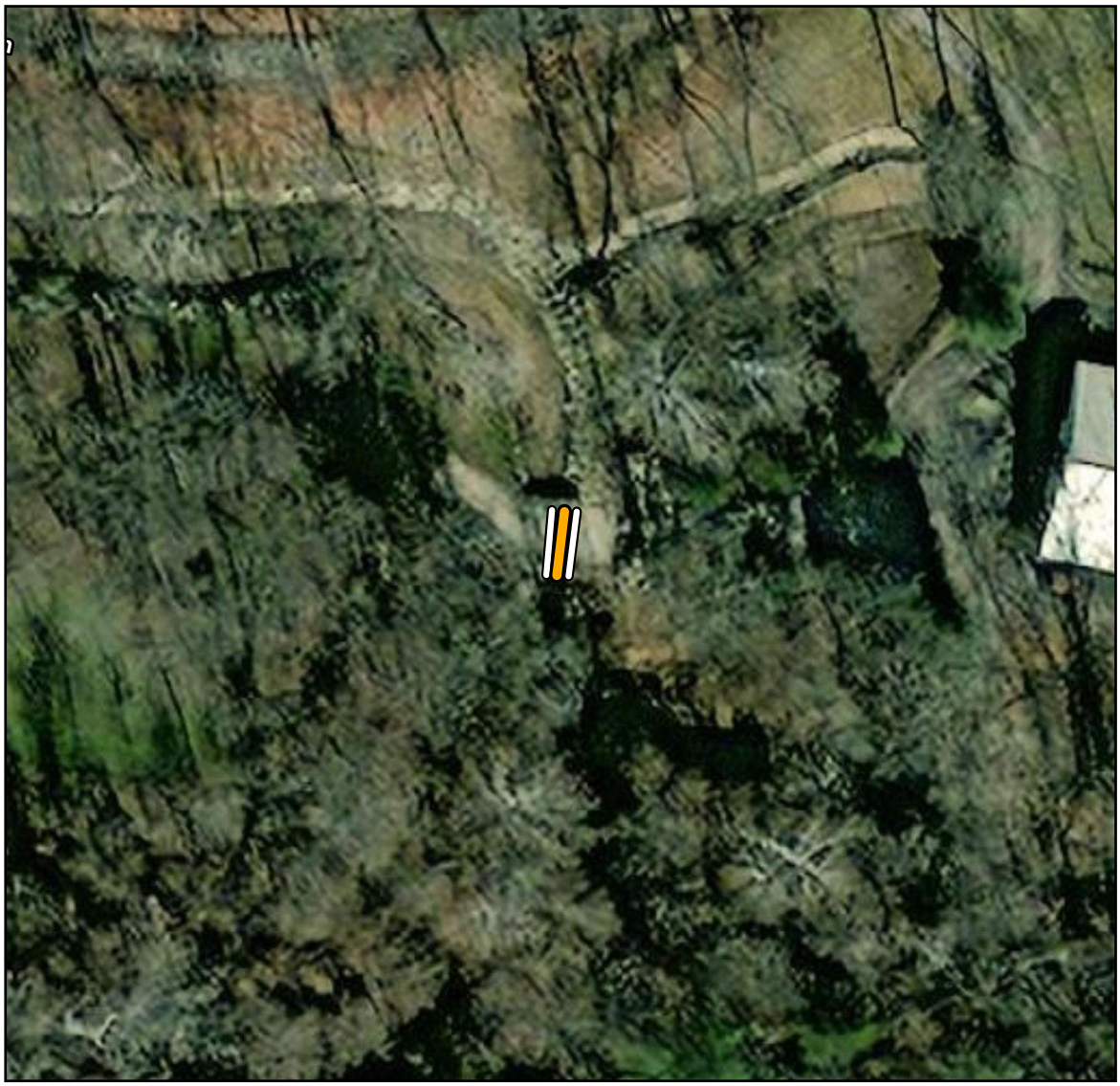


Photos

Identification

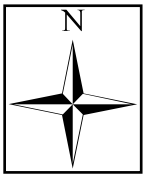
Culvert ID: B4_09

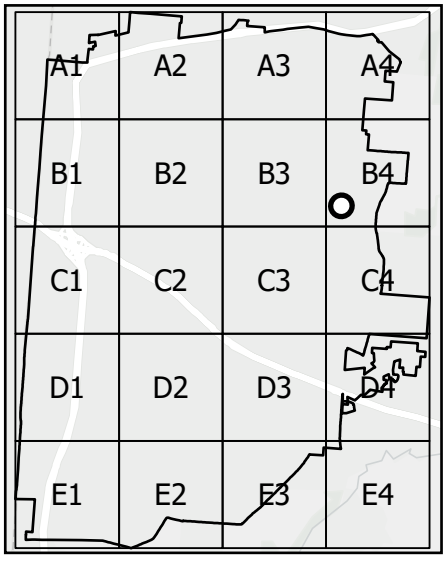
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 22

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 853.87
Downstream Elevation (ft): 853.82





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Culvert Cutsheets

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Photos

Identification

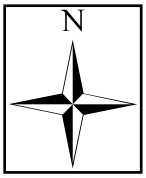
Culvert ID: B4_10

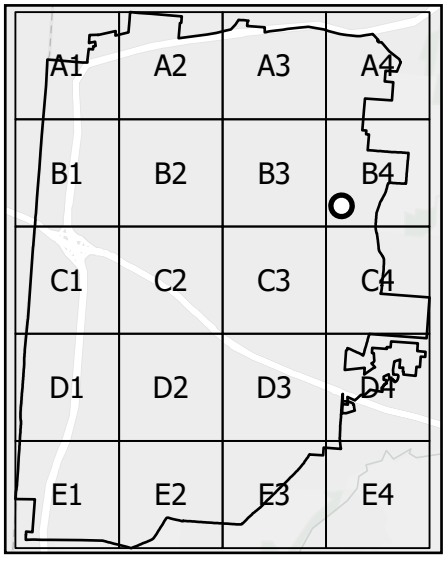
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 23

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 853.75
Downstream Elevation (ft): 853.76





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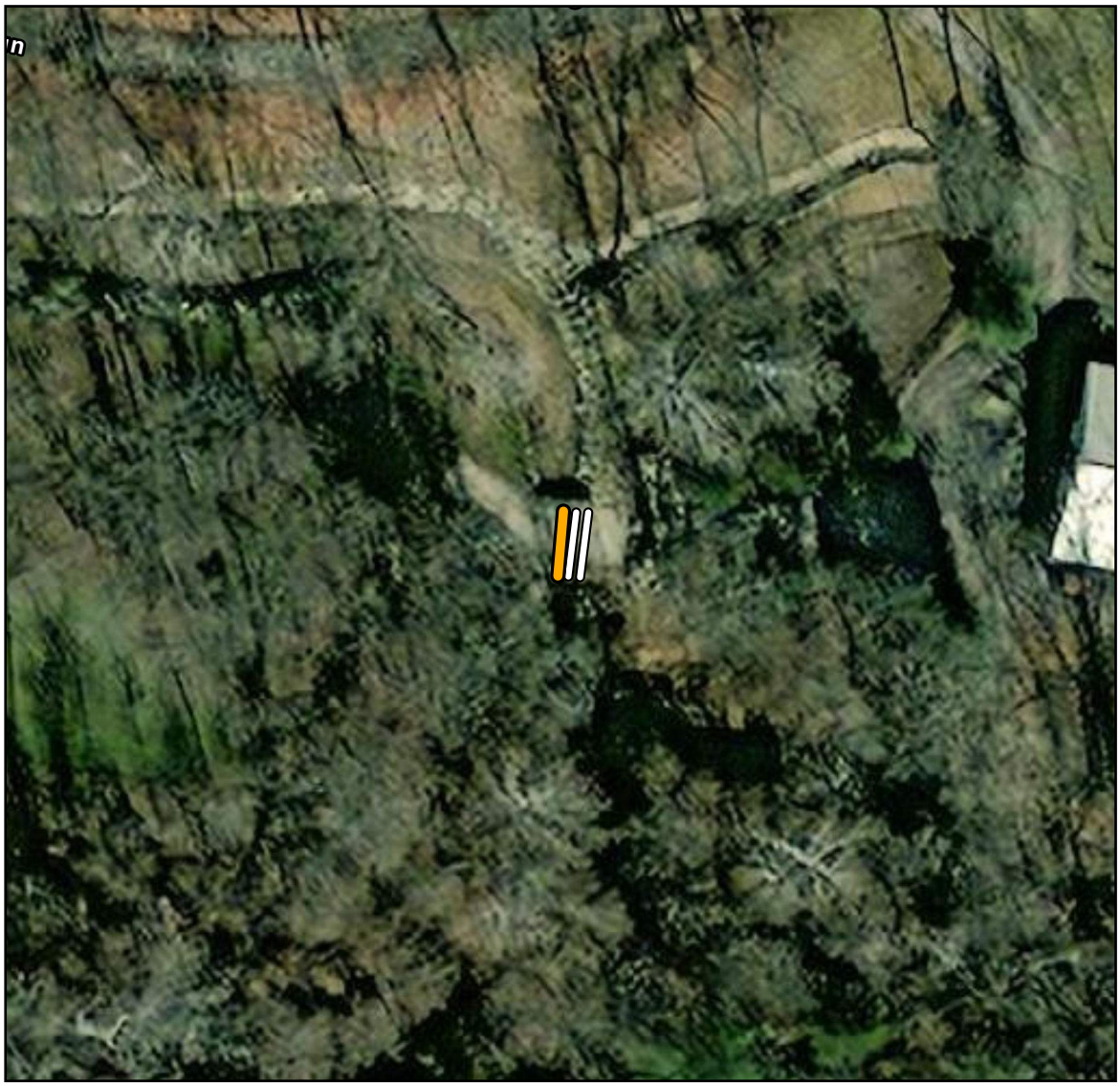


Photos

Identification

Culvert ID: B4_11

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 23

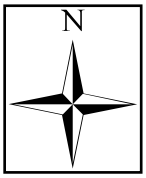
Field Inspection

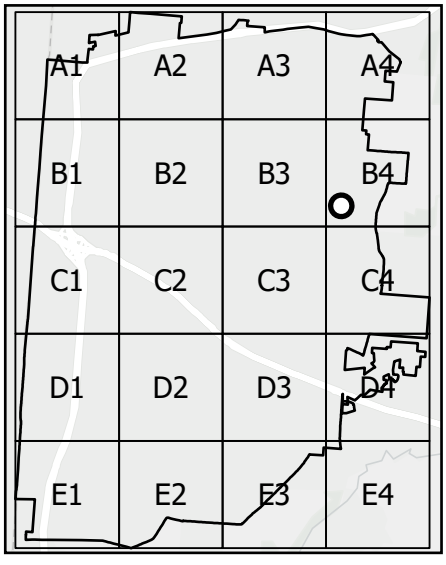
Structural Score: 1

Maintenance Score: 1

Upstream Elevation (ft): 853.73

Downstream Elevation (ft): 854.08





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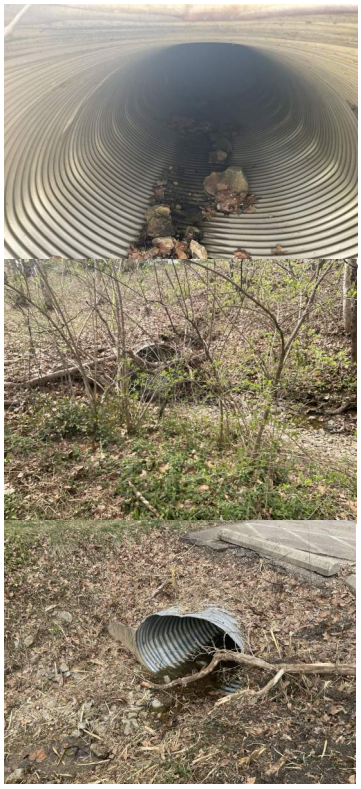


Identification

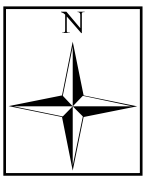
Culvert ID: C2_01

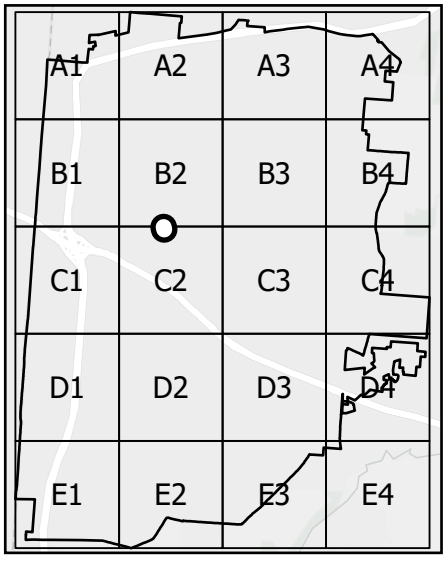
Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 5
Culvert Span (ft): 7
Culvert Length (ft): 163

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 913.18
Downstream Elevation (ft): 901.99





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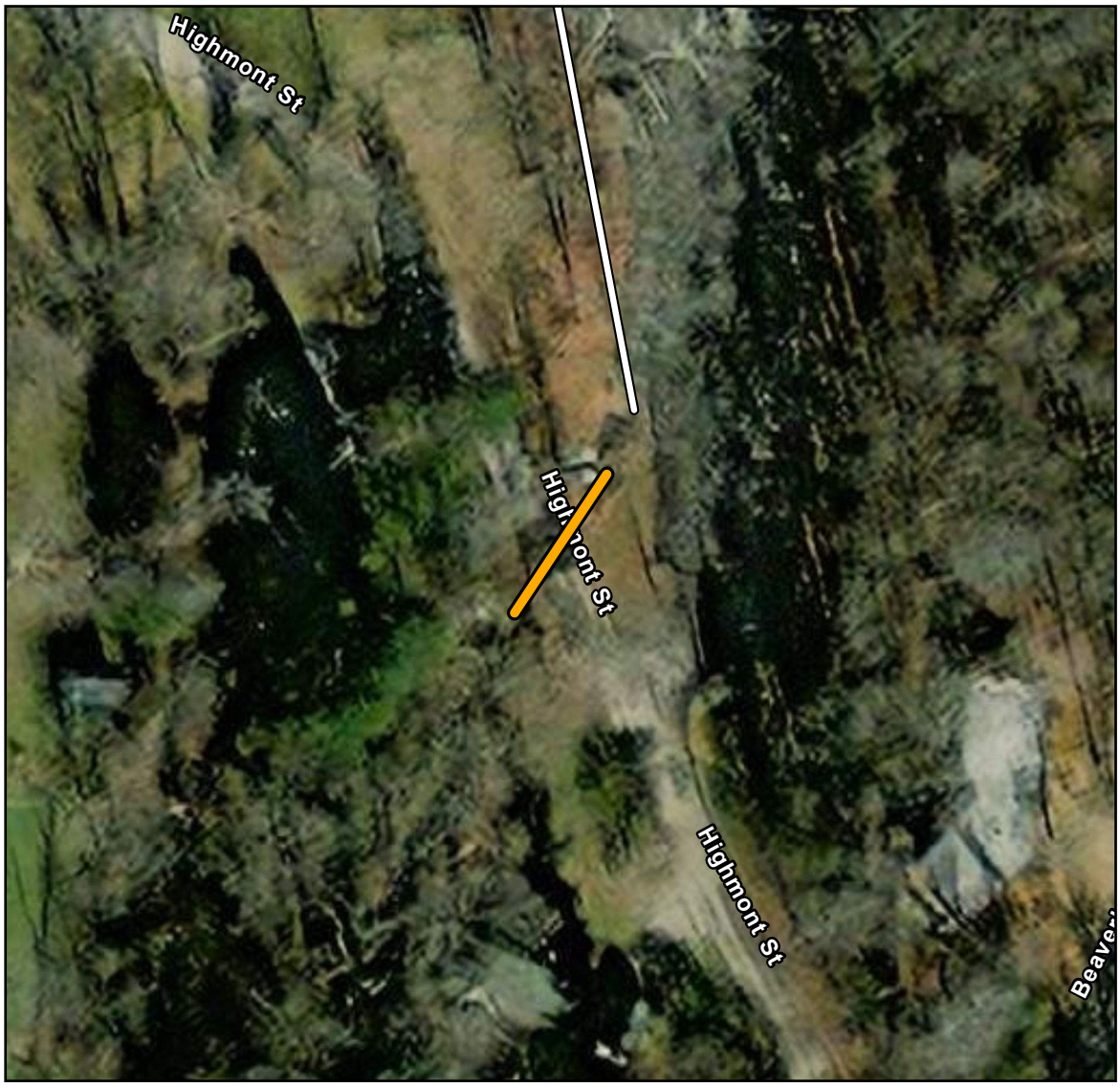


Photos

Identification

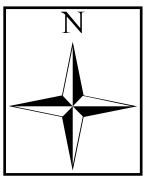
Culvert ID: C2_02

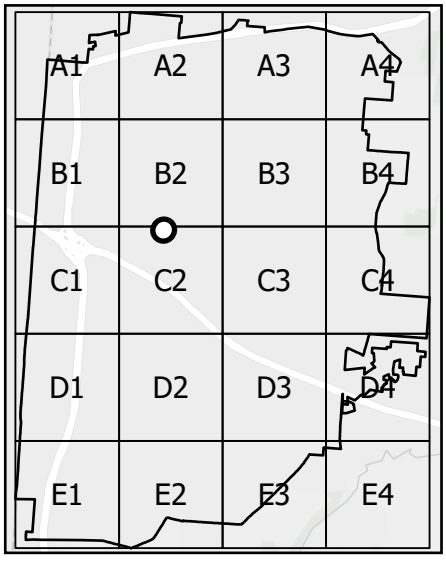
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 4.45
Culvert Span (ft): 6
Culvert Length (ft): 58

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 902.25
Downstream Elevation (ft): 901.67





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Photos

Identification

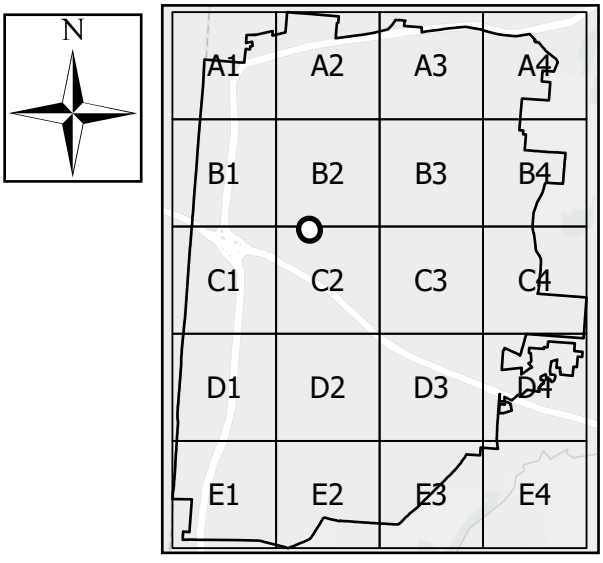
Culvert ID: C2_03

Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 117

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 921.74
Downstream Elevation (ft): 912.86



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Identification

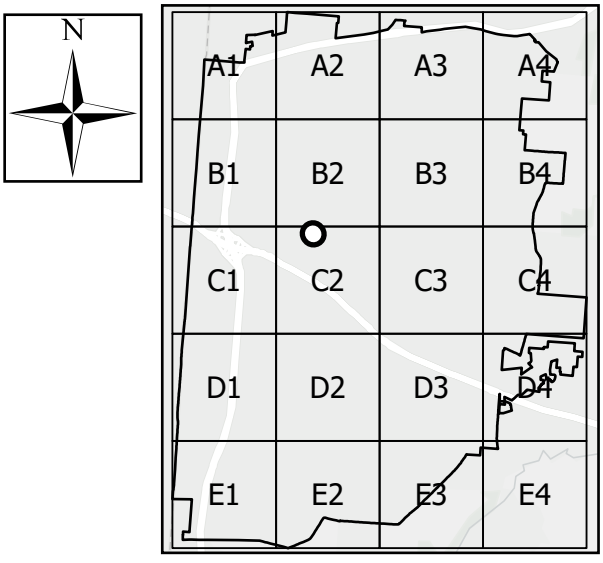
Culvert ID: C2_04

Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 4.5
Culvert Length (ft): 55

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 910.5
Downstream Elevation (ft): 909.5



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Identification

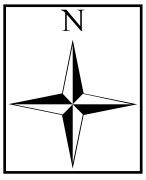
Culvert ID: C2_05

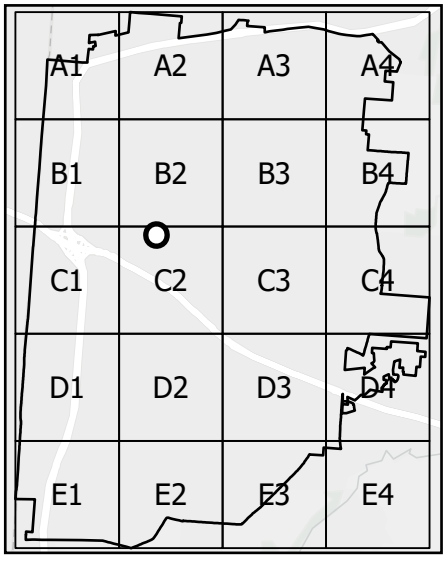
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 68

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 912.3
Downstream Elevation (ft): 907.64





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Photos

Identification

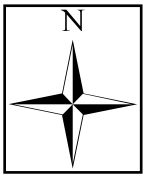
Culvert ID: C2_06

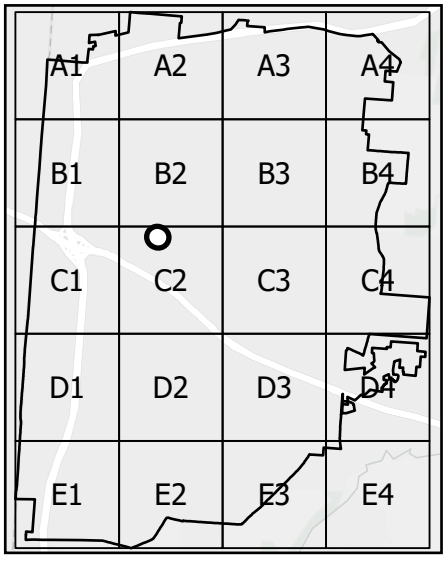
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 71

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 903.58
Downstream Elevation (ft): 901.96





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Photos

Identification

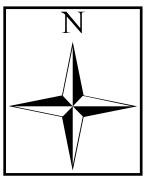
Culvert ID: C2_07

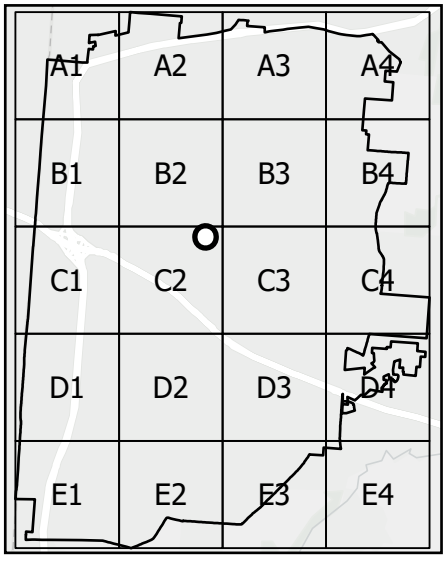
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 74

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 908.29
Downstream Elevation (ft): 907.35





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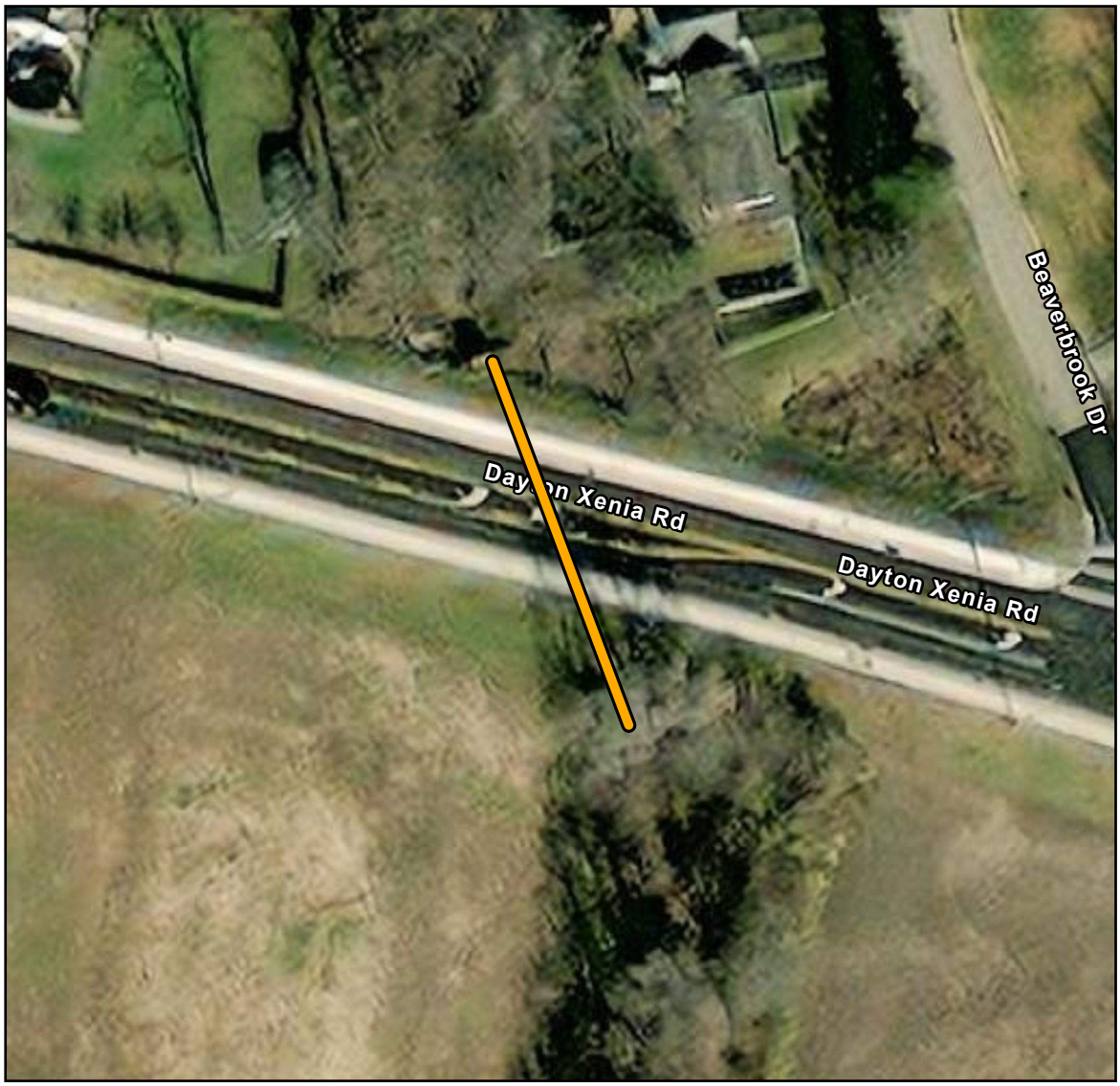


Photos

Identification

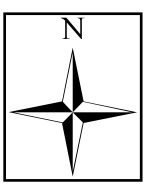
Culvert ID: C2_08

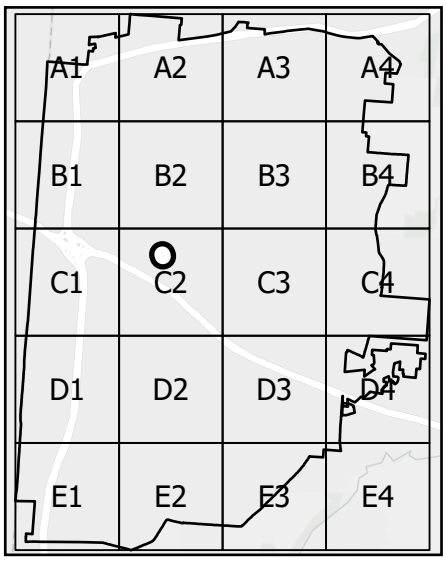
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: RCP
Culvert Rise (ft): 7.25
Culvert Span (ft): 11
Culvert Length (ft): 135

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 881.47
Downstream Elevation (ft): 880





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

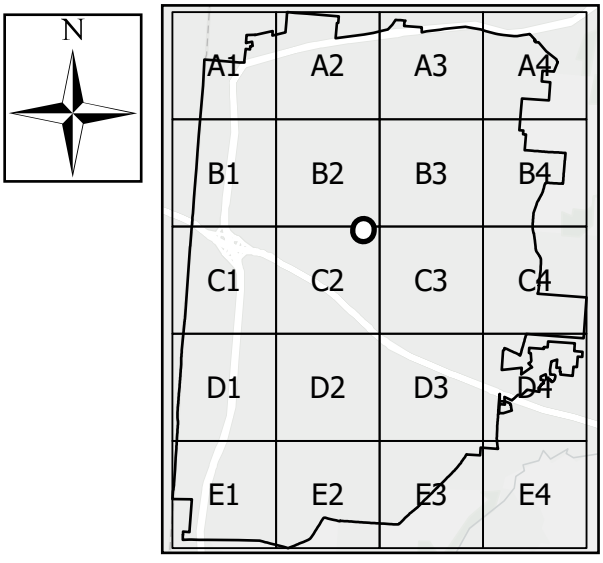
Culvert ID: C2_09

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 122

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 919
Downstream Elevation (ft): 917.26



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Beavercreek Drainage Master Plan

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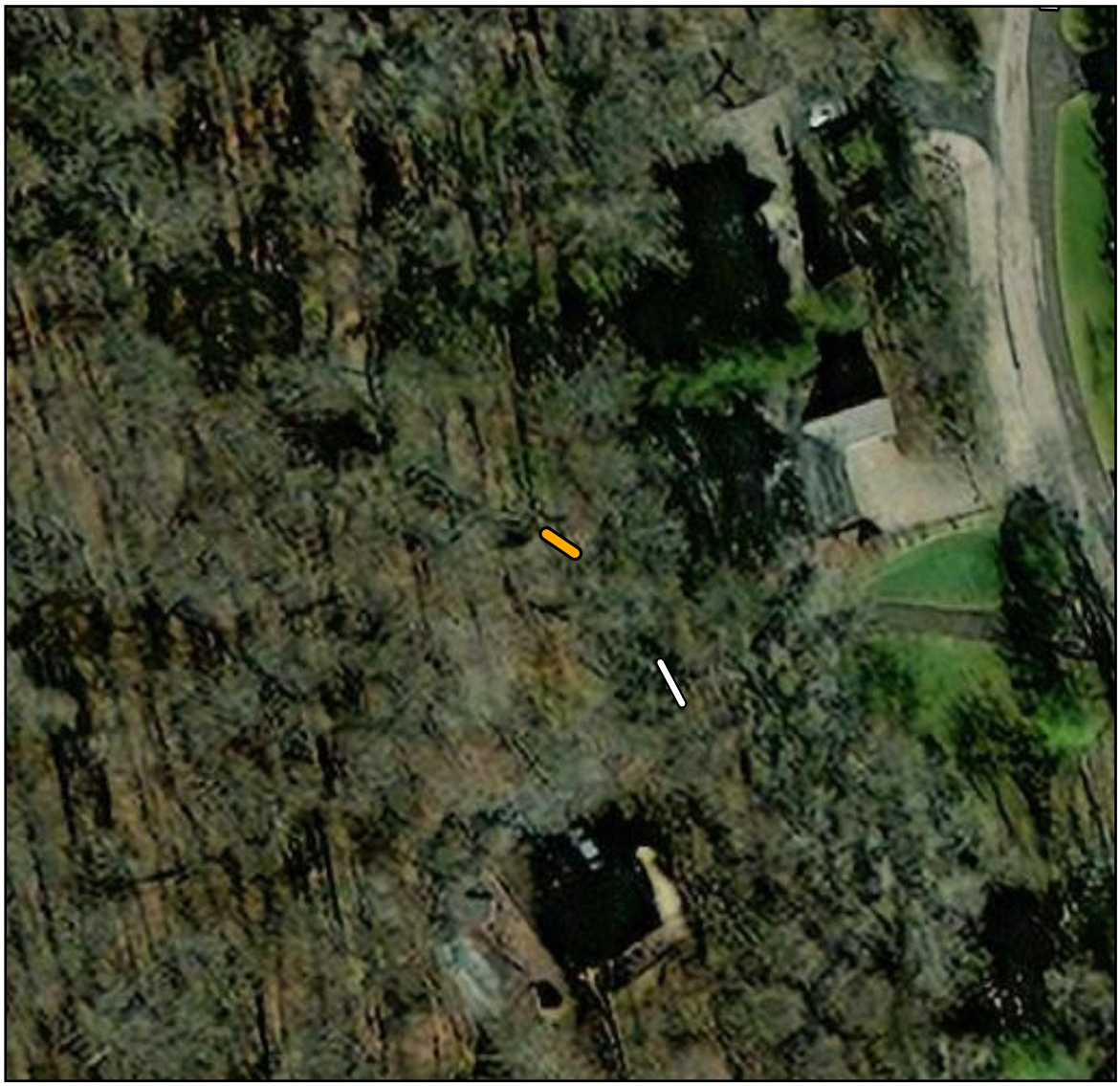


Photos

Identification

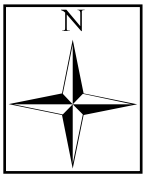
Culvert ID: C2_10

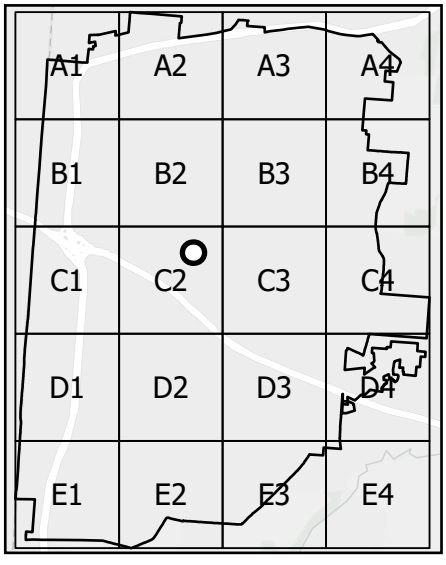
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 3.8
Culvert Span (ft): 5.4
Culvert Length (ft): 12

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 887.5
Downstream Elevation (ft): 887.4





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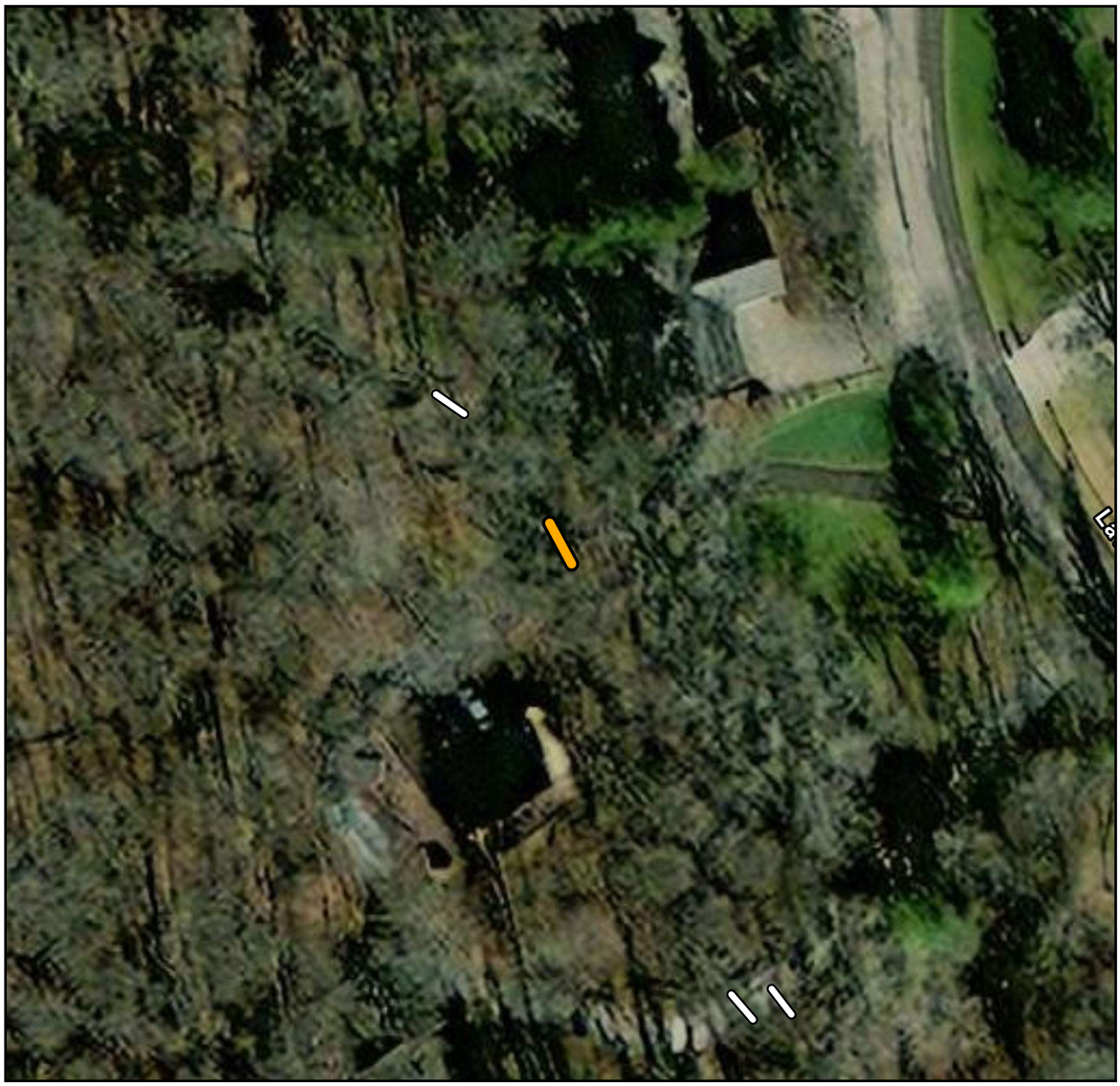


Photos

Identification

Culvert ID: C2_11

Structure Attributes

Culvert Shape: Arch

Culvert Material: CMP

Culvert Rise (ft): 3.8

Culvert Span (ft): 5.4

Culvert Length (ft): 16

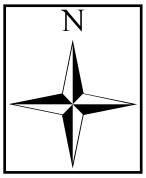
Field Inspection

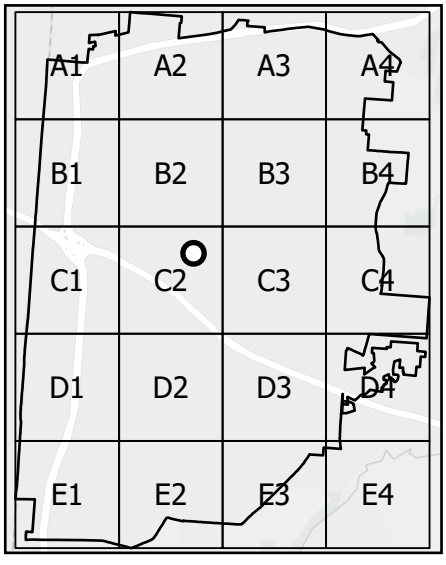
Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 887

Downstream Elevation (ft): 886.6





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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Photos

Identification

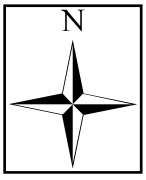
Culvert ID: C2_12

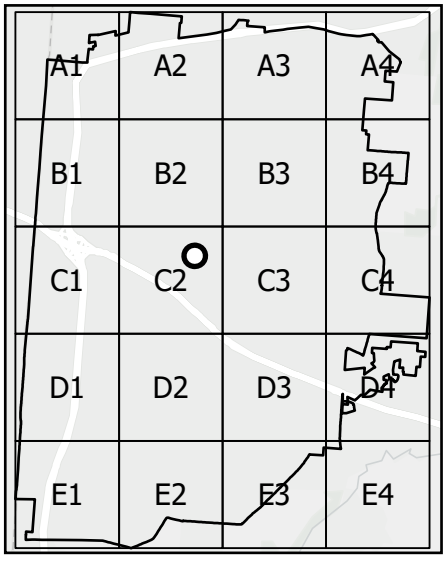
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 11

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 885
Downstream Elevation (ft): 884.5





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Beavercreek Drainage Master Plan

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Photos

Identification

Culvert ID: C2_13

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 12

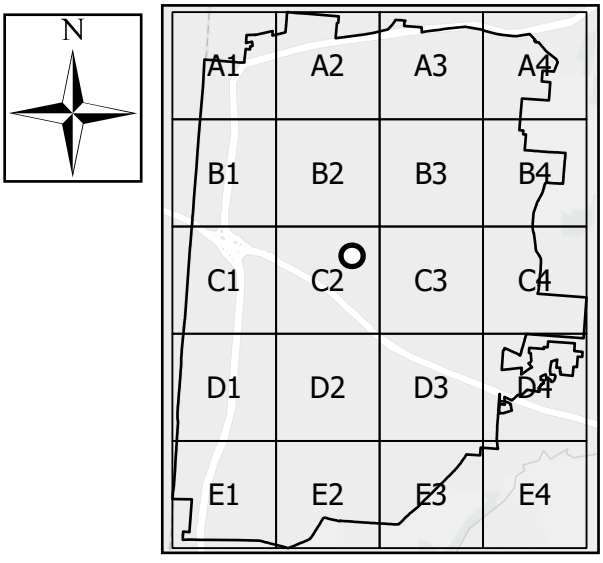
Field Inspection

Structural Score: 2

Maintenance Score: 3

Upstream Elevation (ft): 885

Downstream Elevation (ft): 884.5



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Culvert Cutsheets

Beavercreek Drainage Master Plan

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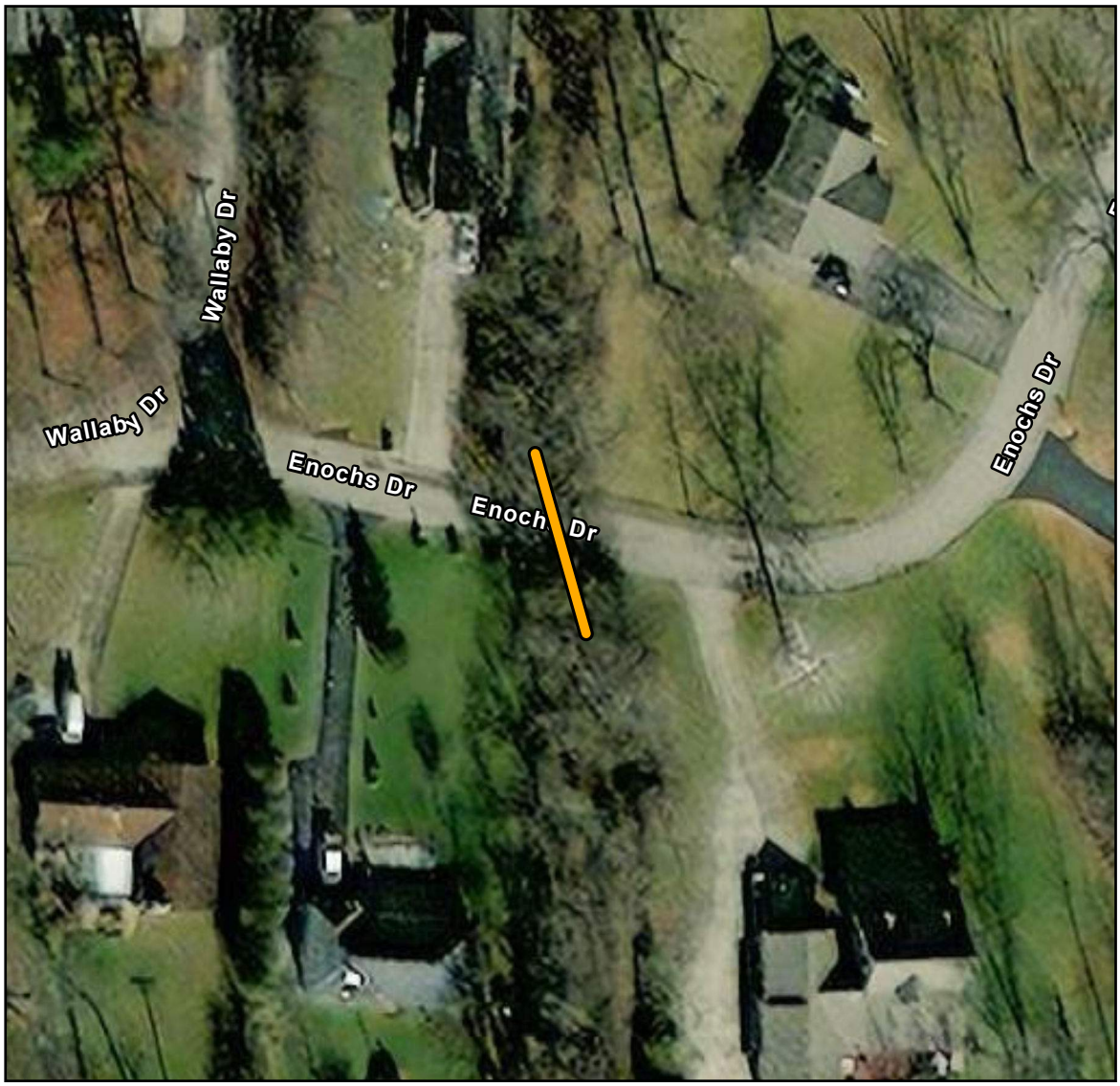


Photos

Identification

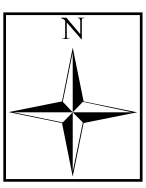
Culvert ID: C2_14

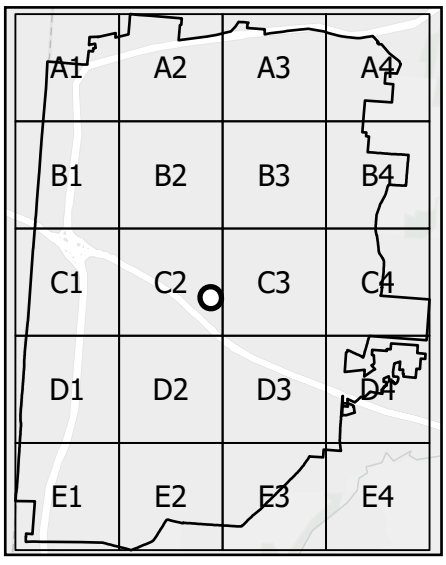
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 65

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 862.72
Downstream Elevation (ft): 862.75





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Culvert Cutsheets

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Photos

Identification

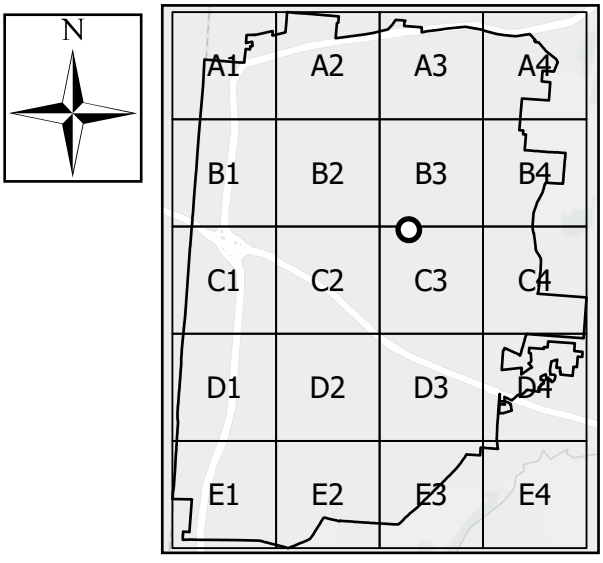
Culvert ID: C3_01

Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 41

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 898
Downstream Elevation (ft): 897



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Culvert Cutsheets

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Photos

Identification

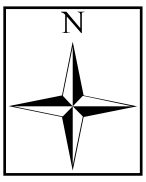
Culvert ID: C3_02

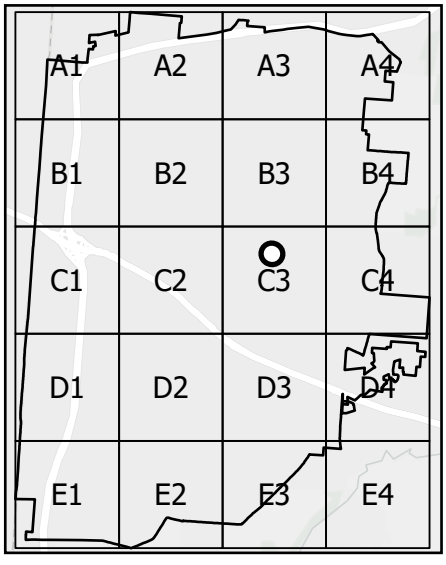
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 8
Culvert Span (ft): 34
Culvert Length (ft): 39

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 875
Downstream Elevation (ft): 872.82





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Photos

Identification

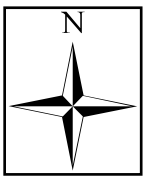
Culvert ID: C3_03

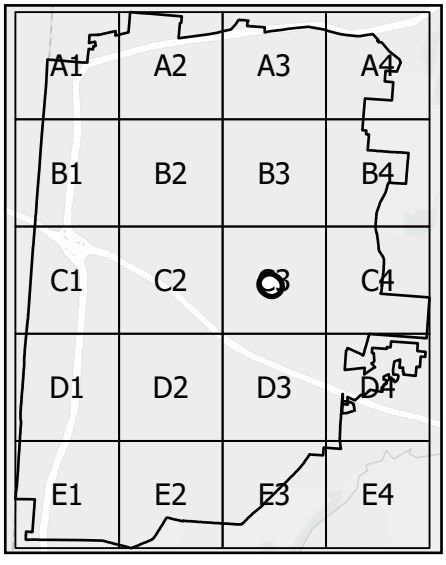
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 187

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 872.5
Downstream Elevation (ft): 868.16





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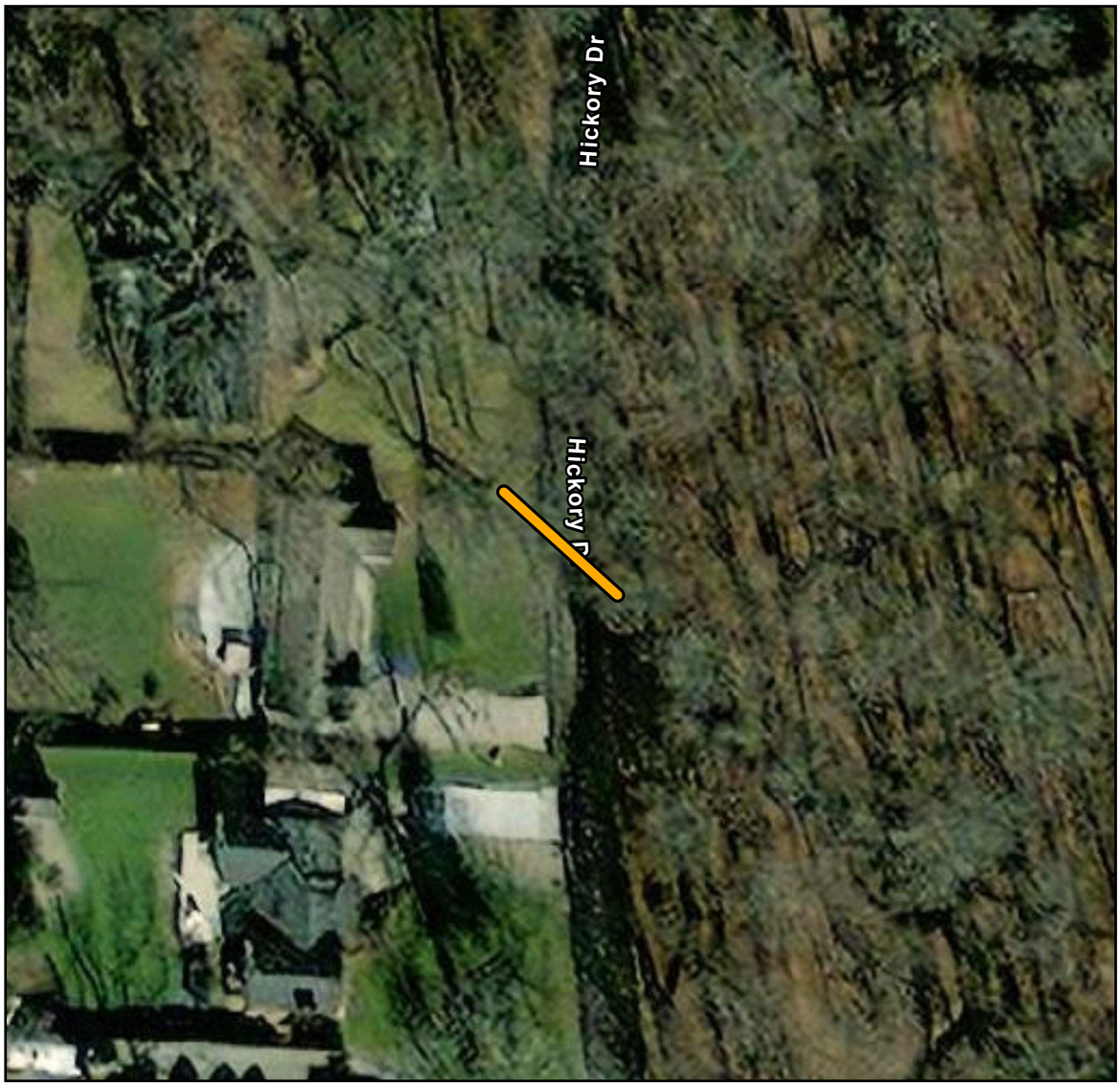


Photos

Identification

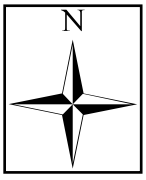
Culvert ID: C3_04

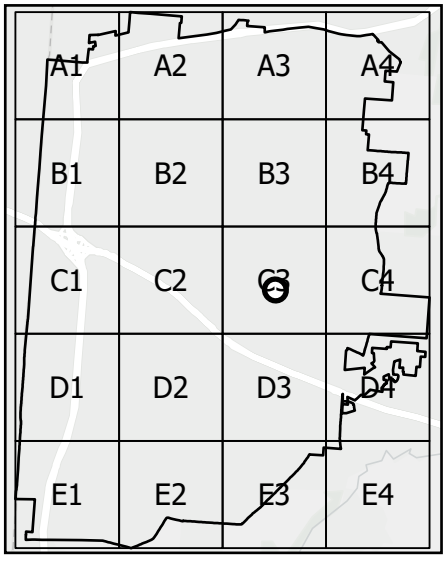
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 54

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 865.65
Downstream Elevation (ft): 862





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Photos

Identification

Culvert ID: C3_05

Structure Attributes

Culvert Shape: Circular

Culvert Material: SLHDPE

Culvert Rise (ft): 3

Culvert Span (ft): 3

Culvert Length (ft): 184

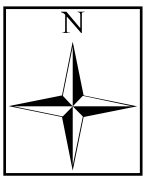
Field Inspection

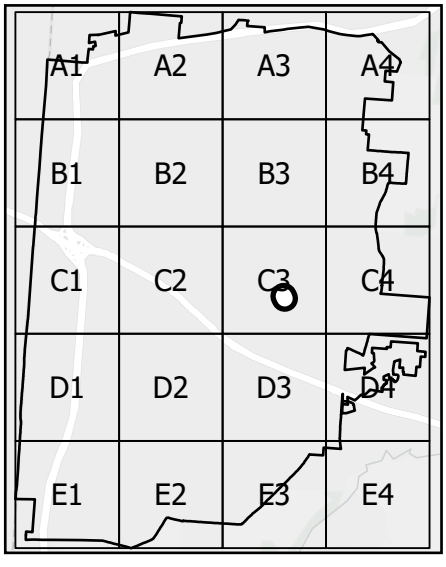
Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 849.54

Downstream Elevation (ft): 858.12





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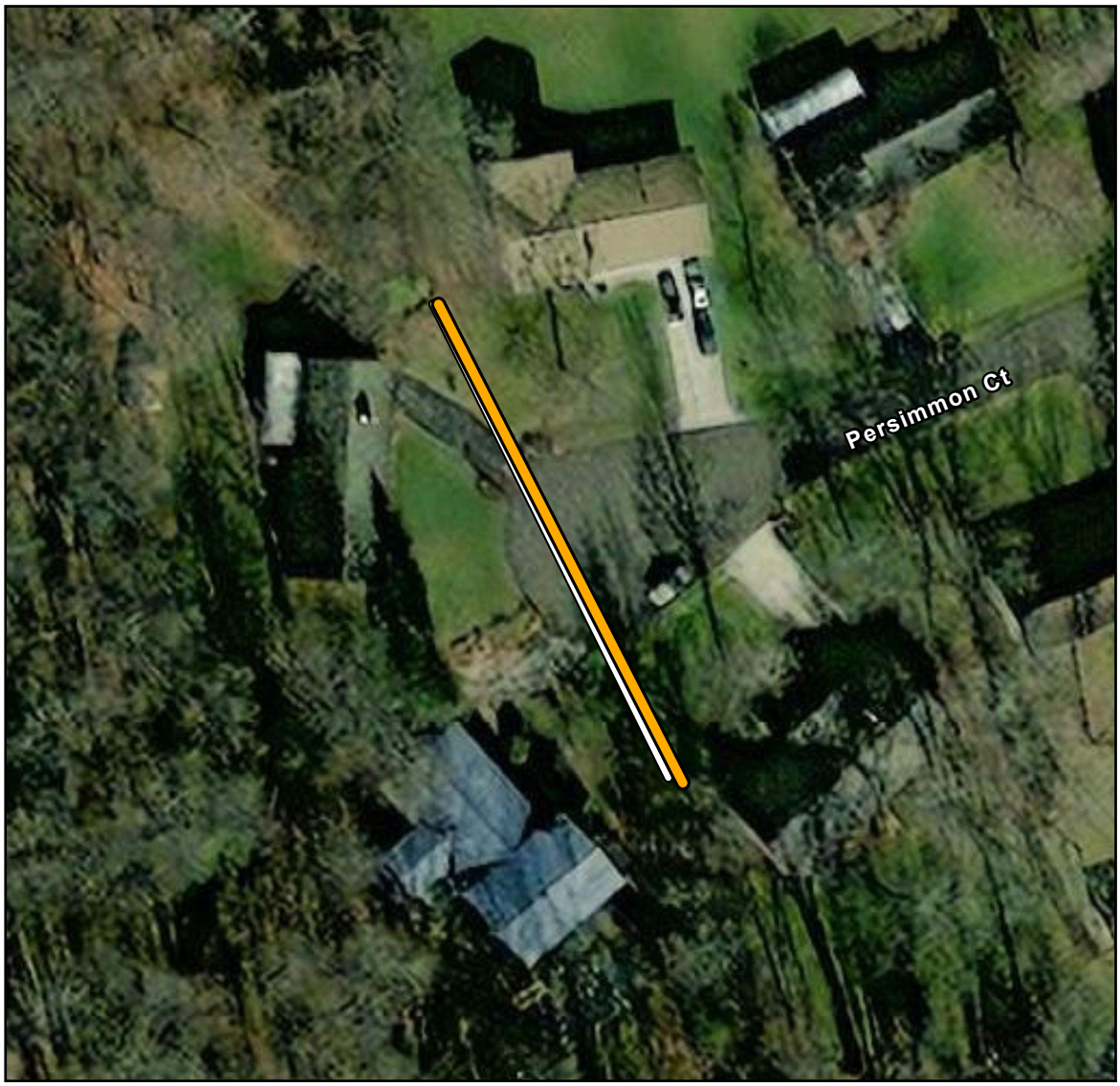


Photos

Identification

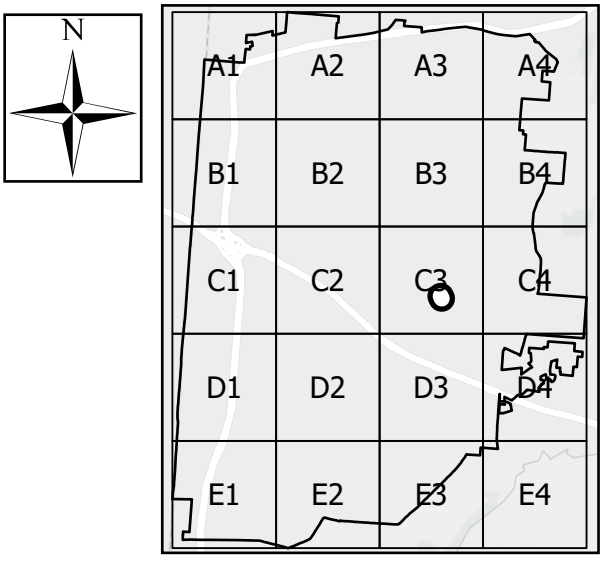
Culvert ID: C3_06

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 187

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 850.34
Downstream Elevation (ft): 857.96



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

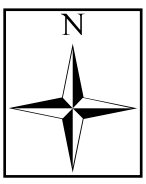
Culvert ID: C4_01

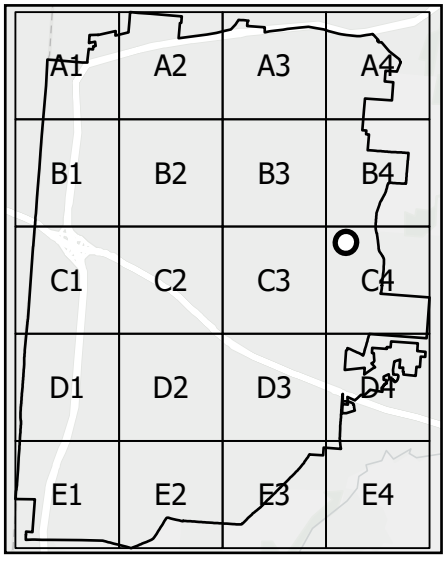
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 6.5
Culvert Span (ft): 6.5
Culvert Length (ft): 52

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 911.25
Downstream Elevation (ft): 909.26





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Culvert Cutsheets

Beavercreek Drainage Master Plan

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Photos

Identification

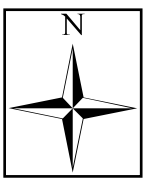
Culvert ID: C4_02

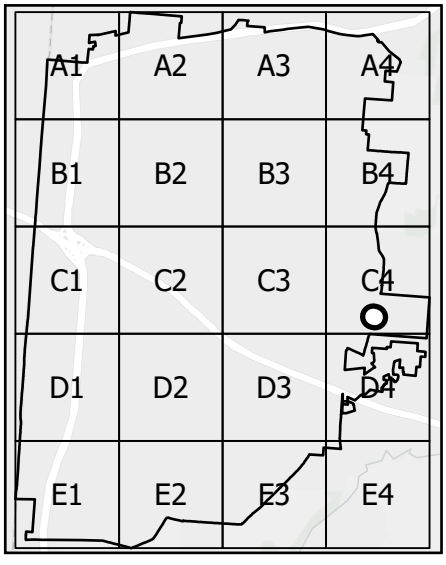
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 5
Culvert Span (ft): 5
Culvert Length (ft): 101

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 846.55
Downstream Elevation (ft): 844.21





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

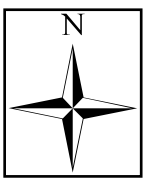
Culvert ID: D1_01

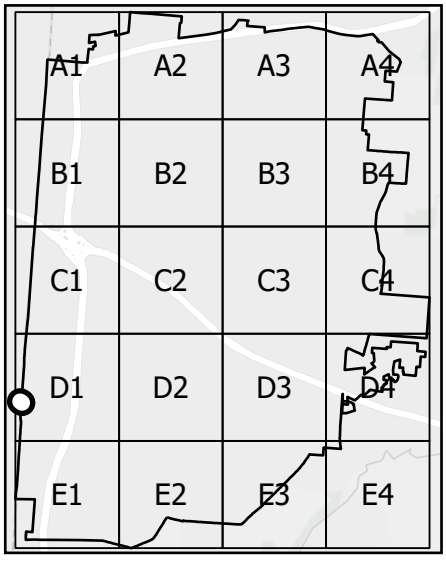
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 12
Culvert Length (ft): 154

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 909.87
Downstream Elevation (ft): 905.08





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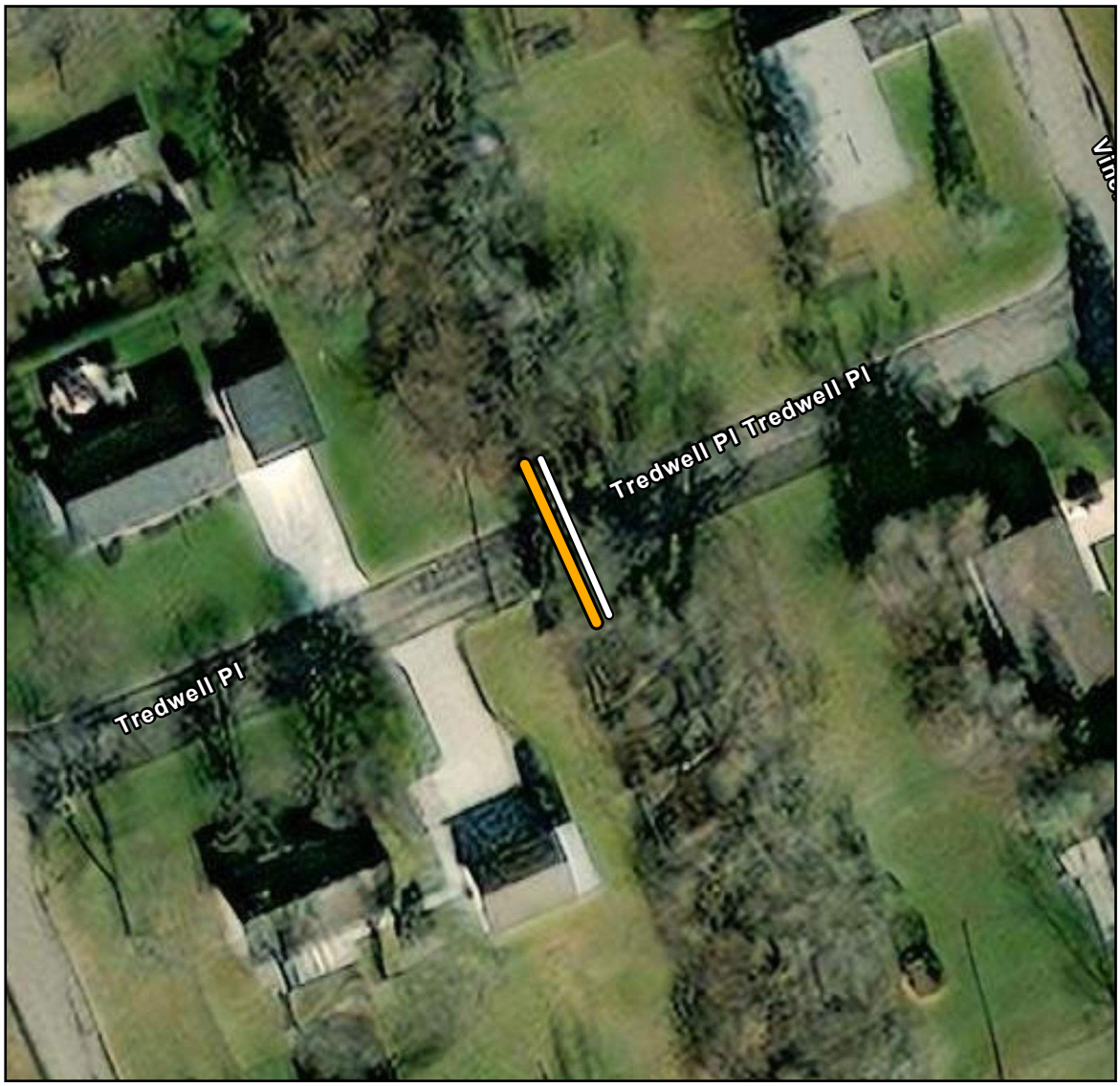


Photos

Identification

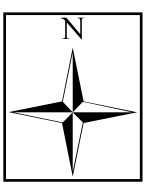
Culvert ID: D1_02

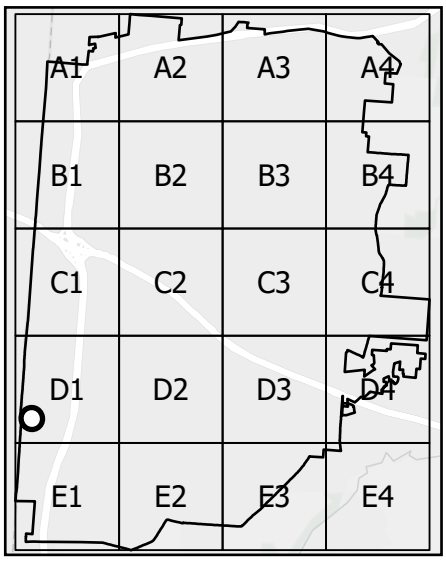
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 61

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 919.41
Downstream Elevation (ft): 918.95





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Culvert Cutsheets

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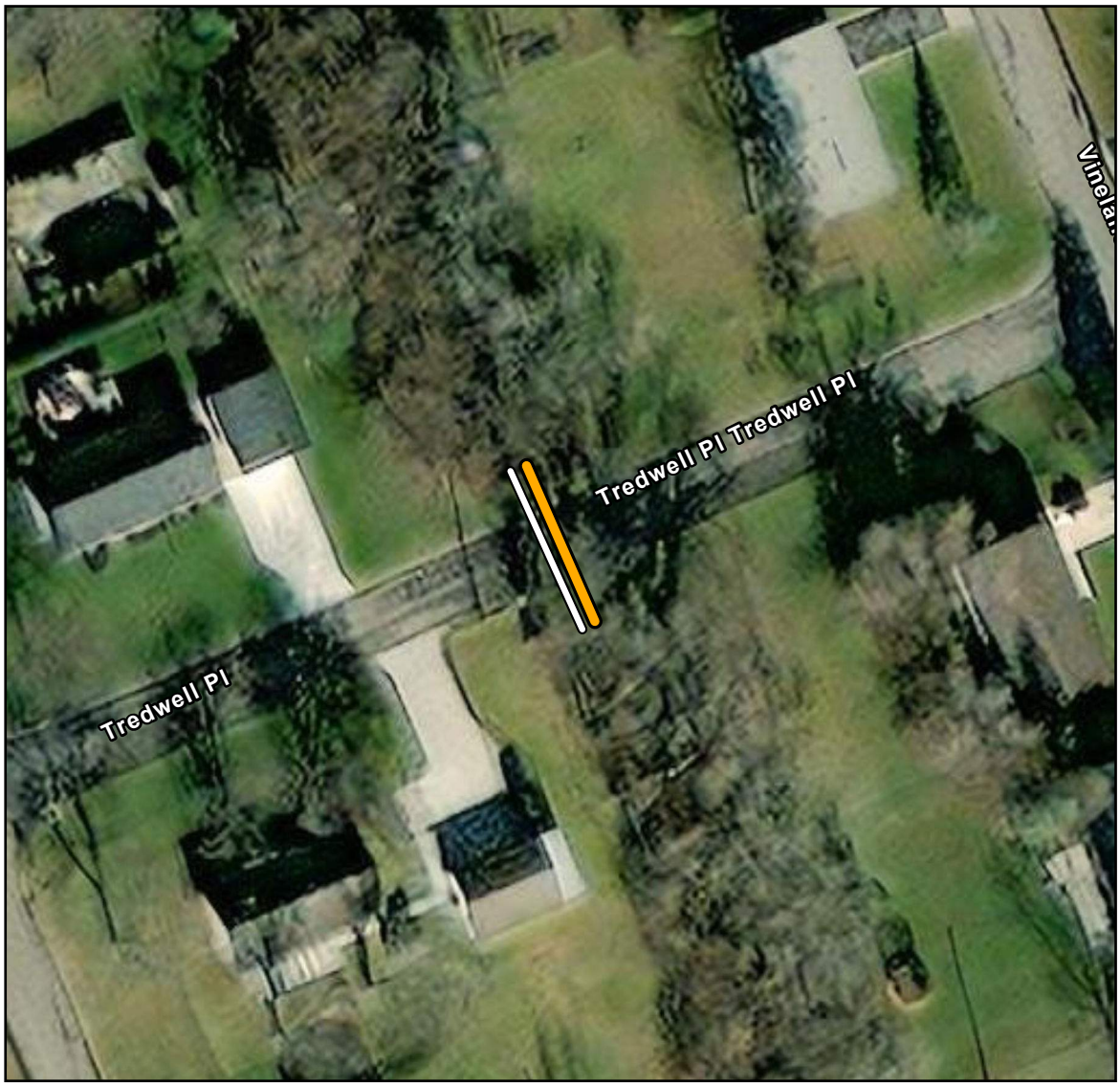


Photos

Identification

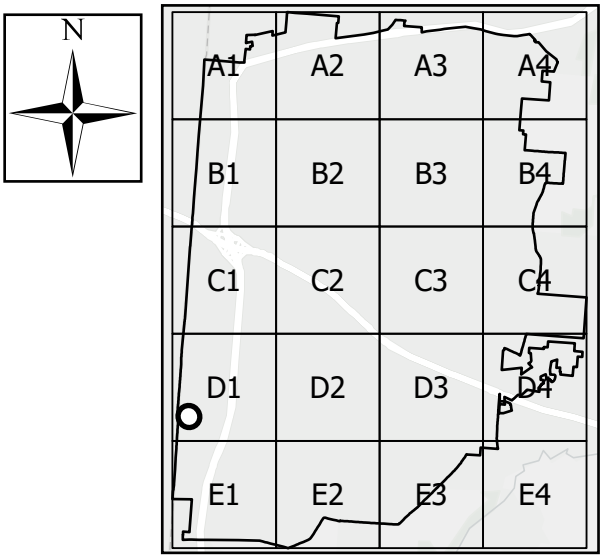
Culvert ID: D1_03

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 59

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 919.28
Downstream Elevation (ft): 918.4



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

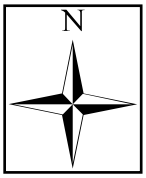
Culvert ID: D1_04

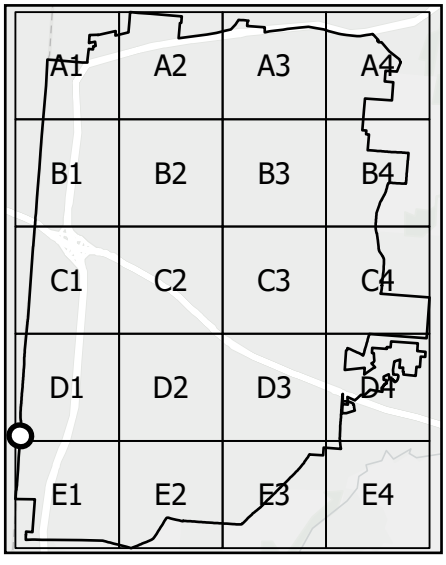
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 14
Culvert Length (ft): 106

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 948.45
Downstream Elevation (ft): 946.5





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

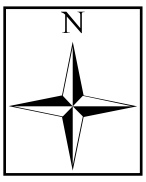
Culvert ID: D1_05

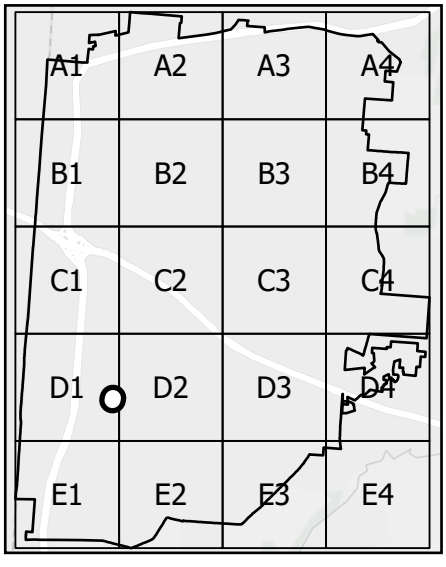
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3.5
Culvert Span (ft): 3.5
Culvert Length (ft): 156

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 919.95
Downstream Elevation (ft): 915.27





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

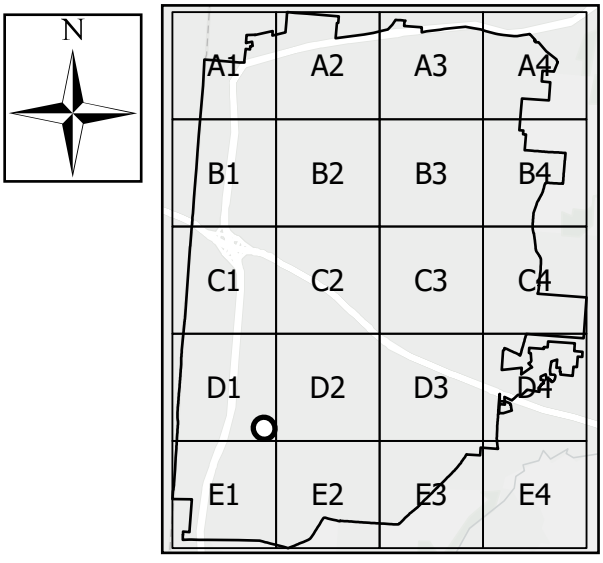
Culvert ID: D1_06

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 64

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 965.04
Downstream Elevation (ft): 964.34



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

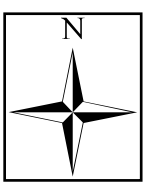
Culvert ID: D1_07

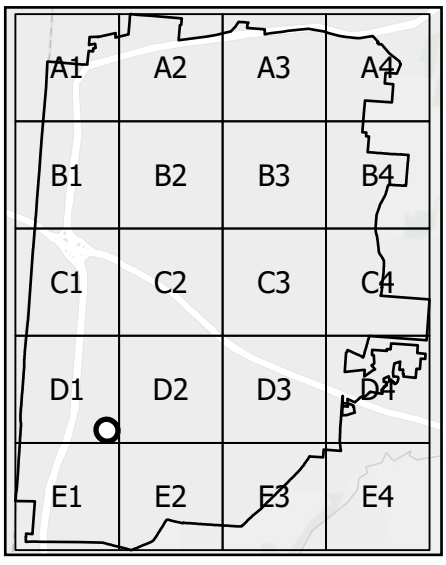
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 64

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 964.97
Downstream Elevation (ft): 964.4





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Photos

Identification

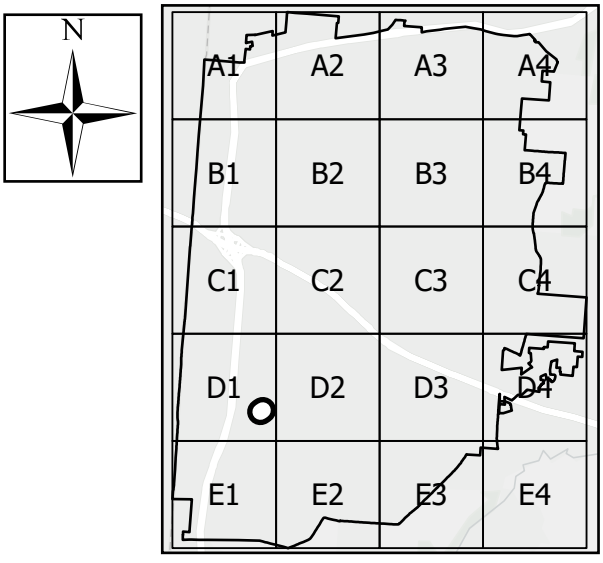
Culvert ID: D1_08

Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 183

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 938.89
Downstream Elevation (ft): 942.19



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Identification

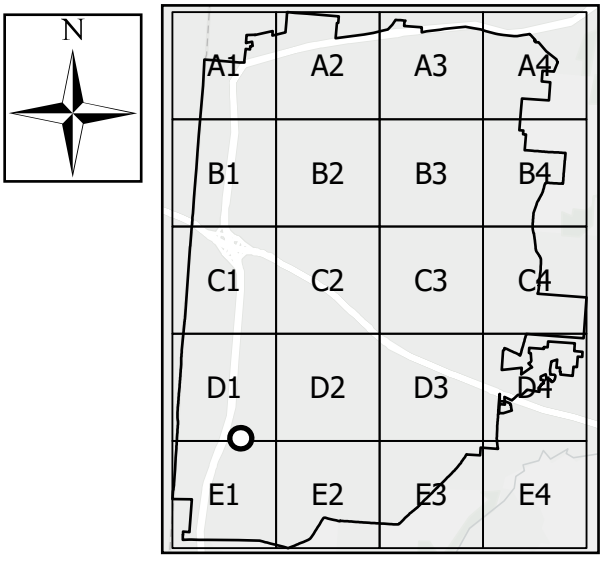
Culvert ID: D1_09

Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 2.5
Culvert Span (ft): 2.5
Culvert Length (ft): 50

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 984.5
Downstream Elevation (ft): 982.69



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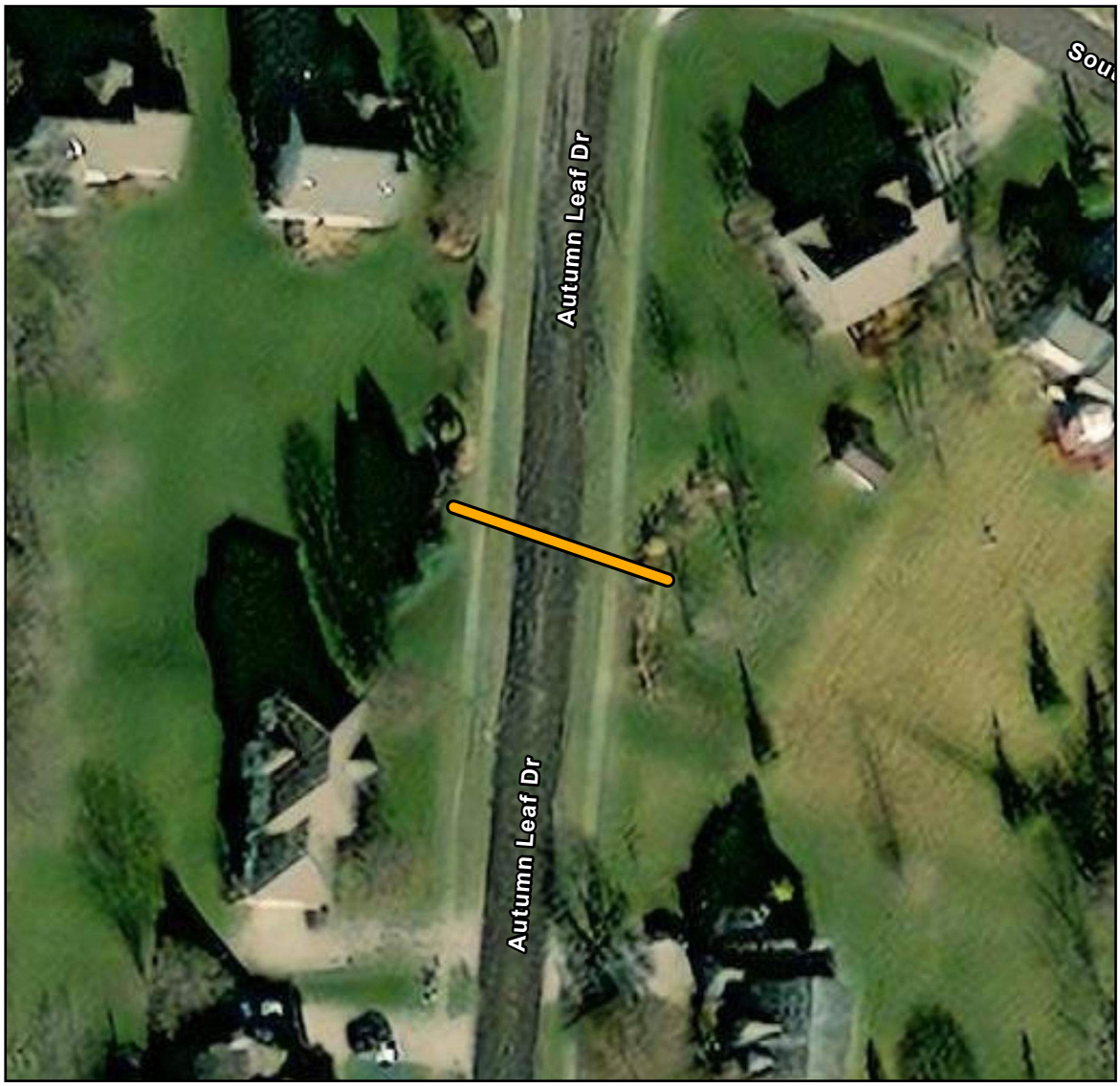


Photos

Identification

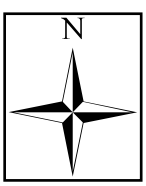
Culvert ID: D2_01

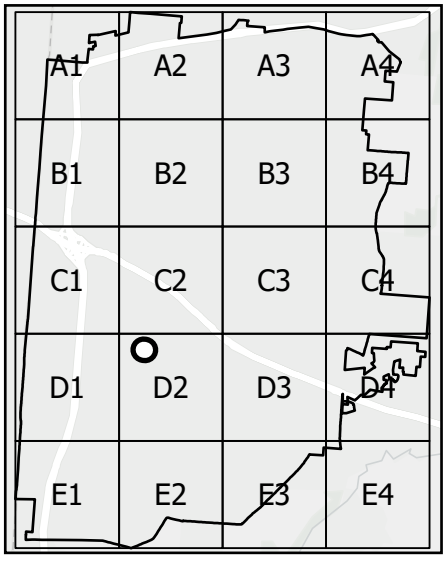
Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 4.5
Culvert Span (ft): 20
Culvert Length (ft): 79

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 860.63
Downstream Elevation (ft): 860.53





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Beavercreek Drainage Master Plan

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Photos

Identification

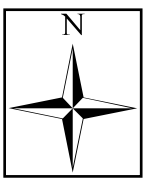
Culvert ID: D2_02

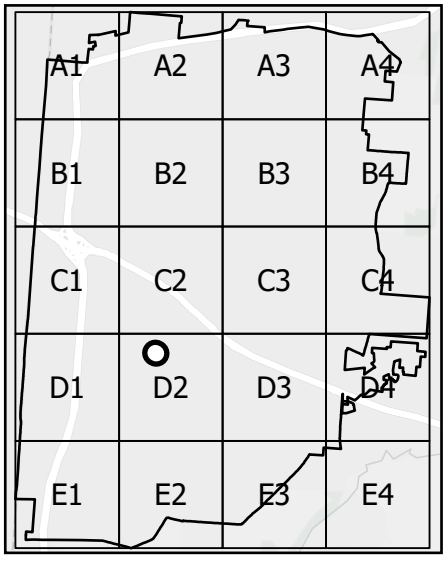
Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 4.5
Culvert Span (ft): 20
Culvert Length (ft): 71

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 859.26
Downstream Elevation (ft): 859.46





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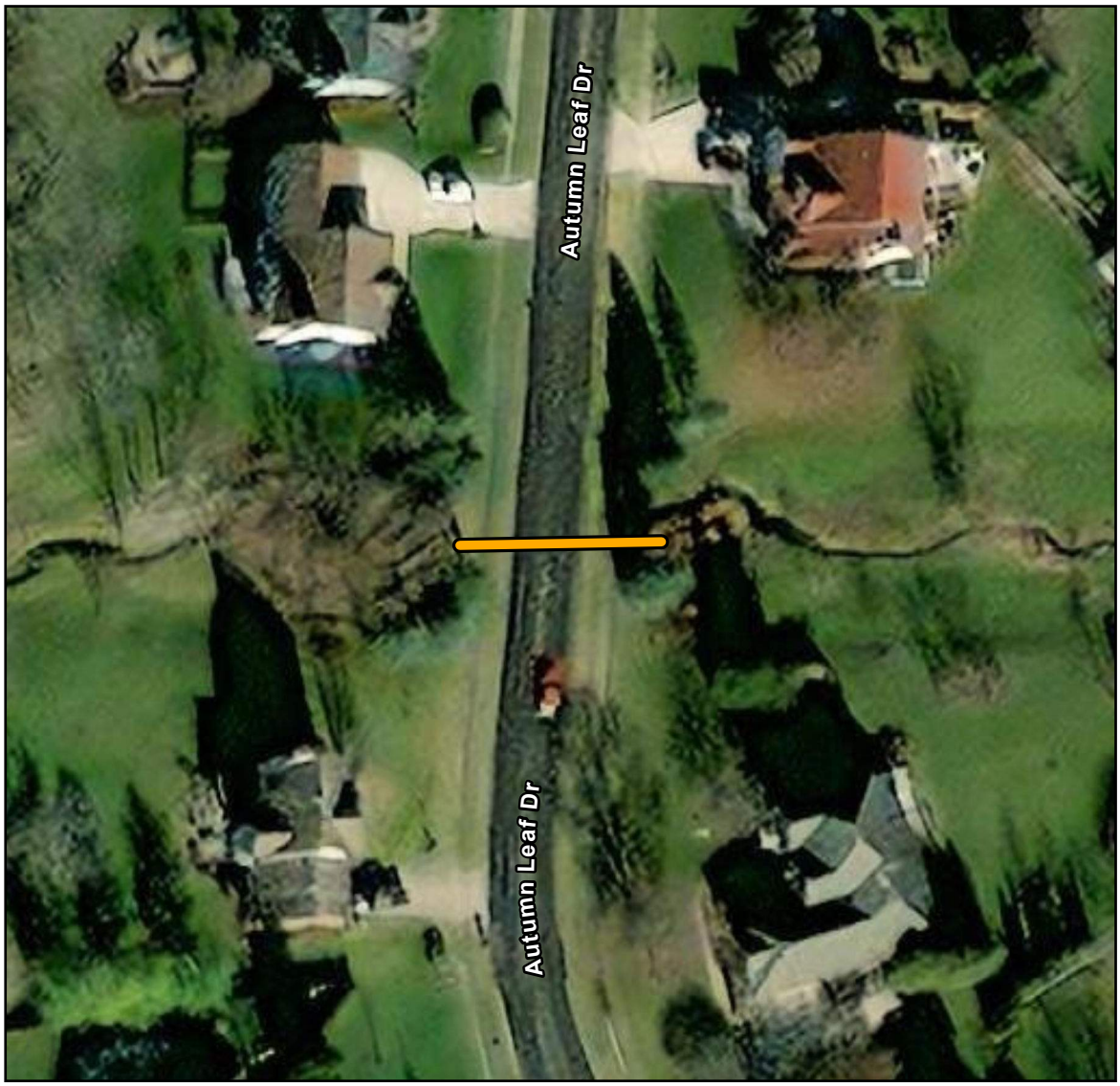


Photos

Identification

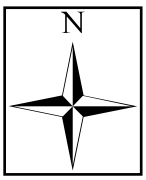
Culvert ID: D2_03

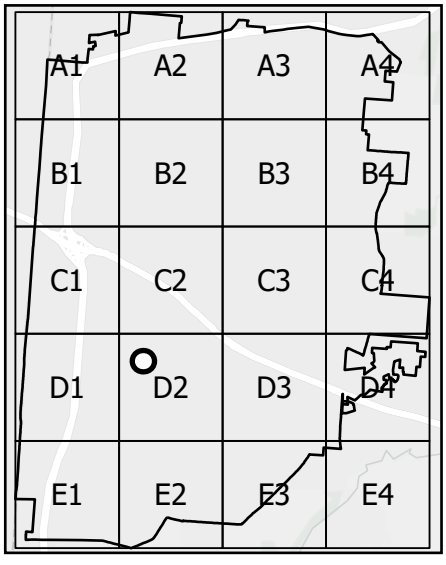
Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 23
Culvert Length (ft): 70

Field Inspection

Structural Score: 1
Maintenance Score: 3
Upstream Elevation (ft): 861.84
Downstream Elevation (ft): 861.78





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Identification

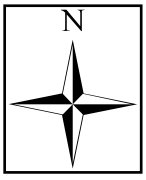
Culvert ID: D2_04

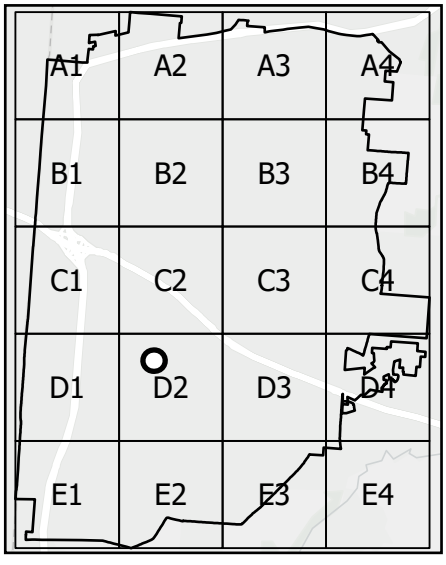
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 73

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 848.87
Downstream Elevation (ft): 848.92





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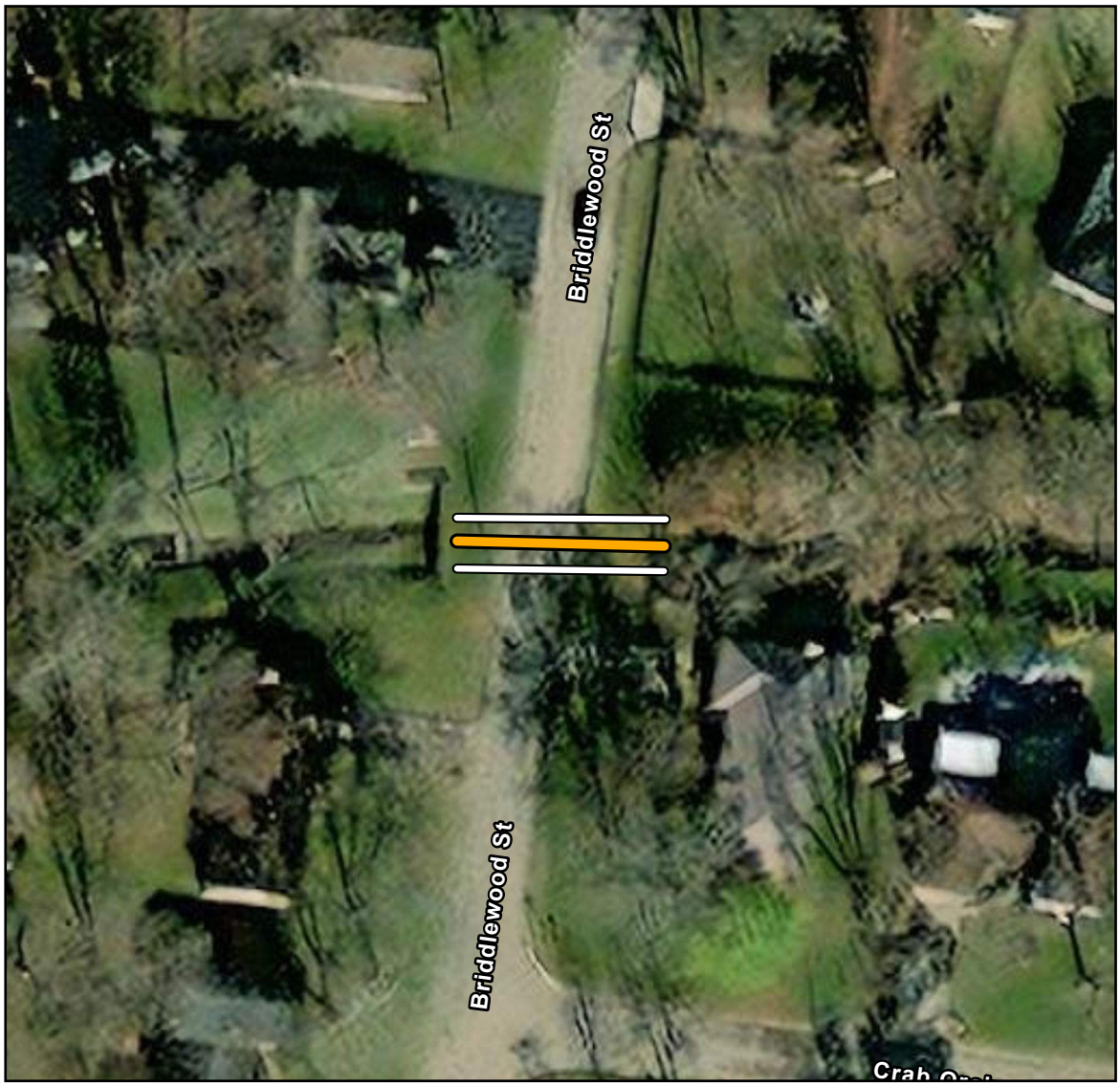


Photos

Identification

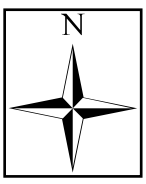
Culvert ID: D2_05

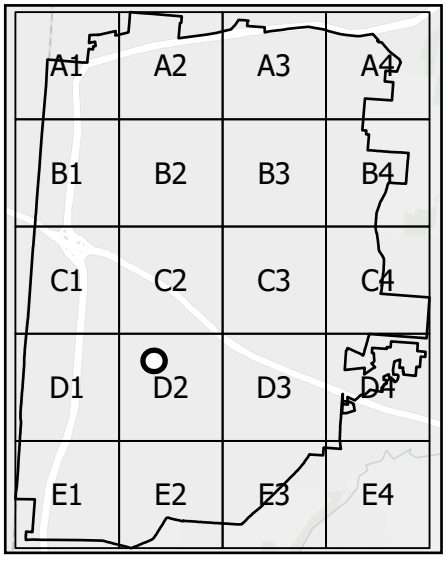
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 72

Field Inspection

Structural Score: 2
Maintenance Score: 1
Upstream Elevation (ft): 848.83
Downstream Elevation (ft): 849.12





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Photos

Identification

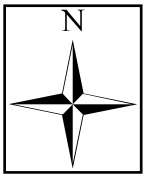
Culvert ID: D2_06

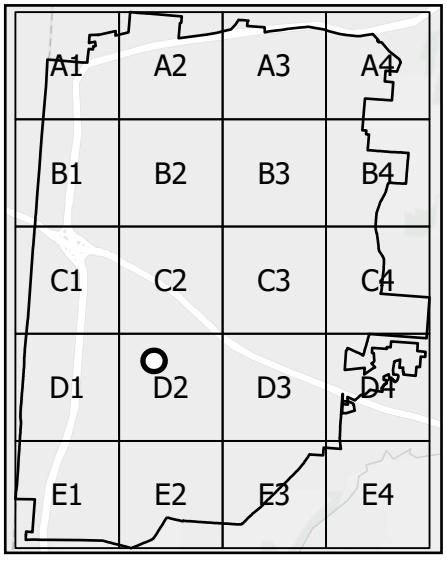
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 6
Culvert Length (ft): 72

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 849
Downstream Elevation (ft): 848.89





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Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

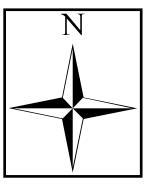
Culvert ID: D2_07

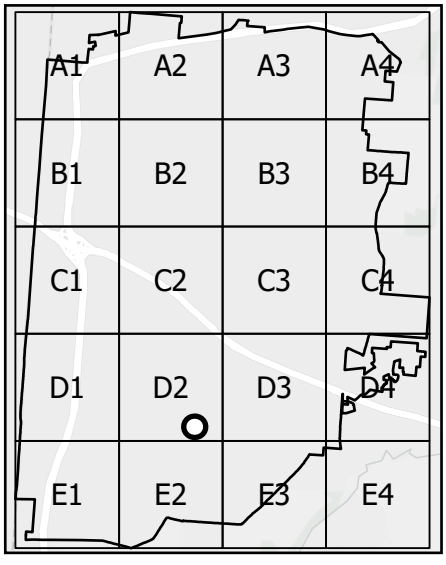
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 4.5
Culvert Span (ft): 4.5
Culvert Length (ft): 44

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 890.39
Downstream Elevation (ft): 889.2





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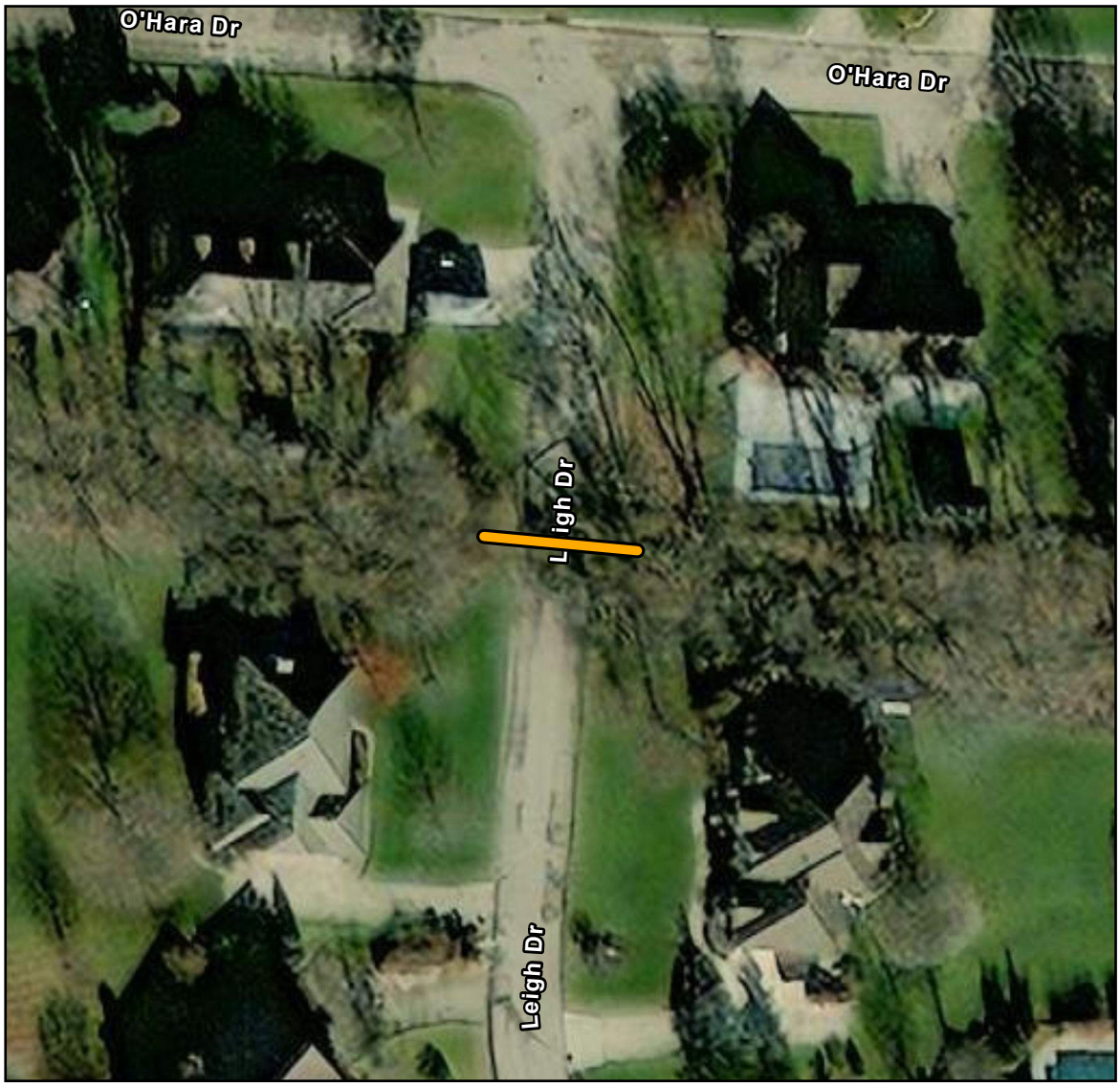


Photos

Identification

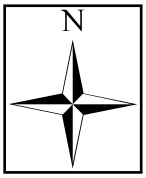
Culvert ID: D2_08

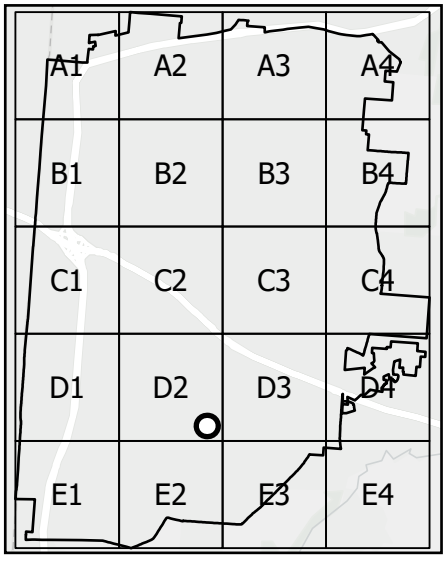
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: RCP
Culvert Rise (ft): 3.6
Culvert Span (ft): 5.5
Culvert Length (ft): 54

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 877.96
Downstream Elevation (ft): 875.93





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

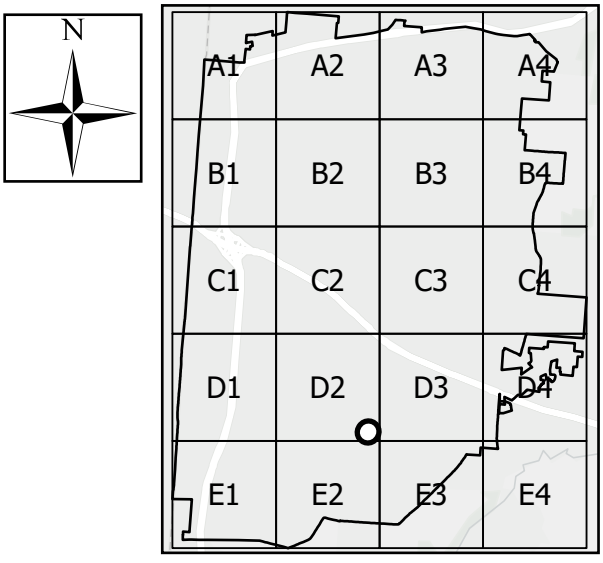
Culvert ID: D2_09

Structure Attributes

Culvert Shape: Arch
Culvert Material: RCP
Culvert Rise (ft): 7
Culvert Span (ft): 20
Culvert Length (ft): 63

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 871.45
Downstream Elevation (ft): 872.01



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Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

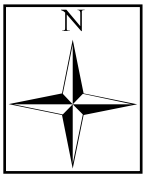
Culvert ID: D3_01

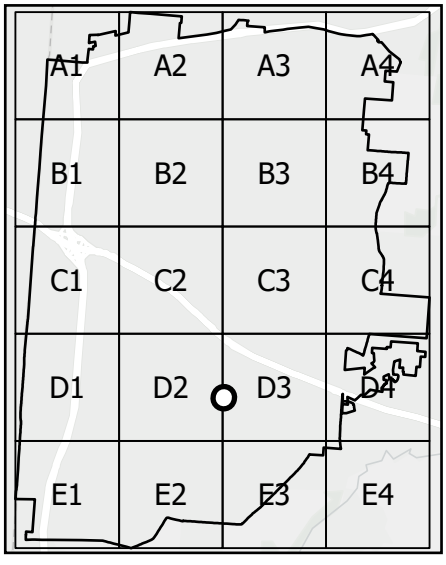
Structure Attributes

Culvert Shape: Box
Culvert Material: RCP
Culvert Rise (ft): 6
Culvert Span (ft): 18
Culvert Length (ft): 77

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 844.18
Downstream Elevation (ft): 842.71





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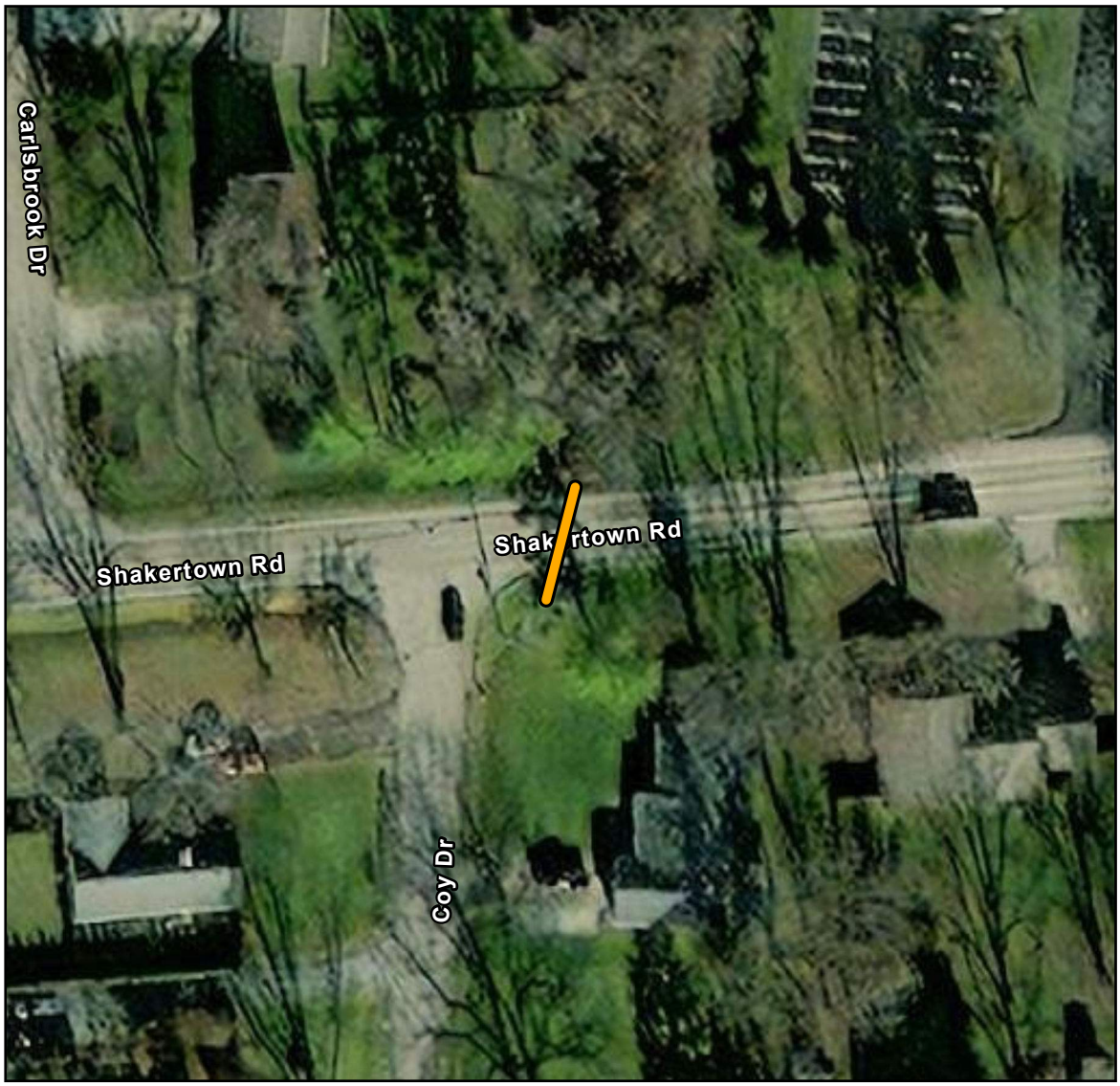


Photos

Identification

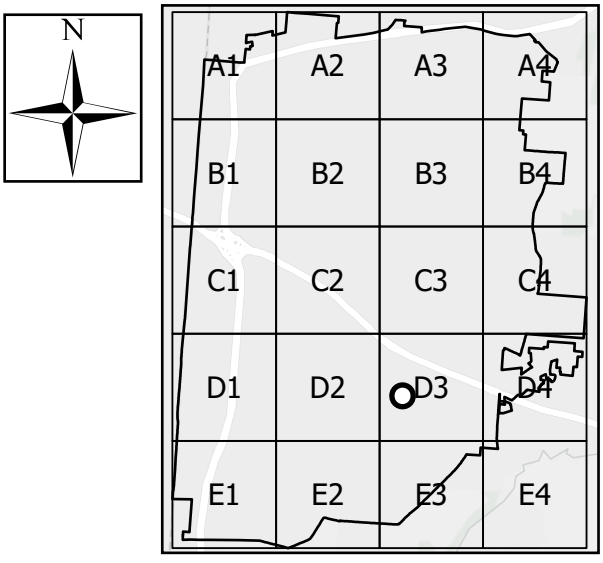
Culvert ID: D3_02

Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 6.5
Culvert Span (ft): 9.5
Culvert Length (ft): 43

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 835.19
Downstream Elevation (ft): 833.9



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Photos

Identification

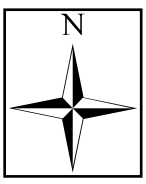
Culvert ID: D3_03

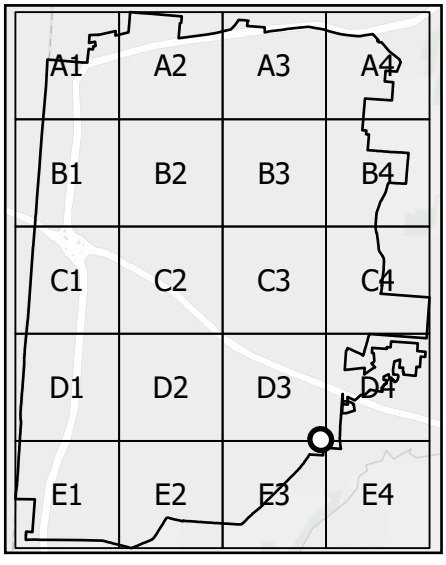
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 2
Culvert Span (ft): 2
Culvert Length (ft): 60

Field Inspection

Structural Score: 2
Maintenance Score: 3
Upstream Elevation (ft): 828.92
Downstream Elevation (ft): 827.12





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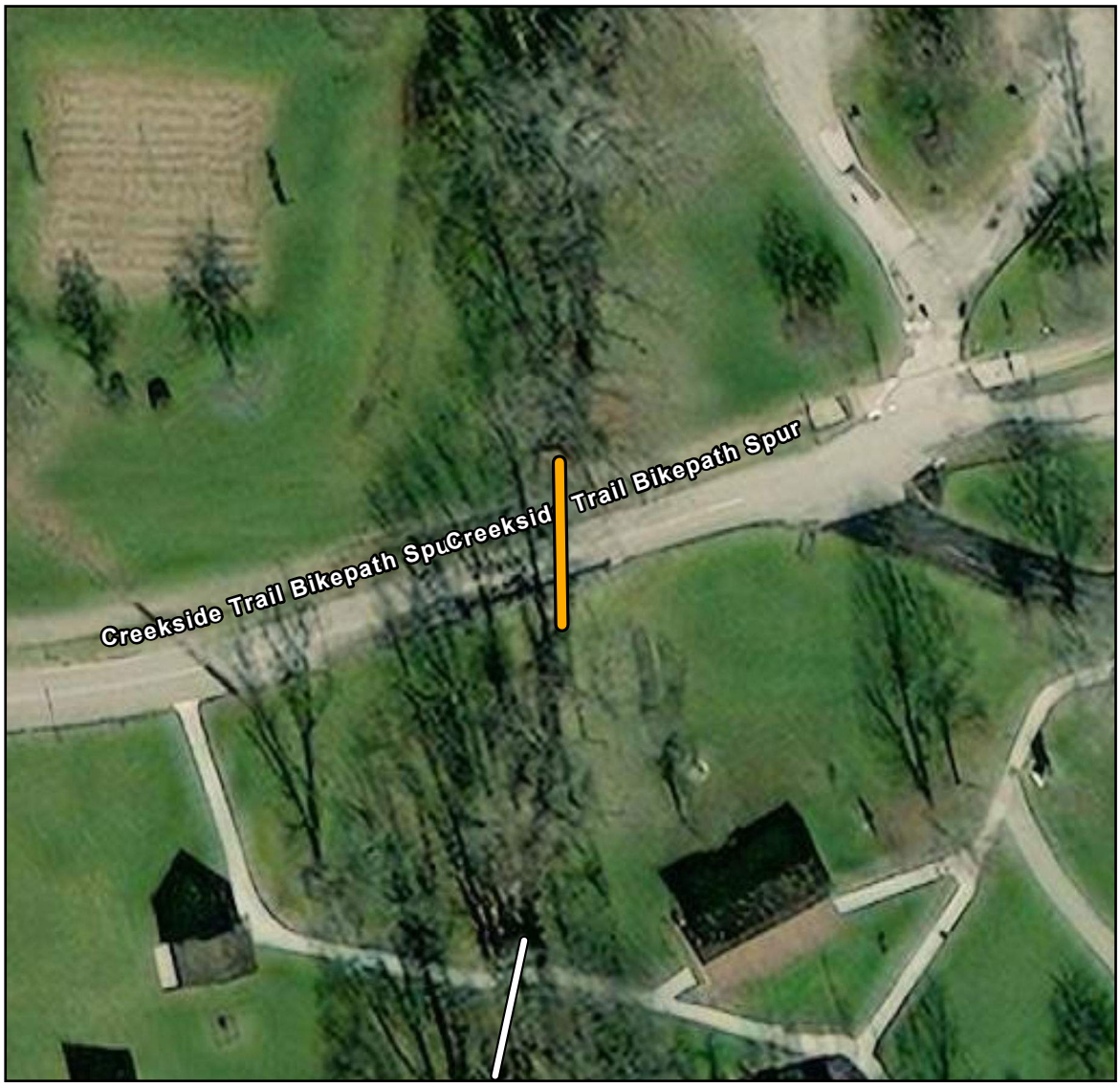


Photos

Identification

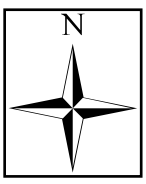
Culvert ID: D4_01

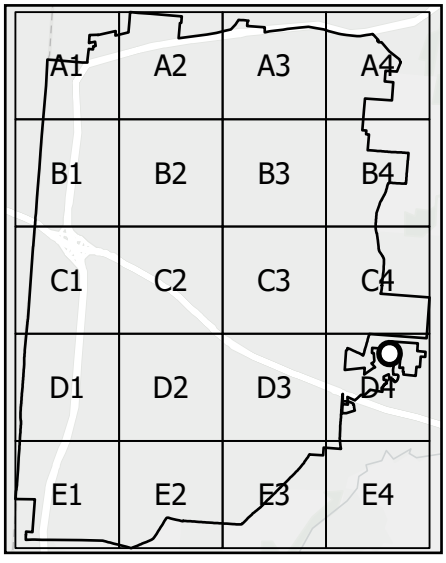
Structure Attributes

Culvert Shape: Ellipse
Culvert Material: CMP
Culvert Rise (ft): 3
Culvert Span (ft): 4
Culvert Length (ft): 57

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 801.8
Downstream Elevation (ft): 801.58





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Culvert Cutsheets

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Identification

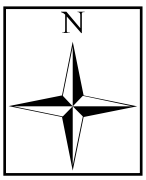
Culvert ID: D4_02

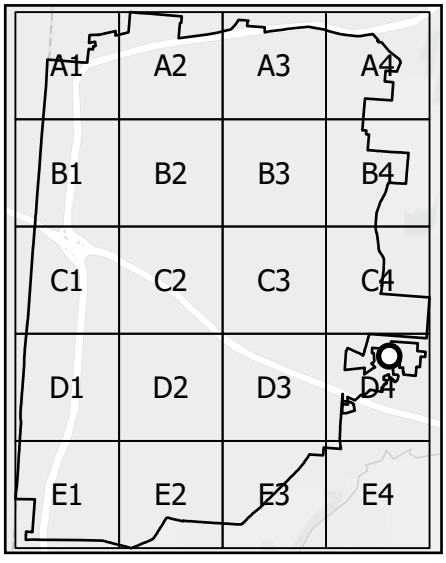
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 48

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 796.52
Downstream Elevation (ft): 799.2





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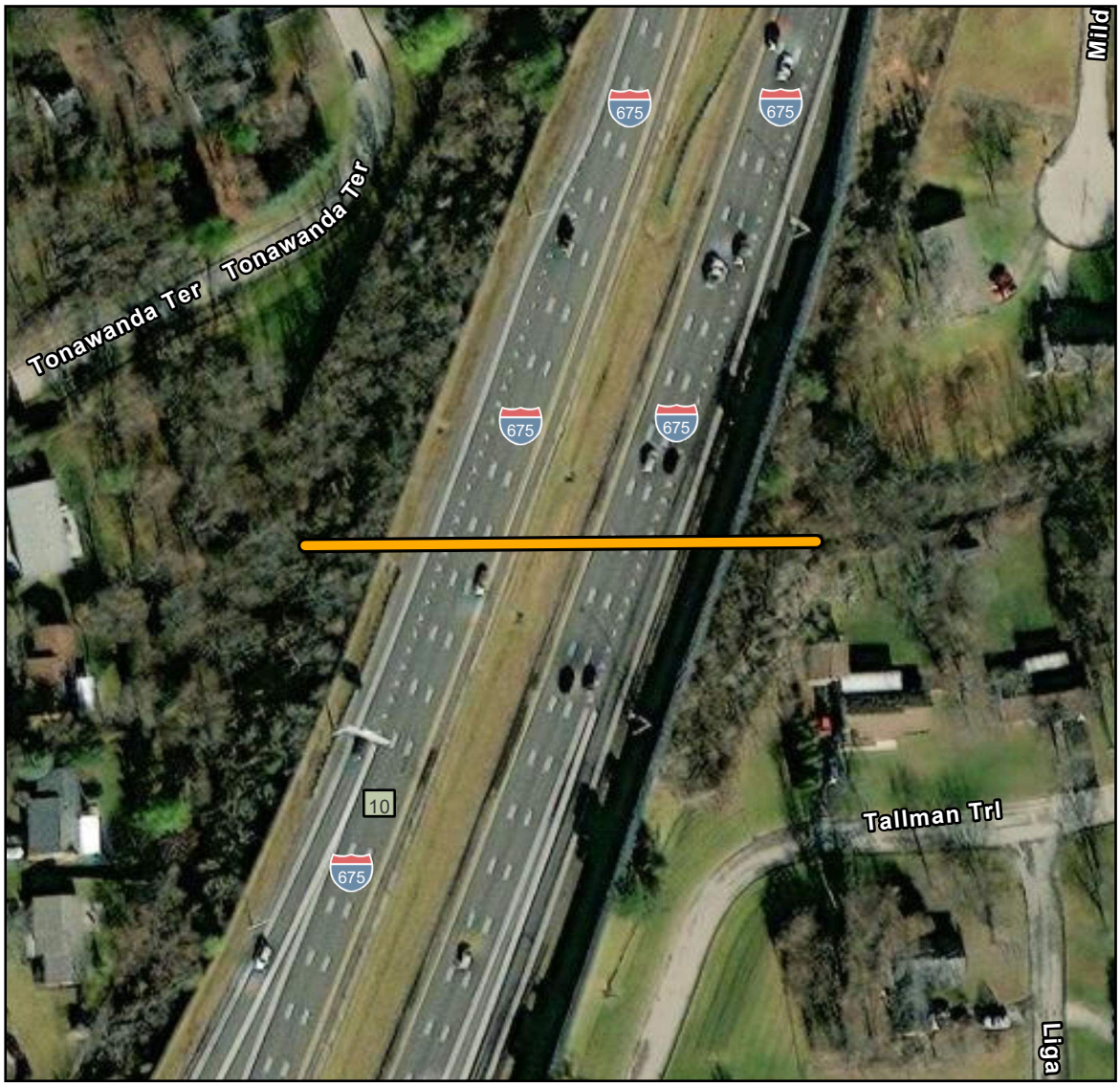
Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

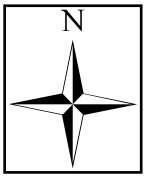
Culvert ID: E1_01

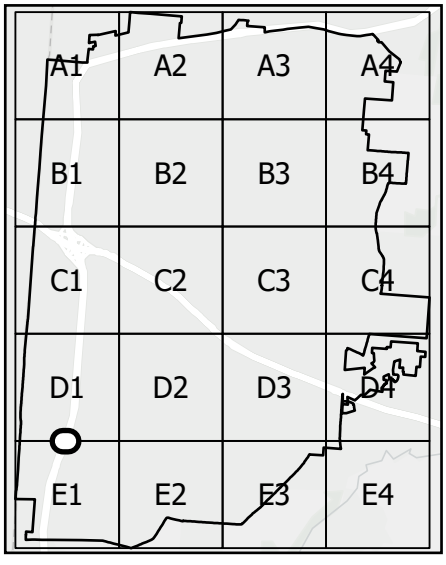
Structure Attributes

Culvert Shape: Circular
Culvert Material: BCCMP
Culvert Rise (ft): 6.5
Culvert Span (ft): 6.5
Culvert Length (ft): 357

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 950.98
Downstream Elevation (ft): 958





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

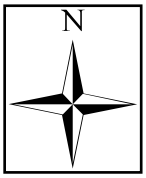
Culvert ID: E1_02

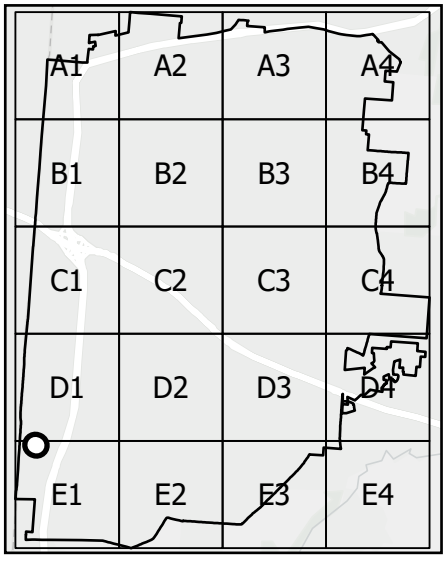
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 89

Field Inspection

Structural Score: 1
Maintenance Score: 3
Upstream Elevation (ft): 961.65
Downstream Elevation (ft): 960.48





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

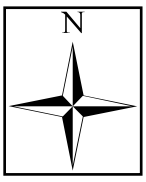
Culvert ID: E1_03

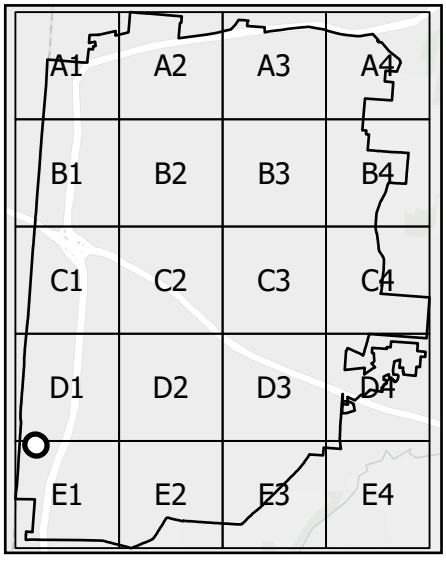
Structure Attributes

Culvert Shape: Circular
Culvert Material: RCP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 86

Field Inspection

Structural Score: 1
Maintenance Score: 2
Upstream Elevation (ft): 961.37
Downstream Elevation (ft): 960.67





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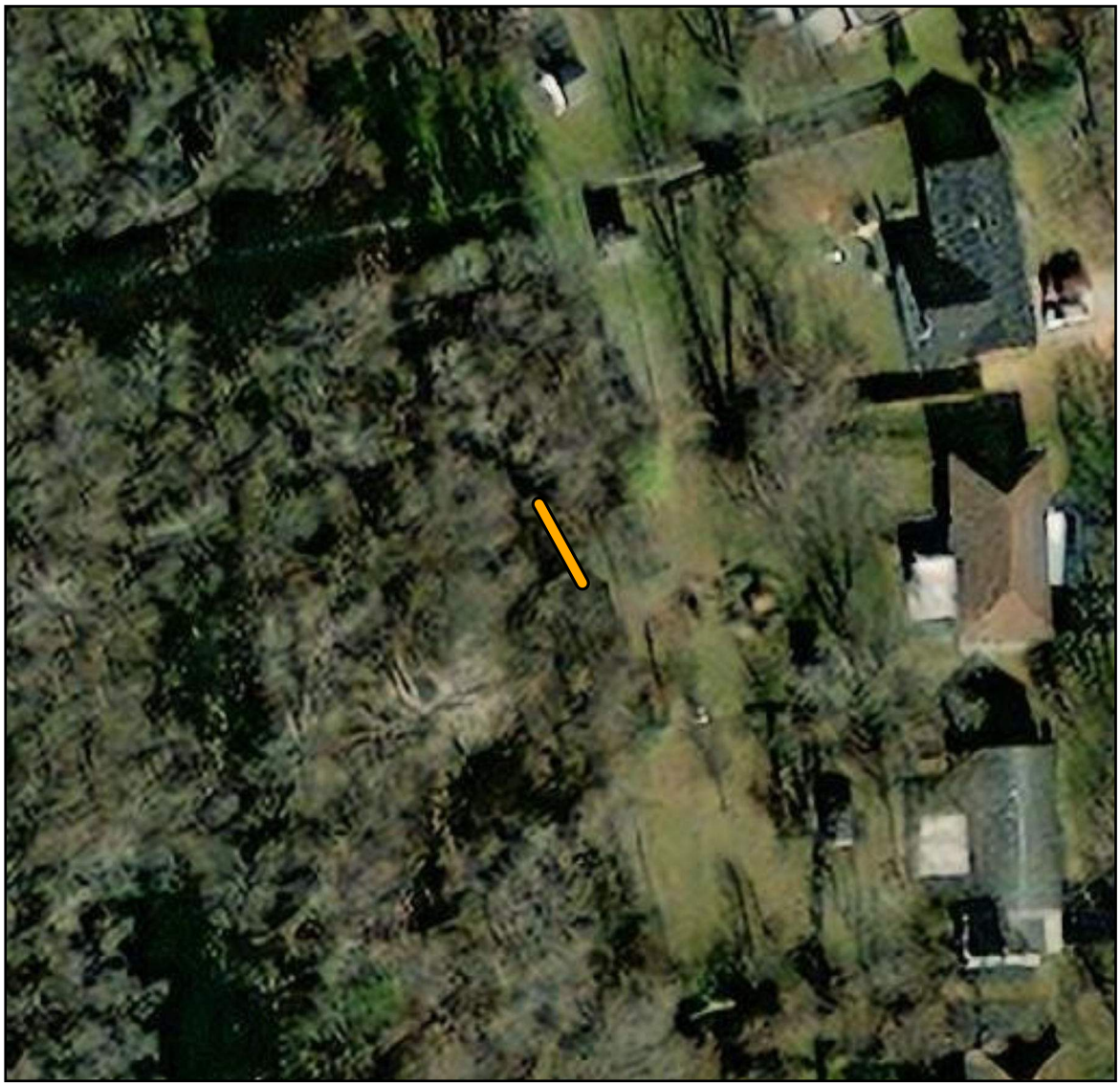
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

Culvert ID: E1_04

Structure Attributes

Culvert Shape: Circular

Culvert Material: RCP

Culvert Rise (ft): 5

Culvert Span (ft): 5

Culvert Length (ft): 31

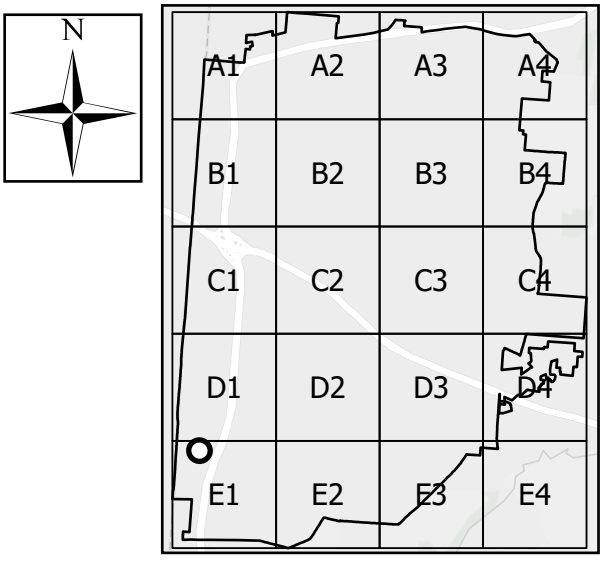
Field Inspection

Structural Score: 2

Maintenance Score: 2

Upstream Elevation (ft): 972

Downstream Elevation (ft): 971.51



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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

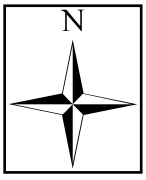
Culvert ID: E1_05

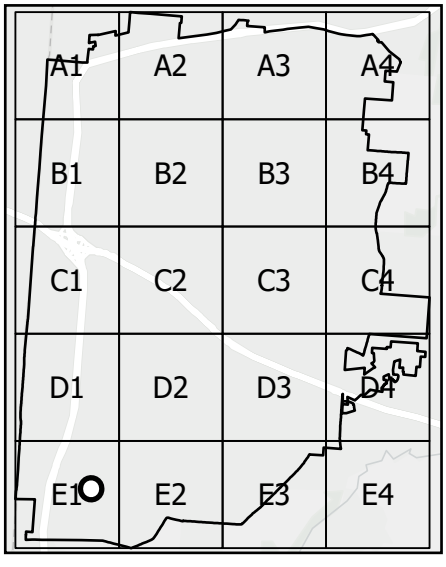
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 4
Culvert Span (ft): 4
Culvert Length (ft): 60

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 996.41
Downstream Elevation (ft): 994.75





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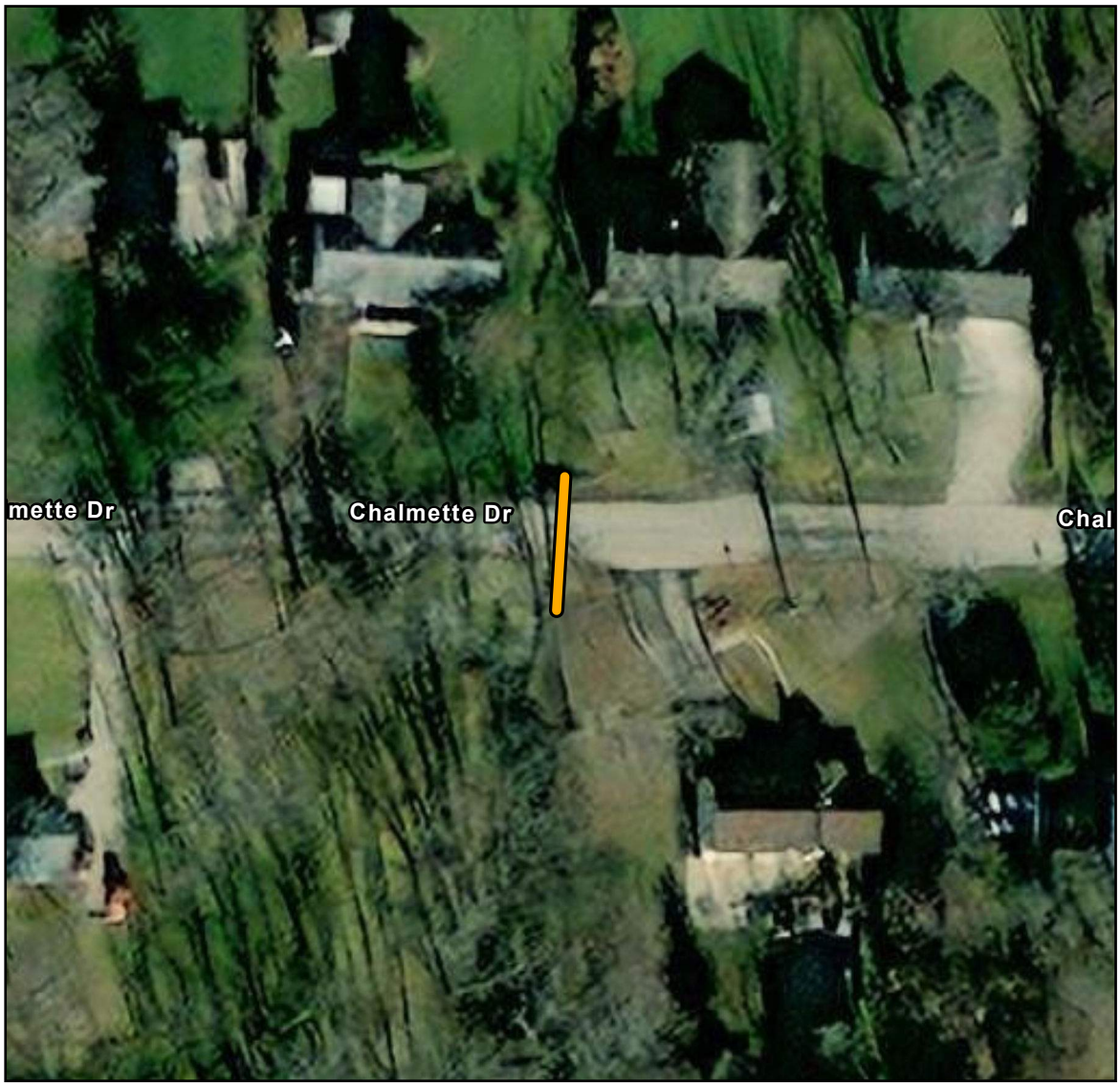
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

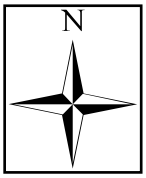
Culvert ID: E1_06

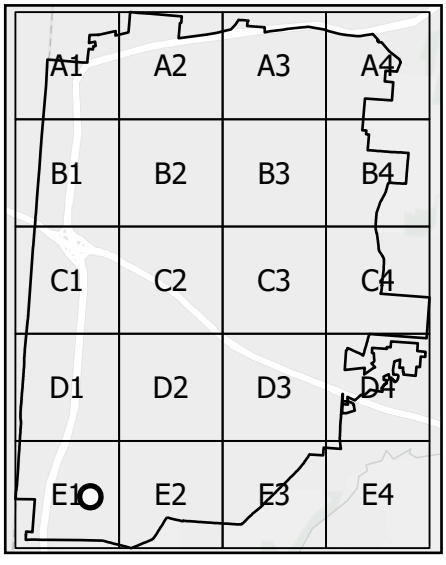
Structure Attributes

Culvert Shape: Circular
Culvert Material: SLHDPE
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 47

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 986.52
Downstream Elevation (ft): 986.45





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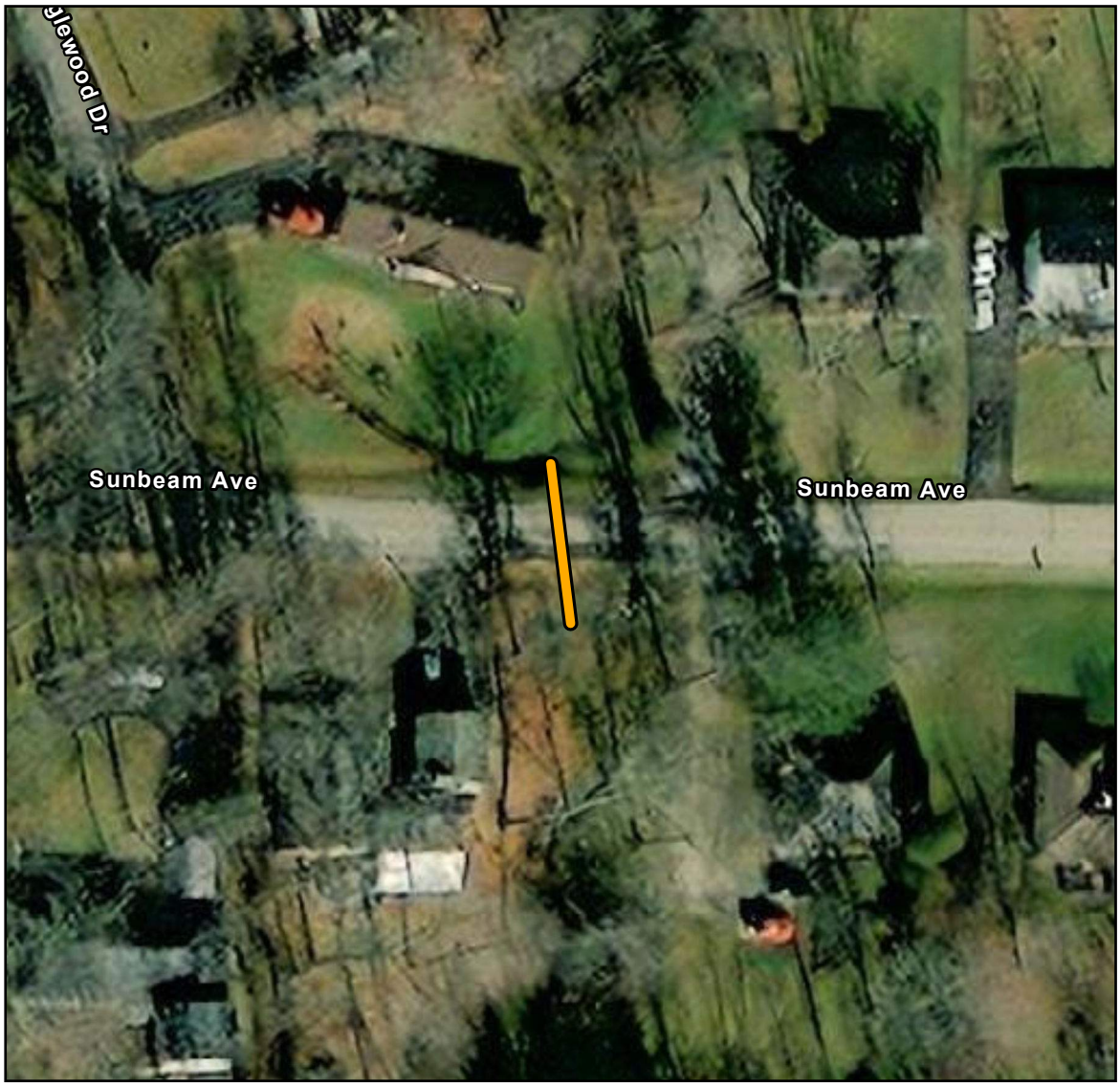
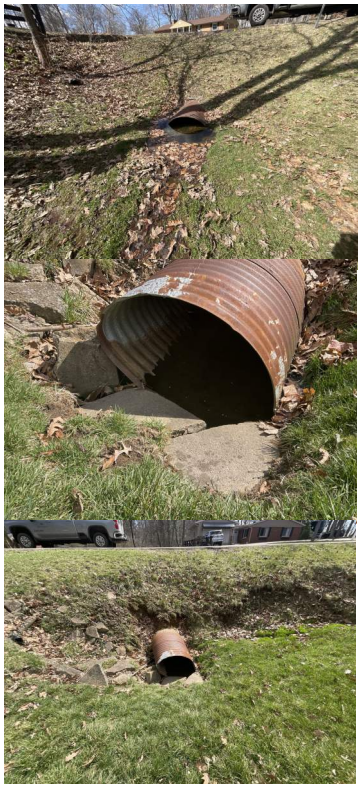
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos



Identification

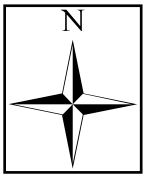
Culvert ID: E1_07

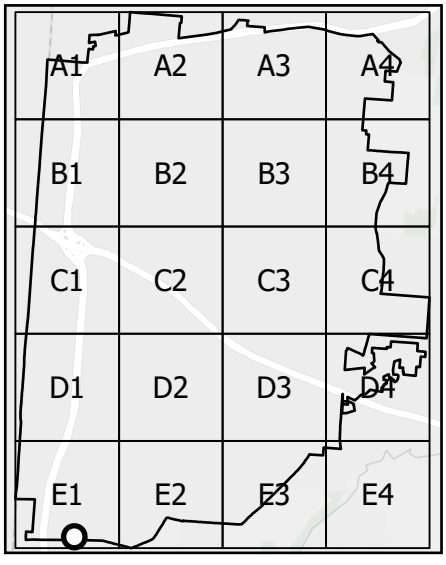
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 56

Field Inspection

Structural Score: 3
Maintenance Score: 3
Upstream Elevation (ft): 967.36
Downstream Elevation (ft): 966.5





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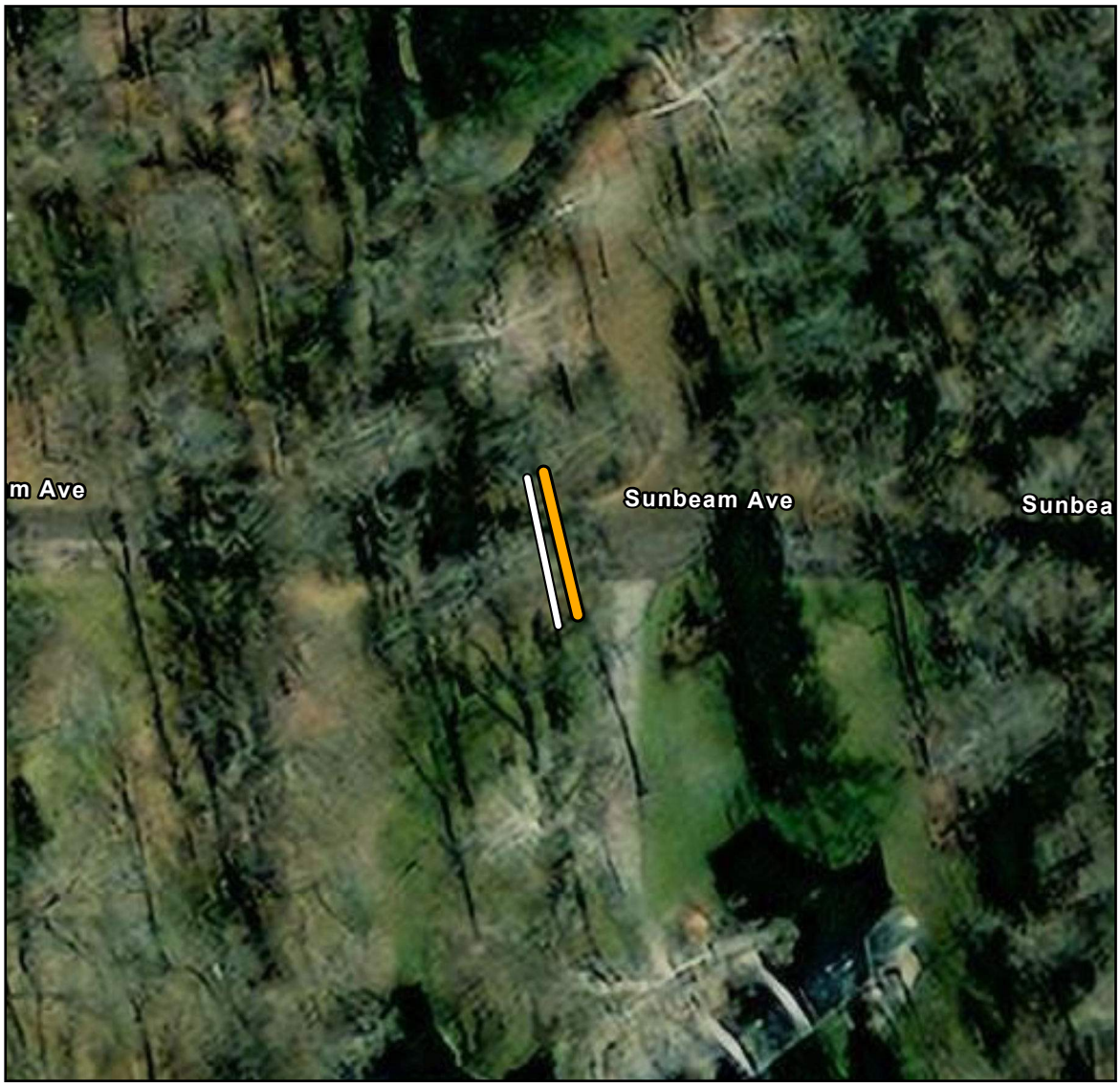
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

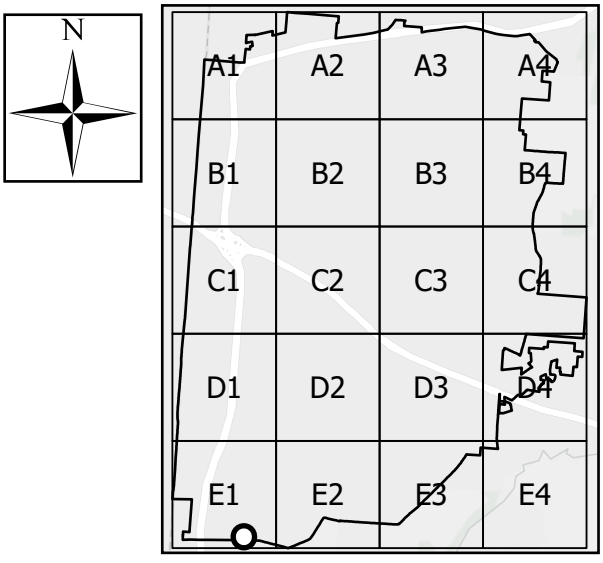
Culvert ID: E1_08

Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 51

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 952.81
Downstream Elevation (ft): 951.47



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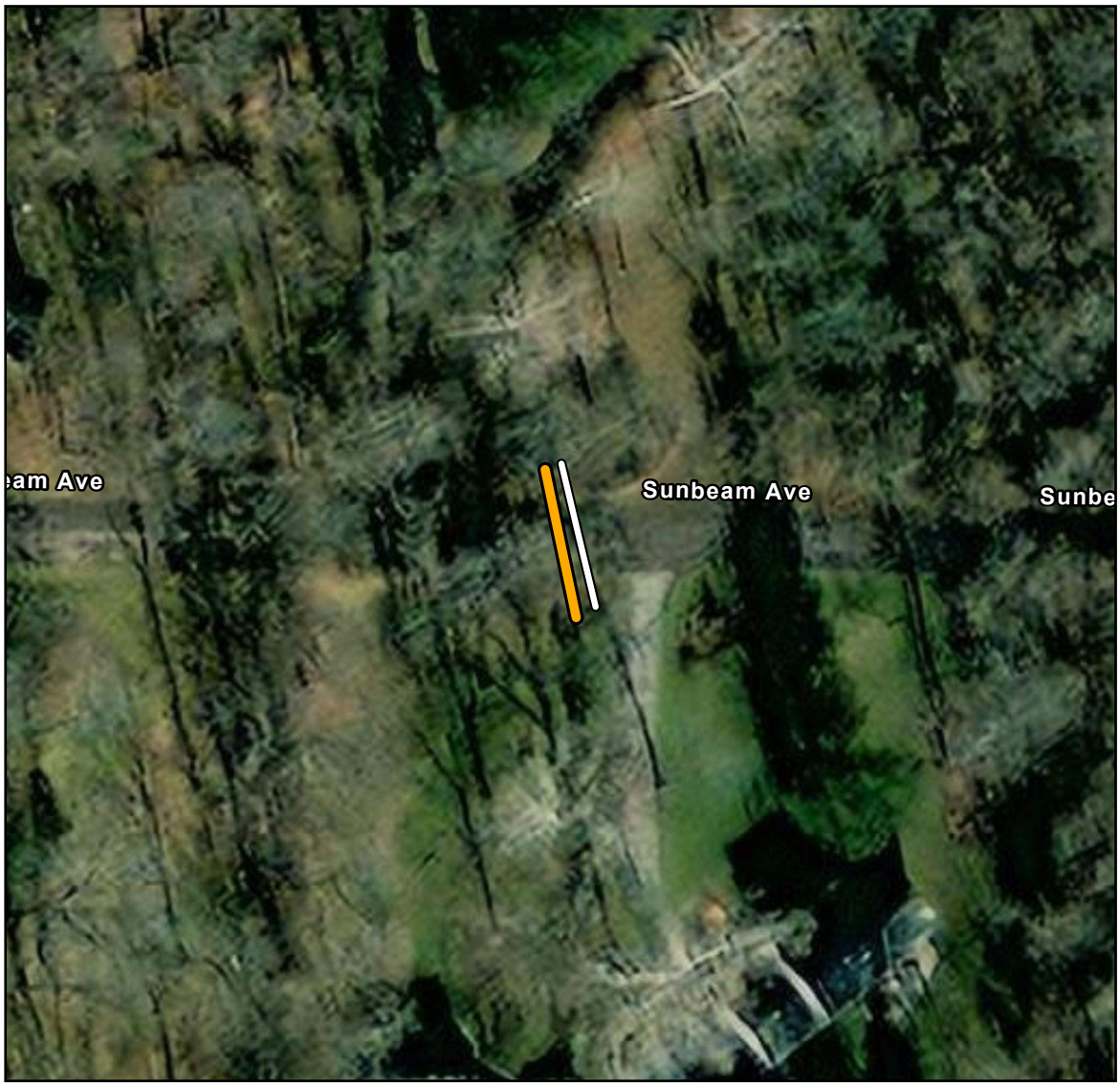
Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Photos

Identification

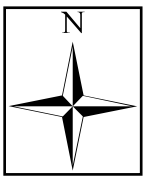
Culvert ID: E1_09

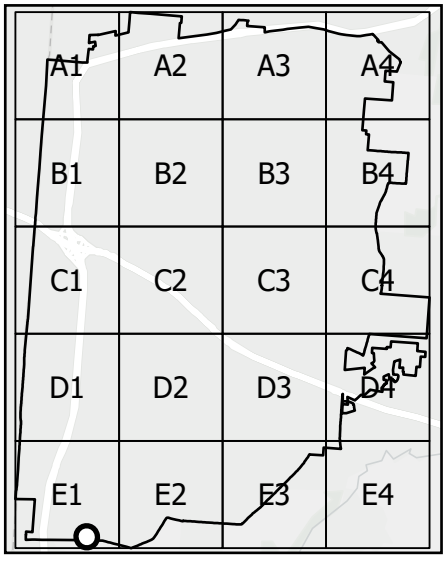
Structure Attributes

Culvert Shape: Arch
Culvert Material: CMP
Culvert Rise (ft): 4
Culvert Span (ft): 5.75
Culvert Length (ft): 53

Field Inspection

Structural Score: 1
Maintenance Score: 1
Upstream Elevation (ft): 954.45
Downstream Elevation (ft): 950.45





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Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH

Photos

Identification

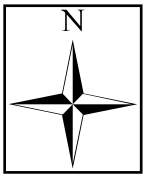
Culvert ID: E1_10

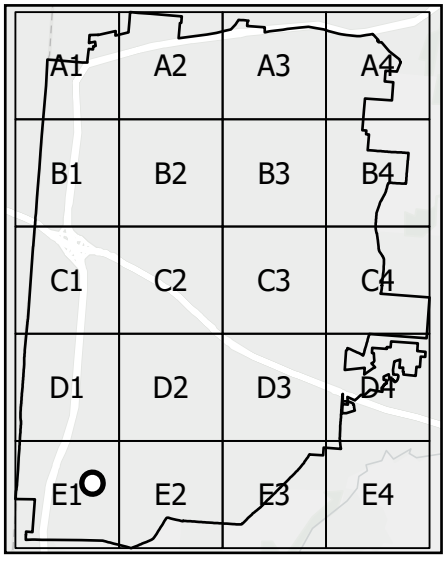
Structure Attributes

Culvert Shape: Circular
Culvert Material: CMP
Culvert Rise (ft): 3
Culvert Span (ft): 3
Culvert Length (ft): 54

Field Inspection

Structural Score: 2
Maintenance Score: 2
Upstream Elevation (ft): 997.31
Downstream Elevation (ft): 995.69





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Appendix F

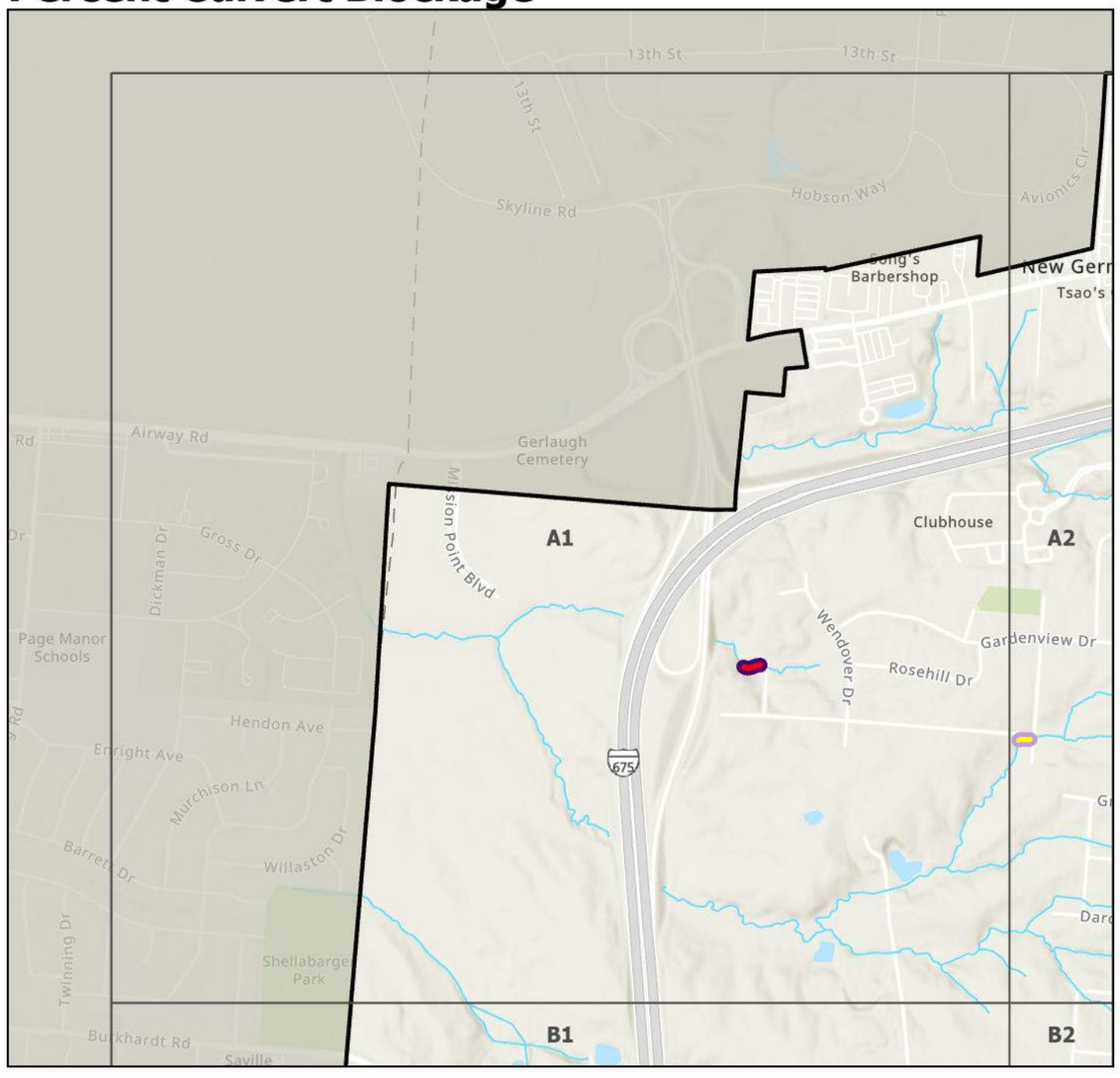
Stream Inspection Grid Sheets

BEAVERCREEK DRAINAGE MASTER PLAN

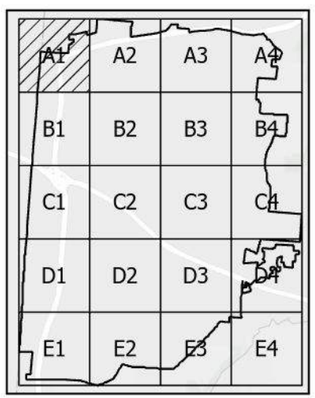
CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage



Stream Assessment Map



NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

Grid Identification

City Limit

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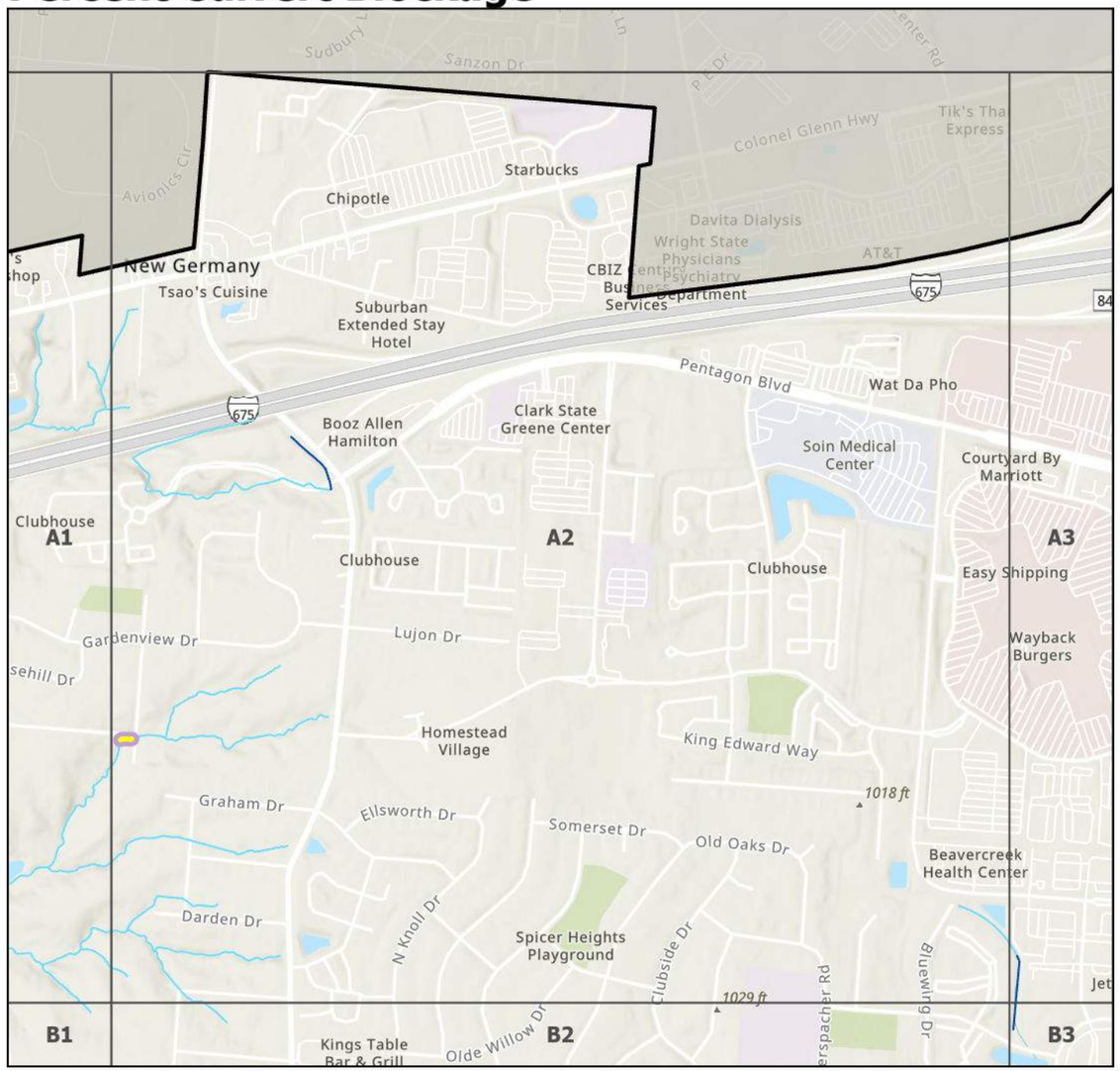
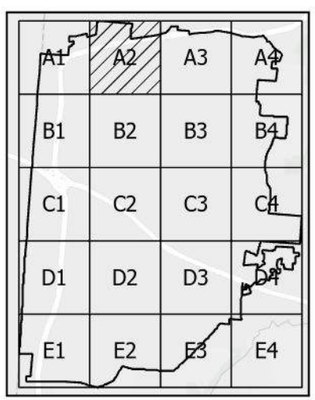
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public
- Grid Identification
- City Limit

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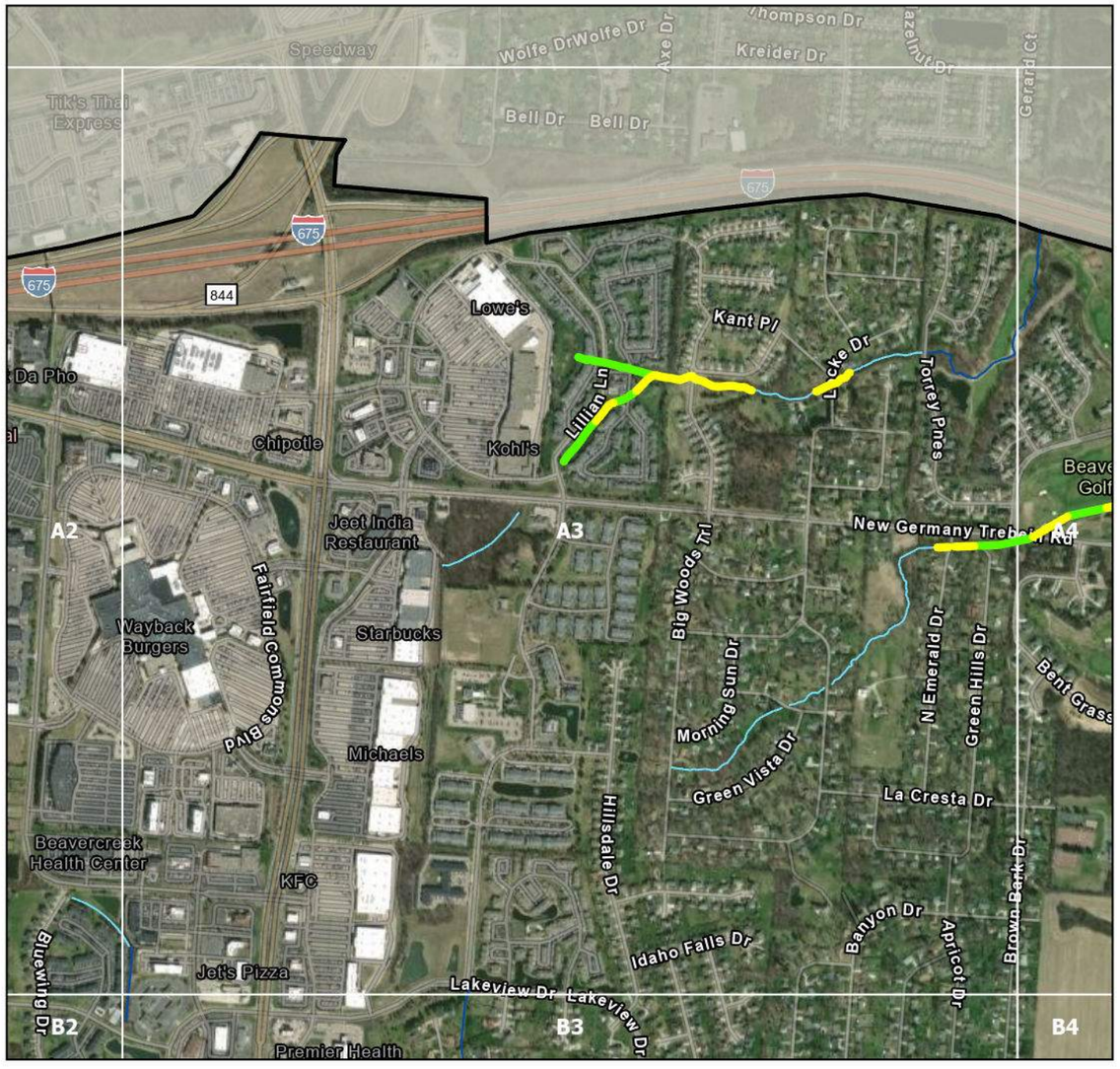
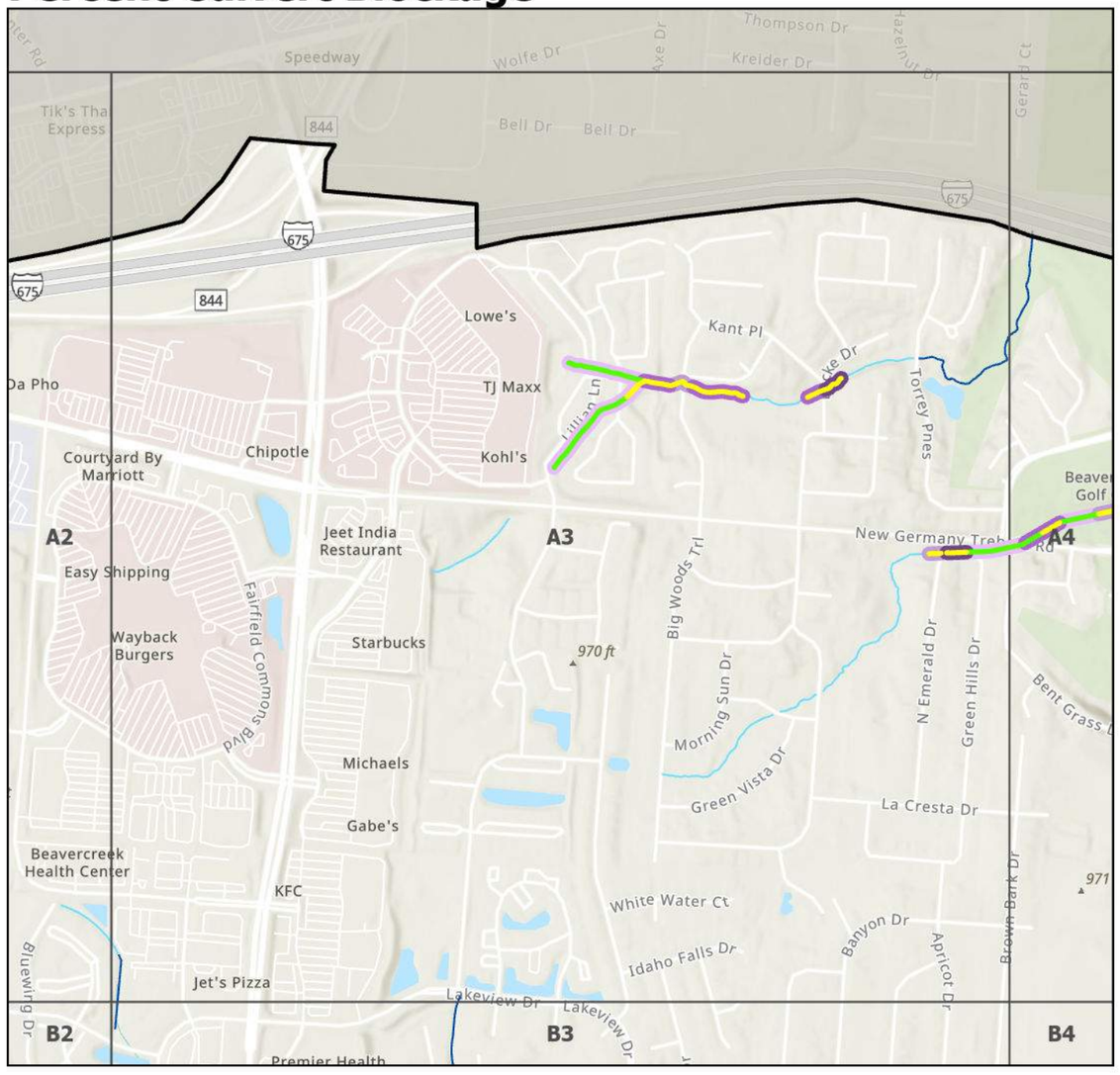
BEAVERCREEK DRAINAGE MASTER PLAN

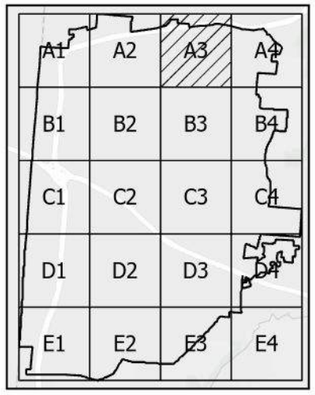
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

Grid Identification

City Limit

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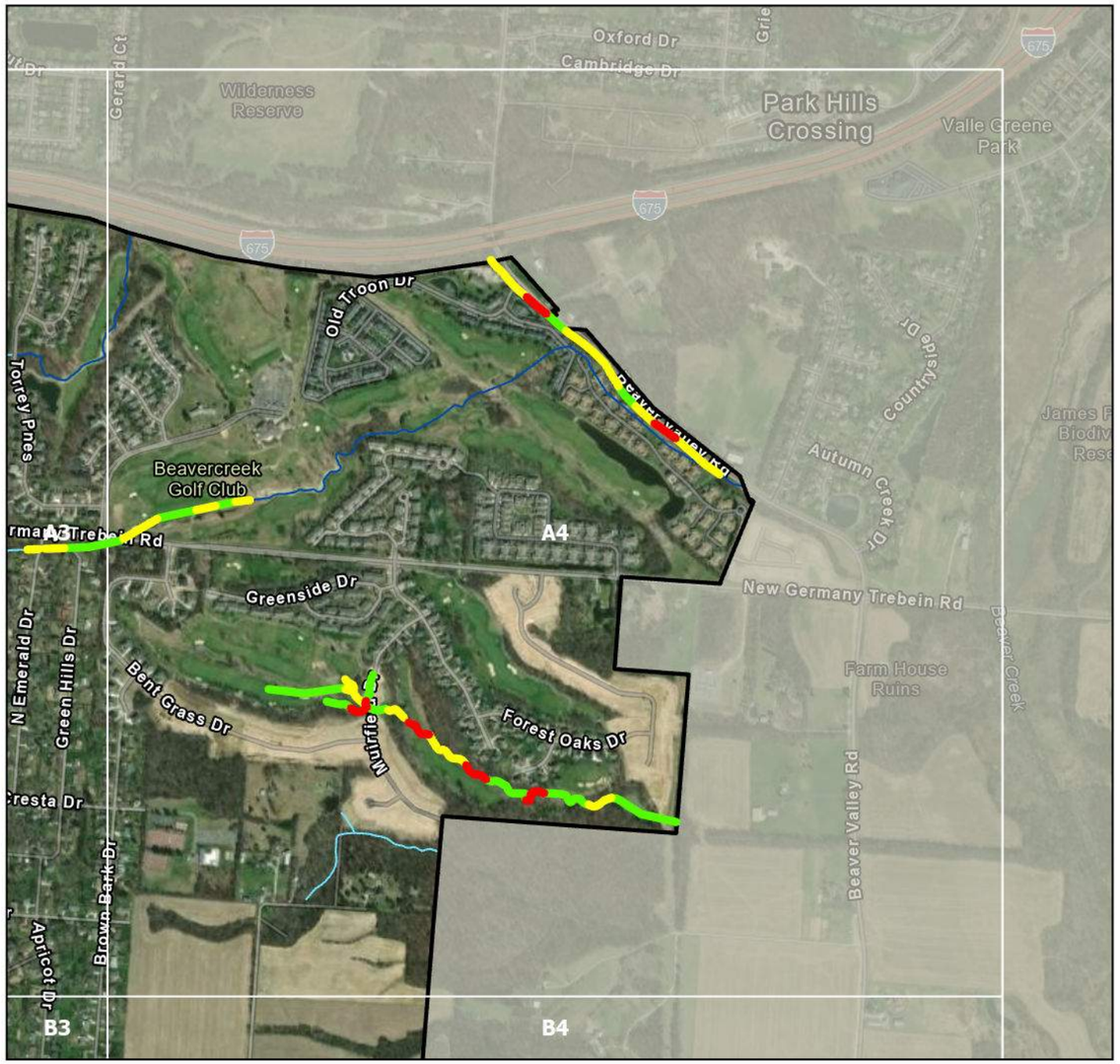
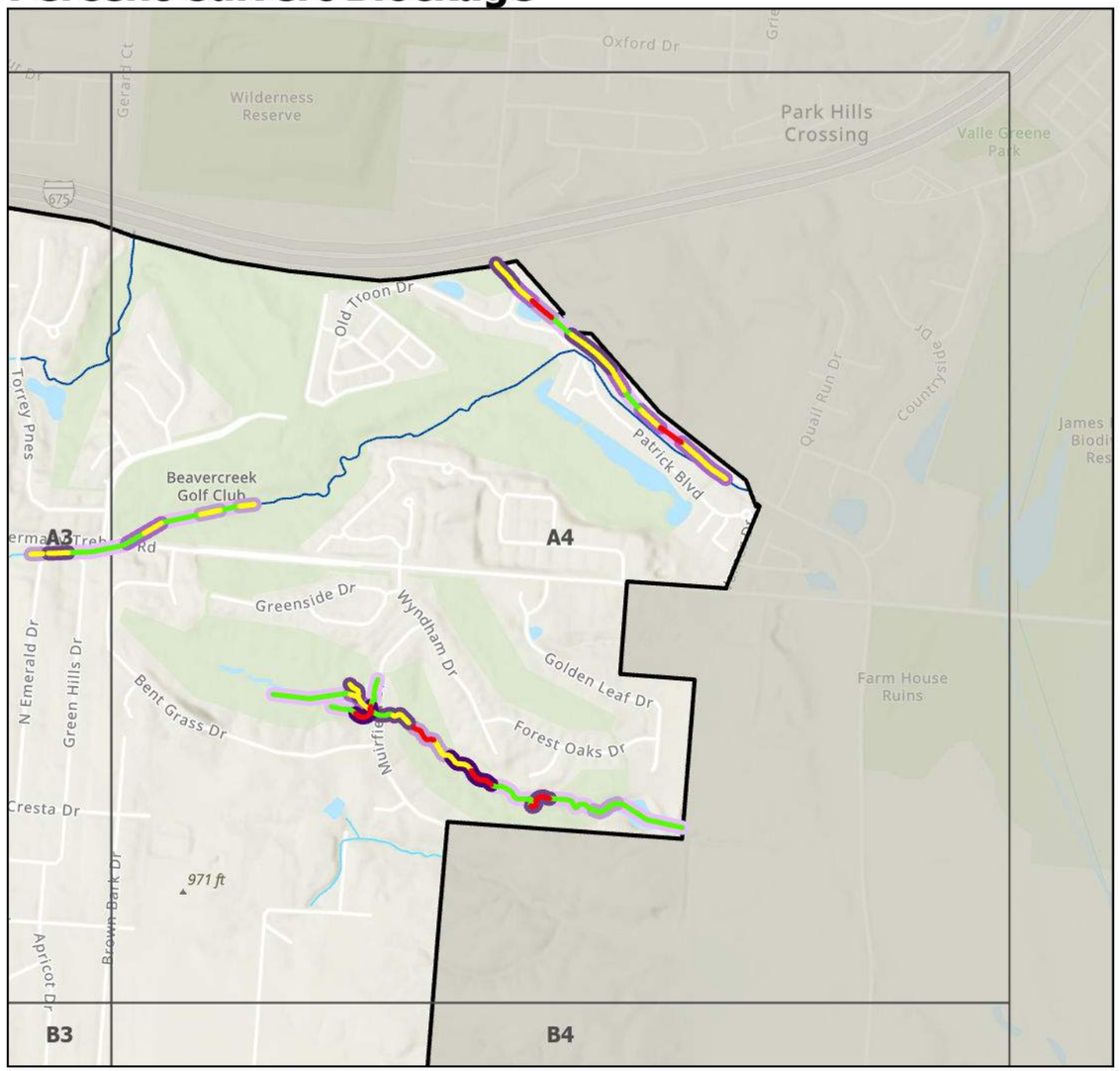
BEAVERCREEK DRAINAGE MASTER PLAN

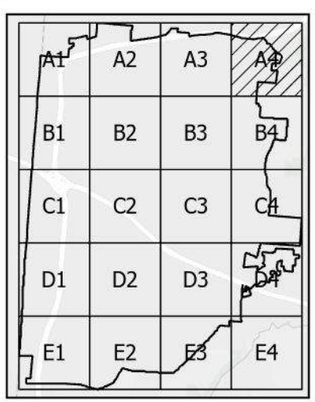
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

Grid Identification

City Limit

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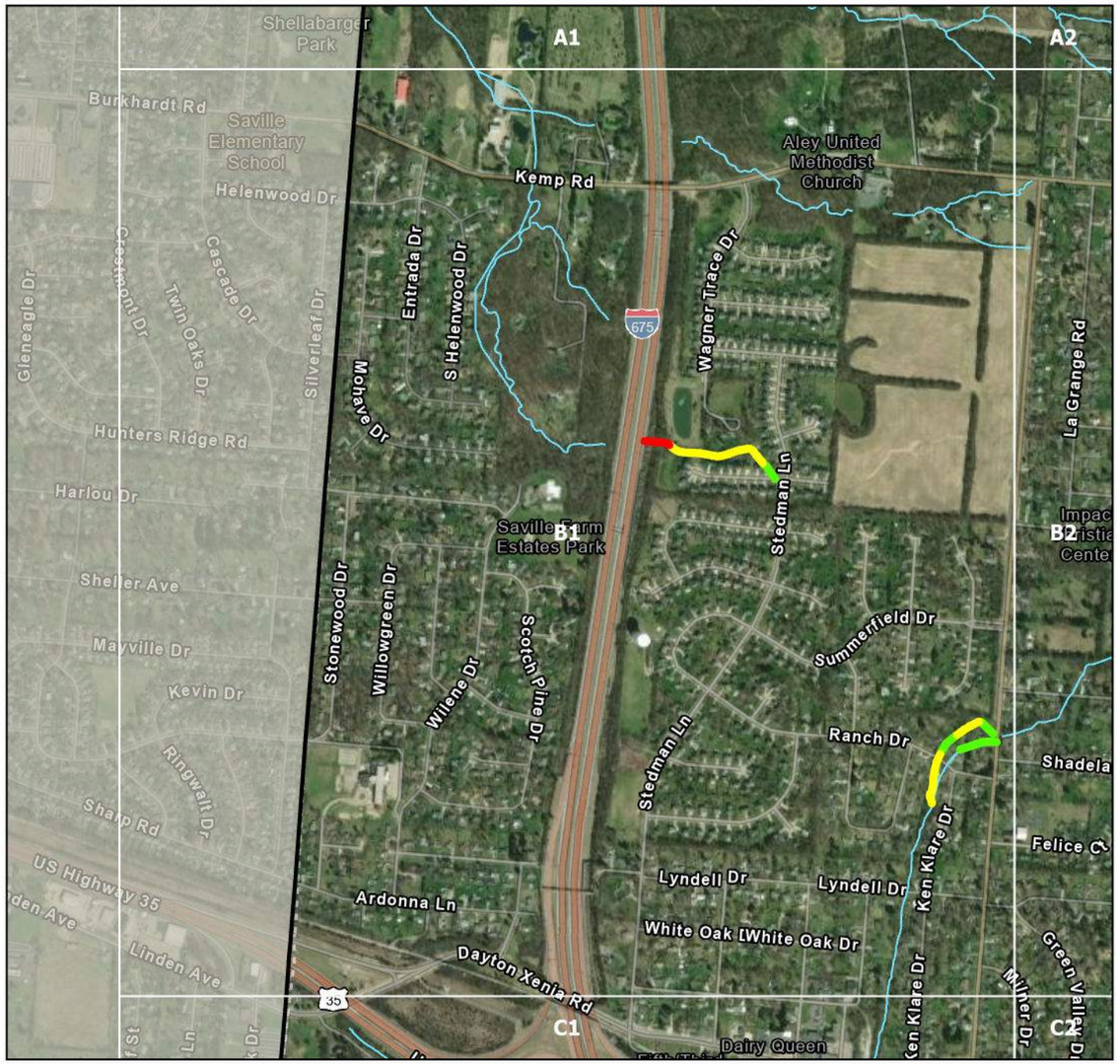
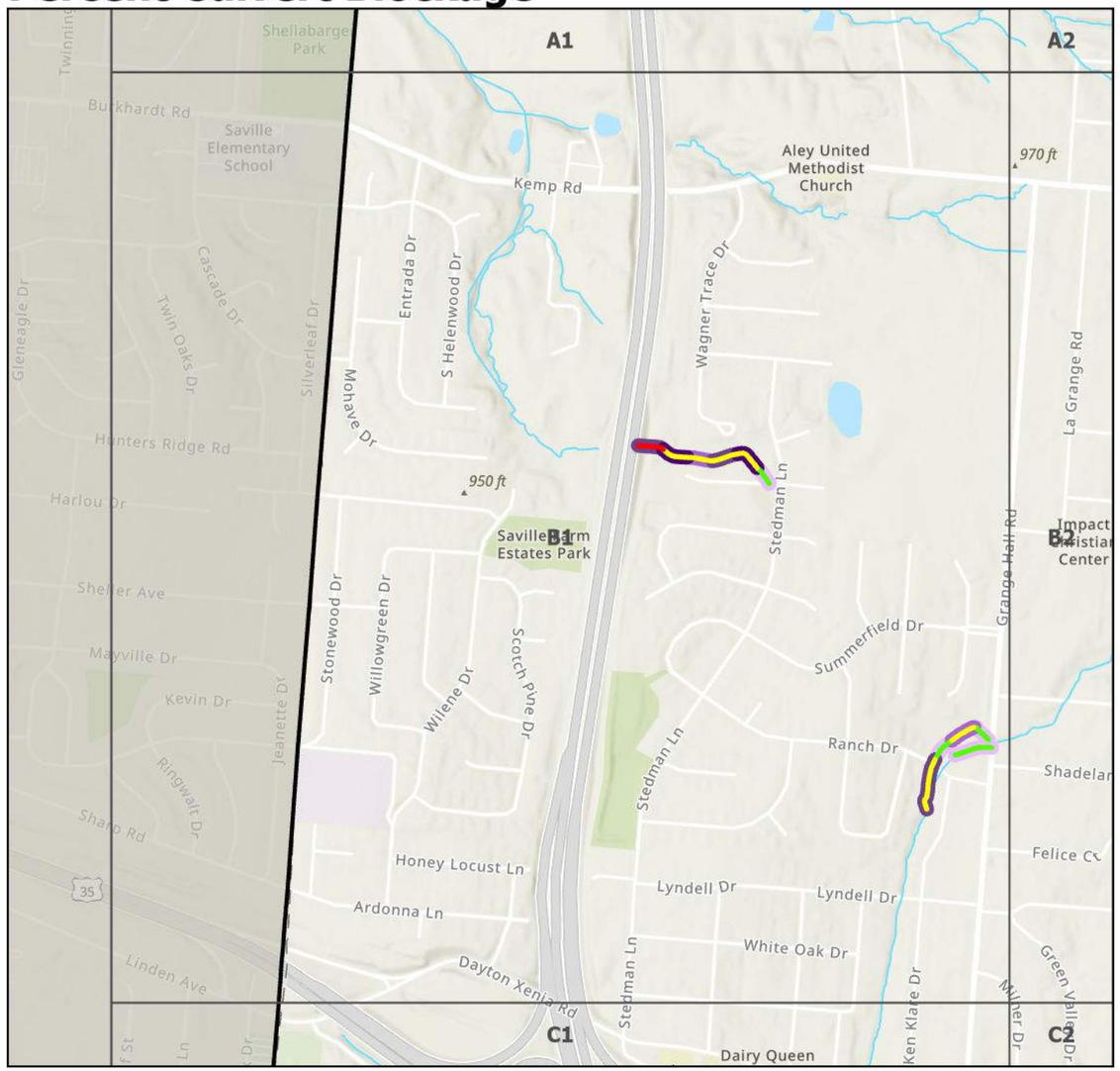
BEAVERCREEK DRAINAGE MASTER PLAN

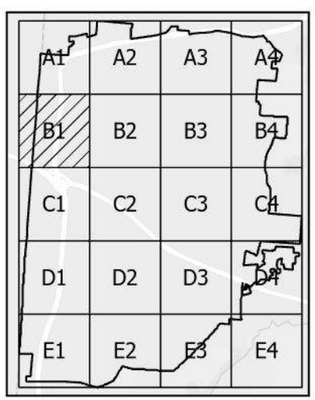
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

Grid Identification

City Limit

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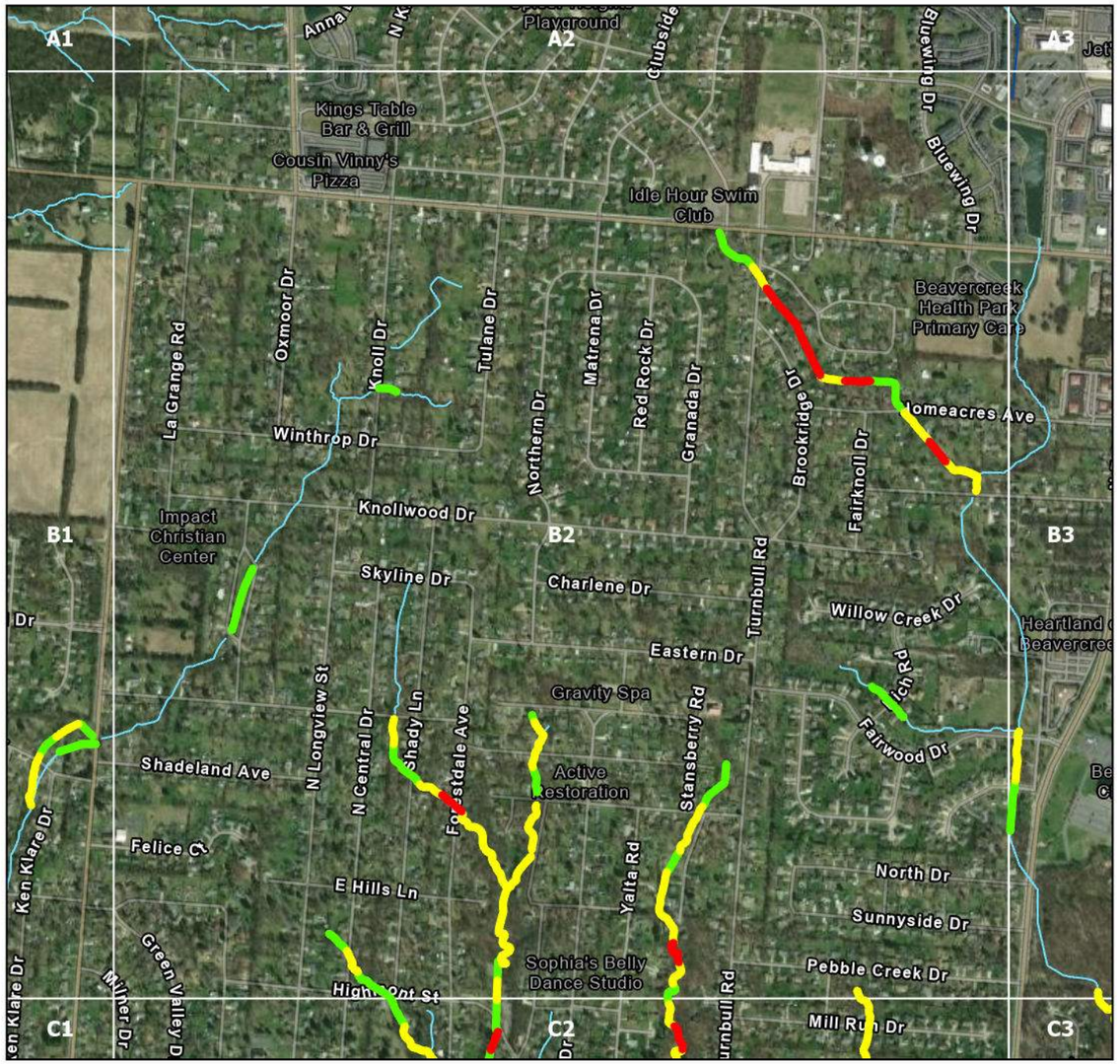
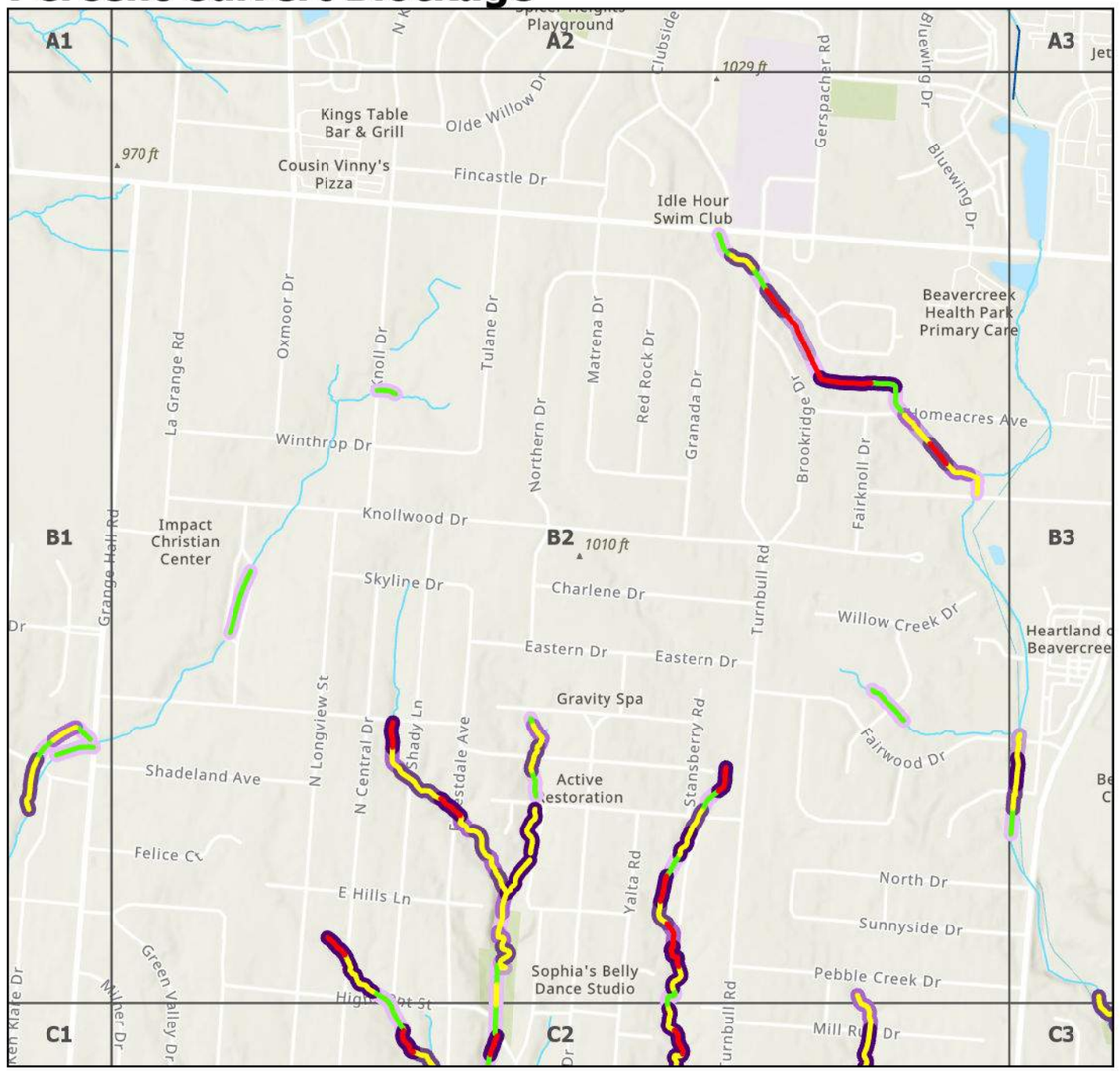
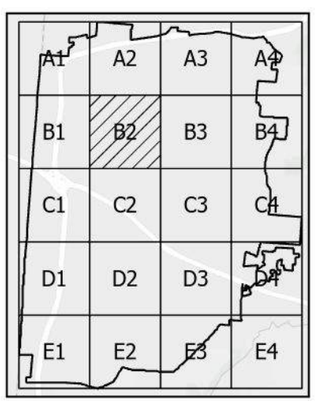
BEAVERCREEK DRAINAGE MASTER PLAN
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public
- Grid Identification
- City Limit

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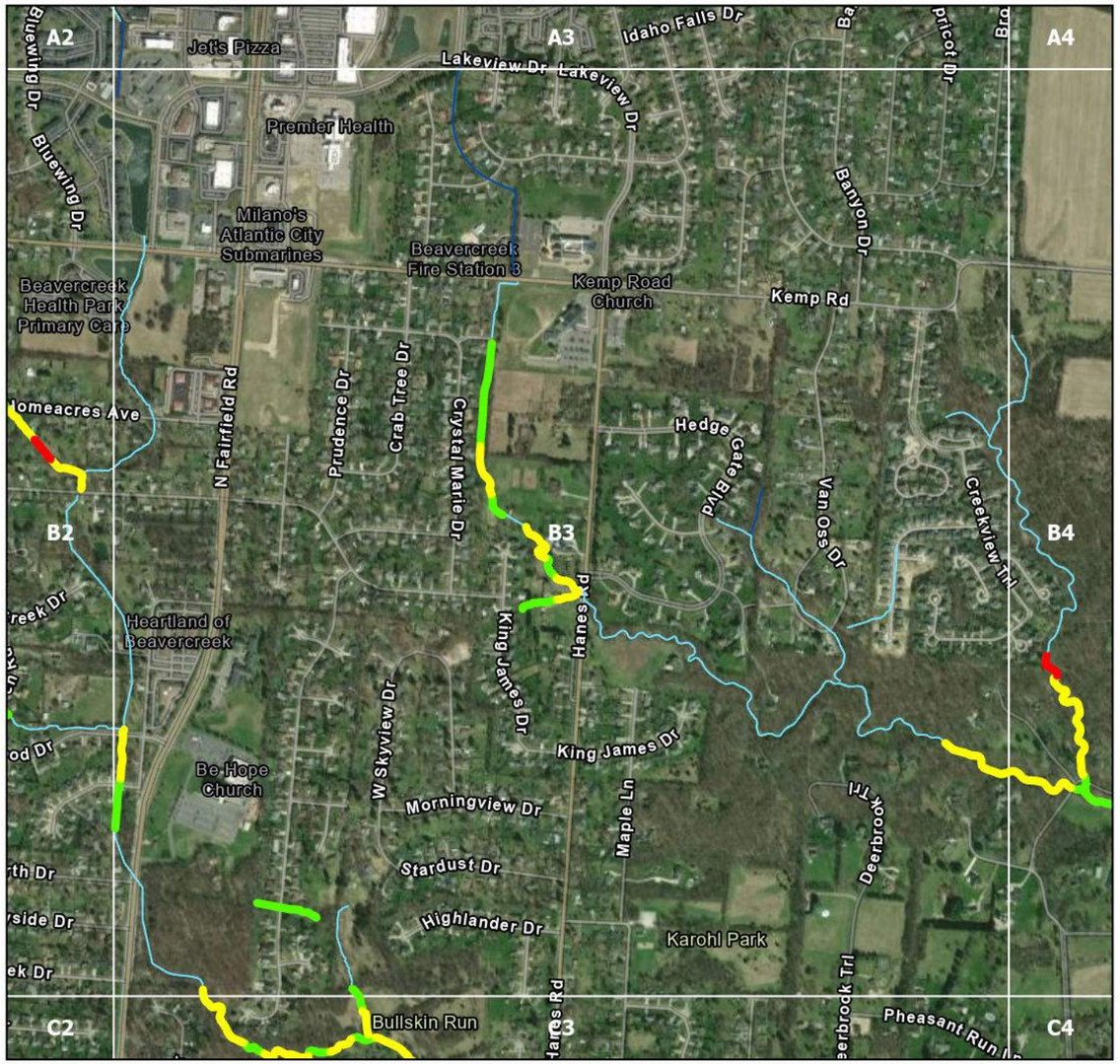
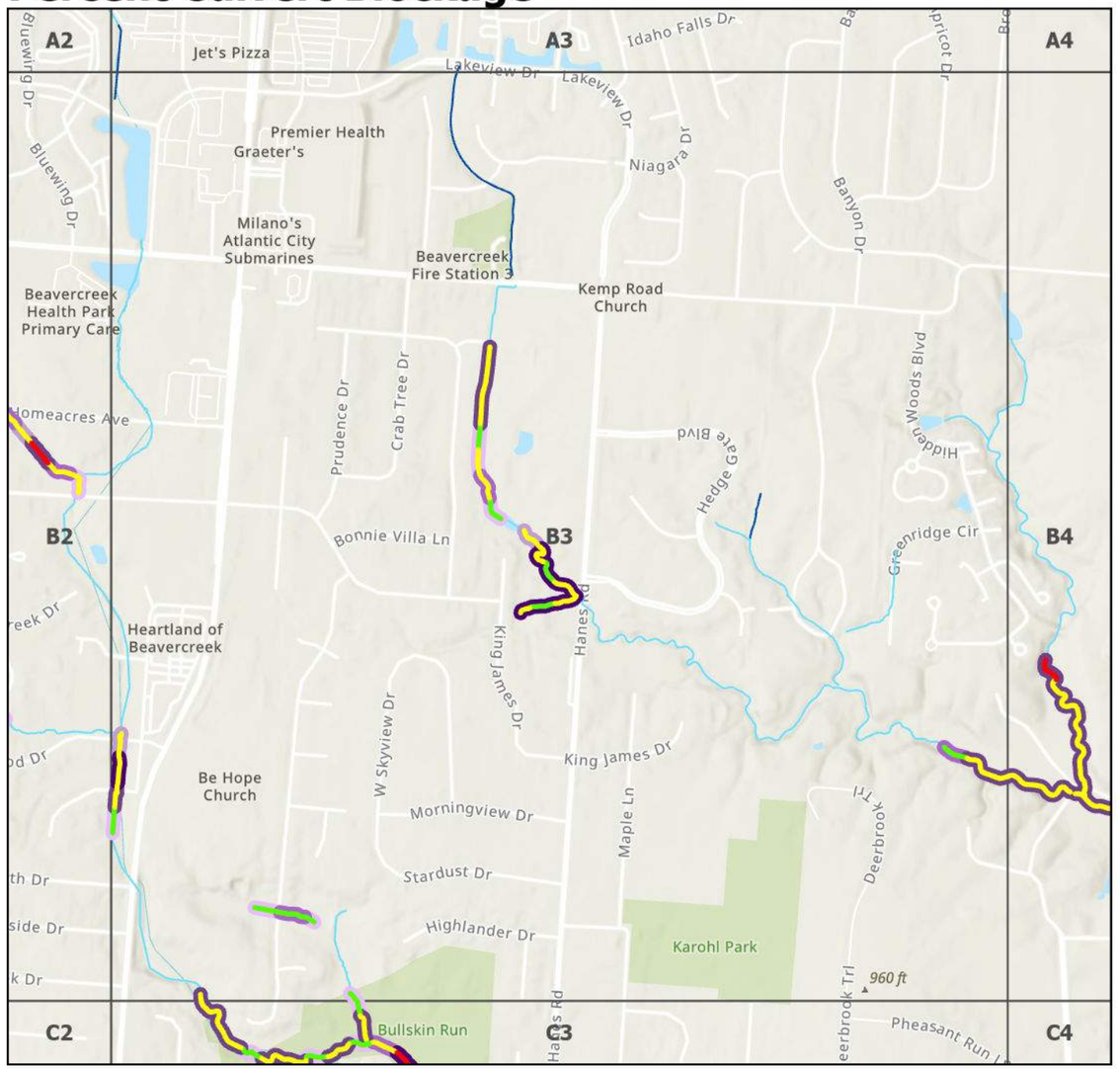
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

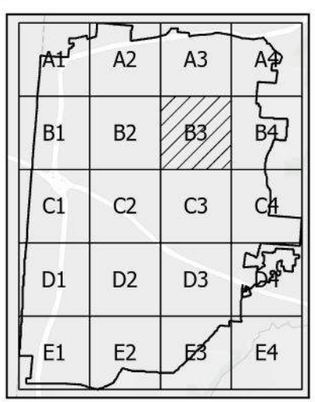
Structural Condition



Maintenance Condition and Percent Culvert Blockage



Stream Assessment Map



NOTES:

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

Grid Identification

City Limit

WOOLPERT

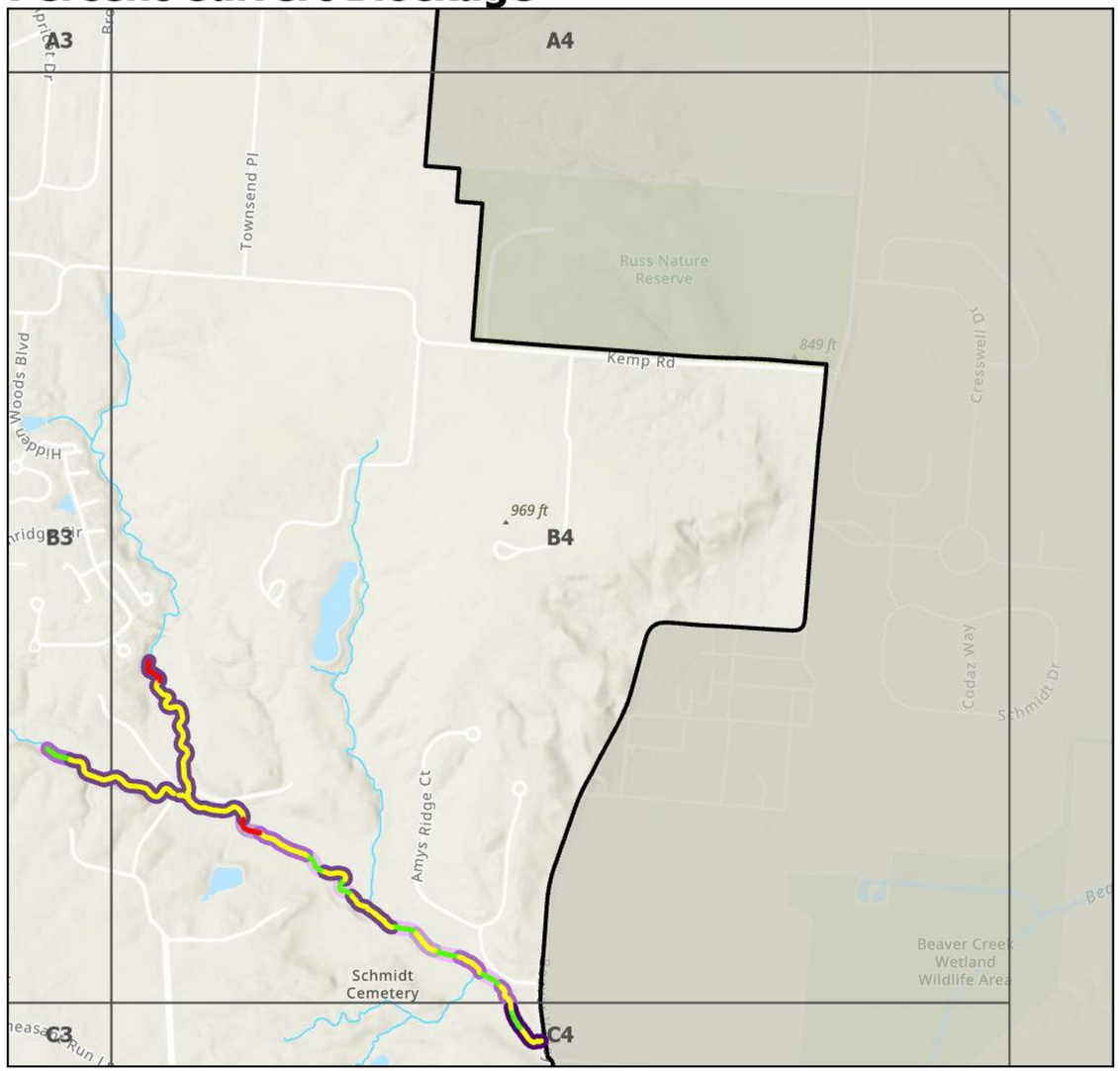
8/7/2025

BEAVERCREEK DRAINAGE MASTER PLAN

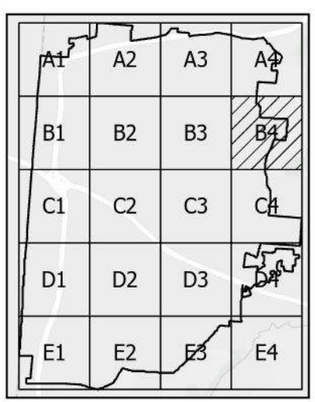
CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage



Stream Assessment Map



NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
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WOOLPERT

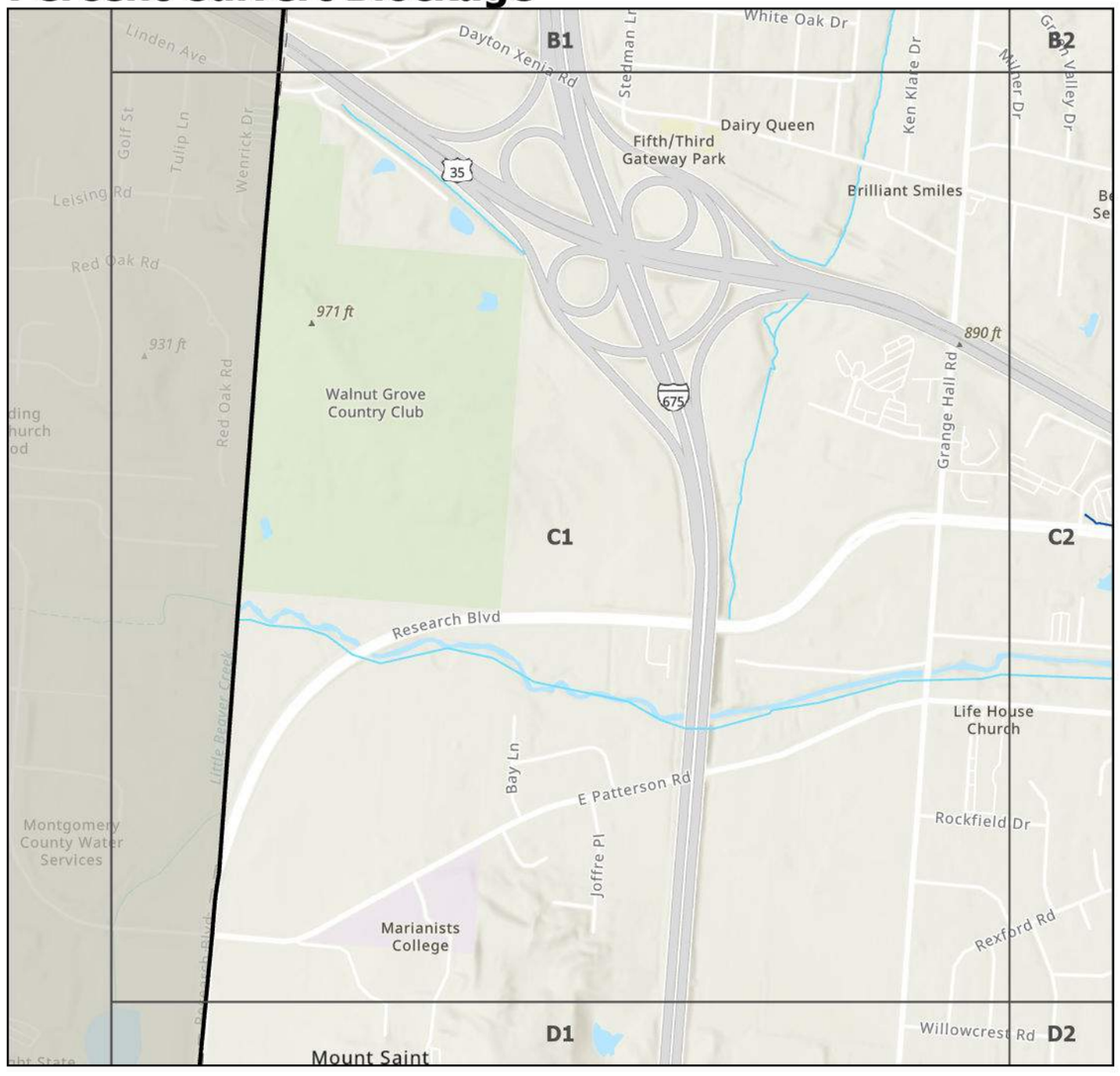
8/7/2025

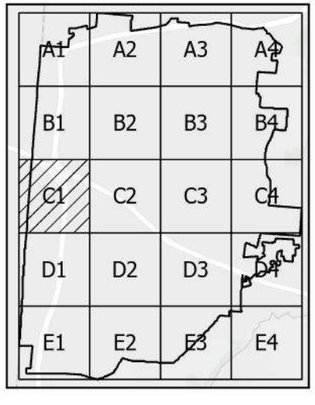
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage





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8/7/2025

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

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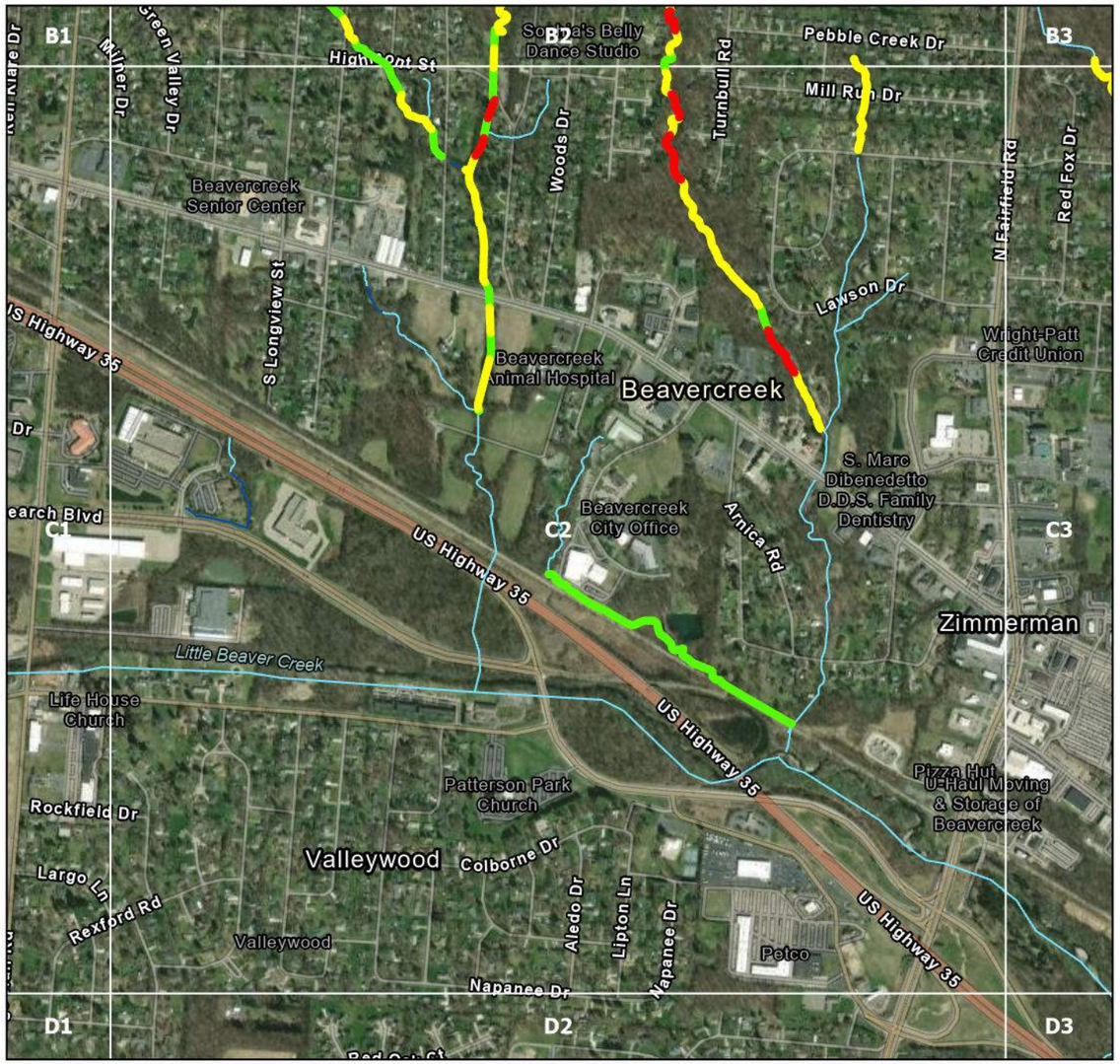
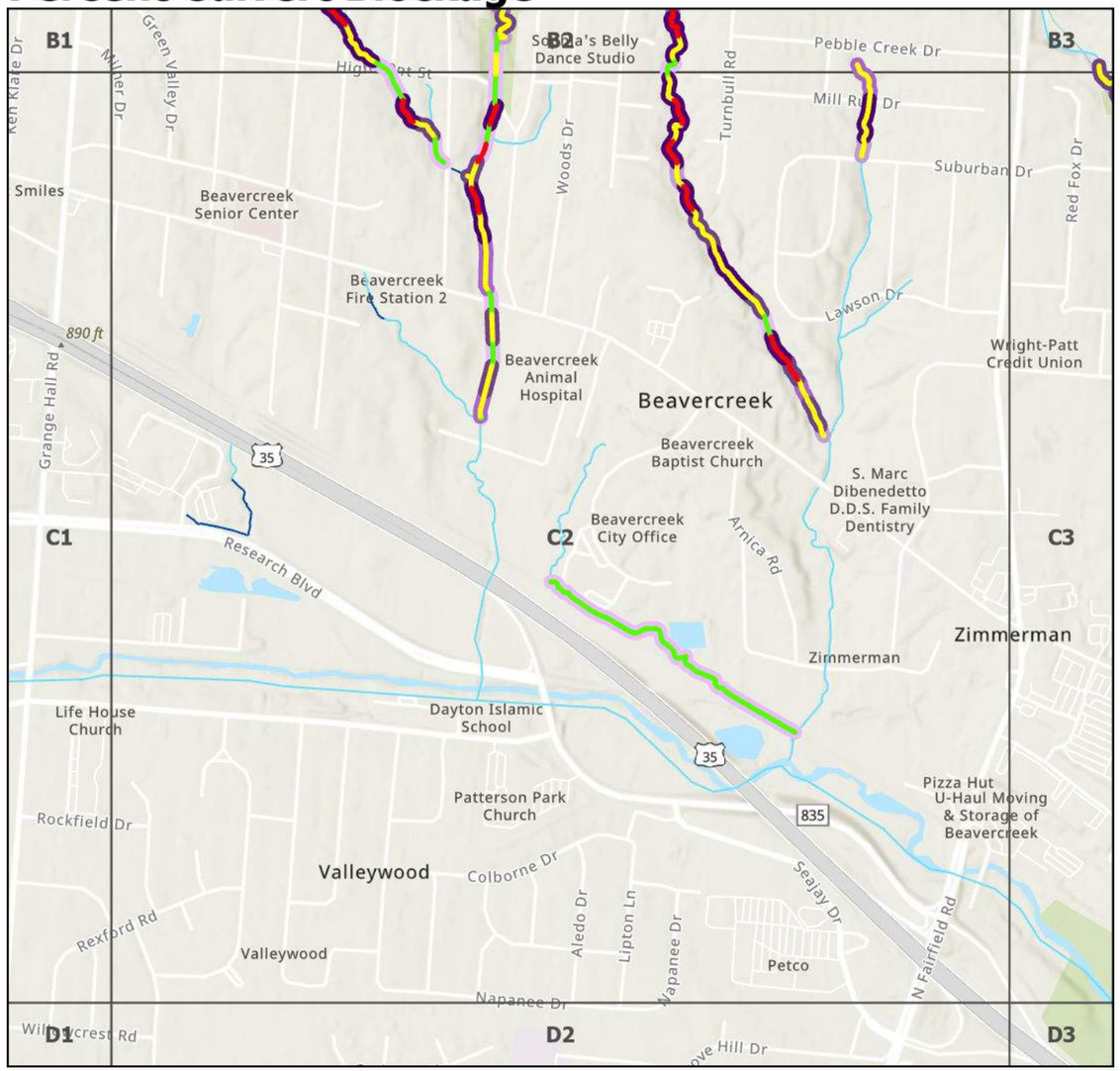
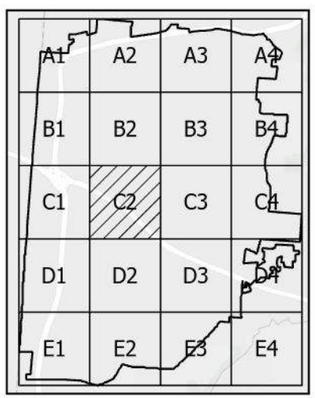


Maintenance Condition and Percent Culvert Blockage





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WOOLPERT

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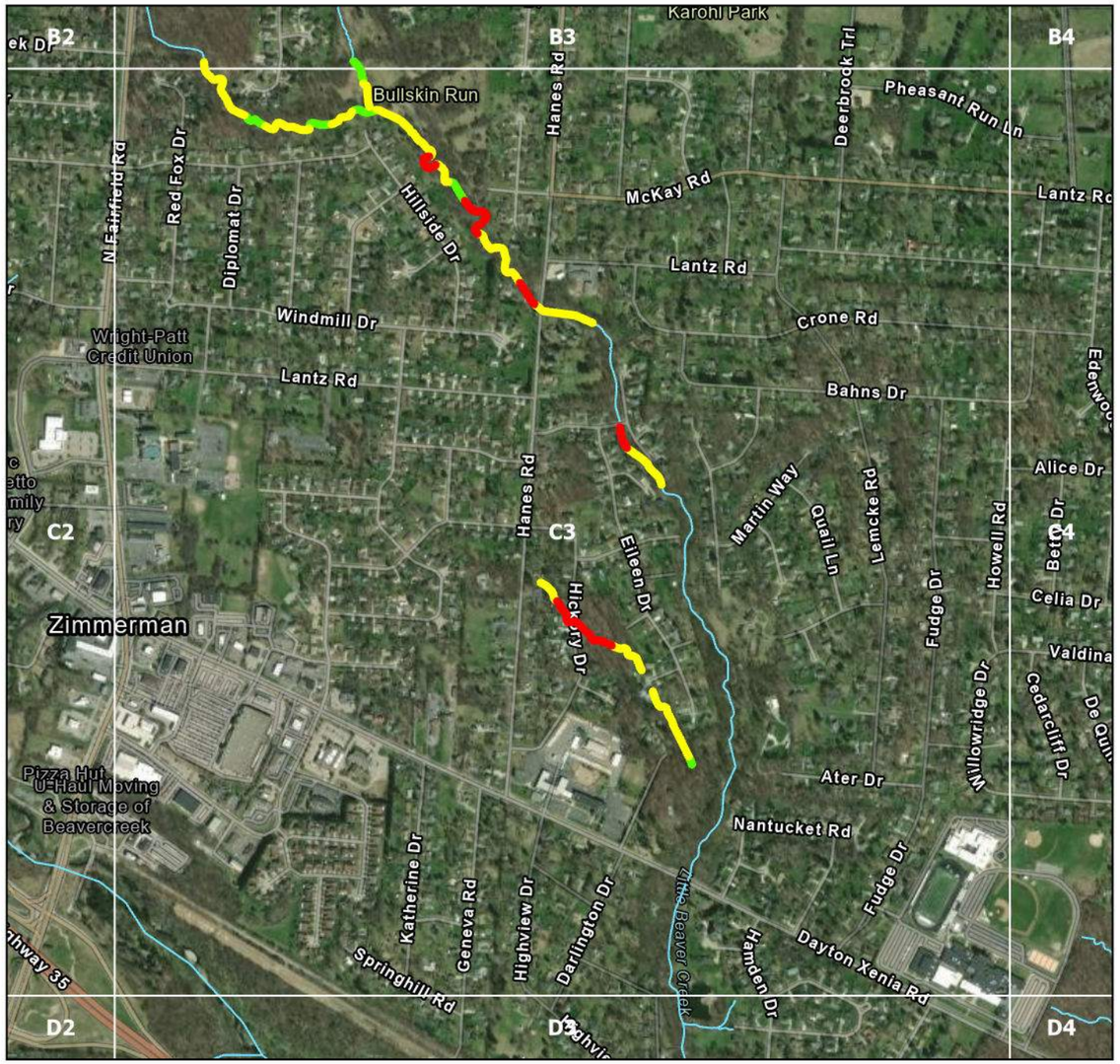
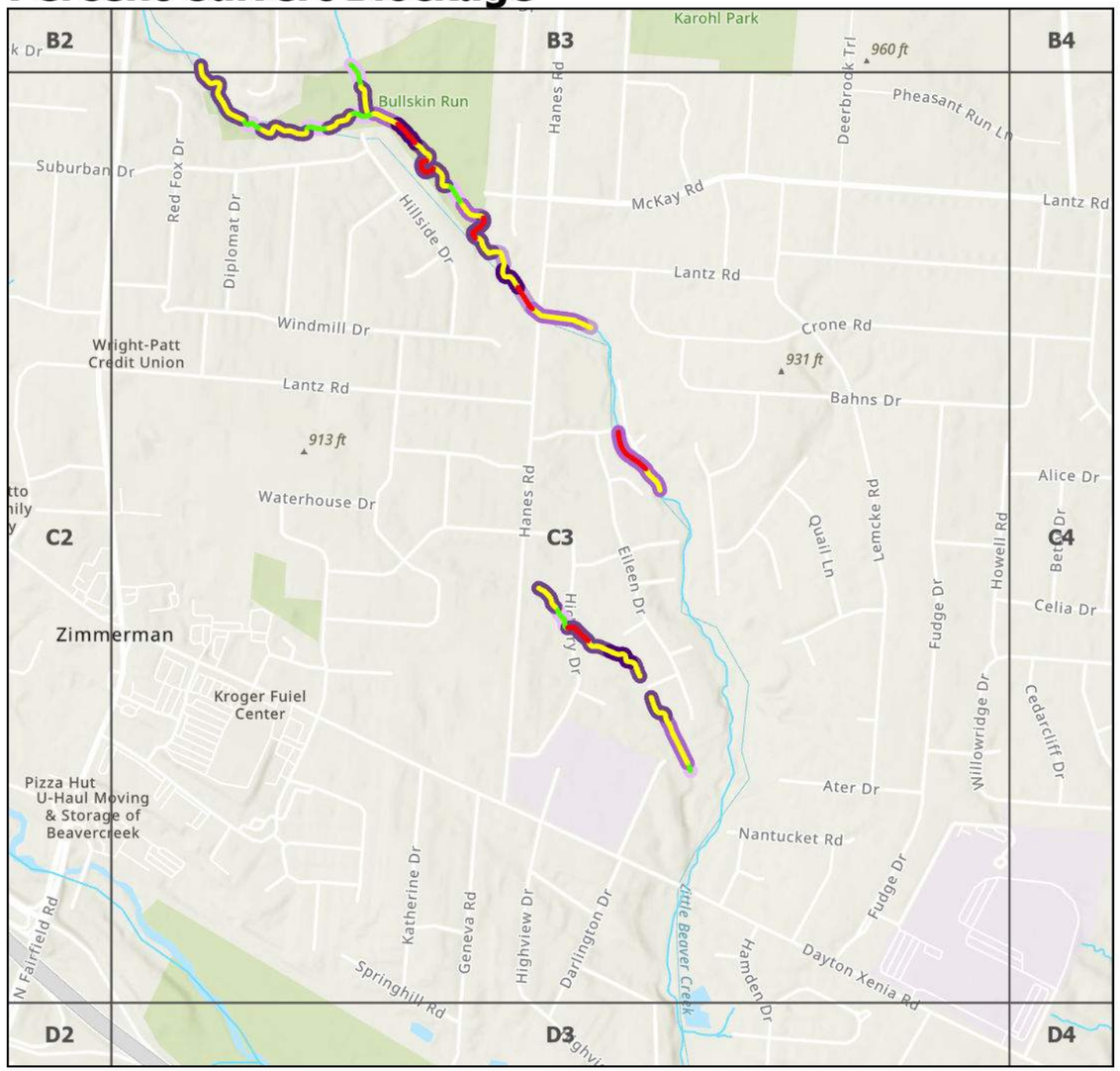
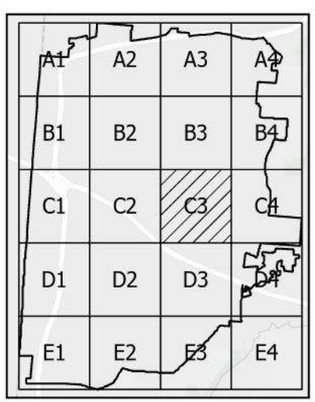
BEAVERCREEK DRAINAGE MASTER PLAN
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





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0 0.25 0.5 1 Miles

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WOOLPERT

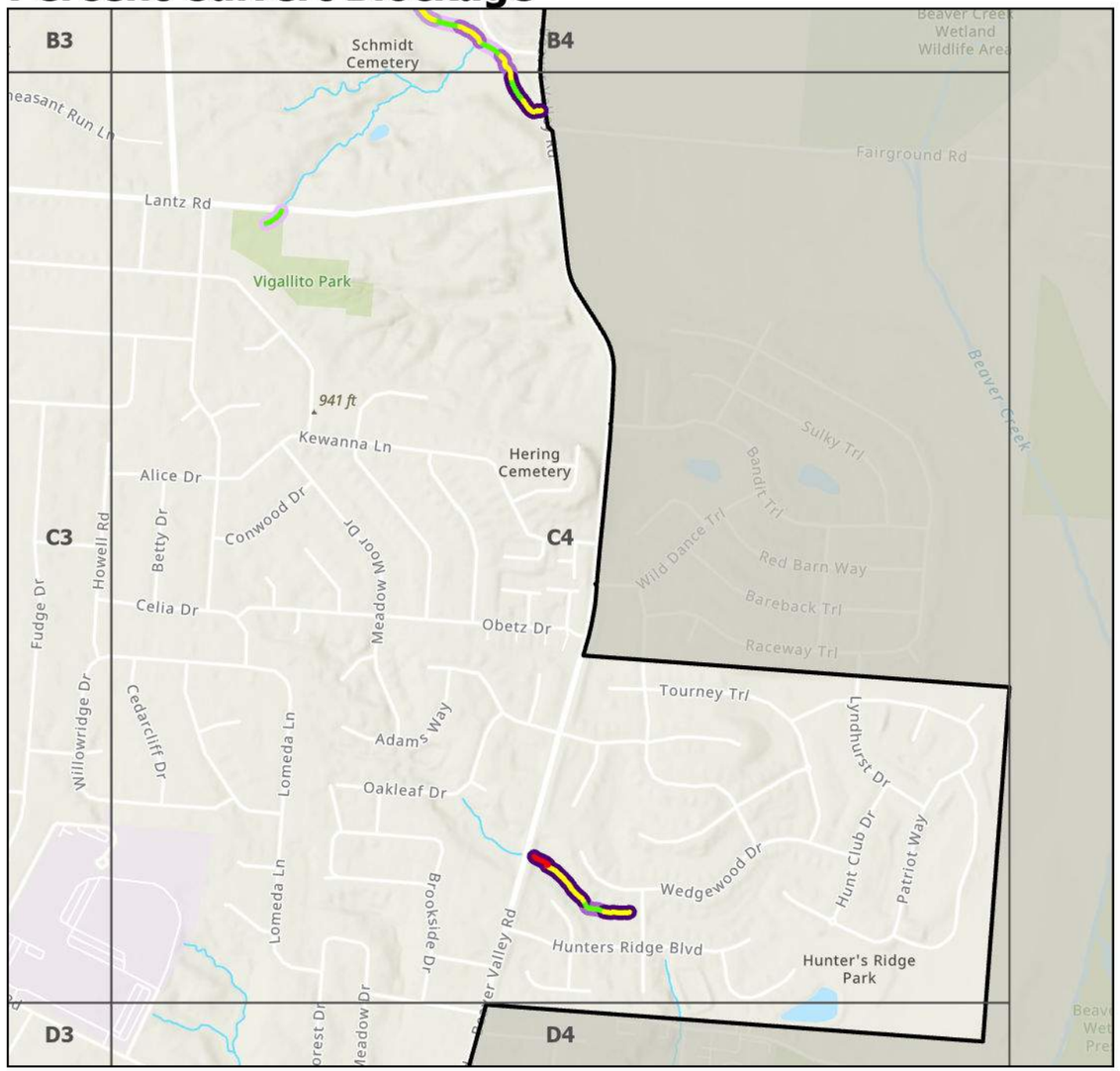
8/7/2025

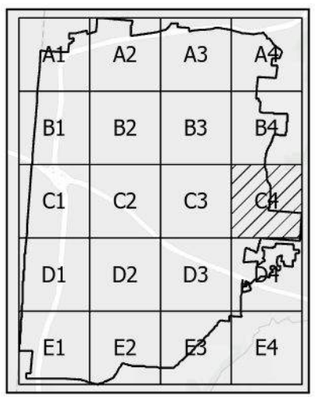
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage





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WOOLPERT

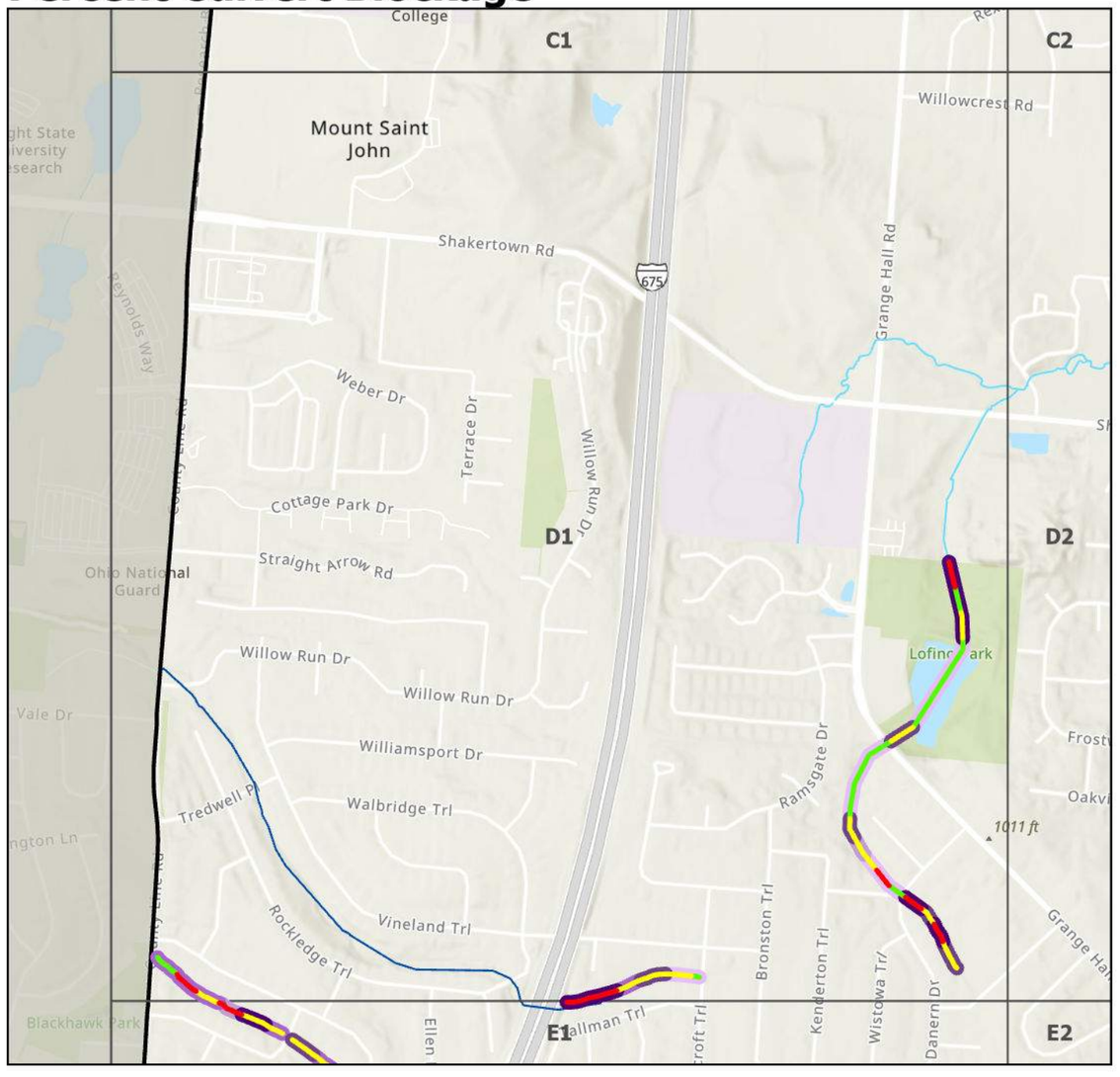
8/7/2025

BEAVERCREEK DRAINAGE MASTER PLAN

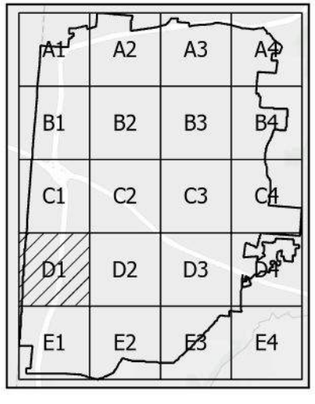
CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage



Stream Assessment Map



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WOOLPERT

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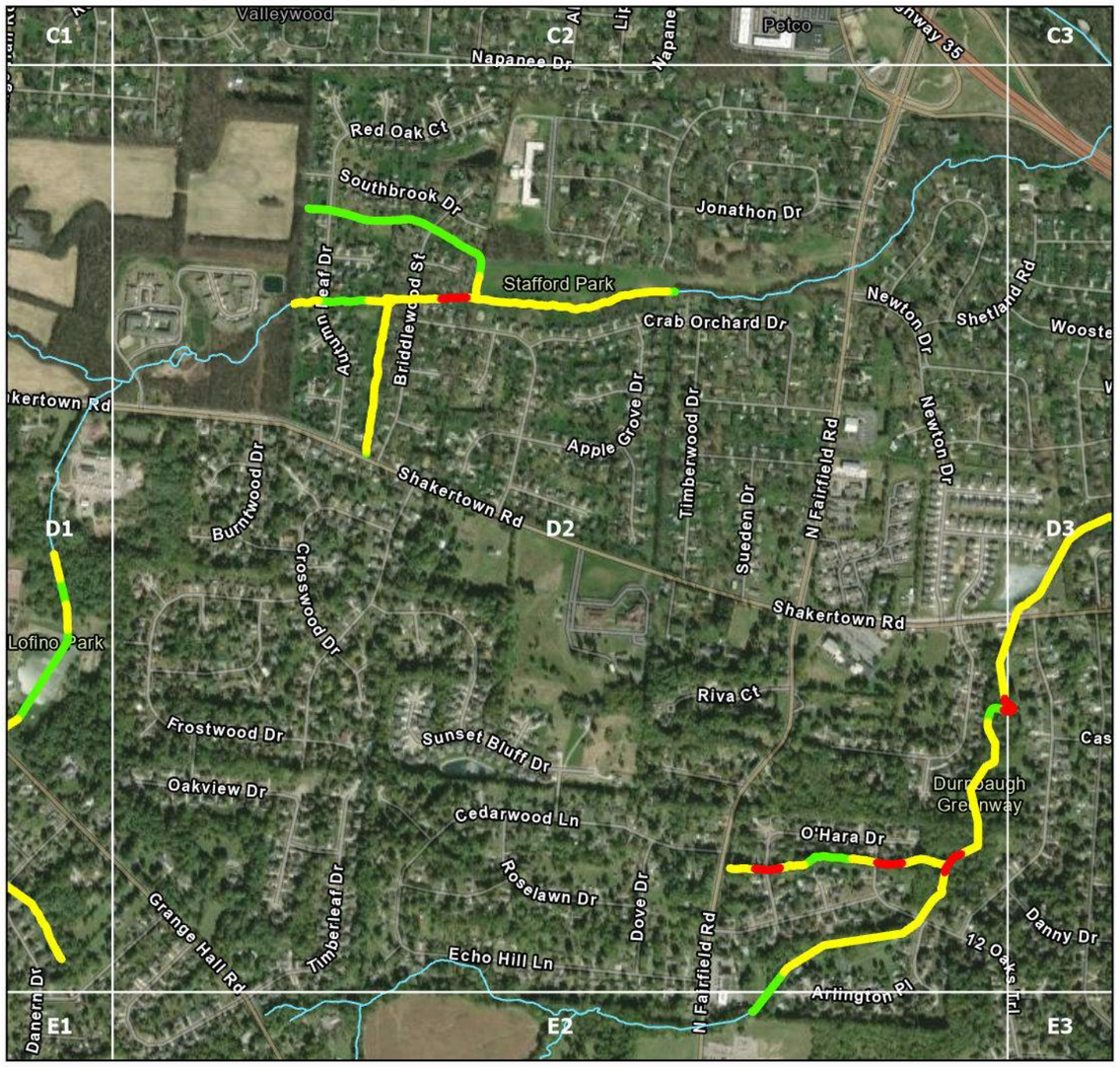
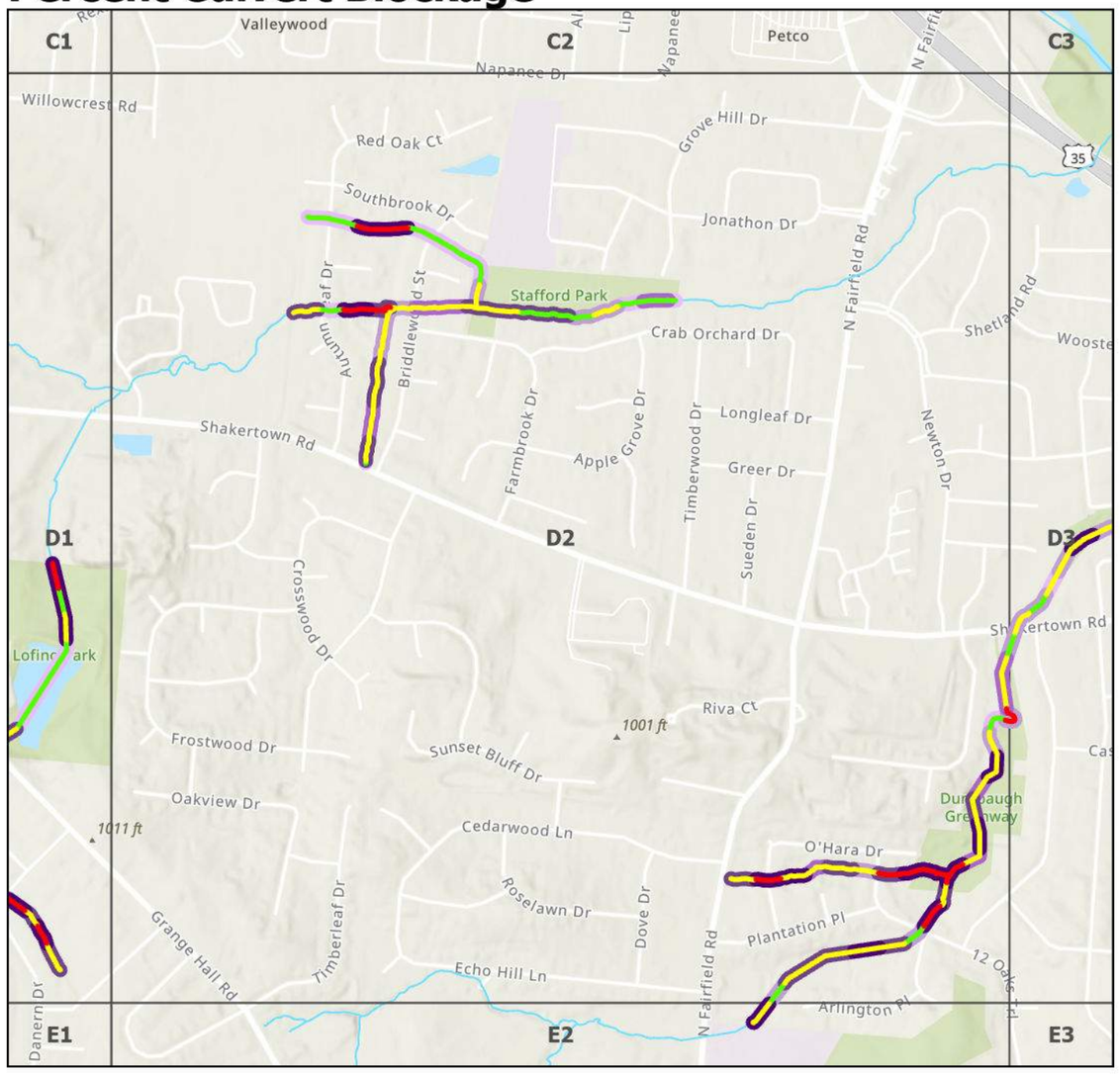
BEAVERCREEK DRAINAGE MASTER PLAN

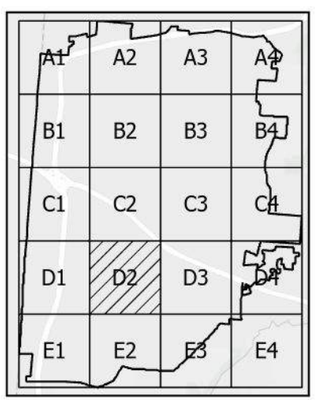
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





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City Limit

WOOLPERT

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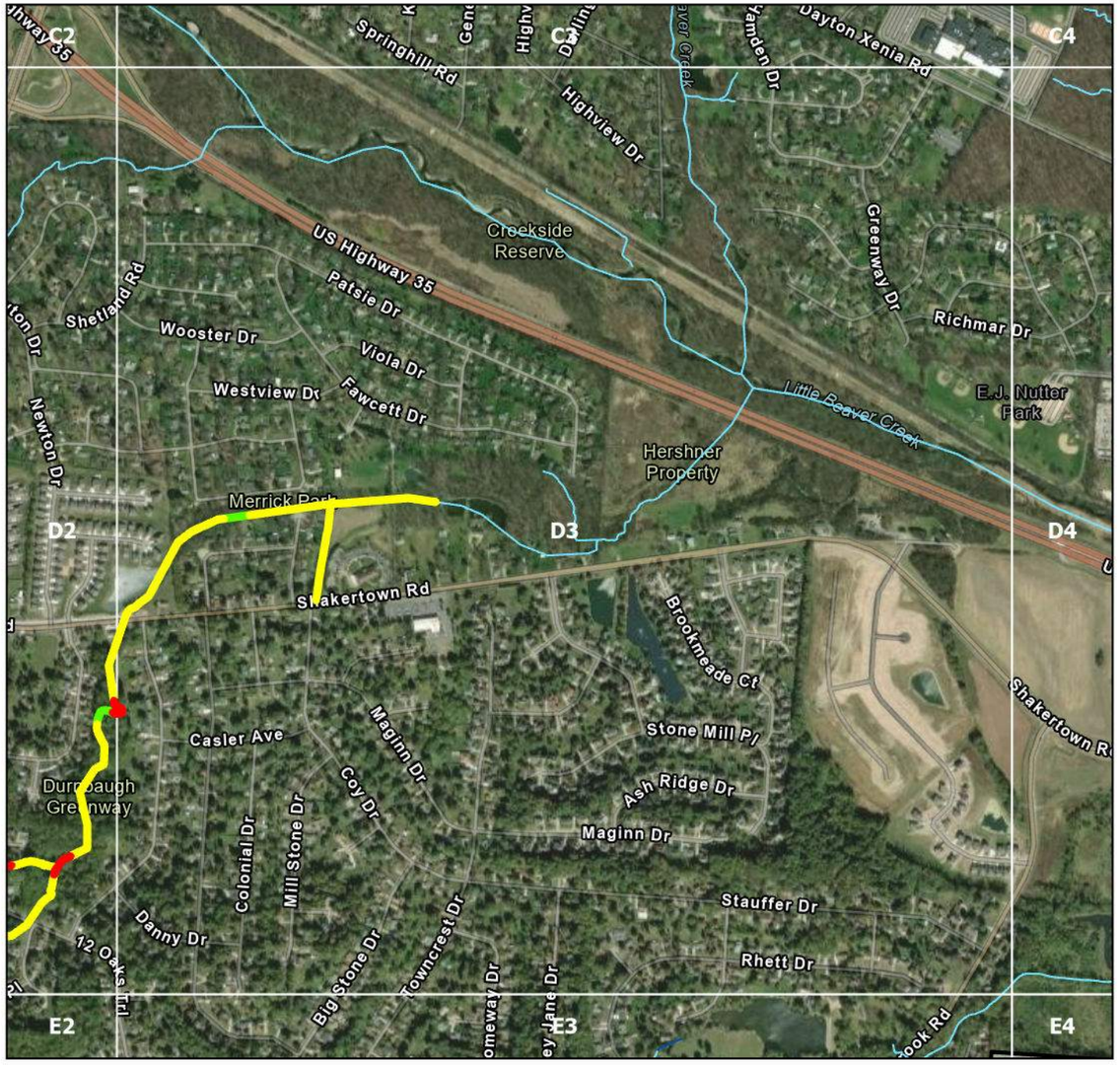
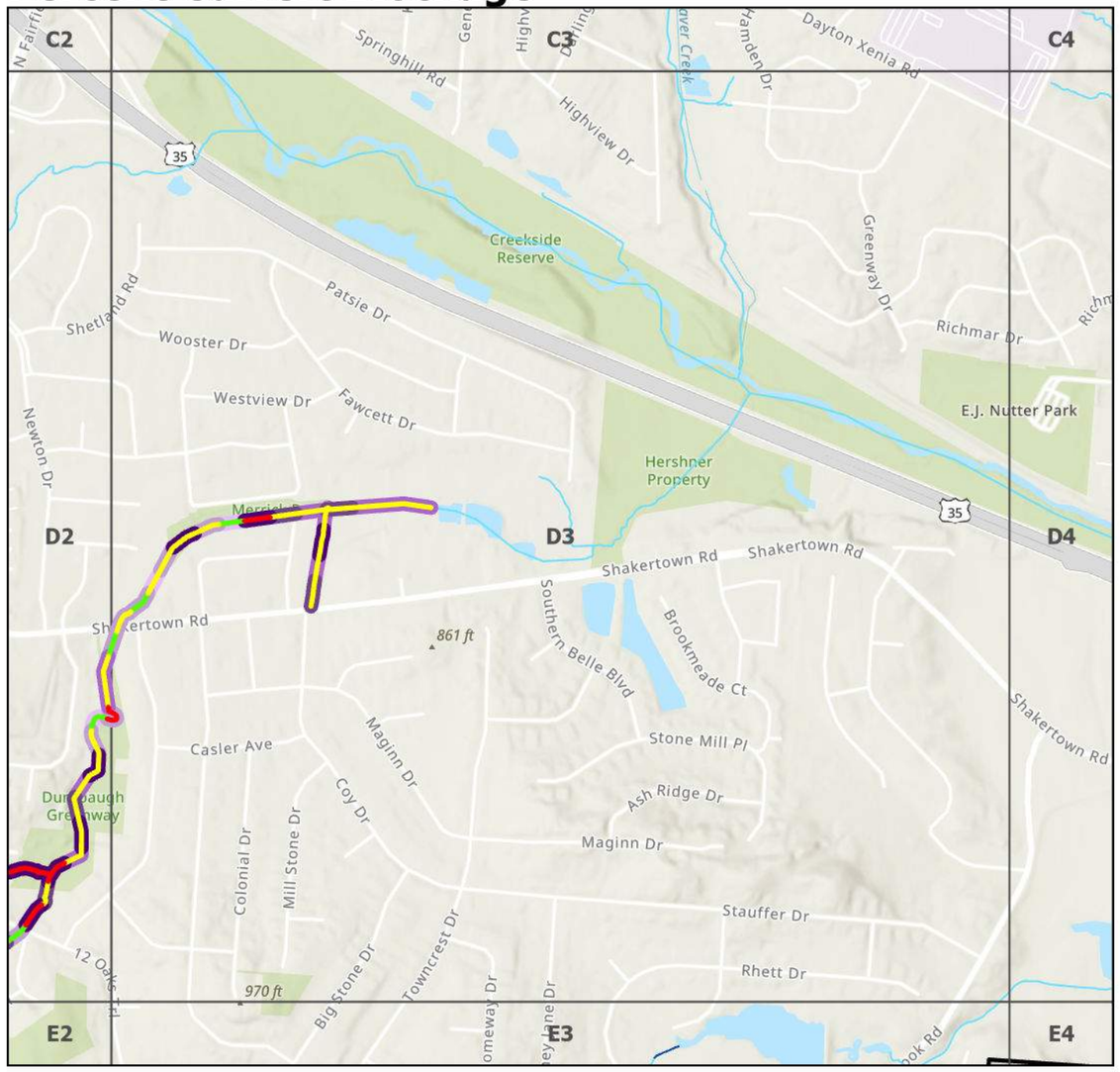
BEAVERCREEK DRAINAGE MASTER PLAN

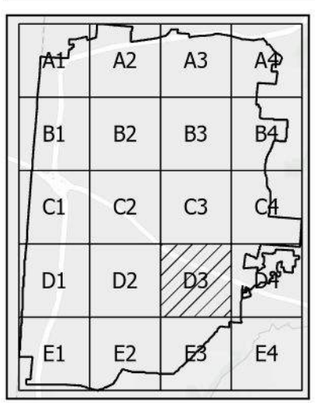
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

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0 0.25 0.5 1 Miles

Legend

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Percent Culvert Blockage
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Grid Identification

City Limit

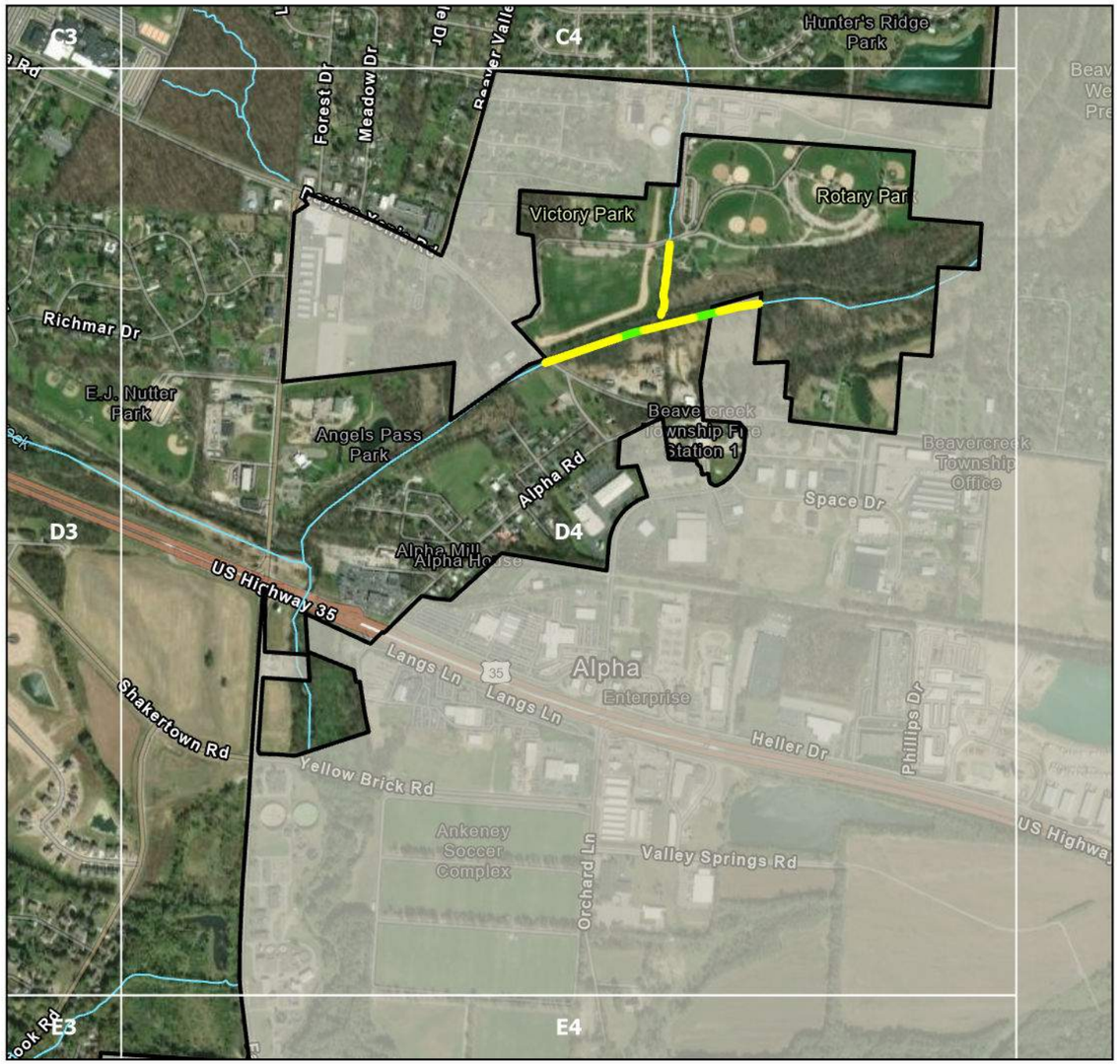
WOOLPERT

8/7/2025

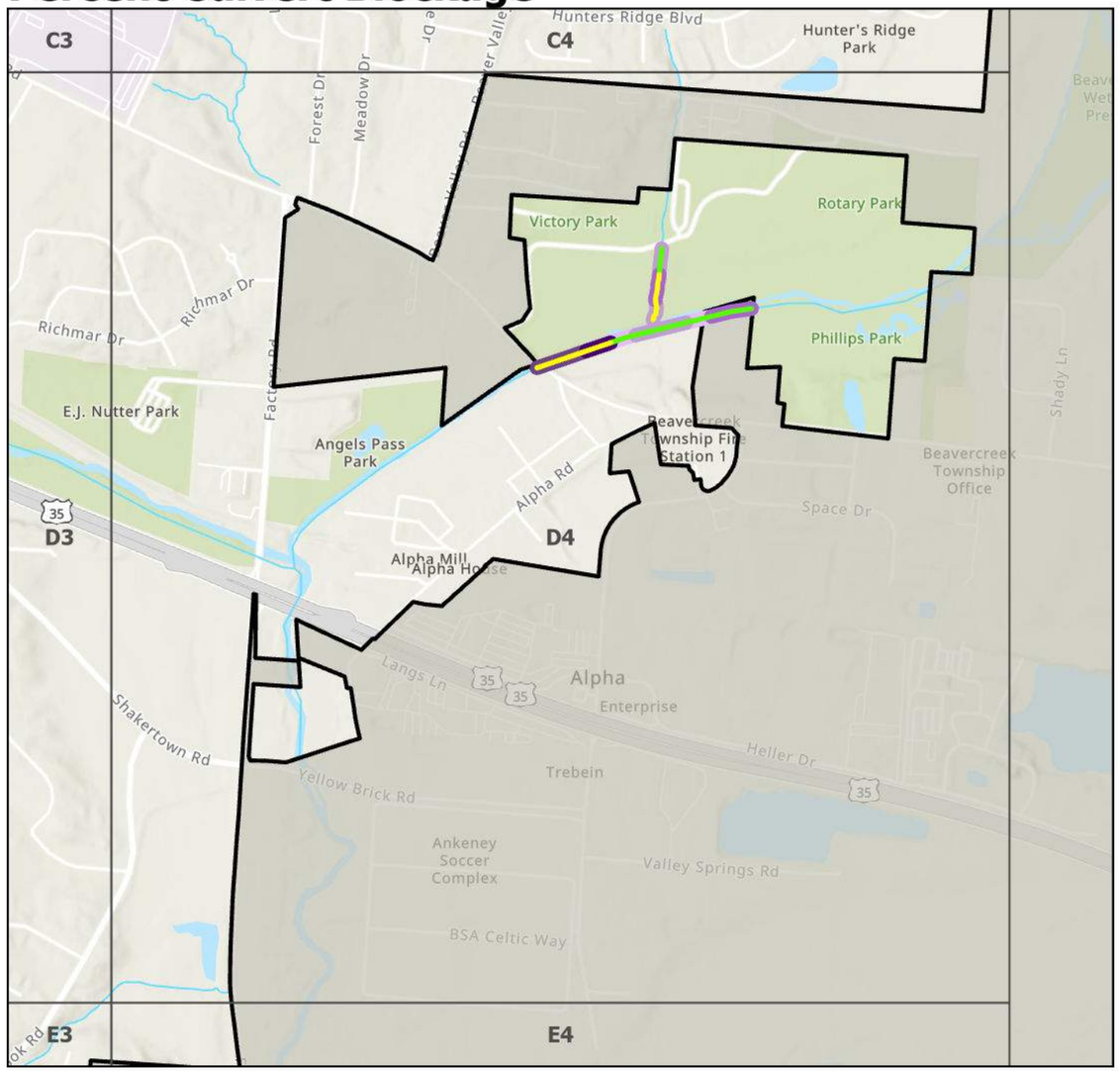
BEAVERCREEK DRAINAGE MASTER PLAN

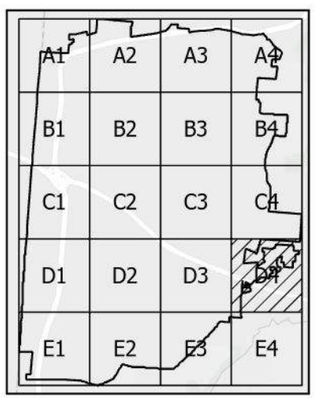
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
- 1
- 2
- 3

Maintenance Score
- 1
- 2
- 3

Percent Culvert Blockage
- 0%
- 25%
- 50%
- 75%
- Completely Blocked

Stream
- Private
- Public

- Grid Identification
- City Limit

WOOLPERT

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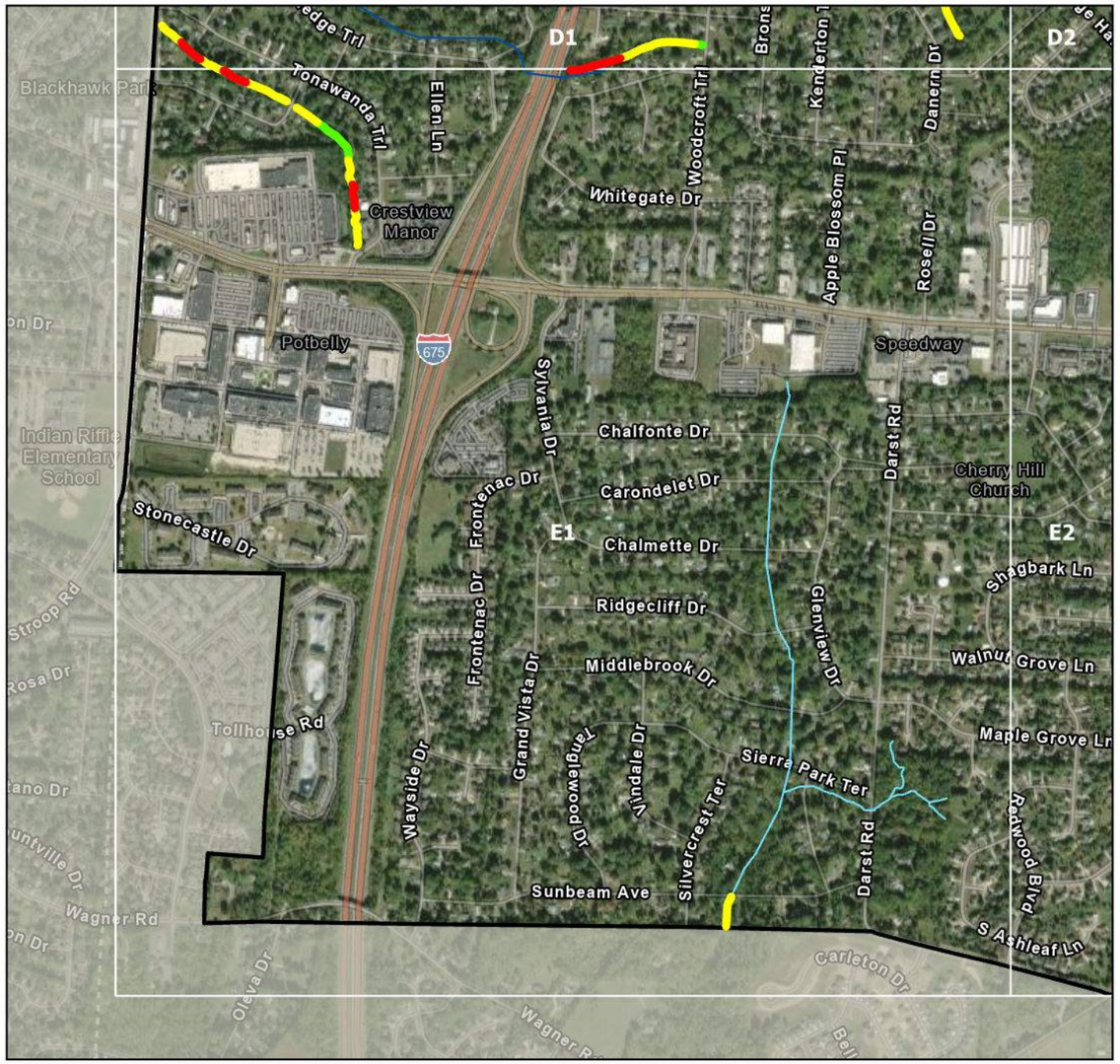
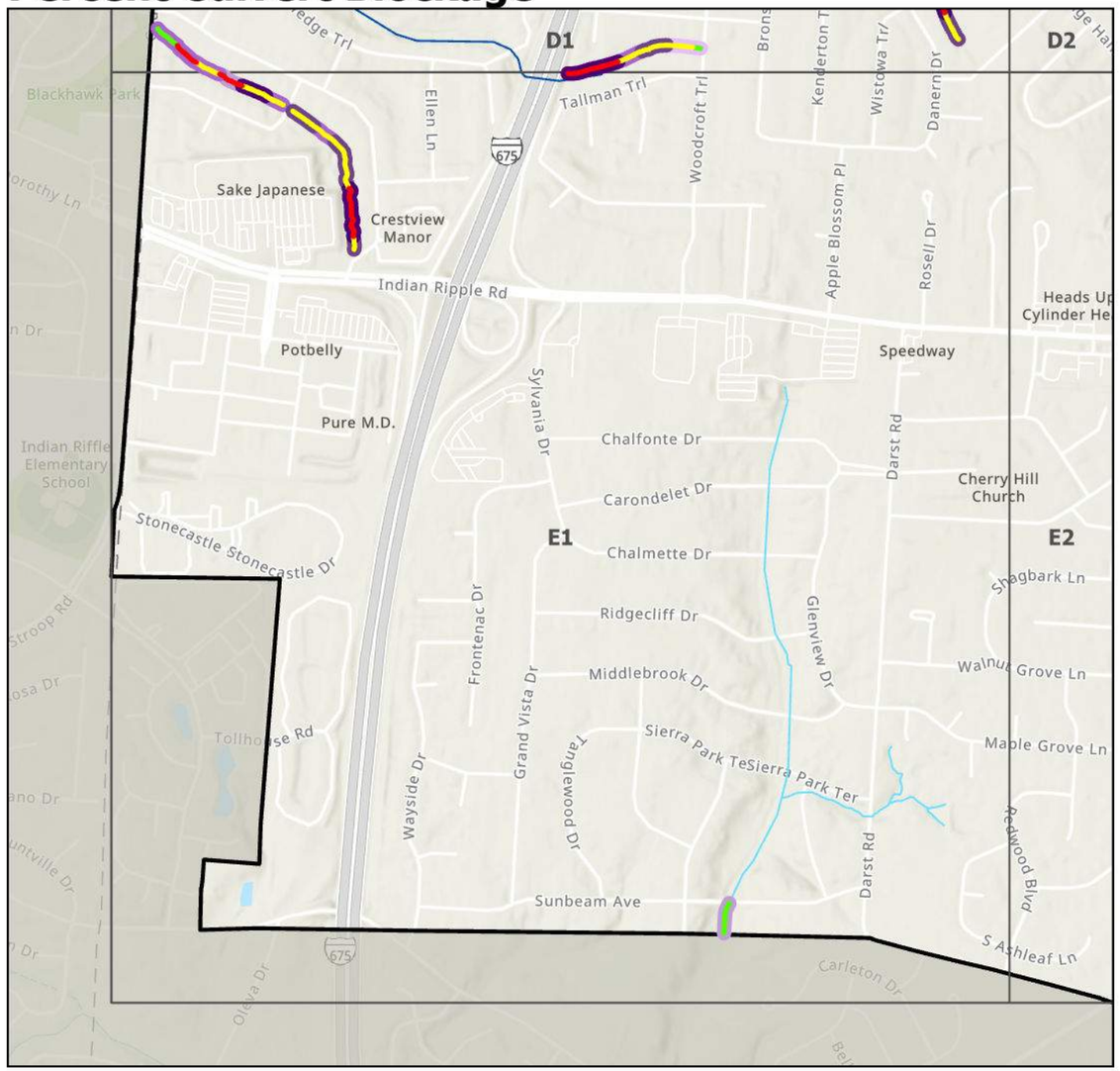
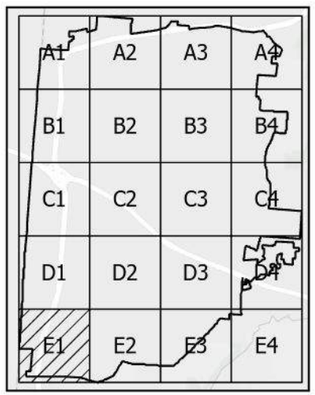
BEAVERCREEK DRAINAGE MASTER PLAN
CITY OF BEAVERCREEK, OHIO

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
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- 2
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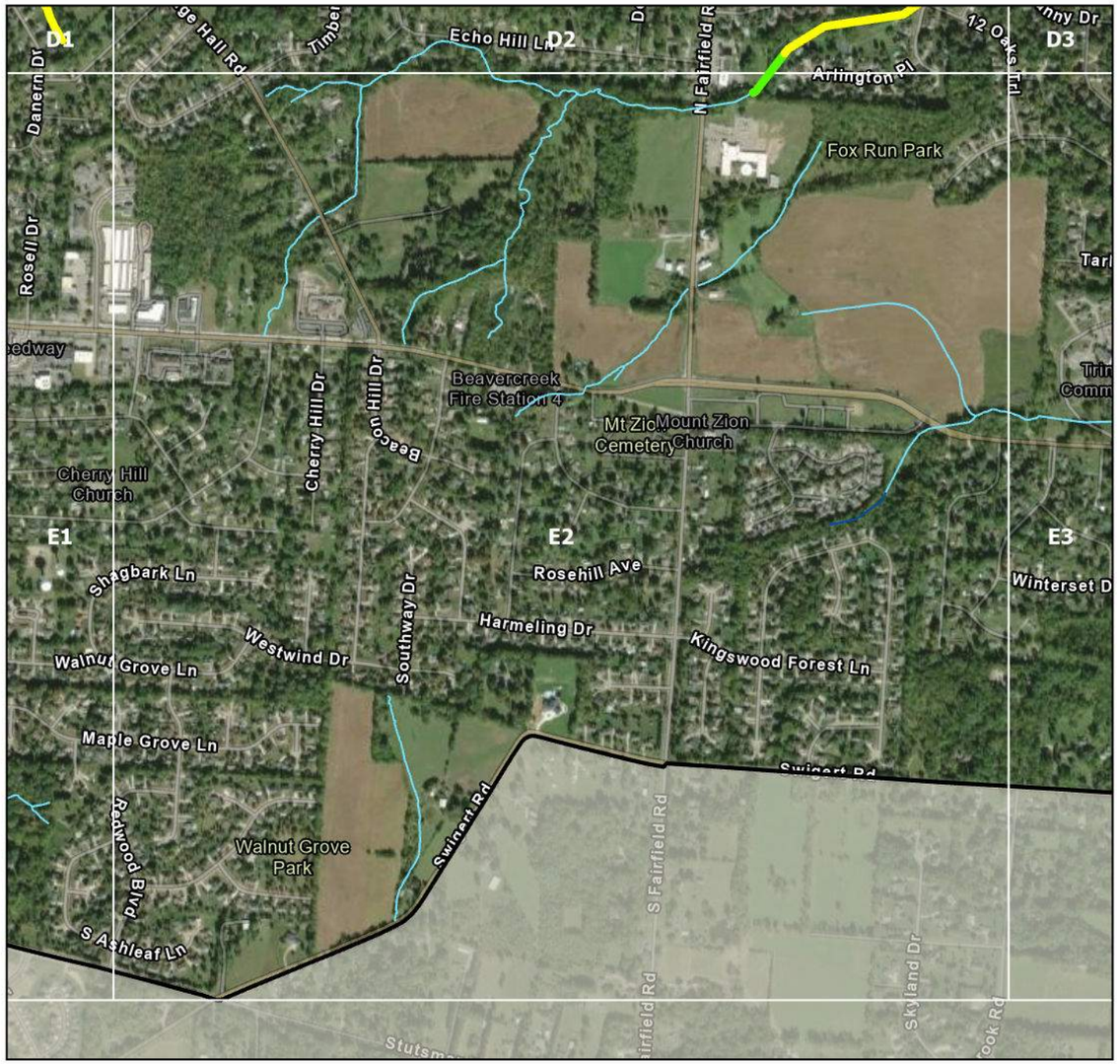
WOOLPERT

8/7/2025

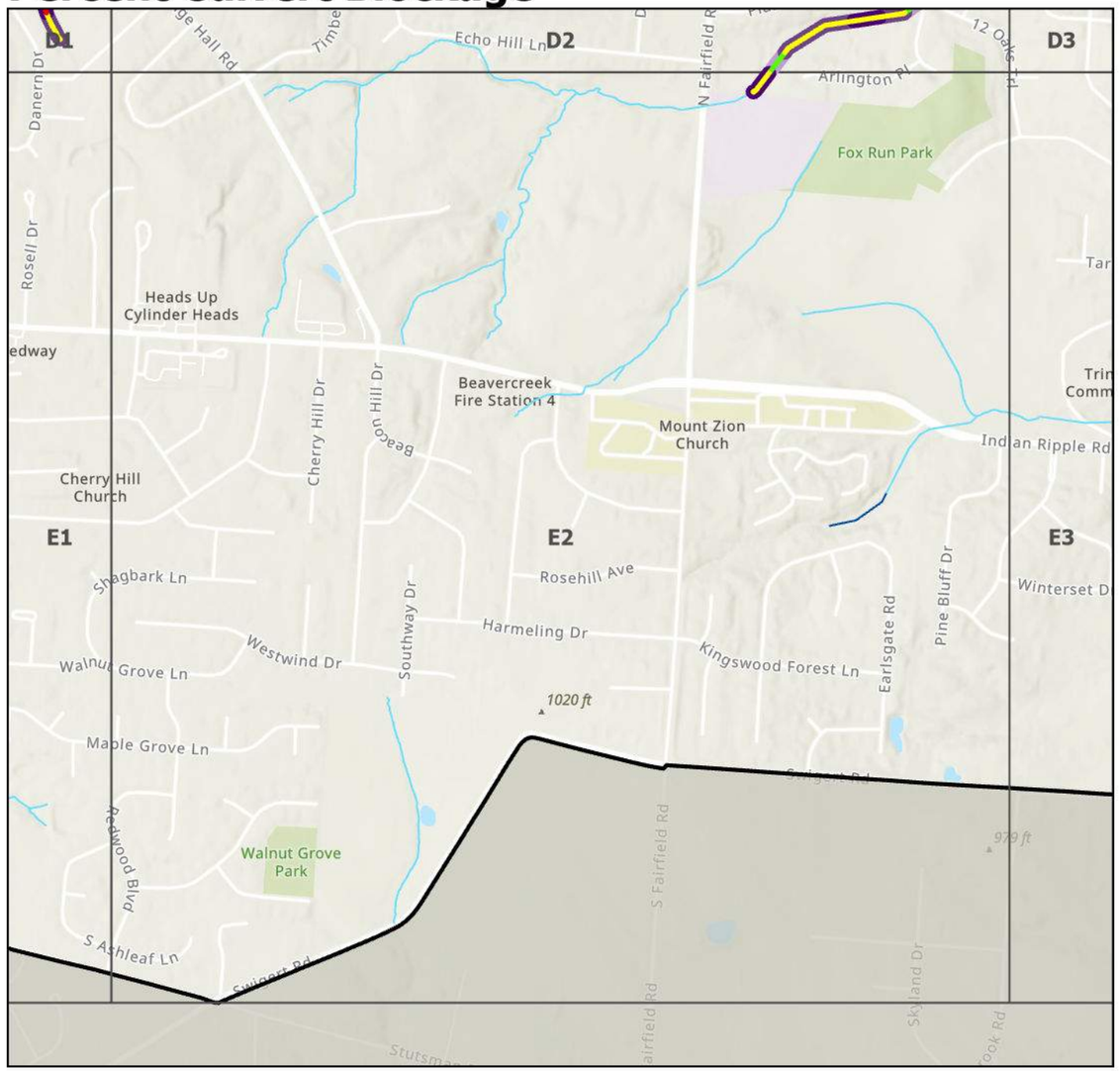
BEAVERCREEK DRAINAGE MASTER PLAN

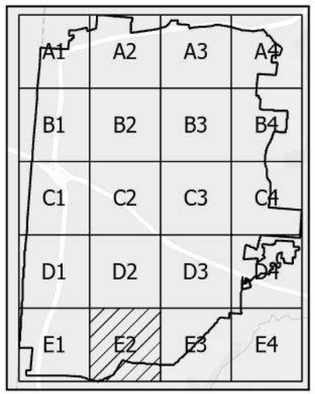
CITY OF BEAVERCREEK, OH

Structural Condition



Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

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- 1
- 2
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WOOLPERT

8/7/2025

BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

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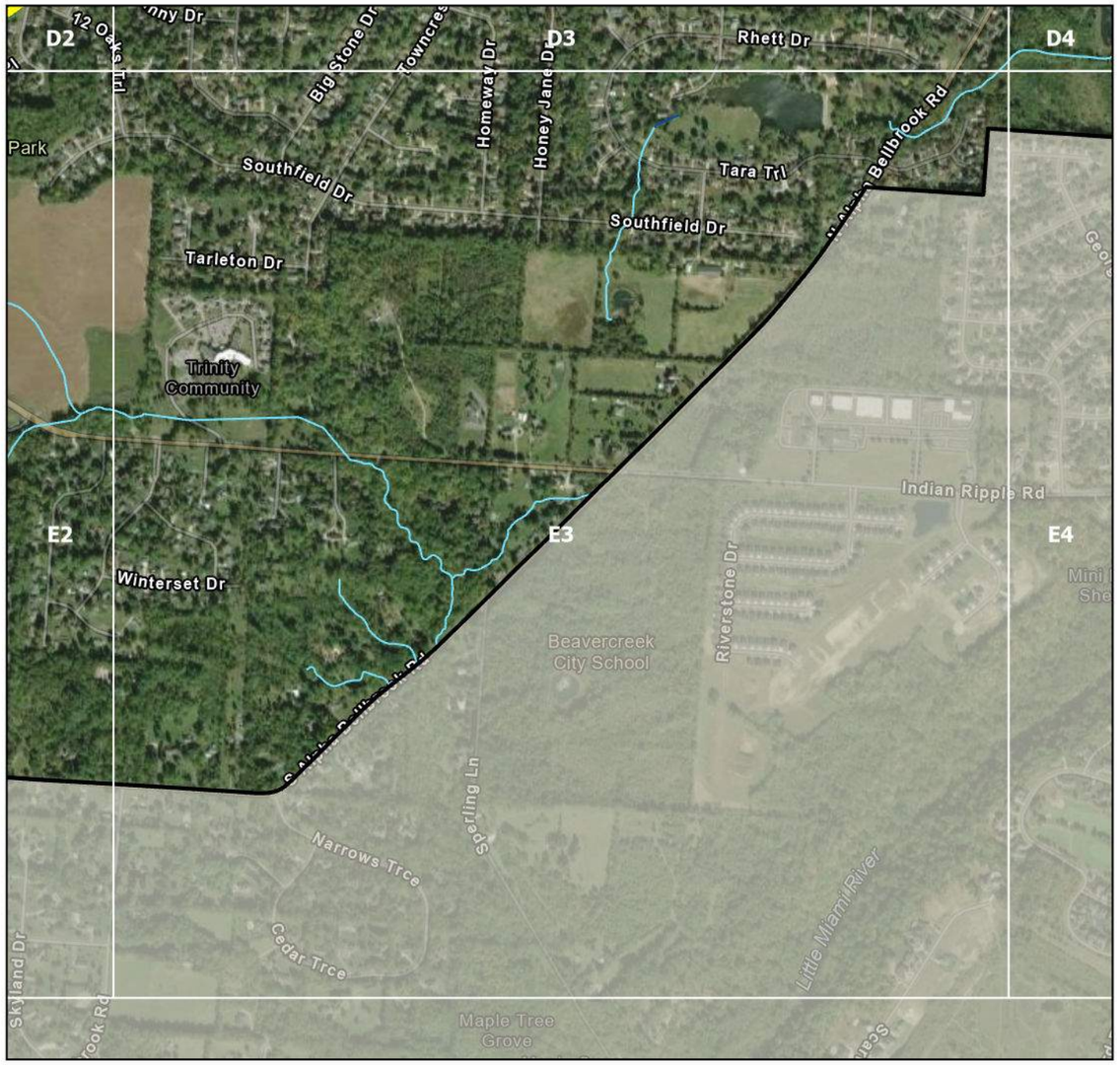

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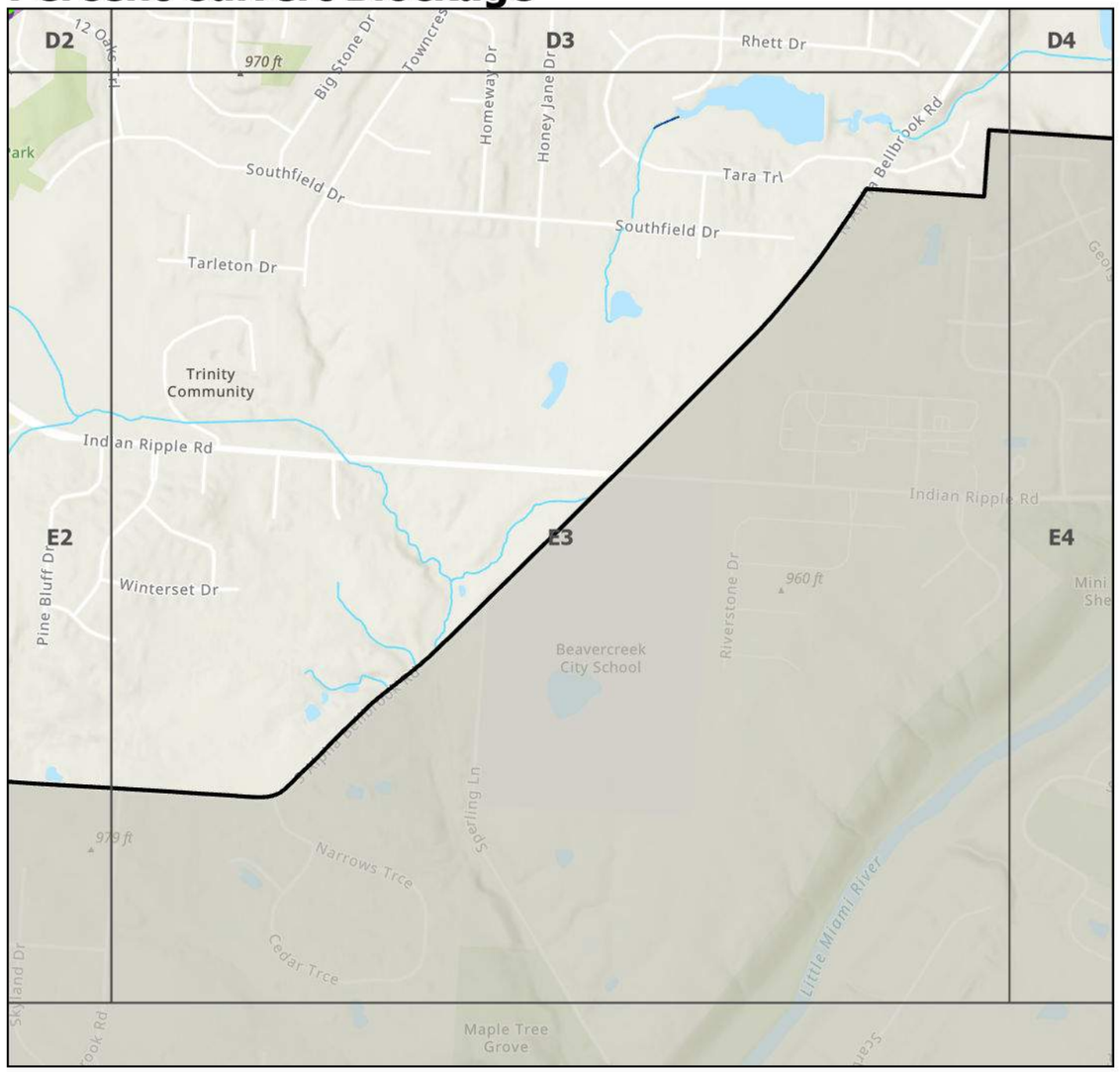

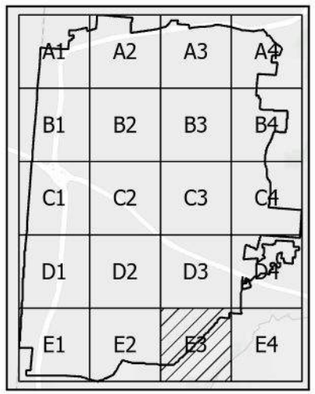

NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score
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- 2
- 3

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City Limit

WOOLPERT

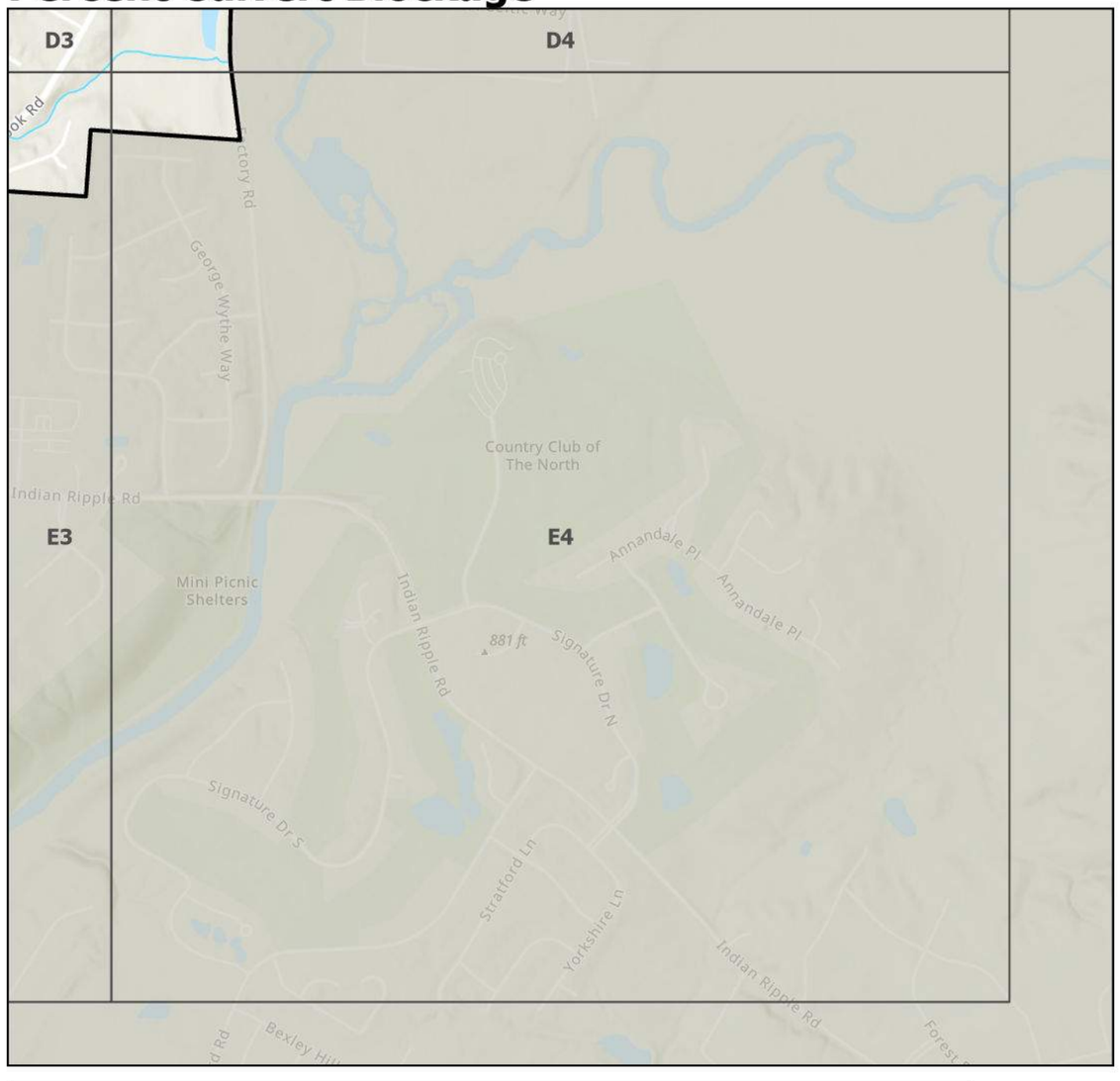
8/7/2025

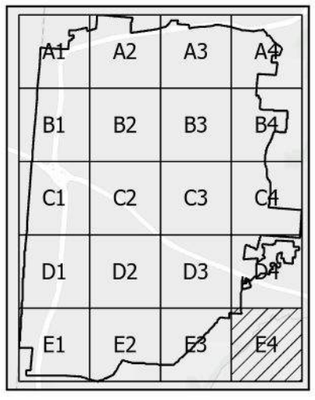
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

Maintenance Condition and Percent Culvert Blockage





NOTES:

N

0 0.25 0.5 1 Miles

Legend

Structural Score	Maintenance Score	Percent Culvert Blockage	Stream
1	1	0%	Private
2	2	25%	Public
3	3	50%	Grid Identification
		75%	City Limit
		Completely Blocked	

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Appendix G

Grid Summary Tables

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Grid A1									
Culvert	A1_01	36" Circular CMP	80	1	1	0%	Replace CMP with upsized 48"	1.83	
Stream	A1_S_01		135	2	3	Completely Blocked	Remove debris	1.80	Private
Grid A2									
Culvert	A2_01	36" Circular CMP	44	2	2	50%	Replace CMP with upsized 4'x6' Box	2.17	
Stream	A2_S_01		91	2	2	25%		1.60	Private
Grid A3									
Culvert	A3_01	48" Circular RCP	87	1	1	0%		1.08	
Culvert	A3_02	4'x13' Box Culvert	74	1	1	0%		1.17	
Culvert	A3_03	5'x18' Box Culvert	83	1	1	0%		1.17	
Culvert	A3_04	5'x18' Box Culvert	41	1	1	25%		1.33	
Culvert	A3_05	72" Circular RCP	489	1	1	0%		1.08	
Culvert	A3_06	4'x6' Arch CMP	37	3	3	25%	Replace CMP with upsized 4'x6' Box	2.58	
Stream	A3_S_01		200	1	1	0%		1.20	Public
Stream	A3_S_02		200	1	1	0%		1.20	Public
Stream	A3_S_03		200	1	1	0%		1.20	Public
Stream	A3_S_04		200	2	2	50%		2.00	Public
Stream	A3_S_05		200	2	2	0%		1.60	Public
Stream	A3_S_06		200	1	1	0%		1.20	Public
Stream	A3_S_07		200	2	1	0%		1.40	Public
Stream	A3_S_08		154	1	1	0%		1.40	Public
Stream	A3_S_09		200	1	1	0%		1.20	Public
Stream	A3_S_10		200	1	1	0%		1.20	Public
Stream	A3_S_11		200	2	2	25%		1.60	Public
Stream	A3_S_12		200	2	2	50%		1.60	Public
Stream	A3_S_13		200	2	2	50%		1.60	Public
Stream	A3_S_14		154	2	2	50%		2.00	Private
Stream	A3_S_15		154	2	2	75%		1.60	Private
Stream	A3_S_16		93	2	2	25%		1.60	Private
Stream	A3_S_17		154	2	2	75%		1.80	Public
Stream	A3_S_18		154	1	1	0%		1.20	Public
Stream	A3_S_19		154	1	1	0%		1.20	Public
Grid A4									
Culvert	A4_01	6'x12' Box Culvert	34	2	3	50%	Clean and CCTV	1.83	
Culvert	A4_02	6'x12' Box Culvert	33	1	3	Completely Blocked	Clean and CCTV	1.67	
Culvert	A4_03	6'x28' Arch RCP	44	1	3	75%	Clean and CCTV	1.67	
Culvert	A4_04	60" Circular RCP	20	2	2	25%	Replace with upsized 4'x8' Box	1.92	
Culvert	A4_05	48" Circular RCP	73	2	2	25%		1.42	
Culvert	A4_06	48" Circular RCP	66	2	2	25%		1.42	
Culvert	A4_07	48" Circular RCP	53	2	2	0%		1.42	
Culvert	A4_08	60" Circular SLHDPE	101	2	1	0%		1.25	
Culvert	A4_09	54" Circular RCP	176	2	2	25%		1.42	
Culvert	A4_10	60" Circular RCP	323	1	1	0%	Replace with upsized 4'x6' Box	1.58	
Stream	A4_S_01		154	1	1	0%		1.40	Public
Stream	A4_S_02		154	2	1	50%		1.60	Public
Stream	A4_S_03		154	2	2	50%		1.80	Public
Stream	A4_S_04		154	1	1	0%		1.40	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	A4_S_05		154	1	1	0%		1.40	Public
Stream	A4_S_06		154	2	2	25%		1.80	Public
Stream	A4_S_07		115	2	2	25%		1.80	Public
Stream	A4_S_08		200	2	2	75%		1.80	Public
Stream	A4_S_09		200	2	2	50%		1.80	Public
Stream	A4_S_10		200	3	3	25%	Stabilization and debris removal	2.60	Public
Stream	A4_S_11		200	1	1	0%		1.20	Public
Stream	A4_S_12		200	2	2	75%		1.60	Public
Stream	A4_S_13		200	2	2	75%		1.60	Public
Stream	A4_S_14		200	2	2	50%		1.60	Public
Stream	A4_S_15		200	1	1	0%		1.20	Public
Stream	A4_S_16		200	2	2	50%		1.60	Public
Stream	A4_S_17		200	3	3	0%	Stabilization and debris removal	2.40	Public
Stream	A4_S_18		200	2	2	50%		1.60	Public
Stream	A4_S_19		200	2	2	50%		1.60	Public
Stream	A4_S_20		42	2	2	50%		1.60	Public
Stream	A4_S_21		200	1	1	0%		1.20	Public
Stream	A4_S_22		200	1	1	0%		1.20	Public
Stream	A4_S_23		200	1	1	0%		1.20	Public
Stream	A4_S_24		200	2	2	50%		1.60	Public
Stream	A4_S_25		125	2	2	75%		1.60	Public
Stream	A4_S_26		200	1	1	0%		1.20	Public
Stream	A4_S_27		200	3	3	Completely Blocked	Stabilization and debris removal	2.00	Public
Stream	A4_S_28		199	1	1	0%		1.20	Public
Stream	A4_S_29		24	1	1	0%		1.20	Public
Stream	A4_S_30		200	1	1	75%		1.20	Public
Stream	A4_S_31		155	2	2	75%		1.60	Public
Stream	A4_S_32		200	3	3	25%	Stabilization and debris removal	2.00	Public
Stream	A4_S_33		200	2	2	25%		1.60	Public
Stream	A4_S_34		200	2	2	Completely Blocked		1.60	Public
Stream	A4_S_35		200	3	3	Completely Blocked	Stabilization and debris removal	2.00	Public
Stream	A4_S_36		200	1	1	0%		1.20	Public
Stream	A4_S_37		200	1	1	0%		1.20	Public
Stream	A4_S_38		200	3	3	75%	Stabilization and debris removal	2.00	Public
Stream	A4_S_39		200	1	1	0%		1.20	Public
Stream	A4_S_40		200	1	1	0%		1.20	Public
Stream	A4_S_41		200	2	1	25%		1.40	Public
Stream	A4_S_42		200	1	1	0%		1.20	Public
Stream	A4_S_43		200	1	1	0%		1.20	Public
Stream	A4_S_44		144	1	1	0%		1.20	Public
Grid B1									
Culvert	B1_02	7'x24' Arch RCP	71	1	3	75%	Clean and CCTV	1.50	
Culvert	B1_03	5.5'x7' Arch CMP	47	2	1	25%	Replace CMP with upsized 4'x6' Box	1.92	
Stream	B1_S_01		200	3	3	75%	Stabilization and debris removal	2.40	Public
Stream	B1_S_02		200	2	2	Completely Blocked		1.60	Public
Stream	B1_S_03		200	2	2	50%		1.60	Public
Stream	B1_S_04		200	2	2	75%		2.00	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	B1_S_05		200	2	2	Completely Blocked		1.60	Public
Stream	B1_S_06		155	1	1	0%		1.20	Public
Stream	B1_S_07		199	2	2	75%		1.60	Public
Stream	B1_S_08		199	2	2	75%		1.60	Public
Stream	B1_S_09		200	1	1	0%		1.20	Public
Stream	B1_S_10		200	2	2	50%		1.60	Public
Stream	B1_S_11		148	1	1	0%		1.20	Public
Stream	B1_S_12		200	1	1	0%		1.20	Public
Stream	B1_S_13		95	1	1	0%		1.20	Public
Grid B2									
Culvert	B2_01	24" Circular SLHDPE	35	2	3	0%	Clean and CCTV	1.67	
Culvert	B2_02	42" Circular CMP	36	3	3	0%	Replace CMP with 42"	2.00	
Culvert	B2_03	48" Circular RCP	19	1	1	0%		1.08	
Culvert	B2_04	3.6'x6' Arch CMP	60	2	3	25%	Replace CMP with upsized 48"x76"	2.42	
Culvert	B2_05	24" Circular SLHDPE	40	1	1	0%	Replace with upsized 34"x53"	1.50	
Culvert	B2_06	48" Circular CMP	43	3	3	0%	Replace CMP with upsized 34"x53"	2.58	
Culvert	B2_07	3.6'x5.3' Ellipse CMP	38	2	2	25%	Replace CMP with upsized 4'x6' Box	2.25	
Culvert	B2_08	3.8'x6' Arch CMP	42	1	1	0%	Replace CMP with upsized 4'x6' Box	1.92	
Culvert	B2_09	3.8'x6' Arch CMP	49	2	2	0%	Replace CMP with upsized 4'x6' Box	2.25	
Culvert	B2_10	3.3'x5' Ellipse RCP	52	3	3	50%	Replace with upsized 4'x6' Box	2.25	
Culvert	B2_11	4.5'x6' Ellipse CMP	59	2	2	50%	Replace CMP with upsized 4'x6' Box	2.08	
Culvert	B2_12	36" Circular SLHDPE	47	1	2	0%	Replace with upsized 38"x60"	1.50	
Culvert	B2_13	30" Circular RCP	60	2	1	0%	Replace with upsized 32"x48"	1.50	
Culvert	B2_14	30" Circular RCP	60	2	3	0%	Replace with upsized 32"x48"	1.83	
Culvert	B2_15	48" Circular RCP	271	1	2	25%	Replace with upsized 38"x60"	1.75	
Culvert	B2_16	3.3'x4.3' Ellipse CMP	52	2	2	25%	Replace CMP with upsized 4'x6' Box	2.08	
Culvert	B2_17	30" Circular RCP	62	3	3	Completely Blocked	Replace with upsized 48"	2.00	
Culvert	B2_18	30" Circular RCP	62	2	3	75%	Clean and CCTV	1.67	
Culvert	B2_19	24" Circular SLHDPE	83	2	1	0%	Replace with upsized 32"x48"	1.50	
Culvert	B2_20	36" Circular RCP	27	2	2	25%		1.33	
Culvert	B2_21	36" Circular RCP	77	2	1	0%	Replace with upsized 38"x60"	1.67	
Culvert	B2_22	36" Circular RCP	39	2	3	50%	Clean and CCTV	1.50	
Culvert	B2_23	36" Circular RCP	38	1	2	0%	Replace with upsized 34"x53"	1.67	
Culvert	B2_24	24" Circular RCP	21	2	2	50%	Replace with upsized 34"x53"	1.67	

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Culvert	B2_25	48" Circular CMP	23	1	1	0%	Replace CMP with 48"	1.42	
Culvert	B2_26	21" Circular RCP	95	2	1	0%	Replace with upsized 19"x30"	1.50	
Culvert	B2_27	24" Circular RCP	274	3	3	25%	Replace with upsized 29"x45"	2.00	
Stream	B2_S_01		145	1	1	0%		1.20	Public
Stream	B2_S_02		199	1	1	0%		1.20	Public
Stream	B2_S_03		199	1	1	0%		1.20	Public
Stream	B2_S_04		102	1	1	0%		1.20	Public
Stream	B2_S_05		200	2	2	0%		1.60	Private
Stream	B2_S_06		200	2	2	50%		1.40	Private
Stream	B2_S_07		200	3	3	75%	Stabilization and debris removal	2.20	Private
Stream	B2_S_08		200	2	2	25%		1.80	Private
Stream	B2_S_09		97	2	2	50%		1.40	Private
Stream	B2_S_10		199	1	1	0%		1.20	Private
Stream	B2_S_11		200	1	1	Completely Blocked		1.20	Private
Stream	B2_S_12		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Private
Stream	B2_S_13		200	2	3	Completely Blocked	Remove debris	1.60	Private
Stream	B2_S_14		200	3	3	0%	Stabilization and debris removal	2.20	Private
Stream	B2_S_15		200	3	3	25%	Stabilization and debris removal	2.20	Private
Stream	B2_S_16		200	3	3	25%	Stabilization and debris removal	2.20	Private
Stream	B2_S_17		200	3	3	75%	Stabilization and debris removal	2.20	Private
Stream	B2_S_18		200	2	1	0%		1.40	Private
Stream	B2_S_19		200	1	2	75%		1.20	Private
Stream	B2_S_20		200	1	1	0%		1.00	Private
Stream	B2_S_21		154	1	1	0%		1.40	Public
Stream	B2_S_22		154	1	1	0%		1.40	Public
Stream	B2_S_23		54	1	1	0%		1.40	Public
Stream	B2_S_24		200	1	3	Completely Blocked	Remove debris	1.40	Private
Stream	B2_S_25		200	1	1	0%		1.00	Private
Stream	B2_S_26		200	2	2	75%		1.60	Private
Stream	B2_S_27		200	2	2	Completely Blocked		1.60	Private
Stream	B2_S_28		200	1	1	0%		1.00	Private
Stream	B2_S_29		199	2	3	Completely Blocked	Remove debris	1.60	Private
Stream	B2_S_30		200	2	2	75%		1.40	Private
Stream	B2_S_31		200	2	3	50%	Remove debris	2.00	Private
Stream	B2_S_32		200	3	3	Completely Blocked	Stabilization and debris removal	2.20	Private
Stream	B2_S_33		200	2	2	Completely Blocked		1.40	Private
Stream	B2_S_34		200	1	1	0%		1.00	Private
Stream	B2_S_35		199	2	3	Completely Blocked	Remove debris	1.60	Private
Stream	B2_S_36		200	1	2	50%		1.20	Private
Stream	B2_S_37		200	1	2	75%		1.20	Private
Stream	B2_S_38		200	2	2	75%		1.40	Private
Stream	B2_S_39		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Private
Stream	B2_S_40		200	2	2	50%		1.40	Private

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	B2_S_41		200	2	2	75%		1.40	Private
Stream	B2_S_42		200	2	2	50%		1.40	Private
Stream	B2_S_43		167	2	2	75%		1.40	Private
Stream	B2_S_44		200	2	2	Completely Blocked		1.40	Private
Stream	B2_S_45		125	2	2	Completely Blocked		1.40	Private
Stream	B2_S_46		200	2	2	Completely Blocked		1.40	Private
Stream	B2_S_47		180	2	2	Completely Blocked		1.60	Private
Stream	B2_S_48		153	2	2	50%		1.80	Public
Stream	B2_S_49		153	2	2	0%		1.80	Public
Stream	B2_S_50		154	2	2	50%		1.80	Public
Stream	B2_S_51		154	2	2	75%		1.60	Public
Stream	B2_S_52		125	2	2	25%		1.80	Public
Stream	B2_S_53		148	1	1	0%		1.40	Public
Stream	B2_S_54		153	2	2	0%		1.80	Public
Stream	B2_S_55		29	1	1	0%		1.40	Public
Stream	B2_S_56		6	1	1	0%		1.40	Public
Stream	B2_S_57		200	1	3	Completely Blocked	Remove debris	1.40	Private
Stream	B2_S_58		200	2	2	Completely Blocked		1.40	Private
Stream	B2_S_59		200	1	2	Completely Blocked		1.20	Private
Stream	B2_S_60		200	1	1	0%		1.00	Private
Stream	B2_S_61		200	2	2	50%		1.40	Private
Stream	B2_S_62		199	1	1	0%		1.00	Private
Stream	B2_S_63		199	2	2	75%		1.40	Private
Stream	B2_S_64		55	1	1	0%		1.00	Private
Grid B3									
Culvert	B3_01	36" Circular CMP	58	1	1	25%	Replace CMP with upsized 38"x60"	1.83	
Culvert	B3_02	36" Circular RCP	12	2	2	25%		1.33	
Culvert	B3_03	36" Circular RCP	11	2	2	25%		1.33	
Culvert	B3_04	12" Circular RCP	263	1	1	0%	Replace with upsized 48"x76"	1.33	
Culvert	B3_05	6'x16' Box Culvert	55	1	2	50%		1.33	
Culvert	B3_06	6'x16' Ellipse RCP	47	1	1	25%		1.17	
Culvert	B3_07	36" Circular CMP	253	2	1	0%	Replace CMP with 36"	1.50	
Stream	B3_S_01		199	1	2	75%		1.60	Public
Stream	B3_S_02		199	1	2	75%		1.60	Public
Stream	B3_S_03		199	1	2	75%		1.60	Public
Stream	B3_S_04		199	1	1	0%		1.40	Public
Stream	B3_S_05		199	2	2	0%		1.80	Public
Stream	B3_S_06		200	2	2	50%		1.80	Public
Stream	B3_S_07		200	2	2	25%		1.60	Public
Stream	B3_S_08		200	2	2	Completely Blocked		1.60	Public
Stream	B3_S_09		200	1	1	Completely Blocked		1.20	Public
Stream	B3_S_10		200	2	2	Completely Blocked		1.60	Public
Stream	B3_S_11		200	2	2	Completely Blocked		1.60	Public
Stream	B3_S_12		89	1	2	Completely Blocked		1.40	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	B3_S_13		200	1	1	Completely Blocked		1.20	Public
Stream	B3_S_14		200	1	1	0%		1.20	Public
Stream	B3_S_15		199	1	1	0%		1.20	Public
Stream	B3_S_16		199	1	2	75%		1.40	Public
Stream	B3_S_17		197	2	2	25%		1.60	Public
Stream	B3_S_18		199	2	2	Completely Blocked		1.60	Public
Stream	B3_S_19		200	1	1	0%		1.20	Public
Stream	B3_S_20		200	1	1	50%		1.20	Public
Stream	B3_S_21		87	1	1	0%		1.20	Public
Stream	B3_S_22		200	2	1	50%		1.20	Private
Stream	B3_S_23		200	2	2	75%		1.40	Private
Stream	B3_S_24		200	2	2	75%		1.40	Private
Grid B4									
Culvert	B4_01	3'x5' Box Culvert	44	2	3	0%	Clean and CCTV	1.58	
Culvert	B4_02	72" Circular CMP	32	2	2	25%	Replace CMP with 72"	1.75	
Culvert	B4_03	72" Circular CMP	31	1	1	0%	Replace CMP with 72"	1.42	
Culvert	B4_04	72" Circular CMP	30	1	2	25%	Replace CMP with 72"	1.58	
Culvert	B4_05	48" Circular SLHDPE	29	1	1	0%		1.08	
Culvert	B4_06	48" Circular SLHDPE	29	1	1	0%		1.08	
Culvert	B4_07	48" Circular SLHDPE	29	1	1	0%		1.08	
Culvert	B4_08	48" Circular SLHDPE	29	1	1	0%		1.08	
Culvert	B4_09	36" Circular RCP	22	1	1	0%	Replace with upsized 38"x60"	1.50	
Culvert	B4_10	36" Circular RCP	23	1	1	0%	Replace with upsized 38"x60"	1.50	
Culvert	B4_11	36" Circular RCP	23	1	1	0%	Replace with upsized 38"x60"	1.50	
Stream	B4_S_01		200	2	2	75%		1.40	Private
Stream	B4_S_02		200	2	2	75%		1.40	Private
Stream	B4_S_03		169	2	2	75%		1.40	Private
Stream	B4_S_04		200	3	3	75%	Stabilization and debris removal	2.20	Private
Stream	B4_S_05		200	2	2	75%		1.40	Private
Stream	B4_S_06		200	2	2	75%		1.40	Private
Stream	B4_S_07		200	2	2	75%		1.40	Private
Stream	B4_S_08		200	2	2	75%		1.40	Private
Stream	B4_S_09		199	2	2	75%		1.40	Private
Stream	B4_S_10		155	1	2	75%		1.20	Private
Stream	B4_S_11		200	1	2	75%		1.40	Private
Stream	B4_S_12		200	1	2	75%		1.40	Private
Stream	B4_S_13		200	1	2	75%		1.40	Private
Stream	B4_S_14		200	3	3	25%	Stabilization and debris removal	2.00	Private
Stream	B4_S_15		200	2	2	50%		1.40	Private
Stream	B4_S_16		200	2	2	50%		1.40	Private
Stream	B4_S_17		200	1	1	0%		1.00	Private
Stream	B4_S_18		200	2	2	75%		1.40	Private
Stream	B4_S_19		200	1	1	0%		1.00	Private
Stream	B4_S_20		176	2	2	75%		1.40	Private
Stream	B4_S_21		200	2	2	75%		1.60	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	B4_S_22		200	1	1	0%		1.20	Public
Stream	B4_S_23		200	2	2	25%		2.00	Public
Stream	B4_S_24		200	1	1	0%		1.20	Public
Stream	B4_S_25		200	2	2	50%		1.60	Public
Stream	B4_S_26		200	1	1	0%		1.20	Public
Stream	B4_S_27		200	2	2	50%		1.60	Public
Grid C1									
No assets assessed in this grid area									
Grid C2									
Culvert	C2_01	5'x7' Arch CMP	163	2	2	0%	Replace CMP with upsized 4'x6' Box	2.25	
Culvert	C2_02	4.45'x6' Ellipse CMP	58	2	1	0%	Replace CMP with 53"x72"	1.75	
Culvert	C2_03	24" Circular SLHDPE	117	3	3	Completely Blocked	Replace with upsized 24"x38"	2.00	
Culvert	C2_04	3'x4.5' Arch RCP	55	2	1	0%		1.25	
Culvert	C2_05	24" Circular RCP	68	3	3	Completely Blocked	Replace with upsized 24"x53"	2.00	
Culvert	C2_06	24" Circular RCP	71	2	2	50%	Replace with upsized 34"x53"	1.83	
Culvert	C2_07	48" Circular RCP	74	2	2	25%		1.58	
Culvert	C2_08	7.25'x11' Ellipse RCP	135	1	2	25%		1.33	
Culvert	C2_09	48" Circular RCP	122	1	1	25%		1.25	
Culvert	C2_10	3.8'x5.4' Ellipse CMP	12	2	2	75%	Replace CMP with 43"x68"	1.75	
Culvert	C2_11	3.8'x5.4' Arch CMP	16	2	2	75%	Replace CMP with upsized 4'x6' Box	2.08	
Culvert	C2_12	48" Circular RCP	11	2	3	Completely Blocked	Clean and CCTV	1.58	
Culvert	C2_13	36" Circular RCP	12	2	3	Completely Blocked	Clean and CCTV	1.50	
Culvert	C2_14	24" Circular RCP	65	2	2	25%		1.50	
Stream	C2_S_01		200	1	1	0%		1.00	Private
Stream	C2_S_02		200	2	3	Completely Blocked	Remove debris	1.60	Private
Stream	C2_S_03		200	2	2	75%		1.40	Private
Stream	C2_S_04		200	1	1	0%		1.00	Private
Stream	C2_S_05		37	1	1	0%		1.00	Private
Stream	C2_S_06		153	1	1	0%		1.40	Public
Stream	C2_S_07		74	1	1	0%		1.40	Public
Stream	C2_S_08		153	3	3	Completely Blocked	Stabilization and debris removal	2.00	Private
Stream	C2_S_09		153	1	1	0%		1.20	Private
Stream	C2_S_10		154	3	3	0%	Stabilization and debris removal	2.20	Public
Stream	C2_S_11		131	2	2	75%		1.60	Public
Stream	C2_S_12		111	2	2	75%		2.20	Public
Stream	C2_S_13		199	2	3	Completely Blocked	Remove debris	1.80	Private
Stream	C2_S_14		199	2	2	Completely Blocked		1.40	Private
Stream	C2_S_15		199	2	2	50%		1.40	Private
Stream	C2_S_16		199	2	2	50%		1.40	Private
Stream	C2_S_17		199	1	1	0%		1.00	Private
Stream	C2_S_18		199	2	2	75%		1.80	Private
Stream	C2_S_19		199	1	1	0%		1.00	Private
Stream	C2_S_20		199	2	2	75%		1.40	Private

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	C2_S_21		199	2	2	50%		1.40	Private
Stream	C2_S_22		25	1	1	0%		1.00	Private
Stream	C2_S_23		200	2	2	Completely Blocked		1.40	Private
Stream	C2_S_24		200	3	3	Completely Blocked	Stabilization and debris removal	2.20	Private
Stream	C2_S_25		200	2	2	Completely Blocked		1.40	Private
Stream	C2_S_26		200	3	3	Completely Blocked	Stabilization and debris removal	2.20	Private
Stream	C2_S_27		200	3	2	25%	Stabilization	1.60	Private
Stream	C2_S_28		200	2	3	Completely Blocked	Remove debris	1.60	Private
Stream	C2_S_29		200	2	2	75%		1.40	Private
Stream	C2_S_30		200	2	2	75%		1.40	Private
Stream	C2_S_31		200	2	2	Completely Blocked		1.40	Private
Stream	C2_S_32		200	2	2	Completely Blocked		1.40	Private
Stream	C2_S_33		200	2	2	75%		1.40	Private
Stream	C2_S_34		200	1	1	0%		1.00	Private
Stream	C2_S_35		200	3	3	Completely Blocked	Stabilization and debris removal	1.80	Private
Stream	C2_S_36		200	3	3	75%	Stabilization and debris removal	1.80	Private
Stream	C2_S_37		200	2	2	50%		1.40	Private
Stream	C2_S_38		200	2	2	75%		1.40	Private
Stream	C2_S_39		81	2	2	25%		1.40	Private
Stream	C2_S_40		200	1	1	0%		1.20	Public
Stream	C2_S_41		200	1	1	0%		1.20	Public
Stream	C2_S_42		200	1	1	0%		1.20	Public
Stream	C2_S_43		200	1	1	0%		1.20	Public
Stream	C2_S_44		200	1	1	0%		1.20	Public
Stream	C2_S_45		200	1	1	0%		1.20	Public
Stream	C2_S_46		200	1	1	0%		1.20	Public
Stream	C2_S_47		200	1	1	0%		1.20	Public
Stream	C2_S_48		200	1	1	0%		1.20	Public
Stream	C2_S_49		200	1	1	0%		1.20	Public
Stream	C2_S_50		200	1	1	0%		1.20	Public
Stream	C2_S_51		200	1	1	0%		1.20	Public
Stream	C2_S_52		154	2	2	50%		1.80	Public
Stream	C2_S_53		153	2	2	50%		2.20	Public
Stream	C2_S_54		153	2	2	Completely Blocked		1.80	Public
Stream	C2_S_55		153	2	2	Completely Blocked		1.80	Public
Stream	C2_S_56		151	2	2	25%		1.80	Public
Grid C3									
Culverts	C3_01	3'x3' Ellipse SLHDPE	41	1	1	0%	Replace with upsized 38"x60"	1.50	
Culverts	C3_02	8'x34' Box Culvert	39	2	2	25%		1.50	
Culverts	C3_03	48" Circular CMP	187	1	2	0%	Replace CMP with 48"	1.75	
Culverts	C3_04	36" Circular RCP	54	3	3	0%	Replace with upsized 32"x48"	2.17	
Culverts	C3_05	36" Circular SLHDPE	184	2	2	25%	Replace with upsized 34"x53"	1.67	
Culverts	C3_06	36" Circular RCP	187	2	2	0%	Replace with upsized 34"x53"	1.67	
Stream	C3_S_01		200	2	2	75%		1.60	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	C3_S_02		200	2	2	75%		1.60	Public
Stream	C3_S_03		200	2	2	75%		1.60	Public
Stream	C3_S_04		200	1	1	0%		1.20	Public
Stream	C3_S_05		200	2	2	75%		1.60	Public
Stream	C3_S_06		200	2	2	75%		2.00	Public
Stream	C3_S_07		200	1	1	0%		1.20	Public
Stream	C3_S_08		200	2	2	75%		1.80	Public
Stream	C3_S_09		200	1	1	0%		1.40	Public
Stream	C3_S_10		200	1	1	0%		1.20	Public
Stream	C3_S_11		200	2	2	75%		1.80	Public
Stream	C3_S_12		39	1	1	0%		1.40	Public
Stream	C3_S_13		200	2	2	50%		1.80	Public
Stream	C3_S_14		200	2	3	Completely Blocked	Remove debris	2.00	Public
Stream	C3_S_15		200	2	2	75%		1.80	Public
Stream	C3_S_16		200	3	3	75%	Stabilization and debris removal	2.40	Public
Stream	C3_S_17		200	2	2	75%		1.60	Public
Stream	C3_S_18		200	1	1	0%		1.20	Public
Stream	C3_S_19		200	3	2	50%	Stabilization	2.20	Public
Stream	C3_S_20		200	3	3	75%	Stabilization and debris removal	2.40	Public
Stream	C3_S_21		200	2	2	75%		1.60	Public
Stream	C3_S_22		200	2	2	25%		1.60	Public
Stream	C3_S_23		200	2	2	Completely Blocked		1.60	Public
Stream	C3_S_24		200	3	3	25%	Stabilization and debris removal	2.00	Public
Stream	C3_S_25		200	2	2	50%		1.60	Public
Stream	C3_S_26		200	2	2	50%		1.60	Public
Stream	C3_S_27		83	2	2	25%		1.60	Public
Stream	C3_S_28		200	2	2	50%		1.60	Public
Stream	C3_S_29		200	2	3	50%	Remove debris	2.20	Public
Stream	C3_S_30		172	3	3	50%	Stabilization and debris removal	2.40	Public
Stream	C3_S_31		200	2	2	75%		1.60	Private
Stream	C3_S_32		200	3	1	0%	Stabilization	1.60	Private
Stream	C3_S_33		200	3	3	75%	Stabilization and debris removal	2.40	Private
Stream	C3_S_34		200	3	2	75%	Stabilization	1.60	Private
Stream	C3_S_35		200	2	2	Completely Blocked		1.40	Private
Stream	C3_S_36		142	2	2	75%		1.40	Private
Stream	C3_S_37		200	2	2	75%		1.40	Private
Stream	C3_S_38		200	2	2	50%		1.40	Private
Stream	C3_S_39		200	2	2	50%		1.60	Private
Stream	C3_S_40		66	1	1	0%		1.20	Private
Grid C4									
Culvert	C4_01	78" Circular RCP	52	1	1	0%		1.25	
Culvert	C4_02	60" Circular RCP	101	3	3	0%	Clean and CCTV	1.75	
Stream	C4_S_01		200	1	1	Completely Blocked		1.20	Public
Stream	C4_S_02		194	2	2	Completely Blocked		1.60	Public
Stream	C4_S_03		160	2	1	0%		1.40	Private
Stream	C4_S_04		200	2	2	Completely Blocked		1.60	Public
Stream	C4_S_05		200	2	1	50%		1.40	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	C4_S_06		200	2	2	Completely Blocked		1.60	Public
Stream	C4_S_07		200	2	2	Completely Blocked		1.60	Public
Stream	C4_S_08		149	3	3	Completely Blocked	Stabilization and debris removal	2.40	Public
Grid D1									
Culvert	D1_01	4'x12' Box Culvert	154	1	1	0%		1.17	
Culvert	D1_02	48" Circular RCP	61	2	3	0%	Replace with upsized 4'x6' Box	2.08	
Culvert	D1_03	48" Circular RCP	59	2	3	75%	Replace with upsized 4'x6' Box	2.08	
Culvert	D1_04	6'x14' Box Culvert	106	1	1	0%		1.17	
Culvert	D1_05	42" Circular RCP	156	1	1	0%		1.00	
Culvert	D1_06	48" Circular RCP	64	2	2	0%		1.58	
Culvert	D1_07	48" Circular RCP	64	2	2	50%		1.58	
Culvert	D1_08	72" Circular CMP	183	2	2	0%	Replace CMP with 72"	1.75	
Culvert	D1_09	30" Circular RCP	50	1	1	0%		1.00	
Stream	D1_S_01		200	2	3	Completely Blocked	Remove debris	1.80	Public
Stream	D1_S_02		200	1	1	Completely Blocked		1.20	Public
Stream	D1_S_03		200	2	2	Completely Blocked		1.60	Public
Stream	D1_S_04		200	1	1	0%		1.20	Public
Stream	D1_S_05		200	1	1	0%		1.20	Public
Stream	D1_S_06		200	1	1	0%		1.20	Public
Stream	D1_S_07		200	1	1	0%		1.20	Public
Stream	D1_S_08		200	2	2	75%		1.60	Public
Stream	D1_S_09		103	1	1	0%		1.20	Public
Stream	D1_S_10		154	1	1	0%		1.00	Private
Stream	D1_S_11		154	1	1	0%		1.00	Private
Stream	D1_S_12		154	2	1	0%		1.40	Private
Stream	D1_S_13		153	2	1	0%		1.60	Public
Stream	D1_S_14		154	2	2	75%		2.20	Public
Stream	D1_S_15		154	2	2	25%		2.20	Public
Stream	D1_S_16		154	2	2	0%		2.20	Public
Stream	D1_S_17		154	3	3	0%	Stabilization and debris removal	2.40	Public
Stream	D1_S_18		154	2	1	0%		1.60	Public
Stream	D1_S_19		154	2	3	Completely Blocked	Remove debris	2.00	Public
Stream	D1_S_20		154	2	2	75%		1.80	Public
Stream	D1_S_21		154	2	3	Completely Blocked	Remove debris	2.00	Public
Stream	D1_S_22		154	2	2	75%		1.80	Public
Stream	D1_S_23		77	2	2	75%		1.60	Public
Stream	D1_S_24		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Public
Stream	D1_S_25		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Public
Stream	D1_S_26		200	2	2	50%		2.00	Public
Stream	D1_S_27		200	2	2	75%		2.00	Public
Stream	D1_S_28		200	2	2	0%		2.00	Public
Stream	D1_S_29		62	1	1	0%		1.20	Public
Stream	D1_S_30		200	2	1	50%		1.80	Public
Stream	D1_S_31		200	3	3	50%	Stabilization and debris removal	2.40	Public
Stream	D1_S_32		200	2	2	50%		1.60	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Grid D2									
Culvert	D2_01	4.5'x20' Arch RCP	79	1	2	25%		1.33	
Culvert	D2_02	4.5'x20' Arch RCP	71	1	2	25%		1.33	
Culvert	D2_03	3'x23' Arch RCP	70	1	3	75%	Clean and CCTV	1.50	
Culvert	D2_04	72" Circular RCP	73	2	3	25%	Clean and CCTV	1.58	
Culvert	D2_05	72" Circular RCP	72	2	1	0%		1.25	
Culvert	D2_06	72" Circular RCP	72	2	3	25%	Clean and CCTV	1.58	
Culvert	D2_07	54" Circular RCP	44	2	2	0%		1.42	
Culvert	D2_08	3.6'x5.5' Ellipse RCP	54	3	3	0%	Clean and CCTV	1.75	
Culvert	D2_09	7'x20' Arch RCP	63	1	2	25%		1.33	
Stream	D2_S_01		200	1	1	0%		1.20	Public
Stream	D2_S_02		200	1	1	0%		1.20	Public
Stream	D2_S_03		200	1	3	Completely Blocked	Remove debris	1.60	Public
Stream	D2_S_04		200	1	3	Completely Blocked	Remove debris	1.60	Public
Stream	D2_S_05		200	1	1	0%		1.20	Public
Stream	D2_S_06		200	1	1	0%		1.20	Public
Stream	D2_S_07		200	1	1	0%		1.20	Public
Stream	D2_S_08		200	1	1	0%		1.20	Public
Stream	D2_S_09		188	2	2	25%		1.60	Public
Stream	D2_S_10		200	2	2	75%		1.60	Public
Stream	D2_S_11		200	1	1	0%		1.20	Public
Stream	D2_S_12		200	1	3	Completely Blocked	Remove debris	1.60	Public
Stream	D2_S_13		200	2	3	75%	Remove debris	2.00	Public
Stream	D2_S_14		200	2	2	25%		1.80	Public
Stream	D2_S_15		200	2	2	50%		1.60	Public
Stream	D2_S_16		200	3	2	50%	Stabilization	2.20	Public
Stream	D2_S_17		200	2	2	75%		1.60	Public
Stream	D2_S_18		200	2	2	75%		2.00	Public
Stream	D2_S_19		200	2	1	75%		1.40	Public
Stream	D2_S_20		200	2	1	75%		1.40	Public
Stream	D2_S_21		200	2	1	25%		1.40	Public
Stream	D2_S_22		200	2	2	25%		1.60	Public
Stream	D2_S_23		200	2	1	0%		1.40	Public
Stream	D2_S_24		200	2	1	50%		1.40	Public
Stream	D2_S_25		54	1	1	0%		1.20	Public
Stream	D2_S_26		154	2	2	25%		1.80	Public
Stream	D2_S_27		153	2	2	25%		1.80	Public
Stream	D2_S_28		153	2	2	25%		1.80	Public
Stream	D2_S_29		153	2	2	75%		1.80	Public
Stream	D2_S_30		153	2	2	75%		1.80	Public
Stream	D2_S_31		153	2	2	50%		1.80	Public
Stream	D2_S_32		153	2	2	50%		1.80	Public
Stream	D2_S_33		153	2	2	75%		1.80	Public
Stream	D2_S_34		200	2	2	75%		1.80	Public
Stream	D2_S_34		200	2	2	75%		1.80	Public
Stream	D2_S_35		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Public
Stream	D2_S_36		200	2	2	Completely Blocked		1.60	Public
Stream	D2_S_37		200	1	2	50%		1.40	Public
Stream	D2_S_38		200	1	2	75%		1.40	Public
Stream	D2_S_39		200	2	2	25%		1.60	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	D2_S_40		200	3	3	75%	Stabilization and debris removal	2.40	Public
Stream	D2_S_41		200	2	3	Completely Blocked	Remove debris	1.80	Public
Stream	D2_S_42		178	2	3	Completely Blocked	Remove debris	2.00	Public
Stream	D2_S_43		200	1	1	25%		1.20	Public
Stream	D2_S_44		200	2	2	75%		1.60	Public
Stream	D2_S_45		200	2	2	75%		1.60	Public
Stream	D2_S_46		200	2	2	75%		1.60	Public
Stream	D2_S_47		200	2	2	Completely Blocked		1.60	Public
Stream	D2_S_48		200	2	2	75%		1.60	Public
Stream	D2_S_49		200	2	1	25%		1.80	Public
Stream	D2_S_50		200	2	3	Completely Blocked	Remove debris	2.40	Public
Stream	D2_S_51		200	2	2	75%		1.80	Public
Stream	D2_S_52		200	3	3	Completely Blocked	Stabilization and debris removal	2.60	Public
Stream	D2_S_53		200	2	2	50%		1.80	Public
Stream	D2_S_54		200	2	2	Completely Blocked		1.80	Public
Stream	D2_S_55		200	2	2	75%		1.80	Public
Stream	D2_S_56		200	2	2	50%		1.80	Public
Stream	D2_S_57		200	2	2	Completely Blocked		1.80	Public
Stream	D2_S_58		200	2	2	25%		1.80	Public
Stream	D2_S_59		200	1	1	0%		1.40	Public
Stream	D2_S_60		200	3	3	25%	Stabilization and debris removal	2.20	Public
Stream	D2_S_61		200	2	2	50%		1.80	Public
Stream	D2_S_62		200	2	2	50%		1.80	Public
Grid D3									
Culvert	D3_01	6'x18' Arch RCP	77	1	1	0%		1.17	
Culvert	D3_02	6.5'x9.5' Arch CMP	43	2	2	0%	Replace CMP with 6'x9' Box	1.67	
Culvert	D3_03	24" Circular CMP	60	2	3	Completely Blocked	Replace CMP with upsized 36"	2.33	
Stream	D3_S_01		200	2	1	25%		1.60	Public
Stream	D3_S_02		200	2	2	25%		1.60	Public
Stream	D3_S_03		200	2	1	25%		1.40	Public
Stream	D3_S_04		200	2	2	0%		1.60	Public
Stream	D3_S_05		200	2	2	25%		1.60	Public
Stream	D3_S_06		200	2	2	Completely Blocked		1.60	Public
Stream	D3_S_07		200	2	2	25%		1.60	Public
Stream	D3_S_08		200	1	1	0%		1.20	Public
Stream	D3_S_09		200	2	3	Completely Blocked	Remove debris	1.80	Public
Stream	D3_S_10		200	2	2	75%		2.00	Public
Stream	D3_S_11		200	2	2	50%		1.60	Public
Stream	D3_S_12		36	2	2	0%		1.60	Public
Stream	D3_S_13		177	2	2	50%		1.60	Public
Stream	D3_S_14		200	2	2	Completely Blocked		1.60	Public
Stream	D3_S_15		200	2	2	75%		1.60	Public
Stream	D3_S_16		200	2	2	50%		1.60	Public
Stream	D3_S_17		200	2	2	50%		1.60	Public
Stream	D3_S_18		200	2	2	75%		2.00	Public

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Stream	D3_S_19		200	2	2	50%		1.60	Public
Stream	D3_S_20		200	2	2	50%		1.60	Public
Stream	D3_S_21		11	2	2	50%		1.60	Public
Grid D4									
Culvert	D4_01	3'x4' Ellipse CMP	57	2	2	0%	Replace CMP with upsized 38"x60"	2.08	
Culvert	D4_02	36" Circular RCP	48	2	2	0%		1.33	
Stream	D4_S_01		199	2	1	25%		1.40	Public
Stream	D4_S_02		199	2	2	50%		1.60	Public
Stream	D4_S_03		159	2	2	25%		1.60	Public
Stream	D4_S_04		200	2	2	75%		1.60	Public
Stream	D4_S_05		200	2	2	75%		1.60	Public
Stream	D4_S_06		200	2	2	Completely Blocked		1.60	Public
Stream	D4_S_07		200	1	1	0%		1.20	Public
Stream	D4_S_08		200	2	1	25%		1.40	Public
Stream	D4_S_09		200	2	1	25%		1.40	Public
Stream	D4_S_10		200	1	1	0%		1.20	Public
Stream	D4_S_11		200	2	1	50%		1.40	Public
Stream	D4_S_12		118	2	1	50%		1.40	Public
Grid E1									
Culvert	E1_01	78" Circular BCCMP	357	2	2	25%	Replace BCCMP with 78"	1.75	
Culvert	E1_02	36" Circular RCP	89	1	3	Completely Blocked	Clean and CCTV	1.50	
Culvert	E1_03	36" Circular RCP	86	1	2	50%		1.33	
Culvert	E1_04	60" Circular RCP	31	2	2	0%		1.42	
Culvert	E1_05	48" Circular CMP	60	2	2	0%	Replace CMP with 48"	1.92	
Culvert	E1_06	36" Circular SLHDPE	47	1	1	0%		1.17	
Culvert	E1_07	36" Circular CMP	56	3	3	50%	Replace CMP with upsized 42"	2.00	
Culvert	E1_08	36" Circular CMP	51	2	2	0%	Replace CMP with upsized 43"x68"	2.17	
Culvert	E1_09	4'x5.75' Arch CMP	53	1	1	0%	Replace CMP with upsized 43"x68"	1.92	
Culvert	E1_10	36" Circular CMP	54	2	2	25%	Replace CMP with upsized 32"x48"	2.17	
Stream	E1_S_01		200	3	3	25%	Stabilization and debris removal	2.40	Public
Stream	E1_S_02		200	2	2	Completely Blocked		1.60	Public
Stream	E1_S_03		149	2	2	50%		1.80	Public
Stream	E1_S_04		200	2	2	75%		1.80	Public
Stream	E1_S_05		200	1	2	50%		1.40	Public
Stream	E1_S_06		200	1	2	75%		1.40	Public
Stream	E1_S_07		200	2	2	75%		2.00	Public
Stream	E1_S_08		200	3	3	Completely Blocked	Stabilization and debris removal	2.40	Public
Stream	E1_S_09		200	2	3	Completely Blocked	Remove debris	1.80	Public
Stream	E1_S_10		100	2	2	75%		1.60	Public
Stream	E1_S_11		154	2	1	25%		1.40	Private
Stream	E1_S_12		85	2	1	25%		1.40	Private

Asset Type	Asset ID	Asset Description	Length	Structural Score	Maintenance Score	Blockage	Recommendation	Priority	Ownership
Grid E2									
Stream	E2_S_01		200	1	2	Completely Blocked		1.40	Public
Grid E3									
No assets assessed in this grid area									
Grid E4									
No assets assessed in this grid area									

Appendix H

Cost Estimate Tables

Pipe Replacement Summary of Costs

					Engineering			Contracting		Construction										Contingency	TOTAL COSTS				
Name	Upsize	Size	Length (Ft)	Pay Item Units Unit Costs	Design const. cost 10%	Permitting const. cost 3%	Const. Admin const. cost 8%	Bonds / Ins const. cost 2%	Bid Asst. const. cost 2%	Mobilization const. cost 5%	Traffic Control const. cost 1%	S&EC const. cost 2%	Clear and Grub AC $ 1,587.00	Excavation CY $ 30.00	Pipe Removal & Install LF Varies	Box Removal & Install LF Varies	Headwall EA Varies	Rip Rap Ton $ 150	Top Soil CY $ 10	Seeding SY $ 15	Asphalt Remove/Replace SY $ 200	Const. Contingency Const. Cost 25%	Engineering	Contracting	Construction	Contingency	PROJECT TOTALS
A1_01	Y	48"	**80**		$ 9,642	$ 2,893	$ 7,714	$ 1,928	$ 1,928	$ 4,464	$ 893	$ 1,784	$ 58	$ 14,222	$ 36,173	$ -	$ 24,000	$ 900	$ 593	$ 2,667	$ 10,667	$ 24,105	$ 20,248	$ 3,857	$ 96,420	$ 24,105	**$ 144,631**
A2_01	Y	4'x6' Box	**44**		$ 10,741	$ 3,222	$ 8,593	$ 2,148	$ 2,148	$ 4,973	$ 995	$ 1,988	$ 32	$ 7,822	$ -	$ 42,240	$ 36,000	$ 900	$ 326	$ 1,467	$ 10,667	$ 26,852	$ 22,556	$ 4,296	$ 107,409	$ 26,852	**$ 161,114**
A3_06	Y	4'x6' Box	**37**		$ 8,553	$ 2,566	$ 6,843	$ 1,711	$ 1,711	$ 3,960	$ 792	$ 1,583	$ 27	$ 6,578	$ -	$ 35,520	$ 24,000	$ 900	$ 274	$ 1,233	$ 10,667	$ 21,384	$ 17,962	$ 3,421	$ 85,534	$ 21,384	**$ 128,301**
A4_04	Y	4'x8' Box	**20**		$ 6,803	$ 2,041	$ 5,442	$ 1,361	$ 1,361	$ 3,150	$ 630	$ 1,260	$ 15	$ 3,556	$ -	$ 23,040	$ 24,000	$ 900	$ 148	$ 667	$ 10,667	$ 17,008	$ 14,286	$ 2,721	$ 68,031	$ 17,008	**$ 102,046**
A4_10	Y	4'x6' Box	**323**		$ 44,978	$ 13,493	$ 35,982	$ 8,996	$ 8,996	$ 20,823	$ 4,165	$ 8,325	$ 235	$ 57,422	$ -	$ 310,080	$ 24,000	$ 900	$ 2,393	$ 10,767	$ 10,667	$ 112,444	$ 94,453	$ 17,991	$ 449,776	$ 112,444	**$ 674,664**
B1_03	Y	4'x6' Box	**47**		$ 9,827	$ 2,948	$ 7,862	$ 1,965	$ 1,965	$ 4,550	$ 910	$ 1,819	$ 34	$ 8,356	$ -	$ 45,120	$ 24,000	$ 900	$ 348	$ 1,567	$ 10,667	$ 24,567	$ 20,637	$ 3,931	$ 98,270	$ 24,567	**$ 147,405**
B2_02	N	42"	**36**		$ 5,800	$ 1,740	$ 4,640	$ 1,160	$ 1,160	$ 2,685	$ 537	$ 1,074	$ 26	$ 6,400	$ 14,243	$ -	$ 20,000	$ 900	$ 267	$ 1,200	$ 10,667	$ 14,500	$ 12,180	$ 2,320	$ 57,998	$ 14,500	**$ 86,997**
B2_04	Y	48"x76"	**60**		$ 8,924	$ 2,677	$ 7,139	$ 1,785	$ 1,785	$ 4,132	$ 826	$ 1,652	$ 44	$ 10,667	$ 33,912	$ -	$ 24,000	$ 900	$ 444	$ 2,000	$ 10,667	$ 22,311	$ 18,741	$ 3,570	$ 89,243	$ 22,311	**$ 133,865**
B2_05	Y	34"x53"	**40**		$ 6,742	$ 2,022	$ 5,393	$ 1,348	$ 1,348	$ 3,121	$ 624	$ 1,248	$ 29	$ 7,111	$ 18,086	$ -	$ 24,000	$ 900	$ 296	$ 1,333	$ 10,667	$ 16,854	$ 14,157	$ 2,697	$ 67,416	$ 16,854	**$ 101,124**
B2_06	Y	34"x53"	**43**		$ 6,959	$ 2,088	$ 5,567	$ 1,392	$ 1,392	$ 3,222	$ 644	$ 1,288	$ 31	$ 7,644	$ 19,443	$ -	$ 24,000	$ 900	$ 319	$ 1,433	$ 10,667	$ 17,398	$ 14,614	$ 2,784	$ 69,592	$ 17,398	**$ 104,387**
B2_07	Y	4'x6' Box	**38**		$ 9,977	$ 2,993	$ 7,981	$ 1,995	$ 1,995	$ 4,619	$ 924	$ 1,847	$ 28	$ 6,756	$ -	$ 36,480	$ 36,000	$ 900	$ 281	$ 1,267	$ 10,667	$ 24,942	$ 20,951	$ 3,991	$ 99,768	$ 24,942	**$ 149,652**
B2_08	Y	4'x6' Box	**42**		$ 9,190	$ 2,757	$ 7,352	$ 1,838	$ 1,838	$ 4,255	$ 851	$ 1,701	$ 31	$ 7,467	$ -	$ 40,320	$ 36,000	$ 900	$ 311	$ 1,400	$ 10,667	$ 22,976	$ 19,299	$ 3,676	$ 91,902	$ 22,976	**$ 137,853**
B2_09	Y	4'x6' Box	**49**		$ 10,082	$ 3,025	$ 8,065	$ 2,016	$ 2,016	$ 4,667	$ 933	$ 1,866	$ 36	$ 8,711	$ -	$ 47,040	$ 24,000	$ 900	$ 363	$ 1,633	$ 10,667	$ 25,204	$ 21,172	$ 4,033	$ 100,817	$ 25,204	**$ 151,226**
B2_10	Y	4'x6' Box	**52**		$ 10,464	$ 3,139	$ 8,371	$ 2,093	$ 2,093	$ 4,844	$ 969	$ 1,937	$ 38	$ 9,244	$ -	$ 49,920	$ 24,000	$ 900	$ 385	$ 1,733	$ 10,667	$ 26,159	$ 21,974	$ 4,186	$ 104,638	$ 26,159	**$ 156,957**
B2_11	Y	4'x6' Box	**59**		$ 11,355	$ 3,407	$ 9,084	$ 2,271	$ 2,271	$ 5,257	$ 1,051	$ 2,102	$ 43	$ 10,489	$ -	$ 56,640	$ 24,000	$ 900	$ 437	$ 1,967	$ 10,667	$ 28,388	$ 23,846	$ 4,542	$ 113,553	$ 28,388	**$ 170,329**
B2_12	Y	38"x60"	**47**		$ 7,249	$ 2,175	$ 5,799	$ 1,450	$ 1,450	$ 3,356	$ 671	$ 1,342	$ 34	$ 8,356	$ 21,252	$ -	$ 24,000	$ 900	$ 348	$ 1,567	$ 10,667	$ 18,123	$ 15,223	$ 2,900	$ 72,492	$ 18,123	**$ 108,738**
B2_13	Y	32"x48"	**60**		$ 7,394	$ 2,218	$ 5,915	$ 1,479	$ 1,479	$ 3,423	$ 685	$ 1,368	$ 44	$ 10,667	$ 23,738	$ -	$ 20,000	$ 900	$ 444	$ 2,000	$ 10,667	$ 18,484	$ 15,527	$ 2,957	$ 73,936	$ 18,484	**$ 110,904**
B2_14	Y	32"x48"	**60**		$ 7,394	$ 2,218	$ 5,915	$ 1,479	$ 1,479	$ 3,423	$ 685	$ 1,368	$ 44	$ 10,667	$ 23,738	$ -	$ 20,000	$ 900	$ 444	$ 2,000	$ 10,667	$ 18,484	$ 15,527	$ 2,957	$ 73,936	$ 18,484	**$ 110,904**
B2_15	Y	38"x60"	**271**		$ 23,492	$ 7,047	$ 18,793	$ 4,698	$ 4,698	$ 10,876	$ 2,175	$ 4,346	$ 197	$ 48,178	$ 122,535	$ -	$ 24,000	$ 900	$ 2,007	$ 9,033	$ 10,667	$ 58,729	$ 49,332	$ 9,397	$ 234,916	$ 58,729	**$ 352,373**
B2_16	Y	4'x6' Box	**52**		$ 11,760	$ 3,528	$ 9,408	$ 2,352	$ 2,352	$ 5,444	$ 1,089	$ 2,177	$ 38	$ 9,244	$ -	$ 49,920	$ 36,000	$ 900	$ 385	$ 1,733	$ 10,667	$ 29,399	$ 24,696	$ 4,704	$ 117,598	$ 29,399	**$ 176,397**
B2_17	Y	48"	**62**		$ 8,337	$ 2,501	$ 6,669	$ 1,667	$ 1,667	$ 3,860	$ 772	$ 1,543	$ 45	$ 11,022	$ 28,034	$ -	$ 24,000	$ 900	$ 459	$ 2,067	$ 10,667	$ 20,842	$ 17,507	$ 3,335	$ 83,369	$ 20,842	**$ 125,053**
B2_19	Y	32"x48"	**83**		$ 8,921	$ 2,676	$ 7,137	$ 1,784	$ 1,784	$ 4,130	$ 826	$ 1,651	$ 60	$ 14,756	$ 32,838	$ -	$ 20,000	$ 900	$ 615	$ 2,767	$ 10,667	$ 22,302	$ 18,734	$ 3,568	$ 89,209	$ 22,302	**$ 133,814**
B2_21	Y	38"x60"	**77**		$ 9,425	$ 2,827	$ 7,540	$ 1,885	$ 1,885	$ 4,363	$ 873	$ 1,744	$ 56	$ 13,689	$ 34,816	$ -	$ 24,000	$ 900	$ 570	$ 2,567	$ 10,667	$ 23,561	$ 19,791	$ 3,770	$ 94,245	$ 23,561	**$ 141,368**
B2_23	Y	34"x53"	**38**		$ 6,597	$ 1,979	$ 5,277	$ 1,319	$ 1,319	$ 3,054	$ 611	$ 1,221	$ 28	$ 6,756	$ 17,182	$ -	$ 24,000	$ 900	$ 281	$ 1,267	$ 10,667	$ 16,491	$ 13,853	$ 2,639	$ 65,966	$ 16,491	**$ 98,949**
B2_24	Y	34"x53"	**21**		$ 5,364	$ 1,609	$ 4,291	$ 1,073	$ 1,073	$ 2,483	$ 497	$ 993	$ 15	$ 3,733	$ 9,495	$ -	$ 24,000	$ 900	$ 156	$ 700	$ 10,667	$ 13,410	$ 11,264	$ 2,146	$ 53,639	$ 13,410	**$ 80,459**
B2_25	N	48"	**23**		$ 5,509	$ 1,653	$ 4,407	$ 1,102	$ 1,102	$ 2,550	$ 510	$ 1,020	$ 17	$ 4,089	$ 10,400	$ -	$ 24,000	$ 900	$ 170	$ 767	$ 10,667	$ 13,772	$ 11,569	$ 2,204	$ 55,089	$ 13,772	**$ 82,634**
B2_26	Y	19"x30"	**95**		$ 7,546	$ 2,264	$ 6,037	$ 1,509	$ 1,509	$ 3,494	$ 699	$ 1,396	$ 69	$ 16,889	$ 21,478	$ -	$ 16,000	$ 900	$ 704	$ 3,167	$ 10,667	$ 18,865	$ 15,847	$ 3,018	$ 75,461	$ 18,865	**$ 113,192**
B2_27	Y	29"x45"	**274**		$ 19,932	$ 5,980	$ 15,946	$ 3,986	$ 3,986	$ 9,228	$ 1,846	$ 3,687	$ 200	$ 48,711	$ 92,919	$ -	$ 20,000	$ 900	$ 2,030	$ 9,133	$ 10,667	$ 49,830	$ 41,857	$ 7,973	$ 199,320	$ 49,830	**$ 298,980**
B3_01	Y	38"x60"	**58**		$ 8,047	$ 2,414	$ 6,437	$ 1,609	$ 1,609	$ 3,725	$ 745	$ 1,489	$ 42	$ 10,311	$ 26,225	$ -	$ 24,000	$ 900	$ 430	$ 1,933	$ 10,667	$ 26,117	$ 16,898	$ 3,219	$ 80,468	$ 20,117	**$ 120,702**
B3_04	Y	48"x76"	**263**		$ 26,770	$ 8,031	$ 21,416	$ 5,354	$ 5,354	$ 12,394	$ 2,479	$ 4,954	$ 192	$ 46,756	$ 148,648	$ -	$ 30,000	$ 900	$ 1,948	$ 8,767	$ 10,667	$ 66,926	$ 56,218	$ 10,708	$ 267,703	$ 66,926	**$ 401,554**
B3_07	N	36"	**253**		$ 18,666	$ 5,600	$ 14,933	$ 3,733	$ 3,733	$ 8,642	$ 1,728	$ 3,453	$ 184	$ 44,978	$ 85,797	$ -	$ 20,000	$ 900	$ 1,874	$ 8,433	$ 10,667	$ 46,664	$ 39,198	$ 7,466	$ 186,657	$ 46,664	**$ 279,985**
B4_02	N	72"	**32**		$ 10,208	$ 3,062	$ 8,166	$ 2,042	$ 2,042	$ 4,726	$ 945	$ 1,890	$ 23	$ 5,689	$ 39,936	$ -	$ 36,000	$ 900	$ 237	$ 1,067	$ 10,667	$ 25,520	$ 21,437	$ 4,083	$ 102,080	$ 25,520	**$ 153,119**
B4_03	N	72"	**31**		$ 9,728	$ 2,918	$ 7,782	$ 1,946	$ 1,946	$ 4,504	$ 901	$ 1,801	$ 23	$ 5,511	$ 35,712	$ -	$ 36,000	$ 900	$ 230	$ 1,033	$ 10,667	$ 24,320	$ 20,429	$ 3,891	$ 97,281	$ 24,320	**$ 145,921**
B4_04	N	72"	**30**		$ 8,336	$ 2,501	$ 6,669	$ 1,667	$ 1,667	$ 3,859	$ 772	$ 1,543	$ 22	$ 5,333	$ 23,040	$ -	$ 36,000	$ 900	$ 222	$ 1,000	$ 10,667	$ 20,840	$ 17,505	$ 3,334	$ 83,358	$ 20,840	**$ 125,038**
B4_09	Y	38"x60"	**22**		$ 5,436	$ 1,631	$ 4,349	$ 1,087	$ 1,087	$ 2,517	$ 503	$ 1,006	$ 16	$ 3,911	$ 9,948	$ -	$ 24,000	$ 900	$ 163	$ 733	$ 10,667	$ 13,591	$ 11,417	$ 2,175	$ 54,364	$ 13,591	**$ 81,546**
B4_10	Y	38"x60"	**23**		$ 5,509	$ 1,653	$ 4,407	$ 1,102	$ 1,102	$ 2,550	$ 510	$ 1,020	$ 17	$ 4,089	$ 10,400	$ -	$ 24,000	$ 900	$ 170	$ 767	$ 10,667	$ 13,772	$ 11,569	$ 2,204	$ 55,089	$ 13,772	**$ 82,634**
B4_11	Y	38"x60"	**23**		$ 5,509	$ 1,653	$ 4,407	$ 1,102	$ 1,102	$ 2,550	$ 510	$ 1,020	$ 17	$ 4,089	$ 10,400	$ -	$ 24,000	$ 900	$ 170	$ 767	$ 10,667	$ 13,772	$ 11,569	$ 2,204	$ 55,089	$ 13,772	**$ 82,634**
C2_01	Y	4'x6' Box	**163**		$ 24,600	$ 7,380	$ 19,680	$ 4,920	$ 4,920	$ 11,389	$ 2,278	$ 4,553	$ 119	$ 28,978	$ -	$ 156,480	$ 24,000	$ 900	$ 1,207	$ 5,433	$ 10,667	$ 61,501	$ 51,661	$ 9,840	$ 246,004	$ 61,501	**$ 369,006**
C2_02	N	53"x72"	**58**		$ 10,759	$ 3,228	$ 8,607	$ 2,152	$ 2,152	$ 4,981	$ 996	$ 1,992	$ 42	$ 10,311	$ 39,338	$ -	$ 36,000	$ 900	$ 430	$ 1,933	$ 10,667	$ 26,897	$ 22,594	$ 4,304	$ 107,590	$ 26,897	**$ 161,385**
C2_03	Y	24"x38"	**117**		$ 9,318	$ 2,796	$ 7,455	$ 1,864	$ 1,864	$ 4,314	$ 863	$ 1,724	$ 85	$ 20,800	$ 33,064	$ -	$ 16,000	$ 900	$ 867	$ 3,900	$ 10,667	$ 23,296	$ 19,569	$ 3,727	$ 93,184	$ 23,296	**$ 139,776**
C2_05	Y	34"x53"	**68**		$ 8,772	$ 2,632	$ 7,018	$ 1,754	$ 1,754	$ 4,061	$ 812	$ 1,623	$ 50	$ 12,089	$ 30,747	$ -	$ 24,000	$ 900	$ 504	$ 2,267	$ 10,667	$ 21,930	$ 18,421	$ 3,509	$ 87,719	$ 21,930	**$ 131,579**
C2_06	Y	34"x53"	**71**		$ 8,989	$ 2,697	$ 7,192	$ 1,798	$ 1,798	$ 4,162	$ 832	$ 1,664	$ 52	$ 12,622	$ 32,103	$ -	$ 24,000	$ 900	$ 526	$ 2,367	$ 10,667	$ 22,474	$ 18,878	$ 3,596	$ 89,894	$ 22,474	**$ 134,842**
C2_10	N	43"x68"	**12**		$ 5,109	$ 1,533	$ 4,087	$ 1,022	$ 1,022	$ 2,365	$ 473	$ 946	$ 9	$ 2,133	$ 6,104	$ -	$ 27,000	$ 900	$ 89	$ 400	$ 10,667	$ 12,771	$ 10,728	$ 2,043	$ 51,086	$ 12,771	**$ 76,629**
C2_11	Y	4'x6' Box	**16**		$ 5,879	$ 1,764	$ 4,703	$ 1,176	$ 1,176	$ 2,722	$ 544	$ 1,088	$ 12	$ 2,844	$ -	$ 15,360	$ 24,000	$ 900	$ 119	$ 533	$ 10,667	$ 14,697	$ 12,346	$ 2,352	$ 58,789	$ 14,697	**$ 88,184**
C3_01	Y	38"x60"	**41**		$ 6,814	$ 2,044	$ 5,451	$ 1,363	$ 1,363	$ 3,155	$ 631	$ 1,261	$ 30	$ 7,289	$ 18,539	$ -	$ 24,000	$ 900	$ 304	$ 1,367	$ 10,667	$ 17,035	$ 14,310	$ 2,726	$ 68,141	$ 17,035	**$ 102,212**
C3_03	N	48"	**187**		$ 17,401	$ 5,220	$ 13,921	$ 3,480	$ 3,480	$ 8,056	$ 1,611	$ 3,220	$ 136	$ 33,244	$ 84,554	$ -	$ 24,000	$ 900	$ 1,385	$ 6,233	$ 10,667	$ 43,502	$ 36,541	$ 6,960	$ 174,007	$ 43,502	**$ 261,010**
C3_04	Y	32"x48"	**54**		$ 6,995	$ 2,099	$ 5,596	$ 1,399	$ 1,399	$ 3,239	$ 648	$ 1,295	$ 39	$ 9,600	$ 21,365	$ -	$ 20,000	$ 900	$ 400	$ 1,800	$ 10,667	$ 17,488	$ 14,690	$ 2,798	$ 69,951	$ 17,488	**$ 104,927**
C3_05	Y	34"x53"	**184**		$ 17,183	$ 5,155	$ 13,747	$ 3,437	$ 3,437	$ 7,955	$ 1,591	$ 3,179	$ 134	$ 32,711	$ 83,197	$ -	$ 24,000	$ 900	$ 1,363	$ 6,133	$ 10,667	$ 42,958	$ 36,085	$ 6,873	$ 171,831	$ 42,958	**$ 257,747**
C3_06	Y	34"x53"	**187**		$ 17,401	$ 5,220	$ 13,921	$ 3,480	$ 3,480	$ 8,056	$ 1,611	$ 3,220	$ 136	$ 33,244	$ 84,554	$ -	$ 24,000	$ 900	$ 1,385	$ 6,233	$ 10,667	$ 43,502	$ 36,541	$ 6,960	$ 174,007	$ 43,502	**$ 261,010**
D1_02	Y	4'x6' Box	**61**		$ 12,906	$ 3,872	$ 10,325	$ 2,581	$ 2,581	$ 5,975	$ 1,195	$ 2,389	$ 44	$ 10,844	$ -	$ 58,560	$ 36,000	$ 900	$ 452	$ 2,033	$ 10,667	$ 32,265	$ 27,103	$ 5,162	$ 129,060	$ 32,265	**$ 193,590**
D1_03	Y	4'x6' Box	**59**		$ 12,651	$ 3,795	$ 10,121	$ 2,530	$ 2,530	$ 5,857	$ 1,171	$ 2,342	$ 43	$ 10,489	$ -	$ 56,640	$ 36,000	$ 900	$ 437	$ 1,967	$ 10,667	$ 31,628	$ 26,568	$ 5,061	$ 126,513	$ 31,628	**$ 189,769**
D1_08	N	72"	**183**		$ 23,992	$ 7,198	$ 19,194	$ 4,798	$ 4,798	$ 11,107	$ 2,221	$ 4,440	$ 133	$ 32,533	$ 134,461	$ -	$ 36,000	$ 900	$ 1,356	$ 6,100	$ 10,667	$ 59,980	$ 50,383	$ 9,597	$ 239,919	$ 59,980	**$ 359,879**
D3_02	N	6'x9' Box	**43**		$ 12,721	$ 3,816	$ 10,177	$ 2,544	$ 2,544	$ 5,889	$ 1,178	$ 2,355	$ 31	$ 7,644		$ 57,792	$ 39,000	$ 900	$ 319	$ 1,433	$ 10,667	$ 31,802	$ 26,714	$ 5,088	$ 127,209	$ 31,802	**$ 190,813**
D3_03	Y	36"	**60**		$ 7,027	$ 2,108	$ 5,622	$ 1,405	$ 1,405	$ 3,253	$ 651	$ 1,300	$ 44	$ 10,667	$ 20,347	$ -	$ 20,000	$ 900	$ 444	$ 2,000	$ 10,667	$ 17,568	$ 14,757	$ 2,811	$ 70,273	$ 17,568	**$ 105,410**
D4_01	Y	38"x60"	**57**		$ 7,974	$ 2,392	$ 6,379	$ 1,595	$ 1,595	$ 3,692	$ 738	$ 1,476	$ 42	$ 10,133	$ 25,773	$ -	$ 24,000	$ 900	$ 422	$ 1,900	$ 10,667	$ 19,936	$ 16,746	$ 3,190	$ 79,743	$ 19,936	**$ 119,614**
E1_01	N	78"	**357**		$ 42,243	$ 12,673	$ 33,795	$ 8,449	$ 8,449	$ 19,557	$ 3,911	$ 7,818	$ 260	$ 63,467	$ 262,309	$ -	$ 39,000	$ 900	$ 2,644	$ 11,900	$ 10,667	$ 105,608	$ 88,711	$ 16,897	$ 422,434	$ 105,608	**$ 633,651**
E1_05	N	48"	**60**		$ 8,192	$ 2,458	$ 6,553	$ 1,638	$ 1,638	$ 3,793	$ 759	$ 1,516	$ 44	$ 10,667	$ 27,130	$ -	$ 24,000	$ 900	$ 444	$ 2,000	$ 10,667	$ 20,480	$ 17,203	$ 3,277	$ 81,918	$ 20,480	**$ 122,877**
E1_07	N	42"	**56**		$ 6,912	$ 2,074	$ 5,530	$ 1,382	$ 1,382	$ 3,200	$ 640	$ 1,279	$ 41	$ 9,956	$ 22,156	$ -	$ 18,000	$ 900	$ 415	$ 1,867	$ 10,667	$ 17,280	$ 14,515	$ 2,765	$ 69,120	$ 17,280	**$ 103,679**
E1_08	Y	43"x68"	**51**		$ 8,175	$ 2,452	$ 6,540	$ 1,635	$ 1,635	$ 3,785	$ 757	$ 1,513	$ 37	$ 9,067	$ 25,943	$ -	$ 27,000	$ 900	$ 378	$ 1,700	$ 10,667	$ 20,436	$ 17,167	$ 3,270	$ 81,745	$ 20,436	**$ 122,618**
E1_09	Y	43"x68"	**53**		$ 8,332	$ 2,500	$ 6,665	$ 1,666	$ 1,666	$ 3,857	$ 771	$ 1,542	$ 39	$ 9,422	$ 26,960	$ -	$ 27,000	$ 900	$ 393	$ 1,767	$ 10,667	$ 20,829	$ 17,497	$ 3,333	$ 83,318	$ 20,829	**$ 124,977**
E1_10	Y	32"x48"	**54**		$ 6,995	$ 2,099	$ 5,596	$ 1,399	$ 1,399	$ 3,239	$ 648	$ 1,295	$ 39	$ 9,600	$ 21,365	$ -	$ 20,000	$ 900	$ 400	$ 1,800	$ 10,667	$ 17,488	$ 14,690	$ 2,798	$ 69,951	$ 17,488	**$ 104,927**

ASSUMPTIONS:
Clearing and grubbing 20 ft wide easement, length of pipe
Excavation .75 CY per ft of pipe
Two inlets per road crossing, Large for 54" and larger
JBs for pipe > 400ft only
Two headwalls per project
Three tons of rip rap each end

Total $ 10,417,558

Pipe Maintenance Summary of Costs

					Engineering	Contracting		Maintenance					Contingency	TOTAL COSTS				
				Pay Item	Maintenance Admin	Bonds / Ins	Bid Asst.	Mobilization	Traffic Control	CCTV / Inspection	Pipe Cleaning	Inlet Cleaning	Maintenance Contingency	Engineering	Contracting	Maintenance	Contingency	PROJECT TOTALS
				Units	Maintenance cost	Maintenance cost	Maintenance cost	Maintenance cost	Maintenance cost	LF	LF	EA	Maintenance Cost					
Pipe ID	Name	Size	Length (Ft)	Unit Costs	8%	2%	2%	5%	1%	Varies	Varies	250	25%					
To Be Replaced	A3_06	48"x72"	**37**		$ 203.18	$ 50.80	$ 50.80	$ 119.80	$ 23.96	$ 481.00	$ 1,665.00	$ 250.00	$ 634.94	$ 203.18	$ 101.59	$ 2,539.76	$ 634.94	$ 3,479.47
	A4_01	6'x12' Box	**34**		$ 266.27	$ 66.57	$ 66.57	$ 157.00	$ 31.40	$ 510.00	$ 2,380.00	$ 250.00	$ 832.10	$ 266.27	$ 133.14	$ 3,328.40	$ 832.10	$ 4,559.91
	A4_02	6'x12' Box	**33**		$ 259.06	$ 64.77	$ 64.77	$ 152.75	$ 30.55	$ 495.00	$ 2,310.00	$ 250.00	$ 809.58	$ 259.06	$ 129.53	$ 3,238.30	$ 809.58	$ 4,436.47
	A4_03	6'x28'	**44**		$ 338.35	$ 84.59	$ 84.59	$ 199.50	$ 39.90	$ 660.00	$ 3,080.00	$ 250.00	$ 1,057.35	$ 338.35	$ 169.18	$ 4,229.40	$ 1,057.35	$ 5,794.28
	B1_02	84"x288"	**71**		$ 532.97	$ 133.24	$ 133.24	$ 314.25	$ 62.85	$ 1,065.00	$ 4,970.00	$ 250.00	$ 1,665.53	$ 532.97	$ 266.48	$ 6,662.10	$ 1,665.53	$ 9,127.08
	B2_01	24"	**35**		$ 74.62	$ 18.66	$ 18.66	$ 44.00	$ 8.80	$ 280.00	$ 350.00	$ 250.00	$ 233.20	$ 74.62	$ 37.31	$ 932.80	$ 233.20	$ 1,277.94
To Be Replaced	B2_02	24"	**36**		$ 76.15	$ 19.04	$ 19.04	$ 44.90	$ 8.98	$ 288.00	$ 360.00	$ 250.00	$ 237.97	$ 76.15	$ 38.08	$ 951.88	$ 237.97	$ 1,304.08
To Be Replaced	B2_04	42"x72"	**60**		$ 316.30	$ 79.08	$ 79.08	$ 186.50	$ 37.30	$ 780.00	$ 2,700.00	$ 250.00	$ 988.45	$ 316.30	$ 158.15	$ 3,953.80	$ 988.45	$ 5,416.71
To Be Replaced	B2_06	24"	**43**		$ 86.84	$ 21.71	$ 21.71	$ 51.20	$ 10.24	$ 344.00	$ 430.00	$ 250.00	$ 271.36	$ 86.84	$ 43.42	$ 1,085.44	$ 271.36	$ 1,487.05
To Be Replaced	B2_10	36"x60"	**52**		$ 153.49	$ 38.37	$ 38.37	$ 90.50	$ 18.10	$ 520.00	$ 1,040.00	$ 250.00	$ 479.65	$ 153.49	$ 76.74	$ 1,918.60	$ 479.65	$ 2,628.48
To Be Replaced	B2_14	30"	**60**		$ 138.22	$ 34.56	$ 34.56	$ 81.50	$ 16.30	$ 480.00	$ 900.00	$ 250.00	$ 431.95	$ 138.22	$ 69.11	$ 1,727.80	$ 431.95	$ 2,367.09
To Be Replaced	B2_17	30"	**62**		$ 142.12	$ 35.53	$ 35.53	$ 83.80	$ 16.76	$ 496.00	$ 930.00	$ 250.00	$ 444.14	$ 142.12	$ 71.06	$ 1,776.56	$ 444.14	$ 2,433.89
	B2_18	30"	**62**		$ 142.12	$ 35.53	$ 35.53	$ 83.80	$ 16.76	$ 496.00	$ 930.00	$ 250.00	$ 444.14	$ 142.12	$ 71.06	$ 1,776.56	$ 444.14	$ 2,433.89
	B2_22	36"	**39**		$ 117.11	$ 29.28	$ 29.28	$ 69.05	$ 13.81	$ 351.00	$ 780.00	$ 250.00	$ 365.97	$ 117.11	$ 58.55	$ 1,463.86	$ 365.97	$ 2,005.49
To Be Replaced	B2_27	24"	**274**		$ 439.43	$ 109.86	$ 109.86	$ 259.10	$ 51.82	$ 2,192.00	$ 2,740.00	$ 250.00	$ 1,373.23	$ 439.43	$ 219.72	$ 5,492.92	$ 1,373.23	$ 7,525.30
	B4_01	3'x5' Box	**44**		$ 338.35	$ 84.59	$ 84.59	$ 199.50	$ 39.90	$ 660.00	$ 3,080.00	$ 250.00	$ 1,057.35	$ 338.35	$ 169.18	$ 4,229.40	$ 1,057.35	$ 5,794.28
To Be Replaced	C2_03	30"	**117**		$ 249.40	$ 62.35	$ 62.35	$ 147.05	$ 29.41	$ 936.00	$ 1,755.00	$ 250.00	$ 779.37	$ 249.40	$ 124.70	$ 3,117.46	$ 779.37	$ 4,270.92
To Be Replaced	C2_05	24"	**68**		$ 125.00	$ 31.25	$ 31.25	$ 73.70	$ 14.74	$ 544.00	$ 680.00	$ 250.00	$ 390.61	$ 125.00	$ 62.50	$ 1,562.44	$ 390.61	$ 2,140.54
	C2_12	36"	**11**		$ 71.57	$ 17.89	$ 17.89	$ 42.20	$ 8.44	$ 99.00	$ 495.00	$ 250.00	$ 223.66	$ 71.57	$ 35.79	$ 894.64	$ 223.66	$ 1,225.66
	C2_13	36"	**12**		$ 91.41	$ 22.85	$ 22.85	$ 53.90	$ 10.78	$ 108.00	$ 720.00	$ 250.00	$ 285.67	$ 91.41	$ 45.71	$ 1,142.68	$ 285.67	$ 1,565.47
To Be Replaced	C3_04	36"	**54**		$ 382.96	$ 95.74	$ 95.74	$ 225.80	$ 45.16	$ 486.00	$ 3,780.00	$ 250.00	$ 1,196.74	$ 382.96	$ 191.48	$ 4,786.96	$ 1,196.74	$ 6,558.14
	C4_02	60"	**101**		$ 697.82	$ 174.45	$ 174.45	$ 411.45	$ 82.29	$ 909.00	$ 7,070.00	$ 250.00	$ 2,180.69	$ 697.82	$ 348.91	$ 8,722.74	$ 2,180.69	$ 11,950.15
To Be Replaced	D1_02	48"	**61**		$ 228.11	$ 57.03	$ 57.03	$ 134.50	$ 26.90	$ 610.00	$ 1,830.00	$ 250.00	$ 712.85	$ 228.11	$ 114.06	$ 2,851.40	$ 712.85	$ 3,906.42
To Be Replaced	D1_03	48"	**59**		$ 221.33	$ 55.33	$ 55.33	$ 130.50	$ 26.10	$ 590.00	$ 1,770.00	$ 250.00	$ 691.65	$ 221.33	$ 110.66	$ 2,766.60	$ 691.65	$ 3,790.24
	D2_03	3'x23'	**70**		$ 110.24	$ 27.56	$ 27.56	$ 65.00	$ 13.00	$ 1,050.00	$ -	$ 250.00	$ 344.50	$ 110.24	$ 55.12	$ 1,378.00	$ 344.50	$ 1,887.86
	D2_04	72"	**73**		$ 473.10	$ 118.27	$ 118.27	$ 278.95	$ 55.79	$ 949.00	$ 4,380.00	$ 250.00	$ 1,478.44	$ 473.10	$ 236.55	$ 5,913.74	$ 1,478.44	$ 8,101.82
	D2_06	72"	**72**		$ 466.91	$ 116.73	$ 116.73	$ 275.30	$ 55.06	$ 936.00	$ 4,320.00	$ 250.00	$ 1,459.09	$ 466.91	$ 233.45	$ 5,836.36	$ 1,459.09	$ 7,995.81
	D2_08	3.6'x5.5'	**54**		$ 89.89	$ 22.47	$ 22.47	$ 53.00	$ 10.60	$ 810.00	$ -	$ 250.00	$ 280.90	$ 89.89	$ 44.94	$ 1,123.60	$ 280.90	$ 1,539.33
To Be Replaced	D3_03	24"	**60**		$ 112.78	$ 28.20	$ 28.20	$ 66.50	$ 13.30	$ 480.00	$ 600.00	$ 250.00	$ 352.45	$ 112.78	$ 56.39	$ 1,409.80	$ 352.45	$ 1,931.43
	E1_02	36"	**89**		$ 617.43	$ 154.36	$ 154.36	$ 364.05	$ 72.81	$ 801.00	$ 6,230.00	$ 250.00	$ 1,929.47	$ 617.43	$ 308.71	$ 7,717.86	$ 1,929.47	$ 10,573.47
To Be Replaced	E1_07	36"	**56**		$ 396.36	$ 99.09	$ 99.09	$ 233.70	$ 46.74	$ 504.00	$ 3,920.00	$ 250.00	$ 1,238.61	$ 396.36	$ 198.18	$ 4,954.44	$ 1,238.61	$ 6,787.58

Total	**$ 136,296.23**
Total Maintenance Only	**$ 80,268.90**

Stream Bank Stabilization Summary of Costs

				Engineering				Contracting		Construction													Contingency	TOTAL COSTS				
Stream ID	Ownership	Length (Ft)	Pay Item Units Unit Costs	Survey const. cost 0%	Design const. cost 10%	Permitting const. cost 3%	Const. Admin const. cost 8%	Bonds / Ins const. cost 2%	Bid Asst. const. cost 2%	Mobilization const. cost 5%	Stream Material Contingency const. cost 5%	S&EC const. cost 2%	Clear and Grub AC $ 1,587	Top Soil CY $ 10	Seeding AC $ 10,000	Vanes EA $ 9,800	Rock Toe LF $ 80	Riffle EA $ 3,900	Rip Rap Ton $ 150	Coir Turf Matting SY $ 11	Permanent TRM SY $ 38	Live Stakes BN $ 1.75	Trees & Shrubs EA $ 100	Const. Contingency Const. Cost 25%	Engineering	Contracting	Construction	Contingency	PROJECT TOTALS
A4_S_10	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
A4_S_17	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
A4_S_27	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
A4_S_32	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
A4_S_35	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
A4_S_38	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B1_S_01	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_07	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_12	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_14	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_15	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_16	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_17	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_32	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B2_S_39	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B4_S_04	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
B4_S_14	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C2_S_08	Private	153		$ -	$ 4,849	$ 1,455	$ 3,879	$ 970	$ 970	$ 2,165	$ 2,165	$ 866	$ 279	$ 1,700	$ 1,756	$ 9,800	$ 12,240	$ 1,193	$ 115	$ 7,480	$ 6,460	$ 744	$ 1,530	$ 12,123	$ 10,183	$ 1,940	$ 48,492	$ 12,123	$ 72,739
C2_S_10	Public	154		$ -	$ 4,874	$ 1,462	$ 3,899	$ 975	$ 975	$ 2,176	$ 2,176	$ 870	$ 281	$ 1,711	$ 1,768	$ 9,800	$ 12,320	$ 1,201	$ 116	$ 7,529	$ 6,502	$ 749	$ 1,540	$ 12,184	$ 10,235	$ 1,950	$ 48,738	$ 12,184	$ 73,106
C2_S_24	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C2_S_26	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C2_S_27	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C2_S_35	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C2_S_36	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_16	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_19	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_20	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_24	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_30	Public	172		$ -	$ 5,315	$ 1,595	$ 4,252	$ 1,063	$ 1,063	$ 2,373	$ 2,373	$ 949	$ 313	$ 1,911	$ 1,974	$ 9,800	$ 13,760	$ 1,342	$ 129	$ 8,409	$ 7,262	$ 836	$ 1,720	$ 13,288	$ 11,162	$ 2,126	$ 53,151	$ 13,288	$ 79,727
C3_S_32	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_33	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C3_S_34	Private	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
C4_S_08	Public	149		$ -	$ 4,751	$ 1,425	$ 3,801	$ 950	$ 950	$ 2,121	$ 2,121	$ 848	$ 271	$ 1,656	$ 1,710	$ 9,800	$ 11,920	$ 1,162	$ 112	$ 7,284	$ 6,291	$ 724	$ 1,490	$ 11,878	$ 9,977	$ 1,900	$ 47,512	$ 11,878	$ 71,267
D1_S_17	Public	154		$ -	$ 4,874	$ 1,462	$ 3,899	$ 975	$ 975	$ 2,176	$ 2,176	$ 870	$ 281	$ 1,711	$ 1,768	$ 9,800	$ 12,320	$ 1,201	$ 116	$ 7,529	$ 6,502	$ 749	$ 1,540	$ 12,184	$ 10,235	$ 1,950	$ 48,738	$ 12,184	$ 73,106
D1_S_24	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D1_S_25	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D1_S_31	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D2_S_16	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D2_S_35	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D2_S_40	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D2_S_52	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
D2_S_60	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
E1_S_01	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026
E1_S_08	Public	200		$ -	$ 6,002	$ 1,801	$ 4,801	$ 1,200	$ 1,200	$ 2,679	$ 2,679	$ 1,072	$ 364	$ 2,222	$ 2,296	$ 9,800	$ 16,000	$ 1,560	$ 150	$ 9,778	$ 8,444	$ 972	$ 2,000	$ 15,004	$ 12,604	$ 2,401	$ 60,017	$ 15,004	$ 90,026

Total	$ 3,880,945
Total (Public Only)	$ 2,187,745

Stream Maintenance Summary of Costs

					Engineering	Contracting		Construction								Contingency	TOTAL COSTS				
				Pay Item Units	Maintenance Admin maint. cost	Bonds / Ins maint. cost	Bid Asst. maint. cost	Mobilization maint. cost	Stream Material Contingency maint. cost	S&EC maint. cost	Clear and Grub AC	Seeding AC	Live Stakes	Bank Repair LF	Debris Removal Truck Load	Const. Contingency Const. Cost	Engineering	Contracting	Construction	Contingency	TOTALS
Stream ID	Name	Percent Blocked	Length (Ft)	Unit Costs	8%	2%	2%	5%	5%	2%	$ 1,587	$ 10,000	$ 1.75	$ 56	$ 2,500	25%					
A1_S_01	Private	100%	135		$ 374	$ 94	$ 94	$ 209	$ 209	$ 84	$ 246	$ 1,550	$ 656	$ 38	$ 1,688	$ 1,170	$ 374	$ 187	$ 4,678	$ 1,170	$ 6,409
A4_S_10	Public	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
A4_S_17	Public	0%	200		$ 330	$ 83	$ 83	$ 184	$ 184	$ 74	$ 364	$ 2,296	$ 972	$ 56	$ -	$ 1,033	$ 330	$ 165	$ 4,131	$ 1,033	$ 5,659
A4_S_27	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
A4_S_32	Public	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
A4_S_35	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
A4_S_38	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
B1_S_01	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
B2_S_07	Private	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
B2_S_12	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B2_S_13	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B2_S_14	Private	0%	200		$ 330	$ 83	$ 83	$ 184	$ 184	$ 74	$ 364	$ 2,296	$ 972	$ 56	$ -	$ 1,033	$ 330	$ 165	$ 4,131	$ 1,033	$ 5,659
B2_S_15	Private	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
B2_S_16	Private	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
B2_S_17	Private	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
B2_S_24	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B2_S_29	Private	100%	199		$ 552	$ 138	$ 138	$ 308	$ 308	$ 123	$ 363	$ 2,284	$ 967	$ 56	$ 2,488	$ 1,724	$ 552	$ 276	$ 6,896	$ 1,724	$ 9,448
B2_S_31	Private	50%	200		$ 442	$ 111	$ 111	$ 247	$ 247	$ 99	$ 364	$ 2,296	$ 972	$ 56	$ 1,250	$ 1,383	$ 442	$ 221	$ 5,531	$ 1,383	$ 7,577
B2_S_32	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B2_S_35	Private	100%	199		$ 552	$ 138	$ 138	$ 308	$ 308	$ 123	$ 363	$ 2,284	$ 967	$ 56	$ 2,488	$ 1,724	$ 552	$ 276	$ 6,896	$ 1,724	$ 9,448
B2_S_39	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B2_S_57	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
B4_S_04	Private	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
B4_S_14	Private	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
C2_S_02	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C2_S_08	Private	100%	153		$ 424	$ 106	$ 106	$ 237	$ 237	$ 95	$ 279	$ 1,756	$ 744	$ 43	$ 1,913	$ 1,326	$ 424	$ 212	$ 5,302	$ 1,326	$ 7,264
C2_S_10	Public	0%	154		$ 254	$ 64	$ 64	$ 142	$ 142	$ 57	$ 281	$ 1,768	$ 749	$ 43	$ -	$ 795	$ 254	$ 127	$ 3,181	$ 795	$ 4,358
C2_S_13	Private	100%	199		$ 552	$ 138	$ 138	$ 308	$ 308	$ 123	$ 363	$ 2,284	$ 967	$ 56	$ 2,488	$ 1,724	$ 552	$ 276	$ 6,896	$ 1,724	$ 9,448
C2_S_24	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C2_S_26	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C2_S_28	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C2_S_35	Private	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C2_S_36	Private	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
C3_S_14	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
C3_S_16	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
C3_S_20	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
C3_S_24	Public	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
C3_S_29	Public	50%	200		$ 442	$ 111	$ 111	$ 247	$ 247	$ 99	$ 364	$ 2,296	$ 972	$ 56	$ 1,250	$ 1,383	$ 442	$ 221	$ 5,531	$ 1,383	$ 7,577
C3_S_30	Public	50%	172		$ 381	$ 95	$ 95	$ 212	$ 212	$ 85	$ 313	$ 1,974	$ 836	$ 48	$ 1,075	$ 1,189	$ 381	$ 190	$ 4,757	$ 1,189	$ 6,516
C3_S_33	Private	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
C4_S_08	Public	100%	149		$ 413	$ 103	$ 103	$ 231	$ 231	$ 92	$ 271	$ 1,710	$ 724	$ 42	$ 1,863	$ 1,291	$ 413	$ 207	$ 5,163	$ 1,291	$ 7,074
D1_S_01	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D1_S_17	Public	0%	154		$ 254	$ 64	$ 64	$ 142	$ 142	$ 57	$ 281	$ 1,768	$ 749	$ 43	$ -	$ 795	$ 254	$ 127	$ 3,181	$ 795	$ 4,358
D1_S_19	Public	100%	154		$ 427	$ 107	$ 107	$ 238	$ 238	$ 95	$ 281	$ 1,768	$ 749	$ 43	$ 1,925	$ 1,334	$ 427	$ 213	$ 5,337	$ 1,334	$ 7,311
D1_S_21	Public	100%	154		$ 427	$ 107	$ 107	$ 238	$ 238	$ 95	$ 281	$ 1,768	$ 749	$ 43	$ 1,925	$ 1,334	$ 427	$ 213	$ 5,337	$ 1,334	$ 7,311
D1_S_24	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D1_S_25	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D1_S_31	Public	50%	200		$ 442	$ 111	$ 111	$ 247	$ 247	$ 99	$ 364	$ 2,296	$ 972	$ 56	$ 1,250	$ 1,383	$ 442	$ 221	$ 5,531	$ 1,383	$ 7,577
D2_S_03	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_04	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_12	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_13	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
D2_S_35	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_40	Public	75%	200		$ 498	$ 125	$ 125	$ 278	$ 278	$ 111	$ 364	$ 2,296	$ 972	$ 56	$ 1,875	$ 1,558	$ 498	$ 249	$ 6,231	$ 1,558	$ 8,536
D2_S_41	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_42	Public	100%	178		$ 493	$ 123	$ 123	$ 275	$ 275	$ 110	$ 324	$ 2,043	$ 865	$ 50	$ 2,225	$ 1,542	$ 493	$ 247	$ 6,168	$ 1,542	$ 8,451
D2_S_50	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_52	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
D2_S_60	Public	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
D3_S_09	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
E1_S_01	Public	25%	200		$ 386	$ 97	$ 97	$ 216	$ 216	$ 86	$ 364	$ 2,296	$ 972	$ 56	$ 625	$ 1,208	$ 386	$ 193	$ 4,831	$ 1,208	$ 6,618
E1_S_08	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495
E1_S_09	Public	100%	200		$ 554	$ 139	$ 139	$ 309	$ 309	$ 124	$ 364	$ 2,296	$ 972	$ 56	$ 2,500	$ 1,733	$ 554	$ 277	$ 6,931	$ 1,733	$ 9,495

TOTAL	$ 524,661
TOTAL (Public Only)	$ 302,425