6 ASSESSMENT OF EXISTING CONDITIONS

6.1 Level of Service

The performance of the drainage systems was assessed by comparing the results against the targeted level of service described in Section 2.2.1 of the RFP and the City's modelling guideline. The targeted level of service criteria is described below.

- **Sanitary Sewer System -** The maximum hydraulic grade line (HGL) of the sanitary system shall be maintained below the basement elevation (1.8 m below street centreline elevation) during a storm equivalent to the May 12, 2000 storm as gauged at the City's Oriole Yard (Station 102) located at Sheppard Avenue and Leslie Street.
- **Storm Sewer System (Minor System)** - The maximum HGL in the storm sewer (minor) system shall be maintained below the basement elevation (assume 1.8 m below the ground elevation) during the 100-year design storm.
- **Shallow Sewer System** - Shallow sewers are defined as having pipe obvert elevations less than 1.8 m below the ground elevation. For shallow storm sewers, no surcharging conditions should occur during a 100-year design storm event. For shallow sanitary sewers, the HGL freeboard of 1.8 m or greater under May 12, 2000 storm event should be maintained.
- **Storm Overland System (Major System)** - The overland flow (major) system shall be maintained within the road allowance. The overland flow depth shall be contained within the road allowance and be no deeper than the recommended standard which varies depending on the type of road during the 100-year design storm. **Table 6.1** summarizes the permissible overland depth for each type of road. **Figure 6.1** shows the concept of allowable overland flow depth by road type. Regardless of road types, the allowable overland flow depth should be maintained within 150 mm above the gutter in areas with reverse-slope driveways.

Table 6.1: Permissible Flow Depth by Road Type

Road Type	Criteria	Paved Road Width (m)	Permissible Depth (m)
Local	The maximum depth of ponding shall be the lesser of 150mm above the crown of road or the water level up to the right-of-way limit during the 100-year storm event.	8.5	0.235
Collector	The maximum depth of ponding shall be the lesser of 100mm above the crown of road or the water level up to the right-of-way limit during the 100-year storm event.	11.0	0.210
Arterial	The maximum depth of flow is the crown of the road during the 100-year storm event.	22.7	0.227

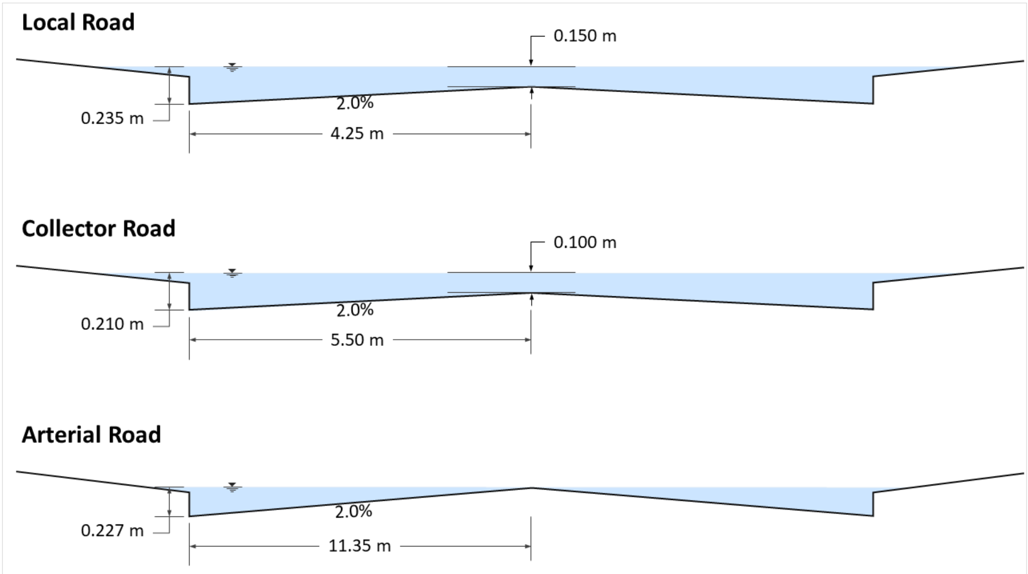


Figure 6.1: Permissible Overland Flow Depth

Colour maps, consistent with the City's approach, have been prepared to assist with the interpretation of results. Surcharging pipes and HGL within basement levels are identified by showing colour-coded pipes and the nodes as follows:

- **Pipes:**
  - **Green,** i.e. Surcharge state < 1: The pipe is not surcharged, operates under free-flow conditions with residual capacity available;
  - **Yellow,** i.e. Surcharge state = 1**:** The pipe is surcharged and the slope of the HGL is less than or equal to the gradient of the pipe. This means that the surcharge condition is caused by backwater from the downstream system; and,
  - **Red,** i.e. Surcharge state = 2: The pipe is surcharged and the slope of the HGL is steeper than the gradient of the pipe. This means that the surcharge is caused by 'bottleneck' condition within that pipe, as the flow exceeds the free-flow capacity of the pipe.
- **Nodes:**
  - **Green:** The connecting pipes are not surcharged at the node, or the pipe is surcharged and the HGL is greater than 1.8 m from the surface elevation (the HGL assumed to be below basement elevation);
  - **Yellow:** A connecting pipe is surcharged and the HGL is within 1.8 m from the surface elevation, predicting potential basement flooding; and,
  - **Red:** HGL is at or above the surface elevation.
- **Overland Flow Depth:**
  - **Green:** Water level in the overland is between surface to 150 mm above gutter surface, indicates that the flow is contained within the street curbline;
  - **Yellow:** Water level in the overland system is between 150 mm and 235 mm above gutter

surface for local roads, 150 mm and 210 mm above gutter surface for collector roads, 150 mm and 227 mm above gutter surface for arterial roads, indicates the water is above the curb but contained within the street right-of-way (public property); and,

- **Red:** Water level in the overland system is more than 235 mm above gutter surface for local roads, 210 mm above gutter surface for collector roads, and 227 mm above gutter surface for arterial roads, indicates potential surface flooding of private properties and potential basement flooding from surface runoff.
- For areas with reverse slope driveways, the overland flow depth criterion is 150mm above gutter surface.

6.2 Sanitary Sewer System

6.2.1 Description of the Sanitary System Model

The sanitary servicing area for the Capacity Assessment Study Area 58 consists of approximately 3,900 properties. A detailed model of the sanitary sewer system was developed to assess the performance of the system, identify any potential sewer system deficiencies, and develop alternative solutions to alleviate the issues found. The model consists of approximately 1,070 sanitary sewers, 1,090 maintenance holes and 830 subcatchments within the study area.

The base flow (ground infiltration rates), theoretical wastewater profile for residential areas, population, trade flows for ICI areas were used as model inputs to simulate sewer flows under various design storm events. The resulting flow and water level in each pipe in the sanitary sewer system is calculated by the model and is based on the dry-weather flow and inflow and infiltration (I/I) rates generated by rainfall.

Boundary conditions were reviewed and established for the sanitary system at the outlets discharging into the existing West Don River STS to account for any potential backwater effects during storm events. Free-flow conditions are assumed at the trunk sewer connections which is supported by a Sanitary System Boundary Conditions and Trunk Sewer Analysis as per **Appendix TM#2**.

External sanitary inflows were also identified and accounted for in this model. Though Area 58 borders with 12 Basement Flooding Areas (BFAs), only Area 26 and Area 28 contribute sanitary flows to Area 58. The external inflows from BFA 26 and 28 were obtained from the “Existing Conditions” InfoWorks EA model. The contributing sanitary flows from BFA 26 and 28 under various storm events have been incorporated into the A58 sanitary model as inflows.

Details regarding the model development and refinement are provided in **Appendix TM#2**.

6.2.2 Dry and Wet Weather Analysis

The sanitary sewer system was evaluated for both the existing (2016) and future (2041) populations under various storm events:

- For dry-weather flow characterization, the existing and future conditions models assume the 2016 and 2041 populations provided by the City respectively. Where data gaps existed in the population data provided, trade flows were then used when available, or assumptions were made based on adjacent areas with similar land use characteristics.

- In the absence of sanitary flow monitoring data, the model used theoretical wastewater profiles and a theoretical Harmon Peaking Factor (PF) of 3.0 as the maximum PF. A generated rate of 240 L/c/d was used as the average daily flow, with a constant rate allowance of 0.26 L/s/ha as the dry-weather infiltration rate. For the future population, a generation rate of 450 L/c/d was used.
- In the absence of sanitary flow monitoring data, the RTK unit hydrograph approach was used to generate an I/I rate of 3 L/s/ha during the May 12, 2000 event as recorded at the Oriole Yard gauge, as per Section 2.3.11.e of the RFP. The existing model was adjusted to generate a 3 L/s/ha of I/I rate, independent of dry weather flow, at the outlets (outlet pipe just upstream of a sanitary trunk sewer or at another location, i.e. downstream pipe of a subsewershed where the former is not feasible).

The sanitary sewer system performance assessment identifies expected flooding locations where the system does not meet the City's targeted level of service as detailed in **Section 6.1** for the May 12, 2000 storm as gauged at the City's Oriole Yard Station. This storm is considered to have a return period of between 1 in 25 and 1 in 50 years, with a 5-minute peak intensity of 160 mm/hr and a total duration of 24 hours. For the sanitary sewer system, the targeted level of service states that the maximum HGL of the sanitary system must be maintained below basement elevations (approximately 1.8 m below ground elevation) under May 12, 2000 storm event.

6.2.3 Model Calibration and Validation

As the historical rainfall and flow monitoring data was limited and no significant rainfall event (> 40mm/hr) was been captured during the Rainfall and Flow Monitoring Program, the model has not been calibrated to flow monitoring results. However, the simulated sanitary system results were validated against the collected flooding incidents, i.e. Hansen records, during TM#2, under various historical storm events.

6.2.4 Summary of Sanitary Sewer System Performance

Overall, approximately 10% of the sanitary system under existing conditions and 11% of the sanitary system under future conditions failed to meet the targeted LOS. In some cases, the HGL is at the theoretical basement levels in commercial/industrial properties. However, these units typically have no basements.

Figure 6.2 shows the simulation results for the May 12, 2000 design storm under existing conditions. The results show that overloaded sewers are a primary cause for surcharging, followed by backwater due to bottlenecks downstream. This can be expected because these sewers were not designed to convey the predicted flows under the current storm criteria. The following summarizes the general locations where sanitary sewer targeted levels were not met as part of the Capacity Assessment Study.

- North section of the study area
  - West of Dufferin Street and south of Steeles Avenue West;
  - Upstream of Robert Hicks Drive outlet; and
  - Along Goldfinch Court south of Finch Avenue West.

- Middle section of the study area
    - Upstream of the Sandringham Drive outlet;
    - Upstream of the Wilson Avenue outlet, west of Yonge Street;
    - Upstream of the York Mills Road outlet, east of Yonge Street;
    - Upstream of the Plymbridge Road outlet, north of the Don River; and
    - Upstream of the Plymbridge Road outlet, south of the Don River
- South section of the study area
    - Upstream of the outlet near Bayview Street near Post Road; and
    - Upstream of the Suncrest Drive outlet.

Specific to the five Assignments being considered for this study, sanitary sewer system deficiencies were also observed within one of the five Schedule B project areas – A58-29: York Mills Road Area. As shown in **Figure 6.2**, various locations along Old Yonge Street, York Mills Road, Hedgewood Road and Highland Crescent are not meeting the City's level of service based on the simulated results.

6.3 Storm Drainage System

6.3.1 Description of the Storm System Model

The storm servicing area for the Capacity Assessment Study Area 58 consists of approximately 3,900 properties. A detailed dual system model, which consists of the sewer system (minor system) and the overland flow system (major system) was developed to assess the performance of the system, identify any potential sewer system deficiencies, and develop alternative solutions to alleviate the issues found. The dual system model considers the interaction between the two systems and simulates the flow and water depth in every element of the minor and the major systems.

The storm sewer network was assembled using the sewer network database provided by the City, including approximately 1,380 storm sewers and 1,420 maintenance holes. The system was modeled maintenance hole to maintenance hole and the number of catchbasins between maintenance hole was input as the number of inlets called gullies in the model to account for the distribution of major and minor system flows. The minor system consisted of the storm sewer network. The overland drainage system typically consisted of streets with flows constrained by the curb and / or municipal right-of-way along both sides of the street, as well as open channels such as ditches. A GIS analysis was undertaken based on the contour information and digital ground model provided by the City to delineate the overland drainage system features such as surface drainage flow path and direction, surface ponding areas, and subcatchment area boundaries. The interaction between the major and minor systems were presented by the inlets.

Surface area hydrologic characteristics were considered for every subcatchment, which were delineated MH-to-MH. The area of each subcatchment draining to a node was delineated using the topographic contour layer, aerial photos, and the City's digital elevation model (DEM). To have flexibility with downspout connectivity and the influence of flat roof storage on the collection system, roof areas were modeled as separate subcatchments, complete with control to the minor system and overflow to the major system. The contributing roof area is the percentage of the directly connected roofs to the sewer system which was based on the information obtained during field survey. All roof downspouts directed into the ground were considered connected to the storm sewer system with the flow up to the capacity of the roof drainage system discharging directly to the sewer.

Nine types of runoff surface areas were considered for every subcatchment . The distribution between pervious, impervious and roof areas in each subcatchment area were determined via spatial overlay of "Land Use" parcels, impervious layers obtained through the City's ESM imagery, and the aerial photography using ArcGIS. The SWMM runoff model was used in conjunction with the Horton infiltration method for the pervious areas within InfoWorks CS. Flow routing was performed using the SWMM routing model.

The model includes 1,386 subcatchment areas, 1,767 nodes, 913 sewer links, and 1,025 overland flow links, as well as user-control conduits to simulate the roof connections. To address the impact of the potential river water levels on system performance, water levels derived from TRCA floodplain mapping for the East Don River were reviewed against the storm outfall elevations. A sensitivity analysis was completed for those outfalls within the floodplain, and three outfalls required the addition of downstream water levels for the simulations.

External storm inflows were also identified and accounted for in this model. Though Area 58 borders with 12 Basement Flooding Areas (BFAs), only two of the areas (BFA 40 and 43) contribute storm flow to Area 58. The external inflows from the two BFAs were obtained from the "Existing Conditions" InfoWorks EA model. The contributing storm flows from the two BFAs under various storm events have been incorporated into the A58 storm model as inflows.

Details regarding the model development and refinement are provided in **Appendix TM#2**.

6.3.2 Storm System Analysis

The existing storm major and minor system was evaluated under a number of storm events. The events include the 100-year design storm and three historical event – May 12, 2000, August 19, 2005 and July 8, 2013 (generated following the Thiessen polygon method). The storm sewer system performance assessment identifies expected flooding locations where the system does not meet the City's targeted LOS as described in **Section 6.1**.

6.3.3 Model Calibration and Validation

As the historical rainfall and flow monitoring data was limited and no significant rainfall event (> 40mm/hr) has been captured during the Rainfall and Flow Monitoring Program, the model has not been calibrated to flow monitoring results. However, the simulated storm system results were validated against the collected flooding incidents, i.e. Hansen records, during TM#2, under various historical storm events.

6.3.4 Summary of Storm Drainage System Performance

The results of the storm drainage system under the 100-year design storm as per the City's targeted level of service together with the reported flooding incidents from Hansen records and online questionnaires are illustrated in **Figure 6.3** and **Figure 6.4**.

The simulated results indicate that approximately 51% of the system does not meet the criteria. Shallow storm sewers, approximately 29% of the storm sewer system, are present in the study area, and approximately 23% of the surcharging sewers are shallow sewers. Overloaded sewers are a primary cause for surcharge; followed by back water. As a consequence of bottlenecked sewers, this can be expected because these sewers were not designed to convey the flow from an extreme storm event. Approximately 17% of the area is expected to experience overland flow depths exceeding the City's allowable overland depth criteria under the 100-year design storm, with approximately 21% of the identified reverse slope driveways subject to potential surface flooding.

A few flood vulnerable areas, which experience both sewer bottlenecks and backups are observed during this event include the following:

- Northern section of the study area
    - Around Supertest Rd area west of Dufferin Street;
    - Along Hidden Trail;
    - Along Finch Avenue W; and
    - Denmark Crescent and Hearthstone Crescent area west of Bathurst Street.
- Middle section of the study area
    - Wilson Ave west of Belgrave Ave;
    - Along Yonge Street south of Highway 401; and
    - Upstream of the York Mills Road outfall east of Yonge Street.
- Southern section of the study area
    - Upstream of Valleyanna Drive outfall;
    - Long High Point Road and Glenorchy Road and Royal Oak Drive area and;
    - Along Bayview Avenue near Kilgour Road.

Specific to this study area, storm drainage system deficiencies were also observed within the five Schedule B project areas based on the simulated model results under the 100-year design storm.

- A58-07: Robert Hicks Area
    - Various degrees of storm sewer surcharging, bottlenecks and overland ponding were observed along Robert Hicks Drive, Virgilwood Drive, Ivan Nelson Drive and Dollery Court area.
    - Two low points and two reverse slope driveways were identified within the area.
- A58-28: Old Yonge Street
    - Various degrees of storm sewer surcharging, bottlenecks and overland ponding were observed along Old Yonge Street.
- A58-29: York Mills Road Area

  - Various degrees of storm sewer surcharging, bottlenecks and overland ponding were observed along Old Yonge Street, Owen Boulevard, Gordon Road, Munro Boulevard, York Mills Road, Beechwood Avenue, Highland Crescent and Hedgewood Road.
  - A few low points and reverse slope driveways were also identified within the area which were subject to overland flooding.
- A58-39: Belgrave / Highway 401 Area
  - Overland flooding and one reverse slope driveway were identified along Belgrave Avenue.
- A58-41: Eglinton Avenue East Area
  - Various degrees of storm sewer surcharging, bottlenecks and overland ponding were observed along Don Mills Road, Wynford Drive, Gervais Drive Eglinton Avenue East and Eglington West lbm.
  - A few low points were also identified within the area.

6.4 Identification of Problem Areas

Flood clusters / problems areas were identified based on a combination of reported flooding incidents from City's Hansen records and simulated model results based on the targeted LOS. The identified flood clusters were reviewed against the questionnaire results to ensure the inclusion of all potential problem areas. Each flood cluster is delineated based on the storm outfall or sanitary outlet catchment area and is a group of hydraulically connected sewers. The flood mitigation solutions are to be developed for all residential areas that fail to meet the targeted LOS criteria. In consultation with the City, it was agreed that the same LOS criteria are also applicable to the ICI areas.

A majority of the identified problems involve deficiencies of the drainage systems within the municipal right-of-way, which can follow the Schedule A / A+ process and have been documented in a separate set of study reports. Nevertheless, there are five areas that involve deficiencies of drainage systems through private properties where no easements have been located on those properties. The five problem areas include:

- A58-07: Robert Hicks Area (Storm system deficiency)
- A58-28: Old Yonge Street (Storm system deficiency)
- A58-29: York Mills Road Area (Storm and sanitary systems deficiency)
- A58-39: Belgrave / Highway 401 Area (Storm system deficiency)
- A58-41: Eglinton Avenue East Area (Storm system deficiency)

It should be noted that although deficiencies were observed in both storm and sanitary system for A58-29, the proposed storm system improvement works will be carried out as a Schedule A/A+ project as part of the Capacity Assessment Study. The A58-29 project in this study only deals with the sanitary sewer system.

6.4.1 Factors Contributions to Basement Flooding

To determine the primary and most possible causes of basement flooding, several sources of available information were reviewed, including:

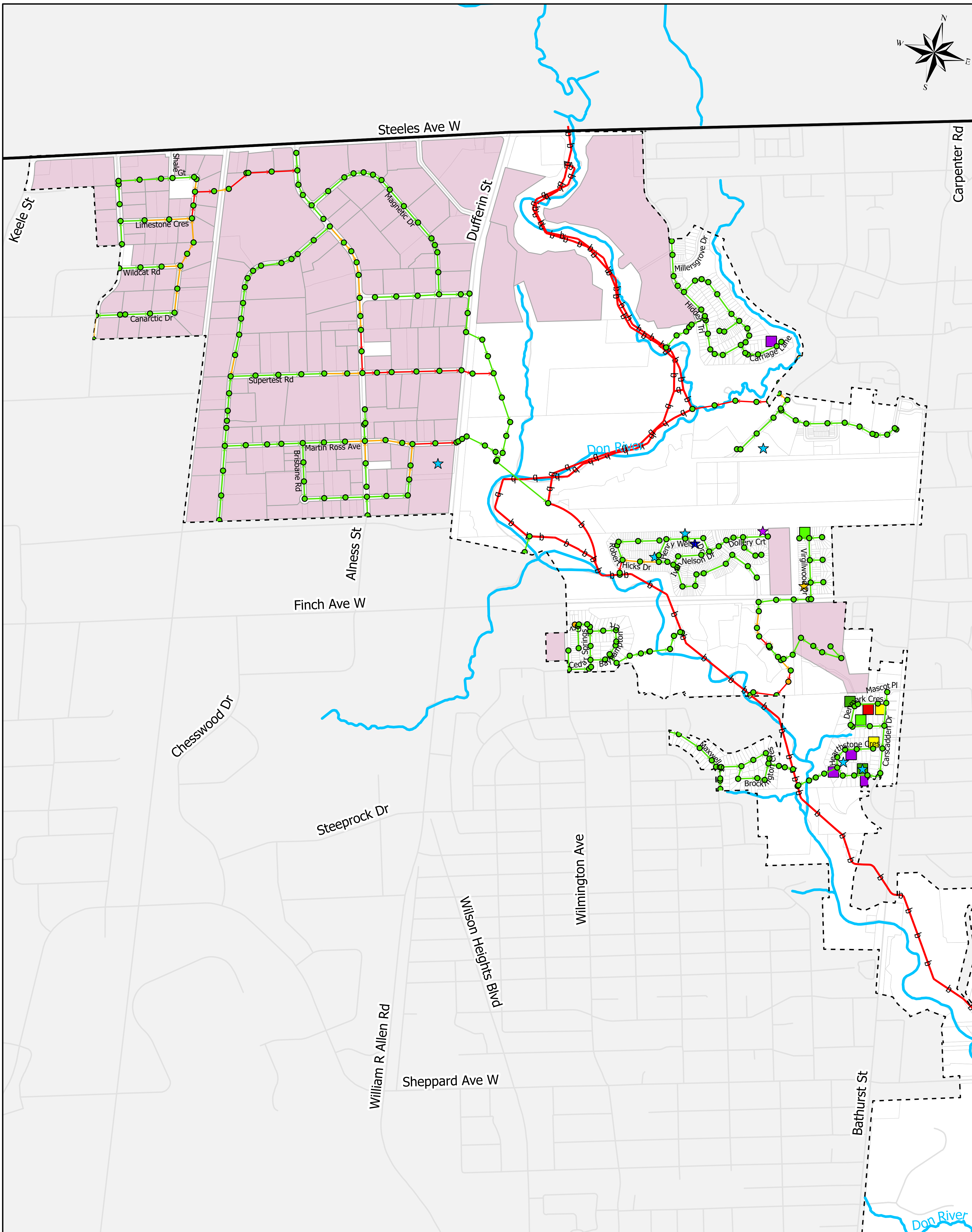
- Sewer network database;
- Digital Elevation Model and LiDAR;
- Review of as-built drawings near properties that reported basement flooding;
- Groundwater elevations in relation to sewer invert elevations;
- Review of the basement flooding reports provided in the Hansen database;
- Inventory of houses with reverse-sloped driveways in priority 1 and 2 clusters;
- Confirmation of low points through the FS&IP;
- Results of the sanitary, storm and overland network for three (3) historic storm events; and,
- CCTV reports to identify blockages in the sewer lines.

Based on the field investigations, background information review and other study findings, the causes of flooding in the study area may be attributed to one or more the following factors:

- Surcharge of the sanitary sewer system caused by overflowing storm water entering the sewer system due to cross-connection to the sanitary system;
- Surcharge of the storm sewer system;
- Limitation of downstream receiving local sewer systems (bottlenecks);
- High overland flow depth above street right-of-way elevation and accumulation of surface runoff in low-lying areas; and
- Surface flooding entering properties with reverse-sloped driveways.

Based on the available information, in locations where flooding complaints exist, but the model results show that the sewer criteria are met, this could be attributed to one or more of the following:

- Local operational issues, e.g. blockages, collapse laterals, poor grading;
- Basement levels lower than 1.8 m from ground elevation;
- Rainfall variability. A high peak intensity of the storm could have been occurred locally within individual cluster areas;
- Structural problems in the private drains;
- Cracks in the basement walls or floor resulting in storm water leakage; and
- Improper installation or operation of backflow prevention valves



Legend

- Municipal Boundaries
- Sanitary Boundary (Revised)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)
- Sanitary Trunk Sewer

Online Questionnaire Results:

- Flooded more than 5 times
- Flooded 4 times
- Flooded 3 times
- Flooded 2 times
- Flooded 1 time
- Flooded with unknown frequency

Flooding Report Date (76):

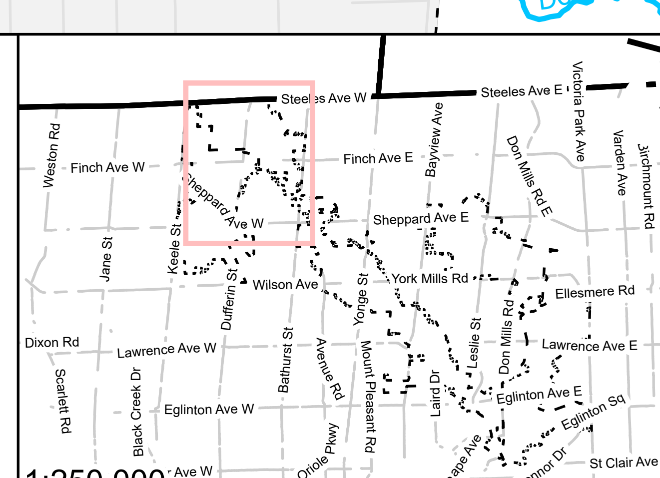
- May 12, 2000
- Aug 19, 2005
- Jul 8, 2008
- Jul 8, 2013
- Oct 16 & 20, 2014
- Aug 7, 2018

Hydraulic Grade Line:

- At or Above Surface
- Within Basement Level (0-1.8m)
- Below Basement (>1.8m)

Sanitary Sewers:

- Bottleneck
- At capacity
- Within Capacity



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Project: Toronto Basement Flooding Study Area 58

Figure 6.2 (A)
Sanitary Sewer System Performance Unde
May 12 2000 Event, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8 Kilometers

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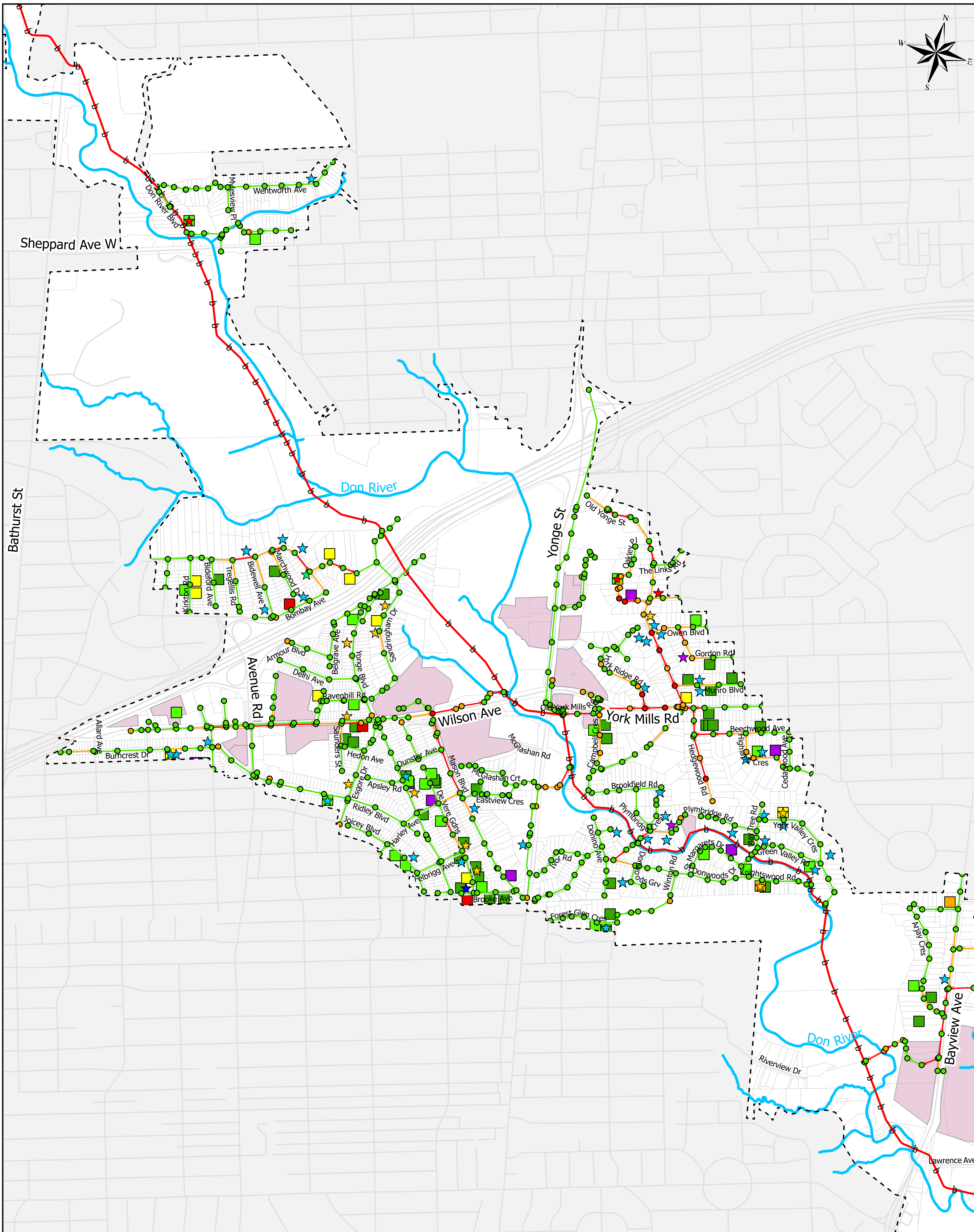

Legend

- Municipal Boundaries
- Sanitary Boundary (Revised)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)
- Sanitary Trunk Sewer

Online Questionnaire Results:
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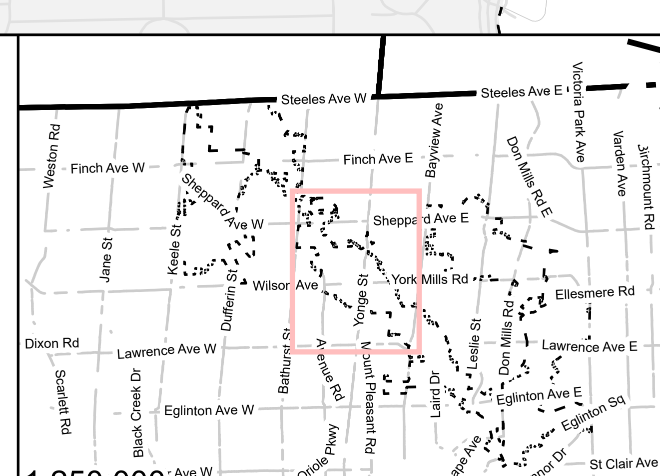
- Below Basement (>1.8m)

Sanitary Sewers:
- Bottleneck
- At capacity
- Within Capacity



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Project: Toronto Basement Flooding Study Area 58

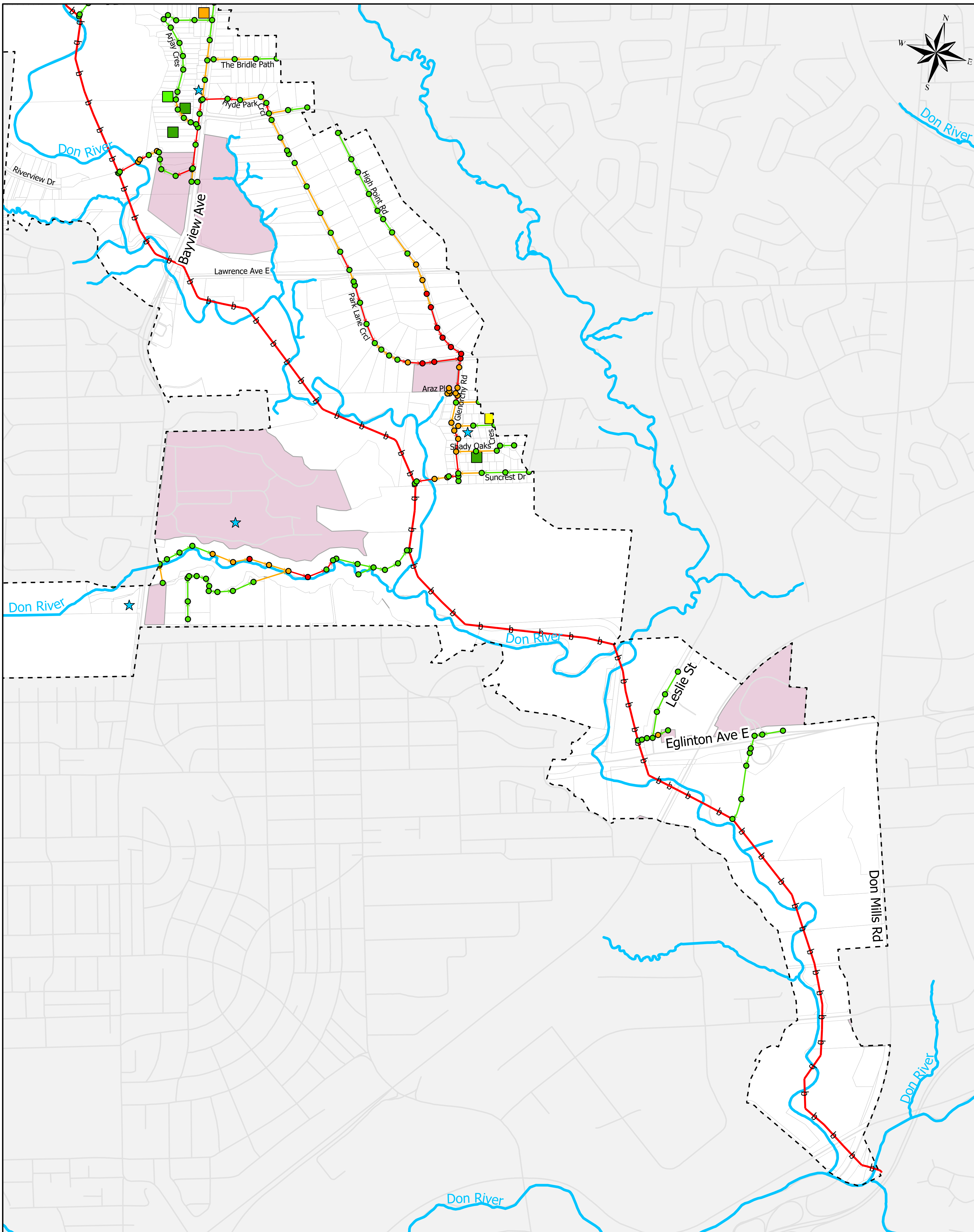
Figure 6.2 (B)
Sanitary Sewer System Performance Under May 12 2000 Event, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8 Kilometers

1:16,000



Legend

- Municipal Boundaries
- Sanitary Boundary (Revised)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)
- Sanitary Trunk Sewer

Online Questionnaire Results:

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Flooding Report Date (76):

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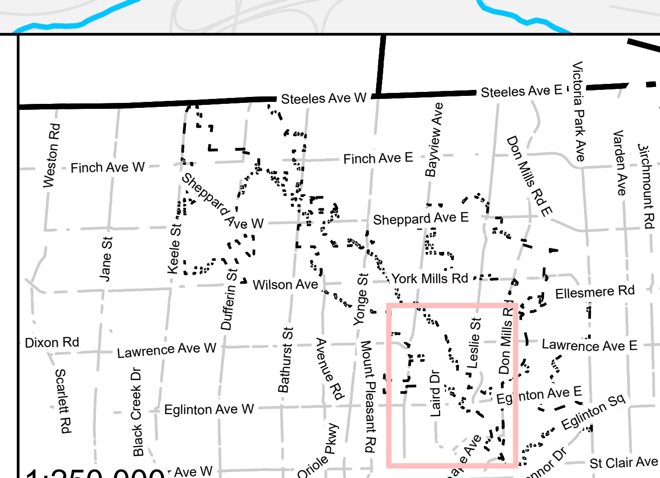
- Jul 8, 2013
- Oct 16 & 20, 2014
- Aug 7, 2018

Hydraulic Grade Line:

- At or Above Surface
- Within Basement Level (0-1.8m)
- Below Basement (>1.8m)

Sanitary Sewers:

- Bottleneck
- At capacity
- Within Capacity



Project: Toronto Basement Flooding Study Area 58

Figure 6.2 (C)
Sanitary Sewer System Performance Unde
May 12 2000 Event, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

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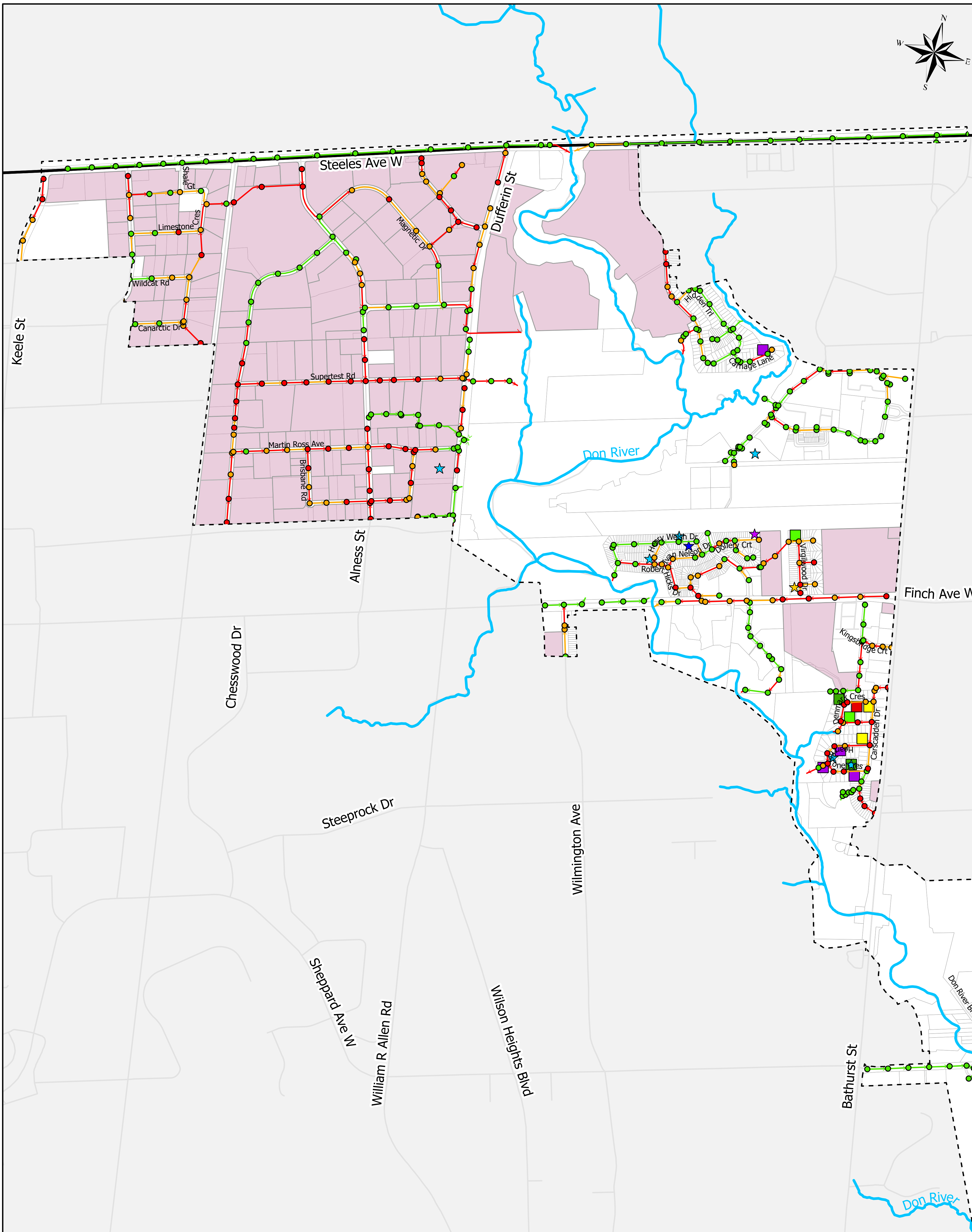
Kilometers

1:16,000



Legend

- Municipal Boundaries
- Storm Boundary
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)

Online Questionnaire Results:

- Flooded more than 5 times
- Flooded 4 times
- Flooded 3 times
- Flooded 2 times
- Flooded 1 time
- Flooded with unknown frequency

Flooding Report Date (76):

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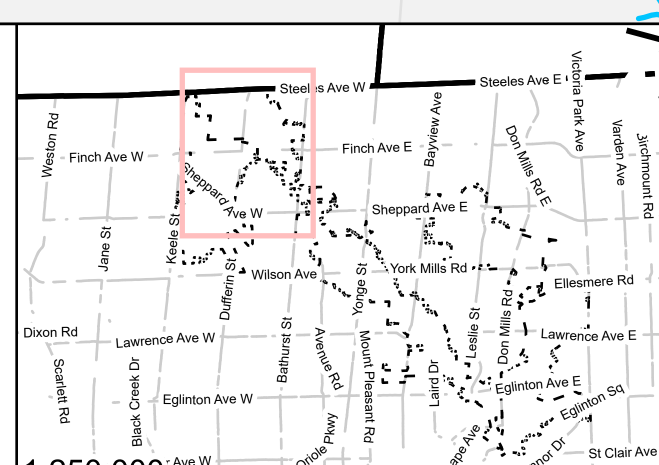
- Below Basement (>1.8m)

Storm Sewers:

- Bottleneck
- At capacity
- Within Capacity



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Project: Toronto Basement Flooding Study Area 58

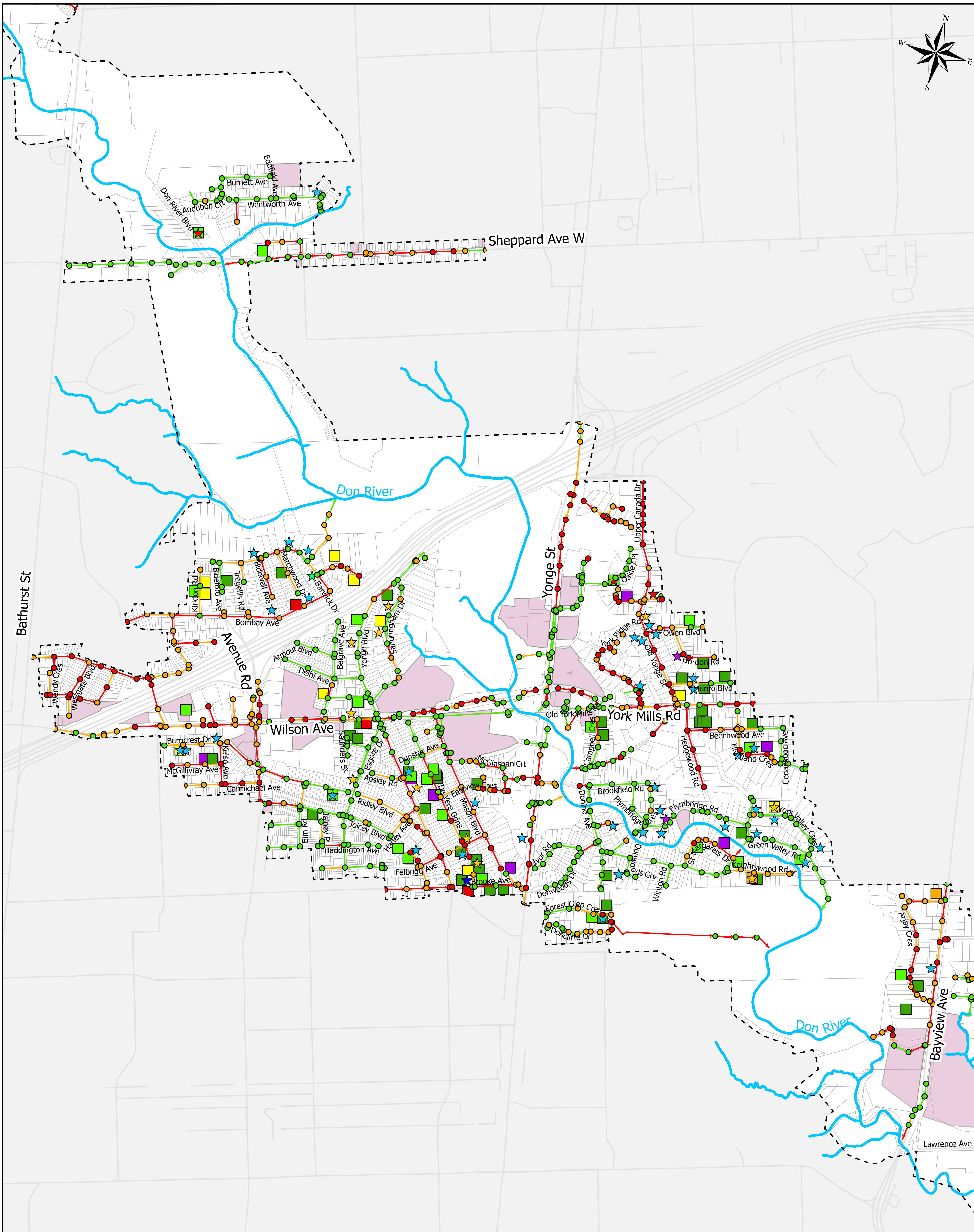
Figure 6.3 (A)
Storm Sewer System Performance Under 100-Year Design Storm, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8
Kilometers

1:16,500



Legend

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- Storm Boundary
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)

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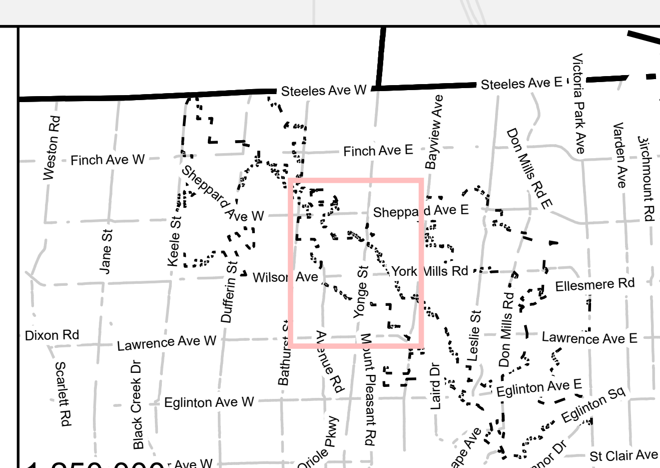
Storm Sewers:

- Bottleneck
- At capacity
- Within Capacity



Project: Toronto Basement Flooding Study Area 58

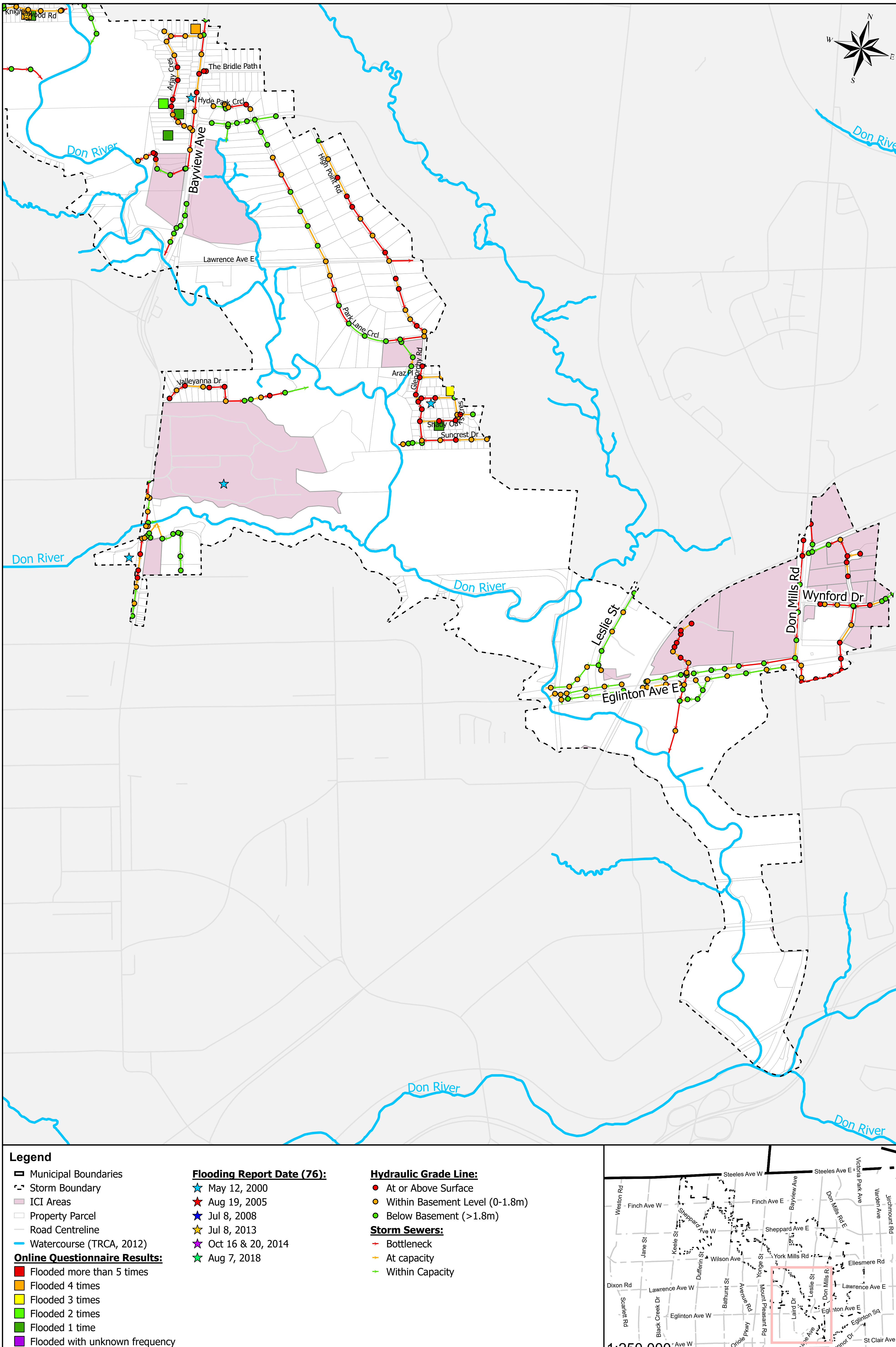
Figure 6.3 (B)
Storm Sewer System Performance Under 100-Year Design Storm, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8
Kilometers

1:16,500



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Project: Toronto Basement Flooding Study Area 58

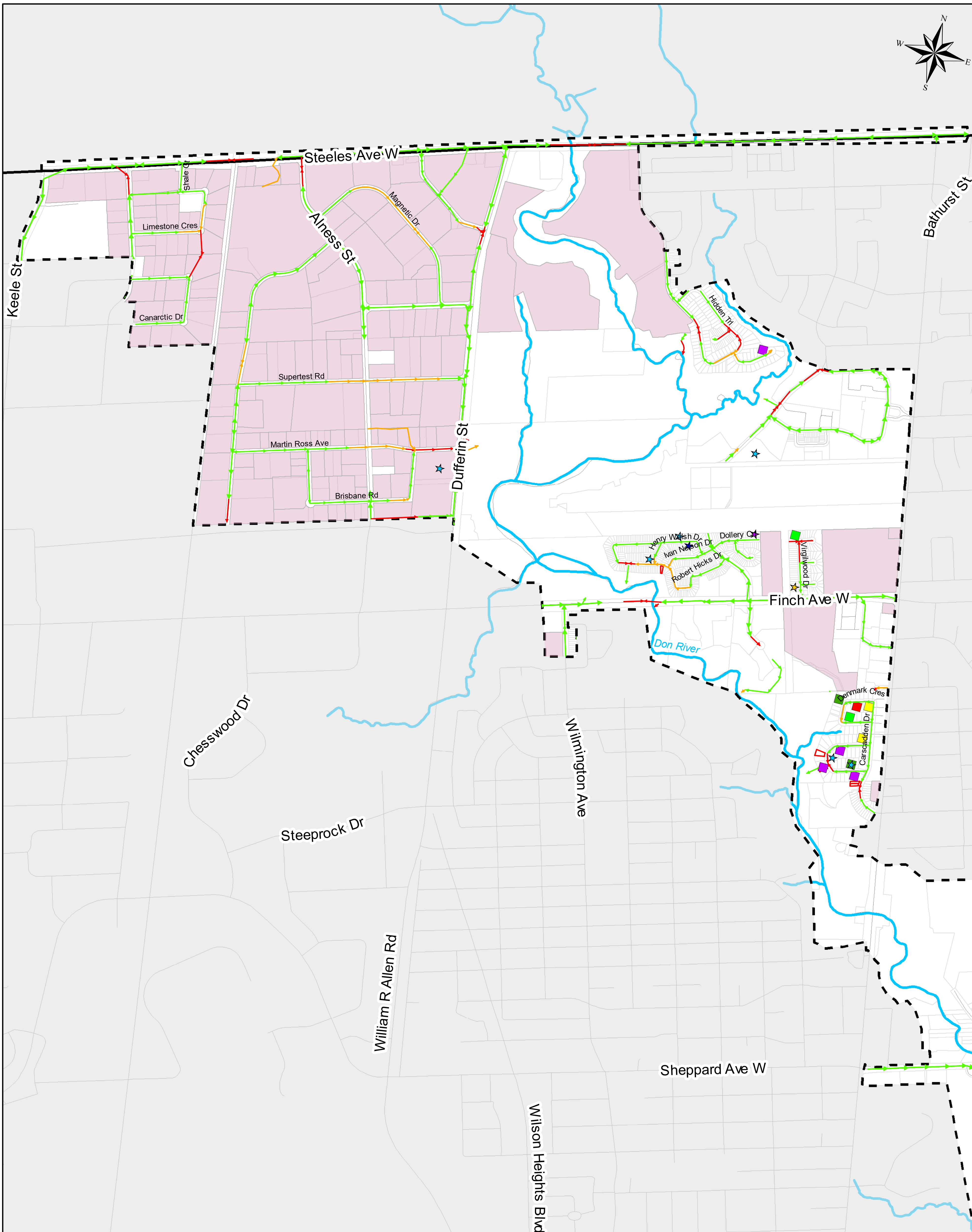
Figure 6.3 (C)
Storm Sewer System Performance Under 100-Year Design Storm, Existing Conditions

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8 Kilometers

1:16,500



Legend

- Municipal Boundary
- Storm Boundary
- Parcels (Reverse Slope Driveway Parcels)
- Flooded Parcels (Reverse Slope Driveway with Overland Depth > 0.15m)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)

Online Questionnaire Results:

- Flooded 5 or more times
- Flooded 4 times
- Flooded 3 times
- Flooded 2 times
- Flooded 1 time
- Flooded with unkown frequency

Flooding Report Date (76):

- May 12, 2000
- Aug 19, 2005
- Jul 8, 2008
- Jul 8, 2013
- Oct 16 & 20, 2014
- Aug 7, 2018

Collector Road Overland Depth

- >=0.21m
- 0.15m - 0.21m
- <=0.15m

Arterial Road Overland Depth

- >0.227m
- >0.15m - 0.226m
- <=0.15m

Open Channel Overland Depth

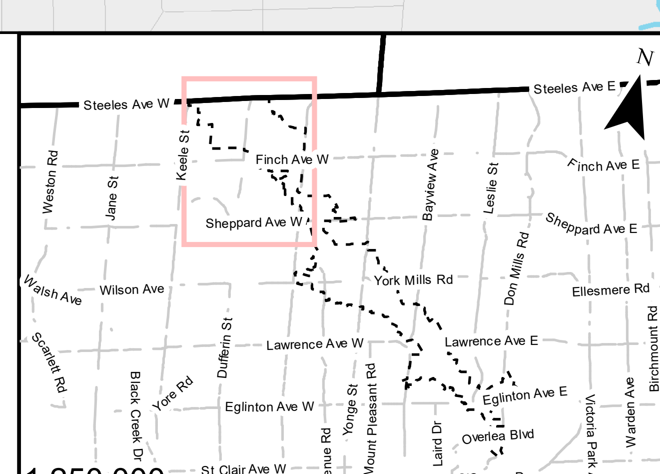
- >0.5m
- >0.15m - 0.5m
- <=0.15m

Local Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m

Rural Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m



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Project: Toronto Basement Flooding Study Area 58

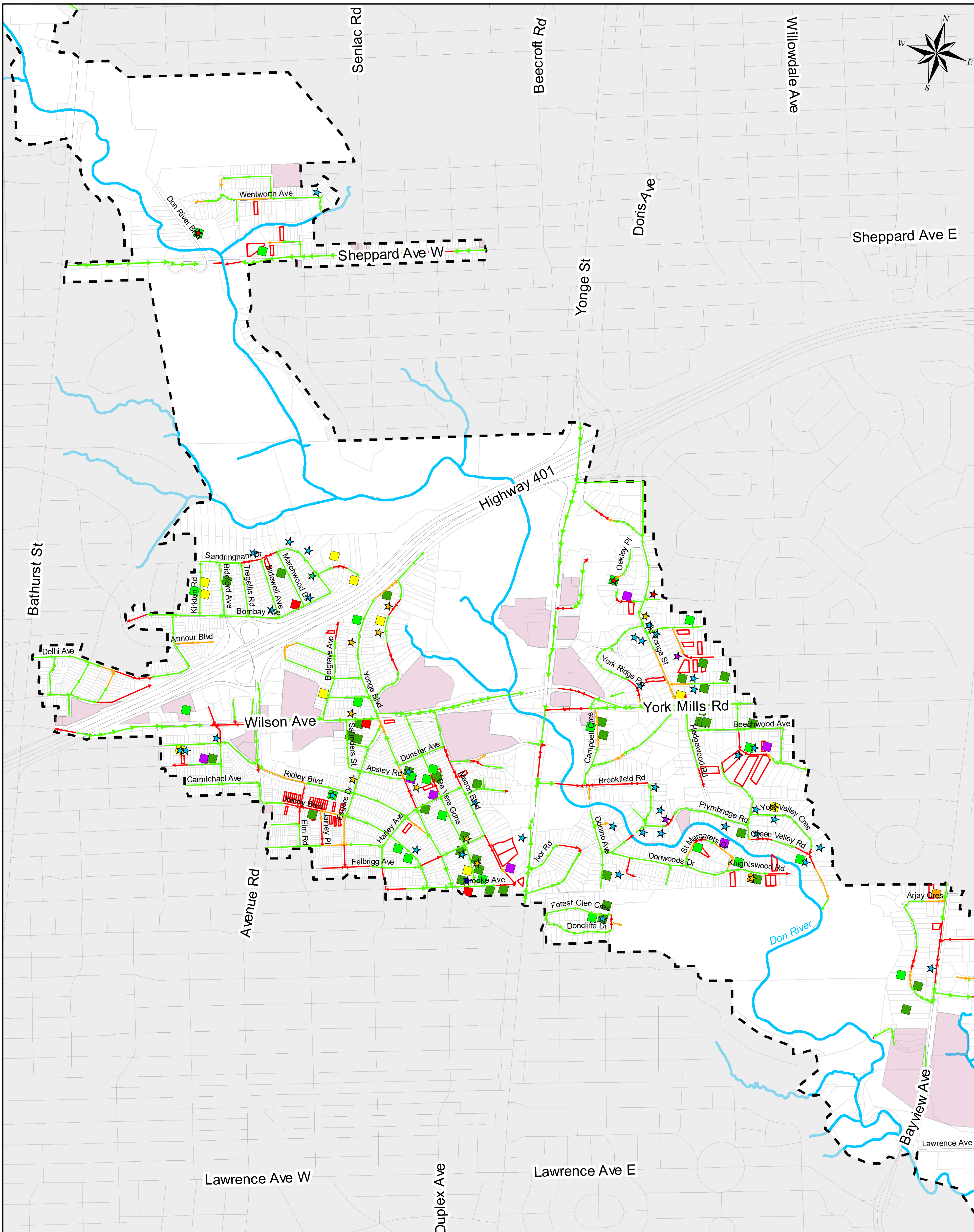
Title: Figure 6.4 (A)
Existing Overland System Performance
- 100Yr Design Storm

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8
Kilometers

1:16,500



Legend

- Municipal Boundary
- Storm Boundary
- Parcels (Reverse Slope Driveway Parcels)
- Flooded Parcels (Reverse Slope Driveway with Overland Depth > 0.15m)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)

Online Questionnaire Results:

- Flooded 5 or more times
- Flooded 4 times
- Flooded 3 times
- Flooded 2 times
- Flooded 1 time
- Flooded with unkown frequency

Flooding Report Date (76):

- May 12, 2000
- Aug 19, 2005
- Jul 8, 2008
- Jul 8, 2013
- Oct 16 & 20, 2014
- Aug 7, 2018

Collector Road Overland Depth

- >=0.21m
- 0.15m - 0.21m
- <=0.15m

Arterial Road Overland Depth

- >0.227m
- >0.15m - 0.226m
- <=0.15m

Open Channel Overland Depth

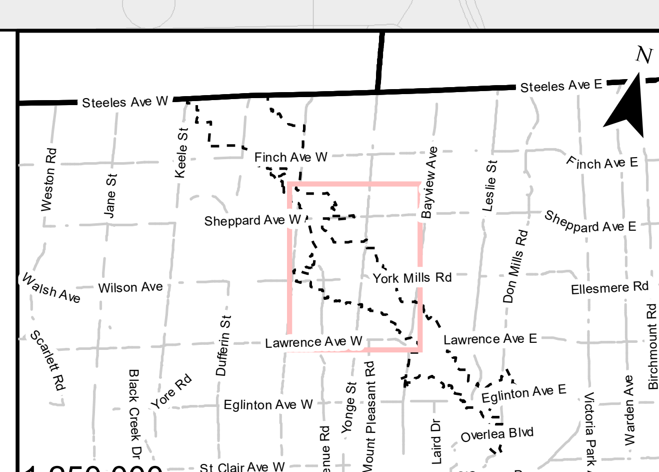
- >0.5m
- >0.15m - 0.5m
- <=0.15m

Local Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m

Rural Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m



Project: Toronto Basement Flooding Study Area 58

Title: Figure 6.4 (B) Existing Overland System Performance -100Yr Design Storm

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.2 0.4 0.8 Kilometers

1:16,500

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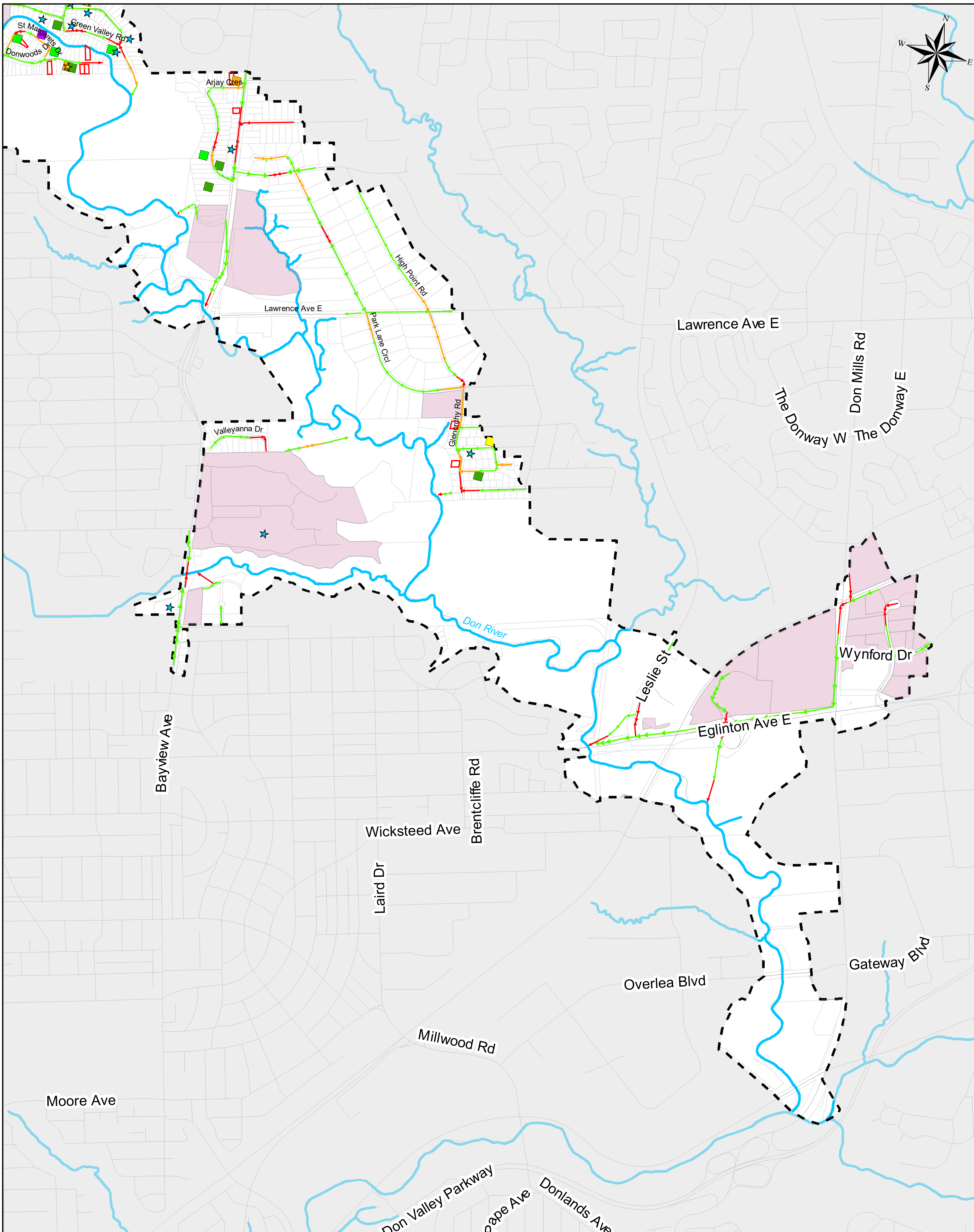


Legend

- Municipal Boundary
- Storm Boundary
- Parcels (Reverse Slope Driveway Parcels)
- Flooded Parcels (Reverse Slope Driveway with Overland Depth > 0.15m)
- ICI Areas
- Property Parcel
- Road Centreline
- Watercourse (TRCA, 2012)

Online Questionnaire Results:

- Flooded 5 or more times
- Flooded 4 times
- Flooded 3 times
- Flooded 2 times
- Flooded 1 time
- Flooded with unkown frequency

Flooding Report Date (76):

- May 12, 2000
- Aug 19, 2005
- Jul 8, 2008
- Jul 8, 2013
- Oct 16 & 20, 2014
- Aug 7, 2018

Collector Road Overland Depth

- >=0.21m
- 0.15m - 0.21m
- <=0.15m

Arterial Road Overland Depth

- >0.227m
- >0.15m - 0.226m
- <=0.15m

Open Channel Overland Depth

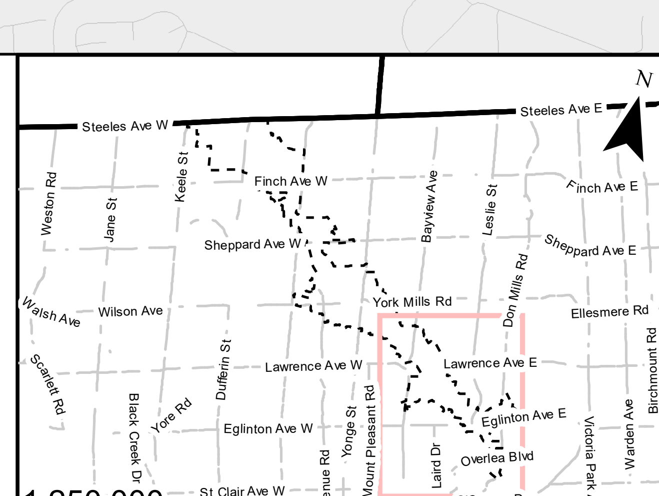
- >0.5m
- >0.15m - 0.5m
- <=0.15m

Local Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m

Rural Road Overland Depth

- >0.235m
- >0.15m - 0.235m
- <=0.15m



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Project: Toronto Basement Flooding Study Area 58

Title: Figure 6.4(C) Existing Overland System Performance -100YrDesignStorm

Projection: NAD_1983_CSRS_MTM_10
Data Source: City of Toronto, TRCA, LIO

Date: August, 2021

0 0.225 0.45 0.9 Kilometers

1:18,000