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Memorandum

To	City of Hamilton	Page	1
Subject	**Residential Drainage Assistance (RDA) Program** 66 and 68 Bromley Road		
Date	May 24, 2022	Project Number	60656489

1. Scope of Study

The City of Hamilton requested that AECOM complete a review of flooding concerns of the rear yards of 66 and 68 Bromley Road (Study Area). These homes will be described as the Study Area (**Fig. 1**). The review will be completed under the Residential Drainage Assistance Program.

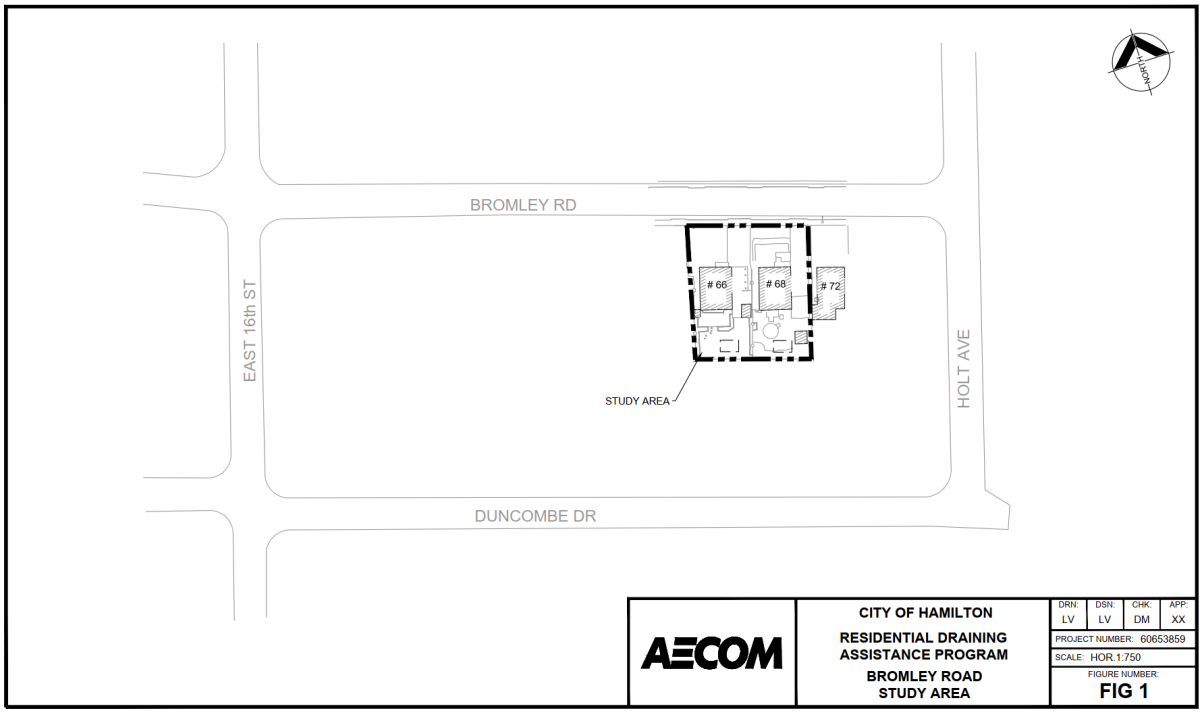

Fig.1 Study Area

The residents, within the Study Area, have raised concerns about the amount of storm runoff from rainfalls or snow melts that is ponding within the rear yard. The ponding has limited the use of their property because of the soggy conditions created by a lack of drainage from the rear yard.

Fig.1a Aerial View of Study Area

The City of Hamilton initiated this study:

- To assess the causes of the drainage issues;
- To determine if there were any mitigation measures that could be put in place to alleviate some of the flooding concerns; and/ or
- To determine if a drainage outlet solution could be put in place to eliminate or reduce the flooding concerns.

2. Background Information

To better assess the flooding issues, AECOM completed a number of background reviews. AECOM's survey team completed a visual and topographic survey of the properties within the Study Area. In addition, a background review of available City of Hamilton Inspection Reports and Drawings was completed to identify existing storm and sanitary sewers in the area and to determine the depth of rock within the study area. A review of the City of Hamilton Drainage Design Guidelines was completed to verify City standards. There was a site meeting with the residents of 66 and 68 Bromley Road to discuss the drainage issues and options.

2.1. Existing Conditions

The properties within the study area and surrounding homes are part of a mature subdivision. The majority of homes in the neighbourhood and within the Study Area have car ports, fences, decks, shrubs, trees or other built structures that make access to the rear yards difficult. These features also hinder a conventional drainage system or neighbourhood rear yard drainage swales. The rear yards within the Study Area are lower in elevation than the front yard and there is no apparent drainage outlet from the rear yards to the front yards. The rear yard at 66 Bromley Road is lower than the neighbouring properties and receives runoff from a number of adjacent properties.

2.2. Topographic Survey

In November 2021, AECOM's topographic survey team visited the Study Area and completed a topographic survey (**Fig. 2**) of the properties to identify existing conditions. The survey team also took

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a series of photographs (Appendix A) to show features (gates, fences, shrubs, etc.) that may not be identified on the topographic survey. The attached Fig. 2 is a graphical representation of the survey results. In general, the survey team noted the following:

- The topography of the area (slope of the yards) generally drains from south to north;
- Each of the individual lots in the neighbourhood and within the Study Area have independent grading issues;
- There are no side yard swales that would allow any of the rear yards to drain to the streets and therefore any storm runoff is trapped in the rear yards; and
- There are no consistent swales that would allow storm runoff to drain along the property lines to a common outlet point or to the municipal outlet.

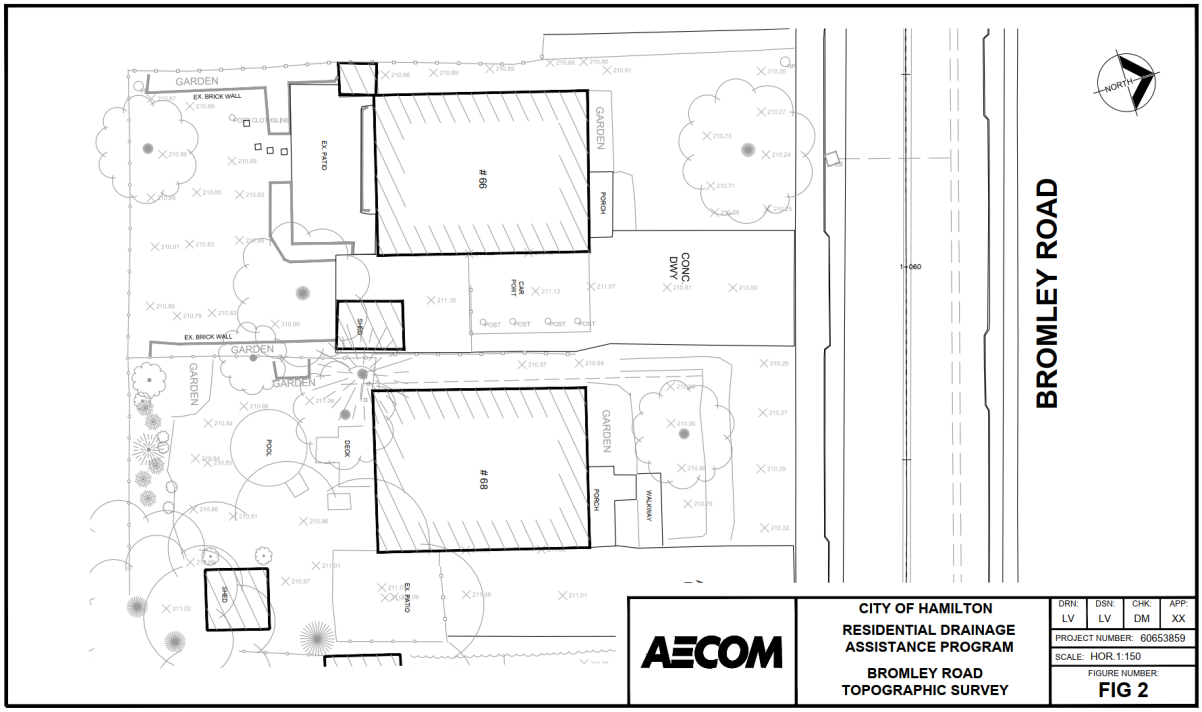

Fig. 2 Topographic Survey of the Rear Yards

2.3. Existing Drainage Tile

The resident at 68 Bromley Road stated that, approx. 8-10 years ago, a soak away pit was installed in their back yard with an outlet drainage tile that extended from the soak away pit to the front yard. At the meeting, the outlet tile was buried in a snowbank and was not visible. The resident said that the drain tile was approx. 3" in diameter. The outlet pipe does not seem to work now.

It was suggested that the resident have the outlet drainage tile flushed to determine if the drain can provide an outlet for their back yard. This feature, alone, would not solve the flooding issue.

2.4. Background Information Review- Drawings, Reports

AECOM reviewed the Engineering drawings received from the City of Hamilton for Bromley Road. The drawings were prepared during the installation of the storm sewer on Bromley Road. Based on the geotechnical information, the elevation of the local bedrock is estimated to be below 208.0m.

An existing 375mm storm sewer is located within the Municipal Right of Way on Bromley Road. The approx. elevation of the storm sewer is 207.70m(+/-).

2.5. City of Hamilton Drainage Design Guidelines

In newer subdivisions, the grading of residential lots is governed by the City of Hamilton's "Engineering Guidelines for Servicing Lands under Development Applications". Section 2.5.2 of the Guidelines outlines the "Design Criteria" that must be followed to ensure that all lots within a new subdivision are graded to provide a positive gravity outlet for storm runoff.

Drainage from rear yards is normally directed from the back of the yards to side yard swales (running along the side property line) which would convey storm runoff to the municipal street and then to the municipal catchbasin (storm sewer) system.

The intent of the guidelines is to ensure that each residential lot is independently drained thereby reducing the risk of rear yard flooding issues. Unfortunately, the age of this subdivision pre-dates the current Engineering Guidelines and the existing lot grading does not comply with the current specifications.

3. Recommended Options

3.1. Design Considerations

Subsequent to the topographic survey, the design team reviewed the following:

1. The existing drainage patterns within the rear yards;
2. Options are available to collect storm runoff within the two yards; and
3. Options for storm runoff be conveyed to the municipal storm sewer system.

3.2. Drainage Options

On March 5, 2022, an AECOM staff member met with the residents of 66 and 68 Bromley Road to discuss their drainage issues. The following options were discussed.

3.2.1. Side Yard Drainage Swale

Based on a review of the topographic survey, it was determined that it is possible to construct a drainage swale (**Fig.3**) between 66 and 68 Bromley Road extending from the rear yards to the front yard. The swale could be constructed with a 1.5 to 2% longitudinal grade that is sufficient to drain the rear yards and to convey the water from the rear yards to the municipal Right of Way.

Although it is possible to install a swale, the following lists several concerns with the construction of the swale:

- The east half of the concrete driveway and the side yard patio at 66 Bromley Road would have to be removed;
- The shed and fence on the patio at 66 Bromley Road would have to be relocated;
- The swale would be approx. 450-550 mm deep adjacent to the carport and approx. 3.0m wide at the deepest point of the swale;
- The fencing at 68 Bromley Road (required for the back yard swimming pool) would have to be removed and relocated;
- A property line swale could damage the root structure of the trees on both properties;
- The swale would be permanent and reduce the concrete area for the carport and patio area.;

- A drainage swale could interfere with the root structure o f the existing trees on both properties.

This option would provide a permanent outlet for storm water drainage and would provide an outlet that meets City of Hamilton standards.

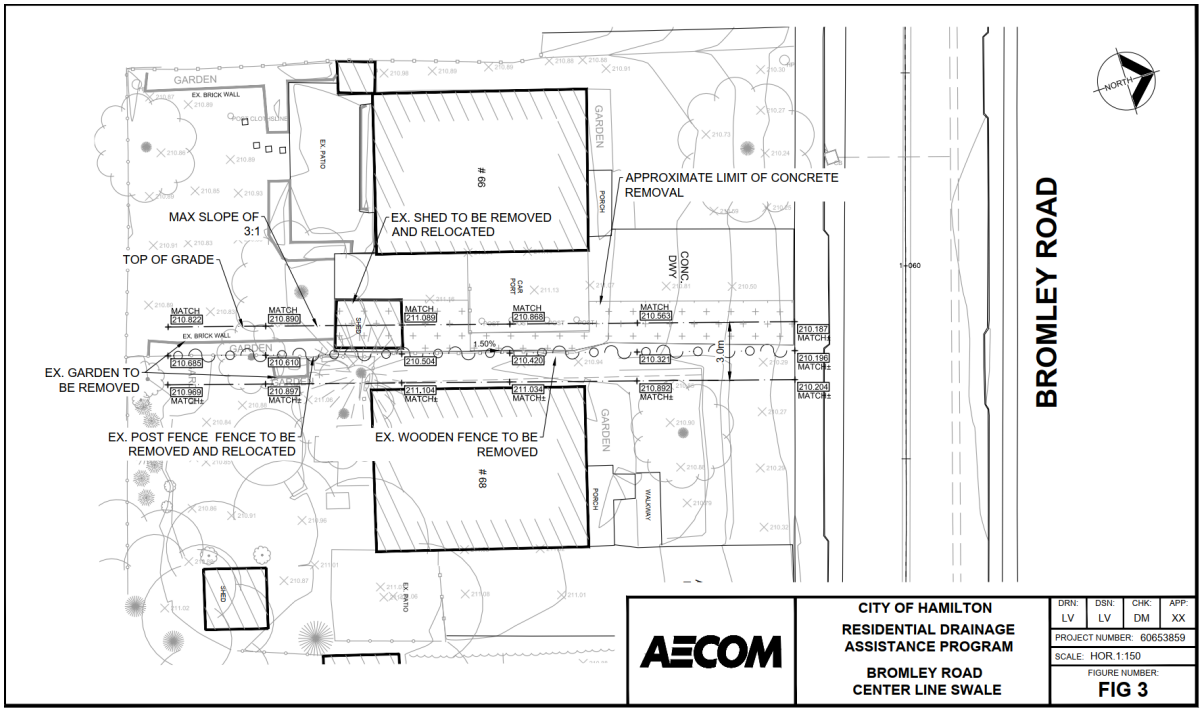

Fig. 3 Existing Side Yard Drain

3.2.1.1. Costs

The anticipated total cost of the installation of the side yard swale is approx. $20,000.00. The final costs for the construction of the side yard swale will depend on the ability of the approved contractor to gain access to the rear yard. As noted previously, the timing and construction of the side yard swale can be arranged by the individual residents. The reader should note that the cost listed is an estimate only and the final costs will vary when the residents tender this work.

Although possible to construct, the residents were not in favour of this solution because the swale would be permanent and reduce the concrete slab area outside of the carport and could impact the location of the fencing required to surround the swimming pool area.

3.2.2.Soak Away Pit

Another option to reduce the chronic flooding issues **(Fig. 4)** includes the installation of a rear yard soak away pits in resident's back yards. The rear yard drainage pit would be designed to capture a volume of storm runoff equal to 25mm of water covering the rear yard. The approximate size and location of the soak away pits are described on Fig. 4.

3.2.2.1. Benefits

The construction of individual drainage pits would have the following benefits:

- Since the soak away pit would be constructed on the individual resident's property, the timing of construction could be arranged by the residents ;
- The pit can be placed and orientated to minimize damage existing properties (trees, building, etc.) and to reduce rear yard grading requirements;
- After construction the residents could have full use of their rear yard; and
- The drainage pits would provide for storage of stormwater underground, for most local storms, thereby decreasing the time for yards to return to normal usage.

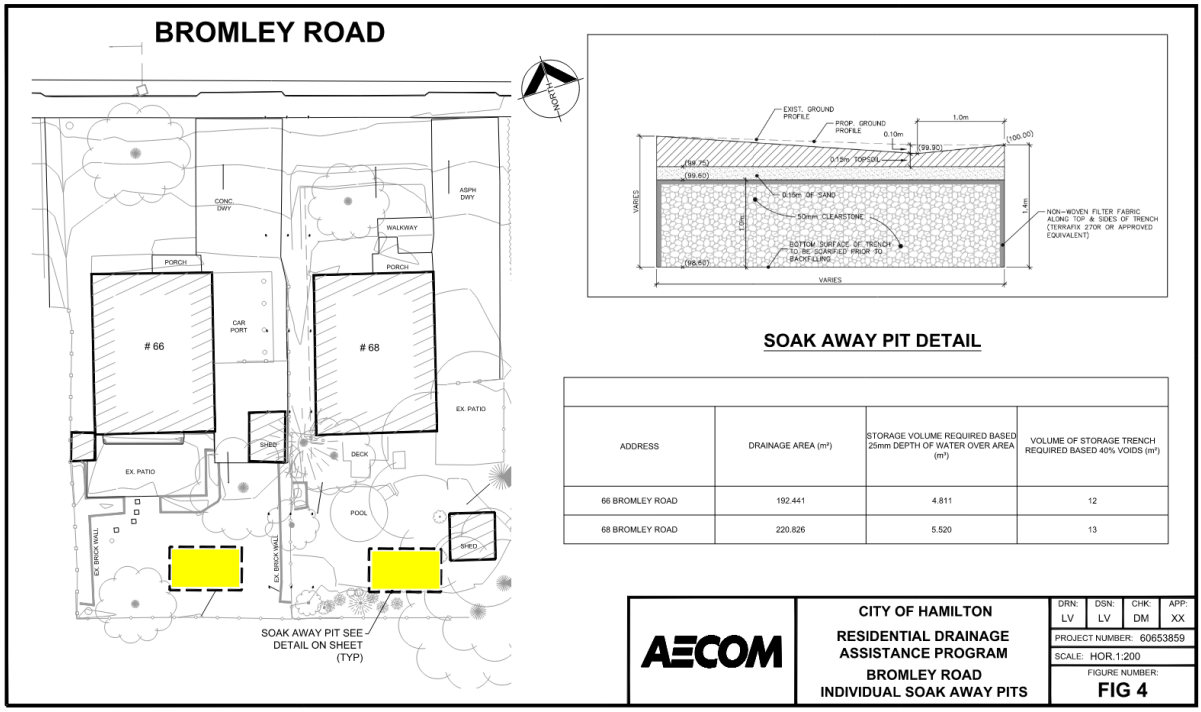

Fig. 4– Individual Soak Away Pits

3.2.2.2. Costs

The anticipated total cost of the installation of the rear yard soak away pits is approx.$6,000.00 to $9,000.00 per lot. The final costs for the construction of the soak away pits will depend on the ability of the approved contractor to gain access to the rear yard. As noted previously, the timing and construction soak away pit can be arranged by the individual residents.

The reader should note that the cost listed is an estimate only and the final costs will vary when the residents tender this work.

3.2.3.Rear Yard Catchbasin

As part of the review, AECOM reviewed the potential to install a rear yard catchbasin (**Fig. 5**) in the back yards of these properties. A rear yard catchbasin would be connected to the storm sewer system within the municipal right of way.

During the March 5, 2022 meeting with the residents the following issues were discussed:

- Ideally, there would a rear yard catchbasin in one of the rear yards with localized grading in each of the lots to direct storm runoff from each of the lots to the catchbasin;
- The residents on 68 Bromley Road did not want to move their back yard fence. The fence is required to yard because of their swimming pool; They were also concerned about damage to the tree in the back yard.;
- The resident at 66 Bromley Road did not want to have his concrete slab outside of his car port permanently removed.;
- Based on the resident's comments, the front half of the outlet sewer would have to be installed on 68 Bromley Road and the back half and rear yard catchbasin installed on 66 Bromley Road.
- To install of the outlet sewer, part of the concrete driveway and patio area at 66 Bromley Road would have to be removed and replaced. The existing shed and wooden fence would have to be relocated. There could be damage to the trees on both properties.
- Since the outlet sewer system would be located partially on both properties, there should be an agreement between the two neighbours to ensure that the flow to the catchbasin or the operation of the sewer is not disrupted in the future.

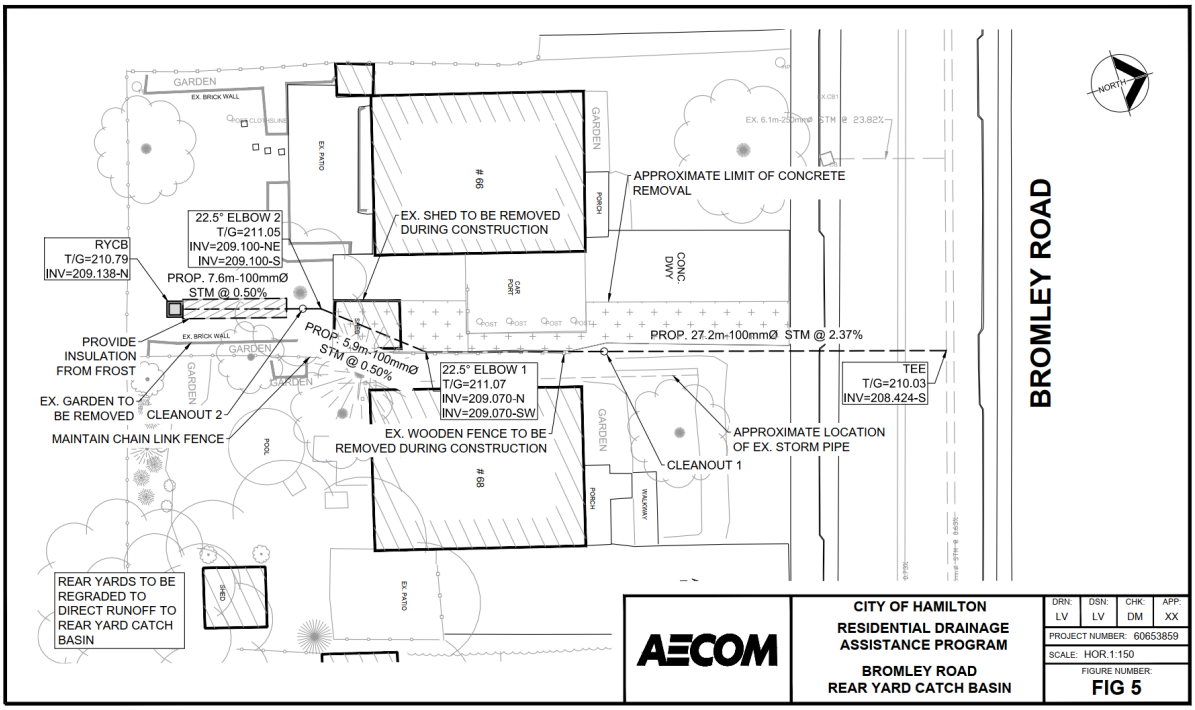

Fig. 5 Rear Yard Catchbasin

The anticipated cost of the rear yard catch basin system would be approx. $21,200.00 for the work within the public Right of Way and $32,000.00 for work on the private side.

The reader should note that the cost listed is an estimate only and the final costs will vary when the residents tender this work.

3.2.4.Recommendation

Based on a review of the various options and the discussions with the residents on 66 and 68 Bromley Road, the recommended option to reduce rear yard flooding and soggy rear yards is the

installation of a rear yard catchbasin. As noted previously, the residents will see the immediate benefit after the construction of the catch basin system. It would also allow for the re-use of the driveway, patio area and shed at 66 Bromley Road.

Appendix A


Nov 22, 202


Nov 22, 202

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Memorandum

City of Hamilton
Residential Drainage Assistance Program
66 and 68 Bromley Road

Appendix B

Memorandum
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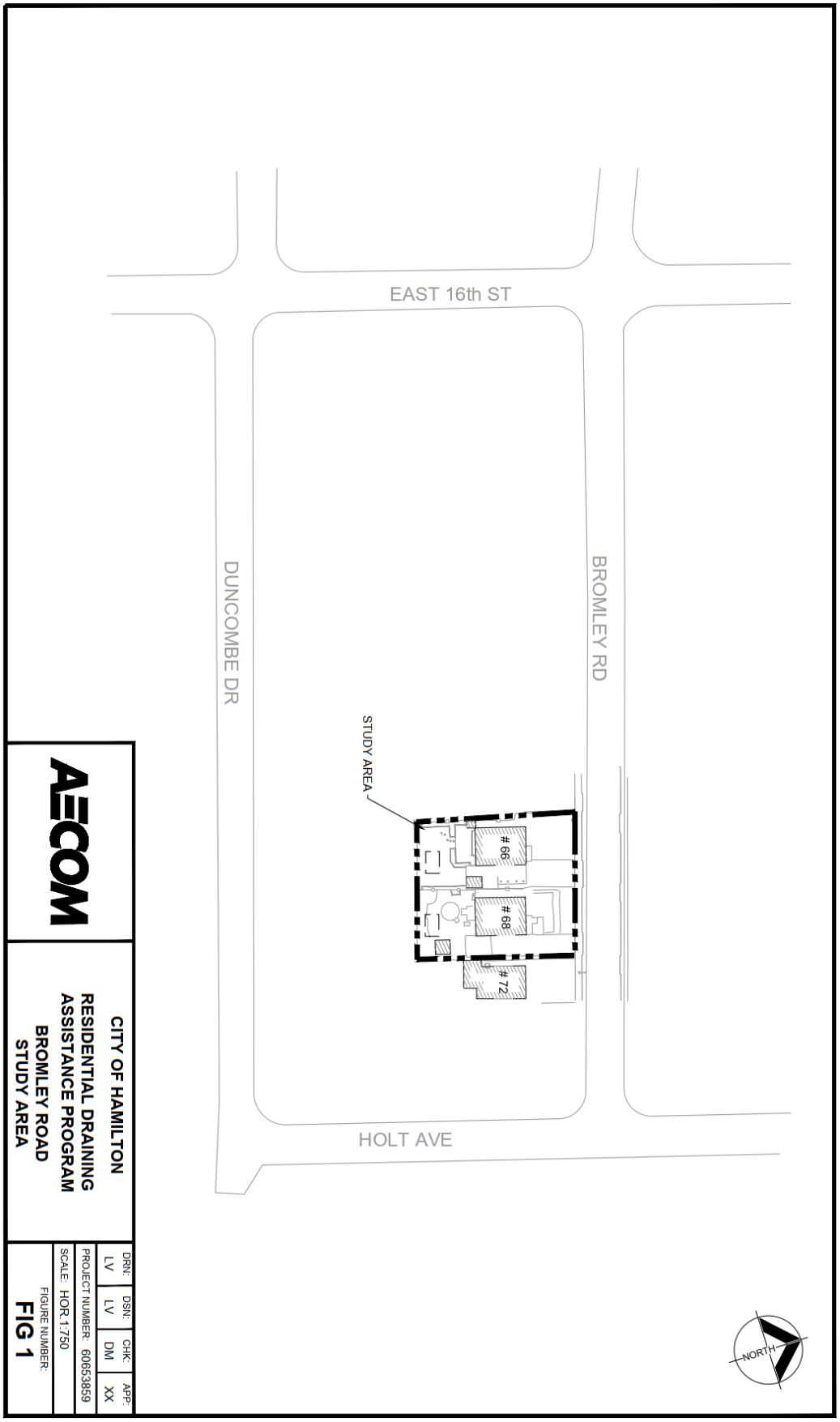
Residential Drainage Assistance Program
66 and 68 Bromley Road




EAST 16th STREET
DUNCOMBE DRIVE
BROMLEY ROAD
68
69
HOLT AVE

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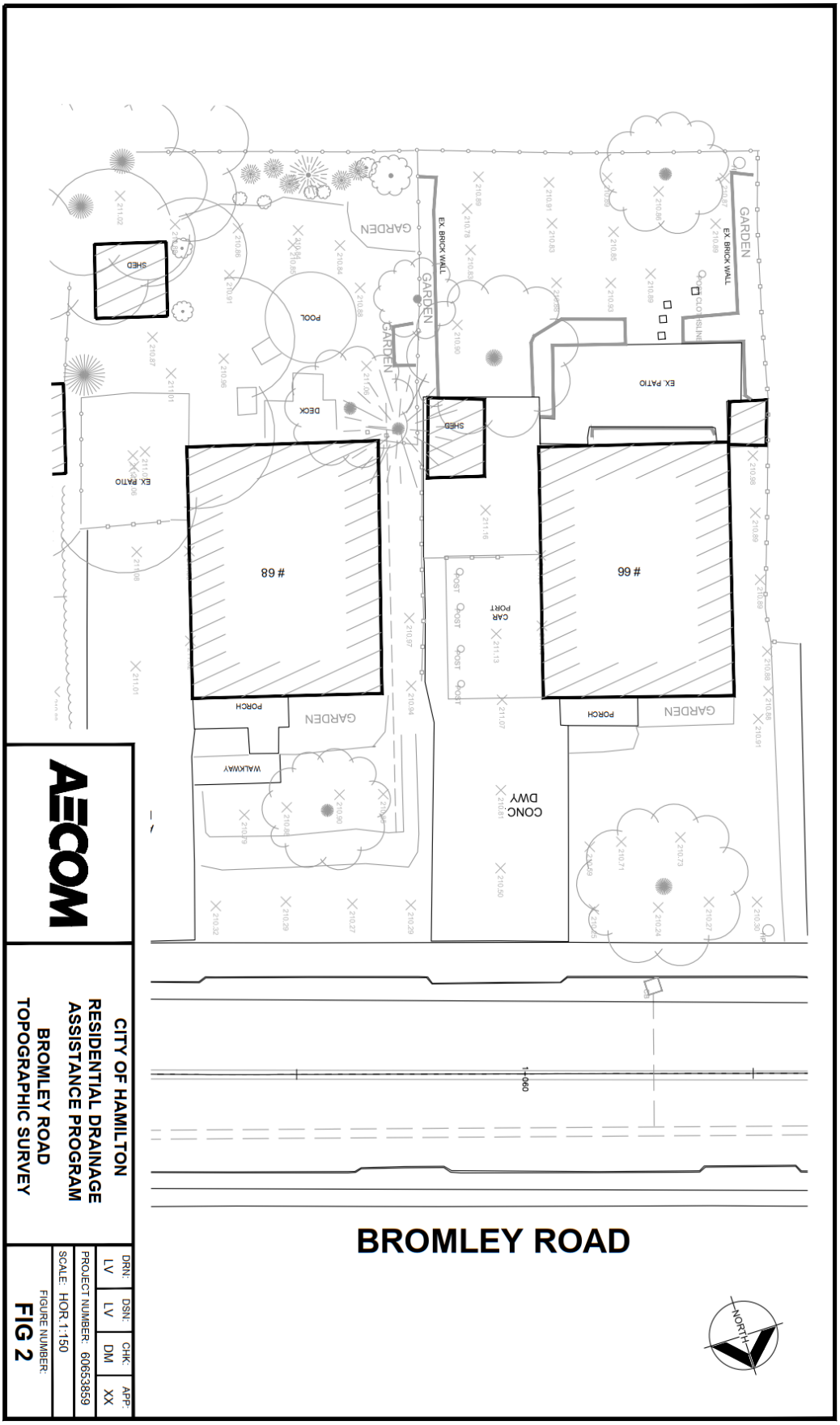
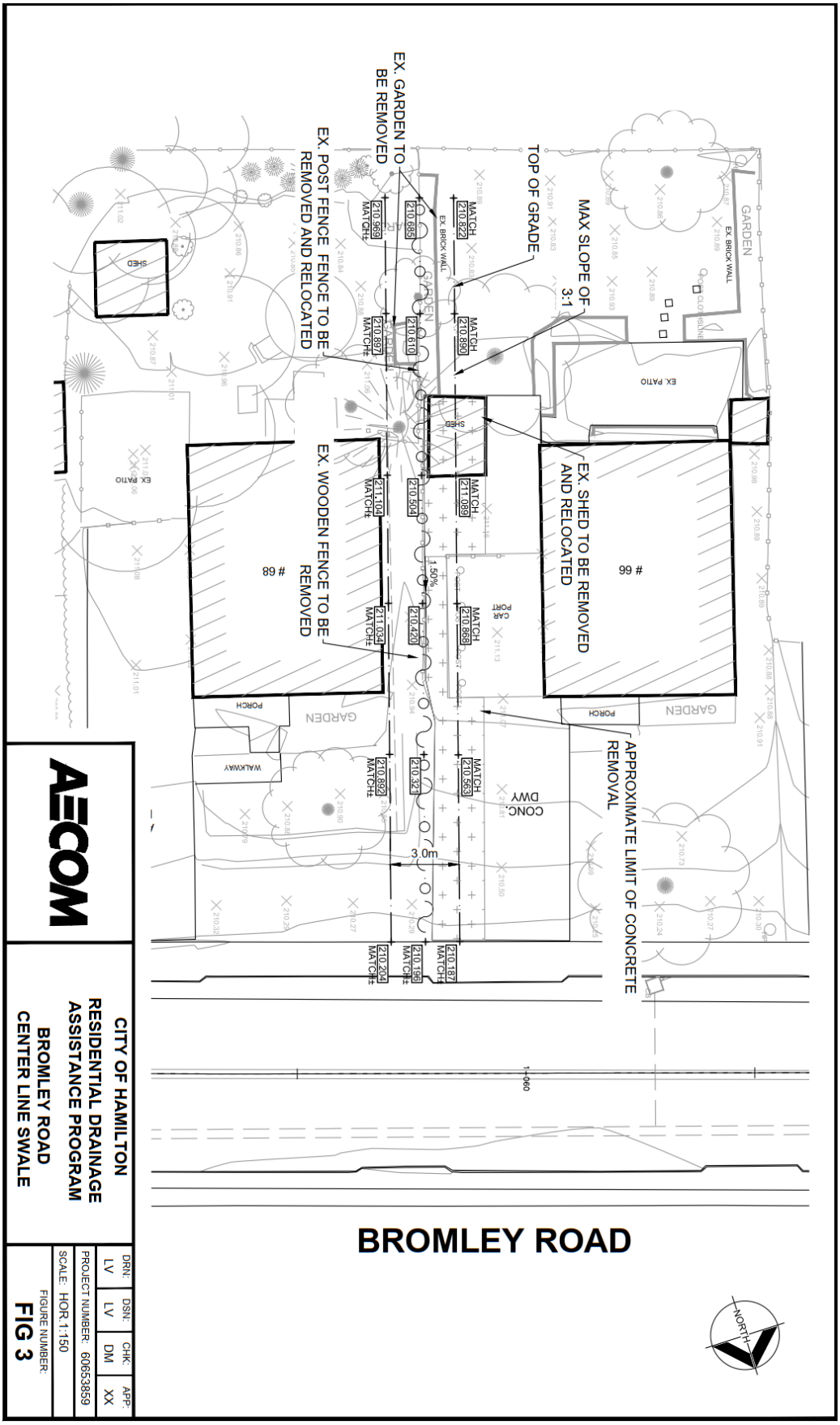
City of Hamilton
Residential Drainage Assistance Program
66 and 68 Bromley Road





CITY OF HAMILTON
RESIDENTIAL DRAINAGE ASSISTANCE PROGRAM
BROMLEY ROAD
CENTER LINE SWALE

DRN:	DSN:	CHK:	APP:
LV	LV	DM	XX

PROJECT NUMBER: 60653859
SCALE: HOR.1:150
FIGURE NUMBER: **FIG 3**

Memorandum

City of Hamilton
Residential Drainage Assistance Program
66 and 68 Bromley Road

SOAK AWAY PIT DETAIL

ADDRESS	DRAINAGE AREA (m²)	STORAGE VOLUME REQUIRED BASED 25mm DEPTH OF WATER OVER AREA (m³)	VOLUME OF STORAGE TRENCH REQUIRED BASED 40% VOIDS (m³)
66 BROMLEY ROAD	192.441	4.811	12
68 BROMLEY ROAD	220.826	5.520	13

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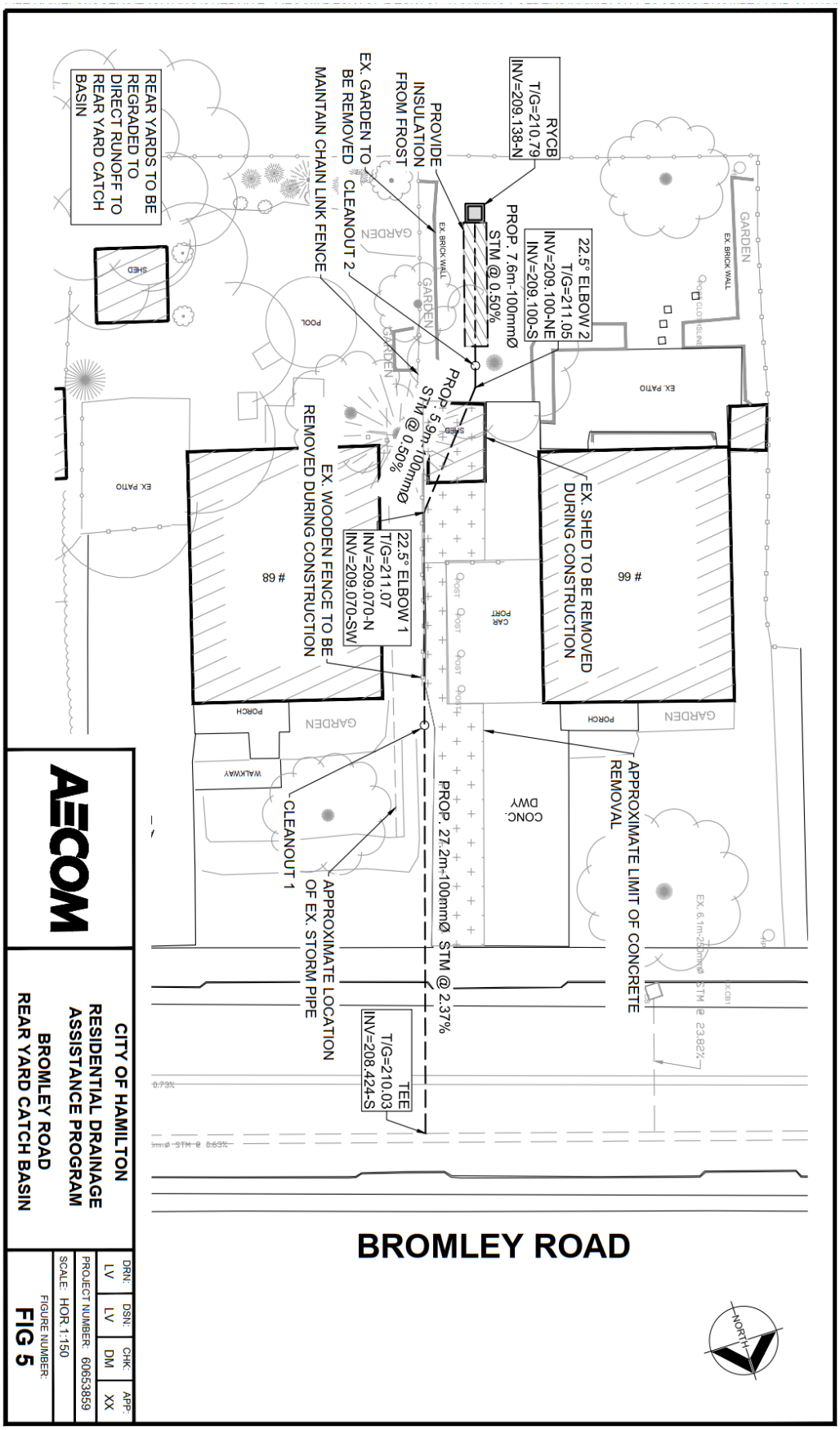
CITY OF HAMILTON
RESIDENTIAL DRAINAGE ASSISTANCE PROGRAM
BROMLEY ROAD
INDIVIDUAL SOAK AWAY PITS

DRN:	DSN:	CHK:	APP:
LV	LV	DM	XX

PROJECT NUMBER: 60653859
SCALE: HOR.1:200
FIGURE NUMBER: **FIG 4**

Memorandum
City of Hamilton
Residential Drainage Assistance Program
66 and 68 Bromley Road



CITY OF HAMILTON
RESIDENTIAL DRAINAGE ASSISTANCE PROGRAM
BROMLEY ROAD
REAR YARD CATCH BASIN

DRN:	DSN:	CHK:	APP:
LV	LV	DM	XX

PROJECT NUMBER: 60653859
SCALE: HOR 1:150
FIGURE NUMBER: FIG 5

Memorandum
City of Hamilton
Residential Drainage Assistance Program
66 and 68 Bromley Road

Appendix C

Residential Drainage Assistance Program

16-Mar-22

66 and 68 Bromley Road
Side Yard Swale

Public Work

Removal			Qnty	Total
Excavator	Hr	$250.00		$0.00
Truck	Hr	$100.00		$0.00
Loader	Hr	$175.00		$0.00
Compactor	Hr	$150.00		$0.00
Labor	Hr	$75.00		$0.00
Foreman	Hr	$100.00		$0.00
Pick up	Hr	$50.00		$0.00
		Sub total		$0.00

Replacement				
Excavator	Hr	$250.00		$0.00
Truck	Hr	$100.00		$0.00
Loader	Hr	$175.00		$0.00
Compactor	Hr	$150.00		$0.00
Labor	Hr	$75.00		$0.00
Foreman	Hr	$100.00		$0.00
Pick up	Hr	$50.00		$0.00
Traffic Control	LS	$100.00		$0.00
		Sub total		$0.00

Surface Works				
Connection	LS	$1,000.00		$0.00
Sewer	M	$150.00		$0.00
Curb	m	$100.00		$0.00
SW	m2	$100.00		$0.00
Granular	t	$60.00		$0.00
Asphalt	t	200		$0.00
		Sub total		$0.00

Public Side Costs $0.00

Private Side

Excavation and receiving pits				
Pits	ea	$1,000.00		$0.00
Installation of Pipe	m	$200.00		$0.00
Rear Yard CB	ea	$1,500.00		$0.00
Concrete removal	m2	$50.00	70	$3,500.00
Shed removal and replacement	ls	$1.00	300	$300.00

Removal of Fencing	m	$20.00	15	$300.00
Removal of Trees	ea	$5,000.00	1	$5,000.00
Regrading	LS	$1.00	2000	$2,000.00
Restoration	m2	$20.00	120	$2,400.00
Fence Replacement	m	$50.00	15	$750.00
Driveway replacement	ea	$6,000.00	1	$6,000.00

Private Side Costs $20,250.00

Project Total Costs $20,250.00

Costs are estimated only. Final costs will be based on the actual quotations from contractors
HST not Included
Contingency allowances are not included

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City of Hamilton
Rear Yard Flooding Review

11-Mar-22

66 and 68 Bromley Road
Option 4 Rear Yard Catchbasin

Public Work

Removal			Qnty	Total
Excavator	Hr	$250.00	5.0	$1,250.00
Truck	Hr	$100.00	5.0	$500.00
Loader	Hr	$175.00	5.0	$875.00
Compactor	Hr	$150.00	5.0	$750.00
Labor	Hr	$75.00	5.0	$375.00
Foreman	Hr	$100.00	5.0	$500.00
Pick up	Hr	$50.00	5.0	$250.00
		Sub total		$4,500.00
Replacement				
Excavator	Hr	$250.00	5.0	$1,250.00
Truck	Hr	$100.00	5.0	$500.00
Loader	Hr	$175.00	5.0	$875.00
Compactor	Hr	$150.00	5.0	$750.00
Labor	Hr	$75.00	5.0	$375.00
Foreman	Hr	$100.00	5.0	$500.00
Pick up	Hr	$50.00	5.0	$250.00
Traffic Control	LS	$100.00	5.0	$500.00
		Sub total		$5,000.00
Pipe and				
Connection	LS	$1,000.00	1.0	$1,000.00
Sewer	M	$150.00	10.0	$1,500.00
Curb	m	$100.00	5.0	$500.00
SW	m2	$100.00	12.0	$1,200.00
Granular	t	$60.00	67.2	$4,032.00
Asphalt	t	200	10.0	$2,000.00
Contingency	1	LS		$1,500.00
		Sub total		$11,732.00
		Total		$21,232.00

Say $21,200.00

Private Side

Excavation and receiving pits					
Pits	ea	$1,000.00	1	$1,000.00	
Installation of Pipe	m	$200.00	40	$8,000.00	
Rear Yard CB	ea	$1,500.00	1	$1,500.00	
Concrete removal	m2	$50.00	70	$3,500.00	
Shed removal and replacement	ls	$1.00	300	$300.00	
Removal of Fencing	m	$20.00	15	$300.00	
Removal of Trees	ea	$5,000.00	1	$5,000.00	
Regrading	LS	$1.00	2000	$2,000.00	
Restoration	m2	$20.00	120	$2,400.00	
Fence Replacement	m	$50.00	15	$750.00	
Driveway replacement	ea	$6,000.00	1	$6,000.00	
Contingency	1	LS		$1,250.00	
				$32,000.00	$32,000.00
		Total		$53,232.00	$53,200.00

Costs are estimated only. Final costs will be based on the actual quotations from contractors
HST not Included