Addendum #1 to the March 13, 2019 Development Charges Background Study

City of Hamilton

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May 15, 2019

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List of Acronyms and Abbreviations

Acronym	Full Description of Acronym
D.C.	Development Charges
D.C.A.	Development Charges Act
L.S.P.	Local Service Policy

Addendum Report to the March 13, 2019 Development Charges Background Study

1. Background

Commensurate with the provisions of the Development Charges Act, 1997, as amended (D.C.A.), the City has undertaken a Development Charges (D.C.) Background Study and released the study in accordance with the D.C.A. The following provides a summary of the key dates in the development charge by-law process:

March 1, 2018, June 14, 2018, September 13, 2018, January 28, 2019, February 19, 2019 & March 25, 2019 – Stakeholder Meetings

March 13, 2019 – Release of the D.C. Background Study and draft by-law

April 18, 2019 – Public Meeting of Council

May 15, 2019 – Addendum to March 13th report released

June 6, 2019 – Audit, Finance & Administration Committee considers adoption of background study and by-law

June 12, 2019 – Passage of Development Charges By-law

Through further discussions with staff and the City's engineering stormwater consultant, Wood PLC (Wood) refinements have been made to the local service policy (L.S.P.) related to Stormwater Drainage Systems in order to increase transparency and provide clarification to the policy. These refinements to the L.S.P. do not result in changes to the capital projects included in the D.C. calculations. This refined policy has been provided as part of this addendum report.

In addition to the L.S.P. refinements, it was recognized that a post period benefit (P.P.B.) deduction was not made against stormwater projects in the Elfrida Boundary Area similar to P.P.B. deductions made against other capital projects identified in this developing area. As such, the D.C. calculations have now been refined to identify the appropriate P.P.B. deduction for stormwater projects.

Further, City staff, along with Wood, have continued to review projects and costing identified by developing landowners and recognize that a number of updates to capital costs for a few projects are required. In addition, a couple projects that were initially missed have been identified and are now included in the calculations.

A revised report has been prepared by Wood to explain the post period benefit deduction and to update the capital project listing and related costing for the growth-

related stormwater program. This report as well as the updated capital project lists have been provided as part of this addendum report.

As a result of discussion with stakeholders, it was identified the project related to the Ancaster Tennis Bubble in Indoor Recreation Services is to receiving fundraising/grant funding. Fundraising from the Ancaster Tennis Club will provide for the costs of this project and as such the $1 million is removed from the D.C. calculation. This results in a decrease in the Indoor Recreation Services charge by $34 per single/semi detached dwelling.

Since the release of the Background Study, the Province has introduced Bill 108, an Act to amend various statutes with respect to housing, other development and various other matters, which includes proposed amendments to the D.C.A. One of the proposed amendments includes removal of "soft" services (e.g. library, paramedic, airport, etc.) from the D.C.A. As a result and in anticipation of the possible changes to the D.C.A., this addendum report has split the Administrative studies into two categories, Engineering Studies which include those service studies which are proposed to continue under the D.C.A. and Community Based Studies which are proposed to be removed from the D.C.A. and would subsequently be considered under a Community Benefit Charge through the Planning Act.

These refinements will form part of the D.C. background study provided prior to by-law adoption.

2. Discussion

This section of the addendum report provides an explanation for the above-noted refinements.

2.1 Refinements to Appendix E Local Service Policy

Based on further review by city staff and Wood, the L.S.P. related to Stormwater Services has been refined to further enhance understanding and transparency. The refinements include the correction of an error in the conversion of per acre to per hectare land values (under section E.1.4 "Land for Stormwater Management Facilities"). This error was only in the written portion of the policy and as such, does not change the overall calculated rates provided by Wood as per Appendix G.

The refinement to the L.S.P. has been updated in the amended pages provided herein.

2.2 Refinements to Stormwater Drainage Systems Capital Project List and Post-Period Benefit Deductions

The capital project listings for Stormwater are provided on Page 5-71 to 5-77 of the March 13, 2019 D.C. background study as well as the report prepared by Wood PLC in Appendix G. Refinements have been made to the project listing to update capital costs of several projects based on further review by staff and Wood and to include a few projects that were initially missed in the listing.

Further, during the additional staff review, it was recognized that projects within the Elfrida Boundary Area required a post period deduction equal to two-thirds (2/3) of the growth-related costs identified. As only one-third of the growth in the Elfrida Boundary Area is anticipated to take place by 2031, this P.P.B. deduction is required to recognize the benefit that the capital infrastructure will have to support future growth post 2031. This deduction is also consistent with the deductions made against other services included in the D.C. that require growth-related capital infrastructure to support this development area.

These changes resulted in a decrease in the charge for stormwater services from $12,986 (per single/semi detached dwelling) to $10,462 within the separated sewer system area. There have been no changes to the D.C. charge within the combined system for stormwater.

2.3 Funding Adjustment for an Indoor Recreation Services Capital Project

During the stakeholder review, it was identified that the Ancaster Tennis Bubble project at an amount of $1,000,000 has been anticipated to receive fundraising and/or grants from the Ancaster Tennis Club. As such, D.C.s are not required for this project and the $1 million is removed from the D.C. calculation. This results in a decrease in the charge for indoor recreation services from $4,464 to $4,430 per single/semi detached dwelling. The updated capital listing has been provided in the amended pages section of this report.

2.4 Refinements to Administrative Studies

As noted in Section 1, the Province has introduced Bill 108, An Act to amend various statutes with respect to housing, other development and various other matters, which includes proposed amendments to the D.C.A. One of the proposed amendments includes deeming "soft" services ineligible for inclusion in D.C. By-laws.

For the City the soft services currently identified in the Background Study include parkland development, indoor recreation services, library services, paramedics, long term care, health services, social & child services, social housing, airport lands, parking services, provincial offences administration, along with some studies identified under the Administrative Studies category.

If Bill 108 receives royal assent, any studies related to the "soft" services would also be deemed ineligible for inclusion in the D.C. By-law. As such, this addendum report has broken out the Administrative Studies category into "Administrative Studies - Community Based Studies", this category will include the studies related to proposed ineligible services and "Administrative Studies - Engineering Services Studies", which includes studies related to services proposed to continue as eligible.

This breakdown does not change the overall calculated rates provided for Council's consideration.

2.5 Overall Changes in the D.C. Calculation

Based on the changes noted above, the calculated development charge (single/semi-detached unit) has decreased from $52,561 to $50,003 in the separated sewer system area. The calculated charges within the combined sewer system area have decreased from $43,523 to $43,489. In regard to the non-residential charges, the calculated development charge (per sq.ft.) has decreased from $20.30 to $20.18 in the separated sewer system area. The charges within the combined sewer system area remain unchanged.

The above changes have been incorporated into the calculations. The summary below outlines the current charges vs. the charges as calculated in the March 13, 2019 D.C. background study and the charges calculated in this addendum report.

Residential (Single Detached) Comparison

Service	Current	Calculated for March 13, 2019 Report	Calculated for Addendum Report
City Wide Services:			
Services Related to a Highway	8,939	10,769	10,769
Public Works Facilities, Vehicles & Equipment	333	784	784
Police Services	421	524	524
Fire Protection Services	371	462	462
Transit Services	544	1,917	1,917
Parkland Development	1,479	2,352	2,352
Indoor Recreation Services	2,271	4,464	4,430
Library Services	642	1,045	1,045
Administrative Studies - Community Based Studies	795	496	335
Administrative Studies - Engineering Services Studies			161
Paramedics	39	137	137
Long Term Care	257	125	125
Health Services	28	1	1
Social & Child Services	31	15	15
Social Housing	583	648	648
Airport lands	261	419	419
Parking services	366	490	490
Provincial Offences Administration	25	40	40
Hamilton Conservation Authority	24	-	-
Waste Diversion	Previously Ineligible	657	657
Total City Wide Services	**17,409**	**25,345**	**25,311**
Water and Wastewater Urban Area Charges:			
Wastewater Facilities	4,090	4,048	4,048
Wastewater Linear Services	5,151	5,415	5,415
Water Services	4,603	4,767	4,767
Total Water and Wastewater Urban Area Services	**13,844**	**14,230**	**14,230**
Stormwater Charges:			
Stormwater Drainage and Control Services (Combined Sewer System)	7,065	3,948	3,948
Stormwater Drainage and Control Services (Separated Sewer System)	7,065	12,986	10,462
GRAND TOTAL CITY WIDE	**17,409**	**25,345**	**25,311**
GRAND TOTAL URBAN AREA COMBINED SEWER SYSTEM	**38,318**	**43,523**	**43,489**
GRAND TOTAL URBAN AREA SEPARATED SEWER SYSTEM	**38,318**	**52,561**	**50,003**

Non-Residential (per sq.ft.) Comparison

Service	Current	Calculated for March 13, 2019 Report	Calculated for Addendum Report
City Wide Services:			
Services Related to a Highway	9.10	8.05	8.05
Public Works Facilities, Vehicles & Equipment	0.19	0.41	0.41
Police Services	0.23	0.26	0.26
Fire Protection Services	0.21	0.23	0.23
Transit Services	0.34	0.98	0.98
Parkland Development	0.11	0.11	0.11
Indoor Recreation Services	0.16	0.20	0.20
Library Services	0.04	0.05	0.05
Administrative Studies - Community Based Studies	0.48	0.25	0.17
Administrative Studies - Engineering Services Studies			0.08
Paramedics	0.02	0.03	0.03
Long Term Care	0.04	0.01	0.01
Health Services	-	-	-
Social & Child Services	-	-	-
Social Housing	-	-	-
Airport lands	0.16	0.21	0.21
Parking services	0.22	0.25	0.25
Provincial Offences Administration	0.01	0.02	0.02
Hamilton Conservation Authority	0.02	-	-
Waste Diversion		0.13	0.13
Total City Wide Services	**11.33**	**11.18**	**11.18**
Water and Wastewater Urban Area Charges:			
Wastewater Facilities	2.30	1.95	1.95
Wastewater Linear Services	2.90	2.61	2.61
Water Services	2.60	2.29	2.29
Total Water and Wastewater Urban Area Services	**7.80**	**6.85**	**6.85**
Stormwater Charges:			
Stormwater Drainage and Control Services (Combined Sewer System)	1.41	-	-
Stormwater Drainage and Control Services (Separated Sewer System)	1.41	2.28	2.16
GRAND TOTAL CITY WIDE	**11.33**	**11.18**	**11.18**
GRAND TOTAL URBAN AREA COMBINED SEWER SYSTEM	**20.54**	**18.02**	**18.02**
GRAND TOTAL URBAN AREA SEPARATED SEWER SYSTEM	**20.54**	**20.30**	**20.18**

2.6 Changes to the Background Report

Based upon the above, the following revisions are made to the pages within the background study (new pages are appended to this report):

Page Reference	Description of Revisions
ES (iii)	Update to item 6 related to the updated calculated charge.
ES (iv)	Update to item 8 related to the updated summary of gross capital costs and recovery of costs over the life of the by-law.
ES (v to vi)	Updated item 9 to reflect the breakout of administrative studies into the two new categories.
ES (vii)	Updates to Table ES-1 to reflect the recalculated charge for Stormwater Services in the separated sewer system area as well as the breakout of the administrative studies category.
1-3	Revised Figure 1-1 to include the release of this addendum report.
5-20 to 5-22	Updates to remove the Ancaster Tennis Bubble project.
5-28 to 5-29	Updates to reflect the breakdown of Administrative Studies into two categories, Engineering Studies and Community Based Studies.
5-30 to 5-31	Table split into two tables for the breakdown of Administrative Studies.
5-71 to 5-78	Updates to reflect the updated capital costs and post period benefit deductions to projects in the Elfrida Boundary Area.
6-4	Table 6-2 updated to reflect the calculated charges for Stormwater Drainage and Control Services within the separated sewer system area.
6-7 to 6-8	Table 6-5 updated to reflect the calculated charges for the two Administrative Studies categories as well as the update to Indoor Recreation Services.
6-9	Table 6-6 updated to reflect the changes to the D.C. calculation.
6-10 to 6-11	Table 6-7 updated to reflect the two Administrative Studies categories as well as changes in costs to Stormwater and Indoor Recreation.
7-3	Updates to section 7.3.2 item 2 to identify the two Administrative Studies categories.
7-8	Updated section 7.4.1 Categories for reserve funds to identify the breakdown of the Administrative Studies category into two.

Appendix C C-4	Update Table to reflect the two Administrative Studies categories as well as changes to costs related to Stormwater and Indoor Recreation Services.
Appendix D D-5	Update Table to reflect the two Administrative Studies categories in the example Treasurer's annual D.C. reserve fund statement.
Appendix E	Revised local service policy related to Stormwater Drainage Systems in order to enhance transparency and clarification.
Appendix G	Updated capital project lists to reflect changes in project costs and post-period benefits. Additional wording added to provide clarification where required

3. Process for the Adoption of the Development Charges By-law

Sections 1 & 2 provide for a summary of the revisions to the City's D.C. Background Study. If Council is satisfied with the above changes to the Background Study and based on the public submissions made at the public meeting, this addendum report #1 will be considered for approval by Council along with the Background Study.

Amended Pages

undertaking a D.C. public process and anticipates passing a new by-law in advance of the expiry date. The mandatory public meeting has been set for April 18, 2019 with adoption of the by-law on May 22, 2019. It is noted that the GO Transit By-law 11-174, as amended, has not been updated as part of this background study.

6. The City's D.C.s currently in effect (excluding GO Transit service and area-specific charges) are $38,318 for single detached dwelling units for full services and non-residential charges are $20.54 per square foot for full services. Note that water, wastewater and stormwater are applicable only in the urban areas. This report has undertaken a recalculation of the charge based on future identified needs (presented in Schedule ES-1 for residential and non-residential). Charges have been provided on a City-wide basis for all services except for stormwater. Historically, stormwater has been calculated on a City-wide basis, but as approved by Council (report FCS18034), direction has provided to utilize an area specific approach based on the combined and separated sewer systems for the Stormwater component for the 2019 D.C. background study. The corresponding single detached unit charge is $43,489 for the combined sewer system area and $50,003 for the separated sewer system area. The non-residential charge is $18.02 per square foot of building area for the combined system, and $20.18 for the separated system area per square foot of building area. These rates are submitted to Council for its consideration.

7. The City's area-specific D.C.s currently in effect in Binbrook for water and wastewater services are $3,211 for single detached dwelling equivalent units. There is no non-residential area-specific charge in Binbrook. Currently it is anticipated that all development will be complete prior to the 2019 by-law being passed and therefore, there will no longer be a Binbrook area specific D.C. included in the 2019 by-law. For Dundas and Waterdown, the area specific D.C.s, currently in effect for single detached dwelling units related to wastewater services is $1,588 and is $1.09 per square foot for non-residential development. This study has undertaken updates to the area-specific charge for Dundas and Waterdown and the resulting charge is $1,971 for single detached dwelling units and $1.04 per square foot for non-residential development.

8. The D.C.A. requires a summary be provided of the gross capital costs and the net costs to be recovered over the life of the by-law. This calculation is provided by service and is presented in Table 6-7. A summary of these costs is provided below:

Total gross expenditures planned over the next five years	$ 2,849,223,312
Less:	
Benefit to existing development	$ 946,283,371
Post planning period benefit	$ 162,098,114
Ineligible	$ 31,192,195
Mandatory 10% deduction for certain services	$ 21,566,486
Grants, subsidies and other contributions	$ 449,484,218
Net Costs to be recovered from development charges	**$ 1,238,598,926**

Hence, $1.610 billion (or an annual amount of $322 million) will need to be contributed from taxes and rates, or other sources. Of this amount, $162 million will be included in subsequent D.C. study updates to reflect the portion of capital that benefits growth in the post period D.C. forecasts.

Based on the above table, the City plans to spend $2.849 billion over the next five years, of which $1.238 billion (43%) is recoverable from D.C.s. Of this net amount, $821.88 million is recoverable from residential development and $416.72 million from non-residential development. It is noted also that any exemptions or reductions in the charges would reduce this recovery further.

9. Considerations by Council – The background study represents the service needs arising from residential and non-residential growth over the forecast periods.

The following services are calculated based on a 13-year City-wide forecast:

- Fire Protection Services;
- Police Services;
- Services Related to a Highway; and
- Public Works Facilities, Fleet & Equipment.

The following services are calculated based on a 13-year urban-wide forecast:

- Wastewater Services – Treatment;
- Wastewater Services – Linear; and

- Water Services.

The following service is based on a 13-year urban area-specific forecast for the separated sewer system and combined sewer system:

- Stormwater Drainage and Control Services.
    - Combined Sewer System; and
    - Separated Sewer System.

All other services are calculated based on a 10-year forecast. These include:

- Transit Services;
- Parking Services;
- Airport Services;
- Parkland Development;
- Indoor Recreation Services;
- Library Services;
- Administrative Studies – Engineering Services Studies;
- Administrative Studies – Community Based Studies;
- Long Term Care;
- Provincial Offences Act;
- Health Services;
- Social and Child Services;
- Paramedics;
- Social Housing; and
- Waste Diversion.

Dundas/Waterdown area-specific charges are based on the remaining single detached equivalent units and the non-residential charges are based on the remaining building area (sq.ft.) anticipated.

Council will consider the findings and recommendations provided in the report and, in conjunction with public input, approve such policies and rates it deems appropriate. These directions will refine the draft D.C. by-law which is appended in Appendix K. These decisions may include:

- Adopting the charges and policies recommended herein;
- Considering additional exemptions to the by-law; and
- Considering reductions in the charge by class of development (obtained by removing certain services on which the charge is based and/or by a general reduction in the charge).

Table ES-1
Schedule of Development Charges

Service	RESIDENTIAL					NON-RESIDENTIAL
	Single-Detached Dwelling & Semi-Detached Dwelling (per unit)	Townhouses & Other Multiple Unit Dwellings (per unit)	Apartments 2-Bedrooms+ (per unit)	Apartments Bachelor & 1-Bedroom (per unit)	Residential Facility Dwelling (per bedroom)	(per sq.ft. of Gross Floor Area)
City Wide Services:						
Services Related to a Highway	10,769	7,708	6,306	4,314	3,479	8.05
Public Works Facilities, Vehicles & Equipment	784	561	459	314	253	0.41
Police Services	524	375	307	210	169	0.26
Fire Protection Services	462	331	271	185	149	0.23
Transit Services	1,917	1,372	1,123	768	619	0.98
Parkland Development	2,352	1,683	1,377	942	760	0.11
Indoor Recreation Services	4,430	3,171	2,594	1,775	1,431	0.20
Library Services	1,045	748	612	419	338	0.05
Administrative Studies - Community Based Studies	335	240	196	134	108	0.17
Administrative Studies - Engineering Services Studies	161	115	94	64	52	0.08
Paramedics	137	98	80	55	44	0.03
Long Term Care	125	89	73	50	40	0.01
Health Services	1	1	1	-	-	0.00
Social & Child Services	15	11	9	6	5	0.00
Social Housing	648	464	379	260	209	0.00
Airport lands	419	300	245	168	135	0.21
Parking services	490	351	287	196	158	0.25
Provincial Offences Administration	40	29	23	16	13	0.02
Waste Diversion	657	470	385	263	212	0.13
Total City Wide Services	**25,311**	**18,117**	**14,821**	**10,139**	**8,174**	**11.18**
Urban Services						
Wastewater Facilities	4,048	2,897	2,371	1,622	1,308	1.95
Wastewater Linear Services	5,415	3,876	3,171	2,169	1,749	2.61
Water Services	4,767	3,412	2,792	1,910	1,540	2.29
Combined Sewer System						
Stormwater Drainage and Control Services	3,948	2,826	2,312	1,582	1,275	0.00
Separated Sewer System						
Stormwater Drainage and Control Services	10,462	7,488	6,127	4,191	3,380	2.16
GRAND TOTAL RURAL AREA	**25,311**	**18,117**	**14,821**	**10,139**	**8,174**	**11.18**
GRAND TOTAL URBAN AREA (COMBINED SEWER SYSTEM)	**43,489**	**31,128**	**25,467**	**17,422**	**14,046**	**18.02**
GRAND TOTAL URBAN AREA (SEPARATED SEWER SYSTEM)	**50,003**	**35,790**	**29,282**	**20,031**	**16,151**	**20.18**
Additional Special Area Charges						
Dundas/Waterdown	1,971	1,410	1,154	789	637	1.04

Figure 1-1
Schedule of Key D.C. Process Dates for the City of Hamilton

1. Data collection, staff review, engineering work, D.C. calculations and policy work	January 2018 to February 2019
2. Development Charges Stakeholders Sub-Committee Meetings	1. March 1, 2018 2. June 14, 2018 3. September 13, 2018 4. January 28, 2019 5. February 19, 2019 6. March 25, 2019
3. Public meeting advertisement placed in newspaper(s)	March 21 & 28, 2019 (Hamilton Community News) March 22 & 29, 2019 (Hamilton Spectator)
4. Background study and proposed by-law available to public	March 13, 2019
5. Public meeting at Audit, Finance & Administration Committee	April 18, 2019
6. Addendum report available to the public	May 15,2019
7. Audit, Finance & Administration Committee considers adoption of background study and by-law	June 6, 2019
8. Council adoption of by-law	June 12, 2019
9. Newspaper notice given of by-law passage	By 20 days after passage
10. Last day for by-law appeal	40 days after passage
11. City makes pamphlet available (where by-law not appealed)	By 60 days after in force date

5.2.6 Indoor Recreation Facilities

With respect to recreation facilities, there are currently many facilities provided by the City, located in Hamilton, Stoney Creek, Ancaster, Dundas, Glanbrook and Flamborough amounting to a total of 2,378,954 sq.ft. of space. The City also provides 242,417 sq.ft. of recreation related buildings within parks (washrooms, concessions, storage, facilities, etc.). The City has sustained the current level of service over the historical 10-year period (2009 to 2018), with an average of 4.40 sq.ft. per capita or an investment of $1,975 per capita. Based on this service standard, the City would be eligible to collect $128,521,139 from D.C.s for facility space.

The City currently has an inventory of 66 vehicles and equipment related to indoor recreation all of which have a total value of $363,900. Over the past ten years, the average level of service was 1 item per 1,000 population or an investment of $0.53 per capita. Based on this service standard, the City would be eligible to collect approximately $34,474 from D.C.s for recreation vehicles and equipment (over the 10-year period). Therefore, the total D.C.-eligible amount for Indoor Recreation is $128,555,613.

Based on the projected growth over the 10-year forecast period (2019 to 2028), the City has identified the need for new community centres, expansions to existing facilities, new washrooms, fieldhouses, and indoor recreation related equipment. The gross capital cost of these projects is $177,020,000. The City has identified the need for growth-related financing for the Riverdale Community Hub & Domenic Agostino Riverdale Community Centre expansion and Sir Wilfred Laurier Gymnasium. The total amount (discounted) included in the D.C. calculations is $2,924,660, which is based on a 15-year term at a rate of 5%. An attribution of $36,025,000 was made to recognize the benefit to growth in the post period and $6,620,000 will benefit existing developments. A deduction of $1 million was made to recognize funding anticipated for the Ancaster Tennis Bubble. Further, a deduction in the amount of $6,112,363 has been made to reflect the balance in the D.C. reserve fund. Therefore, the net growth capital cost after the mandatory 10% deduction of $116,849,797 has been included in the D.C.

While indoor recreation service usage is predominately residential-based, there is some use of the facility by non-residential users. To acknowledge this use, the growth-related capital costs have been allocated 95% residential and 5% non-residential.

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Indoor Recreation Facilities

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2028	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Subtotal	Less:	Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development		Other (e.g. 10% Statutory Deduction)	Total	Residential Share 95%	Non-Residential Share 5%
1	Valley Park Community Centre Expansion	2019-2021	1,800,000	-		1,800,000	180,000		1,620,000	162,000	1,458,000	1,385,100	72,900
2	Norman Pinky Lewis Recreation Centre Expansion	2023-2025	6,600,000	-		6,600,000	3,300,000		3,300,000	330,000	2,970,000	2,821,500	148,500
3	Winona Community Centre	2022-2024	26,500,000	-		26,500,000	-		26,500,000	2,650,000	23,850,000	22,657,500	1,192,500
4	Elfrida Community Centre	2027-2036	27,500,000	22,000,000		5,500,000	-		5,500,000	550,000	4,950,000	4,702,500	247,500
5	Binbrook Community Centre	2028	27,500,000	14,025,000		13,475,000	-		13,475,000	1,347,500	12,127,500	11,521,125	606,375
6	Sackville Expansion	2026	6,700,000	-		6,700,000	-		6,700,000	670,000	6,030,000	5,728,500	301,500
7	Waterdown Community Centre	2025-2027	27,000,000	-		27,000,000	-		27,000,000	2,700,000	24,300,000	23,085,000	1,215,000
8	Riverdale Community Hub & Domenic Agostino Riverdale Community Centre Expansion	2020-2022	11,000,000	-		11,000,000	-		11,000,000	1,100,000	9,900,000	9,405,000	495,000
9	Riverdale Community Hub & Domenic Agostino Riverdale Community Centre Expansion - Growth Related Debt Interest (Discounted)	2023-2038	1,436,413	-		1,436,413	-		1,436,413		1,436,413	1,364,592	71,821
10	William Connell Park Washroom and changeroom Facilities (under construction)	2019	3,700,000	-		3,700,000	-		3,700,000	370,000	3,330,000	3,163,500	166,500
11	Sir Wilfrid Laurier Gymnasium	2020-2021	8,650,000	-		8,650,000	-		8,650,000	865,000	7,785,000	7,395,750	389,250
12	Sir Wilfrid Laurier Gymnasium - Growth Related Debt Interest (Discounted)	2022-2037	1,488,247	-		1,488,247	-		1,488,247		1,488,247	1,413,835	74,412
13	Mt. Hope new Rec Centre	2025-2028	4,850,000	-		4,850,000	-		4,850,000	485,000	4,365,000	4,146,750	218,250
14	William Connell Ward 8 Ice Loop	2028	4,360,000	-		4,360,000	-		4,360,000	436,000	3,924,000	3,727,800	196,200
15	Ancaster Tennis Bubble	2019-2020	1,000,000	-		1,000,000	-	1,000,000	-	-	-	-	-
16	Parkdale Outdoor Pool Washroom & Changeroom	2019-2021	3,000,000	-		3,000,000	2,640,000		360,000	36,000	324,000	307,800	16,200
17	Dundas Valley Washroom	2019	565,000	-		565,000	-		565,000	56,500	508,500	483,075	25,425

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Indoor Recreation Facilities

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2028	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Subtotal	Less:	Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development		Other (e.g. 10% Statutory Deduction)	Total	Residential Share 95%	Non-Residential Share 5%
18	Durand Park Washroom Building	2019	325,000	-		325,000	-		325,000	32,500	292,500	277,875	14,625
19	Stadium Precinct Park Fieldhouses & Washrooms	2020	5,200,000	-		5,200,000	-		5,200,000	520,000	4,680,000	4,446,000	234,000
20	Confederation Park - Sports Park Buildings Phase 1: Gatehouse	2019	700,000	-		700,000	-		700,000	70,000	630,000	598,500	31,500
21	Confederation Park - Sports Park Buildings Phase 2: Fieldhouse and Staff Works Yard	2020-2024	5,500,000	-		5,500,000	-		5,500,000	550,000	4,950,000	4,702,500	247,500
22	Confederation Park - Ice skating rink/loop, field house & zamboni	2027-2036	3,570,000	-		3,570,000	-		3,570,000	357,000	3,213,000	3,052,350	160,650
23	West Harbour Washroom/Concession	2021-2022	1,000,000	-		1,000,000	500,000		500,000	50,000	450,000	427,500	22,500
24	Reserve Fund Adjustment						6,112,363		(6,112,363)		(6,112,363)	(5,806,745)	(305,618)
	Total		**179,944,660**	**36,025,000**	**-**	**143,919,660**	**12,732,363**	**1,000,000**	**130,187,297**	**13,337,500**	**116,849,797**	**111,007,307**	**5,842,490**

5.2.8 Administrative Studies

The D.C.A. permits the inclusion of studies undertaken to facilitate the completion of the City's capital works program. The City has made provisions for the inclusion of new studies undertaken to facilitate this D.C. process, as well as other studies which benefit growth (in whole or in part). With the introduction of Bill 108, it proposes that a number of services may become ineligible for inclusion in the D.C., therefore, this category is further broken down into two categories and the list of studies included for each is as follows:

Engineering Studies:

- Water and wastewater studies;
- Transit studies;
- Future transit hubs and stations studies;
- Operations facilities studies;
- Police studies;
- Fire studies; and
- Development Charges studies.

The cost of these studies, including the reserve fund deficit of $1,299,988, is $9,518,922. Included in this capital cost is the recovery of outstanding debt (principal and discounted interest) related to previous growth-related studies at an amount of $235,434. A deduction for benefit to existing development of $2,196,200 has been made. Further, a deduction in the amount of $631,890 has been made in order to account for the ineligible landfill related portion of waste diversion studies. Under the current legislation, the D.C. studies and waste diversion studies require a 10% mandatory deduction, thus the net growth-related capital cost is $6,415,671. This amount has been included in the D.C.

Community Based Studies:

- Community service studies;
- P.O.A. studies;
- Parks and recreation studies;
- Paramedics studies;

- Library studies;
- Official plans;
- Secondary plans; and
- Provision for other unidentified studies.

The gross cost of these studies included in the D.C. calculation is $19,025,000. A deduction of $4,227,400 has been made to account for the benefit to existing growth. The net growth-related capital cost, after the mandatory 10% deduction is $13,317,840 and is being included in the D.C.

These costs have been allocated 63% residential and 37% non-residential based on the incremental growth in population to employment for the 10-year forecast period.

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Administrative Studies - Engineering Services Studies

Prj.No	Increased Service Needs Attributable to Anticipated Development 2019-2028	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions*	Net Capital Cost	Less:		Subtotal	Less:	Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development		Other (e.g. 10% Statutory Deduction)	Total	Residential Share 63%	Non-Residential Share 37%
1	Development Charge Study	2019	730,800	-		730,800	-		730,800	73,080	657,720	414,364	243,356
2	Development Charge Study (to 2041)	2021	730,800	-		730,800	-		730,800	73,080	657,720	414,364	243,356
3	Development Charge Study	2026	730,800	-		730,800	-		730,800	73,080	657,720	414,364	243,356
	Water & Wastewater Studies:			-			-						
4	Integrated Water and Wastewater Master Plan	2019-2028	1,500,000	-		1,500,000	-		1,500,000		1,500,000	945,000	555,000
5	Water and Sanitary Sewer Models	2019-2028	130,000	-		130,000	65,000		65,000		65,000	40,950	24,050
6	Centennial Secondary Plan - Servicing Study	2019	200,000	-		200,000	-		200,000		200,000	126,000	74,000
	Transit Studies:						-						
7	Hamilton West Interregional Transit Terminal Location Study	2019-2022	84,300	-		84,300	75,900		8,400		8,400	5,292	3,108
8	Rapid Ready & 10 Year Strategy Review	2019-2028	150,000	-		150,000	75,000		75,000		75,000	47,250	27,750
9	James Mountain Road - Transit only Roadway Feasibility Study	2020-2023	112,400	-		112,400	56,200		56,200		56,200	35,406	20,794
	Future Transit Hubs and Stations:						-						
10	SCUBE Transit Terminal Study	2019	242,400	-		242,400	-		242,400		242,400	152,712	89,688
	Operations Facilities:						-						
11	Yards Need Study	2025-2028	168,600	-		168,600	-		168,600		168,600	106,218	62,382
	Police:						-						
12	Police - Space Needs Study (GRIDS II)	2019	56,200	-		56,200	-		56,200		56,200	35,406	20,794
13	Police Business Plan	2019	32,000	-		32,000	24,000		8,000		8,000	5,040	2,960
14	Police Business Plan	2022	32,000	-		32,000	24,000		8,000		8,000	5,040	2,960
15	Police Business Plan	2025	32,000	-		32,000	24,000		8,000		8,000	5,040	2,960
16	Police Business Plan	2028	32,000	-		32,000	24,000		8,000		8,000	5,040	2,960
	Waste Diversion:												
17	Waste Management Research & Development Program	2019-2023	1,229,100	-	245,820	983,280	882,500		100,780	10,078	90,702	57,142	33,560
18	Waste Management Research & Development Program	2024-2028	1,229,100	-	245,820	983,280	882,500		100,780	10,078	90,702	57,142	33,560
19	Solid Waste Management Master Plan Approvals	2019-2021	561,000	-	140,250	420,750	63,100		357,650	35,765	321,885	202,788	119,097
	Other:												
20	Outstanding Debt Principal	2019-2023	198,550	-		198,550	-		198,550		198,550	125,086	73,463
21	Outstanding Debt Interest (Discounted)	2019-2023	36,884	-		36,884	-		36,884		36,884	23,237	13,647
22	Reserve Fund Adjustment		1,299,988	-		1,299,988	-		1,299,988		1,299,988	818,993	480,996
	Total		**9,518,922**	**-**	**631,890**	**8,887,032**	**2,196,200**	**-**	**6,690,832**	**275,161**	**6,415,671**	**4,041,873**	**2,373,798**

*Other deductions are portions attributable to landfill

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Administrative Studies - Community Based Studies

Prj.No	Increased Service Needs Attributable to Anticipated Development 2019-2028	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Subtotal	Less:	Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development		Other (e.g. 10% Statutory Deduction)	Total	Residential Share 63%	Non-Residential Share 37%
1	Official Plan (Urban and Rural) Review	2019-2021	2,000,000	-		2,000,000	1,000,000		1,000,000	100,000	900,000	567,000	333,000
2	Comprehensive Zoning By-Law 05-200 Update	2019-2021	57,000	-		57,000	28,500		28,500	2,850	25,650	16,160	9,491
3	GRIDS/MCR Update	2019-2020	2,195,000	-		2,195,000	-		2,195,000	219,500	1,975,500	1,244,565	730,935
4	Residential Intensification Strategy	2019	157,000	-		157,000	-		157,000	15,700	141,300	89,019	52,281
5	Site Plan Guidelines Update/Consolidation	2019-2022	200,000	-		200,000	-		200,000	20,000	180,000	113,400	66,600
6	Digital Planning Application Software/Hardware	2019-2022	150,000	-		150,000	-		150,000	15,000	135,000	85,050	49,950
7	Natural Areas Inventory Study	2019-2028	300,000	-		300,000	30,000		270,000	27,000	243,000	153,090	89,910
8	Woodland Protection Strategy	2019	325,000	-		325,000	32,500		292,500	29,250	263,250	165,848	97,403
9	3D Model Development for Development Review Process	2019	120,000	-		120,000	-		120,000	12,000	108,000	68,040	39,960
10	Planning and Zoning Growth Area	2019-2022	1,215,000	-		1,215,000	-		1,215,000	121,500	1,093,500	688,905	404,595
	Secondary Plans and Strategies - Nodes and Corridors:			-			-						
11	Sub-Regional Nodes			-			-						
12	- Eastgate/Centennial Node	2019-2020	320,400	-		320,400	192,200		128,200	12,820	115,380	72,689	42,691
13	- Limeridge Node	2019-2020	320,400	-		320,400	192,200		128,200	12,820	115,380	72,689	42,691
14	Corridors:			-			-						
15	- Main/King Corridor (B-Line)	2019-2022	304,700	-		304,700	182,800		121,900	12,190	109,710	69,117	40,593
16	- James/Upper James Corridor (A-Line)	2019-2022	320,400	-		320,400	192,200		128,200	12,820	115,380	72,689	42,691
17	Community Nodes:			-			-						
18	- Waterdown Node	2019-2021	282,200	-		282,200	211,700		70,500	7,050	63,450	39,974	23,477
19	- Centre Mall Node	2021-2022	282,200	-		282,200	197,500		84,700	8,470	76,230	48,025	28,205
20	- Dundas Node	2019-2020	282,200	-		282,200	169,300		112,900	11,290	101,610	64,014	37,596
21	- Stoney Creek Node	2020-2021	304,700	-		304,700	182,800		121,900	12,190	109,710	69,117	40,593
22	Community Planning Studies - Durand Neighbourhood	2019-2021	150,000	-		150,000	37,500		112,500	11,250	101,250	63,788	37,463
22	East of Downtown Secondary Plan	2024-2025	320,400	-		320,400	-		320,400	32,040	288,360	181,667	106,693
23	Elfrida Urban Boundary Expansion & Secondary Plan	2019-2021	1,577,500	-		1,577,500	-		1,577,500	157,750	1,419,750	894,443	525,308
24	City-wide Employment Survey	2019-2028	900,000	-		900,000	-		900,000	90,000	810,000	510,300	299,700
25	Community Energy Plan	2019-2021	100,000	-		100,000	50,000		50,000	5,000	45,000	28,350	16,650
	Community Services:			-			-						
26	Long Term Care Services Needs Study	2027	242,800	-		242,800	121,400		121,400	12,140	109,260	68,834	40,426
27	Child Care Service Plan	2020-2025	84,300	-		84,300	42,200		42,100	4,210	37,890	23,871	14,019
28	Human Services Study	2020-2025	224,900	-		224,900	112,500		112,400	11,240	101,160	63,731	37,429
29	Human Services Plan - Housing Affordability Study	2020-2025	45,000	-		45,000	11,300		33,700	3,370	30,330	19,108	11,222
30	Affordable Housing - Residential Pre-zoning & Underutilized Site Mapping	2020-2025	89,900	-		89,900	22,500		67,400	6,740	60,660	38,216	22,444
31	City Housing Hamilton Energy Investment Study	2020-2025	393,500	-		393,500	295,100		98,400	9,840	88,560	55,793	32,767
32	Ontario Works Review	2020-2025	112,400	-		112,400	84,300		28,100	2,810	25,290	15,933	9,357
33	Human Services Market Planning Study	2020-2025	224,900	-		224,900	56,200		168,700	16,870	151,830	95,653	56,177
34	Neighbourhood Community Needs Study	2020-2025	67,500	-		67,500	33,800		33,700	3,370	30,330	19,108	11,222

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Administrative Studies - Community Based Studies

Prj.No	Increased Service Needs Attributable to Anticipated Development 2019-2028	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Subtotal	Less:	Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development		Other (e.g. 10% Statutory Deduction)	Total	Residential Share 63%	Non-Residential Share 37%
	Paramedics:			-									
35	Paramedics - Space Needs Study	2023	112,400	-		112,400	28,100		84,300	8,430	75,870	47,798	28,072
36	Paramedics - Space Needs Study	2028	112,400	-		112,400	-		112,400	11,240	101,160	63,731	37,429
	Parking:			-									
37	Parking Master Plan	2019	200,000	-		200,000	50,000		150,000	15,000	135,000	85,050	49,950
	Library Studies:			-									
38	Library Master Plan	2022	25,000	-		25,000	6,300		18,700	1,870	16,830	10,603	6,227
39	Service Model Master Plan	2020	25,000	-		25,000	6,300		18,700	1,870	16,830	10,603	6,227
	Parks:			-									
40	Trails Masterplan Update	2021	204,000	-		204,000	51,000		153,000	15,300	137,700	86,751	50,949
41	Parks Master Plans	2019-2023	1,214,200	-		1,214,200	303,600		910,600	91,060	819,540	516,310	303,230
42	Recreation Studies	2019-2023	607,100	-		607,100	151,800		455,300	45,530	409,770	258,155	151,615
43	Recreation Studies	2024-2028	607,100	-		607,100	151,800		455,300	45,530	409,770	258,155	151,615
	Other:			-									
44	Provision for Growth Component of Unidentified Studies	2019-2023	2,248,500	-		2,248,500	-		2,248,500	224,850	2,023,650	1,274,900	748,751
	Total		**19,025,000**	**-**	**-**	**19,025,000**	**4,227,400**	**-**	**14,797,600**	**1,479,760**	**13,317,840**	**8,390,239**	**4,927,601**

5.3.5 Stormwater Drainage and Control Services

Wood Environment & Infrastructure Solutions (Wood) undertook an assessment of the needs for stormwater management within the serviced areas of the City. Appendix G provides the detailed assessment and allocation of works between existing benefit and growth. Historically, the Stormwater D.C. calculation has been undertaken on a City-wide basis, but under Bill 73, Council is required to consider the use of area-specific charges when completing a D.C. background study. Based on staff recommendations, Council has directed as per report FCS18034, the use of an area-specific D.C. calculation for Stormwater services on the basis of the combined sewer system versus the separated sewer system for the 2019 D.C. background study. It was identified that some of the stormwater works, including channels, drainage and studies, benefit both the combined and the separated systems. These works were proportioned between the combined and separated systems based on the anticipated growth in population and employment in each. Other works, such as on-site controls, are required in the combined system, as the development of stormwater management ponds is not possible; whereas, ponds are required for development in the separated system. As such, Wood has identified the works required in each system and costs have been allocated to these respective areas.

Within the separated sewer system Wood has identified $681,578,067 in works required. In addition, the City has identified $26,713,318 in stormwater studies, provisions for Best Efforts Agreements in the amount of $952,693 and outstanding stormwater credits in the amount of $18,626,355 to be included in the calculations. Outstanding debt owed to the Ontario Land Corporation is included in the D.C. at an amount of $1,404,656 (apportioned between the combined and separated sewer systems). An amount of $6,211,845 has been included in the D.C. calculation to recognize the reserve fund deficit, as well as $274,463 of existing debt. The resulting gross cost in the separated sewer system is $735,761,398. Of this amount, $26,629,917 has been identified as benefiting existing development and $134,109,622 is a benefit to growth beyond the 13-year forecast period. A further deduction of $226,174,652 has been made to recognize the non-residential portion of the residential ponds. These deductions result in a net amount of $348,847,708 attributable to growth over the 13-year forecast period.

Within the combined sewer system area, Wood has identified $9,000,000 in future capital works. Staff have also identified $7,876,682 of stormwater studies within the combined sewer system area. $1,902,094 of debt owed to the Ontario Land Corporation has also been identified in the D.C. recoverable costs. $114,198 has been included in the D.C. calculation in order to reflect the reserve fund deficit, resulting in a gross cost of $18,892,974. A deduction of $107,336 has been made to reflect the benefit to existing in addition to $79,264, which reflects the benefit to growth beyond the 13-year forecast period. This results in a D.C. eligible amount of $18,706,374 for the combined sewer system area.

The existing reserve fund deficit has been allocated amongst the separated versus combined systems based on the proportion of D.C. eligible costs identified in each respective system in the 2014 D.C. background study. As discussed in section 7.4.1, it is recommended that the City split out the reserve fund to reflect the area-specific charges.

Although the D.C. charge will be lower in the combined sewer system for the stormwater component, landowners are required to pay for additional on-site works, and the relative reduction would assist in providing a more equitable cost for development in this area.

The following is a summary of the gross and net recoverable costs for the separated versus combined system based on Wood's assessment and all other adjustments:

Separated Sewer System	Gross Cost	Net D.C. Recoverable Cost
Future Capital Works	$681,578,067	$295,607,777
Stormwater Studies	$26,713,318	$25,769,918
Reserve Fund Adjustment	$6,211,845	$6,211,845
Provision for Stormwater Credits	$18,626,355	$18,626,355
Provision for Best Efforts Agreements	$952,693	$952,693
Outstanding Debt to Ontario Land Corp.	$1,404,656	$1,404,656
Existing Debt	$274,463	$274,463
Total	**$735,761,398**	**$348,847,708**

Combined Sewer System	Gross Cost	Net D.C. Recoverable Cost
Future Capital Works	$9,000,000	$9,000,000
Stormwater Studies	$7,876,682	$7,690,082
Outstanding Debt to Ontario Land Corp.	$1,902,094	$1,902,094
Reserve Fund Adjustment	$114,198	$114,198
Total	**$18,892,974**	**$18,706,374**

The costs for all stormwater services except facilities are shared 44%/56% between residential and non-residential based on the benefiting lands associated with the stormwater management works over the 13-year forecast period.

For stormwater facilities within the separated system, the costs identified are attributable 100% to residential development. Non-residential development is required to provide facilities as part of the local service policy.

The costs for stormwater in the combined system are attributable 100% to residential.

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Stormwater Works & Studies (excluding Facilities) - Within Separated Sewer System

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2031	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development	Total	Residential Share 44%	Non-Residential Share 56%
1	Open Watercourses - Channel System Improvements - Residential (Category A)	2019-2023	2,913,000	-		2,913,000	-		2,913,000	1,281,720	1,631,280
2	Open Watercourses - Channel System Improvements - Residential (Category A)	2024-2028	1,410,000	-		1,410,000	-		1,410,000	620,400	789,600
3	Open Watercourses - Channel System Improvements - Residential (Category A)	2029-2031	16,600,000	3,793,333		12,806,667	-		12,806,667	5,634,933	7,171,734
4	Open Watercourses - Channel System Improvements - Non-Residential (Category A)	2019-2023	1,590,000	-		1,590,000	795,000		795,000	349,800	445,200
5	Open Watercourses - Channel System Improvements - Non-Residential (Category A)	2029-2031	21,497,000	-		21,497,000	2,667,500		18,829,500	8,284,980	10,544,520
6	Off Site Erosion Works (Category B)	2019-2031	25,804,837	-		25,804,837	12,339,935		13,464,902	5,924,557	7,540,345
7	Oversizing of trunk sewers and culverts (Category D)	2019-2023	14,118,070	-		14,118,070	-		14,118,070	6,211,951	7,906,119
8	Oversizing of trunk sewers and culverts (Category D)	2024-2028	2,784,639	-		2,784,639	-		2,784,639	1,225,241	1,559,398
8	Culverts and Bridges not previously identified (Category E)	2019-2023	2,529,000	-		2,529,000	337,200		2,191,800	964,392	1,227,408
9	Culverts and Bridges not previously identified (Category E)	2024-2031	6,912,600	334,390		6,578,210	1,331,940		5,246,270	2,308,359	2,937,911
10	GRIDS Related Open Watercourses	2019-2031	19,497,638	4,716,709		14,780,929	-		14,780,929	6,503,609	8,277,320
11	Existing Debt on Growth Related Projects - Principal (Discounted)	2019-2031	212,923	-		212,923	-		212,923	93,686	119,237
12	Existing Debt on Growth Related Projects - Interest (Discounted)	2019-2031	61,539	-		61,539	-		61,539	27,077	34,462
13	Outstanding Debt to Ontario Land Corporation	2019-2031	1,404,656	-		1,404,656	-		1,404,656	618,049	786,607
14	Reserve Fund Adjustment		1,845,614			1,845,614	-		1,845,614	812,070	1,033,544
	Stormwater Studies:					-	-		-	-	-
15	Stormwater Management Monitoring (Separated System)	2019-2031	8,000,000	-		8,000,000	-		8,000,000	3,520,000	4,480,000

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Stormwater Works & Studies (excluding Facilities) - Within Separated Sewer System

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2031	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development	Total	Residential Share 44%	Non-Residential Share 56%
16	Specific Area Water Shed Master Plans for Separated System Area	2019-2031	3,750,000	-		3,750,000	-		3,750,000	1,650,000	2,100,000
17	Airport Block Servicing Studies (Separated System)	2019-2028	6,000,000	-		6,000,000	-		6,000,000	2,640,000	3,360,000
18	Cherry Beach EA & Preliminary Design Study (Lower Stoney Creek) (Separated System)	2022	500,000	-		500,000	-		500,000	220,000	280,000
19	Falkirk East Storm Drainage Study (Separated System)	2025	500,000	-		500,000	-		500,000	220,000	280,000
20	Stoney Creek Watercourse 6 Drainage Improvements Hwy. 8 to Lake Ontario (Separated System)	2019	1,500,000	-		1,500,000	-		1,500,000	660,000	840,000
21	Stoney Creek Watercourse 7 Drainage Improvements Upstream of Barton to Hwy. 8 (Separated System)	2020	750,000	-		750,000	-		750,000	330,000	420,000
22	Watercourse 10 - S.C.U.B.E. Drainage Improvement Study (Separated System)	2020	500,000	-		500,000	-		500,000	220,000	280,000
23	Stormwater Master Plan Update - City Wide (Proportion for Separated Sewer System)	2019	208,717	-		208,717	41,743		166,973	73,468	93,505
24	Stormwater Master Plan Update - City Wide (Proportion for Separated Sewer System)	2024	1,252,301	-		1,252,301	250,460		1,001,840	440,810	561,031
25	Stormwater Master Plan Update - City Wide (Proportion for Separated Sewer System)	2029	1,252,301	400,736		851,564	250,460		601,104	264,486	336,618
26	Unidentified Studies (Separated System)	2019-2031	2,500,000	-		2,500,000	-		2,500,000	1,100,000	1,400,000
	Total		**145,894,835**	**9,245,168**	**-**	**136,649,667**	**18,014,239**	**-**	**118,635,428**	**52,199,588**	**66,435,840**

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Stormwater Facilities - Within Separated Sewer System

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2031	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development	Total	Residential Share 100%	Non-Residential Share 0%
1	Stormwater Management Quality/Quantity Facilities - Residential	2019-2023	89,997,369	-		89,997,369	-		89,997,000	89,997,000	-
2	Stormwater Management Quality/Quantity Facilities - Residential	2024-2031	89,686,075	-		89,686,075	5,922,300		83,764,000	83,764,000	-
3	Provision for Non-Residential Portion of Residential Ponds	2019-2031	(1,022,108)	-		(1,022,108)	-		(1,022,000)	(1,022,000)	-
4	Stormwater Management Quality/Quantity Facilities - Non-Residential	2019-2023	4,122,067	-		4,122,067	2,018,178	2,103,889	-	-	-
5	Stormwater Management Quality/Quantity Facilities - Non-Residential	2024-2031	103,879,110	-		103,879,110	675,200	103,203,910	-	-	-
6	Provision for Residential Portion of Non-Residential Ponds	2024-2031	651,896	-		651,896	-		652,000	652,000	-
7	GRIDS Related SWM Projects - Residential Portion	2019-2031	98,626,698	65,751,132		32,875,566	-		32,876,000	32,876,000	-
8	GRIDS Related SWM Projects - Non-Residential Portion	2019-2031	179,980,176	59,113,322		120,866,854	-	120,866,853	-	-	-
9	Provision for Stormwater Credits	2019-2031	18,626,355	-		18,626,355	-		18,626,355	18,626,355	-
10	Provision for Best Efforts Agreements	2019-2031	952,693	-		952,693	-		952,693	952,693	-
11	Reserve Fund Adjustment		4,366,231	-		4,366,231	-		4,366,231	4,366,231	-
	Total		**589,866,563**	**124,864,454**	**-**	**465,002,109**	**8,615,678**	**226,174,652**	**230,212,280**	**230,212,280**	**-**

Infrastructure Costs Covered in the D.C. Calculation

City of Hamilton
Service: Stormwater Facilities - Within Combined Sewer System

Project Number	Increased Service Needs Attributable to Anticipated Development 2019-2031	Timing (year)	Gross Capital Cost Estimate (2019$)	Post Period Benefit	Other Deductions	Net Capital Cost	Less:		Potential D.C. Recoverable Cost		
							Benefit to Existing Development	Grants, Subsidies and Other Contributions Attributable to New Development	Total	Residential Share 100%	Non-Residential Share 0%
1	Stormwater Management Quality/Quantity Facilities (Combined)	2024-2031	6,000,000	-		6,000,000	-		6,000,000	6,000,000	-
2	Oversizing of trunk sewers and culverts (Category D)	2019-2023	2,000,000	-		2,000,000	-		2,000,000	2,000,000	-
3	Oversizing of trunk sewers and culverts (Category D)	2024-2031	1,000,000	-		1,000,000	-		1,000,000	1,000,000	-
4	Outstanding Debt to Ontario Land Corporation	2019-2031	1,902,094	-		1,902,094	-		1,902,094	1,902,094	-
	Stormwater Studies:										
5	Specific Area Water Shed Master Plans for Combined Sewer Area	2019-2031	3,750,000	-		3,750,000	-		3,750,000	3,750,000	-
6	Ainslie Wood Westdale Stormwater Drainage Master Plan (Combined System)	2019	750,000	-		750,000	-		750,000	750,000	-
7	Ainsliewood/Westdale Neighbourhoods Class EA (Combined System)	2023	340,000	-		340,000	-		340,000	340,000	-
8	Unidentified Studies (Combined System)	2019-2031	2,500,000	-		2,500,000	-		2,500,000	2,500,000	-
9	Stormwater Master Plan Update - City Wide (Proportion for Combined Sewer System)	2019	41,283	-		41,283	8,257		33,027	33,027	-
10	Stormwater Master Plan Update - City Wide (Proportion for Combined Sewer System)	2024	247,699	-		247,699	49,540		198,160	198,160	-
11	Stormwater Master Plan Update - City Wide (Proportion for Combined Sewer System)	2029	247,699	79,264		168,436	49,540		118,896	118,896	-
12	Reserve Fund Adjustment		114,198	-		114,198	-		114,198	114,198	-
	Total		**18,892,974**	**79,264**	**-**	**18,813,711**	**107,336**	**-**	**18,706,374**	**18,706,374**	**-**

Table 6-2
Development Charge Calculation
Area Specific Services – Separated Sewer System (Other Built Boundary & Greenfield)
2019 to 2031

SERVICE	2019$ D.C.-Eligible Cost		2019$ D.C.-Eligible Cost	
	Residential	Non-Residential	SDU	per ft²
	$	$	$	$
1. Stormwater Drainage and Control Services				
1.1 Channels, drainage and studies	52,199,588	66,435,840	1,934	2.16
1.2 Residential Ponds	230,212,280	-	8,528	-
	282,411,868	66,435,840	10,462	2.16
TOTAL	**282,411,868**	**$66,435,840**	**10,462**	**2.16**
D.C.-Eligible Capital Cost	282,411,868	$66,435,840		
Urban (13 Year) Gross Population/GFA Growth (sq.ft,)	91,917	30,726,700		
Cost Per Capita/Non-Residential GFA (sq.ft.)	**$3,072.47**	**$2.16**		
By Residential Unit Type **P.P.U.**				
Single and Semi-Detached Dwelling 3.41	$10,462			
Apartments - 2 Bedrooms + 1.99	$6,126			
Apartments - Bachelor and 1 Bedroom 1.36	$4,191			
Other Multiples 2.44	$7,488			
Residential Facility 1.10	$3,380			

Table 6-5
Development Charge Calculation
City-Wide Services
2019 to 2028

SERVICE	2019$ D.C.-Eligible Cost		2019$ D.C.-Eligible Cost	
	Residential	Non-Residential	SDU	per ft²
	$	$	$	$
8. Transit Services				
8.1 Transit facilities, vehicles and other infrastructure	48,046,855	28,217,994	1,917	0.98
	48,046,855	28,217,994	1,917	0.98
9. Other Transportation Services				
9.1 Parking services	12,290,688	7,218,340	490	0.25
9.2 Airport lands	10,494,005	6,163,146	419	0.21
	22,784,693	13,381,486	909	0.46
10. Parkland Development				
10.1 Parkland development, amenities, trails, vehicles & equipment	58,944,902	3,102,363	2,352	0.11
	58,944,902	3,102,363	2,352	0.11
11. Indoor Recreation Services				
11.1 Recreation facilities, vehicles & equipment	111,007,307	5,842,490	4,430	0.20
	111,007,307	5,842,490	4,430	0.20
12. Library Services				
12.1 Library facilities and vehicles	23,415,983	1,232,420	934	0.04
12.2 Library materials	2,784,436	146,549	111	0.01
	26,200,419	1,378,969	1,045	0.05
13. Administrative Studies				
13.1 Administrative Studies - Community Based Studies	8,390,239	4,927,601	335	0.17
13.2 Administrative Studies - Engineering Services Studies	4,041,873	2,373,798	161	0.08
	12,432,112	7,301,399	496	0.25
14. Long Term Care				
14.1 Long Term Care Facilities	3,126,267	347,363	125	0.01
	3,126,267	347,363	125	0.01
15. Social & Child Services				
15.1 Social and Child Services Facilities	373,841	41,538	15	-
	373,841	41,538	15	-
16. Health Services				
16.1 Health department space	21,868	2,430	1	-
17. Provincial Offences Administration				
17.1 P.O.A. facilities	1,003,680	589,463	40	0.02
18. Social Housing				
18.1 Social housing facilities	16,239,109	-	648	-
19. Paramedics				
19.1 Paramedics facilities	1,974,810	219,423	79	0.02
19.2 Vehicles & Equipment	1,453,626	161,514	58	0.01
	3,428,436	380,937	137	0.03

Table 6-5 Continued
Development Charge Calculation
City-Wide Services
2019 to 2028

SERVICE	2019$ D.C.-Eligible Cost		2019$ D.C.-Eligible Cost	
	Residential	Non-Residential	SDU	per ft²
20. Waste Diversion				
20.1 Waste diversion facilites, vehicles, equipment and other	16,475,018	3,374,401	657	0.13
	16,475,018	3,374,401	657	0.13
TOTAL	**320,084,505**	**63,960,834**	**12,772**	**2.23**
D.C.-Eligible Capital Cost	$320,084,505	$63,960,834		
10-Year Gross Population/GFA Growth (sq,ft,)	85,329	28,791,900		
Cost Per Capita/Non-Residential GFA (sq.ft.)	**$3,751.18**	**$2.23**		
By Residential Unit Type P.P.U.				
Single and Semi-Detached Dwelling 3.41	$12,773			
Apartments - 2 Bedrooms + 1.99	$7,480			
Apartments - Bachelor and 1 Bedroom 1.36	$5,117			
Other Multiples 2.44	$9,142			
Residential Facility 1.10	$4,126			

Table 6-6
Development Charge Calculation
Total Cost for All Services

	2019$ D.C.-Eligible Cost		2019$ D.C.-Eligible Cost	
	Residential	Non-Residential	SDU	per ft²
	$	$	$	$
Urban-wide Services 13 Year (Within Combined Sewer System)	470,252,587	265,193,808	18,178	$6.85
Urban-wide Services 13 Year (Within Separated Sewer System)	733,958,081	331,629,648	24,692	9.01
City-Wide Services 13 Year	403,086,503	349,590,851	12,539	8.95
City-wide Services 10 Year	320,084,505	63,960,834	12,772	2.23
TOTAL COMBINED SEWER SYSTEM	**$1,193,423,596**	**$678,745,492**	**$43,489**	**$18.02**
TOTAL SEPARATED SEWER SYSTEM	**$1,457,129,089**	**$745,181,332**	**$50,003**	**20.18**

Table 6-7
Cost to be Incurred Over the Life of the D.C. By-law

Service	Total Gross Cost	Sources of Financing						
		Tax Base or Other Non-D.C. Source				Post D.C. Period Benefit	D.C. Reserve Fund	
		Other Deductions	Benefit to Existing	Other Funding	Legislated Reduction		Residential	Non-Residential
1. Stormwater Drainage and Control Services (Combined Sewer System)								
1.1 Stormwater Facilities	5,535,129	0	8,257	0	0	0	5,526,873	0
1. Stormwater Drainage and Control Services (Separated Sewer System)								
1.1 Channels, drainage and studies	50,513,585	0	5,920,072	0	0	1,814,119	18,822,933	23,956,460
1.2 Residential Ponds	201,275,926	0	2,018,178	48,591,140	0	48,024,790	102,641,615	0
2. Wastewater Services								
2.1 Wastewater Facilities	631,279,374	0	295,267,624	274,326,078	0	15,421,418	29,146,480	17,117,774
2.2 Wastewater Linear Services	203,215,000	0	18,669,750	3,065,000	0	11,891,200	106,841,102	62,747,949
3. Water Services								
3.1 Facilities, Storage and Distribution systems	245,776,700	0	24,090,500	2,912,000	0	16,462,420	127,456,421	74,855,359
4. Services Related to a Highway								
4.1 Services Related to a Highway	466,160,359	0	73,493,504	0	0	21,585,530	195,428,662	175,652,662
5. Public Works Facilities, Vehicles & Equipment								
5.1 Facilities	27,498,731	0	10,866,800	0	593,438	0	9,943,866	6,094,627
5.2 Vehicles & Equipment	7,430,738	0	8,212	0	313,925	0	4,407,333	2,701,269
6. Fire Protection Services								
6.1 Fire facilities, vehicles & equipment	18,678,500	0	3,342,275	0	0	0	9,508,460	5,827,766
7. Police Services								
7.1 Police facilities, vehicles & equipment	35,328,169	0	16,257,400	0	0	339,008	11,613,692	7,118,069
8. Transit Services								
8.1 Transit facilities, vehicles and other infrastructure	380,013,550	22,270,000	183,095,900	108,800,000	0	12,225,050	33,782,238	19,840,362
9. Other Transportation Services								
9.1 Parking services	6,475,000	0	883,500	0	559,150	0	3,170,381	1,861,970
9.2 Airport lands	14,000,000	0	0	0	1,400,000	0	7,938,000	4,662,000
10. Parkland Development								
10.1 Parkland development, amenities, trails, vehicles & equipment	97,856,033	0	31,144,600	0	5,051,135	16,200,080	43,187,207	2,273,011
11. Indoor Recreation Services								
11.1 Recreation facilities, vehicles & equipment	64,781,667	0	4,420,000	0	6,036,167	0	51,609,225	2,716,275
12. Library Services								
12.1 Library facilities and vehicles	19,224,000	0	7,893,100	1,250,000	1,008,090	0	8,619,170	453,641
12.2 Library materials	1,915,400	0	0	0	191,540	0	1,637,667	86,193
13. Administrative Studies								
13.1 Administrative Studies - Community Based Studies	14,629,667	0	3,734,900	0	1,089,477	0	6,177,333	3,627,957
13.2 Administrative Studies - Engineering Services Studies	5,594,833	0	250,100	0	371,010	0	3,133,446	1,840,278

Table 6-7
Cost to be Incurred Over the Life of the D.C. By-law

Service	Total Gross Cost	Sources of Financing						
		Tax Base or Other Non-D.C. Source				Post D.C. Period Benefit	D.C. Reserve Fund	
		Other Deductions	Benefit to Existing	Other Funding	Legislated Reduction		Residential	Non-Residential
14. Long Term Care								
14.1 Long Term Care Facilities	11,850,000	0	6,140,000	2,640,000	307,000	0	2,486,700	276,300
15. Social and Child Services								
15.1 Social and Child Services Facilities	2,000,000	0	0	2,000,000	0	0	0	0
16. Health Services								
16.1 Health department space	0	0	0	0	0	0	0	0
17. Provincial Offences Administration								
17.1 P.O.A. facilities	0	0	0	0	0	0	0	0
18. Social Housing								
18.1 Social housing facilities	282,848,000	0	237,607,200	5,900,000	2,577,830	13,562,500	23,200,470	0
19. Paramedics								
19.1 Paramedics facilities	2,200,000	0	0	0	68,000	1,520,000	550,800	61,200
19.2 Vehicles & Equipment	1,715,000	0	0	0	171,500	0	1,389,150	154,350
20. Waste Diversion								
20.1 Waste diversion facilites, vehicles, equipment and other	51,427,950	8,922,195	21,171,500	0	1,828,226	3,052,000	13,656,844	2,797,185
Total Expenditures & Revenues	**$2,849,223,312**	**$31,192,195**	**$946,283,371**	**$449,484,218**	**$21,566,486**	**$162,098,114**	**$821,876,068**	**$416,722,656**

f) the approval of a description under section 50 of the Condominium Act; or

g) the issuing of a building permit under the Building Code Act in relation to a building or structure.

7.3.2 Determination of the Amount of the Charge

The following conventions be adopted:

1) Costs allocated to residential uses will be assigned to different types of residential units based on the average occupancy for each housing type constructed during the previous decade. Costs allocated to non-residential uses will be assigned based on the amount of square feet of gross floor area constructed for eligible uses (i.e. industrial, commercial and institutional).

2) Costs allocated to residential and non-residential uses are based upon a number of conventions, as may be suited to each municipal circumstance, e.g.

   - for Administrative Studies – Engineering Services Studies, Administrative Studies – Community Based Studies, Transit, Parking, Airport, P.O.A., the costs have been based on a population vs. employment growth ratio (63%/37%) for residential and non-residential, respectively) over the 10-year forecast period;
   - for Fire, Police and Public Works facilities, fleet and equipment the costs have been based on a population vs. employment growth ratio (62%/38%) for residential and non-residential, respectively) over the 13-year forecast period;
   - for Indoor Recreation, Parkland Development and Library services, a 5% non-residential attribution has been made to recognize use by the non-residential sector;
   - for Health, Social & Child Services, and Paramedics a 10% non-residential attribution has been made to recognize use by the non-residential sector;
   - for Social Housing, a 100% residential attribution has been made to recognize use by the residential sector only;
   - for Services Related to a Highway, a 50% residential/50% non-residential attribution has been made based on the use of the origins and destinations derived from trips for the a.m. peak hour;

- Social Housing;
- Paramedics;
- Stormwater Drainage and Control Services;
- Water;
- Wastewater Treatment Plant;
- Wastewater Linear;
- Dundas/Waterdown Special Area Charge; and
- Binbrook Special Area Charge.

It is recommended that the City create a reserve fund for waste diversion as it will commence collection for this previously ineligible service. It is also recommended to rename the Administrative Studies reserve fund to Administrative Studies – Engineering Services Studies and add a new reserve fund for Administrative Studies – Community Based Studies. Further, the stormwater reserve fund should now be split out into combined and separated system reserves to reflect the area specific charge.

Further, it is recommended that the existing balance in the stormwater development charge reserve fund be split between the two new reserve funds based on the adjustments identified in Chapter 4, section 4.8.

Appendix D outlines the reserve fund policies that the City is required to follow as per the D.C.A.

7.4.2 By-law In-force Date

A by-law under the D.C.A. comes into force on the day after which the by-law is passed by Council, or a later date as specified in the by-law. The recommended date is July 6, 2019 to align with the expiration of the existing City D.C. by-law.

7.4.3 Minimum Interest Rate Paid on Refunds and Charged for Inter-Reserve Fund Borrowing

The minimum interest rate is the Bank of Canada rate on the day on which the by-law comes into force (as per s. 11 of O.Reg. 82/98).

Table C-1
Operating Capital Impacts for Future Capital Expenditures

SERVICE	GROSS COST LESS BENEFIT TO EXISTING	ANNUAL LIFECYCLE EXPENDITURES	ANNUAL OPERATING EXPENDITURES	TOTAL ANNUAL EXPENDITURES
1. Stormwater Drainage and Control Services (Combined Sewer System)				
1.1 Stormwater Facilities	18,785,638	553,969	7,289	561,258
1. Stormwater Drainage and Control Services (Separated Sewer System)				
1.1 Channels, drainage and studies	127,880,596	5,908,621	484,203	6,392,824
1.2 Residential Ponds	581,250,884	30,097,564	2,200,828	32,298,392
2. Wastewater Services				
2.1 Wastewater Facilities	567,719,790	33,389,393	4,535,562	37,924,955
2.2 Wastewater Linear Services	322,373,551	13,080,990	8,087,981	21,168,971
3. Water Services				
3.1 Facilities, Storage and Distribution systems	328,766,296	17,686,822	11,815,876	29,502,698
4. Services Related to a Highway				
4.1 Services Related to a Highway	1,142,995,041	80,052,490	25,140,863	105,193,353
5. Public Works Facilities, Vehicles & Equipment				
5.1 Facilities	27,090,379	1,599,217	595,869	2,195,086
5.2 Vehicles & Equipment	14,673,987	1,727,050	322,763	2,049,813
6. Fire Protection Services				
6.1 Fire Facilities	26,154,468	1,291,290	13,102,119	14,393,409
6.2 Fire Vehicles & Equipment	4,126,179	213,916	2,067,015	2,280,931
7. Police Services				
7.1 Police Facilities	44,257,033	2,159,995	23,871,860	26,031,855
7.2 Police Vehicles & Equipment	5,576,700	2,741,686	3,008,024	5,749,710
8. Transit Services				
8.1 Transit facilities, vehicles and other infrastructure	228,745,715	15,555,020	16,549,474	32,104,494
9. Other Transportation Services				
9.1 Parking services	27,018,228	1,592,380	1,477,677	3,070,057
9.2 Airport lands	26,009,151	0	11,767	11,767
10. Parkland Development				
10.1 Parkland development, amenities, trails, vehicles & equipment	120,959,645	7,415,218	4,919,664	12,334,882
11. Indoor Recreation Services				
11.1 Recreation facilities, vehicles & equipment	166,212,297	8,634,663	4,996,818	13,631,481
12. Library Services				
12.1 Library facilities and vehicles	46,928,133	2,477,310	3,657,766	6,135,076
12.2 Library materials	4,816,650	586,350	375,429	961,779
13. Administrative Studies				
13.1 Community Based Studies	14,797,600	0	0	0
13.2 Engineering Services - Studies	7,322,722	0	0	0
14. Long Term Care				
14.1 Long Term Care Facilities	9,367,630	683,280	6,266,814	6,950,094
15. Social and Child Services				
15.1 Social and Child Services Facilities	2,415,379	103,664	7,672,682	7,776,346
16. Health Services				
16.1 Health department space	82,598	30,220	5,646,141	5,676,361
17. Provincial Offences Administration				
17.1 P.O.A. facilities	3,197,903	0	528,171	528,171
18. Social Housing				
18.1 Social housing facilities	77,455,149	4,383,960	6,958,847	11,342,807
19. Paramedics				
19.1 Paramedics facilities	5,370,233	228,060	3,373,856	3,601,916
19.2 Vehicles & Equipment	3,482,500	576,115	2,187,885	2,764,000
20. Waste Diversion				
20.1 Waste diversion facilites, vehicles, equipment and other	46,271,300	4,016,951	3,299,837	7,316,788
Total	**4,002,103,375**	**236,786,194**	**163,163,082**	**399,949,276**

Figure 1 Continued
City of Hamilton
Annual Treasurer's Statement of Development Charge Reserve Funds

Description	Services to which the Development Charge Relates														
	Discounted Services														
	Transit Services	Parkland Development	Indoor Recreation Services	Library Services	Administrative Studies - Engineering Services Studies	Administrative Studies - Community Based Studies	Paramedics	Long Term Care	Health Services	Social & Child Services	Social Housing	Airport lands	Parking services	Waste Diversion	Total
Opening Balance, January 1, _____															0
Plus:															
Development Charge Collections															0
Accrued Interest															0
Repayment of Monies Borrowed from Fund and Associated Interest[1]															0
Sub-Total	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**
Less:															
Amount Transferred to Capital (or Other) Funds[2]															0
Amounts Refunded															0
Amounts Loaned to Other D.C. Service Category for Interim Financing															0
Credits[3]															0
Sub-Total	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**
Closing Balance, December 31, _____	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**

[1] Source of funds used to repay the D.C. reserve fund

[2] See Attachment 1 for details

[3] See Attachment 2 for details

Charges Act , whereby charges are not directly or indirectly imposed on development nor has a requirement to construct a service related to

Appendix E: Local Service Policy

E.1 Local Service Policy for Stormwater Drainage Systems

Stormwater runoff "minor" systems are designed and implemented to accommodate drainage to avoid property damage and flooding and to minimize inconvenience to the public from 1 in 5-year rainfall events. Minor systems are typically comprised of underground piping, manholes, catch basins, and outfall structures in addition to a rural type drainage system consisting of ditches and culverts.

Stormwater runoff "major" systems are designed and implemented for flood control to avoid loss of life, injuries, and significant damage to property from events greater than 1 in 5-year return producing unusual high intensity rainfall and/or large volume run-off. Major systems can be large diameter underground piping, open channels, road overland flow route, stormwater facilities, natural streams, or any combination thereof, capable of conveying run-off, from events up to and including a 1 in 100-year return period, to the ultimate receiving stream or water body.

The following should be read in conjunction with the City's Comprehensive Development Guidelines and Financial Policies and Storm Drainage Policy, as amended.

E.1.1 Storm Sewers

1. The Developer is responsible for the full cost of all storm sewer mains up to and including 1,200 mm diameter in size (the local service component).
2. Storm sewers larger than 1,200 mm diameter in size are considered trunk sewers for the purposes of oversizing and are eligible for Development Charges (D.C.) contribution based flat rates outlined in the City's Financial Policies for Development.

   Storm sewer sizing to be designed to City standard criteria for minimum velocity (0.8 m/s) and slope (0.2 %), to convey the 5-year event assuming a 5 year downstream boundary water level, without surcharging. Elliptical pipes are to be converted to equivalent circular diameter for oversizing calculation. Oversizing as a result of lower than standard velocity/slope/hydraulic grade line due to site design conditions is the responsibility of the local development and not D.C.

eligible (excluding industrial lands as per the City's "Comprehensive Development Guidelines and Financial Policies Manual").

3. Storm sewers conveying an event larger than five (5) year return period (i.e. major system flows) are not eligible for D.C. contributions unless required to do so by the City. In some areas, a storm sewer system may not be viable, and the major overland system may not be able to safely convey the runoff resulting from a 1 in 100 year design storm event. In this case a relief sewer or alternate conveyance mechanism may provide the additional capacity required, and be funded through Development Charges.

4. The construction of storm sewers deemed to be temporary are not eligible for D.C. contributions.

5. Installation of private drain connections or private systems is considered a local service component and is the developer's responsibility.

6. The construction of on-site open watercourse and overland flow routes for conveyance Internal to a Development is considered a local service component and is not eligible for D.C. contributions. The construction of downstream off-site outlets to service more than one development, including open watercourses and/or culverts and storm sewers, identified through the City's Stormwater Master Plan, a Master Plan, a Master Drainage Plan, a Watershed/Subwatershed Study or a Block Plan or Neighbourhood Plan, has been included in the D.C. Background Study and is eligible for D.C. contributions.

E.1.2 Stormwater Management Facilities

1. Stormwater Management Facilities (S.W.M.) in Series: If the stormwater management plan for local development involves two or more S.W.M. facilities in series, conveyance of the controlled 100-year peak flow between facilities in series is not D.C. eligible for oversizing (the connecting works are not considered to be part of the S.W.M. facility and outlet structure and appurtenances). However, if local 5-year flows are added to the storm sewer between the facilities in series, then the potential oversizing (compared to the sewer without any local inflow) is D.C. eligible.

2. Centralized stormwater management facilities (e.g. wet ponds and dry ponds) identified through the City's Stormwater Master Plan, a Master Plan, a Master Drainage Plan, or a Watershed/Subwatershed Study have been included in the D.C. Background Study and are eligible for D.C. contributions.

3. A stormwater management facility not identified in an approved City Stormwater Master Plan, a Master Plan, a Master Drainage Plan, or a Watershed/Subwatershed Study is deemed a local service. Nothwithstanding, an unidentified stormwater management facility may be eligible for D.C. contributions provided it can be demonstrated that it is a centralized public facility servicing a catchment area through an approved neighborhood stormwater study.

4. Stormwater quality treatment by mechanical means (i.e. oil/grit separators) is not eligible for D.C. contributions.

5. Stormwater management facilities serving only non-residential areas (i.e. industrial, commercial, institutional) are not eligible for D.C. contributions.

6. For stormwater facilities which benefit both residential and non-residential only the residential portion will be eligible for D.C. contributions. The portion servicing the non-residential land uses shall be the financial responsibility of the developer.

7. Where a centralized (communal) facility serves both residential and non-residential parcels, the cost is shared by the ratio of the areas served and factored by the respective runoff coefficients. Note that the non-residential area, if commercial, may also be required to provide lot-level quality controls, depending on location.

8. The construction of stormwater facilities deemed by the City to be temporary as part of the phasing of development is not eligible for D.C. contributions. Such a facility may be considered for D.C. contribution in the future if it is subsequently determined to be a permanent municipal facility forming part of the City's centralized system.

9. The Developer is responsible to acquire lands for stormwater management facilities External to a Development. The City will not act as a third-party agent in

the negotiation and acquisition of lands for stormwater management facilities on behalf of private interest, unless otherwise approved by Council.

10. Oversizing – Downstream Constraints: If local development improves an existing downstream constraint to conveyance, e.g. mitigation or removal of historically observed/recorded surface or basement flooding due to inadequate capacity of the existing culverts and/or sewers downstream, then a portion of this work may be D.C. eligible subject to a detailed study that the developer shall provide at their cost.

11. 100 Year Control: City policy dictates that the controlled 100-year outlet flow from the facility is required to be conveyed in an enclosure to the development outlet, and potentially also beyond the development limit, to the receiving watercourse. This is considered by the City to be part of the outlet works, which is the responsibility of the development. (Note: current City practice is to request the development to enclose the 100-year peak flow between the S.W.M. block and the outlet, and not spill onto City roads). If the S.W.M. facility outlet pipe size exceeds 1,200 mm to convey the controlled 5-year flow, then there may be a City share in accordance with the oversizing policy.

12. Rural Settlement Areas (R.S.A.): For Rural Settlement Areas, and other areas outside the Urban Boundary, the stormwater management system is deemed a local service component, and stormwater management infrastructure is not eligible for D.C. contributions.

13. Airport Employment Growth District (A.E.G.D.) lands:

    - Stormwater quality controls to be provided on-site by local developers (ref. City A.E.G.D. Subwatershed Study, April 2017).
    - Neighbourhood quantity control facilities to be dry ponds, per Federal Transport Canada regulation prohibiting wet ponds in the vicinity of airports.
    - The neighbourhood dry ponds serving roads with 26 m or greater right-of-way (R.O.W.), are partially D.C. eligible on account of also controlling runoff from subject public roads. The City estimates the share to be 5% of the total area of road R.O.W. contributing. Notwithstanding, non-

residential stormwater management facilities are currently excluded from the City stormwater D.C.

14. City Standard: Proposed facilities not to exceed 40 ha of drainage area (based on limits associated with overland runoff conveyance in road R.O.W.s).

15. Public Roads/Single Applicants: In the case of a Public road draining to a non-centralized facility under single applicant, the developer would construct the facility, and the City assumes and maintains facility, hence not D.C. eligible.

16. Underground Tanks: Underground storage tanks are not D. C. eligible.

17. Mixed Use Buildings: In mixed use buildings, where the residential square foot area is equal to or more than the non-residential area, the facility is assigned to the residential section of the D.C.

18. Commercial Lands: When a commercial parcel or parcels is nested within a predominantly residential area, and serviced by a residential S.W.M. facility, the commercial parcels are required to manage their own runoff (i.e. quality control) and are assigned a zero share of the centralized/communal quantity control volume.

E.1.3 Land for Stormwater Management Facilities

1. Calculation of Land Area: The footprint (area of land) for stormwater management facilities in the D.C. Background Study is the larger of the footprint required by:

    a. 6% of the drainage area for a wet pond (quality and quantity) facility; or

    b. 4% of the total contributing drainage area for a dry pond (quantity only) facility or a footprint area determined by a supporting study. An exception to this is lands within the Fruitland-Winona Secondary Plan (i.e. Stoney Creek Urban Boundary Expansion (S.C.U.B.E.)) where 10% of the drainage area was used to establish the footprint.

2. Valuation of Land: The value of land for stormwater management facilities in the D.C. Background Study have been established as follows:

a. Land designated in the Official Plan for development in Ancaster and Waterdown – $754,800/Acre ($1,865,111/ha);

b. Land designated in the Official Plan for development in Hamilton, Stoney Creek, Dundas, Glanbrook – $652,800/Acre ($1,613,069/ha);

c. Land located outside the Urban Boundary shall be based on Open Space value established by an independent real estate appraisal to be obtained at the cost of the developer.

3. D.C. contributions allocated to land costs for stormwater management facilities shall be limited to lands within an approved block net of any identified setbacks and buffers (e.g. Ministry of Transportation (M.T.O.), the City's Natural Heritage System).

4. Land Footprint Contingency: Land cost will be based on actual stormwater management footprint size at the established land value as outlined in Clause 1.3.2. The Land Footprint Contingency will be used to compensate for facilities with a footprint size larger than identified on the individual project.

5. Engineering fees are not eligible for D.C. contributions for land acquisition costs.

6. Tailwater Impacts on Land: If local downstream grades beyond the development limits create tailwater conditions at a facility outlet (e.g. flat topography), the land area requirements to achieve the required stormwater volumes will be more and therefore will increase the cost of the facility above the average cost for a facility using the unitary relationships. Detailed studies are required to identify potential candidate facilities to which this condition applies, in order to be able to include this higher cost in the D.C. In the absence of studies, the City has estimated the facilities for which this is potentially a condition, and for sizing allocated 10% of the contributing drainage area (e.g. S.C.U.B.E. facilities) versus 6% under standard size.

7. Land costs are adjusted annually for inflation using the Statistics Canada Quarterly, Non-Residential Construction Price Index (Table 18-10-0135-01) for the most recent year-over-year period as set out in D.C.A. and reviewed with every D.C. study.

E.1. 4 Capital Costs of Stormwater Management Facilities

1. Capital costs assigned to the individual projects are based on $80/m3 of total volume for the first 6,500 m3, and $40/m3 of total volume for the balance of storage volume in excess of 6,500 m3. The costs are adjusted annually for inflation using the Statistics Canada Quarterly, Non-Residential Construction Price Index (Table 18-10-0135-01) for the most recent year-over-year period as set out in D.C.A. and reviewed with every D.C. study.

2. Bedrock Impacts: If local conditions dictate that part of a facility excavation is required to be in rock, this will increase the cost of the facility above the average cost for a facility. An allowance has been made to increase the unit cost for rock excavation for these facilities, based on actual costs, up to a maximum of $80/m3.

3. Frontage Calculation: Facility frontage calculation has been updated using historical actual costs. Pond frontage costs will be limited to a maximum of 120 m at $1,500/m (aboveground and underground works).

4. Capital costs will be paid based on tendered prices in accordance with the City's Financial Policies, to an upset limit established based on the required total storage at the unit cost as outlined in Clause E.1.4.1.

5. Stormwater Management features eligible for D.C. contribution include the following:

    a. Erosion and Sediment control;
    b. Excavation (excludes cost to haul surplus material off site and/or placement and compaction of surplus material within subdivision);
    c. Fine grading;
    d. Decanting areas;
    e. Forebay structures, pond liner, cooling trenches, etc.;

f. Outlet control structures within the facility;
g. Inlet control structures (e.g. flow splitter manhole and headwall) excluding the inlet conveyance pipe upstream of the forebay headwall;
h. Emergency spillways;
i. Maintenance access roads;
j. Landscaping and pond signage; and
k. Bollards

6. Engineering fees (design engineering and soft costs)) are included in the capital cost assigned to individual projects in the D.C. Background Study.

7. Performance monitoring or development impact monitoring of S.W.M. facilities are not eligible for D.C. contributions.

8. Facility Volume Contingency: Eligible capital cost will be based on the required total storage volume at the established capital cost rate as outlined in Clause E1.4.1. The Facility Volume Contingency will be used to compensate for facilities larger in size than identified on the individual project.

9. Stormwater management facilities eligible for D.C. contributions must be publicly tendered in accordance with the City's Financial Policies for Development.

10. D.C. contribution for land value and capital cost are independent.

E.1.5 Culverts and Bridges

1. Culverts and Bridges (as related to road infrastructure): The responsibility for the cost of stormwater conveyance infrastructure associated with road infrastructure, as part of new development or redevelopment, is to be determined as follows:

    a. The costs of stormwater infrastructure items (excluding land) shall be direct developer responsibilities as a local service for:

        i. all crossings (new or extending or replacement) up to the 20 m local cross-section for roads that are required to service the development

b. The costs of stormwater infrastructure items shall be eligible for inclusion in a stormwater Development Charge for:

    i. new crossings (e.g. culverts/bridges) for roads greater than 20 m, where the D.C.-eligible portion is the fraction calculated by the length in excess of the width of 13.0 m (defined by the standard 8.0 m width of pavement, plus 2 x 0.5 m curbs, and plus 2 x 2.0 m sidewalks required for a local road), divided by the total length (i.e.

Summary of D.C. Eligibility for Culverts/Bridges					
Road Type	**Road Right-of-Way Width**	**Culvert/Bridges (1)**	**Oversizing of Storm Sewers and Ditches for Conveyance and/or Treatment (A.E.G.D.) (2)**	**Contributing to Neighbourhood S.W.M. (A.E.G.D.)**	**Existing Culvert/Bridge Upgrades to meet City Design Standards (3)**
Urban Local	20 m				
Urban Collector	26 m	Length greater than 13 m is D.C. eligible, costed as a fraction of the total length	In A.E.G.D., a 26 m road is 100 % developer responsibility; not D.C. eligible	Not D.C. eligible	a portion is D.C. eligible
Urban Arterial Minor	32 m	Length greater than 13 m is D.C. eligible, costed as a fraction of the total length	Subject to study, oversizing of stormwater conveyance elements greater than 26 m may be D.C. eligible	5 % of road R.O.W. assumed to contribute to facility, D.C. eligible	a portion is D.C. eligible
Urban Arterial Major	40 m	Length greater than 13 m is D.C. eligible, costed as a fraction of the total length	Subject to study, oversizing of stormwater conveyance elements greater than 26 m may be D.C. eligible	5 % of road R.O.W. assumed to contribute to facility, D.C. eligible	a portion is D.C. eligible
Rural Local	20 m	N/A			a portion is D.C. eligible
Rural Collector	20 m	N/A			a portion is D.C. eligible
Road Widening for Development	varies				Extensions to existing culverts bridges beyond the minimum 13 m length are D.C. eligible

Notes:

1. slopes on culvert ends are assumed common for urban roads hence the weighting is proposed to use pavement/curb/sidewalk width only
2. For A.E.G.D. only, road-specific Low Impact Development (L.I.D.) Best Management Practices (B.M.P.s) will require an update to City Standards. Notwithstanding, non-residential stormwater management facilities are currently exempted from the City stormwater D.C.
   Notwithstanding, non-residential stormwater management facilities are currently exempted from the City stormwater D.C.
3. Existing culvert/bridge upgrades will be subject to study to determine remaining service life of existing culvert/bridge and D.C. eligible portion

the City cost share is 13 m divided by the total length of the proposed crossing in m).

ii. Extensions to culverts/bridges for road R.O.W.s greater than a 20 m R.O.W., and length of crossings greater than 13 m, 100 % D.C. eligible.

E.1.6 Watercourses

1. Watercourses: Local development is responsible for any watercourse realignment and/or enclosures within its development limits. Local development is responsible for conveyance of upstream external flows through its development. Watercourse works to accommodate runoff from the development, external to the development, identified in City Master Drainage Plans and/or other related studies are D.C. eligible, proportionate to growth serviced by the watercourse.

2. Watercourse Enclosures: Watercourses enclosed by the development are not subsequently eligible for storm sewer oversizing under the D.C.

E.1.7 Combined Sewer Watershed

1. Combined Sewer Watershed: Current City practice is to control the future land use 100-year peak flow to pre-development land use 2-year levels, and required storage is the responsibility of development and not D.C. eligible. D.C.-eligible projects have been added as provisional items. Future studies will define locations for these provisional items.

2. Combined Sewer Watershed: New stormwater outlets potentially created through studies will be D.C. eligible where new development may be serviced by new separate storm sewers and a new suitable outlet. Stormwater costs will be shared 50/50 between the City (existing) and new development. The City will identify candidate locations subject to future study.

E.1.8 Miscellaneous

1. Off-site System Monitoring (holistic):

    - Local monitoring of stormwater infrastructure built within the local development is the responsibility of the local developer. In addition, any off-site system monitoring required by a specific development as a condition of Site Plan/Draft Plan approval is the responsibility of the local developer.
    - Holistic monitoring of more than one development (i.e. typically based on a Secondary Plan or Tertiary Plan Area) is D.C. eligible (included in list of D.C. eligible studies), and is currently proposed as a minimum for Elfrida, Greensville, S.C.U.B.E., and the A.E.G.D. lands. Estimated costs for a 7 to 10-year duration of multi-disciplinary monitoring is $2M per study, based on recent similar studies in the Greater Golden Horseshoe area.

E.2 Local Service Policy for Water and Wastewater

Utilizing the City's development assumptions, the water and wastewater infrastructure required to service these areas was identified. To determine if a project is a Development Charges (D.C.) related project, the following two categories were considered:

Category 1 – Projects External to Proposed Development Lands (i.e. on existing road allowance and servicing more than one development)

The following project descriptions fall into Category 1 and will be fully or partially allocated to Development Charges:

- New infrastructure or upgrades to existing City infrastructure required to service more than one potential proposed development and/or development property, whether in a Greenfield area or Intensification area. This includes upgrades to infrastructure that is upstream (water) or downstream (wastewater) of multiple developments.
    - If an upgrade is triggered by growth (single or multiple potential development) and that planned growth is less than or equal to the

CITY OF HAMILTON
2019 DEVELOPMENT CHARGES UPDATE

STORMWATER
BACKGROUND STUDY

May 14, 2019

Wood Environment & Infrastructure Solutions
Wood Canada Limited

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Appendices

1. Introduction

This Background Study forms part of the overall City of Hamilton 2019 Development Charges Update to carry out a review of Water and Wastewater, Roads, and Stormwater Development Charges in the City of Hamilton, including changes and updates affecting the determination process for the stormwater component of the Development Charges that have occurred in the 2014-2018 period. The changes and updates have been summarized as follows:

- New projects have been identified and added
- New stormwater-related studies, and associated project and costs estimates, have been updated or completed (either superseding older studies, or where no earlier studies existed)
- Projects have been updated/modified and/or removed, based on new information from the City
- Land requirement calculations for stormwater management facilities, where no studies exist, have been verified by the City, based on recent actual facility land requirements
- Capital cost calculations for stormwater management facilities have been verified by the City, based on actual facility capital costs for those constructed in the 2014-2018 period
- Contingencies have been added for stormwater management facility footprint and volume increases
- Land requirement estimates for facilities subject to flat existing grades, and potentially backwater, have been adjusted
- Capital cost estimates for facilities in rock have been adjusted
- The Local Service Policy has been updated, and twenty-two new policies added (ref. Section 1.4 of this report for a summary, and Appendix E of the overall background Report for the full policies)
- Projects have been removed, due to being constructed and financed through the Development Charges
- Projects have been deleted from the planning timeframe of 2031 as a result of the updates to the City's growth forecasts.
- Non-residential stormwater facility growth costs excluded from the Development Charge; therefore having non-residential developers provide their stormwater management facilities directly.
- In instances where both residential and non-residential growth lands are proposed to contribute to a stormwater management facility, the areally-estimated component shares have been separated for costing purposes.

In addition to the above, unit rates for land costs have increased, and have been provided by the City's Real Estate Department; and capital costs for the materials for construction of stormwater infrastructure have increased by 12.4 %, in accordance with the Non Residential Construction Index prescribed by the Development Charges Act.

1.1 Study Area

For the 2019 Development Charges Update, development in the former member municipalities of the City of Hamilton has again been combined for financial purposes, however a column in the stormwater costing tables has been maintained for reference purposes (and to assist in locating the projects on the overall drawing), in which the City has been divided into the following seven (7) areas:

- Ancaster,
- Binbrook/Mount Hope,
- Hamilton Mountain,
- Stoney Creek (Lower),
- Stoney Creek (Mountain),
- Waterdown,
- Other (Hamilton Downtown, Dundas, Greensville, Carlisle, Freelton, and other outlying areas).

1.2 Background and Purpose

This stormwater background study provides information for the portion of the Development Charges relating to stormwater infrastructure including: channel system improvements, off-site erosion control, stormwater management works, oversizing of stormwater related infrastructure, and culverts related to identified road projects. Projects included in this study are future growth related, which include both planned and unplanned projects. Future growth related information has been collected from the City and City-approved studies and, where no information was available, appropriate assumptions and calculations have been made.

This report provides a summary of the approach used in establishing and summarizing of the stormwater-related Development Charges for both residential and non-residential development. The report consists of the following sections: Introduction, Municipal Stormwater Drainage Policies and Criteria, Methodology, Development Charges Summaries, and Conclusions.

1.3 Development Charges Act: Storm Services

According to the Development Charges Act (S.O. 1997, Chapter 27), the "council of a municipality may by by-law impose development charges against land to pay for increased capital costs required because of increased needs for services arising from development of the area to which the by-law applies".

The services referred to include stormwater drainage and control. Costs to acquire land may be included, as well as costs to undertake studies in connection with any of the services, as well as the cost of the development charge background study (1997, c.27, s.3, 5).

The Development Charges are based on a projection of the costs to service new development to "build-out" over the next 13 years (i.e. to 2031).

All components of drainage works that have been considered to require development funding have been included. Storm drainage infrastructure has been classified into five categories: open watercourses (channel system improvements), off-site erosion control (not previously identified), stormwater

management facilities (quality and quantity), storm sewer oversizing, and culverts/bridges (not previously identified, and associated with new or widened roads).

1.4 City of Hamilton Development Charge – Local Service Policy

Within a development charge policy, there are certain works which are deemed "local services" which remain the responsibility of the developing landowner. The Local Service Policy for Stormwater Drainage Systems can be found in Appendix E of the Development Charge Background Study.

The following summarizes the updates and new policies that have been added to the City of Hamilton's Local Service Policy for Stormwater Drainage Systems, as part of this update to the Development Charge Bylaw. The new policies are primarily definitions and clarifications of current City guidelines, and practices, which had previously not been enshrined in the Local Service Policy. Many are previously documented in the City's "Comprehensive Development Guidelines and Financial Policies Manual, 2017":

Amended Policies From 2014

- Storm sewer oversizing definition related to minimum velocity and slope
- Definition of watercourse work downstream of off-site outlets to service more than one development, including open watercourses and/or culverts and storm sewers
- Updated valuation of land for stormwater management facilities

New Policies For 2019

- Stormwater management facilities in series
- Combined Residential / Non- Residential stormwater management facilities
- Oversizing of stormwater management facilities due to downstream constraints
- 100 Year Control in stormwater management facilities
- Criteria for stormwater management facilities in Airport Employment Growth District (A.E.G.D.)
- City Standard for total drainage area to stormwater management facilities
- City Standard for stormwater management facilities treating public roads / single applicants
- Definition of underground tanks for stormwater management facilities not Development Charge eligible
- Definition of stormwater management facilities servicing Mixed Use buildings
- Definition of stormwater management facilities servicing Commercial lands
- Tailwater impacts on land for stormwater management facilities
- Construction cost estimates for stormwater management facilities
- Bedrock impacts on stormwater management facilities cost estimates and actuals
- Frontage calculation for stormwater management facilities
- Definitions for culverts and bridges (as related to road infrastructure)
- Definition for culverts and bridges Development Charge eligible costs
- Watercourses definitions

- Watercourse enclosures not Development Charge eligible
- Combined sewer watershed peak flow control
- Combined sewer watershed provisional Development Charge eligible projects
- Combined sewer watershed provisional outlets
- Monitoring (holistic) of more than one development is Development Charge eligible

1.5 Background Information Collected

City staff, through the Technical Committee noted in Section 1.6, has supplied the following background information:

- Applicable background reports
- Summary of stormwater management facility construction costs and land areas
- Digital topographic mapping
- Digital growth-related land use fabric
- Digital DRAFT Staging of Development Plan land use fabric
- Stormwater policy/philosophy related to Development Charges
- Reviews and comments on overall map of growth areas and identified projects
- Culvert and bridge, and subdivision-related storm sewer oversizing database.

1.6 Administration

Many City of Hamilton staff have assisted in collecting the background information for this study, as well as meeting with Wood Environment & Infrastructure Solutions staff to review the various stormwater projects, cost estimates, financially committed projects, and underlying philosophy and assumptions; these have included:

Tony Sergi, Senior Director of Growth Management

Sally Yong-Lee, Manager of Infrastructure Planning

Monir Moniruzzaman, Senior Project Manager

Lindsay Gillies, Senior Financial Analyst

2. Municipal Stormwater Policy and Criteria

2.1 Overview

The costs to provide stormwater servicing are, in accordance with the Development Charges Act, related to the level of service to be provided.

The City of Hamilton's Storm Drainage Criteria and level of service has been summarized in this Section. The City's standards have been developed to provide this level of service, and to recognize other Provincial and Federal criteria for management of flooding, erosion, stormwater quality, and fisheries habitat protection and enhancement.

2.2 Storm Sewer System

The storm sewer system provides for the drainage and conveyance of the runoff resulting from a design storm event having a 5 year return period. In the former municipalities of the City of Hamilton, the storm sewers were designed to have the capacity for storm events ranging between a 1 in 2 year event and approximately a 1 in 50 year event (ref. Table G1):

TABLE G.1
COMPARISON OF FORMER AREA MUNICIPALITIES
STORM DRAINAGE SYSTEM CRITERIA AND POLICY

Former Municipality	Minor System Criteria	Foundation Drainage Requirements (2)	Combined Sewers	Roof Leader Policy	Major System Criteria
Hamilton	18 – 50 yr (1)	Gravity	Yes	Direct to Sewer	100 yr
Ancaster	2 yr	Sump Pumps	No	Surface	100 yr
Dundas	2 – 5 yr	N/A	No (3)	N/A	100 yr
Flamborough	2 – 5 yr	Gravity/ Sump Pumps	No	Surface	100 yr/Regional (4)
Glanbrook	5 yr	Sump Pumps	No	Surface	100 yr
Stoney Creek	5 yr	Gravity	No	Surface	100 yr

Notes:
(1) 1942 - 1992 (inclusive) used an 18 year storm event; post 1992 used 50 year. Both design storms uses in Modified Rational Area Method
(2) Foundation drainage requirement exceptions are currently permitted upon receipt of a stormwater management report.
(3) The Pleasant Valley neighbourhood (Dundas) only has a combined sewer system permitted by By-Law.
(4) Regional event is Hurricane Hazel

New storm sewers will have to be designed to the new criteria, but new development must also reflect both the external upstream drainage and the existing storm sewer system (potentially none) downstream of the site.

The City of Hamilton Criteria and Guidelines for Stormwater Infrastructure Design (September 2007) outlines the criteria for the storm sewer system as follows:

Approved Master Drainage Plans (M.D.P.'s), which have established storm sewer sizing criteria other than 1 in 5 year standard will govern. In the absence of approved M.D.P.'s, storm sewers shall be designed to a minimum 1 in 5 year, unsurcharged standard (i.e. 85% of pipe capacity). For any storm sewer to be assumed by the City the minimum allowable pipe diameter is 300 mm.

Interfacing between new storm sewers designed to the minimum 1 in 5 year, unsurcharged standard and existing storm sewers of variable sizing standard shall require hydraulic analysis of the existing and proposed storm sewers. Flow capacity of the proposed storm sewer shall be determined based on the receiving existing sewer remaining unsurcharged. The proposed storm sewer flow capacity would either be the 1 in 5 year standard or designed to allow the existing storm sewer to remain unsurcharged. Should the proposed storm sewer flow capacity be required to be less than the 1 in 5 year standard, to prevent downstream surcharging, inlet capacity for the storm sewer should be designed accordingly. Should the existing downstream system be already surcharged, the proposed upstream storm sewer should not increase the level of surcharging downstream.

Hydraulic analysis of the proposed and existing storm sewer system shall provide hydraulic grade lines for the inlet capacity and/or 1 in 5 year standard and 1 in 100 year standard. Hydraulic analysis should demonstrate that no negative impact on the receiving storm sewer system results from the proposed storm sewer. The extent of the downstream off-site analysis needs to be verified with City staff prior to initiation, to ensure that downstream conditions are adequately accounted for in the analysis. The City shall provide the consultant with the 100 year hydraulic grade line for the existing storm infrastructure system when available. Should downstream storm sewer surcharging be a concern under existing conditions, the proponent may be required to restrict inlet capacity to ensure no negative impact on the receiving system. In addition, the proponent is to ensure that adequate overland flow capacity is available in the development and in the receiving major system, incorporating the influence of the restricted inlet capacity of the storm sewer system.

Storm Sewer Oversizing

The Development Charges are applicable primarily to oversizing of existing or new storm sewers, to allow for the conveyance of runoff from new development. Current City financial policy provides for relief for storm sewers in excess of 1200 mm in diameter (ref. Comprehensive Development Guidelines and Financial Policies Manual, 2017). Oversizing is common when a development has a large upstream drainage area that has also been proposed to be developed. When the stormwater peak flows from ultimate land use must be conveyed through a downstream development, the Development Charges provide a method for collecting funds for the net difference between the storm sewer system required solely for the subject development, and the oversized system required for the multiple developments.

In some areas, a storm sewer system may not be viable, and the major overland system may not be able to safely convey the runoff resulting from a 1 in 100 year design storm event. In this case a relief sewer or alternate conveyance mechanism may provide the additional capacity required, and be funded through Development Charges.

2.3 Road Crossings

Waterway openings for culverts and bridge crossings shall be designed in accordance with the Ministry of Transportation Ontario (M.T.O.) policies and guidelines.

Notwithstanding the M.T.O.'s drainage policy and guidelines, it is required that new roadway culverts and bridges have sufficient conveyance capacity to pass the Regulatory flood (larger of Hurricane Hazel or 100 year event), in order to avoid adverse backwater effects (ref. M.T.O. Directive B-100). If, due to economics or other mitigating circumstances, this is not feasible, a backwater analysis must be undertaken to determine the limits of upstream flooding and provide necessary mitigating design modifications.

Arterial and collector roadways in new developments should be, where possible, the only road classifications permitted to cross a watercourse having a drainage area in excess of 125 ha. Spacing and location of roadway crossings other than arterial or collector roads may be considered by the City when documented within the Stormwater Management Plan.

Freeboard and clearance (as defined in the governing M.T.O. manuals and the Ontario Bridge Code) requirements for watercourse crossings should be based on current M.T.O. criteria.

Where a permit is required from a Conservation Authority, watercourse crossings will not be permitted to increase upstream flooding on private lands, unless appropriate waivers can be secured.

Culvert replacements may require a Class Environmental Assessment as outlined within the City's Storm Drainage Policy.

Allowable Regional Storm event (Hurricane Hazel) flooding depths on roadways should be determined based on the standards within the Ontario Ministry of Natural Resources Natural Hazards Technical Guides, latest revision.

2.4 Natural Watercourse Systems

The City of Hamilton Criteria and Guidelines for Stormwater Infrastructure Design (September 2007) outlines the criteria for the open watercourses as follows:

Where watercourse alterations are proposed as part of a development, the design of such alterations shall incorporate and consider the following:

Design Approach and Principles

- Channel design is to be based on natural channel forming processes to achieve a dynamically stable system. The channel evaluation methodology and design approach is to be consistent with the most current Provincial guidelines (ref. Ontario Ministry of Natural Resources Natural Hazards Technical Guides, March 2003 and "Adaptive Management of Stream Corridors in Ontario", M.N.R., 2001).
- Alteration to a regulated watercourse will require a permit from the respective Conservation Authority (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses) and potentially clearance/authorization from the Federal Department of Fisheries and Oceans (Fisheries Act) and Ontario Ministry of Natural Resources (Lakes and Rivers Improvement Act).
- Remedial works shall incorporate fish habitat protection/mitigation or compensation in accordance with the requirements of the Federal Department of Fisheries and Oceans (DFO) and Ontario Ministry of Natural Resources and Forestry (M.N.R.F.), related to stream type and significance.

- Remedial works shall incorporate the requirements of the governing Official Plan, as well as the requirements of provincial Ministries and other public agencies for protection of associated natural features such as:

Environmentally Significant Areas (E.S.A.)

- City of Hamilton
- Conservation Authorities

Niagara Escarpment

- Niagara Escarpment Commission (N.E.C.)

Heritage Sites

- Ontario Ministry of Tourism, Culture and Recreation

Setbacks

Conservation Authorities have established various watercourse setback policies which regulate development boundaries. The proponent should always verify that the most current Conservation Authority's setback policies are being adhered to. Each of the four Conservation Authorities, Hamilton Conservation Authority (H.C.A.), Niagara Peninsula Conservation Authority (N.P.C.A.), Grand River Conservation Authority (G.R.C.A.), and Conservation Halton (C.H.), require development to adhere to their specific setback policies. The most current policies were adopted in 2004, with each Conservation Authority creating a specific version of the Generic Regulations for development in or adjacent to hazardous lands and other regulated areas, i.e. "Development, Interference with Wetlands and Alteration to Shorelines and Watercourses".

The size of setbacks from the watercourse edge to developable lands is typically a function of the significance of the valley form, the sensitivity of the watercourse and the type of development (building or other).

The Conservation Authorities may establish setbacks using "Understanding Natural Hazards", M.N.R., 2001 to define the erosion hazard limit using stable slope allowances. Development Proponents should be aware that watercourse setbacks will typically be established by a Conservation Authority using the greater of the fisheries, valley and floodplain setbacks.

Access/Maintenance

- Creek block dedications adjacent to private land in new developments shall be fenced to prevent human access and encroachment. Fencing shall be on public property, 150 mm from the property line. Private access gates to creek block areas are not allowed.
- Natural channel design shall consider channel and utility maintenance requirements by incorporating access routes. Access routes may be located within the appropriate top of bank setback limit or adjacent to the low flow area in appropriately designated areas.

2.5 Stormwater Management Facilities

The City of Hamilton Stormwater Policy (March 2004) outlines the criteria for stormwater management quality, quantity and erosion control as follows:

Quality Control

Urbanization typically increases the contaminant load (i.e. sediment, metals, nutrients, bacteria) to natural stream systems. To mitigate this effect, stormwater quality treatment is required for all new development and redevelopment (including reconstruction of roadways with additional lanes, widening and cross-section revisions as required by review on an individual case basis by the Ministry of Environment) within the City of Hamilton, except for areas draining directly to a combined sewer system.

Stormwater quality treatment should provide a comprehensive approach to both surface runoff and groundwater. Thus, as a general consideration, maintenance of the natural hydrologic cycle including infiltration is encouraged and the use of stormwater management practices (S.W.M.P.) which enhance or maintain infiltration should be considered for each development.

Generally, active infiltration measures, such as soakaway pits and rear yard ponding, will be most applicable in permeable soils areas and their use will require supporting soils property documentation. Passive measures such as disconnection of roof leaders have been historically applied in many areas and shall be implemented in all areas unless specific constraints (such as in the former City of Hamilton and Town of Dundas where zero lot line construction on narrow width lots is permitted, or in the older City of Hamilton downtown areas where there is insufficient pervious area) preclude these measures. In all cases, the potential for groundwater contamination shall be considered where infiltration of road runoff is contemplated. In areas where hydrogeologic concerns are identified, particularly in areas where groundwater is used for human consumption and/or critical linkages to fisheries habitat are present, additional study and analysis may be required to determine the appropriate level of mitigation.

Stormwater quality treatment measures shall adhere to the specific guidelines for stormwater management practices that have been developed by the Province (ref. Stormwater Management Planning and Design Manual, Ministry of Environment, March 2003, or subsequent updates).

The design of stormwater quality facilities shall conform to existing Provincial requirements (ref. Stormwater Management Planning and Design Manual, M.O.E., March 2003, Water Management Policies, Guidelines Provincial Water Quality Objectives (Blue Book), M.O.E.E., 1994), as well as current policies within the City of Hamilton (i.e. Hamilton Harbour Remedial Action Plan, Vision 2020), or subsequent updates of the foregoing.

All new development shall implement a stormwater quality management strategy, which considers surface runoff and groundwater in compliance with the existing provincial and municipal policies.

In areas of existing development where re-development is proposed, requirements for stormwater quality measures will be evaluated on a site-specific basis, with regard to the feasibility of implementation. Where on-site measures are considered infeasible, or in areas serviced by combined sewers, the City of Hamilton's Planning and Development Department may consider the potential for contributions to off-site improvements in the form of a cash-in-lieu policy, as in the current Provincial Stormwater Management Planning and Design Manual, March 2003, or subsequent updates. In order to appropriately direct these

resources, a Master Storm Water Quality Plan (a regional assessment to identify retrofit locations and costs) is being contemplated by the City's Public Works Department. A 'pilot' study has been prepared for the former community of Stoney Creek.

Quantity Control and Flood Protection

Urbanization causes increases in runoff volumes and rates, due to an increase in impervious area and changes in conveyance systems. Without proper stormwater management, these increases may result in flooding and erosion.

The specified level of control for subject lands in the City of Hamilton is designated by a Watershed/Subwatershed or Master Drainage Plan where they exist. Such plans account for additional constraints (i.e. economic and physical limitations) which may limit the capacity of proposed stormwater management systems. Such plans may also demonstrate that the existing downstream capacities are sufficient to accommodate local increases in post-development peak flows (i.e. oversized sewers or watercourse reaches with adequate capacity and resistance to flow increases).

Local Conservation Authorities, through their mandate to control flooding and limit flood damage, have developed criteria for runoff control. Hence, application of these criteria through a co-ordinated approach to drainage planning on a watershed and subwatershed basis is required to ensure effective runoff control and minimization of flood damages.

*Several Municipal jurisdictions have implemented a **"zero increase in peak runoff rate"** policy for controlling post-development runoff. While this type of policy provides simple and clear direction regarding stormwater management flood control, a uniform application of this type of policy does not consider the potentially negative effects on watercourses from extended periods of controlled peak discharge (i.e. increased erosion).*

In cases where no Master Drainage Plan (M.D.P.) or Watershed/Subwatershed Planning has been completed or development lands are considered as external drainage areas to a M.D.P., watershed/subwatershed planning areas, consultation with the City shall determine if runoff peak flows shall be controlled to pre-development levels or alternative stormwater management is required. Discussion with the City's Planning and Development Department shall be required to determine the scope of assessment based on the potential impact on the receiving storm system (ref. Conditions for Practice). Should the proponent establish, to the satisfaction of the City's Planning and Development Department, that the potential impact of the proposed development would be minimal, the City's Planning and Development Department could decide that detailed modelling and analysis may not be required, as per the Conditions of Practice within the Criteria and Guidelines for Stormwater Infrastructure Design Manual. Should the City's Planning and Development Department deem a more detailed assessment appropriate, the proponent would need to demonstrate through appropriate modelling and analysis, that uncontrolled flow will not cause detrimental impacts on downstream properties and watercourse systems as per the Criteria and Guidelines for Stormwater Infrastructure Design Manual. At the development application stage, before the City's Planning and Development Department will accept an increase in runoff rates, the proponent must also receive endorsement from the agencies having jurisdiction. Over-control of runoff (i.e. less than pre-development runoff), may also be required as it relates to downstream constraints. .

2.6 Erosion Control

The rate that uncontrolled runoff, due to urbanization, can accelerate the natural evolutionary processes of a watercourse depends upon topography and soil conditions. When erosion and/or bank instability is probable (e.g. from outlets from future development areas), the proponent shall either provide effective on-site or system controls (e.g. end-of-pipe controls), stabilize the receiving watercourse by appropriate remedial measures, or contribute to a fund designated towards future watercourse improvements, typically identified in Watershed and Subwatershed Plans. Should on-site or system controls not adequately control flows below the receiving system's erosion threshold, either off-site watercourse remedial measures or contribution to a fund shall be required.

Requirements for erosion control will generally be determined through upper level studies such as Watershed/Subwatershed/Master Drainage Plans. In these cases, the proponent(s) will be required to provide mitigation in accordance with the Watershed or Subwatershed Plans or with the Master Drainage Plans, as well as policies of the local Conservation Authority.

In areas where no Watershed, Subwatershed Plan or Master Drainage Plan exists, it shall be the responsibility of the development proponent to mitigate potential erosion impacts in accordance with Provincial Guidelines, unless it can be demonstrated through appropriate modelling and/or analysis that erosion processes will not be adversely affected by the proposed development.

In areas where the downstream receiving watercourse is determined to be unstable, or where control/over control of flow rates is either not possible or not feasible, design of watercourse alterations would be considered subject to design in accordance with Natural Channel Design principles.

The City of Hamilton supports Natural Channel Design Principles, as specified by the Province in Natural Channel Systems, An Approach to Management and Design, M.N.R., 1994 (or most recent update) and "Adaptive Management of Stream Corridors in Ontario", M.N.R. 2002 (or most recent update) Implementation of Natural Channel Design principles on area watercourses shall follow the guidance within the Criteria and Guidelines for Stormwater Infrastructure Design Manual. Any watercourse alteration shall be designed to the future flow regime with stormwater management controls in-place.

Storm sewer outfalls in natural channels should be provided with proper protection against erosion, which includes appropriate bank scouring protection on either side of the outfall and creek. When storm sewer outfalls outlet to steep and/or deep valleys, drop structures shall be designed in such a manner as to ensure bank stability. Such local erosion protection measures shall be designed so as not to interfere with the natural channel forming processes of the receiving watercourse system. Natural channels shall be designed to accommodate various flow regimes resulting from phased stormwater management measures.

Although both swales and ditches only provide a flow conveyance function and not the natural channel form, swales and ditches should be designed with appropriate erosion protection. Erosion protection measures shall be provided at storm outfalls and for the swale/ditch according to erosion thresholds.

3. Methodology

3.1 Overview

All components of drainage works that have been considered to require development funding have been included in this assessment/calculation. Storm drainage infrastructure may consist of open watercourses, storm sewers (shared and outlet works), and stormwater management facilities. For the purposes of this assessment, the charges have been separated into five categories of work as follows:

A. Open Watercourses: Channel System Improvements (identified projects)

- Erosion control and conveyance works, including channelization and major culverts, identified along watercourses to address the impacts of growth, such as increased peak flows, volumes, and durations of erosive flows, as identified in currently approved studies

B. Open Watercourses: Erosion Control – Anticipated Future Works

- Off-site (immediately downstream of new development) erosion control and conveyance works not yet identified in any approved studies along watercourses to mitigate impacts of growth (i.e. areas not covered in current Master Drainage Plans, Subwatershed Studies, etc.).

C. Stormwater Management (Quality and/or Quantity Facilities)

- Stormwater quantity and quality control infrastructure required to manage runoff from future growth areas, to mitigate impacts on downstream systems.
- Retrofit facilities for managing runoff from future growth included
- Includes end-of-pipe infrastructure such as wetlands, wet ponds, dry ponds
- Includes opportunity for certain qualifying source controls, such as Best Management Practices, and Low Impact Development (unidentified in the list)

D. Storm Sewers – Oversizing and Neighbourhood Outlet Works

D1 Oversizing of trunk storm sewers

- Includes the oversizing of storm sewers to accommodate the new growth, or where multiple new growth areas combine to generate sufficient additional runoff that a sewer in excess of 1200 mm in diameter is required; the cost of the oversizing would be considered a Development Charge. Local storm sewers to service new growth, equal to and less than the 1200 mm diameter threshold, are considered a local Developer Contribution, and are not included in the Development Charge.

D2 Storm sewer – neighbourhood outlet works (recommended by studies)

- Includes the storm sewers and outlet works, shared by multiple development growth parcels, required to accommodate the new growth

E. Culverts and Bridges: Anticipated Future Works

- Future works (i.e. those not identified in previous studies as part of Category A) which require an upgrade (either in length or capacity) normally associated with new road construction to support growth.

A further two sub-categories (one for stormwater management facilities and one for watercourses) have been included, to specifically capture the infrastructure required for the identified growth areas:

- G.R.I.D.S. stormwater management facilities
- G.R.I.D.S. watercourses

G.R.I.D.S. is the City's Growth Related Integrated Development Strategy, which includes the areas identified as Potential New Business Park, in the existing Airport Business Park Special Policy Area, new employment lands adjacent to the Airport SPA lands, and a proposed urban boundary expansion/employment lands to the south and east of Highway 20 and Highway 53/Elfrida.

This growth area includes the lands which are the subject of the completed studies: Airport Employment Growth District – Phase 2, Dillon et al 2009, A.E.G.D. Subwatershed Study and Stormwater Master Plan (S.W.M.P.) Implementation Document, Aquafor Beech Ltd., April 2017, and Elfrida Subwatershed Study, Phase 1 Report, Aquafor Beech Limited, May 2018.

3.2 Future Development (Residential /Non-Residential growth area)

Figures G1-G7 cover the City of Hamilton, along with the bounded development areas from previous Development Charge Background Studies. For this 2019 Update Study, the City has provided a draft development staging plan (June 2018), which identifies the parcels of residential and non-residential growth, and where possible, the status of the lands with respect to anticipated timing of development. The City Development Engineering staff has also reviewed the proposed time frame of all of the stormwater projects, and grouped them into three time periods: 0-5 years, 6-10 years, and 11+ years.

It should be noted that for the purpose of calculating the development charge, there is no distinction between the three time frames. There has been a column left in the costing tables for reference purposes only.

Figures G1-G7 show the approximately forty (40) different subwatersheds that cover the City study area. These subwatersheds form part of four Conservation Authorities, namely: Conservation Halton, Hamilton Conservation Authority, Grand River Conservation Authority, and the Niagara Peninsula Conservation Authority.

3.3 Costing Assumptions

The estimates of the costs are based on the best available information for future projects. A complete listing of all the projects is in Appendix G1. All assumptions used to derive the costs are listed in this section. The costs are based on estimated construction costs plus a 15 % allowance for engineering, design, legal, and survey. Estimated land costs have also been included in the totals. Residential land costs have been tracked by the City, and currently have been set at $652,800/ac ($1,613,069/ha), except for Ancaster and Waterdown, which has been set at $754,800/ac. ($1,865,111/ha).

The costs have either been calculated using formulas based on 2011-2018 construction prices from projects completed in the City, and neighbouring Municipalities in the GTA, where no cost estimates are available in the background reports, or where construction estimates were available, the unit rates used in those estimates are considered to be valid in 2019 (i.e. are the same as rates from current contract bids).

The Development Charge component cost of the project (i.e. the portion attributable to new development) has been determined by examining the percentage of existing development that would benefit from the infrastructure.

3.3.1 Specific Costing Assumptions By Category

A complete summary listing of all projects is in Appendix G1, with the Residential listing first followed by the Non-Residential, and both sorted by geographic area, then category of project.

Costs for Category A (Open Watercourses: Channel System Improvements, for projects identified in City studies) have been established using the existing studies provided by the City (ref. list of references at the end of the report), and adjusted as per Section 3.3. In instances where the studies identified watercourse and road crossings, but no specific costs (Elfrida Secondary Plan, Waterdown East-West Corridor, Airport Employment Growth District), the City estimated the culvert crossing size and costing estimate using the method described below for Category E.

Costs for Category B (Open Watercourses: Erosion Control – Estimated Future Works not identified in previous studies) have been calculated as follows:

- for existing open watercourses downstream of new development, the length has been abstracted from the topographic mapping provided by the City,
- The applicable length for erosion protection has been defined by the distances to a receiving water body (i.e. lake), or to a point downstream where erosion is deemed to no longer be predicted to occur as a result of the subject development. This point has been estimated as the point where the total tributary drainage area exceeds 2 times the area tributary to the development discharge point (i.e. immediately downstream of the new development). This approach is intended to reflect the diminished erosion impact of developed discharge, as the size of the drainage area and flow in the watercourse increases downstream from the point of discharge.
- The percentage of the total length of channel to require erosion works has been established at between 5 and 20 %, depending on the relationship of total development area related to upstream drainage area. The greater the fraction of developed area, tributary to the subject watercourse, the greater the percentage of watercourse assumed to require erosion control. The maximum of 20 % reflects the anticipated benefits from on-site stormwater management which would greatly reduce downstream erosion potential. However, since volume control is not considered practical in most parts of Hamilton, erosion potential would not be eliminated entirely with on-site controls in place.
- The cost per metre of work has been estimated to be either $1500 or $2500 depending on the general size or depth of the creek bankfull section, and potential valley slopes, which has been expressed as a function of the upstream drainage area. Subject watercourses having an upstream drainage area of under 500 ha have been costed at $1500 /m, and drainage areas over 500 ha at $2500 /m. The difference reflects the condition whereby the required protection may vary between simple regrading of banks and vegetative bioengineering, to structural measures such as armour-stone and major earth excavation. The unit rate of $1500 /m involves site preparation, dewatering, earth excavation, bioengineering (live staking, timber cribs, brush mattresses, etc.), and site

restoration. The unit rate of $2500 /m differs in that more structural materials are employed for erosion control, such as riprap, and armour stone, which typically involve more excavation and items such as geotextiles, subdrains and backfill.

- The cost for land (easement) has been assumed to be the same as for stormwater management facilities, i.e. assuming highest and best use for the land. The land required for an easement has been estimated as either 5 m or 10 m width depending on the size of the creek (i.e. drainage area under or over 500 ha), multiplied by the length of creek to be treated. This estimate does not allow for connections between easements on separate sections of the creek.

- The fraction allocated to growth, or the new development fraction, is calculated by dividing the new development area (residential and non-residential) by the total of existing and future development area (residential and non-residential) within the contributing drainage area to the watercourse erosion project reach in question

Costs for Category C (stormwater management facilities) have either been based on previous studies or, if no estimate was available, the cost has been based on a formula relating the drainage area, required volume, and the required land to accommodate the facility footprint. The cost of land has been set at either $652,800 per acre, or $754,800 per acre (Ancaster and Waterdown) in accordance with the City's calculated costs.

Target volumes for stormwater quality, erosion control and flood control vary widely, each being specific to the location and watershed. Ranges have been estimated to be between 100 and 200 m^3/impervious hectare for quality only; between 100 and 400 m^3/impervious hectare for extended detention erosion control, and between 300 to 500 m^3/impervious hectare for flood control. These are based on recent experience in developing urban environments in Hamilton, as well as in the Greater Golden Horseshoe. The specific targets will be directly related to the type of receiving watercourse. For sizing quality control facilities in the absence of available reporting, an average target volume of 475 m^3/impervious hectare has been used, with an approximate impervious fraction of 40 %, therefore an average volume of 190 m^3 /hectare has been used for Development Charge calculation purposes for quality control facilities. An estimated volume of 720 m^3 /hectare has been used for Development Charge calculation purposes for combined quantity/quality control facilities.

The erosion control and flood control volumes are typically placed above the water quality control volumes, hence there may be economies in terms of land requirements when multiple functions are required at a facility. The construction costs have been based on the total volumes.

The land costs have been developed to take into account the required footprint of the facilities and have been based on the following rule:

- If the footprint has been established through a City-approved study, this area is to be used;
- If no study exists, a quality (only) facility or quantity (only) facility will require 4 % of the contributing drainage area; or
- If no study exists, a combined quality/quantity facility (and those combined facilities that include an erosion control volume) will require 6 % of the contributing drainage area

- The City has subsequently identified seven (7) facilities in the Fruitland-Winona Secondary Plan area, which will require 10 % of the contributing drainage area, due to grading constraints associated with local grades and existing ditch outlets. The City has furthermore identified two (2) additional residential facilities for which grading constraints have been identified, and hence applied the 10 % estimate to the area requirement: Ancaster facility ANC 14 at Meadowlands Phase 4, and Hamilton facility HAM 31 at Stonechurch and Wellington. (The City has identified one (1) non-residential facility for which grading constraints have been identified: Ancaster facility ANC 23 at Trustwood Industrial East).

The general construction cost relationship has been developed from both estimates and actual construction costs of a range of stormwater management facilities constructed in Southern Ontario over the past five years. Capital costs assigned to the individual projects are based on $\$80/m^3$ of total volume for the first 6,500 m^3, and $\$40/m^3$ of total volume for the balance of storage volume.

The City has identified ten (10) facilities which are known to be located in an area of shallow depth to bedrock. The City has estimated the volume of rock that will be encountered, and increased the facility cost estimate for excavation accordingly, based on using a premium of $\$80/m^3$, for the estimated rock volume, in addition to the standard cost estimate for earth excavation noted above. (Note that the City also has a contingency for additional facilities which may encounter more bedrock than estimated).

Unidentified Projects (Category C – Res. – Facility U1)

The City has included an item entry under Category C for stormwater management facilities that are currently not identified in the list of projects. The City has had several occasions over the preceding years where development has occurred in such a manner as to require temporary or additional stormwater management works. These works may, in some cases, be determined by the City to provide a long-term benefit to the stormwater system, and hence the City proposes to add these select works to their infrastructure. The City may then credit these works in part or in full, and hence have created this item as a form of a Credit Pool. The City will also review whether previously identified works in the area may need to be updated to reflect the new works. The City will develop a process for the auditing and accounting of these potential works to confirm the reasonableness of each cost estimate of the facility or portion of facility for which credit is being sought.

Low Impact Development Credit Policy (Category C – Res. – Facility U2)

The City of Hamilton supports Low Impact Development Best Management Measures to complement traditional stormwater management techniques. Low Impact Development Best Management Practices (LID BMP's) essentially promote treatment/management of storm runoff at the source. The benefits of this approach are widely understood and documented, hence not repeated within this document. Key concerns relate to implementation. The issues and challenges associated with the implementation of Low Impact Development Best Management Practices relate primarily to the fact that these measures are typically "on-lot" within private control, outside of the direct control of the Municipality. Due to this basic circumstance, the question is raised by municipal managers as how best to ensure that the "on-lot" measures are maintained, working, and not removed by private landowners and/or businesses. Clearly, by installing these Best Management Practices on private property, there will be an eventual loss of

effectiveness, either through lack of maintenance and/or removal in their entirety. The question relates to what extent this "loss" will occur and will this vary by land use.

Notwithstanding, Low Impact Development Best Management Practices in developing subwatersheds, have the potential to reduce the scale and scope of conventional end-of-pipe stormwater management systems. The question related to the foregoing perspective though, is how can this be accounted for functionally and financially in the construction and financing of traditional end-of-pipe stormwater management facilities. It must also be clear, in the case of intensification and infills, whether the stormwater management involves quality, quantity, or both.

As noted earlier, the City of Hamilton is supportive of Low Impact Development measures and as such wishes to encourage these through a form of incentive program. To this end, the City, through this Development Charge, has set up an initial Low Impact Development Credit Pool in the amount of $1,500,000. The City is developing a policy for the management of this credit, which will be refined as the policy evolves over time.

Facility Road Frontage Costs (Category C – Res. – Facility U3)

The City has included an item entry under Category C for S.W.M. facility road frontage costs, to cover the portion of road cost that is fronted by a City S.W.M. facility block. The average frontage is 120 m, based on the average footprint and geometry of facilities, and verification of past frontages from the previous 8 years. This amounts to 120 m * $1500/m/facility for the 38 residential facilities listed (retrofits excluded) or $6,840,000.

Facility Land Footprint Contingency (Category C – Res. – Facility U4)

The City has included an item entry under Category C for special instances where the land footprint required is more than either the City formula-based calculation or the detailed estimate. The City has had several occasions over the preceding years where the footprint was between 6 and 10 %, and hence the Development Charge for those facilities did not cover the cost of the land. The City has proposed that, on average, 1 in 4 stormwater management facilities designed will require a larger footprint. Since there are 38 residential facilities on the list, this amounts to approximately 10 facilities. The average footprint for the 38 facilities has been used to calculate the land footprint contingency, using an average exceedance of the footprint by 20 %, amounting to approximately $3,500,000 in land. Note that for the 2019 Study, the City has identified eight (8) facilities which have been identified to need a larger footprint, and they would not apply to this contingency. In identifying the eight (8) facilities, the likelihood of another ten (10) requiring a larger footprint is expected to be lowered.

Facility Volume Construction Contingency (Category C – Res. – Facility U5)

The City has included an item entry under Category C for special instances where the volume required is more than either the City estimate or the detailed estimate. This may be for exceptional circumstances, including an increase in land use density at a specific facility. The City has had several occasions over the preceding years, and based on this experience has assumed that 1 in 10 facilities will exceed the design volume by 10 %, amounting to $3,150,000 in construction cost (primarily excavation).

Facility Rock Excavation Construction Contingency (Category C – Res. – Facility U6)

The City has included an item entry under Category C for special instances where the volume of rock encountered is more than either the City estimate or the detailed estimate. The City has recorded the instances of extra rock encountered in the facility construction over the preceding 5 years, and based on this experience has assumed that approximately 1 in 20 facilities (2) will encounter 9,000 m^3 of rock, amounting to $1,440,000 in extra construction cost for excavation. Note that for the 2019 Study, the City has specifically identified ten (10) facilities which have been identified in bedrock, and therefore they would not apply to this contingency. In identifying the ten (10) facilities, the likelihood of other facilities encountering bedrock has been lowered.

Unidentified Facilities in Combined Sewer Area (Category C – Res. – Facility U7)

The City has included an item entry under Category C for stormwater management facilities in the combined sewershed area, which are currently not identified in the list of projects. These works may, in some cases, be determined by the City to provide a long-term benefit to the stormwater system, and hence the City proposes to add these select works to their infrastructure. The area is currently under study, and the City estimates that there will be three (3) projects that result in a facility, costing an estimated $2,000,000 each, for a total of $6,000,000.

Retrofits

The City, as part of its Stormwater Master Plan (2007), has assessed the feasibility of retrofitting existing stormwater management facilities in order to provide stormwater quality control and erosion control measures. The objective for the City is to improve environmental conditions in the downstream receiving water bodies.

There are 29 identified retrofit opportunities (e.g. add a quality or erosion component to an area currently receiving only quantity or flood control) in the City. These have been separated into those 11 locations which serve only existing development (therefore not growth-related, and not currently considered), and those 18 which serve both existing and new development (the benefit to existing must be deducted).

For the 18 facilities that meet the criteria, the total area served is 759 ha and the growth-related fraction has been estimated at 54.45 %. Note that the City has confirmed that one of the facilities (Binbrook R54) has been superseded through the development process, and this one has been removed from the 2019 list of potential retrofits.

G.R.I.D.S.

G.R.I.D.S. is the City's Growth Related Integrated Development Strategy, which includes the areas identified as Potential new Business Park, in the existing Airport Business Park Special Policy Area, new employment lands adjacent to the Airport SPA lands, and a proposed urban boundary expansion/employment lands to the south and east of Highway 20 and Highway 53/Elfrida.

The growth areas identified in the G.R.I.D.S. study accounts for approximately 75 new projects, including an estimated 57 stormwater management facilities and 18 off-site erosion control projects, with the erosion projects lumped into 5 area erosion studies, based on the watersheds and distinct growth areas.

The City has completed the Draft Airport Employment Growth District study (December 2009), and the Airport Employment Growth District Subwatershed Study and Stormwater Master Plan (S.W.M.P) Implementation Document (April 2017), however the reports do not detail the siting of all future stormwater management facilities. There may be opportunities to further plan the areas, and reduce the infrastructure, however it is left at the conservative level for the charge calculation purposes. Once a Final Master Drainage Plan is complete, an update may be required for the G.R.I.D.S. stormwater management facilities (number, location, and sizes).

The G.R.I.D.S. development areas are drained by the Welland River, Three Mile Creek, and Twenty Mile Creek, each of which are considered to be sensitive coldwater fish habitat. Based on the anticipated Enhanced level of protection to be applied to the tributaries, it is proposed that all watercourse tributaries will be required to remain open: this therefore increases the number of facilities required to service the area.

Similar to the 2004, 2009, 2011 and 2014 Development Charge Background Studies, there are off-site erosion control studies and potentially work proposed for each receiving tributary downstream of the growth area.

The Airport SPA facilities have been preliminarily sized to have larger footprints on account of the condition that Transport Canada typically imposes on stormwater management facilities near airports. There cannot be open water facilities since these are considered to attract waterfowl, and pose a navigation hazard to aircraft. The facilities have therefore been sized as dry ponds. (ref. Storm Drainage System Local Service Policy number 18, Appendix E).

Costs for Category D (Storm Sewers Oversizing and Neighbourhood Outlet Works) are developed for two sub-categories: storm sewer oversizing, and storm sewers identified for neighbourhood outlet works.

Storm Sewers - Oversizing

The oversizing costs are based on the relative increase in cost for storm sewers over a threshold diameter of 1200 mm, as set by previous City Financial Policy. A list of projects has been generated by the City Development Engineering Department, and is included in Appendix G1-D. The list is based on two sources of information: Draft Approved Subdivision Plans, and Approved Secondary Plans.

Storm Sewers – Neighbourhood Outlet Works

The neighbourhood outlet works cost estimates are based on City studies for five (5) proposed neighbourhood storm outlet works (shared by multiple development growth parcels). A list of projects has been generated by the City Development Engineering Department, and is included in Appendix G1-D.

The City has included a provisional entry under Category D2 for storm sewer neighbourhood outlet works within the combined sewershed that are currently under study by the City and not identified in the list of projects. The City estimates a total of three (3) new neighbourhood outlets to service growth, at an estimated cost of $1,000,000 each.

Costs for Category E (culvert and bridge upgrades not identified in previous studies) have been estimated in the following manner:

- Based on the planned Development Charge eligible road projects (replacement and widening of existing) affected watercourse crossings, based on the topographic mapping, have been determined (current estimate =152),
- The size of the new culvert cross-sectional area has been estimated as a function of the upstream drainage area,
- All "small" crossings where the culvert will likely have a diameter smaller than 1200 mm have been removed from the calculation, as those works would be assumed to be part of the road works,
- Also, any culverts previously identified in Category A (64) have not been included under this category,
- The remaining (87) culverts have been separated into three categories, based on: estimated flow conveyance area of 2 m^2, 4 m^2, and 8 m^2, (74, 7, and 6 respectively); for costing purposes unit rates of $84,300, $168,600 and $337,200 per culvert/bridge respectively have been used, assuming a 26 m road width for all culverts/bridges. This cost estimate is based on concrete box culverts, and has been developed using 2014 unit rates and adjusted by the CPI factor for 2014-2018 of 12.4 %, installation estimated at double the supply cost, and allows for an average depth of cover on each culvert.

The costs are currently attributed to new development based on the benefit to growth percentage established in the roads study (ref. Appendix H).

3.4 Existing Agreements

As noted in Section 2, there are existing agreements (e.g. Special Policy Areas, Local Area Improvements, and Developer Agreements) in force that will need to be accounted for in the financial section of the Development Charges Update. Where it can be identified and verified by the City, existing developer contributions that have been made under existing agreements will be credited after the Development Charges are collected.

4. Summary of Stormwater Component of Development Charges

4.1 Overview

The following tables present the stormwater development charges cost estimates, by Category A to E, plus G.R.I.D.S.. In each table, the costs have been split into Residential and Non-Residential, providing the gross costs and the Development Charge related costs.

Table G.2: Summary of Stormwater Development Charges Costs

Type of Work		Gross Estimated Cost	Development Charge Eligible Growth %	Development Charge Cost
A Channel System Improvements (Identified Projects)				
	Residential	$20,923,000	100.00	$ 20,923,000
	Non-Residential	$23,087,000	85.00	$19,624,500
Subtotal A		$44,010,000	92.13	$40,547,500
B Erosion Control – Estimated Downstream Future Works				
	Residential	$17,745,811	48.10	$8,535,252
	Non-Residential	$8,059,025	61.17	$4,929,650
Subtotal B		$25,804,837	52.18	$ 13,464,902
C Stormwater Management Quality/Quantity Facilities				
	Residential	$185,683,445	96.81	$179,761,145
	Non-Residential	$108,001,177	0.00	$0
Subtotal C		$293,684,622	61.21	$179,761,145
D Oversizing of trunk sewers and culverts				
	Residential	$16,918,709	100.00	$16,918,709
	Non-Residential	$2,984,000	100.00	$2,984,000
Subtotal D		$19,902,709	100.00	$19,902,709

Table G.2: Summary of Stormwater Development Charges Costs

Type of Work		Gross Estimated Cost	Development Charge Eligible Growth %	Development Charge Cost
E Culverts and Bridges (not in Category A)				
	Residential	$4,467,900	79.15	$3,536,385
	Non-Residential	$4,973,700	85.17	$4,236,075
Subtotal E		$9,441,600	82.32	$7,772,460
G.R.I.D.S. Stormwater Management Quality/Quantity Facilities				
	Residential	$98,626,698	100.00	$98,626,698
	Non-Residential	$179,980,176	0.00	$0
Subtotal G.R.I.D.S. S.W.M.		$278,606,874	35.40	$98,626,698
G.R.I.D.S. Watercourses				
	Residential	$7,075,064	100.00	$7,075,064
	Non-Residential	$12,422,574	100.00	$12,422,574
Subtotal G.R.I.D.S. Watercourses		$19,497,638	100.00	$19,497,638
TOTAL		**$690,948,280**	54.94	**$379,573,051**
Residential		$351,440,627	95.43	$335,376,253
Non-Residential		$339,507,653	13.02	$44,196,799

All of the proposed projects in Categories A to E and G.R.I.D.S., which have been considered for the storm drainage Development Charge, can be attributed to distinct parcels of residential and/or non-residential growth lands. These linkages form the basis for the proposed split of the total charge. For categories D, and E, in the absence of information to support the establishment of a City share, the % attributable to the City has been set at zero.

Note that for all projects listed related to the Elfrida growth area (Cat A, E, G.R.I.D.S. SWM and Watercourses), there has been a post-period deduction of two-thirds, for the projects scheduled for after 2031.

Table G.3: Summary of Stormwater DC Eligible In Period Costs					
Category	**Gross Estimated Cost**	**DC Eligible Growth (%)**	**DC Eligible Growth Cost**	**DC Eligible Post Period**	**DC Eligible In Period**
A Watercourses	44,010,000	92.13	40,547,500	3,793,333	36,754,167
B Off-Site Erosion	25,804,837	52.18	13,464,902	-	13,464,902
C SWM	293,684,622	61.21	179,761,145	-	179,761,145
D Sewer Oversizing/Outlets	19,902,709	100.00	19,902,709	-	19,902,709
E Culverts/Bridges	9,441,600	82.32	7,772,460	334,390	7,438,070
GRIDS SWM	278,606,874	35.40	98,626,698	65,751,132	32,875,566
GRIDS Watercourses	19,497,638	100.00	19,497,638	4,716,709	14,780,929
Total	**690,948,280**	**54.94**	**379,573,051**	**74,595,564**	**304,977,487**

4.2 Summary

The City of Hamilton has updated the 2014 Development Charges project listing. The City has prepared an overall report, including appendices for details related to Stormwater, Water, Wastewater, and Transportation.

This appendix provides information for the portion of the Development Charges relating to stormwater including: erosion control, channel improvements, stormwater management works, oversizing of existing stormwater related infrastructure and stormwater related studies. Projects included in this report are future growth related which includes both planned and unplanned projects. Future growth related information has been collected from the City and other studies, and where no information was available appropriate assumptions have been made, as detailed herein. This appendix provides a summary of the approach used in establishing the Development Charges related costs and summarizing of the stormwater-related Development Charges for both residential and non-residential development.

A gross total of $690,948,280 for stormwater projects has been identified, with the portion allocated to new development totaling $379,573,051. The portion DC eligible in this period totals $304,977,487.

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Ancaster Commercial Development (S.W.M. Report)		September-95	Cosburn Patterson Wardman Limited
Ancaster Community Center (S.W.M. Plan)	September-91		Sandwell Swan Wooster.
Ancaster Industrial Park (S.W.M. Report Update)	September-02	December-02	A.J. Clarke and Associates Ltd.
Ancaster Industrial Park Detention Pond No. 2 (S.W.M. Study Addendum)	November-98		A.J. Clarke and Associates Ltd.
Ancaster Master Drainage Plan (Final Draft)	January-87		Philips Planning and Engineering Limited
Ancaster Meadows Phase 1 (S.W.M. Updated)	November-09		Metropolitan Consulting Inc.
Ancaster Meadows Phase II (Storm Drainage & Final Detention Pond Design)	August-86		Upper Canada Consultants
Ancaster Village Townhomes (S.W.M. Report)	September-93	January-95	A.J. Clarke and Associates Ltd.
Ancaster Woodlands Subdivision (S.W.M. Report)	July-013	Jan 14	S. Llewellyn & Associates Limited
Anpropco Developments (S.W.M. Study)		December-80	Paul Theil Associates Limited
Binbrook Settlement Area (Master Drainage Plan Update Report)	December-08		Weslake Inc.
Binbrook Urban Settlement Area (S.W.M. Report)	June-00		A.J. Clarke and Associates Ltd.
Bogle Subdivision (Functional Servicing Design Report)	June-00		Stantec
Bridgeport Subdivision (Preliminary S.W.M. Report)	May-03		A.J. Clarke and Associates Ltd.
Bridgeport Watercourses (Hydrologic & Hydraulic Analysis)	May-05		A.J. Clarke and Associates Ltd.
Bridle Ridge Subdivision Phase 3 ((S.W.M. Report)	July-05		S. Llewellyn & Associates Limited
Canada Bread (S.W.M. NGIBP S.W.M. Facility HC3-FB)		Aug-010	AMEC Earth & Environmental
Chedoke Golf Course Channel Municipal Class EA (Schedule B) Final	July-08		McCormick Rankin Corporation
City of Stoney Creek (Implementation of Drainage Works Watercourse 5,6,7 & 9)	May-92		Philips Planning and Engineering Limited
Clappison's Corners Industrial Business Park Master Drainage Plan (Final Report)	May-89		Totten Sims Hubicki Associates Consultants
Clovervale Subdivision (S.W.M. Report)	September-04		Lamarre Consulting Group Inc.
Clovervale Subdivision (Retrofit Design-S.W.M. Facility & Associated Conveyance Improvements)	November-013		AMEC Environment & Infrastructure
D'Aminco Cimico (S.W.M. Report)	September-09		Kenneth Youngs Engineering Inc.
Dartnall Rd Extension Culvert/Bridge (Hydraulic Impacts Report) Final Report	March-012		Dillon Consulting
Delsey Creek (Storm Drainage Master Plan - Class EA Study Project File Report)	October-03		MTE Consultants Inc.

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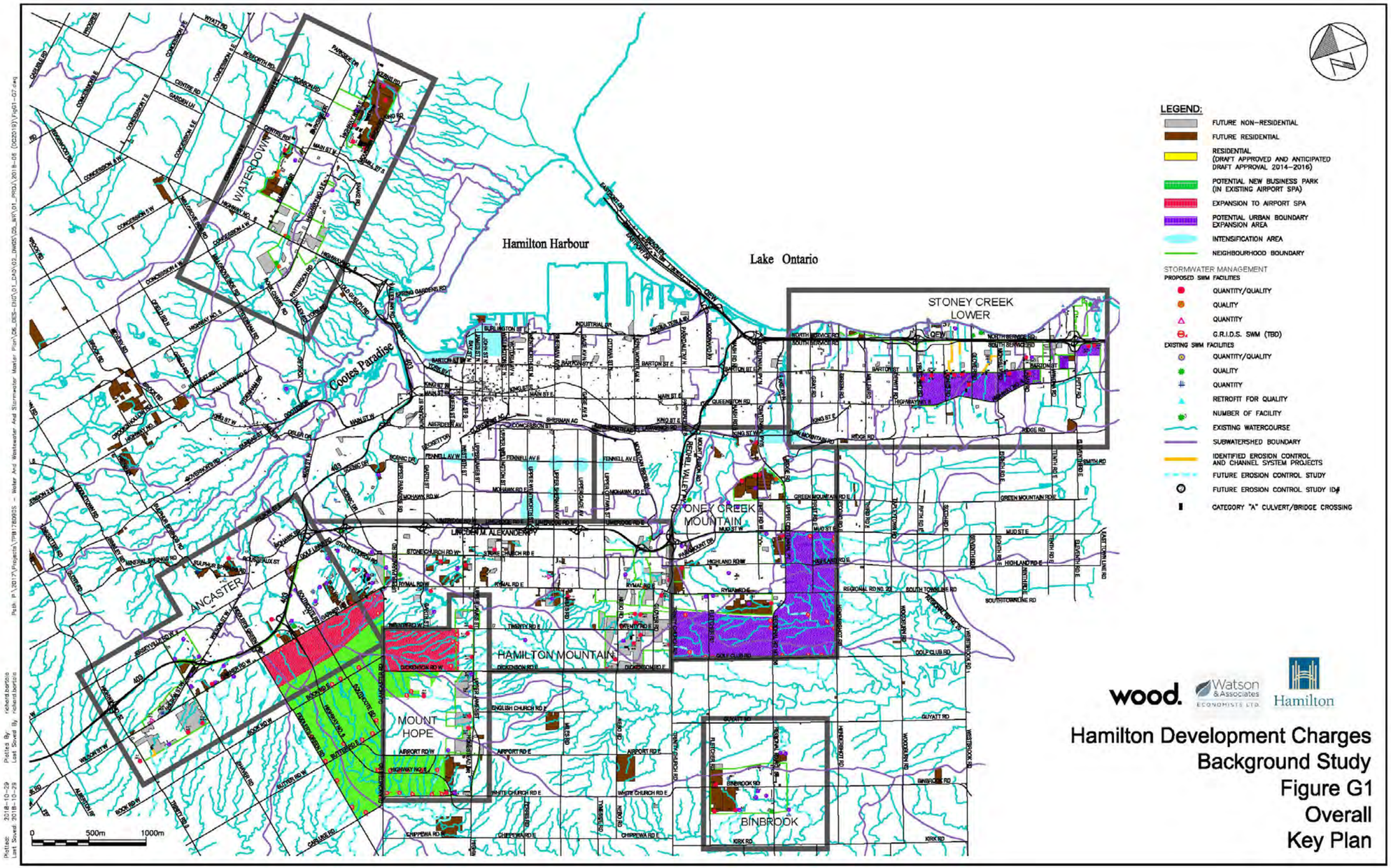
Duff's Corners Business Park (S.W.M. Report)	May-06	April-07	A.J. Clarke and Associates Ltd.
Dussin Property - Meadowlands Neighbourhood (S.W.M. Report)	May-013		Lamarre Consulting Group Inc.
Elizabeth Gardens - Binbrook Settlement Area (S.W.M. Report)	June-04		Lamarre Consulting Group Inc.
Enclave The (S.W.M. Report)	April-97	July-97	A.J. Clarke and Associates Ltd.
Falling Brook Estates (S.W.M. Assesment)	July-96		A.J. Clarke and Associates Ltd.
Fiddler's Green Estates (S.W.M. Report)	July-91		Aquafor Engineering Limited
Fifty Road Joint Venture Inc. (S.W.M. Implementation Report)	February-00		Rand Engineering Corporation
Fifty Point West Neighbourhood (Addendum to Preliminary S.W.M. Plan)	November-97		Hydro Comp Inc.
Flamborough Business Park - Highway 6 & Dundas Street (S.W.M. Report)	March-06		Lamarre Consulting Group Inc.
Fontana Gardens Phase 3 (S.W.M. Assessment Report)	December-07		A.J. Clarke and Associates Ltd.
Foothills of Winona Avatar International Realty Corporation (S.W.M. Report)	August-01		Planning & Engineering Initiatives Limited
Forest Ridge (S.W.M. Report)	December-04		A.J. Clarke and Associates Ltd.
Forty Mile Creek Flood Damage Reduction Study	August-95		Aquafor Beech Limited
Fruitland Centre (S.W.M. Report)	June-03		Serabill Designbuild Corporation Inc.
Fruitland Meadows (S.W.M. Report for Existing S.W.M. Facility Retrofit)	January-02	March-03	S. Llewellyn & Associates Limited
Garner Grove Subdivision (S.W.M. Report)	December-02	July-03	Ashenhurst Nouwens Limited
Garner Neighbourhood (Master Drainage Plan)	July-96		Philips Planning and Engineering Limited
Garth Trails (S.W.M. Addendum)	June-02		A.J. Clarke and Associates Ltd.
Gates of Ancaster II Limited (S.W.M. Report)	April-07		John Towle Associates Limited
Gatesbury Developments Phase IV (Functional Report)	November-94		F. J. Ternoway & Associates Limited
Greater Hamilton Airport Business Park Phase 1 (SW Drainage Report)		August-92	CC Parker Consultants Limited
Green Millen Shore Estates (S.W.M. Report)	February-011	September-11	AMEC Environment & Infrastructure
Greenforest Estates (S.W.M. Report)	September-08		Kenneth Youngs Engineering Inc.
Greenhill Avenue Area Storm Drainage Study	June-08		SNC Lavalin
Greenwood Estates Subdivision (S.W.M. Report)	May-88		Youngs Consultants
Greystones (S.W.M. Report)	December-08		A.J. Clarke and Associates Ltd.
Hamilton International Airport Apron Expansion Phase 2 (S.W.M. Report)	October-02		Giffels Associates Limited
Hannon Creek Subwatershed NGIBP (Master Drainage Plan) Draft Report	March-07		Totten Sims Hubicki Associates Consultants
Head of the Lake (Mount Hope Terrace) (S.W.M. Report)	October-90	July-91	Philips Planning and Engineering Limited
Heritage Green Community - (Functional Engineering Report)	April-91		Delcan

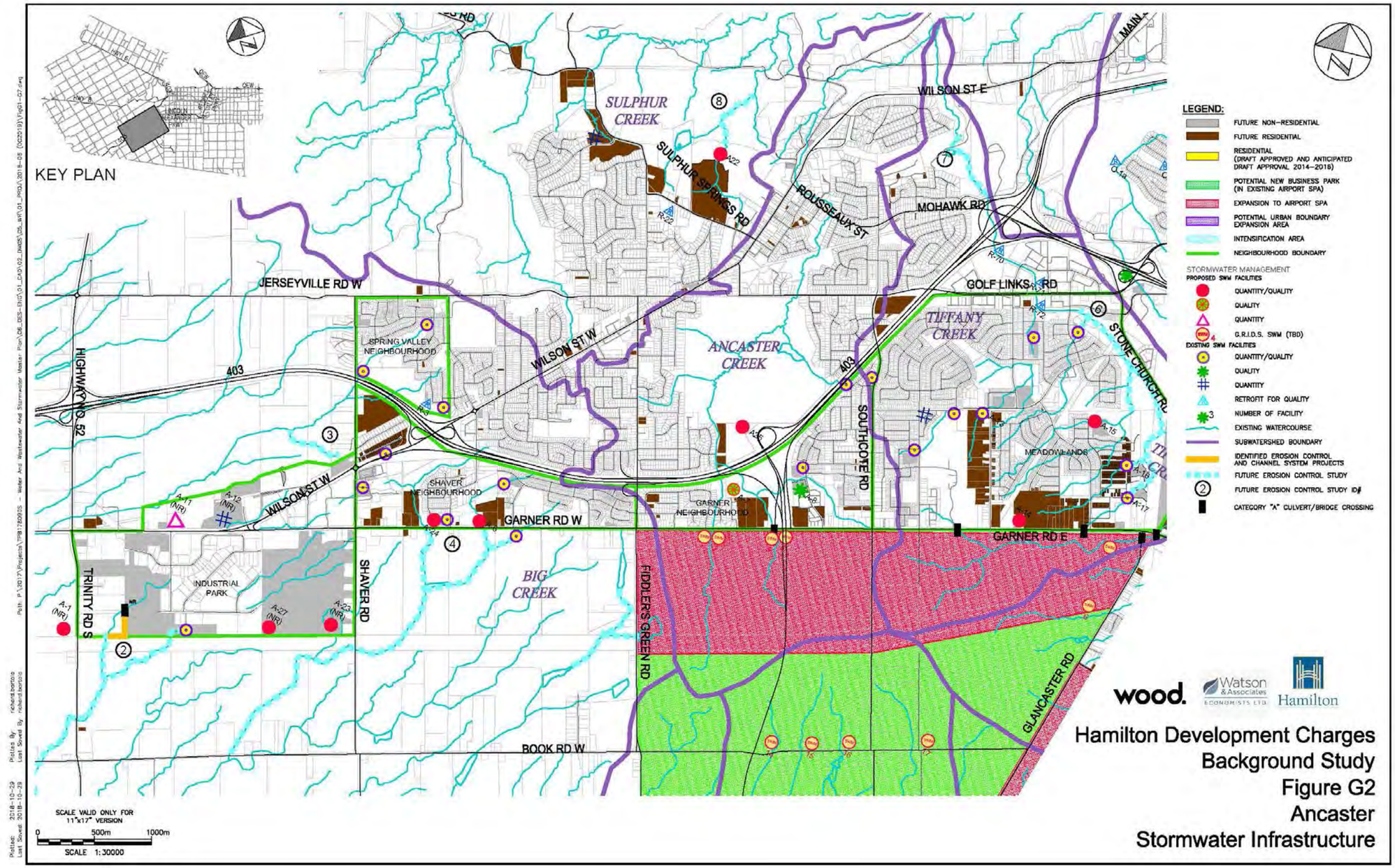
NAME	DATE	REVISIONS	AUTHOR
Highgrove Park Estates (S.W.M. & Floodplain Mapping Tributary of Ann St Creek)	April-86	July-86	G. M. Serns & Associates Ltd.
Highland Estates (S.W.M. Review)	November-92		C.C. Parker Consultants Limited
Jackson Heights Phase 3 (S.W.M. Report)	July-06		A.J. Clarke and Associates Ltd.
Kaleidoscope Phase 1 - 157 Parkside Drive (S.W.M. Report)			AMEC Environment & Infrastructure
Kopperfields West Residential Community (S.W.M. Report)	September-98		Paul Theil Associates Limited
Lake Vista Winona Subdivision (Mattamy Winona Limited)	June-06	November-06	David Schaeffer Engineering Ltd
Lewis Road Improvements Class EA from Barton Street to South Service Road (Draiange and S.W.M. Report	October-06	July-07	MacViro Consultants
Limberlost Estates (S.W.M. Report)	November-91		Town of Ancaster
Lime Kiln (S.W.M. Plan)	September-88		Philips Planning and Engineering Limited
Limestone Manor (S.W.M. Report)	September-12		Lamarre Consulting Group Inc.
Maple Leaf Foods - New Build (Site S.W.M. Design Report)	March-012		AECOM
Mattamy (Southcote) Limited (S.W.M. Implementation Report)	September-09		Rand Engineering Corporation
Mattamy on the Lake Subdivision (Mattamy (Winona) Limited) (S.W.M. Report)	April-07		David Schaeffer Engineering Ltd
Meadowbrook Manors (S.W.M. Report)	January-95		Weslake Inc.
Meadowlands Neighbourhoods 3, 4, 5 (Master Plan)	F-00		A.J. Clarke and Associates Ltd.
Meadowlands Neighbourhood 4 (Functional Servicing & S.W.M. Report)	March-04		Metropolitan Consulting Inc.
Meadowlands of Ancaster (Phase 6) (Proposed S.W.M. Facility)	October-01		A.J. Clarke and Associates Ltd.
Meadowlands of Ancaster (Phase 7) (S.W.M. Report)	March-03		A.J. Clarke and Associates Ltd.
Meadowlands Phase 10 (Proposed S.W.M. Plan)	January-08	May-08	Stantec Consulting Ltd.
Meadowlands Place (Functional Servicing & S.W.M. Assessment)	March-98	March-99	A.J. Clarke and Associates Ltd.
Meadowlands Place (S.W.M. Report)	September-98		A.J. Clarke and Associates Ltd.
Meadowlands The (Tiffany Watershed) (Detailed Master Drainage Plan)	March-88		Philips Planning and Engineering Limited
Millcreek Estates (S.W.M. Report)	September-92		Kenneth Youngs Engineering Inc.
Millers Pond Subdivision (S.W.M. Report)	July-01	July-02	S. Llewellyn & Associates Limited
Millrun Condominiums (S.W.M. Plan)	September-99		Phillips Planning and Engineering Limited
Montgomery Creek (S.W.M. Class EA)	August-97		Philips Planning and Engineering Limited
Morgan Firestone Arena Twinning (S.W.M. Report)	August-10		Their and Curran Architects Inc.
Mount Hope Secondary Plan (S.W.M. Report)	No date		Youngs Consultants

NAME	DATE	REVISIONS	AUTHOR
Mount Hope Urban Settlement Area (Master S.W.M. Plan)		December-94	Kenneth Youngs Engineering Inc.
Orchard Park Subdivision (S.W.M. Report)	May-13	Aug13;Oct13	S. Llewellyn & Associates Limited
Orkney Acres Rural Estate Subdivision (S.W.M. Report)	June-04		Lamarre Consulting Group Inc.
Orlick Aeropark (Design Brief)	February-08	April-09	Odan/Detech Group Inc.
Paradise Gardens (S.W.M. Report)	May-03		A.J. Clarke and Associates Ltd.
Paramount Estates (S.W.M. Report)	October-013		Lamarre Consulting Group Inc.
Parkside Hills Phase 1 (S.W.M. Design Brief)	May-07		Metropolitan Consulting Inc.
Pleasant Valley Development (S.W.M. Report)		July-07	Planning & Engineering Initiatives Limited
QEW Drainage Report (Pinelands Ave to Fifty Road)	No date		UMA Enginering Ltd.
Redeemer University College (S.W.M. Report)	November-04	Dec04;Apr05	Van der Woerd & Associates Ltd.
Ridgeview Subdivision (S.W.M. Report)	September-011		Lamarre Consulting Group Inc.
Riocan Power Centre (S.W.M. Report)	March-06		A.J. Clarke and Associates Ltd.
Rockcliffe Gardens (Storm Drainage Study)	February-77		William L. Sears and Associates Limited
Rockview Summit (S.W.M. Report)	Septemer-93	August-94	A.J. Clarke and Associates Ltd.
Rothsay Avenue Flood Remediation (Class EA) DRAFT	February-012		AMEC Environment & Infrastructure
Scenic Wood (Ancaster) (S.W.M. Study)	No date		Stantec
Seabreeze (S.W.M. Report)	July-06	April-07	A.J. Clarke and Associates Ltd.
Shaver Estates (S.W.M. Report)	January-04	June-04	A.J. Clarke and Associates Ltd.
Shaver Neighbourhood (East) (S.W.M. Plan)	November-96		Philips Planning and Engineering Limited
Shaver Neighbourhood (Master Drainage Plan - Addendum) (Final)	April-97		Weslake Inc.
Silverwood Homes (Functional Servicing & S.W.M. Report)	July-08		Metropolitan Consulting Inc.
Southampton Estates (S.W.M. Report)	April-03		Lamarre Consulting Group Inc.
Southcote Woodlands Plan of Subdivision (Design Brief for Phase II)	January-86	Jan;Jun;Jul07	Odan/Detech Group Inc.
Spencer Creek Estates (Preliminary S.W.M. Report)	October-98	January-99	Philips Planning and Engineering Limited
Spencer Creek Estates (S.W.M. Report)	April-98		CVE Engineering Ltd.
Spencer Creek Estates Phase 2 (S.W.M. Report)	May-12		EXP
Spencer Creek Village (S.W.M. Report)	June-99	October-99	Planning & Engineering Initiatives Limited
Springbrook Meadows - Phase 1 (S.W.M. Report)	February-92		Philips Planning and Engineering Limited
Spring Valley West, Shaver and Garner (S.W.M. Study Expanded Urban Area)	February-92		Philips Planning and Enginering Limited
Spring Valley West, Shaver and Garner (M.D.P. - Proposed Amendment)	November-96		Weslake Inc.

NAME	DATE	REVISIONS	AUTHOR
Stone Church Centre (S.W.M. Report)	March-04		A.J. Clarke and Associates Ltd.
Stoney Creek Master Drainage Plan Industrial Corridor Area No's 5-7(Addndm 1)	January-91		Philps Planning and Engineering Limited
Summerlea West Residential Subdivision (S.W.M. Report)	February-011	January-12	MTE Consultants Inc.
Sundusk Estates Subdivision (S.W.M. Report)	August-94		Kenneth Youngs Engineering Inc.
Sunnymeade Property (Storm Drainage Report)	February-88		Upper Canada Consultants
Sunset Ridge (S.W.M. Report)	July-98		Planning Initiatives Ltd.
Tech Park (S.W.M. Report)	February-94		Philips Planning and Engineering Limited
Tiffany (S.W.M. Report)	June-93	Oct-93 Jun 97	A.J. Clarke and Associates Ltd.
Trillium Estates Subdivision (S.W.M. Report)	August-03		S. Llewellyn & Associates Limited
Town of Ancaster (Master Drainage Plan)	August-99		C.N. Watson and Associates Ltd.
Twenty Road (Regional Stormwater Facility Design Report)	August-012		AECOM
Twin Gable Estates - Shaver Neighbourd (East) (S.W.M. Plan)	July-97		Philips Planning and Engineering Limited
Upcountry Estates Limited - Proposed Residential Subdivision (Functional)	May-09		Condeland Engineering Ltd.
Van Every Gardens (S.W.M. Report)	March-96		Kenneth Youngs Engineering Inc.
Venetor Crane Ltd. (S.W.M. Report)	May-06		S. Llewellyn & Associates Limited
Village Grove in Carlisle Subdivision (Final S.W.M. Report)	November-00		Stantec
Ward Estates (S.W.M. Report)	August-00		A.J. Clarke and Associates Ltd.
Waterdown Bay (Functional S.W.M. Plan Final Report)	May-05		McCormick Rankin Corporation
Watercourse 5.0 & 6.0 (Hydraulic Assessment)	January-011		Dillon Consulting
Waterdown North (Master Drainage Plan Addendum)	February-012		AMEC Environment & Infrastructure
Waterdown Woods (Functional Report)	January-91		Kenneth Youngs Engineering Inc.
Webster Estates (S.W.M. Report)	June-02	September-02	S. Llewellyn & Associates Limited
Wellington Meadows (Preliminary S.W.M. Plan)	July-97	September-97	Hydro Comp Inc.
West Bloom Estates (S.W.M. Update Report)	April-12		Metropolitan Consulting Inc.
West Central Mountain Drainage Assessment Supplemental Capacity Analysis & S.W.M. Sizing	October-11		AMEC Environment & Infrastructure
Westover Winds (Servicing/S.W.M. Report)	July-06		Weslake Inc.
Westview Estates (S.W.M. Plan)	November-96	May-97	Hydro Comp Inc.
Wilson Woods Condominium (S.W.M. Report)	August-94	November-94	A.J. Clarke and Associates Ltd.
Winona Crossing (Functional Servicing Report & S.W.M. Report)	January-013	November-013	A.J. Clarke and Associates Ltd.
Winona Meadows (S.W.M. Assessment)	July-95		A.J. Clarke and Associates Ltd.

NAME	DATE	REVISIONS	AUTHOR
Winona Park Estates (S.W.M. Study)	April-90		Environmental Hydraulics Group
Winona Urban Area (Master Drainage Plan Implementation)	May-90		Philips Planning and Engineering Limited
Winona Urban Boundary Expansion (Preliminary Engineering Servicing Study)	August-92		Philips Planning and Engineering Limited
Woodland Manor (Functional Servicing Report)	May-08		Stantec Consultant Ltd.


WATERDOWN
ANCASTER
Hamilton Harbour
Lake Ontario
Cootes Paradise
STONEY CREEK LOWER
STONEY CREEK MOUNTAIN
HAMILTON MOUNTAIN
MOUNT HOPE
BINBROOK
LINCOLN M. ALEXANDER PKY
LEGEND:
FUTURE NON-RESIDENTIAL
FUTURE RESIDENTIAL
RESIDENTIAL (DRAFT APPROVED AND ANTICIPATED DRAFT APPROVAL 2014-2016)
POTENTIAL NEW BUSINESS PARK (IN EXISTING AIRPORT SPA)
EXPANSION TO AIRPORT SPA
POTENTIAL URBAN BOUNDARY EXPANSION AREA
INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
RETROFIT FOR QUALITY
NUMBER OF FACILITY
EXISTING WATERCOURSE
SUBWATERSHED BOUNDARY
IDENTIFIED EROSION CONTROL AND CHANNEL SYSTEM PROJECTS
FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
0
500m
1000m
wood.
Watson & Associates ECONOMISTS LTD.
Hamilton
Hamilton Development Charges
Background Study
Figure G1
Overall
Key Plan


KEY PLAN
SULPHUR CREEK
SULPHUR SPRINGS RD
WILSON ST E
ROUSSEAUX ST
MOHAWK RD
GOLF LINKS RD
STONE CHURCH RD
TIFFANY CREEK
ANCASTER CREEK
JERSEYVILLE RD W
WILSON ST W
HIGHWAY NO. 52
403
SPRING VALLEY NEIGHBOURHOOD
SHAVER NEIGHBOURHOOD
GARNER NEIGHBOURHOOD
GARNER RD W
GARNER RD E
SOUTHCOTE RD
MEADOWLANDS
INDUSTRIAL PARK
TRINITY RD S
SHAVER RD
BIG CREEK
FIDDLER'S GREEN RD
GLANCASTER RD
BOOK RD W
LEGEND:
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FUTURE RESIDENTIAL
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NEIGHBOURHOOD BOUNDARY
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QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
RETROFIT FOR QUALITY
NUMBER OF FACILITY
EXISTING WATERCOURSE
SUBWATERSHED BOUNDARY
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FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
SCALE VALID ONLY FOR 11"x17" VERSION
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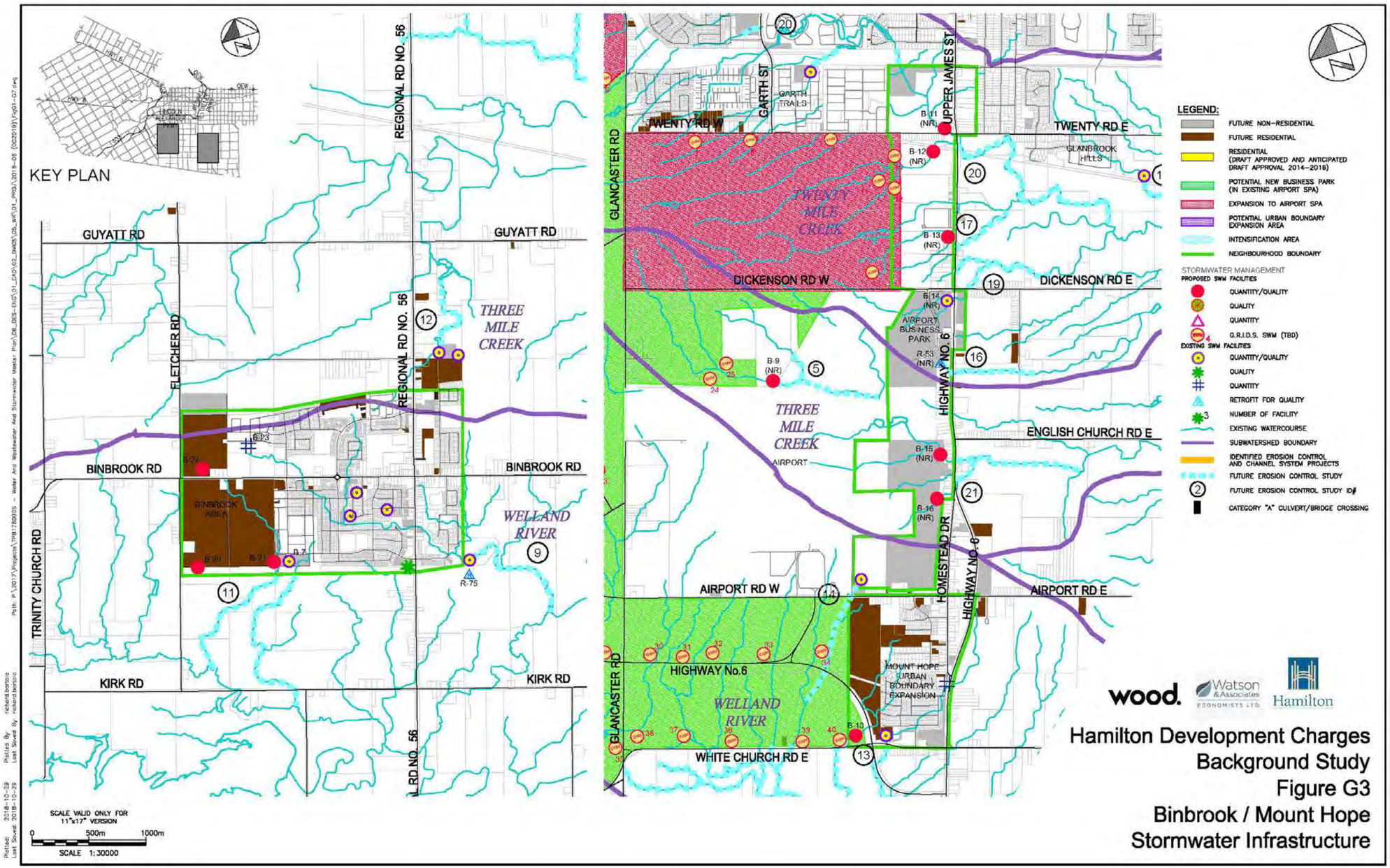
Watson & Associates Economists Ltd.
Hamilton
Hamilton Development Charges Background Study
Figure G2
Ancaster
Stormwater Infrastructure


KEY PLAN
REGIONAL RD NO. 56
GUYATT RD
FLETCHER RD
THREE MILE CREEK
BINBROOK RD
WELLAND RIVER
TRINITY CHURCH RD
KIRK RD
GLANCASTER RD
GARTH ST
GARTH TRAILS
UPPER JAMES ST
TWENTY RD W
TWENTY RD E
GLANBROOK HILLS
TWENTY MILE CREEK
DICKENSON RD W
DICKENSON RD E
AIRPORT BUSINESS PARK
HIGHWAY NO. 6
ENGLISH CHURCH RD E
AIRPORT
HOMESTEAD DR
AIRPORT RD W
AIRPORT RD E
HIGHWAY No.6
MOUNT HOPE URBAN BOUNDARY EXPANSION
WHITE CHURCH RD E
LEGEND:
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FUTURE RESIDENTIAL
RESIDENTIAL (DRAFT APPROVED AND ANTICIPATED DRAFT APPROVAL 2014-2018)
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INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
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PROPOSED SWM FACILITIES
QUANTITY/QUALITY
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G.R.I.D.S. SWM (TBD)
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QUANTITY/QUALITY
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RETROFIT FOR QUALITY
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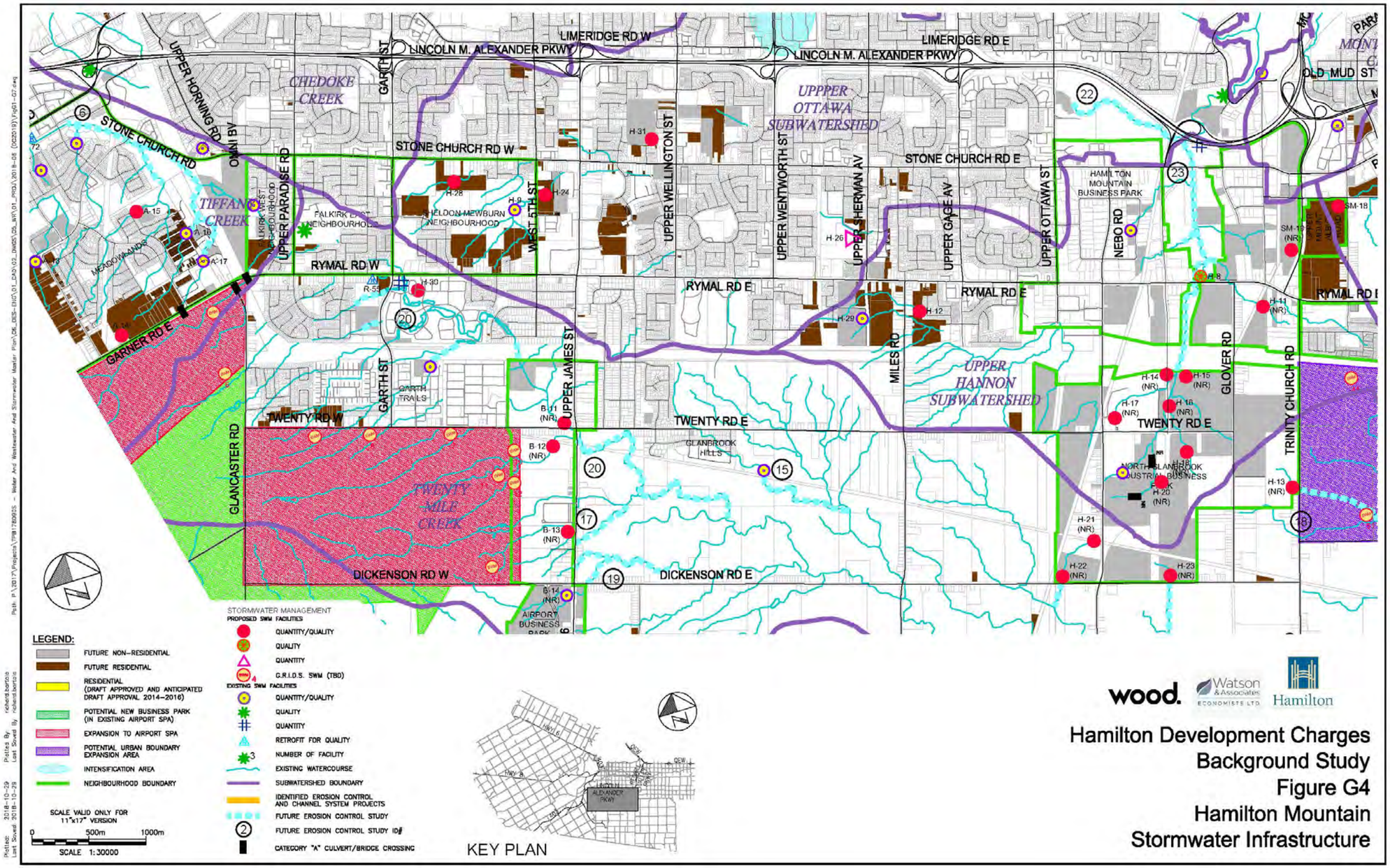
Figure G3
Binbrook / Mount Hope
Stormwater Infrastructure


LIMERIDGE RD W
LINCOLN M. ALEXANDER PKWY
LIMERIDGE RD E
LINCOLN M. ALEXANDER PKWY
STONE CHURCH RD
STONE CHURCH RD W
STONE CHURCH RD E
RYMAL RD W
RYMAL RD E
RYMAL RD E
TWENTY RD W
TWENTY RD E
DICKENSON RD W
DICKENSON RD E
OLD MUD ST
GARNER RD E
GLANCASTER RD
UPPER HORNING RD
UPPER PARADISE RD
GARTH ST
UPPER JAMES ST
UPPER WELLINGTON ST
WEST 5TH ST
UPPER WENTWORTH ST
UPPER SHERMAN AV
UPPER GAGE AV
UPPER OTTAWA ST
MILES RD
NEBO RD
GLOVER RD
TRINITY CHURCH RD
CHEDOKE CREEK
TIFFANY CREEK
TWENTY MILE CREEK
UPPPER OTTAWA SUBWATERSHED
UPPER HANNON SUBWATERSHED
FALKIRK WEST NEIGHBOURHOOD
FALKIRK EAST NEIGHBOURHOOD
HELDON-MEWBURN NEIGHBOURHOOD
MEADOWLANDS
GARTH TRAILS
GLANBROOK HILLS
HAMILTON MOUNTAIN BUSINESS PARK
NORTH GLANBROOK INDUSTRIAL BUSINESS PARK
AIRPORT BUSINESS PARK
LEGEND:
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FUTURE RESIDENTIAL
RESIDENTIAL (DRAFT APPROVED AND ANTICIPATED DRAFT APPROVAL 2014-2016)
POTENTIAL NEW BUSINESS PARK (IN EXISTING AIRPORT SPA)
EXPANSION TO AIRPORT SPA
POTENTIAL URBAN BOUNDARY EXPANSION AREA
INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
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STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
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G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
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RETROFIT FOR QUALITY
NUMBER OF FACILITY
EXISTING WATERCOURSE
SUBWATERSHED BOUNDARY
IDENTIFIED EROSION CONTROL AND CHANNEL SYSTEM PROJECTS
FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
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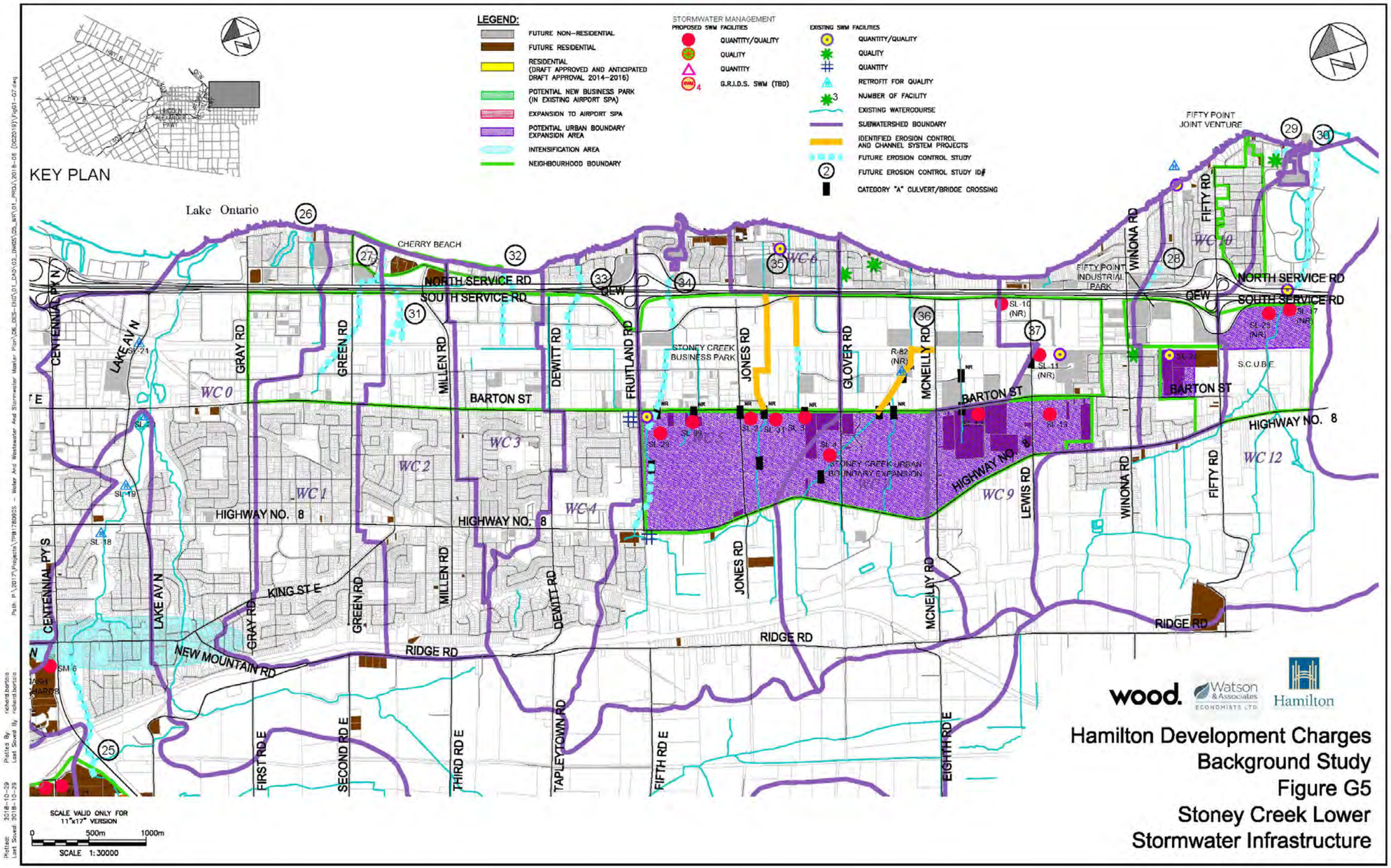
Figure G4
Hamilton Mountain
Stormwater Infrastructure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INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
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RETROFIT FOR QUALITY
NUMBER OF FACILITY
EXISTING WATERCOURSE
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FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
Lake Ontario
CHERRY BEACH
NORTH SERVICE RD
SOUTH SERVICE RD
FIFTY POINT JOINT VENTURE
FIFTY POINT INDUSTRIAL PARK
STONEY CREEK BUSINESS PARK
STONEY CREEK URBAN BOUNDARY EXPANSION
BARTON ST
HIGHWAY NO. 8
KING ST E
RIDGE RD
NEW MOUNTAIN RD
CENTENNIAL PKY S
LAKE AV N
GRAY RD
GREEN RD
MILLEN RD
DEWITT RD
FRUITLAND RD
JONES RD
GLOVER RD
MCNEILLY RD
WINONA RD
FIFTY RD
LEWIS RD
FIRST RD E
SECOND RD E
THIRD RD E
TAPLEYTOWN RD
FIFTH RD E
EIGHTH RD E
WC 0
WC 1
WC 2
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WC 6
WC 9
WC 10
WC 12
SCALE VALID ONLY FOR 11"x17" VERSION
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wood.
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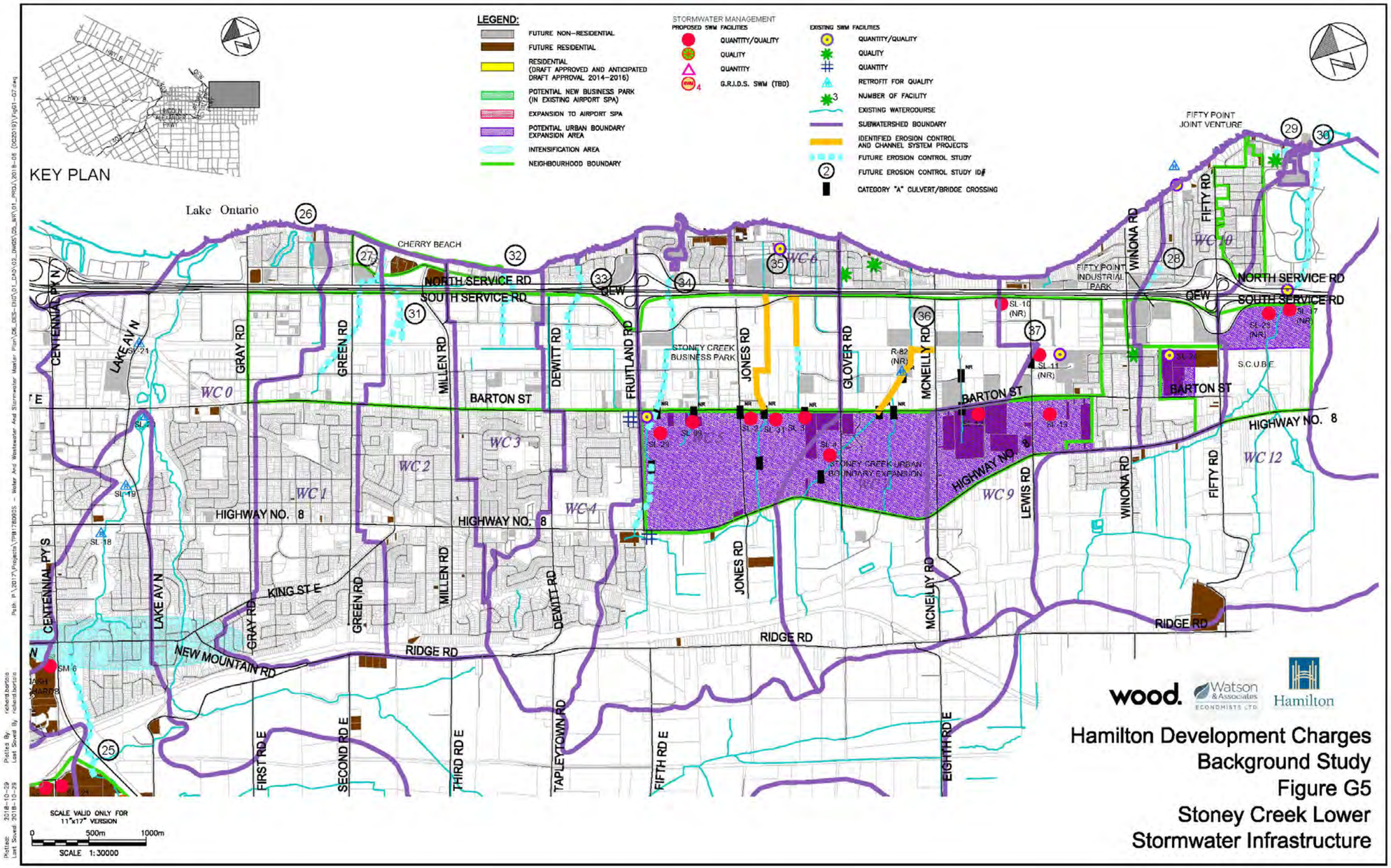
Background Study
Figure G5
Stoney Creek Lower
Stormwater Infrastructure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INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
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QUANTITY/QUALITY
QUALITY
QUANTITY
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EXISTING WATERCOURSE
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FUTURE EROSION CONTROL STUDY ID#
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KEY PLAN
Lake Ontario
CHERRY BEACH
NORTH SERVICE RD
SOUTH SERVICE RD
FIFTY POINT JOINT VENTURE
FIFTY POINT INDUSTRIAL PARK
STONEY CREEK BUSINESS PARK
STONEY CREEK URBAN BOUNDARY EXPANSION
S.C.U.B.E
BARTON ST
HIGHWAY NO. 8
KING ST E
RIDGE RD
NEW MOUNTAIN RD
CENTENNIAL PKY S
LAKE AV N
GRAY RD
GREEN RD
MILLEN RD
DEWITT RD
FRUITLAND RD
JONES RD
GLOVER RD
MCNEILLY RD
LEWIS RD
WINONA RD
FIFTY RD
FIRST RD E
SECOND RD E
THIRD RD E
TAPLEYTOWN RD
FIFTH RD E
EIGHTH RD E
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WC 10
WC 12
SCALE VALID ONLY FOR 11"x17" VERSION
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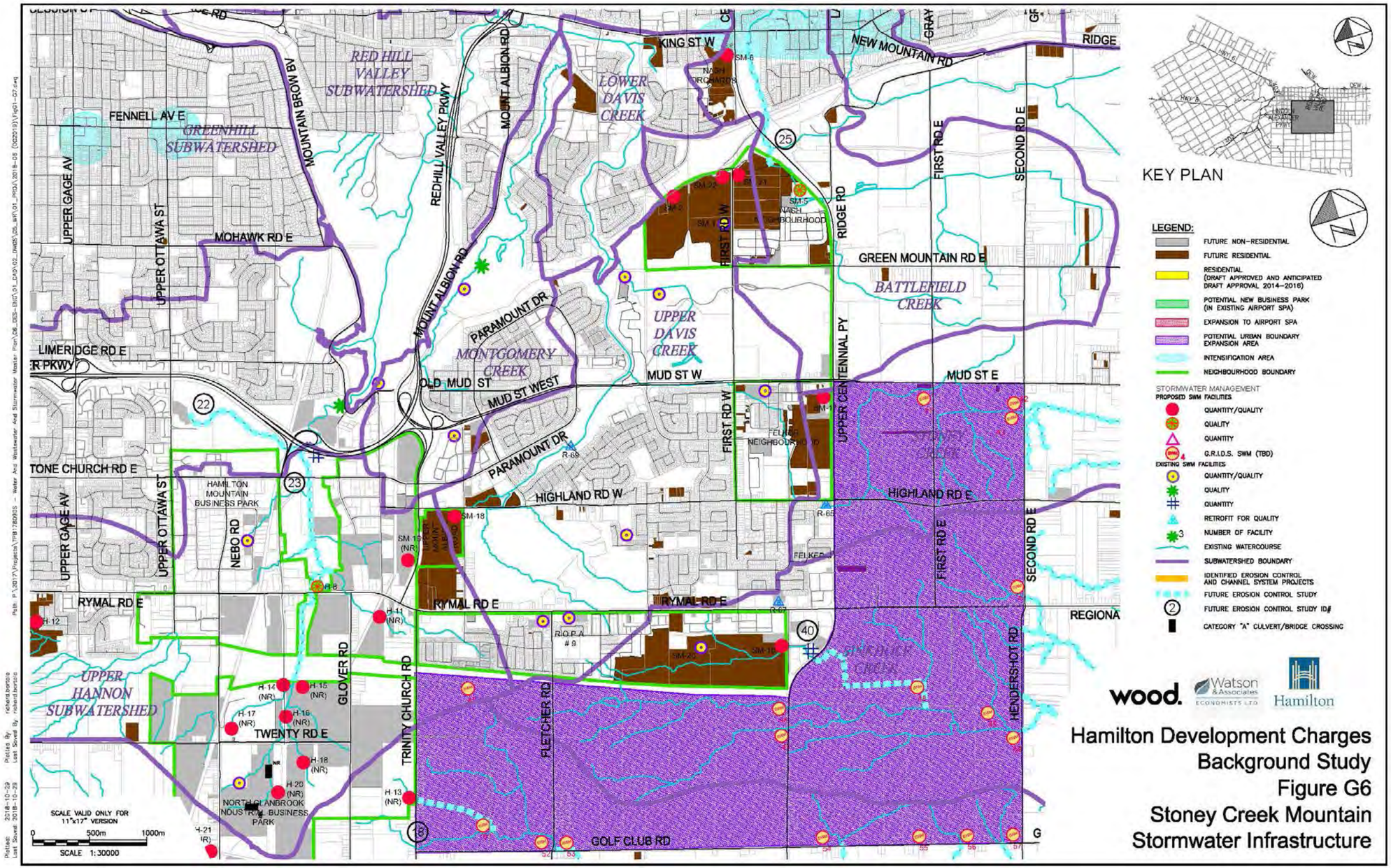
wood.
Watson & Associates ECONOMISTS LTD
Hamilton
Hamilton Development Charges
Background Study
Figure G5
Stoney Creek Lower
Stormwater Infrastructure


RED HILL VALLEY SUBWATERSHED
GREENHILL SUBWATERSHED
LOWER DAVIS CREEK
UPPER DAVIS CREEK
MONTGOMERY CREEK
BATTLEFIELD CREEK
UPPER HANNON SUBWATERSHED
FENNELL AV E
MOHAWK RD E
LIMERIDGE RD E
TONE CHURCH RD E
RYMAL RD E
TWENTY RD E
KING ST W
NEW MOUNTAIN RD
GREEN MOUNTAIN RD E
MUD ST W
MUD ST E
MUD ST WEST
OLD MUD ST
PARAMOUNT DR
HIGHLAND RD W
HIGHLAND RD E
REGIONAL
GOLF CLUB RD
MOUNTAIN BROW BV
REDHILL VALLEY PKWY
MOUNT ALBION RD
UPPER GAGE AV
UPPER OTTAWA ST
NEBO RD
GLOVER RD
TRINITY CHURCH RD
FLETCHER RD
RIDGE RD
FIRST RD W
FIRST RD E
SECOND RD E
HENDERSHOT RD
UPPER CENTENNIAL PY
HAMILTON MOUNTAIN BUSINESS PARK
NORTH GLANBROOK INDUSTRIAL BUSINESS PARK
SCALE VALID ONLY FOR 11"x17" VERSION
0 500m 1000m
SCALE 1:30000
KEY PLAN
LEGEND:
FUTURE NON-RESIDENTIAL
FUTURE RESIDENTIAL
RESIDENTIAL (DRAFT APPROVED AND ANTICIPATED DRAFT APPROVAL 2014-2016)
POTENTIAL NEW BUSINESS PARK (IN EXISTING AIRPORT SPA)
EXPANSION TO AIRPORT SPA
POTENTIAL URBAN BOUNDARY EXPANSION AREA
INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
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RETROFIT FOR QUALITY
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EXISTING WATERCOURSE
SUBWATERSHED BOUNDARY
IDENTIFIED EROSION CONTROL AND CHANNEL SYSTEM PROJECTS
FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
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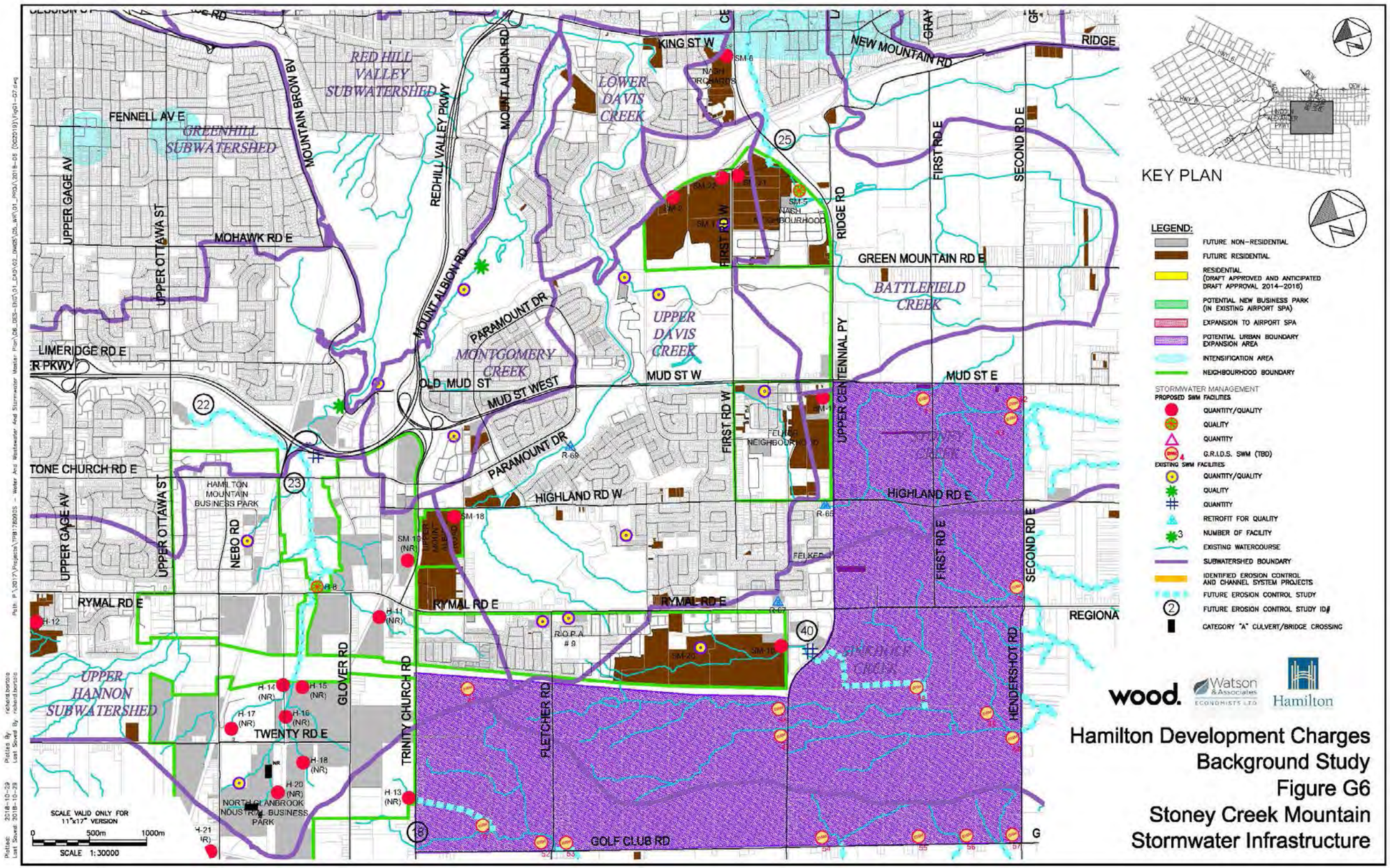
Hamilton Development Charges
Background Study
Figure G6
Stoney Creek Mountain
Stormwater Infrastructure


RED HILL VALLEY SUBWATERSHED
GREENHILL SUBWATERSHED
LOWER DAVIS CREEK
UPPER DAVIS CREEK
MONTGOMERY CREEK
BATTLEFIELD CREEK
UPPER HANNON SUBWATERSHED
FENNELL AV E
MOHAWK RD E
LIMERIDGE RD E
TONE CHURCH RD E
RYMAL RD E
TWENTY RD E
KING ST W
NEW MOUNTAIN RD
GREEN MOUNTAIN RD E
MUD ST W
MUD ST E
MUD ST WEST
OLD MUD ST
PARAMOUNT DR
HIGHLAND RD W
HIGHLAND RD E
REGIONAL
GOLF CLUB RD
MOUNTAIN BROW BV
REDHILL VALLEY PKWY
MOUNT ALBION RD
UPPER GAGE AV
UPPER OTTAWA ST
NEBO RD
GLOVER RD
TRINITY CHURCH RD
FLETCHER RD
RIDGE RD
FIRST RD W
FIRST RD E
SECOND RD E
HENDERSHOT RD
UPPER CENTENNIAL PY
HAMILTON MOUNTAIN BUSINESS PARK
NORTH GLANBROOK INDUSTRIAL BUSINESS PARK
SCALE VALID ONLY FOR 11"x17" VERSION
0 500m 1000m
SCALE 1:30000
KEY PLAN
LEGEND:
FUTURE NON-RESIDENTIAL
FUTURE RESIDENTIAL
RESIDENTIAL (DRAFT APPROVED AND ANTICIPATED DRAFT APPROVAL 2014-2016)
POTENTIAL NEW BUSINESS PARK (IN EXISTING AIRPORT SPA)
EXPANSION TO AIRPORT SPA
POTENTIAL URBAN BOUNDARY EXPANSION AREA
INTENSIFICATION AREA
NEIGHBOURHOOD BOUNDARY
STORMWATER MANAGEMENT
PROPOSED SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
G.R.I.D.S. SWM (TBD)
EXISTING SWM FACILITIES
QUANTITY/QUALITY
QUALITY
QUANTITY
RETROFIT FOR QUALITY
NUMBER OF FACILITY
EXISTING WATERCOURSE
SUBWATERSHED BOUNDARY
IDENTIFIED EROSION CONTROL AND CHANNEL SYSTEM PROJECTS
FUTURE EROSION CONTROL STUDY
FUTURE EROSION CONTROL STUDY ID#
CATEGORY "A" CULVERT/BRIDGE CROSSING
wood.
Watson & Associates ECONOMISTS LTD.
Hamilton
Hamilton Development Charges
Background Study
Figure G6
Stoney Creek Mountain
Stormwater Infrastructure

Appendix G-1

Cost Summary Sheets – Detailed By Category

APPENDIX G-1: CATEGORY A - OPEN WATERCOURSES: CHANNEL SYSTEM IMPROVEMENTS (IDENTIFIED PROJECTS) RESIDENTIAL

Category			Project Title	Study Year	Drainage Area (ha)	Purpose	SWMF/ Drainage Work							Estimated Total Cost (Rounded)($)	Growth Related %	Net Growth Related Cost ($)	Growth Related Post Period Cost ($)	Net Total Cost ($)	Remarks	Other Changes From 2014 Study
Primary Dev. Areas	Build Out (yr)	Secondary					Type of Work	Location of Work	Type	Description	Length (m)	2014 Estimated Capital Cost ($)	2019 Estimated Capital Cost ($)							
ANC	6+	A	Garner Road EA	2013			5 structures	Garner Rd Hwy 6 to Glancaster				1,250,000	1,405,000	1,410,000	100	1,410,000		1,410,000		Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1989		Erosion Control and Channel System Improvements	Lower culvert by 0.4 m - South Service Rd. under w/c #6					163,182	183,417	180,000	100	180,000		180,000	will be updated when WC5,6 ,studied	Inflation applied
SCL	11+	A	SCUBE - Barton Street	2013		road crossings at existing watercourses	7 structures (3@$400k, 4@$750k)	Fruitland to Fifty				4,200,000	4,720,800	4,720,000	100	4,720,000		4,720,000		Inflation applied
SCL	0-5	A	SCUBE Block 1	2017		road crossings at existing watercourses	1 structure	Fruitland to N/S Collector				750,000	843,000	843,000	100	843,000		843,000	location set with Block plan - study underway	Inflation applied
SCL	0-5		SCUBE Block 2	2017		road crossings at existing watercourses	2 structures	Jones to Glover				1,500,000	1,686,000	1,690,000	100	1,690,000		1,690,000	location set with Block plan - study underway	Inflation applied
SCM	11+	A	ELFRIDA Secondary Plan major roads xngs	2017		road crossings at existing watercourses	20 culverts (6 small, 6 med, 8 large)	ELFRIDA SP				4,215,000	4,737,660	4,740,000	100	4,740,000	3,160,000	1,580,000	2/3 Post-Period	Inflation applied
SCM	11+	A	ELFRIDA Secondary Plan upgrade ex Hwy 56 xngs	2017		ex road crossings at existing watercourses	3 culverts (1 med, 2 large)	ELFRIDA SP				843,000	947,532	950,000	100	950,000	633,333	316,667	2/3 Post-Period	Inflation applied
WAT	11+	A	East West Corridor - North Waterdown Drive	2012		road crossings at existing watercourses	6 culverts (med)	EW2,3,4,7,8,EW9					1,011,600	1,010,000	100	1,010,000		1,010,000	NEW	NEW
WAT	11+	A	East West Corridor - North Waterdown Drive	2012		road crossings at existing watercourses	1 structure	EW5					5,000,000	5,000,000	100	5,000,000		5,000,000	NEW	NEW
WAT	0-5	A	Parkside Drive EA	2013			2 culverts (med)	Parkside Dr Hwy 6 to Hollybush				337,200	379,013	380,000	100	380,000		380,000		Inflation applied
Total Residential												**13,258,382**	**20,914,022**	**20,923,000**	**100**	**20,923,000**	**3,793,333**	**17,129,667**		

ANC: Ancaster
BMH: Binbrook / Mount Hope
HAM: Hamilton Mountain
SCL: Stoney Creek - Lower
SCM: Stoney Creek - Mountain
WAT: Waterdown

APPENDIX G-1: CATEGORY A - OPEN WATERCOURSES: CHANNEL SYSTEM IMPROVEMENTS (IDENTIFIED PROJECTS) NON-RESIDENTIAL

Category			Project Title	Study Year	Drainage Area (ha)	Purpose	SWMF/ Drainage Work					2014 Estimated Capital Cost ($)	2019 Estimated Capital Cost ($)	Estimated Total Cost (Rounded)($)	Growth Related %	Net Growth Related Cost ($)	Growth Related Post Period Cost ($)	Net Total Cost ($)	Remarks	Other Changes From 2014 Study
Primary Dev. Areas	Build Out (yr)	Secondary					Type of Work	Location of Work	Type	Description	Length (m)									
ANC	0-5	A	Ancaster Industrial Park - Cormorant Midblock	2013			culvert	Trinity to Tradewind					400,000	400,000	50	200,000		200,000	City updated estimate ref. AJC study and tender	city updated estimate ref. AJC study and tender
ANC	0-5	A	Ancaster Industrial Park - Cormorant Midblock	2013			channel improvements	Trinity to Tradewind					400,000	400,000	50	200,000		200,000	city updated estimate ref. AJC study and tender	city updated estimate ref. AJC study and tender
BMH	11+	A	AEGD major roads crossings	2017		road crossings at existing watercourses	40 culverts (12 small, 12 med, 16 large)	AEGD				8,430,000	9,475,320	9,480,000	100	9,480,000		9,480,000	Ciity updated estimate	Inflation applied
HAM	11+	A	Red Hill Business Park - Dartnall Road	2017			2 culverts (small)	Twenty to Dickenson					400,000	400,000	100	400,000		400,000	Upper Hannon Creek MDP Oct 2017	NEW
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			Triple-Culvert replacement - QEW Corridor at w/c #5					1,405,493	1,579,774	1,580,000	100	1,580,000		1,580,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			New culvert - North Service Rd. at w/c #5					233,434	262,380	260,000	100	260,000		260,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Creek System Improvement W/C 7	2003			Lower culvert by 0.4 m - South Service Rd. under w/c #6					117,145	131,670	130,000	50	65,000		65,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			Culvert replacement - QEW Corridor on w/c #6.2					518,783	583,112	580,000	100	580,000		580,000		Inflation applied
SCL	11+	A	Water Course 5- Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990	582		channel improvements			Length of channel improvement work	1015	2,305,703	2,591,610	2,590,000	100	2,590,000		2,590,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			Lower culvert by 1.6 m - Arvin Ave. on w/c #5					62,477	70,224	70,000	20	14,000		14,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			Culvert replacement - CNR line on w/c #5					163,556	183,837	180,000	20	36,000		36,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Water Course 6 - Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990	67		channel improvements			Length of channel improvement work	1077	2,469,333	2,775,530	2,780,000	50	1,390,000		1,390,000	to be updated when WC 5/6 studies completed	Inflation applied
SCL	11+	A	Master Drainage Plan Area No. 5, 6, 7. City of Stoney Creek	1990			Lower culvert by 1.84 m - South Service Rd. under w/c #5					117,145	131,670	130,000	100	130,000		130,000		Inflation applied
SCL	0-5	A	SCUBE - Barton Street	2017			WC9 channel/enclosure	west property limit of school to 140 m east				700,000	786,800	790,000	50	395,000		395,000	new configuration	Inflation applied
SCL	11+	A	SCUBE - NSR	2013			culvert	Green easterly to City limits				750,000	843,000	843,000	100	843,000		843,000		Inflation applied
WAT	11+	A	Hwy 5/6 Interchange				2 or 3 culverts	Hwy 5/6 and ramp				1,200,000	1,348,800	1,350,000	25	337,500		337,500	per City agreement with MTO	Inflation applied
WAT	11+	A	Highway 6				culvert	Borer's Ck				1,000,000	1,124,000	1,124,000	100	1,124,000		1,124,000		Inflation applied
Total Non-Residential												**19,473,068**	**23,087,728**	**23,087,000**	**85**	**19,624,500**	**0**	**19,624,500**		
Grand Total												**32,731,450**	**44,001,750**	**44,010,000**	**92**	**40,547,500**	**3,793,333**	**36,754,167**		

ANC: Ancaster
BMH: Binbrook / Mount Hope
HAM: Hamilton Mountain
SCL: Stoney Creek - Lower
SCM: Stoney Creek - Mountain
WAT: Waterdown

APPENDIX G-1 CATEGORY B: OFF SITE EROSION WORKS NOT IDENTIFIED IN PREVIOUS STUDIES (RESIDENTIAL & NON RESIDENTIAL)

ID #	Primary Development Area	Res/Non-Res	Subwatershed	Watershed	Remarks	Watershed Area[1]	Existing Development Area (ha)		Future Development Area (ha)		Development Fraction	Fraction of Watercourse Assumed to Require Erosion Control[2]	Total Length of Downstream Watercourse to Assumed End-Point[3]	Length of Erosion Control Works	Cost[4]	Land Cost	Total Cost	New Development Fraction	Development Related Cost	Remarks	Other Changes from 2014 Study
						A	B	C	D	E	F = 100 X (B+C+D+E) / A	G	H	I = G X H	J	K	L=J+K	M = (D+E) / (B+C+D+E)	L X M		
							Res.	Non-Res.	Res.	Non-Res.											
						(ha)	(ha)	(ha)	(ha)	(ha)	(%)		(m)	(m)	($)	($)	($)		($)		
2	ANC	Non-Res	Big Creek (Outlet #1 & #2 Industrial Park)	Big Creek		271		11.6	5.32	136.83	56.73	0.15	4,988	748	$1,122,300	$697,738	$1,820,038	0.925	$1,682,721	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
3	ANC	Res	Big Creek (Spring Valley West and Shaver Neighbourhood)	Big Creek	South of Shaver Neighbourhood	43	35		5.5		94.19	0.20	600	120	$180,000	$111,907	$291,907	0.136	$39,642	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
4	ANC	Res	Big Creek (Spring Valley West and Shaver Neighbourhood)	Big Creek		100	70.92		21.48	0.29	92.69	0.20	1,500	300	$450,000	$279,767	$729,767	0.235	$171,399	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
5	BMH	Non-Res	Three Mile Creek	Twenty Mile Creek	Part of Airport Business Park and Airport	165		20		24.48	26.96	0.10	1,500	150	$225,000	$139,883	$364,883	0.550	$200,817	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
6	ANC	Res	Tiffany Creek	Coote's Paradise	Meadowlands, Garner, Ancaster. A portion of the w/c is lined in a SWMF	165	25		129.84	0.37	94.07	0.20	2,500	500	$750,000	$466,278	$1,216,278	0.839	$1,020,369	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
7	ANC	Res	Tiffany Creek	Coote's Paradise	Falkirk West and Bayview Glen Estates	110			11.5	1.76	12.05	0.05	450	23	$33,750	$20,982	$54,732	1.000	$54,732	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
8	ANC	Res	Sulphur Creek	Coote's Paradise		1794			15.98		0.89	0.05	500	25	$62,500	$46,628	$109,128	1.000	$109,128	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
9	BMH	Res	Binbrook Node B	Welland River	Binbrook Urban area of 200 ha Draining at Node 'B'	300	191.27		100.12	0.5	97.30	0.20	4,500	900	$1,350,000	$725,881	$2,075,881	0.345	$715,595	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
11	BMH	Res	Binbrook Node D	Welland River	Three tributaries B7-a,b,c	133			100.26		75.38	0.20	4,100	820	$1,230,000	$661,358	$1,891,358	1.000	$1,891,358	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
12	BMH	Res	Binbrook Node G	Twenty Mile Creek (Three Mile, Sinkhole Creek)	Jackson Heights etc	25	15		9.14		96.56	0.20	750	150	$225,000	$120,980	$345,980	0.379	$130,997	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
13	BMH	Res	Node of Welland River south of Mount Hope Urban Boundary SWMF # B-10	Welland River	Mount Hope & adjacent areas (including Airport Business Area)-two outlet	220	128.52	20	47.39	4.76	91.21	0.20	1,500	300	$450,000	$241,960	$691,960	0.260	$179,826	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
14	BMH	Non-Res	Node of Welland River north of Mount Hope Urban Boundary	Welland River		30				20	66.67	0.15	1,200	180	$270,000	$145,176	$415,176	1.000	$415,176	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
15	HAM	Res	Node Downstream of Glanbrook Hills	Twenty Mile Creek (Three Mile, Sinkhole Creek)	Garth Trail, North Glenbrook Industrial Park, Airport Industrial Business Park, part of Binbrook and others	40	20		16.47		91.18	0.20	900	180	$270,000	$145,176	$415,176	0.452	$187,495	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated

[1]To point immediately d/s of future development (start of off-site erosion assessment)

[2]-0.05 - Where Development Fraction is 0 - 25%
0.10 - Where Development Fraction is 26 - 49%
0.15 - Where Development Fraction is 50 - 74%
0.20 - Where Development Fraction is 75 - 100%

Coote's Paradise (Borer's Creek, Spencer Creek, Sulphur Creek, Ancaster Creek, Chedoke Creek, Others)
Hamilton Harbour (Red Hill Creek, Central Business Park)

[3]Location where d/s of this point no erosion is deemed to occur from subject development; total drainage area to this point estimated as a maximum of 2X the study watershed area (Column A). Note that the end point may also be set by Hamilton Harbour or La

[4]$2500/m for Watershed Area > 500 ha
$1500/m for Watershed Area < 500 ha

APPENDIX G-1 CATEGORY B: OFF SITE EROSION WORKS NOT IDENTIFIED IN PREVIOUS STUDIES (RESIDENTIAL & NON RESIDENTIAL)

ID #	Primary Development Area	Res/Non-Res	Subwatershed	Watershed	Remarks	Watershed Area[1]	Existing Development Area (ha)		Future Development Area (ha)		Development Fraction	Fraction of Watercourse Assumed to Require Erosion Control[2]	Total Length of Downstream Watercourse to Assumed End-Point[3]	Length of Erosion Control Works	Cost[4]	Land Cost	Total Cost	New Development Fraction	Development Related Cost	Remarks	Other Changes from 2014 Study
						A	B	C	D	E	F = 100 X (B+C+D+E) / A	G	H	I = G X H	J	K	L=J+K	M = (D+E) / (B+C+D+E)	L X M		
							Res.	Non-Res.	Res.	Non-Res.											
						(ha)	(ha)	(ha)	(ha)	(ha)	(%)		(m)	(m)	($)	($)	($)		($)		
16	BMH	Non-Res	Node Downstream of SWMF # R53	Twenty Mile Creek (Three Mile, Sinkhole Creek)		40				36.81	92.03	0.20	850	170	$255,000	$137,111	$392,111	1.000	$392,111	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
17	HAM	Non-Res	Node Downstream of SWMF #B 13	Twenty Mile Creek (Three Mile, Sinkhole Creek)		32				19.67	61.47	0.15	600	90	$135,000	$72,588	$207,588	1.000	$207,588	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
18	HAM	Non-Res	Node Downstream of SWMF # H 13	Twenty Mile Creek (Three Mile, Sinkhole Creek)		181				63.3	34.97	0.10	2,000	200	$300,000	$161,307	$461,307	1.000	$461,307	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
19	HAM	Non-Res	Node Downstream of SWMF # B 14	Twenty Mile Creek (Three Mile, Sinkhole Creek)		58				5.71	9.84	0.05	1,100	55	$82,500	$44,359	$126,859	1.000	$126,859	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
20	HAM	Non-Res	Node Downstream of SWMF # B 11 & B 12	Twenty Mile Creek (Three Mile, Sinkhole Creek)		700	282.29		26.2	48.63	51.02	0.15	3,000	450	$1,125,000	$725,881	$1,850,881	0.210	$387,829	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
21	BMH	Non-Res	Node Downstream of SWMF # B 15 & 16	Twenty Mile Creek (Three Mile, Sinkhole Creek)		179	100			54.41	86.26	0.20	1,400	280	$420,000	$225,830	$645,830	0.352	$227,573	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
22	HAM	Res	Upper Ottawa subwatershed	Hamilton Harbour	Erosion works downstream identified in previous studies	1356	766	308.9	136.28	0.86	89.38	0.20	1,100	220	$550,000	$354,875	$904,875	0.113	$102,385	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
23	HAM	Res	Hannon Creek subwatershed	Hamilton Harbour		1070	115.2	357.7	75.95	292.53	78.63	0.20	2,000	400	$1,000,000	$645,228	$1,645,228	0.438	$720,523	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
25	SCL	Res	Battlefield Creek	Lake Ontario (Battlefield Creek, SC, WC 0-12)	Nash	300			62.09	1.92	21.34	0.05	1,250	63	$93,750	$50,408	$144,158	1.000	$144,158	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
26	SCL	Res	Water Course 0	Lake Ontario (Battlefield Creek, SC, WC 0-12)	WC 0	321	112.9	149.7	1.12	2.98	83.08	0.20	50	10	$15,000	$8,065	$23,065	0.015	$355	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
27	SCL	Res	Water Course 1	Lake Ontario (Battlefield Creek, SC, WC 0-12)	WC 1	330	157.5	61	13.09	2.87	71.05	0.15	1,900	285	$427,500	$229,862	$657,362	0.068	$44,748	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
28	Water Course 10/12	Non-Res	Fifty Point Industrial Park	Lake Ontario (Battlefield Creek, SC, WC 0-12)	assumed Fruitland-Winona SP land use	20				16.56	82.80	0.20	600	120	$180,000	$96,784	$276,784	1.000	$276,784	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated

[1]To point immediately d/s of future development (start of off-site erosion assessment)

[2]-0.05 - Where Development Fraction is 0 - 25%
0.10 - Where Development Fraction is 26 - 49%
0.15 - Where Development Fraction is 50 - 74%
0.20 - Where Development Fraction is 75 - 100%

Coote's Paradise (Borer's Creek, Spencer Creek, Sulphur Creek, Ancaster Creek, Chedoke Creek, Others)
Hamilton Harbour (Red Hill Creek, Central Business Park)

[3]Location where d/s of this point no erosion is deemed to occur from subject development; total drainage area to this point estimated as a maximum of 2X the study watershed area (Column A). Note that the end point may also be set by Hamilton Harbour or La

[4]$2500/m for Watershed Area > 500 ha
$1500/m for Watershed Area < 500 ha

APPENDIX G-1 CATEGORY B: OFF SITE EROSION WORKS NOT IDENTIFIED IN PREVIOUS STUDIES (RESIDENTIAL & NON RESIDENTIAL)

ID #	Primary Development Area	Res/Non-Res	Subwatershed	Watershed	Remarks	Watershed Area[1]	Existing Development Area (ha)		Future Development Area (ha)		Development Fraction	Fraction of Watercourse Assumed to Require Erosion Control[2]	Total Length of Downstream Watercourse to Assumed End-Point[3]	Length of Erosion Control Works	Cost[4]	Land Cost	Total Cost	New Development Fraction	Development Related Cost	Remarks	Other Changes from 2014 Study
						A	B	C	D	E	F = 100 X (B+C+D+E) / A	G	H	I = G X H	J	K	L=J+K	M = (D+E) / (B+C+D+E)	L X M		
							Res.	Non-Res.	Res.	Non-Res.											
						(ha)	(ha)	(ha)	(ha)	(ha)	(%)		(m)	(m)	($)	($)	($)		($)		
29	SCL	Res	Fifty Point Joint Venture	Lake Ontario (Battlefield Creek, SC, WC 0-12)		45	32		1.17	0.19	74.13	0.20	300	60	$90,000	$48,392	$138,392	0.041	$5,642	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
30	SCL	Non-Res	Water Course 12	Lake Ontario (Battlefield Creek, SC, WC 0-12)	assumed Fruitland-Winona SP land use	642	75.8	14.1	0.89	24	17.88	0.05	1,350	68	$168,750	$108,882	$277,632	0.217	$60,199	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
31	SCL	Res	Water Course 2	Lake Ontario (Battlefield Creek, SC, WC 0-12)	WC 2	283	148	76.8	1.69	0.56	80.23	0.20	1,100	220	$330,000	$177,438	$507,438	0.010	$5,029	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
32	SCL	Res	Water Course 3	Lake Ontario (Battlefield Creek, SC, WC 0-12)	WC 3	190	74.4	73.3	4.44	2.44	81.36	0.20	900	180	$270,000	$145,176	$415,176	0.045	$18,479	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
33	SCL	Non-Res	Water Course 4	Lake Ontario (Battlefield Creek, SC, WC 0-12)	WC 4	376	133.9	60.9		14	55.53	0.15	800	120	$180,000	$96,784	$276,784	0.067	$18,558	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
34	SCL	Res	Water Course 5	Lake Ontario (Battlefield Creek, SC, WC 0-12)	w/c 5.1-1100m, w/c 5.0-2500; assumed FWSP land use	636	121.4	112.9	118.35	7.64	56.65	0.15	3,600	540	$1,350,000	$871,057	$2,221,057	0.350	$776,683	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
35	SCL	Res	Water Course 6	Lake Ontario (Battlefield Creek, SC, WC 0-12)	assumed Fruitland-Winona SP land use	100	19	18.1	50.39	11.65	99.14	0.20	1,300	260	$390,000	$209,699	$599,699	0.626	$375,281	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
36	SCL	Non-Res	Water Course 7	Lake Ontario (Battlefield Creek, SC, WC 0-12)	assumed Fruitland-Winona SP land use	421	77.2	28.2	25.28	36.2	39.64	0.10	1,000	100	$150,000	$80,653	$230,653	0.368	$84,975	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
37	SCL	Non-Res	Water Course 9	Lake Ontario (Battlefield Creek, SC, WC 0-12)	assumed Fruitland-Winona SP land use	579	148.76	51.2	86.41	16.98	52.39	0.15	800	120	$300,000	$193,568	$493,568	0.341	$168,222	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
40	SCM	Res	Sinkhole Creek	Twenty Mile Creek (Three Mile, Sinkhole Creek)	Felkirk South and ROPA #9 (Rymal Rd.)	140	63.1		100.13		116.59	0.20	1,200	240	$360,000	$193,568	$553,568	0.613	$339,575	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated

[1]To point immediately d/s of future development (start of off-site erosion assessment)

[2]-0.05 - Where Development Fraction is 0 - 25%
0.10 - Where Development Fraction is 26 - 49%
0.15 - Where Development Fraction is 50 - 74%
0.20 - Where Development Fraction is 75 - 100%

Coote's Paradise (Borer's Creek, Spencer Creek, Sulphur Creek, Ancaster Creek, Chedoke Creek, Others)
Hamilton Harbour (Red Hill Creek, Central Business Park)

[3]Location where d/s of this point no erosion is deemed to occur from subject development; total drainage area to this point estimated as a maximum of 2X the study watershed area (Column A). Note that the end point may also be set by Hamilton Harbour or La

[4]$2500/m for Watershed Area > 500 ha
$1500/m for Watershed Area < 500 ha

APPENDIX G-1 CATEGORY B: OFF SITE EROSION WORKS NOT IDENTIFIED IN PREVIOUS STUDIES (RESIDENTIAL & NON RESIDENTIAL)

ID #	Primary Development Area	Res/Non-Res	Subwatershed	Watershed	Remarks	Watershed Area[1]	Existing Development Area (ha)		Future Development Area (ha)		Development Fraction	Fraction of Watercourse Assumed to Require Erosion Control[2]	Total Length of Downstream Watercourse to Assumed End-Point[3]	Length of Erosion Control Works	Cost[4]	Land Cost	Total Cost	New Development Fraction	Development Related Cost	Remarks	Other Changes from 2014 Study
						A	B	C	D	E	F = 100 X (B+C+D+E) / A	G	H	I = G X H	J	K	L=J+K	M = (D+E) / (B+C+D+E)	L X M		
							Res.	Non-Res.	Res.	Non-Res.											
						(ha)	(ha)	(ha)	(ha)	(ha)	(%)		(m)	(m)	($)	($)	($)		($)		
42	WAT	Res	Falcon Creek	Grindstone Creek/ North Shore Watershed	OPA 28 South	48			48		100.00	0.20	1,200	240	$360,000	$223,813	$583,813	1.000	$583,813	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
43	WAT	Res	Grindstone Creek SWMF # W7	Grindstone Creek/ North Shore Watershed		45			45		100.00	0.20	900	180	$270,000	$167,860	$437,860	1.000	$437,860	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
44	WAT	Res	Grindstone Creek	Grindstone	OPA 28 South and Uncounty Estates	1011	254.8		108.81		35.97	0.10	2,000	200	$500,000	$373,022	$873,022	0.299	$261,251	new development fraction recalculated as fraction of	land values updated
45	WAT	Non-Res	Flamborough Industrial Park SWMF # W14	Grindstone Creek/ North Shore Watershed		45				15	33.33	0.10	900	90	$135,000	$83,930	$218,930	1.000	$218,930	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
46	WAT	Res	Indian Creek	Grindstone Creek/ North Shore Watershed	OPA 28 South	14			10.91		77.93	0.20	450	90	$135,000	$83,930	$218,930	1.000	$218,930	new development fraction recalculated as fraction of existing and future development, not drainage area	land values updated
48	OTH	Res	Central Business Subwatershed	Hamilton Harbour	Not in growth area	2400					0.00	0.00		0	$0	$0	$0	0.000	$0		
49	OTH	Res	Chedoke Creek	Hamilton Harbour	Not in growth area	2706					0.00	0.00		0	$0	$0	$0	0.000	$0		
50	OTH	Res	Green Hill subwatershed	Hamilton Harbour	Not in growth area	1225	1102.5				90.00	0.20	0	0	$0	$0	$0	0.000	$0		
51	OTH	Res	Logies Creek	Coote's Paradise	Not in growth area	1217					0.00	0.00		0	$0	$0	$0	0.000	$0		
52	OTH	Res	Lower Spencer Creek	Coote's Paradise	Not in growth area	277					0.00	0.00		0	$0	$0	$0	0.000	$0		
53	OTH	Res	Mid Spencer Creek	Coote's Paradise	Not in growth area	5513					0.00	0.00		0	$0	$0	$0	0.000	$0		
54	OTH	Res	Spring Creek	Coote's Paradise	Not in growth area	1305					0.00	0.00		0	$0	$0	$0	0.000	$0		
55	OTH	Res	Sydenham Creek	Coote's Paradise	Not in growth area	442					0.00	0.00		0	$0	$0	$0	0.000	$0		
			Grand Total			**27,643.0**	**4,270.5**	**1,364.4**	**1,379.2**	**863.9**	**28.50**		**58,638**	**9446**	**$16,191,050**	**$9,613,787**	**$25,804,837**	**52.18**	**$13,464,902**		

[1]To point immediately d/s of future development (start of off-site erosion assessment)

[2]-0.05 - Where Development Fraction is 0 - 25%
0.10 - Where Development Fraction is 26 - 49%
0.15 - Where Development Fraction is 50 - 74%
0.20 - Where Development Fraction is 75 - 100%

Coote's Paradise (Borer's Creek, Spencer Creek, Sulphur Creek, Ancaster Creek, Chedoke Creek, Others)
Hamilton Harbour (Red Hill Creek, Central Business Park)

[3]Location where d/s of this point no erosion is deemed to occur from subject development; total drainage area to this point estimated as a maximum of 2X the study watershed area (Column A). Note that the end point may also be set by Hamilton Harbour or La

[4]$2500/m for Watershed Area > 500 ha
$1500/m for Watershed Area < 500 ha

Total Residential	**$17,745,811**	**48.10**	**$8,535,252**
Total Non-Residential	**$8,059,025**	**61.17**	**$4,929,650**

APPENDIX G-1: CATEGORY C - STORMWATER MANAGEMENT (QUALITY AND OR QUANTITY) FACILITIES RESIDENTIAL

Category			SWMF #	Project Title	Year	Drainage Area (ha)	Purpose	SWMF/ Drainage Work										Growth Related %	Net GrowthTotal Associated Cost ($)	Existing Benefit	Direct Developer Contribution ($)	Non-Res Area Fraction Cost ($)	Net Total Associated Cost ($)	Remarks	Other Changes From 2014 Study
Primary Dev. Areas	Build Out (yr)	Secondary						Type of Work	Location of Work	Type	Description	Total Volume (m3)	Estimated Footprint 4% (ha)	Estimated Footprint 6% (ha)	Study/Draft Plan Footprint (ha)	Footprint (ha)	Land Cost	Estimated Capital Cost ($)	Estimated Total Cost Including Land							
ANC	11+	C	7	Garner Neighbourhood Master Drainage Plan. Ancaster	July. 1996 Rev. Nov. 2003	10.4	MDP addressing drainage related issues for existing and future development	Proposed Quality Facility #1: Extended detention wetland	Between proposed Highway 6 (new) interchange corridor and the existing development	Quality	Storage Capacity =	910	0.42			0.42	775,886	72,800	848,686	100	848,686	-	-	-	848,686		land values updated
ANC	0-5	C	14	Meadowlands Phase IV		6			Springbrook at Garner	Quality / Quantity	Storage Capacity =	2,110		0.36	0.60	0.60	1,119,066	168,797	1,287,863	100	1,287,863	-	-	-	1,287,863	Increase land to 10% due to known grade constraint	land values updated
ANC	11+	C	22	Woodland Manor Preliminary SWM Report	Jul-08	15.3	SWM Plan for proposed urban development	SWMF	Sulpher Springs Road and Mansfield Drive	Quality / Quantity	Storage Volume =	13,289		0.92		0.92	1,712,172	791,576	2,503,748	100	2,503,748	-	-	-	2,503,748		land values updated
ANC	11+	C	24	Miller's pond expansion		5		SWMF	Shaver Road and Garner Road	Quality		3,600	0.20			0.20	373,022	288,000	661,022	100	661,022	-	-	-	661,022		land values updated
ANC	11+	C	25	Golf Stream Manor		36				Quality / Quantity		25,920	1.44			1.44	2,685,760	1,296,800	3,982,560	100	3,982,560	-	-	-	3,982,560		land values updated
ANC	11+	R	3	N/A	N/A	31.34	Flood Control	Future Retrofit	Galley Crt & Speers Rd	Quality						0.00	-	443,100	443,100	30	132,930	310,170	-	-	132,930		
ANC	11+	R	22	N/A	N/A	2.19	Flood Control	Future Retrofit	Harrington Place and Lover's Lane	Quality						0.00	-	422,000	422,000	50	211,000	211,000	-	-	211,000		
ANC	11+	R	70	Drainage Report - The Meadowlands	N/A	296.9		Future Retrofit	Hwy 403 and Golf Links Rd	Quality						0.00	-	4,135,600	4,135,600	40	1,654,240	2,481,360	-	-	1,654,240		
ANC	11+	R	71	Drainage Report - The Meadowlands	N/A	42.51		Future Retrofit	Golf Links Rd and Meadowlands Blvd	Quality						0.00	-	601,350	601,350	40	240,540	360,810	-	-	240,540		
ANC	11+	R	72	Drainage Report - The Meadowlands	N/A	18.03		Future Retrofit	Golf Links Rd. and Meadowlands Blvd.	Quality						0.00	-	422,000	422,000	40	168,800	253,200	-	-	168,800		
BMH	11+	C	24	Ceterini	2013	15		SWMF	Binbrook Rd west of Woodland	Quality / Quantity	Storage Capacity =	9,400		0.90		0.90	1,451,762	635,996	2,087,758	100	2,087,758	-	-	-	2,087,758		land values updated
BMH	0-5	C	10	Mountaingate Functional Servicing Report	Oct. 2007	100.66	SWM Plan for proposed urban development	SWMF	South west of new Hwy - 6	Quality / Quantity	Storage Volume =	34,698		6.04	5.15	5.15	8,307,304	1,647,904	9,955,208	100	9,955,208	-	-	-	9,955,208		land values updated
BMH	11+	C	21	Master Drainage Plan Update Report : Binbrook Settlement Area	Oct. 2006	31	additional facility adjacent to the watercourse	SWMF		Quality / Quantity	Storage Capacity =	19,376		1.86		1.86	3,000,308	1,035,058	4,035,366	100	4,035,366	-	-	-	4,035,366		land values updated
BMH	11+	C	20	Binbrook Settlement Area	2013	22.72	MacNeilly facilty	SWMF	Area draining to the south west near Fletcher Road	Quality / Quantity	Storage Capacity =	19,201		1.36	1.80	1.80	2,903,524	1,028,029	3,931,552	100	3,931,552	-	-	-	3,931,552		land values updated
HAM	11+	C	12	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Nov. 2008	10		SWMF	Upper Gage/Terni in tandem with HAM29	Quality / Quantity	Storage volume =	8,817		0.40		0.40	645,228	1,252,664	1,897,892	100	1,897,892	-	-	-	1,897,892	per City comments; estimated 8,000 m3 in rock	land values updated
HAM	0-5	C	24	Mewburn and Sheldon Neighbourhoods Master Servicing Plan	2011	15.9	SWM Plan for proposed urban development	SWMF	West 5thand Stonechurch Road	Quality / Quantity	Storage Capacity =	12,650		0.95	1.25	1.25	2,016,336	1,246,000	3,262,336	100	3,262,336	-	-	-	3,262,336	New pond to help H-9; estimated 6000 m3 rock	land values updated
HAM	11+	C	28	305 Stone Church Road West	2011	33.29	SWM Plan for proposed urban development	SWMF	NE limit of development	Quality / Quantity	Storage volume =	20,382		2.00		2.00	3,221,944	1,955,266.46	5,177,210	100	5,177,210	-	-	-	5,177,210	estimated 11,000 m3 rock	land values updated
HAM	11+	C	29	Miles	2011	42	SWM Plan for proposed urban development	SWMF	NE limit of development	Quality / Quantity	Storage volume =	37,000		2.52		2.52	4,064,933	3,420,000	7,484,933	100	7,484,933	-	-	-	7,484,933	per City comments; estimated 21,000 m3 in rock	land values updated
HAM	11+	C	30	St Elizabeth expansion	2013	50	SWM facility expansion	SWMF	expand for new development	Quality / Quantity	Storage volume =	38,000				0.00	-	1,780,000	1,780,000	100	1,780,000	-	-	-	1,780,000		
HAM	0-5	C	31	Upper Wellington and Stonechurch		14		SWMF	SW corner of Upper Wellington and Stonechurch Rd	Quantity / Quality	Extended Detention Pond	11,263		0.84	1.40	1.40	2,258,296	1,270,529.60	3,528,826	100	3,528,826	-	-	-	3,528,826	Increase land to 10% due to known grade constraint; estimated 7000 m3 in rock	land values updated
HAM	11+	R	55	Villages of Glancaster	Jul. 1990	77.63	Flood Control	Future Retrofit	Twenty Rd and Garth St	Quality		-	3.11			3.11	5,008,901	1,086,650	6,095,551	80	4,876,441	1,219,110	-	-	4,876,441		land values updated
SCL	0-5	C	2	SCUBE Subwatershed Study (Phase 3)	May-13	26.4	Stormwater management strategy	SWMF	WC6 south of Barton SCUBE West	Quantity / Quality	wet pond #3	13,216		1.58	2.64	2.64	4,258,502	788,640	5,047,142	100	5,047,142	-	-	-	5,047,142	Increase land to 10% due to known grade constraint	land values updated
SCL	0-5	C	3	SCUBE Subwatershed Study (Phase 3 - Block2)	Sep-18	16.4	Stormwater management strategy	SWMF	WC6.1 south of Barton SCUBE West	Quantity / Quality	wet pond for 6.0	10,331		0.98	1.64	1.64	2,645,433	673,240	3,318,673	100	3,318,673	-	-	-	3,318,673	Increase land to 10% due to known grade constraint	land values updated
SCL	0-5	C	31	SCUBE Subwatershed Study (Phase 3 - Block 2)	Sep-18	27.6	Stormwater management strategy	SWMF	WC6.1 south of Barton SCUBE West	Quantity / Quality	wet pond for 6.1	18,115		1.66	2.76	2.76	4,452,070	984,600	5,436,670	100	5,436,670	-	-	-	5,436,670	Increase land to 10% due to known grade constraint	land values updated
SCL	0-5	C	12	SCUBE Subwatershed Study (Phase 3)	May-13	54	Stormwater management strategy	SWMF	SCUBE Central	Quantity / Quality	wet pond #9-2	34,060		3.24	5.40	5.40	8,710,572	1,622,400	10,332,972	100	10,332,972	-	-	-	10,332,972	Increase land to 10% due to known grade constraint	land values updated
SCL	0-5	C	13	SCUBE Subwatershed Study (Phase 3)	May-13	23.1	Stormwater management strategy	SWMF	SCUBE Central	Quantity / Quality	wet pond #9-3	14,592		1.39	2.31	2.31	3,726,189	843,680	4,569,869	100	4,569,869	-	-	-	4,569,869	Increase land to 10% due to known grade constraint	land values updated

ANC: Ancaster
BMH: Binbrook / Mount Hope
HAM: Hamilton Mountain
SCL: Stoney Creek - Lower
SCM: Stoney Creek - Mountain
WAT: Waterdown

APPENDIX G-1: CATEGORY C - STORMWATER MANAGEMENT (QUALITY AND OR QUANTITY) FACILITIES RESIDENTIAL

Category			SWMF #	Project Title	Year	Drainage Area (ha)	Purpose	SWMF/ Drainage Work										Growth Related %	Net GrowthTotal Associated Cost ($)	Existing Benefit	Direct Developer Contribution ($)	Non-Res Area Fraction Cost ($)	Net Total Associated Cost ($)	Remarks	Other Changes From 2014 Study
Primary Dev. Areas	Build Out (yr)	Secondary						Type of Work	Location of Work	Type	Description	Total Volume (m3)	Estimated Footprint 4% (ha)	Estimated Footprint 6% (ha)	Study/Draft Plan Footprint (ha)	Footprint (ha)	Land Cost	Estimated Capital Cost ($)	Estimated Total Cost Including Land							
SCL	0-5	C	29	SCUBE Subwatershed Study (Phase 3)	May-13	39.8	Stormwater management strategy	SWMF	WC5 south of Barton SCUBE West	Quantity / Quality	wet pond #1	19,417		2.39	3.98	3.98	6,420,014	1,036,680	7,456,694	100	7,456,694	-	-	-	7,456,694	Increase land to 10% due to known grade constraint	land values updated
SCL	0-5	C	30	SCUBE Subwatershed Study (Phase 3)	May-13	24.5	Stormwater management strategy	SWMF	WC5.2 south of Barton SCUBE West	Quantity / Quality	wet pond #2	12,773		1.47	2.45	2.45	3,952,019	770,920	4,722,939	100	4,722,939	-	-	-	4,722,939	Increase land to 10% due to known grade constraint	land values updated
SCL	11+	R	16	Lake Vista			Stormwater quality and associated resource management	Storm outfall retrofit	Lake Vista	Quality	OGS					0.00	-	50,000	50,000	100	50,000	-	-	-	50,000		
SCL	11+	R	18	Stormwater Quality Management Strategy Stoney Creek Master Plan	2004	27.2	Stormwater quality and associated resource management	Storm outfall retrofit	BFC. Little League Park, Queenston Rd.	Quality	Wetland	2,413				0.00	-	193,040	193,040	100	193,040	-	-	-	193,040		
SCL	11+	R	19	Stormwater Quality Management Strategy Stoney Creek Master Plan	2004	33	Stormwater quality and associated resource management	Storm outfall retrofit	BFC, Lake Ave. Park, Huckleberry Dr.	Quality	Wetland	2,582				0.00	-	206,560	206,560	100	206,560	-	-	-	206,560		
SCL	11+	R	20	Stormwater Quality Management Strategy Stoney Creek Master Plan	2004	77	Stormwater quality and associated resource management	Storm outfall retrofit	North of Barton St.	Quality	Wetland	6,724				0.00	-	528,960	528,960	100	528,960	-	-	-	528,960		
SCL	11+	R	21	Stormwater Quality Management Strategy Stoney Creek Master Plan	2004	20.5	Stormwater quality and associated resource management	Storm outfall retrofit	Lake Avenue, Warrington St.	Quality	Wetland	1,923				0.00	-	153,840	153,840	100	153,840	-	-	-	153,840		
SCM	0-5	C	10	Summit Park - ROPA 9		83.9	MDP addressing drainage related issues for future development	Proposed wetland/wetpond #3	West side of Swayze Road	Quantity / Quality		52,577				0.00	-		3,320,000	100	3,320,000	-	-	-	3,320,000	per development schedules May 2018	
SCM	0-5	C	18	Future Planned Residential Development		42	easterly portion	SWMF		Quality / Quantity		29,890				0.00	-		3,630,000	100	3,630,000	-	-	-	3,630,000	per development schedules May 2019	
SCM	11+	C	21	Davis Ck SWS - Nash Nhd		24.5		SWMF	North limit of First Road W. at east side	Quantity / Quality	Extended Detention Pond	17,615		1.47		1.47	2,371,211	2,373,800	4,745,011	100	4,745,011	-	-	-	4,745,011	per City comments; estimated 17,615 m3 in rock	land values updated
SCM	0-5	C	22	Davis Ck SWS - Nash Nhd		15		SWMF	North limit of First Road W. at west side	Quantity / Quality	Extended Detention Pond	11,425		0.90		0.90	1,451,762	1,516,996	2,968,758	100	2,968,758	-	-	-	2,968,758	per City comments; estimated 10,000 m3 in rock	land values updated
SCM	11+	C	2	Davis Ck SWS - Nash Nhd		22.85		Wet pond	Northwest portion, east of historical lands	Quantity / Quality	Extended Detention Pond	22,394			1.66	1.66	2,677,694	1,795,757	4,473,451	100	4,473,451	-	-	-	4,473,451	per City comments June 17, 2011; estimated 8,000 m3 in rock	land values updated
SCM	11+	C	6	Montgomery Creek Nash Orchards		22.49				Quality		17,436	0.90		1.35	1.35	2,177,643	957,429	3,135,072	100	3,135,072	-	-	-	3,135,072		land values updated
SCM	0-5	C	17	Pleasant Estates + Fisher Community Functional SWM	Nov. 2008	30	Functional Service Plan for proposed urban development	SWMF	SW corner Mud St. and Upper Centennial PKWY.	Quality / Quantity	Storage volume =	20,300		1.80	1.87	1.87	3,016,439	1,071,992	4,088,431	100	4,088,431	-	-	1,022,108	3,066,323		land values updated
SCM	11+	R	65	N/A	N/A	15.2		Future Retrofit	Hwy 20 and Highland Rd	Quality						0.00	-	422,000	422,000	30	126,600	295,400	-	-	126,600		
SCM	11+	R	67	Deerfield Estate Phase 1	Apr. 1991	19.8		Future Retrofit	Rymal Rd E and Whitedeer Rd.	Quality						0.00	-	422,000	422,000	50	211,000	211,000	-	-	211,000		
SCM	11+	R	69	Heritage Green Valley Park Stage II	Sept. 1990	83.9		Future Retrofit	Winter Drive and Paramount Drive	Quality						0.00	-	1,160,500	1,160,500	50	580,250	580,250	-	-	580,250		
WAT	0-5	C	1	Mtview Heights/Waterdown Bay Phase 2	Jul-13	12.43	To guide future development and management of the South Waterdown lands	SWMF	Grindstone Creek - East Tributary 58 (Northwest)	Quantity / Quality	Storage Capacity =	13,509				0.00	-		3,400,000	100	3,400,000	-	-	-	3,400,000	cost estimate including land, from developer, 2018	
WAT	0-5	C	3	Mtview Heights/Waterdown Bay Phase 2	Jul-13	8.89	To guide future development and management of the South Waterdown lands	SWMF	Grindstone Creek - East Tributary (north west) 5D	Quantity / Quality	Storage Capacity =	10,037				0.00	-		4,000,000	100	4,000,000	-	-	-	4,000,000	cost estimate including land, from developer, 2018	
WAT	0-5	C	4	Mtview Heights	Jul-13	41.06	To guide future development and management of the South Waterdown lands	SWMF	Grindstone Creek - South west Tributary 2	Quantity / Quality	Storage Capacity =	53,288		2.46	2.98	2.60	4,849,288	3,591,510	8,440,798	100	8,440,798	-	-	-	8,440,798	footprint per draft plan; estimated 15,000 m3 rock	land values updated
WAT	11+	C	5	Mtview Heights	Jul-13	12.71	To guide future development and management of the South Waterdown lands	SWMF	East side of Waterdown Bay property	Quantity / Quality	Storage Capacity =	28,055		0.76	1.56	1.56	2,909,573	1,782,187.94	4,691,761	100	4,691,761	-	-	-	4,691,761	footprint per draft plan; estimated 5,000 m3 rock	land values updated
WAT	11+	C	6	Mtview Heights	Jul-13	5.66	To guide future development and management of the South Waterdown lands	SWMF	Salem Property	Quantity / Quality	Storage Capacity =	16,754		0.34		0.34	633,392	930,160	1,563,551	100	1,563,551	-	-	-	1,563,551		land values updated
WAT	0-5	C	19	Waterdown North Master Drainage Plan	Feb. 2007	9.7	Assess proposed expansion for the urban settlement area of Waterdown	SWMF for quality and erosion control	Along Borer's Creek, NW of Centre Road and Parkside Road intersection	Quality/Erosion	Storage Capacity =	5,918			1.75	1.75	756,744	473,448	1,230,192	100	1,230,192	-	-	-	1,230,192	footprint estimated June 1, 2011 by Metropolitain/City agreed hazard land impacts price $175,000 acre	land values updated
U	11+	C	U1	Unidentified			provisional item for unidentified SWM works		open	Quantity / Quality							-	5,000,000	5,000,000	100	5,000,000	-	-	-	5,000,000		
U	11+	C	U2		Infills		to include provision for LID infrastructure cost recovery		open	Quality							-	1,500,000	1,500,000	100	1,500,000	-	-	-	1,500,000		
U	11+	C	U3	Frontage Costs			estimate of road frontage costs for 38 residential SWM facilities (Retrofits and Unidentified facilities excluded)		open	Quantity / Quality	120m * $1500/m per facility						-	6,840,000	6,840,000	100	6,840,000	-	-	-	6,840,000		
U	11+	C	U4	Land Footprint Contingency			estimate that 10 facilities will exceed the estimated land footprint by 20%		open	Quantity / Quality							3,500,000		3,500,000	100	3,500,000	-	-	-	3,500,000		
U	11+	C	U5	Facility Unidentified Volume Contingency			estimate that 1/10 facilities will exceed the estimated volume by 10%		open	Quantity / Quality								3,150,000	3,150,000	100	3,150,000	-	-	-	3,150,000		
U	11+	C	U6	Facility Unidentified Rock Volume Contingency			estimate that two (2) facilities will encounter unanticipated 9000 m3 rock		open	Quantity / Quality								1,440,000	1,440,000	100	1,440,000	-	-	-	1,440,000	per development engineering	
U	11+	C	U7	Unidentified - Within Combined Sewershed			under study - estimate 3 projects will result in SWM facilities @ $2M each		combined sewershed	Quantity / Quality								6,000,000	6,000,000	100	6,000,000	-	-	-	6,000,000	per development engineering	
Total Residential												**691,959**					**98,052,984**	**73,280,460**	**185,683,445**	**96.81**	**179,761,145**	**5,922,300**	**0**	**1,022,108**	**178,739,037**		

APPENDIX G-1: CATEGORY C - STORMWATER MANAGEMENT (QUALITY AND OR QUANTITY FACILITIES) NON-RESIDENTIAL - NOTE: FOR INFORMATION ONLY - NON-RES FACILITIES NOT INCLUDED IN DC CHARGE

Category								SWMF/ Drainage Work																		
Primary Dev. Areas	Build Out (yr)	Secondary	SWMF #	Project Title	Year	Drainage Area (ha)	Purpose	Type of Work	Location of Work	Type	Description	Total Volume (m3)	Estimated Footprint 4% (ha)	Estimated Footprint 6% (ha)	Study/Draft Plan Footprint (ha)	Footprint (ha)	Land Cost ($)	Estimated Capital Cost ($)	Estimated Total Cost Including Land	Growth Related %	Net GrowthTotal Associated Cost ($)	Existing Benefit	Direct Developer Contribution ($)	Residential Area Fraction Cost ($)	Net Total Associated Cost ($)	Remarks	Remarks
ANC	11+	C	11	Ancaster Industrial Park, Stormwater Detention Facilities Area No. 1,3 and 4	July. 1990	8.2			Detention Pond #A	Quantity		2,187	0.33			0.33	611,756	174,929	786,685	0	-	-	786,685	-	-		
ANC	11+	C	23	Trustwood Industrial Park east facility	Dec-07	30	Functional Servicing Report industrial	SWMF	west of Shaver	Quality / Quantity	final drainage area to be determined	21,600		1.80	3.00	3.00	5,595,332	1,124,000	6,719,332	0	-	-	6,719,332	-	-	Increase land to 10% due to known grade constraint	Increase land to 10% due to known grade constraint
ANC	11+	C	27	Trustwood Industrial Park west facility		19	Functional Servicing Report industrial	SWMF	west of Shaver	Quality / Quantity	final drainage area to be determined	5,185		1.14		1.14	2,126,226	414,763	2,540,990	0	-	-	2,540,990	-	-		
BMH	11+	C	9	Future Planned Non-Residential Development		25		SWMF		Quality / Quantity	Storage Capacity =	6,667		1.50		1.50	2,419,603	526,660	2,946,263	0	-	-	2,946,263	-	-		
BMH	11+	C	11	Future Planned Non-Residential Development		36		SWMF		Quality / Quantity	Storage Capacity =	9,600		2.16		2.16	3,484,229	643,990	4,128,219	0	-	-	4,128,219	-	-		
BMH	11+	C	12	Future Planned Non-Residential Development		20		SWMF		Quality / Quantity	Storage Capacity =	5,333		1.20		1.20	1,935,683	426,656	2,362,339	0	-	-	2,362,339	-	-		
BMH	11+	C	13	Future Planned Non-Residential Development		26		SWMF		Quality / Quantity	Storage Capacity =	6,933		1.56		1.56	2,516,387	537,326	3,053,714	0	-	-	3,053,714	-	-		
BMH	11+	C	15	Future Planned Non-Residential Development		40		dry pond		Quantity	Storage Capacity =	10,666	1.60			1.60	2,580,910	686,656	3,267,566	0	-	-	3,267,566	-	-		
BMH	11+	C	16	Future Planned Non-Residential Development		15		dry pond		Quantity	Storage Capacity =	4,000	0.60			0.60	967,841	319,992	1,287,833	0	-	-	1,287,833	-	-		
BMH	11+	R	53	Greater Hamilton Airport Business Park	Oct. 1991	11.65	Quality control facility		Hwy 6 & Dickenson Rd W	Quality						0.00	-	422,000	422,000	0	-	-	422,000	-	-		
HAM	11+	C	11	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	108.7	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC3	Quality / Quantity	Flood Control Volume =	59,291		6.52	4.10	4.10	6,613,582	2,631,658	9,245,240	0	-	-	9,245,240	651,896	(651,896)		
HAM	11+	C	13	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	36	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	TM3	Quality / Quantity	Flood Control Volume =	19,357		2.16	1.85	1.85	2,984,177	1,034,270	4,018,448	0	-	-	4,018,448	-	-		
HAM	11+	C	14	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	46.3	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC6	Quality / Quantity	Flood Control Volume =	23,889		2.78	2.09	2.09	3,371,314	1,215,554	4,586,868	0	-	-	4,586,868	-	-		
HAM	11+	C	15	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	71.3	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC7	Quality / Quantity	Flood Control Volume =	40,430		4.28	3.11	3.11	5,016,644	1,877,214	6,893,858	0	-	-	6,893,858	-	-		
HAM	11+	C	16	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	21.6	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC8	Quality / Quantity	Flood Control Volume =	18,647		1.30	2.00	2.00	3,226,138	1,005,874	4,232,012	0	-	-	4,232,012	-	-		
HAM	11+	C	17	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	14.1	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC9	Quality / Quantity	Flood Control Volume =	12,503		0.85	1.54	1.54	2,484,126	760,136	3,244,262	0	-	-	3,244,262	-	-		
HAM	11+	C	18	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	19.2	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC12	Quality / Quantity	Flood Control Volume =	12,775		1.15	1.60	1.60	2,580,910	770,995	3,351,905	0	-	-	3,351,905	-	-		
HAM	11+	C	20	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	40.7	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	HC14	Quality / Quantity	Flood Control Volume =	30,739		2.44	2.72	2.72	4,387,547	1,489,542	5,877,090	0	-	-	5,877,090	-	-		
HAM	11+	C	21	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	16.6	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	TM1a	Quality / Quantity	Flood Control Volume =	7,586		1.00	0.75	0.75	1,209,802	563,422	1,773,224	0	-	-	1,773,224	-	-		
HAM	11+	C	22	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	16.6	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	TM1b	Quality / Quantity	Flood Control Volume =	7,586		1.00	0.75	0.75	1,209,802	563,422	1,773,224	0	-	-	1,773,224	-	-		
HAM	11+	C	23	Hannon Creek SWS – North Glanbrook Industrial Business Park MDP	Mar-09	35.5	Develop a Master Drainage Plan for the Hannon Creek Subwatershed	SWMF	TM2	Quality / Quantity	Flood Control Volume =	18,508		2.13	1.78	1.78	2,871,262	1,000,317	3,871,580	0	-	-	3,871,580	-	-		
SCL	11+	C	10	Stormwater Quality Management Strategy. City of Stoney Creek - Master Plan	2004	63	Stormwater quality and associated resource management	Proposed SWMFQuality	Area F/G: S.W of Lewis & S. service Rd.	Quality / Quantity	Wetland	17,897		3.78		3.78	6,097,400	975,863	7,073,263	0	-	-	7,073,263	-	-		
SCL	11+	C	17	SCUBE Subwatershed Study (Phase 3)	May-13	11.8	Stormwater management strategy	SWMF	Fifty Creek east SCUBE East	Quantity / Quality	wet pond #12-1	8,969		0.71		0.71	1,142,053	618,760	1,760,813	0	-	-	1,760,813	-	-		
SCL	0-5	C	23	SCUBE Subwatershed Study (Phase 3)	May-13	14.5	Stormwater management strategy	SWMF	Fifty Creek west SCUBE East	Quantity / Quality	wet pond #12-2	11,013		0.87		0.87	1,403,370	700,520	2,103,890	0	-	-	2,103,890	-	-		
SCL	11+	R	82	Glover Industrial Park Phase 2B	Jan. 1989	2.05	Flood Control	Future Retrofit	Arvin Av / Glover Rd	Quality						0.00	-	422,000	422,000	0	-	-	337,600	84,400	-		
SCM	0-5	C	19	Future Planned Industrial Development		14	westerly portion			Quality / Quantity		10,080		0.84		0.84	1,354,978	663,200	2,018,178	0	-	2,018,178	-	-	-		
WAT	11+	C	12	Clappison Industrial Park		60	Quality only	SWMF	to be determined	Quality / Quantity	Storage Capacity =	21,100		3.60		3.60	6,714,399	1,103,984	7,818,383	0	-	-	7,818,383	-	-		
WAT	11+	R	35	Tech Park	Feb. 1994	15.66	Quality and Flood Control	Future Retrofit	Hwy 6 & Hwy 5	Quality						0.00	-	422,000	422,000	0	-	-	337,600	84,400	-		
U	11+	C	UNR	Unidentified			provisional item for unidentified non-res SWM works with residential component		open	Quantity / Quality						0.00	-	10,000,000	10,000,000	0	-	-	10,000,000	-	-		
																									-		
Total Non-Residential												**392,538**					**74,905,471**	**33,095,706**	**108,001,177**	**0.00**	**0**	**2,693,378**	**105,307,800**	**651,896**	**(651,896)**		
Grand Total												**1,084,497**				**TOTAL =**	**172,958,455**	**106,376,167**	**293,684,622**	**61.21**	**179,761,145**	**8,615,678**	**105,307,800**	**1,674,003**	**178,087,141**		

ANC: Ancaster
BMH: Binbrook / Mount Hope
HAM: Hamilton Mountain
SCL: Stoney Creek - Lower
SCM: Stoney Creek - Mountain
WAT: Waterdown

APPENDIX G-1: CATEGORY D1 - STORM SEWERS - OVERSIZING - DRAFT APPROVED SUBDIVISIONS & SECONDARY PLANS

PART ONE - SUBDIVISIONS

Subdivision and Road-Related Oversizing (where draft plans indicate storm sewers over 1200 mm diameter)

TYPE	Pipe Size	Application Number	Pipe Length	Oversize Pipe Cost	Number MH	Oversize MH Cost	Total Over-Size Cost 0-5 Years	Total Over-Size Cost 5-10 Years	Notes
Storm Sewer	1350 mm Diam.	25T201305 - Sheldon's Gate	200	$82,982.56	3	$0.00	$82,982.56		Rymal Road West to Storm Pond
		25T201801 - 78 and 80 Marion Str	200	$82,982.56	0	$0.00	$82,982.56		through part of Lot 11 and Street A to Street B throug h Block 126
		25T-88031 - Sandrina Gardens	135	$56,013.23	0	$0.00	$56,013.23		Street "G" From west limit of Plan to Street "B" and Street "B" From Street "G" To Street "C"
		25T-95002 - Miles Estates	283	$117,420.32	9	$0.00	$117,420.32		Through Block 132 to Upper Sherman Avenue
	1500 mm Diam.	25T200723 - Mountaingate	200	$184,258.40	4	$0.00	$184,258.40		West leg of Provident Way and south along Rosebury Way to Block 307
		25T201003 - Parkside Hills Phase 2	300	$276,387.60	3	$0.00	$276,387.60		Cole Street to Pond SWMF WAT#19
		25T201209 1125 West Fifth	200	$184,258.40	3	$0.00	$184,258.40		Possible Street 'A' from West 5th to existing 1500mm in easement to east
		25T201301 - Red Hill - Phase 2	200	$184,258.40	3	$0.00	$184,258.40		
		25T201503 - 165 Upper Centennial Parkway	200	$184,258.40	3	$0.00	$184,258.40		Dancy Street and Street D
		25T201611 - Nash Neighbourhood - Phase 2	300	$276,387.60	3	$0.00	$276,387.60		
		25T201612 - Nash Neighbourhood - Phase 3	300	$276,387.60	3	$0.00	$276,387.60		
		25T201706 - Jackson Heights Extension	300	$276,387.60	3	$0.00	$276,387.60		
		25T-88031 - Sandrina Gardens	135	$124,374.42	0	$0.00	$124,374.42		Street "C" From Street "B" To Court "E"
		25T-95002 - Miles Estates	152	$140,036.38	4	$0.00	$140,036.38		Street "G" From Miles Road To Street "F" and Street "F" From Street "G" To Block 132
	1650 mm Diam.	25T00610 - Caterini	200	$294,283.20	3	$18,440.42	$312,723.62		
		25T200723 - Mountaingate	200	$294,283.20	3	$18,440.42	$312,723.62		Mountaingate Drive
		25T200908 - Paletta - Felker Nhd	200	$294,283.20	0		$294,283.20		Drancy Road frin SWM headwall to Drancy Rd
		25T-88031 - Sandrina Gardens	80	$117,713.28	2	$12,293.61	$130,006.89		Street "C" from Terni Blvd. To Court "E"
		25T - 3105 Fletcher Road	400	$588,566.40	5	$30,734.04	$619,300.44		
	1800 mm Diam.								
	2100 mm Diam.								
Subtotals			**4185**	**$4,035,522.75**	**54**	**$79,908.49**			
Total by Period							**$4,115,431.24**	**$0.00**	

Draft Approved Subdivision Sub-total							**$4,115,431.24**	

PART TWO - SECONDARY PLANS

Anticipated City Cost Sharing in Secondary Plans
Not Identified Under Subdivision Draft Plans
To be Funded From Development Charges

Secondary Plan Calculations

Add Overhead = 32.00%
Adjustment 2013 to 2018 1.0965

Binbrook
Westerly extention of Windwood Drive to Fletcher Road

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1650 mm	300	1110	333000	439560	$ 219,780.00	$ 219,780.00
Storm Sewer Over-Sizing 1800 mm	400	1630	652000	860640	$ 430,320.00	$ 430,320.00
				1300200		

Fruitland - Winona
Collector Roads D, E, and F

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1500 mm	400	695	278000	366960	$ 183,480.00	$ 183,480.00
Storm Sewer Over-Sizing 1650 mm	1000	1110	1110000	1465200	$ 732,600.00	$ 732,600.00
Storm Sewer Over-Sizing 1800 mm	300	1630	489000	645480	$ 322,740.00	$ 322,740.00
				2477640		

Jerome
Storm sewer servicing into storm water management pond H-31

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1500 mm	200	695	139000	183480	$ 91,740.00	$ 91,740.00

Mewburn
1500 Diam. To Pond HAM#24

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1500 mm	350	695	243250	321090	$ 160,545.00	$ 160,545.00

Nash Neighbourhood
North/South, East/West Street abutting Neighbourhood Park

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1650 mm	150	1110	166500	219780	$ 109,890.00	$ 109,890.00
Storm Sewer Over-Sizing 1800 mm	200	1630	326000	430320	$ 215,160.00	$ 215,160.00
				650100		

Sheldon
North/South mid-block collector road oppposite Matthew Street to Stone Church Road

Description	Length in (m) or Quantity	Rate	City Contribution	City Contribution Incl Overhead	0-5 Years	5-10 Years
Storm Sewer Over-Sizing 1350 mm	300	313	93900	123948	$ 61,974.00	$ 61,974.00
Storm Sewer Over-Sizing 1650 mm	350	1110	388500	512820	$ 256,410.00	$ 256,410.00
				636768		

Total by Period						**$2,784,639.00**	**$2,784,639.00**
Secondary Plan Anticipated Oversizing Sub-total							**$5,569,278.00**

APPENDIX G-1: CATEGORY D2 -STORM SEWERS - NEIGHBOURHOD STORM OUTLETS (AS PER APPROVED STUDIES)

Description		City Capital Cost Estimate	City Contribution			
Nebo Rd: Twenty to 400 m s of Rymal (NON-RES)	1	1800000	1800000	$ 1,800,000.00		preliminary estimate by City - study not completed
Parkside Dr storm sewer project (NON-RES)	1	500000	500000	$ 500,000.00		preliminary estimate by City - study not completed
Roxborough Nhd Storm Outlet (RES)	1	950000	950000	$ 950,000.00		preliminary estimate by City - study not completed
Airport Road Marion to Mountaingate (RES/NON-RES)	1	1368000	1368000	$ 1,368,000.00		preliminary estimate by City - study not completed
Swayze Nhd Storm Outlet (RES)	1	2600000	2600000	$ 2,600,000.00		based on cost chedule in subdivision agreement
3 Unidentified Projects in Combined Watershed (RES)	3	1000000	3000000	$ 2,000,000.00	$ 1,000,000.00	preliminary estimate by City - study not completed

Total by Period					**$9,218,000.00**	**$1,000,000.00**
Neighbourhood Storm Outlet Sub-total						**$10,218,000.00**
STORM SEWERS - Oversizing and Outlets - Total						**$19,902,709.24**

APPENDIX G-1 - CATEGORY E - CULVERTS AND BRIDGES NOT PREVIOUSLY IDENTIFIED IN CATEGORY A

Ref: Hamilton Development Charges -Transportation

Item Number	Road Project Description	From	To	Improvement	Length km	Benefit to Growth % (Roads)		Number of Culverts/Bridges > 1m^2 end area	Replacement /Widening/ New	Identified in Category "A"	Small @$84,300 1-4m^2	Meduim @$168,600 4-8m^2	Large @$337,200 >8m^2	Cost (2019$)	Benefit to Growth % (SWM)	Growth Related Cost	Growth Related Post Period Cost	Net Growth Related Cost	Notes	Other Changes From 2014 Study
	AEGD Projects																			
1	Airport Road	Upper James Street	Glancaster Road	2r-4u	2.84	60		3	Widening		3			$252,900	60	$151,740		$151,740	non-res	inflation applied to benchmark costs
2	Airport Road	Butter Road	Glancaster Road	2r-4u	0.86	85		0	Widening		0			$0	85	$0		$0		
3	Airport Service Road	Glancaster	Airport Road	4u	1.93	100		0	New		0			$0	100	$0		$0		
4	Book Road	Fiddler's Green Road	Highway 6	2r-4u	0.99	85		1	Widening		1			$84,300	85	$71,655		$71,655	non-res	inflation applied to benchmark costs
5	Book Road	Highway 6	Southcote Road	2r-4u	1.11	85		1	Widening		1			$84,300	85	$71,655		$71,655	non-res	inflation applied to benchmark costs
6	Book Road	Highway 6	Southcote Road	4u-6u	1.11	85		0	Widening		0			$0	85	$0		$0	do under 4 lane	
7	Book Road E	Collector 2W	Glancaster Road	2r-2u	0.59	85		0	Widening		0			$0	85	$0		$0		
8	Butter Road	Fiddler's Green Road	Glancaster Road	2r-4u	3.39	85		0	Widening		0			$0	85	$0		$0	non-res	
9	Carluke Road East	Fiddler's Green Road	Glancaster Road	2r-4u	1.05	85		0	Widening		0			$0	85	$0		$0	non-res	
10	Collector Road 10N	Garner Road	Smith Road	2u	0.83	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
11	Collector Road 10N	Smith Road	Collector Road 2W	2u	0.65	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
12	Collector Road 1E	Collector 6N	Dickenson Road	2u	0.76	100		5	New (Cat A)	5				$0	100	$0		$0	non-res	inflation applied to benchmark costs
13	Collector Road 1N	Southcote Road	Collector Road 2E	2u	2.06	100		5	New (Cat A)	5				$0	100	$0		$0	non-res	inflation applied to benchmark costs
14	Collector Road 2E	Collector Road 1N	Airport Boundary	2u	0.47	100		0	New (Cat A)	0				$0	100	$0		$0		
15	Collector Road 2W	Garner Road	Collector Road 10N	2u	0.27	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
16	Collector Road 2W	Collector Road 10N	Dickenson Road extension	2u	1.35	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
17	Collector Road 6E	Collector 6N	Dickenson Road	4u	0.71	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
18	Collector Road 6N	Glancaster Road	Collector Road 6E	4u	1.93	100		3	New (Cat A)	3				$0	100	$0		$0	non-res	inflation applied to benchmark costs
19	Collector Road 6N	Collector Road 6E	Collecror Road 7E	4u	2.56	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
20	Collector Road 7E	Dickenson Road	Collector 6N	2u	0.49	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
21	Collector Road 7E	Collector 6N	Upper James Street	4u	0.58	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
22	Collector Road 7N	Book Road	Southcote Road	2u	0.91	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
23	Collector Road 7N	Southcote Road	Collector Road 2W	2u	0.89	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
24	Collector Road 12S	Collector 4E	Collector 5E	2u	0.35	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
25	Collector Road 12S	Collector 3E	Collector 4E	2u	0.35	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
26	Collector Road 1S	Fiddler's Green Road	Collector Road 9W	2u	0.41	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
27	Collector Road 2N	Collector Road 7N	Smith Road	2u	0.64	100		0	New (Cat A)	0				$0	100	$0		$0		
28	Collector Road 2S	Fiddler's Green Road	Collector Road 9W	2u	0.41	100		0	New (Cat A)	0				$0	100	$0		$0		
29	Collector Road 3E	Collector 12S	White Church Road	2u	0.2	100		0	New (Cat A)	0				$0	100	$0		$0		
30	Collector Road 3S	Collector 6W	Southcote Road	2u	0.52	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
31	Collector Road 4E	Collector 12S	White Church Road	2u	0.18	100		0	New (Cat A)	0				$0	100	$0		$0		
32	Collector Road 5E	Collector 12S	White Church Road	2u	0.18	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
33	Collector Road 5N	Fiddler's Green Road	Collector Road 8W	2u	0.84	100		0	New (Cat A)	0				$0	100	$0		$0		
34	Collector Road 6S	Glancaster Road (north)	Airport Road	2u	0.92	100		0	New (Cat A)	0				$0	100	$0		$0		
35	Collector Road 6S	Airport Road	Glancaster Road (south)	2u	0.4	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
36	Collector Road 6W	Collector 3S	Butter Road	2u	0.52	100		0	New (Cat A)	0				$0	100	$0		$0		
37	Collector Road 7S	Fiddler's Green Road	Collector 9W	2u	0.4	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
38	Collector Road 8S	Fiddler's Green Road	Collector 9W	2u	0.41	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
39	Collector Road 8W	Garner Road	Collector 5N	2u	1.36	100		0	New (Cat A)	0				$0	100	$0		$0		
40	Collector Road 9W	Garner Road	Carluke Road	2u	5.9	100		4	New (Cat A)	4				$0	100	$0		$0	non-res	inflation applied to benchmark costs
41	Dickenson Road	Glancaster Road	Upper James Street	2r-4u	2.9	85		8	Widening		7		1	$927,300	85	$788,205		$788,205	non-res	inflation applied to benchmark costs
42	Dickenson Road extension	Southcote Road	Smith Road	4u	0.42	100		1	New		1			$84,300	100	$84,300		$84,300	non-res	inflation applied to benchmark costs
43	Dickenson Road	Southcote Road	Smith Road	2r-4u	0.42	100		0	Widening					$0	100	$0		$0		
44	Dickenson Road extension	Smith Road	Glancaster Road	4u	0.8	100		0	New					$0	100	$0		$0	non-res	
45	Dickenson Road East	Upper James Street	w/o Nebo Road	2r-2u	4.6	60		0	Widening		0			$0	60	$0		$0		
46	Garner Road	w/o Southcote	e/o Glancaster	2r-5u	2.98	85		2	Widening		2			$168,600	85	$143,310		$143,310		inflation applied to benchmark costs
47	Garner Road	e/o Fiddler's Green Road	w/o Southcote Road	2r-4u	2.02	85		1	Widening		1			$84,300	85	$71,655		$71,655		inflation applied to benchmark costs
48	Garth Street extension	Twenty Road	Dickenson Road	5u	1.5	100		2	New		2			$168,600	100	$168,600		$168,600	non-res	inflation applied to benchmark costs
49	Garth Street extension	Dickenson Road	Collector 2E	5u	0.62	100		1	New		1			$84,300	100	$84,300		$84,300	non-res	inflation applied to benchmark costs

APPENDIX G-1 - CATEGORY E - CULVERTS AND BRIDGES NOT PREVIOUSLY IDENTIFIED IN CATEGORY A

Ref: Hamilton Development Charges -Transportation

Item Number	Road Project Description	From	To	Improvement	Length km	Benefit to Growth % (Roads)		Number of Culverts/Bridges > 1m^2 end area	Replacement /Widening/ New	Identified in Category "A"	Small @$84,300 1-4m^2	Meduim @$168,600 4-8m^2	Large @$337,200 >8m^2	Cost (2019$)	Benefit to Growth % (SWM)	Growth Related Cost	Growth Related Post Period Cost	Net Growth Related Cost	Notes	Other Changes From 2014 Study
	AEGD Projects																			
50	Glancaster Road	Collector 1N	Airport Boundary	2r-2u	0.49	85		0	Widening		0			$0	85	$0		$0		
51	Glancaster Road	Dickenson Road extension	Collector 1N	2r-4u	0.37	85		0	Widening		0			$0	85	$0		$0		
52	Glancaster Road	Garner Road	Dickenson Road	2r-4u	2.46	85		4	Widening		4			$337,200	85	$286,620		$286,620	non-res	inflation applied to benchmark costs
53	Smith Road	Dickenson Road extension	Collector 1N	2r-4u	0.65	85		0	Widening					$0	85	$0		$0		
54	Smith Road	Garner Road	Dickenson Road extension	2u	1.57	100		1	New		1			$84,300	100	$84,300		$84,300		inflation applied to benchmark costs
55	Smith Road	Collector 1N	Airport Boundary	2r-2u	0.35	100		0	Widening					$0	100	$0		$0	non-res	
56	Smith Road extension	Hydro corridor north crossing		2u	0.26	100		0	New					$0	100	$0		$0		
57	Southcote Road	Garner	Twenty Road extension	2r-4u	0.97	85		0	Widening					$0	85	$0		$0		
58	Southcote Road	Twenty Road extension	Book Road	2r-4u	0.97	85		0	Widening					$0	85	$0		$0		
59	Twenty Road	Glancaster Road	Aldercrest Avenue	2r-4u	3.08	85		9	Widening		9			$758,700	85	$644,895		$644,895	non-res	inflation applied to benchmark costs
60	Twenty Road extension	Southcote Road	Glancaster Road	4u	1.86	100		2	New		2			$168,600	100	$168,600		$168,600	non-res	inflation applied to benchmark costs
61	Fiddler's Green Road	Garner Road	Carluke Road	2r-4u	6.07	85		7	Widening		7			$590,100	85	$501,585		$501,585	non-res	inflation applied to benchmark costs
62	Glancaster Road	Butter Road	White Church Road	2r-4u	2.31	85		2	Widening		2			$168,600	85	$143,310		$143,310	non-res	inflation applied to benchmark costs
63	Southcote Road	Book Road	Collector 1N	2r-4u	0.65	85		0	Widening		0			$0	85	$0		$0		
64	Southcote Road	Airport Boundary	Butter Road	2u	0.81	100		0	Replacement		0			$0	100	$0		$0	non-res	
65	Upper James Street	Ardelea Avenue	Homestead Drive	4u-6u	4.69	85		6	Widening		5	1		$590,100	85	$501,585		$501,585	non-res	inflation applied to benchmark costs
66	White Church Road	Glancaster Road	Highway 6	2r-4u	2.31	85		1	Widening		1			$84,300	85	$71,655		$71,655	non-res	inflation applied to benchmark costs
67	Upper James Street	Malton	Highway 6	4r-5u_NBR	7	85		0	Widening					$0	85	$0		$0		
	SMATS Projects																			
68	West 5th Street	Rymal Road	Stone Church Road	2r-3u	1	60		0	New					$0	60	$0		$0		
69	Garth Street	Rymal Road	Stone Church Road	2r-4u	1	85		0	Widening					$0	85	$0		$0		
70	Rymal Road	Glancaster Road	Garth Street	2r-5u	1.3	85		1	Widening				1	$337,200	85	$286,620		$286,620		inflation applied to benchmark costs
71	Rymal Road	Fletcher Road	Upper Centenial	2r-5u	2.49	85		1	Replacement				1	$337,200	85	$286,620		$286,620		inflation applied to benchmark costs
72	Rymal Road	Upper Wentworth	West of Dartnall	3r-3u	3.29	85		0	Widening					$0	85	$0		$0		
73	Rymal Road	Upper James Street	Upper Wellington Street	2r-5u	0.87	85		0	Widening					$0	85	$0		$0		
74	Rymal Road	Upper Wellington Street	Upper Wentworth Street	2r-5u	0.86	85		0	Widening					$0	85	$0		$0		
75	Upper Wellington Street	Rymal Road	Stone Church Road	2u-4u	1	60		0	Widening					$0	60	$0		$0		
	SCUBE Projects																			
76	Arvin Avenue	McNeilly	Lewis Road	2u	0.8	100		0	New					$0	100	$0		$0		
77	Arvin Avenue	Jones Road	existing east end	2u	0.5	100		0	New					$0	100	$0		$0		
78	Arvin Avenue	McNeilly	existing west end	2u	0.4	100		1	New (Cat A)	1				$0	100	$0		$0		
79	SCUBE Central (east-west collector)	McNeilly Road	eastern boundary collector	2u	1.47	100		0	New					$0	100	$0		$0		
80	SCUBE Central (north-south collector)	Highway 8	Arvin Road extension	2u	0.48	100		0	New					$0	100	$0		$0		
81	SCUBE Central (north-south collector)	Barton Street	Highway 8	2u	0.66	100		0	New					$0	100	$0		$0		
82	SCUBE West (Block 1) (east-west	Fruitland Road	north-south collector	2u	1.36	100		1	New (Cat A)	1				$0	100	$0		$0		
83	SCUBE West (Block 1) (north-	Barton Street	Highway 8	2u	0.76	100		0	New					$0	100	$0		$0		
	Ancaster Industrial Park and TMP Projects																			
84	Ancaster New E/W Road (Trinity@Wilson	Tradewind/ Corporate	Trinity Road	2u	0.81	100		1	New (Cat A)	1				$0	100	$0		$0	non-res	inflation applied to benchmark costs
85	Garner Road / Wilson St / Hwy 2	Fiddler's Green Road	Hwy 2	2r-4r	3.5	85		0	Widening					$0	85	$0		$0		
86	Golf Links Rd intersection improvements (Martindale			Int	--	85		0	Widening					$0	85	$0		$0		
87	Golf Links Road	McNiven Road	Kitty Murray Lane	2r-3u	0.8	85		0	Widening					$0	85	$0		$0		
88	Jerseyville Road	Shaver Road	Wilson Street	2r-3u	3.10	60		0	Widening					$0	60	$0		$0		
89	Springbrook Avenue	Regan Drive	Garner Road	2r-2u	0.69	85		0	Widening					$0	85	$0		$0		
90	Trinity Road	1km S. of Wilson	Hwy 403	2r-4u	2.2	85		2	Widening				2	$674,400	85	$573,240		$573,240		inflation applied to benchmark costs
91	Shaver Road	Trustwood	Garner Road	2r-2u	1.00	85		0	Widening					$0	85	$0		$0		
92	Southcote Road	Calder Street	Garner Road	2r-3u	1.26	60		0	Widening					$0	60	$0		$0		
93	McNiven Road	Rousseaux Street	Golf Links Road	2r-3u	0.63	20		0	Widening					$0	20	$0		$0		
94	Mohawk Road	McNiven Road	Highway 403	2r-3u	1.3	60		0	Widening					$0	60	$0		$0		
95	Stone Church Road	Harrogate Drive	Stonehenge Drive	2r-4u	0.34	85		0	Widening					$0	85	$0		$0		

APPENDIX G-1 - CATEGORY E - CULVERTS AND BRIDGES NOT PREVIOUSLY IDENTIFIED IN CATEGORY A

Ref: Hamilton Development Charges -Transportation

Item Number	Road Project Description	From	To	Improvement	Length km	Benefit to Growth % (Roads)		Number of Culverts/Bridges > 1m² end area	Replacement /Widening/ New	Identified in Category "A"	Small @$84,300 1-4m²	Meduim @$168,600 4-8m²	Large @$337,200 >8m²	Cost (2019$)	Benefit to Growth % (SWM)	Growth Related Cost	Growth Related Post Period Cost	Net Growth Related Cost	Notes	Other Changes From 2014 Study
	RHBPS Projects																			
96	Dartnall Road Extension	Twenty Road	Dickenson Road	4u	1.65	100		2	New (Cat A)	2				$0	100	$0		$0	non-res	inflation applied to benchmark costs
97	Dickenson Road	w/o Nebo	w/o Glover	2r-2u	1.1	60		3	Widening		3			$252,900	60	$151,740		$151,740		inflation applied to benchmark costs
98	Nebo Road	Rymal Road	Twenty Road	2r-2u	1.3	85		1	Replacement		1			$84,300	85	$71,655		$71,655	non-res	inflation applied to benchmark costs
99	Nebo Road	800m South of Twenty Road	Dickenson Road	2r-2u	0.6	85			Widening					$0	85	$0		$0	non-res	
100	Regional Road 56	Rymal Road	ROPA 9 Boundary	2r-5u	1.2	85		3	Widening		3			$252,900	85	$214,965		$214,965		inflation applied to benchmark costs
101	Regional Road 56	Cemetery Road	South Limits of ROPA 9	various/ESR	0	85		0	Widening					$0	85	$0		$0		
102	Twenty Road extension	Glover Road	Upper Red Hill Valley Parkway	3u	0.6	100		2	New		2			$168,600	100	$168,600		$168,600		inflation applied to benchmark costs
103	Glover Road	Twenty Road	Rymal Road	2r-2u	2.6	85		0	Widening					$0	85	$0		$0		
104	Upper Red Hill Valley Parkway (previously Dartnall Road extension	Rymal Road	Dartnall Road extension	5u	2.5	100		1	New		1			$84,300	100	$84,300		$84,300	non-res	inflation applied to benchmark costs
	Waterdown Projects																			
105	Burke Street	Dundas Street	Mountain Brow	4u	0.85	95		0	New					$0	95	$0		$0		
106	Parkside Drive	Highway 6	Main Street	2r-4u	2.92	60		2	New Cat A	2				$0	60	$0		$0		
107	Parkside Drive	Main Street	Churchill (500 m east)	2r-4u	0.61.52	60		0	Widening					$0	60	$0		$0		
108	East-West Road Corridor (Waterdown By-Pass)	Kerns Road	Highway 6	4u	6.34	95		8	New Cat A	8				$0	95	$0		$0		
109	Waterdown Road (Burlington portion)	Mountain Brow Road	Craven Avenue	2r-4u	1.9	100		0	Widening					$0	100	$0		$0		
110	Mountain Brow Road	Waterdown Road	New north-south link	2r-4u	0.91	85		2	Widening			2		$337,200	85	$286,620		$286,620		inflation applied to benchmark costs
111	Dundas Street	New north-south link	Hamilton Boundary	4u-6u	0.87	85		0	New (Cat A)					$0	85	$0		$0		
112	Centre Road	Northlawn	Parkside Drive	2r-3u	0.4	60		0	New (Cat A)					$0	60	$0		$0		
	Fruitland Winona Projects																			
113	Barton Street	Fruitland Road	Fifty Road	2r-3u	5	60		5	Widening (Cat A)	5				$0	60	$0		$0		inflation applied to benchmark costs
114	Fifty Road	South Service Road	Barton Street	2r-4u	1	85		0	Widening					$0	85	$0		$0	non-res	
115	Fifty Road Escarpment Access	QEW	Highway 8	2r-2u	0.8	85		0	Widening					$0	85	$0		$0	non-res	
116	Fruitland Road By-pass	Barton Street	Highway 8	4u	1.1	85		1	New (Cat A)	1				$0	85	$0		$0		inflation applied to benchmark costs
117	Fruitland Road	Arvin Avenue	Barton Street	2u-4u	0.3	85		0	Widening					$0	85	$0		$0		
118	Highway 8 (Stoney Creek)	Dewitt Road	Fruitland Road	2r-5u	0.8	60		0	Widening					$0	60	$0		$0		
119	Highway 8 (Stoney Creek)	Fruitland Road	East City Limit	2r-4r_NBR	3.3	60		4	Widening		3	1		$421,500	60	$252,900		$252,900		inflation applied to benchmark costs
	Elfrida Boundary Expansion Projects (NOTE: 2/3 Post-Period)																			
120	First Road East	Highway 20	Mud Street	2r-3u	2.1	85		1	Widening		1			$84,300	85	$71,655	$47,770	$23,885	2/3 Post-Period	inflation applied to benchmark costs
121	Fletcher Road	500m South of Rymal	Golf Club Road	2r-3u	1.6	85		1	Widening		1			$84,300	85	$71,655	$47,770	$23,885	2/3 Post-Period	inflation applied to benchmark costs
122	Golf Club Road	Trinity Church Road	Hendershot Road	2r-2u	7.00	85		1	Widening		1			$84,300	85	$71,655	$47,770	$23,885	2/3 Post-Period	inflation applied to benchmark costs
123	Hendershot Road	Highway 20	Golf Club Road	2r-3u	2.10	85		1	Widening		1			$84,300	85	$71,655	$47,770	$23,885	2/3 Post-Period	inflation applied to benchmark costs
124	Highland Road	Upper Centennial Parkway	Second Road East	2r-3u	2.00	85		0	Widening					$0	85	$0	$0	$0	2/3 Post-Period	
125	Mud Street	Upper Centennial Parkway	Second Road East	2r-2u	2.00	85		1	Widening		1			$84,300	85	$71,655	$47,770	$23,885	2/3 Post-Period	inflation applied to benchmark costs
126	Second Road East	Highway 20	Mud Street	2r-3u	3.00	85		1	Widening			1		$168,600	85	$143,310	$95,540	$47,770	2/3 Post-Period	inflation applied to benchmark costs
127	Trinity Church Road	Hydro corridor	Golf Club Road	2r-2u	2.00	85		0	Widening					$0	85	$0	$0	$0	2/3 Post-Period	
128	Upper Centennial Parkway	Green Mountain Road	Highway 20	4r-5u	2.90	85		0	Widening					$0	85	$0	$0	$0	2/3 Post-Period	
129	Hwy 56	Hydro Corridor	Golf Club Road	4r-5u	TBD	85		3	New (Cat A)	3				$0	85	$0	$0	$0	2/3 Post-Period	
	Other Road Projects																			
130	Binbrook Road	Royal Winter Drive/Binhaven Road	Fletcher Road	2r-3u	0.7	85		0	Widening					$0	85	$0		$0		
131	Highway 8 (Dundas)	Bond Street	Dundas Limits	2r-3u	0.4	60		0	Widening					$0	60	$0		$0		
132	Highway 8 (Dundas)	Hillcrest	Park Ave	2r-3u	0.6	60		1	Widening		1			$84,300	60	$50,580		$50,580		inflation applied to benchmark costs
133	Jones Road	Barton Street	South Service Road	2r-2u	0.90	50		1	Widening		1			$84,300	50	$42,150		$42,150	non-res	inflation applied to benchmark costs
134	Lewis Road	Barton Street	South Service Road	2r-2u	0.80	50		1	New (Cat A)	1				$0	50	$0		$0	non-res	inflation applied to benchmark costs
135	Longwood Road	Aberdeen Avenue	Main Street	various/ESR	0.65	50		0	Widening					$0	50	$0		$0		
136	Miles Road	Rymal Road	Hydro Corridor	2r-3u	2.00	85		1	Widening		1			$84,300	85	$71,655		$71,655		inflation applied to benchmark costs
137	Millen Road	Barton Street	South Service Road	2r-3u	1.00	60		0	Widening					$0	60	$0		$0	non-res	
138	Fletcher Road	Binbrook Road	Golf Club Road	2r-2u	4.20	60		3	Widening		3			$252,900	60	$151,740		$151,740		inflation applied to benchmark costs
139	South Service Road	Millen Road	Gray	2r-2u	1.70	85		0	Widening					$0	85	$0		$0	non-res	
140	Trinity Church Road	Binbrook Road	Golf Club Road	2r-2u	5.20	60		1	Widening				1	$337,200	60	$202,320		$202,320		inflation applied to benchmark costs

APPENDIX G-1 - CATEGORY E - CULVERTS AND BRIDGES NOT PREVIOUSLY IDENTIFIED IN CATEGORY A

Ref: Hamilton Development Charges -Transportation

Item Number	Road Project Description	From	To	Improvement	Length km	Benefit to Growth % (Roads)		Number of Culverts/Bridges > 1m² end area	Replacement /Widening/ New	Identified in Category "A"	Small @$84,300 1-4m²	Meduim @$168,600 4-8m²	Large @$337,200 >8m²	Cost (2019$)	Benefit to Growth % (SWM)	Growth Related Cost	Growth Related Post Period Cost	Net Growth Related Cost	Notes	Other Changes From 2014 Study
141	Nebo Road	800m South of Twenty Road	Dickenson Road	2r-2u	0.6	85		0	Widening					$0	85	$0		$0		
142	Twenty Road	Aldercrest Avenue	600m west of Nebo Road	2r-2u	4.1	60		0	Widening					$0	60	$0		$0		
143	Upper Gage Street	Mohawk Road	Thorley	4u-5u	0.6	50		0	Widening					$0	50	$0		$0		
144	Upper Sherman Avenue	Stone Church Road	LINC	2r-3u	0.90	60		0	Widening					$0	60	$0		$0		
145	Upper Sherman Avenue	Stone Church Road	Rymal Road	2r-3u	1.00	60		0	Widening					$0	60	$0		$0		
146	Upper Wellington Street	Limeridge Street	Stone Church Road	2r-5u	1.20	60		0	Widening					$0	60	$0		$0		
147	West 5th Street	Limeridge Street	Stone Church Road	2r-3u	1.20	60		0	Widening					$0	60	$0		$0		
148	Shaver Road	Hwy 403	Wilson Road		1.50	100		1	Widening			1		$168,600	100	$168,600		$168,600		inflation applied to benchmark costs
149	Scenic Drive	Old City Limits	Lavender S Leg		1.40	100		1	Widening			1		$168,600	100	$168,600		$168,600		inflation applied to benchmark costs
150	North Service Road	Green Road	East City Limits		8.30	100		1	New (Cat A)	1				$0	100	$0		$0		inflation applied to benchmark costs
151	Victoria Avenue	Ferrie Street	Burlington Street	Two-way conversion	0.46	85		0	Widening					$0	85	$0		$0		
152	Highway 5/6 municipal roads			Service Roads		100		1	New (Cat A)	1				$0	100	$0		$0		inflation applied to benchmark costs
																$0		$0		
Grand Total								**154**		**67**	**74**	**7**	**6**	**$9,441,600**		**$7,772,460**	**$334,390**	**$7,438,070**		
Growth %																**82%**				
Total Growth																**$7,772,460**	**$334,390**	**$7,438,070**		

Total Residential	**$4,467,900**	**Res**	**$3,536,385**	**$334,390**	**$3,201,995**
Total Non-Residential	**$4,973,700**	**Non-Res**	**$4,236,075**	**$0**	**$4,236,075**

APPENDIX G-1 - GRIDS-RELATED STORMWATER MANAGEMENT (QUALITY AND OR QUANTITY) FACILITIES

Primary Dev. Areas	SWMF #	AEGD Stage #	Drainage Area (ha)	Volume (m3)	Estimated Footprint 4% (ha)	Land Cost 4%	Estimated Capital Cost ($)	Estimated Cost ($)	Growth Related %	Total Growth Assiciated Cost ($)	Post Period Cost ($)	Net Total Assiciated Cost 2014-2031 ($)	Direct Developer Contribution (%)	Direct Developer Contribution ($)	Net Total Assiciated Cost ($)	Remarks	Other Changes From 2014 Study
Expansion to Airport SPA	1	2	77	17,325	3.08	4,968,252	1,096,673	6,064,924	100	6,064,924	6,064,924	-	100	-	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	2	2	33	7,425	1.32	2,129,251	470,003	2,599,253	100	2,599,253	2,599,253	-	100	-	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	3	2	38.5	8,663	1.54	2,484,126	548,336	3,032,462	100	3,032,462	3,032,462	-	100	-	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	4	2	88	19,800	3.52	5,678,002	1,253,340	6,931,342	100	6,931,342	6,931,342	-	100	-	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	5	1	160	36,000	6.40	10,323,640	2,278,800	12,602,440	100	12,602,440	-	12,602,440	100	12,602,440	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	6	1	63	14,175	2.52	4,064,933	897,278	4,962,211	100	4,962,211	-	4,962,211	100	4,962,211	-	In Ancaster, south of Garner Road	land value updated, benchmark costs verified unchanged
	10	1	33	7,425	1.32	2,129,251	470,003	2,599,253	100	2,599,253	-	2,599,253	100	2,599,253	-	North of Airport	land value updated, benchmark costs verified unchanged
	11	1	28	6,300	1.12	1,806,637	398,790	2,205,427	100	2,205,427	-	2,205,427	100	2,205,427	-	North of Airport	land value updated, benchmark costs verified unchanged
	12	1	17.88	4,023	0.72	1,153,667	254,656	1,408,323	100	1,408,323	-	1,408,323	100	1,408,323	-	North of Airport	land value updated, benchmark costs verified unchanged
	13	1	108	24,300	4.32	6,968,457	1,538,190	8,506,647	100	8,506,647	-	8,506,647	100	8,506,647	-	North of Airport	land value updated, benchmark costs verified unchanged
Potential New Busniess Park (In existing Airport Spa)	14	1	42.5	9,563	1.70	2,742,217	605,306	3,347,523	100	3,347,523	-	3,347,523	100	3,347,523	-		land value updated, benchmark costs verified unchanged
	15	1	25.5	5,738	1.02	1,645,330	363,184	2,008,514	100	2,008,514	-	2,008,514	100	2,008,514	-		land value updated, benchmark costs verified unchanged
	16	1	34	7,650	1.36	2,193,774	484,245	2,678,019	100	2,678,019	-	2,678,019	100	2,678,019	-		land value updated, benchmark costs verified unchanged
	17	1	41	9,225	1.64	2,645,433	583,943	3,229,375	100	3,229,375	-	3,229,375	100	3,229,375	-		land value updated, benchmark costs verified unchanged
	18	1	124.88	28,098	5.00	8,057,601	1,778,603	9,836,205	100	9,836,205	-	9,836,205	100	9,836,205	-		land value updated, benchmark costs verified unchanged
	19	1	100	22,500	4.00	6,452,275	1,424,250	7,876,525	100	7,876,525	-	7,876,525	100	7,876,525	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	20	1	230.5	51,863	9.22	14,872,494	3,282,896	18,155,391	100	18,155,391	-	18,155,391	100	18,155,391	-		land value updated, benchmark costs verified unchanged
	21	1	15	3,375	0.60	967,841	213,638	1,181,479	100	1,181,479	-	1,181,479	100	1,181,479	-		land value updated, benchmark costs verified unchanged
	22	1	34	7,650	1.36	2,193,774	484,245	2,678,019	100	2,678,019	-	2,678,019	100	2,678,019	-		land value updated, benchmark costs verified unchanged
	23	1	140.88	31,698	5.64	9,089,965	2,006,483	11,096,449	100	11,096,449	-	11,096,449	100	11,096,449	-		land value updated, benchmark costs verified unchanged
	24	1	50.5	11,363	2.02	3,258,399	719,246	3,977,645	100	3,977,645	-	3,977,645	100	3,977,645	-		land value updated, benchmark costs verified unchanged
	25	1	97	21,825	3.88	6,258,707	1,381,523	7,640,229	100	7,640,229	-	7,640,229	100	7,640,229	-		land value updated, benchmark costs verified unchanged
	26	2	45	10,125	1.80	2,903,524	640,913	3,544,436	100	3,544,436	3,544,436	-	100	-	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	27	2	42.75	9,619	1.71	2,758,348	608,867	3,367,215	100	3,367,215	3,367,215	-	100	-	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	28	2	18	4,050	0.72	1,161,410	256,365	1,417,775	100	1,417,775	1,417,775	-	100	-	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	29	2	196.75	44,269	7.87	12,694,851	2,802,212	15,497,063	100	15,497,063	15,497,063	-	100	-	-		land value updated, benchmark costs verified unchanged
	30	2	24.75	5,569	0.99	1,596,938	352,502	1,949,440	100	1,949,440	1,949,440	-	100	-	-		land value updated, benchmark costs verified unchanged
	31	2	16.25	3,656	0.65	1,048,495	231,441	1,279,935	100	1,279,935	1,279,935	-	100	-	-		land value updated, benchmark costs verified unchanged
	32	2	15	3,375	0.60	967,841	213,638	1,181,479	100	1,181,479	1,181,479	-	100	-	-		land value updated, benchmark costs verified unchanged
	33	2	30.25	6,806	1.21	1,951,813	430,836	2,382,649	100	2,382,649	2,382,649	-	100	-	-		land value updated, benchmark costs verified unchanged
	34	1	24.75	5,569	0.99	1,596,938	352,502	1,949,440	100	1,949,440	-	1,949,440	100	1,949,440	-		land value updated, benchmark costs verified unchanged
	35	2	12.75	2,869	0.51	822,665	181,592	1,004,257	100	1,004,257	1,004,257	-	100	-	-		land value updated, benchmark costs verified unchanged
	36	2	22.5	5,063	0.90	1,451,762	320,456	1,772,218	100	1,772,218	1,772,218	-	100	-	-		land value updated, benchmark costs verified unchanged
	37	2	33.75	7,594	1.35	2,177,643	480,684	2,658,327	100	2,658,327	2,658,327	-	100	-	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	38	2	56.25	12,656	2.25	3,629,405	801,141	4,430,545	100	4,430,545	4,430,545	-	100	-	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
	39	1	37.5	8,438	1.50	2,419,603	534,094	2,953,697	100	2,953,697	-	2,953,697	100	2,953,697	-	Involves off-site stream work	land value updated, benchmark costs verified unchanged
Potential Urban Boundary Expansion Area	7	1	20	4,500	0.80	1,290,455	284,850	1,575,305	100	1,575,305	-	1,575,305	100	1,575,305	-	South of Twenty Road West, north of Airport	land value updated, benchmark costs verified unchanged
	8	1	37.25	8,381	1.49	2,403,473	530,533	2,934,006	100	2,934,006	-	2,934,006	100	2,934,006	-	South of Twenty Road West, north of Airport	land value updated, benchmark costs verified unchanged
	9	1	58.13	13,079	2.33	3,750,708	827,917	4,578,624	100	4,578,624	-	4,578,624	100	4,578,624	-	South of Twenty Road West, north of Airport	land value updated, benchmark costs verified unchanged
	40	1	11.25	2,531	0.45	725,881	160,228	886,109	100	886,109	-	886,109	100	886,109	-	potential to combine with B10	land value updated, benchmark costs verified unchanged
	41	Elfrida (Res)	126	28,350	5.04	8,129,867	1,794,555	9,924,422	100	9,924,422	6,616,281	3,308,141	0	-	3,308,141	First Rd E and Mud	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	42	Elfrida (Res)	21.25	4,781	0.85	1,371,108	302,653	1,673,762	100	1,673,762	1,115,841	557,921	0	-	557,921	Second Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	43	Elfrida (Res)	60	13,500	2.40	3,871,365	854,550	4,725,915	100	4,725,915	3,150,610	1,575,305	0	-	1,575,305	Second Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	44	Elfrida (Res)	71.25	16,031	2.85	4,597,246	1,014,778	5,612,024	100	5,612,024	3,741,349	1,870,675	0	-	1,870,675	Second Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	45	Elfrida (Res)	22	4,950	0.88	1,419,501	313,335	1,732,836	100	1,732,836	1,155,224	577,612	0	-	577,612	NW corner, Trinity Church at Hydro ROW	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	46	Elfrida (Res)	147	33,075	5.88	9,484,845	2,093,648	11,578,492	100	11,578,492	7,718,995	3,859,497	0	-	3,859,497	HWY 56	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	47	Elfrida (Res)	168.75	37,969	6.75	10,888,214	2,403,422	13,291,636	100	13,291,636	8,861,091	4,430,545	0	-	4,430,545	HWY 56	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	48	Elfrida (Res)	140	31,500	5.60	9,033,185	1,993,950	11,027,135	100	11,027,135	7,351,424	3,675,712	0	-	3,675,712	First Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	49	Elfrida (Res)	66	14,850	2.64	4,258,502	940,005	5,198,507	100	5,198,507	3,465,671	1,732,836	0	-	1,732,836	Second Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	50	Elfrida (Res)	130.75	29,419	5.23	8,436,350	1,862,207	10,298,557	100	10,298,557	6,865,704	3,432,852	0	-	3,432,852	Second Rd E, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	51	Elfrida (Res)	38.5	8,663	1.54	2,484,126	548,336	3,032,462	100	3,032,462	2,021,641	1,010,821	0	-	1,010,821	u/s confluence u/s Fletcher	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	52	Elfrida (Res)	102.25	23,006	4.09	6,597,451	1,456,296	8,053,747	100	8,053,747	5,369,165	2,684,582	0	-	2,684,582	Fletcher at Golf Club	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	53	Elfrida (Res)	25.16	5,661	1.01	1,623,392	358,341	1,981,734	100	1,981,734	1,321,156	660,578	0	-	660,578	Fletcher at Golf Club ,Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	54	Elfrida (Res)	29.25	6,581	1.17	1,887,290	416,593	2,303,884	100	2,303,884	1,535,922	767,961	0	-	767,961	Golf Club E of 56, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	55	Elfrida (Res)	48.75	10,969	1.95	3,145,484	694,322	3,839,806	100	3,839,806	2,559,871	1,279,935	0	-	1,279,935	Golf Club btwn 56 and Hendershott	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	56	Elfrida (Res)	29.25	6,581	1.17	1,887,290	416,593	2,303,884	100	2,303,884	1,535,922	767,961	0	-	767,961	Golf Club W of Hendershott, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
	57	Elfrida (Res)	26	5,850	1.04	1,677,592	370,305	2,047,897	100	2,047,897	1,365,264	682,632	0	-	682,632	Gol Club at Hendershott, Involves off-site stream work	land value updated, benchmark costs verified unchanged; 2/3 Post Period
Total								**278,606,874**	**100**	**278,606,874**	**124,864,454**	**153,742,420**		**120,866,854**	**32,875,566**		

Total Residential								**98,626,698**	**100**	**98,626,698**	**65,751,132**	**32,875,566**		**-**	**32,875,566**		
Total Non-Residential								**179,980,176**	**100**	**179,980,176**	**59,113,322**	**120,866,854**		**120,866,854**	**-**		

APPENDIX G-1 - GRIDS-RELATED OPEN WATERCOURSES: EROSION CONTROL AND CHANNEL SYSTEM IMPROVEMENTS

Primary Dev. Areas	Location	Total Length of Downstream Watercourse to Assumed End-Point[3]	Fraction of Watercourse Assumed to Required Erosion Control[2]	Length of Erosion Control Works	Estimated Cost ($)	Land Cost	Estimated Total Cost ($)	Growth Related %	Net Total Assiciated Growth Related Cost ($)	Growth Related Post Period Cost ($)	Net Total Assiciated Growth Related Cost ($)	Remarks	Other Changes From 2014 Study
Expansion to Airport SPA	Ancaster	1,303	0.2	260.6	390,900	243,024	633,924	100	633,924		633,924		land values updated (City benchmark unit costs unchanged)
	North of Airport	-	0.2	-	-	-	-	100	-		-		land values updated (City benchmark unit costs unchanged)
Potential New Busniess Park (In Existing Airport Spa)	West of Airport	24,231	0.2	4,846.2	7,269,300	4,519,350	11,788,650	100	11,788,650		11,788,650		land values updated (City benchmark unit costs unchanged)
Potential Urban Boundary Expansion Area	South of Twenty Road West, north of Airport	-	0.2	-	-	-	-	100	-		-		land values updated (City benchmark unit costs unchanged)
	Northwest of Golf Club Road and Hendershott	15,337	0.2	3,067.4	4,601,100	2,473,964	7,075,064	100	7,075,064	4,716,709	2,358,355	Residential	land values updated (City benchmark unit costs unchanged); 2/3 Post-period
Grand Total							**19,497,638**	**100**	**19,497,638**	**4,716,709**	**14,780,929**		
Total Residential							**7,075,064**	**100**	**7,075,064**	**4,716,709**	**2,358,355**		
Total Non-Residential							**12,422,574**	**100**	**12,422,574**	**-**	**12,422,574**		

[2]-0.05 - Where Development Fraction is 0 - 25%
0.10 - Where Development Fraction is 26 - 49%
0.15 - Where Development Fraction is 50 - 74%
0.20 - Where Development Fraction is 75 - 100%

[3]Location where d/s of this point no erosion is deemed to occur from subject development; total drainage area to this point estimated as a maximum of 2X the study watershed area.

[4]$2500/m for Watershed Area > 500 ha
$1500/m for Watershed Area < 500 ha