STORMWATER MANAGEMENT

AND

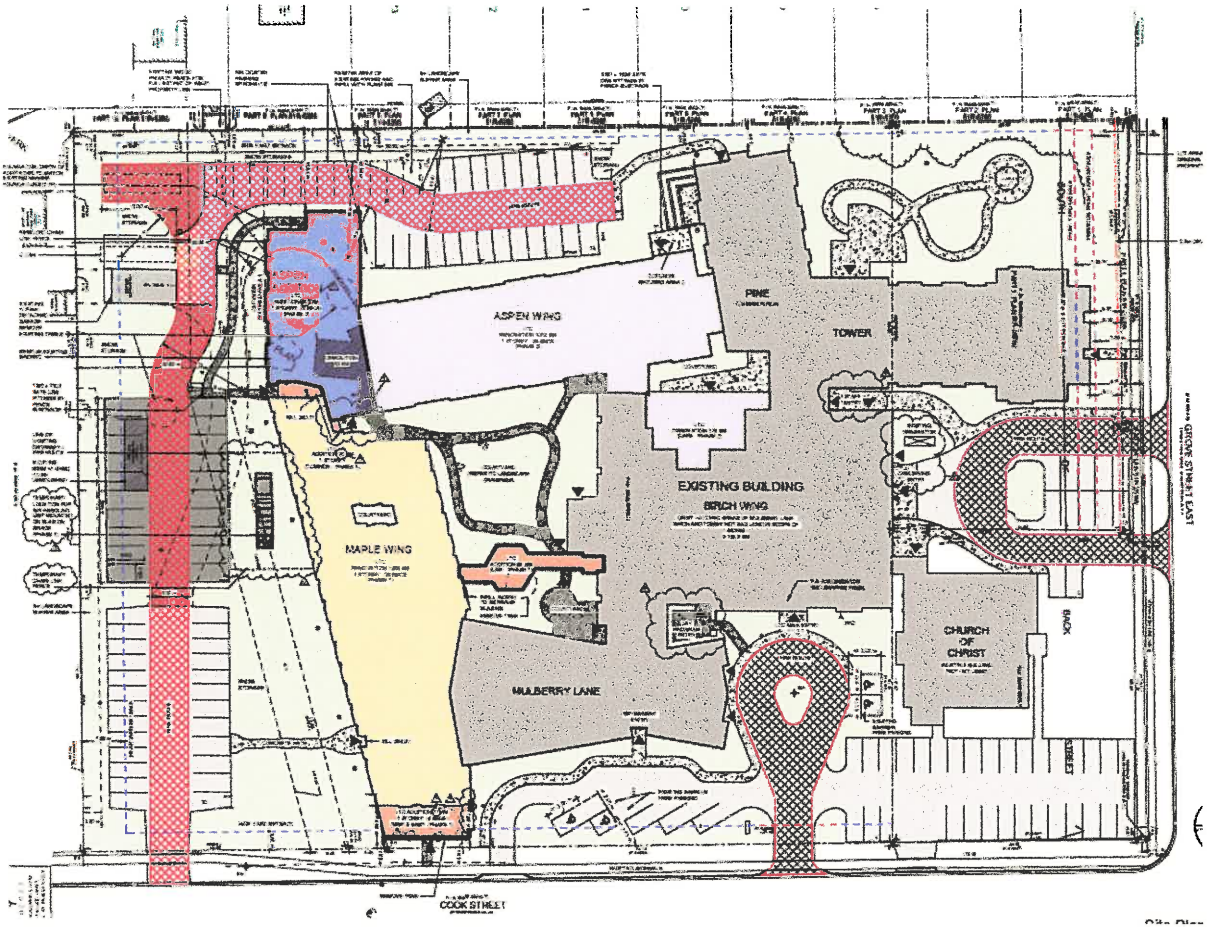
FUNCTIONAL SERVICING REPORT

FOR

PROPOSED EXPANSIONS TO

234 COOK STREET, GROVE PARK RETIREMENT HOME,

CITY OF BARRIE, COUNTY OF SIMCOE



PROJECT J5 FILE NO: **168**
DATE: **MARCH 17, 2023**

PREPARED BY:
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1.0 INTRODUCTION:

1.1 APPOINTMENT

JFive Developments Ltd., Consulting Engineer, has been retained by the Ted Handy and Associates Inc. Architect on behalf of Grove Park Retirement Home to provide the Civil engineering services related to the proposed site development expansion. The subject site development property (property), is located on the south side of Grove Street and west side of Cook Street in the City of Barrie. More specifically, the site is located at 234 Cook Street.

This report identifies the current existing municipal servicing and proposed servicing of the property in relation to:

a) Stormwater Management and Servicing
b) Watermain Servicing,
c) Sanitary Sewer Servicing,
d) Transportation/Roads,
e) Lot Grading,
f) Engineered Fill, and,
g) Utility Servicing.

This report will be submitted to the City of Barrie and any other agencies as required, in support of amendment applications associated with the property.

1.2 SUPPORTING DOCUMENTS: includes the following:

- Topographical Survey completed by Rudy Mak Surveying Ltd., OLS, dated March 9, 2023. A copy of this survey has been included in **Appendix 'B'** and is the detailed information used for the project design. The same survey also provides the legal boundary data.
- Previous design as built data and design provided by L.M. Huget Architects, dated July, 1966,
- Previous design as built data and design provide by Leonard M. Huget Architect, dated June 15, 1985,
- Previous design as built data and design provided by Salter Farrow Pilon Architect Inc., dated March 7, 2002,
- Previous design as built data and design provided by Jain & Associated Limited, dated March 7, 2002,
- Phase 1 Environmental Site Assessment by Terraprobe Limited, dated November. 29, 2001,
- Geotechnical Investigation by Peto MacCallum Ltd., dated February, 2001,
- Report of Storm Water Run-off report by Jain & Associates Ltd., dated February 4, 2002.

Please note that copies of the above document are available upon request.

1.3 SUBJECT PROPERTY BACKGROUND:

The 1.8167 ha property is comprised of Part of Lot 25, south side of Back Street, Registered Plan 112, City of Barrie, County of Simcoe. See **Figure 1, Location Plan** in the Figure appendix. The subject property is bordered on the north by Grove Street, to the south and west by residential development and to the east by Cook Street.

This report is prepared in support of the proposed site development as related to the proposed Site Plan (Plan) as prepared by Ted Handy and Associates Inc. Architect. This report shall demonstrate that the proposed site development can be appropriately serviced.

The property is approx. 1.82 ha (4.5 acres) in area. The Plan proposes the expansion and renovation of portions of the existing site development as identified on the Site Plan. See **Appendix 'A'** for an 11" x 17" reduction of the Proposed Site Plan as prepared by Ted Handy and Associates Inc. More specifically, the project generally involves the following:

a) Phase 1 renovations,
b) Phase 1 addition,
c) Demolition to accommodate Phase 2 addition,
d) Phase 2 renovations,
e) Phase 2 addition,
f) Modification and expansion of existing parking lot and servicing works to accommodate the phases of works noted above.

A detailed pre-engineering topographical survey has been completed by Rudy Mak Surveying, OLS, specifically for the areas of the proposed works as noted above. A reduced copy of this survey has been included in **Appendix 'B'**.

1.4 APPROVING AUTHORITIES

This Report will be submitted to the City of Barrie in support of the proposed Site Plan Amendment application.

Planning Pre-consultation comments were provided by the City of Barrie, February 17, 2023.

1.5 DESIGN CRITERIA

The following documents have been referenced and used in preparation of this report and the supporting Civil design drawings:

- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003,
- City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines,
- Ontario Building Code,

2.0 STORMWATER MANAGEMENT AND SERVICING:

2.1 Existing Storm Drainage System:

As noted above, the site is approx. 1.82 ha in area. The site has been developed and expanding over the years. The first development was in 1966, followed by a further expansion in 1985 and then in 2002. All the expansions involved the development of a nursing home and long-term care facilities for seniors. The last expansion completed in 2002 provided for a detailed stormwater management review and design by Jain & Associates Ltd. A copy of that review/report and the related design has been included in **Appendix 'C'** and **Appendix 'D'** for ease of reference.

There are no external drainage flows entering the site development. The following identifies how there will be no flooding or negative impacts to any properties adjacent and immediately downstream of the subject site development.

The latest design completed in 2002 by Jain & Associated Ltd. generally identified the following design specifics:

1. No roof top controls were provided for in the 2002 design.

2. The existing storm drainage system for the site has three (3) defined storm drainage outlet locations, as follows, and the storm water flows have been controlled to pre-development levels as noted in the Jain & Associated Ltd. report of 2002.
   a) One outlet is to the west side of the property where the drainage is discharged via an existing 657mm storm sewer. This storm sewer is contained within an existing 4.5m wide easement. This storm sewer then outlets into the storm sewer system within Davies Crescent.
   b) A second outlet for a small portion of the site, i.e., the parking lot and cul-de-sac on the east side of the Mulberry Lane Block E building, outlets into the storm sewer system in Cook Street, and,
   c) The third outlet is for the existing Birch Wing, Building B, the building identified a 'Tower' on the Site Plan drawing in **Appendix 'A'**, plus the landscaped area in the NW corner of the site, which discharges via the existing on-site storm sewer system to the Grove Street storm sewer.

3. Each of the three (3) storm sewer discharge outlet locations have been provided with orifice control devices to ensure pre-development flow rates are maintained, based on the details as presented in Jain & Associates Ltd. report dated February 2002. As well, on-site stormwater ponding limits have also been identified on the supporting Site Plan, Mechanical drawing by Jain & Associates ltd., Dwg M101, dated March 7, 2002. A reduced copy of this drawing has been included in **Appendix 'D'**. More specifically,
   a) **Davis Crescent**: The outlet to the west side of the property where the drainage is discharged via the existing 657mm storm sewer has been provided with a 75mm diameter orifice plate on the outlet pipe from the control CBMH # 2.
   b) **Cook Street**: The outlet to the Cook Street storm sewer has been provided with a 110mm diameter orifice plate on the outlet pipe from the control CBMH # 1, and,
   a) **Grove Street**: The outlet to the Grove Street storm sewer has been provide with a 109mm diameter orifice plate on the outlet pipe from the control MH # 2.

4. **Stormwater Quality Control Structures**: Each of the three (3) storm sewer discharge outlet locations have also been provided with water quality control structure as follows, of which were all installed in 2002 as per the design by Jain & Associates Ltd.:
   a) **Davis Crescent**: The outlet to the west side of the property where the drainage is discharged via the existing 657mm storm sewer, an oil interceptor, model STC 750 structure has been provided down-stream of the control CBMH #3,
   b) **Cook Street:** The outlet to the Cook Street storm sewer has an oil interceptor, model STC 300 structure has been provided down-stream of the control CBMH #1, and,
   c) **Grove Street**: The outlet to the Grove Street storm sewer has an oil interceptor, model STC 300 structure has been provided down-stream of the control MH #2.

2.2 Post Development Conditions:

The design documentation of the 2002 design have been included with this report in **Appendix 'C'** and **Appendix 'D'**. The new supporting Civil design for the proposed expansion of the site has been presented on the supporting Civil drawings which form part of the subject Site Plan Amendment submission.

1. **Flows to Davis Crescent**: The proposed development modifications will result in changes to the building coverage (Aspen phase 2 addition), parking lot relocation and expansion and landscape coverage. As such, stormwater mitigations will be required to ensure stormwater flows tributary to the existing 675mm storm sewer system outlet to Davis Crescent are implemented. The following provides an assessment of the tributary area to the outlet into Davis Crescent:

Surface Area		**Pre-Dev** (2002 design)	**Existing** (2002 design)	**Proposed** (2023 design)
Building	(R =0.90)	0.4808 ha	0.4708 ha	0.4646 ha
Paved	(R= 0.90)	0.3476 ha	0.2400 ha	0.5400 ha
Sod	(R =0.25)	0.8067 ha	0.5523 ha	0.2134 ha
Phase 2 addition	(R = 0.90)	n/a	0.0 ha	0.0451 ha
Total		1.6351 ha	1.2631 ha	1.2631 ha
Composite 'R' value		0.58	0.62	0.79

See the stormwater management calculations in **Appendix 'E'**.

Required storage from 2002 was identified as 0.0 cu.m. in the Jain & Associates Ltd. report.

Due to the new intensity criteria established by the City of Barrie in 2016, and the proposed Site Plan Amendment development modifications, the required stormwater storage will result in an increased in stormwater quantity control requirements. This is while maintaining the original allowed discharge for the pre-development situation prior to the design of 2002. As such, the proposed storage volume needs will include for underground storage within the storm sewer pipes and structures, plus the added above ground storage. See **Appendix 'E'** for the detailed calculations and the areas for the above ground storage.

To achieve the additional quantity control required, it is proposed to install a 275mm dia. orifice plate in the downstream (north) outlet pipe of the existing CBMH #3. See the Site Plan Dwg., SS-1 for the location. As well, to ensure the required storage ponding volume is achieved, the existing berming along the westerly limit of the site will also need to be raised to elevation 264.00 in order to provide for a free board of 100mm. Refer to the area of the berm work as noted on the **Dwg. SG-1, Site Grading Plan.** The new stormwater ponding depth shall be increased from 263.80m to 263.90m.

Based on the Hydraulic Calculation Sheet in **Appendix 'E'**, the storage volumes as summarized below as follows:

Storm Event (year)	Pre-Dev. Q (cms)	65% of Q Q (cms)	Post Dev. Q (cms)	Required Storage (cu.m)	Provided Storage (cu.m.)	Max. WL (m)
2	0.191	0.1242	0.1837	64.4	66.2	263.66
5	0.248	0.1612	0.2219	85.0	89.0	263.90

As well, to protect from flooding the existing court yards and proposed Aspen building addition and the existing Maple Wing, three (3) backflow preventers shall be provided in the following structures. The details of these backflow preventers have been identified on the support Civil design plans which form part of the Site Plan Amendment submission.

1) The proposed CBMH #4 which will replace the ex. CB#4,
2) The existing CB #7, and,
3) The proposed CBMH #2.

2. **Flows to Cook Street**: The proposed changes to the tributary area which outlets to Cook Street will have a very marginal reduction in the grassed area upon the Phase 1 addition as follows, the proposed building coverage will result in a reduction of the grassed area by only 70.8 sq.m. This equates to the following:

Surface Area		**Existing** (2002 design)	**Proposed** (2023 design)
Paved	(R =0.90)	0.090 ha	0.090 ha
Sod	(R =0.25)	0.0961 ha	0.0884 ha
Phase 1 addition	(R = 0.90)	n/a	0.0077 ha
Total		0.1861 ha	0.1861 ha
Composite 'R' value		R = 0.56	R = 0.59

This is noted as a very marginal increase in the 'R' value. As such, it has been considered to be negligible and so no detailed assessment in storage requirements has been completed for this area.

3. **Flows to Grove Street:** The post-development stormwater drainage to the outlet to Grove Street will not change. As such, no modifications are required to the storm sewer and drainage system for this outlet. That is, there will be no development changes in the tributary areas flowing to the outlet into Grove Street.

Surface Area		**Existing** (2002 design)
Building	(R = 0.90)	0.1569 ha
Paved	(R = 0.90)	0.0605 ha
Sod	(R = 0.25)	0.1545 ha
Total		0.3719 ha
Composite 'R' value		0.63

Required storage of 22.16 cu.m. does not change.

2.3 EROSION AND SEDIMENT CONTROL:

2.3.1 Temporary Controls

A high level of attention to protecting against sedimentation and erosion issues has been ensured in the design during the construction stages. Due to the existing drainage slope of the property and the existing on-site catchbasin, all site drainage within the area of proposed site development will be directed to flow to the existing on-site catchbasin. To ensure filtration of such stormwater discharge, the existing CB's and proposed CB's shall be fitted with a siltation control bags.

In addition to the above, siltation control fence shall be installed as identified on Dwg. ESC-1. As well, a mud mat shall be provided at the construction entrance of the site.

The following practises for erosion and siltation controls (ESC) shall also be adhered to for proposed site development:

1. Adopt a multi-barrier approach to provide ESC through erosion controls.
2. Retain existing ground cover and stabilize exposed soil with vegetation.
3. Limit the duration of exposure of soils and phase the construction accordingly.
4. Limit the size of disturbed areas by minimizing nonessential clearing & grading,
5. Minimize slope length and gradient of disturbed areas,
6. Maintain overland sheet flow and avoid concentrated flows, and when not possible, provide erosion protection materials for such flow to flow over and through,
7. Ensure the contractor understands the importance of the provision of implementation of such controls, inspects such regularly and maintains such as required,
8. Make required adjustments to the ESC works on-site as necessary, subject to the construction activities,
9. Assess all the ESC works before, during and after all rainfalls, significant snowfalls and snow melt events,
10. Maintain a detailed Inspection Record of the inspection of the ESC works.

The following sequence of ESC works and site works are proposed:

1. First the siltation control fence works shall be installed as identified on the **Dwg. SG-1, Site Grading Plan,** which is enclosed with the supporting Civil design drawings,
2. The installation of the temporary construction mud mat shall be completed at the new entrance location,
3. All stripped top soil shall be removed from the site,
4. Complete any remaining site earth work as required,
5. Complete removals and demolition work as required,
6. Proceed to construct underground services,
7. Proceed to construct building,
8. Minimize the length of open trenches during the installation of underground services,
9. During any works stoppages during the installation of underground services, provide temporary plugs to ensure silt laiden drainage does not flow into the existing downstream sewers.
10. All CB inlet structures shall be fitted with temporary siltation insert and be maintained sufficiently enough to ensure continued filtering of silt laiden stormwater runoff.
11. All silt laiden water pumped from construction trenches must be directed into a filter ringed areas (basin) or filter bags prior to such water being directed to the sedimentation control basin,
12. Dust control shall be provided during the dry periods as directed by the site engineer.
13. All streets and hard surface areas shall be swept on a regular basis, as directed by the site engineer.
14. Where surface drainage is not directed to be captured by these sediment control basins, site surface drainage shall be directed as sheet flow and swale flow through the proposed siltation control fences during the construction phase.
15. All disturbed landscaped areas shall be provided with top soil and seeded and/or sodded at the earliest opportunity in order to assist in erosion control.

Through the implementation of the proposed construction practises discussed above and regular maintenance of these controls, it can be ensured that satisfactory protection of the surrounding areas will occur during the construction stage of the proposed site development.

2.3.2 Permanent Controls:

The following practises are proposed to provide permanent water quality control:

- Provide surface infiltration within swales and the landscape areas;
- Where possible, direct surface drainage from the asphalt areas as overland flow over landscaped and grassed areas prior to discharging into the downstream storm drainage system;

2.4 INSPECTION AND MAINTENANCE:

The following is a minimum recommended inspection schedule which should be implemented and adhered to for the full length of the construction period and following construction of all site works and surface works once a stable vegetative growth covers the site landscape areas:

1. All erosion and siltation control devises shall be inspected on a weekly basis by the consultant's resident inspector.
2. All erosion and siltation controls shall be inspected after each and every significant rainfall event by the consultant's resident inspector.
3. All erosion and siltation controls shall be inspected after significant snowfall events by the consultant's resident inspector if construction operations are occurring during such time events.
4. A detailed written and photo record shall be provided on site of each inspection related to the erosion and siltation control inspections and maintenance works.
5. During inactive construction periods where the site is left with no works for 30 days or longer, a monthly inspection shall be conducted.
6. Regular maintenance shall consist of cleaning out leaves, debris and accumulated sediment caught in pre-treatment devices, inlets and outlets annually or as needed.
7. Regular clean out of storm manhole sumps and catch basin sumps. It is recommended to clean out the sumps at the end of the Fall season to get rid of leaves and other such debris. As well, clean out is also recommended in the early Spring to get rid of sands deposited during the winter season. The purpose of the sumps is exactly for this reason; however, the sumps do not have an unlimited volume of capture.
8. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded area, dethatching and aerating as needed.
9. Removal accumulated sediment on the swale surface area when dry and exceeding 25mm depth.
10. For all landscape filter strip along the easterly limit of the site, routine maintenance will be the same as for any other landscape areas, weeding, pruning and litter removal. Regular watering may be required during the first 2 years until the vegetation is established. Routine inspection is very important to ensure that dense vegetation cove is maintained and inflowing runoff doe not become concentrated and short circuit the grassed filter strip along the east limit of the site. For routine mowing of the grassed filter strip, the lightest possible mowing equipment should be used to prevent soil compaction.
11. Inspections should be conducted in the Spring and Fall of each year and after major storm events for damage by foot or vehicle traffic, channelization, accumulation of debris, trash and sediment and structural damage to pre-treatment devices.
12. Regular inspection and maintenance as per the manufacture recommendation of the three (3) existing on site oil grit separator structures.

3.0 WATER SERVICING:

The existing site development is currently provided with full municipal water servicing all in accordance with the design standards and criteria of the City of Barrie of 2002. More specifically, the site is serviced with a 200mm diameter fire line connected to the existing 300mm diameter watermain in Grove Street. The Siamese connection for the site is located on the south side of the Birch Wing (Block 'B') building fronting onto Cook Street. Refer to the Site Servicing Plan, Dwg. SS-1 for the details of this existing servicing system which is part of the Civil design drawings associated with this submission.

As well, there is a 100mm diameter domestic line connected to the existing watermain in Grove Street.

In addition, there is one on site fire hydrant and valve located in the cul-de-sac in front of the Birch Wing (Block 'B') building fronting Cook Street. This fire line is connected to the existing 150mm diameter main within Cook Street.

The intention is to service all the proposed building additions through the existing servicing systems within each of the adjoining buildings where the additions are proposed.

To date, a formal servicing analysis of the domestic and fire flow demands (Fire Underwriters Survey calculations) and pressure testing has not been completed. It is understood that a fire hydrant flow test was conducted on the existing on-site fire hydrant east of the Birch Wing Block B building. The fire hydrant is connected to the existing 150mm diameter watermain in Cook Street. Based on the test, the flow rate was only 90 l/s. The required flow rate for this development is to be a minimum of 200 l/s. It is suggested that an additional fire hydrant flow test is necessary. At the recommendation of City staff, a flow test should be completed on the existing fire hydrant located north of the site on Grove Street. This fire hydrant is connected to the existing 300mm diameter watermain in Grove Street and should identify the required flow rate can be achieved. This flow test sis to be scheduled to occur in April sometime. Following that flow test, a detailed analysis of the watermain system shall be completed and formally submitted to the City of Barrie for review and approval.

The proposed additions are to ultimately be provided with fire sprinkler systems.

4.0 SANITARY SERVICING:

The existing site development is provided with full municipal serviced via two (2) connections to the existing 400mm diameter municipal trunk sewer which crosses the southerly quadrant of the site. Refer to the Site Servicing Plan, Dwg. SS-1 for the details of these two (2) connection points and the internal existing sanitary sewer systems.

The proposed building additions shall be provided with sanitary service via connection to the existing internal servicing systems within each of the adjoining buildings where the additions are proposed.

5.0 TRANSPORTATION/ROADS:

Access/egress for the overall site development shall not change. That is, access and egress to and from both Cook Street and Grove Street will remain unchanged.

With the Phase 2 addition, there will be the requirement to remove and relocate some of the existing parking lot and driveway. The detailed design of this has been identified on the Dwg. SG-1, Site Grading Plan, which is part of the Civil design drawings associated with this submission.

There will also be removal of some of the existing sidewalks and walkways to accommodate Phase 1 LTC Maple East addition and the Phase 2 Aspen addition. The specifics of the removals are presented on Dwg. R-1, Removals Plan. New sidewalks will also be provided for the building addition entrances to ensure pedestrian linkages are achieved and maintained. See Dwg. SG-1, Site Grading Plan, which forms part of the Civil design drawings associated with this submission.

The center courtyard area where the LTC Link addition is proposed will also result in modifications to the courtyard walkways and landscape areas. The details of the design shall be presented on the related landscape plans and are also shown on the Dwg. SG-1, Site Grading Plan.

Fire truck routes have been identified on the Dwg. A1.1, Site Plan by Ted Handy and Associated Inc. Architect. A reduced copy of this plan is provided in **Appendix 'A'**.

As a requirement of the amended Site Plan, a 0.5m widening is to be provide across the Grove Street frontage. This has been identified on all appropriate plans, and a draft reference plan has been prepared by Rudy Mak Surveying, OLS.

A pavement marking and signage plan has been prepared by Ted Handy and Associated Inc. Architects.

6.0 LOT GRADING:

The proposed parking lot area and driveway modifications and reconstruction in the southerly limit of the site shall be completed to standard engineering practices. The design of such has been provided on the related Dwg.G-1, Site Grading Plan which forms part of the Civil design drawings associated with this submission. A 'pre-engineering' topographical survey was also completed by the team OLS to ensure precise detailed data for the design. This data has been resented on the related Civil drawings. A reduced copy of the topographical survey plan has been provided in **Appendix 'B'**. .

The design of the area proposed for works typically provides minimum slopes of not less than 2% and maximum of slopes not greater than 7%. All grassed areas shall have minimum slopes of 2%. Any required berm works shall meet have slope not steeper than 3 horizontals to 1 vertical. The grading design shall match to all the abutting properties with slopes as noted above and all slopes shall not direct surface drainage into any abutting lands.

7.0 ENGINEERED FILL

Prior to receiving and/or removing fill from the site, a Fill Management Plan is to be provided in accordance with the City of Barrie By-law 2014-100.

As well, based on the shallow works associated with the storm sewer works and the building construction, permanent dewatering operations are not anticipated.

8.0 UTILITY SERVICING:

8.1 HYDRO

Alectra Utilities is the electrical service provider for the subject property. The electrical distribution to be provided via connection to the existing infrastructure within the site. The detailed design shall be provided by the electrical consultant. Once the details have been confirmed, such will be identified and coordinated with the detailed Civil design and coordinated accordingly on the Composite Utility Plan.

8.2 COMMUNICATIONS

Communication service shall be provided via connection to the existing servicing infrastructure within the subject property. Again, the details of these works shall be provided by the Electrical Consultant. Once the details have been confirmed, such will be identified and coordinated with the detailed Civil design and coordinated accordingly on the Composite Utility Plan.

8.3 NATURAL GAS

Enbridge Gas is the provider for the subject property. The details of these works shall be provided by Enbridge Gas. Once the details have been confirmed, such will be identified and coordinated with the detailed Civil design and coordinated accordingly on the Composite Utility Plan.

8.4 CABLE

Cable service shall be provided via connection to the existing infrastructure within the subject site. Once the details have been confirmed, such will be identified and coordinated with the detailed Civil design and coordinated accordingly on the Composite Utility Plan.

9.0 CONCLUSIONS:

The following is a brief summary of the existing and proposed servicing for the subject site development:

- The provision of storm sewers and on-site stormwater management controls have been as outlined in detail in **Section 2.0** above. Specifically, the on-site storm drainage systems shall outlet into the three (3) existing drainage system, these being, i) to the Davis Crescent storm sewer via a 657mm storm sewer on the east side of the site, ii) to Grove Street storm sewer system via the 450mm storm sewer

lead at the north limit of the site, and, iii) to Cook Street storm sewer system via the 200mm storm sewer lead at the east limit of the site. Additionally, on-site stormwater ponding areas are to be provide at locations adjacent to these three (3) outlet areas. Refer to the ponding area in **Appendix 'D'**.

There will also be the requirement to relocate some of the existing storm sewer system and modify the ponding limits for quantity control west and south of the proposed Aspen addition. Refer to Dwg. SS-1, Site Servicing Plan.

- The provision of watermains service for the existing buildings and the new building expansions shall be serviced as outlined in **Section 3.0** above. Specific for the new additions, connections shall be made to the existing water distribution systems within each of the abutting buildings where the additions are to be tied into. There are no other watermain works on site proposed.

- The provision of sanitary servicing for the existing and new building expansions shall be serviced as outlined in **Section 4.0**. Specific for the new additions, connections shall be made to the existing sanitary drain systems within each of the existing buildings where the additions are to be tied into. There will also be the requirement to relocate some of the existing sanitary sewer just west of the proposed Aspen addition. Refer to Dwg. SS-1, Site Servicing Plan.

- The site access/egress location onto Cook Street and Grove Street will remain unchanged. There will be the requirement to relocate the existing driveway and parking lot areas and sidewalks west and south of the proposed Aspen addition. The details of this are outlined in **Section 5.0** above. The detailed design is presented on Dwg. SG-1, Site Grading Plan.

- Lot grading is detailed in **Section 6.0** and as has been presented on the supporting Civil Site Grading Plan, Dwg. SG-1. The detailed design has been completed to meet the City of Barrie lot grading standards. Minor berming works will be required along the westerly limit of the site adjacent to the parking lot area west of the Aspen building addition.

- The provision of utility infrastructure as outlined in **Section 8.0** of this report and once available, will be identified on a supporting Civil Composite Utility Plan, Dwg. CUP-1.

In conclusion, it is recommended that the Approving Authorities support the application for the proposed County of Simcoe Paramedic Services Development as presented in the Site Plan Application.

Respectfully Submitted,

JFIVE Developments Ltd.
Consulting Engineer

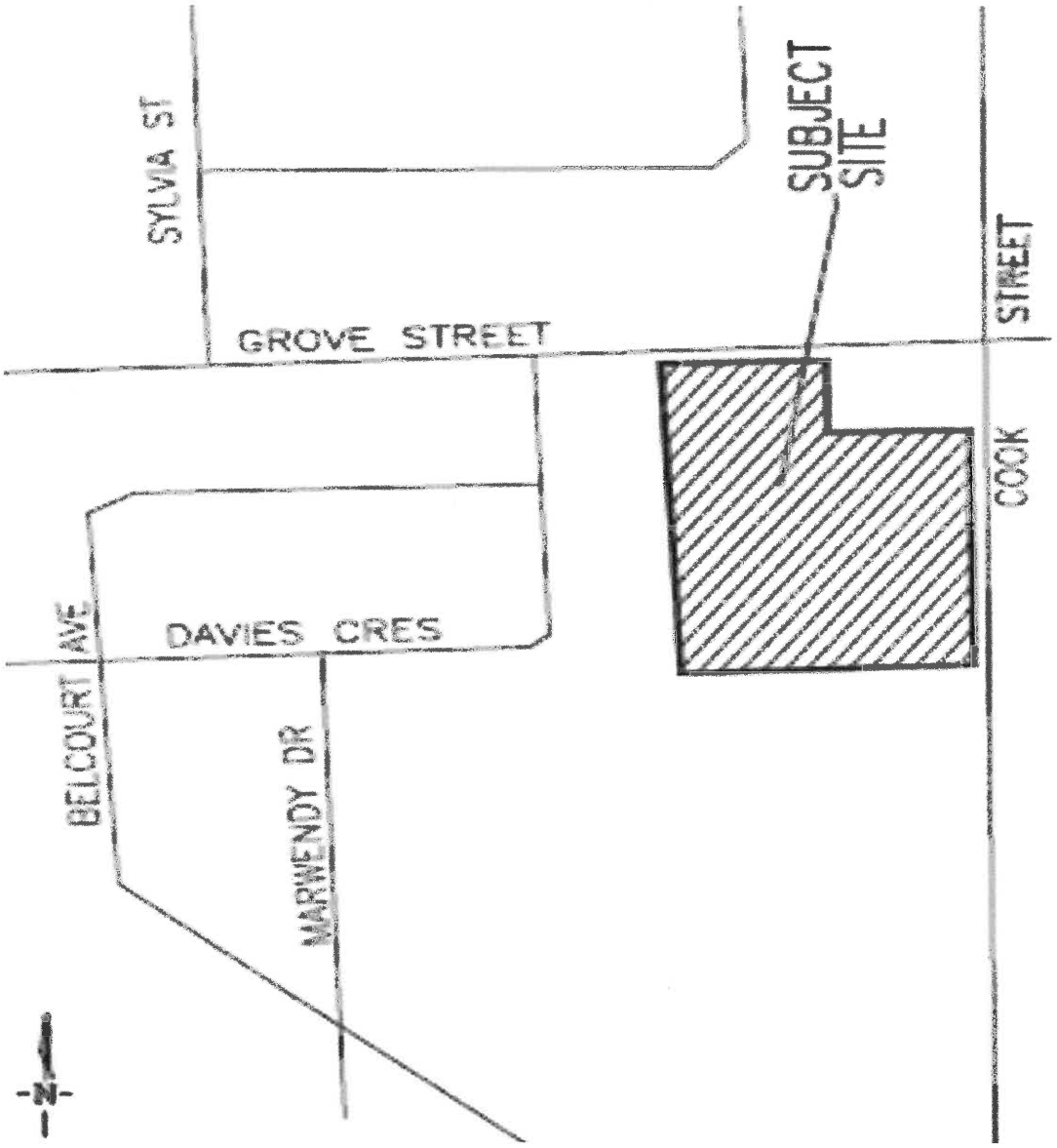
John Foster, P. Eng.
Project Manager/Senior Design Engineer

March 20, 2023

FIGURES

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301



LOCATION PLAN

FIGURE 1

APPENDIX 'A'

PROPOSED SITE PLAN
BY
TED HANDY AND ASSOCIATES
ARCHITECTS

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

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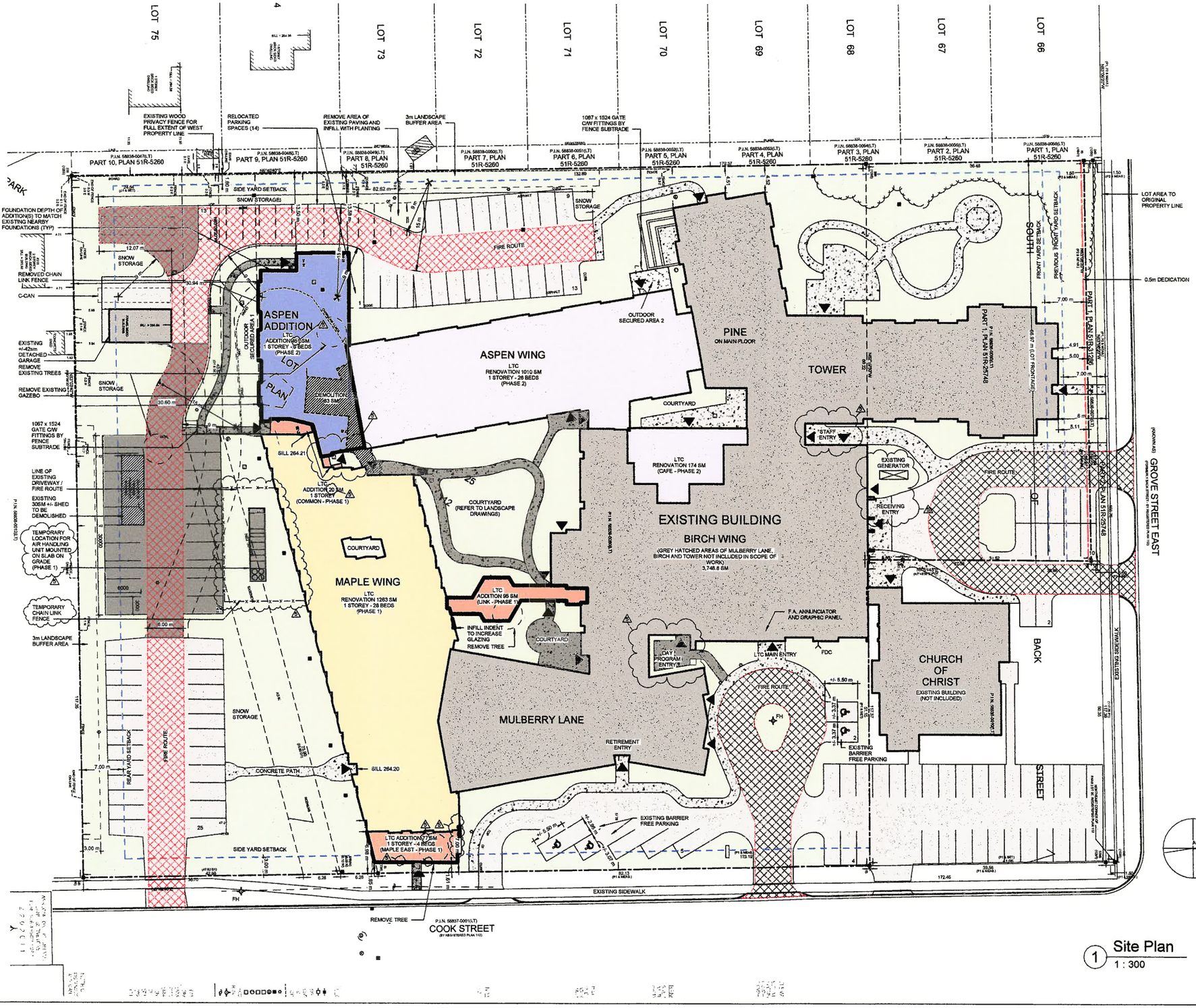


1 Site Plan
1 : 300

Site Context
1 : 5000

SITE INFORMATION - ZONING

ZONE: RM2

DESCRIPTION: PART 1 - PLAN OF SURVEY OF PART OF PARK LOT 25 SOUTH SIDE OF BACK STREET REGISTERED PLAN 112

MUNICIPAL ADDRESS: 234 COOK STREET, BARRIE, ON, L4M 4H5

	PROVIDED	REQUIRED
LOT AREA	18,167 m²	720 m²
LOT FRONTAGE (Grove Street)	98.97 m	21 m
BUILDING LOT COVERAGE:		
EXISTING GROVE PARK HOME (NOT INCL. BELOW)	6,276.8 m²	
DEMOLITION (PHASE 1 & 2)	-63 m²	
MAPLE EAST ADDITION (PHASE 1)	776 m²	
MAPLE WEST ADDITION (PHASE 1)	20 m²	
LINK ADDITION (PHASE 1)	96 m²	
ASPEN ADDITION (PHASE 2)	451m²	
TOTAL BUILDING LOT COVERAGE	6,956.8 m² (38%)	35% MAX.
ACCESSORY BUILDINGS:		
EXISTING DETACHED GARAGE (COVERAGE IS IN ADDITION TO ABOVE: SEE 5.3.5)	+/- 58 m² (0.3%)	10% MAX.
GROSS FLOOR AREA:		
EXISTING	9,129.6m² (50.3%)	
NEW (75+20+95+451)	641m²	
LESS REMOVED AREA	-83m²	
TOTAL GFA LOT COVERAGE	9,687.6m² (53.3%)	60%
SETBACKS:		
FRONT YARD (Grove Street)	6.0 m	7 m
SIDE YARD (Cook Street)	1.8 m*	3 m
SIDE YARD (West)	4.51 m	1.8 m
REAR YARD (South)	30.6 m	7 m
BUILDING HEIGHT:		
EXISTING GROVE PARK HOME (N.I.C. IN SCOPE)	< 10m	10 m MAX
EXISTING MAPLE	< 10m	
PROPOSED MAPLE	< 10m	
EXISTING ASPEN	< 10m	
PROPOSED ASPEN	< 10m	
LINK	< 10m	
PARKING:		
EXISTING (INCL. 2 SPACES ON CHURCH PROPERTY) 143 EXISTING LTC BEDS (72) 14 EXISTING RETIREMENTS SUITES (7) (INCLUDES 4 EXISTING BARRIER FREE SPACES)	84	
PROPOSED (2 BEDS ADDED = 1 SPACE REQ'D)	90	85
LANDSCAPE:		
LANDSCAPE OPEN SPACE INCL. WALKWAYS	39.5%	35% MIN

NOTES:
1. BACKGROUND SITE PLAN INFORMATION DERIVED FROM A101 SITE PLAN BY SALTER PILON FARROW ARCHITECTS, DATED MARCH 7, 2002 AND SURVEY BY RAIKES SURVEYING LTD DATED SEPTEMBER 27, 2002.
2. FOR GRADING PLAN & STORM WATER REFER TO CIVIL DRAWINGS BY JFIVE DEVELOPMENTS LTD.
3. REFER TO DRAWINGS BY E-LUMEN FOR ELECTRICAL INFORMATION, INCLUDING SITE LIGHTING AND PHOTOMETRICS.
4. REFER TO LANDSCAPE DRAWINGS BY LANDMARK ENVIRONMENTAL GROUP LTD FOR PLANTING
5. * = MINOR VARIENCE REQUIRED

LEGEND

- EXISTING CONCRETE
- CONCRETE
- EXISTING ASPHALT
- ASPHALT
- HEAVY DUTY ASPHALT
- EXISTING FIRE ROUTE
- NEW FIRE ROUTE
- LANDSCAPED AREA
- LANDSCAPE BUFFER AREA
- FH FIRE HYDRANT
- FDC FIRE DEPARTMENT CONNECTION

LEGEND

- EXISTING BUILDING (NIC)
- PHASE 1 RENOVATION
- PHASE 1 ADDITION
- PHASE 2 RENOVATION
- PHASE 2 ADDITION
- DEMOLITION

GENERAL NOTES

ALL DRAWINGS ARE THE PROPERTY OF THE ARCHITECT. REPRODUCTION OF DRAWINGS WITHOUT WRITTEN PERMISSION OF THE ARCHITECT IS PROHIBITED.

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE ARCHITECT IMMEDIATELY.

ALL WORK SHALL CONFORM TO THE LATEST EDITION OF THE ONTARIO BUILDING CODE.

IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO COORDINATE ALL STRUCTURAL, MECHANICAL AND ELECTRICAL WORK.

No.	Description	Date
1	Planning Preconsultation Submission	18 Jan 2023
2	Preliminary MLTC Submission	24 Jan 2023
3	Schematic Design Approval	10 Feb 2023
4	Minor Variance Submission	24 Feb 2023
5	Revisions	13 Mar 2023

TED HANDY and ASSOCIATES Inc. ARCHITECTS
76 Mary Street
Barrie, Ont L4N 1J1
tel /05 734 3580
fax /05 721 0265

Grove Park Home Redevelopment

234 Cook Street, Barrie

Site Plan

Project number 1758

A1.1

Scale As indicated

2023-03-13 3:18:55 PM

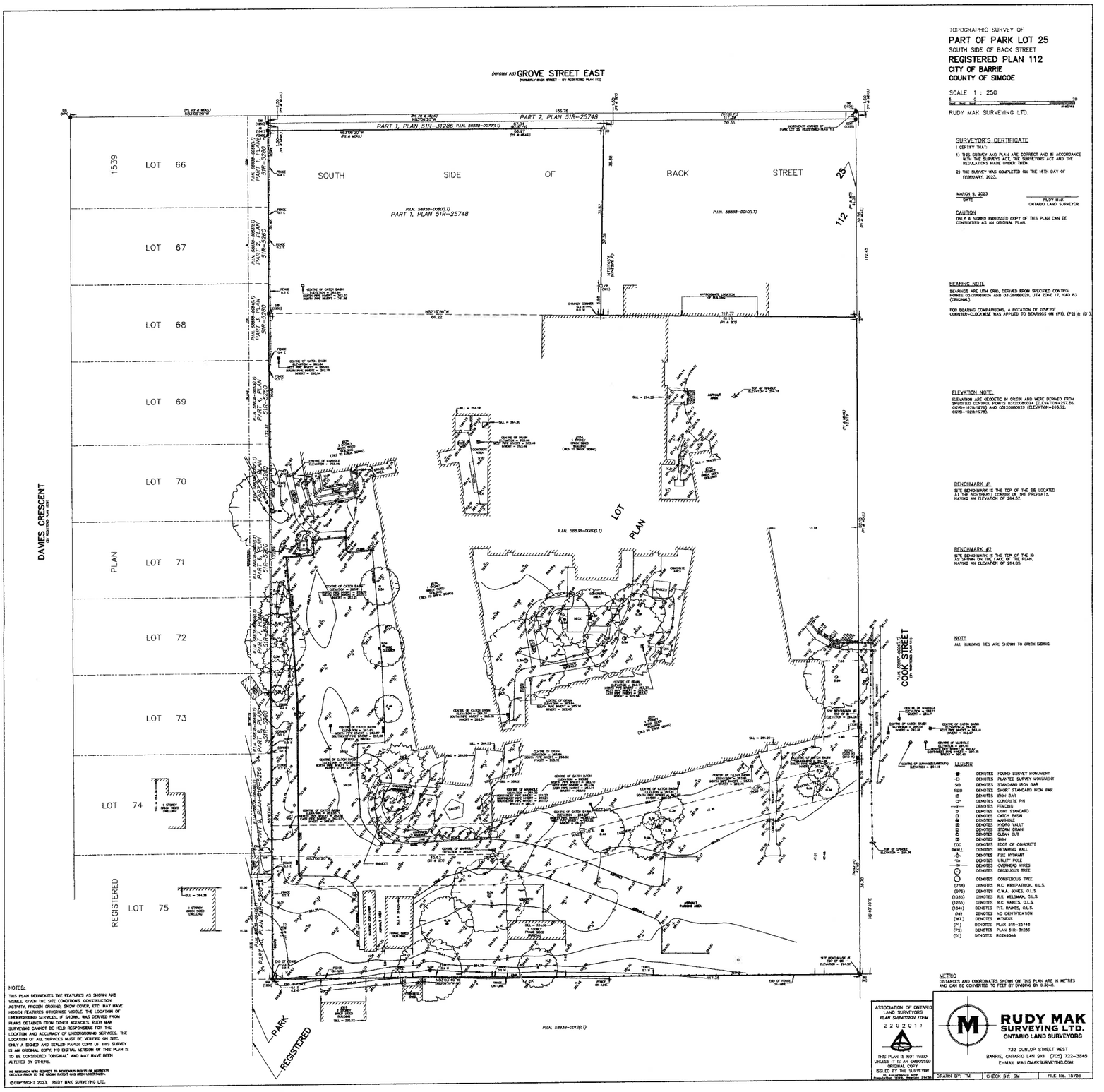
APPENDIX 'B'

Topographical Survey
by
Rudy Mak Surveying

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

PREPARED BY:

JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301



TOPOGRAPHIC SURVEY OF

PART OF PARK LOT 25

SOUTH SIDE OF BACK STREET

REGISTERED PLAN 112

CITY OF BARRIE

COUNTY OF SIMCOE

SCALE 1 : 250

0 5 10

RUDY MAK SURVEYING LTD.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.

2) THE SURVEY WAS COMPLETED ON THE 16TH DAY OF FEBRUARY, 2023.

MARCH 9, 2023
DATE

RUDY MAK
ONTARIO LAND SURVEYOR

CAUTION

ONLY A SIGNED EMBOSSED COPY OF THIS PLAN CAN BE CONSIDERED AS AN ORIGINAL PLAN.

BEARING NOTE

BEARINGS ARE UTM GRID, DERIVED FROM SPECIFIED CONTROL POINTS 0310080094 AND 0310080029, UTM ZONE 17, NAD 83 (ORIGINAL).

FOR BEARING COMPARISONS, A ROTATION OF 0°58'20" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON (P1), (P2) & (D1).

ELEVATION NOTE:

ELEVATION ARE GEODETIC BY ORIGIN AND WERE DERIVED FROM SPECIFIED CONTROL POINTS 0310080024 (ELEVATION=257.86, CGVD-1928:1978) AND 0310080029 (ELEVATION=263.72, CGVD-1928:1978).

BENCHMARK #1

SITE BENCHMARK @ THE TOP OF THE SB LOCATED AT THE NORTHEAST CORNER OF THE PROPERTY, HAVING AN ELEVATION OF 264.52.

BENCHMARK #2

SITE BENCHMARK @ THE TOP OF THE IB LOCATED AT THE S.W. LIMIT OF THE PLAN, HAVING AN ELEVATION OF 264.03.

NOTE

ALL BUILDING TIES ARE SHOWN TO BRICK SIDING.

LEGEND

●	DENOTES FOUND SURVEY MONUMENT
○	DENOTES PLANTED SURVEY MONUMENT
SB	DENOTES STANDARD IRON BAR
SIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
CP	DENOTES CONCRETE PIN
	DENOTES FENCING
S	DENOTES LIGHT STANDARD
C	DENOTES CATCH BASIN
M	DENOTES MANHOLE
H	DENOTES HYDRO VAULT
D	DENOTES STORM DRAIN
S	DENOTES CLEAN OUT
W	DENOTES WELL
	DENOTES EDGE OF CONCRETE
RWALL	DENOTES RETAINING WALL
FH	DENOTES FIRE HYDRANT
	DENOTES UTILITY POLE
	DENOTES OVERHEAD WIRES
	DENOTES DECIDUOUS TREE
	DENOTES CONIFEROUS TREE
(T.M)	DENOTES R.C. KIRKPATRICK, O.L.S.
(S.K)	DENOTES C.W.A. JONES, O.L.S.
(1655)	DENOTES R.E. WILLIAMS, O.L.S.
(1255)	DENOTES R.C. RAMES, O.L.S.
(1641)	DENOTES P.T. RAMES, O.L.S.
(M)	DENOTES NO IDENTIFICATION
(WIT.)	DENOTES WITNESS
(P1)	DENOTES PLAN 51R-25748
(P2)	DENOTES PLAN 51R-31286
(D1)	DENOTES RO49346

METRIC

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES:

THIS PLAN DELINEATES THE FEATURES AS SHOWN AND VISIBLE GIVEN THE SITE CONDITIONS. CONSTRUCTION ACTIVITY, FROZEN GROUND, SNOW COVER, ETC. MAY HAVE HIDDEN FEATURES OTHERWISE VISIBLE. THE LOCATION OF UNDERGROUND SERVICES, IF SHOWN, WAS DERIVED FROM PLANS OBTAINED FROM OTHER AGENCIES. RUDY MAK SURVEYING CANNOT BE HELD RESPONSIBLE FOR THE LOCATION AND ACCURACY OF UNDERGROUND SERVICES. THE LOCATION OF ALL SERVICES MUST BE VERIFIED ON SITE. ONLY A SIGNED AND SEALED PAPER COPY OF THIS SURVEY IS AN ORIGINAL COPY. NO DIGITAL VERSION OF THIS PLAN IS TO BE CONSIDERED "ORIGINAL" AND MAY HAVE BEEN ALTERED BY OTHERS.

NO PERSON MAY REPRINT OR REPRODUCE WORKS OR PORTIONS THEREOF FROM THIS PLAN WITHOUT THE WRITTEN CONSENT OF RUDY MAK SURVEYING LTD.

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2 2 0 2 0 1 1

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR

RUDY MAK SURVEYING LTD.
ONTARIO LAND SURVEYORS
732 DUNLOP STREET WEST
BARRIE, ONTARIO L4N 0Y1 (705) 722-3045
E-MAIL MAIL@MAKSURVEYING.COM

DRAWN BY: TM | CHECK BY: GM | FILE No. 15709

APPENDIX 'C'

Report of Storm Water Run-off
By
Jain & Associates,
Feb. 4, 2002

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301

REPORT
OF
STORM WATER RUN-OFF
GROVE PARK HOME
BARRIE, ONTARIO

Prepared by:
Jain & Associates Ltd.

February 4, 2002
Revised

1. GENERAL

Grove Park Nursing Home provides Long-Term Care Facilities for seniors. At present there are 93 beds and after the expansion facilities will increase by 65 beds making a total of 158 beds. The site is located at southwest corner of Cook Street and Grove Street with the municipal address of 234 Cook Street in Barrie.

2. SCOPE OF REPORT

Purpose of this report is to implement on site controls of storm water run-off to ensure post development flows do not exceeds the pre-developed levels from the proposed development conditions.

3. EXISTING CONDITIONS

The site is about 1.8167 hectares consisting of one storey building use as a nursing home and two parking lots. One parking lot is facing the Grove Street and other parking lot is located at the back of the building and mainly used by the staff. Both parking lots have paved surfaces.

In addition to these two parking lots some additional paved surfaces are also located in easterly direction of the building and used as an entrance from Cook Street to the building. This paved driveway sheet drains into existing catch basin located in grassed area close to sidewalk.

The site also has storm sewer system. The building storm line and all catch basins are connected through pipe system to a headwall located at west of property. The headwall is discharging all water to an open culvert running through the neighbouring property to Davies Crescent storm sewer system.

4. POSTDEVELOPMENT CONDITIONS

The expansion of present facility will include increase in residential building and paved parking spaces with asphalt driveways. No control roof drains are proposed as the major portion of the building has slope roof.

It was agreed with the City Engineering Department to reuse existing storm outlet for most of the existing storm sewer system. The new building with paved surface along Grove Street may be connected to Grove Street storm sewer system. One outlet to Cook Street for easterly parking lot is also proposed. All three outlets will be controlled to pre-develop levels. The outlet to present culvert outlet (to Davies Crescent) will be less because existing northerly paved surface which is connected to culvert, will have the proposed building addition and that will be connected to Grove Street storm sewer system.

4. POSTDEVELOPMENT CONDITIONS (Cont'd)

Due to reason the new south west parking doesn't require any retention but still it is proposed to control it to pre-develop level in order to utilise the existing sewer pipe sizes.

The following are the summary of all outlets contributing areas:

1) Flow to Grove Street storm system

Surface	Area.
Building(C=0.9)	0.1569 ha
Paved. (C=0.9)	0.0605 ha
Sod (C=0.25).	0.1545 ha
Total.	0.3719 ha
'C' factor.	0.63
Storage Required.	22.16 (See Appendix).

2) Flow to Cook Street storm sewer system: (Easterly Parking Lot)

Surface	Existing.	Proposed.
Paved: (C=0.9)	0.074 ha	0.09 ha
Sod (C=0.25)	0.1121 ha	0.096 ha
Total.	0.1861 ha	0.1861 ha
'C' factor	0.51	0.56
Storage required		1.63 cubic meters. (See Appendix)

3) Flow to Davies Street storm sewer system.

Surface	Existing.	Purposed.
Building(C=0.9)	0.4808 ha	0.4708 ha
Paved. (C=0.9)	0.3476 ha	0.24 ha
Sod (C=0.25).	0.8067 ha	0.5523 ha
Total.	1.6351 ha	1.6351 ha
'C' factor.	0.58	0.62
Storage Required.		0 cubic meters. (See Appendix).

5. STORM DISCHARGE

As stated above all the existing storm system from the site is discharging to an open culvert through headwall. Existing 675 mm storm sewer if already not available at property line, it will be extended to property subject to permission from the neighbours. The post development flow to this system will be less than the pre-develop flow. The storm discharge to Grove Street and Cook Street will be retained to pre-develop levels.

The attached calculations indicates 22 cubic meters of storage is required to retain the water to 5 years pre-develop levels to storm line discharging to Grove Street storm sewer system. The required storage will be provided inside pipes, manholes, catch basins and over the sod area to a height of 200mm.

The easterly parking lot will require only two cubic meters of storage to control to pre-develop levels before discharging to Cook Street storm sewer system.

The parking lot of 0.088 hectares that is located at south west of property is calculated separately in order to utilise the existing storm sewer line close by the parking lot. Storage of nine cubic meters is required.

6. RETENTION

The area affected by the retention of storm water is indicated on drawing M101. The maximum possible pond depth will be about 300mm. Retention at this depth will provide storage for 100 years storm intensity.

7. OVERFLOW

The present topographic information indicates that the present culvert used as an outlet of storm water discharge from the site is at lowest elevation. It is intended to use this outlet as an emergency overflow for storm of 100 years or more. This is in order to prevent any water backing into building and maintain present topography.

8. QUALITY CONTROLS

During construction each catch basin will be provided with sedimentation controls as detailed on Drawing M101.

In addition to this Stormceptors are also provided to maintain quality of water before discharging to street storm sewer system.

9. CONCLUSION

The existing and proposed conditions presented indicates the peak rate of site run-off discharge into storm sewer systems of Cook Street and Grove Street is within 5- years of storm intensities. The discharge to Davies Street storm sewer will be less than the present discharge.

The increase in run-off will be retained over the two parking lots and in sod areas to a safe limit of 300 mm depth.

Present topography is not altered and the present outlet to Davies Crescent is also utilised.

The quality measures implemented during construction to prevent any mud water flows into storm sewer system.

On the basis of above analysis the storm winter run-off from the site will meet quality and quantity criteria.

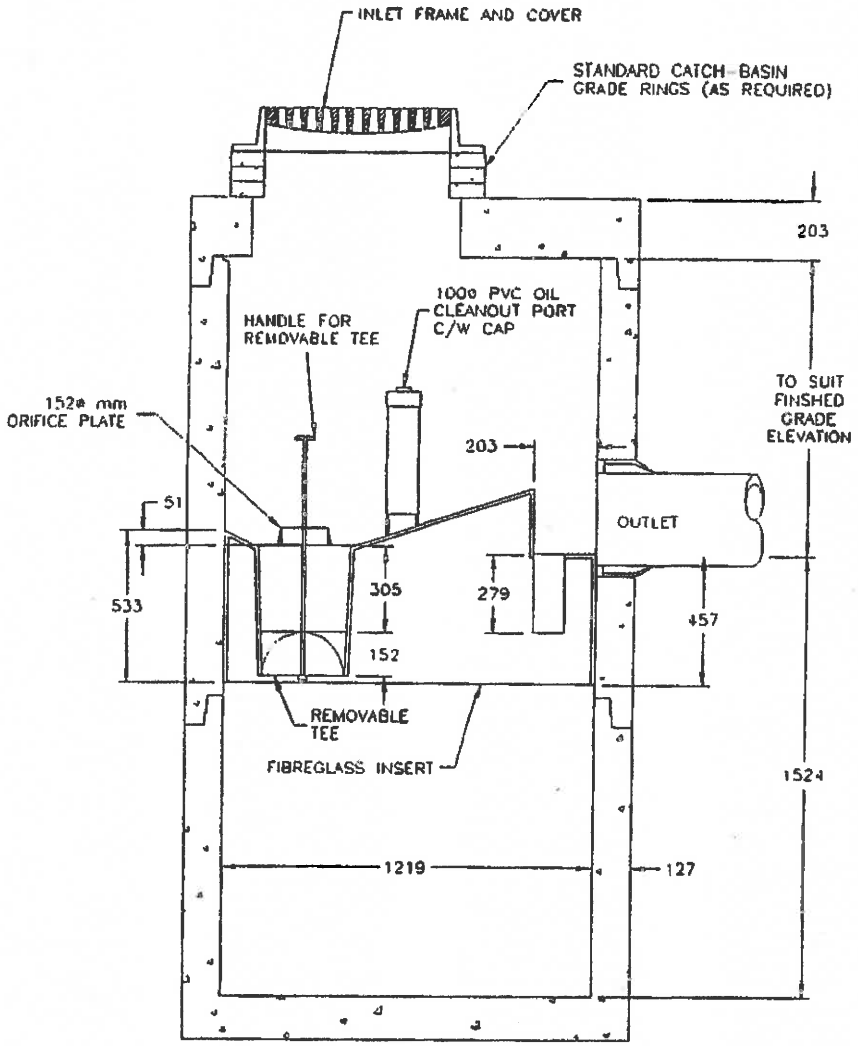
Stormceptor Sizing Table

Drainage Area (ha)	Annual Runoff Volume by Model (%)									Annual TSS Removal by Model (%)									Drainage Area (ha)
	300	750	1000	1500	2000	3000	4000	5000	6000	300	750	1000	1500	2000	3000	4000	5000	6000	
0.1	95	99	99	99	100	100	100	100	100	85	91	91	92	94	95	96	96	97	0.1
0.3	83	97	97	97	99	99	99	99	100	73	83	84	84	87	88	91	91	93	0.3
0.5	74	93	93	93	97	97	99	99	99	67	78	79	80	83	84	87	88	90	0.5
0.7	66	89	89	89	94	94	98	98	99	62	74	75	76	80	81	85	86	88	0.7
0.9	60	87	87	87	92	92	96	96	98	58	71	73	73	77	79	83	83	86	0.9
1.1	55	84	84	84	91	91	95	95	97	55	69	70	71	75	77	81	82	84	1.1
1.3	51	81	81	81	89	89	94	94	96	52	67	68	69	73	75	79	80	82	1.3
1.5	47	79	79	79	87	87	93	93	95	50	65	67	67	72	73	78	78	81	1.5
1.7	44	76	76	76	85	85	92	92	95	48	64	65	65	70	72	76	77	80	1.7
1.9	41	74	74	74	84	84	91	91	94	46	62	63	64	69	70	75	76	79	1.9
2.1	39	72	72	72	82	82	90	90	93	44	61	62	62	68	69	74	75	78	2.1
2.3	37	70	70	70	81	81	89	89	92	43	60	61	61	66	68	73	74	77	2.3
2.5	35	68	68	68	79	79	88	88	91	41	59	60	60	65	67	72	73	76	2.5
2.7	33	66	66	66	78	78	87	87	91	40	57	59	59	64	66	71	72	75	2.7
2.9	32	65	65	65	77	77	86	86	90	39	56	58	58	64	65	70	71	74	2.9
3.1	30	63	63	63	75	75	85	85	89	38	55	57	57	63	64	70	70	74	3.1
3.3	29	62	62	62	74	74	84	84	89	37	55	56	56	62	63	69	70	73	3.3
3.5	28	60	60	60	73	73	83	83	88	36	54	55	55	61	62	68	69	72	3.5
3.7	27	59	59	59	72	72	82	82	87	36	53	54	54	60	62	67	68	72	3.7
3.9	26	57	57	57	71	71	81	81	87	35	52	53	53	60	61	67	68	71	3.9
4.1	25	56	56	56	69	69	80	80	86	34	51	52	53	59	60	66	67	71	4.1
4.3	24	55	55	55	68	68	80	80	85	34	51	52	52	58	60	66	66	70	4.3
4.5	24	54	54	54	67	67	79	79	85	33	50	51	51	58	59	65	66	69	4.5
4.7	23	53	53	53	66	66	78	78	84	32	49	50	50	57	58	65	65	69	4.7
4.9	22	52	52	52	65	65	77	77	83	32	49	50	50	56	58	64	65	68	4.9

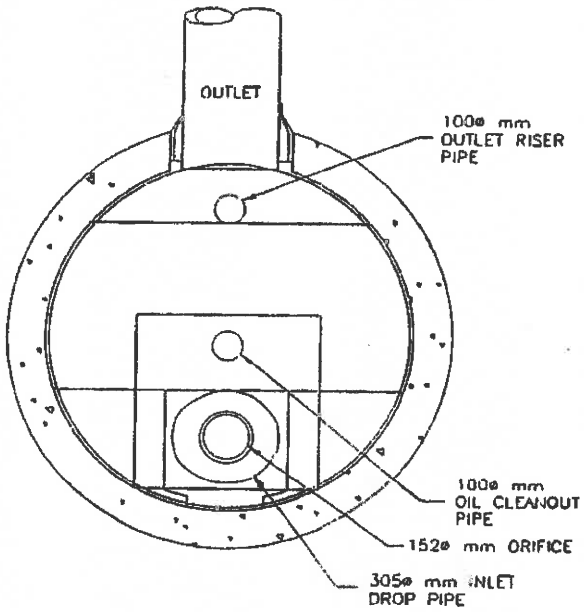
Notes:

1. All estimates are based on simulations using the Expert 2.0 Sizing Program.
2. Simulations are based on Toronto Central rainfall data, 1986-1996. All drainage areas assumed were 100% impervious.
3. Simulations are based on no upstream control.
4. All values are based on Fine Particle Distribution.
5. STC 300i is recommended for inlet applications only.

LEVEL I = 80%
II = 70%
III 60%



SECTION VIEW



PLAN VIEW

NOTES:
1. ACCESS OPENING SHOULD BE LOCATED OVER THE OIL CLEANOUT PORT TO ALLOW FOR INSPECTION AND MAINTENANCE FROM THE SURFACE
2. PIPE INSTALLATION BY NON-SHRINK GROUT OR FLEXIBLE BOOTS.

DESIGN SPECIFICATIONS:
1. MANUFACTURED TO CSA A257.4
2. CONCRETE STRENGTH: 30 MPa
3. REINFORCING STEEL: 448 MPa
4. WELDED WIRE FABRIC TO CSA G30.5
5. CONCRETE COVER TO STEEL: 25 mm MIN.
6. DESIGNED TO OHBDC '91 3rd EDITION LOADING

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:

CANADIAN PATENT NO. 2,009,208
CANADIAN PATENT NO. 2,137,942
CANADIAN PATENT NO. 2,175,277
CANADIAN PATENT NO. 2,180,305

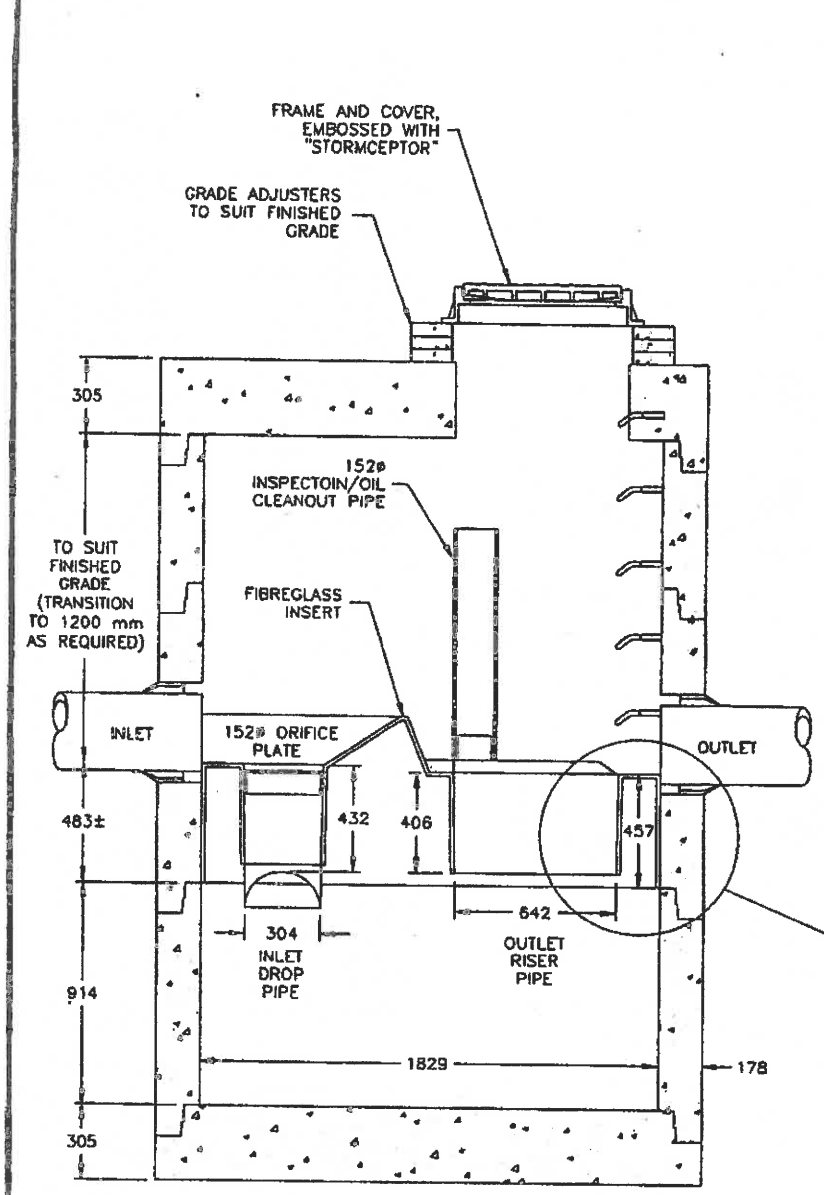
STORMCEPTOR MODEL STC 300i CAPACITIES				
MAXIMUM TREATMENT FLOWRATE (L/s)	DOWN PIPE DIAMETER/ ORIFICE (mm)	SEDIMENT CAPACITY (L)	OIL CAPACITY (L)	TOTAL HOLDING CAPACITY (L)
5	100	950	350	1425

Centennial Concrete Pipe & Products Inc.

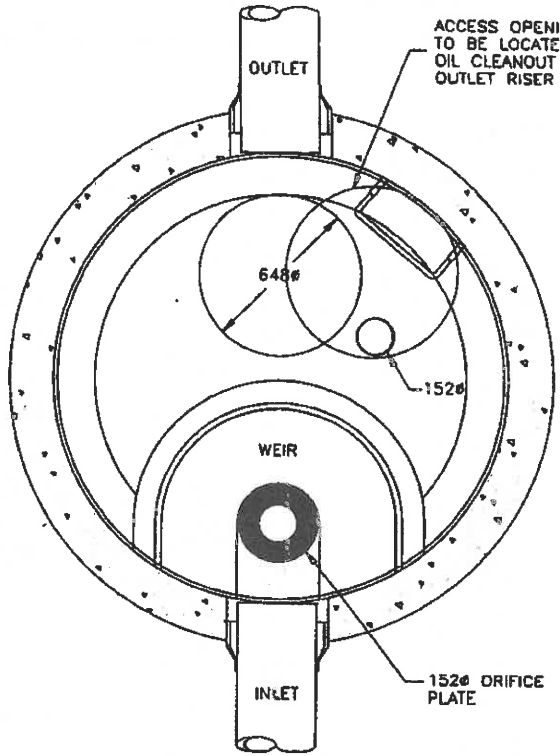
Stormceptor®

STC-300i
INLET STORMCEPTOR
300 GALLON CAPACITY

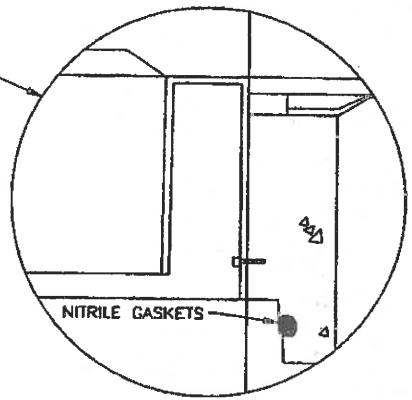
DATE: 10 MAY 00
D.B. B.L. | UNITS METRIC | SCALE: 1:25



SECTION VIEW



PLAN VIEW



Notes:
1. 610 mm OUTLET RISER PIPE TO BE USED FOR CLEANOUT ACCESS TO THE TREATMENT CHAMBER.
2. ACCESS WAY IS OFFSET TO ALLOW ACCESS TO THE FIBREGLASS BYPASS SLAB AND TO ALLOW FOR INSPECTION AND MAINTENANCE FROM THE SURFACE.
3 PIPE INSTALLATION BY NON-SHRINK GROUT OR FLEXIBLE BOOTS.
4. SAFETY GRATES FOR THE 610 mm OUTLET RISER PIPE ARE PROVIDED.

DESIGN SPECIFICATIONS:
1. MANUFACTURED TO CSA A257.4
2. CONCRETE STRENGTH: 30 MPa
3. REINFORCING STEEL: 448 MPa
4. WELDED WIRE FABRIC TO CSA G30.5
5. CONCRETE COVER TO STEEL: 25 mm MIN.
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CANADIAN PATENT NO. 2,137,942
CANADIAN PATENT NO. 2,175,277
CANADIAN PATENT NO. 2,180,305

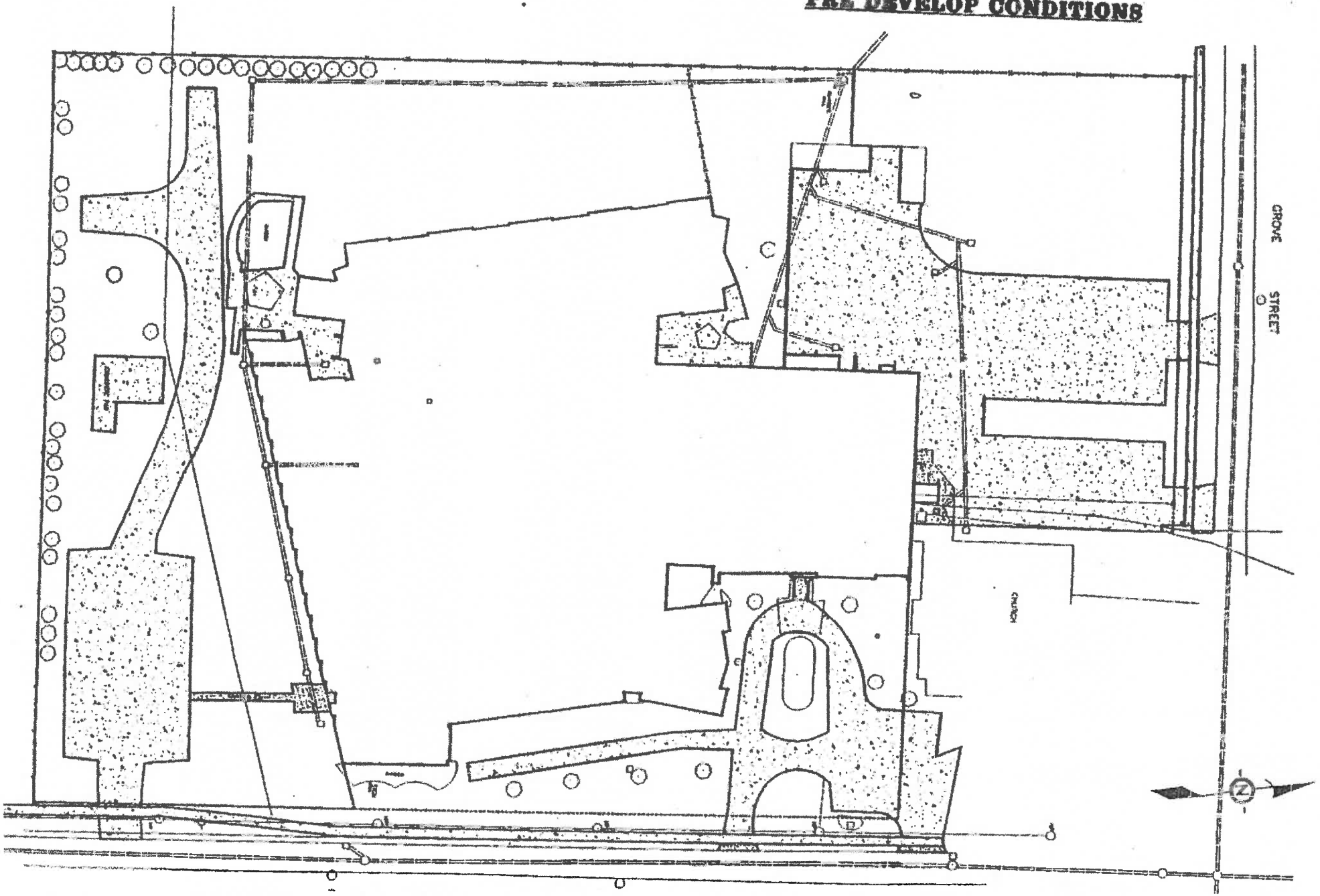
Centennial
Concrete Pipe & Products Inc.

Stormceptor®

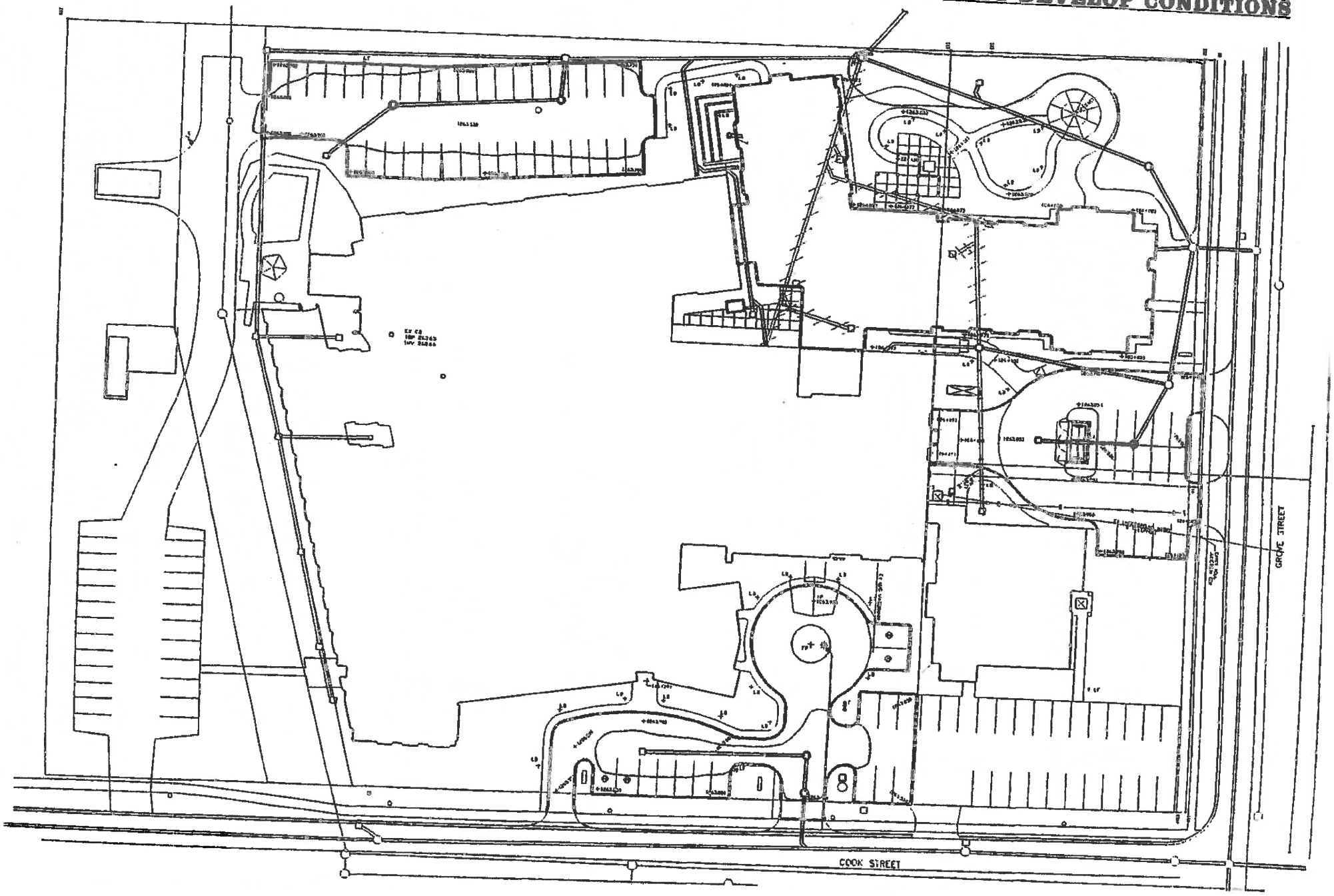
STC-750
IN-LINE STORMCEPTOR
750 GALLON CAPACITY

DATE: 17 MAR 00			
D.B. B.L.	UNITS: METRIC	SCALE: 1:30	

PRE DEVELOP CONDITIONS



POST DEVELOP CONDITIONS



APPENDIX

GROVE PARK - NURSING HOME
Flow from Building and N.Parking
to Grove Street storm sewer system.- 5 year storm

Year	A	B
2	20.8	-0.683
5	27.9	-0.674
10	32.7	-0.67
25	38.6	-0.667
50	43	-0.665
100	47.4	-0.663

COPY COLUMNS A,B, FROM ABOVE
FOR THE REQUIRED STORM INTO THE
ROW BELOW:

27.9	-0.674

T.C. (min):	10
C (PRE DEVELOPMENT):	0.25
C (POST DEVELOPMENT):	0.63

		Post-dev.
AREAS:	ROOF(ha):	0.1569
	PARKING(ha):	0.0605
	GRASS(ha):	0.1545
	TOTAL(ha):	0.3719

ALLOWABLE PRE DEV.	0.024
ROOF DISCH. (cms):	0
UNCONTROLLED FLOW:	0.0
RELEASE RATE (cms):	0.024

TIME	I (mm/hr)	Q (cms)	STORE Q.
10	93.34	0.06	22.16
11	87.53	0.06	21.86
12	82.55	0.05	21.49
13	78.21	0.05	21.07
14	74.40	0.05	20.59
15	71.02	0.05	20.06
16	68.00	0.04	19.50
17	65.28	0.04	18.89
18	62.81	0.04	18.26
19	60.56	0.04	17.59
20	58.50	0.04	16.89

Storage Required (m^3):	22.2
Top of Water Elevation (m):	263.200
Oriface Elevation (m):	262.225
Head (m)	0.975
Q (cms)	0.024
g (m/s^2)	9.81
c	0.6
d (mm)	109

GROVE PARK - NURSING HOME
Flow from east parking to Cook Street - 5 years storm.
(CB#1 & CB/mh#1)

Year	A	B
2	20.8	-0.683
5	27.9	-0.674
10	32.7	-0.67
25	38.6	-0.667
50	43	-0.665
100	47.4	-0.663

COPY COLUMNS A,B, FROM ABOVE
FOR THE REQUIRED STORM INTO THE
ROW BELOW:

	27.9	-0.674
T.C. (min):	10	
C (PRE DEVELOPMENT):	0.51	
C (POST DEVELOPMENT):	0.56	

		Pre-dev.	Post-dev.
AREAS:	ROOF(ha):	0	0
	PARKING(ha):	0.074	0.09
	GRASS(ha):	0.112	0.096
	TOTAL(ha):	0.186	0.186

ALLOWABLE PRE DEV.	0.02
ROOF DISCH. (cms):	0
UNCONTROLLED FLOW:	0.0
RELEASE RATE (cms):	0.02

TIME	I (mm/hr)	Q (cms)	STORE Q.
10	93.34	0.03	1.63
11	87.53	0.02	0.00
12	82.55	0.02	0.00
13	78.21	0.02	0.00
14	74.40	0.02	0.00
15	71.02	0.02	0.00

Storage Required (m^3):	1.6
Top of Water Elevation (m):	263.700
Oriface Elevation (m):	262.750
Head (m)	0.950
Q (cms)	0.025
g (m/s^2)	9.81
c	0.6
d (mm)	110

GROVE PARK - NURSING HOME
Flow to Davies Street storm system - 5 years.

Year	A	B
2	20.8	-0.683
5	27.9	-0.674
10	32.7	-0.67
25	38.6	-0.667
50	43	-0.665
100	47.4	-0.663

COPY COLUMNS A,B, FROM ABOVE
FOR THE REQUIRED STORM INTO THE
ROW BELOW:

27.9 -0.674

T.C. (min): 10

C (PRE DEVELOPMENT): 0.58

C (POST DEVELOPMENT): 0.62

		Pre-dev.	Post-dev.
AREAS:	ROOF(ha):	0.4808	0.4708
	PARKING(ha):	0.3476	0.24
	GRASS(ha):	0.8067	0.5523
	TOTAL(ha):	1.6351	1.2631

ALLOWABLE PRE DEV. 0.25 CMS (1.635x0.58x93.34x0.0028)

ROOF DISCH. (cms): 0

UNCONTROLLED FLOW: 0.0

RELEASE RATE (cms): 0.20 (1.263x0.62x93.34x0.0028)

STORAGE REQUIRED. 0

GROVE PARK - NURSING HOME
Flow from SOUTH WEST parking - 5 years storm.
(CB#3, CB/MH#2, CB/MH#8)

Year	A	B
2	20.8	-0.683
5	27.9	-0.674
10	32.7	-0.67
25	38.6	-0.667
50	43	-0.665
100	47.4	-0.663

COPY COLUMNS A,B, FROM ABOVE
FOR THE REQUIRED STORM INTO THE
ROW BELOW:

	27.9	-0.674

T.C. (min):		10
C (PRE DEVELOPMENT):		0.25
C (POST DEVELOPMENT):		0.90

		Post Dev.
AREAS:	ROOF(ha):	0
	PARKING(ha):	0.088
	GRASS(ha):	0
	TOTAL(ha):	0.088

ALLOWABLE PRE DEV.	0.006
ROOF DISCH. (cms):	0
UNCONTROLLED FLOW:	0.0
RELEASE RATE (cms):	0.006

TIME	I (mm/hr)	Q (cms)	STORE Q.
10	93.34	0.02	8.97
11	87.53	0.02	9.02
12	82.55	0.02	9.04
13	78.21	0.02	9.04
14	74.40	0.02	9.03
15	71.02	0.02	9.00
16	68.00	0.02	8.96
17	65.28	0.01	8.90
18	62.81	0.01	8.83
19	60.56	0.01	8.76
20	58.50	0.01	8.67
21	56.61	0.01	8.57
22	54.86	0.01	8.47
23	53.24	0.01	8.36
24	51.74	0.01	8.24
25	50.33	0.01	8.12
26	49.02	0.01	7.99
27	47.79	0.01	7.85
28	46.63	0.01	7.71
29	45.54	0.01	7.57
30	44.51	0.01	7.42
31	43.54	0.01	7.26
32	42.62	0.01	7.11
33	41.74	0.01	6.94
34	40.91	0.01	6.78
35	40.12	0.01	6.61

Storage Required (m^3):	9.0
Top of Water Elevation (m):	263.800
Oriface Elevation (m):	262.830
Head (m)	0.970
Q (cms)	0.006
g (m/s^2)	9.81
c	0.6
d (mm)	53
proposed	75mm

APPENDIX 'D'

Site Plan Mechanical
Dwg. M101
By
Jain & Associates,
March 7, 2002

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

PREPARED BY:

JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301

APPENDIX 'D'

Site Plan Mechanical
Dwg. M101
By
Jain & Associates,
March 7, 2002

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

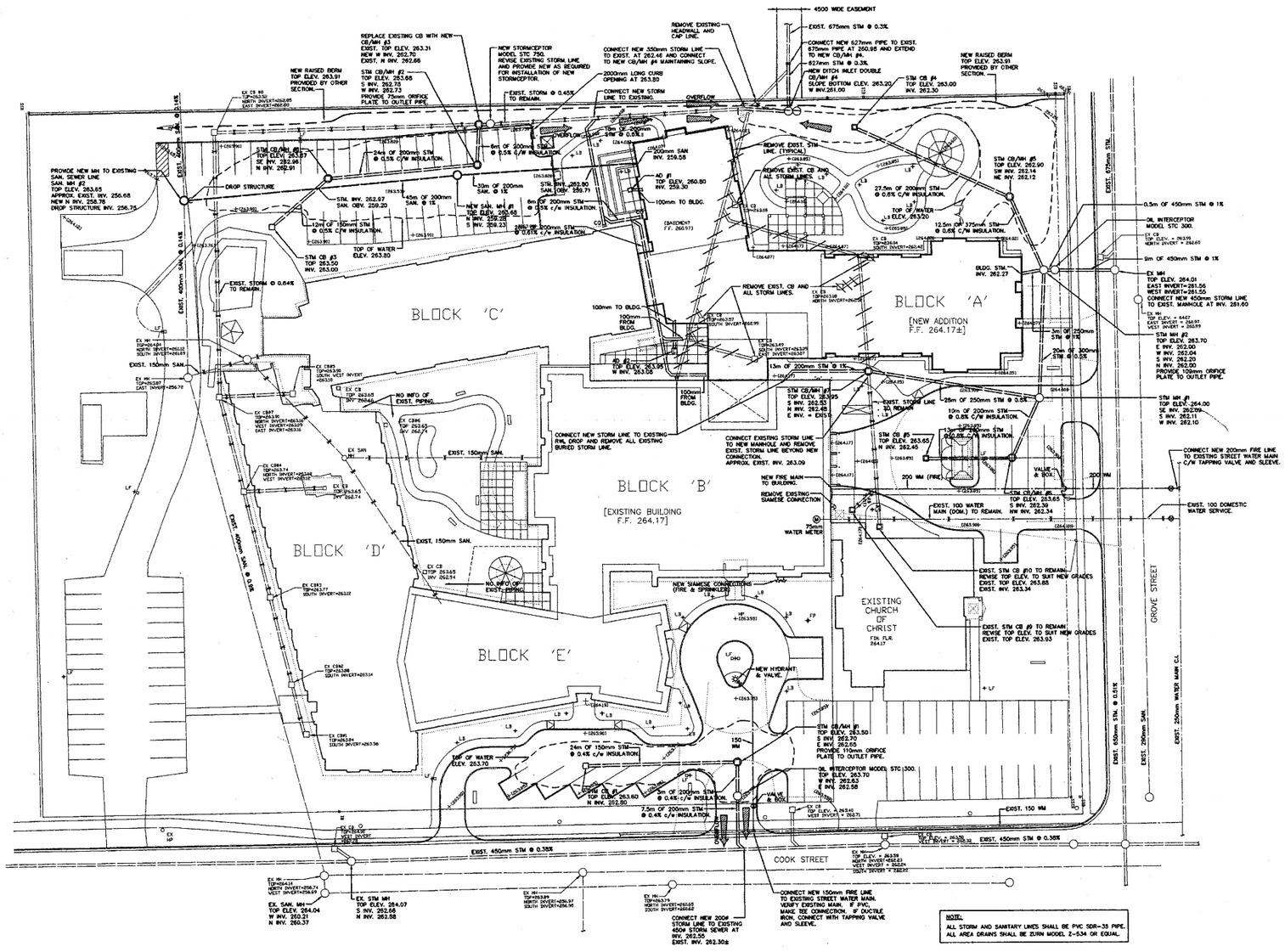
PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301

PLUMBING & DRAINAGE LEGEND

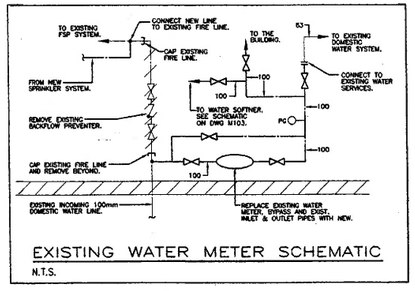
	SANITARY DRAIN (ABOVE GRADE)
	SANITARY DRAIN (BELOW GRADE)
	STORM DRAIN (ABOVE GRADE)
	STORM DRAIN (BELOW GRADE)
V	VENT LINE
D	DOMESTIC COLD WATER LINE
H	DOMESTIC HOT WATER LINE
HC	DOMESTIC RECIRCULATION LINE
F	FIRE LINE (STANDPIPE SYSTEM)
G	GAS LINE
T	TEMPERED WATER LINE
	EXISTING PIPING TO REMAIN
	EXISTING PIPING TO BE REMOVED
T	CONNECT NEW PIPE TO EXISTING PIPE
CO	CLEANOUT
HB	HOSE BIBB
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
RH	ROOF HOPPER
RH (1)	ROOF HOPPER
	NUMBER OF WEIRS
	GATE VALVE
	CHECK VALVE
	GLOBE VALVE
	UNION
	STRAINER
MS	RECIRCULATION LINE CONTROL 'DOLE' FITTING & SIZE
	ELECTRICALLY SUPERVISED VALVE (MONITORING SWITCH)
AD	ACID RESISTANT DRAIN
F.H.C.	FIRE HOSE CABINET
F.E.	FIRE EXTINGUISHER
F.E. & CAB	FIRE EXTINGUISHER & CABINET
T.V. & F.	TRAP, VENT & FLUSH
M.H.	MANHOLE
A.D.	AREA DRAIN
C.B.	CATCHBASIN
P.A.	PIPE ANCHOR
R.W.L.	RAINWATER LEADER
B.W.V.	BACK WATER VALVE

ONTARIO PROVINCIAL STANDARD

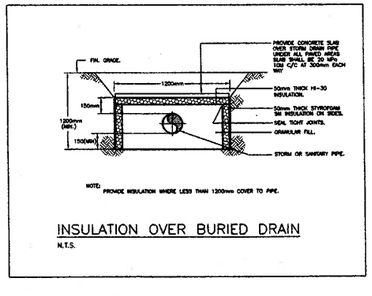
OPSD – 400.02	CATCHBASIN : FRAME & GRATE
OPSD – 401.03	MANHOLE FRAME & GRATE (WITH TIGHT)
OPSD – 405.01	MANHOLE STEPS.
OPSD – 700.03	CATCHBASIN AND MANHOLE.
OPSD – 701.01	PRECAST MANHOLE 1200mm DIAMETER.
OPSD – 701.02	PRECAST MANHOLE
OPSD – 701.03	PRECAST MANHOLE COMPONENTS.
OPSD – 705.02	PRECAST CATCHBASIN (600x600mm)
OPSD – 708.01	CATCHBASIN CONNECTION.
OPSD – 802.03	BEDDING FOR STORM SEWER UP TO 1800mm DIAMETER. (RIGID PIPE)
OPSD – 1000.01	SANITARY MANHOLE.
OPSD – 1003.01	MANHOLE DROP STRUCTURE
OPSD – 1003.02	MANHOLE DROP STRUCTURE.
OPSD – 1004.01	BENCHING DETAILS.
OPSD – 1005.01	BEDDING FOR SANITARY.
OPSD – 1100.02	GATE VALVES
OPSD – 1101.02	VALVE OPERATOR
OPSD – 1102.01	BEDDING FOR WATER MAIN.
OPSD – 1103. 01	THRUST BLOCK
OPSD – 1105.01	HYDRANT



NOTE:
ALL STORM AND SANITARY LINES SHALL BE PVC SDR-35 PIPE.
ALL AREA DRAINS SHALL BE ZURN MODEL Z-534 OR EQUAL.

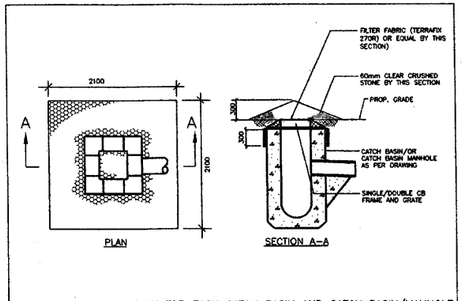


EXISTING WATER METER SCHEMATIC
N.T.S.



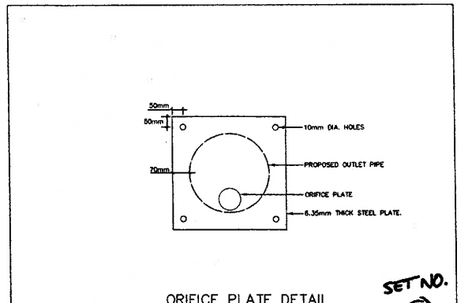
NOTE: PROVIDE INSULATION WHERE LESS THAN 1200mm COVER TO PIPE.

INSULATION OVER BURIED DRAIN
N.T.S.



PLAN SECTION A–A

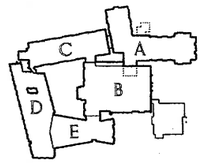
TEMPORARY SEDIMENTATION FOR EACH CATCH BASIN AND CATCH BASIN/MANHOLE
N.T.S.



ORIFICE PLATE DETAIL
N.T.C.

SET NO. 2

Grove Park HOME



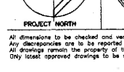
BEFORE COMMENCING WORK

CHECK AND VERIFY LOCATION OF ALL PIPES, DUCTS AND EQUIPMENT WITH ALL OTHER TRADES TO PREVENT INTERFERENCE.
REMOVAL OR RELOCATION OF ANY SUCH WORK INTERFERING WITH WORK OF OTHER TRADES IS THE RESPONSIBILITY OF THE MECHANICAL TRADE CONCERNED UNLESS OTHERWISE APPROVED IN WRITING.

Mechanical

No.	Revisions	Date
1	ISSUED FOR TENDER	MAR. 7/02

Orientation



Seal

01-150

All dimensions to be checked and verified on the job. Any discrepancies are to be reported to the Consultant. All drawings remain the property of the Consultant. Only issued approved drawings to be used for construction.

JAIN & Associates Limited
CONSULTING ENGINEERS
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MISSISSAUGA, ONTARIO L4Z 1X3
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Project

REDEVELOPMENT OF
GROVE PARK HOME
LONG TERM CARE FACILITY & RETIREMENT LIVING UNITS

Location
234 COOK STREET BARRIE, ONTARIO

For
Grove Park Home for Senior Citizens

Drawing Title
SITE PLAN MECHANICAL

Date	MAR. 7/02	Project No	Drawing No
Drawn by	T.T./M.M.	0060	M101
Scale	1:300		

APPENDIX 'E'

Stormwater Management Calculations

DATE: **MARCH 17, 2023**
PROJECT NO.: **#168**

PREPARED BY:
JFIVE Developments Ltd.
Consulting Engineer, Barrie, Ontario (705) 794-0301

Grove Park Retirement Home

a) Flows to Davies Crescent storm sewer system – 5 year

City of Barrie IDF formula:

Year	A	B	C	I (mm/hr)
2	678.085 4.699	0.781	83.1	
5	853.608 4.699	0.766	108.9	
10	975.865 4.699	0.760	126.5	
25	1143.275	4.922	0.757	147.8
50	1236.152	4.699	0.751	164.2
100	1426.408	5.273	0.759	180.2

Where I (mm/hr) = $A/(t+B)^C$,

Where:			
	TC (min)	=	10 minutes
	R (pre-development)	=	0.58
	R (post development)	=	0.79

2- yr. storm event calculation:

- Allowed pre-development Q (2yr) (prior to 2002) = (1.6351 x 0.58 x 72 x 0.0028) = 0.191 cms
- Post development Q (2yr) (design for 2023) = (1.2631 x 0.79 x 83.1 x 0.0028)= 0.232 cms

5-year storm event calculation:

- Allowed pre-development Q (5yr) (prior to 2002) = (1.6351 x 0.58 x 93.34 x 0.0028)= 0.248 cms
- Post development Q (5yr) (design for 2023) = (1.2631 x 0.79 x 108.9 x 0.0028)= 0.304 cms

Therefore, quantity control is required for the site area which is subject to additional development of the building expansions and the parking lot/driveway expansion. This is understandable because of the in the 'R' value plus the addition increase in the Intensities of the new IDF curve values since the latest design of 2002. As such, there will be a need to provide for additional on-site stormwater storage volume.

The Bowstring Method of Storage Calculations was used to determine the orifice sizing and the required storage for the area discharging to the west out of the site. See the following pages for the calculation spread sheet use. Some of the specifics provide in the calculations are as follows:

The required flow rates have been determined above for the 2-year and 5-year events. The level of assessment reflects that which was required in the 2002 design completed for the last site expansion:

For max. allowed flow rate in the calculation sheet has been multiplied by 65% for each storm event to reflect the approx. average release rate due to a variable head release rate on the proposed orifice control pipe.

i.e 2-yr allowed release rate = 0.191 x 0.65 = 0.1242 cms
5-yr allowed release rate = 0.248 x 0.65 = 0.1612 cms

JFIVE Developments Ltd.
Consulting Engineer

Project No.: 168	File: 168
Date: MARCH 20/23	Sheet No. 2 of 7
Design By: JF	Checked By: JF
Subject: SWM CALCULATIONS	

Davis Crescent Outlet:

A) UNDERGROUND STORAGE TO MAX. WL = 263.90 m

Ex. CB #1	T/L = 263.89, INV = 263.41	= 0.6 x 0.6 x (263.89 - 263.41)	= 0.17	m^3
Ex CB #2	T/L = 263.91, INV = 263.16	= 0.6 x 0.6 x (263.90 - 263.16)	= 0.27	"
Ex CB #3	T/L = 263.31, INV = 263.08	= 0.6 x 0.6 x (263.31 - 263.08)	= 0.26	"
NEW CBMH #4	T/L = 263.78, INV = 263.22	= $(\frac{1.2}{2})^2 \pi$ x (263.78 - 263.22)	= 0.63	"
NEW CB #1	T/L = 263.86, INV = 263.40	= 0.6 x 0.6 x (263.86 - 263.40)	= 0.17	"
Ex. CB #7	T/L = 263.82, INV = 263.09	= 0.6 x 0.6 x (263.82 - 263.09)	= 0.26	"
PROP. CB #2	T/L = 263.85, INV = 263.04	= $(\frac{1.2}{2})^2 \pi$ x (263.85 - 263.04)	= 0.92	"
PROP. CB #3	T/L = 263.73, INV = 263.10	= 0.6 x 0.6 x (263.73 - 263.10)	= 0.23	"
PROP. CBMH #4	T/L = 263.55, INV 262.91	= $(\frac{1.2}{2})^2 \pi$ x (263.55 - 262.91)	= 0.72	"
PROP. CB #5	T/L = 263.85, INV = 263.04	= 0.6 x 0.6 x (263.85 - 263.04)	= 0.29	"
PROP. CBMH #6	T/L = 263.67, INV = 262.87	= $(\frac{1.2}{2})^2 \pi$ x (263.67 - 262.87)	= 0.90	"
Ex. CBMH #2	T/L = 263.61, INV = 262.70	= $(\frac{1.2}{2})^2 \pi$ x (263.61 - 262.70)	= 1.03	"
Ex. CBMH #3	T/L = 263.31, INV = 262.60	= $(\frac{1.2}{2})^2 \pi$ x (263.31 - 262.60)	= 0.80	"
			6.36	m^3 *

B) PIPE STORAGE TO MAX WL = 263.90m

EX 200 Ø	(55m + 15.3m + 6.0m)	= $(0.1)^2 \pi$ x 76.3m	= 2.40 m^3
NEW 200 Ø	(8.5m + 6.0m + 16.5m)	= $(0.1)^2 \pi$ x 31.0m	= 0.97 "
NEW 300 Ø	(7.0m + 37.5m)	= $(0.15)^2 \pi$ x 44.5m	= 3.14
EX 300 Ø	(45m)	= $(0.15)^2 \pi$ x 45	= 3.18
			9.69 m^3 *

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JFIVE Developments Ltd.
Consulting Engineer

Project No.: 168	File: 168
Date: MARCH 2023	Sheet No. 3 of 7
Design By: JF	Checked By: JF
Subject: SWM CALCULATION	

C) ABOVE GROUND STORAGE: (SEE NEXT PAGE FOR PONDING AREA)

AREA # 1

$(36 \times 5.5) + (6.0 \times 6.0) + (24.5 \times 5.5) \times \frac{1}{2} \times (263.90 - 263.72) = 62.3\ m^3$ (AVERAGE @ C of parking lot)

$+ (32 \times 4.0) \times \frac{1}{3} \times (263.90 - 263.75) = 6.4\ m^3$

AREA # 2

$(49.5m \times 2.0) \times \frac{1}{3} \times (263.90 - 263.78) = 4.0\ m^3$

AREA # 3

$(18m \times 1.5) \times \frac{1}{3} \times (263.90 - 263.86) = 0.36\ m^3$

Plus $(\frac{2.5}{2})^2 \times \pi \times (263.90 - 263.85) = 0.24\ m^3$

$73.3\ m^3$

TOTAL AVAILABLE STORAGE

a) + b) + c) = 6.36 + 9.69 + 64.1 = 89.35 m^3

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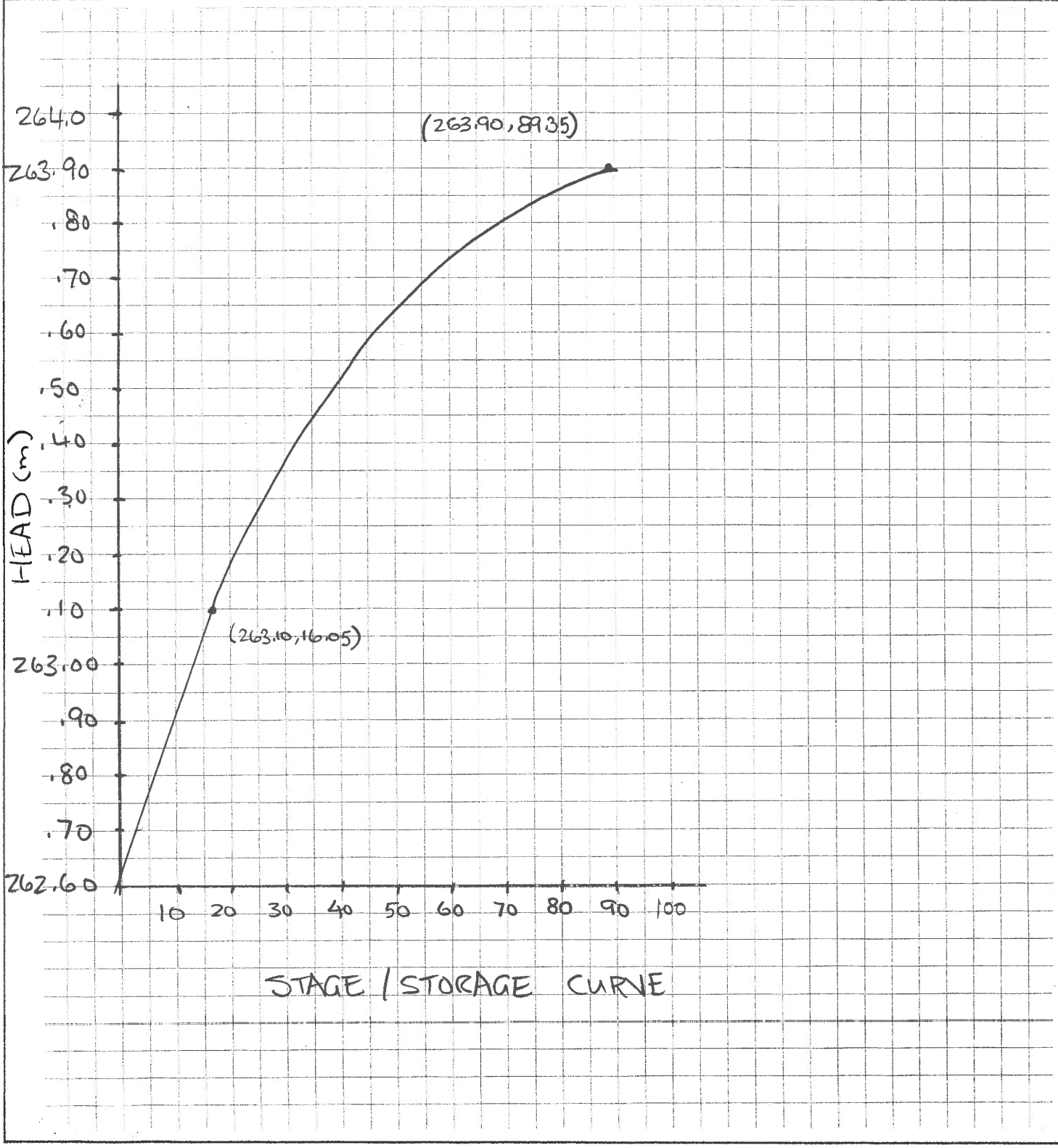
Consulting Engineer

Project No.: 168	File: 168
Date: MARCH 20/23	Sheet No. 4 of 7
Design By: JF	Checked By: JF
Subject: SWM CALCULATIONS	



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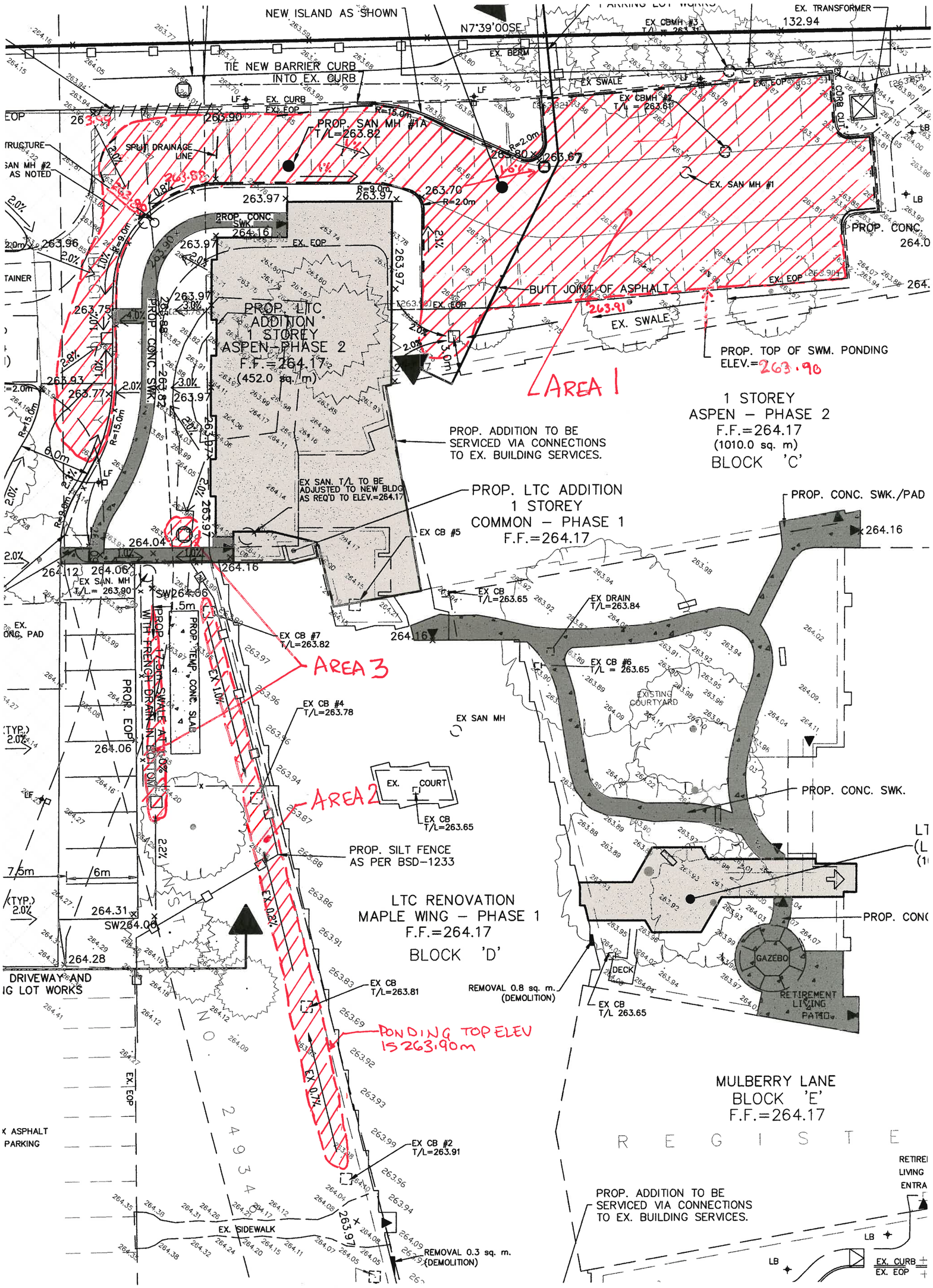

ABOVE GROUND STORM WATER STORAGE AREAS

SCALE : 1:300

Grove Park Retirement Home *Hydraulic Calculation Sheet*
Storage Stage Discharge Calculations

Orifice Plate	
RADIUS=	0.1375 m
Outlet Dia=	275.0 mm
Height=	0.00 m
Invert=	262.66 m

DICB	
Width=	600.0 mm
Slope=	5H:1V
Grate Height=	0.00 m
Invert=	0.000 m

Secondary Orifice	
RADIUS=	0.000 m
Outlet Dia=	0.0 mm
Height=	0.00 m
Invert=	0.00 m

Orifice Pipe Discharge
$Q = 0.8 \times A \times (2gh)^{0.5}$
Weir Discharge
$Q = 4.7857 \times h^2 + 0.3557 \times h - 0.0023$
Polynomial equation of MTO Design Chart 4.20 (3H:1V)

TOTAL Active STORAGE m^3	PRIMARY ORIFICE PIPE m^3/s	SECONDARY OUTLET m^3/s	WATER DEPTH m	TOTAL OUTFLOW m^3/s	ELEVATION m	
0.00	**0.0000**	**0.0000**	**0.00**	**0.0000**	**262.66**	**Orifice Outlet at 262.66m**
1.00	0.0080	0.0000	0.05	0.0080	262.71	
2.00	0.0150	0.0000	0.10	0.0150	262.76	
4.00	0.0235	0.0000	0.15	0.0235	262.81	
6.00	0.0526	0.0000	0.20	0.0526	262.86	
8.00	0.0706	0.0000	0.25	0.0706	262.91	
10.00	0.0000	0.0000	0.30	0.0000	262.96	
12.00	0.0970	0.0000	0.35	0.0970	263.01	
14.00	0.0000	0.0000	0.40	0.0000	263.06	
16.05	0.1176	0.0000	0.45	0.1176	263.11	
20.70	0.1267	0.0000	0.50	0.1267	263.16	
25.20	0.1351	0.0000	0.55	0.1351	263.21	
29.80	0.1431	0.0000	0.60	0.1431	263.26	
34.30	0.1506	0.0000	0.65	0.1506	263.31	
38.90	0.1578	0.0000	0.70	0.1578	263.36	
43.40	0.1646	0.0000	0.75	0.1646	263.41	
48.00	0.1712	0.0000	0.80	0.1712	263.46	
52.50	0.1776	0.0000	0.85	0.1776	263.51	
57.10	**0.1837**	**0.0000**	**0.90**	**0.1837**	**263.56**	
61.60	0.1896	0.0000	0.95	0.1896	263.61	
66.20	**0.1954**	**0.0000**	**1.00**	**0.1954**	**263.66**	**WL for 2-yr event**
70.70	0.2009	0.0000	1.05	0.2009	263.71	
75.30	0.2064	0.0000	1.10	0.2064	263.76	
79.80	0.2117	0.0000	1.15	0.2117	263.81	
84.50	0.2168	0.0000	1.20	0.2168	263.86	
90.00	**0.2219**	**0.0000**	**1.25**	**0.2219**	**263.91**	**Max WL at 263.90**
93.80	0.2268	0.0000	1.30	0.2268	263.96	

Existing Storage in underground pipes, structures and parking lot areas

Elevation	Depth	Volume	
262.60	0	0.00	**Orifice Plate Invert at 262.66**
262.70	0.10	3.00	
262.80	0.20	6.00	
262.90	0.30	10.00	
263.00	0.40	13.00	
263.10	0.50	16.05	
263.20	0.60	21.00	
263.30	0.70	27.00	
263.40	0.80	32.00	
263.50	0.90	39.00	
263.60	1.00	47.00	
263.70	1.10	57.00	
263.80	1.20	69.00	
263.90	1.30	89.35	**MAX. WL at 263.90**
264.00	1.40	94.00	**Top of Berm**

Grove Park Retirement Home
Bowstring Method Storage Calculations
SWM Storage for Davis Crescent Outlet

JFIVE Project No. **(168)**

2-Year

Catchment Area			12,631	m^2
Post-Development Runoff Coefficient			0.79	
Reduced Flowrate (65% of allowed)			0.1242	m^3/s
Duration Window		From	1	min
		to	31	min
A	678.1			
B	4.699	Required Storage	**64.4**	m^3
C	0.781			
		Provided Storage (approx.)	66.2	m^3

Duration (min)	IDF Intensity (mm/hr)	Post Developmen Peak Q (m^3/s)	Inflow Volume (m^3)	Outflow Volume (m^3)	Required Storage (m^3)
1.000	174.2	0.483	29.0	7.5	21.5
2.000	153.5	0.426	51.1	14.9	36.2
3.000	137.7	0.382	68.7	22.4	46.4
4.000	125.2	0.347	83.3	29.8	53.5
5.000	115.0	0.319	95.6	37.3	58.4
6.000	106.5	0.295	106.3	44.7	61.6
7.000	99.3	0.275	115.6	52.2	63.5
8.000	93.2	0.258	123.9	59.6	64.3
9.000	87.8	0.243	131.4	67.1	64.4
10.000	83.1	0.230	138.2	74.5	63.7
11.000	78.9	0.219	144.4	82.0	62.4
12.000	75.2	0.209	150.1	89.4	60.7
13.000	71.9	0.199	155.4	96.9	58.5
14.000	68.9	0.191	160.3	104.3	56.0
15.000	66.1	0.183	164.9	111.8	53.2
16.000	63.6	0.176	169.3	119.2	50.0
17.000	61.3	0.170	173.3	126.7	46.7
18.000	59.2	0.164	177.2	134.1	43.0
19.000	57.2	0.159	180.8	141.6	39.2
20.000	55.4	0.154	184.3	149.0	35.3
21.000	53.7	0.149	187.6	156.5	31.1
22.000	52.1	0.145	190.8	163.9	26.8
23.000	50.7	0.140	193.8	171.4	22.4
24.000	49.3	0.137	196.7	178.8	17.9
25.000	48.0	0.133	199.5	186.3	13.2
26.000	46.8	0.130	202.2	193.8	8.4
27.000	45.6	0.126	204.8	201.2	3.6
28.000	44.5	0.123	207.3	208.7	-1.4
29.000	43.5	0.120	209.7	216.1	-6.4
30.000	42.5	0.118	212.0	223.6	-11.6
31.000	41.6	0.115	214.3	231.0	-16.8

5-Year

Catchment Area			12,631	m^2
Post-Development Runoff Coefficient			0.79	
Reduced Flowrate (65% of allowed)			0.1612	m^3/s
Duration Window		From	1	min
		to	31	min
A	853.6			
B	4.699	Required Storage	**85.0**	m^3
C	0.766			
		Provided Storage (approx.)	89.0	m^3

Duration (min)	IDF Intensity (mm/hr)	Post Developmen Peak Q (m^3/s)	Inflow Volume (m^3)	Outflow Volume (m^3)	Required Storage (m^3)
1.000	225.1	0.624	37.4	9.7	27.8
2.000	198.9	0.551	66.1	19.3	46.8
3.000	178.8	0.495	89.2	29.0	60.2
4.000	162.8	0.451	108.3	38.7	69.6
5.000	149.8	0.415	124.5	48.4	76.2
6.000	138.9	0.385	138.6	58.0	80.6
7.000	129.7	0.360	151.0	67.7	83.3
8.000	121.8	0.338	162.1	77.4	84.7
9.000	115.0	0.319	172.1	87.0	85.0
10.000	108.9	0.302	181.1	96.7	84.4
11.000	103.6	0.287	189.5	106.4	83.1
12.000	98.8	0.274	197.1	116.1	81.1
13.000	94.5	0.262	204.3	125.7	78.5
14.000	90.6	0.251	210.9	135.4	75.5
15.000	87.0	0.241	217.1	145.1	72.0
16.000	83.8	0.232	223.0	154.8	68.2
17.000	80.8	0.224	228.5	164.4	64.1
18.000	78.1	0.216	233.7	174.1	59.6
19.000	75.5	0.209	238.7	183.8	54.9
20.000	73.2	0.203	243.4	193.4	50.0
21.000	71.0	0.197	248.0	203.1	44.9
22.000	69.0	0.191	252.3	212.8	39.5
23.000	67.0	0.186	256.4	222.5	34.0
24.000	65.2	0.181	260.4	232.1	28.3
25.000	63.6	0.176	264.2	241.8	22.4
26.000	62.0	0.172	267.9	251.5	16.4
27.000	60.5	0.168	271.5	261.1	10.3
28.000	59.0	0.164	274.9	270.8	4.1
29.000	57.7	0.160	278.2	280.5	-2.3
30.000	56.4	0.156	281.5	290.2	-8.7
31.000	55.2	0.153	284.6	299.8	-15.3