GM BluePlan ENGINEERING

PEOPLE | ENGINEERING | ENVIRONMENTS

OWEN SOUND
JAN 09 2019
COMMUNITY SERVICES

November 13, 2018
Our File: S-1364

Via Email: peter@andpetrealty.com

Mr. Peter Van Dolder
c/o AndPet Realty Ltd.
1545 16th Street East, Unit 4
Owen Sound, ON N4K 5N3

Re: Preliminary Stormwater Management Design
AndPet Subdivision
16th Avenue East, Owen Sound

Dear Peter,

About 2006, Draft Plan Approval was received by AndPet Realty Ltd. for the development of a subdivision on their approximately 7.07 ha property located on 16th Avenue East near 16th Street East, in the City of Owen Sound. At the time of approval, the Draft Plan included:

- 52 single family residential lots (2.70 ha),
- Two (2) blocks for medium density residential townhouses (1.26 ha),
- Two (2) blocks for a walkway and the now constructed 10th Street East (0.21 ha),
- One (1) block for a combination park and stormwater management facility (1.40 ha), and;
- Approximately 1.49 ha of roadway.

About March 2018, an Addendum to Stormwater Management (SWM) Report Letter was submitted to City of Owen Sound (City) staff to update the previously approved 2006 SWM Report in support of a revised Draft Plan which intended to intensify development within the proposed subdivision. Within the original and revised Draft Plan, the block allotted to the construction of a SWM facility was consistent in area and location. Similarly, the original SWM Report and the Addendum to SWM Report Letter supported the same proposed SWM facility design of a dry pond.

Since the time of the Addendum to SWM Report Letter, the proponent has revised the Draft Plan again to further intensify development, resulting in a reduction to the area of the SWM block. The current, revised Draft Plan, enclosed as Attachment 1, includes:

- 27 townhouse dwelling lots (1.05 ha),
- Two (2) blocks for semi-detached dwellings (1.86 ha),
- One (1) block for apartment dwelling (1.01 ha),
- One (1) block for long term care facility (1.02 ha),
- One (1) block for open space (0.46 ha),
- One (1) block for a stormwater management pond (0.66 ha), and;
- Approximately 1.01 ha of roadway, and road widening/ reserve.

The purpose of this letter is to describe the SWM considerations for the current, revised Draft Plan for the proposed subdivision development.

Based on the previously approved 2006 SWM Report, as well as discussions with City staff, the SWM criteria used to develop the appropriate SWM approach for the proposed subdivision development are as follows.

1. Post-development peak flow rates discharging from the subject property are to be attenuated to less than 0.70 m^3/s, the capacity of the existing 750 mm Ø storm sewer stub located at the northeasterly corner of the subject property and draining to the 16th Avenue East storm sewer system, for all design storm events up to, and including, the 100 year design storm event.

2. The on-site storm sewer system will convey the runoff associated with a 5 year design storm event at the minimum.

3. An "Enhanced" level of water quality treatment (80% TSS removal rate) is to be provided for runoff draining from the site prior to discharging to the 16th Avenue East storm sewer system.

SWM Quantity Control

Under the currently proposed post-development conditions, the proposed SWM facility is expected to receive runoff from the entirety of the approximately 7.07 ha subject property in addition to approximately 0.35 ha of off-site lands consisting of the municipal right-of-way lands located along the northerly side of the 10th Street East roadway as well as the southeasterly portion of the adjacent, existing subdivision located westerly of the subject property. The catchment area expected to drain to the proposed SWM facility, Catchment 100, is generally as shown on Figure No. 1 – Post-Development Drainage Area Plan, enclosed as Attachment 2.

Catchment 100 is expected to drain to the proposed SWM facility via overland flow and the proposed on-site storm sewer. The proposed on-site storm sewer consists of two systems: the inlet storm sewer system and the outlet storm sewer system. The proposed storm sewers and SWM facility are also shown, at a conceptual level, in Figure No. 1 – Post-Development Drainage Area Plan.

The inlet storm sewer system, generally located within the central and easterly portions of the proposed development, receives, conveys and discharges site runoff to the proposed SWM facility's forebay. The inlet storm sewer system will be designed to convey the site runoff associated with a 5 year design storm event at the minimum. Surcharged runoff within the inlet storm sewer system is expected to be conveyed along the 14th Street East roadway and ultimately spill to the proposed SWM facility via overland flow.

The outlet storm sewer system, generally located from the outlet of the proposed SWM facility to the existing 750 mm Ø storm sewer stub, drains temporarily stored runoff from the SWM facility to the 16th Avenue East storm sewer. Within the outlet storm sewer system, the section of pipe immediately upstream of the existing 750 mm Ø storm sewer stub is proposed to be undersized to function as an orifice tube. The orifice tube is proposed to be 200 mm in diameter and is considered to drain via orifice flow having a discharge coefficient of C = 0.80. Runoff draining to the outlet storm sewer system upstream of the orifice tube is expected to be attenuated by it and back up into the temporary storage volume within the proposed SWM facility. To maintain the orifice tube as the sole point of attenuation within the outlet storm sewer system, sewer sections located upstream of the orifice tube are proposed to have a capacity greater than the expected flow draining via orifice tube during the 100 year design storm event. Surface grading along the 14th Street East roadway will permit surcharged runoff within the outlet storm sewer system to spill from the roadway to the proposed SWM facility prior to spilling to the 16th Avenue East roadway.

The SWM facility is proposed to be generally designed as a wetland as per the requirements of the Stormwater Management Planning and Design Manual (SWMPDM), as published by the Ministry of the Environment, Conservation and Park (MOECP; formerly, the MOECC). The wetland is proposed to have a 0.25 m-deep permanent pool below the elevation of the outlet and provide temporary (active) storage above the elevation of the permanent pool. Runoff temporarily stored within the active storage of the wetland drains via the outlet storm sewer system under the control of the orifice tube's attenuation. A forebay is proposed to be located within the westerly portion of the wetland at the inlet storm sewer system's point of discharge. The forebay is proposed to be separated from the main storage area of the wetland by an earthen berm throughout the facility and extending to the elevation of the permanent pool.

A clear stone berm with geotextile fabric in it is proposed to be installed above the earthen berm to promote the dispersion of inlet flows. The conceptual cross-section of the forebay berm is shown in Figure No. 2 – Proposed Forebay Berm Detail (enclosed as Attachment 3). Should the outlet storm sewer system become clogged or the storage volume of the proposed SWM facility be surcharged, runoff is expected to spill overland to the 14th Street East roadway and be conveyed by it to the 16th Avenue East roadway. The Stage-Storage-Discharge Calculations for the proposed SWM facility are attached as Attachment 4.

To conservatively consider the increased imperviousness of the current, revised Draft Plan, the proposed subdivision development was modelled as being completely (100%) impervious for the 100 year design storm event. The MIDUSS modelling for Catchment 100 is enclosed as Attachment 5 and the results are summarized in the table below:

Catch.	Area (ha)	Imperviousness	Freq. of Design Storm Event	Allowable Peak Flow Rate/ Cap. Of Ex. Storm Sewer Stub (m^3/s)	Post-Development Peak Flow Rate (m^3/s)
100	7.41	100 %	100 year	0.70	0.128

As shown above, for a conservatively considered 100% imperviousness, the peak flow rate draining from the subject property under post-development conditions for the current, revised Draft Plan, is expected to be less than the allowable peak flow rate during the 100 year design storm event.

Therefore, since the currently proposed subdivision development is planned to be less than 100% impervious, the peak flow rates discharging from the subject property under post-development conditions are expected to be less than the allowable peak flow rate.

SWM Quality Control

The design features and storage volume provided within the proposed SWM facility, generally designed as a wetland, is expected to provide water quality treatment to site runoff prior to draining to the 16th Avenue East storm sewer system.

The proposed SWM facility provides approximately 640 m^3 (approximately 126 m^3/ha) of storage volume within its permanent pool and approximately 3974 m^3 (approximately 536 m^3/ha)of active storage volume at the elevation of ponding during a 100 year design storm event. The SWMPDM recommends that, for wetlands, to provide an 80% TSS removal rate, the wetland should provide 120 m^3/ha and 250 m^3/ha within its permanent pool storage for a 70% and 85% imperviousness, respectively, as well as 40 m^3/s of active storage. Therefore, through extrapolation and given the approximately 7.42 ha tributary area (Catchment 100), the proposed SWM facility is expected to provide an 80% TSS removal rate to an overall site imperviousness of approximately 74.7%, or approximately 5.54 ha in total impervious surface area. Assuming that the blocks allotted to Stormwater Management (0.66 ha), and Open Space (0.46 ha) within the current, revised Draft Plan are not planned to have any impervious surfaces, the proposed SWM facility can be expected to provide an 80% TSS removal rate to an imperviousness of approximately 88.0% within the remainder of Catchment 100. Furthermore, considering an existing 0.10 ha of impervious surfaces within the approximately 0.35 ha off-site portion of Catchment 100 (estimated via satellite imagery), the proposed SWM facility can be expected to provide an 80% TSS removal rate to an imperviousness of approximately 91.5% within the remainder of the subject property.

Therefore, given the stormwater quality treatment provided by the proposed SWM facility's permanent pool and active storage volumes, it is expected that an Enhanced water quality treatment level (80% TSS removal rate) will be provided to runoff draining from the proposed subdivision development prior to discharging to the 16th Avenue East storm sewer system.

In conclusion, upon the completion of the proposed subdivision development, as outlined in the current, revised Draft Plan, runoff draining from the subject property to the existing 16th Avenue East storm sewer system is expected to be managed as follows:

1. Post-development peak flow rates draining from the subject property to the existing 16th Avenue East storm sewer system, are expected to be attenuated to less than the allowable peak flow rate of 0.70 m^3/s for all design storm events up to, and including, the 100 year design storm event.

2. An Enhanced level (80% TS removal rate) of water quality treatment is expected to be provided to runoff draining from the subject property prior to draining to the existing 16th Avenue East storm sewer system for an imperviousness of up to, and including, approximately 74.7% of its tributary area. Assuming the blocks allotted to Stormwater Management (0.66 ha), and Open Space (0.46 ha) are not planned to have any impervious surfaces and considering the existing impervious surfaces within the tributary off-site lands, an Enhanced level of water quality treatment can be expected to be provided to an imperviousness of up to, and including, approximately 91.5% within the remainder of the subject property.

3. The proposed inlet storm sewer system is proposed to convey the runoff associated with a 5 year design storm event at the minimum.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Prepared by:

Alex Wilkinson, E.I.T.
AW/mz

Reviewed by:

John Slocombe, P.Eng.

Encl.

cc: Jones Consulting: Lorelie Spencer, via Email – lspencer@jonesconsulting.com
File No. S-1364

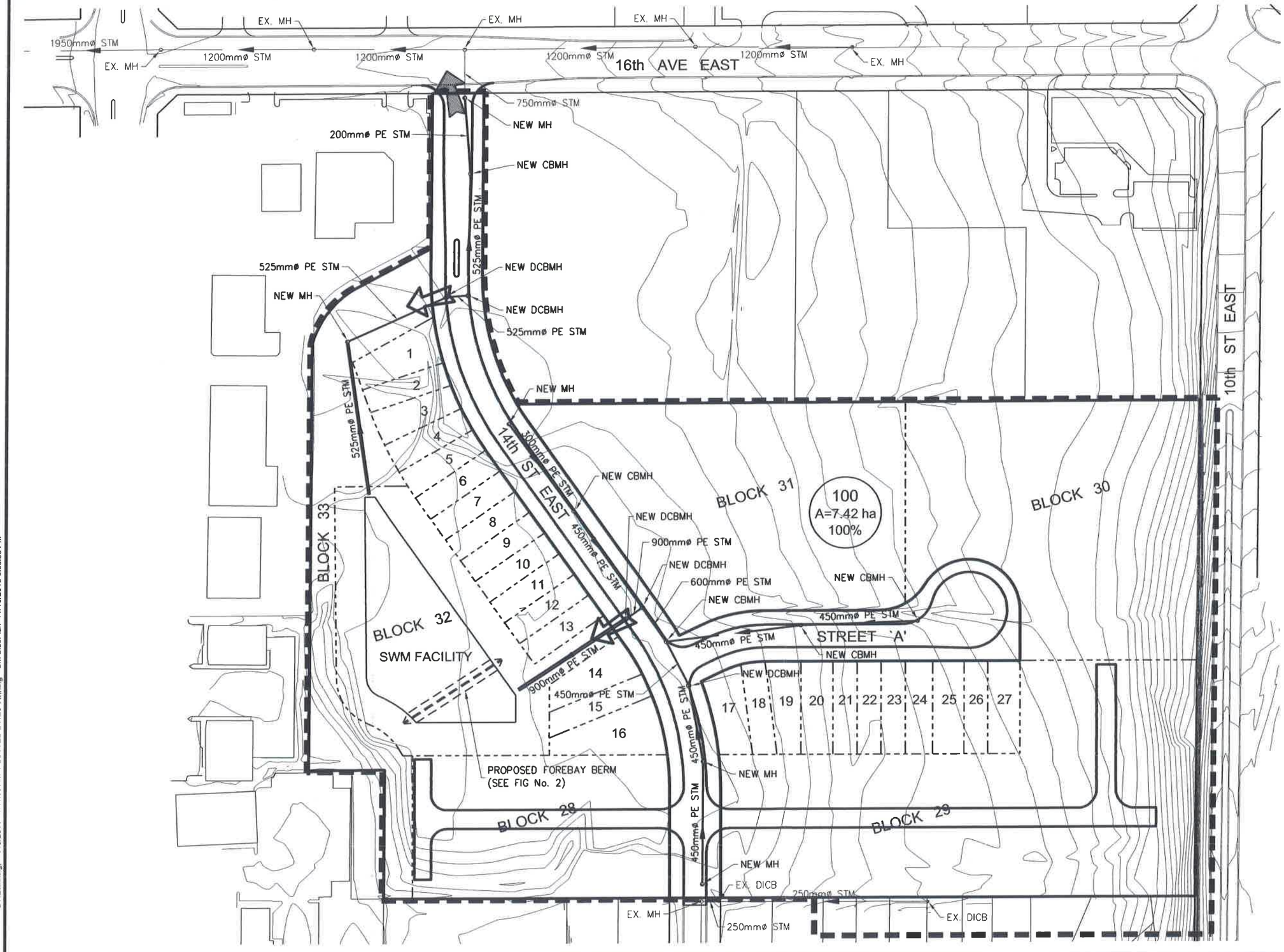
ATTACHMENT 1

Revised Draft Plan – November 2018

ATTACHMENT 2

Figure No. 1 – Post-Development Drainage Area Plan

S-1364
Andpet Subdivision
City of Owen Sound



LEGEND

- 100 / A=7.42 ha / 100% — CATCHMENT, DRAINAGE AREA, % IMPERVIOUS
- CATCHMENT BOUNDARY
- OVERLAND FLOW ROUTE TO SWM FACILITY
- EMERGENCY OVERLAND FLOW ROUTE FROM SITE

SCALE = 1:1,500
NOVEMBER 2018

POST DEVELOPMENT DRAINAGE AREA PLAN

Part of Park Lots 4 & 5
Range 5 EGR, PL
Owen Sound

Figure No. 1

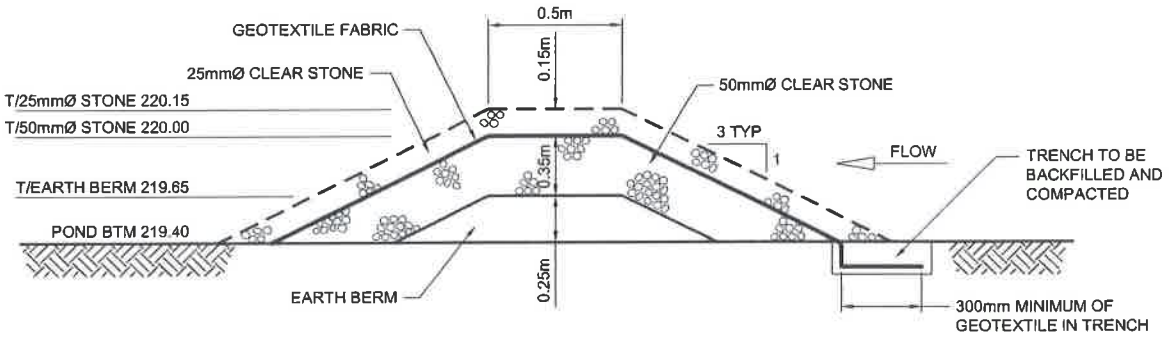
BluePlan ENGINEERING

FILE:\\os-2k8\users_private\etwining\Documents\Drawings\s1364fige1.dwg LAYOUT:FIG DR-1
LAST SAVED BY:Etwining, 11/13/2018 11:41:08 AM PLOTTED BY:Ed Twining - GM BluePlan 11/13/2018 3:08:58 PM

ATTACHMENT 3

Figure No. 2 – Proposed Forebay Berm Detail

S-1364
Andpet Subdivision
City of Owen Sound



NOT TO SCALE

NOVEMBER 2018

PROPOSED FOREBAY BERM DETAIL

Part of Park Lots 4 & 5
Range 5 EGR, PL
Owen Sound

Figure No. 2

BluePlan ENGINEERING

FILE:\\os-2k8\users_private\etwining\Documents\Drawings\s1364fige1.dwg LAYOUT:FIG 2
LAST SAVED BY:Etwining, 11/13/2018 11:41:08 AM PLOTTED BY:Ed Twining - GM BluePlan 11/13/2018 3:09:40 PM

ATTACHMENT 4

Stage-Storage-Discharge Calculations

ANDPET SUBDIVISION
CITY OF OWEN SOUND
OUR FILE: S-1364
NOVEMBER 2018

SWM FACILITY
WETLAND FACILITY

ELEV (m)	INC DEPTH (m)	SURFACE AREA (sq m)	AVERAGE AREA (sq m)	INCR. VOL (cu m)	ACCUM PERMANENT STORAGE VOL (cu m)	ACCUM ACTIVE STORAGE VOL (cu m)	
219.32	0.00	0	0	0	0	0	Inv. of Orifice
219.40	0.08	2400	0	0	0	0	B/ Pond
219.50	0.18	2528	2464	246	246	0	
219.60	0.28	2656	2592	259	506	0	
219.65	0.33	2720	2688	134	640	0	B/ Active Storage
219.75	0.43	2848	2784	278	640	278	
219.85	0.53	2976	2912	291	640	570	
219.95	0.63	3104	3040	304	640	874	
220.05	0.73	3232	3168	317	640	1190	
220.15	0.83	3360	3296	330	640	1520	
220.25	0.93	3488	3424	342	640	1862	
220.35	1.03	3616	3552	355	640	2218	
220.45	1.13	3744	3680	368	640	2586	
220.55	1.23	3872	3808	381	640	2966	
220.65	1.33	4000	3936	394	640	3360	
220.75	1.43	4128	4064	406	640	3766	
220.80	1.48	4192	4160	208	640	3974	T/ Main Storage Area

Outlet Orifice

Orifice Dia.:	200 mm
Orifice Area:	0.031 m^2
Coefficient:	0.8
Invert Elev:	219.32 m

ELEV (m)	STAGE (m)	STORAGE VOLUME (cu m)	DISCHARGE PRIMARY ORIFICE FLOW (cu m/s)	DISCHARGE OVERFLOW WEIR FLOW (cu m/s)	DISCHARGE TOTAL FLOW (cu m/s)	
219.32	0.00	0.0001	0.000	0.000	0.000	Inv. of Orifice
219.40	0.08	0.0002	0.010	0.000	0.010	B/ Pond
219.50	0.18	0.0003	0.031	0.000	0.031	
219.60	0.28	0.0004	0.047	0.000	0.047	
219.65	0.33	0.0005	0.053	0.000	0.053	B/ Active Storage
219.75	0.43	278	0.064	0.000	0.064	
219.85	0.53	570	0.073	0.000	0.073	
219.95	0.63	874	0.081	0.000	0.081	
220.05	0.73	1190	0.088	0.000	0.088	
220.15	0.83	1520	0.095	0.000	0.095	
220.25	0.93	1862	0.101	0.000	0.101	
220.35	1.03	2218	0.107	0.000	0.107	
220.45	1.13	2586	0.113	0.000	0.113	
220.55	1.23	2966	0.118	0.000	0.118	
220.65	1.33	3360	0.123	0.000	0.123	
220.75	1.43	3766	0.128	0.000	0.128	
220.80	1.48	3974	0.131	0.000	0.131	T/ Main Storage Area

ATTACHMENT 5

MIDUSS Modelling – Post-Development Conditions

```
"              MIDUSS Output ------------------------------------------------>"
"              MIDUSS version                              Version 2.25  rev. 473"
"              MIDUSS created                          Sunday, February 07, 2010"
"        10    Units used:                                              ie METRIC"
"              Job folder:       \\os-2k8\users_private\awilkinson\Documents\"
"                                                                    MIDUSS\S-1364"
"              Output filename:                S-1364 - Post 100yr - Nov18.out"
"              Licensee name:                                                gmbp"
"              Company                                      Hewlett-Packard Company"
"              Date & Time last used:                       11/5/2018 at 5:21:53 PM"
" 31         TIME PARAMETERS"
"     5.000    Time Step"
"   210.000    Max. Storm length"
"   360.000    Max. Hydrograph"
" 32       STORM Chicago storm"
"         1    Chicago storm"
"  2171.754    Coefficient A"
"     8.303    Constant B"
"     0.867    Exponent C"
"     0.375    Fraction R"
"   210.000    Duration"
"     1.000    Time step multiplier"
"              Maximum intensity          202.862    mm/hr"
"              Total depth                 71.271    mm"
"         6    100hyd   Hydrograph extension used in this file"
" 33       CATCHMENT 100"
"         2    Rectangular"
"         3    Specify values"
"         1    SCS method"
"       100    Subject Property and Off-Site Lands"
"   100.000    % Impervious"
"     7.420    Total Area"
"   100.000    Flow length"
"     2.000    Overland Slope"
"     0.000    Pervious Area"
"   100.000    Pervious length"
"     2.000    Pervious slope"
"     7.420    Impervious Area"
"   100.000    Impervious length"
"     2.000    Impervious slope"
"     0.250    Pervious Manning 'n'"
"    78.000    Pervious SCS Curve No."
"     0.000    Pervious Runoff coefficient"
"     0.062    Pervious Ia/S coefficient"
"     4.442    Pervious Initial abstraction"
"     0.015    Impervious Manning 'n'"
"    98.000    Impervious SCS Curve No."
"     0.922    Impervious Runoff coefficient"
"     0.147    Impervious Ia/S coefficient"
"     0.762    Impervious Initial abstraction"
"                 4.192     0.000     0.000     0.000 c.m/sec"
"              Catchment 100          Pervious   Impervious Total Area "
"              Surface Area           0.000      7.420      7.420      hectare"
"              Time of concentration  27.103     3.493      3.493      minutes"
"              Time to Centroid       124.605    95.510     95.510     minutes"
"              Rainfall depth         71.271     71.271     71.271     mm"
"              Rainfall volume        0.01       5288.32    5288.32    c.m"
"              Rainfall losses        39.018     5.591      5.591      mm"
"              Runoff depth           32.253     65.681     65.680     mm"
"              Runoff volume          0.00       4873.49    4873.49    c.m"
"              Runoff coefficient     0.000      0.922      0.922      "
"              Maximum flow           0.000      4.192      4.192      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   4.192     4.192     0.000     0.000"
" 54         POND DESIGN"
"     4.192    Current peak flow    c.m/sec"
"     0.700    Target outflow    c.m/sec"
"    4873.5    Hydrograph volume    c.m"
"       17.    Number of stages"
"   219.320    Minimum water level    metre"
"   220.800    Maximum water level    metre"
"   219.320    Starting water level    metre"
```



```
"     0    Keep Design Data: 1 = True; 0 = False"
"            Level Discharge    Volume"
"          219.320     0.000  1.00E-04"
"          219.400   0.01000   0.00020"
"          219.500   0.03100   0.00030"
"          219.600   0.04700   0.00040"
"          219.650   0.05300   0.00050"
"          219.750   0.06400   278.400"
"          219.850   0.07300   569.600"
"          219.950   0.08100   873.600"
"          220.050   0.08800  1190.400"
"          220.150   0.09500  1520.000"
"          220.250    0.1010  1862.400"
"          220.350    0.1070  2217.600"
"          220.450    0.1130  2585.600"
"          220.550    0.1180  2966.400"
"          220.650    0.1230  3360.000"
"          220.750    0.1280  3766.400"
"          220.800    0.1310  3974.400"
"       Peak outflow                  0.128    c.m/sec"
"       Maximum level               220.758    metre"
"       Maximum storage            3799.326    c.m"
"       Centroidal lag                7.142   hours"
"            4.192     4.192     0.128     0.000 c.m/sec"
" 38    START/RE-START TOTALS 100"
"     3   Runoff Totals on EXIT"
"       Total Catchment area                      7.420    hectare"
"       Total Impervious area                     7.420    hectare"
"       Total % impervious                      100.000"
" 19    EXIT"
```