June 21, 2018

Reference No. 11139278-21
Previous Ref. No. 11139368-01

MJD Investments (1986) Inc.
Murray J. Davenport, P.Eng.
PO Box 711 Lakefield ON K0L 2H0
davenporteng@gmail.com

Dear Mr. Davenport:

Re: Hydrogeologic Update Letter
Proposed Residential Development
343622 Church Side Road East
Owen Sound, ON

The following letter presents an update of the hydrogeological assessment report prepared by GHD Limited (GHD) of a proposed residential development at the above noted property (the Site). The original hydrogeological report was dated July 4, 2017. The purpose of this update letter is to assess potential hydrogeological impacts due to a change in the servicing and the number of lots to be developed. The previous hydrogeological report was prepared to assess a proposed residential development on municipal water and private septic services.

A new site plan was forwarded to GHD by Mr. Davenport and is provided in the Enclosures of this update letter. The plan shows 20 lots and will be supported by municipal water and municipal sewer services at this time. The area of the Site has also been reduced from 19.87 hectares (ha) to 18.03 ha.

Based upon the new proposed residential development on municipal services, there will be no impact to groundwater from a water usage perspective as there will be no water wells and there will be no impact to groundwater from a water quality perspective as there will be no septic systems or nitrate impacts.

GHD re-calculated the water balance to evaluate if pre-development infiltration can be maintained after construction of the development. The detailed water balance calculations are provided in Appendix A. The calculations indicate that the pre-development infiltration is nearly 21,000 m^3/year for the Site. Post-development calculations include 20 homes / garages covering a roof top area of about 330 square metres (~3500 square feet) per house for a total of nearly 0.67 ha; asphalt roads covering about 0.68 ha; and vegetated areas (includes lawn, forest and pasture areas) covering about 16.68 ha. The calculations indicate that without infiltration of rooftop runoff that there would be an infiltration deficit of 680 m^3/year. Based upon the 20 roof tops, about 11.5% of the roof top runoff from each home would need to be infiltrated to meet pre-development values.

Provided that roof top runoff is directed via downspouts to sodded yards, it is our opinion that pre-development infiltration will be maintained using this low impact development (LID) strategy. LID manuals indicate that the infiltration of 25% of the roof runoff in low permeability soils is an acceptable value to consider. If 25% of the roof runoff is infiltrated, a surplus of infiltration compared to pre-development values will result.

It is our professional opinion that the Site can support a 20 lot plan of subdivision based upon municipal water and sewer servicing. The water balance is maintained for the 20 proposed lots.

We trust that this letter report meets with your immediate requirements. Should you have any questions, please contact our office.

Sincerely,

GHD

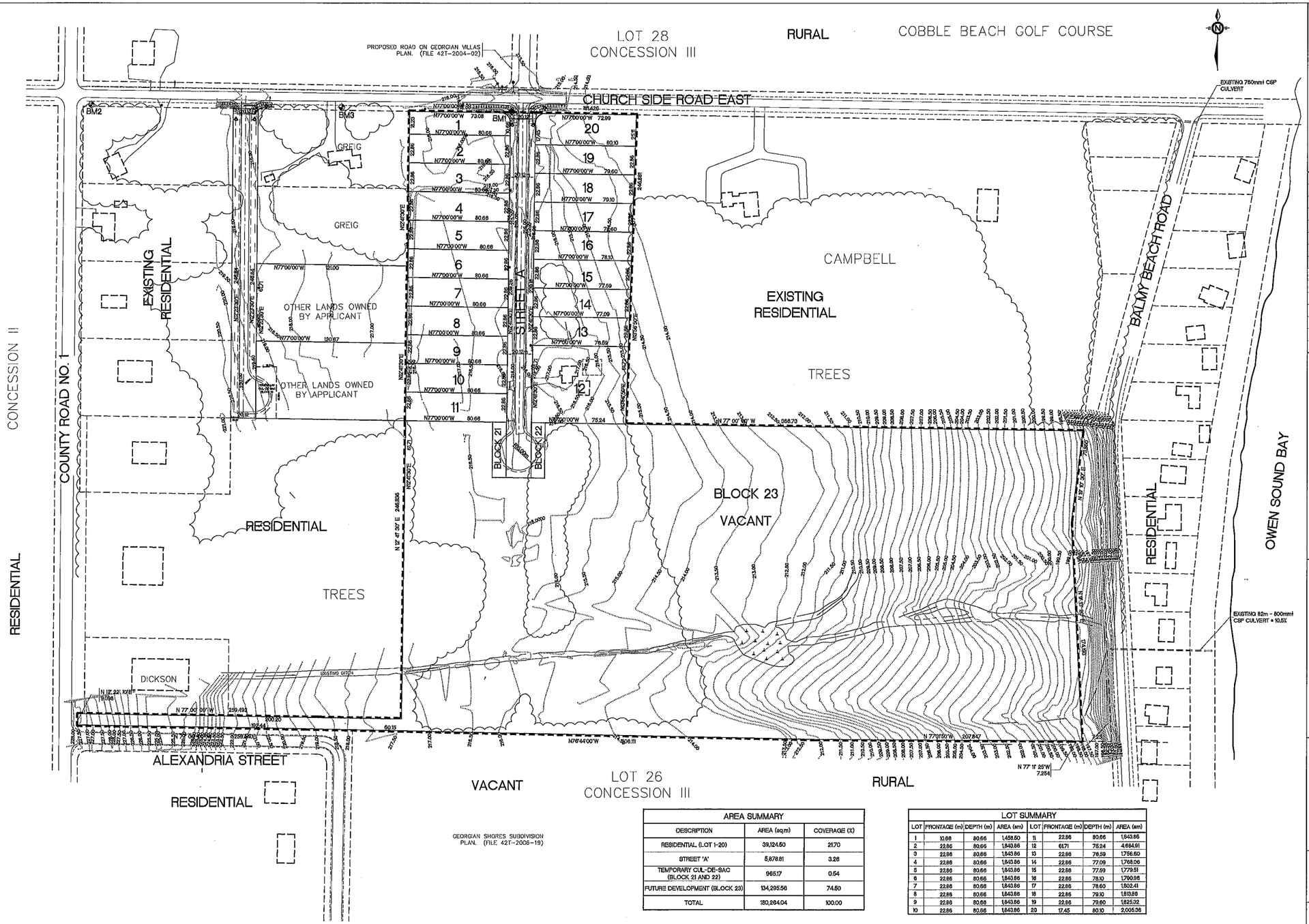
Robert Neck, M.Eng., P.Geo. (Limited)

Nyle McIlveen, P.Eng.

/BN/nmc/01

Enclosures

Site Plan (provided by M.J. Davenport)



AREA SUMMARY		
DESCRIPTION	AREA (sq.m)	COVERAGE (%)
RESIDENTIAL (LOT 1-20)	39,124.50	21.70
STREET 'A'	5,878.81	3.26
TEMPORARY CUL-DE-SAC (BLOCK 21 AND 22)	965.17	0.54
FUTURE DEVELOPMENT (BLOCK 23)	134,295.56	74.50
TOTAL	180,264.04	100.00

LOT SUMMARY							
LOT	FRONTAGE (m)	DEPTH (m)	AREA (sm)	LOT	FRONTAGE (m)	DEPTH (m)	AREA (sm)
1	10.66	80.66	1,458.50	11	22.86	80.66	1,843.86
2	22.86	80.66	1,843.86	12	61.71	75.24	4,684.91
3	22.86	80.66	1,843.86	13	22.86	78.59	1,756.60
4	22.86	80.66	1,843.86	14	22.86	77.09	1,768.06
5	22.86	80.66	1,843.86	15	22.86	77.59	1,779.51
6	22.86	80.66	1,843.86	16	22.86	78.10	1,790.96
7	22.86	80.66	1,843.86	17	22.86	78.60	1,802.41
8	22.86	80.66	1,843.86	18	22.86	79.10	1,813.86
9	22.86	80.66	1,843.86	19	22.86	79.60	1,825.32
10	22.86	80.66	1,843.86	20	17.45	80.10	2,005.36

PLAN

OF PROPOSED SUBDIVISION ON PART
OF LOT 27, CONCESSION III
IN THE TOWNSHIP OF SARAWAK
IN THE TOWNSHIP OF GEORGIAN BLUFFS
IN THE COUNTY OF GREY.

30 15 0 75 150
SCALE = 1 : 1 500

SURVEYOR'S CERTIFICATE:

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN.

HEWETT AND MILNE LIMITED
ONTARIO LAND SURVEYORS
BOX 112,
302 8TH STREET EAST,
OWEN SOUND, ONT.
N4K 5P1

NEIL C. MILNE
ONTARIO LAND SURVEYOR

INFORMATION REQUIRED UNDER SECTION 51, SUBSECTION 17, OF THE PLANNING ACT.

A. EXISTING ROADS ARE AS SHOWN ON PLAN.
B. AREA INDICATED ON KEY PLAN SHOWS COMPLETE HOLDINGS OF SUBDIVIDER.
C. ADJOINING SUBDIVISIONS AND LOT LIMITS ARE AS SHOWN HEREON.
D. PROPOSED LOT USAGE – RESIDENTIAL
E. ADJACENT LOT USAGE – RESIDENTIAL, AGRICULTURAL, VACANT.
F. LOT DIMENSIONS ARE AS SHOWN ON PLAN.
G. TOPOGRAPHIC FEATURES ARE AS SHOWN ON PLAN.
H. WATER SUPPLY – MUNICIPAL
I. SOIL – RED CLAY
J. ALL CONTOURS ARE AS SHOWN ON PLAN.
K. MUNICIPAL WATER SUPPLY AND SEPTIC SYSTEMS
L. NO RESTRICTIVE COVENANTS OR EASEMENTS.

OWNER'S CERTIFICATE:

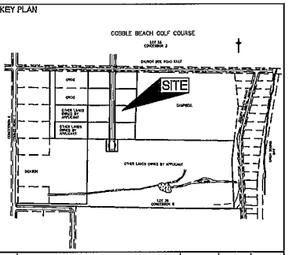
I AUTHORIZE M.J. DAVENPORT & ASSOCIATES LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE MINISTRY OF MUNICIPAL AFFAIRS.

DATE — PATRICIA A. DAVENPORT

DATE — MURRAY J. DAVENPORT

DATE — M.J.D. INVESTMENT (1986) INC.

KEY PLAN



NO.	REVISIONS	DATE	BY	APP'D
1.	NEW LOT ARRANGEMENT	13/03/18	JZ	MJD
1.	NEW LOT ARRANGEMENT	25/04/17	JC	MJD

BENCHMARKS

BM 1 ELEV. 216.32
NAIL IN EAST FACE OF HYDRO POLE LOCATED AT INTERSECTION OF SUBJECT PROPERTY ROADWAY AND CHURSIDE ROAD EAST.

BM 2 ELEV. 225.320
SPIKE IN FACE OF HYDRO POLE LOCATED AT INTERSECTION OF GREY COUNTY ROAD #1 AND CHURSIDE ROAD EAST.

BM 3 ELEV. 219.04
NAIL IN FACE OF HYDRO POLE 20.6m EAST TO NORTH-WEST CORNER OF THE SUBJECT PROPERTY, SOUTH SIDE OF CHURSIDE ROAD EAST.

LEGEND

- PROPERTY LIMIT
- PHASE LIMIT
- NEW SANITARY SEWER
- NEW STORM SEWER
- NEW WATERMAIN
- PROPOSED DRAINAGE
- [100.00] PROPOSED LOT CORNER ELEVATION
- (100.00) PROPOSED ELEVATION AT HOUSE
- (100.00) PROPOSED SWALE ELEVATION
- EXISTING DRAINAGE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- 100.00 EXISTING LOT CORNER ELEVATION
- *100.00 EXISTING ELEVATION TO REMAIN THE SAME

M.J. DAVENPORT
& ASSOCIATES LIMITED
P.O. BOX 2452 STN MAIN
LOCATION: 2010 KEENE ROAD
OTONABEE, ONTARIO
K9J 7Y8
TEL. : (705) 745-6676
FAX : (705) 745-7326

DAVENPORT SUBDIVISION
PART OF LOT 27
CONCESSION III
TOWNSHIP OF SARAWAK
TOWNSHIP OF GEORGIAN BLUFFS

DRAFT PLAN

DESIGNED BY: M.J. DAVENPORT	SCALE: 1 : 1500
DRAWN BY: J. ZHOU	
DATE: MARCH, 2018	DWG. No.: 3969-DP2
PROJECT No.: 06-D-3969	

Appendix A
Water Balance Calculations

Appendix A.1

Water Budget (Thornthwaite Method) - Average Values*

Owen Sound MOE (1981 - 2010) **Elevation:** 178.9 masl **Distance Away:** 8.6 km south

Month	Mean Temperature (^{o}C)	Heat Index	Potential ET (mm)	Daylight Correction Factor	Adjusted ET (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-5.4	0	0	0.82	0	128.8	128.80	
February	-4.8	0	0	0.82	0	86.3	86.30	
March	-1	0	0	1.03	0	77.8	77.80	
April	5.8	1.25	26.53	1.12	29.71	71	41.29	
May	11.5	3.53	55.09	1.27	69.96	84	14.04	
June	16.6	6.15	81.51	1.28	104.34	73.5	0.00	30.84
July	20.1	8.22	99.98	1.3	129.98	70.4	0.00	59.58
August	19.6	7.91	97.33	1.2	116.79	78.7	0.00	38.09
September	15.8	5.71	77.33	1.04	80.42	106.1	25.68	
October	9.6	2.68	45.43	0.95	43.16	98	54.84	
November	3.8	0.66	16.89	0.81	13.68	110	96.32	
December	-1.8	0	0	0.78	0	129.9	129.90	
TOTAL	7.5	36.1	500.1		588.0	1114.5	655.0	128.5
				TOTAL WATER SURPLUS:		526.5	mm	

Notes:

*Average values of precipitation were used. Average values of temperature were also used.

Appendix A.2
Water Budget Pre-Development

Catchment Designation	SITE			
	Pasture Area	Forest Area	House Rooftop	Total
Area (m^2)	110064	70000	200	180264
Pervious Area (m^2)	110064	70000	0	180064
% Pervious	61%	39%	0%	99.9%
Impervious Area (m^2)	0	0	200	200
% Impervious	0%	0%	0.1%	0.1%
INFILTRATION FACTORS				
Topography Infiltration Factor	0.15	0.1	0.15	
Soil Infiltration Factor	0.1	0.1	0.1	
Land Cover Infiltration Factor	0.15	0.2	0	
MOE Infiltration Factor	0.4	0.4	0.25	
Actual Infiltration Factor	0.2	0.25	0	
Runoff Coefficient	0.8	0.75	1	
Runoff from Impervious Surfaces*	0	0	0.8	
INPUTS (PER UNIT AREA)				
Precipitation (mm/yr)	1115	1115	1115	1115
Run On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	1115	1115	1115	1115
OUTPUTS (PER UNIT AREA)				
Precipitation Surplus (mm/yr)	526	526	892	527
Net Surplus (mm/yr)	526	526	892	527
Evaportranspiration (mm/yr)	588	588	223	588
Infiltration (mm/yr)	105	132	0	115.4
Rooftop Infiltration (mm/yr)	0	0	446	0.5
Total Infiltration (mm/yr)	105	132	446	115.9
Runoff Pervious Areas	421	395	446	411
Runoff Impervious Areas	0	0	0	0
Total Runoff (mm/yr)	421	395	446	411
Total Outputs (mm/yr)	1115	1115	1115	1115
Difference (Inputs - Outputs)	0	0	0	0
INPUTS (VOLUMES)				
Precipitation (m^3/yr)	122666	78015	223	200904
Run On (m^3/yr)	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0
Total Inputs (m^3/yr)	122666	78015	223	200904
OUTPUTS (VOLUMES)				
Precipitation Surplus (m^3/yr)	57944	36852	178	94975
Net Surplus (m^3/yr)	57944	36852	178	94975
Evaportranspiration (m^3/yr)	64722	41163	45	105929
Infiltration (m^3/yr)	11589	9213	0	20802
Rooftop Infiltration (m^3/yr)	0	0	89	89
Total Infiltration (m^3/yr)	11589	9213	89	20891
Runoff Pervious Areas (m^3/yr)	46355	27639	89	74084
Runoff Impervious Areas (m^3/yr)	0	0	0	0
Total Runoff (m^3/yr)	46355	27639	89	74084
Total Outputs (m^3/yr)	122666	78015	223	200904
Difference (Inputs - Outputs)	0	0	0	0

Notes:
*Evaporation from impervious areas was assumed to be 20% of precipitation.
Assumed that 50% of roof top runoff is infiltrated

Appendix A.3

Water Budget Post-Development - No Mitigation Strategies

Catchment Designation	SITE					
	Roof tops	Vegetated Areas			Asphalt	
	20 homes	Lawns	Forest	Pasture	road access	Total
Area (m^2)	6651	32473	100722	33574	6844	180264
Pervious Area (m^2)	0	32473	100722	33574	0	166769
% Pervious	0%	18.0%	55.9%	18.6%	0%	92.5%
Impervious Area (m^2)	6651	0	0	0	6844	13495
% Impervious	3.7%	0%	0%	0%	3.8%	7.5%
	INFILTRATION FACTORS					
Topography Infiltration Factor	0.15	0.15	0.1	0.15	0.15	
Soil Infiltration Factor	0.1	0.1	0.1	0.1	0.1	
Land Cover Infiltration Factor	0	0.15	0.2	0.15	0	
MOE Infiltration Factor	0.25	0.4	0.4	0.4	0.25	
Actual Infiltration Factor	0	0.2	0.25	0.2	0	
Runoff Coefficient	1	0.8	0.75	0.8	1	
Runoff from Impervious Surfaces*	0.8	0	0	0	0.8	
	INPUTS (PER UNIT AREA)					
Precipitation (mm/yr)	1115	1115	1115	1115	1115	1115
Run On (mm/yr)	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0
Total Inputs (mm/yr)	1115	1115	1115	1115	1115	1115
	OUTPUTS (PER UNIT AREA)					
Precipitation Surplus (mm/yr)	892	526	526	526	892	554
Net Surplus (mm/yr)	892	526	526	526	892	554
Evaportranspiration (mm/yr)	223	588	588	588	223	561
Infiltration (mm/yr)	0	105	132	105	0	112
Rooftop Infiltration (mm/yr)	0	0	0	0	0	0
Total Infiltration (mm/yr)	0	105	132	105	0	112
Runoff Pervious Areas	0	421	395	421	0	375
Runoff Impervious Areas	892	0	0	0	892	67
Total Runoff (mm/yr)	892	421	395	421	892	442
Total Outputs (mm/yr)	1115	1115	1115	1115	1115	1115
Difference (Inputs - Outputs)	0	0	0	0	0	0
	INPUTS (VOLUMES)					
Precipitation (m^3/yr)	7413	36192	112254	37418	7628	200904
Run On (m^3/yr)	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0
Total Inputs (m^3/yr)	7413	36192	112254	37418	7628	200904
	OUTPUTS (VOLUMES)					
Precipitation Surplus (m^3/yr)	5930	17096	53026	17675	6102	99829
Net Surplus (m^3/yr)	5930	17096	53026	17675	6102	99829
Evaportranspiration (m^3/yr)	1483	19096	59228	19743	1526	101075
Infiltration (m^3/yr)	0	3419	13256	3535	0	20211
Rooftop Infiltration (m^3/yr)	0	0	0	0	0	0
Total Infiltration (m^3/yr)	0	3419	13256	3535	0	20211
Runoff Pervious Areas (m^3/yr)	0	13677	39769	14140	0	67586
Runoff Impervious Areas (m^3/yr)	5930	0	0	0	6102	12032
Total Runoff (m^3/yr)	5930	13677	39769	14140	6102	79619
Total Outputs (m^3/yr)	7413	36192	112254	37418	7628	200904
Difference (Inputs - Outputs)	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Each individual roof top assumed to cover about 3500 square feet

Appendix A.4

Water Budget Post-Development - With Mitigation Strategies

Catchment Designation	SITE					
	Roof tops	Vegetated Areas			Asphalt	
	20 homes	Lawns	Forest	Pasture	road access	Total
Area (m^2)	6651	32473	100722	33574	6844	180264
Pervious Area (m^2)	0	32473	100722	33574	0	166769
% Pervious	0%	18%	56%	19%	0%	92.5%
Impervious Area (m^2)	6651	0	0	0	6844	13495
% Impervious	3.7%	0%	0%	0%	3.8%	7.5%
	INFILTRATION FACTORS					
Topography Infiltration Factor	0	0.15	0.1	0.15	0	
Soil Infiltration Factor	0	0.1	0.1	0.1	0	
Land Cover Infiltration Factor	0	0.15	0.2	0.15	0	
MOE Infiltration Factor	0	0.4	0.4	0.4	0	
Actual Infiltration Factor	0	0.2	0.25	0.2	0	
Runoff Coefficient	1	0.8	0.75	0.8	1	
Runoff from Impervious Surfaces*	0.8	0	0	0	0.8	
	INPUTS (PER UNIT AREA)					
Precipitation (mm/yr)	1115	1115	1115	1115	1115	1115
Run On (mm/yr)	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0
Total Inputs (mm/yr)	1115	1115	1115	1115	1115	1115
	OUTPUTS (PER UNIT AREA)					
Precipitation Surplus (mm/yr)	892	526	526	526	892	554
Net Surplus (mm/yr)	892	526	526	526	892	554
Evaportranspiration (mm/yr)	223	588	588	588	223	561
Infiltration (mm/yr)	0	105	132	105	0	112
% Rooftop to balance infiltration	11.5%	0%	0%	0%	0%	--
Rooftop Infiltration (mm/yr)	102	0	0	0	0	4
Total Infiltration (mm/yr)	102	105	132	105	0	116
Runoff Pervious Areas	0	421	0	0	0	76
Runoff Impervious Areas	789	0	395	421	892	362
Total Runoff (mm/yr)	789	421	395	421	892	438
Total Outputs (mm/yr)	1115	1115	1115	1115	1115	1115
Difference (Inputs - Outputs)	0	0	0	0	0	0
	INPUTS (VOLUMES)					
Precipitation (m^3/yr)	7413	36192	112254	37418	7628	200904
Run On (m^3/yr)	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0
Total Inputs (m^3/yr)	7413	36192	112254	37418	7628	200904
	OUTPUTS (VOLUMES)					
Precipitation Surplus (m^3/yr)	5930	17096	53026	17675	6102	99829
Net Surplus (m^3/yr)	5930	17096	53026	17675	6102	99829
Evaportranspiration (m^3/yr)	1483	19096	59228	19743	1526	101075
Infiltration (m^3/yr)	0	3419	13256	3535	0	20211
Rooftop Infiltration (m^3/yr)	680	0	0	0	0	680
Total Infiltration (m^3/yr)	680	3419	13256	3535	0	20891
Runoff Pervious Areas (m^3/yr)	0	13677	0	0	0	13677
Runoff Impervious Areas (m^3/yr)	5250	0	39769	14140	6102	65262
Total Runoff (m^3/yr)	5250	13677	39769	14140	6102	78938
Total Outputs (m^3/yr)	7413	36192	112254	37418	7628	200904
Difference (Inputs - Outputs)	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Each individual roof top assumed to cover about 3500 square feet

Will require ~11.5% of the roof top runoff to balance the water budget

Appendix A.5
Water Budget Summary

PARAMETER	SITE				
	Pre-Development	***Post-Development No Mitigation***	***Difference Pre- vs. Post-***	***Post-Development Mitigation***	***Difference Pre- vs. Post-***
INPUTS (VOLUMES)					
Precipitation (m^3/yr)	200904	200904	0%	200904	0%
Run On (m^3/yr)	0	0	0%	0	0%
Other Inputs (m^3/yr)	0	0	0%	0	0%
Total Inputs (m^3/yr)	200904	200904	0%	200904	0%
OUTPUTS (VOLUMES)					
Precipitation Surplus (m^3/yr)	94975	99829	5%	99829	5%
Net Surplus (m^3/yr)	94975	99829	5%	99829	5%
Evapotranspiration (m^3/yr)	105929	101075	-5%	101075	-5%
Infiltration (m^3/yr)	20802	20211	-2.8%	20211	-3%
Rooftop Infiltration (m^3/yr)	89	0	0%	680	--
Total Infiltration (m^3/yr)	20891	20211	-3.3%	20891	0%
Runoff Pervious Areas (m^3/yr)	74084	67586	-9%	13677	-82%
Runoff Impervious Areas (m^3/yr)	0	12032	-	65262	-
Total Runoff (m^3/yr)	74084	79619	7%	78938	7%
Total Outputs (m^3/yr)	200904	200904	0%	200904	0%