B1

APPENDIX B1

Engineering Assessment, The Mission Special Character Zone, Puketitiri Road, Napier

ENGINEERING ASSESSMENT

REV 0

stratagroup CONSULTING ENGINEERS

The Mission Special Character Zone

Puketitiri Road
Napier

December 2016

Rev 0

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Document Control

Project Name - The Hill at the Mission

Project Ref - J4042

Version	Date	Status	Prepared

Version	Extent of Revision
0	Issued for Council Comment

Table of Contents

1. Brief

Strata Group Consulting Engineers Ltd has been engaged by Marist Holdings (Greenmeadows) Ltd (MHL) to undertake an engineering assessment of the civil engineering aspects of the proposed Mission Special Character Zone residential development at Puketitiri Road, Napier.

The assessment is based on a maximum density of 550 dwellings.

The following aspects of the development were considered:

- Earthworks
- Internal roading design standards
- Stormwater collection and disposal
- Wastewater disposal
- Water supply
- Utilities

2. Earthworks

The terrain consists of rolling hills dissected with steeper valleys draining in a westerly direction toward open farmland. The eastern face of the development area is steep and is not included in the urban zoning.

The extent of earthworks could vary considerably for the project depending on demand, yield and project economics. A higher yield would typically require more earthworks. The volume of earthworks would be determined as each stage is developed.

An earthworks management plan would be required for each stage in the development. The plan would address:

- Protecting heritage sites
- Silt runoff and management
- Dust control
- Noise control and hours of work
- Remediation

Based on the previous geotechnical report[1] there are no technical reasons to restrict the extent of earthworks provided it is undertaken in accordance with the recommendations of the geotechnical engineer and NZS4402: “Code of practice for earth fill for residential development”.

Each stage of development would require a detailed investigation of the existing ground and the proposed earthworks. The geotechnical report would address the stability of the proposed earthworks and that each lot satisfies the requirements of “good ground” under the New Zealand Building Code: NZBC B1/AS4.

[1] Tonkin and Taylor Report Ref Number 21027 dated February 2004 prepared by Bernard Hegan

3. Roading

The main access to the development is from Puketitiri Road.

Provisions were made during construction of the realigned and upgraded Puketitiri Road in 2003 for an intersection into the development area. The intersection position took into account safe sight stopping distances for vehicles. An intersection design was undertaken by Opus to the satisfaction of Napier City Council. The Mission Special Character Zone would adopt this approved design.

A secondary entrance is required for emergency access.

The road construction would generally consist of asphalt surfacing with concrete kerb and channels. Architectural and landscaping features would be incorporated into the design.

The main access roads would generally comply with the Napier City Council Code of Practice for Subdivision and Land Development. The narrower local roads proposed by Isthmus Group would require relief from some of the Code's road design standards.

Other departures from the Code of Practice could include gradients, horizontal curves, carriageway widths, footpaths and design speed.

The following road design criteria is likely to be adopted:

- Gradient not to exceed 12.5% on main roads and 15% on minor roads with 19% over short distances
- Carriageway width varies from 8.5m on main roads to 6m on minor roads and 3m on access lanes with provision for vehicles to pass
- 3% cross fall on both the road and car parking
- Raised concrete kerb between car parking and berm/landscaping
- Footpath width 1.2 to 2.0m
- Grassed or landscaped berms on both sides of the road
- The horizontal curve radii shall be designed to reflect the intended road use and anticipated traffic speed environment.

Low impact stormwater features would be incorporated into the streetscape such as rain gardens and tree pits to slow down the flow of stormwater off the development.

A comprehensive development plan would be required for each stage to demonstrate the departures from the Code of Practice and how the underlying principles of safe road design and integration with pedestrian users would be mitigated.

4. Stormwater

A Council reticulated stormwater system is not available to the site.

The natural flow of stormwater runoff is in the westerly direction through a series of water courses in the Turirau Catchment before discharging into the Tutaekuri River. A small portion of the proposed development area flows toward the city and is collected in the Taipo Stream.

The proposed development results in the reduction of natural surface area and the potential for hydrocarbons and other contaminants to enter the water course. Controls can be incorporated in the engineering design for these risks compared to the current farm operation which has no restrictions on stock numbers or fertiliser application. The nutrient runoff generated from the existing farming activity currently enters the waterways without any form of treatment.

The option of mitigating stormwater downstream of the development was investigated and consultation undertaken with some of the affected land owners. Through this consultation process it was discovered that there has been a long history of flooding in the area. There is an inland depression which would have been swamp before intensive farming activities drained the wetland and turned it into arable land for pasture and cropping. There is no natural outlet from the area, and the current farming operation uses pumps to drain it. Consideration was given to restoring the inland depression to a natural wetland which could have accommodated the runoff from the Mission Special Character Zone, however that option was not supported by the property owner.

Upgrades to the Turirau Stream profile were considered, however there was some doubt as to how effective this would be and the conveyance of stormwater involved the approval of a number of land owners.

We considered the only feasible option remaining for the rezoning is to construct a stormwater system on site that replicates the natural wetland that would have existed in the area prior to intensive farming. The design principles of wetlands for stormwater treatment and attenuation are well document in the Hawke's Bay Regional Council (HBRC) Water Way Guidelines. These guidelines have been used as the basis for determining if on-site stormwater management is feasible.

Stormwater quantity calculations have been undertaken, refer Appendix B, and is summarised below:

Catchment No	Total Area (Ha)	Developed Area (Ha)	Time of Concentration Tc (Hr)	Pre-Development Peak Runoff 100 Year m^3/sec	Storage 100 Year m^3
1	26.4	9.7	2	1.0	5,200
2	57.0	26.3	2	2.2	9,800
3	34.4	10.6	2	1.4	6,100
4	64.8	4.5	2	2.5	6,400
5	44.2	7.9	2	1.7	5,900

The storage volume has been sized to accommodate the total volume of stormwater runoff during a 100 year 2 hour duration event.

There is adequate land available in the base of the gullies to accommodate these storage volumes behind low level check dams of less than 3m high. In accordance with the HBRC waterway guidelines the design would include a series of depression areas to allow stormwater quality retention time in each area and allow for natural absorption and evaporation processes.

Consultation has been undertaken with Hawke's Bay Regional Council who have recommended that that a Certificate of Compliance for the diversion and discharge of stormwater is obtained, provided the wetland design is undertaken in accordance with the HBRC Waterway Guidelines.

Low impact stormwater design principles would be incorporated throughout the development to achieve best practice from source through to discharge at the boundary.

We consider the impact of stormwater on the receiving water courses can be mitigated through the construction of wetlands within the 290 Hectare property. The wetlands would restore the natural habitat in the gullies and watercourses and act as a "sponge" to obsorb stormwater volumes, control peak runoff to the predevelopment flow and treat the stormwater quality.

5. Wastewater

There are no existing wastewater connections to the site. The nearest Council reticulation is at the intersection of Prebenson Drive and Church Road.

The existing sewer consists of a gravity main falling to a pump station at the end of Pinotage Drive where it is pumped overland to Westminster Avenue. A preliminary assessment of the existing network has found there is no spare capacity in this system as it is limited by the Pinotage Pumpstation and there are site constraints to upgrading the pump station. The nearest feasible connection point is therefore the existing 150mm diameter rising main east of the pumpstation.

A minimum of two pump stations would be required to collect and pump waste water from the development into the Council reticulation as shown on Drawing CO2 Appendix A.

The design flows from the development are summarised in the Table below:

Peak wet weather flow (PWWF)	1,100 Litres/Person/Day
Population density	2.7 Persons/lot
Number of Lots	550
Population	1,485
Wastewater volume	1,634 m^3/day
Flow rate - Average PWWF	18.9 Litre/Sec

Consultation has been undertaken with Napier City Council development engineers and they have confirmed that there is adequate capacity for in the existing DN 150 Pinotage pump station rising main. The proposed connection point and pipeline route is shown

A number of pump stations would be required within the development area to convey wastewater from the gravity system within the development area to the Napier City network.

6. Water Supply

A water reservoir was constructed on MHL land for the joint benefit of the Kent Terrace development and the then proposed Western Hills residential development in 2003. The capacity of the reservoir is 1,000m^3. MHL has contributed 80% toward the cost of the reservoir for 800m^3 of dedicated storage. The reservoir is located at 128m elevation to enable a gravity supply to the Mission Special Character Zone without the need for pumping.

The lower levels of the zone may need pressure reducing valves to reduce house hold water pressure.

The water demand is summarised as follows:

Residential dwellings	550
People per dwelling	2.7
Average demand on maximum day	900 Litres/person/day
Average flow demand per day	15.5 Litres/second
Peak demand on average day	32.7 Litres/second
Fire fighting storage	90,000 Litres
Domestic storage	765 m^3

The water supply reticulation shall be undertaken in accordance with the Napier City Code of Practice for Subdivision and Land Development.

7. Utility Services

Both power and telecommunication providers have confirmed they are able to provide services to the development.

8. Conclusion

Development of a 550 Lot subdivision in the proposed Mission Special Character Zone is technically feasible subject to the following:

- Earthworks shall be undertaken in accordance with NZS4431: “Code of practice for earthfill for residential development” and to the satisfaction of the geotechnical engineer and that each lot satisfies the requirements of “good ground” under the New Zealand Building Code: NZBC B1/AS4.

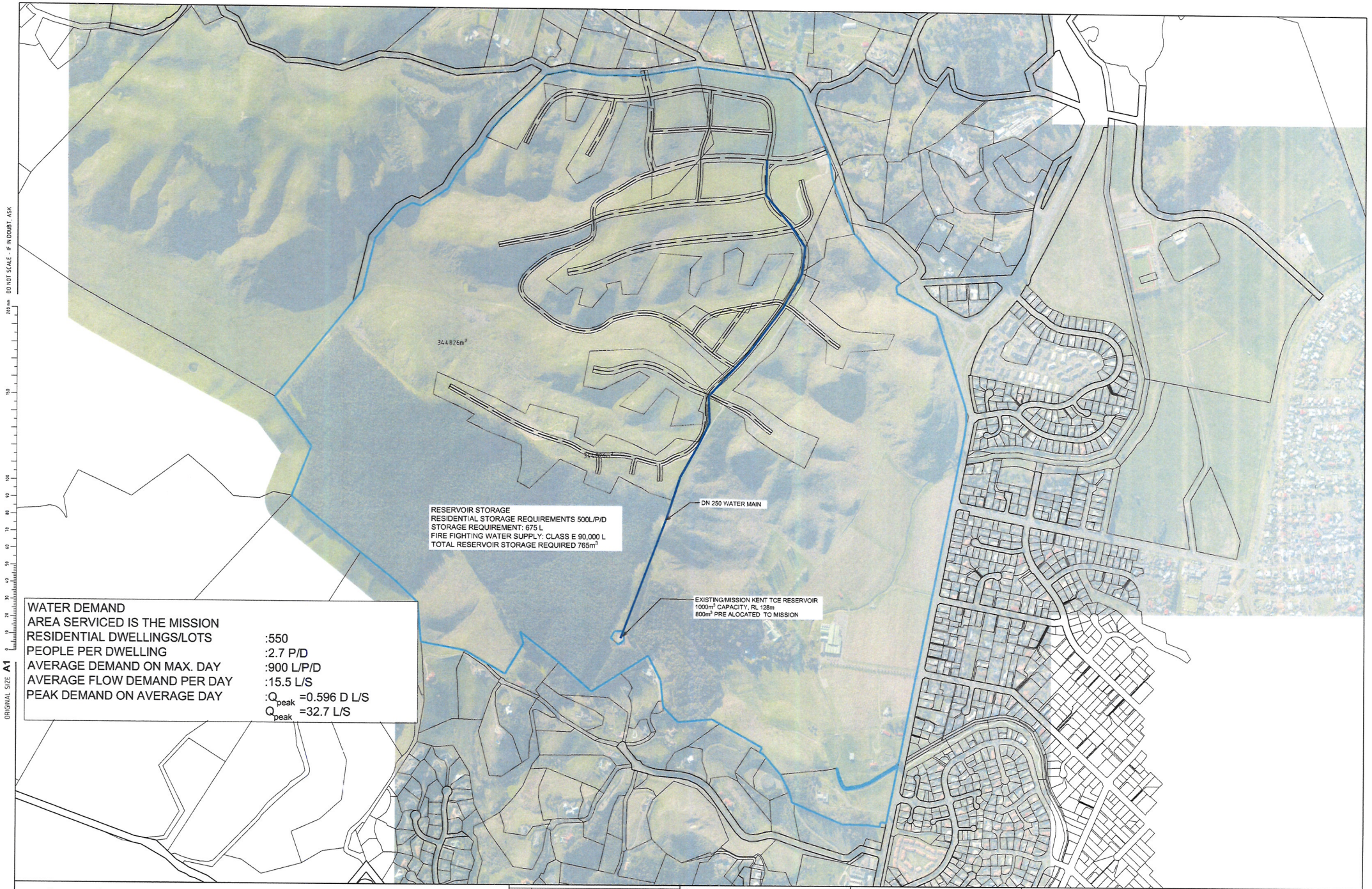
- Roading is generally undertaken in accordance with the Code of Practice for Subdivision and that any departures are addressed through a comprehensive development plan to the satisfaction of the Napier City Council roading engineers at each stage of the development.

- Water supply is provided via the existing MHL/Kent Terrace reservoir which has existing capacity for the proposed zoning.

- Wastewater is connected to the Napier City Council pumping main down stream of the Pinotage pump station.

- Stormwater attenuation and water quality treatment shall be undertaken on site through wetlands in accordance with the Hawke’s Bay Regional Council Waterway Guidelines and the Certificate of Compliance.

Appendix A: Drawings



WATER DEMAND	
AREA SERVICED IS THE MISSION	
RESIDENTIAL DWELLINGS/LOTS	:550
PEOPLE PER DWELLING	:2.7 P/D
AVERAGE DEMAND ON MAX. DAY	:900 L/P/D
AVERAGE FLOW DEMAND PER DAY	:15.5 L/S
PEAK DEMAND ON AVERAGE DAY	:Q_{peak} =0.596 D L/S
	Q_{peak} =32.7 L/S

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

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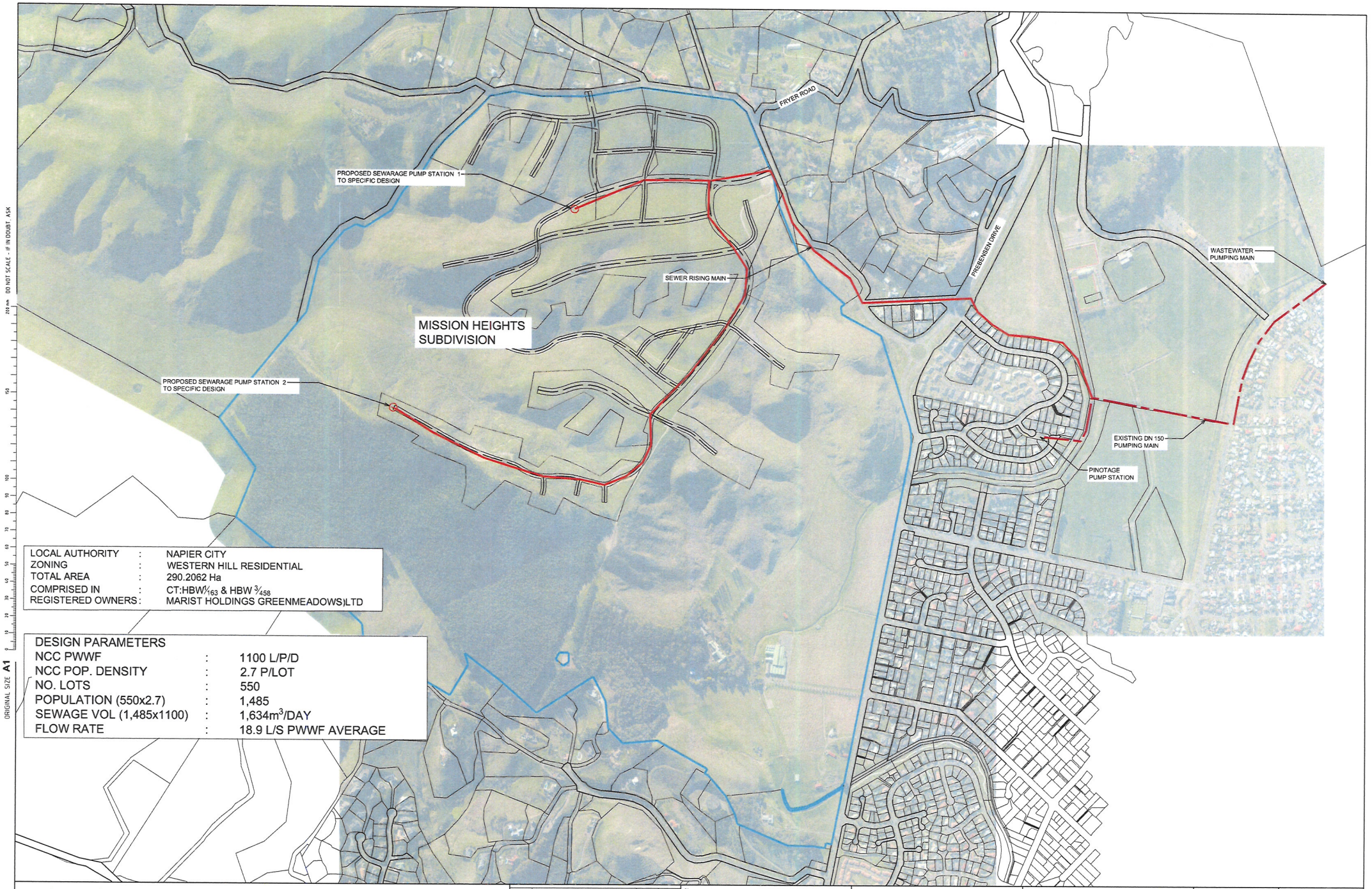
Revision	Reason For Issue	Date	By
A	SCHEME PLAN	111116	AMa

Client: MARIST HOLDINGS (GREENMEADOWS) LTD

Project: THE MISSION SPECIAL CHARACTER ZONE

Title: TOWN WATER SUPPLY SCHEME PLAN

Designed	AMa
Drawn	AMa
Checked	RN
Date	NOVEMBER 2016
Project No	J4042
A1 Scale	1:5000
A3 Scale	1:10000
Sheet	C01
Revision	A



LOCAL AUTHORITY	:	NAPIER CITY
ZONING	:	WESTERN HILL RESIDENTIAL
TOTAL AREA	:	290.2062 Ha
COMPRISED IN	:	CT:HBW1/163 & HBW 3/458
REGISTERED OWNERS	:	MARIST HOLDINGS GREENMEADOWS)LTD

DESIGN PARAMETERS		
NCC PWWF	:	1100 L/P/D
NCC POP. DENSITY	:	2.7 P/LOT
NO. LOTS	:	550
POPULATION (550x2.7)	:	1,485
SEWAGE VOL (1,485x1100)	:	1,634m^3/DAY
FLOW RATE	:	18.9 L/S PWWF AVERAGE

DO NOT SCALE - IF IN DOUBT ASK

ORIGINAL SIZE A1

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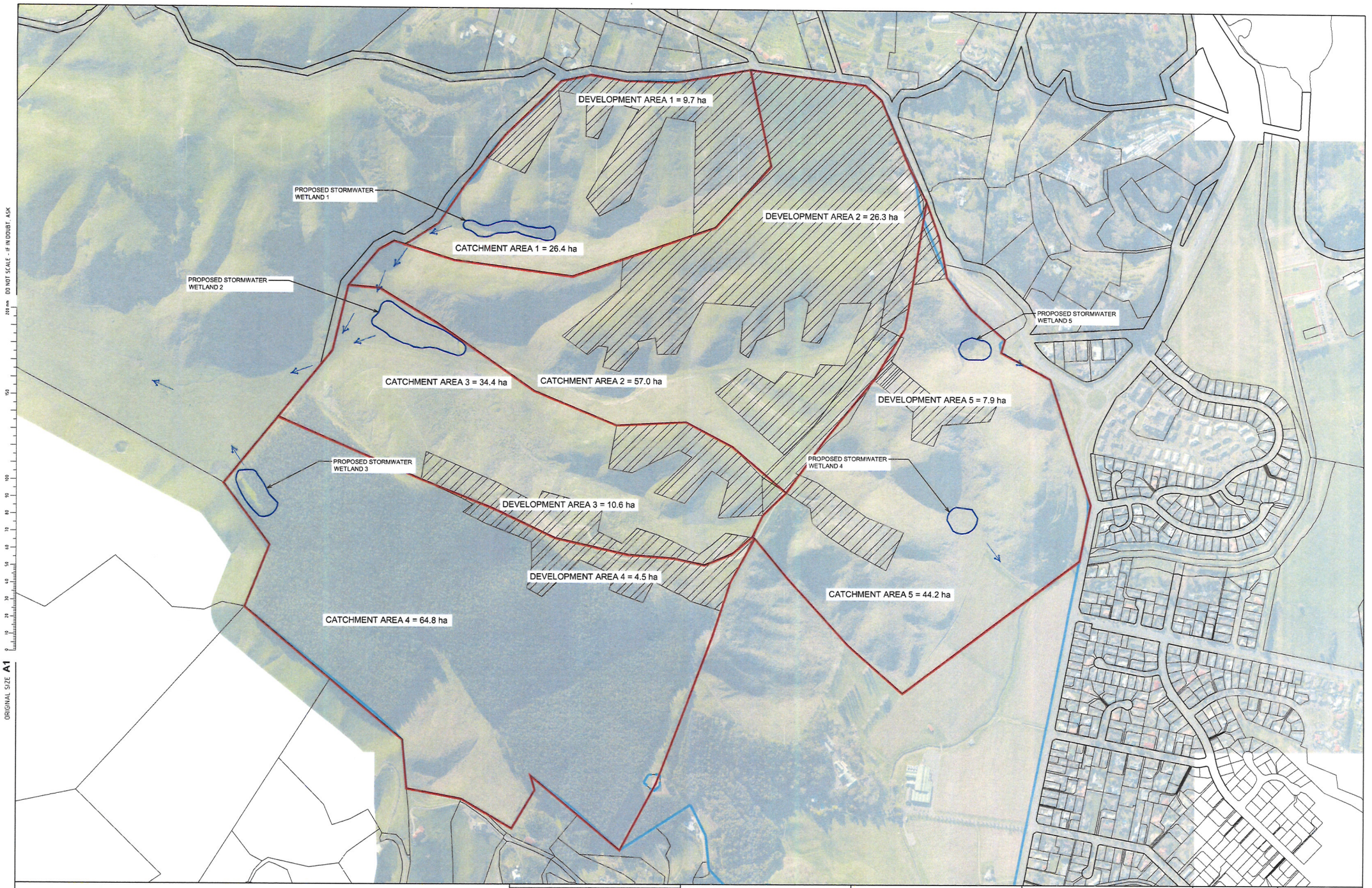
Revision	Reason For Issue	Date	By
A	SCHEME PLAN	111116	AMa

Client: MARIST HOLDINGS (GREENMEADOWS) LTD

Project: THE MISSION SPECIAL CHARACTER ZONE

Title: SANITARY SEWER SCHEME PLAN

Designed	AMa
Drawn	AMa
Checked	RN
Date	NOVEMBER 2016
Project No.	J4042
A1 Scale	1:5000
A3 Scale	1:10000
Sheet	C02
Revision	A



DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

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Revision	Reason For Issue	Date	By
A	SCHEME PLAN	111116	AMa

Client: MARIST HOLDINGS (GREENMEADOWS) LTD

Project: THE MISSION SPECIAL CHARACTER ZONE

Title: CATCHMENT AREA SCHEME PLAN

Designed	AMa
Drawn	AMa
Checked	RN
Date	NOVEMBER 2016
Project No.	J4042
A1 Scale	1:4000
A3 Scale	1:8000
Sheet	C03
Revision	A

Appendix B: Stormwater Calculations

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Mission Hill Catchment 1
2 hours Time of Concentration

Project No.	J 4042
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PRE DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	26.4000	=	1759.01	1288.40	1068.44	781.78	522.40	273.22	182.78	122.57
Total Flow l/s								26.4000		1759.01	1288.40	1068.44	781.78	522.40	273.22	182.78	122.57

100 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	26.4000	=	3564.31	2592.23	2170.48	1597.00	1038.95	524.62	339.46	3564.31
Total Flow l/s								26.4000		3564.31	2592.23	2170.48	1597.00	1038.95	524.62	339.46	3564.31

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Mission Hill Catchment 1
2 hours Time of Concentration

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POST DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.7	X	I	X	9.7000	=	1508.04	1104.57	916.00	670.24	447.87	234.24	156.70	105.08
Pasture	Q=	2.78	X	0.3	X	I	X	16.7000		1112.71	815.01	675.87	494.54	330.46	172.83	115.62	77.54
Total Flow l/s								26.40		2620.75	1919.59	1591.87	1164.78	778.33	407.07	272.32	182.62
Pre-development Flow										522.40	522.40	522.40	522.40	522.40	522.40	522.40	522.40
Flow to Storage		l/s								2098.35	1397.18	1069.47	642.38	255.92	0.00	0.00	0.00
Storage Volume		m3								1259.01	1676.62	1925.05	2312.55	1842.65	0.00	0.00	0.00

100 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.75	X	I	X	9.7000	=	3274.04	2381.12	1993.72	1466.94	954.34	481.89	311.81	203.15
Pasture	Q=	2.78	X	0.3	X	I	X	16.7000	=	2254.70	1639.78	1372.99	1010.22	657.21	331.86	214.73	139.90
Total Flow l/s								26.40		5528.74	4020.90	3366.71	2477.16	1611.55	813.75	526.55	343.05
Pre-development Flow										1038.95	1038.95	1038.95	1038.95	1038.95	1038.95	1038.95	1038.95
Flow to Storage		l/s								4489.79	2981.95	2327.76	1438.21	572.60	0.00	0.00	0.00
Storage Volume		m3								2693.87	3578.34	4189.96	5177.57	4122.74	0.00	0.00	0.00

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Mission Hill Catchment 2
2 hours Time of Concentration

Project No.	J 4042
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PRE DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	57.0000	=	3797.87	2781.77	2306.87	1687.94	1127.91	589.90	394.63	264.64
Total Flow l/s								57.0000		3797.87	2781.77	2306.87	1687.94	1127.91	589.90	394.63	264.64

50 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	57.0000	=	7695.68	5596.86	4686.26	3448.06	2243.19	1132.70	732.92	7695.68
Total Flow l/s								57.0000		7695.68	5596.86	4686.26	3448.06	2243.19	1132.70	732.92	7695.68

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Mission Hill Catchment 2
2 hours Time of Concentration

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POST DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.7	X	I	X	26.3000	=	4088.82	2994.88	2483.59	1817.25	1214.32	635.10	424.86	284.92
Pasture	Q=	2.78	X	0.3	X	I	X	25.8000	=	1719.03	1259.12	1044.16	764.02	510.53	267.01	178.62	119.79
								30.7000									
Total Flow l/s								52.10		5807.85	4254.00	3527.75	2581.27	1724.85	902.10	603.48	404.70
Pre-development Flow										1127.91	1127.91	1127.91	1127.91	1127.91	1127.91	1127.91	1127.91
Flow to Storage		l/s								4679.94	3126.08	2399.84	1453.35	596.94	0.00	0.00	0.00
Storage Volume		m3								2807.96	3751.30	4319.71	5232.07	4297.94	0.00	0.00	0.00

100 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.75	X	I	X	26.3000	=	8877.03	6456.02	5405.64	3977.37	2587.53	1306.58	845.43	550.81
Pasture	Q=	2.78	X	0.3	X	I	X	25.8000	=	3483.31	2533.31	2121.15	1560.70	1015.34	512.69	331.74	216.14
Total Flow l/s								52.10		12360.34	8989.34	7526.79	5538.08	3602.87	1819.27	1177.18	766.95
Pre-development Flow										2243.19	2243.19	2243.19	2243.19	2243.19	2243.19	2243.19	2243.19
Flow to Storage		l/s								10117.16	6746.15	5283.60	3294.89	1359.69	0.00	0.00	0.00
Storage Volume		m3								6070.29	8095.39	9510.49	11861.60	9789.73	0.00	0.00	0.00

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Mission Hill Catchment 3
2 hours Time of Concentration

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POST DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.7	X	I	X	10.8000	=	1679.06	1229.84	1019.88	746.25	498.66	260.80	174.47	117.00
Pasture	Q=	2.78	X	0.3	X	I	X	23.6000		1572.45	1151.75	955.12	698.87	467.00	244.24	163.39	109.57
Total Flow l/s								34.40		3251.51	2381.59	1975.00	1445.11	965.65	505.04	337.86	226.57
Pre-development Flow										680.71	680.71	680.71	680.71	680.71	680.71	680.71	680.71
Flow to Storage		l/s								2570.80	1700.88	1294.30	764.41	284.95	0.00	0.00	0.00
Storage Volume		m3								1542.48	2041.06	2329.73	2751.87	2051.61	0.00	0.00	0.00

100 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.75	X	I	X	10.8000	=	3645.32	2651.14	2219.81	1633.29	1062.56	536.54	347.17	226.19
Pasture	Q=	2.78	X	0.3	X	I	X	23.6000	=	3186.28	2317.30	1940.28	1427.62	928.76	468.98	303.46	197.71
Total Flow l/s								34.40		6831.60	4968.44	4160.08	3060.91	1991.32	1005.52	650.63	423.89
Pre-development Flow										1353.78	1353.78	1353.78	1353.78	1353.78	1353.78	1353.78	1353.78
Flow to Storage		l/s								5477.82	3614.66	2806.30	1707.13	637.54	0.00	0.00	0.00
Storage Volume		m3								3286.69	4337.59	5051.34	6145.67	4590.27	0.00	0.00	0.00

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Mission Hill Catchment 3
2 hours Time of Concentration

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PRE DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA l/s

									(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
							Ha									
Existing	Q=	2.78	X	0.3	X	I	X	34.4000	=	2292.05	1678.82	1392.21	1018.69	680.71	356.01	238.16	159.72
Total Flow l/s								34.4000		2292.05	1678.82	1392.21	1018.69	680.71	356.01	238.16	159.72

50 YEAR
Q=2.78CIA l/s

									(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
							Ha									
Existing	Q=	2.78	X	0.3	X	I	X	34.4000	=	4644.41	3377.75	2828.20	2080.94	1353.78	683.59	442.32	4644.41
Total Flow l/s								34.4000		4644.41	3377.75	2828.20	2080.94	1353.78	683.59	442.32	4644.41

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Mission Hill Catchment 4
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PRE DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	64.8000	=	4317.58	3162.44	2622.54	1918.92	1282.26	670.63	448.63	300.86
Total Flow l/s								64.8000		4317.58	3162.44	2622.54	1918.92	1282.26	670.63	448.63	300.86

50 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	64.8000	=	8748.77	6362.74	5327.54	3919.90	2550.15	1287.70	833.22	8748.77
Total Flow l/s								64.8000		8748.77	6362.74	5327.54	3919.90	2550.15	1287.70	833.22	8748.77

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POST DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA **l/s**

									Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.7	X	I	X	4.5000	=		699.61	512.43	424.95	310.94	207.77	108.67	72.69	48.75
Pasture	Q=	2.78	X	0.3	X	I	X	60.3000			4017.74	2942.82	2440.42	1785.66	1193.21	624.06	417.48	279.97
Total Flow l/s								64.80			4717.35	3455.25	2865.37	2096.60	1400.99	732.72	490.17	328.72
Pre-development Flow											1282.26	1282.26	1282.26	1282.26	1282.26	1282.26	1282.26	1282.26
Flow to Storage		l/s									3435.09	2172.99	1583.11	814.34	118.73	0.00	0.00	0.00
Storage Volume		m3									2061.06	2607.59	2849.60	2931.63	854.84	0.00	0.00	0.00

100 YEAR
Q=2.78CIA **l/s**

									Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.75	X	I	X	4.5000	=		1518.88	1104.64	924.92	680.54	442.73	223.56	144.66	94.25
Pasture	Q=	2.78	X	0.3	X	I	X	60.3000	=		8141.22	5920.89	4957.57	3647.69	2373.05	1198.27	775.35	505.16
Total Flow l/s								64.80			9660.10	7025.53	5882.49	4328.23	2815.79	1421.83	920.01	599.40
Pre-development Flow											2550.15	2550.15	2550.15	2550.15	2550.15	2550.15	2550.15	2550.15
Flow to Storage		l/s									7109.96	4475.38	3332.34	1778.08	265.64	0.00	0.00	0.00
Storage Volume		m3									4265.97	5370.46	5998.21	6401.09	1912.61	0.00	0.00	0.00

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PRE DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	44.2000	=	2945.01	2157.09	1788.83	1308.89	874.63	457.43	306.01	205.22
Total Flow l/s								44.2000		2945.01	2157.09	1788.83	1308.89	874.63	457.43	306.01	205.22

50 YEAR
Q=2.78CIA l/s

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Existing	Q=	2.78	X	0.3	X	I	X	44.2000	=	5967.53	4340.02	3633.91	2673.76	1739.45	878.34	568.34	5967.53
Total Flow l/s								44.2000		5967.53	4340.02	3633.91	2673.76	1739.45	878.34	568.34	5967.53

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Mission Hill Catchment 5
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POST DEVELOPMENT FLOW

10 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.7	X	I	X	7.9000	=	1228.20	899.60	746.02	545.87	364.76	190.77	127.62	85.58
Pasture	Q=	2.78	X	0.3	X	I	X	36.3000		2418.64	1771.55	1469.11	1074.95	718.30	375.68	251.32	168.54
Total Flow l/s								44.20		3646.84	2671.15	2215.13	1620.82	1083.06	566.45	378.94	254.12
Pre-development Flow										874.63	874.63	874.63	874.63	874.63	874.63	874.63	874.63
Flow to Storage		l/s								2772.21	1796.52	1340.50	746.19	208.43	0.00	0.00	0.00
Storage Volume		m3								1663.33	2155.83	2412.91	2686.29	1500.72	0.00	0.00	0.00

100 YEAR
Q=2.78CIA **l/s**

								Ha		(I) 10 MIN	(I) 20 MIN	(I) 30 MIN	(I) 60 MIN	(I) 2 HR	(I) 6 HR	(I) 12 HR	(I) 24 HR
Developed Area	Q=	2.78	X	0.75	X	I	X	7.9000	=	2666.49	1939.26	1623.75	1194.72	777.24	392.47	253.95	165.45
Pasture	Q=	2.78	X	0.3	X	I	X	36.3000	=	4900.93	3564.31	2984.41	2195.87	1428.55	721.35	466.76	304.10
Total Flow l/s								44.20		7567.42	5503.58	4608.15	3390.60	2205.80	1113.82	720.71	469.55
Pre-development Flow										1739.45	1739.45	1739.45	1739.45	1739.45	1739.45	1739.45	1739.45
Flow to Storage		l/s								5827.97	3764.12	2868.70	1651.14	466.35	0.00	0.00	0.00
Storage Volume		m3								3496.78	4516.95	5163.66	5944.12	3357.69	0.00	0.00	0.00

B2

APPENDIX B2

Letter Response to Stormwater and Staging components of Further Information Request

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1st June 2017

Mitchel Daysh

PO Box 149

Napier

Attention: Phillip McKay

Dear Phillip

Re: **Mission Special Character Zone Private Plan Change Request**

Refer letter dated 24 March 2017 from Kydd Smith Environmental.

Responses to the stormwater and staging parts follow:

Stormwater Management

(a) While peak flow of stormwater will remain the same, the total volume will increase and there does not appear to be any assessment or analysis of downstream effects provided;

- It has been demonstrated by the stormwater analysis provided that there is adequate area available within the Mission property to provide attenuation facilities to mitigate the downstream effects. As the peak flow and volume will be mitigated, there is no reason to undertake an assessment of downstream effects.

(b) There is no evidence of consultation or approval to dispose of stormwater via private property within the Hastings District. The Council requires a level of assurance that it will not inherit an issue or perceived issue by the affected landowner;

- Consultation has been undertaken with Mathew Kneebone of Hastings District Council. Provided we manage the stormwater as described in the engineering report, Mr Kneebone is satisfied that there will be no adverse effects on the Hastings District Council Network, which consists of the two culverts beneath the Springfield and Puketapu Roads.

(c) There is no detail on how the proposed on-site detention ponds and low impact design will operate or be maintained;

- This work will be undertaken at detailed design stage. The stormwater collection, treatment and attenuation system is an integral part of the roading layout, streetscape and landscaping design and cannot be undertaken in isolation. As this is all part of a green infrastructure stormwater solution, the detailed design work requires the input from all stakeholders including the operational and maintenance departments within Council.

(d) There is no detail provided on how flow will reach the drainage network from stormwater ponds 4 and 5;

- Open channel flow via grass swales and vegetated valley floors will be utilised where possible to provide stormwater treatment and infiltration. This requires careful design and detailing which will form part of the engineering approval process at detailed design stage.

(e) *It is uncertain how water from stormwater ponds 1-3 will enter the neighbouring property – is it via overland flow or will it be a piped system, and will it be into new or existing water courses?;*

- As per (d) above, green infrastructure is the preferred means of stormwater conveyance outside of the urban development areas.

(f) *It is uncertain what will happen in a greater than 1:50 event – is there a fail-safe on the detention ponds?; and*

- The ponds will be designed for a larger event than 1:50 and will also have a factor of safety for climate change. There is adequate space available to accommodate attenuation to meet Napier City Council and Hawke's Bay Regional Council design standards.

(g) *The stormwater design for the developed area is 1:10 – what are the overland flow paths for 1:50 events?*

- Overland flow paths will be via the street as per the Engineering Code of Practice, and will connect to the natural drainage channels via vegetated channels that are engineered to minimise erosion and maintenance. This will be part of the detailed design stage.

(h) *It would be helpful to have an actual design provided as to how the wetlands will function (stand-alone ponds, or connected in a series);*

- There are a number of operational wetland facilities and best practice guidelines such as the Hawke's Bay Regional Council Waterway Guidelines which will be adopted.

(i) *Will a planting plan for the wetlands be provided?*

- A planting plan will be provided for the wetlands following consultation with all stakeholders at the detailed design stage.

(j) *What will be the treatment efficiency regarding contaminant attenuation through the wetlands?*

- Stormwater quality is part of the detailed design and will require specialist input from biological experts.

(k) *How often, and is it likely, that the treatment ponds/wetlands will need to be cleaned out?*

- This is part of the detailed design which will require input from Council's operational and maintenance groups as this is a key aspect of the stormwater quantity and quality design process.

Staging plan

The staging plan is based around existing roading infrastructure and the connections for water supply and wastewater to the Napier City Council network.

The water supply connection is required in the first stage which consists of a 250mm diameter water supply main from the existing reservoir. This pipeline provides the backbone for the water supply network to the entire development. The future development stage will extend outward from this main service corridor.

We have been advised that there is some existing capacity in the Pinotage Pump station which means that the first stages of the development can connect to the existing waste water reticulation in Oak Place. The rising main to the northern side of Merlot Drive will be installed once the existing infrastructure has reached capacity.

Yours sincerely,
For an on behalf of Strata Group Consulting Engineers Ltd

Russell Nettlingham