EIGHTY6 ENGINEERING

2 HALIFAX AVENUE, EPSOM
AUCKLAND 1051

FLOOD ASSESSMENT REPORT

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REVISION HISTORY

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A	20.04.2023	Consent Issue	Justin Lahpai	Yeewen Ong

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Attachment 1 Epsom - New Market Flood Hazard Mapping

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVE

This report describes the site characteristics, summarises the existing stormwater drainage conditions and provides a high-level flood hazard risk assessment for 2 Halifax Avenue, Epsom. This report does not address any specific stormwater management requirements such as water quality treatment, hydrology mitigation, stream assessment and flow attenuation etc.

2.0 THE SITE

2.1 SITE LOCATION

The subject site is located at 2 Halifax Avenue, Epsom in central Auckland and within the Epsom New Stormwater Catchment (Figure 1).

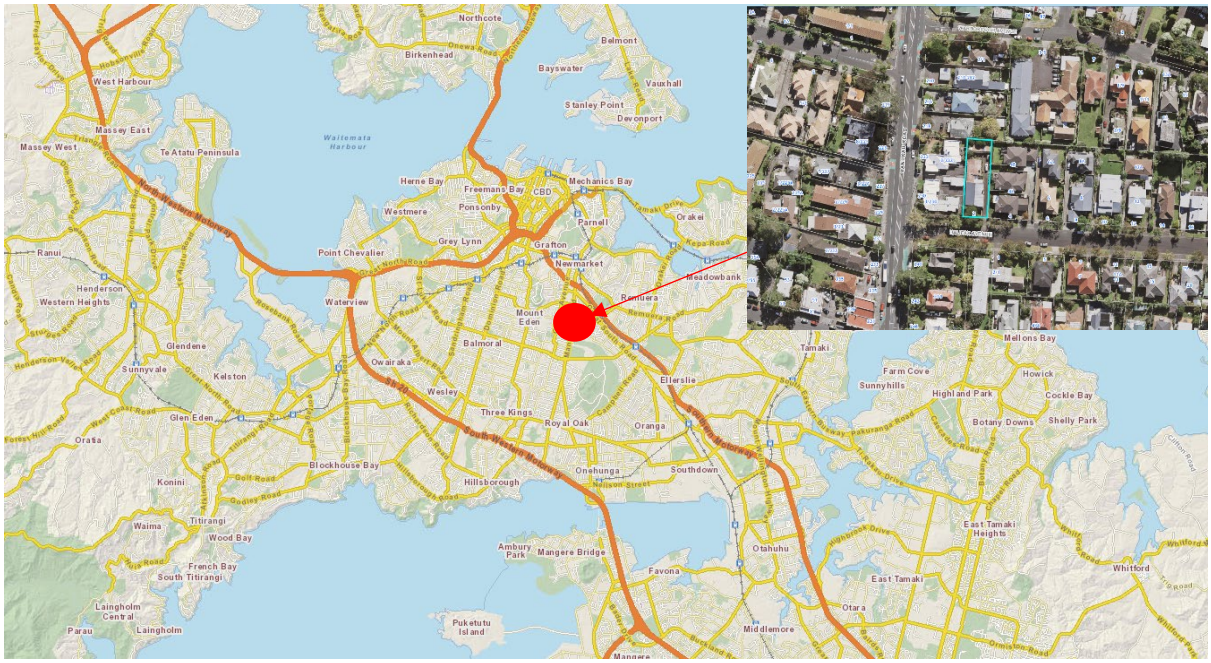


Figure 1: Location Map (Auckland Council GeoMaps, 2023)

2.2 SITE DESCRIPTIONS

The site consists of an existing residential dwelling and has a total area of 750m^2. The current housing zone is regarded as Residential - Mixed Housing Suburban Zone. The legal description of the site parcel is LOT 1 DP 410159.

2.3 TOPOGRAPHY

As observed from the topographic survey, the site slopes from the northern boundary to the southern boundary. Existing ground elevations range from approximately RL 76.90m at the northern boundary to RL 75.70m at the southern boundary of the site.

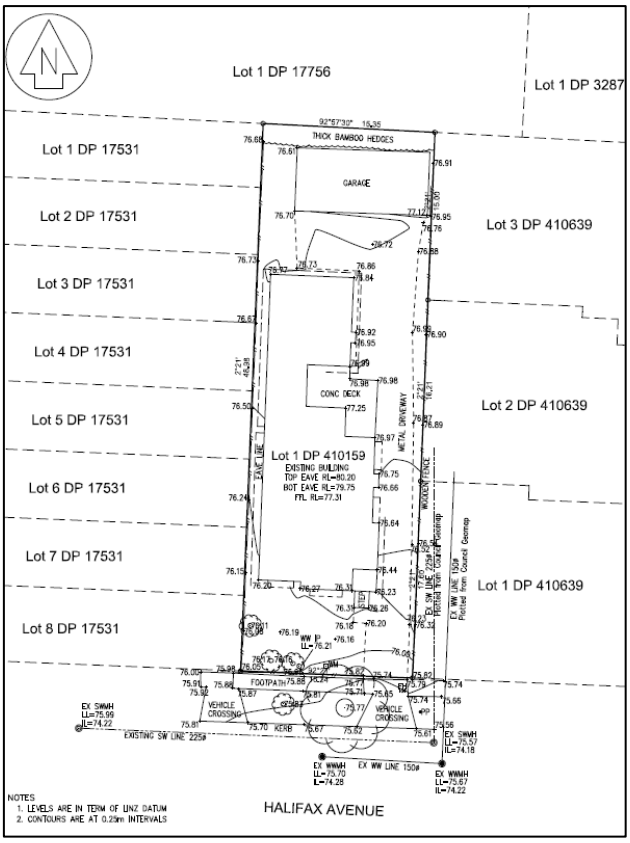


Figure 2: Topography Plan (Sourced from: Kol Noun Surveyors Ltd)

2.4 EXISTING STORMWATER INFRASTRUCTURE AND DRAINAGE

The Auckland Council GeoMaps indicates the stormwater runoff from the upper catchment including the subject site discharges into the existing Ø225mm public stormwater pipe (SAP ID:2000924340) as shown in Figure 3 below.

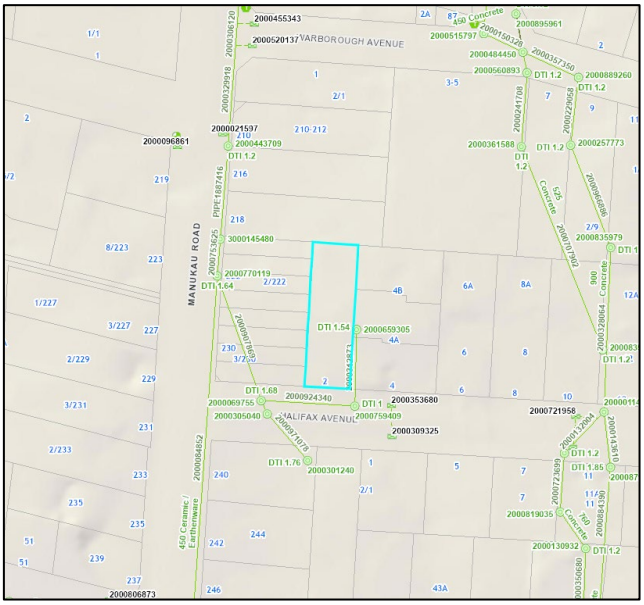


Figure 3: Existing Stormwater Drainage (Auckland Council GeoMaps, 2023)

3.0 PROPOSED DEVELOPMENT

The proposed development consists of 3 new residential dwellings, a common accessway and an upgrade of the existing vehicle crossing as shown in Figure 4 Proposed Site Layout Plan.

Minor earthworks have been proposed at the subject site to form the common accessway only, which requires a cut volume of 23m^3 and a fill volume of 10m^3 as shown in Figure 11. The orange dashed line indicates the extent of the proposed earthwork on site. Details refer to Appendix A: Engineering Plans: FP210b-21.

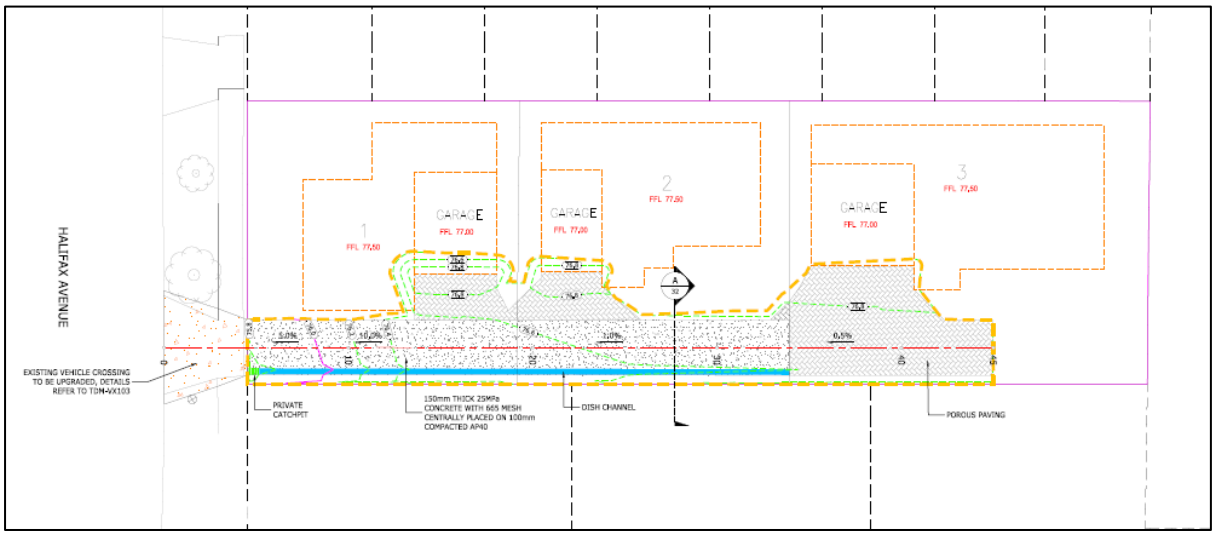


Figure 4: Proposed Site Layout

4.0 FLOOD RISK ASSESSMENT

4.1 OVERLAND FLOW AND 100YR FLOODPLAIN

Auckland Council GeoMaps indicates parts of the subject site is located within the 100yr ARI flood plain with a major overland flow path (OLPF) flowing along Halifax Avenue and crossing the neighbour's property. The 100yr ARI floodplain and the overland flow path available on Auckland Council GeoMaps was generated by AECOM ltd in 2016.

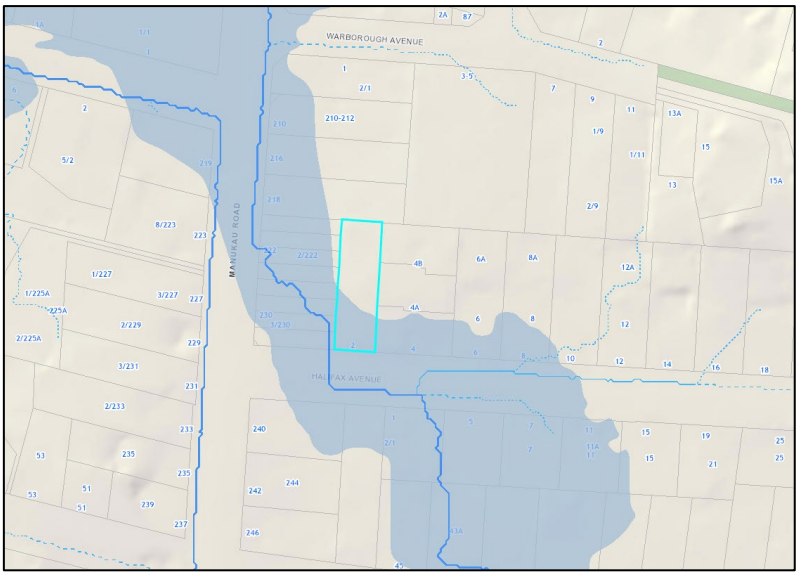


Figure 5: OLFP and 100yr Flood Plain (Sourced from Auckland council GeoMaps)

As per the Epsom - New Market Flood Hazard Mapping report produced by AECOM 16th May 2016 southern part of the subject site is within the 100year flood plain area with the consideration of MPD scenario. The Flood Plain cross section data of ID 208 has shown been adopted for the development and the analysis shows that the maximum 100-year water level is 76.47m.

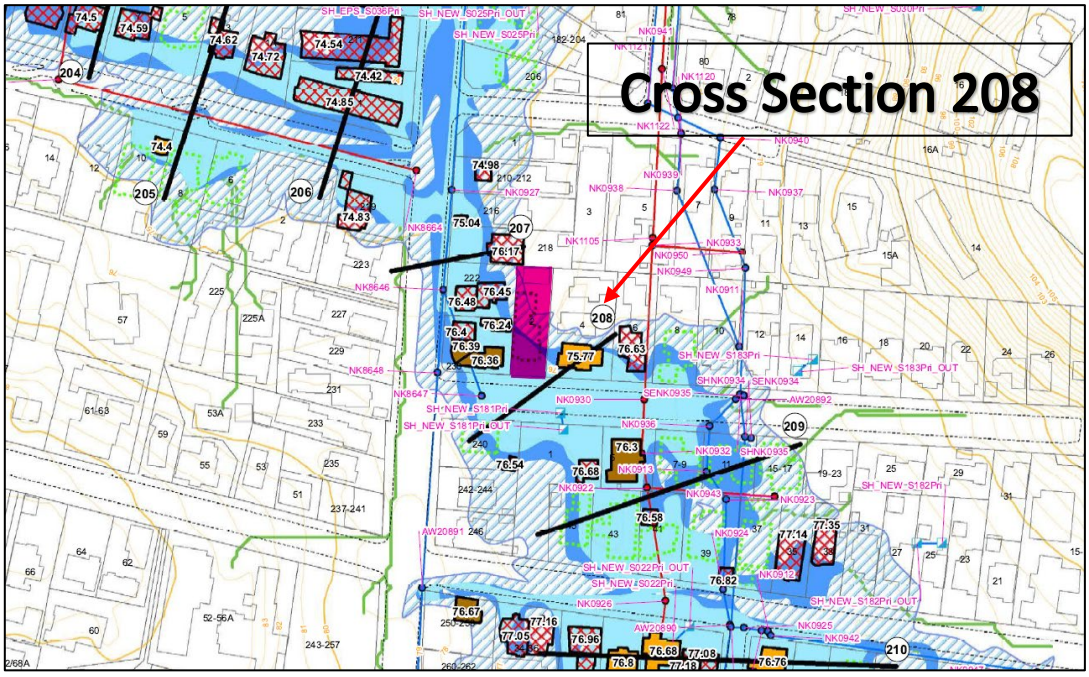


Figure 6: 100yr Flood Hazard Map (Sourced from Auckland Council Geomaps)

From site investigation of the recent major Flood event which occurred in January of 2023 in Auckland and the impact on the subject site, it has been shown that the flood maximum water level reached to a level of 380mm below the existing house FFL. As per the investigation, January flood

maximum water level is measured to be RL of 76.93m. This means that the recent flood maximum water level is higher than the GIS flood level of 76.47m by 0.46m. For photo evidence of the flood impact refer to figure 7 below:

Figure 7: Site Investigation of the site after the impact of January Flood

4.2.1 DEVELOPMENT WITHIN THE 100YR OVERLAND FLOW PATH AND FLOODPLAIN

The subject site is located within the 100yr ARI flood plain and impacted by the flood which occurred during January of 2023. With the site constraints, the following mitigation is adapted to the proposed design:

- The proposed dwellings are to be built on piles to have sufficient freeboard above the recent (January 2023) flood maximum water level.
- Boundary fences for the entire site are to be permeable fencing with 70% (aperture ratio) to allow the flood water conveyance.
- In order to provide feasible accessibility, minor earthworks with 23m^3 cut and 10m^3 fill resulting in a total cut of 13m^3 have been proposed to form the common accessway as shown in Figure 11 below. Therefore, the impact to the flood storage on site is neglective.

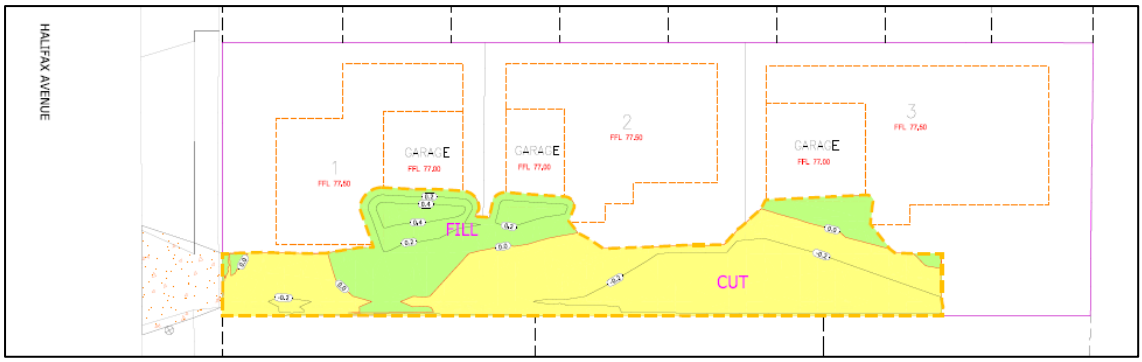


Figure8: Cut and Fill Plan (Appendix A – Engineering Plans: FP328-21)

4.2.2 FREEBOARD REQUIREMENTS FOR FINISHED FLOOR LEVELS

The freeboard requirements are as below, as per Table 4.5 within Section 3.5 of the Auckland Design Manual (7).

Scenario	Freeboard
More Vulnerable Activities* in floodplains	• 500 mm
Less Vulnerable Activities* in floodplains	• 300 mm
Overland flow paths where flow is less than 2m³/s	• 500 mm where surface water has a depth of 100 mm or more and extends from the building directly to a road or car park, other than a car park for a single dwelling • 150 mm for all other cases
Overland flow paths, where flow is equal to or in excess of 2m³/s	• 500 mm for More Vulnerable Activities* • 300 mm for Less Vulnerable Activities*

Flood Hazard Model shows that the maximum water level of 76.47m but the recent flood event is sighted to be affect subject site with maximum water level of RL 76.93m. For the habitable area of the development a minimum freeboard of 500mm above the maximum flood level is required as per the requirements in the Auckland Council Code of Practice for Land Development and Subdivision Chapter 4 – Stormwater (CoP). To determine the FFL of the proposed units, the recent maximum flood water level have been utilised.

The minimum finished floor level was calculated by:

FFL = maximum flood level + freeboard

The minimum FFLs are summarised in Table 2 below:

Lot	Max water level (m)	Minimum Freeboard (m)	Calculated FFL (m)	Recommended FFL (m) Habitable Area
1-3	76.93	0.50	77.43	77.50

5.0 Overland Flow Path Hazard Risk Assessment

A flood hazard risk assessment is required to be undertaken as per Section E36 within the Unitary Plan. The flood hazard risk assessment is outlined below:

a) the type, frequency and scale of the natural hazard and whether adverse effects on the development will be temporary or permanent;

The natural hazard being assessed throughout this flood hazard risk assessment is the 1% AEP Flood plan and recent large storm event which occurred in January 2023. The effects of this natural hazard will be temporary.

b) the type of activity being undertaken and its vulnerability to natural hazard events;

The proposed development is not vulnerable as the OLF is expected to flow along the accessway and will not be extended to the proposed dwelling.

c) the consequences of a natural hazard event in relation to the proposed activity;

The FFL of the proposed dwellings has been set to be above the minimum freeboard requirements.

d) the potential effects on public safety and other property;

No effects to the public safety and other property is anticipated

e) any exacerbation of an existing natural hazard risk or the emergence of natural hazard risks that previously were not present at the location;

Not applicable.

f) whether any building, structure or activity located on land subject to natural hazards near the coast can be relocated in the event of severe coastal erosion, inundation or shoreline retreat;

Not applicable.

g) the ability to use non-structural solutions, such as planting or the retention or enhancement of natural landform buffers to avoid, remedy or mitigate hazards, rather than hard protection structures;

Not applicable.

h) the design and construction of buildings and structures to mitigate the effects of natural hazards;

Not applicable, as no building or structure is mitigating the natural hazard.

i) the effect of structures used to mitigate hazards on landscape values and public access;

Not applicable, as no building or structure is mitigating the natural hazard.

j) site layout and management to avoid or mitigate the adverse effects of natural hazards, including access and exit during a natural hazard event;

The FFL of the proposed dwellings has been set to be above the minimum freeboard requirements.

k) and the duration of consent and how this may limit the exposure for more or less vulnerable activities to the effects of natural hazards including the likely effects of climate change.

The consent sought is not limited as to duration and has been designed considering climate change.

5.1 Overland Flow Path Specific

Section E36 of the Unitary Plan also requires to:

a) *Maintain the function of overland flow paths to convey stormwater runoff safely from a site to the receiving environment.*

The minor OLFP entering the site is to be remained at the same location as in the pre-development scenario.

b) *Require changes to overland flow paths to retain their capacity to pass stormwater flows safely without causing damage to property or the environment.*

Not applicable.

6.0 CONCLUSION AND RECOMMENDATIONS

A flood assessment for 2 Halifax Ave, Epsom has been undertaken.

- The subject site is located within the 100yr ARI flood plain with a major overland flow path running along the carriageway of Halifax Avenue
- A net earthwork cut of 13m³ within the flood plain has been proposed to form the common accessway only. The impact to the flood storage is neglective.
- It is recommended to have the proposed buildings on piles to avoid filling the floodplain.
- Minimum freeboard 500mm is provided for the habitable rooms as per the Stormwater CoP requirements.
- The Epsom - New Market Hazard Mapping indicates the maximum water level is RL 76.47m and the recent flood impact on site shows that the maximum water level reached based on site investigation is RL 76.93m.
- The proposed FFLs for habitable area of Lot 1-3 are 77.50m which is set above the required minimum FFLs. For inhabitable area of lot 1-3, the minimum FFL required is 77.00m providing 530mm freeboard over the maximum water level shown by Auckland Council GIS of RL 76.47m.
- Boundary fences for the entire site are to be permeable fencing with 70% (aperture ratio) to allow the flood water conveyance.

7.0 LIMITATIONS

This report is for the use of 2 Halifax Avenue only, for the objectives described herein. The author accepts no responsibility for the content of this report if it is used by any other party or for any other objective. Any use of or reliance on the information contained in this report for decisions made by third parties is the responsibility of these third parties. The author accepts no responsibility for damage incurred by third parties resulting from the use of or reliance on this report, or if the report is used by any party for purposes other than the objectives described herein. This report has been prepared for the project described to us and its extent is limited to the scope of work agreed between the client and the author. No responsibility is accepted by the author for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes. This report is provided for use in site investigation and concept development and is not intended to be used for detailed design.

Attachment 1: Epsom - New Market Flood Hazard Mapping

N

BELVEDERE STREET

INVERARY AVENUE

MARKET ROAD

LEGEND

- Catchment Boundary
- Outside_Catchment
- Cross Sections

Building Categorization

- 10 yr MPD Flood Frequency
- 50 yr MPD Flood Frequency
- 100 yr MPD Flood Frequency
- Within 500 mm of 100 yr
- Non Surveyed Buildings Within Floodplain
- Buildings_Footprint
- Modelled Culverts
- Parcels

Modelled Nodes

- Combined
- Storm Water
- Wastewater
- Soakage Modelled

Modelled Network

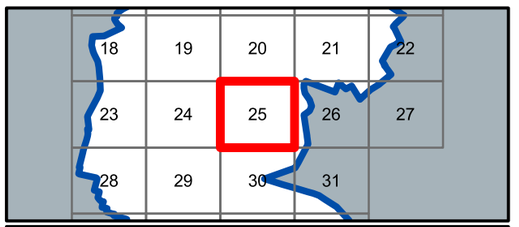
- Combined
- Storm Water
- Wastewater
- 10yr Floodplain
- 100yr Floodplain
- Flood Sensitive Area

Overland Flow

- 100Yr Minor OLFP (<0.5 m3/s)
- 100Yr Major OLFP (0.5 - 2 m3/s)

Contours

- 5m
- 1m



Date: 10/15/2016
Version: 1

Drawn: QB
Checked: MS

0 10 20 40 60 80 100 Meters

SCALE (A3): 1:2,000

AECOM

Epsom-Newmarket Catchment
Floodplain Mapping

Figure 1.25 Floodplain Map (MPD Scenario)

Epsom - Newmarket
Cross Section Data

Cross Section ID	10yr Flow Max	10yr Max WL	100yr Flow Max	100yr Max WL	Ground Level
181	0.50	86.67	0.90	86.73	86.42
182	0.14	86.67	0.38	86.73	86.53
183	0.08	86.66	0.30	86.71	86.53
184	0.06	84.30	0.33	84.38	83.98
185	0.39	90.71	0.77	91.10	90.45
186	0.37	90.71	0.40	91.01	90.24
187	0.17	90.71	0.21	91.01	90.18
188	0.04	90.48	0.16	90.61	90.28
189	0.31	90.16	0.46	90.27	89.92
190	0.31	89.66	0.64	89.74	89.27
191	0.66	88.97	1.03	89.15	87.01
192	0.07	87.07	0.30	87.13	86.88
193	0.06	86.69	0.40	86.78	86.57
194	0.12	86.52	0.46	86.56	86.40
195	0.25	79.39	0.41	79.68	79.03
196	na	na	0.05	73.81	73.67
197	1.07	74.16	2.22	74.37	72.54
198	1.04	73.19	1.20	73.81	71.92
199	1.27	73.19	0.58	73.81	72.53
200	2.32	73.19	1.49	73.81	71.08
201	0.14	73.81	0.22	73.81	72.50
202	0.03	73.53	0.04	73.91	73.38
203	0.05	73.96	0.13	74.11	73.63
204	0.06	73.96	0.25	74.11	73.19
205	0.38	74.41	1.83	74.42	73.74
206	0.70	74.54	2.01	74.57	74.01
207	1.54	75.45	3.71	75.52	75.26
208	1.04	76.29	3.48	76.47	75.51
209	2.01	76.47	4.20	76.55	75.72
210	2.73	76.84	4.65	76.92	76.36
211	2.55	77.03	3.97	77.08	76.71
212	0.52	73.63	1.50	73.80	73.45
213	0.37	77.49	0.61	77.53	77.20
214	0.43	73.39	1.23	73.79	72.76
215	0.01	73.39	0.75	73.79	73.22
216	2.62	77.37	4.23	77.42	77.05
217	1.54	79.15	2.72	79.16	77.45
218	2.27	80.92	3.76	80.95	80.57
219	2.48	85.43	4.24	85.45	84.77
220	0.17	79.97	0.37	80.25	79.75
221	2.89	85.90	4.56	85.96	85.21
222	0.01	86.37	0.04	86.42	85.75
223	0.30	86.98	0.65	87.00	86.29
224	0.20	70.81	0.65	71.19	68.44
225	0.11	71.12	0.90	71.25	67.94
226	0.65	72.55	1.15	72.61	69.28
227	0.08	73.92	0.11	76.93	73.36
228	16.60	4.78	24.09	3.19	0.91
229	16.25	5.10	24.07	5.41	1.38
230	16.50	5.41	24.00	5.75	3.28
231	16.38	5.63	24.00	6.05	2.82
232	16.20	5.83	23.54	6.27	3.86
233	16.09	6.73	23.70	7.80	4.86
234	15.57	7.20	23.16	7.84	6.49
235	4.34	10.08	7.85	10.94	10.03
236	4.30	14.83	7.05	14.92	13.85
237	2.04	28.06	3.02	28.08	26.34
238	2.13	31.40	3.01	31.76	30.98
239	1.80	37.60	2.58	37.70	37.33
240	0.45	21.54	1.01	21.58	21.42