IN THE MATTER	of the Resource Management Act 1991 ("RMA" or "the Act")
AND	
IN THE MATTER	of an application under section 88 of the Act to NAPIER CITY COUNCIL (ref RMA19006) by DURHAM PROPERTY INVESTMENTS LIMITED to subdivide and develop the Main Residential Zone at 16 and 38 Willowbank Avenue, Te Awa, Napier.

STATEMENT OF EVIDENCE OF RUSSELL GRANT NETTLINGHAM

CIVIL ENGINEER

1. INTRODUCTION

1.1 My full name is Russell Grant Nettlingham. I am a Chartered Professional Civil Engineer and managing director at Strata Group Civil Engineers Ltd.

1.2 This evidence is given in respect of resource consent application RMA19006 ("Application") by Durham Property Investments Limited ("Applicant") to Napier City Council ("Council") for the development of 162 dwellings and a staged subdivision to form 181 residential lots, at 16 and 38 Willowbank Avenue, Napier ("Site").

Qualifications and experience

1.3 I have a New Zealand Certificate in Engineering (Civil) (Central Institute of Technology 1986), a Bachelor of Engineering (Civil) (University of Canterbury 1989) and I am a Chartered Professional Engineer (CPEng (Civil).

1.4 I have been practicing as a Chartered Professional Engineer for 27 years and during that time have specialised in land development and infrastructure.

1.5 I am the managing director of Strata Group Consulting Engineers Ltd and lead a team of 30 professional engineers and technicians.

1.6 I have relevant engineering experience with a number of subdivisions including some within the Te Awa structure plan area in the last two years. These have been

undertaken to the satisfaction of the Napier City Council. Relevant projects I have been involved in include:

(a) Greenstone Land Development - 48 Lots at Corner of Eriksen Road and Kenny Road, Te Awa, Napier.

(b) Te Awa Land Developments – 67 Lots at Hunter Drive, Te Awa, Napier.

(c) Waterview Estate – 95 Lot gated lifestyle community Omokoroa, Western Bay of Plenty.

(d) Summerset Retirement Village – Greenmeadows, Napier.

(e) Citrus Grove Subdivision – 49 Lots at Merlot Drive, Napier.

(f) Lyndhurst Subdivision, Hastings – 220 Lots.

Involvement in the project

1.7 I became involved in the project in 2012 after the land was purchased by Durham Property Investment. Strata Group was engaged to provide advice in respect of civil infrastructure requirements and civil engineering requirements for the proposed development.

1.8 Strata Group provided a Land Development Report J4345 Rev D that was submitted in support of the application for resource consent.

Site visits and background material

1.9 I have visited the site and its surrounds on several occasions during the engineering design process. I visit the Te Awa area bi-monthly in my role as Engineer to the Contract on the Greenstone Land Development site which occupies most of the Stage 2 area of the Te Awa Staging Plan.

1.10 In preparing this evidence I have read:

(a) The officers report prepared by Rebecca Sutton, Senior Planner of Stradegy Planning Ltd.

Purpose and scope of evidence

1.11 The purpose of my evidence is to provide an assessment of the three waters (water supply, wastewater, and stormwater) and roading components of the development.

1.12 Specifically, my evidence will:

(a) Give a brief description of the proposal (Section 3);

(b) Summarise the infrastructure requirements (Section 4);

(c) Address water supply (Section 5);

(d) Address wastewater (Section 6);

(e) Address stormwater (Section 7);

(f) Address the proposed earthworks (Section 8);

(g) Respond to the issue of lateral spread (Section 9);

(h) Address the proposed roading (Section 10);

(i) Address provision of utilities (Section 11);

(j) Address the staging of the Te Awa Structure Plan (Section 12)

(k) Address and respond to issues raised in the Officer's Report (Section 13);

(l) Address and respond to issues raised in submissions (Section 14); and

(m) Provide a brief conclusion (Section 15).

1.13 A summary of my evidence is contained in Section 2.

1.14 My evidence should be read together with the evidence of:

(a) Geotechnical evidence, prepared by Cam Wylie (RDCL); and

(b) Traffic evidence, prepared by Ian Constable (Traffic Solutions Ltd).

Expert Witness Code of Conduct

1.15 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's 2014 Practice Note. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.16 I understand and accept that it is my overriding duty to assist the Independent Commissioner in matters which are within my expertise (civil engineering).

2. SUMMARY OF EVIDENCE

2.1 The engineering design has been undertaken in consultation with the Napier City Council engineering staff and has been designed in accordance with the Code of Practice for Subdivision and Land Development of Napier City Council.

2.2 I am not aware of any technical engineering departures from the Code of Practice that would prevent the roading and services within the subdivision from being vested in Council. It has all been designed to the same standard whether it is vested in Council or is retained under private ownership.

2.3 The development is feasible from a civil engineering perspective and all services and utilities can be adequately provided:

(a) The earthworks required are reasonable and the impact of earthworks can be appropriately managed;

(b) Stormwater, wastewater and water supply are all able to be provided via connections to existing networks and there is sufficient capacity in these networks to cater for the anticipated levels that will be generated by the development;

(c) Provision has been made to ensure gas, electricity and internet services can be provided to the development; and

(d) The roading layout is appropriate and the access design for the site is safe and meets the Code of Practice and District Plan requirements.

3. BRIEF DESCRIPTION OF PROPOSAL

3.1 The proposal comprises a residential development which will progress as a staged multi-unit development, comprising 181 residential lots and additional lots to incorporate the required infrastructure. The proposal is intended to cater for retired occupiers, or residents aged 55 and over.

3.2 The development would be undertaken in stages of groups of approximately 20 lots, with the first being connection to underground services.

3.3 The infrastructure required for the development including roading and access, three waters and utilities is all intended to be privately managed as common assets via a Residents' Society. However, the infrastructure has been designed so that it could either be managed privately or could be vested in the Council.

4. INFRASTRUCTURE REQUIREMENTS

4.1 The required infrastructure for the development is relatively basic. The unconstrained large open site allows for modern comprehensive engineering design, access to wastewater out and water in are straightforward. In my opinion, there are no factors of site shape or topography that requires complicated engineering design.

4.2 The civil works associated with the proposed development were addressed in my Land Development Report J4345 Rev D that was submitted with the application.

4.3 All engineering design was based on the Napier City Council Code of Practice for Subdivision and Land Development ("Code of Practice") on the basis that the proposal can be assessed as a typical subdivision. It has been designed so that all services and roading satisfy the Code of Practice and District Plan standards and it is understood that the infrastructure could be vested in the Council.

4.4 Consultation has been undertaken with Napier City Council staff on several occasions throughout the preparation of the engineering plans. We have received comments in response and have made modifications to the design to satisfy all of their requests with respect to the technical design of the three waters infrastructure and roading.

4.5 I have provided input into the RFI responses to Council, and I am of the understanding that all the technical engineering matters have been satisfied.

4.6 I address the civil servicing requirements in more detail below.

5. WATER SUPPLY

5.1 Water supply is available from the 200mm diameter main in Eriksen Road with adequate capacity in the network for the expected demand of the development. There is no additional demand on the water supply allocated to the site than what is expected from a standard subdivision in the area. There may even be less due to the type of occupancy the subdivision is targeted for, being a lifestyle village for '*retired occupiers, over the age of 55'* where children or extended families are not expected to be permanently residing in.

5.2 Water reticulation has been presented to the Council engineers during consultations with supply being via connection to the existing DN200 trunk main on Eriksen Road. Pipe connection sizes have also been discussed during these consultations and amended where requested.

6. WASTEWATER

6.1 Wastewater would be collected via a standard gravity piped system to a central pump station located in reserve land at the Eriksen Road entrance. This pump station will service the entire development. It is a short distance to the allocated discharge point to the existing pumping main in Eriksen Road approximately 250m south of the development. As the development is out of sequence, the developer is responsible for the additional length of rising main and this has been included in the application.

6.2 It is my opinion that the existing wastewater network has sufficient capacity to meet the expected level of wastewater that will be generated by the development.

6.3 The central pump station has been located on reserve land along Eriksen Road adjacent to the southern entrance. This pump station including the reserve land is to be vested in Napier City Council. Whilst the lot has been sized with maintenance work and public safety in consideration, there is room for adjustment here which can be dealt with at engineering design approval stage.

6.4 Further, according to the Traffic Report prepared by Traffic Solutions Ltd, sight distances available from both vehicle crossings of the subdivision exceed the recommendations of the NZTA publication RTS 6 "Guidelines for Visibility at Driveways" *'even at higher operating speed'* and that *'the visibility is adequate to enable both accesses to operate safely'* even with the pump station being located as proposed.

7. STORMWATER

7.1 The stormwater solution is unchanged from the Beca structure plan design. This consists of swale drains along the western and southern boundaries that are constructed within the 40m wide stormwater designation land. The recommended depths have also been adopted.

7.2 Stormwater is collected within the site and piped to the swale in accordance with the Beca structure plan. Specific detail and design of the swale drains will be finalised at the engineering design approval stage.

7.3 Council officers had requested some form of gross water quality treatment prior to discharging into the swale. This type of detail can be explored and agreed upon with Council officers at engineering design approval stage.

7.4 Stormwater from the swale drains adjoining the development is to discharge to the Serpentine Pond in accordance with the Beca structure plan. The Council proposed box culvert crossing the Eriksen Road linking the Cowshed Drain to the attenuation pond is expected to be built simultaneously with the development.

7.5 Should this task not be in Council's schedule of works during the time of construction of the subdivision, the developer wishes to have the option to do the build themselves with the associated cost deducted from the local offsite development contributions in Stage 2.

8. EARTHWORKS

8.1 The majority of the existing site contour is above the modelled flood level of RL 11.28m for the Te Awa area (Beca three waters report), however the lower lying areas would require imported structural fill of up to 0.6m to mitigate potential flood risks. It is expected river silt will be used as bulk fill which is common practice for the Te Awa and Parklands development areas.

8.2 Land to the east of the proposed site has been lifted with imported material during previous construction. It is intended to match into these existing levels and shape lots to fall toward roads and accessways.

8.3 The structure plan drainage swale along the western and southern boundaries would be a potential source of fill material for raising the land and would reduce the cost for Council to truck off site.

8.4 It is proposed to batter back into adjacent land at the northern boundary. Land owner approval for the batter has been sought and an agreement reached.

8.5 Topsoil will be stripped and stockpiled prior to bulk filling and placed back on lots before grassing. Approximately 40,000 m^3 of topsoil will be stripped to stockpile. Excess topsoil would be removed from site on completion of the bulk earthworks.

8.6 A site-specific earthworks and silt management plan will be submitted to Napier City Council for approval prior to earthworks commencing on site.

8.7 Preliminary earthworks volumes are as follows:

(a) Strip top soil to stockpile 40,000m^3

(b) Cut open drainage channel 33,000m^3

(c) Fill low lying land 26,000m^3

(d) Import river silt 7,000m^3

9. LATERAL SPREAD

9.1 The Geotechnical Report prepared by Resource Development Consultants Ltd ("RDCL") dated 4 November 2020 has identified that there is risk to lateral spread on land within

35m of the drain with recommendations of TC3 foundations in general for buildings to be constructed within this range. Further to this, the report recommends that site-specific geotechnical investigations be conducted on identified sites within this range to determine actual type of foundation to be used. The recommendation of this report will be implemented at the engineering design approval to mitigate the lateral spread risk.

10. ROADING

10.1 The development will comprise internal roading access, with two vehicle accesses proposed from Eriksen Road. No vehicle access is proposed from Willowbank Avenue.

10.2 In reliance on Mr Constable's brief of evidence, it is my opinion that the proposed roading for the development is compliant with the Code of Practice and the District Plan requirements. The width, gradient and curvature of the roads are all to the satisfaction of the Code and there are no departures from the geometrical design standards.

11. UTILITIES

11.1 Power, telecommunication, and gas utilities are available on Eriksen Road and are proposed to be extended through to the development.

11.2 It is our expectation that the undergrounding of the main powerlines in the Eriksen Road will be undertaken by Council as part of the road frontage Te Awa Development Contributions which is $3568.10/m. No further cost can be put on the developer as has been suggested by Council during the consultation process.

12. TE AWA STURCTURE PLAN STAGING

12.1 The application land forms Stage 5 of the Te Awa Structure Plan. While extensive development has been completed or is progressing to completion across the majority of Stages 1 and 2, development has not commenced on Stages 3 and 4. It is noted that detailed plans for commercial development within Stage 4 have now advanced through Council's building consent approval.

12.2 As the development is proposed in advance of the intended structure plan sequencing, it is necessary to consider the implications on the required provision of Council servicing infrastructure. In an effort to discourage out of sequence development, the structure plan requires that out of sequence development funds any additional infrastructure arising from advancement of sequencing. The background to the structure plan infrastructure is summarised in the Beca Carter Hollings and Ferner Ltd Section 32 Analysis Te Awa Structure Plan: Proposed Plan Change to the Napier District Plan report provided at Appendix 1.

12.3 In this case, the development requires the Eriksen Road widening and formation works to be undertaken, the construction of the adjacent western swale and the southern swale, the construction of the neighbourhood park, the construction of a box culvert under Eriksen Road linking the swale to the Cowshed Drain and the construction of a wastewater pump station. Minor service extensions are also required to link the wastewater pump station and potable water supply to existing Council infrastructure. These works are more fully described in the Beca Carter Hollings and Ferner Ltd Te Awa Structure Plan – Three Waters report provided at Appendix 2.

12.4 The Eriksen Road formation, the western swale and the wastewater pump station are all works that primarily serve the development and which are not programmed to be formed in earlier stages of structure plan development. The neighbourhood reserve is one of two within the structure plan area, in addition to the reserves within the earlier Te Awa Estates stages of development, and this reserve generally serves the northern stages (Stages 5 and 6) of the structure plan.

12.5 The southern swale and Eriksen Road box culvert serve both the development site and stormwater drainage from the Stage 3 and 4 land to the south. Stages 3 and 4 are intended to drain stormwater westward to a formed swale adjacent to Willowbank Avenue that then drains northward to meet the proposed southern swale within the current application site. This swale then drains eastward to the Cowshed Drain, which in turn drains to the Serpentine Pond.

12.6 The drainage arrangement is such that structure plan development of Stages 3 and 4 is dependent on the prior formation of the southern swale within the application site. While the stormwater swale dependency is not accurately reflected in the staging of the Te Awa Structure Plan, the stormwater arrangement necessitates the Stage 5 southern swale being formed in advance of development of Stages 3 and 4. Without formation of the southern swale and box culvert, there is nowhere for the controlled stormwater of Stages 3 and 4 to discharge.

12.7 While the southern swale and Eriksen Road box culvert stormwater infrastructure are therefore necessary to service Stages 3, 4 and 5, the southern swale is anomalously located within Stage 5. Both the swale and box culvert are necessary to be formed at the commencement of structure plan development of any one of these stages. Council would therefore have to commit to this construction for the next sequential stage, Stage 3, or for the proposed construction of Stage 5 in entirety. The benefit being offered by the current scenario is that land control for the southern swale within the site can be readily obtained.

12.8 On the basis of investigation of the function of the southern swale within the site and the Eriksen Road box culvert it is apparent that comprehensive development of Stage 5 in advance of Stages 3 and 4 does not result in a requirement for advancement of

infrastructure construction that could have been otherwise expected to be formed with Stages 3 and 4.

13. ISSUES RAISED BY OFFICER'S REPORT

13.1 An issue has been raised in the Officer's Report as to the effects of lateral spread on the reserves, particularly in relation to the stormwater swale drains to be located on the western and southern boundaries.

13.2 This matter has been identified in the S92 response in good faith and no mitigation works have been proposed due to the need for discussions with council in terms of the manner by which this can be mitigated and the possible maintenance requirements that may arise will fall under their jurisdiction.

13.3 A similar risk has been identified in the existing stormwater pond and mitigation works have been introduced by Council engineers. We understand these works were undertaken under Council's expense as part of the onsite and offsite development contributions. We expect the same policy to be applied to the swale drains adjoining this development.

13.4 The issue of lateral spread is addressed in more detail in the evidence of Cam Wylie.

14. ISSUES RAISED IN SUBMISSIONS

14.1 The Hawkes Bay Regional Council, in their submission on the application, raised an issue regarding site-specific geotechnical investigation on foundations to be applied to lots adjacent to the stormwater drain.

14.2 This matter is addressed in the evidence of Cam Wylie.

14.3 There have been no further issues relevant to engineering or infrastructure provision raised in the submissions that would affect the subdivision's engineering design as submitted with the application.

15. CONCLUSION

15.1 I have undertaken appropriate design calculations and drawings to confirm that the subdivision is technically feasible and that the three waters and roading are able to comply with the Code of Practice. These documents were submitted to Council after a series of consultations, and to my knowledge all requests for information have been satisfactorily responded to.

15.2 In my professional opinion all relevant engineering and infrastructure matters are appropriately addressed and the Site can be appropriately serviced in accordance with the outcomes sought by the Te Awa Structure Plan.

Russell Grant Nettlingham
Strata Group Consulting Engineers Ltd

14 May 2021

APPENDIX 1 - SECTION 32 ANALYSIS TE AWA STRUCTURE PLAN: PROPOSED PLAN CHANGE TO THE NAPIER DISTRICT PLAN

Report

Section 32 Analysis Te Awa Structure Plan: Proposed Plan Change to the Napier District Plan

Prepared for Napier City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Be

27 October 2010

Revision History

Revision Nº	Prepared By	Description	Date
A	Lisa Lyons	First Draft	14 June 2010
B	Lisa Lyons	First Draft for Client Comment	16 June 2010
C	Tim Ryder / Damien McGahan	Final Draft for client review	16 Sept 2010
D	Damien McGahan	Incorporate updated information	27 October 2010

Document Acceptance

Action	Name	Signed	Date
Prepared by	Lisa Lyons, Tim Ryder and Damien McGahan		27 Oct 2010
Reviewed by	Damien McGahan		27 Oct 2010
Approved by	Amelia Linzey		27 Oct 2010
on behalf of	Beca Carter Hollings & Ferner Ltd		

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Napier District Plan - Proposed Plan Change 6: Te Awa Structure Plan

1 Introduction

Responding to future population growth identified in Regional and District strategies, this proposed Plan Change (Plan Change 6 or PC6) seeks to establish a new urban residential area approximately 3.5km south of Napier's Central Business District (CBD).

To articulate Council's strategic direction for the area the Te Awa Structure Plan (the Structure Plan) has been developed. The Structure Plan seeks to:

- Increase certainty for developers, NCC, and the public as to how the area will be developed in the future;
- Provide an integrated management approach to site specific environmental issues that affect the site;
- Confirm a coordinated approach to infrastructure provision;
- Identify potential staging options for future development, and
- Promote quality urban design and landscape outcomes.

To achieve this, the Structure Plan identifies a suite of Design Outcomes that should be implemented as the Te Awa Development area develops. The Structure Plan and the Design Outcomes developed provide a broad framework for the orderly development of the land and provide the strategic justification for this Plan Change.

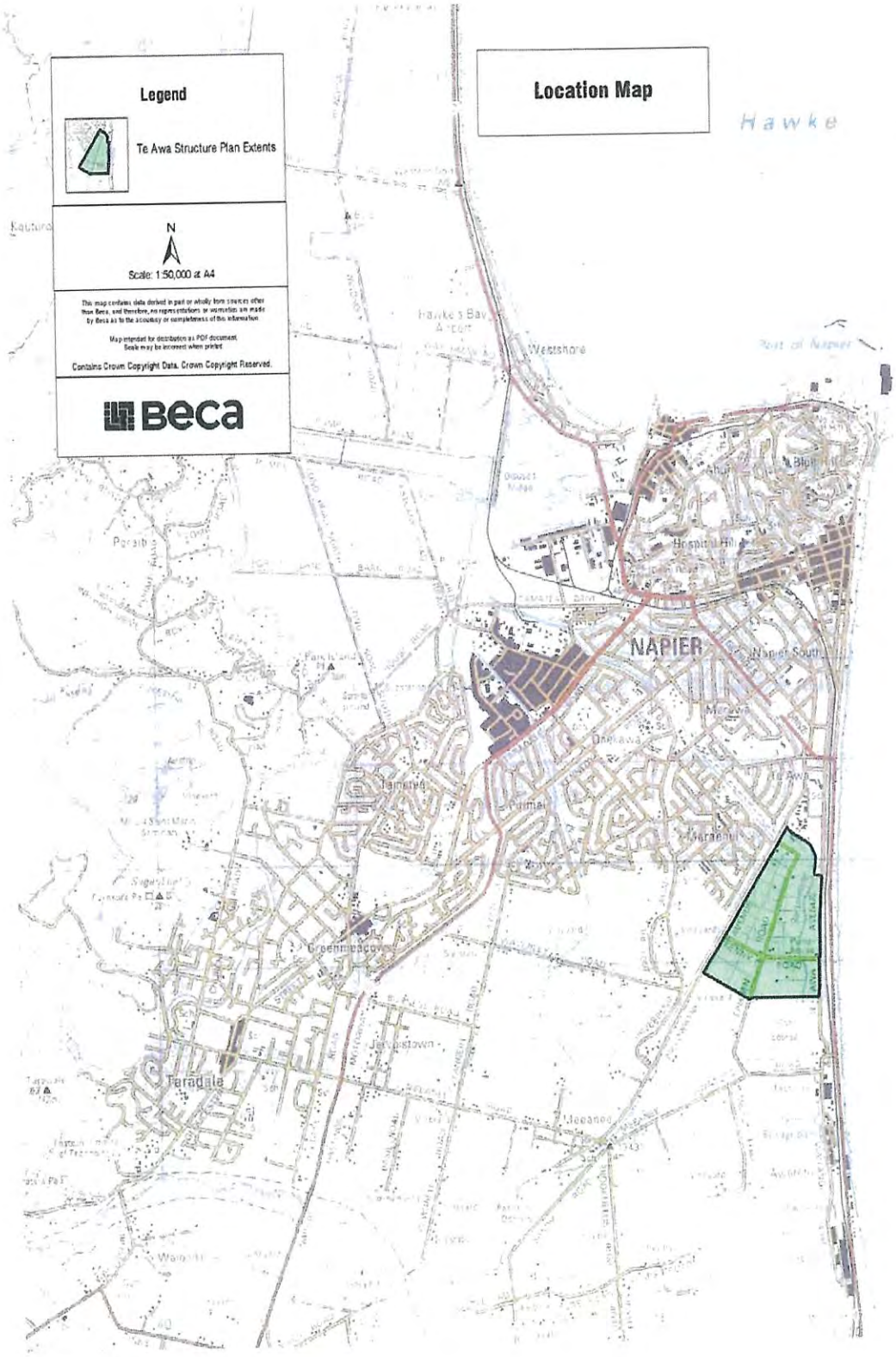
To enable the establishment of this new residential area, proposed PC6 proposes to rezone the subject land from Main Rural to Main Residential and to incorporate the Te Awa Structure Plan Design Outcomes within the Napier District Plan (District Plan or NDP). To appropriately align the NDP with the Structure Plan, amendments are also proposed to the following chapters of the NDP:

- Chapter 1: Introduction;
- Chapter 4: Residential Environments (objectives, policies and methods);
- Chapter 5: Main Residential Zone Rules;
- Chapter 12: Assessment Criteria (Residential Environments);
- Chapter 65: Financial Contributions;
- Part 10: Appendices;
- Code of Practice for Subdivision for Land Development A; and
- Planning Maps H7, H8, I7, I8.

This report provides a background information regarding the proposed Plan Change, assesses proposed PC6 against Section 32 of the Resource Management Act 1991 (RMA); considers out the cost and benefits of the proposed Plan Change; and confirms how the proposed Plan Change achieves the purpose of the RMA.

This report should be read in conjunction with the Schedule of Amendments to the District Plan (Appendix 3) and the Te Awa Structure Plan report.

Figure 1: Te Awa Development area – Location Map (Area for proposed Rezoning)



2 Location and Area Description

The Te Awa Development area (Te Awa Development area) is triangular in shape and is located in the rural environment approximately 3.5km south of Napier's Central Business District (CBD) (see Figure 1).

Immediately adjacent to the Te Awa Development area is Napier Boys High School (to the north), Willowbank Avenue (to the west), Te Awa Avenue (to the east) and the Cross Country Drain (CCD) to the south. The Te Awa Development area is separated from the coast by State Highway 2 (SH2) and the Palmerston North/Gisborne Railway line. Other landuses nearby include the Maraenui Golf Club (to the south) and housing to the east.

The Te Awa Development area is flat and low lying. Existing landuses within the Te Awa Development area include horticulture, cropping, and the Te Awa Estates Ltd residential subdivision development which includes a constructed stormwater pond. The most significant feature within the Te Awa Development area is the Serpentine Drain which extends from north to south on the eastern extent, parallel to Te Awa Avenue. This feature represents the lowest part of the Te Awa Development area.

Existing infrastructure within the Te Awa Development area includes the Serpentine Drain and the Kenny Road Pump Station. As part of the Te Awa Estates Ltd development stormwater, wastewater and water supply infrastructure has been extended into the area. In addition Te Awa Estates Ltd have consented and constructed a stormwater pond just to the north of their existing development and have recently been given approval for an additional 255 residential lots.

The land proposed for rezoning is held in 148 lots. A full list of lots subject to Plan Change 6 is attached at Appendix 5.

3 The Proposed Plan Change

This proposed Plan Change seeks to facilitate residential development of the Te Awa Development area in an orderly manner. To achieve this, the Plan Change will rezone the Te Awa Development area from Main Rural to Main Residential (an existing zone) and alter a number of District Plan provisions to integrate the Structure Plan design outcomes within the NDP.

Specifically, this Plan Change proposes the following changes to the NDP:

- Rezone the Te Awa Development area from Main Rural to Main Residential and amend maps I7, I8, H7 and H8 accordingly;
- Amend Chapter One: Introduction to include references to the new Structure Plan Appendices and Section 1.11 to include a reference to the release of the 'Te Awa land' as a new greenfield residential area;
- Amend Chapter Four: Residential Environments to include a new policy (Clause 4.3.4) and associated supporting text (Clause 4.3) which requires Council to undertake a Structure Planning process for future urban areas identified in Regional or District Growth Strategies in order to avoid ad hoc development and infrastructure provision;
- Amend Chapter Five: Main Residential Zone (Clause 5.13, 5.36) to require that subdivision and development located within the Te Awa Development area which is inconsistent with the Structure Plan Design Outcomes and associated Maps be considered as a Discretionary activity;
- Amend Chapter Five: Main Residential Zone (Clause 5.22) to amend the noise condition table to include a Willowbank Avenue Noise Boundary;
- Amend Chapter 12: Residential Environments Assessment Criteria (Clauses 12.2) to include criterion relating to development within the Te Awa Development area and the extent to which the relevant Structure Plan Design Outcomes can be achieved;
- Amend Chapter 65: Financial Contributions to include a requirement for subdividers and developers to construct any relevant utilities, roads and open space areas shown on the approved Structure Plan as part of any development;
- Amend Chapter 65 Financial Contributions to insert the Financial Contributions (Table 1);
- Amend Part 10 (Appendix 29) to incorporate Structure Plan Maps and specific Design Outcomes which apply to the Te Awa Development area.
- Amend Part 10 (Appendix 31) to provide the location of the Te Awa Structure Development area and a breakdown of 'Non Local Off-Site' Financial Contributions that apply.
- Amend Section 5.2.13 and 6.3 of the Code of Practice for Subdivision for Land Development to provide for the Te Awa Structure Plan and its associated Design Outcomes.

4 Reason for the Proposed Plan Change

This section sets out the strategic basis for the Te Awa Development area (an identified urban growth area of Napier which is currently rurally zoned). The plan change is a statutory response to better enable targeted urbanisation through the establishment of an appropriate residential zoning underpinned by a comprehensive Structure Plan.

4.1 Napier Urban Growth Strategies

The Te Awa Development area is identified in the Napier Urban Growth Strategy (NUGS) 1999 and Situation Analysis – Napier Urban Growth Strategy (SANUGS) as a future residential area for greenfield development.

a. Napier Urban Growth Strategy 1999

In 1999, Napier City Council (NCC) reviewed the Napier Urban Growth Strategy (1992) to assess the recommendations of the earlier report. Key recommendations of the strategy included:

- Continuing with a policy of urban consolidation and intensification and relying on infill development and limited peripheral expansion to retain a compact city form.
- Providing for future long-term expansion to the south-east as far as the line of the CCD.

The NUGS confirmed that population growth was occurring at higher than predicted levels and consequentially there was a need to identify additional areas to accommodate growth. The NUGSR identified the Te Awa area as the fourth priority for growth accommodation (behind greenfield expansion in the north and west). It was also recommended that a Structure Plan be developed for the Te Awa area because of the site characteristics i.e. low lying and flat), associated infrastructural constraints and to take into consideration other values associated with the site including its location close to Napier City.

Situation Analysis – Napier Urban Growth Strategy

In 2008, the NUGS 1999 was re-examined in the Situation Analysis Urban Growth Strategy 1999. This was undertaken to examine the actual urban growth that had taken place since 1999 and to identify any gaps in the NUGS. The SANUGS confirmed that growth was tracking along a high projection path and that development within this area had occurred ahead of the growth period.

The SANUGS recommends that NCC continue its focus on the policy of urban consolidation and intensification. However, the Te Awa Development area continued to be identified as a greenfield area suitable for residential development.

It is noted that the Te Awa Development area will limit the urban growth of Napier to a defined boundary. The new southern boundary for urban expansion will be the CCD which forms the southern boundary of the Te Awa Development area.

SANUGS recommended that early structure planning for greenfield areas (the Loop and Riverbend) be commenced which were identified in the NUGS as being required beyond 2016. It is noted that the Loop and Riverbend are adjacent to the Te Awa Development area. It was acknowledged in SANUGS that the Structure Plan for the Te Awa area had already commenced.

4.2 Heretaunga Plains Urban Development Strategy 2010

The Heretaunga Plains Urban Development Strategy (HPUDS) seeks to provide strategic direction for the sustainable growth and development of the Heretaunga Plains. Spatially, HPUDS relates to an area stretching from Waipatiki to the north, Maraekakaho to the west and Waimarama in the south; however, the area is primarily centered around the urban areas of Napier and Hastings.

Historically, planning for urban growth within this area has been carried out independently by both NCC and Hastings District Council (HDC); however, HPUDS involves a collaborative approach which combines inputs from these two authorities and the Hawkes Bay Regional Council.

Both NCC and HDC have growth strategies in place that are effective until 2015 and it is at this juncture that HPUDS is intended to become the primary growth strategy for the area. HPUDS has a time horizon of 2045 and will be subject to regular review.

Following a period of community consultation it was confirmed that HPUDS should promote a settlement pattern which:

- Avoids encroachment onto the Heretaunga Plains;
- Increases densities and intensification in suitable locations;
- Reduces the spread of Hastings and Napier;
- Provides for a range of housing types; and
- Encourages walking, cycling and public transport as an alternative to the private motor car.

This approach is primarily predicated on the importance of ensuring long term sustainability for the Heretaunga Plains versatile soils. However, the HPUDS is underpinned by the current growth strategies of NCC and HDC and whilst promoting the urban consolidation objectives sought by both strategies, HPUDS provides for greenfield development in the locations earmarked by the respective growth strategies for these authorities. Specifically, the HPUDS identifies the Te Awa Development area as a growth area identified for greenfield development within NCC's current growth strategy.

HPUDS confirms that the areas identified for greenfield development have been included after careful consideration of such issues as providing definitive future boundaries of the urban edge, avoiding reverse sensitivity, making the most efficient use of existing infrastructure and recognising the importance of providing workplace environments in close proximity.

4.3 Other Matters - Recent Site Development

In December 2005, resource consent was granted for the Te Awa Estates Ltd development, a 173 lot (13.5 ha) subdivision and the placement of 82,000m^3 fill, in the south eastern corner of the Te Awa Development area. In the Te Awa Estates Ltd Commissioner's Report and Decision (reference RMS05060), it was noted that submitters had some concerns about development occurring prior to a Structure Plan being developed. The Commissioner suggested that because the environmental effects on the development had been mitigated, that granting consent would not preclude future development. However, the Commissioner noted that Council should give serious consideration to how this area will be developed in the future and that the area would benefit from a structure plan being developed, to enable local amenities and infrastructure requirements to be considered together.

In August 2010, resource consent (reference: RMS09067) was obtained by Te Awa Estates Ltd to create 255 residential lots and a number of recreation and drainage reserves, on a site directly to the north of the subdivision approved under resource consent RMS05060. It is noted

that the application as notified sought to create 277 lots, however, prior to the hearing, the applicant reduced the number of lots to 255 and also increased the size of the stormwater detention reserve form 3.7 hectares to 4.4 hectares so that it would serve a wider area than the application site. Further, the Cowshed Drain reserve will be widened by Council from 25 metres to 40 metres and the layout of the detention area and associated open space has been altered to accommodate the new pumping station required to serve the entire Te Awa Development area. It is noted that the majority of these amendments have been incorporated to ensure that the subdivision design is consistent with the approach of the proposed Structure Plan.

The Te Awa Estates Ltd development demonstrates that the existing provisions of the Rural Chapter and Code of Practice for Subdivision Division are limited in protecting rural amenity within the Te Awa Development area. Currently, there are no provisions in the Rural Chapter that require Te Awa Development areas to be comprehensively developed.

4.4 Summary

Napier is currently growing and this growth rates are predicted to continue for the foreseeable future in terms of current planning horizons (i.e. through to 2050). Regional and District growth strategies indicate that predicted growth cannot be provided for within Napier's existing boundaries and in response propose that a portion of this growth be accommodated through the use of greenfield land for residential development. The growth strategies consider potential sites and specifically identify the Te Awa Development area as a location suitable for residential development, noting that a Structure Plan is necessary to ensure that the land is developed in a sustainable manner.

The recent development by Te Awa Estates Ltd within the Te Awa Development area is an early indicator of market support for development in the area. In addition, the indication of this area as being suitable for future urban growth and the lack of clear development planning is resulting in pressure for residential development in the rural zone.

Responding to the population growth envisaged by the growth strategy, Council has prepared a Structure Plan for the site to avoid ad hoc residential development in the Rural Zone. The proposed rezoning of land will provide greater statutory certainty to landowners, developers and Council alike, that the Te Awa Development area is intended to provide for urban growth and that this growth will be accommodated and serviced in an orderly manner. The proposed plan change will implement the Te Awa Structure Plan and will provide an integrated approach to infrastructure provision and staging of development within the Te Awa Development area.

5 Consultation and Discussion

The following section sets out the consultation that has been undertaken in the development of the Te Awa Structure Plan to date. It identifies the key issues raised which have assisted in guiding its development.

5.1 Early Consultation

a. Consultation Undertaken

Initial consultation included a NCC workshop on 24 January 2008 to obtain feedback from NCC officers on the draft *Te Awa Structure Plan - Scoping Study*. Officers from planning, community facilities and reserves, water, drainage, asset management and traffic attended and their feedback formed the basis of future consultation.

Information letters were sent to directly affected landowners and neighbouring landowners in March 2008. Directly affected landowners were sent the *Te Awa Structure Plan - Scoping Study* report and neighbouring landowners were sent a pamphlet which summarised the options identified through the Scoping Study. Both groups were sent a feedback form and invited to participate in separate workshops held on 14 and 15 April 2008. The purpose of these workshops was to provide landowners with an opportunity to hear the conclusions and outcomes of the *Te Awa Structure Plan - Scoping Study*, report back on feedback, review and to identity any issues, concerns or ideas for further option development. In addition, a key outcome of the workshops was to assist in identifying a preferred option.

NCC also carried out stakeholder meetings and discussions from 14 - 20 April 2008. Stakeholders were identified as being organisations involved in the review, or who would likely make decisions on the project, such as Hawke's Bay Regional Council. The purpose of these meetings was to provide an overview of the project and to obtain feedback.

b. Consultation Responses

Consultation responses included 56 feedback forms/email responses and two substantive submissions. The outcomes of the consultation are detailed in the *Te Awa Structure Plan Consultation Outcomes Report* (Beca, 2008). The following key themes were identified in the consultation:

- In relation to **infrastructure**, it was noted that flood attenuation and stormwater management was a key concern, as the area has a history of flooding during high rain fall events. Responses also focussed on the potential costs associated with the proposed options which included upgrading existing infrastructure and the provision of new infrastructure. It was also noted that there would need to be careful management of the stormwater pond to ensure that residential amenity is maintained.

- Responses in relation to the **development of the Te Awa Development area** indicated that for the majority of respondents, that development was inevitable; however some noted that they did not want development to occur in this area.

- Responses relating to **providing for community needs** suggested that there was a need for village type centre with community facilities including shops, and early childhood facilities. It was suggested that there should be adequate provision of open space areas and these should be linked by footpaths and cycle ways.

- **Traffic safety** was another issue raised in responses, with intersection safety at Willowbank Avenue and Eriksen Road being a key concern. It was also noted that there should be provision for public transport, footpaths and cycle ways.

Issues highlighted for further investigation in the *Consultation Outcomes Report* have been addressed through:

- Further modelling in relation to stormwater and traffic;
- Development of clear urban design framework which has been translated into specific planning controls and outcomes for the Te Awa Development area and through the proposed Plan Change to the District Plan;
- Development of pedestrian and cycle networks; and
- Development of a connected open space network.

5.2 Recent Consultation

a. Consultation Undertaken

An initial draft of the Structure Plan (and associated plan change) was presented separately to Napier City Councillors and landowners (and their representatives); adjacent landowners and other affected or interested stakeholders on 8 June 2009.

The presentation involved an explanation of the preferred Structure Plan concept, a discussion of the primary constraints and opportunities and the associated outcomes sought along with an overview of the proposed plan change. A formal feedback form was provided.

b. Consultation Responses

Fifteen responses were received. Responses from landowners and adjacent landowners raised included:

- A few submitters raised concerns over the use of private land for development.
- Concerns in relation to the location of landuses including high density and commercial.
- The need to provide adequate stormwater storage and to provide a stormwater pond that contributes to local amenity and passive recreation.
- Safety issues associated with open channel areas.
- Traffic safety (speed environment, especially on Te Awa Avenue).
- Roading layout and design and Structure Plan access points.
- The need to identify development contributions (i.e. who pays for development and infrastructure) and share costs equally between various landowners.
- Consideration should be given to provisions that encourage and enable outdoor living.

The **Ministry of Education** (MoE) provided the following comments the draft Structure Plan:

- The layout encouraged residents to enrol children at Te Awa School which was easily accessible;
- The density rules would lead to highly populated area (made up of between 1300-1500 households);

- The indicative future western road link is not well demonstrated and creates uncertainty;
- Only one large area of indicative green space shown that would be suitable for a future school site.

The MoE cautioned that the type of development proposed at Te Awa (i.e. modern, low maintenance housing) has proven to be attractive to young people with families and as such the demographic balance or potential for significant growth in school age children should not be underestimated.

The MoE noted that Te Awa school is close to capacity with limited potential for growth however other surrounding schools did have some capacity ((Richmond School and Maraenui School). The MoE would like to see the Structure Plan commit to the future western road link and provide space for a potential new school in the future (preferably a site of up to 3ha).

The **NZ Transport Agency** (NZTA) noted that the Te Awa Development area would make good use of the existing road network, ensuring that the main arterials were not affected. The NZTA did seek greater clarity on the mitigation proposed for the Te Awa Avenue/Ellison Street intersection as well as the intersection of Meeanee Road/State Highway 2. In addition, it is seen as important that the roading layout of the Structure Plan is able to fully accommodate public transport and other forms of alternative transport. The NZTA also seeks a more specific strategy with respect to guiding urban design principles such as how the cycleway route network should develop.

KiwiRail noted that it was comfortable with the Structure Plan but highlighted the need to plan carefully in respect of the stormwater discharge point as it relates to rail infrastructure (noting that the discharge would cross KiwiRail land). KiwiRail confirmed that it is comfortable negotiating with Council in respect of property rights to enable a stormwater discharge crossing point.

- Te Awa Estates Ltd provided a detailed submission on the draft Structure Plan and draft plan change document. The following points are noted from this submission:
- The information provided a general lack of detail (noting it had not had the opportunity to review the key background reports that feed into the Structure Plan and draft plan change;
- The concept of hydraulic neutrality is not reflected in the Structure Plan and therefore it fails to ensure adverse effects associated with stormwater runoff are managed. Te Awa Estates Ltd seeks a stormwater solution that is based upon full hydraulic neutrality at all times (i.e. before and after the new pump station is operational);
- The draft Structure Plan/plan change lacks meaningful detail on urban design principles or preferred building typologies;
- Te Awa Estates Ltd has no desire to undertake high density or commercial / retail development (therefore these Precinct areas should be removed from Te Awa Estates Ltd land);
- Residential standards proposed differ from those in the District Plan and Te Awa Estates Ltd sees no rationale for this. Te Awa Estates Ltd seeks that the development standards from the main residential zone of the operative District Plan are applied to the Structure Plan;
- Te Awa Estates Ltd considers that the amenity buffer reserve area is unnecessary and represents and inefficient use of natural and physical resources and seeks its removal;
- Te Awa Estates Ltd considers that the network of open drains is unnecessary and undesirable from a safety point of view. The rationale for the open drains needs to be confirmed.

- The staging proposed is generally supported but it must reflect the reality of the Te Awa Estates Ltd development (currently underway) in terms of the provision of infrastructure; and
- The Structure Plan outcomes are considered to be overly prescriptive and need to be recast to provide landowners a level of discretion. A number of specific comments are made in relation to particular outcomes.

5.3 On-going Discussions with Te Awa Estates Ltd

Since June 2009, a number of meetings have been held between Te Awa Estates Ltd and Council officers with respect to development proposals and the on-going development of the Structure Plan itself. In particular, attention has been focussed upon the agreeing an appropriate stormwater drainage solution which would service the wider Te Awa Structure Plan Development area to and be implemented as part of the Te Awa Structure Plan. General agreement was reached on an appropriate stormwater design solution. It is noted that Commissioners recently approved the Te Awa Estates Ltd 255 lot subdivision (Stages 5–13), Council reference RMS09067.

6 Resource Management Act 1991 - Section 32 Requirements

Section 32 of the Resource Management Act (the Act) establishes a process for local authorities to test the appropriateness of any proposed provisions to Plans and Policy Statements (either new provisions or changes to provisions).

This report has been prepared to demonstrate how the requirements of Section 32 of the Act have been fulfilled, with respect to the proposed amendments to the Plan to provide for future urban growth. In this respect, this evaluation does not evaluate the existing objectives, policies and methods of the Napier District Plan per say, but rather the application of these for the proposed rezoning of the Te Awa Development area as appropriate (as described in Section 2 above).

7 Section 32 Evaluation

This section provides the analysis required under Section 32 of the Act to undertake a plan change to the Operative Napier District Plan framework.

It should be read together with the text of the Plan Change itself. The analysis set out below is prepared in accordance with the requirements of section 32(5) of the Act. The Council considers that the contents of this section will satisfy the requirements of this Section 32 of the Act.

7.1 Options for Evaluation

The purpose of the proposed Plan Change is to accommodate within the Te Awa Development area, increased residential capacity to cater for predicted population growth envisaged by regional and district growth strategies both for Napier City and the wider region. This will be achieved by facilitating residential development within the Te Awa Development area. Pursuant to the provisions of the Napier District Plan (the District Plan), the area subject to the Plan Change is currently zoned Main Rural. It is considered that the following four options represent the only practicable scenarios for facilitating residential development within the Te Awa Development area:

- Option 1: Rezone the Te Awa Development area to a new, bespoke Residential zone;
- Option 2: Rezone the Te Awa Development area to Main Residential with no amendments (i.e. a blanket rezoning);
- Option 3: Rezone the Te Awa Development area to Main Residential Zone with amendments to facilitate the implementation of a Structure Plan and Design Outcomes; and
- Option 4: Status quo – retain the existing zoning: Main Rural Zone.

The benefits and costs of these options are considered in the following section.

7.2 Benefits and Costs of Options

a. Option 1: Rezone to a new zone

The benefits and costs of developing a bespoke, new residential zone focussed on high-level amenity outcomes with new objectives and policies, rules, performance standards and assessment criteria which are specific to the Te Awa Development area are detailed below:

Table 1 - Option 1: Benefits and Costs

Benefits	Costs
▪ Provides for the integration of key features such as open space areas, pedestrian/cycle linkages, and provision of network utilities by linking provisions of the new zone directly to the Structure Plan.	▪ Costs to Council to develop and implement a plan change to amend the District Plan provisions for the Te Awa Development area.
▪ Provides certainty to landowners, Council and developers in terms of the intent of a specific bespoke, new residential zone and the outcomes sought.	▪ The rules, objectives and policies of the existing Main Residential zone have already been tested through the statutory planning process. The rules for the new residential zone will not have been subject to such testing and would be a departure from the direction of the existing District Plan (in terms of rules and methods). This potentially would lead to additional costs to Council, landowners and

Benefits	Costs
	developers in terms of testing any new provisions through statutory processes (e.g. public hearing and Environment Court).
▪ Provides an opportunity for the specification of core infrastructure and associated higher quality urban amenity outcomes through the application of new performance standards and assessment criteria.	▪ Potential uncertainty as to the application of the new rules, performance standards and assessment criteria (in terms of interpretation and implementation).
▪ New performance standards provide more housing choice/diversity.	▪ Costs of new development for developers which require the implementation of new planning provisions (rules, performance standards and assessment criteria) for the Te Awa Development area. It is noted that these costs are administrative and are not a significant component of the overall cost of development.
▪ The rules and activities allowed in the zones reflect the specific opportunities and constraints of the Te Awa Development area.	▪ Increased costs to Council for monitoring and ensuring compliance with the District Plan and processing of resource consents (with new rules and associated performance standards), and the administration costs associated with these.
▪ It would enable the extension of the residential zone to an obvious and appropriate city limit boundary (i.e. by indicating likely future urban expansion parameters).	▪ A rezoning for residential purposes would result in a more intensified use of the rural soil resource and the immediate loss of a large area of land for land based primary production activities (e.g. horticulture, grazing). This could potentially have economic impacts for the local community. Essentially, the loss of productive soil for agricultural and horticultural production is an opportunity cost for local landowners and secondary processing industries.
▪ Provides for the residential greenfields resource to be developed, which would assist in meeting a component of the overall market demand identified in the NUGS 1999 and SANUGS 1999 (2008), thus enabling the community to provide for its social, economic and cultural wellbeing (in terms of the physical resource of dwellings)..	▪ A new residential zoning would lead to a loss of the existing rural outlook.
▪ The extension of the residential development proposed through new performance standards can be adequately and readily serviced through proposed infrastructure detailed in the Te Awa Structure Plan.	
▪ Provides the Council the opportunity to confirm a Financial Contribution regime to provide for planned growth (e.g. infrastructure and services) and to grow the rating base.	

Option 2: Rezone to Main Residential Zone with no amendments

The benefits and costs of a blanket rezoning of the entire Te Awa Development area to Main Residential (with no amendments or references to the Te Awa Structure Plan and any associated outcomes) are detailed below:

Table 2 - Option 2: Benefits and Costs

Benefits	Costs
▪ No additional District Plan provisions need to be developed. Therefore the cost to Council in initiating and administering changes to the District Plan are avoided (in comparison to Option 4 other options).	▪ Costs to Council to develop and implement a plan change to amend the District Plan provisions for the Te Awa Development area (although this needs to be balanced against the benefit of confirming a Financial Contribution regime to provide for planned growth) and an increased rating base.
▪ The provisions in the existing Main Residential zoning are familiar and understood by Council, landowner's and developers.	▪ This approach does not encourage a mixture of different development types (thereby limiting amenity and lifestyle related outcomes and reducing the communities ability to provide for its social, cultural and economic wellbeing). Non-residential activities which include small scale retail activities are discretionary activities in the Main Residential Zone.
▪ The effects associated with the density of development provided for under the Main Residential zoning on the environment are understood from existing development in other areas zoned Main Residential across the City.	▪ This approach does not necessarily provide for the provision of infrastructure in a holistic and integrated manner which considers the whole Te Awa Development area.
▪ The rules objectives and policies have already been well tested through the statutory planning process.	▪ This approach does not encourage a range of housing as rules are intended for the development of single dwellings only.
▪ It would enable the extension of the residential zone to an obvious and appropriate city limit boundary (i.e. by indicating likely future urban expansion parameters).	▪ Would not secure specific Design Outcomes sought for the Te Awa Structure Plan including how the site might be developed in stages, how infrastructure might be provided in an integrated manner and the inclusion of specific outcomes which seek infrastructure upgrades and an associated high standard of urban design and landscaping.
▪ Provides for the residential greenfields resource to be developed, which would assist in meeting a component of the overall market demand identified in the NUGS 1999 and SANUGS 1999 (2008). thus enabling the community to provide for its social, economic and cultural wellbeing (in terms of the physical resource of dwellings).	▪ Potential adverse effects associated with ad hoc residential development and associated infrastructure provision which may compromise the ability to co-ordinate development appropriately within the Te Awa Development area.
▪ Provides the Council the opportunity to confirm a Financial Contribution regime to provide for planned growth (e.g. infrastructure and services) and to grow the rating base.	▪ A rezoning for residential purposes would result in a more intensified use of the rural soil resource and the immediate loss of a large area of land for land based primary production activities (e.g. horticulture, grazing). This could potentially have economic impacts for

Benefits	Costs
	the local community. Essentially, the loss of productive soil for agricultural and horticultural production is an opportunity cost for local landowners and secondary processing industries.
	▪ A new residential zoning would lead to a loss of the existing rural outlook.

b. Options 3: Rezone to Main Residential Zone with amendments to facilitate a Structure Plan

The benefits and costs of rezoning the Te Awa Development area to Main Residential with detailed Structure Plan provisions (Design Outcomes) are detailed as follows:

Table 3 - Option 3: Benefits and Costs

Benefits	Costs
▪ Only minor additions to District Plan provisions need to be developed. Therefore the cost to Council in initiating and administering changes to the District Plan are limited (in comparison to other options).	▪ Costs to Council to develop and implement a plan change to amend the District Plan provisions for the Te Awa Development area (although this needs to be balanced against the benefit of confirming a Financial Contribution regime to provide for planned growth) and increased rating base.
▪ The rules, objectives and policies of existing Main Residential Zone have already been through the statutory planning process and only minor amendments are proposed in order to provide greater linkages with the Te Awa Structure Plan and the associated Design Outcomes. This is considered to be an innovative response in terms of establishing a new urban growth area while reflecting the specific opportunities and constraints of the Te Awa Development area.	▪ The rules, objectives and policies of the existing Main Residential zone have already been tested through the statutory planning process. The new / amended rules, performance standards and assessment criteria for the new amended residential zone will not have been subject to such testing and would be a minor departure from the direction of the existing District Plan (in terms of rules and methods). This potentially would lead to some additional costs to Council, landowners and developers in terms of testing any new provisions through statutory processes (e.g. interpretation, implementation, public hearing and Environment Court).
▪ Provides certainty to Council, landowners and developers about desired development Design Outcomes which requires that the site developed in stages, that infrastructure is provided in an integrated manner and outcomes which seek a high standard of urban design and landscaping.	▪ Costs of new development for developers which require the implementation of new planning provisions (rules, performance standards and assessment criteria) for the Te Awa Development area. It is noted that these costs are administrative and are not a significant component of the overall cost of development.
▪ Provides an opportunity and encourages developers to achieve higher quality urban amenity outcomes through the application of specific Design Outcomes.	▪ A minor initial increase in costs to Council for monitoring and ensuring compliance with the District Plan and processing of resource consents (with new and amended rules and associated performance standards / Design Outcomes).
▪ Planning for the staged provision of key infrastructure will enable Council to effectively plan for and budget expenditure of public	▪ A rezoning for residential purposes would result in a more intensified use of the rural soil resource and the immediate loss of a large

Benefits	Costs
money in this key urban growth area.	area of land for land based primary production activities (e.g. horticulture, grazing). This could potentially have economic impacts for the local community. Essentially, the loss of productive soil for agricultural and horticultural production is an opportunity cost for local landowners and secondary processing industries.
▪ Provides for the integration of key features such as open space areas, pedestrian/cycle linkages, and provision of network utilities by making minor amendments to the Main Residential Zone to link to the Structure Plan Design Outcomes.	▪ This approach does not encourage a mixture of different development types (thereby limiting amenity and lifestyle related outcomes and reducing the communities ability to provide for its social, cultural and economic wellbeing). Non-residential activities which include small scale retail activities are discretionary activities in the Main Residential Zone.
▪ Encourages development of the Structure Plan in a sustainable and integrated manner without restricting future development of the Te Awa Development area.	▪ A new residential zoning would lead to a loss of the existing rural outlook
▪ It would enable the extension of the residential zone to an obvious and appropriate city limit boundary (i.e. by indicating likely future urban expansion parameters).	
▪ Provides for the residential greenfields resource to be developed, which would assist in meeting a component of the overall demand identified in the NUGS 1999 and SANUGS 1999 (2008), thus enabling the community to provide for its social, economic and cultural wellbeing (in terms of the physical resource of dwellings).	
▪ The extension of the residential development proposed can be adequately and readily serviced through proposed infrastructure detailed in Structure Plan Design Outcomes.	
▪ Provides the Council the opportunity to confirm a Financial Contribution regime to provide for planned growth (e.g. infrastructure and services) and to grow the rating base.	

c. Option 4: Retain the Status quo

The benefits and costs of retaining the status quo are detailed below:

Table 4 - Option 4: Benefits and Costs

Benefits	Costs
▪ It is anticipated that the existing rural land use and associated primary land production activities would be able to continue in the short to medium term (noting that growth is ultimately expected to occur within the Te Awa Development area).	▪ This approach would not provide a clear strategic direction from Council on its intention to provide for residential growth in this area. This would potentially lead to increased pressure for ad hoc residential development of rural land.

Benefits	Costs
▪ The rural outlook of the Te Awa Structure plan, for the time being, would be retained.	▪ Does not provide for an integrated Structure Plan design solution to be implemented in an area where residential development is currently occurring and which is set aside as a future residential growth area (in strategic documentation). Higher core Council servicing costs will result if provided in the longer term or if provided retrospectively. Costs would be taken from the rating base as opposed to a Financial Contribution.
	▪ Increased potential for uncoordinated and ad hoc development that could compromise the development potential of the Te Awa Development area in the longer-term.
	▪ Infrastructure may not be provided at appropriate junctures and/or in an efficient manner. This can lead to cost inefficiencies, environmental costs and reduced amenity outcomes which can all affect the communities ability to provide for it social, economic and cultural wellbeing.
	▪ Residential development will require resource consent with increased likelihood of notification adding cost and potential delay to developers (i.e. time and financial costs associated with protracted public hearing procedures and potentially, the Environment Court).
	▪ Financial cost on the Council to build core infrastructure as residential development pressure / demand increases. Provision will be in response to growth and it reduces Council's ability to be proactive in service provision (and therefore in achieving the associated improved environmental and amenity outcomes). Cost is spread over the entire rating base population

7.3 Evaluation of Options

The options all provide scenarios which would result in the residential development of the Te Awa Development area (it is noted that Option 4, while maintaining the existing rural provisions, can still be developed for residential purposes albeit in the absence of an overall development plan and in an uncoordinated fashion). It is noted that a number of the benefits and costs identified are applicable to more than one of the options considered. The key issues relating to the likely effectiveness and efficiency of each option are discussed below.

Utilising a bespoke residential zone (Option 1) to provide for the specific design outcomes envisaged through a Structure Plan is considered to likely deliver higher amenity outcomes than other options. However, in this case it is considered to be an inefficient planning tool as the residential development envisaged by the existing Structure Plan broadly aligns with that sought through the existing Main Residential zone. In addition, the Te Awa Development area is constrained by a number of factors and these constraints drive a number of very specific Design

Outcomes (and associated amenity outcomes). As such, the preparation of a new zoning framework would be unnecessary and would unlikely achieve significantly greater residential amenity outcomes to that provided for under existing provisions and therefore represents an inefficient use of resources. Further, it is noted that the introduction of a new zone creates risk and uncertainty for both Council and developers as a new zone will not have previously been tested by the statutory planning process.

With regards to Option 2, the key benefit is the implementation of an existing zone that has been subject to testing within the statutory planning framework and is familiar to both Council and developers. However, the absence of references to the Te Awa Structure Plan Design Outcomes within the provisions of the District Plan is seen as problematic as without such references, the Structure Plan will not carry statutory weight and provide the direction for which it has been designed. This could result in on-going uncoordinated, ad hoc development which could compromise the development potential of the Te Awa Development area. Further, the absence of references to the Structure Plan could result in the failure to provide infrastructure in an orderly and timely manner. The provision of stormwater infrastructure at appropriate junctures is particularly important given the susceptibility of the area to flooding. The absence of direct links between the Structure Plan and the District Plan is considered to represent an ineffective planning solution.

Option 3 involves utilising an existing zone, coupled with making amendments to the District Plan which enshrine Structure Plan Design Outcomes within relevant sections of the District Plan, it is an option which is considered to bring about the key benefits of Options 1 and 2, whilst limiting the extent of uncertainty and risk generated by the introduction of a new zone. The use of the Main Residential zone will provide a robust planning framework that is familiar, and provides increased certainty to developers, Council and landowners. Further, the specific references within the District Plan to the Structure Plan and the inclusion of the Structure Plan Design Outcomes will provide developers and the local community with clear guidance as to Council's intended direction for this area in terms of staging, infrastructure provision (and its timing) and urban design and landscaping outcomes. While Option 1 may have resulted in better environmental outcomes, the costs associated with this option (for administration and implementation) are considered to outweigh these benefits.

Option 4 involves retaining the existing Main Rural zone and continuing to allow residential development to occur under the provisions of this zone via resource consent. The recent Te Awa Estates Ltd development provides evidence that this option is practicable but not ideal when the whole area needs to be considered in an integrated and coordinated manner. However, the absence of any strategic direction for the development of the area is likely to result in the inefficient, ad hoc development described in relation to Option Two. As noted in Table 4, further inefficiencies associated with this option are likely to arise in terms of development and regulatory planning processes (i.e. the need for applications as they arise to be publically notified and subject to a public hearing and potentially Environment Court proceedings).

Overall, **Option 3** (Rezoning to Main Residential with Structure Plan provisions) is considered to have a higher proportion of benefits to costs and therefore is considered the most effective and efficient response to achieving Council's strategic objectives and in turn, the residential objectives of the District Plan. Accordingly it is considered that implementing **Option 3** represents the most appropriate solution for facilitating residential development within the Te Awa Development area and will best meet the intent of Part 2 of the Act by applying an already existing zoning to the Te Awa Development area with a focus on specific Design Outcomes associated with staging of development, infrastructure provision and good urban design and landscaping outcomes through use of a Structure Planning process.

7.4 Policies

Having established that Option 3 (rezoning to Main Residential with Structure Plan provisions) is the most appropriate option and which best achieves the purpose of the Act through the implementation of an existing zone with amendments to incorporate a Structure Plan, the evaluation requires an assessment in terms of section 32(3) (b) as to whether the policies, rules and other methods are the most appropriate means to achieve the existing objectives of District Plan.

Proposed Plan Change 6 seeks to establish three additional policies in order to achieve the objectives of the District Plan. Appendix 1 provides an analysis of the benefits and costs associated with the proposed policies. Appendix 1 also includes an assessment of the risk of acting / not acting.

Based on this assessment, it is concluded that benefits of the proposed policies are appropriate when balanced against the costs and that these policies are an efficient and effective approach to achieve the objectives of the District Plan. In summary:

- The proposed policies are effective because they provide a clear statement of direction where Council's identified growth areas are concerned, confirm that Structure Planning is an appropriate method to achieve co-ordinated and well planned growth and that there is a cost methodology in place to apportion development costs;
- The proposed policies are efficient as they ensure that the plan change will result in the well planned, coordinated use of the site (or Te Awa Development area) and that costs associated with infrastructure provision will be fairly and appropriately apportioned; and
- They are appropriate in terms of implemented Council's existing District Plan objectives and other guiding strategic documentation (including growth strategies and ESDP documents).

Further evaluation will be undertaken to address and incorporate, as appropriate, benefits and costs identified by submitters through the on-going plan change process.

7.5 Costs and Benefits of Specific Methods (Rules, Assessment Criteria and associated Te Awa Structure Plan Design Outcomes)

Proposed Plan Change 6 seeks to establish an additional Discretionary activity trigger (or condition) in Rule 5.13. Sub-clause (g) references a new provision requiring consideration of Rule 5.36 (ties subdivision and development to the Te Awa Structure plan Design Outcomes and Maps). In addition the plan change incorporates additional assessment criteria in Chapter 12.2 which ensures that the requisite Design Outcomes and Structure Plan Maps are considered when development is proposed within the Te Awa Development (or Structure Plan) area.

The application of a noise boundary along Willowbank Avenue (posted 100km/hr) where development can build to within 3 metres of the Te Awa Development area boundary is considered an appropriate approach to ensure that residential amenity is maintained. Existing 'tested' District plan provisions relating to noise will apply.

Chapter 65, Table 1 indicates the Financial Contributions payable associated with development in the Te Awa Development area. This is appropriate to ensure the cost of core infrastructure is provided for thereby ensuring a high level of servicing and environmental amenity is maintained within the Structure Plan area. The introduced financial contributions also apportion costs

depending on the location of certain development in respect of already constructed Council infrastructure. This is considered to be a fair and appropriate approach.

Appendix 2 examines the benefits and costs of the proposed amendments to rules and methods. Appendix 1 includes an assessment of the risk of acting / not acting associated with not having the objectives, policies and methods proposed in the Main Residential Zone.

The assessment concludes that the benefits of the amendments to proposed policies and methods are appropriate when balanced against the costs and that these rules, assessment criteria and methods are an efficient and effective approach to achieve the means to achieve the existing objectives and proposed policies of the District Plan. In summary:

- The proposed rules, assessment criteria and methods are effective because they provide a clear structure and a co-ordinated direction / approach as to how development in the Te Awa Development area should progress. In addition, the application of an existing District Plan noise provision is effective and will ensure a high level of residential amenity is maintained along Willowbank Avenue;
- The proposed amendments to rules, assessment criteria and methods are efficient as they ensure that the plan change will result in the well planned, coordinated use of the Te Awa Development area and that costs associated with infrastructure provision will be fairly and appropriately apportioned; and
- The proposed amendments to rules, assessment criteria and methods are the most appropriate method to achieve co-ordinated and well planned growth and infrastructure provision while also achieving high quality urban design and landscape related outcomes. In addition, there is a clear and transparent cost methodology in place which fairly apportions development costs.

It is considered that any rezoning to Main Residential (with amendments to incorporate Structure Plan Design Outcomes and apply existing residential noise attenuation provisions) should be supplemented with additional activity status triggers in order to formally recognise these provisions. This is considered to be the most appropriate option in terms of recognising the opportunities and constraints associated with the Te Awa Development area. In turn, this approach best achieves the purpose of the Act, through the implementation of a range of Design Outcomes (included within District Plan conditions, appendices and referenced in additional proposed assessment criteria) and the application of an existing residential noise attenuation rule and an updated schedule of Financial Contributions. The evaluation has confirmed that the rules and other methods are the most appropriate means to achieve the existing objectives of District Plan (as required under section 32(3)(b) of the Act).

Further evaluation will be undertaken to address and incorporate, as appropriate, benefits and costs identified by submitters through the on-going plan change process.

7.6 Appropriateness of the Plan Change (Part 2)

Whether or not the Plan Change is necessary or appropriate is directly linked to Part 2 of the Resource Management Act (Purpose and Principles).

Plan Change 6 is considered appropriate for the following reasons:

- It promotes sustainable management through the efficient use and development of the existing Napier land resource, by providing for managed, co-ordinated and controlled residential expansion out to a defined point/limit (and as defined in both Regional and District growth strategy documentation);
- It will enable people (landowners) and communities to provide for their social, economic and cultural wellbeing by facilitating urban growth (an important physical resource) and

development within an appropriate statutory framework (a framework which does not currently exist);

- It will avoid remedy and mitigate effects of the environment through existing and proposed controls (and amendments to controls) in the District Plan which clearly links to the Te Awa Structure Plan Design Outcomes and therefore future development proposals; and
- Through the application of existing District Plan provisions of the Main Residential Zone and existing performance standards (successfully applied elsewhere around the City) and through the introduction of specific Design Outcomes, appropriate regard can be given to maintaining and enhancing amenity values both within the Te Awa Development area, and in adjoining residential areas.
- The plan change will lead to consolidated urban development that reduces ad hoc and more dispersed or unplanned growth and the opportunity for planning of such growth to provide for efficient end use of energy (e.g. reducing travel, being close to the CBD and enabling an appropriate density level when compared to a rural-lifestyle type development).

8 Conclusion

It is considered that the rezoning of land bounded by Napier Boys High school (to the north), Willowbank Avenue (to the west), Te Awa Avenue (to the east) and the Cross Country Drain (CCD) to the south is consistent with the purpose of the RMA, providing for the sustainable management of resources in Napier City. The proposed Plan Change (Plan Change 6) is a result of identification of the Te Awa Development area for future residential development in both Regional and District Growth Strategies.

The proposed Plan Change is considered to apply the most effective and efficient land zoning to the subject area, allowing for the managed and controlled extension of residential development to a limit while ensuring the effective staging of well-planned infrastructure and the maintenance and enhancement of a high level of urban amenity, while avoiding actual and potential adverse effects on the environment.

Appendix 1: Evaluation of Proposed Policies

Table 1: Appropriateness of new policies in achieving objectives of the Napier District Plan

Proposed Policy	Existing Objective	Are the Proposed Policies Most Appropriate for Achieving Existing Objectives?
Volume 1 - Chapter 4: Residential Objectives and Policies		
Policy 4.3.4 Council will undertake a Structure Planning process where areas for future urban development are identified in district or regional growth strategies before initiating a plan change to avoid remedy or mitigate adverse effects on the environment associated with ad hoc development and infrastructure provision.	*Objective 4.3:* *To accommodate growth through residential intensification in appropriate areas and limited peripheral expansion, and to create a City-wide settlement pattern that maintains the vitality of the City's commercial and community nodes, supports public transport and reduces private vehicle use.*	This policy is most appropriate because it provides a direct link between identified urban growth areas and the utilisation of comprehensive Structure Planning as a tool to assist in the management of adverse environmental effects associated with subdivision and development.
Volume 1 - Chapter 65: Financial Contributions		
Policy 65.4.3 Subdividers and Developers will be required to construct any utilities, roads and open space areas shown on an approved Structure Plan (See Appendices 26-30). The standard specified in the Code of Practice for Subdivision and Land Development or on any approved Structure Plan will generally be required to be met and will be required to be vested in Council.	*Objective 65.4* *To have regard to the efficient use of resources in the delivery of infrastructure to new development through ensuring that fair and reasonable costs are met by new development.*	This policy is the most appropriate because it encourages the effective and efficient development of Te Awa Development areas. Utilities, roads and indicative open space areas identified on the Structure Plan Maps provide direction on key sewer, water and stormwater services, roading and open space areas for development.
Volume 2 - Part A: Code of Practice for Subdivision and Land Development		
Section 5.2.13 - Policy 13 Subdividers and Developers shall be required to	*Section 5.1.6: Objective 6:*	This policy is appropriate because it provides for the efficient provision of infrastructure by implementing the

Proposed Policy	Existing Objective	Are the Proposed Policies Most Appropriate for Achieving Existing Objectives?
accommodate within the design and layout of any subdivision or development any Road, Utilities and Open Space identified on an approved Structure Plan contained in Appendices 26-30 of the District Plan	*The provision of an efficient and effective infrastructure, services and utility network that provides for the current and reasonably foreseeable needs of the City. The efficient use of resources, particularly finite resources, are other matters to be considered under the Act (sections 7[b] and [g]). Promoting efficient use of the City's land resource at the development stage is fundamental to providing for these matters, as is the efficient design and establishment of the City's network of services, utilities, roads (including the state highway network) and other infrastructural components. Promoting efficient land development will help to reduce the environmental costs of development for present and future generations, and to sustain the future potential of the resources.*	relevant Design Outcomes of the Te Awa Structure Plan which considers how infrastructure can be planned and coordinated efficiently and cost effectively to avoid actual and potential adverse effects on the environment.

Table 2: Benefits and Costs of Proposed Policies

Proposed Policy	Benefits ☑ / Costs ☒ of Proposed Policy	Risk of Acting and Not Acting *This has only been completed where there is considered relevant uncertainty regarding the subject matter of the policy/method*
Volume 1 - Chapter 4: Residential Objectives and Policies		
Policy 4.3.4 ***Council will undertake a Structure Planning process where areas for future urban development are identified in District or Regional Growth Strategies before initiating a plan change to avoid remedy or mitigate adverse effects on the environment associated with ad hoc development and infrastructure provision.***	**BENEFITS** ☑ Identifies opportunities and constraints associated with urban development areas. ☑ Manages adverse effects of urban development through Structure Planning process. ☑ Provides for a coordinated approach to infrastructure provision. ☑ Provides for urban growth in the sustainable manner. ☑ Provides greater certainty to developers, the council, the public and affected parties regarding the layout, and costs of development in an area identified for growth or redevelopment. **COSTS** ☒ Costs to Council of undertaking Structure Planning exercises across the City.	There is sufficient certainty regarding structure planning and the impacts of ad hoc development. Development would likely continue in an uncoordinated and ad-hoc manner and result in associated inefficiencies (including increased costs to Council, landowners and developers). Acting now through the proposed Plan Change process will provide certainty and clear direction to landowners, surrounding landowners, potential developers and the wider community for the intended use and development within the Te Awa Development area (via a comprehensive Structure Plan).
Volume 1 - Chapter 65: Financial Contributions		
Subdividers and Developers will be required to construct any utilities, roads and open space areas shown on an approved Structure Plan (See Appendices 26-30). The standard specified in the Code of Practice for Subdivision and Land or on any approved Structure Plan will generally be required to be met	**BENEFITS** ☑ Provides certainty regarding ownership, and management of utilities. ☑ Provides for a coordinated approach to infrastructure provision.	There is sufficient certainty regarding the importance of providing adequate servicing and open space where residential growth o proposed.

Proposed Policy	Benefits ☑ / Costs ☒ of Proposed Policy	Risk of Acting and Not Acting *This has only been completed where there is considered relevant uncertainty regarding the subject matter of the policy/method*
and will be required to be vested in Council.	☑ Provides greater certainty regarding cost of urban development and how these costs will be apportioned. **COSTS** ☒ Costs associated with meeting Structure Plan requirements.	Development of infrastructure would likely continue in an uncoordinated and ad-hoc manner and result in associated inefficiencies (including increased and potentially unplanned costs to Council, landowners and developers) and adverse amenity and environmental impacts.
Volume 2 - Part A: Code of Practice for Subdivision and Land Development		
Section 5.2.13 - Policy 13 ***Subdividers and Developers shall be required to accommodate within the design and layout of any subdivision or development, any Road, Utilities and/or Open Space requirements as identified on an approved Structure Plan contained in Appendices 26-30 of the District Plan.***	**BENEFITS** ☑ Provides certainty regarding provision of roads and utilities in approved Te Awa Development areas. ☑ Provides for a coordinated approach to infrastructure provision. ☑ Provides for urban growth in the sustainable manner. **COSTS** ☒ Costs associated with meeting Structure Plan requirements (compliance).	Landuse development and the associated development of infrastructure would likely continue in an uncoordinated and ad-hoc manner and result in associated inefficiencies (including increased and potentially unplanned costs to Council, landowners and developers). Acting now through the proposed Plan Change process will provide certainty and clear direction to landowners, surrounding landowners, potential developers and the wider community of landuse direction and key infrastructural requirements, their staging and likely costs.

Appendix 2: Evaluation of Proposed Methods (Preferred Option 3)

Table 3: Alternative Options Evaluation of New/Amended Rules in this Proposed Plan Change

Rule Options Considered	Benefits	Costs
a. Main Residential Zone: Proposed Amendment to Discretionary Activities		
Option 1 Retain Main Residential Zone Discretionary Activities Control 5.13 Discretionary Activities 1. The following land uses are discretionary activities. A resource consent application must be made and consent may be declined or granted with or without conditions. The Council will have regard to the objectives and policies of this Plan and the assessment criteria in Chapter 12. The Council's discretion is unrestricted. a) A supplementary unit that does not comply with all the relevant conditions. b) Retirement complexes. c) Any non-residential activity not stated by a rule elsewhere in this Chapter. d) Use of explosives, other than for temporary military training purposes. e) The establishment of any noise sensitive activity within the Airport Noise Boundary as shown on Planning Map G5 or Appendix 27. f) Any business of prostitution (including those that do not comply with all of the relevant conditions as a Home Occupation).	☑ Retains development potential at status quo in Plan – of benefit to those developing sites. ☑ Understood as 'status quo' by community – of benefit for ease of understanding by whole community.	☒ Does not link to Structure Plan Design Outcomes. ☒ Does not provide for coordinated infrastructure provision in Te Awa Development areas. ☒ Potential for adverse effects on the environment associated with ad hoc development and infrastructure provision.
Option 2 Amend Main Residential Zone Land Development control to implement Te Awa Structure Plan Design Outcomes 5.13 Discretionary Activities 1. The following land uses are discretionary activities. A resource consent application must be made and consent may be declined or	☑ Provides greater certainty regarding Structure Plan staging and the implementation of Design Outcomes sought for the Te Awa Development area. ☑ Provides for coordinated infrastructure	☒ Costs to Developers and Council associated with the implementation of Te Awa Structure Plan Design Outcomes (compliance). ☒ Subdivision and development that does not comply with the relevant

Rule Options Considered	Benefits	Costs
granted with or without conditions. The Council will have regard to the objectives and policies of this Plan and the assessment criteria in Chapter 12. The Council's discretion is unrestricted. a) A supplementary unit that does not comply with all the relevant conditions. b) Retirement complexes. c) Any non-residential activity not stated by a rule elsewhere in this Chapter. d) Use of explosives, other than for temporary military training purposes. e) The establishment of any noise sensitive activity within the Airport Noise Boundary as shown on Planning Map G5 or Appendix 27. f) Any business of prostitution (including those that do not comply with all of the relevant conditions as a Home Occupation). ***g) Any landuse that does not comply with the conditions in Rule 5.36 (Development of Land within Structure Plan areas).*** ***Condition 5.36 – Development of Land within Structure Plan Areas*** ***1. The relevant provisions of any Structure Plan must be complied with. Refer to Appendices 26 – 30 of this District Plan.*** 12.2 General Assessment Criteria ***vii) Where the site is located within the Te Awa Development area the extent to which relevant Te Awa Structure Plan Outcomes can be met (in Appendix 29A-F of the District Plan)***	provision in the Te Awa Development area. ☑ Potential and actual adverse environmental impacts can be appropriately managed through the application of the Structure Plan design outcomes	Structure Plan Design Outcomes would be considered as a discretionary activity.

Recommended Most Effective and Efficient Option:

On balance, it is considered that the most appropriate, effective and efficient option is option 2, as changing the activity status to discretionary for non-compliance with Structure Plan staging provisions and Design Outcomes will encourage developers to comply with the Structure Plan which seeks specific planned infrastructure provision or improvements and a higher level of urban amenity and landscaping outcomes. The implementation of option 2 is anticipated to provide certainty to landowners, adjacent landowners, developers and the wider public of the intended development direction of the site through the provision of a robust framework as to the staging, infrastructure provision and urban design and landscaping outcomes expected for the Te Awa Development area.

Table 4: Evaluation of New/Amended Rules in this Proposed Plan Change (Noise)

Rule Option Considered	Benefits	Costs
b. Main Residential Zone: Proposed Amendment to Condition Table 5.22		
The following acoustic insulation conditions shall apply to all new noise sensitive activities within the Expressway Noise Boundary ***and Willowbank Noise Boundary***: a) Where any building used for a noise sensitive activity is to be located within the Expressway Noise Boundary ***or Willowbank Noise Boundary*** as shown on the planning maps: i) All habitable spaces within buildings used for the noise sensitive activity must be adequately insulated from noise arising from use of the Napier/Hastings expressway***, and Willowbank Avenue***. ...	☑ Ensures a high level of residential amenity is maintained for residential dwellings located in close proximity to Willowbank Avenue (a 100km/hr road). ☑ Is a provision consistently and successfully applied in the existing District Plan (i.e. it is a tested provision).	☒ Cost of additional noise attenuation (compliance).

Recommended Most Effective and Efficient Option:
It is considered that this is the most appropriate, effective and efficient option to ensure that residential amenity is maintained for residential dwellings built along the boundary of the Te Awa Development area. This rule is an existing District Plan provision and is well tested. Setbacks are not considered appropriate in this instance as this reduces residential yield.

Table 5: Te Awa Structure Plan Design Outcomes Evaluation

Rule – Preferred Method (Option 2) - Te Awa Structure Plan Design Outcomes	Benefits	Costs
8.1.2 Te Awa Structure Plan Design Outcomes - Landuse Design Outcomes		
Design Outcome 1: The Te Awa Development area shall be zoned Main Residential. The rules and conditions of the Main Residential zone shall be applied to development. *Note: full Design Outcome not repeated here.*	☑ Applies existing, tested zone provisions to the Te Awa Development area which benefit s those developing sites. ☑ Provides greater certainty to landowners and the community regarding the future use of land within the Te Awa Development area.	
Design Outcome 2: A node of Suburban Commercial has been indicatively located within the Te Awa Development area. Although Suburban Commercial activities will not initially be permitted within the Te Awa Development area, it is anticipated that this landuse activity should be provided for in the medium-term (i.e. beyond 2015) as an appropriate response to a market demand to service the Te Awa Development area. This Design Outcome could be realised via a supplementary plan change. Any Suburban Commercial activity should be of a small scale and appropriate to the locality.	☑ Signals Council's intent to potentially rezone a portion of the Te Awa Development area Suburban Commercial (subject to market demand). ☑ Identifies that Suburban Commercial of a certain scale is an appropriate use within the Te Awa Development area. ☑ Provides an opportunity to build in flexibility to the Te Awa Structure Plan should the market demand such flexibility.	☒ Costs associated with preparing a supplementary plan change to realise Suburban Commercial activity within the Te Awa Development area. ☒ Uncertainty for landowners/developers as to the commitment and timing for developing a plan change to realise Suburban Commercial zone within the Te Awa Development area.
Design Outcome 3: The Te Awa Development area is a clearly defined growth area and should be rezoned to Main Residential. Until such time as development is proposed on specific landholdings, existing rural landuse activity should remain as the dominant landuse.	☑ Recognises and provides for Council's District Growth Strategy direction. ☑ Applies existing, tested zone provisions to the Te Awa Development area. ☑ Provides for future urban growth within the existing rural context. ☑ Landuse is compatible the surrounding residential uses. ☑ Provides for existing rural uses until such time as land is developed.	☒ Loss of existing rural character associated with full build out of Te Awa Development area over time.

Rule – Preferred Method (Option 2) - Te Awa Structure Plan Design Outcomes	Benefits	Costs
Design Outcome 4: Orderly and cost efficient staging will be achieved through the progressive construction of infrastructure in cells illustrated on the Structure Plan Map – Staging (Appendix 29F). The staging acknowledges existing infrastructure developed as part of Te Awa Estates Ltd consented developments and reflects Council's current longer-term infrastructure planning. Before subdivision and land development can commence in each of the consecutive steps of staged development the percentage of lots (as a total across the relevant stage/s) that must have received Section 224 certification is as follows: Staged Development Step: Prerequisite (no. of lots with Section 224 Certification) 1: None 2: Stage 1 = 60% 3: Stage 1+2 = 65% 4: Stage 1+2+3 = 70% 5: Stage 1+2+3+4 = 75% 6: Stage 1+2+3+4+5 = 80% As an example Staged Development Step 2 will not commence until 60% of the total number of lots across Stages 1 have received Section 224 Certification, Staged Development Step 3 will not commence until 65% of the total number of	☑ Provides certainty regarding the staged provision of core infrastructure. ☑ Provides for more efficient infrastructure provision. ☑ Cost efficiencies associated with staging infrastructure. ☑ Directs the development in areas where infrastructure is a priority.	☒ Costs to developers/landowners where land is within a later stage of infrastructure staging. ☒ Additional costs associated with developing areas that are out of sequence with the proposed staging of infrastructure.

Rule – Preferred Method (Option 2) - Te Awa Structure Plan Design Outcomes	Benefits	Costs
lots across Stages 1 and 2 have received Section 224 Certification, and Staged Development Step 4 will not commence until 70% of the total lots across Stages 1, 2 and 3 have received Section 224 Certification, and so on.		
Design Outcome 5: Out of sequence development will be discouraged by… -Requiring out of sequence development to be a Discretionary activity -Requiring developers to fund the full cost of infrastructure -Requiring out of sequence developments to provide at their own cost an internal buffer from surrounding rural landuse activities	☑ Provides certainty regarding the staged provision of core infrastructure. ☑ Provides for more efficient infrastructure provision. ☑ Cost efficiencies associated with staging infrastructure. ☑ Directs the development in areas where infrastructure is a priority. ☑ Council can confidently budget infrastructure expenditure.	☒ Costs to the developer of funding full cost of infrastructure if development occurs out of sequence. ☒ Cost to the developer of providing a buffer to surrounding rural landuses, if development is out of sequence.

Rule – Preferred Option 2 Te Awa Structure Plan Design Outcomes	Benefits	Costs
8.1.3 Te Awa Structure Plan Design Outcomes - Urban Amenity Design Outcomes		
Design Outcome 6: Provide a north to south "sub-spine" street running between Willowbank Avenue and Eriksen Road. The open drainage network (indicatively shown on the Te Awa Structure Plan Map) should be an integrated feature of this where practicable, and other local street networks.	☑ Provides for north-south orientation enhancing long locating views through the precinct which contribute to identity /and sense of place. ☑ Provides for greater connectivity for vehicles, pedestrians and cyclists (positive amenity outcomes). ☑ Open drainage network and its integration with the roading network is consistent with the pattern of existing stormwater infrastructure in Napier City (cohesive amenity and sense of identity with wider urban form of the City).	☒ Reduction in developable land area with open drainage network compared to a piped stormwater system.
Design Outcome 7: Local streets shall be orientated north-south where possible. Urban blocks shall be designed within the range of 60 to 100m to 90 by 170m. The collector street network providing the structure of the transport network shall intersect via single lane roundabouts. The use of on-street traffic calming using cycle lanes and on-street car parking and berm design shall be considered fundamental design elements of the street cross section.	☑ Provides for a street network that is well connected ☑ Reduces travel distances for vehicles, pedestrians and cyclists and therefore promotes greater energy efficiency.	☒ Classic urban block pattern marginally reduces developable land area compared to potential cul de sac development patterns.
Design Outcome 8: Subdivision design shall seek to activate the street frontage through the orientation of dwellings to face the street and overlook public open space (where applicable) to enable passive surveillance and improved street amenity outcomes.	☑ Contributes to perception of safety for pedestrians and cyclists. ☑ Activated street frontages – enhancing urban amenity.	☒ Perception of reduction in privacy by requiring dwellings to face the street or overlook public open space.
Design Outcome 9: Provide for the consistent landscaping treatment of streets and reserves (including the Serpentine Pond environments and open drainage channels) that contribute to urban amenity and landscape values and retains and enhances vistas through the Te Awa Development area.	☑ Supports framing of views contributing to identity and sense of place (positive amenity outcome). ☑ Provides for a high level of street amenity. ☑ In the Serpentine Pond area and the open drain network, this Design	☒ Costs to Council in terms of on-going maintenance.

Rule – Preferred Option 2 Te Awa Structure Plan Design Outcomes	Benefits	Costs
	Outcome provides for a potential integrated ecological and landscape design response.	
Design Outcome 10: A consistent generously landscaped buffer strip of 3m will be provided along the western extent of the Te Awa Development area (fronting Willowbank Avenue) in accordance with the Te Awa Structure Plan Map (the 3m buffer is indicatively shown on the western boundary of the Te Awa Development area to the north and south of the open drain channel). This Design Outcome requires that 75% of the buffer setback is densely planted at the time of development with specimens that will reach of 3-5m at maturity.	☑ Provides an appropriate setback and the maintenance of a high level of amenity from Willowbank Avenue and the adjacent rural environment (where development backs onto Willowbank Avenue). ☑ Provides an appropriate setback from the road and provides for increased levels of amenity for rear or side yards where a residential use establishes within the Te Awa Development area.	☒ Cost of providing land and establishing landscape planting.
Design Outcome 11: Off road pedestrian and cycle linkages (indicatively shown on the Te Awa Structure Plan Map) which link open spaces to each other, to the street network and to Serpentine stormwater pond shall be wide, open and safe and connect to one another.	☑ Supports connectivity to destinations such as schools, larger parks beyond the local walkable catchment – improves amenity and opportunity for end use energy efficiency. ☑ Provides for high urban amenity through greater opportunities for recreation. ☑ Contributes to health and wellbeing by providing opportunities for walking and cycling. ☑ Promotes the use of local open spaces through improved access to open space areas (off road pedestrian and cycleways).	☒ Reduction in developable land associated with the provision of off road pedestrian and cycle linkages. ☒ Costs to Council and developers in terms of providing these features. ☒ Costs to Council in terms of on-going maintenance.

Rule – Preferred Option 2 Te Awa Structure Plan Design Outcomes	Benefits	Costs
8.1.4 Te Awa Structure Plan Design Outcomes - Accessibility Design Outcomes		
Design Outcome 12: Road upgrading shall proceed in conjunction with staging of development within the Te Awa Development area. The road upgrading is shown indicatively on the Te Awa Structure Plan Map. *Note: full Design Outcome not repeated here.*	☑ Largely applies existing, tested Council engineering standards to the Te Awa Development area which benefits those developing sites. ☑ Applies a Main Street and Local Street typology to improve street amenity, safety and sense of place. ☑ Provides certainty in terms of the provision of a roading framework for the Te Awa Development area which avoids, remedies and mitigates potential and actual adverse effects on the environment.	☒ Costs to Council and developers of providing for new roading and upgrades. ☒ Costs to Council in terms of on-going maintenance.
Design Outcome 13: No additional collector streets are necessary within the Te Awa Development area. Internal streets shall generally comply with Napier City Council standards and design for local streets, except where Council may wish to promote with a developer innovative and attractive solutions that enhance residential amenity, safety and sense of place. Therefore Council will look favourably on alternative subdivision concepts that achieve safe, pedestrian friendly streets and discourage through traffic.	☑ Applies existing, tested Napier City Council standards to the design of streets to the Te Awa Development area. ☑ Provides for innovative solutions where these enhance residential amenity, safety and sense of place (see application of a Main Street and Local Street typology to improve street amenity, safety and sense of place)	☒ Costs to Council and developers to initiate and develop higher amenity and safer roading solutions. ☒ Uncertainty in terms of what might constitute an innovative and attractive solution for roading design.

Rule – Preferred Option 2 Te Awa Structure Plan Design Outcomes	Benefits	Costs
8.1.5 Te Awa Structure Plan Design Outcomes - **Infrastructure Design Outcomes**		
Design Outcome 14: Stormwater management infrastructure shall comprise a combination of a reticulated pipe network (constructed to Napier City Council standards), open drains, the Serpentine stormwater pond and a new pump station and coastal discharge point. These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the Te Awa Structure Plan Map – Stormwater Network and are more fully described in the Te Awa Structure Plan – Three Waters report. *Note: full Design Outcome not repeated here.*	☑ Provides for more efficient infrastructure provision. ☑ Cost efficiencies associated with staging infrastructure. ☑ Directs development in areas where infrastructure is a priority. ☑ Provides certainty in terms of the provision of a stomwater system for the Te Awa Development area which avoids, remedies and mitigates potential and actual adverse effects on the environment.	☒ Reduction in developable land area associated with open drainage network compared to a piped stormwater system.
Design Outcome 15: Minimum front boundary levels have been set for new development in various sub-catchments taking account of maximum water levels associated with the 2% AEP rainfall event. These minimum front boundary levels range from RL 11.58m to RL 12.21m. Refer to the Te Awa Structure Plan – Three Waters Report for further details.	☑ Provides for more efficient infrastructure provision. ☑ Provides certainty in terms of the provision of a stomwater system for the Te Awa Development area which avoids, remedies and mitigates potential and actual adverse effects on the environment (particularly natural hazards).	☒ Costs associated with raising ground-levels in order to achieve minimum front boundary levels.
Design Outcome 16: Wastewater infrastructure shall comprise of a combination of a reticulated pipe network (constructed to Napier City Council standards) and three (no. 3) pumping stations. The wastewater system will connect into the future wastewater pressure main from a new pump station near Taradale Road that will feed directly to the Awatoto milliscreen plant to the south (via Eriksen Road). These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the Te Awa Structure Plan Map – Wastewater Network and are more fully described in the Te Awa Structure Plan – Three Waters report. *Note: full Design Outcome not repeated here.*	☑ Provides for more efficient infrastructure provision. ☑ Cost efficiencies associated with staging infrastructure. ☑ Directs development in areas where infrastructure is a priority. ☑ Provides certainty in terms of the provision of a wastewater system for the Te Awa Development area which avoids, remedies and mitigates potential and actual adverse effects on the	☒ Costs associated with infrastructure provision and in terms of on-going maintenance.

Rule – Preferred Option 2 Te Awa Structure Plan Design Outcomes	Benefits	Costs
	environment.	
Design Outcome 17: Water supply network infrastructure shall comprise of a combination of a reticulated pipe network (constructed to Napier City Council standards) and two 450mm main connections. The primary supply point will be at the intersection of the CCD and Eriksen Road where the proposed 450mm Awatoto Trunk Main is proposed to be built. The Awatoto Trunk Main will eventually be extended to connect with the Enfield Reservoir via Eriksen Road, giving an additional northern supply point at the intersection of Willowbank Avenue and Eriksen Road. These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the Te Awa Structure Plan Map – Water Supply Network and are more fully described in the Te Awa Structure Plan – Three Waters report. *Note: full Design Outcome not repeated here.*	☑ Provides for more efficient infrastructure provision. ☑ Cost efficiencies associated with staging infrastructure. ☑ Directs development in areas where infrastructure is a priority.	☒ Costs associated with infrastructure provision and in terms of on-going maintenance.
Design Outcome 18: Developers shall meet fair and reasonable costs towards the provision of essential utility services, road upgrading and open space. This obligation may be met by physical works, financial contributions or a combination of both subject to agreement with Council. Costs for various utility infrastructure service provision has been assessed as part of the technical background work. Financial contributions are specified in Chapter 65, Table 1 of the District Plan.	☑ Provides for fair distribution of the costs of Structure Plan development through financial contributions. ☑ Provides certainty of costs associated with aspects of infrastructure required as part of developing the Te Awa Development area.	☒ Costs to Council and developers associated with infrastructure provision and on-going maintenance (for Council).

Appendix 3: SCHEDULE OF AMENDMENTS TO THE NAPIER DISTRICT PLAN

CHAPTER 1: INTRODUCTION

ADD NEW APPENDICES UNDER HEADING STRUCTURE PLANS IN LIST OF APPENDICIES AS SHOWN ***IN BOLD AND ITALICS***:

29A Te Awa Structure Plan Design Outcomes
29B Te Awa Structure Plan Map
29C Te Awa Structure Plan – Water Supply Network
29D Te Awa Structure Plan – Stormwater Network
29E Te Awa Structure Plan – Wastewater Network
29F Te Awa Structure Plan - Staging

AMEND TEXT IN SECTION 1.11 AS SHOWN IN ***BOLD AND ITALICS***:

In addition to the adoption of this timing and release of greenfield areas, the Council has rezoned a part of the 'Lagoon Farm' ***and Te Awa*** land. -This resolution ensures an adequate supply of greenfield areas is available over the life of this Plan, due to uncertainties existing surrounding the availability and development potential of those areas identified within the Urban Growth Strategy.

CHAPTER 4: RESIDENTIAL ENVIRONMENTS (OBJECTIVES, POLICIES AND METHODS)

ADD NEW POLICY AS SHOWN IN ***BOLD AND ITALICS***:

Policy 4.3.4
Council will undertake a Structure Planning process where areas for future urban development are identified in District or Regional growth strategies before initiating a plan change to avoid remedy or mitigate adverse effects on the environment associated with ad hoc development and infrastructure provision.

AMEND PRINCIPAL REASONS FOR ADOPTING OBJECTIVE AND POLICIES AS SHOWN IN ***BOLD AND ITALICS***

Amend principal reasons for adopting objective and policies as follows:

Adequate and functioning infrastructure including roading, stormwater and sewerage networks is an important element of the community's social and economic wellbeing, particularly within the urban environment. This policy recognises that infrastructural limitations need to be taken into account in any intensification of settlement to ensure appropriate environmental outcomes and that the health and safety of the community is provided for. ***Council recognises that where future urban growth areas are identified in the District or Regional Growth Strategy, Structure Planning can be used as a tool to comprehensively coordinate the staging of development over time, and provide a co-ordinated approach to infrastructure provision.***

AMEND ANTICIPATED ENVIRONMENTAL RESULTS AS SHOWN IN ***BOLD AND ITALICS***:

Section 4.8:

(16) Planned coordinated residential growth that is consistent with the District and Regional Growth Strategies.

AMEND ZONE DESCRIPTIONS AS SHOWN IN ***BOLD AND ITALICS***:

Section 4.9.2:

The Main Residential zone applies to broad residential areas covering most of the City where there are no significant environmental constraints that may otherwise indicate intensified residential development should not occur. ***This Zone also includes residential growth areas including the Te Awa Development area.*** The Main Residential zone allows for a degree of consolidation and intensification of residential development consistent with the maintenance and enhancement of residential amenity values by way of development standards.

CHAPTER 5: MAIN RESIDENTIAL ZONE

AMEND SECTION 5.13 DISCRETIONARY ACTIVITIES AS SHOWN IN ***BOLD AND ITALICS***:

5.13 Discretionary Activities
1. The following land uses are discretionary activities. A resource consent application must be made and consent may be declined or granted with or without conditions. The Council will have regard to the objectives and policies of this Plan and the assessment criteria in Chapter 12. The Council's discretion is unrestricted.
a) A supplementary unit that does not comply with all the relevant conditions.
b) Retirement complexes.
c) Any non-residential activity not stated by a rule elsewhere in this Chapter.
d) Use of explosives, other than for temporary military training purposes.
e) The establishment of any noise sensitive activity within the Airport Noise Boundary as shown on Planning Map G5 or Appendix 27.
f) Any business of prostitution (including those that do not comply with all of the relevant conditions as a Home Occupation).
g) Any landuse that does not comply with the conditions in Rule 5.36 (Development of Land within Structure Plan areas).

AMEND SECTION 5.22 NOISE CONDITION TABLE AS SHOWN IN ***BOLD AND ITALICS***:

5.22.2 Noise

The following acoustic insulation conditions shall apply to all new noise sensitive activities within the Expressway Noise Boundary ***and Willowbank Noise Boundary***:
a) Where any building used for a noise sensitive activity is to be located within the Expressway Noise Boundary ***or Willowbank Noise Boundary*** as shown on the planning maps:
i) All habitable spaces within buildings used for the noise sensitive activity must be adequately insulated from noise arising from use of the Napier/Hastings expressway, ***and Willowbank Avenue.***

...

ADD NEW MAIN RESIDENTIAL CONDITION 5.36 AS SHOWN IN ***BOLD AND ITALICS***:

Condition 5.36 – Development of Land within Structure Plan Areas

1. The relevant provisions of any Structure Plan must be complied with. Refer to Appendices 26 – 30 of this Plan.

CHAPTER 12 RESIDENTIAL ENVIRONMENTS ASSESSMENT CRITERIA

AMEND SECTION 12.2 GENERAL ASSESSMENT CRITERIA AS SHOWN IN ***BOLD AND ITALICS***:

The following criteria will be used by the Council in considering a resource consent application for a Discretionary Activity or a Restricted Discretionary Activity for noncompliance with one or more conditions in the relevant activity table and/or condition table.

a) Any unusual circumstances including, but not limited to, those listed below:

i) Inherent site considerations: including unusual size, shape, topography, substratum, vegetation or flood susceptibility;

ii) Particular site development characteristics: including the location of existing buildings or their internal layout, achievement of architectural harmony, compliance with engineering or bylaw standards, enhancement of private open space, achievement of a better relationship between the site and the road, building renovation or restoration of demonstrable merit, the design and arrangement to facilitate access for the disabled, or legal impediments;

iii) Unusual environmental circumstances: including adverse topography, unusual use or location of buildings on adjacent sites, improved amenity for neighbouring sites, and the presence of effective on-site screening.

iv) Proximity to the Rural Environment.

v) In the absence of adequate private open space, whether the maintenance and enhancement of public reserves or amenity treatment appropriate with the level of impact of the development is required.

vii) Where the site is located within the Te Awa Development area the extent to which the relevant Te Awa Structure Plan Design Outcomes can be met (in Appendix 29A-F of the District Plan)

CHAPTER 65 FINANCIAL CONTRIBUTIONS

ADD NEW POLICY 65.4 AS SHOWN IN ***BOLD AND ITALICS***:

Policy 65.4

Subdividers and Developers will be required to construct any utilities, roads and open space areas shown on an approved Structure Plan (See Appendices 26-30). The standard specified in the Code of Practice for Subdivision and Land Development or on any approved Structure Plan will generally be required to be met and will be required to be vested to Council.

INSERT FINANCIAL CONTRIBUTIONS IN TABLE 1 AS SHOWN IN ***BOLD AND ITALICS***:

Development Area	***Non-Local Contributions Plus*** ***($ per lot/unit unless stated otherwise)***	***Local Contributions Plus*** ***($ per lot/unit unless stated otherwise)***	***On Site Contributions*** ***($ per lot/unit unless stated otherwise)***
Te Awa[1]	*$15,466*	*$379,800 per ha, plus $2,400 per metre of road frontage*[2]	*See Note* [1]

[1] *Developers expenses will also include costs for:*

a) Infrastructure shown in Appendix 29A-F Te Awa Structure Plan

b) Where a developer needs to increase the size of stormwater, water or sewer mains to provide additional capacity for areas outside of his development in accordance with the Te Awa Structure Plan, a main of sufficient capacity to service the total area that will be serviced by that main must be installed at the developer's cost. When the balance of that area is developed, capital contributions will be required from subsequent developers to recover the additional cost that was incurred by the original developer, to reimburse him. In the case of the Water Supply Ring Main, the Council will reimburse the cost difference between the developer's requirement (150mm diameter) and the upgrading to a 200mm diameter main.

[2] *Where lots front onto Konny Road, Eriksen Road and the new "Middle Road" between Eriksen Road and Willowbank Avenue (net of structure plan drainage reserves).*

PART 10 (APPENDICES)

NEW APPENDICES 29A TE AWA STRUCTURE PLAN DESIGN OUTCOMES AS SHOWN IN ***BOLD AND ITALICS***:

Appendix 29A: Te Awa Structure Plan Design Outcomes

1. Introduction

The Te Awa Structure Plan sets out a framework for development within the Te Awa Development area. The Structure Plan includes the Te Awa Structure Plan Map which shows key features including, landuse, indicative open space areas, stormwater infrastructure, proposed roads, proposed off-road pedestrian and cycleways. The Te Awa Structure Plan - Water Supply Network Plan (Appendix 29C), the Te Awa Structure Plan - Stromwater Network Plan (Appendix 29D) and the Te Awa Structure Plan – Wastewater Plan (Appendix 29E) show the layout of proposed service infrastructure.

The Te Awa Structure Plan Design Outcomes (set out in the Te Awa Structure Plan) have been developed as part of the Te Awa Structure planning process and associated specialist analysis. The objectives that underpin the Te Awa Structure Plan Design Outcomes include:

1. Landuse

2. Urban Amenity

3. Accessibility

4. Infrastructure

The Te Awa Structure Plan Design Outcomes seek to guide development and minimise potential effects associated with urban development. The Design Outcomes are considered to be critical to achieving the desired intent of the Te Awa Structure Plan.

2. Te Awa Structure Plan Design Outcomes

Applicants will need to demonstrate when applying for landuse development and subdivision resource consents within the Te Awa Development area, that the relevant Design Outcomes can be achieved. Every subdivision or land development shall make provision for the infrastructure shown on the Te Awa Structure Plan Maps (refer to Appendix 29C-F) and which lie within the application land, generally shown on these Maps. The Structure Plan Design Outcomes are set out as follows:

<u>Landuse Design Outcomes</u>

Design Outcome 1:

The Te Awa Development area shall be zoned Main Residential. The rules and conditions of the Main Residential zone shall be applied to development. The Permitted activities in this zone include:

- *Residential activities*
- *Home occupations*
- *A supplementary unit*
- *Residential care facilities*
- *Day care centres*
- *Travellers accommodation*
- *Education facilities*

Development will generally be of a low to moderate density. Subdivision and density requirements for permitted activities will be those applied in the Main Residential zone as follows:

- *Maximum density: 1 dwelling per 350m2*

Design Outcome 2:

A node of Suburban Commercial has been indicatively located within the Te Awa Development area. Although Suburban Commercial activities will not initially be permitted within the Te Awa Development area, it is anticipated that this landuse activity should be provided for in the medium-term (i.e. beyond 2015) as an appropriate response to a market demand to service the Te Awa Development area. This Design Outcome could be realised via a supplementary plan change. Any Suburban Commercial activity should be of a small scale and appropriate to the locality.

Design Outcome 3:

The Te Awa Development area is a clearly defined growth area and should be rezoned as a single block to Main Residential. Until such time as development is proposed on specific landholdings, existing rural landuse activity should remain as the dominant landuse.

Design Outcome 4:

Orderly and cost efficient staging will be achieved through the progressive construction of infrastructure in cells illustrated on the Structure Plan Map – Staging (Appendix 29F). The staging acknowledges existing infrastructure developed as part of Te Awa Estates Ltd consented developments and reflects Council's current longer-term infrastructure planning.

Before subdivision and land development can commence in each of the consecutive steps of staged development the percentage of lots (as a total across the relevant stage/s) that must have received Section 224 certification is as follows:

Staged Development Step	*Prerequisite (no. of lots with Section 224 Certification)*
1	*None*
2	*Stage 1 = 60%*
3	*Stage 1+2 = 65%*
4	*Stage 1+2+3 = 70%*
5	*Stage 1+2+3+4 = 75%*
6	*Stage 1+2+3+4+5 = 80%*

As an example Staged Development Step 2 will not commence until 60% of the total number of lots across Stages 1 have received Section 224 Certification, Staged Development Step 3 will not commence until 65% of the total number of lots across Stages 1 and 2 have received Section 224 Certification, and Staged Development Step 4 will not commence until 70% of the total lots across Stages 1, 2 and 3 have received Section 224 Certification, and so on.

Design Outcome 5:

Out of sequence development will be discouraged by:

- *Requiring out of sequence development to be a Discretionary activity*
- *Requiring developers to fund the full cost of infrastructure*
- *Requiring out of sequence developments to provide at their own cost an internal buffer from surrounding rural landuse activities*

<u>Urban Amenity Design Outcomes</u>

Design Outcome 6:

Provide a north to south "sub-spine" street running between Willowbank Avenue and Eriksen Road. The open drainage network (indicatively shown on the Te Awa Structure Plan Map) should be an integrated feature of this where practicable, and other local street networks.

Design Outcome 7:

Local streets shall be orientated north-south where possible. Urban blocks shall be designed within the range of 60 to 100m to 90 by 170m. The collector street network providing the structure of the transport network shall intersect via single lane roundabouts. The use of on-street traffic calming using cycle lanes and on-street car parking and berm design shall be considered fundamental design elements of the street cross section.

Design Outcome 8:

Subdivision design shall seek to activate the street frontage through the orientation of dwellings to face the street and overlook public open space (where applicable) to enable passive surveillance and improved street amenity outcomes.

Design Outcome 9:

Provide for the consistent landscaping treatment of streets and reserves (including the Serpentine Pond environments and open drainage channels) that contribute to urban amenity and landscape values and retains and enhances vistas through the Te Awa Development area.

Design Outcome 10:

A consistent generously landscaped buffer strip of 3m will be provided along the western extent of the Te Awa Development area (fronting Willowbank Avenue) in accordance with the Te Awa Structure Plan Map (the 3m buffer is indicatively shown on the western boundary of the Te Awa Development area to the north and south of the open drain channel). This Design Outcome requires that 75% of the buffer setback is densely planted at the time of development with specimens that will reach 3-5m at maturity.

Design Outcome 11:

Off road pedestrian and cycle linkages (indicatively shown on the Te Awa Structure Plan Map) which link open spaces to each other, to the street network and the Serpentine stormwater pond shall be wide, open and safe and connect to one another.

<u>Accessibility Design Outcomes</u>

Design Outcome 12:

Road upgrading shall proceed in conjunction with staging of development within the Te Awa Development area. The road upgrading is shown indicatively on the Te Awa Structure Plan Map. The following works are required:

Off Site Non Local

- *The following intersections will be upgraded:*

  - Riverbend / Latham Street intersection shall be upgraded to a single lane roundabout.

  - State Highway 2 / Kennedy Road intersection shall be upgraded to incorporate intersection control (improvements to signals).

Off Site Local

- *The following intersections shall be upgraded:*

  - State Highway 2 / Awatoto Road shall be upgraded to incorporate a seagull intersection.

  - State Highway 2 / Te Awa Avenue / McGrath Street shall be upgraded to a single lane roundabout.

  - State Highway 2 / Marine Parade shall be upgraded to a single lane roundabout.

- *The following local collector streets shall be upgraded or constructed to Napier City Council standards and design and in general accordance with the Main Street and Local Street typical cross sections (see the Te Awa Structure Plan – Transportation report) to serve as the primary connections through the Te Awa Development area:*

  - Kenny Road, 10m carriageway with cycle lanes, footpaths , car park / landscape berm areas, pedestrian footpaths and verge.

  - Eriksen Road, 10m carriageway with cycle lanes, footpaths , car park / landscape berm areas, pedestrian footpaths and verge. Eriksen Road will be designed and upgraded with single lane roundabouts at all major intersections (see below) with 120^0 deflection designed into the roundabout design to assist in reducing traffic speeds along this length of road.

  - Three (no. 3) additional cross link roads (linking Eriksen Road to Willowbank Avenue and Te Awa Avenue), 10m carriageway with cycle lanes, footpaths, car park / landscape berm areas, pedestrian footpaths and verge.

  - Three (no. 3) priority intersections shall be provided to Te Awa Avenue.

  - One (no. 1) priority intersection shall be provided to Willowbank Avenue.

- *Single lane roundabouts shall be provided at the following intersections:*

  - Eriksen Road / Kenny Road.

  - Along Eriksen Road at all junctions with cross link roads – three (no. 3) intersections.

  - Willowbank Avenue / Kenny Road.

  - Willowbank Avenue / Eriksen Road.

- *Street design shall provide for consistent landscaping treatment that contributes to urban amenity and landscape.*

Design Outcome 13:

No additional collector streets are necessary within the Te Awa Development area. Internal streets shall generally comply with Napier City Council standards and design for local streets, except where Council may wish to promote with a developer innovative and attractive solutions that enhance residential amenity, safety and sense of place. Therefore Council will look favourably on alternative subdivision concepts that achieve safe, pedestrian friendly streets and discourage through traffic.

Infrastructure Design Outcomes

Design Outcome 14:

Stormwater management infrastructure shall comprise a combination of a reticulated pipe network (constructed to Napier City Council standards), open drains, the Serpentine stormwater pond and a new pump station and coastal discharge point. These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the Te Awa Structure Plan Map – Stormwater Network and are more fully described in the Te Awa Structure Plan – Three Waters report. The following works are required:

- *A network of pipes (various sizes) to convey runoff from sub-catchments to open drains.*
- *Construction of new open drains west of Eriksen Road. A north-south orientated open drain with a total width of 40m will be constructed adjacent Willowbank Avenue and will drain through to an upgraded Cowshed Drain.*
- *Widening and reshaping of the existing Serpentine Drain to achieve a total width of 31m.*
- *Widening and reshaping of the existing Cowshed Drain to achieve a total width of 40m.*
- *Construction of a 4.4 hectare stormwater pond with a cumulative storage capacity of 71,000m3 (the Serpentine stormwater pond).*
- *Construction of a new pump station with a capacity of 4.5m3/s adjacent to the Serpentine stormwater pond with an associated coastal discharge point and beach discharge structure.*

Design Outcome 15:

Minimum front boundary levels have been set for new development in various sub-catchments taking account of maximum water levels associated with the 2% AEP rainfall event. These minimum front boundary levels range from RL 11.58m to RL 12.21m. Refer to the Te Awa Structure Plan – Three Waters Report for further details.

Design Outcome 16:

Wastewater infrastructure shall comprise of a combination of a reticulated pipe network (constructed to Napier City Council standards) and three (no. 3) pumping stations. The wastewater system will connect into the future wastewater pressure main from a new pump station near Taradale Road that will feed directly to the Awatoto milliscreen plant to the south (via Eriksen Road). These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the

Te Awa Structure Plan Map – Wastewater Network and are more fully described in the Te Awa Structure Plan – Three Waters report. The following works are required:

- *A network of 225 and 150mm diameter pipes to convey wastewater to three (no. 3 pumping stations).*
- *Pumping stations. Three pump stations are located on Eriksen Road.*

Design Outcome 17:

Water supply network infrastructure shall comprise of a combination of a reticulated pipe network (constructed to Napier City Council standards) and two 450mm main connections. The primary supply point will be at the intersection of the CCD and Eriksen Road where the proposed 450mm Awatoto Trunk Main is proposed to be built. The Awatoto Trunk Main will eventually be extended to connect with the Enfield Reservoir via Eriksen Road, giving an additional northern supply point at the intersection of Willowbank Avenue and Eriksen Road. These works shall proceed in conjunction with staging of development within the Te Awa Development area. These elements are shown on the Te Awa Structure Plan Map – Water Supply Network and are more fully described in the Te Awa Structure Plan – Three Waters report. The following works are required:

- *A network of pipes (various sizes) to convey potable water. A 200mm ring main will provide reticulation around the Te Awa Development area, with 100mm and 150mm internal mains supplying local streets.*

Financial Contributions

Design Outcome 18:

Developers shall meet fair and reasonable costs towards the provision of essential utility services, road upgrading and open space. This obligation may be met by physical works, financial contributions or a combination of both subject to agreement with Council. Costs for various utility infrastructure service provision has been assessed as part of the technical background work. Financial contributions are specified in Chapter 65, Table 1 of the District Plan.

NEW APPENDICES INCLUDE 29B (TE AWA STRUCTURE PLAN MAP), 29C (TE AWA STRUCTURE PLAN - WATER SUPPLY NETWORK PLAN), 29D (TE AWA STRUCTURE PLAN - STROMWATER NETWORK PLAN), 29E (TE AWA STRUCTURE PLAN – WASTEWATER PLAN) AND 29F (TE AWA STRUCTURE PLAN - STAGING PLAN).

AMEND APPENDIX 31 FINANCIAL CONTRIBUTION AREAS

Amend Appendix 31 to include reference to the ***Te Awa Development area*** as a development area.

AMEND APPENDIX 31A BREAKDOWN OF 'NON-LOCAL OFF-SITE' FINANCIAL CONTRIBUTIONS IN CHAPTER 65, TABLE 1

See Table at rear of this appendix (Appendix 3).

VOLUME 2: CODE OF PRACTICE FOR SUBDIVISION FOR LAND DEVELOPMENT A

ADD NEW POLICY 5.2.13 AS SHOWN IN ***BOLD AND ITALICS***:

Section 5.2.13 - Policy 13

Subdividers and Developers shall be required to accommodate within the design and layout of any subdivision or development, any Road, Utilities and/or Open Space requirements as identified on an approved Structure Plan contained in Appendices 26-30 of the District Plan.

AMEND SECTION 6.3 DISCRETIONARY ACTIVITES AS SHOWN IN ***BOLD AND ITALICS***:

Any development (including subdivision) which fails to comply with four or more standards and terms for a Controlled Activity shall be a Discretionary Activity for which a resource consent application must be made and consent may be granted subject to conditions or declined.

Subdivision and land development (located in the Te Awa Development area) that does not comply with the relevant Te Awa Structure Plan Design Outcomes (Appendix 29A), the Te Awa Structure Plan Map (Appendix 29B), the Te Awa Structure Plan - Water Supply Network Plan (Appendix 29C), the Te Awa Structure Plan - Stromwater Network Plan (Appendix 29D), the Te Awa Structure Plan – Wastewater Plan (Appendix 29E) and the Te Awa Structure Plan - Staging Plan (Appendix 29F) of the District Plan is a Discretionary activity.

The Council will have regard to the Objectives and Policies of this Plan and the assessment criteria in A8. The Council's discretion is unrestricted.

AMEND SECTION A8 ASSESSMENT CRITERIA AS SHOWN IN ***BOLD AND ITALICS***:

8.2 General

vii) Where the site is located within the Te Awa Development area the extent to which relevant Te Awa Structure Plan Design Outcomes can be met.

PLANNING MAPS

AMEND PLANNING MAPS I7, I8, H7, H8

Amend planning maps to show extent of Te Awa Development area and change in zoning.

APPENDIX 31A
Breakdown of 'Non-Local Off-Site' Financial Contributions in Chapter 65, Table 1

Development Area	General Purpose									
	Non-Local Off-Site Contributions								Local Off-Site Contributions ($)	On-Site Contributions ($)
	Library ($)	Reserves ($)	Roading & Transport ($)	Sports-grounds ($)	Stormwater ($)	Wastewater ($)	Water Supply ($)	TOTAL NON-LOCAL OFF-SITE ($)		
RESIDENTIAL Te Awa	360	1787	9267	1690	-	971	1391	**15,466**	$379,800 per ha $2,400 per metre (road frontage)	-

NOTES:

1. All figures exclude GST and are on a per lot/unit basis unless otherwise stated (as at Dec 2009)
2. Reference to the Napier City Council's Schedule of Fees and Charges will assist Plan users to identify discounted and/or indexed financial contributions

Appendix 4: MAPS / PLANS TO BE INSERTED INTO THE NAPIER DISTRICT PLAN (AS PART OF PLAN CHANGE 6)

Amended District Plan Planning Maps I7, I8, H7, H8

Appendix 29B - Te Awa Structure Plan Map

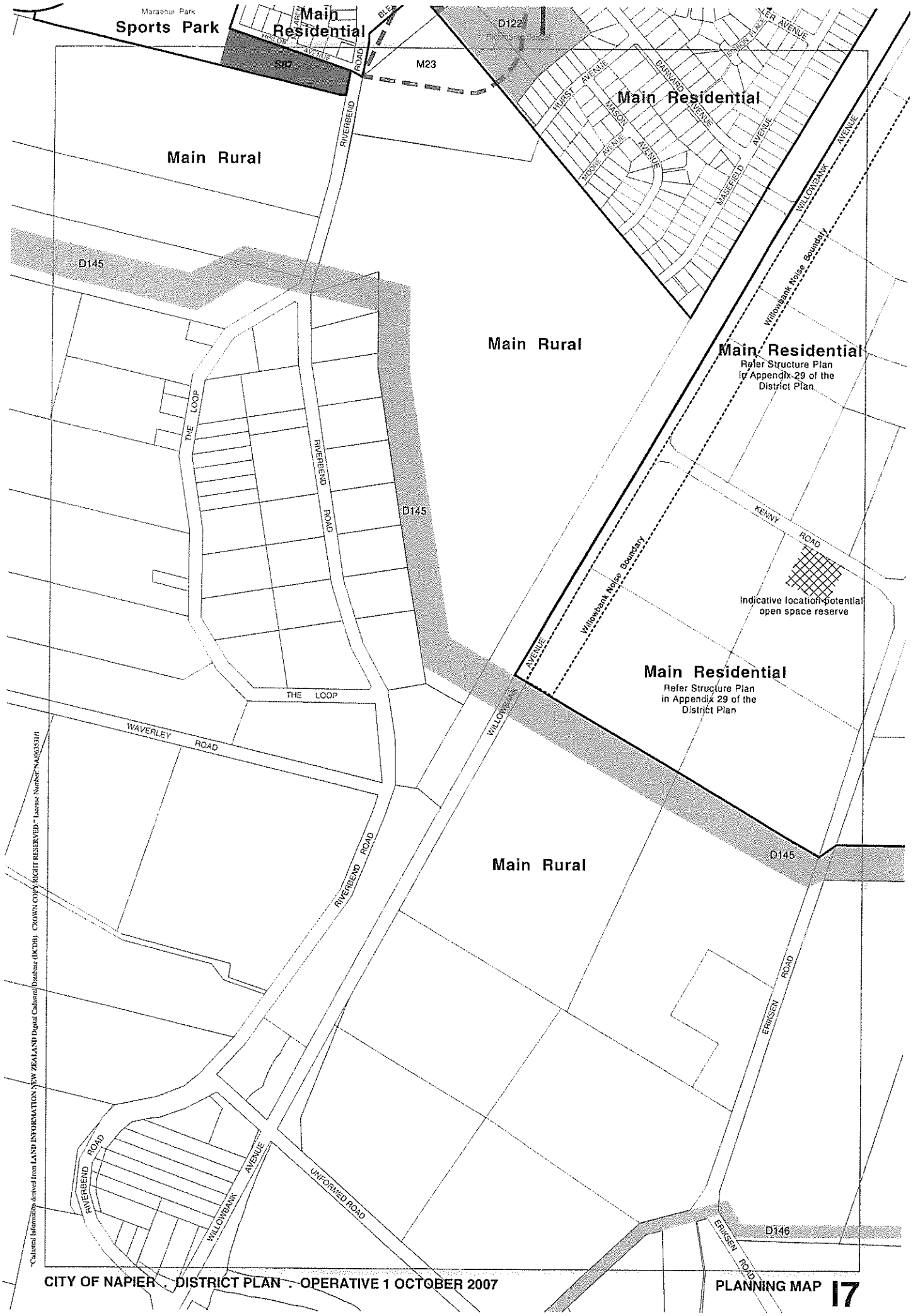
Appendix 29C - Te Awa Structure Plan – Water Supply Network

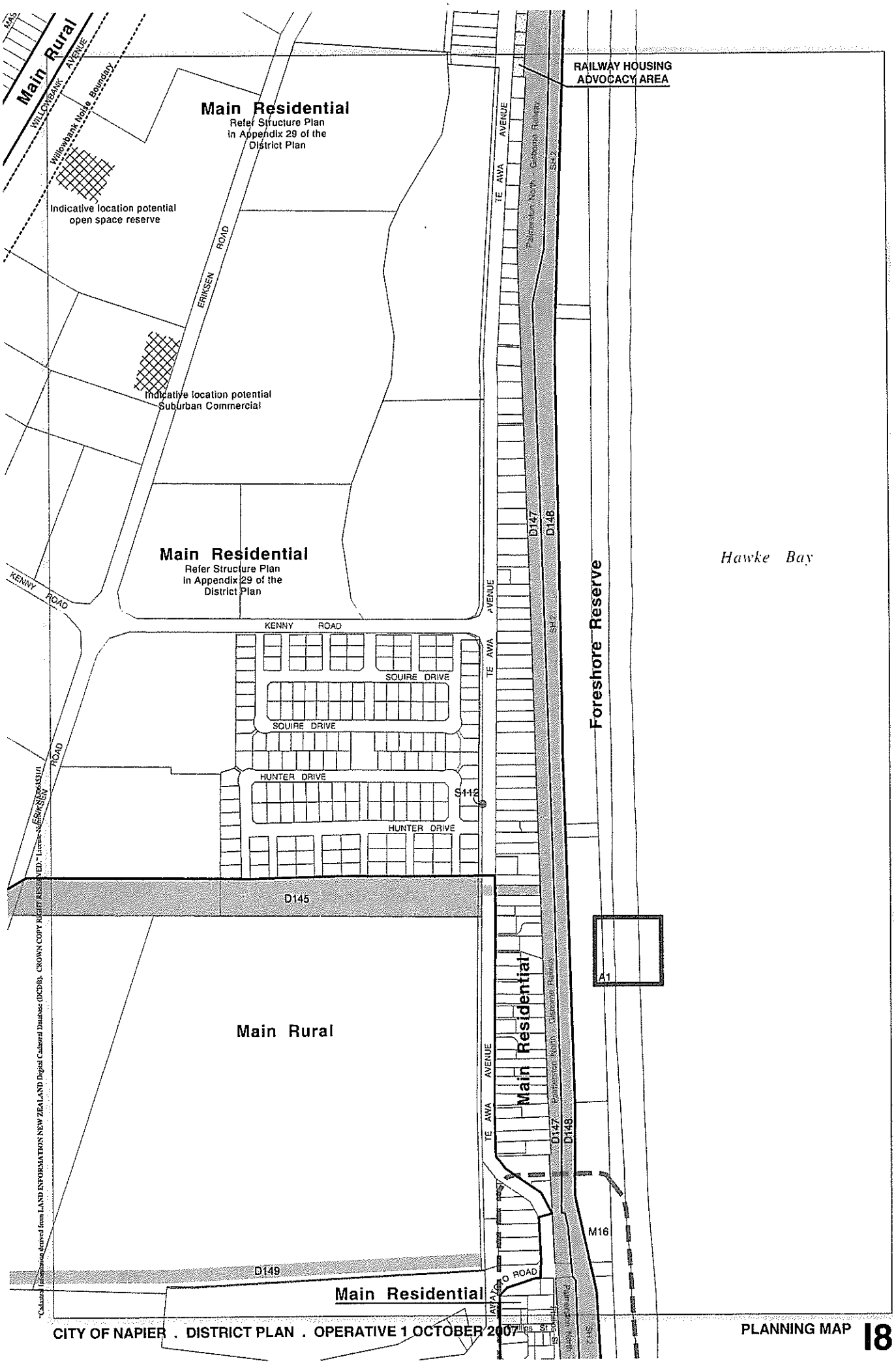
Appendix 29D - Te Awa Structure Plan – Stormwater Network

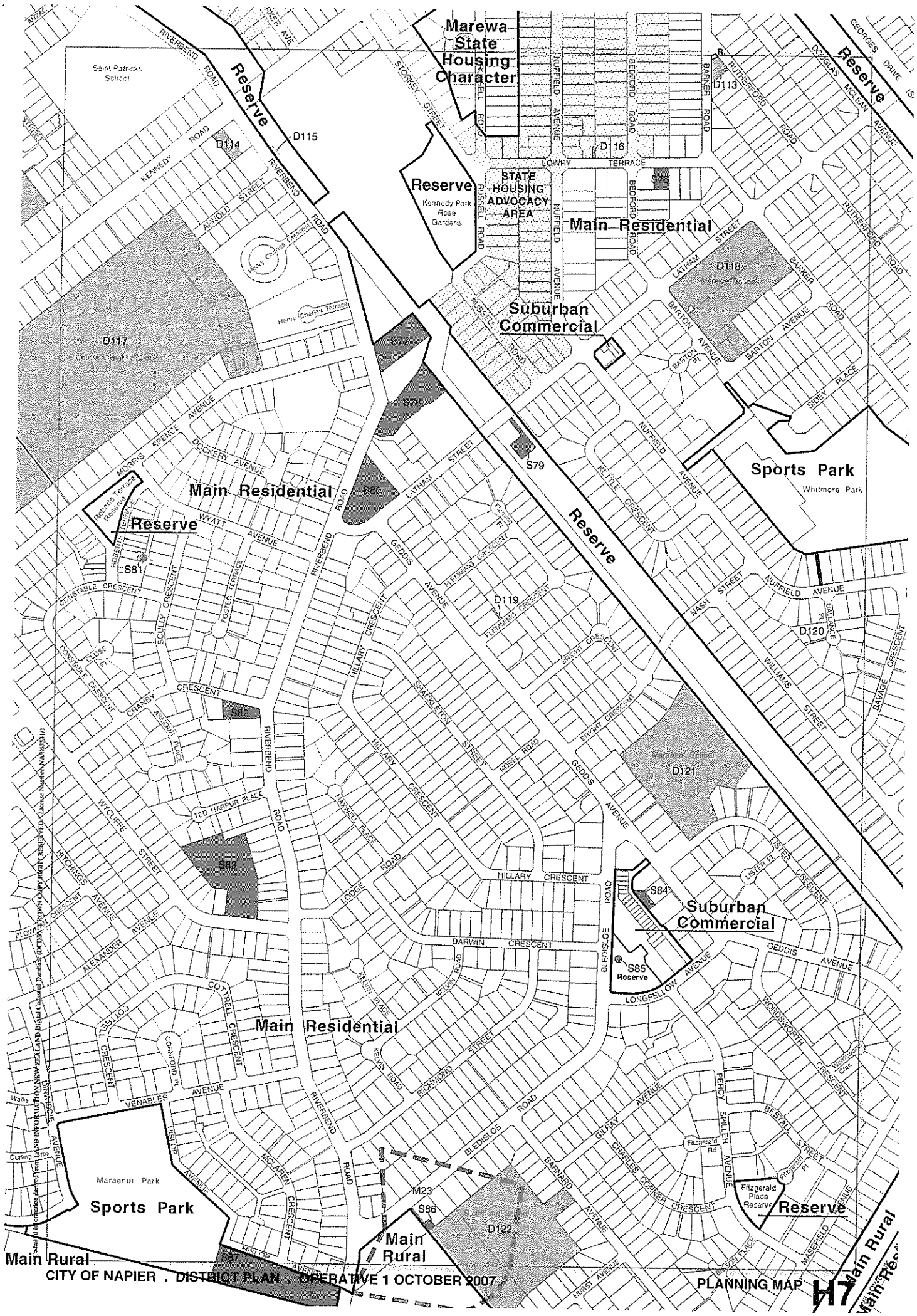
Appendix 29E - Te Awa Structure Plan – Wastewater Network

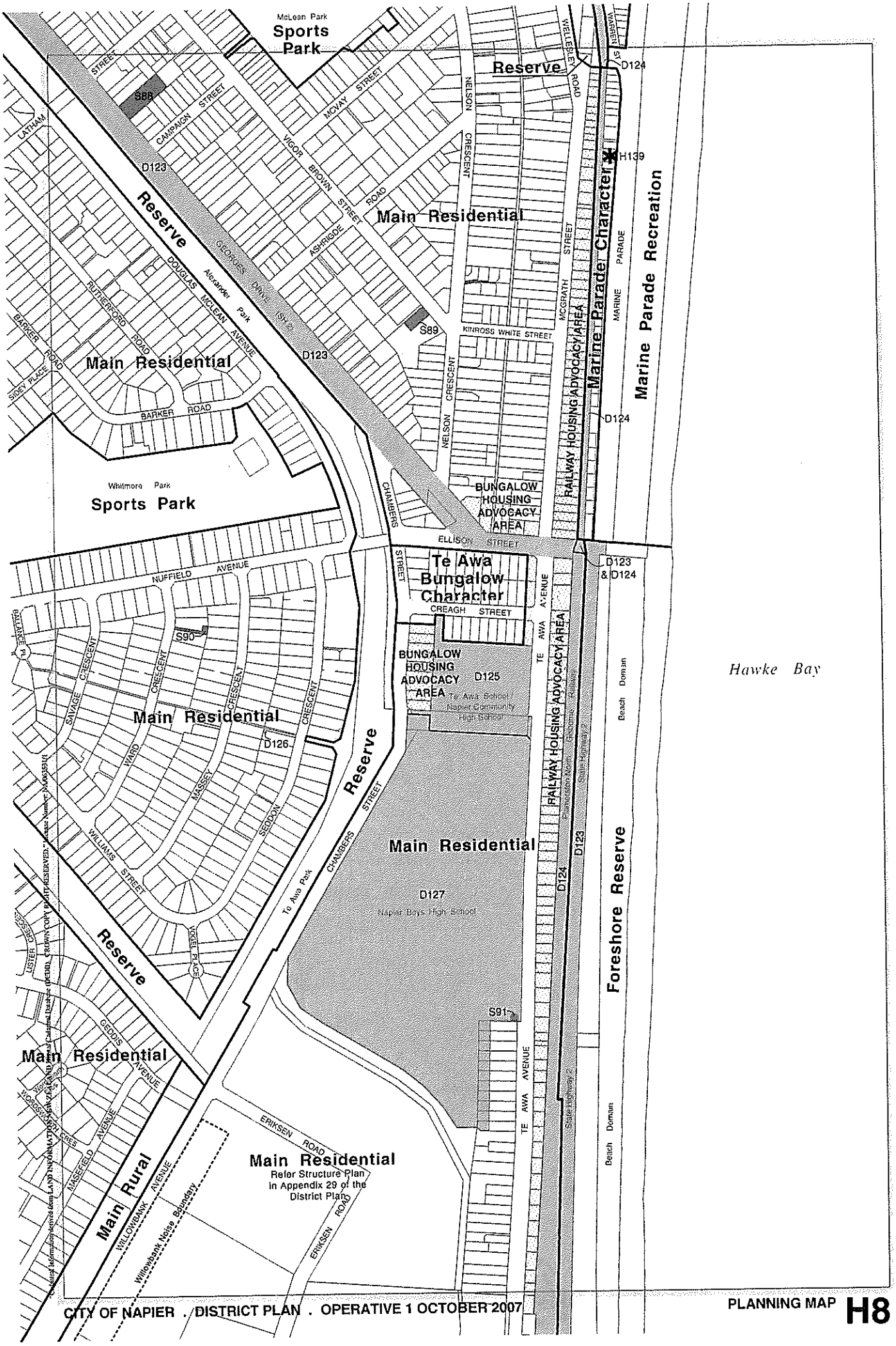
Appendix 29F - Te Awa Structure Plan - Staging

Appendix 31 – Financial Contribution Areas



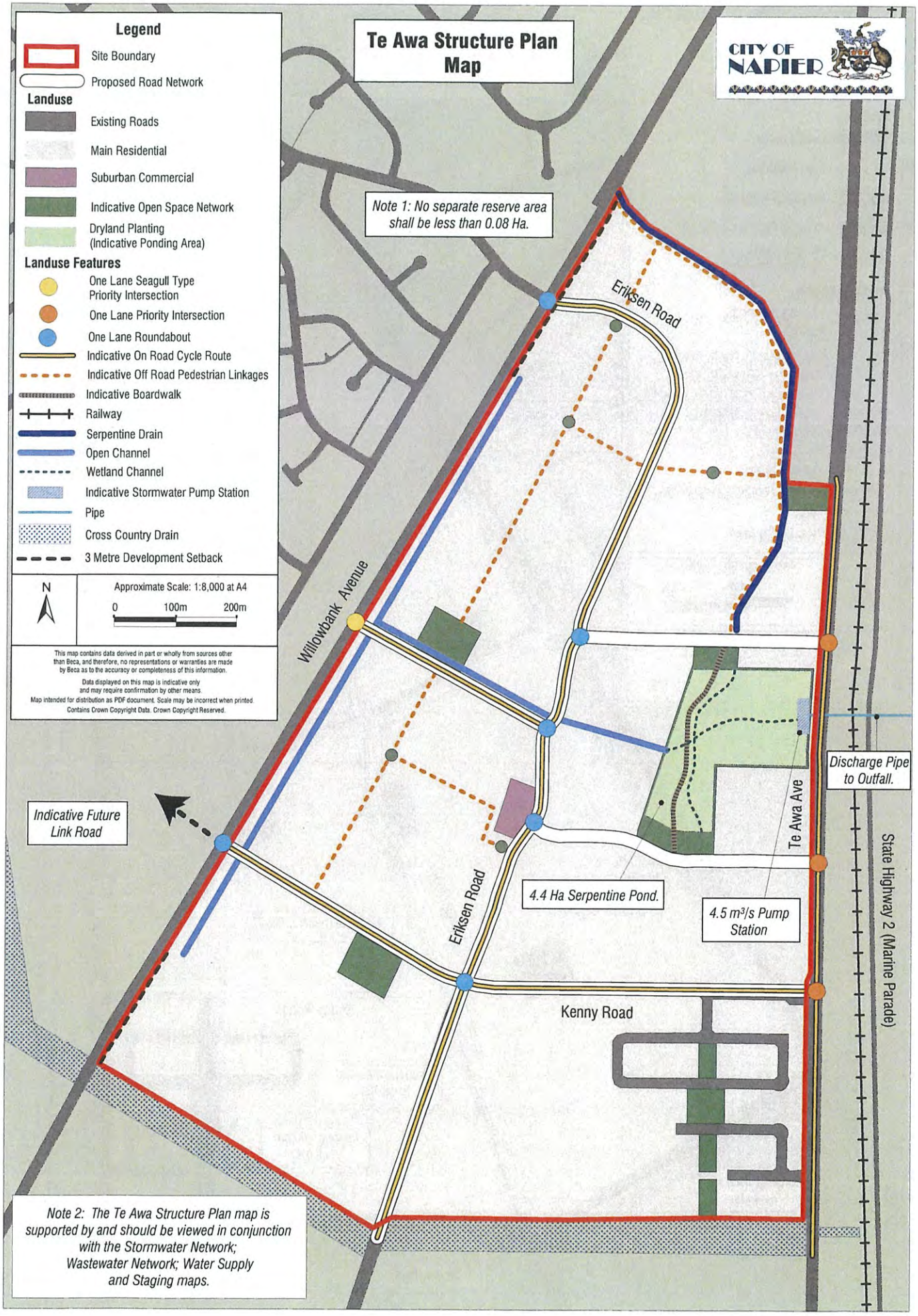

Main Rural
WILLOWBANK AVENUE
Willowbank Neighbourhood Boundary
Main Residential
Refer Structure Plan
in Appendix 29 of the
District Plan
Indicative location potential
open space reserve
ERIKSEN ROAD
Indicative location potential
Suburban Commercial
RAILWAY HOUSING
ADVOCACY AREA
TE AWA AVENUE
Palmerston North - Gisborne Railway
D147
D148
Foreshore Reserve
Hawke Bay
Main Residential
Refer Structure Plan
in Appendix 29 of the
District Plan
KENNY ROAD
KENNY ROAD
SQUIRE DRIVE
SQUIRE DRIVE
HUNTER DRIVE
HUNTER DRIVE
S112
D145
A1
Main Rural
Main Residential
M16
D149
Main Residential

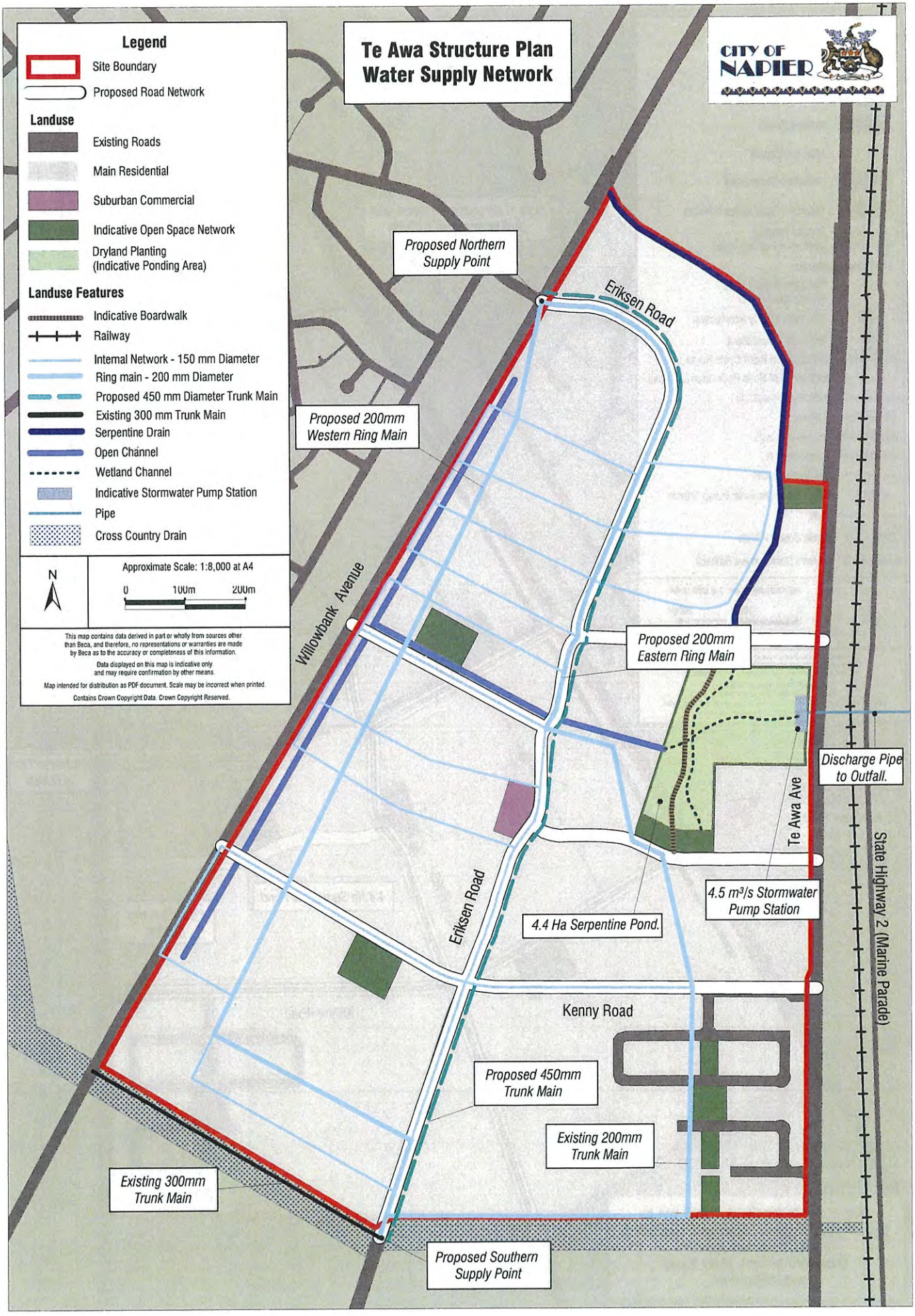

Marewa State Housing Character
Reserve
Reserve
Reserve
Reserve
Reserve
Reserve
Reserve
Reserve
Kennedy Park Rose Gardens
STATE HOUSING ADVOCACY AREA
Main Residential
Main Residential
Main Residential
Suburban Commercial
Suburban Commercial
Sports Park
Whitmore Park
Sports Park
Maraenui Park
Main Rural
Main Rural
Main Rural
Saint Patricks School
Marewa School
Maraenui School
Bluerock School
Fitzgerald Place Reserve
Roberts Terrace Reserve
D113
D114
D115
D116
D117
D118
D119
D120
D121
D122
S76
S77
S78
S79
S80
S81
S82
S83
S84
S85
S86
S87
M23
RIVERBEND ROAD
KENNEDY ROAD
ARNOLD STREET
MORRIS SPENCE AVENUE
DOCKERY AVENUE
WYATT AVENUE
CONSTABLE CRESCENT
SCULLY CRESCENT
CRANBY CRESCENT
HILLARY CRESCENT
GEDDIS AVENUE
FLEMMING CRESCENT
SHACKLETON STREET
NORTH ROAD
BRIGHT CRESCENT
NASH STREET
NUFFIELD AVENUE
WILLIAMS STREET
SAVAGE CRESCENT
LATHAM STREET
BARTON AVENUE
BARKER ROAD
RUTHERFORD ROAD
DOUGLAS MCLEAN AVENUE
GEORGES DRIVE
LOWRY TERRACE
RUSSELL ROAD
NUFFIELD AVENUE
BEDFORD ROAD
STORKEY STREET
KETTLE CRESCENT
SIDEY PLACE
WYCLIFFE STREET
PITCHINGS AVENUE
ALEXANDER AVENUE
COTTRELL CRESCENT
VENABLES AVENUE
HISLOP AVENUE
MCLAREN CRESCENT
LODGE ROAD
DARWIN CRESCENT
KELVIN ROAD
RICHMOND STREET
BLEDISLOE ROAD
LONGFELLOW AVENUE
LISTER CRESCENT
WORDSWORTH CRESCENT
PERCY SPILLER AVENUE
BESTALL STREET
GILRAY AVENUE
CHARLES CORNER CRESCENT
BARNARD AVENUE
MASEFIELD AVENUE
HURST AVENUE
TED HARPUR PLACE
ARMOUR PLACE
FOSTER TERRACE
MAXWELL PLACE
CORNFORD PL
Fitzgerald Rd
Curling Rink
Walks



CITY OF NAPIER . DISTRICT PLAN . OPERATIVE 1 OCTOBER 2007

PLANNING MAP **H8**


Te Awa Structure Plan Map
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
One Lane Seagull Type Priority Intersection
One Lane Priority Intersection
One Lane Roundabout
Indicative On Road Cycle Route
Indicative Off Road Pedestrian Linkages
Indicative Boardwalk
Railway
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
3 Metre Development Setback
N
Approximate Scale: 1:8,000 at A4
0 100m 200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
Data displayed on this map is indicative only and may require confirmation by other means.
Map intended for distribution as PDF document. Scale may be incorrect when printed.
Contains Crown Copyright Data. Crown Copyright Reserved.
Note 1: No separate reserve area shall be less than 0.08 Ha.
Eriksen Road
Willowbank Avenue
Indicative Future Link Road
Eriksen Road
4.4 Ha Serpentine Pond.
4.5 m³/s Pump Station
Te Awa Ave
Discharge Pipe to Outfall.
State Highway 2 (Marine Parade)
Kenny Road
Note 2: The Te Awa Structure Plan map is supported by and should be viewed in conjunction with the Stormwater Network; Wastewater Network; Water Supply and Staging maps.


Te Awa Structure Plan
Water Supply Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Internal Network - 150 mm Diameter
Ring main - 200 mm Diameter
Proposed 450 mm Diameter Trunk Main
Existing 300 mm Trunk Main
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Approximate Scale: 1:8,000 at A4
0 100m 200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
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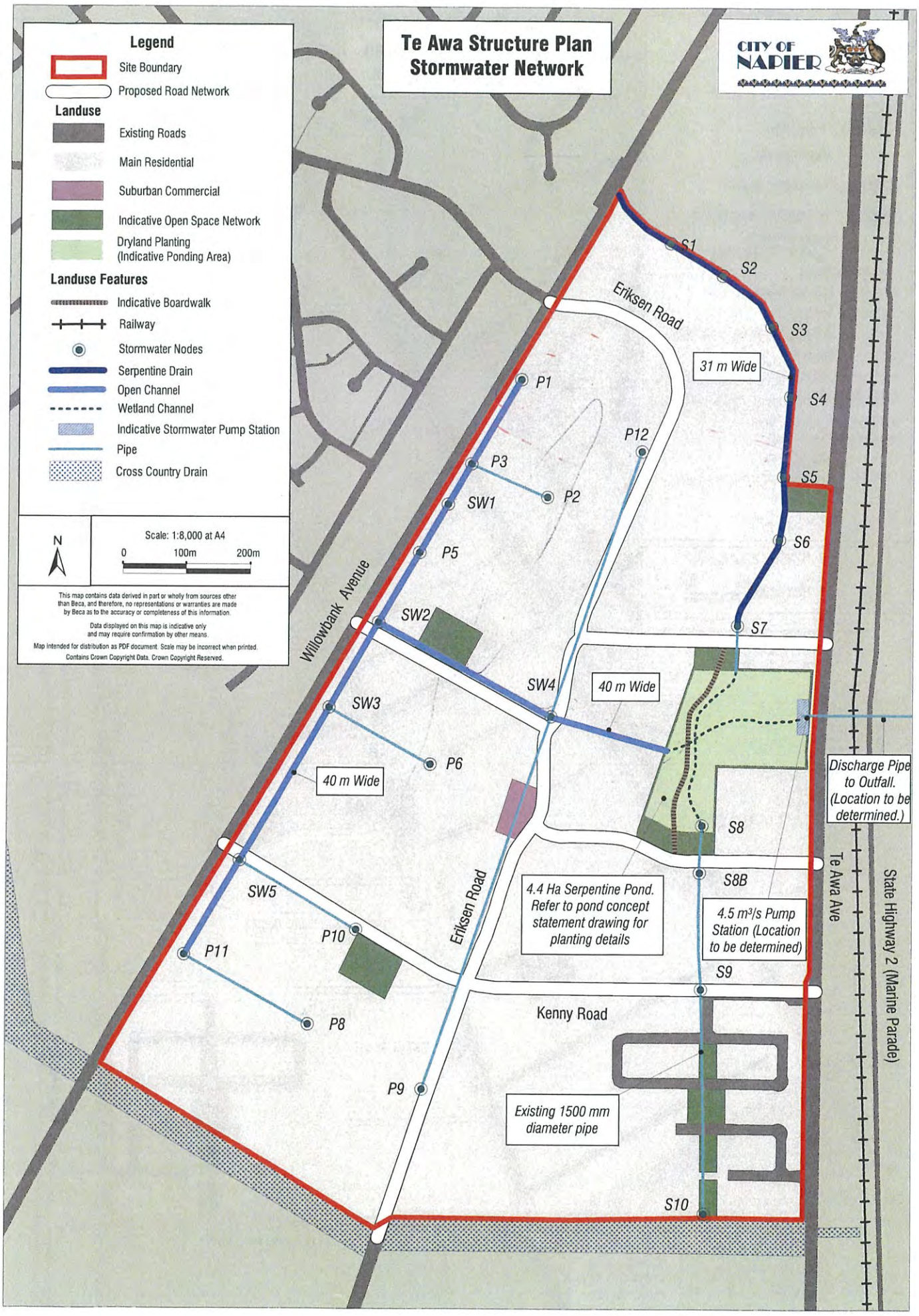
Proposed Northern Supply Point
Eriksen Road
Proposed 200mm Western Ring Main
Willowbank Avenue
Proposed 200mm Eastern Ring Main
Discharge Pipe to Outfall.
Te Awa Ave
State Highway 2 (Marine Parade)
4.5 m³/s Stormwater Pump Station
4.4 Ha Serpentine Pond.
Eriksen Road
Kenny Road
Proposed 450mm Trunk Main
Existing 200mm Trunk Main
Existing 300mm Trunk Main
Proposed Southern Supply Point


Te Awa Structure Plan
Stormwater Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Stormwater Nodes
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Scale: 1:8,000 at A4
0 100m 200m
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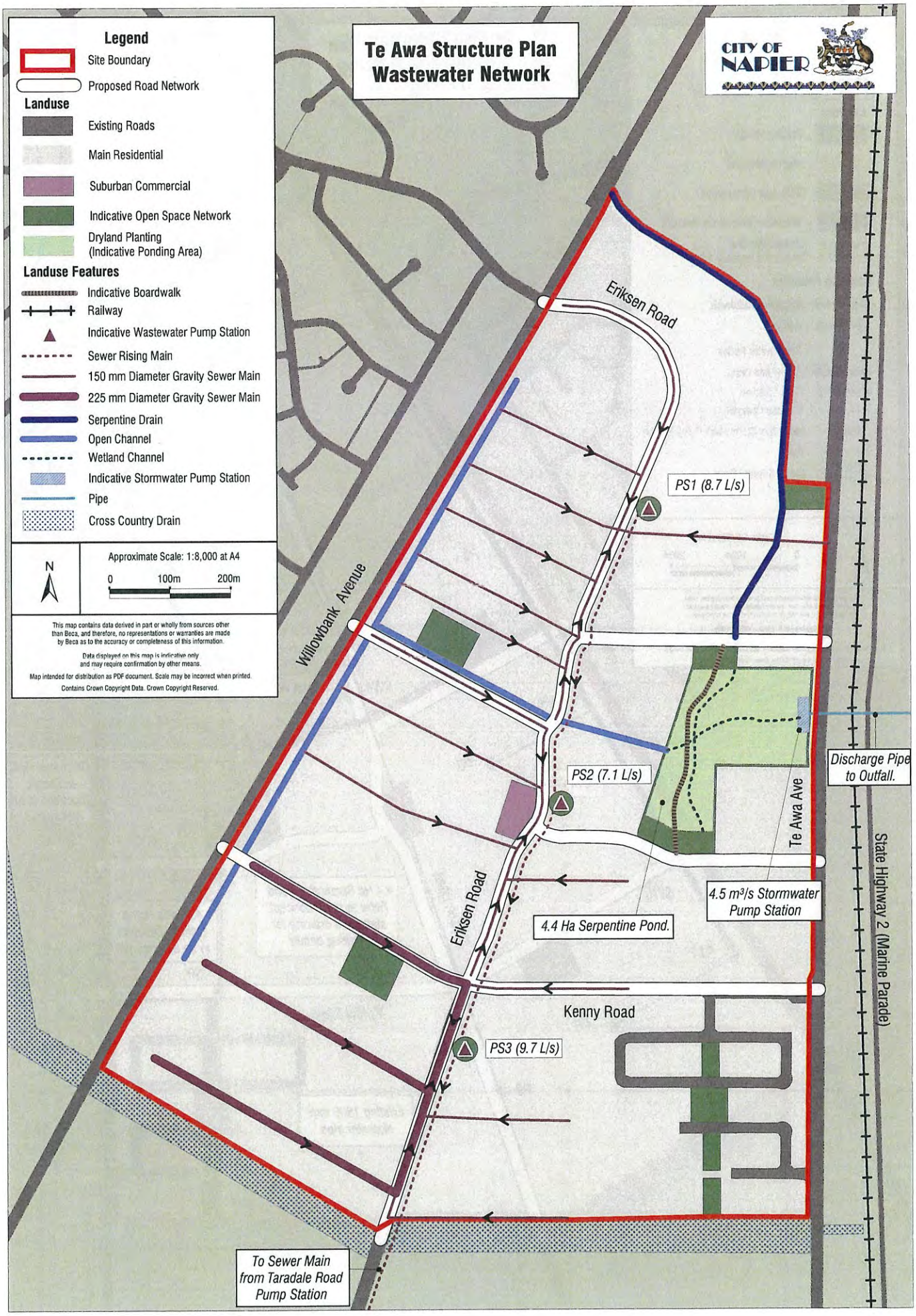
Eriksen Road
31 m Wide
40 m Wide
40 m Wide
Willowbank Avenue
Eriksen Road
Kenny Road
Te Awa Ave
State Highway 2 (Marine Parade)
4.4 Ha Serpentine Pond. Refer to pond concept statement drawing for planting details
4.5 m³/s Pump Station (Location to be determined)
Discharge Pipe to Outfall. (Location to be determined.)
Existing 1500 mm diameter pipe
S1
S2
S3
S4
S5
S6
S7
S8
S8B
S9
S10
P1
P2
P3
P5
P6
P8
P9
P10
P11
P12
SW1
SW2
SW3
SW4
SW5


Te Awa Structure Plan
Wastewater Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Indicative Wastewater Pump Station
Sewer Rising Main
150 mm Diameter Gravity Sewer Main
225 mm Diameter Gravity Sewer Main
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Approximate Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
Data displayed on this map is indicative only and may require confirmation by other means.
Map intended for distribution as PDF document. Scale may be incorrect when printed.
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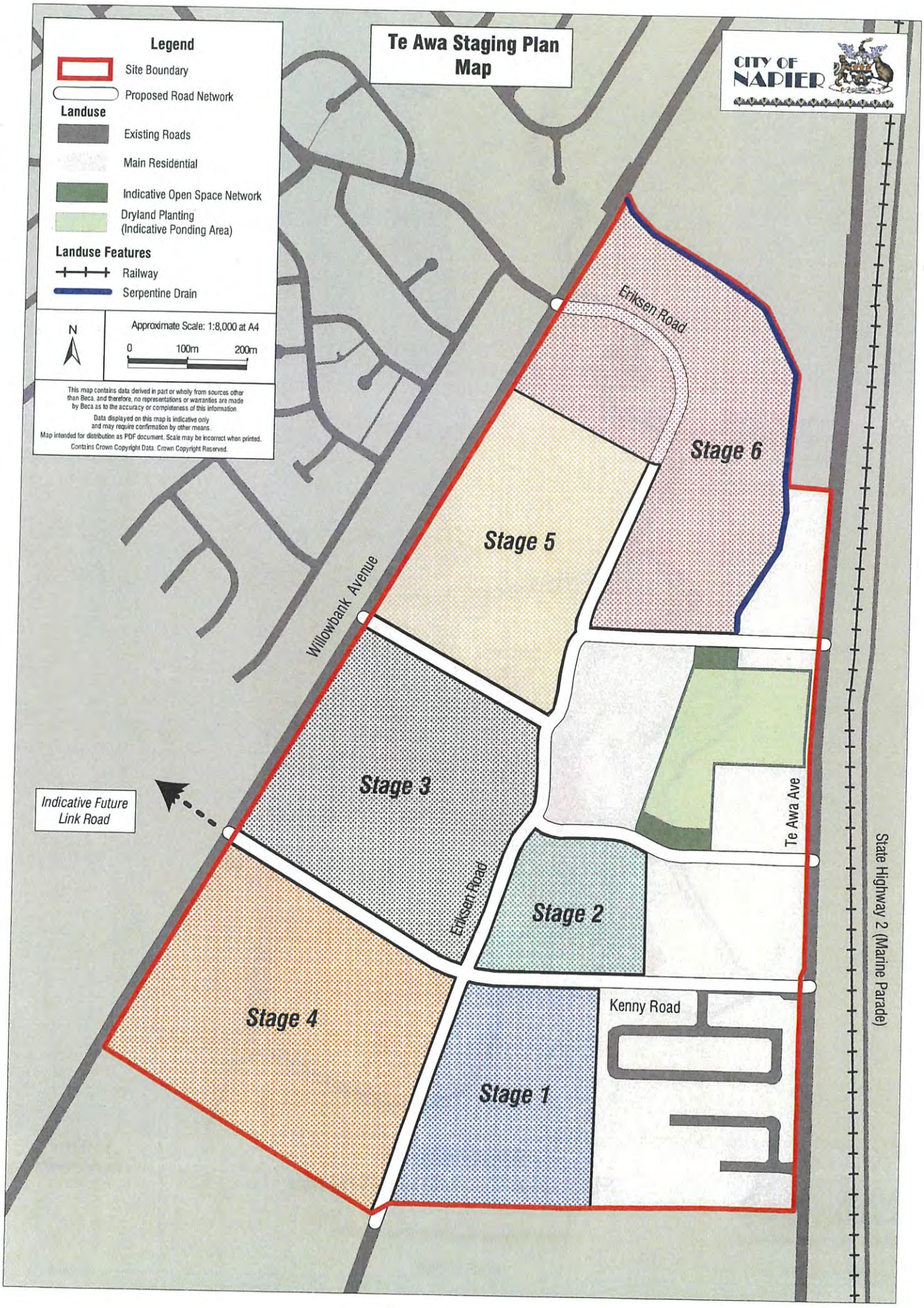
Eriksen Road
PS1 (8.7 L/s)
Willowbank Avenue
PS2 (7.1 L/s)
Discharge Pipe to Outfall.
Te Awa Ave
State Highway 2 (Marine Parade)
4.5 m³/s Stormwater Pump Station
4.4 Ha Serpentine Pond.
Eriksen Road
Kenny Road
PS3 (9.7 L/s)
To Sewer Main from Taradale Road Pump Station


Te Awa Staging Plan Map
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
Railway
Serpentine Drain
N
Approximate Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
Data displayed on this map is indicative only and may require confirmation by other means.
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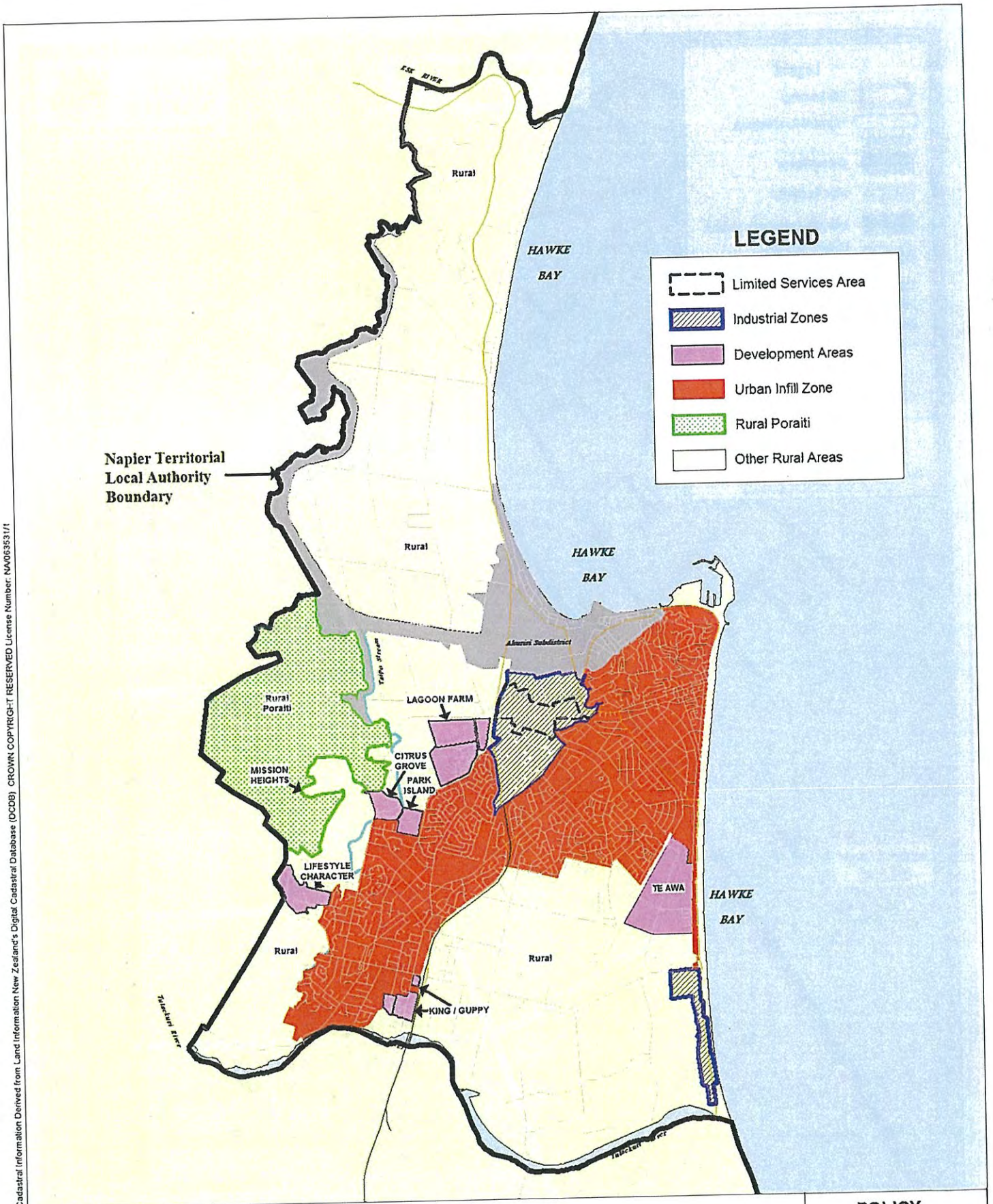
Stage 6
Stage 5
Stage 3
Stage 2
Stage 4
Stage 1
Eriksen Road
Willowbank Avenue
Indicative Future Link Road
Te Awa Ave
Kenny Road
State Highway 2 (Marine Parade)



Cadastral Information Derived from Land Information New Zealand's Digital Cadastral Database (DCDB). CROWN COPYRIGHT RESERVED License Number: NA/063531/1

CITY OF NAPIER

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Appendix 31
Financial Contribution Areas

0 2.2 4.5km

Scale 1:90000

POLICY PLANNING

The information displayed in the GIS has been taken from Napier City Council's databases and maps. It is made available in good faith but its accuracy or completeness is not guaranteed. If the information is relied on in support of a resource consent it should be verified independently.

Appendix 5: SCHEDULE OF LOTS SUBJECT TO PLAN CHANGE 6

3 Hunter Drive	Lot 2 DP 389775	0.0533	360321
1 Squire Drive	LOT 86 DP 391236	0.0437	366123
14 Hunter Drive	LOT 62 DP 380702	0.0573	323177
95 Eriksen Road	Lot 12 DP 6055	1.601	B2/1223
106 Hunter Drive	LOT 59 DP 380702	0.0622	323174
7 Hunter Drive	Lot 4 DP 388339	0.1332	353516
59 Squire Drive	LOT 114 DP 413288	0.9271	449524
61 Squire Drive	LOT 115 DP 413288	0.9271	449524
63 Squire Drive	LOT 116 DP 413288	0.9271	449524
65 Squire Drive	LOT 117 DP 413288	0.9271	449524
67 Squire Drive	LOT 118 DP 413288	0.9271	449524
67 Squire Drive	LOT 119 DP 413288	0.9271	449524
71 Squire Drive	LOT 120 DP 413288	0.9271	449524
73 Squire Drive	LOT 121 DP 413288	0.9271	449524
75 Squire Drive	LOT 122 DP 413288	0.9271	449524
79 Squire Drive	LOT 123 DP 413288	0.9271	449524
79 Squire Drive	LOT 124 DP 413288	0.9271	449524
81 Squire Drive	LOT 125 DP 413288	0.9271	449524
83 Squire Drive	LOT 126 DP 413288	0.9271	449524
85 Squire Drive	LOT 127 DP 413288	0.9271	449524
87 Squire Drive	LOT 128 DP 413288	0.9271	449524
89 Squire Drive	LOT 129 DP 413288	0.9271	449524
91 Squire Drive	LOT 130 DP 413288	0.9271	449524
93 Squire Drive	LOT 131 DP 413288	0.0516	449508
95 Squire Drive	LOT 132 DP 413288	0.0439	449507
97 Squire Drive	LOT 133 DP 413288	0.0427	449506

99 Squire Drive	LOT 134 DP 413288	0.1056	449505
101 Squire Drive	LOT 135 DP 413288	0.0425	449504
103 Squire Drive	LOT 136 DP 413288	0.05	449503
105 Squire Drive	LOT 137 DP 413288	0.05	449502
107 Squire Drive	LOT 138 DP 413288	0.0425	449501
109 Squire Drive	LOT 139 DP 413288	0.0414	449500
111 Squire Drive	LOT 140 DP 413288	0.1059	449499
113 Squire Drive	LOT 141 DP 413288	0.0425	449498
115 Squire Drive	LOT 142 DP 413288	0.0501	449497
117 Squire Drive	LOT 143 DP 413288	0.0488	449496
119 Squire Drive	LOT 144 DP 413288	0.0425	449495
121 Squire Drive	LOT 145 DP 413288	0.0417	449494
58 Squire Drive	LOT 158 DP 413288	0.0504	449526
120 Squire Drive	LOT 159 DP 413288	0.0504	449527
60 Squire Drive	LOT 160 DP 413288	0.0504	449528
118 Squire Drive	LOT 161 DP 413288	0.0504	449529
62 Squire Drive	LOT 162 DP 413288	0.0504	449530
116 Squire Drive	LOT 163 DP 413288	0.0504	449531
64 Squire Drive	LOT 164 DP 413288	0.0504	449532
104 Squire Drive	LOT 165 DP 413288	0.0504	449533
66 Squire Drive	LOT 166 DP 413288	0.0504	449534
102 Squire Drive	LOT 167 DP 413288	0.0504	449535
68 Squire Drive	LOT 168 DP 413288	0.0504	449536
100 Squire Drive	LOT 169 DP 413288	0.0504	449537
70 Squire Drive	LOT 170 DP 413288	0.0504	449538
98 Squire Drive	LOT 171 DP 413288	0.0504	449539
72 Squire Drive	LOT 172 DP 413288	0.0542	449540

96 Squire Drive	LOT 173 DP 413288	0.0542	449541
81-95 Hunter Drive	LOT 3	0.8805	383701
57A Squire Drive	LOT 3 DP 413288	0.8805	449525
156 Eriksen Road	PT LOT 2 DP 24007	4.3934	V1/1123
2 Willowbank Avenue	Lot 1 DP 27054	0.6001	W3/364
95 Eriksen Road	Lot 11 DP 6055	1.8185	B2/1223
5 Kenny Road	Lot 17 DP 6055	4.8233	E2/435
136 Eriksen Road	Lot 1 DP 24007	9.878	V1/1122
16 Hunter Drive	LOT 64 DP 380702	0.053	323179
1 Hunter Drive	Lot 1 DP 389775	0.0584	360320
107 Hunter Drive	Lot 52 DP 389775	0.056	360323
103 Hunter Drive	Lot 50 DP 388339	0.056	353526
5 Squire Drive	LOT 88 DP 391236	0.0507	366125
9 Squire Drive	LOT 90 DP 391236	0.0443	366127
54 Squire Drive	LOT 154 DP 391236	0.0504	366137
23 Squire Drive	LOT 96 DP 396242	0.0426	383700
31 Squire Drive	LOT 100 DP 396242	0.0504	383704
95 Eriksen Road	Lot 14 DP 6055	2.0689	B2/1224
120A Eriksen Road	Lot 35 DP 6055	3.2501	B2/1230
120 Eriksen Road	Lot 35 DP 6055	3.2501	B2/1230
6 Squire Drive	LOT 157 DP 391236	0.0504	366140
111 Hunter Drive	Lot 54 DP 389775	0.0561	360325
35 Kenny Road	Lot 18 DP 6055	4.3857	E2/436
10 Hunter Drive	LOT 58 DP 380702	0.0614	323173
49 Squire Drive	LOT 109 DP 391236	0.0504	366143
151 Eriksen Road	Lot 2 DP 417341	4.3406	466886
25 Squire Drive	LOT 97 DP 396242	0.1049	383701

113 Hunter Drive	Lot 55 DP 389775	0.0566	360326
11 Squire Drive	LOT 91 DP 391236	0.1083	366128
8 Squire Drive	LOT 155 DP 391236	0.0504	366138
105 Hunter Drive	Lot 51 DP 388339	0.056	353527
95 Eriksen Road	Lot 15 DP 6055	1.9676	B2/1224
19 Squire Drive	Lot 94 DP 396242	0.0501	383713
52 Squire Drive	LOT 152 DP 391236	0.0504	366135
104 Hunter Drive	LOT 61 DP 380702	0.0546	323176
99 Hunter Drive	LOT 48 DP 391236	0.056	366122
90 Kenny Road	LOT 2	6.2	W3/875
123 Te Awa Avenue	LOT 1	6	W3/875
25 Hunter Drive	Lot 12 DP 388339	0.0616	353524
22 Squire Drive	LOT 149 DP 391236	0.0504	366132
46 Squire Drive	LOT 146 DP 391236	0.055	366129
16 Willowbank Avenue	Lot 1 DP 14417	4.5526	G2/863
11 Hunter Drive	Lot 6 DP 388339	0.0616	353518
95 Eriksen Road	Lot 9 DP 6055	2.165	B2/1223
19 Hunter Drive	Lot 9 DP 388339	0.0588	353521
35 Squire Drive	LOT 102 DP 396242	0.0505	383706
47 Squire Drive	LOT 108 DP 391236	0.0474	366142
117 Hunter Drive	Lot 57 DP 389775	0.058	360328
153 Eriksen Road	Lot 1 DP 417341	0.5339	466885
17 Squire Drive	Lot 93 DP 396242	0.0426	383712
102 Hunter Drive	LOT 63 DP 380702	0.0575	323178
12 Hunter Drive	LOT 60 DP 380702	0.0552	323175
95 Eriksen Road	Lot 10 DP 6055	2.1549	B2/1223
17 Hunter Drive	Lot 8 DP 388339	0.0532	353520

4 Squire Drive	LOT 204 DP 391236	0.0784	366150
9 Hunter Drive	Lot 5 DP 388339	0.0532	353517
39 Squire Drive	LOT 104 DP 396242	0.0549	383708
95 Eriksen Road	Lot 16 DP 6055	2.117	B2/1224
41 Squire Drive	LOT 105 DP 396242	0.0571	383709
33 Squire Drive	LOT 101 DP 396242	0.0505	383705
56 Kenny Road	Lot 36 DP 6055	3.245	B2/1231
51 Squire Drive	LOT 110 DP 391236	0.0504	366144
115 Hunter Drive	Lot 56 DP 389775	0.0566	360327
45 Squire Drive	LOT 107 DP 391236	0.0511	366141
120 Willowbank Avenue	Lot 19 DP 6055	5.2685	E2/437
101 Hunter Drive	Lot 49 DP 388339	0.056	353525
21 Squire Drive	LOT 95 DP 396242	0.0501	383699
10 Squire Drive	LOT 153 DP 391236	0.0504	366136
24 Squire Drive	LOT 147 DP 391236	0.055	366130
15 Hunter Drive	Lot 7 DP 388339	0.0616	353519
37 Squire Drive	LOT 103 DP 396242	0.0505	383707
95 Eriksen Road	Lot 13 DP 6055	2.0563	B2/1224
60 Eriksen Road	LOT 2 DP 318389	11.1624	71900
53 Squire Drive	LOT 111 DP 391236	0.0504	366145
29 Squire Drive	LOT 99 DP 396242	0.0504	383703
3 Squire Drive	LOT 87 DP 391236	0.0442	366124
5 Hunter Drive	Lot 3 DP 389775	0.0589	360322
38 Willowbank Avenue	Lot 2 DP 14417	9.2648	G2/864
23 Hunter Drive	Lot 11 DP 388339	0.0532	353523
20 Squire Drive	LOT 151 DP 391236	0.0504	366134
6 Willowbank Avenue	Lot 2 DP 6396	7.4866	B2/751

48 Squire Drive	LOT 148 DP 391236	0.0504	366131
57 Squire Drive	LOT 113 DP 391236	0.0504	366147
46 Eriksen Road	LOT 1 DP 318389	6.1891	71899
27 Squire Drive	LOT 98 DP 396242	0.0504	383702
56 Squire Drive	LOT 156 DP 391236	0.0504	366139
109 Hunter Drive	Lot 53 DP 389775	0.0605	360324
7 Squire Drive	LOT 89 DP 391236	0.052	366126
100 Hunter Drive	LOT 65 DP 380702	0.0533	323180
6 Willowbank Avenue	Lot 1 DP 6396	4.0949	B2/751
50 Squire Drive	LOT 150 DP 391236	0.0504	366133
21 Hunter Drive	Lot 10 DP 388339	0.1331	353522
15 Squire Drive	Lot 92 DP 396242	0.0425	383711
43 Squire Drive	LOT 106 DP 396242	0.0559	383710
55 Squire Drive	LOT 112 DP 391236	0.0504	366146

APPENDIX 2 – TE AWA STRUCTURE PLAN – THREE WATERS

Report

Te Awa Structure Plan - Three Waters

Prepared for Napier City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

23 September 2010

Revision History

Revision N°	Prepared By	Description	Date
A	Adrienne Khor		
B	Adrienne Khor & Maria Utting	Draft for client review	August 2010
C	Adrienne Khor & Maria Utting	Inclusion of client comments	September 2010

Document Acceptance

Action	Name	Signed	Date
Prepared by	Maria Utting		
Reviewed by	Ian Garside		
Approved by	Amelia Linzey		
on behalf of	Beca Carter Hollings & Ferner Ltd		

Table of Contents

Appendices

1 Introduction

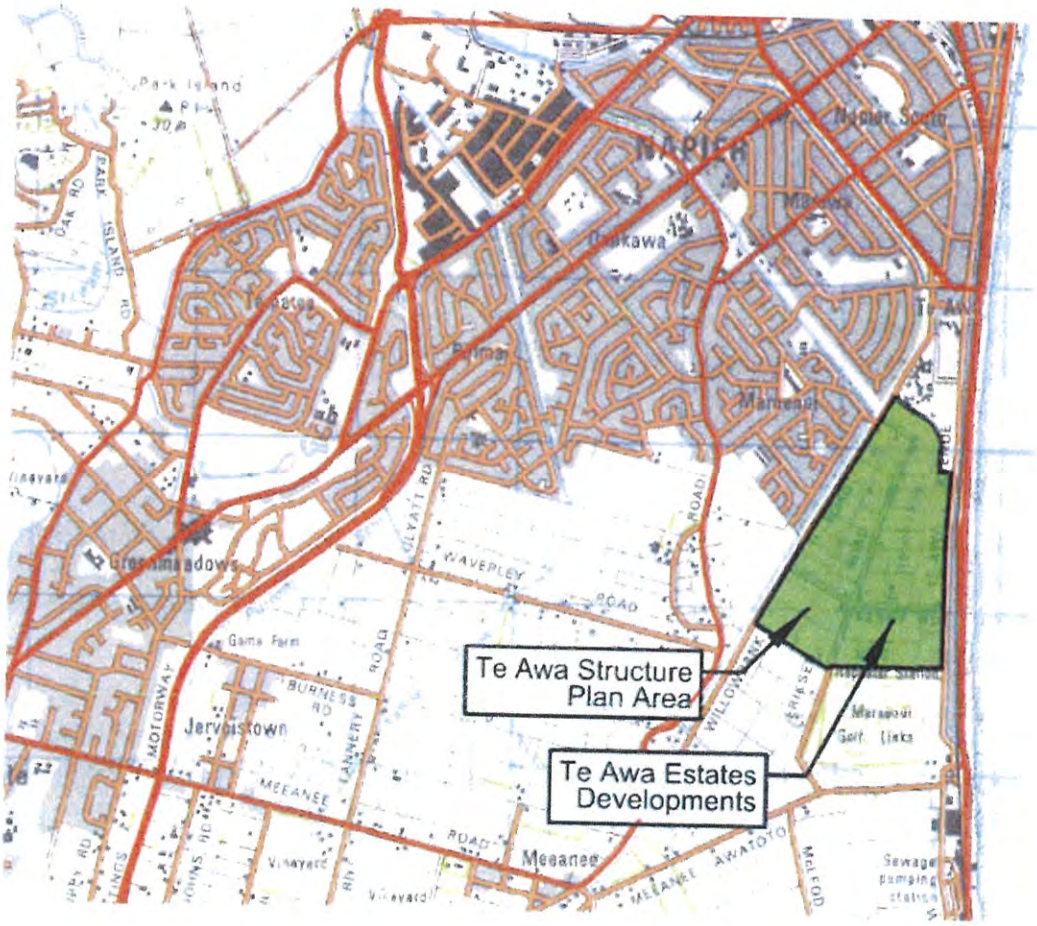
Napier City Council (NCC) have commissioned Beca Carter Hollings and Ferner Ltd. (Beca) to prepare a Structure Plan for Te Awa area (previously referred to as the Serpentine/Boys High area) approximately 3.5km south of Napier City. The Structure Plan is designed to provide for structured future growth and to support a future proposed plan change to rezone land to provide for residential growth within Napier City.

This report for the stormwater, wastewater and water services has been prepared to support the process of developing the Te Awa Structure Plan. A series of strategic reports were produced in the past to document the overarching three waters and transportation infrastructure in relation to the proposed land use strategies for the Te Awa Structure Plan area.

The Structure Plan is approximately 125 hectares. The study area is generally triangular in shape, with the north bordered by Napier Boys High School. The eastern boundary of the area is defined by Te Awa Avenue, to the east of which is a strip of existing residential properties known as the Te Awa Railway Housing. The Palmerston North / Gisborne Railway and State Highway 2 separate this proposed residential strip from the Hawke Bay coastline to the east.

The southern boundary of the area is defined by the recently constructed Cross Country Drain. The western boundary of the site is bounded by Willowbank Avenue and a bordering strip of undeveloped land, which separates the study area from the suburb of Maraenui to the west.

Figure 1.1: Location Map[1]



[1] Figure 1.1 provided by Napier City Council

Existing activities within the Structure Plan area include horticulture, cropping and rural-residential or lifestyle lots. The south eastern corner of the area was recently subdivided into residential lots by Te Awa Estates Ltd.

1.1 Objective and Report Structure

This report has been prepared as part of the wider Te Awa Structure Plan project. The objective of this report is to prepare well-planned, effective, staged future growth and development for the three waters infrastructure for the Structure Plan area. In order to achieve this objective, the following items were investigated in the concept design of the supporting infrastructure:

Stormwater (Section 2)

- Confirm the stormwater mitigation and management approach;
- Identify any stormwater quality issues and treatment required; and
- Concept design of the stormwater system.

Wastewater (Section 3)

- Establish additional wastewater loads;
- Confirm point of connection into the trunk main; and
- Concept design of the wastewater system.

Water Supply (Section 4)

- Establish water demand;
- Confirm point of connection into the existing or proposed pumping mains for the water supply system; and
- Concept design of the water supply system.

Staging (Section 5)

- Identify any staging issues in reference to the stormwater, wastewater and water supply networks.

Cost Estimates (Section 6)

- Provide relevant estimated capital expenditure for infrastructure provision.

Conclusions (Section 7)

- Conclusions of the report.

The proposed new and upgraded infrastructure identified in this report support the main Structure Plan report which seeks to support a change to the District Plan. In addition, the report provides inputs into the Council's Long Term Council Community Plan (LTCCP) planning for infrastructure development to service the proposed Structure Plan area.

Additionally, the stormwater mitigation and management approach proposed in this report forms part of the basis for the stormwater discharge consent application which will be sought at a later stage. This stormwater discharge consent application will require an Assessment of Environmental Effects supported by an appropriate pump station and outfall design and associated reporting.

1.2 Sources of Information

The three water infrastructure design and assessment were undertaken based on a review of available data provided by different sources, including the following codes, standards, technical references, and background information:

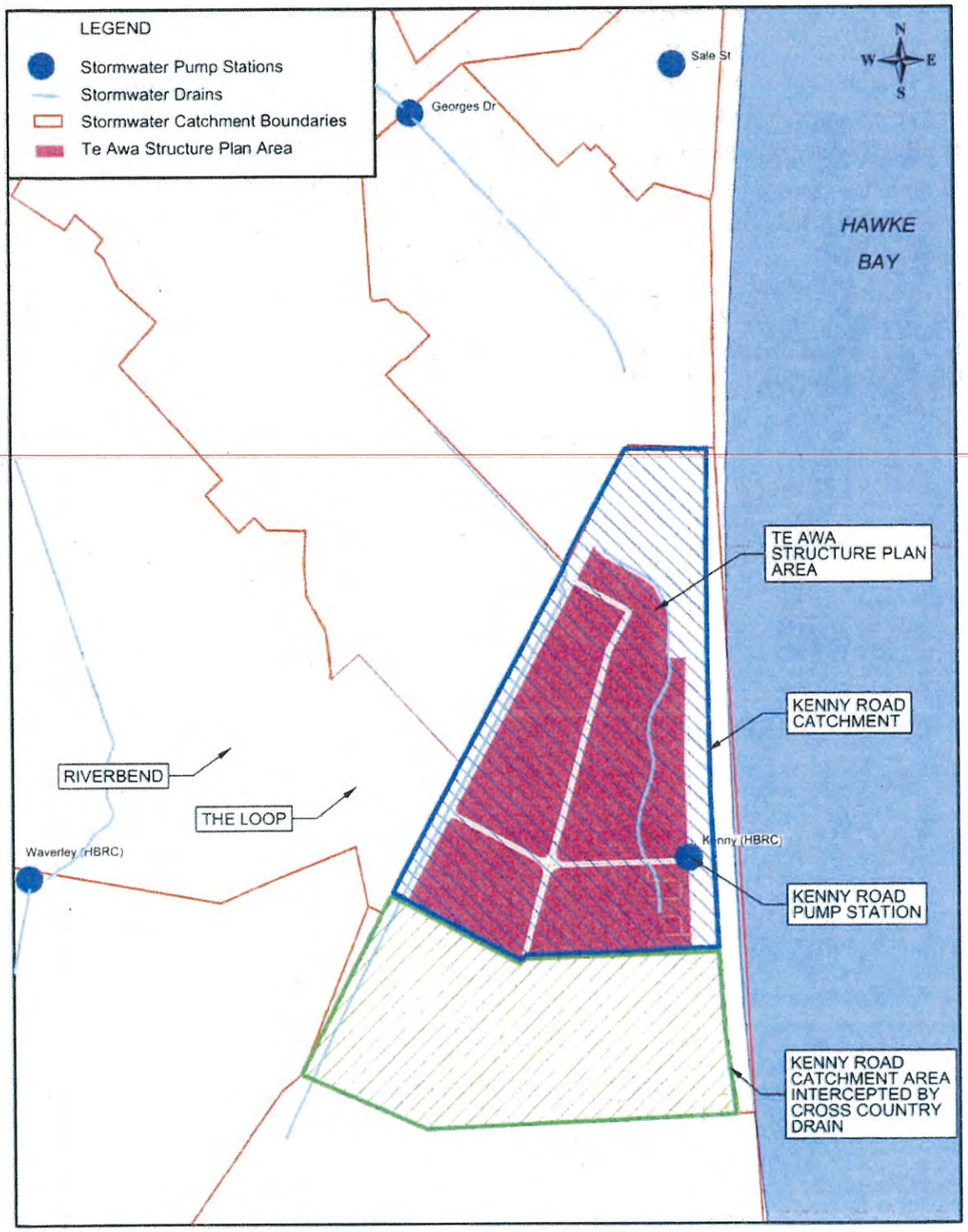
- Proposed City of Napier District Plan Volume II, Napier City Council, Specified Designations Operative 20 December 2003;
- Napier District Plan Volume 2 – Parts A, B & C of the Code of Practice for Subdivision & Land Development, Napier City Council, October 2007;
- Essential Services Development Report – Stormwater Disposal, Napier City Council, September 2000;
- Essential Services Development Report – Wastewater Disposal, Napier City Council, September 2000;
- Essential Services Development Report – Water, Napier City Council, October 2000;
- Te Awa Structure Plan Scoping Study, Beca Carter Hollings & Ferner, March 2008;
- Te Awa Structure Plan Stormwater Modelling Report, Beca Carter Hollings & Ferner. August 2010;
- Approved Document for New Zealand Building Code Surface Water Clause E1, Building Industry Authority, January 2002;
- Impacts on Climate Change on High Intensity Rainfall in Napier, National Institute of Water and Atmospheric Research Ltd, April 2008; and
- Napier City Open Channel Drainage Network Hydraulic Modelling Analysis, Hydraulic Modelling Services Ltd, December 2008.

2 Stormwater

2.1 Catchment

Figure 2.1 shows the Structure Plan existing stormwater catchment boundary.

Figure 2.1: Existing Drainage System[2]



[2] Figure 2.1 provided by Napier City Council

2.2 Existing System

At present, stormwater runoff from the entire Kenny Road / Serpentine catchment area drains to the Kenny Road pump station. The pump station is currently the sole stormwater disposal facility for the Te Awa Structure Plan area.

NCC completed the construction of the Cross Country Drain (CCD) south of the Structure Plan area in 2009. The construction of the CCD has reduced the stormwater catchment area serviced by the Kenny Road pump station as shown in Figure 2.1.

The Kenny Road pump station is managed by Hawke's Bay Regional Council (HBRC). The current pumps operate at 80% of the total pump capacity of 1.05m^3/s. During moderate storm events, surface runoff tends to pond over the lower-lying parts of the Structure Plan area as the pump station cannot cope with the storm runoff. In the context of the current rural land use, this ponding has a relatively minor effect. Such a situation will not be acceptable if development proceeds and as such the drainage system will need to be upgraded.

The principal drainage system in the area is a network of open drains. The most significant open drain is the Serpentine Drain flowing north to south, parallel to Te Awa Avenue. This drain remains partially filled with water throughout the year due to its level relative to the groundwater and sea level. A section of the Serpentine Drain (section flowing south to north), south of Kenny Road, was removed as part of the Te Awa Estates development. A 1500mm diameter pipeline connecting the CCD to the Kenny Road pump station replaced this section of the drain. This pipeline is intended as a backstop to allow for transfer of flow between the Serpentine Drain and the CCD in case of failure of either drainage system.

The minimum ground section level for the existing Te Awa Estates subdivision has been set at RL 11.28m as one of their consent conditions, with minimum habitable floor level at RL 11.58m. As further development is contiguous with this consented area, a maximum design flood level criteria of RL 11.28m for further residential development within this low-lying area is appropriate such that sections are not inundated. The existing Te Awa Estates subdivisions have been built with an average road level of RL11.16m and average front section ground level at RL 11.52m across the development.

2.3 Constraints and Issues Identified

Through the lifespan of this study, relevant stormwater related constraints and issues that pertain to the design of the catchment wide stormwater management system were identified or provided by relevant stakeholders.

The existing stormwater management issues are as follows:

- The low-lying invert of the Serpentine Drain, compared to the mean sea level (MSL) at RL 10.0m, means that there is seepage from groundwater and the ocean into the Serpentine Drain throughout the year leading to elevated salinity rates.
- The existing Kenny Road pumps turn on at RL 8.5m, thereby keeping the water levels in the Serpentine Drain low.
- The existing Kenny Road pump station total discharge capacity is 1.05 m^3/s. It operates at 80% capacity with a discharge capacity of 0.84 m^3/s. At present, this results in inundation of the rural low-lying areas during small and large rainfall events as the pump station cannot cope with the large volume of stormwater generated by these rainfall events.
- The Cross Country Drain pump station was designed to service stormwater discharges conveyed from the south western green field areas of Napier and infill development within these catchments (identified within the Essential Services Development Report – Stormwater Disposal[1]). It was not designed to include runoff from the Te Awa Structure Plan area.

[1] Essential Services Development Report – Stormwater Disposal, Napier City Council, September 2000.

- Flows was observed (mid 2009) to the Kenny Road pump station through a 675 mm diameter pipe, approximately 25m back from the Kenny Road / Te Awa Avenue intersection. Runoff from this pipe empties into the Serpentine Drain from the south side, immediately west of the Kenny Road pump station. The outlet invert level of this pipe is IL 9.40m. It potentially carries saline groundwater that is picked up along Te Awa Avenue. The possibility of saline water entering the proposed stormwater management system would need to be considered and accounted for in the overall design of the normal water level in the pond.

The future stormwater management constraints include:

- The existing Kenny Road pump station does not have enough discharge capacity to cope with future development.
- The CCD pump station was not designed to service additional runoff from the developed Structure Plan area, therefore this may not be a viable discharge point option. The CCD is intended to service development areas located further inland
- The Structure Plan area has an alternative direct stormwater disposal route to Hawke Bay. Therefore, the use of the limited discharge capacity of the CCD pump station would compromise future inland development. This is in contrast with the principles of sustainable management.
- Identifying suitable ponding areas large enough to store runoff generated.
- Identifying suitable pumping regime and location to cope with runoff generated.
- Saline water in the stormwater system due to saline intrusion for the daily low flow will have impact on the viability of the drain and pond ecology.
- Specific planting in the pond environmentneeds to be considered to allow for expected short term inundation and the presence of saline water.

2.4 Design Standards

2.4.1 Minimum Protection Criteria

As per the October 2007 NCC Code of Practice for Subdivision and Land Development (Code of Practice), stormwater drainage is considered by NCC as the total system that protects land infrastructure and improvements against the potential impacts of flooding.

The stormwater systems shall be designed to drain the total catchment. It shall also assume land use and site coverage as defined in the District Plan including both current and deferred land use.

The Code of Practice sets the minimum stormwater protection standards for the following return periods (set out in the table 2.1):

Table 2.1 : Minimum Protection

Function	AEP Event
Primary Protection	
Rural and rural residential	10%
Residential	10%
Commercial and Industrial	10%
All areas where no secondary flow path is available	2%
Secondary Protection	
Satisfied by appropriately sized channels or pipes, provision of secondary flow paths, controlled flood plains and the setting of appropriate building levels	2% (combined capacity of both primary and secondary systems)

2.5 Design Inputs

Infoworks CS v 9.0 was used to model the stormwater management options to simulate the catchment runoff and proposed network layouts. The following sections below summarize the design inputs used in the modelling and hydraulic analysis. Refer to the Stormwater Modelling Report (Appendix B) for detailed information on the modelling and hydraulic analysis.

The stormwater management design is required to consider the peak flow and total flow volume during a specific storm event. Peak flows are considered to be suitable for open channel and pipe sizing, while total flow volumes are used for sizing of the ponding area and pumping capacity, where necessary.

2.5.1 Rainfall

The 10% AEP 12 hour duration storm and 2% AEP 24 hour duration storm events were used in the hydrological assessment. The 10% AEP 12 hour rainfall and 2% AEP 24 hour rainfall depths are 99mm and 189mm respectively. These are the year 2090 rainfall depths for Taradale which included the mid-range temperature climate change scenario. The rainfall depths were extracted from the April 2008 NIWA report titled Impacts of Climate Change on Napier High Intensity Rainfall.

2.5.2 Curve Numbers

Residential density is assumed to be 12 lots/ha. The corresponding residential volumetric runoff coefficient of C = 0.55 was assumed for the design of the catchment wide stormwater system as specified by the Code of Practice. This runoff coefficient is used in the Rational Method to calculate the stormwater runoff generated.

There are several methods to determine stormwater runoff. The stormwater model uses the Soil Conservation Service Runoff Curve Number (SCS CN) method that is often used in stormwater models. The key parameter to calculate stormwater runoff using this method is the curve number (CN). A CN 74 of the SCS CN method corresponds to a C of 0.55 of the Rational Method. Therefore, a CN of 74 is used in the model.

2.5.3 Time of Concentration

On average, the time of concentration is 15 minutes for each subcatchment.

2.5.4 Roughness Coefficient

Roughness coefficients used in the model are:

Open Drain Mannings n = 0.03

Pipe Mannings n = 0.013

2.6 Key Design Criteria

There were several key design criteria which were used to develop and assess the stormwater management options. The key design and performance criteria are described below in order of importance.

1. Maximum water level for the 2% AEP rainfall event in the low-lying areas shall not exceed RL 11.28m in order to prevent water entering properties. This would also avoid Section 73 notices relating to inundation from being issued.
2. Floor levels must be at RL 11.58m or higher to provide a minimum freeboard of 300mm above the 2% ARP rainfall event maximum water level under normal operating conditions.
3. In the unlikely event of a total pump failure during a 2% AEP rainfall event, the minimum freeboard can be reduced to 200mm. For design purposes, it is assumed that the pump station failure would last for 4 hours at the peak of the rain storm.
4. No flooding is allowed on road carriageways and berms for rainfall events smaller than the 10% AEP rainfall event. For the 2% AEP rainfall event, runoff is allowed to pond on road carriageways and berms up to 300mm above sump grate level.

2.7 Stormwater Management Options

2.7.1 Historical Options Considered

Three stormwater management options were documented in the March 2008 Beca Scoping Report. These options were:

- Option A: A new pump station plus limited emergency storage;
- Option B: A new smaller pump station plus large volume of storage; and
- Option C: Discharge to the CCD with a new pump station near the existing CCD pump station.

Hydraulic Modelling Services modelled these three options in August 2008 and the Open Channel Drainage Network Hydraulic Modelling Analysis Report (December 2008) summarises the model outputs. The model outputs demonstrated that Option A and C are technically feasible with both options requiring additional discharge pumping capacity. For Option A, a new pump station would be required adjacent to the pond, with a pumping main and beach discharge. For Option C, a new pump station would be required at the CCD, with a pumping main and beach outfall adjacent to the existing CCD structures.

Option B was not considered further as it requires storage volume greater than 100,000m^3 whilst utilising the existing Kenny Road pump station.

Option A was the preferred option for the following reasons:

- Retains future flexibility for the expansion of the CCD Pump Station to address additional flow from the current catchments that it services, particularly the deferred Taradale infill upgrading and other potential upstream green field developments. This allows for the strategic utilisation of the CCD for its intended purpose and design.
- Provides two discharge outfalls catering for both the Taradale and Te Awa area by retaining two potentially inter-connected discharge points, in the event that either the CCD or the proposed new pump station encounters operational difficulties.

2.7.2 New Options Considered

Following further discussion with NCC in 2009 and submission of the Te Awa Estates proposed subdivision development plans in the low-lying areas of the Structure Plan, the options described above were superseded by two additional options. Two models were created to simulate these two options called Option A and B. Note that these Options are not directly related to the historical Option A and B. The assessment and modelling results of these Options can be found in Appendix B.

For Option A, the model represents the proposed stormwater infrastructure that consists of the Serpentine Drain, proposed large Serpentine Pond, existing 1500mm diameter pipe within the developed Te Awa Estates connected to the CCD, proposed pipe between Kenny Road Pump station and the pond, and the existing Kenny Road Pump Station.

This option utilises the existing Kenny Road Pump Station without increasing its existing discharge capacity of 1.05m^3/s. There is no requirement for a new pumping main and beach discharge structure. The existing 1500mm diameter pipe connecting the CCD would need to be extended to the Serpentine Pond to convey runoff generated from the south eastern corner of the Structure Plan into the pond.

As the results of the modelling developed, it became apparent that a ponding area of approximately 14.9 hectares would be required. The required ponding area is big and did not result in an appropriate level of development within the Structure Plan area. Therefore, this option was not considered further.

For Option B, the model represents the proposed stormwater infrastructure that consists of the Serpentine Drain, proposed smaller Serpentine Pond, open channels along Willowbank Avenue, existing 1500mm diameter pipe within the developed Te Awa Estates connected to the CCD, proposed pipes between Kenny Road and the pond, and a new pump station adjacent to the Serpentine Pond.

A new pumping station adjacent to the pond with a total discharge capacity of 4.5 m^3/s, located adjacent to the Serpentine Pond, would be required, including a pumping main and beach discharge structure. Similar to Option A, the existing 1500mm diameter pipe connecting the CCD needs to be extended to the Serpentine Pond to convey runoff generated from the south eastern corner of the Structure Plan into the pond.

The Serpentine Pond footprint required is approximately 4.4 hectares. Total available storage within the open drains and in the road carriageways and berms in the low-lying areas was taken into account in determining the Serpentine Pond size. This option is adopted as the stormwater management system for the Structure Plan area as it requires a smaller ponding area enabling a greater residential yield. Approximate ponding area for this Option is 3.5% of the Structure Plan area versus ponding area in Option A of 11.9% of the Structure Plan area. As this is the adopted option, the model was subsequently refined to include the catchment wide stormwater system.

For each option, two scenarios were assessed – one without pump failure (normal operating conditions) and another with a total of 4 hours pump failure at the rainfall peak. The pump failure option was assessed to establish the maximum water levels in the system such that no habitable floor is inundated. Refer to Appendix A for the network layout map.

2.8 Proposed Stormwater System

It is proposed that the Structure Plan area in the future is drained by several open channels. These channels, including the Serpentine Drain, drain into the proposed Serpentine Pond. Stormwater in the pond will be pumped directly into Hawke Bay. The following upgrades are required to implement Option B:

- Construction of a 4.4 hectares pond (called the Serpentine Pond);
- A new pump station with a capacity of 4.5 m^3/s adjacent to the Serpentine Pond with pumping main and beach discharge structures;
- Piping of the Serpentine Drain south of the Serpentine Pond;
- Construction of new open drains along Willowbank Ave with a total reserve width of 30m;
- Widening and reshaping of the Cow Shed Drain (from node SW2 to the Serpentine Pond) with a total reserve width of 40m;
- Widening and reshaping of the Serpentine Drain north of the Serpentine Pond to a reserve width of 31m; and
- Laying of pipes to channel and convey runoff from individual subcatchments into the open drains.

With the above upgrades in place, the Serpentine Pond will be inundated for 9 hours under normal operating conditions and 14 hours with 4 hours total pump failure during the 2% AEP rainfall event.

2.8.1 Primary Flow Conveyance

Circular pipes were used in the model to convey primary flows from subcatchments west of Eriksen Road and subcatchments south of the Serpentine Pond. These pipes were sized to meet the following criteria:

- In the 10% AEP event with no pump failure, pipes are allowed to surcharge up to the sump grate levels.
- In the 2% AEP event with no pump failure, pipes are allowed to surcharge 300mm above the sump grate levels. In the event of total pump failure, the surcharge can exceed 300mm above the sump grate levels, where sectional flooding is allowed but no flooding to habitable floor levels is allowed.

The proposed pipe sizes are shown in Table 2.2.

Table 2.2: Proposed Pipe Sizes

Upstream Node	Downstream Node	Circular Pipe Diameter (mm)
P1	P3	900
P10	SW5	1050
P2	P3	825
P3	SW1	900
P4	P5	750
P6	SW3	900
P8	P11	825
P9	P11	825
S10	S9	1500
S8B	S8	2 x 1350 (or single 1800)
S9	S8B	2 x 1350 (or single 1800)

Twin 1350mm diameter pipes were used in the model between nodes S9 to S8. NCC indicated the preference of using a single 1800mm diameter pipe instead of the twin 1350mm diameter pipes. Upon further discussion with NCC, a single 1800mm diameter pipe should provide sufficient capacity to convey the peak flow with the provision of overland flow path. Note that only the twin 1350 diameter pipes were modelled while the single 1800mm diameter pipe option is not modelled.

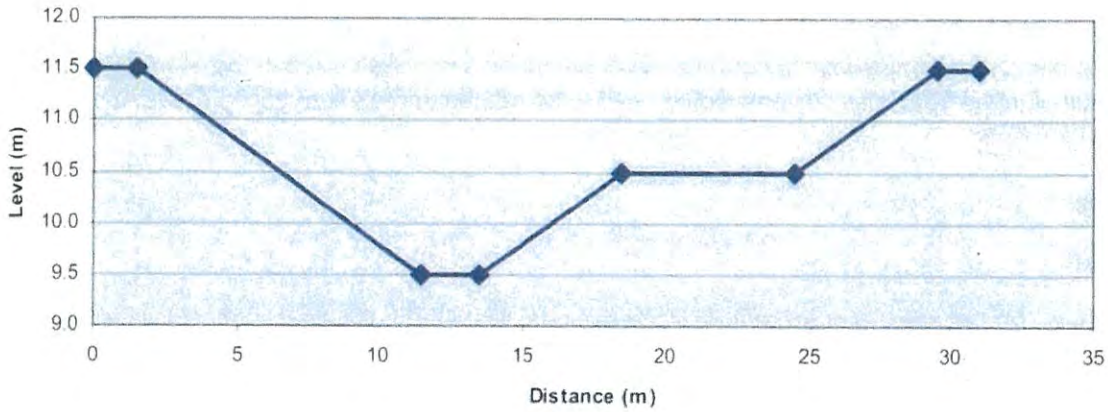
Circular pipes were used for modelling purposes to identify the cross sectional area required for each piped length. This could be refined during detailed design but the cross sectional area and fall should remain the same.

2.8.2 Secondary Flow Conveyance

Two stage open channels are used to convey secondary flows in the Structure Plan area. These open channels have 1:5 batters and 6m maintenance berm. The main channel conveys the daily flow and overtops into the secondary channel in large rainfall events. The open channels were sized such that the combined primary and secondary systems provide a 2% AEP rainfall event protection to existing habitable floor levels. The locations of these open channels are shown in Appendix A.

The existing Serpentine Drain needs to be shaped to match the proposed typical cross section shown in figure 2.4.

Figure 2.4: Proposed Typical Serpentine Cross Section



Several new open channels are also required to service the remainder of the Structure Plan area. The locations of these open channels are along Willowbank Ave (node SW1 to P11) and the widened Cow Shed Drain (node SW2 to Pond) that connects the western open channels to the Serpentine Pond. Figures 2.5 and 2.6 show the typical cross sections for these open channels.

Figure 2.5: Typical Open Channel Cross Section along Willowbank Ave

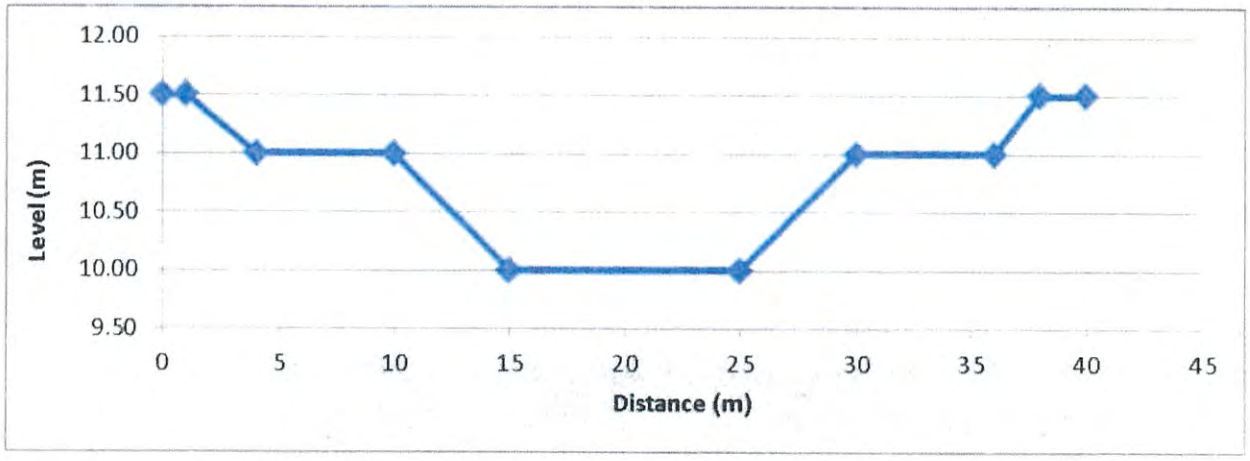
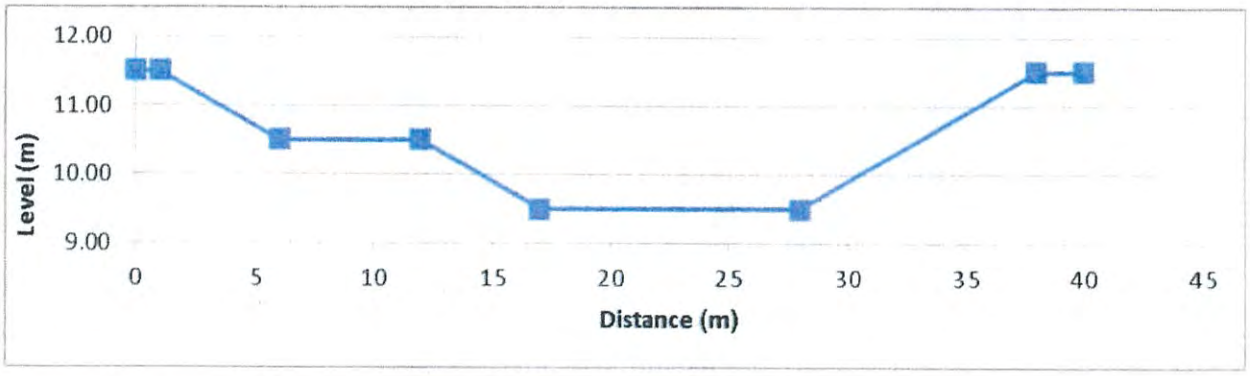


Figure 2.6: Cow Shed Drain



Generally, the open channels longitudinal slopes are very flat. They were modelled with a slope of 1:1000.

It is recommended that these open channels are grassed to provide some level of water quality treatment. As the inverts of the Serpentine Drain are below MSL, grassing specification would need to consider the water salinity in the drain.

The 6m wide berm in the open channel is used for maintenance purpose. It also acts as a safety feature to aid people to exit the drain. The 1:5 batter slope facilitates the growth of emergent dryland plants to deter people from entering the open channels.

Cross culverts under road carriageways to connect the open drains have been sized to the 2% AEP rainfall event. The details of these box cross culverts would need to be refined in the future upon confirmation of the local road alignments.

2.9 Storage

Serpentine Pond

Refer to Appendix C for the proposed Serpentine Pond Concept Statement. Wetland channels traverse through the pond to convey the daily low flows.

The invert of the wetland channels are RL 8.60m and the average invert of the open grass areas are RL 9.35m. The top batter of the pond is RL 11.28m. The normal water level in the pond is RL8.80m and is controlled by the pump operational levels.

Under the normal day to day operation, stormwater will be confined to the wetland channels and the open grassed areas can be used for recreational activities. The pond has an approximate cumulative storage capacity of 80,000m^3 from the normal water level (RL 8.80 to RL 9.00m – determined by the pump on and off levels) to top of the pond at RL 11.28m. The recommended minimum gradient for the open grass area in the pond is 1:100.

Carriageway and Berm

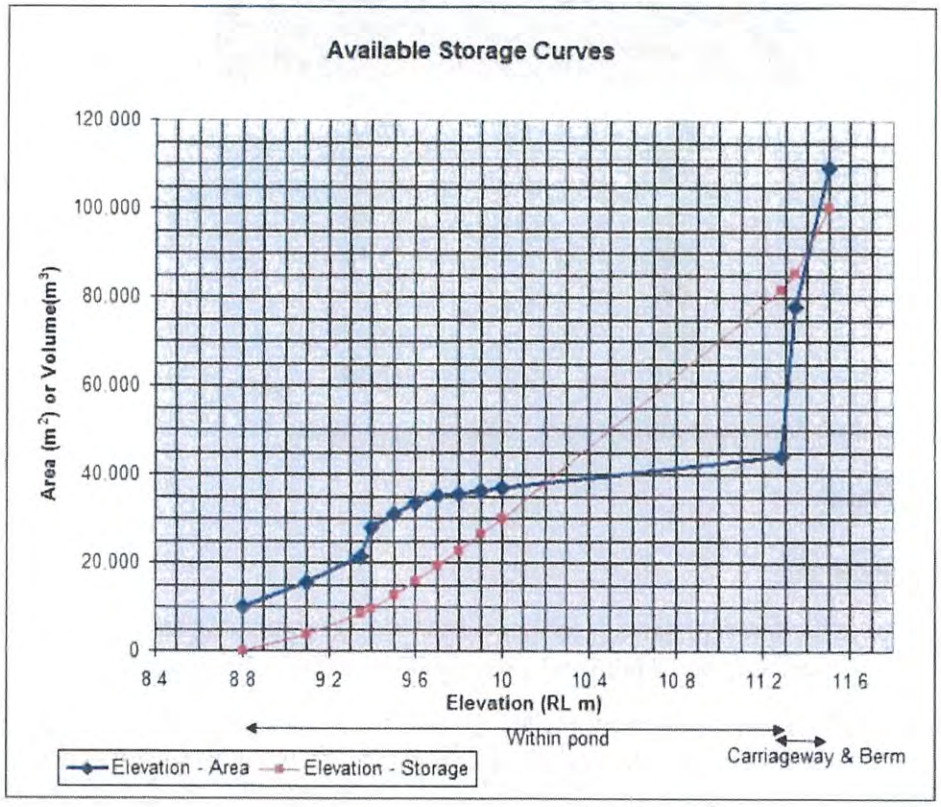
The road carriageways and berms within the Structure Plan area also function as stormwater storage areas for rainfall events larger than the 10% AEP rainfall event. On average, 15% of each subcatchment area will form the carriageway and berm areas for local stormwater ponding in addition to the storage capacity available in the Serpentine Pond.

The elevation versus combined storage curve and graph are shown in figure 2.7.

Table 2.3: Elevation – Storage Curve

Elevation (RL m)	Cumulative Area(m^2)	Cumulative Volume (m^3)
8.80	10,096	0
9.10	15,480	3,836
9.35	21,486	8,457
9.40	27,827	9,690
9.50	30,999	12,631
9.60	33,329	15,848
9.70	35,141	19,271
9.80	35,665	22,811
9.90	36,377	26,413
10.00	36,765	30,071
11.28	44,462	81,760
11.34	77,977	85,420
11.50	109,181	100,392

Figure 2.7: Elevation – Storage Curve Graph



2.9.1 New Pump Station

The model showed that a pump with a 4.5m^3/s pump capacity is required to reduce the flood levels to less than RL 11.28m for the 2% AEP rainfall event. The proposed new pump station would require the operational levels provided in table 2.4:

Table 2.4: New Pump Station Data

Parameter	Values
Discharge Capacity	4.5 m^3/s
Switch On Level	RL 9.00m
Switch Off Level	RL 8.80m

The exact pump station location is yet to be determined. Noise, landscaping and aesthetic issues need to be considered in determining the pump station location.

2.9.2 Front Boundary Levels

Taking into account of the proposed stormwater system servicing the Structure Plan area and the maximum water levels of the rainfall events of interest, the minimum front boundary ground levels for new developments are shown in table 2.5. These ground levels were calculated on the basis of a minimum 500mm cover for a Z class circular pipe located in the berm.

Table 2.5: Proposed Front Boundary Levels

Upstream Node	Front Boundary Level (RL m)
P1	11.71
P10	12.08
P2	11.65
P4	11.50
P6	11.73
P8	12.03
P9	11.26
P12	10.93

For more details on the front boundary ground levels, refer to Appendix B.

2.10 Serpentine Pond

2.10.1 Safety Considerations

The Serpentine Pond is a dry detention pond. It remains dry unless a large rainfall occurs whereby flows in the wetland channels overtop the channel banks and start ponding in the open grass areas.

The open grass areas are designed to be relatively flat to allow for recreational use but still have some nominal slope to promote flows into the wetland channel. Therefore, perimeter fencing around the pond is not necessary. The open grass areas are intended to be used for recreational purposes during the dryer periods.

Similarly, no fencing is required for the wetland channels. Dense wetland planting running alongside the wetland channels offers an equal level of protection and at the same time discourages reserve users from entering the channels.

2.10.2 Plant Landscaping

The landscape concept aims to serve two purposes:

- improved landscape amenity associated with the stormwater/wetland channels and perimeter of the stormwater basin; and
- maintain open grass space for both community recreational use and stormwater retention.

The plant species selection is based on a simple palette of plants that are both coastal tolerant and able to withstand the anticipated variance in site conditions from dry to wet to periodic stormwater submergence. As well as stormwater submergence the plant species have been selected specifically for their salt tolerance as there is the potential for saline mixing during a flood event.

The planting areas are specified to tolerate short periods of water submergence however the risk of dieback exists where plants are subject to periods of water submergence for more than typically 24 hours. This is unlikely to happen as the Serpentine Pond inundation period for up to the 2% AEP storm event is less than 24 hours.

The turf grass applied to the open areas of the site will be affected by saline conditions with dieback identified as a risk during flood events and prolonged periods of water submergence.

Refer to Appendix C for the Pond Concept Statement.

2.11 Stormwater Quality

Three receiving water environments are identified for the Structure Plan area runoff – open channels, Serpentine Pond and Hawke Bay. Potential contaminants from residential land uses include nutrients, heavy metals, hydrocarbons and sediments. Many of the contaminants are attached to the sediments. In an area such as Te Awa, where the roads are only local, servicing the local neighbourhood, there will be less contribution of heavy metals and hydrocarbons than expected from more heavily trafficked urban areas. The need for treatment, and some approaches to minimising the contaminant loading, is discussed below.

2.11.1 Open Channels and Serpentine Pond

The open channels and pond will exist primarily for stormwater detention, but will also provide an aesthetic, visual and recreational amenity and freshwater habitat (albeit limited). The Serpentine Drain and wetland channels in the pond will have permanent flows which are pumped to the sea when the pump is switched on. During a large rainfall event, the Serpentine Pond will act as a settlement pond, so that sediment and particulate contaminants will accumulate on the bed of the pond before runoff gets pumped to the sea.

Given that the Serpentine Drain and Pond can at best provide a freshwater habitat of limited value, specific stormwater treatment in the catchment to remove particulates appears unnecessary. However, such treatment should be considered, particularly in the construction phase. It is important to note that existing aquatic values in the Serpentine Drain have not been assessed.

Stormwater treatment typically requires large-area wetlands, and does not appear justified in this case. However, some typical low-impact urban design measures could be provided to enhance the stormwater discharge quality. The typical low-impact urban design for residential areas is:

- Grass strips on roads and footpaths to intercept runoff before it reaches sumps.
- Encouraging residents to direct runoff from driveways and other impervious surfaces into the garden.
- Particularly conscientious efforts to avoid wastewater reaching the stormwater collection system, including: avoiding cross-connections, and ensuring that gully traps are high enough to prevent stormwater ingress (which can then lead to wastewater spills).

2.11.2 Hawke Bay Coastal Waters

The coastal environment at Te Awa is a high-energy one, with strong mixing provided by currents and (particularly) ocean wave action. Dilution and dispersion of contaminants are expected to be very strong, so that contaminant concentrations will be kept to a minumum. In general, management of stormwater contaminants is therefore not considered necessary to protect this environment. In addition, the Serpentine Drain and Pond will provide settlement of sediments, and will therefore also trap particulate contaminants.

An exception can be made for accidental spills of petrol, wastewater or other contaminants such as pesticides. In calm weather, these could impact on the coastal marine environment. It is difficult to detail permanent treatment devices to safeguard against spillage events, but the proposed Serpentine Pond provides an almost perfect bunding or isolating facility to prevent contaminated discharge to the ocean. Protocols could be set up to ensure that when spills are reported, pumping to the sea is disabled (unless a rising pond level makes it unavoidable), and clean-up of the pond follows as soon as practicable.

3 Wastewater

3.1 Existing System

The majority of Napier's urban areas have a reticulated sewerage system with the sewage being pumped to the existing milliscreen plant at Awatoto and finally disposed after treatment via a marine outfall into Hawke Bay. At present, the Structure Plan area is not serviced by a wastewater disposal system with the exception of the Te Awa Estates development in the southeast. The existing wastewater infrastructure in the vicinity includes:

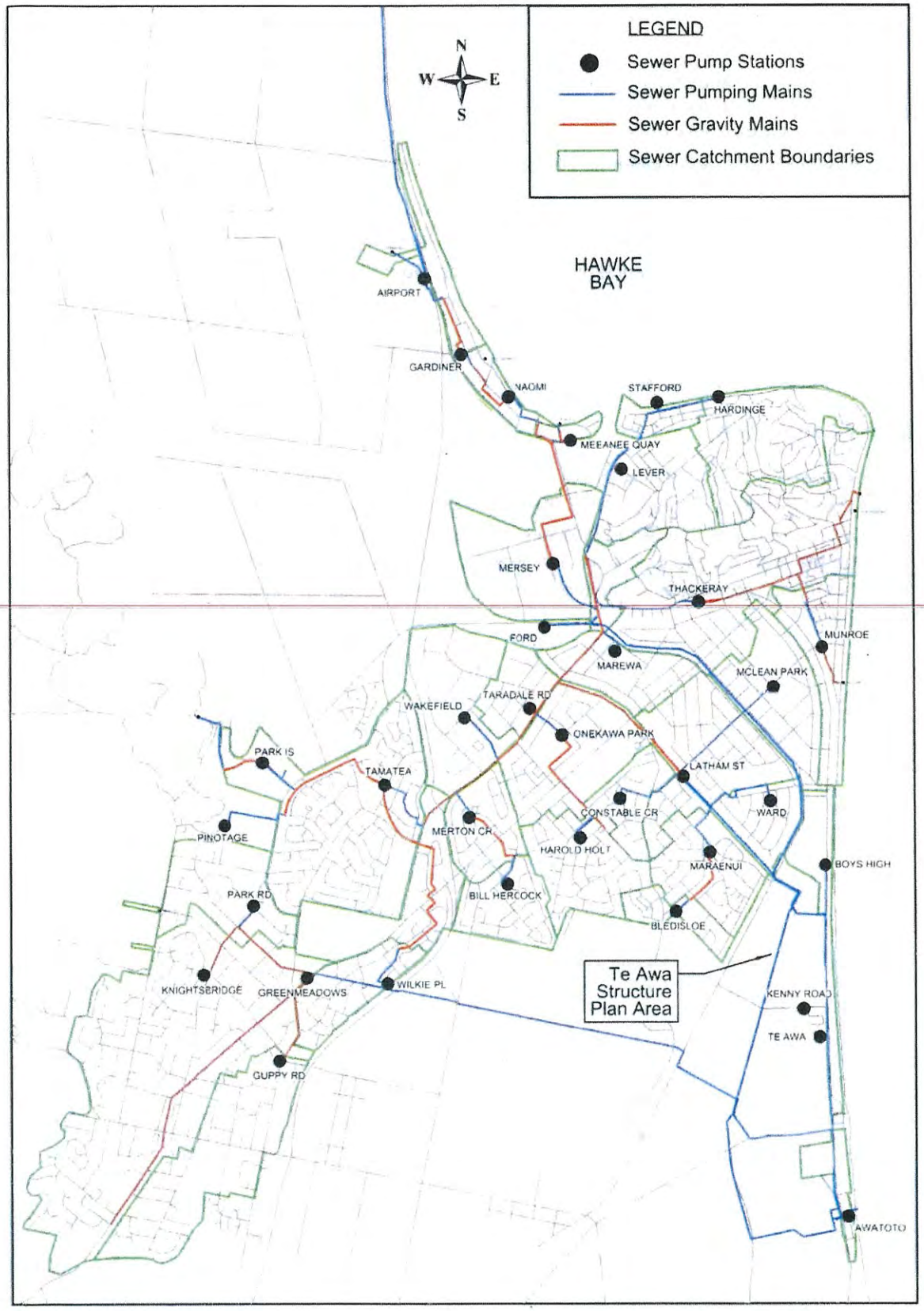
- Pumping main from the Latham Street pump station into the Awatoto pumping main;
- Te Awa pump station along Te Awa Avenue, which feeds into the milliscreen plant; and
- Kenny Road wastewater pump station, servicing the existing Te Awa Estates development.

Figure 3.1 extracted from the Wastewater Disposal Essential Services Development Report (ESDR – Wastewater) shows the location of the existing pump stations.

3.2 Proposed Connection

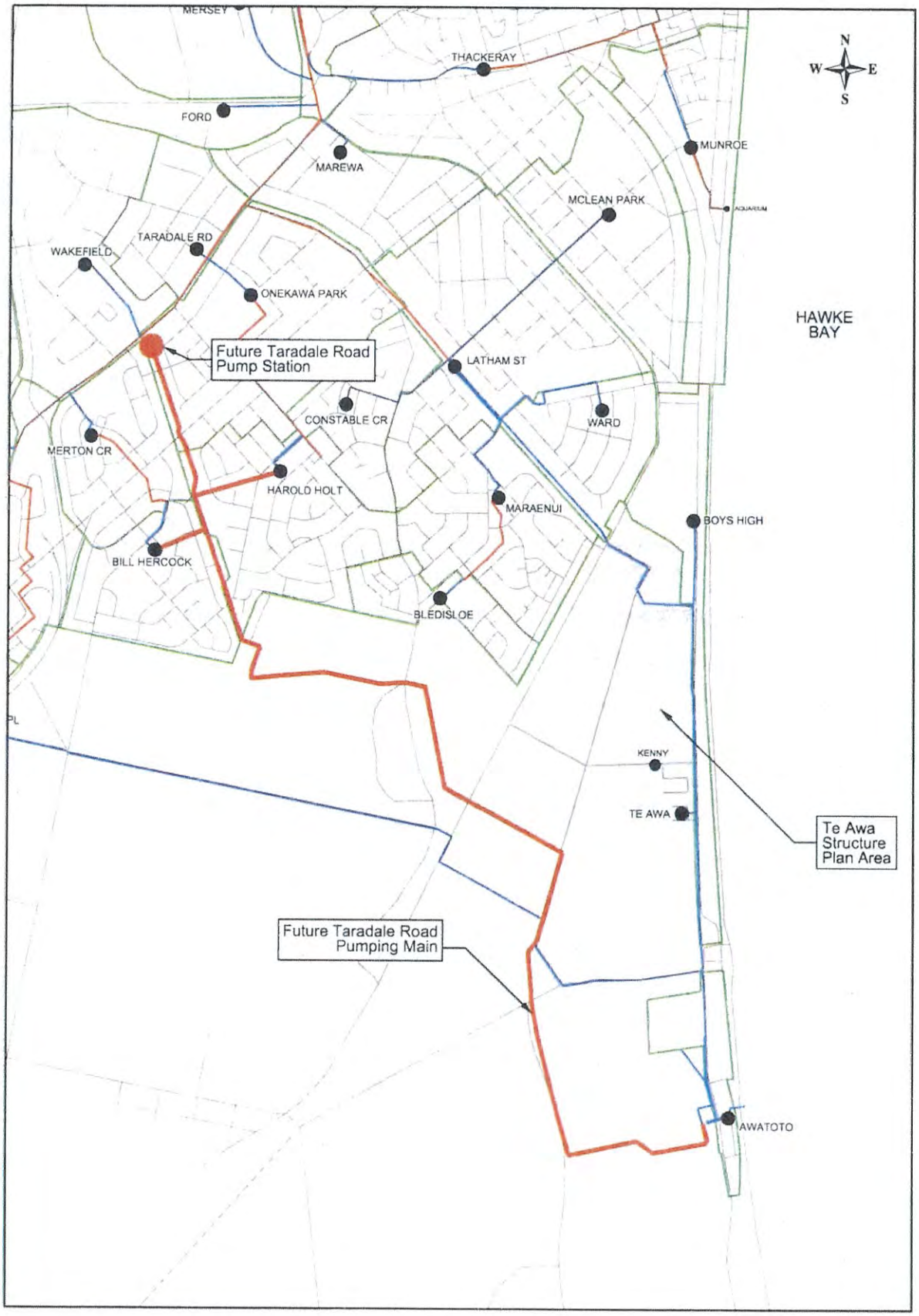
In the ESDR – Wastewater Section 3.8, it is recommended that any future development in the Te Awa Structure Plan area would require a connection to the proposed wastewater pressure main from Taradale Road, from a new pumping station that would feed directly to the Awatoto milliscreen plant as shown in Figure 3.2. Although the area is close to the two principal pumping mains serving Latham and Greenmeadows catchments, connection into either of these mains is not recommended, as neither have the required capacity.

Figure 3.1: Location of Sewer Pump Stations and Mains[1]



[1] Figure 3.1 provided by Napier City Council

Figure 3.2: Taradale Road Pump Station and Pumping Main[5]



[5] Figure 3.2 provided by Napier City Council

Sewage from new residential development within the Structure Plan area would connect into a new pressure main from a new pumping station near Taradale Road to intercept the existing trunk main in Taradale Road and pump the flow to Awatoto. It is anticipated that this new system will have a total capacity of 650 L/s compared to the total 40 L/s peak wet weather flow (PWWF) sewage generated from the Structure Plan area.

3.3 Design Standards

The Code of Practice[6] requires all wastewater systems to serve the entire upstream catchment, and assumes a minimum residential density of 12 lots per hectare and a household occupancy rate of 2.7 people. However, in accordance with the Beca Scoping Report, an occupancy rate of 2.5 people per household has been assumed for the purpose of this Structure Plan, as this occupancy rate is a more realistic figure based on recent census and LTCCP population data.

3.3.1 Design Flows

Sewer pipes shall be sized to convey the PWWF without surcharge. PWWF is 1,100 L/person/day as outlined in the Code of Practice.

Pumping stations need to be sized for the PWWF generated from the total catchment area to allow maximum potential urban development within the catchment.

Gravity systems shall be designed to carry the PWWF including allowances for groundwater and stormwater inflow and infiltration. In the absence of accurate flow record of the wet and dry weather residential flows the following Code of Practice standards were used:

Average dry weather flow (ADWF) – 275 litres/person/day

Peak wet weather flow (PWWF) – 1,100 litres/person/day

Peak dry weather flow (PDWF) – 550 litres/person/day (twice ADWF)

3.3.2 Pipe Design

Wastewater mains should be designed using Mannings or Colebrook White formulae. The minimum diameter of the main is to be 150mm, and the minimum connection diameter is 100mm. Maximum depth to invert for the network is to be 3m.

The design minimum velocity under PWWF is 0.7 m/s while the maximum velocity is 2.5 m/s. Due to the flat grades within the Structure Plan area, the above criteria would result in a large number of pump stations. Following advice from NCC, the network has subsequently been designed to achieve the above velocity rates where possible, with a minimum grade of 0.4% used where the design velocity was not met. The aim of this revised criterion is to keep the number of pumping stations required to service the development to a minimum.

Where design velocities can be achieved, the normal acceptable minimum grades are provided in table 3.1:

[6] 1October 2007, Napier District Plan, Volume 2, Parts A, B & C of the Code of Practice for Subdivision & Land Development

Table 3.1: Minimum Pipe Grade

Pipe Internal Diameter (mm)	Gradient Percentage
100	1.0
150	0.4
200	0.3
225	0.25
250	0.2
300	0.17

3.4 Structure Plan Design

3.4.1 Demand

The total forecast demand for the residential development is 40L/s based on a total of 1,257 households as calculated in the Structure Plan yield assessment. This uses a housing density of 12 lots per hectare where achievable and takes into account public reserve and stormwater management areas not available for housing development. Table 3.2 below shows the PWWF generated by each subcatchment of the development.

Table 3.2 - PWWF Generated

Section	Number of lots	PWWF (L/s)
PS1	351	11
PS2	244	7.6
PS3	222	7.9
Te Awa Estates	440	13.5
Total	**1,257**	**39.5**

3.4.2 Proposed Gravity Systems and Pumping

The sewage from the area is pumped from one pump station to another in series. The pump stations are connected via gravity sewers. The sewage from each subcatchment is lifted and discharged into the downstream gravity sewer which then flows to the next subcatchment's pump station. The network layout has been designed to minimise the number of pump stations required for the Structure Plan area. In order to achieve this, longer rising mains are required to connect the subcatchment networks.

The terminal pump station will be designed to connect into the proposed wastewater pressure main along Taradale Road that feeds directly into the Awatoto milliscreen plant as described in Section 3.2. The connection will be at the southern boundary of the study area. Refer to the drawing in Appendix A for the sewer layout and pump station locations. Sewer sizes are shown in the sewer layout in Appendix A. The majority of pipelines are 150mm diameter, with the pipelines leading to PS2 and PS3 being 225mm in diameter. To isolate the pump stations for maintenance, isolating valves are required. Therefore, preliminary costing includes these valves.

The Te Awa Estates development that forms part of this Structure Plan, includes one sewer pump station that has already been constructed, along with an additional proposed pumping station at the northern part of the development. These pump stations are included in Table 3.3 below. It has been assumed that the proposed additional pump station will discharge to PS1, at the northern part of the Structure Plan area.

The pumped wastewater main runs along Eriksen Road from north to south with horizontal branches from the residential area pump stations connecting into this main, creating a grid system.

The sewer design is constrained by:

- The allowable maximum pipe depth of 3m from the existing ground level; and
- Requirement to pass under open channel stormwater drains: and
- Minimum pipe grades for individual pipe sizes.

Design sewer slopes range from 0.3% to 0.6%, while pipe invert levels range from RL 10.75m to RL 7.48m. Pipeline capacities and flow rates were calculated using the Colebrook-White formulae, applying the roughness value recommended for concrete pipes. Velocities achieved within the pipelines are given in Table 3.3 below.

Table 3.3 - Velocities within Gravity Sewer Pipelines

Pipeline	Peak Wet Weather Flow (m/s)		Peak Dry Weather Flow (m/s)	
	Minimum	Maximum	Minimum	Maximum
Sewer mains along spine	0.82	1.0	0.7	0.82
Branch mains	0.4	0.7	0.32	0.57

A total of 3 pump stations are required along the wastewater main that runs along Eriksen Road, plus the two pumping stations associated with the Te Awa Estates subdivision. The pump stations have been located at points such that the maximum cover of 3m to sewer pipes is achieved and the number of pump stations is minimised. Additionally, the locations of the pump stations and rising mains ensure that the clash with the Cow Shed Stormwater drain is mitigated. A figure of the proposed sewer network is provided in Appendix A.

Pump stations are required by the Code of Practice to be sized for the PWWF, with storage provided for 6 hours at the ADWF rate. The required pumping capacities are shown in Table 3.4 below.

Table 3.4 - Wastewater Pump Station Capacity

Pumping Station	Flow Capacity (l/s)	Storage Volume required (m^3)
PS1	14.5	78
PS2	22.1	120
PS3	30	163
Existing Kenny Rd Pump Station (Te Awa Estates)	10	54
Proposed Te Awa Estates pump station	3.5	19

Further refinement of the location and catchment areas of these pumping stations will be required as road and stormwater pond layouts are confirmed. Further consideration should also be given to the best method of including flows from the area serviced by the proposed Te Awa Estates pumping station at the northern end of the subdivision as these are currently based on the borders of the Te Awa estates development rather than the network requirements of the Structure Plan.

The required storage at the pump stations could be significantly reduced if connections were provided between the pump station controls. If a pump station failed, all upstream pump stations would automatically switch off, utilising storage provided locally. This would result in storage only being required for the gravity portion of the receiving flows for each pump. The revised storage volumes, if this method was utilised, would be 59, 41 and 42.5m^3 respectively for PS1, PS2 and PS3.

4 Water Supply

4.1 Existing System

The potable water in Napier City is supplied from an integrated system, which comprises of pumped wells, trunk mains, reservoirs and distribution mains. Additionally other pump stations pump into a trunk main system associated with the reservoirs. Figure 4.1 extracted from the Water Essential Services Development Report (ESDR – Water) shows the location of the existing water mains.

Prior to the recent Te Awa Estates development, the Structure Plan area was not serviced by Napier City potable water supply network. The closest mains were the 150mm main along Te Awa Avenue and the 150mm main at the intersection of Willowbank and Eriksen Roads. Neither of these are suitable to service the new development. A 300mm main has been provided along the CCD alignment to Eriksen Rd, and a 200mm main from there to Kenny Rd. Further water supply infrastructure is required in order to service the complete Te Awa Structure Plan area and this is further described below.

Figure 4.1: Enfield Bulk Water Supply System[7]

[7] Figure 4.1 provided by Napier City Council

4.2 Design Standards

The Code of Practice specifies that the network mains shall be designed to deliver the maximum expected catchment demand during the lifetime of the subdivision. The mains are required to be designed to cope with each of the following cases:

- The peak demand on the maximum day, and
- Fire flow plus two thirds of the peak demand on the maximum day.

4.2.1 Demand

The forecast demand is based on each dwelling having 2.5 people and 1,257 lots as per the Structure Plan. The average demand on a maximum day is 900 L/person/day as per the Code of Practise. The peak demand on a maximum day for a population greater than 2,700 people (the study area has a proposed total of 3,100 people for a total area of 125 hectares) should be calculated using the formula below:

$$Q_{peak} = 0.0467\ D\ (L/s); \quad \text{where } D = \text{number of dwelling units}$$

The water supply demand shall be sized in accordance with the minimum design requirement of the New Zealand Fire Service Code of Practice for Fire Fighting Water Supplies[8], which requires that each hydrant delivers a minimum of 12.5 L/s within a radial distance of 135m. However, for the purposed of this study, a minimum of 25 L/s is adopted for fire flow as it is expected that there will be houses larger than 200m^2 in the Structure Plan area with radial distance greater than 135m. The maximum day demand on a peak day to include fire flow is calculated using the formula below:

$$Q_{max} = \text{fire flow} + 2/3\ Q_{peak} = 25 + 2/3\ (0.0467D)$$

4.2.2 Pipe Design

The Code of Practice specifies that the principal mains must be 100mm nominal diameter or greater and the typical acceptable pipe sizes are 150mm, 200mm, 300mm, 375mm and 450mm in diameter.

The acceptable hydraulic grade line (HGL) is 0.2% from the floor level of the reservoir. The water mains should be laid no steeper than a 1 to 4 slope.

For development of 50 lots or more, potable water is required to be supplied from at least two independent principal mains, each which should be capable of supplying the peak day demands.

The Code of Practice specifies that a 300mm or larger principal main shall be considered a trunk main and therefore no direct tapping of service connections from this main shall be permitted. In this situation, rider mains shall provide the direct connection, and have a connection into one further principal main whereby the maximum allowable rider main length is 600 meters.

4.2.3 Isolating Valves

The maximum distances between isolating valves on mains with service connections shall be 300 metres and 1,000 metres for mains without service connections.

Sluice valves should be used for 100mm diameter pipes and larger, while pipes 300mm and larger shall be fitted with either a bypass valve to balance pressures or an enclosed reduction gearbox.

[8] SNZ PAS 4509:2008, New Zealand Fire Service Firefighting Water Supplies Code of Practice

4.2.4 Pressures

Pressure in the water supply system shall not be less than 200kPa with a maximum pressure of 900kPa to convey the peak demand flow, excluding fire flows, as per the Code of Practice. Large fluctuations in pressure are not acceptable under normal flow conditions.

The pressurised pipes should be designed such that they can convey the peak day demand (excluding fire flows) with the pressures in the system staying within the minimum and maximum pressure specified above. During fire flows, the minimum available head in the network is to be 10m.

4.3 Structure Plan Design

4.3.1 Demand

A total of 1,257 lots was assumed with the total population of 3,163 people. This equates to a total daily peak water demand of 59 L/s, including the Te Awa Estates development.

Table 4.1: Peak Water Demand

Location	Lots	Q Peak (L/s)	Q Max (L/s) includes fire flow
Northwest section, North of Kenny Rd and West of Eriksen Rd	357	16.7	36.1
Southwest section, South of Kenny Rd and West of Eriksen Rd	194	9.1	31.0
Northeast section, north of Kenny Rd and East of Eriksen Rd	436	20.4	38.6
Southeast section South of Kenny Rd and East of Eriksen Rd	270	12.6	33.4
Total	**1,257**	**59**	**66.4**

Industrial, retail or suburban commercial area water demands were not considered separately at this stage, as it is not anticipated that significant areas of such land uses will be developed within the Structure Plan area.

4.3.2 Pipe Design

The water supply network is designed such that there are two independent supply points. These are the existing connection from the 300mm Pirimai Trunk Main at the intersection of Eriksen Road and the Cross Country Drain (Southern Supply Point), and a connection to the proposed 450mm Awatoto Trunk Main at Willowbank Avenue (Northern Supply Point.

Southern Supply Point

The Southern Supply Point, connecting to the 300mm Pirimai Trunk Main is currently in place, however does not have sufficient pressure to supply the whole Structure Plan area. Once the proposed 450mm Awatoto Trunk Main is constructed, the hydraulic grade line at the connection point will be 46m.

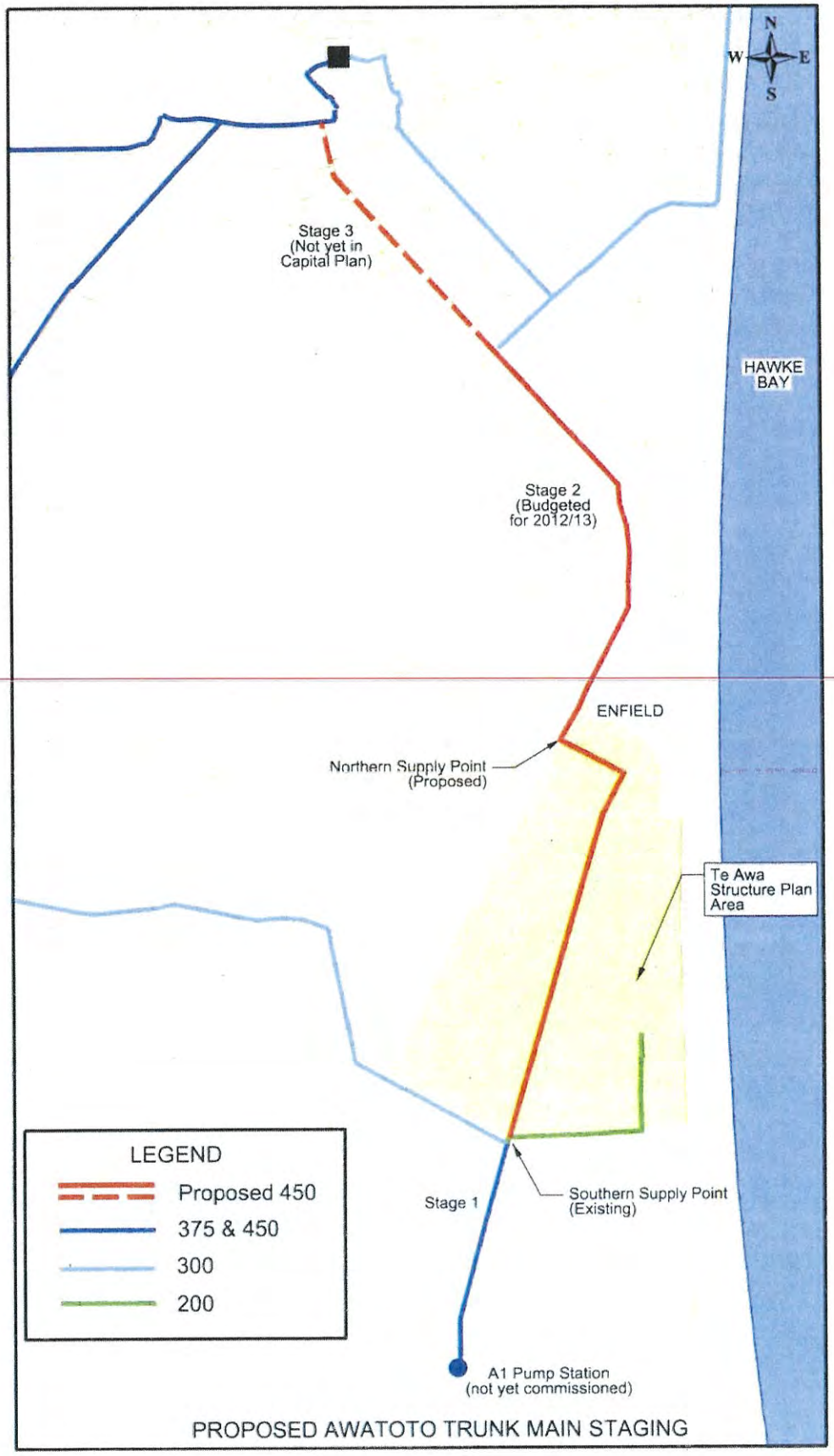
A 200mm main supplying the Te Awa Estates development has been constructed and is shown on figure 4.2. This will be extended through the northern section of the development to Eriksen Road.

Northern Supply Point

The proposed 450mm Awatoto trunk main will provide the Northern supply point at the intersection of Eriksen Rd and Willowbank Ave. The Awatoto Trunk main is proposed for the 2012/2013 financial year, as shown in figure 4.2. The Southern supply point will be the only supply to the area until this time.

Completion of the Awatoto Trunk Main will significantly improve the available head in the Structure Plan area. The Northern and Southern supply points will be the only connections to the Awatoto Trunk Main in the vicinity of the Structure Plan area.

Figure 4.2: Proposed Awatoto Trunk Main Staging[9]



[9] Figure 4.2 provided by Napier City Council

Structure Plan Reticulation Network

The reticulation network supplying the Structure Plan area will consist of a 200mm ring main, with 100mm and 150mm pipes supplying individual streets. This will ensure all areas of the network can be supplied from either end.

The ring main will run between Willowbank Ave and Eriksen Road along the west of the Structure Plan area and run through the centre of Te Awa Estates development, joining Eriksen Road at the Cow Shed drain in the east. Connections to the 450mm trunk main will be provided at the intersection of Eriksen Rd and Willowbank Ave to the North and the Intersection of Eriksen Road and the CCD to the south.

A section of the 200mm ring main has already been constructed to service the Te Awa Estates development, this will be extended northwards as development progresses. The proposed water network is shown in Appendix A, Te Awa Structure Plan Water Supply Network.

5 Staging

It is envisaged that the Structure Plan area will be developed in six stages.

The development stages are shown in Appendix A, with development of the southern areas in the first stages and northern areas in the final stages.

The design of the three waters infrastructure has considered this development staging. The sections below provide more details on the staging of the individual infrastructure networks. Refer to Appendix A for the Te Awa Structure Plan Staging Map.

5.1 Stormwater

To accommodate the existing Te Awa Estates development and Stages 1 and 2, the major earthworks and grassing of the proposed Serpentine Pond would be required. Construction of the pond is required in this stage to store additional runoff generated from the increased impervious area as well as to prevent construction access issues in the other development stages. The piped sections from the Serpentine Pond to the existing 1500mm diameter pipe within the existing Te Awa Estates subdivisions (node S8 to Node S10) in the south eastern corner would also be required to facilitate runoff generated to enter the pond. A connection in the northern end of the pond is required to allow runoff from the Serpentine Drain to enter the pond. It is likely that construction beyond the Te Awa Estates development stage XII would require the design of the new 4.5m^3/s pump station to be considered.

To service stages 3 and 4 of development, the open drain to the west of Eriksen Road, the Cow Shed Drain and the Southern section of the north-south drain need to be constructed such that runoff from the south western corner of the Structure Plan can be conveyed to the Serpentine Pond. It is likely that the development of these stages will require the design of the new 4.5m^3/s pump station to be considered.

Stages 5 and 6 of the development can be serviced by the open drain to the west of Eriksen Road running from north to south and also partly by widening the Serpentine Drain. With the completion of this development, the new pump station would need to operate at its full capacity of 4.5m^3/s.

5.2 Wastewater

A large portion of the existing development and Stages 1 and 2 will be accommodated in the Kenny Road wastewater pumping station that has already been constructed by the developer. This pump station discharges independently of the remaining Structure Plan wastewater infrastructure allowing much of this initial stage to be completed without the need for development of the other pump stations.

In order to service Stages 3 and 4, pump stations PS2 and PS3 would be required along with the associated reticulation network. Stages 5 and 6 would be serviced by completion of PS1.

5.3 Water Supply

The existing Te Awa estates development, along with Stages 1 and 2 are being serviced by the 200mm supply line that has been provided from the intersection of Eriksen Rd and the CCD. This will be extended northwards as development continues.

Stages 3-6 of development would require completion of the ring main around the western side of the Structure Plan area. Internal supply mains would be completed as development progresses within this area. This will require the completion of the proposed 450mm main to provide the 2 connection points and ensure sufficient pressure is available for the Structure Plan area.

The result is that the Structure Plan area will have two independent water supplies servicing the area when both connections are completed.

6 Cost Estimates

The overall preliminary capital expenditure cost for the Structure Plan area is $34,136,000 inclusive of the three waters infrastructure, roadwork, traffic management and landscaping. The three waters infrastructure accounts for $14,428,000 of this overall cost.. A detailed breakdown of the anticipated infrastructure to be provided by NCC is provided in Appendix D.

The purpose of this cost estimate is to assist NCC in determining fair and reasonable financial contributions for development in the Te Awa Development area. Operational costs have not been considered in this estimate as this will be included in detailed design. Data used in developing these costs has been sourced from NCC supplied data, Beca data and currently industry rates. This is further detailed in Appendix D.

Professional services fees (i.e. design and design management) for the infrastructure within the structure plan area is included in the preliminary capital expenditure cost as a separate line item. Typically the design and design management fees are 6% and 4% of the total construction cost.

6.1 Stormwater Cost Estimate

The preliminary stormwater infrastructure cost is approximately $12,840,000 inclusive of the Serpentine Pond landscaping cost. A considerable proportion of this cost is made up of land acquisition for stormwater works ($4,650,305) and the stormwater Pump Station ($5,416,000). The cost estimate for stormwater infrastructure includes the following:

- Open drains
  - Drainage reserve acquisition for the Cow Shed Drain, Serpentine Drain and the new drain west of Eriksen Road. The preliminary value per square metre of $55 was provided by Telfer Young.
  - Earthworks required to shape the new drains.
  - Cross culverts under the proposed roads.
- Concrete gravity pipes
  - A single 1800mm diameter pipe between nodes S9 and S8B is required to convey flow from the contributing subcatchment to the Serpentine Pond. However, to service runoff from the existing and proposed Stages V-XIII Te Awa Estates development, only a single 1500mm diameter pipe is required. The developer shall bear the cost of the 1500mm diameter pipe while the cost of upsizing the pipe to 1800mm diameter will be part of the Structure Plan cost.
  - Also the cost of extending the 1800mm diameter pipe into the Serpentine Pond will be part of the Structure Plan cost.
- Serpentine Pond
  - Similar to the 1800mm diameter gravity pipe, the cost of upsizing the headwall from a 1500mm diameter to 1800mm diameter headwall will be included in the Structure Plan cost.
  - Landscaping – grassing and specific plant species that are suitable for the Serpentine Pond environment.
  - 1.8m wide timber boardwalk along the edge of the wetland channel in the north-south alignment.
- 4.5m^3/s Pump Station
  - The stormwater pumping station survey, investigations, tests, structural, pumps, mechanical, electrical and outfall costing is based on the scaled down cost of the Cross County Drain Pump Station.
  - Structure Plan stormwater discharge consenting cost of approximately $100k (as advised by NCC).
  - One property along Te Awa Avenue opposite the Serpentine Pond to construct the stormwater pump station discharge pipe lines. A preliminary valuation was undertaken by Telfer Young and the approximate cost is $300,000.

The following items are excluded:

- Serpentine Pond earthworks.
- Cow Shed Drain re-shaping and drainage reserve acquisition between Eriksen Road and the Serpentine Pond.
- Gravity pipes servicing individual subdivision.

6.2 Wastewater Cost Estimate

The preliminary Wastewater infrastructure cost is $1,000,000. This includes the following infrastructure:

- 3 Wastewater Pump Stations
  - PS3 - 30L/s terminal pump station on Eriksen Rd at the South of the Structure Plan area
  - PS2 - 22L/s pump station on Eriksen Rd to the North of Kenny Rd
  - PS1 - 14.5L/s pump station on Eriksen Rd in the North of the Structure Plan area
  - Costing is based on the cost provided by NCC for the Parklands Pump Station
- Gravity 150 and 225 sewer mains forming the main sewer spine, running along Eriksen Rd
  - Including required manholes
- Rising mains from PS1 and PS2

The following items are excluded:

- Gravity pipes servicing individual streets
- ~~Two Pump stations and piped network within Te Awa Estates development~~

6.3 Water Supply Cost Estimate

The preliminary Water Supply infrastructure cost is $588,000. This includes the following infrastructure:

- 200mm ring main described in section 4.3.2, excluding portion already constructed through Te Awa Estates development
- Connection to proposed 450mm trunk main at Northern and Southern supply points
- Pressure reducing valves at supply points
- Fire hydrants along ring main
- Anticipated sluice valves required along ring main

The following items are excluded and will be provided by the developer or are included in separate NCC budgets:

- Rising mains from PS1 and PS2
- All 100mm and 150mm internal supply mains
- All rider mains
- Valves and hydrants required on internal supply network
- Proposed 450mm Trunk main
- Section of 200mm ring main already constructed within Te Awa Estates development

7 Conclusions

The Te Awa Structure Plan area would require extensive stormwater, wastewater and water supply upgrades to service the development that primarily consists of residential lots. The sections below summarise the upgrades required for each of the three waters Structure Plan components.

7.1 Stormwater Network

A combination of pipes, open drains and a stormwater pond are required for the stormwater system of the Structure Plan area such that new and existing properties (RL 11.28m) will not be inundated in the 2% AEP rainfall event.

The existing Cow Shed Drain and Serpentine Drain will need to be re-shaped and widened, while a new drain west of Eriksen Road would need to be constructed. A new pond with an approximate footprint of 4.4 hectares and a pump station with a discharge capacity of 4.5m^3/s would also be required. To service the new pump station, a new pumping main and beach discharge structure would be required. The exact location for these structures will be determined at a later stage following detailed design.

7.2 Wastewater Network

A traditional sewerage network is feasible within the Structure Plan area; however it requires 5 pump stations in order to meet grade and depth criteria.

The total peak design flow for the Structure Plan area is 40 L/s. This flow will be pumped to a new pressure main and discharged to the Awatoto milliscreen plant. A total of 5 pump stations are included within the Structure Plan area, two of which are part of the Te Awa Estates development, with the other three servicing the remaining development.

7.3 Water Supply Network

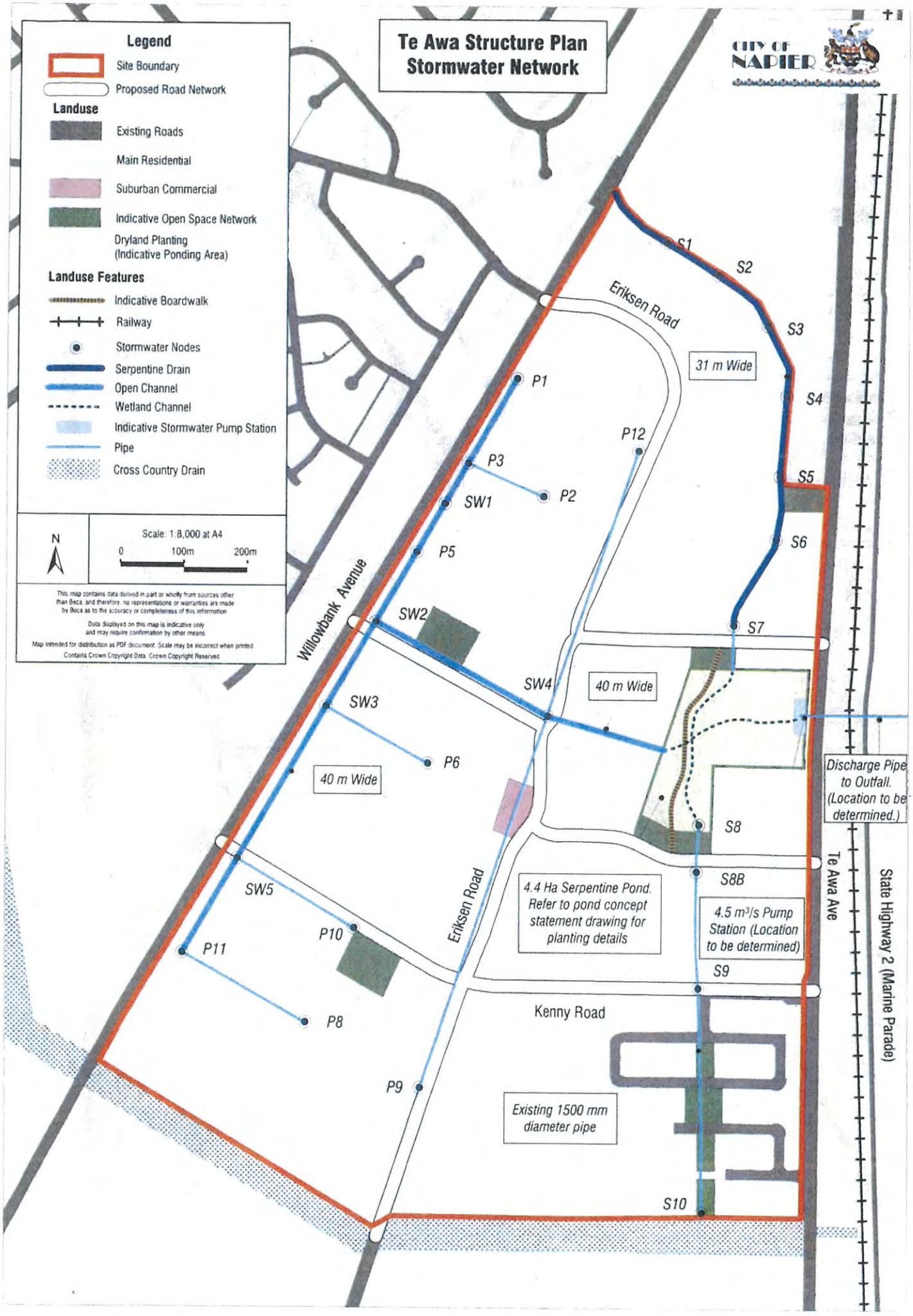
The water supply network will be provided at the south of the Structure Plan area from a connection to a proposed 450mm main from Eriksen Road. A 200mm ring main will provide reticulation around the Structure Plan area, with 100mm and 150mm internal mains supplying local streets.

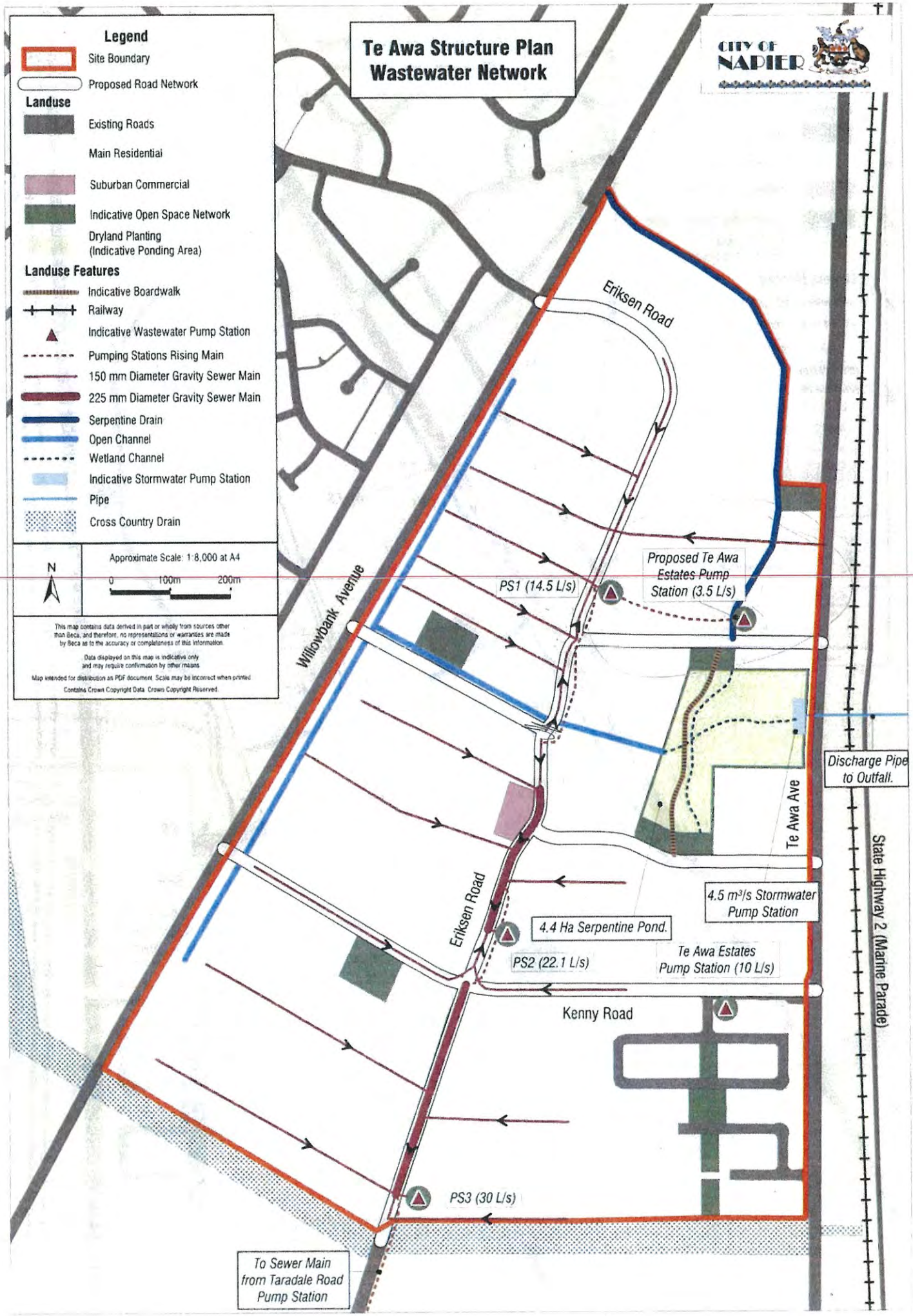
A secondary supply point will be provided at the North of the network via a proposed main serviced by the Awatoto trunk main.

The peak residential demand from the Structure Plan area is 59 L/s, with a total demand during fire flow of 64.4 L/s.

Appendix A

Proposed Infrastructure Network Layouts


Te Awa Structure Plan
Stormwater Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Stormwater Nodes
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Scale: 1:8,000 at A4
0 100m 200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information
Data displayed on this map is indicative only and may require confirmation by other means
Map intended for distribution as PDF document. Scale may be incorrect when printed
Contains Crown Copyright Data. Crown Copyright Reserved
Eriksen Road
31 m Wide
40 m Wide
40 m Wide
Willowbank Avenue
Eriksen Road
Kenny Road
Te Awa Ave
State Highway 2 (Marine Parade)
Discharge Pipe to Outfall. (Location to be determined.)
4.4 Ha Serpentine Pond. Refer to pond concept statement drawing for planting details
4.5 m³/s Pump Station (Location to be determined)
Existing 1500 mm diameter pipe
S1
S2
S3
S4
S5
S6
S7
S8
S8B
S9
S10
P1
P2
P3
P5
P6
P8
P9
P10
P11
P12
SW1
SW2
SW3
SW4
SW5


Te Awa Structure Plan
Wastewater Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Indicative Wastewater Pump Station
Pumping Stations Rising Main
150 mm Diameter Gravity Sewer Main
225 mm Diameter Gravity Sewer Main
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Approximate Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
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Map intended for distribution as PDF document. Scale may be incorrect when printed.
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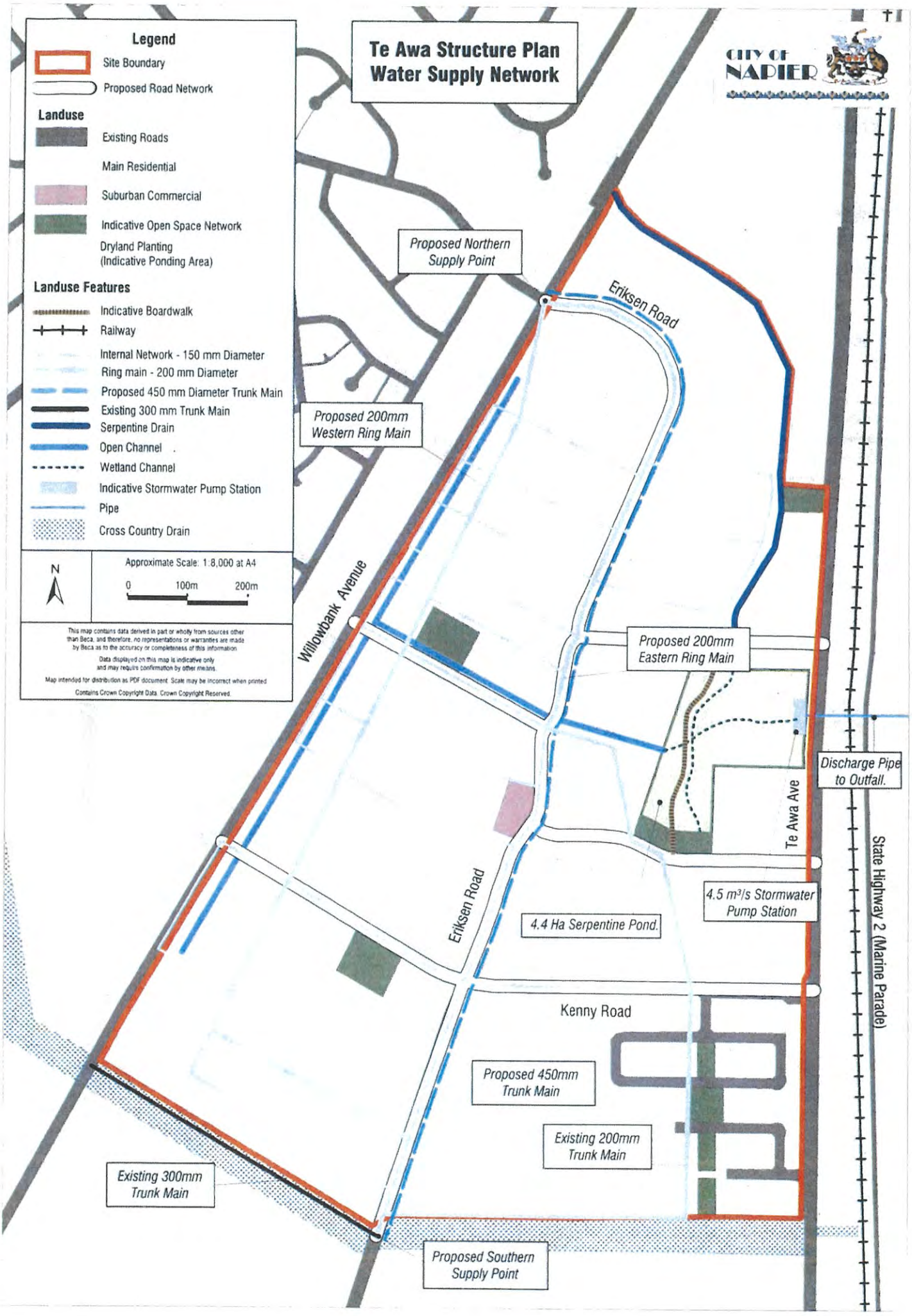
Eriksen Road
Willowbank Avenue
PS1 (14.5 L/s)
Proposed Te Awa Estates Pump Station (3.5 L/s)
Discharge Pipe to Outfall.
Te Awa Ave
State Highway 2 (Marine Parade)
4.5 m³/s Stormwater Pump Station
4.4 Ha Serpentine Pond.
PS2 (22.1 L/s)
Te Awa Estates Pump Station (10 L/s)
Kenny Road
PS3 (30 L/s)
To Sewer Main from Taradale Road Pump Station


Te Awa Structure Plan
Water Supply Network
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Indicative Boardwalk
Railway
Internal Network - 150 mm Diameter
Ring main - 200 mm Diameter
Proposed 450 mm Diameter Trunk Main
Existing 300 mm Trunk Main
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
N
Approximate Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
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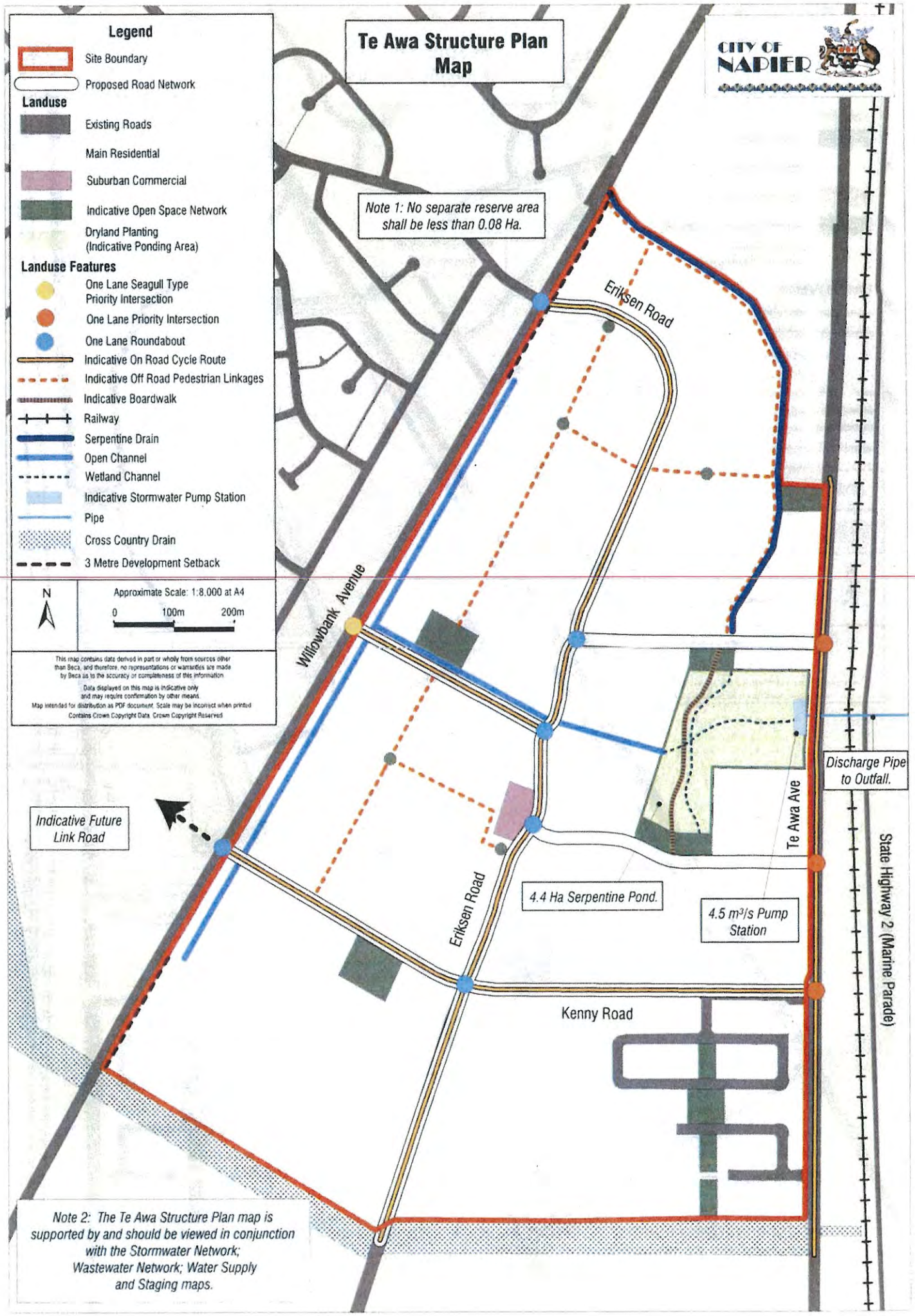
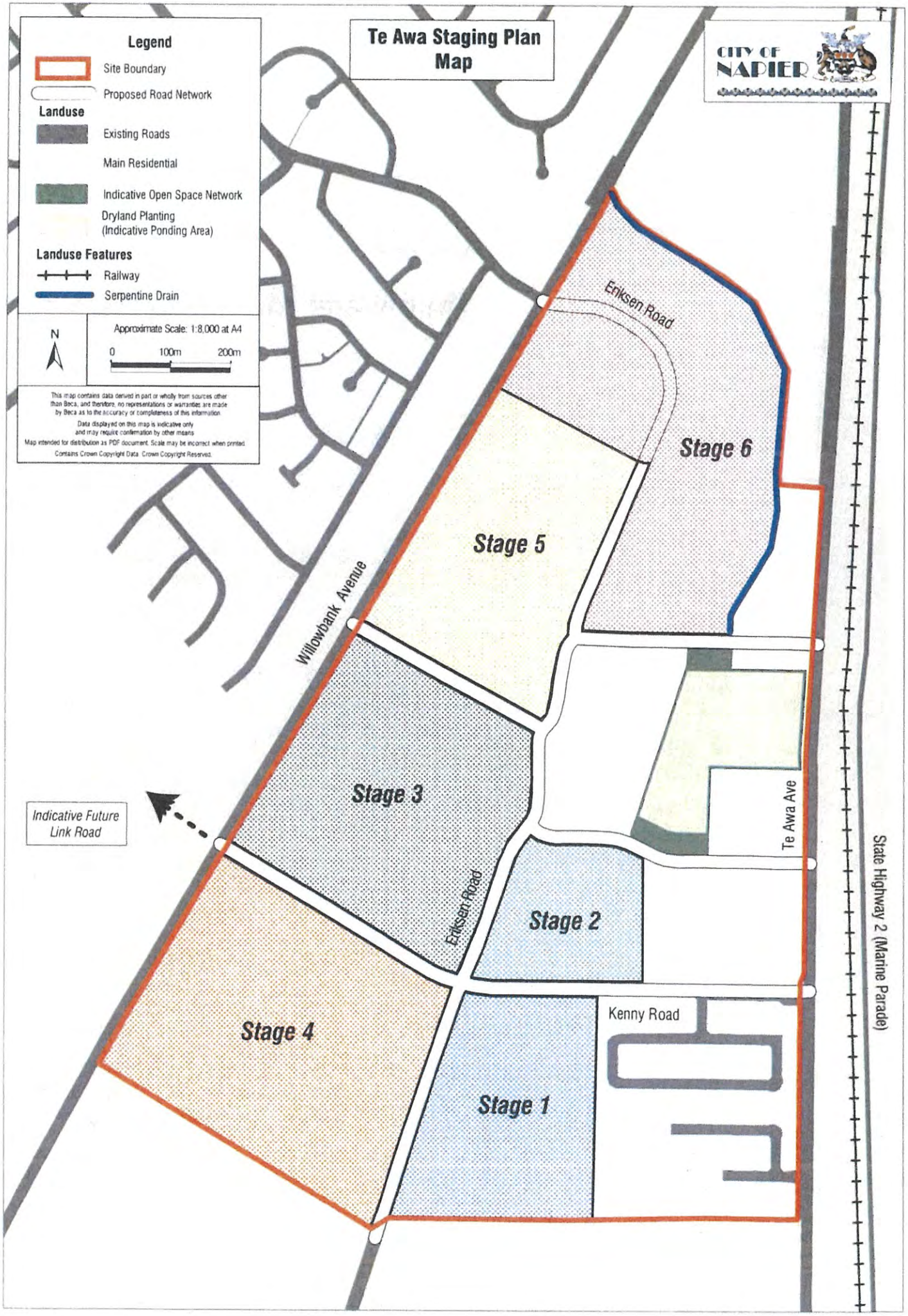
Proposed Northern Supply Point
Eriksen Road
Proposed 200mm Western Ring Main
Willowbank Avenue
Proposed 200mm Eastern Ring Main
Discharge Pipe to Outfall.
Te Awa Ave
State Highway 2 (Marine Parade)
4.5 m³/s Stormwater Pump Station
4.4 Ha Serpentine Pond.
Eriksen Road
Kenny Road
Proposed 450mm Trunk Main
Existing 200mm Trunk Main
Existing 300mm Trunk Main
Proposed Southern Supply Point


Te Awa Structure Plan Map
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
One Lane Seagull Type Priority Intersection
One Lane Priority Intersection
One Lane Roundabout
Indicative On Road Cycle Route
Indicative Off Road Pedestrian Linkages
Indicative Boardwalk
Railway
Serpentine Drain
Open Channel
Wetland Channel
Indicative Stormwater Pump Station
Pipe
Cross Country Drain
3 Metre Development Setback
N
Approximate Scale: 1:8,000 at A4
0 100m 200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information
Data displayed on this map is indicative only and may require confirmation by other means.
Map intended for distribution as PDF document. Scale may be incorrect when printed
Contains Crown Copyright Data. Crown Copyright Reserved
Note 1: No separate reserve area shall be less than 0.08 Ha.
Eriksen Road
Willowbank Avenue
Indicative Future Link Road
Eriksen Road
4.4 Ha Serpentine Pond.
4.5 m³/s Pump Station
Te Awa Ave
Discharge Pipe to Outfall.
State Highway 2 (Marine Parade)
Kenny Road
Note 2: The Te Awa Structure Plan map is supported by and should be viewed in conjunction with the Stormwater Network; Wastewater Network; Water Supply and Staging maps.


Te Awa Staging Plan Map
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Indicative Open Space Network
Dryland Planting (Indicative Ponding Area)
Landuse Features
Railway
Serpentine Drain
N
Approximate Scale: 1:8,000 at A4
0
100m
200m
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Eriksen Road
Stage 6
Stage 5
Willowbank Avenue
Stage 3
Indicative Future Link Road
Te Awa Ave
State Highway 2 (Marine Parade)
Eriksen Road
Stage 2
Kenny Road
Stage 4
Stage 1

Appendix B

Stormwater Modelling Report

Report

Te Awa Structure Plan - Stormwater Modelling Report

Prepared for Napier City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

15 September 2010

Revision History

Revision N°	Prepared By	Description	Date
A	Adrienne Khor	Draft for client review	May 2010
B	Adrienne Khor	Draft for client review	August 2010
C	Pete Campbell	Draft for client review	September 2010

Document Acceptance

Action	Name	Signed	Date
Prepared by	Adrienne Khor	pp	15th Sept 2010
Reviewed by	Ian Garside	pp	15th Sept 2010
Approved by	Amelia Linzey		15th Sept 2010
on behalf of	Beca Carter Hollings & Ferner Ltd		

Table of Contents

Appendices

1 Introduction

This stormwater modelling report has been prepared for Napier City Council (NCC) to support the Te Awa Structure Plan – Three Waters Report as a wider process of developing a Structure Plan for the Te Awa area. The area considered is approximately 125 hectares and is south of Napier City. At present the stormwater runoff generated from the Structure Plan area drains to the Serpentine Pond and is pumped by the existing Kenny Road Pump Station to Hawke Bay.

There are several stormwater management options available to NCC to manage the additional stormwater generated as a result of developing the area. In agreement with NCC, two options were examined. These options are:

- Option A – A combination of using the existing Kenny Road Pump station with a large ponding volume; and
- Option B – A combination constructing a new pump station with higher pumping capacity with a smaller ponding volume.

1.1 Purpose

A preliminary assessment undertaken in February 2010 specifically examined the sensitivity of the required pond volume versus pump station capacity. A series of different Serpentine Pond and pump sizes using input hydrographs was examined. This assessment showed that for pump size ranging from 0.9 m^3/s to 6 m^3/s, ponding volume ranging from 57,000 m^3 to 165,000m^3 for a 2% AEP rainfall event would be required. The assessment considers four hours of total pump outage at the storm peak.

Subsequently, stormwater modelling has been undertaken to confirm and refine the Serpentine Pond and pump station design for Option A and B. The objectives of the models were to determine:

- Water levels in the Serpentine Pond and development areas adjacent to the pond;
- Serpentine Pond size;
- Pump capacities; and
- Open channel size.

1.2 Sources of Information

The assessment and modelling were undertaken based on a review of available data provided by several different sources, including the following technical references, drawings and background information:

- Napier City Open Channel Drainage Network, Hydraulic Modelling Services (HMS), December 2008;
- Napier City Open Channel Drainage Network MIKE 11 Model, Hydraulic Modelling Services, May 2009;
- Te Awa Structure Plan Open Channels and Pipes Modelling Memorandum, Beca, April 2009;
- Impacts on Climate Change on High Intensity Rainfall in Napier, National Institute of Water and Atmospheric Research Ltd, April 2008;
- Existing Kenny Road Pump Operation data, Hawke's Bay Regional Council (HBRC), October 2009;
- Te Awa Estates Development Contract Number 2 Roading As-Builts Drawing, Works Infrastructure Ltd, December 2006;
- Te Awa Estates Development Contract Number 5 Roading As-Builts Drawing, Downer EDI Works Ltd, May 2008;

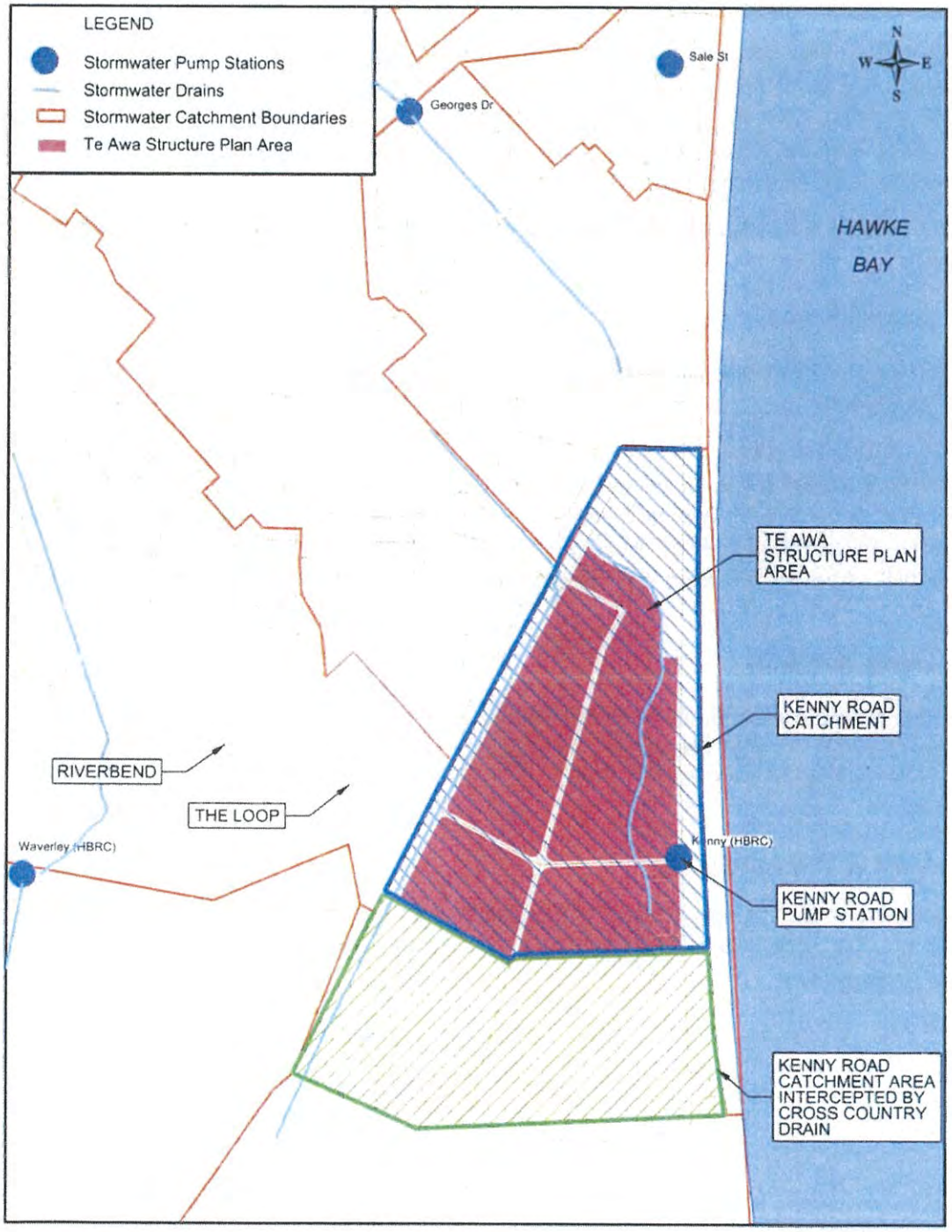
- Te Awa Estates Development Site Levels and Depth of Fill Plan Contract Number 2, Works Infrastructure Ltd, December 2006;
- Te Awa Estates Development Site Levels and Depth of Fill Plan Contract Number 3, Downer EDI Works Ltd, August 2007;
- Stage 3 Te Awa Estates Earthworks Finished Levels As-Built, Civil Sevices (HB) Ltd, November 2008; and
- Te Awa Estates Residential Development Stages V-XIII, Takis Koutsos Engineering Consultants Ltd, September 2009.

2 Hydrology

2.1 Catchment

The figure below shows the Structure Plan area stormwater catchment boundary, which equates to approximately 125 hectares.

Figure 1: Stormwater Catchment Boundary



An existing 1500mm diameter pipe within the existing Te Awa Estates land connects the Te Awa Structure Plan stormwater catchment and the Cross Country Drain (CCD) stormwater catchment. Te Awa Estates was required to install a valve to stop flows from their development entering the

CCD and vice versa. Therefore, the catchment is hydraulically isolated from the adjacent CCD, Riverbend and Plantation catchments. These catchments are located west of Willowbank Avenue.

2.2 Rainfall

2.2.1 Rainfall Depths

The 10% annual exceedance probability (AEP) 12 hour duration storm and 2% AEP 24 hour duration storm events were used in the hydrological assessment. These storm durations were chosen as historical modelling work undertaken by HMS showed that these were the dominant storm durations that would have a strong influence on the stormwater system sizing.

The 10% AEP 12 hour duration storm and 2% AEP 24 hour rainfall depths are 99mm and 189mm respectively. These are the year 2090 rainfall depths for Taradale which included the mid-range temperature climate change scenario. The rainfall depths were extracted from the NIWA report[1] for high intensity rainfall in Napier. The rainfall depths for year 2090 were used as the planned infrastructure asset life is between 80 to 100 years.

Refer to Appendix A for the year 2090 rainfall depths for a range of rainfall return periods and durations.

2.2.2 Rainfall Pattern

For the previous modelling study, HMS used a rainfall profile that is similar to the NIWA nested rainfall hydrograph.

For this assessment, a more conservative rainfall profile has been used. The updated profile has a higher peak compared to the previous profile. This is predominantly due to the fact that the main design output is the maximum water level in the Serpentine Pond and development areas adjacent to the pond which would affect the new building levels. This is of importance to ensure that building levels sit well above the expected 2% AEP flood level. Refer to Appendix B for the hyetograph used.

2.3 Curve Numbers

Residential density is assumed to be approximately 12 lots/ha. Therefore, a residential volumetric runoff coefficient of C = 0.55 was assumed for the design of the pond and pump capacity as specified by the Napier City Code of Practice. This corresponds with a weighted curve number (CN) of 74.

2.4 Time of Concentration

On average the time of concentration is 15 minutes for each subcatchment. Calculations were undertaken using Desbordes Formula and the method recommended by Clause E1 of the New Zealand Building Code.

[1] Impacts of Climate Change on High Intensity Rainfall in Napier. National Institute of Water and Atmospheric Research Ltd. April 2008.

3 Modelling & Hydraulic Analysis

Infoworks CS was used to model both the catchment runoff and to simulate the hydraulics of the Serpentine Drain, Serpentine Pond, the existing pipe between the Cross Country Drain (CCD) and pond, and the pump station capacity.

3.1 Methodology

Two models were created to simulate Option A and B, described in Section 1 for the 10% AEP and 2% AEP rainfall events.

For Option A, the model consists of the Serpentine Drain, proposed large Serpentine Pond, existing 1500mm diameter pipe within the developed Te Awa Estates connected to the CCD, proposed pipe between Kenny Road Pump Station and the pond, and existing Kenny Road Pump Station.

For Option B, the model consists of the Serpentine Drain, proposed smaller Serpentine Pond, open channels to the west of Eriksen Road, existing 1500mm diameter pipe within the developed Te Awa Estates connected to the CCD, proposed pipes between Kenny Road and the pond, and a new pump station adjacent to the Serpentine Pond.

For each option, two scenarios were modelled – one without pump failure (normal operating conditions) and another with pump failure.

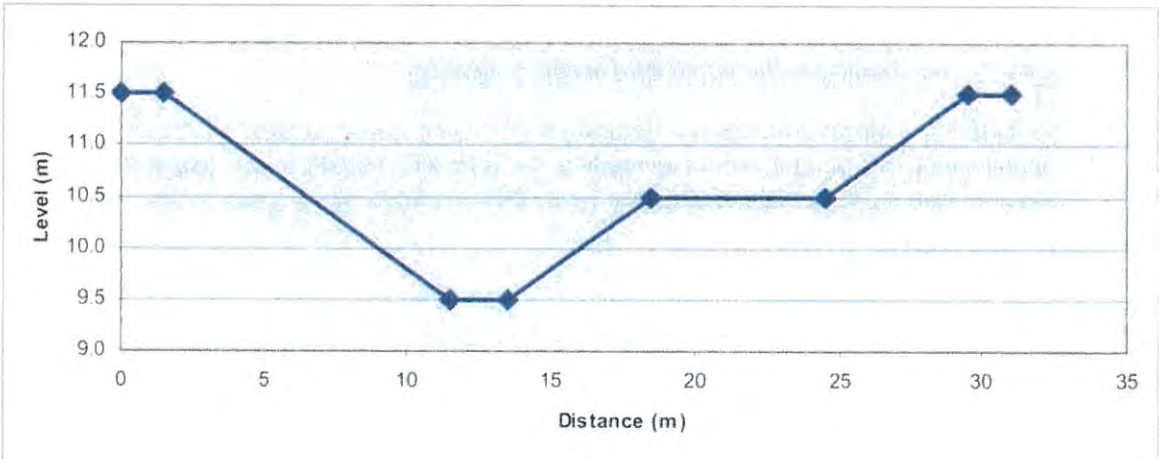
Refer to Appendix C for the model layouts.

3.2 Hydraulic Assumptions

3.2.1 Cross-Sections

The Serpentine Drain cross-sections were extracted from the MIKE 11 model provided by HMS. These cross-sections were updated in model such that drain batters have a 1:5 slope and a 6m berm for maintenance purpose. The figure below shows the proposed typical Serpentine Drain cross section.

Figure 2 – Proposed Typical Serpentine Cross Section



The modelled longitudinal slope of the Serpentine drain is 1:1000.

3.2.2 Roughness Coefficient

The channel roughness coefficient, Manning's n, used for the Serpentine drain is 0.03. This value is reasonable for a channel kept in a reasonable condition with grassed banks as recommended by Clause E1 of the New Zealand Building Code.

The Manning's n used for the existing and proposed 1500mm diameter pipes is 0.013 for circular concrete pipes as recommended by Clause E1 of the New Zealand Building Code.

3.3 Pump Failure

One of the scenarios assessed included pump failure. Similar to the CCD pump station design, the model included four hours of pump failure at storm peak (two hours before and after the storm peak). Therefore, pump failure buffer volume needed to be accounted for in sizing the Serpentine Pond.

For the 10% AEP 12 hour storm duration, the model is simulated for 12 hours from 0:00 hour to 12:00 hour. The pump failure for this storm duration occurs between 5:00 to 9:00 hour.

For the 2% AEP 24 hour storm duration, the model is simulated for 24 hours from 0:00 hour to 24:00 hour. The pump failure for this storm duration occurs between 12:00 to 16:00 hour.

3.4 Key Design Criteria

There were several key design criteria which were used to develop and assess the stormwater management options. The key design and performance criteria are described below in order of importance.

1 Maximum water level for the 2% AEP rainfall event in the proposed Serpentine Pond and the areas adjacent to the pond shall not exceed RL 11.28m to prevent water entering properties. This would also avoid Section 73 notices relating to inundation from being issued.

2. Floor level must be at RL 11.58m or higher to provide a minimum freeboard of 300mm from the 2% AEP rainfall event maximum water level under normal operating conditions.

3. New floor levels will have a minimum freeboard of 400mm from the 2% AEP rainfall event maximum water level under normal operating conditions. This freeboard can be reduced in an event of total pump failure (total pump outage for 4 hours), where sectional flooding can occur but no flooding to habitable floor levels is allowed.

4. No flooding is allowed on road carriageways for rainfall events smaller than the 10% AEP rainfall event. For rainfall events exceeding the 10% AEP rainfall event, runoff is allowed to pond on road carriageways and berms up to 300mm above sump grate levels.

4 Option A Modelling Results

For Option A, there is no change to the existing pump station with the exception of extending the existing 1500mm diameter pipe northwards to connect into the pond. The existing Kenny Road Pump Station will be retained with no provision of additional pumping capacity. This pump station is located at the junction of Kenny Road and Te Awa Avenue. The model layout is shown in Appendix C.

A large pond would be required to provide enough stormwater storage to utilise the existing pump station such that the design criteria of maximum water level of RL 11.28m in the pond is met. It is likely that the pond required will encroach into developable land.

Numerous modelling simulations and trials were undertaken in order to determine the pond size required. The following sections below outline the best practicable mitigation scenarios (with and without pump failure) for Option A.

4.1 Pump Capacity

The existing Kenny Road Pump Station data was provided by HBRC. The pump station contains three pumps, each with a pumping capacity of 0.35m^3/s. HBRC advised that these pumps operate at 80% capacity. As a result of that, the pumps in the model operate at a constant discharge capacity of 0.28m^3/s. The pump station operational data modelled is outlined in the table below.

Table 1 – Option A – Existing Kenny Road Pump Station Data

Parameter	Values
Number of pumps	3
Total Discharge Capacity	0.96m^3/s
Each Pump Discharge Capacity (at 80%)	0.28m^3/s
All three pumps	
Switch On Level	RL 9.00m
Switch Off Level	RL 8.80m

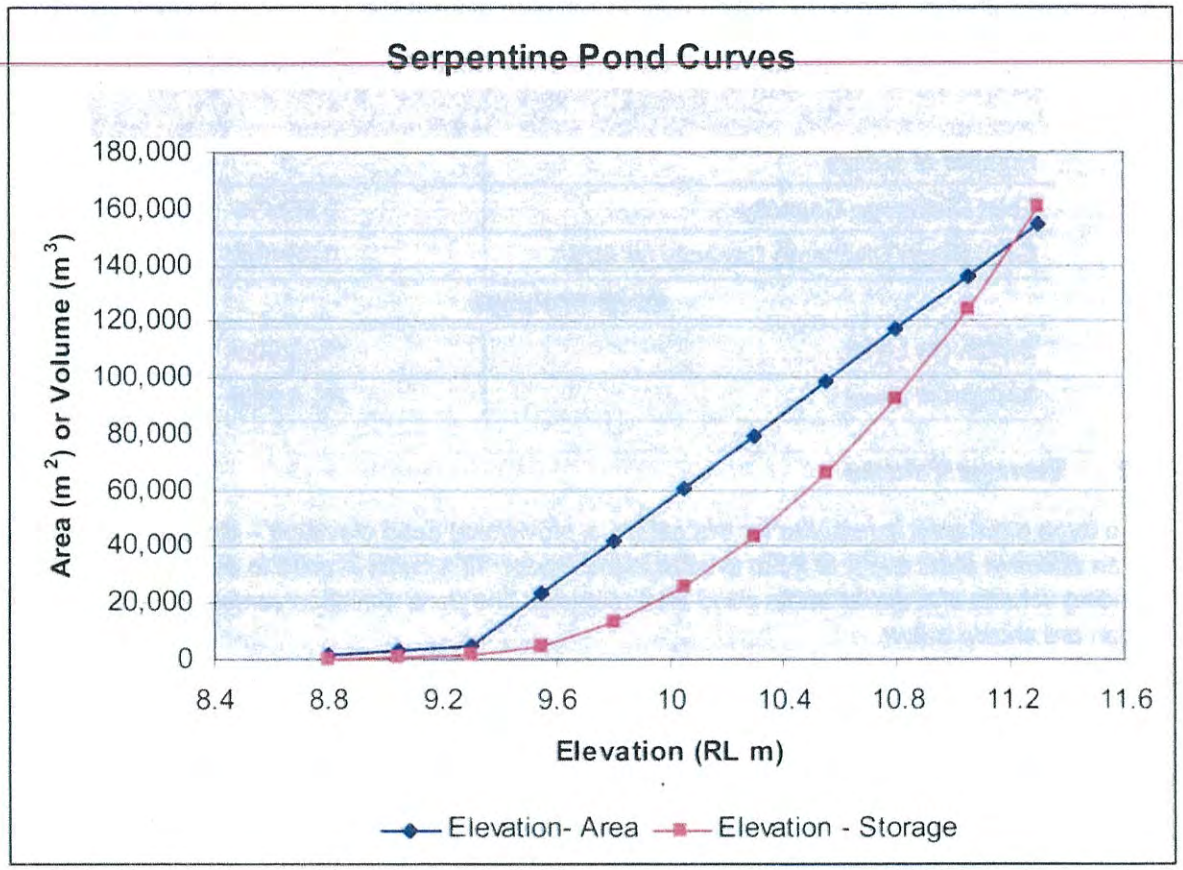
4.2 Storage Volume

As a large pond area is required for this option, a provisional pond elevation – storage curve based on an effective pond depth of 2.5m is used in the model. This curve is used to determine the total ponding volume and approximate pond area required. The pond elevation versus storage curve and graph are shown below.

Table 2 - Option A – Serpentine Pond Elevation – Storage Curve

Elevation (RL m)	Cumulative Area Area (m^2)	Cumulative Volume (m^3)
8.80	1,500	0
9.05	3,000	563
9.30	4,500	1,500
9.55	23,250	4,969
9.80	42,000	13,125
10.05	60,750	25,969
10.30	79,500	43,500
10.55	98,250	65,719
10.80	117,000	92,625
11.05	135,750	124,219
11.30	154,500	160,500

Figure 3: Option A – Serpentine Pond Elevation – Storage Graph



4.3 No Pump Failure

It is assumed that no pump failure occurs at the storm peak for this scenario. The tables below summarise the model outputs for both the 2% AEP and 10% AEP rainfall events.

Table 3 - Option A - No Pump Failure Scenario for the 2% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 11.12 m
Maximum flood volume in the pond	132,500m^3
Storm peak	14:00 hour
Ponding duration	In excess of 3 days
Pump capacity	0.84 m^3/s

Table 4 - Option A - No Pump Failure Scenario for the 10% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 10.38 m
Maximum flood volume in the pond	49,600 m^3
Storm peak	07:00 hour
Ponding duration	1 day 2 hours
Pump capacity	0.84 m^3/s

For both the 2% AEP and 10% AEP rainfall events, the ponded stormwater is confined to the pond and it does not breach the pond batter. The tables above show that under the normal operating condition scenario the maximum water level for a 2% AEP event is RL 11.12m. This corresponds to a ponding area of approximately 14.9 hectares (refer Table 2) is required.

The pond is inundated for a significant period of time for both rainfall events before all the stormwater is pumped out of the pond.

4.4 With Pump Failure

For this scenario pump failure occurs for four hours at the storm peak as described in Section 3.3. The tables below summarise the model outputs for both the 2% AEP and 10% AEP rainfall events.

Table 5 - Option A - With Pump Failure Scenario for the 2% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 11.19 m
Maximum flood volume in the pond	143,500 m^3
Storm peak	14:00
Ponding duration	In excess of 3 days
Pump capacity	0.84 m^3/s

Table 6 - Option A - With Pump Failure Scenario for the 10% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 10.51 m
Maximum flood volume in the pond	61,000 m^3
Storm peak	07:00
Ponding duration	1 day 5 hours
Pump capacity	0.84 m^3/s

5 Option B Modelling Results

A further refinement to Option A was to abandon the existing Kenny Road Pump Station and the open drain connecting it to the Serpentine Pond to form Option B. The model layout is shown in Appendix C.

A new pump station adjacent to the Serpentine Pond, a pumping main and beach discharge would be required to discharge stormwater from the pond into Hawke Bay. The pump capacity needs to be designed to meet the design criteria such that the maximum water level in the pond shall not exceed RL 11.28m.

Similar to Option A, numerous modelling simulations and trials were undertaken in order to determine the pond size, open channel sizes west of Eriksen Road and pumping capacity required to service the Structure Plan area. The following sections below outline the best practicable mitigation scenarios (with and without pump failure) for Option B which provides the best balance between the pond size, open channel size and pumping capacity.

5.1 Pump Capacity

The new pump station in the model operates at a constant discharge capacity to pump stormwater from the pond to the outlet. The model showed that a pump with a 4.5 m^3/s pump capacity is required to reduce the flood level to less than RL 11.28m for the 2% AEP rainfall event. The new pump station operational data modelled is outlined in the table below.

Table 7 - Option B - New Pump Station Data

Parameter	Values
Discharge Capacity	4.5 m^3/s
Switch On Level	RL 9.00m
Switch Off Level	RL 8.80m

5.2 Storage Volume

5.2.1 Serpentine Pond Storage

Considerable effort has been put into the design of the pond concept to set its invert level and size. Refer to Appendix E for the proposed Serpentine Pond shape. The required pond footprint required for this option is 4.4 hectares. The invert of the wetland channels are RL 8.60m and the average invert of the open grass areas are RL 9.35m. The top batter of the pond is RL 11.28m. The normal water level in the pond is RL8.80m and is controlled by the pump operational levels. Under the normal day to day operation, stormwater will be confined to the wetland channels.

The recommended minimum gradient for the pond is 1:100.

5.2.2 Carriageway and Berm Storage

It is proposed that the road carriageway and berm within the Structure Plan area also function as stormwater storage area for rainfall events larger than the 10% AEP event.

An assessment of the existing development within the Structure Plan area showed that the average sump lid level for Stage 2 and 5 of the Te Awa Estates developments are RL 11.21m and RL 11.11m respectively. For modelling purpose, an average of RL 11.16m is adopted as the new sump lid level for the development adjacent to the pond (Stages V-XIII).

Based on the as-built drawings provided, the average total carriageways and berms width is approximately 16.70m. The total carriageway and berm area comprise of 17.5% of Stage V-XIII subcatchments. The additional storage provided in the carriageway and berm for Stage V-XIII is calculated based on the values described above to simulate the total available stormwater storage volume in the model.

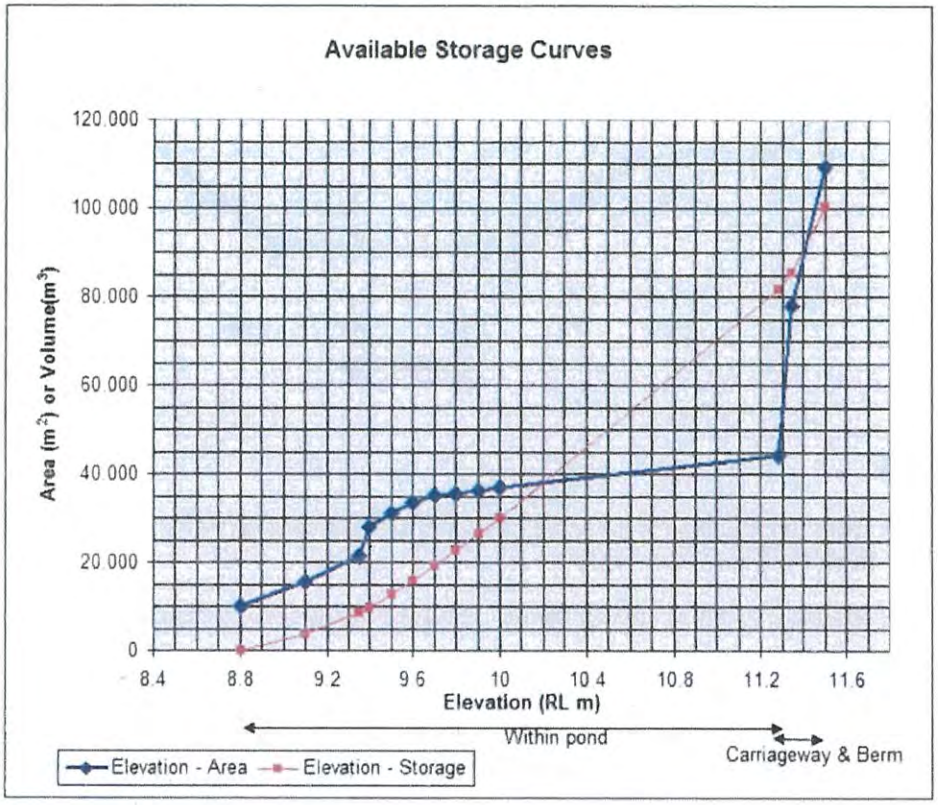
For the remainder of the subcatchments west of Eriksen Road, it is assumed that 15% of each subcatchment area will form the carriageway and berm areas for local stormwater ponding. Refer to Appendix G for subcatchment boundaries.

The elevation versus combined storage curve and graph are shown below.

Table 8 - Option B Elevation – Storage Curve

Elevation (RL m)	Cumulative Area(m^2)	Cumulative Volume (m^3)
8.80	10,096	0
9.10	15,480	3,836
9.35	21,486	8,457
9.40	27,827	9,690
9.50	30,999	12,631
9.60	33,329	15,848
9.70	35,141	19,271
9.80	35,665	22,811
9.90	36,377	26,413
10.00	36,765	30,071
11.28	44,462	81,760
11.34	77,977	85,420
11.50	109,181	100,392

Figure 4: Option B – Elevation – Storage Curve Graph



5.3 Open Channels

The Serpentine Drain cross-sections used in the model are described in Section 3.2.1.

Several open channels are required to service the Structure Plan area. The locations of these open channels are adjacent to Willowbank Avenue, running north to south and the widened Cow Shed Drain that runs west to east into the Serpentine Pond. The stormwater layout and proposed location of these channels are shown in Appendix C.

The typical cross section of the Cow Shed Drain open channel has a 1:5 batter and a 6m berm for maintenance purposes. The Willowbank Avenue open channel has a 1:5 batter and two 6m berms. The longitudinal slope for these open channels is 1:2000. Figure 5 shows the typical open channel cross section at Willowbank Avenue and Figure 6 shows the widened Cow Shed Drain.

Figure 5: Option B – Typical Open Channel Cross Section at Willowbank Avenue

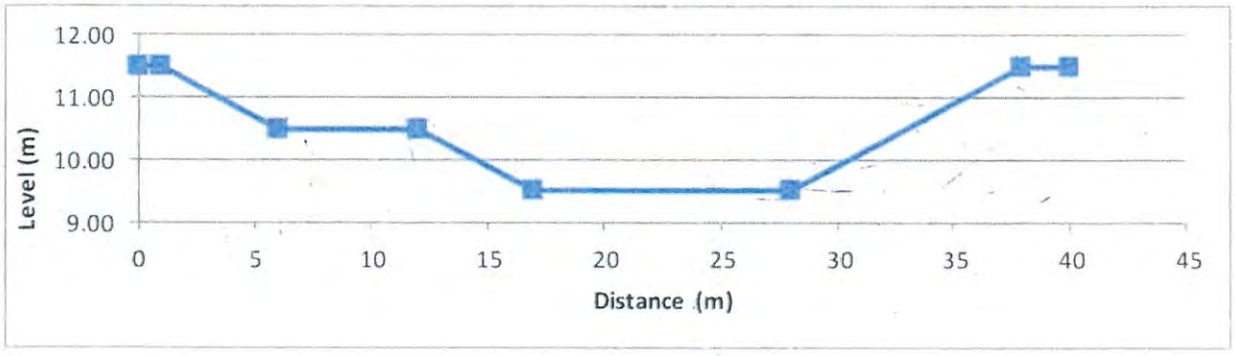
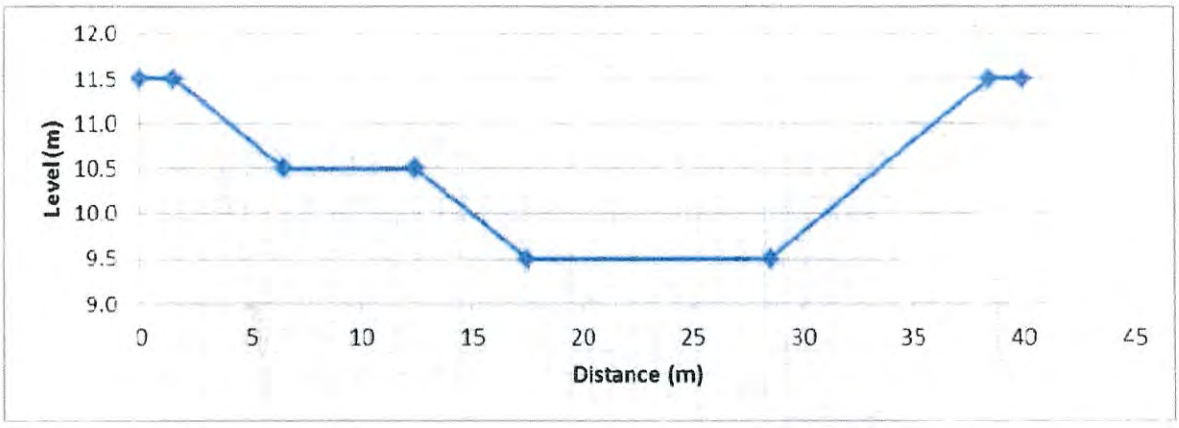


Figure 6: Option B – Cow Shed Drain



5.4 Pipes

Circular pipes were used in the model to service subcatchments west of Eriksen Road. These pipes were sized to meet the following criteria:

- In the 10% AEP event with no pump failure, pipes are allowed to surcharge up to the sump grate levels.
- In the 2% AEP event with no pump failure, pipes are allowed to surcharge 300mm above the sump grate levels. In the event of total pump failure, the surcharge can exceed 300mm above the sump grate levels, where sectional flooding can occur but no flooding to habitable floor levels.

The roughness coefficient, Manning's n, used in the model is 0.013. The proposed pipes sizes are shown below.

Table 9 - Option B – Proposed Pipe Sizes

Upstream Node	Downstream Node	Circular Pipe Diameter (mm)
P2	P3	825
P4	P5	750
P6	SW3	900
P10	SW5	1050
P8	P11	900
P9	SW4	450
P12	SW4	450
S10	S9	1500
S8B	S8	2 x 1350
S9	S8B	2 x 1350

The pipe sizes shown above are largely determined by the second design criteria described above, whereby larger pipe sizes were required such that no habitable floor flooding occurs in the 2% AEP event with total pump failure.

Circular pipes were used for modelling purpose to identify the cross sectional area required for each piped length. Note that box culverts with equivalent cross sectional area could be use instead of circular pipes.

Pipe size and design would need to be refined during the development of these subcatchments and the model re-checked once pipe design is confirmed.

5.5 No Pump Failure

It is assumed that no pump failure occurs at the storm peak for this scenario. The tables below summarise the model outputs for both the 2% AEP and 10% AEP rainfall events.

Table 10 - Option B - No Pump Failure Scenario for the 2% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 10.53m
Maximum flood volume in the pond	52,800m^3
Storm peak	14:00
Ponding duration	9.5 hours
Pump capacity	4.5m^3/s

Table 11 - Option B - No Pump Failure Scenario for the 10% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 9.70m
Maximum flood volume in the pond	21,400m^3
Storm peak	07:00
Ponding duration	3.5 hours
Pump capacity	4.5m^3/s

For both the 2% AEP and 10% AEP rainfall events, the ponded stormwater is confined to the pond and it does not breach the pond batter. The tables above show that under the optimum operating scenario, the maximum water level in the pond, pond size and pump capacity meet the key design criteria and there is no sectional or habitable floor flooding to existing properties.

5.6 With Pump Failure

For this scenario pump failure occurs for four hours at the storm peak as described in Section 3.3. The tables below summarise the model outputs for both the 2% AEP and 10% AEP rainfall events.

Table 12 - Option B - With Pump Failure Scenario for the 2% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 11.13m
Maximum flood volume in the pond[1]	77,500m^3
Storm peak	14:00
Ponding duration	15 hours
Pump capacity	4.5m^3/s

[1] Pond is overtopped with additional ponding on road carriageway and berm occuring.

Table 13 - Option B - With Failure Scenario for the 10% AEP Rainfall Event

Parameters	Values
Maximum water level in the pond	RL 10.37m
Maximum flood volume in the pond	46,500m^3
Storm peak	07:00
Ponding duration	9 hours
Pump capacity	4.5m^3/s

The model showed that the maximum water level with 4 hours total pump failure for the 2% AEP event is RL 11.13m. Runoff in both the 2% and 10% AEP events is confined to the pond.

For the 2% AEP event, the total storage buffer volume required is approximately 65,000m^3. Based on Table 10 and Table 12, a total of 24,700m^3 is stored in the pond while the remainder 40,300m^3 is stored within the Serpentine Drain and Cow Shed Drain.

5.7 Peak Water Levels in the Serpentine Drain

Peak water levels in the Serpentine Drain for both scenarios are confined within its bank. Water levels in the drain are largely influenced by the water level in the Serpentine Pond. Refer to Appendix D for the long sections showing the maximum water level in the drain.

5.8 Summary of Results

Under the normal operating conditions, the model results showed that the maximum water levels in the pond for the 2% and 10% AEP events are RL 10.53m and RL 9.70m respectively. Runoff is stored within the proposed Serpentine Pond and there is no sectional or habitable floor levels flooding to existing properties for both rainfall events based on the provision of a 4.4 hectare pond utilising the new pump station with a pumping capacity of 4.5m^3/s.

The consented minimum sectional and floor levels for the existing Te Awa Estates development are RL 11.28m and RL 11.58m respectively. Therefore, to be conservative, it is proposed to adopt a maximum water level of RL 11.28m for the 2% AEP event for this scenario. On this basis, the minimum proposed new floor level shall be RL 11.58m (RL 11.28m + 0.3m freeboard) such that there will be no sectional or habitable floor flooding to both existing and new properties.

The maximum water levels for the 2% and 10% AEP events with 4 hours total pump failure are RL 11.13m and RL 10.37m respectively. In the 2% AEP event, no existing properties will have sectional or habitable floor flooding.

5.8.1 Front Boundary Levels

Taking into account the proposed stormwater circular pipe soffit levels and open channels servicing the subcatchment west of Eriksen Road, the proposed front boundary levels are shown in the table below. The front boundary levels are calculated on the basis that there is a minimum of 500mm cover for a Z class pipe located in the berm.

Table 14 - Option B – Proposed Front Boundary Levels

Upstream Node	Front Boundary Level (RL m)
P1	11.71
P10	12.08
P2	11.65
P4	11.50
P6	11.73
P8	12.03
P9	11.26
P12	10.93

The intention of the table above is to show the minimum front boundary level (and fill) required for each subcatchment to facilitate the hydraulics of the proposed Option B stormwater system. In the future, the model would need to be updated and refined to replicate the stormwater system proposed for each subcatchment to determine the front boundary levels and (or) water levels. It is likely that these values will change based on the individual developer's stormwater system and development pattern.

6 Recommendations

Stormwater modelling was undertaken to design the stormwater management required as a result of developing the Te Awa Structure Plan area. In order to design and determine the Serpentine Pond size and pumping capacity required, two models were created to simulate the two potential stormwater management options available, and its physical and design constraints for the Structure Plan area.

It is recommended that Option B is adopted as the stormwater management option for the Structure Plan area. The following upgrades are required for this option:

- Construction of a 4.4 hectares pond;
- A new pump station with a capacity of 4.5 m^3/s adjacent to the Serpentine Pond;
- Piping of the Serpentine Drain south of the Serpentine Pond;
- Construction of new open drains adjacent to Willowbank Avenue with a total width of 40m;
- Widening and reshaping of the Cow Shed Drain to 40m wide;
- Widening and reshaping of the Serpentine Drain north of the Serpentine Pond to 31m wide; and
- Laying of pipes to channel and convey runoff from individual subcatchments.

With the above upgrades in place and under the optimal operating conditions, the proposed stormwater system is sufficient to ensure that maximum flooding level does not exceed RL 11.28m (existing sectional level) and therefore does not exacerbate flooding to existing properties in the 2% AEP 24 hour duration rainfall event. This option meets with the design criteria specified.

Should total pump failure occur during the storm peak, the stormwater overtops the pond and additional stormwater runoff is stored on road carriageways and berms such that there will no habitable floor flooding to existing and proposed habitable floor levels.

The minimum existing and proposed new habitable floor levels are RL 11.58m.

Option A is not recommended as the ponding area required is approximately 14.9 hectare. The Serpentine Pond will encroach into developable land for future residential lots, resulting in decreased residential yield.

Appendix A

Year 2090 Rainfall Depths

Table 14. Mid-Range Temperature Scenario for 2040 and 2090: Depth (mm) – Duration (hours) – Frequency (years) for Taradale.

2040

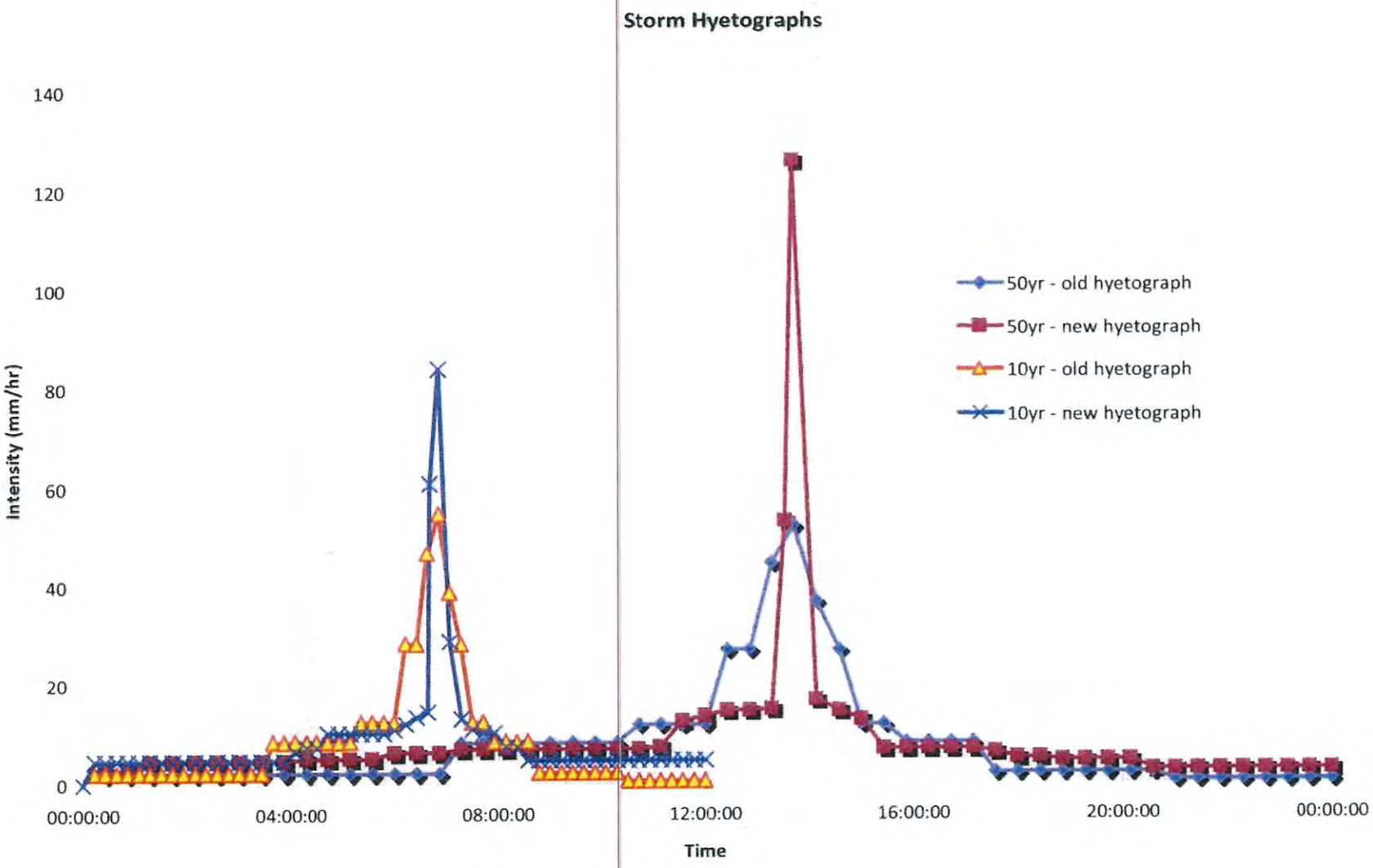
ARI (yr)	Duration (hour) 0.167	0.5	1	2	6	12	24	48	72
2	7	14	18	24	41	57	77	95	104
10	13	22	29	39	66	92	125	158	176
20	15	27	34	46	77	108	146	184	206
30	17	29	37	50	84	117	159	201	224
50	19	32	41	55	92	129	175	221	247
100	22	37	46	62	104	146	197	248	278

2090

ARI(yr)	Duration (hour) 0.167	0.5	1	2	6	12	24	48	72
2	8	15	19	26	43	60	80	99	108
10	14	24	31	42	71	99	133	168	187
20	17	29	36	49	83	116	157	198	221
30	18	31	40	54	91	127	173	217	242
50	21	35	44	60	100	140	189	239	268
100	24	40	50	68	113	158	213	269	301

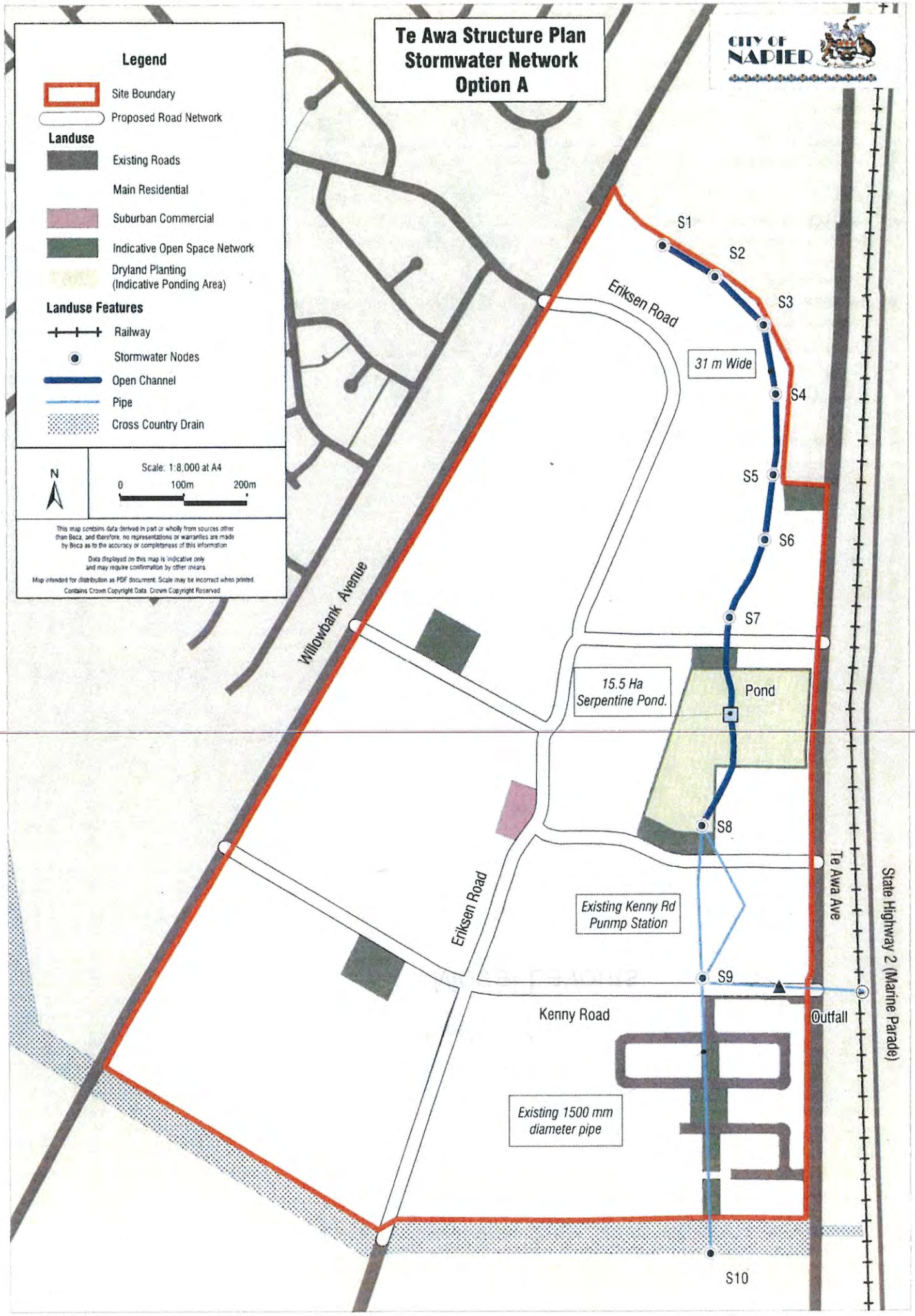
Appendix B

Rainfall Hyetographs


Storm Hyetographs
140
120
100
80
60
40
20
0
Intensity (mm/hr)
00:00:00
04:00:00
08:00:00
12:00:00
16:00:00
20:00:00
00:00:00
Time
50yr - old hyetograph
50yr - new hyetograph
10yr - old hyetograph
10yr - new hyetograph

Appendix C

Model Layouts


Te Awa Structure Plan
Stormwater Network
Option A
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Railway
Stormwater Nodes
Open Channel
Pipe
Cross Country Drain
N
Scale: 1:8,000 at A4
0
100m
200m
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Data displayed on this map is indicative only and may require confirmation by other means
Map intended for distribution as PDF document. Scale may be incorrect when printed.
Contains Crown Copyright Data. Crown Copyright Reserved
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
Eriksen Road
31 m Wide
Willowbank Avenue
15.5 Ha
Serpentine Pond.
Pond
Eriksen Road
Existing Kenny Rd
Punmp Station
Te Awa Ave
State Highway 2 (Marine Parade)
Kenny Road
Outfall
Existing 1500 mm
diameter pipe

Appendix D

Open Drain Long Sections

Option A Serpentine Drain Long Sections

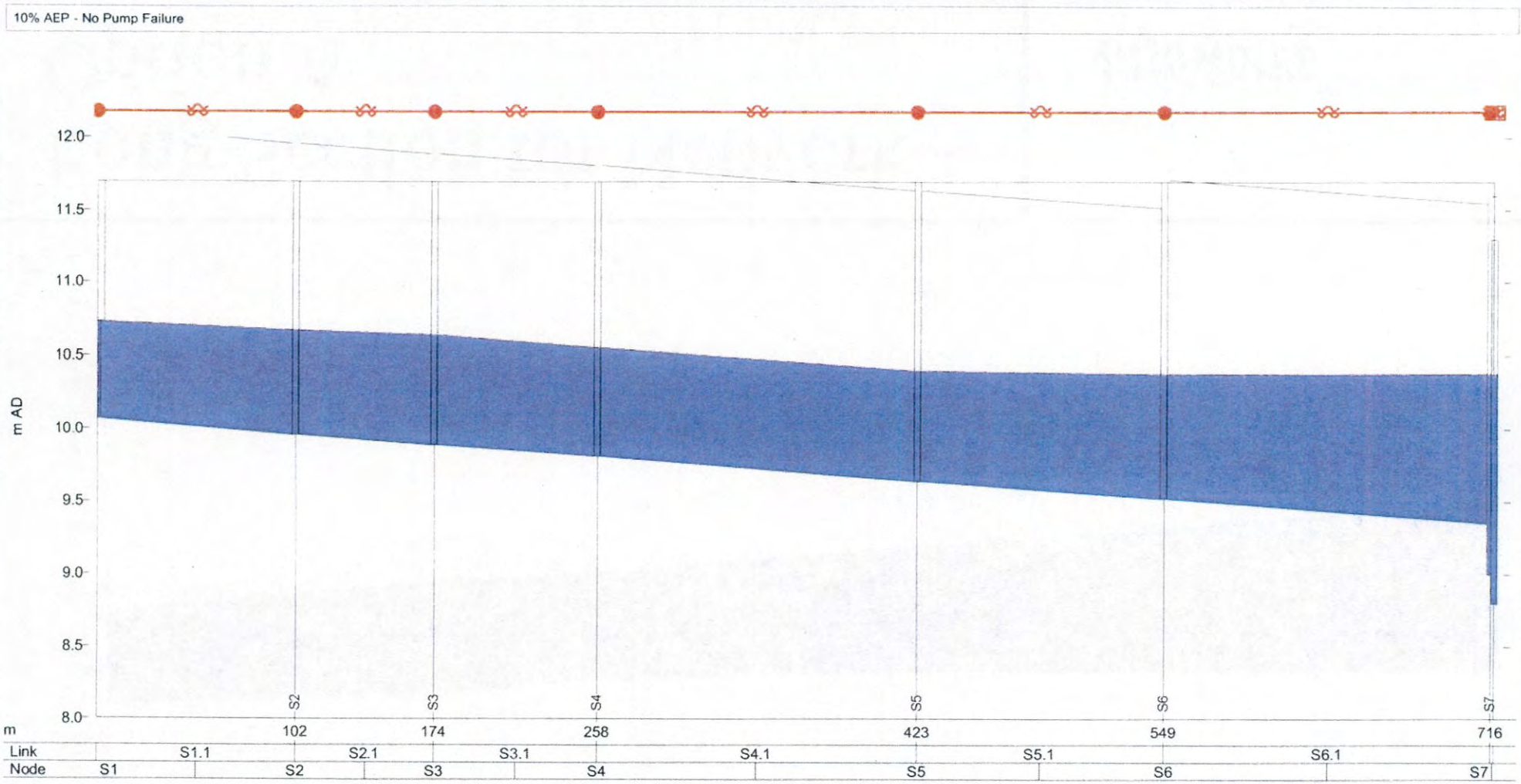
Long Sections from Node S1 to Pond

Page 1 – 10% AEP with no pump failure

Page 2 – 10% AEP with 4 hrs total pump failure

Page 3 – 2% AEP with no pump failure

Page 4 – 2% AEP with 4 hrs total pump failure



Long Section for Network - Option A

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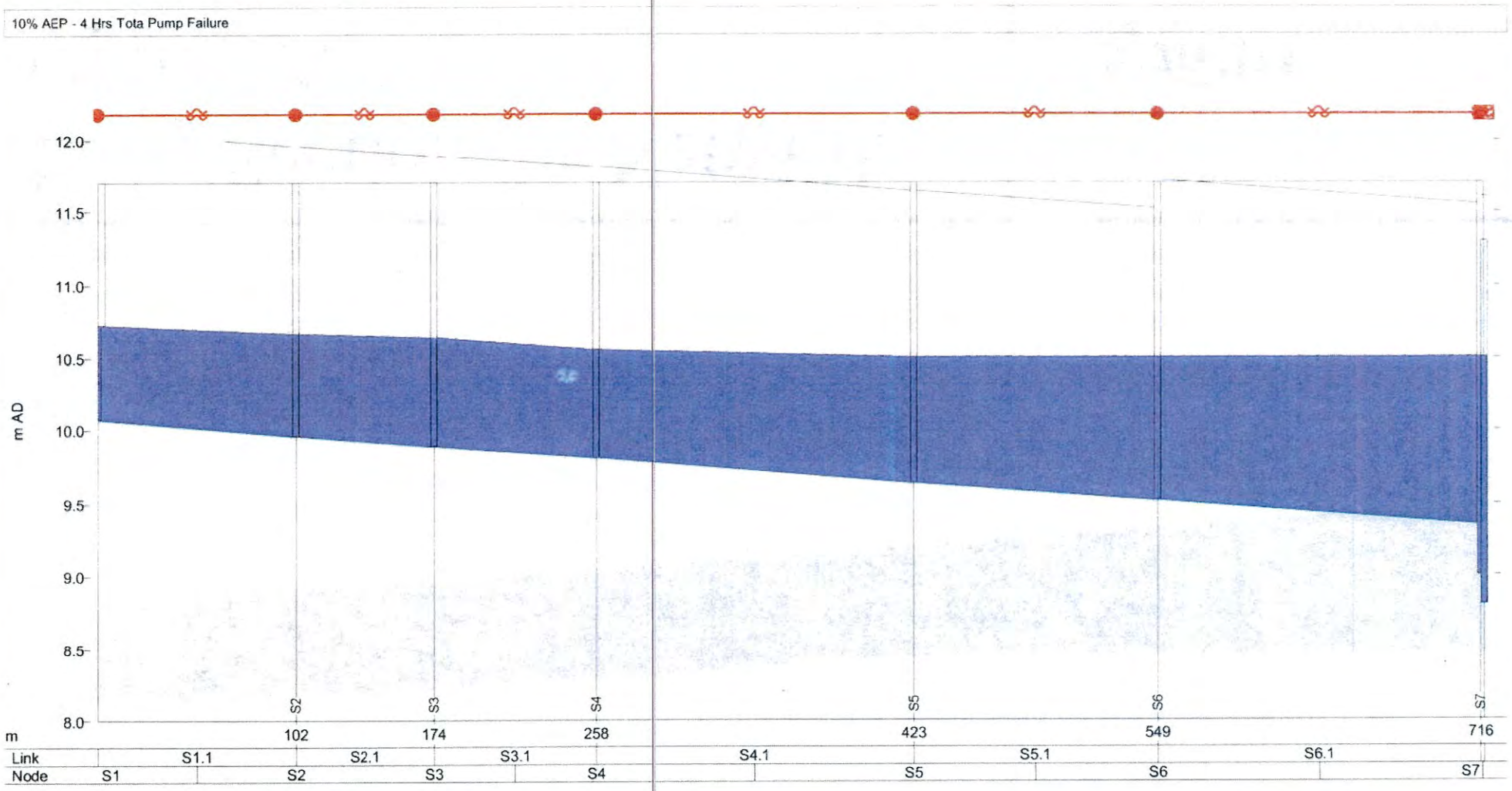
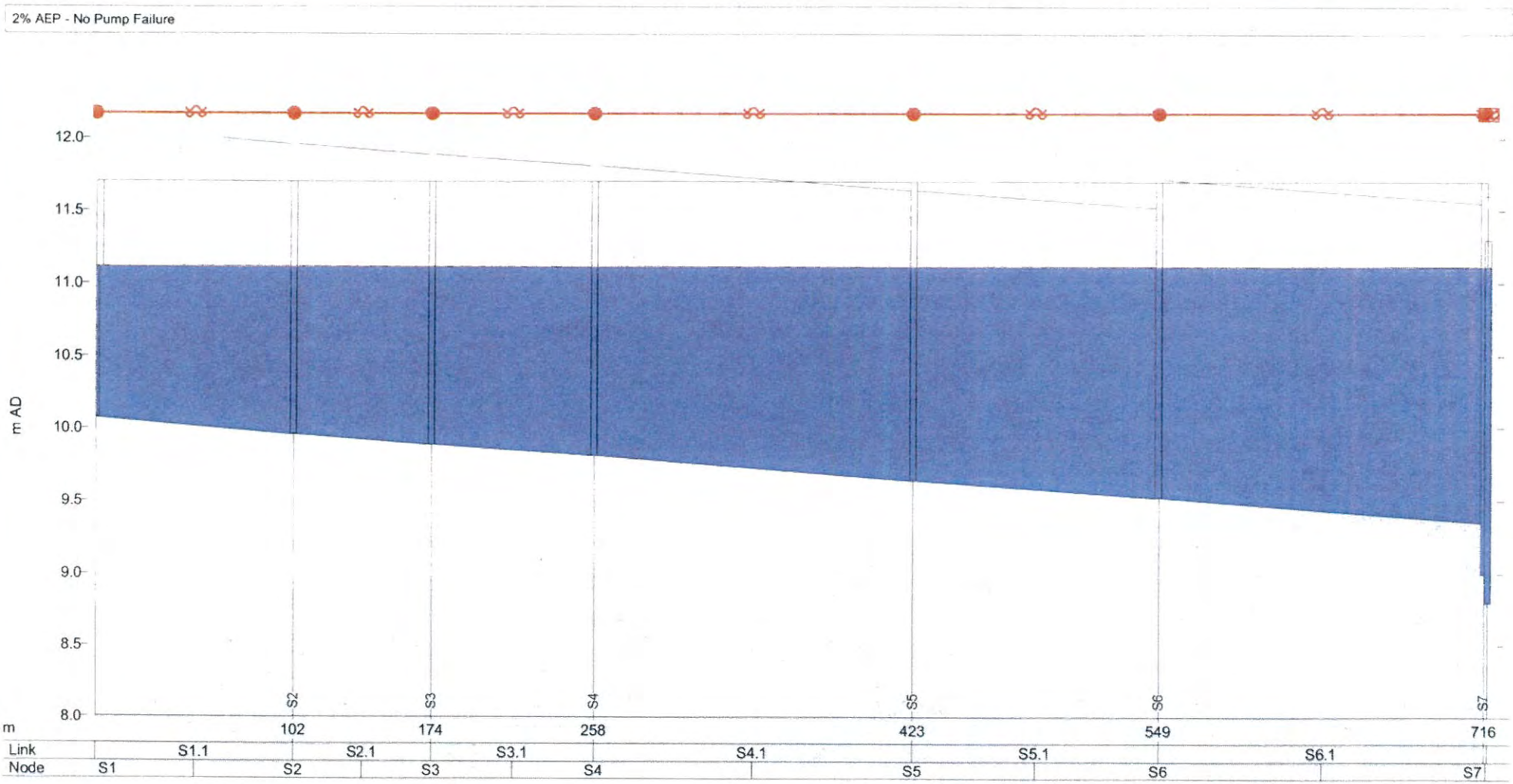


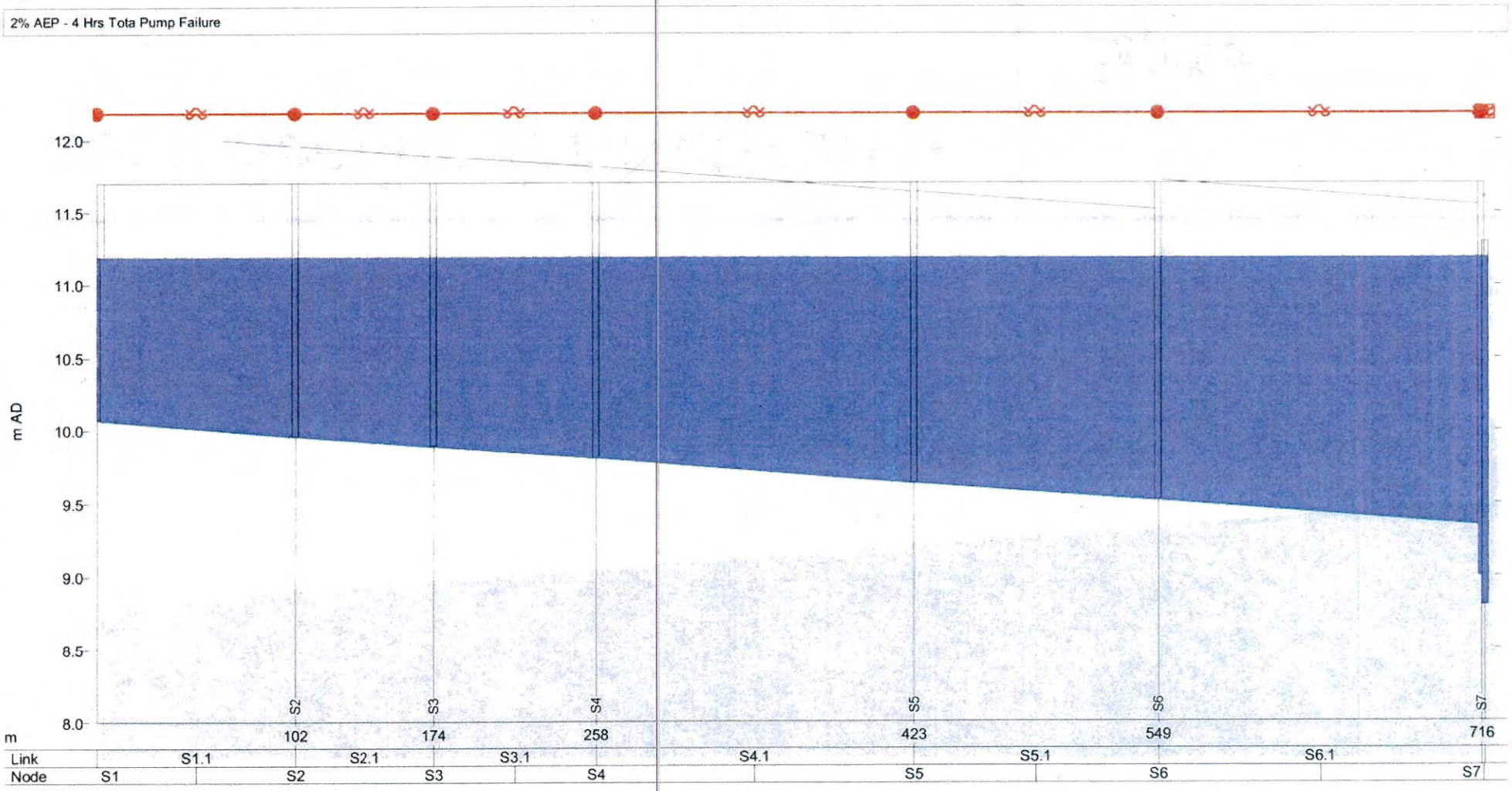
Long Section for Network - Option A

Powered by InfoWorks™



Long Section for Network - Option A

Powered by InfoWorks™



Long Section for Network - Option A

Powered by InfoWorks™

Option B Serpentine Drain Long Sections

10% AEP with No Pump Failure

Page 1 – From Node S1 to Pond

Page 2 – From Node P1 to Pond

Page 3 – From Node P8 to Pond

10% AEP with 4 Hours Total Pump Failure

Page 4 – From Node S1 to Pond

Page 5 – From Node P1 to Pond

Page 6 – From Node P8 to Pond

2% AEP with No Pump Failure

Page 7 – From Node S1 to Pond

Page 8 – From Node P1 to Pond

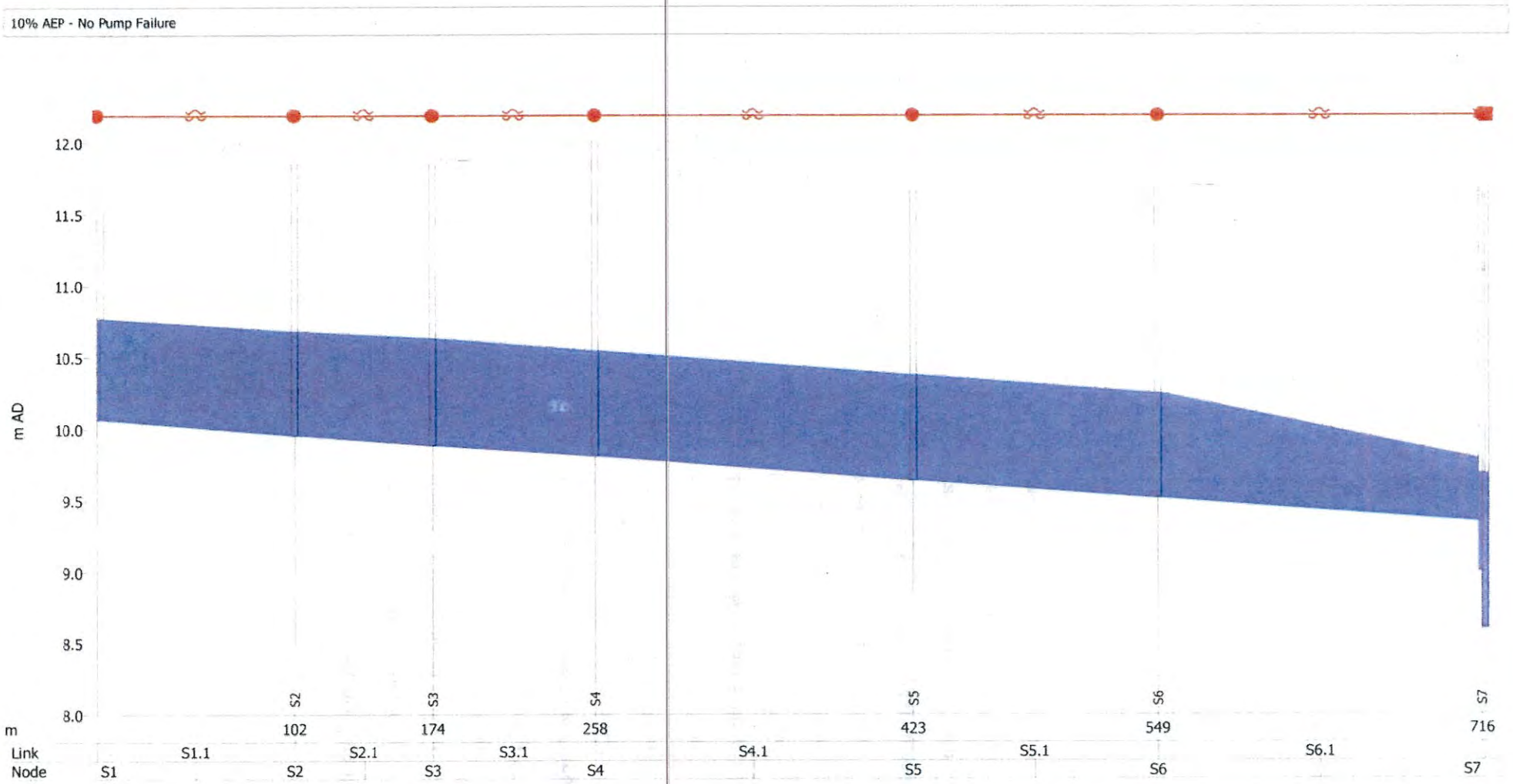
Page 9 – From Node P8 to Pond

2% AEP with 4 Hours Total Pump Failure

Page 10 – From Node S1 to Pond

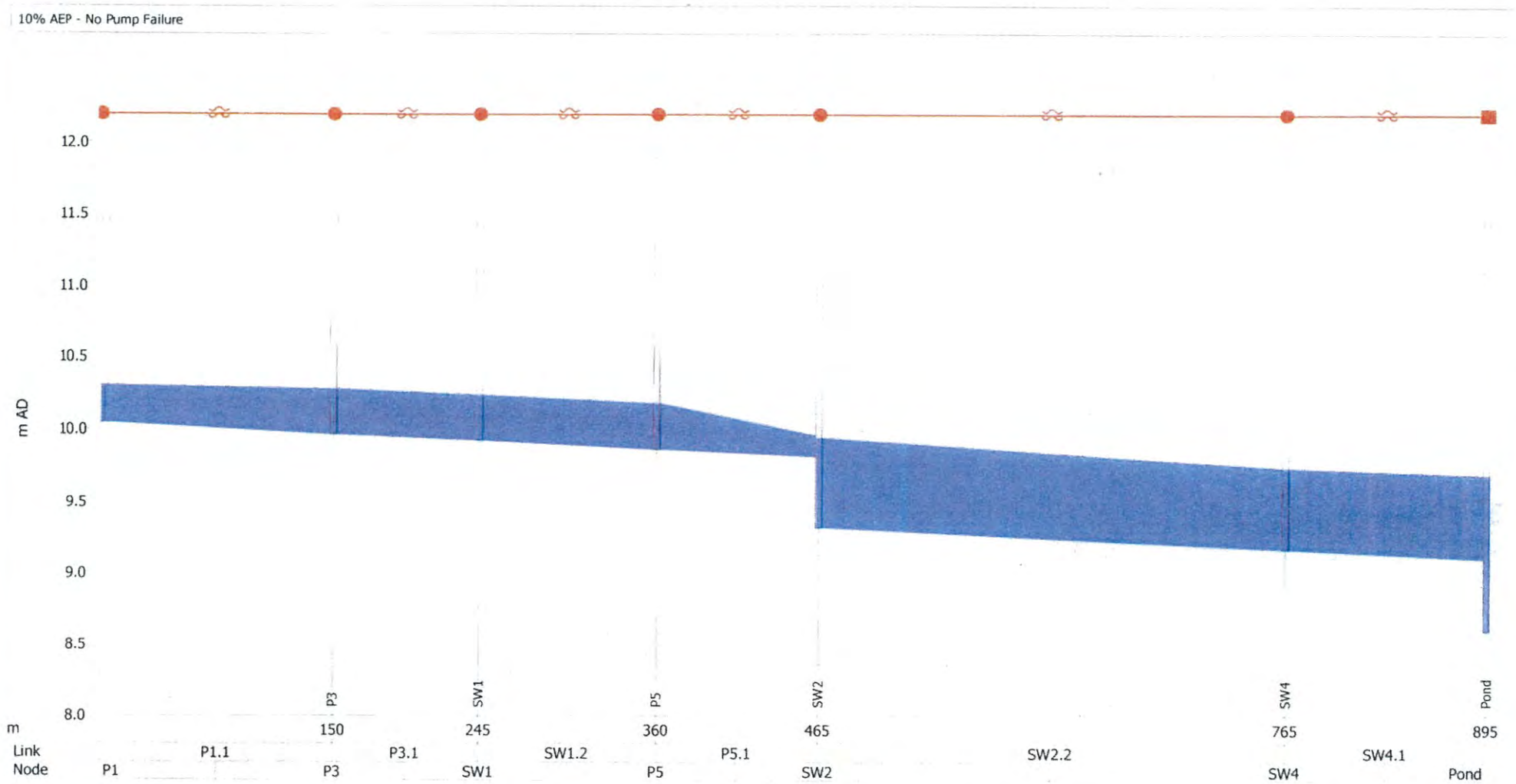
Page 11 – From Node P1 to Pond

Page 12 – From Node P8 to Pond



Long Section for Network - Option B.

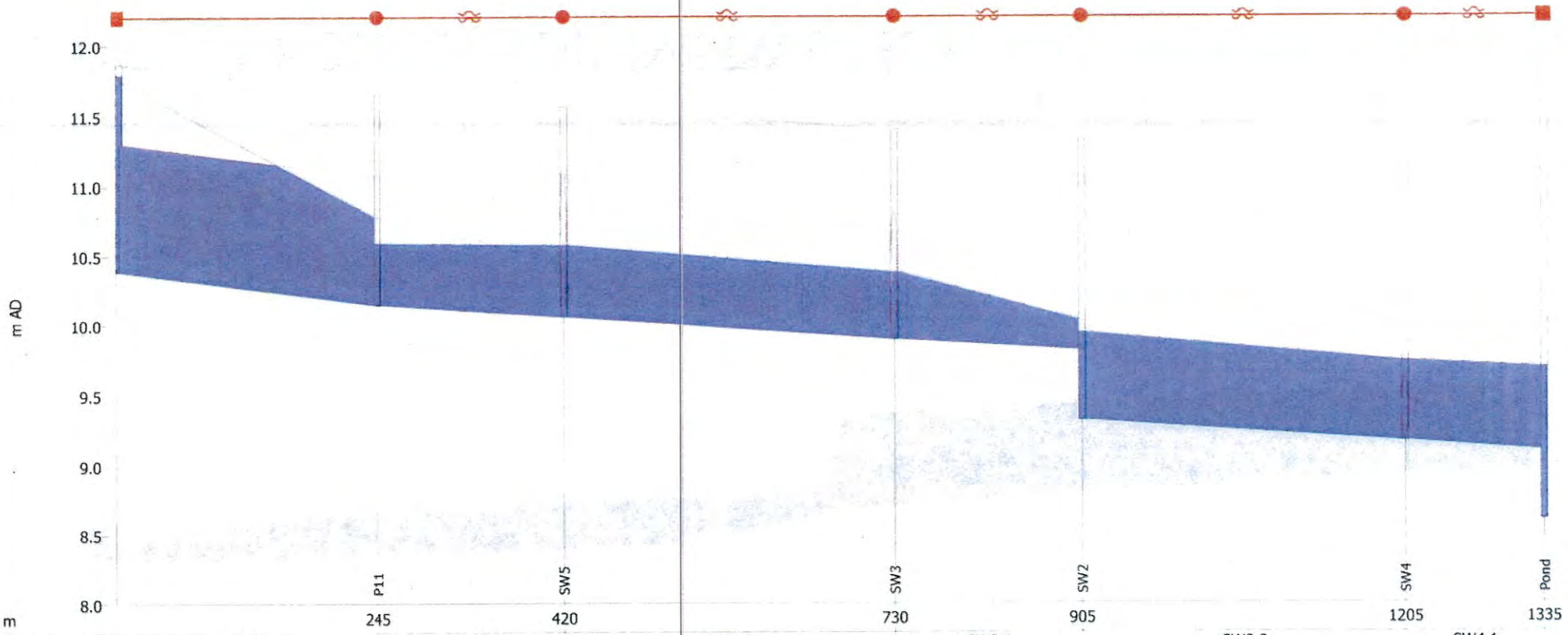
Powered by InfoWorks™



Long Section for Network - Option B.

Powered by InfoWorks™

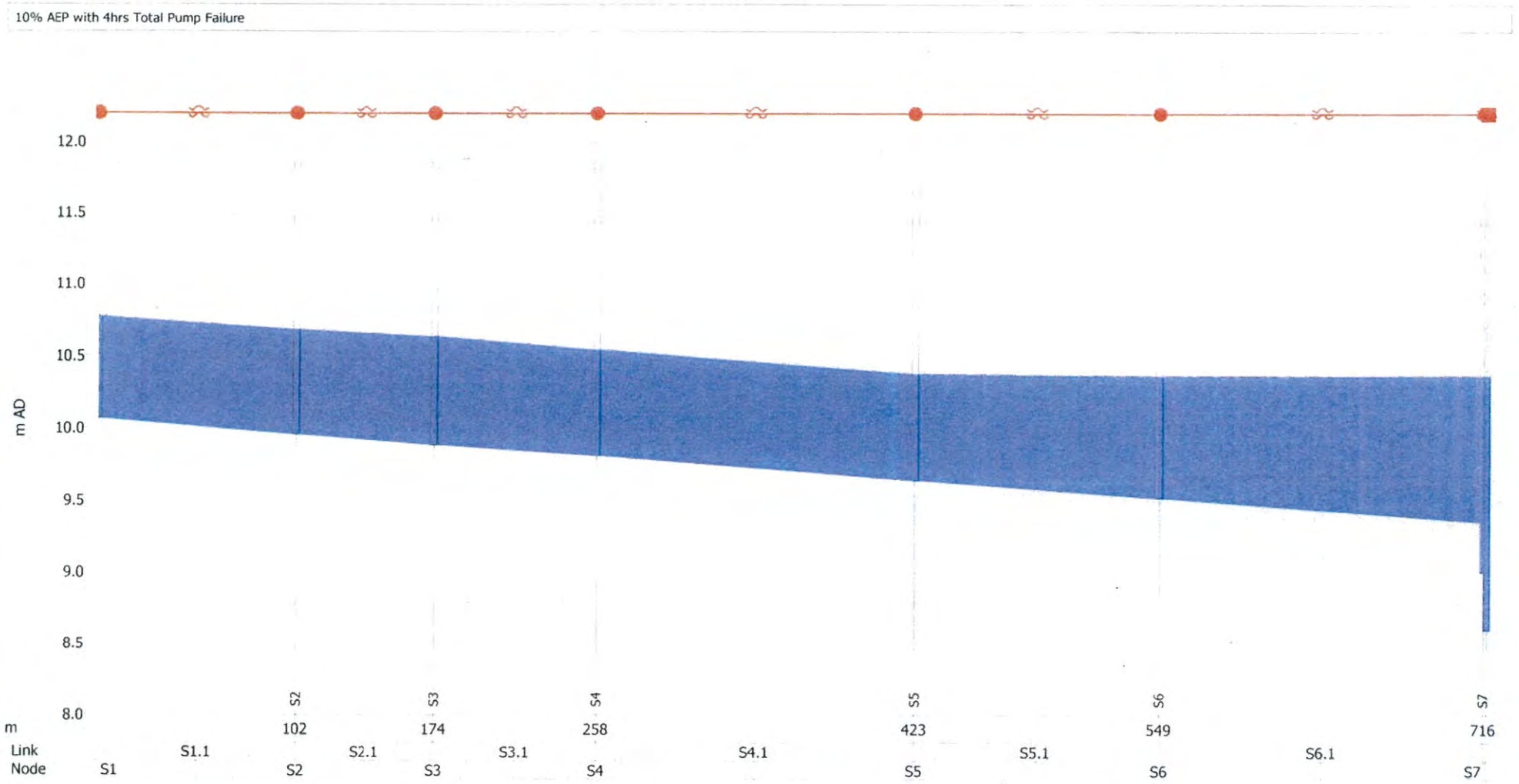
10% AEP - No Pump Failure



Link		P8.2		P11.1		SW5.2		SW3.1		SW2.2		SW4.1
us inv (m		10.390		10.150		10.060		9.900		9.320		9.170
ds inv (m		10.150		10.060		9.900		9.820		9.170		9.100
Node	P8		P11		SW5		SW3		SW2		SW4		Pond

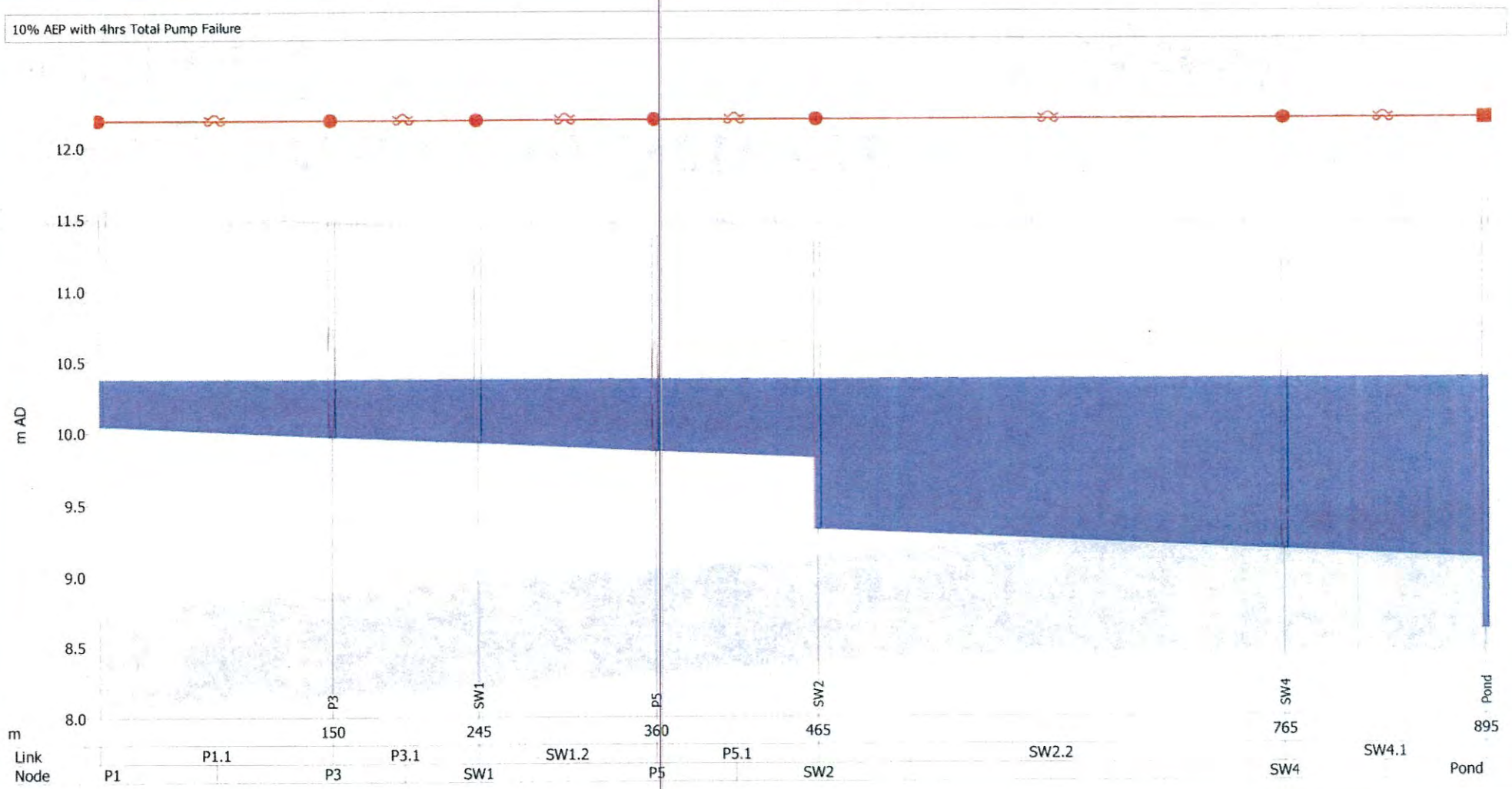
Long Section for Network - Option B.

Powered by InfoWorks™



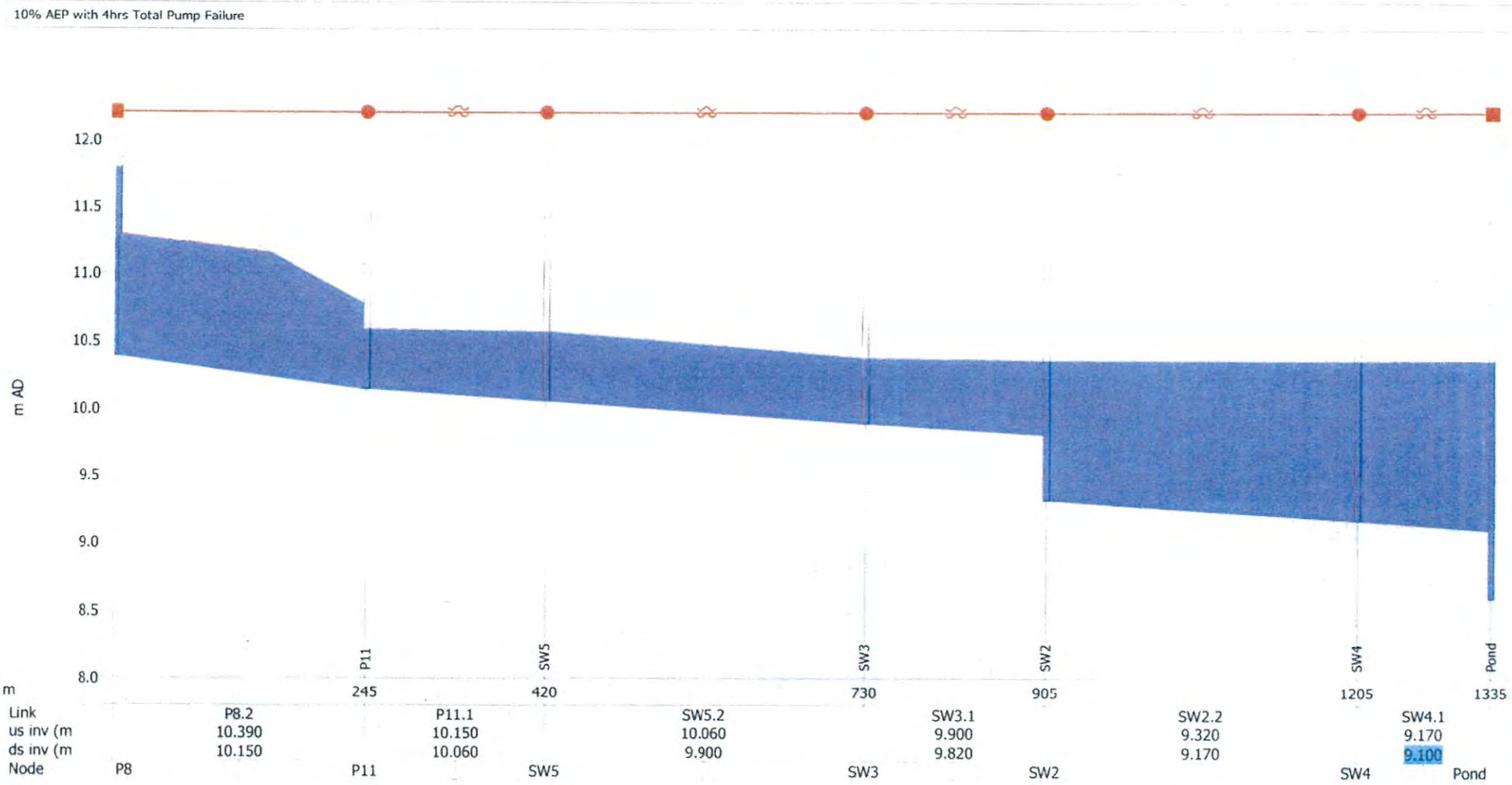
Long Section for Network - Option B.

Powered by InfoWorks™



Long Section for Network - Option B.

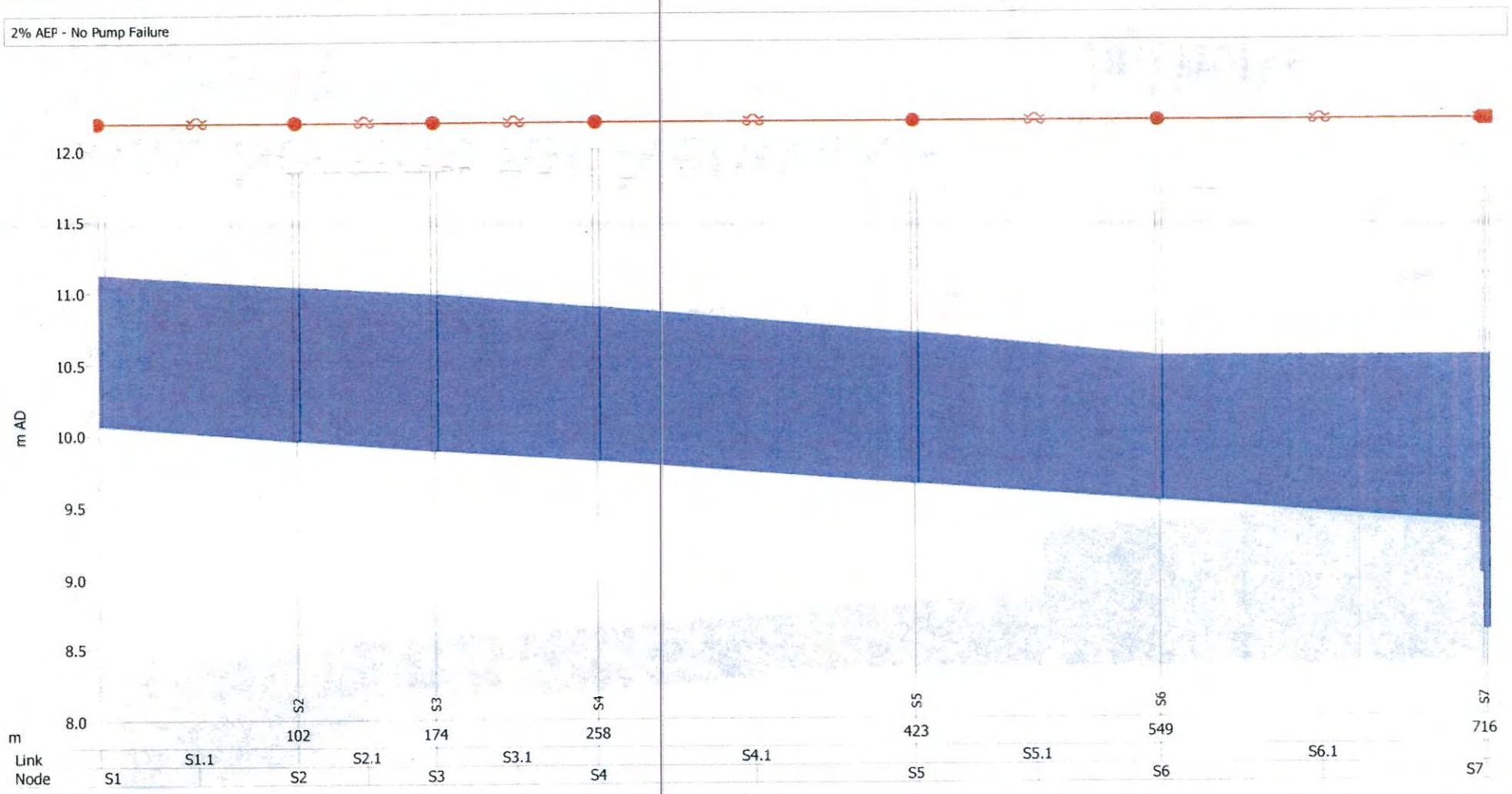
Powered by InfoWorks™



Long Section for Network - Option B.

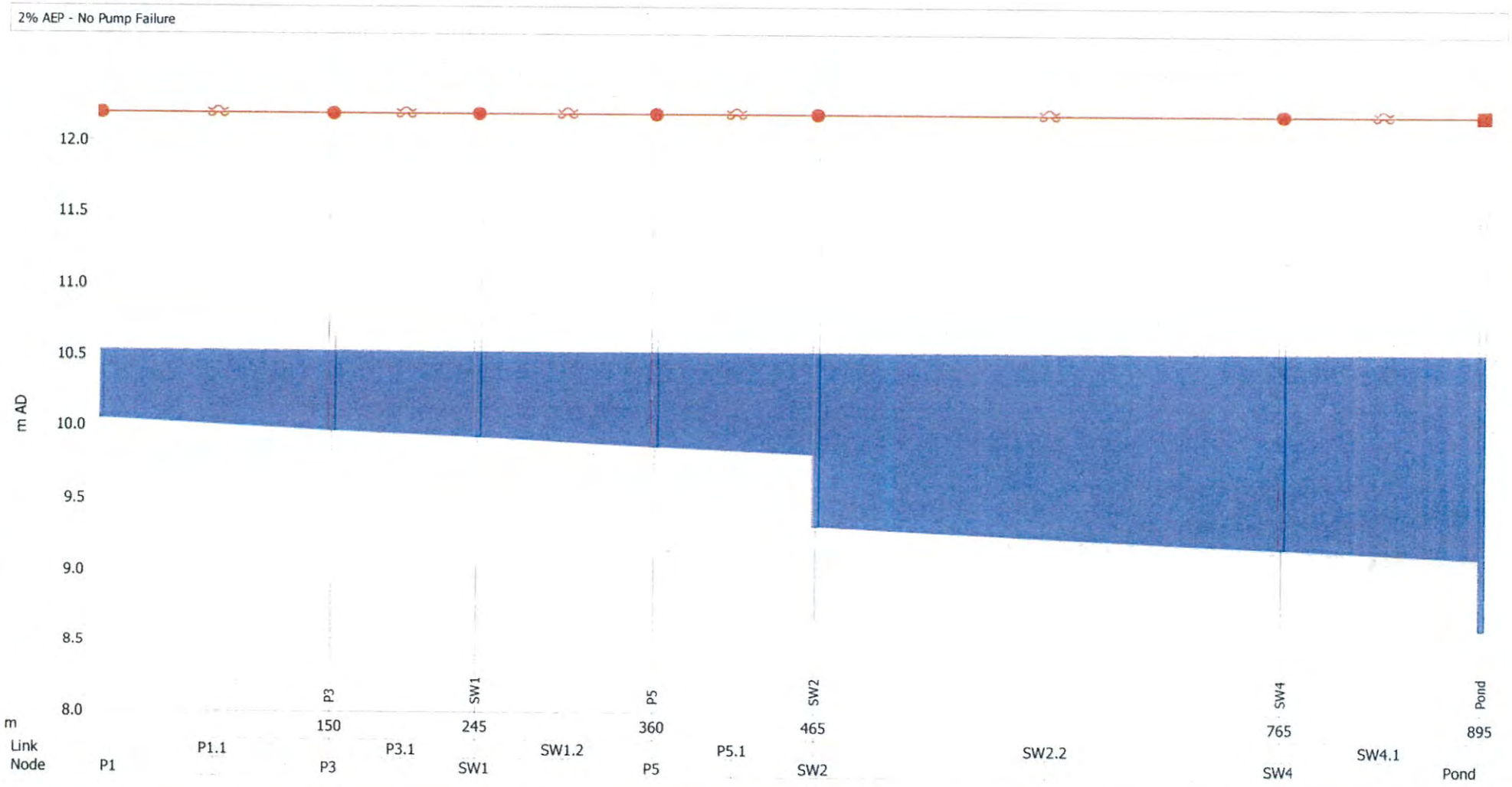
Powered by

InfoWorks™



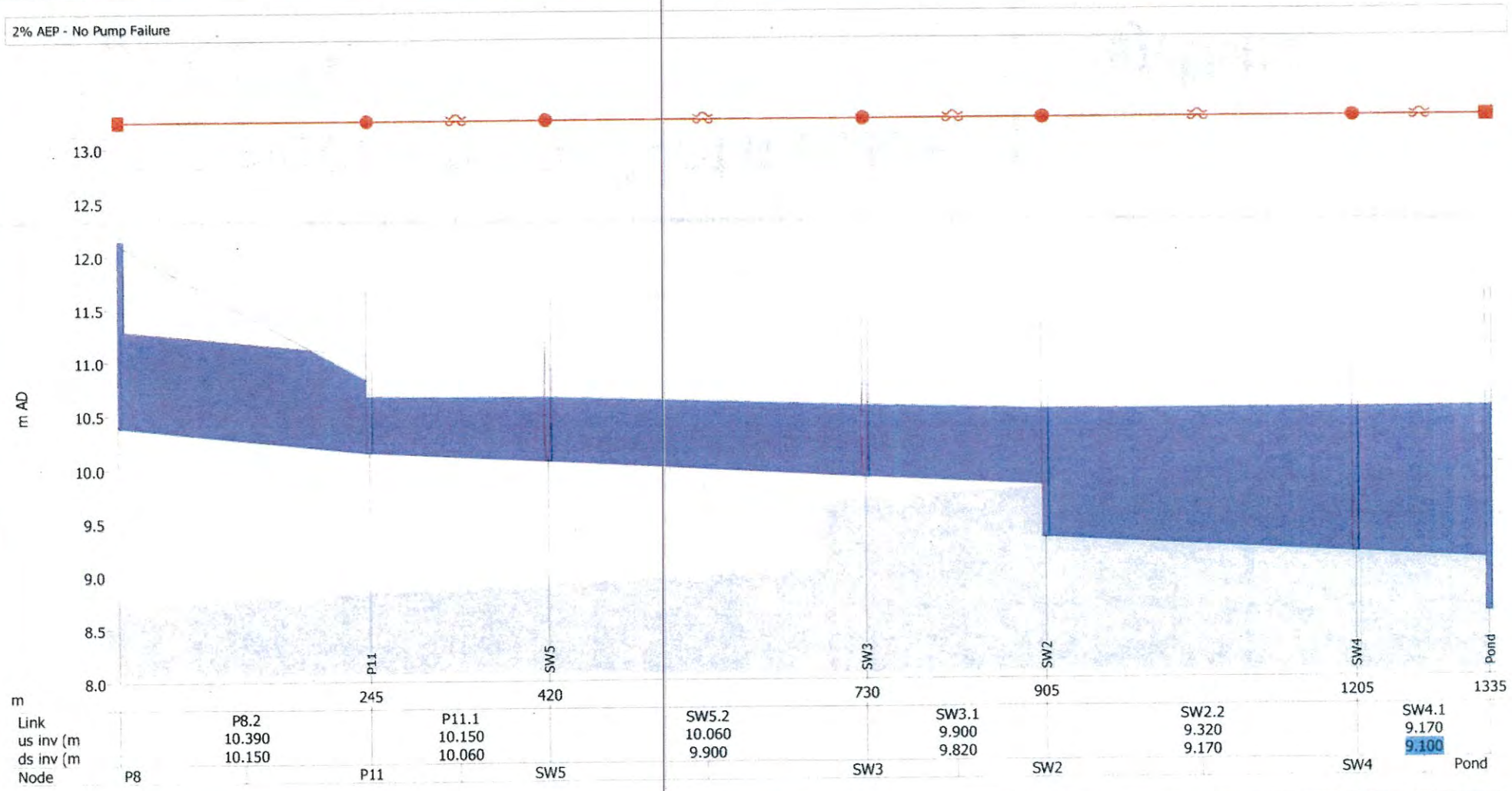
Long Section for Network - Option B.

Powered by InfoWorks™



Long Section for Network - Option B.

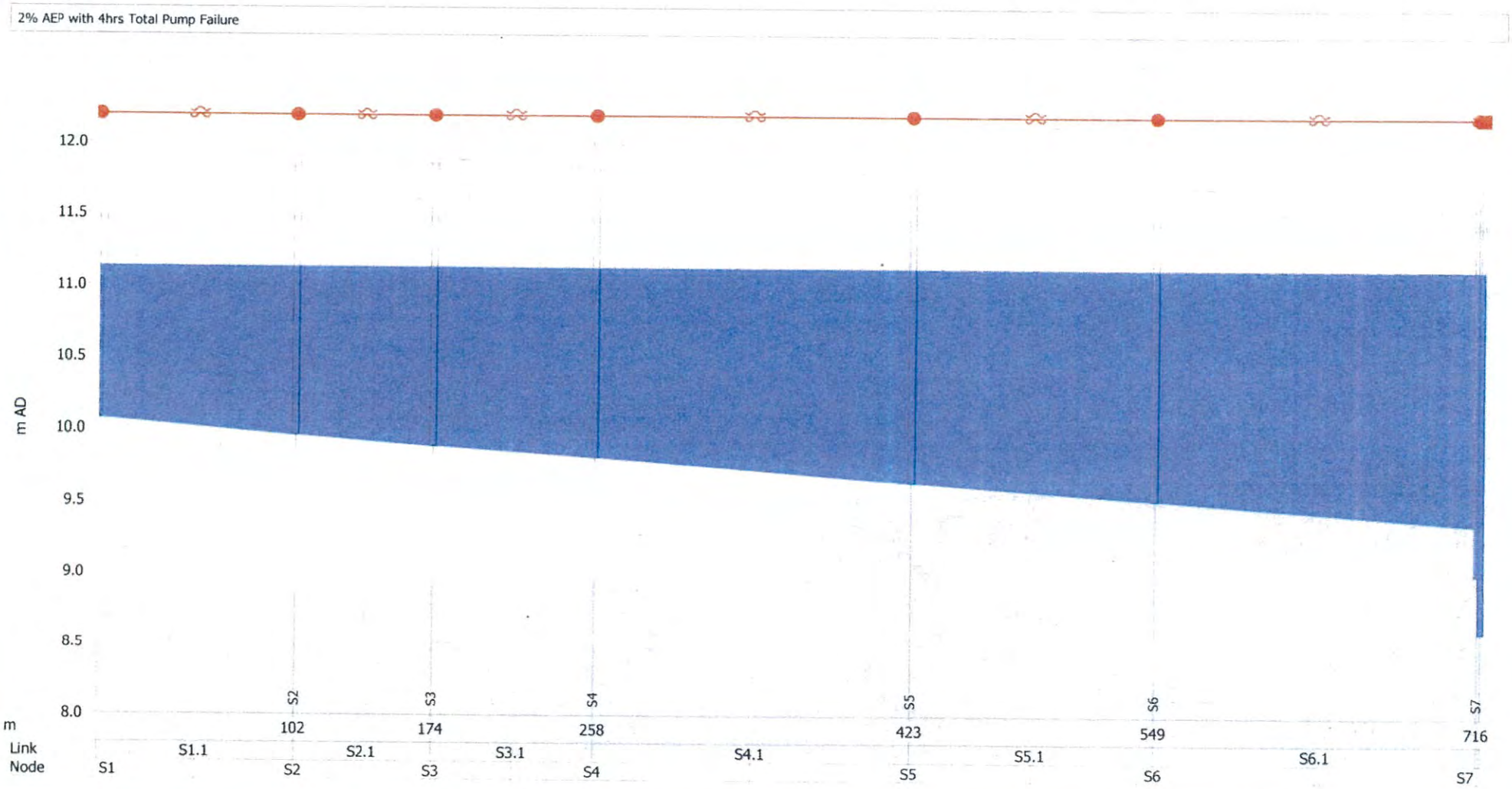
Powered by InfoWorks™



Long Section for Network - Option B.

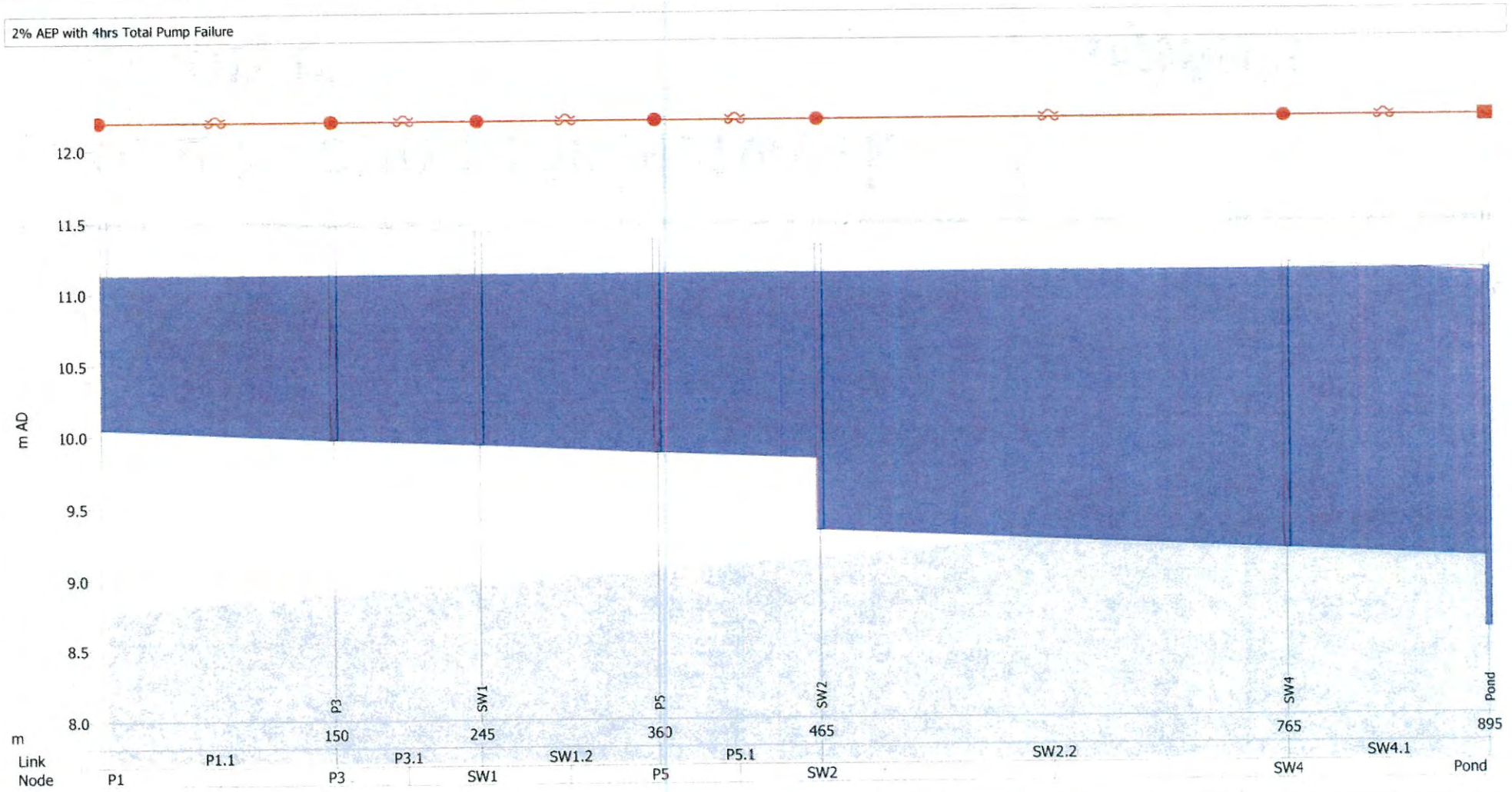
Powered by

InfoWorks™



Long Section for Network - Option B.

Powered by InfoWorks™



Long Section for Network - Option B.

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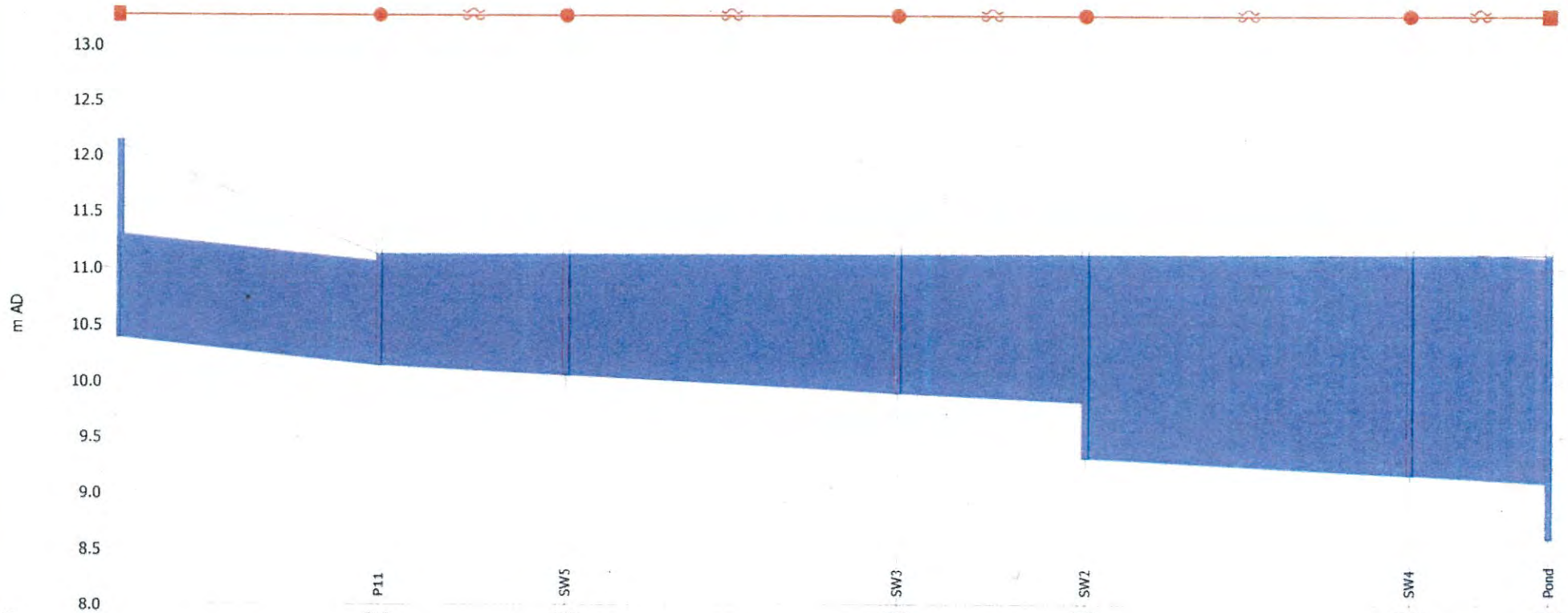
2% AEP with 4hrs Total Pump Failure



m			245		420		730		905		1205		1335
Link		P8.2		P11.1		SW5.2		SW3.1		SW2.2		SW4.1	
us inv (m		10.390		10.150		10.060		9.900		9.320		9.170	
ds inv (m		10.150		10.060		9.900		9.820		9.170		9.100	
Node	P8		P11		SW5		SW3		SW2		SW4		Pond

Long Section for Network - Option B.

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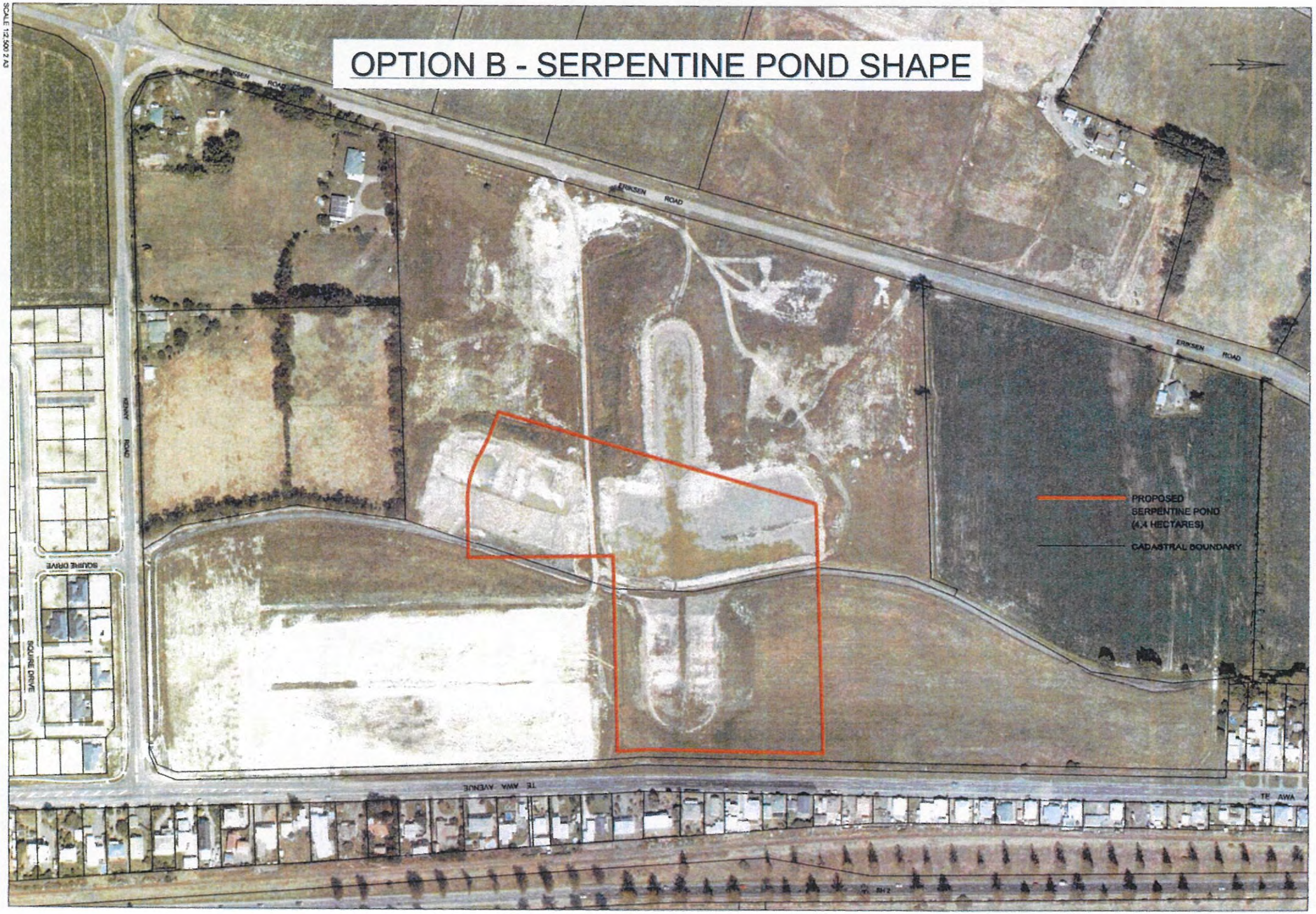
Appendix E

Option B Serpentine Pond Shape

OPTION B - SERPENTINE POND SHAPE



SCALE 1:2,500 2 A3

Appendix F

Storage Hydrographs

Option A Storage Hydrographs

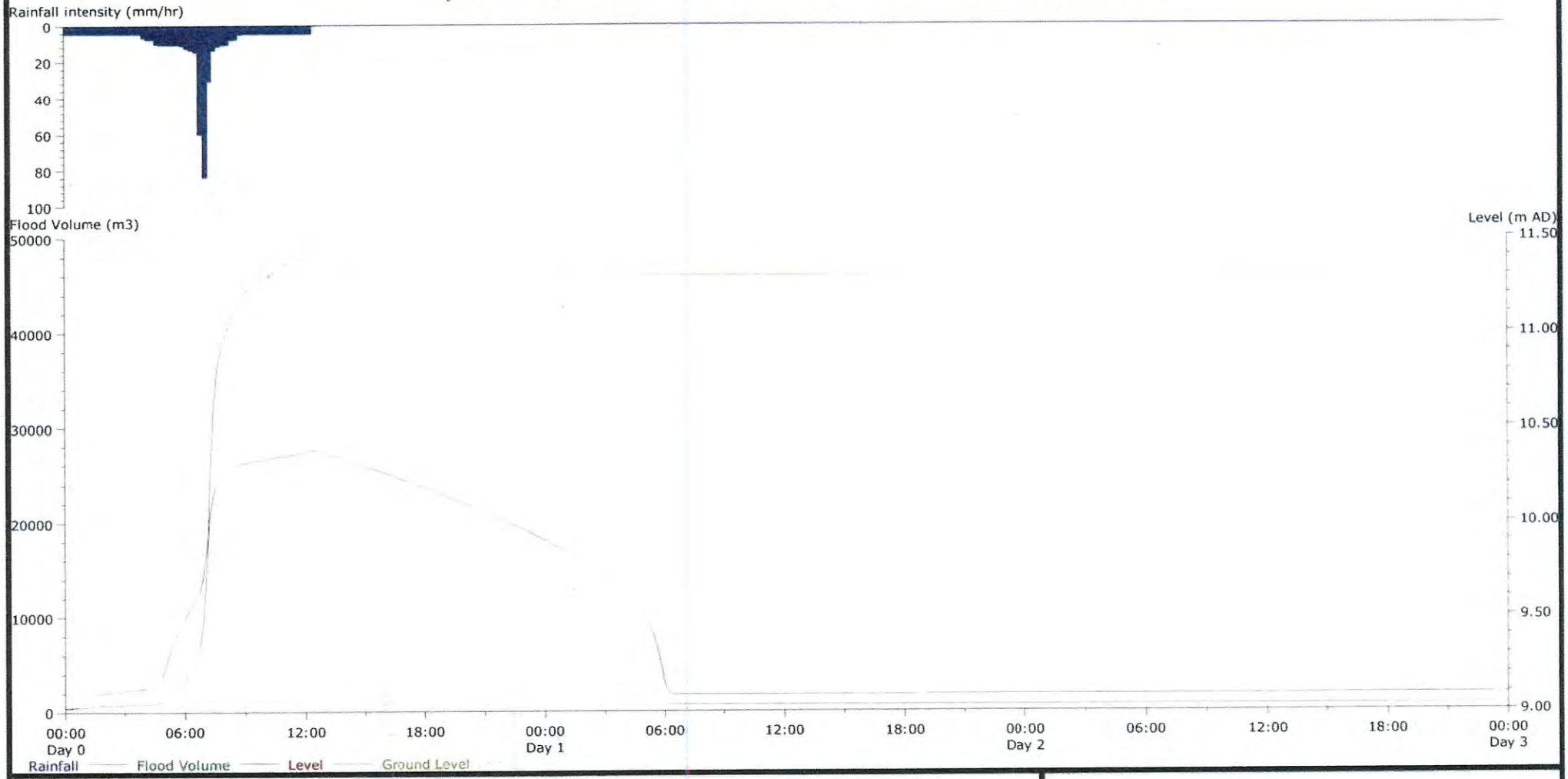
Page 1 – 10% AEP with no pump failure

Page 2 – 10% AEP with 4 hours total pump failure

Page 3 – 2% AEP with no pump failure

Page 4 – 2% AEP with 4 hours total pump failure

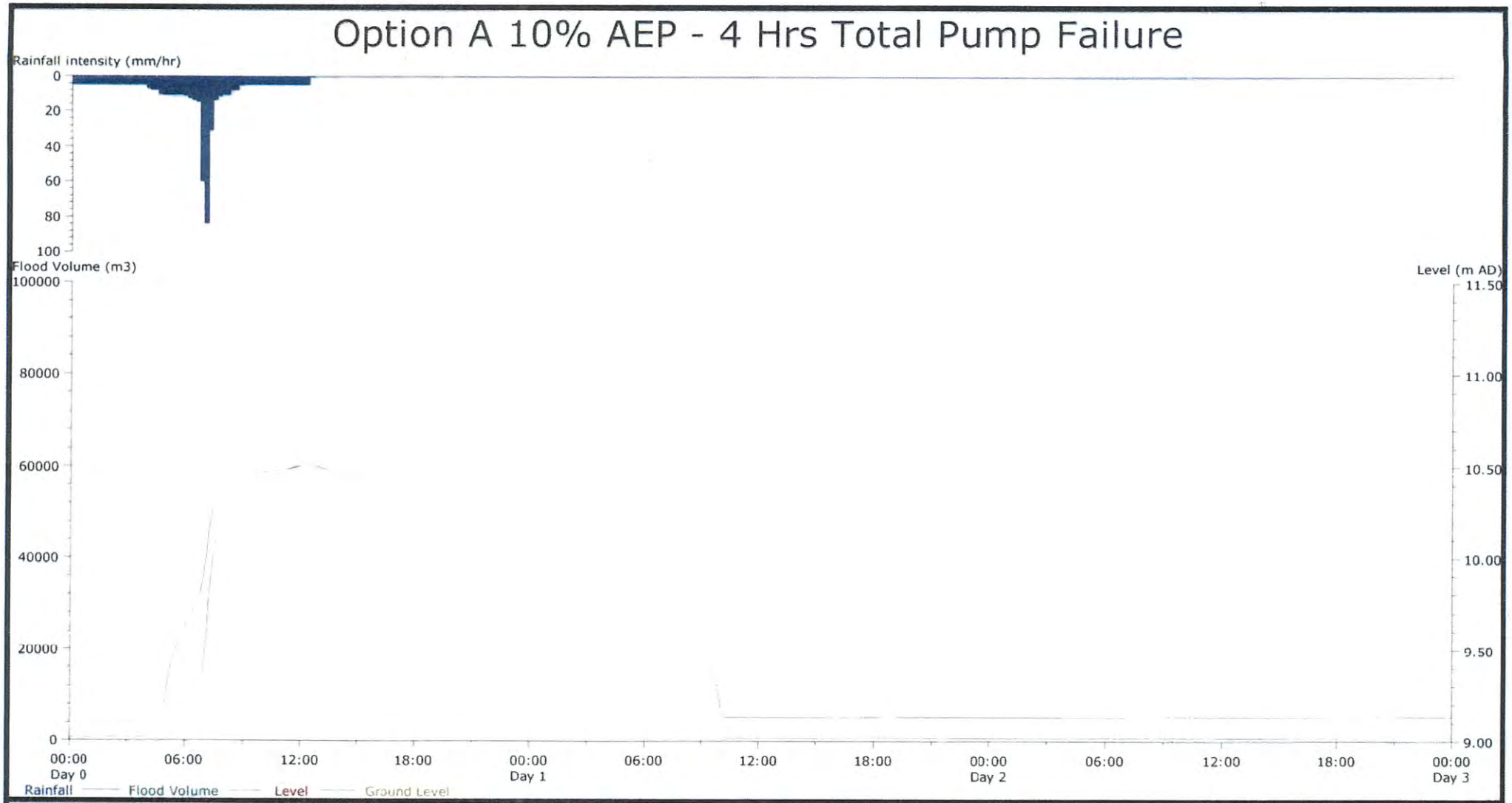
Option A 10% AEP - No Pump Failure



Node Pond Option A No Pump Failure 10% AEP!

Powered by

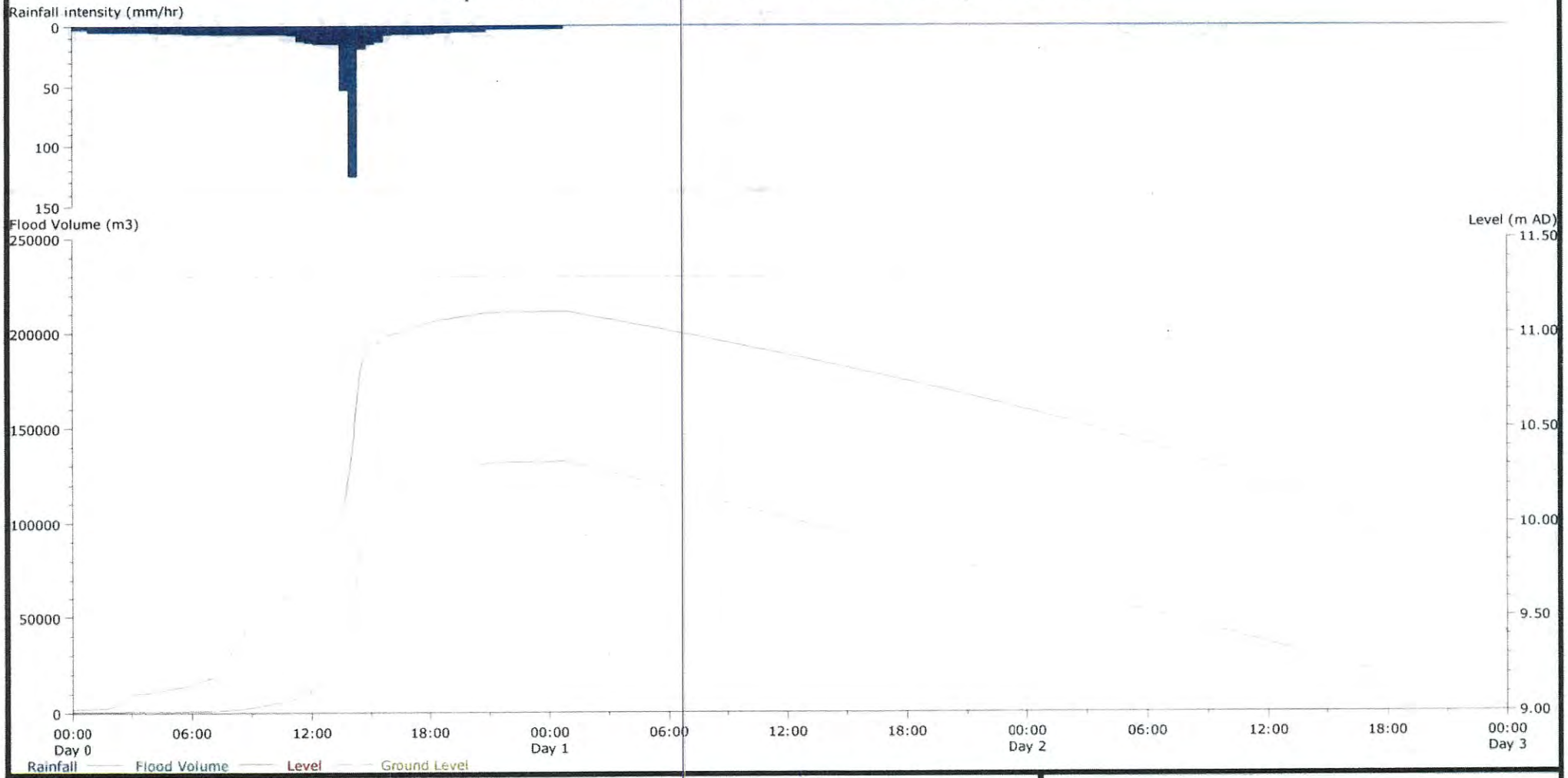
InfoWorks™



Node Pond Option A With Pump Failure 10% AEP!

Powered by InfoWorks™

Option A 2% AEP - No Pump Failure



Node Pond Option A No Pump Failure 2% AEP!

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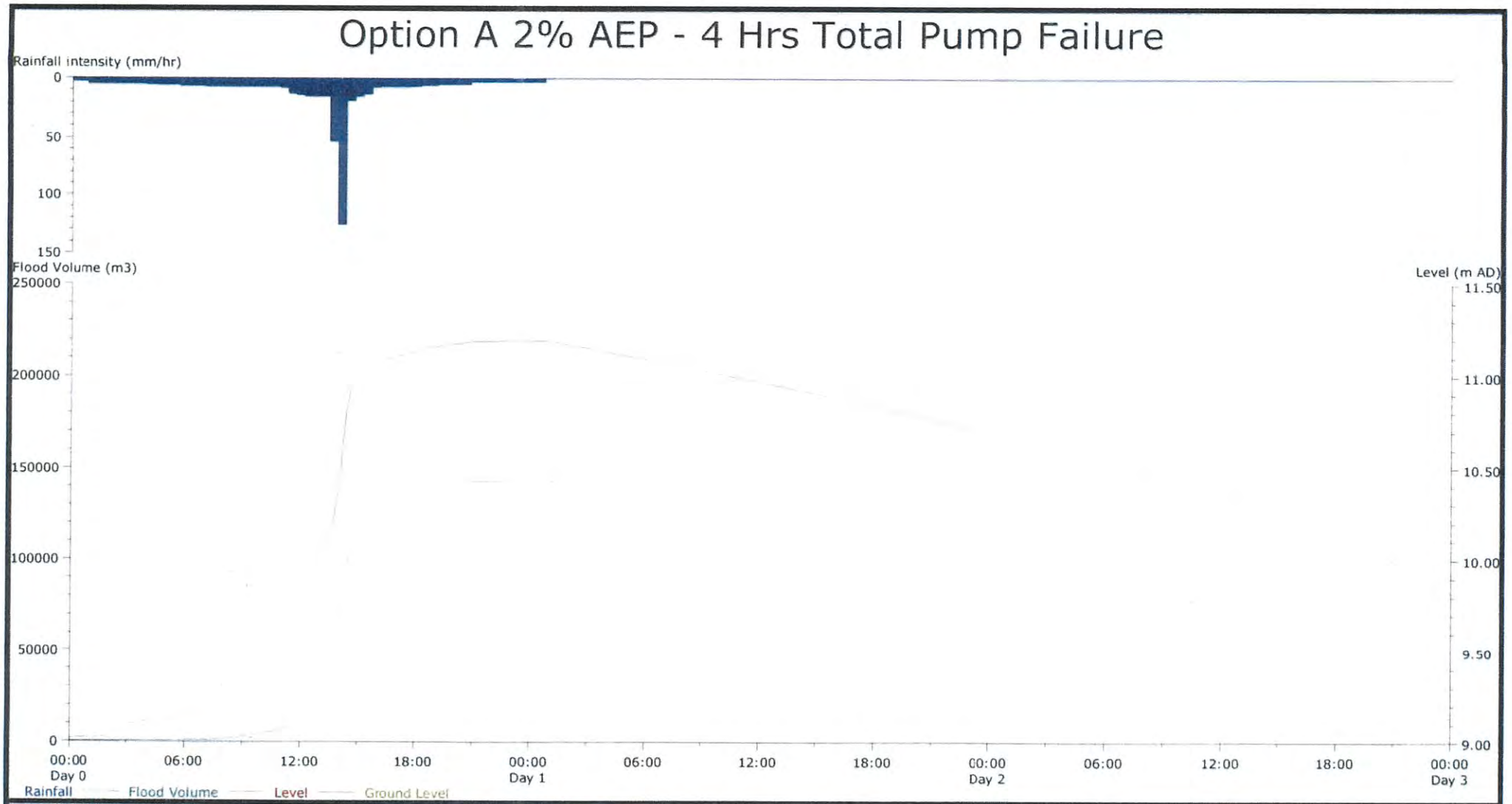

Node Pond Option A With Pump Failure 2% AEP!

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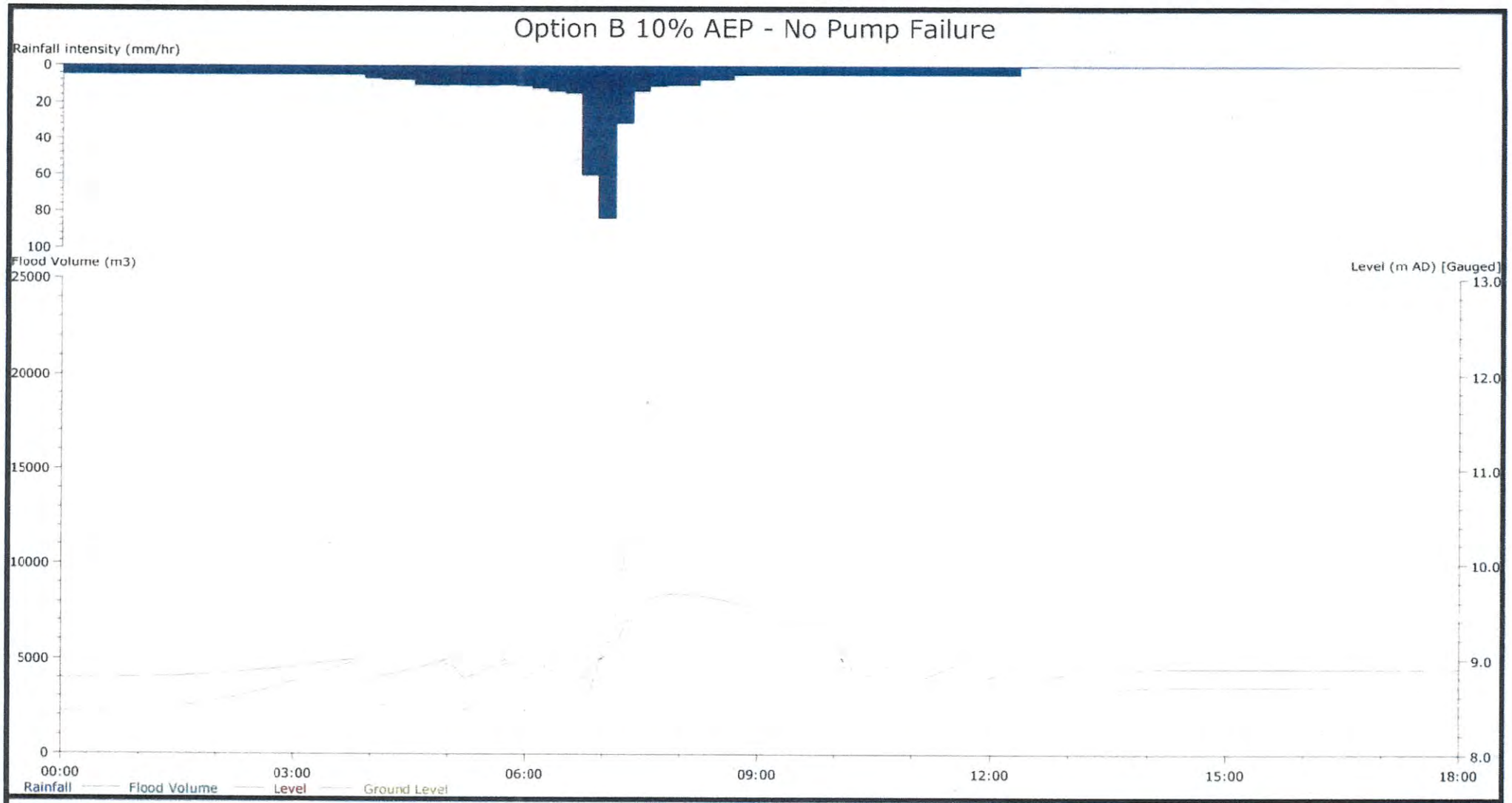
Option B Storage Hydrographs

Page 1 – 10% AEP with no pump failure

Page 2 – 10% AEP with 4 hours total pump failure

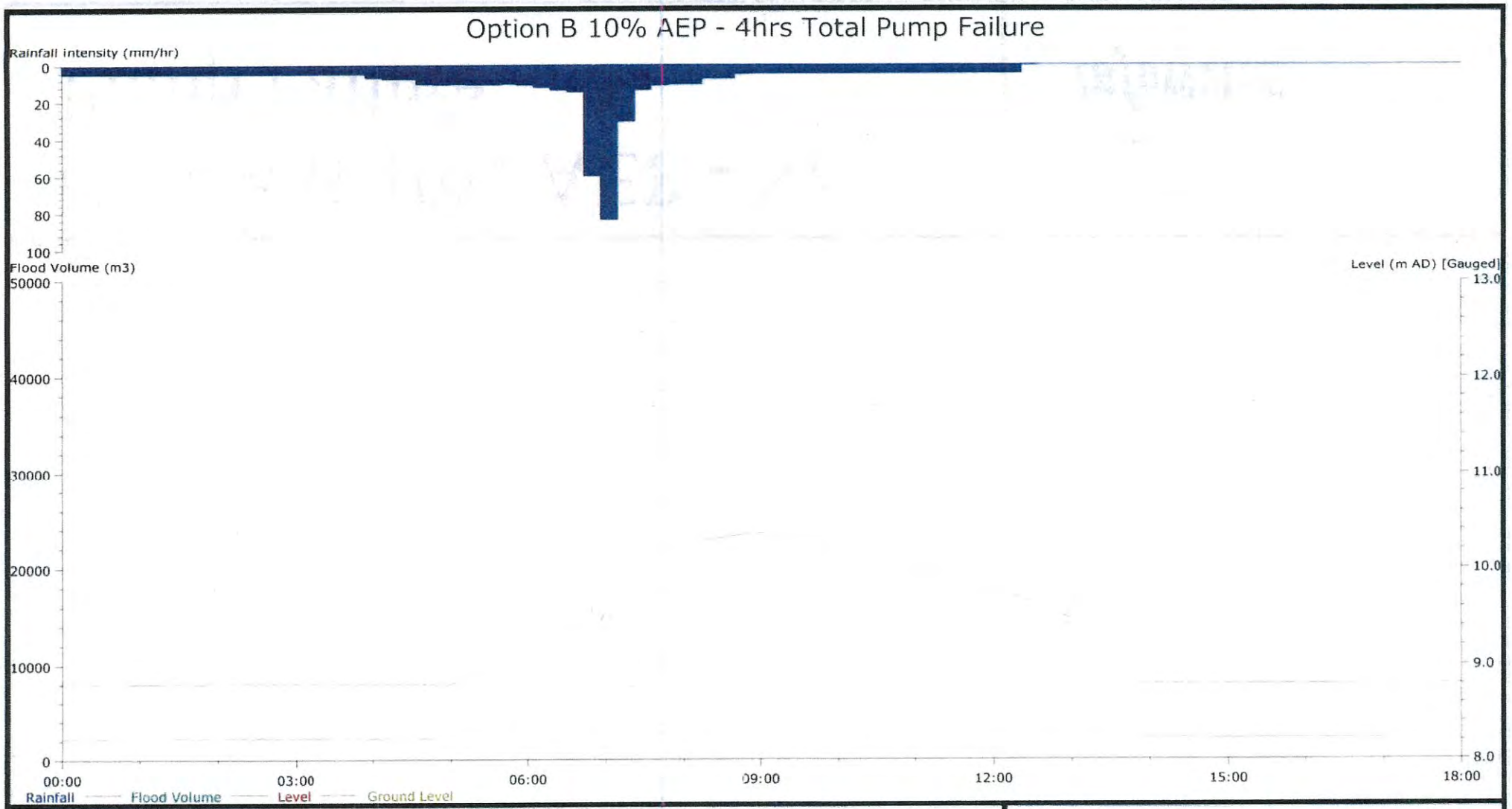
Page 3 – 2% AEP with no pump failure

Page 4 – 2% AEP with 4 hours total pump failure



Option B 10% AEP - No Pump Failure

Powered by InfoWorks™



Option B 10% AEP - With Pump Failure

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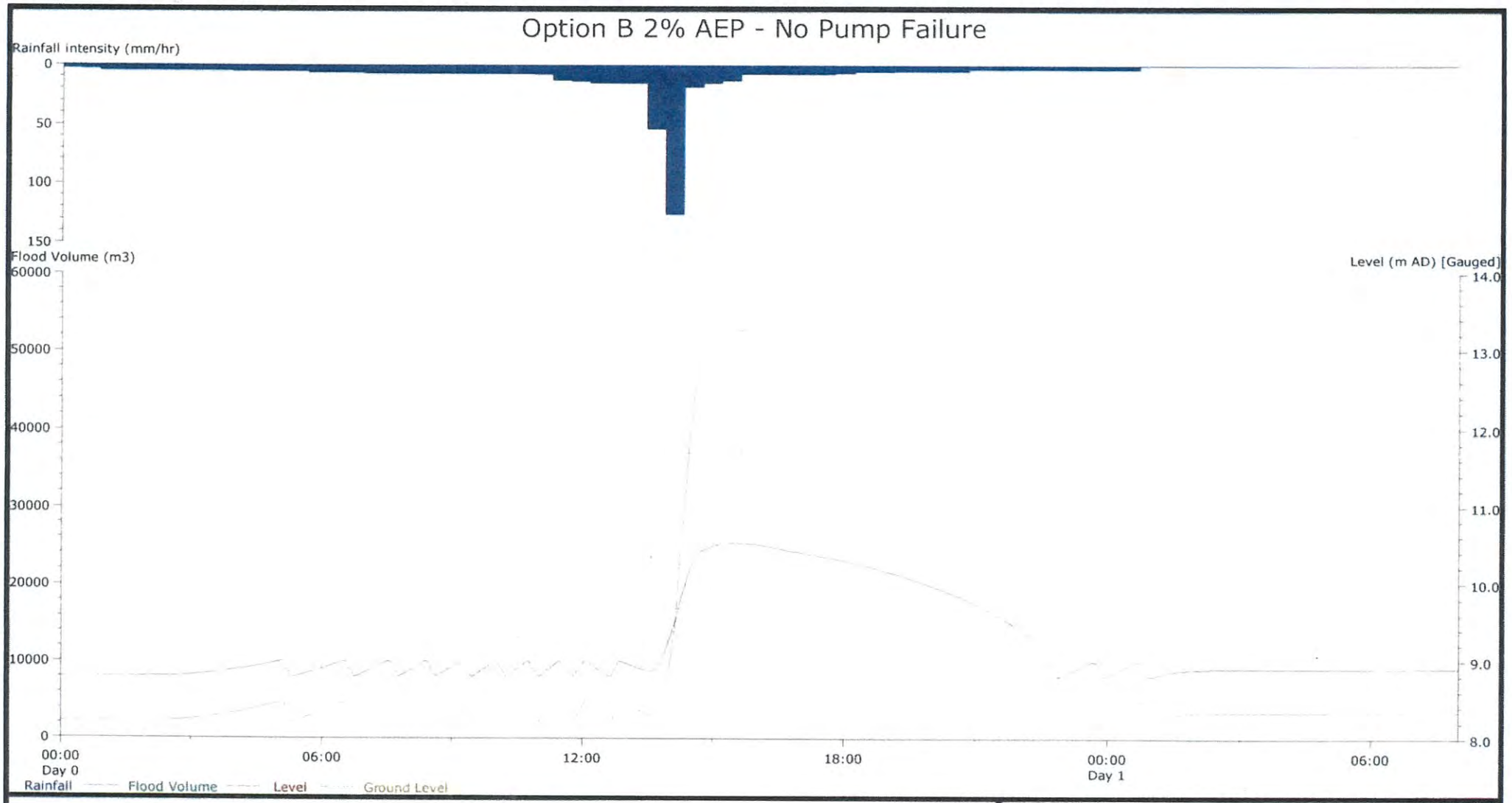
InfoWorks™



Option B 2% AEP - No Pump Failure

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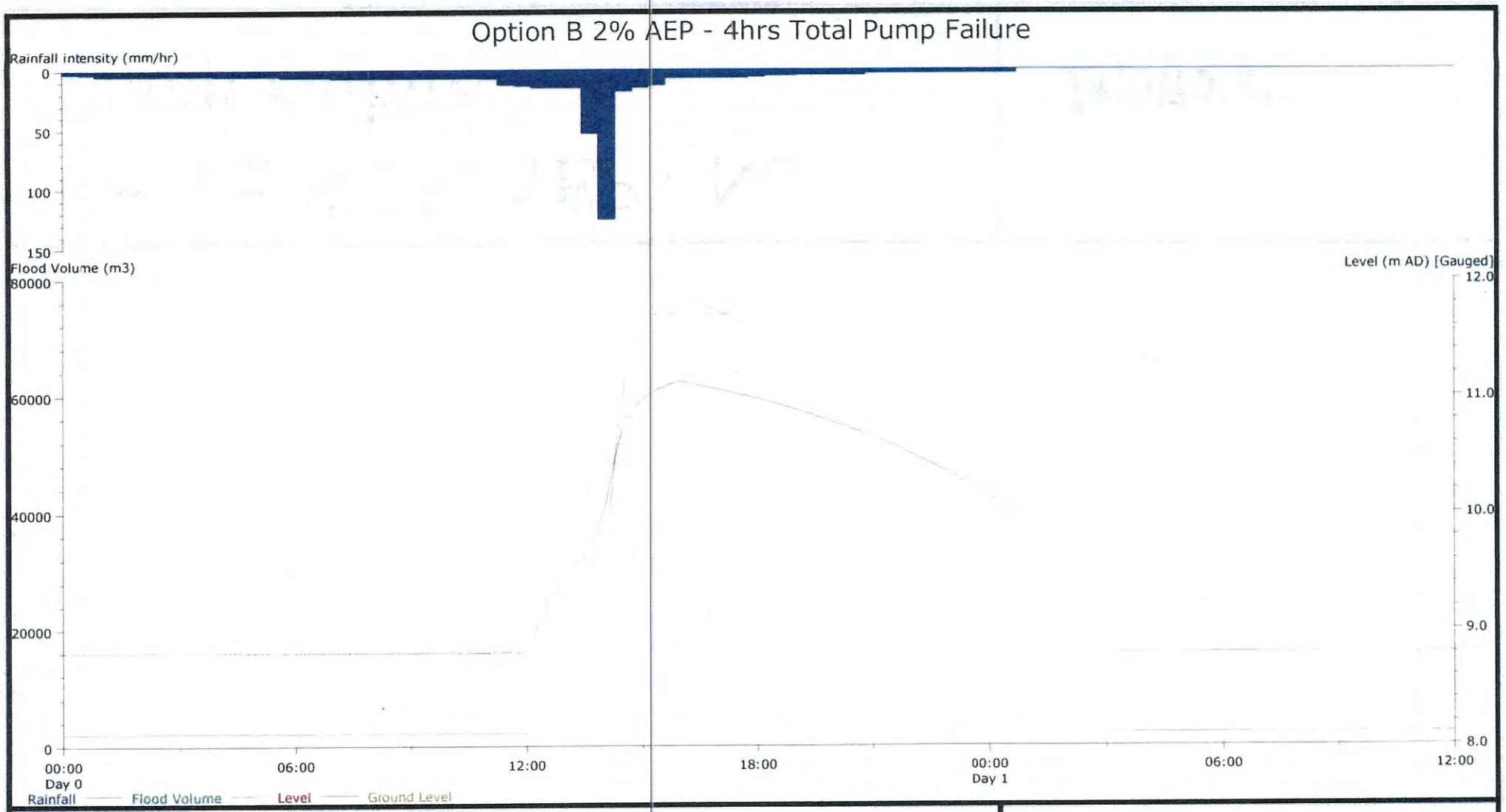
InfoWorks™



Option B 2% AEP - With Pump Failure

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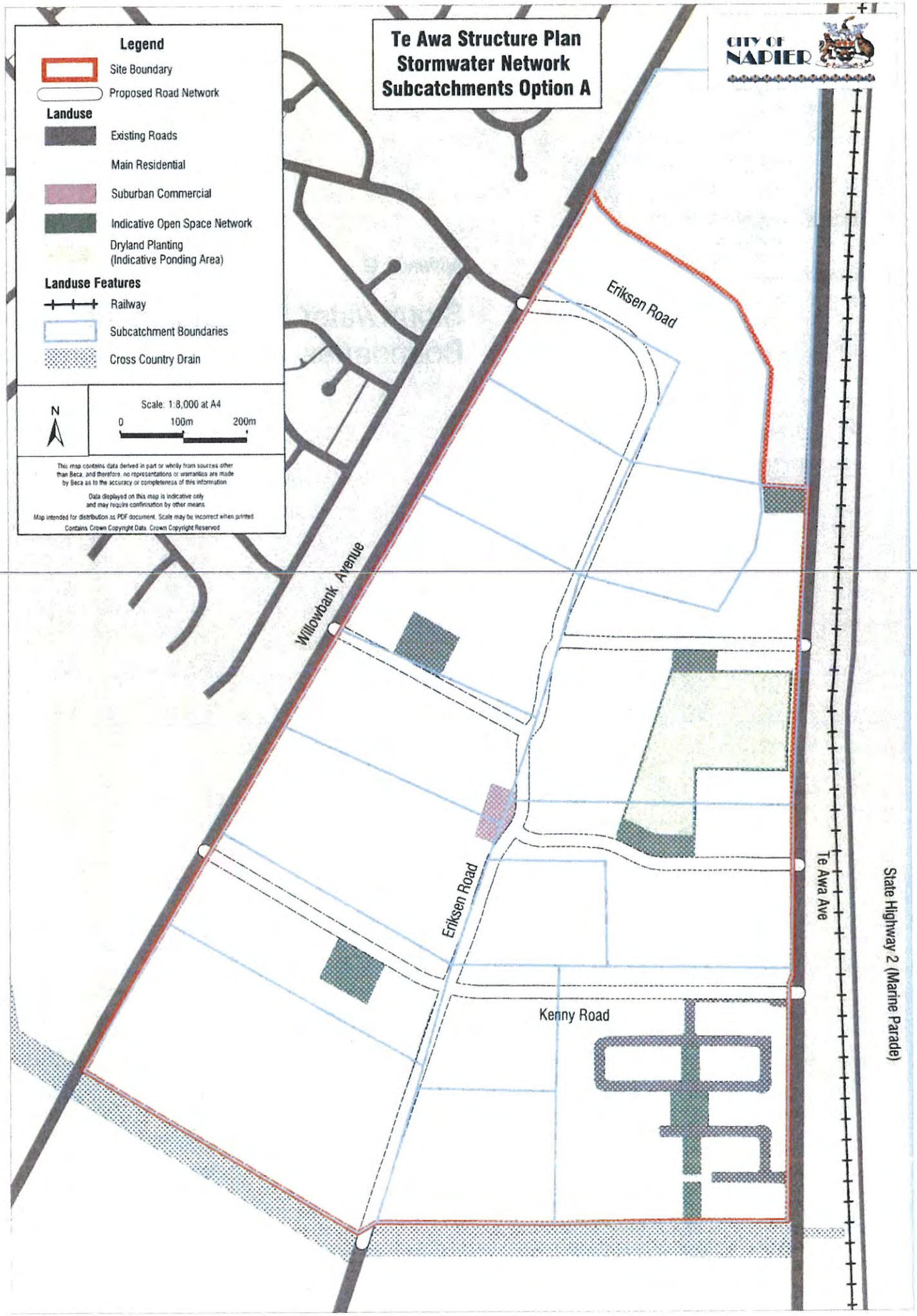
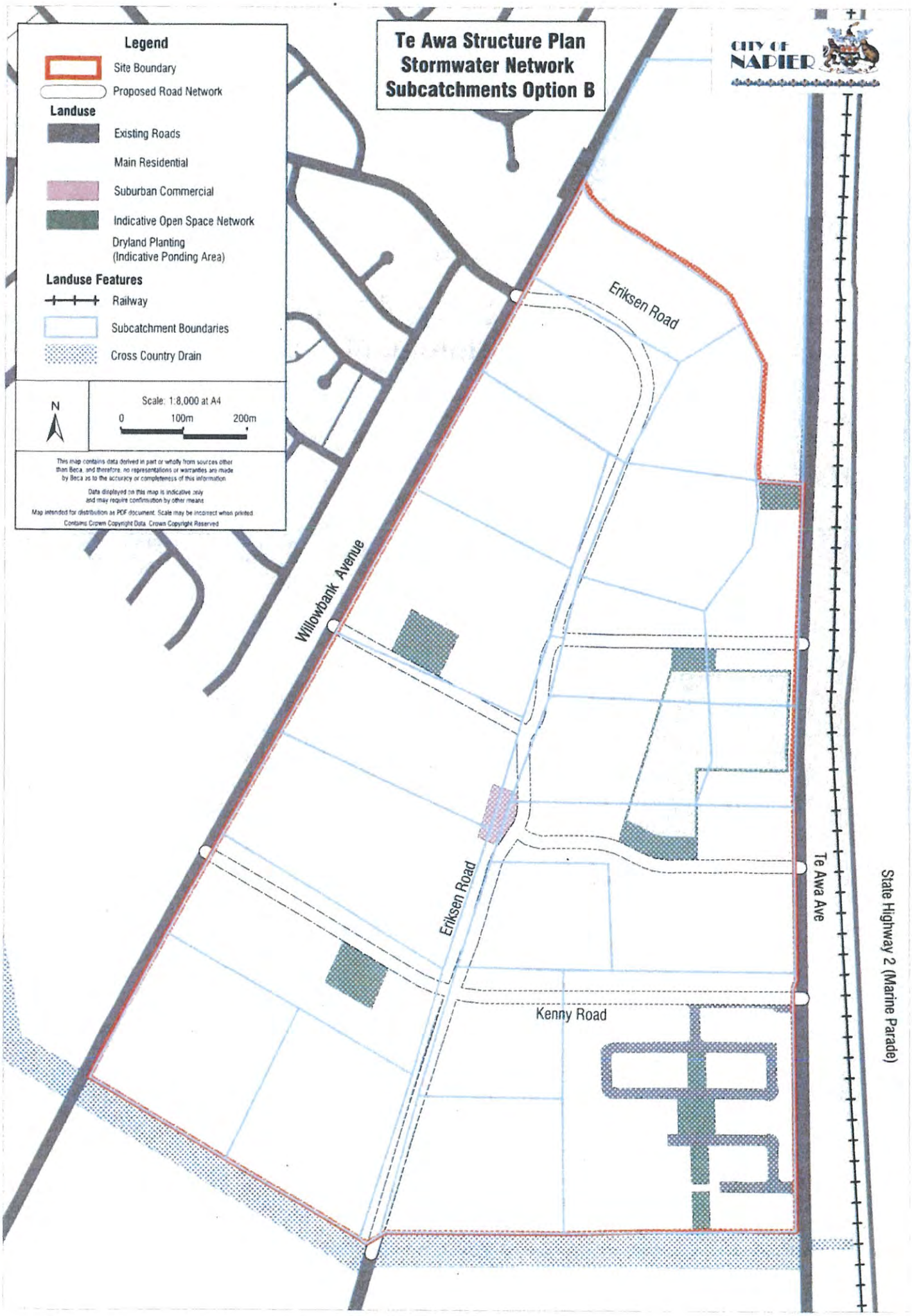
Appendix G

Stormwater Subcatchment Boundaries


Te Awa Structure Plan
Stormwater Network
Subcatchments Option A
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Railway
Subcatchment Boundaries
Cross Country Drain
N
Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
Data displayed on this map is indicative only and may require confirmation by other means.
Map intended for distribution as PDF document. Scale may be incorrect when printed.
Contains Crown Copyright Data. Crown Copyright Reserved.
Eriksen Road
Willowbank Avenue
Eriksen Road
Kenny Road
Te Awa Ave
State Highway 2 (Marine Parade)


Te Awa Structure Plan
Stormwater Network
Subcatchments Option B
CITY OF NAPIER
Legend
Site Boundary
Proposed Road Network
Landuse
Existing Roads
Main Residential
Suburban Commercial
Indicative Open Space Network
Dryland Planting
(Indicative Ponding Area)
Landuse Features
Railway
Subcatchment Boundaries
Cross Country Drain
N
Scale: 1:8,000 at A4
0
100m
200m
This map contains data derived in part or wholly from sources other than Beca, and therefore, no representations or warranties are made by Beca as to the accuracy or completeness of this information.
Data displayed on this map is indicative only and may require confirmation by other means.
Map intended for distribution as PDF document. Scale may be incorrect when printed.
Contains Crown Copyright Data. Crown Copyright Reserved.
Eriksen Road
Willowbank Avenue
Eriksen Road
Kenny Road
Te Awa Ave
State Highway 2 (Marine Parade)

Appendix C

Serpentine Pond Concept Statement

POND CONCEPT STATEMENT

The stormwater detention pond landscape treatment will be concentrated on the wetland channel margins and flanks of the walkway while the balance of the site will be in grass groundcover.

Species selection is based on a simple palette of plants that are both coastal tolerant and able to withstand periodic stormwater submergence.

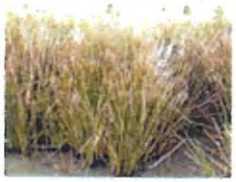
Marginal Strip Planting

Saltmarsh Ribbonwood - *Plagianthus divaricatus*
Height - 3 metres
Comments - Can be grown in salt marshes and along estuaries. Also grows in dune hollows and coastal gravels

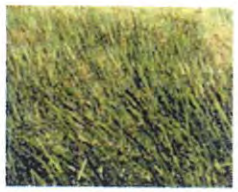
Harakeke Flax - *Phormium tenax*
Height - 2-3 metres
Comments - Very hardy, tolerant of salt exposure. Grows in all areas including back dunes, saltmarsh, wetlands and estuaries
Phormium cookianum would be a suitable adjacent to the boardwalk - low foliage height maintaining open sightlines

Pukio - *Carex Secta*
Height - 1 metre
Comments - Common in swampy areas (beside waters edge). Older specimens form thick sturdy trunks of matted roots.

Riparian and Waterway Planting



Jointed Twig Rush - *Baumea articulata*
Height - 1 metre
Comments - Found in lowland coastal swamps and saltmarsh areas



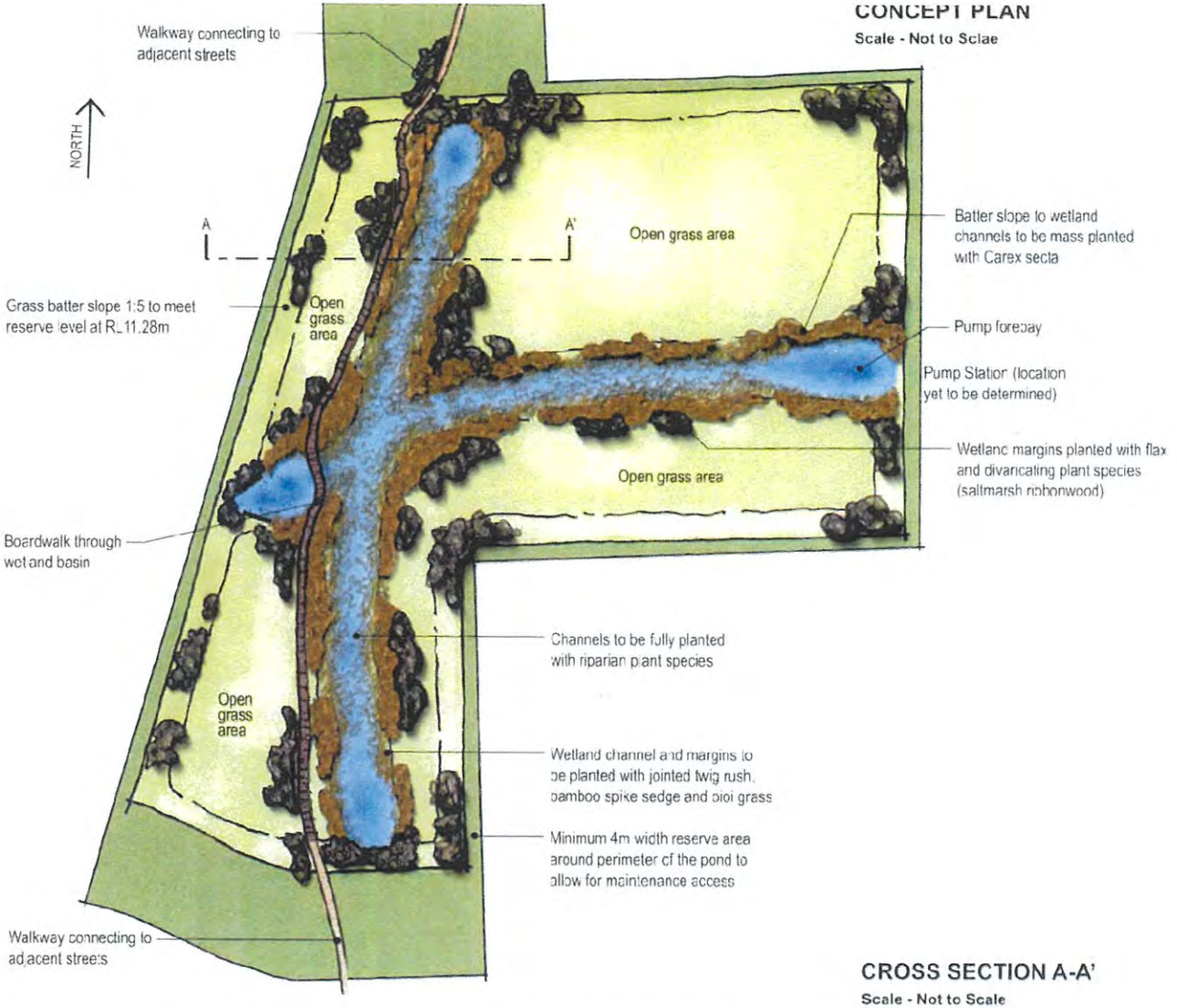
Bamboo Spike Sedge - *Eleocharis sphacelata*
Height - 1 metre
Comments - suitable for swamps and waterway edges (partially submerged)

Oioi Grass - *Leptocarpus similis*
Height - 1 metre
Comments - suitable for coastal marshlands and estuaries. Will grow in both moist and dry conditions and take on a different foliage colour in dry conditions

NOTE: Species selection subject to review following assessment of the receiving environment
Trial planting of selected species is recommended to ensure plant species tolerance to soil conditions and flood events (with saline mixing).

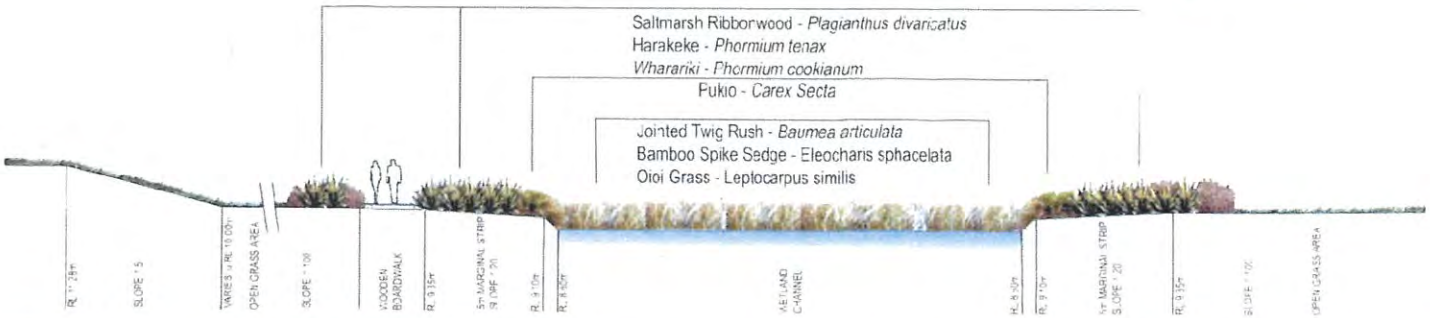
CONCEPT PLAN

Scale - Not to Sclae



CROSS SECTION A-A'

Scale - Not to Scale



Beca

TE AWA STRUCTURE PLAN

NOT FOR CONSTRUCTION

CLIENT NAPIER CITY COUNCIL | DESIGN JC DRAWN KD REVIEWED PRG BECA REF 4213220/316 | DRAWING ISSUE A CONCEPT 20TH AUGUST 2010 | SCALE AS SHOWN ORIGINAL SIZE A3

Appendix D

Preliminary Capital Costs

GENERAL SUMMARY

PROJECT : TE AWA / WILLOWBANK STRUCTURE PLAN

SubTitle : REV4

COMPANY : Beca

DATE : Fri 10 Sep 2010 02:42pm

Bid Currency : New Zealand

CO	SECTION NAME	UNIT	QUANTITY	RATE	COST
01	PRELIMINARIES AND GENERAL COSTS				3,238,000
02	TRAFFIC MANAGEMENT				231,000
03	LANDSCAPING				2,075,000
04	ROADWORKS - TE AWA				4,855,000
05	STORMWATER				12,840,000
06	WASTEWATER				1,000,000
07	WATER SUPPLY				588,000
08	CONTINGENCY				6,206,000
	PROFESSIONAL SERVICES				3,103,000
	Information Used				
1.	Beca Te Awa Transportation Report.				
2.	Beca Te Awa Urban Design Report.				
3.	Beca Te Awa Three Waters Report.				
4.	Beca water design sketches and measurements.				
5.	Valuation of the land to be purchased by NCC is provided by Telfer Young				
	Inclusions / Assumptions				
1.	Land aquisition cost for the stormwater pump station and Cow Shed, Serpentine, and New Drain adjecent to Willowbank Avenue is included in the above estimat (pl. refer Stormwater section of this estimate for the allowed land costs)				
2.	Cycleway will be part of the main street development as advised by engineers.				
3.	Grassing and topsoil is allowed only on the batters and berms of the open drain.				
4.	Costing for exposed aggregate concrete cycleway is allowed in this estimate, 5 nos of cycle way bridges are allowed in this estimate. (Please refer Landscaping section of this estimate for the allowed costs.)				
	Exclusions				
1.	GST				
2.	Escalation				
3.	Consent Fees				
4.	Legel fees				
5.	Client managed costs				
6.	No allowance for open space development in this estimate.				
7.	No allowance for any landscaping outside the pond in this estimate				
8.	No allowance for any separate cycleway in this estimate				
9.	Any other land aquisition except land purchase for various derains mentioned in the inclusions/ Assumptions part of this estimate.				

CO	SECTION NAME	UNIT	QUANTITY	RATE	COST
	Level of Accuracy Estimate level of Feasibility Estimate is +/- 30%				
	TOTALS OF SELECTED SECTIONS				34,136,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Preliminary and General Costs				
1	Allowance for Preliminary and General Costs	%	21,589,000	0.15	3,238,350
2	Rounding	LS	-1	350.00	-350
	Totals for Section '01'-'PRELIMINARIES AND GENERAL COSTS'				3,238,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	TRAFFIC MANAGEMENT				
1	Prepare temporary traffic management plan	LS	1	5,000.00	5,000
	Temporary Traffic Management at various locations (closure in days)				
2	Eriksen road - Willowbank Avenue Roundabout (level 2)	day	20	1,500.00	30,000
3	Kenny road - Willowbank Avenure Roundabout (level 2)	day	20	1,500.00	30,000
4	Willowbankd Avenue - New Main Street T junction(level 2)	day	20	1,500.00	30,000
5	Willowbankd Avenue Upgradation (level 2)	day	20	1,500.00	30,000
6	Eriksen Road	day	10	800.00	8,000
7	Kenny Road	day	10	800.00	8,000
	Offsite Local				
8	SH2 / Awatoto road - Seagull Island (level 2)	day	20	1,500.00	30,000
9	SH 2 / Te Awa Avenue / Mc Grath Street - Roundabout (level 2)	day	20	1,500.00	30,000
10	SH 2 / Marine Parade Roundabout (level 2)	day	20	1,500.00	30,000
	Totals for Section '02'-'TRAFFIC MANAGEMENT'				231,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Landscaping				
	Boardwalk in the Serpentine Pond				
1	1.8 m wide timber Boardwalk without hand rails	m2	666	500.00	333,000
	Pond Developments				
2	Grassing for the reserve area around the pond	m2	25,640	1.00	25,640
3	200 mm imported topsoil to the grassing reserve area	m3	5,128	40 00	205,120
	Planting in pond				
4	Sedge species in water (RT3-4 grade)	m2	3,800	35.00	133,000
5	Carex secta (channel edge)	m2	4,800	35.00	168,000
6	Perimeter planting	m2	4,800	35.00	168,000
	2m wide exposed aggregate concrete cycleway				
7	Subgrade preperation	m2	6,240	1.00	6,240
8	150mm exposed aggregate concrete cycleway	m2	6,240	65.00	405,600
9	Cycleway Bridge over the swale (5 no)	m2	225	2,800.00	630,000
10	Rounding	ls	1	400.00	400
	Totals for Section '03'-'LANDSCAPING'				2,075,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Eriksen Road Upgrade length 1750 m				
	Excavation				
1	Excavate 500 mm deep the existing road and dispose off the excavated material off site	m3	6,125	25.00	153,125
2	Undercutting for soft spots and backfilling with imported fill (say 5% of earthworks)	m3	307	60.00	18,420
	Pavement and Surfacing				
3	Subgrade preparation and testing	m2	17,500	1.00	17,500
4	350mm thick AP65 sub basecourse including all necessary compaction	m3	6,125	50.00	306,250
5	150mm thick M4 basecourse including all necessary compaction	m3	2,625	115.00	301,875
6	2 Coat chip seal	m2	17,500	6.00	105,000
7	25mm thick AC14 Mix 10 surfacing	m2	17,500	15.00	262,500
8	Regrade existing road to tie into new road level	LS	1	10,000.00	10,000
	Kerbs and Edging				
9	Subsoil drain	m	3,500	30.00	105,000
10	Kerb and channel	m	3,500	45.00	157,500
	Parks / berm				
11	Strip topsoil 150 mm deep and stockpile and respread	m3	1,575	20.00	31,500
12	Landscaping in the 3 m wide strip (including trees @ 20.0 m centers)	m2	10,500	15.00	157,500
	Footpath/Verge/Front Garden				
13	1.5 m wide concrete footpath including excavation, basecourse etc.	m2	5,250	65.00	341,250
14	1.0 m wide verge	m2	3,500	4.00	14,000
	New Main Street between (Cross Link Road) Eriksen Road and Kenny road and Willowbank Avenue length - 350 m				
15	Strip topsoil 150 mm deep and stockpile and respread	m3	525	20.00	10,500
	Pavement and Surfacing				
16	Subgrade preparation and testing	m2	3,500	1.00	3,500
17	350mm thick AP65 sub basecourse including all necessary compaction	m3	1,225	50.00	61,250
18	150mm thick M4 basecourse including all necessary compaction	m3	525	115.00	60,375

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
19	2 Coat chip seal	m2	3,500	6.00	21,000
20	25mm thick AC14 Mix 10 surfacing	m2	3,500	15.00	52,500
21	Regrade existing road to tie into new road level	LS	1	10,000.00	10,000
	Kerbs and Edging				
22	Subsoil drain	m	700	30.00	21,000
23	Kerb and channel	m	700	45.00	31,500
	Parks / berm				
24	Strip topsoil 150 mm deep and stockpile and respread	m3	315	20.00	6,300
25	Landscaping in the 3 m wide strip (including trees @ 20.0 m centers)	m2	2,100	15.00	31,500
	Footpath/Verge/Front Garden				
26	1.5 m wide concrete footpath including excavation, basecourse etc.	m2	1,050	65.00	68,250
27	1.0 m wide verge	m2	700	4.00	2,800
	Kenny Road Upgrade (between Eriksen Road and Willowbank Avenue) - length 460 m				
28	Excavation				
29	Excavate 500 mm deep the existing road and dispose off the excavated material off site	m3	1,610	25.00	40,250
30	Undercutting for soft spots and backfilling with imported fill (say 5% of earthworks)	m3	81	60.00	4,860
	Pavement and Surfacing				
31	Subgrade preparation and testing	m2	4,600	1.00	4,600
32	350mm thick AP65 sub basecourse including all necessary compaction	m3	1,610	50.00	80,500
33	150mm thick M4 basecourse including all necessary compaction	m3	4,215	115.00	484,725
34	2 Coat chip seal	m2	4,600	6.00	27,600
35	25mm thick AC14 Mix 10 surfacing	m2	4,600	15.00	69,000
36	Regrade existing road to tie into new road level	LS	1	10,000.00	10,000
	Kerbs and Edging				
37	Subsoil drain	m	920	30.00	27,600
38	Kerb and channel	m	920	45.00	41,400

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Parks / berm				
39	Strip topsoil 150 mm deep and stockpile and respread	m3	414	20.00	8,280
40	Landscaping in the 3 m wide strip (including trees @ 20.0 m centers)	m2	2,760	15.00	41,400
	Footpath/Verge/Front Garden				
41	1.5 m wide concrete footpath including excavation, basecourse etc.	m2	1,380	65.00	89,700
42	1.0 m wide verge	m2	920	4.00	3,680
	Roundabouts (including mountable kerbs, landscaping, line markings, signs etc.)				
43	Kenny Road and Eriksen Road roundabout	no	1	80,000.00	80,000
44	1st roundabout after Kenny road and Eriksen Road roundabout on Eriksen Road	no	1	80,000.00	80,000
45	2nd roundabout on Eriksen road	no	1	80,000.00	80,000
46	3rd roundabout on Eriksen road	no	1	80,000.00	80,000
47	Eriksen road and Willowbank Avenue roundabout	no	1	150,000.00	150,000
48	Kenny road and Willowbank Avenue roundabout	no	1	150,000.00	150,000
49	Intersection improvement at the New Main Street and Willowbank Avenue - Seagull Island	no	1	80,000.00	80,000
	Off Site Local (Te Awa Developments Only)				
50	SH2/ Awatoto Road - Seagull Islands	no	1	80,000.00	80,000
51	SH2/Te Awa Avenue / McGrath Street - roundabout	no	1	80,000.00	80,000
52	SH2/ marine Parade roundabout	no	1	80,000.00	80,000
	LIGHTING, SERVICE TRENCHING AND DUCTING				
	ROAD LIGHTING				
	12 m Galvanised steel pole with 150 W lantern at 50 m centers in a typical staggered arrangements (prices including supply , installation, storage, cabling etc.)				
53	Eriksen Road	no	70	6,000.00	420,000
54	Cross Link Road	no	14	6,000.00	84,000
55	Kenny Road	no	19	6,000.00	114,000
56	Rounding	ls	1	1,510.00	1,510
	Totals for Section '04'-'ROADWORKS - TE AWA '				4,855,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Supply and lay concrete gravity pipe (RCRRJ Class Z) in the various trench depth.				
1	Upsizing 1500 mm dia RCRRJ Class Z pipe to 1800 mm dia RCRRJ Class Z pipe	m	448	500.00	224,000
2	1800 RCRRJ Class Z pipe - Trench depth 1-2 m	m	40	2,300.00	92,000
3	450 RCRRJ Class Z pipe - Trench depth 0-1 m depth	m	1,090	325.00	354,250
	Re-shaping of Cow Shed Drain (430 m)				
4	Box culvert 2 x 1.5 m high x 3.0 m wide	m	20	10,300.00	206,000
5	Strip topsoil and stockpile	m3	2,387	11.00	26,257
6	Cut to waste	m3	18,415	20.00	368,300
7	Respread topsoil up on completion of work	m3	1,774	6.50	11,531
8	Remaining topsoil to waste	m3	613	20.00	12,260
9	Grassing	m2	11,825	1.00	11,825
10	Land purchasing	m2	17,200	55.00	946,000
	Re-shaping of Serpentine Drain (721 m)				
11	Strip topsoil and stockpile	m3	3,029	11.00	33,319
12	Cut to waste	m3	18,602	20.00	372,040
13	Respread topsoil up on completion of work	m3	2,921	6.50	18,986
14	Remaining topsoil to waste	m3	108	20.00	2,160
15	Grassing	m2	19,467	1.00	19,467
16	Land purchasing	m2	22,351	55.00	1,229,305
	New Drain adjecent to Willowbank Avenue (1125 m)				
17	Box culvert 2 x 1.5 m high x 4.0 m wide	m	20	12,600.00	252,000
18	Strip topsoil and stockpile	m3	6,244	11.00	68,684
19	Cut to waste	m3	30,460	20.00	609,200
20	Respread topsoil up on completion of work	m3	5,063	6.50	32,910
21	Remaining topsoil to waste	m3	1,181	20.00	23,620
22	Grassing	m2	33,750	1.00	33,750
23	Land purchasing	m2	45,000	55.00	2,475,000
	Serpentine Pond				
24	Upsize cost for the headwall to accomodate 1500 dia pipe to headwall to accomodate				

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	1800 dia pipe	no	1	2,000.00	2,000
25	Landscaping for serpentine pond (included in landscaping section of this estimate)				
26	Boardwalk in the serpentine pond (included in the urban features section of this estimate)				
	Pumping station				
27	Stormwater pumping station with the capacity of 4.5 m3/s. (Costing is based on the scaled down information taken from the Cross Country Drain Pump Station Costing - info supplied by NCC)				
28	Survey	no	1	10,000.00	10,000
29	Investigation & Tests	no	1	50,000.00	50,000
30	Pump Station Structures (including ancillary & structural elements)	no	1	2,214,000.00	2,214,000
31	Pumps & Mechanical	no	1	334,000.00	334,000
32	Electricla & Generator	no	1	1,208,000.00	1,208,000
33	Outfall & outfall pipes	no	1	1,200,000.00	1,200,000
34	Property cost to accomodate discharge pipes	ls	1	300,000.00	300,000
35	Stormwater discharge consenting process	ls	1	100,000.00	100,000
36	Rounding	ls	-1	864.00	-864
	Totals for Section '05'-'STORMWATER'				12,840,000

pump station $5.4 m.

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Sewerline Schedule				
	Supply and lay concrete gravity pipe Trench depth 1-2 m				
1	150 mm diameter	m	380	203.00	77,140
2	225 mm diameter	m	125	315.00	39,375
	Supply and lay concrete gravity pipe Trench depth 2-3 m				
3	150 mm diameter	m	370	263.00	97,310
4	225 mm diameter	m	290	390.00	113,100
	Supply and install PE rising main depth 1 m				
5	100 mm diameter NB from PS 1	m	350	100.00	35,000
6	150 mm diameter NB from PS 2	m	150	150.00	22,500
	Supply and install 1050 mm dia manholes including lid and CI cover				
7	Up to 1-2 m depth	no	6	3,700.00	22,200
8	Up to 2-3 m depth	no	9	4,300.00	38,700
9	Pump Station 1 14.5 l/s flow rate 78m3 emergency storage Storage not specifically included in Pump Station 1 costing	no	1	133,131.00	133,131
10	Pump Station 2 22 l/s flow rate 120 m3 emergency storage Storage not specifically included in Pump Station 2 costing	no	1	182,620.00	182,620
11	Pump Station 3 30 l/s flow rate 163 m3 emergency storage Storage not specifically included in Pump Station 3 costing	no	1	229,665.00	229,665
12	Allow to connect into the Taradale road sewer main	LS	1	10,000.00	10,000
13	Rounding	LS	-1	741.00	-741
	Totals for Section '06'-'WASTEWATER'				1,000,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Water Schedule				
	Supply and install uPVC watermain at 0-1 m depth				
1	200 mm diameter	m	3,478	115.00	399,970
	Supply and install valves				
2	200 mm diameter sluice valves	no	24	3,600.00	86,400
	Supply and install hydrants				
3	150 mm diameter hydrant connection	no	18	2,350.00	42,300
	Supply and install fittings				
4	200 mm dia Pressure Release Valve	no	2	20,000.00	40,000
5	Allow to connect new water supply network to the existing water supply network	LS	2	10,000.00	20,000
6	Rounding	ls	-1	670.00	-670
	Totals for Section '07'-'WATER SUPPLY'				588,000

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Contingency				
1	Allowance for Contingency	%	24,827,000	0.25	6,206,750
2	Rounding	LS	-1	750.00	-750
	Totals for Section '08'-'CONTINGENCY'				6,206,000

Section "-'PROFESSIONAL SERVICES'

PROJECT : TE AWA / WILLOWBANK STRUCTURE PLAN

SubTitle : REV4

COMPANY : Beca

DATE : Fri 10 Sep 2010 02:42pm

Bid Currency : New Zealand

BQREF	DESCRIPTION	UNIT	QTY	RATE	COST
	Professional Services				
1	Design Fees (6% of total construction cost)	LS	1	1,861,980.00	1,861,980
2	Design management fees (4% of total construction cost)	LS	1	1,241,320.00	1,241,320
3	Rounding	LS	-1	300.00	-300
	Totals for Section "-'PROFESSIONAL SERVICES'				3,103,000

The model showed that the maximum water level, with 4 hours total pump failure, for the 2% AEP and 10% AEP events are only marginally higher then when the pumps are operating without failure. This is attributed to the total pump capacity.

In the 2% AEP event scenario, the additional runoff that needs to be stored in the pond and Serpentine Drain as result of the 4 hours total pump failure compared to the normal operating condition scenario is approximately 12,000m^3. The difference in storage volume within the pond for the 2% AEP event is 11,000m^3 (comparison between no pump failure and total pump failure scenarios). The remainder of the 1,000m^3 of runoff is stored within the Serpentine Drain.

Similar to the normal operating condition scenario, the pond is inundated for a significant period of time for both rainfall events before all the stormwater is pumped out of the pond.

4.5 Peak Water Levels in the Serpentine Drain

Peak water levels in the Serpentine Drain for both scenarios are confined within its bank. Water levels in the drain are largely influenced by the water level in the Serpentine Pond. Refer to Appendix D for the long sections showing the maximum water level in the drain.

4.6 Summary of Results

Under the normal pump operating conditions, the model results showed that the maximum water levels in the pond for the 2% and 10% AEP events are RL 11.12m and RL 10.38m respectively. Runoff is stored within the proposed Serpentine Pond and there is no sectional or habitable floor flooding to existing properties for both rainfall events based on the provision of a 14.9 hectares pond utilising the existing Kenny Road Pump Station.

The consented minimum sectional and floor levels for the existing Te Awa Estates development are RL 11.28m and RL 11.58m respectively. Therefore, to be conservative, it is proposed to adopt a maximum water level of RL 11.28m for the 2% AEP event for this scenario. On this basis, the minimum proposed new floor level shall be RL 11.58m (RL 11.28m + 0.3m freeboard) such that there will be no sectional or habitable floor flooding to both existing and new properties.

The maximum water levels for the 2% and 10% AEP events with 4 hours total pump failure are RL 11.19m and RL 10.51m respectively. In the 2% AEP event there will be no sectional or habitable floor flooding to existing and new properties. Under the total pump failure scenario the existing and proposed properties 300mm freeboard can be achieved.