

Reservoir Site Layout Development Report

Huia Replacement Water Treatment Plant

Prepared for Watercare Services Ltd

Prepared by Beca Limited

22 May 2019



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Revision History

Revision N°	Prepared By	Description	Date
1	Scott Pearson	Draft for Client Review	17/05/2019
2	Scott Pearson	For Resource Consent Application	22/05/2019

Document Acceptance

Action	Name	Signed	Date
Prepared by	Scott Pearson		22/05/2019
Reviewed by	Jon Reed		22/05/2019
Approved by	Jon Reed		22/05/2019
on behalf of	Beca Limited		

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1 Introduction

Watercare Services Limited (Watercare) is responsible for the treatment and supply of potable water and for the collection, treatment and disposal of wastewater to around 1.5 million people in Auckland. Watercare is a Council Controlled Organisation (CCO), wholly owned by the Auckland Council.

Watercare operates five dams within the Waitākere Ranges, including the Upper and Lower Huia Dams and the Upper and Lower Nihotupu Dams. Water from these western water supply dams is treated at the Huia and Waitākere Water Treatment Plants before being distributed via the water transmission network, primarily to west and north Auckland. The Huia Water Treatment Plant (Huia WTP) is the third largest water treatment plant in Auckland and is a crucial component of Auckland's water supply network, treating approximately 20% of Auckland's water.

The Huia WTP was constructed in 1929 and is now nearing the end of its operational life (90 years old). Watercare therefore proposes to construct a new WTP to replace the aging Huia WTP. As part of this project Watercare is also proposing to construct two treated water reservoirs (50,000 m³ total capacity) to increase treated water storage within the western supply zone.

This report is intended to be read in conjunction with North Western Water Supply: Storage Requirements Report¹, which sets out the preferred size and location of reservoir storage. The purpose of this report is to describe the constraints and decisions made to develop a concept design of the reservoirs to support the Huia Replacement WTP Project resource consent application. Information on the Huia Replacement WTP siting and concept are provided in separate reports outside the scope of this report.

For further detail on individual aspects, reference should be made to the relevant specialist reports included with the Huia Replacement WTP consent application and Assessment of Environmental Effects.

This report has been prepared to assess the reservoir component of the proposed works and to accompany the regional resource consent application and outline plan of works in relation to the proposed construction and operation of the WTP and reservoirs.

1.1 Project description

The replacement WTP will be constructed on the corner of Manuka Road and Woodlands Park Road directly across from the existing Huia WTP site. The replacement WTP will have a treatment capacity of 140,000 m³/day. A new 25,000 m³ treated water reservoir will be located on the northern side of Woodlands Park Road (Reservoir 1), with another 25,000 m³ reservoir (Reservoir 2) subsequently constructed on the existing Huia WTP site once the existing plant has been decommissioned. The proposed works also include construction of the North Harbour 2 watermain (NH2) valve chamber and tunnelling reception shaft within the Reservoir 1 site.

Refer to the "Huia Replacement WTP Assessment of Environmental Effects Report prepared by Tonkin + Taylor Ltd (May 2019)" for further details.

1.2 Site description

The project is located on land owned by Watercare and is designated in the Auckland Unitary Plan (AUP) for 'Water supply purposes – water treatment plants and associated structures' (designation reference 9324 – Huia and Nihotupu Water Treatment Plants). The project spans three sites owned by Watercare which have

¹ North Western Water Supply: storage requirements - Assessment of storage required and site selection assessment, Beca Ltd, May 2019.

a total site area of approximately 145,700 m². The site on which the proposed replacement Huia WTP is located has an area of approximately 42,000 m², the proposed Reservoir 1 site has an area of approximately 63,600 m², and the existing WTP site (on which Reservoir 2 is proposed) has an area of approximately 40,100 m².

The replacement Huia WTP is proposed to be located adjacent to the existing Huia WTP site on the corner of Woodlands Park Road and Manuka Road. The first 25,000 m³ reservoir (Reservoir 1) will be located on the northern side of Woodlands Park Road below Exhibition Drive directly across from the existing Huia WTP. The second 25,000 m³ reservoir (Reservoir 2) will be located on the existing Huia WTP sites. The sites are all accessed from Woodlands Park Road. These three sites are collectively referred to as “the project site”.

The project site is located approximately 1 km from Titirangi Village and approximately 1.5 km north of the closest reach of the Manukau Harbour. The project site is predominately surrounded by residential (large lot) zones in all directions other than to the south-east of the proposed WTP site which adjoins land zoned Open Space – Conservation and designated by Auckland Council for Regional Park purposes.

The replacement WTP site slopes gently from the Woodlands Park Road to the south with gullies located at the southern boundary running north to south. The eastern extent of this site features steep slopes which rise up towards Scenic Drive. A section of the Yorke Gully Stream traverses the south eastern part of the replacement WTP site and a small tributary of the Armstrong Gully Stream is located in the north-western corner of the site.

The Reservoir 1 site is relatively hummocky with a knoll located in the middle of the site near the southern boundary, and a small gully feature (Armstrong Gully) runs through the site. Extremely steep slopes are present along the northern boundary beneath and above Exhibition Drive. A permanent section of Armstrong Gully stream is located to the west of Reservoir 1.

The existing WTP site where Reservoir 2 will be located has been developed as a WTP for the last 90 years. The site has a generally moderate to steep slope towards the south, with very steep slopes along the eastern and southern site boundaries. The Armstrong Gully watercourses are piped beneath the centre of the site, discharging into an open channel near the southern boundary. A small tributary of the Armstrong Gully Stream extends from the replacement WTP site into the north-eastern corner of the existing Huia WTP site.

Both the WTP and Reservoir 1 sites are almost completely vegetated in native bush, while the existing WTP site is approximately half vegetated in native bush with the remainder developed as part of the existing Huia WTP. The sites are identified as part of an extensive Significant Ecological Area (SEA_T_5539) in the AUP that essentially extends throughout the entire Waitakere Ranges area.

2 Basis of design and layout

The process for selection of this reservoir concept is covered in the North Western Water Supply : Storage Requirements Report³. Table 1 summarises the design parameters and basis for the reservoirs.

Table 1: Design basis for the reservoirs

Parameter	Value	Comments / Basis
Volume required - Initial	25,000 m ³ /day	Refer North Western Water Supply : Storage Requirements Report
Total Volume Required – Future	50,000 m ³ /day	Refer North Western Water Supply : Storage Requirements Report
Number of reservoirs	Two	Provides resilience and allows for maintenance of a single reservoir with minimal disruption. A larger number of smaller reservoirs provide additional operational complexity and cost and are not considered.

³ North Western Water Supply : Storage Requirements Report, Beca Ltd., May 2019

3 Site layout development

3.1 Reservoir 1 constraints

The identified constraints for Reservoir 1 are described in this section and indicated in Figure 1.

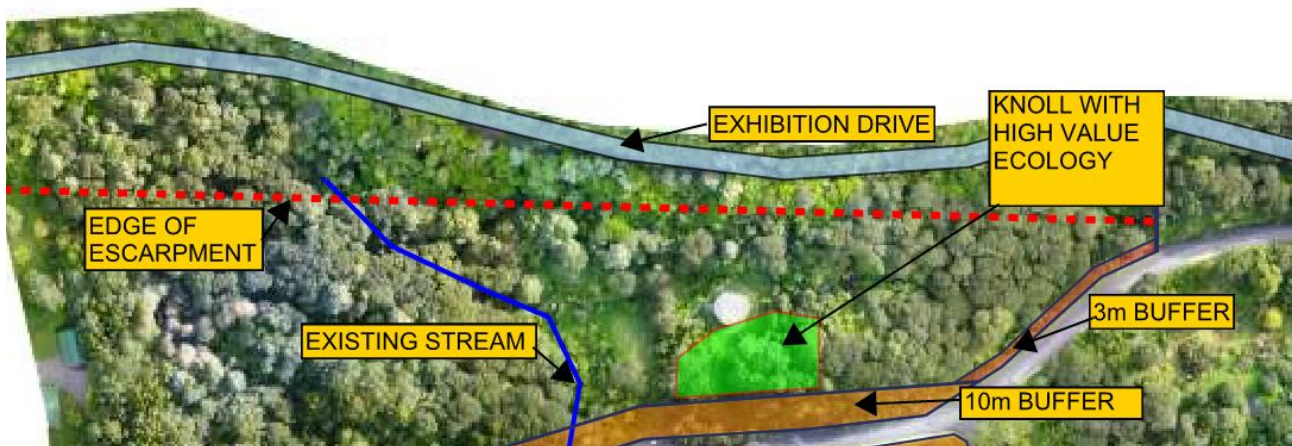


Figure 1: Identified Reservoir 1 constraints

3.1.1 Ecology

There are numerous surveyed mature native trees on the Reservoir 1 site, including Kauri and Kahikatea. There is a knoll on the site to the south of the existing tank, considered to be of particular ecological value with multiple Kauri trees.

A section of Armstrong Gully stream classified as permanent flow is located on the site.

The highly vegetated escarpment to the north of the site running up to Exhibition Drive is a dominant landscape feature and is noted as a protected ridgeline in the AUP.

3.1.2 Topography

The ground is relatively hummocky with a knoll located in the middle of the site near the southern boundary, and a small gully feature (Armstrong Gully) running through the site. Extremely steep slopes are present along the northern boundary beneath Exhibition Drive.

The existing Huia WTP filter backwash supply tank is located on the site, and alternative facilities will be required to supply filter backwashing water during construction of Reservoir 1 in order to maintain operation of the existing WTP until the replacement WTP is built and commissioned.

3.1.3 Access

Permanent access to the Reservoir 1 site will be required to both the inlet and outlet of Reservoir 1, and to the North Harbour 2 Watermain tunnel portal and valve chamber.

3.1.4 Landscape buffer

A landscape buffer is required between the site boundary on Woodlands Park Road and the reservoir to allow for planting and mitigation of visual effects. Watercare has confirmed that a buffer of 10m is required to the site boundary on the southern edge of the site (to the west of the Manuka Rd intersection) and a 3m

buffer on the south eastern edge of the site (east of the Manuka Rd intersection) is the minimum required where the vegetation is of lesser significance.

3.2 Reservoir 2 constraints

The identified constraints for Reservoir 2 are described in this section and indicated in Figure 2.

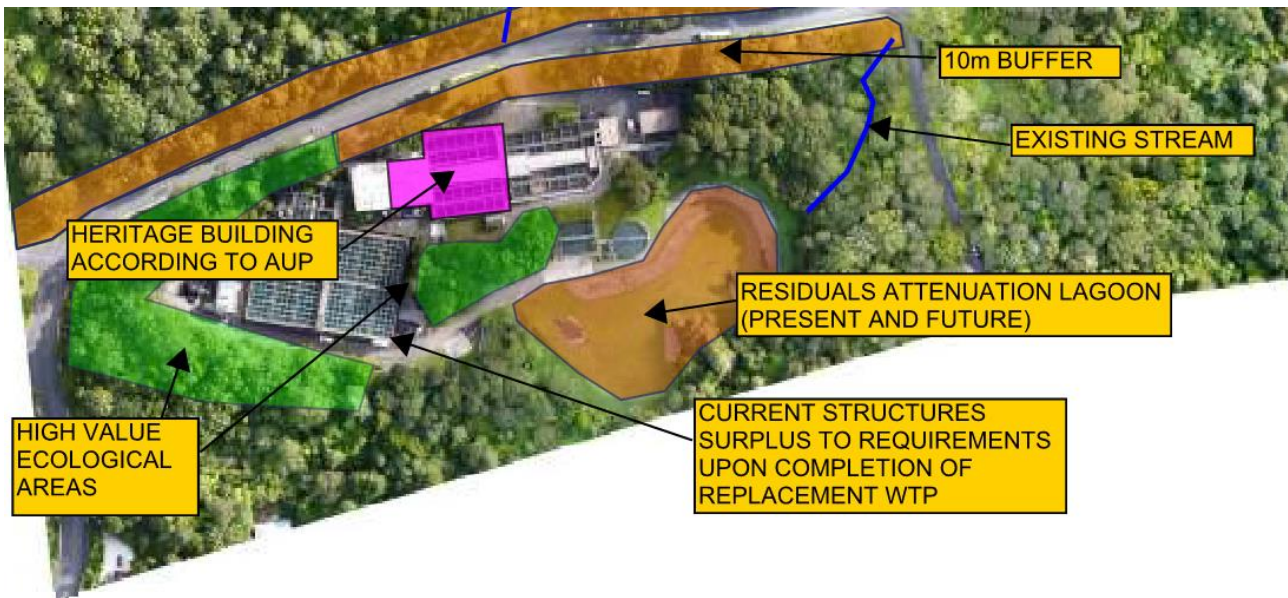


Figure 2: Identified Reservoir 2 constraints

3.2.1 Ecology

The existing Huia WTP site contains pockets of high value vegetation to the south of the heritage building and to the west of the site as denoted in green shading in Figure 2. Vegetation to the north-east of the site has been identified as lower value than the prominent knoll and Kauri trees on the Reservoir 1 site although both areas are classified as level 2. Two significant Totara are identified on the Reservoir 2 site. A small stream runs adjacent to the north-eastern site boundary (blue line in Figure 2), with more significant vegetation on the eastern side of this stream.

3.2.2 Topography

The existing WTP site levels range from approximately 105 m RL to 120m RL and slopes generally down towards the south.

3.2.3 Landscape buffer

A landscape buffer is required between the site boundary on Woodlands Park Road and the reservoir to allow for planting and mitigation of visual effects. A buffer of 10m from the proposed Reservoir wall to the northern site boundary has been provided. Pipework will be installed below ground in this area. Mitigation planting will be provided. Any planting over pipework will consider maintaining the pipe integrity and allow removal for any required pipe maintenance over the life of the reservoir.

3.2.4 Reservoir timing

Reservoir 2 construction will require the Huia Replacement WTP to be operational to allow for decommissioning of the existing Huia WTP in order to occupy and prepare the site of Reservoir 2.

As identified in the North Western Water Supply : Storage Requirements Report, storage greater than 25,000 m³ is required by 2030, so Reservoir 2 is proposed for construction as soon as occupation of the site and decommissioning of the existing WTP allows.

3.2.5 Access

The existing WTP site accesses are from Woodlands Park Rd at the western end and the centre of the site. It is proposed that these accesses will be retained as required.

3.2.6 Watercare requirements

The existing attenuation lagoon is proposed to be re-used for the Huia Replacement WTP and for scour and overflows from the two reservoirs and the replacement WTP. The volume and footprint of this lagoon is to be retained.

3.3 Operational requirements

The proposed functionality between the Huia Replacement WTP, reservoirs and NH1 and NH2 pipeline is to provide the ability for:

- Operation of Reservoirs 1 and 2 in parallel, with Reservoir 1 supplying NH2 and Reservoir 2 supplying NH1
- Operation of the reservoirs in series, with Reservoir 1 supplying Reservoir 2. Reservoir 2 can then supply both NH1 and NH2 watermains
- Both the NH1 and NH2 watermains to be supplied when either Reservoir 1 or 2 are out of service
- Pumping into Reservoir 2 from the Titirangi Reservoirs for resilience when the Huia Replacement WTP is out of service

A schematic of the proposed configuration is provided in Appendix A. The operational philosophy and integration with the wider Watercare Water Supply Network, particularly during resilience scenarios are still to be confirmed.

3.4 Proposed reservoir layouts

The proposed reservoir layouts have been developed in conjunction with the Project Team leads including landscape architects, ecologists, arborists and constructability specialists. Reference should also be made to their reports for further details on specific items including surveyed trees, construction methodology and required footprints. Cut slopes of 1:2.7 and fill slopes of 1:1 have been used for the concept layout development.

3.4.1 Reservoir 1

The location of Reservoir 1 to the eastern side of the site, north of the Woodlands Park Rd has been selected with the following considerations:

- Reducing the overall effects to northern ridgeline
- Avoiding effects of surveyed Kauri on the site, including the mature Kauri on a prominent knoll. Kauri dieback spread prevention measures will be undertaken during construction
- Reducing effects on Armstrong Stream.
- Maintaining agreed landscape buffers to the site boundary.

In order to meet the required volume and operational requirements, the reservoir shape (footprint) has been adapted to fit within the above constraints, rather than a more traditional circular or rectangular shape. Concept drawings showing Reservoir 1, including a site plan and section are provided in Appendix A.

The reservoir, when completed will be effectively below ground level and have limited visibility from the road.

3.4.2 Reservoir 2

Reservoir 2 has been located to the east of the existing Huia WTP Site with the following considerations:

- Retain the existing attenuation pond to the south. This requires the removal of the vegetation to the north east of the existing Huia WTP site, including the two identified Totara trees.
- Retain the heritage structure of the existing Huia WTP to the east of the Reservoir 2 site. Pipework and an overland flow path for stormwater is proposed to the west of the reservoir 2 site in the corridor between the reservoir and heritage buildings.
- Provide a 10m setback from the reservoir wall to the northern site boundary. Underground pipework is to be located in this corridor
- Reduce effects on vegetation and works around the stream to the east of the reservoir 2 site.
- Site access is proposed through the existing WTP site access.

A rectangular reservoir is proposed in this area, with chambers integrated in the overall structure. Concept drawings showing Reservoir 2, including a site plan and section are provided in Appendix A.

3.4.3 Pipework

Pipework has been drawn to include the valves as depicted in the process schematic. Pipework corridors have been considered to reduce the ecological effects where possible. An overall plan with identified pipework is provided in Appendix A. Micro-tunnelling of pipework is proposed between the reservoirs and chambers. Pipework location and effects to the Kauri between the NH2 valve chamber and the Reservoir 1 site boundary (at the intersection of the Reservoir 1 proposed western site access and Woodlands Park Road) will be minimised through this approach.

3.4.4 Staging

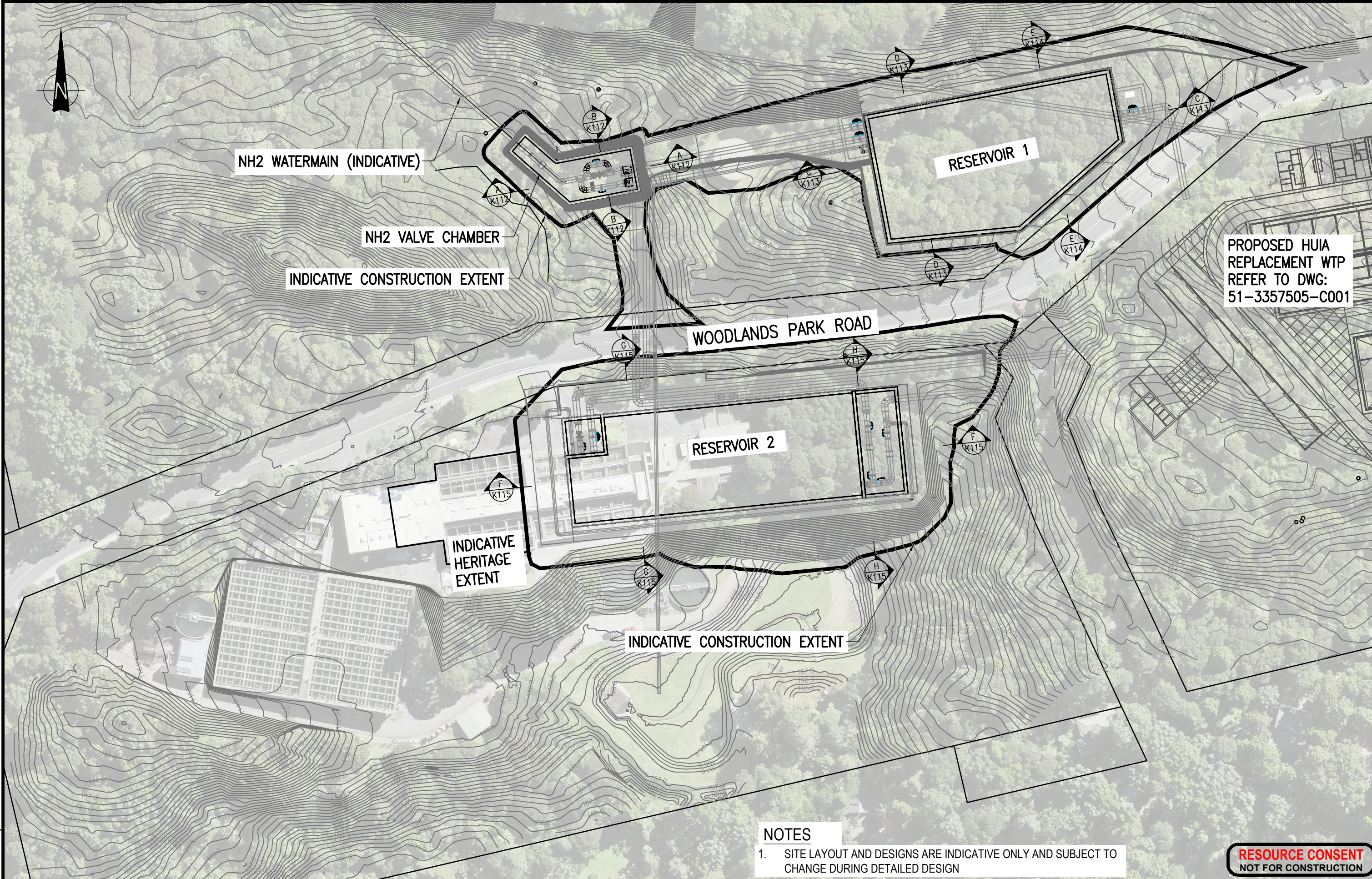
To maintain a continued supply from the Huia WTP sources, the Huia Replacement WTP and Reservoir 1 are required to be commissioned and operational, prior to the decommissioning of the existing Huia WTP and construction of Reservoir 2. The current proposal is to construct the works on the Reservoir 1 site including pipework to the existing WTP site with construction of the Huia Replacement WTP.

A connection from Reservoir 1 into the Titirangi Aqueduct will be made prior to the decommissioning of the existing WTP.

This staging increases the duration of construction, estimated at an additional 24 months for the decommissioning of the existing Huia WTP and construction of Reservoir 2.

A

Appendix A – Drawings



NOTES

1. SITE LAYOUT AND DESIGNS ARE INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN

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ISSUE	DATE	AMENDMENT			BY	APPD.		

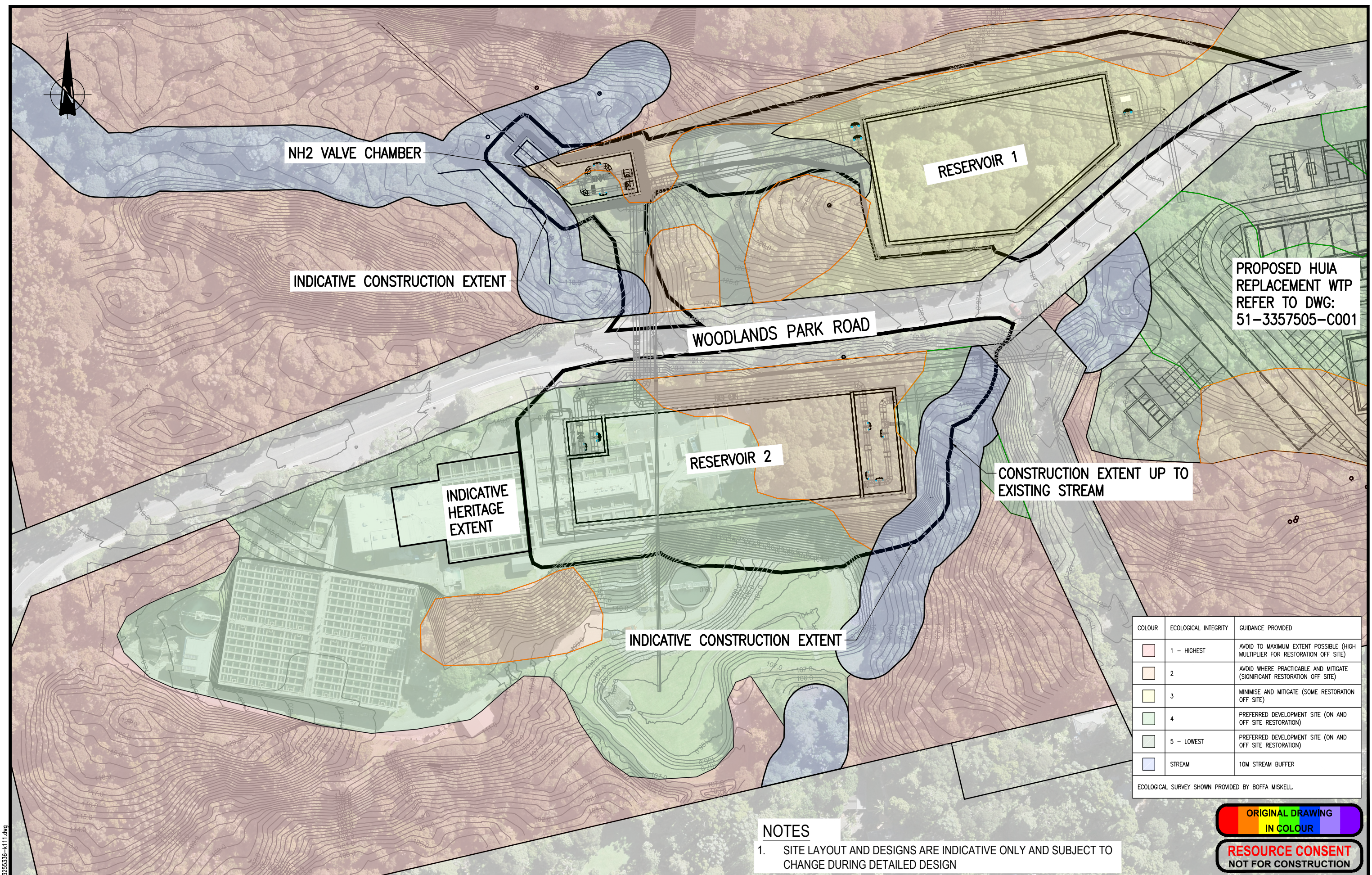


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HUIA REPLACEMENT WATER TREATMENT PLANT
TREATED WATER STORAGE RESERVOIRS
RESERVOIR CONCEPT - PLAN

CAD FILE 3255336-K110	DATE 21.05.19
ORIGINAL SCALE A3 1:1000	CONTRACT No. -
REF No.	
DWG No. 3255336 -K110	ISSUE OB



COLOUR	ECOLOGICAL INTEGRITY	GUIDANCE PROVIDED
<div></div>	1 - HIGHEST	AVOID TO MAXIMUM EXTENT POSSIBLE (HIGH MULTIPLIER FOR RESTORATION OFF SITE)
<div></div>	2	AVOID WHERE PRACTICABLE AND MITIGATE (SIGNIFICANT RESTORATION OFF SITE)
<div></div>	3	MINIMISE AND MITIGATE (SOME RESTORATION OFF SITE)
<div></div>	4	PREFERRED DEVELOPMENT SITE (ON AND OFF SITE RESTORATION)
<div></div>	5 - LOWEST	PREFERRED DEVELOPMENT SITE (ON AND OFF SITE RESTORATION)
<div></div>	STREAM	10M STREAM BUFFER

ECOLOGICAL SURVEY SHOWN PROVIDED BY BOFFA MISKELL.

NOTES

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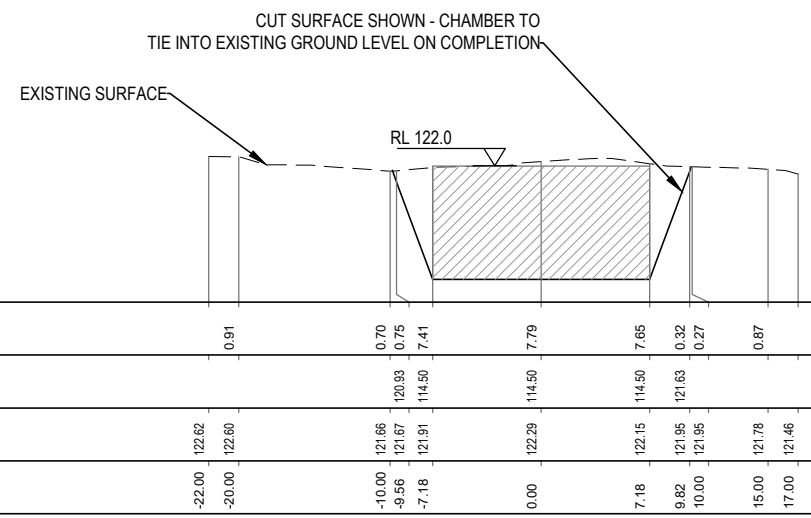
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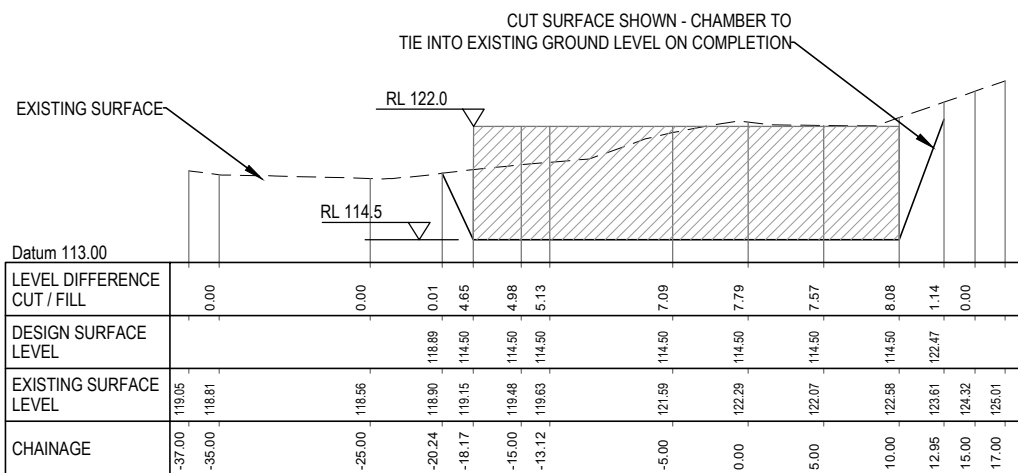
HUIA REPLACEMENT WATER TREATMENT PLANT
TREATED WATER STORAGE RESERVOIRS
RESERVOIR CONCEPT – ECOLOGICAL FEATURES

CAD FILE 3255336-K111	DATE 21.05.19
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DWG No. 3255336 -K111	ISSUE 0B

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SECTION **B-B**
SCALE: 1:500 **K110**



SECTION **A-A**
SCALE: 1:500 **K110**

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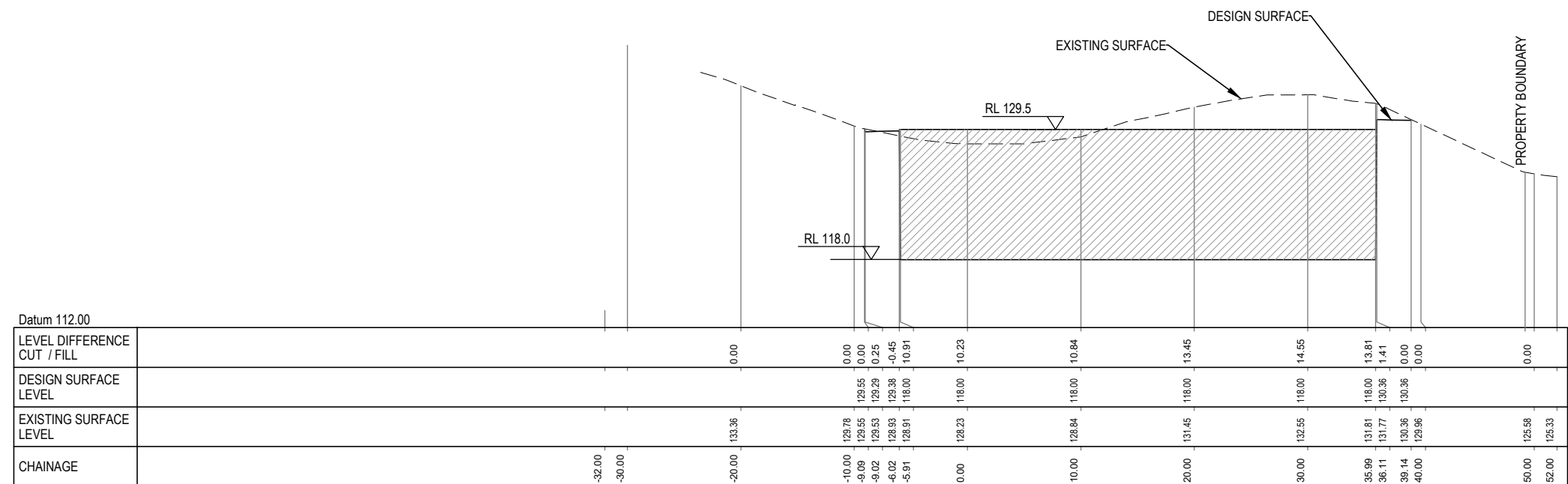
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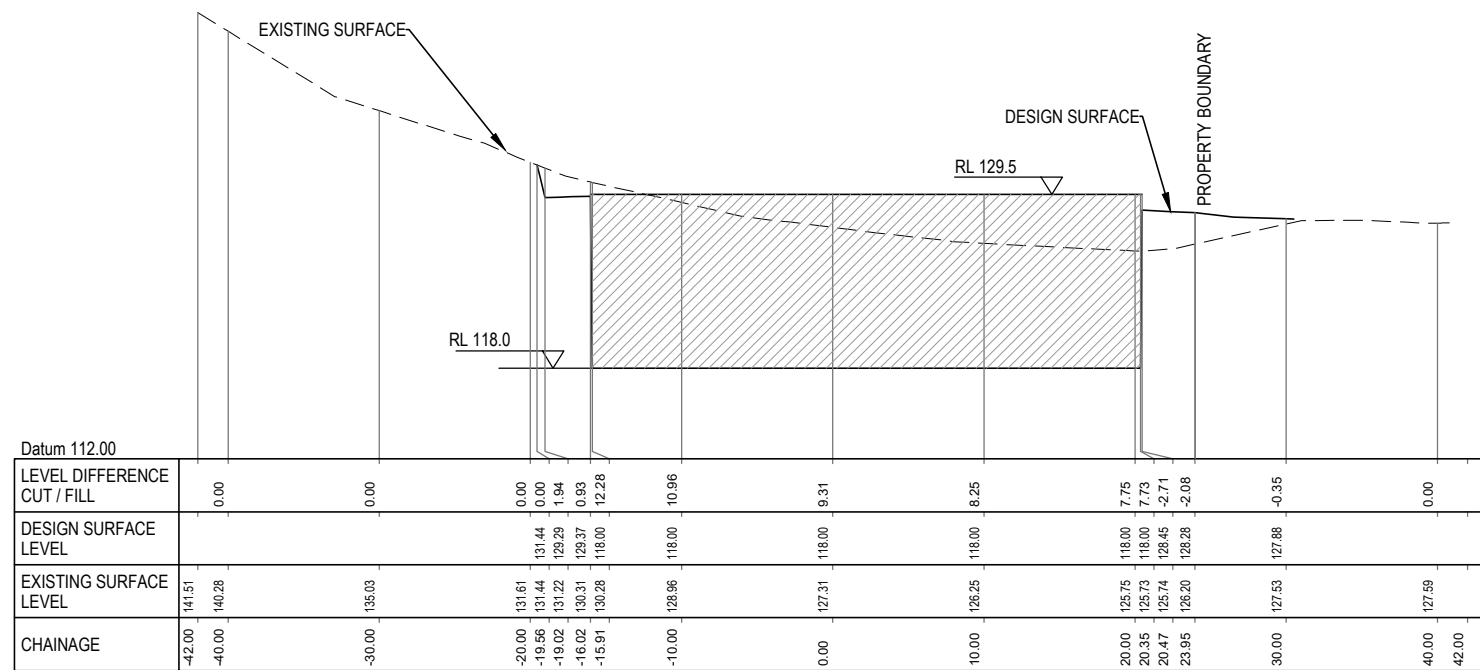
HUIA REPLACEMENT WATER TREATMENT PLANT

TREATED WATER STORAGE RESERVOIRS

NH2 VALVE CHAMBER – SECTIONS A & B

CAD FILE 3255336-K112	DATE 21.05.19
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REF No.	
DWG No. 3255336 -K112	ISSUE 0B





SECTION E-E
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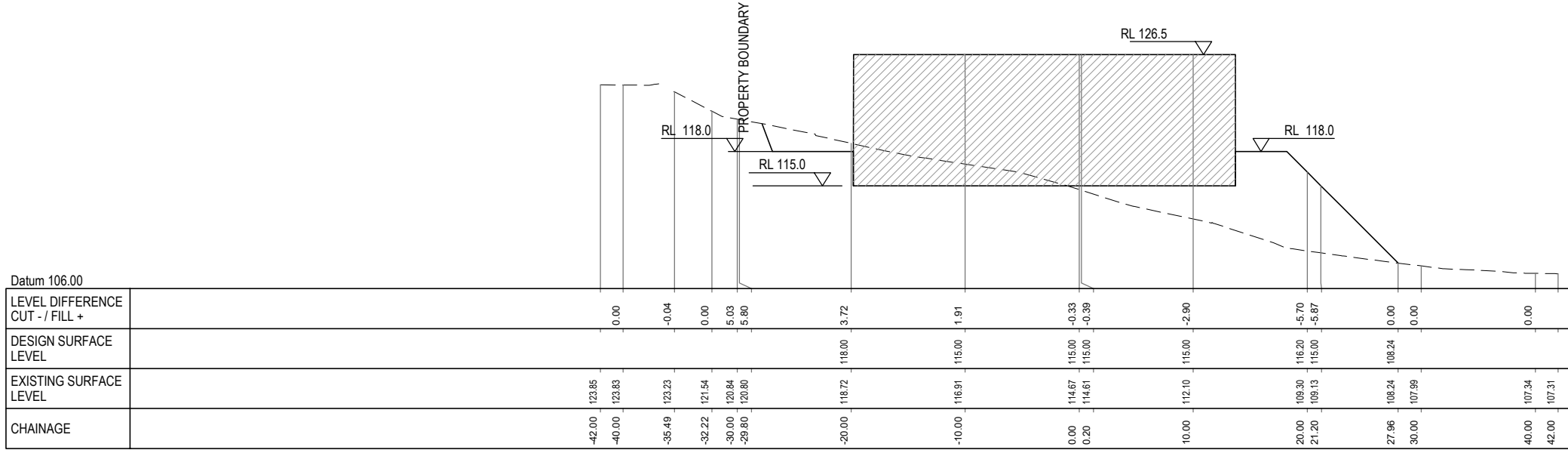
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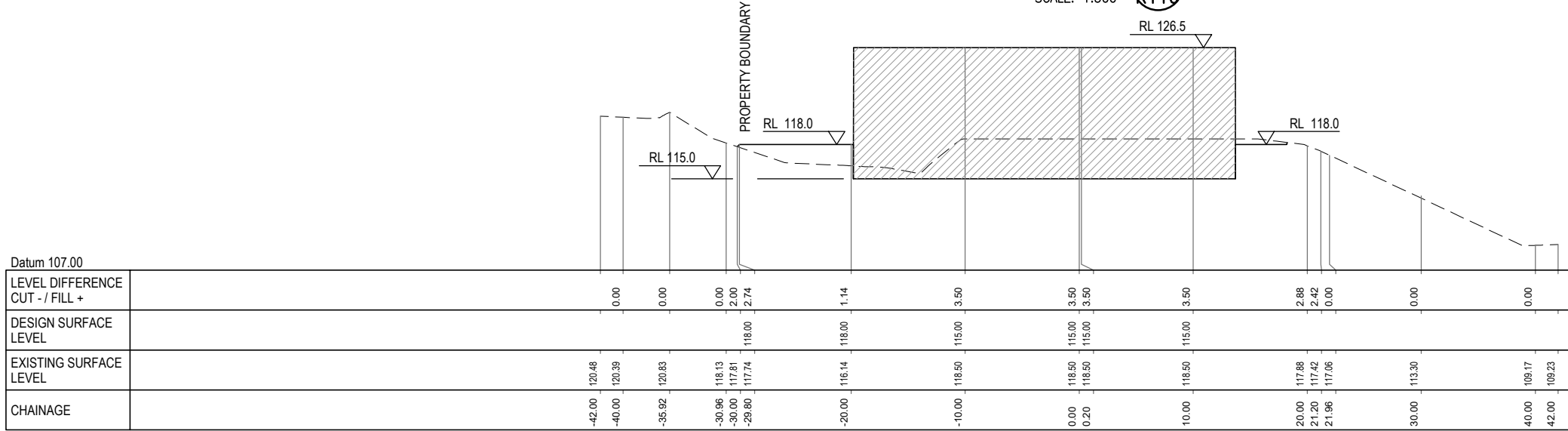

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HUIA REPLACEMENT WATER TREATMENT PLANT
TREATED WATER STORAGE RESERVOIRS
RESERVOIR 1 – SECTIONS E

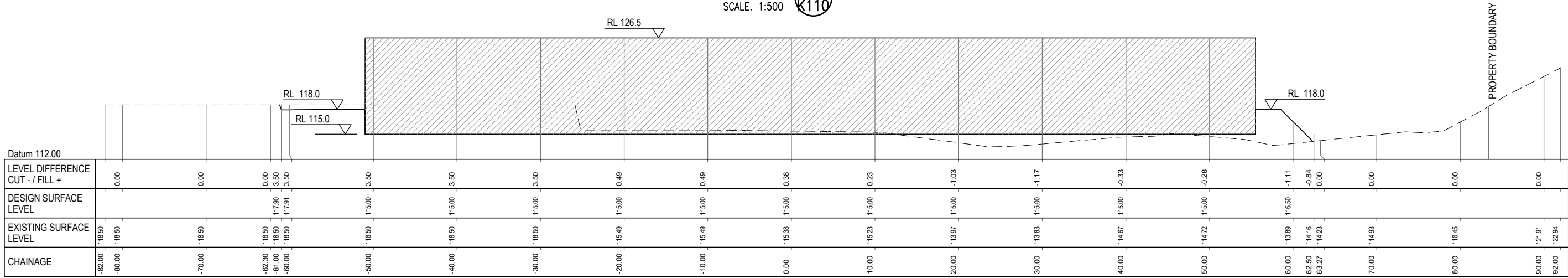
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REF No.	
DWG No. 3255336 -K114	ISSUE OB



SECTION H-H
SCALE: 1:500
K110



SECTION G-G
SCALE: 1:500
K110



SECTION F-F
SCALE: 1:500
K110

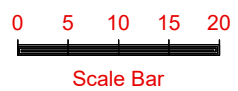
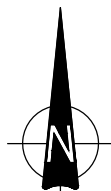
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HUIA REPLACEMENT WATER TREATMENT PLANT
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RESERVOIR 2 – SECTIONS F & G & H

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EARTH WORKS CUT / FILL DEPTH			DEPTH COLOUR	
CUT / FILL DEPTH				
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-13	to	-12		
-12	to	-11		
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9	to	10		


WORK SITE	CUT VOLUME	FILL VOLUME	BALANCE	DISTURBED AREA
RESERVOIR 1	-44,000m ³	400m ³	-43,600m ³	8,800m ²
RESERVOIR 2	-6,000m ³	11,000m ³	5,000m ³	9,000m ²
TOTAL/BALANCE	-50,000m ³	11,400m ³	-38,600m ³	17,800m ²

NOTES
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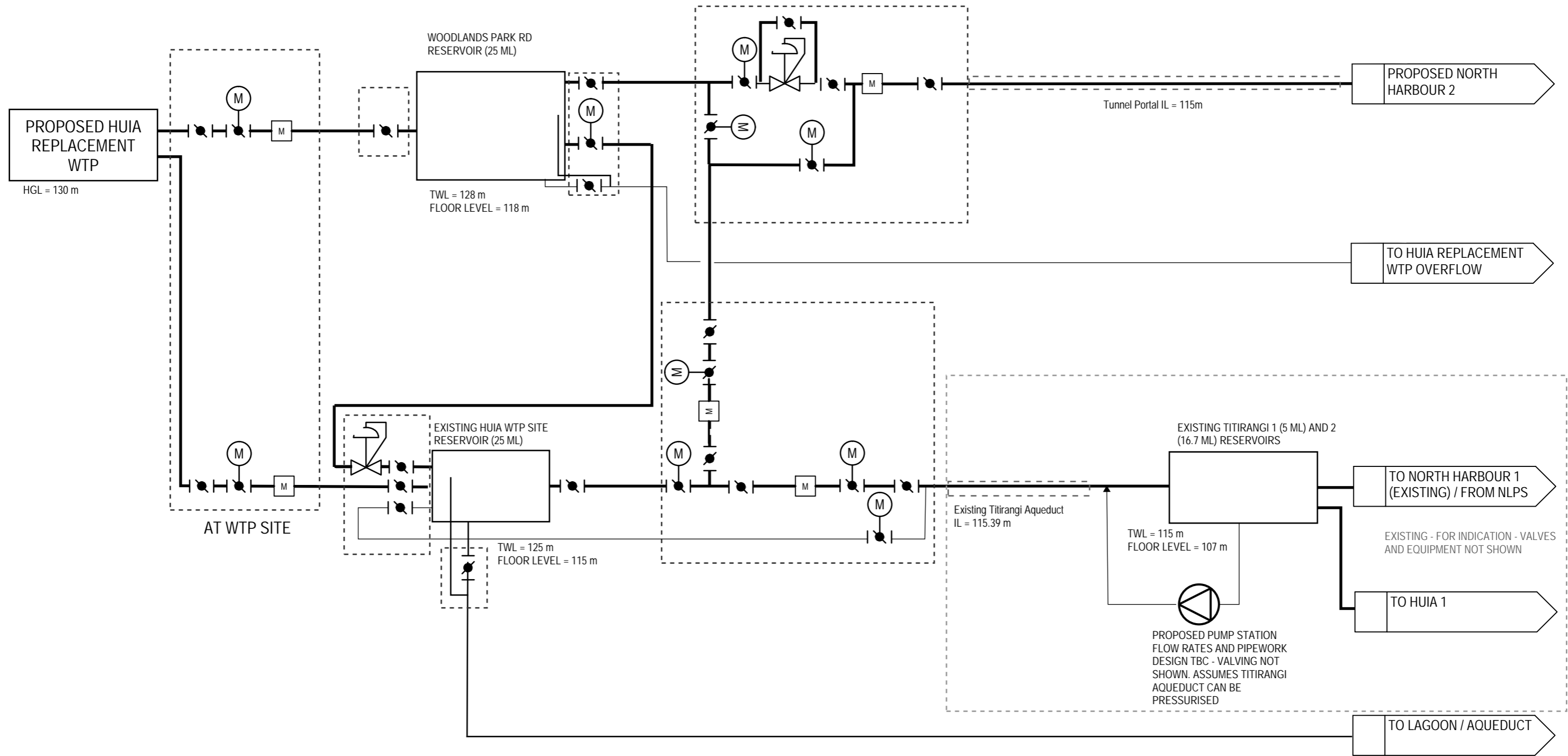
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HUIA REPLACEMENT WATER TREATMENT PLANT

TREATED WATER STORAGE RESERVOIRS

RESERVOIR CONCEPT – EARTHWORKS PLAN

CAD FILE 3255336-K116		DATE 21.05.19
ORIGINAL SCALE A3 1:1000		CONTRACT No. —
REF No.		
DWG No.	3255336 -K116	
ISSUE	OB	



FOR INFORMATION
NOT FOR CONSTRUCTION

B	UPDATED CONCEPT - FOR CONSENT APPLICATION	SJP	DS	JR	22.05.19
A	PRESENTATION OF CONCEPT	SJP	PLR	JR	08.03.19
No.	Revision	By	Chk	Appd	Date

Drawing Originator:



Original Scale (A1)

Reduced Scale (A3)

Design	S. PEARSON	03.19
Drawn	S. PEARSON	03.19
Design Verifier	P. LA ROCHE	03.19
Design Check	P. LA ROCHE	03.19
* Refer to Revision 1 for Original Signature		

Client:



Project:

WESTERN STORAGE SELECTION

Title:

PROCESS FLOW DIAGRAM
25ML + 25ML RESERVOIRS

Discipline:

PROCESS

Drawing No.

3255336-PA-SK-001

Rev.

A