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WATER & LAND ADVISORY

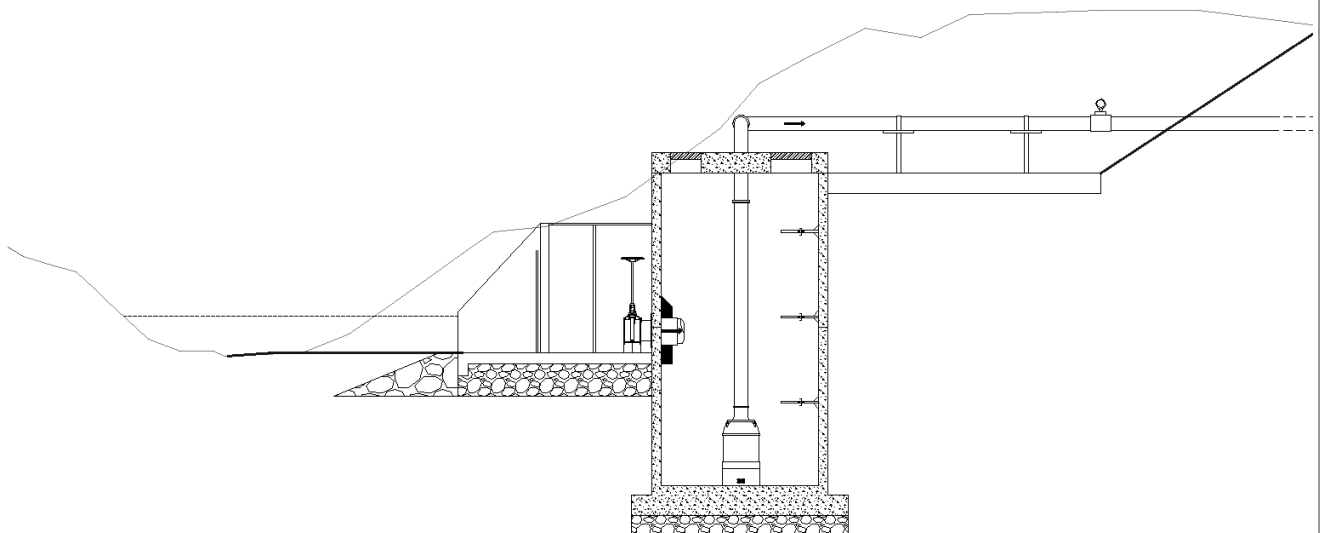
Milldale Stages 14-17 Development

Stream Inlet Works Concept Design

FULTON HOGAN LAND DEVELOPMENT

WWLA1603 | Rev. 2

03 August 2026



Stream Inlet Works Concept Design

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Project manager: Jon Williamson
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1	23 July 2026	Client	Draft for review
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Statement of Qualifications and Experience

Author

My full name is Barbara F da Cunha Tasca.

I am an Experienced Graduate Hydrologist at Williamson Water & Land Advisory. I hold a bachelor's degree in environmental engineering, a postgraduate in urban development, and a master's in environmental physics, and have 8 years of professional experience in environmental impact assessments, monitoring, and compliance. My experience lies in hydrological assessments for urban development, water resource management, numerical modelling, and geospatial analysis applied to water resources.

Author

My full name is Jaide Holly Derbyshire.

I am an Intermediate Hydrologist at Williamson Water & Land Advisory. I hold a bachelor's degree in environmental Earth science, and a master's degree in exploration and environmental geoscience. I have over 5 years of professional experience in hydrology, flood risk management, hydraulic modelling, and structural geology. My experience lies in groundwater and surface water takes, flood risk management, system capacity analysis, catchment delineations, and groundwater-surface water interactions. I have also gained experience in CAD design drawings for stream intakes, stormwater systems, and treatment devices.

Reviewer

My full name is Jonathan Lindsay Williamson.

I am the Managing Director at Williamson Water & Land Advisory. I hold the qualifications of Bachelor of Science, and Master of Science and Technology (Earth Science) from the University of Waikato and have over 30 years' professional experience in the field of hydrology and hydrogeology. My experience includes professional consultancy with experience in research and assessment of environmental impacts for a wide range of projects. My experience includes appearances at Council, Environment Court, Board of Enquiry, and EPA Fast-track Legislation Hearings, along with involvement in joint witness processes.

Ethical Declaration

We have been engaged by Fulton Hogan Land Development Limited (FHLD) (the Applicant) to undertake an assessment of environmental effects associated with the Milldale Stages 14-17 project and to prepare this report in support of the substantive application under the Fast-track Approvals Act 2024 (FTAA).

While this is not an Environment Court proceeding, we confirm that I have prepared this assessment in accordance with the applicable professional and ethical obligations of our profession and that the opinions expressed are within our area of expertise.

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1. Introduction

This report has been prepared in support of the substantive application for the Milldale Stages 14-17 (Milldale North) Project under the Fast-track Approvals Act 2024 (FTAA).

The Project relates to approximately 231 ha of land centred around Wainui Road in Wainui, Auckland. The proposal provides for a comprehensively planned urban development including residential neighbourhoods, a supporting commercial node, transport and servicing infrastructure, open space, wetland and ecological restoration, and associated enabling works.

The application seeks approvals necessary to facilitate the staged development of the Project, including a suite of resource consents required under the FTAA framework.

The substantive application is supported by a comprehensive set of technical assessments and plans addressing the environmental, servicing and infrastructure matters associated with the proposal. This report should be read alongside the Planning Report and the appended technical reports and drawings lodged in support of the substantive application.

1.1 Purpose and Scope of this Report

Williamson Water & Land Advisory (WWLA) was commissioned by Fulton Hogan Land Development Limited (FHLDL) in 2025 to investigate and design facilities to screen and pump stream water to a storage pond for the proposed Milldale Stages 14-17 development.

The project objective was to complete a concept design of a water intake structure and pumpstation meeting the likely requirements of a resource consent to provide raw water to a storage reservoir.

The scope of works for the project objectives was to:

1. Provide concept design detail sufficient to inform the resource consent application;
2. Comply with the anticipated water take resource consent conditions; and
3. Outline requirements of facility structures such as intakes, chambers and pumphouse.

1.2 Site Description

The site comprises approximately 231 ha of land located to the north of the existing Milldale development. The site comprises two distinct areas:

- Residential subdivision area to the south of the Ōrewa river (shown in red in **Figure 1**); and
- Te Korowai o Maraeariki to the north of the Ōrewa river (shown in orange in **Figure 1**).

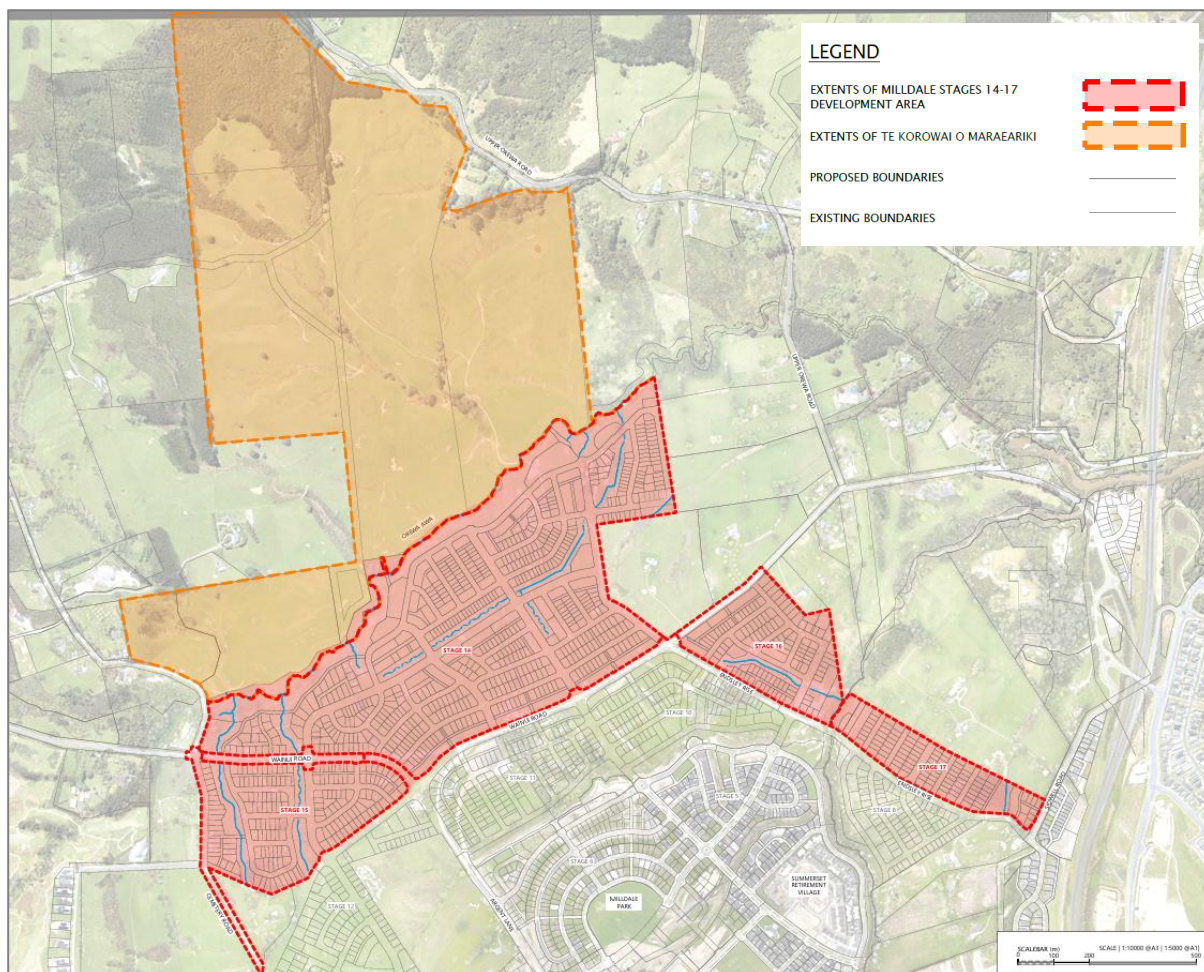


Figure 1. Site Location Plan.

The proposed residential subdivision area is located within the Future Urban Zone under the AUP. This part of the site is characterised by gently undulating to rolling pasture, with several streams, natural wetlands, constructed ponds and artificial drains traversing the area.

Te Korowai o Maraeariki is located to the north of the Ōrewa River and is zoned Rural Production under the AUP. This area is characterised by more undulating to steep terrain, with a series of ridgelines separated by incised gullies extending from the Ōrewa River. The land is predominantly managed pasture interspersed with streams and natural wetlands, together with pine plantations, exotic vegetation and gorse scrub. Relatively large areas of indigenous vegetation are also present, including a Significant Ecological Area – Terrestrial Overlay in the north-western portion of the site.

There is existing water, stormwater and wastewater infrastructure surrounding the site as a result of the extensive development within previous Milldale Stages. However, the site itself is not currently serviced in terms of supply and infrastructure. The surrounding roading network has been progressively developed in accordance with the staging of the Milldale development.

The surrounding area is now substantially developed. Milldale Stages 1 to 6 are complete, while Stage 7 is well advanced, with subdivision completed for Stages 7A–7C and construction of Stage 7D anticipated to commence in early 2027. Separate consents for the Stage 8 and 9 enabling works and subdivision were granted in 2024, with the associated offset and construction works now complete. The Milldale Local Centre has also been constructed, together with associated roads, accessways and drainage reserves. Community infrastructure within the surrounding area includes Ahutoetoe Primary School, two early childhood education centres and the

Summerset retirement village. Beyond the urban extent of Milldale, the site adjoins a number of rural residential properties.

Further detail regarding the site, surrounding environment and planning framework is provided within the Planning Report and technical reports appended to the application.

1.3 Background

The Orewa River flows through the centre of the proposed Milldale Stages 14-17 development. The proposed residential subdivision is located south of the river. Ecological planting and offsetting, as well as proposed private water and wastewater infrastructure are located north of the river.

Water within the Orewa River is classified as 'very good' in the Ecology Report¹ being of sufficient quality to support native fish and biota, though influenced by farming activities.

Resource consent is sought to take water from the Orewa River, at a location approximately 100 m downstream of the river culvert crossing on Gervin Road identified on **Figure 2**. As part of the application, a suite of proposed consent conditions has been developed to protect the stream ecology. These conditions require that abstraction only occurs when flows exceed the median flow and limit the rate of abstraction to a maximum of 30% of the instantaneous river flow. The concept design of the intake structure has been designed to avoid adverse effects on biota and fish.

¹ Virdis. 2026. Ecology Report.



Map Title:
Inlet Works Location

Project:
Milldale North Development

Client:
Fulton Hogan Land Development Ltd



- Legend**
- Inlet Works
 - Control Shed
 - 0.5 m Contour
 - Road
 - Stream / River
 - Reservoir
 - Milldale North Boundary

Data Provenance
Aerial, topo map imagery, and contour data from LINZ Data Service.

Drawn by: Josh Mawer
18/05/2026

Layout & Project File
A3 Landscape Template



Figure 2.

2. Proposed Water Take & Proposed Conditions

2.1 Proposed Water Take

Woods Consulting has advised that an average daily demand of 836 m³/day is required for municipal supply. This is based on up to 1,425 dwellings, with dual flush, low flow toilets. This is equivalent to a constant abstraction rate of 10.2 L/s, and an annual volume of 321,200 m³/year.

The water treatment plant proposed will be 95% efficient (i.e., 5% of water is lost during processing). Therefore, a daily supply of 880 m³/day of raw water is required. Raw water will be supplied to the treatment plant from both a groundwater take and surface water take. A total of 455 m³/day will be supplied by the groundwater bore, and the remaining 425 m³/day will be required from a surface water supply.

As detailed in the Catchment Hydrology Report (WWLA, 2026)², flows in the Orewa River can recede to very low rates (well below 10.2 L/s) during summer periods and hence a run-of-river water take is not considered a viable or reliable water source option. Therefore, a high-flow surface water take, and a water storage reservoir are proposed.

A 95,000 m³ water storage reservoir is proposed, located near the western boundary of the site, on the northern bank of the Orewa River (**Figure 2**). The reservoir is to be filled via high-flow surface water abstractions from the Orewa River, immediately south of the reservoir. A maximum abstraction rate of 25 L/s would occur when flows are above median (i.e., >36.6 L/s, at the point of take) and be restricted to taking no more than 30% of the river flow rate at any point in time when operating. As such, the maximum abstraction rate of 25 L/s would only occur when flows at the point of take are in excess of 84 L/s.

2.2 Proposed Consent Conditions

This section provides a short summary of proposed consent conditions relating to the surface water take, and how the application proposes to address these.

Stream Monitoring and Management of the Take

Stream flow is continuously monitored at a location near to the surface water take as a means to assess the allowable high flow take rate. Flow monitoring should be aligned with industry-accepted best practises, including but not limited to site location, routine check and maintenance of the site equipment and, when necessary, flow gaugings to establish suitable rating curves as much as practicable.

The high flow take is not permitted until the measured stream flow at the surface water take site exceeds the median stream flow. The median stream flow at the proposed water take location is set at 36.6 L/s at the time of this consent approval.

The applicant must analyse the measured streamflow data and high-flow take rate and report to Auckland Council on an annual basis, the following:

- 1. Compliance to the high-flow take rate, clearly comparing the monitored streamflow to the measured water take.*
- 2. Analysis of the hydrological flow regime, clearly identifying the minimum, median, mean, and maximum stream flows.*

Abstraction Monitoring

A water meter is required on the water take to ensure the consented maximum take rate does not exceed 25 L/s, or 30% of the flow in the stream at the time of abstraction. The water meter and associated infrastructure

² WWLA. 2026. Milldale North – Catchment Hydrology Assessment. Prepared for Fulton Hogan Land Development

must be appropriately maintained to provide reasonable confidence and data and minimal adverse effects on the stream bed and banks.

The surface water tank pump must be configured with a telemetry system to enable the pumps to be remotely operated (i.e., started or stopped). The SCADA system will have a connection to the reservoir that will stop the pumps from operating when the reservoir is full.

General and Detailed Design

Works and operations must be carried out in general accordance with the preliminary design plans and technical drawings.

Prior to the commencement of construction, final detailed design drawings and design calculations (certified by a Chartered Professional Engineer - CPEng) must be submitted to Auckland Council.

Intake Structure and Screens

The intake structure and screens must be installed and maintained in accordance with the National Environmental Standards for Freshwater (NES-F) and the Auckland Unitary Plan (AUP) Chapter E7.

Construction Phase

Auckland Council must be notified in writing at least 10 working days prior to the commencement of stream bed works.

All construction works within or adjacent to the stream bed must comply with Auckland Council's Guideline Document GD05 (Erosion and Sediment Control Guide for Land Disturbing Activities).

A final Construction Environmental Management Plan (CEMP) must be submitted for certification prior to works.

Maintenance, Inspection, and Monitoring

The intake structure and screens must be inspected and maintained routinely (e.g post-flood clearance, screen clearing, structural checks) to design velocities and function.

3. Preliminary Site & Geotechnical Considerations

The location of the stream intake is illustrated in **Figure 2**. The key considerations that were taken into account when selecting this location were:

- Proximity to the reservoir and associated infrastructure;
- Channel geometry and geomorphology; and,
- Geotechnical considerations.

The position of the stream intake structure was chosen based on the suitability of the stream channel, which has a well-defined geometry, is reasonably deep, and is on an outside bend to minimise sedimentation in front of the intake works. This site is also close to the reservoir which will minimise infrastructure and associated operational costs (i.e., pumping into the reservoir).

The pump house and associated electrical components have been positioned safely outside of the 1% Average Exceedance Probability (AEP) flood extent, which is mapped in Auckland Council's Geomaps service.

The median water level of the stream will determine the invert of the stream intake and pump chamber, allowing the base of the wingwall to sit on the stream bed.

4. Proposed Design

4.1 Concept Design

4.1.1 Basis of Design

A concept design has been prepared based on the information available at the time of design (i.e., pre-consenting). A concept design uses accepted design principles to provide sufficient information for the consent application to be assessed and ultimately to inform future specimen design.

4.1.2 Design Overview

The conceptual design comprises a multi-component intake and conveyance system designed to abstract and transfer stream water to the dam. The intake structure includes a wingwall that guides flow toward the intake pump chamber, while providing hydraulic stability and reducing local turbulence. At the intake, coarse and fine screens are incorporated to protect against debris ingress and limit sediment entrainment. Rip rap armouring is also proposed to stabilise the channel bed and banks against erosion.

Adjacent to the intake, a precast concrete channel houses an intake screening system, providing controlled flow transition and facilitating maintenance access. A gate valve is installed within this section to regulate inflow to the pump station and allow isolation of the system during maintenance or operational shutdowns.

The flow is then directed into a pump chamber designed to maintain required submergence conditions and dampen hydraulic fluctuations prior to pumping. A submersible pump is located within this chamber, lifting water under controlled conditions. From the pump station, a conveyance pipeline transfers the abstracted water to the dam.

4.2 Intake Structure

The sub-sections below describe the key components of the intake structure; including the wingwall, intake screen, and surrounding riprap armouring.

4.2.1 Intake Wingwall

The proposed intake works is located and aligned along the stream bank in a setback position that will reduce the risk of damage from large objects entrained with the stream under high flow conditions. The intake wing walls promote the smooth transition of flow from the stream into the intake and reduce scour around the margins. Rip rap provides protection for the stream bank around the intake structure and the immediate bank surrounds.

Figure 3 shows examples of different types of wingwalls. **Figure 3a** shows an existing wingwall installed at a stream intake at Muriwai. An intake protection grate with a screen guide rail will cover the entrance to prevent large objects from entering or damaging the components inside (similar to that shown in **Figure 3b**, also taken from the existing steam intake at Muriwai).



Figure 3. Examples of wingwall arrangement and installation. a) precast wingwall, and b) wingwall installation in stream channel showing grate.

4.2.2 Channel and Opening Cover for Intake Screen and Isolation Valve

A precast channel will house the intake screen and Hawle gate valve. The channel serves multiple purposes:

- Transfers stream water to the pump well link pipework;
- Houses the coarse screen;
- Houses the fine screen;
- Houses the intake isolation valve; and,
- A lockable lid provides access and a secure enclosure.

The concept design is based on a Hynds concrete channel system, or equivalent. The back of the channel will include a concrete wall with hole to allow for casting in the link pipe. The link pipework shall include a flanged stub cast into the channel back wall.

4.2.3 Screens

The intake will consist of two screens.

The outer coarse screen, or intake protection grate, will comprise a standard galvanised grate, such as Hynds Galvanised HEELPROOF™ Grate & Frame (or similar) with a 3.00 mm aperture.

The inner screen will consist of a Johnson Vee-Wire Flat Panel Fish Diversion Screen with an aperture size of finer mesh with a 1.5 mm aperture between wire as to meet the requirements of the Auckland Unitary Plan (AUP) E7.6.1.1 (take and use of surface water).

The entrance velocity will be <0.15 m/s to ensure that fish are not pinned against the screen and debris is not aggressively sucked into the slots.

Designing the entrance velocity to be <0.15 m/s provides a buffer against the regulatory 0.3 m/s generally accepted. The lower velocity protects juvenile native fish from being trapped against the screen and ensures compliance even if the screen becomes partially blocked by debris.

The dimensions of the concrete chamber will determine the exact screen dimensions, and the chamber will be fitted with guide rails for easy installation and maintenance. The screen is to be hot dipped galvanised after any

modifications are completed. There will be lifting lugs to evenly distribute the screen weight while lifting into and out of service, and a chain with appropriate latch points to make access to the installed screen easy.

The fine screen selection fulfils several criteria:

- Meets the permitted activity requirements of the AUP;
- Easy to install and remove;
- Robust;
- Clog resistant; and
- Ease of cleaning.

4.2.4 Rip Rap Armouring

Armouring of the stream bank is important to prevent scour around the intake structure, and to prevent undermining of the wingwall.

The intake is situated on the outside of a small bend in the stream meaning the energy of the water is primarily focused on the wingwall at this point in the stream. The wingwall will be angled to reduce scour conditions and naturally direct flow along the existing pathway. Scour conditions could increase during storm events, hence it is important that the bank is properly protected.

Rip rap rock, or rock filled gabion baskets, are to be installed to firm the ground at the base of the stream. The median rip-rap rock diameter should be in the range of 250 mm and 425 mm based on the predicted velocity and flow of the Orewa River. The placement of additional rip rap at the embankment toe will further improve stability.

Figure 4 illustrates stream armouring solutions of rip rap or rock filled gabions.



Figure 4. Examples of stream bank armouring using rip rap. The right photo shows the stream intake at Muriwai.

4.3 Intake Pump Station

4.3.1 Pump Chamber Precast Components

The concept design drawings detail the pump chamber and illustrates key levels and dimensions of the design. The key features are as follows:

- 2.3 m nominal internal diameter precast concrete components.
- Flanged base with fully bonded starter riser including not less than 200 NB pipe stub.
- Risers of combined height approx. 4.8 m.

- Install safety rungs or similar to enable egress.
- Lid with additional holes cast-in for:
 - Manway access (mostly for suction cleaning of the sump – not specifically for man access).
 - Pump pipework.
 - Cabling or instrument mount (depending on preference).
- Confined space entry warning sign.

4.3.2 Pumps

To achieve the required abstraction rate, we propose the installation of two pumps, installed in parallel. We recommend Sakuragawa U-Series pumps are installed. These pumps are suitable for stream take applications and incorporate integrated motor protection systems, including thermal protection and infiltrative water detection systems, suitable for demanding operating environments. The pumps are also fitted with double mechanical seals operating in an oil bath to provide reliable sealing under continuous duty conditions.

The U-264KA pumps details are summarised in **Table 1** below.

Table 1. Pump model specifications.

Description	Value (per pump)
Pump model	Sakuragawa U-264KA
Discharge diameter	100 mm
Motor output	4.5 kW
Total head	15 m
Capacity	1 m ³ /min
Max diameter	340 mm

The following criteria shall be incorporated into the pump control system:

- Stream median flow (approximately at 16.3 m RL³, to be confirmed via streambed topographic survey and flow gauging);
- Not to pump more than 30% of the total stream flow at the time of take;
- Pump well minimum operating levels (to be confirmed during specimen design);
- Analogue variance of pump speed to stay within consented limits using a control loop to the discharge flow meter;
- Full duty/standby with changeover every day; and
- Project system alarms, cf. proprietary pump control alarms.

4.3.3 Pump Wet Well Design

The pump chamber shall be of sufficient size to manage critical hydraulic conditions for the pump. These conditions are:

- The number of pump-starts per hour for a given wet well storage volume and pump flow rate.
- The pump chamber requires sufficient water depth over the pump intake to prevent a vortex forming and delivery of air to the pump.
- The chamber must also be able to house the pump outlet pipework and be suitable for instruments to monitor the water level.

³ NZVD2016

4.3.4 Pump Chamber Design Summary

The pump chamber design is summarised as follows:

- A pump well chamber volume containing 9.5 m³ working water volume is sufficient to control pump starts per hour to mitigate the motor overheating of a single pump for consented flows without the need for special controls.
- Provided the stream depth at median flow is consistent with the design record and the screens are regularly cleaned, then the depth of submergence over the intake will be sufficient to mitigate vortex action (air entrainment) at the intake to any significant effect. Additional measures can be retrofitted should air entrainment ultimately occur to the point where the pumps are affected.
- Electrical controls are needed to modulate pump flows that optimise the water take volume within the resource consent limits and pump operating ranges.

4.4 Pipework

4.4.1 Minimum Pipe Sizes

Pipes were sized using the Hazen-Williams formula to minimise friction losses. **Table 2** summarises the minimum pipe sizes and pressure rating.

Table 2. Minimum pipe sizes and materials.

Description	Length (m)	Bore (NB)	Selection/comment
Link pipe from intake to pump chamber	< 1	300	PE100/ PN6 or next larger available size and/or pressure rating.
Pump intake and discharge, main manifolds	Approx. 5	100	Possibly schedule 20 mild steel pipe, hot dipped galvanised.
Rising main	TBC*	150	PE100/ PN6 or next larger available size and/or pressure rating.

4.4.2 Special Pipework Provisions

A number of components require non-standard pipe fittings or special fittings to overcome function or servicing issues. These are discussed below:

- The pump inlet includes a foot valve to assist to prime the pump intake. The manifold is kept full by a small supply of water from the pump discharge manifold.
- The pump foot valve is to include a strainer on the intake side of the valve. Apart from preventing the passage of large solids that somehow get into the chamber, this will assist to prevent a vortex forming if the chamber water level is lower than specified. This condition may occur if the intake screens are excessively blocked.
- Vertical pipework within the pump well is designed to be extracted using a crane to lift the entire pipe and foot valve.
- The link between the pump chamber and pump intake manifold includes fittings to allow minor differential settlement of the structures. One fitting is to be restrained and the other not. This will allow both vertical and horizontal movement to be accommodated.

5. Recommendations

Based on the assessment detailed in this report, the following recommendations are made to avoid, remedy or mitigate potential adverse effects associated with the proposal and to support the appropriate implementation of the development.

Surface Water Intake Recommendations

- Erosion control: Rip rap rock, or rock filled gabion baskets, are to be installed to firm the ground at the base of the stream. The median rip-rap rock diameter should be in the range of 250 mm and 425 mm based on the predicted velocity and flow of the Orewa River.
- Screens: An inner screen with a maximum 1.5 mm aperture, and an outer screen with a maximum 3.0 mm aperture size. Entrance velocity limited to <0.15 m/s.
- Pump control: The pump will only operate when streamflow is above the median flow, taking a maximum of 30% of stream flows abstracted above the median flow.

Recommendations relating to the surface water take are also provided in the technical assessment by WWLA⁴ and are summarised below.

Abstraction and Flow Recommendations

- Maximum Abstraction Rate: Stream abstraction should be limited to a maximum abstraction of 25 L/s.
- Flow Condition Threshold: Abstractions must be restricted to periods when streamflow is above the median flow, taking a maximum of 30% of stream flows abstracted above the median flow.
- Reservoir Storage: storage reservoir capacity of 95,000 m³ is recommended to support the required daily surface water demand (425 m³/day) while achieving 100% water supply reliability.

Abstraction and Flow Monitoring Recommendations

- Continuous Flow Measurement: Install a telemetry-enabled water meter on the intake line to continuously log daily abstraction volumes and instantaneous rates, ensuring operational compliance with the proposed maximum limit of 25 L/s and the daily demand limit of 425 m³/day.
- Streamflow Trigger Gauging: Establish continuous flow monitoring (or leverage automated data from the calibrated model reference site) to ensure the intake operates strictly when streamflow exceeds the median flow threshold. The system should automatically cut off abstraction when streamflow drops below median flow.
- Proportional Abstraction Control: Integrate automated intake controls (PLC) linked to the stream gauge to restrict abstraction to no more than 30% of instantaneous flow above the median.

⁴ Surface Water Take Assessment, Milldale Stages 14-17 Fast-Track. WWLA, 23 July 2026.

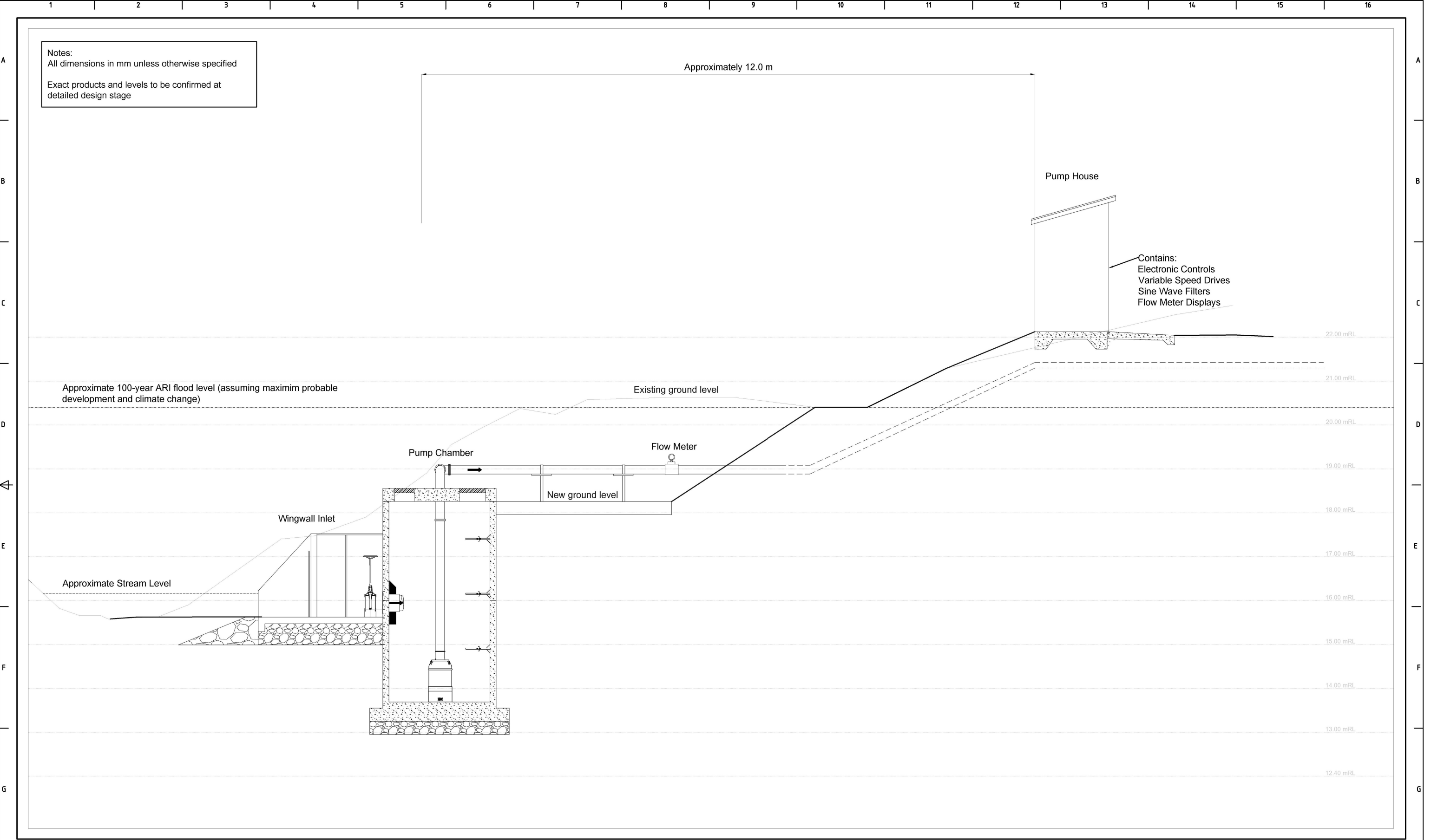
6. Conclusions

The stream intake design provides concept level details on the proposed stream inlet and pump infrastructure. Inlet velocities will be limited to <0.15 m/s as to protect juvenile fish from entrapment. There will be an outer screen of 3.00 mm aperture, and an inner screen of 1.5 mm aperture to prevent fish and debris from entering the inlet chamber. Rip rap rock armouring will protect the bank around the inlet structure.

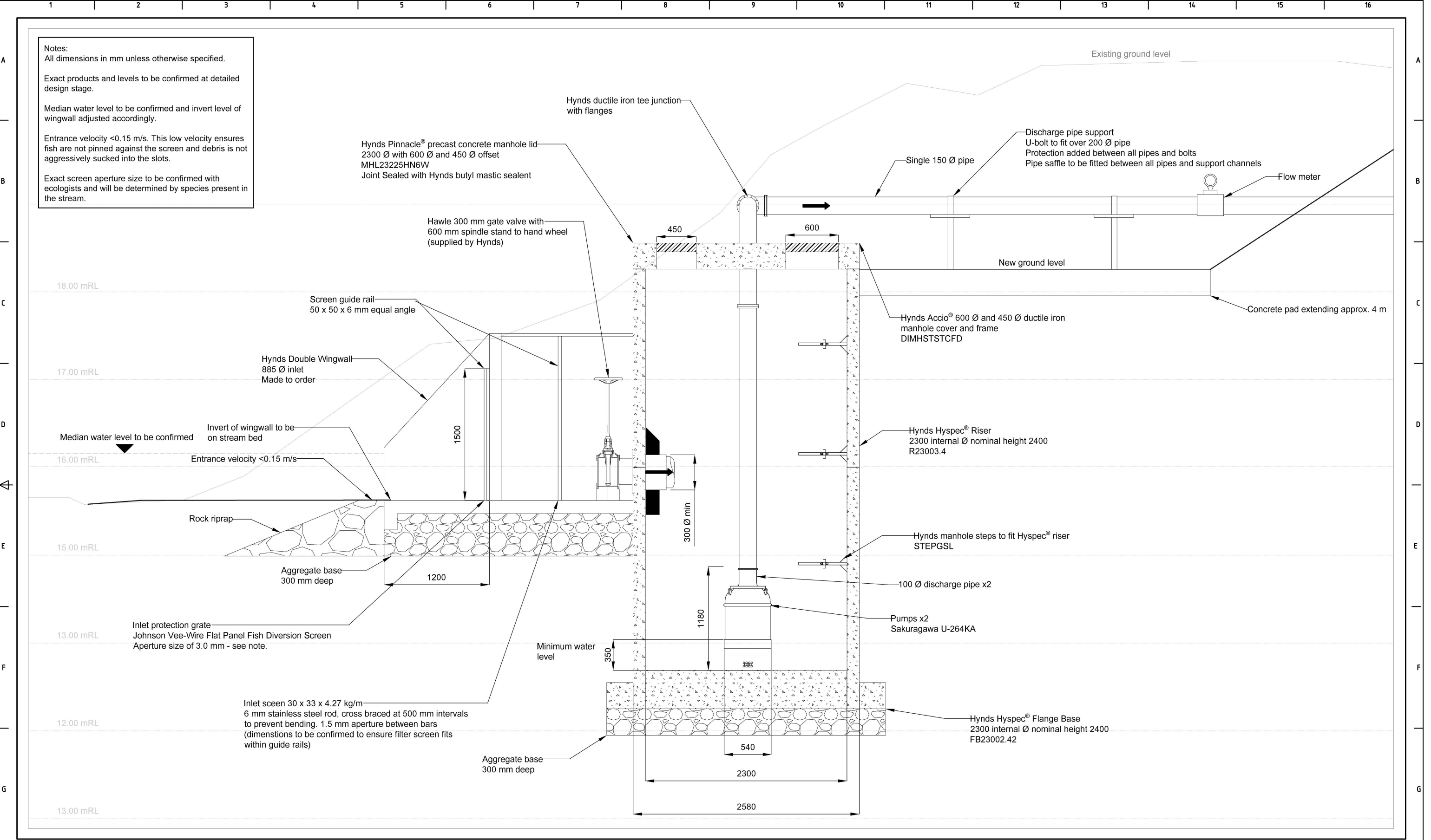
The pump will integrate automated intake controls (PLC) linked to the stream gauge to restrict abstraction to no more than 30% of instantaneous flow above the median. A water meter will ensure that the maximum abstraction rate of 25 L/s is adhered to, up to a daily maximum volume of 425 m³/day.

Appendix A. Concept Design Drawings

Refer drawing set WWLA1603 drawings 1 to 4.



 WILLIAMSON WATER & LAND ADVISORY	CLIENT NAME	Fulton Hogon Land Development	DRAWING TITLE	Stream Intake Design Long Section			PROJECT NUMBER	WWLA1608	REV	DATE	REVISIONS		BY
	Site Address	Milldale North, Orewa River	DESIGNED	Jaide Derbyshire	26/05/2026	SCALE	A3	SIZE	1	22/06/2026	Final design		JD
	PROJECT NAME	Milldale Stages 14-17 Fast Track	DRAWN	Jaide Derbyshire	26/05/2026	1:125		REVISION	2	03/08/26	Title Update		JW
			CHECKED	Jon Williamson	26/05/2026	DRAWING NUMBER	1 of 4		3	---	---		JD
			APPROVED	Jon Williamson	18/06/2026				4	---	---		JW
									5	---	---		---



Notes:
All dimensions in mm unless otherwise specified.

Exact products and levels to be confirmed at detailed design stage.

Median water level to be confirmed and invert level of wingwall adjusted accordingly.

Entrance velocity <0.15 m/s. This low velocity ensures fish are not pinned against the screen and debris is not aggressively sucked into the slots.

Exact screen aperture size to be confirmed with ecologists and will be determined by species present in the stream.



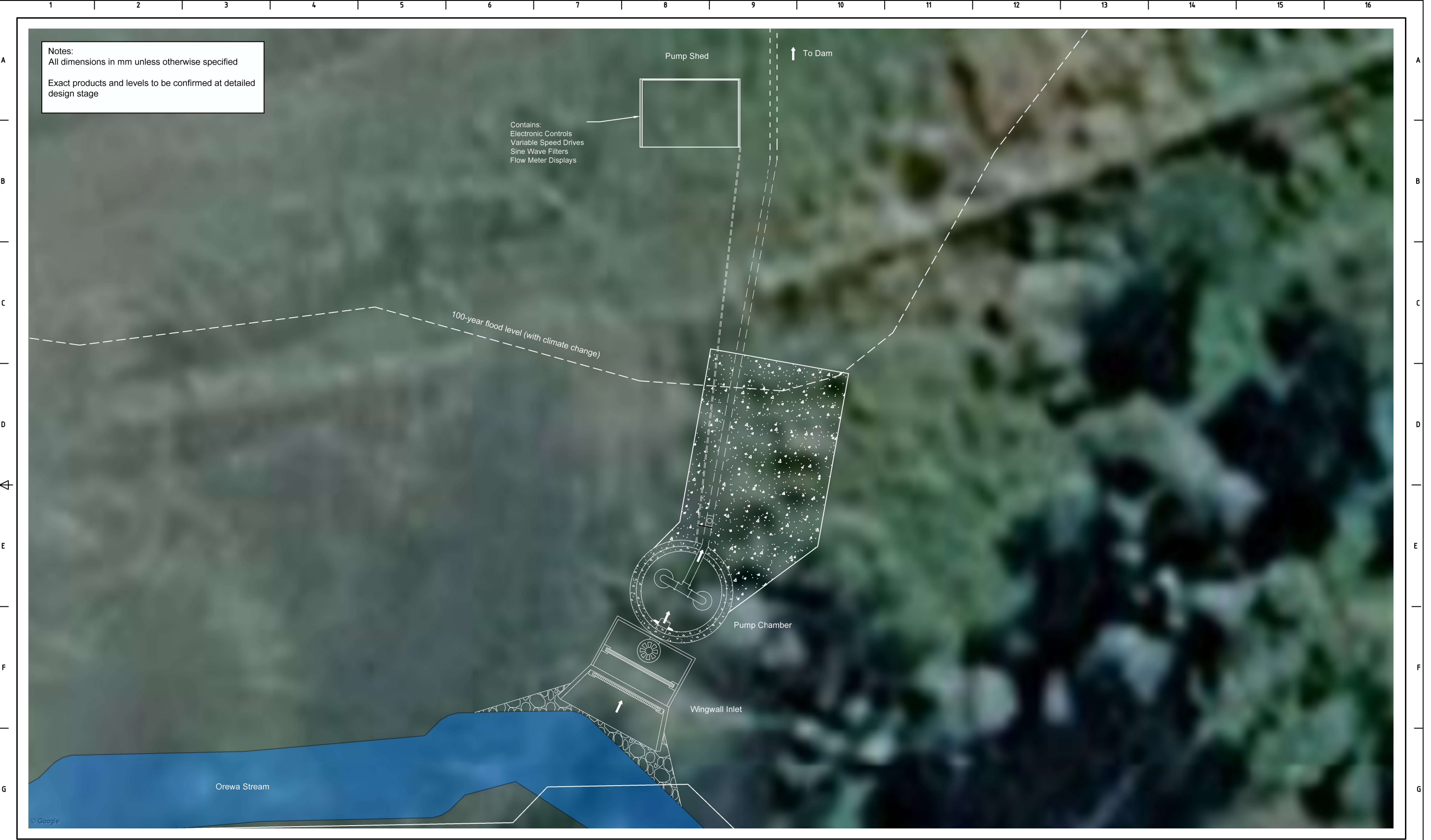
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CLIENT NAME	Fulton Hogan Land Development
Site Address	Milldale North, Orewa River
PROJECT NAME	Milldale Stages 14-17 Fast Track

DRAWING TITLE	Stream Intake Design Cross Section		
DESIGNED	Jaide Derbyshire	26/05/2026	SCALE
DRAWN	Jaide Derbyshire	26/05/2026	1:25
CHECKED	Jon Williamson	26/05/2026	DRAWING NUMBER
APPROVED	Jon Williamson	18/06/2026	2 of 4

PROJECT NUMBER	REV	DATE	REVISIONS
WWLA1608	1	21/05/2026	First Draft
	2	22/06/2026	Final design
	3	03/08/26	Title update
REVISION	4	---	---
	5	---	---

BY	CHK
JD	JW
JD	JW
JD	JW
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 WILLIAMSON WATER & LAND ADVISORY	CLIENT NAME	Fulton Hogon Land Development	DRAWING TITLE	Stream Intake Design Plan View (Wide)			PROJECT NUMBER	WWLA1608	REV	DATE	REVISIONS		BY	CHK
	Site Address	Milldale North, Orewa River	DESIGNED	Jaide Derbyshire	26/05/2026	SCALE	SIZE	A3	1	22/06/2026	Final design		JD	JW
			DRAWN	Jaide Derbyshire	26/05/2026				2	03/08/26	Title update		JD	JW
			CHECKED	Jon Williamson	26/05/2026	DRAWING NUMBER	REVISION	2	3	---	---		---	---
			APPROVED	Jon Williamson	26/05/2026				4	---	---		---	---
PROJECT NAME	Milldale Stages 14-17 Fast Track					3 of 4		5	---	---		---	---	

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 WILLIAMSON WATER & LAND ADVISORY	CLIENT NAME	Fulton Hogon Land Development	DRAWING TITLE	Stream Intake Design Plan View			PROJECT NUMBER	WVLA1608	REV	DATE	REVISIONS		BY	CHK
	Site Address	Milldale North, Orewa River	DESIGNED	Jaide Derbyshire	26/05/2026	SCALE	A3	SIZE	1	22/06/2026	Final design		JD	JW
	PROJECT NAME	Milldale Stages 14-17 Fast Track	DRAWN	Jaide Derbyshire	26/05/2026	1:15		REVISION	2	03/08/26	Title update		JD	JW
			CHECKED	Jon Williamson	26/05/2026	DRAWING NUMBER	4 of 4		3	---	---		---	---
			APPROVED	Jon Williamson	26/05/2026				4	---	---		---	---
									5	---	---		---	---