Heights Road Plan Change

Civil Infrastructure Report

9-49 Heights Road, Paerata, Auckland
G Bar Properties Ltd

Plan Change – Clause 24 Revision

31/07/2024

Document Control

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Approval	Brian Flood - Director
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Contents

1.	**Introduction**	**4**
1.1.	Brief	4
1.2.	Site Description	4
1.3.	Legal Description	4
1.4.	Existing and Surrounding Land Use	5
1.5.	Site Features	5
1.6.	Proposed Development	6
2.	**Civil Infrastructure**	**7**
2.1.	Site Preparation	7
2.2.	Roading	8
2.3.	Stormwater	9
2.4.	Wastewater	12
2.5.	Water Supply	13
2.6.	Utilities	13
3.	**Summary**	**15**
Appendix A – Record of Titles		**16**
Appendix B – Development Masterplan		**17**
Appendix C – Stormwater Management Plan		**18**
Appendix D – Water & Wastewater Calculations		**19**
Appendix E – Wastewater Assessment Report		**20**

1. Introduction

This report has been prepared on instruction by G Bar Properties Ltd to undertake a Civil Infrastructure Assessment for Plan Change for the properties located at 9-49 Heights Road, Paerata, Auckland. This report details the investigations undertaken and summarises the results of that investigation.

1.1. Brief

The objective of this assessment is to assist G Bar Properties Ltd in their evaluation as to the suitability of the site for the proposed plan change. To accomplish this objective the following tasks have been undertaken:

- Review existing site, constraints, history.
- Undertake high level assessment of flood hazards on site - assessment of OLFPs, flood plain, flood prone area,
- Consult Watercare, Auckland Transport, and Utilities Providers with regards capacity and the future developments in the area,
- Confirm the design requirements for the site to service the proposed development.
- Summarize findings and outline requirements for the next phase of works.

1.2. Site Description

The site is bound by Paerata Road (SH16) to the east, Heights Road to the north and Heights Park Cemetery to the south and west. The site is currently terraced for building platforms and has a creek in the south western end. The central part of the site is generally level with slopes towards the boundaries. The gradients are steeper on the western boundaries, decreasing towards east on the Paerata Road frontage.

1.3. Legal Description

The Record of Title for the site is summarised in **Table 1** below and included in **Appendix A**.:

Table 1: Certificate of Title

Site address	9 – 49 Heights Road, Paerata, Auckland
Legal Description	Lot 1 DP 73272, Lot 2 DP 109824, Lot 1 DP 109824
Site Area	5.35 ha
Operative Plans	Auckland Unitary Plan (AUP)
Precinct	NA
Zone	Future Urban Zone
Overlays	High-Use Aquifer Management Areas Overlay [rp] – Pukekohe Kaawa Aquifer High-Use Aquifer Management Areas Overlay [rp] – Pukekohe Central Volcanic Quality-Sensitive Aquifer Management Areas Overlay [rp] – Franklin Volcanic Aquifer
Controls	Macroinvertebrate Community Index – Rural
Designations	Designations – 6705, State Highway 22: Karaka to Pukekohe – Road widening, Designations, New Zealand Transport Agency

1.4. Existing and Surrounding Land Use

The site contains 5.35ha, and is bound to the north by Heights Road, east by State Highway 22 (SH22, Paerata Road), south and west by Heights Park Cemetery. To the south of the cemetery is the Glenbrook railway branch line, which traverses east to west.

The site contains a variety of activities. The existing (consented) environment comprises the following:

- Tractor centre (rural commercial services and industrial) activity across 9 and 33 Heights Roads.
- Tractor centre storage shed (2362m^2) with associated paved vehicle parks (16) and landscaping.
- 1750m^2 and 2840m^3 of land modification works.
- 260m of engineering retaining walls to a maximum height of 5 meters; and
- Impervious area (4562m^2) and stormwater management raingardens.

Figure 1: Locality diagram (Source: Auckland Council GIS Maps).

1.5. Site Features

Auckland Council's GIS identifies a watercourse located east of the site and associated overland flow path and flood plain on the site (see Figure 2). A stormwater assessment report has been prepared by Woods and its outcomes are discussed in Section 2.3.2 of this report.

It is understood that this is a tributary of the Whangaouri Creek and a portion of this tributary has been historically piped between 9 and 33 Heights Road.

The Auckland Council GIS Maps shows this site has been used as:

- Meat Processing – Up to 2001,
- Light industrial – 2001 to present.

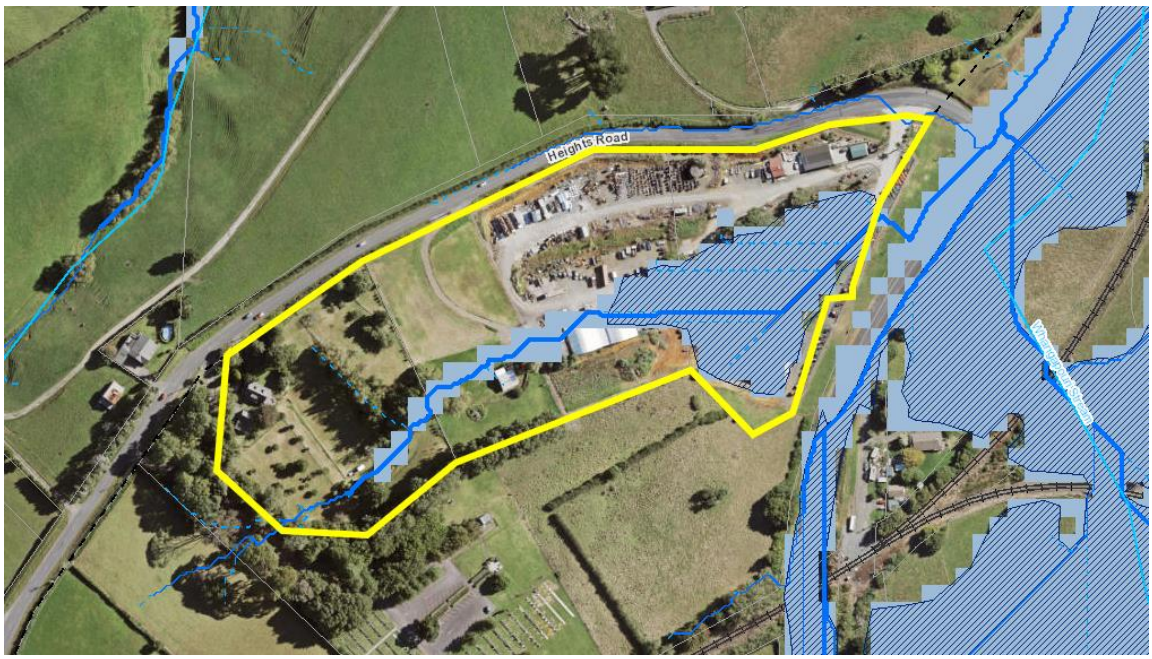


Figure 2: Catchments and hydrology diagrams (Source: Auckland Council GIS Maps).

1.6. Proposed Development

The proposed development includes two stages:

- Stage 1 – This stage is located on the eastern side of the site and consists of the existing tractor centre plus one new dry industrial building located along the northern side of the site. This stage has been consented.
- Stage 2 – This stage is located on the western side of the site and consists of several new dry industrial buildings.

Figure 3: Development Plan

2. Civil Infrastructure

2.1. Site Preparation

2.1.1. Existing Infrastructure

There are existing buildings constructed that serves to the current business activities being undertaken in the site. These buildings are currently serviced by:

- Existing Private Pump Station located at the Heights Road Site with rising main to Possum Borne Reserve where it discharges to the public gravity wastewater network.
- Public 300mm dia PE watermain in Paerata Road frontage with a 100mm dia connection to the site.
- Private stormwater network within the site which discharges into a watercourse on the eastern side of Paerata Road.
- Power connection with existing Counties Energy 11KV-22KV from transformer Heights Road frontage.
- Telecommunication connection with Chorus network (confirmed by Chorus online Broadband Checker service).

2.1.2. Existing Vegetation

The majority of the site is metalled with some areas grassed. Vegetation located within the western part of the site (shown on Figure **1**) was recently cleared and felled (via authorised works) and this part of the site is now open grassed area.

Auckland Council Unitary Plan maps do not show any notable trees within the site. At the time of a resource consent application, an arborist should be contacted to confirm that no constraints related to the remaining vegetation will arise.

2.1.3. Contamination

A preliminary environmental site investigation report has been undertaken by ENGEO (reference: 21253.000.001 dated 2 February 2023). The findings of that report were:

- Several activities were identified that may have contributed to site contamination in the past, however there was no sign of plant stress or contamination on the visual inspection.
- A detailed site investigation (DSI) should be undertaken as part of a resource consent application to determine whether there is any contamination present that should be remediated.
- Any contamination found should be removed to a licensed managed site.

It is also noted that the Auckland Council GIS maps show the presence of asbestos cement (AC) pipes as part of the existing stormwater network servicing within the site. If any rework is required to those pipes or if they are damaged, then they shall be removed along with the surrounding soil to a managed site.

2.1.4. Bulk Earthworks

Minor earthworks are necessary to achieve the required levels. Geometric modelling for the earthworks profile will be undertaken as part of a land use resource consent application and excavation is anticipated to include cuts and fills of between 1 m and 2 m deep.

2.1.5. Erosion & Sediment Control

In order to undertake earthworks and civil works, erosion & sediment controls shall be required in accordance with Auckland Council's GD05 and district plan dust management provisions. These should be detailed as part of a resource consent application.

2.1.6. Geotech Report

ENGEO have prepared a geotechnical investigation report as part of the plan change assessment (reference: 21253.000.001 dated 23 June 2023). The findings of that report were that the land was generally suitable for the proposed land use and these are detailed further in the items below.

- Ground Water Levels - did not encounter standing groundwater, however saturated ground conditions were encountered below 2.5m below ground level.
- Preloading – the report states most of the natural ground soil is stiff to very stiff cohesive soils. The likelihood that the development requires preloading are low and dependant on the future detailed design. If fill loads in conjunction with heavy building loads are proposed the soil may subjected to settlement.
- Soil Characteristics (type of soils, strength capacity) - Ground conditions encountered through the site were broadly consistent with the published geology. Overall, the native ground found to be suitable for a light industrial development. A few areas where underlying fill with poor compaction was found will require engineering to achieve the minimum requirements for light industrial buildings development.

2.2. Roading

2.2.1. Transportation Assessment

An Integrated Transport Assessment has been prepared for the development by Commute and found that there are no traffic engineering or transportation planning reasons that would preclude development of the site. A summary of their finding is itemised below:

- The proposed site will generate trips the are expected to have minimal impact on the operation and efficiency of the existing intersection.
- Widening of the carriageway on Heights Road will be required at the vehicle crossing locations.
- On site parking, loadings and accessways are able to meet the Unitary Plan requirements.
- No external pedestrian access is required, however on-site pedestrian facilities should be provided.

2.2.2. Vehicle Crossings

There are three vehicle crossings from Heights Road frontage currently provided on site. One entrance for each of the properties part of the site.

Two accesses from Heights Road are proposed as part of the development and these changes require a Permit to Construct a Vehicle Crossing application to be lodged with Auckland Transport. The exact layout of the vehicle crossings is to be determined during the design stages, but it is estimated that a 9m wide crossing will be required to provide access for large vehicles turning curve radii.

2.2.3. Car and Cycle Parking

There is limited existing parking available within the site. As part of a new development scheme, 341 carparks are proposed to comply with the Auckland Unitary Plan requirements. The proposed quantum of carparks shall be confirmed as part of a Resource Consent application.

Eight mobility spaces are proposed to be distributed across the site based on the number of parking spaces provided for each of the proposed buildings.

It is considered that the site is large enough to accommodate the number of cycle parks required by the unitary plan. The location of these will be confirmed during the detailed design stage.

2.2.4. Future Upgrades

Auckland Transport portal has been consulted for further information regarding future upgrades to the adjacent roading network and no works are proposed or are currently being undertaken in the vicinity of the site.

2.3. Stormwater

2.3.1. Existing Stormwater Network and Features

The existing stormwater features comprises the following components:

- Secondary Flow Paths - Overland flow
- Primary Flow Paths - Existing public stormwater network

2.3.1.1. Existing Overland Flow

The subject site generally falls towards the site's eastern boundary. Auckland Council (AC) Geomaps shows an overview of the flood prone areas, overland flow paths (OLFP) and associated floodplains for the site, as shown in Figure 4.

The OLFP identified on the AC Geomaps are however inaccurate as it does not allow for the culvert present underneath Paerata Road (SH22). A more accurate description of the flood plains and OLFPs are provided within the Stormwater Management Plan prepared to support this plan change request.

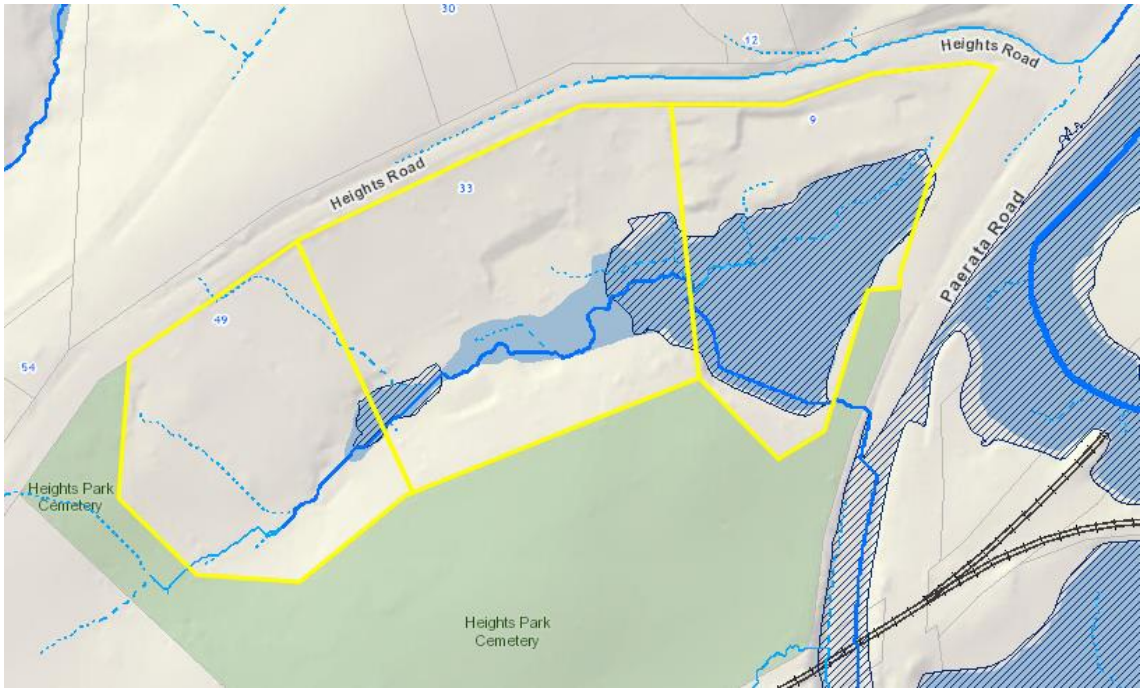


Figure 4: OLFP and associated floodplain (Source: Auckland Council GIS Maps).

Two external OLFP from Heights Road are shown to enter the site, as shown in Figure 3. The AC Geomaps indicate another external OLFP generated at Heights Park Cemetery and enters the neighbouring site at its western boundary.

Auckland Council Healthy Waters currently hold a Stormwater model for the Ngakaroa Stream and Oira Creek and assessments for overland flow will utilise this to determine effects from the proposed development.

Existing Stormwater Network

A review of AC Geomaps indicates a private network located either within or adjacent to the site's eastern boundary as shown in Figure 5. No public stormwater reticulation is shown on the site.

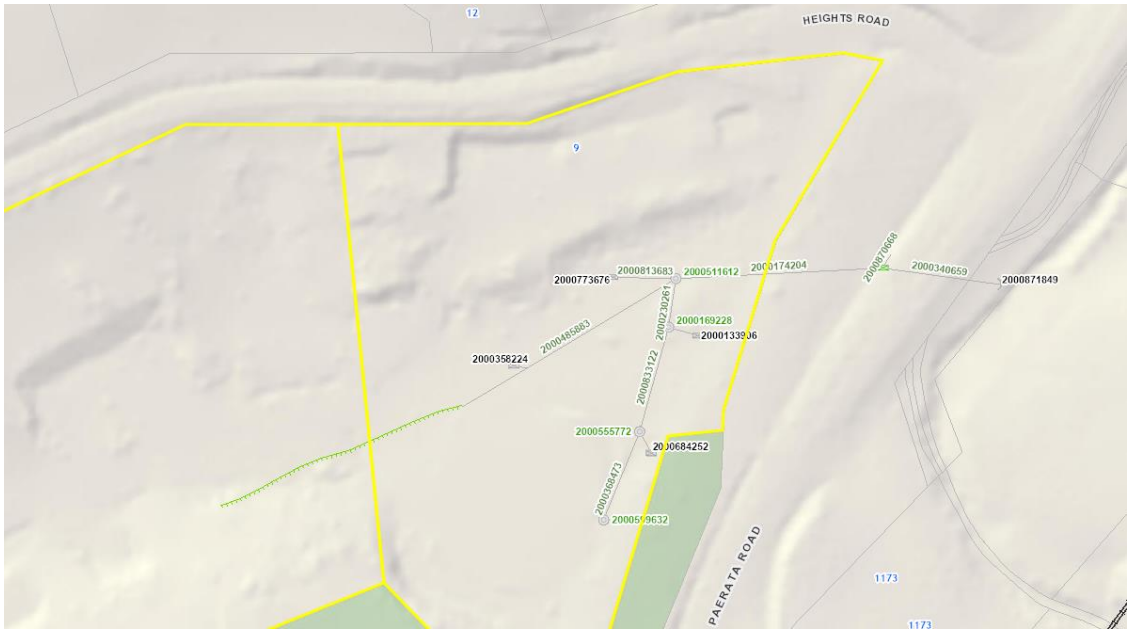


Figure 5: Stormwater infrastructure (Source: Auckland Council GIS Maps).

The existing 600mm piped private network collects the runoff from the site and discharges to Whangapouri Stream as shown on Figure 5. The site has existing stormwater management system approved in previous Resource Consent applications (LUC60134266).

Figure 6: Private network discharging to Whangapouri Stream (Source: Auckland Council GIS Maps).

2.3.2. Stormwater Catchment Assessment

Woods have prepared a separate stormwater memo regarding the stormwater aspects in support of this re-zoning from Future Urban Zone to Light Industrial Zone. The findings of that report are summarised below:

- Site Classification - a significant portion of the site is still greenfield and there is no surrounding urban area or zoning which makes it consistent with a greenfield development scenario. Therefore, the subject site is classified as a greenfield site under the regionwide stormwater network discharge consent (NDC), and therefore requirements under Schedule 4 of the NDC is likely to be applied.
- Stormwater Management Plan (SMP) - a site specific SMP as per Healthy Water's template in accordance with Schedule 4 of the NDC has been prepared by Woods. Refer to section 2.3.3.
- Flood Assessment – two flood models were assessed: Pass Flows Forward and Flood Storage. Both options are considered appropriate as no flooding effects are seen on SH22 or any other properties upstream or downstream of the site in either of the options. It is expected that Pass Flows Forwards option will require culvert duplication and consultation and agreements with Waka Kotahi, whereas Flood Storage will require attenuation of flows on site.

2.3.3. Stormwater Management Plan

A Stormwater Management Plan (SMP) has been prepared by Woods to address the NDC Schedule 4 requirements including:

- Water Quality
- Stream Hydrology
- Flooding: 10% AEP – Property/Pipe Capacity
- Flooding: 1% AEP

Whilst the SMP cannot be authorised under the Auckland Council's NDC (upon advice from Healthy Waters) due to stormwater discharging to a private asset (culvert beneath SH22), the requirements of the NDC have been used as a basis to demonstrate how adverse stormwater and flooding effects will be avoided, remedied and mitigated (if any) as this is understood to be the Best Practicable Option (BPO) when managing stormwater runoff from Greenfields site.

2.3.4. Proposed Stormwater Infrastructure

The proposed development shall have the following infrastructure installed:

- Private Stormwater – as part of a building consent application
    - Catch pits, manholes and pipes to convey the 10-year flows
    - Stormwater attenuation devices if storage is adopted – ponds (preferable option) or tanks
    - Water quality treatment devices including water quality ponds (preferable) or proprietary devices
- Public Stormwater – as part of an engineering plan approval application
    - Outfall structures to the watercourses
    - Culvert duplication or replacement if pass flows forward is adopted

2.4. Wastewater

2.4.1. Existing Network

There is no existing public wastewater network that can service the site. There are public and private rising mains on Paerata Road including a 280mm diameter rising main from the Te Paea Ave Pump Station in Paerata Rise.

The site is currently serviced by a private wastewater pump station (WWPS) and a rising main that discharges at a public gravity system adjacent Possum Borne Reserve.

2.4.2. Site Requirements

Table 1: Calculated Wastewater Flows

Catchment	Floor Area (m^2)	Average Flow (l/s)	Peak Flow (l/s)
Existing	5080	0.26	1.77
Proposed	12863	0.67	4.49
Total	17943	0.93	6.26

These flows are fully detailed in Appendix D.

2.4.3. Proposed Servicing Solution

Woods have undertaken a separate assessment to determine servicing of the site for the future development. The findings of that report are summarised below:

- Four options have been considered to service the wastewater catchment for the proposed Heights Road site including both interim and permanent solutions including:
    - Use of the existing pump station
    - Construction of a new pump station
    - On Site Treatment
    - Combinations of these options.
- The recommendation of this report is that the existing system is utilised until such a time that it can no longer operate effectively and to the requirements of the local authority, where by then a new pump station is construction to service this development.
- To prolong the lifespan of the existing system, the following interim measures have been considered:
    - the use of on-site treatment to reduce the wastewater flows to the pump station
    - repair/rehabilitation of the existing rising main
    - on site treatment and disposal on site until a time when a new pump station can be constructed.

A copy of this assessment is included in Appendix E.

2.4.4. Future Upgrades

Discussions with Watercare Services Ltd (WSL) have been undertaken and it was confirmed that the ongoing upgrade in the existing wastewater network from Watercare will be completed and ready to provide the site with a public connection to a new WWPS located at Isabella Reserve by 2028. Details on how that connection will be made have not been confirmed, however it is anticipated that it will be a pumped connection.

2.5. Water Supply

2.5.1. Existing Network

There is a 300mm dia PE public network installed at the Paerata Road/SH22 frontage of the site. The AC GIS indicated that there is a 100mm dia connection to the site from this line. WSL have confirmed that the line does not have enough capacity to provide water to the proposed development at this stage.

The site is currently serviced by a private supply in the form of a consented borehole working in conjunctions with storage tanks, which has the capacity to provide enough water to the existing development until the new development is completed.

2.5.2. Site Requirements

Catchment	Floor Area (m^2)	Daily Demand (MLD)	Peak Daily Demand (l/s)
Existing	5080	0.010	1.32
Proposed	12863	0.026	3.35
Total	17943	0.036	4.67

These flows are fully detailed in Appendix D.

2.5.3. Proposed Servicing Solution

For the purposes of the plan change, the site can utilise the water from the consented borehole in conjunction with the existing tanks until a public connection is available. Some water saving measures can be put in place at the site to keep daily demand flow rates down to the consented draw of approximately 0.58 l/s.

Should there be a delay to the supply from WSL, an amendment could be made to seek to change the bore supply amount to draw per day to suit the final development requirements of approximately 1.59 l/s.

2.5.4. Future Upgrades

Discussions with WSL have been undertaken and it was confirmed that the supply issues at Pukekohe are being solved and the public network will be able to provide a lot connection with enough capacity to the site at late 2025/early 2026.

2.5.5. Fire Suppression

There is a single fire hydrant located at the intersection of Paerata Road (SH22) and Heights Road that can be used for fire suppression, however this does not comply with the minimum requirements with two further hydrants required.

WSL upgrades including servicing on Heights Road should provide the additional capacity within the public network and it is expected that this will be in place by the time the development will be constructed.

Internal fire protection of structures should be considered by a fire engineer's report when undertaking the design of the buildings with provision for additional on-site storage tanks at the time of a building consent application.

2.6. Utilities

Plans of the services for the area were requested via B4UDig and service providers were contacted to assess capacity and site requirements. Prior to undertaking a resource consent application, the service providers should be contacted to confirm capacity and provide updated servicing plans.

2.6.1. Gas

Vector plan shows that the site and surroundings are served by a MP4 gas pipeline installed on Paerata Road/SH22. If gas service is required by any development, a connection to Vector's network can be sought.

2.6.2. Power

Counties Energy plans show that existing 11KV-22KV lines. The existing network services the site and is likely to have capacity to the proposed development.

2.6.3. Telecommunications

Chorus have confirmed that copper VDSL services are available to the site. As can be seen below there is the opportunity to upgrade this to fibre (as a cost to the project). See **Figure 7** below.

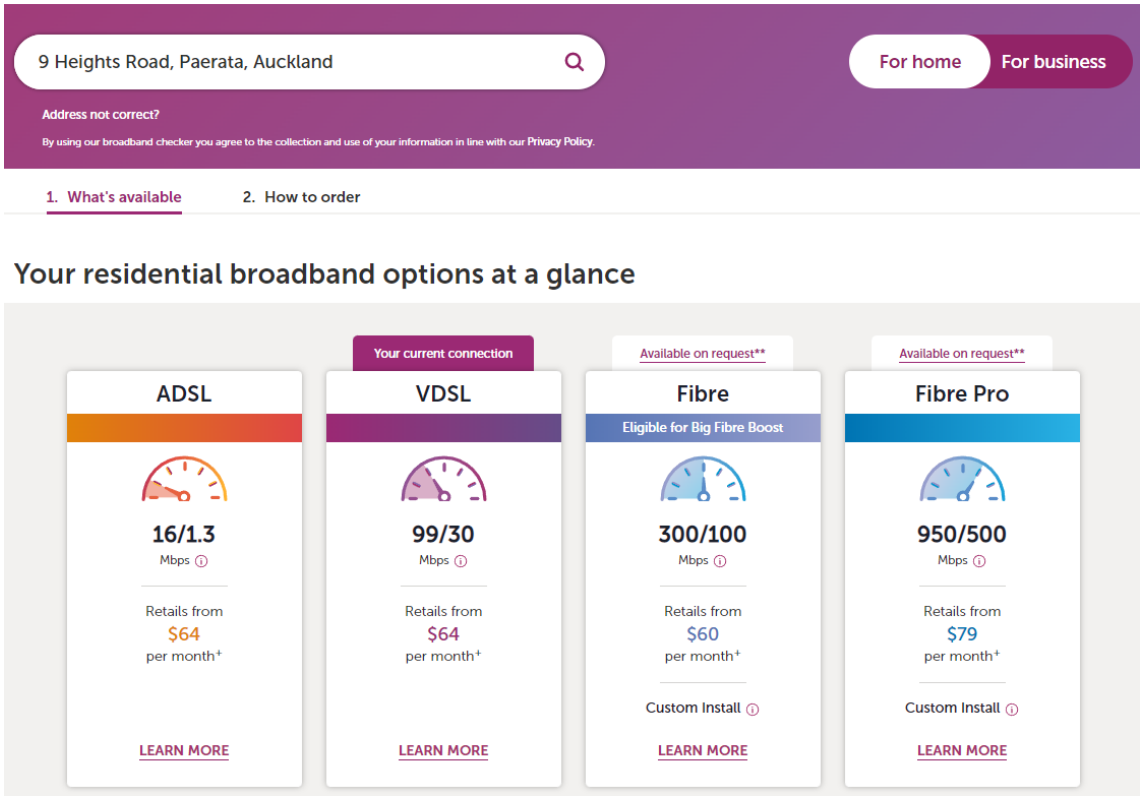


Figure 7: Telecom available services (Source: Chorus website)

Please note that according to the plans provided by B4UDig, Spark and Vocus also provide existing network along Paerata Road/ SH22 and can be contacted for services inquiry.

3. Summary

This report outlines the civil infrastructure components needed to service the proposed development at Heights Road, Paerata. The infrastructure works required for the plan change can be summarised in the section below:

- Earthworks – Minor earthworks are required to complete the landform including some minor geotechnical works depending on the land use and contamination removal subject to a full site investigation at the time of resource consent. Any earthworks undertaken will need to comply with council requirements for erosion and sediment control and dust management. Global stability of the site supports the proposed buildings and infrastructure based on current geotechnical investigations.
- Roading – The existing public roading network has capacity to attend the traffic generated by the proposed development and vehicle crossing upgrades can be undertaken as part of an engineering plan approval process.
- Stormwater – A new private stormwater network will be constructed to covey flows within the development along with the following measures:
    - The effects of the proposed development to the existing flood plains and overland flow paths can be minimised and no adverse effects to the neighbours will not occur by either providing attenuation within site or upgrading the culvert across Paerata Road will provide sufficient flood mitigation
    - Water quality treatment is required for runoff from all impervious and hardstand areas
- Wastewater – The site is serviced by a private WWPS and rising main with sufficient capacity to service the full development until a public connection needs to be considered.
- Water Supply – The site is serviced by a private borehole with storage tanks. Water saving measures or a new bore hole and water take consent can be made to service the site if needed ahead of a public connection being allowed.
- Utilities
    - Gas – An existing pipeline with available supply is located adjacent to the site and can be connected to if needed.
    - Power – The site is currently serviced by an existing medium voltage network which is suitable for the proposed land use.
    - Telecommunications – The site is currently serviced by Chorus, with sufficient capacity in the network on Paerata Road/SH22 available.

With reference to the items above, the proposed development can be fully serviced utilising either public or private infrastructure, so therefore there is no reason to consider that the civil infrastructure should constrain the proposed plan change.

Appendix A – Record of Titles

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Guaranteed Search Copy issued under Section 172A of the Land Transfer Act 1952

R.W. Muir
Registrar-General
of Land

Identifier	**NA29B/709**
Land Registration District	**North Auckland**
Date Issued	31 October 1974

Prior References
NA22A/1048

Estate	Fee Simple
Area	1.6187 hectares more or less
Legal Description	Lot 1 Deposited Plan 73273

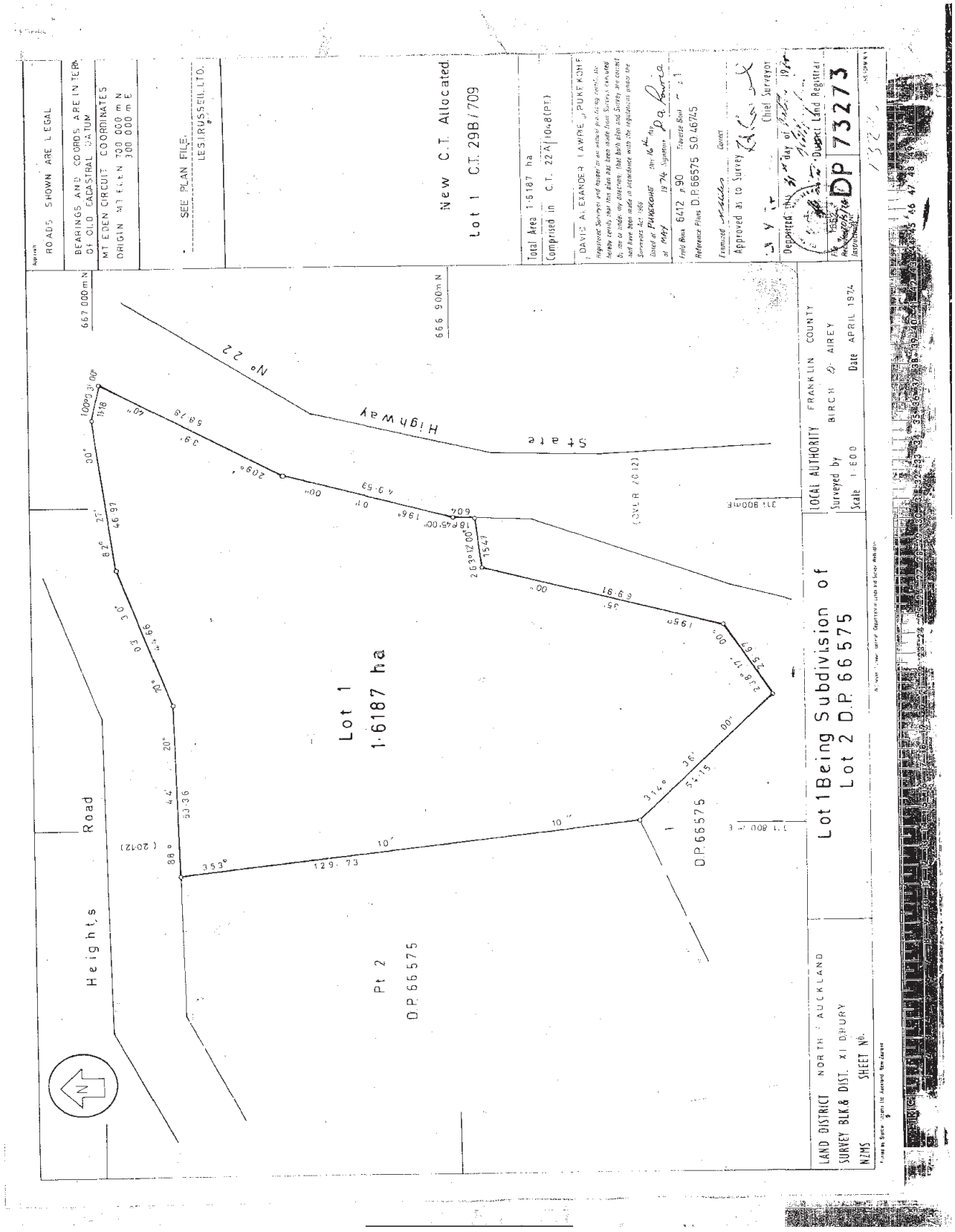
Proprietors
GBAR Properties Limited

Interests

535811.1 Gazette Notice declaring part No. 22 State Highway (Runciman to Te Uku) adjoining the within land State Highway to be a limited access road - 21.3.1977 at 11.31 am

D656351.3 Mortgage to Bank of New Zealand - 13.11.2001 at 11.37 am

Identifier **NA29B/709**



COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Guaranteed Search Copy issued under Section 172A of the Land Transfer Act 1952

R.W. Muir
Registrar-General
of Land

Identifier	**NA62A/149**
Land Registration District	**North Auckland**
Date Issued	26 March 1986

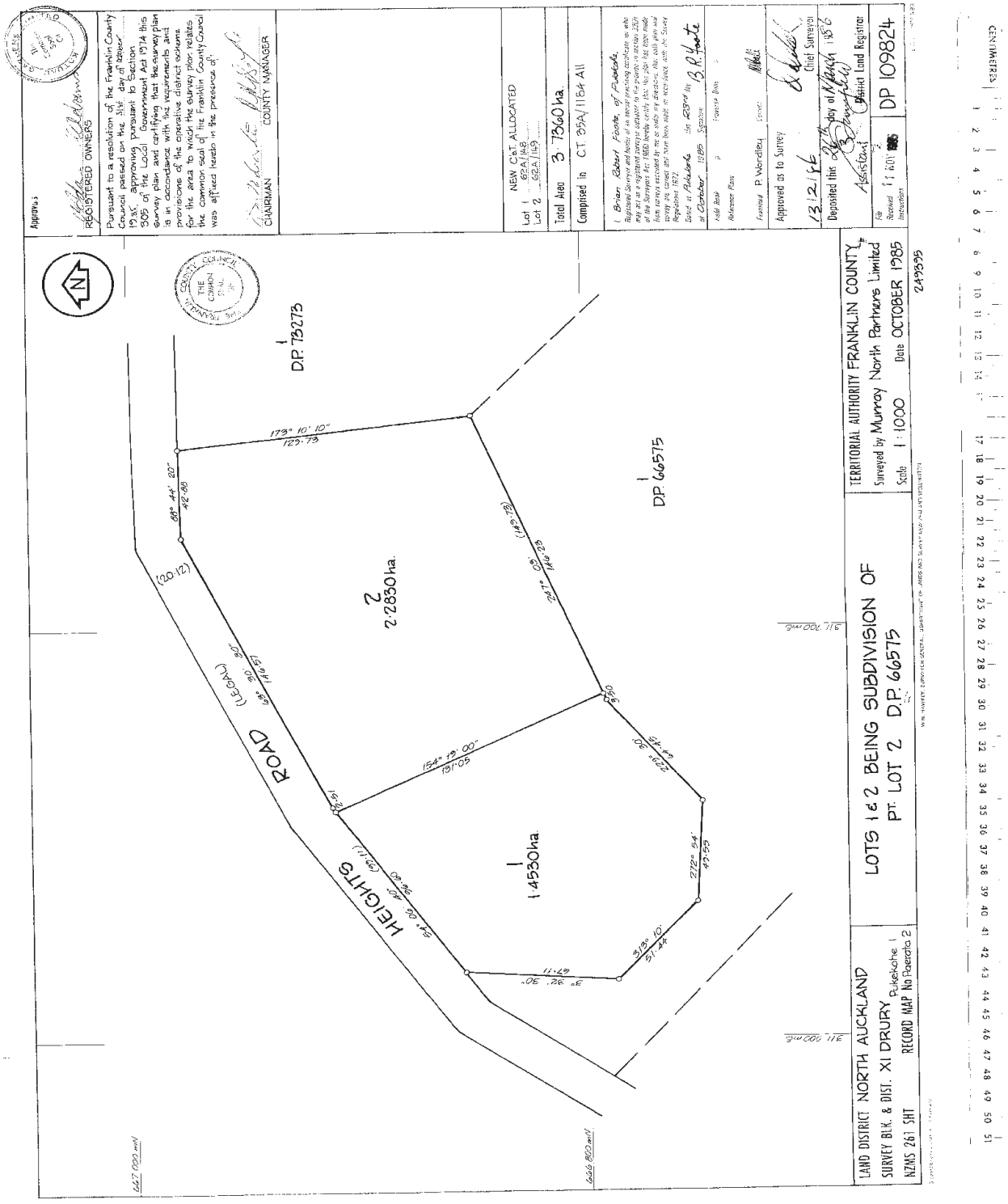
Prior References
NA35A/1184

Estate	Fee Simple
Area	2.2830 hectares more or less
Legal Description	Lot 2 Deposited Plan 109824

Proprietors
Gbar Properties Limited

Interests
10015513.3 Mortgage to Bank of New Zealand - 8.6.2015 at 9:08 am

Identifier **NA62A/149**



Appendix B – Development Masterplan

AREA SCHEDULE SUMMARY

	EXISTING BUILDING 1	EXISTING BUILDING 2	NEW BUILDING 1	NEW BUILDING 2	NEW BUILDING 3	NEW BUILDING 4	NEW BUILDING 5	NEW BUILDING 6	NEW BUILDING 7	NEW BUILDING 8	NEW BUILDING 9
GFA	2,414m²	2,666m²	1,819m²	1,962m²	950m²	1,000m²	900m²	1,550m²	1,500m²	1,500m²	1,382m²
PARKING PROVIDED	15	45	20	51	16	30	35	44	35	30	20

TOTAL STORMWATER POND AREA	2,000m²
TOTAL GFA (EXISTING + NEW)	17,643m²
TOTAL PARKING PROVIDED	341

WOODS
EST.1970

SITE PLAN LEGEND

- PROPERTY BOUNDARY
- 0.5m CONTOURS
- EXISTING RETAINING WALL
- PROPOSED RETAINING WALL
- EXISTING WAREHOUSE
- PROPOSED WAREHOUSE
- PROPOSED CANOPY & LOADING
- PROPOSED STORMWATER POND
- LANDSCAPE AREA
- SERVICE AREA

REVISION DETAILS		BY	DATE
A	PLAN CHANGE	SW	22/06/2023

DESIGNED	SW	9, 33, and 49 HEIGHTS ROAD, PUKEKOHE
DRAWN	SW	
CHECKED	EW	
APPROVED	EW	WOODS.CO.NZ

N

GBAR PROPERTIES

9-49 HEIGHTS ROAD PROPOSED PLAN CHANGE

INDICATIVE MASTERPLAN

STATUS	PLAN CHANGE	REV
SCALE	1:1500 @A3	A
COUNCIL	AUCKLAND COUNCIL	
DWG NO	P18-188-UD101	

Appendix C – Stormwater Management Plan

Refer to Separate Document

Appendix D – Water & Wastewater Calculations

9, 39, 49 - Heights Road Development
Watermain Demand Calculations
Refer Woods Drawing P18-188-UD101

Project Number:	P18-088	**Originator:**	AL
Date:	7/06/2023	**Checked By:**	BP

9,33,49 Heights Road (Dry Industry)	Floor Area (m^2)	No. of People	Litres per person or m^2 per day (L/p/d)	Peak Day Factor	Peak Hourly Factor	Average Daily Demand (ADD) (L/d)	PeakDay Demand (PDD) (L/d)	Peak Hourly Demand (PHD) (L/s)
Existing	5080	-	2	4.5	2.5	10160	45720	1.32
Proposed	12863	-	2	4.5	2.5	25726	115767	3.35
					Total	**35886**	**161487**	**4.67**

9, 39, 49 - Heights Road Development
Wastewater Flows Calculations
Refer Woods Drawing P18-188-UD101

Project Number:	P18-088	**Originator:**	AL
Date:	7/06/2023	**Checked By:**	BP

9,33,49 Heights Road (Dry Industry)	Floor Area (m^2)	No. of People	Routine Peak Daily Discharge	PF: Self Cleans. Design Flow (Normal PDWF)	PF: Peak Des. Flow (Normal PWWF)	Peak Design Flow (L/s)	Peak Design Flow x PF_{Self} Cleansing Flow (L/s)	Peak Design Flow x PF_{Peak} Design Flow (L/s)
Existing	5080	-	4.5	5.0	6.7	0.26	1.32	1.77
Proposed	12863	-	4.5	5.0	6.7	0.67	3.35	4.49
					Total	**0.93**	**4.67**	**6.26**

Total Upstream Catchment	**Total Peak Design Flow (L/s)**	**Self-Cleansing Design Flow (L/s)**	**Peak Design Flow (L/s)**
	0.93	**4.67**	**6.26**

Total 8 Hours Storage (ADWF x 28,800)/1000 (m3)	**26.91**
Total 24 Hours Storage (ADWF x 86,400)/1000 (m3)	**80.74**

Appendix E – Wastewater Assessment Report

Heights Road Plan Change

Wastewater Servicing Report

Corner Heights Road & Paerata Road, Pukekohe
GBar Properties Ltd

Plan Change

Document Control

Project Number	P18-088
Project Name	Wastewater Servicing Report
Client	GBar Properties Ltd
Date	21/02/2022
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Issue Status	Plan Change
Originator	Ben Pain – Associate Engineer Ed Ryan – Technical Specialist Engineer
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Contents

1.	**Introduction**	**5**
1.1.	Background	5
1.2.	Site Description	5
1.3.	Development Description	6
1.4.	Existing Infrastructure	6
1.5.	Stakeholder Engagement	6
1.5.1.	Watercare Services Ltd	6
1.5.2.	GBar Properties Ltd	6
1.5.3.	Pump & Valve Specialities Ltd	6
1.5.4.	Wastewater Treatment Industry	6
1.6.	Assessment Criteria	7
2.	**Wastewater Catchment Details**	**8**
2.1.	Proposed Developed Site	8
2.2.	Hydraulic Design Assumptions	8
2.2.1.	Relevant Standards	8
2.2.2.	Specific Conditions	8
2.3.	Development Flows	8
2.4.	Interim Flow Staging	9
2.4.1.	Staged Development	9
2.4.2.	Reduced Flows	9
2.4.3.	Combination Options	9
3.	**Option 1 – Utilise Existing Private Pump Station**	**10**
3.1.	Option Description	10
3.2.	Existing System Checks	11
3.2.1.	Information Received & Site Inspection	11
3.2.2.	Assumed Parameters	11
3.2.3.	Pump Flow Checks	11
3.2.4.	Rising Main Assessment	11
3.3.	Option Analysis	12
4.	**Option 2 – New Pump Station**	**14**
4.1.	Option Description	14
4.2.	Pump Station Description	14
4.2.1.	Private Pump Station	14
4.2.2.	Public Pump Station	14
4.3.	Rising Main Routes	15
4.3.1.	To Possum Borne Reserve	15
4.3.2.	To Isabella Drive Pump Station	16
4.3.3.	Other Considerations	17
4.4.	Option Analysis	17
5.	**Option 3 – On-Site Treatment**	**19**
5.1.	Option Description	19
5.2.	Wastewater Treatment Descriptions	19
5.2.1.	Primary Treatment – At Source	19
5.2.2.	Secondary Treatment – with Primary Treatment at Source	20
5.2.3.	MBR Plant	20
5.2.4.	Other Treatment Stages	21
5.3.	Discharge Locations	21
5.4.	Option Analysis	22

6. Combination Options & Other Options 24
6.1. Permanent Solutions 24
6.2. Interim Solutions 24
6.3. Other Options 24

7. Combined Option Analysis 25
7.1. Assessment Description 25

8. Summary, Conclusions & Recommendations 26

Appendix A – Calculations

Appendix B – Existing Pump Station Details

Appendix C – New Pump Station Details

Appendix D – On Site Treatment Details

Appendix E – Stakeholder Engagement

1. Introduction

1.1. Background

GBar Properties Ltd seek a private plan change for their properties located at 9, 33 and 49 Heights Road, Pukekohe. This report outlines wastewater servicing options for the site to confirm it can be serviced in its developed state.

1.2. Site Description

The development site is located at 9, 33 and 49 Heights Road, Pukekohe highlighted by the cyan boundary in the figure below.

Figure 1 - 9, 33 and 49 Heights Road - Aerial Image (Auckland Council)

The site encompasses the following lots:

Street Address	Legal Description
9 Heights Road	Lot 1 DP 73273
33 Heights Road	Lot 2 DP 109824
49 Heights Road	Lot 1 DP 109824

1.3. Development Description

The proposed development includes two stages:

- Stage 1 – This stage is located on the eastern side of the site and consists of the existing tractor centre plus two new dry industrial buildings located along the northern side of the site. This stage has been consented.
- Stage 2 – This stage is located on the western side of the site and consists of 6 new dry industrial buildings.

1.4. Existing Infrastructure

As part of this assessment, the following infrastructure has been identified:

- Existing Private Pump Station located at the Heights Road Site with rising main to Possum Borne Reserve where it connects to the public gravity wastewater network.
- Existing public wastewater networks and pump stations as shown on the Auckland Council GeoMaps
- Proposed Isabella Drive Pump Station Location

1.5. Stakeholder Engagement

Woods have engaged with the following stakeholders and parties in order to formulate this servicing report to support the plan change.

1.5.1. Watercare Services Ltd

Watercare Services Ltd (WSL) have provided a letter confirming that any future public wastewater flows should be directed to their proposed Transmission Wastewater Pump Station at Isabella Drive. Refer to Appendix E.

1.5.2. GBar Properties Ltd

Woods undertook an on site assessment of the existing private pump station including discussions with the client on the history of the site as he understood it.

1.5.3. Pump & Valve Specialities Ltd

Woods engaged with Pump & Valve to provide new pump station options for consideration as part of this assessment.

1.5.4. Wastewater Treatment Industry

Woods engaged with members of the wastewater treatment industry in order to provide options for on site wastewater treatment systems.

1.6. Assessment Criteria

A multi-criteria assessment methodology has been used to compare the different options. The criteria and their descriptions are summarised below:

Criteria	Sub-Criteria	Description
System	Reliability	Ability to perform consistently well
	Robustness	Ability to withstand site conditions
	Modular	The ability to add to the system easily as the development flow rates increase
	Flexibility	Able to adapt to development constraints and requirements
Spatial	Footprint	Ability to fit within the development footprint without compromising the development
	Level	Elevation requirements and depths of chambers
Consenting	Types	Types of consents needed for system
	Risk	Is there consenting risk with option presented?
	Stakeholder Input	Does there need to be specific stakeholder input as part of the design of the system
Construction	Complexity	How complex it is to set up
	Guarantees	What are the producer statements, warrantees, certificates, etc come with the product
	Requirements	Are there any specific requirements that need to be considered during construction, ie additional work that may be required prior to setting up the system
Performance	Quality	What is the quality of the discharge for the system into the receiving location/environment
	Requirements	What is required in order to achieve ongoing high performance
	Benefits	Benefits of the system
	Monitoring	How is performance monitored
Operations	Maintenance Contractor	Who does the maintenance, what is involved
	Complexity	How complex is it to maintain or operation
	Return Period	How often is maintenance required, are there systems to detect when maintenance is needed
Costs	CAPEX	What is the budget capital costs for the plant
	OPEX	What is the budget operating costs
	Upgrades	How much does upgrades, additional modules cost
	Decommissioning	How easy is it to decommission the plant, what is involved, are there any special considerations
	Re-saleability	Are there components that have re-saleability following the project, what is the anticipated depreciation

2. Wastewater Catchment Details

2.1. Proposed Developed Site

The proposed site shall consist of 9 dry industrial buildings plus associated infrastructure.

2.2. Hydraulic Design Assumptions

2.2.1. Relevant Standards

The hydraulic design has been based on the following standards:

- Watercare Services Ltd Code of Practice for Wastewater (COP-02) Version 2.2 Dated 1st November 2019
- Auckland Council's On-site Wastewater Management Guide (GD06, 2021/006) Version 1 (Draft) Dated January 2021
- Watercare Services Ltd Standard for Network Pumping Stations and Pressure Rising Mains (DP-06) Version 1 Dated 15 December 2017
- NZ Standards Land Development and Subdivision Infrastructure (NZS4404:2010)
- Sewage Pumping Station Code of Australia (WSA 04-2005) Version 2.1
- Pressure Sewerage Code of Australia (WSA 07-2007) Version 1.1

2.2.2. Specific Conditions

The development flows have been generated utilising the following items from the abovementioned standards:

- WSL COP-02 Table 5.1.4 – Dry industrial design wastewater flow allowance and peaking factors for light water users or up to two stories

Dry Industrial Activity Type	Routine Peak Daily Discharge	Self-Cleansing Design Flow PF (Normal PDWF)	Peak Design Flow PF (PWWF)
Light water users, or up to 2 storeys	4.5 L/m2/d	5.0	6.7

- WSL DP-06 Section 6.2.1 – *"The system design shall be based on the total pumping head with design flows anticipated at ultimate wet weather inflows and used to develop the system curve."*

2.3. Development Flows

The development flows have been summarised in the table below:

Stage	GFA (m2)	ADWF (L/s)	PDWF (L/s)	PWWF (L/s)
1 – Existing	2,641	0.14	0.69	0.92
1 - Approved	4,146	0.22	1.80	1.45
2	8,460	0.44	2.20	2.95
Total	**15,247**	**0.79**	**3.97**	**5.32**

For full calculations, refer to Appendix A.

2.4. Interim Flow Staging

As the works are to be progressed in stages, interim servicing options can be considered should some components of options not be available immediately or there is a preference to delay the capital costs until later in the project.

2.4.1. Staged Development

The development stages could be developed over a longer period of time or sub-staged in order to meet an interim flow requirement.

2.4.2. Reduced Flows

The use of water and subsequently the generation of wastewater could be managed in order to stage upgrades to the wastewater system. This could be achieved by:

- Using water saving fittings
- Pre-treatment of wastewater

2.4.3. Combination Options

Combining options such as utilising the existing private pump station up to its capacity and utilising on site treatment for part of the second stage could be considered.

3. Option 1 – Utilise Existing Private Pump Station

3.1. Option Description

This option consists of utilising the existing pumped system and rising main which was designed and constructed in the late 1970's for the previous meatworks. The private pump station consists of a wet well and valve chamber located adjacent to the Tractor Centre building and a rising main along SH22 to a discharge manhole located within the carriageway adjacent to Possum Bourne Park.

Figure 1: Pump Station Location

The wet well and valve chamber is in a poor but operable state and currently services the Tractor Centre building. There is a single pump in the wet well, and there is significant rust damage to the wet well parts.

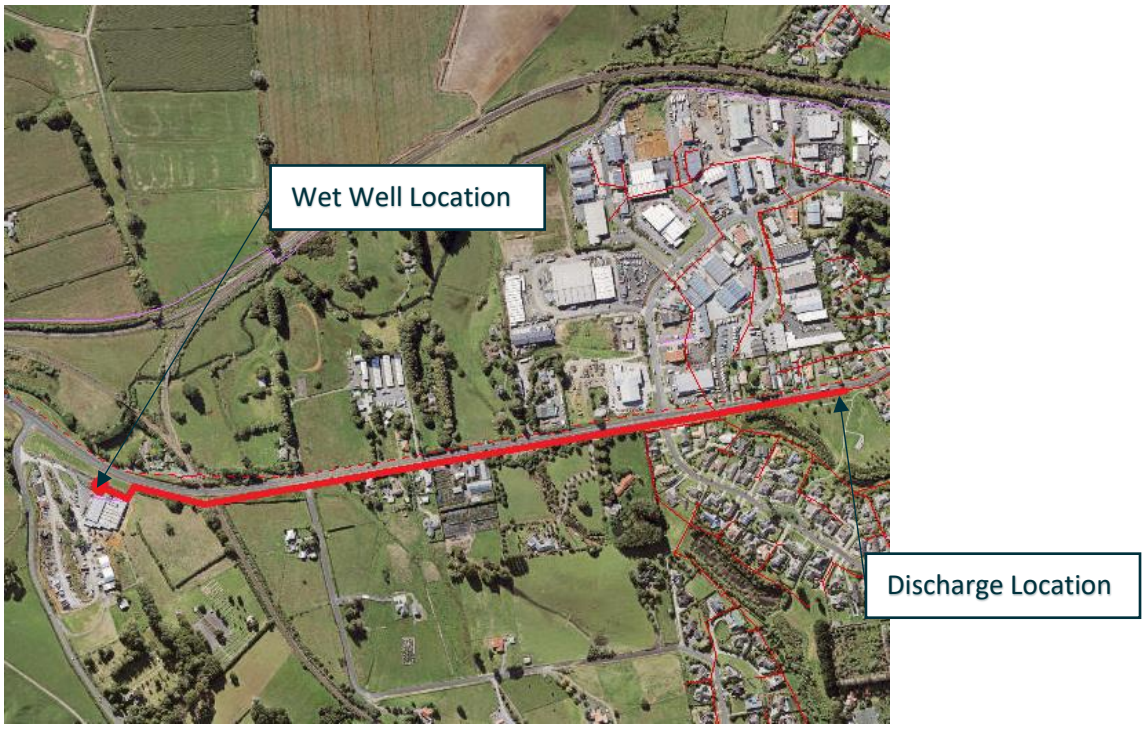


Figure 2: Existing Rising Main Route – approximately 1150m long

3.2. Existing System Checks

Due to the lack of an available operations and maintenance manual or other documentation for the existing pump station, a review of the design drawings contained within the property file and estimation of the pump station operational parameters.

3.2.1. Information Received & Site Inspection

The property file contained some information for the design of the pumping system including a wet well layout with pumps shown, however this appeared to be different in construction to what was present on the site with a smaller wet well diameter and constructed out of steel instead of concrete. Other details from a visual inspection appeared to be similar to the drawings from the property file.

The condition of the pump station was poor with much of the wet well fittings and covers having considerable rust. It appeared that there was only a single pump within the wet well.

A second pump was located on the site in storage but this appeared to be different in size and shape and investigation into its serial number demonstrated that this was a smaller pump from a different manufacturer, so was not considered as part of the assessment.

3.2.2. Assumed Parameters

Parameter	**Value**
Pump	Flygt CP 3126 HT with 460 Impellor
Wet Well Depth	5.0m
Wet Well Lid Level	RL 45.0
Discharge Manhole Invert Level	RL 54.0
Static Head	14.0m
Rising Main Length	1140m
Rising Main Size (from GIS)	DN100 AC
Maintenance Structures	4x along rising main

3.2.3. Pump Flow Checks

The assumed parameters were used to determine the likely capabilities of the pump station. The calculated inputs into the pump selection were:

Inputs	**Value**
Friction Head	5.72
Total Head	19.72
Available Pump	Flygt CP 3126 HT with 461 Impellor

Pump curves were provided by Flygt and demonstrate that it is likely that the pump flow for the assumed head is 19.0 l/s. This would indicate that the pump station is suitable for all stages of the development.

Full details are included in Appendix B.

3.2.4. Rising Main Assessment

been assessed due to the difficulty of undertaking CCTV of the line due to its length.

The GeoMaps information indicates there is 4 maintenance points along the rising main route, however upon a site inspection, the access points appear to be under the road carriageway with no access provided.

Further investigations of this line for suitability should be undertaken if it is to be utilised as part of the servicing of the site. The rising main is indicated as a 100mm dia Asbestos Concrete pipe. The condition of the pipeline has not been confirmed as part of this assessment.

Based on a 100mm dia pipe size, the capacity of the rising main should be 15 l/s based on WSL standards. This suggests that if the pipeline were to utilised, then flows could be increased to the full development flows with upgrades/replacement of the existing pump station.

3.3. Option Analysis

This option has been analysed against multiple criteria

Criteria	Sub-Criteria	Description
System	Reliability	Due to its current poorly maintained nature, there is risk that the system will not be able to operate for a sustained period, without remedial works or replacement
	Robustness	Due to its poor condition this pump station it is unlikely to provide a robust solution without remedial works or replacement.
	Modular	The system is not modular and would not support a modular approach. Any upgrades would need to be done externally as part of a treatment train approach.
	Flexibility	Due to the low flow rate capability, the pump station can not be too flexible unless it is combined with other systems or without remedial works or replacement
Spatial	Footprint	The pump station takes up a very small footprint located in a relatively unusable area.
	Level	The depth of the wet well appears to be suitable for servicing most of the site.
Consenting	Types	No further consenting would be required in order to utilise this system unless changes were made to the flow rate.
	Risk	Repair, modification or upgrades to this system could result in a building consent. Changes to the flow rate could trigger downstream effects.
	Stakeholder Input	Should there be changes to the system, the local authority may require input based on the discharge agreements.
Construction	Complexity	Any repairs may prove to be complex in order to ensure they rest of the system does not fail given its poor condition.
	Guarantees	No documents of this nature have been sourced for the existing system and it may be difficult to obtain any such documents for modifications to the system based on its poor condition.
	Requirements	Changes, repairs and upgrades should consider relevant current standards. This may mean upgrades are not feasible.
Performance	Quality	The system appears to be operating within appropriate parameters.

	Requirements	Due to the reliable history of the pump station, it is not considered likely that the proposed design flows will cause problems with the system.
	Benefits	The short term benefit with using this system is deferring replacement costs.
	Monitoring	Monitoring of the system is undertaken manually as part of normal operations & maintenance requirements.
Operations	Maintenance Contractor	This will be organised and undertaken by the operator.
	Complexity	Due to its poor condition, it may be difficult to maintain within a conventional sense.
	Return Period	Due to its poor condition, regular checks should be undertaken.
Costs	CAPEX	Deferred
	OPEX	These are likely to be unchanged from the current costs
	Upgrades	If any upgrades to the system are undertaken, this could cause other parts of the system to degrade faster and lead to more expense.
	Decommissioning	A new system should be put in place prior to decommissioning this system. Given its degraded condition, it is likely that it will be destroyed and taken to tip.
	Re-saleability	There are unlikely any components of this system which can be reused, sold or recycled.

4. Option 2 – New Pump Station

4.1. Option Description

A new pump station could be installed to replace the current system which is highly degraded. There are several sub-options which could be considered:

a) Private Pump Station – Discharge to Possum Borne Reserve via Existing or New Rising Main

b) Private Pump Station – Discharge to Isabella Drive Pump Station via New Rising Main

c) Public Pump Station – Discharge to Possum Borne Reserve via Existing or New Rising Main

d) Public Pump Station – Discharge to Isabella Drive Pump Station via New Rising Main

e) Public Pump Station – Located as part of wider catchment including other nearby developments with Discharge to Isabella Drive Pump Station via New Rising Main

4.2. Pump Station Description

Given then size of the new pump station it shall of a single wet well with dual (Duty/Standby) pumps. This will likely be provided by a package pump station suppliers such as:

- Pump & Valve
- Aquatech
- Maskell
- Hynds/Aquate

For this assessment, Pump & Valve have been contacted and have provided proposed systems for the different options. Details of these are provided in full in Appendix C.

4.2.1. Private Pump Station

The private pump station shall be designed to NZ Building Code standards and is likely to consist of:

- 2m dia fibreglass wet well
- 50-250mm dia pipework with resilient seated valves
- Dual 11 kW (Possum Borne) to 15 kW (Isabella) pumps
- Passive Odour Filter
- Washdown systems including a wet well washer, tank washers and a 50mm RPZ
- 2.5m dia by 12.1m long storage tank
- Dual alternating pump controller with level alarms

4.2.2. Public Pump Station

The public pump station shall be designed to Watercare Services Ltd Code of Practice standards and is likely to consist of:

- 2m dia fibreglass wet well
- 50-250mm dia pipework with flextend articulated flexible joints and metal seated valves
- Dual 15 kW (Possum Borne) to 22 kW (Isabella) pumps
- Passive Odour Filter
- Washdown systems including a wet well washer, tank washers and a 50mm RPZ

- 1.85m dia by 4.6m long storage tank
- 500kg SWL Lifting Pole
- WSL Compliant wastewater pump station controller with SCADA connection, level alarms, and sensors.

4.3. Rising Main Routes

Two rising main routes have been considered for this assessment based on a pump station located within the Heights Road site and discharging to either the existing discharge location at Possum Borne Reserve or to the new Watercare Services Ltd Isabella Drive Transmission Wastewater Pump Station.

4.3.1. To Possum Borne Reserve

The new rising main route shall follow the existing rising main route and be constructed utilising one of the following methodologies:

- Duplication – a new pipeline is installed in parallel with the existing pipeline
    - Open Cut Excavation – trenching installation with replacement of the trench and surface structure when complete
    - Horizontal Directional Drilling – a hole is bored then the pipeline is pulled through
- On-line Replacement – the existing pipe is replaced with a new pipe
    - Open Cut Excavation – the pipeline is replaced in sections via a trenching methodology and the flows are diverted
    - Pipe Bursting – the old pipe is burst as the new pipe is pulled through it with the help of a bursting head
    - Pipe Reaming – the old pipe is broken with a modified head on a horizontal directional drill then the new pipe is pulled through the cavity

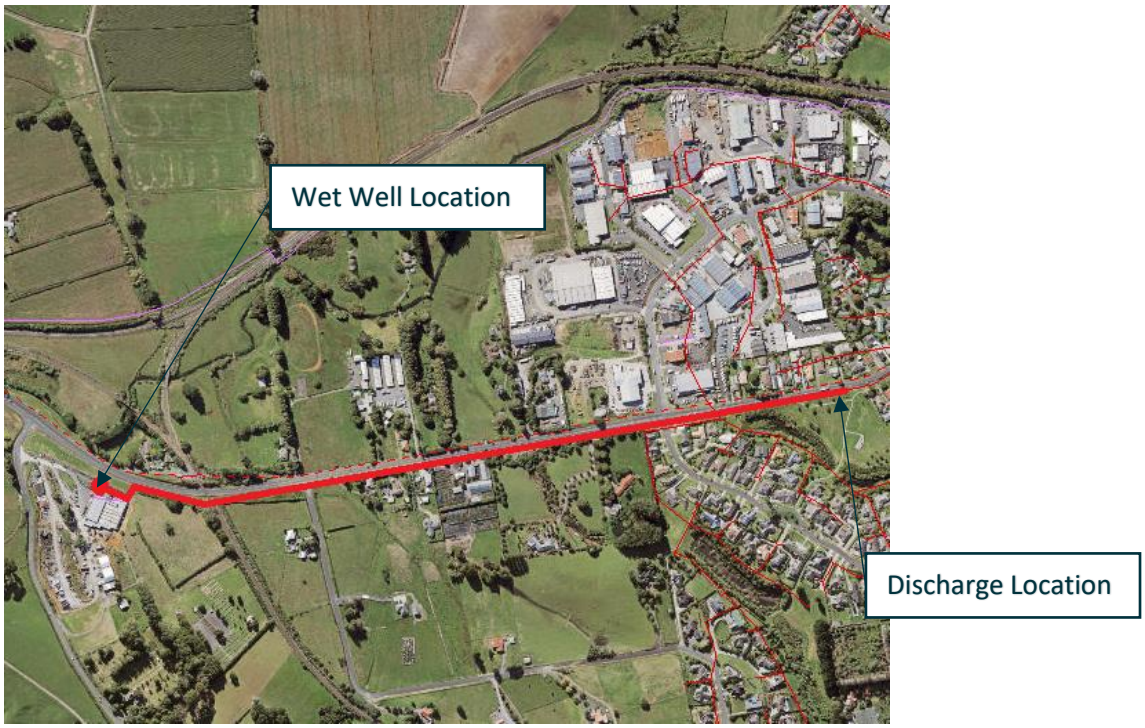


Figure 3: Proposed Rising Main Route to Possum Borne Reserve

- Rehabilitation – the old rising main is rehabilitated
    - Slip Lining – a new smaller pipe is pulled through the old pipe with grout filling of any gap between pipes
    - Spiral Wound Lining – a single strip of PVC with interlocking edges is spirally wound into the existing pipe and interlocked to form a new pipeline inside the old pipe
    - CIPP Lining – a fabric tube impregnated with resin is pulled through the pipe then inflated and cured in place to create a new internal lining to the pipe.
    - Fold & Form Lining – a folded liner is pulled through the pipe then with then inflated with steam and set to its original shape inside the old pipe

4.3.2. To Isabella Drive Pump Station

A new rising main is constructed to the new WSL Transmission Wastewater Pump Station at Isabella Drive via a new rising main.

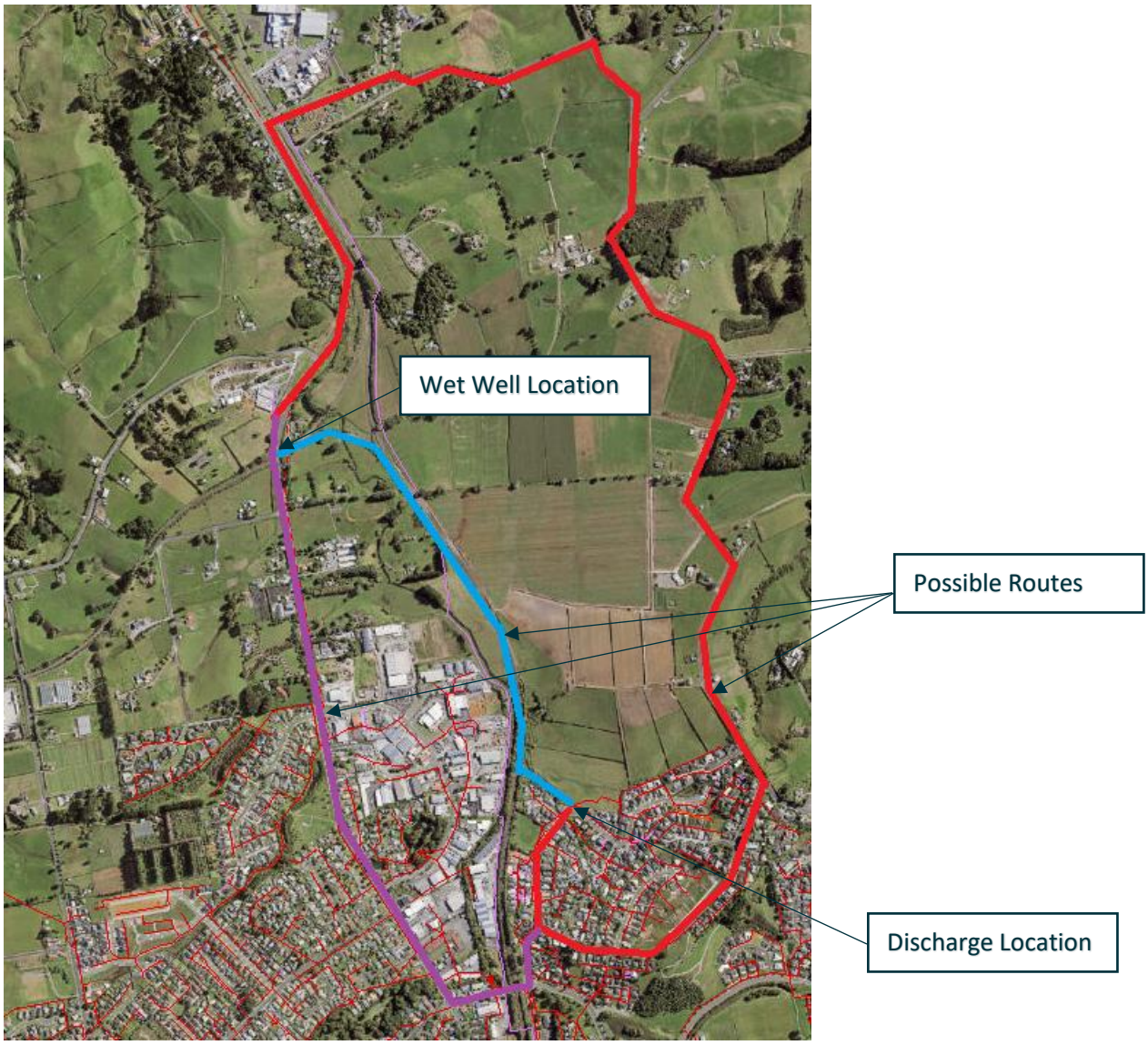


Figure 4: Proposed Rising Main Routes to Isabella Drive Pump Station

There are 4 sub-options considered:

a) From the Heights Road Tractor Centre, north along Paerata Road to Tuimata Road, Crossing under KiwiRail, East on Tuimata Road, South on Cape Hill Road, North on Isabella Drive (5430m)

b) From the Heights Road Tractor Centre, South along Paerata Road, East on Cape Hill Road, North on Isabella Drive (2490m)

c) Utilise existing rising main to Possum Borne Reserve with similar installation options as listed in that route, Continue south of Paerata Road, East on Cape Hill Road, North on Isabella Drive (2490m)

d) From the Heights Road Tractor Centre, South along Paerata Road, Into KiwiRail designation and travel south parallel with tracks, enter Isabella Drive WWPS from the east (1580m)

Installation methods likely to consist of open cut excavation or horizontal directional drilling.

4.3.3. Other Considerations

For the sub-option where a pump station was constructed as part of wider development in the area, the location of this would depend on the low point of the catchment it was servicing. It is assumed that this pump station would be able to cater for this development and be designed as part of the local authority's wider network plans.

4.4. Option Analysis

This option has been analysed against multiple criteria

Criteria	Sub-Criteria	Description
System	Reliability	A new package system will be able to perform well. If the system is private, this relies on regular maintenance.
	Robustness	The proposed package systems are made from robust materials and should achieve 100 year design life for public systems and 50 year design life for private systems in accordance with their design criteria.
	Modular	Given the size of station, this is likely to be built as a single stage
	Flexibility	The systems is reasonably flexible in design to accommodate the site constraints
Spatial	Footprint	Private systems are more flexible than public systems given WSL's spatial requirements.
	Level	Levels will be based on the position of the pump station and the incoming pipelines
Consenting	Types	Public systems will need to be approved through WSL including NDC discharge requirements. Private systems will require private discharge consents for overflows and building consent.
	Risk	Private discharge consents may pose risks along with providing new private rising mains within public streets.
	Stakeholder Input	Asset holders should be consulted as part of the process including AMA for rising main routes within SH22.

Construction	Complexity	Package pump stations are relatively simple to construct with a civil contractor provided a good QA system is put in place by the Engineer.
	Guarantees	PS1's during design and PS3's, PS4's and other construction documentation shall be provided. If a public system is used, the compliance statement process will be used instead of the producer statements.
	Requirements	Deep excavations and crane requirements for chamber installation and installation methodologies for the rising main should be considered during construction procurement.
Performance	Quality	These systems should not have any performance issues if properly maintained.
	Requirements	Maintenance in alignment with the operations & maintenance manual will ensure these perform correctly.
	Benefits	This option is the more common option utilised for projects of this nature.
	Monitoring	Alarmed systems within the pump station allow the maintenance contractor to monitor and react to any issues.
Operations	Maintenance Contractor	For public systems, WSL have maintenance contractors to undertake regular maintenance. For private systems, the body corporate should employ a qualified maintenance contractor such as Hiflo.
	Complexity	A qualified maintenance contractor should not have any trouble with maintaining this system
	Return Period	In accordance with the operations & maintenance manual
Costs	CAPEX	Private systems will be cheaper than public systems given the design life and WSL requirements. A public system could be approximately $1m or higher if combined with other catchments. Cost fluctuations due to market conditions such as related to supply issues during the pandemic could increase this.
	OPEX	The major costs for the pump station is the power and regular maintenance. Planned upgrades and replacements can be allowed for over the design lift.
	Upgrades	Replacement of some systems will need to be undertaken over the lifespan of the pump station including pumps and electrical systems. Wells, chambers and pipework should not need to be replaced.
	Decommissioning	Decommissioning of the pump station should be relatively easy if its has been well maintained.
	Re-saleability	Depending on age of the equipment, some parts may have re-saleability value.

5. Option 3 – On-Site Treatment

5.1. Option Description

Treatment of wastewater on site could be considered for as both interim and permanent measures. Sub-options to consider are:

a) Pre-Treatment and discharge reduced flows to a rising main – this would require private treatment and removal of solids via a treatment system which would reduce the flow rate to a pumped system

   a.1. Primary Treatment – removal of solids, and a low level of treatment completed

   a.2. Secondary Treatment – removal of solids and a high level of treatment completed

b) Treatment and land disposal

   b.1. Primary Treatment – a low level of treatment completed requiring a large disposal field

   b.2. Secondary Treatment – a high level of treatment completed requiring a smaller disposal field

c) Treatment and watercourse disposal – this would require a high level of treatment utilising a package MBR plant or similar

5.2. Wastewater Treatment Descriptions

There are several stages of treatment which can be considered and can be utilised in conjunction with each other. These have been described in the sections below with product information provided in Appendix D.

5.2.1. Primary Treatment – At Source

Systems such as Innoflow Technologies Ltd STEP tanks and pumps are located at each property and collect and provide primary treatment prior to discharging into a pressure main. The pressure main can either go to a centralised pump station, discharge field, secondary treatment or to a discharge location (such as the end of a rising main).

This system requires the lot owners to undertake regular maintenance of their system including removal of solids approximately every 10 years.

Each Lot shall contain a STEP Tank for primary treatment & solids removal, including:

- 4000 l tank
- ProSTEP pump
- Control Panel + accessories

Figure 4: STEP System

5.2.2. Secondary Treatment – with Primary Treatment at Source

The Innoflow Technologies Ltd STEP system can be combined with an Advantex AX-Max Treatment Vault secondary treatment system located in a centralised location to provide a high level of treatment prior to discharging into a pressure main. The pressure main can either go to a centralised pump station, discharge field, discharge pond, further treatment or to a discharge location (such as the end of a rising main).

Figure 5: STEP System

The AdvanTex AX-Max Secondary Treatment Plant includes:

- Anaerobic (MBR) treatment, to process waste particles
- Number of vaults depends on catchment size
- Control Panel + accessories

5.2.3. MBR Plant

Membrane Bioreactors (MBR) provide a high level of treatment (up to tertiary stage) and are suitable for on site treatment where there is a sensitive receiving environment. A packed MBR plant typically includes:

- Fine Screen Filters
- Flow Equalisation Zone
- Sludge Holding Zone
- Anoxic Zone
- Aeration Zone
- Membrane Module

There are a number of different suppliers in NZ who provide packaged plant in either containerized or permanent formats, including Smith & Loveless, MENA, Guaranteed Flow Systems, Masons, and Fluence.

These systems are generally centrally operated and can discharge directly to receiving environments, but can easily be discharged to other discharged locations.

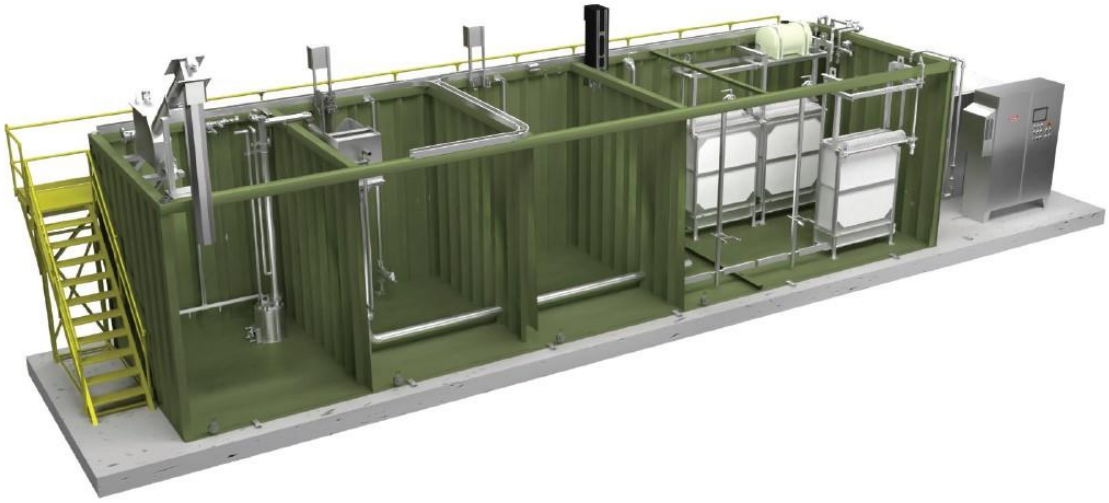


Figure 6: Smith & Loveless Titan MBR Wastewater Treatment Plant

5.2.4. Other Treatment Stages

Further stages of treatment could be considered, including

- De-nitrifying bed – to remove nitrogen based compounds
- Ultrafiltration System (Reverse Osmosis Membrane) – to remove fine particles and first stage disinfection
- UV – Ultraviolet light to eradicate any microbes and pathogens
- Chemical Dosing – application of chemicals to kill microbes and pathogens
- Discharge Pond – a spilling pool before entering the receiving environment.

5.3. Discharge Locations

Treated effluent could be discharged in the following locations:

- Effluent Field – this is a disposal field where treated effluent is dispursed to land. The size of the field is based on the dispersal method, level of treatment and infiltration rate of the land. Dispersal methods include:
    - Dripper pipe – low pressure pipelines with small holes laid at regular intervals in a field
    - Soakage trenches – perforated dose lines are laid in drainage trenches at regular intervals
    - Spray systems – treated effluent is sprayed over the ground surface
- Public Wastewater Network – pre treated effluent is pumped to the existing network at a lower rate than if a normal untreated pumped flow was delivered. The method which the effluent was pre treated should not effect the down stream treatment plant.
- Watercourse – a high level of treatment would be required in order to discharged directly to a watercourse.

5.4. Option Analysis

This option has been analysed against multiple criteria

Criteria	Sub-Criteria	Description
System	Reliability	The treatment system depends on the inflow of wastewater. During initial stages there may not be enough feed for the microbes as part of the treatment process.
	Robustness	Generally these systems are very robust
	Modular	The treatment solutions can be easily scaled and increased in a modular fashion tailored to the development build out.
	Flexibility	These systems are reasonably flexible, however may have issues during initial low flows.
Spatial	Footprint	Depending on the scale, these can fit within driveways or within shipping containers. For larger systems, there may be space constraints. On site disposal could be large
	Level	The systems required both above and inground systems.
Consenting	Types	The consenting process may be building consent and may require discharge consents
	Risk	Risk with discharge consents meeting local authority and manu whenua requirements.
	Stakeholder Input	It is suggested that manu whenua input is made during the preliminary design phase of on site treatment if a discharge consent is going to be required.
Construction	Complexity	These systems can be relatively complex down to relatively simple if package systems are provided and set up by the manufacturers.
	Guarantees	Normal Producer Statements and Guarantees are provided as part of the Building Consent, Consent and Supply processes
	Requirements	There maybe specific lining or seismic requirements if certain systems are used. Discharge structures may be complex
Performance	Quality	Depending on the level of treatment selected. Primary Treatment will provide a low level of treatment, Secondary Treatment will provide a good level of treatment and Tertiary treatment will provide a high level of treatment,.
	Requirements	Regular maintenance and sludge removal is required in order to achieve high performance.
	Benefits	On site treatment does not require work within existing roads, or waiting for new public infrastructure to be installed.
	Monitoring	Alarms and monitoring systems are included in the package systems.

Operations	Maintenance Contractor	For the centralised systems, a maintenance contractor employed by the body corporate will undertake maintenance. Where an on site primary system like the STEP system is used, the lot owner will be responsible for monitoring and maintaining their own system.
	Complexity	Centralised systems will require a qualified maintenance contractor to maintain, where as on site systems are less complex and maintenance could be undertaken by a plumber or other professional.
	Return Period	Based on the operations and maintenance manual and the design of the system.
Costs	CAPEX	On site systems like STEP, the cost is deferred to the lot owner. Centralised systems can be costly, however since they can be installed in a modular fashion, some costs can be deferred to later.
	OPEX	Power and maintenance costs.
	Upgrades	Replacements costs based on the operations & maintenance manual.
	Decommissioning	Given the modular nature of these systems, most are relatively easy to disassemble once the desludging has occurred.
	Re-saleability	Depending on age of the equipment, some parts may have re-saleability value.

6. Combination Options & Other Options

There are several permanent and interim solutions which could be considered which combine parts of the three options considered. These have been listed but not fully explored as part of this report.

6.1. Permanent Solutions

The following permanent solutions could be considered when designing the wastewater servicing for this site:

- Primary Treatment at the lots with a STEP system or similar then discharge to the new pump station – the size of the pump station could reduce due to the primary treatment at the lots reducing the liquid volume. The internal private pipe network would consist of low diameter pressure pipe. This option could be used in conjunction with a slip lining option of the rising main if the slip lining required lower flow rates in order to be achieved.
- Secondary Treatment at a centralised location then discharge to the new pump station. The size of the pump station would reduce based on the primary and secondary treatment reducing the liquid volume. This option could be used in conjunction with a slip lining option of the rising main if the slip lining required lower flow rates in order to be achieved.

6.2. Interim Solutions

The following interim solutions could be considered when designing the wastewater servicing for this site:

- Treatment on site, then tanking effluent off site to discharge at the public wastewater treatment plant.
- Treatment on site, then discharging to existing pump station until it reaches the end of its life.
- Treatment on site, and discharging to an effluent field until that area is developed, when a permanent discharge location will need to be provided.

6.3. Other Options

The following other options have been considered as part of this assessment but have not been fully realised in this report:

- Low pressure sewer system – each tenancy could have a low pressure sewer pump and connection to a combined pressure main, which the pressure main could be conveyed to the rising main discharge locations. Due to WSL's general dislike of public low pressure systems, this system would need to be a private system.
- Vacuum wastewater system – the site is relatively small with few contours through it and therefore a vacuum wastewater system could be considered. A packaged wastewater pump station within a container could be used with vacuum lines in the driveways and vacuum pits providing connections to the lots. The reason this has not be considered in too much detail is that traditional gravity reticulation works within the site.
- Tankered solutions where interim raw effluent flows are removed from site and discharged via trucks to the public WWTP. An on-site storage tank maybe required as part of this solution.

7. Combined Option Analysis

7.1. Assessment Description

A multi-criteria assessment methodology has been used to compare the different options. The criteria and their descriptions are summarised below:

Criteria	Sub-Criteria	Option 1 Existing Pump Station	Option 2 New Pump Station	Option 3 On-Site Treatment
System	Reliability	Low	High	High
	Robustness	Low	High	High
	Modular	No	No	Yes
	Flexibility	No	Reasonably	Yes
Spatial	Footprint	Small	Medium	Large
	Level	Existing	Deep	Above & Below Ground Level
Consenting	Types	N/a	EPA or BC	BC and Discharge
	Risk	Lifespan	Public/Private Asset Interface	WW Discharge
	Stakeholder Input	N/a	Local Authority	Local Authority Manu Whenua
Construction	Complexity	N/a	Low	Medium-High
	Guarantees	None	Yes	Yes
	Requirements	None/ Rehabilitation	Deep excavation, working on public roads	Lining or seismic considerations, discharge structures
Performance	Quality	Within design requirements	Good	Good
	Requirements	Meets design flows	As specified	As specified
	Benefits	Deferred costs	Normal solution	On site only
	Monitoring	Visual	As specified	As specified
Operations	Maintenance Contractor	Private	Private or Public	Private
	Complexity	Poor condition	Normal	High
	Return Period	Regular	As specified	As specified
Costs	CAPEX	Deferred	Medium-High	Low-High
	OPEX	Current Levels	Low-Medium	Medium
	Upgrades	No	Replacements	Modular and Replacements
	Decommissioning	Destroyed	Straightforward	Desludge, then modular

	Re-saleability	No	Depends on lifespan	Depends on lifespan

8. Summary, Conclusions & Recommendations

Three main options have been considered to service the wastewater catchment for the proposed Heights Road site including both interim and permanent solutions including:

- Use of the existing pump station
- Construction of a new pump station
- On Site Treatment
- Combinations of these options.

A multi-criteria analysis was undertaken for each option and this analysis was compared against each option.

This reports shows that the wastewater flows from this development is able to be serviced via several feasible engineering methods.

It is the recommendation of this report, that the existing system is utilised until such a time that it can no longer operate effectively and to the requirements of the local authority, where by then a new pump station is construction to service this development. The new pump station could be public or private or combined with other nearby development as part of the local authority's wider network plans.

Interim servicing options could be considered in order to prolong the lifespan of the existing system including:

- the use of on site treatment to reduce the wastewater flows to the pump station
- repair/rehabilitation of the existing rising main
- on site treatment and disposal on site until a time when a new pump station can be constructed.

Appendix A – Calculations

P18-088 Heights Road, Paerata - Tractor Centre Plan Change
Water and Wastewater Development Assessment

Calculations by: S.P.
Date: 15/04/2021
Reviewer: C.D.

Wastewater

	Design routine peak flow (L/s)	Self-cleansing design flow (L/s)	Peak Design flow (L/s)
Stage 1			
Existing	0.14	0.69	0.92
Proposed (Approved)	0.22	1.08	1.45
Stage 2			
Proposed	0.44	2.20	2.95
Total	0.79	3.97	5.32

Water

Stage 1			
Existing	0.14		0.28
Proposed (Approved)	0.22		0.43
Stage 2			
Proposed	0.44		0.88
Total	0.79		1.59

Building Areas

Stage 1 Existing	2641	m2
Stage 1 Approved	4146	m2
Stage 2 Proposed	8460	m2

Basis of Calculation

Dry Industry
Light Industrial / Up to 2 Storeys
Routine Peak Daily Usage = 4.5 $L/m^2/d$

Appendix B – Existing Pump Station Details

Existing Pump Station

Woods have undertaken an assessment of the existing pumping station based on:

- A visual inspection undertaken on site
- Plans and documentation available in the property file
- Information on Auckland Council GeoMaps

Site photos have been provided as an attachment to this appendix.

Preliminary Assumptions

The preliminary assumptions based on the available information are as outlined in the table below

Item	Detail
Pump	Flygt CP 3126 HT with 460 Impellor based on design drawing
Wet Well	DTI = 5.0m, IL = 40.00
Discharge Manhole	IL = 54.00, based on downstream GIS manhole and 2% grade
Static Head	H = 14.00
Rising Main	1140m 100mm dia AC based on GIS information
Maintenance Structures	4x based on GIS data

Preliminary Calculations

Woods undertook preliminary head calculations based the information in the table above and anticipated head losses in reasonably expected fittings.

Total Head = Static Head + Friction Head

= 14.50 + 5.72

= 19.72

Pump Selection Confirmation

Due to lack of design or operational information for the existing system, Woods worked with the supplier to reverse engineer the pumping capability of the pumping system.

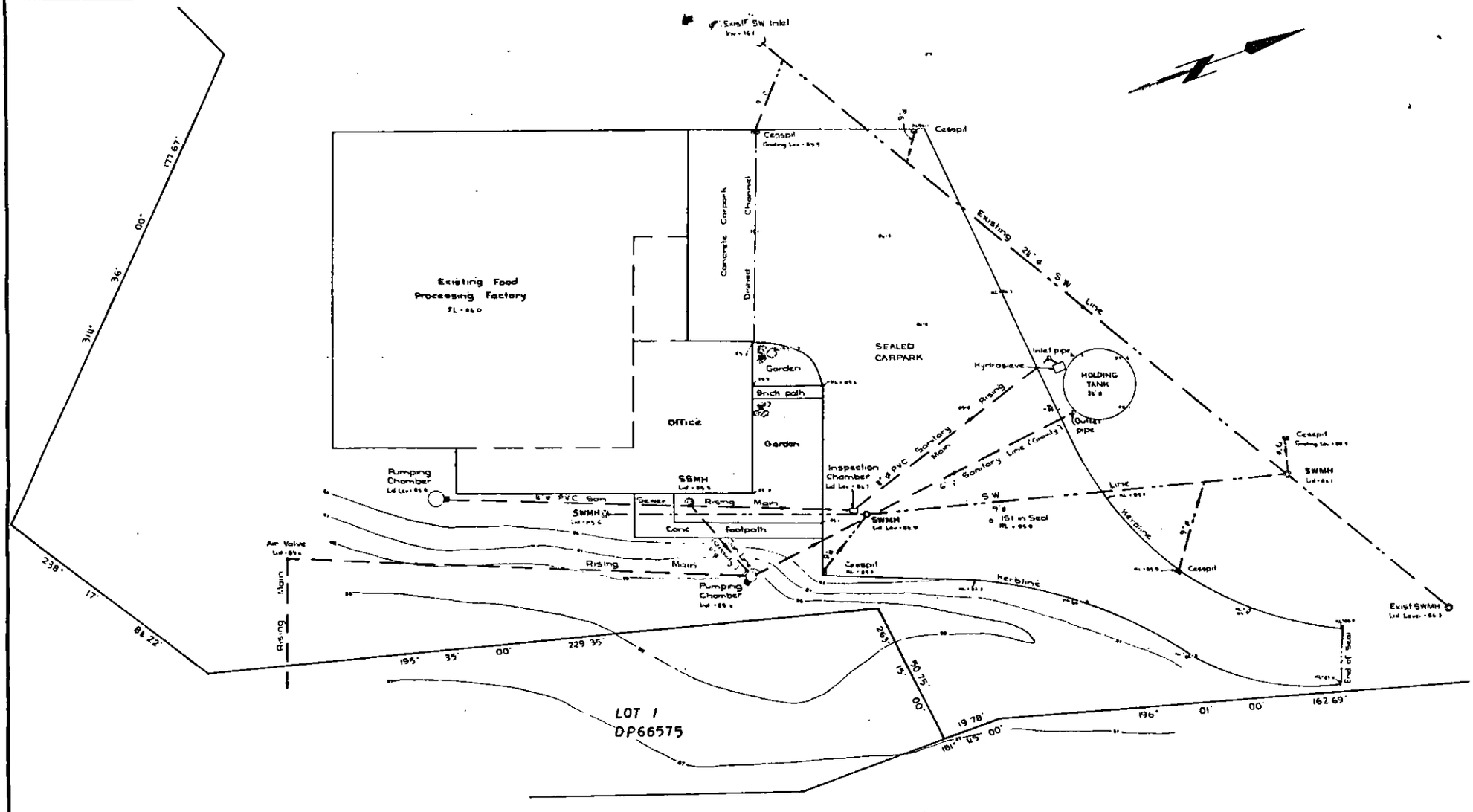
Flygt noted that the 460 impellor selected in the design plans was not used for this pump type and therefore confirmed a 461 impellor would have been the most likely impellor installed. Flygt provided pump curves to Woods to analyse.

Woods checked the pump against the head calculated and deduced the following results:

- 58 % pump efficiency
- 50 % overall efficiency
- 19 l/s estimated pump flow rate

Site Photos

Design Plans from Property File



NOTE :
All Measurements and levels are in feet

STATE HIGHWAY NO. 22

LEGEND
Sewer Lines
Stormwater Lines
Conc Drained Channel

SURVEYED	W.K.M. May '76	APPROVED	Prepared for KING KOLE PREPARED FOODS LTD.	AS – BUILT PLAN OF SEALED AREAS & STORMWATER & SANITARY DRAINAGE	FRASER, THOMAS, GUNMAN, SHAW & PARTNERS Consulting Engineers Registered Surveyors Architects & Town Planners 152 KOLMAR ROAD PAPATOETOE AUCKLAND
DESIGNED					SCALE 1/16" = 1'-0"
DRAWN	W.K.M. May '76				AMENDMENTS
TRACED	L.S. May '76	L.B.			DRAWING No. 70359 A-1
CHECKED	W.K.M. June '76	I.B.			SHEET OF SHEETS

PROPOSED REMOTE FILL LINE

Exist SW. Inlet Inv = 76.1

PROPOSED SHELL DIES KERBSIDE DISP'D

EXISTING SHELL DIESOLINE TANK

Cesspit Grating Lev = 85.5

Cesspit

PROPOSED 10,000 LTR MOTOR SPRIT TANK - KERBSIDE DISP'D

Existing Food Processing Factory FL = 86.0

Concrete Dished Channel

Existing 2" ø

S.W. Line

SEALED CARPARK

Garden

Brick path

Garden

Office

Hydrasieve

Inlet p.Dr.

HOLDING TANK 28' ø

Outlet pipe

Rising Main

Pumping Chamber Lid Lev = 85.9

SSMH Lid = 85.5

4" ø P.V.C. San Sewer

Inspection Chamber Lid Lev = 86.7

4" ø PVC Sanitary Main

6" ø Sanitary Line (Gravity)

SWMH Lid = 85.6

Rising Main

Conc footpath

SWMH Lid Lev = 86.9

S.W. 9" ø 151 in Seal RL = 85.8

Cesspit Grating Lev = 90.7

SWMH Lid = 84.1

Air Valve Lid = 89.6

Rising Main

4" ø Gravity San Line

Pumping Chamber Lid = 88.6

Cesspit RL = 85.4

Kerbline

Cesspit RL = 85.9

Exist SWMH Lid Level = 86.3

End of Seal

238° 17' 84.22'

177.67' 3¼" 36' 00"

195° 35' 00" 229.35'

263.15' 50.75' 00"

196° 01' 00" 162.69'

181° 45' 00" 19.78'

LOT 1 DP66575

STATE HIGHWAY NO. 22

NOTE

All Measurements and levels are in feet.

LEGEND

Sewer Lines

Stormwater Lines

Conc Dished Channel

SURVEYED	W.K.M May '76	APPROVED	
DESIGNED			
DRAWN	W.K.M. May '76		L.B.
TRACED	I.F.S. May '76		F.B.
CHECKED	W.K.M June '76		

Prepared for: KING KOLE PREPARED FOODS LTD.

AS-BUILT PLAN OF SEALED AREAS & STORMWATER & SANITARY DRAINAGE

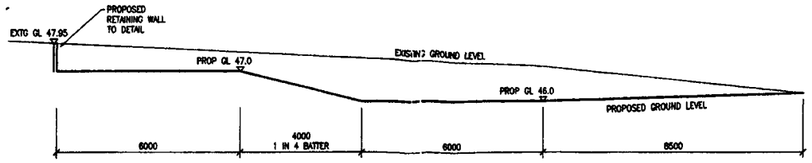
FRASER, THOMAS, GUNMAN, SHAW & PARTNERS
Consulting Engineers, Registered Surveyors, Architects & Town Planners
152 KOLMAR ROAD PAPATOETOE AUCKLAND

SCALES 1/16" - 1'-0"

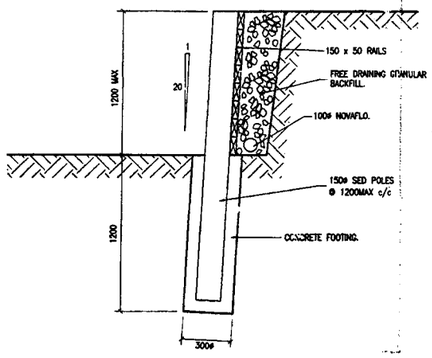
AMENDMENTS

DRAWING No 70359 A-1

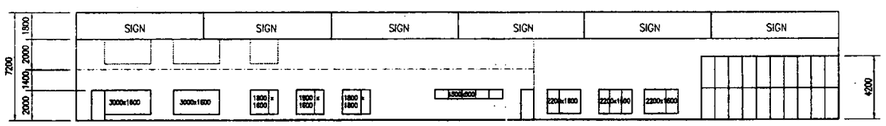
SHEET OF SHEETS



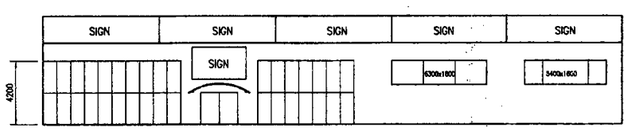
PROPOSED TRACTOR DISPLAY SECTION X–X
1:100



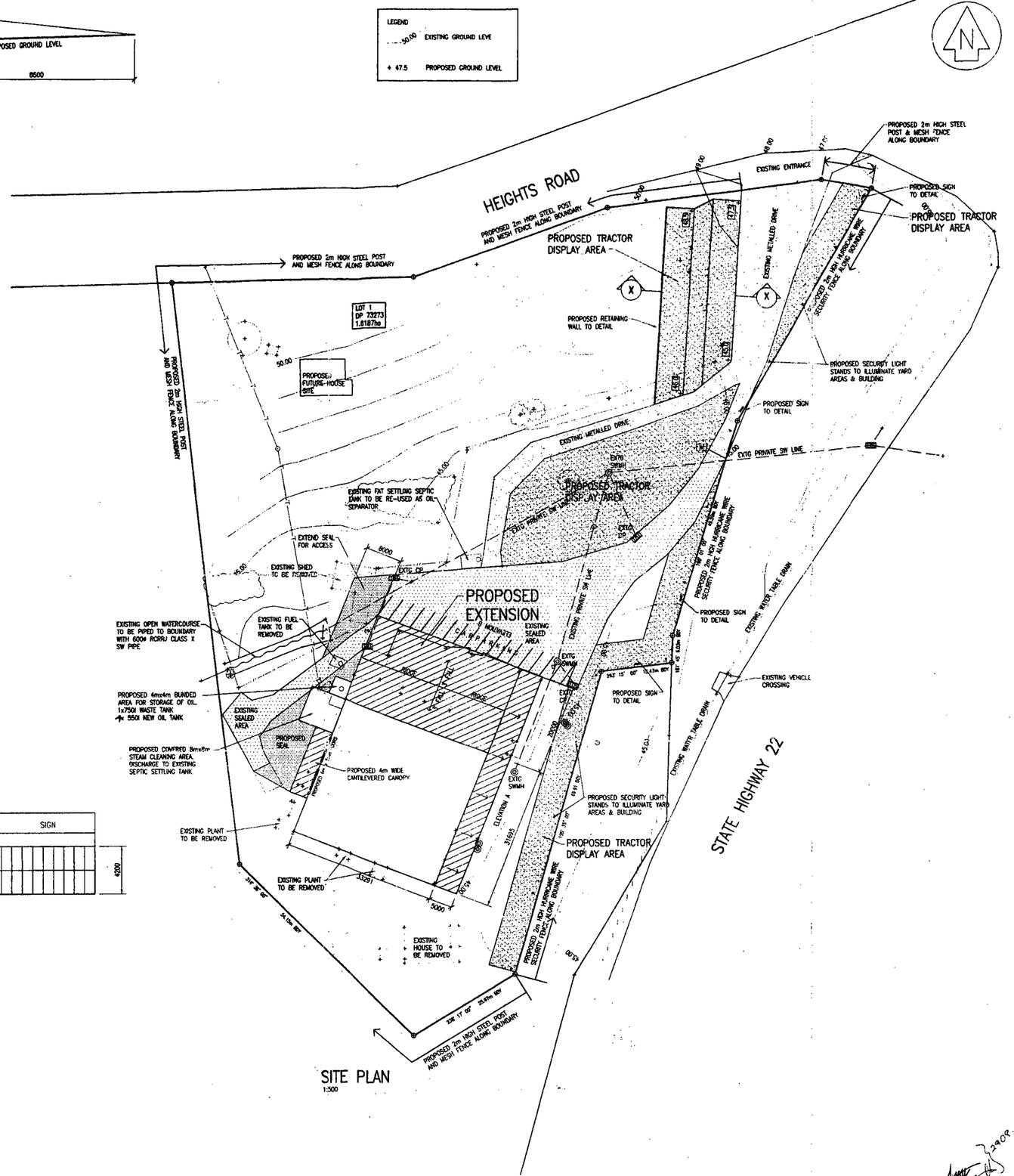
RETAINING WALL DETAIL
SCALE 1 : 25



ELEVATION A
SCALE 1:200



ELEVATION B
SCALE 1:200



SITE PLAN
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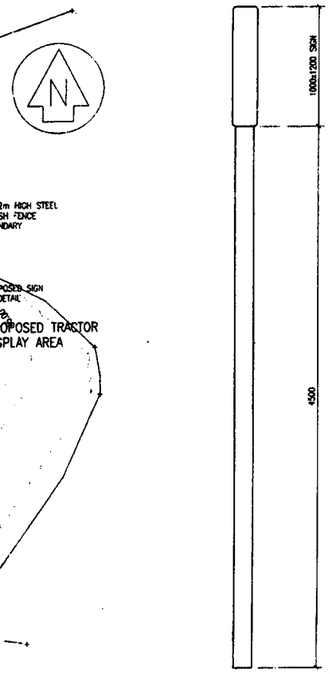


ILLUMINATED SIGN DETAIL
SCALE 1 : 25

No.	Revision Details	Date

Drawing Title.
SITE PLAN
SECTION X–X
ELEVATIONS A & B

Job Title.
PROPOSED SITE PLAN
& BUILDING ELEVATIONS
FOR
THE TRACTOR CENTRE
AT
HEIGHTS ROAD
PAERATA

AIREY CONSULTANTS LTD
Member of the D.N. BOAK CONSULTANT GROUP
CONSULTING CIVIL & STRUCTURAL ENGINEERS
Pukekohe, Takapuna, Howick, Waluku, Orewa

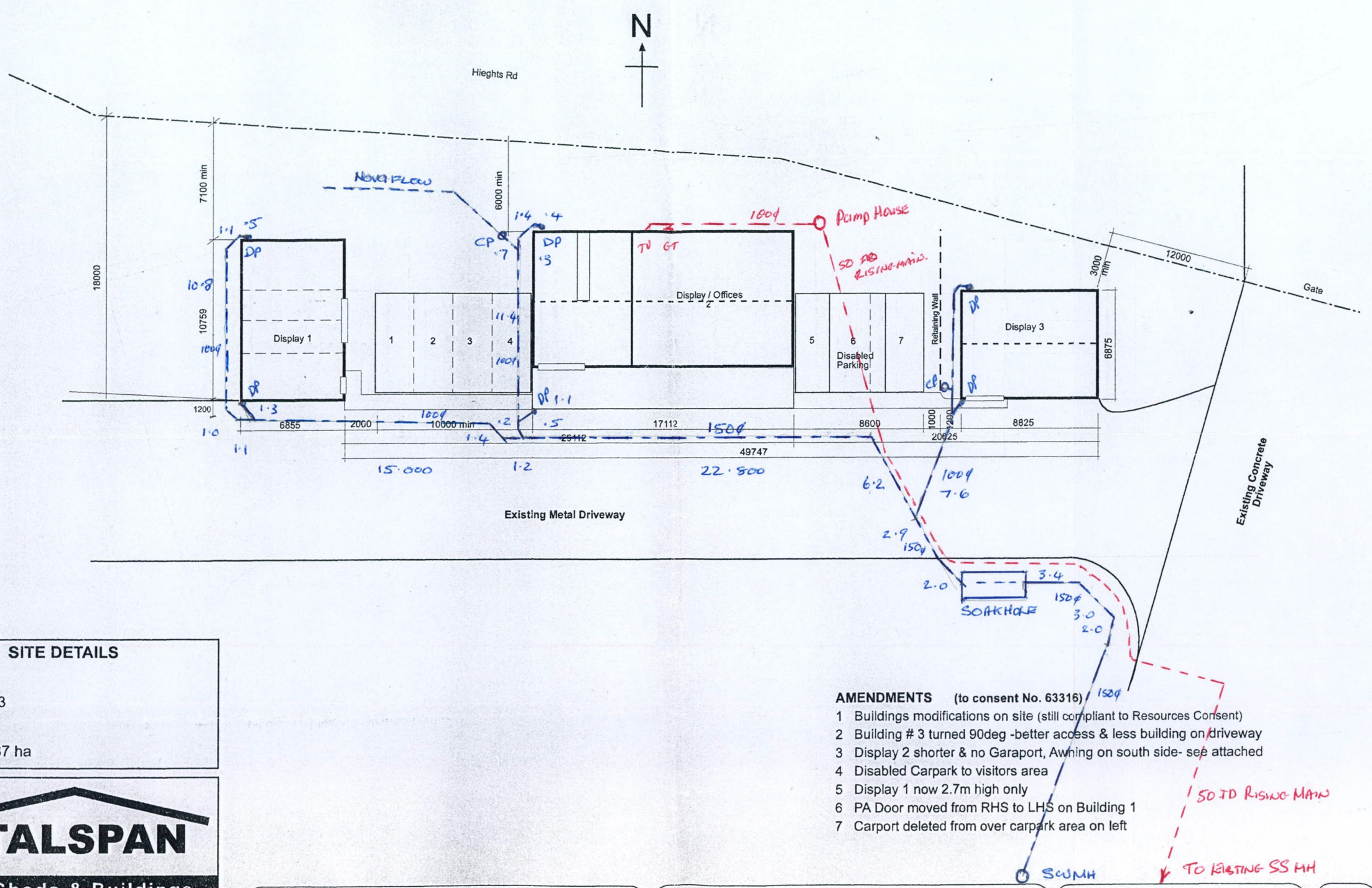
Design M WILLIAMS (PUKEKOHE)
Survey
Drawn DJ
Checked MW
Date 21/3/2001
Scale (A1) AS SHOWN
CAD Filename

DRAFT

Original Size:

File No.	Rev.	Sheet No.
AP 9682	–	1 – 1

Contractor to verify all dimensions prior to starting - All dimensions in mm unless stated otherwise.



SITE DETAILS

Lot: 1
DP: 73273
CT:
1.6187 ha

AMENDMENTS (to consent No. 63316)

1 Buildings modifications on site (still compliant to Resources Consent)
2 Building # 3 turned 90deg -better access & less building on driveway
3 Display 2 shorter & no Garaport, Awning on south side- see attached
4 Disabled Carpark to visitors area
5 Display 1 now 2.7m high only
6 PA Door moved from RHS to LHS on Building 1
7 Carport deleted from over carpark area on left

TOTALSPAN
Steel Sheds & Buildings

Head Office
210 Great South Road
Takaninni

Contact Details
Ph 09 296 5347
Fax 09 299 1693

Project Title	Drawing Title	Scale: 1:2500	Date : Aug 05	Sheet
NEW DISPLAYS - PUKEKOHE	NEW DISPLAYS - PUKEKOHE	Drawn:	Fle :	of

Head Calculations

Heights Road Tractor Centre

Wastewater Pump Station

Sheet #: **1 of 1**
Project #: **P18-088**
By: **ER**
Date: **3/11/2021**

3. Head Calculations

Static Head Calculations

Items	Static Head			Friction Head	Total Head
Description	Downstream Invert	Upstream Invert	Static Head		
Static Head - Rising Main - Tractor Centre to Discharge M/H	40.00	54.00	14.00	5.7	19.7

Friction Head Calculations

Items	Inputs				Head Calulation			
Description	Internal Dia (mm)	K Factor	Length (m) (or Equiv)	Number	Design Pump Flow (l/s)	Velocity	Friction Head	
Pipework								
Pipework - Wet Well	100.0	0.20	5.00	1	2.5	0.32	0.01	See Note 3
Pipework - Pump Station	100.0	0.15	3.00	1	2.5	0.32	0.01	See Note 3
Rising Main - Asbestos cement	100.0	0.10	1140.00	1	2.5	0.32	5.42	
Fittings								
Pump Foot - 90 Degree Bend (80mm)	100.0	0.75	1.60	1	2.5	0.32	0.01	See Note 3
Pump Foot - Reducer 80 to 100	90.0	0.45	0.50	1	2.5	0.00	0.00	See Note 3
Wet Well - Dismantiling Joint	100.0	0.45	0.50	1	2.5	0.32	0.01	
Valve Chamber - 90 Bend	100.0	0.75	3.15	1	2.5	0.32	0.01	
Valve Chamber - Tee (to Air Valve)	100.0	0.75	3.15	1	2.5	0.00	0.00	
Valve Chamber - Rubber Check Valve	100.0	2.00	16.50	1	2.5	0.32	0.01	See Note 3
Valve Chamber - Gate Valve	100.0	0.17	1.28	1	2.5	0.32	0.04	See Note 3
Pump Station Pipework - AFJ	100.0	0.05	0.52	1	2.5	0.32	0.02	See Note 3
Pump Station Pipework - Gate Valve	100.0	0.17	1.28	1	2.5	0.32	0.04	See Note 3
Pump Station Pipework - 45 Degrees Bend	100.0	0.09	0.94	2	2.5	0.32	0.04	See Note 3
Air Valve - Reducer 162.5 to 150	100.0	0.45	0.52	2	2.5	0.32	0.01	
Air Valve - Tee	100.0	1.00	1.18	2	2.5	0.32	0.03	See Note 3
Scour Valve - Reducer 162.5 to 150	100.0	0.45	6.30	2	2.5	0.32	0.00	See Note 3
Scour Valve - Tee	100.0	0.45	1.18	2	2.5	0.32	0.03	
Discharge Manhole - 45 Bend	100.0	0.60	2.46	2	2.5	0.32	0.03	
TOTAL							**5.72**	

Notes
1. Hazen Williams calculation used for head loss
2. Hazen Williams C factor = 140
3. Calculation based on Pipe Flow Wizard v2

Pump Curves

FLYGT

PERFORMANCE CURVE

PROD	TYPE
CP 3126.280	HT

CURVE NO: 63-461-0-3865

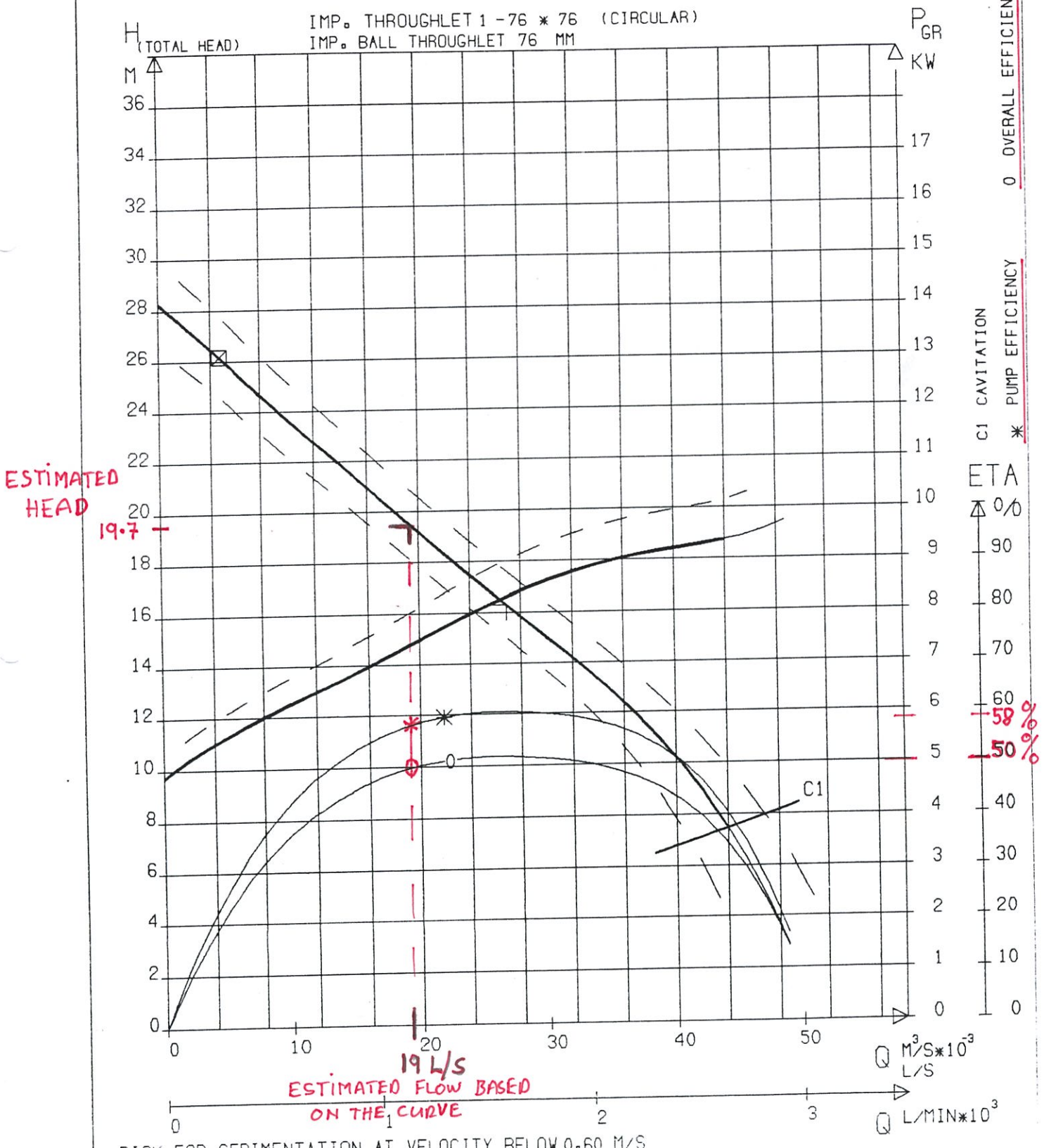
DATE	QN M3/S	HN M	ETA MAX	ETA GR MAX
1987-07-15	0.0269	16.3	60 0/0	52 0/0

ID NO	VOLT	MAX AMP	P GR MAX WATT
86120200004	460	13.89	9366

ISSUE	TESTS	IMPELLER PART NO	PUMPHOUSING PART NO
1	4	436 83 03	457 84 00

COMMENTS: IMP. DIAM. 232 MM

ACCEPTANCE-TEST IN ACC. WITH ISO 2548 (FLYGT(404) A 3204.1)



RISK FOR SEDIMENTATION AT VELOCITY BELOW 0.60 M/S
CHANGE TO SMALLER PIPE DIAM AT POINT ☒ (STANDARD DIAM 100 MM)

Appendix C – New Pump Station Details

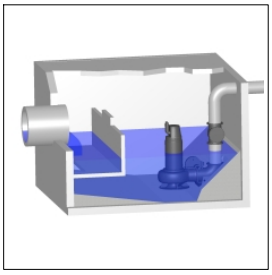
WWPS Design Calculations

Customer	**Woods**
Project	**Heights Road Tractor 2l**
Area	**Auckland**
Date	**12.11.2021**
Created by	**JH**
P & V No.	
Project No.	**P-1970**
DWF total per day [l/day]	69120
ADWF [l/sec]	0.80
Peaking factor (PDWF)	3
Peaking factor (PWWF)	6.7
PDWF [l/sec]	2.4
PWWF [l/sec]	5.36
Design flow SF	2.00
Design flow [l/sec)	10.72
Discharge invert level [m]	22.00
Wet Well Lid level [m]	10
Storage Tank Lid Level [m]	10
Overflow Invert level [m]	8.80
Inlet invert level [m]	7
High level alarm to inlet invert [m]	2.3
"Duty on" to high level alarm [m]	0.1
High level alarm [m]	4.70
Working level ("Duty on") [m]	4.60
"Duty off"	4.00
Inlet invert to "Duty off" [m]	3.00
Pump station invert [m]	3.50
Valve chamber depth	1.20
Storage requirements	
Hours required	24
Daily Flow	69120
Hourly Flow	2880
Storage capacity [l] for 8 hours Storage	69120
Storage capacity [m3]	69.12
Pump station & storage tank sizing	
Pump station	
Diameter [m]	**2**
Straight Shell Capacity [m3/m]	3.14
Storage - High level to overflow [m]	4.10
Storage volume equals [m3]	12.88
Plus working levels [m]	1.1
Total depth of the station [m]	**6.50**
Storage tank 1	
Storage tank requirement [m3]	56.24
Tank dia [m]	**2.50**
Tank length	12.1
Tank inlet/outlet invert RL [m]	6
Multiple tanks?	1
Storage tank volume	56.32518379
sufficient cover above storage tanks	Yes
Total storage volume WW + ST	69.21

PUMP & VALVE SPECIALTIES LTD

Working level and starts per hour - Design Flow

Project	**Heights Road Tractor 2B**				
Date	12.11.2021				
Inflow (l/sec)	0.80	in cubes =	2.88	m3/hr	
Outflow (l/sec)	20.40	in cubes =	73.44	m3	
Dia of station		2	m		
Distance between floats		0.3	m		
Volume of AWL		0.9426	m3		
Effective outflow in cube		70.56			
Time taken to **fill** the AWL		0.33	x 60	19.64	mins
Time taken to **empty** the AWL		0.01	x 60	0.80	mins
Cycle time	20.44	min			
Cycles / hour	**2.935559966**				
Starts / hr per pump	**1.5**				
Detention time for DF [mins]	**20**				
Name	Height above lower	Height from floor			
High level	0.1	1.1			
Standby On	0.1	1			
Duty On	0.3	0.9			
Standby off	0.1	0.6			
Duty off	0.1	0.5			
Low level	0.1	0.4			
Min water level	0.3	0.3			
Sump floor	0	0			
Therefore the total depth of working volume is		1.1	m		



Friction loss calculation

Pumped fluid Water, pure	**Static head** 18	**Layout** Wet well installation
Flow 20.4 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss

Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710 SDR 11 (PN 16) / DN 150 (180x16,4 mm) / DIN 8074/75 /EN 13244

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Pipe length	147.2	2500 m	1	1.199	0.04	23.62
Discharge Connection	147.2	0.3	1	1.199		0.02197
Elbows	147.2	0.3	1	1.199		0.02197
Inlet	147.2	1	1	1.199		0.07324
Non-return valves	147.2	0.9	1	1.199		0.06592
Outlet	147.2	1	1	1.199		0.07324
T-piece	147.2	0.4	1	1.199		0.0293
Valve	147.2	0.6	2	1.199		0.04394
Total friction head						**23.95**

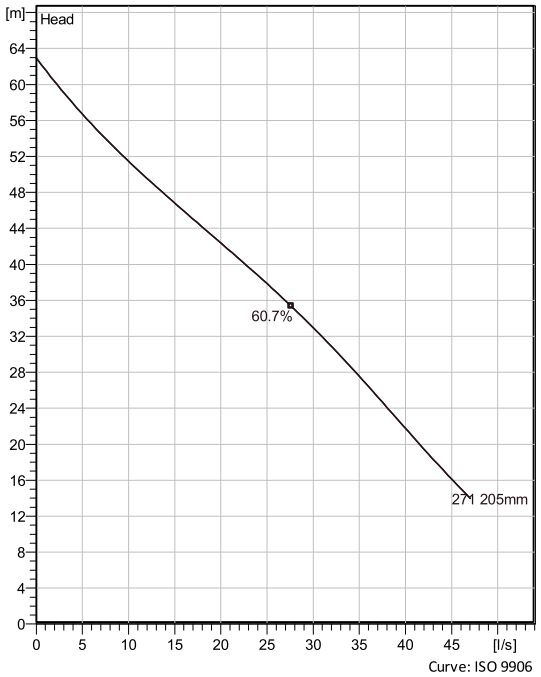
Friction loss head	23.95 m
Total static head	18 m
Total head	**41.95 m**

NP 3153 SH 3~ 271

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3153.182 21-18-2BB-W 15KW

Installation type
P - Semi permanent, Wet

Impeller diameter
205 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
205 mm

Discharge diameter
80 mm

Inlet diameter
150 mm

Maximum operating speed
2920 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 271

Technical specification

Motor - General

Motor number N3153.182 21-18-2BB-W 15KW	**Phases** 3~	**Rated speed** 2920 rpm	**Rated power** 15 kW
Approval No	**Number of poles** 2	**Rated current** 27 A	**Stator variant** 1
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 182			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 90.3 %	**Total moment of inertia** 0.0374 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 91.0 %	**Starting current, direct starting** 222 A	
Power factor - 1/2 Load 0.69	**Motor efficiency - 1/2 Load** 90.5 %	**Starting current, star-delta** 74 A	

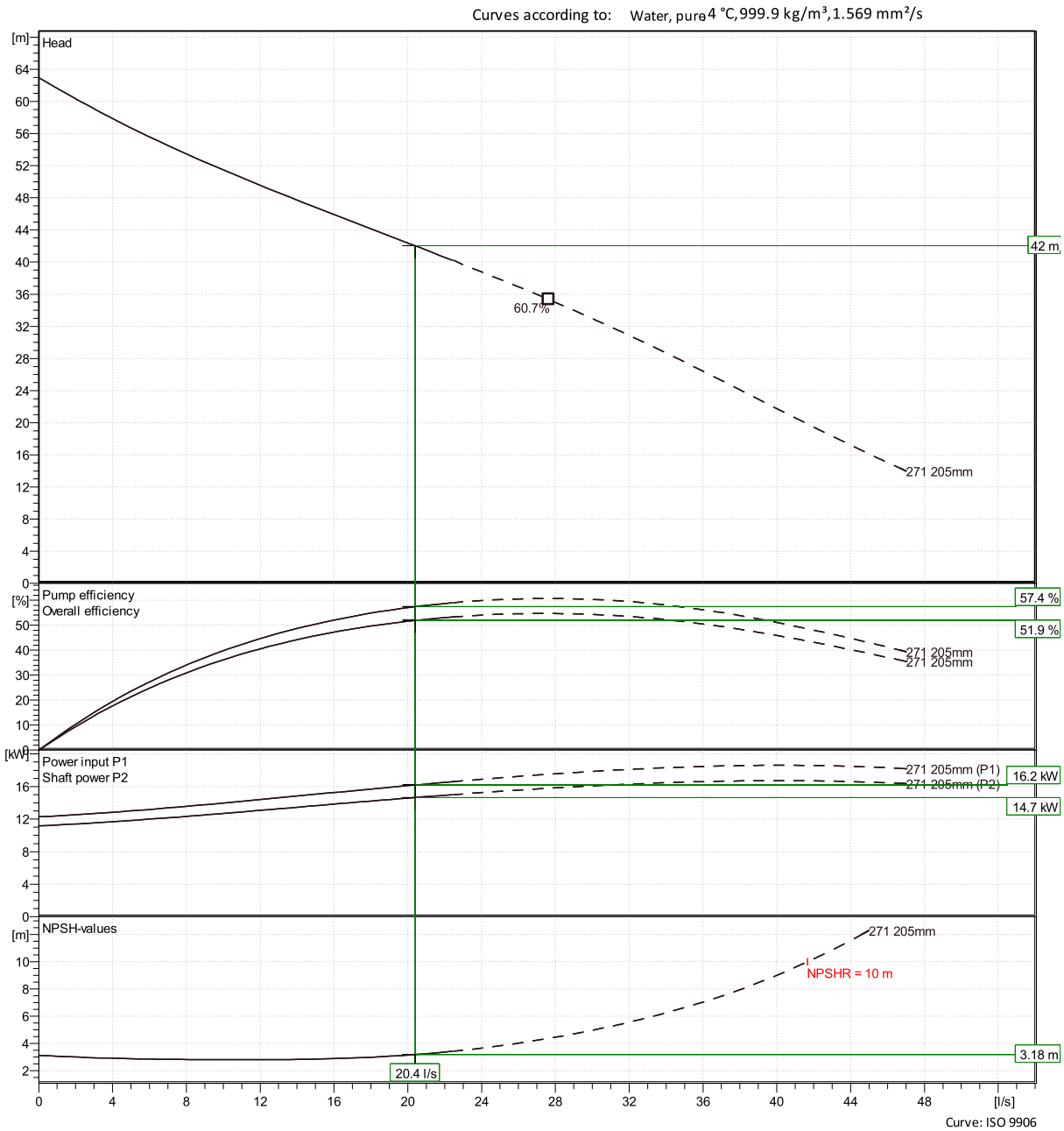
Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 271

Performance curve

Duty point

Flow	Head
20.4 l/s	42 m

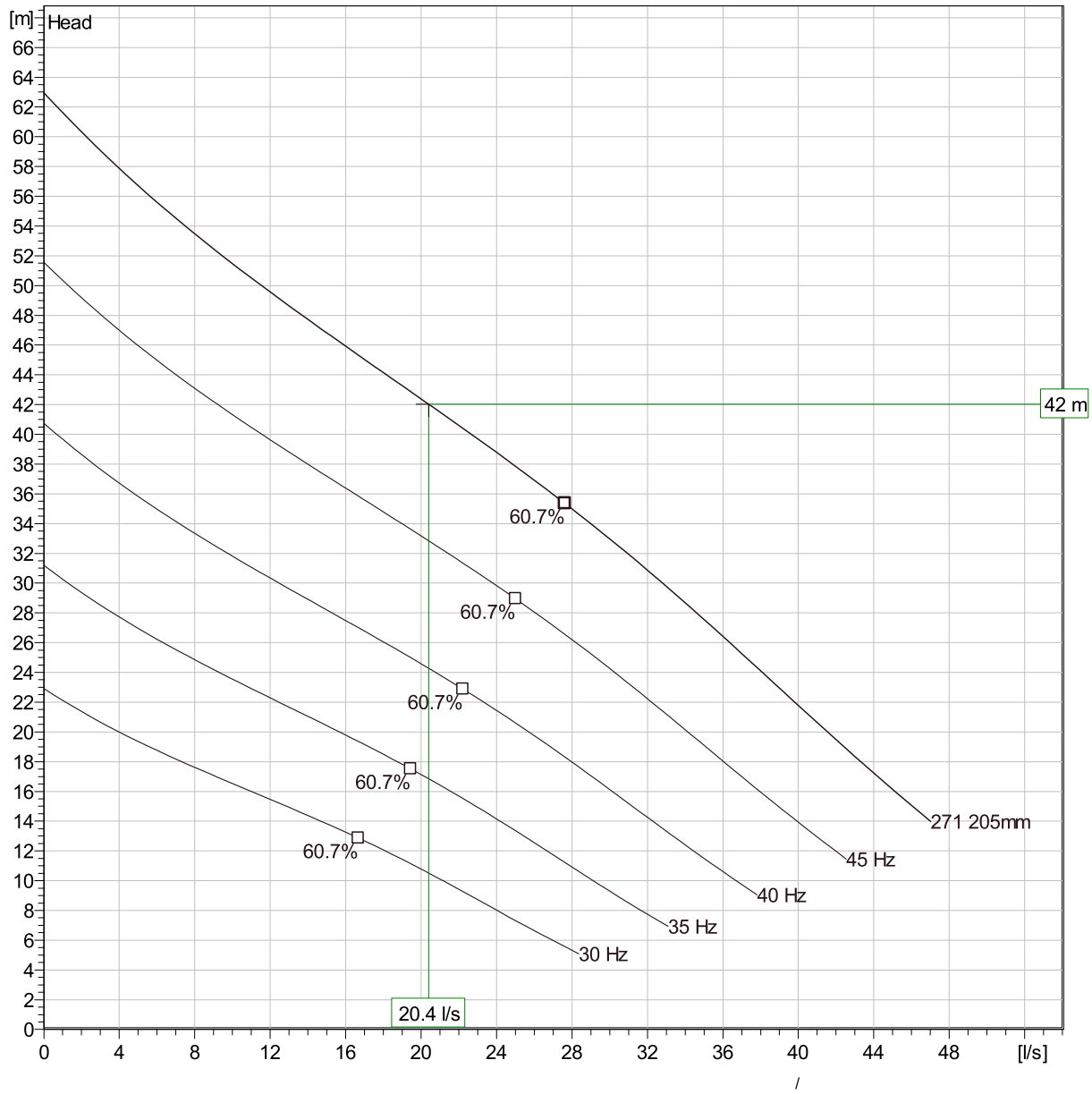


Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 271

Duty Analysis

Curves according to: Water, pure [100%] ; 4°C; 999.9kg/m³; 1.569mm²/s



Operating characteristics

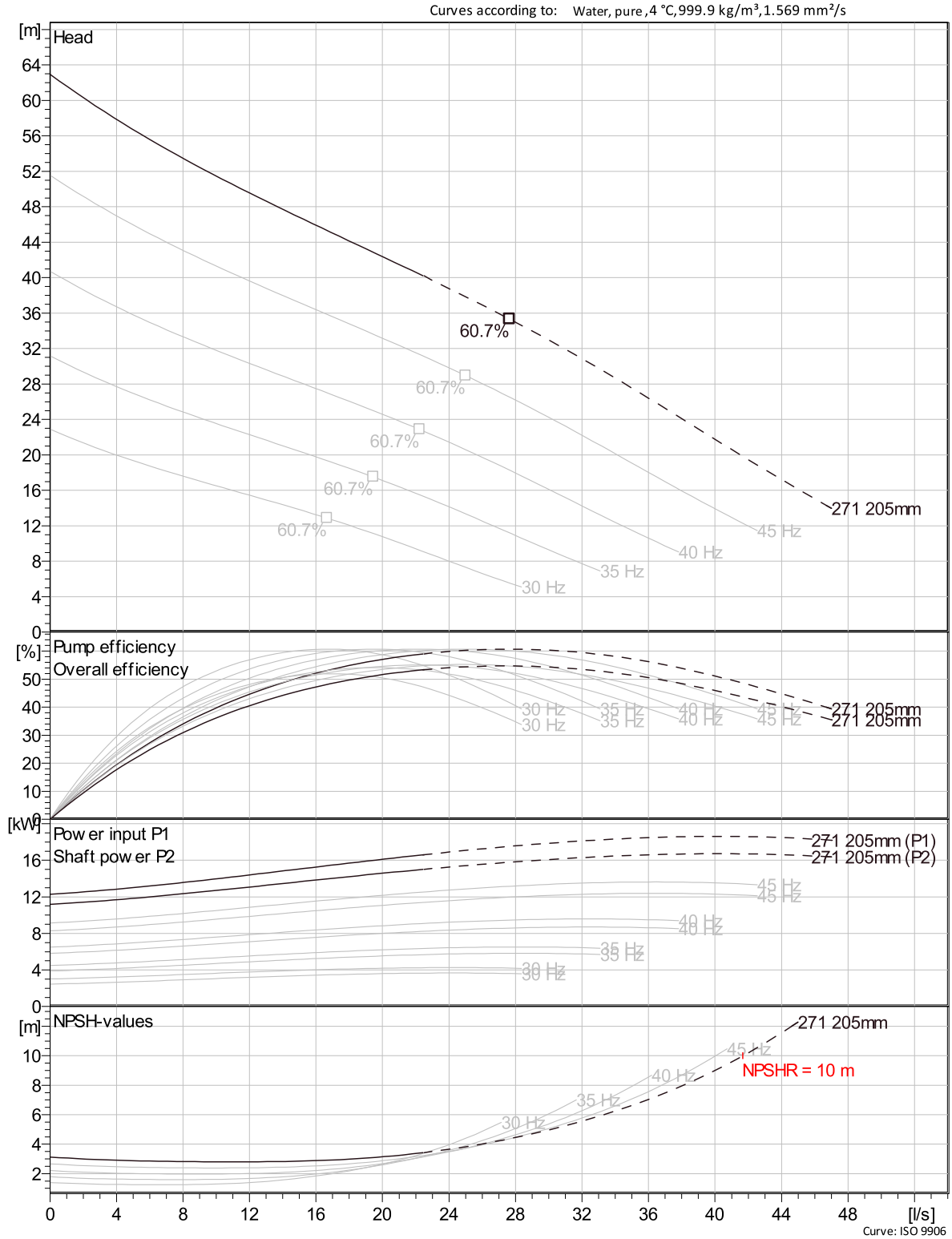
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	20.4	42	14.7	20.4	42	14.7	57.4 %	0.221	3.18

Project		**Created by**	Kobus Steyn		
Block		**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 271

VFD Curve

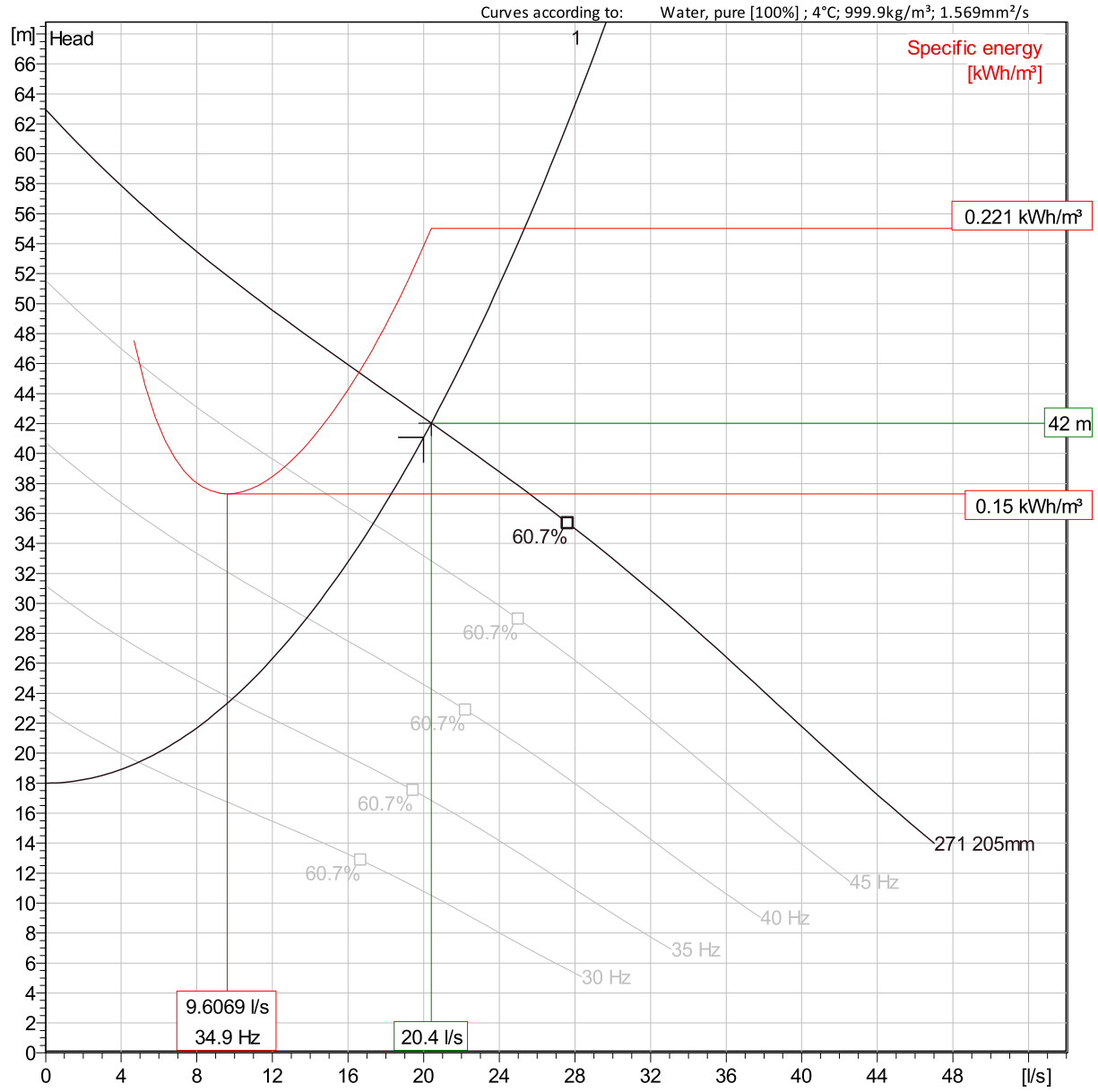
Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s



Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 271

VFD Analysis



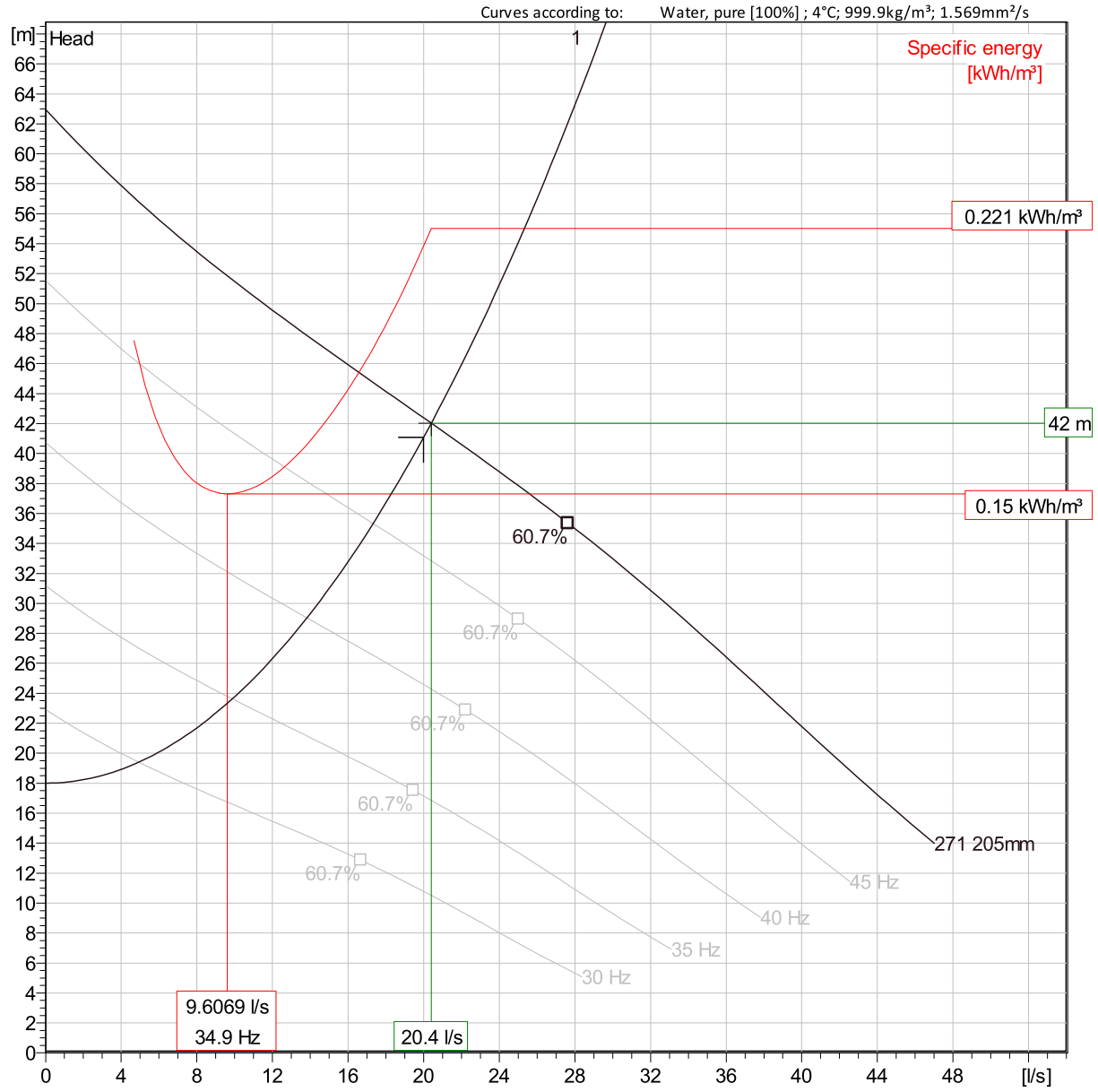
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	20.4	42	14.7	20.4	42	14.7	57.4 %	0.221	3.18
1	45 Hz	17.1	34.9	10.4	17.1	34.9	10.4	56 %	0.186	2.58
1	40 Hz	13.6	28.7	7.15	13.6	28.7	7.15	53.6 %	0.162	2.04
1	35 Hz	9.66	23.4	4.58	9.66	23.4	4.58	48.4 %	0.15	1.59

Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 271

VFD Analysis



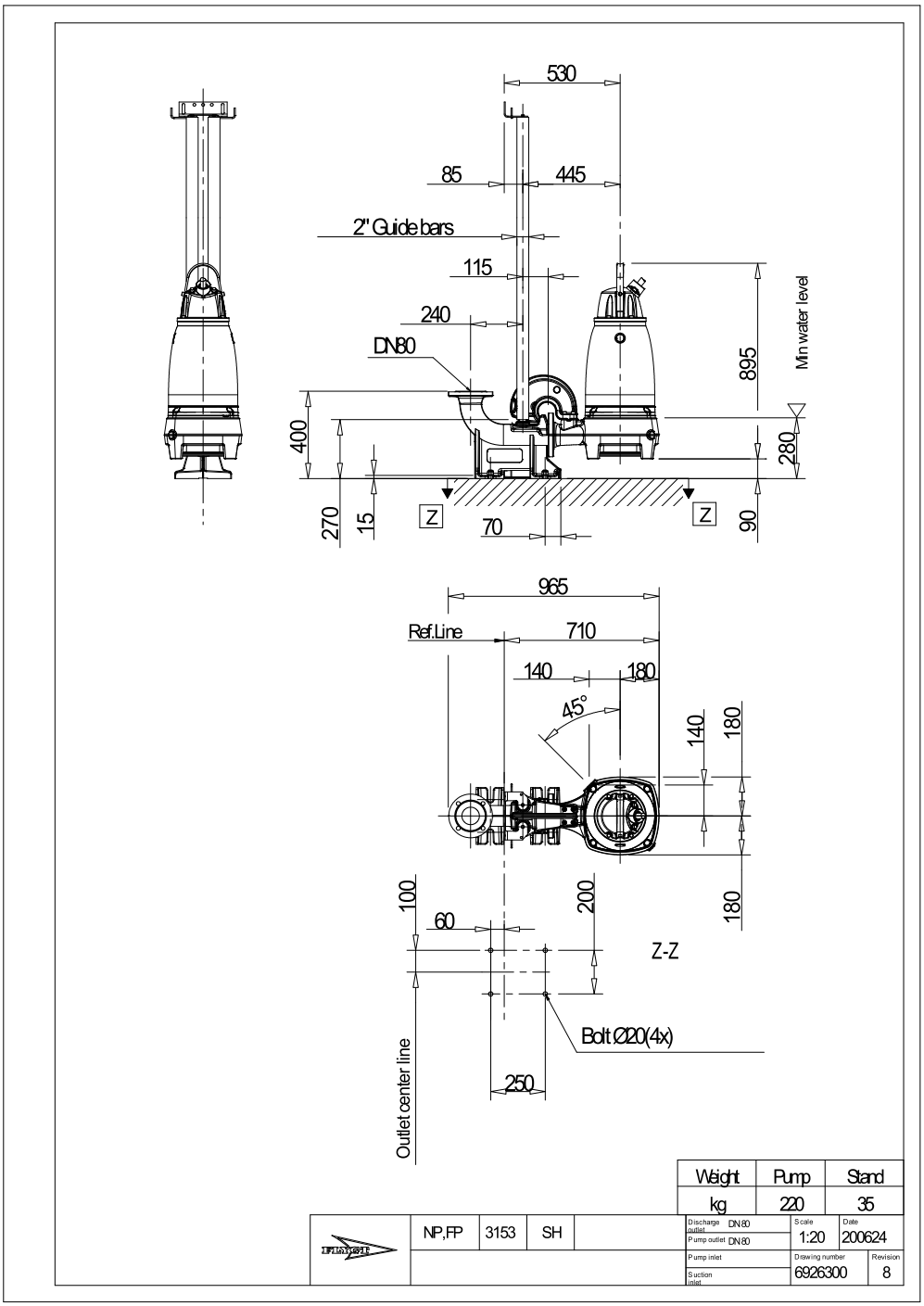
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	4.67	19.3	2.64	4.67	19.3	2.64	33.4 %	0.19	1.24

Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 271

Dimensional drawing



Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

PUMP & VALVE SPECIALTIES LTD

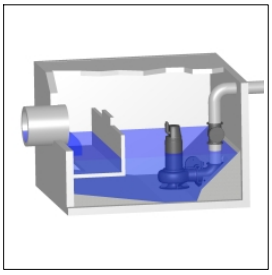
WWPS Design Calculations

Customer	**Woods**
Project	**Height Road Tractor 2A**
Area	**Auckland**
Date	**12.11.2021**
Created by	**JH**
P & V No.	
Project No.	**P-1970**
ADWF [l/sec]	0.80
Peaking factor (PDWF)	3
Peaking factor (PWWF)	6.7
PDWF [l/sec]	2.4
PWWF [l/sec]	5.36
Design flow SF	1.10
Design flow [l/sec)	5.90
Discharge invert level [m]	19.00
Wet Well Lid level [m]	10
Storage Tank Lid Level [m]	10
Overflow Invert level [m]	8.80
Inlet invert level [m]	7
High level alarm to inlet invert [m]	2.3
"Duty on" to high level alarm [m]	0.1
High level alarm [m]	4.70
Working level ("Duty on") [m]	4.60
"Duty off"	4.00
Inlet invert to "Duty off" [m]	3.00
Pump station invert [m]	3.50
Valve chamber depth	1.20
Storage requirements	
Hours required	24
Daily Flow	69120
Hourly Flow	2880
Storage capacity [l] for 8 hours Storage	69120
Storage capacity [m3]	69.12
Pump station & storage tank sizing	
Pump station	
Diameter [m]	**2**
Straight Shell Capacity [m3/m]	3.14
Storage - High level to overflow [m]	4.10
Storage volume equals [m3]	12.88
Plus working levels [m]	1.1
Total depth of the station [m]	**6.50**
Storage tank 1	
Storage tank requirement [m3]	56.24
Tank dia [m]	**2.50**
Tank length	12.1
Tank inlet/outlet invert RL [m]	6
Multiple tanks?	1
Storage tank volume	56.32518379
Total storage volume WW + ST	69.21

PUMP & VALVE SPECIALTIES LTD

Working level and starts per hour - Design Flow

Project	**Height Road Tractor 2A**				
Date	12.11.2021				
Inflow (l/sec)	0.80	in cubes =	2.88	m3/hr	
Outflow (l/sec)	14.23	in cubes =	51.228	m3	
Dia of station		2	m		
Distance between floats		0.3	m		
Volume of AWL		0.9426	m3		
Effective outflow in cube		48.348			
Time taken to **fill** the AWL		0.33	x 60	19.64	mins
Time taken to **empty** the AWL		0.02	x 60	1.17	mins
Cycle time	20.81	min			
Cycles / hour	**2.883607623**				
Starts / hr per pump	**1.4**				
Detention time for DF [mins]	**21**				
Name	Height above lower	Height from floor			
High level	0.1	1.1			
Standby On	0.1	1			
Duty On	0.3	0.9			
Standby off	0.1	0.6			
Duty off	0.1	0.5			
Low level	0.1	0.4			
Min water level	0.3	0.3			
Sump floor	0	0			
Therefore the total depth of working volume is		1.1	m		



Friction loss calculation

Pumped fluid Water, pure	**Static head** 15	**Layout** Wet well installation
Flow 14.23 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss

Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710 SDR 11 (PN 16) / DN 150 (160x14,6 mm) / DIN 8074/75 /EN 13244

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Pipe length	130.8	1150 m	1	1.059	0.04	9.989
Discharge Connection	130.8	0.3	1	1.059		0.01715
Elbows	130.8	0.3	1	1.059		0.01715
Inlet	130.8	1	1	1.059		0.05716
Non-return valves	130.8	0.9	1	1.059		0.05144
Outlet	130.8	1	1	1.059		0.05716
T-piece	130.8	0.4	1	1.059		0.02286
Valve	130.8	0.6	2	1.059		0.0343
Total friction head						**10.25**

Friction loss head	10.25 m
Total static head	15 m
Total head	**25.25 m**

Product description

Pos.no	Description	Item no.	Quant.
	XFP 80E CB1 50HZ		
	Centrifugal pump: XFP80E CB1		1

XFP PE1-3
Type: XFP80E CB1

Submersible sewage pump type ABS XFP is designed for municipal and industrial wastewater equipped with Premium Efficiency (IE3 level) motor for:

Main applications

- Water and wastewater
- Sewage containing solids and fibrous material
- Sewage with sludge and high content of rags
- Industrial raw water
- Municipal combined sewage and storm water systems.

Main design features

- Premium efficiency IE3 motors in acc. with IEC60034-30
- Approval for ATEX (Ex II 2G k Ex db IIB T4 GB), FM and CSA as standard
- Water pressure-tight encapsulated fully flood-proof motor
- Motor insulation according to Class H (140°C temperature sensors)
- Temperature rise according to NEMA Class A
- Continuously rated motor suitable for wet and dry installation as standard for PE1 and PE2 in 50Hz. Optional for 60Hz
- PE3 has the option of internal closed loop cooling system for dry installation
- EMC version as option for PE1-3
- Condition monitoring of temperature and water ingress.
- Solid passage min. 75 mm and greater for CB Plus
- Hydraulics with open CB Plus type single and multi-vane (PE3) or vortex impellers suitable for handling of water, polluted water, sewage containing solids, faecal slurry and sludge

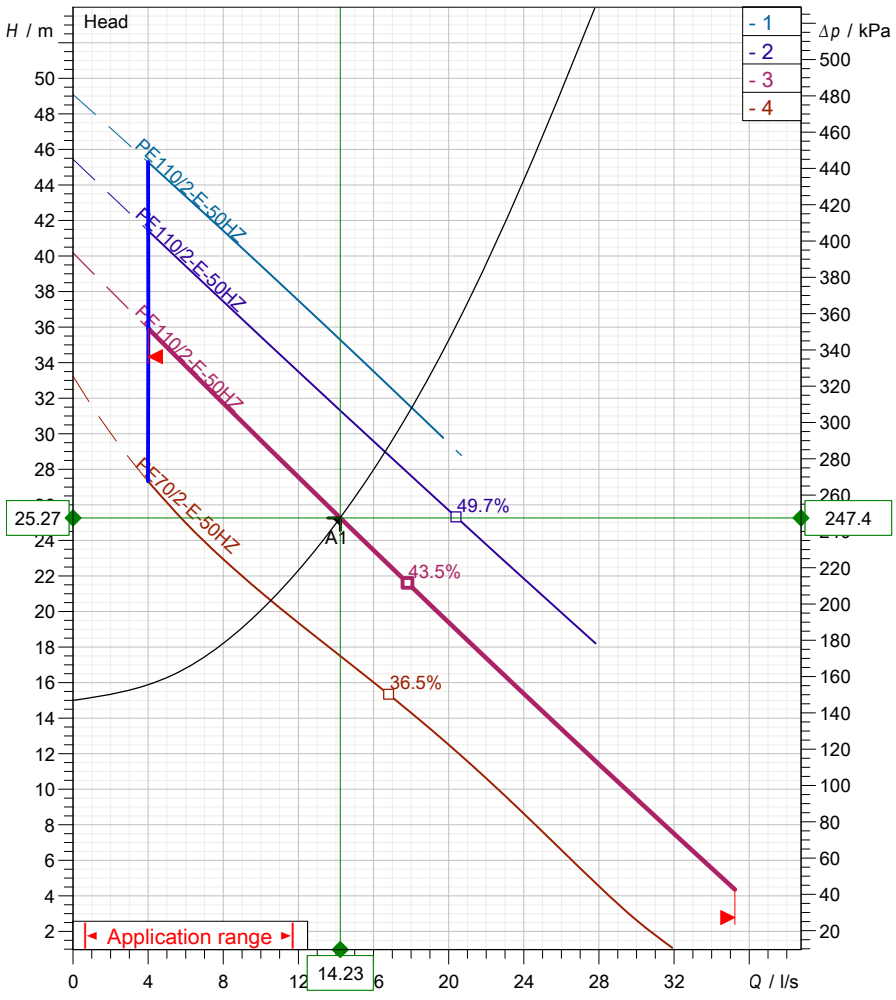
50Hz
Capacity up to 750 m3/h
Head, max. 74 m

60Hz
Capacity up to 3500 US g.p.m.
Head, max. 330ft

Type: XFP80E CB1
Technical data

Delivery rate	: 14.23 l/s
Delivery head	: 25.27 m
Hydr. Efficiency	: 42.01 %
Total efficiency	: 38.45 %
Shaft power	: 8.49 kW
Speed	: 2947 1/min
Impeller type	: Contrabloc impeller, 1 vane
Motor output	: 11 kW
Voltage	: 400 V
Frequency	: 50 Hz
Suction outlet	: DN100
Discharge outlet	: DN80/100

XFP 80E CB1 50HZ



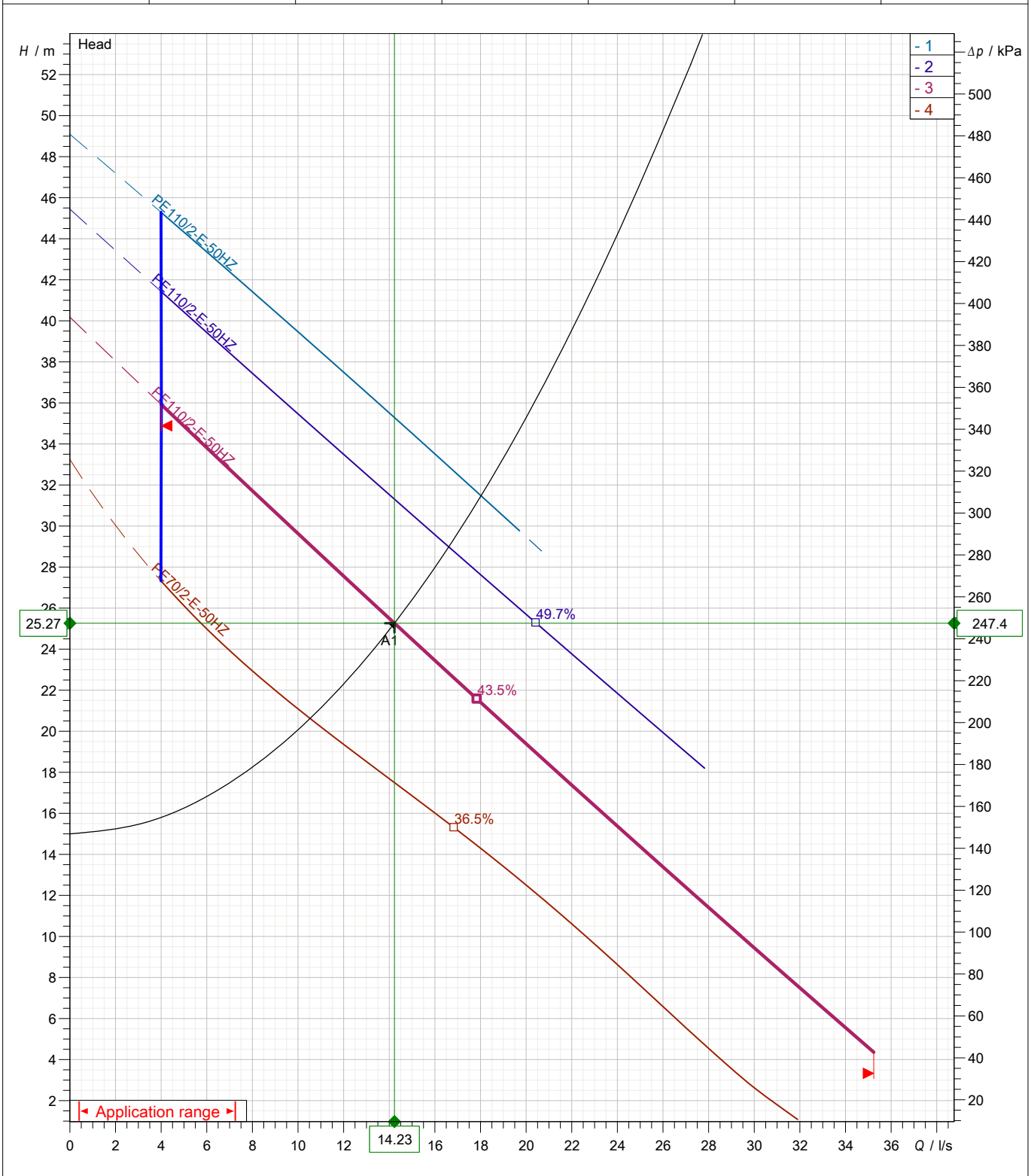
Testnorm
ISO9906:2012,HI 11.6/14.6≤10kW

2021-11-12

Operating data specification			
Flow	14.23 l/s	Power input	9.28 kW
Efficiency	42 %	Head	25.3 m
NPSH	3.04 m	Rated power	8.49 kW
Temperature	20 °C	Fluid	Water
No. of pumps	1	Nature of system	Single head pump
Pump data			
Type	XFP 80E CB1 50HZ	Make	SULZER
Series	XFP PE1-PE3	Impeller	Contrabloc impeller, 1 vane
N° of vanes	1	Impeller size	170 mm
Free passage	45 mm	Suction flange	DN100
Discharge flange	DN80/100	Type of installation	
Moment of inertia	0.013 kg m²		Wet Well installation with pedestal
Motor data			
Rated voltage	400 V	Frequency	50 Hz
Rated power P2	11 kW	Nominal Speed	2930 1/min
Number of poles	2	Efficiency	91.2 %
Power factor	0.87	Rated current	20.1 A
Starting current	156 A	Rated torque	35.9 Nm
Starting torque	84.7 Nm	Degree of protection	IP 68
Insulation class	H	No. starts per hour	15

Curve number	Pump performance curves	SULZER
Reference curve XFP80E CB1 50HZ	**XFP 80E CB1 50HZ**	

					Discharge	Frequency
					DN80/100	50 Hz
Density	Viscosity	Testnorm			Rated speed	Date
998.3 kg/m³	1.005 mm²/s	ISO9906:2012,HI 11.6/14.6≤10kW			2947 1/min	2021-11-12
Flow	Head	Shaft power	Power input	Rated power P2	Hydraulic efficiency	NPSH
14.23 l/s	25.3 m	8.49 kW	9.28 kW	11 kW	42 %	3.04 m



Impeller size	N° of vanes	Impeller	Solid size	Revision
170 mm	1	Contrabloc impeller, 1 vane	45 mm	

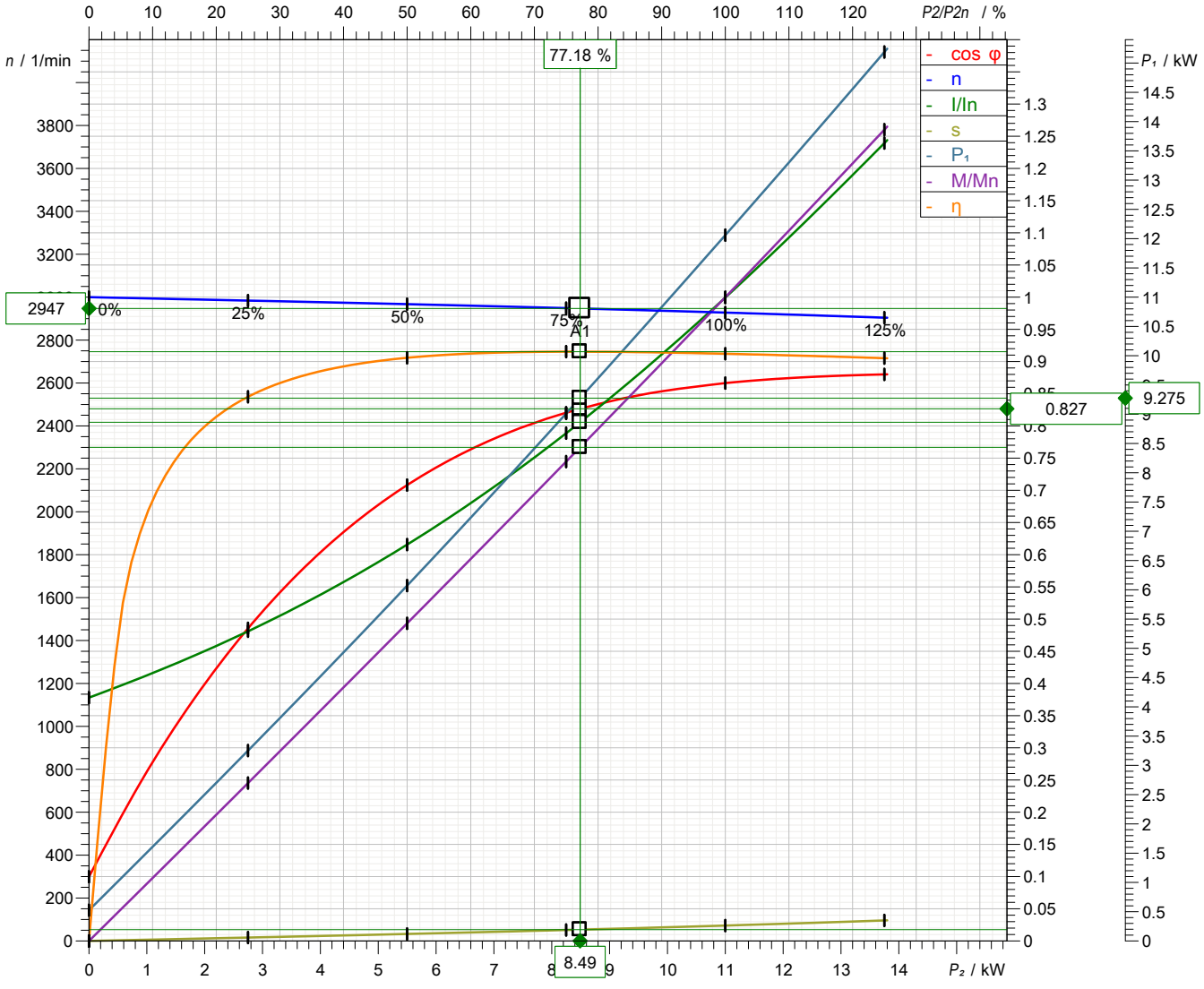
Frequency	PE2
50 Hz	

Motor performance curve

PE110/2-E-50HZ

SULZER

Rated power	Service factor	Nominal Speed	Number of poles	Rated voltage	Date
11 kW	1.3	2930 1/min	2	400 V	2021-11-12



Symbol	No loac	25 %	50 %	75 %	100 %	125 %
P_2 / kW	0	2.75	5.5	8.25	11	13.75
P_1 / kW	0.5254	3.253	6.072	9.013	12.06	15.19
η / %	0	84.53	90.59	91.54	91.21	90.53
n / 1/min	3000	2984	2967	2949	2928	2904
cos φ	0.09982	0.4856	0.7081	0.8206	0.8666	0.8801
I / A	7.598	9.669	12.38	15.85	20.09	24.91
s / %	0	0.5298	1.088	1.701	2.394	3.186
M / Nm	0	8.8	17.7	26.71	35.87	45.21

Tolerance according to VDE 0530 T1 12.84 for rated power

Starting current	Starting torque	Moment of inertia	No. starts per hour
156 A	84.7 Nm	0.0212 kg m²	15

Spaix® 4, Version 4.3.12 - 2020/05/28 (Build 328
Data version June 2020

PUMP & VALVE SPECIALTIES LTD

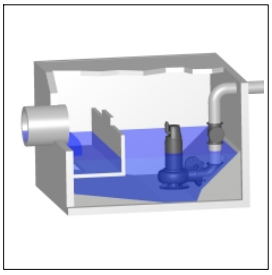
WWPS Design Calculations

Customer	**Woods**
Project	**Height Road Tractor 2A**
Area	**Auckland**
Date	**12.11.2021**
Created by	**JH**
P & V No.	
Project No.	**P-1970**
ADWF [l/sec]	0.80
Peaking factor (PDWF)	3
Peaking factor (PWWF)	6.7
PDWF [l/sec]	2.4
PWWF [l/sec]	5.36
Design flow SF	1.20
Design flow [l/sec)	6.43
Discharge invert level [m]	19.00
Wet Well Lid level [m]	10
Storage Tank Lid Level [m]	10
Overflow Invert level [m]	8.45
Inlet invert level [m]	6.9
High level alarm to inlet invert [m]	2.3
"Duty on" to high level alarm [m]	0.1
High level alarm [m]	4.60
Working level ("Duty on") [m]	4.50
"Duty off"	3.90
Inlet invert to "Duty off" [m]	3.00
Pump station invert [m]	3.40
Valve chamber depth	1.20
Storage requirements	
Hours required	8
Daily Flow	69120
Hourly Flow	2880
Storage capacity [l] for 8 hours Storage	23040
Storage capacity [m3]	23.04
Pump station & storage tank sizing	
Pump station	
Diameter [m]	**2**
Straight Shell Capacity [m3/m]	3.14
Storage - High level to overflow [m]	3.85
Storage volume equals [m3]	12.10
Plus working levels [m]	1.1
Total depth of the station [m]	**6.60**
Storage tank 1	
Storage tank requirement [m3]	10.94
Tank dia [m]	**1.85**
Tank length	4.5
Tank inlet/outlet invert RL [m]	7.1
Multiple tanks?	1
Storage tank volume	11.03509818
Total storage volume WW + ST	23.13

PUMP & VALVE SPECIALTIES LTD

Working level and starts per hour - Design Flow

Project	**Height Road Tractor 2A**				
Date	12.11.2021				
Inflow (l/sec)	0.80	in cubes =	2.88	m3/hr	
Outflow (l/sec)	20.70	in cubes =	74.52	m3	
Dia of station		2	m		
Distance between floats		0.3	m		
Volume of AWL		0.9426	m3		
Effective outflow in cube		71.64			
Time taken to **fill** the AWL		0.33	x 60	19.64	mins
Time taken to **empty** the AWL		0.01	x 60	0.79	mins
Cycle time	20.43	min			
Cycles / hour	**2.93729647**				
Starts / hr per pump	**1.5**				
Detention time for DF [mins]	**20**				
Name	Height above lower	Height from floor			
High level	0.1	1.1			
Standby On	0.1	1			
Duty On	0.3	0.9			
Standby off	0.1	0.6			
Duty off	0.1	0.5			
Low level	0.1	0.4			
Min water level	0.3	0.3			
Sump floor	0	0			
Therefore the total depth of working volume is		1.1	m		



Friction loss calculation

Pumped fluid
Water, pure

Static head
15

Layout
Wet well installation

Flow
20.7 l/s

Number of pumps
1

Calculation model
Colebrook-White

Viscosity
1.569 mm²/s

Nature of system
Single head pump

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710 SDR 11 (PN 16) / DN 150 (180x16,4 mm) / DIN 8074/75 /EN 13244						
Pipe length	147.2	1150 m	1	1.216	0.6	17.38
Discharge Connection	147.2	0.3	1	1.216		0.02262
Elbows	147.2	0.3	1	1.216		0.02262
Inlet	147.2	1	1	1.216		0.07541
Non-return valves	147.2	0.9	1	1.216		0.06787
Outlet	147.2	1	1	1.216		0.07541
T-piece	147.2	0.4	1	1.216		0.03016
Valve	147.2	0.6	2	1.216		0.04525
Total friction head						**17.72**
Friction loss head						17.72 m
Total static head						15 m
Total head						**32.72 m**

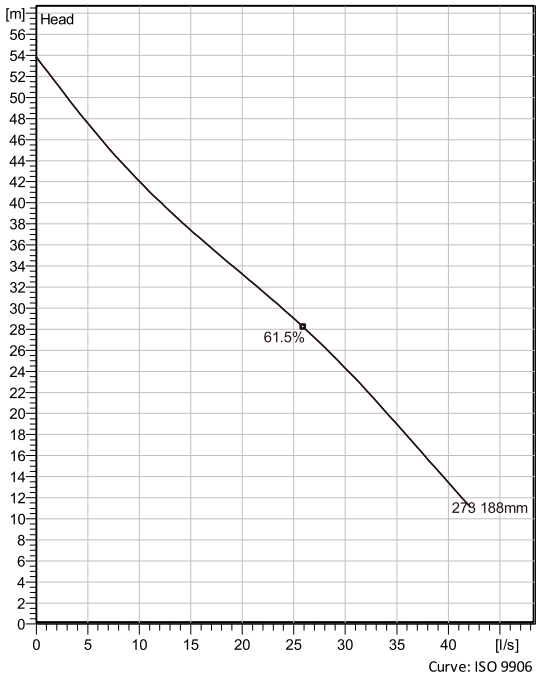
Project	**Created by**	Kobus Steyn	**Last update**	11/11/2021	
Block	**Created on**	11/11/2021			

NP 3153 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3153.185 21-18-2BB-W 15KW

Installation type
P - Semi permanent, Wet

Impeller diameter
188 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
188 mm

Discharge diameter
80 mm

Inlet diameter
150 mm

Maximum operating speed
2920 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron

Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 273

Technical specification

Motor - General

Motor number N3153.185 21-18-2BB-W 15KW	**Phases** 3~	**Rated speed** 2920 rpm	**Rated power** 15 kW
Approval No	**Number of poles** 2	**Rated current** 27 A	**Stator variant** 1
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 185			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 90.0 %	**Total moment of inertia** 0.0336 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 91.0 %	**Starting current, direct starting** 222 A	
Power factor - 1/2 Load 0.69	**Motor efficiency - 1/2 Load** 90.5 %	**Starting current, star-delta** 74 A	

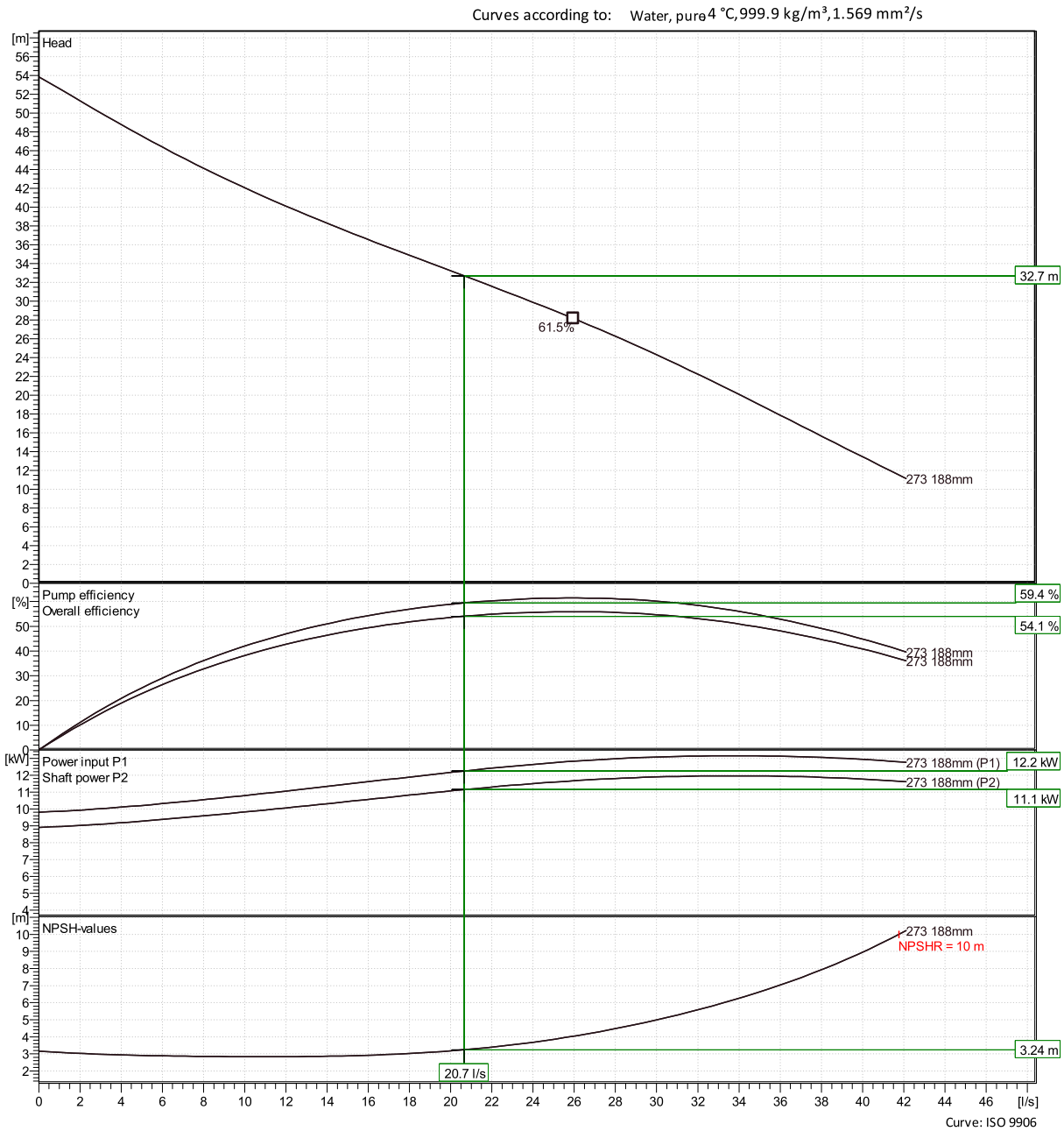
Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 273

Performance curve

Duty point

Flow	Head
20.7 l/s	32.7 m

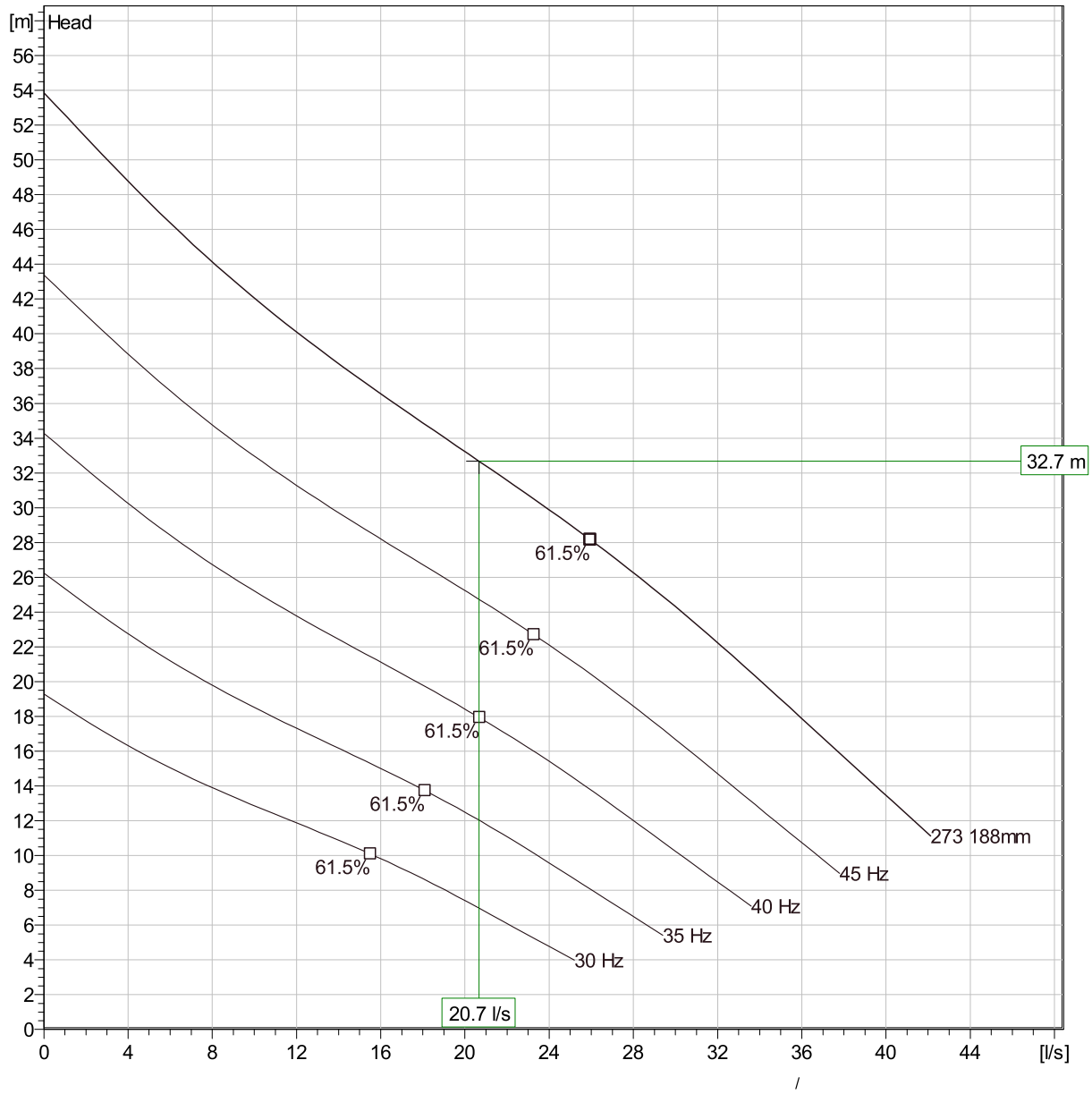


Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

Duty Analysis

Curves according to: Water, pure [100%] ; 4°C; 999.9kg/m³; 1.569mm²/s



Operating characteristics

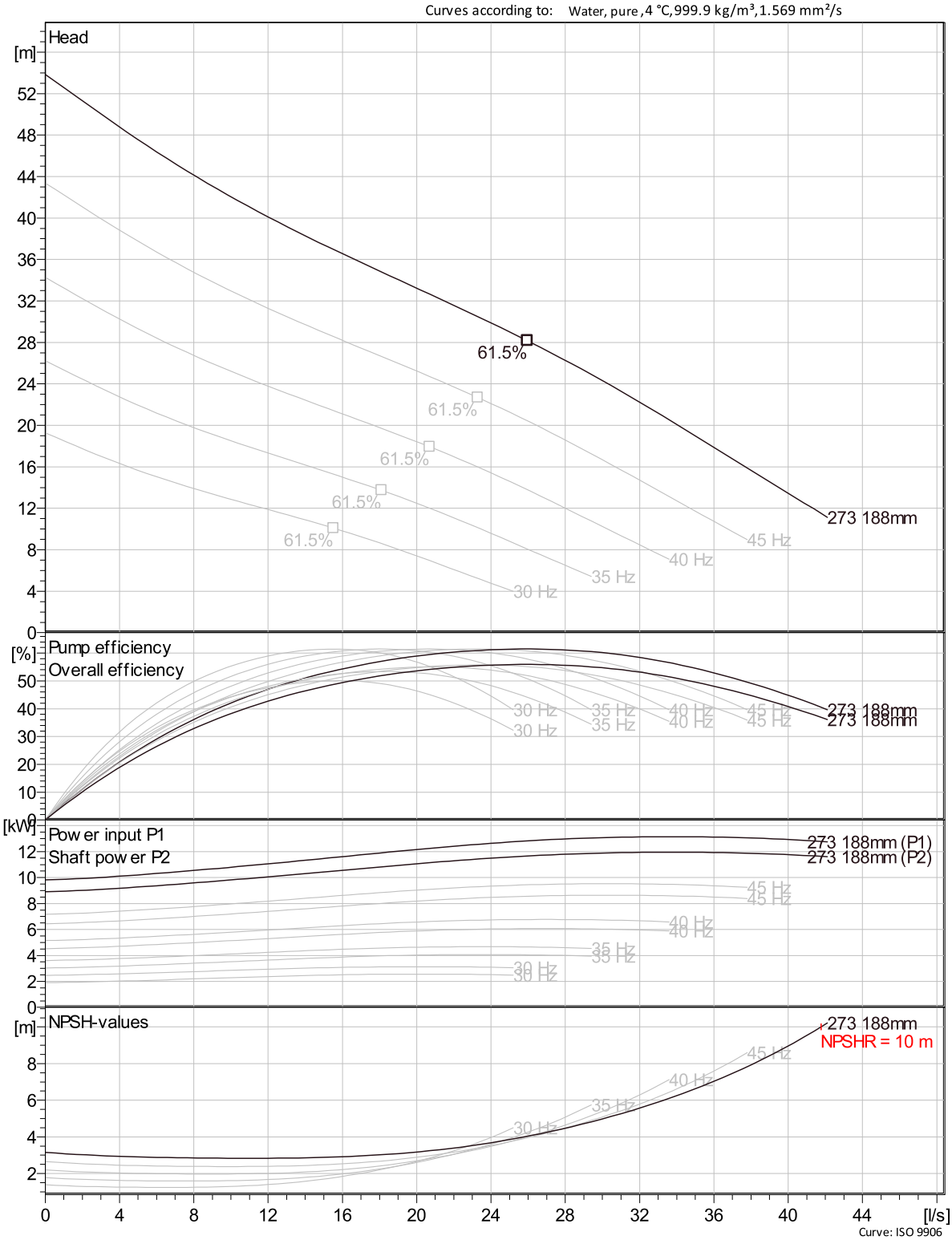
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	20.7	32.7	11.1	20.7	32.7	11.1	59.4 %	0.165	3.24

Project		**Created by**	Kobus Steyn		
Block		**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

VFD Curve

Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s

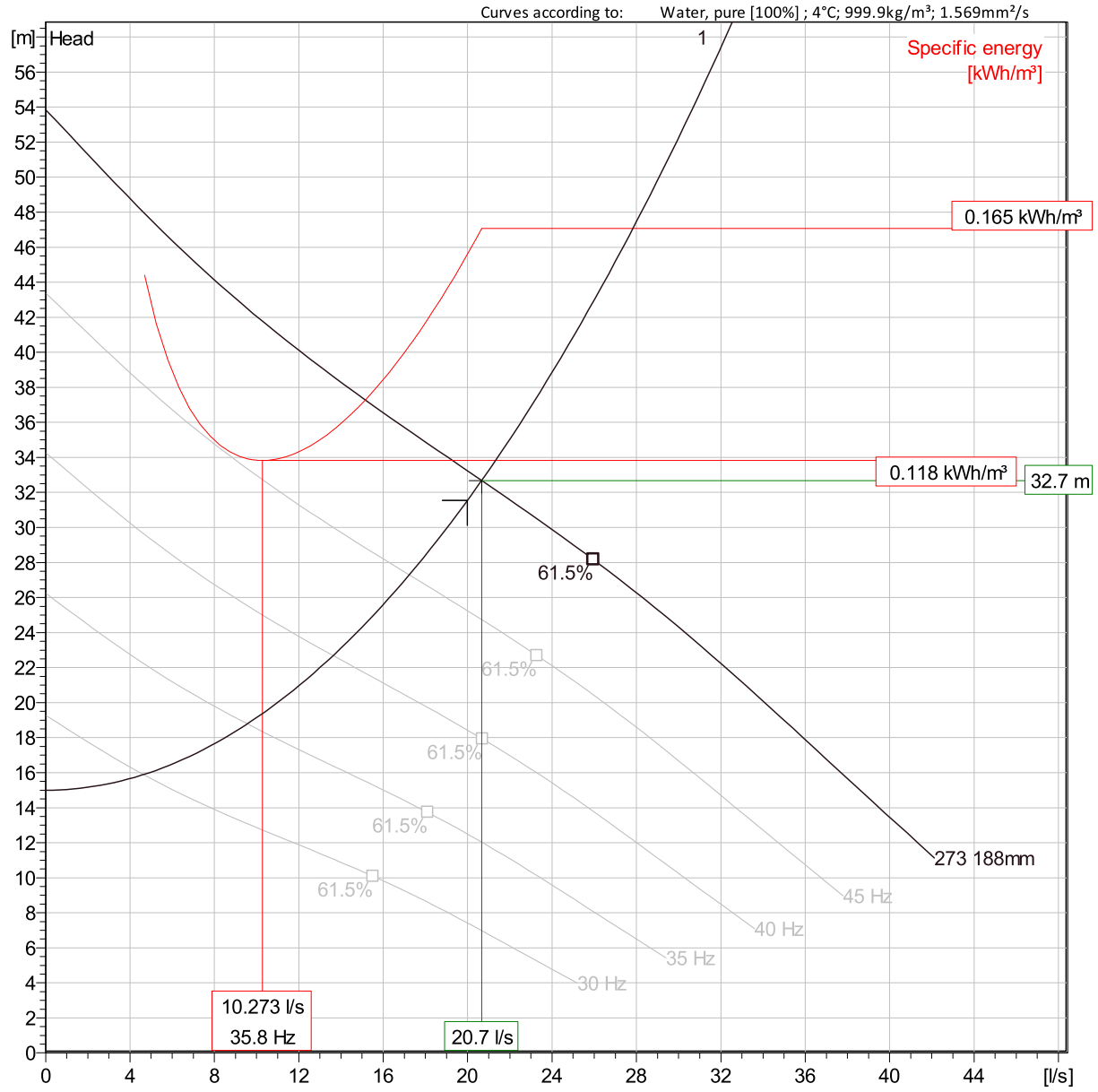


Curve: ISO 9906

Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

VFD Analysis



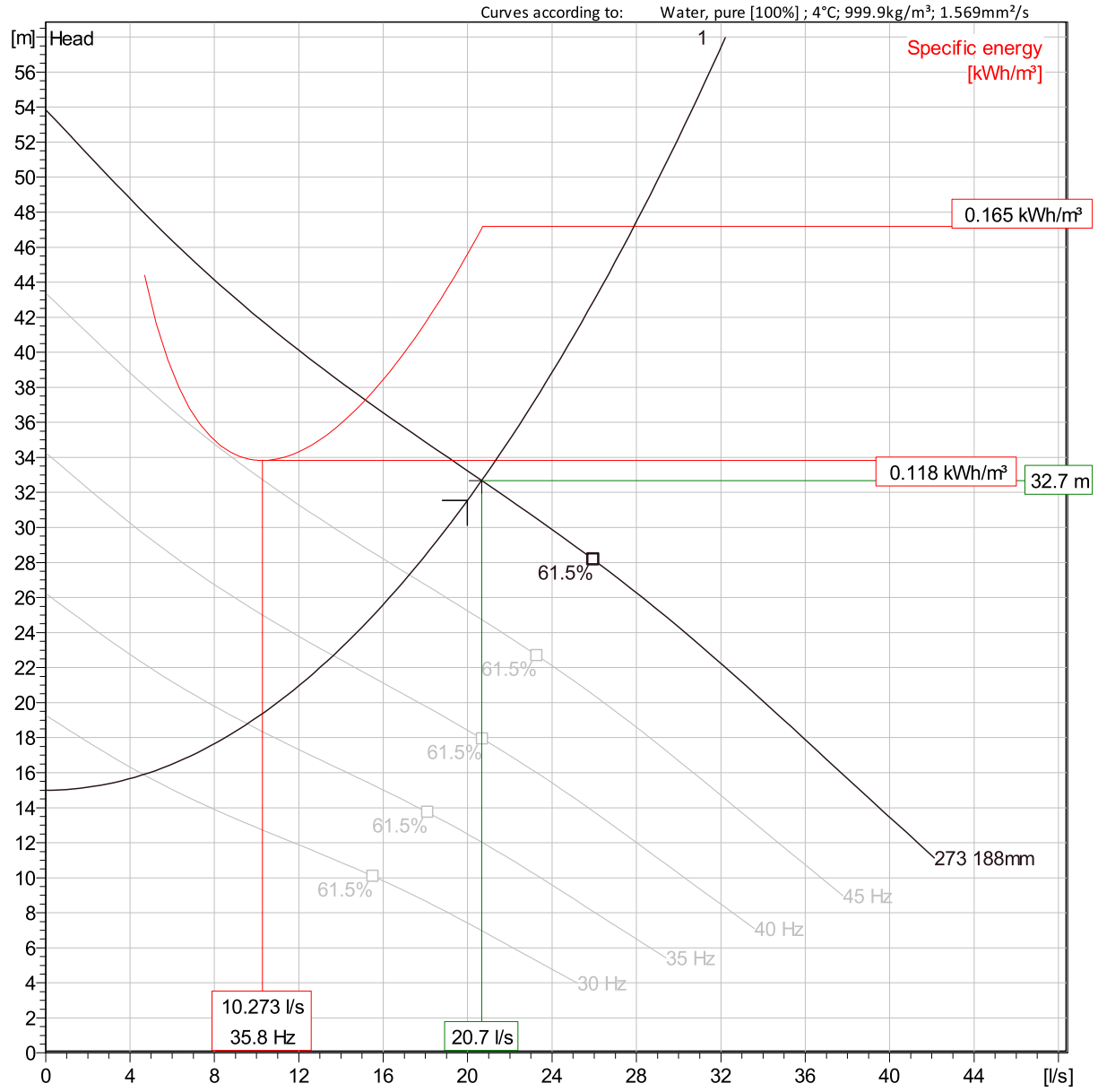
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	20.7	32.7	11.1	20.7	32.7	11.1	59.4 %	0.165	3.24
1	45 Hz	17.3	27.4	7.97	17.3	27.4	7.97	58.2 %	0.141	2.62
1	40 Hz	13.7	22.7	5.46	13.7	22.7	5.46	55.8 %	0.125	2.07
1	35 Hz	9.61	18.8	3.51	9.61	18.8	3.51	50.5 %	0.119	1.61

Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

VFD Analysis



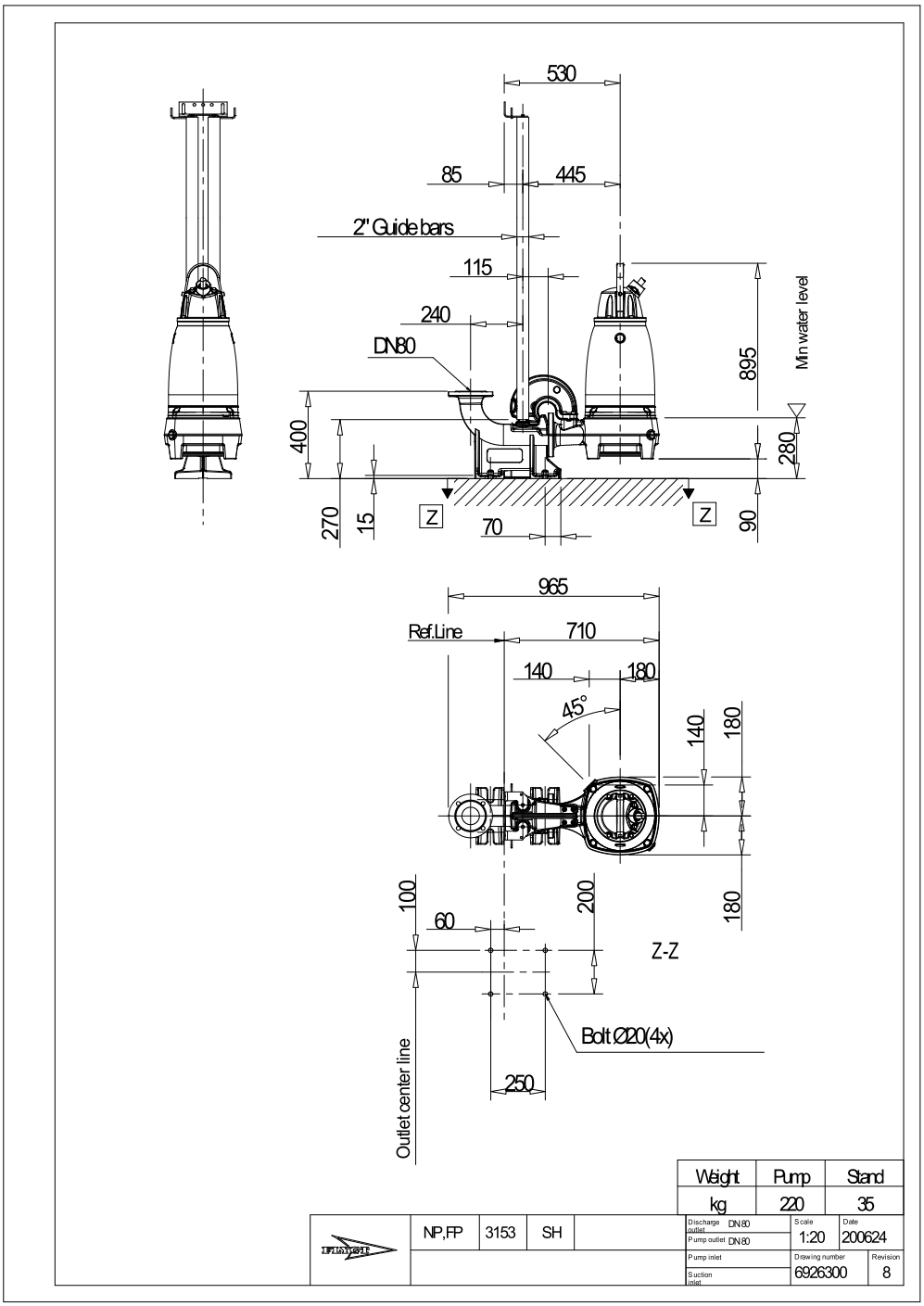
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	4.7	15.9	2.06	4.7	15.9	2.06	35.6 %	0.155	1.26

Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

Dimensional drawing



Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

PUMP & VALVE SPECIALTIES LTD

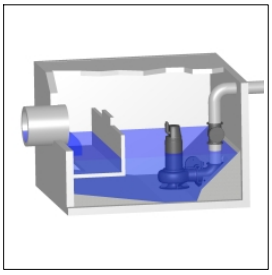
WWPS Design Calculations

Customer	**Woods**
Project	**Height Road Tractor 2A**
Area	**Auckland**
Date	**12.11.2021**
Created by	**JH**
P & V No.	
Project No.	**P-1970**
ADWF [l/sec]	0.80
Peaking factor (PDWF)	3
Peaking factor (PWWF)	6.7
PDWF [l/sec]	2.4
PWWF [l/sec]	5.36
Design flow SF	1.20
Design flow [l/sec)	6.43
Discharge invert level [m]	19.00
Wet Well Lid level [m]	10
Storage Tank Lid Level [m]	10
Overflow Invert level [m]	8.45
Inlet invert level [m]	6.9
High level alarm to inlet invert [m]	2.3
"Duty on" to high level alarm [m]	0.1
High level alarm [m]	4.60
Working level ("Duty on") [m]	4.50
"Duty off"	3.90
Inlet invert to "Duty off" [m]	3.00
Pump station invert [m]	3.40
Valve chamber depth	1.20
Storage requirements	
Hours required	8
Daily Flow	69120
Hourly Flow	2880
Storage capacity [l] for 8 hours Storage	23040
Storage capacity [m3]	23.04
Pump station & storage tank sizing	
Pump station	
Diameter [m]	**2**
Straight Shell Capacity [m3/m]	3.14
Storage - High level to overflow [m]	3.85
Storage volume equals [m3]	12.10
Plus working levels [m]	1.1
Total depth of the station [m]	**6.60**
Storage tank 1	
Storage tank requirement [m3]	10.94
Tank dia [m]	**1.85**
Tank length	4.5
Tank inlet/outlet invert RL [m]	7.1
Multiple tanks?	1
Storage tank volume	11.03509818
Total storage volume WW + ST	23.13

PUMP & VALVE SPECIALTIES LTD

Working level and starts per hour - Design Flow

Project	**Height Road Tractor 2A**				
Date	12.11.2021				
Inflow (l/sec)	0.80	in cubes =	2.88	m3/hr	
Outflow (l/sec)	20.70	in cubes =	74.52	m3	
Dia of station		2	m		
Distance between floats		0.3	m		
Volume of AWL		0.9426	m3		
Effective outflow in cube		71.64			
Time taken to **fill** the AWL		0.33	x 60	19.64	mins
Time taken to **empty** the AWL		0.01	x 60	0.79	mins
Cycle time	20.43	min			
Cycles / hour	**2.93729647**				
Starts / hr per pump	**1.5**				
Detention time for DF [mins]	**20**				
Name	Height above lower	Height from floor			
High level	0.1	1.1			
Standby On	0.1	1			
Duty On	0.3	0.9			
Standby off	0.1	0.6			
Duty off	0.1	0.5			
Low level	0.1	0.4			
Min water level	0.3	0.3			
Sump floor	0	0			
Therefore the total depth of working volume is		1.1	m		



Friction loss calculation

Pumped fluid
Water, pure

Static head
15

Layout
Wet well installation

Flow
20.7 l/s

Number of pumps
1

Calculation model
Colebrook-White

Viscosity
1.569 mm²/s

Nature of system
Single head pump

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710 SDR 11 (PN 16) / DN 150 (180x16,4 mm) / DIN 8074/75 /EN 13244						
Pipe length	147.2	1150 m	1	1.216	0.6	17.38
Discharge Connection	147.2	0.3	1	1.216		0.02262
Elbows	147.2	0.3	1	1.216		0.02262
Inlet	147.2	1	1	1.216		0.07541
Non-return valves	147.2	0.9	1	1.216		0.06787
Outlet	147.2	1	1	1.216		0.07541
T-piece	147.2	0.4	1	1.216		0.03016
Valve	147.2	0.6	2	1.216		0.04525
Total friction head						**17.72**
Friction loss head						17.72 m
Total static head						15 m
Total head						**32.72 m**

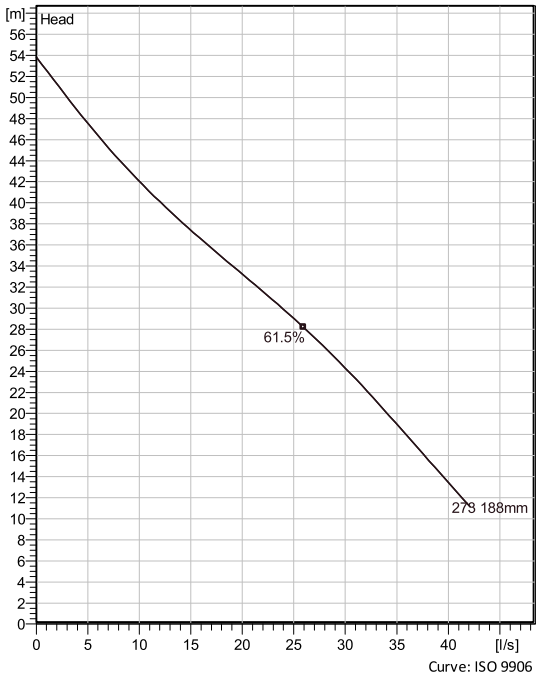
Project	**Created by**	Kobus Steyn	**Last update**	11/11/2021	
Block	**Created on**	11/11/2021			

NP 3153 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3153.185 21-18-2BB-W 15KW

Installation type
P - Semi permanent, Wet

Impeller diameter
188 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
188 mm

Discharge diameter
80 mm

Inlet diameter
150 mm

Maximum operating speed
2920 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron

Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 273

Technical specification

Motor - General

Motor number N3153.185 21-18-2BB-W 15KW	**Phases** 3~	**Rated speed** 2920 rpm	**Rated power** 15 kW
Approval No	**Number of poles** 2	**Rated current** 27 A	**Stator variant** 1
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 185			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 90.0 %	**Total moment of inertia** 0.0336 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 91.0 %	**Starting current, direct starting** 222 A	
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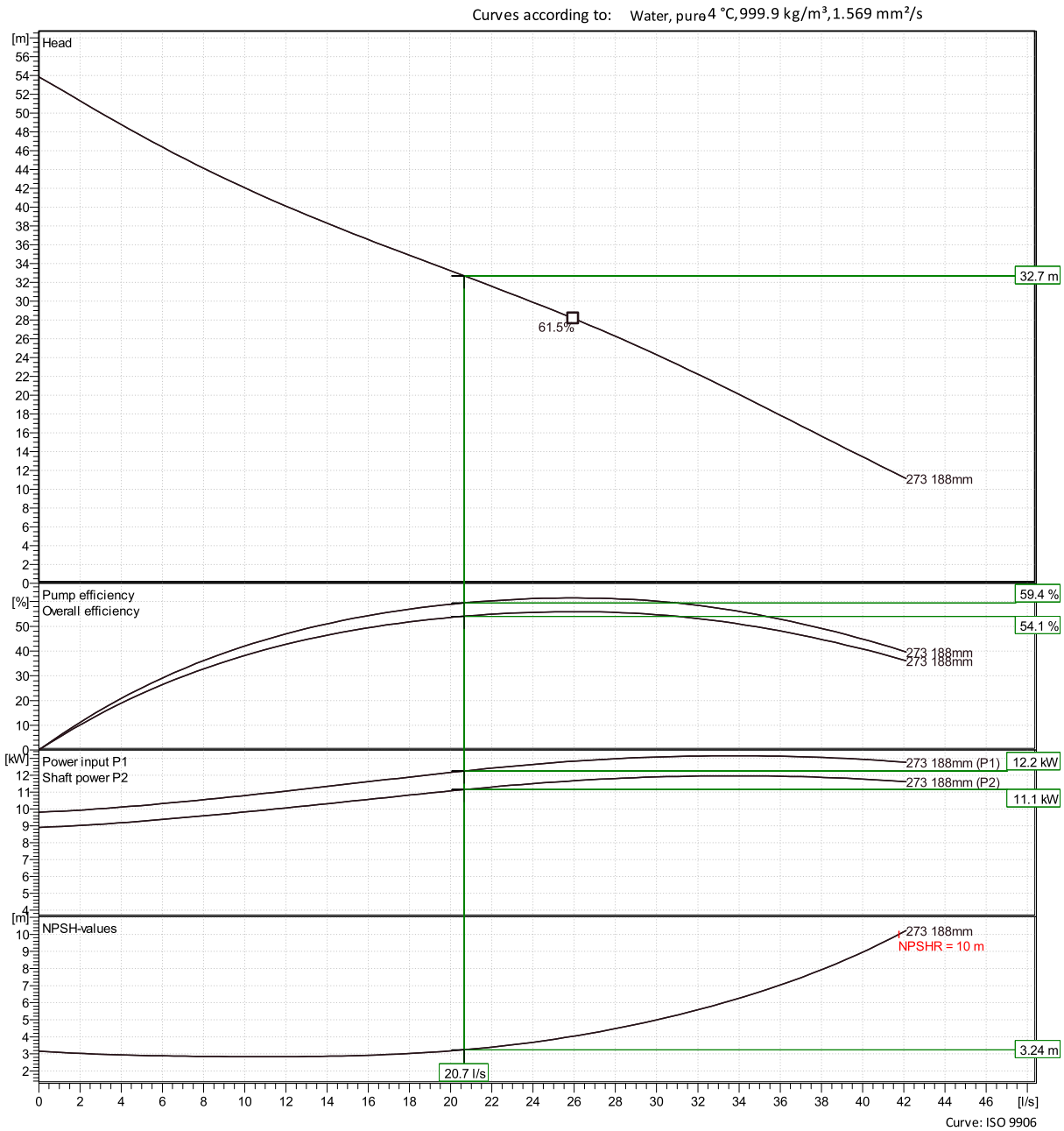
Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

NP 3153 SH 3~ 273

Performance curve

Duty point

Flow	Head
20.7 l/s	32.7 m



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NP 3153 SH 3~ 273

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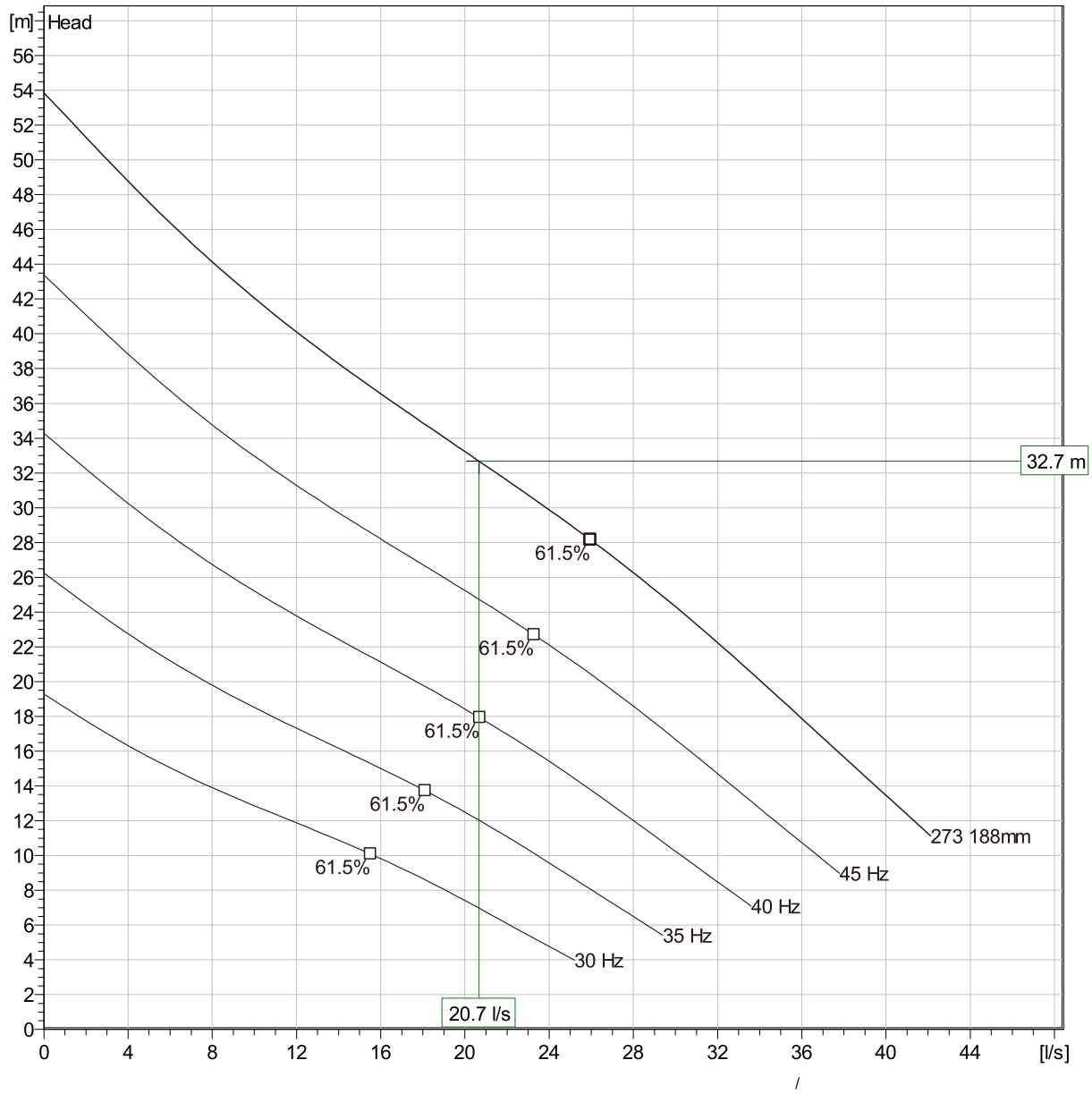

Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
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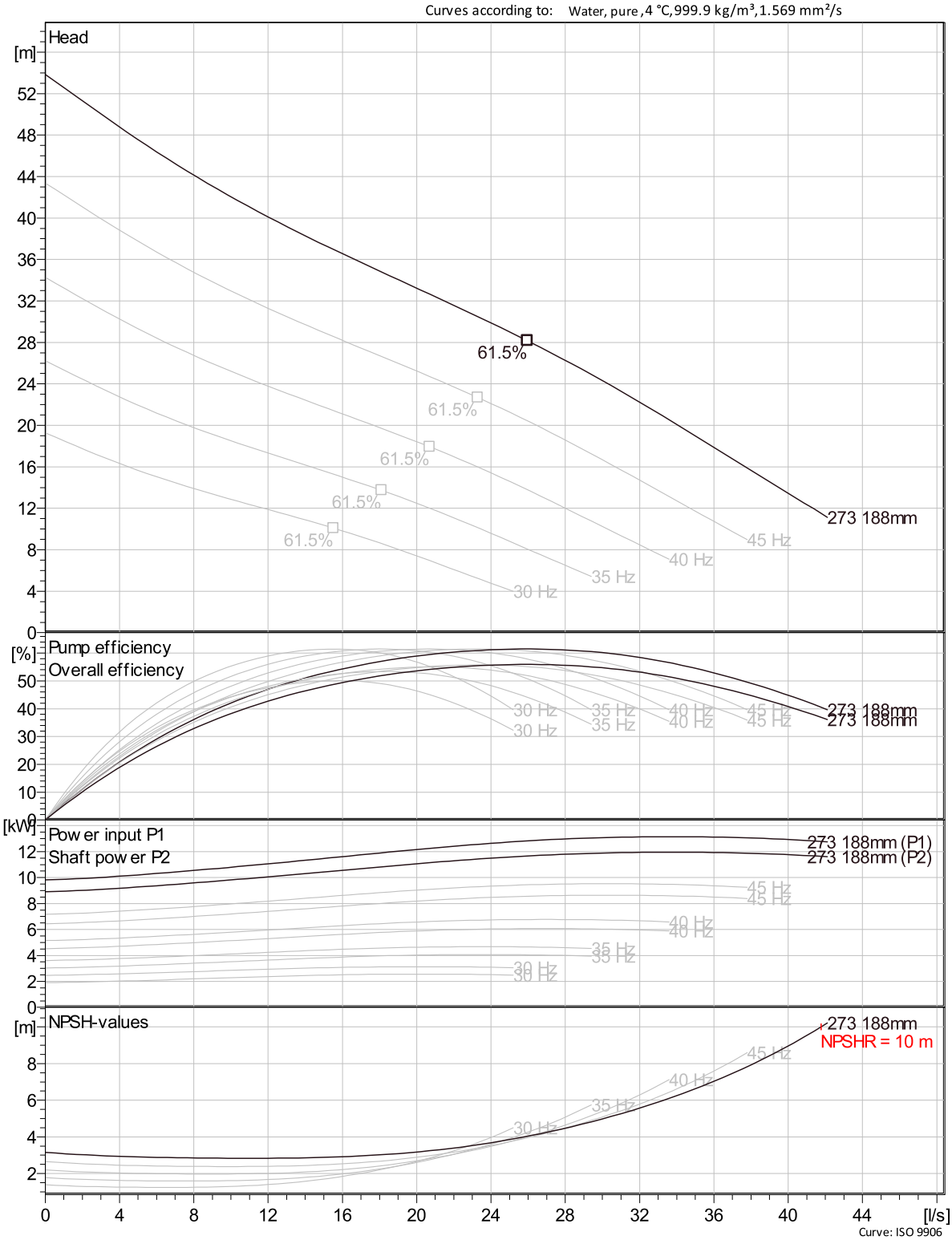
NP 3153 SH 3~ 273

VFD Curve

Curves according to: Water, pure ,4 °C,999.9 kg/m³,1.569 mm²/s



Curve: ISO 9906

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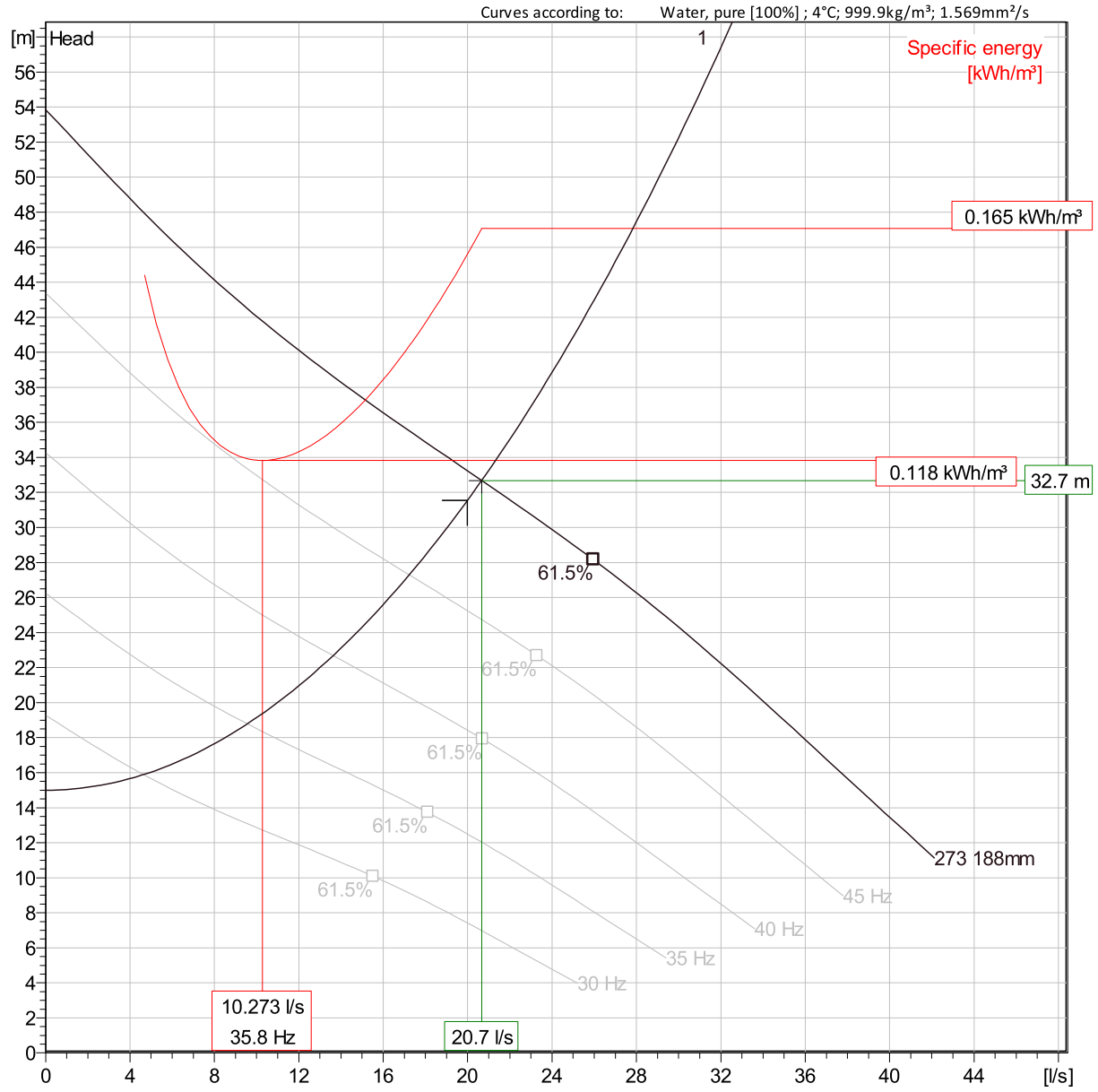
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

VFD Analysis



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		l/s	m	kW	l/s	m	kW		kWh/m³	m
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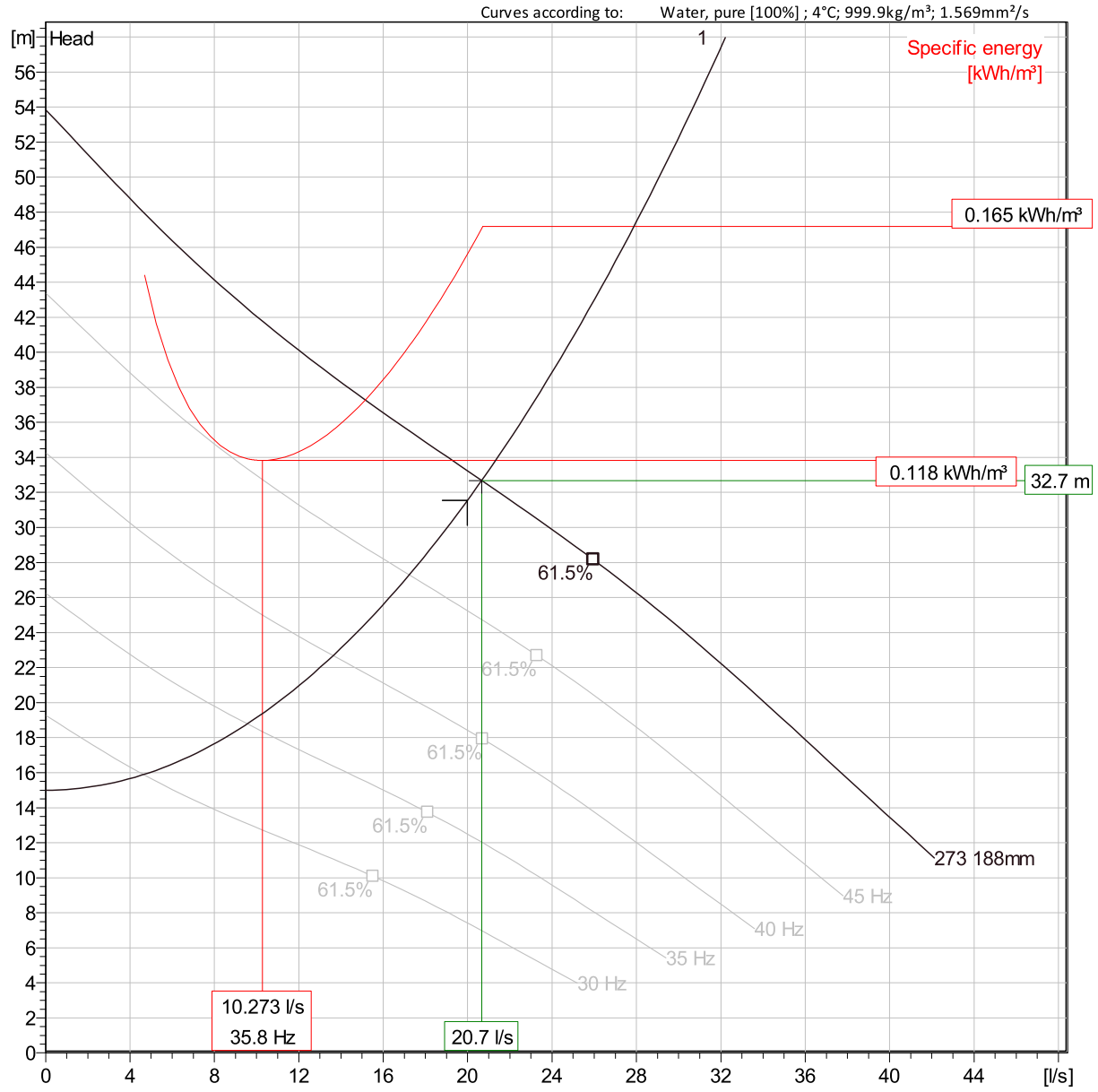
NP 3153 SH 3~ 273

VFD Analysis



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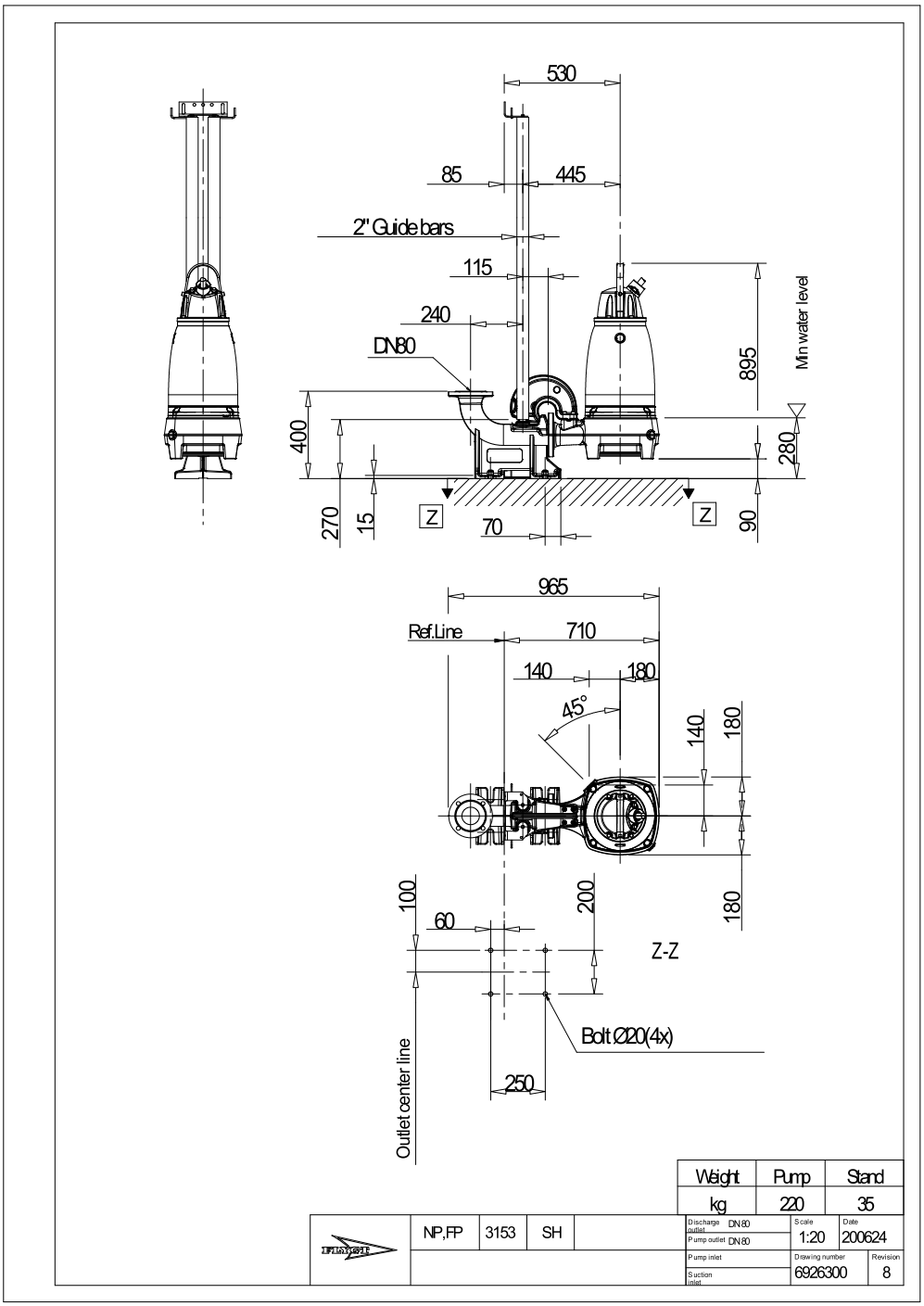
Project		**Created by**	Kobus Steyn		
Block	0	**Created on**	11/11/2021	**Last update**	11/11/2021

NP 3153 SH 3~ 273

Dimensional drawing



Project		**Created by**	Kobus Steyn
Block	0	**Created on**	11/11/2021 **Last update** 11/11/2021

Appendix D – On-Site Treatment Details

Smith & Loveless Inc.

TITAN™ MBR

Delivering the Best Experience... Packaged for You.

The MBR Packaged for You...

TITAN MBR™

From the Innovator in operator-friendly packaged treatment systems, S&L delivers to you the best available MBR technology for Operation and Maintenance and Total Cost of Ownership.

Performance with Smart Automation

- Achieve efficient treatment for high quality effluent and reuse
- Automation features include decanting and chemical cleaning
- Color touchscreen PLC controls offer intuitive monitoring & control

Easiest Operation & Maintenance of all MBRs

- Infrequent & simplest membrane cleaning of any MBR
- Easily accessible PLC, electrical & process components
- No internal mechanical pumps eliminate O&M tasks & costs

Robust System Design

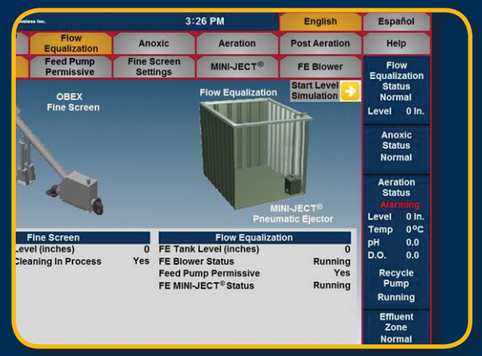
- Quality-controlled manufacturing with stainless steel components
- Flat-sheet membrane construction for less breakage & longer life
- Pre-wired, compact models ideal for shipping & site requirements

Creating Value for You

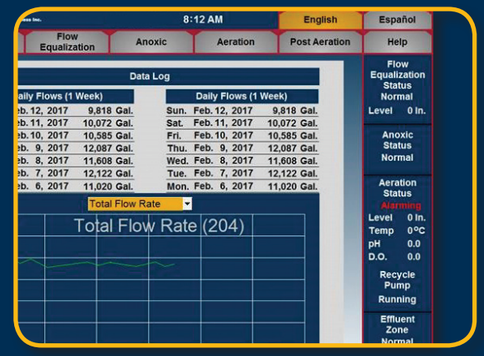
- Superior total cost of ownership with simplified O&M
- Best Available Technology: achieves water reuse quality effluent
- Single-source support comes from company with 70+ years

Sample Screenshots

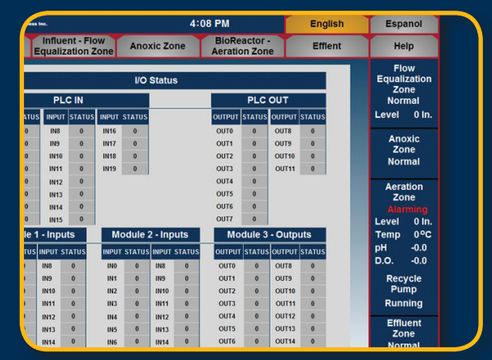
[Entire screen not displayed here]



System Overview



Data Log



I/O Status

QUICK SMART™ System Controls

Main Features

- 9.7" (24.6 cm) 65K-Color TFT LCD Touch Screen HMI
- PLC/Microprocessor-Based Controller
- NEMA 4 Rated when Installed in Enclosure
- UL Certified
- Protected by Surge Protective Device (SPD)
- English/Spanish Toggle
- More than 15 Different Screen Selections
- Data, Maintenance, and Alarm Logging
- Complete "Help" Menu and Support Screens

RemoteView™ Cloud Services through QUICKSMART™

Gain remote access monitoring and troubleshooting services with RemoteView™ from S&L. We are here to help you make owning and operating an MBR the easiest of any

Intuitive PLC Controls

featuring

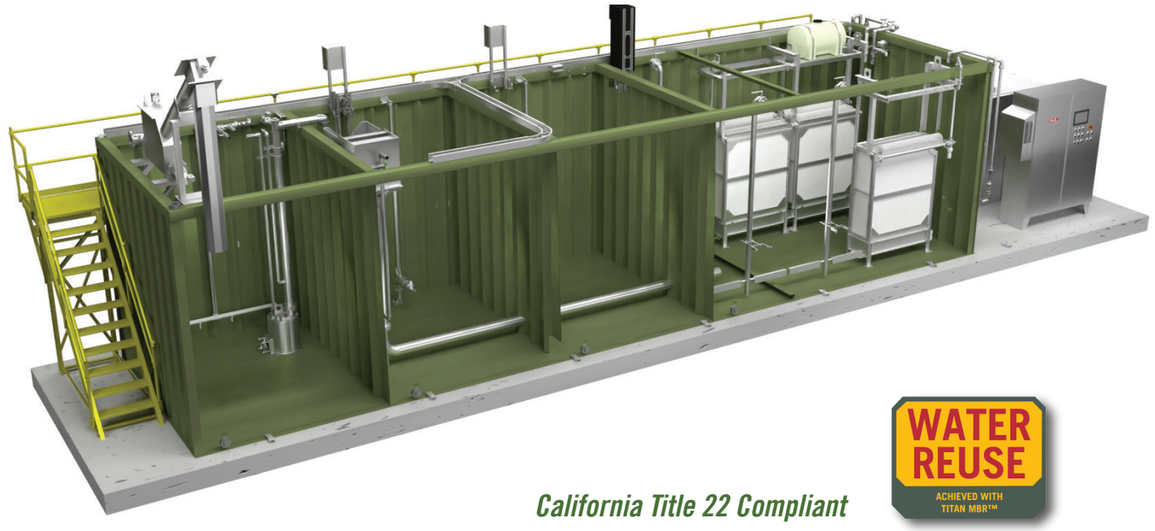
QUICKSMART™ System Controls

- Superior Graphics
- Easy-to-Navigate
- Remote Automation

Delivering simplified operation yet powerful TITAN MBR™ control, **QUICKSMART™** System Controls provide unparalleled ability to monitor and adjust all of your treatment system functions, including:

- **Troubleshooting** support comes standard with new I/O Status screen that displays controller digital and analog I/O status.
- **Maintenance Log** - Displays recommended O&M instructions and makes suggestions based on actual system operation.
- **Automated Decanting** - Automatic sludge storage decanting airlift with timer controlled by QUICKSMART™ PLC with HMI operator adjustment. Air to sludge storage zone is shut down automatically before decanting airlift runs.
- **RAS Automation** - Adjusts the recycle LIQUIDLIFT™ [when anoxic zones are present] to accommodate lower flow conditions to maintain high levels of nitrification.
- **Dual-language toggle** provides control screens fully in Spanish and English with a simple toggle button.

System Overview



California Title 22 Compliant

WATER REUSE
ACHIEVED WITH TITAN MBR™

Achieve Superior Effluent Quality

BOD:	< 3 mg/l
TSS:	< 1 mg/l
Turbidity:	< 0.2 NTU
TN:	< 3 mg/l*
NH_3:	< 1 mg/l
TP:	< 0.05 mg/l*

** achievable with optional process selections*

S&L Flat-Plate Membrane Data [Typical]

Type:	Submerged, PVDF+PET Flat-Plate
Design Flux:	13 gpd/sf [22.1 lmh]
Pore Sizing:	0.08 microns [MF]
TMP Range:	[Trans Membrane Pressure] 0.50 - 2.00 psi [35 - 138 mB]
Cleaning:	In-Place; Semi-annual cycle**; 4 hrs.

*** depending upon the influent*

Flow: 5,000 gpd - 0.1 MGD / 19 cmd - 378 cmd

Standard Systems

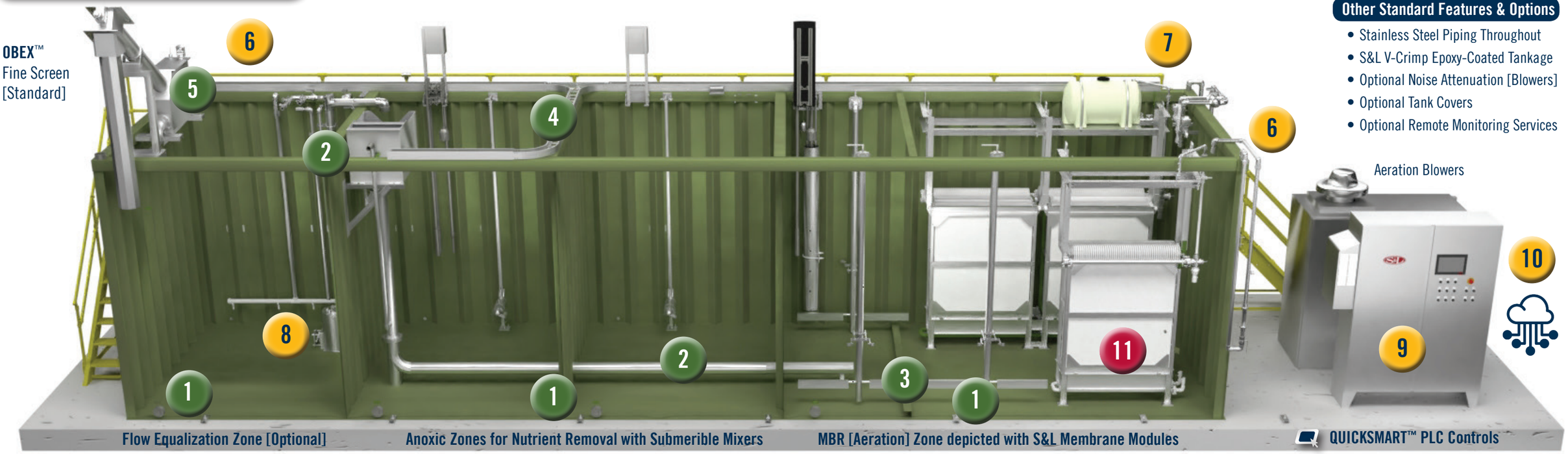
Each American factory-built **TITAN MBR™** System includes robust, epoxy and polyurethane coated S&L V-Crimp tankage, configured process and MBR zones with S&L flat-plate Membranes, automatic fine screening (if selected), stainless steel internal components, pre-wired instrumentation, and **QUICKSMART™** Touchscreen PLC Controls. The result provides best-available MBR technology with superior O&M ease.

Featured Options

- Enhanced Remote Monitoring
- Process Instrumentation
- Zones for Enhanced Nutrient Removal
- Tank Covers / Weatherization Packages
- Skid-mounted Chemical Cleaning Tank
- Covers for Instrumentation
- Aluminum or 316 Stainless Steel Cable Trays

System Diagram & Features

*Designed with robust stainless steel piping, smart automation and O&M cost-saving features, **TITAN MBR**™ delivers the best in MBR experience.*



Other Standard Features & Options

- Stainless Steel Piping Throughout
- S&L V-Crimp Epoxy-Coated Tankage
- Optional Noise Attenuation [Blowers]
- Optional Tank Covers
- Optional Remote Monitoring Services

System Process & Construction Features

1 Flexible Process Zones, Configured

TITAN MBR™ comes configured to meet your effluent goals. Optional Flow Equalization, Anoxic & Sludge Storage Zones complement the MBR Zone. California Title 22 compliant, achieving water reuse.

2 Automatic Anoxic Recycle System

Adjustable recycle stainless steel **LIQUIDLIFT**™ accommodates lower flow conditions to maintain high levels of nitrification. Automatically controlled by the PLC with HMI operator input.

3 Robust, Efficient Aeration

Stainless steel, medium-bubble aeration lowers operating costs while eliminating the fouling and maintenance costs associated with fine bubble type diffusers.

4 Smart Wire Management System

Factory-installed and strategically located instrumentation and cable wireways minimize field wiring for easier installation. Optional instrumentation covers [shown above] are available.

5 Simple, Automatic Fine Screening

Any **TITAN MBR**™ model with Flow Equalization comes standard with integral **OBEX**™ fine screening.

Operation & Maintenance Features

6 Safe & Easy O&M Access [Factory-Supplied]

S&L stairway access to walkway for easy O&M. All maintenance tasks can be safely and comfortably accomplished from here—protected by OSHA standard 42" high [106 cm] safety railing.

7 Easy, Infrequent Membrane Cleaning

Membrane clean-in-place [CIP] system, typically conducted semi-annually for less than 4 hours, features easy to access tankage for feed and spent chemicals.

8 Influent Transfer Eliminates Pump O&M

S&L **MINI-JECT**™ influent transfer with no moving parts eliminates need for mechanical pumps and associated maintenance & replacement costs. Provides constant flow regardless of flow level.

9 QUICKSMART™ PLC Touchscreen Ease

QUICKSMART™ System Controls provide unparalleled ability to monitor and adjust all of your treatment system functions with a highly intuitive, easy-to-navigate touchscreen PLC interface.

10 RemoteView™ Cloud Remote Monitoring

Cloud-based **RemoteView**™ monitoring services are available from Smith & Loveless Inc. We are here to help you!

S&L Flat-Plate Membrane Features

11 Robust Submerged S&L Flat-Plate Membranes [MBR Zone]

TITAN MBR™ Flat-Plate Membranes (MF) maintain high permeability and flux rates even at peak-day rates. They stack within a fully submerged module inside the aeration zone. Transmembrane pressure created by gravity drives the flow through the membranes. Clean water discharges while blocked solids remain in the aeration zone. Diffusers beneath the module scour the membranes while also providing air supply to the bacteria. Chemical cleaning occurs efficiently in-place—typically on a semi-annual basis—with simple chemical injection. No permeate pumps are required, saving energy and maintenance compared to most other MBR systems.

Compare Submerged S&L Flat-Plate Membranes vs. Hollow-Fiber & Other Types

- Lower fouling rate because of better air scour with the flat sheet
- Cleaned in place; no need to remove membranes
- Less chemicals needed to clean
- Less time to clean
- No breakage issues; more durable
- No issues with stringy solids like hair
- No backwash or back pulse required
- No air integrity testing or pinning of fibers

Achieves Title 22 Water Reuse

Type:	Submerged, PVDF+PET Flat-Plate
Design Flux:	13 gpd/sf [22.1 lmh]
Pore Sizing:	0.08 microns [MF]
Trans Membrane Pressure:	0.50 - 2.00 psi [35 - 138 mB]
Cleaning:	In-Place; Semi-annual cycle; 4 hrs.

TITAN™ MBR

Delivering the Best Experience...Packaged for You

Performance

TITAN MBR™ provides high oxygen transfer and a stable process tailored to your requirements, and is capable of achieving superior effluent quality and Title 22 approved water reuse.

Easiest MBR O&M

Experience the best O&M of any MBR through quick component access, smart instrumentation, remote data monitoring, reduced process complexity, & streamlined [CIP] membrane cleaning.

Robust Design

Rugged tank and flat-sheet membrane construction with expanded stainless-steel componentry and streamlined electrical design. Intuitive graphical touchscreen **QUICKSMART™** PLC provides easy control.

Value

Increased energy effiency [up to 30%] with updated process & automation & no permeate pumps. Backed by complete single-source technical support, from pre-design to installation and beyond.

wef member association · UL LISTED · CE · UVDB Registered · WATEREUSE

TITAN MBR™ *arrives in compact factory-built system models now with significantly less field assembly for swifter installation and start-up. Every system is backed by complete single-source technical support, from pre-design to installation and beyond, from Smith & Loveless, a company with more than 70 years experience and a strong reputation for reliability.*

Smith & Loveless Inc.
www.SmithandLoveless.com

Phone: (913) 898-5201
Fax: (913) 888-2173

14040 Santa Fe Trail Dr.,
Lenexa, KS USA 66215-1284

AdvanTex® Treatment Systems

AX-Max™

Manufactured by Orenco Systems®, Inc.

This full-sized AdvanTex® AX-Max™ wastewater system was installed at a 50-site campground in the LaPine State Park, LaPine, Oregon, to handle design flows of 7,500 gpd (28.4 m³/day).

Decentralized Wastewater Treatment for Commercial Properties and Communities

Applications:

- Municipal systems
- Subdivisions, apartments
- Golf course developments, resorts
- Manufactured home parks
- Parks, RV parks, campgrounds
- Schools, churches, businesses
- Rest areas, truck stops

Orenco® SYSTEMS

814 Airway Avenue, Sutherlin, Oregon, USA 97479
Toll-Free: 800-348-9843 • +1-541-459-4449 • www.orenco.com

AdvanTex® AX-Max™ Treatment System

Reliable, Energy-Efficient Wastewater Treatment Everywhere!

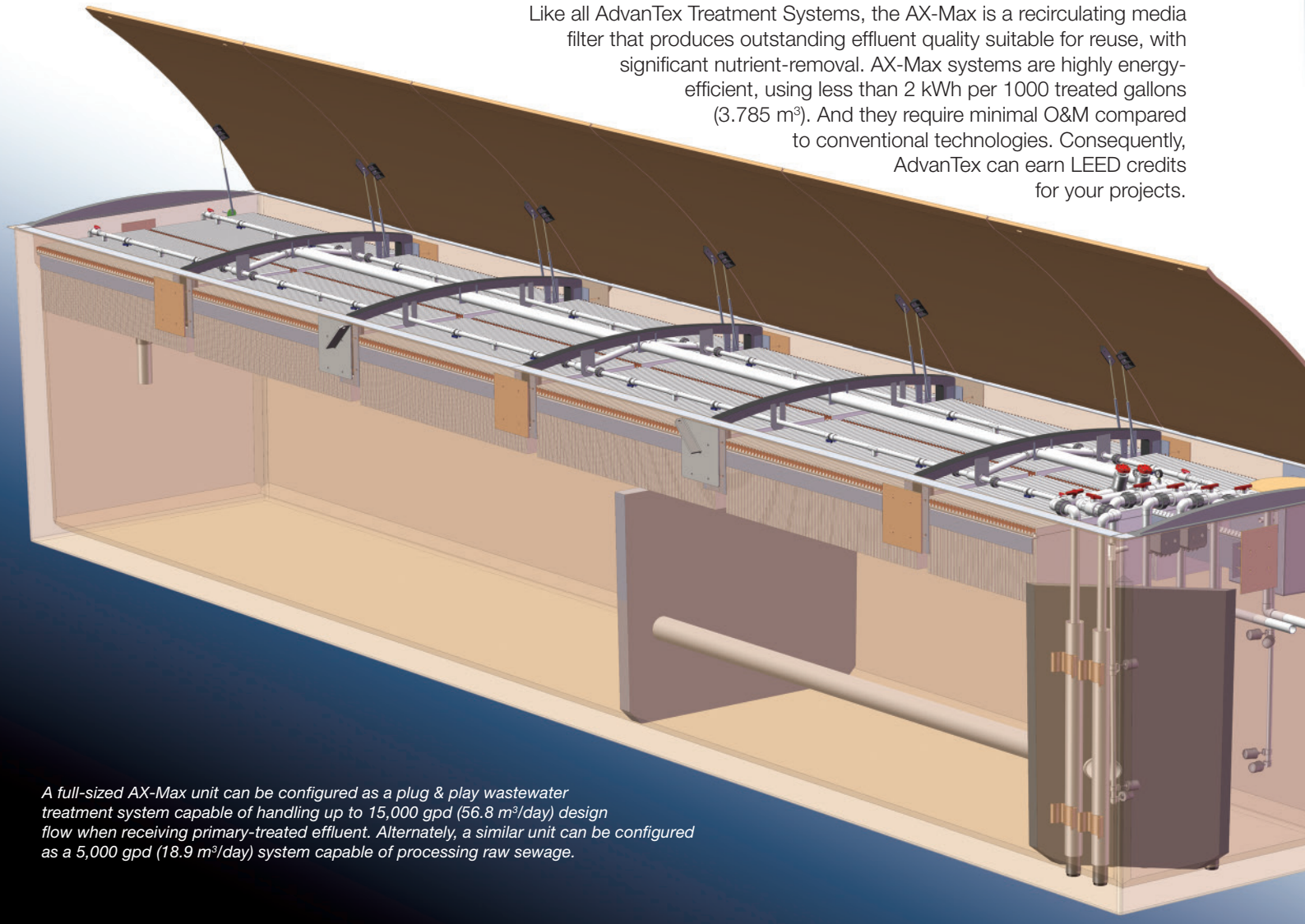
The Yakama Nations Housing Authority in Washington state added five AdvanTex® AX-Max units (background) to its ten AdvanTex AX-100 units, increasing the capacity of its wastewater system by 50%. Photo courtesy of Fextex Systems, Inc.

For more than 15 years, Orenco's AdvanTex® Treatment Systems have been providing reliable, energy-efficient wastewater treatment inside and outside the urban core. AdvanTex textile filter technology has been winning awards and coming out on top in field trials and demo projects, all over the world.

Orenco's newest product in the AdvanTex line is the AX-Max™: a completely-integrated, fully-plumbed, and compact wastewater treatment plant that's ideal for commercial properties and communities. It's also ideal for projects with strict discharge limits, limited budgets, and part-time operators.

A Sustainable Solution for Wastewater Treatment

Like all AdvanTex Treatment Systems, the AX-Max is a recirculating media filter that produces outstanding effluent quality suitable for reuse, with significant nutrient-removal. AX-Max systems are highly energy-efficient, using less than 2 kWh per 1000 treated gallons (3.785 m^3). And they require minimal O&M compared to conventional technologies. Consequently, AdvanTex can earn LEED credits for your projects.



A full-sized AX-Max unit can be configured as a plug & play wastewater treatment system capable of handling up to 15,000 gpd (56.8 m^3/day) design flow when receiving primary-treated effluent. Alternately, a similar unit can be configured as a 5,000 gpd (18.9 m^3/day) system capable of processing raw sewage.

AdvanTex® AX-Max™ Treatment System

Units range from 14'-42' in length. This 21' unit is ideal for lower flows.

Set, Plumb, Wire, and Go

The AX-Max is pre-plumbed and easy to install, so AX-Max projects can meet the tightest deadlines. The entire system — including treatment, recirculation, and discharge — is built inside an insulated fiberglass tank that ranges from 14-42 feet (4.3-12.8 m) in length. AX-Max units can be installed above-ground — for maximum versatility in temporary or variable-flow situations — or in-ground. They can also be installed individually or in multi-tank arrays, treating up to 1 MGD (3,800 m^3/day).

For Every Climate and Condition

AX-Max systems provide excellent treatment anywhere, and they have been installed all over the world. For example, AX-Max systems have been installed at Malibu's famous beach parks and New Zealand's Glendhu Bay campground. Several more were installed in Soyo, Africa, to serve a new hospital and school. Other AX-Max systems have been installed on top of Alaska's frozen tundra and St. Lucia's volcanic rock. Still more have been installed in mining camps from Alberta to Texas and, in the Midwest, at a U.S. Department of Defense demo site.

Benefits

- Containerized, fully-plumbed
- Capable of meeting stringent permit limits
  - ~ Reuse-quality effluent
  - ~ Significant reductions in ammonia, total nitrogen
- Compact and versatile
- Above-ground or in-ground installation
- Easy to set
- Simple to operate
- Low energy usage: <2 kWh per 1000 treated gal. (<2 kWh per 3.785 m^3)*

  ** When treating domestic waste*

Textile Treatment Media

The treatment medium is a uniform, engineered textile. AdvanTex textile is easy to clean and allows loading rates as high as 50 gpd/ft^2 (2000 L/day/m^2) with primary-treated influent.

Effluent Distribution

High-quality, low-horsepower pumps micro-dose the treatment media at regular intervals, and proprietary spin nozzles efficiently distribute the effluent, optimizing treatment.

Telemetry Controls

Orenco's telemetry-enabled control panels use a dedicated phone line or ethernet connection, ensuring 24/7 monitoring and real-time remote control.

AdvanTex® AX-Max™ Treatment System

Carefully Engineered by Orenco

Orenco Systems has been researching, designing, manufacturing, and selling leading-edge products for small-scale wastewater treatment systems since 1981. The company has grown to become an industry leader, with about 300 employees and 300 points of distribution in North America, Australasia, Europe, Africa, and Southwest Asia. Our systems have been installed in more than 70 countries around the world.

Orenco maintains an environmental lab and employs dozens of civil, electrical, mechanical, and manufacturing engineers, as well as wastewater treatment system operators. Orenco's technologies are based on sound scientific principles of chemistry, biology, mechanical structure, and hydraulics. As a result, our research appears in numerous publications and our engineers are regularly asked to give workshops and trainings.

Powered by Franklin Electric

Orenco SYSTEMS

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www.orenco.com

ABR-ATX-MAX-1
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Orenco Systems®, Inc.

Project Summary

Installation photos courtesy of BioSolutions, Inc.

Point Dume State Beach and Preserve, Southern California

In spring, 2011, Los Angeles County needed to quickly upgrade restrooms at Malibu's Point Dume State Beach in time for the long — and busy — Memorial Day weekend. The county's engineer specified three AX-Max units, one for each restroom, and all three were installed in a matter of days. The small footprint of this configuration saved the county valuable space for visitor parking. After disinfection, the treated effluent is dispersed right into the sand. Point Dume is part of a large-scale upgrade of L.A. County beach parks, virtually all of which include AdvanTex Treatment Systems of various sizes and configurations.

Fully Supported by Orenco

AdvanTex Treatment Systems are part of a comprehensive program that includes ...

- Designer, installer, and operator training
- Design assistance, technical specifications, and plan reviews
- Installation and operation manuals
- Lifetime technical support

Distributed by:

Appendix E – Engagement Information

Watercare
An Auckland Council Organisation

Watercare Services Limited
info@water.co.nz
www.watercare.co.nz
Private Bag 94010
Auckland 2241
Customer service line
Mon to Fri 7.30am to 6pm
09 442 2222

Fault line
24 hours
09 442 2222

7 June 2021

WOODS
Euan Williams

Watercare application CON-73500

Dear Euan,

Thank you for your application. This letter responses to your request for information on wastewater and water servicing of the proposed private Plan Change development at Heights Rd Pukekohe – Light industrial lots.

We have undertaken a high-level assessment for the proposed development. Our comments are set out below.

Water Supply

The 300mm watermain along Paerata Road capacity is currently servicing the live zone land to the north. While the 300mm watermain has been sized to cater for a wider population in northern Paerata, its current capacity is limited by constraints in the Pukekohe township and resilience considerations. Therefore, there is no available capacity for this development at this time. Watercare is currently reviewing the water supply servicing for the area, but this review has not yet been completed.

It is likely that significant new water infrastructure will be required to service the proposed development. Some of this new infrastructure is likely to be at the developer's cost.

Wastewater

There are capacity constraints downstream. These include:

- Capacity constraints at the Franklin Road pump station. Watercare is currently planning to address this constraint with the construction of a new transmission pump station (Isabella Pump Statin). This Pump Station is currently in the design phase and is planned for completion in 2024.
- Local network upgrades downstream of the development.

Transmision upgrades to cater for growth up to the development levels provided for in the Unitary Plan are likely to be carried out by Watercare. Any required upgrades of the local network will be at the developer's cost.

We also understand that the existing Pump Station and rising main at the development site are private. If a new pump station is proposed to service this area, the pump station design must be designed to cater for the wider catchment area.

The assessment is at the *time of this letter and is just for your information based on the information provided.* The timing of the development is critical and future upgrade requirements will be assessed by Watercare in more detail under the Resource Consent (RC) stage and / or engineering plan approval process.

This review does not constitute resource consent or engineering plan approval. You will need to apply to Auckland Council and submit these documents with your consent application.

If you have any questions please contact the Connections Team via connections@water.co.nz or the Contact Centre on 09 442 2222 and select option 4.

Yours faithfully,

Shahram Morteza-Nia
Development Engineer, Developer Services
Watercare Services Limited

Watercare
- Ilze Gotelli, head of Major Developments

Woods
Colin Dryland – Senior Associate Engineer

W-REF: P18-088
20 April 2021

Watercare Infrastructure Assessment for Plan Change

9, 33 and 49 Heights Road, Paerata

Dear Ilze,

The following preliminary infrastructure assessment relates to a Proposed Plan Change to rezone 9, 33 and 49 Heights Road, Paerata from Future Urban to Light Industry.

The site currently comprises established light industrial activities associated with The Tractor Centre and ancillary services.

The plan change will initiate further development of the site which is proposed to occur in two stages as indicated on the plan in **Attachment 1**:

1) Stage 1 includes modifications to the existing tractor centre building and two recently consented industrial buildings. The buildings are consented and approved, and are considered Dry Industry uses in terms of WSLCOP.

   We have summarised the anticipated flows / demands from Stage 1 in **Attachment 2**. It will take over a year to construct the new buildings and renovate the existing building. Water supply is proposed via the existing on-site bore, and wastewater is proposed to flow to Franklin Road via the existing private pump station and rising main.

   The plan change and tenanted buildings will require access to water in replacement of the bore. The site has an existing public water connection which will be utilised. Once the new buildings are constructed, there will be an increase in wastewater flows to Franklin Road. On-site wastewater and water storage options are available to meet any shortfall in network servicing ability.

2) Stage 2 includes the development of additional 'dry industrial' buildings on the rear portion of the site. Water demand and wastewater flows are indicated in **Attachment 2**. The approval for plan change can be contingent upon network upgrades within a timeframe deemed reasonable by our client and WSL.

We seek the opportunity to discuss Stage 1 and 2 further with Watercare; specifically the method to gain support for the Plan Change to enable the formalisation of the existing site use by way of Plan Change and the timeline for infrastructure upgrades to enable Stage 2. For completeness, the WSL enquiry form is included in **Attachment 3**.

Yours faithfully

Colin Dryland

Senior Associate Engineer

Attachment 1: Site Development Plan

STAGE 1.

STAGE 2

HEIGHTS ROAD

PAERATA ROAD

INDUSTRIAL BUILDING 229m²

2,230 m²

SITE SERVICES AREA 682m²

WORKSHOP 1380m²

OFFICE AMENITIES 345m²

SHOWROOM 845m²

PYLON SIGN

RAIN GARDEN

COMMON ACCESSWAY

600 CONC

300 CONC

225 CONC

Building 1
1,000 m²
FFL : 57

Building 2
1,880 m²
FFL : 51

Building 3
1,000 m²
FFL : 52

Building 4
1,050 m²
FFL : 50

Building 5
1,300 m²
FFL : 47

Building 6
630 m²
FFL : 51

Building 7
600 m²
FFL : 50

Building 8
1,000 m²
FFL : 49

EXISTING SHEDS DEMOLISHED

EXISTING SHEDS DEMOLISHED

4m Retaining

2m Retaining

3.5m RW Retaining

Secondary Flow

RL57

RL47

RL48

LOT 1 DP 109824
14530

LOT 2 DP 109824
22830

LOT 1 DP 66575
44596

LOT 1 DP 38588

LOT 1 DP 170647

300 PE

450 PVC

100 AC (Rising)

Red - existing (S1)

Blue - Approved (S1)

orange - proposed (S2)

Attachment 2: Anticipated flows/demand

P18-088 Heights Road, Paerata - Tractor Centre Plan Change
Water and Wastewater Development Assessment

Calculations by: S.P.
Date: 15/04/2021
Reviewer: C.D.

Wastewater

	Design routine peak flow (L/s)	Self-cleansing design flow (L/s)	Peak Design flow (L/s)
Stage 1			
Existing	0.14	0.69	0.92
Proposed (Approved)	0.22	1.08	1.45
Stage 2			
Proposed	0.44	2.20	2.95
Total	0.79	3.97	5.32

Water

Stage 1			
Existing	0.14		0.28
Proposed (Approved)	0.22		0.43
Stage 2			
Proposed	0.44		0.88
Total	0.79		1.59

Building Areas

Stage 1 Existing	2641	m2
Stage 1 Approved	4146	m2
Stage 2 Proposed	8460	m2

Basis of Calculation

Dry Industry
Light Industrial / Up to 2 Storeys
Routine Peak Daily Usage = 4.5 $L/m^2/d$

Attachment 3: WSL Enquiry Form

GENERAL ENQUIRY Infrastructure Assessment Form		
Date of Application	14/04/21	
Address of Development	9-49 Heights Road, Pukekohe	
Layout Plan of Proposed Development clearly showing: • Aerial photograph • Road names • Boundary of development		
	Description	**Comment**
Current Land Use	Future Urban Zone	*Residential (Single family dwellings) / Residential (Multi-unit dwellings) / Residential (Multi-storey apartment blocks) / Commercial / Industrial / Other (Please Specify)*
Proposed Land Use	Light industry Zone	
Total Development Area (Ha.)	5.35 ha	
Estimated Number of Residential Households (Consent & Ultimate)	15,247m² of warehouse (proposed & existing)	*E.g. 12- storey apartment building with 4 units per storey is 48 residential households.*

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 6 Water Supply

Water Supply Development Assessment		
Average and Peak Non-Residential Demand (L/s)	Routine 0.79 Peak 1.59	*Watercare CoP*
Average and Peak Non-Residential Demand (L/s)		*Watercare CoP*
Further Water Supply comments		

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 5 Wastewater

Wastewater Development Assessment		
Peak DWF and WWF Residential Design Flows (L/s)	Routine 0.79 Peak 5.32	*Watercare CoP*
Peak DWF and WWF Non-Residential Design Flows (L/s)		*Watercare CoP*
Further Wastewater comments		

For internal Watercare use only

Date Application Received	
Application Ref No.	
Assigned Connections Engineer	
Prior Developer Correspondence with Watercare	
Neighbouring developments to consider in capacity assessment	