To: Hailey Kim (Auckland Council) **Date:** 19 September 2023

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Subject: Functional need for the pump station / pipe within and adjacent to Wetland C and Wetland D

As set out in the application, Watercare is proposing to install a wastewater pump station (the slaughterhouse pump station) and associated gravity and rising main to support the planned and future development within Whenuapai. An options assessment has been undertaken for the Project, which was provided with the application (refer Appendix J of the application). This sets out the reasons for the Project, and the considerations for the location of the proposed infrastructure, including the location of the pump station.

Notwithstanding this, Auckland Council has asked for further information in relation to demonstrating the "functional need" for the Project, specifically in relation to the location of the pump station adjacent 'Wetland C' and the gravity pipeline which runs through the wetland, as it pertains specifically to the consents sought under the National Environmental Standard: Freshwater (NES: F). In addition, an additional wetland has been identified to the east of the pump station during a site visit undertaken on 28th August 2023 ('Wetland D')(refer to Figure 1). Wetland D is located on a slope and appears to be fed by surface water flows. It is likely to have developed and expanded due to the change in land use at the site (ie. the site is no longer grazed), and the wet conditions in Auckland over the last 9 months. Whilst Wetland D is currently approximately 900 m^2 in size, it is likely to expand and contract according to seasonal changes. Vegetation within the wetland comprises of primarily exotic species. Wetland D is assessed to have low ecological value, consistent with the Wetlands C and A.

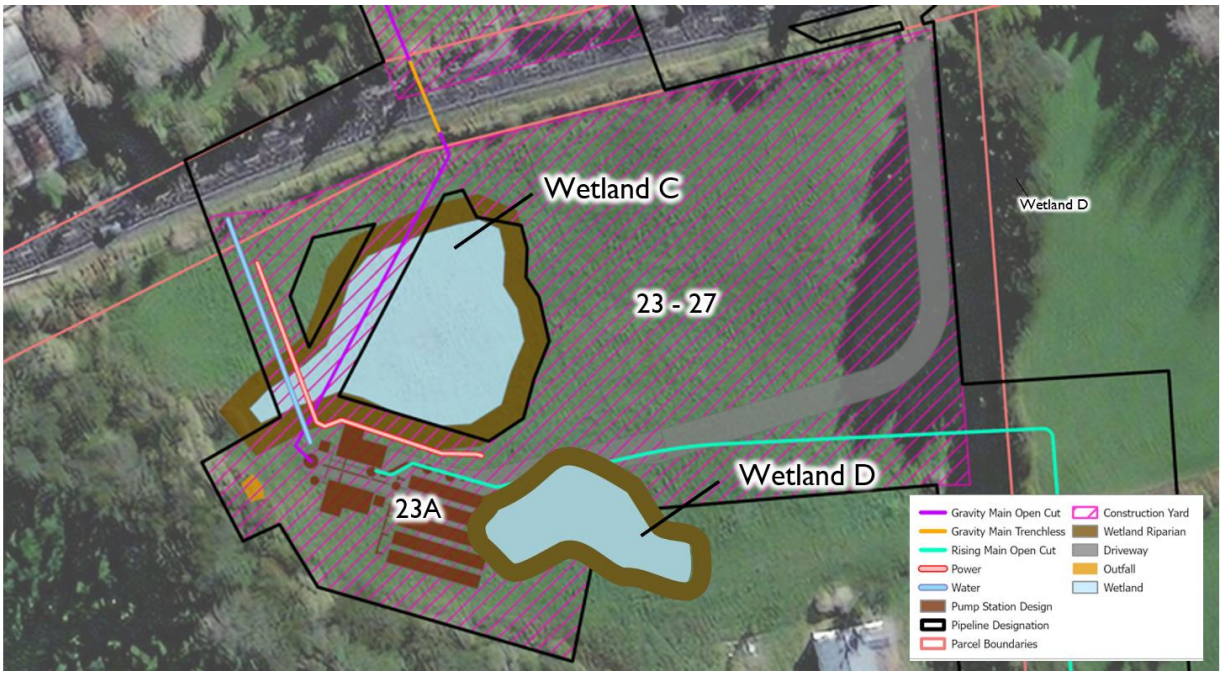

Figure 1. Pump station area, including Wetland C, and indicative area of newly identified Wetland D.

Under the National Policy Statement for Freshwater Management (NPS: F) this project is considered "specified infrastructure". The NPS: F defines "specified infrastructure" to include, among other things '*(a) infrastructure that delivers a service operated by a lifeline utility (as defined in the Civil Defence Emergency Management Act 2002)*'. The Civil Defence Emergency Management Act 2002 further defines 'lifeline utility'

in Schedule 1, and given that the project is being implemented by Watercare, which is "*an entity that provides a waste water or sewerage network or that disposes of sewage or storm water*" (as set out in Schedule 1), then the Project can be classified as "specified infrastructure".

As specified infrastructure, the Project has a consenting pathway where if it impacts a natural wetland under Regulation 45 of the NES: F consent is required for a discretionary activity.

However, as set out in Regulation 45, a resource consent for a discretionary activity can only be granted if the consent authority has satisfied itself that the specified infrastructure will provide a national or regional benefit (Regulation 45(a)), that there is functional need for the specified infrastructure in that location (Regulation 45(b)) and that the effects management hierarchy has been applied (Regulation 45(c)).

Considering these limbs in Regulation 45:

1. The application has set out the reasons for the project which demonstrates the regional benefits of this infrastructure. In summary, the project is needed in order to support the urban development in this area (in relation to Regulation 45 (a)).

2. There is a functional need for the specified infrastructure to be located adjacent to and within the wetland (45(b)). "Functional need" is defined in the NPS: FW[1] as "the need for a proposal or activity to traverse, locate or operate in a particular environment because the activity can only occur in that environment". In summary, and as described in detail in the following, the Project has a functional need to be located and operate in this environment because:

    - The location of the pumpstation is centrally located and one of the lowest parts of the catchment.
        - As a gravity pump station, it is required to be at the lowest part of the catchment which so as this maximises wastewater gravity flows to the pump station. This enables wastewater to flow by gravity to the pump station and reduces the amount of pumping and length of rising main required to the main trunk. The gravity pipework captures wastewater flows from the catchment, and transports the wastewater to the lowest point of the catchment area, which is the inlet manhole to the pump station at Site B (refer to Figure 4 below).
        - Being centrally located enables the pump station to accept some future gravity flows from future pipelines and further removes the need for additional pumpstations and utility network complexity.
    - The location of the pump station at the proposed location also reduces the rising main length, to reduce potential for septicity of the wastewater.
    - Wetlands and streams are naturally at the lowest part of the catchment therefore it is not unexpected that the pump station and gravity pipeline are located within proximity of these features.
    - The pump station requires a suitable receiving environment nearby for an emergency overflow point. Therefore, it is necessary for it to be located within close proximity to a stream.

3. The management hierarchy process has been worked through to reduce impacts on the wetlands (45 (c)). This is described below and in the application. Specifically:

    - The pump station is located outside of Wetland C, but not further east/northeast, to reduce earthworks and potential hydrological impacts on this wetland.

[1] February 2023

- The gravity pipeline has not been able to avoid Wetland C for the reasons set out below. However, Wetland C will be able to be reinstated following completion of the works, and it is anticipated the restoration will lead to positive outcomes for the biodiversity of the wetland.
- The pump station has not been able to avoid Wetland D for the reasons set out below. As Wetland D has only recently been identified, further investigations are currently being undertaken to assess the potential effects of the works on the wetland, and how these effects will be mitigated and / or offset.

Catchments served by the Whenuapai Wastewater Servicing Scheme

As set out in the application, the pump station and associated infrastructure is part of Watercare's long term servicing strategy for the North-West catchments of Auckland. The North-West servicing strategy was developed in conjunction with Auckland Council to address the identified targeted growth areas (called transformation areas) within the Special Housing Act (SHA) that required significant investment to provide utilities and servicing to enable growth.

The North-West Transformation Area (NWTA) of Auckland City includes: Kumeu, Riverhead, Huapai, Whenuapai, Redhill's, Hobsonville Point, Scott's Point and Massey.

The overall concept of the North-West servicing strategy is shown on Figure 1. In general, the pump station will serve as a central collector of gravity flows from the Whenuapai and Redhills catchments, which will then convey flows via a rising main to the Northern Interceptor. The Northern Interceptor is a main trunk sewer which conveys flows via gravity to the Hobsonville Pump station for further conveyance into Watercare's treatment network.

Given this concept, the pump station and associated infrastructure has a functional need to be located generally within the area of the yellow triangle on Figure 1, so as to enable the gravity flows of wastewater from the Whenuapai and Redhills catchments to be collected at the pump station.

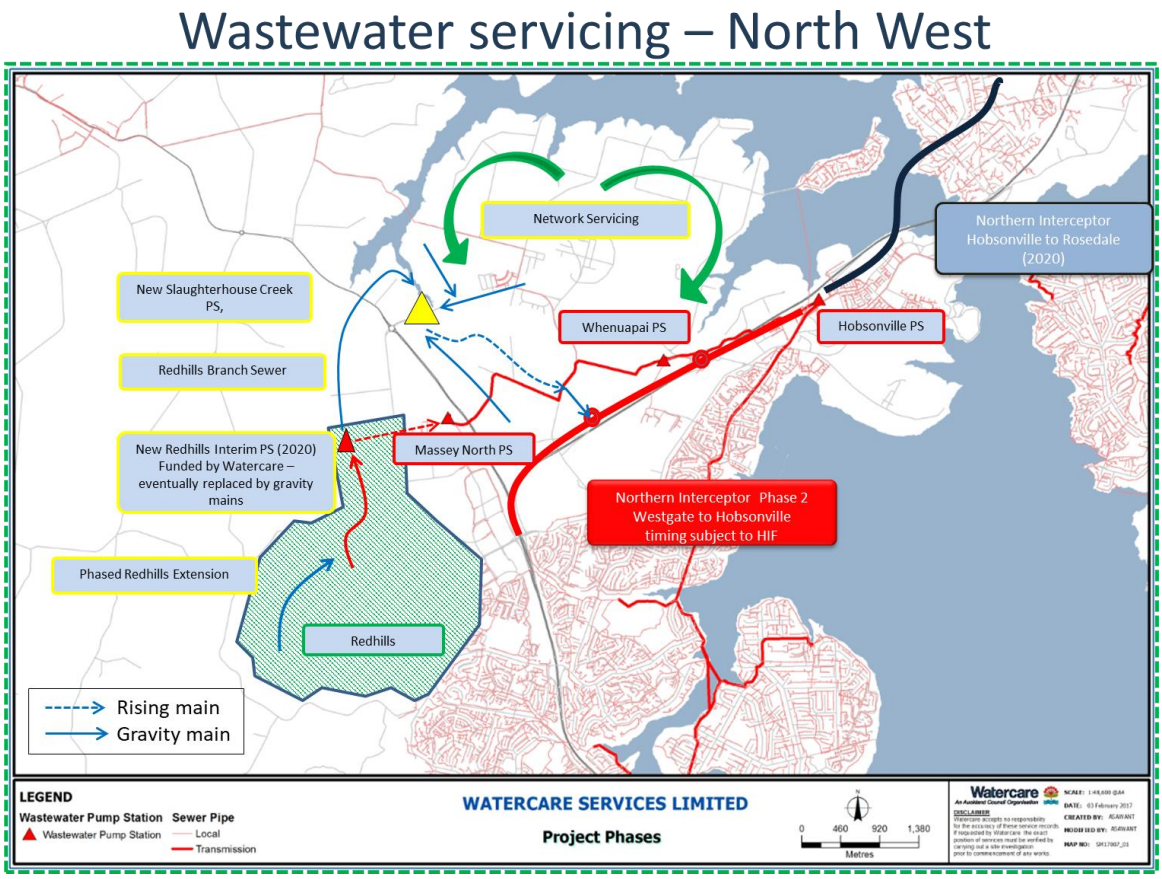

Figure 2: WSL NW Servicing Strategy for Whenuapai and Redhills (indicative required location of proposed pump station shown by yellow triangle)

The pump station is also required to be sized to manage the flows of up to 12,300 people by 2031 (refer Table 1), after which additional wastewater infrastructure may be required.

Table 1: Projected Flows for North West

	2021	2026	2031	2036	2041	2046
Whenuapai	2,400*	4,300	6,300	8,300	10,200	12,000
Redhills	230	3,000	6,000	9,000	11,500	14,000
Total	2,630	7,300	12,300	17,300	21,700	26,000
Peak Wet Weather Flow (L/s) **	81	230	320	542	677	813

* Includes properties that are currently on septic tank.

** Flows are based on 3 people per dwelling

Location of the pump station and associated infrastructure within the site

The main factors considered when locating the pump station were:

- Maximising the operational functioning of the network;
- Centrally located within the Whenuapai and Redhills catchments;
- Collecting the wastewater by gravity mains as far as practicable; and
- Minimising the length of rising main to reduce potential septicity of wastewater.

The efficient and effective functioning of the network was a key consideration when locating the pump station. The pump station location needed to be a low enough elevation to enable all sources of wastewater in the Whenuapai and Redhills catchment to drain to it by gravity. Equally important was for the location to be one that minimised the length of the rising main required to pump the collected wastewater to the main trunk, to reduce the time the wastewater spends in the pipe and therefore the risk of the wastewater turning septic. Once the wastewater turns septic it is hard to move along and can cause issues once received at the treatment plant. Furthermore, there is a hydraulic “balance” that must be achieved between the length and size of the rising main, and the size of the pumps required to pump the wastewater through the rising main, as the size of the pumps is the main driver of the size of the pump station, which significantly influences the duration and extent of the excavation and other construction activities to build the pump station.

The proposed location of the pump station is one which has been assessed as the best location for the most efficient functioning of the wastewater network, maximising the gravity flow into the pump station, whilst minimising the rising main connection to the Northern Interceptor.

Other considerations when selecting the location included the need for there to be sufficient space for the pump station, including being accessible for maintenance and repair activities, and having sufficient space for personnel to safely access and operate the pump station's equipment, including lifting pumps, working on valves, and control systems. The proposed location has sufficient space for the pump station, and good connections via the new Spedding road to enable access and maintenance.

Recognising the potential impacts on the wetland and the adjacent stream, other configurations were considered on the site, in particular in relation to identifying opportunities to move the gravity main outside of the wetland.

Consideration was given to the matters below, which are indicatively illustrated in Figure 3 below:

1. Whilst the best location for the pump station would have been within Wetland C itself (as the lowest point on the site), the design team were able to locate the pump station just outside of the Wetland C area, but also within proximity to the stream to enable provision of an emergency overflow from the pump station.

2. Moving the pump station further east and/or north/east. This was discounted as the contours on the site would mean that there would be significant excavation required over and above what was already required, to get the required depth of the pump station. This would have greater environmental effects associated with earthworks and potentially greater dewatering impacts on Wetland C, and may also affect Wetland D. Deeper excavations and the associated increase in duration required not only pose greater effects to the environment (e.g., drawdown of the wetlands over time) but also increase the health and safety risks to plant and personnel working on the site. Furthermore, a deeper pump station also results in a larger pump station footprint due to structural and operation requirements of being deeper underground. The larger and deeper pump station will effectively increase construction carbon emission and built carbon (more concrete, steel, material etc.).

   Finally, the location in question is owned by a private developer. During negotiations with the developer for the pump station land purchase, they understood the logical location for the pump station which matched their preference for the pump station to be located outside of the prime developable land. The use of the site would be further compromised by siting the pump station in the middle of an area surrounded by residential sites with clearances required and reduction in net area available for development.

3. Keeping the pump station where it is but having the gravity main extend around the eastern side of Wetland C. This was discounted because:

   - To the east of Wetland C, the topography rises, therefore the gravity pipe would have to be approximately 3 metres deeper to maintain a down-slope grade. Constructing the gravity pipe at this depth would require a significantly greater area and volume of excavation and increased dewatering timeframes, with subsequent greater effects on Wetland C. Specifically, increasing the depth of the gravity main increases the benching and trench width required to reach that depth, which would mean the excavations would extend towards (and potentially into) Wetland C resulting in greater effects than the current proposal.
   - This is also a longer route to the inlet manhole, which would result in a deeper pump station design, with all associated increased construction risk, increased cost, increased construction dewatering, and associated effects on the environment.
   - The gravity pipe would have to traverse through the compact pump station site to reach the inlet manhole (lowest point) while avoiding other pump station assets, which will likely require an expanded pump station footprint to accommodate the extra pipework or the gravity main installed under the pump station, requiring a deeper inlet structure with an additional primer pump.
   - The current gradient of the pipeline is at the limit of the allowable range in the codes and standards for wastewater pipelines, meaning the pipe cannot be “shallowed up” any further.
   - Any change in direction of the gravity main requires an additional manhole. Rerouting the gravity main would require somewhere in the order of 3 to 5 additional manholes. Considering each manhole construction would be approximately 7 metres deep and 1.5 metres in diameter, the establishment of additional manholes would require a significantly greater area and volume of excavation, compounding the effective earthworks volumes, construction duration and drawdown of the wetland. Furthermore, increasing the number of manholes on a gravity main that has a shallow gradient decreases the hydraulic capability of the main and increases the risk of stagnation and septicity due to misalignment,

this could require an increase to the pipeline diameter which would have greater environmental effects due to the associated increase in excavations etc.
- The ground conditions in this area and the required gradient are not conducive to trenchless installation methods to install the gravity main in part or in full, thus open trench excavation has been proposed.
- It is key to understand any additional pipe depth due to the route topography results in deeper trench for construction, encountering lower groundwater level, increasing dewatering duration and volume, and ultimately greater risk of groundwater table drawdown and risk of settlement.

4. Keeping the pump station as it is but having the gravity main around the western side of Wetland C. This option was discounted because:

- To the west of the wetland, the Wetland C riparian margin meets the riparian margin for Sinton Stream.
- There is no corridor for the gravity pipe to pass through on the west without affecting either Wetland C or the stream. The project team recognizes the value of the riparian margin and protections provided to it. Any construction through this area would likely result in the damage or removal of the riparian planting.
- There are significant construction difficulties and long-term stability considerations with locating the gravity main near the slope face to the stream. This route would increase the risk of erosion of the stream banks, and increased sediment in the stream, as well as health and safety for construction near the face of the stream working over water.
- Any change in direction of the gravity main requires an additional manhole. Rerouting the gravity main would require somewhere in the order of 3 to 5 manholes. Considering each manhole construction would be approximately 7 metres deep and 1.5 metres in diameter, the establishment of additional manholes would require a significantly greater area and volume of excavation, compounding the effective earthworks volumes, construction durations and drawdown of the wetland. Furthermore, increasing the number of manholes on a gravity main that has a shallow gradient decreases the hydraulic capability of the main and increases the risk of stagnation and septicity due to misalignment, this could require an increase to the pipeline diameter which would have greater environmental effects due to the associated increase in excavations etc.
- The ground conditions in this area and the required gradient are not conducive to trenchless installation methods to install the gravity main in part or in full, thus open trench excavation has been proposed.
- It is key to understand any additional pipe depth due to the route topography results in deeper trench for construction, encountering lower groundwater level, increasing dewatering duration and volume, and ultimately greater risk of groundwater table drawdown and risk of settlement.

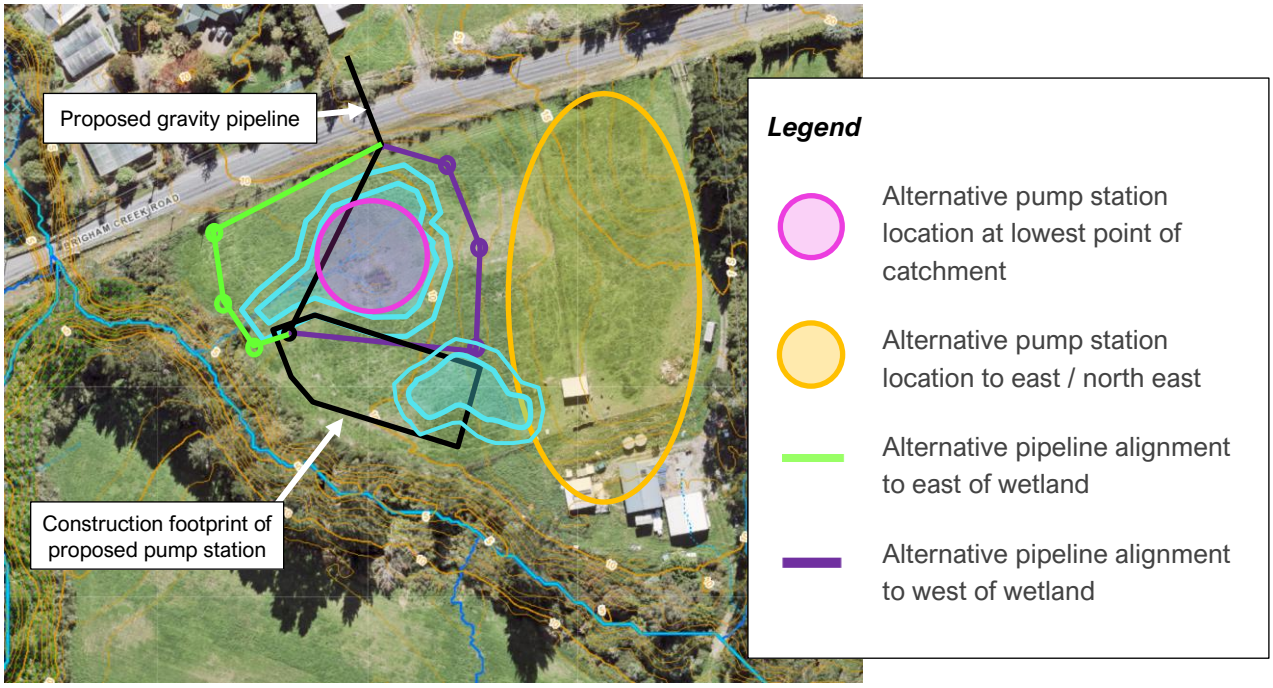

Figure 3. Considerations for pump station and gravity pipeline location

In summary, given the functional need for the pump station and associated infrastructure to be located at the lowest point on the site to provide the most efficient hydraulic functioning of the infrastructure, the proposed location and configuration of the pump station and associated infrastructure is the best available option because:

- The pump station is at the lowest possible elevation providing for the most efficient hydraulic operation of the network, whilst being outside of Wetland C itself. This maximises gravity flows to the pump station and minimises the extent of the rising main (and associated septicity issues).
- There are no alternative gravity main alignments which would not impact Wetland C, as any other location on the site would require greater excavations, with associated greater environmental effects including increased drawdown of the wetland.
- The location of the pump station in proximity to the stream enables the provision of an emergency overflow from the pump station.
- Whilst the pipeline will traverse Wetland C, the disturbed area of the wetland is proposed to be reinstated and given the current poor quality of the wetland, the mitigation will provide the opportunity to provide an overall improvement to the quality of the wetland. Furthermore, the relative simplicity of a short, straight gravity main section through the wetland and the shorter construction duration (relative to the other discounted alignments) is believed to have the least effects on the wetland.
- Whilst works within Wetland D have not been able to be avoided, the effects will be mitigated through the effects management hierarchy. This may include reinstatement of the wetland, and / or offset mitigation through restoration of a wetland in an alternative location.

Other sites considered

As set out in the Assessment of Alternatives report[2] provided as Appendix I to the application, during the development of the project 6 sites were considered as a potential location for the pump station (Options A to D – see Figure 3 and Figure 4 below).

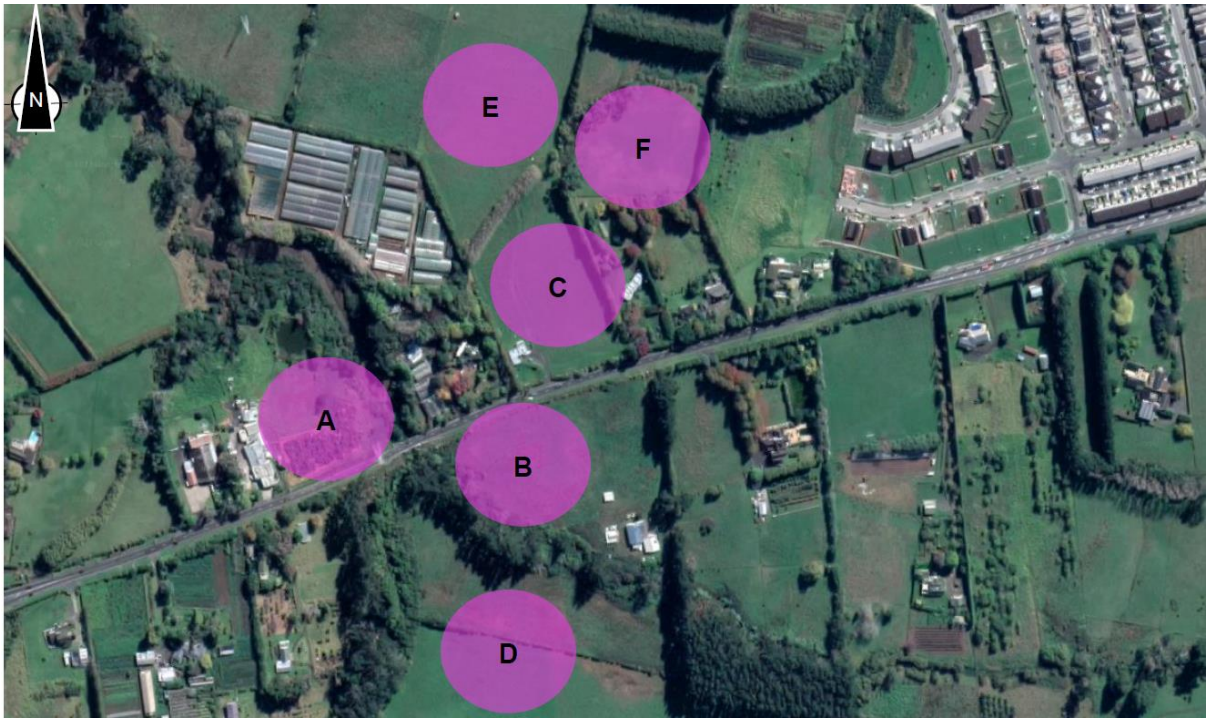

Figure 4: Options considered for the location of the pump station

All of these sites are close to or have wetlands and/ or streams within proximity (see Figure 3).

[2] Whenuapai Wastewater Servicing Scheme Phase 1 – Alternatives Assessment, prepared by Beca Ltd, dated 28 October 2022

Figure 5: Hydrological features within proximity of the potential pump station locations

Table 2 below summarises the options considered and the reasons the proposed pump station site was selected.

Table 2. Summary of all alternative sites considered (green shading preferred, yellow shading indicates short listed options, no shading indicates long list option)

Site	Location	Environmental Features/ Constraints	Operational considerations	Constructability/Other Constraints	Comments	Outcome
A	16 Brigham Creek Road Owned by Watercare	Wetland located within the site	A high voltage electricity pylon on the site also introduced operational risks.	Site would require construction of a substantial pipe bridge. Presence of a high voltage electricity pylon on the site also introduced construction risks.	On short list because site owned by Watercare However, to enable construction of the pump station the whole wetland would require reclamation and significant off set mitigation and compensation for its loss.	Discounted
B	23A Brigham Creek Road Owned by Watercare	Pump station able to be located outside of Wetland C. Steep contours to Stream. Sinton Stream has higher flow than Slaughterhouse Stream to receive overflow flows. Not located within flood plain.	Centrally located at the intersection of the Redhills and Whenuapai catchments to maximize collection of gravity flows to the pumpstation. Access to Brigham Creek Road from Spedding Road Stream provides for emergency discharge point	Contour across site means large amount of earthworks – need for mitigation to minimize impacts of dewatering on wetland. Some risks with instability or stream bed deposits, requires careful siting.	Pump station located outside of Wetland C, and outside of area of slope instability. Temporary impacts to Wetland C during construction, but able to be mitigated onsite with an overall improvement in wetland.	Preferred

Site	Location	Environmental Features/ Constraints	Operational considerations	Constructability/Other Constraints	Comments	Outcome
C	20-22 Brigham Creek Road	Much of the site located in proximity to the stream is a flood plain. Slaughterhouse Stream has lower flow than Sinton Stream to receive overflow flows.	Less suitable for accommodating future connections to nearby catchments. Located within floodplain – not preferred given potential impacts related to impacts on electrical components and potential access constraints during a flood event. Long access road required to Brigham Creek Road, potential limited access for heavy vehicles.		Not preferred as in a floodplain.	Discounted
D	23-27 Brigham Creek Road	Several streams	Less suitable for future connections to neighboring catchments. Substantial pipe bridge required over Sinton Stream, introduces weak point / risk into network during extreme weather events.	Longer dedicated access road would also be required.	More significant infrastructure required, including the access road and multiple stream crossings	Discounted
E	20-22 Brigham Creek Road	Several streams required to be crossed	A significantly longer rising main pipeline (and associated septicity) compared to options A, B, C, and D Deeper pump station to accommodate the gravity flow from the new Oyster Capital gravity main to the pump station.	Extensive dedicated access road and bridge Requires multiple stream crossings. More significant excavation associated with deeper pump station.	More significant infrastructure required, including the access road and multiple stream crossings	Discounted

Site	Location	Environmental Features/ Constraints	Operational considerations	Constructability/Other Constraints	Comments	Outcome
F	26 Brigham Creek Road	Several streams adjacent to the site	Requires a significantly longer rising main pipeline (and associated septicity issues) compared to options A, B, C, and D, Deeper pump station to accommodate the gravity flow from the new Oyster Capital gravity main to the pump station.	Lengthy dedicated access road spanning over at least 2 private properties	Not preferred given more significant infrastructure required, and private property requirements	Discounted