

Report

Drury South Water and Wastewater Servicing Options

Prepared for Stevenson Group Ltd (Client)

By Beca Infrastructure Ltd (Beca)

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1 Introduction

The Drury South Business Project (DSBP) proposes the development of approximately 223 Ha of 'Land Extensive Business Activity' land (within a total study area of around 361 Ha), which is anticipated to provide employment for approximately 6,880 people when fully developed (around 2025-30). The project is located in the Drury basin, to the east of the State Highway 1 Motorway (SH1), between Drury interchange in the north, and Ramarama interchange in the south. The DSBP area lies within the Franklin Ward of the Auckland Council and across the boundary between the Papakura and Franklin District Plan areas. Drury Quarry is located at the base of the Hunua foothills on the eastern edge of the project area, with the Quarry Zone extending into the project area. Figure 1 shows the location of the project.

The DSBP responds to the following strategic imperatives:

- n The regional significance of Stevenson Drury Quarry (as a substantial aggregate resource with in excess of 150 years of aggregate resource remaining) and the need to manage the impact of reverse sensitivity pressure from adjoining sites and vehicle movements.
- n An objective established by the former Papakura District Council to provide further capacity for local employment and business growth through the establishment of a 'construction cluster'.¹
- n The shortage of business land in the Auckland region, particularly for industrial business including manufacturing, wholesale trade, construction, transport and storage.

As the DSBP area is currently zoned for rural purposes, plan changes to the Papakura and Franklin District Plans are required for the project to proceed. Because the DSBP area lies outside of Auckland's metropolitan urban limits (MUL) an amendment to the MUL through a change to the Regional Policy Statement will be required to allow the district plan changes to proceed. The amendment to the MUL in turn requires an application for a stormwater network discharge consent (NDC). The land required for key public infrastructure including roads, stormwater management and public open space is anticipated to be secured through a Notice of Requirement (designation) process to ensure the timely and coordinated implementation of these infrastructure components. These Notices of Requirement would need to be initiated by Auckland Council, Auckland Transport and NZTA as the relevant requiring authorities. This report forms one part of the overall suite of documents that inform those planning processes.

¹ Papakura District Council, Economic Development Strategy (2007)

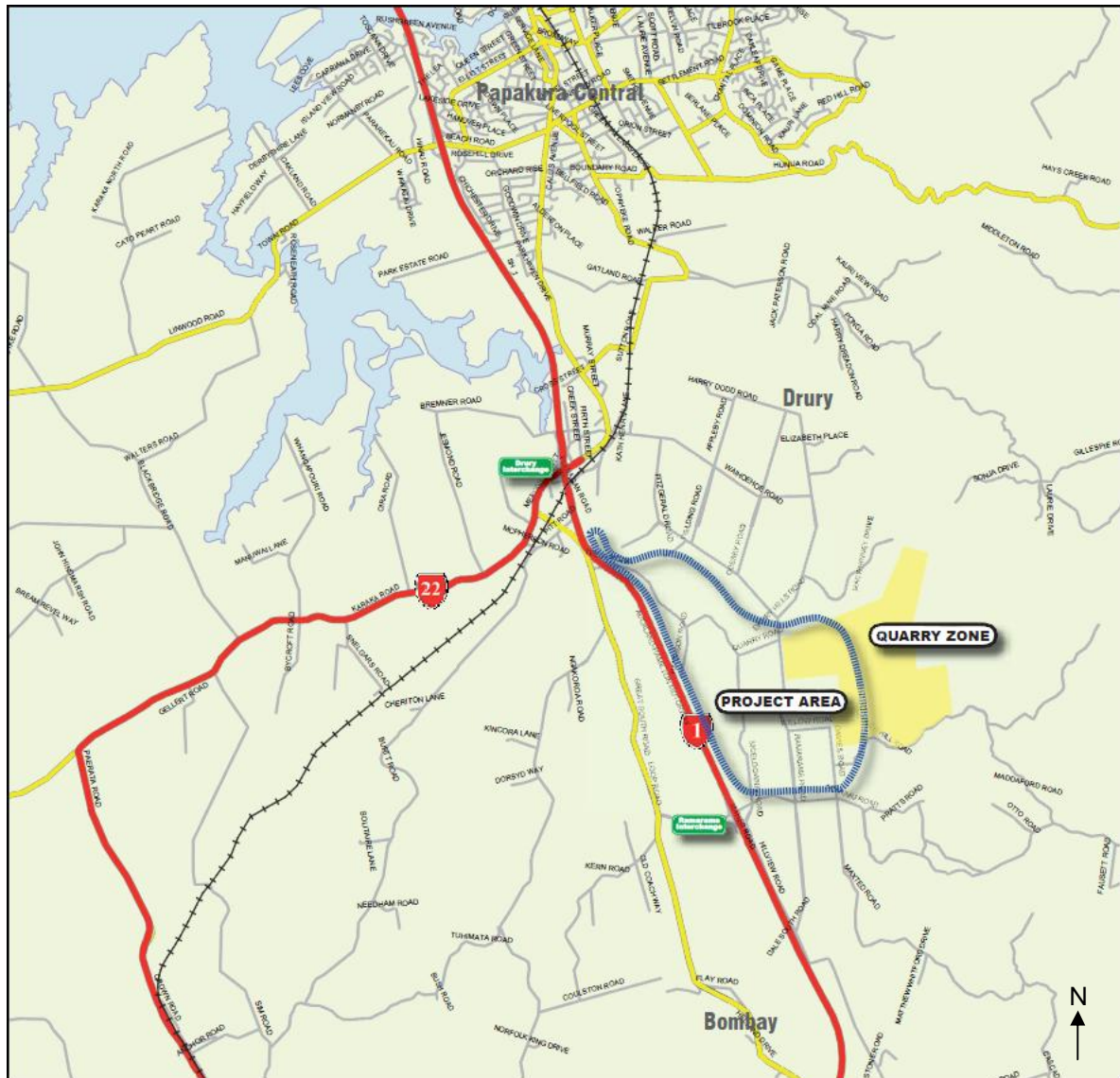


Figure 1 Location of Drury South Business Project

2 Background

The purpose of this report is to describe how the Drury South Business Project (DSBP), a potential 223 ha industrial site in Drury could be serviced for potable water and wastewater. The report describes likely servicing options on site as well as external implications for infrastructure and is intended to accompany the District Plan Change request and the application for an amendment to the Auckland Metropolitan Urban Limit.

Two approaches to the servicing strategy for both water and wastewater have been considered. The first approach was the traditional approach, where services for supply, treatment and collection of water and wastewater are provided to the site by external suppliers. The second was a three waters strategy which seeks to maximise the use of water resources on site. The traditional

approach is described in section 3 of this report, whilst the three waters approach is described in section 4.

Examination of both approaches has demonstrated that the area can be serviced for water and wastewater using a combination of resources internal and external to the proposed site.

2.1 Physical

The proposed development straddles the boundary between the Papakura and Franklin District Plan Areas. As the area is predominantly rural, at present there is currently minimal local water or wastewater infrastructure (both reticulation and treatment) in the immediate vicinity of the site. Further, neither the former Papakura nor Franklin District Councils anticipated the need for reticulated water supply or wastewater collection in the proposed development area in their respective Long Term Council Community Plan (LTCCP) reports.

Water and Wastewater Providers

2.1.1 Auckland Council Establishment

Auckland Council was established on 1st November 2010 and provision of all regional water and wastewater services became the responsibility of the Council Controlled Organisation, Watercare.

2.1.2 Franklin District Plan area

In the Franklin District Plan area, water and wastewater activities are managed by Watercare. The water supply activity provides potable water to thirteen townships across the District Plan area, of which the closest of significant size (demand) is the Pukekohe / Paerata supply, which is served by a mixture of springs and bores, but is still around 10km from the site.²

The wastewater activity maintains five sewer systems and treats sewage from 10 communities across the District Plan area. Again, the closest system of any size is the Tuakau WWTP, which is situated ~4km west of Tuakau (i.e. about 16-18km south-west of the proposed development) and services Pukekohe and the surrounding area. The main projects described in the former council(Franklin District)'s Asset Management Plan (AMP) include upgrading the trunk sewers from Pukekohe and Tuakau to the treatment plant, and upgrading the treatment plant to provide improved performance and capacity.³

2.1.3 Papakura District Plan area / United Water

Prior to 1 November 2010, water supply and sewerage services were provided by United Water International Pty Ltd (UWI) under the long-term (50-year) Papakura District Water and Wastewater Franchise Agreement. This agreement has now been novated to Watercare and the two relevant parties are UWI and Watercare.

² Ref: Franklin District Council Water Supply Activity, AMP, Version 2006/7.

³ Ref: Franklin District Council Wastewater Activity, AMP, Version 2006/7.

Watercare's role is limited to monitoring delivery of services and co-ordination of delivery of other services and infrastructure. Consideration will have to be given to the way that the development would be viewed under the on going agreement between Watercare and UWI.⁴

Downstream of the bulk supply points, potable water is supplied to consumers on the reticulated supply through the UWI operated water reticulation system. The supply of drinking water to rural properties is primarily via non-reticulated sources such as rain tanks and the occasional groundwater bore.

Urban wastewater is collected by the pipe network, managed by UWI, and routed to the trunk mains, for treatment at the Mangere Wastewater Treatment Plant. The disposal of wastewater from rural properties is primarily via the use of septic tanks and associated disposal fields on private property.

The closest UWI-operated water supply and wastewater systems serve South Papakura, some 5.5 km north of the proposed development site.⁵

2.1.4 Watercare Services Limited

Watercare supplies potable water to the Papakura District Plan area from the Ardmore Water Treatment Plant (and previously from the Papakura Treatment Plant).

Watercare's Waikato pipeline passes to the western side of the DSBP area and at its nearest point is less than 1 km from the development area. The pipeline transports treated water from its Waikato Treatment Plant at Tuakau to its reservoir complex at Redoubt Road in Manukau City.

The closest section of Watercare's trunk wastewater network is the pump-station at the site of the now-decommissioned Drury oxidation ponds. The relatively new pump station, known as DPS63, is understood to have a design flow rate of around 100 l/s. The pump station is approximately 4 km from the northern end of the proposed site of the DSBP industrial development, on the western side of SH1 and the main north-south railway line.

The rising main from DPS63 transfers the wastewater to a gravity section of the system for connection to the Papakura South Branch Sewer, about 2 km further north. The first "major" pump station in the reticulation network is DPS49, which is located towards the southern end of Manurewa, to the west of the Great South Road intersection, a further 5 km north of Papakura.

3 Servicing Options Considered

3.1 Internal Servicing Options and Requirements

3.1.1 Water Supply Servicing

⁴ Ref: Progress Papakura LTCCP, Volume 1 – Community Plan, and Volume 2 – Activity Statements.

⁵ Ref: PDC Assessment of Water and Sanitary Services in Papakura District, March 2005.

The key water supply servicing requirements for DSBP are to ensure sufficient supply capacity to simultaneously meet both the development demand and the fire fighting demand.

The development water demand has been calculated using the demand value of 35l/s/100ha. This is the average industrial demand given by Watercare's reticulation guidelines⁶. The fire fighting demand was developed from SNZ PAS 4509/2008 New Zealand Fire Service Fire fighting Water Supplies Code of Practice, using example 1, page 21. The resulting water demand for DSBP is given in Table 1 below. Further details on the development of potable water design flows for Drury can be found in Appendix A.

Table 1 - DSBP Potable water demand

	Development demand	Fire fighting demand	Total DSBP water demand
Potable water requirements (l/s)	78	150	228

A preliminary layout of a traditional potable reticulation system has been developed to demonstrate that all of the proposed sections are serviceable. A traditional ring main has been applied around the development, with connecting lines supplying the inner streets. It has been assumed that the water supply connection will be either directly from the Waikato pipeline, or from a service reservoir provided near the development. These options are discussed further in Section 3.2; however they make minimal difference to the internal layout. Pipe sizing details can be found in Appendix B, with a layout schematic in Appendix C.

3.1.2 Wastewater Servicing

The traditional approach to wastewater reticulation encompasses a primarily gravity feed system, with pumping as required to the discharge point. The wastewater demand for the DSBP has been developed using Watercare's Wastewater Reticulation design guideline and resulted in the design wastewater flows given in Table 2 below.

Table 2 - DSBP Wastewater Design Flows

	Average flow (l/s)	Peak wet weather flow (l/s)
DSBP design flows	78	128

Further detail on the development of design flows can be found in the Watercare file note dated 14th January 2010, in Appendix D.

The DSBP site generally falls towards the Hingaia Stream, with flat gradients along the road running up the western edge of the site. In order to achieve the minimum gradients required in a sewer network, 3 pump stations are likely to be required, further detail can be found in Appendix A. A concept layout and network sizing has been completed, with preliminary network sizing given in Appendix B and the network layout in Appendix C.

3.2 External Servicing Options and Requirements

3.2.1 Water Supply

⁶ Watercare Services Ltd, Guidelines for Design of Wastewater Reticulation and Pumping Stations, Watercare Reticulation Guidelines.

Reliability of supply and ability to meet peak demands are the key requirements of providing potable water supplies. The average water and wastewater demand of the development is likely to be 78l/s, with the peak demand of 228l/s. Therefore the water infrastructure should be sufficiently large to provide this peak flow.

It is normal practice to provide contingency arrangements (security of supply) in the event of failure of the main supply. This is normally satisfied by the provision of a service reservoir, the water from which would be used in the event of a failure of the mains supply. In this case a storage reservoir would be provided on the site or nearby with a volume to provide between 24 hours and 48 hours of water at average demand flow rates.

a. Options

i. Extend supply from Papakura Water Supply Network

The Papakura potable water reticulation network is around 4km to the north on the DSBP site. Papakura is supplied by the Ardmore treatment plant and has service reservoirs built into the system. Providing a connection to the DSBP would require roughly 4km of new pipeline, with additional upgrades required in the Papakura network. Early discussions with Watercare indicated that this option was not likely to be feasible due to the high demand of the DSBP relative to the available capacity in this network and treatment available at the Ardmore treatment plant.

ii. Provide direct connection from Waikato pipeline

The Waikato water supply pipeline runs past the site, around 1km from the DSBP site boundary. This pipeline supplies a high volume of potable water to the Redoubt Rd reservoir complex in Manukau City. Discussions with Watercare have indicated that providing the DSBP with a direct connection to the Waikato pipeline is feasible and that the direct connection would be capable of meeting the peak supply requirements.

There are currently no other direct connections from the Waikato pipeline and water currently flows via the Redoubt Road service reservoirs which provide for the security of supply to the downstream network, in the event of the Waikato supply being offline.

As the DSBP is upstream of the Redoubt Road reservoirs, security of supply could be overcome through provision of a service reservoir at or close by the DSBP site. Alternatively, it is understood that Watercare is investigating the feasibility of upgrading the Redoubt Rd facility such that back-pumping can be provided to the Waikato pipeline to provide security in the event of the Waikato supply being offline.

iii. Water supply from ground or surface water source

There are potentially four aquifers thought to underlie the DSBP Site. Two of these, the Kaawa and the Drury Sand Aquifer, are identified in the Auckland Regional Plan: Air Land and Water (ARP:ALW) maps as within a high use aquifer management area. This means that the aquifer's potential water supply capacity is more than 50% allocated, the aquifer is a major source of spring and stream flow and/or is adversely affected by over pumping or likely to become so being in an area of high potential growth. Therefore it is unlikely that these aquifers will be able to provide a water source for the DSBP area.

In addition, the use of surface water as a water supply source is unlikely to be feasible as there are no water sources in the vicinity that are likely to have sufficient capacity or water quality to reasonably supply the full DSBP supply needs.

Either ground or surface water options would require further treatment and a supply reservoir in order to provide potable water standards.

b. Discussion of Options

Due to the lack of available water resource, **water supply from ground or surface water source** would appear to be infeasible and would likely require the provision of a dedicated treatment facility and is thus not a favourable option.

The option of **extending the supply from Papakura water supply network** will bring with it the need to provide a pipeline of some distance to the DSBP, may require upgrades of the Ardmore WTP facility, service reservoirs or major upgrades to the water reticulation network in Papakura. It is likely that these upgrades would come with significant costs and thus this option is not favoured.

The most favourable option is the provision of a water supply from the **Waikato Pipeline** as the pipeline is immediately adjacent to the site and has adequate capacity available in the pipeline. To provide for the security of supply there may be a need to provide a service reservoir on or adjacent to the DSBP site. The construction of a service reservoir in this area could provide for a reliable water source for other developments in the area.

Discussions with Watercare have indicated that the approximate cost of the bulk supply point and a service reservoir to provide a supply from the Waikato pipeline would be in the order of \$7M. Costs have not yet been determined for the other water supply options, as they weren't as attractive as the Waikato pipeline option.

3.2.2 Wastewater

The average and peak wastewater flows anticipated for the fully developed DSBP are 78 and 128l/s respectively. The internal wastewater network will terminate to a single point, from where it will be discharged to an external or internal treatment facility prior to discharge to the environment. Three potential discharge options have been identified as described below.

a. Options

i. Discharge to the Mangere WWTP via Southern Interceptor

The Southern Interceptor is part of Watercare's trunk wastewater collection system and at its nearest point (at the junction with the Papakura Branch Sewer) is around 5km north of the DSBP. The Southern Interceptor conveys flows to the Mangere WWTP via the pump station DPS049, near Wattle Downs. The Mangere WWTP is subject to consent conditions that limit the discharge of treated wastewater to the Manukau Harbour.

The interceptor is currently nearing capacity, with several upgrades planned in the next 35 years to ensure an adequate level of service is maintained. Currently planned upgrades include duplicating a section of the interceptor and installing 2 storage tanks upstream of DPS049, which are estimated to cost around \$13M in total. These upgrades are planned for 2025 and 2035.

In conjunction with Watercare, the upgrades required to accommodate future flows including those from DSBP have been determined. The remote location of the DSBP from the WWTP means that an alternative and larger solution upstream of DPS049 will be required. This will require some additional sections of the Southern Interceptor to be upgraded beyond that already planned. The cost of these upgrades has been estimated at \$25.5M, including the \$13M already planned by Watercare.

In addition to this there would be a need for a pump station and a rising main to convey flows to the Southern Interceptor at its junction with the Papakura Branch Sewer. The cost of this pump station and rising main has been estimated at \$17M.

The overall cost therefore for both the upgrade to the Southern Interceptor and the new assets to transport flows to the Southern Interceptor would be \$42.5M (\$22.5M upgrade of Southern Interceptor plus \$17M connection to the Southern Interceptor).

A diagrammatic representation of the network and the anticipated upgrades are presented in Figure 2 below.

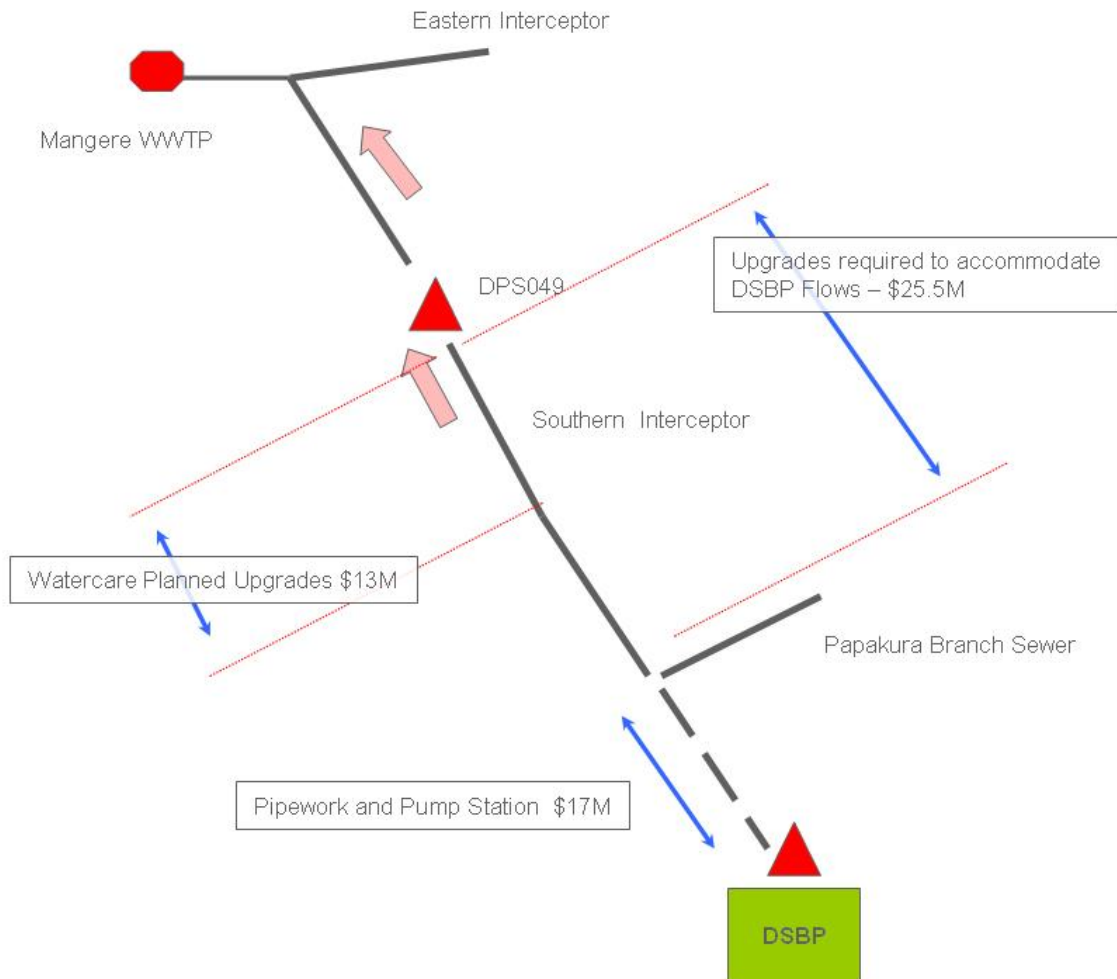


Figure 2 – Diagrammatic Representation of Planned and Required Wastewater Network Upgrades

Further details of this option and estimated costs are given in Appendix D.

There is some uncertainty concerning the timing of the development of DSBP relative to the timing of the planned Watercare upgrades and further discussions with Watercare would be conducted to identify the appropriate timing and cost allocation for the Southern Interceptor upgrades.

ii. Discharge to Tuakau WWTP

The Tuakau WWTP is around 21km from the DSBP and primarily services the areas of Pukekohe and Tuakau. The treatment plant discharges to the Waikato River a different water body to the other discharge locations considered in this report.

Discharging to the Tuakau WWTP would require a 21km pipeline, connecting DSBP directly to the WWTP. Alternatively this pipeline length may be reduced to around 17km if flows were discharged to the Pukekohe interceptor which transports flow to the Tuakau WWTP. In both cases the initial 10km of the pipeline route undergoes a significant elevation change of around 120m and will require a 2 stage pumping arrangement to convey flows. For the remaining 11km flow will be transported by gravity. Further details of this option are given in Appendix D of this report.

Cost estimates for the 21km pipeline and pumping stations are \$40,6M. Operating costs of this option are expected to be relatively high due to the high pumping requirement and there is no ability to stage the connection option. Further discussion is required to ascertain the available capacity at the Tuakau WWTP and the staging of any planned upgrades with its current and potential future owner.

iii. Onsite WWTP

An onsite WWTP has been assessed as a high level option due to the distance of DSBP from existing infrastructure. Only preliminary estimates of the volume and nature of the wastewater that will be treated are presently available and therefore the type of technology required and hence costs are also preliminary at this stage. For the purpose of this comparison with external discharge options, the use of a Membrane Batch Reactor (MBR) plant has been assumed.

An MBR plant with a capacity of 11.ML/d has been assumed to determine rough order of costs associated with providing wastewater treatment on-site. The flow rate is based on the wastewater demand used in the other options. Wastewater would be treated to a high level at this plant and flows would most likely be discharged to the Hingaia Stream. Alternative use or land disposal could be further investigated with this option; however this would come with additional cost.

The estimated cost for an onsite WWTP is \$ 45M. Additionally, ownership and operating responsibilities would need to be established. It is likely that this option could be phased as development progresses; however discharge consent requirements would need to be agreed from plant start up. A discussion of these options is provided below.

b. Discussion of Options

The provision of an **onsite WWTP** brings with it the potential for beneficial reuse and a potential for land disposal. The likely modular construction of such a facility has the potential to be able to match treatment capacity with needs and there would be no need for off site construction as there would be with the other options considered. However, the likely discharge point for the treated wastewater will likely require a very high level of treatment and hence cost (\$45M) and consenting the discharge could be a long and costly process. With this option the ownership and long term operation of the plant would need to be resolved.

The **discharge of wastewater to Tuakau WWTP** will require discharge of flows a considerable distance from DSBP with, due to the topography, significant pumping requirement and cost (\$40.6M). Due to the size of the discharge from DSBP, relative to the capacity of Tuakau WWTP it is likely that much of the available capacity will like be taken up to accommodate the DSBP discharge. However, because the discharge point, being the Waikato River, is under less pressure than the Manukau Harbour, this option may be easier to consent.

The discharge of flow to the **Mangere WWTP via the Southern Interceptor** has the benefit of largely being consistent with Watercare's plans to increase the capacity of the Southern Interceptor. This option is also likely to have lower operating costs than the other options but, because of discharge limits on the Mangere WWTP, provides Watercare less flexibility in terms of regional treatment than the other options considered. Whilst the cost of both parts of the option described above totals \$42.5M (\$25.5 + \$17M) and therefore is comparable with the other options, if the \$13M of Watercare planned upgrade is considered then it is an attractive option with the net additional cost of providing a wastewater service for DSBP being \$29.M.

3.3 Three Waters Servicing Option

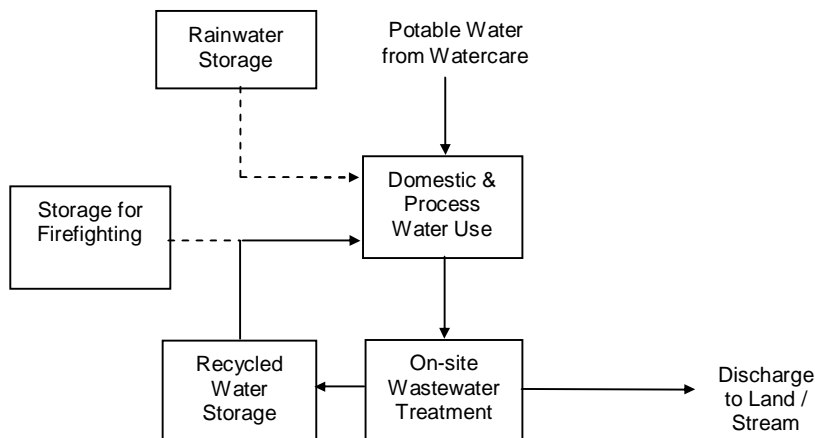
Applying an integrated approach to the management of potable water supply, wastewater treatment and disposal and stormwater collection, treatment and disposal has been considered for the DSBP to maximise the use of resources and minimise the required connections to external services. The three waters approach aims to reduce the net water impact of the development, through considering water reuse and alternative disposal options to reduce the total water demand, discharge requirements and stormwater impacts of the site. Further details on the Three Waters concept can be found in Appendix E.

A conceptual design was developed for DSBP which considered the following key ideas:

- n The commercial/industrial nature of the proposed development offers the opportunity to actively promote water demand management and beneficial use of stormwater and treated wastewater for non-potable and industrial purposes.
- n Rainwater collected on-site can be used as a source of non-potable water and can have benefits in relation to stormwater management although potentially more expensive than alternatives as this would require an additional reticulation network.
- n The use of treated wastewater for industrial purposes is considered viable, although the extent of use will depend on the relative costs compared to potable water.
- n Use of treated wastewater as a direct substitute for potable water is technically feasible, but is currently excluded, as this would require strong support from both the community and the Ministry of Health. Therefore, use of treated wastewater will not be considered as a substitute for potable water for this project. Therefore the need for a potable water supply to the site would be required.

The following schematic diagram gives an overview of the Three Water concept for the DSBP.

Figure 2: Three Waters Concept for DSBP



A concept Wastewater Treatment and Reuse diagram has been developed and is included in Appendix C. This has not been updated to reflect changes to the DSBP concept layout resulting from consultation; however these layout changes do not affect the basis of the scheme or concept.

3.3.1 Water / Wastewater System

Recycled wastewater schemes for urban water recycling or reuse, requires the provision of recycled water pipes, often called 'purple pipe' systems in addition to the potable water and wastewater networks. The key features of recycled water systems include:

- n Urban use can include landscape irrigation, toilet flushing, outdoor washing activities (e.g. cars, paths and car parks), fire-fighting, construction, quarry activities and ornamental landscape
- n The type of recycled water scheme tends to be influenced by physical constraints, regulations, public opinion and demand
- n Potential industrial uses vary depending on the quality of the supply and the types of industries attracted to the development area, but can include cooling water, boiler feed water and process water
- n Other potential reuse options that have not been considered as yet include agricultural reuse, environmental reuse (such as stream augmentation) and indirect potable reuse by augmentation of surface or groundwater supplies

Due to the potential for inadvertent cross-connection between potable and recycled water systems in buildings, and therefore the potential for human ingestion of recycled treated wastewater, a high level of treatment and disinfection of wastewater will be required. The same quality of recycled water will be provided via a single system for both process water use and 'domestic' use within buildings.

In the absence of a New Zealand Standard for recycled water for non-potable uses, the Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006, and the resultant state guidelines (such as the Queensland Water Recycling Guidelines) would be used.

The concept plan includes on-site secondary (biological) wastewater treatment based on conventional activated sludge technology, followed by tertiary treatment using reverse osmosis membranes and disinfection using ultraviolet and/or chlorination.

3.3.2 Stormwater System

The concept plan includes for recycling of rainwater collected from roof areas. In order to be cost-effective, it is envisaged that collection and storage of rainwater adjacent to the buildings would be required, and that reuse would be for local non-potable and process water requirements.

The concept plan also currently includes the potential for recycling of stormwater after treatment in wetlands/ponds. The potential for contamination from industrial processes, and vehicular traffic on roads and paved areas, and insufficient demand for water may later preclude this option.

3.4 Advantages and Disadvantages of the Three Waters Concept

Advantages and disadvantages have been identified for the implementation of a Three Waters concept for the DSBP and are presented in Table 3 below.

Table 3 - Advantages and Disadvantages of using Three Water Concept

	Advantages	Disadvantages
Overall Strategy	Adds value to the brand of the development through using sustainable concepts	Likely to be considerably more costly than traditional approach
	Reduces total water, wastewater and stormwater demands	Still requires extensive works to connect to external water services
	Provides potential for land discharge option and good cultural outcomes	
Potable water supply	Reduced daily water demand due to use of recycled water for non-potable uses and fire fighting	Does not remove the need for external water supply
Wastewater network	Reduces environmental impact of discharge through reduction in discharge volume	Cost in providing tertiary treatment and secondary 'purple pipe' supply network
		Will still require either connection to external discharge point or considerable consenting effort to discharge to land or stream
Stormwater network	Reduces development impact on environment due to discharge reduction	Additional cost associated with storage tanks or reticulation of stormwater stored in ponds / wetland
	Reduces potable water demand	Would not be suitable to replace fire-fighting demand due to security of supply as stormwater is weather dependent
	Likely to receive more community support than recycling of wastewater	

3.5 Discussions with Watercare

Since 10th September 2009, there have been regular meetings with Watercare for them to consider water and wastewater servicing options for DSBP. Subsequent meetings have been held on 8th October 2009, 27th November 2009, 8th December 2009 and 15th January 2010. Much of the information in this report has been provided to or discussed with Watercare, either formally or informally. Two file notes detailing this information were provided to Watercare dated 16th December 2009 and 14th January 2010. Copies of these file notes are presented in Appendix D of this report. Two letters have been received from Watercare, dated 9th October 2009 and 27th January 2010 and are presented in Appendix F of this report.

Watercare have indicated that water and wastewater services could be provided to the new development and that they will work together with Stevenson, as well as the Auckland Council and the Regional Policy Steering Group, as the project progresses. This involvement will be necessary to ensure alignment of land use planning, infrastructure development and funding.

4 Discussion of Options

4.1 Water Supply Options

Due to the relatively high water demand for the DSBP, the preferred option for water supply is to obtain a direct connection to the Waikato pipeline. This option is known to have sufficient capacity to meet the DSBP peak water demand and is also the closest potable water source to the site. Additionally, the Waikato pipeline is expected to require the least capital investment and be the least risky of the options considered. Watercare has confirmed that this is a feasible option for the DSBP in our discussions with them.

Recycling of stormwater on site to reduce potable water demand would provide a good use of resources, but would be unlikely to provide sufficient benefit to reduce potable water infrastructure requirements. The recycling of wastewater to supplement water supply is considered to be too costly and with insufficient demand to make this a viable option.

Provision of security of supply needs to be confirmed for supply from the Waikato pipeline, with either a service reservoir being required on or near the site or back pumping provided from the Redoubt Rd reservoir facility.

4.2 Wastewater Options

Three external wastewater discharge options plus the Three Waters Concept were considered for the discharge of wastewater for DSBP. The preferred option is to discharge to the Southern Interceptor as this is likely to require the least infrastructure investment and is likely to be suitable for a phased implementation. While the total project cost is similar to the other options investigated, implementing this option is consistent with upgrades already planned by Watercare, with \$13M being assigned in their plans. Infrastructure with a cost of \$29.5M of the \$42.5M would be required to service the DSBP site and as such this is the most attractive option.

Discussions with Watercare have indicated that both the Southern Interceptor and Tuakau options are feasible. However, the Tuakau WWTP option is considered to have a high capital and operational cost, with limited scope for phasing. This option has not, however, been ruled out due to the consent limitations at the Mangere WWTP.

Discussion with Watercare will be on going to ensure the most suitable solution is adopted.

The on-site treatment plant and Three Waters Concept are not favoured due to the difficulty in consenting and high expected cost. The Hingaia Stream discharges ultimately to the Manukau Harbour, and therefore would fall under the same consent limitation conditions as the Mangere WWTP. Discharging to land would be a favourable solution both culturally and environmentally and could be accommodated in the Three Waters and On Site WWTP options, but in both cases would likely fall under the same consent limitation conditions as the Mangere WWTP.

5 Conclusions and Recommendations

5.1 Conclusions

The following can be concluded from this investigation.

- n The DSBP area can be serviced for water and wastewater and two alternative approaches have been examined (traditional and three waters). Both approaches require external infrastructure to be provided or upgraded.
- n Three external disposal options for wastewater have been identified (Southern Interceptor, Tuakau WWTP, on-site WWTP), each with associated benefits and issues.
- n Watercare have confirmed that water and wastewater services could be provided, subject to further investigations, and that the DSBP will have implications for the water and wastewater servicing costs in the region.
- n Determination of the final approach to external water and wastewater servicing will require further investigation and detailed assessment which, due to the statutory planning lead times for such projects, should be initiated soon after notification of the DSBP plan change and MUL amendment applications.

Overall, the assessment presented in this report demonstrates the feasibility of providing water and wastewater services to the DSBP area and that rezoning of the DSBP area for industrial and associated uses, as per the DSBP Structure Plan, is appropriate.

5.2 Recommendations

It is recommended that

- n Stevenson's work with Watercare, Auckland Council and the Regional Policy Steering Group to ensure that the costs for servicing this development are manageable and that future infrastructure is aligned with future land use planning directions that will be set by the Auckland Council.
- n Further investigations and detailed assessment will be required to identify the preferred approach to servicing the site, development and refinement of design assumptions is required for each of the servicing options considered.

Appendix A

Traditional Servicing Details

File Note

By: Maria Utting **Date:** 24 February 2010
Subject: Appendix A Traditional servicing details **Our Ref:** 3910474

1 Traditional Water and Wastewater supply

A conceptual design has been completed for both services, indicating likely water and wastewater demands and demonstrating a likely method of providing water and wastewater services. The design also served to provide information for Watercare Services Limited (Watercare) to determine how and if the demand for water and the treatment and disposal of wastewater can be accommodated using Watercare's existing facilities. The basis of the traditional approach concept is:

- n The concept design is based on a traditional supply approach, with no water reuse considered within either the water supply or wastewater systems.
- n Water and wastewater demands have been developed using values given in Watercare's "Guidelines for Design of Wastewater Reticulation and Pumping Stations" report. Water demand is based on 35l/s/100ha and wastewater demand is based on 50,000l/ha/d.
- n Fire fighting water demand values have been developed using SNZ PAS 4509, New Zealand Fire Service Fire fighting Water Supplies Code of Practice.

1.1 Potable Water

1.1.1 Objectives

The objectives of the investigation were to

- n Determine the demand for water on all parts of the site for normal and fire fighting purposes
- n Develop a conceptual layout for a traditional water reticulation network
- n Determine the total water demand required to supply the entire site from an external source.
- n Determine likely external sources for water in conjunction with Watercare Services Limited
- n Demonstrate that the site could be serviced from existing water sources, which also supply the remainder of the Auckland Metropolitan Area.

1.1.2 Potable Water Demand

Water supply requirements have been based on SNZ PAS 4509/2008 New Zealand Fire Service Fire fighting Water Supplies Code of Practice, with daily demand based on the workday average flow given in Watercare's 'Wastewater reticulation design guideline.

a. Fire fighting demand

As the exact nature and size of industry that will be housed within the development has some flexibility, assumptions have been made in order to determine the fire requirements. Example 1, page 21 of PAS 4509 provides a close match to our design scenario and has been selected for this design. This results in a Fire Hazard Category of 3 and fire fighting water supply of FW5 which designates the water supply requirements. This rating is based on individual sections of 1,000m² and building coverage of 40-79%, requiring a fire flow of 150l/s. Any development exceeding this

File Note

fire classification would require a sprinkler system or onsite storage to meet additional fire supply demands.

b. Development demand

The water demand for the Drury development has been developed based on the assumption that water in = water out. The workday average flow given in the Watercare "Wastewater Reticulation Design Guidelines" has therefore been applied for calculation purposes. Based on 237Ha developed area and a 35l/s/100ha demand, the total development demand for Drury is 83l/s.

It has been assumed that industry within the Drury development will be light or dry industry. If any wet industry (such as food processing) is proposed at a later date, design provisions will need to be reviewed to ensure total supply requirements can continue to be met.

Based, on the above, the total conveyance capacity required is 233l/s as summarised below.

Table 1 - Potable Water Demand

	Development water use (l/s)	Fire fighting flow requirements (l/s)	Total conveyance capacity required (l/s)
Demand (l/s)	83	150	233

1.1.3 Water Reticulation Network

A concept design of a Water Reticulation network has been developed using the standard model of a ring main around the development, with supply lines branching through the internal roads. This reticulation network is designed to distribute the normal demand plus fire flows around the development, with the development water supply assumed to come from the north.

An indicative network layout is presented in Appendix A, with pipe dimension presented in Appendix B. Updated capital cost estimates for the provision of the reticulation have not been assessed at this stage.

1.2 Wastewater

1.2.1 Objectives

The objectives of the investigation were to

- n Determine the design wastewater flows on all parts of the site
- n Develop a wastewater network layout
- n Determine the design wastewater flows for the entire site.
- n Determine likely external treatment options for wastewater in conjunction with Watercare Services Limited
- n Demonstrate that wastewater from the site could be serviced from existing facilities which provide services to the remainder of the Auckland Metropolitan Area.

1.2.2 Wastewater Demand

The wastewater system has been designed based on design values provided by Watercare reticulation design guidelines¹. Peak wet weather values have been assumed to be twice peak daily

¹ Watercare Services Ltd, Guidelines for Design of Wastewater Reticulation and Pumping Stations, Watercare Reticulation Design Guidelines.

File Note

flow which is not specifically provided for in the design guideline but is considered appropriate due to discussions with Watercare and experience with other wastewater networks. The resulting total demands based on 270 Ha ²of developed land are given in table 2 below.

Table 2 - Wastewater Design Flows

Flow Scenario	Design Value	Drury total demand (l/s)
Average Daily Flow	35 (l/s/100 Ha)	83
Peak Flow	50,000 (l/Ha/d)	136

The peak flow that would be conveyed to the Watercare system is therefore 136l/s.

By way of contrast, the following table indicates Watercare's current operational standards for service that Watercare is committed to achieving

Table 3 - Watercare's contractual; level of service parameters - applied to Drury South Site (Watercare AMP, 2008)

Component	Design Allowance (l/ha/d)	Drury South Site Dimension (ha)	Design Allowance (l/s)
Normal Commercial Areas	25,000	237	69
Low Rise Commercial areas	50,000	237	136
High Rise Commercial Areas	85,000	237	233
Industrial Areas	50,000	237	136

The design allowance for industrial areas has been agreed as being the most appropriate for the DBPD wastewater network. It has been noted however, that this has a smaller than normal allowance for wet weather inflow and infiltration. Care will need to be taken to minimise wet weather risk to the wastewater network and ensure stormwater connections are made to the appropriate network.

1.2.3 Wastewater Reticulation Network

The proposed site falls towards the stream along the western boundary of the primary road, in a southeast to northwest direction. The primary road following the path of the stream northwards has a very flat grade, with secondary roads typically aligned directly up the slope. This results in difficulties achieving minimum gradients along the primary road, which is the lowest point of the site and the primary receiving point.

Pump stations will be required within the site reticulation in order to achieve reasonable gradients, to prevent significant siltation issues, allow reasonable construction depths and achieve a constructible gradient within the network. A grade of 0.5% has been used as the minimum allowable grade for this network. This is below the typical design grade, however reasonable velocities can be achieved and this gradient allows sewer depths to be kept below 4m. Achieving

² Subsequent to the analysis presented in this report, the DSBP concept was modified in response matters raised during consultation. The current concept provides for 223 Ha of developed land and therefore less demand than presented in this report.

File Note

gradients of no less than 0.5% requires a total of 3 pump stations within the network. Two pump stations will solely provide collection of sub catchments and pumping to the terminal pump station. This terminal pump station will collect wastewater from the 3rd sub catchment, along with discharges from the 2 collector pump stations. It is anticipated that the total wastewater flow will be discharged to a connection to the Watercare sewer network, however an option to discharge to the Tuakau WWTP is also being developed.

In order to achieve buildable gradients in the network, flows will be collected by pump stations and pumped to the head of the next downstream network. A total of 3 pump stations are required, including the terminal pump station (PS1) at the most downstream end of the network. The pump stations will be located immediately adjacent to the primary road running down the west of the development. It has been assumed at this stage that each pump station will pump directly to the well of the next downstream pump, however this will be further refined during detailed design. If the wastewater connection is to be made to Tuakau then the pump station order will be reversed, with PS3 becoming the terminal pump station. The key parameters of the three pump stations are presented in Table 4 below.

Table 4 - Pumping Station Parameters

Pump station	Location	Receiving flows, Dry Weather (l/s)	Peak receiving flows (WWF)(l/s)	Pumping to
PS3	Southern Pump	Catchment = 16	26	PS2
PS2	Centre Pump	Catchment = 45 + PS1 = 16	100	PS1
PS1	Terminal Pump (north)	Catchment = 22 + PS2 = 61	136	Off Site

Updated capital cost estimates for the provision of the reticulation or pumping stations have not been assessed at this stage.

An indicative network layout is presented in Appendix A with pipe dimensions presented in Appendix B.

Maria Utting

Appendix B

Preliminary Network Sizing

Appendix B

Table 1

DBPD Wastewater Network

Pipe Reference	Length (m)	Diameter (mm)	Gradient (%)	US Invert (m R.L.)	DS Invert (m R.L.)
G-D	450	150	0.005	17.0	14.7
D-B	155	150	0.005	14.7	14.0
B-PS1	900	225	0.005	14.0	9.5
I-PS3	655	225	0.005	17.1	13.8
H-I	180	150	0.005	18.0	17.1
J-I	300	150	0.010	20.0	17.1
F-E	150	150	0.005	15.5	16.2
E-D	155	150	0.005	15.5	14.7
T-E	300	150	0.005	17.0	15.5
U-T	310	150	0.005	18.5	17.0
S-T	240	150	0.005	18.2	17.0
X-R	420	150	0.013	32.5	27.0
R-S	500	150	0.018	27.0	18.0
S-G	155	150	0.006	18.0	17.0
X-Q	275	150	0.022	32.5	26.5
Q-V	405	150	0.006	26.5	24.0
V-PS2	655	150	0.011	24.0	16.5
R-V	285	150	0.012	27.5	24.0
P-Q	300	150	0.005	28.0	26.5
P-W	410	150	0.016	28.0	21.5
W-M	250	150	0.006	21.5	20.0
M-H	345	225	0.009	20.0	17.0
H-PS2	300	225	0.006	17.0	15.2
N-W	285	150	0.005	23.0	21.5
N-M	550	150	0.005	23.0	20.0
O-N	405	150	0.010	27.0	23.0
P-O	285	150	0.005	29.0	28.0
G-PS2	300	225	0.005	17.0	15.5

Table 2

DBPD Water Supply Reticulation

Pipe Reference	Diameter	Length
A-B	450	1020
B-C	450	500
C-D	450	300
D-E	450	300
E-F	450	540
E-J	450	385
J-K	450	550
K-L	450	420
C-P	450	155
P-O	450	500
O-N	450	690
N-M	450	300
M-L	450	300
B-	375	350
F-G	375	950
P-Q	375	240
Q-U	375	275
Q-T	375	285
D-R	300	645
N-R	300	395
O-R	300	285
M-S	300	405
R-S	300	300
J-S	300	250
K-S	300	285

Appendix C

Preliminary Network Layouts

Potable water network

Wastewater Network

Three Waters Concept

Appendix D

File Note to Watercare

File Note

By: Maria Utting **Date:** 14 January 2010
Subject: Water and Wastewater Servicing Options for DSBP **Our Ref:** 3910474

1 Introduction

The Drury South Business Project (DSBP) is a concept for the development of approximately 237ha of 'land extensive' business land (within a total study area of around 419ha), which is anticipated to provide employment for approximately 8,500 people when fully developed (around 2025-30). The project is located in the Drury basin, to the east of the State Highway 1 Motorway (SH1), between Drury interchange in the north, and Ramarama interchange in the south. The DSBP area straddled the Papakura District Council (PDC) and Franklin District Council (FDC) boundary with some of the area in each District. Stevenson's Drury Quarry is located at the base of the Hunua foothills on the eastern edge of the project area, with the quarry zone extending into the project area. Figure 1 shows the location of the project.

The DSBP responds to the following strategic imperatives:

- n The regional significance of Stevenson Drury Quarry (as a substantial aggregate resource with in excess of 150 years of aggregate resource remaining) and the need to manage the impact of reverse sensitivity pressure from adjoining sites and vehicle movements.
- n Papakura District Council's objective of providing further capacity for local employment and business growth through the establishment of a 'construction cluster'.¹
- n The shortage of business land in the Auckland region, particularly for industrial business including manufacturing, wholesale trade, construction, transport and storage.

As the DSBP is currently zoned for rural purposes and lies outside of the Auckland Region's metropolitan urban limits (MUL), an extension to the MUL and plan changes to the Papakura and Franklin District Plans are required for the project to proceed. This report forms one part of the overall planning documentation and assessment of environmental effects required to accompany the request for those plan changes and the request to extend the MUL. The Stevenson's project team have been working closely with both the Franklin and Papakura District Council's to assess the possibility of the DSBP and prepare the planning documentation.

¹ Papakura District Council, Economic Development Strategy (2007)

File Note

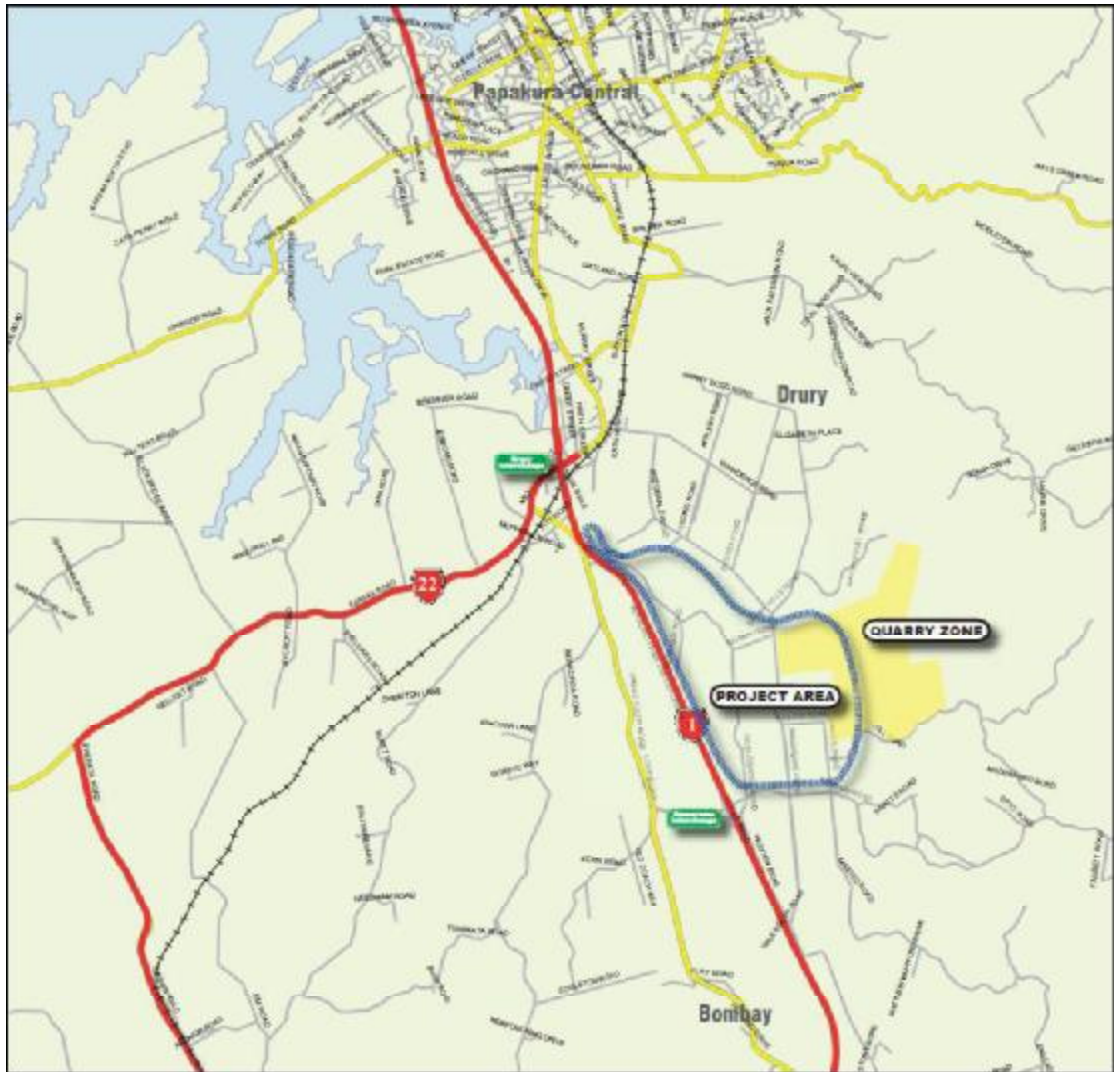


Figure 1 Location of Drury South Business Project

2 Wastewater Servicing

2.1 Wastewater Demand

The Drury wastewater demand has been calculated based on values given in the Watercare reticulation design guidelines and the contractual level of service values for industrial areas. Based on these design parameters, the average and peak wastewater demand parameters used are given in Table 1 below.

Table 1 - Wastewater Design Flows

Flow Scenario	Design Value	Source	Drury total demand (l/s)
Average Daily Flow	35 (l/s/100Ha)	Reticulation design guideline	83
Peak Flow	50,000 (l/Ha/d)	Level of Service	136

File Note

Due to the very flat nature of the low part of the site, it is anticipated that 3 pump stations will be required to collect and convey wastewater flows. This will include to collector pump stations and a terminal pump station that will for part of the servicing solution for the development.

2.2 Servicing Options

The DSBP site is a significant distance from developed wastewater infrastructure in the area. Three main options have been investigated for wastewater disposal for the DSBP and are discussed below.

2.2.1 Southern Interceptor

The Southern interceptor is part of Watercare's wastewater collection system and at its nearest point is around 5km north of the Drury development and conveys wastewater flows to the Mangere WWTP. The interceptor is currently nearing capacity, with several upgrades planned in the next 35 years to ensure an adequate level of service is maintained.

Currently planned upgrades include upgrading the capacity of pump station DPS049, duplicating a section of the interceptor and installing 2 storage tanks.

Upgrades required to provide for the additional Drury demand have been sized to convey the 2101 population growth estimate along with peak Drury flows. It is anticipated that the Southern interceptor would need to be duplicated between manholes SIN076 and SIN115, resulting in a duplicate length of 7.5km. The duplicate pipeline would vary from 525-1200mm in diameter and would be sufficient to convey the predicted 2101 flows. It is understood that capacity issues are less significant downstream of DPS049, however dynamic modelling would be required to confirm this.

Around 5.5km of rising main would be required to connect the DSBP to the Southern Interceptor. It is proposed that the main would follow main roads to the Southern Interceptor and flows would be pumped from the terminal pump station within the DSBP.

a. Key Servicing Issues

The key issues identified in servicing the DSBP through the Southern Interceptor have been identified as follows:

- Consented discharge limits for the Mangere WWTP
- Substantial advancement of capital investment on the Southern Interceptor
- Potential implications on downstream network which have not yet been assessed

b. Key Servicing Benefits

- Allows an increased customer base
- Resolves current and future capacity issues on the Southern Interceptor to a high level
- Less pumping required than in other solutions

2.2.2 Tuakau

The Tuakau WWTP is around 21km from the DSBP and services the key areas of Pukekohe and Tuakau. The treatment plant discharges to the Waikato River and provides the opportunity to make use of Auckland's regional wastewater assets.

File Note

Discharging to the Tuakau WWTP would require a 21km pipeline, connecting DSBP to the WWTP. This pipeline length may be reduced to around 17km by connecting to the Pukekohe interceptor. The initial 10km of the pipeline route entails a significant elevation change of around 120m. This will require a 2 stage pumping arrangement to convey flows the first 10km, followed by a gravity pipeline for the remainder of the distance.

Further discussion is required to ascertain the available capacity at the Tuakau WWTP and the staging of any planned upgrades with its current and potential future owner, Key issues and benefits of the Tuakau discharge option are discussed below.

a. Key Servicing Issues

- Significant distance between DSBP and Tuakau WWTP
- High pumping requirements will result in significant operating costs
- Likely to use significant portion of available/planned capacity
- Power upgrades are likely to be required to meet pump station requirements

b. Key Servicing Benefits

- Avoids potential to contribute to breaching of consent discharge limits for the Mangere WWTP
- Improves potential serviceability of wider area

2.2.3 On-site WWTP

An on site WWTP has been assessed as a high level option due to the significant infrastructure investment required to discharge wastewater to an external service provider. This option has not been assessed in detail due to the uncertain nature of the wastewater, however has been completed sufficiently to provide a base point comparison.

The costs of an MBR plant of the size required has been assessed to determine rough order of costs associated with providing wastewater treatment on-site.. Wastewater would be treated to a high level at this plant and flows would be discharged to the Hangia Stream. This has several key advantages and disadvantages as given below:

a. Key Servicing Issues

- A very high level of treatment would likely be required to allow discharge to the stream, due to the sensitive nature of this receiving environment and the downstream Manukau Harbour
- Obtaining a discharge consent would likely be a very involved , potentially long and costly consenting process
- Additional land would be required within the development for the WWTP, this land would no longer be available for development
- Ownership and operation of the treatment plant is unclear.
- The treatment plant would likely have significantly higher operating costs than the pumping options

File Note

b. Key Servicing Benefits

- Provides the potential for beneficial reuse of wastewater within the development
- Increases the total treatment capacity for the Auckland Region
- Some potential for the WWTP to generate additional power depending on the wastewater strength, which could mitigate some of the operating costs

2.3 Cost Assessment

Indicative costs have been developed for each option using the Watercare Unit Rate Costs, 2009 for pipeline options and reviewing historical (Beca) projects for the on site WWTP option.

A comparison is provided in Table 2, below between cost of the already planned (by Watercare) upgrade of the Southern Interceptor and the additional costs required for Southern Interceptor upgrades to provide sufficient additional capacity to accommodate the Drury development

Table 2 – Additional Cost of Upgrading Southern Interceptor to accommodate DSBP Flows

	Watercare Planned Costs	Total Cost of upgrades including the accommodation of DBPD Flows	Additional Cost
Capital Cost (\$)	13,000,000	25,467,000	12,467,000
Operating cost (\$ PA)	-	53,000	53,000

Table 3 below provides a comparison between the three servicing options

Table 3 - Cost Estimates for DSBPwastewater servicing options

Servicing Option	Via Southern Interceptor and Mangere WWTP	Via New Pipeline to Tuakau WWTP	On-site WWTP
Capital Cost (\$)	42,467,000	40,563,300	45,000,000
Operating cost (\$ PA)	153,000	244,000	500,000

It should be noted that in the case of the Tuakau and Mangere disposal options that additional operational expenditure is not included. Furthermore, operating cost estimates are a rough estimate of additional power costs for pumping of each option. Operating cost estimates for the onsite WWTP are a rough order of magnitude estimate only.

It can be seen from the cost estimates that the total capital costs for the 3 options are quite similar, with key differences being in the expected operating costs and wider benefit of the expenditure.

2.3.1 Net Present Value Analysis

Watercare have indicated that they propose to upgrade the Southern Interceptor in two phases. The first phase is planned to be constructed in 2025 at a cost of \$7 million. The second phase, planned to be constructed in 2035 at a cost of \$6 million.

In order to accommodate the DSBP flows both phases would need to be completed by 2015.

A Net Present Value analysis of the two options using Watercare's standard method and including operational costs yielded the following results.

File Note

Table 4 – Additional Cost of Upgrading Southern Interceptor to Accommodate DSBP Flows, expressed as Net Present Value

	Watercare Planned Costs	Total Cost of upgrades including the accommodation of DSBP Flows
NPV (cost \$)	2,629,000	11,380,000
Planned Construction Years	2025 & 2035	2015

The following table provides a comparison of the three servicing options for DSBP expressed as Net Present Value. The analysis has assumed that whichever option is chosen will be constructed in 2015.

Table 5 - Cost Estimates for DSBP wastewater servicing options expressed as Net Present Value

Servicing Option	Via Southern Interceptor and Mangere WWTP	Via New Pipeline to Tuakau WWTP	On-site WWTP
NPV (cost \$)	18,127,000	18,912,000	22,705,000

The NPV analysis was completed using the Watercare standard spreadsheet, with discount rates and depreciation applied using the sewer network standard value. . The analysis did not allow for revenue generated from wastewater charges at DSBP .

2.4 Discussion

The analysis has demonstrated that the DSBP is serviceable, has indentified the external infrastructure required to service it and cost estimates of this infrastructure have been made.

The next outcome required is confirmation from Watercare that the site can be serviced for wastewater, subject to further investigations and some negotiation concerning financial aspects of the project.

3 Water Supply Servicing

3.1 Water Demand

The water demand for the DSBP is made up of the development demand and the fire fighting demand. This makes up the instantaneous demand and capacity for the water supply network. The development demand had been calculated based on the Watercare Reticulation guidelines, using the assumption that water in = water out.

Fire fighting demand has been calculated using Example 1, page 21 of PAS 4509, which provides a close match to our design scenario and has been selected for this design. This results in a Fire Hazard Category of 3 and fire fighting water supply of FW5 which designates the water supply requirements. This rating is based on individual sections of 1,000m² and building coverage of 40-79%, requiring a fire flow of 150l/s.

The total demand the DSBP are given in Table 6 below

File Note

Table 6 - Potable Water Demand

	Development water use (l/s) (35l/s/100Ha)	Fire fighting flow requirements (l/s)	Total conveyance capacity required (l/s)
Demand (l/s)	83	150	233

3.2 Supply Options

It is anticipated through discussions with Watercare that the DSBP will be serviced through a bulk service connection to the Waikato pipeline. This option is favourable due to the close proximity and high capacity of the pipeline. A supply point capable of providing 233l/s would be required, however daily use would be the development water use of 83l/s.

3.2.1 Supply redundancy

In line with normal supply guidelines, it is expected that a storage reservoir will be required to service the DSBP supply zone. Watercare's standard storage volume is 24hrs at normal flows. This doesn't however, include an allowance for fire flows and it is unclear at this stage what provisions, if any shall be included.

Additionally, the Waikato pipeline is currently solely supplied by the Waikato treatment plant, resulting in a greater risk to the security of supply to the DSBP. It is possible that back pumping may be provided from the Redoubt Rd reservoirs to mitigate this risk.

Due to the factors discussed above, several reservoir sizings have been considered for the DSBP potable supply. These options are 24 hours storage, 48 hours storage and with or without 3 hours fire flow.

Table 7 - Drury Potable Water Reservoir Options

	24 hours Storage provision	48 hours Storage provision
Size with no fire flow allowance (m3)	7,171	14,340
Size with 3hrs fire flow allowance (m3)	8,790	15,960

The location of the reservoir has not yet been identified, however it is likely to be off-site to achieve sufficient elevation to supply flows to the entire site.

3.2.2 Cost estimate

Watercare have indicated that a bulk supply point from the Waikato pipeline is likely to cost in the order of \$500,000. Additional costs to service the DSBP include the reservoir and connecting pipeline. As the reservoir location has not yet been determined, a cost estimate has not yet been developed for the total cost to service DSBP. Costs have been developed in table 8 below for the 4 reservoir options based on the Watercare Unit Rate Costs, 2009.

Table 8 - Potable Water Reservoir Cost Estimates

	24 hours storage provision	48 hours storage provision
Cost estimate with no fire flow allowance (\$)	4,167,000	6,529,000

File Note

	24 hours storage provision	48 hours storage provision
Cost estimate wit 3hrs fire flow allowance (\$)	4,754,000	6,998,000

3.3 Discussion

The DSBP is expected to be serviced from the nearby Waikato pipeline. The size and location of the storage reservoir are yet to be determined, further guidance is required as to the appropriate storage requirements for the reservoir.

The next outcome required is confirmation from Watercare that the site can be serviced for potable water, subject to further investigations and some negotiation concerning financial aspects of the project.

File Note

4 Summary

The analysis has demonstrated that the DSBP is serviceable for Water and Wastewater and has identified the external infrastructure required to service it and cost estimates of this infrastructure have been made.

The preferred options for wastewater servicing are to discharge to either the Southern Interceptor or the Tuakau WWTP. The preferred potable water supply is a bulk supply connection to the Waikato pipeline.

Confirmation is required from Watercare that the site can be serviced for both potable water and wastewater, subject to further investigations and some negotiation concerning financial aspects of the project.

Maria Utting

Appendix E

Three Waters Design Details

File Note

By: Maria Utting

Date: 24 February 2010

Subject: Appendix E - Three Waters Servicing

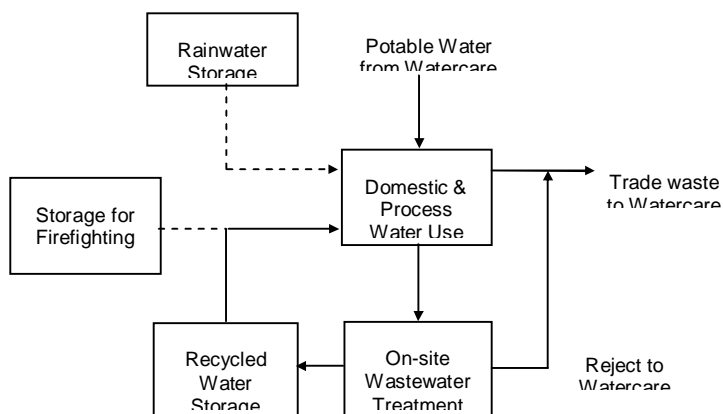
Our Ref: 3910474

1 Three Waters approach

A conceptual design for the proposed development site has been developed, applying an integrated approach to the management of potable (and perhaps a “non-potable” grade) water supply, wastewater treatment and disposal, and stormwater collection, treatment and disposal. This approach was considered on the following basis:

- n The commercial / industrial nature of the proposed development offers the opportunity to actively promote water demand management and beneficial use of stormwater and treated wastewater for non-potable and industrial purposes.
- n Rainwater collected on-site can be used as a source of non-potable water and can have benefits in relation to stormwater management although potentially more expensive than alternatives.
- n The use of treated wastewater for industrial purposes is considered viable, although the extent of use will depend on the relative costs compared to potable water.
- n Use of treated wastewater as a direct substitute for potable water is technically feasible, but is currently excluded from the draft Strategic Plan, as this would require strong support from both the community and the Ministry of Health. Therefore, use of treated wastewater will not be considered as a substitute for potable water for this project.

The following schematic diagram has been prepared to give an overview of the Three Waters strategy for the study area.



A Concept Wastewater Treatment and Reuse diagram has been developed and is included in Appendix A. This has not been updated to reflect changes to the DBPD concept layout, however these layout changes do not affect the basis of the scheme or concept.

File Note

1.1 Wastewater System

1.1.1 Recycling Treated Wastewater

The concept provides for recycling treated wastewater, which, for urban water recycling or reuse schemes, requires the provision of recycled water pipes, often called 'purple pipe' systems, in addition to potable water pipelines.

The key features of recycled water systems include:

- n Urban use can include landscape irrigation, toilet flushing, outdoor washing activities (e.g. cars, paths, and car parks), fire-fighting, construction and ornamental landscape.
- n The type of recycled water scheme tends to be influenced by physical constraints, regulations, public opinion and demand.
- n Potential industrial uses vary depending on the quality of the supply and the types of industries attracted to the development area, but can include cooling water, boiler feed water and process water.
- n Other potential reuse options that have not been considered as yet include agricultural reuse, environmental reuse (such as stream augmentation) and indirect potable reuse by augmentation of surface or groundwater supplies.

1.1.2 Reuse of Rainwater

The concept plan includes for recycling of rainwater collected from roof areas. In order to be cost-effective, it is envisaged that collection and storage of rainwater adjacent to the buildings will be required, and that reuse will be for local non-potable and process water requirements.

The concept plan also currently includes the potential for recycling of stormwater after treatment in wetlands/ponds. The potential for contamination from industrial processes, and vehicular traffic on roads and paved areas, and insufficient demand for water, may later preclude this option. Therefore, it is likely that rainwater collected from hard standing areas and roadways will be treated using on-site systems as required, swales and wetland systems, and will ultimately be discharged from the development site to the local receiving environment.

1.1.3 Wastewater Collection

A conventional gravity wastewater collection system will be provided around the development site; with main sewers following the main roads to the proposed wastewater treatment plant site towards the north of the site. This will likely require the provision of pumping stations as described in the traditional servicing design.

1.1.4 Wastewater Treatment Process

Due to the potential for inadvertent cross-connection between potable and recycled water systems in buildings, and therefore the potential for human ingestion of recycled treated wastewater, a high level of treatment and disinfection of wastewater will be provided.

The same quality of recycled water will be provided via a single system for both process water use and 'domestic' use within buildings.

In the absence of a New Zealand Standard for recycled water for non-potable uses, the Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006, and the resultant state guidelines (such as the Queensland Water Recycling Guidelines) will be used for planning purposes.

File Note

The concept plan includes on-site secondary (biological) wastewater treatment based on conventional activated sludge technology, followed by tertiary treatment using reverse osmosis (RO) membranes and disinfection using ultraviolet (UV) and/or chlorination.

1.1.5 Trade Waste

Although it has been assumed that a proportion of the trade waste will be treated by the on-site wastewater treatment plant along with the wastewater of domestic origin, the concept plan (refer Concept Wastewater Treatment and Reuse diagram in Appendix A) allows that some trade waste will not be suitable for on-site treatment, and a separate trade waste collection system will be provided for a portion of the development area.

1.1.6 Water for Fire fighting Purposes

The concept plan allows for the provision of water for fire fighting purposes as a reticulated supply of recycled treated wastewater, providing dedicated storage adjacent to the on-site wastewater treatment plant.

1.1.7 Recycled Water Reticulation

As well as storage of water for fire fighting purposes, the concept allows for storage of recycled water adjacent to the on-site treatment plant and pump station to distribute the recycled water through the purple-pipe reticulation network.

For concept purposes, it is envisaged that a single recycled water main will be sufficient to meet the requirements of both recycled water and fire fighting water supply, and will be provided with fire hydrants at appropriate intervals.

The "purple" pipe reticulation system will provide principal mains along each main road throughout the development area (refer. Concept Wastewater Treatment and Reuse diagram in Appendix A). Additional hydrant mains will be provided as required to ensure adequate coverage of the development area.

1.2 Potable Water Supply

Design of the on-site potable water supply network may have to follow the requirements of district council engineering standards, but for the purposes of concept planning, the system has currently been sized for the estimated potable water demands across the development site, with principal mains provided on each main road in the development area.

Maria Utting

Appendix F

Correspondence with Watercare



Watercare Services Limited

2 Nuffield Street
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www.watercare.co.nz

27th January 2010

Beca
132 Vincent Street
PO Box 6345
Auckland 1010
NEW ZEALAND

Attention: Ian Garside

Dear Ian

Drury Water and Wastewater Services

I am responding to your request to provide confirmation that the Drury South Business Project can be serviced for both potable water and wastewater.

Based on the results of the investigation undertaken by Beca (File Note 14th January 2010), water and wastewater services could be provided to the new development, subject to further investigations. However, this development will have implications for water and wastewater servicing costs on the region.

The cost of servicing the development is in the order of \$7 million for water and \$43 million for wastewater. The cost of providing water and wastewater services will require significant expenditure before the development could proceed in 2015. No allowance has been made for providing this area with water and wastewater services and funding will need to be secured before this development proceeds.

Based on the information provided to date, Watercare will need to work with the ARC, Regional Policy Steering Group (RSPG) and developer to ensure that the costs for servicing this development are not prohibitive and that future infrastructure is aligned with future land use planning directions that will be set by the new Auckland Council.

As you will see, we have copied this reply to the ARC for their information.

Yours sincerely

A handwritten signature in black ink, appearing to read "Phil Jaggard", written over a white background.

Phil Jaggard
Principal Planner
Asset Management

Cc. Craig McIlroy, Jim Hodges, Helen Edmonds, Lesley Baddon (ARC)



Watercare Services Limited

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9th October 2009

Beca
132 Vincent Street
PO Box 6345
Auckland 1010
NEW ZEALAND

Attention: Ian Garside

Dear Ian

Drury Water and Wastewater Services

I am responding to your request to provide information and indicative costs of providing water supply and wastewater services to a possible 270 hectare industrial development near the Drury Quarry. By way of information, we are working with the ARC and the Regional Policy Steering Group (RSPG) to ensure our future infrastructure planning is aligned with future land use planning directions that will be set by the new Auckland Council. Any development like that being considered in Drury would clearly have major regional planning implications and before we could provide information and costs as requested, we would need to be guided by the ARC on this matter.

We would be happy to provide specific cost information as requested, provided the ARC and RSPG have no objection. As you will see, we have copied this reply to the ARC for their information and, no doubt, they will provide guidance in due course. We can advise, in the meantime, that any such services would cost many tens of millions of dollars.

Yours sincerely

A handwritten signature in black ink, appearing to read "Phil Jaggard", written over a horizontal line.

Phil Jaggard
Principal Planner
Asset Management

Cc. Craig McIlroy, Jim Hodges, Helen Edmonds, Lesley Baddon (ARC)

GM