LYSAGHT

ALLEN FABRICS LIMITED
REZONING – THREE WATERS ASSESSMENT REPORT
KIMIHIA LAKES DEVELOPMENT
EAST MINE ROAD, HUNTLY
REVISION 3

Client Allen Fabrics Limited

Project Kimihia Lakes Development

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1.0 EXECUTIVE SUMMARY

Lysaght Consultants Ltd ("Lysaght") was engaged by Allen Fabrics Limited ("AFL") to provide an assessment of the three waters reticulation serviceability of the proposed development at Kimihia Lakes, to support an application for the rezoning of the land. The proposed development is to be undertaken at the site of the old Huntly East Mine and is to be a multi-use destination on the bank of a newly filled lake (the old open cast mine).

Lysaght analysed the historic servicing of the Huntly East Mine and the servicing needs of the proposed development, and presented conclusions for stormwater, wastewater, and water supply, as follows:

1.1 STORMWATER

The proposed site layout is relatively sparse, leaving considerable land area available for the construction of low impact stormwater treatment infrastructure within the development. Low impact stormwater treatment will deliver the environmental outcomes sought by the Waikato River Authority's Vision and Strategy for the Waikato River and the Waikato-Tainui Environmental Plan. Specifically, a network of vegetated swales are recommended for the conveyance of runoff to a centralised constructed wetland, prior to discharge to the newly filled lake. Further, rainwater re-use tanks are proposed for use with all significant buildings, to provide a supplementary non-potable water supply, and to lessen the runoff volume into the wetland and lake.

1.2 WASTEWATER

The developed site is expected to discharge approximately 48m³/day when all of its facilities are fully occupied, compared to the approximate 10m³/day that the Huntly East Mine is estimated to have discharged at its peak staffing rate. AFL has indicated an interest in discharging wastewater to land using on site effluent treatment infrastructure, but the soils are typically stiff clays and not well suited to wastewater disposal. Therefore, only a portion of the total discharge could be sent to land without a prohibitively large land area being required. An analysis of the capacity of the existing council wastewater network and treatment plant was undertaken, as well as a review of the proposed upgrades to the system (according to Mott McDonald and Stantec's Mid-Waikato Water and Wastewater Servicing Strategy, June 2020). That analysis concluded that the increased discharge can be accommodated by both the existing and future upgraded council systems.

1.3 WATER SUPPLY

The developed site is expected to require approximately 44m³/day of potable water supply when all of its facilities are fully occupied, compared to the approximate 106m³/day of demand at the Huntly East Mine. As for the wastewater above, an analysis of the capacity of the existing council water network and treatment plant was undertaken, as well as a review of the proposed upgrades to the system (according to Mott McDonald and Stantec's Mid-Waikato Water and Wastewater Servicing Strategy, June 2020). That analysis concluded that the water demand can be accommodated by both the existing and future upgraded council systems, and that sufficient head is available at the site to meet the level of service requirements in Waikato Local Authority Shared Services' Regional Infrastructure Technical Specification for both potable and fire-fighting water supply.

1.4 RECOMMENDATIONS

On the basis of Lysaght's analysis, it is recommended that:

1. The re-zoning application to the Proposed Waikato District Plan for the Kimihia Lakes Zone is granted.
2. The three waters servicing options and concepts described in this report are further developed to identify preferred options for implementation.

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2.0 INTRODUCTION

2.1 BACKGROUND

Lysaght Consultants Ltd ("Lysaght") was engaged by Allen Fabrics Limited ("AFL") to provide an assessment of the three waters reticulation serviceability of the proposed development at Kimihia Lakes, to support an application for the rezoning of the land.

AFL proposes to redevelop the site previously occupied by the Huntly East Mine, by allowing the now disused open cast mine to refill, and by establishing a multi-purpose recreation, education and natural park facility. The site, subject to this rezoning proposal is approximately 164 hectares in size, with a variety of topography and land coverings within it (native and exotic vegetation, farmland, and the remnants of the Huntly East mining operations).

The development of the site is likely to occur in yet to be determined stages. This assessment has been carried in terms of the fully developed site, which is the worst case scenario in terms of impact on three waters infrastructure. It is not anticipated that the staging of the development will present any increased effects beyond those considered in this report".

State Highway 1 passes by the site to the east, suburban Huntly lies west of the site, with the Huntly speedway and wastewater treatment plant in close proximity to the north. Rural and rural residential properties bound the site to the south.

TABLE 2.1: SITE DESCRIPTION	
SITE LOCATION	239 East Mine Road Lot 1 DP 307535
SLOPE AND TOPOGRAPHY	Topography varies widely across the site. The primary feature is the central depression formed by open cast mining operations, which is to become the new lake. The land of immediate interest to the development lies on the southern bank of the future lake, and generally slopes toward the lake (between RL 10m and RL 15m).
EXISTING STRUCTURES	Minor structures and buildings left over from the Huntly East Mine remain on the site, however most have been removed entirely. A network of underground mine tunnels and structures remain beneath the surface, which will fill with water as the lake water level rises. An electrical sub-station is located on the main access road into the site, and will remain in place.
PROPOSED DEVELOPMENT	A multi-purpose recreation, education and natural park facility. The site will feature a community centre, an aquatic activity hub, a museum, accommodation and outdoor recreation facilities, and cultural discovery experiences.
SURROUNDING PROPERTIES	State Highway 1 to the east, suburban Huntly to the west, the Huntly speedway and wastewater treatment plant to the north, rural and rural residential properties to the south.

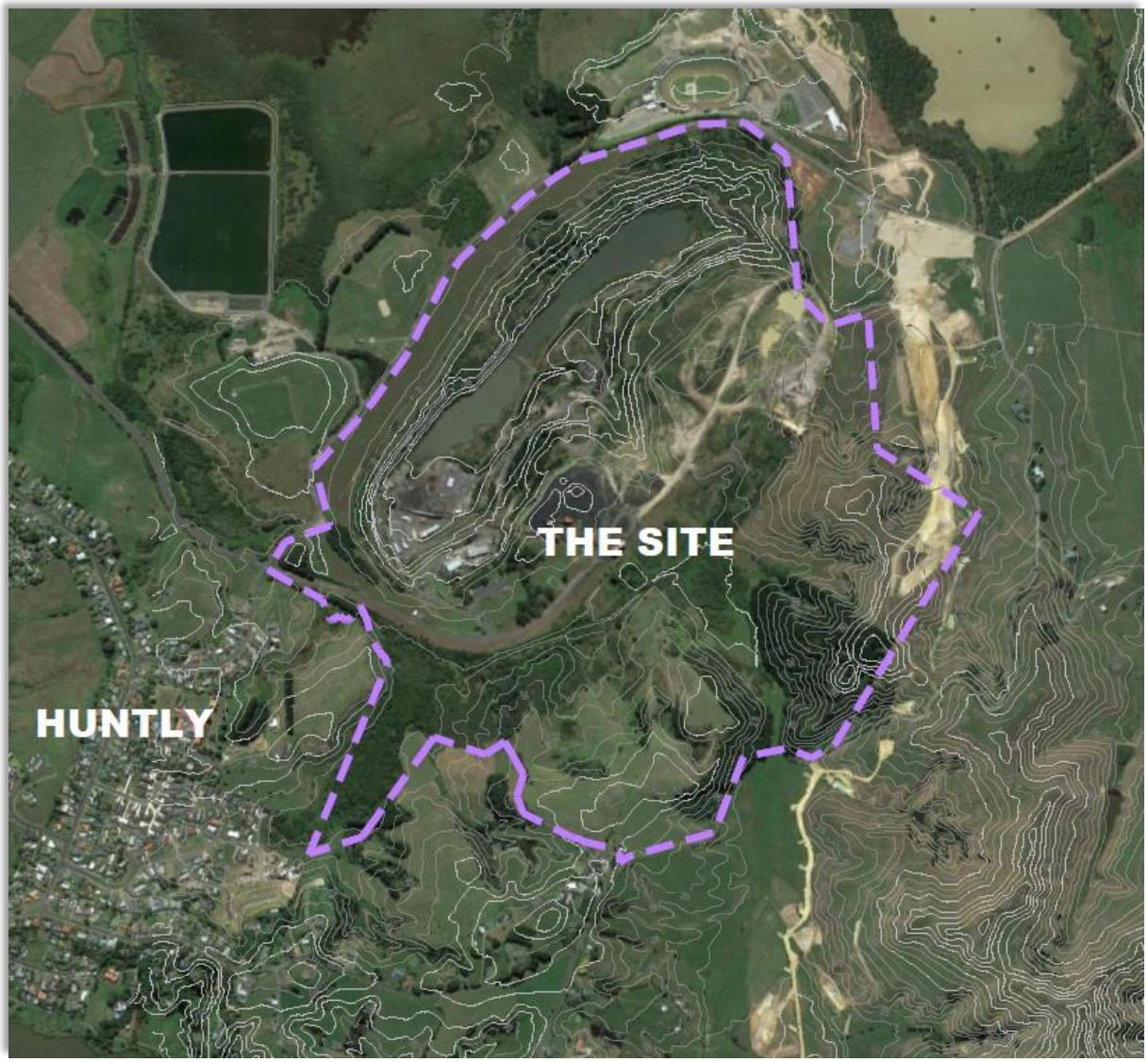

Figure 1: Existing site boundaries, contours and aerial.

2.2 PURPOSE

The purpose of this report Is to analyse the servicing needs of the proposal for stormwater, wastewater, and water supply, as follows:

2.2.1 STORMWATER

- Analyse the amount of additional runoff generated by the proposed land use, and the effects of that additional runoff on the receiving environment.
- Determine the broad extent of stormwater treatment required to ensure that all runoff from the proposed land use is sufficiently clean to drain into the new lake without compromising water quality.
- Discuss stormwater treatment options and demonstrate their feasibility within the conceptual footprint of the proposed site layout.

2.2.2 WASTEWATER

- Determine the volume of wastewater anticipated to be generated by the proposed land use, along with the historical volume from the Huntly East Mine.
- Explore the capacity of the existing Huntly wastewater network and the wastewater treatment station and provide commentary on the existing and future capacity available to receive the sewage from the proposed development.
- Discuss on-site effluent treatment and disposal options and provide commentary on their feasibility within the conceptual footprint of the proposed site layout.

2.2.3 WATER

- Determine the peak demand flow rate and daily volumetric demand of the proposed land use, along with the historical demand of the Huntly East Mine.
- Explore the capacity of the existing Huntly water network, and water take/treatment plant to provide water for the proposed development.
- Discuss on-site water collection options and provide commentary on their feasibility within the conceptual footprint of the proposed layout.

2.3 ENVIRONMENTAL DESIGN PRINCIPLES

Sustainable environmental practice is at the heart of the proposed development, and is stated first among the project design principles in the Boffa Miskell Masterplan. Therefore, this report discusses and recommends options and technologies that are in keeping with that design principle wherever practical. These environmental practices are in keeping with the principles of the Waikato River Authority's Vision and Strategy for the Waikato River, and the Waikato-Tainui Environmental Plan.

2.4 REFERENCE DOCUMENTS

The following documents were referenced in the preparation of this report:

- Boffa Miskell's Masterplan ("Masterplan"), Kimihia Lakes Development, 17 July 2020
- Waikato Local Authority Shared Services ("LASS") Regional Infrastructure Technical Specification ("RITS")
- Tonkin and Taylor's Site Appraisal and Preliminary Assessment Report, October 2019
- Waikato River Authority's Vision and Strategy for the Waikato River
- Waikato-Tainui Environmental Plan, August 2013
- HCC's Three Waters Management Practice Note, HCC 05: Rainwater Reuse and Detention System ("HCC 05")
- AS/NZS1547-2012, On-site Domestic Wastewater Management
- Auckland Regional Council's ("ARC") Technical Publication 10 ("TP10"), Stormwater Management Devices: Design Guidelines Manual (2003)
- Mott McDonald and Stantec's Mid-Waikato Water and Wastewater Servicing Strategy ("MWSS"), June 2020
- "Small and Decentralized Wastewater Management Systems" by Crites and Tchobanoglous ("Tchobanoglous") (1998)
- "Section 64: Determinations of Equivalent Tenements Guidelines" by the Australian Water Directorate ("ET Guidelines") (2017).

4.0 THE PROPOSAL

4.1 PROPOSED ACTIVITIES AT THE HUB

As shown in the Masterplan (a screenshot of which is presented in figure 2 below), the site hub (referred to as the 'Development Precinct' in the rezoning proposal) is to be developed into a multi-use lakeside destination, featuring:

- A Coalfields museum to commemorate the site's history as a coal mine,
- A community centre hub, including a café, conference rooms and teaching spaces,
- A boat ramp with trailer parking and an aquatic equipment hire centre,
- An accommodation facility, featuring camping sites, dormitories, and motel units,
- Outdoor education spaces,
- Playgrounds, beaches, walking tracks, playgrounds, etc.

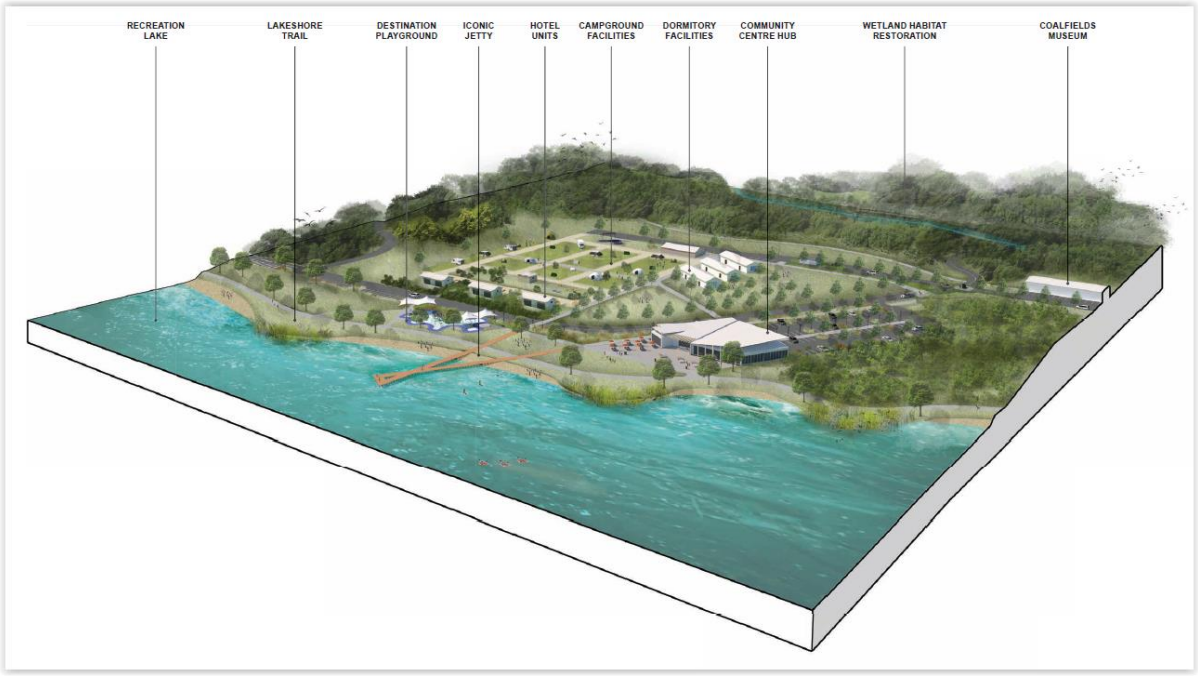

Figure 2: Concept artist's impression of the hub area (Sourced from Boffa Miskell's Kimihia Lakes Development Masterplan, Revision 1, 17/07/2020).

4.2 WIDER DEVELOPMENT

Outside of the hub described above, the greater site is to feature a number of proposed land uses:

- Farmland for drystock grazing and forestry,
- A mountain biking zone within an existing wooded forestry block,
- A plant nursery,
- Native and exotic vegetation, including forestry, habitat and slope stabilisation,
- A residential development precinct (not considered as part of this rezoning application).

With the exception of the residential development (not considered in detail here), these activities are expected to have limited need for three waters consideration at this stage, however they are discussed at a high level in the subsequent sections of this report.

5.0 HISTORIC LAND USE

5.1 HUNTLY EAST MINE

Since the 1880's, the site has been home to mining operations of various types and methodologies. In terms of this three waters assessment, the most relevant land use to consider is the most recent, the operation of the Huntly East Mine. The mine used underground coal shafts, with many of the coal extraction facilities being in the base of the old open cast mine, on the banks of the lowered lake.

5.2 THREE WATERS SERVICING OF THE MINE

Lysaght met with Hank Ollington, a former Solid Energy employee with extensive knowledge of how the mine operated. Mr. Ollington provided details of the three waters servicing of the mine, as follows:

4.2.1 STORMWATER

- Runoff was drained from buildings and hardstand areas directly into the lake itself, both by pipe and overland.
- No stormwater treatment was known to be provided prior to discharging into the lake.

4.2.2 WASTEWATER

- Wastewater from the mine was drained by gravity to a centralised pumping station, which pumped into the Huntly municipal system at an unknown location.
- Based on Lysaght's review of the existing Huntly infrastructure, the most logical connection point for the rising main from the site would appear to be in McVie Road or East Mine Road, but the exact connection point could not be identified.
- The above ground office and ablution facilities above ground featured approximately 22 showers and at least 6 toilets.
- Mr. Ollington suggested that staff working in the underground mineshafts would make their ablutions beneath ground without returning to the surface facilities.

4.2.3 WATER

- Water was supplied to the mine via a 150mm fabric wrapped steel pipeline from Kimihia Road, south of the site.
- On site, it was demonstrated that the pressure available within the existing connection was considerable.
- Mr. Ollington recalled that on one occasion the water reservoir in Tawa Street was drained entirely through a leak in the mine connection line.

5.3 STAFFING NUMBERS

An exact peak staffing number for the mine has been difficult to ascertain, however it is understood that as many as 300 staff worked at the mine simultaneously. In assessing the three waters servicing of the mine, a conservative figure of 200 simultaneous staff on site was used (using a lower figure

underestimates the historic servicing needs of the mine and therefore overestimates the additional needs of the future development when compared against the mine)

6.0 STORMWATER TREATMENT AND DISPOSAL

6.1 SCOPE OF STORMWATER ANALYSIS

This report considers the stormwater runoff discharged from the proposed rezoned land uses to the lake, but not the greater stormwater catchment or the runoff attenuation function of the lake (discussed in Tonkin and Taylor's Site Appraisal and Preliminary Assessment Report, October 2019). It is understood that the lake will receive runoff from the upstream catchment and discharge it via a weir to the west at a rate less than or equal to that of the pre-development scenario. It is therefore assumed that the effect of the proposed rezoning of the land will have negligible downstream effects in terms of volumetric runoff rates.

The focus of this report is instead to analyse the runoff from the rezoned land in terms of treatment and runoff quality. Stormwater discharge quality is of paramount importance to the proposal, as the lake must be swimmable and usable for recreational activities, and the discharge from the lake ultimately enters the Waikato River.

6.2 HISTORIC STORMWATER TREATMENT AND DISPOSAL – HUNTLY EAST MINE

The stormwater discharge from the mine site was not analysed in detail, as the receiving environment into which the proposed development will discharge will be materially different than what the mine discharged into. However, it is worth noting that no stormwater treatment infrastructure is understood to be in place at the mining facility, and historical photography suggests that runoff from the mine drift in the lakebed was allowed to enter the drained lake untreated. Therefore, by providing treatment infrastructure, the developed site will discharge considerably cleaner runoff into the lake than the mine did.

6.3 CHARACTER OF THE RUNOFF FROM THE DEVELOPMENT

Hardstand areas within the developed site will be standard roofs and sealed road and carparks, meaning that low impact stormwater treatment infrastructure will be appropriate for the removal of regular contaminants (suspended solids, phosphorus, nitrogen, metals). Therefore, TP10 has been used in analysing the following treatment options. Considered as a whole, the impervious surfaces proposed for the development will occupy a very low percentage of the site, meaning that both the increase in runoff volume and the increase in contaminants are likely to be relatively low.

6.4 TREATMENT INFRASTRUCTURE OPTIONS

As per Section 4 of TP10, several low impact design infrastructure types are available for use in the treatment of stormwater runoff, many of which are appropriate to this site. Historic soil testing supplied for the site and surrounds suggest that the site is underlain by stiff clays, meaning that infiltration technologies are not applicable here.

5.4.1 VEGETATED SWALES

Given the relatively sparse style of development (large open areas amongst the buildings and hardstand areas), small scale infrastructure could be applied to small sub-catchments within the development. For example, vegetated swales and raingardens could be placed throughout the site to

collect and treat runoff from all hardstand areas, in a manner similar to that shown in the figure below. This method would require little in the way of traditional piped infrastructure, but would require an increased investment in ongoing maintenance (silt removal, weeding, general landscaping).

Figure 3: Diagrammatic representation of how vegetated swales might be located within the site.

Figure 4: Diagrammatic representation of how a centralized constructed wetland might be located within the site.

5.4.2 CENTRALISED CONSTRUCTED WETLAND

A centralised formed wetland could also provide the necessary treatment to runoff from the hardstand areas. Traditionally, runoff from the roofs and pavements would be collected in downpipes and catchpits and reticulated underground to the wetland, which would then discharge into the lake. Expensive underground infrastructure is necessary under this option, but the ongoing maintenance requirements would be less than that of the swale/raingarden option. The figure ABOVE depicts how this system might be sited within the proposed development (sized in accordance with TP10 at 2% of the contributing catchment, or 1,500m^2). Note that the location of the wetland shown is conceptual in nature only. Alternative options elsewhere within the site can be explored at a later date.

5.4.3 HYBRID SOLUTION – TREATMENT TRAIN

The use of both swales and a centralised wetland would provide a further improved quality of stormwater discharge and lessen the initial investment in underground infrastructure. Runoff from hardstand areas would be conveyed to the wetland in open swales, where a degree of initial treatment would occur. The wetland itself could be reduced in size from that used in the option above, but the ongoing maintenance of this option would be the most demanding of the three options presented here. It is understood that the site is to remain in private ownership, and therefore the ongoing maintenance of the infrastructure would remain the obligation of the landowner. The figure below indicates how this system might fit conceptually within the site.

Figure 5: Diagrammatic representation of how a hybrid "treatment train" option might be located within the site.

6.6 RAINWATER RE-USE

Sustainability and guardianship of the site's environmental resources are central concepts to the development, and therefore rainwater re-use is proposed for use wherever possible. Each significant building is to be provided with a rainwater re-use tank, to be designed and constructed in accordance with HCC 05, albeit without the need for detention volume to be provided, given that the lake will provide the necessary volumetric mitigation. The tanks will reduce the volume of water discharged into the treatment system, and should be factored into the detailed design of the system accordingly.

6.7 AT-SOURCE STORMWATER TREATMENT

In addition to the treatment methodologies discussed above, all catchpits (if used) are to be installed with gross pollutant traps (eg. Stormwater360's Enviropod filter), and all roof downpipes are to be fitted with gross pollutant grates, to prevent pollutants (leaves, debris, etc.) from reaching the downstream treatment devices and compromising their functionality. Where possible, rain gardens may also be applicable in carparking areas, to remove pollutants from runoff prior to releasing it into the vegetated swales discussed above.

6.8 CONCLUSIONS – STORMWATER

As discussed in section 5.1 above, the lake itself is to act as a stormwater attenuation device, ensuring that the runoff discharged from the contributing catchment will be no greater in volume or peak flow rate than that of the pre-development scenario. The specifics of that functionality are not explored in detail as part of this report.

The stormwater reticulation and treatment analysis above confirms that several stormwater treatment options are available and appropriate for the development, and that the site is laid out favourably to accommodate them. Low impact stormwater treatment infrastructure is recommended for the site, which will deliver the environmental outcomes sought by the Waikato River Authority's Vision and Strategy for the Waikato River and the Waikato-Tainui Environmental Plan. Specifically, for optimum runoff quality and a lessened initial investment in underground infrastructure, it is recommended that a treatment train of vegetated swales and a central constructed wetland be pursued, despite the increased need for ongoing maintenance (by the private landowner, as the land is to remain in private ownership). Traditional underground piped infrastructure is also practically feasible when used in conjunction with a wetland, but would require an increased initial investment.

7.0 WASTEWATER TREATMENT AND DISPOSAL

7.1 SCOPE OF WASTEWATER ANALYSIS

The following section analyses the expected wastewater discharge rate from the developed site, compares that against the historic discharge made from the Huntly East Mine, and provides commentary on potential options for wastewater discharge methodologies.

7.2 HISTORIC WASTEWATER DISPOSAL – HUNTLY EAST MINE

As per section 4.1 of this report, wastewater from the mine was drained to a central pump station and pumped into the Huntly municipal system at an unknown location. The ablution facilities were known to include approximately 22 showers and at least 6 toilets. Using an assumed peak staffing rate of 200 simultaneous workers, discharge rates and volumes from the mine were derived as per the table below.

TABLE 6.2: HUNTLY EAST MINE WASTEWATER DISCHARGE RATE ANALYSIS	
PARAMETER	VALUE
No. OF SIMULTANEOUS STAFF	200
DAILY DISCHARGE RATE PER PERSON	50 L/d (derived from tables 4-2 – 4-4 of "Small and Decentralized Wastewater Management Systems" by Crites and Tchobanoglous)
TOTAL DAILY DISCHARGE	10,000 L/d (ADWF)

7.3 HUNTLY MUNICIPAL SYSTEM – CAPACITY ANALYSIS

The Mid-Waikato Water and Wastewater Servicing Strategy ("MWSS") summarises the existing capacity of the Huntly wastewater system and analyses the projected future growth for the catchment. Section 1.3.5 of that report states that the primary challenges for the system are:

- Network issues (inflow and infiltration, poor condition),
- Overtopping of oxidation ponds,
- Flooding from the Waikato River,
- Effluent quality compliance,
- Poor maintenance access,
- Unreliable facilities,
- Sludge build-up at the treatment plant,
- Discharge consent expiry in 2029.

In terms of current Huntly Wastewater Treatment Plant ("WWTP") capacity:

- Table 4-2 of Technical Memo 1 in the MWSS notes that the WWTP has a discharge consent for 11,500m³/day (ADWF),
- 2014 inflow data is presented in section 5.2.1 of Technical Memo 1 in the MWSS, stating that the wastewater treatment plant received an Average Dry Weather Flow (ADWF) of 1,816m³/day, and a Peak Wet Weather Flow of 10,000m³/day.
- Section 4.2 of Technical Memo 2 in the MWSS states that the WWTP is designed for an ADWF of 2,100m³/day.

The central premise of the MWSS report is however to recommend that the wastewater reticulation, treatment, and discharge network of the Mid-Waikato region be upgraded to allow for forecast growth beyond 2050. The recommended option includes the 2025 construction of a new centralised WWTP at Huntly with a capacity of 13,500m³/day to service both Huntly and Ohinewai. If that recommendation were to be followed, it is likely that the new WWTP will be in place prior to the full completion of the Lake Kimihia development.

7.4 EXPECTED DISCHARGE FROM THE COMPLETED DEVELOPMENT

Based on the Boffa Miskell master planning documentation, the maximum expected simultaneous occupancy of the site is as per the table below. The associated discharge figures are also presented, derived using a combination of the RITS and Tchobanoglous. As per the table, the total peak discharge from the facility is expected to be in the order of 48m³/day (ADWF).

TABLE 6.4: KIMIHIA LAKES WASTEWATER DISCHARGE RATE ANALYSIS			
FACILITY	OCCUPANCY	RATE/HEAD	TOTAL DISCHARGE
Community Centre Hub - Staff	18	38 L/d	684 L/d
Community Centre Hub - Guests	130	34 L/d	4,420 L/d
Coal Mining Museum	80	19 L/d	1,5200 L/d
Accommodation – Staff	9	38 L/d	342 L/d
Accommodation – Guests	65	150 L/d	9,750 L/d
Accommodation – Camp Guests	160	110 L/d	17,600 L/d
Accommodation – Motel Guests	20	190 L/d	3,800 L/d
Contingency/Miscellaneous	N/A	10,000 L/d	10,000 L/d
TOTAL	**602**		**48,116 L/d**

7.5 SITE LEVELS ANALYSIS

The precise location of the old Huntly East Mine wastewater connection is not currently known, but it is assumed to be in either McVie Road or East Mine Road, and likely near the intersection between the two. The approximate ground level at the intersection is RL 11m, and the approximate ground level within the hub area varies between RL 8m and RL12m. Therefore, a new pump station and rising main will be required to enable a connection to the council network.

7.6 ON SITE EFFLUENT TREATMENT AND DISPOSAL

An alternative to discharging into the Huntly system is to treat and dispose of the wastewater on site. A review has been undertaken of historic soils testing at the site and in surrounding properties, as follows:

- Soils and Site Assessment, Phoenix Consulting Engineers and Kirk Roberts Consulting Engineers, Ref. 160629, September 2016: This investigation was done nearby in Tawa Road, and confirmed that the soils were clays, with poor percolation rates.
- On-site Wastewater Management Assessment, Septic Solutions, July 2016. This investigation was also undertaken in Tawa Road and observed clayey soils. The report characterised the soils as Category 5 or 6 (as defined in AS/NZS1547-2012, and recommended the use of secondary treatment and dripper irrigation.
- Geotechnical Assessment for Proposed Subdivision, J H Wilson Consulting Engineer, April 2004. This assessment was undertaken in nearby Kimihia Road, and again noted stiff clays and a poor percolation rate, and recommended secondary treatment and dripper irrigation.

Using the above theoretical peak discharge rate of 48,116 L/d, and an assumed soil category of five (as per AS/NZS1547-2012), the total area of the required drip irrigation system would be in the order of 16,000m², assuming that secondary treatment would be provided for. In addition to that, a 100% reserve area must be allowed for at the site, meaning a total of 32,000m² must theoretically be set aside for on-site wastewater disposal should traditional disposal methods from AS/NZS1547-2012 be used. Alternative specialist designs may be available requiring less land area, but they have not been considered as part of this analysis.

It is understood that the landowner/developer is interested in exploring the use of wastewater generated at the site to fertilise plant nurseries or other similar green facilities. The qualitative assessment of such a use for the wastewater discharge is beyond the scope of this report. However,

the quantitative analysis above suggests that only a portion of the wastewater generated at the site would be required to irrigate an area equivalent to the proposed plant nursery, which is shown occupying a 6,000m² area in the Masterplan. For example, wastewater from the campground facility (or a part thereof) could be reticulated through a secondary treatment device, and into a drip irrigation field in the plant nursery, while the rest of the site would drain to the Huntly public system.

Beyond the central hub, other small facilities are proposed (for example, the mountain biking park), where ablution facilities may be provided. In those small isolated instances, on site effluent treatment and disposal will be feasible within a smaller land application footprint, and likely preferable to reticulating wastewater back to the central hub pump station.

7.7 CONCLUSIONS – WASTEWATER

Once fully developed, the site is expected to discharge approximately 48m³/day (ADWF). A portion of that may be disposed to land using secondary on-site effluent treatment and disposal, potentially to provide nutrients to plant nurseries or other similar green facilities. The table below summarises the expected discharges from the site, and the historic discharge from the Huntly East Mine site.

TABLE 6.7: SUMMARY OF WASTEWATER DISCHARGES

SCENARIO	TOTAL WASTEWATER DISCHARGE	DISCHARGE TO HUNTLY COUNCIL SYSTEM	OSET DISCHARGE TO GROUND
HUNTLY EAST MINE	10m³/day	10m³/day	-
DEVELOPED SITE	48m³/day	38m³/day	10m³/day
DIFFERENCE	38m³/day	28m³/day	10m³/day

*All stated discharge rates are Average Dry Weather Flow (ADWF)

The discharge into the Huntly council system will require a pump station to be constructed within the site due to the vertical difference between the most logical connection point in McVie Road/East Mine Road and the development area.

A review has been carried out of the capacity of the existing Huntly WWTP, and of the planned upgraded Huntly WWTP. That review suggests that the existing WWTP has a design capacity of 2,100m³/day, and that in 2014 it received an average inflow of 1,816m³/day. Therefore, the modest increase of discharge from the site of approximately 26m³/day is not expected to compromise the design capacity of the WWTP. The review also confirmed that the existing network and WWTP are subject to a range of operational and network issues in terms of quality and reliability. Those issues are not expected to be exacerbated by the development of the site, or the modest increase in discharge rate. A new treatment plant is planned for construction in Huntly within the next 10 years, which will see a significant increase in the treatment capacity of the network, which will further increase the network's capacity to receive the wastewater from the development. Further, it is important to note that the discharge estimates above are very conservative, and unlikely to be realised on any given day, let alone for a sustained period of time. Therefore, it is considered that the proposal can be adequately serviced by both the present day council network, and the upgraded network once complete.

Figure 6: Diagrammatic representation of the proposed wastewater reticulation might fit within the site.

As per the table above, a portion of run-off is to be sent to green facilities if possible. A review of available geological information has been carried out, and confirmed that the site soils can generally be characterised as soil types five or six (as per AS/NZS1547-2012), which informs the conceptual dripper field sizing carried out. Detailed site investigations and specific design must be undertaken at a later date.

8.0 WATER SUPPLY

8.1 SCOPE OF WATER SUPPLY ANALYSIS

This section of the report analyses the anticipated water demand rates at the developed site, compares that against the historic demand of the Huntly East Mine, and provides commentary on potential options for water supply technologies.

8.2 HISTORIC WATER DEMAND – HUNTLY EAST MINE

An historic metered water tax invoice has been provided by the current landowners Murray and Jennifer Allen. On that, invoice, 6-monthly approximate water usage figures are provided from March 2016 (25,900m³), and September 2015 (12,950m³) are included. For the purposes of this analysis, the average of those two figures has been used, 19,425m³ per six months, which equates to approximately 106m³/day.

8.3 HUNTLY MUNICIPAL SYSTEM – CAPACITY ANALYSIS

The Mid-Waikato Water and Wastewater Servicing Strategy ("MWSS") summarises the existing capacity of the Huntly water supply system and analyses the projected future growth for the catchment. Section 1.3.5 of that report describes the system as follows:

- Water is extracted from the Waikato River
- The Huntly Water Treatment Plant ("WTP") is a conventional treatment process, using PAC dosing, coagulation/flocculation, clarification, filtration, UV disinfection, pH correction, chlorination and fluoridation.
- Discharge of residuals, supernatant, and sludge is made to holding tanks, the Waikato River, and the wastewater system respectively.
- Consent for the water take and residual discharge expires in 2046.
- Beyond 2035, the demand from Huntly and Ngaruawahia is expected to exceed the consented maximum water take.

Section 5.1.5 of Technical Memo 1 of the MWSS discusses the capacity of the Huntly WTP and is summarised in the table below.

TABLE 7.3: HUNTLY WATER TREATMENT PLANT CAPACITY SUMMARY	
PARAMETER	VALUE
CURRENT TREATMENT CAPACITY	8 ML/d
CURRENT HUNTLY DEMAND	4 ML/d
CURRENT CENTRAL WAIKATO ALLOCATION	2 ML/d (Only 1 ML/d typically used)
SPARE CAPACITY	2 ML/d

The MWSS also recommends upgrades to the existing network and treatment facilities to allow for future growth in the area. The preferred option is for a new treatment plant to be constructed in 2025 in Te Kauwhata to service Te Kauwhata, Rangiriri, and Ohinewai, and to be subsequently upgraded in 2040. Until 2025, the Huntly WTP will continue to serve its present catchment, and to serve Ohinewai (anticipated to grow significantly as part of the Sleepyhead development). Once the new Te Kauwhata WTP in complete, Ohinewai will be served from there instead. Under this scheme, the capacity of the Huntly WTP is forecast to be sufficient until at least 2060.

8.4 RAINWATER RE-USE

As per section 5.5, rainwater re-use is proposed within the development wherever possible. Each significant building is to be provided with a rainwater re-use tank, to be designed and constructed in accordance with HCC 05 (without the need for detention volume to be provided), thus reducing the use of potable water from the public water supply system.

8.5 EXPECTED DEMAND OF THE COMPLETED DEVELOPMENT

Based on the Masterplan, the relevant parameters for deriving the development's water supply demand as per the table below. The associated demand figures are also presented (Derived using the ET guidelines). As per the table, the total maximum peak demand at the facility is expected to be in the order of 43.5m^3/day.

TABLE 7.5: KIMIHIA LAKES WATER DEMAND RATE ANALYSIS			
FACILITY	PARAMETER	ET	TOTAL DEMAND
Community Centre Hub (Assume 700m² of active restaurant/café)	700m²	0.01/m²	4,410 L/d
Coal Mining Museum	8 public toilets	0.4/toilet	2,020 L/d
Accommodation – Dorm Beds	75	0.15/bed	7,090 L/d
Accommodation – Camp Sites	60	0.5/site	18,900 L/d
Accommodation – Motel Rooms	6	0.3/room	1,130 L/d
Contingency/Miscellaneous	N/A	N/A	10,000 L/d
TOTAL			**43,550 L/d**

8.6 EXISTING CONNECTION AND AVAILABLE PRESSURE

An accurate measurement on the water pressure available within the site hasn't been undertaken. The site levels and the nearby water reservoir in Tawa Street would however suggest that a suitable level of service can be delivered. The water reservoir is at an elevation of approximately RL 58m, while the site is at approximate RL 10m. Therefore, the pressure available at the site is considered to be sufficient to provide the level of service required by the RITS for potable and fire fighting water supplies.

As per section 3.2 of this report, the existing site connection to the network is in Kimihia Road, near the existing reservoir. A 150mm steel pipeline connection runs along a meandering and undulating route through the southern portion of the site and terminates approximately at the end of East Mine Road. It is understood through discussions with Solid Energy staff member Mr. Ollington, and email communication with WaterCare Waikato Senior Operations Engineer Ross Dillon that the connection line has been known to be prone to damage and leakage, and is therefore likely to be in poor condition, while current property owner Murray Allen has stated that the pipe is in good condition. It is therefore recommended that a condition survey of the main be carried out. In the event that the pipework is in poor condition, the main should be replaced with either a new PE main on a similar alignment, or with a new connection to the existing main in McVie Road.

8.7 CONCLUSIONS – WATER SUPPLY

Based on the above analysis, the Huntly water supply network has the necessary capacity and the available pressure to provide for the proposed development.

The development is likely to require approximately 43.5m³ per day from the Huntly council network when all facilities are operating at full capacity, compared to the approximate 106m³ per day that the Huntly East Mine drew from the system.

TABLE 7.7: SUMMARY OF WATER DEMAND			
SCENARIO	TOTAL WATER DEMAND	POTABLE WATER FROM HUNTLY WATER SUPPLY	NON-POTABLE WATER FROM RE-USE TANKS
HUNTLY EAST MINE	106m³/day	106m³/day	-
DEVELOPED SITE	43.5m³/day	40.5m³/day	3m³/day*
DIFFERENCE	-62.5m³/day	-65.5m³/day	3m³/day*
*Assumed rate of use			

The existing Huntly water treatment plant theoretically has 2,000m³/day of spare capacity, while the proposed upgrade in 2025 will provide a considerable increase in capacity for water treatment to the network. The network in the immediate vicinity of the site is well equipped to deliver the necessary pressure and flow rate to service the site, thanks primarily to the water reservoir in Kimihia Road, which is elevated as much as 50m higher than the site. Two potential connection locations are available, at either the existing location in Kimihia Road, or at the intersection between McVie and East Mine Roads. Therefore, the both the present day Huntly council network, and the future upgraded network is considered capable of providing the necessary supply of potable and fire-fighting water to the site.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Options for the provision of three waters servicing have been identified and analysed (refer to the previous sections of this report with respect to Stormwater, Wastewater, and Water, and to the Executive Summary for a detailed summary of those servicing options), demonstrating the viability of the site for the intended purpose. On this basis, it is recommended that:

3. The re-zoning application to the Proposed Waikato District Plan for the Kimihia Lakes Zone is granted.
4. The three waters servicing options and concepts described in this report are further developed to identify preferred options for implementation.

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