IN THE MATTER of the Resource Management Act 1991

#### AND

IN THE MATTER of the hearing (Stage 1) by the Waikato District Council on the Proposed Waikato District Plan

# EVIDENCE BY CRAIG SMITH Terra Firma Resources Limited

17 February 2021

#### 1.0 Introduction

- 1.1. My name is Craig Lincoln Smith and I am a Director of Terra Firma Resources Ltd (TFR), a company set up in 2018 with my immediate family. I have been a Huntly resident for the past 20 years, and live on Rotowaro Rd with my wife. My three children and their families also live nearby, within Huntly and Ngaruawahia.
- 1.2. I am semi-retired, and work part time as a Mining Executive for Terra Firma Mining Ltd, a separate company owned by my son and daughter-in-law. My previous role was General Manager for Solid Energy NZ Ltd. When I left Solid Energy in 2013, I had had 41 years in the mining industry in New Zealand and Australia in both engineering and management roles.
- 1.3. Between 1999 and 2013 I was General Manager of the SENZ North Island operations which included the Rotowaro Opencast Mine and Huntly East Underground Mine. The Weavers Mine had discontinued operations by this time and was in the final stages of rehabilitation.
- 1.4. TFR owns 27 Ha of land surrounded by the Puketirini Reserve in Huntly. The land was purchased from SENZ through a public tender process in 2018. The land is proposed to be zoned Rural under the Proposed Waikato District (PDP).
- 1.5. TFR (Submitter 732) seeks that part of the land is rezoned to a residential zoning and the remainder re-zoned Rural.
- 1.6. This site is a relatively new prospect for rezoning, but is significant in size, location and amenity. The land was not previously considered for re-zoning while it was still being rehabilitated by SENZ.
- 1.7. TFR has carried out an initial geotechnical evaluation to determine the suitability of the land for residential development. The results of this evaluation have identified that the North East block and the Weavers Block are good ground while the South

Western part of the block is not found to be good ground. Accordingly, TFR is applying for the NE block to be re-zoned Residential with a small Commercial Zone, the SW block to be rezoned Rural, and the Weavers Block rezoned to Village Zone.

1.8. TFR has developed a plan for a residential development of approximately 200 houses in the NE block and approximately 10 houses in the Weavers block.

#### 2.0 Rehabilitation of Weavers Mine

- 2.1 The cycle of the mining operation at Weavers Mine involved the removing of the overburden, mining the coal and backfilling the mined-out area with the next block of overburden. This truck and shovel process worked from South to the northern extremity of the mine. The lake is the final mining void that was not backfilled. Following completion of mining the overburden dumps were re-contoured using dozers to compact the ground and create the final landform. Pre-stripped topsoil was then placed on the final land surface and grassed.
- 2.2 The rehabilitation plan evolved into three separate parts: the lake and lakeshore (to become a public amenity); the perimeter strip, to be planted in a mix of native and exotic species (also to become a public amenity); and, the rehabilitation of the overburden area (to be returned as grazing farmland in the interim).
- 2.3 During my time at Solid Energy, I was directly involved in and responsible for the final rehabilitation activities to meet the requirements of the Coal Mining Licence and enable the land to be disposed of. This included the extensive landscaping involving the planting of approximately 40,000 trees, the controlled filling of the lake, the construction of the lower reaches of the stream and its discharge into the lake, and the construction of a network of walking and cycling tracks in what is now the Lake Puketirini Reserve.
- 2.4 As General Manager I established a sponsorship programme with Huntly schools and sports clubs participating in the planting programme and construction of the

mountain bike tracks. The intention of this programme was to introduce the facility to the local community and establish local ownership.

- 2.5 Over the years, I have undertaken voluntary track construction and maintenance and maintained my commitment to the reserve as a member of the Puketirini Management Committee.
- 2.6 I was directly responsible for the transfer of the lake and land to the Waikato District Council and it has been personally and professionally satisfying to be directly involved in the transformation of the Weavers Opencast Mine to a popular recreational reserve. It serves as a great example of how to create an enduring community asset from a worked-out coal mine.
- 2.7 TFR sees its land as being able to be developed into attractive residential properties compatible with, and further enhancing, the existing recreational reserve. TFR seeks to develop its own land from the current low-quality grazing land into desirable residential land, which we understand is much needed in Huntly.

# 3.0 Background to Terra Firma Resources

- 3.1. TFR was established in order to purchase the Puketirini land from Solid Energy in2018, with a view to investigating it being developed for residential purposes.
- 3.2. My son Lincoln Smith is a co-director of TFR. We are both familiar with the site and its rehabilitation over the years, and have long considered it a beautiful location.
- 3.3. We did not have access to any geotechnical analysis prior to submitting our tender but did consider that part or all of the land may prove not to be suitable for development.
- 3.4. Our vision for the site is to create a housing development that takes advantage of the lake and pastoral setting and which enhances and does not detract from the

value of the Puketirini Reserve and does not negatively impact on the enjoyment of the Reserve users.

3.5. TFR currently leases the land for grazing to a local dairy farmer. The land provides useful supplementary grazing and haylage production. However, the proximity of the farm operation to the reserve is not ideal and has resulted in fencing and gates being interfered with, theft of farm property, and on one occasion stray dogs mauling cattle.

#### 4.0 Description of TFR Land

- 4.1. The subject land is in close proximity to the existing residential area of Huntly West and approximately 1.5 km from the main township, accessed over the Waikato River by the Tainui Bridge. A plan of the Huntly area is provided in **Attachment 1** to show the site in context.
- 4.2. The bulk of TFR's land is surrounded by Puketirini Recreational Reserve and is zoned Recreational. This parcel is approximately 27 hectares and is referred to as the Puketirini Block. A two-hectare Rural Zone parcel is located at 63 Weavers Crossing Road and is referred to as the Weavers Block.
- 4.3. The Puketirini Block is accessed via an easement across the Reserve from Rotowaro Road while the Weavers Block is accessed off Weavers Crossing Road.
- 4.4. Existing residential zones are located generally to the north and east of the Puketirini Block, and the Weavers Crossing residential area is located to the west. Industrial zones are situated on the south side of Rotowaro Road, and to the northeast and a business zone is to the east. Existing zonings in the area are shown in **Attachment 2**.
- 4.5. The Proposed District Plan seeks to rezone the Puketirini Block to Rural Zone, amongst other changes in the area (refer **Attachment 3**).

- 4.6. The Puketirini Block is generally north to north-west facing with extensive views over Lake Puketirini and Lake Waahi. The land gradient is gently sloping and undulating with relatively level areas to the south of the property, sloping towards the lake in the north, and then levelling out to swampy areas adjoining Puketirini Reserve. There are no waterways on the land. Other than the reserve, the only immediately adjoining land is grazing land to the south west. Refer aerial photo in **Attachment 4** and site photographs in **Attachment 5**.
- 4.7. At 54ha, Lake Puketirini is the largest post-mining lake in New Zealand and is the venue for on-water recreational activities including waka ama, yachting, water skiing, kayaking and swimming. Lake water quality is good and the high underwater visibility and depth make it ideal for deep sea dive training. The surrounding network of walking and mountain biking trails within exotic and native species is popular with walkers, runners and cyclists.

#### 5.0 Puketirini Block

- 5.1. TFR's Puketirini Block has a number of attributes that make it an attractive and viable option for residential development.
- 5.2. The land is located on the fringe of the Huntly West residential zone and is a logical extension to this land use. TFR understands that WDC is investigating measures to uplift Huntly West following completion of the SH1 bypass. The proposed rezoning and subsequent development is a step towards this goal.
- 5.3. The Puketirini Block has good connectedness to Huntly township via the Tainui Bridge, which is only 900m from the eastern edge of the block. The main Huntly shops are approximately 1.5 km away, and it is feasible that residents could walk or cycle to and from the town.

- 5.4. The recently introduced commuter rail system connecting Hamilton and Huntly to Auckland will further enhance Huntly as a sought-after residential area. The Puketirini Block is ideally suited to help meet this market.
- 5.5. Council sewerage and water supply reticulation infrastructure is located close to the subject site (**Attachment 6**). TFR understands the Council's existing wastewater infrastructure has sufficient capacity to accommodate residential development of the block, and also that that town water can be supplied via existing reticulation.
- 5.6. The block generally has a north-facing aspect and its elevation at the side of the lake allows for pleasant views of the lake and surrounds and beyond to rural land. The land has topographical separation from the Industrial Zone to the south. The minimum width of the buffer zone and road is approximately 120 m and the buffer zone is extensively planted.
- 5.7. Public access to the Puketirini Reserve will not be limited by the proposed residential development. The proposal includes numerous public footpaths connecting the development to the reserve. The expected high residential use of the reserve will raise its profile as a prized destination within the Waikato.

# 6.0 Weavers Block

- 6.1. The Weavers Block is approximately 2 Ha, currently zoned Rural and immediately adjacent to the Weavers Crossing settlement.
- 6.2. The block is currently being leased as part of the grazing lease of the Puketirini Block, but this arrangement is far from ideal. Due to lack of connectivity to the Puketirini Block and the small size of the block, this land is currently only used to produce haylage.

- 6.3. The block is ideally suited for housing development and it is proposed to re-zone the land Village Zone and subdivide the block into approximately 10 lots of 1500m<sup>2</sup> to 2000m<sup>2</sup>.
- 6.4. The block is not able to be connected to the Huntly wastewater system and the proposed lots have been sized to allow package wastewater treatment systems to be installed.

# 7.0 Terra Firma Resources Vision

- 7.1. TFR's vision for the Puketirini Block is to create a settlement that ensures the visual and environmental appeal of the location is optimised and sustained. We envision an up-market development with architecture and roadway design to be visually interesting and appealing and not just utilitarian. There will be a variety of lot sizes and housing options to encourage a mix and a diversity of residents to create a strong and inclusive community.
- 7.2. TFR's vision is also to ensure the housing development does not unduly interfere or detract from the enjoyment users of the reserve currently enjoy. This objective will be achieved through a mix of covenants, set-backs from the reserve boundary, design of connecting footpaths and expanded planting and green zones.
- 7.3. TFR proposes a small business zone to house offices and a café to further the community engagement and enjoyment. The business zone will be located close to the reserve to further increase the connection of the settlement to the reserve and to connect the settlement to other reserve users.
- 7.4. As a greenfields site, the Puketirini Block offers design opportunities that will:
  - a) Align with the surrounding landscape;
  - b) Provide links to Puketirini Reserve;
  - c) Help to foster a sense of community;
  - d) Embody energy efficiency principles;

- e) Encourage safer communities through location of houses, lighting etc;
- f) Encourage residents to walk, cycle or use public transport; and,
- g) Improve the biodiversity of the area by planting appropriate species.
- 7.5. Subdivision design would provide for a mix of high-quality housing, appropriate to the lakeside setting, and include additional green space. TFR will consider covenants e.g. in relation to dwelling location, energy efficiency design, materials, features and colours.
- 7.6. TFR's indicative 200 lot concept plan for the Puketirini Block is provided in
   Attachment 7. TFR is seeking to re-zone the NE zone to Residential and to re-zone the SW zone to Rural. The Residential Zone proposes a lot size range of 450m<sup>2</sup> 1200m<sup>2</sup>. The NE zone includes a Business Zone, provision for two wetlands and green space.
- 7.7. TFR's indicative 10 lot concept plan for the Weavers Block is also provided in Attachment 7. TFR is seeking to re-zone the Weavers Block to Village Zone. The lots will be approximately 1500m<sup>2</sup> to 2000m<sup>2</sup>.

# 8.0 Staging

- 8.1. Following rezoning of all its land, TFR's priority is to develop the 2-hectare Weavers Block with approximately 10 lots.
- 8.2. The Puketirini Block will be developed in three or four stages in a general east to west direction.
- 8.3. The timing and staging of development of the Puketirini Block will be influenced by the sub-division geotechnical assessment and market demand.

# 9.0 Technical Reports/Findings

9.1. TFR has engaged the following consultants: Strata Control Technology Ltd (SCT) Raglan Geotech Wainui Environmental CKL
CSI – Guy Sowry

# 10.0 Geotechnical - Strata Control Technology (SCT) and Raglan Geotech

- 10.1. The Puketirini Block is part of the former Weavers Opencast Mine site, which was mined by various state organisations until its closure by Solid Energy in 1993. The subsequent rehabilitation process included contouring and soil placement on the overburden dumps, riparian planting and filling of the final pit void to create the lake. In 2005, the lake reached its maximum depth of approximately 64m. Waikato District Council acquired the lake and surrounding land from Solid Energy in 2006.
- 10.2. Uncertainty around the site's rehabilitated ground conditions has been a major hurdle to a residential rezoning in the past, due in part to a desktop assessment by GHD in 2017.
- 10.3. TFR initially engaged Strata Control Technology Ltd, (SCT) to provide a more detailed geotechnical assessment of the land and its suitability for residential development. SCT is one of Australasia's most experienced geotechnical firms and has extensive geotechnical experience in Australia and New Zealand, particularly in mine subsidence.
- 10.4. SCT's initial high-level assessment was that notwithstanding that the land comprised rehabilitated mining overburden there did not appear to be any obvious reason to rule out residential development. The overburden has been in place and allowed to further consolidate after initial mining-related placement and compaction over a period in excess of 25 years.

- 10.5. SCT's geotechnical assessment was positive, concluding that there are no fatal flaws that would prevent residential development of the land. The fill material is the same as the foundations of the Huntly area and there has been sufficient time for consolidation over the past 26 years. Individual site investigations will determine proper foundation design and construction.
- 10.6. TFR has spoken to Peter Scott, a Huntly dairy farmer who leased the Puketirini block from SENZ from the mid-1990s to 2018. Mr Scott advised that over this period he did not observe any indication of on-going subsidence or lateral movement. Mr Scott maintained that the surface topsoil would become slippery in the wet winters as is typical in the Waikato but that the ground beneath was very hard. Mr Scott said the alignment and condition of the original fences had remained stable with no sign of untoward movement. Mr Scott's advice is anecdotal and not a professional assessment but nonetheless corroborates SCT's initial assessment.
- 10.7. SCT proposed to carry out further on-site investigations but the travel restrictions imposed by the Covid pandemic ruled out SCT's on-going involvement.
- 10.8. TFR subsequently engaged Michael Carter (MSc, CMEngNZ (PEngGeol)) of Raglan Geotech, a civil engineer based in Raglan and very familiar with Waikato rocks and soils.
- 10.9. Raglan Geotech carried out field tests and drilled a number of holes across the site to identify rock types present, to identify the presence and depth of groundwater, to calculate shear strength by in-situ shear vane testing, and to determine soil-bearing capacity using dynamic penetrometer testing.
- 10.10. TFR understands this testing regime is typical of the initial geotechnical assessment Raglan Geotech would carry out on any other Waikato site to determine a prospective building site's ability to comply with the light-framed foundation bearing capacity standard (NZS 3604: 2011).

- 10.11. Raglan Geotech concluded that on the basis of this preliminary testing the land could be divided into two zones with very different soil properties and consequent suitability for building on.
- 10.12. Raglan Geotech found that the zone to the NE had bearing capacity results that qualified the land as good ground whereas the land to the SW was significantly weaker and would not qualify as good ground.
- 10.13. Raglan Geotech recommended that the land in the designated NW zone justified investment in a full subdivision geotechnical assessment required by a sub-division application whereas the land in the designated SW zone fell short of that justification.
- 10.14. On the basis of discussions with Raglan Geotech and in light of Raglan Geotech's conclusions TFR is seeking to re-zone the NE zone to Residential and apply to re-zone the SW zone to Rural.
- 10.15. TFR is not ruling out that the SW zone may be shown to be suitable for development at some time in the future and following further strength and consolidation testing.
- 10.16. TFR understands that there is likely to be significant variability in the composition of the rock and soils present across the site, and that the density of the Raglan Geotech test boreholes is not sufficient to be totally confident about the conditions across the whole of the NE zone.
- 10.17. However, TFR believes that the results are sufficiently positive for the land to be rezoned Residential and that the required full subdivision geotechnical assessment will comprehensively determine the appropriate foundation methodology to be employed on a section-by-section basis.
- 10.18. TFR understands this approach is consistent with any geotechnical assessment that the regulatory authority would require of a proposed development of land that has

been reclaimed for example or where the competence of the rock or soil may be in question.

- 10.19. TFR believes that a requirement to carry out further testing ahead of the land being re-zoned Residential presents prohibitive financial risk and that it is reasonable and appropriate for this detailed geotechnical assessment to be carried out as part of the sub-division application.
- 10.20. Notwithstanding the financial risk referred to above, TFR has commissioned Pilbrow Surveying Ltd to commence a long-duration monitoring survey of the site to identify and quantify the presence of any on-going vertical or lateral movement of the land which provide confirmation about the state of the current consolidation.
- 10.21. Pilbrow Surveying Ltd specialise in monitoring land movement, for example slope stability monitoring in high hazard situations such as slopes in mines and quarries and highway cuttings.

# 11.0 Wainui Environmental

- 11.1. TFR engaged Wainui Environmental Ltd to undertake a three waters impact assessment for the proposed development, with a particular emphasis on stormwater management to maintain the high-water quality of Lake Puketirini.
- 11.2. For the Puketirini Block, the Three Waters report proposes a capture and divert system for stormwater runoff, with water and wastewater being reticulated to the Council systems nearby.
- 11.3. The Weavers Block can be serviced with on-site package wastewater treatment systems. Water supply will be by rain water tanks, supplemented by trickle feed from the WDC mains water which is already on-site. Stormwater can be connected to the existing Weavers Crossing stormwater system.

# 12.0 CKL Ltd.

- 12.1. TFR engaged CKL Ltd to prepare an integrated traffic assessment to assess the traffic effects of the proposed residential development (refer **Attachment 8**).
- 12.2. CKL has concluded that improvements including formation of appropriate access from Rotowaro Road and development of the transport network indicated in the concept plan, TFR's proposed zoning change can be appropriately accommodated.

# 13.0 CSI

- 13.1. TFR engaged CSI to undertake a preliminary site investigation of the Weavers Block and Puketirini Block to identify potential ground contaminants (refer **Attachment 9**).
- 13.2. CSI carried out an historical appraisal of activities on the site and an on-site assessment and concluded that:

The site has been backfilled with mine spoil that is similar to the natural soil in Huntly as it is clay deposits. The potential contaminants polycyclic aromatic hydrocarbons, boron and arsenic are likely to be below NES SCS based on sampling result of a similar site by CSI.

13.3. CSI further concluded that:

There is a low risk to human health and the environment, as there are no identified potential contaminants/hazards and, it is highly unlikely that there will be a risk to human health if the site is developed into the more sensitive land use of residential.

#### 14.0 Consultation

14.1. TFR has discussed the proposal and consulted with the following parties:

lwi

Neighbours

Porter Group

Huntly Community Board

Waikato District Council – Planning, Reserves, and Roading Departments Harcourts Real Estate

15.0 lwi

- 15.1. TFR engaged with Waikato-Tainui through discussions with Waahi Whaanui Trust.
- 15.2. TFR discussed with Waahi Whaanui the mining history of the site, the current status of the site, and the proposed re-zoning application and residential development proposal.
- 15.3. TFR understands that Waahi Whaanui had involvement with SENZ during the rehabilitation phase of the mining operation and that Waahi Whaanui is very familiar with the Puketirini Reserve and the value it provides to the community.
- 15.4. Waahi Whaanui expressed an opinion that the land would hold much appeal as a residential development and were not opposed to the proposal.
- 15.5. TFR discussed with Waahi Whaanui the potential cultural and environmental uplift that the proposed residential development might achieve.
- 15.6. TFR discussed the ecological enhancement brought about by the elimination of the current farming contaminants that currently run into the lake and the existing wetland, and the water quality improvement that would come from the establishment of the wetlands to manage the stormwater run-off from the residential development.
- 15.7. TFR and Waahi Whaanui discussed the social benefits the Puketirini Reserve brings especially to the local Huntly community and that the proposed residential development would expand the population who would be able to enjoy these benefits.

- 15.8. TFR and Waahi Whaanui discussed the current problem of some members of the local community abusing Puketirini through cutting fences to bring motor bikes and cars onto the walking tracks. TFR believes that increasing the population of park users will help to control some of these undesirable activities.
- 15.9. TFR and Waahi Whaanui both respect the mining history of Weavers Mine and the history of the site in pre-mining and pre-colonial times. TFR is committed to help preserve and tell these stories through interpretation panels and other means.
- 15.10. In the Kaitiaki Environmental Impact Assessment (refer **Attachment 10**), Waahi Whaanui concluded that:

TFR has the potential to improve the local landscape and ecological value and respond to cultural values present in this location. Efforts for environmental and cultural net should be factored into the planning of this zone change and future subdivision applications.

The findings of this KEIA indicates that Whanui <u>does not oppose</u> the Terra Firma Resources Ltd proposal.

As a reflection of goodwill and trust, Whanui recognized that good faith consultation has taken place in this stage of the TFR development and look forward to progress and working with TFR in achieving key mitigation outcomes overtime.

# 16.0 Neighbours

16.1. TFR invited by letter all Weavers Crossing owners and occupiers to an on-site meeting to discuss the re-zoning application and residential development proposal. The notices of the meeting and details of all who attended the meeting is attached as Attachment 11.

- 16.2. There were some questions about the timing of the consultation and the re-zoning process and the proposed timing of the residential development but the majority of the feedback was general opposition to any change from the status quo to any residential development.
- 16.3. No formal or written feedback was received but the main objections were: effect on visual amenity; increased number of road users in the vicinity; noise and dust from protracted civil and building works; the separation of Weavers Crossing settlement from Huntly would be reduced; and, potential for the Weavers Crossing houses to suffer a reduction in value. There were assertions expressed that the mining company had previously given undertakings that residential development of the site was not planned.
- 16.4. There was little comment from the neighbours on the proposal to re-zone and subdivide the Weavers Block.
- 16.5. TFR shared a preliminary concept plan of the proposed residential development and undertook to keep the neighbours updated on the outcome of the re-zoning application and any further developments.

# 17.0 Porter Group

- 17.1. The Porter Group own part of the land enclosed by the Puketirini Reserve that borders the TFR land to the South West.
- 17.2. TFR has had involvement with Porters in agreeing to include their land as part of the grazing lease with the local dairy farmer.
- 17.3. Porters invited TFR to purchase their land in 2018. TFR submitted an offer which was not responded to.

- 17.4. At subsequent meetings with Porters, TFR has advised Porters of the process TFR is undertaking to re-zone its land.
- 17.5. Porters has not disclosed to TFR its long term plans for its land. TFR has ensured in its planning for part of the TFR land to be re-zoned Residential that the current and any likely future use of the Porters land is not compromised.

# 18.0 Huntly Community Board

- 18.1. TFR presented its re-zoning and residential development proposal to the Huntly Community Board meeting in Huntly on 15 September 2020 and 27 October 2020.
- 18.2. Members of the HCB were generally very positive and expressed support for the proposal. The HCB advised TFR to make every effort to ensure the proposed subdivision optimised the high intrinsic value of the land to maximise the appeal to prospective buyers. This advice is reflected in the mix of lot sizes in the proposed concept plan, in particular avoiding a predominance of small lots.

# 19.0 Waikato District Council

- 19.1. TFR met with council planning staff in 12 September 2018 to discuss the general proposal to seek to re-zone the land to allow development.
- 19.2. TFR's concept at this stage was to develop a small number (10 to 20) of lifestyle sections on the Puketirini Block and 4 to 6 sections on the Weavers Block.
- 19.3. The feedback from the WDC planning staff was that WDC's priority, indeed the central government's priority, was to create more intensive developments to cater for the rapidly increasing demand for housing in the Huntly district. The WDC planning staff were not favourable to limiting the use of the land to a small number of lifestyle sections.

- 19.4. The WDC planning staff also identified that uplifting the Huntly West housing area was a key council strategy. The development of the Puketirini Block was seen as being a potentially key element in the Huntly West uplift.
- 19.5. In late 2020 TFR met with WDC Reserves staff to discuss some specific elements of the TFR residential concept plan concerning access to the land from Rotowaro Road across the Puketirini Reserve and also access across the Reserve Summit Track that roughly divides the NE Block from the SW Block.
- 19.6. TFR also briefed the Reserves staff on the multiple pedestrian footpaths proposed to connect the proposed housing development with the Puketirini Reserve, and the proposal to create wetlands to manage stormwater run-off and protect and enhance the existing wetland within the Reserve.
- 19.7. TFR understands that the WDC is open to discussing roading access and pedestrian footpaths when TFR reaches the subdivision stage in the process.
- 19.8. TFR, and its roading consultant CKL, has had discussions with WDC Roading staff principally concerning whether a second road connecting the housing development to Rotowaro Road is required for safety reasons.
- 19.9. Due to the physical constraints and safety issues involved in crossing the Reserve, TFR is proposing to establish a single connecting road. There are emergency access points to the land in the unlikely event that the short single connecting road is disrupted.
- 19.10. TFR does not believe that the proposed 200 lots in the NE Block reaches a reasonable threshold where the risk of relying on a single access point is unacceptable. TFR is open to considering an additional access road in the future. The development of a second connecting road may also be warranted if the Porters land or the SW Block is developed for residential use.

#### 20.0 Harcourts Real Estate

- 20.1. TFR consulted with Harcourts Real Estate Huntly staff in 2020 to gauge potential demand for housing lots in the proposed Puketirini Block and Weavers Block residential developments.
- 20.2. Harcourts stated that there is currently high demand for building sections in Huntly and this high demand outstrips supply due to the scarcity of new sections coming to the market. Harcourts were of the view that Puketirini was a prime block that would likely be in high demand and that the sections would likely attract a premium due to the location and outlook.
- 20.3. Harcourts were not able to be specific about the size of section favoured by buyers other than stating that smaller sections were now the norm, both as a lifestyle (ease of maintenance) choice of buyers, and cost.

#### 21.0 Conclusion

- 21.1. TFR believes that the Puketirini NE Block and Weavers Block have the potential to be hugely attractive residential land.
- 21.2. The current use of the land as a grazing block is a very poor economic use of the land.
- 21.3. TFR believes that developing the land as residential will result in cultural and environmental uplift of the land and the surrounding Puketirini recreational reserve.
- 21.4. The subdivision design envisioned by TFR would provide for a mix of high-quality housing to take advantage of the magnificent outlook and lakeside setting.
- 21.5. The initial geotechnical assessment of the NE Block is cautiously optimistic and supports the application to re-zone the land Residential.

- 21.6. TFR acknowledges that the rehabilitated land within the NE block presents geotechnical uncertainties that need to be well understood and managed at the subdivision stage.
- 21.7. The next step is for TFR to carry out a full subdivision geotechnical assessment of the NE Block that will comprehensively determine the appropriate residential limits and foundation treatment.

Signed: \_\_\_\_\_

Craig Smith, 17/02/2021

- Attachment 1: General Location Plan Huntly
- Attachment 2: Puketirini Area Existing Zoning
- Attachment 3: Puketirini Area Proposed Zoning
- Attachment 4: Puketirini Area Aerial Photograph
- Attachment 5: Site Photographs
- Attachment 6: Location of Existing and Potential Services
- Attachment 7: Concept Plan Puketirini Block and Weavers Block
- Attachment 8: Transportation Assessment by CKL Surveyors Ltd
- Attachment 9: Preliminary Site Investigation by CSI
- Attachment 10: Kaitiaki Environmental Impact Assessment by Norman Hill
- Attachment 11: Consultation with Weavers Crossing Neighbours Meeting Notices and Attendance

**General Location Plan - Huntly** 



Attachment 1: General location plan – Huntly (TFR land shown in red outline)

Puketirini Area - Existing Zoning



Attachment 2: Existing zoning under Operative District Plan- Recreational Zone (green) and Rural Zone (grey). TFR land shown in red outline.

Puketirini Area - Proposed Zoning





Puketirini Area – Aerial Photograph



Attachment 4: Aerial photograph showing TFR land holdings (outlined in red), with key features

Attachment 5 Site Photographs

# Attachment 5: Site Photographs

North-western view from approximate southern boundary of Puketirini Block



North-eastern view from approximate southern boundary of Puketirini Block



Northern view from approximate southern boundary of Puketirini Block



Western view from approximate southern boundary of Puketirini Block



Southern view of Puketirini Block with reserve and lake in the foreground



Southern view of Puketirini Block with lake and boat ramp in the foreground



Western view of part Puketirini Block and Weavers Crossing with lake in the foreground



South-western view of part Puketirini Block with lake and wetland in the foreground



Location of Existing and Potential Services

# **Attachment 6: Location of Existing and Potential Services**

Potential wastewater servicing option.



Potential water servicing option.



Concept Plan - Puketirini Block and Weavers Block


Attachment 8

Transportation Assessment by CKL Surveyors Ltd



# Planning | Surveying | Engineering | Environmental

**Integrated Transportation Assessment** 

Terra Firma Resources Ltd

Lake Puketirini, Huntly, New Zealand

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# 1.0 Introduction

- 1.1.1 CKL has been engaged by Terra Firma Resources Limited ('TFR') to assess the traffic and transportation effects of developing approximately 27.8ha of land located south of Lake Puketirini in Huntly. Some 20ha of land is proposed to be rezoned as either Residential or Country Living Zone through the current District Plan review process, with the residual 7.8ha being considered as potential future development.
- 1.1.1 The subject site is located within Waikato District Council's (WDC) jurisdiction and has been assessed against the relevant transportation criteria of the WDC Operative District Plan (ODP) as well as the Proposed District Plan (PDP)
- 1.1.2 Currently, most of the area located south of Lake Puketirini is zoned as Recreational by the ODP. WDC's PDP seeks to rezone this land to a 'Rural Zone'. However, it is noted that TFR opposes this provision and seeks to rezone the land to a 'Residential Zone' for the provision of medium housing and some supporting commercial activities. Consequently, an Integrated Transportation Assessment ('ITA') has been prepared to assess the relevant traffic and transportation effects of such a rezoning.
- 1.1.3 By way of summary, it is concluded that with formation of appropriate access from Rotowaro Road, extension of the public footpath network or equivalent, and development of the multimodal transport network as outlined in the subdivision concept plan, the proposed change in zoning can be appropriately accommodated.

# 2.0 Site Location

2.1.1 The subject land is located on the southern side of Lake Puketirini, to the west of the established Huntly urban area. It is generally bounded by Weavers Crossing Road to the west, Rotowaro Road to the south and east and the lake to the north. The site location is shown as Figure 1.



Figure 1: Site Location (Source: Open Street Maps)

- 2.1.2 The land owned by TFR comprises four separate titles, being:
  - Allotment 9C Pepepe PSH;
  - Lot 1 DPS 61669;
  - Part Lot 2 DPS 61669; and
  - Pt Sec 1 SO 58281.
- 2.1.3 The site covers approximately 27.811ha of surveyed land and is irregular in shape. The site has varying topography and sits higher than the surrounding road network. The land is currently undeveloped and is used for livestock grazing and agricultural purposes.
- 2.1.4 There are two points of access to the site. The first access is public, providing access to a car park which is used for access to Lake Puketirini and the surrounding reserve. There is also an unsealed access point located on the southern boundary of the site, providing access directly onto Rotowaro Road. This is referred to as the existing 'west access' throughout this report. This crossing also provides the lonely point of access to the adjoining Porters land. There is an existing public walking track within the reserve area between the site and Rotowaro Road which can be accessed from this point and the car park.
- 2.1.5 The lots are highlighted below in Figure 2. The existing access points are also shown.

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**Figure 2: TFR Land Parcels** 

- 2.1.6 The area shaded yellow is some 20 hectares and is subject to the current rezoning proposal through the District Plan review process. The area shaded in blue is some 7.811 hectares in area. There are some geotechnical constraints associated with this smaller area which mean that it is not forming part of the current rezoning proposal. However, TFR anticipates that it may be developed for residential purposes at some point in the future and it has therefore been considered within this ITA.
- 2.1.7 Under the WDC ODP the land is zoned Recreational. Under the WDC PDP the land would become Rural, with the surrounding land being Reserve. The site location in the context of the PDP zoning is shown as Figure 3.



Figure 3: Site Location with PDP Zoning

# **3.0** Existing Road Network

### 3.1 Physical Environment

- 3.1.1 Rotowaro Road is classified as a Collector Road in the ODP road hierarchy between Harris Street and Waikokowai Road. Under the PDP, this classification is retained and extended over the full length from Harris Street to Waingaro Road.
- 3.1.2 Near the site, Rotowaro Road is generally flat and curves around the southern boundary of the property. It provides one 3.7m wide traffic lane in each direction and a painted centreline and edgelines. There are sealed shoulders of varying width (typically around 0.5m) on both sides of the road. The existing form of Rotowaro Road is shown as Figure 4.



Figure 4: Rotowaro Road (Looking East)

- 3.1.3 Rotowaro Road has a posted speed limit of 50km/h in the Huntly urban area. This changes to 80km/h approximately 140m south of Cobham Crescent, and increases again to 100km/h just west of the existing eastern access to the site.
- 3.1.4 Opposite the site is the Huntly Coal Screening Plant. This access is located 60m west of the site's eastern access and has a right turn bay. Due to the presence of the right turn bay, the eastbound lane on Rotowaro Road widens to approximately 5.5m near the site access.
- 3.1.5 Weavers Crossing Road is classified as a local road by both the ODP and the PDP. It provides one lane in each direction separated by a painted centreline. It has a curving horizontal and vertical alignment. The posted speed limit is 100km/h however the operating speed is lower, due to the alignment.
- 3.1.6 Weavers Crossing Road provides access to both Lake Puketirini and adjacent Lake Waahi. It also services a small community of approximately 14 dwellings. There is a level crossing over the Huntly/Glen Afton Branch Railway. Weavers Crossing Road is shown as Figure 5.



Figure 5: Weavers Crossing Road Cross Section (Looking North)

## 3.2 Traffic Volumes

- 3.2.1 Data published by WDC shows that Rotowaro Road carries an average daily traffic volume (ADT) of 2,920 vehicles per day (vpd) near the Riverview Road roundabout. Past the site, between Porritt Avenue and Weavers Crossing Road, the ADT is 2,070 vpd. The volume reduces further to 1,690 vpd beyond Weavers Crossing Road. Heavy commercial vehicles (HCVs) make up 8% of the flow on Rotowaro Road in Huntly, 9% past the site, and 4% beyond Weavers Crossing Road. Weavers Crossing Road. Weavers Crossing Road has a daily volume of 160 vpd, including 4% HCV.
- 3.2.2 Intersection counts were arranged at three intersections along the route between the subject land and Great South Road, in September 2020. The recorded peak hour volumes during the weekday morning, weekday evening and Saturday midday peaks are shown as Figure 6, Figure 7 and Figure 8.



#### Figure 6: AM Peak Hour (8:00-9:00am) Intersection Counts



Figure 7: PM Peak Hour (4:15-5:15pm) Intersection Counts



Figure 8: Saturday Midday Peak (11:00am-12:00pm) Intersection Counts

- 3.2.3 The Figures show that Tainui Bridge Road carried approximately 920-938 vehicles per hour (vph)(two-way) during the weekday morning and evening peaks. On Saturday, it carried up to 690 vph.
- 3.2.4 Until the Huntly Section of the Waikato Expressway was opened in early 2020, Great South Road carried an average daily volume of around 24,300 vpd<sup>1</sup> and peak hour volumes of up to 1,900 vph<sup>2</sup>, two-way. Volumes on Great South Road have reduced significantly since the new route was opened.
- 3.2.5 The survey data recorded Great South Road as carrying peak hour volumes of 630 vph during the morning, 800 vph during the evening and 620 vph on Saturday. This indicates that traffic

<sup>&</sup>lt;sup>1</sup> AADT published by NZTA for 2018 (24,344 vpd)

<sup>&</sup>lt;sup>2</sup> Hourly count data extracted from NZTA TMS Database for February 2020

volumes through Huntly have dropped to around 35% of what they were before the Huntly Section of the Expressway opened.

## 3.3 Road Safety

- 3.3.1 The Waka Kotahi Crash Analysis System (CAS) database was used to review the road safety performance of the area. The study area covered Rotowaro Road from the Weavers Crossing Road intersection to the Riverview Road intersection (a length of 2.5km), as well as the full length of Weavers Crossing Road.
- 3.3.2 A five-year search (2015 to 2019 inclusive, and any available data from 2020) revealed 14 crashes. Six resulted in minor injuries, eight did not result in any injury.
- 3.3.3 Two crashes were reported at or near the intersection of Rotowaro Road/Weavers Crossing Road/Hillside Heights Road. A minor injury was sustained when a driver turned into Hillside Heights Drive and hit the rear of a vehicle reversing out of a driveway. Visibility being impeded by vegetation was noted as a factor. In the second crash, the driver of a stolen vehicle fled police and lost control approaching Hillside Heights Road from the east.
- 3.3.4 Nine crashes were reported at midblock locations along Rotowaro Road. Most involved loss of control. The causes and contributing factors were mixed and included excessive speed, driver fatigue, wet road conditions, impairment due to alcohol, and deliberately racing or chasing other drivers.
- 3.3.5 One crash was reported at the Rotowaro Road/Porritt Avenue intersection when a driver failed to notice another vehicle slowing/stopping to turn into Porritt Avenue.
- 3.3.6 Two crashes were reported at the Rotowaro Road/Harris Street roundabout. Both involved drivers losing control through the roundabout. One driver was involved in a police pursuit earlier in the evening. The other was impaired due to alcohol. Both crashed into property fences near the roundabout.
- 3.3.7 The reported crashes mostly involved loss of control and were predominantly attributed to driver behaviour. There are no commonalities that indicate underlying road safety issues with the transport network in this area.

# 4.0 Sustainable Travel Modes

## 4.1 Walking and Cycling

- 4.1.1 Measured from the north-east corner of the site, the approximate walking distance and time to various destinations in Huntly are:
  - Huntly College (1.3km, 17 minutes)
  - Huntly Countdown (1.6km, 20 minutes)
  - Huntly West Primary School (1.6km, 20 minutes)
  - Huntly CBD/Main Street (2.2km, 28 minutes)
- 4.1.2 Consistent with the existing rural character of the area, there are no formal provisions for pedestrians or cyclists along Rotowaro Road or Weavers Crossing Road in the vicinity of the site. The urban footpath network in Huntly begins around the 80km/h to 50km/h speed transition, south of Cobham Crescent.
- 4.1.3 There is an existing network of off-road trails that runs through the reserve land around Lake Puketirini as well as circling and crossing the site itself. These trails can be seen in the vegetated areas shaded red on Figure 9.



Figure 9: Off Road Trail Network

## 4.2 Public Transport

4.2.1 Huntly is served by one existing bus route, the Northern Connector (21). The nearest stop to the site is on Tainui Bridge Road, east of Harris Street. This service runs between the Hamilton Transport Centre and Te Kauwhata, with a once daily connection to and from Pukekohe. There are approximately 20 services per day in each direction.

# 5.0 Committed Environmental Changes

- 5.1.1 Huntly Train Station (located approximately 2.5km from the site) is proposed to be upgraded as part of the Te Huia passenger rail service between Hamilton and Auckland. The overall project is planned to be completed by early 2021 but has been recently delayed due to required track work in Auckland. No information is currently available as to expected start dates.
- 5.1.2 The planned Huntly Station upgrade includes raised platforms, new shelters and a park and ride facility. When operational, the Te Huia service will provide an alternative transport option for those commuting between Huntly, Hamilton and Auckland.
- 5.1.3 It is understood that WDC is proposing to close the intersection of Porritt Avenue/Rotowaro Road and make Porritt Avenue accessible only from its eastern end. The existing intersection has been assumed to be in place in this assessment (in terms of spacing requirements for example) however it is noted that it may not remain in the long term.
- 5.1.4 It is further understood that WDC is undertaking a general upgrading of walking and cycling networks in Huntly.

# 6.0 Proposed Rezoning

## 6.1 Overview

6.1.1 A subdivision concept plan for the site is shown as Figure 10 below.



Figure 10: Subdivision Concept Plan (Prepared by Wainui Environmental)

- 6.1.2 It is noted that the western area of the site is not currently being proposed as a part of the plan change due to geotechnical constraints. However, consideration of this area being developed into residential activities has been included and assessed within this ITA as it would be accessed via the proposed new Residential Zone.
- 6.1.3 Vehicle access for the rezoned area is proposed to be via a new T-intersection with Rotowaro Road (known as the 'east access'). There is an existing west access. This is currently a 9m wide right of way over WDC Reserve land which provides access to the TFR and neighbouring land. This access is currently unsealed and is to an agricultural standard. It is anticipated that

this access can be used for emergency access as it stands, and may be upgraded at some point in future to provide a second means of access to support additional development, subject to details of future subdivision applications.

- 6.1.4 The residential area at 63 Weavers Crossing Road is proposed to have access from an existing paper road that joins Weavers Crossing Road approximately 250m north of Rotowaro Road. This area of the site is proposed as a Village Zone.
- 6.1.5 The existing off-road walking and cycling trails along the lakefront and through the site are to be retained and integrated with the proposed subdivision road and path network. Provision has also been made for connections into adjacent third-party land, should that be developed in future.
- 6.1.6 The developable site area is 20ha and anticipated to yield 180 dwellings. However, including the future planned western area of the site not included within the proposed rezoning, the overall site area is 27.811ha and is estimated to yield approximately 270 residential lots of varying sizes, including an allowance of 20 apartments within the commercial zone. The overall lot density is equivalent to an average density of 8.9 dwellings/ha gross i.e. making no allowance for roading or reserve areas. A commercial zone of 0.85ha has been assessed as yielding four buildings with 500 to 1,000m<sup>2</sup> gross floor area (GFA).

## 6.2 Traffic Generation

- 6.2.1 Trip generation rates for the anticipated residential activity have been derived using NZTA's *Research Report 453* (RR453). All residential lots have been assessed as 'outer suburban'. The commercial floor area has been assessed using a weighted average rate of commercial and office activities.
- 6.2.2 It is appropriate to assume that some traffic generation will be contained within the rezoned area. For example, people living in the area may work or shop at the commercial activities. To account for this, a reduction of 10% has been applied to the residential trip rate within the proposed residential zone and future development area and a reduction of 40% has been applied to the commercial activities. Trips associated with the Weavers Crossing Village Zone

have not been adjusted. The trip rates and the corresponding number of trips generated by the proposal is summarised in Table 1.

#### Table 1: Trip Generation Assessment

6 atiit.	Sino	Peak	Hour	Daily		
Αςτιντιγ	5120	Trip Rate	Trips (vph)	Trip Rate	Trips (vpd)	
Residential (Rotowaro Road)	270 dwellings	0.8	216	7.4	1,998	
Residential (Weavers Crossing Road)	10 dwellings	0.9	9	8.2	82	
Commercial	4,000 m <sup>2</sup> GFA	8.0	321	55.5	2,221	
Total	-	-	546	-	4,301	

6.2.3 The rezoned area has the potential to generate 546 vph (IN+OUT) during the peak hours of the day. Over the course of a full day the estimated traffic generation is 4,301 vpd (IN+OUT).

## 6.3 Access

- 6.3.1 Three access points are potentially available to connect the subject land to the existing transport network, two on Rotowaro Road (one being an emergency/future stage access) and one on Weavers Crossing Road.
- 6.3.2 The easternmost access to Rotowaro Road is currently shown approximately 110m north of Porritt Avenue, approximately 30m west opposite the carpark at Te Wananga o Aotearoa. The available sight distance at this location is 200m to the north, towards Huntly and 175m to the south. These views are shown as Figure 11 and Figure 12.



Figure 11: Sight Distance from Rotowaro Road Eastern Access to North



Figure 12: Sight Distance from Rotowaro Road Eastern Access to South

- 6.3.3 These distances meet the requirements for either an 80km/h speed zone (175m) or a 50km/h speed zone (90m), as discussed further later in this report. It has been noted that a change in speed limit at this location is supported from WDC. Further details of WDC consultation are included in Section 8 of this report.
- 6.3.4 The westernmost emergency/future stage access to Rotowaro Road is proposed to be located approximately 340m south of Porritt Avenue, opposite the Huntly Coal Screening Plant. The available sight distance at this location is 150m to the east, towards Huntly and 250m to the west away from Huntly. The available sight distance to the west satisfies the requirements of either an 80km/h or 50km/h speed zone. The distance to the east falls short of the 80km/h requirement but satisfies the 50km/h requirement. Views east and west from this location are shown as Figure 13 and Figure 14. It is anticipated that this crossing will be used for emergency purposes for initial stages of development. It may be formed as a second point of access subject to details assessed at the time of a future subdivision application once details of a specific development is known.



Figure 13: Sight Distance from Rotowaro Road Western Access to East



Figure 14: Sight Distance from Rotowaro Road Western Access to West

The available sight distances from the paper road serving 63 Weavers Crossing Road were 115m to the north and 170m to the south. Views from this location are shown as Figure 15 and Figure 16.



Figure 15: Sight Distance from Weavers Crossing Road to Left (North)



Figure 16: Sight Distance from Weavers Crossing Road to Right (South)

6.3.5 Given the posted speed limit of 100km/h, 250m of sight distance is technically required for entrances along Weavers Crossing Road. In practice, the operating speed in this area is lower due to the existing topography and road alignment. The available distances of 115m and 170m are appropriate for up to 60km/h and 78km/h, respectively. This is assessed as adequate for the proposed land use and the existing operating environment.

# 7.0 Assessment of Effects

## 7.1 Network Effects

7.1.1 The performance of the existing network has been modelled using the isolated intersection analysis package SIDRA. Levels of service during the weekday morning (AM), weekday evening (PM) and Saturday peak hours are summarised in Table 2 below. Full results are presented as Appendix A. The table includes the surveyed 2020 volumes and a 2033 scenario (which allows three years for implementation and a ten-year growth horizon beyond that) with background growth of 2% per annum applied to all movements. These assessments consider the proposed Residential Zone, the Weavers Crossing proposed Village Zone and the potential future residential development area.

	Manager of Derformance	2020			2033		
Intersection	Measure of Performance	AM	РМ	SAT	AM	РМ	SAT
	Level of Service	В	В	В	В	В	В
Great South Road/Tainui	Degree of Saturation	0.381	0.468	0.370	0.483	0.589	0.466
Bridge Road	Longest 95-th Percentile Queue (m)	30.9	35.7	26.2	40.4	46.9	34
Tainui Bridge	Level of Service	А	А	А	А	А	А
Road/George	Degree of Saturation	0.221	0.272	0.204	0.288	0.365	0.269
Drive/Tumate Mahuta Drive	Longest 95-th Percentile Queue (m)	10.4	12.1	8.3	14.4	17.8	11.7
	Level of Service	А	А	А	А	А	А
Rotowaro Road/Te Araroa Trail/Tainui Bridge Road	Degree of Saturation	0.382	0.402	0.253	0.508	0.520	0.325
	Longest 95-th Percentile Queue (m)	18.9	21.3	11.2	28.3	32.3	15.8

Table 2. F	victing and	Eorocast Euturo	Intersection	Dorformanco	(No Rezoning	a or Develo	nmont)
	inisting and	i uluie	Intersection	Ferrormance	(NO NEZOIIII)	s of Develop	unent

- 7.1.2 Table 2 shows that all three intersections are operating with a good level of service (LOS A or LOS B) and are expected to maintain that good level of service by 2033. There is spare capacity at all intersections, with the maximum degree of saturation reaching 0.589 (58.9%) at the Great South Road/Tainui Bridge signals during the PM peak. The maximum 95-th percentile queue length on any approach at any intersection is 47m (equivalent to approximately six vehicles).
- 7.1.3 The traffic movements associated with the rezoning have been distributed using the following assumptions. Turning movement diagrams are presented in Appendix B.
  - The traffic generated the anticipated generation of approximately 280 lots, which includes Weavers Crossing and the western end of the site which is not a part of this proposal
  - 70% of movements outbound in the AM, 30% inbound
  - 30% of movements inbound in the PM, 70% inbound
  - 3% of the site traffic uses Weavers Crossing Road, 97% uses the eastern Rotowaro Road access.
  - 90% of all traffic movements are made to/from Huntly
  - At existing intersections, site traffic movements distribute in accordance with existing traffic movement patterns.
- 7.1.4 The intersections were modelled again in SIDRA with the forecast site traffic movements added to the estimated 2033 volumes during the AM and PM peak hours<sup>3</sup>.

		2033 No	Rezoning	2033 With Rezoning		
Intersection	Measure of Performance	АМ	РМ	АМ	РМ	
	Level of Service	В	В	В	В	
Great South Road/Tainui Bridge Road	Degree of Saturation	0.483	0.589	0.561	0.649	
	Longest 95-th Percentile Queue (m)	40.4	46.9	51.9	51.7	
	Total Volume (vph)	1,065	1,249	1,231	1,392	
	Change	-	-	166 (16%)	143 (11%)	
Tainui Bridge Road/George	Level of Service	A	A	A	A	
	Degree of Saturation	0.288	0.365	0.384	0.526	

Table 3: 2033 Intersection Performance with and with Rezoning and Potential Future Residential Development

<sup>&</sup>lt;sup>3</sup> The Saturday scenario was not modelled as flows on the network and predicted site traffic movements are both lower than the weekday peak hours.

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Drive/Tumate Mahuta Drive	Longest 95-th Percentile Queue (m)	14.4	17.8	21.0	31.1
	Total Volume (vph)	1,458	1,583	1,830	1,988
	Change	-	-	372 (26%)	405 (26%)
Rotowaro Road/Te Araroa Trail/Tainui Bridge Road	Level of Service	А	А	В	А
	Degree of Saturation	0.508	0.520	0.726	0.803
	Longest 95-th Percentile Queue (m)	28.3	32.3	66.6	89.0
	Total Volume (vph)	1,343	1,365	1,845	1,866
	Change	-	-	502 (37%)	502 (37%)

- 7.1.5 Table 3 shows that all three intersections continue to operate with no worse than LOS B with the site traffic movements added. The rezoning and potential future residential development increase volumes through the intersections by 16-37%. This increases the degree of saturation to up to 0.803 (worst case) and 95-th percentile queue lengths increase by up to 50m (6-7 vehicles) on any approach. Overall, all intersections are shown to operate within their available capacity and a good level of service is maintained around the network.
- 7.1.6 Table 4 shows the expected daily volumes on Rotowaro Road, Weavers Crossing Road, and the new connector roads into the rezoned area. This analysis again assumes that 90% of traffic movements generated by the rezoning are to/from the east.

Road Section	2020	2033	Traffic Generated from Rezoning	2033 with Rezoning	% Change
Rotowaro Road, west of Riverview Road	2,920	3,679	3,957	7,636	108%
Rotowaro Road, between Site West Connection and Emergency Access	2,070	2,608	1,856	4,464	71%
Rotowaro Road, east of Weavers Crossing Road	2,070	2,608	558	3,166	21%
Rotowaro Road, west of Weavers Crossing Road	1,690	2,129	440	2,569	21%
Weavers Crossing Road	160	202	82	284	71%
Site West Connection	-	-	4,248	4,248	-
Emergency/Future Stage Access	-	-	-	-	

Table 4: Daily Traffic Volumes (vpd, two-way)

- 7.1.7 Rotowaro Road is expected to carry up to around 7,640 vpd as it leaves Huntly, reducing to some 2,570 vpd beyond Weavers Crossing Road. The Waka Kotahi NZTA 'One Network Road Classification' (ONRC) classifies Rotowaro Road as a primary collector. A daily volume of 7,640 vpd falls at the higher end of the typical range for an urban collector road and the lower end of the typical range for an arterial.
- 7.1.8 The ONRC framework gives general guidance regarding appropriate classifications based on traffic volumes and other characteristics. In urban areas, roads with more than 5,000 vpd and more than 300 HCV/day (which Rotowaro Road is expected to have) align with the arterial road classification.
- 7.1.9 On this basis, WDC may wish to review the classification of Rotowaro Road over time and elevate its status in the District's hierarchy, if appropriate. This is a matter for WDC to determine in the context of their overall network strategy and priorities for Huntly. Either classification can adequately accommodate the needs of the rezoning.
- 7.1.10 Weavers Crossing Road is expected to carry up to 350 vpd. This is well under the ONRC threshold of 1,000 vpd for local/access roads. It is also under the level at which the WDC PDP suggests roads should be classified as collectors. Table 14.12.5.14 gives this threshold as 100 lots or more, which is equivalent to upward of 800-1,000 vpd.
- 7.1.11 The site connections are forecast to carry 1,620 vpd to 2,630 vpd each, assuming the wider site has two accesses for the full development of 270 dwellings and commercial zone across the both the proposed area of rezoning and possible future development area. However, with one access for the anticipated 180 dwellings and commercial centre within the proposed residential zone only (i.e. excluding the future development area), this site access is forecast to carry 2,170 to 3,530 vpd. On the basis of both the ONRC guidance and the PDP, with either scenario of development, they would be appropriately classified as collector roads.

## 7.2 Speed Environment

7.2.1 Rezoning of the subject land would create a more urban environment in this part of Huntly and increase the volume of vehicles, pedestrians and cyclists moving through the area. There

would also be one new intersection on Rotowaro Road, with a potential second intersection pending for future development, combined with existing entrances to industrial and educational activities on the opposite side of the road.

7.2.2 It is recommended that the 50km/h speed zone that currently ends around 140m south of Cobham Crescent be extended approximately 700m. This would see the transition to 80km/h move west of Porritt Avenue and provide plenty of space for drivers to decelerate prior to the proposed eastern access to the site area. If the emergency access is formed to support further development at some point in future, additional extension of the 50kmh speed limit may be appropriate.

### 7.3 Intersection Effects

- 7.3.1 The existing intersection volumes and estimates of site traffic volumes presented in Section 7.1 (also presented in Appendix B) were used to estimate volumes at the proposed new (east) access intersection and the possible future (west) access intersection on Rotowaro Road. Based on these volume estimates, both the proposed intersection and future possible intersection meet the Austroads warrants for right turn bay treatments, irrespective of the speed environment.
- 7.3.2 The design of any intersections provided on Rotowaro Road should be developed in consultation with WDC and be subject to WDC approval at subdivision stage. The designs will need to consider the future speed environment, extent of actual development planned on site and the existing activities on the opposite side of the road.

## 7.4 Access Effects

7.4.1 Under the PDP<sup>4</sup>, roads in residential zones serving more than 100 allotments should be classified as collector roads and have a 22m legal width. This is considered the appropriate classification and legal width for the proposed eastern and future possible western connections from Rotowaro Road, but does not apply to the emergency access.

<sup>&</sup>lt;sup>4</sup> PDP Table 14.12.5.14



7.4.2 The collector roads for the development are shown in grey below in Figure 17.

## Figure 17: Proposed Collector Roads (In Grey)

- 7.4.3 The ODP<sup>5</sup> and the PDP<sup>6</sup> require accesses catering for more than 40 vpd in 80km/h speed rural environments to provide at least 175m of sight distance. This can be achieved in both directions at the eastern access, and to the west from the future possible (western) access. Only 150m is available from the western access to the east. Removal of vegetation may make compliant sight distance available.
- 7.4.4 If the recommended change in speed limit is adopted and the area is classed as urban, required sight distance reduces to 80m and both accesses can comply.

<sup>&</sup>lt;sup>5</sup> Appendix A, Table 6

<sup>&</sup>lt;sup>6</sup> Table 14.12.5.3

7.4.5 The ODP and PDP requirements for a 100km/h environment are not met at the intersection between the paper road and Weavers Crossing Road. As discussed above at 6.3.5, the available sight distance is considered appropriate for the existing road environment and for the scale of residential use proposed.

## 7.5 Active Mode Integration

- 7.5.1 There is an existing network of off-road walking and cycling trails around Lake Puketirini and through the reserve areas adjacent to Rotowaro Road. The proposed subdivision concept plan has been designed to integrate with and extend this network.
- 7.5.2 This off-road network, combined with the footpaths that can be expected to be formed on the internal subdivision roads, provides a high level of permeability and connectivity around and through the site for people walking and cycling.
- 7.5.3 It is recommended that integration with the existing on-street footpath network in Huntly is completed by either constructing a footpath on the western side of Rotowaro Road from the existing termination point west of Smith Avenue to the eastern site access road or by providing a connection through to the Lake Puketirini reserve. The suggested options are shown on Figure 18. The final form of pedestrian access can be confirmed at subdivision stage.



Figure 18: Recommended Footpath Extension

7.5.4 Future pedestrian and cycling paths are recommended to be built in accordance with District Plan standards. The design and location of these facilities can be confirmed at the subdivision stage once a particular development is proposed.

## 7.6 Road Safety Effects

7.6.1 The road safety history summarised earlier in Section 3.3 is dominated by loss of control incidents with mixed contributing factors. With urbanisation of the area and increased volumes of vehicles, pedestrians and cyclists in the area, it is recommended that existing

50km/h speed zone is extended around 700m further west. This can be expected to make a positive contribution to both crash risk and crash severity indicators.

- 7.6.2 The proposed site access point to the Residential Zone on Rotowaro Road has been assessed and can provide appropriate sight distance for the proposed speed environment. It is recommended that the intersection with Rotowaro Road is formed with a right turn bay, to manage delays and minimise risk associated with rear-end crashes.
- 7.6.3 The proposed access point on Weavers Crossing Road does not meet visibility requirements for the posted speed limit of 100km/h. However, as discussed in Section 6.3.6 of the report, due to the existing topography and road alignment, driver speeds are likely to be much lower at this point. The available sight distances of 115m and 170m are appropriate for up to 60km/h and 78km/h, respectively. These speeds are assessed as adequate for the existing operating environment. It is also noted that Weavers Crossing Road is constrained by its topography. Therefore, this access is located at the point with the maximum available visibility.
- 7.6.4 Given that the western access is an unformed emergency access that would likely be used infrequently, it is not considered necessary to upgrade this access into an intersection or provide a right turn bay. If it is formed to support additional development in future, then considerations of the effects of this non-compliance can be assessed at that time and appropriate mitigations identified.
- 7.6.5 With the recommended infrastructure upgrades provided, the traffic movements associated with the rezoning are expected to be safely and appropriately accommodated on the transport network.

## 7.7 Staging

7.7.1 It is reasonable to expect that if the land is rezoned, development within the area will be staged and may start with subdivision around the proposed eastern intersection and the site

would be developed westward. Details of staging can be considered at subdivision consent stage.

# 8.0 Waikato District Council Consultation

- 8.1.1 Consultation has been undertaken with WDC informally in early 2020 with regard to speed limit changes along Rotowaro Road and on access opportunities into the site.
- 8.1.2 Consultation was also undertaken on Friday 12 February 2021 via a meeting with regard to the transportation related matters of the proposed plan change. Below is a summary of the consultation that occurred:
  - WDC are supportive in principle of a future speed limit reduction to 50km/h in the vicinity of the potential eastern access.
  - The proposed eastern access is acceptable in principle. As a minimum, this will need to include a right turn bay, and depending on the scale of development accessed from this point, may need to be a small urban roundabout. This can be confirmed at subdivision consent.
  - WDC will need to consider staging of development within any rezoned area. Depending
    on the intensity of development proposed, this may require the provision of a second
    means of road access. Both of these mattes can be assessed through the subdivision
    consents process.
  - WDC is looking for full compliance with District Plan for roading standards in terms of corridor width, provision within the corridor and pedestrian and cycle paths. No departure from standards is proposed as part of the rezoning.
  - WDC is looking for options to integrate the potential future development into Huntly's active modes network. Options have been identified through this ITA and the detail of provision can be confirmed at the subdivision consent stage and when detail design plans are made.
  - WDC is likely to require bilingual signage. This can be addressed at the detailed design stage.

# 9.0 Planning Framework

# 9.1 Objectives and Polices

9.1.1 An assessment has been made against the transportation objectives and policies outlined in section 6.5 of the PDP. This assessment is summarised in Table 5 below.

Table 5: Proposed	<b>District Plan</b>	Transportation	Objectives/	Polices	Assessment
Table J. Froposeu	District Flam	riansportation	Objectives/	FUILES /	

Objective/Policy	Comment	Status
<ul> <li>6.5.1 Objective – Land Transport Network</li> <li>a) An integrated land transport network where: <ul> <li>i) All transport modes are accessible, safe and efficient</li> <li>ii) Adverse effects from construction, maintenance and operation of the transport network are managed</li> </ul> </li> </ul>	The proposed rezoning is considered to align with this objective given that it includes provision for pedestrians, cyclists, private vehicles and integrates with an existing network of off-road trails.	Supports
<ul> <li>6.5.2 Policy - Construction and Operation of the Land Transport Network <ul> <li>a) Promote the construction and operation of an efficient, effective, integrated, safe, resilient and sustainable land transport network through:</li> <li>(i)Corridor, carriageway and intersection design which is appropriate to the road function as specified in the road hierarchy and in accordance with relevant guidelines;</li> <li>(ii)The appropriate design and location of sites accesses;</li> <li>(iii)Traffic signage, road marking, lighting, rest areas and parking as appropriate;</li> <li>(iv)Provision for pedestrians and cyclists that addresses accessibility, including off-road facilities and connections;</li> <li>(v)Corridor and carriageway design which is sufficient to enable provision of public transport;</li> </ul> </li> </ul>	The proposed rezoning and subdivision concept plan are considered to align with this policy given that appropriate connections have been planned to integrate with the existing network.	Supports
<ul> <li>(vi)Provision for other infrastructure, including where suitable low impact design stormwater facilities;</li> <li>(vii)Provision for stock underpasses where suitable access is not readily available;</li> </ul>		
<ul> <li>(viii)Discouraging the installation of new at grade road and pedestrian rail level crossings:</li> <li>A. Controlling the location of buildings and other visual obstructions within the sightline areas of rail level crossings; and</li> <li>B. Bailway crossing design in accordance with</li> </ul>		
the requirements of the rail operator.		

<b>6.5.3 Policy – Road hierarchy and function</b> Provide a hierarchy of roads for different functions and modes of land transport while recognising the nature of the surrounding land use within the district.	The proposed rezoning respects the road hierarchy and existing form of the transport network in the area. Specific infrastructure upgrades have been recommended to protect the intended function of Rotowaro Road.	Supports
<b>6.5.4 Policy – Road standards</b> Ensure that the construction and operation of roads is consistent with their function in the road hierarchy.	Two new collector roads are proposed. The construction of these and other internal roads and vehicle manoeuvring areas are expected to be consistent with their function	Supports
<b>6.5.5 Policy - Road safety</b> Ensure that structures, lighting, signage and vegetation are located and designed so as to not compromise the safe and efficient operation of the land transport network, or obscure RAPID numbers.	Lighting, signage etc are expected to be designed at the time of subdivision to the appropriate standards thereby not compromising the safe or efficient operation of the land transport network	Supports
<b>6.5.6 Policy – Network utility location</b> Encourage the location of network utility infrastructure within transport corridors where the function, safety and efficiency of the transport network will not be compromised.	Utility connections are expected to be integrated with transport corridors.	Supports
<b>6.5.7 Policy – Vehicle access</b> Control the location of new vehicle accesses to sites adjacent to other accesses and rail level crossings to improve the safety and efficiency of the land transport network.	A limited number of high standard intersections are proposed to serve the area, as opposed to direct access to existing public roads.	Supports

9.1.2 Overall, the proposed rezoning is considered to align with the objectives and policies of the PDP. No changes to these policies are proposed in regard to the subject land.

# 9.2 Rules

9.2.1 Table 6 below summarises an assessment of the rezoning proposal against the transportation criteria from Section 14.12 of the notified version of the PDP.

#### Table 6: Proposed District Plan Compliance

Rule	Requirement	Proposed	Compliance					
14.12	14.12.1.1 Vehicle Access for All Activities							
1a	The site has a vehicle access to a formed road that is maintained by a road controlling authority	New transport corridors are proposed to provide access to all sites.	Compliance achievable					
1b	The site has a vehicle access that is constructed to comply with the relevant requirements of Table 14.12.5.1, Figure	Roads serving the rezoned area are expected to comply with the relevant standards. Comments on known access	Compliance achievable					
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	14.12.5.2, Table 14.12.5.3 and Figure 14.12.5.4	arrangements on Rotowaro Road are provided below.	
1c	No new vehicle access shall be created from Newell Road (south of Birchwood Lane)	N/A	N/A
1d	No access, access leg or right-of-way shall run parallel to any road within 30m of the road	No parallel access roads expected	Compliance achievable
1e	On a site with legal access to two roads, the activity only accesses the road with the lower classification in the road hierarchy in Tables 14.12.5.5 and 14.12.5.6 (where the roads have the same classification, access is only to the road with the lower average daily traffic movements)	There are two distinct lots of land. One has frontage to Weavers Crossing only and one has frontage to Rotowaro Road only.	N/A
1f	New vehicle accesses/entrances are not to be constructed to any site from the following roads	No listed roads are near site	N/A
1g	No new vehicle access shall be created within 30 metres of a railway level crossing	No access proposed near level crossings.	Compliance achievable
14.12	.1.2 On-Site Parking and Loading		
1a	The parking requirements in Table 14.12.5.7 and 14.12.5.11,		Compliance achievable
1b	On-site bicycle space requirements in Table 14.12.5.10,		Compliance achievable
1c	Any on-site car parking spaces for non- residential activities within the Residential Zones must be set back at least 3m from the road boundary of the site and screened by planting or fencing		Compliance achievable
1d	On-site car parking spaces and loading bays are to be provided in accordance with the requirements of Table 14.12.5.7, Figure 14.12.5.8 and Table 14.12.5.11 and be located on the same site as the activity for which they are required;	Individual activities within the rezoned area are expected to be able to comply with the relevant parking and loading	Compliance achievable
1e	On-site car parking spaces and loading bays are formed	rules at the time they are designed and consented.	Compliance achievable
1f	On-site car parking spaces and loading bays are to be permanently marked if five or more parking spaces are required;		Compliance achievable
1g	On-site car parking spaces and loading bays are not to be located on any shared access or residential court;		Compliance achievable
1h	Vehicles occupying any on-site car parking or loading spaces must have ready access to the road (or relevant access or right of way) at all times, without needing to move any other vehicle occupying other on-site car parking or loading spaces;		Compliance achievable

-			
1i	On-site car parking spaces and loading bays are not required on sites with sole frontages to the following	No listed roads are near site	N/A
14.12	.1.3 On-Site Manoeuvring and Queuing		
1a	On-site manoeuvring space shall be provided to ensure that no vehicle is required to reverse onto a road		Compliance achievable
1b	A 90 percentile car, as defined in Figure 14.12.5.8, can enter and exit all parking spaces without making more than one reverse movement, excluding spaces required for a dwelling	Individual activities within the rezoned	Compliance achievable
1c	On-site manoeuvring space for any heavy vehicle shall comply with the tracking curve (relevant for the type of activities to be carried out on the site and trucks to be used),	area are expected to be able to comply with the relevant manoeuvring and queueing rules at the time they are designed and consented.	Compliance achievable
1d	On-site manoeuvring space shall be formed		Compliance achievable
1e	On-site queuing space shall be provided in accordance with Table 14.12.5.12 for vehicles entering and exiting any on-site car parking, loading or manoeuvring space		Compliance achievable
1f	On-site manoeuvring and queuing spaces are not required on sites with vehicle accesses/entrances to the following:	No listed roads are near site	N/A
14.12	.1.4 Traffic Generation		
1a	Within the Residential, Village or Country Living Zones there is a maximum of 100 vehicle movements per day, and no more than 15% of these vehicle movements are heavy vehicle movements;	Individual site traffic generation will be assessed at the time of subdivision/development.	Compliance expected.
1b	Within the Rangitahi Peninsula Zone	Site not in this zone	N/A
1c	Within the Business Zone Tamahere, Business Zone or Business Town Centre Zone	Site not in these zones	N/A
1d	Within the Rural Zone	Site no longer proposed to be within this zone	N/A
1e	Within the Industrial Zone and Heavy Industrial Zone (excluding the Huntly Power Station and Huntly Quarry)	Site not in this zone	N/A
1f	From the Huntly Power Station	Site not in this zone	N/A
1g	From the Huntly Quarry	Site not in this zone	N/A
1h	Within Precincts A and B of the Te Kowhai Airpark Zone	Site not in this zone	N/A
1i	Within Precincts C and D of the Te Kowhai Airpark Zone	Site not in this zone	N/A

14.12	.1.5 Operation, maintenance and minor upgr	ading of existing public roads	
1a	The works occur within the road or unformed road	No public works proposed outside road reserve	Compliance achievable
1b	<ul> <li>Works within the road must be:</li> <li>i) Incidental to, and serve a supportive function for, the existing public road; or</li> <li>ii) Required for the safety of road users; or</li> <li>iii) Required for the safety of adjacent landowners or occupiers;</li> </ul>	Upgrade works will support future development	Compliance achievable
1c	Lighting shall be designed and located to comply with the Australia New Zealand Roading Lighting Standard 1158, (series) – Lighting for Roads and Public Spaces: 2005	Lighting expected to comply with these standards	Compliance achievable
1d	Any earthworks must comply with Rule 14.3.1.3	Earthworks expected to comply	Compliance achievable
14.12	.1.6 New Public Roads		
1a	The public road is located within road or unformed road	New public roads will be formed in appropriate areas.	Compliance achievable
1b	The public road is not located within an Identified Area	Proposed roads are not through Identified Areas	Compliance achievable
1c	The design requirements of Table 14.12.5.14 or 14.12.5.15, based on their function within the Road Hierarchy as set out in Table 14.12.5.5	Internal roads are expected to comply with the relevant criteria for their classification.	Compliance achievable
1d	Within road or unformed road located within the Tamahere Country Living Zone	Site is not in this zone	N/A
1e	Within road or unformed road located within the Rangitahi Peninsula Zone, the relevant access and road requirements of the Rangitahi Structure Plan take priority over the conditions in Table 14.12.5.14 or 14.12.5.15 in the event of any conflict	Site is not in this zone	N/A
1f	Within road or unformed road located within the Te Kauwhata Structure Plan area	Site is not in this zone	N/A
1g	Any earthworks must comply with Rule 14.3.1.3	Earthworks expected to comply	Compliance achievable
14.12	.1.7. Access and New Roads – Te Kowhai Airp	ark Zone	
1a	Airpark roads which are to be vested in Council must comply with the following conditions: The design requirements of Table 14.12.5.14 or 14.12.5.15, based on their function within the Road Hierarchy as set out in Table 14.12.5.5,	Site is not in this zone	N/A
2	Road alignment and the taxiway network within the Te Kowhai Airpark Zone shall be	Site is not in this zone	N/A

	in accordance with Appendix 9 – The Te Kowhai Airpark Framework Plan		
3	The western boundary of the Te Kowhai Airpark Zone shall provide for future connectivity options (vehicular and / or pedestrian) in accordance with the location identified in Appendix 9 – The Te Kowhai Airpark Framework Plan.	Site is not in this zone	N/A
4	Any earthworks must comply with Rule 14.3.1.3.	Site is not in this zone	N/A
14.12	.1.8 Off-Road Pedestrian and Cycle Facilities		
I	Have a minimum 2.0m width	Any new off-road paths expected to comply with this standard	Compliance achievable
li	Are formed	Any new off-road paths expected to comply with this standard	Compliance achievable
lii	Comply with the relevant setback standards for the applicable zone	Any new off-road paths expected to comply with this standard	Compliance achievable
lv	Any earthworks must comply with Rule 14.3.1.3	Earthworks expected to comply	Compliance achievable
V	Are not located within an Identified Area.	Off-road paths expected to comply with this standard	Compliance achievable
14.12	.1.9 Stock Underpasses		
1a	Any earthworks must comply with Rule 14.3.1.3	No stock underpasses proposed	N/A
1b	Are not located within an Identified Area	No stock underpasses proposed	N/A

- 9.2.2 Development within the area would be subject to future subdivision and consent processes. Overall, it is evident that future activities in the rezoned area are expected to achieve a high level of compliance with the relevant rules that apply to the Residential zone in the PDP. No changes are recommended to the PDP rule framework.
- 9.2.3 Some rules relating to the proposed external access connections can be assessed at this stage. In an 50km/h speed environment, the ODP and the PDP require side road intersections on a collector road to be at least 100m apart. The proposed new access road is at least 100m from Porritt Avenue.
- 9.2.4 In a 50km/h speed environment, the ODP and the PDP require accesses on a collector road to be at least 30m from side road intersections. This spacing requirement has been considered in the recommended location of the eastern access, to provide a 30m offset to the Te Wananga o Aotearoa access. Separation distances between any future upgrade of the

emergency access to serve future development on site can be assessed at the appropriate time.

9.2.5 The new roads connecting to Rotowaro Road are recommended to be collector roads, with cross-section standards guided by Table 14.12.5.14 of the PDP. Details of road cross-sections and access to individual activities within the subject site can be addressed through subdivision applications that would follow if the land is rezoned.

#### **10.0** Conclusions and Recommendations

- 10.1.1 Terra Firma Resources Ltd is seeking to change the intended PDP zoning of approximately 20ha of land on the southern side of Lake Puketirini from Rural to Residential. The estimated yield of the land is 180 residential dwellings with an estimated 4,000m<sup>2</sup> of supporting commercial GFA. A further 7.811 ha of land may be developed in future, although it is currently not included within the proposed rezoning due to current geotechnical constraints. If this area were to be developed, there could be a total of 280 residential dwellings (including apartments in commercial zone and Weavers Crossing lots. Therefore, for robustness of the ITA these additional future anticipated dwellings have been included and assessed within this ITA.
- 10.1.2 The proposed rezoning and the future 7.811 ha of potential future residential development is assessed as generating approximately 4,301 vpd including up to 546 vph onto the surrounding road network. Most of these movements are expected to be made to and from the east, towards Huntly and Great South Road (formerly SH1).
- 10.1.3 The transport network is currently operating at a good level of service (LOS A or LOS B). It has seen a significant reduction in traffic volume, and release of capacity, since opening of the Waikato Expressway Huntly Section in early 2020.
- 10.1.4 Two new intersections are recommended as part of the rezoning, one on Rotowaro Road and one on Weavers Crossing Road. An existing third unformed access is recommended to be retained for emergency access to serve the rezoned land. Depending on future development intensity and the form of the eastern site access, this may be formed to create a second means

of access. The need for and form of such an intersection can be assess through the subdivision consents process.

- 10.1.5 Capacity modelling of the three main intersections located between the subject site and Great South Road has confirmed that site traffic volumes, combined with assumed 2% per annum growth from other sources to the year 2033, can be accommodated without adversely affecting the operation of the network. For robustness of this assessment, it was assessed that the full 27.811 ha of the site is developed.
- 10.1.6 To support rezoning of the land, the following infrastructure upgrades are recommended:
  - A new collector road network providing access to the rezoned area from Rotowaro Road, supported by a network of local roads and laneways within the rezoned area.
  - As a minimum a priority t-intersection should be provided between a collector road and Rotowaro Road approximately 140 m north of Porritt Avenue. Depending on the future intensity and staging of development, this intersection may need to be a small urban roundabout and consideration may need to be given to providing a second access intersection further to the south;
  - Provision of an appropriate walking and cycling network within the rezoned land and connecting the site with urban Huntly. Options exist to utilise either Rotowaro Road or the existing reserves and the details of this can be confirmed at subdivision consent stage;
  - In consultation with Waikato District Council, a review of the speed environment along Rotowaro Road with a view to extending the existing 50km/h zone approximately 700m further west.
- 10.1.7 The delivery of the above infrastructure can be governed through the subdivision consenting process and it is not considered necessary to provide any specific zone rules around infrastructure delivery.
- 10.1.8 Some existing limitations have been recognised on Weavers Crossing Road. It is recommended that the small portion of the site that has access to Weavers Crossing Road is used only for low density residential activities consistent with the proposed Village Zone.
- 10.1.9 With these measures in place, and the relevant District Plan Zone rules applied at the time of subdivision, including provision of a suitably focused Integrated Transportation Assessment,

the anticipated traffic effects arising from rezoning of the land from Rural to Residential with supporting commercial activities, and Village Zone can be accommodated by the surrounding transportation network with no loss of function or safety.

CKL

#### **APPENDIX A**

SIDRA Output

#### Site: 101 [AM Existing (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	Vehicle Movement Performance													
Mov ID	Turn	INF VOLI	PUT JMES	DEM. FLO	AND WS	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE	ACK OF EUE	Prop. Que	Effective Stop	Aver. No.	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		[ Veh. veh	Dist] m		Rate	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	130	17	137	13.1	0.108	8.0	LOS A	0.6	4.9	0.32	0.65	0.32	51.9
2	T1	167	12	176	7.2	*0.365	20.3	LOS C	2.8	20.6	0.91	0.70	0.91	50.5
Appro	bach	297	29	313	9.8	0.365	14.9	LOS B	2.8	20.6	0.65	0.68	0.65	51.1
North	: Grea	t South	Road											
8	T1	141	7	148	5.0	0.179	9.3	LOS A	2.2	16.3	0.64	0.52	0.64	59.4
9	R2	87	10	92	11.5	*0.381	29.2	LOS C	2.2	16.9	0.95	0.76	0.95	39.5
Appro	bach	228	17	240	7.5	0.381	16.9	LOS B	2.2	16.9	0.76	0.61	0.76	49.8
West	: Tainu	i Bridge	Road											
10	L2	126	29	133	23.0	0.114	6.1	LOS A	0.6	5.1	0.32	0.59	0.32	47.2
12	R2	194	24	204	12.4	*0.374	19.3	LOS B	4.0	30.9	0.82	0.77	0.82	41.5
Appro	bach	320	53	337	16.6	0.374	14.1	LOS B	4.0	30.9	0.62	0.70	0.62	43.6
All Vehic	les	845	99	889	11.7	0.381	15.2	LOS B	4.0	30.9	0.67	0.67	0.67	47.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.		
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed		
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
West: Tainui B	ridge Ro	ad											
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [AM 2033 (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance														
Mov	Turn	INF	PUT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop.	Effective	Aver.	Aver.
ID		VOLI	JMES	FLO	WS	Satn	Delay	Service	QUE	EUE	Que	Stop	No.	Speed
		[ Total	HV ]	[ Total	HV ]				[Veh.	Dist]		Rate	Cycles	
		veh/h	veh/h	veh/h	%	V/C	sec		veh	m				km/h
South	n: Grea	at South	Road											
1	L2	164	21	173	12.8	0.138	8.2	LOS A	0.9	7.0	0.34	0.66	0.34	51.7
2	T1	210	15	221	7.1	*0.459	20.7	LOS C	3.6	26.5	0.92	0.73	0.92	50.2
Appro	bach	374	36	394	9.6	0.459	15.2	LOS B	3.6	26.5	0.67	0.70	0.67	50.9
North	: Grea	t South	Road											
8	T1	178	9	187	5.1	0.226	9.5	LOS A	2.9	21.1	0.66	0.54	0.66	59.2
9	R2	110	13	116	11.8	*0.483	29.7	LOS C	2.8	21.8	0.96	0.78	0.96	39.3
Appro	bach	288	22	303	7.6	0.483	17.2	LOS B	2.9	21.8	0.77	0.63	0.77	49.6
West	: Tainu	i Bridge	Road											
10	L2	159	37	167	23.3	0.147	6.5	LOS A	0.9	7.5	0.35	0.60	0.35	47.0
12	R2	244	30	257	12.3	*0.470	19.9	LOS B	5.2	40.4	0.85	0.79	0.85	41.2
Appro	bach	403	67	424	16.6	0.470	14.6	LOS B	5.2	40.4	0.65	0.71	0.65	43.3
All Vehic	les	1065	125	1121	11.7	0.483	15.5	LOS B	5.2	40.4	0.69	0.68	0.69	47.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov	Input	Dem.	Aver.	Level of <i>i</i>	AVERAGE	BACK OF	Prop. Ef	fective	Travel	Travel	Aver.		
ID Crossing	Vol.	Flow	Delay	Service	QUI	EUE	Que	Stop	Time	Dist.	Speed		
					[Ped	Dist ]		Rate					
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
West: Tainui B	Bridge Ro	ad											
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [AM 2033 with PC (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	ehicle Movement Performance													
Mov	Turn	INF	PUT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop.	Effective	Aver.	Aver.
ID		VOLU	JMES	FLO	WS	Satn	Delay	Service	QUE	EUE	Que	Stop	No.	Speed
		[ lotal	HV J	[ lotal	HV J	vic	600		[Veh.	Dist J		Rate	Cycles	km/b
South	n: Grea	at South	Road	VEII/II	70	v/C	360	_	ven		_		_	NIII/11
1	L2	193	21	203	10.9	0.163	8.2	LOS A	1.1	8.3	0.35	0.66	0.35	51.7
2	T1	210	15	221	7.1	*0.516	21.9	LOS C	3.7	27.4	0.94	0.74	0.94	49.4
Appro	bach	403	36	424	8.9	0.516	15.3	LOS B	3.7	27.4	0.66	0.70	0.66	50.5
North	: Grea	at South F	Road											
8	T1	178	9	187	5.1	0.236	10.2	LOS B	3.0	21.9	0.68	0.56	0.68	58.5
9	R2	129	13	136	10.1	* 0.560	30.1	LOS C	3.4	25.7	0.98	0.80	1.02	39.1
Appro	oach	307	22	323	7.2	0.560	18.6	LOS B	3.4	25.7	0.80	0.66	0.82	48.4
West	: Tainu	ii Bridge	Road											
10	L2	204	37	215	18.1	0.182	6.5	LOS A	1.2	9.5	0.36	0.60	0.36	47.9
12	R2	315	30	332	9.5	*0.561	19.7	LOS B	6.9	51.9	0.87	0.80	0.87	41.7
Appro	bach	519	67	546	12.9	0.561	14.5	LOS B	6.9	51.9	0.67	0.73	0.67	44.0
All Vehic	les	1229	125	1294	10.2	0.561	15.8	LOS B	6.9	51.9	0.70	0.70	0.70	47.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.		
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed		
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
West: Tainui B	ridge Ro	ad											
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [PM Existing (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	/ehicle Movement Performance													
Mov ID	Turn	INF VOLI	PUT JMES	DEM. FLO	AND WS	Deg. Satn	Aver. Delay	Level of Service	95% BA Que	ACK OF EUE	Prop. Que	Effective Stop	Aver. No.	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		[ Veh. veh	Dist] m		Rate	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	142	6	149	4.2	0.109	7.7	LOS A	0.6	4.4	0.30	0.65	0.30	52.1
2	T1	294	7	309	2.4	*0.468	18.0	LOS B	4.7	33.7	0.88	0.71	0.88	52.1
Appro	bach	436	13	459	3.0	0.468	14.7	LOS B	4.7	33.7	0.69	0.69	0.69	52.1
North	: Grea	t South	Road											
8	T1	151	8	159	5.3	0.176	8.0	LOS A	2.2	16.3	0.60	0.49	0.60	60.7
9	R2	64	2	67	3.1	*0.309	29.8	LOS C	1.6	11.7	0.95	0.75	0.95	39.3
Appro	bach	215	10	226	4.7	0.309	14.5	LOS B	2.2	16.3	0.70	0.57	0.70	52.2
West	: Tainu	i Bridge	Road											
10	L2	121	10	127	8.3	0.108	6.7	LOS A	0.7	5.4	0.36	0.60	0.36	49.7
12	R2	219	13	231	5.9	*0.462	21.3	LOS C	4.9	35.7	0.87	0.79	0.87	41.4
Appro	bach	340	23	358	6.8	0.462	16.1	LOS B	4.9	35.7	0.69	0.72	0.69	44.1
All Vehic	les	991	46	1043	4.6	0.468	15.1	LOS B	4.9	35.7	0.69	0.68	0.69	49.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance													
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.		
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed		
	ped/h	ped/h	sec		ped	m			sec	m	m/sec		
West: Tainui B	ridge Ro	ad											
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [PM 2033 (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	cle M	ovemer	nt Perfor	mance										
Mov ID	Turn	INF VOLI	PUT JMES	DEM. FLO	AND WS	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI	ACK OF EUE	Prop. Que	Effective Stop	Aver. No.	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		[ Veh. veh	Dist] m		Rate	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	179	8	188	4.5	0.139	7.9	LOS A	0.9	6.4	0.32	0.66	0.32	52.0
2	T1	370	9	389	2.4	*0.589	18.7	LOS B	6.2	44.0	0.91	0.75	0.91	51.7
Appro	bach	549	17	578	3.1	0.589	15.2	LOS B	6.2	44.0	0.72	0.72	0.72	51.8
North	: Grea	it South I	Road											
8	T1	190	10	200	5.3	0.221	8.2	LOS A	2.9	21.0	0.62	0.51	0.62	60.5
9	R2	81	3	85	3.7	*0.393	30.2	LOS C	2.1	15.1	0.96	0.76	0.96	39.1
Appro	bach	271	13	285	4.8	0.393	14.8	LOS B	2.9	21.0	0.72	0.58	0.72	52.0
West	: Tainu	i Bridge	Road											
10	L2	152	13	160	8.6	0.140	7.4	LOS A	1.1	8.4	0.41	0.62	0.41	49.3
12	R2	276	16	291	5.8	*0.582	22.0	LOS C	6.4	46.9	0.91	0.81	0.91	41.1
Appro	bach	428	29	451	6.8	0.582	16.8	LOS B	6.4	46.9	0.73	0.74	0.73	43.7
All Vehic	les	1248	59	1314	4.7	0.589	15.7	LOS B	6.4	46.9	0.72	0.70	0.73	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian I	Noveme	ent Perf	orman	ce							
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
West: Tainui B	ridge Ro	ad									
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [PM 2033 with PC (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	cle M	ovemen	it Perfor	rmance										
Mov	Turn	INF	PUT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop.	Effective	Aver.	Aver.
ID		VOLU		FLO	WS	Satn	Delay	Service		EUE Diat 1	Que	Stop	No.	Speed
		veh/h	⊓vj veh/h	veh/h	⊓vj %	v/c	sec		ven. veh	m Dist		Rale	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	240	8	253	3.3	0.188	7.9	LOS A	1.2	8.9	0.34	0.67	0.34	52.0
2	T1	370	9	389	2.4	*0.642	20.1	LOS C	6.5	46.2	0.93	0.78	0.98	50.7
Appro	oach	610	17	642	2.8	0.642	15.3	LOS B	6.5	46.2	0.70	0.74	0.72	51.2
North	n: Grea	t South F	Road											
8	T1	190	10	200	5.3	0.231	8.9	LOS A	3.0	21.9	0.64	0.53	0.64	59.8
9	R2	108	3	114	2.8	*0.520	30.7	LOS C	2.8	20.4	0.98	0.78	1.00	38.9
Appro	oach	298	13	314	4.4	0.520	16.8	LOS B	3.0	21.9	0.76	0.62	0.77	50.1
West	: Tainu	ii Bridge	Road											
10	L2	172	13	181	7.6	0.156	7.4	LOS A	1.3	9.5	0.42	0.62	0.42	49.5
12	R2	311	16	327	5.1	*0.609	21.5	LOS C	7.2	52.4	0.91	0.82	0.92	41.5
Appro	oach	483	29	508	6.0	0.609	16.5	LOS B	7.2	52.4	0.73	0.75	0.74	44.0
All Vehic	cles	1391	59	1464	4.2	0.642	16.0	LOS B	7.2	52.4	0.72	0.72	0.74	48.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian I	Noveme	ent Perf	orman	ce							
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
West: Tainui B	ridge Ro	ad									
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [SAT Existing (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	cle M	ovemen	t Perfor	mance										
Mov	Turn	INF	TUY	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop.	Effective	Aver.	Aver.
ID		VOLU		FLO	WS	Satn	Delay	Service		EUE Dict 1	Que	Stop	No.	Speed
		veh/h	veh/h	veh/h	пvј %	v/c	sec		ven.	m		Nale	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	108	5	114	4.6	0.083	7.6	LOS A	0.4	3.2	0.29	0.64	0.29	52.1
2	T1	239	6	252	2.5	*0.351	16.6	LOS B	3.6	25.9	0.84	0.67	0.84	53.2
Appro	oach	347	11	365	3.2	0.351	13.8	LOS B	3.6	25.9	0.67	0.66	0.67	52.8
North	: Grea	t South F	Road											
8	T1	137	4	144	2.9	0.151	7.3	LOS A	1.9	13.8	0.57	0.46	0.57	61.4
9	R2	59	2	62	3.4	*0.285	29.7	LOS C	1.5	10.8	0.95	0.74	0.95	39.3
Appro	oach	196	6	206	3.1	0.285	14.1	LOS B	1.9	13.8	0.68	0.55	0.68	52.5
West	: Tainu	ii Bridge	Road											
10	L2	88	5	93	5.7	0.076	6.3	LOS A	0.5	3.4	0.33	0.59	0.33	50.5
12	R2	166	5	175	3.0	*0.370	21.6	LOS C	3.6	26.2	0.86	0.77	0.86	41.7
Appro	oach	254	10	267	3.9	0.370	16.3	LOS B	3.6	26.2	0.68	0.71	0.68	44.4
All Vehic	les	797	27	839	3.4	0.370	14.7	LOS B	3.6	26.2	0.68	0.65	0.68	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian I	Noveme	ent Perf	orman	ce							
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
West: Tainui B	ridge Ro	ad									
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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#### Site: 101 [SAT 2033 (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehi	cle M	ovemen	t Perfor	rmance										
Mov	Turn	INF	UT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop.	Effective	Aver.	Aver.
ID			JMES	FLO	WS	Satn	Delay	Service	QUE		Que	Stop	No.	Speed
		l Iotai veh/h	HV J veh/h	l Iotai veh/h	нvј %	v/c	sec		ιven. veh	DIST J m		Rate	Cycles	km/h
South	n: Grea	at South	Road											
1	L2	108	5	143	4.6	0.106	7.7	LOS A	0.6	4.2	0.30	0.65	0.30	52.1
2	T1	239	6	317	2.5	*0.442	17.1	LOS B	4.7	33.6	0.86	0.70	0.86	52.9
Appro	bach	347	11	460	3.2	0.442	14.2	LOS B	4.7	33.6	0.69	0.68	0.69	52.6
North	: Grea	at South F	Road											
8	T1	137	4	182	2.9	0.190	7.5	LOS A	2.5	17.7	0.58	0.48	0.58	61.2
9	R2	59	2	78	3.4	*0.360	30.0	LOS C	1.9	13.7	0.96	0.76	0.96	39.2
Appro	bach	196	6	260	3.1	0.360	14.3	LOS B	2.5	17.7	0.70	0.56	0.70	52.4
West	: Tainu	ii Bridge	Road											
10	L2	88	5	117	5.7	0.099	6.6	LOS A	0.7	4.8	0.36	0.60	0.36	50.3
12	R2	166	5	220	3.0	*0.466	22.1	LOS C	4.7	34.0	0.89	0.79	0.89	41.5
Appro	bach	254	10	337	3.9	0.466	16.8	LOS B	4.7	34.0	0.71	0.72	0.71	44.2
All Vehic	les	797	27	1057	3.4	0.466	15.0	LOS B	4.7	34.0	0.69	0.67	0.69	49.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

\* Critical Movement (Signal Timing)

Pedestrian I	Noveme	ent Perf	orman	ce							
Mov Crossing	Input	Dem.	Aver.	Level of /			Prop. Ef	fective	Travel	Travel	Aver.
	VUI.	FIOW	Delay	Service	[ Ped	Dist ]	Que	Rate	Time	DISI.	Speed
	ped/h	ped/h	sec		ped	m			sec	m	m/sec
West: Tainui B	ridge Ro	ad									
P4 Full	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16
All Pedestrians	30	32	19.4	LOS B	0.0	0.0	0.88	0.88	182.4	211.9	1.16

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay) Pedestrian movement LOS values are based on average delay per pedestrian movement. Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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### V Site: 101 [AM Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n. Geo	rae Drive	ven/n	ven/n	70	V/C	Sec	_	ven	111	_	_	_	KIII/II
1	1. 000	40	2	50	4.4	0 110	6.2	1084	0.6	47	0.57	0.65	0.57	45.2
1 2	L2 T1	49	2 1	0Z	4.1	0.119	0.2		0.6	4.7	0.57	0.05	0.57	45.5
2	ו ו רם	31 10	ו ס	33 10	3.Z	0.119	10.0		0.6	4.7	0.57	0.05	0.57	40.1
3		10	0	19	0.0	0.119	10.0		0.0	4.7	0.57	0.05	0.57	45.6
Appr	- U	00	6	104	6.1	0.119	60		0.0	4.7	0.57	0.05	0.57	40.0
Аррі	Jach	99	0	104	0.1	0.119	0.9	LUGA	0.0	4.7	0.57	0.05	0.57	45.7
East:	Tainui	Bridge F	Road											
4	L2	12	0	13	0.0	0.016	6.1	LOS A	0.1	0.5	0.48	0.55	0.48	45.6
5	T1	174	22	183	12.6	0.208	5.1	LOS A	1.2	9.6	0.51	0.58	0.51	46.2
6	R2	53	5	56	9.4	0.208	8.5	LOS A	1.2	9.6	0.51	0.58	0.51	46.0
6u	U	1	0	1	0.0	0.208	10.0	LOS A	1.2	9.6	0.51	0.58	0.51	46.8
Appro	bach	240	27	253	11.3	0.208	5.9	LOS A	1.2	9.6	0.50	0.58	0.50	46.1
North	: Tuma	ate Mahu	ta											
7	L2	72	0	76	0.0	0.092	6.3	LOS A	0.5	3.2	0.51	0.61	0.51	45.5
8	T1	44	4	46	9.1	0.214	5.2	LOS A	1.3	9.1	0.51	0.66	0.51	45.3
9	R2	199	3	209	1.5	0.214	8.5	LOS A	1.3	9.1	0.51	0.66	0.51	45.2
9u	U	1	0	1	0.0	0.214	10.1	LOS B	1.3	9.1	0.51	0.66	0.51	45.8
Appro	bach	316	7	333	2.2	0.214	7.6	LOS A	1.3	9.1	0.51	0.65	0.51	45.3
West	: Tainu	i Bridge I	Road											
10	L2	219	2	231	0.9	0.180	4.6	LOS A	1.0	7.1	0.30	0.50	0.30	46.1
11	T1	232	48	244	20.7	0.221	4.2	LOS A	1.3	10.4	0.30	0.47	0.30	46.7
12	R2	50	3	53	6.0	0.221	7.5	LOS A	1.3	10.4	0.30	0.47	0.30	46.7
12u	U	1	0	1	0.0	0.221	9.1	LOS A	1.3	10.4	0.30	0.47	0.30	47.4
Appro	bach	502	53	528	10.6	0.221	4.7	LOS A	1.3	10.4	0.30	0.48	0.30	46.5
All Vehic	les	1157	93	1218	8.0	0.221	5.9	LOS A	1.3	10.4	0.42	0.56	0.42	46.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### W Site: 101 [AM 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle Mo	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF UE Dist ]	Prop.   Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South		ven/n	ven/h	ven/n	%	V/C	sec	_	veh	m	_	_	_	Km/n
Souu	I. Geol	ge Drive	-											
1	L2	62	3	65	4.8	0.168	7.2	LOSA	1.0	7.1	0.66	0.72	0.66	44.8
2	T1	39	1	41	2.6	0.168	7.1	LOSA	1.0	7.1	0.66	0.72	0.66	45.6
3	R2	23	4	24	17.4	0.168	11.1	LOS B	1.0	7.1	0.66	0.72	0.66	45.3
3u	U	1	0	1	0.0	0.168	12.1	LOS B	1.0	7.1	0.66	0.72	0.66	46.1
Appro	bach	125	8	132	6.4	0.168	7.9	LOS A	1.0	7.1	0.66	0.72	0.66	45.2
East:	Tainui	Bridge F	Road											
4	L2	15	0	16	0.0	0.022	6.7	LOS A	0.1	0.8	0.54	0.58	0.54	45.3
5	T1	219	28	231	12.8	0.281	5.7	LOS A	1.8	14.0	0.60	0.65	0.60	45.9
6	R2	67	6	71	9.0	0.281	9.1	LOS A	1.8	14.0	0.60	0.65	0.60	45.7
6u	U	1	0	1	0.0	0.281	10.5	LOS B	1.8	14.0	0.60	0.65	0.60	46.4
Appro	bach	302	34	318	11.3	0.281	6.5	LOS A	1.8	14.0	0.60	0.64	0.60	45.8
North	: Tuma	ate Mahu	ta											
7	L2	91	0	96	0.0	0.125	7.0	LOS A	0.7	4.6	0.58	0.67	0.58	45.1
8	T1	55	5	58	9.1	0.288	5.8	LOS A	1.9	13.3	0.60	0.71	0.60	45.1
9	R2	251	4	264	1.6	0.288	9.1	LOS A	1.9	13.3	0.60	0.71	0.60	45.0
9u	U	1	0	1	0.0	0.288	10.7	LOS B	1.9	13.3	0.60	0.71	0.60	45.6
Appro	bach	398	9	419	2.3	0.288	8.2	LOS A	1.9	13.3	0.60	0.70	0.60	45.1
West	Tainu	i Bridge I	Road											
10	L2	276	3	291	1.1	0.234	4.8	LOS A	1.4	9.7	0.35	0.52	0.35	46.0
11	T1	292	60	307	20.5	0.285	4.4	LOS A	1.8	14.4	0.36	0.49	0.36	46.6
12	R2	63	4	66	6.3	0.285	7.7	LOS A	1.8	14.4	0.36	0.49	0.36	46.5
12u	U	1	0	1	0.0	0.285	9.2	LOS A	1.8	14.4	0.36	0.49	0.36	47.2
Appro	bach	632	67	665	10.6	0.285	4.9	LOS A	1.8	14.4	0.36	0.50	0.36	46.3
All Vehic	les	1457	118	1534	8.1	0.288	6.4	LOS A	1.9	14.4	0.50	0.60	0.50	45.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [AM 2033 PC (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	rmance										
Mov ID	Turn	INF VOLU [ Total	PUT JMES HV ]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI [ Veh.	CK OF EUE Dist ]	Prop. E Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
	-	veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South	n: Geo	rge Drive	;											
1	L2	76	3	80	3.9	0.207	8.2	LOS A	1.3	9.2	0.74	0.78	0.74	44.3
2	T1	39	1	41	2.6	0.207	8.1	LOS A	1.3	9.2	0.74	0.78	0.74	45.1
3	R2	23	4	24	17.4	0.207	12.2	LOS B	1.3	9.2	0.74	0.78	0.74	44.7
3u	U	1	0	1	0.0	0.207	13.1	LOS B	1.3	9.2	0.74	0.78	0.74	45.6
Appro	oach	139	8	146	5.8	0.207	8.9	LOS A	1.3	9.2	0.74	0.78	0.74	44.6
East:	Tainui	i Bridge F	Road											
4	L2	15	0	16	0.0	0.024	7.3	LOS A	0.1	0.8	0.60	0.62	0.60	45.0
5	T1	268	28	282	10.4	0.352	6.3	LOS A	2.5	18.9	0.70	0.71	0.70	45.6
6	R2	67	6	71	9.0	0.352	9.7	LOS A	2.5	18.9	0.70	0.71	0.70	45.5
6u	U	1	0	1	0.0	0.352	11.1	LOS B	2.5	18.9	0.70	0.71	0.70	46.2
Appro	oach	351	34	369	9.7	0.352	7.0	LOS A	2.5	18.9	0.69	0.71	0.69	45.6
North	: Tum	ate Mahu	ıta											
7	L2	91	0	96	0.0	0.150	8.5	LOS A	0.8	5.7	0.67	0.75	0.67	44.3
8	T1	55	5	58	9.1	0.382	7.0	LOS A	2.7	19.5	0.74	0.79	0.74	44.5
9	R2	307	4	323	1.3	0.382	10.3	LOS B	2.7	19.5	0.74	0.79	0.74	44.4
9u	U	1	0	1	0.0	0.382	11.8	LOS B	2.7	19.5	0.74	0.79	0.74	45.0
Appro	oach	454	9	478	2.0	0.382	9.5	LOS A	2.7	19.5	0.73	0.78	0.73	44.4
West	: Tainu	ii Bridge l	Road											
10	L2	386	3	406	0.8	0.325	4.9	LOS A	2.1	14.9	0.39	0.53	0.39	45.9
11	T1	408	60	429	14.7	0.384	4.4	LOS A	2.7	21.0	0.40	0.50	0.40	46.5
12	R2	88	4	93	4.5	0.384	7.8	LOS A	2.7	21.0	0.40	0.50	0.40	46.5
12u	U	1	0	1	0.0	0.384	9.3	LOS A	2.7	21.0	0.40	0.50	0.40	47.1
Appro	bach	883	67	929	7.6	0.384	5.0	LOS A	2.7	21.0	0.40	0.51	0.40	46.2
All Vehic	les	1827	118	1923	6.5	0.384	6.8	LOS A	2.7	21.0	0.56	0.64	0.56	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [PM Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. E Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n. Geo	rae Drive	ven/n	ven/n	70	V/C	Sec	_	ven	111	_	_	_	K[1]/11
1	1.000	00	1	05	4.4	0.217	67	1084	1 2	0.1	0.62	0.71	0.62	45.0
2	LZ T1	90 50	4	90 53	4.4	0.217	6.7		1.3	9.1	0.03	0.71	0.03	45.0
2	יי רם	36	2 1	38	4.0 2.8	0.217	10.7		1.3	9.1	0.03	0.71	0.03	45.0
311	112	1	0	1	2.0	0.217	11.6		1.3	9.1 Q 1	0.03	0.71	0.03	45.7
Appro	bach	177	7	186	4.0	0.217	7.4	LOSA	1.3	9.1	0.63	0.71	0.63	45.4
East:	Tainui	Bridge F	Road											
4	L2	10	0	11	0.0	0.014	6.6	LOS A	0.1	0.5	0.53	0.57	0.53	45.3
5	T1	157	6	165	3.8	0.196	5.3	LOS A	1.2	8.6	0.55	0.62	0.55	46.1
6	R2	54	1	57	1.9	0.196	8.8	LOS A	1.2	8.6	0.55	0.62	0.55	45.9
6u	U	2	0	2	0.0	0.196	10.3	LOS B	1.2	8.6	0.55	0.62	0.55	46.6
Appro	bach	223	7	235	3.1	0.196	6.3	LOS A	1.2	8.6	0.55	0.61	0.55	46.0
North	: Tuma	ate Mahu	ta											
7	L2	111	6	117	5.4	0.135	6.2	LOS A	0.7	5.2	0.50	0.61	0.50	45.5
8	T1	54	1	57	1.9	0.272	5.0	LOS A	1.7	12.1	0.51	0.66	0.51	45.4
9	R2	262	7	276	2.7	0.272	8.5	LOS A	1.7	12.1	0.51	0.66	0.51	45.2
9u	U	2	0	2	0.0	0.272	10.0	LOS B	1.7	12.1	0.51	0.66	0.51	45.8
Appro	bach	429	14	452	3.3	0.272	7.5	LOS A	1.7	12.1	0.51	0.65	0.51	45.3
West	: Tainu	i Bridge I	Road											
10	L2	178	1	187	0.6	0.156	4.8	LOS A	0.9	6.1	0.35	0.52	0.35	46.0
11	T1	196	20	206	10.2	0.195	4.3	LOS A	1.1	8.6	0.35	0.49	0.35	46.7
12	R2	51	1	54	2.0	0.195	7.6	LOS A	1.1	8.6	0.35	0.49	0.35	46.6
12u	U	2	0	2	0.0	0.195	9.2	LOS A	1.1	8.6	0.35	0.49	0.35	47.2
Appro	bach	427	22	449	5.2	0.195	4.9	LOS A	1.1	8.6	0.35	0.50	0.35	46.4
All Vehic	les	1256	50	1322	4.0	0.272	6.4	LOS A	1.7	12.1	0.48	0.60	0.48	45.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### W Site: 101 [PM 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI [ Veh.	ACK OF EUE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South	n: Geo	rge Drive												
1	L2	113	5	119	4.4	0.309	8.1	LOS A	1.9	14.1	0.74	0.80	0.74	44.3
2	T1	63	3	66	4.8	0.309	8.1	LOS A	1.9	14.1	0.74	0.80	0.74	45.1
3	R2	45	1	47	2.2	0.309	11.4	LOS B	1.9	14.1	0.74	0.80	0.74	45.0
3u	U	1	0	1	0.0	0.309	13.0	LOS B	1.9	14.1	0.74	0.80	0.74	45.6
Appro	bach	222	9	234	4.1	0.309	8.8	LOS A	1.9	14.1	0.74	0.80	0.74	44.6
East:	Tainui	Bridge F	Road											
4	L2	13	0	14	0.0	0.021	7.4	LOS A	0.1	0.7	0.60	0.61	0.60	44.9
5	T1	198	8	208	4.0	0.271	6.0	LOS A	1.8	13.1	0.66	0.69	0.66	45.7
6	R2	68	1	72	1.5	0.271	9.4	LOS A	1.8	13.1	0.66	0.69	0.66	45.6
6u	U	3	0	3	0.0	0.271	11.0	LOS B	1.8	13.1	0.66	0.69	0.66	46.2
Appro	bach	282	9	297	3.2	0.271	7.0	LOS A	1.8	13.1	0.66	0.68	0.66	45.7
North	: Tuma	ate Mahu	ta											
7	L2	140	8	147	5.7	0.184	6.9	LOS A	1.0	7.4	0.58	0.67	0.58	45.1
8	T1	68	1	72	1.5	0.365	5.6	LOS A	2.5	17.8	0.61	0.71	0.61	45.1
9	R2	330	9	347	2.7	0.365	9.1	LOS A	2.5	17.8	0.61	0.71	0.61	45.0
9u	U	3	0	3	0.0	0.365	10.6	LOS B	2.5	17.8	0.61	0.71	0.61	45.6
Appro	bach	541	18	569	3.3	0.365	8.1	LOS A	2.5	17.8	0.60	0.70	0.60	45.1
West	: Tainu	i Bridge I	Road											
10	L2	224	1	236	0.4	0.204	5.1	LOS A	1.2	8.4	0.41	0.55	0.41	45.8
11	T1	247	25	260	10.1	0.254	4.5	LOS A	1.6	11.9	0.42	0.52	0.42	46.5
12	R2	64	1	67	1.6	0.254	7.9	LOS A	1.6	11.9	0.42	0.52	0.42	46.4
12u	U	3	0	3	0.0	0.254	9.4	LOS A	1.6	11.9	0.42	0.52	0.42	47.0
Appro	bach	538	27	566	5.0	0.254	5.2	LOS A	1.6	11.9	0.42	0.53	0.42	46.2
All Vehic	les	1583	63	1666	4.0	0.365	7.0	LOS A	2.5	17.8	0.57	0.65	0.57	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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#### V Site: 101 [PM 2033 PC (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	rmance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF UE Dist ]	Prop. E Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	Coo	ven/n	ven/n	ven/n	%	V/C	sec	_	ven	m	_	_	_	KM/N
Jour			<b>-</b>	470	2.0	0.400	44.0		4.0	20.0	0.00	1.00		
1	LZ	164	5	173	3.0	0.498	14.0	LOSB	4.2	30.2	0.93	1.06	1.14	41.4
2	11	63	3	66 47	4.8	0.498	14.1	LOSB	4.2	30.2	0.93	1.06	1.14	42.1
3	R2	45	1	47	2.2	0.498	17.4		4.2	30.2	0.93	1.00	1.14	42.0
Ju	U	1	0	207	0.0	0.490	14.6		4.2	30.2	0.93	1.00	1.14	42.5
Аррго	Jach	213	9	201	3.3	0.490	14.0	LU3 B	4.2	30.2	0.95	1.00	1.14	41.0
East:	Tainui	Bridge F	Road											
4	L2	13	0	14	0.0	0.024	8.7	LOS A	0.1	0.9	0.71	0.67	0.71	44.2
5	T1	286	8	301	2.8	0.428	7.5	LOS A	3.4	24.1	0.85	0.82	0.85	45.2
6	R2	68	1	72	1.5	0.428	11.0	LOS B	3.4	24.1	0.85	0.82	0.85	45.1
6u	U	3	0	3	0.0	0.428	12.5	LOS B	3.4	24.1	0.85	0.82	0.85	45.7
Appro	bach	370	9	389	2.4	0.428	8.3	LOS A	3.4	24.1	0.84	0.82	0.84	45.2
North	: Tuma	ate Mahu	ta											
7	L2	140	8	147	5.7	0.218	8.0	LOS A	1.2	8.8	0.64	0.74	0.64	44.5
8	T1	68	1	72	1.5	0.526	6.8	LOS A	4.4	31.1	0.75	0.80	0.78	44.5
9	R2	477	9	502	1.9	0.526	10.3	LOS B	4.4	31.1	0.75	0.80	0.78	44.4
9u	U	3	0	3	0.0	0.526	11.8	LOS B	4.4	31.1	0.75	0.80	0.78	45.0
Appro	bach	688	18	724	2.6	0.526	9.5	LOS A	4.4	31.1	0.73	0.78	0.76	44.5
West	: Tainu	i Bridge I	Road											
10	L2	274	1	288	0.4	0.250	5.1	LOS A	1.6	10.9	0.44	0.56	0.44	45.8
11	T1	302	25	318	8.3	0.307	4.5	LOS A	2.1	15.4	0.45	0.53	0.45	46.4
12	R2	79	1	83	1.3	0.307	7.9	LOS A	2.1	15.4	0.45	0.53	0.45	46.3
12u	U	3	0	3	0.0	0.307	9.5	LOS A	2.1	15.4	0.45	0.53	0.45	47.0
Appro	bach	658	27	693	4.1	0.307	5.2	LOS A	2.1	15.4	0.44	0.54	0.44	46.1
All Vehic	les	1989	63	2094	3.2	0.526	8.5	LOS A	4.4	31.1	0.68	0.75	0.72	44.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [SAT Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLL [ Total	PUT IMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF UE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n. Geo	rae Drive	ven/n	ven/n	70	V/C	Sec	_	ven	111	_	_	_	KIII/II
1	1. 000	20	0	44	0.0	0 11 2	<b>E E</b>	1084	0.6	4.0	0.50	0.60	0.50	
1	LZ T4	39	0	41	0.0	0.112	5.5	LOSA	0.0	4.2	0.50	0.62	0.50	40.4
2	ו ו רם	30	0	32 25	0.0	0.112	5.4		0.0	4.Z	0.50	0.02	0.50	40.2
3	ΠZ	33	2	35	0.1	0.112	9.0		0.0	4.2	0.50	0.02	0.50	40.0
Appr	U Dach	104	2	100	1.0	0.112	6.7		0.0	4.2	0.50	0.02	0.50	40.7
Аррі	Jach	104	2	109	1.9	0.112	0.7	LUGA	0.0	4.2	0.50	0.02	0.50	45.0
East:	Tainui	Bridge F	Road											
4	L2	17	0	18	0.0	0.023	6.1	LOS A	0.1	0.8	0.48	0.56	0.48	45.6
5	T1	99	5	104	5.1	0.133	4.8	LOS A	0.8	5.5	0.47	0.58	0.47	46.2
6	R2	49	3	52	6.1	0.133	8.3	LOS A	0.8	5.5	0.47	0.58	0.47	46.0
6u	U	5	0	5	0.0	0.133	9.8	LOS A	0.8	5.5	0.47	0.58	0.47	46.7
Appro	bach	170	8	179	4.7	0.133	6.1	LOS A	0.8	5.5	0.47	0.57	0.47	46.1
North	: Tuma	ate Mahu	ta											
7	L2	81	3	85	3.7	0.094	5.6	LOS A	0.5	3.4	0.42	0.56	0.42	45.8
8	T1	65	0	68	0.0	0.204	4.5	LOS A	1.2	8.3	0.41	0.61	0.41	45.7
9	R2	188	2	198	1.1	0.204	8.0	LOS A	1.2	8.3	0.41	0.61	0.41	45.6
9u	U	3	0	3	0.0	0.204	9.6	LOS A	1.2	8.3	0.41	0.61	0.41	46.2
Appro	bach	337	5	355	1.5	0.204	6.8	LOS A	1.2	8.3	0.41	0.60	0.41	45.7
West	: Tainu	i Bridge I	Road											
10	L2	181	0	191	0.0	0.133	4.5	LOS A	0.7	5.0	0.29	0.50	0.29	46.1
11	T1	138	8	145	5.8	0.146	4.2	LOS A	0.8	5.7	0.31	0.48	0.31	46.8
12	R2	36	1	38	2.8	0.146	7.6	LOS A	0.8	5.7	0.31	0.48	0.31	46.7
12u	U	1	0	1	0.0	0.146	9.2	LOS A	0.8	5.7	0.31	0.48	0.31	47.4
Appro	bach	356	9	375	2.5	0.146	4.7	LOS A	0.8	5.7	0.30	0.49	0.30	46.5
All Vehic	les	967	24	1018	2.5	0.204	5.9	LOS A	1.2	8.3	0.39	0.55	0.39	46.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [SAT 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfoi	rmance										
Mov ID	Turn	INF VOLU [ Total	PUT JMES HV]	DEM FLO [ Total	AND WS HV ]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI [ Veh.	ACK OF EUE Dist ]	Prop. E Que	ffective Stop Rate	Aver. No. Cycles	Aver. Speed
	-	veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South	n: Geo	rge Drive	)											
1	L2	39	0	52	0.0	0.153	6.1	LOS A	0.8	6.0	0.58	0.67	0.58	45.1
2	T1	30	0	40	0.0	0.153	6.1	LOS A	0.8	6.0	0.58	0.67	0.58	45.9
3	R2	33	2	44	6.1	0.153	9.7	LOS A	0.8	6.0	0.58	0.67	0.58	45.7
3u	U	2	0	3	0.0	0.153	11.2	LOS B	0.8	6.0	0.58	0.67	0.58	46.3
Appro	oach	104	2	138	1.9	0.153	7.4	LOS A	0.8	6.0	0.58	0.67	0.58	45.5
East:	Tainu	i Bridge F	Road											
4	L2	17	0	23	0.0	0.031	6.7	LOS A	0.2	1.1	0.54	0.60	0.54	45.3
5	T1	99	5	131	5.1	0.179	5.3	LOS A	1.1	7.9	0.55	0.62	0.55	45.9
6	R2	49	3	65	6.1	0.179	8.8	LOS A	1.1	7.9	0.55	0.62	0.55	45.8
6u	U	5	0	7	0.0	0.179	10.3	LOS B	1.1	7.9	0.55	0.62	0.55	46.4
Appro	oach	170	8	225	4.7	0.179	6.6	LOS A	1.1	7.9	0.54	0.62	0.54	45.8
North	n: Tum	ate Mahu	ita											
7	L2	81	3	107	3.7	0.125	6.1	LOS A	0.6	4.6	0.48	0.60	0.48	45.6
8	T1	65	0	86	0.0	0.269	4.9	LOS A	1.7	11.7	0.49	0.64	0.49	45.6
9	R2	188	2	249	1.1	0.269	8.3	LOS A	1.7	11.7	0.49	0.64	0.49	45.4
9u	U	3	0	4	0.0	0.269	9.9	LOS A	1.7	11.7	0.49	0.64	0.49	46.0
Appro	oach	337	5	447	1.5	0.269	7.1	LOS A	1.7	11.7	0.49	0.63	0.49	45.5
West	: Tainu	ii Bridge l	Road											
10	L2	181	0	240	0.0	0.172	4.7	LOS A	1.0	6.8	0.34	0.51	0.34	46.0
11	T1	138	8	183	5.8	0.190	4.4	LOS A	1.1	7.8	0.36	0.50	0.36	46.7
12	R2	36	1	48	2.8	0.190	7.8	LOS A	1.1	7.8	0.36	0.50	0.36	46.6
12u	U	1	0	1	0.0	0.190	9.4	LOS A	1.1	7.8	0.36	0.50	0.36	47.2
Appro	oach	356	9	472	2.5	0.190	4.9	LOS A	1.1	7.8	0.35	0.51	0.35	46.3
All Vehic	cles	967	24	1283	2.5	0.269	6.2	LOS A	1.7	11.7	0.46	0.59	0.46	45.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [AM Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI [ Veh.	ACK OF EUE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South	n: Rive	rview Ro	ad											
1	L2	3	0	3	0.0	0.181	5.6	LOS A	1.0	8.2	0.58	0.70	0.58	44.5
2	T1	37	1	39	2.7	0.181	5.6	LOS A	1.0	8.2	0.58	0.70	0.58	45.4
3	R2	99	29	104	29.3	0.181	10.4	LOS B	1.0	8.2	0.58	0.70	0.58	45.0
3u	U	1	0	1	0.0	0.181	12.7	LOS B	1.0	8.2	0.58	0.70	0.58	48.8
Appro	bach	140	30	147	21.4	0.181	9.0	LOS A	1.0	8.2	0.58	0.70	0.58	45.1
East:	Tainui	Bridge F	Road											
4	L2	40	3	42	7.5	0.336	3.8	LOS A	2.3	17.3	0.34	0.55	0.34	45.3
5	T1	92	9	97	9.8	0.336	3.8	LOS A	2.3	17.3	0.34	0.55	0.34	46.2
6	R2	272	17	286	6.3	0.336	7.7	LOS A	2.3	17.3	0.34	0.55	0.34	46.1
6u	U	3	0	3	0.0	0.336	10.8	LOS B	2.3	17.3	0.34	0.55	0.34	49.7
Appro	bach	407	29	428	7.1	0.336	6.5	LOS A	2.3	17.3	0.34	0.55	0.34	46.1
North	: Te Ar	aroa Trl												
7	L2	310	16	326	5.2	0.382	4.8	LOS A	2.5	18.9	0.51	0.58	0.51	46.2
8	T1	57	15	60	26.3	0.382	5.2	LOS A	2.5	18.9	0.51	0.58	0.51	47.0
9	R2	21	0	22	0.0	0.382	8.6	LOS A	2.5	18.9	0.51	0.58	0.51	47.2
9u	U	2	0	2	0.0	0.382	11.8	LOS B	2.5	18.9	0.51	0.58	0.51	50.9
Appro	bach	390	31	411	7.9	0.382	5.1	LOS A	2.5	18.9	0.51	0.58	0.51	46.4
West	: Rotov	varo Roa	d											
10	L2	35	0	37	0.0	0.153	5.7	LOS A	0.8	6.1	0.57	0.62	0.57	45.8
11	T1	92	7	97	7.6	0.153	6.0	LOS A	0.8	6.1	0.57	0.62	0.57	46.7
12	R2	1	0	1	0.0	0.153	9.7	LOS A	0.8	6.1	0.57	0.62	0.57	46.7
12u	U	1	0	1	0.0	0.153	12.8	LOS B	0.8	6.1	0.57	0.62	0.57	50.4
Appro	bach	129	7	136	5.4	0.153	6.0	LOS A	0.8	6.1	0.57	0.62	0.57	46.5
All Vehic	les	1066	97	1122	9.1	0.382	6.2	LOS A	2.5	18.9	0.46	0.59	0.46	46.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### W Site: 101 [AM 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLL [ Total	PUT IMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUI [ Veh.	ACK OF EUE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South	n: Rive	rview Ro	ad											
1	L2	4	0	4	0.0	0.255	6.5	LOS A	1.5	12.4	0.68	0.78	0.68	44.1
2	T1	47	1	49	2.1	0.255	6.6	LOS A	1.5	12.4	0.68	0.78	0.68	44.9
3	R2	125	37	132	29.6	0.255	11.5	LOS B	1.5	12.4	0.68	0.78	0.68	44.5
3u	U	1	0	1	0.0	0.255	13.6	LOS B	1.5	12.4	0.68	0.78	0.68	48.2
Appro	bach	177	38	186	21.5	0.255	10.1	LOS B	1.5	12.4	0.68	0.78	0.68	44.6
East:	Tainui	Bridge F	Road											
4	L2	50	4	53	8.0	0.435	4.1	LOS A	3.4	25.5	0.43	0.57	0.43	45.1
5	T1	116	11	122	9.5	0.435	4.1	LOS A	3.4	25.5	0.43	0.57	0.43	46.0
6	R2	343	21	361	6.1	0.435	8.0	LOS A	3.4	25.5	0.43	0.57	0.43	45.9
6u	U	4	0	4	0.0	0.435	11.1	LOS B	3.4	25.5	0.43	0.57	0.43	49.5
Appro	bach	513	36	540	7.0	0.435	6.8	LOS A	3.4	25.5	0.43	0.57	0.43	45.9
North	: Te Ar	aroa Trl												
7	L2	391	20	412	5.1	0.508	5.5	LOS A	3.8	28.3	0.64	0.66	0.64	45.9
8	T1	72	19	76	26.4	0.508	6.0	LOS A	3.8	28.3	0.64	0.66	0.64	46.7
9	R2	26	0	27	0.0	0.508	9.3	LOS A	3.8	28.3	0.64	0.66	0.64	46.9
9u	U	3	0	3	0.0	0.508	12.4	LOS B	3.8	28.3	0.64	0.66	0.64	50.6
Appro	bach	492	39	518	7.9	0.508	5.8	LOS A	3.8	28.3	0.64	0.66	0.64	46.1
West	: Rotov	varo Roa	ıd											
10	L2	44	0	46	0.0	0.214	6.8	LOS A	1.2	9.2	0.67	0.70	0.67	45.4
11	T1	116	9	122	7.8	0.214	7.0	LOS A	1.2	9.2	0.67	0.70	0.67	46.3
12	R2	1	0	1	0.0	0.214	10.7	LOS B	1.2	9.2	0.67	0.70	0.67	46.3
12u	U	1	0	1	0.0	0.214	13.9	LOS B	1.2	9.2	0.67	0.70	0.67	49.9
Appro	bach	162	9	171	5.6	0.214	7.0	LOS A	1.2	9.2	0.67	0.70	0.67	46.1
All Vehic	les	1344	122	1415	9.1	0.508	6.9	LOS A	3.8	28.3	0.57	0.64	0.57	45.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [AM 2033 PC (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle Mo	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	UT IMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n <sup>.</sup> Rive	rview Ro	ad	ven/n	70	V/C	sec	_	ven	111	_	_	_	KIII/II
1	12	8	0	Q	0.0	0 311	7.0	1054	2.0	16.3	0.70	0.86	0.70	13.3
2	L2 T1	47	1	40	0.0	0.311	7.9 8.0		2.0	16.3	0.79	0.00	0.79	43.5
2	н В2	47	י 37	49	2.1	0.311	13.2		2.0	16.3	0.79	0.00	0.79	44.1
30	112	120	0	1	23.0	0.311	15.2	LOS B	2.0	16.3	0.79	0.00	0.79	47.3
Appro	bach	181	38	191	21.0	0.311	11.6	LOS B	2.0	16.3	0.79	0.86	0.79	43.8
East:	Tainui	Bridge F	Road											
4	L2	50	4	53	8.0	0.558	4.5	LOS A	5.3	39.3	0.59	0.59	0.59	45.0
5	T1	235	11	247	4.7	0.558	4.5	LOS A	5.3	39.3	0.59	0.59	0.59	45.9
6	R2	343	21	361	6.1	0.558	8.4	LOS A	5.3	39.3	0.59	0.59	0.59	45.8
6u	U	4	0	4	0.0	0.558	11.5	LOS B	5.3	39.3	0.59	0.59	0.59	49.4
Appro	bach	632	36	665	5.7	0.558	6.7	LOS A	5.3	39.3	0.59	0.59	0.59	45.8
North	: Te Ar	aroa Trl												
7	L2	391	20	412	5.1	0.726	13.3	LOS B	8.9	66.6	0.96	1.13	1.35	41.8
8	T1	72	19	76	26.4	0.726	14.3	LOS B	8.9	66.6	0.96	1.13	1.35	42.4
9	R2	54	0	57	0.0	0.726	17.0	LOS B	8.9	66.6	0.96	1.13	1.35	42.6
9u	U	3	0	3	0.0	0.726	20.2	LOS C	8.9	66.6	0.96	1.13	1.35	45.6
Appro	bach	520	39	547	7.5	0.726	13.9	LOS B	8.9	66.6	0.96	1.13	1.35	42.0
West	Rotov	varo Roa	d											
10	L2	140	0	147	0.0	0.674	11.9	LOS B	7.5	53.0	0.90	1.05	1.23	42.7
11	T1	368	9	387	2.4	0.674	12.1	LOS B	7.5	53.0	0.90	1.05	1.23	43.5
12	R2	4	0	4	0.0	0.674	15.9	LOS B	7.5	53.0	0.90	1.05	1.23	43.5
12u	U	1	0	1	0.0	0.674	19.0	LOS B	7.5	53.0	0.90	1.05	1.23	46.7
Appro	bach	513	9	540	1.8	0.674	12.1	LOS B	7.5	53.0	0.90	1.05	1.23	43.3
All Vehic	les	1846	122	1943	6.6	0.726	10.7	LOS B	8.9	66.6	0.80	0.90	1.00	43.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [PM Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop.   Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South		ven/n	ven/n	ven/n	%	V/C	sec	_	ven	m	_	_	_	KM/N
Jour			au	5	00.0	0.444	0.4	100.4	0.0	5.0	0.50	0.00	0.50	
1	LZ	5	1	5	20.0	0.141	6.4	LOSA	0.8	5.8	0.59	0.69	0.59	44.4
2	11	35	0	37	0.0	0.141	5.8	LOSA	0.8	5.8	0.59	0.69	0.59	45.4
3	R2	13	9	1	12.3	0.141	10.1		0.8	5.8 5.9	0.59	0.69	0.59	45.3
Annr	U	11.4	10	120	0.0	0.141	12.9		0.0	5.0	0.59	0.69	0.59	40.0
Appro	Dach	114	10	120	0.0	0.141	0.0	LU5 A	0.0	5.0	0.59	0.69	0.59	45.5
East:	Tainui	Bridge F	Road											
4	L2	93	7	98	7.5	0.402	3.8	LOS A	3.0	21.3	0.34	0.54	0.34	45.5
5	T1	131	5	138	3.8	0.402	3.8	LOS A	3.0	21.3	0.34	0.54	0.34	46.4
6	R2	283	1	298	0.4	0.402	7.7	LOS A	3.0	21.3	0.34	0.54	0.34	46.4
6u	U	2	0	2	0.0	0.402	10.8	LOS B	3.0	21.3	0.34	0.54	0.34	50.0
Appro	bach	509	13	536	2.6	0.402	6.0	LOS A	3.0	21.3	0.34	0.54	0.34	46.3
North	: Te Ar	aroa Trl												
7	L2	226	5	238	2.2	0.292	4.6	LOS A	1.8	12.9	0.48	0.57	0.48	46.3
8	T1	47	3	49	6.4	0.292	4.7	LOS A	1.8	12.9	0.48	0.57	0.48	47.2
9	R2	25	2	26	8.0	0.292	8.7	LOS A	1.8	12.9	0.48	0.57	0.48	47.1
9u	U	1	0	1	0.0	0.292	11.7	LOS B	1.8	12.9	0.48	0.57	0.48	51.0
Appro	bach	299	10	315	3.3	0.292	5.0	LOS A	1.8	12.9	0.48	0.57	0.48	46.5
West	: Rotov	varo Roa	ıd											
10	L2	26	2	27	7.7	0.187	5.8	LOS A	1.0	7.6	0.57	0.62	0.57	45.7
11	T1	125	7	132	5.6	0.187	5.7	LOS A	1.0	7.6	0.57	0.62	0.57	46.6
12	R2	7	1	7	14.3	0.187	9.9	LOS A	1.0	7.6	0.57	0.62	0.57	46.5
12u	U	3	0	3	0.0	0.187	12.7	LOS B	1.0	7.6	0.57	0.62	0.57	50.3
Appro	bach	161	10	169	6.2	0.187	6.0	LOS A	1.0	7.6	0.57	0.62	0.57	46.5
All Vehic	les	1083	43	1140	4.0	0.402	6.0	LOS A	3.0	21.3	0.44	0.57	0.44	46.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### W Site: 101 [PM 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT JMES HV]	DEM FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF UE Dist ]	Prop. E Que	ffective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n <sup>.</sup> Rive	rview Ro	ad	ven/n	70	V/C	sec	_	ven	111		_	_	K[1]/11
1	1.1.1.10	6	1	6	16.7	0.201	7.4	1084	1.2	0.0	0.60	0.77	0.60	12.0
2	LZ T1	11	0	46	0.0	0.201	6.8		1.2	0.9	0.09	0.77	0.09	43.9
2	 ₽2	44 02	11	40	12.0	0.201	11.2		1.2	0.9 8 0	0.09	0.77	0.09	44.9
311	11	1	0	1	0.0	0.201	13.0		1.2	8.9 8.9	0.03	0.77	0.03	48.2
Appro	bach	143	12	151	8.4	0.201	9.7	LOSA	1.2	8.9	0.69	0.77	0.69	44.8
East:	Tainui	Bridge F	Road											
4	L2	117	9	123	7.7	0.520	4.2	LOS A	4.5	32.3	0.45	0.56	0.45	45.2
5	T1	165	6	174	3.6	0.520	4.1	LOS A	4.5	32.3	0.45	0.56	0.45	46.2
6	R2	357	1	376	0.3	0.520	8.0	LOS A	4.5	32.3	0.45	0.56	0.45	46.2
6u	U	3	0	3	0.0	0.520	11.1	LOS B	4.5	32.3	0.45	0.56	0.45	49.7
Appro	bach	642	16	676	2.5	0.520	6.3	LOS A	4.5	32.3	0.45	0.56	0.45	46.0
North	: Te Ar	aroa Trl												
7	L2	285	6	300	2.1	0.390	5.2	LOS A	2.6	18.9	0.58	0.63	0.58	46.0
8	T1	59	4	62	6.8	0.390	5.3	LOS A	2.6	18.9	0.58	0.63	0.58	46.9
9	R2	32	3	34	9.4	0.390	9.3	LOS A	2.6	18.9	0.58	0.63	0.58	46.8
9u	U	1	0	1	0.0	0.390	12.2	LOS B	2.6	18.9	0.58	0.63	0.58	50.6
Appro	bach	377	13	397	3.4	0.390	5.6	LOS A	2.6	18.9	0.58	0.63	0.58	46.2
West	: Rotov	waro Roa	ad											
10	L2	33	3	35	9.1	0.262	6.8	LOS A	1.6	11.6	0.66	0.70	0.66	45.3
11	T1	158	9	166	5.7	0.262	6.7	LOS A	1.6	11.6	0.66	0.70	0.66	46.3
12	R2	9	1	9	11.1	0.262	10.8	LOS B	1.6	11.6	0.66	0.70	0.66	46.1
12u	U	4	0	4	0.0	0.262	13.6	LOS B	1.6	11.6	0.66	0.70	0.66	49.9
Appro	bach	204	13	215	6.4	0.262	7.0	LOS A	1.6	11.6	0.66	0.70	0.66	46.2
All Vehic	les	1366	54	1438	4.0	0.520	6.6	LOS A	4.5	32.3	0.55	0.62	0.55	46.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [PM 2033 PC (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle Mo	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLL [ Total	PUT JMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n: Rive	rview Ro	ad	VG11/11	/0	V/C	300		VCII					111/11
1	L2	17	1	18	5.9	0.370	11.9	LOS B	2.7	20.3	0.96	0.99	0.98	41.7
2	 T1	44	0	46	0.0	0.370	11.6	LOS B	2.7	20.3	0.96	0.99	0.98	42.5
3	R2	92	11	97	12.0	0.370	16.2	LOS B	2.7	20.3	0.96	0.99	0.98	42.4
3u	U	1	0	1	0.0	0.370	18.7	LOS B	2.7	20.3	0.96	0.99	0.98	45.5
Appro	bach	154	12	162	7.8	0.370	14.4	LOS B	2.7	20.3	0.96	0.99	0.98	42.3
East:	Tainui	Bridge F	Road											
4	L2	117	9	123	7.7	0.803	6.7	LOS A	12.5	89.0	0.86	0.69	0.92	44.4
5	T1	451	6	475	1.3	0.803	6.6	LOS A	12.5	89.0	0.86	0.69	0.92	45.3
6	R2	357	1	376	0.3	0.803	10.5	LOS B	12.5	89.0	0.86	0.69	0.92	45.3
6u	U	3	0	3	0.0	0.803	13.6	LOS B	12.5	89.0	0.86	0.69	0.92	48.7
Appro	bach	928	16	977	1.7	0.803	8.1	LOS A	12.5	89.0	0.86	0.69	0.92	45.2
North	: Te Ar	aroa Trl												
7	L2	285	6	300	2.1	0.512	6.9	LOS A	4.1	29.3	0.76	0.79	0.80	44.9
8	T1	59	4	62	6.8	0.512	7.1	LOS A	4.1	29.3	0.76	0.79	0.80	45.8
9	R2	86	3	91	3.5	0.512	10.9	LOS B	4.1	29.3	0.76	0.79	0.80	45.8
9u	U	1	0	1	0.0	0.512	13.9	LOS B	4.1	29.3	0.76	0.79	0.80	49.3
Appro	bach	431	13	454	3.0	0.512	7.7	LOS A	4.1	29.3	0.76	0.79	0.80	45.2
West	Rotov	varo Roa	ad											
10	L2	58	3	61	5.2	0.469	7.7	LOS A	3.6	25.7	0.79	0.82	0.84	44.9
11	T1	277	9	292	3.2	0.469	7.6	LOS A	3.6	25.7	0.79	0.82	0.84	45.8
12	R2	15	1	16	6.7	0.469	11.7	LOS B	3.6	25.7	0.79	0.82	0.84	45.8
12u	U	4	0	4	0.0	0.469	14.6	LOS B	3.6	25.7	0.79	0.82	0.84	49.3
Appro	bach	354	13	373	3.7	0.469	7.9	LOS A	3.6	25.7	0.79	0.82	0.84	45.7
All Vehic	les	1867	54	1965	2.9	0.803	8.5	LOS A	12.5	89.0	0.83	0.76	0.88	45.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [SAT Existing (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT JMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. I Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
South	n: Rive	rview Ro	ad	ven/n	70	V/C	SEC	_	ven	111	_	_	_	K111/11
1	12	6	0	6	0.0	0 101	47		0.5	3.8	0.46	0.62	0.46	15 1
2	T1	23	1	24	4.3	0.101	4.8	LOSA	0.5	3.8	0.46	0.02	0.46	45.9
3	R2	68	3	72	4.4	0.101	8.8	LOSA	0.5	3.8	0.46	0.62	0.46	45.9
3u	U	1	0	1	0.0	0.101	11.8	LOS B	0.5	3.8	0.46	0.62	0.46	49.4
Appro	bach	98	4	103	4.1	0.101	7.6	LOS A	0.5	3.8	0.46	0.62	0.46	45.8
East:	Tainui	Bridge F	Road											
4	L2	64	3	67	4.7	0.253	3.5	LOS A	1.6	11.2	0.23	0.52	0.23	45.8
5	T1	86	2	91	2.3	0.253	3.5	LOS A	1.6	11.2	0.23	0.52	0.23	46.7
6	R2	180	3	189	1.7	0.253	7.4	LOS A	1.6	11.2	0.23	0.52	0.23	46.7
6u	U	1	0	1	0.0	0.253	10.6	LOS B	1.6	11.2	0.23	0.52	0.23	50.4
Appro	bach	331	8	348	2.4	0.253	5.7	LOS A	1.6	11.2	0.23	0.52	0.23	46.6
North	: Te Ar	aroa Trl												
7	L2	216	5	227	2.3	0.238	4.1	LOS A	1.4	9.8	0.36	0.50	0.36	46.6
8	T1	34	0	36	0.0	0.238	4.0	LOS A	1.4	9.8	0.36	0.50	0.36	47.5
9	R2	19	0	20	0.0	0.238	8.0	LOS A	1.4	9.8	0.36	0.50	0.36	47.5
9u	U	1	0	1	0.0	0.238	11.1	LOS B	1.4	9.8	0.36	0.50	0.36	51.3
Appro	bach	270	5	284	1.9	0.238	4.4	LOS A	1.4	9.8	0.36	0.50	0.36	46.8
West	: Roto	varo Roa	ad											
10	L2	25	0	26	0.0	0.099	4.6	LOS A	0.5	3.6	0.44	0.51	0.44	46.3
11	T1	72	1	76	1.4	0.099	4.7	LOS A	0.5	3.6	0.44	0.51	0.44	47.2
12	R2	1	0	1	0.0	0.099	8.6	LOS A	0.5	3.6	0.44	0.51	0.44	47.2
12u	U	1	0	1	0.0	0.099	11.7	LOS B	0.5	3.6	0.44	0.51	0.44	50.9
Appro	bach	99	1	104	1.0	0.099	4.8	LOS A	0.5	3.6	0.44	0.51	0.44	47.0
All Vehic	les	798	18	840	2.3	0.253	5.4	LOS A	1.6	11.2	0.33	0.53	0.33	46.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### V Site: 101 [SAT 2033 (Site Folder: General)]

New Site Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfor	mance										
Mov ID	Turn	INP VOLU [ Total	PUT IMES HV]	DEM/ FLO [ Total	AND WS HV]	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [ Veh.	CK OF EUE Dist ]	Prop. E Que	ffective: Stop Rate	Aver. No. Cycles	Aver. Speed
South	n Rivo	ven/n rview Ro	ven/n	ven/n	%	V/C	sec	_	ven	m	_	_	_	Km/n
J			au	0	0.0	0.420	5.0		0.7	E 4	0.50	0.00	0.52	44.0
1	LZ T4	0	0	8 04	0.0	0.138	5.2	LOSA	0.7	5.4	0.53	0.00	0.53	44.8
2		23	1 2	31	4.3	0.138	5.4	LOSA	0.7	5.4 5.4	0.53	0.00	0.53	45.0
3	R2	08	3	90	4.4	0.138	9.3		0.7	5.4 5.4	0.53	0.00	0.53	45.0
Annr	U	1	0	120	0.0	0.130	12.3		0.7	5.4	0.53	0.00	0.53	49.1
Appro	Jach	90	4	130	4.1	0.130	0.1	L03 A	0.7	5.4	0.55	0.00	0.55	45.0
East:	Tainui	Bridge F	Road											
4	L2	64	3	85	4.7	0.325	3.6	LOS A	2.2	15.8	0.28	0.52	0.28	45.7
5	T1	86	2	114	2.3	0.325	3.6	LOS A	2.2	15.8	0.28	0.52	0.28	46.6
6	R2	180	3	239	1.7	0.325	7.5	LOS A	2.2	15.8	0.28	0.52	0.28	46.6
6u	U	1	0	1	0.0	0.325	10.7	LOS B	2.2	15.8	0.28	0.52	0.28	50.2
Appro	bach	331	8	439	2.4	0.325	5.8	LOS A	2.2	15.8	0.28	0.52	0.28	46.4
North	: Te Ar	aroa Trl												
7	L2	216	5	286	2.3	0.312	4.4	LOS A	1.9	13.7	0.44	0.54	0.44	46.4
8	T1	34	0	45	0.0	0.312	4.4	LOS A	1.9	13.7	0.44	0.54	0.44	47.3
9	R2	19	0	25	0.0	0.312	8.3	LOS A	1.9	13.7	0.44	0.54	0.44	47.3
9u	U	1	0	1	0.0	0.312	11.4	LOS B	1.9	13.7	0.44	0.54	0.44	51.1
Appro	bach	270	5	358	1.9	0.312	4.7	LOS A	1.9	13.7	0.44	0.54	0.44	46.6
West	: Roto	varo Roa	ld											
10	L2	25	0	33	0.0	0.134	5.1	LOS A	0.7	5.0	0.51	0.56	0.51	46.1
11	T1	72	1	95	1.4	0.134	5.2	LOS A	0.7	5.0	0.51	0.56	0.51	47.0
12	R2	1	0	1	0.0	0.134	9.1	LOS A	0.7	5.0	0.51	0.56	0.51	47.0
12u	U	1	0	1	0.0	0.134	12.2	LOS B	0.7	5.0	0.51	0.56	0.51	50.7
Appro	bach	99	1	131	1.0	0.134	5.3	LOS A	0.7	5.0	0.51	0.56	0.51	46.8
All Vehic	les	798	18	1058	2.3	0.325	5.6	LOS A	2.2	15.8	0.39	0.55	0.39	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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#### **APPENDIX B**

Turning Diagrams

AM Peak - new movements

Total 

IN 

OUT

Check 558

151 119









40%

60%

39%



SIDRA Modelling with and without Rezoning - note some cells added here for u-turns **EXISTING** 

Light







129 178

193 210

205

315

PM Peak - new movements

Total 558

IN 390 OUT 167

Check 558

351 286 351 286

151

151

119

119

55

55

	0	4		_		6	56	
1	1		10		14	2		130
38			16		28			20







31%

27

61

69%

6
SIDRA Modelling with and without Rezoning - note some cells added here for u-turns **EXISTING** 

Light







	108	190
172		
311		
	240	370

Right turn bay warrant volumes at the eastern access on Rotowaro Road

AM Peak - new

Right turn bay warrant volumes at the western access on Rotowaro Road



**Attachment 9** 

Preliminary Site Investigation by CSI

## PRELIMINARY SITE INVESTIGATION 0 WEAVERS CROSSING ROAD HUNTLY



**Contaminated Site Investigation** 

34 Brookfield Street Hamilton

Ph: 07 859 1481 Mob: 021 072 5617

contaminatedsite@xtra.co.nz

# PREPARED FOR: TERRA FIRMA RESOURCES LTD

**NOVEMBER 2020** 

PSI REPORT: 0 Weavers Crossing Road, Huntly		
Prepared by: GUY SOWRY	Date:	
07	16.02.2021.	
DIRECTOR		
CSI		
CONTAMINATED SITE INVESTIGATION		

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## 0.0 Executive Summary

Purpose	Undertake a PSI for 0 Weavers Crossing Road, Huntly. For ease of reading the site is separated into the two following parts by Weavers Crossing Road: eastern and western.
Current and Proposed Site Status	The site is predominantly pastoral land with shed present on the western boundary. Change the zone of the site from recreational or rural to residential which, would result in residential development and subsequent occupation.
History	Eastern Site Pastoral land prior to and after Weavers Open Cast Coal Mine, which, occupied part or all of the site between the years 1958 to 1993, with no workshops or permanent refuelling facilities. Western Site Pastoral land with no structures present prior to at least 1941 and pastoral land with a farm shed present from circa 1963 to the present day.
Geology Hydrogeology Hydrology	The soil at the site is clay. A deep groundwater system may be present beneath the site. A wetland is located approximately 20 metres to the north of the site. Lake Puketirini is located approximately 30 metres to the north of the site.
Site Investigation	<ul> <li>Walkover</li> <li>Undertaken by Guy Sowry on 13 November 2020. No current HAIL noted and no significant areas of ground staining noted.</li> <li>History</li> <li>Open cast coal mine on the eastern site that has been backfilled with clay.</li> <li>Potential HAIL</li> <li>E7 - mining industries.</li> <li>Potential Ground Contaminants</li> <li>None. The site has been backfilled with mine spoil that is similar to the natural soil in Huntly as it is clay deposits. The potential contaminants polycyclic aromatic hydrocarbons, boron and arsenic are likely to be below NES SCS based on sampling result of a similar site by CSI.</li> <li>Conceptual Site Model</li> <li>A low risk to human health and the environment, as there are no identified potential contaminants/hazards.</li> </ul>
NES	It is highly unlikely that there will be a risk to human health if the site is developed into the more sensitive landuse of residential.
Recommendations	<ol> <li>That no further contaminated land investigations are required.</li> <li>The site shall be separated from Weavers Open Cast Mine listed on WDC and WRC Selected Land Use Registers and listed separately as 'Investigated – no risk to human health'.</li> </ol>
This sheet is intende site. This sh	ed to provide a summary only of the assessment study of the neet does not provide a definitive scientific analysis.

## 1.0 INTRODUCTION

- 1.1 Contaminated Site Investigations (CSI) has been appointed by Terra Firma Resources (TFR) to undertake a Preliminary Site Investigation (PSI) of 0 Weavers Crossing Road, Huntly. A PSI was requested in support of a submission on the Proposed Waikato District Plan to rezone the land for residential purposes as the site is considered by the Waikato District Council (WDC) to have had the following Hazardous Activity or Industry (HAIL) occur:
  - E7 Mining industries (excluding gravel extraction) including exposure of faces or release of groundwater containing hazardous contaminants, or the storage of hazardous wastes including waste dumps or dam tailings; has occurred at the site.
- 1.2 The aim of the PSI is to provide TFR with an evaluation of ground conditions to determine if any HAIL has occurred at the site and if yes:
  - the potential risk to human health; and
  - the potential risk to the environment.
- 1.3 The PSI has been completed in general accordance with: the Resource Management Act 1991 (RMA) and the Resource Management Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011(NES).
- 1.4 This report is based on a review of aerial photos, oblique photos, consultation, a literature review and a site walkover. The report has been prepared by Guy Sowry in accordance with the NES and in particular the Ministry for the Environment (MfE) *Contaminated Land Management Guidelines (CLMG) No 1 Reporting on Contaminated Land.*
- 1.5 As per the NES User Guide Suitably Qualified and Experienced Practitioner requirements Guy Sowry holds a postgraduate diploma in 'Environmental Health Science' and over 25 years experience investigating and reporting on contaminated land.
- 1.6 The following limitation should be noted:
  - the investigation is only a preliminary investigation with no soil samples. Should
    a risk to human health be proven a detailed site investigation shall be required.
- 1.7 Attention is drawn to the report conditions shown in Appendix A.

## 2.0 CURRENT SITE LAND STATUS

#### 2.1 Site Identification

- 2.1.1 The site is situated on the western outskirts of Huntly township as shown in Figure 1.
- 2.1.2 Details of the site are provided in Table 1: Site Details.

#### Table 1: Site Details

ADDRESS	VRN	LEGAL DESCRIPTION	SIZE
0 Weavers Crossing Road	06331/344/02	ALLOT 9C PEPEPE PSH SO 34206 LOT 1 DPS 61669 PT LOT 2 DPS 61669 PT SEC 1 SO 58281	45.18ha

- 2.1.3 The site is irregular in shape as shown in Figure 2 Site Plan and is separated into the two following parts by Weavers Crossing Road: east of Weavers Crossing Road (hereafter referred to as the eastern site), which is 43 ha in size; and west of Weavers Crossing Road (hereafter referred to as the western site), which is 1. 4 ha in size.
- 2.1.4 The eastern site is zoned in the Operative District Plan as 'Recreational' and in the Proposed District Plan as 'Rural' and western site is zoned in both plans as 'Rural'.

#### 2.2 Site Description

2.2.1 The site is predominantly pastoral land with scrub, an access road and a building.

#### **Eastern Site**

- 2.2.2 Pastoral land is present over all of the site except for a small area of scrub in the central north. A dirt road dissects the site from south to north in the west. Post, wire and batten farm fences divided the site into a number of paddocks. Concrete watering troughs are also present.
- 2.2.3 The northern boundary is fenced with a post, wire and batten farm fence with bush beyond. Further beyond is a dirt road followed by bush or reserve land and then Lake Puketirini. The southern boundary in the centre and east is fenced with a post, wire and batten farm fence or open with bush and a dirt road beyond. The southern boundary in the west is open to pastoral land. The eastern boundary is fenced with a post, wire and batten farm fence with bush or vacant grassed land and a dirt access road beyond. Further beyond is reserve land, another dirt road and then Rotowaro Road. The western boundary is fenced with a post, wire and batten farm fence with bush and a dirt access road beyond. Further beyond is reserve land, another dirt road and then Rotowaro Road. The western boundary is fenced with a post, wire and batten farm fence with bush and a dirt road beyond. Further beyond is bush and then Weavers Crossing Road.
- 2.2.4 The topography of the site is undulating with an overall gentle slope down to the north.

- 2.2.5 The site is entirely pastoral land with one building present. The site is divided into two paddocks by a post, wire and batten farm fence running from east to west in the central south. A rectangular building with corrugated iron cladding is located in the central west, immediately south of the farm fence and adjacent to the western boundary. Access to the site is via a dirt road in the south.
- 2.2.6 All boundaries are fenced with a post, wire and batten farm fences. Beyond the northern boundary are two residential properties with residential properties further beyond. Beyond the southern and easter boundaries is Weavers Crossing Road. Beyond the western boundary is pastoral land.
- 2.2.7 The site slopes gently down to the south and east.

## 2.3 Surrounding Environment

- 2.3.1 The site is situated in an area typified by recreational reserve, residential, pastoral, educational faculties and industrial.
- 2.3.2 Immediately to the north of the eastern site is reserve land associated with Lake Puketirini. Lake Puketirini is located beyond. Approximately 200 metres to the west of the western site is Lake Waahi. Approximately 200 metres northeast of the eastern site beyond Rotowaro Road are recreation fields including netball courts and a softball diamond.
- 2.3.3 Residential properties are present immediately to the north of the western site and immediately beyond Rotowaro Road in the east and north east.
- 2.3.4 Pastoral land is located immediately to the south of the eastern site and south and west of the western site. Pastoral land is also present to the south beyond Rotowaro Road.
- 2.3.5 The Te Wananga O Aotearoa educational facility is located to the east of the site beyond Rotowaro Road. The Subsea Training Centre is also present in this locality.
- 2.3.6 A number of industrial premises are located to the south immediately beyond Rotowaro Road.

## 2.4 **Proposed Development**

- 2.4.1 The current owners consider that the site is suitable for medium to high density residential. The location lends itself to residential development as it is a gently sloping area with a north-facing aspect overlooking lake and rural land with excellent established surrounding infrastructure.
- 2.4.2 Therefore, the current owners have lodged a Proposed District Plan submission to change the proposed zoning of the land to Village Zone and/or Residential Zone.

### 3.0 HISTORICAL REVIEW

#### 3.1 Aerial Photos

- 3.1.1 Reproductions of aerial photos are included in this report as SK01 (1943) to SK10 (2008) and are located in Appendix B.
- 3.1.2 Eastern Site
  - 3.1.2.1 The **1941** reproduction (SK01) shows the site as a mixture of pastoral, vegetation or wetlands with no structures present. Lines are present across the site and are considered to be drains and farm fence lines. Immediately to the north is a pond surrounded by wetlands. The site is open to pastoral land or wetlands in the east and south. Immediately to the west is Weavers Crossing Road.
  - 3.1.2.2 The **1963** reproduction (SK02) shows the central and southern part of the site as an open cast mine, the north eastern part as pastoral land and the western part as vacant vegetated land with a dirt road adjacent to Weavers Crossing Road. A dirt road is also present in the north which, runs east and then south into the pit. Coal appears to be present at the base of the working pit. A number of small buildings are present. Ponded water is present within a pit immediately to the east of the working pit. Immediately to the north is wetlands and pastoral land. Immediately to the central south is a mine pit and mine working which, includes the conveyor. Immediately to the east in the south and central is vegetated land and in the north is the conveyor which runs to a hopper that is surrounded by pile of coal. The site is open to the vegetated land in the south, west of the pit. Immediately to the west is Weavers Crossing Road.
  - 3.1.2.3 The **1966** reproduction (SK03) shows similar conditions to the 1963 reproduction however the working pit has increased in size to the east with ponded water is present in the base of the pit. Ponded water is also present in an older pit to the south. Exposed soil is present in the north east and northwest. Immediate surrounding conditions remain very similar to the 1963 reproduction.
  - 3.1.2.4 The **1972** reproduction (SK04) shows the entire eastern side of the site as mine workings and the western side pastoral except in the northwestern corner, which is bare soil. The working pit is located in the central north with a number of small structures present. The other objects within the pit and workings are considered to be trucks. The conveyor is no longer present. Ponded water is also present in older pits in the centre and south. Immediate surrounding land conditions remain similar to the previous 1963 and 1966 reproductions with the exception of a train track with wagons present immediately to the east.
  - 3.1.2.5 The **1974** reproduction (SK05) shows similar conditions to the 1972 reproduction except a line is present running east from the working pit to the adjacent hopper and therefore is considered to be a conveyor. Immediate surrounding land conditions remain similar to the 1972 reproduction.

- 3.1.2.6 The **1979** reproduction (SK06) shows the entire site, except for small pockets of vegetation and a strip of pastoral land between the dirt road and Weavers Crossing Road in the west, as mine workings. The conveyor has increased in length into the centre of the site. A number of small structures and trucks are present across the site. Immediate surrounding land conditions remain similar to the 1972 reproduction except the land in the north east is now a mine pit and the land in the southwest is mine workings.
- 3.1.2.7 The **1982** reproduction (SK07) shows very similar conditions to the 1979 reproduction. The main workings continue to be in the central north and northeast however, the conveyor is no longer present. Immediate surrounding land conditions remain similar to the 1979 reproductions.
- 3.1.2.8 The **1986** reproduction (SK08) shows similar conditions to the 1979 and 1984 reproduction. Immediate surrounding land conditions remain similar to the 1979 and 1982 reproductions with the exception of a rectangular building present in the northeast west of Rotowaro Road.
- 3.1.2.9 The **1991** reproduction (SK09) shows the entire site as either bare exposed soil or vegetated land with no structures present other than the rectangular structure in the northeast. Large areas of vegetation are present in the central east and west and grassed land is present along the eastern and western boundaries. The immediate land to the north is now the major mine pit. The land immediately to the south is either exposed soil or vegetated land with no structures present. The land immediately to the east is grassed land. Immediately to the west is Weavers Crossing Road.
- 3.1.2.10 The **1995** reproduction (SK10) shows the entire site as either grassed or vegetated land with no structures present. Dirt roads are visible in the east, south and northwestern corner. The immediate surrounding land to the north is a dirt road with vegetation and then a body of water beyond. The land immediately to the south, east and west remains similar to the 1991 reproduction.
- 3.1.2.11 The **2008** reproduction (SK11) shows the majority of the site as pastoral land with no structures present. A pocket of bush is present in the central north. A strip of vegetation is present adjacent to Weavers Crossing Road. A dirt road dissects the site, north to south, in the central west. The land immediately to the north is bush or grass with Lake Puketirini beyond. The land immediately to the central south and southeast is vegetated with a dirt road adjacent to Rotowaro Road. The land immediately to the east is pastoral. The land immediately to the south and southwest is pastoral.

#### 3.1.3 Western Site

3.1.3.1 The **1941** reproduction (SK01) shows the site as pastoral land with no structures present. The site appears to be fenced on all boundaries. Immediately beyond the northern and western boundaries is pastoral land with no structures present. Immediately beyond the southern and eastern boundaries is Weavers Crossings Road.

- 3.1.3.2 The **1963** reproduction (SK02) shows the as pastoral land with a rectangular structure present which, is considered to be in exactly the same location and have the same footprint as the present day shed. Immediate surrounding conditions to the west, east and south remains the same. Immediately to the northeast are residential properties with pastoral land with no structures present to the northwest.
- 3.1.3.3 The **1966** reproduction (SK03) shows similar conditions on site and immediately off site to the 1963 reproduction.
- 3.1.3.4 The **1972** reproduction (SK04) shows the same conditions on site to the 1963 and 1966 reproductions. The immediate off site conditions also remain similar except the pastoral land in the northwest is now residential.
- 3.1.3.5 The **1974** reproduction (SK05) shows similar conditions on site and immediately off site to the 1972 reproduction.
- 3.1.3.6 The **1979** reproduction (SK06) shows similar conditions on site and immediately off site to the 1972 and 1974 reproductions.
- 3.1.3.7 The **1982** reproduction (SK07) shows similar conditions on site and immediately off site to the previous reproductions.
- 3.1.3.8 The **1986** reproduction (SK08) shows similar conditions on site and immediately off site to the previous reproductions.
- 3.1.3.9 The **1991** reproduction (SK09) shows similar conditions on site and immediately off site to the previous reproductions.
- 3.1.3.10 The **1995** reproduction (SK10) shows similar conditions on site and immediately off site to the previous reproductions.
- 3.1.3.11 The **2008** reproduction (SK11) shows the site as pastoral land with a building present in the central west. Immediately to the east and south is Weavers Crossing Road. Immediately to the west is pastoral land with no structures present. Immediately to the north are residential properties.

## 3.2 Aerial Oblique Photos

- 3.2.1 Reproductions of aerial oblique photos are included in this report as SK12 (1959) to SK16 (1970) and are located in Appendix C.
- 3.2.2 The **1959** reproduction (SK12) shows part of the site looking towards the north. An open cast mine with several small structure is present in the south. Bare soil is present to the east and north of the mine. Around the northern and eastern margins of this bare soil is pastoral land. The western part of the site is entirely vegetated land. A line is present at the bottom of the pit running to the east and then north on adjacent land to a building in north. South of the site on adjacent land is a series of large buildings.

- 3.2.3 The **1966** reproduction (SK13) shows part of the site looking towards the east. An open cast mine is present in nearly all of the eastern part of the site with the pit containing a number of small structures roughly in the centre. Ponded water is present at the bottom of the pit. Vegetated land, with the exception of an area of bare soil in the western corner, is present in the west. South of the site on adjacent land is a series of large buildings. A railway line is also present adjacent to the site in the south, east and north. A hopper is also present in the north.
- 3.2.4 The **1970** reproduction (SK14) shows most of the western site looking towards the northeast. A deep pit with ponded water is present in the northeast of the site. Excavations are occurring immediately to the north and east of this pit as the soil is exposed and large vehicles are present. Older pit workings with ponded water is visible in the central east. In the south is exposed soil. The western part of the site is a mixture of bush, marginal pastoral land and mine workings. Dirt roads are present on adjacent land to the south, east and north east. The working pit extends into adjacent land in the north east. The land to the north is predominantly bush.
- 3.2.5 The **1979** reproduction (SK15) shows all of the site looking towards the west. Current or past mine workings are present over most of the eastern site with a small strip of vegetated land adjacent to Weavers Crossing Road. A large working pit is present in the north with older workings in the south as vegetation is present. A number of small structures are present within the working pit and in the central east. Beyond Weavers Crossing Road is the western site, which is pastoral with a building present in the centre. Immediately adjacent to the eastern site in the south and east is vegetated with a building in the south. A dirt road and railway line are present adjacent to Rotowaro Road. The railway line runs to a building north east of the site. The main working pit extends onto the land immediately to the north.
- 3.2.6 The **1990** reproduction (SK16) shows the land immediately to the north and north east, which is an open cast mine.

## 4.0 CONSULTATIONS AND LITERATURE REVIEW

## 4.1 Waikato District Council

4.1.1 Consultation was not undertaken with WDC as it was considered that they would not hold any significant additional information to that provided by WRC.

## 4.2 Waikato Regional Council

- 4.2.1 The following information was requested from the WRC:
  - Selected Land Use Status (SLUR);
  - consents and or permits issued to the site; and
  - pollution incidents at the site.
- 4.2.2 The eastern site is included in a wider entry as presented in Table 2: WRC SLUR.

## Table 2: WRC SLUR

SITE ID/NAME	LUI07028 Weavers Opencast Mine	
STATUS	Current record.	
CLASSIFICATION	Verified HAIL – no sampling	
HAIL	E7 Mining industries	
	A17 Storage tanks for fuel and other chemicals	

- 4.2.3 This entry includes Lake Puketirini and margins immediately to the north and north east, immediately adjacent land to the south and east, and land further to the south beyond Rotowaro Road.
- 4.2.4 WRC also advised that they hold no contaminated land management reports for this site and there is no record of any pollution incidents having occurred.
- 4.2.5 The site is currently not consented by WRC.

## 4.3 Ms. Lucy Smith, Current Site Owner

- 4.3.1 Ms. Smith stated that they purchased the site in 2018 and at the time the site was predominantly pastoral land with only the one building present on the western site. No farm landfills were noted and no other building foundations were noted. Ms. Smith stated that the shed on the western site has not been used for a least five years.
- 4.3.2 Ms. Smith stated that the eastern site was farmed by Mr. Peter Scott for over ten years.
- 4.3.2 Ms. Smith provided a copy of a high level geotechnical report, which is discussed in Section 4.5 and rehabilitation plans, which are discussed in Section 4.6.

#### 4.4 Mr. Craig Smith, Current Site Owner

- 4.4.1 Mr. Smith stated that Terra Firma Resources Ltd was established in in 2017 with the sole purpose being to purchase the Puketirini land from Solid Energy Ltd.
- 4.4.2 Mr. Smith stated that the site was part of the Weavers Open Cast Mine, which was mined by various state organisations from 1958 until its closure by Solid Energy in 1993. The subsequent rehabilitation process of their site included soil placement, contouring and riparian planting.

#### 4.5 Mr. Peter Scott, Former Occupier

- 4.5.1 Mr. Scott stated that he leased the eastern site from Solid Energy from approximately 1996 to 2015. Mr. Scott stated that he was the first lease holder and farmer of the site after rehabilitation and as such no chemical storage, landfills or sheep dips were present. The shed was used as a hay barn.
- 4.5.2 Mr. Scott stated that they have not landfilled any waste at the site. No hazardous substances have been stored or used at the farm apart from Roundup and no dipping has occurred. Superphosphate was applied on the odd occasion as he did not want to invest in the property as the lease was only yearly.
- 4.5.3 Mr. Scott stated that during his occupation the western site was only ever pastoral land and that the shed on site was only used as a hay barn and to his knowledge always had been. Mr. Scott further stated that he knows this area very well as he has lived in this area his whole life and farmed in this area for most of it.

#### 4.6 Strata Control Technology Ltd, High Level Geotechnical Review

- 4.6.1 A summary of the review for the eastern site only is presented below. A full copy of the review is available upon request.
- 4.6.2 Objective
  - 4.6.2.1 Provide a geotechnical summary of the site characteristics, particularly relating to the nature of spoil placement.
- 4.6.3 Data
  - 4.6.3.1 Review based on comprehensive data including technical mine plans from the former State Coal Mines NZ from the mid 1980's to mine closure and rehabilitation in the early 1990's.
  - 4.6.3.2 Specific technical drawings relating to the construction of an engineered earth bund wall (No 8 Bund) to enable placement of mine spoil and to separate the site from Lake Puketirini.
- 4.6.4 Spoil Emplacement
  - 4.6.4.1 The site was constructed by the placement of mine spoil comprising sediments of the Tauranga Group and Te Kuiti Group, behind an engineered earth bund.
  - 4.6.4.2 The sediments in the mine spoil are the same as those encountered beneath most of the Huntly area.

## 4.7 State Coal Mine Maps

- 4.7.1 Reproductions of State Coal maps are included in this report as SK17 (1990) and SK18 (1991) and are located in Appendix D.
  - 4.7.1.1 The 1990 reproduction (SK17) shows the location of No 8 Bund in relation to the eastern site with no buildings noted at the site. Coal Corps Workshops and Downers Workshops are located to the south beyond Rotowaro Road.
  - 4.7.1.2 The 1991 reproduction (SK18) shows all of the eastern site with the No 8 Bund immediately to the north and the Eastern Hall Road immediately to the east. No buildings are noted at the site. On adjacent land in the east are two buildings between the eastern hall road and Rotowaro Road, opposite Coal Crop's Regional Office.

## 4.8 CSI DSI 137 Rotowaro Road

- 4.8.1 CSI completed a DSI for part of 137 Rotowaro Road, Huntly. This site was considered to be part of Weavers Open Cast Mine by WRC. It is located to the south west of the subject site beyond Rotowaro Road.
- 4.8.2 The history component of the DSI determined that all workshops and permeant refuelling facility associated with Weavers Open Cast Mine were located to the south of Rotowaro Road, Huntly.

## 4.9 CSI PSI 1153 Rotowaro Road

- 4.9.1 CSI completed a DSI for a proposed residential site at 1153 Rotowaro Road, Huntly. This site was considered to be located on potential overburden from the Rotowaro Coalfield by WRC, which has the same geology as Weavers open Cast Mine.
- 4.9.2 The history component of the PSI determined that the site was infilled with overburden from the nearby Rotowaro Coalfield. As a result of coal being observed during the site walkover polycyclic aromatic hydrocarbons and metals were considered potential contaminants.
- 4.9.3 An intrusive investigation was undertaken by Guy Sowry comprising the collection of four surface soil samples with analysis undertaken at Hills Laboratories, Hamilton, for basic heavy metals and polycyclic aromatic hydrocarbon. Note boron was not analysed as no aquatic receptors in close proximity to the site.
- 4.9.4 Metal concentrations were below NES SCS, New Zealand specific Ecological Guideline (ECO) values, and the WRC background range. Benzo(a)pyrne was below laboratory detection levels.

## 5.0 GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

## 5.1 Geology

- 5.1.1 The **Strata Control Technology Ltd, High Level Geotechnical Review** documents the soil at the eastern site as mine spoil from the Tauranga Group and Te Kuiti Group, both clay deposits. The soil sampling undertaken by CSI for the PSI at 1153 Rotowaro Road, Rotowaro, which is considered to have the same geology, identified the soil as clay. Therefore, the soil at the eastern site is considered to be clay.
- 5.1.2 The Land Resource Information System (LRIS) Portal documents the surface soil at the western site as clay.

#### 5.2 Hydrogeology

5.2.1 Information from the Waikato Regional Council indicates a probable groundwater system beneath the site at about 20 metres. This information is based on bore 69\_1443, O'Reilly TJ, located at 165 Rotowaro Road, which documents a bore depth of 21 metres.

#### 5.3 Hydrology

- 5.3.1 The nearest surface water in the form of a wetland is present 20 metres to the north of the site in the central north. This wetland discharges into Lake Puketirini, which is located approximately 30 metres further to the north.
- 5.3.1 Lake Puketirini is located approximately 30 metres to the north of the eastern site at the closest point in the north and approximately 150 metres northeast of the western site.

## 6.0 SITE EVALUATION

#### 6.1 Walkover

- 6.1.1 A site walkover was undertaken by Guy Sowry on 13 November 2020. At the time of the walkover the day was overcast with no rain. A selection of the photos taken on this day are provided for in Appendix E.
- 6.1.2 Both sites were predominantly pastoral land with post, wire and batten farm fences and one building present at the western site. Rushes were present in the central north of the eastern site and strip of vegetation was present along the western boundary of the eastern site. No coal specks were noted in bare surface soil. No hummocky land was noted to suggest landfilling. No past building foundations were noted. No odour was noted and no vegetation stress was observed.

## 6.2 History

- 6.2.1 Aerial Photos
  - 6.2.1.1 An aerial photo from 1941 shows the site as pastoral land with no structures present.
  - 6.2.1.2 Aerial photos from 1963 to 1986 show the eastern site as a mix of an open cast mine, with minor structures present, or marginal vegetated land. An aerial photo from 2008 shows the eastern site as pastoral land with no structures present.
  - 6.2.1.3 Aerial photos from 1963 to 2008 shows the western site as pastoral with a building present in the central west.
- 6.2.2 Aerial Oblique Photos
  - 6.2.2.1 Oblique aerial photos from 1959 to 1979 document the eastern site as predominantly an open cast mine with minor structures present.
  - 6.2.2.2 An oblique aerial photo from 1979 shows the western site as pastoral land with a building present in the central west.
- 6.2.3 Waikato Regional Council
  - 6.2.3.1 The eastern site is listed on WRC SLUR as: LUI07028 Weavers Opencast Mine; Verified HAIL – no sampling; HAIL E7 mining and HAIL A17 Storage tanks for fuel and chemicals. No contaminated land reports are held for the site.
  - 6.2.3.2 There is no current permits or consents issued to the site and no record of pollution incidents at the site.

- 6.2.4 Ms. Lucy Smith, Current Site Owner
  - 6.2.4.1 Ms. Smith stated that the site was purchased in 2018 and at the time the site was pastoral with only the one building present at the western site. No farm landfills or old building foundations were noted.
- 6.2.5 Mr. Craig Smith, Current Site Owner
  - 6.2.5.1 Mr. Smith stated that the eastern site was part of the Weavers Open Cast Mine, from 1958 until 1993. Rehabilitation included soil placement, contouring and riparian planting.
- 6.2.6 Mr. Peter Scott, Former Occupier
  - 6.2.6.1 Mr. Scott stated that he has farmed the eastern site from 1996 to 2015. No farm landfilling, sheep dipping or chemical storage occurred. Only glyphosate has bene used. Superphosphate was applied on the odd occasion. To his knowledge the shed on the western site is a hay barn and always has been.
- 6.2.7 Strata Control Technology Ltd, High Level Geotechnical Review
  - 6.2.7.1 The eastern site was constructed by the placement of mine spoil comprising sediments of the Tauranga Group and Te Kuiti Group, behind an engineered earth bund.
- 6.2.8 State Coal Mine Maps
  - 6.2.8.1 A 1990 reproduction notes workshops south of Rotowaro Road with no buildings noted at the site.
  - 6.2.8.2 A 1991 reproduction shows the engineered bund immediately to the north and the eastern hall road immediately to the east. No buildings are noted.
- 6.2.9 CSI DSI 137 Rotowaro Road
  - 6.2.9.1 The history component determined that all workshops and permanent refuelling facilities associated with Weavers Open Cast Coal Mine were located to the south of the site beyond Rotowaro Road.
- 6.2.10 CSI PSI 1153 Rotowaro Road
  - 6.2.10.1 Soil sampling of a site with what is considered to be the same geology documented no arsenic and benzo(a)pyrne equivalents concentrations above NES SCS, ECO values, and the WRC background range.
- 6.2.11 History Summary

#### Eastern Site

6.2.11.1 Pastoral land prior to and after Weavers Open Cast Coal Mine, which, occupied part or all of the site between the years 1958 to 1993, with no workshops or permanent refuelling facilities.

Western Site

6.2.11.2 Pastoral land with no structures present prior to 1941 and pastoral land with a farm shed present from circa 1963 to the present day.

## 6.3 **Potential Ground Contaminants**

#### **Coal Mine**

- 6.3.1 The eastern site was an open cast coal mine with no workshops or permanent refuelling facilities from 1958 to 1993. The eastern site was backfilled with mine spoil and recontoured.
- 6.3.2 The MfE considers the following hazardous substances to be typically associated with mining industries: arsenic; mercury; cyanide, sulphides, and metals. However, coal mines do not use or have compounds of or by-products of cyanides and sulphides. Therefore, it is considered that the MfE classification of coal yard is more appropriate which, identifies the typical hazardous substances as: polycyclic aromatic hydrocarbons; boron; and arsenic.
- 6.3.3 A walkover of the site documented no flecks of coal on bare soil at the eastern site.
- 6.3.4 Soil sampling by CSI of a proposed residential site on mine spoil from the same coal seams, with specks of coal present, documented: no arsenic concentrations above the NES Soil Guideline Value (SGV); ECO value; and WRC background range. Note: arsenic is considered to be the limiting human health contaminant. Note benzo(a)pyrne was below laboratory detection levels and therefore by extension it is considered to fall within a acceptable background range for this area.
- 6.3.5 Therefore, it is considered that any potential ground contaminants from mining activities has not occurred at the site.

#### **Pastoral Land**

- 6.3.6 Pastoral land prior to 1958 and from 1996 to the present day. Whilst pastoral farming is not considered to be HAIL the farming activities of livestock dipping, landfilling (including offal pits), chemical storage (drums), fuel storage (tanks or drums), persistent pesticide application (DDT and Dieldrin to control grass grub) and the intentional or accidental release of a hazardous substance, are. A Waikato Regional Council Report titled *Historic Pesticides Residues in Horticultural and Grazing Soils in the Waikato* Region, Sally Gaw, 2003, documents the accidental release of a hazardous substance from farming practices to be: cadmium in superphosphate; and zinc in facial eczema remedies. Each of the above potential HAIL are presented below in comparison to the most sensitive intended landuse scenario of residential.
- 6.3.7 Livestock Dipping, Farm Landfilling, Chemical and Fuel Storage
  - 6.3.7.1 Aerial photos clearly document that the site was not occupied by structures associated with livestock dipping. Anecdotal information documents that livestock dipping has not occurred. A site walkover documented no evidence of structures associated with livestock dipping.

- 6.3.7.2 Aerial photos from 1963 onwards document a shed at the western site. Anecdotal information documents that no drums of fuel or chemicals other than glyphosate have been stored in this shed or at the farm site since 1993 and no evidence to suggest it ever occurred prior to this. No evidence of chemical storage i.e. soil staining or odour noted during site walkover.
- 6.3.7.3 Anecdotal information documents that farm landfilling has not occurred at the farm site since 1993 and no evidence to suggest it occurred prior. No evidence of landfilling i.e. hummocky land noted during site walkover.
- 6.3.7.4 It is considered that any potential ground contaminants from livestock dipping, farm landfilling, chemical storage and fuel storage has not occurred at the site and therefore, these HAIL have not occurred at the site.
- 6.3.8 Persistent Pesticide Application
  - 6.3.8.1 It is not known if DDT and any other organochlorines were applied to the pastoral land prior to it becoming an open cast coal mine or at the western site. Glyphosate has been used however, it is not considered to be a persistent pesticide as its half-life is approximately 96 days.
  - 6.3.8.2 The WRC Report titled *Historic Pesticides Residues in Horticultural and Grazing Soils in the Waikato* Region, Sally Gaw, 2003, documents a DDT high of 0.75 mg/kg for pastoral land. When this value is compared to the NES residential landuse SGV for DDT of 70 mg/kg, DDT and other organochlorines are not considered to be potential human health ground contaminants at the site.
  - 6.3.8.3 When this value of 0.75 mg/kg is compared to the ECO residential value for DDT of 4.8 mg/kg, DDT and other organochlorines are not considered to be potential environmental ground contaminants at the site.
  - 6.3.8.4 Organochlorines are not considered to be a HAIL at this site.
- 6.3.9 Accidental Release of Hazardous Substances Cadmium
  - 6.3.9.1 Superphosphate has been applied to the eastern site and may have been to the western site. Superphosphate contains high concentrations of cadmium.
  - 6.3.9.2 The WRC Technical Report 2005/51 *Cadmium Accumulation in Waikato Soils,* Dr. Nick Kim, 2005 documents for pastoral land a cadmium average of 0.70 mg/kg and a cadmium high of 1.5 mg/kg. When these concentrations are compared to the NES residential landuse scenario SGV for cadmium of 3 mg/kg, the accidental release of cadmium from superphosphate application is not considered to be a potential human health ground contaminant at the site.
  - 6.3.9.3 When the high of 1.5 mg/kg is compared to the residential ECO value for cadmium of 17 mg/kg, cadmium is not considered to be a potential environmental ground contaminant at the site.

- 6.3.9.4 When the average of 0.70 mg/kg is compared to the WRC Background range for cadmium of 0.03 1.2 mg/kg, cadmium is not considered to be a HAIL.
- 6.3.10 Accidental Release of Hazardous Substances Zinc
  - 6.3.10.1 Facial eczema remedies may have been given to stock that grazed the site. Therefore, zinc from facial eczema remedies such as boluses or fortified feed, may have been passively released by stock onto the land.
  - 6.3.10.2 The WRC Report titled *Historic Pesticides Residues in Horticultural and Grazing Soils in the Waikato* Region, Sally Gaw, 2003, documents a zinc high of 58 mg/kg for pastoral land. When this value is compared to a NES approved landuse scenario SGV for zinc of 200 mg/kg, the accidental release of zinc is not considered to be a potential contaminant at the site.
  - 6.3.10.2 When this value of 58 mg/kg is compared to the residential ECO value for zinc of 100 mg/kg, zinc is not considered to be a potential environmental ground contaminants at the site.
  - 6.3.9.4 When this value of 58 mg/kg is compared to the WRC Background range for zinc of 0.8 140 mg/kg, zinc is not considered to be a HAIL.
- 6.3.11 Conclusion
  - 6.3.11.1 Based on the above information it is considered that there are no potential likely contaminants present at the site.

#### 6.4 HAIL Assessment

6.4.1 it is considered that HAIL E7 - Mining industries (excluding gravel extraction) including exposure of faces or release of groundwater containing hazardous contaminants, or the storage of hazardous wastes including waste dumps or dam tailings; has occurred at the site as coal mine faces were historically exposed.

## 6.5 Conceptual Site Model

6.5.1 A Conceptual Site Model (CSM) for the proposed redevelopment of the site into a residential subdivision is presented in Table 3: Conceptual Site Model.

## Table 3: Conceptual Site Model

ELEMENTS		CONTAMINANTS			
		PAH's	Boron and Arsenic		
CONTAN	MINANTS	None.			
Air Stormwater		Surface exposed during subdivision and lot development. PAH's are considered to be marginally volatile however, for this to occur they need to be present at high concentrations, which is considered to be highly unlikely.			
		Discharges into/onto: an adjacent wetland which, will reduce any contaminant concentrations before discharging into Lake Puketirini; adjacent land, which is grass on a clay soil thereby limiting lateral migration of any potential contaminants into Lake Puketirini located approximately 30 metres north of the site.			
		discharging into a permitted/cons	uture stormwater discharges to be treated on site prior to discharging into a permitted/consented disposal option.		
	Groundwator	At depth beneath the site and therefore, more than likely confined by the clay soil.			
Contact Groundwater The site is n is consider proces Direct conta occupatio		is considered that there is no significant risk to microbial processes, soil invertebrates, plants and wildlife.			
		Direct contact with soil developme occupation limited due to hards	rect contact with soil development. Direct contact during occupation limited due to hardstand and grass cover.		
	Human Health	On site – developers, future main occupiers and	tenance workers, future pets.		
RECEPTOR		Off site – Lake Puketirini recrea	tional users and pets.		
Ecological		On site - none. Off site - aquatic organisms in lake.			
	Built	None.			
Human Health					
RISK	Ecological	LOW			
Built					

6.5.4 The CSM documents a **low** risk to human health and the environment as there are no identified potential contaminants.

## 6.6 Risk Assessment

6.6.1 A risk assessment is not required as the risk to human health and the environment is considered to be **LOW** as demonstrated by the conceptual site model.

## 7.0 CONCLUSION AND RECOMMENDATIONS

#### 7.1 Conclusion

- 7.1.1 The purpose of this investigation was to determine if the following HAIL has occurred or is occurring at 0 Weavers Crossing Road, Huntly as a submission is before WDC to rezone the land for residential purposes.
  - E7. Mining industries (excluding gravel extraction) including exposure of faces or release of groundwater containing hazardous contaminants, or the storage of hazardous wastes including waste dumps or dam tailings.
- 7.1.2 A desk top investigation by Guy Sowry of CSI comprising a review of: historical photos; consultation, literature review and a site walkover documents that HAIL E7 has occurred and HAIL associated with pastoral farming has not.
- 7.1.3 The Conceptual Site Model documents a **LOW** risk to human health and the environment as contaminant pathways are considered to be incomplete as there are no identified potential contaminants. It is considered that any concentrations associated with historical mining activities are more than likely below NES SCS and ECO values. It is also considered that they are likely to be within the WRC background range.
- 7.1.4 Therefore, it is highly unlikely that there will be a risk to human health or the environment if the site is developed into the more sensitive landuse of residential.

#### 7.2 **Recommendations**

- 7.2.1 No further contaminated land investigations are required for this site.
- 7.2.2 That the eastern site is separated from the Weavers Crossing WDC and WRC Selected Land Use Registers entry and be listed in a sperate entry as 'Investigated no risk to human health or the environment'.
- 7.2.3 That the western site listed on WDC and WRC Selected Land Use Registers entry as 'Entered in Error' to enable this report to be attached to the file for future record keeping.



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	FIGURE 1
Hamilton	SITE LOCATION



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	FIGURE 2
Hamilton	SITE PLAN

#### **APPENDIX A**

#### **REPORT CONDITIONS**

This report is prepared solely for the benefit of Terra Firma Resources and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, with the limitations stated, to the conditions of site at the time of the investigation. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on aerial photos, anecdotal information and a site walkover. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research.

Whilst the findings detailed in this report reflect our best assessment, we are unable to give categoric assurances that they will be accepted by regulatory authorities without questions as such authorities may have unpublished more stringent objectives. This report is prepared and written for the proposed uses stated in the report and should not be used in a different context without reference to CSI. In time approved practices or amended legislation may necessitate a re-assessment.

The report is limited to those aspects of land contamination specifically reported on and is necessarily restricted and no liability is accepted for any other aspects especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report. If migrating pollution or contaminants (past or present) exists further research will be required before the effects can be better determined.

## APPENDIX B

**AERIAL PHOTOS** 



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK01
Hamilton	1941



CSI		0 WEAVERS CROSSING ROAD, HUNTLY	
Contaminated Site Investigations	SK02		
Hamilton	Jueer	1963	



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK03
Hamilton	1966



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK04
Hamilton	1972



CSI	0 WEAVER
Contaminated Site Investigations	SK05
lamilton	1974

0 WEAVERS CROSSING ROAD, HUNTLY



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK06
Hamilton	1979



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK07
Hamilton	1982


CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK08
Hamilton	1986



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations	SK09
Hamilton	1991



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street Hamilton	SK10
	1995



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street Hamilton	SK11
	2008

#### APPENDIX C

#### **OBLIQUE AERIAL PHOTOS**



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street	SK12
Hamilton	SOURCE: WHITES AVIATION ALEX TURNBULL COLLECTION WA-49196
	1959



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street	SK13
Hamilton	SOURCE: WHITES AVIATION ALEX TURNBULL COLLECTION WA-66550-G
	1966



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street	SK14
Hamilton	SOURCE: WHITES AVIATION ALEX TURNBULL COLLECTION WA-68888-G
	1970



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street	SK15
Hamilton	SOURCE: WHITES AVIATION ALEX TURNBULL COLLECTION WA-74733-F
	1979



CSI	0 WEAVERS CROSSING ROAD, HUNTLY
Contaminated Site Investigations 34 Brookfield Street	SK16
Hamilton	SOURCE: WHITES AVIATION ALEX TURNBULL COLLECTION WA-80908-F
	1991

#### APPENDIX D

#### STATE COAL MINE MAPS



CSI	0 WEAVERS CROSSING ROAD, HUNTLY	
Contaminated Site Investigations 34 Brookfield Street Hamilton	SK17	
	1990	



CSI	0 WEAVERS CROSSING ROAD, HUNTLY	
Contaminated Site Investigations	SK19	
Hamilton	1991	

#### **APPENDIX E**

#### SITE WALKOVER PHOTOS





EASTERN SITE



EASTERN SITE



EASTERN SITE



WESTERN SITE



WESTERN SITE

Attachment 10

Kaitiaki Environmental Impact Assessment

by Norman Hill on behalf of Waahi Whaanui Trust

## TERRA FIRMA RESOURCES LTD KAITIAKI ENVIRONMENTAL IMPACT ASSESSMENT

Prepared by Norman Hill on behalf of Waahi Whaanui Trust



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## 1. Introduction

Terra Firma Resources Ltd (TFR) is a local, family-owned company that owns approximately 29 hectares near Lake Puketirini in Huntly. Most of the land is surrounded by the reserve, is currently zoned Recreation and is proposed to become Rural Zone.

#### 1.1 Purpose

This purpose of this Kaitiaki Environmental Impact Assessment (KEIA) is to ensure the principles, significant values and issues of Waahi Whaanui Trust are articulated, acknowledged and understood in response to the proposed TFR developments.

The report specifically deals with the site in relation to environmental values.

Furthermore, this KEIA aims to:

- Provide a description of the history cultural values, interests and associations of Waahi Whaanui Trust;
- Reaffirm statutory obligations.
- Ensure that aspirations, potential issues, and values are identified and documented.
- Identify issues and opportunities for the incorporation of iwi values through an analysis of objectives and policies outlined in the Waikato Tainui Environmental Management Plan.
- Understand the actual and potential adverse effects on the cultural and environmental values in relation to the current and proposal including any future resource consent applications:
- Identify how relationships between Waahi Whaanui Trust, their culture, ancestral land, water, sites, waahi tapu and other tāonga might be affected by the proposal.
- Outline recommendations to mitigate cultural and environmental concerns and
- To assess whether the principles of the Treaty of Waitangi and relevant settlement acts are affected by the proposal.

#### 1.2 Methods

This KEIA has been prepared in accordance with the information researched and the feedback received from these sources.

- 1. Meetings with Craig Smith from TFR Ltd.
- 2. Site visit of Lake Puketirini.
- 3. A review of sources of information regarding the Whanui history.
- 4. A review of the Waikato Tainui Iwi Environmental Management Plan.
- 5. Understanding issues and opportunities for the incorporation of iwi values through an analysis of objectives and policies outlined in the Waikato Tainui and environmental management plans and other relevant documents.

#### 1.3 Description of the Project

Lake Puketirini and the surrounding area were formed by rehabilitation of the former Solid Energy Weavers Opencast Mine. The site was mined until 1993, at which point Solid Energy began the rehabilitation process including contouring and soil placement on the overburden dumps, riparian planting and shaping of the final pit void to create the lake.

TFR submitted to the Waikato Proposed District Plan (PDP) to rezone all its land to allow residential development. Following the geotechnical assessment, TFR now proposes to retain approximately one third of the main block as Rural Zone. As a rough indication, approximately 180 to 200 lots can be accommodated in the downsized main block, and six to ten lots on the Weavers Crossing site.



Figure 1: Location of TFR land (red outline)

TFR's development vision is to protect the intrinsic value of Puketirini, and to generally maintain the rural experience of park users for example by architectural design, riparian planting, boundary setbacks and covenants.

TFR intends that the development builds on the uniqueness of the site and differentiates itself from other housing developments.

## 2. Waahi Whaanui Trust as Mana Whenua

Mana whenua refers to the mana or 'authority' held by an iwi, hapū or whanau over the land, territory and/or resources of a particular area. The Resource Management Act 1991 provides that 'mana whenua' means customary authority exercised by an iwi or hapu in an identified area. This authority is passed down through whakapapa (genealogy) and is based on the settlement and occupation of, and continued use and control of natural resources within, an area. Mana whenua is also used to describe the people who hold this authority, and who are also considered the kaitiaki (guardian/ caregiver, steward) of their area or takiwā.

In that regard, we are mindful of the importance of relevant settlement statutory plans and policy and the processing of resource consents. Iwi must have an integral and governance level role. We must see our values expressed in the Plan and we must have a seat at the decision-making table as the rightful Kaitiaki.

Waahi Whanui Trust (Whanui) is an umbrella organisation of six marae within the catchment area of Huntly. The six marae (Te Ohaaki, Kaitumutumu, Matuhuru, Te Kauri, Taupiri and Waahi Paa) affiliate to Ngaati Mahuta, Ngaati Whawhaakia and Ngaati Kuiarangi hapuu (subtribe) As an umbrella entity, the organisation aims to provide a robust support, protective and developmental system to the local whanau, marae and hapuu, inclusive of our natural environs.

Whanui have been designated the role of Kaitiaki guardian, custodian and protector of the environment and all its natural resources. This term is used in a holistic sense to ensure the well-being not only of the physical environment such as forests, water, air and soil, but also to maintain the spiritual balance of the environment by replacing what is taken. It is not simply the exercise of traditional property rights, but it is to practice an active exercise of power in a manner beneficial to the resource.

This ensures that the wounds that Papatuanuku suffers, are returned in a form that will restore or enhance the balance of the environment and to guarantee that the wairua of the environment circulates as a whole entity without "cuts and bruises".

Whanui values are outlined below and include:

- Manaakitanga Giving prestige to or elevating the prestige of individuals or organizations through the expression of affection, hospitality, generosity and mutual respect;
- Rangatiratanga Finding opportunities to develop Maori, Indigenous self-determination of taangata whenua through mana atua, mana tuupuna and mana Whenua;
- Whaanaungatanga Affirming the relationships that taangata whenua and other people have to each other individually or with whaanau, and iwi through a common whakapapa and reciprocal obligations inherent in that relationship;
- Kotahitanga Demonstrating commitment and unity of purpose in pursuit of a vision;
- Kaitiakitanga Exercising the responsibility that we have to our collectives of whānau, hapu and iwi to protect the environment for future generations;
- Mana Tupuna/Whakapapa connecting us to the past, present and future and ultimately to one another

## 3. Consent Authority Responsibilities

The Consent Authority, in this case the Waikato District Council and Waikato Regional Council both have responsibilities to Tangata Whenua under the Resource Management Act. Furthermore, WDC has responsibilities to take into account/have regard to Whanui when an activity being applied for.

Whanui is fully aware of the Consent Authority responsibilities and will be keen to ensure that the Consent Authority upholds those responsibilities.

#### 3.1. Te Mana o Te Wai

Te Mana o Te Wai is a matter of national significance within the National Policy Statement for Freshwater Management. Regional Council must consider Te Mana o Te Wai when preparing or changing regional policy statements and plans. The new policy requires councils to make or change plans to achieve the objective, noting the connection between fresh water and the broader environment; and the role of community values when setting freshwater objectives and limits.<sup>1</sup>

#### 3.2 Te Ture Whai Mana (Vision and Strategy for the Waikato River)

Te Ture Whai Mana is consistent with the overarching purpose of the settlement between Waikato-Tainui and the Crown to restore and protect the health and wellbeing of the Waikato River.

The Vision and Strategy responds to four fundamental issues as set out below:

1. The degradation of the Waikato River and its catchment has severely compromised Waikato River iwi in their ability to exercise Mana Whakahaere or conduct their tikanga and kawa;

2. Over time, human activities along the Waikato River and land uses through its catchments have degraded the Waikato River and reduced the relationships and aspirations of communities with the Waikato River;

3. The processes of the Waikato River have been altered over time by physical intervention, land use and subsurface hydrological changes. The cumulative effects of these uses have degraded the Waikato River; and

4. It will take time and commitment to restore and protect the health and wellbeing of the Waikato River.

The vision statement of the Vision and Strategy/Te Ture Whaimana Tooku awa koiora me oona pikonga he kura tangihia o te maataamuri - The river of life, each curve more beautiful than the last.

#### 3.3 Tai Tumu Tai Pari Tai Ao

This KEIA is assessed against Tai Tumu Tai Pari Tai Ao – Waikato-Tainui Environment Plan and concludes that the application aligns with, or gives effect to, Tai Tumu, Tai Pari, Tai Ao. It identifies the following key matters in regard to how the applicant has addressed the Plan:

- The applicant at the point of preparing their assessments of Tai Tumu Tai Pari Tai Ao has engaged with Waikato-Tainui.
- The applicant has engaged with Whanui, Taupiri Marae and Ngaati Tamainupo

<sup>&</sup>lt;sup>1</sup> MFE Changes to Freshwater NPS

- The proposal does take into account the kaitiaki responsibilities of Waikato-Tainui for the natural resources within the rohe of Waikato Tainui.
- The proposal has given thought to the enhancement approach advocated in the Waikato-Tainui Environmental Plan

### 4. Overview of Cultural and Environmental Issues

This section provides an overview of the cultural and environmental issues in relation to TFR proposal in its entirety. It is important to look at the environmental issues and concerns to interconnected wider rohe. While traditional and natural cultural has been modified by mining operations, this does not diminish the historical or cultural importance of the location.

#### 4.1 Kaitiakitanga

Whanui, have the right to determine what is significant in terms of respect of natural and physical resources and other taonga within its tribal boundaries. Of importance is to enhance, restore and protect the natural character of the landscape.

Whanui emphasises the importance of healthy uncontaminated water throughout the rohe. Waiora is the water of life, the purest form of freshwater that gives and sustains life and can rejuvenate damaged mauri. Mauri is the life force that regenerates and binds the physical and spiritual elements of resources together.

Kaitaikitanga interconnects with biodiversity and is integral to the principle of mauri for Whanui. Its value cannot be over-estimated, and it is interwoven with many of our traditional values and practices.

#### Recommendations and outcomes sought:

- TFR contributes to restore Lake Puketirini mauri, with a focus on water quality, wetland development and ecological enhancements;
- Consideration for the subdivision design to maximise on the natural characteristics of the area.

#### 4.2 Infrastructure

Whanui understand that inadequate and outdated infrastructure within the Raahui Pookeka surrounding rohe is not keeping up with growth and contributing to environmental degradation across the rohe. TFR development may create demand for infrastructure and services beyond that which is currently available.

Whanui is concerned about unsustainable stormwater and wastewater issues. A significant issue is the inability of infrastructure to service new growth cells and future structure plans and any other subdivision with the rohe. TFR proposes to manage stormwater run-off from the site by directing stormwater to wetlands that will be constructed on the site. These wetlands will be designed and constructed to ensure the water flowing from the wetlands is essentially free of pollutants and contaminants. Currently the existing wetlands within the reserve receive stormwater from the farming activities on the land which contains residual fertilizer and animal effluent. The health of the existing wetlands will be improved by the TFR proposal.

The accumulative negative issues with development cannot be sustained by the receiving and localised environments including Lake Puketirini and Waahi Lake. TFR is proposing to connect into the Huntly fresh water and wastewater infrastructure. The TFR proposal is to minimise earthworks and

retain the existing topography. Strict sediment control will be in place during the construction phase to minimise any environmental impact.

An increase in climate change and therefore extreme weather events and associated natural hazards is an issue for infrastructure and the natural environment.

#### Recommendations and outcomes sought

- Design, apply and execute best practise infrastructure systems throughout TFR development;
- Ensure all buildings are designed and constructed to achieve sustainable/best practice outcomes, particularly in relation to water use and treatment (stormwater) to protect iwi values.
- Ensure that any consented water structures are constructed and operated in a way to manage and adverse effects of climate change; and
- Water take and water allocation applications be reviewed by Whanui to ensure efficient use and management of the resource.

#### 4.3 Heritage

Whanui acknowledges the site is formed by rehabilitation of the former Solid Energy Opencast Mine. However, the TFR area, including Lake Waahi, has significant cultural heritage, values and importance.

#### Recommendations and outcomes sought

- That future development within the site includes design elements that reflect key cultural values and context and draw inspiration from Waikato iwi pūrakau, art forms, taonga as well as involving iwi endorsed artists;
- Encourage specific indigenous planting regimes/palettes for individual section/home landscaping through subdivision design guidelines.

#### 4.4 Biodiversity

Biodiversity continues to be under threat despite successive plans to restore and revive native habitats and species within subdivision developments in Raahui Pookeka. The natural environment is a taonga. The removal of native vegetation on the site removes local habitat and ecosystem.

#### Recommendations and outcomes sought

- Development of wetland strategy or management plans that allow a catchment approach to create and improving the current onsite wetlands.
- That a landscape plan is developed in conjunction with Whanui to include valued food gathering species or those that support habitat for mahinga kai species for both reserves and roads/streets; and
- Strengthen ecological corridors and native biodiversity through the use of a wide range of native species that support a variety of insects and birds and the use of larger-growing native trees within the development.

#### 4.5 Sustainable Development

Residential developments are not sustainable if infrastructure cannot be managed consistent with our cultural values.

#### Recommendations and outcomes sought

• Ensure that the future subdivision consent applications provide an appropriate summary of the engagement undertaken Whanui as well as the issues (and potential remedies) identified in this cultural values assessment.

#### 4.6 Whenua and Geotechnical

TFR commissioned a high-level assessment from Strata Control Technologies (SCT), Australasia's foremost geotechnical experts with extensive experience in New Zealand coal mines (including Huntly) and their rehabilitation. Due to Covid restrictions TFR was not able to continue to employ SCT to complete the assessment and TFR engaged Michael Carter, a civil engineer based in Raglan. Michael Carter is an expert in the Waikato environment and has carried out all the field work and provided advice about the suitability for the residential development.

#### Recommendations and outcomes sought

• Ensure that the future subdivision consent applications provide an appropriate summary of the engagement undertaken with Whanui.

#### 5. KEIA Position Statement

The Puketirini site and receiving environment of Lake Puketirini and Lake Waahi are now considered natural features, landscape of cultural significance, albeit being modified due to mining activities.

TFR has the potential to improve the local landscape and ecological value and respond to cultural values present in this location. Efforts for environmental and cultural net should be factored into the planning of this zone change and future subdivision applications.

The findings of this KEIA indicates that Whanui <u>does not oppose</u> the Terra Firma Resources Ltd proposal.

As a reflection of goodwill and trust, Whanui recognized that good faith consultation has taken place in this stage of the TFR development and look forward to progress and working with TFR in achieving key mitigation outcomes overtime.

> Mehemea kāre ano, he whakakitenga, ka mate te Iwi Where there is no vision the people will perish

Attachment 11

Consultation with Weavers Crossing Neighbours

- Meeting Notices and Attendance

# Terra Firma Resources Ltd

Phone: 0274 336 585 Email: rachel@terrafirma.kiwi.nz

18/01/2021

#### **RE: Weavers Crossing Community Consultation**

Dear Householder,

We are holding a meeting to discuss our application to the Waikato District Council to have the Puketirini land and the Weavers Crossing land that we own rezoned Residential.

At the meeting we will share with you our draft Concept Plan and the results of the work that our consultants have carried out to date. Please find the meeting details below.

Date: Thursday 28<sup>th</sup> January, 2021 Time: 6 – 7 pm Venue: Lake Puketirini (Weavers Crossing Entrance)

We hope you will be able to join us.

Kind regards,

Crag Lite.

**Craig Smith** 

# Terra Firma Resources Ltd

Phone: 0274 336 585 Email: rachel@terrafirma.kiwi.nz

#### 25/01/2021



#### **RE: Weavers Crossing Community Consultation**

Dear

Apologies for the late notice of the Weavers Crossing Community meeting that is being held this Thursday,  $28^{th}$  January, 6-7 pm, at Lake Puketirini (Weavers Crossing Entrance). We have only just been notified by Waikato District Council that you are non-resident owners.

We understand that you may not be able to attend the meeting due to this late notice. We are happy to forward the information presented and discussed.

If you have any questions or would like to receive further information, please do not hesitate to contact us.

Please email: rachel@terrafirma.kiwi.nz

Kind regards,

Grag Sette

Craig Smith

#### Weavers Crossing Community Consultation

## Terra Firma Resources Ltd

Date: Thursday 28<sup>th</sup> January, 2021 Time: 6 – 7 pm Venue: Lake Puketirini (Weavers Crossing Entrance)

Attendee Details:			
Name:	Address:	Phone:	Email:
Ressell & Gernis	970 Walerenge Rd. Tekaushata	078267619	raked segmall.com
YVONNE GILES 5	65 WEAVERS CROSSING	82 87192	
CAROLYNE CLARK	S6 FAIRFIELD AVE, HUNTLY	82 89782	
Shelley hund	76 WEavers Crossing	0273347352	•
Joyle Scott	82 Weavers crossing	02/0336323	joyla leury scotte quailion
DENS HICLMAN	91 11 11	0274927784	
AZAN RIX	73 11 11	8289224	
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Michelle Comins	1 0	~	
- Adam Comins	1 1 1	~	
Phoebe Comins		/	
Russell Kime Emma	93A WEAVEUS Crossing RDI Woods HUAHLY	07828700	woody spanel share ginail.com
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