BEFORE Independent Commissioner appointed by Tasman District Council

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an application by CJ Industries Ltd for land use consent RM200488 for gravel extraction and associated site rehabilitation and amenity planting and for land use consent RM200489 to establish and use vehicle access on an unformed legal road and erect associated signage

EVIDENCE OF RYAN CHARLES SMITH NICOL ON BEHALF OF CJ INDUSTRIES LIMITED (GROUNDWATER)

15 July 2022

1. INTRODUCTION

1.1 My full name is Ryan Charles Smith Nicol. I am a Hydrogeologist.

1.2 The applicant has applied for resource consents authorising the extraction of gravel, stockpiling of topsoil, and reinstatement of quarried land, with associated amenity planting, signage and access formation at 134 Peach Island Road, Motueka:

(a) RM200488 land use consent for gravel extraction and associated site rehabilitation and amenity planting and

(b) RM200489 land use consent to establish and use vehicle access on an unformed legal road and erect associated signage

1.3 My evidence addresses clean fill parameters and a groundwater assessment. The applicant has lodged an associated application for consent to discharge a contaminant to land in circumstances where it may enter water. My evidence is most relevant to the

discharge permit application, but is filed at this point because aspects of my evidence (in particular, cleanfill parameters) are also relevant to the land use activities, to other witnesses' assessments of those activities, and to the proposed consent conditions (e.g. conditions relating to clean fill parameters and backfilling requirements). I have indicated by the use of grey shading the aspects of my evidence that are principally relevant to the discharge permit rather than the land use activities.

Qualifications and Experience

1.4 I am a hydrogeologist with Pattle Delamore Partners Limited (PDP) and have been employed in that role since 2012. I hold the qualifications of Bachelor of Science (Geology) from the University of Canterbury and a Master of Science (Hydrogeology) from the University of Canterbury. I am a member of the New Zealand Hydrological Society. I have 10 years of experience as a hydrogeologist specialising in the assessment and management of groundwater resources.

1.5 My technical skills and experience directly relevant to my assessment include:

(a) Groundwater resource evaluation throughout New Zealand;

(b) Groundwater quality and quantity assessments;

(c) Assessments of groundwater and surface water interaction;

(d) Groundwater resource consent compliance assessments, specifically relating to landfill and clean fill quarry activities.

Purpose and Scope of Evidence

1.6 The purpose of my evidence is to assess the groundwater effects of the proposal, and to provide recommendations to avoid, remedy or mitigate adverse effects on groundwater resources at Peach Island.

Code of Conduct

1.7 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and I agree to comply with it. My evidence is within my area of expertise, however where I make statements on issues that are not in my area of expertise, I will state whose evidence I have relied upon. I have not omitted to consider

material facts known to me that might alter or detract from the opinions expressed in my evidence.

2. EXECUTIVE SUMMARY

2.1 CJ Industries Ltd are seeking resource consent to establish an aggregate quarry at Peach Island. This will involve the extraction of aggregate material from excavation pits at the site and backfilling of the pits with uncontaminated, clean fill material sourced from both on and off site.

2.2 A shallow, unconfined alluvial aquifer system, that is predominantly recharged by flow losses from the Motueka River, is the source of water abstracted from a number of privately owned and operated boreholes in the area to provide water for irrigation and domestic supply purposes to properties at Peach Island.

2.3 Groundwater levels in the aquifer at Peach Island have been measured by Envirolink Limited and PDP on behalf of the Applicant, fluctuating between 1.2 and 4.4 metres below ground level (m bgl).

2.4 The aquifer also underlies the location of the proposed quarry and therefore it is necessary to consider the potential for adverse effects on the quality of groundwater resources.

2.5 The quarry activities that have the potential to impact groundwater quality at Peach Island if not appropriately managed are:

(a) Exposure of groundwater within open pit excavations, increasing the susceptibility for contamination of the groundwater.

(b) Groundwater inundation of material used to backfill the quarry excavations, causing contaminants within the fill material to become mobilised within the aquifer and affect neighbouring wells.

2.6 An overarching groundwater and clean fill management plan provides details for implementing the controls to reduce the risk of adverse groundwater quality changes in the Peach Island aquifer. The management plan defines those control measures and a groundwater level and quality monitoring regime to continually assess effects of the quarry activities on downgradient groundwater quality. The plan also refers to mitigation

measures to respond to the results of the monitoring programme. This report is referred to in my evidence as "the Groundwater and Clean Fill Management Plan" or GMP.

3. EVIDENCE

3.1 A specific hydrogeology report has been prepared which details the existing environment and assessment of groundwater effects. This report is titled "Peach Island Proposed Quarry: Hydrogeology" (July 2022) and is referred to in my evidence as "the groundwater report". The figures I refer to in this evidence are contained in that report and are reproduced at the end of this evidence.

Geology and hydrogeology

3.2 The proposed quarry site is located near the western edge of Moutere Depression at the foot of the Arthur Range, in the lower Motueka River Valley. The elevation of the site ranges between 17 and 20 metres above sea level and is partly located on an active flood plain of the Motueka River. The Arthur Range to the west of the quarry site consist of steep hills which provides the catchment for "Shaggery Stream" which diverts surface flows from the Arthur Range around the western edge of Peach Island. Peach Island is located around 1 km upstream of the Motueka – Riwaka Plains.

3.3 I describe the regional geology of the wider area in Section 2.1 of the groundwater report. Available borelogs for bores located at Peach Island area indicate that the near surface strata generally consist of interbedded, grey to brown well sorted and poorly sorted sandy gravel with minor silt to depths of 9 m below ground level. This stratum was deposited via a combination of fluvial processes in the Motueka River transporting sediments eroded from the Southern Alps and colluvial processes eroding granitic material of the Separation Point Granite Suite from the steep catchments of the adjacent Arthur Range. The borelogs indicate granitic rocks of the Separation Point Granite Suite were encountered in two bores at depths of around 5.8 m bgl near the southern end of the Peach Island area, indicating that the gravel strata are likely to be relatively thin in this area of the Motueka River Valley.

3.4 The hydrogeology of the nearby Motueka – Riwaka aquifer which underlies the Motueka – Riwaka Plains is described in a report by Weir and Thomas (2018) and is described as an important water source in the area. The Motueka – Riwaka aquifer is reported to be 20 – 30 m thick and is divided into shallow and deep aquifers both around 10 m thick

and consisting of permeable sandy, gravel. Separating the two aquifers is an aquitard consisting of less permeable claybound gravel. The Motueka – Riwaka aquifer is underlain by the less permeable, claybound Moutere gravels and granite of the Separation Point Granite suite (Weir and Thomas, 2018). The Motueka – Riwaka aquifer is reported to receive significant groundwater recharge via flow losses from both the Motueka and Riwaka Rivers.

3.5 While Weir and Thomas (2018) do not define the wider Peach Island area as part of the Motueka – Riwaka aquifer, the similarity in geology and proximity suggest that the general hydrogeology of the shallow aquifer system beneath the Peach Island area is similar.

3.6 Groundwater levels have been measured in six bores at Peach Island by Envirolink Limited and PDP on behalf of the Applicant. The locations of these bores are shown in Figure 4 of the groundwater report and have intermittent groundwater level data from October 2019 onwards. The data show that groundwater levels have fluctuated beneath the proposed quarry site at Peach Island between 1.2 m bgl and 4.4 m bgl. The water level data also show a strong correlation with variations in flow within the Motueka River.

3.7 Groundwater levels measured on 7 July 2022 in six bores at Peach Island by PDP were used to generate groundwater elevation contours to interpolate groundwater flow directions. The locations of the bores and the resulting groundwater contours are shown in Figure 3 of the groundwater report.

3.8 The groundwater level contours indicate that groundwater has an overall, north north easterly flow direction that is generally subparallel to the Motueka River. The contours indicate that a major source of groundwater recharge at the southern extent of the proposed quarry is sourced from the Motueka River, which would be consistent with flow losses at a bend in the Motueka River in the vicinity of Hurley Road.

3.9 The contours indicate that toward the eastern extent of the proposed quarry site, groundwater flows back toward the Motueka River. Available geological information indicates that a paleo channel exists in the vicinity of Shaggery Stream locally known as the "Peach Island Channel" and is a topographical low (Martin and Hewitt, 2019). It is possible that the alluvial strata in the vicinity of this paleo channel is relatively more

permeable than surrounding strata and may cause some groundwater at the western side of the proposed quarry site to flow in this direction.

3.10 The available borelog information indicates that the shallow aquifer at Peach Island (referred to as the "Peach Island Aquifer") is a thin (around 10 m thick), relatively permeable unconfined aquifer that receives the majority of groundwater recharge from the flow losses from the Motueka River. Smaller contributions of recharge to the Peach Island Aquifer are likely to also occur from rainfall infiltration and flow losses from Shaggery Stream.

3.11 A limited suite of groundwater quality data is available from two bores (24544 and 24546) that were sampled by Envirolink Limited on behalf of the Applicant in September 2020 and October 2020 respectively. A summary of the water quality data is provided in Table 3 of the groundwater report and indicates that no parameters exceeded the relevant Drinking-Water Standards New Zealand (DWSNZ) 2005 (MOH, Revised 2018) maximum acceptable value (MAV) for the protection of human health or guideline value for aesthetic effects.

3.12 A much larger water quality record is available for the Motueka River at the Tasman District Council monitoring site Woodmans Bend and as the dominant source of groundwater recharge to the Peach Island Aquifer, provides an indication of the expected water quality. The water quality data for this site indicates relatively good quality water. A summary of the Motueka River water quality data at Woodman's Bend is shown in Appendix C of the groundwater report.

The proposal

3.1 The Applicant proposes to undertake gravel extraction at the proposed quarry at Peach Island in three stages, within an area of approximately 73,500m^2, and over a 15-year period.

3.2 Commencement of quarrying shall occur at locations at the greatest upgradient distance from any water supply bores, as far as can practicably be achieved. This will allow additional water quality data to be collected at downgradient locations that are less likely to show any changes associated with quarrying activities and assist with establishing groundwater quality conditions.

3.3 Excavations to extract aggregate will occur to a depth that will not result in exposure of groundwater at the surface, with shallower excavation occurring at times of high groundwater levels and deeper excavations occurring at times of low groundwater levels. As discussed below, a vertical separation will be maintained at all times between the base of the excavation and actual groundwater level. Excavations will be back filled using clean fill material before groundwater levels rise.

Potential effects on the environment and management controls

3.4 The potential receptors to any effects associated with the proposed quarry are:

(a) Downgradient groundwater users.

(b) Downgradient waterways (i.e. Motueka River, Shaggery Stream).

3.5 Groundwater level and groundwater contour data indicate a strong relationship between shallow groundwater and flow variations in the Motueka River with areas of the aquifer discharging back to the river. Therefore, the Motueka River is considered to be a receptor of any groundwater effects associated with the proposed quarry activity, mostly as a result of groundwater chemistry changes. However, any water quality effects associated with the proposed quarry on water quality in the Motueka River via groundwater are expected to be minimal due to significant dilution effects from much higher flows in the river compared to the shallow aquifer.

3.6 Shaggery Stream may also be a potential receptor to effects associated with the proposed quarry. LiDAR (LINZ, 2008 – 2015) data indicates that the reach of Shaggery Stream adjacent to the proposed quarry is elevated above shallow groundwater and therefore may lose flow to ground which generally appears to be supported by aerial imagery (Google Earth) showing the that stream channel is frequently dry. However, the groundwater contour information indicates that the bed of the reach of Shaggery Stream adjacent to the proposed quarry may have a lower permeability than the underlying strata and therefore any flow losses from the stream to shallow groundwater will be low. Under certain groundwater level conditions, it is possible that the lower reaches of Shaggery Stream may gain flow from groundwater discharges at the surface, although Shaggery Stream eventually discharges into the Motueka River and therefore any changes in water chemistry would be significantly diluted by the much larger flows in the Motueka River.

3.7 Information available from Tasman District Council indicates that there are 20 bores located in the Peach Island area. The locations of the bores are shown in Figure 7 of the groundwater report. The uses of the bores are documented as irrigation, monitoring/piezometer, domestic and unknown. Of the 20 bores, 16 are located downgradient of the proposed quarry with the closest bore used for water supply purposes located 86 m downgradient (21033, 4.8 m deep). This bore is owned by Mr Corrie-Johnston. The closest downgradient bores used for water supply purposes not owned by the Applicant are 21435 (located 88 m downgradient and screened between 3.0 – 6.8 m bgl) and 22116 (located around 250 m downgradient and screened between 7.5 and 9.0 m bgl) and are therefore potential receptors to any effects associated with the proposed quarry activities.

3.8 The proposed quarry involves backfilling excavations with clean fill material not originally sourced from the excavation. WasteMINZ (2018) is a document that provides guidance for defining different classes of solid waste deposition, which WasteMINZ (2018) refer to as "landfills", and it includes clean fills. It is important to note that clean fill areas (i.e. areas used exclusively for the disposal of clean fill material, as proposed for Peach Island) are excluded from the definition of landfill in the National Planning Standards (MfE 2019).) Whilst the WasteMINZ (2018) document has no official status, I have used it as a reference point to consider the groundwater-related effects of the proposed quarry. The key hydrogeological constraints outlined in that document for determining the type of solid waste that can be deposited is whether the aquifer system beneath the deposition area is used for drinking water purposes. WasteMINZ (2018) guidance states that only Class 5 landfills should be located over aquifers used for drinking-water supply purposes.

3.9 As the Peach Island aquifer is used for drinking-water supply purposes, I recommend that the backfill for the quarry meets the Class 5 landfill criteria, which means only clean fill material or "*Virgin excavated natural materials (VENM) such as clay, soil and rock…"* that is uncontaminated can be deposited as backfill.

3.10 The excavation of the natural strata and the backfilling with clean fill will alter the structure of the ground through which the subsurface water moves. The main potential effect on groundwater resources at Peach Island from the proposed quarry activities is on groundwater quality. The quarry activities that have the potential to impact groundwater quality at Peach Island if not appropriately managed are:

(a) Exposure of groundwater within aggregate excavation pits.

(b) Backfill of pits using material that may become inundated at times of high groundwater levels and cause contaminants to become mobilised.

3.11 A Groundwater and Clean Fill Management Plan (GMP) outlines the operational controls the Applicant will use to manage effects associated with the proposed quarry activities at Peach Island. This GMP should form part of any resource consent if granted. The potential effects described in the following sections of my evidence will be avoided or mitigated by the measures and operational controls outlined in the GMP.

3.12 Exposure of groundwater within an excavation increases the susceptibility for contamination from animals (e.g. faecal contamination from birds attracted to the ponded water) and spills from heavy machinery operating in the excavations. This will be avoided by the Applicant maintaining a working excavation pit:

(a) To no less than 0.3 m above groundwater level with a requirement that the area of the pit where the deeper extraction has occurred is backfilled with clean fill within the same day as extraction.

(b) Otherwise at least 1 m above groundwater at the time of the excavation, in which case the excavation can be backfilled when extraction in that area of the excavation has ceased.

(c) All excavations to depths between 1 m and 0.3 m above groundwater level will be undertaken during dry weather conditions.

3.13 Groundwater levels will be monitored in real-time via telemetry system in dedicated monitoring bores at the proposed quarry site. Prior to excavation works being undertaken each day, the telemetered groundwater level data will inform the excavation machinery operator(s) of the allowable elevation of the base of the excavation floor . This will ensure that the thickness of the material between the excavation and groundwater is not reduced to less than 0.3 m. These records will be provided to Council as part of the Applicant's reporting requirements.

3.14 In the event of significant weather events, groundwater levels may rise rapidly, increasing the risk of groundwater exposure in open excavations. To avoid this, the Applicant will maintain an onsite supply of clean fill material to rapidly backfill any excavations.

3.15 The existing strata at the site has been deposited via natural geological processes. Excavation of the existing strata and backfilling with clean fill material will change the physical structure of the strata that the groundwater occurs in. As some of the clean fill material used for backfilling will be sourced off-site, it will likely contain material with a different geology and chemistry compared to the existing strata. Therefore, the removal of the naturally occurring strata and backfilling with imported material could result in some level of change in groundwater chemistry, particularly when the fill material becomes inundated by groundwater. Provided that the requirements of the GMP are met, the level of change in the aquifer will not be expected to cause adverse effects on groundwater resources at Peach Island. Any change would most likely be subtle differences in the concentrations of common cations and anions that would not be noticeable to people who use the aquifer for drinking-water supply purposes.

3.16 As the proposed backfill activity is considered to be a Class 5 landfill, only uncontaminated natural clean fill materials can be used to backfill excavations. Strict fill material acceptance criteria will be used to determine if it is appropriate prior to placement within any excavations. Sections 3.0 and 4.0 of the GMP outline the acceptance criteria for clean fill material.

3.17 The fill material will only comprise natural material sourced from both on site and off site and includes uncontaminated soil, clay rock and gravel.

3.18 Fill material sourced off site must not be from a Hazardous Activities and Industries List (HAIL) site and will only be accepted if total soil contaminant concentrations in the imported fill are below soil background concentrations specific to the Tasman region as provided in the Landcare Research report "Background concentrations of trace elements and options for the managing of soil quality in the Tasman and Nelson Districts" (Cavanagh, 2015).

3.19 The fill material sourced both on site and off site may include some incidental biodegradable organic matter, but this will not exceed 2% by volume per load of fill and exclude soils with high organic content (i.e. peat, loam, topsoil etc.).

3.20 The use of heavy machinery operating in excavations pose a potential risk to groundwater quality from spillages of hydrocarbons such as diesel fuel, hydraulic oil etc. To reduce the potential risk of this happening, appropriate management practices such as

ensuring re-fuelling and maintenance of vehicles occurs outside of any excavations will be implemented.

3.21 Quarry staff will be trained in spill response measures and spill kits will be available in excavation pits. Spills will be immediately managed by Quarry staff and if a spill greater than 20 L occurs, the Applicant must notify Tasman District Council of the incident.

3.22 Excavations near streams can cause a change in groundwater flow towards the excavation as the open excavation can act as a flow preferential pathway if it intercepts a zone of stream seepage losses flow to ground.

3.23 A tributary of Shaggery Stream is located around 25 m from the boundary of the proposed quarry site (excavation area Stage 1 as shown in Figure 1 of the groundwater report) and the stream channel is around 0.25 m higher than the Stage 1 quarry area based on LiDAR (2008 - 2015). As such, it is possible that this reach of Shaggery Stream could lose flow to ground and therefore open excavations close to the stream could intercept seepage losses from the stream. However, groundwater contour data indicates that the stream bed has a lower permeability than the underlying strata and therefore any flow losses will have a small impact on shallow groundwater levels.

3.24 Regardless, the 25 m wide buffer distance should be sufficient to avoid any seepage effects, but if seepage inflows were observed to enter the excavation area, the quarry excavation along this boundary would need to be restricted during times of low, or no streamflow, and backfilled before streamflow recommenced. It is expected that the Shaggery Stream will likely be dry or have reduced flow at times of low groundwater level and therefore no inflows from Shaggery Stream into the excavation should occur at those times.

3.25 Inflows to excavations from the Motueka River are also not expected to occur as the buffer distance to that river is over 100 metres and no excavations will occur below shallow groundwater.

3.26 Provided that the proposed quarry is operated as outlined in the GMP, any effects of the quarrying activities on the groundwater resources at Peach Island will be less than minor. In my opinion, the GMP requirements are readily capable of being implemented in full by a quarry operator.

Monitoring for effects

3.27 As set out above, due to the nature of the activity, the excavation and backfilling of excavations at the proposed quarry with uncontaminated clean fill material will likely alter the physical structure of that part of the aquifer (i.e. a change in hydraulic conductivity of the aquifer material) and cause a localised change in the chemistry and biological condition of the Peach Island aquifer. However, I expect any change in the aquifer arising from the quarry activities to be at a level that will not adversely affect the downgradient environment or groundwater users, based on the operational provisions of the GMP.

3.28 For additional certainty, in addition to the management and operational controls (including groundwater level monitoring), groundwater quality monitoring will be used to assess any changes in groundwater quality as a result of the proposed quarry activities.

3.29 The proposed groundwater quality monitoring and response to complaints regarding groundwater quality from downgradient groundwater users is outlined in Section 6.0 of the GMP. Section 7.0 of the GMP provides actions the Applicant will take in response to any issues rising during groundwater quality monitoring. These involve working with Tasman District Council and bore owners to address the cause of any contamination related to quarry activities to ensure that a suitable water supply to neighbouring properties is not jeopardised by quarry activities.

3.30 Groundwater quality sampling will involve samples being collected from at least one dedicated upgradient monitoring bore at the southern extent of the quarry and at least two dedicated downgradient monitoring bores at the northern extent of the quarry. Samples will also be collected from up to three downgradient, water supply bores located within at least 500 m of the proposed quarry, subject to the approval of the bore owner and land owner.

3.31 Groundwater sampling shall occur at three monthly intervals. To establish groundwater chemistry prior to quarrying, groundwater samples shall be collected by the Applicant on at least two occasions prior to quarrying activities commencing and sampling will continue until two years after quarrying and backfilling activities cease.

3.32 The groundwater quality data collected as part of the quarry monitoring will be used to determine any effects on groundwater quality arising from quarrying activities. This

assessment process is provided in Sections 7.1 and 7.2 of the GMP and involves a comparison of upgradient and downgradient concentrations, comparison with trigger levels as provided in Table 2 of the GMP and a comparison against the relevant DWSNZ 2022 (Taumata Arowai, 2022) MAV and GV. Any issues arising from groundwater quality monitoring will be investigated and managed via the procedures provided in Section 7.1 of the GMP and includes notifying Tasman District Council of any issues, undertaking additional groundwater quality monitoring, undertaking investigations to establish the potential cause of any issues, cessation of any quarrying activities identified as causing the issue, removal of any backfill material and providing an alternative water supply to downgradient groundwater users if deemed necessary.

3.33 The Applicant will maintain a complaints register relating to groundwater quality issues and will investigate any complaints of bad taste, odour or illness reported in downgradient drinking-water supply bores.

3.34 An annual monitoring report will be prepared by the Applicant and provided to Tasman District Council which will include all groundwater and excavation elevation data, all groundwater quality data and any trends, exceedances of groundwater quality trigger levels, and mitigation actions in response to any groundwater quality issues as well as the effectiveness of those actions.

3.35 The measures in the GMP have been designed to avoid adverse groundwater quality effects on neighbouring bores. However, it must be recognised that contamination risks already exist for the shallow bores in the current rural environment and it is important that the GMP mitigation measures do not get used to address contamination incidents that are not related to quarry activities. This situation can be avoided by appropriate monitoring and hydrogeologic interpretation of the monitoring data as proposed in the GMP.

Consistency with policy direction

3.36 The provisions relevant to groundwater, are found in Chapters 5 ,8, 12, and 33 of the TRMP and in the National Policy Statement for Freshwater Management 2020 ("NPSFM"). I note that in the NPSFM, "freshwater" is expressly defined to include groundwater (Clause 1.5). These provisions are summarised in the AEE and in the planning evidence of Mr Hayden Taylor.

3.37 In my opinion, the key objectives and policy directions for the purposes of assessing the actual and potential effects of the proposal and groundwater and the proposal's consistency with these planning instruments are:

(a) When making decisions on resource use, the first priority is to ensure the health and well-being of water bodies and freshwater ecosystems.

(b) Freshwater is managed in an integrated way across a catchment and from the 'point of impact' down to receiving environments. This brings cumulative effects into consideration.

(c) Maintain and improve water quality, and protect existing groundwater quality.

(d) Avoid, remedy, or mitigate adverse effects of land disturbance and discharges on groundwater.

3.38 I consider that the proposed quarry, implemented in accordance with the GMP, can operate in a manner that is consistent with the provisions relevant to groundwater as found in the TRMP and NPSFM.

Matters raised in submissions

3.39 A summary of the submissions to the quarry consent applications, relating to groundwater are:

(a) Concerns regarding groundwater contamination from excavations below the groundwater table, backfilling excavations with contaminated material and contamination from machinery spills.

(b) Concerns about resource consent compliance issues with a similar quarry owned by the Applicant at 83 Douglas Road may occur at the proposed quarry, including contamination of bores.

3.40 While I understand that compliance is not a relevant consideration for an application for resource consent, I was asked to provide comment from a technical perspective on complaints relating to groundwater quality and bore contamination. The following information is by way of correction of the information that has been provided by

submitters. CJ Industries lodged a Local Government Official Information and Meetings Act (LGOIMA) request to TDC regarding complaints relating to the Applicant's quarry at 83 Douglas Road. The TDC response to that request indicated that there have been no recorded complaints of contaminated groundwater in nearby bores. The complaints register also documented concerns from neighbouring landowners that the Applicant had been excavating below the maximum excavation depth allowed for the 83 Douglas Road site. However, the complaints register indicated that the only non-compliance issue reported in the information provided by Tasman District Council was that fill materials that did not comply with the resource consent were observed near an open excavation (but were not observed in the pit). As there are no recorded complaints specific to groundwater bore contamination, there are no groundwater quality issues I can comment on.

3.41 The controls to avoid contamination of groundwater at the proposed quarry site are aimed at ensuring that any excavations do not expose groundwater, utilising strict fill acceptance criteria to ensure that only uncontaminated clean fill is used to back fill any excavations and undertaking appropriate measures to avoid spills in excavation pits, as addressed in Sections 3.1 through to 3.2 of my evidence. These controls are outlined in the GMP. Based on that implementation approach, any changes in groundwater quality from the proposed quarry activities should be at a level that does not cause an adverse effect on downgradient groundwater users and therefore will be a less than minor effect on groundwater quality.

Matters raised in s 42A report

3.42 In this section, I discuss the comments made in the s42A Officers report, specifically the items detailed in Section 12. The GMP addresses a number the issues raised in the s42A report and it is acknowledged that the GMP was not available to the s42A Officers at the time of the preparation of their report.

3.43 I am in general agreement with the Council Officers regarding the hydrogeological setting for the Peach Island area and the proposed quarry.

3.44 Paragraphs 12.6, 12.7, and 12.8 of the S42A report raises concerns about potential for loss of value to ecosystem health (including water quality) indigenous biodiversity and hydrogeological functioning as a result of the quarrying activities at Peach Island. The

proposed quarry activities will result in a change to the physical structure of the aquifer (i.e. changes in hydraulic conductivity) and there may be changes to the chemical and biological condition of the Peach Island aquifer at some level. However, no noteworthy change to the physical and chemical values of the wider aquifer are expected, in terms of ecosystem health (including water quality), indigenous biodiversity, hydrological functioning, based on the implementation of the measures in the GMP.

3.45 Paragraphs 12.3, 12.4, 12.5 and 12.30 query whether the proposed quarry activities give effect to Te Mana o Te Wai (prioritisation of water health). The focus of the GMP is to ensure that the excavations and their backfilling do not result in adverse effects on groundwater quality and this will be accomplished by implementing appropriate controls to keep any changes to the aquifer from the proposed quarry activities to a low level. Therefore, the proposed quarry activities are considered to give effect to the prioritisation of water health (Te Mana o Te Wai).

3.46 Paragraphs 12.18 and 12.20 raises concerns regarding resource consent compliance issues noted by submitters regarding the Applicant's quarry at 83 Douglas Road, specifically relating to "contaminated water supplies" and concerns that similar issues may arise at the proposed quarry at Peach Island. As noted in paragraph 3.40, the response to the LGOIMA request did indicate that some non-compliant fill material was observed by Council staff near an open excavation at the Applicant's 83 Douglas Road site. However, there are no documented groundwater supply contamination complaints as a result of quarrying activities at the Applicants site at 83 Douglas Road. I am not aware of the conditions and management plan requirements applicable at 83 Douglas Road. In my view, a clearly defined document such as the GMP is the best way to ensure that operators and all interested parties know how the excavations and backfill are to be managed.

3.47 Paragraphs 12.14, 12.15, 12.16, 12.17, 12.23 and 12.24 of the s42A report express concerns regarding potential effects on groundwater quality as a result of proposed quarrying activities, specifically relating to controls on the quality of the back fill material. All material used for clean fill at the proposed quarry will be sorted and graded by the Applicant prior to delivery to the proposed quarry. All fill material will be natural hardfill with no more than 2% incidental organic material and any fill sourced from outside of the proposed quarry site will only be accepted if it meets the acceptance criteria outlined in Section 2.0 of the GMP, which excludes any man-made materials (i.e. no concrete,

bricks, asphalt etc). If the fill material meets this acceptance criteria, no adverse leaching of contaminants will occur.

3.48 Paragraphs 12.25 and 12.26 raise the issue of excavations within groundwater. Exposure of groundwater within an excavation pit at the proposed quarry increases the susceptibility of groundwater to contamination. The measures requiring a separation distance from actual groundwater are described in paragraph 3.12 above. The Applicant will maintain a sufficient supply of clean fill material onsite to back fill any excavations in the event of a significant forecast rainfall/flood event to prevent exposure of groundwater in any excavations. Section 5.0 of the GMP details the groundwater level monitoring requirements to inform excavation depths at the proposed quarry.

3.49 Paragraphs 12.19 and 12.27 repeat the issue of groundwater quality and query the proposed monitoring to assess for any effects arising from quarry activities. I agree with the s42A report that groundwater quality monitoring should be undertaken in both upgradient and downgradient bores. The Applicant will collect at least two groundwater samples with three months between samples, in both downgradient and upgradient monitoring bores at the proposed quarry prior to commencement of any quarry activities. The proposed suite of water quality parameters that the Applicant will test groundwater samples for is provided Table 2 of the GMP, and includes the parameters recommended in the s42A report. This pre-quarry information, in combination with ongoing monitoring, will allow any trends in groundwater quality to be identified, as documented in Section 7.0 of the GMP.

3.50 Paragraphs 12.19 and 12.27 also query the frequency of monitoring once any quarrying activities at the site have commenced. In addition to the pre-quarry groundwater quality monitoring, monitoring bores shall be sampled at three monthly intervals after the commencement of quarrying and continue for two years after quarrying and backfilling has been completed. This is considered sufficient to recognise any trends. It is noted that the groundwater quality monitoring frequency proposed by the Applicant is consistent with the frequency proposed in the s42A report (every three months) and will continue for two years following completion of quarrying activities.

3.51 Paragraph 12.29 queries how changes in groundwater quality will be used to assess effects possibly arising from the quarrying activities and acknowledges that monitoring is considered to be a "backstop" to assess effects after they arise. I agree that the key to

avoiding adverse effects on groundwater quality will be through the proposed controls to manage the quality of the back fill material and avoiding exposure of groundwater as outlined in the GMP. I expect effects to be less than minor on that basis, however, the proposed water quality monitoring still serves a useful purpose to identify any trends in changing groundwater quality before unanticipated adverse effects arise and helps to guide any mitigation response if it is required. Section 7.0 of the GMP outlines the procedures and methodology to identify any effects associated with quarrying activities and the response to any issues.

3.52 Paragraph 12.28 advises that the quarrying activities should cease if there is a change in groundwater chemistry of >20% compared to pre-quarry groundwater quality. This approach is considered to be unrealistically restrictive as small changes in concentration may result in a greater than 20% change even though they do not indicate any adverse effect on groundwater quality. For example, dissolved iron has been measured at a concentration of 0.02g/m^3 in the on-site monitoring bore 24544 (Piezo 2). This concentration is 10 times less than the aesthetic guideline value of 0.2 g/m^3 currently listed in DWSNZ 2005 (Revised 2018) (and Taumata Arowai are proposing that the aesthetic guideline value should be raised to 0.3 g/m^3). A 20% threshold would be breached if the iron concentration increased above 0.024 g/m^3, which is a very small change that could occur due to natural variations and is still well below the guideline values for aesthetic determinands. Consequently, the proposed 20% change threshold could be breached due to insignificant natural variations in groundwater quality that represent no adverse effect. Therefore, it is proposed that an approach based on comparing the groundwater quality results between upgradient and downgradient monitoring bores as well as trigger levels (provided in Table 2 of the GMP) are used to identify trends in the water quality data that may be associated with quarrying activities. The results will also be compared against groundwater quality data collected prior to commencement of quarrying activities as well as the relevant Drinking-water Standards for New Zealand maximum acceptable values (MAV) and guideline values (GV). As noted in 3.34, all monitoring information (including groundwater level and quality data) will be provided to TDC in an annual monitoring report, which represents an independent check on the data that is collected.

4. CONCLUSION

4.1 The main potential impact of the proposed quarry on groundwater resources at Peach Island relates to groundwater quality.

4.2 The main quarrying activities that could affect groundwater quality are:

(a) Exposure of groundwater within open pit excavations increasing the susceptibility of the groundwater to contamination.

(b) Inundation of contaminated fill material in backfilled pits, causing contaminants within the fill material to become mobilised within the aquifer.

4.3 A GMP has been prepared outlining management, monitoring and mitigation measures. Operation of the quarry in accordance with the GMP will result in less than minor effects on groundwater quality.

Ryan Charles Smith Nicol

15 July 2022

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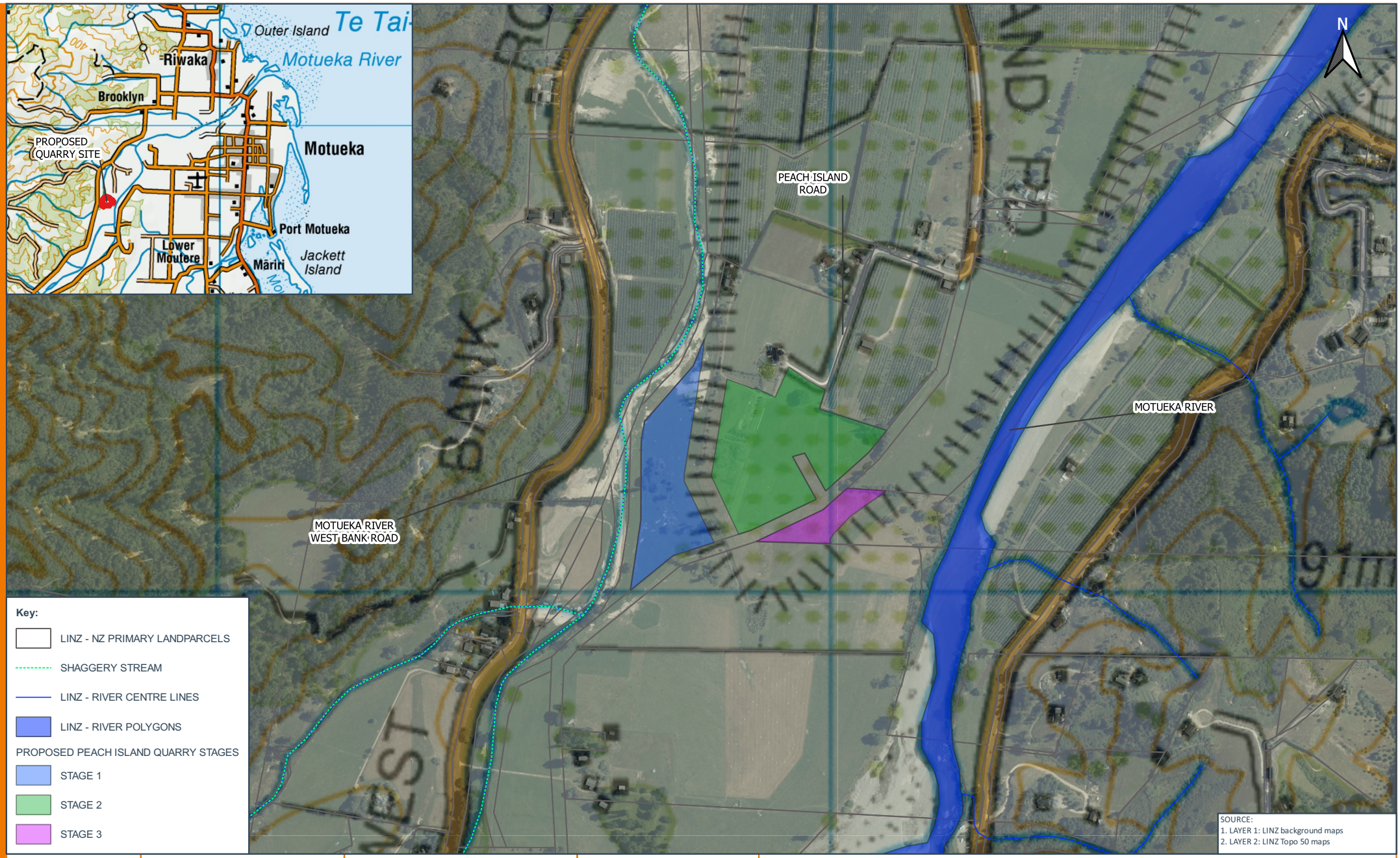

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FIGURE
FIGURE 1: LOCATION OF PROPOSED PEACH ISLAND QUARRY SITE

PROJECT
PEACH ISLAND PROPOSED QUARRY - HYDROGEOLOGY

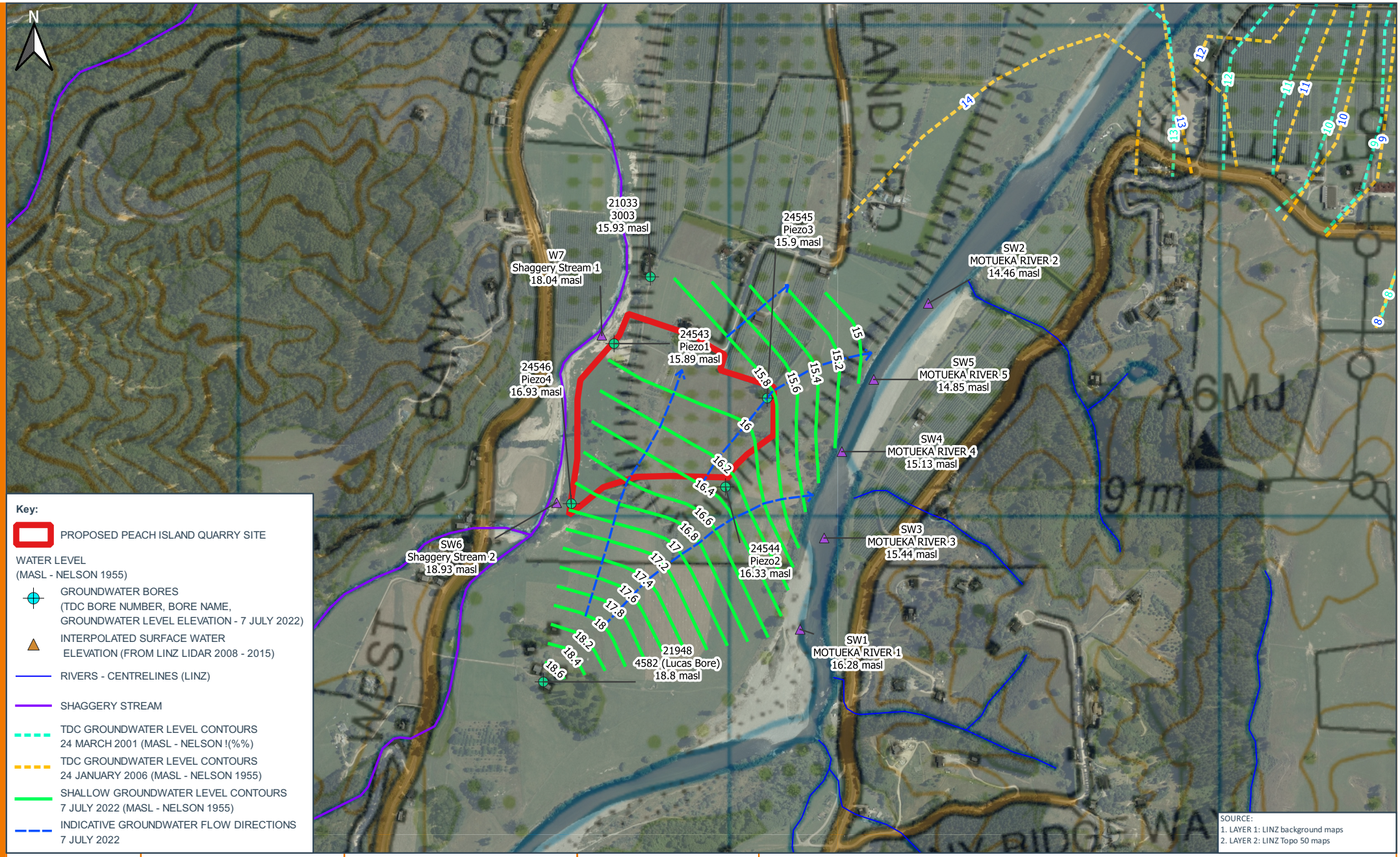

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FIGURE

FIGURE 3: GROUNDWATER LEVEL CONTOURS AND INDICATIVE SHALLOW GROUNDWATER FLOW DIRECTIONS

PROJECT

PEACH ISLAND PROPOSED QUARRY - HYDROGEOLOGY

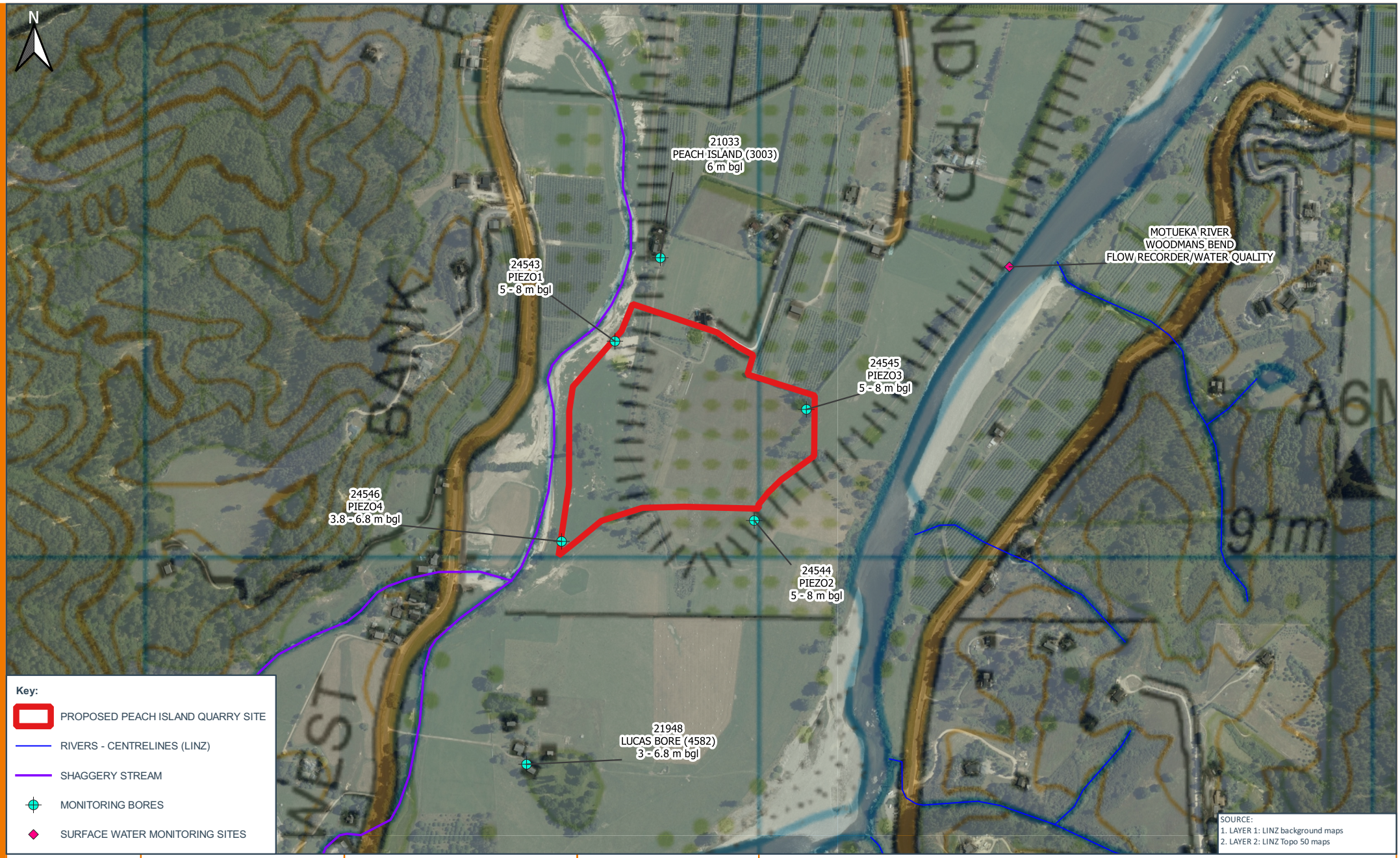

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FIGURE

FIGURE 4: BORES WITH AVAILABLE LONG-TERM GROUNDWATER LEVEL RECORDS AND SURFACE WATER MONITORING SITES AT PEACH ISLAND

PROJECT

PEACH ISLAND PROPOSED QUARRY - HYDROGEOLOGY

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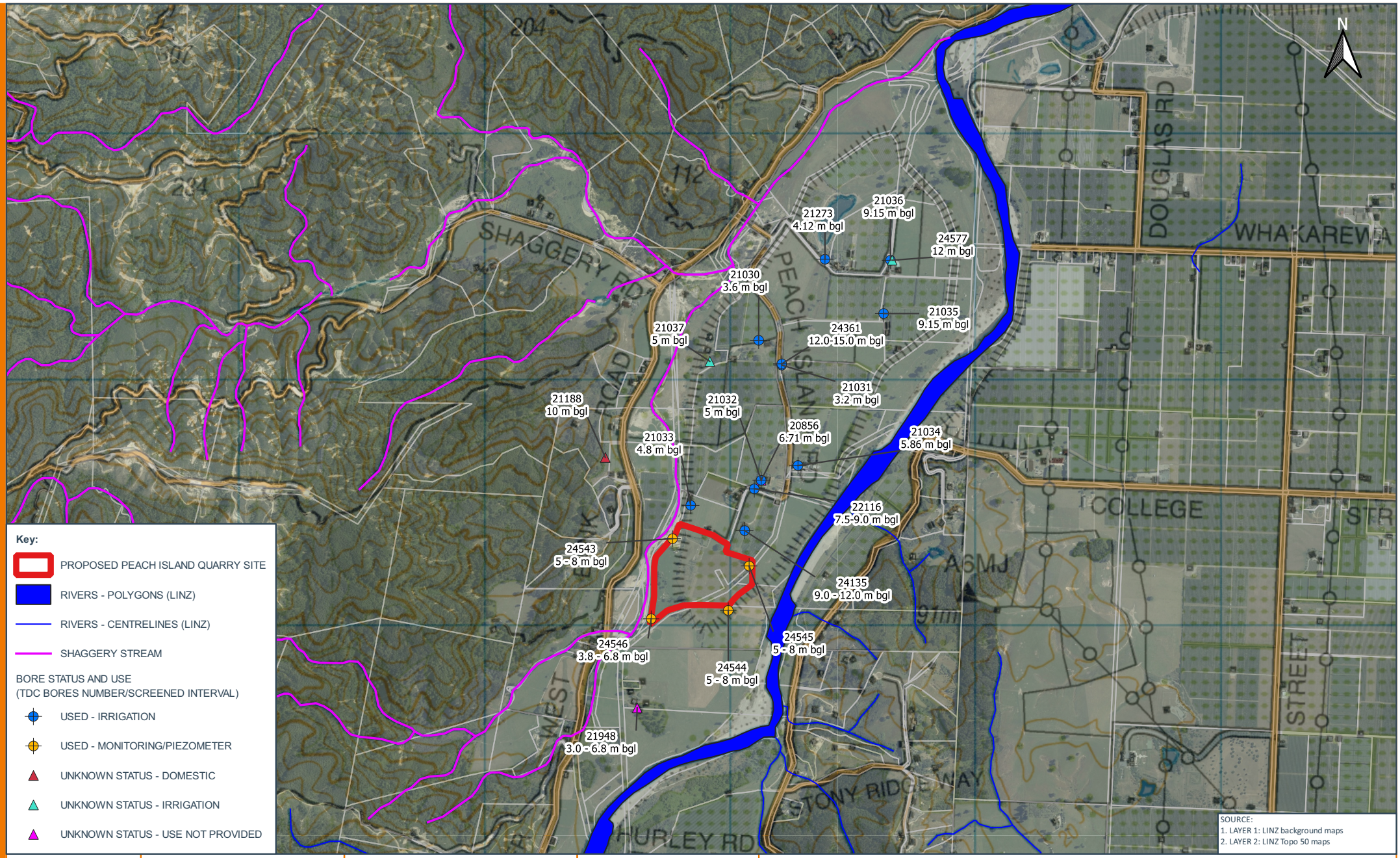

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FIGURE

FIGURE 7: STATUS AND USES OF BORES AT PEACH ISLAND BASED ON INFORMATION FROM TDC

PROJECT

PEACH ISLAND PROPOSED QUARRY - HYDROGEOLOGY