Assessment of effects

1. Overview

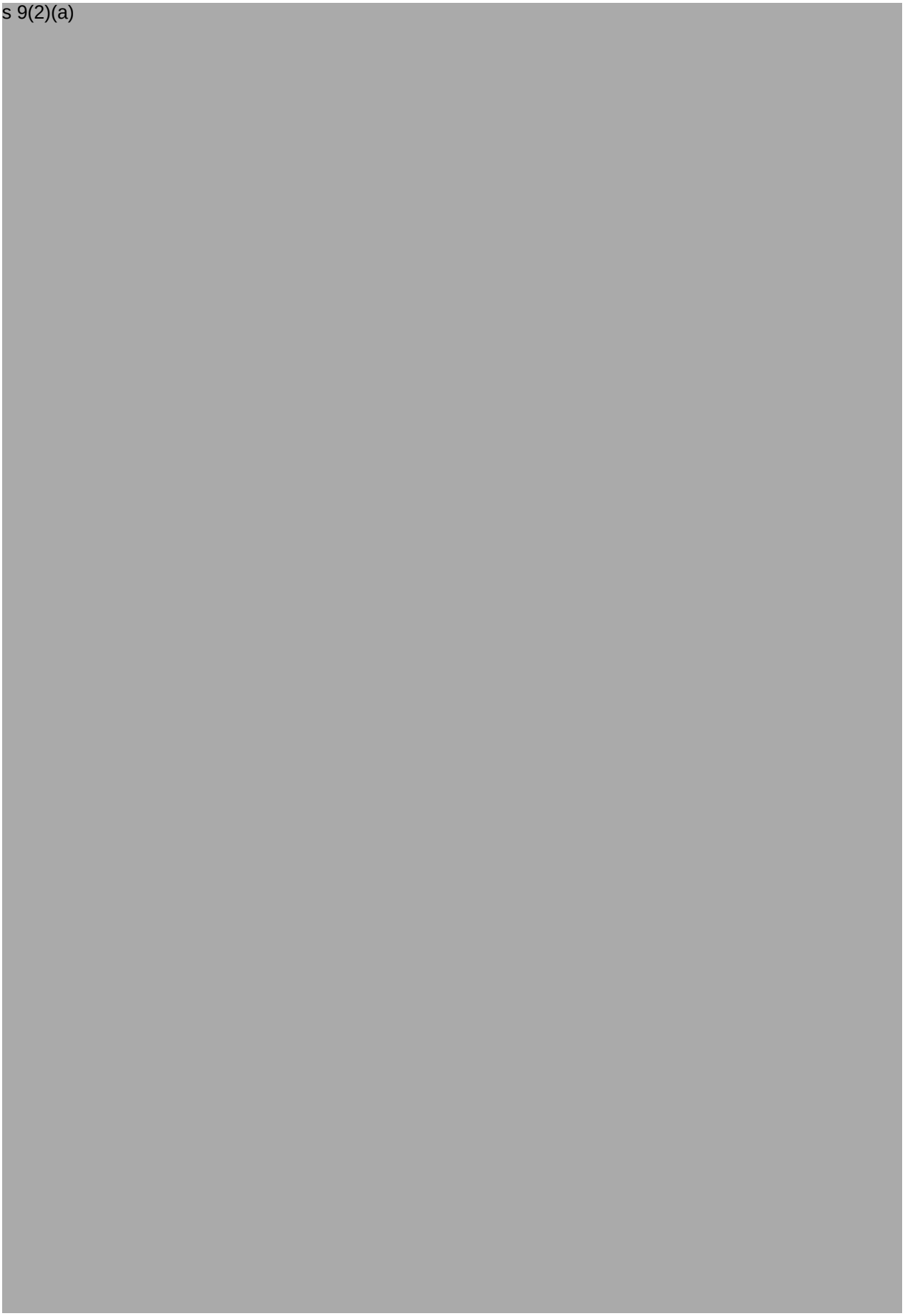
The below is an assessment of effects relative to the scale and significance of the proposed activity. This assessment is addressed under the following headings:

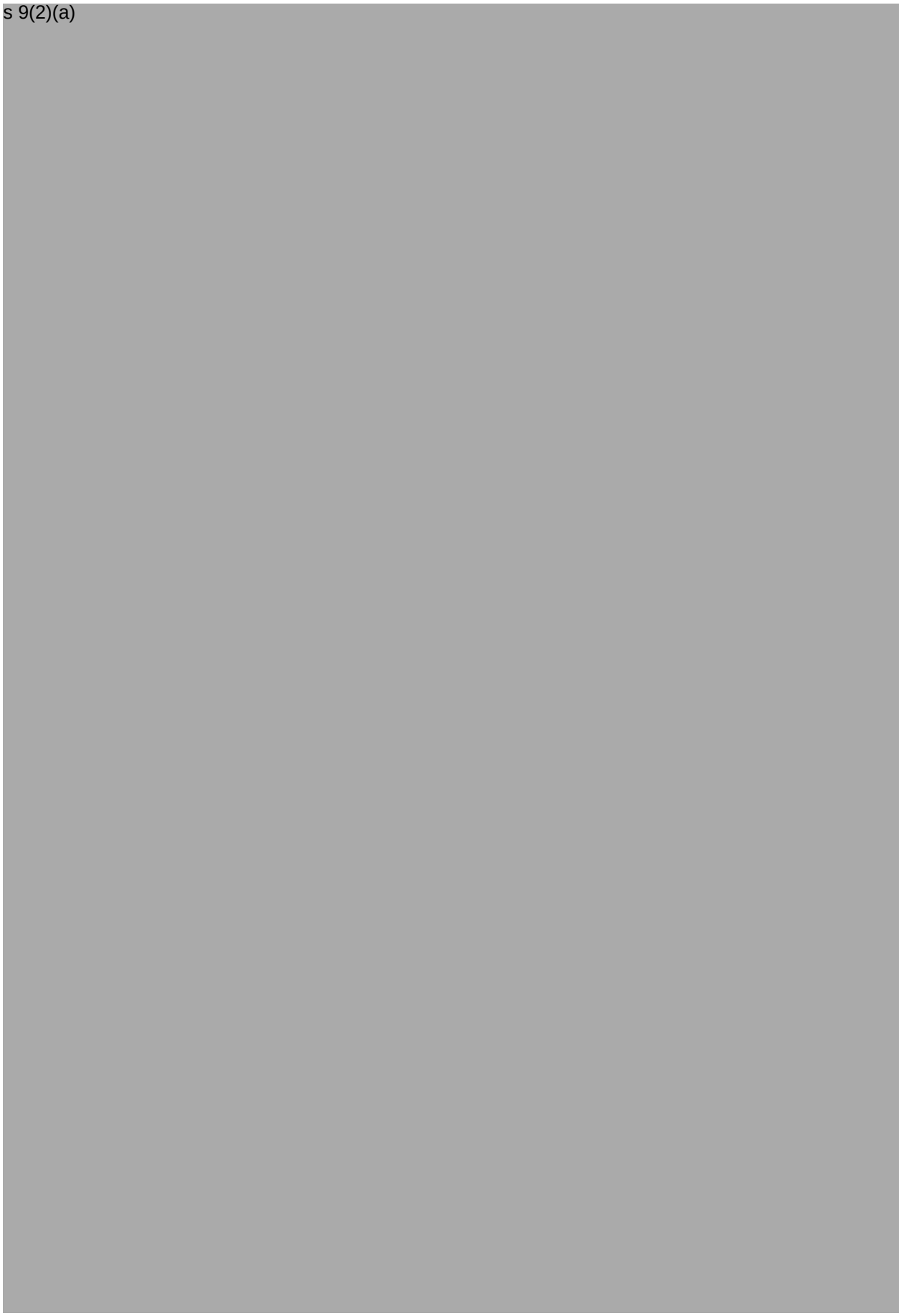
- Written Approvals
- Visual amenity and landscape character effects
- Dust effects
- Noise effects
- Vibration effects
- Effects on land stability
- Soil disturbance in a HAIL site
- Transport effects
- Effects of scale of activity on rural character
- Effects on archaeological values
- Effects on public access
- Flood hazard effects
- Effects of hazardous substance storage
- Aquifer allocation
- Surface water allocation
- Surface water quality
- Groundwater quality
- Other water users
- Freshwater ecology
- Effects on cultural values
- Positive effects

2. Written approvals

Written approvals from parties as shown graphically in **Figure 1** below and listed in **Table 1** below. In addition to those parties shown graphically, written approval has also been provided by the Clutha Gold Cycle Trust

Figure 1 Spatial representation of parties who have provided written approval to the application.


s 9(2)(a)


s 9(2)(a)

s 9(2)(a)

3. Visual amenity and landscape character effects

The Applicant has engaged Mike Moore Landscape Architect, to prepare a landscape effects assessment report. The site is within an 'other rural landscape', i.e., not within an outstanding or significant natural landscape. The District Plan Objective 4.3.3 seeks to: *maintain and where practicable enhance rural amenity values created by the open space, landscape, natural character and built environment values of the District's rural environment, and to maintain the open natural character of the hills and ranges.*

Mr Moore advises that the site is not in an area of significant landscape quality and sensitivity to mining is lowered considering the extent that is has already been subject to mining and quarrying. The site's position between the Clutha Gold cycle trail and Teviot Road increases its sensitivity to visual amenity impacts.

Mr Moore advises that the proposal does not affect the open natural character of the hills and ranges, and the effects of the proposal are on the already modified valley landscape, in particular characteristics of openness, naturalness and rural amenity. The mitigation measure recommended by Mr Moore minimise adverse effects to the extent practicable. The recommended mitigation measures are:

- Limit the consent duration to 10 years and require rehabilitation to be undertaken within that timeframe.
- Grassed earth bunds to 3m high, shall be established to assist with screening of the working area of the mining works from Teviot Road.
- Gravel stockpiles shall be no higher than 7m.
- Progressive rehabilitation of areas where mining is complete, with land contoured to blend with the surrounding land and established in pasture.
- Removal of all buildings, roadways, stockpiles, plant and bunds on completion of mining.
- 20m minimum setback from the Tima Burn and Clutha / Mata-au.
- Containers / buildings on the site to be finished in Resene Iron Sand (LRV 9%) and the container shelter fabric to be painted dark green.

Overall Mr Moore concludes that the effects on landscape amenity will fall within the following ranges:

- Teviot Road: Adverse / Low (minor) – Adverse / Moderate (more than minor).
- State Highway 8: Adverse / Low – Adverse / Low-moderate (minor).
- Oven Hill Road: Adverse / Low-moderate (minor) – Adverse / Moderate (more than minor).
- Clutha Gold Trail: Adverse / Low-moderate (minor) – Adverse / Moderate-high (more than minor).
- After rehabilitation, effects on visual amenity and landscape character range from very low to positive.

In regard to private property owners who have not provided written approval, Mr Moore concludes the magnitude of effects to be:

- On 1334 Teviot Road: low-moderate (minor) during stage 2 and 3A, and very low (less than minor) at other times.
- On 67 Clutha Road: low (minor) during stage 2, and very low (less than minor) at other times.

These conclusions are subject to the mitigation measures recommended by Mr Moore, which the Applicant proposes to adopt.

4. Temporary buildings

One temporary building will not comply with the District Plan Standard 4.7.6D due to the nature of the material forming the canopy. Other temporary buildings will comply with the District Plan requirements.

Mr Moore has provided advice that the container shelter canopy should be a dark green colour and considers that this will assist with the visual integration of this structure with the other temporary buildings on the site and minimise its prominence. The Applicant adopts this recommended mitigation.

Temporary buildings, including the workshop / container shelter, will be removed on completion of the mining project. Mr Moore concludes that following rehabilitation there will be no residual adverse landscape effects.

5. Dust effects

A Dust Management Plan (**DMP**) has been created for the operation. Dust will be controlled on site in accordance with good industry practise, including use of water carts as necessary, slow vehicle speeds on unsealed roads and establishing vegetation on the bunds. A moving mine cell method of operation will ensure progressive rehabilitation of the site and limit the active work area to approximately 12ha at a time.

Water for dust control will be sourced from dewatering of the mine pit. At least 30L/s (continuous) will be dewatered from the pit and discharged to a sediment treatment pond and then to an infiltration basin. Dust management will be undertaken with a 40,000L

water tanker which is sufficient to undertake a circuit of the maximum anticipated exposed area of the mine over approximately 40 minutes. The tanker can then refill and repeat as necessary.

The Applicant will have access to a weather monitoring station and dust monitors with telemetered data that can be monitored electronically. Real time wind and dust information will be telemetered, with notifications to the Site Manager or their delegate when wind speeds or dust deposition rates are above the trigger values specified in the DMP.

The processing of gold bearing wash through the gold plant will not generate dust because the process is wet. Gold bearing gravels are excavated from below the water level in the mine pond and then run through a screen with spray bars. Screened wet gravel is then returned to the pond while gold bearing fines are transported by water to gold separation devices.

6. Noise effects

Hegley acoustics have modelled the noise effects of the proposal at seven locations internal to the site, selected for proximity to surrounding residences. Noise is modelled with all machinery at the ground surface, and it is recognised that this is a noisiest scenario because, for most of the time, the machinery will below ground level which will further mitigate noise levels. All noise levels are no greater than 50dBA L10, noting the District Plan daytime noise limit is 55dBA L10. Noise levels at each receiver vary considerably, depending on the location of mining activity within the site, hence the modelled result is the highest noise level, the duration of which is estimated to be 2-3 months at most.

Special audible characteristics are managed by preventing the use of tonal reversing alarms and are accounted for in the noise assessment.

Dewatering pumps operating overnight have been assessed at 29dBA L_{10} during stage 1 and no greater than 21dBA L_{10} during all other stages. This is well below the District Plan nighttime noise limit of 40dBA L_{10}.

7. Vibration effects

A vibration assessment as requested has been undertaken by a suitably qualified and experienced consultant. The appropriate standard is DIN 4150-3 and the Applicant's proposal is well within the applicable limits.

8. Effects on land stability

The earthworks design will focus on avoiding steep slopes and areas of instability which will enable works to occur with minimal disruption at all times of year and little impact on slope stability. No earthworks will occur during high rainfall events and any areas that suffer damage from storm events will be restabilised so as to avoid further damage. Mine

pit detailed design will be undertaken informed by geotechnical expertise as necessary to maintain pit stability.

9. Soil disturbance in a HAIL site

The Applicant proposes to undertake earthworks within a 'piece of land', as defined in the NESCS. The area was used as a stockyard in the 1970s and a former landfill is immediately adjacent to the mine pit.

Advice from contaminated land specialist, EC Otago, has been sought. In relation to the site of the former stockyards, EC Otago conclude that the results of sampling and analysis indicate that contaminant concentrations at all sampling locations are consistent with the predicted background levels.

In relation to the site of the former landfill, a mining perimeter has been identified by EC Otago, outside which it is highly unlikely that the soils present a risk to human health or the environment in their current state or during the proposed mining works, based on the preliminary sampling undertaken.

10. Transport effects

The site has frontage to Teviot Road, two un-named public gravel access roads. Vehicle access to the site will be provided from Teviot Road only, via an existing formed gravel access road.

Teviot Road is a two-way, two-lane, sealed road with a north-westerly to south-easterly alignment and is classified as an Arterial Road under the District Plan. Teviot Road is signposted with a 100km per hour speed limit with no cyclist or pedestrian infrastructure, and no on-road parking.

Abley have provided a transport assessment report that addresses traffic safety effects of the proposal and use of the vehicle accesses. Abley have assessed the additional traffic generation in section 5.2 of their report and concluded that the additional vehicle movements generated by the proposal are well within the capacity of the adjacent road network and will not reduce road safety performance.

Abley recommend that the vehicle accesses are sealed for a distance of 5m from Teviot Road and adequately drained; the Applicant adopts this mitigation.

Abley conclude that the application is supportable from a traffic engineering perspective.

11. Effects of scale of activity on rural character

The mining activity will operate on Monday to Friday 7am – 7pm and Saturday 7am – 1pm with up to 20 staff. Machinery maintenance and dust control activities will occur outside of these core operating hours. The staff activities will be spread across the large site with a focus of activity around the site office, workshop and storage areas which will be largely screened by the bunds or undertaken underground.

Vehicle movements will be concentrated at the start and finish of the day as staff arrive and depart the site in cars. Staff will be based in the surrounding towns, and it is likely that a car-pooling arrangement will be made for travel to the site. Even in a conservative assessment scenario where all staff travel to site individually in a car, the number of vehicle movements is not considered to be disruptive to the character of the rural environment.

The Applicant estimates an average of two heavy vehicle movements per day once the mine is established. The number of heavy vehicle movements is not considered to be noticeably greater than that which could normally occur in the surrounding environment, given stock trucks, machinery and other heavy vehicles are a normal part of the rural environment.

Effects on the existing rural character of the locality will be mitigated by the activities undertaken on the site being largely screened or underground, bunding around the site perimeter providing mitigation of noise and visual effects, and appropriate hours of operation.

12. Effects on archaeological values

The Applicant has commissioned Heritage Properties Limited to undertake an archaeological assessment over the project area and apply for an archaeological authority (if necessary). The Applicant accepts an accidental discovery protocol condition on the District Council consent subject of this application. There are no notations in the District Plan identifying any archaeological values within the site area.

13. Effects on public access

The proposal will have the effect of restricting public access to paper roads within the site, one of which provides access to the Clutha River / Mata-au.

The Applicant has undertaken to operate the mine in a manner which will provide for a similar level of local public access, and this is reflected in the proposal design and mitigation.

The northern paper road provides access to private properties, and the owners of these properties are all party to an access agreement with the Applicant. The northern paper road does not provide through-access to any other public road, nor the Clutha / Mata-au.

The southern paper road provides access to private properties, and the Clutha River / Mata-Au. The owners of the properties accessed from this paper road have also provided written approval to the application.

The Applicant's will provide a separate temporary river access for the general public over a rehabilitated part of the work site to the north of the existing river access, or over unmined land to the south, when the mine reaches a stage of impacting on the southern paper road. The Applicant will erect signage to inform the public of the duration of the closure of the paper road, and the location of the alternative access.

14. Cycle Trail

The work will also impact the Clutha Gold cycle trail. The Applicant has discussed the proposal extensively with the Clutha Gold Charitable Trust, who are responsible for the operation of the Clutha Gold cycle trail and has committed by way of private agreement with the Trust to:

- Provide a diversion of the cycle trail across private land owned by the Applicant and public road.
- Ensure that there will always be a trail for use by the Trust.
- Reinstatement of the existing trail on completion of mining.

Public access to the cycle trail will be maintained.

15. Flood hazard effects

The site is located within an area noted for flood hazard within the District Plan maps. Geosolve have provided a Flood Hazard Assessment Report (**Attachment [P]**).

Geosolve conclude that flooding within the mine pit is unlikely and, if it did occur, there would likely be an extended warning period as the river rises, which would enable the evacuation and / or protection of staff and machinery. Flooding of the mine pit would have the overall effect of attenuating flood waters, thereby having a net positive effect on downstream flooding.

Geosolve further conclude that there is no reduction in floodplain capacity due to the setbacks proposed from the waterway, positioning of the bunds and reinstatement of the site following completion of mining.

Overall, the existing capacity of the floodplain is protected, and the proposal will not exacerbate any effects of flooding on private property or the wider environment. In the unlikely event that the mine pit is flooded, internal damage is able to be managed or remediated by the Applicant without effect on the wider environment.

16. Effects of hazardous substance storage

Up to 60,000 litres of diesel storage will occur on site to fuel the machinery, where the permitted quantity is 10,000 litres. Diesel will be stored on the site in a containment facility compliant with Health and Safety at Work (Hazardous Substances) Regulations 2017, including in a double skinned tank that has an appropriately sized secondary containment (bunded) area.

The diesel will be stored on flat land near the workshop. The storage location will be outside of the flood hazard areas identified in the district plan, and setback from the active mine pit.

17. Aquifer allocation

The take is predominantly non-consumptive with water taken during initial dewatering returned to land overlying the aquifer and soaking back into groundwater. Effects will be less than minor.

18. Surface water allocation

The hydraulic connection between the underlying aquifer and the Clutha River/Mata-Au means that groundwater extraction could impact the river's flow and ecological values. However, the predicted stream depletion from such an extraction is minimal, at just 0.03% of the Clutha River's mean annual low flow, and measures are in place to offset any potential depletion.

Additionally, the proposed non-consumptive use of water and mitigation strategies, including ongoing monitoring and flow augmentation for the Tima Burn, are expected to keep any adverse effects on the river and related ecosystems to a less than minor level.

19. Surface water quality

The discharge of sediment-laden water from mining activities into an infiltration pond, which is at least 50 meters away from the Clutha River/Mata-Au, is designed to prevent water quality impacts on the river.

The Applicant has calculated a conservative groundwater velocity of 10 meters per day, suggesting that the natural filtration through gravels will prevent any measurable turbidity impact on the river. Additionally, ongoing water quality monitoring will ensure that the Tima Burn receives only clean, oxygenated water, maintaining a safe distance from discharges.

Given the setbacks of discharges from surface water bodies and mitigation measures proposed, it is considered that adverse effects on the water quality of surface water bodies can be appropriately managed and mitigated, so to be less than minor.

20. Groundwater quality

The key issues in respect of groundwater quality are from sediment discharges from washing, the mobilisation of contaminants from the closed landfill, and the possible introduction of sediments during augmentation.

The groundwater extraction for mine dewatering would draw upon a moderately large areal extent of the aquifer, significant dilution of any naturally (currently) occurring landfill drainage will result, and that effects on the environment or any person with regard to potential contamination are not considered to be measurable.

Further the Applicant proposes to implement dedicated monitoring bores are installed on the site boundaries, with ongoing monitoring of turbidity, total suspended solids, and landfill contaminant indicators such as NH4-N, Cl, and metals. Monitoring conditions will

also ensure that provision can be made for alternate water supplies for groundwater users, should monitoring indicate they may be impacted.

Whilst there is a small area in the northern portion of the mine site may require augmentation to enable successful operation of the mine plant, there is a modest negative head or pond

outflow to the aquifer could result, which may introduce some sediment-laden water to the saturated gravels surrounding the mine pit pond. A small amount of sediment-laden water may progress into the aquifer, however, this can be offset by continued water abstraction to again establish a positive head toward the mine pit pond and remove the majority of any sediment-laden water.

Further the Applicant has proposed to undertake a technical assessment of all groundwater levels and quality data collected each year to determine if the assessment made continues to be accurate as the mining operation progresses, in addition to a groundwater quality baseline being established prior to commencement of operations. This information will be provided to both Otago District Council and the Millers Flat Water Company to ensure they have full transparency to ensure the water source remains safe and reliable for users.

Overall, considering the mitigation proposed above, potential adverse effects on groundwater quality are expected to be no more than minor.

21. Other water users

Abstraction of groundwater creates a cone of depression in groundwater levels (drawdown) that extends laterally from the pumping bore as water is abstracted. This may result in lowering groundwater levels in neighbouring bores. The lowering and/or consequent change in aquifer characteristics may prevent existing users from taking their authorised amount.

The Applicant has sought and received written approval from all potentially affected water users, with the exception of one. The Applicant proposes to provide for the continuity of water supply for the potentially affected well owner and therefore adverse effects will be mitigated to be less than minor.

22. Freshwater ecology

The Tima Burn has several Schedule 1A values, including the presence of indigenous fish species threatened with extinction, and a significant habitat for koaro. However, the lower Tima Burn is characterised by a depleted aquatic ecosystem, with low diversity and abundance, particularly in the stretch below Teviot Road, which dries up in summer. It is noted that the presence of two threatened fish (longfin eel and inanga) indicate that the stream values are high.

Should mine pit dewatering decrease the Tima Burn's flow, it's expected to impact this already vulnerable section. However, any reduction in flow outside of summer is less likely

to cause drying but may reduce riffle habitats, which are already compromised by willow root mats and lack sensitive species. However, if mining activities does affect water levels, the Tima Burn should regain its current ecological state within six to twelve months.

The Applicant has proposed that flows of the Tima Burn are augmented when dewatering causes a significant water table decline, groundwater taken and supplied to the Tima Burn will be metered, and dissolved oxygen is monitored downstream (after reasonable mixing) of the flow augmentation input on the Tima Burn to mitigate or avoid adverse effects.

As such, any adverse effects on freshwater ecology will be less than minor.

23. Effects on cultural values

Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga (Kā Rūnaka) have been consulted with. The relationship of Kā Rūnaka and Kāi Tahu with the Mata-au, and their cultural values and interests in the catchment are acknowledged. There is a Statutory Acknowledgement in respect of the Mata-au (Clutha River).

Kā Rūnaka identify that the Mata-au and Tima Burn are part of an integrated ancestral landscape (wāhi tūpuna), and there may be potential effects on the values of the ancestral landscape. Significant wāhi tūpuna areas and their associated cultural values have been identified in draft mapping by Kā Rūnaka, however, this information is not available to the general public.

The Applicant has sought to identify and mitigate effects on cultural values. Mitigation measures include:

- Setbacks of at least 20m from waterbodies (Tima Burn and Mata-au);
- Management of effects to ensure no discharge to waterbodies;
- No chemical contaminants used for on-site processing;
- Diesel appropriately stored and bunded;
- Archaeological investigation and monitoring;
- Provision of uninterrupted public access to the Clutha / Mata-au;
- Avoidance of disturbance to indigenous vegetation and habitats of indigenous fauna; and
- Consultation with regard to biodiversity enhancement options.

There are no sites of cultural significance recorded in the District Plan or NRMP within the project area. The Applicant accepts an Accidental Discovery Protocol forming a condition of consent to mitigate against any potential discovery. Mined land will be rehabilitated to the same or better standard.

The Applicant's consultation with Kā Rūnaka is ongoing.

24. Positive effects

The proposal will result in social and economic benefits by providing work and socio-economic activity in the local area.

The proposal provides opportunity for habitat and ecological value improvements to (location), by planting native riparian vegetation and removal of exotic weed species.

The proposal will result in some enhancement to visual amenity by rehabilitation of the Council green waste pit and tailing stockpile currently on the site.

25. Conclusion

In consideration of the abovementioned matters, it is considered that any potential for adverse effects can be appropriately avoided, remedied, or mitigated.