Section 5: Adverse effects

What are the anticipated and known adverse effects of the project on the environment?

The proposal will have more than minor effects on stream and wetland habitat within the SAL landholdings, and minor or less than minor effects on a range of other features of the environment including terrestrial flora and fauna, groundwater, surface water, air quality, traffic, noise, vibration, archaeology and landscape.

An Assessment of Environmental Effects has been undertaken for the Sutton Block project that sets out the proposed design features and operational measures for the Sutton Block pit and measures proposed to minimise potential adverse effects on the environment. These include a staged management approach to erosion and sediment control, detailed design and construction monitoring, including implementation of trial batters to inform the quarry slope design, controlled blasting, dust mitigation measures, surface water augmentation to offset loss of stream base flows, pest management, riparian planting, stream diversions and off-site stream and wetland offset works.

Potential key[1] environmental effects	Proposed effects management (in order of priority: avoid, remedy or mitigate)	Offset or Compensation
Terrestrial ecology		
Removal of 9.74 ha of indigenous vegetation to enable pit development. This includes 7.4 ha from within Significant Ecological Area overlay.	• Pest management across 40.48 ha (primarily Significant Ecological Area – terrestrial vegetation) on site. • Buffer infill planting to minimise effects on vegetation retained around the edge of the Sutton Block pit. • Utilisation of forest resources salvaged for restoration planting.	• 40.48 ha of revegetation planting on the application site to offset the lost vegetation. • 69.42 ha of enhancement of existing forest areas on the application site through restoration planting, increased flora species diversity, restoration of forest structure tiers and removal of pest plants that threaten forest ecological integrity. • Fencing around restoration planting areas. • Offset and compensation planting areas legally protected in perpetuity. Offset package will result in no net loss (likely net gain).
Loss of native habitat could result in adverse effects on native fauna. A wide range of common (not threatened) fauna has been identified as present or likely to be present across the Stevenson landholdings.	• Vegetation clearance to be undertaken outside peak bird breeding season. • Pre-clearance surveys and fauna relocation. • Habitat enhancement and enhancing connectivity to adjoining Significant Ecological Areas. • Suite of management plans outlining mitigation and management measures to minimise adverse effects to native fauna	• Enhancement of existing avifauna habitats by increasing food supply, recovery of fauna through improved breeding success, removal of pest predators and browsers on the application site.

[1] Note, this table summarises key potential adverse effects. It is not an exhaustive list of potential or actual predicted adverse effects. Further detail will be outlined in the Assessment of Environmental Effects.

Freshwater ecology		
Reclamation of approximately 2,643 m of permanent and intermittent stream to provide for the development of the Sutton Block pit classified as having low-moderate ecological value.	• Avoid as far as practicable stream reclamation. Redesign of the pit footprint resulted in a reduction of 610 m of stream loss. • Stream diversions prioritised through pit design, including creating an additional 556 m of stream within the Project site. • Riparian planting along degraded streams. • Native fish management before all stream works to capture and relocate native fish and measures to prevent fish re-entering impacted reaches. • Fish passage provided for in culvert design to maintain fish passage.	• 1,727m of existing stream will be enhanced with riparian planting, fencing and restoration of native fish passage at Tuakau offset site (located approximately 16 km southeast of Drury Quarry). Overall, residual effects are anticipated to be reduced to a demonstrable no-net loss (but likely net gain).
Reclamation of 1.9 ha of wetland to provide for the development of the Sutton Block pit classified as having low-moderate ecological value.	• Avoid as far as practicable wetland reclamation. Redesign of the pit footprint resulted in the retention of 5,241 m² of wetland extent. • Restoration and enhancement of onsite retained wetlands.	• Restoration and recreation of 4.04 ha of wetland habitat at the Tuakau offset site. Offset package will result in a positive aquatic ecological benefit.
Loss of freshwater volume - the reduction of the catchment size contributing to the remaining streams adjacent to the Sutton Block will result in a drawdown of freshwater volumes.	• Riparian planting with native vegetation along the remaining streams and wetlands. • Augmentation with groundwater is proposed to supplement the reduction in stream baseflows.	
Cultural		
Effects on known wāhi tapu sites within Stevenson's wider landholdings, particularly Ballard's Cone Pā, a wāhi tapu site located between the existing Drury Pit and Sutton Block pit.	• Minimum 13ha buffer from the edge of the pit from Ballard's Cone Pā (wāhi tapu site). • Avoidance of all scheduled wāhi tapu and taonga sites within the Project area. • Pit footprint has been redesigned to protect wāhi tapu, resulted in a reduction of 610 m of stream loss and 5,241 m² of wetland extent as a secondary beneficial outcome. • Further native planting, pest control and fencing of Ballard's Cone wider extent.	Not required.

	• A Cultural Management Plan will be prepared in collaboration with tangata whenua.	
Effects of development and operation on freshwater resources, including stream and wetland reclamation.	• Best practice approach to earthworks and sediment and erosion control, which is designed to minimise the generation of sediment and prevent the discharge of sediment-laden water, which will protect water quality. • Organic treatment options will also be considered and used where appropriate. • The proposed augmentation regime to supplement the loss in stream base flows will use groundwater that naturally feeds the stream (e.g. from the same catchment and puna). • Groundwater drawdowns will not affect groundwater or lava flows below Ballard's Cone.	Not required.
Removal of native vegetation (ngahere).	• Salvaging of native seeds, cuttings and seedlings to preserve the whakapapa of the mature forest species being lost. • Other native trees and plants will be sourced from the Hunua Ecological District, including from the Ngāti Tamaoho future nursery to ensure they are sourced from within the same rohe to further protect the whakapapa. • Potential for tangata whenua to utilise native logs for cultural use. • Tangata whenua to exercise their kaitiakitanga in assisting in the proposed ecological mitigation and compensation works. This will be a requirement in the Cultural Management Plan.	Not required.
Landscape and visual amenity		
Pit development will result in a change in natural character effects through the removal and diversion of several streams and wetlands.	• Native mitigation planting is proposed to the south of the proposed pit to enhance the connectivity of Ballard's Cone natural landscape feature and the surrounding landscape. • Riparian planting along retained streams. • Enhancement of retained wetland features. • Use of stream diversions to minimise loss of stream extent.	Not required.

Pit development will change the landscape characteristics from grazed pastoral farming landscape to quarry.	• Avoids Natural Heritage: Outstanding Natural Landscape Overlay. • Majority of the pit is within the Special Purpose Quarry Zone, with some located outside in the Mixed Rural Zone. • Creation of a bund directly to the north of the pit to minimise visual effects. • 13ha setback and mitigation planting along the southern extent of the pit to enhance the lower flanks of the Ballard's Cone landform and connectivity with adjoining Significant Ecological Areas and minimise landscape effects on Ballard's Cone.	Not required.
The pit will result in a change in landscape values from nearby viewing audiences, namely three (3) residential properties adjoining the Sutton Block project to the north and four (4) properties elevated to the east of the site. For these properties, the visual effects range from moderate to high.	• Creation of a northern bund and vegetation screening along the eastern portion of the bund to minimise visual effects. • Vegetation screening along the northern and north eastern portion of the quarry pit to screen views from the north and east. • Vegetation screening and enhancement planting along the western portion of the pit to screen the site from viewing audiences to the west. • Minimising lighting as far as practicable to comply with permitted activity standards of the zone and careful placement and direction of lights.	Not required.
Geology		
Slope stability modelling indicates there are some areas of instability within the Sutton Block footprint, primarily in the overburden material that overlays the rock.	• This will be managed during the detailed design of the quarry through batter design and blasting trials to optimise geotechnical design parameters to increase stability. • Ongoing monitoring during construction and operation from a geotechnical engineer, including the preparation of a Slope Stability Management Plan incorporating annual stability review of the batters (trial and operational).	Not required.
Air quality		
Dust (amenity) effects - Potential for unmitigated dust emissions off-site to the west.	• Through the implementation of dust mitigation measures (e.g., dust suppression via water tanks/sprinklers, reduction in vehicle	Not required.

	speed, stabilise areas etc) dust emissions will be internalised to within 50 – 100 m of the source through these measures. • A Dust Management Plan will be prepared setting out dust mitigation measures.	
Groundwater		
Groundwater take, diversion and drawdown of groundwater as a consequence of aggregate extraction. The proposed lowest dewatering level for the Sutton Block pit is -60 RL and a maximum groundwater diversion rate of 19,183 m^3/d. The predicted worst-case scenario zone of influence extends from 4.4 km (Stage 2) to 7.5 km (Stage 4).	• Further baseline monitoring and ongoing monitoring will be undertaken to refine worst-case scenario predictions as the quarry floor deepens. • Groundwater Monitoring and Contingency Plan will be prepared to monitor and manage effects including setting limits on quantities for dewatering and groundwater drawdown, trigger levels and monitoring parameters to inform mitigation measures such as deepening of bores or lowering pumps, construction of new monitoring bores and augmentation flow rates.	Not required.
Drawdown on neighbouring groundwater users, specifically neighbouring bores and a nearby quarry.	• Quarrying at Drury would stop at a higher RL if groundwater modelling showed a risk of drawing down adjoining quarry groundwater flows beyond consented limits. • Continuous monitoring and in the worst case scenario deepen neighbouring bores or lower bore pumps.	Not required.
Stream depletion effects – From Stage 2 onwards (approximately around 5-6 years) dewatering of the Sutton Block pit is predicted to result in a reduction in stream baseflows to four nearby streams ranging between 120 m^3/d to 1,383 m^3/d.	• Augmentation with groundwater is proposed to supplement the reduction in stream baseflows. The groundwater source for augmenting will be either taken from the Sutton Block pit sump or a proposed bore located within Stevenson's landholdings.	Not required.
Freshwater habitat effects - augmenting stream flows with groundwater has the potential to adversely effect freshwater habitats, hydrology and water quality.	• Stream baseflow monitoring data will be obtained prior to augmentation to inform the compensation flow regime. • Streams will be supplemented from groundwater that would otherwise supply the stream minimising risk of change in water quality. Baseline water quality data will be taken to ensure the supplemented flows do not result in an increase in water temperature or dissolved oxygen concentrations.	Not required. .

Erosion and sedimentation		
Sediment discharges to the downstream receiving environment during vegetation clearance and bulk earthworks.	• An iterative staged management approach to earthworks is proposed, alongside a staged, site-specific approach to erosion and sediment control. Mitigation measures include sediment retention ponds, decanting earth bunds, clear water diversion, ongoing monitoring etc. • An Erosion and Sediment Control Plan will be prepared for each stage of work.	Not required.
Ground contamination		
A discrete area of the Project site has localised soil contamination. Disturbance of this material could result in a risk to human health through inhalation, ingestion or skin absorption.	• Contaminated Soils Management Plan and Remedial Action Plan will be prepared setting out health and safety procedures for undertaking excavation works and soil disposal in the known contaminated area. Implementation of these measures will reduce risk to human health and the environment to very low.	Not required.
Noise		
Sutton Block pit is proposed to operate in some capacity 24 hours a day. Noise modelling predicts compliance with relevant noise standards (for all day and nighttime works) but an increase in ambient noise levels at some nearby receivers. The highest predicted noise increase is 7dB L_{Aeq} at a nearby property to the west, resulting in a noticeable change to the ambient noise levels.	• Night-time activities are scaled-down compared with daytime and will meet the 45 dB L_{Aeq} noise limit at the nearest dwelling. • Pit-edge screening will be maintained in the north-west corner to block line of sight from the nearest dwellings to the west. • Natural noise screening from pit edge. As the pit gradually deepens the better shield operational noise will be, reducing overall noise effects. • Iterative staged management approach, in conjunction with on-going noise monitoring, is proposed to manage both day and night-noise effects. • A Construction Noise and Vibration Management Plan and Communication Plan will be developed to ensure neighbours are informed of activities and timing.	Not required.

Vibration		
Operation of heavy vehicles, plant and blasting associated with expanding and deepening the pit will result in vibration effects. Blasting will be controlled to avoid cosmetic damage to structures and be within acceptable amenity standards. Predicted vibration levels range from 0.00mm/s to 3.5mm/s between 500m and 1000m distance.	• Use of electric conveyor belt as the primary infrastructure to transport rock from the Sutton Block pit to processing facilities (front of house area) will significantly reduce vibration. • Controlled blast techniques will be put in place to ensure blasts comply with both NZ (DIN4150) and Australian (AS2187.2-2006) Standards for maintaining human comfort and preventing cosmetic damage to structures.	Not required.