

Management and Mitigation Measures	
Bobs Farm Sand Quarry	
Category	Management and Mitigation Measure
Quarry operations	General - All excavation work to be completed with reference to the Code of Practice 'Excavation Work' dated March 2020 by Safe Work Australia - Where working platforms are required, particularly where adjacent to crest of excavations or natural batters, these will be designed by an engineer - Crushed concrete or aggregate should be placed along access and haul roads to facilitate site access by dump truck and utility vehicles. Further assessment of subgrade e.g. CBR conditions to be carried out for pavement thickness design of longer-term access roads Soils and Erosion Control - Barrier fencing to be installed to limit access to rehabilitated areas or stockpiles. Management practices (bunding and cover, e.g. geotextile or plastic sheeting) will be carried out to minimise areas being affected by wind and water erosion. - All erosion and sediment control will be designed in accordance with the Best Practice Erosion and Sediment Control (IECA 2025).
Biodiversity	Clearing of native vegetation - When clearing of native vegetation, areas are to be delineated to avoid unnecessary clearing with associated signage and inductions around 'no-go' areas - Clearing along boundaries of excavation areas is to have regard to Tree Protection measures - A suitably licensed and trained fauna handler is to be present during any clearing works where clearing is for vegetation greater than 3m in height Removal of hollow-bearing trees / habitat resulting in fauna injury and mortality - Pre-clearance surveys are to be undertaken to determine the presence of fauna habitat features (i.e. nests or hollows) as well as during any clearing - A suitable Hollows Offset Program to be included in the Biodiversity Management Plan which is to include provision for 793 replacement hollows of a suitable type (reclaimed hollows from site and / or nest boxes as well as ongoing maintenance; the erection of suitable posts within the rehabilitation area; and, Replacement Hollows Report to be prepared at year 10 of the quarry Impacts to surface and groundwater quality and quantity due to sediment and / or contaminant runoff - Erosion and sediment controls employed as needed - Excavation to 0.7m above the groundwater table with the exception of poles and piers required for construction - Appropriate contamination mitigation measures including all site-vehicles carrying spill kits, limiting the use of pesticides where possible, and employing appropriate hydrocarbon controls onsite for containment of spills Vehicle collision with fauna - Speed limits within the site to be limited to 40km/h with appropriate signage and site inductions Transfer of weeds and pathogens to and from the site - All vehicles working outside established hardstand areas must arrive to site clean - Ensure measures to limit soil and seed material transfer

	- Identify weed infestations and map these in the Biodiversity Management Plan. Noise, vibration, lighting, waste and air pollution impacts to adjacent sensitive habitat areas - Measures to mitigate impacts on flora and fauna from noise, vibration, waste, light and air pollution such as – - Enforce a carry-in carry-out policy for rubbish and waste generated onsite during operations to avoid waste materials entering adjacent vegetation - Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction - Fence sensitive areas to delineate ‘no go’ zones - Operations only within operating hours - Levels of lighting to be reduced to a minimal level and directed away from retained vegetation areas to reduce any adverse effects upon the essential behavioural patterns of light sensitive fauna. Lighting design and utilisation during construction and operational phases of the development to be based on principles detailed in Appendix A of the National Light Pollution Guidelines for Wildlife (DEE 2020). - Lighting to comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting. - Noise minimisation practices in accordance with a Noise Management Plan. - Implement dust control measures such as covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water tankers as required, to control dust; and rehabilitation of native vegetation - Induction of all personnel on measures to minimise noise, dust and vibration on the adjoining environment and community.
Rehabilitation	Rehabilitation Monitoring Program - Post-closure monitoring will include: - Annual inspections - Vegetation establishment surveys - Weed assessments - Groundwater level confirmation - Corrective measures such as infill planting or additional stabilisation will be implemented where required Rehabilitation Management - Rehabilitated land will be actively managed with measures such as – - Soil chemistry is to be investigated prior to revegetation to determine if ameliorants are required. - Weeds and feral animal control - Erosion and drainage control works - Environmental monitoring and management of surface water, groundwater, ecology and land capability in line with other approved environmental management plans required by the development - Re-seeding/planting of rehabilitation areas that may have failed (e.g. Lack of germination, high plant mortality rate, etc) or require the establishment of later phase successional species - Repair of fence lines, access tracks and other general related land management activities
Noise	Operational Hold Point - A hold point at the end of Stage 2 with the purpose of ensuring noise impacts on nearby sensitive receivers is suitable and adopting noise mitigations, as appropriate and if required, prior to commencing further stages by means of - - Validating model assumptions relating to equipment sound power levels and operational frequencies. - Quantifying actual noise emissions from the extraction, haulage and processing / sales are during normal operation - Measuring noise levels at key receptors, particularly those that are currently predicted to experience exceedances in later stages - Identifying any variance between predicted and measured noise levels and determine whether additional mitigation is required before advancing to Stage 3 and beyond. - Providing a valid evidence base for refining an Operational Noise and Vibration Management Plan (ONVMP) and updating stage-specific noise envelopes.

To achieve the above outcomes, the following actions will be implemented –

- On-site attended and unattended noise monitoring to be undertaken during representative daytime and nighttime operating conditions (relevant nighttime operating hours being between 6am to 7am), including periods of adverse meteorology if possible.
- Receptor-based monitoring should be conducted at a minimum of R10-R18 and at any other locations where community concern may be raised
- Operational activity logs (equipment usage, haulage frequency, extraction location, weather conditions) should be maintained to correlate measured noise levels with actual site conditions.
- Model recalibration should be undertaken using the measured data to refine predictions for Stages 3-15, with particular emphasis on stages where exceedances are forecast even with mitigation.
- Updated mitigation recommendations should be prepared where measured levels exceed predictions or where compliance margins are narrower than anticipated.

Progression to Stage 3 only to occur once the verification monitoring and modelling demonstrates that –

- Operational noise levels are consistent with, or lower than, modelled predictions.
- Recommended mitigation measures (if any) have been implemented
- Any additional controls required to ensure compliance in later stages have been identified and incorporated into the Operational Noise and Vibration Management Plan.

General Operational Management Measures

- The following measures will be incorporated into the operation of the quarry –
 - Excavation should progress with the focus of ensuring all equipment benefits from the maximum amount of shielding from the pit walls for each stage.
 - Restriction on excavation during adverse weather conditions. Onsite weather data should be monitored frequently to determine wind speed and direction. Where wind speeds are observed to be unfavourable for noise propagation to certain receptors, operation should be reconsidered to pause / provide respite, or relocate to another area of the stage / quarry during these conditions to avoid adverse impact.
 - Installation of broadband ‘quacker’ style reverse alarm systems on all mobile equipment
 - Optimisation of haul routes between excavation and processing plant to keep truck movements shielded by pit walls and bunds.
 - Installation of temporary mobile acoustic barriers where high noise activities are expected.

Construction and Operational Noise and Vibration Management Plan (CONVMP)

- Prepare and adopt a Construction and Operational Noise and Vibration Management Plan (CONVMP) to –
 - Minimise noise and vibration emissions to the maximum extent possible.
 - Provide a process for the investigation of complaints relating to noise and vibration in a timely manner and for derivation of measures that deal effectively with the causes of legitimate complaints.
 - Reduce the potential exceedances relation to noise and vibration emissions.
 - Document proactive mitigation measures for each noise and vibration sources.
 - Identify stage-specific trigger levels for construction and operational noise as necessary for key receptors.
 - Implementation of automated alerts when trigger levels are exceeded.
 - Document actions and responsibilities in the event of an exceedance of a noise and vibration trigger level or a legitimate complaint.

Stage Noise Forecasts

- For the benefit of the surrounding stakeholders, the following will be included in the Construction and Operational Noise and Vibration Management Plan –
 - Before each new extraction stage begins, the quarry should prepare Stage Noise Forecasts that include –
 - Updated 3D terrain and bund topography
 - Predicted noise levels for the upcoming stage

	- Identification of high-noise activities and periods - Proposed operational restrictions or controls if exceedances are predicted - Expected duration of stage extraction and any exceedances that are unable to be avoided The above information will be provided via a letterbox drop as part of a Stage Commencement Notification Package to all involved stakeholders.
Vibrations	General • Include Vibration Management as a component within the Construction and Operational Noise and Vibration Management Plan
Dust and air quality	General Dust Control Measures • Include air quality requirements in site inductions and regular toolbox meetings to ensure employee awareness of potential dust impacts • Review operations in adverse weather conditions (e.g. high wind speeds) where required • Review operations in adverse weather conditions (e.g. high wind speeds) where required • Review operations/mitigation measures when monitoring data exceed air quality criteria • Maintain processing plant operations to allow effective washing of materials reducing the risk of dust generation • Limit drop heights for material loading/unloading activities • Minimisation of spillage from loading/unloading and cleanup of any spillage as soon as practicable. • Use of water carts and/or sprays on all materials-handling and stockpile areas to minimise dust generations as necessary and practicable. Exposed and disturbed areas including material stockpiles • Use of water carts and/or sprays to maintain moisture in material to limit wind erosion. • Adoption of progressive rehabilitation of inactive areas to minimise exposed soils • Reshape topsoil and rehabilitate completed overburden dumps as soon as practicable as far as practicable • Active maintenance of vegetation Haul roads • Use of water carts as necessary and practicable on all trafficked areas to minimise excessive visible dust. • Enforcement of onsite vehicle speed limits < 40km/h. • Regular maintenance of haul roads to maintain a smooth surface and removal of excessively fine/silty material Dust Monitoring Procedure • Real-time continuous dust monitoring (e.g. using a light-scattering instrument or similar) is recommended to take place prior to commencement (i.e. as a baseline) and continue following commencement of operations at location(s) adjacent to the site throughout the year. • Monthly dust deposition samples are recommended to be collected at the same location(s). The installation of these instruments will allow proactive dust management techniques to be employed which may reduce the likelihood of complaints and exceedances.

Aboriginal Heritage	General • The persons responsible for the management of onsite works will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Regulation 2019, under the National Parks and Wildlife Act 1974; • Should any human remains be uncovered during works, all work will cease in that location immediately and the local police contacted; • RAPs to be involved in the ongoing management of the Aboriginal cultural materials within the project study and will be formalised in the Environmental Management Plan • A cultural awareness program should be included as part of the site induction program and developed with the RAPs and form part of the Environmental Management Plan and site inductions. Sites • A community collection of the surface sites will be undertaken prior to any works being undertaken at those locations. • An Aboriginal Site Impact Recording Form (ASIRF) will be completed following the community collection.																		
Hydrogeological	Groundwater level monitoring • Groundwater levels should be dipped six-weekly at all available monitoring wells. Continuous monitoring at 1-hour intervals should be undertaken at MW104, MW202 and MW203, with data downloaded at least quarterly and compiled for reporting along with manual dip measurements. Trigger Value Development • Trigger values to be reviewed and refined following a minimum of three to six months of additional pre-quarrying monitoring to confirm baseline conditions. Groundwater Quality Monitoring • Groundwater samples should be collected from all available monitoring wells after purging, using laboratory supplied bottles with appropriate preservatives and no headspace. Samples should be dispatched to a NATA accredited laboratory under COC documentation and within appropriate holding times. Water Quality Parameters • A minimum of three baseline sampling rounds should be taken prior to commencement of works to establish trigger values for the following analytes – <table><tr><th>Parameter Group</th><th>Analytes</th><th>Sampling Frequency</th></tr><tr><td>Physical parameters</td><td>pH, EC, temperature, dissolved oxygen</td><td>Quarterly</td></tr><tr><td>Major ions</td><td>Chloride, sulphate, carbonate / bicarbonate alkalinity, sodium, potassium, magnesium, calcium</td><td>Quarterly</td></tr><tr><td>Nutrients</td><td>Oxidised nitrogen, total Kjeldahl nitrogen, total nitrogen, total phosphorus, ammonia</td><td>Quarterly</td></tr><tr><td>Heavy metals (dissolved)</td><td>Al, As, Cd, Cr, Cu, Co, Fe, Mn, Ni, Zn</td><td>Quarterly</td></tr><tr><td>Hydrocarbons</td><td>TRH, BTEX</td><td>Quarterly</td></tr></table>	Parameter Group	Analytes	Sampling Frequency	Physical parameters	pH, EC, temperature, dissolved oxygen	Quarterly	Major ions	Chloride, sulphate, carbonate / bicarbonate alkalinity, sodium, potassium, magnesium, calcium	Quarterly	Nutrients	Oxidised nitrogen, total Kjeldahl nitrogen, total nitrogen, total phosphorus, ammonia	Quarterly	Heavy metals (dissolved)	Al, As, Cd, Cr, Cu, Co, Fe, Mn, Ni, Zn	Quarterly	Hydrocarbons	TRH, BTEX	Quarterly
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	Analysis and reporting • All groundwater level and quality data to be recorded and maintained by the hydrogeological consultant. • Data to be reviewed on a quarterly basis to assess trends and identify unexpected or unacceptable impacts. • In the event that trigger values are exceeded, additional monitoring to be undertaken to confirm the exceedance and assess potential causes. Where required, mitigation measures should be implemented following appropriate consultation. • Results should be summarised in annual reporting and provided to Council and DPHI. Reports should include comparison against trigger values, identification of any exceedances, documentation of any corrective actions taken.
Geotechnical	Slope batters in the vicinity of Nelson Bay Road • If excavation extends into the zone of influence, then these excavations should take into consideration requirements of the NSW Department of Planning and Environment (DoPE) and <i>RMS Development Near Rail Corridors and Busy Roads – Interim Guideline, 2008</i>). Alternatively, batter angles may need to be further reduced New Infrastructure • Foundation design for new infrastructure should consider conditions at actual locations. However, allowable end bearing pressures of 50 kPa may be adopted for preliminary design of high-level lightly loaded footings founding on loose and medium dense (or better) sand respectively, subject to a minimum cover of 1 m to the groundwater table; uniform foundation conditions to a depth of at least twice the least footing dimension below foundation level and a minimum embedment of 0.75 m. Preliminary retaining wall designs, should they be required, may be carried out using a triangular pressure distribution and adopting active and passive earth pressure coefficients of $K_a = 0.4$ and $K_p = 2.8$ respectively for aeolian sands and $K_a = 0.3$ and $K_p = 3.3$ respectively for marine sands.
Surface Water Management	Surface Water Management Plan • Preparation of a Surface Water Management Plan (SWMP) to describes the management of surface water on the site, including - ○ Limit rates of fertilisers to be applied to rehabilitation areas to a rate determined through analysis of growth medium material. ○ Vegetation and topsoil stockpiles to be suitably stabilised and not located in areas of concentrated flows. ○ If water quality samples are required, these will be collected and testing by a NATA accredited facilities in accordance with the Approved Methods for the sampling and analysis of water pollutants in NSW (EPA) ○ Water quality monitoring of process wastewater recycled through the plant is automatically monitored in realtime with additional monitoring parameters and frequency being determined by the plant operator based on operational requirements. ○ Visual checks of stability and operation of all drains, swales and level spreaders effecting any necessary repairs, and checking there is no discharge of surface water off-site. ○ Drains and culverts for both clean and dirty water to be examined for vegetation cover and blockages and maintenance performed to ensure effective working. ○ Diversion bund walls inspected regularly to assess integrity and effectiveness . ○ Removal of spilled materials from hazard areas including land closer than five (5) metres from areas of likely high velocity flows ○ Ensuring rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate, and ○ Constructing additional erosion and / or sediment control works as might become necessary.

	○ Monitoring of soil erosion, sediment and water is undertaken at least quarterly and recorded ○ Top soil stripping to be visually monitored to check moisture content of soil depth of stripping ○ Stockpiles to be visually assessed at time for forming to check they do not exceed two (2) metres high ○ Annual surface water management to be completed as part of the site's long-term management with reporting including: rainfall conditions; progress of quarry operations; any changes to the SWMP; any sediment and erosion 'events' experienced; records of water use and water quality monitoring ○ Comparison of water balance records with the previous year and any long-term observations / trends ○ Identification of events / issues experienced and management / remedial process ○ Audits of the stormwater management and monitoring system and any recommendations for continued operation ○ Surface drainage to be directed away from the crest of batters and batter slopes should be kept vegetated or covered to limit erosion ○ Erosion stockpiles should be limited by providing erosion control measures such as bunding and cover e.g. geotextile or plastic sheeting
Weed and pest control	General ● Prior to stripping, vegetation to be sprayed for weeds to assist in reducing the weed content in topsoil that may be transferred to new rehabilitation areas ● Weed and pest control will be undertaken by licensed contractors. Chemicals for weed and pest control not to be stored on site and only minor amounts are used
Hazardous goods	General ● Design of double skin diesel storage tank (110% capacity) to ensure ability to contain spills or leaks. Fuel stored on site to be in a covered and bunded fuel cell. Refuelling is to be conducted within the bunded hardstand area and contractors are to carry spill kits at all times. ● Designated refuelling and maintenance areas to include a concreted bunded area to contain spills or leaks ● Ensure separation of drainage lines and sensitive environmental features ● Only minimal volumes of oils / solvents or lubricants should be stored on site for the operation of the processing plant.
Contamination	Soil Management Plan ● Implement the Soil Management Plan (Appendix 11) during quarry operations Unexpected Finds Protocol ● Implement an Asbestos / Unexpected Finds Protocol (UFP) for all stripping and earthworks, with emphasis on bushland / track areas and any zones where placed / reworked material is encountered
Acid Sulphate Soils	Acid Sulphate Soils Management Plan ● Preparation of a targeted Acid Sulphate Soils Management Plan to address Potential Acid Sulfate Soils
Bushfire	Compliance with Planning for Bushfire Protection ● Maintain an Asset Protection Zone (Inner Protection Area) for a minimum of 100m from the processing and sales area or until the property boundary, whichever comes first

	• Construction of the new office structure to BAL-12.5 and upgrading of the existing dwelling to be used as a manager's residence to comply with BAL-12.5 • Maintenance of any landscaping in accordance with Table 7.4a of PBP • Preparation of a bushfire emergency management plan consistent with the NSW RFS Guidelines for the Preparation of Emergency / Evacuation Plans. • Installation of a 20,000 litre static water supply water tank with construction / installation compliant with PBP • Any new access roads comply with the following requirements for Property Access as detailed in section 7.4 of Planning for Bush Fire Protection 2019
Historic heritage	General • Incorporate an Unexpected Finds Procedure into the Construction Environmental Management Plan • Implement the Unexpected Finds Procedure during works.
Visual impacts	General • Retention of vegetation buffers at a minimum of 15m along the site boundary. • Installation of a solid gate or fencing at the site access to restrict views from Nelson Bay Road • Maintenance of vegetated screening along Nelson Bay Road Visual impacts to landowners who benefit from existing right-of-carriageway • Construction of vegetated visual bund adjacent right of carriageway as shown at Figure 1.
Social Impacts	Social Impact Monitoring Plan • Develop a Social Impact Monitoring Plan to formalise positive social impacts from the development such as – ○ Use of local contractors as far as possible ○ Documenting local spend and supply chains ○ Adopt a “locals first” employment and procurement policy • Establish a way for contact with the Proponent to be made and concerns to be recorded • Include school bus times in Driver Inductions to improve safety awareness • Create and implement a Local Sponsorship Policy • Include monitoring reports in newsletters and on the Proponent's website
Waste Management	General • Waste to be managed through established waste handling procedures and removed from the site by licensed contractors where required • Reuse of suitable materials onsite, including vegetation and sediment fines • Waste management practices would be consistent with the waste hierarchy and relevant NSW regulatory requirements Effluent Disposal • Onsite facilities to be serviced by licensed contractor

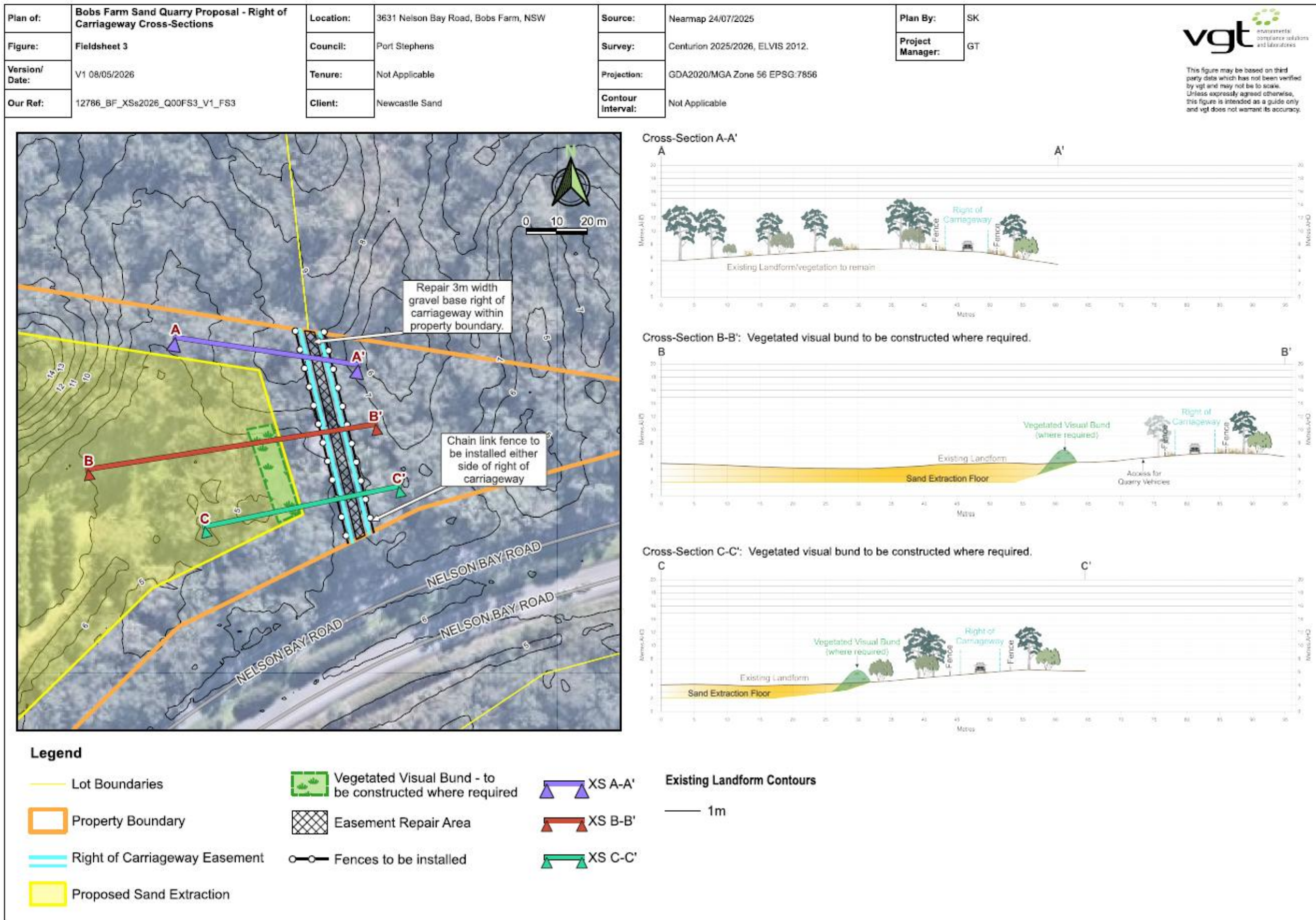


Figure 1: Mitigation measure for right-of-carriageway and adjacent land