25. Temporary infrastructure

Temporary infrastructure includes that infrastructure required for transitory access to land to accommodate a range of construction related facilities, logistics and activities. It is expected that requirements will be refined by the constructor in accordance with the detailed design, construction methodology and staging.

The purpose of this report is to present the findings of an investigation into temporary access onto land to accommodate a range of construction related facilities and activities for the utilisation of the contractor during the construction of the Pacific Highway upgrade. The investigation also considered the impact of ancillary construction facilities and activities upon local natural resources, infrastructure and property.

With the development of the concept design of the preferred route underway, preliminary quantity estimates of raw materials required for construction of the upgrade have been calculated. These estimates, along with geotechnical site investigations, and previous research ensure a comprehensive appreciation of the overall requirements for temporary construction facilities and activities. Where possible, a strategic assessment of the study area was undertaken so as to identify suitable areas for temporary infrastructure.

The investigation also outlined likely physical infrastructure requirements for the project (ie materials etc) as well as their specific supporting requirements. For each type of temporary activity the potential environmental impacts and related mitigation measures have been identified.

While the project is under construction, the construction contractor would require temporary areas for construction compounds, batch plant sites, storage facilities for material and equipment for a range of construction related activities. The equipment used would depend on the contractor's requirements, final design elements and work method chosen. The approach taken has been to identify potential sites that could be utilised by the construction, to assess likely impacts and to describe mitigation measures.

Identification of suitable areas has been based on typical requirements for similar projects in NSW, combined with the environmental constraints identified. While a number of potential sites have been nominated, the construction contractor would be responsible for selecting suitable sites for each type of activity according to the methods employed and final design. All work undertaken on temporary sites would be subject to satisfying site-specific environmental criteria, mitigation measures and local and state authority requirements. It would be the contractor's responsibility to apply and have approved temporary facilities in accordance with all requirements of noise, dust, storage, environment and waste management.

The ancillary facilities would be temporary and would be removed on completion of the project. They would be for the exclusive use of the project. Once the facilities are no longer required, they would be removed and areas restored to acceptable conditions.

25.1 Temporary infrastructure requirements

Current identified temporary infrastructure requirements include, but are not limited to, the following:

- Site compounds including site offices, sheds and storage compounds.
- Batch plants including asphalt batching plants and concrete batching plants.
- Earthworks including:
  - Crushing plants.
  - Stockpile areas.
  - Spoil disposal areas.

Possible locations for temporary infrastructure have been identified based on criteria from previous project requirements for facilities, logistics and activities. Preliminary investigations have been undertaken for the possible locations to identify any impacts.

25.1.1 Site compounds

Potential site compounds required include:

- Offices.
- Car parking facilities.
- Workforce facilities including toilets and lunchrooms.
- Storage areas for plant and construction materials.

Temporary site compounds will be generally located close to intersection and overpass sites. To minimise traffic movements, it is expected that the contractor will utilise multiple site compounds along the route in line with construction staging. More than one compound may also be required for each construction phase. The location of these compounds will depend upon the project delivery method, detailed design, and staging of the project. Some possible locations are on existing easements, cleared land or by arrangement with local landholders. General site compounds should:

- Allow safe and easy access to the work site.
- Be located on relatively flat ground with good drainage but allowing for containment and treatment of run-off.
- Allow for water, electricity and phone services to be available or able to be provided without additional environmental impact.

25.1.2 Batch plants

The supply of concrete and asphalt forms an essential ancillary works for the construction phase. On-site concrete and asphalt batching plants are a cost effective and more environmentally sustainable approach to supplying both concrete and asphalt to the project.

Concrete batching plants

It has been estimated that the structures in the project require approximately 85,000 m^2 of lean mix concrete for the sub base and 120,000 m^2 base onsite concrete.

A typical concrete batching plant requires a land footprint of approximately 0.5 ha to accommodate cement materials silos, aggregate storage bins with dust suppression systems, conveyor belt (with cover) from aggregate storage bins to surge bins and drum mixer, drum mixer, water holding tanks, fuel tanks, materials storage facilities, truck holding bays, a generator and holding rooms, and any required staff facilities (office, ablutions, etc).

Asphalt batching plants

Asphalt batching plants would need to be established at approved locations along the project route. The purpose of an asphalt plant is to receive bitumen, aggregate, sand and other material, mix these together and batch and load asphalt into trucks. A total of up to 11,600 tonnes of asphalt (assuming a thickness of 14 mm) is estimated to be required for pavement.

A typical asphalt batching plant requires a land footprint of between 1 and 2 ha to accommodate asphalt materials silos, aggregate storage bins with dust suppression systems, fuel and bitumen tank, filter silo, mixing drum, two wet scrubber recycling pits, materials storage facilities, truck holding bays, and any required staff facilities (office, ablutions, etc).

25.1.3 Earthworks

Temporary infrastructure associated with earthworks activities include:

- Crushing plant.
- Stockpile areas.
- Spoil disposal areas.

Crushing plant

There may be a need for a crushing plant to produce the desired size and grading of aggregate for construction.

The major cuttings are currently in the vicinity of Kangaroo Trail Road and close to the commencement of Section C of the project, which will generally require excavations in medium to high strength rock. Given the likely volumes of materials to be excavated in these areas (approximately 100,000m^3 in Kangaroo Trail Road Section) and reused elsewhere on the project, it is likely a crushing plant will be needed in the vicinity for efficiency of operation and to reduce haul distances. However, the final location of these crushing plants will depend upon detailed design, staging of the project, and further geotechnical investigations.

Stockpile areas

Several stockpile locations will be required along the project due to its length. The number, location and size stockpile areas will depend upon the final design, construction methodology, and staging of the project, along with the availability of land. The concept design has been adjusted to achieve a slight deficit of material overall but there will be a surplus of material in Sections C and D and a shortfall in Sections A and E. Construction methodology and staging can be managed to reduce haul distances for materials and allow material to be transported directly from cut areas and placed in fill areas or spoil disposal areas without the need for stockpiling.

Potential stockpile locations include existing easements, cleared crown land, or by arrangement with local landholders. As construction progresses, it may be possible to use sections of redundant road formation for aggregate stockpiles before these areas are finally rehabilitated. Much of the material to be stockpiled would be accommodated within crushing and batching plant areas, along with the existing road reserve.

Topsoil material will need to be stockpiled along the route for placement as landscape fill as construction progresses along the route. It has been estimated that approximately 200,000 m^3 of topsoil will need to be stockpiled over the length of the project. Assuming a maximum stockpile height of 3m, up to 6 ha will be required over the project length to stockpile topsoil. Based upon the concept design, it has been estimated that approximately 14 sites will be needed assuming a maximum haul distance for each topsoil stockpile area of 1 km. Each topsoil stockpile is therefore estimated to be an average of 0.42 ha.

Spoil disposal areas

The proposal will result in more cut material (spoil) being produced than required for filling. As such excess material will be required to be stockpiled off site at approved stockpiling sites.

Further design and geotechnical investigations will determine the amount of excess material that will be unsuitable for fill. During the detailed design phase when additional geotechnical testing would be carried out, the volume of excess material could be further reduced. Design refinements could include minor adjustments to the highway profile and utilising material unsuitable for the highway embankment for non-critical areas such as noise bunds or as surcharge material on embankments above soft soils.

25.2 Potential locations

The possible location of temporary infrastructure will depend on detailed design, construction methodology and staging of the project. The identification of potential locations has been based on typical area requirements for projects of a similar scale, combined with an understanding of this project site, environmental issues and constraints.

The methodology for determining appropriate sites for temporary infrastructure focuses on those features of the landscape that pose environmental and social limitations to the potential use. Some of the constraints below create exclusions against potential locations for certain requirements. Other constraints merely require further investigation or mitigation matters that may influence the type of temporary infrastructure requirements. The following criteria have been used in determining potential sites for temporary infrastructure facilities:

- Central to a substantial portion or specific location of the works.
- Located with ready access to local road network.
- Within the road reserve or in areas where land use is permitted.
- Separated from nearest residence by at least 200 m or it can be demonstrated that no adverse impact would occur at the nearest residence.
- Not within 100 m of State Environmental Planning Policy Number 14 wetlands.
- Not located within 100 m of any drain that discharges into the wetland or mitigation measures are provided.
- Of low conservation significance for flora and fauna.

- Sufficient room for effective operation of the infrastructure.
- Access to water source.
- Not located within a one in 100 year flood plain.
- Relatively level.
- Selected so that the use of construction facilities does not affect land use of adjacent properties.

In determining locations suitable for temporary infrastructure purposes a ranking system was developed and applied to the various constraints that apply to the project area, as shown above. Some rankings reflect some constraints that are limiting and highlights the constraints that can be overcome through mitigation measures and management. The constraints ranking system includes the following:

1. Most suitable location for temporary infrastructure (relatively unconstrained).
2. Marginally suitable for temporary infrastructure – may require further investigation and / or specific engineering solution, mitigation measures or exclusion of certain areas.
3. Unlikely suitable for temporary infrastructure.

Based on the above criteria and ranking system a range of potential sites for compounds, batch plants, crushing plants stockpiles and spoil disposal areas have been selected. These potential sites are shown in Table 25-1. It should be noted that it would be the responsibility of the constructor to obtain approval to use any of the sites, and to maintain all appropriate environmental measures in place throughout the contract.

Specific Notes:

- Lot 1 DP 396968 and Lot 130 DP 820653 may not be considered suitable given its small size and the extent of recent intersection works. Alternatively, temporary use of the site may be feasible.
- Further investigation is required and other sites may become preferable.
- Only portions of particular properties may be suitable. Consideration should be given to areas that are relatively level, have access to the highway corridor, water supply and have minimal impact on adjacent properties.

Table 25-1 Temporary infrastructure location suitability

Project ref.	Location (Lot and DP)	Site compound	Batching plant	Crushing plant	Stockpile area	Spoil disposal area	General comments
Section A and B							
1	Lot 52 DP 851056	1	2	2	2	2	Located adjacent to the proposed overbridge at Kangaroo Trial Road. Site is relatively large and cleared private land located on both sides of the proposed highway. The location is not located on a floodplain or within 200 metres of a residence. Located within close proximity to reservoir as well as Corindi Creek.
2	Lot 51 DP 851056	1	1	2	1	2	Located adjacent to the above property. Site is relatively large and cleared private land located on both sides of the proposed highway. Located within close proximity to reservoir as well as Corindi Creek.
3	Lot 1 DP 379009	1	2	2	2	2	Residence exists on the standard sized property on both sides of the proposed highway. Located within close proximity to Redbank Creek.
4	Pt 11 DP 752820	1	2	2	2	1	Portion of the land is cleared and is not located on a flood plain. Located within close proximity to Redbank Creek.
Section C							
5	Lot 1102 DP 803773	1	2	2	2	2	Separated from nearest residence by at least 200 metres. No adverse impact would occur at Blueberry Farm and local residents. The site is approximately 7 hectares and 3 small dams currently exist on site. Relatively flat with remnant vegetation.

Project ref.	Location (Lot and DP)	Site compound	Batching plant	Crushing plant	Stockpile area	Spoil disposal area	General comments
6	Lot 2 DP 746387 23 DP 705683	1	1	1	1	1	Mostly cleared site on southern side of the highway with good separation from neighbours.
7	Lot 2 DP 710318	1	1	2	2	2	Residence and a dam exists on a 12 hectare sized property on both sides of the proposed highway. Located within close proximately to water supply of Chiquita Brands. Remanent vegetation exists on a portion of the site. Adjacent to Blueberry Farms
8	Lot 9 DP 707325	1	2	2	1	1	Site exists on both sides of the proposed highway. A very large site of approximately 96 hectares. Areas of both cleared and heavily vegetated.
9	Lot 8 DP 7077325	1	2	2	2	2	Site exists on both sides of the proposed highway. A very large site of approximately 47 hectares. Site is heavily vegetated.
10	Lot 1 DP 396968: Lot 130 DP 820653	1	2	2	1	1	Small site of approximately 0.14 hectares adjacent to proposed highway. Close to Dunmare Lane and relatively cleared.
11	Lot 7005 DP 1058539	1	2	2	2	2	Crown Land in close proximity to Halfway Creek.
Section D							
12	Lot 52 DP 801481	1	1	1	1	1	Residence and a dam exists on a 10 hectare sized property. The site is relatively flat with only a small area around the residence cleared of vegetation.

25.3 Proposed environmental controls

During the construction phase, short-term impacts associated with noise, air quality, traffic and transport, water quality and social impacts may have a negative cumulative impact on the overall amenity of the proposed locality. Mitigation and management measures have been suggested to minimise impacts and ensure that the short-term effects of the temporary infrastructure are appropriately managed. Table 25-2 provides a list of potential impacts along with appropriate mitigation and management measures in order to minimise impacts. In addition, the constructor will be required to prepare a Contractors Environmental Management Plan.

Outlined below are the main environmental issues associated with temporary infrastructure.

Site compounds

The formation of the site compounds will involve the clearing of the site and the installation of suitable environmental controls for the area. In addition, compacted areas would be provided for parking storage, access roads and site sheds.

Refuelling of construction materials and vehicles should occur by tanker in dedicated refuelling areas or on site. These areas will need to be bunded and contain appropriate spill response equipment. Fuel should be stored off site. All wastes from site compounds, including sewage waste, should be removed from site by an appropriate licensed contractor. It is not recommended any hazardous materials be stored on site.

The potential impacts of site compounds will include light spill noise, visual, traffic, waste, odours and contamination. To avoid potential impacts site compounds should be located:

- More than 50 metres away from waterways.
- Away from areas of native vegetation.
- More than 150 metres from residences that may be impacted by operational noise.

Batching and crushing plants

During the construction phase, pollutants from batching and crushing plants such as sediment, soil nutrients and construction waste have the potential to enter drainage lines and stormwater systems, particularly during high rainfall events. Spillage of diesel during refuelling and leakage of hydraulic and lubricating oil from plant and equipment, or rinse water from plant washing and concrete slurries, also have the potential to enter drainage lines.

Wastewater generated from batching should be discharged into agitator trucks and be transported to holding pits, which will encourage heavy sediment fallout. Some recycling of wastewater will occur provided water quality requirements can be met. Sediment within the pit will be removed, dried and reused on site or disposed of to a licensed landfill.

The operation of the batch plant will also require a number of truck movements associated with raw material supply and concrete/asphalt production and delivery. The cumulative impacts of on-site batch plants would result in a net reduction of the overall number of truck movements on local / regional roads compared to off-site batch plants.

Other potential impacts include noise, emissions to air, visual effects and impacts on local flora and fauna. These should be managed in accordance with Table 25-2.

Stockpile areas and spoil sites

The impacts associated with stockpile areas and spoil sites will vary according to individual site circumstances and the receiving environment. Stockpile areas should be designed and management controls be implemented to minimise the impacts identified in a formal risk assessment of each location. Potential impacts of stockpile areas include, but are not limited to, the following:

- Erosion and sediment generation.
- The bulk storage of materials can cause dust, smoke and odour impacts in surrounding communities/environments.
- The bulk storage of materials can cause impacts on nearby waterways. If contaminated stormwater, leachate and windborne materials enters a waterway it has the potential to reduce dissolved oxygen levels.
- The transfer of material to stockpile areas and the subsequent removal of the materials for use, can cause noise impacts for nearby residents.

Management and mitigation measures outlined in Table 25-2 should be implemented.

Table 25-2 Potential environmental impacts and mitigation measures

Environmental impact	Mitigation and management measures
Water quality	
Soil erosion and sedimentation of Waterways	• Minimise areas of disturbance. • Installation of temporary erosion sediment and water quality controls. • Treatment of runoff from hardstand / vehicle wash areas. • Stockpile areas to be covered appropriately. • Rehabilitation of disturbed areas. • Designate areas for plant and construction material storage and provide cutoff drains to ensure runoff from upstream areas is diverted around the site. • Construct sediment fences on upstream edges of buffer areas and at base of fill embankments. • Provide devices such as retained vegetation, timber windrows, hay bales, silt fences and sand bags along catch drains to slow flow, reduce scour and capture part of the sediment from the runoff. • Construct diversion banks at upstream boundary of construction activities to ensure upstream runoff is diverted around exposed areas. • Construct catch drains at downstream boundary to ensure sediment laden runoff is contained and diverted to treatment areas and not allowed to flow over undisturbed areas and into existing drainage systems that may become blocked. • Regularly maintain and inspect all mitigation measures and repair or de-silt where necessary after severe rainfall to ensure they are in working order at all times. • Progressively revegetate cut and fill areas as appropriate. • Progressively complete construction areas to ensure sites are exposed for minimum duration.

Environmental impact	Mitigation and management measures
	• Cover stockpiles, if necessary, to minimise transportation of sediment material. • Mulch and retain vegetation and topsoil for site rehabilitation and landscaping work. • Stockpiles would be managed in accordance with the Stockpile Management Procedures (RTA 2001).
Spillage of fuel and chemicals. Contamination of ground and surface water.	• Fuel / chemical areas bunded and prompt cleanup of spills. • Hardstand surfaces provided where necessary. • Plant and equipment would be located at the site compound sites when not in use.
Noise and vibration	
Generation of noise and vibration	• Construction noise and vibration DECC guidelines to be adhered to. • Regularly monitor noise levels. • Undertake regular maintenance of vehicles and machinery to ensure efficient operation. • If required, installation of temporary noise mitigation measures at nearby residences. • All temporary batch and crushing plant would be regularly inspected and tested to ensure the emission levels do not deteriorate over the life of the project. • High efficiency mufflers would be installed for major plant items, particularly those that would be used for long periods on the project to reduce construction noise.
Air quality	
Dust generation	• If necessary, water unsealed areas used by construction traffic or during weather conditions conductive to dust generation. • Raw materials would be damped to suppress dust emissions. • Ensure that the tailgates of all vehicles transporting materials to and from construction sites are securely fixed prior to loading and immediately after loading and materials covered immediately prior to transportation.

Environmental impact	Mitigation and management measures
	• Minimise drop heights between conveyors. • Bag fills in batch plants would not be filled to the top of the silos. • Delivery vehicles would be covered. • Remove mud from the wheels and bodies of haulage equipment before they enter public roads or other sealed pavements. • Immediately clear mud or other materials spilt by construction-related equipment on public roads or properties outside the construction zone. • Spray any long-term stockpiles with a suitable stabilising agent, or grass them, to prevent fugitive dust emissions. • Put in place a "call-out" system for events that require dust suppression out of hours and on weekends. • Re-program some activities during periods of high wind so as not to cause nuisance or danger to people or property. • Maintain the exhaust systems of construction plant, vehicles and machinery to manufacturers' specifications to minimise exhaust emissions. • Ban any open burning or incineration on site.
Fumes from batch plants or crushing plants	• Regularly maintain and service all operational plant and equipment to ensure optimum performance and reduce the potential for emissions.
Traffic	
Traffic generation as a result of construction	• Establishment and monitoring of safe access points to work areas for construction vehicles from the adjacent road network including safety measures such as barriers, maintaining sight distance requirements and signage. • Impose a load limit on trucks using the proposed road to avoid excessive heavy vehicle noise.

Environmental impact	Mitigation and management measures
Hazards	
Contaminated soils	• If fill or soils were identified as contaminated, these materials would be kept separate from clean material and appropriate storage, transport and disposal measures implemented to ensure that risk to workers and the public is minimised. Contaminated material would be quantified, separated from clean material and disposed of in accordance with the Contaminated Land Management Act, 1997.
Other hazards	• Bund storage areas for oils and other hazardous liquids in accordance with Australian Standards and collect any spillages for off-site disposal at a licensed facility. • Conduct regular audits of storage areas to identify and address storage concerns (inappropriate storage practices, leaking bunds). • Ensure that spill control material is readily available. • Permit potentially hazardous activities, including washing out of delivery vehicles, washing down of construction plant, refuelling plant and handling hazardous chemicals to be undertaken only at appropriate locations that have adequate environmental protection measures.
Waste	
Waste generation resulting from temporary construction facilities	• Minimise the size of excavations to reduce the amount of spoil generated. • Remove liquid and solid waste by tanker or truck for disposal at an approval facility. • Balance cut and fill works where possible. • Any soil not suitable for use in road embankments would be used for mounding for landscaping where practicable. • Contractors to employ all reasonable measures to reuse and recycle excavated spoil material by utilising as fill for road works. • Surplus excavated sandstone would be crushed and reprocessed for use in construction materials. • Trees cleared during construction would be used for timber windows for sedimentation control or revegetation to re-establish habitat on site.

Environmental impact	Mitigation and management measures
	• Topsoil free of weeds that is stripped prior to undertaking earthworks would be stockpiled and stored. Following completion of earthworks, topsoil would be spread on the road batters as part of landscaping and revegetation works. Any stored stockpiles would be protected from water and wind erosion by spreading with hydroseed until required or by covering with a geotextile fabric. • Large logs and tree limbs to be used to assist in sediment control. • Good site housekeeping to prevent littering. • Recycling facilities would be provided for general rubbish, ie glass, plastic, waste paper and metals, utilising colour-coded bins. • Surplus soil material (spoil) created as a result of the project would be reused in landscaping and rehabilitation works as a first priority. Any waste material unable to be reinstated as fill material as part of the project would be transported to land that can lawfully receive that waste and stockpiled for storage, future reuse or disposal.
Flora and fauna	
Potential significant impact of the project on threatened species, populations or ecological communities, and their habitats	• Avoid and/or minimise locally native tree and shrub removal at all times. • Significant trees to be flagged particularly hollow bearing trees, and retained where possible. • Placement of stockpiles away from areas of native vegetation and drainage lines where they could be spread downstream during rainfall events. Stockpile sites would be covered to prevent soil from blowing into adjacent areas. • Prior to clearing, inspect areas to be cleared for presence of native fauna. • On the completion of construction work, areas of bare soil or heavily infested weedy areas would be professionally revegetated with suitable local indigenous shrub species in conjunction with stabilisation measures such as matting, and mulching to stabilise soil batters and embankments. Revegetation with locally indigenous species collected from local seed sources is preferred and would be undertaken in consultation with NPWS. • Any noxious plant species or significant environmental weeds would be removed during and following revegetation works in accordance with the Noxious Weeds Act 1993 and Pesticides Act, 1999. Regular checks would be made in the early seeding stage and weeds removed.

Environmental impact	Mitigation and management measures
Visual quality	
Short term temporary visual impacts will occur during construction phase	• Work areas and compounds would be left in a tidy condition during the construction period. • All fencing or barriers around the work areas such as site compounds would be maintained free of graffiti and unauthorised advertising. During construction, any graffiti would be cleaned off and unauthorised advertising removed within 24 hours or as soon as feasible if access is required from the rail corridor, or for other operational reasons. • Use of lighting during nighttime works would take into consideration the light spill impacts on surrounding residential dwellings. Light would be directed onto the work area, baffles would be used where necessary, and only those work areas being used would be lit at any time. • Consider the installation colour coordinated shade cloth for site compounds and batching and crushing plants on perimeter fencing to reduce visual impact. • Consider supplementary planting for external perimeter fencing.
Climate change	
Impact on energy resources and energy use	• Water use would be minimised and regulated and, where possible, water conservation techniques would be used. This would include aerated taps, waste efficient appliances, trigger action hoses, low/dual flushing or composting toilets, and prompt repair of leaking taps and pipes. • Energy efficient construction plant and equipment would be used, where possible. • Construction equipment would be regularly maintained. • Sensible energy management practices would be implemented, such as turning off equipment when not in use.
Heritage	
Temporary infrastructure may have an potential impact on non indigenous and ideogenous heritage	• Known sites of heritage significance would be avoided by all staff and equipment. • Construction activities would be monitored by the LAC.