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AD JOHNSON PTY LIMITED
ABN 62 129 445 398

Environmental Assessment

NSW Train Support Facility

Property:
Maitland Road, Hexham

Applicant:

QR NATIONAL

Date:
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Project: NSW Train Support Facility

Subject Land:

Lot 1	DP 128309
Lot 101	DP 1084709
Lot 102	DP 1084709
Lot 2	DP 735456
Lot 10	DP735235
Lot 104	DP 1084709
Lot 113	DP 755232
Lot 1	DP 155530
Lot 12	DP 1075150
Lot 1	DP1062240
Lot 311	DP 583724

Certificate: I certify that I have prepared the content of this Environmental Assessment and to the best of my knowledge it is in accordance with the Environmental Planning and Assessment Act and Regulation and is not false or misleading.

Signature: ....
Craig Ian Marler

Date: 13 November 2012

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Glossary and Abbreviations

AADT	Annual Average Daily Traffic.
ABS	Australian Bureau of Statistics.
ACM	Asbestos Containing Material.
ACHMP	Aboriginal Cultural Heritage Management Plan.
ADG	Australian Dangerous Goods.
ADWJ	ADW Johnson Pty Ltd.
AEP	Annual exceedance probability – the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. E.g., if a peak flood discharge of 500m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500m^3/s or larger events occurring in any one year.
AHD	Australian Height Datum.
AMBS	Australian Museum Business Services
APZ	Asset Protection Zone.
ARI	Average Recurrence Interval – the long-term average number of years between the occurrence of a flood as big as or larger than the selected event. E.g., floods with a discharge as great as or greater than the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
ARTC	Australian Rail Track Corporation.
AS	Australian Standard.
ASSMAC	Acid Sulphate Soils Management Advisory Committee.
Ballast	Crushed rock or stone upon which rail sleepers will sit.
BCA	Building Code of Australia.
CEMP	Construction Environmental Management Plan.
CMA	The Hunter-Central Rivers Catchment Management Authority.
CTGM	Chichester Trunk Gravity Main.
DA	Development Application.
DECC	Department of Environment and Climate Change (former name of NSW Office of Environment and Heritage).
Dewatering	Removal or draining of surface water or groundwater from construction site including excavations.
DG	Director-General.
DGR	Director-General's Requirements for the Environmental Assessment.
Down Coal	The Down Coal is the primary coal rail line that coal trains usually traverse when they are heading away from Newcastle Port and is usually positioned on the right when facing towards Newcastle.
Down Main	The Down Main is the side of the track on which trains travel when they are heading away from Sydney and is usually positioned on the right when facing towards Sydney.
DP	Deposited Plan.
DP&I	Department of Planning & Infrastructure.
EA	Environmental Assessment.
EEC	Endangered Ecological Community.
EMP	Environmental Management Plan.
EP&A Act	Environmental Planning and Assessment Act 1979.
EPA	NSW Environment Protection Authority.

EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999.
ESD	Ecologically Sustainable Development.
Gabion	Cages, cylinders, or boxes filled with rocks, concrete or sand and soil.
GDE	Groundwater Dependent Ecosystem – ecosystems partially or entirely dependent on underground water.
Genset	A machine to generate electricity.
GHG	Greenhouse Gases.
GNR	Great Northern Railway (also known as the Main Northern Railway).
GPT	Gross Pollutant Trap
HRR	ARTC Hexham Relief Roads Project.
HVCCC	Hunter Valley Coal Chain Coordinator Limited.
HWC	Hunter Water Corporation.
INP	Industrial Noise Policy.
KCT	Kooragang Coal Terminal.
LA1	The noise level exceeded for 1% of the 15 minute interval.
LA10	The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
LA90	The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
LAeq	The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time varying sound.
LGA	Local Government Area.
LHRS	Lower Hunter Regional Strategy.
MSB	Mine Subsidence Board.
Mainline	Main Railway Line
mtpa	Million tonnes per annum.
NCC	Newcastle City Council.
NCIG	Newcastle Coal Infrastructure Group.
Newcastle LEP	Newcastle City Council Local Environmental Plan 2003.
NPWS	NSW National Parks and Wildlife Act 1974.
NSW	New South Wales.
OEH	Office of Environment & Heritage.
PAD	Potential Archaeological Deposit.
PASS	Potential Acid Sulphate Soil.
PCD	Potential Cultural Deposit.
PMF	Probable Maximum Flood – the PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.
Project Area	The Project Area captures the area where all works associated with the proposed TSF will be undertaken.
PWCS	Port Waratah Coal Services.

RAP	Remedial Action Plan.
Relief Road	A rail line that runs parallel with the Up Coal. A Relief Road usually provides a passing facility enabling trains to pass those traversing or stationary on the Up Coal thus giving relief to the Up Coal operations. A Relief Road can also allow trains to remain stationary off the Up Coal allowing trains to continue to traverse the Up Coal.
RFS	New South Wales Rural Fire Service.
RL	Relative Level.
RMS	Roads and Maritime Services.
SEPP	State Environmental Planning Policy.
SEPP 14	State Environmental Planning Policy No. 14 – Coastal Wetlands.
SEPP 33	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development.
SEPP 71	State Environmental Planning Policy No. 71 – Coastal Protection.
SEPP State and Regional Development	State Environmental Planning Policy (State and Regional Development) 2011.
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities.
Spoil	Excess rock and/or earth material resulting from excavation activities.
Study Area	The study area is an area that is necessary for a technical specialist to undertake and complete an assessment of the proposed Project and varies in size depending on the discipline.
SWMP	Stormwater Management Plan.
The Site	A 255ha study area at Hexham within the Newcastle City Council local government area.
TSC Act	NSW Threatened Species Conservation Act 1995.
TSF	Train Support Facility.
TSF Footprint	The TSF footprint (38ha) is the area in which the proposed project would operate and be constructed.
Turnout	A rail track component that connects two railway tracks. The turnout comprises a length of straight track and a section of curved track that joins the straight track. The curved track includes a moveable section of track. The moveable section is adjusted to allow a train to travel from the curved track to the straight track.
Up Coal	The Up Coal is the primary coal rail line that coal trains usually traverse when they are heading toward Newcastle Port and is usually positioned on the left when facing towards Newcastle.
Up Main	The Up Main is the primary (main) rail line that trains usually traverse when they are heading toward Sydney and is usually positioned on the left when facing towards Sydney.
UTM	Unit Train Maintenance.

1.0 Executive Summary

This Environmental Assessment (EA) considers the proposed Train Support Facility (TSF) at Hexham, NSW to be established by QR National. QR National is a publicly listed national rail, freight and logistics business which was previously part of Queensland Rail, a government owned entity.

QR National has identified a 255ha study area at Hexham within the Newcastle City Council (NCC) local government area. QR National seeks approval to establish a TSF which will occupy a 38ha portion of the site. The TSF is required to service QR National's growing Hunter Valley coal freight business and accommodate train servicing facilities.

This EA has been prepared to address the Director-General's Requirements (DGR) and in particular considers the full range of environmental, statutory and socio-economic implications of the proposed TSF.

The Proposal

QR National is seeking planning approval to construct and operate the TSF and associated infrastructure at Hexham, NSW. The proposed TSF is located approximately 16km north west of Newcastle CBD.

Key components of the proposed TSF include:

- Construction of new connections to the Great Northern Railway (GNR);
- Construction of 10 new train lines (tracks) and sidings parallel to the existing main railway line (Mainline) to accommodate QR National trains for provisioning, inspections, servicing and maintenance;
- Buildings for the provisioning of QR National locomotives and the maintenance of rollingstock;
- A bulk fuel storage area with capacity for up to 400,000L of diesel fuel;
- Construction of an intersection and a new vehicular access road from the Tarro Interchange;
- Approximately 380,000m^3 of earthworks (import to fill) for the construction of the railway formation, access road, drainage and building foundations;
- Construction of internal vehicular access roads; and
- The protection or diversion of existing utilities.

The estimated cost of the project is $130 million and is planned to be constructed in two stages over approximately 24 months. The proposed TSF is a major investment for the region and will provide significant flow-on benefits.

The Site

The site has a total area of 255ha, with the TSF to be developed in a 38ha portion of the site. The site is bounded by the GNR and the Pacific Highway to the east and the New England Highway to the north. It is also bounded by rural and environmental lands to the south and west, including the Hexham Swamp Nature Reserve. The site is located away from any significant residential area however, there are a small number of dwellings within the local vicinity of the site.

The northern portion of the site has had a history of agricultural use while the southern part of the site (zoned industrial) has a long association with the coal and rail industry and specifically has been used for the storage, preparation and loading and unloading of coal. The proposed development, which is predominantly on the southern part of the site, will continue the site's coal and rail related activities.

The site is strategically located close to the Port of Newcastle, adjoining the GNR with well-established rail links to mines in the Hunter Valley. The strategic importance of the site is recognised by the Lower Hunter Regional Strategy (LHRS) which identifies much of the site as employment lands. The proposed development is consistent with this initiative.

Need for the Proposal

The key purpose of the proposed TSF by QR National is to provide a more efficient and cost effective method of supporting QR National operations in the Hunter Valley Coal Chain (HVCC) by providing daily train running requirements and rollingstock maintenance needs.

Australian Rail Track Corporation (ARTC) is encouraging "above rail operators", including QR National, to re-establish their current train provisioning facilities outside of the Port Terminals to minimise rail congestion on the approach to the dump stations. ARTC documented these requirements in the 2012-2021 Hunter Valley Corridor Capacity Strategy.

The removal of existing QR National rail facilities from the Newcastle Port Terminals will improve the efficiency of coal loading operations at Kooragang Coal Terminal (KCT). The Hunter Valley Coal Chain Coordinator (HVCCC) has provided a letter in support of QR National's TSF application.

Newcastle is presently the largest coal exporting harbour in the world, exporting over 97Mt of coal in 2009–10 with plans to expand annual capacity to 180Mt by 2013. Mining of black coal is one of Australia's most important industries, creating significant employment in regional Australia, fuel for low-cost electricity generation and steel-making and vital export income. Australia is the world's biggest coal exporter, and black coal is Australia's largest export, worth more than $A50 billion in 2008-09.

The TSF initiative is part of the process of continuous improvements associated within the HVCC network. The proposed QR National TSF will ultimately result in improved efficiency in the transport of coal to market.

Justification for the Proposal

The proposed TSF is intended to support the projected increase in coal export by establishing a facility where train running requirements and rollingstock maintenance needs could be undertaken away from the Port of Newcastle.

The proposed TSF will incorporate provision for:

- Operation and management of QR National trains;
- QR National trains undergoing statutory and routine maintenance inspections;
- Locomotives and wagons to be attached/detached to QR National trains;
- Locomotives to be provisioned;
- Locomotives and wagons to be serviced;
- Locomotives and wagons to be stabled; and
- Spare parts to be held for locomotives and wagons.

The TSF initiative is consistent with the ARTC strategy of continuous improvement associated with the Hunter Valley Corridor Capacity Strategy. The development will result in the relocation of existing QR National rail facilities on Kooragang Island, providing for more efficient coal loading operations. The proposed TSF will allow for trains to be maintained and serviced away from the Newcastle Port operations alleviating the congestion of trains queuing on the Mainline before entering the KCT.

In this context the proposal is vitally important to the local, regional and national economies as it supports the efficient and competitive delivery of coal for export. Strong world demand for coal is encouraging major investment across the entire coal chain; this includes the establishment of new mines, increasing investment in the rail system and initiatives to increase the coal export capacity of the port.

The site is located in close proximity to the Newcastle Port, major transport routes and the Hunter Valley coal mines. The site is free of any significant constraints and it is considered to be an ideal location for the proposed TSF.

Project Alternatives

In 2011 a Location Constraints Analysis review was undertaken by QR National to confirm the preferred location in the Hunter Valley for the TSF. Some 54 sites were considered as part of the investigations with seven sites, including the preferred site at Hexham, examined in detail.

Further to the review of suitable sites, a number of design investigations were also undertaken to achieve an optimal TSF layout at Hexham that met the QR National operational requirements while minimising environmental impacts.

An outline of the seven alternative sites is included in the table below.

Alternative Site Options Assessed		
Option	Location	Details
Option 1	Hexham	This site has a frontage of 3.30kms adjoining the Main Northern Line at Hexham (Down Main)
Option 2	Rutherford	This site has a frontage of 4.71 km along the Down Main at Rutherford
Option 3	Allandale	Option 3 has a frontage of 3.10km along the Down Main at Rutherford.
Option 4	Belford East	Option 4 has a frontage of 3.33km along the Down Main at Belford
Option 5	Belford West	Option 5 has a frontage of 3.42km along the Down Main at Belford
Option 6	Whittingham	Option 6 has a frontage of 3.00km along the Down Main at Whittingham
Option 7	Singleton	Option 7 has a frontage of 3.08km along the Down Main at Singleton

Three options were considered for the track layout of the TSF within the Hexham site, these being the parallel, extended and compressed options. The parallel option was selected because it is best suited to the site's constraints, the design parameters for the TSF and is the most widely used layout option throughout the rail industry.

Options Assessment Criteria

QR National considered seven alternative site options and a 'do nothing' option for further detailed operational modelling and environmental and economic analysis.

QR National used criteria that included strategic locality, accessibility, topography and logistical concerns as well as environmental, servicing and operational considerations to score the sites' suitability in order to select a preferred option. Following this, Option 1 (the proposed TSF) was selected as the preferred option based on the following:

- The locality has had a long association with industrial activity associated with coal processing and rail transport facilities;
- Excellent accessibility to the routes between the coal mines and the Port of Newcastle coal loading terminals;
- The site adjoins a 3km straight length of the Mainline;
- Flat topography and little vegetation cover;
- Separation from heavily populated residential areas, minimising potential issues associated with noise, dust and vibration;
- Close proximity to the Newcastle and Hunter Valley area workforce;
- Direct access to the New England Highway for fuel deliveries; and
- The use of existing disturbed land to minimise environmental impact.

Consultation

QR National developed a Stakeholder Engagement Strategy to inform Government, the community and other stakeholders about the proposed TSF, and to address all relevant environmental, social and economic issues raised by stakeholders and the community in the EA.

The community consultation undertaken as a part of the EA process included:

- Special interest groups;
- State and local government authorities including NCC, ARTC, Office of Environment and Heritage (OEH), Roads and Maritime Services (RMS), Hunter Water Corporation (HWC) and Hunter Central Rivers Catchment Management Authority (CMA);
- Local community of Hexham and Tarro;
- Landowners identified as directly adjacent to the proposal; and
- Utility providers including Ausgrid, Jemena, Telstra, HWC, and Optus.

The QR National Community information line will be utilised and a project email address will be established to ensure that project information is continuously collected and appropriately dealt with.

The following activities will be undertaken once the proposal has been submitted for exhibition:

- EA public notification (Newspaper advertisement);
- EA project newsletter;
- EA exhibition notification letter;
- EA exhibition static display (hardcopy available for viewing); and
- EA community information session.

Issues raised by Government, the community and stakeholders have been addressed in the relevant sections of the EA.

The ARTC is progressing a development proposal for the Hexham Relief Roads Project (HRR), a State Significant Infrastructure Project involving the establishment of five new rail tracks which is also designed to reduce congestion and improve the efficiency of operations in and around the Newcastle Port. The HRR development proposed will be located on land currently owned by QR National between the site for the proposed TSF and the GNR. QR National is liaising closely with ARTC to coordinate the approval process and development works associated with the two projects.

Assessment of Environmental Impacts

Outlined below is a summary of the key environmental impacts associated with the proposed TSF which have been addressed within this EA.

Ecology

Three endangered ecological communities (EEC) occur in the study area: Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions; Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions.

No threatened flora species were recorded within the study area, though Zannichellia palustris was considered a potential occurrence.

Eleven threatened fauna species were recorded within the study area and an additional four threatened fauna species were considered likely to occur. Six migratory species listed under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) are also considered likely to occur.

The majority of the area proposed to be affected on the site comprises cleared/disturbed land or rehabilitated land (zoned industrial), containing both native and non-endemic species. The proposed development will require removal of 2.72ha of Freshwater Wetlands on Coastal Floodplains which is an EEC. Approximately 25.7ha of the EEC was mapped within the study area. The magnitude of impact on EECs has been assessed and no threatened species or communities are considered likely to be significantly affected by the proposal.

A Biobanking Assessment of the proposed development and proposed offset lands was completed to determine if sufficient credits would be generated on the offset lands to achieve the 'improve or maintain' outcome according to the methodology.

The proposal will achieve a no net loss outcome for two of the four communities, with a mitigated loss for Swamp Oak Swamp Forest and Coastal Floodplain Sedgelands, Rushlands, and Forblands of the North Coast. Overall, the offset will deliver a surplus of 170 credits. QR National have committed to the protection and management of 53.63ha of native vegetation and habitat on site in perpetuity.

Approximately 5.69ha of degraded SEPP14 Coastal Wetlands will be directly affected by the proposed TSF. An appropriate offset has been provided for this impact. A referral of the project under the EPBC Act has been made. The project has been determined to not be a controlled action.

Flood Impact

The results of the modelling and flood impact assessment have confirmed that Peak 1% Annual Exceedence Probability (AEP) flood levels for existing conditions are estimated to vary from 3.7m AHD at the northern end of the site to 3.5m AHD at the southern end. The majority of the proposed development would be subject to significant inundation in major flood events where typical 1% AEP flood depths across the site are of the order of 1.5 – 3.0m. Corresponding peak flow velocities for the 1% AEP event under existing conditions are typically in the order of 0.5m/s, but locally higher. Development of the proposed TSF is not considered to have a significant impact on the existing flooding regime as the intention is to mimic the natural flows of the site.

The site is to be raised to a level above that of the 2% AEP flood level but largely below the 1% AEP flood level. Local increases in peak flood level of up to 0.1m upstream of the proposed access road alignment are simulated for the 2% AEP event with peak flood level increases of less than 0.05m being typical for other design events. Elsewhere localised increases in peak flood level can be addressed through adequately designed cross drainage infrastructure.

Climate change considerations of increased tailwater levels and rainfall intensity increased the 1% AEP flood level by 0.32m.

Stormwater

Two discharge locations were identified that are likely to affect EECs sensitive to changes in low flow events, these being Swamp Oak Floodplain Forest and Coastal Saltmarsh. The impact to EECs is considered to be negligible, these areas are relatively waterlogged and/or semi-permanent submerged environments, in large, flat, open areas where depth changes are insignificant, or are within areas where the proposed development represents relatively minor changes to significantly larger catchments. Erosion and sediment control measures have been identified to address areas considered sensitive to minor changes in flow rates.

Modelling has indicated that there are opportunities for stormwater management on the site to assist in creating favourable conditions for restoration of suitable environments as an offset for the area of the site lost due to the proposed development. This can be achieved by changing the discharge and overflow locations and frequencies to specific areas as part of the ongoing design.

Modelling has also indicated that the proposed treatment trains will achieve the adopted stormwater treatment targets for the site. The adopted treatment measures are considered conservative and have not included the significant additional benefits of the removal of grazing and certain areas of effluent irrigation from the site.

Investigations undertaken concluded that the proposed TSF can feasibly be developed in accordance with current guidelines, and will not have a significant impact on the adjacent areas.

Effluent Disposal

There is sufficient area available for onsite effluent disposal allowing for independence and separation from the existing irrigation area. Conventional control of design of the system falls under Section 68 of the Local Government Act, with NCC as the consent authority. QR National, through the design of the TSF, has proposed an environmentally sound wash down facility including water recycling and rainwater tanks.

Traffic and Access

Access to the project area is proposed via an access road from the Tarro Interchange to the subject site. Extensive consultation with RMS has been undertaken with regard to providing access to the site.

The access proposal off the Tarro Interchange will provide a good level of service for traffic access to the proposed development site. Whilst traffic flows on the New England Highway are high at peak times, the relatively low number of staff and shift work operations means that there will be little, if any, impact upon the existing traffic flows along the New England Highway at this location during operation. The future extension of the F3 Freeway to the Pacific Highway at Heatherbrae will reduce flows along the New England Highway in the vicinity of the proposed TSF.

Construction traffic will peak to around 170 vehicles per day entering the site during this period. The peak daily traffic volume is predicted to be in the order of 340 vehicle movements per day, which will be spread over a period of 7 – 8 hours. This peak would be temporary, predicted to occur over a 2 – 4 month period of the 18 month construction program.

Traffic in the peak construction period is mitigated by the arrival of site staff prior to the morning peak period and departing after the afternoon peak period. Materials movements will occur after the morning peak period optimising the efficiency of supply movement.

Geotechnical and Acid Sulphate Soils

Field testing found that a clay crust is present over the site which is generally about 0.5m to 1m thick. The subgrade significantly reduces in strength below this level. It is recommended, where possible, that minimal excavation into the surface crust be carried out to avoid exposing underlying, softer soils. Due to the relatively low strength of the clay soils and associated long term total settlements, buildings will need to be founded on piled foundations.

A preliminary geotechnical analysis of the settlement and slope stability of the proposed rail embankment has been undertaken. It is noted that ground improvement may be required to increase both the shear strength of the clay soils and slope stability depending on the final embankment slope and findings from further detailed analysis on slope stability that will be undertaken during the detailed design phase.

Acid sulphate screening tests have been conducted at the site. Test results have established that the Acid Sulphate Soils Advisory Management Committee (ASSAMC) action criteria for excavations above and below 1,000 tonnes has been exceeded, confirming that potential acid sulphate soils (PASS) are present within the TSF site.

For construction purposes, the disturbance of soils through excavation and dewatering within natural soils (excluding fill) should be treated as PASS and thus must be managed under the Acid Sulphate Soils Management Plan (ASSMP). The ASSMP provides analysis of the acid sulphate soils and appropriate mitigation necessary for excavation activities during construction.

Groundwater

A conceptual groundwater model has been developed for the proposed TSF indicating that the majority of groundwater flow is expected to occur in the filling areas and will be driven by infiltration of rainfall and irrigated water on the more elevated parts of the site, in particular, the existing coal tailings stockpiles which are located to the west of the proposed TSF development area.

Groundwater flow radiates out from near the centre of the coal tailings area, however much of the groundwater flow from this area towards the north, west and east would be expected to be intercepted by the existing perimeter drainage, rather than flowing to the groundwater beyond. The intercepted water is diverted towards the Hexham Swamp to the west.

Some fluctuations in groundwater levels within the filling could be expected due to the close proximity to the Hunter River. Based on an average water level in the Hunter River of about RL 0.0 or slightly higher and a distance of between 600m and 900m to the River, the available hydraulic gradient towards the Hunter River will be limited.

There is limited use of groundwater in the vicinity of the site. Registered wells in the vicinity of the site are limited to nine monitoring bores installed in 2011 at the perimeter of the site for the purpose of monitoring groundwater quality and levels. The wells were installed as part of site investigations for the proposed TSF development. It is understood that there are no wells registered for beneficial use within 3km of the site. Therefore, no impacts to groundwater levels from the TSF development are expected to occur at such a proximity to the site.

Groundwater Dependent Ecosystems (GDEs) are highly disturbed from previous land uses and remain in relatively poor condition due to weed invasion. Given the improvement of GDE's in the offset lands, any possible detrimental effects locally are not significant in terms of the Hunter Estuary.

Contamination

Results of a preliminary contamination assessment indicated the absence of gross contamination within the soil, groundwater and surface water samples tested. Elevated levels of nutrients and faecal coliforms were encountered in groundwater and surface water samples taken at the site. Based on field observation and laboratory testing, it is considered that the elevated nutrient and faecal coliform concentrations may be attributed to the infiltration of irrigated treated effluent from neighbouring sewerage treatment operations and historical agricultural use. It is noted that the detected concentration of nutrients are significantly lower than the estimated nutrient and organic loading rates of the treated effluent.

In addition, slightly elevated levels of heavy metal contamination were encountered in groundwater and surface water samples taken at the site. Based on field observations and laboratory testing in soils, no apparent impact was observed on the site to suggest gross heavy metal contamination within soils.

It is considered that there is a potential for offsite migration of groundwater and surface water containing elevated heavy metals, hydrocarbons, nutrients and faecal coliforms. It is proposed that such contamination will be addressed through appropriate management within a Water

Quality Management Plan. Effluent irrigation activities at the site could be contributing to the impacts on waters at the site. It is understood that effluent irrigation carried out by the sewerage treatment operator is proposed to continue under Environmental Protection Licence (No 816) for the interim. Additional sampling and laboratory analysis would be required to confirm the source/type and significance of impacts and potential for offsite migration of waters from the site.

A Remedial Action Plan (RAP) has been prepared to identify where remediation of contaminated land is necessary.

Servicing Infrastructure

Potential connections to existing water, telecommunications and gas services can be achieved to service the proposed TSF.

Waste water will be treated using an onsite treatment system with onsite effluent disposal. Additionally a dedicated recycling system is included to wash down locomotives prior to maintenance.

As part of the proposed TSF, relocation/protection of services is required and negotiations have commenced with the relevant authorities.

Aboriginal Cultural Heritage

The Awabakal Descendants Traditional Owners Aboriginal Corporation, the Awabakal Local Aboriginal Land Council, and the Awabakal Traditional Owners Aboriginal Corporation were consulted during the preparation of the Aboriginal Heritage Impact Assessment.

Searches of the statutory and non-statutory registers returned 93 results for listed Aboriginal sites under the Aboriginal Heritage Information Management System (AHIMS) database within a 10km radius of the study area.

In 2011 McCardle Cultural Heritage, in consultation with the relevant Aboriginal Stakeholders, identified a Potential Cultural Deposit (PCD) on the proposed TSF site. Investigation undertaken by Australian Museum Business Services (AMBS) identified an Archaeological Site (HS1) surface extent and sub-surface extent and a potential Archaeological Deposit (PAD) on the site as part of their work in relation to the adjoining ARTC HRR Project. Site HS1 was not identified during a second site visit by McCardle Cultural Heritage following its identification by AMBS, notwithstanding this, the assessment has assumed that the Site HS1 is present.

Much of the northern part of the site will not be impacted by the proposed TSF and Site HS1 (surface extent) will be completely avoided.

Works are proposed in the PCD and it is proposed that these areas would be tested prior to any work to minimise any impact. If required, excavation and salvage of artefacts would be undertaken prior to any work taking place.

An Aboriginal Cultural Heritage Management Plan (ACHMP) would be developed, in consultation with Aboriginal stakeholders, and implemented prior to construction.

European Heritage

The proposed TSF was found to have very minimal inherent impact on European heritage values of the site. While several items associated with previous uses, such as the dairy ruins, remnant trackwork, coal preparation plant footings and conveyor support footings, will likely be demolished, these have a very limited level of significance and their loss will not be detrimental.

Development of the proposed TSF may necessitate disturbance, concealment or removal of a range of built items. These include some remnant items of track work which are associated with the Minmi to Hexham Railway which is recognised as a Local Heritage Item within Schedule 5 of the Newcastle LEP 2012. Whilst these items provide evidence of previous use of the area, none of these items are considered to be of high heritage significance.

QR National is committed to interpreting as much of the site's history as possible within the parameters of modern needs. This has been demonstrated by QR National's commitment to mitigation which includes; salvage of undamaged bricks from the control cabin for reuse and the provision of a plaque on site providing details of the site's history, and a Construction Non-Indigenous Management Plan. Also, the appointment of an Excavation Director and excavation of relics may be undertaken where appropriate.

In heritage terms, the site has been found to be suitable for the proposed TSF. For over 130 years the site has been associated with the coal and rail industries. These associations will be preserved by the revival of the site's previous use (industrial uses) being the transportation of coal.

Noise and Vibration

Operational noise levels from the proposed TSF are predicted to meet the project specific noise criteria at all receiver locations under prevailing weather conditions. The acoustic report determines that the number of traffic movements associated with the proposed development is insignificant in acoustic terms and that compliance with the NSW Road Noise Policy (RNP) is predicted to be met.

Construction noise levels are predicted to be below the relevant guidelines at the closest residential receivers. The additional traffic associated with construction activity will result in a negligible change to the existing road traffic noise level generated on the New England Highway and therefore are predicted to meet the requirements of the RNP.

With regard to vibration, the distance between both construction and operational sources will mean that the proposal is below the criteria for risk of cosmetic damage to residential and commercial properties.

Air Quality

A number of potential sensitive receptors surrounding the proposed TSF site have been identified, in particular, residents of the Hexham and Tarro areas. The closest sensitive receptors are located in the Hexham area adjacent to the western boundary of the site, to the north of the site, and in Woodlands Close, Clark Street and Old Maitland Road.

In undertaking an Air Quality Assessment, estimates of background concentrations of criteria pollutants were derived from the Beresfield monitoring site for 2011, with the exception of carbon monoxide for which the Newcastle data set was used. ARTC HRR modelling results at sensitive receptor locations have also been considered in assessing operation and construction activities relating to the proposed TSF.

The Air Quality Assessment has considered both operational and construction activities relating to the proposed project and a range of air pollutants has been considered including nitrogen dioxide, carbon monoxide, sulphur dioxide, and particulate matter. Air toxics associated with fuel storage and diesel exhaust from locomotives has also been considered.

Dust generated in association with construction and impacts of nitrogen dioxide from diesel locomotive exhaust emissions are the most significant sources of air pollutants associated with the proposed TSF project.

Operation of the TSF is expected to have a minimal impact on air quality at the location of the sensitive receptors. The cumulative impact of the TSF and adjacent ARTC operations are also expected to have a minimal impact on air quality at the location of the sensitive receptors.

Impacts from dust emissions during construction will be minimised through the implementation of industry accepted best practice dust mitigation measures addressed within this EA. The low volume of trains using the TSF suggests that diesel exhaust emissions associated with onsite activities are unlikely to have a significant impact on local air quality.

Greenhouse Gas Emissions

The greenhouse gas (GHG) emissions associated with the proposed TSF have been assessed in terms of potential direct emission (Scope 1), potential indirect emission (Scope 2) and potential significant upstream/downstream emission (Scope 3). A GHG Assessment has been undertaken to consider the predicted impact of the proposed TSF in comparison to that currently experienced as a result of the current QR National operations at KCT. The construction of the TSF is short term in nature and it is anticipated that GHG emissions during the operation of the facility will be higher than those generated during construction. Therefore, the assessment of the construction of the TSF has not been considered in detail within the GHG Assessment.

The GHG Assessment has found that the principal source of GHG emissions during the operational phase of the proposed TSF is the onsite usage of diesel, however when compared to NSW and Australian emissions totals, the increase associated with the proposed TSF is not considered significant.

Comment on the EA for the Hexham TSF

Comments on any aspect of the proposed TSF or this EA document can be made by making a written submission to Department of Planning and Infrastructures (DP&I) during the exhibition period. The submissions will be treated as public documents unless confidentiality is requested.

The EA can be downloaded from the NSW Department of Planning and Infrastructure's website http://www.planning.nsw.gov.au or viewed at its offices at 23-33 Bridge St, Sydney. Copies would also be available in the Newcastle Council office and library.

The address for written submissions is:

> *Train Support Facility - Hexham Redevelopment Project (MP 07_0171)*
> *Department of Planning and Infrastructure*
> *GPO Box 39, SYDNEY NSW 2001*

Submissions can also be made online through the DP&I's website.

Next Steps

Following exhibition of the EA, the issues raised in submissions will be considered and addressed by QR National. A Preferred Project Report (if required) may be completed to address any changes to the proposal.

In order to proceed with approval for the proposed TSF, the EA Submissions Report and Preferred Project Report (where necessary) would be submitted to DP&I for assessment. DP&I would examine the information provided and prepare an assessment report for the Minister for Planning and Infrastructure.

The Minister for Planning and Infrastructure would then determine the proposed TSF application. If approved, conditions of approval would be set to outline necessary control measures based on the Statement of Commitments addressed within this EA.

It is anticipated that the community and project stakeholders would continue to be engaged/consulted throughout the detailed design and construction phases of the project.

2.0 Introduction

2.1 OVERVIEW

QR National is seeking planning approval to construct and operate the TSF and associated infrastructure at Hexham, NSW. The proposed TSF is located approximately 16km north west of Newcastle CBD.

QR National is the largest rail freight company in Australia and was formerly owned by the Queensland Government. It was created as an independent company on 1 July 2010 when transport and logistics company QR Limited was split into two companies. Queensland Rail is responsible for the state's passenger operations, regional track and support services, and remains owned by the Queensland Government. QR National owns the balance of the QR business – above-rail coal and freight services, the export coal network in Queensland and rollingstock manufacturing and track maintenance services. QR National was privatised by the Government through an initial public offering and the company was listed on the Australian Securities Exchange (ASX) on 22 November 2010.

The Port of Newcastle is the world's largest export coal port. The efficient, economic and safe transport of coal to the Port cannot be underestimated in terms of its contribution to the region as well as the NSW and Australian economies.

In order to ensure that QR National is able to continue to contribute to improving efficiency in the HVCC it is imperative that the proposed TSF is established as soon as practical. The current arrangement for the servicing of trains within the Newcastle Port itself is not sustainable in the long term.

Given the significance of the proposed development the Minister for Planning determined on 30 September 2007 that a State Significant Site Study should be prepared and that the project was a Major Project to be determined under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). On 30 November 2007 notice was given that the project proposal had been received and the site was declared as a potential state significant site within the SEPP (Major Projects) 2005, Schedule 3 Sites of State Significance.

In 2011 the State Government repealed Part 3A of EP&A Act, made amendments to SEPP (Major Development) 2005 and introduced SEPP (State & Regional Development) 2011. Given that the project application for the proposed TSF at Hexham was submitted prior to these changes and noting the relevant transitional provisions contained within EP&A Act, the proposal will be considered as a transitional Part 3A project.

This EA addresses the DGR's issued on 22 March 2010 (superseding those of 13 February 2008) and in particular considers the full range of environmental, statutory and socio- economic implications of the proposed TSF, allowing an informed decision to be made about the project. Appendix A contains a schedule of the requirements and notes where they are addressed in this EA.

2.2 THE PROPONENT - QR NATIONAL

The QR National brand was established in the 2004/2005 financial year when QR National's three freight business streams – coal, bulk and containerised services, were brought under one banner. It was formed with the charter to operate freight services in Queensland and around Australia.

QR National is a $3b a year business, and is Australia's largest rail freight operator.

QR National currently operates 11 train sets in NSW; the fleet consists of 31 locomotives (5000 class) and 900 QHAH coal wagons. QR National anticipates significant expansion of the fleet over the next 5 years.

QR National Mission Statement

We will create value through delivering responsive, innovative, rail-based solutions for our customers and stakeholders.

QR National Goals

QR National's goals are the key strategic outcomes that to be achieved over the next five years:

- Our shareholders value QR National as a sound commercial investment.
- QR National is recognised as a national leader in transport solutions with global reach.
- QR National's people are recognised for service excellence.
- Customers are able to achieve their sustainability outcomes (social, safety and environment) through the use of QR National's services and products.

QR National & Sustainability

QR National is committed to integrating sustainability thinking and actions into all aspects of the business.

> *QR National's model for a sustainable future is based on leading and learning; and the three pillars of sustainable development are steadily addressed in a converging journey of cultural reform, innovation and learning. This approach is a new paradigm compared with traditional approaches to corporate sustainability thinking (focussed on managing three parallel streams of economic, environmental and social performance associated with the business).*

Social Sustainability

> *Community consultation gives people a say in the future of their community. QR National undertakes extensive community engagement before any proposed rail developments, and outlines the costs and benefits to the community. Feedback, ongoing consultation and negotiation with communities ensure that QR National continually improves its service and provides value to customers and shareholders.*

Environmental Sustainability

> *Corporate environmental responsibility means engaging in management practices that safeguard for future generations both the ecosystems and natural resources which may be affected by QR National's operations.*
>
> *QR National is committed to ensuring that rail remains Australia's most environmentally sound method of large scale transportation. Our aim is to protect and conserve the environment and move beyond just meeting regulatory requirements. QR National strives to be an innovator and early adopter of effective solutions for strategic and operational environmental management issues.*
>
> *QR National is involved directly and indirectly in a varied range of large and small activities. Our key focus in the coming year will be to further progress management activity and associated programs involving natural systems and resource protection, environmental impact minimisation and environmental management processes.*

Economic Sustainability

> *QR National's commitment to creating value for shareholders is one reason it is a strong organisation that has endured 141 years of operations and continues to grow in size and scope. QR National is a major force in the transport industry and has undergone fundamental changes over the past few years to ensure it is in a position to tackle the challenges and take advantage of the opportunities that come with a competitive, national market.*

2.3 THE PROJECT

QR National is seeking planning approval to construct and operate the TSF and associated infrastructure at Hexham, NSW. Key components of the proposed TSF include:

- Construction of new connections to the Mainline;
- Construction of 10 new train lines (tracks) and sidings parallel to the existing Mainline to accommodate QR National trains for provisioning, inspections, servicing and maintenance;
- Buildings for the provisioning of QR National locomotives and the maintenance of rollingstock;
- A bulk fuel storage area with capacity for up to 400,000L of diesel fuel;
- Construction of an intersection and a new vehicular access road from the Tarro Interchange;
- Approximately 380,000m^3 of earthworks (imported fill) for the construction of the railway formation, access road, drainage and building foundations;
- Construction of internal vehicular access roads; and
- The protection of the Jemena 500mm gas pipeline.

The estimated cost of the project is $130m and is planned to be constructed in two stages over approximately 24 months. The proposed TSF is a major investment for the region and will provide significant flow on benefits.

2.4 PROJECT BACKGROUND

As part of QR National's decision to enter the NSW market it began site investigation for this project in 1998.

Some 54 sites in total were considered and detailed due diligence has been completed in relation to seven of them. QR National is confident that the subject site is the most suitable particularly having regard to the following:

- Site location relative to customers;
- Site location relative to the Port of Newcastle;
- Site location relative to existing rail infrastructure;
- Access to a skilled labour force;
- The flat topography and quantum of land available;
- Manageable site constraints; and
- The regional importance of the site under the LHRS.

Upon being convinced of the Hexham site's ability to cater for the company's needs QR National began the process of seeking planning approval. This process is outlined in Section 2.8 Environmental Assessment Process.

2.5 STATE STRATEGIC IMPORTANCE

ARTC is encouraging 'above rail operators', including QR National, to re-establish their current train provisioning facilities outside of the ports to minimise rail congestion on the approach to the dump stations. ARTC documented these requirements in the 2012-2021 Hunter Valley Corridor Capacity Strategy. This project by QR National responds in part to the ARTC strategy.

The TSF will play an important part in improvements to the HVCC network. A letter from the Hunter Valley Coal Chain Coordinator (HVCCC) in support of QR National's TSF application is supplied in Appendix T.

Newcastle is presently the largest coal exporting harbour in the world, exporting over 97Mt of coal in 2009–10 with plans to expand annual capacity to 180Mt by 2013. Mining of black coal is one of Australia's most important industries, creating significant employment in regional Australia, fuel for low-cost electricity generation and steel-making, and vital export income. Australia is the world's biggest coal exporter, and black coal is Australia's largest export, worth more than $A50b in 2008-09.

The TSF initiative is part of the process of continuous improvements associated within the HVCC network. The proposed QR National TSF will ultimately result in improved efficiency in the transport of coal to market. The removal of existing QR National rail facilities from the Port will improve the efficiency of coal loading operations at KCT. The proposed TSF will allow for trains to be maintained and serviced away from the Port operations alleviating the congestion of trains queuing on the Mainline before entering the KCT.

The proposed TSF will cost in the order of $130m to construct. This is a significant investment for the region and will provide significant flow on benefits to all sectors of the community.

The proposal is consistent with overall State planning objectives, with the site being strategically identified for employment outcomes under the LHRS. The proposal is also consistent with the NSW 2021 Plan, promoting investment and in particular promoting investment in regional NSW whilst at the same time ensuring environmental outcomes are achieved.

The site location is ideally suited to the proposed development, located close to the Port of Newcastle, mining in the Hunter Valley and being located immediately adjacent to the existing rail network.

The proposed development will have minor environmental impact and will result in a number of environmental improvements. The proposal represents an opportunity to remediate contamination on site that without a development outcome would remain in-situ. Similarly, it is expected that existing water quality entering the adjoining wetlands will improve as a result of the proposed development.

2.6 THE ARTC HEXHAM RELIEF ROADS PROJECT

The ARTC HRR includes the construction of five new relief roads (tracks) next to existing track at the Pacific Highway and Hexham Railway Station, NSW. The project site is located between the proposed QR National TSF site and the GNR at Hexham. The ARTC has lodged a development application (DA) with the DP&I for the construction of the five relief roads. The purpose of the project is to relieve coal network congestion by allowing coal trains to be temporarily held off the main tracks dedicated to coal trains.

The ARTC project falls within category of State Significant Infrastructure and is being assessed under Part 5.1 of the EP&A Act. QR National and ARTC are working cooperatively in the design, assessment and approvals phases of the two projects. It is anticipated the construction works associated with the two projects will be undertaken concurrently.

2.7 THE QR NATIONAL / ARTC PROJECTS INTERFACE

ARTC and QR National have jointly prepared a Project Interface document to assist with the coordination of the TSF and the HRR projects. The document addresses key issues requiring the coordination of future works and will be a precursor to a 'Heads of Agreement' which will formalise the actions and responsibilities of both parties.

The Project Interface document addresses the following:

- Rail Interface Agreement: This agreement will provide modelling to prove the viability of connecting the TSF with the ARTC network.
- Site Access and Internal Roads: RMS has noted that both projects should share a common site access, preferably off the Tarro Interchange.
- Third Party Right of Carriageway: A third party right of carriageway crosses both the ARTC Lease area and QR National land. Agreement from the third party is required to relocate this access.
- Jemena Gas Mains: Jemena's approval is required for protection works associated with a 500mm gas main supplying Newcastle and the Hunter Valley.

- Property Acquisition: ARTC needs to purchase land from QR National to build the HRR and vice versa for QR National to build the TSF.
- Services Relocations: Possible services relocation or protection common to both projects includes; 33kV power, Optus fibre optic cable, HWC trunk mains, Jemena Gas pipelines & Brancourts' effluent line.
- Mitigation Offset Areas: Both projects are required to provide environmental offsets. An opportunity exists for ARTC and QR National to manage this process jointly and utilise offset areas already within the QR National land holding.
- Cumulative Impacts: Cumulative impacts arising from both developments need to be addressed in the respective environmental submissions.
- EPBC Referral: ARTC and QR National made a joint presentation to SEWPAC. EPBC referrals for both projects were submitted in February 2012. Both projects have been assessed as non-controlled actions.
- Signalling Design: Signalling design for the HRR does not currently include turnouts for the TSF. It may be beneficial for QR National to request ARTC to vary the scope within the HRR Project to include signalling enabling works to facilitate connection of the TSF.
- Construction Compounds: Ensure a coordinated approach to the EA and location of a construction compound(s) for both projects.
- Site Masterplan: The Masterplan is to incorporate both projects addressing drainage, services, access and internal traffic circulation.
- Consultation: Ensure a coordinated approach to consultation with State and Federal agencies, adjoining landholders and the community.

2.8 ENVIRONMENTAL ASSESSMENT PROCESS

This EA has been prepared in accordance with the EP&A Act 1979 (and Regulations) which provide a framework for environmental planning in NSW.

A Project Application was lodged in 2008 for the TSF as a major project under Part 3A of the EP&A Act. Part 3A applied to development types that are important and significant to the State of NSW as identified under SEPP (Major Development) 2005. At the same time a State Significant Site study was prepared and an amendment to SEPP (Major Development) 2005 was proposed to include the site as a State Significant Site.

In 2011 the State Government repealed Part 3A of the EP&A Act, introduced Transitional Part 3A arrangements, made amendments to SEPP Major Development and introduced SEPP (State & Regional Development) 2011. Given that the Project Application for the Hexham TSF was submitted prior to these changes and noting the relevant transitional provisions contained within the EP&A Act, the proposal is being lodged as a Part 3A project.

A Planning Focus Meeting was held on 16 January 2008. This, in conjunction with the Preliminary Planning Report, allowed the DP&I together with the various state agencies to determine the relevant DGRs.

Following the issue of the DGR, QR National initiated investigations and documentation for submission with the State Significant Site Study, Concept Plan and Project Application. The finalisation and lodgement of these documents was delayed and subsequently the DG issued an updated set of Requirements on 22 March 2010. These have been addressed through expert detailed investigations and copies of the consultants' reports are included as Appendices to this EA. Refer to the DGR compliance table provided in Appendix A.

It is noted that the DGRs refer to the project as:

> *"Hexham Redevelopment; Concept Plan (train support facility, intermodal terminal and industrial subdivision), and Project Application (train support facility)."*

QR National has decided to proceed only with the Project Application for the TSF.

Following exhibition of the EA, QR National will consider and provide a response to the issues raised in submissions. If required, a Preferred Project Report may be completed to address any changes to the proposal.

The EA Submissions Report and any Preferred Project Report would be submitted to the DP&I for assessment. The Department would examine the information provided and prepare an assessment report for the Minister for Planning and Infrastructure. The Minister for Planning and Infrastructure would then determine whether to grant approval to carry out the TSF project. If approved, conditions of approval would be set to outline necessary control measures.

2.9 STRUCTURE OF THE ENVIRONMENTAL ASSESSMENT

The purpose of this EA is to enable consideration of the implications of proceeding with the proposed TSF at Hexham. The EA has been prepared in accordance with the applicable legislative framework and industry standards, and in consultation with relevant government agencies and stakeholders.

The EA is structured as follows:

Section 1: Executive Summary

Provides an overarching summary of the proposed TSF.

Section 2: Introduction

Introduces the EA and provides an overview of the project background and its strategic importance, provides a summary of the key features of the project, an overview of the assessment and approvals process and a summary of the structure of the EA.

Section 3: Site Description

Provides a detailed description of the site including context, past and present land uses site conditions and context analysis.

Section 4: Strategic and Project Justification

Provides an overview of the strategic need and objectives for the proposed TSF in light of current planning strategies, and provides a summary of the economic benefits of the TSF and locational criteria.

Section 5: Alternative Sites

Provides an overview of the various site options considered for the TSF, the advantages and disadvantages of each and the assessment criteria.

Section 6: The Proposal

Provides a detailed overview of the proposed TSF and a discussion of the key design elements including a summary of the construction methodology, operation and maintenance activities.

Section 7: Planning and Related Statutory Provisions

Provides an overview of the relevant Regional, State and Commonwealth legislation including environmental planning instruments, and their application to the proposed TSF.

Section 8: Stakeholder Consultation

Provides an overview of the Stakeholder Engagement Plan, the consultation activities that have been undertaken and future consultation proposed.

Section 9: Assessment of Environmental Impacts

Provides an assessment of the existing environmental behaviour, potential environmental impacts and propose mitigation measures for minimising potential impacts, including an assessment of cumulative impacts.

Section 10: Ecologically Sustainable Development (ESD)

Provides an overview of the principles of ESD in regard to the proposed TSF and addresses GHG, climate change and sustainability.

Section 11: Hazard and Risk

Provides an overview of potential hazards and risks to the proposed TSF including dangerous goods, bushfire, flooding and contamination.

Section 12: Environmental Risk Analysis

Outlines the process and outcomes of the environmental risk analysis conducted for the proposed TSF.

Section 13: Draft Statement of Commitments

Presents the commitments identified by undertaking the EA.

Section 14: Conclusion

Provides the justification for the proposed TSF in relation to the objects of the EP&A Act, the DGRs and in the context of ESD.

Volumes 2 & 3: Appendices

The Appendices to the EA supplement the main document. Appendix A contains the DRGs for this EA and a table providing the location where the DGRs have been addressed within the EA. Appendices B & C provide details of the formal land titles and Appendices D – R contain the specialists' technical assessments which have been prepared to assess the key potential environmental impacts. Appendix S identifies the Amendment to SEPP Major Projects. Appendix T contains a letter of support for the project from the HVCC Network and SEWPAC correspondence is contained within Appendix U. Appendix V contains development plans for the proposed TSF.

3.0 Site Description

3.1 SITE IDENTIFICATION DETAILS

The following table contains the relevant land parcels and ownership details of the site:

Table 1: Relevant Land Parcels and Ownership Details.

Lot	Deposited Plan	Land Owner
101	DP1084709	K. Wallin
102	DP1084709	QR National
2	DP735456	QR National
10	DP735235	QR National
104	DP1084709	QR National
113	DP755232	QR National
1	DP155530	QR National
12	DP1075150	QR National
1	DP1062240	ARTC
311	DP583724	QR National
1	DP 128309	HWC

Lot 1 DP 1062240 identified in Table 1 is currently owned by ARTC. QR National seek to purchase part of this lot before construction would commence. A plan identifying the relevant Lot & DPs is located at Figure 2 and Appendix B.

Copies of the Certificates of Title & Deposited Plans are located at Appendix C.

3.2 SITE LOCATION & CONTEXT

The site comprises a 255ha parcel of land largely owned by QR National. The site, in its broader context, is identified in Figure 1.

The site is located approximately 16km from the Newcastle CBD and is located immediately on the west side of the New England Highway, the GNR and the Pacific Highway. The site is adjoined by lands used for rural activities and environmental conservation (including SEPP 14 Coastal Wetlands) further to the west and south. Land immediately to the south of the site is low lying with some areas filled.

The site is located in close proximity to the existing Hexham industrial area which is located on the east side of the Pacific Highway. The site is geographically well located relative to the Port of Newcastle, QR National's customer base being mines within the Hunter Valley as well as being located adjacent to the existing rail network.

Figure 1: Regional Context of the Hexham site.

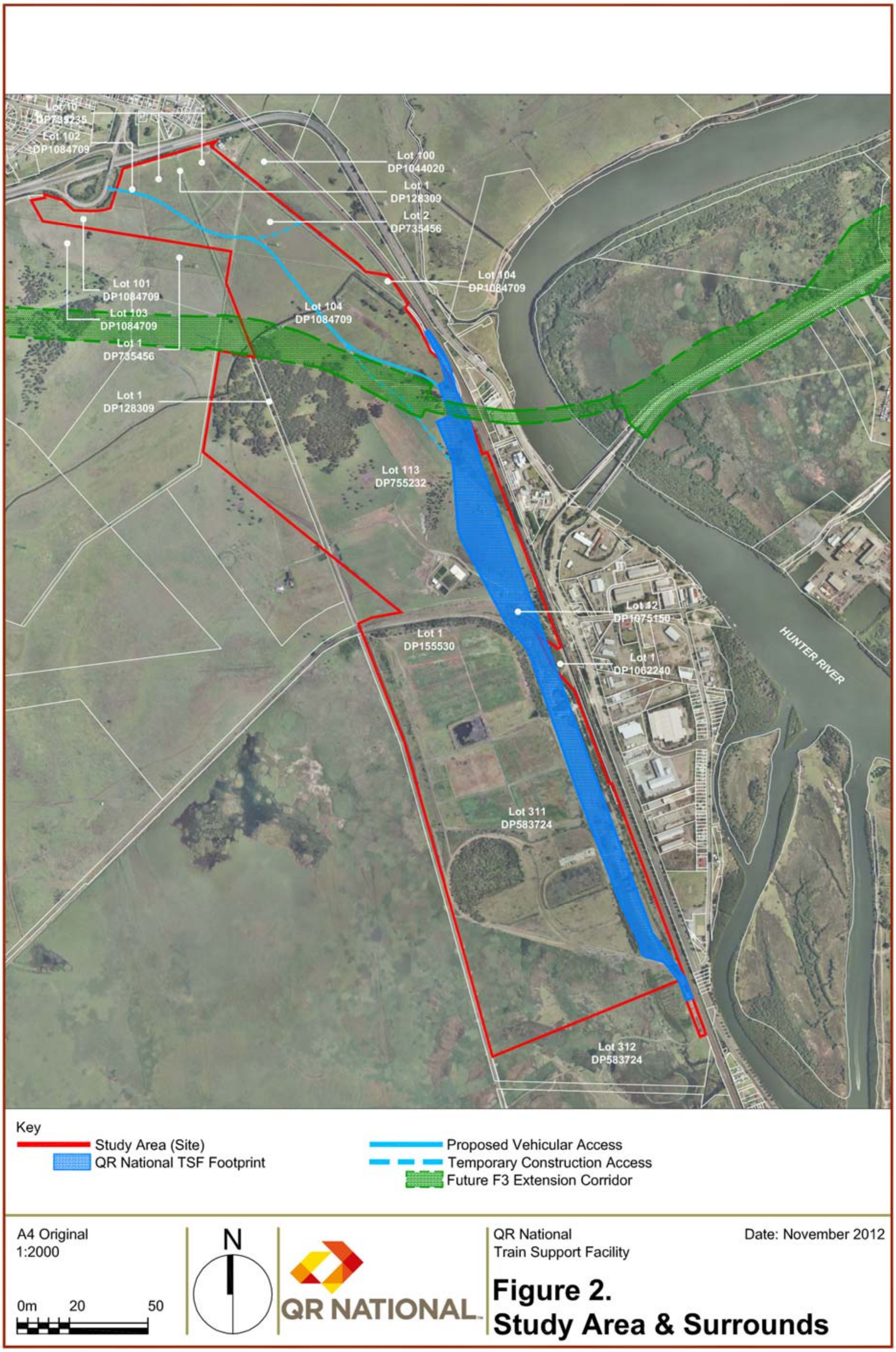


Figure 2: Study Area and Surrounds

The main QR National activities to be undertaken at the site will be separated from any key residential areas. The nearest residential areas are located north of the New England Highway at Tarro and Beresfield. A small number of dwellings are located within lands surrounding the site.

As illustrated in Figure 2, the corridor for the future F3 Freeway traverses the northern part of the site. Following discussions with RMS, road access from the Tarro Interchange to the TSF has taken into account the current design parameters of the Freeway. The F3 incorporates a flyover which will cross the TSF access road and tracks, adjoining infrastructure and the Hunter River. See Section 9.6 for further detail.

The HRR Project involves the construction of five new relief roads (tracks) on land abutting the TSF site. Figure 3 shows the location of the site for the proposed TSF and its proximity to the ARTC HRR Project. A detailed description of the proposed development and project components is contained within Section 6.

The conceptual Fassifern to Hexham rail link joins the Mainline in the vicinity of the TSF site. The TSF has been designed as to not hinder the development of this future Rail Link project. Further details are provided in Section 7.

3.3 EXISTING LAND USE & SITE IMPROVEMENTS

The existing and surrounding land uses are identified within Figure 4. The current zoning reflects the existing and previous land uses where the northern portion of the site is identified as agricultural land and the southern portion as industrial land due to past site disturbances.

Part of the site is used for grazing of cattle and part is unused industrial lands. A small part of the site contains wetlands one of which is comprised of SEPP 14 Coastal Wetlands.

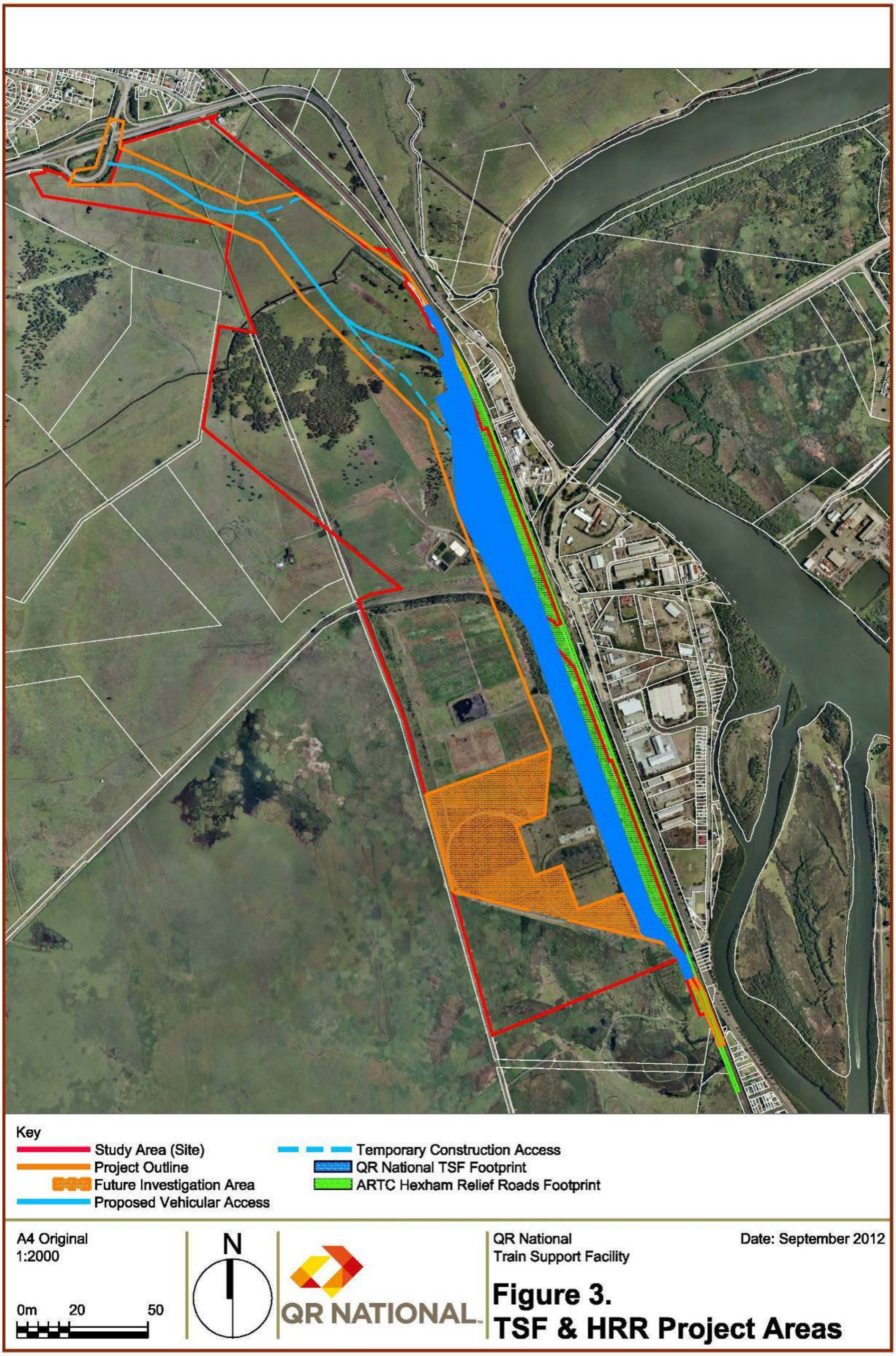


Figure 3: The Proposed QR National TSF & ARTC HRR Project Areas

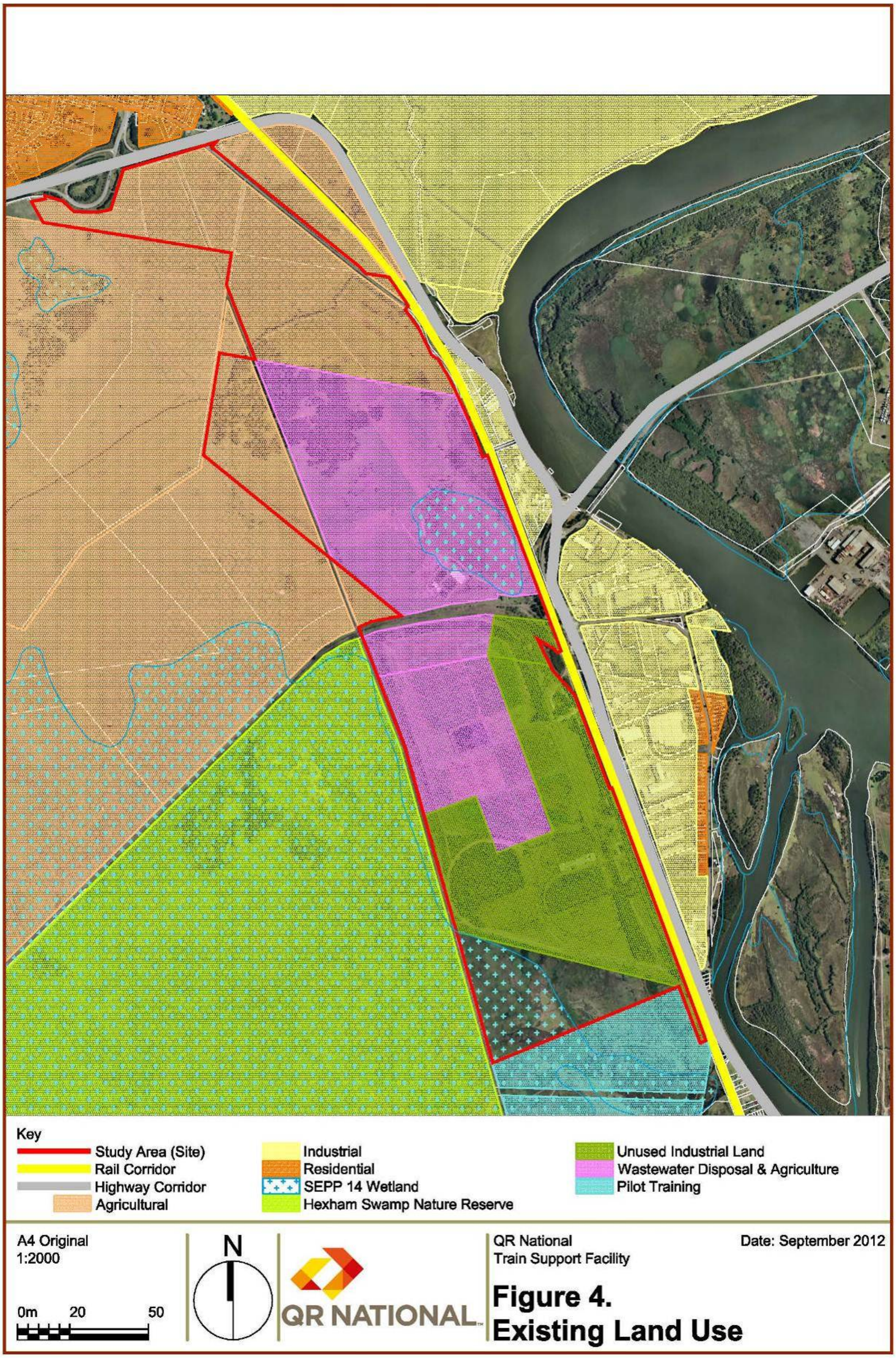


Figure 4: Existing Land Use

The southern part of the site contains in the order of 1.5 million tonnes of coal tailings and 1.8 million tonnes of chitter both commonly referred to as coal reject. This material remains from the previous operations on the site for coal storage washing and loading and unloading. The former use of the site is outlined in Section 3.4 under Site History.

Existing structures associated with the former use of the site have generally been removed, however a former bath house and control box/lunchroom remain. Some concrete footings associated with previous uses can be found on site.

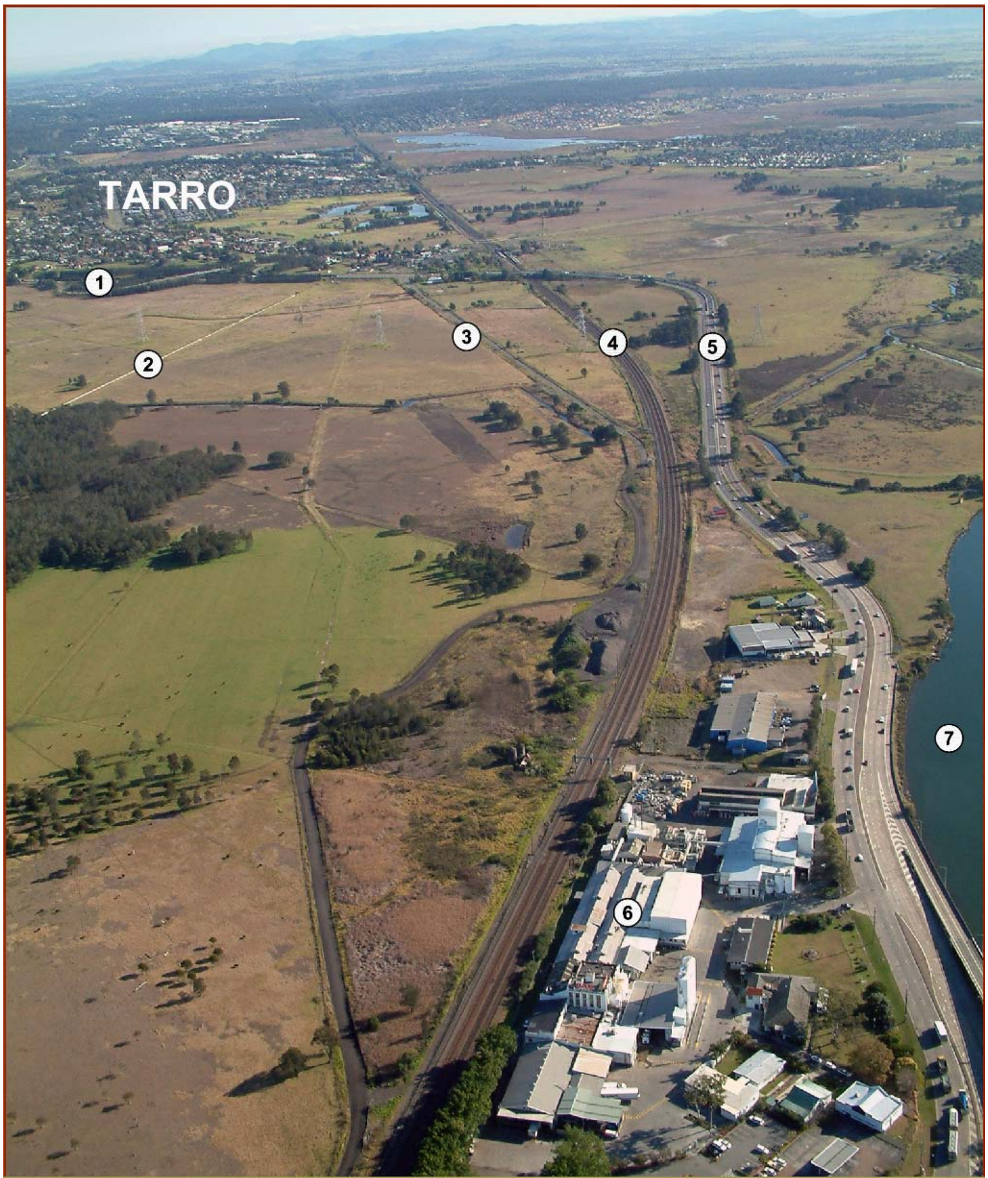
The Brancourts' facility is located adjacent the site on the Pacific Highway and comprises a factory for the production of dairy products. Brancourts operates a waste water treatment facility within the site. Parts of the site are irrigated with treated waste water for agricultural purposes. This process is the subject of a licence from the Environment Protection Authority (EPA).

On the following pages are photographs of the site and surrounds.

Key

(1) **Tarro Interchange**
(2) **New England Highway**
(3) **Woodlands Close**
(4) **Main Northern Railway**
(5) **Chichester Trunk Gravity Main**

Photograph 1: View of the northern part of the site as viewed from the south



Key

1. Tarro Interchange
2. Chichester Trunk Gravitation Main
3. Woodlands Close
4. Main Northern Railway
5. New England Highway
6. Brancourts
7. Hunter River

Photograph 2: The Site as viewed from the south

Key

1. Hexham Industrial Area
2. Maitland Road
3. Main Northern Railway
4. Hunter River
5. Brancourts Waste Treatment Facility
6. Former Richmond Vale Railway
7. Chichester Trunk Gravitation Main
8. Former Balloon Loop
9. Port of Newcastle

Photograph 3: Southern Portion of the site as viewed from the north

Key

1. Hexham Industrial Area
2. Maitland Road
3. Hunter River
4. Pacific Highway (Hexham Bridge)
5. Brancourts Waste Treatment Facility
6. Former Bath House & Control Box
7. Former Richmond Vale Railway
8. Chichester Trunk Gravitation Main
9. Former Balloon Loop
10. Main Northern Railway

Photograph 4: Southern part of the site as viewed from the east

Key

(1) Hexham Industrial Area	(6) Former Bath House & Control Box
(2) Maitland Road	(7) Former Richmond Vale Railway
(3) Hunter River	(8) Chichester Trunk Gravitation Main
(4) Pacific Highway (Hexham Bridge)	(9) Tomago Aluminum
(5) Brancourts Waste Treatment Facility	(10) Main Northern Railway

Photograph 5: Southern part of the site as viewed from the west

Key

(1) Hexham Industrial Area	(6) Brancourts Waste Treatment Facility
(2) Maitland Road	(7) Former Richmond Vale Railway
(3) Hunter River	(8) Chichester Trunk Gravitation Main
(4) Pacific Highway (Hexham Bridge)	(9) Former Balloon Loop
(5) Main Northern Railway	

Photograph 6: Southern part of the site as viewed from the south

Photograph 7: Former bathhouse and control box/lunchroom

Photograph 8: Brancourts' waste water treatment facility

3.4 SITE HISTORY

The following provides a general summary of the history of the site since European settlement. A detailed overview of the site history is contained in the Heritage Impact Assessment prepared by EJE and attached as Appendix D. Reference should also be made to Section 9.13 of this EA which contains specific environmental impacts associated with current and proposed land use activities. The northern part of the site has a history of agricultural use while the southern part of the site is predominantly associated with rail activity and coal storage, preparation and loading and unloading.

1830's - The subject site was mostly used for agricultural and dairying purposes.

1850's - The site was first utilised for storage and loading of coal.

1857 - John Eales constructed a railway to carry coal from the Mines at Minmi to loading at Hexham.

1859 - JA Brown purchases the site and will become Australia's largest coal producer.

1927 - Part of the site becomes the headquarters for the Hunter Valley Co-Operative Dairy Company to become known as the Oak.

1930's - Coal preparation was commenced on site and this included the construction of a coal washery in 1955. Photograph 9 identifies the extent of coal operations on the south part of the site in 1977. The site maintained this scale of operation up until its closure in 1987.

1955 - Oak Milk Bar was opened.

1987 - Last Coal delivery to the site and coal washery ceases operation.

1997 - Newcastle Rail Terminals purchased the site with plans to use the site to help alleviate coal transportation problems to the Port of Newcastle.

2001 - Investigations undertaken regarding the establishment of a coal terminal at the Hexham site.

2003 - Coal tailings site rezoned to 4(b) Port and Industry under *Newcastle City Council Local Environmental Plan 2003* (Newcastle LEP2003).

2005 - Investigations undertaken to determine if coal tailings could be used in power stations.

2006 - QR National purchases the site.

2006 - Minister for Planning gives notice of receipt of a project application and designates the Hexham Redevelopment site as a potential State Significant Site.

2007 - Minister for Planning gives notice of receipt of a project application and amends SEPP (Major Projects) 2005 to include the Hexham Redevelopment site as a potential State Significant Site.

2008 - State Significant Site Study Requirements and DGRs were released for the Hexham Redevelopment Project.

2010 - Revised State Significant Site Study Requirements and DGRs were issued for the Hexham Redevelopment Project.

2011 - Coal tailings site rezoned to IN3 Heavy Industry under Newcastle City Council draft LEP 2011.

2011 - ARTC submit a project application for the HRR Project.

Photograph 9: Former coal operations 1977

3.5 TOPOGRAPHY

The natural topography of the site and surrounding locality is flat low lying land with elevations ranging between 0.2m AHD and 1.5m AHD. A significant portion of the southern part of the site still contains coal rejects from the site's previous use and this part of the site has elevations of up to 13m AHD. No reject will need to be moved offsite as a result of the proposed TSF.

A site survey showing the existing levels across the site is identified in Figure 5 below. The additional site survey information is contained within Appendix E. The extent of coal rejects can be identified from the levels on the southern part of the site.

A3 Original

0m 50 100 200

Scale 1: 5000 (A3)

KEY

- Study Area (Site)
- QR National TSF Footprint
- Cadastre
- Proposed Vehicular Access
- Temporary Construction Access

N

QR NATIONAL.

QR National
Train Support Facility

Date: November 2012

Figure 5. Sheet 1 of 2.
Existing Site Survey Plan

A3 Original

0m 50 100

Scale 1: 5000 (A3)

KEY

Study Area (Site)

QR National TSF Footprint

Cadastre

Proposed Vehicular Access

Temporary Construction Access

N

QR NATIONAL

QR National

Train Support Facility

Date: November 2012

Figure 5. Sheet 2 of 2
Existing Site Survey Plan

3.6 FLOODING

The Lower Hunter River has a long history of flooding with many reported instances of floodwaters overtopping the natural banks of the River and inundating the adjoining floodplain.

The site is located on the southern floodplain of the Hunter River at Hexham. At the 10% design storm event level, Hunter River floods overtop the New England Highway into the site. Run off from the Hexham Swamp catchment is considered only a minor flooding issue because overflows have outfall to Ironbark Creek to the south. There is a set of eight flood gates located on Ironbark Creek, near the confluence with the Hunter River South Arm. These gates control flows in and out of Hexham Swamp through Ironbark Creek for lower order flood events, but are overtopped for events above the 5% AEP.

The northern part of the site will not be developed other than to provide an access road to the proposed TSF from Tarro Interchange. The southern part of the site is to be developed for the TSF and ARTC HRR Project. Flood modelling by BMT WBM has established that the peak 100 year recurrence flood level is predicted to vary from 3.7mAHD at the northern end of the site to 3.5mAHD at the southern end of the site. BMT WBM categorise the site to be high hazard flood storage area.

The entire area of the existing development site, with the exception of a high portion of land at the south-western side, is predicted to be inundated during the 100 year Average Recurrence Interval (ARI) flood at depths in the order of 1 to 2 metres. The highest depths of floodwater on the site during the 100 year ARI flood are between 2 and 3 metres and occur in the north-east corner of the site within a slightly lowered drainage path just west of the bend in the River.

3.7 DRAINAGE

The existing drainage in the northern part of the site is to the north-west while the existing drainage for the south part of the site is to the south. Ultimately all water falling on the site will flow to the surrounding wetlands and Purgatory Creek. The Stormwater Management Plan (SWMP) prepared by Worley Parsons describes in greater detail the existing drainage regime and is attached as Appendix L.

Prior to European settlement of the Hexham area, the site formed part of the Hexham Swamp Estuarine wetlands. Over the past 150 years, anthropogenic alterations on both a local and regional scale have significantly altered the local and regional hydrodynamic regimes. The site has been impacted by coal stockpiling, infilling of wetlands, construction of tailings ponds and drainage swales and irrigation of waste water effluent. The resulting landform is considered highly disturbed.

It is recognised that the site and adjacent areas are located in an ecologically important environment in particular Hexham Swamp is recognised as a regionally important system. In addition to the ecological aspects, Hexham Swamp is also important for storage during major flooding events. The swamp is inundated by flows from the Hunter River during floods generally around the 10 year ARI.

The Hexham Swamp is also recognised as containing a number of EECs which have been taken into account in the preparation of the CEMP and EMP for the site.

The stormwater management objective for the site is to minimise the disturbance to the local and regional hydrologic regimes during low recurrence interval rainfall events. This will be achieved by identifying areas of the proposed development which could potentially produce significant surface water contamination. In addition stormwater controls are to be placed on the remainder of the site to minimise the impact on receiving waters and communities. Monitoring and contingency measures are to be established to allow for the containment of an accidental spill or major leak.

3.8 UTILITIES

Details of the major services and infrastructure and proposed measures for the provision of services are set out in the Services Investigation Report prepared by Worley Parsons (Appendix M). With regard to the principal services; the site is not sewered, water service and power is available adjacent to the site. An overview of the main elements are discussed below and illustrated in Figure 11 in Section 6.4.4.

Gas Mains:

A high pressure trunk gas transmission main, operated by Jemena, intersects the TSF site. The main is a 500mm diameter steel pipe operating at a pressure of 7MPa. It provides gas to Newcastle and the Hunter Valley. Potential impacts and protection measures, which may include a concrete cover slab supported on piles, will be addressed in consultation with Jemena during detailed design. Approval is sought within this EA for protection works of the 500mm gas main.

A secondary gas main, 350mm in diameter, runs along the western edge of Woodlands Close. This conveys gas to the Hunter Valley. The temporary construction compound abuts this main while the access road to the TSF is located to the west of the gas main.

Trunk Gravity Main Pipeline:

The Chichester Trunk Gravity Main (CTGM) pipeline operated by the HWC generally follows the western and southern boundaries of the TSF project area. The CTGM consists of a single 900mm pipeline, in 2011 the original above ground pipeline was removed and replaced with a new below ground structure.

The CTGM delivers water from the Dungog Treatment Plant to the Maitland and Cessnock systems as well as the Newcastle system. A 200mm branch line from CTGM supplies Hexham and crosses the TSF site south of the Brancourts' waste water treatment plant running parallel to the Jemena 500mm gas pipeline. As part of the detailed design, potential impacts on the pipeline would be addressed. If works are required, these would be undertaken as part of the proposed TSF in consultation with HWC. QR National is currently seeking approval from HWC with regard to water usage at the site.

Brancourts' Waste Water Treatment Plant and Effluent Pipeline:

The Brancourts' waste water treatment facility is located near the southern boundary of Lot 113. A pipeline runs north east from the plant to the Brancourts' dairy facility located on the eastern side of the New England Highway. The treatment plant will be unaffected by the TSF. The capacity of the pipeline to withstand construction and operational loads would be reviewed as part of the design and protection measures provided. The protection works for Brancourts are also sought under this approval.

Electricity Transmission Lines:

A high voltage electricity transmission line is located within the northern boundary of the project area. The TSF and access road will have no impact on this transmission line. Construction of the access road from the Tarro Interchange will require adjustment to a 33kV overhead line to provide adequate clearance under the line for vehicular traffic. This would be undertaken by Ausgrid under separate approval.

Optus Fibre Optic Cable:

As part of works to provide site access from the Tarro Interchange, protective works to the existing Optus fibre optic cable will be required to provide sufficient cover within the proposed road works. These works are to be carried out under a separate approval from Optus.

3.9 EASEMENTS

The site contains a significant number of easements, including rights of way, water supply, gas and transmission line. Easements are shown on the Site Survey included at Appendix E.

3.10 SITE AND CONTEXT ANALYSIS

The site is well located for QR National to access the existing rail network and relative to the Port of Newcastle and importantly QR National customer base in the Hunter Valley.

The character of the area is mixed with existing industry to the east and agricultural pursuits to the north and west together with wetlands to the south and west. The site is separated from any significant residential areas.

The site exhibits a number of constraints, in particular; flooding, access, geotechnical, contamination, and environmental. It will be necessary for these issues to be appropriately managed as part of the development. These issues are discussed at Section 9 of this EA.

4.0 Strategic and Project Justification

Servicing of QR National's trains is currently undertaken at UGL's Broadmeadow facility. Provisioning and inspection of the QR National fleet occurs on Kooragang Island within the KCT. In addition to the KCT, QR National also operates a number of remote fuelling facilities on mine loading loops within the Hunter Valley.

The need for the proposed TSF is driven by ARTC's encouragement to re-establish the current train provisioning facilities outside of the Port Terminals to minimise rail congestion. The proposed TSF will allow for trains to be maintained and serviced away from the Port operations, alleviating the congestion of trains queuing on the Mainline before entering the KCT.

QR National's objectives for the TSF at Hexham are to:

- Establish a single new site for statutory and routine maintenance and inspections of QR National locomotives and wagons;
- Establish a site for locomotives and wagons to be stabled and for the storage of spare parts and fuel;
- Assist with the alleviation of congestion in the HVCC network by removing existing fuelling and servicing facilities from Kooragang Island;
- Provide an appropriate level of facilities away from the Port of Newcastle to allow for more efficient use of the existing infrastructure;
- Provide a safe, clean and efficient working environment for QR National staff; and
- Ensure that environmentally sustainable design principles are applied to the project design.

There are numerous and significant reasons for the proposed TSF to proceed. These are addressed below.

4.1 NSW 2021

NSW 2021 is the State Government's 10 year plan to guide policy and budget decision making and to deliver on community priorities. It sets long term goals and targets, and outlines immediate actions to help to achieve the goals. The goals reflect the Government's commitment to state growth to improve opportunities and quality of life for people in regional and metropolitan NSW.

NSW 2021 is based around five (5) key strategies:

1. *Rebuild the economy – restore economic growth and establish NSW as the 'first place in Australia to do business'.*

   The proposed development in its entirety represents an opportunity for a significant number of positions to be created and a significant investment. The proposed TSF component of the project will cost in the order of $130m to construct.

The proposed TSF will create in the order of 30 permanent positions which will benefit the region. In addition to these predicted full time positions it is expected that additional flow on effects will create further employment, particularly during the construction phase of the development.

It will also stimulate significant and continued business investment with Newcastle and the Lower Hunter Region for an extended period of time.

2. *Return quality services – provide better transport, health, education, policing, justice and family services, with a focus on the customer.*

   The proposed TSF is consistent with this strategy given that it will facilitate an increase of efficiency within the coal transportation chain.

3. *Renovate infrastructure – build the infrastructure that makes a difference to both our economy and people's lives.*

   The development will result in the relocation of fuelling and other provisioning and inspection activities currently located on Kooragang Island thereby reducing congestion and disruption within the terminal.

   The relocation of the activities will also provide for the more effective use of the available infrastructure on the Island and more efficient coal loading operations.

   Ultimately the infrastructure that supports coal transport and export capacity is of benefit to the broader community. Coal export makes a significant contribution to standard of living.

4. *Strengthen our local environment and communities – improve people's lives by protecting natural environments and building a strong sense of community.*

   The study area comprises disturbed lands, including evidence of widespread soil disturbance from excavation and filling, interspersed with revegetation and depressions.

   The project will have some impact on native vegetation and habitat however no threatened species or communities are considered likely to be significantly affected by the proposal. Furthermore a habitat for the Green and Golden Bell Frog is to be created.

   With the implementation of mitigation measures, the proposed development is considered to meet a no net loss outcome and is unlikely to result in significant impacts to threatened species, EEC's, migratory species or other Matters of NES pursuant to the EP&A Act and EPBC Act. In fact, with introduction of water quality measurements the proposal will improve the existing environment.

5. *Restore accountability to government – talk honestly with the community, return planning powers to the community and give people a say on decisions that affect them.*

   The proposed development will be publicly advertised to the community allowing comment to be made to the NSW DP&I in relation to the proposed development.

4.2 STATE AND REGIONAL SIGNIFICANCE

Australian Rail Track Corporation (ARTC) is encouraging "above rail operators", including QR National, to re-establish their current train provisioning facilities outside of the ports to minimising rail congestion on the approach to the dump stations. ARTC documented these requirements in the 2012-2021 Hunter Valley Corridor Capacity Strategy, this project by QR National responds in part to the ARTC strategy.

In this context the proposal is vitally important to the local, regional and national economies as it supports the efficient and competitive delivery of coal for export. Continuing strong world demand for coal is encouraging major investment across the entire coal chain; this includes the establishment of new mines, increasing investment in the rail system and initiatives to increase the coal export capacity of the Port.

4.2.1 The Coal Industry

Newcastle is presently the largest coal exporting harbour in the world, exporting over 97Mt of coal in 2009–10 with plans to expand annual capacity to 180Mt by 2013. Mining of black coal is one of Australia's most important industries, creating significant employment in regional Australia, fuel for low-cost electricity generation and steel-making, and vital export income. Australia is the world's biggest coal exporter, and black coal is Australia's largest export, worth more than $A50b in 2008-09. For additional detail relating to the coal industry's importance refer to Section 4.3 and Section 9.16 of this EA.

4.2.2 Hunter Valley Coal Chain

The TSF will play an important part in improving the HVCC network. The HVCCC has indicated support of QR National's TSF application.

The Hunter Valley coal industry is serviced by three coal loader terminals which are owned and operated by Port Waratah Coal Services (PWCS) and Newcastle Coal Infrastructure Group (NCIG). The terminals are:

- PWCS Carrington Coal Terminal;
- PWCS Kooragang Coal Terminal; and
- NCIG Coal Terminal, Kooragang Island.

Most of the track in and around the terminals is leased from ARTC and all train operations are controlled by ARTC.

The established operators, QR National and Pacific National were joined in 2011 by X-Rail, a joint venture between Xstrata and Freightliner, which will service a portion of the Xstrata task. Southern Shorthaul (SSR) has also entered the market hauling coal from Newstan to Newcastle and Port Kembla for Centennial Coal, while Qube Logistics (through its acquisition of Southern and Silverton) provides containerised coal haulage for a number of producers.

4.2.3 *Kooragang Island Terminal 4*

The development of T4 is being undertaken by PWCS which has been granted a lease of the remaining vacant land on Kooragang Island. The site for T4 sits immediately to the west of the existing PWCS facility and to the north of the NCIG rail facility. Getting an appropriate configuration for rail access into this facility is complex due to the constraints of current infrastructure and the environmentally sensitive areas around Kooragang Island.

The proposed TSF will support the growth of the HVCC by providing efficient refuelling and inspection facilities outside of the Newcastle Port Terminals.

4.2.4 *State Growth Objectives*

The proposed development is consistent with overall State planning objectives, with the site being strategically identified for employment outcomes under the LHRS.

NSW 2021 promotes investment and including investment in regional NSW whilst at the same time ensuring environmental outcomes are achieved. This strategy is consistent with the project objectives.

The proposed TSF is also consistent with the objectives and considerations of the LHRS, where the site is strategically identified for employment outcomes. The proposed TSF is also consistent with the following regional planning policies, which are further addressed within Section 7.2:

- State Infrastructure Strategy; and
- Lower Hunter Regional Strategy.

4.2.5 *Freight Hub Hunter Report*

The *Freight Hub Hunter Report* (Strategic Design & Development Pty Limited, Cox and Hyder 2008) was prepared to analyse economic demand and opportunities for a freight hub in the Hunter and associated activities in the context of regional, state and national development over 25 years (to 2031) in line with the Regional Strategy.

The report investigated long term prospects for intermodal freight to/from Newcastle and its potential to make use of an intermodal facility. The report concluded that while the movement of containers would be the primary catalyst for a major intermodal facility, there is also significant potential for general domestic freight to avail itself of the opportunity provided by such a facility to either transfer to rail or to more efficient line haul road transport. The report further concluded that under certain conditions a link from Fassifern to Hexham could be required to support the freight hub, this is further outlined within Section 7.2.3.

The proposed TSF would not obstruct the most recently considered alignments for the Fassifern to Hexham Rail Link and would not impact upon the viability of the proposed freight hub.

4.2.6 *Lower Hunter Transport Needs Study*

The *Lower Hunter Transport Needs Study* (Hyder Consulting Pty Ltd 2008) examined the long term transport needs for the Lower Hunter Region of NSW. The study considered population growth, settlement patterns, travel patterns and freight movements to determine the transport needs of the Lower Hunter Region and to provide a basis for identifying future infrastructure requirements and prioritizing projects. The study commenced in July 2008 and was completed in May 2009.

It is noted that the study relied on working documents of the *Freight Hub Hunter Report* discussed in Section 4.2.5 above. Of relevance to the proposed TSF is the inclusion of the Fassifern to Hexham Rail Link and freight hub discussed in both the report and the study. As discussed in Section 4.2.5, the proposed TSF Project would not obstruct the more recently considered alignments for the rail link and would not impact the viability of the proposed freight hub due to the proposed TSF being located parallel to the Mainline.

4.3 ECONOMIC BENEFITS

The development of the TSF will entail a significant investment for the region and provide extensive flow on benefits to the wider community. Estimates indicate the development of the QR National TSF at Hexham will:

- Contribute around $130m directly to the economy during construction. This will generate the equivalent of 727 job years directly in construction related activities;
- Based on ABS benchmarks, generate a further $118m of activity in production induced effects and $125m in consumption induced effects;
- Result in at least $373m of construction generated total economic activity;
- During construction generate at least 2,986 job years in the economy (direct and multiplier impacts);
- Provide around 30 full time and part time jobs on site after construction;
- Contribute in the order of $8.9m per annum to NSW Gross State Product brought about by wages paid to workers involved in the operation of the facility; and
- Provide strategic infrastructure to support the state's coal export sector which is a key driver of the Regional and State economy.

The TSF is important to local, regional and national economies as it supports the efficient and competitive delivery of coal for export. A continuing strong world demand for coal is encouraging major investment across the entire coal chain; this includes the establishment of new and existing mines, increasing investment in the rail system and initiatives to increase the coal export capacity of the Newcastle Port.

4.4 LOCATIONAL CRITERIA

The site location is ideally suited to the proposed development, located close to the Port of Newcastle, mining activities in the Hunter Valley and being located immediately adjacent to the existing rail network.

The proposed development of the site presents an opportunity to improve lands of strategic value adjoining Hexham Swamp National Park and the Hexham Swamp Nature Reserve. Proposed water quality controls, which are addressed in Section 9.4.3, will improve water flow quality to these adjoining lands.

The site is located away from substantial residential areas and in conjunction with appropriate controls will ensure that there are no unreasonable impacts to the surrounding area. This is confirmed through the environmental investigations provided in Section 9 of this EA.

There are only limited sites in the Hunter which have the locational attributes required for a TSF including flat land, length of site to cater for coal trains and separation from housing all within proximity of the existing rail network. QR National has spent a number of years looking for a site in the Hunter and many years consolidating land for the purpose. QR National is confident that the Hexham site is appropriate and represents a rare opportunity.

QR National began searching for appropriate sites in the Hunter in 1998. The main locational criteria for the site were:

- Good proximity the HVCC network via the GNR and the KCT;
- Availability of land with a relatively straight length of approximately 3.0km adjoining the existing rail network to allow adequate train access and egress at a suitable rolling speed;
- Relatively flat topography with minimal change in grade over the length of the site;
- Proximity to services and labour. The TSF requires multiple daily B-double fuel truck deliveries and the regular delivery of other train provisions. As such proximity to a major service centre with a high quality road access was essential;
- Minimising externalities associated with noise, dust and vibration. To avoid poor amenity outcomes for residential and other sensitive land uses it was essential that the site be located an appropriate distance from established urban areas;
- Minimising environmental impacts by utilising existing industrial or disturbed ecological areas; and
- Proximity to available labour within Newcastle and the Hunter Valley.

Additionally, it is important to note that environmental and economic considerations were taken into account in regards to the location of the TSF as addressed in Section 5.9.

5.0 Alternative Sites

QR National commissioned Engenicom to undertake a final Location Constraints Analysis review to confirm the preferred location in the Hunter Valley for the TSF. Some 54 sites were considered as part of the investigations with seven sites examined in detail.

The Hexham site is identified as the preferred location in these investigations. Further to the review of suitable sites a number of design investigations were also undertaken to achieve an optimal TSF layout at Hexham that met the QR National operational requirements, maximised economic benefit and minimised environmental impacts. An overview of the alternative sites is included below.

5.1 OPTION 1 – HEXHAM (Preferred)

The Hexham option has a frontage of 3.30kms adjoining the GNR at Hexham. This option has minimal site grading as the topography is relatively level however flooding is an issue. The site zoning is only partly compatible with the proposed facility.

Road access for the construction phase is difficult however the adjacent ARTC HRR Project provides opportunities for shared access.

This option facilitates operational flexibility in terms of the number of paths available from the coal terminals, its frontage to dedicated coal lines and proximity to the Newcastle coal terminals. QR National owns the area identified as the study area. Part of Lot 1 DP1062240 will be purchased from ARTC by QR National.

Advantages:

- The locality has had a long association with industrial activity (industrial zone) associated with coal processing and rail transport facilities;
- Excellent accessibility to the routes between the coal mines and the Port of Newcastle coal loading terminals;
- The site adjoins a 3km straight length of the Mainline;
- Flat topography and little vegetation cover;
- Separation from the main residential areas of Tarro and Hexham minimising potential issues associated with noise, dust and vibration;
- Close proximity to the Newcastle and Hunter Valley area workforce; and
- Direct access to the New England Highway for fuel deliveries.

Disadvantages:

- Will result in the partial loss of a SEPP 14 Coastal Wetlands area;
- Site is located within the Hunter River floodway area;
- Significant access works necessary to the Tarro Interchange;
- Potential Aboriginal cultural heritage issues to be addressed in the locality of the access road;
- Construction challenges including:
    - Major interface with the ARTC's HRR Project;
    - Potential for flooding of the site and the high water table;
    - Existing infrastructure including gas mains will require mitigation works; and
    - Soft ground and tidal conditions – poor bearing capacity of soil base.

5.2 OPTION 2 - RUTHERFORD

The Rutherford option has a frontage of 4.71km along the Down Main at Rutherford. This option has topography described as undulating and there are no issues with flooding. Currently zoning is not compatible with the proposed usage but the possibility of a rezoning exists in the future. A large number of road access options exist for the option especially via links with the future Hunter expressway. There are 18 landholders and 20 lots requiring acquisition.

Traffic volumes may require an upgrade at the New England Highway and Wollombi Road Intersection. Access of the New England Highway via Station Land utilises the existing turning lane, limiting impact on highway traffic. Access from the Hunter expressway along old North Road will also utilise the proposed turn-off thus avoiding any impact on traffic.

Advantages:

- Has the longest track frontage of the sites considered which improves access;
- Relatively close proximity to workforce; and
- Simple construction from a geotechnical perspective.

Disadvantages

- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes;
- Grades may make shunting difficult;
- Significant works necessary if Local Government access requirements are to be satisfied; and
- Does not provide QR National with the same amount of operational flexibility in the Live Run as Hexham;

5.3 OPTION 3 - ALLANDALE

The Allandale option has a frontage of 3.10km along the Down Main at Allandale. This option has topography which can be best described as hilly and there may be some issues associated with flash flooding due to a major gully running through the site. Site zoning is currently not compatible with the proposed usage but the possibility of a re-zoning exists in the future.

A large number of road access options exist, especially via links with the future Hunter Expressway. This option requires QR National's trains leaving the terminals for the facility to utilise planned paths. There are 14 landholders and 15 lots requiring acquisition. Constructability is flagged as being a major issue for this option due to the hilly topography.

Advantages:

- Relatively close proximity to workforce; and
- Simple construction from a geotechnical perspective.

Disadvantages:

- Major earthworks required;
- Does not provide QR National with the same amount of operational flexibility as Hexham;
- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes; and
- Grades may make shunting difficult.

5.4 OPTION 4 - BELFORD EAST

The Belford East option has a frontage of 3.33km along the Down Main at Belford. This option has topography which can best be described as undulating and there may be some issues associated with flash flooding due to a major gully running through the site. Site zoning is currently not fully compatible with the proposed usage but the possibility of a re-zoning exists in the future.

Only one road access option was identified from the New England Highway via Pothana Lane and a rail overbridge (recently upgraded). This option requires QR National trains leaving the terminals for the facility to utilise planned paths. There are two landholders and five lots requiring acquisition. Operability is flagged as a major issue for this option due to topography and the existing Mainline vertical and horizontal alignments.

Advantages

- Simple construction from a geotechnical perspective; and
- Relatively simple road access when compared with other options.

Disadvantages

- Major earthworks required;
- Does not provide QR National with the same amount of operational flexibility as Hexham;
- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes;
- Grades may make shunting difficult;
- Mainline track curvature makes the connection to the Mainline difficult; and
- Not in close proximity to workforce.

5.5 OPTION 5 - BELFORD WEST

The Belford West option has a frontage of 3.42km along the Down Main at Belford. This option has topography which best be described as undulating and there appears to be no issue with flooding. Site zoning is currently not fully compatible with the proposed usage but the possibility of a re-zoning exists in the future.

Only one road access option was identified from the New England Highway via Hermitage Road overbridge which has been upgraded as part of ARTC's Maitland to Minimbah 3rd Road Project. This option requires QR National trains leaving the terminals for the facility to utilise planned paths. There are nine landholders and 25 lots requiring acquisition. Operability is flagged as a major issue for this option due to topography and the existing Mainline vertical and horizontal alignments.

Advantages

- Simple construction from a geotechnical perspective.

Disadvantages

- Major earthworks required;
- Does not provide QR National with the same amount of operational flexibility in Hexham;
- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes;
- Grades may make shunting difficult;
- Mainline track curvature makes connection the Mainline difficult; and
- Not in close proximity to workforce.

5.6 OPTION 6 - WHITTINGHAM

The Whittingham option has a frontage of 3.00km along the Down Main at Whittingham. This option has topography which can be best described as flat and there may be some issues associated with flooding due the sites location on the Hunter River floodplain. Site zoning is currently not fully compatible with the proposed usage but the possibility of a re-zoning exists in the future.

Road access was identified as being from New England Highway via Range Road overbridge. This option requires QR National trains leaving the terminal for the facility to utilise the planned paths. There are six landholders with seven lots requiring acquisition. There is the possibility of a major structure across Muddies Creek being required.

Advantages

- Good road access; and
- Flat grade assists with shunting.

Disadvantages

- Major visual intrusion;
- Major structure requires to span Muddies Creek;
- Possible indigenous heritage issues around Muddies Creek;
- Construction on a floodplain may be problematic;
- Not within close proximity to workforce;
- Smallest track frontage of the options considered;
- In close proximity to Minimbah Bank (Whittingham Junction) which is the ruling grade for the network;
- Does not provide QR National with the same amount of operational flexibility in Hexham; and
- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes.

5.7 OPTION 7 - SINGLETON

The Singleton option has a frontage of 3.08km along the Down Main at Singleton. This option has topography which can be best described as flat and there may be some issues associated with flooding due the sites location on the Hunter River floodplain. Site zoning is currently not fully compatible with the proposed usage but the possibility of a re-zoning exists in the future.

Road access was identified as being from New England Highway via Golden Highway and Putty road. There may be some issues associated with route through a nearby residential area. This option requires QR National trains leaving the terminals for the facility to utilise planned paths. There are five landholders and 13 lots requiring acquisition. Environmental impact is flagged as a major issue with this option due to the nearby location of residential housing.

Advantages

- Flat grade assists with shunting.

Disadvantages

- Construction on a floodplain may be problematic.
- Not within close proximity to workforce.
- In close proximity to Minimbah Bank (Whittingham Junction) which is the ruling grade for the network;
- Does not provide QR National with same amount of operational flexibility in Hexham.
- Timing issues associated with property acquisition and environmental approvals may not allow for implementation in line with the required project timeframes.

5.8 OPTION – NOT PROCEEDING

The impact of not proceeding would result in ongoing congestion and disruption to Port activities associated with the maintenance, refuelling, provisioning and inspection activities of above rail operators such as QR National. This would limit the ability for QR National to meet growth/business targets. This would not contribute to the achievement of the 2011 – 2012 Hunter Valley Corridor Capacity Strategy, which seeks to improve the passage of coal trains through the Kooragang Coal Handling Facility. Overall, this would have a detrimental impact on the productivity of the Newcastle Terminals.

Not proceeding will result in an ideally located site that has been demonstrated to be suitable to facilitate the proposed TSF not being developed. This would eventually require a TSF to be developed on an alternate site in another location. Additionally, by not proceeding, the opportunity to maintain, service and provision trains away from the KCT would not be realised and would limit the servicing capabilities to a maximum of one train per day (as is the current situation).

5.9 ASSESSMENT CRITERIA

QR National used criteria that included strategic locality, accessibility; topography and logistical concerns as well as environmental, servicing and operational considerations to score the sites' suitability in order to select a preferred option. Following this, the Hexham option (the proposed TSF) was selected as the preferred option based on the following:

- The locality has had a long association with industrial activity associated with coal processing and rail transport facilities;
- Excellent accessibility to the routes between the coal mines and the Newcastle Terminals;
- The site adjoins a 3km straight length of the Mainline;
- Flat topography and little vegetation cover;
- Separation from the main residential areas of Tarro and Hexham minimising potential issues associated with noise, dust and vibration;

- Close proximity to the Newcastle area workforce; and
- Direct access to the New England Highway for fuel deliveries.

Additionally, of importance to the selection of the Hexham site are the environmental and economic considerations. These are outlined below.

5.9.1 Environment

- The proposed TSF location and design minimises impact on SEPP 14 Coastal Wetlands and EEC's;
- The impact has been limited to degraded SEPP 14;
- The design incorporates a limited footprint allowing for onsite offsets to be conserved in perpetuity;
- The design is located in a position to minimise any impacts or have no impacts on the Hexham Swamp Nature Reserve or the Hexham Swamp rehabilitation project; and
- The TSF footprint is located outside of existing coal tailings and located on land which was historically used for industrial, coal and rail use.

5.9.2 Economic

- Ideal design for the TSF to be located parallel to the Mainline to maximise entry and exit speed limiting any impacts to the Mainline operation;
- The design has been developed as to not limit future potential development of the site with regards to the freight hub and possible future rail links; and
- There are existing commercial arrangements for the current use of the site and the TSF footprint has been designed to coexist with these arrangements and thus allowing Brancourts operation to remain in-situ. Brancourts employ approximately 30 people.

6.0 The Proposal

6.1 INTRODUCTION

QR National currently hauls coal from the Hunter Valley to the Port of Newcastle. They have a secured and forecast growth that will increase train sets from 11 sets today (31 locomotives and 900 wagons) to 38 sets (96 locomotives and 2,856 wagons) by 2019. This will drive demand for additional train service capacity.

The increase in rollingstock will require new servicing and maintenance facilities. It is proposed to relocate the existing maintenance and provisioning operations on Kooragang Island to a site at Hexham, 16km northwest of the city of Newcastle. This also forms part of an overall strategy by ARTC and HVCCC to relieve congestion in and around the Newcastle Coal Terminals. Adjacent to the site at Hexham, ARTC are planning to construct the HRR Project to assist with relieving congestion within the HVCC.

QR National propose to develop a TSF on the site at Hexham to support its operations in the Hunter Valley.

6.2 THE PROJECT

The primary elements of the TSF project include:

- Construction of new connections to the GNR;
- Construction of 10 new train lines (tracks) parallel to the existing Mainline to accommodate QR National trains for provisioning, inspections, servicing and maintenance;
- Buildings for the provisioning of QR National locomotives and the maintenance of rollingstock;
- A bulk fuel storage area with capacity for up to 400,000L of diesel fuel;
- Construction of an intersection and a new access road from the Tarro Interchange;
- Civil earthworks of approximately 380,000m3 of import to fill for the construction of the railway formation, access road, drainage and building foundations;
- Construction of internal access roads; and
- The protection or diversion of existing utilities.

The estimated cost of the project is $130m and is planned to be constructed in two stages over approximately 24 months.

The building and track layout is identified within Figure 6 and 7. Detailed preliminary drawings of the proposed TSF are contained within Appendix V.

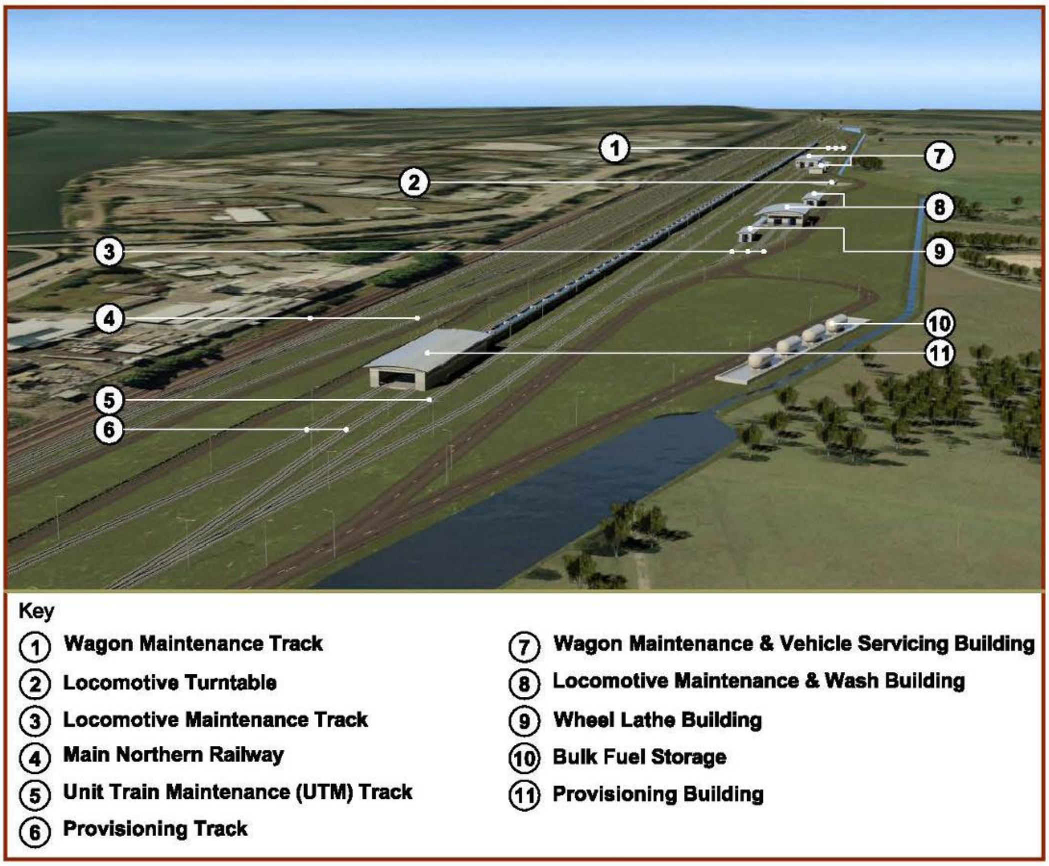


Figure 6: Building & Track Layout of Proposed Facility

6.3 PROPOSED OPERATION

6.3.1 Operational Components

The TSF will enable QR National's daily train running requirements and rollingstock maintenance needs to be undertaken in an efficient and cost effective method. The facility would provide QR National a service centre where:

- QR National trains can undergo statutory and routine maintenance inspections;
- Locomotives and wagons can be attached/detached to/from QR National trains;
- Locomotives can be provisioned (fuel, oil, water and sand) , inspected, serviced and maintained;
- Wagons can be inspected, serviced and maintained;
- Locomotives and wagons can be stabled; and
- Spare parts can be held for locomotives and wagons.

The TSF will be separated into three areas:

- Train provisioning and inspection;
- Wagon servicing and maintenance; and
- Locomotive servicing and maintenance.

These activities are described further in Section 6.3.2 below.

The facility is primarily designed to accommodate empty coal trains on their journey from the Newcastle Terminals to the mines. These trains will predominately enter and depart the facility in the down (north bound) direction only. A new crossover at the city end (south) of the TSF is proposed to enable locomotives and wagons requiring repair to return to Newcastle for major servicing and/or repairs.

6.3.2 Operational Activities

The TSF will allow QR National to improve train inspection, wagon maintenance and provisioning capabilities. The TSF will replace the existing fuelling facility at KCT.

The TSF will accommodate Hunter Valley trains up to 1550m in length and will provide full locomotive provisioning capability, including fuel, oil, water, sand, cab cleaning and light maintenance.

The building and track layout of the proposed TSF is identified in Figure 6. A schematic layout of the operation is identified within Figure 9.

The sequence of the proposed operation is outlined as follows:

- Trains will enter the QR National TSF from the city end only off the ARTC Down Coal at Hexham using a new turnout. Estimated turnout speed will be 45 km/h maximum;
- Trains that enter the site will be directed to provisioning or inspection:
    - Provisioning will occur on the provisioning tracks labelled as 6 (Figure 6), which run through the Provisioning Building. The provisioning process is addressed in Section 6.4.2;
    - Inspections of locomotives and wagons will be undertaken on the UTM tracks labelled as 5 (Figure 6). Locomotives or wagons requiring service of repairs will be removed (cut out) of the train and replaced with rollingstock on site. Further detail regarding servicing and repairs is detailed below.
- Locomotives or wagons requiring service will be shunted to the respective service area. Servicing will be undertaken as outlined in Section 6.4.2. Repaired locomotives and wagons will be held until required.
- Trains will be required at the TSF for up to 60 minutes for provisioning, crew change and the occasional locomotive change. Statutory inspections can take between 8 and 24 hours.
- A crossover will be provided between the Down Coal and the Up Coal to allow for the departure from the TSF city end for transfer of rollingstock to third party maintenance facilities at Carrington or Broadmeadow for major servicing or repairs.
- Access road at the northern end of the proposed TSF. There is no access from the Up Coal to admit loaded trains into the TSF.

The proposed TSF will not increase the number of train movements on the GNR.

Provisioning and Inspection

Full provisioning capabilities will be provided on two tracks, with light provisioning and inspection capabilities on the Unit Train Maintenance (UTM) track. Allowance is made for vehicular access between each track to facilitate the inspection process. Provisioning, inspections and unscheduled rollingstock maintenance on the provisioning and UTM tracks will be performed on a 24 hour, 7 days per week basis.

Provisioning includes:

- Replenishing locomotives with fuel, sand, water, oil and other consumables; and
- Cab preparation and cleaning.

Servicing & Maintenance

- Two custom designed buildings will be provided for rollingstock servicing, including a wagon maintenance building and a locomotive maintenance building. Both buildings will be equipped with overhead travelling cranes and the Locomotive maintenance shed will have a wash-down bay on the approach. The wagon maintenance facility will be capable of performing most of QR National's wagon maintenance requirements.

Wagon maintenance will be performed on a 2 shift, 5 days per week basis, between 06:00 and 22:00 hours, with hours of operation driven by demand. This could increase to a 7 day and 24 hour operation when and if required. Wagon maintenance activities will include:

- Replace break blocks;
- Replace wheels/wheel sets;
- Replace bogie containers; and
- Routine repairs.

The locomotive maintenance building will be capable of performing most of QR National's locomotive maintenance requirements. The following A, B and C service inspections will be carried out in this building:

- An "A" service will occur approximately every 122 days (4 monthly service/inspection) and will generally comprise of the following activities:
  - Inbound inspection, shunting, load testing, brake testing, oil change, filter change, locomotive wash, underframe inspection, inspection of all components, and an outbound inspection, load test and brake test.
- A "B" service will occur approximately every 366 days (yearly service) which comprises activities the same as the "A" Service plus:
  - Brake rack filter changes, alternator slip ring brushes changed, grease all blowers, alternator cab (traction motor & exhauster blower), clean and lubricate all compressor components, crankshaft thrust measurement, valve timing, grid blower brushes, engine torque checks, engine coalescer filter, gearcase oil changed, and wiper blades changed.

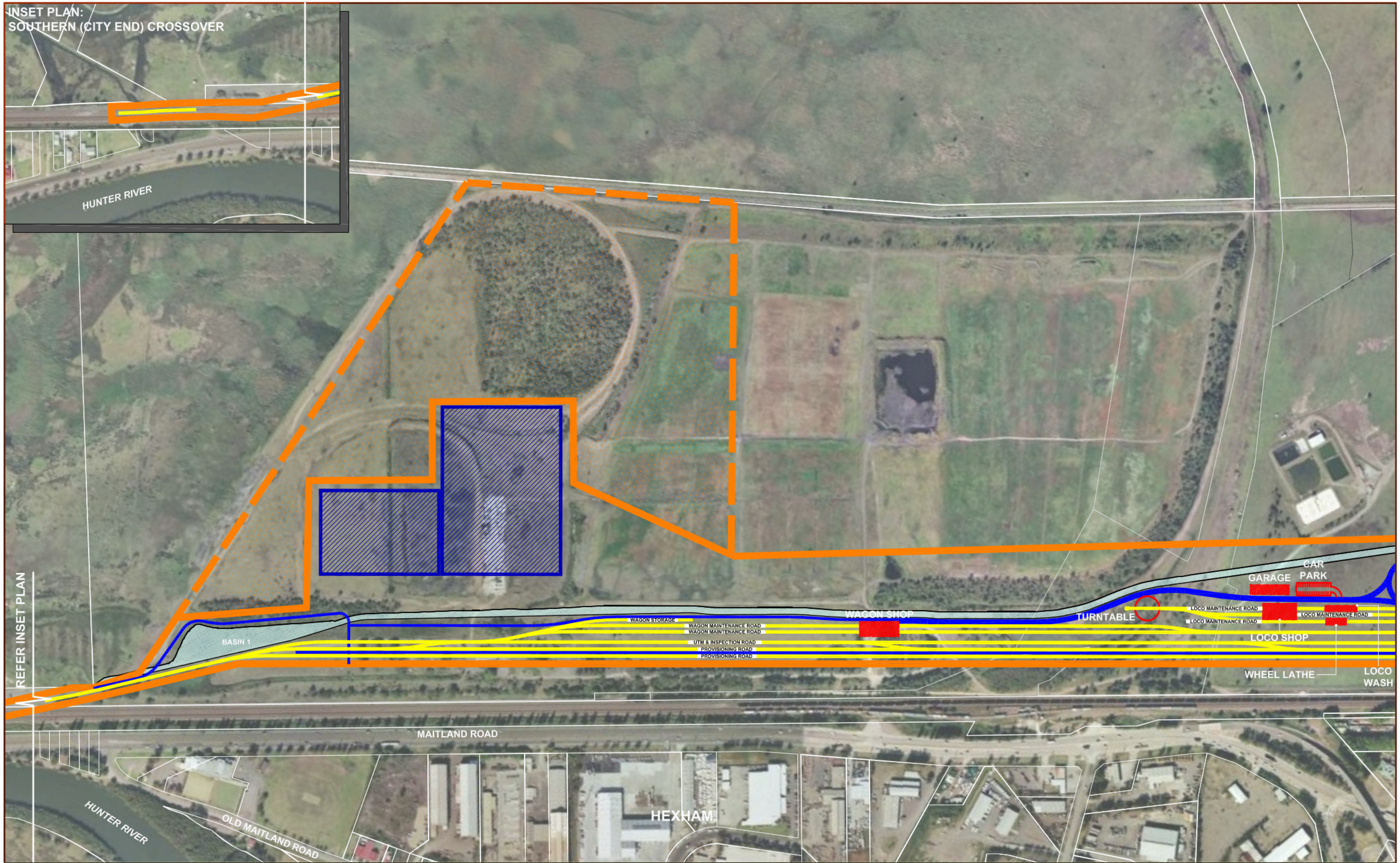
- A “C” service will occur approximately every 732 days (2 year service, that includes the same activities as for the “B” Service plus:
    - Clean auto drain valves and replace gaskets, replace radiator cap, replace compressor breather, check valve timing, replace air dryer desiccant and eye, high pressure fuel line removal and installation.

Locomotive and wagon maintenance will be performed on a 2 shift, 5 day per week basis between 06:00 and 22:00 hours, with hours of operation driven by demand. This could increase to a 7 day per week operation when and if required.

Both the wagon and locomotive maintenance operations will be subject to QR National’s Noise Management Practices.

It is envisaged that the operational staff will number approximately 30 in total and be dispersed over the shift times outlined above.

It is estimated that by 2014/15 provisioning and servicing is likely to occur at a frequency of approximately 12.5 trains per day which equates to 62.5 per week, 250 per month and over 3,000 per year based on a five day week operation. Due to an expected increase in the growth of the coal industry, the frequency is likely to increase to approximately 24 trains per day by 2020.



A3 Original

0m 50 100 200

Scale 1: 5000 (A3)

KEY
- Project Outline
- Future Investigation Area
- Cadastre
- Proposed Vehicular Access
- Temporary Construction Access
- Proposed Vehicular Circulation
- Proposed TSF Track
- Proposed TSF Buildings
- Proposed Drainage
- Effluent Irrigation Areas

N

QR NATIONAL

QR National
Train Support Facility

Date: September 2012

Figure 7. Sheet 1 of 2
Project Components Figure

A3 Original

0m 50 100 200

Scale 1: 5000 (A3)

KEY
- Project Outline
- Future Investigation Area
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- Proposed Vehicular Access
- Temporary Construction Access
- Proposed Vehicular Circulation
- Proposed TSF Track
- Proposed TSF Buildings
- Proposed Drainage

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QR NATIONAL

QR National
Train Support Facility

Date: September 2012

Figure 7. Sheet 2 of 2
Project Components Figure

6.4 LAYOUT AND DESIGN

There are four primary components associated with the proposed TSF project:

- Track & Signalling;
- Buildings & Infrastructure;
- Road Infrastructure; and
- Utilities.

These are described in further detail below.

6.4.1 Track & Signalling

Three options were considered for the track layout of the TSF, these being:

1. Parallel -Track located directly adjacent to the existing GNR;
2. Extended – large radius curves occupying full extent of site; and
3. Compressed – small radius curves occupying minimal extent of site.

These three options were developed once a number of site constraints were established, including:

- Extent of QR National land ownership;
- Existing site zoning;
- Extent of existing coal tailings stockpile;
- Interface with ARTC's HRR Project;
- Extent of SEPP14 Wetland; and
- ARTC entry/exit speed requirements.

Figure 8 illustrates the three layouts explored. The compressed option was designed to fit entirely within the IN3 heavy industry zone.

The economic and environmental considerations are detailed within Section 5.9. Additional detail relating to selection of the Hexham site is included within Section 5.

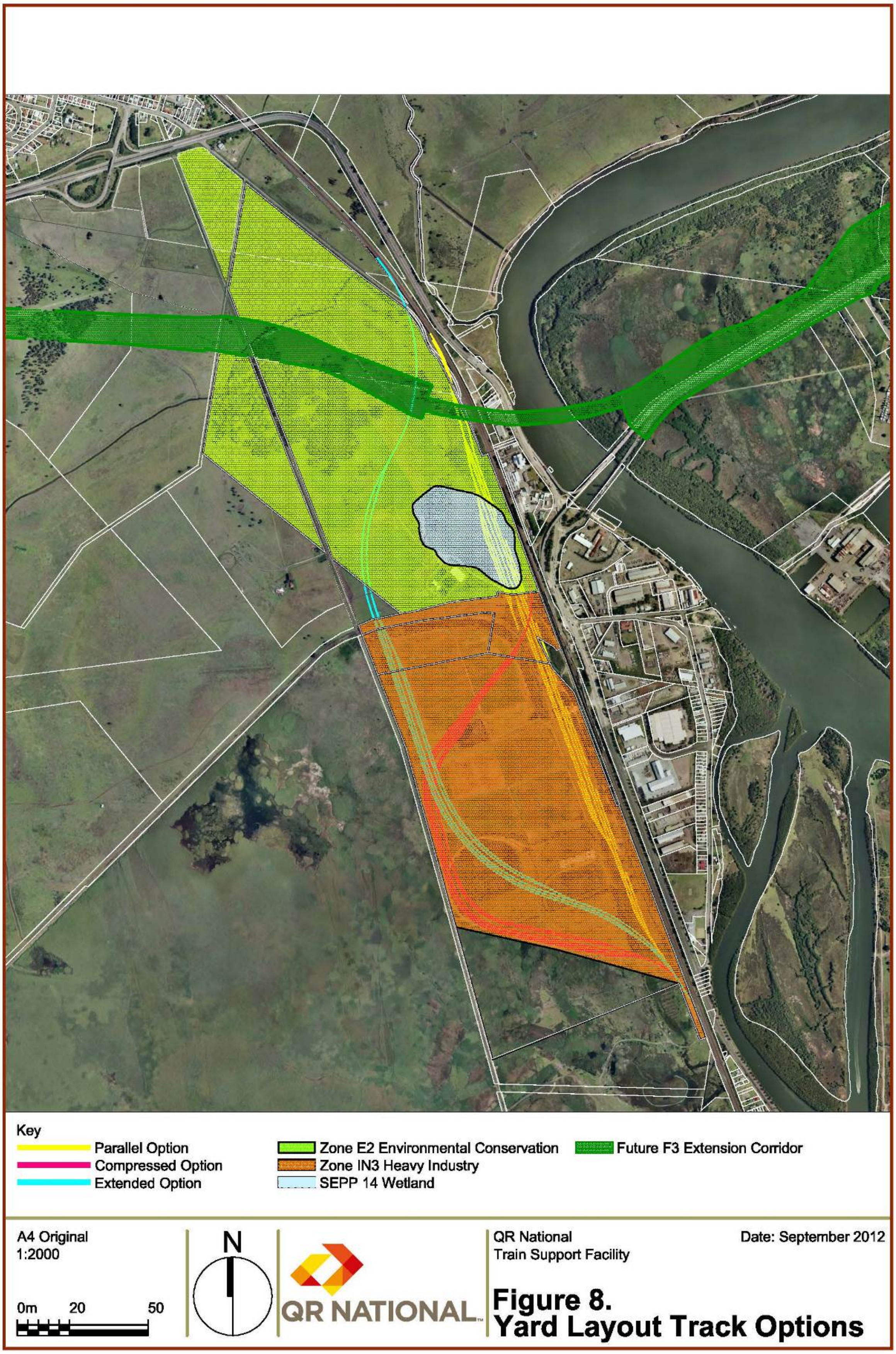


Figure 8: Layout Options including Zoning

The parallel option is the most widely used layout option throughout the rail industry. The compressed option was developed to ascertain whether or not it would be possible to fit the facility within the portion of the QR National site appropriately zoned for the proposed usage. The extended option was developed to cater for high speed entry and exit. Figure 8 shows the location of the SEPP 14 Coastal Wetlands in relation to the yard layout options.

After careful consideration of the relationship between the site constraints and the track layout options for the facility, it was decided to progress the parallel option as:

- The parallel option eliminates the need for remediation work associated with the coal tailings stockpile;
- The parallel option facilitates future expansion while the extended and compressed option hindered future expansion;
- While the parallel option requires the use of land subject to SEPP 14, there are offsets on site which will mitigate this;
- The parallel option is the least likely to impact on the connection of the possible future Fassifern to Hexham Rail Link;
- Trains stationed on curves hinder inspections; and
- The parallel option will have the least amount of track therefore should be the lowest cost to construct.

Track Layout Details

The layout of the TSF track runs parallel to the existing GNR and requires the construction of approximately 11kms of new track. It is proposed that the entry track for the TSF will connect to the Down Coal and exit further north on the same line.

The major components of the new track within the facility include:

- 2 x 1580m provisioning tracks;
- 1 x 1580m inspection UTM track;
- 2 x wagon maintenance tracks;
- 1 x 150m wagon storage tracks;
- 2 x locomotive maintenance tracks;
- 1 x locomotive storage and run round track;
- 1 x Locomotive turntable; and
- 1 x wheel lathe.

Below is a schematic diagram illustrating the proposed layout of the TSF.

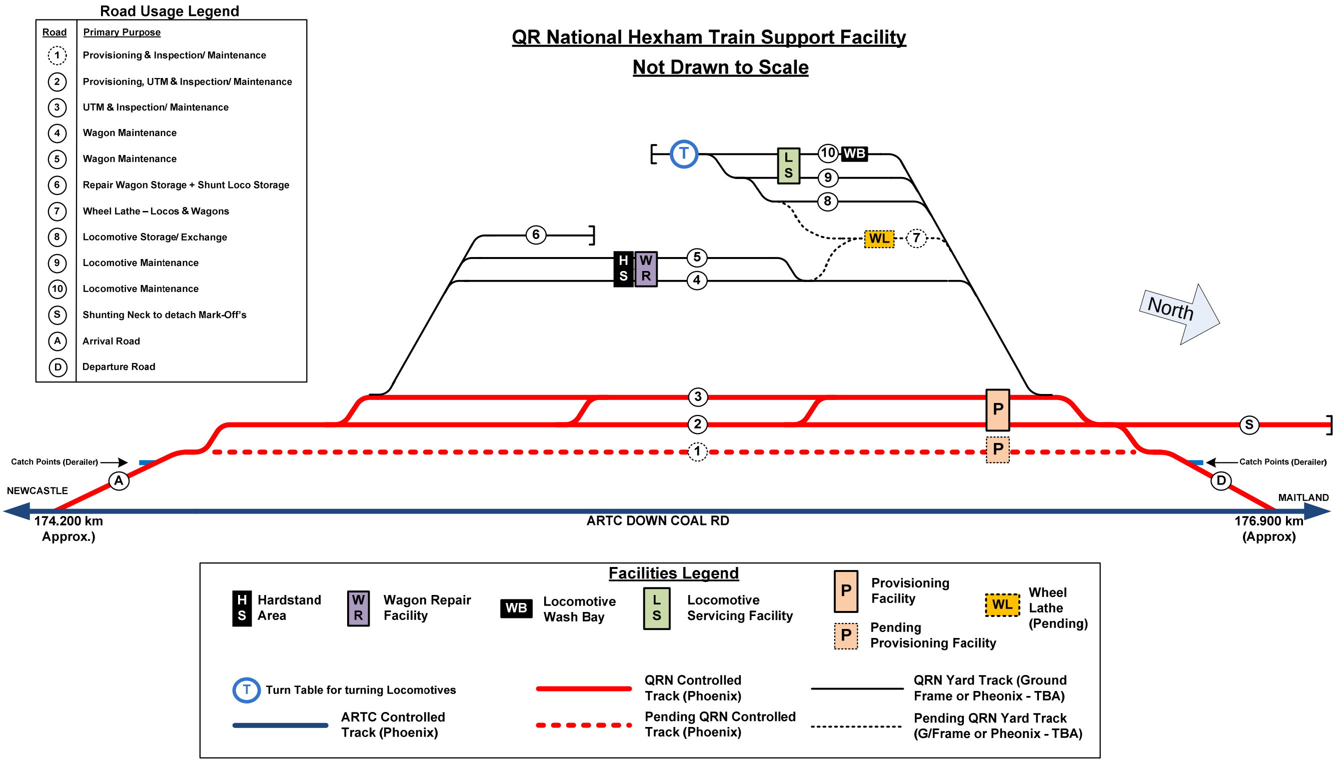


Figure 9: Schematic Layout of Proposed TSF

Signalling

ARTC, being the regulator of the above ground rail network, have stipulated that trains entering or departing the TSF must not impact on Network capacity. ARTC use the Phoenix Train Control System to remotely control all signals and points throughout the Hunter Valley Rail Network. The optimal way of ensuring the TSF integrates with ARTC network operations is to implement the Phoenix system within the TSF.

Several signalling and yard control options are available to the project however the most appropriate in terms of cost and efficiency is to install the Phoenix system to control the signals and points for the first three roads adjacent the Mainline (two provisioning roads and the UTM tracks).

Access to the wagon and locomotive facilities section of the yard will be controlled through an electric release system. Once in the un-signalled part of the facility, all movements would be manually controlled using manual point machines and hand signals/ radio commands.

6.4.2 Buildings & Infrastructure

All buildings are to be designed with the intended purpose and function clearly defined. This process has already commenced with design workshops at the preliminary design phase that included all internal relevant stakeholders. Building designs will comply with relevant Australian Standards (AS) but in particular with the Building Code of Australia.

Provisioning & Inspection Facilities

There will be two provisioning facilities provided at the Hexham TSF as follows:

1. Dedicated Provisioning Building

A custom designed permanent provisioning building will be constructed over the two provisioning tracks and will enable full provisioning capabilities, simultaneously on both tracks. The Provisioning Building will have a total area of 1,390m^2 with dimensions; 79m x 17.6m and 6m in height.

The building foundations will be piled with a steel portal framed structure with a relatively flat roof pitch. Wall cladding will be a combination of corrugated steel sheeting, clear fiberglass sheeting for light entry and a fixed louvre system for ventilation. The roof will also be corrugated steel sheeting. It is intended that both ends of the building will be open.

The building will be designed so that three locomotives will be able to be provisioned simultaneously on each provisioning track. Elevated platforms within the building will provide personnel access to the walkway levels on the locomotives.

Two remote 100,000 litre above ground, self-bunded fuel storage tanks will be installed initially, with allowance for an additional two 100,000 litre tanks (maximum) as the demand for fuel increases, to support the provisioning process. Fuel delivery rates of at least 800 litres/ minute/ locomotive are required.

The self-bunded tanks will be enclosed within a concrete bunded area to provide an additional level of environmental protection, considering the proximity to sensitive wetland areas, in the event of an accidental spill.

A 5,000 litre oil storage tank is required, along with town water hoses to deliver water to all three locomotives. Three 10 tonne sand bins are to be mounted adjacent to the shed, sand, water, oil and fuel will be reticulated using piping systems to all the provisioning points within the shed.

2. Light Provisioning Facility

Light provisioning is to be provided for the inspection track to provide provisioning capabilities for trains undergoing inspections and/or UTM. This would be of similar specification to the existing QR National operations at KCT.

This facility consists of:

- A nominal 100,000 litre self-bunded portable fuel storage tank with attached pumping unit and fuelling booms. Fuel delivery rate for this unit is 500 litres/ minute;
- Provision for the storing and distribution of 2000 litres of new oil; and
- A 27 tonne sand storage, distribution and delivery system.

The facility is to be placed on bunded concrete apron slabs with in-ground runoff collection pits to control contaminated runoff due to minor accidental spills. An awning is proposed to be built over this provisioning location for all weather operation.

Servicing & Repairs

There are to be two separate servicing & repair buildings:

- A wagon maintenance building; and
- A locomotive maintenance building.

<u>Wagon Maintenance and Administration Building</u>

The primary function of the wagon maintenance building is to allow for the routine inspection, scheduled and unscheduled servicing and repairs of wagons. This will be the first maintenance building to be built at the facility.

The Wagon Maintenance Building (including administration) will have a total area of 2,232m^2 with dimensions as follows:

- Shed - 56m x 28m and 12m in height;
- Office – 25m x 12 and 2.7m ceiling height; and
- Store – 17m x 12m and 5.2m in height.

The proposed wagon maintenance building will be built over the two proposed wagon maintenance tracks. The foundations will be piled with a steel portal framed structure with a relatively flat roof pitch. Wall cladding will be a combination of corrugated steel sheeting, clear fiberglass sheeting for light entry and a fixed louvre system for ventilation. The roof will be sheeted in corrugated steel. Doors are to be provided at either end of the shed for security and weather protection purposes. An overhead travelling crane to lift the wagon bodies from wheel sets will be installed within the building. The maintenance access platforms and access stairs for the crane will be constructed entirely within the building

The main body of the building will accommodate two coupled wagons on each of the tracks within the building. The building will be approximately 54m in length to provide adequate space around the wagons to perform maintenance. Off the side of the building will be the ancillary support spaces for storage of wagon spares, support workshop, lunchroom, male and female amenities including showers. Office space is included for the Facility Manager, Yard Controller and three Administration Staff. The floor level of the administration area will be raised to above the 1% AEP flood level.

As a part of the construction of the wagon maintenance building, a wheel set storage bay will be constructed, consisting of a hardstand area with rails set in for the storage of wheel sets in rows. The slab will be appropriately drained and allow for stormwater flow to the overall site stormwater collection and disposal system.

Locomotive Maintenance Building

The primary function of the locomotive maintenance building is to allow for the routine inspection, scheduled and unscheduled servicing and repairs of locomotives.

The Locomotive Maintenance Building will have a total area of 2,440m^2 with dimensions as follows:

- Shed - 66.5m x 20.5m and 12m on height;
- Office – 21m x 12m x 2.7m ceiling height; and
- Store – 33m x 25m x 5.2m ceiling height.

The locomotive maintenance building will have two incoming tracks and will accommodate four locomotives (two on each of the tracks) within the building. The foundations will be piled with a steel portal framed structure, and relatively flat roof pitch. Wall cladding will be a combination of corrugated steel sheeting, clear fiberglass sheeting for light entry and a fixed louvre system for ventilation. The roof will be sheeted in corrugated steel. The floor will be depressed around each of the four maintenance bays with pedestrian access from the building floor level by stairs with handrail protection. Inspection pits will extend below the area of depressed floor for inspection under the locomotives. Elevated steel access and work platforms will be provided on either side of each locomotive to provide safe work access to the servicing door level of the locomotives. There will be provision for future wheel management for the maintenance of locomotive and wagon wheels.

Doors are to be provided at either end of the shed for security and weather protection purposes. An overhead travelling crane will be installed within the building. The maintenance access platforms and access stairs for the crane will be constructed entirely within the building.

The main body of building will be approximately 56m in length. This includes an allowance for a 2m gap in between each locomotive, with an additional 5m clear at the far end of each locomotive. Off the side of the building will be the ancillary support spaces including storage for locomotive spares, workshop, lunchroom, male and female amenities including showers and supervisor's office.

Locomotive Wash Bay

Located on the approach to the locomotive maintenance building is a wash bay for cleaning of locomotives prior to service. The Locomotive Wash Bay will have a total area of 551m^2 with dimensions; 31.5m x 17.5m and 11m in height.

This will remove grime from the exterior of the locomotives, but mainly to remove oil, grease and dirt build-up from the bogies, engine compartments and undercarriage prior to entry to the workshop. The principal cleaning method will be steam cleaning with hand held high pressure water washing as a backup and for cleaning the locomotive exterior panels and roof.

There will be a depressed floor that will facilitate low level cleaning and as well high level and mid-level (locomotive walkway level) access platforms for the full length of the building to allow access to the engine bay and to the top of the locomotives. The locomotive wash will have precast concrete walls to prevent water mist drift and will be roofed over so that rainfall runoff does not enter the return wash water system. Entry to the depressed floor of the locomotive wash will be by steps protected by handrails.

Reuse of wash-down water is an important ESD philosophy that will be adopted in the design of this facility. Runoff from the wash bay will enter a coarse waste coal trap, followed by treatment by flocculating and adjustment of the pH level. Water will then flow through an oil/grease separator to a wash down water storage. From the wash down water storage the water will be chlorinated and pumped to a reuse header tank where it can be topped up with mains water or harvested rainwater. The water would then be recycled through the locomotive wash system.

<u>Service Vehicle Garage Building</u>

A prefabricated steel framed and clad building (sized to house the permanent onsite maintenance vehicles) will be provided for the breakdown truck and quad bikes used to transport maintenance people around the yard. The Service Vehicle Garage Building will have a total area of 288m^2 with dimensions; 24m x 12m and 5m in height.

The building will have three bays each with a panel tilt door for access. A minor amount of fuel (200 litre drum) and emergency response equipment and quad bike servicing equipment will be kept in this shed.

<u>Wheel Lathe Building</u>

The wheel lathe building will house an underfloor wheel lathe specifically designed to machine wheel profiles for all rollingstock (coupled or uncoupled) and locomotive wheel sets. The building will have a total area of 480m^2 with dimensions; 40m x 12m and 6.5m in height.

6.4.3 Road Infrastructure

The TSF includes three major components of road infrastructure:

- Intersection with the Tarro Interchange;
- Access road from the Tarro Interchange to the facility; and
- Internal access roads.

Extensive consultation with RMS has been undertaken with regard to providing safe access to the site.

Tarro Interchange

Given the proximity to one another, the TSF and HRR projects have agreed to work collaboratively towards developing road access options. Currently the only access to the site is via Woodlands Close which does not meet Austroads standards. The RMS have indicated that the use of Woodlands Close would not be an appropriate access for the projects except for the initial site preparation works and under an approved Traffic Management Plan.

QR National and ARTC have examined the permanent and construction site access options to provide for safe access and egress from the site. The access is designed to accommodate a maximum vehicle size of a B-double configuration.

Initially eight options were assessed on the basis of the following criteria:

- Road Safety (double weighting);
- Property Acquisition;
- Constructability;
- Cost;
- Utility Diversions;
- Construction Timeframe / Staging; and
- Environmental Impacts.

Following the assessment of the eight options, two options were eliminated on the basis of having poor safety performance and being difficult to construct. A further two major infrastructure options were discounted as they were assessed to be difficult to construct, expensive and would not improve road safety.

The four remaining options all involve access from the Tarro Interchange. They all achieve good safety performance; they do not require significant adjustment to public utilities and have minimal impacts to property.

The preferred option is for a right turn in and left turn out intersection located on the existing Tarro Interchange and is illustrated in Figure 10 below.

The land required for this option is owned by RMS and QR National. The preferred option is much smaller and easier to construct than a roundabout on the interchange. Although a roundabout offers a long-term solution there is not the volume of traffic on the road to justify the option.

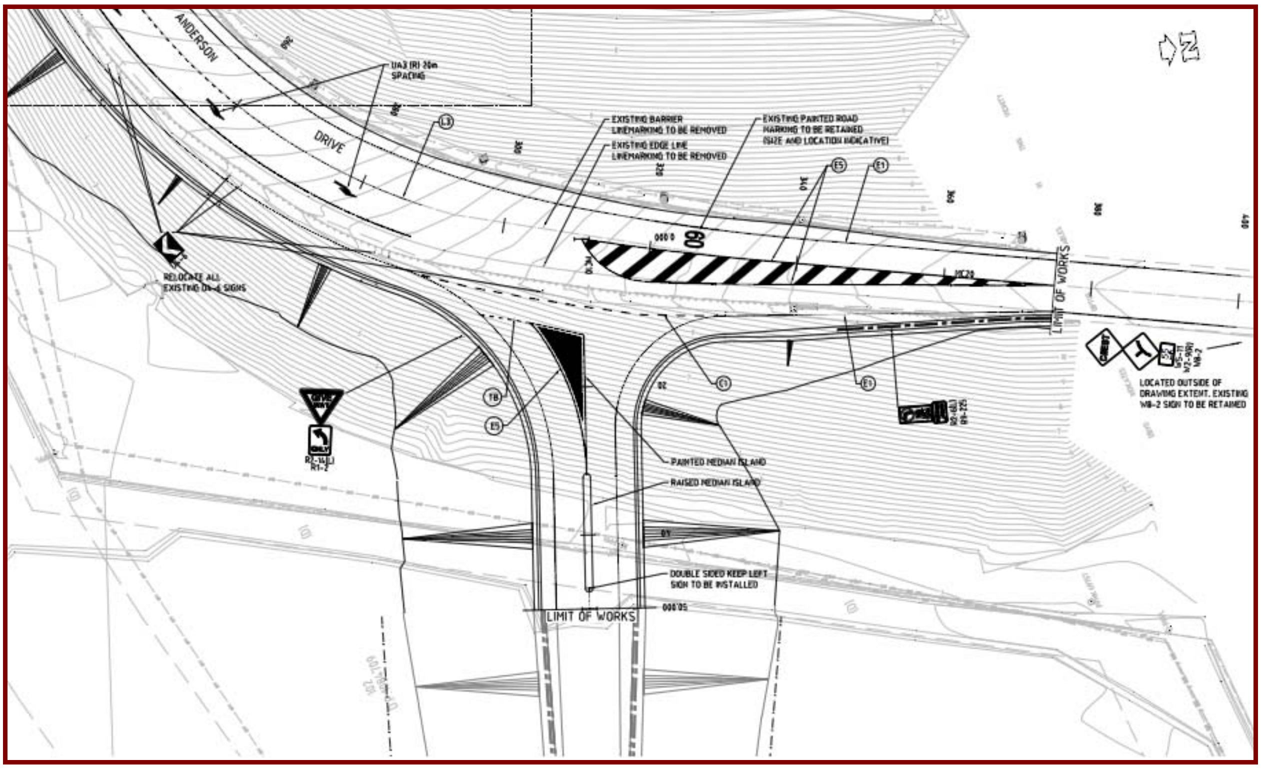


Figure 10: Tarro Interchange Concept

Approval for this access requires the proponent to enter into a Works Authorisation Deed (WAD) with the RMS to cover the legal requirements. ARTC will manage the WAD process with RMS for construction of the intersection off the Tarro Interchange. The approval for the proposed intersection and access road to the TSF is sought within this EA. The access will be shared by ARTC and QR National.

Site Access Road

A site access road from the Tarro junction to the main site will be comprised of two 3.0m wide travelling lanes with 2.0m wide shoulders. The road construction is envisaged as a flexible pavement with 40mm of asphalt surfacing. The current alignment of the site access road follows the alignment of a redundant Hunter Water pipeline, avoiding environmental constraints as well as the future F3 Freeway easement. Part of the proposed access road has been identified as temporary and the option to adjust the road alignment upon development of the future F3 Freeway has been provided (Figure 3).

At a point approximately 600m along the site access, the road diverges to provide access to the QR National TSF and the ARTC HRR Project.

The QR National portion of the site access road will have a bridge constructed over Purgatory Creek and finish about 150m from the southern end of existing Woodlands Close, where it will connect to the internal access road network of the TSF. The site access road will be designed to NCC standards, allowing for the road ownership to be transferred at a later point in time if required.

Internal Access Road

The principal internal roads will provide vehicular access to all buildings within facility and a loop road enabling adequate access for the B-double tankers delivering fuel to the facility. Two secondary access roads will extend for the entire length of the site to provide full circulating site access.

In addition to the sealed internal access roads, the area between ballasted tracks will be brought up to the track level in gravel and will be used by light vehicles transporting personnel undertaking rollingstock inspections or other maintenance activities.

Car Parking

Dedicated onsite parking will be provided adjacent to the offices and amenities as identified within Figure 6 (Project Components) and on hardstand areas adjacent to main work areas. The facility car park would have 38 parking spaces including two disabled spaces.

6.4.4 Utilities

Details of the major utilities and infrastructure and proposed measures for the provision of services are set out in the Services Investigation Report, Appendix M.

There are two elements to the utilities works to the project. First, the protection or relocation of existing services infrastructure traversing the site. Preliminary advice is being sought from the relevant provider for the protection or potential relocation of existing utility services over or adjacent to the TSF. The second aspect of the utilities component is the provision of services to enable the TSF facility to function.

The services located on site are illustrated in Figure 11 and are listed below and include:

- Chichester Trunk Gravity Main pipeline;
- 500 & 350mm diameter gas mains;
- High voltage transmission lines;
- 33kV sub transmission lines (adjacent to Tarro Interchange);
- 33kV and 11kV electricity (Woodlands Close); and
- Optus telecommunication service.

Water

HWC operates the Chichester Trunk Gravity Main pipeline that supplies water to the Maitland, Cessnock and Newcastle water systems. The pipe is constructed on the western boundary of the site. The CTGM is made up of a single 900mm pipeline. In 2011 the original above ground pipeline was removed and replaced with a new below ground structure. A 200mm branch line from CTGM crosses the TSF project. As part of detailed design, potential impacts on the pipeline would be addressed. If works are required these would be undertaken as part of the proposed project in consultation with HWC.

It is proposed to connect to the 200mm HWC main to provide potable water to the TSF. In terms of water usage, the total average daily demand for the TSF is 2.6kL/day for Stage 1 and an ultimate demand of 7.4kL/day at Stage 2. Preliminary investigations into the capacity of the existing 200mm water main indicate that the TSF demand could be sufficiently supplied without an upgrade. A 150mm ring main will reticulate water to service the TSF and provide necessary access for fire fighting. The reticulation main will be located outside road and rail routes.

Gas Service

A 500mm diameter high pressure gas pipeline supply from Sydney to Newcastle and the Hunter Valley crosses the TSF (and HRR) site. A 350mm diameter high pressure gas distribution main is situated on the western side of Woodlands Close and is the supply for the Hunter Valley.

A Safety Management System workshop has been held with Jemena to determine the protection system to be used or whether the pipeline should be diverted. It is anticipated that a cover slab will be required over the pipeline, supported on concrete piles.

Jemena has advised that it will need to fully uncover the pipeline over the affected length to inspect the condition of the pipeline and its protective coating prior to construction of the TSF.

Power

There are substantial existing electrical assets on site including eight high voltage transmission line and Ausgrid 33kV/11kV lines. At the proposed access road and Tarro Interchange intersection there is a 33kV transmission line that is almost level with the proposed intersection. In order for the intersection to be constructed the existing 33kV power poles are to be removed and replaced with taller concrete poles. These works will need to be conducted as enabling works for the proposed access road. All construction works are to be carried out in the existing road reserve to mitigate potential environmental issues. This work would be undertaken by Ausgrid under a separate approval.

The major areas and items that require electrical supply at the TSF include:

- Office & Amenities;
- Locomotive Turntable;
- Locomotive Wash Area;
- Wagon Maintenance Shed;
- Locomotive Maintenance Shed;
- Wheel Lathe;
- Provisioning Shed; and
- Yard Lighting and Road Lighting.

Based on the above, the maximum electrical load is estimated to be in the vicinity of 500kVA. This load will require the installation of a dedicated kiosk substation with the installation of at least two connection points from Ausgrid's existing 11kV network providing a ring feed.

Telecommunications

To enable the construction of the site access from the Tarro Interchange, protection of the existing Optus infrastructure may be required under Optus approval.

To provide data and telecom services to the TSF, preliminary investigations suggest that the installation of a 100 pair data cable to a central location with 50 pair data cable distributing communication services will be required as part of the development.

Local UHF receiver and transmitter bases would be required in the Provisioning, Locomotive and Wagon Maintenance buildings for direct communication with train crew and signalling personnel.

Conduits or service trenches/culverts will be provided as a part of Stage 1 construction to avoid disruption to operating rail line when installing services for later stages.

Wastewater Services

Brancourts have four waste pipes that traverse the TSF site. These pipes transport waste to an existing water treatment plant located approximately 300m to the south west of the Brancourts' facility. To construct the proposed tracks these pipes will need to be protected or replaced at a greater depth. As part of the detailed design phase, an appropriate means of protection would be reviewed and suitable protection measures provided. QR National is seeking approval for these works.

HWC have confirmed that there is currently no wastewater network system that is sufficiently close for connection to the TSF. As a result, two onsite wastewater systems are proposed:

- Wastewater treatment systems for sewage, requiring pipe reticulation, pump station(s), a package treatment plant and
- A designated irrigation area for onsite effluent disposal.

Runoff from the wash bay will enter a coarse waste coal trap, followed by treatment by flocculating and adjustment of the pH level. Water will then flow through an oil/grease separator to a wash down water storage. From the wash down water storage the water will be chlorinated and pumped to a reuse header tank where it can be topped up with mains water or harvested rainwater. The water would then be recycled through the locomotive wash system.

A diagram that explains water recycling and the waste water treatment can be found at Figure 23 in Section 9.5.

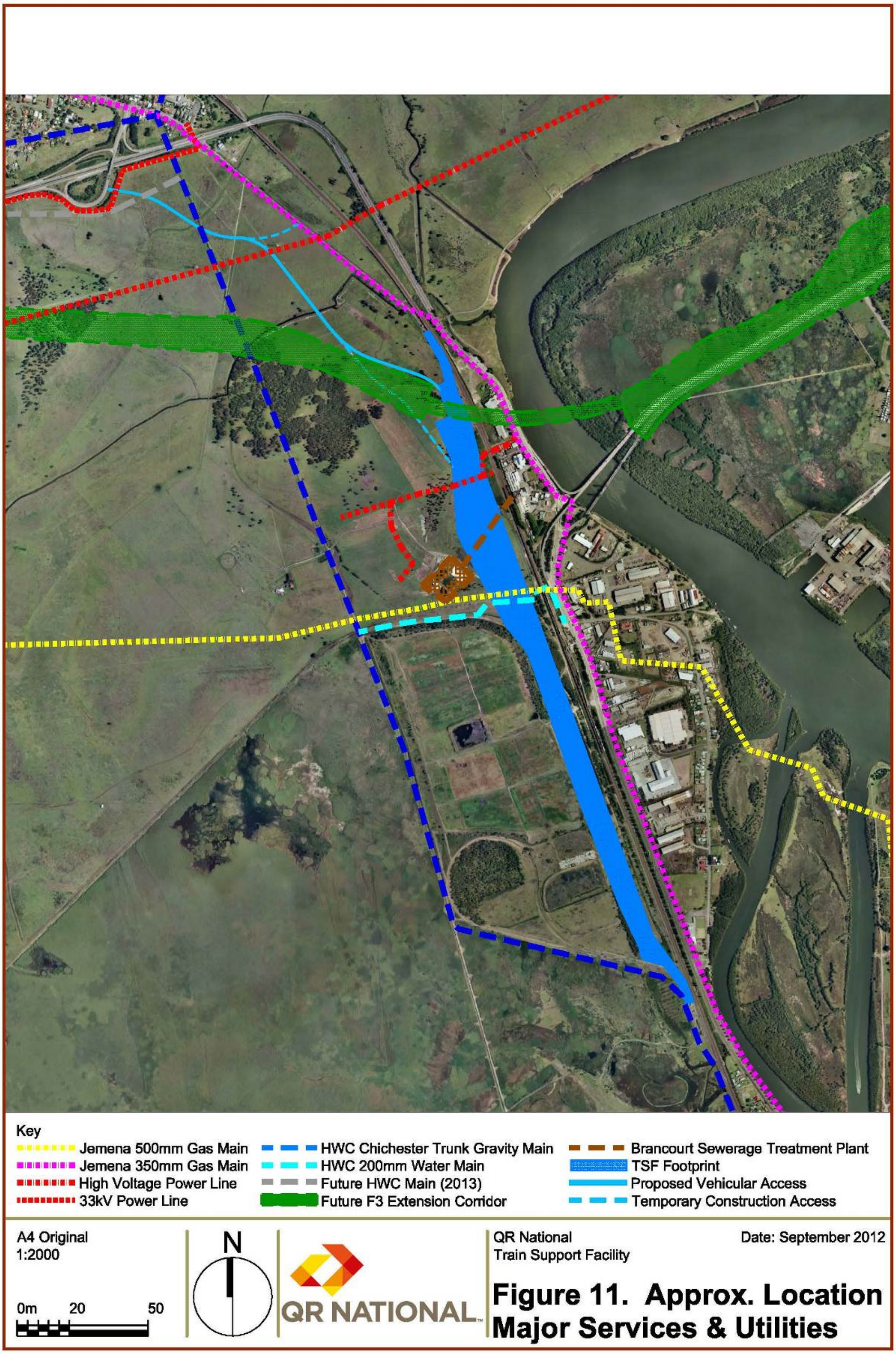


Figure 11: Approximate Location of Major Services & Utilities

6.5 CONSTRUCTION

Construction of the TSF would be undertaken in two stages to meet QR National's operational requirements. A summary of each Stage is included below and illustrated in Figure 12.

Stage 1

- Civil work (including works associated with Stage 2);
- Tarro Interchange, site access road and internal access roads;
- Mainline connections and crossover;
- Bulk Fuel Storage;
- Provisioning facility;
- Provisioning & UTM tracks;
- Wagon maintenance and Administration building;
- Wagon maintenance tracks;
- Car Parking; and
- Landscaping.

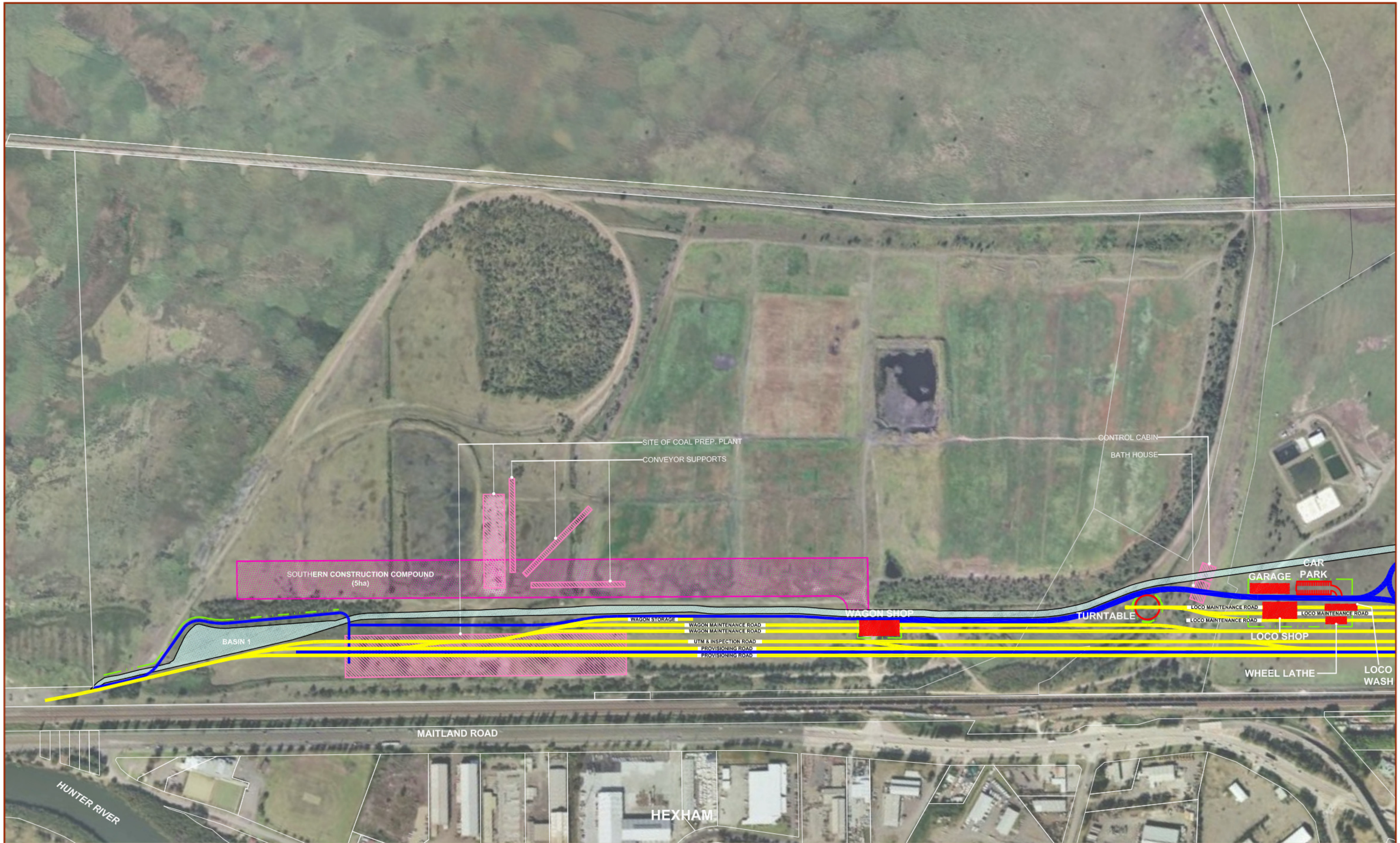
Stage 2

- Locomotive maintenance building;
- Locomotive wash building;
- Locomotive turntable; and
- Locomotive maintenance tracks; and
- Wheel lathe.

Demolition of several items associated with previous uses of the site will be undertaken where necessary during both phases of construction, these include:

- The dairy ruins;
- The control cabin and bath house;
- Remnant trackwork;
- Coal preparation plant footings; and
- Conveyor support footings.

The location of these items have been identified within Figure 12. The Statement of Heritage Impact revealed that these items have a very limited level of significance and their loss will not be detrimental.



A3 Original

0m 50 100 200

Scale 1: 5000 (A3)

KEY

- Temporary Construction Access
- Construction Compound
- Proposed Drainage
- Sediment Fencing
- Truck Shaker Bay
- Proposed Vehicular Circulation
- Proposed Vehicular Access
- Proposed TSF Track
- Proposed TSF Buildings
- Proposed Demolition

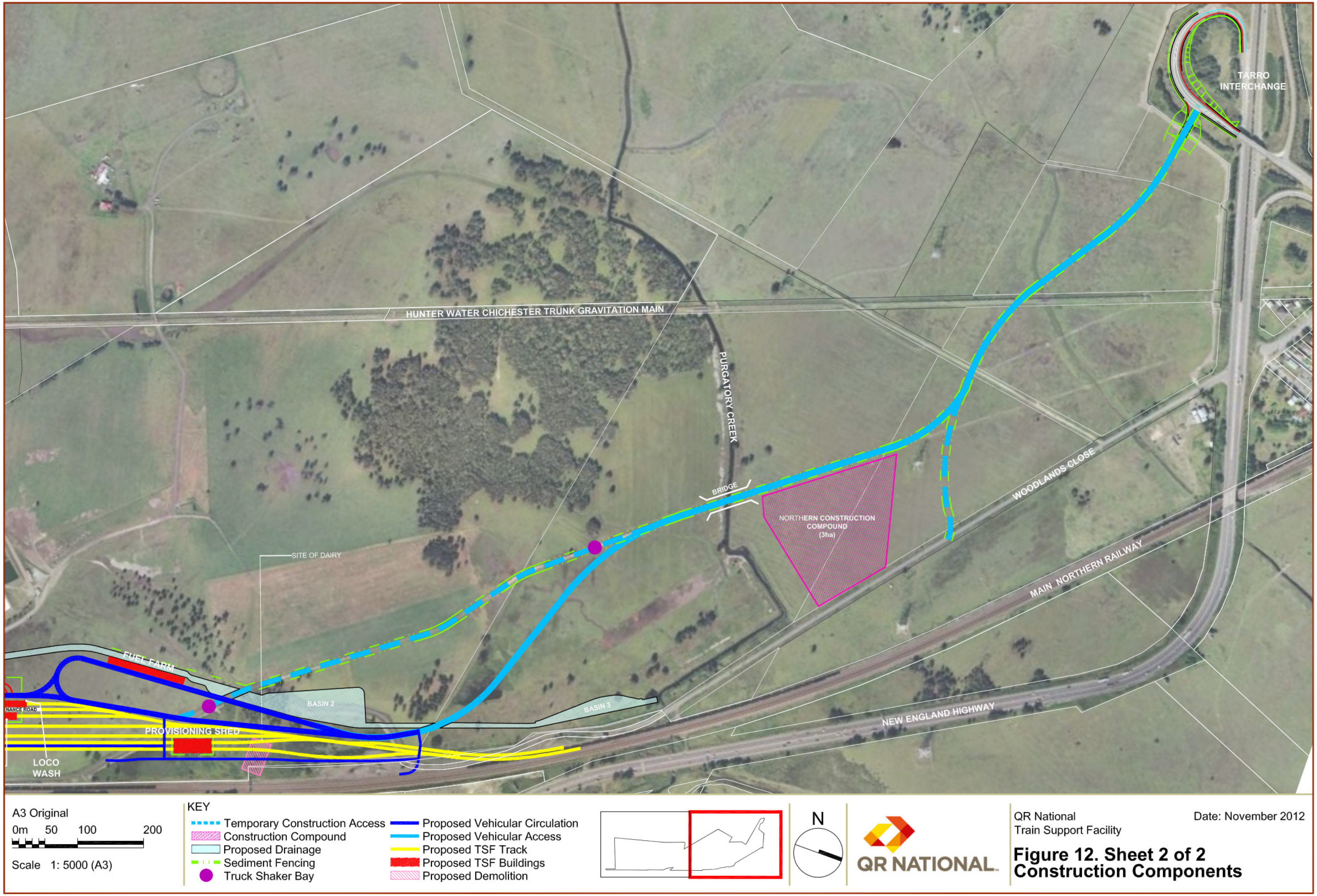
N

QR NATIONAL

QR National
Train Support Facility

Date: November 2012

Figure 12. Sheet 1 of 2
Construction Components



QR NATIONAL

QR National
Train Support Facility

Date: November 2012

Figure 12. Sheet 2 of 2
Construction Components

6.5.1 Program

Construction Stage 1 will be delivered by July 2014. Delivery of Stage 2 will be driven by demand and anticipated business growth and is targeted for 2016.

Table 2: Outline Stage 1 Construction Program

Stage 1 Phase	1Q13	2Q13	3Q13	4Q13	1Q14	2Q14	3Q14	4Q14
Enabling Works	■							
Utilities		■	■					
Civil Works		■	■	■	■			
Track & Signalling				■	■	■	■	
Building				■	■	■	■	
Commissioning							■	■

Table 3: Outline Stage 2 Construction Program

Stage 2 Phase	1Q16	2Q16	3Q16
Enabling Works	■		
Civil Works	■		
Track & Signalling	■	■	■
Building	■	■	■
Commissioning			■

6.5.2 *Methodology*

Key construction activities within Stage 1 are outlined in the following table.

Table 4: Indicative Stage 1 Construction Activities

Stage 1 Phase	Activity	Indicative Schedule
Enabling Works	• Install environmental controls. • Construct site access from Tarro Interchange. • Protection or diversion of utilities. • Establish compound. • Clear & grub TSF footprint. • Survey set out for works.	June 2013 to September 2013
Civil Works	• Strip and stockpile topsoil. • Bulk earthworks (Import to fill). • Piling for buildings and track slabs. o Provisioning Building & Wagon Maintenance Building. • Excavate and place drainage & stormwater. • Construct new internal access roads.	June 2013 to February 2014
Track & Signalling	• Install city crossover. (Undertaken during ARTC possession) • Install Mainline connections. (Undertaken during ARTC possession) • Place ballast. • Install rail, sleepers and weld. o Provisioning, UTM & Wagon Maintenance. • Install rail within building. • Tamp & regulate track.	October 2013 to June 2014

Buildings	• Excavate and install foundations and footings for:
	  o Provisioning Building &Wagon Maintenance,
	  o Service Vehicle Garage &Administration Building.
	• Pour concrete slabs
	• Erect steel superstructure.
	• Install external cladding and roofing.
	• Installation of building services (mechanical, electrical & hydraulics) and specialist equipment.
	• Fit out.
		October 2014
		to
		June 2014

Commissioning	• Testing & commissioning of railway systems & signals. • Testing & commissioning of building services & equipment.	July 2014
Demobilisation	• Installation of road pavement. • Removal of site compound. • Landscaping. • Removal of temporary environmental controls.	July 2014 to December 2014

Key construction activities within the phases of Stage 2 are outlined in the following table.

Table 5: Indicative Stage 2 Construction Activities

Stage 2 Phase	Activity	Indicative Schedule
Enabling Works	• Survey set out for works.	January 2016
Civil Works	• Piling for buildings and track slabs. o Locomotive Maintenance Building.	February 2016 To March 2016
Track & Signalling	• Place ballast. • Install rail, sleepers and weld. o Locomotive Maintenance. • Install rail within building. • Tamp & regulate track.	February 2016 To July 2016
Building	• Excavate and install foundations and footings. o Locomotive Maintenance Building, o Locomotive Turntable. • Pour concrete slabs. • Erect steel superstructure. • Install external cladding and roofing. • Installation of building services (mechanical, electrical & hydraulics) and specialist equipment. • Fit out.	February 2016 To July 2016
Commissioning	• Testing & commissioning of railway systems & signals. • Testing & commissioning of building services & equipment.	August 2016
Demobilisation	• Removal of site compound.	September 2016

Enabling Works

To prepare the site for the commencement of construction the following activities will be undertaken:

- Construction of the proposed Tarro Interchange intersection and link road to provide site access would be completed;
- Dilapidation surveys would be undertaken on third party assets that the project may affect;
- Fencing would be constructed to delineate site boundaries and work areas;
- Any identified Aboriginal cultural sites and environmentally sensitive or contaminated areas will be suitably fenced prior to any enabling works;
- Utilities would be protected or diverted as required to allow construction to proceed; and
- Environmental and traffic management controls would be installed ahead of the commencement of civil works.

QR National has been in regular liaison with ARTC regarding HWC service connection and vehicle access to the site.

Construction Compound

A primary site construction compound is proposed to be established at the northern end of the site, and accessed from the site access road. It is anticipated that this compound will be shared with the ARTC HRR Project. The compound area is 29,450m^2 with a perimeter of 700m and is offset approximately 50m from Purgatory Creek.

The compound itself would be cleared and grubbed with a 300mm thick sub-base installed below a compacted 400mm thick road base. A security fence would be installed to the compound perimeter and the entry to the compound gated. Lighting would also be installed throughout the yard to provide security. There would be a collection of various temporary site buildings including offices, amenities and ablutions. Supporting the onsite accommodation, there would be an array of storage tanks, including wastewater, rainwater and diesel fuel (used to power the temporary genset). General storage would be provided for by a number of 40ft (approx. 12m x 2.5m) shipping containers, as well as a lay down area for the storage of any oversize items purchased direct by QR National, such as the railway turnouts.

A second compound is proposed to be established at the southern end of the site in close proximity to the majority of construction works in the south of the site. For further detail refer to the construction components drawing (Figure 12).

Civil Works

Civil works are the major construction component of the project. Due to the poor bearing capacity of the existing soils, a significant amount of engineered fill and potential subsoil treatment will be required. A typical cross section of the facility illustrating earthworks is shown in Figure 13 below. Overall the extent of cut and fill required for the proposed development generally ranges between plus and minus 1m from the existing site levels.

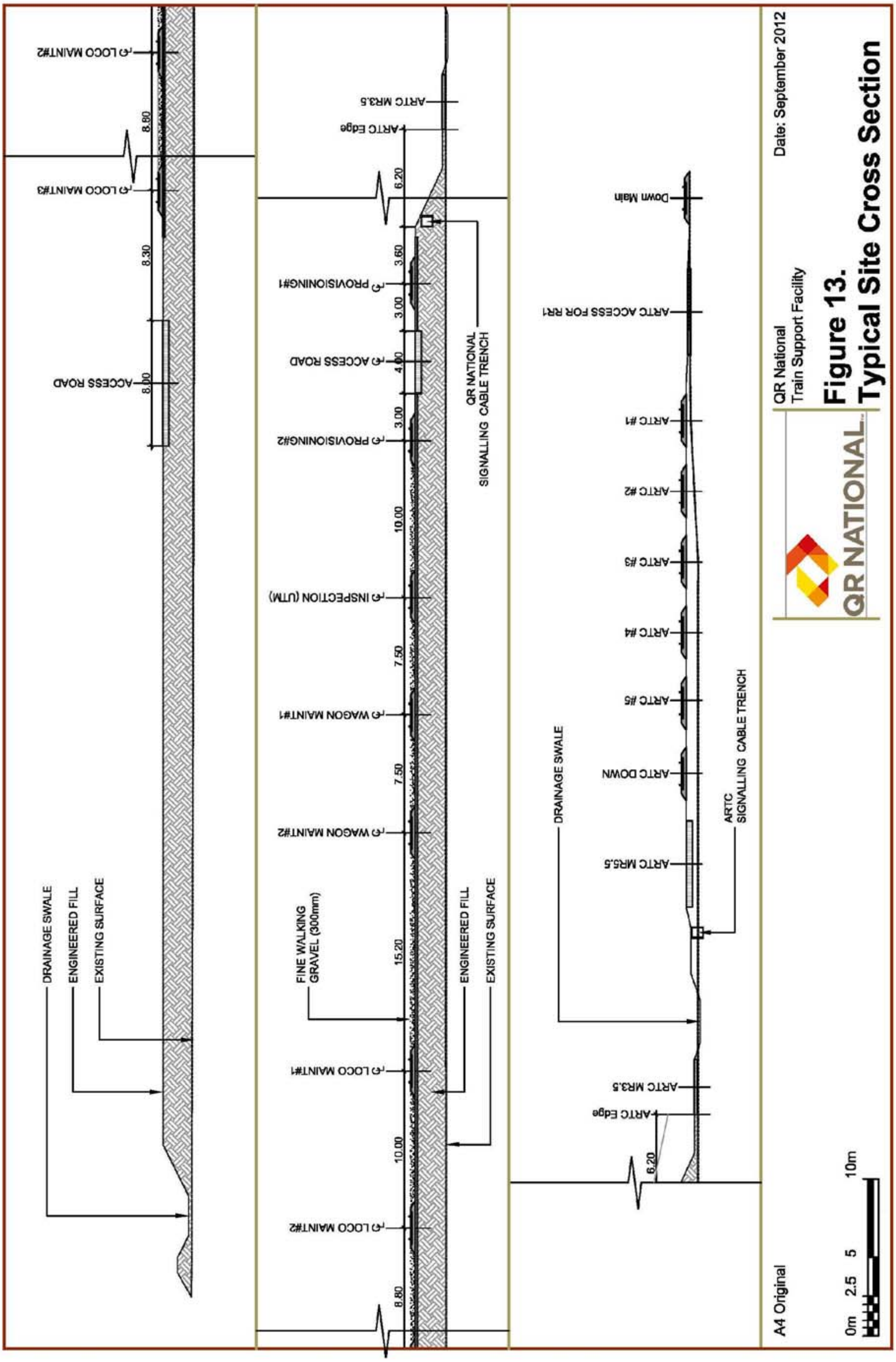


Figure 13: Typical Site Cross Section

It is estimated that approximately 180,000m^3 of engineered fill will be required to bring the site to required design levels and additional 30,000m^3 for the construction of the main access road. The final earthworks methodology will be determined by the Geotechnical Engineer in consultation with the design team, but there are a number of design alternatives to be considered to achieve the required loadings and long term serviceability.

At this stage it is envisaged that the imported material will be transported to site by truck and will be compacted in layers to achieve desired heights. An onsite stockpile will be developed to store excess material. The proposed stockpile location is to the west of the southern construction compound illustrated in Figure 12. Potential fill for the site is likely to be sourced from reputable quarries to the north and west of the site where suitable clean fill is available. The particular source of fill will be further investigated upon completion of the project design phase. Importing of material to the site has been assessed within the Traffic Impact Assessment contained within Appendix O.

Following the DP&I adequacy review, the TSF footprint has been revised and will have no impact on the coal tailings on the site and no coal tailings will be extracted/removed from the site as part of the proposed development (under the current proposal). An area has been identified for future investigations on the Project Components Plan (Figure 7), whereby, if suitable fill material is identified during investigations, it may be utilised on the site. If this strategy is to be implemented, details will be incorporated into the Preferred Project Report.

Drainage Structures such as culverts, drainage pits and pipes will be installed as part of the Civil Works. As there is limited elevation on the site for drainage grades, the larger of these structures will require additional foundation support such as ballast, earth rafts or timber mini piles, to avoid settlement.

All piling works associated with the buildings and track slabs for Stage 1 would be undertaken during a Civil Works phase of construction.

It is proposed to undertake all major civil works, compaction, engineered fill, drainage and services to the entire footprint of the site in one operation. As the site is linear in nature, greater efficiencies can be achieved in the excavation, hauling, placing and compaction operations. The approximate volume of earthworks for each material type is outlined in Table 6:

Table 6: Approximate Earthworks Volumes

Material	Approximate Volume (m^3)	Description
Import Select Fill	215,000	Import of fill and compacted to create a level site.
Ballast	30,500	Ballast would be placed on the compacted formation layer.
Import (Sandy) Loam	30,000	Wastewater disposal soak away.
Road Base	105,000	Granular material for formation of new road network.
Total	**380,500**	

Spoil Generation

Significant volumes of spoil are not expected to be generated by the project, if unsuitable materials require excavation and spoiling the material will be managed in accordance with the CEMP. Small quantities of contaminated materials may be removed from site for disposal to landfill as required. Contaminated spoil will be assessed and managed in accordance with the requirements of the RAP included in Appendix J.

Track & Signalling

Ballast would be sourced from quarries within the Hunter Valley. There is approximately 25km of rail, a portion of which is set into the concrete floor slabs of the proposed buildings. The remaining rail will be installed on approximately 17,900 precast concrete sleepers. Up to 21 new turnouts within the yard and two additional turnouts to connect with the Mainline will be installed as well as the new crossover at the city end to enable locomotives to leave the facility in the city direction.

The rail embankment will be constructed from fill brought to the site to create a level surface for the rail tracks at about 2.65m AHD. The width of the embankment varies over the proposed TSF footprint due to the track layout. The typical width of the embankment for the rail tracks ranges from 70m to a maximum of 150m.

Buildings

The Civil Works will provide the compacted formation, required earthworks levels and services. The construction of buildings may require deep foundation support for portal framed buildings and any proposed service pits within the locomotive and wagon maintenance buildings.

Demobilisation

Following the commissioning of the TSF, final works would be completed including, landscaping and installation of road pavements. As these works are completed the removal of the temporary construction facilities, including the site compound, fencing, signage and temporary environmental controls will be undertaken.

6.5.3 Construction Staff

Staff numbers are likely to range from between 10 to 75 during the construction phases of the project. Minimal staff would be present during the site establishment and pre-construction activities. The peak would be reached during Stage 1 of construction when the bulk earth works phase is underway. With bulk earthworks complete, the majority of track installed, road infrastructure complete and the wagon maintenance and provisioning buildings constructed, Stage 2, by comparison should represent a reduction in construction staff to approx. 50 people.

Work would be generally undertaken during standard construction work hours:

- 0700 to 1800 - Monday to Friday;
- 0800 to 1300 – Saturday;
- No work on Sundays or Public Holidays.

Construction work to be undertaken outside of the above standard work hours include:

- Work undertaken during track possessions;
- Works undertaken by utility service providers; and
- Oversize deliveries, unloading of machinery or any other emergency work required or as stipulated by the RMS / Police for safety reasons.

Any work proposed to be conducted outside of the standard work hours would be undertaken in accordance with the relevant approvals for the project.

6.5.4 Construction Plant & Equipment

Table 7 below outlines the plant and equipment likely to be required for the various construction phases of the project.

Table 7: Construction Plant & Equipment

Plant / Equipment	Number	Application
Grader	2	Trimming & maintenance of access tracks, structural fill & capping layers.
30t Excavator	4	Loading trucks from stockpile area & digging of building foundations.
Bulldozer	2	Pushing / placing fill, structural fill & capping.
5t Excavator	2	Trenching for drainage and services.
Backhoe	1	Trenching & general works.
Elevated Work Platform	2	Installation of cladding to shed walls, roofs & high level services.
Bobcat	1	General site works.
Trucks	4	Hauling material.
Articulated Dump Truck	6	Hauling material.
Truck & dog	30+	Importation of structural fill, capping & ballast.
Water Cart	3	Dust suppression & compaction.
Franna Crane	2	Lifting precast culvert, turnouts & culverts.
Mobile Crane	1	Lifting railway turnouts & crossovers. Installation & lifting of structural steel frame.
Roller	4	Compaction of access track & formation material.
Concrete Trucks	4+	Delivery of concrete for culverts, foundations, ground floor slabs to buildings.
Tamper	1	Tamping of track ballast.
Regulator	1	Regulates & profiles ballast.
Front End Loader	2	Movement of material & loading.

6.5.5 *Construction Traffic & Access*

A number of access road options from the external road network for the construction of the project have been assessed. The preferred option involves the construction of an access road connecting to the existing Tarro Interchange.

The access road would be approximately 10m wide. The speed limit on this access road would be 40 km/h and will be unsealed during construction.

Construction of the access road and the new intersection off Tarro Interchange would take approximately three months to complete. During this time construction vehicles would enter the site via the New England Highway/Woodlands Close intersection under traffic control. Access would primarily be required for the purposes of construction of the new access road and intersection.

Following the construction of the access road, construction vehicles would access the site via the new intersection with the Tarro Interchange. Through traffic lanes would be provided in both directions at this intersection. The intersection on the Tarro Interchange would allow right-in, (left-in for light vehicles only) and left-out movements only, no right-out movement would be permitted at the intersection. As part of the intersection construction, a concrete median barrier would be constructed to prevent illegal right turn movements from the Tarro Interchange eastbound off-ramp toward Anderson Drive.

Vehicles associated with the construction works would include light vehicles, semi-trailers delivering construction plant and equipment, truck and dogs delivering quarry materials and mobile cranes. It is anticipated that fill will be sourced from local quarries.

The anticipated maximum number of light and heavy vehicles entering the construction site during different phases of construction is provided in Table 8.

Table 8: Anticipated Maximum Construction Traffic Volumes

Construction Traffic Type	Daily No. of Vehicles	Total Two-way Movement/day
Light Vehicles*	70	140
Heavy Vehicles**	120	240
Total Movements	190	380

* Light vehicles include transportation used by staff to arrive at the worksite at start of shift and site visitors.
** Heavy vehicles include trucks and semi-trailers delivering construction plant and equipment and truck and dogs delivering quarry products (structural fill, capping and ballast).

Further details regarding traffic movements, potential impacts on surrounding land uses and mitigation measures are provided in Section 9.6 and potential impacts are addressed within Sections 9.14 and 9.15.

6.5.6 *Construction Water*

The majority of water to be used in the construction phase of the project will be for fill compaction and dust suppression. It is likely that the water supply would be obtained from HWC and be sourced from a suitable hydrant on or adjacent to the project area. If this is the case, no licence would be required for the supply of water. Further investigation is being undertaken exploring the viability of water sources on and adjacent to site as a possible supplementary source of water. If this proves to be viable, the appropriate licence for the extraction of water would be obtained from the NSW Office of Water.

6.5.7 Construction Environmental Management Plan (CEMP)

A CEMP will be established based on the mitigation and management measures in the EA and the DP&I conditions of approval. The CEMP provides the framework for the management of all potential environmental impacts resulting from construction activities. The CEMP will outline the environmental mitigation measures to be implemented during the construction phase and will document mechanisms for ensuring compliance with the conditions of approval.

The CEMP will set out the auditing and inspection frameworks for the site (in coordination with ARTC) and will cover the following issues:

- Construction traffic management;
- Construction noise and vibration management;
- Water quality and soil management;
- Groundwater management;
- Flora, fauna and weed management;
- Non-indigenous and indigenous heritage management;
- Community liaison;
- Hazards and risk management;
- Spoil management;
- Waste management; and
- Air quality management.

6.6 Hexham Relief Roads Project

ARTC proposes to develop the HRR Project adjacent to the TSF at Hexham. The HRR Project comprises five Up relief roads (train lines) to the west of the existing Up Main, Down Main and Up Coal.

Key components of the HRR Project are:

- The removal of the existing Down Coal (located to the west of the Up Coal);
- The construction of five new train lines (tracks) for the HRR;
- The construction of a new Down Coal to the west and outside of the proposed HRR;
- Each Relief Road to accommodate trains generally comprising two or three locomotives and up to 91 wagons (1,543m long) requiring a minimum standing room of 1,670m;
- New turnouts, return curves and other track changes;

- Installation of new signal infrastructure for the five relief roads including signal location cases, huts and gantries;
- Earthworks of approximately 265,000 cubic metres, including track formation, drainage and minor structures; and
- Vehicular tracks, land acquisition and upgrading of existing rail infrastructure and public utilities.

The HRR Project has been submitted to the DP&I and is currently being assessed.

7.0 Planning & Related Statutory Provisions

7.1 LOCAL STATUTORY PLANNING FRAMEWORK

7.1.1 Newcastle Local Environmental Plan 2012

Under the *Newcastle Local Environmental Plan* 2012 (Newcastle LEP 2012) the subject site upon which the majority of the proposed TSF is located is zoned IN3 Heavy Industrial, formerly 4(b) Port & Industry within the Newcastle LEP 2003. The northern part and a small portion in the south west corner of the site is zoned E2 Environmental Conservation, formerly 7(b) Environmental Protection within the Newcastle LEP 2003. The remaining area is zoned SP2 Infrastructure, formerly 5(a) Special Uses within the Newcastle LEP 2003. The current site zoning of the site is represented in Figure 14 below.

The development footprint of the TSF has an area of 38ha. The majority of the TSF (22ha) is located within the IN3 Heavy Industrial zone and 16ha located within the E2 Environmental Conservation zone. The access road is located entirely within the E2 Environmental Conservation zone and during the construction phase there will be a 3ha construction compound located within the E2 Environmental Conservation zone. A 5ha area has also been identified for a temporary compound within the IN3 Heavy Industrial zone in the south.

Components of the proposed development located within the E2 Environmental Conservation zone, which includes part of the TSF and the access road, are prohibited within that zone under the Newcastle LEP 2012. Part of the TSF is located within the IN3 Heavy Industrial zone within which the proposed activity is a permitted use.

Due to the large area required (significant length of track) to accommodate and access the trains it is not possible to contain the proposed development to lands zoned IN3 Heavy Industrial. The assessment of alternative sites in Section 5 has determined that there is no suitable alternative to the location adjoining the existing rail line within the Environmental Conservation zone.

Given that the proposed TSF is being undertaken as a Part 3A Project, the provisions of the Newcastle LEP 2012 do not apply and therefore planning approval from NCC is not required. The only Environmental Planning Instruments that will apply to the proposed TSF will generally be other SEPPs and Regional plans, where applicable.

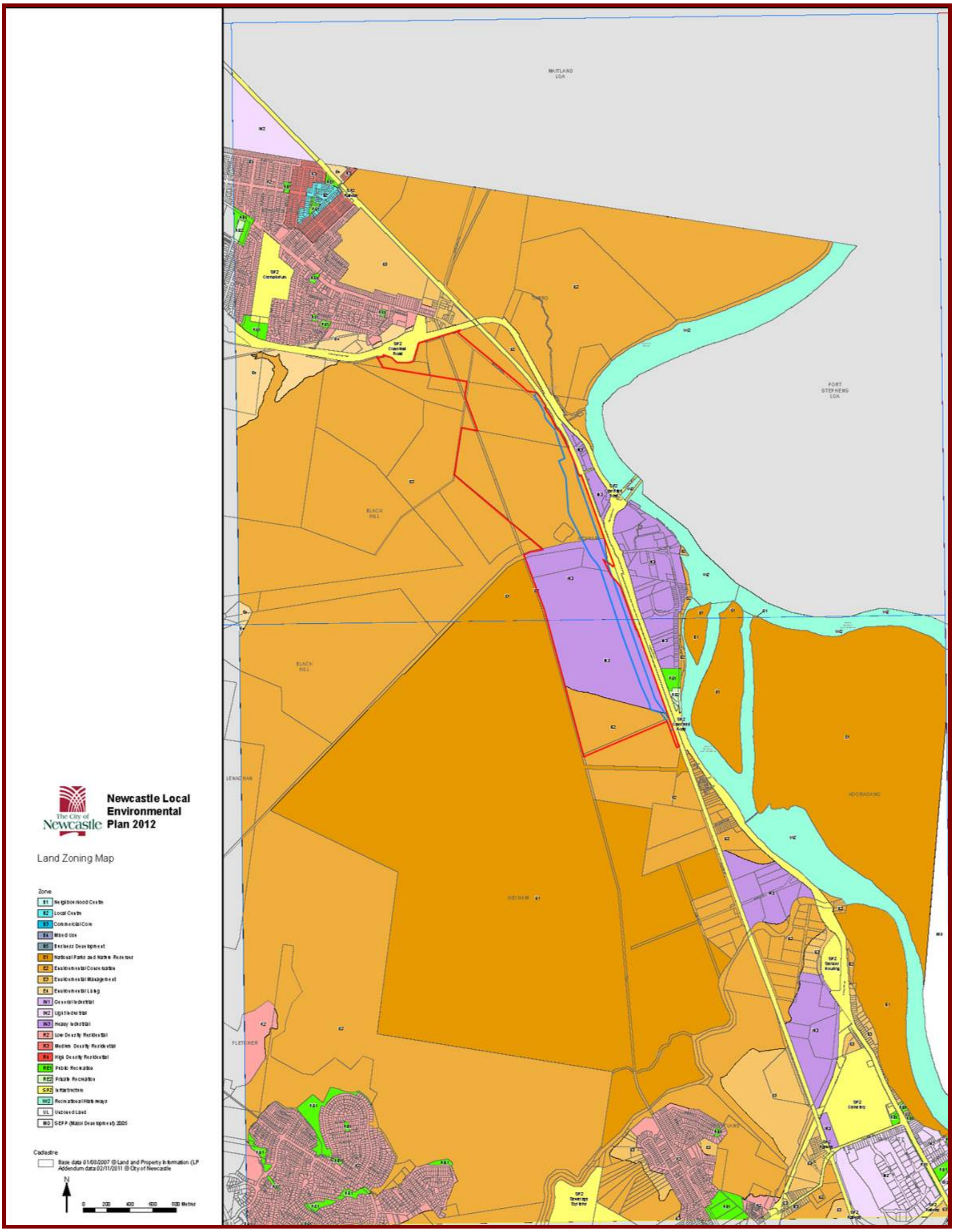


Figure 14: Site Zoning

7.2 REGIONAL PLANNING FRAMEWORK

The relevant regional plans that apply are as follows:

7.2.1 Lower Hunter Regional Strategy (2006)

The majority of the area to be developed for the proposed TSF is identified in the LHRS as 'Employment Lands' as identified in Figure 15.

The proposal is consistent with the LHRS objectives of:

- Ensure that sufficient employment lands are available to cater for 66,000 positions;
- Plan for an additional 160 000 residents and 115 000 new dwellings;
- Establish important green corridors, to protect and even enhance the Region's strong environmental and biodiversity assets; and
- Reinforce the role of the Newcastle City Centre as the Regional City.

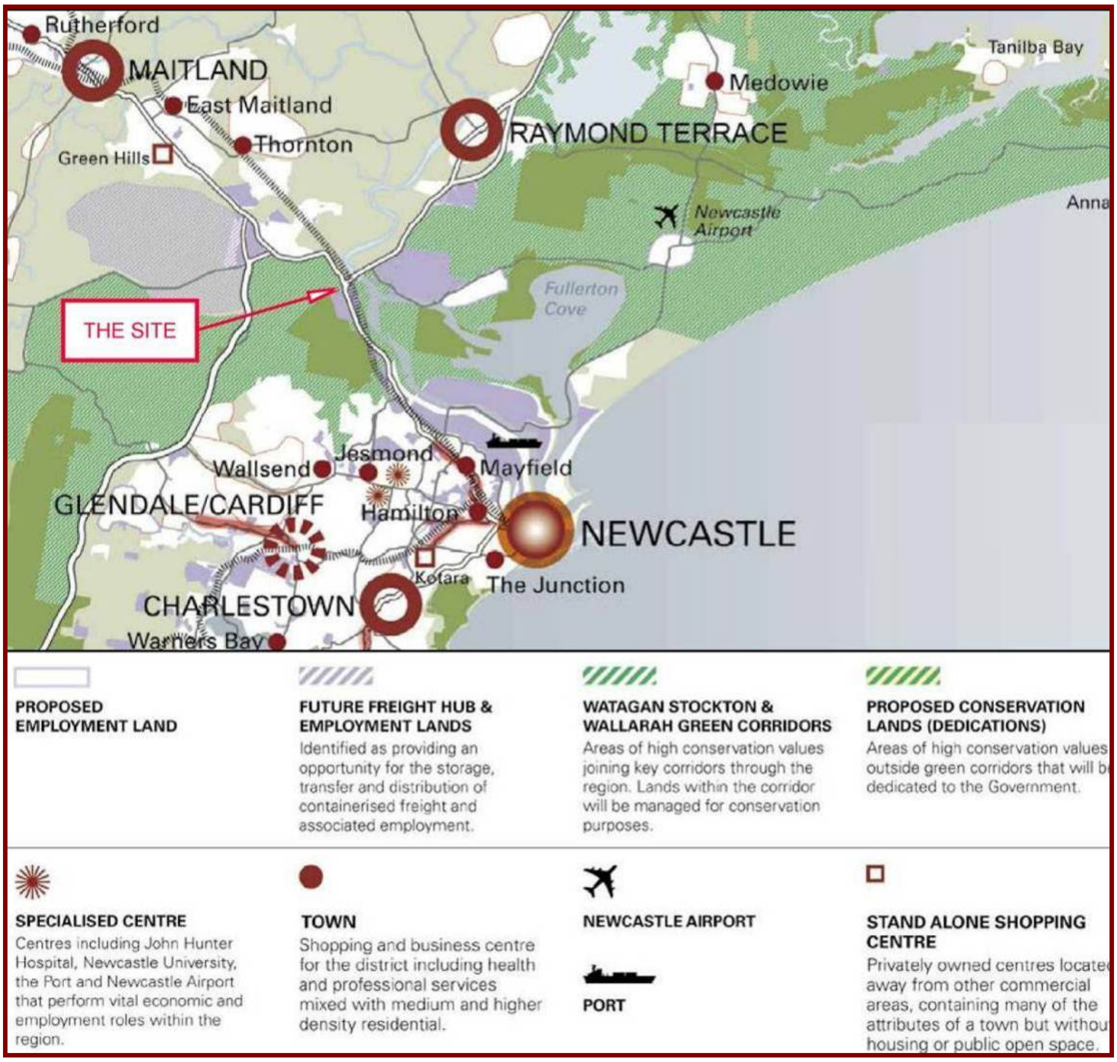


Figure 15: Extract from the Lower Hunter Regional Strategy

A very small part of the proposed TSF being the proposed access road and a portion of the proposed rail line will extend across the green corridor shown on the LHRS map adjoining the north of the subject site. Due to the previously disturbed nature of the site, the impact on the green corridor is considered negligible and appropriate offsets will be negotiated with OEH, details of which can be found in Section 9.2.4.

QR National is not currently pursuing the development of an industrial subdivision and intermodal facility on the adjoining land in conjunction with the TSF. However the TSF project, in the context of the future development of the remainder of the QR National site for industrial purposes, bears consideration in the context of other major proposals in the Hunter Region. The need for industrial land with strategic access to the Port and rail infrastructure has been recognised in strategies and economic planning for the area.

The LHRS identifies land at Stony Pinch/ Beresfield, in the vicinity of the intersection of the Pacific Highway and the New England Highway, as having opportunity to be used, in the long term, as a freight hub. Additionally, future employment lands are identified adjoining the site, to provide support to the freight hub. This site is also identified with an associated rail bypass.

The "Intertrade Industrial Park" is a site located directly on the Port of Newcastle, and was the former BHP site. The draft master plan prepared for the site includes:

- A direct port and industry precinct;
- An intermodal and port support zone;
- A general industry precinct; and
- A technology and commercial precinct.

The QR National site differs from the Beresfield/Stony Pinch and Intertrade Industrial Park sites in a number of key areas. A main difference is the size of the respective sites. The Beresfield/Stony Pinch site has an area of 4,000 ha. Presumably, detailed investigations of the site will reveal some constraints, meaning not all of the area is able to be developed. However the end yield is likely to be many times larger than the QR National site. The Intertrade Industrial Park site covers 150 ha, which again is substantially larger than the QR National site.

The variance in development timelines also represents a key difference between the QR National site and the Beresfield /Stony Pinch site. There is no current timeline in place for an industrial and intermodal development on the QR National site although there are no insurmountable obstacles to the lodgement of an application within the next ten years. The Beresfield/Stony Pinch site is a major long-term development which may require substantial infrastructure upgrades, for example the construction of the associated freight rail bypass, before coming online. The LHRS indicates that the timeline for development for this site is in the "long term", which, in the context of the Strategy, represents a 25 year horizon.

The differences in scale and timelines between the QR National proposal, Intertrade Industrial Park and, particularly, the Beresfield/Stony Pinch plans are sufficient that the pursuit of each development need not jeopardise the viability of any other. Each site has unique characteristics that ensure its advantages for development. The QR National site has immediate access to the working rail line and is planned for a short-medium timeframe; the Beresfield/Stony Pinch site is extremely large and represents a major long term infrastructure project, while the Intertrade Industrial Park site enjoys a prime position directly on the Port of Newcastle.

7.2.2 Fassifern to Hexham Rail Link

The LHRS incorporates specific regional infrastructure requirements that are identified in the *State Infrastructure Strategy*. Two sections of the LHRS require consideration by the proposal, being the expansion of freight handling and transport.

1. Expansion of Freight Handling – The regional strategy highlights a long term opportunity for the designation of a future freight hub and investigation into a Newcastle freight bypass. The strategy identifies land for a freight hub within proximity to the Port and in the vicinity of the junction of the New England Highway and Pacific Highway at Beresfield. The proposed QR National TSF is not proposed on any land identified for future freight hub.

   A freight hub report for the Hunter, completed by Strategic Design + Development Pty Ltd, Cox & Hyder in 2008 for the Hunter Economic Development Corporation (now Hunter Development Corporation), identified two freight rail bypass alignments from Fassifern to Newcastle. The proposed QR National TSF will not impede future development of the identified alignments.

2. Transport – The LHRS seeks to achieve the following:

   - Continue to improve the north – south access through the region, including planning of the linkage of the F3 to the Pacific Highway at Raymond Terrace and upgrades to the Pacific Highway. The proposal will not impact on the potential future linkage of the F3 to the Pacific Highway. For further information refer to Section 9.6 of this EA.

   - Streamline freight movements along the north – south rail corridor between Sydney and Brisbane. In particular, investigate the possibility of constructing a freight rail bypass of Newcastle, which if implemented, would reduce congestion between freight and passenger trains on the Newcastle rail network. The proposed QR National TSF does not impact any land identified for a future freight bypass of Newcastle.

The Lower Hunter Transport Needs Study (Hyder Consulting Pty Ltd), prepared in 2008, considered the long term transport needs for the lower Hunter region. The report identified a possible Fassifern to Hexham Rail Link and freight hub. The proposed QR National TSF will not impede such future development.

Consultation has been undertaken during the EA process in relation to both the proposed TSF and HRR projects. Regular liaison between QR National and Transport for NSW has already occurred and will continue throughout the assessment and design process to ensure that the future development of the Rail Link will not be compromised. The design of the QR National facility has taken into account feedback from Transport for NSW and the concept of the Fassifern to Hexham Rail Link. The TSF design has been developed so as not to affect or limit future development opportunity for the Fassifern to Hexham rail link to proceed.

7.3 STATE STATUTORY PLANNING FRAMEWORK

7.3.1 Environmental Planning and Assessment Act (1979)

The EP&A Act is the primary piece of planning legislation in NSW. Among other things, it sets out the process for the assessment of development proposals such as that proposed by QR National.

The proposed development, identified as the 'Hexham Redevelopment Project' by the DP&I, has been declared a potential State Significant Site under Part 3A of the EP&A Act. Furthermore the DG has issued DGRs as part of the assessment of the project application.

In 2007, QR National also submitted an application to the Minister for Planning and Infrastructure for concept plan approval for a freight intermodal facility and further industrial subdivision. At this point in time, QR National is not proposing to proceed with this additional development on land adjacent to the TSF.

On 1 October 2011, Part 3A of the EP&A Act was repealed by the *Environmental Planning & Assessment (Part 3A Repeal) Act 2011 No. 22*. Despite this, Part 3A continues to apply to the proposed development based on the transitional provision identified in Schedule 6A of the EP&A Act.

Legislation that does not apply to Part 3A projects

Part 3A of the EP&A Act provides that certain additional approvals and authorisations under other Acts are not required in respect of Part 3A projects. Under Section 75U of the EP&A Act, the following authorisations are not required for approved Part 3A projects:

- Concurrence under Part 3 of the *Coastal Protection Act* 1979 of the Minister administering that Part of that Act;
- A permit under Section 201,205 or 219 of the *Fisheries Management Act* 1994;
- An approval under Part 4 or an excavation permit under Section 139, of the *Heritage Act* 1977;
- An Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act* 1974;
- An authorisation referred to in Section 12 of the *Native Vegetation Act* 2003 (or under any Act repealed by that Act) to clear native vegetation or State protected land;
- A bushfire safety authority under Section 100B of the *Rural Fires Act* 1997; and
- A water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act* 2000.

Approvals that must be applied consistently to Part 3A projects

Under Section 75V of the EP&A Act, an authorisation of the following kind cannot be refused if it is necessary for carrying out an approved Part 3A project and is to be substantially consistent with the approval under this Part:

- An aquaculture permit under Section 144 of the *Fisheries Management Act* 1994;
- An approval under Section 15 of the *Mine Subsidence Compensation Act* 1961;
- A mining lease under the *Mining Act 1*992;
- A production lease under the *Petroleum (Onshore) Act* 1991;
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act* 1997 (for any of the purposes referred to in section 43 of that Act);
- A consent under Section 138 of the *Roads Act* 1993; and
- A licence under the *Pipelines Act* 1967.

The additional authorisations required for the TSF project are considered in further detail later in this chapter.

Compliance with the Objects of the EP&A Act

The proposed development is consistent with the objects of the EP&A Act as outlined below:

a) To encourage:

I. The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.

The proposed TSF will service the expansion of the coal mining industry in the Hunter Valley by improving the rail transportation system without increasing the number of trains on the rail network. The establishment of an efficient new facility at Hexham will replace existing facilities within the Newcastle Coal Terminals which are hindering current operations due to the congestion of trains queuing on the Mainline before entering the KCT.

Investigations undertaken as part of the site selection process and concept design seek to identify and minimise adverse environmental effects and provide amelioration measures when these impacts cannot be avoided.

The selected site, adjoining the main rail link between the Hunter Valley mines and the coal loading terminals, has a long association with processing and transportation of coal. The reuse, in part, of an existing industrial site and a focus on minimising the development footprint has limited the loss of sensitive vegetation. The use of adjoining lands for environmental offsets which will enhance the Hexham Wetlands is consistent with best practice in environmental land use planning. An offset strategy has been formulated for the proposed TSF which is consistent with the 'Policy Framework' (*OEH, Principles for the use of Biodiversity Offsets in NSW).* For further detail refer to Section 9.2.4.

II. *The promotion and co-ordination of the orderly and economic use and development of land.*

The Hexham site, much of which has had a long association with coal processing and haulage industry, provides a key strategic location in relation to the coal chain corridor. The use of this site will lead to improvements in the Hunter Valley coal network including reduced costs, minimised off track time and improved reliability.

The proposal is consistent with the ARTC's infrastructure enhancement strategy for the Hunter Valley corridor which seeks to ensure that rail corridor capacity stays ahead of coal demand.

The project will maximise existing rail network infrastructure to support increased capacity of the system and access to the port. The improvements will improve competitiveness and at the same time reduce haulage costs which underpin the international competitiveness of the industry.

III. *The protection, provision and co-ordination of communication and utility services.*

Communication and utility services have been identified and addressed through site investigations and liaison with the relevant authorities and agencies. Consultation with all of the relevant utility providers has been undertaken. A detailed utilities plan has been prepared to ensure the future connection and minimal disruption to existing utilities and services is managed efficiently and that protection of services is undertaken to the satisfaction of service providers.

IV. *The provision of land for public purposes.*

The proposed development does not interfere with the provision of land for public purposes and is itself not required for public use other than for the utility authorities, which have been accounted for.

NCC have indicated a potential cycle path along the HWC CTGM, which would connect with the potential future Richmond Vale Rail Trail cycle path, and provide a regional link between the Hexham area through to Kurri Kurri and beyond. Consultation with NCC has begun and is ongoing in regard to this matter.

V. *The provision and co-ordination of community services and facilities.*

The proposed development does not impact on the provision and co-ordination of community services and facilities.

VI. *The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.*

A detailed overview of the proposed TSF's impact on the environment is addressed within Section 9.2. Mitigation measures will be implemented to ensure the protection and conservation of the environment.

VII. Ecologically sustainable development.

The ecological assessment undertaken for this EA incorporates the results of previous investigations supplemented by additional onsite surveys. Measures to minimise the impact of the project on flora and fauna were identified and mitigation measures to reduce and avoid potential impacts on threatened species and ecological communities and their habitats have been developed. The project includes biobanking offsets in the Hexham locality in response to the assessment that has been undertaken. The offsets strategy is addressed within Section 9.2.4 of this EA.

Throughout the construction and operation of the proposed development, ESD principles and guidelines will be implemented and adhered to (see Section 10.0 Ecological Sustainable Development).

b) To promote the sharing of the responsibility for environmental planning between the different levels of government in the State.

The assessment and consultation process undertaken for this Part 3Aproject entails liaison being undertaken with local, State and Federal level government authorities and agencies. DP&I and the proponent have undertaken this liaison through the transfer of project information and direct contact with the relevant agencies.

c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.

QR National has undertaken consultation and liaison with community groups and individuals over a number of years with regards to the development of the Hexham site for the TSF. Feedback from this consultation has informed the design process and has led to design modifications which seek to minimise impacts on the neighbouring properties.

In addition the Part 3A process contains extensive formal public consultation provisions which will continue as part of the project assessment process.

7.3.2 SEPP (Major Development) 2005

SEPP (Major Development) 2005 identified the types of development that were subject to Part 3A of the EP&A Act. The TSF fell under Clause 23 of Schedule 1 of the SEPP as a rail and related transport facility and as such was to be assessed under Part 3A.

As part of the previous determination that the project was a Major Project, the Minister for Planning on 30 November 2007 gave notice of receipt of a proposal to amend SEPP Major Developments to include the site as a State Significant Site under Schedule 3. A copy of the notice is included in Appendix S.

On 1 October 2011, Part 3A of the EP&A Act was repealed. Despite this, the project was already lodged in accordance with SEPP (Major Development) 2005, and was therefore development to which the transitional provisions identified in Schedule 6A of the EP&A Act apply. These transitional arrangements confirm (Schedule 6A (3)(2)(a)) that 'any State Environmental Planning Policy or other instrument made under or for the purposes of Part 3A, as in force at the date of its repeal, continues to apply to and in respect of a transitional Part 3A project'. Therefore SEPP (Major development) 2005 continues to apply to the proposed development.

7.3.3 SEPP (State and Regional Development) 2011

The aims of this Policy are as follows:

(a) To identify development to which the State Significant Development Assessment and approval process under Part 4 of the EP&A Act applies;

(b) To identify development that is State Significant Infrastructure and critical State Significant Infrastructure; and

(c) To confer functions on joint regional planning panels to determine development applications.

SEPP (State and Regional Development) 2011 includes a class of State Significant Development which could encompass the QR National TSF project. The description of this class is as follows:

Schedule 19 Road, train and related transport facilities.

(1) Development that has a capital investment value of more than $30m for the following purposes:

(a) heavy railway lines associated with mining, extractive industries or other industry;

(b) railway freight terminals, sidings and intermodal facilities; or

(c) roads (including bridges).

(2) Development within a rail corridor or associated with railway infrastructure that has a capital investment value of more than $30m for any of the following purposes:

(a) commercial premises or residential accommodation;

(b) container packing, storage or examination facilities; or

(c) public transport interchanges.

However as the TSF project is a transitional Part 3A project the SEPP (Major Development) 2005 continues to apply to this development and therefore SEPP (State and Regional Development) 2011 will not apply to the assessment and approval of the TSF project.

7.3.4 SEPP 14 (Coastal Wetlands)

SEPP 14 (Coastal Wetlands) ensures that coastal wetlands are preserved and protected for environmental and economic reasons. The policy identifies over 1300 wetlands of high natural value from Tweed Heads to Broken Bay and from Wollongong to Cape Howe. Part of the proposed development will be across SEPP 14 land (see Figure 16 below).

As identified within Figure 16 the site contains two areas of SEPP 14 Coastal Wetlands. The area in the south will not be impacted by the proposed development and is proposed to be conserved as part of the environmental offsets.

The area of SEPP 14 land further to the north in the central part of the site will be impacted by the proposed development where the proposed TSF rail lines will pass through the SEPP 14 area as shown in Figure 16. It is noted that this area is degraded and is also disconnected from more significant wetland areas and so its value is somewhat limited. Despite the minor impact on the

SEPP14 Coastal Wetlands, a good environmental outcome has been proposed, providing environmental offsets of wetlands and EECs to account for the minor impact on SEPP 14 Coastal Wetlands on the site.

The environmental impact and offset strategy is discussed in more detail in Section 9 of this EA.

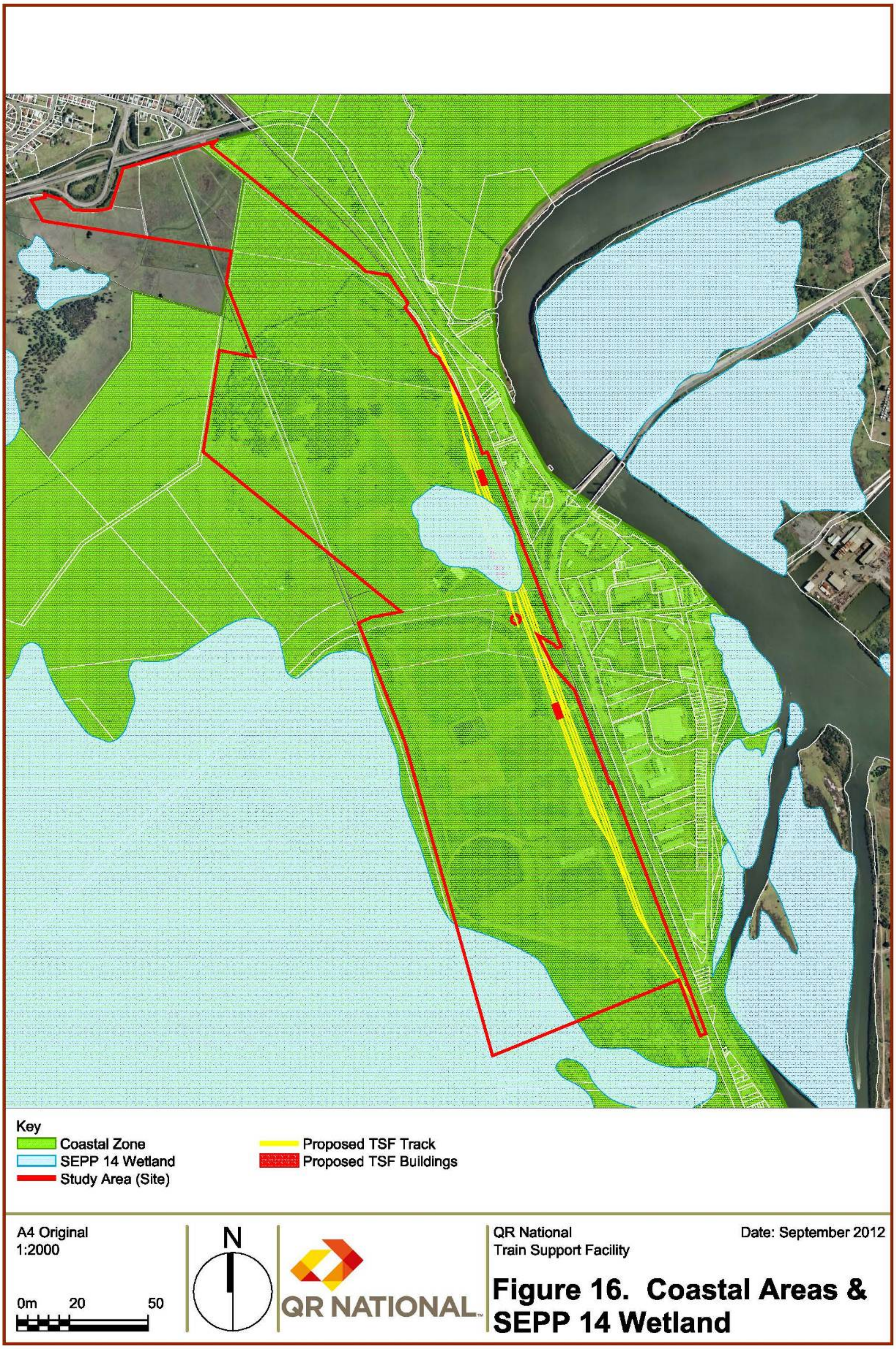


Figure 16: Coastal Areas & SEPP 14 Coastal Wetlands

7.3.5 SEPP 33 (Hazardous and Offensive Development)

This policy regulates the storage of hazardous and offensive materials on a site, including materials such as fuels.

The TSF project requires the storage of diesel for the refuelling of trains and oil on site. Measures will be implemented on site to mitigate against any environmental or human health risks on site as a result of fuel storage and therefore this fuel storage arrangement does not trigger the provisions of SEPP 33. A 200L drum of petrol will also be kept on site for refuelling of a maintenance truck and quad bikes. This will be stored separately from the train refuelling facilities and similarly will not trigger the SEPP 33 provisions. Further detail concerning the storage of hazardous materials and substances is contained within Section 11 of this EA.

7.3.6 SEPP 55 (Remediation of Land)

This SEPP outlines the procedures for remediation of contaminated land. The site contains a number of hotspots requiring remediation. It is intended that this process will comply with the requirements of the SEPP.

Contamination is addressed further in Section 9.9 of this EA, including details of the RAP for the site.

7.3.7 SEPP 71 (Coastal Protection)

The overall aim of this SEPP is to protect the NSW Coastline. The site is located within the coastal zone (identified within Figure 16), therefore consideration will need to be given to the matters contained within the SEPP.

SEPP 71 Coastal Protection requires development within the Coastal Zone must consider Clause 8, Matters of Consideration which are set out below. The following points address these matters:

(a) The aims of this Policy set out in clause 2.

The proposed development is consistent with the aims of the Policy as set out in Clause 2 which are generally to protect and manage the natural, cultural, recreational and economic attributes, vegetation and visual amenity of the NSW Coast as it applies to the site.

(b) Existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved.

The proposal is consistent with the aims of this policy; any existing public access will not be impeded by the proposed development.

(c) Opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability.

The proposal is consistent with the aims of this policy. The site is not strategically located to provide additional access points to the coastal foreshore.

(d) The suitability of development given its type, location and design and its relationship with the surrounding area.

It is considered that the site is suitable for the proposed development, and that this suitability is evident from the assessment presented in this EA. The proposed development is consistent with the strategic planning for the locality, providing employment opportunities as envisaged by the LHRS, and is consistent with the industrial zoning of the site. The proposal is consistent with the established industrial development in the locality, and the proposed future character of the area.

(e) Any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore.

The proposed development does not impact on the coastal foreshore amenity.

(f) The scenic qualities of the New South Wales coast, and means to protect and improve these qualities.

The proposal is consistent with the aims of this policy. The location of the site and topography will ensure no significant adverse impact on existing scenic quality will occur.

(g) Measures to conserve animals (within the meaning of the <u>Threatened Species Conservation Act 1995</u>) and plants (within the meaning of that Act), and their habitats.

The proposal is consistent with the aims of this policy. A Flora and Fauna assessment has been undertaken and is presented separately in this EA. Areas of impact have been appropriately offset.

(h) Measures to conserve fish (within the meaning of Part 7A of the <u>Fisheries Management Act 1994</u>) and marine vegetation (within the meaning of that Part), and their habitats.

The proposal is consistent with the aims of this policy. Areas of impact have been appropriately offset.

(i) Existing wildlife corridors and the impact of development on these corridors.

The proposal is consistent with the aims of this policy. The proposal has a small intrusion into the Green Corridor identified on the LHRS map however no significant impact will result. Offset strategies will be subject to negotiation with NSW OEH.

(j) The likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards.

The proposal is consistent with the aims of this policy. The proposal is not subject to any likely coastal processes. The impact of flooding is discussed separately in this EA, including consideration of sea level rise.

(k) Measures to reduce the potential for conflict between land-based and water-based coastal activities.

The proposal is consistent with the aims of this policy and does not result in any conflict between land or water based activities.

(l) Measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals.

The proposal is consistent with the aims of this policy. An Aboriginal Archaeological assessment has been undertaken and is presented separately with the appendices to this EA. The investigation was undertaken with local Aboriginal stakeholder input. It identifies an area containing a PCD and measures to protect the cultural significance of the area.

(m) Likely impacts of development on the water quality of coastal waterbodies.

This matter is addressed within Section 9.4 of this EA. Measures are proposed to protect water quality, noting the important Hexham Swamp nearby.

(n) The conservation and preservation of items of heritage, archaeological or historic significance.

The proposal is consistent with the aims of this policy. Aboriginal, archaeological and European heritage investigations have been undertaken for inclusion within this EA to ensure conservation and preservation of significant items are addressed and where necessary mitigation and management measures are implemented.

(o) Only in cases in which a council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities.

The proposal is not the subject of consideration under this clause.

(p) Only in cases in which a DA in relation to proposed development is determined:

(i) The cumulative impacts of the proposed development on the environment.

The proposed development will have an insignificant cumulative impact on the environment given that it can be demonstrated how each issue of the proposal will be adequately managed.

(ii) Measures to ensure that water and energy usage by the proposed development is efficient.

This matter is addressed in Section 10.1.2. Water capture and re-use, and energy efficiency and security of supply have been important considerations in designing the proposed development.

7.3.8 SEPP (Infrastructure) 2007

The SEPP provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The SEPP supports greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency. The proposed development is not exempt from the requirement for consent by way of this SEPP.

The proposed development adjoins an existing rail corridor and so the procedures for involving ARTC must be followed including the need to obtain the concurrence from ARTC. The consent authority must also consider the impact of connecting to a classified road. The SEPP requires the RMS to be consulted in relation to the proposed road connection.

7.3.1 State Infrastructure Strategy

The Infrastructure Strategy is a rolling 10 year strategy to plan and fund the infrastructure that supports economic growth and the services that the NSW Government delivers. It is guided by NSW government agencies, and forms the link between the infrastructure plans detailed in the four forward years of each State budget, the 10 year NSW State Plan, and the 25 year metropolitan and regional strategies.

The Infrastructure Strategy includes agency infrastructure plans for human services, justice, transport, electricity and water. The Infrastructure Strategy also maps infrastructure projects by six broad regions being Sydney, Central Coast, Hunter, North Coast, Illawarra, South East and inland NSW.

Of relevance to the proposed TSF is the agency infrastructure report for transport. An initiative of the ARTC detailed in the plan includes the Hunter Valley Investment Strategy, worth $375m, to provide rail capacity to meet the growing demand for coal haulage.

The needs and objectives of the proposed TSF are consistent with supporting increased rail coal haulage in the Hunter Valley and therefore the proposed project is consistent with the State Infrastructure Strategy.

7.3.2 NSW Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act* 1995 (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the EP&A Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development or an activity will affect threatened species, populations and EEC or their habitat. To determine this, an ecological survey of sites is required, the finding of which are outlined below.

Three EEC's occur in the study area: Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions; Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions. The EECs are identified on Figure 19 within Section 9.2.

No threatened flora species were recorded within the study area, though Zannichellia palustris was considered a potential occurrence.

Eleven threatened fauna species were recorded within the study area and an additional four threatened fauna species were considered likely to occur. Six Migratory species listed under the EPBC Act are also considered likely to occur. A more detailed discussion of the ecological investigations is contained within Section 9.2 of this EA.

7.3.3 *NSW Roads Act 1993*

Works within the roadway will also require approval under Section 138 the *Roads Act* 1993 (Roads Act). The Roads Act requires that a person obtain the consent of the responsible roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a public road.

The RMS is the responsible authority. The proposed site intersection will require approval from the RMS. As described within Section 6.4.3, the approval process requires the proponent to enter into a Works Authorisation Deed (WAD) with RMS to cover the legal requirements. ARTC will manage the WAD process with RMS for construction of the intersection off the Tarro Interchange and the approval for the proposed access road from the intersection to the TSF is sought within this EA. The access will be shared by ARTC and QR National.

7.3.4 *Protection of the Environment Operations Act 1997*

The purpose of the *Protection of the Environment Operations Act* 1997 is to control pollution and set up a licence regime. This Act requires the issue of an Environment Protection Licence (EPL) for scheduled activities listed in Schedule 1 of the Act.

Railways Systems Activities are identified as a scheduled activity under Clause 33 of Schedule 1 and includes the installation, on site repair, onsite maintenance or on site upgrading of track or the operation of rolling stock on track. In this context, 'track' means railway track that forms part of, or consists of, a network of more than 30 kilometres of track. The construction and operation of the TSF will be a Railways Systems Activities which requires an EPL.

Chemical Storage is also a scheduled activity under Clause 9 of Schedule 1 and includes the storage or packaging of 2,000 tonnes or more of petroleum or petroleum products in containers, bulk storage facilities or stockpiles. The storage of 100,000 litres of fuel on site will be a scheduled activity for which an EPL is required.

Extractive Activities is identified as a scheduled activity under Clause 19 of Schedule 1 if it involves the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials. If more than 30,000 tonnes of coal rejects are to be extracted from the existing coal tailings area per year than an EPL will also be required for this scheduled activity.

An EPL may therefore be required for the TSF for the scheduled activities of Railway Systems Activities, Chemical Storages and Extractive Activities.

7.3.5 *Contamination Land Management Act 1997*

This Act requires that the Department of Environment, Climate Change and Water be notified of contamination likely to be of "significant risk of harm" to human health or the environment. The Act also details the requirements for investigation and remediation of contaminated land. It is considered on the basis of the work completed that the site will not classify as being of significant risk of harm. Further detail concerning contamination of the site is addressed within Section 9.9 of this EA.

7.3.6 *National Parks and Wildlife Act 1974*

The *National Parks and Wildlife Act* 1974 (NP&W Act) applies to adjoining land owned and managed by the National Parks and Wildlife Services (NPWS).

Under Section 90 of the NP&W Act, consent is required to destroy, deface or damage an Aboriginal object or Aboriginal place. Pursuant to Section 75U of the EP&A Act, consent under Section 90 of the NP&W Act is not required for an approved Part 3A project.

The minister can issue stop work orders in relation to an action that may detrimentally affect an Aboriginal object or place. No relics or sites are to be impacted upon as a result of the proposed TSF. In the instance where items of Aboriginal heritage are found, appropriate mitigation action has been identified within Section 9.12.

The NP&W Act also applies to the establishment of two conservation areas that total approximately 53ha in close proximity to Hexham Swamp. These areas are to be managed in accordance with a Conservation Management Plan and are proposed to be subject of a Conservation Agreement under the NP&W Act to ensure long term management and security of biodiversity.

7.3.7 *Rural Fires Act 1997*

Under this Act, the owner or occupier of land is obliged to take practicable steps to prevent the occurrence and spread of bushfires on their land.

As indicated in Figure 17 below, part of the site is identified as bushfire prone land. Whilst separate approvals under Section 100B of the Rural Fires Act 1997 is not required, the DGRs stipulate that the EA must identify and assess the risk to the project and surrounding land use and development from bushfire hazards. As such a bushfire protection assessment that clearly identifies and describes components of the project and surrounding land uses which may be affected from bushfire hazards has been undertaken and is presented within Appendix F.

Given the nature of the proposed development the fact that the site is substantially cleared, and considering the materials proposed to be used in construction, it is not believed that there is any substantial threat from bushfire.

7.3.8 *Noxious Weeds Act 1993*

The *Noxious Weeds Act* 1993 requires noxious weeds to be managed in a manner that restricts their establishment and dispersal. Appropriate mitigation measures and controls will be included in the Conservation Management Plan to manage the risks associated with noxious weeds identified on site.

7.3.9 *Waste Avoidance and Resource Recovery Act 2001 (WARR Act)*

The purpose of this Act is to encourage the most efficient use of resources and to reduce potential environmental harm from waste material through a hierarchy of waste management processes (avoid, recover, dispose).

The waste management hierarchy referred to in the Act will be applied to any waste materials generated during construction and operation of the proposed TSF.

7.3.10 Water Act 1912 and Water Management Act 2000

The *Water Act* 1912 (Water Act) and the *Water Management Act* 2000 (WM Act) regulate the licensing and use of surface and groundwater in NSW. The WM Act applies in circumstances where a water sharing plan has been enacted for a specified area and in respect of certain water sources within that area. The Water Act continues to apply to the licensing and use of water in all other areas of the State.

The project area is covered by the *Hunter Unregulated and Alluvial Groundwater Source Water Sharing Plan 2009* (WSP). This WSP applies to surface water and alluvial groundwater in the project area. However, the WSP does not apply to water contained in alluvial sediments downstream of the tidal limits. Section 75U of the EP&A Act provides that a water use approval, a water management work approval or an activity approval (other than an aquifer interference approval) are not required for an approved Part 3A project.

However, a water access licence (WAL) under the WM Act will be required if water is to be taken from Purgatory Creek for the purpose of dust suppression and construction uses. A separate application for a WAL will be made to the NSW Office of Water if required.

7.3.11 Transport Administration Act 1988

This Act regulates the administration of transport activities undertaken in NSW. The Act requires that QR National obtain approval from ARTC prior to connecting to the NSW rail network. This approval from ARTC will be is separate to this planning approval process.

7.4 COMMONWEALTH STATUTORY PLANNING FRAMEWORK

7.4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires consideration of the following:

- Actions that have a significant impact on matters of national environmental significance;
- Actions that have a significant impact on Commonwealth land; and
- Actions carried out by the Commonwealth.

Approval from the Commonwealth Environment Minister is required under the EPBC Act if the action (can include a project, development, undertaking or activity) will, or is likely to, have a significant impact on matters considered to be of national environmental significance (NES matters). NES matters relevant to this study include threatened species, ecological communities and migratory (JAMBA/CAMBA) species that are listed under the EP&A Act.

The EPBC Act does not define significant impact but identifies matters that are necessary to take into consideration. Additional information is available within EPBC Act Policy Statements that provide background information and guidelines on how to survey for, and assess impacts on, matters of NES. If the matter is referred to the Minister a decision is generally required within 20 days in relation to whether an action requires Commonwealth approval.

So as to seek clarity with regards to EPBC Act approval requirements for NES matters (migratory birds, RAMSAR wetlands, Green and Golden Bell Frog, Grey-headed flying-fox), a referral was submitted to the Australian Government Department of Sustainability, Environment, Water, Population & Communities (SEWPAC). The proposed action was deemed not to be a controlled action on 20 March 2012 (EPBC Act referral 2012/6285), for further detail refer to the SEWPAC correspondence contained in Appendix U).

7.4.2 Native Title Act 1993

The *Native Title Act* 1993 administers processes relating to the recognition, protection and determination of native title and dealings with native title land. Native title is concerned with the rights and interests of Aboriginal peoples in relation to land and water in Australia and its territories.

A search of the National Native Title Register, the Register of Native Claims, and the Register of Indigenous Land Use Agreements has been completed as part of the preparation of the Aboriginal Cultural Heritage Report.

No lands were determined to have native title and no registered native claims or Indigenous land use agreements were located within the Project Area.

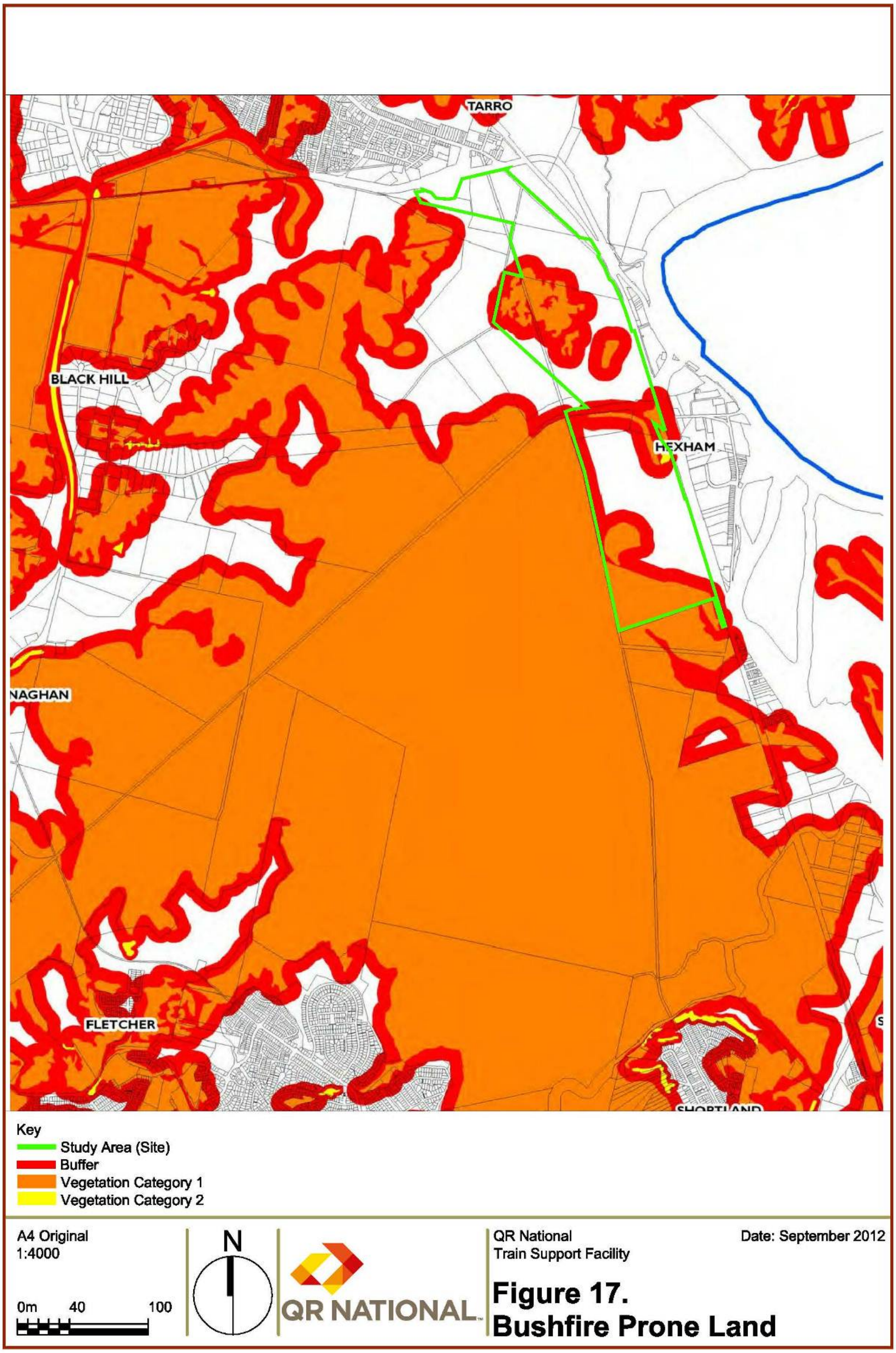


Figure 17: Bushfire Prone Land

8.0 Stakeholder Consultation

8.1 INTRODUCTION

The original application for a TSF in association with an intermodal terminal and an industrial subdivision, previously known as the Hexham Redevelopment Project, was submitted to the Department of Planning (now DP&I) late in 2007. Further detail of the project background is addressed within Section 2.3.

Stakeholder/community consultation was conducted with key community groups and local residents and businesses in 2008. Since that time the project has been substantially reduced in size, with the TSF as the only aspect of the original project that will be put forward for assessment with the industrial subdivision and intermodal facility no longer being part of the project. This results in a much smaller project footprint. As such the feedback received at that time remains relevant. It is not anticipated that the views expressed at the time would have significantly changed during the intervening period.

Follow-up liaison has been undertaken in 2011 and 2012 with residents in the immediate vicinity of the site, local elected representatives, key industry representatives and government agencies. A Stakeholder Engagement Plan has been prepared by QR National detailing the consultation process. An information session will be held during the public exhibition coinciding with the EA Public Exhibition. This information session will provide the opportunity for the community to discuss with QR National representatives the most up to date details of the project. It will also provide the channel for additional feedback about the project to be provided. Consultation will continue with adjoining landowners, local businesses and relevant stakeholders as the project progresses.

8.2 STAKEHOLDERS

The Stakeholder Engagement Plan outlines QR National's approach and implementation plan for consultation with stakeholders and communities regarding the proposed Hexham TSF. This will ensure that all of the relevant environmental, social and economic issues raised by stakeholders and the community are considered and addressed by the project team within the EA process.

Stakeholder and community members/groups consulted to date as part of the EA process include:

- Community Groups
    - Beresfield Community Forum,
    - Hunter Bird Observers,
    - The Green Corridor Coalition,
    - The local community; and
    - Aboriginal Community Representatives;

- Adjoining Landholders;
- State Members for Wallsend and Cessnock;
- Minister for The Hunter;
- Industry
  - HVCCC,
  - Hunter Business Chamber;
- Government Agencies
  - NCC, ARTC, DP&I, OEH, NSW Office of Water, NSW Department of Primary Industries (Fisheries), Transport for NSW, RMS, SEWPAC, Railcorp, CMA, Hunter Development Corporation.
- Utility Providers
  - Ausgrid, Jemena, Telstra, Optus, Visionstream, HWC.

The Stakeholder Engagement Plan outlines how QR National and its advisors will research and identify community and other stakeholder groups to ensure all relevant individuals and groups are consulted with at the appropriate phases of the project.

8.3 CONSULTATION TO DATE

Information sessions provided an opportunity for direct consultation with 3 identified community groups:

- Beresfield Community Forum;
- Hunter Bird Observers; and
- The Green Corridor Coalition.

These sessions provided project information to the groups and allowed for their feedback and responses to be recorded. For further details refer to the Socio Economic Impact Assessment within Appendix D of this EA.

A further information session was conducted with members of the Hunter Business Chamber, who were supportive of the project and the regional contributions it would make.

An information letter was sent to 121 surrounding residents and businesses located locally within the Hexham area. The letter provided community members with project information and invited them to respond with comments and feedback. Currently community feedback is still being received and will be monitored as part of QR National's ongoing community consultation strategy.

As a consequence of the initial community consultation, QR National was invited to attend a meeting of the Beresfield Community Forum which was accepted. QR National representatives gave a presentation and answered questions from the group of 37 residents, which included the then NCC Mayor, John Tait.

Further to the consultation with the local community and community groups, the Project Team has engaged in regular consultation with State Government Departments and Local Authorities.

8.4 ONGOING CONSULTATION TOOLS

Consultation tools have been established and maintained to ensure to ensure that project information is continuously being collected, exchanged and distributed. The ongoing consultation tools are described below.

Briefings

During the construction and operation of the project, briefings may be held to provide information on the project, and to seek input to the project. Relevant project team members and QR National management would attend to answer questions.

Newsletters

Periodically throughout the project, newsletters may be prepared that would contain information about:

- Project progress;
- Upcoming works;
- Possible impacts to adjoining landholders;
- Mitigation measures to be used; and
- Contact details for complaints and questions.

The newsletters would be delivered to the residences of properties in the vicinity of the project, and other stakeholders as deemed appropriate.

Telephone Info Line / Email

The QR National Community Information Line - 1800 033 881 (toll-free) and email community@qrnational.com.au will be used for any enquiries or complaints relating to the project.

A record of the complaint or enquiry would be incorporated into the Project Issues Register to ensure that the matter is dealt with and closed off.

Media

Advertising in the local media, including possible radio interviews for QR National will be co-ordinated by QR National's External Relations and Communications team in accordance with the corporate principle.

One-on-One Meetings

Upon request, or on an as needs basis, meetings may be held with individuals, businesses, or agencies to discuss the project and how any issues will be addressed.

8.5 SUMMARY OF ISSUES RAISED BY STAKEHOLDERS

QR National and ARTC have cooperated on both projects. Joint stakeholder presentation and briefings have been held with the following:

- DP&I;
- OEH;
- Department of Sustainability Environment Water Population and Communities;
- Transport for NSW;
- NCC;
- RMS;
- HWC; and
- Brancourts.

QR National and ARTC also hold fortnightly coordination meetings where key issues affecting both projects are discussed and addressed. Issues such as site access, drainage and run off, and property access are addressed in this forum.

A summary of issues raised is identified within Table 9 below.

Table 9: Summary of Issues raised by Stakeholders During Consultation

Timing	Stakeholder	Comment/Issues Raised	Where addressed in EA
Ongoing	DP&I (Sydney and Hunter Office)	• EA to include section on cumulative impacts of both projects re: Aboriginal archaeology	Section 9.12
May 2012 Ongoing	OEH	• Biodiversity offset strategy - potential conservation options	Section 9.2.4 and Appendix F
Dec 2011	SEWPAC	• EPBC referral – requirments of process	Section 7.4 and Appendix U
May 2012 Ongoing	NCC	• Access to site from Woodlands Close • Council road access across proposed site access (ongoing consultation) • Richmond Vale rail trail bike track • Public road and private road ownership for site access	Section 9.6
May 2012	Department of Trade and Investment, Regional Infrastructure & Services	• Meeting to present project and discuss key issues • Future development of the Fassifern to Hexham Rail Link	Sections 7.2.3 and 9.6
May 2012 Jan 2012 Oct 2012 Ongoing	Transport for NSW	• Meeting to present project and discuss key issues and future development of Fassifern to Hexham Rail link.	Sections 7.2.3 and 9.6
May 2012 Ongoing	RMS	• Access to site from New England Highway	Section 9.6
Ongoing	ARTC	• Continuing consultation via fortnightly coordination meetings – key issues: o Site access o Cumulative impacts o Drainage o Design	Sections 2.7 and 9.6 Section 9.19
Ongoing	HWC	• Access to site • Crossing & protection of Hunter Water assets • Allowance for new pipeline to Beresfield	Section 9.11.2
April 2012 Nov 2012 Community info day - ongoing	Community	• Cumulative Impacts of QR National and ARTC Projects • Air quality - (dust) during construction • Traffic and transport – increased numbers during construction • Noise during construction and operation • Flooding/drainage • Property access (location of access road)	Section 9.19 Section 9.15 Section 9.6 Section 9.14 Section 9.3 Section 9.6
September 2012	Department of Primary Industries (Fisheries)	• Not restricting flows in Purgatory Creek	Section 9.4
May 2012 Ongoing	Brancourts	• Protection of assets • Property access	Section 3.8 Section 9.6
October 2012	CMA	• Water quality • Stormwater - potential impacts and changes in flow to direction & quality of run off	Section 9.4

Further issues will emerge from a broader range of stakeholders and will be tracked and addressed through reporting and complaints management processes. All complaints and enquiries will be managed in accordance with QR National's Complaints and Enquiries Management Protocol with a Record of Interaction Log completed to record all complaints and enquiries.

8.6 CONCLUSION

QR National has consulted with key stakeholders about the project over a period of time. In that time the project has been reduced significantly in size from the original proposal. Issues that have been raised have been considered in the design of the project. The technical studies have also addressed issues raised. Extensive interaction with ARTC has resulted in the coordination and integration of strategies (e.g. Site access, drainage) to address cumulative issues in a coordinated manner.

QR National will hold an information session during the EA exhibition. The information session will be publicised in the local print media and provide an additional opportunity for further consultation.

Mitigation measures have been identified and will be incorporated in the CEMP prior to construction commencing. QR National will continue to liaise with neighbours as per the Stakeholder Engagement Plan and continue to discuss the project with the community and consider any issues raised as the project progresses.

9.0 Assessment of Environmental Impacts

9.1 INTRODUCTION

This section of the EA is designed to further explore the proposal and discuss key environmental impacts. The relevant DGRs and other key environmental issues have been addressed as part of this EA.

9.2 ECOLOGICAL CONSIDERATIONS

Eco Logical Australia Pty Ltd (ELA) was commissioned by QR National to prepare an Ecological Assessment for the proposed TSF. The assessment has been carried out on the basis that the proposal is a Part 3A Major Project. The Ecological Assessment is provided within Appendix F of this EA.

9.2.1 Existing Environment

The study area comprises disturbed lands, including evidence of widespread soil disturbance (excavation and filling), interspersed with revegetation and depressions. As already outlined the southern part of the study area has a long history associated with coal stockpiling, loading and unloading and to this day the site contains a significant quantity of coal tailings. The remaining study area contains remnant, albeit highly disturbed, swamp oak forest, salt marsh and freshwater wetland in the south, artificial freshwater wetlands (i.e. drains and ponds) and open pasture. Much of the site is currently subject to pasture improvement and cattle grazing.

The site adjoins NPWS Estate (Hexham Swamp) to the west. Recognised SEPP 14 Coastal Wetlands also adjoins the study area and extends onto the site as identified within Figure 18.

Eco Logical Australia has adopted the proven methodology of Database Review, Literature Review and Flora & Fauna Survey effort to identify potential effects of the proposal on threatened species, population or ecological communities or their habitats.

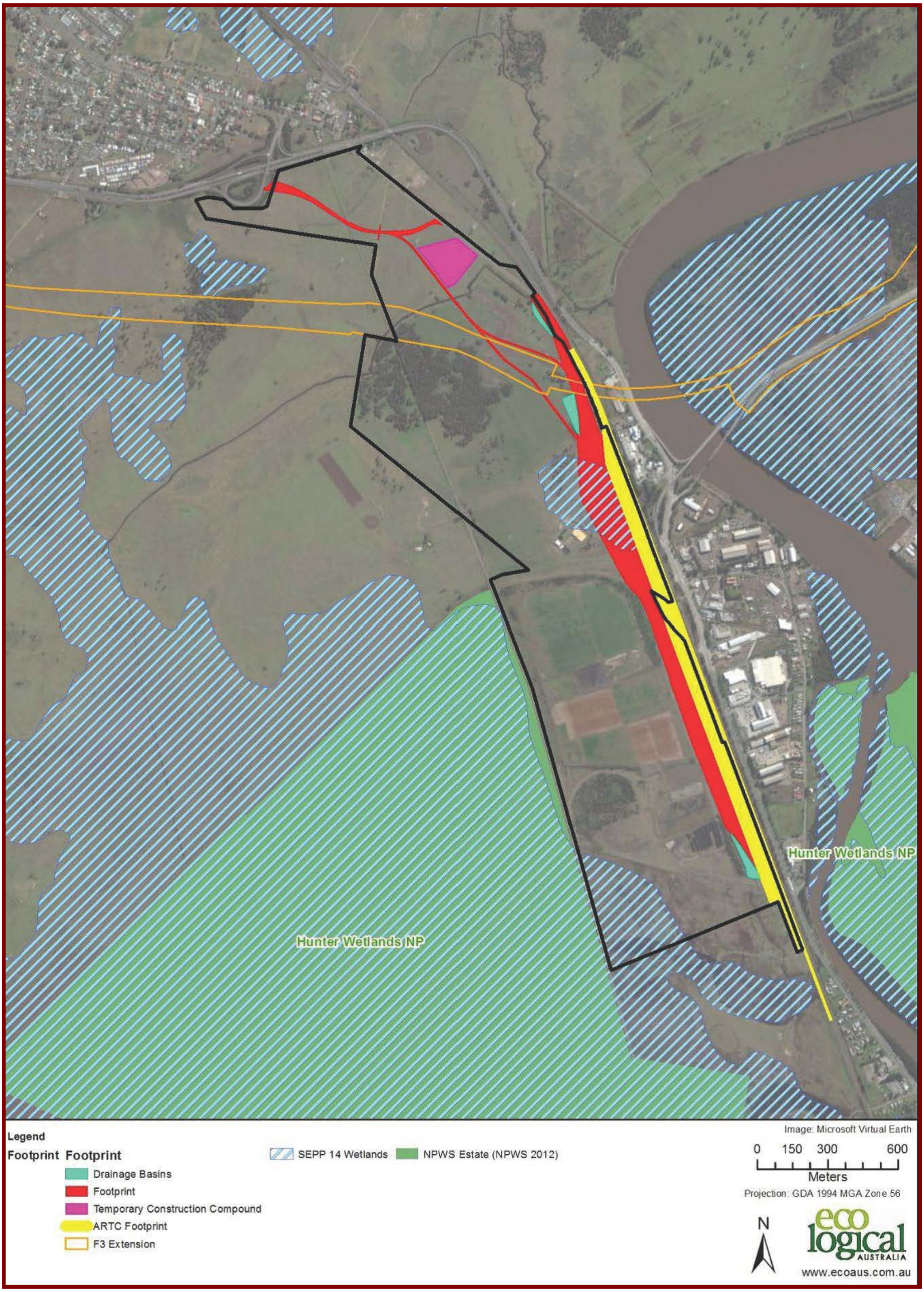


Figure 18: NPWS Estate (Hexham Swamp) & SEPP 14 Coastal Wetlands.

Database Review

The data audit was based on analysis of environmental database searches including the Atlas of NSW Wildlife and the EPBC Act. Searches included a 10km radius around the site, centred on the study area, to determine the local occurrence of threatened flora and fauna in accordance with state and federal statutory requirements. These searches were carried out on 25 February 2011.

An assessment of likelihood of occurrence was made for threatened flora and fauna identified from the database search. This assessment was based on database or other records, presence or absence of suitable habitat within the study area, results of the field investigations and professional judgement.

Literature Review

Three recent studies have compiled ecological information on the study area, including: EcoBioiogical (2008), EcoHub Ecological Consultants (2009), and Parsons Brinckerhoff (2012). Whilst these documents were not finalised and published, the data from EcoBiological (2008) and EcoHub Ecological Consultants (2009) studies have been included in this study.

Flora & Fauna Survey

The survey methods for this project have been designed to supplement the previous surveys to ensure survey effort meets the Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (DEC 2004); DECCW (2011) Field Survey Guidelines; DECC (2009) Threatened species survey and assessment guidelines field survey methods for fauna - Amphibians; and the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act) survey guidelines for Nationally Threatened Species.

Survey effort for the study area from this and previous flora and fauna studies are addressed with the Ecological Investigation Report within Appendix F. The survey has met OEH requirements in relation to vegetation community mapping, call playback (owls), bats, birds, nocturnal amphibians (spotlighting and play-back) and di-urnal amphibian and reptiles.

With regard to vegetation plots and fauna trapping, the survey effort was appropriate for the site, but does not strictly meet the guidelines. For example, two rather than three plots were undertaken in the Phragmites Australia / Typha orientalis wetlands due to the homogeneity of the site. With regard to fauna trapping, the total number of trap nights for the entire site exceeded the survey guidelines, however cage and arboreal trapping was not undertaken in the saltmarsh and Phragmites australis wetlands due to a lack of suitable habitat for ground-dwelling mammals. Eco Logical Australia (ELA) believes the survey intensity and location was appropriate for the site and indeed exceeds the survey requirements in a number of cases.

An overview of the consolidated survey effort is addressed within Table 10 below.

Table 10: Consolidated Survey Effort - flora & fauna studies/comparison to guidelines.

Survey Method	Survey Guidelines (DEC 2004; OE&H 2010)	Survey	Timing	Stratification type, area and survey effort per type: Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner	Coastal floodplain sedgelands, rushlands and forbs of the North Coast	Phragmites Australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin	Saltmarsh in estuaries of Sydney Basin and South East Corner	Disturbed / Cleared Vegetation	Compliance with OE&H Guidelines
				47.15	9.69	15.66	9.24	172.26	
Rapid Data Points (RDP)	N/A	EcoBiological (2008)	3/12/207 and 9/1/2008	4 points	3 points		1 point		N/A
		ECOHUB (2008) (descriptive quadrats)	December 2007	7 points in total (locations unknown)					
Floristic quadrats	Swamp Oak Forest - 4 quadrats; Coastal floodplain sedgelands - 3 quadrats; Phragmites australis and Typha orientalis freshwater wetlands - 3 quadrats; Saltmarsh - 3 quadrats; Disturbed/cleared - 0 quadrats	EcoBiological (2008)	3/12/207 and 9/1/2008	3 plots					Not all stratification units have been sampled as per the guidelines; however given the homogeneity of stratification units as found during extensive random meanders, the site is considered to have been adequately surveyed.
		ECOHUB (2008)	11-16 June 2008	4 quadrats in total (locations unknown					
		Eco Logical Australia (2011)	January - February 2011	4 quadrats	2 quadrats	2 quadrats	2 quadrats		
Wetland survey	N/A	EcoBiological (2008)	11/1/2008 and 31/3/2008		1 survey				N/A
Floristic searches	N/A	EcoBiological (2008)	3/12/207 and 9/1/2008	1 transect	1 transect			1 transect	N/A
		ECOHUB (2008)	11-16th June 2008	3 transects	1 transects	2 transects	1 transects	1 transects	
		Eco Logical Australia (2011)	January - February 2011	2 transects plus random meander across study area	1 plus random meander across study area	1 plus random meander across study area	1 plus random meander across study area	random meander across study area	
Vegetation community mapping	Stratify the site in to Biometric vegetation types	EcoBiological (2008)	3/12/207 and 9/1/2008	Random meander across the entire site					Yes
		Eco Logical Australia (2011)	January - February 2011	Random meander across the entire site					
		ECOHUB (2008)	June 2008	Random meander across the entire site					
Targeted flora and fauna habitat transects	N/A	EcoBiological (2008)	November 2007 to March 2008	1 transect	1 transect			1 transect	N/A
		ECOHUB (2008)	11-16 June 2008	2 transects	1 transect			1 transect	
		Eco Logical Australia (2011	January - February 2011	Random meander across the entire site					
Elliot A trapping (terrestrial)	100 trap nights over 3-4 consecutive nights. Effort per stratification unit up to 50ha, plus an additional effort for every additional 100ha	EcoBiological (2008)	19-23/11/2007	72 trap nights					132 trap nights have been sampled on the site. Given the suitability of the habitat on the site (depauperate and long history of disturbance), this level of survey effort is considered adequate.
		ECOHUB (2008)	11th-14th June 2008 and 21-25th June 2008	80 trap nights (western boundary of subject site) plus 80 trap nights (southwest section of subject site). Actual location unknown					

Survey Method	Survey Guidelines (DEC 2004; OE&H 2010)	Survey	Timing	Stratification type, area and survey effort per type					Compliance with OE&H Guidelines
				Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner	Coastal floodplain sedgelands, rushlands and forbs of the North Coast	Phragmites Australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin	Saltmarsh in estuaries of Sydney Basin and South East Corner	Disturbed / Cleared Vegetation	
				47.15	9.69	15.66	9.24	172.26	
Elliot B trapping (terrestrial)	100 trap nights over 3-4 consecutive nights. Effort per stratification unit up to 50ha, plus an additional effort for every additional 100ha	EcoBiological (2008)	19-23/11/2007	36 trap nights					Due to inadequate location of survey sites, it's difficult to say whether precise guidelines per stratification unit have been met. However, 36 trap nights have been sampled on the site, presumably in more favourable habitats. Given the suitability of the habitat on the site (depauperate and long history of disturbance), this level of survey effort is considered adequate.
Arboreal trapping (ECOHUB arboreal glider traps)	24 trap nights over 3-4 consecutive nights. Effort per stratification unit up to 50ha, plus an additional effort for every additional 100ha	ECOHUB (2008)	11th-14th June 2008 and 21-25th June 2008	72 trap nights plus 36 trap nights (location unknown)					Given arboreal habitat is confined to the swamp oak forest, the combined arboreal trapping and hair tubing effort by EcoBiological (2008) and ECOHUB (2008) is adequate.
Hair tubes (arboreal)		EcoBiological (2008)	19-23/11/2007	96 trap nights					
Cage trapping	24 trap nights over 3-4 consecutive nights. Effort per stratification unit up to 50ha, plus an additional effort for every additional 100ha	ECOHUB (2008)	11th -14th June and 21st -25th June 2008	16 trap nights (location unknown)					No. However, given the available habitat, past disturbance and the likelihood of encountering threatened fauna targeted by this method, this level of effort is considered adequate.
Spotlighting	2x 1 hour up to 200ha of stratification unit at 1km per hour on 2 separate nights.	EcoBiological (2008)	22/11/2007;	12.5hrs total effort (location unknown)					It is difficult to accurately calculate effort per stratification unit, due to lacking survey location information. However, given the complexity and habitat suitability of the study area, the effort employed is considered adequate.
		Eco Logical Australia (2011)	January - February 2011	1 x 20min transect 3 repeat visits	1 x 20min transect 3 repeat visits	2 x 20min transects 3 repeat visits	1 x 20min transect 3 repeat visits	meander transects	
		ECOHUB (2008)	8th June 2008	2 hours (location unknown)					
Call playback	Sites to be separated by 800m-1km. At least 5 visits on separate nights for Powerful Owl, Barking Owl and Grass Owl. 6 visits for Sooty Owl and 8 visits for Masked Owl.	EcoBiological (2008)	22nd November 2007 - 10th January 2008	3 sites over 4 nights					Yes
		ECOHUB (2008)	8th -12th June 2008	1hr each night for 4 nights (unknown locations)					
Anabat II bat call recorder	2 sound activated devices - effort per 100ha of stratification unit targeting preferred habitat.	EcoBiological (2008)	22nd November 2007 - 10th January 2008	4 sites x 12hrs			1 site x 12hrs	3 sites x 12hrs	Yes
		ECOHUB (2008)	11th -14th June and 21st -25th June 2008	2 sites (nights and hours unknown)	2 sites (nights and hours unknown)	2 sites (nights and hours unknown)		1 sites (nights and hours unknown)	
Bird survey	Species time curve is suggested	EcoBiological (2008)	22nd November 2007 - 10th January 2008	4 transects x 30min each	1 transects x 30min each	1 transects x 30min each	1 transects x 30min each	3 transects x 30min each	Yes
		ECOHUB (2008)	11th -14th June and 21st -25th June 2008	3 transects (12 hours total)	1 transect (12 hours total)	1 transect (12 hours total)		1 transect (12 hours total)	
		Eco Logical Australia (2011	January - February 2011	Opportunistic	Opportunistic	Opportunistic	Opportunistic	Opportunistic	

Survey Method	Survey Guidelines (DEC 2004; OE&H 2010)	Survey	Timing	Stratification type, area and survey effort per type					Compliance with OE&H Guidelines
				Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner	Coastal floodplain sedgelands, rushlands and forbs of the North Coast	Phragmites Australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin	Saltmarsh in estuaries of Sydney Basin and South East Corner	Disturbed / Cleared Vegetation	
				47.15	9.69	15.66	9.24	172.26	
Targeted waterbird survey	A 1 hr census at dawn or duck per wetland	EcoBiological (2008)			2x2hr searches				Yes
Nocturnal amphibian survey (including Green and Golden Bell Frog call playback)	Tadpole surveys, call surveys and active searches (day and night). Small habitat areas 1hr on 3 separate occasions. Large areas 3 separate four-hourly searches. Surveys should be done between Sept - January during wet and humid nights.	EcoBiological (2008)	4 separate days/nights 22nd November 2007 - 10th January 2008	4 survey points (14 hours total effort)	5 survey points x 30min each (14 hours total effort)	4 survey points x 30min each (14 hours total effort)	3 survey points x 30min each (14 hours total effort)	5 survey points x 30min each (14 hours total effort)	Yes
		ECOHUB (2008) (descriptive quadrats)	June 2008; and humid and wet nights 9th, 10th, 14th, 19th and 21st November 2008	5 repeat visits of 2 sites	5 repeat visits of 3 sites	5 repeat visits of 3 sites		5 repeat visits of 1 site (dam)	
		Eco Logical Australia (2011	January - February 2011		1 site 3 repeat visits	4 sites 3 repeat visits	1 site 3 repeat visits	2 sites 3 repeat visits (dam)	
Diurnal reptile and amphibian survey	30-minute search on two separate days targeting specific habitat	EcoBiological (2008)	22nd November 2007 - 10th January 2008	6 person hours within subject site and opportunistic through subject site					Yes
		ECOHUB (2008) (descriptive quadrats)	18th June 2008	2 transects with 5 sub-plots (location unknown)					

Note:

Stratification of the site for field survey was initially based on Biometric Vegetation Type. Where patches of the same BVT were fragmented, survey design ensured a 20m x 20m vegetation plot, rapid data point or random meander was undertaken in each patch. This approach ensured the variability of vegetation community and condition was adequately surveyed.

The following paragraphs describe the supplementary fieldwork undertaken by Eco Logical Australia in 2011.

Vegetation Community Mapping

Vegetation communities within the study area were mapped and defined based on biometric vegetation types.

Field work was carried out in January and February 2011. Random meander traverses were used to validate the vegetation communities, their boundaries and condition classes. There was particular focus on delineating the boundaries of EEC listed under state or federal legislation and investigating SEPP14 wetland within the study area.

Vegetation Community Validation

Four biometric vegetation communities were identified, described and mapped during the field survey and corresponded to three respective EEC's (Table11). Vegetation condition varied across the study area. Swamp Oak Swamp Forest had considerable variation in quality due to past disturbance, with some areas being in moderate condition, areas of rehabilitation that contained Swamp Oak (Casuarina glauca) and other areas consisting of a predominantly native understorey only and a cleared canopy (Derived Grassland). Areas of Swamp Oak Swamp Forest that comprised rehabilitation were not considered to reflect the description of Swamp Oak Floodplain Forest EEC due to modifications/introduced soil and floristic composition. Table 11 below provides the vegetation types, corresponding EEC's and the area of each type.

All remnant native vegetation on the site (excluding the rehabilitation plantings of Swamp Oak Swamp Forest) is considered to meet the definition of Groundwater Dependence Ecosystems as described in NSW State Groundwater Dependent Ecosystem Policy (DLWC 2002) due to the likely interaction of the vegetation with shallow watertables and periodic inundation of floodwater.

Table 11: Biometric Vegetation Types and EECs

Biometric Vegetation Types	EEC	Area (ha)
Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner	*Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions.*	28.65
	Nil (planted and not consistent with the EEC definition).	18.50
Coastal floodplain sedgelands, rushlands and forbs of the North Coast	*Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.*	9.69
Phragmites Australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin		15.66
Saltmarsh in estuaries of Sydney Basin and South East Corner	*Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions.*	9.24
Disturbed / Cleared Vegetation		172.03
Total		**253.77**

Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner – 47 ha

This vegetation community was present in four variations on the site, including remnant forest, areas containing a scattered canopy, mostly native understorey and absent canopy, and rehabilitation areas containing Swamp Oak.

Remnant patches of this community were detected on poorly drained soils scattered throughout the northern portion of the study area as shown in Figure 19.

The canopy was dominated by Casuarina glauca (Swamp Oak), with occasional Melaleuca styphelioides (Prickly-leaved Tea Tree) also observed. The shrub layer was absent and the dense ground layer was dominated by native and exotic grasses and herbs, including Aster subulatus, Atriplex prostrata, Cirsium vulgare (Spear Thistle), Cynodon dactylon, Pennisetum clandestinum and Persicaria lapathifolia (Pale Knotweed).

The rehabilitation area was dominated by planted Acacia saligna (Golden Wreath Wattle), Melaleuca armillaris (Bracelet Honey-myrtle) and Swamp Oak, as well as a variety of exotic species such as Chloris gayana (Rhodes Grass), Cirsium vulgare (Spear Thistle), Lantana camara (Lantana) and Verbena bonariensis (Purpletop). The rehabilitation variant of Swamp Oak Swamp Forest was in poor condition across its range, due to being planted out with a weedy Western Australian species (Acacia saligna) and mismanagement of the area effectively leading colonisation of exotic species.

All variants of this community were subject to stock grazing and infestation of the weeds mentioned above.

Considering the floristic assemblage, position in the landscape and observations of surface soil, two of the variants (Moderate condition and Scattered Swamp Oak) of this community were considered to align with the EEC Swamp Oak Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner. The remaining variants were not considered to qualify as the EEC due to modifications to soil and/or floristic composition

In a survey undertaken by EcoBiological in 2008 a total of 682 trees bearing potential habitat hollows were identified and mapped and the size class of hollows were recorded. The majority of hollows were small and over 90% of the hollow bearing trees were Swamp Oak.

The following photographs have been taken at locations (Photo Points) as identified on Figure 19.

Photograph 10: Swamp Oak Swamp Forest (Location 2)

Photograph 11: Rehabilitation variant of Swamp Oak Swamp Forest (Location 3)

Coastal floodplain sedgelands, rushlands and forblands of the North Coast - 9.69 ha

This community was scattered throughout the pastures in the northern end of the study area and was also recorded in several constructed drainage lines in the south of the study area as shown on Figure 19. Sections of this community were mapped as Freshwater Wetland Complex (Ephemeral Swamps) by Ecobiological (2008).

The shrub layer was absent, and the ground layer was dominated by a mix of native and exotic species. Common native species included Bolboschoenus caldwellii, Cynodon dactylon (Common Couch), Paspalum distichum (Water Couch) and Phragmites australis (Common Reed), while common exotic species included Aster subulatus (Wild Aster) and Pennisetum clandestinum (Kikuyu).

This community was in moderate condition, being used to graze cattle, and having modified hydrology and simplified floristics.

The floristic and structural elements of remnant patches of this community were consistent with the NSW Scientific Committee's listing Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, an EEC listed under the TSC Act.

Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin – 15.66 ha

Several remnants of this community were detected throughout the study area as shown on Figure 19. It was also present in a large constructed drainage line in the middle of the study area.

Phragmites australis was the dominant species throughout this community, while Bolboschoenus caldwellii and Typha orientalis (Broad-leaved Cumbungi) were also present. Saltmarsh species, including Juncus kraussii (Sea Rush), Paspalum vaginatum (Salt-water Couch) and Sarcocornia quinqueflora (Samphire) were present in the ecotone between the saltmarsh and phragmites rushland communities, making it difficult to determine their precise boundaries. This community was in moderate condition throughout the study area. It was subject to stock grazing and was infested with several exotic species, particularly Juncus acutus (Sharp Rush).

The floristic and structural elements of this community were consistent with the NSW Scientific Committee's listing Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, an EEC listed under the TSC Act.

Photograph 12: Coastal Freshwater Wetland (Location 1)

Saltmarsh in estuaries of the Sydney Basin and South East Corner– 9.24 ha

This community was present in the south of the study area as shown in Figure 19.

Juncus kraussii, Paspalum vaginatum, Sarcocornia quinqueflora and Sporobolus virginicus were the dominant species throughout this community. Bolboschoenus caldwellii and Phragmites australis were common in the ecotone between this community and Phragmites australis and Typha orientalis coastal freshwater wetland, making it difficult to determine the precise community boundaries.

This community was in moderate condition throughout its extent. The area was subject to stock grazing and drainage has been modified by a levy. Common exotic species include Aster prostrata, Cotula coronopifolia (Water Buttons), Juncus acutus and Wild Aster.

The floristic and structural elements of this community were consistent with the NSW Scientific Committee's listing Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions, an EEC listed under the TSC Act.

Photograph 13: Saltmarsh (Location 5)

Floristic Surveys

In January and February 2011 a total of 10 20x20m vegetation plots and five (5) transects were completed. Surveys consisted of recording all flora species present within the plots and encountered along transects.

Vegetation survey proformas were used to collect information, with the data including the date of survey, recorder/s, site number, quadrat size (20 m x 20 m), MGA coordinates (all taken with a GPS using WGS84) and vegetation structure. One or more digital photographs were taken at each site.

Within each 0.04ha plot all vascular plants species were recorded and identified as far as was possible. In some cases a lack of flowering material was a hindrance, with some samples only undergoing identification to the genus level. Samples of unknown species were collected for later identification. Nomenclature followed the Flora of New South Wales (Harden 1992; 1993; 2000; 2002) except where more recent taxonomic changes have taken place.

Biometric data were gathered concurrently with the flora survey quadrats, in accordance with the Biobanking Methodology (DECC 2008) and Biobanking Assessment Methodology and Credit Calculator Operation Manual (DECC 2009), This involved gathering data within a 20mx50m plot/transect on native species richness, over-storey cover, mid-storey cover, native ground cover, exotic cover, number of trees with hollows, over-storey regeneration and length of logs.

For further details of the vegetation plots and transects refer to the Survey Methods identified within Figures 3 & 4 of the Ecological Investigations Report (Appendix F).

Targeted Threatened Flora Surveys

Targeted threatened flora searches were undertaken for those species considered to potentially occur on the site based on database searches in the locality and habitat on site. In terms of seasonally cryptic species, only species whose optimal period of detection corresponded with the survey timing (i.e. January to February) were adequately surveyed for. The following threatened flora species were targeted:

- Callistemon *linearifolius* (Netted Bottlebrush);
- *Melaleuca biconvexa* (Biconvex Paperbark);
- Persicaria elatlor(Tall Knotweed); and
- Zannlchellia palustris.

No threatened flora species were recorded within the study area, though Zannichellia palustris was considered a potential occurrence.

The OEH have indicated that the following additional species should be considered and justification on the adequacy of survey for these species should be provided

- Asperula asthenes (Trailing Woodruff);
- Lindernia alsenoides (Noah's False Chick Weed); and
- Maundia triglochinoides (Small Water Ribbons).

Asperula asthenes grows in damp sites along river banks from Taree to Bulahdelah. This species is best to be surveyed for during spring, which is outside of the survey season applied to this study. However, survey for the ARTC project (Parsons Brinkerhoff, 2012) which included the majority of the TSF subject site and was undertaken in the appropriate season did not identify this species and concluded that the likelihood of it being present on site was low. ELA concurs with this assessment.

Lindernia alsinoides also grows in swampy sites in sclerophyll forest and coastal heath north from Bulahdelah, and is most detectable when flowering in November, which is outside of this study's survey period. Survey of the subject site was undertaken by Parsons Brinkerhoff (2012) during the appropriate season for the ARTC project, however the species was not observed. Given the disturbance history of the study area and the nearest record of these species is over 14km and 66km respectively from the site, these species are not considered potential occurrences. Parsons Brinkerhoff concluded that the likelihood was low and habitat not present.

Maundia triglochinoides has been recorded approximately 3km from the study area and grows in swamps and shallow fresh water on heavy clay and is detectable for most of the year, with distinct leaf form and venation. The species flowers in November – January and would therefore have been flowering during field survey by ELA in 2011. This species was not detected during surveys, nor was it observed by Parsons Brinkerhoff (2012) in their surveys for the ARTC project on the same land. It is therefore highly unlikely that the species is present on this site.

Fauna Surveys

Given the detailed surveys that *were* undertaken as part of EcoBiological (2008) and EcoHub (2009), fauna surveys were limited to targeted amphibian surveys in suitable habitat. Survey timing was preferentially aligned with periods following rainfall, during periods of moderate to high humidity and low wind speed.

Table 12: Weather conditions during the fauna survey.

Date	Rainfall (mm)	Temperature (Max daily C°)
7 January 2011	18.2	Not Recorded
8 January 2011	0.0	28.8
9 January 2011	3.0	29.0
10 January 2011	3.6	29.5
11 January 2011	2.0	27.8
12 January 2011	0.4	30.0
15 February 2011	11.6	25.7
16 February 2011	1.4	27.2
17 February 2011	0.0	32.2
18 February 2011	41.8	Not Recorded

Nocturnal Surveys

Nocturnal amphibian surveys involved 24 person hours searching suitable wetland habitats using 50 watt handheld spotlights, Traverses were generally undertaken on foot, though fauna *were* opportunistically encountered during vehicular movements.

At several locations call playback surveys were undertaken, consisting of green and golden bell frog *(Litoria aurea)*, grass owl *(Tylo capensis)* and masked owl *(Tylo novaeho/landiae)* call broadcasting for approximately 5 minutes followed by a 5 minute listening period for each call. Spotlights were then used to detect any cryptic species following each call being played. All fauna species encountered or heard calling were recorded and are included in Table 13.

Diurnal Surveys

Diurnal amphibian surveys involved traverses in areas of suitable habitat for searching for basking individuals.

Traverses are identified on Figures 3 & 4 within the Ecological Investigations Report (Appendix F).

Opportunistic Observations

Opportunistic observations of species were recorded at all times, including reptiles, frogs, mammals and birds. Opportunistic observations included identification of indirect evidence such as scats and tracks.

Figure 19 shows the identified vegetation communities and EECs on the site. It can be seen that much of the site is cleared. No Threatened flora species were recorded within the study area.

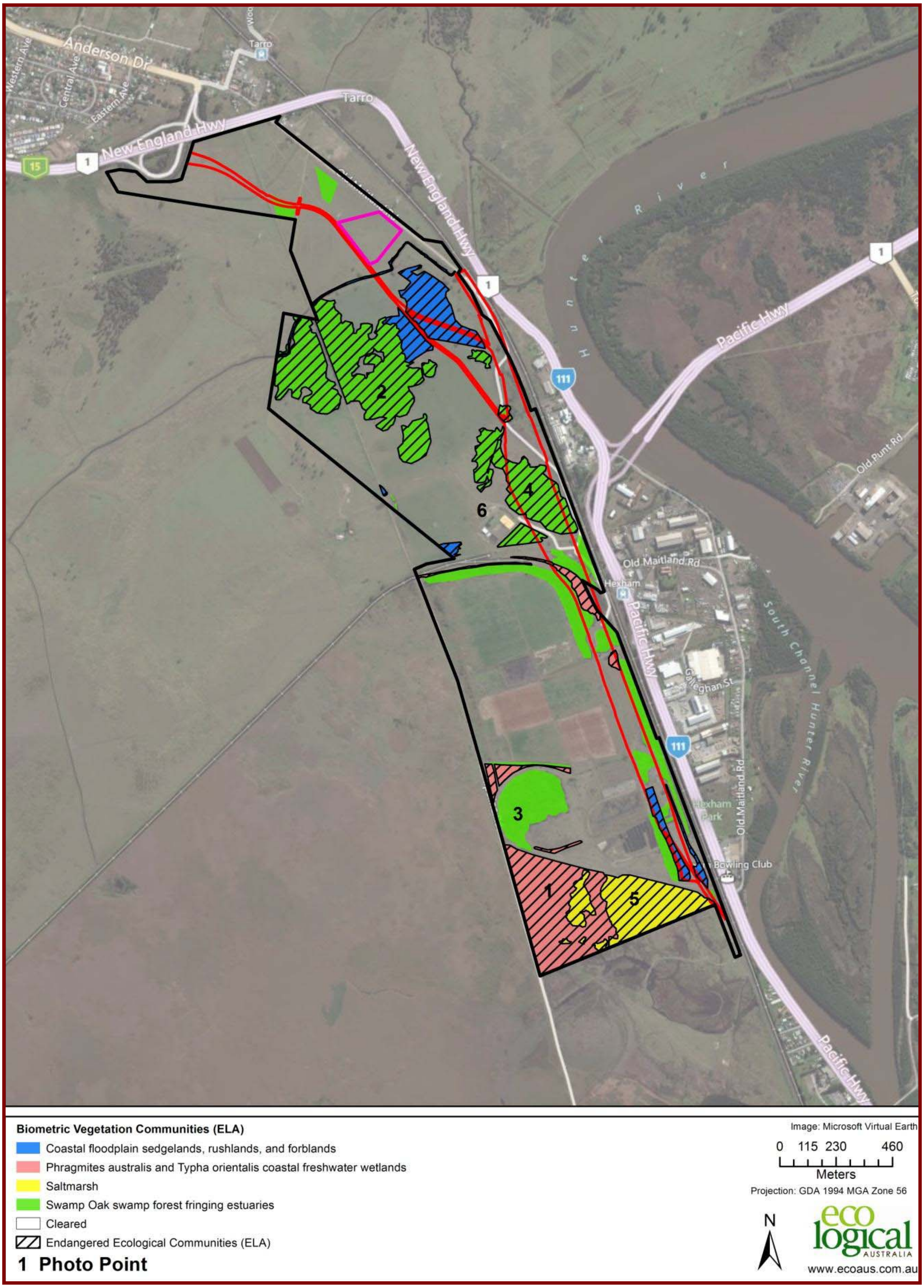


Figure 19: Vegetation Communities, EECs & Threatened Fauna Species.

Table 13 below presents the biodiversity values present within the site, including threatened biodiversity (EEC's, threatened species and migratory species) recorded or considered likely occurrences, a summary of general biodiversity, habitat condition and connectivity values.

Table 13: Summary of Biodiversity Values

Note: Within the table, V refers to vulnerable species and M refers to migratory species under the TSC and EPBC Acts.

BIODIVERSITY VALUE	SUMMARY			
Scientific Name	Common Name	TSC Act	EPBC Act	Likelihood of Occurrence
—	*Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions.*	EEC	—	Recorded
—	*Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*	EEC	—	Recorded
—	*Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions*	EEC	—	Recorded
Zannichellia palustris		E	—	Potential
Litoria aurea	Green and Golden Bell Frog	E	V	Potential
Hieraaetus morphnoides	Little Eagle	V	—	Recorded onsite
Anseranas semipalmata	Magpie Goose	V	M	Recorded onsite
Botaurus poiciloptilus	Australasian Bittern	V	—	Recorded onsite
Ephippiorhynchus asiaticus	Black-necked Stork	E	—	Some marginal potential
Rostratula australis (a.k.a. R.benghalensis)	Painted Snipe (Australian subspecies)	E	V	Potential
Tyto capensis	Grass Owl	V	—	Recorded onsite
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Potential
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	—	Recorded onsite
Gallinago hardwickii	Latham's Snipe	—	M	Unlikely
Merops ornatus	Rainbow Bee-eater	—	M	Unlikely
Miniopterus australis	Little Bent-wing Bat	V	—	Recorded onsite
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	—	Recorded onsite
Mormopterus norfolkensis	East Coast Freetail Bat	V	—	Recorded onsite
Myotis adversus	Large-footed Myotis	V	—	Recorded onsite
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Recorded onsite
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	—	Potential
Scoteanax rueppellii	Greater Broad-nosed Bat	V	—	Recorded onsite
Apus pacificus	Fork-tailed Swift	—	M	Potential
Haliaeetus leucogaster	White-bellied Sea-Eagle	—	M	Recorded onsite
Hirundapus caudacutus	White-throated Needletail	—	M	Potential
Ardea alba	Great Egret	—	M	Potential
Ardea ibis	Cattle Egret	—	M	Potential

Biodiversity	Overall a total of 168 fauna species were recorded, including 9 Amphibian species, 128 Avian species, 25 Mammal species and 6 reptile species. 20 threatened or migratory fauna species have either been recorded or are considered potential occurrences (see above) 268 flora species were recorded across each of the three different studies. Of these 86 were introduced species with additional species considered to have been introduced to the study area through vegetation rehabilitation works. One threatened flora species, *Zannichellia palustris*, listed as endangered is considered a potential occurrence on the site but has not been recorded within the study area.

	The study area contains five broad vegetation types, with four of these considered to be native vegetation communities in variable condition and covering approximately 32% or 81ha of the study area. Each of these vegetation types are considered to represent three respective EEC's listed under the TSC Act (see above). The remaining study area is classed as either disturbed or a vegetation rehabilitation area.
Habitat Condition	The site evidences a long history of industrial and agricultural disturbances, with the spatial representation of the rehabilitation area and disturbed vegetation in Figure 3 depicting the worst affected areas (75% of the site). The central portion of the study area has been subject to coal stockpiling, excavation works and is essentially an artificial landscape. Much of this area is subject to pasture improvement and cattle grazing, with grazing also extending to the north and into areas mapped as having the native vegetation. Despite this level of disturbance, the site does still contain some ecological values, in the form of the three endangered ecological communities associated with wetlands and habitat for threatened species. With the exception of the Green and Golden Bell Frog and hollow roosting bats, the study area generally constitutes foraging or intermittent refuge habitat. Several surveys for Green and Golden Bell Frog have been conducted within the study area over a three year period, with no results indicating the presence of the species. At best, wetland habitats within the study area (i.e. Coastal floodplain sedgelands, rushlands, and forbs; Phragmites australis and Typha orientalis coastal; and the edges of Coastal Saltmarsh in estuaries of the Sydney Basin) potentially support very occasional and intermittent movements and foraging by Green and Golden Bell Frog, although this has not been confirmed with any sightings. In terms of habitat for hollow obligate Microchiropteran bats (e.g. East Coast Freetail Bat, Large-footed Myotis and Greater Broad-nosed Bat), the area of remnant Swamp Oak swamp forest fringing estuaries in the north of the study area contains 682 hollow bearing trees, with the majority of hollows being in the small (<8cm class) (EcoBiological 2008). None of these hollow bearing trees will be affected by the proposed development.
Connectivity	The study area is positioned in a highly fragmented landscape, which has developed through historic agricultural, infrastructure and industrial land uses. The study area itself is highly fragmented, with small patches of isolated remnant vegetation such as the Swamp Oak Forest and areas of wetland occurring within a mostly disturbed/cleared area. The northern railway line, New England Highway, pacific Highway and Hexham industrial area form barriers to movement to the east and north. Cleared pasture interspersed with low lying wetland areas occurs to the west. The primary habitat connection to the study area occurs to the southwest, whereby the study area is connected to wetland habitats within Hexham Swamp Nature Reserve. Habitat within the reserve is generally non-woody freshwater or estuarine wetland and is therefore only suitable for a restricted fauna assemblage (i.e. not suitable for forest/woodland dependant species).

9.2.2 Impact Assessment

The TSF has the potential to have the following impacts:

- Clearing of EEC and habitat for threatened species;
- Fragmentation of habitat; and
- Changes to hydrological environment.

Clearing of Native Vegetation

The subject site is highly disturbed, having had a long history of industrial and agricultural land use. Vegetation communities on the site are therefore in a somewhat degraded state. Approximately 10.64ha of native vegetation will be impacted, of which 7.48ha met the definition of an ECC

(Table 10 and Figure 19). In addition to the impact on 7.48ha of EEC, the adjoining ARTC development will impact on approximately 9.1ha of EEC, giving a total impact of 16.58ha.

The Part 3A Draft Guidelines for Threatened Species Assessment (DECC and DPI 2005) identifies matters which are relevant to the assessment of impacts to EEC, endangered populations and threatened species. Appendix 3 of DECC and DPI (2005) guidelines lists six questions and associated sub-questions that address the impacts of proposed developments on threatened species, populations, or ecological communities. A detailed assessment accounting for the ecological impacts associated with the proposed TSF for ecological communities recorded or considered likely to occur in the study area (see species and EEC's in Table 13). The assessment concludes that due to the degraded nature of the EECs and their distribution in the locality and region, the proposed development will not have a significant impact on these EECs.

The impacts on native vegetation communities associated with the proposed TSF development are provided in Table 14.

Table 14: Extent of impact on biometric vegetation types & corresponding EEC

Biometric Vegetation Type	Area Vegetation Community Impacted (ha)	Corresponding EEC	Area EEC Impacted (ha)
Coastal floodplain sedgelands, rushlands, and forbs	1.49	Freshwater wetland on coastal floodplain	1.49
Phragmites australis and Typha orientalis coastal	1.23	Freshwater wetland on coastal floodplain	1.23
Saltmarsh in estuaries of the Sydney Basin	0.00	Coastal saltmarsh	0.00
Swamp Oak swamp forest fringing estuaries, Sydney Note: approx. half this biometric vegetation type meets definition of the EEC	7.70	Swamp oak forest on coastal floodplain	4.76
Total to be Impacted	10.64		7.48

Threatened Flora Species

In terms of impacts to threatened flora species, Zannichellia palustris was the only threatened flora species considered a potential occurrence within the study area. Whilst there is some possibility of the species occurring within the study area, the impacts of the proposal are limited to a relatively small area of potential habitat (1.23ha) in which the species has not been located.

The proposed offset strategy will ensure that a vast majority of potential habitat will be retained within the study area and managed for conservation.

Threatened Fauna Species

With regard to threatened fauna species and their habitats, Table 4 within the Ecological Investigations Report (Appendix F) provides a list of those species likely to occur with the study area. The study area generally constitutes foraging or intermittent refuge habitat. Several surveys for Green and Golden Bell Frog have been conducted within the study area over a three year period, with no results indicating the presence of the species.

A total of 168 fauna species were recorded, including 9 amphibian species, 128 avian species, 25 mammal species and 6 reptile species. 21 threatened or migratory fauna species have either been recorded or are considered potential occurrences including 6 migratory birds, 5 threatened birds, 9 mammals (all of which are bats) and 1 amphibian.

With the exception of the Green and Golden Bell Frog and hollow roosting bats, the study area generally constitutes foraging or intermittent refuge habitat for these species. The quality of such habitat on site is generally poor due to weed invasion, lack of diversity in the vegetation communities and the fragmentation of native vegetation on site. The loss of such habitat is not significant given the presence of the Hexham Swamp Nature reserve which contains higher quality and greater extent of these habitats.

At best, wetland habitats within the study area (i.e. Coastal floodplain sedgelands, rushlands, and forbs; Phragmites australis and Typha orientalis coastal; and the edges of Coastal Saltmarsh in estuaries of the Sydney Basin) potentially support very occasional and intermittent movements and foraging by Green and Golden Bell Frog. With the proposal impacting upon 2.72ha of this marginal habitat for the species and the retention and conservation management of up to 13.41ha, habitat provision will continue and will be improved for the species within the study area, therefore avoiding a significant impact on the species.

In terms of habitat for hollow obligate Microchiropteran bats (e.g. East Coast Firetail Bat, Large-footed Myotis and Greater Broad-nosed Bat), the area of remnant Swamp Oak Swamp Forest Fringing Estuaries in the north of the study area contains 682 hollow bearing trees, with the majority of hollows being in the small (<8cm class) (EcoBiological 2008). None of these hollow bearing trees will be affected by the proposed development (refer to Appendix F) and therefore a significant impact on these species is not likely to occur. Whilst there will be loss of native vegetation and habitat, no threatened species or communities are considered likely to be significantly affected by the proposal.

SEPP 14 Coastal Wetlands

The study area contains approximately 18.88ha of SEPP14 Coastal Wetlands and adjoins Hexham Swamp (Hunter Wetlands National Park). Wetland number 833 is approximately 10.6ha and will have direct impacts of 5.71 ha. The remainder of wetland 833 is likely to be affected by changes in hydrology. Due to historic disturbance regimes, this wetland is considered to be of very low value as a coastal wetland.

The other area of SEPP 14 Coastal Wetlands on the site is in the southern portion where no direct or indirect impacts are expected to occur and indeed this area is proposed for protection via a conservation agreement as described in Section 7.3.13. Given the large extent of wetland in the area and the mitigation measures described in Section 9.2.4 of this document, the development of this site is not considered to have a significant impact on the broader wetland complex of the Lower Hunter.

Connectivity

The proposal is located within the Watagan to Stockton Corridor identified in the LHRS. The corridor represents a broad strategic corridor rather than one designed for a particular species. The proposal will remove disturbed vegetation within the corridor, in a location where the corridor is already significantly broken (for terrestrial species) by the railway line, Maitland Road and the Hunter River. An Offset Strategy will be implemented that will seek to improve the habitat on site and therefore improve the 'stepping stone' opportunities for birds and bats. The offset area provides for significant areas of improved management which would result in a better outcome than the existing information.

Changes to Hydrological Environment

Native vegetation communities on site are considered to be groundwater dependent ecosystems. These occur not only as terrestrial communities, but also within the two main agricultural drains that flow to Hexham Swamp. The drains contain wetland species such as Phragmites australis (dominant), Bolboschoenus caldwellii and Typha orientalis (Broad-leaved Cumbungi). No threatened species listed under the Fisheries Management Act 1994 or Threatened Species Conservation Act 1995 have been recorded in the drains, nor are they considered likely due to poor habitat condition and the presence of Gambusia sp.

Changes to the hydrological and aquatic environment can occur due to:

- Increased rate and volume of run-off from hardstand areas leading to changes in water quality and salinity in estuarine environments;
- Ponding or retention of storm/flood water due to construction of buildings or roads; and
- Changes to ground water levels due to filling.

The SWMP by WorleyParsons (2012) describes the current site hydrology, water quality and changes to these as a result of the development. Stormwater Run-off and quality is discussed in Section 9.4.

Retention and Dissipation of Flood Waters

As all ecosystems on the site are groundwater dependent, proposed changes to flooding regimes as a result of the development need to be assessed. Flood modelling has been completed by BMT WBM and is discussed in Section 9.3.

The assessment has determined that the proposed TSF will have a negligible effect on the retention or dissipation of floodwaters and will therefore not have a significant impact on the current hydrological regime of the Swamp Oak Forest.

Groundwater and Surface Water Interaction

Douglas Partners (2012b) has prepared an investigation into the effects of the proposed development on the groundwater within and adjacent to the subject site. This report indicates that, whilst surface flow and velocity may increase and recharge ground water levels, actual ground water levels are unlikely to change significantly. Douglas Partners (2012b) indicates that groundwater directly adjacent to road and building infrastructure may increase slightly (in the order of <2cm).

The loss of this vegetation is inconsistent with the NSW Groundwater Dependent Ecosystem Policy which provides five policies for the protection and management of GDEs. All of the EECs identified on the site are GDEs. However the GDEs on site are highly disturbed through previous land uses and remain in relatively poor condition through weed invasion. Given the improvement of GDEs within the proposed offset areas, this loss is not significant for GDEs in the Hunter estuary. The location of the EECs/GDEs are identified at Figure 19 and the extent of impact as a result of the proposed TSF is identified within Table 14.

9.2.3 Mitigation Measures

Ecological survey was used to understand the environmental sensitivities of the site prior to design of the TSF. As a result, the TSF is located primarily on the disturbed part of the site and avoids the southern area which contains saltmarsh.

The following onsite practices are to be undertaken during the construction phase and will be contained within a CEMP.

Table 15: Mitigation measures during pre-construction, construction & operation

	Mitigation Measure / Ecological Management Procedure	Timing
1. Site-specific environmental induction	• Ensure that all staff working on the Project undertake a site-specific environmental induction. The induction should include items such as: - Sensitivity of wetlands, particularly saltmarsh; - Site environmental procedures (vegetation management, sediment and erosion control, protective fencing, noxious weeds); - What to do in case of emergency (sediment fence failure, injured fauna); and - Key contacts in case of environmental emergency e.g. WIRES.	Pre-construction and during construction for new staff
2. Identification of clearing limits	• Accurately and clearly mark out the limits of clearing and trees/vegetation to be retained. • Identify trees close to work areas which are at risk during construction and install protective fencing (temporary fluoro orange 'para-web' fencing or similar) to reduce risk of damage during the construction phases of the development. • Do not store materials/vehicles under the drip-line (canopy) of retained vegetation.	Pre-construction
3. Pre clearing survey	• Qualified ecologist to conduct pre-clearing surveys of: - hollow bearing trees; and - freshwater wetlands. • Fauna at risk of injury are to be relocated to suitable habitat a safe distance from the proposed works by a qualified ecologist.	Pre and during construction
4. Clearing of vegetation	• Where trees require felling, retain the timber, particularly sections with hollows - as Coarse Woody Debris for enhancement of the Northern Offset area; and • Cease work immediately if any previously unknown	Construction

	Mitigation Measure / Ecological Management Procedure	Timing
	threatened flora or fauna species are encountered. WIRES should be consulted if any injured fauna are encountered.	
5. Management of erosion and sediment control	• Provide appropriate controls to manage exposed soil surfaces and stockpiles to prevent erosion and subsequent sediment discharge into surrounding wetlands; • Clearly identify stockpile and storage locations and provide erosion and sediment controls around stockpiles; • Stockpiles of topsoil to be stored in windrows no higher than 2m and be maintained free of weeds; and • Undertake dust suppression where required in accordance with the Protection of the Environment Operations Act 1997 (POEO Act) where there is a risk of increased dust outside of acceptable levels.	Pre and during construction
6. Site office and plant storage	• Ensure these areas are located in the nominated compound.	During construction
7. Weed Management	• Establish and implement a hygiene protocol for vehicles entering and leaving the site to minimise spread of weeds and other biological risks such as alligator weed.	Pre, during & post construction
8. Monitoring	• Develop a monitoring program during construction (including a weekly checklist) to ensure that all mitigation measures proposed have been undertaken. The checklist should include items such as fencing and sediment and erosion control.	Pre, during and post construction

9.2.4 Offset Strategy

The DGRs for this project required the ecological assessment to include consideration of o*ffsets for native vegetation clearance consistent with the improve or maintain principle.* This section describes the policy framework for offsets, the offset strategy proposed and an assessment of how the offset is consistent with the policy framework.

Policy framework

The NSW OEH has adopted *Principles for the use of Biodiversity Offsets in NSW*. Details of which are provided in Appendix D of the Ecological Investigations Report.

OEH have also adopted the *Interim Policy on Assessing and Offsetting Biodiversity Impacts of Part 3A Developments* (DECCW 2010). The policy is designed to assist OEH in assessing the adequacy of an offset. To do so, the policy requires the use of the Biobanking Assessment Methodology to calculate the credits required to offset an impact and the credits generated by a proposed offset. The outcome of this assessment is described as meeting one of three outcomes, with a Tier 1 being the preferred outcome (further details are provided in Table 9 of the Ecological Investigations Report, (Appendix F)). The policy notes that proposals assessed as State Significant projects do not have to meet the "improve or maintain" standard which is required under the biobanking scheme as some projects will not be able to achieve improve or maintain" but, due to their social or economic benefits, should proceed. The term 'red flag' in the table relates to certain communities or species that are 'red flagged' under the Biobanking Assessment Methodology. This means that the loss and offset of this community or species cannot achieve an improve or maintain outcome. The term 'impacts fully offset' refers to an offset where the credit requirements are fully met.

Offset Required

The project will impact on 10.64ha of native vegetation. The credits required to offset the impacts are described in Table 16 with the full Credit Report provided on page 114 of the Ecological Investigations Report (Appendix F). The credits required are based on the biometric vegetation type being impacted and the habitat for threatened species that uses these communities.

Table 16: Offset Credits Required

Biometric Vegetation Type	Hectares of impact	Credits required to offset impacts of clearing
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	1.49	13
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin	1.23	17
Saltmarsh in estuaries of the Sydney Basin and South East Corner	0	0
Swamp Oak swamp forest fringing estuaries, Sydney Basin	7.92	231
Total	10.64	261

Proposed Offset

QR National have committed to the protection and management of 53.63ha of native vegetation and habitat on site. Figures 20 and 21 indicate the lands proposed for offset.

Description of vegetation communities

The Northern Offset (Figure 20) is dominated by Casuarina glauca (Swamp Oak), with occasional Melaleuca styphelioides (Prickly-leaved Tea Tree) also observed. The vegetation contains over 600 hollow-bearing trees, although most of these hollows are less than 8cm. The shrub layer is absent and the dense ground layer is dominated by native and exotic grasses and herbs, including Aster subulatus (Wild Aster), Atriplex prostrata, Cirsium vulgare (Spear Thistle), Cynodon dactylon (Common Couch), Pennisetum clandestinum (Kikuyu) and Persicaria lapathifolia (Pale Knotweed). The area is also heavily grazed. Weed treatment and stock management will therefore be an important management requirement. The Northern offset also contains an area that is currently clear and will require re-establishment of native vegetation to return it to swamp oak swamp forest.

The southern offset area (Figure 21) is a combination of saltmarsh and Phragmites australia and Typha orientalis coastal freshwater wetland. These communities were also subject to stock grazing and weed infestation and will therefore require management actions addressing these issues in particular.

Management

Management of the offset sites will be undertaken in accordance with a Conservation Management Plan that will address standard management actions such as weed management, feral animal control, management of retained vegetation, fire management, buffer zones, management of edge effects, management of hydrological changes, habitat enhancement (e.g. for Green and Golden Bell Frog) and rehabilitation measures, and monitoring. Of particular relevance for these two sites will be weed management and stock management.

The Conservation Management Plan is to be prepared following confirmation with OEH that the site is suitable for a Conservation Agreement (discussed below). The Northern Offset area will not include the Hunter Water pipeline that runs north-south through the site. The pipeline is on land owned by Hunter Water and is a separate lot to the offset. Access to maintain the pipeline or any other infrastructure should not be inhibited by the Conservation Management Plan.

Security

To meet the NSW Principles for Offsetting, the mechanism or instrument should provide certainty in the long term – i.e. it should 'run with the land' regardless of ownership and should require management in accordance with pre-determined actions.

There are several options available for long term security of offsets:

- Property Vegetation Plans under the Native Vegetation Act;
- Biobanking Agreements under the Threatened Species Conservation Act 1995;
- Covenants under the Conveyancing Act 1919;
- Conservation Agreements under the National Parks and Wildlife (NP&W) Act 1974;
- Trust Agreements under the Nature Conservation Trust Act 2001; and
- Planning Agreement under the EP&A Act 1979.

Each has its merits, however QR National propose to utilise a Conservation Agreement. Preliminary discussions with the OEH have occurred, with OEH advising that a Conservation Agreement under the NP&W Act 1974 is considered an appropriate mechanism for conserving land in perpetuity and is one of OEHs preferred methods. Appendix G of the Ecological Investigations Report (Appendix F) contains OEH correspondence. Conservation Agreements are legally binding and are specifically designed for conservation management. Conservation Agreements typically take 6-12 months to establish. During this time the Conservation Management Plan will be prepared.

Credits generated

The Biobanking Assessment Methodology has been used to calculate the credits generated by the proposal. These are contained in the table below.

Table 17: Credits Generated by Offsets

	Northern Offset		Southern Offset		Combined	
Vegetation Type	Ha	Credits Generated	Ha	Credits Generated	Ha	Credits Generated
Coastal floodplain sedgelands, rushlands, and forbs	0.61	4	-	-	0.61	4
Swamp Oak swamp forest fringing estuaries, Sydney	18.1	139	-	-	18.1	139
Swamp Oak swamp forest fringing estuaries, Sydney – to be rehabilitated	14.6	97	-	-	14.6	97
Phragmites australis and Typha orientalis coastal			12.8	119	12.8	119
Saltmarsh in estuaries of the Sydney Basin			7.52	72	7.52	72
Total	33.31	240	20.32	191	53.63	431

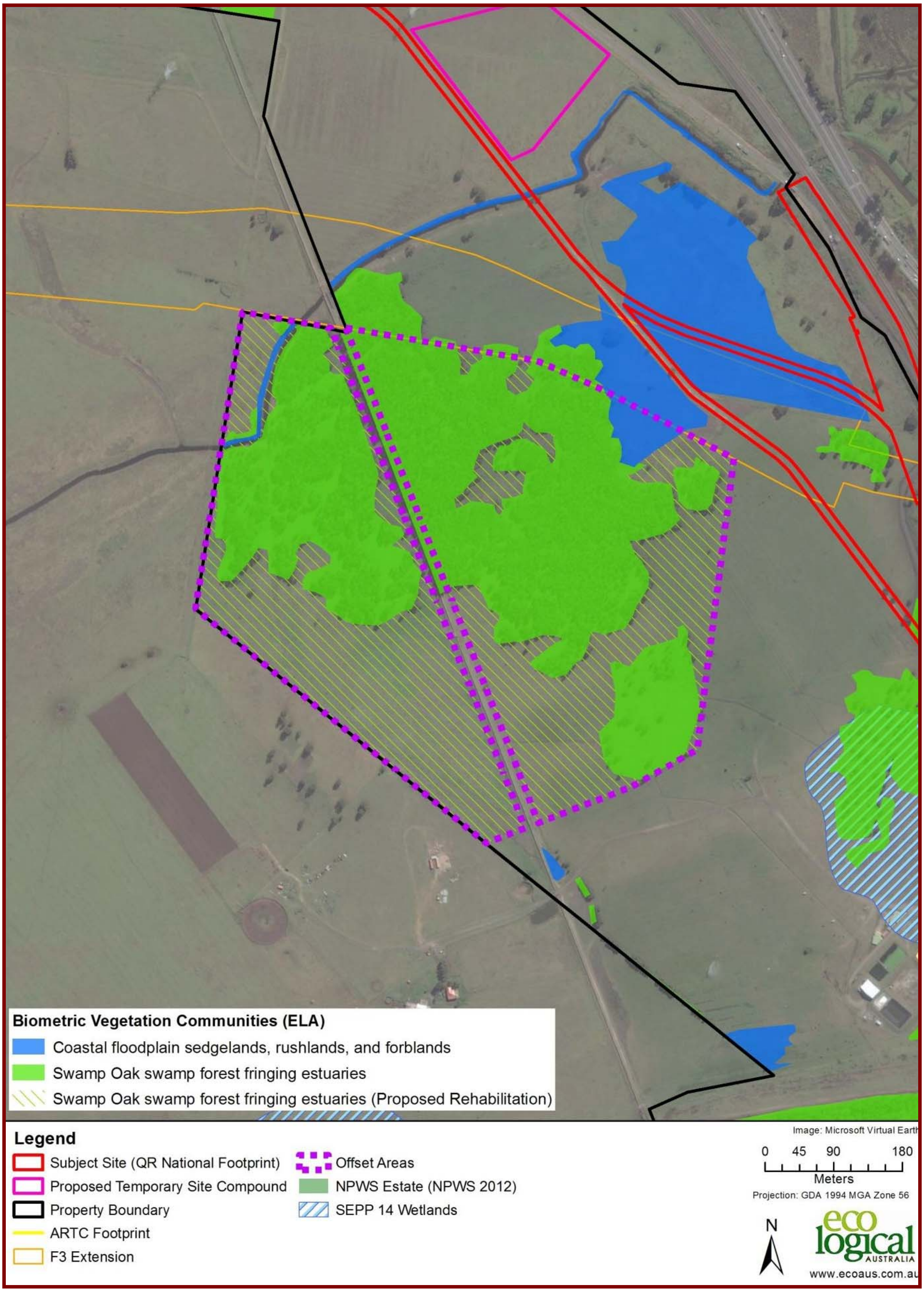


Figure 20: Proposed Northern Offset Area

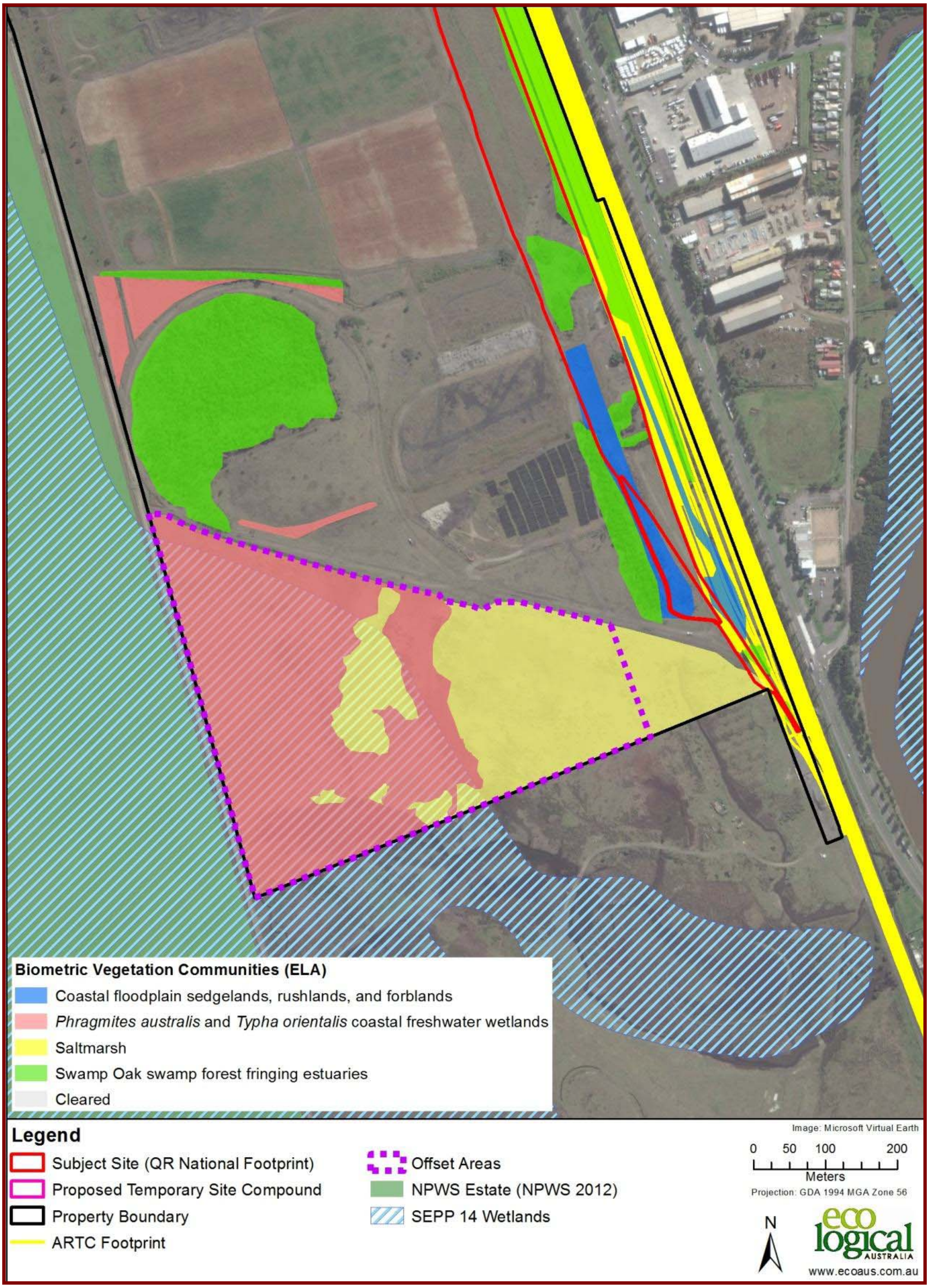


Figure 21: Proposed Southern Offset Area

Evaluation of Offset Strategy

An evaluation of the impacts and offsets has been undertaken using the Biobanking Assessment Methodology (DECC 2008). Table 18 provides a summary of credits required to offset the loss of native vegetation as well as the number of credits generated by the proposed offsets. The outcome is that credit requirements are met for three out of the four communities. The only community to be in deficit is the Coastal floodplain sedgelands, rushlands and forblands, which is 9 credits short. This shortfall cannot be made up on site as there are no other areas of this community to protect. However, this loss is more than made up by the over-all credit surplus of 170. In terms of the OEH Interim Policy on Assessing Impacts and Offsets of Part 3A Development, achieving an 'improve or maintain' outcome by the project is not possible as red-flagged EECs are being impacted. A Tier 2 outcome for three out of four communities is achieved and a Tier 3 outcome is achieved for the Coastal floodplain sedgelands community.

The offsets are also consistent with the OEH Principles for Offsetting as identified in Section 6.3.4 of the Ecological Investigations Report (Appendix F). The Offset Strategy represents a very positive outcome.

Table 18: Credit Balance

Vegetation type	Credits required to offset impacts of clearing	Credits created by onsite conservation management	Balance
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	13	4	Deficit of 9
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin	17	119	Surplus of 102
Saltmarsh in estuaries of the Sydney Basin and South East Corner	0	72	Surplus of 72
Swamp Oak swamp forest fringing estuaries, Sydney Basin	231	236	Surplus of 5
Total	261	431	Surplus of 170

9.2.5 Conclusion

Three EEC's occur in the study area: Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions; Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions.

No threatened flora species were recorded within the study area, though Zannichellia palustris was considered a potential occurrence.

Eleven threatened fauna species were recorded within the study area and an additional four threatened fauna species were considered likely to occur. Six migratory species listed under the EPBC Act are also considered likely to occur.

The majority of the area proposed to be affected on the site comprises cleared/disturbed land or rehabilitation, containing both native and non-endemic species. However, there will be some impact on native vegetation and habitat. The magnitude of this impact has been assessed with the result being that no threatened species or communities are considered likely to be significantly affected by the proposal.

A Biobanking Assessment on the proposed development and proposed offset lands was completed to determine if sufficient credits would be generated on the offset lands to achieve the 'improve or maintain' outcome according to the Methodology.

Credit requirements are met for three out of the four biometric vegetation communities, with an over-all credit surplus of 170. The only community to be in deficit is the Coastal floodplain sedgelands, rushlands and forblands, which is 9 credits short. In terms of the OEH Interim Policy on Assessing Impacts and Offsets of Part 3A Development, achieving an "improve or maintain" outcome by the project is not possible as red-flagged EECs are being impacted. A Tier 2 outcome for three out of four communities is achieved and a Tier 3 outcome is achieved for the Coastal floodplain sedgelands community.

Statutory considerations that have been addressed include impacts on SEPP14 Coastal Wetland with approximately 5.69ha of degraded SEPP14 wetland being directly affected.

A referral of the project under the EPBC Act has been made. The project has been determined to not be a controlled action.

9.3 FLOODING

The Flood Impact Assessment for the proposed TSF and other planned developments in the vicinity of the site was undertaken by BMT WBM. The full report is contained in Appendix G.

The Flood Impact Assessment by BMT WBM is an update and supersedes an existing Flood Impact Assessment completed by WorleyParsons, Issue 1, dated 23 August 2011. The updated assessment considers the cumulative impacts of the QR National TSF, ARTC HRR and the access road alignment from the Tarro Interchange.

BMT WBM was engaged to undertake the flood impact assessment of the future F3 proposal on behalf of the RMS. The cumulative impacts of the RMS Pacific Highway upgrade from the F3 to Heatherbrae project has also been assessed cumulatively with the proposed development.

9.3.1 Existing Environment

The Hunter River catchment covers an area of the order of 22,000km^2 which flows into the Tasman Sea through the Port of Newcastle. The lower reaches of the Hunter River system are tidal and forms the Hunter River estuary. Three major rivers discharge into the estuary, namely the Hunter River, the Paterson River and the Williams River. The confluence of the Williams River is at Raymond Terrace and the Paterson River joins the Hunter River further upstream of Raymond Terrace between Morpeth and Hinton.

The site is located adjacent to the Hunter River in the vicinity of the Hexham Bridge. Immediately upstream of Hexham Bridge, the Hunter River changes from a general south-westerly direction to a south-easterly direction. Downstream of Hexham Bridge the main channel splits into two arms, the North Arm and South Arm separated by Kooragang Island. To the south west of this location is the Hexham Swamp, separated from the Hunter River by industrial development including the New England Highway and the GNR.

The Hunter River has experienced many floods during its recorded history. The largest flood on record was the 1955 flood. This flood has been estimated at approximately 1% AEP event (also known as a 1 in 100 year event).

When floodwaters reach Hexham Bridge, overtopping of the New England Highway will occur at a level equivalent to 5% AEP (1 in 20 year event) peak level of the Hunter River, filling the available flood storage of Hexham Swamp. Flood flows will then return to the Hunter River South Arm in the vicinity of Ironbark Creek, the principal natural drainage channel of Hexham Swamp. The progression of flood flows through Hexham Swamp is controlled by a number of topographical features, including an abandoned railway (Hexham to Minmi) and the Chichester Pipeline.

There is a set of eight flood gates located on Ironbark Creek, near the confluence with the Hunter River South Arm. These gates control flows in and out of Hexham Swamp through Ironbark Creek for lower order flood events, but are overtopped for events above the 5% AEP. The model configuration is representative of the current operation, where three of the gates have been raised open to enable flow into the swamp, while all eight gates are flapped to enable flow out of the swamp.

Ocean water levels, influenced by storm surge and the tide, have an effect on flood levels within the lower estuary, up to Green Rocks (approx. 8km upstream of the Williams River / Hunter River confluence).

In higher frequency low discharge floods, the Hunter River flow is contained within the river banks and levees. As flood magnitude increases, floodwaters overtop the natural and man-made levees and flows across the floodplain.

The site is situated within the broader floodplain area of Hexham Swamp. This floodplain receives flows spilling over the New England Highway and in major flood events will be subject to significant inundation. Major catchment flooding of the Hunter River system is the predominant flooding mechanism at the site.

Existing Hunter River Flood Conditions and Model Calibration

To understand and assess the flood behaviour in the project area, a hydraulic model of the lower Hunter River floodplain was utilised.

There have been a considerable number of flood studies undertaken to understand flood behaviour in the vicinity of the project area, where available these studies have been reviewed, BMT WBM has used their TUFLOW two dimensional model to undertake a project area assessment to understand the impact on flood behaviour for the project individually and cumulatively with both the ARTC HRR Project and the Pacific Highway Upgrade from the F3 to Heatherbrae.

The existing Williams River/Hunter River flood model has been used to simulate design flood conditions for the development assessment. Model simulations for a range of design event magnitudes(10%, 5%, 2% and 1% AEP and probable maximum flood (PMF) events) have been undertaken to establish existing flooding conditions across the site and to provide baseline conditions for assessing the impact of the TSF and adjacent projects.

The BMT WBM TUFLOW model has simulated the peak flood levels at the proposed development site for a range of design event magnitudes. There is a general flood water level gradient from north to south across the site. Table 19 presents the maximum flood depths at the northern and southern ends of the site.

Table 19: Design Flood Levels (mAHD)

Design Flood Magnitude	Northern End of Site	Southern End of Site
10% AEP	1.0	0.8
5% AEP	1.2	10
2% AEP	2.2	2.1
1% AEP	3.7	3.5
PMF	8.3	7.7

The nature of flooding across the site is similar for a range of design events. This principally originates from floodwaters spilling over the New England Highway from the Hunter River to Hexham Swamp at the northern end of the site. At the 1% AEP event the Hexham Swamp floodplain becomes fully connected, with floodwaters entering over the New England Highway and flowing back to the Hunter River between Hexham Bridge and Ironbark Creek.

The site is not flood affected at the 20% AEP event as the Hunter River remains principally in bank. At the 10%, 5% and 2% AEP events, flood waters spill over the New England Highway into Hexham Swamp at the northern end of the project area, Hexham Swamp is also filled from the southern end by flow from the Hunter River South Arm through Ironbark Creek.

Peak flood velocities are typically less the 0.5m/s, but are locally much higher near the New England Highway, where the initial spilling from the Hunter River occurs. The floodplain flow distribution shows that the major area of conveyance is through the area to the north of the Hexham Swamp. The northern end of the project area is located in this flow path. The majority of the site downstream of Hexham Bridge is sheltered to some degree by the surrounding areas of higher land and is not in the principle flow path.

Local Runoff Events

Flooding in the project area is dominated by Hunter River flood events. Analysis of the local topographic survey and local runoff events shows there are a number of formal, non-formal and swampy areas that store and convey local runoff to the north, west and south of the project area. These channels provide some capacity for flood flows. Due to the size of the Hunter River catchment flood flows in these areas would have dissipated prior to a Hunter River flood reaching the project area and are insignificant compared to the flood flows. Section 9.4 details the management of stormwater runoff from the proposed development.

In addition QR National are undertaking further modelling of the local storm flows as part of detailed design to mitigate any impacts to the broader flood plain, in particular the proposed access road from Tarro Interchange and the northern end of the project will be assessed.

9.3.2 Impact Assessment

The development includes regrading of site elevations up to a level of approximately 2.65m AHD. Rail and building infrastructure that is situated at or above this level will remain flood free in the 2% AEP event, which has a peak level of approximately 2.2m AHD. Under the developed conditions the site will be largely flood free at the 2% AEP event, but inundated during a 1% AEP design event. This reduction of flood inundation frequency is only local to the development site itself and does not impact on the flooding frequency of the broader Hexham Swamp system.

Although the highest parts of the site will be located above the 2% AEP flood level, there will be a residual on site flood risk for larger magnitude events such as the 1% AEP and PMF events. The peak flood level at the 1% AEP event is around 3.7m AHD, which will correspond to a flood depth of over 1m across the development site. This has implications for the onsite rail and building infrastructure. Critical infrastructure, such as electrical supply and equipment and administration buildings will be elevated above the 1% AEP flood level.

At the 1% AEP event the velocity depth product for the elevated site area does not exceed 1.0 and is therefore suitable for light building constructions, as recommended by the NSW Floodplain Development Manual. Impacts on the velocity depth product remote from the development site are not significant.

The access road from the Tarro Interchange to the TSF will have a finished surface level (crest level) of approximately 1.1mAHD varying to 2.2mAHD. The adopted culvert size beneath the access road for the creek crossings is 3 x 1.5m coinciding with those below the railway and New England Highway, 3 x 1.5m.

The cumulative impacts of the proposed works, in terms of changes in peak flood water level and peak flood velocity for the 1% AEP, 2% AEP, 5% AEP and 10% AEP are restricted locally to the site and Hexham Swamp. The impact to the Hunter River floodplain beyond Hexham Swamp is negligible. The most significant impacts of the proposed developments are associated with the inclusion of the access road. The impacts from the rail developments are minor in comparison as the rail development is situated within an area of relatively low floodplain conveyance.

Buildings

The TSF will comprise a mix of maintenance and administration buildings. Maintenance and provisioning buildings will be constructed with floor levels that are marginally below the 1% AEP event to match rail levels, administration buildings will be raised above the 1% AEP event. It is recognised that the maintenance buildings could be inundated during a major flood of the order of the 1955 flood and that there is potential for flooding of this magnitude to cause damage to components of the TSF.

Flow velocities across the Hexham floodplain during major flood events are typically low and are therefore unlikely to result in structural damage to components of TSF infrastructure. The TSF will be constructed from flood compatible materials in accordance with the guidelines outlined in the NSW Government's 'Floodplain Development Manual' (2005). This would include the siting of power facilities at a suitable freeboard above the 1% AEP event level.

Given the ample flood warning time, there is time for staff to relocate stock and equipment to higher ground prior to the oncoming flood. There is also opportunity to move rollingstock to higher ground further up the Valley.

Surrounding Land

Upstream of the proposed access road peak flood levels are increased by just under 0.1m (typical flood depths increase from 1.5m to 1.6m) for the 2% AEP flood.

The flood plain flow peaks at around $560m^3/s$, with $250m^3/s$ conveyed through cross drainage and the remainder flowing over the road. For the 1% AEP event the impacts are less than those of the 2% AEP event. The peak flood level impact of the access road is reduced to around 0.05m (with typical flood depths being approximately 3m), as substantial overtopping of the road crest occurs. The road embankment is effectively drowned out, limiting adverse flood impacts. At the 1% AEP flood velocities increase is in the order of 1m/s above the existing velocity of 1m/s. Typical velocities will therefore be over 2m/s and locally higher.

For the 5% and 10% AEP events flood impacts are relatively minor. Peak flood levels upstream of the access road are typically increased by around 0.04m, with some localized increase of up to 0.6m at the 10% AEP event. The impact at the 10% AEP event would be mitigated by the provision of cross drainage through the proposed access road.

The impacts on peak flood velocity for the 2% AEP event are in a similar order to those experienced at the 1% AEP event. The impact on peak velocity is minimal for both the 5% and 10% AEP events.

The rail embankment results in a small redistribution of floodplain flows, pushing more water round to the west through Hexham Swamp. Impacts are restricted to the east of the project in isolated locations where water is trapped behind the rail embankment. Typically peak flood levels are increased by 0.2m, however no cross drainage has been modeled in these areas. There are localised peak velocities in the order of 1m/s where existing velocities are 1m/s. This occurs at the onset of spilling from the Hunter River. Cross drainage structures will be investigated during detailed design to mitigate the impacts in these localized areas.

Local Infrastructure

The most significant impact to local infrastructure occurs at the 2% AEP event for a 1km stretch of the Pacific Highway immediately north of Hexham Bowling Club caused by water spilling from the Hunter River becoming trapped behind the new rail formation. The modeling shows peak flood levels increase in the order of 0.1-0.2m and peak velocities of around $3m^3/s$ at this location. As noted above no cross drains have been modeled in this area and will be investigated during detailed design to mitigate the impacts.

At the 1% AEP event there is approximately a 0.05m modeled increase in the modeled peak flood level across the New England Highway to the north of Hexham Bridge. This impact is related to the redistribution of flood flows from the rail corridor to Hexham Swamp. There is a corresponding 0.1m decrease in peak levels modeled across the New England Highway to the south of Hexham Bridge.

At Woodlands Close modeled flood level increases are in the order of 0.08m at the 2% AEP event, 0.04m at the 1% AEP event and 0.03m at the 5% AEP event. Impacts in this location are related to both the local redistribution of flood flows and the proposed access road.

Impacts on Local Housing

The flood impacts to local housing are predominantly associated with the access road. The most significant impact on local housing occurs at the 2% AEP event, where a 0.08m peak flood level increase is modelled at the property located on Woodlands Close. The impact on peak flood level at this location for the 1% AEP event is 0.04m and at the 5% AEP event it is 0.03m. These impacts are related to both the local redistribution of flood flows and the proposed access road.

Elsewhere, the only event indicating an impact on local housing is the 1% AEP event. There are three houses located on the New England Highway, to the north of Hexham Bridge and another house situated within Hexham Swamp to the west of the development. These four properties show a 0.03m increase in peak flood level at the 1% AEP event, related to the redistribution of flood flows from the rail corridor to Hexham Swamp. There is a corresponding reduction in peak flood levels of 0.03m indicated for the 30 or so properties located along Old Maitland Road.

The 0.03m peak flood level increase in Hexham Swamp for the 1% AEP event also has implications for properties fringing the swamp in suburbs such as Shortland, Birmingham Gardens, Jesmond and Wallsend. However, this is unlikely to have a significant impact on flooding to houses, but rather a small increase in peak flood levels to low-lying land that is already inundated. Development of the proposed TSF would not result any significant flooding impact to local housing.

Impacts on Local Businesses

The only local businesses that may experience a flood impact resulting from development of the proposed TSF and HRR Project are those located on the former Oak Milk site (Brancourts). At the 5% AEP and 2% AEP events there is a local increase in peak flood levels of around 0.4m. This impact is due to the higher spill level of the proposed development restricting the progression of flood flows through the site. For the 1% AEP event and events of a greater magnitude the local flood impact is negligible as the entire site becomes fully connected with the wider floodplain and is substantially inundated.

At events of a 5% magnitude the flow rate of flood waters spilling through the site is sufficiently small that they can be mitigated through the provision of local cross drainage infrastructure. However, for a narrow range of flood events of greater magnitude (e.g. the 2% AEP), prior to the extensive inundation of the site, the flow rates are large enough to require alternative mitigation works. There are a number of options through which this impact can be mitigated and these are currently being investigated as part of the detailed design.

Impacts on Geomorphology

The proposed development has negligible impact on the flood flows within the Hunter River channel and so will not impact on the Hunter River geomorphology. The impacts of the proposed development are predominantly within the partially disconnected floodplain of Hexham Swamp and are restricted to events of around 5% AEP magnitude and greater. Due to the negligible impact on high frequency flood events no significant geomorphic impacts are anticipated.

Within Purgatory Creek local peak flood velocities are increased to around 2m/s through the access road cross drainage. This impact can be mitigated through the inclusion of appropriate scour protection works in the vicinity of the access road crossing. Impacts to flood velocities in the local flood plain are typically less than 0.2m/s.

Local Flood Impacts

Local rainfall events in the vicinity of the project are not expected to impact the facility and will be managed through the stormwater drainage system which is described further in Section 9.4. Modelling of the proposed stormwater system shows a peak reduction of approximately 15% for the 1 year ARI storm and an increase of approximately 5% for the 2 year ARI storm at the project boundaries. All local stormwater flows would be managed to minimise impact on surrounding catchments.

Cumulative Impacts (Future F3 Upgrade & Hexham Relief Roads)

The investigation considers cumulative impacts of the TSF, access road, ARTC's HRR Project and the F3 Freeway upgrade.

Overall there is no significant increased flood impact resulting from the cumulative consideration of the three proposed developments when compared to the developments in isolation.

During the cumulative impacts assessment, results from the 5% AEP event indicate a peak flood level increase of approximately 0.16m resulting from an uncoordinated approach on culvert alignments. Revising culvert locations for consistency between the proposed developments will minimise the impact.

Climate Change

The impact of climate change, initially addressed in the WorleyParsons report, was based on consideration of the following for a 1% AEP Hunter River flood in the RMA-2 model:

- 10% increase in peak discharges that define the inflow hydrograph at the upstream limit of the model (near Green Rocks) which was considered to reflect an increase in peak rainfall intensity over the entire catchment; and
- An increase of 0.9m in the tidal boundary condition to reflect median sea level rise predictions for 2100. This analysis was undertaken in accordance with recommendations outlined in the DECC Guideline "Floodplain Risk Management Guideline – Practical Considerations of Climate Change' (October 2007).

The peak 1% AEP flood level at the northern end of the site under the above climate change conditions is predicted by this model to increase by 0.32m.

The fill platform to be used as a rail embankment to the TSF will have a finished surface level of approximately 2.65mAHD (top of formation) and rail level of approximately 3.32mAHD. The formation level is approximately 0.45m above the 2% AEP, exceeding the potential increase from climate change of 0.32m.

The BMT WBM Flood Impact Assessment has considered the impact of sea level rise scenarios on the proposed developments. A sensitivity test on the 1% AEP design event has been undertaken incorporating a 0.9m increase in water level conditions at Newcastle Harbour (model boundary).

The cumulative impacts of the proposed TSF, the HRR and the access road (including flood mitigation measures) and the F3 Freeway Upgrade were assessed under the future climate change conditions for the 2100 planning horizon. The flood impacts under future climate change conditions are similar to those modelled under current conditions for the cumulative projects.

9.3.3 Mitigation Measures

For the access road, the flood mitigation to overcome the impact experienced during the 5% AEP storm event is to provide an additional 150m^2 of flow area, represented as 300m by 0.5m high culvert openings. The final configuration of flood relief measures will be refined during the detailed design stage as a combination of lowering the access road elevations to be less than 1.2mAHD and reduce the number of culverts. The flood impact of the final design should then be reassessed (refer to Figure 22).

The cumulative impacts of the TSF, HRR Project and the access road in terms of changes to peak flood water level and peak flood velocity are shown in Figures 4-2 to 4-9, Appendix G of this EA.

Local impacts adjacent to the rail formation to the east of the site will be addressed through the provision of cross drainage structures. A number of mitigation measures exist to address potential flood impacts to the Brancourts site and will be investigated during detailed design.

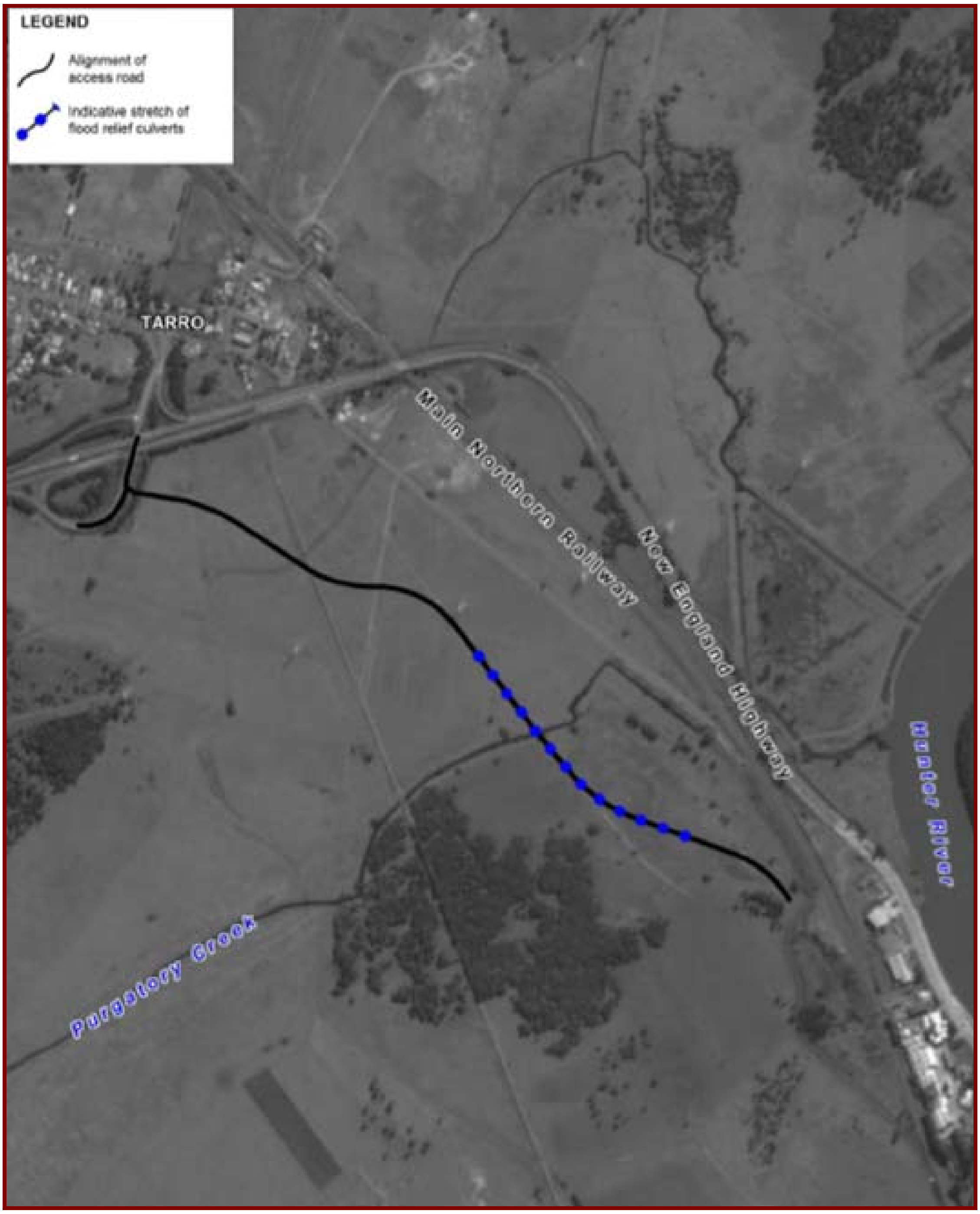


Figure 22: Location of Flood Relief Culverts Distribution.

Evacuation Plan

Depending on the specific rainfall distributions in a given event, it is likely that significant flooding of Hexham Swamp will typically not occur until 2 – 3 days after a major rainfall event. Actual timing of the flood peak is dependent on rainfall location and intensity. This is due to the large catchment size of the Hunter River, with extensive catchment upstream of Singleton. Flood warnings issued by the Bureau of Meteorology (BoM) and the State Emergency Service (SES) are given 24 hours in advance for Singleton and Maitland. This provides sufficient warning a day in advance of when Hexham Swamp is likely to be inundated by Hunter River flood waters. Given the ample flood warning time, there is adequate of time for safe evacuation from the site.

9.3.4 *Conclusion*

The objective of the study was to undertake a detailed flood impact assessment of the proposed cumulative development on Hunter River flood conditions. Central to this was the application of a two-dimensional hydraulic model of the Hunter River floodplain developed as part of the Williams River Flood Study (BMT WBM, 2009) and updated for the Williamtown / Salt Ash Flood Study Review (BMT WBM, 2011) for Port Stephens Council.

Specifically the modelling undertaken for the proposed cumulative development aimed to:

- Confirm existing flooding conditions across the site including flood levels, flows and velocities to establish baseline conditions for impact assessment;
- Identify the potential flood impacts of the proposed cumulative developments of the Hexham TSF, HRR and access road for a range of design flood magnitudes; and
- Consider the potential cumulative flood impacts of development with the RMS Pacific Highway upgrade from the F3 to Heatherbrae.

The results of the modelling and flood impact assessment have confirmed:

- Peak 1% AEP flood levels for existing conditions are estimated to vary from 3.7m AHD at the northern end of the site to 3.5m AHD at the southern end;
- The majority of the proposed development would be subject to significant inundation in major flood events where typical 1%;
- Corresponding peak flow velocities for the 1% AEP event under existing conditions are typically of the order 0.5m/s, but locally higher;
- The site is to be raised to a level above that of the 2% AEP flood level but largely below the 1% AEP flood level;
- Local increases in peak flood level of up to 0.1m upstream of the proposed access road alignment are simulated for the 2% AEP event with peak flood level increases of less than 0.05m being typical for other design events;
- Elsewhere localised increases in peak flood level can be addressed through adequately designed cross drainage infrastructure;
- Climate change considerations of increased tailwater levels and rainfall intensity increased the 1% AEP flood level by 0.32m;
- The cumulative impacts of the proposed rail developments and access road with the proposed F3 upgrade show no significant additional flood impacts to those when considering the developments in isolation for the 1% AEP event; and
- The cumulative assessment of the proposed access road and F3 upgrade show an increased flood impact for the 5% AEP event. However, there is scope to reduce this by considering the distribution of flood relief culverts for the two developments together, rather than in isolation.
- There is the possibility that the Brancourts site may experience a flood impact resulting from development of the proposed TSF and HRR Project at the 5% AEP and 2% AEP events. WBM BMT have advised that a number of mitigation measures exist to address

potential flood impacts to the Brancourts site which will be investigated during the detailed design phase.

- For the 1% AEP event and events of a greater magnitude the local flood impact is negligible as the entire site becomes fully connected with the wider floodplain and is substantially inundated.

9.4 STORMWATER & WATER QUALITY

WorleyParsons were engaged by QR National to prepare a SWMP for the TSF and the full document is contained in Appendix L.

9.4.1 Existing Environment

The site is dominated by a large coal reject stockpile filled to levels ranging between 3m to 13m AHD surface levels. The natural surface levels are predominantly 0.5 - 2mAHD, generally dominated by disturbed lands used for cattle grazing. Eco Logical's Ecological Investigations Report contained within Appendix F has identified SEPP14 Coastal Wetlands, Coastal Saltmarsh EEC and Swamp Oak Floodplain Forest EEC in parts of the site (refer to Figure 18 within Section 9.2).

All remnant vegetation on the site (excluding the Swamp Oak Swamp forest rehabilitation plantings) is considered to meet the definition of GDEs as described in the NSW State Groundwater Dependent Ecosystem Policy (DLWC 2002) due to the likely interaction of the vegetation with shallow watertables and periodic inundation by floodwater.

Existing Hydrological Conditions

Whilst some flow is toward Hexham Swamp, drainage for the site is predominantly toward the Hunter River via Purgatory Creek in the north and Ironbark Creek beyond the southern boundary. Ironbark Creek is the principal natural drainage channel for Hexham Swamp. Purgatory Creek through the site appears to be an old farm drain excavated to create the pasture lands now used for grazing. Existing and proposed hydrological conditions are shown in Figure 4 in the SWMP in Appendix L.

Existing Water Quality

Existing water quality of groundwater and surface water is reported by Douglas Partners in the Contamination Report in Appendix J to contain elevated heavy metals, hydrocarbons, nutrients and faecal coliforms. Douglas Partners has extensive testing results for groundwater and surface water, site knowledge and inspection for the site and adjacent sites.

9.4.2 Impact Assessment

The proposed stormwater management strategy is summarised as follows:

- Prevention: The following preventative measures would be adopted as development controls to reduce the generation of pollutants under normal conditions as well as provide contingencies in the event of an accidental spill of potentially polluting substances:

- Minimise area of development footprint by providing a compact and efficient design;
- Provision of industry best practice arrangements for the dispensing of fuel and other provisions (sand, lubricating oil, coolant, water, etc) to both locomotives and on-site vehicles and machinery. Management is to be in accordance with all relevant Australian Standards and guidelines; and
- Development and implementation of operational procedures which define how to operate the site in an environmentally responsible manner. Procedures would include, disposal of hazardous and potentially hazardous material and contingencies in the case of a potentially damaging environmental event (such as a fuel spillage).

- Isolation: Operational activities identified as potentially generating significant contamination are to be isolated from the greater stormwater system. These areas include wagon and locomotive wash down bays, maintenance areas and refuelling/provisioning areas. All water generated in these areas would be either disposed of to trade waste or treated onsite and reused;
- Treatment: Runoff would be treated or controlled by a series of stormwater management devices prior to discharge into the environment;
- Contingencies: There is a potential for an accidental spill/leak to occur at any point in the rail yard. Therefore appropriate measures will be in place to isolate an area for clean-up purposes; and
- Monitoring: A comprehensive surface water and groundwater monitoring plan would be undertaken by QR National to establish existing baseline parameters and observe the surface and ground water quality during the construction and operation phases of the TSF development.

The stormwater management system has been designed to segregate potentially contaminated waters from operational areas (which will be directed to a dirty water system for reuse) and divert all other water to on-site storage basins where treatment will occur through the use of several varieties of gross pollutant traps (GPTs).

A GPT will be located at the outlet of each pond as a final barrier to remove suspended solids, remaining floating debris (e.g. plant material) and hydrocarbons. Low flows will pass through the GPT with larger flows discharging over a spillway.

Details relating to flooding at the site are provided within Section 9.3 of this EA.

Hydrology

As the overall site is predominately flat, runoff would currently occur slowly, with the majority of rainfall being stored on site in the lower lying areas. It is likely that runoff would only occur during/after extended periods of rainfall.

Following development there will be an increase in impervious area (shown in Table 20). Due to site constraints, the proposed drainage systems have been designed to fall at absolute minimum gradients (sometimes flat).

The flat grades of the drainage system will act to minimise time of concentration changes and maximise infiltration. As a result, the following potential impacts will need to be addressed:

- Potential changes to the hydrologic response of catchments contributing to sensitive areas during normal wetting and drying cycle events (i.e. events <1 year ARI return period);
- Peak flows from frequent storm events (e.g. 1 to 2 year ARI events) which affect "stream forming" flows in the downstream drains, etc. Note that many of the existing surface drains within the neighbouring properties are recent human constructions; and
- Large return period events (e.g. 10 year ARI) where significant changes in peak flow may cause localised erosion, should controls not be implemented at the point of discharge to the surrounding landscape.

The hydrodynamics within the existing site have been significantly altered by previous land use practices of coal stockpiling, infilling of wetlands, construction of tailings ponds and drainage swales and irrigation of wastewater treated effluent. The resulting landform is considered highly disturbed. The existing hydrology at the site is represented within Figure 3 of Appendix L.

The following discharge locations have been identified including channel realignment of Purgatory Creek and have been used to assess potential impacts from the proposed development:

- Location 1 - Culvert to Hunter River north of the site;
- Location 2 - Swamp Oak Floodplain Forest (EEC) north of the site;
- Location 3 - SEPP14 west of HWC watermain and North of abandoned railway;
- Location 4 - SEPP14 west of HWC watermain within Hexham Swamp and South of abandoned railway; and
- Location 5 – Coastal Saltmarsh (EEC) south of the site.

Given the highly disturbed state as previous coal, rail and agricultural land uses, it is difficult to numerically assess the existing hydrological behaviour of the site. In view of this, a combination of qualitative and quantitative approaches has been used to assess stormwater management measures appropriate to the development. Quantitative modelling was carried out using DRAINS to assess low frequency, high intensity storm events. Qualitative methods were used to assess high frequency, low rainfall and the effects on wetting/drying periods.

Table 20: Composition of Catchment Areas

	Existing			Developed		
Outlet Location	Total Area (Ha)	Impervious Area (Ha)	% Impervious	Total Area (Ha)	Impervious Area (Ha)	% Impervious
Location 1 - Culvert to Hunter River	379.0	2.3	1%	381.1	5.0	1.3%
Location 2 - Swamp Oak Forrest	30.5	0.3	1%	25.5	0.5	1.9%
Location 3 - SEPP14 North	37.2	1.9	5%	52	14.6	28%
Location 4 - SEPP 14 South	66.8	3.9	6%	50.7	2.97	6%
Location 5 - Coastal Saltmarsh	32.6	2.8	9%	39.1	8.3	21%
Total	**546.1**	**11.2**	**2%**	**548.4**	**31.4**	**5.7%**

The SWMP identified two Discharge Locations would be sensitive to changes in low flow events, these being Location 2 - Swamp Oak Floodplain Forest (EEC) and Location 5 – Coastal saltmarsh (EEC).

At Location 2 - Swamp Oak Floodplain Forest there is a minor change in catchment area draining to Location 2. It is concluded that this will not impact minor flow regimes, however it will increase the frequency of inundation from every second year to yearly. As the percentage of the catchment that is impervious doesn't appreciably change, there will be a negligible change to existing wetting and drying periods. The change is negligible on an area and quantitative basis. In view of this, it is concluded that the proposed development will have a negligible impact to the EEC.

At Location 5 – Saltmarsh EEC, there is an increase in the volume of fresh water discharged to this location due to the increase in impervious area. However, due to the proposed detention basins the impact is not considered significant in comparison to the overall size and quantity of water within the estuarine environment. Refer to Part 5.1.2 of the SWMP contained within Appendix L.

Due to the proposed erosion and sediment control mitigations, locations 1, 3 and 4 (Table 20) are not considered sensitive to minor changes in flow rates. This is because these areas are relatively waterlogged and/or semi-permanent submerged environments, in large, flat, open areas where depth changes are negligible, or are within areas where the proposed development represents relatively minor changes to significantly larger catchments. Any incidental ponding, as a result of the access road embankment, will be addressed with piped drainage during detailed design of the access road.

Modelling indicated that there are opportunities for stormwater management on the site to assist in creating favourable conditions for restoration of suitable environments as an offset for the area of the site lost due to the proposed development. This can be achieved by changing the discharge and overflow locations, and frequencies to specific areas as part of the ongoing design.

From the ecological report contained in Appendix G, the Groundwater Dependent Ecosystems (GDEs) are highly disturbed from previous land uses and remain in relatively poor condition due to weed invasion. Given the improvement of GDE's in the offset lands, any possible detrimental effects locally are offset and not significant in terms of the Hunter Estuary.

Water Quality

The construction of the TSF and HRR projects is to involve significant earthworks to achieve required site grading. As a result of the soil disturbances, there is potential for increased sediment loads to occur from the site. If disturbed soils are contaminated from previous land uses, then disturbance of these soils could potentially result in contaminated sediment being exported from the site in surface water runoff

During operation, the following potential contaminant sources have been identified:

- Locomotive Wash: Designated locomotive wash down areas will be protected from weather and bunded to prevent runoff; runoff would be treated (via sediment traps and oil/grease separators) prior to discharge to the proposed wash down recycling system described in Section 6.4.2. These systems are totally separate from the stormwater system;
- Locomotive and Wagon Maintenance Facilities: Locomotive and wagon maintenance facilities will be contained within specifically designed building structures that are protected from all weather, and have separate bunded collection, treatment and disposal systems, such that no contaminates can enter the stormwater system;
- Provisioning and Refuelling Areas: Proposed provisioning and refuelling areas would be covered and bunded so that there is no runoff from these areas into the environment. Hence, it is unlikely that the provisioning/refuelling operation would be a source of hydrocarbon contamination into the environment; and
- Rail Yard: It is likely that the rail yard would have a low coal particulate load, primarily through the coal particulate either falling off wagons or washing off during periods of rainfall. Additionally, there is potential for hydrocarbon and metal contamination resulting from the rail yard operations. Runoff from the rail yard would be treated in gross pollutant traps and constructed wetlands prior to discharge. Monitoring of the discharge quality is required to verify the treatment effectiveness.

A detailed construction stormwater management plan will be included in the CEMP. An overview of the proposed stormwater regime for the construction period is described as follows:

- The proposed water quality ponds would be used as sediment basins during the construction phase. These ponds should be installed before any other works take place on site. All ponds would be inspected following rainfall events to ensure stormwater meets the necessary quality requirements prior to being discharged off site;
- Construction of temporary surface drains to minimise the flow of clean runoff into the construction site. Surface flows should also be directed away from material stockpiles and open trenches;
- Creation of designated no-go areas to minimise site disturbance;
- Silt fences or similar will be required around exposed ground and material stockpiles, including the use of bunding where considered appropriate;
- Provision of shaker pads or other similar devices at all site entry locations to ensure construction vehicles are not tracking material off site;
- Minimise areas of earthworks and trenches under construction at any one time;

- Progressive revegetation of disturbed areas;
- Regular cleaning of public roads which are used by construction traffic;
- Where possible, vegetated filter strips will be provided between construction works and areas of sensitive vegetation;
- Construction plant and materials to be stored and maintained away from watercourses and high water tables; and
- Inspection (on a daily basis) of construction areas, stormwater devices (silt fences, sediment basins, etc) and any other appropriate areas.

For constriction of the access road, road side swales and small temporary sediment ponds could be established to ensure retention of sediment laden runoff prior to discharging into adjacent areas. Where a sufficient width filter strip cannot be located between a natural drainage line and the construction works, sediment fences will be located beyond the available filter strip.

ARTC Relief Roads Project

In terms of ARTC's HRR Project, it is expected that stormwater runoff volume and velocity will not increase as a result of the development. This is due to the fact that train lines formation will be constructed on ballast and gabion rock. The surface roughness of the material is higher than the current bare earth of 0.03 to 0.04 (runoff coefficient) which will help decrease stormwater runoff rates and attenuate the peak flows. The result will be a flattening of the discharge hydrograph profile.

The cumulative impacts of the proposed ARTC HRR Project have been considered in this EA. Modelling incorporating catchments covering both projects concluded that there is no significant effect on overall peak volumes.

9.4.3 Mitigation Measures

Stormwater treatment targets adopted for the SWMP are summarised below:

- Suspended Solids (TSS) - 85% retention of the developed average annual load;
- Total Phosphorous (TP) - 65% retention of the developed average annual load; and
- Total Nitrogen (TN) - 45% retention of the developed average annual load.

Water Quality Control Strategies

Based on the above, the stormwater quality management measures outlined in this EA have been developed. MUSIC modelling was undertaken to determine the treatment efficiencies of the proposed measures. These measures are set out below:

- Areas of high sediment, oil & grease and nutrient loads will be separated from the stormwater system (e.g. wash bays, provisioning sheds, servicing sheds). These areas will be treated separately and discharged to trade waste or for re-use in wash down. This will be achieved by the use of separate drainage systems, bunds, roofing and hardstands in these areas;
- Where possible, runoff will be directed over gravel/ballast areas prior to entering the drainage system to encourage pollutant removal, infiltration and decreased run off

rates. Given the porosity of the ballast, it is considered that reasonably heavy storms would infiltrate through the gravel and eventually drain to the cess drain running the length of the site;

- Gross Pollutant Traps will be utilised to provide primary screening of stormwater. This will comprise formed concrete stilling basins with trash racks located at the outlet to basins. Areas draining directly to the ponds will utilise stormwater GPT's. The GPT's will be located offline to prevent re-suspension of material during larger storm events. A baffled outlet will be provided to trap hydrocarbons and other floating material in the GPT; and
- Water Quality Control Ponds (WQCP) – three ponds are proposed across the site to facilitate removal of suspended solids. The characteristics of these ponds are summarised in Table 21 below.

Table 21: WQCP Details

WQCP	Volume (M^3)	Surface Area	Depth (M)
1	1,230	2,190	0.6m
2	3,900	6,800	0.6m
2	3,800	6,560	0.6m

- Access roads are to be provided with road side swales that will provide treatment throughflow attenuation and sedimentation of suspended sediments;
- Figure 34 in Appendix L illustrates the location and concept layout for the water quality ponds. The characteristics of these ponds would be further developed and refined during the detailed design stage; and
- A further GPT will be located at the outlet of each pond as a final barrier to remove suspended solids, remaining floating debris (e.g. plant material) and hydrocarbons. Low flows will pass through the GPT with larger flows discharging over a spillway.

Modelling indicates that the proposed treatment trains will achieve the adopted stormwater treatment targets for the site. The adopted treatment measures are considered conservative and have not included the significant additional benefits of the removal of grazing from the site.

Water quality monitoring will be undertaken in accordance with Section 7 of Appendix L. The water quality monitoring program consists of establishing the baseline surface and groundwater quality and periodic monitoring against the baseline during construction and operation.

Construction SWMP

A preliminary construction SWMP has been prepared for the site. As part of the SWMP, preliminary Inspections and Test Plans (ITP) have been prepared for the specific activities (relevant to the SWMP) in accordance with the Blue Book (refer Appendix E of the WorleyParsons report in Appendix L).

It is concluded that the construction SWMP demonstrates that the proposed development can be feasibly constructed in accordance with current best practice, and will therefore minimise impacts to the surrounding areas during this phase. Final construction SWMP will be developed as part of the management plan and construction certificate process.

9.4.4 Conclusion

Based on the investigation, it is concluded that the proposed TSF can feasibly be developed in accordance with current best practice guidelines, and will not have a significant impact on the adjacent areas.

9.5 EFFLUENT DISPOSAL

An Effluent Disposal Assessment has been completed by Douglas Partners and the full report is contained in Appendix N.

HWC has confirmed that there is no regional sewer connection sufficiently close for connection of the TSF, so onsite effluent disposal will be required. Wastewater flows calculations for the TSF development have been derived by Worley Parsons in accordance with the relevant standards. The water demand and wastewater flow calculations are contained in the Services Investigation Report in Appendix M. The suitability of the land for onsite effluent disposal has been determined by Douglas Partners and their reporting is contained in Appendix N.

9.5.1 Existing Environment

The irrigation site area was selected for proximity to the TSF and being elevated above flooding inundation potential. The site is predominantly open, flat grassed area and there is significant space available. Following the assessment guidelines there are number of limitations to the site has localised embankment slopes greater than 20%, moderate to high potential for run on and seepage of Brancourts effluent irrigation at the northern end and presence of intermittent waterways with ponded surface water.

The subsurface conditions comprise fill material combinations of silty gravel, silty sandy gravel, clayey sandy gravel and predominantly coal reject. Potentially existing concrete slabs from the previous buildings of the former site uses may intrude into the selected irrigation areas.

9.5.2 Impact Assessment

Water Demand and Availability

The ultimate water demand for the TSF is 32 equivalent tenements (ET). The water supply would be provided for the showers and toilets in the administration block, two maintenance facilities and other facilities within the TSF. Water demand is calculated as follows:

Table 22: Water Demand

Stage	ET	Average Day Demand			Peak Day Demand (KL/day)	Extreme Day Demand (KL/day)	Peak Hour Demand (KL/day)
		Administration (KL/day)	Wash Down Top Up (KL/day)	Total (KL/day)			
Stage 1	11	2.0	0.25	2.6	6.1	7.0	10.8
Stage 2	32	6.0	0.45	7.4	15.5	17.6	27.8

Water connection for the TSF is likely to be made to an existing 200mm water main which in turn is connected to the 900mm diameter Chichester Trunk Gravity Main (CTGM) passing through the QR National site adjacent to the TSF. HWC has previously confirmed that the existing 200mm diameter main for connection has capacity for the demand from the TSF.

Wastewater Management

The TSF would be serviced by reticulated sewer to a package sewage pump station located in the vicinity of the buildings and would transport wastewater up to the package treatment plant. A package wastewater treatment plant would be provided for treatment of domestic effluent, a separate treatment process is proposed for reclamation of wash down water.

The irrigation pump station would comprise two pumps mounted on a concrete slab with an adjacent control cabinet. A buffer storage tank with sufficient storage for 60 days of treated effluent discharge from the TSF would be employed in case of wet weather. A backup irrigation pump has also been provided. During operation, the volume stored will be monitored and in exceptional circumstances, such as prolonged wet weather, pump out and transport by tanker truck would be required to an appropriate discharge point into HWC's system.

The Stage 2 sewer flows will be as follows:

- Average Dry Weather Flow (ADWF) = 0.15L/s; and
- Peak Wet Weather Flow (PWWF) = 1.5L/s

These flows are based on a sewer load of 13.6 ET, which is based on the assumption of 60 people per day using the site, in 2 shifts over 24 hours. A schematic flow diagram of the system is represented in Figure 23.

The wash down water treatment recycle system is for the wash down of locomotives. Gross pollutants, waste traps and oil/grease separators would be used in the return of wash down water for reuse. A pump station with chlorine dosing would be used to manage flow to the reuse header tank. A small proportion, in the order of 250L/day, of wash down water will be disposed to the main wastewater treatment system.

Irrigation Area Requirements for Disposal

The minimum disposal areas were calculated by Douglas Partners. The minimum irrigation area for the Stage 1 average dry weather flow (ADWF) is 13,600m^2, while the Stage 2 footprint size of the irrigation area will be 39,300m^2.

It will be necessary to provide stormwater drainage diversions and bunds adjacent to the irrigation areas to minimise potential for rainfall runoff and run on entering the irrigation areas.

The disposal area will be filled and regraded to meet design standard requirements. There is physical separation from Brancourts irrigation area and the two systems would operate independently. The soil will be improved with lime and gypsum as required. A minimum 250mm thick suitable clay loam fill to form the surface of the irrigation area. This is to improve soil properties and minimise the potential for groundwater pollution. Any existing concrete found during irrigation area construction will be topped with a minimum 500mm thick fill layer or be removed depending on final extent of intrusion.

Approval Process

Following detailed site design and design of the wastewater systems for the TSF, application will be made for approval under Section 68 of the Local Government Act with NCC. The recycle system will be subject to approval from NSW Office of Water/OEH.

9.5.3 Mitigation Measures

Mitigation measures to address effluent disposal impacts are outlined below:

- A wastewater system for effluent disposal and primary and secondary disposal areas have been proposed as identified within Figure 6 (Project Components). Further details are provided within the Effluent Disposal Report (Appendix N);
- A recycle system for wash down water;
- An irrigation area with the following site improvements:
    - Removal of the concrete hardstand and footings in the central portion of the site, or placement of 0.5m of suitable clay loam fill material over concrete;
    - Addition of lime to acidic soils to maintain plant growth;
    - Addition of gypsum to improve the soil structure and reduce dispersion/erosion;
    - Earthworks to re-contour and fill drainage channels and redirect surface water flow around the proposed irrigation area (meeting buffer distance requirements);
    - Where required, placement of suitable fill or earthworks to raise site levels to at least 1m above the permanent groundwater table and/or at least 0.6m between the highest seasonal water table level and the base of the irrigation areas (whichever is the greater);
    - Importation and placement of a suitable clay loam fill to form the surface of the irrigation area to improve soil properties and minimise the potential for the groundwater pollution; and
    - Installation of catch drains/bunds upslope and downslope of the irrigation area to prevent rainfall run-on and runoff;
- Temporary erosion and sediment controls will be required during construction works;
- Dewatering licensing to cover the sewer installation is potentially required;
- Rainwater tank top up of recycle water system; and
- Given that there are two irrigation areas within close proximity and independent to one another, additional targeted sampling of surface waters and groundwater is undertaken up-gradient, within and down gradient of the proposed effluent irrigation area prior to development to confirm baseline surface water and groundwater quality. Groundwater wells should be located to allow for monitoring of groundwater up-gradient, within and down-gradient during operation of the effluent disposal area.

9.5.4 Conclusion

There is sufficient area available for onsite effluent disposal and its independence and separation from the existing irrigation area. Conventional control of design of the system falls under Section 68 of the Local Government Act with NCC as the consent authority. QR National, through the design of the TSF, has proposed an environmentally sound wash down facility of recycling water and rainwater tank top up for reduced water supply.

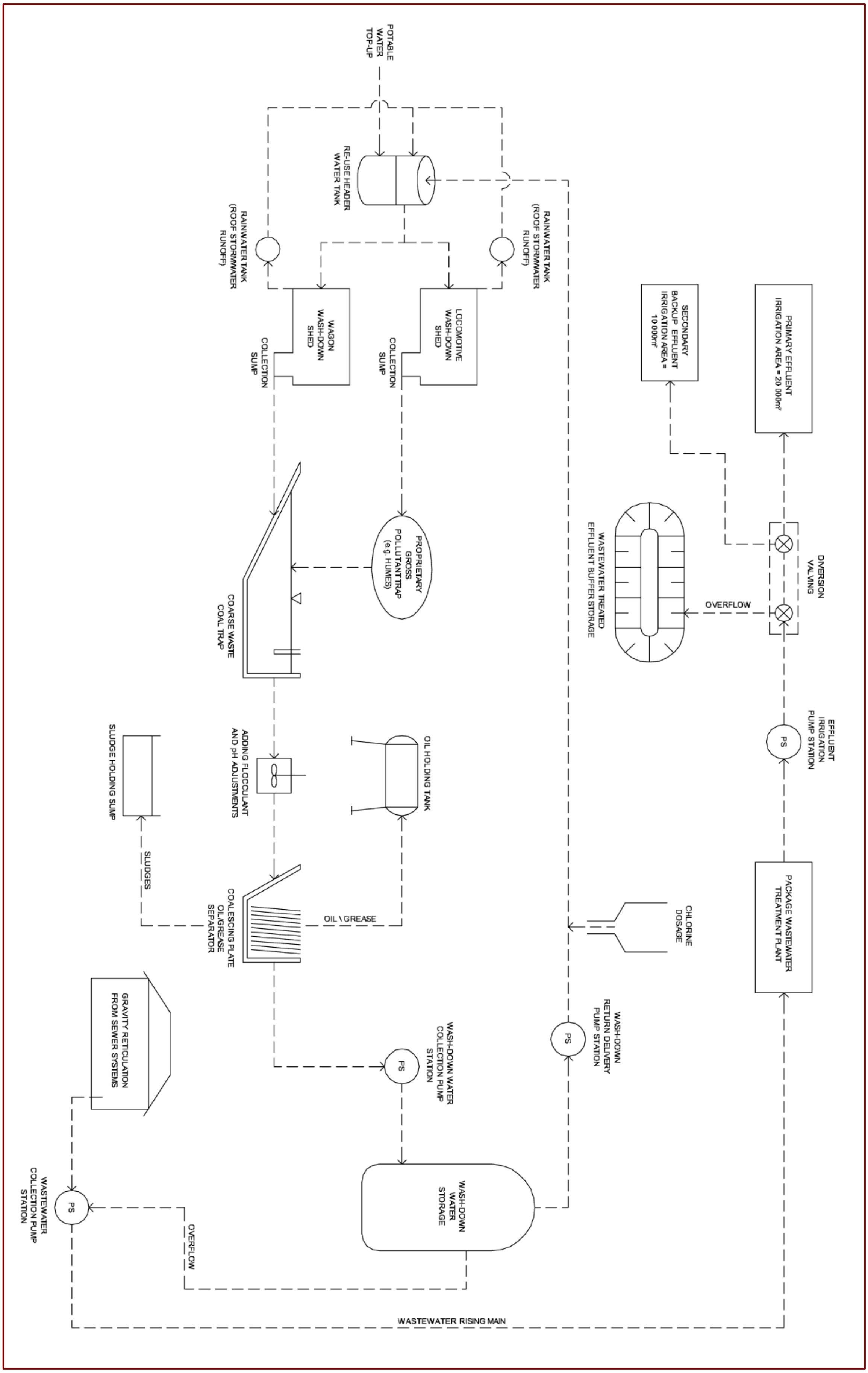


Figure 23: System Schematic Process/Flow Diagram.

9.6 TRAFFIC, ACCESS & CARPARKING

A Traffic Impact Assessment (TIA) has been prepared by Better Transport Futures (BTF) for the proposed TSF and the full report is contained in Appendix O. The TIA includes a review of the impact of the TSF on the local road network during both the construction and operational stages. The TIA also takes into account the ARTC HRR Project and future RMS plans for the proposed F3 Freeway to Heatherbrae Upgrade.

9.6.1 Existing Environment

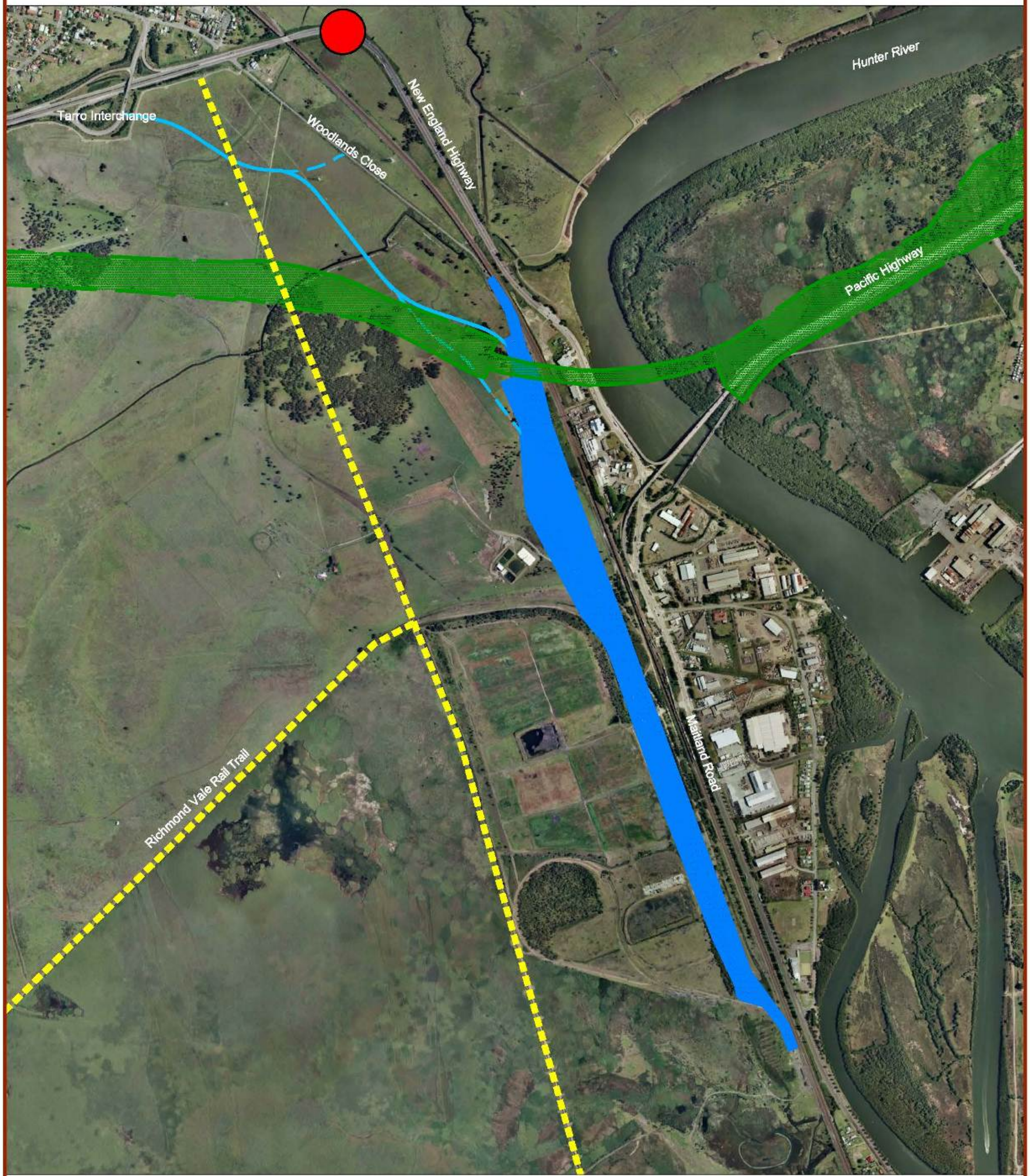
The site has existing access to the New England Highway via Woodlands Close to the north. The existing intersection at Woodlands Close and the New England Highway provides only for left turn in and left turn out. The New England Highway in the vicinity is a dual carriageway with two lanes of traffic in both directions and a posted speed limit of 90km/h. To the west of Woodlands Close is the Tarro Interchange which provides local access to Tarro and Beresfield from the New England Highway. It is not possible to access Maitland Road (Pacific Highway) from the site at Hexham due to the location of the rail corridor (refer to Figure 24).

Richmond Vale Rail Trail

Consultation with NCC has indicated a potential cycle path along the HWC owned land, which would connect with the potential future Richmond Vale Rail Trail cycle path, and provide a regional link between the Hexham area through to Kurri Kurri and beyond. The design of the internal road network and operations allows for connection for the northern proposed cycle routes.

F3 Freeway Extension

Investigations have commenced into an extension of the F3 Freeway from John Renshaw Drive to the Pacific Highway at Heatherbrae. Consultation with RMS has identified the preferred route of the extension has the potential to significantly reduce traffic flows along the New England Highway in the vicinity of the site. The design of the access road and proposed TSF track has been coordinated with the preliminary proposals for the F3 Freeway to Heatherbrae Upgrade. The location of the future F3 Freeway is identified within Figure 24.



Key
- Proposed Cycle Paths
- Future F3 Extension Corridor
- RMS Count Station (05.055)
- TSF Footprint
- Proposed Vehicular Access
- Temporary Construction Access

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Figure 24.
Existing Traffic Environment

Figure 24: Existing Traffic Environments

Fassifern to Hexham Rail link

Transport for NSW has advised that the design of a Rail Link between Fassifern and Hexham on the GNR Line is under review. The Rail Link would form a rail freight bypass of western Newcastle. Preliminary studies have been carried out on a route which diverges from the existing railway at Fassifern and joins the existing Hunter Valley Line in the vicinity of Hexham.

The Fassifern to Hexham Rail Link would be justified by an increase in coal traffic from south of Fassifern, additional regional container traffic from the north west or the proposed container freight terminal at Beresfield. Additional traffic from these sources has the potential to cause congestion on the bank between Adamstown and Cardiff which would be alleviated by a bypass between Fassifern and Hexham.

During the assessment and design of the TSF, Transport for NSW will be further consulted where any adjustments or amendments are made to the proposed TSF to ensure that changes do not have an impact on the future Rail Link. The proposed TSF has been designed with consideration of the current proposal for the Fassifern to Hexham Rail Link.

Ongoing consultation with Transport for NSW and other relevant agencies will be undertaken via meetings at key milestones throughout the project process, for example; following submission of the Preferred Project Report/Submissions Report. The proponent has agreed to keep Transport for NSW and RMS up to date on project progress and Transport for NSW and RMS will do likewise regarding the progress of future development in the area, in particular the future F3 extension and Fassifern to Hexham Rail Link.

Existing Traffic Volumes

New England Highway – Traffic data provided by RMS from a traffic volume survey station (05.055) located to the north of the site, on the New England Highway (Figure 24) is illustrated in the table below.

Table 23: Recorded AADT on New England Highway, Count Station 05.055

Year	1988	1990	1992	1995	1998	2001	2004	2010	2011
AADT	29551	34451	34523	41052	43337	45783	48879	56430	52116
Growth		4900	72	6529	2285	2446	3096	7551	-4313
% / annum		8.29	0.10	6.30	1.86	1.88	2.25	2.57	-7.64

The last 5 years of data show rate of growth is just on 2.7%, reflecting the growth in traffic between the Upper Hunter and Maitland through to Newcastle.

The New England Highway is classified as an Arterial Road under RMS road classification guidelines and is found to have some spare capacity for increased traffic flows.

Tarro Interchange – BTF traffic surveys completed in July 2011 of the two way combined peak flows on the Tarro Interchange found 350-400 vehicle movements in the morning peak and 450-500 vehicle movements in the afternoon peak. The operation of the Tarro Interchange was observed during the study and delays to vehicles on both roads were observed to be low. Sight distances were found to be acceptable for traffic exiting the New England in both directions.

The intersection of the New England Highway with Woodlands Close operates well with little delay. It is noted however that it does not meet Austroads standards and the traffic flows in and out of Woodlands Close are very low, as there is currently little development off Woodlands Close to create demand. The RMS has indicated that the use of Woodlands Close would not be an appropriate access for the TSF project.

9.6.2 Impact Assessment

To assess the impact of traffic from the proposed TSF, Sidra traffic modelling has been undertaken to analyse the level of service for the proposed intersection (at AM and PM peak periods), the level of queuing and expected delays. The results of the Sidra modelling are contained within the Traffic Impact Assessment in Appendix O.

Construction

It has been proposed that a new intersection be constructed on the Tarro Interchange that provides access to the site during the construction and operational phases of the facility. The proposed intersection off the Tarro Interchange is identified in Figure 25.

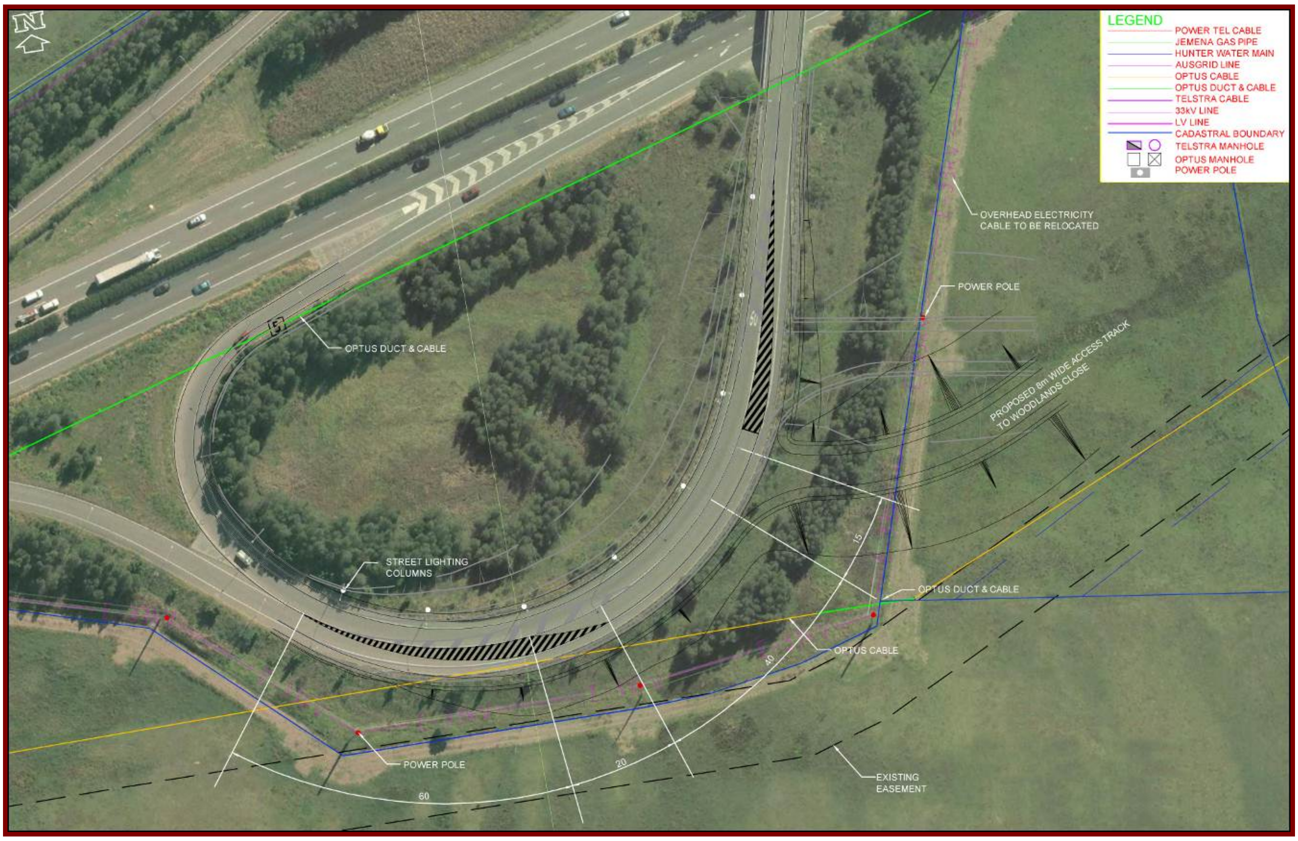

Figure 25: Proposed Intersection of Access Road with Tarro Interchange.

To enable the construction of the intersection with Tarro Interchange, initial access will be required to the site via Woodlands Close, in order to mobilise the heavy machinery and material required for construction. The movement of vehicles in and out of the site via Woodlands Close will require the development of a Traffic Management Plan. It is considered that this would require access to be restricted to night work and potentially the closure of the left hand lane off the New England Highway and an appropriate reduction in the speed limit. This would form part of a separate application to RMS.

Following completion of the access road and Tarro Interchange intersection, construction of the TSF can commence, with workers and materials now able to enter and exit the site safely, without disruption to flow of traffic on the New England Highway.

The proposed working hours for the construction of the TSF are between 7.00am – 6.00pm, with up to 75 construction workers on site during the peak construction period. There will be two distinct peaks in traffic flow, coinciding with construction workers arriving on site and departing at the end of the day, with remaining traffic flows being spread out between 9.00am and 3.00pm. The traffic associated with construction workers will generally impact outside of the traditional peak hours on the New England Highway at this location. Construction of the proposed TSF will result in no impact to the existing rail services. Construction of connecting tracks will be undertaken during scheduled closedowns to ensure that no impact to existing services occurs.

The peak volume of traffic coincides with the civil works to the site. Significantly, this would involve the importation of up to 380,000m^2 of fill to provide a level platform on which to construct the rail formation and buildings. A summary of the quantities associated with the importation of the fill are illustrated in the table below.

Table 24: Fill Quantities

Total Fill Required (Measured on Plan)	Total Tonnage (based on 1.7t/m3)	Total Number of Inbound Movements (Truck & Dog 30t Load)
380,000m^3	646,000	21,533

Construction traffic will peak to around 190 vehicles per day entering the site, during this period. The peak daily traffic volume is predicted to be in the order of 380 vehicle movements per day, which will be spread over a period of 7 – 8 hours. This peak would be temporary, predicted to occur over a 2 – 4 month period of the 18 month construction program.

The peak traffic movement associated with the construction phase of this project are outlined in the table below.

Table 25: TSF Peak Vehicle Movements

	Daily Number of Vehicles	Total Two-Way Movements
Light Vehicles	70	140
Heavy Vehicles	120	240
Total Movements	190	380

The following is a summary of vehicle movement paths for vehicles entering and exiting the site, which has been developed in consultation with RMS:

- Accessing from the south, vehicles will left turn in off the existing slip road to the Tarro Interchange and then turn right into the access road to the subject site;
- Accessing from the north, vehicles would continue along the New England Highway to the signalised turn around area under the Hexham Bridge (opposite Brancourts) then turn right back onto the New England Highway to proceed to the Tarro Interchange as above;

- Exiting movements wishing to head north will turn left onto the Tarro Interchange and then merge onto the New England Highway; and
- Exiting movements wishing to head south will turn left onto the Tarro Interchange and then merge onto the New England Highway, before turning down John Renshaw Drive and making a U-turn at the roundabout controlled intersection of John Renshaw Drive with the F3 Freeway (at the end of Weakleys Drive).

Refer to Figure 26 for the access routes in and out of the subject site.

Key

- Study Area (Site)
- Vehicle Route - Site Entry
- Vehicle Route - Site Exit

*Note: Light Vehicle only for Left Turn into site. Not shown for clarity.

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Date: September 2012

Figure 26.
Vehicular Access Routes

Figure 26: Vehicular Access Routes

Cumulative Impacts

ARTC Hexham Relief Roads Project

ARTC is planning to undertake construction of their HRR Project on land adjacent to the TSF site with their works commencing in March 2013.

The Parsons Brinkerhoff Traffic Impact Assessment provides traffic numbers associated with construction of the HRR Project. These numbers are similar to the maximum numbers for the TSF project.

Consistent with the TSF project the ARTC peak vehicle rate is primarily associated with bulk material delivery timing spread throughout the day. This would result in cumulative traffic flows during the peak construction period in the order of 720 vehicle movements per day. This is a worst case scenario assessment of both projects experiencing bulk material, peak vehicle movements simultaneously.

The total number of construction workers for both projects is in the order of 150 with the remainder of the traffic flow spread out over the primary delivery period between of 9.00am to 3.00pm.

During the morning and afternoon peak traffic periods, flow on the New England Highway is high, with little capacity for additional traffic movements. However given the construction hours proposed, the peak influx of workers in and out of the site will generally impact outside of the peak traffic flows of the New England Highway.

Peak construction traffic associated with the importation of fill equates to approximately 95 vehicles per hour entering and leaving the site. Outside of the peak periods, the traffic flows are 1 000 or more per hour less than the peak period indicating significant spare capacity for the additional traffic movement.

Overall it is considered that the construction traffic associated with the TSF and ARTC works will have an acceptable impact upon the operation of traffic flows along the New England Highway in this location.

Operational

An assessment of traffic generation has also been undertaken for the operational phase of the TSF and is summarised in the table below.

Table 26: Operational Vehicular Movements

DEMAND	Number per Day	Inbound per Day	Outbound per Day	Total per Day
Staff	30	30	30	60
Fuel Delivery	3	3	3	6
Delivery Vehicles	20	20	20	40
Total	53	53	53	106

The facility will be open 24 hours 7 days a week, with the servicing and maintenance operations occurring between 6.00am and 10.00pm. Staff number approximately 30 and work in shifts, decreasing the peak demands on the road network accordingly.

Delivery of fuel for the facility will require up to three B doubles accessing the site each day. Other delivery vehicles movements will generate 20 inbound and outbound movements per day. Based upon a typical eight hour day for the delivery of supplies it is expected that there would be on average three vehicles inbound and outbound per hour. It is considered that three vehicles inbound and outbound per hour would have a negligible impact upon the operation of the New England Highway at this location, given the construction of the new intersection with the Tarro Interchange.

Car Parking

Dedicated onsite parking will be provided adjacent to the offices and amenities as identified within Figure 7 (Project Components) and on hardstand areas adjacent to main work areas. The facility car park would have 38 parking spaces including two disabled spaces.

9.6.3 Mitigation Measures

The assessment of traffic impacts for the proposed TSF requires a commitment to undertake the following:

- Construction of a new T-intersection on the Tarro Interchange with sheltered right turn lane to accommodate the site access road; and
- Construction of an access road connecting the Tarro Interchange with the TSF.

9.6.4 Conclusion

The access proposal off the Tarro Interchange will provide an appropriate level of service for traffic access to the proposed development site. Whilst traffic flow on the New England Highway is high at peak times, the relatively low number of staff and shift work operation means that there will be little if any impact upon the existing traffic flows along the New England Highway at this location. The future extension of the F3 Freeway to the Pacific Highway at Heatherbrae, will reduce flows along the New England Highway in vicinity of the proposed project.

The peak construction period, anticipated to be over 3-4 months, is only temporary and mitigated by the arrival of site staff prior to the morning peak period and departing after the afternoon peak period. Materials movements will occur after the morning peak period optimising supply movement efficiencies.

9.7 GEOTECHNICAL

A preliminary geotechnical investigation of the proposed TSF site was carried out by Douglas Partners and their full report is contained in Appendix H. This included a field investigation consisting of a number of test bores as well as cone penetration testing. A number of soil samples, including samples from the test bores, were collected for laboratory testing. Preliminary ground improvement methods were considered in the report for construction methodology and costing purposes. Preliminary pavement design advice was provided for costing purposes. Slope stability of the rail embankment and batters of the Tarro Interchange were also assessed in the report.

9.7.1 Existing Environment

The field investigation found that the southern half of the site contains fill typically at a depth of 0.5m to 1.5m with maximum depth of up to 2m. The fill is predominantly coal reject (chitter), from the former Coal Handling Plant, intermixed with sand and clays. Douglas Partners found that the fill may be suitable to act as bridging layer for support of pavements such as access roads, however this application is reliant on import of all fill required for the embankments. Coal reject reuse opportunities are being assessed in parallel with the approval. The use of coal reject will only be proposed as part of the fill solution if the assessment determines that the material is suitable for reuse and all standards are met.

The natural subgrade was found to consist of soft to firm clay at depths typically in the range of 15m to 17m and up to a maximum of 25m thick. As the clay soils have low permeability and are highly compressible, they are subject to long term consolidation when placed under load. The underlying soils are sand with occasional gravel increasing in density with depth with a further clay layer underlying this and weathered bedrock at depths in the range of 25m to 33m. Ground water was identified typically between 0m and 2m below the natural surface. In accordance with AS2870-2011 the site classification is P.

Subsurface Conditions

Table 27 below presents a summary of the subsurface conditions determined from various investigations undertaken on and in the vicinity of the site.

Table 27: Subsurface Conditions

Stratum	Description
Fill	Predominantly comprising coarse coal reject (chitter), and intermixed with sand and clays where spread elsewhere particularly on the southern half of the site in the area of a former Coal Handling Preparation Plant. Over the southern half of the site the fill depth is typically 0.5 m to 1.5 m depth, but up to about 2 m.
Clay (alluvial)	Soft to firm silty clays / clays and clayey silts are present beneath the fill at all CPT test locations. The clay layer is typically 15 m to 17 m thick but up to 25m thick at the southern end of the site. It is this layer which presents issues of poor bearing capacity for footings and pavements, as well as potential long term settlements under load due to its compressibility. The clay profile is interbedded by silty sand / clayey sand, particularly in the upper profile of the unit.
Sand	Sand, clayey sand or silty sand, with occasional gravel, usually loose to medium dense, becoming dense with depth. The thickness and distribution of this layer is quite variable and it is not present at all locations.
Clay (residual)	The deeper clays are generally stiff to very stiff sandy clay, grading to hard clays and weathered rock although weathered rock was not encountered during the current investigation.
Bedrock	Sandstone, siltstone, shale and coal were encountered in previous bores that were taken to rock. The depth to rock varies considerably, from about 25 m (below natural surface) in the south-eastern area (former colliery facilities) to 33 m near the former rail loop, west of the southern end of the site. More generally, it appears that the depth to rock is round 30 m to 35 m over most of the site, probably increasing to the west towards Hexham Swamp.

9.7.2 Impact Assessment

Implications of Site Conditions on Construction

Field testing found that a clay crust is present over the site which is generally about 0.5m to 1m thick. The subgrade significantly reduces in strength below this level. It is recommended where possible that minimal excavation into the surface crust is carried out to avoid exposing underlying softer soils. For any required excavations where a surcharge is created by machinery or for excavations below a depth of approximately 2.5m (without surcharge), the use of sheet piling is recommended to ensure stability and prevent base heave. Dewatering by the use of internal sumps and pumps will also likely be required in any excavations due to the presence of high groundwater.

Due to the relatively low strength of the clay soils and associated long term total settlements Douglas Partners noted the use of high level foundations for buildings would not be appropriate particularly where the structure is sensitive to settlement including buildings with overhead cranes. These buildings will need to be founded on piled foundations with foundations taken to the underlying sand or bedrock. Review of the various piling methods are considered in the report (Appendix H). Ground improvement could also be considered to improve the shear strength and thus bearing capacity of the soils. Any licences required will be sought from NSW Office of Water when necessary.

Slope Stability

The Geotechnical Assessment of Embankment Settlement and Stability has been assessed by Douglas Partners for both the proposed TSF and for the road embankment off the Tarro Interchange.

The geometry of an embankment is controlled by the required height of the embankment, water level and the batter slopes required to provide acceptable factors of safety against slope instability. The slope stability is controlled by the upper soft clay, which varies in strength and thickness across the site. For the purposes of the stability assessment, the stability of the rail embankment was modelled in the area where the clays were weakest and the height of the embankment is greatest.

The slope stability assessment was undertaken using the program Slope/W Ver 2007. The results of the analysis for the TSF indicated that the factor of safety against slope failure during preload is 1.5 which is considered satisfactory for no load at crest.

The stability of the embankment following preload was estimated. The stability of the embankment (with train loads) will be a function of the amount of strength gain the underlying clays have achieved during the partial preload.

Based on the results of the analysis, the degree of consolidation of the upper 3m of soft clay after a period of 1 year was estimated to be about 50%. The strength of the upper 3m of the soft clay due to a fill height of 2m was estimated to be about 10 kPa.

The factor of safety was reassessed after a period of one year when the clays have partially consolidated and using a shear strength of 10 kPa. The analysis was also based on additional load applied at the crest of the embankment due to the load of a train. A value of 60 kPa (positioned at least 1m from the shoulder of the embankment) was assumed in the analysis for the stress applied by the train loads onto the fill embankment.

The results of the analysis for the Tarro Interchange embankment indicate that the factor of safety against slope failure is 1.40 which is slightly below the normally accepted factor of safety of 1.5 for long – term structures. The factor of safety increases to greater than 1.5 for embankment heights of less than 6m. The stability was reanalysed for a batter slope 3H:1V. The results of the analysis indicated a factor of safety of 1.6, which was considered acceptable.

The results of the analysis indicated that for embankments greater than 6m in height, the batter slope should be no steeper than 3H:1V and for embankments less than 6m in height, batters should be no steeper than 2.5H:1V.

A detailed overview of the assessment is described within the Preliminary Geotechnical Assessment contained within Appendix H.

9.7.3 Mitigation Measures

Ground Improvement

A number of possible ground improvement options have been considered in an aim to reduce the post construction settlement for rail embankments, roads and services and possibly building areas. The report noted that the use of preloading would be a suitable technique, however even with the inclusion of wick drains, the settlement time is unacceptable to the delivery timeframes for the project. Deep soil mixing has been used successfully by others recently adjacent to the TSF site and so this is likely to be the preferred ground improvement option. Piling is the likely method to be used to support building footings. The ground improvement method should be monitored by geotechnical instrumentation to measure and verify performance.

Pavements

The use of both an unbound granular pavement and a bound pavement has been considered with a preliminary pavement design presented for both options. Both pavement options require the use of a select subgrade to bridge the existing soft clays thereby providing a working platform.

9.7.4 Conclusion

In summary, the detailed geotechnical analysis undertaken for the proposed TSF has found that the site is suitable for the proposed TSF and associated infrastructure provided that settlement and slope stability issues are addressed.

9.8 GROUNDWATER

An assessment of potential groundwater level impacts has been undertaken by Douglas Partners which is contained in Appendix J, following the Preliminary Contamination Report in Appendix J.

9.8.1 Existing Environment

Douglas Partners completed an assessment of potential groundwater level impacts in 2012 which builds on groundwater investigations in 2008. These investigations included installation of nine groundwater monitoring bores and utilised five existing monitoring wells.

NSW Office of Water records indicate that there are nine registered groundwater wells located around the perimeter of the site and are used for monitoring purposes. The monitoring bores were registered in October 2011 and were installed as part of the current investigations associated with the proposed TSF development.

Groundwater levels were recorded in each of the fourteen wells with levels varying from RL0.3 to RL2.88 AHD (typically within 1.5m of the ground surface). Further monitoring was undertaken of groundwater levels in 2011 in a total of 35 wells. This monitoring found similar groundwater levels to those in the 2008 study.

The regional groundwater flow was identified as being multidirectional due to the height and location of the coal reject stockpile. Site observations and measurements indicated groundwater flows to the west of the site towards Hexham Swamp Nature Reserve, to the east of the site towards the Hunter River and towards two unlined drainage channels connecting to Purgatory Creek and then the Hunter River.

As the overall site is relatively flat, surface water runoff currently occurs slowly, with the majority of rainfall being stored on site in the lower lying areas, with groundwater/surface water interaction at these lower elevations. It is likely that runoff would only occur during/after extended periods of rainfall.

Due to the likely interaction of the vegetation with shallow water tables and periodic inundation by floodwater, all remnant vegetation on the site, excluding the Swamp Oak swamp forest rehabilitation plantings, is considered to meet the definition of groundwater dependent ecosystems as described in the NSW State Groundwater Dependent Ecosystem Policy (DLWC 2002). Refer to the groundwater contour plan contained within the Preliminary Contamination Assessment in Appendix J.

Extensive review of groundwater quality and contamination has been undertaken over a number of years. Douglas Partners Report May 2012 noted contaminant observations during fieldwork generally indicated the absence of gross contamination within the soil, groundwater and surface water. Laboratory testing of the groundwater and surface water samples found results generally within the adopted criteria, however elevated concentration of heavy metals, nutrients and faecal coliforms were detected in the majority of samples tested. The contamination assessment is dealt with in detail under Section 9.9 of this EA.

The 2012 assessment identified the following with respect to groundwater at the TSF site:

- The site has previously been used for a number of agricultural and commercial/industrial land uses including grazing, wastewater treatment and associated effluent disposal, coal preparation and associated railway lines and sidings;
- A number of potential contamination sources are associated with the current/former land uses at the site, including above ground fuel storage tanks and bowsers, railway lines, coal reject filling, fill material of unknown origin, former cropping, wastewater treatment and associated irrigation, potentially buried wastes, potential acid generation from exposure of ASS during construction of the HWC pipeline;
- Laboratory testing of groundwater and surface water samples has found elevated concentrations of heavy metals, nutrients and faecal coliforms in the majority of samples. Elevated hydrocarbons were also detected in some locations. The groundwater contamination was considered likely to be associated with effluent irrigation onsite, leaching of contaminants from fill materials or localised contaminant sources (i.e. fuel storage); and
- It is noted that existing groundwater impact is widespread and this portion of the Hexham Wetland is in a degraded state.

9.8.2 Impact Assessment

The proposed TSF fill embankment associated with the rail, access roads and buildings may result in a slight rise in groundwater levels in the vicinity of the fill. No significant variation in levels is expected for the remainder of the site.

From the ecological report contained in Appendix F, the GDEs are highly disturbed from previous land uses and remain in relatively poor condition due to weed invasion. Given the improvement of GDE's any possible detrimental effects locally are not significant in terms of the Hunter Estuary.

Potential Impacts to GDEs

The proposed development will be constructed partly over several areas of GDEs, some of which are classified as EECs, and as a consequence the remnant EECs will be left in immediate proximity to the development.

Impacts to water levels due to the development are generally expected to be localised and in the case of construction activities only temporary and recoverable.

During construction there is some risk of lowering of the water table due to localised dewatering estimates, however such drawdowns are not expected to have significant impacts on water levels outside of the development footprint.

Groundwater levels on the majority of the site are at or near the surface and typically controlled by surface water drainage features. The majority of site changes have potential for slightly changed groundwater levels within filled areas (probably slightly higher), increased run-off, and in places increased seepage, to the ground surfaces adjacent to the development.

The increased run-off will have little effect on groundwater levels during wet times as the water levels are controlled by surface water controls. In times of dryer weather the increased run-off is likely lead to certain areas staying wetter for longer than they may have prior to development. There would be some risk of localised pockets receiving less run-off than previously, however the risk of this is limited as the ground is generally low lying with limited fall, encouraging spreading of the run-off.

Impacts to groundwater levels from the development are expected to be limited to close proximity to the TSF development footprint. Impacts on water levels on the western parts of the site in Hexham Swamp to the West and the Hunter River to the east, are expected to be negligible.

Recharge times are not expected to be impacted by the small increase in impervious area provided by the TSF footprint relative to the site area and the flood regimes are not expected to be altered by the development.

Existing Groundwater Uses

There is limited use of groundwater in the vicinity of the site. Registered wells in the vicinity of the site are limited to nine monitoring bores installed in 2011 at the perimeter of the site for the purpose of monitoring groundwater quality and levels. The wells were installed as part of site investigations for the proposed TSF development. It is understood that there are no wells registered for beneficial use within 3 km of the site. Therefore, no impacts to groundwater levels from the TSF development are expected to occur at such a proximity to the site.

9.8.3 Mitigation Measures

Potential mitigations to reduce the risk of impacts to groundwater levels would include:

- Detailed design of any dewatering to limit impacts on groundwater levels. This may include limiting the depth of excavation as well as the extent of dewatering occurring at any one time, in particular for dewatering in close proximity to GDEs;
- Matching the level of outlet structures from the drainage system to closely match level of existing surface flow controls;
- Permanent sediment basins will be lined or raised above the groundwater level to prevent inception or connection of the stormwater and groundwater systems, this issue however is considered minor as the treated stormwater should not be contaminated;
- Groundwater monitoring during and following construction;
- Any activities requiring licences from the NSW Office of Water will be obtained prior to the commencement of construction.

9.8.4 Conclusion

Groundwater is present at relatively shallow depths over the site. Other than a slight rise in groundwater levels in the vicinity of the fill, no significant variation in levels is expected for the remainder of the site.

The assessment of potential groundwater level impacts from the development of the proposed TSF at Hexham considered possible impacts associated with the following:

- Excavation dewatering;
- Site filling;
- Ground improvement;
- Site capping;
- Site drainage; and
- Irrigation of Effluent.

A conceptual groundwater model was developed for the site on the basis of available background information including site hydrogeology, the proposed TSF development and existing and proposed site hydrology.

In summary, the proposed development and stormwater controls are generally sympathetic to the existing site hydrology. Potential impacts to groundwater levels are likely to be limited to the immediate vicinity of the proposed TSF development, or short term and recoverable.

It is noted that the TSF development area is limited to a corridor of approximately 150 m adjacent to the GNR (excluding the five ARTC train lines) located over the western strip of the greater site area. Potential risks associated with impacts to groundwater levels will be managed through detailed design, construction and monitoring for the proposed TSF development. All licences required for groundwater monitoring and boreholes, will be gained prior to works occurring.

9.9 CONTAMINATION

A Preliminary Contamination Assessment (PCA) has been carried out by Douglas Partners and their full report is contained in Appendix J. The PCA was undertaken to assess past and present contaminating activities, report on site conditions and provide a preliminary assessment of site contamination. The report has been recently updated to address the issues raised in the DP&I Adequacy Review.

9.9.1 Existing Environment

The desktop review identified the site as having a long history of industrial development. Minmi-Hexham Railway and a Coal Preparation Plant occupied the site closing in 1988. While the majority of infrastructure associated with these uses has been removed, the landscape has been significantly altered and particularly by the placement of the coal reject stockpile. Figure 27 identifies the former coal preparation plant.

At the northern end of the site, rural land uses of cropping and cattle grazing dominated the landscape. Brancourts irrigates treated effluent over northern and southern portions of the site.

Fieldwork and laboratory testing for contaminates was undertaken initially in 2008. Further updates to the reporting have occurred since, including work by ERM from 2010. Douglas Partners was also present on site, during the construction of the HWC's DN900 water main upgrade works.

The results of the above mentioned assessments indicated the following with respect to potential soil, groundwater and surface water contamination:

Proposed TSF Development Area:

- Presence of soil hydrocarbon impact (TRH C_{10}-C_{36}) in Pit 128 from the surface to about 1.5m, considered likely to be associated with a former abandoned UST;
- Presence of localised soil and groundwater hydrocarbon impact (TRH C_{10}-C_{36}) possibly associated with the former fuelling area (Bore 102/0.3-0.5 and BH03/1.3);
- Presence of soil TRH (C_{10}-C_{36}) soil contamination adjacent to former infrastructure;
- Presence of TRH (C_{10}-C_{36}) soil contamination within fill material generally comprising coal fines and coal reject located throughout the southern portion of the site, including the coal tailings stockpile (viz. DP Bore 101/0.8-1.0, Pit 160/4.0, and TP18, BH03, MW08);
- Presence of fibre cement fragments containing asbestos within the former control cabin;
- Presence of dumped filling, building rubble, concrete, bricks, etc., (potential for asbestos contamination);
- Presence of groundwater heavy metal and nutrient impact in all bores;

- Presence of groundwater faecal coliform impact in Bore 109, possibly associated with effluent irrigation;
- Presence of surface water heavy metal and nutrient impact at all surface water sampling locations; and
- Presence of surface water faecal coliform impact at SW201, SW202, SW203, SW205, SW210 and SW211, possibly associated with effluent irrigation.

The available results of previous and current contamination assessments have been collated by GHD and are presented in the GHD Contamination Drawings contained within the Contamination Assessment in Appendix J. Sample locations undertaken by ERM in 2010 are identified within Figure 28.

Site Disturbance

Excavations on site are expected to include:

- Proposed Basins 1 to 3;
- Proposed cess drains;
- Site preparation for proposed access roads and associated culverts; and
- Temporary trench excavations for buried services.

Based on the shallow groundwater levels at site it is anticipated that most excavations will intersect groundwater (refer to GHD Areas of Disturbance Plan in Appendix E of the Preliminary Contamination Assessment in Appendix J). Temporary dewatering may be required to allow construction activities, especially of the access road, culvert and buried service excavations. For the proposed cess drains and detention ponds it may be possible to excavate these without dewatering.

The results of the preliminary contamination assessment have identified soil, groundwater and surface water impacts that will require management due to disturbance (i.e. excavation / dewatering) associated with the development of the TSF.

Soil Contamination

The results of site investigations generally indicated the absence of gross soil contamination associated with the proposed TSF. Soil exceedences were generally associated with non-volatile medium to heavy chain hydrocarbons. Due to the non-volatile nature of the of the localised impacts observed within fill materials during the site investigations it is unlikely that significant odours will be generated if such materials are excavated or disturbed during TSF development.

Based on the site observations and historical information, the potential for widespread soil contamination within the TSF development area is considered to be low.

Minor bonded asbestos containing materials (ACM) were observed in the immediate vicinity of former site buildings (i.e. control cabin). Potential ACM may also be present in localised dumbed piles of filling containing building rubble. The occurrence of asbestos containing materials within the proposed TSF footprint is therefore not likely to be widespread.

Groundwater/Surface Water Contamination

It is noted that the results generally indicate the absence of gross contamination within the soil, groundwater and surface water samples tested. Elevated levels of nutrients and faecal coliforms were encountered in groundwater and surface water samples taken at the site. Based on field observation and laboratory testing, it is considered that the elevated nutrient and faecal coliform concentrations may be attributed to the infiltration of irrigated treated effluent. Refer to the Preliminary Contamination Assessment in Appendix J for additional detail.

In addition, slightly elevated levels of heavy metal contamination were encountered in groundwater and surface water samples taken at the site. Based on field observations and laboratory testing in soils, no apparent impact was observed on the site to suggest gross heavy metal contamination within soils. It is therefore possible that that the slightly elevated heavy metal concentrations in groundwater and surface water are consistent with regional groundwater and surface water quality.

Site observations and measurements indicated that the groundwater flow direction is towards the west of the site towards Hexham Nature Reserve, to the east of the site towards the Hunter River, and to the north towards to unlined drainage channels in the northern portion of the site. Surface water drains in the northern portion of the site flow towards two shallow drainage channels that flow to Purgatory Creek then the Hunter River. A drainage channel around the perimeter of the coal tailings stockpile in the central portion of the site drains in a westerly direction towards Hexham Nature Reserve.

9.9.2 Impact Assessment

Based on the above field and analytical observations, it is considered that there is a potential for offsite migration of groundwater and surface water containing elevated heavy metals, hydrocarbons, nutrients and faecal coliforms. Effluent irrigation activities at the site could be contributing to the impacts on waters at the site. It is understood that effluent irrigation is proposed to continue under Environmental Protection Licence (No 816) for the interim. Additional sampling and laboratory analysis would be required to confirm the source/type and significance of impacts and potential for offsite migration of waters from the site.

Subject to further investigation and appropriate remediation and validation works the site is likely to be suitable for proposed industrial development from a contamination perspective.

Excavations on site are detailed in Section 9.9.1. Excavations on the southern parts of the site will be predominately through existing filling which is typically granular and can be expected to be relatively permeable. Dewatering is likely to be achieved by a combination of sump and pump methods for localised excavations with spear point dewatering in some areas.

On the northern parts of the site excavations will be through the natural clay soils, which are generally of low permeability of these soils flow rates are expected to be relatively low if they are not under surface water.

Localised site remediation is likely to be required to remediate detected hydrocarbon contamination within the fill material in the southern portion of the site and fibro fragments containing asbestos in the former control cabin.

The remedial works likely to be required to render the site suitable for the proposed development includes:

- Localised excavation to remove hydrocarbon impacted soil associated with the former fuel tank (Pit 128) and former fuelling area (Bore 102 and Pit 128);
- Appropriate removal and validation of asbestos within the former control cabin, or on site management of asbestos impacted materials;
- Assessment and classification of numerous fill stockpiles (many of which were not assessed as part of the current assessment) and subsequent re-use or offsite disposal to landfill as required; and
- Preparation of management procedures to minimise impacts of contaminated groundwater/surface water on the proposed development.

9.9.3 Mitigation Measures

An integrated surface water and groundwater monitoring program would be undertaken to establish existing groundwater and surface water conditions at the site. The assessment would consider the potential source of impacts on waters, background quality, potential for offsite migration and significance of elevated contaminant concentrations in waters. Groundwater monitoring would utilise the existing wells, together with additional wells to improve the monitoring network.

Management procedures will be formulated to minimise the potential impacts of groundwater/surface water contamination on the proposed development during and following construction. Monitoring of discharge waters from both operation and construction in accordance with a Water Quality Management Plan discussed in Section 9.4.

Dewatering will be managed in accordance with the general procedures included in the Acid Sulphate Soil Management Plan (ASSMP) detailed in Section 9.10. In addition, site activities including dewatering should be conducted in accordance with the Water Quality Management Plan.

Contaminated soils will be managed in accordance with the ASSMP in Appendix I and the RAP which is contained within Appendix J following the PCA.

The following is recommended to address potential impacts in regard to contamination associated with the proposed TSF development:

- Adherence to the RAP for contaminated soils contained within Appendix J;
- Additional investigations to refine remediation requirements outlined within the RAP for the TSF development;
- Conduct localised remediation and validation of soils impacted by site development (i.e. areas subject to earthworks and ground disturbance); and
- Prepare a Water Quality Management Plan to manage surface water and groundwater contamination during and following TSF development. The WQMP would include the following:
  - Mitigation measures to protect human health and the environment;

- Procedures to minimise the risk of exposure to and potential for migration of impacted waters;
- An integrated surface water and groundwater monitoring strategy; and
- Contingency measures.

Management of soil, surface water and groundwater impacts will be incorporated with the CEMP for the TSF development. The CEMP will address potential impacts through soil and water management (i.e. contaminated soils and waters, acid sulphate soil management, dewatering and drainage, etc.). Measures to minimise exposure of impacted soils and waters will be implemented through staged development, monitoring and contingency procedures.

The development area is therefore considered to be suitable for construction of the TSF, subject to appropriate soil remediation and surface water and groundwater management during and following construction.

9.9.4 Conclusion

The PCA identified soil, surface water and groundwater impacts that will require management to facilitate the development of the TSF.

Management of soil, surface water and groundwater impacts will be incorporated with the CEMP for the TSF development. The CEMP will address potential impacts through soil and water management. Measures to minimise exposure of impacted soils and waters will be implemented through staged development through, monitoring and contingency procedures.

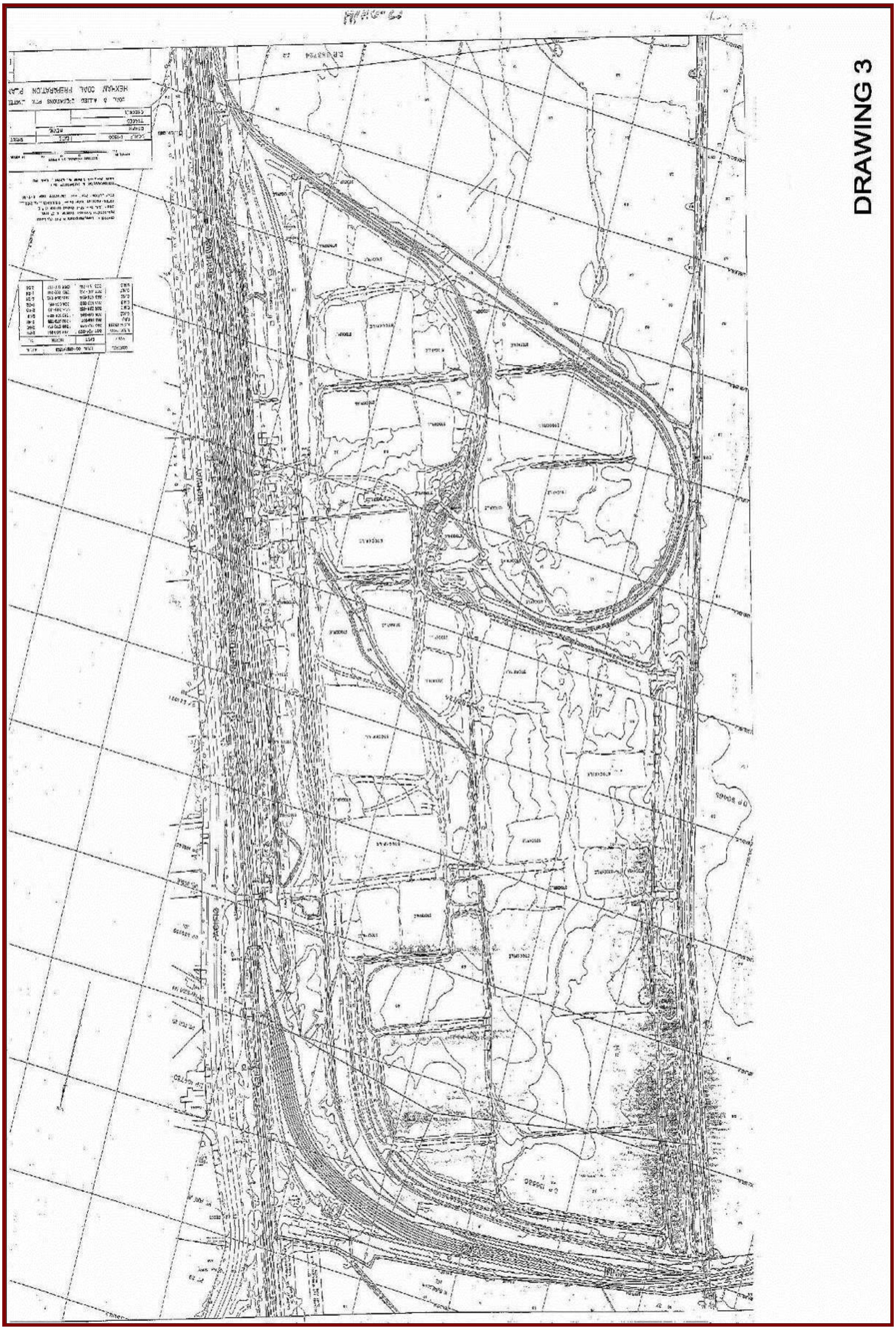

Figure 27: Former Coal Preparation Plant.

Figure 28: Sample Location Map.

9.10 ACID SULPHATE SOILS

An ASSMP of the proposed TSF site was carried out by Douglas Partners and is contained in Appendix I of this EA.

9.10.1 Existing Environment

The TSF site is underlain by quaternary alluvium consisting of unconsolidated sediments deposited in a fluvial or estuarine environment which includes gravel, sand, silt and clay. Groundwater levels typically vary between 0-2m below ground level throughout the site.

The Department of Land and Water Conservations 1:25,000 scale "Acid Sulphate Soil Risk Map for Beresfield" (sheet 9232 N3), indicates a uniform probability of acid sulphate across the site. Douglas Partners investigation of the eastern portion of the site has confirmed the presence of PASS within natural soils. With the exception of the coal reject stockpile, Douglas Partners conclude from the before mentioned maps that the natural subsurface conditions are likely to be across the site and thus PASS will affect the whole site.

9.10.2 Impact Assessment

Acid sulphate screening tests have been conducted with the use of 37 bore/test pits within a 2.5km^2 section of the eastern portion of the site. Acid sulphate screening tests on the samples were then completed by ALS Environment Pty Ltd (ALS). Test results have established that the Acid Sulphate Soils Advisory Management Committees (ASSMAC) action criteria for excavations above and below 1000 tonnes has been exceeded, confirming that PASS are present within the TSF site.

For construction purposes, the disturbance of soils through excavation and dewatering within natural soils (excluding fill) should be treated as having potential for oxidising PASS and thus must be managed under the ASSMP. Construction activities for the TSF for which the ASSMP will apply is water and sewer servicing, gas relocation and roads and stormwater drainage installations.

Summary of Acid Sulphate Soil Conditions

The acid sulphate screening results have been reproduced in Table 28 below. The results of the acid sulphate soil assessment generally indicated the presence of PASS conditions within natural soils.

Table 28: Acid Sulphate Soils Screening Tests

Bore / Test Pit	Sample Depth (m)	Sample RL (mAHD)	Sample Description	Screening Test Results			
				pH			Strength of Reaction [b]
				pH_F	pH_{FOX}	pH_F - pH_{FOX}	
14	2.4	-0.9	Silty Sand – grey	7.2	2.6	4.6	3FH
14	2.9	-1.4	Silty Sand – grey	7.4	5.2	2.2	1
16	2.3	0.0	Silty Clay – grey / brown	7.3	6.1	1.2	1-2
16	2.8	-0.5	Sandy Silty Clay – grey	7.6	6.5	1.1	1
16	3.0-3.45	-0.7 to -1.1	Sandy Silty Clay – grey	7.6	2.3	5.3	1-2
21	0.5-0.95	0.6 to 1.0	Silty Clay – grey brown	7.4	6.2	1.2	1-2
21	1.5-1.95	0.0 to -0.4	Silty Clay – grey brown	7.6	6.9	0.7	1
21	2.4	-0.9	Sandy Silt – grey	7.5	6.9	0.6	1
21	3.0-3.45	-1.5 to -1.9	Clayey Sand – grey	7.6	6.2	1.4	1
22	0.4	0.3	Silty Clay – grey	6.8	5.9	0.9	1H
22	0.9	-0.2	Silty Clay – grey	6.8	6.7	0.1	1H
22	1.4	-0.7	Clayey Silty Sand – grey mottled orange	7.0	6.8	0.2	1
22	1.7	-1.0	Clayey Silty Sand – grey mottled orange	7.1	6.9	0.2	1
22	2.4	-1.7	Clayey Silty Sand – grey mottled orange	7.1	6.9	0.2	1
23	0.7	0.4	Silty Clay – grey	7.4	6.6	0.8	1H
23	0.9	0.2	Silty Clay – grey	7.2	6.6	0.6	1H
23	1.2	-0.1	Clayey Silty Sand – grey	7.1	7.0	0.1	1H
24	0.4	3.1	Silty Clay – grey brown	7.3	6.0	1.3	1
24	0.7	2.8	Silty Sand – grey	6.7	6.3	0.4	1
24	0.9	2.6	Silty Sand – grey	6.7	6.2	0.5	1
24	1.6	1.8	Silty Sand – grey	6.5	5.5	1.0	1
25	0.8-0.95	0.4 to 0.5	Silty Sand - grey	8.4	7.2	1.2	1
25	1.4	-0.1	Silty Sand - brown	8.0	7.5	0.5	1
25	1.5-1.95	-0.2 to -0.6	Silty Sand - brown	8.0	6.4	1.6	1
25	2.4	-1.1	Silty Sand – brown (shells)	8.5	6.9	1.6	1-2
25	3.9	-2.6	Silty Sand - brown	8.3	6.3	2.0	1-2
27	1.5-1.95	0.3 to -0.2	Silty Clay - grey	8.1	5.5	2.6	1
27	2.4	-0.6	Clayey Silty Sand -grey	8.1	6.3	1.7	1
27	2.9	-1.1	Clayey Silty Sand -grey	8.0	6.0	2.0	1-2
27	3.0-3.45	-1.2 to -1.7	Clayey Silty Sand - grey	8.2	7.2	1.0	1-2
28	3.3	-0.3	Silty Clay - grey	7.8	3.9	3.9	1-2
28	4.5-4.95	-1.5 to -1.9	Sandy Silt - grey	7.6	5.6	2.0	1-2
30	0.4	1.4	Sandy Clay - brown	5.9	4.4	1.5	2
30	0.5-0.95	0.8 to 1.3	Sandy Clay -brown	6.3	6.3	0.0	1-2
30	1.4	0.4	Clay -grey	7.2	6.6	0.6	1-2
30	1.5-1.95	0.3 to -0.2	Clay -grey	7.1	6.5	0.6	1

Bore / Test Pit	Sample Depth (m)	Sample RL (mAHD)	Sample Description	Screening Test Results			
				pH			Strength of Reaction [b]
				pH_F	pH_{FOX}	pH_F - pH_{FOX}	
30	2.4	-0.6	Silty Sand – grey mottled orange	7.0	6.6	0.4	1
30	3.0-3.45	-1.2 to -1.7	Clayey Silt – grey (shells)	7.7	2.4	5.3	1-2
30	4.5-4.95	-2.7 to -3.2	Clayey Silt – grey (shells)	7.5	2.6	4.9	4HF
31	1.3	0.0	Silty Clay – grey mottled orange	7.4	6.1	1.3	1H
31	1.5	-0.2	Silty Clay – grey mottled orange	7.0	6.9	0.1	1H
31	1.8	-0.5	Silty Clay – grey mottled orange	7.7	7.6	0.1	1H
34	1.3	-0.7	Silty Clay - grey	7.2	6.4	0.8	1
34	1.4-1.95	-0.8 to -1.35	Silty Clay - grey	7.1	6.5	0.6	1
34	2.4	-1.8	Silty Clay - grey	7.0	6.1	0.9	1
34	3.0-3.45	-2.4 to -2.8	Silty Clay - grey	7.2	4.5	2.7	1
36	0.4	0.8	Silty Sand - brown	6.9	5.4	1.5	1-2
36	0.5-0.95	0.3 to 0.7	Sandy Clay -brown	7.6	7.6	0.0	1
36	1.4	-0.2	Sand -brown	8.0	7.8	0.2	1
36	1.5-1.95	-0.3 to -0.7	Sand -brown	8.1	7.8	0.3	1
36	2.5	-1.3	Silty Sand - grey	8.1	6.6	1.5	1
36	3.0-3.45	-1.8 to -2.2	Silty Sand - grey	8.1	4.8	3.3	1-2
36	4.0	-2.8	Silty Sand - grey	8.2	6.8	1.4	1-2
37	1.4	-0.1	Clay -grey	7.3	5.2	2.1	1
37	2.4	-1.1	Clayey Silt -grey	7.3	2.9	4.4	1
Guideline			Sands to Loamy Sands Sandy Loams to Light Clays Medium to Heavy Clays and Silty Clays	<4[c]	<3.5[d]	>1[d]	-

Notes:

[a] Depth below ground surface
[b] Strength of Reaction
1 denotes no or slight reaction
2 denotes moderate reaction
3 denotes high reaction
4 denotes very vigorous reaction
F denotes bubbling/frothy reaction indicative of organics
H denotes heat generated
[c] For actual Acid Sulphate soils (ASS)
[d] Indicative value only for PASS
Shaded results indicate potential for acid generation upon oxidation (i.e. PASS)

Detailed laboratory testing for TPA, TAA and Chromium Reducible Sulphur content was undertaken on five selected soil samples and results are presented in Table 29 below.

Table 29: Detailed Acid Sulphate Soil Laboratory Testing

Bore / Test Pit	Sample Depth [a] (m)	Sample RL (mAHD)	Sample Description	Laboratory Results			
				pH_{KCL}	Scr %S	TAA (mole H+/t)	TAA (mole H+/t)
14	2.4	-0.9	Silty Sand - grey	5.6	0.65	6	359
16	3.0-3.45	-0.7 to -1.1	Sandy Silty Clay -grey	6.8	0.08	<2	388
27	1.5-1.95	0.3 to -0.2	Silty Clay - grey	5.5	<0.02	21	184
28	3.3	-0.3	Silty Clay - grey	5.9	<0.02	4	<2
30	0.4	1.4	Sandy Clay - brown	5.4	0.04	16	230
Guideline			Sands to Loamy Sands	-	0.03	18	18
			Sandy Loams to Light Clays		0.06[b]/0.03[c]	36[b]/18[c]	36[b]/18[c]
			Medium to Heavy Cays and Silty		0.1[b]/0.03[c]	62[b]/18[c]	62[b]/18[c]

Notes:

[a] Depth below ground surface

[b] ASSMAC Action Criteria for disturbance of 1-1000 tonnes of material

[c] ASSMAC Action Criteria for disturbance of more than 1000 tonnes of material

Shaded results indicate an exceedence of ASSMAC action criteria for 1-1000 tonnes of ASS soil.

The result of the chromium reducible sulphur testing and TPA testing for samples 14/2.4m, 16/3.0-3.45m, 27/1.5-1.95m and 30/0.4m exceed the ASSMAC action criteria (Ref 2) for excavations above and below 1000 tonnes. The results of detailed laboratory analysis therefore confirm that PASS are present within the site.

For construction purposes, disturbance of soils (either by excavation or dewatering) within natural soils (i.e. excluding filling) should be treated as PASS and managed under the guidance of the ASSMP contained within Appendix I.

The preliminary geotechnical investigation contained within Appendix H found subsurface conditions generally comprised filling (typically coarse coal reject and intermixed sand and clays) up to 2 metres depth in the southern portion of the investigation area, overlying alluvial clays, overlying sands, overlying residual clays at depth.

Groundwater levels typically varied between about 0 - 2 metres below ground level. Due to frequent irrigation over the northern portion of the site, combined with flooding, perched water levels within fill and the ground surface may have been present. Additional detail relating to groundwater is contained within the Preliminary Contamination Report, Appendix J,

Groundwater levels measured during the preliminary contamination assessment varied between about 0.3m to 2.6m below ground level (RL 0.2 AHD to 2.9 AHD). It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

9.10.3 Mitigation Measures

The ASSMP outlines management strategies to be implemented for implementation to address PASS which include:

- Soil Treatment – Neutralisation of PASS should be undertaken in accordance with the ASSMAC guidelines;
- Neutralising Leachate - Leachate water collected from the bunded area (in a multi stage sedimentation tank, if required) should be neutralised as necessary before release; and
- Dewatering – A specific dewatering procedure is recommended in order to minimise potential adverse impacts resulting from excavation and dewatering of acid sulphate soils during construction.

A more comprehensive outline of the management strategies is contained within the ASSMP within Appendix I. The key elements of the management measures are presented below as mitigation measures:

- Excavated soils and leachate containing acid sulphate will be appropriately stored within a bunded area with an impermeable base. The spoil and leachate will be appropriately treated prior to authorised disposal according to the acceptance criteria outlined in ASSMP and regulatory requirements. Water produced from excavation will be similarly stored in multi-stage sediment tanks with treatment to regulatory requirements and acceptance criteria before disposal. No excessive amounts of PASS will be disturbed to minimise impact of required dewatering and excavation;
- Stockpiled soil will initially be limed at an average rate of 37kg/m^3 of soil (27kg lime/tonne of soil) for neutralisation as soon as practicably possible;
- Acid sulphate produced from excavated soil and dewatering will be appropriately managed in accordance with the ASSMAC guidelines. Excavated soil, dewatering and leachate will all be treated with suitable neutralising agents of acid sulphate. Treatment agents include agricultural lime ($CaCO_3$), calcined magnesia (MgO or $Mg(OH)_2$) and dolomite ($MgCO_3.CaCO_3$);
- Continuous monitoring of soils, water and leachate will be conducted throughout construction, thus levels and frequency of dosing will be altered accordingly to requirements;
- Records of the treatment of acid sulphate soils on site will be maintained by the contractor with necessary detailed information. A record of contingency measures and additional treatment used shall also be undertaken. A final report upon completion of works will present the monitoring regime and results to confirm that no adverse environmental impact has occurred during construction;
- The contingency plan involves remedial action if the agreed standards or acceptance criteria have not been achieved. Remedial action involves increased lime dosing to treat acid sulphate as well as mitigation actions during rainfall events affecting acid sulphate

soils. Sufficient lime will be stored during construction for the neutralisation of acid sulphate soils and contingency methods; and

- The ASSMP will be adopted directly into the CEMP for the TSF applying to excavation activities.

9.10.4 Conclusion

The ASSMP has identified acid sulphate soils within the TSF site. Analysis has been provided of the acid sulphate soils and appropriate mitigation necessary for excavation activities during construction. This plan will be adopted directly into the CEMP for the TSF applying to excavation activities.

9.11 INFRASTRUCTURE & SERVICES

A servicing report has been prepared by WorleyParsons and is contained in Appendix M. Existing and proposed utilities and protection is described within Section 6.4.4 of this EA and identified within Figure 11.

9.11.1 Existing Environment

Worley Parsons has completed searches of existing service availability surrounding the site. Contact has been made with authorities for preliminary advice on the servicing of the TSF and relocating or protecting utility services over or adjacent to the TSF.

Notable existing infrastructure through the site are transmission lines with steel towers east-west across the northern portion of the site, 33kV sub transmission lines adjacent to Tarro Interchange 33kV and 11kV poles down Woodlands Close, the DN900 Chichester Trunk Gravity Main – water main north south along the western edge of the site and DN500 high pressure gas main.

A description of existing and proposed services and utilities is described below and a detailed description of services and utilities is contained within Section 6.4 of this EA.

9.11.2 Impact Assessment

Water Services

Existing - HWC has recently upgraded their DN900 CTGM to be underground and realigned it parallel to the Western and Southern boundaries of the development site. It has been assumed that the existing DN200 water main has been connected to the new below ground CTGM and this will be confirmed in service requirements advice from HWC.

Proposed - The total average daily demand for the TSF is 2.6kL/day for the initial build up and an ultimate demand of 7.4kL/Day. Preliminary investigations into the capacity of the existing DN200 water main indicate that the TSF demand could be sufficiently supplied without an upgrade. However due to filling works across the site, part of the water main may need to be re-laid to reduce the pipe depth for maintenance. A loop DN150 reticulation water main will service the TSF and provide necessary access for fire fighting. The reticulation main will be located outside road and rail routes.

Relocation/protection of the water supply to Brancourts treatment plant may be required and has been included in this EA. Works crossing or improving Hunter Water easements and access will be confirmed with Hunter Water.

Wastewater Services

Existing - There is currently no HWC wastewater network system nearby in the area available for connection. There is an existing on site effluent disposal operated by Brancourts including a treatment plant and irrigation areas leased from QR National.

Proposed – There are two on site wastewater systems proposed for the TSF. The first wastewater system is for sewage, requiring reticulation, pump station(s), a package treatment plant and an irrigation area for onsite effluent disposal. The effluent disposal is discussed further in Section 9.5 of this EA. Buffer storage for 60 day capacity is maintained on site for extended wet weather or any time when disposal cannot be to the irrigation area. The water level would be monitored and can be tankered for orderly disposal in the HWC network system. Consent authority for this system will be NCC under Section 68 of the Local Government Act.

The second wastewater treatment stream is dedicated to wash down water recycling. In order to recycle the water for use, there will be an oil/grease trap, gross pollutant trap, pH adjustment, pump station and reuse header tank. Initial wash down water allowance is 7.5KL/week for locomotives, subject to recycling. Building roof water is also being captured in rainwater tanks for this system. Waste stream of non-useable wash down water blown down to the sewer system is estimated to be approximately 125L/day, increasing to 250L/day.

The consent authority for this system will be NCC subject to Section 68 of the Local Government Act. It is likely that the OEH may also take a concurrent approval role in the recycling system. Both treatment systems will be owned and managed by QR National.

The proposed effluent irrigation areas, as described above, will be constructed and commissioned following construction of the TSF. Up until this stage the area is proposed to be utilised for stockpiling.

Telecommunications Services

Telstra, Optus and Nextgen telecommunications networks are located within Woodlands Close with Telstra being the relevant telecommunications authority responsible for the proposed development. According to the Telstra's preliminary servicing advice, the size and scale of the network upgrade would be dependent upon amount of services required. The network upgrade would likely involve an underbore of the existing railway.

Correspondence has commenced with Optus on relocation/protection as a result of the access road crossing existing Optus infrastructure near the Tarro Interchange.

Gas Services

The relocation/protection of the gas main is necessary for the construction of the TSF. Correspondence has commenced with the authorities. The EA covers the relocation/protection of the gas main. Jemena's preliminary servicing has also advised that natural gas is available and could be extended for TSF use.

Electrical Services

Power Solutions Pty Ltd has carried out a preliminary estimate of electrical demand based upon the loading of a similar facility. The major areas and items that require electrical supply at the TSF include:

- Office and amenities;
- Locomotive wash area;
- Wagon maintenance building;
- Locomotive maintenance building;
- Provisioning building;
- Turntable;
- Wheel lathe; and
- Yard lighting.

Due to the intermittent nature of the power usage of much of the equipment at the TSF, the diversity factor is expected to be quite low. Based on the above, the estimated maximum electrical load is estimated to be in the vicinity of 500kVA. This load will require the installation of a dedicated kiosk substation with the installation of at least two connection points from Ausgrid's existing 11kV network providing a ring feed. This provides all of the TSF's power needs while the ring feed allows maintenance to be undertaken without disruption.

The initial connection point for the TSF is expected to be the 11kV underground line to the North of the development which currently supplies an industrial wastewater treatment plant. The second connection point will be an existing overhead 11KV line on the Eastern side of the highway creating the ring feed. This connection is likely to require underboring of the Great North Rail Line and Maitland Road (Pacific Highway).

As outlined previously there are substantial existing electrical assets on site including transmission lines, steel towers and Ausgrid 33kV/11kV affecting the site. Relocation of the 33kV Transgrid overhead services adjacent to Tarro Interchange is required for the access road connection. Correspondence is ongoing with Ausgrid on temporary relocation or realignment provisions and permanent realignment. Furthermore there is potential for the 33kV/11kV to be realigned down Woodlands Close. This EA includes the relocation as required.

A visual representation of the services and utilities described above is contained within Figure 11.

9.11.3 Mitigation Measures

- Provide water servicing of the TSF through approvals from HWC;
- Provide an onsite effluent disposal system. Consent authority for this system will be NCC under Section 68 of the Local Government Act;
- Provide a recycled wastewater system for wash down of locomotives. Approval authority for this system will be NCC under Section 68 of the Local Government Act and potentially OEH;
- Provide electrical servicing of the TSF through approvals from Ausgrid;
- Extend telecommunications to service the TSF through approvals from Telstra; and

- Relocation or protection of gas, water, electrical transmission, tele-communication and easement requirements with the relevant authorities.

9.11.4 Conclusion

This services investigation report has identified potential connection to existing water, telecommunications and gas services and conventional wastewater system with onsite effluent disposal can be achieved to service the TSF. Additionally a dedicated recycling system is included to wash down locomotives prior to maintenance. It has been identified that as part of the TSF, relocation/protection of services is required and negotiations have commenced with the relevant authorities. The ARTC HRR Project will not have any impact on water or wastewater servicing for the TSF.

9.12 ABORIGINAL ARCHAEOLOGY

McCardle Cultural Heritage Pty Ltd has been engaged by QR National to carry out a Heritage Impact Assessment of the proposed development. A copy of the report is included at Appendix K. As part of this assessment, consideration has been given to the report prepared by AMBS in 2012, in relation to the adjoining relief road project being undertaken by ARTC.

9.12.1 Existing Environment

A search of the OEH AHIMS register has shown that 93 known Aboriginal sites are currently recorded within a ten kilometre radius of the study area. The recorded sites include 51 open camps, 25 artefact sites, six isolated finds, three grinding grooves, three artefact/PADs, three PADs, one scarred tree and one artefact/PAD/grinding groove site. The location of the sites within the context of the study area are identified within Figure 29.

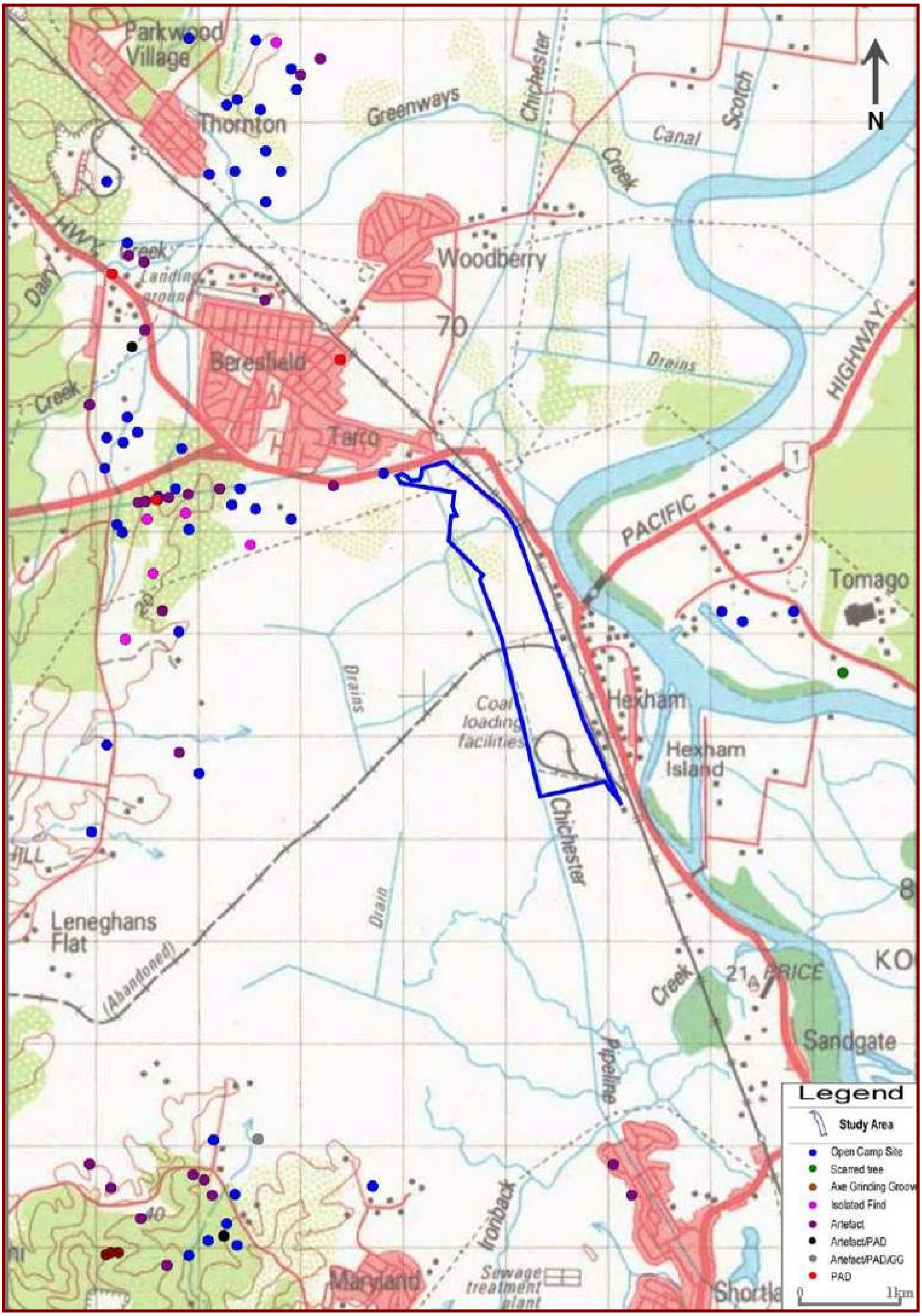

Figure 29: Local Sites Identified from OEH AHIMS Register.

A detailed site survey was carried out by McCardle Cultural Heritage Pty Ltd together with the registered Aboriginal Groups and traditional owners on 9 February 2011. Registered Aboriginal Group representatives that attended the survey were:

- Kerrie Brauer - Awabakal Traditional Owners Aboriginal Corporation; and
- Shane Frost and James Frost – Awabakal Descendants Traditional Owners Aboriginal Corporation.

During the survey, the Aboriginal representatives were also asked of their traditional knowledge and of any areas of cultural significance within the study area and if they felt comfortable in sharing that information. Discussions centred on places associated with ceremonial, spiritual, mythological beliefs, traditions and known sites that date from the precontact period. Sites or places with historical associations and/or significance which date from the post-contact period and that are remembered by people today (e.g. plant and animal resource use areas, known camp sites) were discussed as well as sites or places of contemporary significance (apart from the above) which has acquired significance recently. The Aboriginal stakeholder field representatives made general statements regarding the cultural significance of the Hexham Swamp area to the Awabakal people.

No sites were identified during the survey. This may be due to a number of reasons including poor visibility, disturbances and the low lying flood prone landform that may not have been suitable for continued occupation. While the study area may have been utilised for hunting and gathering, resulting in reduced evidence of occupation, the previous land use in the northern portion would have disturbed that evidence. The disturbances in the southern section would have destroyed any such evidence.

A site was identified by AMBS (HS1) as part of their work in relation to the adjoining ARTC HRR Project, however, this was not identified during a second site visit by MCH. Notwithstanding, this the assessment has assumed that the Site is present. The Site HS1 is identified in Figure 30.

The inferences that can be made about the nature of occupation within the investigation area and the specific sites identified area are limited by the small sample size. However, consistent with the Hunter Valley occupation model (Kuskie and Kamminga 2000), it is inferred from the evidence that:

- Aboriginal people used and occupied the area but generally at a very low intensity within the last 4,000 years. Although occupation of the region extends back to at least 20,000 years ago, the environmental context would have been very different to the present over such an extended period of time;
- Most of the artefact evidence is consistent with transitory movement through the landscape and occasional and short-duration visits by small parties of hunters and/or gatherers for food procurement;
- These activities appear to have occurred more frequently on swamp margins rather that the swamp itself; and
- Evidence is identified as a result of disturbances and exposures.

Notwithstanding the points above, the generally very low density of artefacts within the investigation area and the topography of the area (low lying swamp land) indicates that in the broader locality focused occupation was more likely to have occurred outside of the direct investigation area in association with those such contexts where more preferential circumstances existed for water, level ground and subsistence resources (such as swamp margins).

The survey results are consistent with, or do not contradict the general model of occupation.

In view of the survey results, the predictive model of site location can be reassessed for the investigation area.

The potential for bora/ceremonial, carved tree, scarred tree, rock engraving and stone arrangement sites to occur within the investigation remains assessed as very low or negligible.

No direct evidence of lithic procurement sites was identified, however the potential for casual, opportunistic procurement of stone, such as quartz, from colluvial gravels within the investigation area cannot be discounted.

No evidence was encountered of burial sites, and although the potential for skeletal remains to occur within the investigation area is considered to be very low, it cannot be discounted.

Sites of traditional cultural significance (such as mythological sites) were not identified by the Aboriginal stakeholders or stakeholder representatives involved in the investigation. The registered Aboriginal stakeholders also did not disclose any specific knowledge of other cultural values/places (for example, historically known places or resource use areas). However, the possibility cannot be excluded that traditional or historical Aboriginal values or associations may exist that were not divulged to McCardle Cultural Heritage by the persons consulted, although this potential is assessed as low.

One artefact scatter was previously identified within the northern portion of the investigation area. There remains a low to moderate potential for additional open artefact evidence to occur in the areas currently obscured by vegetation (swamp/flats to the north), and such evidence is likely to occur in a low density. The artefact evidence may involve a broad range of artefact and stone types. Environmental contexts in which a higher artefact density and potentially deposits of research significance may occur, in association with more focused and/or repeated Aboriginal occupation, are largely absent from the investigation area.

Site location, in relation to landforms and proximity to reliable water is also supported by the evidence.

Significance Assessment

One of the key steps in the process of cultural heritage management is the assessment of significance. Not all sites are equally significant and not all are worthy of equal consideration and management (Sullivan and Bowdler 1984; Pearson and Sullivan 1995: 7). The determination of significance can be a difficult process as the social and scientific context within which these decisions are made is subject to change (Sullivan and Bowdler 1984). This does not lessen the value of the heritage approach, but enriches both the process and the long-term outcomes for future generations as the reasons for, and objectives of, site conservation also change over time.

The significance of indigenous archaeological sites or cultural places can be assessed on the criteria of the Burra Charter, the Australian Heritage Commission Criteria of the National Estate, and the OEH guidelines that are derived from the former two. The NSW NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit (1997) emphasises two realms of significance assessment:

- Aboriginal cultural significance; and
- Archaeological (scientific) significance.

Scientific significance is assessed according to the contents of a site, state of preservation, integrity of deposits, representativeness/rarity of the site type, and potential to answer research questions on past human behaviour (NPWS 1997). The following extract from the McCardle report identifies the determined scientific significance.

Table 30: Identifying the Assessed Scientific Significance

Site	Site Type	Representative	Integrity	Res. Pot	Sci. Sig
PCD	PCD	Unknown	Fair	Unknown	Unknown
HS1 (surface site)	Artefact Scatter	Unknown (may be part of fill)	Poor	Low / Moderate	Low / Moderate
HS1 (PAD)	PAD	Unknown	Unknown	Unknown	Unknown

The PCD and site HS1 are identified in Figure 30 below. Also identified in Figure 30 are the 'cultural sites'. These cultural sites were identified by the registered Aboriginal stakeholders during the AMBS assessment in the far south of the study area. AMBS stated they were not archaeological sites but culturally identified by Aboriginal site officers and as such the site officers would submit a site card to OEH. These objects were not given a designated site name but for the purpose of clarification they have been named COHS/1 (Cultural Objects/Hexham Swamp/1).

While Aboriginal sites and places may have scientific significance, they also have cultural/social significance to the Aboriginal people from that area. Determining cultural/social significance can only be determined by the Aboriginal people from the area in which the sites and/or places were identified. Consultation with the Aboriginal stakeholders has been undertaken in order to document cultural/social significance, all registered stakeholders have stated the Hexham Swamp area is of very high cultural significance.

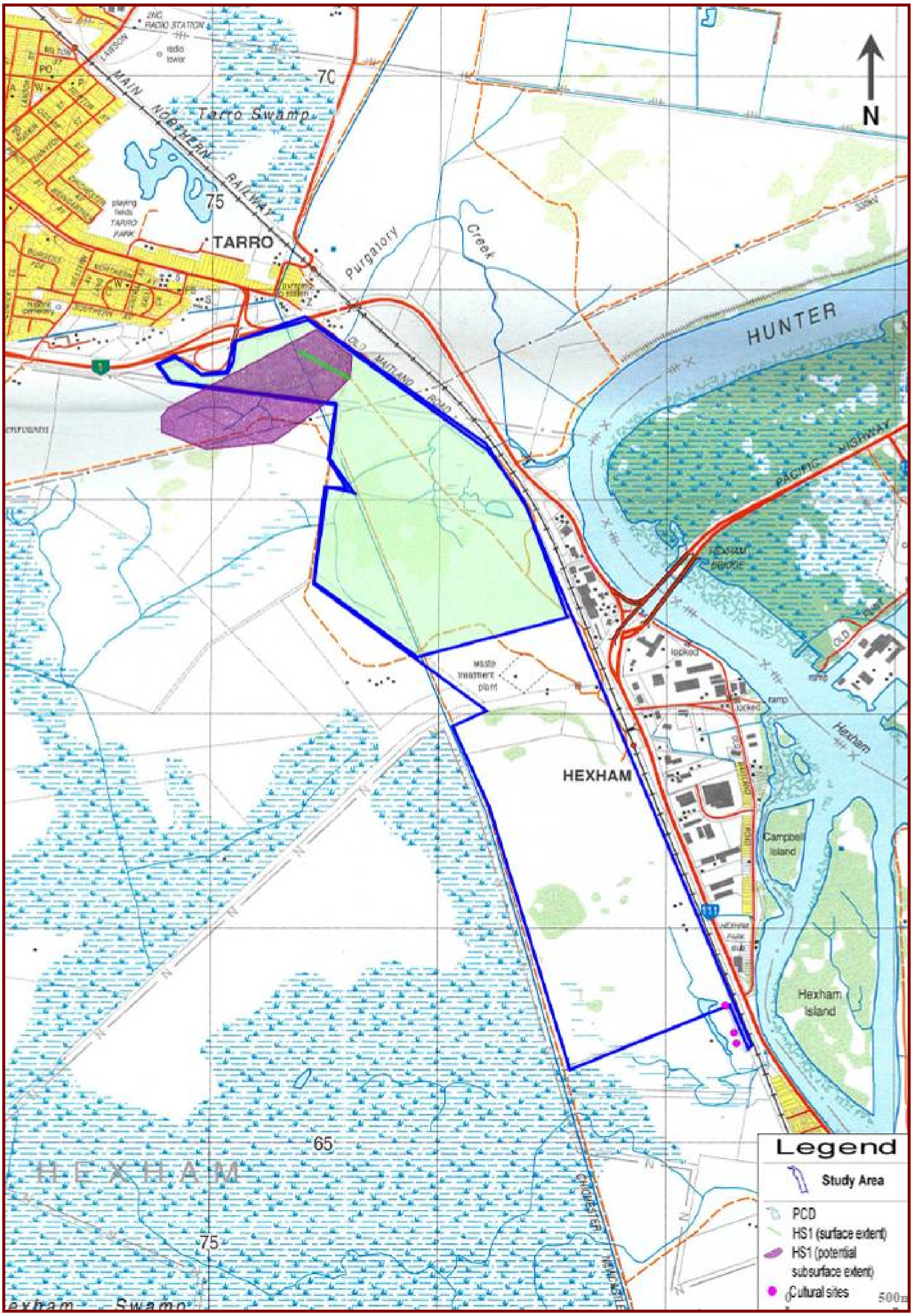

Figure 30: Location of PCD and Sites.

9.12.2 *Impact Assessment*

The PCD will be impacted through the construction of an access road and a section to the east will be impacted upon by the TSF footprint. A small portion of the PAD will be impacted by the access road but site HS1 (surface expression) will be completely avoided.

The OEH Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (2010:21) describes impacts to be rated as follows:

1. Type of harm: is either direct, indirect or none.
2. Degree of harm is defined as either total, partial or none.
3. Consequence of harm is defined as either total loss, partial loss, or no loss of value.

The following table identifies the assessed impact of the proposed development on the PCD and HS1.

Table 31: Assessed Impact of the Proposed Development on the PCD & HS1

Site	Site Type	Type Of Harm	Degree Of Harm	Consequence Of Harm	Representative	Integrity	Res. Pot	Sci. Sig
PCD	PCD	Direct	Partial	Partial Loss Of Value	Unknown	Unknown	Unknown	Unknown
HS1 (surfaces site)	Artefact scatter	None	None	No loss of value	Unknown (may be part of fill)	Poor	Low/ Mod	Low/ Mod
HS1 (PAD)	PAD	Direct	Partial	Partial Loss Of Value	Unknown	Unknown	Unknown	Unknown

9.12.3 *Mitigation Measures*

Specific management strategies are considered below for the management of identified sites and potential archaeological deposits (PAD) or potential cultural deposits (PCD) within the study area.

One of the most important considerations in selecting the most suitable and appropriate strategy is the recognition that Aboriginal cultural heritage is very important to the local Aboriginal stakeholders. Decisions about the management of sites and PAD should be made in consultation with the appropriate local Aboriginal stakeholders.

To summarise the findings of this assessment, the area with the least disturbances is the northern portion which is an identified PCD, site HS1 and HS1PAD are also within the PCD.

The project plans had been altered during this assessment to ensure the least impact on the cultural heritage. Based on the current plans and assessment the following has been determined:

- The surface expression of Site HS1will not be impacted on;
- The majority of the HS1/PAD will not be impacted on. The only portion to be impacted on will be the eastern section where the access road will be placed;
- The majority of the PCD will not be impacted on. The only portion that will be impacted on will be the where the access road will be placed; and
- The cultural site known as COHS/1 is not a registered archaeological site, however the Aboriginal stakeholders will be given the opportunity to collect the objects prior to works.

The following management strategies are discussed in relation to the project, the results of the assessment and discussions with the Aboriginal stakeholders.

Conservation/Protection

Conservation is the first avenue and is suitable for all sites, especially those considered of high archaeological significance and/or cultural significance. Conservation includes the processes of looking after an indigenous site or place so as to retain its cultural significance and are managed in a way that is consistent with the nature of peoples' attachment to them.

As the surface expression of Site HS1 will not be impacted on, this site will be temporarily fenced to ensure its protection during construction.

As the only portion of the HS1/PAD that will be impacted on will be the eastern section where the access road will be placed, the road construction foot print will be temporarily fenced to ensure its protection during construction.

As the only portion of the PCD that will be impacted on will be the access road, the road construction foot print will be temporarily fenced to ensure its protection during construction.

Such measures will ensure the temporary fencing will delineate the development footprint and prevent any access to the remaining areas, thus ensuring the protection of areas not impacted by the proposed development. COHS/1 is in a highly disturbed context and will be impacted on by the development and as such conservation is not justified.

Further Investigations

An Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NP&W Act 1974 is not required for Part 3A projects to undertake archaeological subsurface test excavations, provided the excavations are carried out in accordance with the Code of Practice and in consultation with the local Aboriginal stakeholders.

Subsurface testing is appropriate when a PAD has been identified, and it can be demonstrated that sub-surface Aboriginal objects with potential conservation value have a high probability of being present, and that the area cannot be substantially avoided by the proposed activity.

Subsurface testing can identify whether subsurface cultural deposits exist, their nature, extent, content, integrity and significance.

As a small part of HS1/PAD may be impacted on, further investigations are required prior to works (HS1 surface expression will not be impacted on and will be avoided). A PCD has also been identified in the northern portion of the study area. The majority of this PCD will be protected by fencing, and it will not be impacted by the project. However, the proposed access road has been planned within this area, and as such further investigations are required prior to works.

Archaeological test excavations will be undertaken as part of the Code of Practice's suggested due diligence approach, to confirm that no harm is caused to Aboriginal objects or places. It is anticipated that no impacts will occur at the surface expression of HS1 and as such it is considered that no further investigations are justified in this area. The registered Aboriginal stakeholders will be provided with the opportunity to collect the cultural objects COHS/1 prior to any works being undertaken.

AHIP

As this project is being assessed under Part 3A, an AHIP is not required for any objects that may be impacted. No impacts will occur at the surface expression of HS1 and as such no further investigations/salvage is justified.

Monitoring

An alternative strategy for areas where archaeological deposits are predicted to occur is was to monitor development works for cultural materials, predominantly during the initial earth moving and soil removal works. This was the main strategy for managing the possible occurrence of Aboriginal skeletal remains.

However, with the legislative changes, monitoring is not an option as if there is even a slight possibility of cultural materials being present this must be addressed through the due diligence process and Code of Practice.

Aboriginal Cultural Heritage Management Plan

QR National is committed to implementing a sustainable Aboriginal Cultural Heritage Management Plan (ACHMP) on site, to facilitate employees and contractors to protect any potential cultural and archaeological deposits on site from harm. The ACHMP will be developed cooperatively with the RAPs, the McCardle archaeologist and QR National.

This ACHMP will cover all activities during the construction and post construction phase of the project. The ongoing sustainable management of the cultural heritage values within the project study area will be the responsibility of QR National. The ACHMP will be an evolving document that will be continuously updated as appropriate at each stage of archaeological investigative works are carried out.

To ensure that all personnel involved in the project, from the initial planning stages through to development, construction and future use of the land, are aware of and implement the appropriate management actions for the protection of Aboriginal cultural heritage values, QR National proposes to prepare an induction program as part of the ACHMP.

The ACHMP will establish the broad framework for achieving sustainable protection of cultural heritage values within the constraints of the project. This section briefly outlines the issues that would be addressed by the ACHMP for the construction phase of the project. The ACHMP will be completed prior to the start of any geotechnical or earth works for the project. The ACHMP will address (but is not necessarily limited to) the following:

- An outline of the project, including archaeological works to date;
- Objectives and targets of the ACHMP;
- Consultation/communications protocol for communications between QR National and the RAPs. This will include ongoing consultation, future archaeological works, ACHMP and the care and control of any cultural materials uncovered. Regular meetings to ensure all parties have a clear understanding of what is feasible and to work constructively together to ensure the best outcomes for the cultural heritage values within the project study area;
- Works schedule that will enable archaeological works to be undertaken in a timely manner;
- Procedures for further investigations, including excavation, site recording, site types uncovered and mitigation options;
- Procedure in the event of unexpected archaeological and/or cultural finds during construction;
- Procedures for skeletal remains if uncovered during construction;
- Care and control agreement for any cultural materials uncovered;
- Artefacts and reporting requirements for all stakeholders including the archaeologist and registered Aboriginal stakeholder;
- Ongoing management of protected areas will include a protocol for the temporary fencing of the boundaries of areas that will be managed for cultural heritage conservation, to ensure that subcontractors do not inadvertently damage those areas and site(s) during the construction of the project. This component of the ACHMP will also examine permanent fencing if required; and
- Cultural heritage awareness training requirements for contractors involved in all earth works during all stages of the project development. Part of the site induction will include an induction on the cultural heritage of the study area. All personnel on site must be inducted and as such are made aware of the cultural heritage values across the study area. The induction package can be included in the EMP and/or ACHMP.

9.12.4 Conclusion

Detailed site investigation relative to the proposed development has identified a potential site HS1, a PCD and PAD in the northern part of the site. Much of the northern part of the site will not be impacted upon by the proposed development, and site HS1 (surface expression) will be completely avoided.

Subject to adoption of the mitigation measures as outlined above the impacts of the proposed development will be appropriately managed.

9.13 EUROPEAN HERITAGE

EJE Heritage has been commissioned by QR National to investigate European Heritage, determine the significance of any European Heritage and to prepare an assessment of the impact. A copy of their report is included in full at Appendix D.

9.13.1 Existing Environment

A detailed overview of the site history is contained in the report prepared by EJE and attached as Appendix D. The whole of the study area has a history of agricultural use and this continues today in respect to the northern part of the site, while the southern part of the site from 1850 has a history associated with the rail industry and coal storage, preparation and loading and unloading.

The following provides a general chronology since 1830.

1830's - The subject site was mostly used for agricultural and dairying purposes.

1850's - The site was first utilised for storage and loading of coal.

1857 - John Eales constructed a railway to carry coal from the Mines at Minmi to loading at Hexham.

1859 - JA Brown purchases the site and will become Australia's largest coal producer.

1927 - Part of the site becomes the headquarters for the Hunter Valley Co-Operative Dairy Company to become known as the Oak.

1930's - Coal preparation was commenced on site and this included the construction of a coal washery in 1955.

1955 - Oak Milk Bar was opened.

1987 - Last Coal delivery to the site and coal washery ceases operation.

1997 - Newcastle Rail Terminals purchased the site with plans to use the site to help alleviate coal transportation problems to the Port of Newcastle.

2001 - Investigations undertaken regarding the establishment of a coal terminal at the Hexham site.

2003 - Coal tailings site rezoned to 4(b) Port and Industry under Newcastle LEP 2003.

2005 - Investigations undertaken to determine if coal tailings could be used in power stations.

2006 - QR National purchases the site.

2006 - Project Approval of the Hexham Swamp Rehabilitation Project on adjacent lands to the south-west.

2007 - Minister for Planning gives notice of receipt of an application to Amend SEPP (Major Projects) 2005 to include the Hexham Redevelopment site as potential State Significant Site.

2008 - State Significant Site Study Requirements and DGRs were released for the Hexham Redevelopment.

2010 - Revised State Significant Site Study Requirements and DGRs were issued for the Hexham Redevelopment.

2011 - Coal tailings site rezoned to IN3 Heavy Industry under Newcastle LEP 2011.

2011 - ARTC submit a project application for the HRR Project.

Figure 31 identifies the rail line structure established by JA Brown, extending from mines through to the subject site. Figure 32 identifies the Brian Andrews, Coal, Railways & Mines.

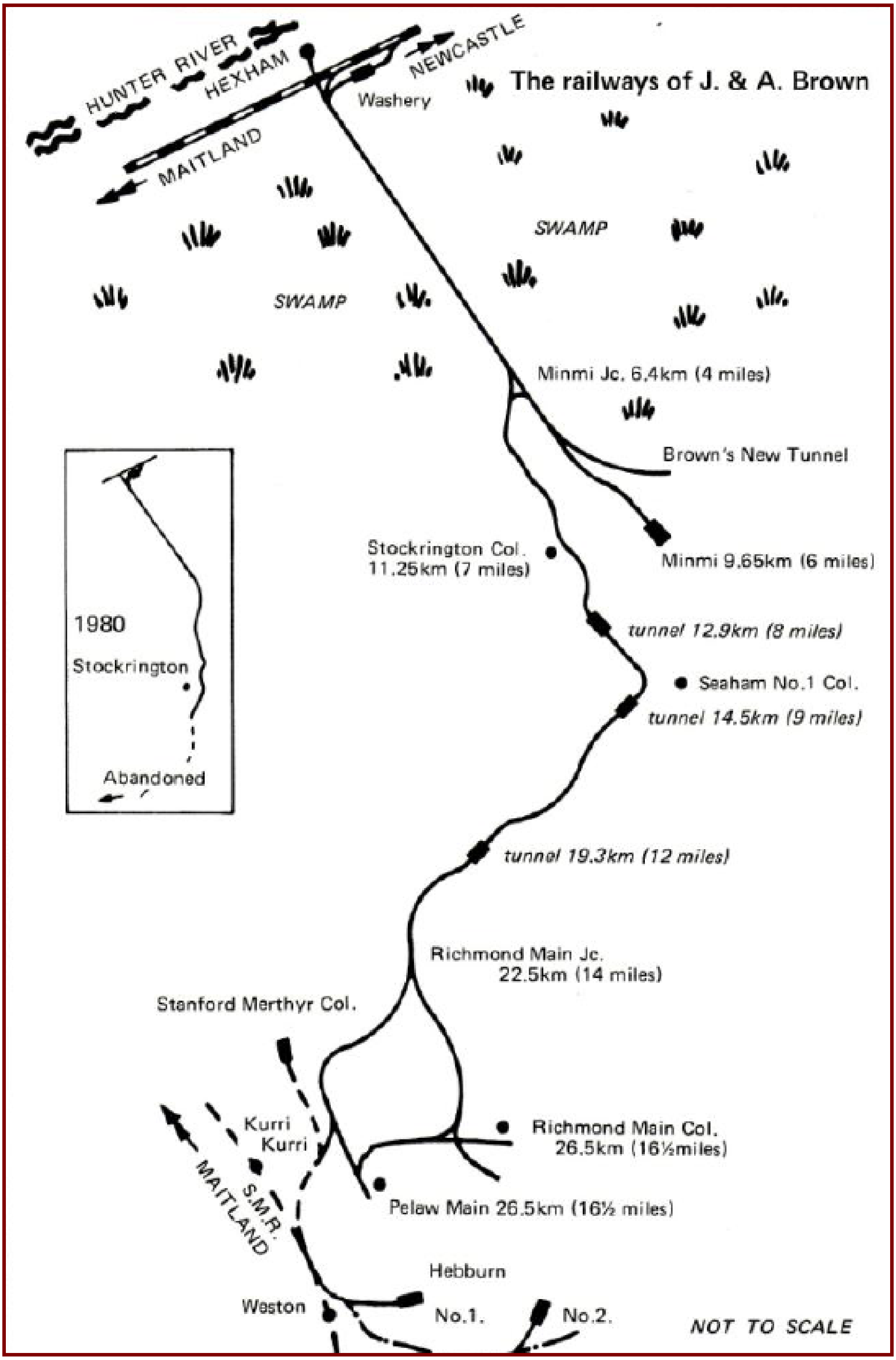

Figure 31: Railways of J. & A. Brown. K. Pearce, Coals to Hexham.

Various track layouts and structures occurred from the early days of site occupation and resulting in the following track layout in 1978:

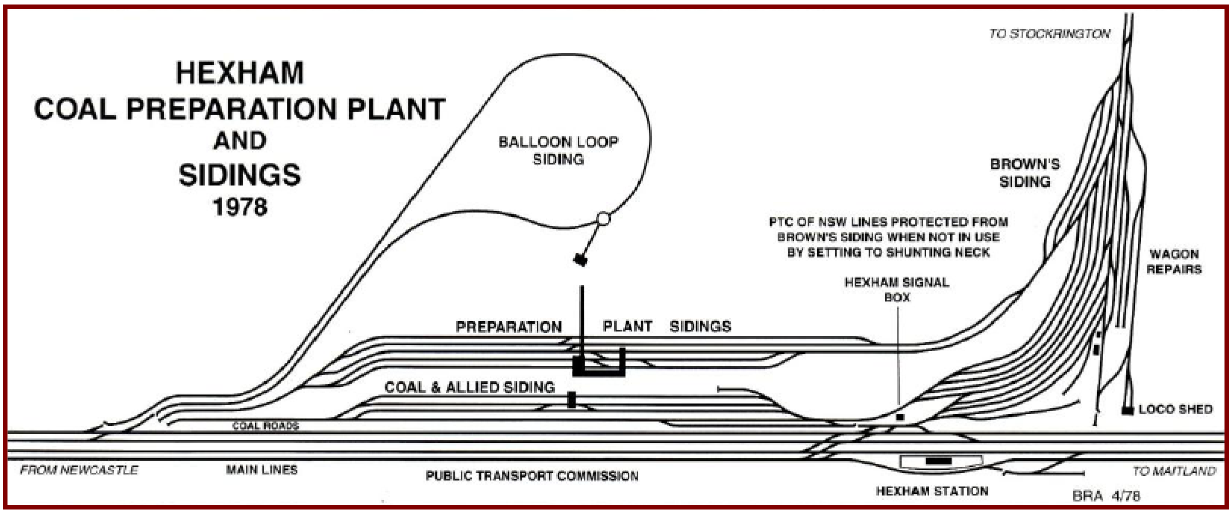

Figure 32: Plan of the site: Brian Andrews, Coal, Railways & Mines.

In May of 1988 the Hexham facility ceased operations, much of the stockpiles that were on site as at this date remain on site and this evident in the levels that can be seen on the site survey included in Appendix D.

The photograph below shows the extent of coal operations on the south part of the site in 1986, not long before operations ceased.

Photograph 14: 1986 Aerial view of the subject Site (NCC Plan Room).

Figure 33 below identifies the site's redundant structures.

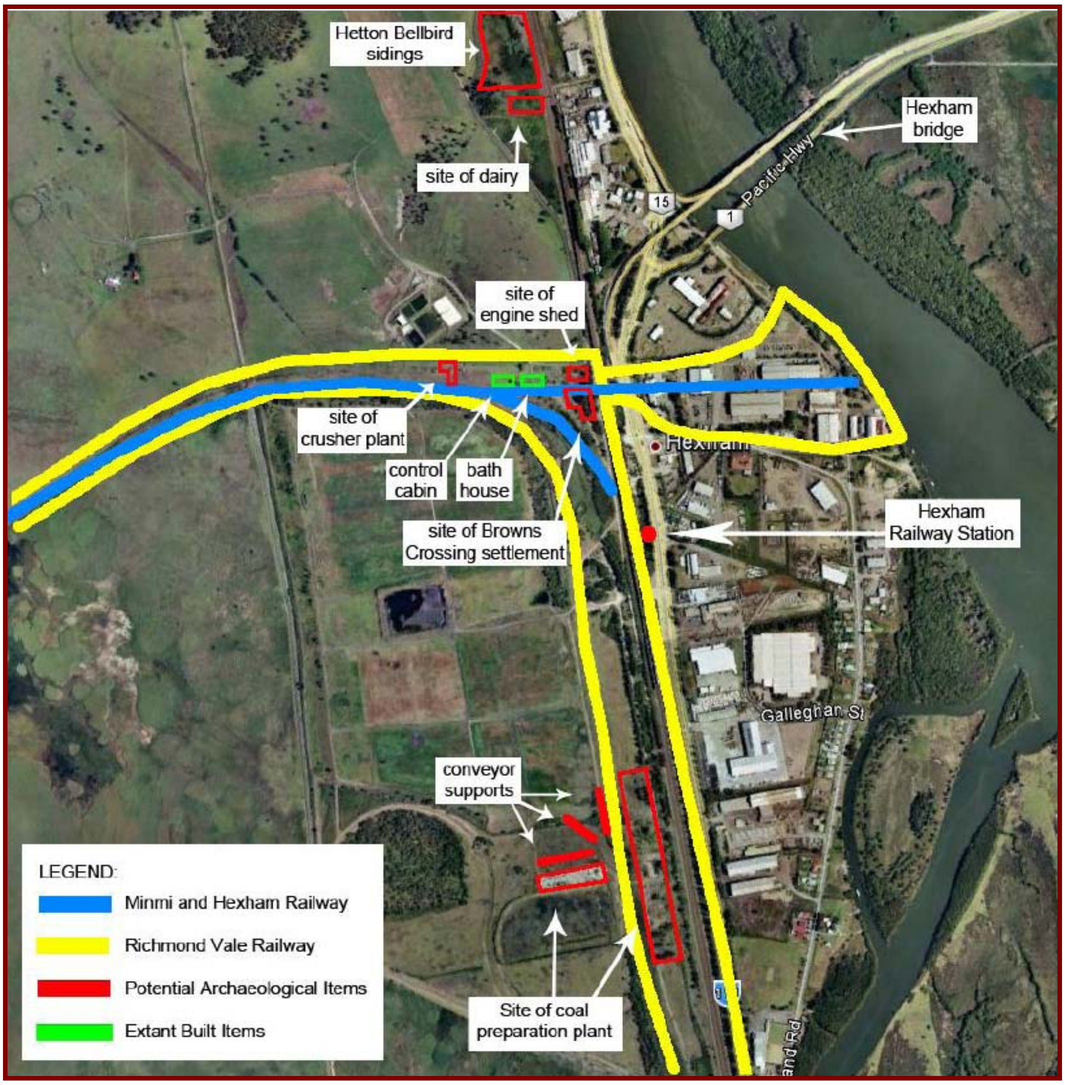

Figure 33: Overlay showing redundant structures.

Significance Assessment

The historical significance of the site lies primarily in its association with the coal and rail industries for in excess of a hundred years. Despite the removal of railway infrastructure, associated buildings and equipment, highly significant evidence relating to the early history of the site remains in the form of a rail corridor and former control cabin and bath house. Activities on the site relating to the transport and treatment of coal link it to the State Heritage Themes of Mining, Transport, Industry and Technology, while association with the coal magnate John Brown links it to the theme of Persons. Although of less historical significance than the coal and rail – related history of the site, agriculture has also played a role, providing an association with the State Heritage Themes of Pastoralism and Agriculture.

Built Items within the Study Area

The Control Cabin

- Built in c. 1909, the control cabin is a two storey structure constructed from bricks made in the J. & A. Brown brick yards. The building consists of brick arched openings and a hipped roof of which only the rafters and some iron sheets remain. Vandalism and neglect, together with the theft of materials has made the building ruinous, with large voids in the brickwork. Floor joists and ceiling rafters have been burned out.
- *Condition* – Ruinous. The control cabin has been burned and robbed of materials and has lost roof covering.


Photograph 15 & Photograph 16: The control cabin.

The Bath House

- Built in 1949, the bath house is a single storey structure with two clear additions to the east and west elevations. The building is ruinous, with vegetation growing within the structure. The bath house consists of tiled interior and a gable roof of which only the timber structure remains.
- *Condition* – Ruinous and has lost roof covering.

Photograph 17: The bath house.

Coal Preparation Plant Conveyor Belt Support Footings & Coal Stockpile

- Coal preparation plant conveyor belt support footings and other coal stockpile buildings remain on site. Thirteen concrete conveyor belt support footings remain as well as those of other coal stockpile buildings.
- *Condition* – The remains are in poor condition.

Photograph 18: Conveyor belt support footings.

Ruins of Dairy Farm Milking Shed, Milking Machine Hut and Silos

- The ruins of a milking shed, including milking machine hut, hay shed and concrete feed silos, are located towards the western end of the study area. The facility was extant by 1944 and anecdotal evidence suggests that it became redundant in the late 1950s.
- *Condition* – The former dairy milking shed, feed shed and milking machine hut are in ruinous condition. The concrete feed silos have resisted flooding and other damage and stand in good condition.

Photograph 19: The ruins of the milking machine hut.

Ruins of the Hetton Bellbird Weighbridge Hut

- The weighbridge hut, which housed the weighing machine showing the weight of each coal hopper shunted across the weighbridge before dumping at the gantry loader, was built at some time after 1935, and was probably demolished during the general clearing of the site in 1976.
- *Condition* – Ruinous. The ruin of the Hetton Bellbird weighbridge hut, together with other remains associated with the Hetton Bellbird (later Peko – Wallsend) sidings and coal loader, is in poor condition.

9.13.2 Impact Assessment

The Statement of Heritage Impact has been written in accordance with the guidelines for Assessing Heritage Significance and Statement of Heritage Impact as issued by the NSW Heritage Office, and the Australia ICOMOS Burra Charter (1999).

The following aspects of the proposal respect or enhance the heritage significance of the item or area for the following reasons:

The significance of the site is directly related to its former use in hauling coal by rail. The proposed TSF, designed to meet the modern requirements of the industry, will reintroduce rail based activities very similar to those that came to an end with the closure of the Richmond Vale Railway in 1987. In cultural terms, it will reactivate what was formerly a busy place of work, in pursuit of innovation and industry best practice in a fashion sympathetic to the efforts of the Brown family. Re – use of the site for railway purposes will increase the meaning and value of the site both for staff, contractors, the people of Hexham, Tarro and Beresfield, and for railway enthusiasts and the wider community.

The following aspects of the proposal could detrimentally impact on the heritage significance of the item or area for the following reasons:

The proposed works necessitate disturbance, concealment or removal of a range of built items including those mentioned above, being the control cabin, bath house and the Hetton Bellbird weighbridge, as well as the dairy, some concrete conveyor belt support footings, coal preparation plant footings and some remnant items of track work which are associated with the Minmi to Hexham Railway which is recognised as a Local Heritage Item within Schedule 5 of the Newcastle LEP 2015.

Whilst these items provide evidence of previous use of the area, none of these items are considered to be of high heritage significance.

There were two extant structures within the study area to which heritage significance might have been assigned. These are the control cabin and the bath house. While these are not listed in statutory planning instruments or Heritage registers, both are within the curtilage of the former Richmond Vale Railway as developed by the Heritage Branch of the DP&I.

9.13.3 Mitigation Measures

The following actions will be undertaken to enhance the interpretation of the abovementioned items:

1. Serviceable bricks from the control cabin will be salvaged and appropriately reused in a symbolic linkage of the past and proposed uses of the site.
   - This will facilitate interpretation of previous uses of the site and also of its heritage significance. For example, clean undamaged bricks may be able to be used for landscaping purposes, paving or within dwarf walls for signage.
2. Appropriate interpretation in the form of a plaque providing details of the site's heritage will be located within the site.
3. The proposed development will be carried out in accordance with the Statement of Heritage Impact prepared by EJE, dated June 2012.

In addition to the above the following measures will be employed to address the potential impacts on the archaeological resources associated with the Minmi to Hexham railway:

Construction Non-Indigenous Management Plan

- The lead contractor for the construction of the TSF will, before commencing site work, prepare a Construction Non-Indigenous Management Plan setting out the mitigation and management strategies that would be implemented to minimise potential impacts to heritage items.

Appointment of an Excavation Director

- An Excavation Director, whose experience complies with the criteria promulgated by the Heritage Branch of the DP&I will be appointed prior to any excavation within the vicinity of the junction of the Minmi to Hexham Railway and the GNR. The Excavation Director will advise on archaeological matters associated with the excavation, and is to ensure compliance with both the procedures to be adopted in the event of unexpected finds and measures for protecting heritage items that are to be conserved;
- The Excavation Director will have the following responsibilities:
  a) Notify the proponent of potentially archaeologically sensitive places;
  b) Closely observe the course and conduct of excavations both in those places and in the entire area of excavations;
  c) Be responsible to the proponent for compliance with the provisions of the Heritage Act 1977 (NSW); and
  d) Advise the proponent as to the level of significance of such relics as may be discovered within the area of excavations. These levels may be Local, State or National.

Excavation Relics

- Should relics be discovered within the area of excavation, and should these, within the opinion of the Excavation Director, have heritage significance, the Excavation Director shall advise the proponent as to practical measures for the protection of those items.

9.13.4 Conclusion

The proposed TSF was found to have very minimal inherent impact on the heritage values of the site. While several items associated with previous uses, such as the dairy ruins, remnant trackwork, coal preparation plant footings and conveyor belt support footings will likely be demolished, these have very restricted level of significance and their loss will not be detrimental.

QR National is committed to interpreting as much of the site's history as possible within the parameters of modern needs. This has been demonstrated by QR National committing to the abovementioned mitigation measures which include salvage of undamaged bricks from the control cabin for reuse and the provision of plaque on site providing details of the site's history.

In heritage terms, the site has been found to be suitable for the proposed TSF. For over 130 years the site has been associated with the coal and rail industries. These associations will be preserved by the revival of the use for which the site was intended, being the transportation of coal.

9.14 NOISE & VIBRATION

SLR Consulting Australia Pty Ltd has been commissioned by QR National to conduct a Noise Impact Assessment for the proposed TSF. A full copy of their report is located at Appendix P and presents the results and findings of the noise assessment including consideration of construction, road traffic and operational noise of the proposed facility.

9.14.1 Existing Environment

An ambient noise monitoring program was conducted by SLR Consulting. Ambient noise levels were monitored at four separate locations, considered to be representative of the nearest potentially affected receivers to the site. The objective of this survey was to measure L_{A90} (15 minute) and L_{Aeq} (15 minute) noise levels at the nearest potentially affected residential locations during the day, for the proposed development in accordance with the NSW Industrial Noise Policy (INP).

Table 32 below and Figure 34 identify the nine locations that have the potential to be affected by the proposed development (sensitive receivers). The sensitive receivers were used for the purpose of survey and assessment. Four monitoring locations have been identified on Figure 34 which are representative of the background noise for the nine sensitive receivers.

Table 32: Noise monitoring locations (sensitive residential receivers).

Residence No.	Description
R1	Hain Property west of site
R2	Lynch property north of site
R3	New England Highway east of site
R4	Old Maitland Road (North) east of site
R5	Old Maitland Road east of site
R6	Old Maitland Road (South) east of site
R7	Maitland Road south-east of site
R8	Church old Maitland Road
R9	Tarro Primary School

Figure 34: Noise monitoring and Receiver Locations

Continuous unattended noise surveys were carried out at locations M1, M2 and M3 from 17 March 2008 to 27 March 2008 to determine the background levels. In addition operator attended noise surveys were conducted at residential locations M1, M2, M3 and M4 to characterize and quantify the main contributions to ambient noise at these locations. The detailed results of these are shown in Tables 33 and 34 below.

Table 33: Background Noise levels at Sensitive Receivers

Location	Description	Measured Background LA90 Noise Level	Adopted Rating Background Level	Estimated Existing Industrial LAeq Contribution
M1 Hain Property	Daytime	41 dBA	41 dBA	< 44 dBA
	Evening	46 dBA	41 dBA	< 39 dBA
	Night	47 dBA	41 dBA	< 34 dBA
M2 Lynch Property	Daytime	56 dBA	56 dBA	< 54 dBA
	Evening	53 dBA	53 dBA	< 44 dBA
	Night	47 dBA	47 dBA	< 39 dBA
M3 Old Maitland Road	Daytime	40 dBA	40 dBA	< 54 dBA
	Evening	40 dBA	40 dBA	< 44 dBA
	Night	39 dBA	39 dBA	< 39 dBA

Table 34: Operator Attended Noise Surveys

Location	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 μPa)					Description of Noise Emission, Typical Maximum Levels LAmax (dBA) and Estimated Existing LAeq Contribution
		LAmax	LA1	LA10	LA90	LAeq	
M1 Hain Property	17/3/2008 15:25 Day W=2 to 4 m/s NE Temp=25°C	69	61	55	49	53	Wind in trees to 50 Distant traffic 45 to 47 Train passby to 50 Birds 52 to 60 Aircraft 55 to 60
M2 Lynch Property	17/3/2008 07:50 Day W= calm Temp=20°C	78	70	66	58	64	Traffic noise dominant 65 Train passby to 63
M3 Old Maitland Road	17/3/2008 14:17 Day W=2 to 3 m/s NE Temp=25°C	69	66	55	47	54	Truck in industry site to 54 Industrial noise 45 to 46 Distant traffic 47
M4 Maitland Road	17/3/2008 14:44 Day W=2 to 3 m/s NE Temp=24°C	79	74	69	55	65	Traffic noise dominant 73 Some wind in trees Some cicadas

The effects of meteorology on noise levels were considered and in both the case of wind and temperature inversion occurred less than 30% of the time and so are not significant in terms of assessment of noise environment.

Rail Movements

Noise monitoring undertaken as part of the EA for the HRR Project identified the number of rail pass by events on 25 and 26 August 2011 which are presented in Table 35 below:

Table 35: Rail Pass by Events

Location	Date	Rail Pass by Events			
		Freight (inc.Coal)		Passenger	
		Day	Night	Day	Night
Adjacent to rail line off Woodland Close	25/08/11	63	34	43	9
	26/08/11	55	25	40	9

Despite the fact that rail movements at Hexham will increase due to the increase in coal freight movements. There will be no increase in train movements going past the site as a result of the proposed TSF.

9.14.2 Impact Assessment

The noise emission design criteria for the proposed TSF have been established with reference to the INP.

TSF Operations

Operational noise levels from the proposed TSF are predicted to meet the project specific noise criteria at all receiver locations under prevailing weather conditions (calm) during day, evening and night periods as shown in table 36 below.

Table 36 details the sound power levels of relevant plant and equipment considered in the model. Table 37 summarises the operational scenario modelled, a tick indicates that the equipment is in operation during the relevant period, where a number is included in brackets flowing the tick, this represents the number of pieces of equipment considered in the noise model. The operational scenario modelled is likely to represent the acoustically worst case scenario.

Table 36: Predicted Noise Levels TSF Operations

Locality	Period	Predicted Noise Level LAeq(15minute) Calm	Intrusiveness Criteria LAeq(15minute)	Amenity Criteria LAeq(Period)	Project Specific Noise Level (PSNL)
R1 Hain Property	Day	38 dBA	46 dBA	60 dBA	46 dBA
	Evening	38 dBA	46 dBA	50 dBA	46 dBA
	Night	38 dBA	46 dBA	45 dBA	45 dBA
R2 Lynch Property	Day	31 dBA	61 dBA	60 dBA	60 dBA
	Evening	31 dBA	58 dBA	50 dBA	50 dBA
	Night	31 dBA	52 dBA	45 dBA	45 dBA
R3 New England Highway	Day	46 dBA	61 dBA	60 dBA	60 dBA
	Evening	46 dBA	58 dBA	50 dBA	50 dBA
	Night	46 dBA	52 dBA	45 dBA	45 dBA
R4 Old Maitland Road (North)	Day	40 dBA	45 dBA	60 dBA	45 dBA
	Evening	40 dBA	45 dBA	50 dBA	45 dBA
	Night	40 dBA	44 dBA	45 dBA	44 dBA
R5 Old Maitland Road	Day	38 dBA	45 dBA	60 dBA	45 dBA
	Evening	38 dBA	45 dBA	50 dBA	45 dBA
	Night	38 dBA	44 dBA	45 dBA	44 dBA
R6 Old Maitland Road (South)	Day	39 dBA	45 dBA	60 dBA	45 dBA
	Evening	39 dBA	45 dBA	50 dBA	45 dBA
	Night	39 dBA	44 dBA	45 dBA	44 dBA
R7 Maitland Road	Day	31 dBA	61 dBA	60 dBA	60 dBA
	Evening	31 dBA	58 dBA	50 dBA	50 dBA
	Night	31 dBA	52 dBA	45 dBA	45 dBA
R8 Church Old Maitland Road	Day	39 dBA	45 dBA	Internal when in use 40 dBA	Internal when in use 40 dBA
	Evening	39 dBA	45 dBA		
	Night	39 dBA	44 dBA		
R9 Tarro Primary School	Day	<30 dBA	61 dBA	Internal Classroom Noisiest 1-hour period when in use 35 dBA	Internal Classroom 35 dBA
	Evening	<30 dBA	58 dBA	N/A	N/A
	Night	<30 dBA	52 dBA	N/A	N/A

The Tarro Primary School has been assessed within an updated assessment and complies with the noise critera as identfied in Table 36 above.

Table 37: Operational Scenario Considered in Noise Model

Plant and Equipment	Day	Evening	Night
Provisioning Facility			
Loco and Wagons	✓(1)	✓(1)	✓(1)
Compressor	✓(1)	✓(1)	✓(1)
Forklift	✓(1)	✓(1)	✓(1)
Hand Tools as required	✓	✓	✓
Locomotive Maintenance Shed and Wash Bay			
Locomotive wash	✓(1)	✓(1)	✓(1)
Loco	✓(1)	✓(1)	✓(1)
Compressor	✓(1)	✓(1)	✓(1)
Forklift	✓(1)	✓(1)	✓(1)
Hand Tools as required	✓	✓	✓
Wagon Shop			
Loco and Wagons	✓(1)	✓(1)	✓(1)
Wagon Placement tractor	✓(1)	✓(1)	✓(1)
Compressor	✓(1)	✓(1)	✓(1)
Forklift	✓(1)	✓(1)	✓(1)
Hand Tools as required	✓	✓	✓
Train shunting	✓(1)	✓(1)	✓(1)

Operational Road Traffic Noise

The acoustic report determines that the number of traffic movements associated with the proposed development is insignificant in acoustic terms and that compliance with the RNP is predicted to be met.

Sleep Disturbance

The following table shows that sleep disturbance noise levels comply with the criteria at all locations.

Table 38: Sleep Disturbance Noise Levels

Location	Period	Predicted Sleep Disturbance Noise Level	Sleep Disturbance Criteria L1(1minute)
R1 - Hain Property	Night	45 dBA	56 dBA
R2 - Lynch property		35 dBA	62 dBA
R3 - New England Highway		57 dBA	62 dBA
R4 - Old Maitland Road (North)		52 dBA	54 dBA
R5 - Old Maitland Road		48 dBA	54 dBA
R6 - Old Maitland Road (south)		51 dBA	54 dBA
R7 - Maitland Road		38 dBA	62 dBA
R8 - Church Old Maitland Road		N/A	N/A
R9 - Tarro Primary School		N/A	N/A

The resulting sleep disturbance project specific noise criteria for residences receiver locations are based on the night time adopted rating background noise levels plus 15 dBA (as described in the Application Notes to the INP).

The assessment of sleep disturbance has been updated to clearly identify that the worst case maximum night time noise levels from trains shunting on site have been used for the assessment of sleep disturbance from the proposed TSF.

Construction Noise

The acoustic report makes an assessment of construction noise impacts associated with road works at the Tarro Interchange, demolition, clearing and drainage, rail works and building works. In addition the transport route for construction has also been assessed. It has been determined based on all machinery and equipment to be used that construction noise levels are predicted to be below the relevant guidelines at the closest residential receivers.

The additional daily traffic of up to 340 vehicles (worst case) associated with construction activity will result in a negligible change to the existing road traffic noise level generated in the New England Highway and therefore are predicted to meet the requirements of the RNP. Construction traffic volumes have been based on a worst case noise assessment which involves import of 100% of material to site.

The results of construction noise predictions for the proposed TSF are contained within Table 39 and show the worst case impact of all construction phases at each nearest residential receivers for the daytime period only. Noise predictions indicate that the construction of the TSF would comply with construction noise goals for the daytime period at all assessment locations. However, a marginal 2 dBA exceedance of the 'noise affected' management noise level is predicted at location R6 during rail works but is well below the 'highly noise affect' management noise level. The exceedance is caused by the operation of the tamping machine.

Sound power levels for construction are considered within the Noise and Vibration Impact Assessment in Appendix P model.

Table 39: Construction Noise Predictions

Location	Weather Conditions	Predicted Noise Level LAeq (15minute)	Management Level LAeq(15minute) (dBA)	
			Noise Affected	Highly Noise Affected
Road Construction				
R1 - Hain Property	Calm	39 dBA	51 dBA	75 dBA
R2 - Lynch Property		50 dBA	66 dBA	
R3 - New England Highway		56 dBA	66 dBA	
R4 - Old Maitland Road (North)		45 dBA	50 dBA	
R5 - Old Maitland Road		43 dBA	50 dBA	
R6 - Old Maitland Road (South)		49 dBA	50 dBA	
R7 - Maitland Road		39 dBA	66 dBA	
R8 - Church Old Maitland Road		49 dBA[1]	45 dBA internal	N/A
R9 - Tarro Primary School		54dBA[1]	45 dBA internal	N/A
Demolition Clearing and Drainage				
R1 - Hain Property	Calm	49 dBA	51 dBA	75 dBA
R2 - Lynch Property		35 dBA	66 dBA	
R3 - New England Highway		51 dBA	66 dBA	
R4 - Old Maitland Road (North)		46 dBA	50 dBA	
R5 - Old Maitland Road		43 dBA	50 dBA	
R6 - Old Maitland Road (South)		50 dBA	50 dBA	
R7 - Maitland Road		39 dBA	66 dBA	
R8 - Church Old Maitland Road		50 dBA[1]	45 dBA internal	N/A
R9 - Tarro Primary School		33 dBA[1]	45 dBA internal	N/A
Rail Works				
R1 - Hain Property	Calm	43 dBA	51 dBA	75 dBA
R2 - Lynch Property		36 dBA	66 dBA	
R3 - New England Highway		61 dBA	66 dBA	
R4 - Old Maitland Road (North)		49 dBA	50 dBA	
R5 - Old Maitland Road		47 dBA	50 dBA	
R6 - Old Maitland Road (South)		52 dBA	50 dBA	
R7 - Maitland Road		39 dBA	66 dBA	
R8 - Church Old Maitland Road		52 dBA[1]	45 dBA internal	N/A
R9 - Tarro Primary School		34 dBA[1]	45 dBA internal	N/A
Building Works				
R1 - Hain Property	Calm	43 dBA	51 dBA	75 dBA
R2 - Lynch Property		32 dBA	66 dBA	
R3 - New England Highway		55 dBA	66 dBA	
R4 - Old Maitland Road (North)		48 dBA	50 dBA	
R5 - Old Maitland Road		45 dBA	50 dBA	
R6 - Old Maitland Road (South)		39 dBA	50 dBA	
R7 - Maitland Road		<30 dBA	66 dBA	
R8 - Church Old Maitland Road		39 dBA[1]	45 dBA internal	N/A
R9 - Tarro Primary School		30 dBA[1]	45 dBA internal	N/A

Note: Construction may only occur between the hours of 7.00 am and 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays. No construction work is to take place on Sundays or Public Holidays

1. These are external noise levels. As a conservative estimate, the difference between external to internal noise levels with a dwelling comprising of standard construction and windows open for adequate ventilation is 10 dB. As a result, the internal noise level for receiver R8 and R9 is 39 dBA and 44 dBA during road construction respectively, 40 dBA and <30 dBA during demolition works respectively, 42 dBA and <30 dBA during rail works respectively and <30 dBA during building works at both receiver R8 and R9. These internal noise levels comply with the internal construction noise criteria 45 dBA.

Vibration

The SLR report has reviewed the potential for impacts associated with vibration noting that the distance between both construction and operational sources will means that the proposal is below the criteria for minimal risk of cosmetic damage to residential and commercial properties.

Cumulative Impacts

The acoustic report identifies that the primary potential for cumulative noise impact is during the construction phase of both the ARTC and QR National developments. Even so the cumulative construction works are below the "highly noise affect" management levels at all times.

9.14.3 Mitigation Measures

Operational noise levels are predicted to be below the relevant guidelines at the closest residential receivers and therefore mitigation is not required.

Although noise levels are predicted to be below the relevant guidelines at the closest residential receivers during construction the following measures should be considered to reduce the construction noise impact:

- Site noisy equipment behind structures that act as barriers or at the greatest distance from the noise-sensitive area or orient the equipment so that noise emissions are directed away from any sensitive areas.
- Keep equipment well maintained;
- Employ "quiet" practices when operating equipment (e.g. positioning and unloading of trucks in appropriate areas); and
- A Construction Noise Management Plan should be prepared and implemented prior to commencement of construction works at the site. This should include the following:
    - Construction noise goals,
    - Recommendations regarding specific physical and managerial measures for controlling noise, noise and vibration monitoring programs and reporting procedures, and
    - Measures for dealing with exceedances and mechanisms to provide ongoing community liaison.

With regard to potentially offensive noise events associated with construction activities AS 2436-1981*"Guide to noise control on construction, maintenance and demolition sites"* provides the following:

If noisy operations must be carried out, then a responsible person should maintain liaison between the neighbouring community and the contractor. This person should inform the public at what time to expect noisy operations and also inform the contractor of any special needs of the public. Consultation and cooperation between the contractor and his neighbours and the removal of uncertainty and rumour can help reduce the adverse reaction to noise.

9.14.4 Conclusion

A noise and vibration impact assessment has been carried out and for operational functions of the TSF compliance is achieved with the maximum allowable noise criteria for the INP in all respects. Noise is only predicted to be a potential area of concern during the construction phase and more particularly where the ARTC and QR National project are to be constructed at the same time. Mitigation measures have however been recommended to minimise impacts. Vibration impacts from construction as well as operations are not predicted to have an impact on sensitive receivers or other nearby commercial receivers.

9.15 AIR QUALITY

SLR Consulting Australia has been commissioned by QR National to conduct an Air Quality Impact Assessment of the proposed TSF. The report considers both the construction and operational phase of the proposed development. The report in its entirety is provided in Appendix Q.

9.15.1 Existing Environment

The proposed project site is situated in the Lower Hunter region of NSW. This region has a significant industrial base including primary metallurgical works, fertiliser manufacturing and coal fired power generators. Emissions from a substantial motor vehicle fleet also contribute to pollution levels in the region.

In the absence of site-specific monitoring data, estimates of the existing air quality environment for the project site has been derived using data from the EPA monitoring sites at Beresfield and Newcastle.

The Beresfield monitoring site is located approximately 3km north-northwest of the project site and is classified as semi-rural. It was commissioned in 1993 and is located in the Francis Greenway High School, on Lawson Avenue, Beresfield.

The EPA maintains a monitoring site in Newcastle which is located approximately 13km southeast of the project site. The site was commissioned in 1992 and is located in the Newcastle Sports Ground, off Dumaresq Street, Newcastle.

The parameters that are currently measured at the Beresfield and Newcastle monitoring sites are summarised in Table 40 below.

Table 40: Parameters Measured at the Beresfield and Newcastle Monitoring Sites.

Parameter	Beresfield	Newcastle
Ozone	✓	✓
Oxides of Nitrogen	✓	✓
Sulphur Dioxide	✓	✓
Particulate Matter as PM10	✓	✓
Particulate Matter as PM2.5	✓	✓
Carbon Monoxide	-	✓
Meteorology	✓	✓

For the purpose of this assessment the estimates of background concentrations of criteria pollutants were derived from the Beresfield monitoring site for 2011, with the exception of carbon monoxide for which the Newcastle data was used.

In establishing the existing background air quality consideration has been given to the cumulative impacts relative to the adjoining ARTC HRR Project.

Table 41 represents the complied background air quality and assumes that ARTC five trains sitting idle on the HRR which provides for a conservative background as it is unlikely that less than this number would sit idle in practice.

Table 41: Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Units	EPA Criteria		Regional Background Levels Assumed
		Averaging Period	Max Allowable (g/m)	
PM10	g/m	24-hour	50	42.8
	g/m	Annual	30	17.2
Nitrogen dioxide	g/m	1-hour	246	79.0
	g/m	Annual	62	33.6
	g/m	1-hour	570	171.6
	g/m	24-hour	228	34.3
	g/m	Annual	60	4.9
Carbon monoxide	g/m	15 minute	100	N/A
	g/m	1-hour	30	N/A
	g/m	8-hour	10	1.7
Dust deposition	g/m /month	Annual	4 g/m /month	2.0

9.15.2 Impact Assessment

For the purpose of assessing the impact of the proposed development both the construction phase and the operational phase has been considered. The following sources have been identified.

Construction Phase

Based on information provided by the Proponent, dust generating construction related activities at the proposed site may include (but may not be limited to):

- Road construction;
- Importing fill (approximately 380,000m^3);
- Loading and unloading of trucks;
- Excavating;
- Use of backhoes;
- Movement of trucks on unpaved roads; and
- Wind erosion of stockpiles and exposed areas.

Due to the irregularity and short duration of the emission sources during this phase, the impact is not expected to have long-term health or ecological impacts beyond the proposed site boundaries. However, as these sources can result in high short-term releases of particulate matter during construction, control measures should be put in place during this phase. The control techniques for fugitive dust sources generally involve watering, chemical stabilisation, wind sheltering and source activity management.

Operational Phase

Air pollutant emission sources associated with the day-to-day operation of the proposed TSF include;

- Refuelling of locomotives with diesel;
- Refilling and emptying of storage tanks;
- Storage of fuels;
- Locomotive exhaust;
- Maintenance operations which includes (but not limited to);
    - Oil and grease removal;
    - Locomotive cleaning; and
    - Wagon and locomotive repairs.
- Vehicles; and,
- Site based equipment including (but not limited to):
    - Wagon placement tractor;
    - Forklift;
    - Compressor;
    - Trucks; and
    - Quad bikes.

In assessing the impacts of the operational phase SLR considered emissions for particulates, nitrogen dioxide (NO_2), sulphur dioxide, carbon monoxide, air toxics and in all cases have determined that all emissions are within acceptable standards. In addition it was determined that it is reasonable to expect that dust deposition resulting from activities associated with the operation of the TSF will not have a significant impact on local amenity.

The incremental increases in 1-hour concentrations of NO_2 are the highest of the particulates considered. The maximum daily maximum 1-hour concentration of NO_2 was 79.0 µg/m^3. The annual average concentration was reported to be 33.6 µg/m^3 in 2011. Table 19 of the Air Quality Impact Assessment (Appendix Q) identifies results of dispersion modelling for Nitrogen Dioxide. As assessed in the Air Quality Impact Assessment, the maximum cumulative results of the dispersion modelling suggest that no exceedences of the relevant NSW EPA goals for ambient concentrations of NO_2 will occur at any of the sensitive receptors locations as a result of activities associated with the operation of the TSF.

Any future increase in train numbers will not be a result of the TSF. Increased train numbers will be a result of growth and expansion of coal mines and the coal industry.

9.15.3 Mitigation Measures

Construction Measures

The following procedures and requirements should be followed during the life of the project to minimise the impact of dust generated in association with the proposed development:

- Watering of roads and sealing of roads will be undertaken during construction;
- Watering of haul roads will be managed for dust suppression during the construction phase;
- Trucks entering and leaving the site should be well maintained in accordance with the manufacturer's specification to comply with all relevant regulations. Fines may be imposed on vehicles which do not comply with smoke emission standards. Truck movement should be controlled on site and restricted to designated roadways. Truck wheel washes or other dust removal procedures (including covering of loads) should be installed to minimise transport of dust offsite if necessary.

The following are general, basic procedures which are designed to control dust and other emissions from construction operations and onsite equipment. The aim of these procedures is to minimise offsite dust nuisance and air quality impacts.

- Activities carried out on site should be such as to ensure that all equipment used and all facilities erected are designed and operated to control the emission of smoke, dust, fume and other objectionable matter into the atmosphere;
- Precautions to be taken include spraying of earthworks, roads and other surfaces as necessary with water or other suitable liquids, providing dust suppression equipment to any onsite materials batching plant, sealing of temporary haul roads and the modification of operations during high or unfavourable wind conditions;
- Working areas and access roads should be stabilised as soon as practicable to prevent or minimise windblown dust;

- All disturbed areas should be stabilised as soon as practicable to prevent or minimise windblown dust;
- All unsealed trafficable areas should be kept sufficiently damp during working hours to minimise windblown traffic generated dust emissions. Continued use of water on dirt roads helps the formation of a crust so that dust is not as easily generated;
- Water sprays, sprinklers and water carts may be employed if needed to adequately dampen stockpiles, work areas and exposed soils to prevent the emissions of dust from the site. Water carts and other equipment will be available to enable watering at least at an hourly rate of 2 litres per square metre;
- Stockpiles and handling areas should be maintained in a condition which minimises windblown or traffic generated dust. Areas that may be inaccessible by water carts should be kept in a condition which minimises windblown or traffic generated dust using other means;
- All equipment for dust control will be kept in good condition. The equipment will be operable at all times with the exception of shutdowns required for maintenance. Construction equipment will be properly maintained to ensure exhaust emissions comply with relevant regulatory requirements;
- If visible smoke can be seen from any equipment (while working on a construction site) for longer than 10 seconds duration, the equipment should be taken out of service and adequately repaired or tuned so that smoke is no longer visible for periods longer than 10 seconds;
- Cleared vegetation, demolition, materials and other combustible waste material should not be burnt on site;
- Silt should be removed from behind filter fences and other erosion control structures on a regular basis, so that collected silt does not become a source of dust;
- No dust, soil or mud should be deposited from any vehicle on public roads. Where wheel washing facilities are provided on construction works area, all drivers of construction vehicles shall utilise the wheel wash prior to leaving the works area and entering public roads;
- Any dust soil or mud deposited on public roads by construction activities and vehicle movements should be removed immediately and disposed of appropriately; and
- Hire agreements should contain provisions to stand down equipment which has excessively smoky exhaust.

Operational Measures

Whilst it has been established that there are no significant air quality impacts from the operational phase the following measures will be adopted to further minimise the potential for impact:

- Minimise any non-essential idling of locomotives;
- Identify and expeditiously repair locomotives with excessive smoke;
- Incorporate the usage of low sulphur diesel fuel where available;
- Minimise fuel spillage; and
- Exhaust emissions associated with low exit velocities have the highest potential for adverse ground-level impacts.

Greenhouse Gas

The proposed TSF will result in a minor increase in the generation of GHGs as a result of operations within the facility, noting that the TSF is designed to service trains that are already on the network.

GHG will be generated for a short period during the construction phase and in general will be relatively insignificant.

A more detailed overview of the proposed development's impact on GHG emissions is outlined within Section 10.2 of this EA.

Construction Mitigation

The primary fuel source for the vehicles operating at the site during construction is diesel. For the purposes of this assessment, and due to the short term nature of construction, a quantitative analysis of GHG emissions from this source has not been conducted. However, the following practises will be adopted to assist in the reduction of GHG emissions during construction:

- Emissions from construction / transport vehicles and onsite machinery will apply with the relevant AS;
- All vehicles and machinery will be regularly maintained to ensure proper and efficient working order and therefore minimise emissions;
- Optimum vehicle / equipment tyre pressures will be maintained; and
- Construction and transport vehicles will be managed to reduce vehicle idling time onsite.

No electricity is proposed to be consumed as a result of the construction of the Train Servicing facility.

9.15.4 Conclusion

An air quality and GHG emissions assessment has been carried out to cover both the construction and operation phase of the proposed development. The proposal has been found to comply with relevant criteria and is predicted to not have an adverse impact on neighbours or the environment.

Dust generation during the construction phase has been identified as the primary source of possible impact and a range of mitigation measures have been proposed. Whilst the operational phase is within the acceptable criteria measures have nonetheless been proposed to further reduce the possibility of impacts.

The operation of the TSF will not generate any additional GHG. During the construction phase, relatively insignificant emissions will be generated for a short period and a number of mitigation measures will be implemented.

9.16 SOCIAL & ECONOMIC

ADW Johnson has been commissioned by QR National to conduct an Economic & Social Impact Assessment for the proposed QR National TSF. A full copy of the report is located at Appendix R.

9.16.1 Existing Environment

Community Profile

A community profile for the project was prepared based on the 2006 Australian Bureau of Statistics Australian Census. The Social and Economic Assessment used the most recently available National census data to undertake the assessment. There has since been the release of the preliminary 2011 census data in July 2012.

During the almost five years since the census there has been little change evidenced in the residential community of the local area. This is consistent with the pattern over the previous census period from 2001 – 2006 where the Hexham population increased by 1, from 148 to 149 persons. Discussions with Newcastle Council confirmed this, revealing that there had been no new housing construction approvals in the Hexham area since 2006.

In a broader sense, the areas to the North and South of Hexham have experienced growth in recent years. The surrounding suburbs of Fletcher and Maryland in the Newcastle LGA, and Thornton, Woodberry and Metford in Maitland LGA, are recognised as strong first and second home buyer areas witnessing growth. The Maitland LGA has experienced in the order of 2.3% growth in population between 2005 and 2010. Projections in the 2011 Maitland Urban Settlement Strategy indicate medium growth forecasts of 2% pa.

Age Profile

Table 42 below displays the number of people in each of the populations within the various age brackets. This data shows the significant differences in populations between the regions, particularly establishing Hexham's small population, contrasted with the large surrounding populations located to the north and south of the site.

Table 42: Age Profile

Age (years)	Surrounding Northern Suburbs	Surrounding Southern Suburbs	Hexham	Newcastle LGA	NSW
0-4	1,344	1,129	*6*	*8,261*	*420,431*
5-9	1,365	1,191	*7*	*7,982*	*431,924*
10-14	1,385	1,223	*19*	*8,076*	*446,561*
15-19	1,253	1,360	*13*	*9,320*	*439,862*
20-24	1,079	1,298	*10*	*12,436*	*431,854*
25-29	1,032	936	*17*	*10,155*	*424,154*
30-34	1,261	1,137	*0*	*9,960*	*466,891*
35-39	1,279	1,161	*0*	*9,608*	*474,684*
40-44	1,271	1,170	*13*	*9,802*	*483,159*
45-49	1,226	1,012	*15*	*9,954*	*475,233*
50-54	1,090	962	*14*	*9,164*	*429,103*
55-59	1,020	809	*14*	*8,125*	*401,921*
60-64	792	599	*6*	*6,498*	*317,625*
65-69	610	440	*0*	*5,353*	*254,424*
70-74	421	380	*0*	*4,831*	*210,901*
75-79	288	298	*5*	*4,859*	*188,091*
80-84	197	232	10	4,103	140,704
85-89	85	123	0	2,178	74,527
90-94	25	40	0	868	29,465
95-99	5	15	0	181	6,606
100+	0	0	0	39	1,057
Total	17,028	15,515	149	141,753	6,549,177

Figure 35 below shows the proportion of each of the subject populations within the various age brackets. With the exception of Hexham, each population area has a similar age profile from the 30 - 34 years age group onwards. However, within the younger 0 - 29 year age groups, deviations exist between the populations, revealing interesting characteristics of the local populations. Most notably, both 'Surrounding Northern Suburbs' and 'Surrounding Southern Suburbs' maintain a higher population percentage within the 0-19 years age group, than both Newcastle LGA and NSW as a whole.

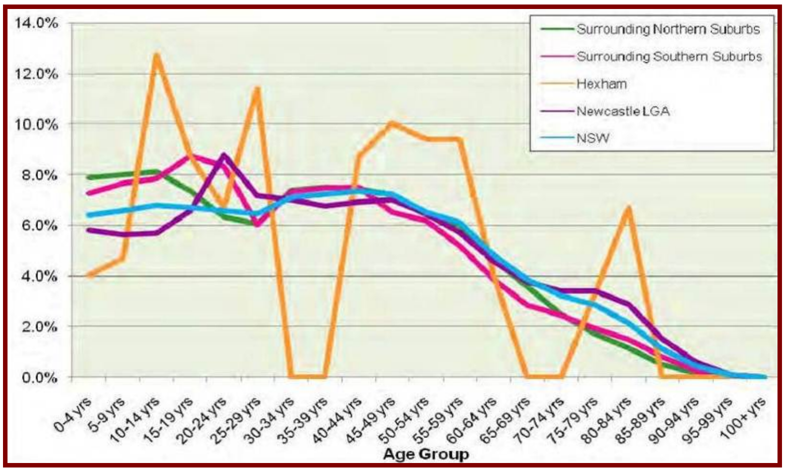

Figure 35: Comparative Age Profile.

The most notable departure from the NSW profile in the older age groups is from 56+ years, where the 'Surrounding Northern and Southern Suburbs' exhibits a smaller population, corresponding to its larger young populations. This is reflective of the local region's recent population increase (discussed in Table 43 below), consisting mainly of working households and families, rather than retirees and pensioners.

Figure 35 above displays high volatility for Hexham, due to its low population total of 149 persons. It can be stated that Hexham's population predominantly falls within the 10 - 29 years, 40 - 59 years and 75 - 84 years age groups.

Table 43 below displays the comparative age profiles of the selected populations for 2001 and 2006. Consistently, all populations have experienced an overall increase. Most notably however, Hexham and its 'surrounding northern and southern suburbs' are shown to have experienced population increases, reflecting the area's strong growth over recent years. The growth of these areas supports the justification for increased infrastructure and employment opportunities within the local area.

Table 43: Comparative 2001 & 2006 Age Profile.

	Surrounding Northern Suburbs		Surrounding Southern Suburbs		Hexham		Newcastle LGA		NSW	
Age (years)	2001	2006	2001	2006	2001	2006	2001	2006	2001	2006
0-4	*	1,344	1,137	1,129	*	6	8,108	8,261	422,341	420,431
5-9	*	1,365	1,232	1,191	*	7	8,114	7,982	445,983	431,924
10-14	*	1,385	1,151	1,223	*	19	8,153	8,076	445,026	446,561
15-19	*	1,253	1,348	1,360	*	13	9,265	9,320	436,626	439,862
20-24	*	1,079	1,210	1,298	*	10	11,380	12,436	408,719	431,854
25-29	*	1,032	1,041	936	*	17	10,197	10,155	446,515	424,154
30-34	*	1,261	1,154	1,137	*	0	9,876	9,960	468,524	466,891
35-39	*	1,279	1,137	1,161	*	0	9,879	9,608	483,003	474,684
40-44	*	1,271	1,075	1,170	*	13	9,801	9,802	482,318	483,159
45-49	*	1,226	974	1,012	*	15	8,999	9,954	438,277	475,233
50-54	*	1,090	830	962	*	14	8,242	9,164	412,967	429,103
55-59	*	1,020	634	809	*	14	6,656	8,125	325,330	401,921
60-64	*	792	421	599	*	6	5,507	6,498	267,064	317,625
65-69	*	610	416	440	*	0	5,044	5,353	228,029	254,424
70-74	*	421	403	380	*	0	5,590	4,831	217,237	210,901
75-79	*	288	305	298	*	5	5,241	4,859	177,684	188,091
80-84	*	197	211	232	*	10	3,503	4,103	114,764	140,704
85-89	*	85	104	123	*	0	2,024	2,178	61,490	74,527
90-94	*	25	37	40	*	0	638	868	22,667	29,465
95-99	*	5	9	15	*	0	178	181	5,778	6,606
Indigenous										1,057
Total										**6,549,177**

Labour Force Summary

The second release of 2006 Census data provides extensive data relating to the labour force of study populations including basic labour force performance, industry of employment and occupation of employment. The 2006 Census data for NSW captures the dramatic improvements which have occurred across many areas of the labour market over the previous 5 years. The basic labour force characteristics are shown in Table 44 below. In 2006, across NSW, the unemployment rate had fallen to 5.9%, which is down from 7.2% as at the 2001 Census.

Direct comparisons from 2001-2006 for the other populations is difficult, due to the fact that community profiles were not compiled for "Hexham State Suburb" and the state suburbs which create the 'Surrounding Northern Suburbs' for the 2001 Census. However, 2001 unemployment figures for Newcastle LGA and each of the state suburbs included in the 'Surrounding Southern Suburbs' region were all higher than their comparative 2006 unemployment rates (with the exception of Fletcher which maintained its 2001 rate). These were: Newcastle LGA: 11.1%, Surrounding Southern Suburbs: 10.4%.

More recently, unemployment information released for the September Quarter 2007, reflects the ABS data which shows a pattern of decreasing unemployment figures and rates. The Statistical Local Areas of Newcastle (Inner and Remainder), displayed in Table 44 below reveal an ongoing steady decline in unemployment numbers and rates over the past year from September 2006 to September 2007.

Table 44: Newcastle Unemployment; September Quarter 2007.

	Unemployment					Unemployment Rate (%)					Labour Force
Statistical	Sep	Dec	Mar	Jun	Sep	Sep	Dec	Mar	Jun	Sep	Sep
Local Area	2006	2006	2007	2007	2007	2006	2006	2007	2007	2007	2007
Newcastle - Inner	266	264	240	218	194	9.4	9.4	8.6	7.9	7.1	2,744
Newcastle - Remainder	4,606	4,602	4,273	3,919	3,525	6.3	6.4	6	5.6	5	70,496

Below shows the labour force participation rate across the subject populations. Surrounding northern suburbs (such as Beresfield, Tarro, Thornton, Woodberry and Millers Forrest) enjoy a higher participation rate than NSW. The unemployment rate across all local and regional profiles, are higher than the NSW unemployment rate. This gap supports the need for increased employment opportunities throughout the region, which could subsequently be created through the proposed QR National development.

Table 45: Labour Force Characteristics ABS 2006.

	Surrounding Northern Suburbs	Surrounding Southern Suburbs	Hexham	Newcastle LGA	NSW
Persons aged 15 years and over	12,943	11,978	123	117,434	5,250,259
Labour force status:					
Employed, worked full-time	4,721	4,139	38	37,989	1,879,628
Employed, worked part-time	2,341	2,303	16	20,373	842,715
Employed, away from work	515	498	3	4,066	187,104
Unemployed, looking for work	532	469	10	4,889	183,157
Total labour force	*8,109*	*7,409*	*67*	*67,317*	*3,092,604*
Not in the labour force	4,263	4,082	52	43,000	1,801,010
% Unemployment	6.6	6.3	14.9	7.3	5.9
% Labour force participation	61.6	58.2	54.9	57.3	58.9

Economic Overview and Context of TSF Project

In 2007 ARTC, having secured a 60 year lease on NSW and interstate rail lines, produced the Hunter Valley Coal 2007-2012 Capacity Strategy. This was the basis for its investment over the next 5 years.

The Hunter Valley Coal 2007-2012 Capacity Strategy identified the following problems to be resolved:

- Bottlenecks, junction conflicts and reduced headways;
- Conflicts between maintenance and train running;
- Limited capacity (single track sections, wagon capacity, train length limitations);
- Inadequacies in maintenance sidings; and
- The demands of rapid growth.

In 2007 the Hunter rail network had capacity for 85 million tonnes per annum (mtpa) of coal, and growth in demand was predicted to reach up to 177mtpa of coal in 2012.

At that time the need for strategies to increase the network's efficiency, capacity and reliability where in clear focus and the QR National proposal was assessed as being in logical support and continuity with ARTC plans.

QR National's proposal is considered consistent with and supportive of the Hunter Valley Coal Capacity Strategy. The proposed development complements the ARTC's plans to relocate all train maintenance and servicing activities out of the Terminals. QR National's proposal will assist to alleviate congestion at the Terminals and enhance the capacity of the Hunter Valley's rail network.

The ARTC reports annually on its priorities, progress and projects in terms of improving the overall efficiency and effectiveness of the network. The 2011-2020 ARTC report continued to provide the context and in-principle support for the QR National project. The report states "For much of the period since the first strategy, the infrastructure solutions have been comparatively straightforward. The rapid growth in demand meant that the primary focus was on delivery of projects to meet the growth. ARTC believes that it has now reached the point where its ability to deliver projects is comfortably ahead of demand and it is increasingly focussed on optimising the management of the delivery program." It further states that they are turning their attention to examining congestion and disruption planning as the network gets increasingly busier. They confirm there is a need to not only optimize capacity but to optimize operational efficiency. They confirm that relocation of fuelling and other provisioning and inspection activities away from the terminal at Kooragang has long been considered the best solution in this regard.

The report explains that PWCS Kooragang Island facility has six departure roads for its three dump stations, but only one arrival road for each dump station. As a result, trains need to queue on the Mainline before being called forward into the arrival road as the preceding train moves through the dump station. The other critical issue at PWCS Kooragang Island is the use of the departure roads for stabling trains while locomotives are serviced and fuelled and trains are examined, and for holding trains where there is a time delay before their next run. PWCS Kooragang Island plan to increase capacity up to the order of 105mtpa with the construction of a fourth dump station on the existing PWCS Kooragang Island loop. Development of dump station four will exacerbate the existing problems, and poses significant issues in terms of providing adequate and suitably configured arrival and departure capacity. There is concern over congestion issues arising from growth, given the limited availability of arrival roads and the use of the Mainline for queuing which underscores the growing system capacity loss as a result of congestion.

Economic Context

Continuing strong world demand for coal is encouraging major investment across the entire HVCC; this includes the establishment of new mines, increasing investment in the rail system, and initiatives to increase the coal export capacity of the Port. Several major new coal projects and expansions to existing projects have been precipitated by high coal prices and strong demand. The combination of high output from existing mines, the coming online of new mines and extensions to the capacity of existing mines, is set to significantly increase the supply of coal eligible for transport to the Port.

When the QR National TSF project was originally conceived in 2007/8 the ARTC (2007- 12) had identified expenditure of $918.2m over the next five years. This was in addition to $71.1m identified for "minor upgrades" and $156.4m identified for major periodic maintenance/renewal.

The updated 5 year expenditure forecast from 2011-2015 of $854.8m is significantly less than that of previous years. This is due to some major projects being completed, the industry decision to not pursue a multi-user provisioning facility, and lower cost solutions for Nundah Bank and the Liverpool Ranges being identified. The Report in no way indicated a weakening of the coal export market or growth of mining in the region.

However, there may be some confusion around this issue. The ARTC's forecasts of industry demand for export coal capacity from the Hunter Valley identified a decline in demand from 2007 to 2011.

- 2007 Report 2012 demand projection 170mtpa;
- 2009 Report 2012 demand projection 190mtpa;
- 2011 Report 2012 demand projection 163mtpa.

The decline in export coal capacity demand was due to changes in the forecasting methodology. The ARTC Bi-annual Reporting of coal transport demand is now separated based on those estimates which are subject to an indicative contractual nomination and those that are prospective volumes in the planning stage. The 2011 Report has indicative contractual nominations reported, whilst prospective volumes are excluded.

The Annual reports of the Newcastle Port Corporation provide evidence of the strength and growth of the Hunter coal mining industry. In the period from 2006-2007 to 2010-2011 coal shipped through the Newcastle Port had increased from 80.77 million tonnes to 108.26 million tonnes – an increase of 34%. In terms of export value, coal trade was estimated at $5.7b in 2006-2007, increasing to $13.55b in 2010-2011, representing an increase of 138% or an average annual increase of 34%.

The Newcastle Port Corporation anticipated that by 2012 the Port will have a loading capacity of 123.6 million tonnes of coal. Furthermore, export coal supply has the potential to reach 275Mtpa between 2017 and 2025. The Newcastle Port Corporation assert the most significant component to expanding coal chain capacity will be sufficient below rail capacity along with support infrastructure to park, refuel and maintain trains.

Context in the Port of Newcastle

Stage 1 of the NCIG Terminal was completed in May 2010 with a capacity to handle 30Mtpa. As at October 2011, NCIG had loaded 20mtpa onto 300 ships. Output through NCIG has already approached loading capacity. Stage 2AA commenced construction in August 2010 and is expected to have a loading capacity of 53Mtpa when completed.

PWCS is pursuing the development of Terminal 4 (T4) to ensure they maintain the Capacity Framework Arrangements which supports the long term infrastructure for the HVCC. T4 is expected to have a maximum capacity of 70Mtpa in Stage 1, 95Mtpa in Stage 2 and 120mtpa when completed. The project has a 10 year time frame with target commencement in 2013.

The Newcastle Port Corporation has graphed the projected coal export capacity (Figure 36) which is expected to grow at 6% per annum.

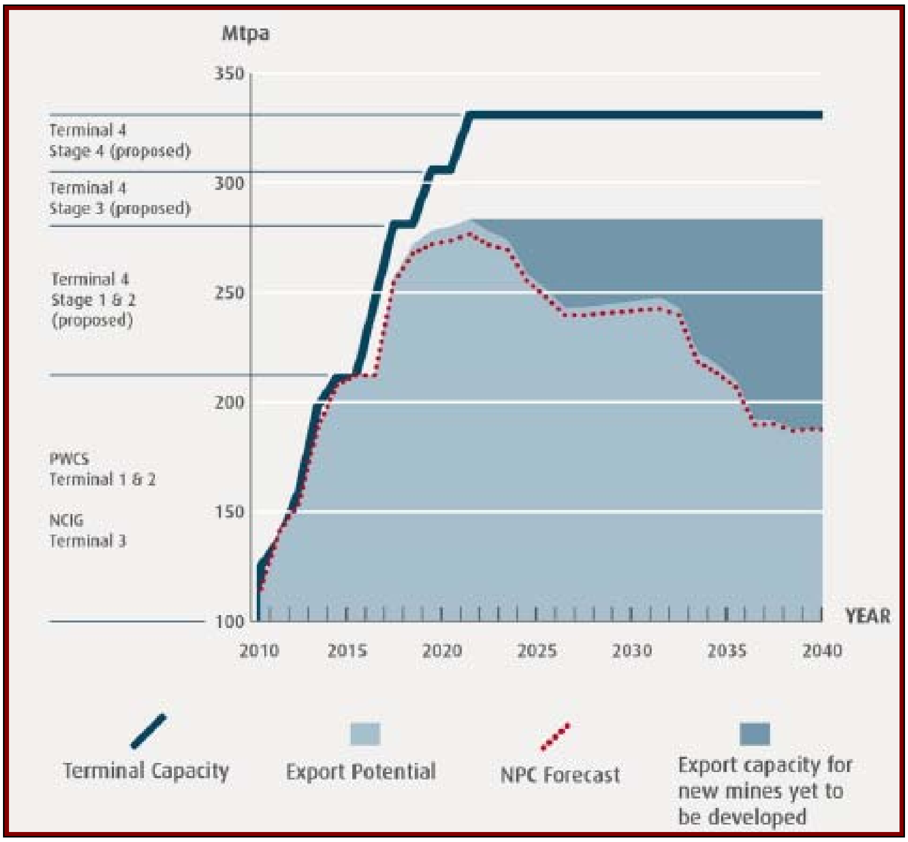

Figure 36: Port Export Capacities.

Global energy consumption is forecast to grow at 53% between 2008 and 2035. Coal will continue to provide a significant proportion of energy needs. Australia is expected to produce 31% of OECD coal production and 7% of total world production by 2035.

In summary there is considerable evidence that HVCC infrastructure needs to be aligned to the future demand for export coal. This is already being addressed by stakeholders who are already undertaking and proposing significant infrastructure investment.

9.16.2 Impact Assessment

Location Considerations

Assessments over the last five years have confirmed the suitability and capability of the Hexham site for the TSF. These locational considerations include:

- The availability of level land immediately adjacent to the existing rail line;
- The ability to keep wagons attached to locomotives during servicing avoiding cost and delays;
- The dimensions of the site to accommodate existing and future train lengths;
- Appropriate industrial zoning and history of industrial/coal related uses;
- The potential for minimal environmental and community conflicts associated with the site;
- The availability of a large scale property in single ownership;

- The adequate depth of the site from the rail line to accommodate the most efficient servicing of rail fleet;
- The ability to amalgamate like and related uses and develop synergistic relationships and activities; and
- The site's close access to a trained and skilled labour force.

Economic Advantages

The opening up of the coal haulage market to competition is the principal benefit of the QR National proposal. The establishment of a TSF will improve QR National's competitiveness by reducing costs, minimising off track time, and improving reliability. This in turn would work to drive down haulage prices. Further, improved efficiency and more competitive pricing would result from becoming self-sufficient, rather than relying on third party facilities and suppliers.

From a broader system perspective, there is a very real need to maximise existing rail network utilisation to support increased capacity of the system and access to the port. Projects such as the QR National TSF have been widely recognised as part of a wider strategy to improve coal chain efficiencies and to ensure continued business viability and market growth.

The proposed TSF aims to improve the efficiency of train time-tabling, maximise haulage time, reduce down time and improve reliability. All these variables will combine to improve competitiveness and at the same time reduce haulage costs which underpin the international competitiveness of the industry.

One of the most significant benefits of the QR National proposal will be the freeing up of land at the Port which is currently used for train servicing. This will enable Kooragang Island to be used for more specific port related functions, thus improving the capacity and efficiency of the existing port facilities.

Employment Considerations

The employment considerations associated with the TSF include the following benefits:

- Ongoing full time equivalent employment of approx. 30 persons;
- Building on and expanding the regions long history and skill base in the rail support sector;
- Skills retention and development;
- Construction employment of up to 20 months of 100 FTE workers; and
- Flow on and multiplier benefits of both the operation of the facility and from increasing the coal chain's overall export capacity.

The most immediate impact will come from the construction phase. Construction investment includes employment and payment of wages, the purchase of construction materials and products. This results in induced consumption and production impacts in the economy. The multiplier effects have been estimated using ABS and Australian National Accounts: Input-Output Tables 1996-97 (ABS Catalogue 5209.0). Tables 46 and 47 identify first round effects, industrial support effects and consumption induced multiplier effects at rates of $0.466, $0.438 and $0.962 respectively to every dollar of construction.

Table 46: Construction Multiplier Effect on Employment - $130m Capital Investment.

Train Support Facility	Effects Direct	Production Induced Effects		Consumption Induced Effects	Total
		First Round Effects	Industrial Support Effects		
Multipliers	1	.33	.45	2.33	4.11
Employment No. per $million	5.59	1.84	2.52	13.02	22.97
Total job years created	727	239	328	1,693	2,986

The proposed development will generate 839 job years directly during construction, with a further 567 to 1,693 positions created from production and consumption induced effects. Therefore, based on an initial construction cost estimate of $130m, the proposed development will generate 2,986 job years in the economy.

Table 47: Contribution to the Economy from Construction of TSF.

Train Support Facility	Direct Effects	Production Induced Effects		Consumption Induced Effects	Total
		First Round Effects	Industrial Support Effects		
Output multipliers	1	0.466	0.438	0.962	2.866
Output ($millions)	$130m	$61m	$57m	$125m	$373m

The multipliers presented above indicate a construction project costing $130m could result in a positive wider multiplier effect factor of 2.86. This is derived from the combined benefit from production induced effects and consumption induced effects. However, it is important to note that multiplier effects tend to impact at a national level and do not necessarily have a local level impact. At this stage of the project, state or local level impacts cannot be precisely quantified because the factors that feed into the assessment of multipliers (such as the origin of materials and construction contracts) have not been determined.

The ABS notes that "Care is needed in interpreting multiplier effects; their theoretical basis produces estimates which somewhat overstate the actual impacts in terms of output and employment. Nevertheless, the estimates illustrate the high flow-on effects of construction activity to the rest of the economy. Clearly, through its multipliers, construction activity has a high impact on the economy."

While the specific direct and indirect employment and economic impacts of the TSF construction are considerable, it is the continuous underpinning and strengthening of the foundations and efficiencies of the coal chain that will secure employment and economic benefits to the region in the longer term.

The ongoing operation of the facility will also have multiplier effects as a result of the payment of wages and from employee's subsequent spending patterns in the local and surrounding economy. As a result, the project will contribute to the New South Wales economy. Table 48 shows the likely contribution of the project to NSW Gross Domestic Product (GDP).

Table 48: Contribution to NSW Gross Domestic Product of TSF.

Effects Direct Production Induced Effects	Consumption Induced Effects Total
	Value
Total Workers (Industrial/Other)	30
Average Salary #	$60,000
Total Wages	$1,800,000
Initial Income Multiplier	2.72
Imputed Turnover (actual + initial multiplier)	$6,700,000
Weighted Avg Direct Value Added Multiplier	0.3333
Direct Value Added	$2,200,000
Direct and Flow-on Value Added PER ANNUM	$8,900,000

Estimated average earnings based on comparative projects, 2006 ABS average weekly earnings for Transport and Storage sector.

The above table indicates that the direct contribution and multiplier (flow on) contribution of workers during the operation of the TSF is expected to result in an annual contribution to the NSW GDP of $8.9m.

Impact Analysis

There will be two levels of impact: firstly, impacts on the neighbouring and adjoining communities and environment; and secondly impacts on the much wider regional community and economy. As is typical, the negative effects are mostly associated with the near neighbour community and the significant positive benefits will flow to the wider regional and state communities.

Potential positive socio-economic impacts include:

- Employment generation associated with the construction and subsequent operation of the TSF;
- Increased efficiency and cost competitiveness in the coal haulage network;
- Enhanced capacity of the coal rail network;
- Increased ability to deliver growth in coal volumes to the Port and subsequent increases in exports;
- Increased capacity of the rail system without increasing the number of tracks through large built up residential communities;
- Development of employment opportunities that build on the region's core competencies and workforce skills and training facilities;
- Freeing up of land within proximity of the Port itself for high value port related activities;
- Multiplier effects associated with increased employment and regional spending; and
- Implementation of strategic planning frameworks which underpin other community and economic objectives for the region.

Potential negative socio-economic impacts include:

- A potential adverse impact on lands of environmental importance both on site and in the adjacent Hexham Swamp; and
- Potential deterioration of the living amenity of near neighbours including visual, traffic and acoustic impacts principally during construction.

It is considered that the potential positive socio-economic impacts outweigh any potential negative impacts on near neighbours. Further that these potential negative impacts can to a significant extent be mitigated with good design, preparation and planning.

To the extent that environmental issues (which are the subject of separate independent reports) also have a socio-economic impact, it is considered that while onsite environmental impacts require the employment mitigation strategies, any potential adverse impacts can be mitigated and managed via approvals conditioning.

This development will represent a strong net socio-economic benefit for the local, regional and national communities.

It is, however, important to appropriately acknowledge and make the distinction between local impacts and wider impacts. It is considered that while potential negative impacts are generally of lower importance or degree, there is a responsibility for QR National to ensure good communications, planning and monitoring to mitigate the local impacts as much as is possible.

9.16.3 Mitigation Measures

The following mitigation measures will be implemented to enhance positive impacts and mitigate negative impacts of the proposed development.

- Adopt recommendations from other expert consultant's reports to enhance amenity and site accessibility, and minimise environmental impacts.
- Develop a 'Near Neighbour Consultation Strategy' for ongoing proactive engagement and communication with surrounding and adjoining residents. Within this strategy, develop and implement policies which aim to increase project knowledge and develop community-staff relations.
- Conduct an open day during the public exhibition period to show and explain the project to interested community members and have technical staff in attendance to answer questions and provide explanations.
- Use existing social structures and venues such as Hexham Bowling Club to disseminate information and receive input.
- Establish an email address for business and community stakeholders to forward questions and make comment during the exhibition of the project proposal.
- Employ ongoing monitoring procedures, including air quality, acoustic and environmental. Incorporate acoustic, pollution and visual mitigation strategies wherever necessary and/or possible throughout the construction and operation phases. Provide open reporting to the community via newsletters.
- Provide local residents, near neighbours and key community stakeholder groups with an information package at the open day on request via email. This could include a finalised site plan, flood management plan, traffic and onsite route overview, timeline

for staged development as well as an artist's impression of the proposed development. This will assist in mitigating community concerns and answer key questions that have been publicly raised.

- Wherever possible utilise regional businesses, resources and materials for construction and operations.
- Where possible promote the employment of local and regional workers to retain and develop the local skills-base.
- Security, design and protocols should ensure the general public do not access the TSF site.
- All safety requirements under WHS guidelines should be employed during design, construction and operational phases.
- Keep near neighbours informed of decisions regarding access arrangements to the development site, any transport arrangements during construction or any one off events that might impact on them.
- Maintain open and direct communications with ARTC and the HVCCC to ensure that potential benefits of the project are maximised and negative impacts minimised; and that as much as possible synergies between the two projects are realised to the widest benefit.
- Ensure clear and appropriate information is provided to key stakeholders regarding regional transport planning.
- Related planning and housing agencies and organisations should be provided with early and adequate information regarding the employment and housing demands of the project to best manage supply issues.

9.16.4 Conclusion

An Economic and Social Impact Assessment has been undertaken in relation to the proposed QR National TSF. Subject to implementation of the above mitigation measures, it has been found that the proposed development will represent a strong net socio-economic benefit for the local, regional and national communities.

9.17 WASTE MANAGEMENT

9.17.1 Existing Environment

The site is partly vacant and filled industrial land, part agriculture and grazing and part used for effluent disposal by the Brancourts' facility. No construction or industrial waste is currently generated on the site.

9.17.2 Impact Assessment

The *NSW Waste and Resource Recovery Strategy 2007* (NSW WARR) aims to maximise the conservation of natural resources and to minimise environmental harm from waste management and disposal of waste.

Inadequate collection, storage and disposal of waste generated during construction and operational activities may have the potential to pollute the surrounding environment, including soil and water.

Relevant waste reduction principles under the NSW WARR are:

- Preventing and avoiding waste;
- Increased recovery and use of secondary materials;
- Reducing toxic substances in products and materials; and
- Reduce litter and illegal dumping.

Waste Generation

Waste would be generated during construction and operation of the proposed TSF.

Potentially waste generating activities would include excavation, construction of buildings, laying hardstands, road and rail infrastructure works, drainage works and equipment operation and maintenance.

Construction Waste

Preparation and excavation works can generate wastes such as spoil, concrete and building rubble which are classified as General Solid Waste (Non-Putrescible) under DECCW's *Waste Classification Guidelines*.

There is the potential for contaminated fill on former industrial areas to be exposed during site excavation works but it will be retained and managed on site.

Construction activities are likely to produce various waste types, including building rubble, concrete, scrap metal, steel, scrap wood and packaging materials. These waste types are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*.

The operation and maintenance of construction equipment is expected to produce small quantities of spent solvents, empty containers, used oil, batteries, lighting equipment and engine oil which would be classified as Hazardous Waste under DECCW's *Waste Classification Guidelines*. Construction site office-related activities are likely to generate wastes such as cardboard, paper, plastic and glass.

Operational Waste

Waste types likely to be generated during operation of the TSF include cardboard, paper, plastic, glass, used cartridges, food/organic waste, vegetation/green waste, machinery parts, scrap metal, oils, used rags, spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil.

Office activities during operation are expected to produce cardboard, paper, plastic, glass and used cartridges which are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*. Site personnel would also generate food/organic waste which is classified as General Solid Waste (Putrescibles) under DECCW's *Waste Classification Guidelines*.

9.17.3 Mitigation Measures

Construction Waste Management

A Construction Waste Management Plan (CWMP) would be prepared prior to the commencement of construction on the site. The CWMP would form part of the CEMP. These plans would address appropriate waste identification, handling, storage and disposal in accordance with the DECCW Guidelines. The different waste streams would be stored separately, collected and disposed of by licensed waste contractors.

The objective of the CWMP is to minimise waste generation by contractors during construction of the Project and by the operator during the life of the project. The specific objectives of the plan are:

- Identification of the types of waste likely to be generated during construction;
- Appropriate storage of waste on site;
- Measures to minimise the amount of waste produced;
- Measures to increase the potential for waste to be re-used and recycled;
- Appropriate methods to assess if waste can be re-used, recycled or disposed to landfill; and
- Maintaining records of waste re-use, recycling and/or disposal.

Construction activities would be carried out as detailed in the CWMP and CEMP to minimise the potential for exposure to contaminated soils. Storage of hazardous waste would prevent or control accidental releases to the air, soil and water resources of the area. Storage provisions would include:

- Adequately sized and organised storage areas including physical separation such as walls or containment bunds as necessary;
- Protection from weather and sunlight:
- Secondary containment systems to prevent loss to the environment;
- Secondary containment being at least 110% of the largest storage container, or 25% of the total storage capacity (whichever is greater) for liquid hazardous waste; and
- Adequate ventilation where volatile wastes are stored.

Hazardous waste storage activities would be subject to special management actions, conducted by employees who have received specific training in handling and storage of hazardous wastes. Management actions would include:

- Provision of readily available information on chemical compatibility to employees, including labelling each container to identify its contents;
- Limiting access to hazardous waste storage areas to employees who have received proper training;
- Clearly identifying (label) and demarcating the area, including documentation of its location on a facility map or site plan;

- Conducting periodic inspections of waste storage areas and documenting the findings; and
- Preparing and implementing spill response and emergency plans to address their accidental release.

Operational Waste Management

An operational WMP will be required to address the ongoing handling, storage and disposal of waste. Licensed waste contractors would be made responsible for collection and appropriate disposal of waste.

General waste (putrescibles and non-putrescibles) generated during the operation of the proposed TSF would be stored, reused, recycled or disposed of in the same manner as described for construction waste above.

Hazardous waste management requirements would be as outlined in the construction waste management section above.

Identification of the waste handling strategy is detailed in Table 49 below.

Table 49: Waste Handling Strategy.

Proposed Waste Handling Strategies		
Waste	**Storage Location**	**Disposal Method**
Timber (pallets, wood blocks)	Collected in recycling area.	Remove off site or wood chip for reuse on landscaped areas.
Oiled rags	Collected in dedicated identified bins within the workshops.	Removed by licensed contractor as trade waste.
Coolant	Circulated to waste coolant collection tank after a number of reuses.	Removed by a licensed contractor to an approved facility as trade waste.
Paper	Collected in various recycling areas around the site.	Removed from site by a waste recycling contractor.
Cardboard	Collected in various recycling areas around the site.	Removed from site by a waste recycling contractor.
Scrap metals /Aluminium	Collected in dedicated recycling bins within the workshops.	Removed from site by a waste metal recycling contractor.
Contaminated oily sand	Stored in an impervious concrete bunker.	Potential for insitu treatment within concrete bunker to be later reused on site for landscaping.
Cleaning rags	General waste bins.	Normal waste removal or removed as Trade Waste, depending on the quantity produced.
Waste oil	Circulated to waste oil collection tank.	Removed by a licensed contractor to an approved facility for recycling.
Oil filters	Collected in waste oil area, then drained.	Oil is drained before removal by licensed contractor as trade waste.
Used batteries	Self-bunded pallet storage in store.	Removed by a licensed contractor to an approved facility for recycling.
General waste	General waste bins	Normal rubbish removal
Paint	Small quantity of tinned paint for touch ups. Held in the store.	Pour liquid paint into sand and allow to set. Dispose of into an industrial waste bin. Removed by a licensed contractor as trade waste.
Plastic wrap	General waste bins.	Normal rubbish removal.
Food waste	General waste bins or in-situ compost bin.	Normal rubbish removal or reuse on landscaped areas.
Air conditioning gas	Recovered using approved A/C equipment stored with empty gas cylinders.	Exchanged with licensed contractor.
Glass	Collected in dedicated recycling bins.	Removed by municipal contractor to municipal recycling centre.
Chemical solutions e.g. chlorates, surfactants, resins, glues	Designated chemical storage area within the store.	Removed by a licensed contractor to an approved facility as trade waste.
Oil/grease from separator	Storage tank adjacent equipment.	Removed by a licensed contractor to an approved facility as trade waste.
Clinical waste	Minimal requirement. Will have "sharps" disposal containers and waste bin in first aid room.	Removed by a licensed contractor to an approved facility as trade waste.
Electrical waste	Old computer equipment etc. held in store.	Removed to municipal recycling centre.
Residue from industrial waste treatment or disposal	Storage tank/bin adjacent equipment.	Removed by licensed contractor to an approved facility as trade waste.
Sewage sludge	Tank storage incorporated within package plant.	Removed by a licensed contractor to an approved facility as trade waste.

Transportation of Waste

Transportation of waste would be conducted so as to prevent or minimise spills, releases, and exposures to employees and the public. Specific procedures for waste transport would be included in the WMP.

Monitoring

Waste management would include regular monitoring as detailed in the WMP and include:

- Regular inspection of all waste storage collection and storage areas;
- Verification that wastes are properly labelled and stored;
- A detailed record keeping system;
- Checking of trains, bins and systems documentation; and
- Regular audits.

9.17.4 Conclusion

A range of waste types and quantities will be generated during construction and operation.

Avoidance and management measures would be required in order to prevent potential environmental harm from waste.

Waste will be minimised and managed for reuse onsite where possible and recycling where not. Hazardous waste would be subject to strict storage procedures and would be disposed of via a licensed contractor to approved sites.

A WMP would be required to provide a framework for sound waste management for all project stages and will form part of the CEMP and the OEMP. These documents will ensure that waste is managed in accordance with relevant statutory and policy requirements and that the potential for environmental harm is minimised and all relevant risks have been reduced to acceptable levels.

9.18 VISUAL

9.18.1 Existing Environment

The subject site lies at a low elevation and is of flat topography. Contextually, the site is surrounded by the following land uses (Figure 37):

- The New England Highway to the north and east;
- The Great Northern Rail Line to the north and east;
- The Hexham industrial area to the east and south east. The Hexham rail station is also located within this area;
- The Hunter River is located east of the New England Highway and the Hexham industrial lands;

- Hexham Swamp to the south west; and
- Rural lands to the south and west.

The project area is generally cleared and disturbed. Exotic grassland is the dominant vegetation type. The site displays a semi-rural character with minimal tree cover.

The site is not located in a prominent position or within an important view corridor and public views to the much of the site are screened by an existing row of trees along the western side of Maitland Road (New England Highway) and industrial land to the east of the site (Brancourts facility). Views into the site from the north are limited for passing motorists using the New England Highway.

The site is considered to have a low scenic amenity.

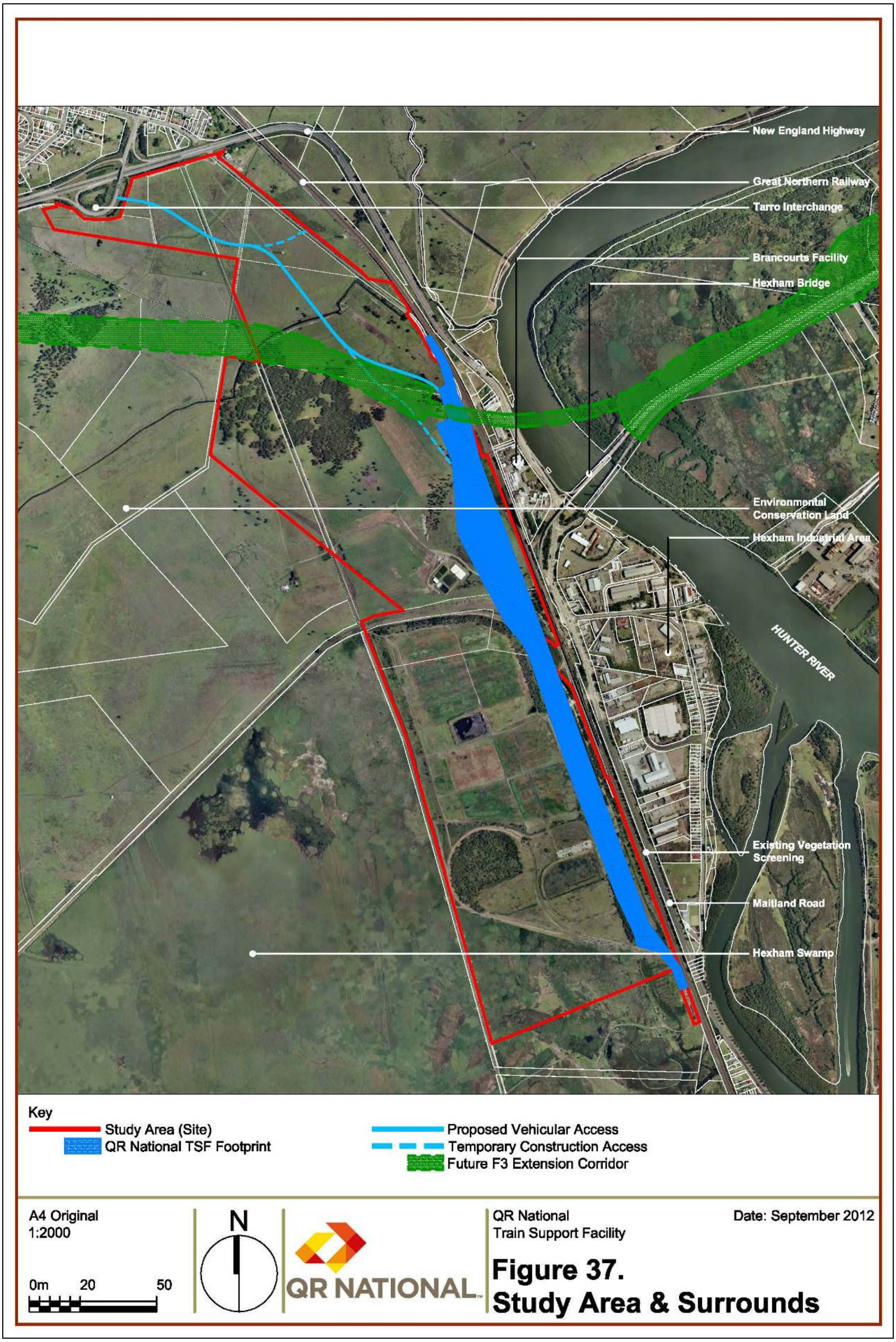

Figure 37: Study Area & Surrounds.

9.18.2 Impact Assessment

The proposed built form on the site does not comprise any tall buildings. The buildings proposed within the TSF are of approximately two storey height. Buildings of this height will not be visually prominent based on the reasons outlined above. The proposal will have no adverse visual impacts.

9.18.3 Mitigation Measures

The following mitigation measures are recommended:

- Following construction, consideration will be given to landscaping treatment throughout the developed area of the site. Appropriate locations will be determined based on environmental, operational and safety considerations; and
- Buildings will be constructed of low reflective materials and colours will be of earth tones.

9.18.4 Conclusion

The subject site is considered to be of low scenic value and is not located within any prominent public view corridor. The site location, topography, existing screening, proposed low level building heights and intended use of low reflective materials will ensure that the TSF has no adverse visual impact.

Figure 6 in Section 6 identifies a visual perspective of the building and track layout of the proposed facility.

9.19 CUMULATIVE IMPACTS

The potential cumulative impacts of the proposal have been assessed. There are both existing and proposed developments in the area sensitive to cumulative effects. The proposed project is likely to be fully operational by 2016. This assessment addresses cumulative impacts likely to arise from the combination of existing development and other recently approved projects.

9.19.1 The Cumulative Impact Context

The proposal is an extension of the NSW rail network capacity and the coal production and transport network of the Hunter region. The cumulative impacts of the proposal sit in the broader context of a more efficient rail network.

The specific context is the site, adjoining development, adjoining infrastructure, the local natural environment and the community.

9.19.2 Future Development Proposals

Future infrastructure development in the vicinity of the site includes:

- An extension of the F3 Freeway will cross the land to the north of the TSF site;
- ARTC are seeking approval for additional tracks in the rail corridor immediately to the east of the site.
- The conceptual Fassifern to Hexham Rail Link may join the Mainline in the vicinity of the TSF site.

9.19.3 Local Sensitivities

There is a range of local land uses with potential sensitivities to cumulative impacts and are listed below. These land uses and the list of uses and sensitivities is:

- The Hexham industrial area east of the site;
- The residential area of Tarro, 1 - 2km to the north of the TSF Site;
- The Hunter River east of the site;
- The location of the site on the Hunter River floodplain;
- An area of SEPP 14 Coastal Wetlands on the site and other areas of vegetation; and
- The Hexham Swamp is an ecologically important area adjoining the site to the west.

Not all would be affected by cumulative impacts linked to the proposal.

9.19.4 Traffic and Transport

Access to the site will be via the New England Highway off the Tarro Interchange. The traffic assessment finds that the additional traffic levels generated by the operation of the proposal are insignificant.

9.19.5 Aboriginal Heritage

The cumulative impact to Aboriginal heritage in the area is limited given that:

- The net development footprint does not affect a high proportion of any particular landform present within the region;
- A comparable suite of landforms (swamps and swamp margins) contain similar archaeological resource occur in multiple contexts within the local area;
- All high density deposits identified to date occur outside the development footprint;
- The placement of the development within the swamplands and within the disturbed context, ensures the cumulative impacts are focused in areas of lower archaeological potential, ensuring impacts are kept to a minimum;
- Plans have been altered to ensure that no part of the surface expression of site HS1 will be impacted upon, thereby retaining a representative archaeological and cultural resource for the study area;

- A small portion of the potential subsurface expression of site HS1 (PAD) may be impacted upon. Test excavations will assist in identifying the nature and extent of any sub-surface materials and allow the proposed development flexibility to plan around such evidence; and
- The PCD has also been subject to long term past land uses (impacts) that have resulted in a disturbed landscape. As a consequence of these disturbances the representative value of the cultural resource is lessened. The majority of the PCD will remain undisturbed, the only disturbance will include the access track, and the remainder will be protected.

9.19.6 Noise and Vibration

There is potential for cumulative noise impacts associated with the project however the only effect is likely to be during construction. Construction noise impacts can be managed using the CEMP.

9.19.7 Air Quality

No significant cumulative effects were identified by the Air Quality Impact Assessment which included GHG.

9.19.8 Hazard and Risk

There is a potential risk to surrounding land use from the proposal. Following implementation of mitigation measures the residual risk is not considered significant. No significant cumulative risk arises from the interaction of the proposed TSF with other development and hazards in the locality.

9.19.9 Flooding

The proposed development and access are located adjacent to the Hunter River. There is the potential for changes that affect flood behaviour and drainage in the locality.

The cumulative flooding impacts, including the future F3 extension and ARTC additional tracks, have been assessed by WBM BMT.

Overall there is no significant cumulative flooding impact from all proposed developments for the 1% AEP (1 in 100 year) flood.

9.19.10 Ecology

The proposal will result in the loss of part of a disturbed SEPP 14 Coastal Wetlands area, some EEC and pasture for access requirements. These are cumulative impacts which have been recognised and mitigated through proposed environmental offsets.

The stormwater from the site has the potential to affect adjoining wetlands through altered wetting and drying cycles and additional runoff from hardstand areas. The proposed stormwater drainage system will manage both the quality and quantity of water coming off the site. This will prevent any cumulative impacts arising from altered drainage.

9.19.11 Infrastructure

The overall additional load on existing infrastructure is minimal due to the project being a new location for an existing enterprise. There are no significant local capacity thresholds that will be exceeded by the proposal.

The proposal will make adequate provision for connection to existing infrastructure as required.

9.19.12 Social and Economic

The cumulative effects are positive for social and economic considerations.

Construction would generate significant direct and indirect employment opportunities for the Lower Hunter Region during this period, as well as in NSW as a whole.

The efficiency of the coal transport chain is of significant importance to coal export and therefore the NSW and Australian economies.

Overall, beneficial cumulative impacts would be expected from the proposed TSF.

9.19.13 Mitigation Measures

The mitigation measures proposed to apply to the project will prevent both direct and cumulative adverse impacts.

9.19.14 Conclusion

Although there is the potential for some adverse cumulative impacts they are addressed by proposed mitigatory measures and project design.

The potential for significant adverse cumulative impacts in combination with the ARTC HRR Project and new development and infrastructure augmentation is unlikely.

Overall the cumulative impacts are likely to be beneficial.

10.0 Ecologically Sustainable Development

This section describes how the proposed TSF addresses the principles of ESD. It also addresses future requirements for adopting sustainability strategies, a number of which relate to climate change.

Australia's national Strategy for Ecologically Sustainable Development (1992) ("NSESD") defines ESD as:

> *"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased."*

10.1 SUSTAINABILITY

10.1.1 Principles of ESD

The EP&A Act encourages ESD in line with four sustainability principles being:

- The precautionary principle;
- The principle of intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation, pricing and incentive mechanisms.

> *The* ***precautionary principle****, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

The precautionary principle has been addressed by carrying out detailed EAS of the environmental characteristics of the site and surrounding area. The assessments have been used to determine potential environmental impacts and recommend environmental management practices and mitigation measures to ensure project impacts are minimised.

The potential for environmental impacts of construction and operation of the TSF are well known. While a number of potential threats are outlined in the residual environmental risk analysis in Section 12, none are considered likely to result in serious or irreversible environmental harm.

Measures to prevent environmental degradation during construction and operation include management plans and monitoring programs, and application of existing policies and best practices. This approach is consistent with the precautionary principle.

> *Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

Mitigation measures identified as part of this EA recognise the requirements to achieve, where possible, a neutral or beneficial effect on the environment. Benefits to future generations would be realised by:

- Strict applicant of mitigation measures to protect current and future values;
- Provision of employment positions during construction and operation;
- Direct economic benefits for the regional and State economy; and
- Investment in the Hunter Region and the Newcastle LGA.

Further discussion on the economic and social benefits of the proposed TSD is provided in Section 9.16.2.

Conservation of biological diversity and ecological integrity, namely that conservation of biological diversity and ecological integrity should be a fundamental consideration.

The industrial and agricultural history of the site (and surrounding area) has resulted in a site with limited biological diversity and ecological integrity. The proposed TSF is able to be constructed without any significant impact on the diversity and integrity of the locality. With the proposed environmental offsets, there would be no adverse impact upon threatened species, populations or ecological communities of their habitats as a result of construction or operation.

The proposed project would improve the management of stormwater runoff from the site which would result in benefits to water quality and the environment of the South Arm of the Hunter River and Hunter Estuary Wetlands.

Improved valuation, pricing and incentive mechanisms, namely, those environmental factors should be included in the valuation of assets and services.

This principle is addressed by actions such as polluter pays, full life cycle costing, and utilising incentive structures/ market mechanisms to meet environmental goals.

Offsetting for the loss of wetland areas recognises the environmental values of the site.

QR National is committed to sustainability through their Environmental Management System (EMS). QR National is committed to achieving the following objectives of the Environmental Policy:

- Establishing, monitoring, reviewing and continually improving environmental objectives, targets and action plans;
- Minimising the environmental impacts of operations and developments;
- Developing and maintaining effective Emergency Response Plans to protect the environment;
- Ensuring contractors engaged by QR National meet QR National's environmental standards and requirements and comply with relevant legislation; and
- Communicating the EMS to all employees and communicating the Environmental Policy to the community.

Consistent with QR National's commitment to sustainability, Section 10.1.2 below outlines how sustainability will be pursued for the Project.

10.1.2 Recommended Sustainability Actions

The following ESD considerations will be incorporated in the detailed design phase of the Project:

- The examination, application and adoption of energy efficient appliances and sustainability features into buildings (WELLS rated installations for plumbing and electrical appliances);
- Optimal use off natural light to reduce energy consumption (cost-effective lighting, sensor lights for yard and external buildings, controller on office lighting);
- Use of low environmental impact materials where practical (low emission fireboards, avoid CECs, minimise use of PVCs);
- Possibility for the use of photovoltaic cells and recycle technologies to improve efficiencies and become self-sufficient or feed back into existing water and energy grids;
- Maximise use of renewable material, fuel and energy sources (green energy – solar power, plantation timber and recycled material);
- Examining "state-of-the-art" technologies and how these may be incorporated into designs for new facilities or extensions to existing facilities, including pollution treatment systems (improving capability, capacity and output quality);
- Considerations of UDIA 'EnviroDevelopment' criteria including elements such as ecosystems (flora and fauna), waste (before, during and after construction), energy (GHG production and energy efficiency), materials (non-toxic and environmentally responsible), water (40% reduction in portable water demand and water efficiency) and community (consultation, transport, safety and facilities);
- Recycling/ reuse opportunities from treated wastewater into amenities, energy storage and rebate availability;
- Rainwater harvesting and reuse;
- Minimisation of the ecological footprint;
- Identification of areas to re-vegetate or rehabilitate to offset any removal of vegetation;
- Adopt the "reduce, reuse and recycle" principle wherever possible;
- Implementation of the proposed offset strategy identified in Section 9.2.4;
- Ensure vegetation corridors and buffer zones are established as part of a rehabilitation scheme; and
- Ensure that monitoring programs are in place to evaluate the effectiveness of rehabilitation and re-vegetation works.

10.2 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

The Australian Government has identified climate change as one of its policy priorities. The Government's climate change policy is built on three pillars:

- Reducing Australia's GHG emissions;
- Adapting to climate change that cannot be avoided; and
- Helping to shape a global solution to climate change.

A GHG assessment was prepared as part of the Air Quality Impact Assessment contained within Appendix Q of this EA. The proposed development would generate GHG during construction and operation.

The DGR's for the proposed TSF request that a GHG assessment (including an assessment of the emissions of the disposal/use of extracted coal tailings) be conducted taking into account the *AGO Factors and Methods Workbook (Australian Greenhouse Office*).

The TSF footprint has been revised and will have no impact on the coal tailings on the site and no coal tailings will be extracted/removed from the site as part of the proposed development, as such a GHG assessment has not been undertaken to assess the emissions from this activity.

The purpose of undertaking a GHG assessment is to determine the amount of GHG emissions estimated to be released as a result of the proposed development and to outline mitigation and management methods to be implemented.

GHGs produced via human activities (predominantly energy consumption) has been considered a major contributing factor to the observed changes in climate over the 20th century. Climate change is defined as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climatic variability observed over comparable time periods (IPCC, 2010).

10.2.1 *Greenhouse Gas Assessment Methodology*

Quantification of potential emissions relating to the proposed TSF has been undertaken in relation to both carbon dioxide (CO_2) and other non-CO_2 GHG emissions.

For comparative purposes, non-CO_2 GHGs are awarded a "CO_2-equivalence" (CO_2-e) based on their contribution to the enhancement of the greenhouse effect. The CO_2-e of a gas is calculated using an index called the Global Warming Potential (GWP). The GWPs for a variety of non-CO_2 GHGs are contained within the Intergovernmental Panel on Climate Change (IPCC), (1996) document "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories".

The GWPs of relevance to this assessment are:

- Methane (CH_4): GWP of 21 (21 times more effective as a GHG than CO_2); and,
- Nitrous oxide (N_2O): GWP of 310 (310 times more effective as a GHG than CO_2).

The short-lived gases such as carbon monoxide (CO), nitrogen dioxide (NO_2), and non-methane volatile organic compounds (NMVOCs) vary spatially and it is consequently difficult to quantify their global radiative forcing impacts. For this reason, GWP values are generally not attributed to these gases nor have they been considered further as part of this GHG assessment.

The GHG emissions associated with the proposed TSF have been assessed in terms of potential direct emission (Scope 1), potential indirect emission (Scope 2) and significant upstream/downstream (Scope 3) emission potential. A summary of the current and potential Project GHG emission sources is provided in Table 50 below.

Electricity and diesel consumption figures for the current operations at the KCT have been used as a baseline to assess potential GHG emissions.

Table 50: Potential GHG Emissions

Project Component	Direct Emissions	Indirect Emissions	
	Scope 1	Scope 2	Scope 3
Diesel	Emissions from the combustion of diesel at the proposed TSF in both mobile and fixed plant and equipment	Not Applicable	Estimated emissions attributable to the extraction, production and transport of diesel consumed at the site.
Electricity	Not Applicable	Emissions associated with the consumption of purchased electricity at the proposed TSF.	Estimated emissions from the extraction, production and transport of fuel burned for the generation of electricity consumed at the site and the electricity lost in delivery in the transmission and distribution network.

Further detail concerning Scope 1, 2 and 3 potential GHG emissions is contained within the Air Quality Assessment in Appendix Q.

10.2.2 Potential Impacts

The GHG assessment contained within the Air Quality Assessment in Appendix Q considers the impact of the proposed TSF and compares this predicted impact to that currently experienced as a result of the current Kooragang facility operations.

The construction of the TSF is short term in nature and it is anticipated that GHG emissions during the operation of the facility will be higher than those generated during construction. Therefore, the assessment of the construction of the TSF has not been considered in detail within the GHG assessment.

In order to undertake the GHG assessment, activity data for the current activities at the KCT with respect to total electricity consumption and diesel consumption was obtained from QR National for the period 1 September 2011 to 31 August 2012.

Due to expected increases in the coal industry/port operations, train movements are likely to increase. As such, QR National operations will eventually increase from 11 train sets (associated with the current Kooragang facility) to 38 train sets at the Hexham facility. For the purposes of being conservative, approximately 3.4 times more trains will be serviced at the proposed TSF. The proposed TSF will not directly result in an increase of train numbers.

A summary of activity data related to the current (Kooragang) and future operations at Hexham is provided in Table 51 below.

Table 51: Project Related Activity Data Relevant to GHG Emissions

Activity	Quantity for Project Operations	
	Current	Future
Annual Electricity Consumption (kWh)	19,316	65,678
Annual Diesel Consumption, onsite operations (L)	120,833	410,834

Direct (Scope 1) GHG emissions (CO_2-e) resulting from the operation of the proposed Hexham TSF are estimated to be 1,102 tpa, an increase of approximately 778 tpa on current Kooragang operations.

Indirect (Scope 2) GHG emissions (CO_2-e) resulting the operation of the proposed Hexham TSF are estimated to be 57.8 tpa, an increase of approximately 40.8 tpa on current Kooragang operations.

Emissions of GHG in NSW were reported to be 161 Mt in 2009, 27% of the Australian total GHG emissions of 545.8 Mt. Comparison of the emissions attributable to the proposed TSF with NSW and Australia emission totals is presented in Table 52 below.

Table 52: Comparison of proposed TSF GHG Emissions to State & National Totals

Emission Scope	Estimated Emissions (tCO_2-e/annum)	% of NSW 2009 GHG Emission Total	% of Australian 2009 GHG Emission Total
Scope 1	1,108	<0.001	<0.001
TOTAL (1, 2 and 3)	1,254.9	<0.001	<0.001

The GHG Assessment has found that the principal source of GHG emissions during the operational phase of the proposed TSF is the onsite usage of diesel, however the estimated emissions are considered negligible when compared to NSW and Australian emissions totals.

The impact of the proposed TSF on GHG emissions would be mitigated during construction by the reduction of fuel use and improved efficiency of plant machinery, vehicles and generators.

There are no sea level rise issues for the site although there is the likelihood of increased flooding risk and potential increased rainfall intensity that could affect stormwater management. These aspects of climate change have been considered in project design and assessment. Adequate mitigation and adaptation capacity for potential climate change effects has been included in the proposal.

11.0 Hazard and Risk

The DGRs call for the identification of hazards and risks associated with construction and operation of the development. These risks are associated with dangerous goods likely to be used on site, land contamination, processes or activities that have the potential to cause harm to people of the environment and risks associated with bushfires and flooding.

The TSF project entails the storage of diesel fuel and other substances associated with the day to day operation of the facility. The Protection of the Environment Operations Act 1997 sets requirements for protecting the environment from pollution. The Contaminated Land Management Act 1997 regulates the investigation and clean-up of land contamination. When using and storing liquid substances legal obligations exist to:

- Ensure that water does not become polluted;
- Prevent spills and leaks to the environment;
- Minimise air pollution;
- Dispose of wastes appropriately;
- Report land contamination; and
- Notify the regulatory authority (local council or OEH if material harm to the environment occurs or if contaminated land poses a significant risk of harm.

There are a number of AS relevant to liquid chemical storage. The *Environmental Protection Manual for Authorised Officers: Bunding and Spill Management Technical Bulletin* (EPA, 1997) provided guidance on the storage of liquid substances which have the potential to cause environmental harm. This has been superseded by *Storing and Handling Liquids: Environmental Protection Participant's Manual* which was produced by the DECC.

The Guide relates to bulk storage as well as smaller container or package storage of liquid substances and includes fuels, oils, industrial chemicals, paints, solvents, pesticides, fertilisers, waste liquids, wash water and process liquids. It provides an overview of legal obligations under NSW environment protection law and guidance on how to meet those obligations. It outlines the minimum environmental protection requirements for the storage and handling of any liquid substance.

The TSF above ground diesel fuel storage tanks will comply with the Australian Institute of Petroleum Code of Practice: *The Design, Installation and Operation of Underground Petroleum Storage Systems CP4-2002*.

11.1 DANGEROUS GOODS

A preliminary risk screening assessment has been undertaken in relation to the storage of dangerous goods on the site in accordance with the requirements of *SEPP 33* and DP&I's guideline document "*Applying SEPP 33*".

All fuels and hazardous substances at the site will be stored in self bunded above ground tanks. The main hazardous substance to be stored at the site is diesel fuel. It is to be stored in 100,000 litre tanks. Two tanks are initially proposed with capacity for expansion to 400,000 litres. It is anticipated that B-double deliveries will take place three to four times per day. Tanks will be located at the fuel storage farm on the west site of the site from where diesel will be pumped to the provisioning buildings. New and used oil will be stored in tanks with a capacity of up to 10,000-15,000 litres at the fuel storage farm.

New coolant will be stored in a 5,000 litre tank and used coolant in a 2,000 litre tank at the locomotive maintenance building. A 200 litre drum of petrol to be used for the maintenance vehicles will be stored at the service vehicle garage.

11.1.1 Preliminary Risk Screening

The purpose of the initial SEPP 33 risk screening is to determine if more detailed assessment is required. The risk screening assessment has been undertaken in accordance with the *guideline "Applying SEPP 33"*.

The TSF will have provision for diesel and smaller quantities of other fuels and other products required for the servicing of locomotives. These products fall under the category of dangerous goods as they can pose a risk to people, property or the environment, due to their chemical or physical properties.

Dangerous goods are defined by the Australian Dangerous Goods Code (ADG). The classification criteria used in the ADG is based on the United Nations Recommendations for the Transport of Dangerous Goods.

Petrol is the only substance to be stored that has a maximum threshold level. The amount to be stored is well below the maximum threshold level and therefore within acceptable limits and confirming that further assessment is not required.

Diesel and oils are classified as combustible C1 and C2 substances. They are only classified as Class 3 dangerous goods substances if they are stored with Class 3 substances. The development plan provides for a clear separation between the storage sites for diesel fuel, oils and petrol, accordingly the diesel and oil are not regarded as Class 3 and are not subject to a threshold.

An inventory of the substances to be stored and ADG threshold levels are set out in Table 53 below.

Table 53: Inventory of the substances to be stored at the TSF

Substance	ADG Class	Storage Capacity	Packing Group	Threshold Capacity
Diesel	C1 (not stored with petrol)	500m^3	-	-
Oil	C2 (not stored with petrol)	15m^3	-	-
Petrol	3	0.2m^3	II	2.5m^3
Coolant	N/A	1m^3	-	-
Detergent	N/A	0.5m^3	-	-
Engine degreaser	N/A	0.15m^3	-	-
Chlorine	5.1	1.41m^3	-	7m^3

The ADG classes above refer to the following:

- 'Classes C1 and C2 ' refer to combustible liquids which are not classified as dangerous goods for transport purposes; and
- 'Class 3' refers to flammable liquids that meet specified flash point criteria.

11.1.2 Dangerous Goods Storage

The dangerous goods to be used at the TSF will be kept at various locations on the site. The main product falling within this category is diesel fuel which will be stored in above ground tanks adjacent to the B–double access loop road, oil will also be stored in above ground tanks at this location.

Petrol will be stored in above ground containers at the Vehicle Servicing Building. Oil, coolant, engine degreaser detergent will be stored in above ground containers at the Locomotive Maintenance Building. Refer to Figure 6 that identifies the proposed buildings.

11.1.3 Transport Screening

The cumulative impacts associated with the transport of dangerous goods can be deemed to be potentially hazardous when significant quantities of dangerous goods are transported in and out of a site. *Table 2 Transporting Screening Thresholds* with SEPP 33 specifies the minimum weekly or annual cumulative vehicle movements entering or leaving the site to be identified as being potentially hazardous. Of the hazardous substances to be stored on the site the only substance which is addressed within Table 2 (SEPP 33) is petrol. A total of 200 litres (approximately 0.15 tonnes) is to be stored at the site. Deliveries are expected to occur on a monthly basis.

Under the thresholds set out in Table 2 (SEPP 33) the cumulative annual and weekly vehicle movements are 750 and 45 respectively. The minimum quantities per load in bulk and packages are 3 and 10 tonnes respectively. As such the total tonnage for the substance storage and the total number of vehicle movements are well under the *Transport Screening Thresholds* in SEPP 33.

The TSF will have diesel fuel storage facilities in four above ground tanks with a total capacity of 400kL. There will be three to four B-Double fuel deliveries daily with each truck having a 57kL capacity. The total fuel transported to the TSF each week from the 21 truck deliveries will amount to 1,197kL. This amounts to 62,425kL of fuel being transported to the site over 12 months from 1,095 truck deliveries.

11.1.4 Dangerous Goods Risk Conclusion

The preliminary risk screening and transport risk screening carried out under SEPP 33 indicates that the development is not classified as potentially hazardous and as such a Preliminary Hazardous Assessment (PHA) is not required.

11.1.5 WorkCover NSW Notification

The amount of diesel fuel to be stored at the TSF exceeds the NSW WorkCover 100kL threshold for C1 combustible goods. As such a Notification of Dangerous Goods on Premises will be lodged with WorkCover NSW prior to construction being initiated.

11.2 BUSHFIRE

The site is located within Bushfire Prone Land on the Bushfire Prone Land Map see Figure17. However given the nature of the proposed development, the cleared nature of the majority of the site and the adjoining lands, the nature of the proposed use and the materials involved in construction it is considered that bushfire does not represent a substantial threat. Additionally, the proposed evacuation route is generally located outside of bushfire prone land.

A Bushfire Safety Authority will not be required, having regard to the assessment pathway under the EP&A Act.

11.2.1 Assessment Requirements

As the development does not involve habitable dwellings, Special Fire Protection Purpose development or a habitable dwelling the proposed development is to be assessed by the consent authority under the provisions of Part 3A of the EP&A Act.

The assessment of the proposed development has been undertaken giving consideration to the NSW Rural Fire Service (RFS) document, Planning for Bush Fire Protection 2006 (NSWRFS 2006), referred to as PBP, and supporting RFS policy. A Bushfire Protection Assessment (BPA) has been undertaken by Ecological and is included as Appendix F.

The Building Code of Australia (BCA) does not provide for any bushfire specific performance requirements for the development types proposed. As such the Asset Protection Zone (APZ) and building construction requirements of PBP and AS 3959 Construction of buildings in bushfire-prone areas do not apply as deemed-to-satisfy provisions for bushfire protection. The general building fire safety provisions required by the BCA for the type of buildings proposed are accepted by PBP and RFS as acceptable solutions for the protection of occupants and the building from bushfires. However the aim and objectives of PBP still apply in relation to other matters of access, the provision of water and other services, emergency planning and landscaping.

11.2.2 Vegetation Types

In accordance with the requirements of the PBP the predominant vegetation class has been determined for a distance of at least 140m out from the proposed development.

The study area comprises disturbed lands, including significant excavation and filling, interspersed with areas of revegetation.

The southern part of the study area has a long history associated with coal stockpiling, loading and unloading and to this day the site contains a significant quantity of coal tailings. The remaining study area contains remnant, albeit highly disturbed, swamp oak forest, saltmarsh and freshwater wetland in the south, artificial freshwater wetlands (i.e. drains and ponds) and open pasture. Much of the site is currently subject to pasture improvement and cattle grazing.

The most significant vegetation communities and structures in vicinity in terms of potential fire behaviour are within the Swamp Oak Sedge Forest within the north western portion of the site, and the Swamp Oak Swamp Forest community within the designated Rehabilitation Area in the south west of the site. Both of these communities potentially present a forest hazard, however, significantly both of these areas are situated >140m from the proposed TSF building footprint.

There are areas of Saltmarsh in the southern extent of the site. This vegetation community and structure is not considered to constitute a bushfire hazard. The remaining notable hazard areas within proximity of the TSF proposal are constituted by Coastal Freshwater Wetland, Coastal Sedgelands, and other Grassland/Pasture areas.

Therefore, the predominant vegetation type influencing the development is categorised under PBP as Freshwater Wetlands and Grasslands. All of these hazard areas occur directly to the west of the TSF building footprint with varying degrees of management and separation. In all other directions is Managed Lands in the form of existing development and infrastructure.

11.2.3 Effective Slope

In accord with PBP the slope that would most significantly influence fire behaviour was determined over a distance of 100m out from the proposed development where the vegetation was found.

The entirety of the subject site and surrounds is considered to be flat lands, consistent with a low-lying wetland area. Whilst there are some localised depressions and topographic features throughout, the hazard has been classified in the PBP category of Upslope/Flat.

11.2.4 Asset Protection Zones

The BPA confirms that an APZ of 20m is achievable and able to be provided (as a minimum defendable space area) between the TSF proposal footprint and the surrounding Freshwater Wetland and Grassland vegetation, effectively the western boundary of the project area. The PBP does not provide for a specific APZ distance for the type of development proposed, however the proposed APZ exceeds the PBP acceptable solutions for residential development, as shown in Table 54.

The proposed APZ is considered adequate and compliant. The land is currently highly disturbed and partially managed, therefore further vegetation clearance will not necessary to establish the APZ.

Table 54: Asset Protection Zone and Bushfire Attack Level.

Direction	Slope	Vegetation	PBP Dwelling APZ	Proposed APZ	AS3959 Bushfire Attack Level (BAL)	Comment
West	Upslope/flat	Freshwater Wetland/ Grassland	10m	20m	BAL -12.5 BAL-LOW (where>50m from hazard)	Due to existing management/ disturbance, further clearing will not be required in order to establish APZ.

11.2.5 APZ Vegetation Management

The BPA confirms that vegetation and fuels within the APZ are to be managed to meet the intent and objectives of the performance requirements of an Inner Protection Area (IPA) as described within PBP. The following fuel management specifications are identified as a guide to achieve the PBP IPA performance requirements:

- No tree or tree canopy is to occur within 2m of the building;

- The presence of a few shrubs or trees in the APZ is acceptable provided that they are well spread out and do not form a continuous canopy and are located far enough away from the building so that they will not ignite the building by direct flame contact or radiant heat emission; and
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (fine fuel means any dead or living vegetation of <6mm in diameter e.g. twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1cm thick layer of leaf litter).

11.2.6 Construction Standards

Table 54 provides an assessment of the Bushfire Attack Level (BAL) on the proposed development. The determination of the BAL was made in accordance with Method 1 of AS 3959-2009 Construction of buildings in bushfire prone-areas. The BAL is based on known vegetation type, effective slope and managed separation distance between the development and the bushfire hazard.

The proposed TSF is rated as BAL-12.5 (>20m from the hazard) and BAL-LOW (where >50m from the hazard).

The building construction provisions within AS 3959 do not apply to the type of development proposed as a deemed-to-satisfy requirement under the BCA. Due to the type of development and compliance with BCA requirements for building fire, it is generally accepted that the development will survive bushfire attack. The BAL assessment above provides an understanding of the bushfire attack the building could experience in a worst-case bushfire scenario. The BAL assessment provides a platform on which to develop any further recommendations specific to the bushfire threat or the proposed building, if deemed appropriate.

To ensure building survival, the BPA includes the following additional recommendations where implementation is possible:

1. Weepholes, vents and openable portions of windows be screened against the entry of embers with steel mesh with maximum aperture of 2 mm;
2. Weather strips to external doors (side-hung);
3. Nylon brush seals around roller doors; and
4. Preventing or sealing gaps at joins of metal sheeting for walls and roof to prevent the entry of embers.

11.3 FLOODING

The TSF is located within the floodplain of the lower Hunter River and is in a high risk flood storage area. There is the potential for flood waters to inundate the TSF site and the surrounding land. In severe floods the depth of inundation across surrounding lands can be substantial and floodwaters can be at elevated levels for several days.

A Flood Emergency Response Plan (FERP) is included in Section 7 of the Flood Impact Assessment located at Appendix G. The primary objective of the FERP is to reduce the threat that floods pose to the safety of people living and/or working on or adjacent to flood affected land.

The critical flooding mechanism for the site is the overtopping of the New England Highway immediately north of the site. The flooding assessment shows this would occur at the 10% AEP flood. Flood of greater severity will cause overtopping of the Pacific Highway downstream of Hexham Bridge.

The development includes regrading of site elevations up to a level of around 2.65m AHD. Rail and building infrastructure that is situated at or above this level will remain flood free in the 2% AEP event, which has a peak level of around 2.2m AHD. Under the developed conditions the site will be largely flood free at the 2% AEP event, but inundated during a 1% AEP design event.

For large flood events a lag time of 20 hours can be expected between the peak flood passing Maitland and arriving at Hexham. Given the ample warning, there is time for staff to relocate stock and equipment to higher ground prior to the oncoming flood. There is also opportunity to move rollingstock to higher ground.

Given the length of time available evacuation of the site during a flood event is unlikely, as staff should be advised not to enter the site when a major flood warning is in place for the Lower Hunter River. In the event that flood evacuation is required, potential evacuation routes have been identified within Figure 38.

11.4 CONTAMINATION

A Preliminary Contamination Assessment (PCA) has been completed by Douglas Partners, attached as Appendix J. The PCA was undertaken to assess past and present contaminating activities, report on site conditions, and provide a preliminary assessment of site contamination. A level of contamination has been found on site from the previous industrial and rural land uses. A RAP has been prepared to support the contamination assessment and is included in Appendix J of this EA. The site is expected to be suitable for the proposed industrial development of the TSF from a contamination perspective, following additional investigation, remediation and validation as required.

For details of asbestos contamination associated with the demolition of existing structures or the excavation or disturbance of filled areas refer to Section 9.9 of this EA. Appropriate removal and validation of asbestos at the site is addressed within the Statement of Commitments (C3).

An assessment of odour impacts has been considered within both the PCA and the RAP documents contained within Appendix J. Aesthetic considerations (odours and staining) will also be taken into account when validating areas of remediation. Areas exhibiting objectionable odours relating to site contamination will not be considered to be satisfactorily remediated.

Both on and offsite impacts from leachability of metals and erosion have been considered with the PCA. It is considered that there is a potential for offsite migration of groundwater and surface water containing elevated heavy metals, nutrients and faecal coliforms. There is also a potential for migration of hydrocarbons via groundwater from the former refuelling area. Measures to manage potential impacts to human health and the environment as a result of potential offsite impacts will be required. This could be achieved through appropriate management via a WQMP which will be part of the CEMP. Refer to Section 9.4 for further detail.

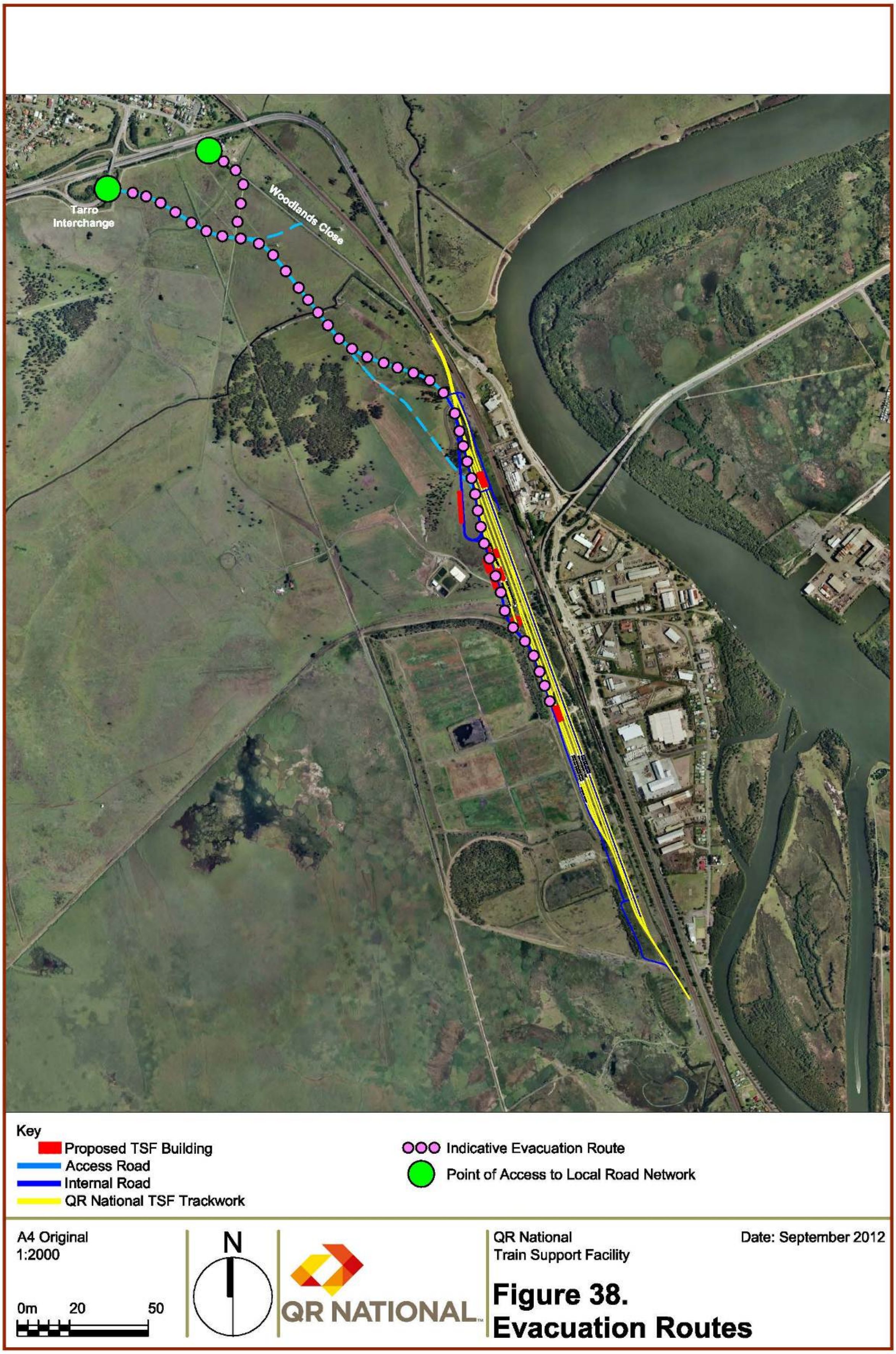

Figure 38: Potential evacuation routes from Hexham

12.0 Environmental Risk Analysis

This chapter provides a summary of the prioritisation process undertaken to identify the key environmental issues associated with the site and proposed development.

The environmental risk analysis addresses the risks associated with the site and proposal, before any mitigation strategies are taken into account, and the residual risk. The residual risk is the potential for environmental harm after the application of mitigation strategies and site management.

The assessment of risk allows for prioritisation of assessment processes, the identification of appropriate levels of environmental management and informs the design of ongoing monitoring programs.

12.1 OBJECTIVES

During the Preliminary EA phase, a Project Environmental Risk Analysis was conducted.

The Environmental Risk Analysis was reviewed and updated as part of the EA process in order to achieve the following objectives:

- Identify and confirm key environmental impacts of the proposed TSF and assist stakeholders to focus on the issues for assessment;
- Identify any additional key issues not specified in the DGR's that would require investigation. This includes an analysis of environmental impacts and potential residual environmental impacts after the application of proposed mitigation measures;
- Verification of the key environmental risks following any changes to the concept design and as the scope of the proposed TSF develops throughout the EA phase;
- Encourage a level of investigation that is equal with the risk of the potential environmental impacts which may result from the proposed TSF; and
- Assess the potential for harm arising from any residual risk.

12.2 METHODOLOGY

Preparation of the PEA, receipt of the subsequent DGRs issued on 22 March 2010 and results from the various sub-consultants assessments assisted in the identification of issues relating to the proposed TSF. This information and the DP&I Adequacy Review were used to identify the level of assessment required for this EA. The EA for the proposed TSF has been under refinement since the initial project application in 2008.

12.3 THE ISSUES

The key environmental issues identified through the PEA process, in the findings of specialist sub-consultant reports and identified in the DGRs are as follows:

- Ecology;
- Hydrology and Geology;
- Transport and Access;
- Infrastructure;
- Heritage (Indigenous and Non-Indigenous);
- Noise and Vibration;
- Air Quality;
- Hazard and Risk; and
- Waste Generation.

No other significant issues or risks have been identified for the site.

12.4 PRIORITISATION OF ISSUES

12.4.1 *Approach*

The risk assessment process is used to prioritise issues based on site sensitivities and the proposed construction and operations. Those issues assessed as having the highest risk require a higher degree of assessment. The assessment process identifies the level of threat to the environment and appropriate mitigation strategies. A level of residual risk remains after mitigation and the consequences of this also require assessment to ensure that there are no unacceptable consequences of the proposal.

The assessment of overall risk is based on the likely consequences or environmental impact of an event and the likelihood of an event occurring. The risk ranking is established by using the event likelihood ratings identified in Tables 55 to 58.

Table 55: Event Consequences.

Event Consequence	Event Impact
Substantial	Permanent widespread damage
Major	Heavy damage costly restoration
Minor	Limited but medium term negative effects
Negligible	Short term damage

Table 56: Event Likelihood.

Event Likelihood	Description
Almost certain	The event is likely to occur
Likely	The event will commonly occur
Possible	The event may occur occasionally
Unlikely	The event could occur infrequently
Rare	The event may occur in exceptional circumstances

Table 57: Risk Matrix.

Risk Matrix	Substantial	Major	Minor	Negligible
Almost Certain	9	8	7	6
Likely	8	7	6	5
Possible	7	6	5	4
Unlikely	6	5	4	3
Rare	5	4	3	2

Table 58: Event Threat Level.

Very High Threat 8 & 9	High Threat 6 & 7	Moderate Threat 5 & 4	Minor Threat 3	Low Threat 2
Red	Orange	Yellow	Pale yellow	White

Table 59 shows the prioritisation matrix used to identify priorities. Each issue was given a pre-mediation ranking based on the scope of the risk.

Following assessment of the potential environmental risks it is necessary to determine the residual environmental risks after the application of mitigation measures. This process assists in determining which issues require a greater degree of monitoring.

The prioritisation of environmental issues related to the proposed TSF is also shown in Table 59. The table is based on the relevant mitigation measures outlined in the draft Statement of Commitments at Section 13 of this EA.

Table 59: Prioritisation of Environmental Risk and Residual Risks.

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
Ecology				
Impact on flora and fauna at the site.	Development will occur over former industrial and agricultural areas with a footprint of some 38 ha. Existing vegetation and habitat, including disturbed wetland areas and EEC will be removed.	5	Environmental offsets of some 53.63ha are proposed. Monitoring of Green and Golden bell frog habitat. Control of stormwater drainage and management of waste. Control and management of contaminants, weed management. Conservation Management Plan for retained vegetation.	2 (Low)
Impact on flora and fauna offsite	Site adjoins an area of National Park including significant wetlands and saltmarsh.	4	Control of stormwater drainage and management of waste. Control and management of contaminants, weed management, ongoing monitoring.	2 (Low)
SEPP 14 Corridors	Rail lines will be constructed in an area of wetland.	7	Environmental offsets proposed. Erosion and sediment controls.	2 (Low)
Hexham Swamp Rehabilitation Project	This project is reintroducing salt water to the wetlands. This is a risk to the project if uncontrolled drainage affects tidal exchange of salt water.	5	Stormwater management to prevent unnecessary flows/runoff to wetlands. Waste water treatment controls.	2 (Low)
Hydrology and Geology				
Flooding	The site is located in an area of high hazard flood storage. There are safety and hazard issues for access, personnel, equipment, plant and storage.	6	Design for roads, equipment, floor levels and storage at safe elevations. A Flood Emergency Response Strategy has been prepared (Appendix G).	2 (Low)
Stormwater	Increased runoff from the development could affect adjoining ecologically sensitive areas.	6	SWMP for the site including prevention, isolation treatment, contingencies and monitoring (Appendix L).	2 (Low)
Acid Sulphate Soils	The site is in an area of PASS. Disturbance of soils can cause significant acid runoff problems. The proposed construction methods will minimise risk.	4	An ASSMP has been prepared for the site. The plan provides for the neutralisation of any affected soil and leachate (Appendix I).	2 (Low)
Surface water quality impacts during construction.	Construction activities can allow rainfall to mobilise silt and pollutants leading to adverse effects on wetlands, waterways and habitat.	6	A SWMP has been prepared which includes erosion and sediment controls (Appendix L).	2 (Low)
Surface water quality impacts during operation.	Surface run off can mobilise pollutants.	4	A SWMP for the site has been prepared. The plan provides for prevention, isolation from the	2 (Low)

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
			main system of areas where potentially significant contaminants may be mobilised, treatment of stormwater, contingency measures and monitoring.	
Impacts to groundwater during construction.	Excavation is very limited. Works are either on or involve fill. Infiltration of rainfall during construction is unlikely to result in adverse groundwater impacts.	2	No specific mitigation required. Refer to the Groundwater Assessment Report (Appendix J).	2 (Low)
Impacts to groundwater during operation.	The ongoing risk is from effluent disposal.	3	Fill to be brought in to improve soil properties of irrigation area and minimise potential for groundwater pollution.	2 (Low)
Erosion and sedimentation during construction.	Construction will involve considerable disturbance of the site surface. Disturbance leaves the site vulnerable to erosion by wind and water and surrounding land vulnerable to dust and sedimentation. Surrounding land including wetlands and water ways are vulnerable to sedimentation and pollution.	6	The issue and risk have been addressed in the SWMP (Appendix L).	3 (Minor)
Erosion and sedimentation during operation.	Signification erosion and sedimentation during operation is unlikely but the sedimentation of surrounding lands adjacent could increase the risk.	5	Erosion and sedimentation issues are addressed in the SWMP (Appendix L).	3 (Minor)
Migration of existing onsite contaminants during construction.	A range of contaminants have been identified on the site.	6	Further investigation, remediation and validation of the site prior to construction commencing.	2 (Low)
Migration of existing onsite contaminants during operation.	Existing contamination over the project footprint will be remediated prior to construction with potential for new contamination from TSF operations.	6	Implementation of site stormwater, storage and waste management systems will maintain risk at acceptable levels.	3 (Minor)
Traffic, Transport and Access				
Temporary increase in road traffic during construction	Local Road traffic will increase as a result of construction.	5	A new access off the Tarro Interchange will be constructed to link with the NEH and avoid traffic utilising Woodland Close. Onsite parking will be provided for construction workers.	2 (Low)
Increases in road	The operational road traffic will	2	No specific requirements, the	2 (Low)

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
traffic during operation	be minor. The measures implemented to ensure construction traffic has no significant impact will also ensure operational traffic is adequately catered for.		access and intersection improvements for the construction phase will satisfy operational needs.	
Increase in rail transport during operation	Any rail traffic increase during operations will be due to increased coal extraction not the proposed TSF.	2	Responsibility for addressing the impacts of increased rail traffic rests with the relevant rail authorities. Mitigation of rail traffic impact is outside the scope of the approval sought.	2 (Low)
Infrastructure				
Impacts on existing infrastructure and utilities.	The proposal will have requirements for water, energy and effluent disposal. While water and energy concerns can be readily addressed by extension of services onsite wastewater disposal is required. A gas main on this site will need to be relocated. A gas main on this site will be protected The proposal will assist in maintaining the efficiency of operation of the rail network.	6	• Obtain water from HWC. • Provide an onsite effluent disposal system. • Provide a recycled water wash down for trains and wagons. • Provide an onsite effluent disposal system. • Extend electrical services to the rail via Ausgrid. • Extend telecommunications to this site via Telstra. • Protection to existing gas main.	3 (Minor)
Impacts on future service demand, capacity and augmentation of proposed infrastructure and utilities.	The site is in an area that functions as a major infrastructure corridor for road, rail and essential services. Project design is such, that conflicts with future infrastructure have been largely avoided.	3	No specific additional mitigation is required. Site management and operations will need to acknowledge the presence of major infrastructure.	3 (Minor)
Hunter Expressway	The ongoing operations and efficiency of the Hunter Expressway will be maintained as access will be off the existing Tarro Interchange.	2	Implement traffic management measures recommended in the Traffic Impact Assessment (Appendix O).	2 (Low)
F3 Extension	The proposed F3 extension is north of the TSF but crosses over the access road.	2	No site operations to be established on or immediately adjacent to the F3 extension corridor.	2 (Low)
Hunter Water Pipeline	The Hunter Water pipeline crosses the site but is outside the TSF footprint. The only potential conflict is with the access road.	3	The proposal design protects and avoids conflicts with the pipeline corridor.	2 (Low)
Power Grid	There are transmission easements in the north of the project site which are in part	2	There is no significant conflict created by the access road.	2 (Low)

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
	over the proposed access road.			
Heritage				
Impacts on existing Non-Indigenous heritage items on the site.	Proposed TSF design has avoided areas of potential archaeological sensitivity. The majority of works will be over already highly disturbed areas. As the area is former wetlands and a floodway the likelihood of significant values is low.	4	Any works on areas not previously used for access or industry may need to be investigated if ground disturbance is involved.	3 (Minor)
European Heritage	The proposed TSF has been assessed as having "very minimal inherent impact" on the heritage values of the site.	2	Reuse of bricks from the demolition of the Control Box and provision of appropriate interpretation on the site will assist in maintaining site heritage values.	2 (Low)
Minmi to Hexham Railway	Remains from the Hexham Minmi railway may be unearthed during construction works.	2	An excavation director will oversee works in the vicinity of the junction of the Hexham Minmi Railway and the GNR (refer to Section 9.13.3 and commitment EH4 in Section 13).	2 (Low)
Impacts on Indigenous heritage at the site.	The proposed TSF footprint avoids impact on sites of archaeological significance. The access road has been designed to avoid Archaeological Site (HS1). The likelihood of the access road impacting on sites of archaeological significance will be assessed prior to its construction.	4	The area of potential archaeological significance will be assessed in cooperation with the HRR Project. Where construction of the proposed access road cannot avoid impacting a site of archaeological significance an AHIP will be obtained. Refer to Section 9.12.3 and commitment AA5 in Section 13.	3 (Minor
Visual				
Intrusive visual impacts on surrounding landscape.	While the proposal occupies a large area, the majority is rail tracks which will not be visible. Sheds will be constructed over work areas but these will be of relatively low profile. The site is of low visual sensitivity and adjoining the railway and other industrial development. The effect on scenic values will be low. There is very little risk to the scenic environment.	3	No specific mitigation measures are required, however landscaping including trees would mitigate external views into the site.	2 (Low)
Noise and Vibration				
Temporary noise emissions during construction.	No noise on vibration impacts are expected during construction. There is however the potential for "marginal" exceedences of relevant noise	3	Noise management recommendations for construction have been made to ensure any effects are mitigated. Refer to commitment N1 in	2 (low)

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
	criteria at a nearby dwelling house.		Section 13.	
Noise emissions during operation.	Operational noise levels are predicted to be below the relevant guidelines at the closest residential receivers	3	No specific operational noise controls are required.	2 (Low)
Vibration impacts during construction.	The assumed level of vibration at the nearest residential premises is expected to be below the criteria for "minimal risk of cosmetic damage".	2	No vibration management is required for the site.	2 (Low)
Air Quality				
Emissions of air pollutants during construction.	Dust from construction is to be addressed.	4	Dust mitigation during construction is essential. Mitigation measures include watering and early stabilisation of disturbed areas.	2 (Low)
Emissions of air pollutants during operation.	Low volume of locomotives will result in minimised diesel exhaust emissions.	3	Dust control measures including road washing, road sealing, wind breaks, truck movement controls and vehicle washing are proposed to minimise transport of dust.	2 (Low)
Odour emissions during operation.	No odour emissions are likely during operations.	2	No mitigation measures are required.	2 (Low)
GHG emissions.	The operation of the TSF is expected to produce no additional GHG emissions.	2	No mitigation required to reduce risk.	2 (Low)
Hazard and Risk				
Dangerous Goods / SEPP 33	Trains will be refuelled on the site. The storage of diesel does not trigger SEPP 33 assessments. No other significant diesel fuel or lubricant storage is required on the site.	3	Risks will be minimised by appropriate fuel storage (refer to Sections 7.3.5 and 11.4).	3 (Minor)
Land Contamination	The site is known to be contaminated as a result of past uses. Farther assessment and remediation will be required.	5	A RAP has been prepared for the site and is contained within Appendix J.	2 (Low)
External environment effects	The main external environmental risk is to adjoining wetland areas which have the potential to be degraded by existing	5	Once the full range of proposed mitigation measures are applied the risk to the external environment is considerably reduced.	2 low

Issue	Scope Of Risk	Pre Mitigation Risk	Management Of Risk/ Issue	Residual Risk
	contamination and uncontrolled run off from the site. The TSF construction and operation could introduce a range of temporary influences on the local environment including nearby dwellings.			
Waste Generation				
Construction Waste	Construction waste is likely to be minimal due to the nature of the project. Solid Waste and minor quantities of Hazardous waste will be generated. The construction risk from waste is moderate and can be almost entirely eliminated by waste management.	4	A construction waste management plan providing for classification and disposal of waste in accordance with DECCW Guidelines will maintain risk from works at low levels (refer to Section 9.17.3 and commitment WM1 in Section 13).	2 (Low)
Operational Waste	Operational works will not be significant. The waste generated by the operational TSF can all be managed within existing waste disposal services.	6	A waste holding strategy has been developed which provides for recycling, reuse on site when appropriate.	2 (Low)
Hazardous Waste	The waste stream from the TSF has been assessed. It will include liquid waste (coolant), waste oil and batteries. These wastes will be removed by licensed contractors for disposal and recycling.	6	A Waste Management Plan for site operations will be required. Provided a suitable plan is implemented in full risks will be kept low (refer to Section 9.17.3 and commitment H1 and H2 in Section 13).	2 (Low)

12.4.2 Assessment of Residual Risks

Following assessment of the potential environmental risks it is necessary to determine the residual environmental risks after the application of mitigation measures. This process assists in determining which issues require a greater degree of monitoring.

The prioritisation of environmental issues related to the proposed TSF is shown below. The assessment is based on the relevant mitigation measures presented within the Statement of Commitments in Section 13 of this EA.

In summary, the final prioritisation of environmental issues is as follows:

Very High Threat:

- No environmental issues.

High Threat:

- No environmental issues.

Moderate Threat:

- No environmental issues.

Minor Threat:

- Hydrology and Geology;
- Traffic, Transport and Access;
- Infrastructure;
- Heritage and Culture;
- Air Quality; and
- Hazard and Risk;

Low Threat:

- Ecology;
- Hydrology and Geology;
- Infrastructure;
- Heritage and Culture;
- Visual Impact;
- Noise and Vibration;
- Air Quality; and
- Waste Generation.

A number of minor threat and low threat residual risks have been identified. However, these risks can be mitigated/managed as demonstrated within Table 61. Management processes that allow a rapid response, should they occur, will need to be included in construction and operational environmental management plans.

13.0 Statement of Commitments

The following table details the proposed management and mitigation measures that QR National commits to for the TSF Project.

Table 60: Statement of Commitments

Item	Commitment
Plans, Documentation And Approvals	
P1	Construction and operation of the TSF will be undertaken in accordance with the submitted plans and the description of the proposed development provided in this Environmental Assessment.
P2	All licences, permits and approvals required by law to construct and operate the TSF will be obtained and maintained as required.
P3	Operation of the TSF will be undertaken in accordance with the Environmental Management Plan (EMP). The EMP will address all measures to be implemented to minimise and manage potential environmental impacts during the operation of the TSF. The EMP will include the following plans: a) Conservation Management Plan; b) Waste Management Plan; c) Traffic Management Plan; d) Stormwater Management Plan; e) Erosion and Sediment Control Plan; f) Flood Emergency Management Plan; g) Water Quality Management Plan; h) Acid Sulphate Soil Management Plan; and i) Aboriginal Cultural Heritage Management Plan.
Construction	
C1	Construction of the TSF will be undertaken in accordance with the Construction Environmental Management Plan (CEMP). The CEMP will outline the environmental mitigation measures to be implemented during the construction phase and will document mechanism for demonstrating compliance with the relevant approvals. The CEMP will include the plans that address the following: a) construction traffic management; b) construction noise and vibration management; c) water quality and soil management; d) groundwater management; e) flora, fauna and weed management; f) non-indigenous and indigenous heritage management; g) aboriginal heritage management; h) community liaison; i) hazards and risk management; j) spoil management; k) waste management; and l) air quality management.
C2	Construction activities associated with the TSF will be undertaken during the following hours: a) Monday to Friday (inclusive) – 7:00am to 6:00pm b) Saturday – 8:00am to 1:00pm c) Sundays and public holidays – No works to be undertaken at any time
C3	Where construction works are required to be undertaken outside of the standard construction

Item	Commitment
	hours, the following measures will be implemented: a) works will be kept to a minimum; b) where feasible noise generating works would be scheduled to be completed outside of the 10:00pm to 7:00am night time period; and c) the works will be undertaken in accordance with the Environment Protection Licence for the TSF Project.
Ecology	
E1	During construction and operation of the TSF, the Conservation Management Plan will be followed. The Conservation Management Plan will include: a) strategies to avoid or minimise impacts to flora and fauna; b) procedures to monitor and control weeds (with special methods for eradicating alligator weed); c) measures to prevent erosion and sediment control procedures, which will also be incorporated into the Erosion and Sediment Control Plan; d) monitoring of frog ponds; e) strategies to minimise the impact of the access route through Proposed Offset Area 2; and f) contingency procedures or corrective actions to be followed should monitoring indicate that the identified objectives and outcomes are not being achieved.
E2	Ecological surveys will be undertaken prior to clearing or filling of the wetland to minimise impacts on threatened and endangered species and ensure that direct impacts to flora and fauna are avoided.
E3	The management of the Southern Offset Area will include: a) the establishment and fencing of the conservation area; b) entering into an appropriate arrangement for the security of the offset area such as a Voluntary Conservation Agreement; c) management of habitat for existing terestial and acquautic, flora and fauna species; and d) an annual monitoring program for the first five years.
E4	The management of the Northern Offset Area will include: a) improving the condition of the Swamp Oak Forest and the Coastal Floodplain Sedgelands; b) entering into an appropriate arrangement for the security of the offset area such as a Voluntary Conservation Agreement; and c) construction of the access route through the Northern Offset Area in a manner that minimises the impact on threatened and endangered species.
Traffic, Access and Car Parking	
T1	A Construction Traffic Management Plan will be prepared and implemented, which will outline: a) the safe access routes to and from site; b) vehicle parking areas during construction; c) appropriate signage requirements; d) construction activities that will result in the disruption of traffic and the arrangements for traffic management; and e) methods to minimise impacts associated with construction activities.
T2	A new T-intersection will be constructed on the Tarro Interchange with a sheltered right turn lane that will be able to accommodate the site access road.
T3	An access road connecting the Tarro Interchange with the TSF will be constructed.
T4	Road construction and associated drainage works will comply with relevant Newcastle City Council and Roads & Maritime Services standards.
T5	Dedicated onsite parking will be provided adjacent to the offices and amenities and on

Item	Commitment
	hardstand areas adjacent to main work areas. The facility car park will have 38 parking spaces including two disabled spaces.
Flooding	
F1	A Flood Emergency Management Plan will be prepared which provides mitigation and management measures to be implemented in the event of a flood on site.
F2	The TSF will be constructed using flood compatible material and site power facilities will be place above the 1% AEP flood levels.
Stormwater Management	
S1	A Stormwater Management Plan will be prepared and implemented and will address the following matters: a) the current site hydrology, water quality and changes to these as a result of the development; b) the formation of a network of catch drains (cess drains) which will drain the TSF site; and c) appropriate erosion and sediment controls to be implemented at discharge locations and spillways to prevent the discharge of sedimentation.
S2	Areas of high sediment, oil & grease and nutrient loads will be separated from the stormwater system (e.g. wash bays, provisioning sheds, servicing sheds). These areas will be treated separately and discharged to trade waste or for re-use in wash down.
S3	Gross Pollutant Traps (**GPTs**) will be utilised to provide primary screening of stormwater. A secondary system of GPTs will be located at the outlet of each Water Quality Control Pond as a final barrier to remove suspended solids, remaining floating debris and hydrocarbons.
S4	Access roads will be constructed with road side swales to provide treatment through flow attenuation and sedimentation of suspended sediments.
Effluent Disposal	
ED1	A wastewater system for effluent disposal will be established.
ED2	A recycle system for wash down water will be established.
ED3	An irrigation area with the following site improvements will be established: a) removal of the concrete hardstand and footings in the central portion of the site, or placement of 0.5m of suitable clay loam fill material over concrete; b) addition of lime to acidic soils to maintain plant growth; c) addition of gypsum to improve the soil structure and reduce dispersion/erosion; d) earthworks to recontour and fill drainage channels and redirect surface water flow around the proposed irrigation area (meeting buffer distance requirements); e) where required, placement of suitable fill or earthworks to raise site levels to at least 1m above the permanent groundwater table and/or at least 0.6m between the highest seasonal water table level and the base of the irrigation areas (whichever is the greater); f) importation and placement of a suitable clay loam fill to form the surface of the irrigation area to improve soil properties and minimise the potential for the groundwater pollution; and g) installation of catch drains/bunds upslope and downslope of the irrigation area to prevent rainfall run-on and runoff.
ED4	Dewatering licences will be obtained in respect of the sewer installations where required.
ED5	Rainwater tanks will be installed to top up the recycled water system.
Contamination	
CT1	Further assessment of potential contamination will be undertaken, including an assessment of the following: a) the lateral extent and depth of hydrocarbon contamination across the site including in the

Item	Commitment
	former refuelling areas; b) the potential source of the hydrocarbon contamination across the site; c) the elevated TRH (C10-C36) concentration in groundwater in Bore 108, MW01, MW03 and MW09; d) the fill materials to determine its leachability and suitability to remain on site; e) the coal reject and fines to be disturbed during construction to assess the extent of potential contaminants (i.e. asbestos, etc.) and the potential management options for the re-use of these coal reject and fines materials on-site; and f) the western portion of Lot 113, DP 755232 (i.e. west of Chichester pipeline), which has not currently been investigated due to modification of the site boundary after completion of field work.
CT2	The sampling and analysis of contaminated land will be undertaken at a density which is commensurate with the NSW EPA Sampling Guidelines.
CT3	Appropriate management action will be taken, including a Remedial Action Plan if required, to: a) remediate hydrocarbon contamination present in fill material; b) remove by localised excavation those hydrocarbon impacted soil associated with former fuel tank (Pit 128) and the former refuelling area (Bore 102 and Pit 128); and c) remove and validate fibro fragments containing asbestos in the former control cabin and former baling shed or establish on-site management of asbestos impacted materials.
Surface and Groundwater Management	
SG1	Surface water and groundwater monitoring will be undertaken prior to the commencement of construction to: a) establish existing water quality baselines; b) identify sources of potential impact from construction operations; and c) determine the potential for off-site migration of contaminants through water sources.
SG2	Surface water and groundwater monitoring will be regularly undertaken during the ongoing operation of the TSF to: a) identify any change in water quality; and b) determine the appropriate treatment strategies to be implemented to maintain or improve water quality.
SG3	A Water Quality Management Plan will be prepared and implemented and will identify a range of preventative, treatment and contingency measures for the TSF project.
Acid sulphate soils	
A1	An Acid Sulphate Soil Management Plan will be prepared and implemented which includes methods and procedures for: a) minimising the disturbance of potential acid sulphate soils through appropriate dewatering and excavation procedures; b) monitoring of soils, water and leachate throughout construction to identify acid sulphates; c) the storage, treatment and disposal of excavated soils, water and leachate containing acid sulphate; d) managing acid sulphate produced from excavated soil and dewatering, in accordance with the NSW Acid Sulphate Soil Management Advisory Committee Guidelines; and e) remedial action or mitigation action to be implemented as a contingency if the acceptance criteria has not been achieved.
Geotechnical	
G1	Deep soil mixing will be utilised for ground improvement. Piling will be used to support building footings.

Item	Commitment
G2	The ground improvement method will be monitored by geotechnical instrumentation to measure and verify performance.
Aboriginal Archaeology	
AA1	An Aboriginal Heritage Management Plan will be prepared and implemented prior to the commencement of any works that may impact on Aboriginal heritage.
AA2	All staff, contractors and others involved in construction and maintenance related activities will be made aware of the statutory provisions protecting Aboriginal objects and Aboriginal places of significance. A cultural awareness program will be included as part of the site induction program and developed in consultation with the registered Aboriginal stakeholders.
AA3	The involvement of the registered Aboriginal stakeholders in the ongoing management of the Aboriginal cultural materials within the project study will be promoted and included in the Environmental Management Plan and the Aboriginal Heritage Management Plan.
AA4	If the identified Potential Cultural Deposit will be impacted upon by the proposed works an archaeological subsurface investigation and salvage will be undertaken in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW.
AA5	If the potential subsurface component of site 'HS1' will be impacted on, an archaeological subsurface investigation and salvage will be undertaken in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW.
European heritage	
EH1	A Construction Non-Indigenous Cultural Heritage Management Plan will be prepared and implemented, which will set out the mitigation and management strategies to be implemented to minimise potential impacts to European heritage items.
EH2	Serviceable bricks from the Control Box will be salvaged and appropriately reused in a symbolic linkage of the past and proposed uses of the place.
EH3	A plaque providing details of the site's heritage will to be located on the site.
EH4	An Excavation Director, with appropriate experience will be appointed prior to any excavation within the vicinity of the junction of the Minmi to Hexham Railway and the Great Northern Railway.
EH5	The Excavation Director will advise on archaeological matters associated with the excavation, and will ensure compliance with procedures to be adopted in the event of unexpected finds and measures for protecting heritage items that are to be conserved.
EH6	All archaeological deposits, features and relics that are exposed during the works associated with the proposed TSF will be recorded in accordance with Heritage Branch guidelines.
Noise and Vibration	
N1	A Construction Noise Management Plan (CNMP) will be prepared and implemented prior to commencement of construction works at the site. The CNMP will include the following: a) construction noise goals; b) specific practical, feasible and reasonable measures for controlling noise, noise and vibration monitoring programs and reporting procedures; and c) mechanisms to provide ongoing community liaison.
N2	Equipment will be kept well maintained to prevent unnecessary noise and vibration.
N3	When noisy operations associated with construction activities must be carried out: a) *Australian Standard 2436-1981 'Guide to noise control on construction, maintenance and demolition sites'* will be followed when relevant; b) where reasonable and feasible, noisy equipment will be sited behind structures that act as barriers or at the greatest distance from the noise-sensitive areas; and c) a responsible person will maintain liaison between the neighbouring community and the contractor.

Item	Commitment
Air Quality and Greenhouse Gas	
AQ1	Activities carried out on site will be undertaken in a manner that will ensure that all equipment used, and all facilities erected, are designed and operated to control the emission of smoke, dust, fumes and other pollutants into the atmosphere.
AQ2	Measures to minimise the impact of dust generated in association with the proposed development will be implemented including: a) watering of roads and sealing of roads if required; b) stabilisation of disturbed areas as soon as possible; c) wind breaks composed of earth banks and other screens to protect areas by reducing capacity of the wind to raise dust; d) trucks entering and leaving the site will be well maintained in accordance with the manufacturer's specification to comply with all relevant regulations; e) fines may be imposed on vehicles which do not comply with smoke emission standards; f) truck movement will be controlled on site and restricted to designated roadways; g) truck wheel washes or other dust removal procedures (including covering of loads) will be installed to minimise transport of dust offsite if necessary; h) during construction if there are periods of high winds, stockpiles and exposed areas will be covered, or watered, or revegetated; i) procedures to control dust and other emissions from construction operations and on-site equipment will be implemented; j) stockpiles and handling areas will be maintained in a condition which minimises windblown or traffic generated dust; k) construction equipment and transport vehicles will be properly maintained to ensure exhaust emissions comply with relevant regulatory requirements, and to minimise emissions; l) cleared vegetation, demolition, materials and other combustible waste material will not be burnt on site; m) silt will be removed from behind filter fences and other erosion control structures on a regular basis, to prevent it becoming a source of dust; n) non-essential idling of locomotives will be minimised, and locomotives with excessive smoke will be expeditiously repaired; and o) low sulphur diesel fuel will be used where available.
Social and Economic	
SE1	The following information will be available for community enquiries and complaints prior to and during the construction and operation of the TSF: a) a contact number on which complaints and enquiries about construction and operational activities may be registered; b) a postal address to which written complaints and enquiries may be sent; and c) an email address to which electronic complaints and enquiries may be sent.
SE2	A Near Neighbour Consultation Strategy will be implemented for ongoing proactive engagement and communication with surrounding and adjoining residents. This strategy will include: a) policies which aim to increase project knowledge and develop community-staff relations; and b) processes to inform neighbours about access arrangements to the development site and changes to property access that may affect them.
SE3	Employment of local and regional workers will be promoted to retain and develop the local skills-base. Local businesses will be utilised where possible for resources and materials for construction and operations.
SE4	Appropriate security protocols will be established to ensure unauthorised persons do not access the TSF site.

Item	Commitment
SE5	Open and direct communications will be maintained with Australian Rail Track Corporation and the Hunter Valley Coal Chain Coordinator, to ensure that potential benefits of the project are maximised and negative impacts minimised.
Waste Management	
WM1	A Construction Waste Management Plan will be prepared prior to the commencement of construction on the site. The Construction Waste Management Plan will address the following: a) appropriate waste identification, handling, storage and disposal in accordance with the Department of Environment Climate Change and Water Guidelines; and b) procedures for how the different waste streams will be stored, collected and disposed of by licensed waste contractors.
WM2	An Operational Waste Management Plan will be prepared to address the ongoing handling, storage and disposal of waste. The Operational Waste Management Plan will provide: a) identification of the types of waste likely to be generated during construction; b) appropriate storage of waste on site; c) measures to minimise the amount of waste produced; d) measures to increase the potential for waste to be re-used and recycled; e) appropriate methods to assess if waste can be re-used, recycled or disposed to landfill; and f) maintaining records of waste re-use, recycling and/or disposal.
WM3	Licensed waste contractors will be made responsible for collection and appropriate disposal of waste.
Visual	
V1	Following construction, landscaping treatment will be undertaken within the developed area of the site. Appropriate locations for landscaping treatment will be determined based on environmental, operational and safety considerations.
V2	Buildings will be constructed of low reflective materials and colours will be of earth tones.
Hazardous Material	
H1	Any hazardous materials will be stored and disposed of in accordance with WorkCover Authority requirements.
H2	The amount of diesel fuel to be stored at the TSF exceeds the NSW WorkCover 100kL threshold for C1 combustible goods. As such notification of Dangerous Goods on Premises will be lodged with WorkCover NSW prior to construction being initiated.
Building Codes Australia	
B1	The proposed development will comply with either the 'deemed to satisfy' provisions of the Building Code of Australia, or alternatively provide a performance-based solution prepared by a suitably qualified person.

14.0 Conclusion

This EA has been prepared in accordance with Part 3A of the EP&A Act. In particular, it addresses each of the issues raised in the DGRs of March 2010 and the Adequacy Review by the DP&I in July 2012.

The proposed QR National's TSF will result in the relocation of infrastructure, fuelling and other provisioning and inspection activities currently located in and around the Port of Newcastle, thereby reducing congestion and disruption associated with these activities.

The proposed TSF is supported by the HVCCC, whose objectives are to plan and coordinate the HVCC to maximise the volume of coal transported through the coal chain to market. QR National's TSF has been identified as a critical element of the coal chain's solution to inefficiency caused by coal terminal congestion, to which the Hunter Valley rail haulage operators' current train fuelling, provisioning and maintenance practices contribute significantly.

The proposed TSF will consolidate QR National's current maintenance and refuelling activity onto one low impact site at Hexham. The TSF will provide an efficient and cost effective method of supporting QR National operations in the HVCC by providing a facility to satisfy daily train operating / maintenance requirements.

The site is strategically located relative to the Port of Newcastle, major road connections, Newcastle Airport and existing industry to the north west and south east of the site. The site has excellent access to workforces, being centrally located to Newcastle, Maitland and Port Stephens. The site is isolated from any significant residential area. The site is also located close to its primary customer base, being mining companies operating in the Hunter Valley. These attributes make the site ideal for the proposed development.

This EA has identified and addressed the key environmental issues relevant to the proposed development. It has been established that the site is appropriate for the on-going operation of the TSF. A range of management measures have been committed to ensuring that no significant adverse impacts will result from the construction and operation of the TSF. The overall environmental impacts are considered to be manageable.

It is considered that this assessment identifies the proposed TSF as being of significance to the Hunter Region, and the State of NSW, both in terms of its initial investment value through construction, but also in terms on the on-going contribution to the economy. The efficiencies gained in the coal transport chain are important to ensure growth in coal exports and the returning economic benefits. The significant economic benefits and employment opportunities arising from the proposal, in combination with the comprehensive measures to be undertaken to minimise any adverse impacts on the receiving environment, confirm that the development is justified and worthy of approval.