

Appendix I

Stage 1 preliminary site investigation –
Contaminated lands

NSW Roads and Maritime

Duplication of Tourle Street and Cormorant Road, Kooragang Stage 1 Preliminary Site Investigation (Contamination)

12 June 2014



Document information

Client: NSW Roads and Maritime
Title: Duplication of Tourle Street and Cormorant Road, Kooragang
Subtitle: Stage 1 Preliminary Site Investigation (Contamination)
Document No: 2200508A-CLM-REP-001 RevA
Date: 12 June 2014

Rev	Date	Details
A	10/02/2014	Draft Stage 1 Preliminary site audit
B	07/03/2014	Client comments addressed
C	12/06/2014	Client comments addressed

Author, Reviewer and Approver details

Prepared by:	Daniel Robinson	Date: 12/06/2014	Signature: 
Reviewed by:	Lisa Powell	Date: 12/06/2014	Signature: 
Approved by:	Steven Crick	Date: 12/06/2014	Signature: 

Distribution

NSW Roads and Maritime, Parsons Brinckerhoff file

©Parsons Brinckerhoff Australia Pty Limited 2013

Copyright in the drawings, information and data recorded in this document (the information) is the property of Parsons Brinckerhoff. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Parsons Brinckerhoff. Parsons Brinckerhoff makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

Document owner

Parsons Brinckerhoff Australia Pty Limited
ABN 80 078 004 798
Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com

*Certified to ISO 9001, ISO 14001, AS/NZS 4801
A GRI Rating: Sustainability Report 2011*

Contents

	Page number
Glossary	iii
1. Introduction	1
1.1 Objectives	1
1.2 Scope of works	1
1.3 Proposed development works	1
2. Site setting	3
2.1 Site location	3
2.2 Environmental planning instruments	3
2.3 Surrounding land uses	3
2.4 Summary of previous investigations	3
2.5 Topography	6
2.6 Geology and soils	6
2.7 Hydrogeological setting	7
2.8 Regional groundwater bores	7
2.9 Acid sulfate soils (ASS)	8
2.10 NSW EPA online notice records database search	8
2.11 Review of aerial photographs	10
2.12 Summary of historical land use	11
3. Site inspection	13
3.1 Surrounding land uses	14
4. Potential for contamination	16
4.1 Contaminants of potential concern	16
4.2 Conceptual site model (CSM)	16
4.3 Key exposure pathways	17
5. Discussion and conclusions	22
6. Recommendations	23
7. References	24
8. Limitations	25

List of tables

	Page number	
Table 2.1	Summary of historical reports	3
Table 2.2	Summary of registered groundwater bores within one km of proposed development area	7
Table 2.3	List of contaminated sites within the proposal area and surrounding suburbs	9
Table 2.4	Historical aerial photograph review summary	10
Table 4.1	Conceptual site model	16

List of figures

	Page number	
Figure 4.1	Areas of significant contamination	18

Glossary

AHD	Australian height datum
ACM	Asbestos containing materials
ANZECC	Australian & New Zealand Environment & Conservation Council
ASS	Acid sulfate soil
ASSMP	Acid sulfate soil management plan
AVMP	Approved voluntary management proposal
BTEX	Benzene, toluene, ethylbenzene, xylenes
CEMP	Construction environmental management plan
EPL	Environmental protection licence
KIWEF	Kooragang Island Waste Emplacement Facility
LEP	Local environment plan
LGA	Local government area
LNAPL	Light non-aqueous phase liquid
NCIG	Newcastle Coal Infrastructure Group
NEPM	National environment protection measure
NSW EPA	New South Wales Environment Protection Authority
PAH	Polycyclic aromatic hydrocarbon
PASS	Potential acid sulfate soil
PEI	Preliminary environmental investigation
PSI	Preliminary site investigation
REF	Review of Environmental Factors
SEPP	State environment planning policy
TPH	Total petroleum hydrocarbons

1. Introduction

Parsons Brinckerhoff Australia Pty Ltd (Parsons Brinckerhoff) was contracted by NSW Roads and Maritime Services (Roads and Maritime) to conduct a preliminary site investigation of the proposed Tourle Street and Cormorant Road Duplication ('the proposal'). The purpose of this investigation was to assess the potential for contamination to exist at the site of the proposal ("the site") that may affect the proposed development of the land.

1.1 Objectives

The objectives of this Stage 1 preliminary site investigation were to:

- assess the site history and historical uses of the site and immediate surrounds
- identify areas of potential contamination
- assess the potential for any contamination that is identified to impact human health and/or the environment
- provide recommendations for additional assessment and/or management of identified contamination.

1.2 Scope of works

The scope of works comprised a desktop review and site walkover, and included the following tasks:

- identification of the site, including location of surrounding infrastructure, area and boundaries
- a site inspection where observations were made regarding areas of potential or actual (visible) contamination and surrounding land uses, including their potential to impact the site
- review of aerial photographs (for the years 1959, 1979, 1987, 2001 and 2012) from the former NSW Department of Lands (now NSW Land and Property Information)
- database search of registered groundwater bores within a one kilometre (km) radius of the site via the NSW Water Information Groundwater Works Reports online resource
- review of the physical site setting including location of surrounding infrastructure, boundaries, regional and local geology, hydrology and hydrogeology
- database search of the NSW Environmental Protection Authority (EPA) contaminated land record and public register for licenses, applications and notices
- database search of the NSW EPA environment protection licences, applications, notices, audits or pollution studies and reduction programs
- review of acid sulfate soil (ASS) maps
- a limited desktop review of historical environmental reports to identify past and present land uses
- preparation of this Stage 1 preliminary site investigation report.

1.3 Proposed development works

The proposal includes the duplication of the existing Tourle Street Bridge over the Hunter River and upgrade of a section of Tourle Street and Cormorant Road at Kooragang Island, NSW. The proposal is required to address current traffic issues and upgrade the capacity of this main road transport corridor between Kooragang Island and the City of Newcastle. Key features of the proposal include:

- construction of a new two-lane bridge to the west of the existing Tourle Street Bridge to accommodate north-bound traffic, the new bridge would consist of eight spans with a deck length of 255 metres (m) and a width of 10 m

- construction of new northern and southern approaches for the new bridge
- widening of Tourle Street and Cormorant Road to four lanes between 350 m north of the intersection of Tourle Street and Industrial Drive to 200 m west of the intersection with Cormorant Road and Egret Street
- minor ancillary roadworks, such as the improvement of intersections at the site and installation of road safety barriers
- relocation of services and utilities, such as underground pipes and cables and overhead electricity lines, as required.

2. Site setting

2.1 Site location

The site is an approximately 3.8 km corridor generally comprising of the existing Tourle Street and Cormorant Road corridor from Industrial Drive where it traverses the southern arm of the Hunter River to Egret Street on Kooragang Island.

The site is defined as the area directly impacted by the construction of the proposal. This includes land adjacent to and including Tourle Street and Cormorant Road, from about 350 m north of the intersection of Industrial Drive and Tourle Street, Mayfield West extending to about 200 m west of the intersection of Cormorant Road and Egret Street, Kooragang Island.

2.2 Environmental planning instruments

The site is located within Newcastle Local Government Area (LGA). The relevant environmental planning instrument is the *Newcastle Local Environment Plan 2012* (NLEP 2012) which is administered by Newcastle City Council (NCC).

The site is within land identified as a State Significant Site and zoned 'SP1 Special Activities' under the *State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2009* (the Three Ports SEPP) which establishes specific zoning and development controls for Kooragang Island and the Newcastle Port Area. The Three Ports SEPP prevails over the NELP.

2.3 Surrounding land uses

The land use surrounding the site generally consists of:

- North – Kooragang Island Waste Emplacement Facility, Newcastle Coal Infrastructure Group (NCIG) coal export facility
- South – Tourle Street, Industrial Drive and the residential suburb of Mayfield
- East – OneSteel facility and former BHP Steelworks site
- West – Former Delta EMD and Steel River commercial park.

2.4 Summary of previous investigations

Table 2.1 provides a summary of the reports that were reviewed as part of this assessment.

Table 2.1 Summary of historical reports

Report reference	Scope of work	Key findings relevant to contamination assessment
Parsons Brinckerhoff 2004. <i>MR108 Replacement of Tourle Street Bridge Project, Review of Environmental Factors.</i>	A review of environmental factors for the construction of the existing Tourle Street Bridge and approaches parallel to and immediately east of a former Tourle Street Bridge.	Sampling and analysis of areas within the site where it was found there was a risk of contamination from surrounding sites. Appropriate control measures were recommended to be put in place for construction works.

Report reference	Scope of work	Key findings relevant to contamination assessment
<p>Parsons Brinckerhoff 2004. <i>Acid Sulfate Soil Investigation and Management Plan, Tourle Street Bridge Duplication.</i></p>	<p>An ASS investigation over the south channel of the Hunter River and the northern abutment.</p>	<p>No ASS was detected at the site. Potential ASS were identified in soils below 1.0 m. An ASSMP was prepared for works at the site.</p>
<p>SMEC 2007. <i>MR108 Replacement of Tourle Street Bridge, Newcastle, Further Contamination Assessment.</i></p>	<p>To determine what potential contamination impacts would have on the proposed construction activities for the replacement of the former Tourle Street Bridge. Included:</p> <ul style="list-style-type: none"> • Review of existing information • Inspection of drainage lines • Drilling and well installation and sampling • establish groundwater link to Hunter River. 	<p>Conditions in the vicinity of the site included:</p> <ul style="list-style-type: none"> • Thin surface fill layer underlain by slag 1–3 m thick, beneath this is a dark grey gravel with elevated polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRH) and metals, underlain by clays of low permeability at 3 mBGL. • Groundwater was encountered between 1.5 and 2 mBGL. • Ground conditions are highly variable due to filling. <p>It was found for the replacement of the former Tourle Street Bridge in 2007, that:</p> <ul style="list-style-type: none"> • Adverse impacts of slag and gravel materials on construction work can be appropriately managed through environmental and safety plans • Evidence shows that the site does not pose a significant risk of harm to the environment that would require confirmation through environmental investigations /monitoring • Evidence also indicates that the site may not contribute significantly to the degraded environmental conditions in the region caused by off-site sources.
<p>SMEC 2007. <i>Contamination displacement assessment – Tourle Street Bridge.</i></p>	<p>An assessment of the potential displacement induced by piling and ground treatment over the known benzene contamination plume on the south-eastern abutment.</p>	<p>Contaminant displacement and migration is unlikely to occur as a result of works associated with the replacement of the former Tourle Street Bridge. Contamination risk could be further reduced by a variety of construction methods detailed in the report. Methods suggested included impermeable barrier between the contamination and the hunter river.as was removal of material from piling drilling and increased monitoring of the groundwater in the area.</p>
<p>SMEC October 2009. <i>Tourle Street Bridge Sediment Sampling Report.</i></p>	<p>Sediment sampling at targeted locations of existing piles of the former Tourle Street Bridge. Contaminants of concern were:</p> <ul style="list-style-type: none"> • metals • TRH • PAHs. 	<p>Contaminants of concern were less than the adopted criteria indicating that the former bridge construction works did not result in disturbance of contaminants in the Hunter River. One sample exceeded the criteria for zinc. Specific management was not recommended for bridge works but contractors were advised to limit the amount of re-suspension of the sediment.</p>

Report reference	Scope of work	Key findings relevant to contamination assessment
<p>Douglas Partners February 2012.</p> <p><i>Proposed Terminal 4 (T4) Project, Kooragang Island.</i></p>	<p>A contamination investigation of the T4 Project area including the Kooragang Island Emplacement Facility, Delta EMD waste disposal area, wharf areas on both sides of the Hunter River with the objects of protecting the environment and human health.</p>	<p>The main contamination issues identified in the site and its surrounds are:</p> <ul style="list-style-type: none"> • Soil and groundwater impacted with coal tar waste in the emplacement area to the north west of the Tourle street study area • Light non-aqueous phase liquid (LNAPL) contamination to the north of Long Pond • Delta EMD waste disposal area; potential mobilisation of contaminants and adverse groundwater interactions during dredging. <p>The area between Cormorant Rd and the Hunter River is considered to be of low contamination risk due to the undisturbed mangroves and minimal historical filling practices.</p> <p>Earthworks in this area were recommended to be managed through a management plan.</p>
<p>Douglas Partners February 2012.</p> <p><i>Summary of contamination issues site F (OneSteel Site)</i></p>	<p>A contamination investigation of the T4 Project area, OneSteel site.</p>	<p>Contaminants of concern identified as benzene, PAHs, metals, cyanide and ammonia associated with steel making.</p> <p>The impact of groundwater on the Hunter River was mitigated by the presence of a clay layer between fill and the estuarine aquifers.</p> <p>The contamination present on this site can be managed through commonly used methodologies for the proposed works</p> <p>Recommendations included:</p> <ul style="list-style-type: none"> • Additional ground water, soil and vapour investigations • Waste classification • Assessment of the extent of contamination and nature across the study site to prepare a remedial action plan.
<p>Parsons Brinckerhoff November 2012.</p> <p><i>MR108 Duplication of Tourle Street and Cormorant Road, Kooragang Island, Preliminary environmental investigation.</i></p>	<p>A preliminary environmental investigation for the current Tourle Street Duplication project.</p>	<p>Prepared to identify potential environmental constraints as part of the development of options for the proposal.</p> <p>Recommended the preparation of a soil and water management plan for erosion and sediment controls and for contamination specific management measures including:</p> <ul style="list-style-type: none"> • Waste disposal • Waste soil and sediment treatment • Assessment of any imported material • Minimalizing any skin exposure of contaminated soils. <p>Recommended the preparation and implementation of an ASS management plan.</p>

2.5 Topography

The site lies within the lowlands associated with the south arm channel of the Hunter River. The south arm channel meanders from Hexham Bridge down to its termination at the river mouth at Carrington. At the Tourle Street Bridge, the Hunter River is approximately 230 m wide and is typically three m deep.

The banks of the Hunter River are typically vegetated with mangroves and seagrass beds. The northern approach onto the existing Tourle Street Bridge is approximately two to three m above sea level (AHD). The proposed new road alignment within this northern approach would generally have an embankment approximately one m high and have a footprint approximately 30 m wide. There is a pond located to the north of the existing northern approach, locally known as Long Pond.

The southern approach area was also a former low lying swamp area which was once dissected by Platt's Channel, with Spit Island between this channel and the present south arm of the Hunter River. The Platt's Channel and southern bank of the Hunter River south channel areas have since been filled with various industrial waste materials to approximately four m AHD. The eastern side of the existing road has had an additional fill embankment placed approximately six m above the current road level.

2.6 Geology and soils

Based on the Newcastle Coalfield Regional 1:100,000 Geology Map (1995) and the Newcastle 1:250,000 Geological Sheet SI/56-2 (1966), the geology of the site comprises Permian-age Tomago Coal Measures overlain by Quaternary alluvium deposits, comprising Quaternary gravel, sand, silt and clay and coal and including man made fill and silt, clay and estuarine deposits.

Parsons Brinckerhoff (2004) reported the depth to the bedrock base to the filled paeleovalley beneath the south channel of the Hunter River is likely to be approximately 50 m deep to the north of the Hunter River at Kooragang Island, rising to less than 20 m deep to the south of the Hunter River. This paeleovalley is filled with sediment types typically comprising marine sand with the upper layers containing estuarine shell fragments and estuarine muds.

As part of the Review of Environmental Factors (REF) prepared for construction of the existing Tourle Street Bridge (Parsons Brinckerhoff 2004) it was indicated that the northern approach is typically underlain by loose sand and soft clay to approximately seven m depth. This is underlain by medium dense sand to 15 m overlying stiff silty clay. Bedrock was encountered in one hole, TS8, at 37 m. On the existing southern approach a fill embankment was present on the eastern side. The subsurface conditions reported show fill comprising predominantly slag with coarse coal washery rejects to at least 5 m (maximum extent of the test pit) with fill to depths of up to 13.2 m. Bore logs from SMEC (2007) report slag present in fill to approximately 3 m under the proposed southern alignment and Douglas Partners (2012) reports that fill is generally up to 12 m AHD but generally less than 9 m AHD across the site.

Reference to the Newcastle Soil Landscape Series Sheet 9232 indicates that the site is located on 'Disturbed Terrain Landscapes', which are described as '*level plain to hummocky terrain, removal or burial of soil. Local relief and slopes are highly variable. Landfill includes soil, rock, building and waste material*'. Limitations to the proposal may include mass movement hazard, steep slopes, foundation hazard, unconsolidated low wet bearing strength materials, potential ASS, impermeable soils, poor drainage, erosion hazard, very low fertility and toxic materials.

2.7 Hydrogeological setting

Key elements of the hydrogeological setting of the site are listed below:

- The Hunter River adjacent to the site is a tidally influenced system with tidal influx accounting for the largest change in water volume.
- During high rainfall periods freshwater flow is the dominant process governing the movement of water in the estuary (Parsons Brinckerhoff, 2004).
- The south channel of the Hunter River is shallow in places with a low tide depth of approximately 3.78 m at Tourle Street Bridge (NSW Maritime 2011).

The groundwater at the site has been recorded in the SMEC investigations (2007) of the southern abutment, the Douglas Partners contamination reports of the T4 Project (2012) and Parsons Brinckerhoff's 2004 Review of Environmental Factors and 2012 Preliminary Environmental Investigation. These reports have defined the groundwater on Kooragang Island as containing an unconfined aquifer in the fill layer above a clay aquitard and a confined aquifer within the estuarine sediments beneath this area. The groundwater is recharged by rainwater and surface water from Kooragang Island and generally drains to the Hunter Estuary Wetlands to the north, and via the south arm of the Hunter River to the south.

2.8 Regional groundwater bores

Based on a review of the NSW Natural Resource Atlas (<http://www.nratlas.nsw.gov.au/>), 22 groundwater bores were identified within a 1 km radius of the site. Details of the individual bores are provided below in Table 2.2.

Table 2.2 Summary of registered groundwater bores within one km of proposed development area

Bore licence ID	Authorised purpose	Approximate distance/direction from site	Date drilled	SWL (mBTOC)	Total depth (m)
GW047734	Industrial	1000 m SE	1/1/1945	–	2.60
GW201307	Monitoring	180 m SW	22/5/2009	–	15.80
GW201306	Monitoring	200 m SW	28/5/2009	–	21.00
GW201311	Monitoring	900 m SW	02/06/2009	–	18.65
GW200087	Test bore	950 m SW	01/04/2002	–	23.70
GW201308	Monitoring	1000 m SW	22/5/2009	–	11.50
GW201305	Monitoring	1000 m SW	18/5/2009	–	21.00
GW201819	Monitoring	600 m NW	28/06/2001	–	7.10
GW201821	Monitoring	650 m NW	29/06/2001	–	7.60
GW201823	Monitoring	700 m NW	28/06/2001	–	12.50
GW202637	Monitoring	950 m N	10/07/1996	–	2.05
GW202646	Monitoring	600 m N	01/07/1995	–	7.00
GW202641	Monitoring	550 m N	02/05/1995	0.90	2.30
GW202645	Monitoring	500 m N	03/05/1995	1.00	2.30
GW202648	Monitoring	450 m N	01/07/1995	–	7.00

Bore licence ID	Authorised purpose	Approximate distance/direction from site	Date drilled	SWL (mBTC)	Total depth (m)
GW202640	Monitoring	450 m NE	10/07/1996	0.5	2.00
GW202643	Monitoring	600 m NE	01/07/1996	6.0	14.00
GW202644	Monitoring	450m NE	13/01/1994	1.40	7.20
GW202639	Monitoring	450m NE	10/07/1996	0.55	2.30
GW202638	Monitoring	600 m NE	01/07/1996	–	2.90
GW202531	Monitoring	700 m NE	04/07/2012	–	4.20
GW202533	Monitoring	700 m E	02/07/2012	–	4.10

Notes

SWL – Standing water level
 mbTOC – m below top of casing

The majority of the bores identified are associated with monitoring of the Kooragang Island Waste Emplacement Facility to the north and the OneSteel and BHP Steelworks sites located to the south-east of the site. It is evident through review of reports from surrounding properties, that there are multiple groundwater bores in the area not present in this search. Douglas Partners (2012) notes that there are 150 groundwater bores investigated in the T4 Project Area.

2.9 Acid sulfate soils (ASS)

Previous site investigations by Parsons Brinckerhoff (2004) and SMEC (2005) did not identify actual ASS in the alignment of the replacement bridge. However, a review of the NSW EPA ASS risk maps indicated the following:

- there is a high probability of occurrence of ASS materials within the Hunter River estuary
- there is a high probability of occurrence of ASS materials within one metre of the surface in some areas within the proposed site area
- parts of the proposed site area have been mapped as ‘Disturbed Terrain’ due to previous filling and land reclamation.

The site is classified as being risk class ‘X2’, being disturbed terrain with an elevation of two to four m AHD. Further assessment of ASS including field screening tests and collection of soil samples for laboratory testing is recommended. The *Acid Sulfate Soil Investigation and Management Plan* (Parsons Brinckerhoff, 2004) was prepared for the previous bridge replacement and should be referenced for further information.

2.10 NSW EPA online notice records database search

A search of the NSW EPA contaminated site register for Newcastle LGA on 23 September 2013 identified 19 records of contaminated sites within the locality of the site. These sites are listed in Table 2.3. It is noted that two of these sites are located within close proximity to the site. These are the former Tourle Street Bridge Replacement Project and the Hunter River Remediation Project. Both of these projects are listed on the contaminant register due to their activity within the Hunter River.

Table 2.3 List of contaminated sites within the proposal area and surrounding suburbs

Site name	Location	NSW EPA Status	Details of contamination
BHP Kooragang	Cormorant Road, Kooragang	Regulated	A management notice (#357) for buried asbestos.
Orica, Kooragang Island	15 Greenleaf Road, Kooragang	Regulated	An approved voluntary management proposal for arsenic and nutrients (ammonia and nitrate) contamination.
BHP Closure Site/ Adjacent Hunter River Sediments	Industrial Drive, Mayfield along the southern arm of the Hunter River approximately 500 m east of Tourle Street	Regulated up until 23 January 2014	Petroleum hydrocarbons (including BTEX), metals, ammonia, cyanide, phenols and polycyclic aromatic hydrocarbons.
Koppers Coal Tar Products Mayfield	Woodstock Street, Mayfield 200 m to the South West of Tourle Street	Regulated	Declaration of remediation site for contaminants Coal tars, which include PAHs have been found in the soil and groundwater at the site. Metals, ammonia, petroleum hydrocarbons (C ₆ -C ₉), cyanide and phenols are commonly associated with coal tar contamination and may be present on the site.
OneSteel Site	Industrial Drive, Mayfield. Adjacent to the eastern side of the Tourle Street Bridge southern abutment	Regulated	Notice: 19033. AVMP, #20131704 contaminated with Benzene and PAHs including naphthalene.
Steel River Industrial Estate	Industrial Drive, Mayfield	Regulated	AVMP, #20131706 relating to contamination with petroleum hydrocarbons (including BTEX), PAHs, metals, phenols, cyanide and ammonia.
Australian Tube Mills Newcastle Site	Industrial Drive, Mayfield	Notified	ND
BHP Closure Site (Hunter River Sediments)	Bed Sediments of the Hunter River adjacent to Lot 221 DP1013964, Mayfield	Notified	ND
BHP Steel River	The Buffer Zone extending directly adjacent to the Hunter River; near the Tourle Street Bridge, Mayfield	Regulated	Declaration of remediation site #21040 and AVMP 20131706. Total petroleum hydrocarbons (including benzene and toluene), PAHs, metals, phenols, cyanide, and ammonia.
BHP Supply site	Industrial Drive, Mayfield	Notified	ND
Mobil Service Station, Mayfield	412-416 Maitland Road, Mayfield	Notified	ND
Newcastle Wire Mill	Ingall Street, Mayfield	Notified	ND
OneSteel (BHP)	Industrial Drive, Mayfield	Notified	ND
Shell Coles Express Service Station, Mayfield	63-69 Maud Street, Mayfield	Notified	ND
Waratah Steel Mill	23 Frith Street, Mayfield	Notified	ND

Site name	Location	NSW EPA Status	Details of contamination
Koppers Coal Tar	East of Woodstock Street and Tourle Street, Mayfield West	Notified	ND
Stevenson Park landfill	2/559 Maitland Road, Mayfield West	Notified	ND
Tourle Street Bridge Project	Tourle Street, Mayfield West	Notified	ND

Notes:

Information accessed from the NSW EPA, record of notices for Newcastle City Council LGA and list of NSW contaminated sites notified to EPA

AVMP – Approved Voluntary Management Proposal

ND – Not detailed in EPA notification

2.11 Review of aerial photographs

Historical aerial photographs dating back to 1959 were obtained from NSW Land and Property Information and reviewed to visually assess changes to the site and surrounding areas over time. The main features noted for the site and surrounding areas in each of the photographs are summarised in Table 2.4.

Table 2.4 Historical aerial photograph review summary

Year	Site	Surrounds
1959	Unsealed tracks exist on either side of the Hunter River where Tourle Street and Cormorant Drive currently run. On the northern portion of the site sand dunes and mangroves occupy the area.	Predominantly vacant land with farming evident on Kooragang Island. Platt's Channel visible with sand dunes present to the south of the Hunter River either side of Tourle Street.
1979	Land has been reclaimed from the Hunter River and Tourle Street Bridge has been constructed. Tourle Street and Cormorant Drive appear to be sealed road surfaces. An overpass has been erected from the Steel River site to the OneSteel site on the southern portion of Tourle Street.	North – The (KIWEF) is present. South --Development has started to occur in the southern portions of Tourle Street with small industrial structures being erected. East – OneSteel site is developing, with stockpiles and industrial buildings.
1987	No major changes to the site. Long Pond present.	Increase in industrial development in the area with the stockpiling and increased development in all directions around the site. More prominent water ponds visible within the KIWEF to the north.
2001	Delta EMD development present to the west of Tourle Street. On either side of Cormorant Drive there have been developments to facilitate the coal handling facility.	South-west – evidence that there has been a decrease in industrial activity to the west of the Delta EMD plant on the south side of the hunter river. South-east – The stockpiles at the OneSteel site have reduced in size and the Waratah Coal facility is in operation. North – Parts of the KIWEF being capped and the capping vegetated with grasses.

Year	Site	Surrounds
2012 (LPI spatial information exchange website)	<p>The new Tourle Street Bridge has been constructed and the old bridge is present.</p> <p>There is a sedimentation pond to the east of the northern abutment which is associated with the storm water runoff from the bridge.</p> <p>Road overpass along the southern portion of the site has been removed and a new coal overpass is present on the eastern section of Cormorant Drive to facilitate the surrounding NCIG export facility.</p>	<p>North and east – The NCIG has been established and there has been significant infrastructure upgrades along either side of Cormorant Drive.</p> <p>South – There has been an overall decrease in industrial activity with evidence of downsizing of facilities of neighbouring properties.</p>

2.12 Summary of historical land use

A summary of the historical land use has been prepared from the review of previous reports by Parsons Brinkerhoff (2004, 2012), SMEC (2007 and 2009) and Douglas Partners (2012). Prior to the disturbance of the site, the site on either side of the Hunter River south arm was made up by low lying tidal islands and sand spits that formed a delta like system. During the late 1800s and into the 1900s the site was used for agriculture and grazing of livestock. Minimal dredging and filling occurred in this time until 1953 with the introduction of the *Newcastle Harbour Foreshore Improvement Act 1953* which allowed for the expansion of the Hunter River. This resulted in the reclaiming of land through the dredging of the Hunter River. During this time, Platts Creek, which was located in the region of the Tourle Street Bridge, was filled in. This Act facilitated the conversion of parts of the Island for industrial uses.

Kooragang Island was named in 1968 and land on the northern side of the Hunter River was reclaimed with sand and silts from river dredging. Similar filling occurred at this time to the allotments on the southern bank of the Hunter River.

Filling in the KIWEF has occurred between 1972 and 1999 and used as a landfill for solid waste material from the BHP Steelworks. The materials deposited in this landfill are recorded to contain (Douglas Partners 2012):

- steel and furnace slag
- flue dust
- coal washery fines
- shale from coal rejects
- plant refuse
- tar
- fly ash
- effluent treatment slurry
- lime sludge
- sludge containing oils and grease
- asbestos waste.

Following the BHP Steelworks closure the landfill was surrendered to the NSW Government. The landfill is licensed as a Solid Waste Class 2 landfill and is managed by the Hunter Development Corporation in accordance with environmental protection licence (EPL) No. 6437. This licence was surrendered in December 2010 (EPA notice number 1111840).

In 2010, NCIG commenced operations on the Kooragang Island site as a coal export facility. Operations include coal stockpiling, handling and ship loading which occur on the site with the coal coming into the facility via rail to the north of Long Pond.

In 2009 the Tourle Street Bridge was upgraded. This involved the removal of the existing bridge and the construction of a 255 metre eight span concrete girder bridge. The works also involved earthworks, construction of embankments, realignment of the water main and stormwater pipework. Additionally, a bentonite cut off wall was constructed on the southern abutment to manage the known benzene plume present in the groundwater from the adjoining site.

3. Site inspection

A site inspection was undertaken by a suitably qualified environmental scientist from Parsons Brinckerhoff on 2 October 2013. The purpose of the inspection was to assess the site setting, surrounding land uses and review of potential contamination sources both on-site and off-site. The walkover was separated into sections due to the length of the site and safety of staff exiting the vehicle adjacent to the main road. A summary of the findings is presented below.

Cormorant Road: Egret Street intersection to the coal conveyor overpass

The section of Cormorant Road from the intersection with Egret Street to the coal conveyor overpass is a multilane dual carriageway which is predominately straight and at the same level as the adjacent ground. Key observations include:

- The Hunter River is approximately 100 m to the south with ships berthed and loaded with coal.
- A rail line runs parallel to the road and crosses Cormorant Road, approximately 150 m west of Egret Street.
- On the northern side of Cormorant Road, the area is grassed for approximately 150 m with sparse low trees and a gravel path to the Boral Kooragang facility.
- Surface soil in the grass area is sandy with shell fragments throughout. Some asphalt pieces were noted.
- The Boral site buildings are approximately 200 m north of Cormorant Road, on the eastern side of Egret Street. The main building appears to contain corrugated asbestos cement sheeting.
- BOC Gases facility is located 200 m to the north of Cormorant Road, on the western side of Egret Street. Gas tanks are visibly present at the site.
- Two covered coal conveyor belts cross from the northern to southern side of Cormorant Road.

Cormorant Road: Coal conveyor overpass to the northern end of Long Pond

This section of Cormorant Road from the coal conveyor overpass to the northern end of Long Pond is similar to the previous section. The NCIG facility exists on the northern and southern side of the road with chain wire fences bordering the site from the road verge. The key observations are listed below:

- To the south of Cormorant Road is a 15 metre grass verge with a narrow embankment less than one metre between the road and chain wire fence.
- Soil is sandy with shell fragments.
- North of the road a chain wire fence separates five m of grass verge and the NCIG coal handling facility. On the northern side of the fence, an embankment approximately three m high covered in woodchips and newly planted vegetation bounds the site.
- Signs running along the northern verge indicate there is Telstra fibre optic cabling parallel to Cormorant Road.
- A carpark and site entrance to the NCIG facility exists on the southern side of Cormorant Road approximately 1.14 km to the west of the conveyor overpass.
- An Ausgrid wind turbine is positioned at the southern border of the carpark.
- The NCIG coal export facility ends at the access road to the north of Cormorant Road and at the end of the carpark.

Cormorant Road: Long Pond to the north of Tourle Street Bridge

Within this section of Cormorant Road, the road bends to the south and adjoins the Tourle Street Bridge. Cormorant Road is two lanes, with one lane in each direction, and both sides of the road are vegetated. The key features of this section include:

- Directly to the west of the car park, there are two depressed areas with rushes and long grasses.
- A dirt path crosses the depressed area 150 m south of the car park; it is raised approximately one metre above and provides access to two manmade clearings to encounter the waterline of the Hunter River.
- To the south of Cormorant Road, soils are predominantly sandy and the topography grades to the Hunter River.

Tourle Street Bridge to Industrial Drive

The southern abutment of the Tourle Street Bridge increases in elevation to a crest in the road approximately halfway between the southern abutment and Industrial Drive. The road slopes back towards Industrial Drive which appears to be a regional depression in topography. On the eastern side of the southern approach of Tourle Street, there is an embankment up to the OneSteel site. The site is fenced and appears to contain bitumen and unsealed surfaces. Two long warehouse buildings exist on the site and which appear to be constructed with asbestos cement sheeting. Key features of this section of the study area include:

- To the west of Tourle Street, the site is the vacant block which was the former Delta EMD site. A densely vegetated area is present from the south of the Delta EMD site to the crest of the hill.
- Embankments containing slag and other fill material are present on both sides of the southern embankment.
- To the east of Tourle Street, Hymix Concrete has a facility with contained stockpiles of raw materials and a concrete mixing facility.
- An aboveground storage tank with approximate 20,000 litres capacity is present on the Hymix property. This is located within a bund on near the truck wash bays in the site.

3.1 Surrounding land uses

A brief description of the surrounding land uses to the site, identified during the inspection is provided below. The nearest residential development is located approximately 800 m south of Tourle Street Bridge, at Tourle Street in Mayfield.

Kooragang Island, northern section of proposed development area

The proposal is located across the southern arm of the Hunter River linking the suburb of Mayfield with Kooragang Island. The southern portion of Kooragang Island comprises industrial activities, predominantly the NCIG operating a coal export terminal with rail, storage, ship loading and associated infrastructure.

The northern side of Kooragang Island is a nature reserve. The area to the west of the bridge and carriageway is a former industrial waste emplacement facility that operates under EPL #6437, held by the Hunter Development Corporation. This includes fill that has come from dredging the Hunter River for the Hunter River Remediation Project and contaminated fill from the former BHP Steelworks operation. Between this facility and Cormorant Road a wetland area, known as the Long Pond, has formed.

Mayfield, southern section of proposed area

The southern approach to Tourle Street Bridge is elevated, comprising fill and dredging spoil. Industrial developments including OneSteel and Steel River industrial estate adjoin Tourle Street. Delta EMD an

electrolytic manganese dioxide manufacturer on the western side of the Tourle Street Bridge has ceased operations, with their EPL surrendered in July 2010 (EPL #3278).

To the east of Tourle Street, the southernmost property is a Hymix concrete batching plant. This property contains segregated storage stockpiles of sand and other raw materials. There are two mixing tanks on site and a loading conveyor belt. Along the fence line there is an aboveground storage tank (approximately 20,000 L) contained within a low concrete bund.

4. Potential for contamination

4.1 Contaminants of potential concern

Based on the site walkover and review of site history detailed in Section 3.5, the contaminants of potential concern within the site are considered to be:

- TRH, PAHs and BTEX compounds associated with existing bitumen and road base and filling with coal reject material at the site. Additionally with the historical storage, distribution and potential spillages or dumping of petroleum and diesel at and adjacent to the site.
- A benzene plume located to the immediate east of the southern approach to the Tourle Street Bridge, immediately adjacent the southern bank of the Hunter River (refer to Table 4.1). This contaminant plume has also potentially migrated into subsurface soils and groundwater within the site area.
- PAHs and heavy metals potentially arising as a result of the historical land reclamation and landfilling activities at the site, involving filling of the site with furnace and blast slags, flue dusts, ash and coal washery slurries.
- Phenolic compounds potentially associated with the storage and distribution of petroleum and diesel products at the site, as well as landfilling activities.
- Asbestos containing materials (ACM) arising at the site from historical land reclamation activities and landfilling at the site. ACMs may also be present as a result of illegal dumping along the site.

4.2 Conceptual site model (CSM)

The CSM has been developed based on the available information to outline the potential sources of impacts, transport mechanisms and receptors based on the site setting including surrounding land uses. For a potential risk to be present, a source, a receptor (human or environmental) and a pathway between the source and receptor must be present for a complete exposure pathway to exist. The CSM is summarised in Table 4.1.

Table 4.1 Conceptual site model

CSM	Factors
Potential sources	Onsite
	Contaminated heterogeneous buried fill and soils.
	Imported fill used in embankments and grading of existing landforms including asbestos and other contaminated fill materials.
	Residual contamination in surface soils due to the application of herbicides and pesticides used during maintenance of existing roadways.
	Acidic water runoff arising from inappropriately managed ASS disturbed during construction.
	Illegal dumping along roadway including asbestos containing materials.
	Existing utilities containing asbestos material in the form of asbestos cement piping, gaskets, malthoid membranes or lagging.
	Offsite
Residual contamination in surface soils from coal tar, bitumen, road base and vehicle emissions associated with the existing highway and adjacent roads.	

CSM	Factors
	Potential benzene plume in groundwater known to be present to the east of the southern approach (OneSteel land) to the Tourle Street Bridge (Douglas Partners, 2012).
	Residual contamination in surface soils affected by historical aerial contaminants dispersed from adjacent industrial site uses (coal dust, cement dust etc.).
Potential pathways	Leaching and migration of contaminants vertically into underlying groundwater.
	Mobilisation of subsurface contaminants (via sediment transport and airborne dust) during excavation, cutting, drilling and piling works.
	Surface water flow and lateral migration of contaminated water through preferential pathways such as natural or artificial drainage lines, sewers and infrastructure trenches.
	Exposure to potentially contaminated soil, sediment and groundwater during construction works by means of direct contact (dermal contact, ingestion and or inhalation).
	Ingestion or adsorption by terrestrial and aquatic flora and fauna through entry of contaminant into waterway.
	Vapour inhalation associated with the benzene plume on the southern abutment of Tourle Street Bridge.
	Mobilisation of contaminants within the existing utilities (through airborne dust) during the removal and relocation.
Potential sensitive receptors	Long Pond and other small wetland areas along Cormorant Road.
	Surface waters of the Hunter River (South Arm), and as a result the aquatic flora and fauna of Hunter River and downstream Newcastle Harbour.
	Groundwater beneath the site due to the interconnectivity to the surrounding site.
	Site construction and maintenance personnel undertaking works at the site.
	Recreational users of the lands and waterways within and adjacent to the site area.
	Terrestrial flora and fauna within and adjacent the site area.

4.3 Key exposure pathways

Key exposure pathways would likely be via direct contact with soils, surface water or groundwater (dermal contact, ingestion and inhalation) by construction/utility workers, users and through the migration of airborne dust to off-site receptors and uptake via dermal contact, ingestion and inhalation. Key exposure pathways are outlined below:

- Exposure to the identified benzene contaminated soil and groundwater around the southern abutment of the Tourle Street Bridge is possible following groundwater disturbance. Exposure to this material can occur through dermal contact and vapour inhalation of benzene by the construction workers involved in the project.
- During construction works the disturbance of the hydrocarbon and heavy metal contaminated sediment and groundwater is possible, potentially impacting the Hunter River and the surrounding environment.
- Acid water runoff is possible arising from oxidation of potential acid sulfate soil (PASS) producing sulfuric acid. This poses a risk to the surrounding environmental receptors and workers and may potentially damage to the surrounding bridge works and infrastructure if left unmanaged.
- Generation of hazardous dusts as a result of moving utilities containing asbestos materials. Workers and surrounding occupants may be exposed to an inhalation risk of these dusts if they are not managed appropriately during the works phase.
- Generation of hazardous dusts is possible from unexpected dumped asbestos around the site. During works, if localised illegal dumping has occurred, workers and surrounding occupants may be exposed to an inhalation risk of these dusts if they are not managed appropriately during the works phase.



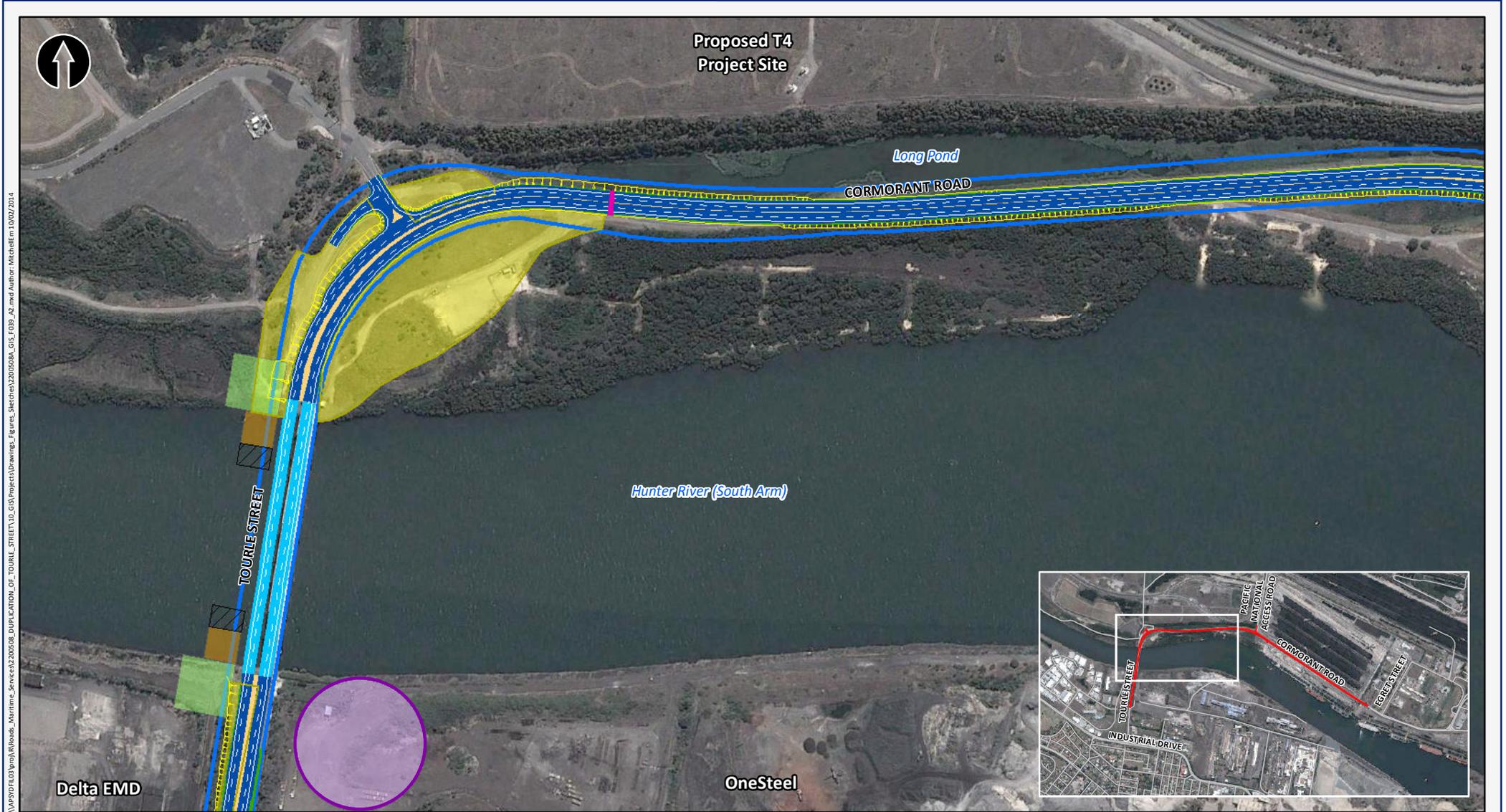
I:\PSP\PEL03\proj\Roads_Maritime_Services\2200516_DUPPLICATION_OF_TOURLE_STREET\10_GIS\projects\Drawings_Figures_Sketches\2200508A_GIS_F039_A4.mxd Author: MitchellM 10/02/2014

Source: Google (2013)

- The Site
- Proposed Road Pavement
- Edge of Road
- Median
- Indicative Compound and Stockpile Areas
- Approximate location benzene plume, subject to management under AVMP #20131704, on OneSteel site



Figure 4.1a
Areas of Significant Contamination



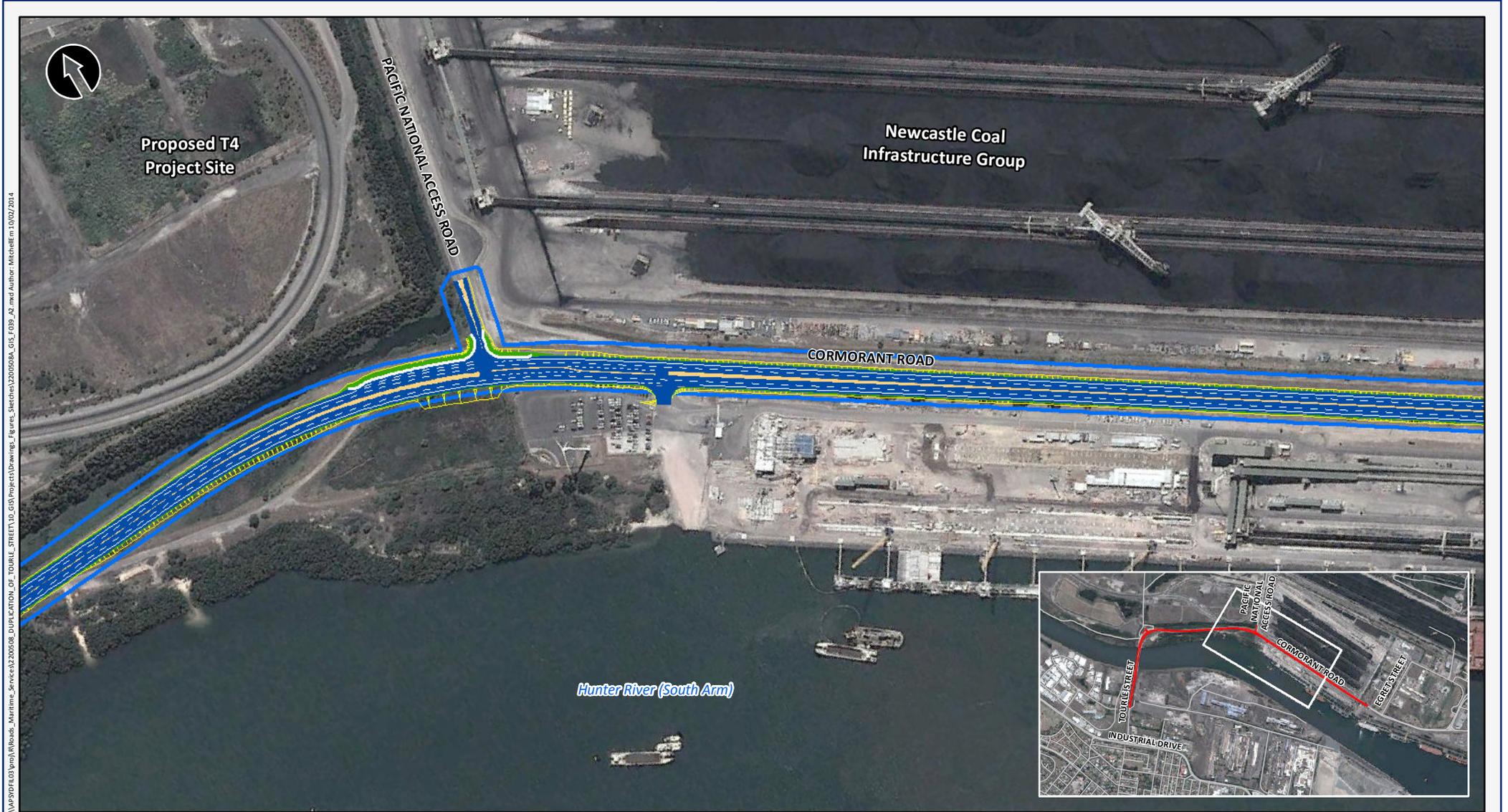
I:\SP\PEL03\proj\Roads_Maritime_Service\2200508_DUPPLICATION_OF_TOURLE_STREET\10_GIS\projects\Drawings_Figures_Sketches\2200508A_GIS_F039_A4.mxd Author: MitchellEm 10/02/2014

Source: Google (2013)

- | | | | |
|----------------------------|---|------------------------------|--|
| The Site | Proposed Road Pavement | Hardsurface Area (50m x 50m) | Approximate location benzene plume, subject to management under AVMP #20131704, on OneSteel site |
| Proposed Bridge Structures | Wharf (30m x 30m) | Dredging Area (30m x 20m) | |
| Edge of Road | Indicative Compound and Stockpile Areas | Culvert | |
| Median | | | |
| | | | |



Figure 4.1b
Areas of Significant Contamination



I:\PSP\PEL03\proj\Roads_Maritime_Services\2200508_DUPPLICATION_OF_TOURLE_STREET\10_GIS\projects\Drawings_Figures_Sketches\2200508A_GIS_F035_A4.mxd Author: MitchellEm 10/02/2014

Source: Google (2013)

- The Site
- Proposed Road Pavement
- Edge of Road
- Median

0 50 100 150 m

Figure 4.1c
Areas of Significant Contamination



I:\PSP\PEL03\proj\Roads_Maritime_Services\220508_DUPPLICATION_OF_TOURLE_STREET\10_GIS\projects\Drawings_Figures_Sketches\220508A_GIS_F039_A4.mxd Author: MitchellEm 10/02/2014

Source: Google (2013)

- Rail
- Proposed Road Pavement
- The Site
- Edge of Road
- Median
- Culvert

0 50 100 150 m

Figure 4.1d
Areas of Significant Contamination

5. Discussion and conclusions

The site and its immediate surrounds have had a history of potentially contaminating activities and known contamination which have been a direct result of the industrial development of the southern bank of the south arm of the Hunter River and Kooragang Island. The major industrial process in the area was steel manufacture with by products and waste generated resulting in the major sources of contamination. This study has reviewed the pertinent site history, previous reports and databases to develop a CSM of the contaminants of concern for the site. This identifies the key contaminants and exposure pathways that may be encountered during the duplication of Tourle Street Bridge.

The key exposure pathways that have been identified through this investigation are:

- exposure to the benzene contaminated soil around the southern abutment of the Tourle Street Bridge as a result of soil and groundwater disturbance. This exposure can occur through dermal contact and vapour inhalation by construction workers involved in the project
- disturbance of the hydrocarbon and heavy metal contaminated sediment and groundwater potentially impacting the Hunter River
- acid water runoff arising from the disturbance and oxidation of PASS from natural soils one metre beneath the ground surface of the hunter river and in natural sediments on the adjacent banks. This could pose an environmental risk to the surrounding environment and potentially damage bridge infrastructure
- the generation of hazardous dusts from the relocation of utilities potentially containing asbestos. This poses an inhalation risk to surrounding workers
- the disturbance of hazardous dusts from unexpected dumped asbestos resultant from illegal dumping around the site. This poses an inhalation risk to surrounding workers.

6. Recommendations

Based on a review of the historical data and the surrounding site uses, in order to manage contamination of soil, groundwater and sediment in the proposal area during the proposed construction works, the following are recommended:

- Prior to commencement of construction, an environmental investigation would be undertaken at the northern and southern approaches to the Tourle Street Bridge. The purpose of this investigation would be to provide an *in situ* waste classification of the material that would be used to determine how soil and groundwater waste is managed at the site. This investigation would also provide an update of the current soil status following construction and demolition activities undertaken in 2009 associated with the existing Tourle Street Bridge. This data would be compared to the NEPM (2013) and compared with historical results in the area. Laboratory analysis for contaminants of concern would at a minimum include PAHs, selected heavy metals, hydrocarbons (TPH and BTEX) and ASS (SPOCAS). The sampling density would be designed to fulfil the requirements of the NSW DECCW (2009) *Waste Classification Guidelines* and to assist with management requirements if ASS/PASS is encountered.
- A waste classification procedure would be prepared following the *Waste Classification Guidelines* (NSW DECCW 2009), NEPM (2013) and NSW EPA (1995) *Sampling design guidelines*. For the defined investigation area to be used for waste disposal purposes.
- Vapour risks associated with hazardous vapours as a result of the documented benzene groundwater contamination would be managed through comparison of the existing groundwater results with the CRC Care technical paper no 10 which provides criteria for intrusive workers in a shallow trench less than one metre. Management of vapour issues will be documented in a Construction Environmental Management Plan (CEMP).
- Available investigation results would be used to determine the need for specific remediation, management and/or disposal requirements for soils/sediments being disturbed during construction works. These measures previously included foundation treatments (jet grouted cut-off wall and pre-grouted pile locations) and would be incorporated in to a CEMP and implemented by the principal contractor. The CEMP would need to consider the previous foundation treatments used to manage potential contamination migration and any other management procedures to be put in place during the relocation of existing utilities and other soil disturbing activities.
- The CEMP would be the overarching guidance document used during construction works to manage existing contamination at the site. The CEMP would be prepared to satisfy the requirements of Roads and Maritime Services (2013) *Guideline for the management of contamination*. The CEMP would include a Soil and Water Management Plan that specifies erosion and sediment controls as well as contamination specific management measures including:
 - ▶ procedures for waste classification and disposal
 - ▶ a waste soil and sediment treatment plan
 - ▶ assessment of imported fill (for organic, inorganic, asbestos contamination and weeds)
 - ▶ minimisation of skin exposure to potentially contaminated soils.
- Preparation of an Acid Sulfate Soil Management Plan (ASSMP) to address the potential for acidity to be generated from ASS and PASS disturbed during the construction phase. Parsons Brinckerhoff has previously prepared an ASSMP (PB Ref #2122349A, Acid Sulfate Soil Investigation and Management Plan, Tourle Street Bridge Duplication, February 2004) for the new bridge construction and demolition of the existing bridge. The purpose of the ASSMP would be to control or mitigate the generation of acid due to construction activities. The ASSMP suggests strategies to:
 - ▶ limit the disturbance of soil
 - ▶ minimise the activities that result in the lowering of the groundwater table or dewatering of ponds
 - ▶ reduce the time soil is exposed to air
 - ▶ neutralise the production of acid for any excavated soils via the application of lime.

7. References

Douglas Partners, February 2012, *Proposed Terminal 4 Project, Kooragang Island*.

Douglas Partners, February 2012, *Summary of contamination issues site F (OneSteel Site)*.

National Environment Protection Council, 2013, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)*.

NSW DECCW, 2009, *Waste Classification Guidelines*.

NSW EPA (1995) *Sampling Design Guidelines*.

Roads and Maritime Services (2013) *guideline for the management of contamination*.

Newcastle Local Environment Plan 2012 (NLEP 2012).

Parsons Brinckerhoff, 2004, *MR108 Replacement of Tourle Street Bridge Project, Review of Environmental Factors*.

Parsons Brinckerhoff, 2004, *Acid Sulfate Soil Investigation and Management Plan, Tourle Street Bridge Duplication*.

Parsons Brinckerhoff, November 2012, *M108 Duplication of Tourle Street and Cormorant Road, Kooragang Island, Preliminary environmental investigation*.

SMEC, 2007, *MR108 Replacement of Tourle Street Bridge, Newcastle, Further Contamination Assessment*.

SMEC, 2007, *Contamination displacement assessment – Tourle Street Bridge*.

SMEC, October 2009, *Tourle Street Bridge Sediment Sampling Report*.

8. Limitations

Scope of services

This environmental site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and Parsons Brinckerhoff (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, Parsons Brinckerhoff access and/or site disturbance constraints.

Reliance on data

In preparing the report, Parsons Brinckerhoff has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, Parsons Brinckerhoff has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Parsons Brinckerhoff will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Parsons Brinckerhoff.

Environmental conclusions

In accordance with the scope of services, Parsons Brinckerhoff has relied upon the data and has not conducted any environmental field monitoring or testing in the preparation of the report. The conclusions are based upon the data and visual observations and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Within the limitations imposed by the scope of services, the assessment of the site and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

Report for benefit of client

The report has been prepared for the benefit of the client and no other party. Parsons Brinckerhoff assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of Parsons Brinckerhoff or for any loss or damage suffered by any other party in relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

Other limitations

Parsons Brinckerhoff will not be liable to update or revise the report to take into account any events, emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to nor ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.