STATEMENT OF ENVIRONMENTAL EFFECTS

VOLUME 1

Main Report

November 2014

Kurnell Refinery Demolition

URS

CALTEX

Statement of Validity

Submission of Statement of Environmental Effects

Prepared as Modification to Development Consent SSD 5544 under S.96 (2) of the *Environmental Planning and Assessment Act 1979*.

Statement of Environmental Effects prepared by:

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In respect of

Applicant and Land Details

Applicant	Caltex Refineries (NSW) Pty Ltd 2 Solander Street, Kurnell, NSW, 2231
Subject Site	Caltex is seeking approval for the demolition works as a modification to development consent SSD 5544 under S.96 (2) of the *Environmental Planning and Assessment Act 1979.*
Project Summary	The demolition works would include the following activities within the demolition works area presented on Figure 4-1: • demolition, dismantling or removal of: - refinery process units and associated infrastructure; - redundant tanks and associated infrastructure; - redundant pipeways and above and underground pipelines; and - redundant buildings and services. • associated civil works; • waste management activities including concrete crushing; and • returning the works areas to ground level. The majority of the demolition works would be completed within the boundary of the Site (as defined by the EIS for SSD 5544). The exceptions to this include: • the removal of the Continental Carbon Pipeline which is also located on land owned by Caltex to the south of the Site; • sections of the redundant pipelines that run through the western and eastern ROWs that are located outside of the Site (i.e. under the roads that cross the ROWs and under Silver Beach); and

	• the removal of the cooling water intake pipelines and associated infrastructure from the Kurnell Wharf. Land owners consent is required for the works within Roads and Maritime owned land at Silver Beach. These works would be completed following the shutdown, deinventorisation and cleaning redundant infrastructure.
Lot and DP	Lot 56/ DP 908; Lot 57/ DP 908; Lot 62/ DP 908; Part Lot 11/ DP 7632; Part Lot 12/ DP 7632; Lot 189/ DP 7632; Lot 190/ DP 7632; Lot 43/ DP 8135; Lot 44/ DP 8135; Lot 45/ DP 8135; Lot 46/ DP 8135; Part Lot 77/ DP 8135; Lot 78/ DP 8135; Lot 79/ DP 8135; Part Lot 122/ DP 8135; Part Lot 123/ DP 8135; Part Lot 124/ DP 8135; Part Lot 125/ DP 8135; Lot 48/ DP 9564; Lot 77/ DP 9564; Lot 78/ DP 9564; Lot 81/ DP 9564; Part Lot 1/ DP 215818; Part Lot 2/ DP 215818; Lot 1/ DP 215819; Lot B/ DP 338897; Lot D/ DP 361103; Part Lot F/ DP 361103; Lot G/ DP 361103; Lot J/ DP 362655; Lot K/ DP 362655; Lot H/ DP 362655; Lot 570/ DP 752064; Lot 24/DP 776328; Lot 1/ DP 1044690; Lot 25 / DP 776328; Lot 283 / DP 752064; and Lot 1 / DP 132055, Lot 2/DP 215818, Lot 3/DP 1165618, Lot 456/DP 1413279.

Statement of Environmental Effects

A Statement of Environmental Effects (SEE) is attached. The SEE assesses the environmental impacts of the modification to the Project and includes the matters referred to in Secretary's Environmental Assessment Requirements provided to the Proponent on the 23rd July 2014 under Section 89G of the *Environmental Planning and Assessment Act 1979*.

Declaration

I certify that I have prepared the contents of the SEE in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* and *Environmental Planning and Assessment Regulation 2000* and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Signature: _____ **Date:** November 2014

Name: WILLIAM MILES

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URS Australia Pty Ltd (URS) has prepared this Statement of Environmental Effects (SEE) in accordance with the usual care and thoroughness and based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this SEE.

This SEE has been produced in accordance with the stipulations in the Environmental Planning and Assessment Act 1979 and the Environmental Planning and Assessment Regulation 2000.

Where this SEE indicates that information has been provided to URS by third parties, URS has made no independent verification of this information except as expressly stated in the EIS. URS assumes no liability for any inaccuracies in or omissions to that information.

This SEE was prepared between May 2014 and November 2014 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This SEE should be read in full. No responsibility is accepted for use of any part of this SEE in any other context or for any other purpose.

NOTES ON TEXT

As a determination of the modification to SSD 5544 will only be made after the Statement of Environmental Effects has been on public display and submissions considered, the future consolidated tense is used throughout this Assessment when describing the modification, alternatives and assessing impacts. “Would” is, therefore, used throughout the text in preference to “will”.

If all approvals are given for the modification to proceed, all “would” references should be interpreted as “will”, subject to final conditions of consent.

ABBREVIATIONS

Abbreviation	Description
AADT	Annual Average Daily Traffic
ABL	Assessment Background Level
AHC Act	*Australian Heritage Council Act 2003* (Commonwealth)
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information System
ALARP	As Low As Reasonably Practicable
Al	Aluminium
AIA	Australia Institute of Architects
ANZECC	Australia and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
AORA Act	*Australian Oil Refining Agreements Act 1954* (NSW)
AOS	Assessments of Significance
AQIA	Air Quality Impact Assessment
AQMP	Air Quality Management Plan
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
As	Arsenic
AS1940	Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids
AS/NZS 4360:2004	AS/NZS 4360:2004 Risk management
AS/NZS ISO 31000:2009	AS/NZS ISO 31000:2009 Risk management - Principles and guidelines
ASC NEPM	National Environment Protection Measure (Assessment of Site Contamination)
ASS	Acid Sulfate Soils
AWS	Automatic Weather Stations
BA	BirdLife Australia, the New Atlas of Australian Birds 1998-2012
BASIX	Building Sustainability Index
BoM	Bureau of Meteorology
BMP	Biodiversity Management Plan
BTEX	Benzene, toluene, ethyl benzene, xylene
CAMBA	China–Australia Migratory Bird Agreement
CBD	Central Business District
CCO	Chemical Control Orders
Cd	Cadmium
CEA	Cumulative Effect Assessment
CEMP	Construction Environmental Management Plan
CHAIR	Construction Hazard Assessment and Implication Review
CHL	Commonwealth Heritage List
CIA	Cumulative Impact Assessment
CLM Act	*Contaminated Land Management Act 1997* (NSW)
CLOR	Caltex Lubricant Oil Refinery
CMA	Catchment Management Authority

Abbreviation	Description
CMZ	Contamination Management Zone
COAG	Council of Australian Governments
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
Cr	Chromium
Cu	Copper
DA	Development Application
dB	Decibel
DCP	Development Control Plan
DECC	NSW Department of Environment and Climate Change (now NSW EPA)
DEMP	Demolition Environmental Management Plan
DHTU	Diesel Hydrotreater Unit
DIPNR	Department of Infrastructure, Planning and Natural Resources
DMDS	Dimethyl disulphide
DoE	Commonwealth Department of Environment
DoE	Commonwealth Department of Environment (previously SEWPAC)
DP	Deposited Plan
DPE	NSW Department of Planning and Environment (previously DP&I)
DP&I	NSW Department of Planning and Infrastructure
DUAP	Department of Urban Affairs and Planning
DWRMP	Demolition Waste and Resource Management Plan
EEC	Endangered Ecological Community
EC	European Commission
EILs	Ecological Investigation Levels
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Representative
EMS	Environmental Management System
ENM	Excavated Natural Material
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPA	NSW Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPIs	Environmental Planning Instruments
EPL	Environmental Protection Licence
ERA	Environmental Risk Analysis
ESA	Environmental Scoping Assessment
ESD	Ecologically Sustainable Development
ESLs	Ecological Investigation Levels
FCCU	Fluid Catalytic Cracking Units
FM Act	*Fisheries Management Act 1994* (NSW)

Abbreviation	Description
GDE	Groundwater Dependent Ecosystem
GILs	Groundwater Investigation Levels
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectares
HAZDEM assessment	The Hazards in Demolition assessment
HAZID	preliminary hazard identification
Heritage Act	*Heritage Act 1977* (NSW)
HES impacts	Health, Environment and Safety impacts
Hg	Mercury
HHIMS	Historic Heritage Information Management System
HHRA	Human Health and Ecological Risk Assessment
HIA	heritage impact assessment
HILs	Health Investigation Levels
HIPAP No. 4	Hazardous Industry Planning Advisory Paper No. 4
HIPAP No. 6	Hazardous Industry Planning Advisory Paper No. 6
HMS	Heritage Management Strategy
HNCMA	Hawkesbury-Nepean Catchment Management Authority
HSLs	Health Screening Levels
IAS	Industrial Archaeological Sites List
ILs	Investigation Levels
ICNG	Interim Construction Noise Guidance
IFH's	Isolation Flux Hoods
INP	NSW Industrial Noise Policy
JAMBA	Japan Australia Migratory Bird Agreement
JUHI	Joint User Hydrant Installation
KTPs	Key Threatening Processes
LALC	La Perouse Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LIN Peak	Linear Peak
LNAPL	Light Non-Aqueous Phase Liquid
LOC	Loss of Containment
LOR	Limit of reporting
LOS	Level of Service
LPG	Liquefied Petroleum Gas
µg/L	Micrograms per Litre
µm	Micrometres
m^3	Cubic metres
mbgl	metres below ground level
MCoA	Minister's Conditions of Approval

Abbreviation	Description
MEA	Monoethanolamine
MEK	Butanone or methyl ethyl ketone
MHF	major hazard facilities
MIIB	Major Incident Investigation Board
ML	Megalitres
MLs	Management Levels
MNES	Matter of National Environmental Significance
MSDSs	Material Safety Data Sheets
MSP	Caltex Management System Process
NEPC	National Environmental Protection Council
NEPMs	National Environment Protection Measures
NHL	National Heritage List
Ni	Nickel
NOW	NSW Office of Water
NP&W Act	*National Parks and Wildlife Act 1974* (NSW)
NPI	national pollution inventory
NPWS	NSW National Parks and Wildlife Services
NSW	New South Wales
NSW DECC	NSW Department of Environment and Climate Change (now OEH)
NSW DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
NSW DPI	NSW Department of Primary Industries
NSW R&M	NSW Roads and Maritime
NV Act	*Native Vegetation Act 2003* (NSW)
NVIA	Noise and Vibration Impact Assessment
NVMP	Noise and Vibration Management Plan
NWQMS	National Water Quality Management Strategy
NW Act	*Noxious Weed Act 1993* (Commonwealth)
OEH	NSW Office of Environment and Heritage
OEMS	Operational Excellence Management System
OMC	Oil Movements Centre
ORP	Odour Reduction Program
OWMS	Oily Water Management System
OWSS	Oily Water Sewer System
PAC	NSW Planning Assessment Commission
PAH	polycyclic aromatic hydrocarbons
PASS	Potential Acid Sulfate Soils
Pb	Lead
PCB	Polychlorinated Biphenyl
PCE	Perchloroethylene
PDU	Propane Deasphalting Unit
PELA Act	*Protection of the Environment Legislation Amendment Act 2011*(NSW)

Abbreviation	Description
PHA	Preliminary Hazard Analysis
PID	Photoionisation detector
PIO	Preliminary Investigation Order
PIRMPs	pollution incident response management plans
PoEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PoEO Waste Regulation	*Protection of the Environment Operations (Waste) Regulation 2005* (NSW)
PPE	Personal protective equipment
PPV	Peak Particle Velocity
PRP	Pollution Studies and Reduction Programs
PSNL	Project Specific Noise Levels
PTW	Permit to Work
PULP	Premium Unleaded Petrol
QRA	Quantitative Risk Assessment
RAMSAR	Wetlands of International Importance
RBL	Rating background level
RNE	Register of National Estate
ROTAP	Rare or Threatened Australian Plants
ROW	Right of Way
RTNP	NSW Road Traffic Noise Policy
SBRP	Silver Beach Remediation Plan
SBU	Strategic Business Unit
SDA	Static dissipater additives
SEE	Statement of Environmental Effects
SEARs	Secretary's Environmental Assessment Requirements
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 55	State Environmental Planning Policy No. 55 – Remediation of Land
SEPP 71	State Environmental Planning Policy No. 71 – Coastal Protection
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SFAIRP	So Far As Is Reasonable Practicable
SHI	State Heritage Inventory
SHR	State Heritage Register
SIC	Significant Impact Criteria
SMCMA	Sydney Metropolitan Catchment Management Authority
SMP	Stormwater Management Plan
SMS	Safety Management System
SoHI	Statement of Heritage Impact
SPC	Sydney Ports Corporation
SPL	Sound Pressure

Abbreviation	Description
SPULP	Super Premium Unleaded Petrol
SSC	Sutherland Shire Council
SSD	State Significant Development
SSLEP	Sutherland Shire Local Environment Plan
Stadis	static dissipater
SVOC	Semi-volatile Organic Compound
T&I	Turnaround and Inspection
TBT	Tributyltin
TCLP	Toxicity Characterisitic Leaching Procedure
TDS	total dissolved solids
TEC	Threatened Ecological Community
TEL	Tetraethyllead
TEX	Toluene, ethylbenzene, and xylenes
TIA	Traffic Impact Assessment
TMB	Trimethylbenzene
TMP	Transport Management Plan
TPH	Total Petroleum Hydrocarbons
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
ULP	Unleaded Petrol
ULSD	Ultra Low Sulphur Diesel
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds
VOL's	Volatile Organic Liquids
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)
WH&S Act	*Work Health and Safety Act 2011* (NSW)
WH&S Regulation	*Work Health and Safety Regulation 2011* (NSW)
WM Act	*Water Management Act 2000* (NSW)
WMP	Waste Management Plan
WMS	Waste Management System
WWTP	Waste Water Treatment Plant
Zn	Zinc

EXECUTIVE SUMMARY

ES 1.1 Introduction

Caltex Refineries (NSW) Pty Ltd ACN 000 108 725 (hereafter referred to as Caltex) announced in July 2012 that it would progress with converting Kurnell Refinery (the 'Site') to a finished product terminal (the 'Project'). This Project was proposed in response to increased competition from refineries in Asia, and the balance of supply and demand in Australia.

The primary objective of the Project is to ensure that Caltex's operations within Australia remain viable and can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

The Project is divided into two initial phases:

- Converting infrastructure to allow the Site to operate as a terminal and shutdown the refinery (the conversion works).
- Demolition and removal of redundant infrastructure (the demolition works).

Caltex has received development consent (SSD 5544) for completing the first phase of the Project (the 'conversion works'). The 'demolition works', are the next phase in the process of establishing a viable, safe, reliable and sustainable finished product import terminal at Kurnell.

The demolition works would involve the demolition, dismantling or removal of refinery process units, redundant tanks, redundant pipelines, redundant services and redundant buildings as well as associated minor civil works and waste management activities. These works are planned to commence in mid-2015 and be completed by the end of 2017.

Caltex is seeking approval for the demolition works as a modification to development consent SSD 5544 under S.96 (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as the works are a continuation of the conversion process, but may result in certain impacts that were not considered under the initial consent. The end result of these works would be substantially the same development as the approved Project under SSD 5544.

This Statement of Environmental Effects (SEE) has been prepared to support the modification application for the demolition works, and to address a set of Secretary's Environmental Assessment Requirements (SEARs) that have been specifically issued for the demolition works. This SEE considers a range of environmental, safety, legal, social and economic impacts related to the demolition works. It describes the mitigation and management measures required to ensure that these impacts are avoided, minimised, mitigated or offset.

ES 1.2 Modifications Need and Alternatives

Modifications Need and Objective

Following a review of refining operations which was initiated in 2011, Caltex concluded that the Kurnell Refinery was no longer financially viable under its current configuration. However, Caltex also identified that the Site is at the hub of Caltex's supply chain for NSW and ACT and therefore needed to be retained as a finished product terminal to receive and distribute refined petroleum product.

The Project's key objective is to ensure that Caltex's operations within Australia remain viable and can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT. The demolition works share this objective, and are intrinsically linked to the ongoing process of converting the Site from an operation that contains both oil refining and liquid fuel depot land uses to a safe and viable operation where the dominant land use becomes 'liquid fuel depot' alone.

Alternatives

The implementation of the current development consent for the conversion works (approved Project SSD 5544) will result in a number of process units, structures, tanks, pipes, buildings and other infrastructure across the Site becoming redundant. This redundant infrastructure presents Caltex with the following options for ongoing management:

1. deterioration of redundant infrastructure to an unsafe state;
2. maintaining redundant infrastructure in a safe state; or
3. demolition and removal of the redundant infrastructure to ensure a safe state.

The demolition and removal of the redundant infrastructure and buildings at the Site is the best option for Caltex to ensure that it meets the objective of the Project. Removing the infrastructure and buildings would eliminate ongoing maintenance costs, ensuring the ongoing commercial viability of the terminal, whilst eliminating the potential risks to the operations at the Site, the terminal workers, the local community and environment.

ES 1.3 Site Location and Existing Environment

The Caltex Kurnell Refinery (the Site) is located on the Kurnell Peninsula within Sutherland Shire Local Government Area (LGA), approximately 15 km south of Sydney's Central Business District (CBD). The Kurnell Peninsula is serviced by Captain Cook Drive, a single lane road that connects the area with the wider road network.

The Site is bounded by the Kamay Botany Bay National Park to the south and east, Captain Cook Drive to the northwest and St Joseph Banks Drive to the south west. The northern Site boundary is bordered by Solander Street, a small southern section of Cook Street, undeveloped land, light industry and residences off the eastern side of Cook Street, and undeveloped land on the southern side of Reserve Road. Additional residences are located on the north side of Reserve Road. The Kurnell residential area is generally located to the immediate north and north west of the Site.

Marton Park, comprising a developed recreational park area and an undeveloped wetland area, is located on the northern side of Solander Road. Kurnell Substation is located on the western side of Captain Cook Drive opposite the Site. The former Continental Carbon Australia facility is located approximately 800 m due south of the southern Site boundary, and is surrounded by the National Park.

The Site is legally described under 38 Lot and deposited plan (DP) numbers, which are listed in **Section 2.1.2** of this SEE.

The majority of the demolition works would be completed within the boundary of the Site. The exceptions to this include:

- the removal of the Continental Carbon Pipeline which is located on land owned by Caltex to the south of the Site (Lot 2/DP 215818);
- sections of the redundant pipelines that run through the Western and Eastern Right of Ways (ROWs) that are located outside of the Site (i.e. under the roads that cross the ROWs (no Lot and DP available) and under Silver Beach (Lot 3/DP 1165618 from the low tide mark into Botany Bay); and
- the removal of the cooling water intake pipelines and associated infrastructure from the Kurnell Wharf (Lot 456/DP 1413279).

The demolition works area in relation to the Site is shown in **Figure ES-1**.

ES 1.4 Project and Demolition Works Description

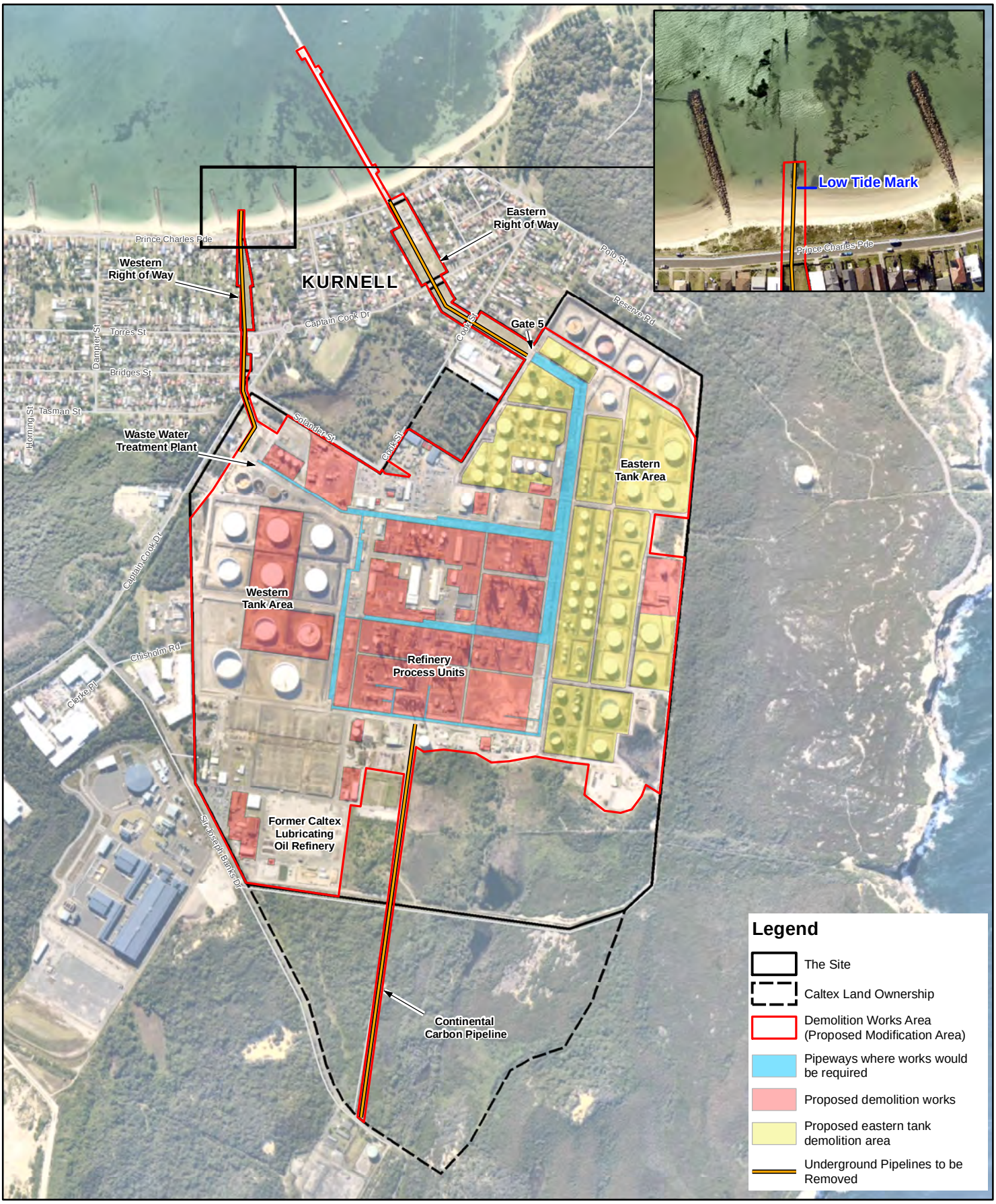
Approved Project

The conversion works involve the conversion of tanks and installation of pumps and associated pipelines to allow for the cessation of refining at the Site. Cessation of refinery operations will occur in Q4 of 2014 and will be followed by the continued conversion of some tanks to hold finished products. Eventually the Site will operate wholly as a finished fuel terminal.

Demolition Works

The demolition works would broadly involve the following activities within the demolition works area:

- demolition, dismantling or removal of:
  - refinery process units and associated infrastructure;
  - redundant tanks and associated infrastructure;
  - redundant pipeways and above and underground pipelines; and
  - redundant buildings and services.
- associated civil works;
- waste management activities including concrete crushing; and
- returning the works areas to ground level.



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W E
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0 100 200 400 600 Meters

Datum: GDA94
Grid: MGA Zone 56

Source: Aerial Imagery - Nearmap 2014

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

PROPOSED DEMOLITION WORKS

URS

File No: 43177915.030.mxd Drawn: STB Approved: WM Date: 13/10/2014

Figure: **ES-1**

Rev. **A** A4

Caltex is planning to commence the demolition works during the second half of 2015. The demolition works are likely to be completed by the end of 2017.

The proposed conversion and demolition schedule is presented in **Table ES-1**. By the time the demolition works commence, the only conversion works still being completed will relate to the conversion of certain tanks across the Site.

Table ES 1 Proposed Conversion and Demolition Schedule

Task	Indicative Date
Conversion Works	
Detailed Engineering & Design Start	Mid 2012
Engineering & Design Completed	Second half 2013
Tank Conversions Start	Q1 2014
Installation of Piping, Pumps and Associated Infrastructure	Q1 2014
Construction on Piping Completed	Q2 2014
Kurnell Refinery Shutdown	Q4 2014
Kurnell Refinery Decommissioning	First half 2015
Continued Tank Conversions	End 2014 – end 2016
CONVERSION TO TERMINAL COMPLETED	December 2016
Demolition Works*	
Demolition of Refinery Process Units	Mid 2015 – Mid 2017
Demolition of Tanks	Mid 2015 – End 2017
Pipeline Removal	Start 2016 – End 2017
Demolition of Buildings	Mid 2016 – End 2017
Concrete Crushing	End 2017

The majority of the demolition works would take place between 7.00am and 10.00pm, across a seven day a week program. This is in line with the Conditions of Consent for SSD 5544, in particular Conditions C18, C19 and C20.

Traffic generated by the demolition works would incorporate a mix of heavy vehicles and construction personnel movements. The demolition works would result in an increase of approximately 230 employees at the Site in 2015 and 130 contractors for 2016 and 2017. The cumulative number of workers at the Site for 2015 to 2017 (410 maximum) would still be significantly lower than the workforce present during refinery operations in 2012 (1,385 maximum).

ES 1.5 Legislation and Planning Policy

A modification through S.96 (2) of the EP&A Act requires that aspects of the demolition works that may have environmental, social or economic impacts that differ from those previously assessed within the Environmental Impact Statement (EIS) for SSD 5544, are required to undergo assessment in line with Section 79C of the EP&A Act.

Under Section 79C, Part 4 of the EP&A Act, the demolition works must be evaluated against a range of considerations including environmental planning instruments, *NSW Environmental*

Planning and Assessment Regulation 2000 (EP&A Regulation), the likely environmental, social and economic impacts of that development, the suitability of the Site, and the public interest.

In order to comply with the requirements for assessing this type of modification, a SEE must be prepared and submitted alongside the Modification Application.

The *Protection of the Environment Operations Act 1997* (PoEO Act) provides for the issue of an Environment Protection Licence (EPL) for certain scheduled activities. Caltex holds an existing EPL (No. 837) for the Site. This EPL licences a number of activities on Site and provides certain agreed limits (e.g. for noise) or monitoring measures (e.g. observing stormwater) in relation to those activities. As the Site is currently operational, the EPL is actively managed by Caltex and the EPA, and includes requirements for a number of Pollution Reduction Plans (PRPs). Where relevant, the provisions of the EPL and PRPs would continue to be implemented and adhered to during the demolition works.

A complete account of relevant Commonwealth, State and local government legislation and policy is provided in **Chapter 5 Legislation and Planning Policy**.

ES 1.6 Consultation

Consultation has continued throughout the preparation of this SEE and will continue during exhibition, following approval of the modification, during demolition and terminal operation.

The objective of consultation to date, with statutory agencies, Sutherland Shire Council and the wider community, has been to provide information to, and understand the concerns of, the various stakeholders.

The Project specific consultation effort has included:

- a series of public meetings; and
- liaison with government agencies, including those identified within the SEARs.

The key methods used to consult (and inform this SEE) have included meetings, letters, telephone calls and data requests.

Chapter 6 Consultation presents a list of the key comments raised during the consultation process and identifies where issues have been addressed in this SEE.

ES 1.7 Environmental Scoping Assessment

In order to assess the environmental impact of the Project, a number of key environmental issues have been identified through consultation with regulators and the community. A qualitative risk assessment was undertaken based on the recognition that a more detailed assessment would be required for the biophysical, environmental, economic and social aspects with the highest potential likelihood and greatest potential consequences. This risk assessment considered the issues mentioned in:

- the SEARs;
- submissions from relevant stakeholders and the public; and

- the EIS for the conversion works (SSD 5544).

The qualitative risk assessment was conducted based upon the guidelines outlined in AS/NZS 4360:2004 and AS/NZS ISO 31000:2009. This assessment, combined with the key issues contained in the SEARs and raised during the consultation process, guided the detailed assessments undertaken for the SEE.

ES 1.8 Hazards and Risks

A Hazards in Demolition (HAZDEM) assessment was completed to identify potential risk impacts from the proposed demolition works on the existing simultaneous terminal operations, and whether the demolition works would change the off-site risk profile of the approved Project.

A two-day workshop was held with a multi-disciplinary team to identify relevant demolition related hazards. During this workshop a total of 20 hazards were identified:

- five associated with process safety related hazards;
- ten with general health and safety hazards; and
- five with loss of amenity and risks to the biophysical environment (not previously covered under other headings).

The general health and safety hazards included those associated with working from heights and subsidence and collapse during excavation.

Five hazards have potential to initiate a process safety incident which could lead to environmental pollution or safety concerns involving Caltex personnel and/or the demolition contractors. These hazards relate to the potential to damage plant, equipment, pipes and tanks during demolition activities or the potential to introduce ignition sources into classified areas. These hazards will also be relevant for the operating terminal and have been adequately assessed in the Preliminary Hazard Analysis (PHA) prepared for the EIS for the Project.

The hazards identified for the demolition works are all well-known and understood by the Caltex personnel and contractors involved in the Project. The safeguards associated with controlling these hazards have been largely established.

The risks associated with the demolition related hazards would be minimised through the implementation of a hierarchy of controls in accordance with the legislative requirements. The management of activities associated with the demolition work would ensure that the probability of an incident happening is minimised and that, should an incident occur, its consequences would be managed.

The HAZDEM concluded that the levels of risks to the biophysical environment and to the safety of the public, staff and contractors are reduced to So Far As Is Reasonably Practicable (SFAIRP) levels.

This conclusion is based on:

- Caltex continuing to implement a number of established processes for managing the Site;
- the demolition contractors undertaking the demolition works in general accordance with *Demolition Code of Practice* (2013) and relevant Australian Standards; and
- the recommendations formulated through the hazard and risk assessment process being implemented.

The assessment has shown that the overall risk associated with the demolition works is low and does not introduce an excessive additional risk to the Site or to the community surrounding the Site.

Further, the hazard and risk assessment has shown that the risk profile, determined in the Preliminary Hazard Analysis for the Project (as reported in the Environmental Impact Statement for the approved Project SSD 5544), remains valid during the demolition works. As such, the risk levels for the Site continue to satisfy the risk criteria specified in *Hazardous Industry Planning Advisory Paper (HIPAP) Number 4 - Risk Criteria* during the demolition works.

ES 1.9 Soil, Groundwater and Contamination

This assessment has been conducted as a desktop investigation which involved the review of existing information available about the Site such as previous investigations, historic information, records of contamination and contamination management. This assessment has also involved a review of online resources including geological maps, Groundwater Dependant Ecosystems databases, acid sulphate and soil maps of the area.

Demolition Impacts

Ground-disturbing activities are predicted to occur during the following demolition works:

- refinery process units removal;
- tank demolition;
- underground pipeline removal; and
- infrastructure, services and building demolition.

An estimated 150,000 tonnes of soil is likely to be excavated during the demolition works.

Ground disturbance associated with the removal of different infrastructure would be to a maximum depth of 2 metres below ground level (mbgl). The ground disturbing works would be staged with the aim of minimising the area of ground disturbed at any one time.

Potential soil and groundwater impacts from the demolition works include:

- demolition workers encountering contaminated soil, asbestos and potential acid sulfate soils (PASS) during excavation activities;
- excavation works and stockpiling of soils generating dust and/or odours that affect on-site and off-site receptors;

- stockpiles, excavated areas and newly disturbed areas subject to erosion and sediment control issues;
- increased infiltration locally affecting groundwater flows as areas that were previously covered by concrete such as the refinery process become permeable;
- disturbance of soils through excavation and backfilling increasing contaminant migration to underlying groundwater;
- contaminants from stockpiles generated during intrusive works potentially contaminating to cause ground and surface water contamination;
- spills and leaks from demolition equipment potentially contaminating soil and groundwater; and
- vehicles dispersing contaminated materials around the Site.

The works required to remove the cooling water outlet from below the low tide mark would result in the disturbance of sediments within Botany Bay. Further details relating to sediment disturbance in Botany Bay are summarised in **ES 1.18 Coastal Processes** and detailed in **Chapter 18 Coastal Processes**.

Mitigation

A Soil and Water Management Plan, Contamination Management Plan and Asbestos Management Plan would be incorporated into the Demolition Environmental Management Plan (DEMP) to manage soil, groundwater and contamination related impacts arising from the demolition works. **Chapter 9 Soils, Groundwater and Contamination** contains a comprehensive description of the proposed mitigation and management measures that would be contained in the DEMP and relevant sub-plans. The assessment concludes that the demolition works would be likely to have negligible impacts on the soil and groundwater environment beneath and around the Site provided the management and mitigation measures outlined in this SEE are implemented.

ES 1.10 Human Health and Ecological Risk

The SEE has assessed the potential risk to human and ecological health during the demolition works. A qualitative Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) were undertaken to address the SEARs for the demolition works. These assessments were based on a desktop review of previous investigations and findings from technical assessments contained in this SEE including site assessments, groundwater modelling assessments, ecology impact assessments (including marine ecology), air quality assessments and wastewater management assessments.

Potential contamination pathways to the on-site and surrounding human and ecological sensitive receptors were identified. Relevant receptors included:

- Caltex facilities;
- Kurnell Village including residences, public places and schools;
- Botany Bay;
- Oyster farming in Quibray Bay and Botany Bay;

- Towra Point Nature Reserve (Ramsar wetland);
- Towra Point Aquatic Reserve;
- Marton Park Wetland; and
- Kamay Botany Bay National Park.

Existing contaminants of concern for soils at the Site are those associated with the fuel refining process. The primary Contaminants of Potential Concern (COPC) are: petroleum hydrocarbons; benzene, toluene, ethylbenzene and xylene (BTEX); polycyclic aromatic hydrocarbons (PAH); phenols; and lead (Pb) and asbestos. Residual asbestos contamination is of relevance to areas of historical spoil stockpiling and for the pipeway easements.

The HRA concluded that based on the primary COPCs exceeding soil or groundwater investigation limits in historical reports, potentially complete exposure pathways, and identified human health receptors, the following risks were considered to require management:

- Site demolition workers exposed to direct contact with soils impacted by asbestos, and the COPC, or groundwater impacted by LNAPL or dissolved phase COPC;
- Site workers or visitors exposed to dust, vapours or impacted run-off; and
- Off-site residents exposed to dust, vapours or impacted run-off.

The ERA concluded that within the terrestrial environment, the proposed demolition works present a low and acceptable risk to the environment as there are limited on-site receptors, and appropriate mitigation and management measures would minimise and offset risks to mobile and off-site receptors. Within the aquatic environment, the proposed removal of the cooling water outlet pipeline is considered to present a low to negligible risk to protected habitats, communities and species.

A number of management and mitigation measures contained in **Chapters 8-9, 11-12, 14** and **17-18**, and in **Chapter 10 Human Health and Ecological Risk,** would reduce and manage risks to human health and ecosystems during demolition works.

ES 1.11 Waste Management

The waste management assessment involved identifying, quantifying and classifying potential sources of liquid and non-liquid waste generated from the demolition works.

Recommendations on the preferred management strategies for effective storage, reuse/recovery, treatment and/or disposal were identified in accordance with relevant legislation, policies and guidelines including the *Waste Avoidance and Resource Recovery Act 2007* (WARR Act) and DECCW, NSW (2009) *Waste Classification Guidelines*.

During the demolition works, primary waste generated would include steel, mixed building and demolition waste, concrete, excavated soil (contaminated and uncontaminated) and asbestos. Other waste steams predicted to be generated in minor quantities are general solid waste (non-putrescible) such as packaging waste; general solid waste (Putrescible) such as food waste; liquid waste and wastewater.

Caltex's existing procedures for the management of waste would be appropriately modified and adopted for the demolition works. This would include the development of a Waste and

Resource Management Plan (WRMP), which would be a sub-plan to the DEMP and would provide a number of strategies and commitments for managing waste generated by the demolition works.

ES 1.12 Surface Water, Wastewater and Flooding

A Water Management assessment was completed to understand the surface water, wastewater and flooding issues associated with the demolition works.

Potential impacts to stormwater associated with the demolition works include those arising from demolition and ground disturbance works (i.e. potential impacts to stormwater run-off quality), as well as potential changes to the operation and functioning of stormwater catchments in the short and longer term (i.e. catchment hydraulics).

Stormwater quality impacts could arise from:

- erosion and entrainment of dust, soil and other material in stormwater from areas where ground disturbance works and excavation are required;
- leaks of fuel and hydraulic fluid from various plant items required for the demolition works potentially impacting on stormwater quality;
- leaks of residual matter from within redundant plant and equipment prior to removal, which could impact rainwater runoff quality; and
- impact on stormwater quality arising from interaction with contaminated soils potentially exposed by demolition and/or excavation works.

These potential impacts would be managed by implementing appropriate management and mitigation measures that are in accordance with 'The Blue Book' *Managing Urban Stormwater - Soils and Construction Volume 1 and 2* (Landcom, 2004) and the use of soil erosion and sedimentation devices as discussed in **Chapter 9 Soil, Groundwater and Contamination**. These measures would be included in a Soil and Water Management Plan as part of the DEMP. Potentially contaminated water would be sent to the on-site wastewater treatment plant via the oily water sewer system for treatment prior to disposal.

Overall, the change in volume and quality of stormwater discharged from the Site, arising from the demolition works is not expected to be significant. The Site stormwater system would continue to be reviewed and improved in line with the requirements of the existing Stormwater Management Plan (SMP). This SMP was prepared for the Site under a previous Environment Protection Licence (EPL) Condition (PRP U24.1).

The demolition works are unlikely to alter the flood risk profile in the demolition works area or to change the ability to accommodate high rainfall events and/or broader flooding events from that which currently exists.

ES 1.13 Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) was undertaken to address the potential noise and vibration impacts related to the demolition works (refer to **Chapter 13 Noise and Vibration**). The SEE also includes a cumulative noise assessment that considered other local development and activities that could occur concurrently with the demolition works.

The NSW *Interim Construction Noise Guidelines* (DECC 2009) (ICNG) guides the assessment of the noise from construction and demolition activities.

The NVIA determined that the demolition noise levels for works on the main site are below the criteria both during daytime hours and out of hours (evening and night) at all receptors except at one residence (30D Cook Street) where an exceedance of 4dBA was predicted. Similarly, the assessment determined identical cumulative noise impacts at the same receptor. The only additional impact resulting from cumulative noise was the predicted exceedance of 5 dBA at one other receiver (residence at Reserve Road) during out of hours.

These impacts would be reduced and managed through a suite of recommended mitigation and management measures, including the preparation of a Demolition Noise and Vibration Management Plan (DNVMP), which would be included in the DEMP. Reasonable and feasible mitigation measures include managing demolition work hours, using low noise equipment and plant, regular consultation with local residents etc.

The NVIA also predicted that demolition works would result in no off-site vibration impacts. Vibration monitoring would be completed on-site to help ensure certain retained structures are protected.

ES 1.14 Air Quality and Odour

An assessment was undertaken to determine the potential air quality and odour impacts associated with the demolition works (refer to **Chapter 14 Air Quality and Odour**). This assessment involved a review of the existing air quality and the scope of demolition works; the identification of emissions likely to be generated from such works; and the determination of management and mitigation measures to be implemented for minimising and offsetting these impacts.

Air emissions are likely to be generated from demolition of the refinery infrastructure, removal of concrete/foundations and services, soil excavation, concrete crushing, and asbestos handling and disposal. The primary emissions identified for such works are dust particulates, Volatile Organic Compounds (VOCs) and odour.

The assessment concluded that given the nature and scale of the demolition works, impacts to air quality would need to be appropriately managed through the implementation of specific mitigation management measures. These measures would be documented in an Air Quality Management Plan (AQMP), which would be a sub-plan to the DEMP. During excavation works, these measures would include: conducting monitoring where required, storing soils away from receptors, excavating during appropriate weather and managing soil exposure. A number of additional odour and dust management measures would also be employed.

ES 1.15 Transport and Access

A Traffic Impact Assessment (TIA) was completed (refer to **Chapter 15 Transport and Access**). A cumulative traffic assessment was also included in the SEE, accounting for potential cumulative impacts resulting from the demolition works being undertaken in parallel with other local development. The TIA was completed in line with the guidance *Guide to Traffic Generating Developments* (RTA, 2002).

In order to determine the impact of the demolition works on the surrounding road network, the projected traffic activity associated with the demolition works was added to existing traffic volumes and construction phase traffic predictions provided within the assessment undertaken as part of the EIS for the conversion works. The reduction of workers at the Site following the shutdown of the refinery was also taken into consideration. This was then compared to the predicted operation of the surrounding road network during the demolition works.

The assessment predicted that there would be no change in the Level of Service (LOS) at Captain Cook Drive both before and during demolition works. It also concluded that the demolition works would have no detrimental impact on the operation of the surrounding road network. The TIA noted that there would be an increase in the number heavy movements on the road network during the demolition works and there would be a requirement for traffic management during the removal of pipelines from the road reserves. In order to ensure safe, continuous and efficient movement of traffic for both the general public and demolition staff, a Traffic Management Plan (TMP) would be developed and implemented. This TMP would involve scheduling works in the road reserves to avoid major events at Kurnell and keeping one lane of affected roads open for access as pipes are being removed.

ES 1.16 Heritage

A Heritage Impact Assessment (HIA) was undertaken as part of this SEE to assess the likely impacts of the demolition works on Aboriginal and Historic (or Non-Aboriginal) heritage values. The HIA built on the work that had been completed for the Heritage Management Strategy (HMS) for the Site and was undertaken in accordance with the relevant state and federal legislation, policies and guidelines.

Aboriginal Heritage Impacts

The HIA concluded that areas at the Site, within the ROWs and along Silver Beach have been extensively disturbed and thus, are not likely to contain subsurface archaeology which pre-dates the refinery. Therefore, any excavations associated with the demolition works would not likely impact on any Aboriginal Heritage items. However, as per provisions in the *National Parks and Wildlife Act 1974 Act* (NPW Act), a Stop Works Procedure would be implemented should any Aboriginal Heritage items be found during demolition works.

Historic Heritage Impacts

The HIA identified five historic heritage items or places that would be affected by the demolition works. The demolition works area itself forms part of the locally significant Australian Oil Refinery, a listed archaeological site in the *State Environmental Planning Policy (Kurnell Peninsula) 1989*. The four other heritage items or places are:

- Four Wheel Drive Track (Captain Cook Drive);
- Silver Beach;
- Kamay-Botany Bay National Park; and
- Kurnell Peninsula Headland.

The demolition works would have a significant adverse impact on the physical fabric, historic, technical and research/scientific significance of the Australian Oil Refinery site, and its rarity

and representativeness. The demolition works would also diminish the Site's ability to demonstrate the principal characteristics of an operational oil refinery, and the development of the oil refining industry in NSW during the twentieth century. The overall historic and physical integrity of the Site would be lost. The landmark value of the Site in the local area would be considerably diminished. The demolition works would also have a major adverse impact on the aesthetic value of the Site's overall grouping of modernist architecture, including significant physical evidence of Bunning and Madden's architectural design work.

A HMS was prepared following the approval of the conversion works (SSD 5544). The HMS was prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works on the Site. The HMS specifically considered the future demolition works at the Site. Its development helped Caltex to identify which parts of the Site could be retained and reused while maintaining a number of representative examples of heritage structures as the Site. Implementation of the HMS for the Site would provide some mitigation for the loss of heritage value.

The demolition works would not impact on significant fabric of the former Four Wheel Drive Track or the historic significance of the local heritage item.

The demolition works would likely generate minor, temporary adverse effects on the aesthetic significance and amenity of the locally listed Silver Beach and Roadway. These impacts would be mitigated through progressive restoration of these features, using the same or appropriate materials.

During the demolition works, there may be minor, temporary adverse impacts on the landscape setting, social and symbolic values of the Kamay Botany Bay National Park and Kurnell Peninsula Headland. However following completion of the demolition works, the removal of the redundant infrastructure from across the Site would likely have a major positive permanent impact on the landscape setting of the State heritage listed Kamay Botany Bay National Park and Kurnell Peninsula Headland.

A number of recommendations for managing the potential impact of the demolition works on Historic Heritage are provided in **Section 16.8**. Measures that are not documented within the HMS would be included in the DEMP.

ES 1.17 Ecology

An Ecology Impact Assessment and a Marine Ecology Impact Assessment were undertaken to assess potential impacts on terrestrial and aquatic biota and communities resulting from the demolition works. In general, the demolition works would have negligible to minor impacts on ecological values of the surrounding area. This is due to the following factors:

- The demolition works would be undertaken in a highly modified and disturbed landscape, largely devoid of native vegetation or fauna habitat;
- The demolition works would not involve the removal or modification of any remnant native vegetation;
- There is a low likelihood of threatened biota and threatened ecological communities present within the demolition works area; and

- The demolition works associated with the removal of the cooling water outlet pipeline would be relatively temporary (approximately two weeks); undertaken in very shallow water with sandy substratum; and disturb a relatively small section of Silver Beach/Botany Bay.

However, minor potential impacts would be mitigated by implementing a number of measures that would safeguard vegetated areas on-site, manage noxious weeds and other invasive species, and protect species that may disperse across the Site. A Biodiversity and Weed Management Plan (BWMP) would document these measures and would form part of the DEMP. The implementation of the mitigation and management measures in the BWMP would help ensure that potential impacts on local flora and fauna, ecosystems and habitats would be avoided, mitigated, offset or managed.

ES 1.18 Coastal Processes

A Coastal Processes Assessment was completed to investigate the potential impact to Silver Beach related to the removal of the Cooling Water Pipeline.

The assessment determined that storms currently cause little change to the existing beach profile within the affected groyne compartment. The assessment also concluded that the removal of the pipeline would not leave the remaining pipeline at risk of exposure.

The assessment concluded that the demolition works have the potential to cause the following key impacts associated with coastal processes:

- Release of suspended sediment into Botany Bay forming a plume of suspended sediments during backfilling work;
- Inadvertent release of contaminants such as oil due to the use of plant and equipment within the water column; and
- Temporary disturbance of sand dunes including existing vegetation, affecting dune stability and increasing dune exposure to wind.

To address these impacts, a number of mitigation and management measures have been identified and would be implemented during demolition. To protect local seagrass communities and contain the spread of sediment plumes and/or contaminants, silt curtains would be installed seaward of the pipe removal works. A Silver Beach Rehabilitation Plan (SBRP) would also be developed as part of the DEMP. The SBRP would address the rehabilitation works of the affected area at Silver Beach, including the reinstatement and revegetation of affected sand dunes.

ES 1.19 Cumulative Impact Assessment

A cumulative impact assessment was undertaken to assess impacts of the demolition works, along with neighbouring projects, on the surrounding environment. A cumulative impact assessment is a receptor based assessment. A cumulative impact can only occur when two or more impacts affect the same receptor.

A cumulative impact for any one environmental aspect cannot occur unless residual environmental effects are expected for that aspect. A residual impact is the impact remaining following the application of management and mitigation measures.

Following this logic, a cumulative impact assessment has only been conducted for the following environmental aspects:

- Noise and Vibration;
- Transport and Access; and
- Heritage.

In order to identify projects with the potential to cause a cumulative impact three databases were reviewed, these were:

- Major Project Assessments register on the NSW Department of Planning and Environment (DPE) website;
- Development Applications register on the Sutherland Shire Council (SSC) website; and
- public notices and the 'invitations to comment' register on the Commonwealth Department of Environment website.

The review of relevant projects from the local area concluded that only the final tank conversion activities from the conversion works (SSD 5544) and the final breasting island works for the Port and Berthing Project (SSD 5353) could potentially affect the same noise and traffic receptors. The cumulative noise assessment concluded that the impacts from SSD 5353 would be unlikely to affect the same receptors and the cumulative impacts with the tank conversions (SSD 5544) would need to be managed in line with the measures presented in **Section 13.9** in **Chapter 13 Noise and Vibration**.

No cumulative traffic impacts were expected due to the closure of the refinery removing approximately 800 private vehicles from the road. Equally no cumulative historic heritage impacts were expected as the other projects do not affect the same values.

ES 1.20 Management and Mitigation Measures

Throughout the SEE, management and mitigation measures have been identified to address potential risks and impacts associated with the demolition works. These measures include those that are relevant and/or have been revised from the approved management and mitigation measures for the conversion works (SSD 5544) and additional measures specific to the demolition works. These measures are contained in **Chapter 8** to **Chapter 19** of this SEE and presented as a compilation in **Chapter 20 Management and Mitigation Measures**. The chapter also outlines how these measures would be implemented and monitored by Caltex through the DEMP.

ES 1.21 Evaluation and Justification

The demolition works are the next step in the evolution of the operation of the Site. The Site was developed as an oil refinery and terminal facility and is now being converted to only manage finished petroleum products as a terminal facility.

Following a number of internal investigations, the first public step in the Project was to seek development approval for the conversion of the refinery to a finished product terminal. The 'conversion works' were deemed State Significant Development (SSD) and an EIS was

produced to support the Development Application for this Project (the approved Project SSD 5544). The approved Project was granted development consent in January 2014.

The demolition works are intrinsically linked to the ongoing process of converting the Site from an operation that contains both oil refining and liquid fuel depot land uses to a safe and viable operation where the dominant land use becomes 'liquid fuel depot' alone. The demolition works form a critical stage in completing the conversion of the Site and are therefore important in ensuring the objectives of the Project are met.

The SEE provides a comprehensive assessment of the demolition works and includes investigations regarding all relevant environmental issues.

Potential impacts have been assessed and strategies to avoid, minimise and mitigate those impacts form a key part of the SEE. The SEE includes a number of commitments to manage environmental impacts during the demolition works.

The demolition works has, to the extent feasible, been designed to address the issues of concern to the community and Government. Caltex has also considered impacts on the surrounding environment and community of Kurnell. Caltex firmly believes it can undertake the demolition works in a manner which would safeguard local environment and public amenity in the area.

This SEE has concluded that the demolition works should proceed because they would:

- result in no long term adverse impacts to the environment or local community;
- ensure the primary objectives of the Project continue to be achieved; and
- satisfy the principles of Ecologically Sustainable Development as described in the EP&A Regulation.

This SEE has highlighted a range of issues which would be addressed through the careful undertaking of the demolition works.

On the basis of the findings detailed within this Statement of Environmental Effects, the demolition works are considered to be justified.

1 INTRODUCTION

1.1 Overview

Caltex Refineries (NSW) Pty Ltd ACN 000 108 725 (hereafter referred to as Caltex) announced in July 2012 that it would progress with converting Kurnell Refinery (the 'Site') (refer to **Figure 1-1**) to a finished product terminal (the 'Project'). This Project was proposed in response to increased competition from refineries in Asia, and the balance of supply and demand in Australia.

The objective of the Project is to ensure that Caltex's operations within Australia remain viable and can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

The Project is divided into two initial phases:

1 converting infrastructure to allow the Site to operate as a terminal and shutdown the refinery (the conversion works); and
2 demolition and removal of redundant infrastructure (the demolition works).

Caltex has received development consent (SSD 5544) for completing the first phase of the Project (the 'conversion works'). The 'demolition works', are the next phase in the process of establishing a viable, safe, reliable and sustainable finished product import terminal at Kurnell.

The demolition works would involve the demolition, dismantling or removal of refinery process units, redundant tanks, redundant pipelines, redundant services and redundant buildings as well as associated minor civil works and waste management activities. These works are planned to commence in mid-2015 and are likely to be completed by the end of 2017. The areas proposed for demolition (the proposed modification area) are shown on **Figure 1-2**.

Caltex is seeking approval for the demolition works as a modification to development consent SSD 5544 under S.96 (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as the works are a continuation of the conversion process, but may result in certain impacts that were not considered under the initial consent. Completion of the demolition works would ensure that the conversion process at the Site can be successfully completed in line with the Project objective. The demolition works would introduce certain impacts that would be temporary in nature and can be appropriately managed; ensuring that the end result of these works would be substantially the same development as the approved Project under SSD 5544.

This Statement of Environmental Effects (SEE) has been prepared to support the modification application for the demolition works. In line with the requirements of S. 96 (2) of the EP&A Act, this SEE provides the information required by clause 115 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). It also addresses a set of Secretary's Environmental Assessment Requirements (SEARs) that have been specifically issued for the demolition works (refer to **Appendix A SEARs and Application Documentation**). This SEE addresses these requirements, and considers a range of environmental, safety, legal, social and economic impacts related to the demolition works. Potential impacts are identified and where necessary mitigated or offset to ensure that potential impacts are minimised for the local environment and Kurnell and Sutherland Shire communities.

Source: Aerial Imagery from Nearmap 2014
^ Office of Environment and Heritage (OEH)

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

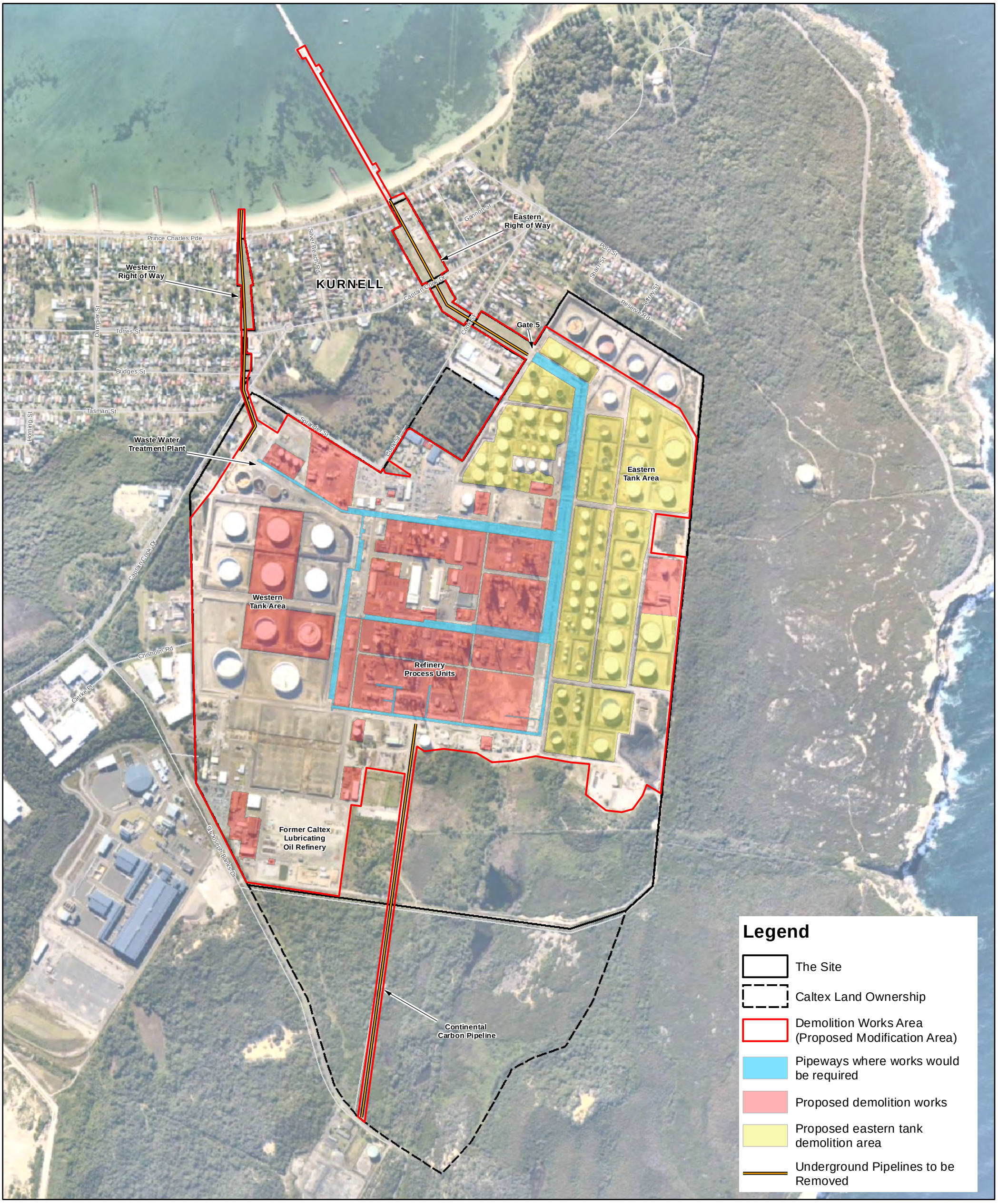
SITE LOCATION

URS

File No: 43177915.012.mxd Drawn: SB/MR Approved: RO Date: 11/08/2014

Figure: **1-1**

Rev. **A** A4



Source: Aerial Imagery - Nearmap 2014

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

PROPOSED DEMOLITION WORKS

URS

File No: 43177915.031.mxd Drawn: STB/MR Approved: WM Date: 04/11/2014

Figure: **1-2**

Rev. **A** A4

1.2 Proponent and Team

The proponent for the works is Caltex Refineries (NSW) Pty Ltd, 2 Solander Street, Kurnell, NSW 2231. The proponent contact is Dr Jos Kusters, Caltex Project Manager.

This SEE has been prepared by URS Australia Pty Ltd ACN 000 691 690 (URS), c/o 407 Pacific Highway, Artarmon, NSW 2064, Tel: (02) 8925 5500. The environmental planning and assessment coordinator is William Miles, Principal Environmental Planner.

1.3 Project Need and Alternatives

1.3.1 Background

The demolition works are the next step in the evolution of the operation of the Site. The Site was developed as an oil refinery and terminal facility and is now being converted to only manage finished petroleum products in a terminal facility.

Following a number of internal investigations, the first public step in the Project was to seek development approval for the conversion of the refinery to a finished product terminal. The 'conversion works' were deemed State Significant Development (SSD) and an Environmental Impact Statement (EIS) was produced to support the Development Application for this Project (the approved Project SSD 5544). The approved Project was granted development consent in January 2014.

The demolition works are intrinsically linked to the ongoing process of converting the Site from an operation that contains both oil refining and liquid fuel depot land uses to a safe and viable operation where the dominant land use becomes 'liquid fuel depot' alone.

1.3.2 Need and Objective of the Project

As noted within the EIS for SSD 5544, "*Caltex initiated a review of its refining operations in May 2011*". In summary, this review concluded that "*the Caltex Kurnell and Lytton refineries in their current configuration are relatively small and are disadvantaged compared to the modern, larger scale and more efficient refineries in the Asian region. This disadvantage is exacerbated by the impact of the ongoing strength of the Australian dollar, lower Caltex refining margins and increasing costs on the 'as is' refining business. As a result of the refining review, Caltex is proposing to close the Kurnell Refinery and convert the Site to a petroleum fuels import (finished product) terminal*".

However, whilst it was concluded that the refinery business is no longer viable at Kurnell, the EIS also stated that the Site is at the hub of Caltex's supply chain for NSW and ACT and therefore needed to be retained as a finished product terminal to receive and distribute refined petroleum product.

This needs case for the Project (SSD 5544) supported its objective which was:

"*To ensure that Caltex's operations within Australia remain viable whilst ensuring that the company can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.*"

1.3.3 Need and Objective of the Demolition Works

The demolition works share the objective noted in **Section 1.3.2** in that the purpose of the demolition works is to ensure that Caltex's operations within Australia remain viable whilst ensuring that the company can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.

The implementation of the current development consent for the conversion works (approved Project SSD 5544) will result in a number of process units, structures, tanks, pipes, buildings and other infrastructure across the Site becoming redundant. This redundant infrastructure presents Caltex with the following options for ongoing management:

1 deterioration of redundant infrastructure to an unsafe state;
2 maintaining redundant infrastructure in a safe state; or
3 demolition and removal of the redundant infrastructure to ensure a safe state.

These options/alternatives are discussed below.

Deterioration of infrastructure

The redundant infrastructure components will start to rapidly deteriorate once they are no longer in use. This is because the infrastructure is designed to operate under certain steady state conditions and as such, certain components will deteriorate quickly following shut down. The deteriorating infrastructure may pose ongoing safety and environmental issues and cause unacceptable levels of risk of harm to:

- the operational infrastructure and staff at the future Kurnell Terminal;
- the environment on and around the Site; and
- the community.

Some potential risks of leaving the equipment in place include falling equipment, deterioration of insulation, environmental damage and community safety risks as redundant underground sewers and pipelines deteriorate.

Caltex does not consider this an acceptable situation for an operating facility. As such this is not a viable management option for the redundant infrastructure.

Maintenance of infrastructure

The redundant infrastructure will require maintenance so the safety and reliability of the terminal operation at Kurnell, the local community, the local environment and by extension, Caltex's operation in NSW and the ACT is not compromised.

During normal refinery operation every unit has ongoing maintenance as well as a major maintenance shutdown every five years. During these major shutdowns the average cost is in the order of $50 million dollars per unit. With regards to the decommissioned refinery units, the maintenance frequency will need to be much higher due to the more rapid deterioration of the redundant infrastructure. This ongoing maintenance cost would put the Kurnell Terminal at an economic disadvantage and could potentially undermine the viability of the facility. The adverse consequences that this would have on the NSW and ACT fuel market would have a significant adverse impact on the State economy and the wider population.

As such, the maintenance of the redundant infrastructure would impose an ongoing and unsustainable financial burden for Caltex's operation at Kurnell.

Demolition of redundant infrastructure

Demolition of the redundant infrastructure will result in the following:

- remove the risk of redundant infrastructure creating unsafe conditions at the Site from:
  - dilapidated infrastructure due to corrosion; and
  - potential contamination and safety issues due to deterioration of infrastructure.
- remove the risk of redundant infrastructure resulting in adverse impacts on the local community and environment; and
- removes unsustainable maintenance costs, ensuring the ongoing commercial viability of the terminal.

As demonstrated, the demolition of the redundant refinery infrastructure is the best option for ensuring a viable, safe, reliable and sustainable finished product import terminal at Kurnell.

1.3.4 Conclusion

Removal of the redundant infrastructure and buildings at the Site is the best way for Caltex to ensure that it meets the objective of the Project, namely:

"*To ensure that Caltex's operations within Australia remain viable whilst ensuring that the company can provide a safe, reliable and sustainable supply of petroleum fuels to NSW and the ACT.*"

Removing the infrastructure and buildings would eliminate ongoing maintenance costs, ensuring the ongoing commercial viability of the terminal, whilst also removing potential risks to the operations at the Site, the terminal workers, the local community and environment.

1.4 Section 96 (2) Modification

The demolition works are directly linked to the approved Project SSD 5544 as they are the next step in the conversion process at the Site to establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell. As the demolition works are part of the same process as the conversion works, they share the same needs case, project objective and the same purpose. Without the demolition works the safety and viably of the operation at the Site would be compromised, as demonstrated above.

As such, Caltex are seeking to modify the development consent for approved Project SSD 5544 to ensure that the Project objective for this consent can be successfully achieved and the Project continued. Caltex have recognised that the inclusion of the demolition works under the development consent SSD 5544 would result in certain impacts that were not considered under the initial consent, as such a modification application under S.96 (2) of the EP&A Act is being sought. Whilst the demolition works would introduce new considerations for the Project, these matters would be temporary in nature. Following completion of the demolition works the end result would be substantially the same development as approved under SSD 5544.

1.5 Section 96 (2) Modification Process

1.5.1 The Scope of this SEE

This Statement of Environmental Effects (SEE) has been prepared to support the modification application for the demolition works. In line with the requirements of S. 96 (2) of the EP&A Act, this SEE provides the information required by clause 115 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). On 23 July 2014, the Department of Planning and Environment (DPE) issued Secretary's Environmental Assessment Requirements (SEARs) for the modification application. These SEARs are provided in **Appendix A1**. A table cross referencing the SEARs and where each requirement is addressed within this SEE can be found in **Appendix A2.** The SEARs identified both general requirements and key issues which must be addressed in the SEE. The key issues include:

- Hazards and Risk;
- Contamination;
- Soil and Water;
- Waste;
- Noise and Vibration;
- Air Quality and Odour;
- Transport and Access;
- Heritage; and
- Ecology.

Further requirements for consideration within the SEE were identified through the consultation process summarised in **Chapter 6 Consultation**. As a result of this consultation, this SEE also includes an assessment of the potential impacts of the demolition works on coastal processes and marine ecology.

The key issues identified in the SEARs and during the consultation process were investigated by Caltex through targeted assessments by specialists in their fields in line with relevant guidelines and assessment requirements. These assessments are summarised in **Chapters 8 to 19** of **Volume 1** of this SEE. Where necessary the conclusions in these chapters are supported by a number of detailed assessments provided in **Appendices B – H** of **Volume 2** of this SEE.

The outcomes of these assessments have been used to formulate the proposed management and mitigation measures (refer to **Chapter 20 Revised Management and Mitigation Measures**) and to justify why the demolition works are needed and should be approved (refer to **Chapter 21 Evalauation and Justification**).

1.5.2 Preparation and Exhibition

The objectives of this SEE are to:

- comply with the requirements of the EP&A Act and EP&A Regulation as formalised in the SEARs;
- address the requirements of key stakeholders as identified in the SEARs and during the consultation process;

- provide the Minister and the Minister's delegates at the PAC with sufficient information to assess the potential environmental impacts, confirm the mitigation measures required and understand the benefits of the demolition works; and
- inform the community about the demolition works. A full account of this process up to lodgement of the modification application is included in **Chapter 6 Consultation**.

Section 115 of the EP&A Regulation contains provisions which indicate the specific information that must be included within the SEE. The relevant clauses in Section 115 and where these have been addressed in the SEE are shown below in **Table 1-1**.

Table 1-1 SEE Statutory Requirements

Clause	Requirement	SEE Location
1(a)	The name and address of the applicant.	**Section 1.2**
1(b)	A description of the development to be carried out under the consent (as previously modified).	**Chapter 3**
1(c)	The address, and formal particulars of title, of the land on which the development is to be carried out.	**Section 1.2** **Section 2.1.2**
1(d)	A description of the proposed modification to the development consent.	**Chapter 4**
1(e)	A statement that indicates either: • that the modification is merely intended to correct a minor error, misdescription or miscalculation, or • that the modification is intended to have some other effect, as specified in the statement,	**Section 1.1** **Section 1.4** **Chapter 21**
1(f)	A description of the expected impacts of the modification.	**Chapter 8-20, Chapter 21**
1(g)	An undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved.	**Section 1.1** **Section 1.4** **Chapter 21**
1(h)	If the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner).	Applicant (Caltex) is owner of land. Land affected is also owned by Sutherland Shire Council and NSW Roads and Maritime – **Appendix A2 Landowners Consent**
1(i)	A statement as to whether the application is being made to the Court (under section 96) or to the consent authority (under section 96AA), and, if the consent authority so requires, must be in the form approved by that authority.	**Section 1.4**
2	The notification requirements of clause 49 apply in respect of an application if the consent of the owner of the land would not be required were the application an application for development consent rather than an application for the modification of such consent	Not applicable
3	Additional requirements if an application for the modification of a development consent under section 96 (2) or 96AA (1) of the Act, if it relates to residential flat development.	Not applicable
4	Additional requirements if an application referred to in subclause	Not applicable

Clause	Requirement	SEE Location
	(3) is also accompanied by a BASIX certificate.	
5	The consent authority may refer the proposed modification to the relevant design review panel but not if the application is for modification of a development consent for State significant development.	The Project is classified as State Significant Development
6	Additional requirements if an application for the modification of a development consent under section 96 (1A) or (2) of the Act, if it relates to development for which the development application was required to be accompanied by a BASIX certificate or BASIX certificate.	Not applicable
7	Additional requirements relating to the appropriate BASIX certificate.	Not applicable
8	An application for modification of a development consent under section 96 (1), (1A) or (2) or 96AA (1) of the Act relating to land owned by a Local Aboriginal Land Council may be made only with the consent of the New South Wales Aboriginal Land Council.	Land is not owned by Local Aboriginal Land Council
9	The application must be accompanied by the relevant fee prescribed under Part 15.	Noted
10	A development consent may not be modified by the Land and Environment Court under section 96 of the Act if an application for modification of the consent has been made to the consent authority under section 96AA of the Act and has not been withdrawn.	Not applicable

The SEE will be placed on public exhibition for a minimum period of 14 days (excluding any school and public holidays), in accordance with Section 118 of the EP&A Regulation.

1.5.3 Assessment and Determination

Following exhibition of this SEE, DPE will provide Caltex with submissions received during the exhibition period. Caltex may then be required to provide a written response to the submissions that have been received.

DPE will make the following documents publically available:

- the SEARs;
- the S.96 application for modification to development consent SSD 5544 , including any accompanying documents or information and any amendments made to the development application;
- any submissions received during the submission period and any response provided (if required by DPE);
- any documents or information provided to the DPE by the applicant in response to submissions; and
- any assessment report prepared by the DPE.

DPE will then prepare an Assessment Report for the demolition works that will take into account comments from relevant Government authorities as well as other stakeholders and the community. The Assessment Report will be provided to the Minister, or their delegate,

who will determine whether to recommend S.96 approval. The Minister may delegate this determination to the NSW Planning Assessment Commission (PAC).

If granted, the approval may include a number of recommended conditions of consent to which the proponent would need to adhere during the undertaking of the demolition works.

1.6 Terms and Definitions

Table 1-2 provides a summary of the terms used throughout this SEE.

Table 1-2 Summary of Key Terms and Definitions

Terminology used in this SEE	Definition
the Project	The conversion of the Caltex Refinery in Kurnell for future use as a viable and sustainable terminal to receive and distribute refined petroleum product.
the conversion works	The previously approved works to convert the Kurnell Refinery to a finished product terminal. These works were approved as SSD 5544 (the approved Project as described in **Chapter 3**).
the demolition works	The works for which Caltex are seeking a modification to development consent SSD 5544 (as described in **Chapter 4**). These works relate to the demolition, dismantling or removal of refinery process units, redundant tanks, redundant pipelines, redundant services and redundant buildings as well as associated minor civil works and waste management activities.
the Site	The Caltex Refinery on the Kurnell Peninsula, land owned and occupied by Caltex Refineries (NSW) Pty Ltd. This is the area bordered by a solid black line on **Figure 1-1**.
Caltex's land ownership	This is the land owned by Caltex on the Kurnell Peninsula. It includes the Site and two other areas adjacent to the Site. This is the area bordered by a dotted black line on **Figure 1-1**.
conversion works area	The part of the Site where all of the currently approved Project works would take place (i.e. the approved Project Area) (refer to **Figure 3-1**).
demolition works area	The area within which all of the demolition works would take place (i.e. the proposed modification area) (refer to **Figure 1-2**).
Eastern Tank Area	The Eastern Tank Area contains finished product tanks and the Oil Movements Centre (OMC) (refer to **Figure 1-2**, highlighted yellow). Of the 77 tanks highlighted, a maximum of 64 would be removed.
Refinery Process Units	The refinery process units are located in the centre of the Site. This area contains all of the process plant that was used to refine crude oil to finished petroleum product and associated buildings (refer to **Figure 1-2**).
Western Tank Area	The Western Tank Area previously included tanks to store crude oil but now is used to store finished petroleum product. This part of the Site also includes the Waste Water Treatment Plant (refer to **Figure 1-2**).
Pipeways	The aboveground pipelines that cross the Site (refer to **Figure 1-2**). A number of pipes would be removed from the pipeway areas.
Eastern ROW	The Eastern Right of Way (ROW) contains various pipelines that run between Kurnell Wharf and the Site. These pipelines are underground and include the cooling water intake lines and a number of product lines (refer to **Figure 1-2**).
Western ROW	The Western Right of Way (ROW) contains the cooling water outlet line

Terminology used in this SEE	Definition
	that runs between the Site and Botany Bay. This pipeline is underground (refer to **Figure 1-2**).
the study area	The area in which environmental studies have been undertaken to assist in determining the impacts of the demolition works. The parameters of a study area will vary depending on the environmental study being completed.
the proponent	Caltex Refineries (NSW) Pty Ltd (Caltex)

1.7 Document Structure

Volume 1

Executive Summary — This summarises the key issues and findings detailed in the other parts of the SEE.

Introduction — **Chapter 1** provides an outline of the approved Project (SSD 5544), proposed Modification, the need for the proposed Modification, briefly outlines the environmental impact assessment process and introduces the various terms used throughout the SEE.

Project Location and Existing Environment — **Chapter 2** provides a description of the location of the Lot and the Site and describes the existing environment.

Approved Project — **Chapter 3** provides a description of the approved Project.

Proposed Modification — **Chapter 4** provides a detailed description of the proposed Modification including a program of activities and how they interact with the approved Project.

Legislation, Planning Policy and Approvals — **Chapter 5** includes the relevant controlling Commonwealth and State legislation and State and local policies. It identifies the licences and approvals required to enable the proposed Modification to proceed.

Consultation — **Chapter 6** summarises the issues raised during consultation with the statutory authorities, other relevant Stakeholders, and the local community. The issues raised during the consultation process are addressed in the subsequent specialist chapters of the SEE.

Environmental Scoping Assessment — **Chapter 7** provides an assessment of the potential environmental impacts of the proposed Modification and identifies the key issues for further assessment.

Environmental Assessment	**Chapters 8 - 19** provide an assessment of the potential impacts of the proposed Modification, including potential cumulative impacts, and the identification of appropriate mitigation measures to safeguard the environment.
Revised Management and Mitigation Measures	**Chapter 20** details the relevant environmental management and mitigation measures to safeguard against or minimise potential impacts from the proposed Modification.
Evaluation and Justification	**Chapter 21** addresses the principles of Ecologically Sustainable Development (ESD) and the objects of the EP&A Act as well as providing a justification for the proposed Modification.
Volume 2	
SEARs and Landowners Consent	**Appendix A** contains the SEARs for the proposed Modification and a SEARs cross reference table outlining where each requirement has been addressed in this SEE. It also includes information on land owners consent for the works that occur on Sutherland Shire Council and NSW Roads and Maritime land.
Technical Studies	**Appendices B – H** contain technical appendices for the hazards and risk assessment, human health and ecological risk assessment, water management report, noise and vibration impact assessment, air quality and odour assessment, heritage impact assessment, ecological impact assessment and coastal processes assessment.

2 PROJECT LOCATION AND EXISTING ENVIRONMENT

2.1 The Site

2.1.1 Refinery and Terminal Operations

The Caltex Kurnell Refinery (the 'Site') is located on Kurnell Peninsula within Sutherland Shire Local Government Area (LGA), approximately 15 km south of Sydney's Central Business District (CBD). The Site location is provided in **Figure 1-1**.

Kurnell Refinery is the largest oil refinery in NSW and the second largest of the seven oil refineries in Australia, based on crude oil processing capacity. As approved in SSD 5544, the Site is currently being converted to a terminal. Refinery operations will cease in Q4 of 2014. A description of the approved conversion works (SSD 5544) is provided in **Chapter 3 Approved Project.**

Once the conversion works are complete, Caltex will only import finished products (gasoline, jet fuel, diesel and fuel oil) through the two fixed berths at the existing wharf and the additional sub berth located in Botany Bay. These products will be stored in existing and converted tanks.

2.1.2 Site History

Caltex requested permission to establish a major oil refinery in NSW in 1951. Permission was granted by Cumberland County Council in June 1952 and the facility was commissioned in 1956. Since commissioning, the Site has been subject to various development applications (DAs). There are a number of DAs that are currently relevant to the works undertaken on the Site. As outlined within Conditions B9, B10 and B11 of the Conditions of Consent for SSD 5544, a number of these DAs would be surrendered within 6 months of ceasing refining operations.

The Site (refer to **Figure 1-1**) is legally described under the following lot and deposited plan (DP) numbers:

- Lot 56/ DP 908
- Lot 57/ DP 908
- Lot 62/ DP 908
- Part Lot 11/ DP 7632
- Part Lot 12/ DP 7632
- Lot 189/ DP 7632
- Lot 190/ DP 7632
- Lot 43/ DP 8135
- Lot 44/ DP 8135
- Lot 45/ DP 8135
- Lot 46/ DP 8135
- Part Lot 77/ DP 8135
- Lot 78/ DP 8135
- Lot 79/ DP 8135
- Part Lot 122/ DP 8135
- Part Lot 123/ DP 8135
- Part Lot 124/ DP 8135
- Part Lot 125/ DP 8135
- Lot 48/ DP 9564
- Lot 77/ DP 9564

- Lot 78/ DP 9564
- Part Lot 1/ DP 215818
- Lot 1/ DP 215819
- Lot D/ DP 361103
- Lot G/ DP 361103
- Lot K/ DP 362655
- Lot 570/ DP 752064
- Lot 1/ DP 1044690
- Lot 283 / DP 752064
- Lot 81/ DP 9564
- Part Lot 2/ DP 215818
- Lot B/ DP 338897
- Part Lot F/ DP 361103
- Lot J/ DP 362655
- Lot H/ DP 362655
- Lot 24/DP 776328
- Lot 25 / DP 776328
- Lot 1 / DP 132055

The majority of the demolition works would be completed within the boundary of the Site. The exceptions to this include:

- the removal of the Continental Carbon Pipeline which is located on land owned by Caltex to the south of the Site (Lot 2/DP 215818);
- sections of the redundant pipelines that run through the Western and Eastern ROWs that are located outside of the Site (i.e. under the roads that cross the ROWs (no Lot and DP available) and under Silver Beach (Lot 3/DP 1165618 from the low tide mark into Botany Bay); and
- the removal of the cooling water intake pipelines and associated infrastructure from the Kurnell Wharf (Lot 456/DP 1413279).

2.1.3 Existing Site Environment

State Environmental Planning Policy (Kurnell Peninsula) (1989) (SEPP (Kurnell Peninsula)) provides the land use zoning for the Site and Kurnell Peninsula. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. The Project is permissible because it would allow the continued use of the Site as a liquid fuel depot.

The refinery has been in operation since 1956 and the Site has been highly disturbed during that time. As such there are few areas of ecological significance within the Site boundary.

The Site is listed as a heritage item on the SEPP (Kurnell Peninsula) as the 'Australia Oil Refinery'. A more complete history of the Site is included as part of the heritage assessment contained in **Appendix F Heritage Impact Assessment** and in **Chapter 16 Heritage**.

2.2 The Surrounding Area

2.2.1 Surrounding land uses

Land uses surrounding the Site are as follows:

- to the east and south of the Site is the southern portion of the Kamay Botany Bay National Park;
- to the north-west of the Site, is the village of Kurnell;
- to the west of the Site is Quibray Bay; and
- land to the south west has the following land use zonings:
  - General Industrial;
  - Light Industrial;
  - Special Industrial; and
  - Special development.

2.2.2 Residential Areas

The village of Kurnell was proclaimed in 1933 and began to flourish following the construction of the Kurnell Refinery as many of the workmen employed to construct the facility took up residence. Many of the men who were employed to construct the refinery elected to stay in the area following the project's completion.

The Site is immediately to the south of the Kurnell Village and the Kurnell Village lies immediately to the south of Botany Bay. In the 2011 census Kurnell was recorded to have a population of 2,213[1].

2.2.3 The Existing Road Network

The Kurnell Peninsula is serviced by Captain Cook Drive. Captain Cook Drive has one lane for the majority of its length, travelling in each direction and is the only route of access and egress from the peninsula. This is discussed further in **Chapter 15 Transport and Access.**

2.2.4 Existing Environment Surrounding the Site

The general Site context in relation to Botany Bay and the wider area of Kurnell is shown in **Figure 1-1.**

The Site is located at the eastern end of Kurnell Peninsula. The Site is bounded by the Kamay Botany Bay National Park to the south and east, Captain Cook Drive to the north west and St Joseph Banks Drive to the south west. The northern Site boundary is bordered by Solander Street, a small southern section of Cook Street, undeveloped land, light industry and residences off the eastern side of Cook Street, and undeveloped land on the southern side of Reserve Road. Additional residences are located on the north side of Reserve Road. The Kurnell residential area is generally located to the immediate north and north west of the Site. Cronulla residential areas are located approximately 5 km to the south west.

[1] http://www.censusdata.abs.gov.au – accessed 22 November 2012

Marton Park, comprising a developed recreational park area and an undeveloped wetland area, is located on the northern side of Solander Road. Kurnell Substation is located on the western side of Captain Cook Drive opposite the Site. Kurnell Desalination Plant is located opposite the refinery on the western side of Sir Joseph Banks Drive. The former Continental Carbon Australia facility is located approximately 800 m due south of the southern Site boundary, and is surrounded by the National Park.

In addition to the Kamay Botany Bay National Park and Marton Park, there are a number of other reserves within proximity of the Site. Captain Cook's Landing Place Park is located approximately 500 m to the north of the Site, while Bonna Point Reserve is located approximately 1.4 km to the north west of the Site. Towra Point Nature Reserve (on Towra Point Peninsula) is a Ramsar Site and is predominately on the other side of Quibray and Weeney Bays which are located west of the Site. Some of the Towra Point Nature Reserve extends as a vegetated fringe around the edge of Quibray Bay to an area close to the Site, north of Captain Cook Drive. Quibray Bay also includes Towra Point Aquatic Reserve which, whilst not part of Towra Point Nature Reserve and the Ramsar Site, forms a wider ecosystem with it. To the north of Kurnell is Botany Bay, a large bay with a diverse number of uses and habitats and where the Georges and Cooks Rivers meet before joining the Pacific Ocean.

3 APPROVED PROJECT

3.1 Introduction

This Chapter provides an overview of the key components of the approved Project (SSD 5544) (the conversion works), a description of the associated construction (conversion), operation and decommissioning activities and a program for these works. A full project description is available in the Kurnell Refinery Conversion EIS (URS, 2013).

The conversion works have commenced (refer to the construction program in **Section 3.3.1**). A number of existing crude oil tanks are being progressively cleaned and modified to allow for the storage of refined product (i.e. conversion to finished product tanks). A small number of other tanks already storing one type of refined product are being converted to store another. New pumps, pipes and electrical infrastructure are being installed within the Site. A range of ancillary works are also being undertaken to improve efficiency and to facilitate the conversion of the refinery into a terminal. These ancillary works include upgrades to, and consolidation of, the utilities, transportation and management systems on the Site.

The refinery plant will be shut down, depressurised, de-inventoried and left in situ at the end of 2014. Caltex shut down, depressurise and de-inventory the refinery plant during routine maintenance activities as part of the existing operation. These works will be completed in line with the Environment Protection Licence (EPL) for the Site.

By mid-2015 all of the works approved under the existing development consent (SSD 5544) will have been completed except for a number of tank conversions. Tank conversions will continue until the end of 2016. Once complete the terminal will continue to use of parts of the Site in a manner similar to the refinery, i.e. for the storage and distribution of petroleum products.

The demolition and dismantling works are the subject of this Modification Application. The remediation work will be subject to a separate approval at a later stage.

3.2 The Conversion Works

3.2.1 Overview

The conversion works include modifications to the existing Kurnell Refinery (the 'Site') to convert it to a working finished product terminal. Once complete the Site will have a nominal maximum storage capacity of 925 megalitres (ML) of refined product and by products. The proposed terminal will manage the following products:

- Gasoline – Unleaded Petrol (ULP), Premium Unleaded Petrol (PULP) and Super Premium Unleaded Petrol (SPULP);
- Diesel;
- Jet Fuel; and
- Fuel Oil.

The terminal will also manage the following by-products:

- Slop[2]; and
- Wastewater.

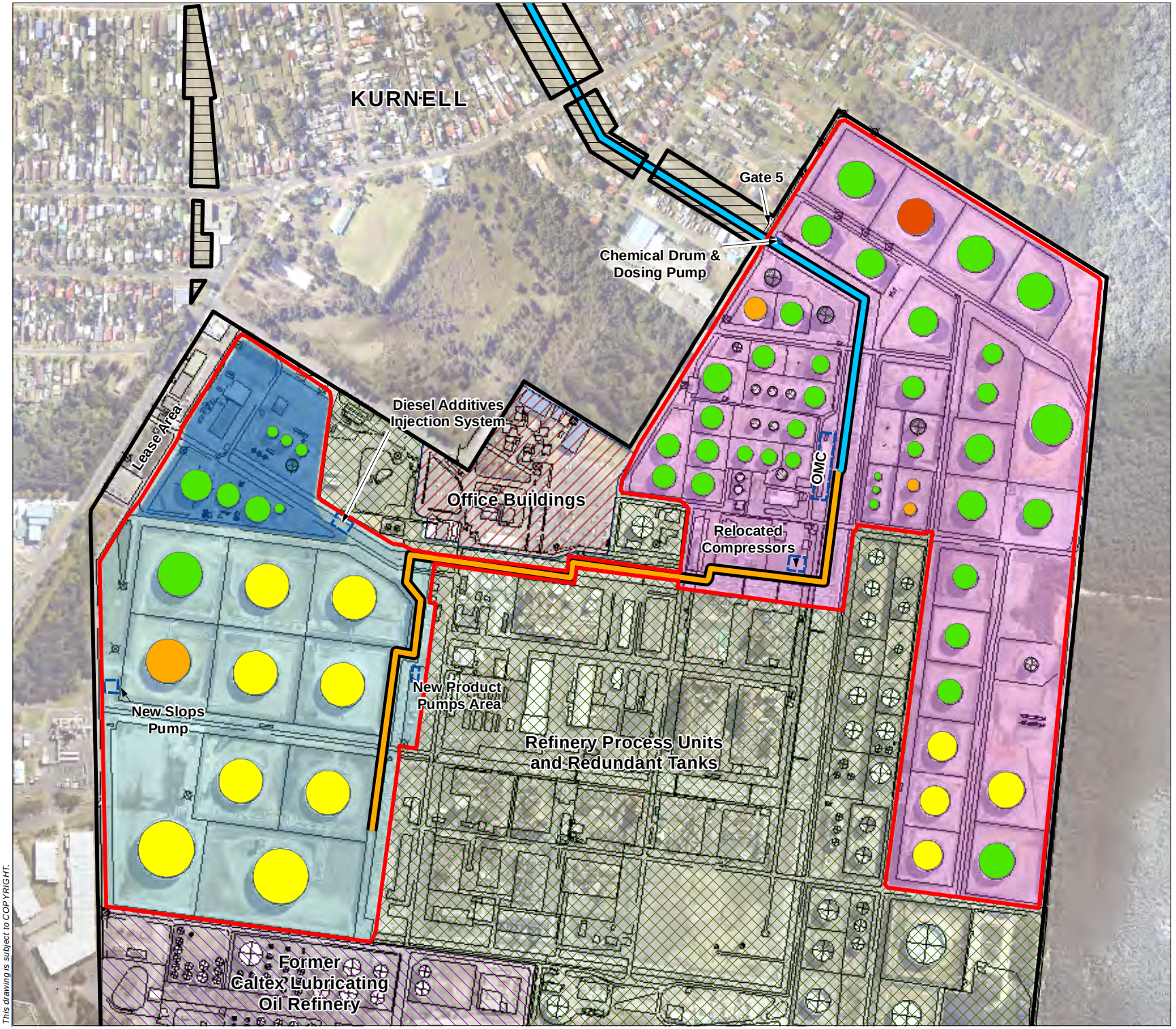
The conversion works involve the conversion of tanks and installation of pumps and associated pipelines to allow for the expansion of terminal operations. These works will all occur within the approved Project Area (referred to as the conversion works area) as presented in **Figure 3-1**.

During the initial conversion activities, the Site will still operate in its current mode as both a refinery and a terminal. Cessation of refinery operations will occur in Q4 of 2014 and will be followed by the continued conversion of some tanks to hold finished products. Eventually the Site will operate wholly as a terminal. Construction staging is described in greater detail in **Section 3.3.1**.

The following provides an overview of the modifications required for the Project:

- Gasoline: Gasoline products, including ULP, PULP and SPULP, will be stored within tanks in the Eastern Tank Area. Four tanks would be converted from other services to ULP/PULP/SPULP service.
- Diesel: One existing tank that is used to store fuel oil will be converted to store diesel. The two existing diesel pipelines will be extended and the existing diesel additives injection system at the OMC manifold will be duplicated at a new location within the Western Tank Area.
- Jet Fuel: Jet fuel would continue to be distributed to six existing finished product tanks within the Eastern Tanks Area. The two existing jet fuel pipelines would be extended and a small chemical drum and dosing pump would be installed at Gate 5.
- Slop Oil: An existing pipeline within Pipeline Easement 1 would be transferred from its current usage to transfer Slop Oil. Slop produced from normal terminal transfers would be stored within five existing tanks within the Eastern Tank Area. It is proposed that a tank within the Western Tank Area would be changed from crude oil into slop service.
- Wastewater: Oily water is treated in the waste water treatment plant (WWTP). The treatment process utilises physical, chemical and biological treatment to treat the oily water. Treated effluent is discharged to the Tasman Sea via the Yena Gap outfall under conditions of the Site EPL. The WWTP would remain in service as part of the Project, operating in line with the EPL for the Site.
- Utilities: The existing air, potable water, firewater, natural gas and nitrogen utilities would remain in place on the Site. Some minor relocation and consolidation of utilities equipment would be required.

[2] Slop or slop oil is a petrochemical industry term for recovered petroleum hydrocarbons in a refinery or terminal, which requires further processing to make it suitable for sale and use. It is a product which Caltex would either reprocess at a separate facility or sell to a customer.



Legend

N
W E
S

- The Site
- Conversion Works Area (Approved Project Area)
- New Infrastructure

Pipeline

- Pipeline Easement 1
- Pipeline Easement 2

Tank Conversion

- Conversion Required
- No Works Required
- Change of Service
- Restore in Kind

Tank Areas

- Eastern Tanks Area
- Western Tanks Area
- Office Buildings
- Refinery Process Units & Redundant Tanks
- Former Caltex Lubricating Oil Refinery (CLOR)
- Pipeline Right of Way
- Waste Water Treatment Plant (WWTP)

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 50 100 200
Meters

Source: Aerial Imagery - Nearmap Hypertiles 2012

PATH: T:\JOBS\43177836\Workspaces\

FILE NO: 43177915.011

DRAWN: STB/MR APPROVED: RO DATE: 11/08/2014

CALTEX (REFINERIES)
NSW PTY LTD

KURNELL REFINERY
CONVERSION MODIFICATION

APPROVED PROJECT

URS

Figure: **3-1**

Rev. **A** A4

3.2.2 Tanks

The existing Site has over 100 tanks used for storing crude oil, refined or finished product, other petroleum intermediate products and effluent water. Some of these tanks will remain in current service, some will change service with no modifications required and some will be modified to contain finished product when the refinery is converted to a terminal.

For tanks which require modification in order to change service or have reached their statutory inspection date (Turnaround and Inspection (T&I)), the works have and will involve some or all the following activities:

- shutdown of the tanks and associated infrastructure;
- removal of the existing product from the tanks;
- draining the excess product from the pipes connecting to the tanks;
- isolating and making safe any infrastructure and instrumentation that is no longer required;
- upgrading control systems to improve efficiency; and
- modifications to the tanks including upgrades to the tank internals, roofs, nozzles, floors, manifolds and finished product distribution pipework where required.

Other works associated with the tank modifications (where required) include:

- installation of additional product quality controls; and
- upgrading safeguard systems.

A tank in the Eastern Tank Area (refer to **Figure 3-1**) is due for routine inspection and will be restored in kind for service. This tank currently sits at ground level on a concrete ring beam pad. The restoration would involve:

- dismantling the existing tank; and
- preparing a foundation for the new tank (which would be the same size and shape as the existing tank) in the same location as the current base. This type of tank floor does not require major excavation works. Excavation depth would not extend past half a metre below ground level.

Tank Conversion Summary

The tank conversion works described above would commence in advance of recommissioning the tanks to receive imported finished product. These works will be conducted throughout the conversion works. At the end of the conversion works there will be a reduction in the total number of tanks required for the storage of finished product imports and terminal operations when compared to the number currently required for refinery operations. The tanks that are not required for terminal operations will be emptied, isolated, cleaned and left with all manhole covers removed.

Table 3-1 provides a summary of the proposed final tankage use within the conversion works area.

Table 3-1 Terminal Tank Changes Summary

Proposed Tank Service	No. of Tanks Requiring Conversion*	No. of Tanks Requiring Change of Service
Gasoline	5	-
Diesel	4	1
Jet Fuel	4	-
Fuel Oil	0	0
Waste Water and SLOP	0	3
Total	**13**	**4**

*One tank in the Eastern Tank Area would be restored in kind

Where it has been identified that either a change of service or no works are required for a tank, a T&I will be carried out for remaining tanks at a date which complies with statutory requirements for that tank. This is a normal operating procedure at the Site. A T&I involves the following high level activities:

- removing the tank out of service and moving the product to another location;
- internally cleaning the tank to allow accurate inspection of the tank walls, floor and roof;
- preparing a scope of works based on the results of the inspection and taking into account the service period since the last tank T&I;
- undertaking repair works as required which may include tank repair, painting or further testing; and
- returning the tank to service with the proposed finished product.

3.2.3 Bunding

Caltex has committed that the bunding capacity for tanks retained in service will comply with the requirements of AS1940. The current inspection programs at the Site monitor external bund walls and identify if repairs are required. The routine tank T&I program will continue through the conversion works and during operation of the terminal.

Tank floors that are rebuilt during the conversion works and during the ongoing operation of the terminal will incorporate a tank underfloor liner.

Protection Measures

Caltex's focus during the conversion and operation of the Project will be on inspections, maintenance and spill prevention within the tank and tank bund areas. Extensive spill prevention measures would continue to be incorporated into the operation of the Project.

The measures for tanks containing low flash materials[3] include:

- explosive vapour detectors within the bunds;
- triple infrared scanners on tank roofs; and
- CCTV in conjunction with infrared cameras as a confirmation for alarms.

All tanks on-site will be subject to:

- an automated high level shut off system[4]; and
- continuance of a comprehensive inspection/repair program.

In addition, in the unlikely event of a spill, the Site has significant contingency arrangements, including tertiary containment capacity available within the oily wastewater system.

3.2.4 Pumps

Five new product transfer pumps will be installed in the Western Tank Area. These pumps will service the newly converted large diesel and jet fuel product tanks (refer to **Figure 3-1**). The product transfer pumps will consist of three jet fuel product pumps and two diesel pumps. They will be located on the eastern side of the Western Tank Area.

One new product transfer pump will be located within the Western Tank Area to transfer Slop Oil. This pump will be located on the western side of the Western Tank Area.

Two new product transfer pumps will be installed at the OMC to transfer slop oil and jet fuel respectively across the Site.

For each set of pumps new concrete foundations will be installed.

3.2.5 Electrical / Instrumental Facilities

Instrumentation on Site will be upgraded as part of the conversion works. This work will include upgrades to the:

- wharf and tank instrumentation and control systems to enable remote and automated control;
- electrical tracing would be implemented to maintain fuel oil temperatures;
- oil movements manifold systems and remote valves with segregated product distribution piping to respective tanks;

[3] The flash point of a chemical is the lowest temperature where it will evaporate enough fluid to form a combustible concentration of gas. The flash point is an indication of how easy a chemical may burn.

[4] This includes multiple high level detection instruments wired to an automatic valve which closes the tank inlet after a defined fill height has been reached.

- power supplies to new pumps; and
- consolidated site electrical systems.

These works will all occur within the existing Site footprint.

3.2.6 Refinery Infrastructure and Redundant Tanks

The conversion works will not include the plant associated with the refining process. The tanks and refining infrastructure (in the area marked *Refinery Infrastructure and Redundant Tanks* shown on **Figure 3-1**) will be shut down, depressurised, de-inventoried and left *in situ* in a staged manner.

The shut down, depressurisation, emptying, isolating and cleaning of the refinery plant is a process that occurs as part of the T&I program on a continuous rotating basis as part of the maintenance program for the Site. Caltex has extensive documented procedures which are used routinely during T&I activities. These procedures enable all safety and environmental aspects (for example, air and noise emissions) of this process to be monitored and managed in compliance with the EPL. The refinery infrastructure will be shut down, depressurised, de-inventoried and left *in situ* from Q4 2014.

For the conversion works, the tanks that are not required would be emptied, isolated, cleaned and left *in situ* with all manhole covers removed. As above, this process already occurs as part of the T&I program on a continuous rotating basis as part of the maintenance program for the Site. This work started in the second half of 2013 and will be completed by the end of 2016.

3.3 Construction Staging and Program

3.3.1 Construction Program

The conversion works have begun. During these works, the Site has continued to operate as both a refinery and a terminal. Cessation of refinery operations will occur in Q4 of 2014. This will be followed by continued conversion of some tanks and associated piping to hold finished products.

A high level schedule for conversion activities is shown in **Table 3-2** below.

Table 3-2 Proposed Construction Schedule

Task	Date
Detailed Engineering & Design Start	Mid 2012
Engineering & Design Completed	Second Half 2013
Tank Conversions Start	Q1 2014
Installation of Piping, Pumps and Associated Infrastructure	Q1 2014
Construction of Piping Completed	Q2 2014
Kurnell Refinery Shutdown	Q4 2014
Continued Tank Conversions	End 2014 – end 2016
CONVERSION TO TERMINAL COMPLETED	December 2016

3.3.2 Working Hours

The Conditions of Consent for SSD 5544 require:

- Construction to be completed between 7.00 am to 10.00 pm seven days a week (Condition C18);
- High noise generating construction works to be confined to less sensitive times of the day and not outside the hours of 7.00 am to 6.00 pm Monday to Saturday (Condition C19); and
- Construction outside those hours only to be undertaken in certain circumstances as defined by Condition C20 of the Conditions of Consent for SSD 5544.

3.3.3 Construction Traffic

The traffic generated by the Project will incorporate a mix of construction plant vehicles, delivery vehicles and construction personnel movements. A summary of the construction vehicles and associated staff numbers for the conversion works is summarised in **Table 3-3**.

Table 3-3 Staff and Plant Requirements for Construction

Description		Daily Movements (return trips)	Peak Hour Trips[1]
Heavy Vehicles	Construction Vehicles (Cranes/semi-trailers etc.)	10	2
	Equipment/Material Delivery Vehicles	10	2
Private Vehicles	Construction Personnel*	140	140
TOTAL		***160***	***144***
Heavy Vehicle Proportion		13%	3%

1. Assumptions

- *All personnel would arrive to site during the AM Peak Hour and depart during the PM Peak Hour;*
- *Personnel would utilise their own private vehicle with no use of car-pooling or public transport;*
- *Heavy vehicle movements would be evenly distributed throughout the hours of operation (10 hour workdays); and*
- *All plant delivery vehicles are assumed to occur on the same day in order to produce a 'worst-case' scenario.*

Max number of construction staff (refer to **Table 3-4).*

3.3.4 Workforce

Table 3-4 provides the workforce profile for the conversion works, including current and projected numbers during the construction and operation of the Project. These workforce numbers do not include the personnel required to complete the demolition works.

The base workforce in 2012, including Caltex employees and contractors, is approximately 885. This increases by up to 500 people during maintenance shutdown periods. These periods range from 8-12 weeks in duration.

During the peak year for the conversion works (2014), the workforce has included up to an additional 140 people on Site.

Following the conversion works, and when the Project is fully operational, there will be approximately 100 people on Site, with an additional 90 people during maintenance shutdown periods. In **Table 3-4** the terminal operational workforce is shown for 2017.

Table 3-4 Workforce Numbers (Current and Projected) - Conversion Works

Workforce Numbers (Current and Projected)						
	2012[2]	**2013**	**2014[3]**	**2015**	**2016**	**2017**
Caltex Employees	410	400	450[4]	40	45	45
Contractors	475	475	475	40	55	55
Project Construction	-	140	140	100	90	-
Total	**885**	**1,015**	**1,065**	**180[5]**	**190**	**100**
Maintenance Shutdown Periods[1]	500	0[6]	0[6]	0[6]	90	90
Total including Maintenance Activities	**1,385**	**1,015**	**1,065**	**180**	**280**	**190**

[1] *Maintenance shutdown periods are periodic and for short time frames (8-12 weeks).*
[2] *Employee numbers at the Site in 2012.*
[3] *2014 will be the peak construction period. Additional personnel brought to the Site for the conversion works would be a maximum of 140 personnel.*
[4] *Additional Caltex Employees in 2014 would be staff hired for terminal operations.*
[5] *The large reduction in numbers between 2014 and 2015 follows the cessation of refining at the Site. The increase in workforce numbers between 2015 and 2016 represents a gradual stabilisation of the terminal operational workforce.*
[6] *No maintenance shutdown periods will occur during 2013 and 2015*

3.4 Operation

3.4.1 Operation as a Terminal

Once the conversion is complete, Caltex will import finished products (gasoline, jet fuel, diesel and fuel oil) through the two fixed berths at the existing wharf and the sub berth located in Botany Bay. These products will be stored in existing and converted tanks.

The major product distribution systems would continue to operate in line with current practice, i.e. product would be pumped under Botany Bay to the Banksmeadow Terminal, the Sydney/Newcastle pipeline or the Joint User Hydrant Installation (JUHI) at Sydney Airport for further distribution. Slop will be out loaded to the wharf and transported via ship to be sold for reprocessing. Under typical operation, road transport of products from the Site will cease.

With the cessation of the refining operation at the Site and the high levels of automation of the terminal, the number of employees on Site would reduce (as described in **Section 3.3.4**). These employees will operate in a shift arrangement 24 hours a day, 7 days a week.

Ongoing operational activities will be undertaken on the Site as described in **Section 3.2.2.** This work would include Tank T&Is.

3.5 Ancillary Facilities and Infrastructure

3.5.1 Electricity

The existing electricity infrastructure on Site will be used to service the new terminal. Electricity usage will reduce significantly following the shutdown of the refinery operations.

3.5.2 Water and Stormwater / Wastewater management

The current Site operations consume approximately 6 ML of potable water per day. Approximately 90% of this consumption will cease following shutdown of the refinery operations.

A further 1 ML of potable water per day is consumed for amenities. This volume will reduce over time as the workforce declines. The long term demand at the Site following the completion of the Project is expected to reduce the overall potable water consumption by approximately 90%.

The drainage arrangements for the existing process plants will be kept in service during the Project. Storm water runoff from paved areas would continue to be routed to the WWTP on Site. Under the conversion works no changes are proposed to this system. Tank bunded areas and tank water draws will remain unchanged and flow from these sources will continue to be processed through the WWTP.

3.5.3 Sewers

Existing sewerage infrastructure will continue to be used. It is expected that the amount of sewerage generated by the Site will decrease significantly.

3.5.4 Road Access

Road access to the Site will remain unchanged. Vehicle (car and truck) usage may increase marginally during initial conversion activities (2013-2014), but will decrease following the cessation of refining. Vehicle movements to and from the Site will continue to decrease until full terminal operation is established reflecting reduced employees, service groups, deliveries and tanker loading activities on Site.

3.5.5 Terminal Decommissioning

The terminal is unlikely to be decommissioned whilst there is still a demand for finished petroleum products.

Continued maintenance and upgrade works are likely to occur over the coming years which would mean that the terminal would remain viable into the future. These upgrade works would

be subject to relevant approvals and permits which would be applied for prior to the works being undertaken as required.

In the event that the terminal is no longer required, all decommissioning and restoration activities would be in accordance with applicable federal, state, and local permits, approvals and regulatory requirements and would be completed in accordance with existing licences and the relevant legislation and safeguards at the time. These works are subject to certain environmental approvals and safeguards, which would help ensure that any related work would be completed in a safe and appropriate manner.

4 PROPOSED MODIFICATION

4.1 Introduction

This Chapter provides an overview of the demolition works (i.e. the proposed Modification), including a description of the works and a program for the works being undertaken. It describes the works that Caltex is seeking approval for under S.96 (2) Modification Application. The demolition works are all in addition to the works described in **Chapter 3** (the approved Project). The demolition works would introduce certain impacts that would be temporary in nature and would need to be appropriately managed. The demolition works would help establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell and as such would be substantially the same development as approved Project (SSD 5544) (refer to **Chapter 3 Approved Project**).

4.2 The Demolition Works

4.2.1 Overview

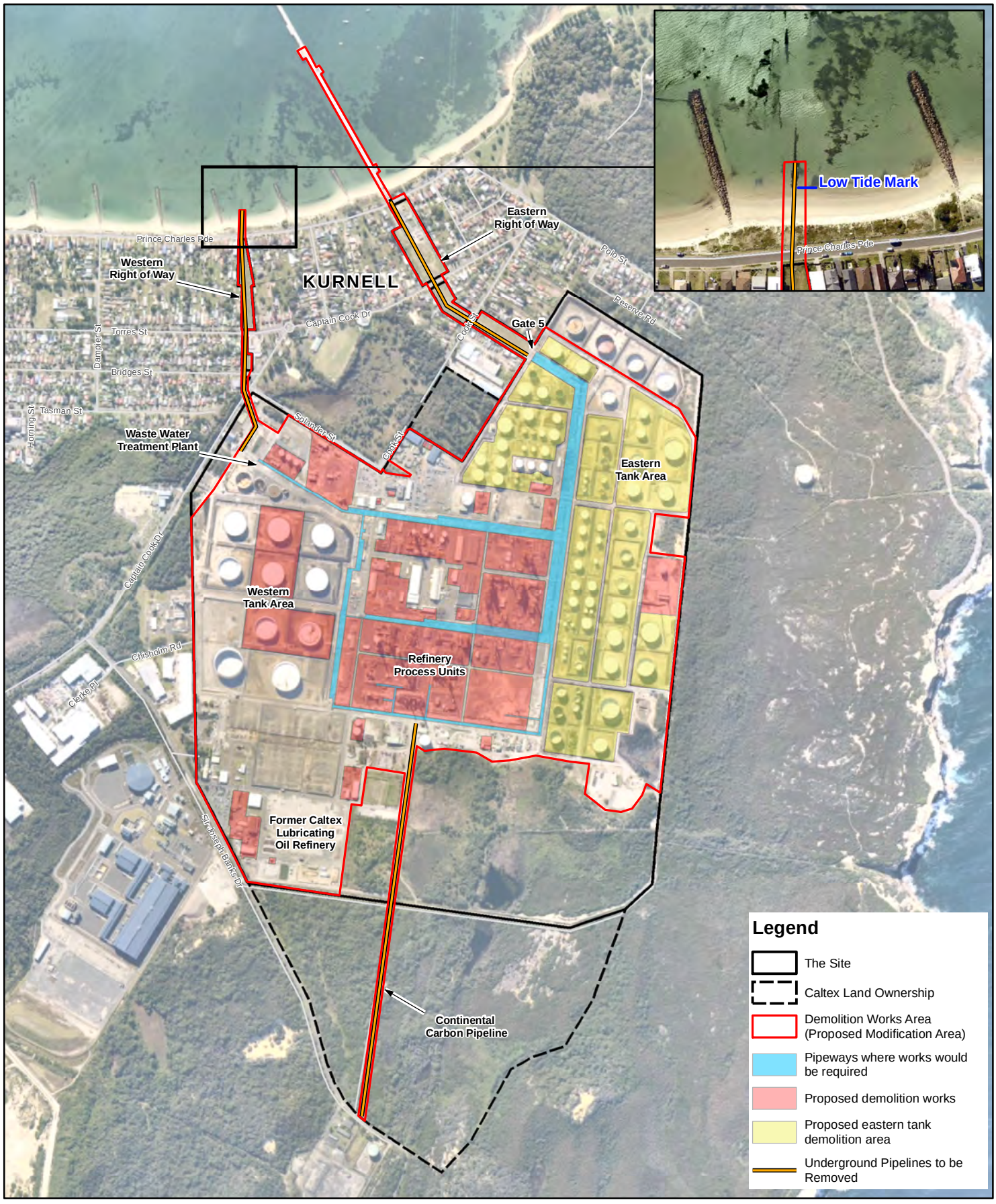
The demolition works would broadly involve the following activities within the demolition works area presented on **Figure 4-1**:

- demolition, dismantling or removal of:
  - refinery process units and associated infrastructure;
  - redundant tanks and associated infrastructure;
  - redundant pipeways and above and underground pipelines; and
  - redundant buildings and services.
- associated civil works with works outlined;
- waste management activities including concrete crushing; and
- returning the works areas to ground level.

Figure 4-1 also shows the location of the demolition works. The majority of the demolition works would be completed within the boundary of the Site (as defined by the EIS for SSD 5544). The exceptions to this include:

- the removal of the Continental Carbon Pipeline which is also located on land owned by Caltex to the south of the Site;
- sections of the redundant pipelines that run through the western and eastern ROWs that are located outside of the Site (i.e. under the roads that cross the ROWs and under Silver Beach); and
- the removal of the cooling water intake pipelines and associated infrastructure from the Kurnell Wharf.

Land owners consent is required for the works within the road reserves and Silver Beach (refer to **Chapter 5 Legislation, Planning Policy and Approvals**). These works would be completed following the shutdown, deinventorisation and cleaning redundant infrastructure.



N
W E
S

0 100 200 400 600 Meters

Datum: GDA94
Grid: MGA Zone 56

Source: Aerial Imagery - Nearmap 2014

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

PROPOSED DEMOLITION WORKS

URS

File No: 43177915.021.mxd Drawn: STB Approved: WM Date: 13/10/2014

Figure: **4-1**

Rev. **A** A4

The buildings and equipment to be demolished have been determined with consideration of the Heritage Management Strategy (HMS). Refer to **Section 16 Heritage** and **Appendix F Heritage Impact Assessment** for more detail.

Following the demolition works, the Site would operate as a finished product terminal. The demolition works would support the operation of Site as a finished product import terminal, as approved by SSD 5544.

The Site would not be remediated as part of this Project. Remediation work would occur in consultation with relevant stakeholders and the relevant approvals would be sought at a later stage.

4.2.2 Refinery Process Units and Associated Infrastructure

This is the first stage of the demolition works and would involve:

- disconnection and removal of pipelines from the process units area;
- removal of insulation, corrosion protection materials and other building materials prior to demolition taking place;
- demolition of the refinery process units by lowering to a level where they can be more easily cut up using heavy machinery;
- intermediate storage of demolished material on the former Caltex Lubricating Oil Refinery (CLOR) as required prior to disposal, recycling or divestment;
- removal of the foundations and slabs below the process units; and
- removal of redundant cabling and some underground services including the Oily Water Sewer from the area beneath the refinery process units.

These demolition works would require excavation work which may extend down to 2 metres below ground level (mbgl).

4.2.3 Tanks and Associated Infrastructure

This is the second stage of the demolition works and would involve:

- disconnection and removal of a number of tanks and vessels from both the eastern and western tank areas;
- demolition of the tanks using heavy machinery to cut them up;
- intermediate storage of the demolished material at the former CLOR prior to disposal or recycling; and
- removal of redundant infrastructure associated with the tanks (such as water draw equipment and pipelines).

These demolition works may require excavation work which may extend down to 1 mbgl. The bunds associated with the demolished tanks would remain intact and in situ. Bund drainage would be by manual drain valve actuation.

Within the Western Tank Area all of the tanks highlighted on **Figure 4-1** would be demolished. Four tanks in the Western Tank Area that were approved under SSD 5544 for conversion, are now proposed for demolition (refer to **Figure 4-1**).

Within the Eastern Tank Area a maximum of 64 of the 77 tanks within the yellow highlighted area would be demolished (refer to **Figure 4-1**).

Following the tank demolition works, the fuel throughput would be less than or equal to the approved throughput under the approved Project SSD 5544.

4.2.4 Pipelines/Pipeways

The demolition work would also include the removal of seven underground pipelines. These pipelines include the following:

- the cooling water outlet running from the refinery through the Western Right of Way (ROW), under Silver Beach and into Botany Bay;
- two cooling water intake lines running from the pumphouse on Kurnell Wharf through the Eastern ROW to the refinery;
- three redundant product lines running through the Eastern ROW; and
- the Continental Carbon pipeline running south from the Site.

The locations of these underground pipelines are shown in orange on **Figure 4-1**. This figure also shows a close up of Silver Beach and the associated demolition works area.

Some pipeways would also be removed as part of the demolition works. This work would all be above ground and within the refinery process area.

Once removed redundant pipes and materials from the pipeways would be stored at the former CLOR site prior to recycling or disposal.

The works to remove the underground pipelines is discussed in more detail below.

Cooling Water Outlet

The cooling water outlet would be removed from the Site, the Western ROW, the roads under which it passes in Kurnell, Silver Beach and part of Botany Bay (refer to **Figure 4-1**). This pipeline is 1.8 m in diameter and is made of reinforced concrete.

Within the Site and the Western ROW, the pipeline would be excavated, removed and the surface returned to grade. Where the pipeline crosses Captain Cook Drive, Bridges Street, Torres Street and Prince Charles Parade, the roads would be excavated, the pipeline removed and the roads restored in kind. The depth of excavation required for the removal of this pipeline would be approximately 2 mbgl.

In addition to removing the pipeline from beneath the ROW and roads, the cooling water outlet pipeline would also be removed from beneath Silver Beach north of Prince Charles Parade up to 20 m seaward from the low tide mark into Botany Bay. As noted, not all of the Cooling Water Pipeline would be removed. Beyond 20 m from the low tide mark the rest of the pipeline would be left in situ. The remaining pipeline is approximately 400 m in length.

The following works are proposed to remove the cooling water outlet pipeline from Silver Beach.

- The pipeline would be excavated where it is covered with sediment/sand. The pipeline would be cut or dismantled at the original construction joints prior to lifting and removal. Where the pipeline needs to be cut into sections, excavations may be deeper (i.e. as deep as the pipe) than elsewhere (possibly only half the pipe height). Two divers may be required to complete the cutting.
- Once dismantled or cut, sections of the pipe would be lifted out of the sea bed. The preferred technique for lifting sections of pipe would be using a terrestrial backhoe with a lifting attachment given the shallow waters.
- Sections of pipe would be moved to the Western ROW for storage prior to being loaded onto a truck and transported to the main refinery site.
- Following removal of the pipeline, the backhoe would backfill the excavated area with suitable material to restore the sea bed profile. A gabion and geotextile material would be placed inside the landward end of the redundant pipe that would remain in Botany Bay to prevent sediments moving down into the pipe over time.

It is anticipated that the proposed works at Silver Beach would be completed before the rest of the cooling water pipeline is removed. This would allow the demolition contractor access to Silver Beach at the point where the Cooling Water Pipeline is currently located, prior to it being removed.

Suitable backfill material to be sourced and brought to Silver Beach to return the dunes, beach, intertidal and sub tidal areas to grade. The beach and dune areas would also be rehabilitated (refer to **Chapter 18 Coastal Processes**).

Cooling Water Intakes and Product Pipelines

There are five redundant pipelines to be removed from the Eastern ROW (refer to **Figure 4-1**). Two of these pipes are the redundant cooling water inlet pipes which are made from cement lined steel, and the other three are redundant product pipelines which are fabricated from carbon steel pipe. These pipelines run from Gate 5 to Kurnell Wharf and are of varying diameters.

The removal of these pipelines would require works on land owned by Caltex (including the Kurnell Wharf), and the road reserves associated with Cook St, Captain Cook Drive and Prince Charles Parade.

In the Eastern ROW and in the road reserves, the six redundant pipelines would be excavated, the pipelines removed and the surface returned to grade or the roads repaired in kind. The depth of excavation required for the removal of these pipelines would be approximately 2 mbgl.

To the north of Prince Charles Parade, where the pipelines move from underground to aboveground and onto the wharf, only the two cooling water intake pipelines would be removed. The four redundant product pipelines would remain on the wharf. The cooling water intake pipelines would be removed from their supports, cut into sections and moved by a barge crane on to a truck located on the wharf.

Continental Carbon Pipeline

The Continental Carbon Pipeline would be removed from the southern section of the Site and within Lot 2 DP215818. This land is owned by Caltex.

This redundant pipeline would be excavated, removed and the surface returned to grade. The depth of excavation required for the removal of this pipeline would be approximately 2 mbgl.

4.2.5 Buildings

The building demolition work would be likely to commence later than the other demolition activities. This work would involve:

- the demolition and removal of a number of redundant buildings on Site related to the operation of the refinery as shown on **Figure 4-1**;
- demolition would be undertaken using heavy machinery such as bulldozers and hydraulic excavators;
- intermediate storage of the demolished material at the CLOR prior to disposal or recycling; and
- removal of foundations and services associated with the redundant buildings.

These demolition works may require excavation work which may extend down to 1 mbgl.

4.2.6 Services

Redundant cabling and underground services associated with the redundant infrastructure in the refinery process area and redundant buildings across the Site would also be removed.

These services include:

- connection points and underground pipes to the Oily Water Sewer beneath the refinery process units; and
- redundant sewer lines and cabling from redundant buildings that included amenities.

4.3 Demolition Staging and Program

4.3.1 Demolition Program

Caltex is planning to commence the demolition works during the second half of 2015. The demolition works are likely to be completed by the end of 2017.

The interaction between the conversion works program and the demolition works program is presented in **Table 4-1**. By the time that the demolition works commence, the only conversion works still being completed will relate to the conversion of certain tanks across the Site.

Table 4-1 Proposed Conversion and Demolition Schedule

Task	Indicative Date
Conversion Works	
Detailed Engineering & Design Start	Mid 2012
Engineering & Design Completed	Second half 2013
Tank Conversions Start	Q1 2014
Installation of Piping, Pumps and Associated Infrastructure	Q1 2014
Construction on Piping Completed	Q2 2014
Kurnell Refinery Shutdown	Q4 2014
Kurnell Refinery Decommissioning Process Units	First half 2015
Kurnell Refinery Decommissioning Tanks and lines	2015 – Mid 2016
Continued Tank Conversions	End 2014 – end 2016
CONVERSION TO TERMINAL COMPLETED	December 2016
Demolition Works*	
Demolition of Refinery Process Units	Mid 2015 – Mid 2017
Demolition of Tanks	Mid 2016 – End 2017
Pipeline Removal	Start 2016 – End 2017
Demolition of Buildings	Mid 2016 – End 2017
Concrete Crushing	End 2017

* Depending on timing of development consent.

4.3.2 Working Hours

The working hours would be in line with the Conditions of Consent for SSD 5544, in particular Conditions C18, C19 and C20. In summary:

- Construction to be completed between 7.00 am and 10.00 pm seven days a week (Condition C18);
- High noise generating construction works would be confined to less sensitive times of the day and not outside the hours of 7.00 am to 6.00 pm Monday to Saturday (Condition C19); and
- Construction outside those hours would only be undertaken in certain circumstances as defined in Condition C20.

As the pipeline removal works within the ROWs would occur close to residential receptors these works would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19.

Potential noise impacts related to the demolition works are discussed further in **Chapter 13 Noise and Vibration** and **Appendix E Noise and Vibration Impact Assessment**.

4.3.3 Demolition Traffic

The traffic generated by the demolition works would incorporate a mix of construction plant vehicles and construction personnel movements. Access would remain the same as for the conversion works with access to the main refinery site only undertaken from Solander Street, Kurnell.

In addition to construction personnel movements, the demolition works are likely to result in approximately 2,675 additional heavy vehicle movements to and from the Site between 2015 and 2017. This equates to approximately 6 heavy vehicle movements a day on average with a peak of 30 additional movements on any one day. Further detail is provided in **Chapter 15 Transport and Access**.

4.3.4 Workforce

The demolition works would result in an increase of approximately 230 employees at the Site in 2015 and 130 contractors for 2016 and 2017. These workers would be in addition to the workforce numbers presented in **Section 3.3.4** for these three years and shown in **Table 3-4**. As demonstrated in **Table 4-2** the cumulative number of workers at the Site for 2015 to 2017 (410 maximum) would still be significantly lower than the workforce present in 2012 (1,385 maximum).

Table 4-2 Workforce Numbers (Current and Projected) – Conversion and Demolition Works

Workforce Numbers (Current and Projected)							
	2012[2]	2013	2014[3]	2015	2016	2017	2018
Caltex Employees	410	400	450[4]	40	45	45	45
Contractors	475	475	475	40	55	55	55
Conversion works construction numbers	-	140	140	100	90	-	
Demolition works construction numbers				**230**	**130**	**130**	
Total	**885**	**1,015**	**1,065**	**410[5]**	**320**	**230**	**100**
Maintenance Shutdown Periods[1]	500	0[6]	0[6]	0[6]	90	90	90
Total including Maintenance Activities	**1,385**	**1,015**	**1,065**	**410**	**410**	**320**	**190**

[1] *Maintenance shutdown periods are periodic and for short time frames (8-12 weeks).*
[2] *Employee numbers at the Site in 2012.*
[3] *2014 will be the peak construction period. Additional personnel brought to the Site for the conversion works would be a maximum of 140 personnel.*
[4] *Additional Caltex Employees in 2014 would be staff hired for terminal operations.*
[5] *The large reduction in numbers between 2014 and 2015 follows the cessation of refining at the Site. The increase in workforce numbers between 2015 and 2016 represents a gradual stabilisation of the terminal operational workforce.*
[6] *No maintenance shutdown periods will occur during 2013 and 2015*

4.4 Demolition Material Management

The demolition works would result in the production of a number of waste streams. Caltex's target is to recycle as much waste material as possible and where possible reuse it at the Site. As demolition works progress, materials would be classified in line with the *Waste Classification Guidelines* (DECCW, 2009) and stored in identified areas on Site prior to being reused, recycled or disposed.

Demolition materials would be managed and stored on Site at the former CLOR prior to being either recycled (e.g. steel, alloys, copper etc.) or disposed offsite.

Further detail on the management of this process is provided in **Chapter 11 Waste Management**.

4.4.1 Concrete Crushing

Concrete that is produced during the demolition works would be reused on Site where possible and appropriate. The concrete would be crushed at the end of the demolition program on the former CLOR site (refer to **Figure 4-1**) and used as an aggregate to cover areas where structures and buildings have been removed.

Further detail on the management of this process is provided in **Chapter 11 Waste Management** and **Chapter 14 Air Quality and Odour**.

4.4.2 Spoil Management

As the works progress, the soil removed during the excavation work would be stockpiled and, where appropriate, reused as backfill. Along pipeline routes, excavation would occur in discrete sections, so that the length of time temporary stockpiles are required is minimised.

Soils would be checked for contamination and odour as they are excavated. Soils considered contaminated would be stored at the former CLOR site. These soils would be placed in stockpiles and appropriately bunded and managed.

Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, Virgin Excavated Natural Material, Excavated Natural Material or appropriately remediated soils would be brought to the demolition works area and used to provide additional backfill material.

Chapter 9 Soils, Groundwater and Contamination provides further detail on the mitigation measures that would be implemented to minimise impact related to the excavation works.

4.5 Operation

The operation of the Kurnell Terminal would be as described in the Kurnell Refinery Conversion EIS (URS, 2013) and would be consistent with the development consent for SSD 5544.

5 LEGISLATION, PLANNING POLICY AND APPROVALS

5.1 Introduction

This Chapter reviews the key Commonwealth and State legislation as well as the State, regional and local planning policies that apply to the demolition works in order to determine the approvals that would be required to allow the works to proceed.

The key approval required for the demolition works to proceed is consent under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The demolition works constitute 'development' as defined by the EP&A Act and therefore require consent under Part 4 of the same Act. As the demolition works result in substantially the same development as approved under SSD 5544 in January 2014, approval is being sought through a modification to the existing approval through Section 96 (2) of the EP&A Act.

A modification through Section 96 (2) of the EP&A Act requires that aspects of the demolition works that may have environmental, social or economic impacts that differ from those previously assessed within the EIS for SSD 5544, are required to undergo assessment in line with Section 79C of the EP&A Act.

Under Section 79C, Part 4 of the EP&A Act, the demolition works must be evaluated against a range of considerations including environmental planning instruments, NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), the likely environmental, social and economic impacts of that development, the suitability of the Site, and the public interest.

In order to comply with the requirements for assessing this type of modification, a Statement of Environmental Effects (SEE) must be prepared and submitted alongside the Modification Application (DA).

In addition to modification approval under the EP&A Act, there are a number of other approvals that may be required. This section reviews Commonwealth and State legislation as well as the State, regional and local planning policies that apply to the demolition works, to determine the approvals that would be required to allow the works to proceed.

5.2 Commonwealth Legislation

5.2.1 Environmental Protection and Biodiversity Conservation Act 1999

Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) states that an action which has, will have or is likely to have a significant impact on a matter of national environmental significance may not be undertaken without prior approval of the Commonwealth Minister for Environment and Heritage, as provided for under the provisions of Part 9 of the EPBC Act. The Act identifies the following as matters of national environmental significance for which Ministerial approval is required:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (including Ramsar Wetlands);

- listed threatened species and ecological communities;
- listed migratory species protected under international agreements (e.g. CAMBA and JAMBA);
- protection of the environment from nuclear actions; and
- Commonwealth marine areas.

The EPBC Act also protects the environment within which any action is proposed to be undertaken, or where an action will affect Commonwealth land.

The demolition works would not involve a nuclear action, are not expected to have a significant effect upon the health and viability of any migratory species listed under provisions of the Act, would not affect any World Heritage property, and would not affect any Commonwealth land or its environment.

Kurnell Refinery is located within two kilometres of the Towra Point Nature Reserve, a listed Ramsar Wetland of international significance. The Kurnell Peninsula Headland is included in the National Heritage List (NHL listing No. 105812) established under the EPBC Act. The NHL was established to protect places that have outstanding value to the nation. Approval from the Minister is required under the EPBC Act for controlled actions which are deemed will have a significant impact on items and places listed under the NHL and on Ramsar Wetlands.

Chapter 10 Human Health and Ecological Risk, Appendix C Human and Ecological Risk Assessment, Chapter 17 Ecology and **Appendix G Ecology** include assessments of the potential impact of the demolition works on the Towra Point Nature Reserve and on threatened species and communities. **Chapter 16 Heritage** and **Appendix F Heritage Impact Assessment** include an assessment of the potential impact of the demolition works on the Kurnell Peninsula Headland.

These assessments concluded that the demolition works would not result in a significant impact on any Matter of National Environmental Significance (MNES). As such the demolition works do not require referral to the Commonwealth Department of Environment (DoE) for approval under the EPBC Act.

5.2.2 Australian Heritage Council Act 2003

The Australian Heritage Council Act 2003 establishes the Australian Heritage Council as an independent advisory body regarding National/Commonwealth heritage places and mandates the Council to maintain the Register of the National Estate (RNE) to promote the assessment and conservation of heritage items.

No items listed under the RNE are located on or adjacent to the Site (refer to **Chapter 16 Heritage** and **Appendix F Heritage Impact Assessment**).

5.3 NSW State Legislation

5.3.1 Environmental Planning and Assessment Act 1979

The demolition works require consent as 'development' under the provisions of the EP&A Act. The demolition works are directly linked to approved Project SSD 5544 as they are the next step in the conversion process at the Site to establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell. As the demolition works are part of the same process as the conversion works, they share the same needs case, project objective and the same purpose. Without the demolition works the safety and viability of the operation at the Site would be compromised.

As such, Caltex are seeking to modify the development consent for approved Project (SSD 5544) to ensure that the Project objective for this consent can be successfully achieved and the Project continued. Caltex have recognised that the inclusion of the demolition works under the development consent SSD 5544 would result in certain impacts that were not considered under the initial consent, as such a modification application under S.96 (2) of the EP&A Act is being sought.

Whilst the demolition works would introduce new considerations for the Project, these matters would be temporary in nature and can be appropriately managed. Additional potential impacts would be managed in line with the proposed management and mitigation measures in **Chapter 20 Revised Management and Mitigation Measures**.

Following completion of the demolition works the end result would be substantially the same development as approved under SSD 5544.

In addition, the SEARs request that Caltex demonstrate the status of compliance with the conditions of consent for SSD 5544. Conditions D7 and D8 of the development consent for SSD 5544 note that within a year of the consent that Caltex commission an Independent Environmental Audit of the Project and that within three months of commissioning this audit, present the audit report to the Director-General (now Secretary).

By the start of March 2015, Caltex will have provided the DPE with an independent audit of the Project in line with the Project's conditions of consent. This audit will include a demonstration of compliance with the conditions of consent for SSD 5544. Therefore this SEARs request has not been provided within this SEE, as it is considered more appropriate to address this request in line with the approved conditions of consent.

The requirements of other legislation that are applicable to the demolition works are discussed in more detail below.

5.3.2 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) operate under the jurisdiction of the EP&A Act and set out planning policies for various geographies and project types within NSW. The relevant SEPPs for the demolition works, and their requirements, are outlined below.

5.3.2.1 *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) outlines the approach used in NSW for planning and assessing the risks and hazards associated with industrial development proposals. Through the policy, the permissibility of an industrial proposal is linked to its safety and pollution control performance. SEPP 33 applies to proposals that fall under the policy's definition of '*potentially hazardous industry*' or '*potentially offensive industry*'. The policy states:

1) "potentially hazardous industry means a development for the purposes of any industry which, if the development were to operate without employing any measures to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality to (a) human health, life or property, or (b) the biophysical environment; and includes a hazardous industry and a hazardous storage establishment.

2) *potentially offensive industry means a development for the purposes of an industry which, if the development were to operate without employing any measures to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.*"

Chapter 8 Hazards & Risk and **Appendix B Hazards and Risk Assessment** summarise the hazards and risks associated with the demolition works, the impacts of demolition works on the existing simultaneous terminal operations and whether these potential risks change the conclusions of the Preliminary Hazards Analysis for the approved Project. The Hazards in Demolition (HAZDEM) assessment concluded that the demolition works (in addition to the approved Project and simultaneously with the approved Project) would not contravene the NSW land-use safety criteria (as detailed within the Hazardous Industry Planning Advisory Papers) and would therefore be acceptable under the provisions of SEPP 33.

5.3.2.2 *State Environmental Planning Policy No. 14 - Coastal Wetlands*

The demolition works would not directly affect any *State Environmental Planning Policy No 14 – Coastal Wetlands* (SEPP 14) wetlands as this SEPP does not apply to wetlands within the Sydney Metropolitan Region.

5.3.2.3 *State Environmental Planning Policy No. 55 - Remediation of Land*

State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) provides a state wide planning approach to the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment. Section 7 of the SEPP specifies that:

'A consent authority must not consent to the carrying out of any development on land unless:

(a) it has considered whether the land is contaminated, and

(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and

(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.'

Contamination issues are discussed within **Chapter 9 Soil, Groundwater and Contamination** and **Chapter 10 Human Health and Ecological Risk**. Contamination issues during demolition would be managed through specific Demolition Environmental Management Plans (DEMP).

Overall remediation of existing contamination on the Site would be assessed as part of a separate approval process. This would be developed in consultation with the NSW Environment Protection Agency (EPA), the Sutherland Shire Council (SSC) and other relevant parties.

The demolition works would require disturbance of an estimated 150,000 tonnes of soil which may result in the requirement to manage contaminated soil. This is discussed further in **Section 5.3.3.3** and **Chapter 9 Soil, Groundwater and Contamination.**

As no change of use is proposed as part of the demolition works, the land would continue to be suitable for its continued use as a liquid fuel depot and therefore the provisions to SEPP 55 do not prevent consent being granted for the works.

5.3.2.4 *State Environmental Planning Policy 71 - Coastal Protection*

State Environmental Planning Policy No. 71 - Coastal Protection (SEPP 71) specifies provisions relating to development control for development within the Coastal Zone including public access, effluent disposal and storm water. The demolition works do not fall within the Coastal Zone.

5.3.2.5 *State Environmental Planning Policy – Kurnell Peninsula*

State Environmental Planning Policy (Kurnell Peninsula) 1989 (SEPP (Kurnell Peninsula)) aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, State, region and locality. SEPP (Kurnell Peninsula) applies to the land within the Sutherland Shire, known as Kurnell Peninsula, and adjacent waterways. SEPP (Kurnell Peninsula) discusses a number of issues that are outlined below.

(i) Zoning of Land

The SEPP (Kurnell Peninsula) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone). The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the demolition works would allow the continued the use of the land as a liquid fuel depot, the works are deemed permissible under the land use zones in this SEPP.

(ii) Land Use Conflict

SEPP (Kurnell Peninsula) seeks to mitigate land use conflicts in the area and to ensure that adequate provision is made for the supply of water and the disposal of all wastes and stormwater from the land. Surface water impacts for the demolition works would be managed using the management and mitigation measures summarised in **Chapter 12 Surface water, Wastewater and Flooding** and discussed in detail in **Appendix D Water Management Report**. Waste impact would be managed using the management and mitigation measures described in **Chapter 11 Waste Management**. Should all the measures within this section be implemented during demolition, the surface water and waste impacts would be mitigated.

(iii) Heritage Protection

Clauses 23A to 23D, SEPP (Kurnell Peninsula) prescribe the protection of items and places of Aboriginal and historic heritage. Schedule 2 'Archaeological Items' and Schedule 3 'Heritage Items' includes the 'Australian Oil Refinery' and a number of items that are in close proximity to the Site.

Schedule 2 Clause 23B (2) states:

(2) The Council may consent to the carrying out of development on an archaeological site or potential archaeological site that has non-Aboriginal heritage significance only if:

a) *it has considered a conservation assessment of the impact of the proposed development on the site, and*
b) *it has notified the Heritage Council of its intention to do so and taken into consideration any comments received from the Heritage Council within 28 days after the notice was sent, and*
c) *it is satisfied that any necessary excavation permit required by the Heritage Act 1977 has been granted.*

A heritage impact assessment has been undertaken for the demolition works. A report documenting this assessment is included in **Appendix F Heritage Impact Assessment** and summarised in **Chapter 16 Heritage**. This assessment has included management and mitigation measures that would be implemented to ensure that the provisions of the SEPP (Kurnell Peninsula) relating to the protection of heritage assets are managed throughout the lifecycle of the works.

5.3.3 Other NSW State Legislation

While the EP&A Act provides the framework for the planning and development approvals system in NSW, there are a number of other Acts, Regulations and Environmental Planning Instruments (EPIs) of relevance to the demolition works. The relevant Acts, Regulations and EPIs are discussed below.

5.3.3.1 Australian Oil Refining Agreements Act 1954

The Australian Oil Refining Agreements Act 1954 (AORA Act) was gazetted to facilitate the construction and operation of the Kurnell Refinery. The Act also allows for Caltex to maintain its asset at the Site.

5.3.3.2 *Maritime Services Act*

The Maritime Division of NSW Roads and Maritime (R&M) manage, amongst other things, the coastal waters of NSW. The State has devolved responsibility to NSW R&M to care for the management of a number of matters including marine safety in NSW, regulation of commercial and recreational boating and property management, which involves overseeing its appropriate use and development. The responsibilities and powers of NSW R&M are set out in the *Maritime Services Act*.

The Maritime Services Act is relevant to the demolition works as Caltex are required to obtain permission to lodge from NSW R&M prior to approval of the modification application. A permission to lodge application has been made to R&M and is currently being processed (refer to **Appendix A SEARs and Application Documentation**).

5.3.3.3 *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (PoEO Act) provides for the issue of an Environment Protection Licence (EPL) for scheduled activities pursuant to Section 48 of the PoEO Act, in relation to pollution and waste disposal caused by development or operation of developments. Activities requiring an EPL are listed in Schedule 1 of the Act.

Activities relating to chemical storage are listed in clause 9 of Schedule 1. These include Petroleum Products Storage with a capacity to store more than 200 tonnes (liquefied gases) or 2,000 tonnes (chemicals in any other form). Caltex has an existing EPL (No. 837) that licenses a number of activities for the Site, including Petroleum Products Storage. Condition B13 of the conditions of consent for SSD 5544 specifically noted the requirement to amend the EPL as the refinery transitions to a terminal operation. The EPL for the Site is frequently amended, in consultation with the EPA, to ensure that the activities at the Site are appropriately managed.

The demolition works are not defined as a Scheduled Activity under the PoEO Act and no licenced emission source has been identified. However, consideration has been given to Schedule 1 Scheduled Activities, of the POEO Act, which notes the following activities which may be relevant to the demolition works:

15 Contaminated soil treatment

(1) This clause applies to contaminated soil treatment, meaning the on site or off site treatment of contaminated soil (including, in either case, incineration or storage of contaminated soil but excluding excavation for treatment at another site).

(2) The activity to which this clause applies is declared to be a scheduled activity if:

(a) in any case, it has the capacity to treat more than 1,000 cubic metres per year of contaminated soil received from off site, or

(b) where it treats contaminated soil originating exclusively on site, it has a capacity:

(i) to incinerate more than 1,000 cubic metres per year of contaminated soil, or

(ii) to treat (otherwise than by incineration) and store more than 30,000 cubic metres of contaminated soil, or

(iii) to disturb more than an aggregate area of 3 hectares of contaminated soil.

The demolition works would require excavation/disturbance of an estimated 150,000 tonnes of soil. This soil would be managed in following the following ways:

- During excavation visual and olfactory indicators of impact would be monitored.
- Soils considered to be contaminated would be stored at the former Caltex Lubricant Oil Refinery Area (CLOR) area in the south west of the Site. These soils would be placed in stockpiles and appropriately bunded and managed in the short term.
- Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or appropriately remediated soils would be used to provide additional backfill material.

Once the soil has been classified, if appropriate it would be managed on-site in accordance with the Site's existing EPL. Where the contaminated soil cannot be appropriately managed on site, it may be taken off-site for disposal at an appropriately licensed facility. The volume of soil that may be required to be disposed of off-site has been estimated to be < 2,000 tonnes. As such, Clause 2 (b)(ii) and 2(b)(iii) are not relevant to the demolition works..

The existing EPL for the Site provides conditions related to offensive odour, dust and asbestos. These conditions would apply across the Site during the demolition works.

16 Crushing, grinding or separating

(1) This clause applies to crushing, grinding or separating, meaning the processing of materials (including sand, gravel, rock or minerals, but not including waste of any description) by crushing, grinding or separating them into different sizes.

(2) The activity to which this clause applies is declared to be a scheduled activity if it has a capacity to process more than 150 tonnes of materials per day or 30,000 tonnes of materials per year.

Concrete that is produced during the demolition works would be reused on Site where possible and appropriate. This concrete would be considered a demolition waste. As Clause 16(1) specifies *'not including waste of any description'*, this clause does not apply and the activity is not considered to be a Scheduled Activity.

The PoEO Act also provides for the management of water, air and noise pollution and the control of wastes. The proposed management and mitigation measures outlined in **Chapter 20 Revised Management and Mitigation Measures** would be implemented through a DEMP to minimise the potential for the demolition works to result in pollution of the environment.

5.3.3.4 Contaminated Land Management Act 1997

The primary objective of the *Contaminated Land Management Act 1997* (CLM Act) is to establish a process for investigating and remediating land where contamination presents a significant risk of harm to human health or another aspect of the environment. Where land is identified as potentially contaminated, consultation with the NSW EPA should be undertaken.

The Site is listed as a NSW Contaminated Site under the CLM Act. In June 2003 the EPA issued an Agreement to the Voluntary Investigation Proposal for the Kurnell Refinery and right of way. This agreement is detailed on the Section 149 Planning Certificates for the Site.

In 2013 the EPA issued Caltex with a Preliminary Investigation Order under Section 10 of the *Contaminated Land Management Act 1997* to address the contamination legacies across the Site. Associated with the PIO, Caltex has produced three reports:

- a report summarising the potential contamination sources related to the Site and the available information about soil, water and offsite migration of contamination (Caltex 2013a);
- a report identifying data gaps relating to the identification and management of contamination on, and related to, the Site (Caltex 2013b); and
- a report outlining the proposed investigation plan to fill any data gaps including details of the staging of the investigation activities and expected timeframes for this process (Caltex 2014).

As such, the Preliminary Investigation Order has been completed to the satisfaction of the EPA.

Overall remediation of existing contamination on the Site would be assessed as part of a separate approval process.

5.3.3.5 *Environmentally Hazardous Chemicals Act 1985*

The *Environmentally Hazardous Chemicals Act 1985* regulates chemical wastes in NSW. Under the Act, Chemical Control Orders (CCO) can be declared for specific wastes types. CCOs can set controls on activities throughout the chemical's lifecycle through general requirements and by requiring that certain activities be subject to particular licence conditions. The EPA currently has five CCOs in place in NSW, which includes Polychlorinated Biphenyl (PCB) wastes.

Condition L8.1 of the Site's EPL 837 notes that the licensee must comply with the "*Chemical Control Order in Relation to Materials and Wastes Containing Polychlorinated Biphenyl, 1997*" This CCO outlines controls on the generation, processing, storing, conveying and disposal of PCB materials or wastes (depending on the concentration of PCB).

Wastes generated as part of the demolition works would need to be managed in accordance with the *Environmentally Hazardous Chemicals Act 1985* and EPL 837.

5.3.3.6 *Work Health and Safety Act 2011*

The *Work Health and Safety Act 2011* (WH&S Act) and its supporting Regulation 2011 (WH&S Regulation) defines major hazard facilities (MHFs), regulates their operation and includes measures to prevent accidents occurring at MHFs.

The Site is classified as a MHF. Any works to or modifications of a MHF require the consent and approval of WorkCover NSW as the administrators of the WH&S Act.

WorkCover NSW has been notified of the demolition works. Caltex will continue to consult with WorkCover NSW regarding the demolition works. A Safety Management Plan would also be implemented for the demolition works. Refer to **Chapter 6 Consultation** and **Chapter 8 Hazards and Risk.**

5.3.3.7 Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates a range of activities undertaken on public roads. Section 138 of the Roads Act requires that a person obtain the consent of the appropriate 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 demolition works would require disturbing a number of Sutherland Shire Council controlled roads and road reserves to remove underground pipelines (refer to **Section 4.2.4)**. The affected roads include Captain Cook Drive, Cook Street, Bridges Street, Torres Street and Prince Charles Parade. .

Sutherland Shire Council have advised (refer to **Chapter 6 Consultation**) that a *Road Opening Application* would be required to be submitted to Sutherland Shire Council for assessment following approval of the Modification Application and prior to the works being undertaken. Caltex will continue to liaise with Sutherland Shire Council on this matter.

5.3.3.8 Water Management Act 2000

The ***Water Management Act 2000*** (WM Act) governs the issue of water access licences and approvals for those water sources (rivers, lakes, estuaries and groundwater) in New South Wales where water sharing plans have commenced. The Site is located within the area covered by the commenced Water Sharing plan entitled the 'Greater Metropolitan Region Groundwater Sources' 2011.

The WM Act creates:

- mechanisms for protecting and restoring water sources and their dependent ecosystems;
- improved access rights to water; and
- partnership arrangements between the community and the Government for water management.

The WM Act defines an aquifer interference activity as that which involves any of the following:

- the penetration of an aquifer;
- the interference with water in an aquifer;
- the obstruction of the flow of water in an aquifer;
- the taking of water from an aquifer in the course of carrying out mining or any other prescribed activity; and
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

The NSW Aquifer Interference Policy applies to any project or activity involving any of the above and a water licence is required whether water is taken for consumptive use or whether

it is taken incidentally by the aquifer interference activity. The Policy recognises that even where there is no take of water, aquifer interference activities can still affect the functioning of aquifers which can impact water users and dependent ecosystems.

Across the Site, groundwater is likely to be encountered in excavations deeper than 1.4 m below ground level (mbgl).

Excavations associated with the demolition works may extend to 2 mbgl in depth. Therefore groundwater is expected to be encountered. However, generally, minor temporary dewatering activities that are estimated to take less than 3 ML/yr of groundwater will generally not require a licence or approval from NOW. Therefore regular consultation with NSW Office of Water (NOW) would occur to ensure that permitting requirements are met as demolition proceeds.

This is further discussed in **Chapter 9 Soil, Groundwater and Contamination** and **Chapter 12 Surface Water, Wastewater and Flooding**.

5.3.3.9 *Water Act 1912*

The WM Act is gradually replacing the planning and management frameworks within the *Water Act 1912*. In water sources where water sharing plans do not yet apply, an aquifer interference activity that is taking or otherwise interfering with groundwater is required to hold a water licence under Part 5 of the *Water Act 1912*.

The Site exists within a commenced Water Sharing plan, the Greater Metropolitan Region Groundwater Sources 2011. No additional approvals for dewatering activities are required in addition to those required under the WM Act.

5.3.3.10 *Threatened Species Conservation Act 1995*

The *Threatened Species Conservation Act 1995* (TSC Act) provides legal status for biota of conservation significance in NSW. The Act aims to '*conserve biological diversity and promote ecologically sustainable development*'.

Chapter 17 Ecology and **Appendix H Ecology** provide the ecological impact assessment for the demolition works. The assessment of potential impacts of the demolition works on species, populations and communities listed under the TSC Act is in line with the requirements of this Act. This assessment has concluded that the demolition works would result in no significant impacts to the values protected by the TSC Act.

5.3.3.11 *Fisheries Management Act 1994*

Part 7a, Section 220A of the *Fisheries Management Act 1994* (FM Act) provides for the conservation of all biological diversity of aquatic and marine vegetation. It also ensures that the impact of any 'action' affecting threatened species, populations or ecological communities is appropriately assessed.

The potential for the demolition works to impact on the ecological values protected by the FM Act has been assessed in **Chapter 10 Human Health and Ecological Risk** and **Chapter 17 Ecology**. These assessments have concluded that no significant impacts on the values protected by the FM Act are expected as a result of the demolition works.

5.3.3.12 *Noxious Weeds Act 1993*

The *Noxious Weeds Act 1993* provides for the identification and control of noxious weeds and specifies the duties of public and private landholders to control noxious weeds. The Act stipulates that an occupier of land must take steps to control noxious weeds on their land. The Act also provides for the monitoring of and reporting on the effectiveness of the management of weeds in NSW. Appropriate methods for controlling noxious weed species are defined under the control category or categories for particular species of weeds.

The impact of the demolition works on noxious weeds and their management on the Site has been assessed within **Chapter 17 Ecology**. Management of noxious weeds on the Site would continue to be subject to Caltex's existing Weed Management Plan.

5.3.3.13 *Heritage Act 1977*

The *Heritage Act 1977* (Heritage Act) provides for the conservation of environmental heritage defined as places, buildings, works, relics, moveable objects, and precincts, of State or local heritage significance that are at least 50 years old. The Act provides for the listing of heritage structures on the State Heritage Register and Orders can be made under the Act to protect relics from removal or alteration. This Act applies to non-Aboriginal relics only. Aboriginal relics are protected under the *National Parks and Wildlife Act 1974* (see below).

An assessment of the potential impacts of the demolition works on heritage items in the area is provided in **Chapter 16 Heritage** and in **Appendix F Heritage Impact Assessment**. That assessment concluded that the overall heritage significance of the Site would be significantly impacted by the demolition works. However, implementation of the strategies within the Heritage Management Strategy (HMS) for the Site would mitigate the heritage impacts associated with the demolition works.

5.3.3.14 *National Parks and Wildlife Act 1974*

Under the *National Parks and Wildlife Act 1974* (NP&W Act) the NSW National Parks and Wildlife Service (NPWS) (part of the Office of Environment and Heritage (OEH)) is responsible for the care, control and management of all national parks, historic sites, nature reserves, Aboriginal areas, state conservation areas and regional parks. The relevant aspect of this Act that relates to the demolition works is discussed below.

(i) Protection of Flora and Fauna

The NP&W Act administers the protection of flora and fauna. It makes it an offense to harm any animal, threatened species, population or community that is protected under this Act within a licence or development consent. It also enables the creation of State-protected sites of ecological value.

The relevant provisions of this Act and relevant State-protected sites of ecological value have been considered within **Chapter 17 Ecology** and **Appendix G Ecology**. This assessment concluded that the demolition works would not have a significant impact on any threatened species, population or community protected under this Act.

5.3.3.15 Pipelines Act 1967

The *Pipelines Act 1967* (Pipelines Act) specifies provisions relating to the construction, operation and maintenance of pipelines and purposes connected therewith. Pursuant to clause 5(1)(a) of the Pipelines Act, subject to Section 5A, a licence is not required to be held in respect of a pipeline constructed or to be constructed under, or under an approval or other authority granted under, any Act, other than this Act or the EP&A Act. Accordingly, the demolition works do not require a licence pursuant to the Pipelines Act.

5.4 Local Planning Policies and Instruments

The demolition works are be assessed in this SEE in accordance with Section 79C(i) of the EP&A Act. This Act states that Environmental Planning Instruments (EPIs) must be considered during the environmental assessment process.

Land use within the Site and the wider Kurnell Peninsula, as discussed in **Sections 2.2 and 5.3.2**, is controlled by SEPP (Kurnell Peninsula). The Site is zoned pursuant to SEPP (Kurnell Peninsula). Therefore, the local zoning provisions of the *Sutherland Shire Local Environment Plan 2006* (SSLEP) are not applicable to the demolition works.

Whilst the zoning provisions in the SSLEP do not apply to the Kurnell Peninsula, Sutherland Shire Council (SSC) are in the process of finalising a new Local Environment Plan (LEP) which will eventually replace the land use planning provisions of SEPP (Kurnell Peninsula). The draft version of the new SSLEP (Draft SSLEP 2013) indicates that the demolition works area will be zoned either Heavy Industrial (IN3) or Infrastructure (SP2 – Pipeline). As the demolition works are for the purpose of a liquid fuel depot, they are permissible under stipulations of the Draft SSLEP 2013 land use table.

Both the SSLEP and the Draft SSLEP aim to promote an appropriate balance of development and management of the environment that will be ecologically sustainable, socially equitable and economically viable. As discussed in **Chapter 21 Evaluation and Justification** the demolition works are consistent with the principles or Ecologically Sustainable Development (ESD).

5.5 Strategic Planning Framework

The SEE has also assessed the demolition works against all relevant strategic planning documents, including those outlined below.

5.5.1 Land Use Safety Study (Kurnell Peninsula) 2007

The Land Use Safety Study assesses the current risks from Caltex Refinery operations to existing and future residential land uses and provides recommendations for risk reduction and development control.

The Land Use Safety Study identifies three main sources of risk from the Site:

- fires from large crude oil and refined petroleum product storage tanks and associated transfer pipelines;
- fires, explosions or toxic gas releases from processing areas; and
- fires and explosions from large liquefied petroleum gas (LPG) storage.

Chapter 8 Hazards & Risk and **Appendix B Hazards and Risks Assessment** present the hazards and risks associated with the demolition works. They assess the potential effect of these risks to the simultaneous terminal operation and whether these change any of the conclusions from the Preliminary Hazards Analysis (PHA) undertaken for the approved Project. The assessment concludes that the overall risk associated with the demolition works is low and does not introduce an excessive additional risk to the surrounding land use as identified in the PHA for the approved Project

5.5.2 The Metropolitan Plan for Sydney 2036

The Metropolitan Plan for Sydney 2036 (Metropolitan Plan) integrates land use, urban and funded transport planning together for the first time, providing a framework for sustainable growth and development across the city to 2036. The demolition works aligns with the Metropolitan Plan as it allows for the continuation of an existing land use.

6 CONSULTATION

6.1 Introduction

This chapter documents the consultation effort for the demolition works. The SEARs provide requirements for consultation in relation to these works. The SEARs require Caltex to:

'consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.'

The SEARs also outline a number of key government stakeholders that should be consulted. These are identified in **Section 6.5**.

The SEARs require that the SEE outline the issues that have been raised during the consultation process and indicate where in the SEE these issues are addressed. This summary is contained within **Table 6-2**.

A summary of the SEARs and where they have been addressed are presented in **Appendix A SEARs and Application Documentation**.

6.2 Methodology

Consultation between Caltex Refinery Management and various stakeholders is an ongoing process. Caltex maintains an open dialogue between the personnel responsible for the Site and those residents with whom it shares the Kurnell Peninsula. Regular community meetings, announcements and feedback sessions with the residents are part of the ongoing consultation process. Consultation on the demolition works has included:

- a series of public meetings; and
- liaison with government agencies, including those identified within the SEARs.

6.3 Objectives of Consultation

The main objectives of the consultation are to:

- identify the relevant stakeholders and advise them of the proposed modifications to the Project;
- identify the key issues and sensitivities related to the modifications to the Project;
- ensure ongoing communication is implemented with regards to the modifications to the Project and approvals process; and
- ensure that relevant government agencies are engaged in the planning and approvals process.

6.4 Stakeholder Identification

Given the nature and location of the demolition works, the stakeholders relevant to these works are identical to those identified as part of Caltex's ongoing community and stakeholder liaison strategy, and in line with the Project specific consultation strategy developed by Caltex prior to the announcement of the Project.

As part of the development of the modification application and SEE, Caltex has continued to consult with relevant State Government agencies, Sutherland Shire Council (SSC) and the Kurnell community.

Caltex has regular discussions with both EPA and SSC to keep these parties informed of the demolition works and to discuss other relevant issues and plans. Caltex would continue this dialogue before, during and after the demolition works.

Caltex also has quarterly meetings with the local Kurnell community to brief them on upcoming developments at the Site and to allow the community to ask questions directly to Caltex staff. Caltex will continue to use this forum to engage with the local community to understand, and where possible respond to, particular queries.

6.5 Government Agency Identification

During the preparation of the SEARs, DPE sought input from the following government agencies:

- EPA;
- NSW Department of Primary Industries (Office of Water and NSW Fisheries);
- SSC; and
- WorkCover NSW.

The SEARs require Caltex to engage in consultation with the following government agencies:

- EPA;
- NSW Department of Primary Industries (Office of Water and NSW Fisheries);
- SSC;
- WorkCover NSW;
- Office of Environment and Heritage (OEH);
- NSW Heritage Council; and
- NSW Health.

To meet the requirements of the SEARs, letters have been sent to these agencies to provide information on the demolition works and to invite each agency to provide feedback during the compilation of the SEE.

At the direction of DPE, letters were also sent to agencies that provided input to the SEARs to advise that there are some additional activities that need to be included in the modification application. These additional activities have been described in **Chapter 4 Proposed Modification**. The additional consultation responses are summarised below.

Consultation has also been undertaken with NSW Roads and Maritime and SSC regarding Permission to Lodge requirements for the works being under taken on land under their jurisdiction (refer to **Section 5.3.3.2** and **5.3.3.7**).

The consultation undertaken with government stakeholders is outlined in **Table 6-1**. A summary of these responses in provided in **Table 6-2** in **Section 6.7**.

Table 6-1 Government Stakeholder Consultation

Department	Consultation Method	Response Provided
NSW Environment Protection Authority (EPA)	Letter sent 8 August 2014. Letter sent 17 September 2014. Phone Call 25 September 2014.	Yes to all. Summary provided in **Table 6-2**.
NSW Department of Primary industries (Office of Water and NSW Fisheries)	Letter sent 8 August 2014. Letter sent 17 September 2014.	Yes, response received to letter sent on the 17 September 2014. Summary provided in **Table 6-2**.
Sutherland Shire Council	Letter sent 8 August 2014. Meeting 1 September 2014. Permission to lodge application sent on 12 September 2014.	Yes to all. Summary Provided in **Table 6-2**.
WorkCover NSW	Letter sent 8 August 2014. Letter sent 17 September 2014.	No
NSW Office of Environment and Heritage (OEH)	Letter sent 8 August 2014.	No
Heritage Council of NSW	Letter sent 8 August 2014.	No
NSW Health	Letter sent 8 August 2014.	No
Civil Aviation Safety Authority	Letter sent 8 August 2014.	No
NSW Roads & Maritime	Permission to lodge application sent on 10 October 2014.	Yes. Summary provided in **Table 6-2**.

6.6 Public Consultation

Caltex maintain on-going dialogue with the local community regarding its operations on the Kurnell Peninsula. Quarterly meetings are held for the community in Kurnell. This consultation is advertised and well-attended by a core group from the local community.

Since the announcement of the Project in July 2012, the quarterly briefings that discussed the works that were planned to occur at the Site (including demolition) occurred on the following dates:

- 15 August 2012;
- 28 November 2012;
- 13 March 2013;
- 11 June 2013;
- 17 September 2013;
- 20 November 2013;
- 12 March 2014; and
- 17 June 2014.

A summary of the questions raised by the community in regards to the demolition works is provided in **Table 6-2** in **Section 6.7**.

Caltex intends to use upcoming meetings to keep the attendees continually updated on the progress of the demolition works and the Project as a whole.

In addition to the quarterly Kurnell Community Meeting, Caltex also engages with the local Kurnell community at the following events:

- Kurnell Progress Residents Association (monthly) Meeting; and
- printed reports in Kurnell Village News (bi-monthly).

6.7 Summary of Issues and Responses

Appendix A provides the SEARs in full, and includes a table showing where each issue has been addressed, discussed, considered and either accommodated or discounted.

Table 6-2 summarises additional comments raised at the community meetings and in the consultations outside of the preparation of the SEARs.

Table 6-2 Issues Raised Through the Consultation Process

Issue	Addressed In
Government Agency issues raised	
NSW Environment Protection Authority	
Overview of responses	
Responses to letters sent were provided on the 12 August and the 29 September 2014 respectively. Key areas raised for consideration included: • The SEE should describe the proposed mitigation, monitoring and management measures that Caltex intend to apply to minimise the potential impacts associated with the removal of pipelines both on land and within Botany Bay.	**Chapter 20 Revised Management and Mitigation Measures**
• Three redundant product pipelines that run from Gate 5 to Kurnell Wharf would remain on the wharf. The SEE should include information on where the removal of these pipelines will stop and how the remaining portion of the pipes will be managed.	**Chapter 4 Proposed Modification**
• The SEE should describe the rehabilitation process including the source and quality of the replacement material.	**Appendix H Coastal Processes**
• Acid Sulphate Soils are known to exist within the Kurnell Area and the Sediments of Botany Bay and this should be taken into consideration.	**Chapter 9 Soils, Groundwater and Contamination** and **Appendix G Ecology**
NSW Department of Primary industries (Office of Water and NSW Fisheries)	
Overview of responses	
Responses to letters sent were provided on the 23 September and 26 September 2014 respectively. Key areas raised for consideration included: • It is important the Coastal Processes Assessment and Marine Ecology Assessment include: – an accurate description of the works - especially in describing the areas of excavation below the mean high water mark, spoil deposition and the type of any material to be used for infill below the mean high water mark; – appropriate erosion and sedimentation measures must be used to ensure that nearby seagrasses are not impacted by turbidity from these works; and – an assessment of potential acid sulphate soil issues and mitigation measures.	**Appendix G Ecology** and **Appendix H Coastal Processes**

Issue	Addressed In
• As the additional works are in proximity to the Marton Park Sydney freshwater wetland, it is suggested the potential impacts of the works on the wetland and any groundwater dependent ecosystems are assessed. If impacts are likely, mitigation measures should be provided.	**Appendix D Water Management Report** and **Appendix G Ecology**
Sutherland Shire Council	
Overview of Responses	
Email received 14 August 2014 in response to consultation letter. Sutherland Shire Council noted that at this stage they had no further inquiries or requirements other than those outlined in their submission provided to the DPE for the SEARs.	None required.
Meeting on the 1 September 2014 was to advise that there are some additional activities that need to be included in the modification application outside of the description of the works provided to guide the development of the SEARs. The additional works (as described in **Chapter 4 Proposed Modification**) require works on land under SSC jurisdiction. Key issues raised for consideration in the SEE included: • Caltex are required to enquire about landowners consent prior to lodging the modification application and Statement of Environmental Effects (SEE). • Caltex will be conditioned to provide Road Opening Application, a detailed traffic management plan and schedule for the works for approval by SSC prior to the works taking place. • Caltex are required to undertake consultation with the R&M during the preparation of the SEE and apply for landowners consent from R&M for the works below the low tide mark on Silver Beach.	**Chapter 4 Proposed Modification** and **Chapter 6 Consultation**
• Caltex to ensure the SEE discusses potential acid sulphate soil management, traffic, noise, ecology, groundwater and coastal process issues.	**Chapters 9 – 20** of the SEE
• The SEE should also note that works in the roadways would be scheduled to ensure they do not coincide with key community events in Kurnell and the National Park (e.g. Australia Day).	**Chapter 15 Transport and Access**
Response to Permission to lodge application sent on 12 September 2014 via email on 26 September 2014. SSC advised that the demolition works do not occur through or over Council owned land (being a lot and DP). Therefore land owner's consent is not required. However, a road opening application is required to be completed and submitted for assessment for the proposed works over and through the roads and road reserves that are affected. All affected roads and road reserves are to form part of the application.	**N/A**
NSW Roads and Maritime	
Overview of Responses	
A Permission to Lodge Application was submitted to NSW Roads and Maritime on the 10 October 2014. On 22 October NSW Roads and Maritime notified Caltex that all required information had been received. NSW Roads and Maritime have indicated that this modification application can be lodged with DPE without Permission to Lodge from NSW Roads and Maritime. However, approval cannot be granted until this has been received.	**N/A**
Community issues raised	
The following outlines relevant questions relating to the SEE that were raised by the community during the community meetings:	

Issue	Addressed In
What area of the refining site is to be dismantled?	**Chapter 4 Proposed Modification** and **Figure 4-1**
In dismantling areas of the Kurnell site for the new import terminal is there a risk (greater risk) of hazardous materials like asbestos and other contaminants?	**Chapter 9 Soil, Groundwater and Contamination** and **Chapter 10 Human Health and Ecological Risk**
What will happen to the land at the refinery after demolition?	**Chapter 4 Proposed Modification**
What are the possible health impacts (airborne) from demolition?	**Chapter 10 Human Health and Ecological Risk**
When the process plants are demolished how will you make sure nothing bad escapes into the environment/air?	**Chapters 9 – 20** of the SEE

6.8 Exhibition

The SEE will be placed on public exhibition by the DPE for a minimum of 14 days. Submissions made during the exhibition of the SEE would be addressed with the Response to Submissions report to be prepared as part of the assessment process for the modification application. This process provides further opportunity for public and government agency involvement and participation in the environmental planning and assessment process. A Kurnell Community Meeting will be held at the start of December 2014 to provide the community with an opportunity to discuss the demolition works with Caltex staff.

6.9 During Demolition Works

During demolition works, it is anticipated that the ongoing public consultation would sufficiently address the public consultation needs required for the demolition works. Caltex also invites the public to raise any comments and concerns via the publicly available telephone and email contacts featured on their website. Comments and concerns received would be managed under the established governance process whereby they would be logged, tracked and responded to promptly.

The process of regular community meetings, the use of the 24 Hour Community Concerns Hotline and providing further information to the community via letter drops would be used throughout the demolition works.

7 ENVIRONMENTAL SCOPING ASSESSMENT

7.1 Environmental Scoping for Modification Application

This SEE documents a number of environmental assessments. These environmental assessments identify additional environmental impacts resulting from the demolition works and identify appropriate measures to manage or mitigate these impacts.

The identification of potential impacts, and confirmation of appropriate assessment methodologies, is determined through a scoping process. The scoping process for this SEE was based on:

- a review of available information and documents relating to the existing environment;
- site visits and appraisals;
- a request for assessment requirements, submitted to DPE;
- receipt of the SEARs for the modification application (refer to **Appendix A SEARs and Application Documentation**);
- consultation with agencies, community groups and other stakeholders (refer to **Chapter 6 Consultation**);
- a review of relevant legislation and planning policy (refer to **Chapter 5 Legislation and Planning Policy**); identifying the sensitivities of the local environment (refer to **Chapter 2 Project Location and Existing Environment**);
- understanding the characteristics of the modification and how they relate to the approved Project (refer to **Chapter 4 Proposed Modification**); and
- an identification of other projects or actions that may cumulatively add to any perceived impact from the demolition works.

7.2 Summary of Potential Issues Identified

Following the scoping process, potential issues were determined for the following environmental aspects, as relevant to the modifications:

- Hazards & Risks;
- Soil, Groundwater and Contamination;
- Human Health and Ecological Risk;
- Waste Management;
- Surface Water, Wastewater and Flooding;
- Noise and Vibration;
- Air Quality and Odour;
- Transport and Access;
- Heritage;
- Ecology (marine and terrestrial); and
- Coastal processes.

7.3 Prioritisation of Potential Issues

A risk assessment was undertaken to determine the key issues and prioritise the scope of work for each environmental aspect. This risk assessment considered the issues mentioned in:

- the SEARs;
- submissions from relevant stakeholders and the public; and
- the EIS for the conversion works (URS, 2013).

The risk assessment was undertaken in accordance with the guidelines outlined in AS/NZS 4360:2004 and AS/NZS ISO 31000:2009.

Table 7-1 outlines the key environmental issues in relation to the demolition works.

Table 7-1 Prioritisation of Environmental Issues

High Priority Issues	Medium Priority Issues	Low Priority Issues
• Hazards and Risks (**Chapter 8**); • Soils, Groundwater and Contamination (**Chapter 9**); • Human Health and Ecological Risk (**Chapter 10**); • Waste Management (**Chapter 11**); and • Heritage (**Chapter 16**).	• Surface Water, Wastewater and Flooding (**Chapter 12**). • Noise and Vibration (**Chapter 13**); and • Air Quality and Odour (**Chapter 14**). • Ecology (marine and terrestrial) **(Chapter 17**); and • Coastal Processes (**Chapter 18**)	• Transport and Access (**Chapter 15**).

7.4 Format of the Assessment Chapters

A common format has been adopted for reporting each of the assessment chapters of the SEE. This is outlined below.

Introduction

This section provides an overview of the environmental aspect under consideration. It also provides cross-reference to other technical assessments or relevant appendices that have been used to inform the assessment chapter.

Scope of the Assessments

This section outlines the relevant SEARs for the particular environmental aspect and explains where certain parts of the SEARs have been excluded along with the reason for the exclusion.

Legislation and Planning Policy

This section outlines legislation, policies and plans relevant to the environmental aspect. Where appropriate, certain guidance may also be discussed. A review of legislation and

policy relevant to the demolition works in general are considered in **Chapter 5 Legislation, Planning Policy and Approvals.**

Method of Assessment

This section summarises the methodology for:

- determining the existing environment relevant to the particular environmental aspect;
- conducting an assessment of the potential impacts of the modifications in relation to the particular environmental aspect;
- determining whether these impacts are significant; and
- providing a suite of mitigation measures that will minimise and manage these impacts.

For each environmental assessment there is an explanation of the approach to identifying impacts and assessing whether a potential impact is likely to be considered significant. Assessments can either be quantitative (relying on criteria, standards and thresholds) or qualitative (using certain scientific material, but ultimately making decisions based on professional judgement).

Existing Environment

The section describes the key components, characteristics and the status of the existing environment relevant to the environmental aspect. It also considers changes to the existing environment over the period of time that the demolition works are to take place.

As the demolition works are a modification to an approved Project, the existing environment takes into consideration the influence the conversion works (i.e. the approved Project) would have on the existing environment. This needs careful consideration as there is an overlap between the approved conversion works and the demolition works in 2015 and 2016.

Also, the key receptors for each assessment will be identified and described in this section.

Impact Assessment

This section identifies potential impacts of the demolition works on the sensitive receptors for the particular environmental aspect and evaluates the significance of the impact in accordance with the criteria detailed in the Method of Assessment.

Impacts may be referred to either prior to (potential impact) or following mitigation (residual impact). In the 'Impact Assessment' section all impacts are potential impacts.

Impacts can be considered:

- direct or indirect;
- adverse or beneficial; and
- significant, non-significant (negligible) or neutral.

Where existing criteria, guidance, environmental standards or assessment methodologies exist, the significance of an impact will be based on that information. Where possible and/or necessary quantitative judgements about the significance of an impact will be made using this

information. Where no explicit guidance or information exists, qualitative judgements on the significance of an impact will be made. Where qualitative judgements are required, some or all of the following impact characteristics will be considered to understand its potential magnitude:

- extent – the area potentially affected by the impact;
- magnitude – the size or amount of the impact;
- duration – how long the impact is likely to last;
- frequency – whether the impact is continuous, brief or intermittent;
- timing – if the impact occurs at a particularly sensitive time; and
- permanence – whether the impact is permanent or temporary.

The judgement as to whether an impact is significant will depend on the importance or sensitivity of the receptor (e.g. as defined by legislation, policy, standards or guidance) and the magnitude of the impact affecting it (as decided by quantitative or qualitative means). For the purposes of the 'Impact Assessment' section of each technical chapter all impacts are considered 'alone' and not cumulatively.

Mitigation

This section describes the management and mitigation measures that have been identified to avoid, reduce or compensate for the effects of significant impacts on the environment.

The mitigation hierarchy has been used to help identify management and mitigation measures for each of the technical assessments. Wherever possible, impacts have been firstly avoided where possible, then either reduced at source or at receptor where avoidance cannot be achieved, and finally either compensated or offset where avoidance or reduction is not possible or would not achieve practicable or acceptable levels of mitigation.

If management and mitigation measures are to be implemented through particular environmental management plans, then these will also be discussed.

Once all of the mitigation measures are identified and described, this section will also consider any residual impacts that would remain following the application of the management and mitigation measures.

Summary

At the end of each assessment chapter a summary is provided. This summary will note residual impacts and other relevant permits or licences that are required. It will also provide a table summarising the management and mitigation measures for just the demolition works. These may include unaltered or amended measures from SSD 5544 or new measures.

The management and mitigation tables from all of the technical assessments are collated into a single table (**Table 20-1**) within **Chapter 20 Revised Management and Mitigation Measures**. **Table 20-1** includes an updated, consolidated schedule of mitigation and management measures, and differentiates between the measures established for the approved Project and those proposed for the demolition works.

8 HAZARD AND RISK ASSESSMENT

8.1 Introduction

This chapter is a summary of the Hazards in Demolition (HAZDEM) assessment undertaken for the demolition works. It focuses on hazards and risks to people and property from potentially significant incidents that whilst unlikely, could occur during demolition works. The HAZDEM assessment is provided in full in **Appendix B Hazards and Risk**.

8.2 Scope of the Assessment

This assessment has been prepared in response to the SEARs for the demolition works (refer to **Appendix A** SEARs and Application Documentation) which required:

'Hazards and risks – including a Hazards in Demolition (HAZDEM) study that identified all significant demolition related hazards, and the assessment of the risks associated with these hazards. The analysis shall cover all phases of the proposed modification (i.e. demolition / removal of redundant assets and infrastructure), and include all components and stages (e.g. demolition of refinery process units, tanks, pipelines etc.). The demolition hazards and risk assessment shall particularly examine the following:

- *The potential risk impacts from the proposed demolition works onto the existing simultaneous terminal operations;*
- *The potential for any of the identified demolition related risks to alter during the proposed works associated with the modification, individually or through interaction with existing operations, the offsite risk profile of the facility as assessed in the PHA report for SSD-554.'*

This chapter and **Appendix B Hazards and Risk Assessment** address these requirements.

8.3 Legislation and Planning Policy

State Environmental Planning Policy No. 33 (Hazardous and Offensive Development) 1992

This SEPP defines the approach used in NSW for planning and assessing industrial development proposals that include hazards or offensive components. Through this policy, the permissibility of an industrial proposal is linked to its safety and pollution control performance.

This SEPP applies to any proposals that fall under the policy's definition for potentially hazardous or offensive industry. As the Project relates to the conversion of the refinery into a terminal to store finished product, the Project qualifies under the SEPP as potentially hazardous industry.

For such proposals, this SEPP establishes a comprehensive test by way of a hazard and risk assessment to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls (mitigation).

Hazardous Industry Planning Advisory Papers 2011

The NSW Government recognises that the risks associated with the storage and handling of hazardous materials can never be eliminated entirely. Industry and the Government have a responsibility to ensure that these risks are negligible compared to the risks faced during the course of everyday life and a number of requirements need to be fulfilled to allow a site to be developed and to operate within NSW.

A rigorous assessment process has been developed by DP&E (as the Department of Urban Affairs and Planning (DUAP) in 1992) with regard to approvals for potentially hazardous industries in NSW. The process follows a number of steps that provide assurances that the risks imposed by a development upon surrounding land uses would be within acceptable limits, and that this would continue to be the case throughout the life of the development.

The first part of this process is an assessment of hazards and risks at the development application stage. This Preliminary Hazards Analysis (PHA) assessment formed part of the EIS process for SSD 5544. Two Advisory Papers were relevant to the PHA and remain relevant for the modification application. They are discussed below.

- **HIPAP No.4: Risk Criteria for Land Use Planning 2008** - This HIPAP includes suggested risk assessment criteria that are to be considered when assessing the land use safety implications of potentially hazardous industrial development. The suggested criteria are equally relevant and applicable to the consideration of land use planning and development in the vicinity of potentially hazardous facilities.
- **HIPAP No.6: Guidelines for Hazard Analysis 2011** - This HIPAP provides advice on the general approach recommended for hazard analysis. This analysis can be applied to proposed or existing development.

A PHA is not required for the modification application, however this HAZDEM does need to confirm that the conclusions of the PHA are not compromised by the demolition works.

Work Health and Safety Act 2011

The finished product terminal would be managed in accordance with the requirements of the *Work Health and Safety Act 2011* and its supporting Regulation. The Regulation sets the general requirements for workplace health and safety risk management. These requirements include the duty to identify hazards, manage risks to health and safety, apply the hierarchy of control measures, and maintain and review the effectiveness of control measures.

Caltex's finished product terminal is classified as a Major Hazard Facility (MHF) in accordance with Chapter 9 of the *Work Health and Safety Regulations (2011)* (WHS Regs).

8.4 Method of Assessment

8.4.1 *Hazard Identification*

The hazard identification process includes a review of potential hazards associated with demolition activities. It included a comprehensive identification of possible causes of potential incident scenarios and their consequences to public safety and the biophysical environment.

It also outlines the proposed operational and organisational safety controls required to mitigate the likelihood of hazardous events occurring.

This process involved a two-day workshop where relevant data and information was reviewed and discussed in a multi-disciplinary team environment to highlight specific areas of potential concern and points of discussion.

The aim of the workshop was to identify and assess hazards and risks during demolition activities. As hazards and risks were identified they were documented in a preliminary hazard identification (HAZID) word diagram.

8.4.2 *Risk Analysis*

8.4.2.1 *Qualitative Risk Analysis*

The risk associated with each potential incident scenario was evaluated in turn for:

- the situation during the demolition works; and
- the situation after the demolition works.

Each potential identified risk scenario was qualitatively evaluated for Health, Environment and Safety (HES). The evaluation process used the Construction Hazard Assessment and Implication Review[5] (CHAIR) safety in design tool, developed by NSW WorkCover. The Chevron Integrated Risk Prioritisation Matrix (refer to **Figure 8-1**) was also utilised.

During the workshop, the team identified hazard scenarios, estimated potential consequences and discussed the effectiveness of installed risk controls. The team then assign qualitative descriptors of Likelihood and Consequence and determine a Risk Level (1 to 10) using the Chevron Integrated Risk Prioritization Matrix. The requirement for further risk improvement is prioritised based upon this assigned risk.

The Chevron Integrated Risk Prioritization Matrix rankings are numbered and aligned with associated required actions for health, environment and safety risks. In accordance with the Chevron risk management rules, risk reduction requirements depend on the following level of risk:

- Risk levels 1, 2, 3, 4 – Short-term, interim risk reduction required. Long term risk reduction plan must be developed and implemented;
- Risk level 5 – Additional long term risk reduction required. If no further action can be practicably taken, Strategic Business Unit (SBU) management approval must be sought to continue the activity;
- Risk level 6 – Risk is tolerable if reasonable safeguards / management systems are confirmed to be in place and consistent with relevant Risk Reduction Procedure and Closure Guidelines; and

[5] CHAIR (Construction Hazard Assessment Implication Review) is a tool to assist designers, constructors, clients and other key stakeholders to come together to reduce construction, maintenance, repair and demolition safety risks associated with design.

- Risk level 7, 8, 9, 10 – No further risk reduction required if risk level is As Low As Reasonably Practicable (ALARP).

In the Caltex Safety Case regime, recommendations are provided for risk priority rankings 5 and above, as well as for events or conditions with low likelihood and high consequence that may require further risk evaluation. Recommendations are also provided for risks where they would eliminate or mitigate the potential causes and / or consequences predicted for the scenario.

The Integrated Risk Prioritization Matrix and associated required actions are used consistently by Caltex when developing the Safety Case of the Site and associated facilities, as part of the requirements under the Major Hazard Facility legislation.

To ensure that the risk is managed in accordance with So Far As Is Reasonable Practicable (SFAIRP) principles (in accordance with NSW *Work Health and Safety Act and Regulations 2011*), and to ensure that the risk profile for the Site during the demolition works does not exceed that of the terminal (as defined in the risk profile reported in the PHA for the EIS for SSD 5544), the risk of each potential hazardous scenario has been minimised, regardless of its risk level. This was completed through the assessment of existing (proposed) risk management controls and by recommending further controls where the risk was not deemed to follow SFAIRP principles. Particular attention was paid to areas where a potential existed for this risk profile of the Site to be affected by a potentially hazardous scenario.

Figure 8-1 Chevron Integrated Risk Prioritization Matrix

For the Assessment of HES & Asset Risks from Event or Activity

Likelihood Descriptions	Likelihood Indices		Decreasing Likelihood	6	5	4	3	2	1
Event can reasonably be expected to occur in life of facility	1	Likely		6	5	4	3	2	1
Conditions may allow the event to occur at the facility during its lifetime, or the event has occurred within the Business Unit	2	Occasional		7	6	5	4	3	2
Exceptional conditions may allow consequences to occur within the facility lifetime, or has occurred within the OPCO	3	Seldom		8	7	6	5	4	3
Reasonable to expect that the event will not occur at this facility. Has occurred several times in the industry, but not in the OPCO	4	Unlikely		9	8	7	6	5	4
Has occurred once or twice within industry	5	Remote		10	9	8	7	6	5
Rare or unheard of	6	Rare		10	10	9	8	7	6

Legend

Legend applies to identified HES risks
(see guidance documents for additional explanations)

1, 2 , 3, 4 - Short-term, interim risk reduction required. Long term risk reduction plan must be developed and implemented.

5 - Additional long term risk reduction required. If no further action can be reasonably taken, SBU management approval must be sought to continue the activity.

6 - Risk is tolerable if reasonable safeguards / management systems are confirmed to be in place and consistent with relevant requirements of the Risk Mitigation Closure Guidelines.

7, 8, 9, 10 - Manage risk. No further risk reduction required. Risk reduction at management / team discretion.

Likelihood Descriptions & Index
(with confirmed safeguards)

Consequence Descriptions & Index
(without safeguards)

Decreasing Consequence/Impact

Consequence Descriptions	Consequence Indices	6	5	4	3	2	1
		Incidental	Minor	Moderate	Major	Severe	Catastrophic
Safety		**Workforce:** Minor injury such as a first-aid. *AND* **Public**: No impact	**Workforce:** One or more injuries, not severe. *OR* **Public**: One or more minor injuries such as a first-aid.	**Workforce**: One or more severe injuries including permanently disabling injuries. *OR* **Public**: One or more injuries, not severe.	**Workforce:** (1-4) Fatalities *OR* **Public**: One or more severe injuries including permanently disabling injuries.	**Workforce**: Multiple fatalities (5-50) *OR* **Public**: multiple fatalities (1-10)	**Workforce**: Multiple fatalities (>50) *OR* **Public**: multiple fatalities (>10)
Health (Adverse effects resulting from chronic chemical or physical exposures or exposure to biological agents)		**Workforce:** Minor illness or effect with limited or no impacts on ability to function and treatment is very limited or not necessary *AND* **Public:** No impact	**Workforce**: Mild to moderate illness or effect with some treatment and/or functional impairment but is medically managable *OR* **Public**: Illness or adverse effect with limited or no impacts on ability to function and medical treatment is limited or not necessary.	**Workforce**: Serious illness or severe adverse health effect requiring a high level of medical treatment or management *OR* **Public**: Illness or adverse effects with mild to moderate functional impairment requring medical treatment.	**Workforce** (1-4): Serious illness or chronic exposure resulting in fatality or significant life shortening effects OR **Public**: Serious illness or severe adverse health effect requiring a high level of medical treatment or management.	**Workforce** (5-50): Serious illness or chronic exposure resulting in fatality or significant life shortening effects *OR* **Public** (1-10): Serious illness or chronic exposure resulting in fatality or significant life shortening effects.	**Workforce** (>50): Serious illness or chronic exposure resulting in fatality or significant life shortening effects *OR* **Public** *(>10)*: Serious illness or chronic exposure resulting in fatality or significant life shortening effects.
Environment		Impacts such as localized or short term effects on habitat, species or environmental media.	Impacts such as localized, long term degradation of sensitive habitat or widespread, short-term impacts to habitat, species or environmental media	Impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species or environmental media	Impacts such as significant, widespread and persistant changes in habitat, species or environmental media (e.g. widespread habitat degradation) .	Impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.	Loss of a significant portion of a valued species or loss of effective ecosystem function on a landscape scale.

The above legend applies only to HES risks, where risk levels 1-6 are actionable and mandatory.
For risks that may result in facility damage, business interruption, loss of product, the "Assets" category below should be used.
Asset risk reduction is at the discretion of management. Under no circumstances may a direct or indirect translation of Asset loss to HES consequences, or between any discrete categories of HES consequences be inferred.

Consequence Descriptions & Index
(without safeguards)

Consequence Descriptions	Consequence Indices	6	5	4	3	2	1
		Incidental	Minor	Moderate	Major	Severe	Catastrophic
Assets (Facility Damage, Business Interruption, Loss of Product)		Minimal damage. Negligible down time or asset loss. Costs < $100,000.	Some asset loss, damage and/or downtime. Costs $100,000 to $1 Million.	Serious asset loss, damage to facility and/or downtime. Costs of $1-10Million.	Major asset loss, damage to facility and/or downtime. Cost >$10 Million but <$100 Million.	Severe asset loss or damage to facility. Significant downtime, with appreciable economic impact. Cost >$100MM but <$1billion.	Total destruction or damage. Potential for permanent loss of production. Costs >$1billion

This matrix is endorsed for use across the Company.
It is not a substitute for, and does not override any relevant legal obligations.
Under no circumstances should any part of this matrix be changed or modified, adapted or customized.
This matrix identifies health, safety, environmental and asset risks and is to be used only by qualified and competent personnel.
Where applicable it is to be used within the Riskman2 structure and governance of an OE Risk Management Process. If applied outside of these Processes, it is also mandatory to manage identified intolerable risks and comply with the Risk Mitigation Closure Guidelines.

8.4.2.2 Quantitative Risk Analysis

A quantitative interpretation of the likelihood ranking was undertaken to allow for an assessment of the effect of the demolition works on the terminal risk profile identified in the PHA for the conversion works.

Table 8-1 provides the quantitative interpretation of the likelihood indices and descriptions provided in the Chevron risk matrix. This interpretation is based on the ISO31000 (Risk Management – Principles and guidelines) and AS3931 (Risk analysis of technological systems – Application guide), as well as on discussions during the HAZDEM workshops (refer to **Appendix B Hazards and Risk Assessment**).

Table 8-1 Likelihood Interpretation

Chevron Risk Matrix		Planager Interpretation to Allow Comparison with Terminal Risk Profile	
Likelihood Descriptions	**Likelihood Indices**	**Likelihood Interpretation**	**Quantitative Estimate**
Consequences can reasonably be expected to occur in the life of the facility	**1 Likely**	You may have heard of (or could well imagine) it happening at the plant since it started up	1 / 10 years
Conditions may allow the consequences to occur at the facility during its lifetime, or the event has occurred within the Business Unit	**2 Occasional**	You may have heard of it happening at a similar plant somewhere in the world (if one plant life time is approximately 30-50 years, then this corresponds to 2 or 3 plant lives)	1 / 100 years
Exceptional conditions may allow the consequences to occur within facility lifetime, or the event has occurred within the Operating Company (OPCO)	**3 Seldom**	You may not have heard of this happening at a similar plant but you can imagine that it could, in exceptional circumstances	1 / 1,000 years
Reasonable to expect that the consequences will not occur at this facility. Has occurred several times in the industry but not within the OPCO	**4 Unlikely**	Most people have not heard of this event but it is not too difficult to imagine that it could happen somewhere in industry. Difficult to imagine that it would happen here.	1 / 10,000 years
Has occurred once or twice within industry	**5 Remote**	You have probably not heard of this happening at any plants that you are aware of, but it is not an impossible event for industry, and you could imagine it happening elsewhere	1 / 100,000 years
Rare or unheard of	**6 Rare**	Very slight probability, almost impossible / non credible (but not quite)	1 / 1,000,000 years

The tolerability of the calculated risk is assessed by comparison with an appropriate risk target or criterion. The risk criteria used to make this assessment are specified in HIPAP4. A summary of these criteria are provided in **Appendix B Hazards and Risk Assessment**.

8.5 Existing Environment

8.5.1 *Conversion works*

Following the conversion works, all process units will have been shutdown, depressurised, de-inventoried and left in situ. All high temperature and high pressure processes on Site would have been stopped. In addition, the terminal would no longer store or handle any significant quantities of materials with Dangerous Goods classification of 2.1 (flammable gas) and 2.3 (toxic gas). These actions will reduce the on-site and, at certain locations, also reduce the off-site risk profile.

Overall, the conversion works result in a downscaling of the operations conducted at the existing Site, and hence a reduction in the complexity and risk associated with the Site.

Chapter 3 Approved Project provides an overview of the process that would occur at the Site.

8.5.2 *Existing and Proposed Safety Management Systems*

Caltex has a commitment to meet the intent and specific requirements of the NSW *Work Health and Safety Act 2011* (WH&S Act) and the NSW *Work Health and Safety Regulation 2011*. Caltex has numerous policies and procedures to create a safe workplace which would be reviewed, modified as necessary and incorporated into the safety management system for the demolition works. Many of these are already in place and would transition for demolition activities.

The demolition works would interface with elements of the existing major hazard facility that has a number of intrinsic hazards as a result of former operations.

The demolition works would comply with current and relevant safety codes and statutory requirements with respect to safe working conditions. There would be no changes to the existing precautions observed at the Site. In particular, this would include standards and requirements relating to the handling and management of flammable liquids. Personnel required to work with these substances would be trained in their safe use and handling and would be provided with all the relevant safety equipment.

Emergency procedures have been developed for the existing Site. These would be reviewed for demolition works. Emergency procedures include responses to emergency evacuation, injury, major asset damage or failure, critical failures, spillages, major fire, and threats.

The Site has a manager with overall responsibility for safety, who is supported by experienced personnel trained in the operation and support of the plant and associated facilities.

A Permit to Work (PTW) system, including Hot Work Permit, and a Management of Change system are currently in use and would be extended to include demolition activities.

Procedures are currently in place to manage incidents and injuries. This includes an established incident reporting and response process.

The existing facility includes a range of safety equipment (alarms, detectors, relief devices etc.) along with other protection systems, which are routinely tested. This equipment would be used during demolition works wherever applicable.

Persons involved demolition activities would be provided with appropriate personal protective equipment (PPE) suitable for use with the specific hazardous substances.

Personnel who are first-aid trained are listed on company noticeboards across the Site.

8.6 Impact Assessment / Risk Analysis

8.6.1 *Hazardous Incident Scenarios*

A detailed Hazard Identification Word Diagram was prepared for the demolition works in line with the requirements for hazard analysis. It includes initiating causes, consequences and proposed / existing safeguards to minimise the consequences or likelihood of an incident.

The Hazard Identification Word Diagram draws from the potential incident scenarios identified during the hazard identification exercise that was undertaken. It is presented in full in **Appendix B Hazards and Risk Assessment**. A total of 20 hazards were identified:

- five associated with process safety related hazards;
- ten with general health and safety hazards; and
- five with loss of amenity and risks to the biophysical environment (not previously covered under other headings).

The Hazard Identification Word Diagram lists the control mechanisms for each identified hazard associated with the demolition works. **Table 8-2** summarises the identified hazards for demolition works.

Table 8-2 Summary of Identified Demolition Hazards

Hazard	
Process Safety Related Hazards	
Scenario 1:	Damage to adjacent plant or equipment due to uncontrolled and/or unplanned falling of structure, object or crane collapse
Scenario 2:	Damage to live pipework during removal or inadvertent cutting into live pipe or pipeline
Scenario 3:	Failure to isolate process equipment
Scenario 4:	Damage to underground cables and/or oily water sewer
Scenario 5:	Introduction of ignition sources in area classified as Hazardous Area
General Health and Safety Related Hazards	
Scenario 6:	Crushing or impact injuries
Scenario 7:	Fall from heights
Scenario 8:	Working over water with a potential for drowning
Scenario 9:	Worker trapped (at end of wharf, at height etc.)
Scenario 10:	Subsidence and collapse/fall into excavation
Scenario 11:	Public and traffic hazardous interaction on public roads or footpath
Scenario 12:	Loss of material in transit leading to traffic incident and potential injury

Hazard	
Scenario 13:	Exposure to airborne hazardous material, or skin contact with such material (heavy metals, asbestos etc.)
Scenario 14:	Damage to overhead power lines
Scenario 15:	Injury during diving operations
Loss of Amenity to Workforce and Community	
Scenario 16:	Discomfort from odour associated with removal and disposal of cooling water pipelines (smell – no health hazard)
Scenario 17:	Offensive odour and community complaints from mercaptan
Scenario 18:	Noise generation (no health risk to community)
Other Risk to the Biophysical Environment	
Scenario 19:	Incorrect classification of waste leading to contamination of trucks and potential delivery to wrong landfill location
Scenario 20:	Re-contamination of opened pipework

8.6.2 *Qualitative Risk Analysis*

The qualitative risk assessment was prepared on the basis of the risk matrix and associated consequence and likelihood scoring tables and also the hazardous incident identification workshop.

The scenarios for demolition works compared with the operating terminal are summarised as follows:

- no scenarios with risk levels one to five were identified for the operating terminal or for the terminal during the demolition works.
- two scenarios were identified as risk level six for demolition works. These two scenarios are ranked the same for the terminal during operation.
- the remaining scenarios were ranked with risk levels seven or eight, both for the demolition works and the operating terminal.

According to the risk criteria for scenarios ranked with risk levels seven, eight, nine, and ten (Refer to **Figure 8-1**) no further risk reduction is required.

The scenarios ranked as risk level six during demolition works include:

- **Scenario 7**: Working at heights; and
- **Scenario 10**: Subsidence and collapse/fall into excavation.

The scenarios ranked as risk level seven during demolition works include:

- **Scenario 1 (tank farms)**: Damage to adjacent plant or equipment due to uncontrolled and/or unplanned falling of structure, object or crane collapse, (this scenario is ranked as risk level 8 for the operating terminal);
- **Scenario 3**: Failure to isolate process equipment;
- **Scenario 5**: Introduction of ignition source in area classified as Hazardous Area;

- **Scenario 6**: Crushing or impact injuries, (this scenario is ranked as risk level 8 for the operating terminal);
- **Scenario 8**: Working over water results in drowning;
- **Scenario 9**: Worker trapped in case of an external incident;
- **Scenario 11**: Hazardous public and traffic interaction on public roads and footpaths;
- **Scenario 13**: (workforce): Exposure to hazardous material or dust, (this scenario is ranked as risk level 8 for the operating terminal);
- **Scenario 14**: Damage to overhead power line;
- **Scenario 18**: Noise generation (no health risk to community); and
- **Scenario 20**: Rain event re-contaminates opened pipework, (this scenario is ranked as risk level 8 for the operating terminal).

The scenarios ranked as risk level eight during demolition works include:

- **Scenario 1 (non-tank farm areas):** Damage to adjacent plant or equipment due to uncontrolled and/or unplanned falling of structure, object or crane collapse (this scenario is ranked as risk level 8 for the operating terminal);
- **Scenario 2**: Damage to live pipework during removal or inadvertent cutting into live pipe or pipeline;
- **Scenario 12**: Loss of material in transit leading to traffic incident;
- **Scenario 13:** (community): Exposure to hazardous material or dust, (this scenario is not considered credible for the operating terminal);
- **Scenario 15**: Injury during diving operations; and
- **Scenario 19**: Incorrect classification of waste.

The scenarios ranked as risk level nine during demolition works include:

- **Scenario 4**: Damage to underground cables and/or oily water sewer; and
- **Scenario 17**: (workforce): Offensive odour and community complaints from mercaptan (this scenario is not considered credible for the operating terminal as the mercaptan would have been removed from the Site).

Table 8-3 and **Table 8-4** show the risk profile of the Site during the demolition works and during terminal operation alone, respectively. In line with **Figure 8-1**, a low number represents a high risk while a high number represents a low risk.

No scenarios were ranked as of level 10 as this assessment focussed on high consequence – low likelihood accidents.

Scenario 16 Discomfort from odour associated with removal and disposal of cooling water intake pipelines, was not considered a major hazard and as such was not assessed further.

Table 8-3 Risk Profile of the Kurnell Terminal During the Demolition Works

Likelihood	Consequences					
Likely 1	6	5	4	3	2	1
Occasional 2	7	6	5	4	3	2
Seldom 3	8	7 Scenario 18 (workforce) Scenario 20	6	5	4	3
Unlikely 4	9 Scenario 4 Scenario 17 (workforce)	8 Scenario 19	7 Scenario 11	6 Scenario 7 Scenario 10	5	4
Remote 5	10	9	8 Scenario 12 Scenario 15	7 Scenario 1 (tank farm) Scenario 3 Scenario 5 Scenario 6 Scenario 8 Scenario 9 Scenario 13 (workforce) Scenario 14	6	5
Rare 6	10	10	9	8 Scenario 1 (all other areas) Scenario 2 Scenario 13 (community)	7	6
	Incidental 6	Minor 5	Moderate 4	Major 3	Severe 2	Catastrophic 1

Table 8-4 Risk Profile of the Kurnell Terminal During Normal Operations

Likelihood	Consequences					
Likely 1	6	5	4	3	2	1
Occasional 2	7	6	5	4	3	2
Seldom 3	8	7 Scenario 18 (workforce)	6	5	4	3
Unlikely 4	9 Scenario 4 Scenario 17 (workforce)	8 Scenario 19 Scenario 20	7 Scenario 11	6 Scenario 10	5	4
Remote 5	10	9	8 Scenario 12 Scenario 15	7 Scenario 3 Scenario 5 Scenario 7 Scenario 8 Scenario 9 Scenario 14	6	5
Rare 6	10	10	9	8 Scenario 1 Scenario 2 Scenario 6 Scenario 13 (workforce & community)	7	6
	Incidental 6	Minor 5	Moderate 4	Major 3	Severe 2	Catastrophic 1

8.6.3 *Quantitative Risk Analysis*

A quantitative risk analysis was conducted as part of the PHA within the EIS for SSD 5544. The PHA developed a number of hazardous Loss of Containment (LOC) scenarios to represent the range of possible failures associated with the terminal. The hazardous LOC scenarios in the PHA mostly relate to a loss of containment event of flammable or combustible liquids with a subsequent ignition and fire or explosion.

The PHA assessed the consequences and likelihoods of each hazardous LOC scenario in turn and then combined the individual scenario risks to generate the risk profile for the operating terminal.

The risk profile for the terminal was shown to adhere to all risk criteria, as presented within the NSW Department of Planning's guideline for risk criteria in landuse planning[6].

The *Hazard Identification Word Diagram* of the HAZDEM study (refer to **Appendix B Hazards and Risk)** determined that the following four potentially hazardous scenarios have a potential to impact on the risk profile of the terminal:

- **Scenario 1**: Damage to adjacent plant or equipment due to uncontrolled and/or unplanned falling of structure, object or crane collapse;
- **Scenario 2**: Damage to live pipework during removal or inadvertent cutting into live pipe or pipeline;
- **Scenario 3**: Failure to isolate process equipment; and
- **Scenario 5**: Introduction of ignition source in areas classified as a Hazardous Area.

Scenarios one, two and three would potentially affect the likelihood of the initiating event, e.g. a LOC. Scenario five would potentially affect the probability of ignition.

Each one of these potentially hazardous scenarios have a potential to affect the hazardous release scenarios identified in the PHA, and each one provides a potential incremental addition to the failure rate data used in the PHA. However, this incremental increase is very low and would have very little impact on the overall risk of a flammable event from the Site.

As such, the demolition works has very little to no impact on the overall risk profile of the Site.

[6] Hazardous Industry Planning Advisory Papers Number 4 – Risk Criteria for land Use Planning, Department of Planning, January 2011

8.7 Mitigation

As part of the process of analysing the hazards identified for the demolition works (**Table 8-2**) a number of risk reduction measures have been identified.

Caltex would implement the 17 risk reduction measures during the demolition works in addition to managing the Site in accordance with existing requirements as a major hazard facility. Where appropriate these risk reduction measures would be incorporated into the DEMP, demolition works plan or other safety management plans. The risk reduction measures include:

- Demolition activities would be coordinated with terminal activities. Where high risk demolition activities are to occur (e.g. where there is a risk of damage to terminal operations), an assessment needs to be completed in conjunction with terminal operations to formulate a hazard control plan specific to the high risk activity.
- Demolition works plan to include framework for considering the demolition of individual tanks in shared tank farm areas (sequence activities for max space around in-service tanks).
- An access control plan would be developed for the demolition area that identifies when a demolition operator is likely to have limited visibility when using heavy machinery / vehicles.
- Requirements would be provided for evacuating buildings and blocking roadways during the felling of tall structures.
- Additional requirements would be outlined for work on interconnecting pipework adjacent to live pipes (e.g. cold cutting and controlled removal; protective barriers).
- There would be increased surveillance (use spotters) for work adjacent to live pipes / pipelines in line with existing Caltex procedures.
- Caltex would check contractor capability for independent verification carried out by contractor (refer to Demolition Code of Practice).
- Additional precautions would be undertaken for floating roof tanks where pontoons may entrap flammable material which may not be detected during normal gas testing.
- Hazardous Area classification drawings for demolition works would be reviewed and updated, particularly in areas where demolition activities are to take place in parallel with the operating terminal. Particular attention would be paid to the fact that demolition contractors may not be well versed with the requirements for control of ignition sources at the Site.
- Where ever possible, ramps for access would be constructed away from operational pipework.
- Precautions would be undertaken to minimise the risk of subsidence to the substation and potentially of the nearby residential dwelling both of which are in very close proximity to the pipelines being removed within the eastern right-of-way.
- A Caltex inspection program would be implemented that includes truck loading activities (e.g. use Tipper Truck Loading / Unloading Safety Inspection Checklist FORM 4.00.03.027).

- In consultation with energy authorities the requirements for isolation and/or installation of protective barriers would be determined for the overhead power lines in the rights-of-way.
- Chemical cleaning requirements would be determined and implemented to remove contamination prior to removal.
- Waste disposal requirements would be determined and implemented for mercaptan building rubble.
- High noise generating demolition works would be confined to less sensitive times of the day and not outside the hours of 7.00 am to 6.00 pm Monday to Saturday (refer to **Appendix E Noise and Vibration Impact Assessment**).

A noise assessment has also been completed in line with relevant NSW guidance as part of the environmental assessment for the modification application. This noise assessment is provided in **Appendix E Noise and Vibration Impact Assessment**. It has identified potential noise impacts from the demolition works and recommended a number of mitigation measures.

8.8 Summary

The results of the risk assessment demonstrate that the demolition works would not change the level of risks identified in the PHA for the EIS for SSD 5544.

The hazard and risk assessment of demolition works has found that the levels of risks to the biophysical environment and to the safety of the public, staff and contractors are reduced to So Far As Is Reasonable Practicable (SFAIRP) levels as long as:

- Caltex continue to implement established processes for managing the Site;
- the demolition contractors undertaking the demolition works complete the works in general accordance with Demolition Code of Practice (2013) and relevant Australian Standards; and
- the measures listed in **Section 8.7** are implemented.

The risks associated with demolition activities were assessed qualitatively by examining potential scenarios and/or incidents. The activities associated with demolition would be subject to rigorous scrutiny by Caltex and by the demolition contractor, safeguarding delivery and operation of the works in a manner that minimises the risk to workers, contractors and the community.

The potential for incidents is well understood and the management of demolition activities would minimise the probability of an incident happening and mitigating an incident if it did occur.

The management and mitigation measure presented in **Table 8-5** would be implemented as part of the demolition works.

Table 8-5 Management and Mitigation Measures – Hazards and Risk

Management and Mitigation Measures	Demolition	
	Design	Implementation
The bullet pointed measures listed in Section 8.7 of the SEE would be implemented to ensure that the conclusions of Appendix C Hazards and Risks Assessment of the SEE remain valid.	✓	✓

9 SOIL, GROUNDWATER AND CONTAMINATION

9.1 Introduction

The following chapter provides a description of the soil, groundwater and contamination management issues relating to the demolition works.

9.2 Scope of the Assessment

This chapter presents a baseline description of the soil, groundwater and contamination status of the areas which would be disturbed during the demolition works (the demolition works area) (refer to **Figure 4-1**). This baseline description is based on a desktop review of existing information. The potential impacts of the demolition works are identified and assessed, and then mitigation measures are provided to minimise the potential impacts of the demolition works on soils, groundwater and contamination.

The SEARs (refer to **Appendix A SEARs and Application Documentation**) identify the following requirements for:

Contamination:

- *How ecological and human health risks posed by contaminants on the site would be mitigated and managed; and*
- *A description of the measure that would be used to identify, capture, treat, remediate and/or dispose of contaminated soil (including acid sulfate soil) and water that is encountered.*

Soil and water:

- *An assessment of the potential impacts to soil, groundwater and surface water resources;*
- *A surface water, waste water and flooding assessment which includes details on how stormwater would be managed during and post works; and*
- *Identification of any water licensing or other approvals required under the Water Act 1912 and/or the Water Management Act 2000.*

Potential ecological and human health risks are addressed in **Chapter 10 Human Health and Ecological Risk** and **Appendix C Human Health and Ecological Risk Assessment**.

Potential surface water, flooding and wastewater impacts are discussed in **Chapter 12 Surface Water Wastewater and Flooding**.

9.3 Legislation, Planning Policy and Guidelines

9.3.1 Commonwealth Guidelines

Commonwealth guidelines relevant to the management of groundwater include the *National Environment Protection (Assessment of Site Contamination) Measure, National Water Quality Management Strategy*, and the *Australian and New Zealand Guidelines for fresh and marine water quality 2000* (ANZECC/ARMCANZ, 2000). These guidelines are discussed below.

9.3.1.1 *National Environment Protection (Assessment of Site Contamination) Measure 1999*

The primary reference for environmental site assessment in Australia is the amended *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC, 2013). This measure includes soil, groundwater, and soil vapour criteria for use in evaluating potential risk to human health and ecosystems. These are presented as generic investigation levels and screening levels and are subject to a range of limitations. Their selection and use must be in the context of a conceptual site model relating to the nature and distribution of impacts and potential exposure pathways. This measure has been used to inform the assessment of impacts of the demolition works.

9.3.1.2 *National Water Quality Management Strategy*

The *National Water Quality Management Strategy* (NWQMS) is a joint national approach to improving water quality in Australian and New Zealand waterways. The NWQMS process involves development and implementation of a management plan for each catchment, aquifer, estuary, coastal water or other water body, by community and government. These plans focus on the reduction of pollution released into coastal pollution hotspots and other aquatic ecosystems around the country. Local government, community organisations and other agencies carry out these plans using the NWQMS to maintain agreed environmental values. NWQMS protection framework involves the identification of the specific beneficial uses of every major aquifer and the strategies which can be applied to protect those beneficial uses. The Site is located on the southern side of the Botany Sand Beds aquifer.

9.3.1.3 *Australian and New Zealand Guidelines for fresh and marine water quality 2000 (ANZECC/ ARMCANZ, 2000)*

These guidelines provide for the sustainable use of Australia's water resources by protecting and enhancing their quality, while maintaining economic and social development. These guidelines contain a number of trigger limits relating to the protection of aquatic ecosystems, primary industries, recreational water quality and aesthetics. They apply to the quality both of surface water and of groundwater since the environmental values which they protect relate to above-ground uses (e.g. irrigation, drinking water, farm animal or fish production and maintenance of aquatic ecosystems). Groundwater should be managed in such a way that when it comes to the surface, whether from natural seepages or from bores, it will not cause the established water quality objectives for these waters to be exceeded, nor compromise their designated environmental values.

9.3.2 ***NSW Legislation and Guidelines***

9.3.2.1 *Protection of the Environment Operations Act 1997*

Prevention of soil and groundwater pollution is a key objective of the *Protection of Environment Operations Act 1997* (PoEO Act) and pollution of groundwater is an offence under the Act. Operation and maintenance activities at the Site are required to be managed so as to ensure that Caltex complies with Section 120 of the PoEO Act 1997, which prohibits the pollution of waters, including any underground or artesian water. **Section 9.5.6** provides further information on the Environment Protection Licence (EPL) for the Site under the PoEO Act.

9.3.2.2 *Contaminated Land Management Act 1997*

Significantly contaminated land in NSW is regulated under the *Contaminated Land Management Act 1997* (CLM Act). This legislation seeks to apply the principle of "polluter-pays" by imposing the obligation and cost of remediating contaminated land on the person or company responsible for the pollution, rather than the community. The general objective of the Act is to establish a process for investigating, and where appropriate, remediating land that is considered to pose a significant risk to human health or the environment.

9.3.2.3 *Water Management Act 2000*

The *Water Management Act 2000* (WM Act) establishes a framework for managing water in NSW. The WM Act defines an aquifer interference activity as that which involves any of the following:

- the penetration of an aquifer,
- the interference with water in an aquifer,
- the obstruction of the flow of water in an aquifer,
- the taking of water from an aquifer in the course of carrying out mining or any other prescribed activity; and
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Excavations associated with the demolition works may extend to 2 metres below ground level (mbgl) in depth. Therefore groundwater is expected to be encountered. However, generally, minor temporary dewatering activities that are estimated to take less than 3 ML/yr of groundwater will generally not require a licence or approval from NSW Office of Water (NOW). Therefore regular consultation with NOW would occur to ensure that permitting requirements are met as demolition proceeds.

9.3.2.4 *Guidelines for the Assessment and Management of Groundwater Contamination*

These guidelines are published by the NSW EPA (formerly the Department of Environment and Conservation NSW when the guidelines where published in 2007) and focus on groundwater contamination from point sources rather than broad-scale impacts derived from diffuse sources. The guidelines outline a framework for assessing and managing contaminated groundwater in NSW.

9.3.2.5 *Acid Sulfate Soil Manual*

The *Acid Sulfate Soils Assessment Guidelines* (Acid Sulfate Soils Management Advisory Committee, 1998) provide guidance in assessing the impacts of proposed works in areas likely to contain acid sulfate soils. The guidelines have been developed primarily for proponents of activities that are likely to disturb acid sulfate soils, and for councils and government authorities responsible for assessing these proposals. The guidelines outline a stepwise process for site assessment and management of proposals in areas likely to contain acid sulfate soils.

9.3.2.6 *The Blue Book*

Managing Urban Stormwater: Soils and Construction (Landcom 2004), also known as the "Blue Book", provides methods and techniques to minimise land degradation and water pollution at development sites in NSW. The guidelines focus on minimising erosion and preventing sediment moving off-site during the construction phase of development. These measures are, however, also applicable to demolition, operation and maintenance activities.

9.3.2.7 *NSW EPA Technical Note: Investigation of Service Stations Sites*

This technical note outlines an assessment methodology for service station sites which considers relevant legislation and policy. This technical note is relevant to the Site as it describes the assessment steps for sites where fuel storage systems are present, e.g. underground tanks, fuel lines, dispensers.

9.4 Method of Assessment

This assessment has been conducted as a desktop investigation which involved the review of existing information about the Site such as: previous investigations, historic information, records of contamination and contamination management. This assessment has also involved a review of online resources including geological maps, Groundwater Dependant Ecosystems databases, acid sulphate and soil maps of the area.

A site walkover was also undertaken to understand the Site's soil, contamination and known groundwater characteristics. This site walkover was undertaken as part of the Kurnell Refinery Conversion EIS (URS, 2013).

The background data used in this chapter is primarily based on a review of the following reports:

- Kurnell Refinery Conversion Environmental Impact Statement (URS, 2013);
- Soil and Groundwater Contamination Assessment, Classification and Risk Ranking Report (Coffey, 2007);
- Contaminated Site Risk Reduction Program Annual Review Progress Report Caltex Refineries (NSW) Pty Ltd, NSW (Caltex, 2012);
- Soil and Water Contamination Data Review – Caltex Refinery, Kurnell (Caltex, 2013a);
- Contamination Data Gap Assessment – Caltex Refinery, Kurnell (Caltex, 2013b);
- Caltex Contaminated Site Risk Reduction Program Annual Review Progress Report (2013c); and
- Contamination Data Gap Investigation Plan – Caltex Refinery, Kurnell (Caltex, 2014).

9.5 Existing Environment

9.5.1 *Regional Topography and Geology*

The Kurnell Peninsula, is an elevated plateau of Hawkesbury Sandstone which is approximately 18 km in length (URS, 2004). The elevation on and around the Site is generally in the region of 5 m Australian Height Datum (AHD). Land to the east of the Site in Kamay

Botany Bay National Park rises to approximately 30 m AHD (Port Hacking 9129-4N Topographic Map, Third Edition, Land and Property Information NSW, 2001). The depth to bedrock beneath the Site varies between 2 m to 20 m. Bedrock surface elevation rises toward the east and south of the Site, with sandstone outcrops mapped at the northeast and southeast boundaries (URS, 2006).

According to published geological information (Sydney 1:100,000 geological service sheet), the Site is underlain by Quaternary (Pleistocene) wind-blown medium- to fine-grained well-sorted marine quartz sand (URS, 2004, 2010).The sandstone is described as medium- to coarse-grained, composed predominantly of quartz with minor lithic fragments, feldspar, mica and clay pellets. The Site lies on the aeolian Kurnell landscape unit, composed of gently undulating to rolling coastal dunefield and relict dunes (NSW Soil Conservation Service Soil Landscape Series, Wollongong-Port Hacking, URS, 2011).

9.5.2 Acid Sulfate Soils

A review of the NSW Acid Sulfate Soil Map (Department of Infrastructure, Planning and Natural Resources (DIPNR)) and previous reports, indicate that the proposed works are on ground classified as 'Low Probability' of containing Potential Acid Sulfate Soils (PASS) (URS, 2011). Environmental problems associated with PASS occur as a result of development works which expose soil with the potential to undergo oxidation reactions on contact with oxygen and water. The result of the oxidation reactions typically produces low pH runoff which in turn acidifies soil, groundwater and surface waters.

Acid sulfate soils have also been recorded and classified by Sutherland Shire Council[7] across the demolition works area. These maps show the demolition works area extends across land classified as Class 4 (the main Site) and Class 3 (Eastern and Western Right of Way (ROWs)) with respect to PASS. Works to the north of the Western ROW and the Eastern ROW would extend into a Class 5 area. Sutherland Shire Council has provided the following definitions of Class 3, Class 4, and Class 5 areas:

- *In a Class 3 area, acid sulfate soils are likely to be found beyond 1 metre below the natural ground surface. Any works that extend beyond 1 metre below the natural ground surface, or works which are likely to lower the water table beyond 1 metre below the natural ground surface, will trigger the requirement for assessment and may require management (Sutherland Shire Council, 2010).*
- *In a Class 4 area, acid sulfate soils area are likely to be found beyond 2 metres below the natural ground surface. Any works that extend beyond 2 metres below the natural ground surface, or works which are likely to lower the water table beyond 2 metres below the natural ground surface, will trigger the requirement for assessment and may require management (Sutherland Shire Council, 2010).*
- *In a Class 5 area, acid sulfate soils are not typically found. Areas classified as Class 5 are located within 500 metres of adjacent Class 1, 2, 3 or 4 land. Works in a Class 5 area that are likely to lower the water table below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land will trigger the requirement for assessment and may require management.*

[7] http://www.sutherlandshire.nsw.gov.au/General/Shire_maps

9.5.3 Hydrogeology

A *Voluntary Investigation Final Report* by Coffey (2003) indicated that groundwater at the Site is contained within an unconfined aquifer in Quaternary sands, generally 2 to 2.5 mbgl. Although the groundwater is generally found at this depth, groundwater monitoring (Coffey 2011, Caltex 2013a) indicates there is variable depth to groundwater across the Site, ranging from approximately 1 mbgl in the north-western area of the Site, to 15 mbgl in the south eastern area of the Site. The groundwater flow is generally to the northwest (**Figure 9-1**) and influenced by the strike and dip of the underlying sandstone bedrock (Coffey 2007). Within the Site there is an east-west groundwater divide located south of the refinery process areas and north of the Caltex Lubricating Oil Refinery (CLOR) area (Caltex, 2013b). To the north of the divide the groundwater flows in a north-westerly direction to Botany Bay at a gradient of 0.003 to 0.005. South of the divide the groundwater is thought to flow south west at gradient of 0.006 towards a stormwater drain, and then flow north west into Botany Bay via Quibray Bay (refer to **Figure 12-2**).

Infiltration of stormwater to soil, and potentially, to the underlying groundwater occurs in parts of the Site that are unpaved and pervious. The Kamay Botany Bay National Park, located on the eastern Site boundary, is generally elevated above the level of the Site. It is a dune area with sandy soils, and so relatively high stormwater infiltration rates would be expected in this area causing groundwater aquifer recharge. Where there are permanent or temporary water bodies, such as ponds, natural retention basins or wetlands, the interaction may be more direct. These areas are discussed in **Chapter 12 Surface Water, Wastewater and Flooding**.

The *Soil and Groundwater Contamination Assessment, Classification and Risk Ranking Report* by Coffey (2007) reports that groundwater is thought to discharge to shallow surface water bodies and swamp areas in the southern half of the Site. North of the Site is a shallow surface water body, Marton Park Wetland that is also a likely groundwater discharge point. The receiving water for groundwater migrating from the Site is Botany Bay to the north, and Quibray Bay to the west. The ecosystem within Quibray Bay is considered sensitive and different parts of it comprise either Towra Point Nature Reserve or Towra Point Aquatic Reserve (refer to **Chapter 17 Ecology** and **Chapter 10 Human Health and Ecological Risk**).

A quarterly groundwater monitoring program is implemented at the Site as a protection system to identify the potential for migration of hydrocarbon contaminated groundwater before it leaves the Site. The monitoring program includes monitoring wells in the central part of the Site and various boundary monitoring wells along the northern and western boundaries of the Site corresponding to the down gradient direction of groundwater flow (Coffey, 2003) (refer to **Figure 9-1)**. There are also a number of private groundwater bores in Kurnell that are generally used for watering gardens. Community groundwater monitoring has been conducted in relation to the Site's voluntary investigation agreement with NSW EPA. Coffey (2003) reported that "*The community groundwater monitoring did not show evidence of migration of contaminated groundwater from the Refinery*."

Caltex has noted that ammonia concentrations are generally elevated across the Site and throughout the Kurnell area including residential areas to the north (Caltex 2013a). Numerous exceedances of ammonia, phosphate, phosphorous, copper and iron have been measured in both in-bound and boundary monitoring wells (Caltex, 2013a) and groundwater wells that are considered to be hydraulically up-gradient of the Site.

The distribution of these compounds does not suggest a point source on the Site but rather that these analytes could be considered representative of wide-spread groundwater quality in Kurnell and are not related specifically to the refinery (Caltex, 2013a).

9.5.4 Groundwater Dependant Ecosystems

The online Groundwater Dependent Ecosystems Atlas was consulted to determine the proximity of the demolition works to potential Groundwater Dependent Ecosystems (GDEs). As shown in **Figure 9-2**, a vegetation GDE that was noted as 'previously identified within a previous desktop study' is located partially on Caltex owned land. This GDE is the Marton Park Wetland (shown in **Figure 9-1**), a freshwater wetland which includes woodland communities.

According to the Marton Park Wetland Management Plan (Molino Stewart Pty Ltd, 2009) the wetland is a freshwater wetland with limited tidal influence. The wetland plays an important role in the drainage of the surrounding area, including the eastern portion of Kurnell, part of the Site, areas of Caltex owned land adjacent to the Site and the Kamay Botany Bay National Park.

Much of the Site is bunded and surface runoff is treated onsite before discharging to Quibray Bay and Botany Bay, However, cleaner surface runoff from some non-industrial areas of the Site (e.g. the administration centre and some car parks) flows into this wetland. Marton Park Wetland is recharged by ground water seepage through the sandy bed during dry periods (refer to **Appendix D Water Management Report**).

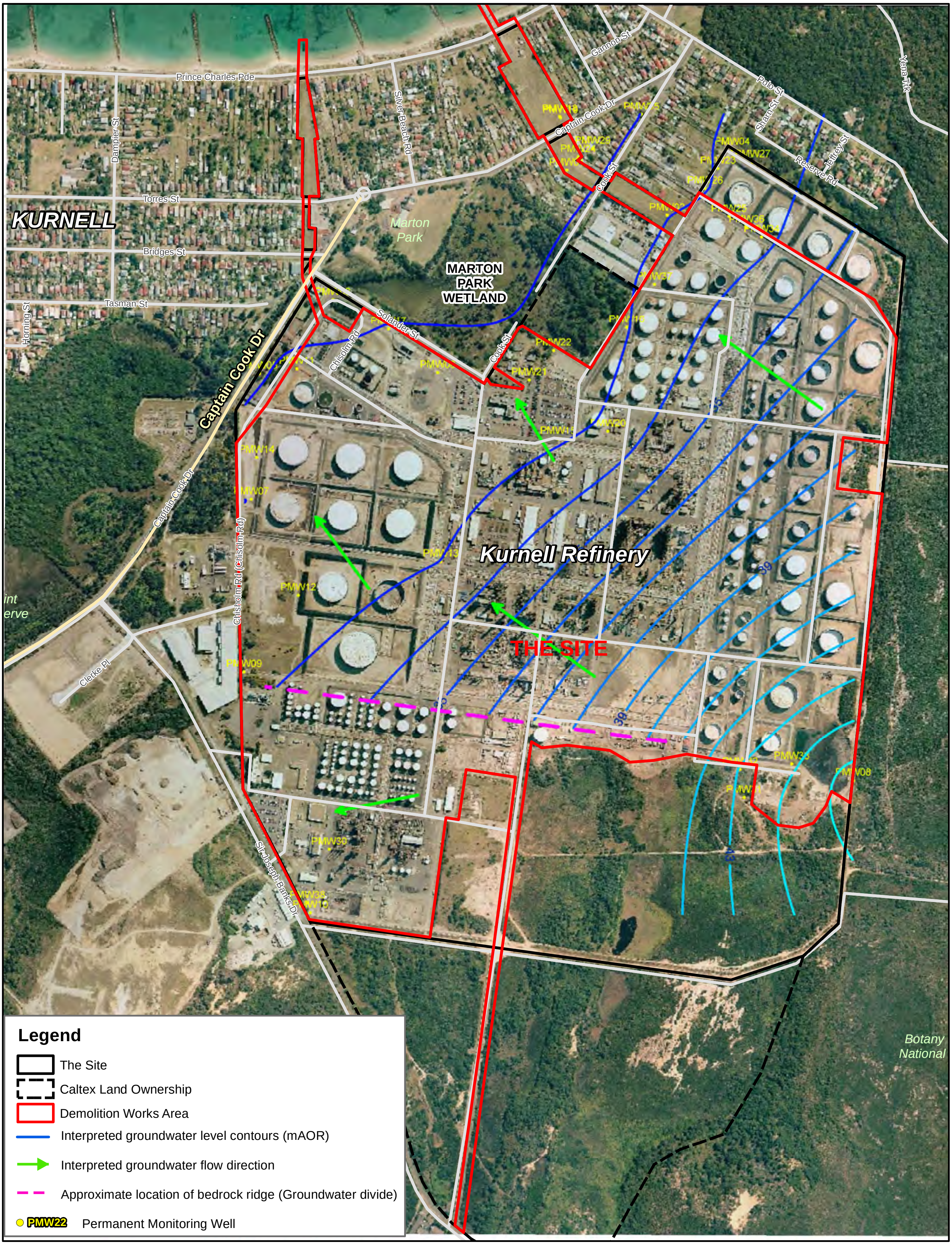
Threats to the groundwater quality include the large number of houses in the area, the area not being sewered for a long time (historical threat), and potential infiltration from industrial sites (including the Site) (Molino Stewart Pty Ltd, 2009). Further information about this GDE is also presented in **Chapter 17 Ecology**.

9.5.5 Contamination

Based on the historical land use and reported activities carried out across the Site, investigations have been conducted to determine key contaminants of potential concern (COPC) for the Site (Coffey, 2007, Coffey, 2011, Caltex, 2013a and AECOM, 2013). Due to its size, the Site was divided into Contamination Management Zones (CMZs[8]) to assist with classifying and managing the types of contaminants that may be found within different areas (refer to **Figure 9-3**). The Site is divided into 22 separate CMZs (Zone A to Zone V).

Table 9-1 presents a summary of COPC within the CMZs that have the potential to be affected by the demolition works (refer to **Section 9.6**). As demonstrated in **Table 9-1** and discussed in **Section 9.5.6**, Caltex have a number of processes and monitoring programs in place on the Site to manage exiting COPC. The information provided in **Table 9-1** has been sourced from Coffey 2007, Caltex 2012, Caltex 2013a and AECOM 2013. CMZs that are outside the demolition works area, or do not have any excavation occurring within them (i.e. the works to be undertaken on Kurnell Wharf) are not summarised in the table.

[8] Contamination Management Zone (CMZ): a part of the Site associated with a particular activity and with an identifiable and limited group of contaminants associated with that activity



Legend

- The Site
- Caltex Land Ownership
- Demolition Works Area
- Interpreted groundwater level contours (mAOR)
- Interpreted groundwater flow direction
- Approximate location of bedrock ridge (Groundwater divide)
- PMW22 Permanent Monitoring Well

Source: Coffey Environments, Feb 2007 (Figure 3, project number ENVILCOV00290AQ)

CALTEX (REFINERIES) PTY LTD

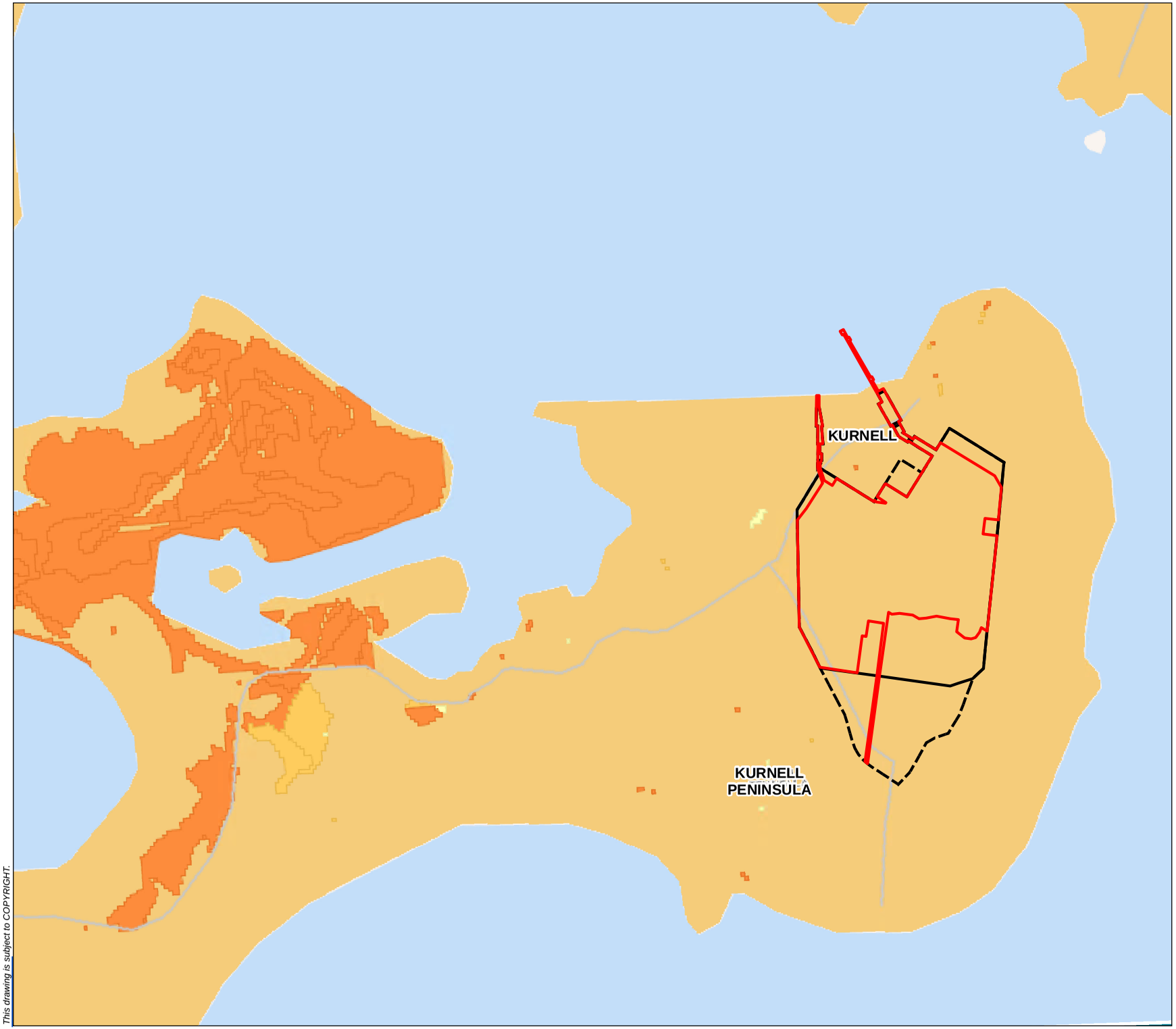
KURNELL REFINERY CONVERSION MODIFICATION

COFFEY (2007) GROUNDWATER FLOW DIRECTION AND GROUNDWATER MONITORING WELLS

URS

Figure: 9-1

File No: 43177915.010c.mxd | Drawn: SB/STB | Approved: KT | Date: 29/09/2014 | Rev. A | A4



LEGEND

- The Site
- Caltex Land Ownership
- Demolition Works Area

GDE, Reliant on subsurface groundwater (vegetation)

- Identified in previous study: fieldwork
- Identified in previous study: desktop
- High potential for groundwater interaction
- Moderate potential for groundwater interaction
- Low potential for groundwater interaction
- No ecosystem analysed

0 400 800 1,600

Meters

Source: Australian Government, Bureau of Meteorology [Dec 2012]

PATH: T:\JOBS\43177836\Workspaces\

FILE NO: 43177915.007b

DRAWN: STB APPROVED: RO DATE: 29/09/2014

CALTEX (REFINERIES)
NSW PTY LTD

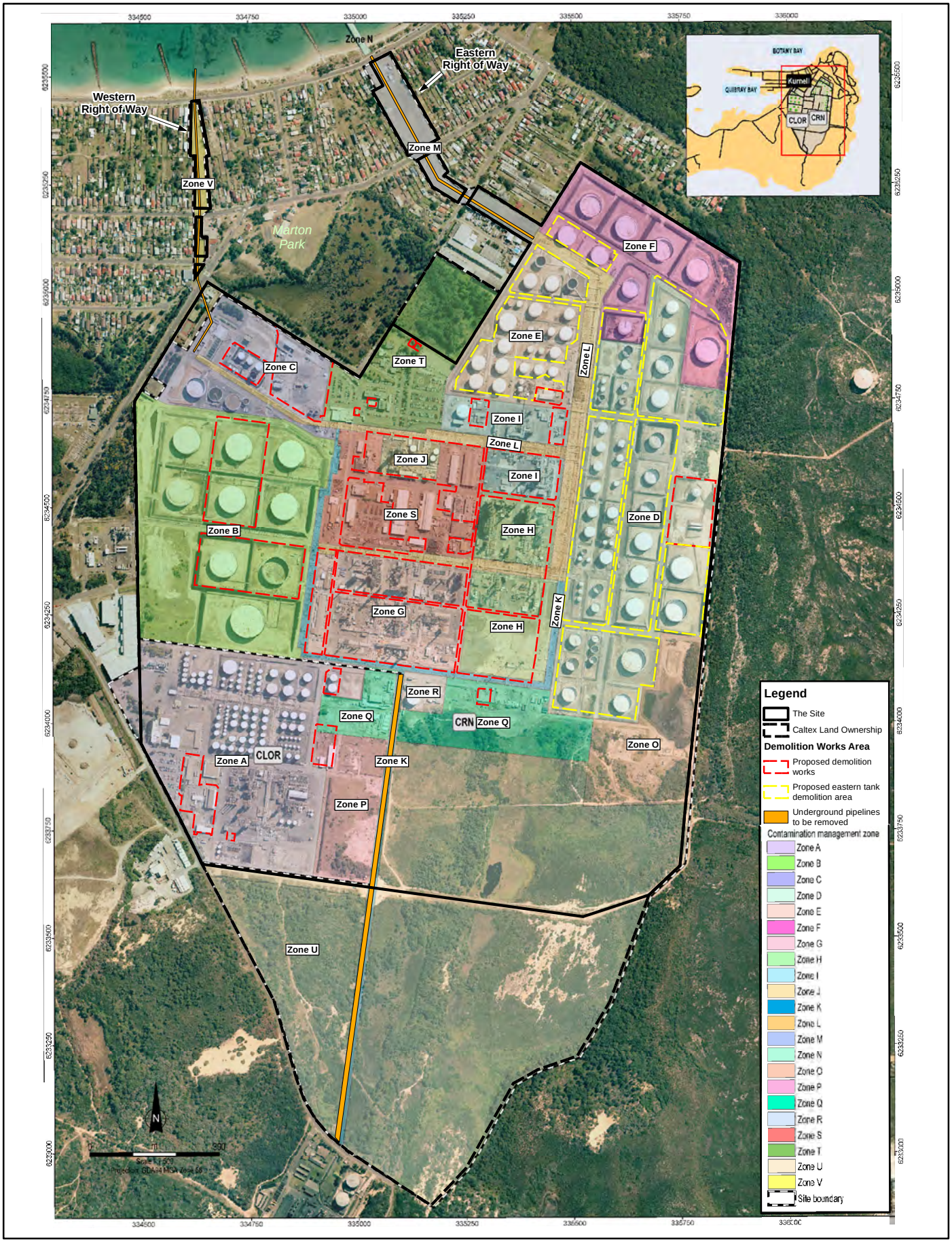
KURNELL REFINERY
CONVERSION MODIFICATION

GROUNDWATER DEPENDANT ECOSYSTEM MAP

URS

Figure: 9-2

Rev. A A4



Source: Coffey Environments, Feb 2007 (Figure 7, project number ENVILCOV00290AQ)

CALTEX (REFINERIES) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

COFFEY (2007) CONTAMINATION MANAGEMENT ZONES

URS

File No: 43177915.006.mxd Drawn: SB/STB Approved: RO Date: 11/07/2014

Figure: 9-3

Rev. A A4

Table 9-1 Baseline Contamination Data Relevant to the Demolition Works

CMZ*	Monitoring / Characterisation	Contaminants of Potential Concern	Groundwater Considerations	Soil Considerations
Western Tank Area - excavations may occur to **1.0 m**				
Zone B Crude oil tanks, Aqueous effluent and Ballast water storage.	Quarterly groundwater monitoring is conducted from three boundary and one in-bound monitoring wells in Zone B. Refer to **Figure 9-1** for monitoring well locations.	Total Petroleum Hydrocarbons (TPH); benzene, toluene, ethylbenzene and xylene (BTEX); polycyclic aromatic hydrocarbons (PAHs).	TPH (primarily C15-C28) groundwater contamination has been measured in two monitoring wells (MPW12 and PMW14) with concentrations decreasing since 2011, and currently below investigation levels. Benzene has been detected at one location (PMW14) in 1999, 2003 and 2004 at concentrations exceeding the relevant guidelines. No further Benzene exceedances have been measured since 2004.	Environmental soil sampling has not been conducted in Zone B; however, the contaminants of concern are based on current and historic activities undertaken in the area.
Zone C Water treatment plant, above ground tank storage area and Liquefied Petroleum Gas (LPG) storage.	Quarterly groundwater monitoring is conducted from four boundary and one in-bound monitoring wells in Zone C. Refer to **Figure 9-1** for monitoring well locations.	TPH, BTEX, PAHs.	TPH C6-C36 has been measured in monitoring wells at concentrations marginally exceeding the criteria since 1998. TPH C6-C28 has been measured at concentrations ranging from 280 ug/L(TPH C10-C14) to 13,100 ug/L (TPH C15-C28). Concentrations have generally decreased since 2007. Minor detections of BTEX and PAHs have also been reported.	One contamination source assessment has been carried out in Zone C (1997). Eight soil samples collected at four locations produced the following results; TPH, BTEX and PAHs not detected, Cadmium (Cd) and Mercury (Hg) not detected, Arsenic (As), Chromium (Cr), Copper (Cu), Nickel (Ni),Lead (Pb) and Zinc (Zn) detected significantly below investigation levels.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Eastern Tank Area - excavations may occur to **1.0 m**				
Zone D Feed stock tanks	Quarterly groundwater monitoring of monitoring wells hydraulically down gradient from Zone D. Refer to **Figure 9-1** for monitoring well locations. Monitoring and recovery wells were installed following a Light Non-Aqueous Phase Liquid (LNAPL) contamination event 1994.	TPH, BTEX, PAHs. Potentially mercaptans and Pb.	LNAPL was identified in the western portion of Zone D in the early 1990s. Although the LNAPL were recovered in 1994, it is possible that affected groundwater may be present. No groundwater analytical results have been sighted since 1998.	LNAPL were identified in the western portion of Zone D in the early 1990s. A distinct smear zone of heavy and light hydrocarbon was observed in soil east of the main pipeline. Lead and other metals were detected at concentrations below investigation levels in investigations in the proposed diesel tank area. Assessment of parts of this CMZ have not indicated significant soil contamination related to refinery operations.
Zone E Storage of refinery products: Diesel, Jet fuel, Fuel oil, bitumen and Oils.	Quarterly groundwater monitoring includes two boundary monitoring wells within Zone E. Refer to **Figure 9-1** for monitoring well locations. No on-site contamination source assessments involving soil sampling have been conducted.	TPH, BTEX, PAHs, lead (inorganic) and Tetraethyllead (TEL)). Potentially contaminants from off-site transported by the stormwater network.	TPH (mainly C15-C28) was elevated historically, ranging from 300 ug/L to 6,600 ug/L (PMW37) between 2001 and 2012. Benzene has been detected above criteria in one well (PMW37) on one occasion, at 143 ug/L in August 2006. Naphthalene in PMW37 exceeded fresh water guidelines in 2008 and 2012. Exceedances of investigation levels have been noted for ammonia, phosphate, phosphorus, copper and iron but are consistent with those in other zones therefore may be indicative of background levels. Concentrations of toluene, ethylbenzene and xylene (TEX), chromium and lead have not exceeded the investigation levels in the Zone E groundwater wells.	Environmental soil sampling has not been conducted in Zone E; however, the contaminants of concern are based on current and historic activities undertaken in the area.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Zone F Gasoline tanks	Quarterly groundwater monitoring includes four boundary monitoring wells and three inbound wells. Refer to **Figure 9-1** for monitoring well locations. Zone F has been the subject of a voluntary investigation program requiring sampling of the on-site groundwater monitoring wells and on-site and off-site soil sampling.	TPH, PAHs, BTEX, Pb (inorganic and TEL).	Historical monitoring has shown elevated concentrations of TPH and BTEX in groundwater on-site and at the boundary. Remediation measures operating in Zone F (e.g. bioventing system, LNAPL recovery) have contributed to the significant reduction in groundwater contaminant concentrations over the past two years.	Elevated concentrations of TPH, BTEX, naphthalene and lead have been measured in soil beneath Zone F. LNAPL has also been detected in monitoring wells along Road B (Caltex 2012). Soil samples analysed in 2013 found chromium reducible sulphur exceeding trigger levels indicative of the presence of potential acid sulphate soils (ASS), although these were reported in only two samples, with remaining samples indicating the majority of soil had a low likelihood of ASS formation.
Zone I Crude oil distillation unit #1, Merox unit, Propane deasphalting unit #2	Quarterly groundwater monitoring includes one in-bound monitoring well within Zone I. Refer to **Figure 9-1** for monitoring well locations. Soil contamination study was undertaken by Woodward Clyde Pty. Ltd. (1996) in conjunction with the proposed co-generation plant site.	TPH, PAHs, BTEX, metals and asbestos.	LNAPL has been encountered at in-bound well PMW20, associated with a historic leak of jet fuel from a line leak in the Zone. Remediation has since been undertaken, including installation of a barrier wall to inhibit migration onto the wetland to the north.	The 1996 soil contamination study identified contamination adjacent to the crude receiving line in Zone I following a leak. The results indicated significant adsorbed phase TPH and BTEX contamination at a depth of about 2 m. LNAPL was identified near the leak and extending into the south-eastern corner of Zone T. Water level gauging in 2007 detected the presence of LNAPL at in-bound monitoring well PMW20 (Caltex 2012).

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Refinery Process Units – excavations may occur to **2.0 m**				
Zone G Crude oil distillation, Hydrotreating / Rheniforming Unit, Catalytic Reforming Unit, ISOSIV Unit, Diesel Hydrotreater Unit (DHTU), Benzene Saturation Unit Amine/Sulphur Unit#1 and #2, Treating and Splitting Unit.	No regular groundwater monitoring has been undertaken in Zone G. Monitoring wells considered to be hydraulically down gradient from Zone G include wells present in Zones B, C, S and T. Refer to **Figure 9-1** for monitoring well locations.	TPH, PAHs, BTEX, Monoethanolamine (MEA) , Perchloroethylene (PCE), Dimethyl disulfide (DMDS), Phenol, Ammonia and Metals (Hg, Cr, Pb). Potential asbestos associated with the insulation of some pipes and equipment.	Groundwater sampling conducted during the contamination source assessment undertaken by URS (2004) involved installation and sampling of two groundwater monitoring wells. One monitoring well was located on the DHTU (DB06) and the other well at the location of the Bensat unit (BB6). Zinc was detected in both of the monitoring wells and TPH C10-C36 was detected in the monitoring well located on the DHTU (DB06)	The results from a contamination source assessment undertaken by Coffey 2003 detected heavy metals (As, Cr, Cu, Ni, Pb and Zn), however these were significantly below the investigation levels. The URS (2004) investigation had soil results at 2.5 – 3.0 m for TPH C10-C36 which were over the investigation levels at only one location. The other nine locations were less than the laboratory reporting.
Zone H Fluid Catalytic Cracking Units (FCCU), Alkylation Unit and Polymerisation Unit	No environmental monitoring or soil and groundwater assessment has been undertaken in Zone H.	TPH, BTEX, PAHs. Aluminium (Al), fluoride and asbestos from the FCCU. Potentially MEA from leaks and spills.	No on-site contamination source assessments involving groundwater sampling have been conducted in Zone H.	Historical investigations undertaken in 1994 to assess the extent of LNAPL sourced from Zone D, indicated contamination may have extended from Zone D to the eastern boundary of Zone H. The current status of the contamination has not been confirmed.
Zone J Refinery power plant for transformer oil and fuel oil.	No environmental monitoring or soil and groundwater assessment has been undertaken in Zone J. Anecdotal evidence reported by Caltex 2013a noted that boiler acid sludge was buried in the western portion of the Zone.	TPH, BTEX, PAHs. Polychlorinated biphenyls (PCBs) associated with transformer oil, are considered a potential contaminant of concern in Zone J. Potentially metals (e.g. Cr) associated with cooling water, PCBs associated with transformer oil and chlorinated compounds.	Groundwater sampling has not been conducted in Zone J. Monitoring wells PMW15 (Zone T) and PMW20 (Zone I) are directly downgradient of this Zone.	Environmental soil sampling has not been conducted in this Zone; however, the contaminants of concern are based on current and historic activities undertaken in the area.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Zone L Main pipeways (Diesel, jet fuel, naphtha, gasoline)	Quarterly groundwater monitoring is not currently conducted in Zone L. Environmental assessments (comprising LNAPL assessments and asbestos assessments of the sand bedding material under and above the pipeways) have been conducted. One contamination source assessment following a series of leaks and asbestos assessments have been undertaken.	TPH, BTEX, PAHs, Phenols, Metals (Pb and Cr) and asbestos. Potentially contaminants from off-site transported by the oily water sewer system (OWSS) and stormwater network.	LNAPL contamination (sourced from Zone D) was identified in the early 1990s in the vicinity of the Pipeline easements. Contamination source assessments and remediation works have been undertaken in relation to identified contamination in the main pipeway (Zone L) and Continental Carbon Pipeline (Zone K). In both cases the contamination was considered to be remediated.	LNAPL contamination and affected subsurface soils (sourced from Zone D) were identified in the early 1990s in the vicinity of pipeline easements. Asbestos contamination has predominately been identified in surface soils within the pipeways. Some detections were also found in the subsurface soils (2 out of 61 samples) (AECOM, 2013).
Zone S Shared Services, (Superintendent, workshops, storage compound, hydroblast, laboratory and offices).	Quarterly groundwater monitoring includes one in-bound monitoring well (PMW13) within Zone S. Refer to **Figure 9-1** for monitoring well locations.	TPH, BTEX, PAHs, Potentially Ammonia Phosphate Tetrachloroethylene Pesticides associated with chemical storage. Possibly contaminants from products derived from other zones connected via the OWSS and stormwater network.	Elevated concentrations of TPH have been detected in monitoring well PMW13 following a crude pipe leak in Pipe Track 3 in Zone K in 1999. Elevated TPH concentrations ranging from 380µg/L to 1050µg/L were detected between 1998 and 2000, prior to the leak in Pipe Track 3. A remediation pump was installed between 2000 and 2006 to remove the LNAPL. Following the removal of the pump, elevated TPH (C6-C36) levels have been measured. The TPH levels from groundwater samples collected from early 2007 to May 2013 generally decreased from 42,290 µg/L to 21,690 µg/L.	Environmental soil sampling has not been conducted in Zone S; however, the contaminants of concern are based on current and historic activities undertaken in the area.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Continental Carbon Pipeline – excavation may occur to **2.0 m**				
Zone K Product pipe racks (Crude oil) and continental carbon pipeline	No regular environmental monitoring is conducted. However, soil, groundwater, and surface water sampling has been conducted following remediation of a pipeline leakage which occurred in September 2004. Soils assessments have been undertaken for soil validation for the remediation of a pipeline leak and a soil assessment for waste classification purposes. The leak and associated impacted soils have been remediated and validated.	TPH, BTEX, PAHs, Phenols, lead and asbestos.	No regular monitoring is undertaken in Zone K. Regular quarterly groundwater monitoring in monitoring well PMW13 (Zone S) has previously detected elevated groundwater concentrations of TPH and naphthalene associated with a leak in Pipe Track 3 in Zone K. LNAPL was detected in monitoring well PMW13 (Zone S) between February 2000 and November 2002. A product recovery pump was installed in this well and Coffey reported no detection of LNAPL in 2006. Elevated TPH C6-C36 have subsequently been reported in this well (42,290 ug/L in 2007 to 21,690 ug/L in 2013).	The impacted soils were deemed to have been remediated following validation sampling after the pipeline leakage. Other metals were detected in the soils assessment, however all were below criteria. Asbestos was identified in both the surface and the subsurface samples (7 out of 33 surface samples were above criteria, and only 1 out of 33 subsurface samples were above criteria (AECOM, 2013)).

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Fuel Pipelines and Cooling Water Intake– Eastern ROW– excavation may occur to **2.0 m**				
Zone M Underground pipes for refinery products through ROW including road reserves.	Quarterly groundwater monitoring includes five monitoring wells within Zone M. Refer to **Figure 9-1** for monitoring well locations.	TPH, BTEX, PAHs, and Lead Potentially contaminants from products in other Zones connected via the stormwater network.	The results of quarterly groundwater monitoring since 1998 have shown TPH C6-C36 in the monitoring wells. This monitoring has shown decreasing TPH concentration trends since 2003. Elevated benzene concentrations have been detected in wells since 1998. There are no clear trends for benzene concentration. Elevated naphthalene concentrations have been detected in the wells in Zone M, with a decreasing trend since 2004. Lead concentration has not been detected above the limit of reporting (LOR) since 1998.	A voluntary investigation (Coffey, 2003) conducted in Zone M noted minor hotspots of elevated soil hydrocarbons. Elevated Photoionization detector (PID) readings in some of the locations were associated with the presence of hydrogen sulphide. Elevated hydrocarbons were generally associated with soil samples collected at the water table at the south-eastern part of Section M1 and at the central western portion of Section M2 (the bend), suggesting the contamination had migrated to these locations in groundwater. A localised hotspot was identified at the south-eastern part of Section M1, which showed elevated TPH and PAHs. A Preliminary Contamination Assessment (Coffey, 2005) assessed the potential for soil contamination along the southern boundary of the ROW adjacent to the residential property on 29 Cook Street. Sampling was conducted at four locations at the southern boundary in the central portion of the ROW, with low photoionisation detectior (PID) readings and TPH, BTEX and PAHs below LOR in all locations.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Cooling Water Outlet Right of Way – **Western ROW** - excavation may occur to **2.0 m**				
Zone V Underground pipeway for Cooling water discharge through ROW including road reserves.	Given the use of Zone V for discharge of cooling water it is considered that there is limited potential for impact from leaks from the underground pipe in Zone V.	Salinity	No groundwater monitoring wells are present in Zone V.	Environmental soil sampling has not been conducted in Zone V; however, the contaminants of concern are based on current and historic activities undertaken in the area.
Buildings– excavations may occur to **1.0 m**				
Zone A Former tank farms, vacant land in the former process unit areas, water treatment area, support areas and offices, biopile.	Quarterly groundwater monitoring is conducted from three boundary and one in-bound monitoring well in Zone A. Refer to **Figure 9-1** for monitoring well locations. A soil assessment was undertaken for waste classification purposes.	TPH, toluene, PAHs, Butanone or methyl ethyl ketone (MEK) and Furfural. Potential asbestos associated with the insulation of some pipes.	Elevated groundwater TPH has been periodically measured in the boundary and in-bound monitoring wells, with a general decrease in TPH and BTEX since 1998. During the contamination source assessments, TPH was measured in temporary surface water within Pipeways A and B, ranging from 6,980µ g/L to 59,200 µg/L One location within Pipeways A and B measured concentrations of naphthalene and phenanthrene in temporary surface water. TPH C6-C36 and/or toluene exceeded the site investigation criteria at 9 locations out of the 13 sampled.	TPH C10-C36 ranging from non-detect to 86,600 mg/kg detected in surface samples (0.3 m) in the Tank Compound. TPH C10-C36 ranged from non-detect to 35,820 mg/kg in deeper soil (>0.8 m) in the Pipeways area. Minor exceedances of TPH C10-C36 were reported in the former Laboratory area and in the MEK/Toluene unloading area. The soil assessment determined that only 1 out of 23 samples had asbestos fragments above criteria. Other metals were detected in the soils assessment, however all were below criteria (AECOM, 2013).
Zone P Storage yard and historically a small land farm which received wastes from Zone A.	Only soil characterisation has been undertaken in this zone. No environmental groundwater assessment has been reported as being undertaken in Zone P.	TPH, BTEX, PAHs and Asbestos.	No groundwater monitoring has been conducted in Zone P.	Reported that historic soil sampling undertaken by PB in 2011.

CMZ*	Monitoring / Characterisation	Contaminants of Concern	Groundwater Considerations	Soil Considerations
Zone T Offices, Main Gate, guardhouse and change house, Car park, Vacant land.	Environmental monitoring has been conducted in Zone T, with the majority of monitoring conducted after 2007 in association with remediation of a jet fuel plume originating hydraulically upgradient of Zone T (in Zone I).	TPH, BTEX, PAHs	Monitoring has shown a large portion of the contamination in Zone T is associated with a historic jet fuel pipeline leak in Zone I, with a LNAPL plume extending under the Zone T carpark. Based on monitoring, TPH compounds are considered to be the main contaminants of concern for groundwater. Active remediation of the jet fuel LNAPL plume has been conducted, with impacts from the Zone I source generally delineated and stable in extent.	Environmental monitoring has been conducted in Zone T, primarily since 2007, in association with remediation of a jet fuel plume. Investigations reported significant TPH and BTEX impacts in soil at approx. 2 mbgs, which is the depth of the water table.

*Only CMZs that are in the area affected by the demolition works have been summarised in this table.

Elevated concentrations of ammonia, phosphorus, aluminium, iron and zinc in groundwater have been detected across the majority of zones, with isolated exceedances of arsenic, cadmium, copper, iron and zinc. These exceedance levels of ammonia, phosphorus, aluminium, arsenic, cadmium, copper, iron and zinc are considered representative of wide-spread groundwater quality in Kurnell, rather than being indicative of contamination sourced from any particular CMZ.

9.5.5.1 *Silver Beach and Botany Bay*

The demolition works area extends across Silver Beach and 20 m beyond the low tide mark into Botany Bay (refer to **Figure 4-1**). Although no information is available for potential contaminants of concern on Silver Beach, contamination data is available for the area surrounding the fixed berths at the end of Kurnell Wharf (refer to Zone N in Caltex 2013a and URS, 2012).

Concentrations of BTEX[9] pesticides, PCBs and volatile compounds were below the analytical LOR in all samples collected within the area surrounding the fixed berths at the end of Kurnell Wharf (URS, 2012). Hydrocarbons and heavy metals were detected within sediment samples. However, the 95% upper confidence level of each was below the guideline limits set for waste classification, contamination and toxicity for all but one analyte, namely Tributyltin (TBT) (URS, 2012). Recent investigations of TBT in sediments near the Kurnell Wharf have identified hotspots in their concentration, consistent with the areas used by large vessels, but none or very low levels in the nearshore environment, (URS, 2013).

9.5.6 ***Remediation and Validation***

Caltex has completed a number of discrete incident based remediation efforts at the Site. There is also a risk reduction program on the Site which aims to reduce the off-site human health and environmental risks in relation to dissolved TPH and BTEX in groundwater.

Condition R4.4 of EPL 837 requires Caltex to prepare a Contaminated Sites Risk Reduction Plan for the Site to establish a program for the reduction of risk to human health or other aspects of the environment associated with contaminated soil and/or groundwater. A report documenting progress against this plan must be submitted to the EPA each year. The purpose of this progress report is to summarise the measures and/or programs implemented over the previous 12 month period and provide a review/update of planned works to track project milestones as well as commenting on additional risks which may be identified.

In 2013 the EPA issued Caltex with a Preliminary Investigation Order (PIO) under Section 10 of the *Contaminated Land Management Act 1997* to address the contamination legacies across the Site. Associated with the PIO, Caltex has produced three reports:

- A report summarising the potential contamination sources related to the Site and the available information about soil, water and potential offsite migration of contamination (Caltex 2013a);
- A report identifying data gaps relating to the identification and management of contamination on, and related to, the Site (Caltex 2013b); and
- A report outlining the proposed investigation plan to fill any data gaps including details of the staging of the investigation activities and expected timeframes for this process (Caltex 2014).

The review of contamination data undertaken by Caltex (2013a) showed that the Zones A, F, I, T and O have levels of contamination that require management. As reported in the Caltex (2013c) *Contaminated Site Risk Reduction Program Annual Review Progress Report,* active

[9] Benzene, toluene, ethyl benzene and xylene. Volatile organic compounds found in petroleum derivatives.

remediation works have been undertaken for a number of years in Zones F, I, T, and O. A summary has been provided below on the works that are occurring, and would continue to occur during the demolition works.

9.5.6.1 Zone A – Tank Compounds and Pipeways CLOR (southwest area)

As reported by Caltex (2013c), TPH are considered to be the main contaminant of concern for the soil and groundwater in Zone A. Groundwater monitoring and contamination source assessments have shown a large portion of the contamination detected in Zone A is associated with surface soils in the tank areas and temporary water in the CLOR Pipeways A and B. The demolition of the CLOR has allowed for further investigation in these areas and the results have shown some localised impact.

9.5.6.2 Zone F – Tank 101 (northeast area)

As reported by Caltex (2013c), elevated concentrations of TPH, BTEX, naphthalene and lead have been measured in soil and groundwater beneath the road in Zone F. Petroleum hydrocarbon product (referred to as LNAPL) has also been detected in monitoring wells in this area. Historical records for Zone F indicate that the contamination is most likely to have been sourced from historical leaks/spills from storage tanks and product transfer pipes.

LNAPL removal was undertaken at two wells (PMW34 and PMW36). A bio-venting system was installed down-gradient from the LNAPL source to remediate and restrict off-site movement of groundwater contamination.

The main goals for CMZ F are to:

- remediate LNAPL in Zone F to the extent practicable;
- reduce potential for contaminant exposure to on-site workers; and
- reduce the potential for off-site migration and exposure of off-site receptors (people and aquatic environments) to impacted groundwater (which is monitored through quarterly groundwater monitoring).

9.5.6.3 Zone I – Jet Plume (north central area)

As reported in Caltex (2013c), water level gauging in 2007 detected the presence of LNAPL at monitoring well PMW20 (refer to **Figure 9-1**). The presence of LNAPL in PMW20 is a potential risk to off-site sensitive areas and may also present a risk to on-site workers, through inhalation or dermal contact pathways. There are currently controls at the Site which reduce the likelihood of worker exposure to this contamination, including the permit to work system and mandatory PPE for Site works. The LNAPL is being actively remediated using a series of skimmer pumps and total fluid pumps.

9.5.6.4 Zone T – (northern area)

As discussed in Caltex (2013a), there are no reported historical spills in this zone. However, historic spills in Zone I of crude oil and jet fuel have caused groundwater impacts to be observed in the south-eastern corner and in the central east part of Zone T. Remediation has been undertaken on these two areas of impacts as outlined below:

- Crude Oil Remediation (southern part of Zone T) – intermittent pumping of LNAPL using a vacuum truck in the late 1990s. LNAPL has not been observed in the recovery well since February 2003.
- Jet Fuel Remediation (central part of Zone T) – LNAPL was observed in well PMW20 in 2007. A number of vacuum extraction events were undertaken on the well which indicated that the LNAPL was part of a large plume. A LNAPL remediation system was designed to recovery LNAPL and also to exert hydraulic controls on the plume. The system, which includes 22 pneumatic active product skimmer and 16 pneumatic total fluids pumps, has been operational since November 2009. A vertical barrier wall was installed down gradient of the plume as an additional contingency measure.

9.5.6.5 Zone O – Limestone Pits (southwest area)

As reported in Caltex (2013c), waste material within the Limestone Pits had elevated concentrations of phosphorus, phosphate, TPH, and low pH. Groundwater impacted by these contaminants extends to the west of the pits. The impacted waste was excavated and remediated before being encapsulated on the Site. A phyto remedial system, planting 700 trees over the groundwater plume, has been established to address groundwater impacts.

9.5.6.6 Data Gaps

Caltex (2014) presented a summary of the data gaps to the EPA identified in Caltex (2013b) and presented an approach to reduce the identified data gaps.

Proposed works to fill the data gaps include:

- Groundwater monitoring well installation and sampling at Site boundaries;
- Investigation of potential contamination source areas; and
- Groundwater sampling of suitable off-site private bores.

Many of the areas with identified data gaps are largely inaccessible at present. Dependant on the approval of this modification application, and subsequent demolition of redundant areas of the Site, further assessment of the data gaps would be completed once access to these areas is available.

9.6 Impact Assessment

9.6.1 Demolition Impacts

9.6.1.1 Overview

Figure 9-4 shows where ground disturbance may occur during the demolition works. An estimated 150,000 tonnes of soil is likely to be excavated during the demolition works from the areas shown in **Figure 9-4**. This soil would be managed in the following ways:

- during excavation visual and olfactory indicators of impact would be monitored;

- soils considered to be contaminated would be stored at the former CLOR site in the south west of the Site. These soils would be appropriately stockpiled, bunded and managed for the short term; and
- where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or appropriately remediated soils would be used to provide additional backfill material.

Once the soil has been classified, if appropriate, it would be managed on-site in accordance with the Site's existing EPL. Where the contaminated soil cannot be appropriately managed on-site, it may be taken off-site for disposal at an appropriately licensed facility. The volume of soil that may be required to be disposed of off-site has been estimated to be < 2000 tonnes.

As discussed in **Section 4.2** and **4.3**, the demolition works would occur over a 2.5 year period. Potential ground-disturbing works during this time include:

- refinery process units removal;
- tank demolition;
- underground pipeline removal; and
- infrastructure, services and building demolition.

The locations and depths of ground disturbance activities are shown on **Figure 9-4** and described below.

1 Foundations, redundant slabs and redundant infrastructure (e.g. the oily water sewer) associated with the Refinery Process Units would be removed and would require excavation work which may extend down to 2 mbgl. At the end of this process, the refinery process units area would be levelled and crushed concrete would be spread across the area.
2 Ground disturbance associated with the removal of tanks in the Eastern and Western Tank Areas would extend to a maximum of 1 mbgl. This ground disturbance would be minimal and would mostly entail the removal of small pipelines/infrastructure within the tank bund. The hardstand below each of the tanks would remain intact.
3 Ground disturbance associated with infrastructure and building demolition would extend to a maximum of 1 mbgl.
4 Ground disturbance associated with pipeline removal would extend to 2 mbgl in the Eastern ROW, Western ROW, road reserves, Silver Beach and Botany Bay. The Continental Carbon Pipeline removal would also require excavation to approximately 2 mbgl.

The works described above would be staged with the aim of minimising the area of ground disturbed at any one time.

According to available Acid Sulfate Soil Mapping (refer to **Section 9.5.2**), the probability of encountering acid sulfate soils across the majority of the demolition works area (PASS Class Area 4) is considered to be low as excavations would only be to 2 mbgl. Exceptions to this are:

- the Eastern and Western Right of Ways (PASS Class Area 3) where the excavations would be to 2.0 mbgl and the potential for acid sulfate soils are noted at depths below 1 mgbl;
- Silver Beach and Botany Bay (PASS Class Area 5), where excavations would extend to 2 mbgl and where acid sulfate soils are not typically found; and
- The other exception is in Zone F where historical assessments (Caltex, 2013) identified potential acid sulfate soils. Measures to manage acid sulfate soils have been provided in **Section 9.7**.

Potential soil and groundwater impacts from the demolition works include:

- demolition workers encountering contaminated soil, asbestos and PASS during excavation activities and mobilising or dispersing it across the Site and local environment;
- excavation works and stockpiling of soils generating dust and/or odours that affect on-site and off-site receptors;
- stockpiles, excavated areas and newly disturbed areas subject to erosion and sediment control issues;
- increased infiltration locally affecting groundwater flows as areas that were previously covered by concrete such as the refinery process area become permeable;
- disturbance of soils through removal of hardstand, excavation and backfilling increasing contaminant migration to underlying groundwater;
- contaminants from stockpiles potentially contaminating ground and surface water;
- spills and leaks from demolition equipment potentially contaminating soil and groundwater; and
- vehicles dispersing contaminated materials across the Site and off-site.

Where further detail is required, these impacts are discussed in the following sections. Measures to minimise the potential for adverse effects are discussed in **Section 9.7**.

9.6.1.2 Sediment Disturbance

The works required to remove the cooling water outlet from below the low tide mark would result in the disturbance of sediments within Botany Bay.

The pipeline would need to be excavated where it is covered with sediment/sand. The pipeline would be cut or dismantled at the original demolition joints prior to being lifted out of the sea bed. It is likely that the sections of pipe would be lifted using a backhoe with a lifting attachment.

A backhoe would then backfill the excavated area with suitable material to restore the sea bed profile. A gabion would be placed inside the landward end of the redundant pipe that would remain in Botany Bay to stop sediments moving down into the pipe over time.

As noted in **Appendix G2 Marine Ecology Impact Assessment**, it is unlikely that the sediments at Silver Beach contain contaminated sediments. Therefore the suspension of nearshore sediments as a result of the cooling water outlet pipeline removal works in Botany

Bay, together with the use of silt curtains, present little to no likelihood of contamination impacts on the marine environment as a result of the demolition works.

Measures to manage and store the sand/soil removed during the works on Silver Beach and in Botany Bay and to rehabilitate Silver Beach are further discussed in **Section 9.7** below and **Appendix G2 Marine Ecology Impact Assessment** and **Appendix H Coastal Processes.**

9.6.1.3 Asbestos

Asbestos is noted as a contaminant of concern for various CMZs in **Table 9-1** including Zones A, B, G, H, I, J, K, L, O, and P. It is noted as mainly being associated with building waste and from the gaskets and insulation associated with piping and other equipment. Asbestos is present in various forms, including small fragments and fibres, and mostly occurs in surface soil layers.

As noted in **Table 9-1** a soil contamination assessment/characterisation was undertaken by AECOM (2013) for waste classification purposes within the pipeways (Zone K and L) and within the CLOR (Zone A). This identified that asbestos is a COPC for Zones A, K and L. Out of the 84 samples undertaken, 17 were above criteria in the surface layers, and 5 were above criteria in the subsurface layer.

Caltex has procedures in place for identifying the presence of asbestos and for working in those areas. Asbestos may also be encountered during exaction works in fill material underlying bitumen or concrete surfaces. The measures required to protect demolition workers and the general public from impacts related to asbestos would be detailed within an Asbestos Management Plan. This plan is discussed further in **Section 9.7.1**.

9.6.1.4 Infiltration and Groundwater

The interaction between surface water and groundwater at the Site may increase as a consequence of the demolition works through the removal of some hardstand/foundation areas, primarily in the Refinery Process Area in the centre of the Site (**Figure 9-4**). An increase in surface water infiltration in this area may cause localised groundwater mounding resulting in localised changes to groundwater gradient and flow direction, however, it is unlikely to affect the overall northwest flow for the Site (refer to **Figure 9-1**).

Another potential impact resulting from the increased interaction between surface and groundwater is the mobilisation of contaminants to groundwater through increased infiltration. While there is the potential for contamination to be mobilised to groundwater, rainwater infiltration would also likely result in an increase in natural attenuation[10] processes. Measures to manage the potential mobilisation of contaminants to groundwater are discussed in **Section 9.7**.

9.6.1.5 Dewatering Activities

Groundwater is not expected to be encountered during ground disturbance works on the main site as groundwater is generally observed to be 2 to 2.5 mbgl across the majority of the

[10] Natural attenuation results from natural processes cleaning up or attenuating pollution in soil and groundwater. This can occur as a result of increased dilution or by the natural breakdown of hydrocarbons etc. by microbes in the soil.

demolition works area. Groundwater may however be intercepted in the Eastern and Western ROWs (**Figure 9-4**) as they are closer to Botany Bay where groundwater is expected to be closer to the surface and the excavations may extend up to 2 mbgl.

In the event that groundwater or surface water (e.g. following a rainfall event) accumulates in an excavation and dewatering is required, then the accumulated water, would be collected and disposed of in the Site's waste water treatment plant (unless it is tested and is of suitable quality to be directed to stormwater)

If contaminated groundwater (or soil) is intercepted during demolition, there is potential that workers could be exposed. **Chapter 10 Human Health and Ecological Risk** provides a human health risk assessment for the various contaminants of concern potentially present across the demolition works area.

Management measures for dewatering and disposing of wastewater would be included in the Demolition Environmental Management Plan (DEMP) (refer to **Section 9.7**).

Legend

- The Site
- Caltex Land Ownership
- Demolition Works Area
- Roads

Areas where excavation may occur to:

- 1.0 m
- 2.0 m

Source: Aerial Imagery - Nearmap 2014

N
W E
S

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 100 200 400 Meters

PATH: T:\JOBS\43177915\Workspaces\

FILE NO: 43177915.009b

DRAWN: STB APPROVED: WM DATE: 29/09/2014

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LOCATION OF POTENTIAL GROUND DISTURBANCE ACTIVITIES

URS Figure: 9-4 Rev. A A4

9.6.2 Post-Demolition Works Impacts

Ongoing investigations and monitoring would continue in accordance with the existing environmental management system for the Site and in line with the EPL.

9.7 Mitigation

9.7.1 Demolition Works

A DEMP would be developed for the demolition works. This DEMP would include a number of sections and if required sub-plans. If required the DEMP and/or specific sub plans may be updated periodically as the demolition works progress.

The following sections outline the measures that will be documented and expanded on within the DEMP to mitigate potential soil, groundwater and contamination impacts.

9.7.1.1 Contamination Management Plan

This plan would outline measures for testing, handling, storing and managing contaminated soils and contaminated groundwater. It would include the following:

- During excavation visual and olfactory indicators of impact would be monitored.
- Excavated soils would be separated into stockpiles according to odours, staining, and other environmental indicators. Contaminated soils would be stored on the site of the former CLOR. These soils would be placed into uniquely identified stockpiles on plastic sheeting and appropriately bunded and managed.
- Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified VENM, ENM or appropriated remediated material would be used to provide additional backfill material.
- If excavated material cannot be re-used or managed on-site then it would be removed off-site as waste to an appropriately licensed facility. The majority of soil is expected to be reused on-site. It has been estimated that up to 2,000 tonnes of soil would potentially require off-site disposal to an appropriately licensed facility.
- Further, excavated material; would be classified in accordance with EPL condition O5.1 which requires “any liquid and/or non-liquid waste generated and/or stored [at the Site] is assessed and classified in accordance with the NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste, batched, further tested” (where required, for example Toxicity Characteristics Leaching Procedure (TCLP) testing).
- The method of disposal or reuse would be in line with the materials’ classification in accordance with specifications set out in a Waste Management Plan (WMP). This would include disposal of contaminated materials to appropriately licensed facilities in accordance with the above classification guidance and the *Contaminated Land Management Act 1997.* Disposal of contaminated soils would also be in accordance with *NSW (2009) Waste Classification Guidelines.*

9.7.1.2 Soils and Water Management Plan

The Soil and Water Management Plan would outline management measures for soils that are excavated or stored on-site during the demolition works and water management requirements. It would identify:

- the areas where soil disturbance is likely;
- how excavations would be staged so that the length of time that excavations are left open and temporary stockpiles are required is minimised;
- locations where soil would be stockpiled on-site for either removal, treatment or reuse;
- that if additional backfill material is required, only certified VENM, ENM or appropriated remediated material would be used;
- procedures to reduce erosion and the spread of dust;
- restricting traffic to defined roads or tracks where necessary;
- measures to protect excavations from increased stormwater runoff (e.g. by using bunds or similar structures, where required);
- measures to manage the storage of demolition specific liquids at the Site and the appropriate bunding or containment of demolition related fuel or chemical storage areas;
- demolition equipment is maintained and operated in a proper and efficient condition to reduce the likelihood of spills or leaks;
- measures to manage vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system;
- measures for the dewatering, storage, movement and treatment of groundwater encountered in excavations. Dewatered groundwater would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established Site wastewater management procedures, unless it is tested and is of suitable quality to be directed to stormwater;
- procedures for dewatering, including the need to liaise with NOW to ensure the necessary water licences are obtained, if required; and
- how the rehabilitation of bare soil would be managed across the Site once areas are returned to grade.

The Soil and Water Management Plan would be developed in accordance with '*The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following:

- silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary;
- silt and sediment traps would be installed across stormwater drains in proximity to excavation areas;
- stockpiles would be restricted to cleared areas and not impact vegetation;
- stockpiles would be placed on impermeable sheeting to prevent any infiltration;
- stockpiles would be managed in order to reduce dust creation; and

- stockpiles would not be located in close proximity to stormwater drainage systems.

The Soils and Water Management Plan would also outline the inspection program for erosion control structures and bunded areas.

Soil and Water Management Plan would also include measures for managing sediment in Botany Bay. This would include the need to have sediment curtains around the works area to ensure that the increased amount of sediment in the water column does not adversely affect the nearby seagrass communities. Measures would need to be taken to ensure that machinery used in the water column is appropriately prepared, checked and cleaned to avoid potential pollution impacts. Spill kits should be readily available. This is discussed in detail in **Chapter 18 Coastal Processes.**

As discussed in **Section 9.6.1**, as impermeable surfaces are removed during ground disturbance works there is the potential for increased rainwater infiltration to cause localised groundwater mounding. To minimise this affect in (e.g. Refinery Process Area), excavations would be undertaken in a staged approach to minimise the time that they are left open during rain events. Once the excavation is backfilled it would be compacted and covered in crushed concrete to help reduce rainwater infiltration.

The existing groundwater monitoring program would continue. Groundwater monitoring wells down gradient of the demolition works during demolition would continue to be tested on a quarterly basis to assess changes in concentrations of chemicals of concern and changes in groundwater flow direction or gradient.

9.7.1.3 Acid Sulphate Soils (ASS) Management Plan

As discussed in **Section 9.5.2**, ASS may be encountered within the demolition works area. As there is the potential for ASS in Zone F, the ROWs, Silver Beach and Botany Bay, an ASS Management Plan would be prepared in accordance with the *ASS Manual* (ASS Management Advisory Committee 1998) to manage ASS if encountered. This ASS management plan would include management and disposal options for acid sulphate soils and, if necessary, monitoring surface water discharges from the Site to ensure stormwater discharge has not been affected.

9.7.1.4 Asbestos Management Plan

An Asbestos Management Plan would be developed in accordance with the following guidelines:

- *Guidelines for the Assessment, Remediation and Management of Asbestos - Contaminated Sites in Western Australia* - May 2009;
- *Working with Asbestos Guidelines 2008*, WorkCover NSW;
- *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia 2011);
- *Code of Practice for the Safe Removal of Asbestos 2nd Edition* (NOHSC: 2002 (2005); and
- *The National Model Work Health and Safety Regulations* Safe Work Australia.

The Asbestos Management Plan should consider the following approach:

- A risk assessment on the management process to help ensure that on-site personnel and the local community are protected.
- Identify the likely potential receptors including site workers, development personnel, the local community, site visitors, future owners and occupiers, and service workers.
- The primary exposure concerns including human activities with the potential to generate the release of airborne asbestos fibres and / or natural forces such as wind and water erosion.
- Remediation options including:
  - Management in situ
  - Containment on-site; and
  - Removal of the contaminated material from the Site.

Caltex would utilise existing registers, procedures and plans in place for the Site for the preparation of an Asbestos Management Plan.

9.7.2 Work Permits

Where there is a potential for the interception of contaminated soils and/or during ground disturbing activities, Caltex would maintain the existing risk reduction measures in place across the Site. A work permit is required for work in the areas where potential soil and groundwater contamination exists (such as within tank bunds or for any works that can potentially expose groundwater). The work permit includes a hazard analysis, outlines controls (such as monitoring) and required personal protective equipment (PPE). Worker exposure is also reduced by restricting access to areas requiring work permits to only authorised personnel. In addition during ground disturbance, Excavation Permits are required. This permit needs to consider the potential for impacts to utilities, explosive atmospheres, ground stability, and exposure to contamination.

9.8 Summary

This chapter has considered a number of potential soil, groundwater and contamination related impacts which could arise from the demolition works. The assessment concludes that the demolition works would be likely to have negligible impacts on the soil and groundwater environment beneath and around the Site provided the management and mitigation measures outlined above are implemented. These management and mitigation measures are summarised below in **Table 9-2**.

Table 9-2 Management and Mitigation Measures – Soils, Groundwater and Contamination

Management and Mitigation Measures	Demolition	
	Design	Implementation
All materials would be stockpiled in accordance with 'The Blue Book' *Managing Urban Stormwater - Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following: • silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary; • silt and sediment traps would be installed across stormwater drains in proximity to excavation areas; • stockpiles would be restricted to cleared areas and not impact any vegetation; • stockpiles would be placed on impermeable sheeting; • stockpiles would be covered and wetted down in order to reduce dust creation; and • stockpiles would not be located in close proximity to any stormwater drainage systems.		✓
If Acid Sulfate Soils (ASS) are encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓
Runoff entering any excavations would be limited by using bunds or similar structures as required.		✓
Construction/***demolition*** workers would be instructed in appropriate health and safety and handling protocols for minimising human contact with contaminated soils and groundwater.		✓
Permits would be required to work in the areas where potential soil and groundwater contamination exists. The work permit includes requirements such as monitoring and PPE. No unauthorised entry into these areas is permitted, without a permit.		✓
A Contamination Management Plan would be developed to outline measures for monitoring, handling, storing and managing contaminated soils and contaminated groundwater. It would include the following: • ***During excavation visual and olfactory indicators of impact would be monitored.*** • ***Excavated soils would be separated into stockpiles according to odours, staining, and other environmental indicators. These soils would be placed into uniquely identified stockpiles and appropriately bunded and managed.*** • ***Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified VENM, ENM or appropriated remediated material would be used to provide additional backfill material.***		✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
• *If excavated material cannot be re-used or managed on-site then it would be removed off-site as waste to an appropriately licensed facility.* • *Further, excavated material; would be classified in accordance with EPL condition O5.1 which requires "any liquid and/or non-liquid waste generated and/or stored [at the Site] is assessed and classified in accordance with the NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste, batched, further tested (where required, for example Toxicity Characteristics Leaching Procedure (TCLP) testing).* • *The method of disposal or reuse would be in line with the materials' classification in accordance with specifications set out in a Waste Management Plan (WMP).*		
The Soil and Water Management Plan would outline management measures for any soils that are excavated or stored on-site during the demolition works and water management requirements. It would identify: • *the areas where soil disturbance is likely;* • *how excavations would be staged so that the length of time that excavations are left open and temporary stockpiles are required is minimised;* • *locations where soil would be stockpiled on-site for either removal, treatment or reuse;* • *that if additional backfill material is required, only certified VENM, ENM or appropriated remediated material would be used;* • *procedures to reduce erosion and the spread of dust;* • *restricting traffic to defined roads or tracks where necessary;* • *measures to protect excavations from increased stormwater runoff (e.g. by using bunds or similar structures where required);* • *measures to manage the storage of demolition specific liquids at the Site and the appropriate bunding or containment of demolition related fuel or chemical storage areas;* • *demolition equipment is maintained and operated in a proper and efficient condition to reduce the likelihood of spills or leaks;* • *measures to manage vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system;* • *measures for the dewatering, storage, movement and treatment of groundwater encountered in excavations. Dewatered groundwater would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established Site wastewater management procedures, unless it is tested and is of*		✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
suitable quality to be directed to stormwater; • ***procedures for dewatering, including the need to liaise with NOW to ensure the necessary water licences are obtained, if required; and*** • ***how the rehabilitation of bare soil would be managed across the Site once areas are returned to grade.***		
The Soil and Water Management Plan would also: • ***be developed in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004);*** • ***outline the inspection program for erosion control structures and bunded areas; and*** • ***The existing groundwater monitoring program would continue; and*** • ***Include a plan for corrective action should an unexpected increase in COPC be observed in the groundwater monitoring***		✓
An Asbestos Management Plan would be developed in accordance with the relevant guidelines. ***Caltex would utilise existing registers, procedures and plans in place for the Site for the preparation of an Asbestos Management Plan.***		✓

10 HUMAN HEALTH AND ECOLOGICAL RISK

10.1 Introduction

This chapter provides a summary of the qualitative assessment undertaken to understand the potential risks posed to human health and the environment by the demolition works. The Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) are provided in full in **Appendix C Human Health and Ecological Risk Assessment** as one consolidated report.

10.2 Scope of the Assessment

A qualitative HHRA and ERA were undertaken to address the SEARs (refer to **Appendix A SEARs and Application Documentation**) which requires the consideration of contamination, specifically:

"How ecological and human health risks posed by contaminants on the site would be mitigated and managed".

This chapter and **Appendix C Human Health and Ecological Risk Assessment** meet this requirement.

The overall objective of the HHRA and ERA was to determine the potential human health and ecological risks resulting from the demolition works and to provide recommendations for effectively mitigating and managing these risks.

To achieve this objective, the HHRA and ERA comprise the following scope of work (as relevant to each of the risk assessments):

- identification of key Contaminants of Potential Concern (COPC) that may be exposed / released as a result of proposed works;
- receptor identification;
- pathway identification and assessment as to whether the pathways are complete;
- qualitative assessment of the risks posed; and
- measures recommended to mitigate identified unacceptable risks.

10.3 Legislation and Planning Policy

Key legislation and policies that are relevant to **Appendix C Human Health and Ecological Risk Assessment** are discussed below.

10.3.1 Commonwealth

Amended National Environment Protection (Assessment of Site Contamination) Measure (NEPM)

The primary national framework for assessing risk on potentially contaminated sites is provided in the amended *National Environment Protection (Assessment of Site*

Contamination) Measure (Amended ASC NEPM) 1999 (NEPC 2013). The Measure has been adopted by all Australian jurisdictions.

This measure contains Guidelines on Investigation Levels For Soil And Groundwater (Schedule B(1)), Health Risk Assessment Methodology (Schedule B(4)), Ecological Risk Assessment (Schedule B(5)) and Health-Based Investigation Levels (Schedule B(7)).

The assessment of risk consists of four main phases, which are applied in the Amended ASC NEPM and considered within assessment:

1 data collection and evaluation;
2 toxicity assessment;
3 exposure assessment; and
4 risk characterisation.

Phases 2 and 3 are often conducted concurrently.

The most common approach to risk assessment is a simple comparison of the contamination site data against the relevant Investigation Levels. In most cases, if the contaminants meet the adopted Investigation Levels, the site is considered to be low risk and acceptable; if the contaminants exceed the adopted Investigation Level, then further evaluation is usually required.

10.3.2 NSW State Guidelines

Contaminated Land Management Act 1997 and Amendment Act 2008

The primary objective of the *Contaminated Land Management Act 1997* (CLM Act) is to establish a process for investigating and remediating land where contamination presents a significant risk of harm to human health or another aspect of the environment.

State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) provides a State wide planning approach to the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment.

State Environmental Planning Policy – Kurnell Peninsula 1989

State Environmental Planning Policy – Kurnell Peninsula 1989 (SEPP Kurnell Peninsula) aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is managed having regard to the environmental, cultural and economic significance of the area to the nation, State, region and locality. SEPP (Kurnell Peninsula) applies to the land within the Sutherland Shire, known as Kurnell Peninsula, and adjacent waterways.

The SEPP Kurnell Peninsula contains a number of aims and objectives including those that relate to the consideration and protection of the ecological resources as well as groundwater vulnerability and protection of wetlands. Ecological resources that are specifically mentioned include national parks, nature reserves, wetland areas, areas of ecological significance and the aquatic environment.

10.4 Method of Assessment

10.4.1 Risk Assessment Methodology

The risk assessment methodology for **Appendix C Human Health and Ecological Risk Assessment** focuses on a Conceptual Site Model (CSM), based on the source-pathway-receptor linkage concept. The CSM includes:

- source of COPC – impacted soil and groundwater resulting from recent or historic leaks or spills;
- transport media – migration of COPC in soil, surface water, groundwater, sediments, soil vapour or air. Groundwater transport includes dissolved phase and free phase liquids (also known as light non-aqueous phase liquids or LNAPL) such as gasoline and other liquid hydrocarbon fuels;
- exposure point/s – human and ecological receptors such as flora and fauna that may be adversely affected by impacts; and
- exposure route – pathway of contact with impacts (e.g. dermal contact, ingestion, inhalation and bioaccumulation).

If any one of these steps (source, transport media, exposure point or route) is absent, then the exposure pathway is incomplete and, hence, further assessment of risks is not required.

Where exposure pathways are complete or partially complete, then the pathways can be considered as significant. The significance of the exposure pathway depends on the nature of the impact present, and the likely exposure concentrations that may be associated with the pathway.

This assessment has been completed following the above approach in general accordance with the relevant legislation and guidance for risk assessment in Australia, as outlined in **Section 10.3** and **Appendix C Human Health and Ecological Risk Assessment**.

10.4.2 Environmental Information Sources

A desktop review of the following reports was completed in order to identify potential contamination sources:

- Soil and Groundwater Contamination Assessment, Classification and Risk Ranking Report (Coffey 2007);
- Soil and Water Contamination Data Review – Caltex Refinery, Kurnell (Caltex 2013a);
- Contamination Data Gap Assessment – Caltex Refinery, Kurnell (Caltex 2013b); and
- Contamination Data Gap Investigation Plan – Caltex Refinery, Kurnell (Caltex 2014).

The Caltex 2013a, 2013b and 2014 reports were issued pursuant to Environmental Protection Licence 837 – Preliminary Investigation Order 20131001 issued by NSW Environmental Protection Agency (EPA).

The following assessments that form part of this SEE were also utilised:

- **Chapter 9 Soil, Groundwater and Contamination;**
- **Chapter 14 Air Quality and Odour**;
- **Appendix G Ecology** (summarised in **Chapter 17 Ecology**) and
- **Appendix H Coastal Processes** (summarised in **Chapter 18 Coastal Processes**).

Taking all the available information into account, including site history, contamination incident reporting and the groundwater monitoring program over nearly 20 years, and considering the nature and scale of the proposed demolition works, it is considered that the Site is sufficiently characterised to enable a qualitative assessment of the risks to be completed.

10.5 Existing Environment

10.5.1 Sensitive Receptors

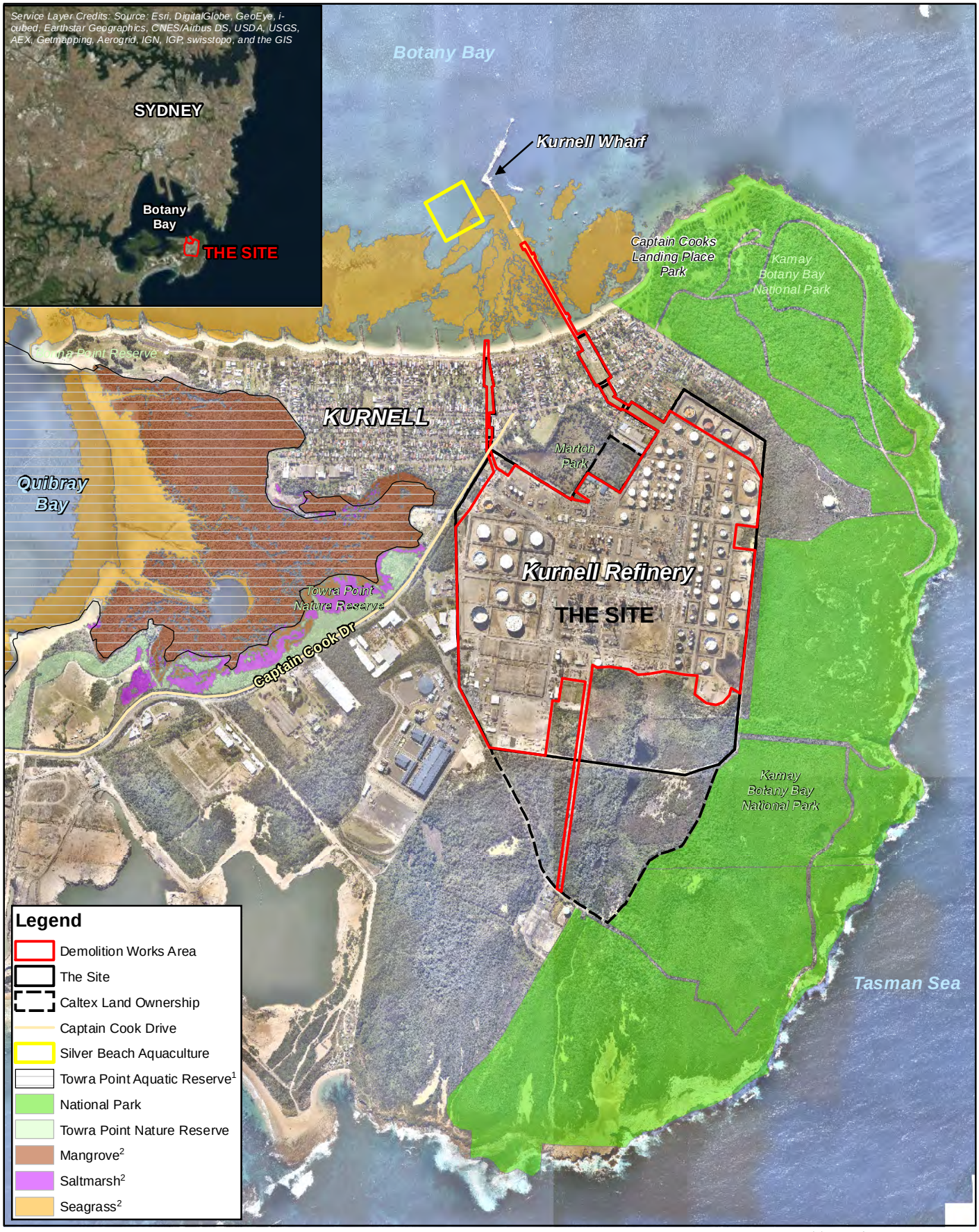
10.5.1.1 Overview

The demolition works area is adjacent to various sensitive receptors (refer to **Figure 10-1**) including:

- residential areas (such as Kurnell Village, containing residential properties, public recreational areas and schools);
- Botany Bay and Quibray Bay;
- Kamay Botany Bay National Park located adjacent to the eastern boundary of the Site;
- Towra Point Nature Reserve, a designated Ramsar wetland (603.7 hectares) located approximately 1.5 km to the west of the Site;
- Towra Point Aquatic Reserve which is adjacent to the Towra Point Nature Reserve and covers the majority of Quibray Bay;
- Marton Park Wetland; and
- areas zoned for Aquaculture (oysters) in Quibray Bay and Botany Bay.

The Site is located on land that was originally a low lying sandy / swampy area. Prior to the construction of the refinery, the Site was levelled and filled by excavating and spreading local sand dunes across the Site, and supplementing with a significant quantity of sediment from Botany Bay.

The majority of the demolition works area is largely devoid of vegetation and associated habitat. The exceptions to this are the Eastern ROW, the Western ROW, the continental carbon pipeline easement and the Silver Beach foreshore. Outside of the areas mentioned, the vegetation that remains is significantly degraded, providing limited value for native fauna. Across the demolition works area, amongst the tanks and bunded areas, hard stand areas, roads and pipeline easements a range of weeds and exotic grasses exist. There is limited connectivity across the demolition works area; however given that the Kamay Botany Bay National Park surrounds a large portion of area, some fauna dispersal across the Site could occur.



Source: Aerial Imagery from Nearmap 2014
[1]Office of Environment and Heritage (OEH)
[2]NSW DPI 2008

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SENSITIVE ENVIRONMENTAL RECEPTORS

URS

Figure: **10-1**

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Potential receptors within the demolition works area are both human receptors (i.e. Caltex staff and contractors) and one patch of native vegetation on Silver Beach foreshore (refer to **Figure 17-1** in **Chapter 17 Ecology**).

The key sensitive environmental aspects that may be impacted by the demolition works are outlined below.

10.5.1.2 Flora and Fauna

Appendix G Ecology contains a full summary of the flora and fauna considered during the development of the ERA.

Flora that were considered in the ERA include the vegetation associated with the stormwater receiving environments, including wetlands that connect with the Towra Point Nature Reserve and Towra Point Aquatic Reserve, a stormwater outlet that discharges on Silver Beach near the Silver Beach Aquaculture, and seagrasses and seaweeds that may be impacted by the removal of the cooling water pipeline (**Figure 10-1**). As discussed in **Section 10.5.1** the demolition works area only supports one patch of native vegetation - Silver Beach foreshore vegetation. This was also considered in the ERA.

While the Site is highly modified, threatened fauna that may potentially disperse across the Site and become trapped in excavations include the Green and Golden Bell Frog and the Wallum Froglet.

10.5.1.3 Soils, Surface Water and Groundwater

Several surface water features comprising both shallow water bodies and swampy areas exist in the southern part of the Site.

An unconfined aquifer of variable yield is located within the quaternary sands beneath the Site. There is evidence to indicate that there is variable depth to groundwater across the Site, ranging from approximately 1 metre below ground level (mbgl) close to the north-western boundary of the Site, to 15 mbgl in the south-eastern part of the Site. Within the demolition works area, the groundwater depth ranges from approximately 1 – 4 mbgl.

The groundwater flow beneath the Site is generally in a north-westerly direction and is largely influenced by the strike and dip of the underlying sandstone bedrock. **Figure 9-1** in **Chapter 9 Soils, Groundwater and Contamination** shows the groundwater flow direction across the Site.

Groundwater recharges through infiltration in the Kamay Botany Bay National Park (up-gradient of the Site). The groundwater merges with surface water as it intersects Botany Bay, or localised swampy wetland areas which exist to the south and north (Marton Park) of the Site (Coffey, 2007).

Marton Park Wetland (refer to **Figure 10-1**), a Groundwater Dependent Ecosystem, is located adjacent to the northern boundary of the Site. It currently receives surface water runoff and infiltration from the non-operational parts of the Site and a section of Caltex owned land between the Site and Marton Park. The vegetation community is a freshwater wetland which includes fringing Swamp Oak Floodplain Forest.

As presented in **Chapter 9 Soils, Groundwater and Contamination**, acid sulfate soils have been recorded and classified by Sutherland Shire Council[11] across the demolition works area. These have also been considered in the assessment.

10.5.2 Contaminants of Potential Concern

Based on historical land use and reported activities at the demolition works area, as well as a review of available data, the following key contaminants of potential concern (COPC) have been identified:

- Total Petroleum Hydrocarbons (TPH) – associated with diesel fuel, gasoline, heating oil, jet fuel, other petroleum-based products and wastes;
- Benzene, toluene, ethyl benzene, xylene (BTEX);
- Polycyclic aromatic hydrocarbons (PAH);
- Phenols;
- Lead (Pb);
- Asbestos; and
- Tributyltin (TBT).

The COPC identified are generally related to fuels and related products stored or used within the demolition works area. TBT is known to occur in certain parts of Botany Bay.

The fuel-based COPC are composed of a range of mixtures of organic compounds, including a range of volatile and semi-volatile organic compounds (VOC and SVOC) that have potentially adverse impacts on human health and the environment.

Contaminants detected at a petroleum refinery site may arise from a number of sources, including spills, leaks and waste management practices. In addition, there may be impacts due to movement of contaminants from other sections of the refinery (e.g. oily water overflow from the sewer system during intense rainfall periods).

Annual groundwater monitoring is undertaken on the Site. The groundwater monitoring program consists of annual monitoring of all wells for a broad range of COPC and other analytes of interest including nutrients, plus quarterly monitoring of targeted wells for TPH, BTEX, lead and phenols.

There are also a number of additional COPC that may potentially be relevant to the Site (refer to **Appendix C Human Health and Ecological Risk Assessment**). There is little or limited site data available for many of these additional COPC since they do not appear to be widespread across the demolition works area. However, given that the potential exposure routes are common with the primary COPC a number of management and mitigation measures provided in **Section 10.7** below would also address risks associated with the additional COPC.

[11] http://www.sutherlandshire.nsw.gov.au/General/Shire_maps

Extent of Impacts Across the Demolition Works Area

The Site is divided into 22 Contamination Management Zones (CMZ) (Zone A to Zone V) (refer to **Figure 9.3 and Chapter 9 Soils Groundwater and Contamination**). Each individual CMZ is a portion of the Site associated with a particular former activity and with an identifiable and limited group of contaminants associated with that former activity.

Table 9-1 of Chapter 9 Soils Groundwater and Contamination presents a summary of the potential sources and types of contaminants by CMZ for the CMZs relevant to the demolition works area. CMZs that are outside the demolition works area, or do not have any excavation occurring within them (i.e. the works to be undertaken on Kurnell Wharf) were not summarised in the table.

In considering the extent of impacts across the demolition works area, the lateral (area) and vertical (depth) extent of excavations were considered.

The lateral extent of the various impacts is presented in **Figure 9-3** and in **Table 9-1** in **Chapter 9 Soils, Groundwater and Contamination**.

The vertical extent of the demolition works would be limited. More specifically, the removal redundant infrastructure would require excavation work which may extend down to 2 mbgl (refer to **Figure 9-4** in **Chapter 9 Soils, Groundwater and Contamination)**.

During demolition works there is the potential for additional sources of contamination to be identified (e.g. beneath and around infrastructure). These materials have not been considered further, but recommendations are made to manage this potential risk in **Section 10.7.**

10.6 Impact Assessment

10.6.1 Human Health Risk Assessment

10.6.1.1 Introduction

The results of the soil investigations noted above have been examined in conjunction with available groundwater data for the Site (refer to **Appendix C Human Health and Ecological Risk Assessment)**. Using the COPC identified and the knowledge of the works to be undertaken, this information has been used to form an overall view of the contamination status of the soil in demolition works area.

As identified in **Section 10.5.2**, primary COPC for consideration in the assessment include TPH, BTEX, PAHs, phenols, lead, and asbestos. These COPC are a combination of both volatile and non-volatile compounds. These COPC may be encountered in soils or groundwater during excavations.

Additional considerations for the HHRA are presented below. Potential exposure pathways are also identified.

10.6.1.2 Contaminated Soils

The demolition works would involve excavations to a depth of up to 2 mbgl. The excavation works would be staged across a 2.5 year time period.

Volatile COPC or their degradation products may be exposed during excavation works. These COPC may pose acute risks to on-site workers through explosive or asphyxiating atmospheres in excavations or below ground services. However as the excavation works will not take place in an enclosed space, the risk of explosions or asphyxiation is minimised.

Asbestos has been noted on the Site in various places, mainly associated with pipeline easements and waste areas. It is described as being present in various forms, including small fragments and fibres, and in surface soil layers. The presence of asbestos has the potential to result in a risk to on-site workers particularly those handling or moving excavated soil. Caltex has procedures in place for identifying the presence of asbestos and for working in areas where asbestos is likely to be present (as noted on a register of contaminated areas for the Site).

Potentially complete pathways for soil contaminants to affect human health receptors during the demolition works include:

- direct contact with exposed soil on-site while working;
- incidental ingestion of soil and dust on-site while working;
- inhalation of vapour on-site from VOCs in the soil;
- inhalation of dust on- and off-site;
- inhalation of asbestos fibres in the soil, if present in a friable form or in a form that can produce fibres;
- contact with soil impacted stormwater run-off by workers on-site or members of the public off-site; and
- contact with dust or inhalation of vapours by members of the public in close proximity to work areas.

Recommendations have been made to minimise and monitor these impacts in **Section 10.7**

10.6.1.3 *Contaminated Groundwater*

Regular groundwater monitoring across the Site has provided the data required to assess how exposure to groundwater COPC could potentially impact on-site and off-site receptors (refer to **Appendix C Human Health and Ecological Risk Assessment**). Potentially complete pathways for groundwater contaminants to affect human health receptors during the demolition works include:

- direct contact with groundwater on-site while working;
- inhalation of vapour on-site from VOCs in the groundwater;
- Contact with groundwater impacted stormwater run-off by workers on-site or members of the public off-site; and
- Inhalation of groundwater vapours by members of the public in close proximity to work areas.

10.6.1.4 Exposure Pathways

Based on the relevant exposure pathways for contaminated soil and groundwater, the likely complete source – pathway – receptors that are present as a result of the demolition works include:

- **On-site Workers** – general staff and demolition-specific staff during preparation for and completion of demolition works. All on-site workers may be exposed to dust and vapours. Demolition workers may have direct contact with impacted soil or groundwater.
- **On-site Visitors** – due to the shorter exposure duration, this group of receptors are less likely to be at risk from the contamination associated with the demolition works compared to on-site workers. However, visitors may be exposed to dust and vapours.
- **Off-site Residents** – potentially exposed to dusts, vapours and run-off from nearby excavations. The Site is generally surrounded by bushland and vegetated areas, which would provide a buffer to residents against dust deposition. As such, there is a low risk of contaminated soil and dust moving from the main Site onto residential areas.

Excavations within the rights-of-way and road reserves may pose an increased risk to adjacent residential receptors. However, as noted in **Chapter 14 Air Quality and Odour**, the majority of winds blow in a direction away from the north and north-west residential areas.

Off-site human health receptors may also be exposed via direct contact with contaminated surface water should impacted stormwater run-off leave the Site. The potential for impacted groundwater to be ingested by off-site receptors has also been considered. Previous groundwater sampling programs inclusive of a number of off-site private bores have provided no evidence of contaminated groundwater from the refinery impacting on these receptors. A number of Kurnell residents have groundwater bores generally used for watering gardens. As such, off-site ingestion of groundwater is considered unlikely.

10.6.1.5 Conclusions

On-going risks to site workers and adjacent residents following the demolition works are considered to be lower than during the works as many of the residual sources of impact (e.g. redundant infrastructure) on the Site would be removed. Excavations would be returned to grade with excavated natural material (ENM), virgin excavated natural material (VENM) or remediated soils at the completion of works, and existing groundwater management measures would continue.

Based on the primary COPCs exceeding soil or groundwater investigation limits in historical reports, potentially complete exposure pathways, and identified human health receptors, the following risks would require management during the demolition works:

- Site demolition workers exposed to, or in direct contact with, soils impacted by asbestos and/or the COPC, or groundwater impacted by LNAPL or dissolved phase COPC;
- Site workers or visitors exposed to dust, vapours or impacted run-off; and
- Off-site residents exposed to dust, vapours or impacted run-off.

The measures to manage these potential risks are presented in **Section 10.7** and are considered appropriate for both the demolition works and the post-demolition phase (i.e. once the demolition works have been completed at the end of 2017).

10.6.2 Ecological Risk Assessment

10.6.2.1 Introduction

The ERA has identified the risks to the environment posed by existing soil and groundwater contamination across the demolition works area and outside the demolition works area This has included a consideration for the potential for contaminated sediment to be disturbed, the potential for the discharge of contaminated surface water to surface water bodies and physical excavation/ disturbance of habitat.

10.6.2.2 Exposure Pathway

Based on the risk assessment methodology in **Section 10.4.1** and the COPC identified in **Section 10.5.2**, **Table 10-1** below identifies potentially complete or partially complete exposure pathways for the demolition works. There are a number of pathways which have been assessed as partially or potentially complete and because of this appropriate management procedures would be required to minimise the potential for COPC to mobilise (refer to **Section 10.7**). Measures would also be required to eliminate or reduce the potential for organisms present within and outside the demolition works area from coming into contact with these contaminants.

Table 10-1 Assessment of Ecological Receptors and Exposure Pathways

Source	Receptor	Pathway/s	Complete / Incomplete?
Contaminated Soils	Flora present in demolition works area	Direct contact Active uptake	**Incomplete**: one parcel of terrestrial vegetation is present in the demolition works area (refer to **Section 10.5**). As this parcel is on Silver Beach, the sand is not likely to have been impacted by historic activities. Therefore this pathway has been excluded.
Contaminated Soils	Fauna present in demolition works area	Direct contact Ingestion of COPC Vapour inhalation Bioaccumulation	**Incomplete**: no fauna are expected to come into contact with the contaminated soils provided adequate measures are put in place (refer to **Section 10.7**).
Contaminated Soils	Flora present outside demolition works area	Mobility of COPC (from the Site via stormwater runoff, leading to (further) contamination of / deposition of contaminants onto soils outside the zone.	**Partial**
Contaminated Soils	Fauna present outside demolition works area	Direct contact with soils during periods of migration (e.g. frogs being exposed to COPC in trenched areas while moving across the study area)	**Partial**

Source	Receptor	Pathway/s	Complete / Incomplete?
Contaminated Groundwater	Flora present in demolition works area	Active uptake (especially by deep-rooted species). VOC damage to root systems.	**Partial:** one parcel of vegetation is present in the demolition works area.
Contaminated Groundwater	Fauna present in demolition works area	Vapour inhalation by burrowing animals	**Partial**
Contaminated Groundwater	Flora present outside demolition works area	Active uptake (especially by deep-rooted species). VOC damage to root systems.	**Partial**
Contaminated Groundwater	Fauna present outside demolition works area	Vapour inhalation by burrowing animals.	**Partial**
Contaminated Sediment	Aquatic flora and fauna	Direct discharge of impacted sediment to surface water.	**Partial**: demolition works disturbing contaminated material could release it into the surrounding environment. Available data suggests that the sand and sediment at Silver Beach are not likely to be significantly contaminated (refer to **Chapter 9 Soils, Groundwater and Contamination**) so this potential pathway has been excluded.
Increased turbidity	Aquatic flora and fauna	Reduction in light reaching aquatic plants and smothering of aquatic plants with sediments.	**Complete**
Discharge of contaminated surface water to surface water bodies	Aquatic flora and fauna	Direct discharge of impacted groundwater or stormwater to surface water.	**Potentially Complete**
Physical excavation / disturbance of habitat	Terrestrial Fauna	Potential hazards posed by trenching works to mobile organisms	**Potentially Complete**

Terrestrial Environment

Ground disturbance may potentially impact on-site and off-site receptors if excavation work and spoil is not appropriately managed. Pathways include surface water run-off, surface water ingress and the mobilisation of contaminants via leaching.

In addition, physical trenching and excavation works may also prove hazardous to wildlife that cross the demolition works area, creating a potential pathway for exposure. Key species of concern are amphibians and reptiles.

Care must therefore be taken to minimise surface disturbances where practicable, and to back-fill excavations and holes as soon as possible after excavation.

Protected species that may potentially be directly impacted by the demolition works are the Green and Golden Bell Frog and the Wallum Froglet (refer to **Chapter 19 Ecology**). Although a significant population is known to occur in close proximity to the Site, only limited potential habitat for threatened frogs was identified within the demolition works area. It is possible that the boundary of the demolition works area may be used by individuals moving between habitat pockets within both the National Park and the greater Kurnell Peninsula; however it is unlikely that they would enter the majority of the demolition works area given the lack of breeding or foraging habitat present. Given the demolition works would impact on only very small areas of marginal breeding or foraging habitats along the Continental Carbon Pipeline it is considered unlikely that the removal of this pipeline would impact on the lifecycle of either threatened frog species.

Loss of the dune vegetation at Silver Beach during the excavation and removal of the cooling water outlet pipeline may result in increased dune erosion. As winds are common in Botany Bay, it is likely that during the removal of the cooling water outlet pipeline and subsequent rehabilitation works, un-vegetated dune sands would be subject to erosive winds for extended periods (possibly up to two weeks). There are no contamination concerns from these works.

Several management procedures have been identified to minimise the risk posed to terrestrial flora and fauna. These are outlined in **Section 10.7**.

Marine Environment

As outlined above, during demolition works the main pathway of concern for aquatic receptors involves rain events potentially mobilising COPC through the infiltration of rainwater through impacted soil followed by the mobilisation of contaminants via leaching and potential discharge of contaminated groundwater to aquatic receptors (e.g. the Towra Point Nature Reserve, Towra Point Aquatic Reserve, Marton Park Wetland and the Aquaculture in Quibray and Botany Bay). In addition, direct surface water and sediment run-off from the demolition works may also provide a potentially complete pathway.

If excavation works were to occur during a rain event there may be a limited window of time when exposed soils may provide a pathway for impact to ecological receptors from increased infiltration of rainwater and potential mobilisation of COPC.

Where the cooling water outlet is being removed from Silver Beach and Botany Bay the potential for acid sulphate soils and other contaminants (TBT) to impact the marine

environment was also considered (refer to **Appendix G2 Marine Ecology Impact Assessment**). This has been identified as a partial pathway. The following was identified:

- The sand close to shore is classified in the low risk category (Class 5). This is due to the mobile nature of these recently deposited sediments which have low potential to cause significant acidification of estuarine waters, and hence little to no potential to damage seagrass or fish in the area.
- Recent investigations of TBT in sediments near the Kurnell Wharf have identified hotspots in their concentration, consistent with the areas used by large vessels, but none or very low levels in the nearshore environment, (URS 2013). The suspension of nearshore sediments as a result of the cooling water outlet pipeline removal works in Botany Bay, together with the use of silt curtains present little to no likelihood of impacts on oysters and marine snails in the intertidal and shallow subtidal zones due to dispersion of TBT.

A potentially complete pathway identified in the marine environment is the potential for works to remove the cooling water pipeline from Silver Beach to increase turbidity in the water column which in turn could adversely affect nearby seagrass communities. Increased turbidity affects seagrasses by reducing photosynthetic capacity and by smothering. To address this potential risk, a number of management and mitigation measures have been suggested. These are provided in **Section 10.7**.

10.6.2.3 Conclusion

Within the terrestrial environment, some partial and complete pathways have been identified (**Table 10-1**). However, the proposed demolition works present a low and acceptable risk to the environment as there are limited to on-site receptors, and appropriate mitigation and management measures would minimise and offset risks to mobile and off-site receptors (refer to **Section 10.7**).

Within the aquatic environment the proposed removal of the cooling water outlet pipeline is considered to present a low to negligible risk to protected habitats, communities and species for the following reasons:

- The proposed pipeline removal works would be in very shallow water with sandy substratum making the habitat unlikely for the vast majority of protected species such as seabirds, whales, dolphins, sharks etc.;
- The works would be of short duration, with the expected demolition period of two weeks unlikely to disrupt breeding migrations, block access to significant feeding grounds or fragment populations of migratory species;
- The works would be staged from land, eliminating potential spills and leaks from boats;
- Short-term disturbance to protected shorebirds using the groynes as foraging or roosting habitat would be limited to groynes 2 and 3 and alternative, suitable habitat occurs along Silver Beach (other groynes) and along the intertidal zone of Kamay Botany Bay National Park to the east of Kurnell Wharf; and
- Formal assessment of potential impacts on protected areas, species and communities undertaken for works of greater duration and involving higher levels of sediment and shoreline disturbance have concluded that impacts on these protected ecological

components were unlikely. Subsequent monitoring of such works have demonstrated no impacts to protected species and communities associated with much larger projects of longer duration (URS 2013, Cardno Ecology Lab 2014).

The demolition works would be conducted in a manner that would minimise and/or mitigate potential impacts that may otherwise affect nearby ecological receptors. These measures are discussed further in **Section 10.7 and Chapter 17 Ecology**.

10.7 Mitigation

The nature of the Human Health and Ecological Risk Assessment means that it draws upon information from a number of sources. As such, **Appendix C Human Health and Ecological Risk Assessment** presents a number of management and mitigation measures that have been provided in the following sections of this SEE:

- **Chapter 8 Hazards and Risks;**
- **Chapter 9 Soils, Geology and Groundwater;**
- **Chapter 11 Waste Management;**
- **Chapter 12 Surface Water, Wastewater and Flooding;**
- **Chapter 14 Air Quality and Odour;**
- **Chapter 17 Ecology;** and
- **Chapter 18 Coastal Processes**

In addition to these, the following management and mitigation measures would be implemented during demolition works and included in the DEMP:

Light Non-Aqueous Phase Liquids

- Light Non-Aqueous Phase Liquids (LNAPL) may be present in some parts of the demolition works area. Therefore Site personnel would be made aware of it and appropriate plans would be developed for managing LNAPL when or if encountered. The DEMP would outline an approach for managing LNAPL.

Health and Safety

- The location of potentially contaminated areas would be noted and provided to demolition personnel (especially with regard to certain specific contaminants such as asbestos, and potentially explosive or asphyxiating conditions in excavations and below ground services). Safety training would be provided and appropriate Personal Protective Equipment (PPE) used.
- If demolition workers are likely to work or come in contact with potentially contaminated soil, their Site induction would include an outline of the measures they can use to limit unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation etc.).
- Safety training, including information on Caltex's existing and demolition specific PPE requirements, would be provided to demolition staff. Where relevant, Site personnel would continue to work under the 'permit to work' system which includes the current practices described in **Chapter 9 Soils, Groundwater and Contamination**.

10.8 Summary

Appendix C Human Health and Ecological Risk Assessment assessed the potential exposure pathways for human and ecological receptors from soil, surface water and groundwater contamination during the demolition works.

Key contaminants of concern for human health and the environment currently present on the Site include the 'primary' Contaminants of Concern expected on a petroleum-based site: TPH, BTEX, Phenols and lead. Some asbestos is also known to be present.

Some primary COPC have been identified at levels that have potential to impact on off-site ecosystems if the contaminants migrate off-site. While the demolition works are unlikely to increase the mobility of these contaminants, the works must be controlled to ensure that these sources are managed appropriately and to minimise and offset potential impacts on nearby receptors.

As previously mentioned, a suite of mitigation measures in **Appendix C Human Health and Ecological Risk Assessment** have been covered in the various chapters of this SEE. Other mitigation measures specific to the assessment, which would be implemented during demolition works are provided in **Table 10-2**.

Table 10-2 Management and Mitigation Measures – Human Health and Ecological Risk

Management and Mitigation Measures	Demolition	
	Design	Implementation
Construction/***demolition*** personnel would be made aware of the potential presence of Non Aqueous Phase Liquids (NAPL) and would be shown how to identify its presence. The CEMP/***DEMP*** would include management measures to appropriately deal with any NAPL found on Site.	✓	
Construction/***demolition*** staff would be inducted and provided with training prior to working with potentially contaminated soil as part of the Project, to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation).	✓	
The location of potentially contaminated areas would be noted in the CEMP/***DEMP*** and provided to construction/***demolition*** personnel involved in soil excavation and handling. The CEMP/***DEMP*** would also identify the type of contamination found in each area. Where necessary, safety training and appropriate PPE would be provided.	✓	✓
Caltex would continue to monitor groundwater quality in areas that are known to contain impacts to ensure that significant mobilisation of COPC from groundwater to surface water is not occurring.	✓	✓

11 WASTE MANAGEMENT

11.1 Introduction

This chapter provides an assessment of the waste management issues relating to the demolition works. This chapter identifies, quantifies and classifies the various waste streams generated from the demolition works and proposes relevant management strategies for effective storage, reuse/recovery, treatment and/or disposal in accordance with applicable standards and regulatory requirements.

11.2 Scope of the Assessment

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requests that this assessment provides the following:

- *"accurate estimates of the quantity, characterization and classification of the potential waste streams generated;*
- *identification of beneficial reuse and/or alternative treatment opportunities for all wastes generated by the development; and*
- *a description of the measures that would be implemented to ensure than any waste produced is appropriately handled, processed and disposed of."*

This chapter will address these requirements by evaluating the waste resulting from demolition works and presenting a number of mitigation measures for appropriate waste management.

11.3 Legislation and Planning Policy

11.3.1 Commonwealth Requirements

11.3.1.1 National Waste Policy: Less Waste, More Resources (National Environment Protection Council, 2009)

The *National Waste Policy: Less Waste, More Resources* (National Environment Protection Council, 2009) (National Waste Policy) provides an integrated policy and regulatory framework that sets Australia's waste management and resource recovery direction to 2020. The policy builds on the 1992 *National Strategy for Ecologically Sustainable Development* (ESD) (COAG, 1992) commitments to improve the range, variety and quality of environmental resources and reduce the environmental impacts of waste disposal. This policy drives streamlined and accurate business reporting to the National Pollutant Inventory (and under a national product stewardship framework in the future).

11.3.1.2 National Environment Protection Measures (Implementation) Act 1998

Under the *National Environment Protection Measures (Implementation) Act 1998*, the National Environmental Protection Council (NEPC) was established to set national environmental goals and standards for Australia through the development of National Environment Protection Measures (NEPMs).

The following NEPM is relevant to the demolition works:

The National Environment Protection (National Pollutant Inventory) Measure (NPI)

The *National Pollutant Inventory* (NPI) NEPM (NEPC, 2008) establishes goals to assist in reducing existing and potential impacts of certain substances being emitted to air, land and water. Where the use of an NPI substance triggers the established threshold for that substance, emissions of that substance must be reported to the NPI. Emissions of these substances from various industrial and diffuse sources are reported to the NPI, (an internet database providing publicly available information on the types and amounts of certain substances being emitted). In 2008, the NPI NEPM was varied to require mandatory reporting of NPI substances in waste transferred to a destination for containment or final disposal.

Emissions to land, air and water from the demolition works would be reported in accordance with the NPI Guide (DSEWPaC, 2011). The NPI Guide (DSEWPaC, 2011) provides direction and guidance on NPI substances, trigger thresholds and reporting of emissions and transfers of waste. Emission estimation will be carried out in accordance with the most current Emission Estimation Technique Manuals (published online). The emissions associated with the demolition works would be reported to the Commonwealth Department of Environment and would be publicly accessible via the NPI database at www.npi.gov.au.

11.3.2 NSW State Requirements

11.3.2.1 *Protection of the Environment Operations Act 1997*

The NSW waste regulatory framework is set by the *Protection of the Environment Operations Act 1997* (PoEO Act). One of the PoEO Act's objectives is:

To reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following:

(i) pollution prevention and cleaner production;

(ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment;

(iia) the elimination of harmful wastes;

(iii) the reduction in the use of materials and the re-use, recovery or recycling of materials;

(iv) the making of progressive environmental improvements, including the reduction of pollution at source; and

(v) the monitoring and reporting of environmental quality on a regular basis.

The PoEO Act defines 'waste' for regulatory purposes and establishes management and licensing requirements along with offence provisions to deliver environmentally appropriate outcomes. The PoEO Act also establishes the ability to set various waste management requirements via the regulation.

11.3.2.2 *Protection of the Environment Operations (Waste) Regulation 2005*

The *Protection of the Environment Operations (Waste) Regulation 2005* (PoEO Waste Regulation) enables NSW to issue 'resource recovery exemptions' that allow for the beneficial 'reuse' of wastes via land application or for use as a fuel. These regulations support the principle of 'wastes to resources' where the wastes are fit for beneficial reuse.

The EPA can issue both general and specific resource recovery exemptions. A general exemption can be issued for commonly recovered, high-volume and well-characterised waste materials. These exemptions may be used by anyone, without seeking approval from EPA, provided generators, processors and consumers fully comply with the conditions they impose.

Where no general resource recovery exemption is available for the intended use, an application may be made to the EPA for a specific exemption, which would then be issued by the agency, if appropriate.

The PoEO Waste Regulation also sets out provisions that cover the way waste is managed in terms of storage and transportation as well as reporting and record keeping requirements for waste facilities. It also makes special requirements relating to asbestos and clinical waste.

Resource recovery exemptions are granted by the EPA where the land application or use as fuel or a waste material is a bona-fide, fit for purpose, reuse opportunity that causes no harm to the environment or human health, rather than a means of waste disposal. An exemption facilitates the use of these waste materials outside of certain requirements of the waste regulatory framework.

Where practical, Caltex intends on re-using and recycling wastes generated from the demolition works and acknowledges the potential need to apply for a resource recovery exemption if a specific waste to be re-used on-site are not listed under the list of general exemptions. The general exemptions potentially applicable to the demolition works include:

- cement fibre board;
- reclaimed asphalt pavement;
- recovered aggregate;
- recovered fines from construction and demolition waste - two exemptions; one based on 'batch' processing and another on 'continuous' processing; and
- stormwater.

11.3.2.3 *Waste Avoidance and Resource Recovery Act 2007*

The *Waste Avoidance and Resource Recovery Act 2007* (WARR Act) promotes waste avoidance and resource recovery by providing a framework for the development of strategies and programs such as the extended producer responsibility scheme for industry. It defines the waste hierarchy ensuring that resource management options are considered against the following priorities:

1 **Avoidance** including action to reduce amount of waste generated;
2 **Resource recovery** including reuse, recycling, reprocessing and energy recovery; and
3 **Disposal** including management of all disposal options in the most environmentally sensitive manner.

11.3.2.4 *Waste Avoidance and Resource Recovery Strategy 2003 and 2007*

The previous NSW Waste Strategy was issued in 2003. It provided a framework for reducing the generation of waste and improving the efficient use of resources. Broad targets included in the strategy aimed at:

- preventing and avoiding waste;
- increasing the recovery and reuse of secondary resources;
- reducing toxic substances in products and materials; and
- reducing litter and dumping.

The 2003 Strategy was superseded in 2007. Whilst this saw the retention of the 2003 targets, it also saw the introduction of a number of key actions and programs that would be implemented by EPA to support meeting these targets. The targets set by the above Strategy can be directly applied to the demolition works. They require that proposals:

- achieve 76% recovery (the target for the construction and demolition sector);
- avoid using any of the 'priority substances' that are considered toxic; and
- ensure appropriate waste management processes are in place to prevent littering/dumping.

The *Waste Avoidance and Resource Recovery Strategy 2007* recognises the importance of the waste hierarchy to guide effective resource management. It acknowledges, however, that different materials require different approaches. The choice of approach, including re-use, recycling and energy from waste, will depend on a balance of factors including economic and environmental considerations.

11.3.2.5 *NSW Waste Classification Guidelines*

Waste classification helps those involved in the generation, treatment and disposal of waste, ensure the environmental and human health risks associated with their waste is appropriately managed in accordance with the PoEO Act and its associated regulations. Part 1 of the Waste Classification Guidelines: (DECCW, 2009) (WCG) provides advice and directions on classifying waste so that appropriate management of all waste types is achieved.

Waste material from the demolition works would be classified in accordance with these guidelines. The following waste classifications are relevant to the demolition works:

- Special waste;
- Liquid waste; and
- Pre-classified waste, including:
  - Hazardous waste;
  - General solid waste (putrescible); and
  - General solid waste (non-putrescible).

Part 2 of the WCG provides guidance on immobilising contaminants in hazardous waste so that they will not be released into landfill as leachate at levels of concern. It also includes

guidelines on applying to the EPA for immobilisation approval. The EPA issues immobilisation approvals in accordance with Clause 50 of the PoEO Waste Regulation. Immobilisation approvals may either be general or specific immobilisation approvals. There is potential need to apply for specific immobilisation approval due to the hazardous wastes generated by the demolition works. A specific immobilisation approval would apply if:

- it is not possible to reuse, recycle or reprocess the waste and that treatment to remove or destroy the contaminants is not feasible; and
- the contaminants are not covered under the existing general immobilisation approvals.

11.3.3 Local Government Requirements

The Site is located within the Sutherland Shire Council Local Government Area (SSC LGA). The *Sutherland Shire Local Environment Plan* (SSLEP) (2006) and *Development Control Plan* (DCP) (2006) outline development requirements which need to be considered for projects within the SSCLGA.

The SSLEP aims to promote an appropriate balance of development and management of the environment that will be ecologically sustainable, socially equitable and economically viable.

Notwithstanding the above, the Site is zoned pursuant to SEPP (Kurnell Peninsula). Therefore, the local zoning provisions of the SSLEP are not applicable to the demolition works. Refer to **Chapter 5 Legislation and Planning Policy** for further details on the SEPP (Kurnell Peninsula) requirements in relation to the demolition works.

The DCP 2006 outlines key control measures designed to ensure sustainable development within the SSC LGA. However, this does not specifically outline waste management control measures that would need to be adopted for the demolition works.

11.4 Method of Assessment

The waste management assessment involved an analysis of the proposed methods for demolition to identify potential or likely waste streams and volumes arising from the demolition works. The assessment has been completed using information provided by Caltex and the requirements of legislation and policy outlined in **Section 11.3**.

11.5 Existing Environment

11.5.1 Existing Waste Management Measures

Wastes generated from Caltex's existing operations in Kurnell are generally recycled or sent to landfill for appropriate treatment and disposal in accordance with the existing certified environmental management system (EMS) for the Site and Caltex's Waste Management System (WMS) 2012. The WMS outlines the current waste management processes currently in place at the Site.

As stated previously, it is intended that the waste generated from demolition works would be recycled and if possible, reused on-site. Some wastes generated from the demolition works such as general solid waste, stormwater, oily water and sewerage would continue to be

managed in accordance with the existing EMS and WMS and associated procedures, in particular:

- PROC 5.06.11.001 Kurnell Waste Management;
- PROC 5.06.11.002 Use of Sludge Lagoons;
- PROC 5.06.11.003 Management of Used and Empty Drums;
- STD 5.06.11.001 Management of Waste Skip Bins in the Kurnell Refinery;
- STD 2.05.03.018 Hazard Control of Equipment & Material Leaving Site; and
- STD 2.05.03.019 Recyclable Materials Handling.

The Site also has conditions on its existing EPL (EPL 837) for the management of waste:

- *O5.1 The licensee must ensure that any liquid and/or non-liquid waste generated and/or stored at the premises is assessed and classified in accordance with the NSW (2009) Waste Classification Guidelines as in force from time to time.*
- *O5.2 The licensee must ensure that waste identified for recycling is stored separately from other waste.*

Where relevant, the management of waste from demolition works would also comply with the conditions of the EPL.

The key on-site waste management facilities utilised for management of waste generated from existing operations include:

- Empty Drum Storage Area: The Empty Drum Storage Area is used for the storage of empty drums prior to sending them for recycling.
- Waste Water Treatment Plant (WWTP): Water treatment involves three stages of treatment from physical to chemical and biological. The unit allows on-site treatment of all effluent, spent caustic waste, second and third flush water from the Polymerisation Plant reactors and a large range of aqueous liquid wastes. Refer to **Appendix D Water Management Report** for further details.
- Landfarm: This is used to degrade the hydrocarbon content of oily sludge's, tank bottoms or highly contaminated sand/soil used during a spill. Access to the Landfarm is controlled through the use of a Waste Disposal Permit. No material is to be placed on the Landfarm or hard stand adjacent to it without the authorisation of an approved Waste Disposal Permit.
- Slop Troughs: The Site operates a melting trough for the recovery of clean oils for reprocessing.
- Metal Recycling Area: This is used to store only uncontaminated metal pieces, which are suitable for on-site reuse, or off-site recycling.

11.6 Impact Assessment

11.6.1 Environmental Values and Potential Impacts

Waste has the potential to impact ecological function and services, biodiversity, water quality, social value and human health. However, if re-use options are available and utilised, waste can be considered a resource.

The environmental values that have the potential to be impacted by waste during the demolition works are:

- life, health and wellbeing of people;
- diversity of ecological processes and associated ecosystems;
- land use capability, having regard to economic considerations; and
- the management of finite natural resources.

The effective management of waste would protect these values through the duration of the demolition works.

If not managed responsibly, waste generated by the demolition works has the potential to cause the following impacts:

- land and water (surface and groundwater) contamination as a result of spills or inappropriate storage, handling, transportation and disposal of solid and liquid wastes;
- increased population of vermin and spread of disease from inappropriate storage and handling of wastes;
- visual amenity impacts caused by poorly executed demolition activities and inappropriate storage of waste; and
- inefficient and careless use of resources.

Management strategies developed for each waste stream have been designed to be consistent with the waste management hierarchy, meet relevant legislation and policy, and to achieve the environmental objectives of the demolition works.

11.6.2 Waste Generation

The key activities associated with the demolition works expected to generate waste include:

- demolition of redundant refinery infrastructure- structures to be pushed over and cut-up to allow for transport by truck;
- demolition of redundant storage tanks - cut-up to allow for transport by truck;
- removal of redundant above ground pipelines- cut-up to allow for transport by truck;
- removal of redundant below ground pipelines including pipelines in the Western ROW, Eastern ROW, road reserves, Silver Beach, Botany Bay, Kurnell Wharf and the Continental Carbon Pipeline (refer to **Figure 4-1**)- pipes would be dug up, cut-up to allow for transport by truck;

- removal of sections of sewer systems, cabling and underground services - pipes would be dug up, cut-up to allow for transport by truck; and
- removal of buildings and foundations associated with redundant infrastructure.

The target is to recycle 90% of the generated material streams and where possible reuse it on-site.

The estimated quantity, classification, and primary source of major waste streams generated during the demolition works are summarised in **Table 11-1**.

Table 11-1 Estimated quantity, classification and source of primary waste streams

Waste Type	Estimated Approximate Quantity	Classification[1]	Primary Source
Steel and alloys	40,000 t	General Solid (Non-Putrescible)	Demolition of redundant refinery infrastructure, tanks and product pipelines
Other mixed building and demolition waste	1,000 t	General Solid (Non-Putrescible)	Demolition of redundant refinery infrastructure, buildings and pipelines
Concrete	3,600 t	General Solid (Non-Putrescible)	Demolition of redundant refinery infrastructure and tanks in particular removal of concrete foundations. Removal of the cooling water intakes and outlet in the Eastern and Western ROWs.
Uncontaminated Soil	148,000 t	General Solid (Non-Putrescible)	Removal of foundations and underground pipelines
Contaminated soil	2,000 t	To be determined	Removal of foundations and underground pipelines
Asbestos	2,000 t	Special Waste	The asbestos removal program would include asbestos waste from all insulation on lines and vessels, internal materials, corrosion protection materials on lines, refractory and building materials.

Notes: 1) Waste classification would be confirmed prior to disposal in accordance with the *Waste Classification Guidelines* (DECCW, 2009)

Other waste streams that would be generated in relatively minor quantities include:

- General Solid Waste (Non-putrescible) including packaging waste, and asphalt waste;
- General Solid Waste (Putrescible) food waste from demolition workers;
- liquid waste including wastewater from dewatered groundwater (contaminated and uncontaminated) from demolition activities (refer to **Chapter 9 Soils. Groundwater and Contamination**); and

11.7 Management Strategy and Mitigation Measures

To manage the potential waste impacts during the demolition works a Demolition Waste and Resource Management Plan (DWRMP) would be produced for the works. This would be a sub-plan to the DEMP.

The DWRMP would be based on the following overarching objectives, principles and strategies to deliver effective waste management across the Site.

11.7.1 Waste Management Objectives

The environmental objectives for the management of waste generated from the demolition works are to:

- minimise the waste generated throughout the demolition works and maximise the reuse and recycling of waste materials produced; and
- store, handle, transport, and dispose of waste in an environmentally responsible manner that does not cause harm or contamination to soil, air or water.

11.7.2 Waste Management Strategy

The waste management hierarchy is a framework for prioritising waste management practices to achieve the best environmental outcome.

The preferred order of adoption is as follows:

- **Avoid** by identifying appropriate materials and procuring.
- **Reduce** waste by optimising construction, operation and decommissioning methods.
- **Reuse** waste by identifying sources that can utilise the waste.
- **Recycle** waste by identifying facilities that are able to recycle waste.
- **Recovery** of waste materials, including energy from waste.
- **Disposal** of waste at an appropriate facility.

The underlying objective of effective waste management is to minimise the impacts to environmental and social values and to implement sustainability principles. To deliver effective waste management across the Site, a number of strategies would be adopted. These are discussed below.

11.7.3 Waste Minimisation and Cleaner Production

Waste prevention and minimisation would be addressed, where feasible, through the use of efficient demolition techniques to minimise generation of residual waste not suitable for re-use or recycling.

During the initial planning and conceptual design phases for the demolition works, waste minimisation measures have been considered and would continue to be developed and implemented during the works. Where feasible the generation of waste would be identified and prevented or reduced through minimising the use of raw materials, energy, and water by applying cleaner design practices.

Cleaner Production

Cleaner production principles are preventive continual environmental protection processes designed to maximise resource efficiency and minimise waste. Cleaner production techniques

involve identifying and reducing environmental impacts along the entire life cycle of a project by conserving resources (raw materials, energy and water), eliminating toxic raw materials and reducing the quantity and toxicity of all emissions and wastes.

The following cleaner production techniques have been identified as being applicable to the demolition works:

- the adoption of demolition techniques that help ensure that minimum waste volumes are generated during demolition works;
- application of efficient demolition processes to ensure resourcefulness in the use of energy, water, and natural resources;
- provision of resource efficiency and waste minimisation procedures in contracts to encourage demolition contractors consider environmental management objectives;
- the re-use of formwork and scaffolding where feasible;
- provision of separate waste containers/skips to ensure waste material segregation and maximise the opportunities for re-use and recycling; and
- safe storage and disposal of residual demolition waste ensuring least amount of harm to surrounding environment.

Source Separation

The identification and separation of solid waste would be carried out at the point of generation to aid the maximum re-use and recycling of materials. Appropriate containers and bins would be provided in designated locations for the source separation of materials and to aid the separation of re-usable and recyclable materials.

11.7.4 Waste Storage and Handling

Table 11-2 outlines the proposed management strategy for each of the primary waste streams expected to be generated from the demolition works. Materials generated by the demolition works that are not required in the short term for backfilling excavations would be stored in dedicated areas on the former CLOR site (refer to **Figure 4-1**) for subsequent re-use, recycling or disposal.

Table 11-2 Waste Management Measures for Primary Waste Streams

Waste Type	Classification[1]	Management Strategy
Steel and alloys	General Solid (Non-Putrescible)	Collected in dedicated scrap metal stockpile bins on-site. Re-use on-site or off-site recycling by a licenced waste contractor.
Other mixed Building materials	General Solid (Non-Putrescible)	Collected in dedicated stockpiles on-site. Re-use on-site, off-site recycling and/or disposal by a licenced waste contractor.
Concrete	General Solid (Non-Putrescible)	Collected in dedicated stockpiles on-site. Concrete that is suspected to have been contaminated would be segregated. Contaminated waste concrete would be appropriately tested and classified prior to recycling or disposal off-site. Contamination free concrete would be reprocessed and reused on-site or sent off-site for recycling.
Uncontaminated Soil	General Solid (Non-Putrescible)	As the works progress, the soil removed during the excavation work would be stockpiled and, where appropriate, reused as backfill. Refer to **Chapter 9 Soil, Groundwater and Contamination** for further details.
Contaminated soil	To be determined	Managed in accordance with methodology outlined in **Chapter 9 Soil, Groundwater and Contamination**.
Asbestos	Special Waste	The asbestos removal program would include asbestos waste from all insulation on line and vessels, internals materials, corrosion protection materials on lines, refractory and building materials. The asbestos waste stream would be prepared for off-site disposal to a licenced facility in line with appropriate controls and existing Caltex procedures.

11.7.5 Waste Re-use

Waste re-use would be achieved by identifying re-use opportunities on-site and subsequently identifying market demands for waste items. To this end Caltex has recently put a large number of redundant process units up for sale and is hopeful that several items may be re-used at other facilities locally and around the world.

Throughout the demolition works, investigations would continue looking into re-use opportunities, both on-site and with local businesses/industries. Additionally, the marketability of wastes would be regularly reviewed to ensure potential new and emerging opportunities for waste re-use are identified and maximised.

To maximise re-use opportunities wastes would be segregated. Where feasible, Caltex would work with suppliers and investigate the opportunities for the re-use of packaging materials and surplus materials, such as timber pallets and scrap metal.

11.7.6 Waste Recycling

Where practical and considering potential health and hygiene issues, wastes would be collected and segregated on-site and stored in suitable containers before being transported to approved licensed facilities.

The market demand for recyclables would be investigated as volumes of waste materials are generated and an assessment would be undertaken to assess the opportunities for these waste streams. This assessment would consider the availability and capacity of local recycling facilities.

Caltex would work with local industries to encourage them to take advantage of opportunities for re-use and recycling where feasible.

11.7.7 Waste Disposal

The disposal of waste materials would be considered as last resort and where all other avenues have been investigated. Where no other option is available, all waste would be handled and disposed of in a manner that causes the least environmental harm.

General waste would be transported to a local licensed landfill for disposal in line with regulatory requirements. Regulated wastes would be handled by a licensed waste contractor and transported to an appropriate regulated waste facility.

Caltex intends to utilise existing local waste management facilities and would employ licenced waste management companies to manage the identified waste streams arising from the demolition works that require disposal.

11.7.8 Waste Monitoring and Auditing

On-site waste monitoring and auditing procedures would be developed for the demolition works for types of waste streams, volumes produced, and waste management practices.

The objectives of these procedures would be to provide:

- an assessment of the actual waste, quantities and their classification;
- monitor the potential environmental impacts;
- review the waste transportation records and disposal routes;
- enable positive actions to be taken in the event of incidents or accidents occurring on-site;
- recommend future actions to improve waste management practices; and
- monitor the implementation of the principles of waste management hierarchy.

Inspections of the waste management areas would be conducted on a weekly basis to ensure that correct waste management procedures are being followed, in that all waste materials are appropriately separated, stored and labelled.

New waste streams would be addressed as they arise and assessed to determine the most suitable management measures to use when handling, storing, transporting and disposing of

the waste. Unidentifiable waste streams would be analysed and sent for testing in an accredited laboratory to assess the risks associated with handling and disposal of the waste.

11.7.9 Waste Reporting

A database inventory would be used to record and report all waste streams, volumes and management measures for all waste streams arising through the demolition works. This database would be used to inform internal and external stakeholders, and government agencies on the types and volumes of waste being generated, re-use and recycling rates, and the types and quality of substances emitted to land, water and air.

Caltex would report on the waste emissions for the demolition works in accordance with EPL and NPI reporting requirements.

11.8 Summary

Table 11-3 provides a summary of the mitigation measures and monitoring commitments that would be described in the DWRMP and implemented during the course of the demolition works to minimise waste impacts and promote resource efficiency. The DWRMP would form part of the DEMP.

Table 11-3 Management and Mitigation Measures – Waste

Management and Mitigation Measures	Demolition	
	Design	Implementation
The Project would be integrated into existing resource efficiency, waste management and handling, emergency response and preparedness plans for the existing ***Site***	✓	✓
Construction and Operation *Waste and Resource Management Plans* (WRMP) and ***Demolition Waste and Resource Management Plans (DWRMP)*** would be compiled prior to the each phase commencing.	✓	
The WRMPs and ***DWRMP*** would: • identify requirements consistent with the waste and resource hierarchy; • ensure resourcing efficiency is delivered through the design and responsible construction, ***demolition*** and operational practices; • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures (consistent with current management practices relating to Caltex's Kurnell Waste Management System); • identify disposal and management routes consistent with current management practices as adapted for the Project; • set out clear requirements for meeting legislative and regulatory requirements; • define requirements to support Caltex's sustainable procurement objectives through effective, design, construction, operation and procurement; and • set out processes for disposal, including on-site transfer, management and the necessary associated approvals.	✓	✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
The WRMP and ***DWRMP*** would incorporate the requirements of the waste and resource hierarchy and cleaner production initiatives.	✓	✓
The WRMP and ***DWRMP*** would include a process for auditing, monitoring and reporting, which would include regular inspections off-site activities and the waste management area(s). The WRMP and ***DWRMP*** would be subject to regular auditing and a system would be used to record and report the types, volumes and management measures for all waste and resource arising from/used for the works.	✓	✓
Project-generated waste would be segregated at source and stored in accordance with current Site practices. Site management practices would potentially need adapting to consider additional storage requirements. Regardless, all waste would be stored in suitable containers and designated waste management areas.		✓
Caltex's existing procedures for the disposal of sewage, greywater, hazardous materials, general waste and recyclable materials would be adopted for the Project (and modified if required). This would include using licensed contractors to remove and transport waste from the Site.	✓	✓
A Waste Register would be prepared, used and maintained by the Demolition Contractor to track all wastes generated from demolition works. ***The Demolition Contractor would retain waste receipts to indicate evidence of waste disposal.***	✓	✓
Stockpiled wastes would be: • ***appropriately segregated to avoid mixing and contamination;*** • ***clearly labelled;*** • ***contained in bunded areas and if necessary on an appropriate lining;*** • ***less than 5m in height; and*** • ***located >40m away from any sensitive receivers, heritage, ecological areas and watercourses.***	✓	✓
Materials to be re-used would be analysed to ensure material is not contaminated and re-use is appropriate.	✓	✓
An Asbestos Management Plan would be prepared and implemented in accordance with relevant legislative and other requirements. This plan would outline proposed methods of managing asbestos waste by the contractor.	✓	✓
The Site's existing Asbestos Waste Register would be amended as appropriate, implemented and maintained to track asbestos wastes generated during demolition works.	✓	✓
If stored on-site, asbestos wastes would be located away from operational areas and properly sealed and contained to ensure minimise human exposure and clearly labelled. Signage and barriers/fencing would be installed to ensure all employees, contractors and visitors would keep away from the area at all times.		✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
The removal and disposal of asbestos wastes would be undertaken by a licenced asbestos contractor.		✓
A Decontamination Area would be provided on-site for all authorised personnel handling asbestos.	✓	✓
All liquid and non-liquid wastes generated from demolition works would be assessed, classified and managed. Wastes would be disposed of at an appropriately licenced facility.		✓

12 SURFACE WATER, WASTEWATER AND FLOODING

12.1 Introduction

This chapter provides a summary of the potential impact of the demolition works on surface water values. It includes a consideration of surface water, wastewater and flooding. The full assessment is provided in full in **Appendix D Water Management Report**.

12.2 Scope of the Assessment

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requests that this assessment provides the following:

- *"an assessment of the potential impacts to soil, groundwater and surface water resources;*
- *a surface water, wastewater and flooding assessment which includes details on how stormwater would be managed during and post works; and*
- *identification of any water licencing or other approvals required under the Water Act 1912 and/or Water Management 2000."*

Impacts related to potential soil, groundwater and land contamination impacts are discussed in **Chapter 9 Soils, Groundwater and Contamination**.

The potential impact of the demolition works on the surface water values at Silver Beach are discussed in **Chapter 10 Human Health and Ecological Risk Assessment** and **Chapter 18 Coastal Processes**.

12.3 Legislation and Planning Policy

Protection of the Environment Operations Act 1997 (PoEO Act)

The Site operates under Environment Protection Licence (EPL) No 837. The EPL was last amended 21 May 2014. The EPL contains conditions regulating a range of Site operations with potential to impact on the environment. These conditions include for the management of impacts on surface waters.

The EPL nominates environmental monitoring and/or permissible discharge points with corresponding identification numbers. The EPL sets treatment/monitoring requirements and may require additional studies and/or investigations to be undertaken. These additional studies/investigations are referred to as Pollution Studies or Pollution Reduction Programs (PRPs) and are included as conditions of the EPL by the EPA.

A Stormwater Management Plan (SMP) was prepared for the Site under a previous EPL Condition (PRP U24.1). This plan committed Caltex to implementing a stormwater management strategy and completing a number of stormwater management measures in a staged manner. This plan and its proposed measures are an important consideration for this assessment.

Water Quality Objectives

Water Quality Objectives are the environmental values and long-term goals that should be considered when assessing the likely impact of activities on waterways. These objectives are set out within the Australian and New Zealand Environment Conservation Council (ANZECC) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) ('the ANZECC Guidelines'). The water quality objectives have been developed for both fresh and estuarine and marine water. They are not intended to act as regulatory criteria, limits or conditions, but offer guidance when making decisions affecting the future of a waterway (DECCW 2009).

The Water Quality Objectives for Estuaries within the Georges River Catchment Management Area (CMA) are:

- aquatic ecosystems - to maintain or improve the ecological condition of waters;
- primary contact recreation - to maintain or improve water quality so that it is suitable for activities such as swimming and other direct water contact sports;
- secondary contact recreation - to maintain or improve water quality so it is suitable for activities such as boating and fishing where there is less bodily contact with the waters;
- visual amenity - to maintain or improve water quality so that it looks clean and is free of surface films and debris; and
- aquatic foods (cooked) - to maintain or improve water quality for the production of aquatic foods for human consumption (whether derived from aquaculture or recreational, commercial or indigenous fishing).

The Tasman Sea, to which treated effluent for the Site is discharged, is classified as a marine water environment. The Marine Water Quality Water Objectives/Environmental Values for the Sydney Metropolitan and Hawkesbury-Nepean area which includes the areas under Sutherland Shire Council are:

- Aquatic ecosystem health – to maintain or improve the ecological condition of oceans waters;
- Primary contact recreational – to maintain or improve ocean water quality so that it is suitable for activities such as swimming and other direct water contact sports;
- Secondary contact recreation – to maintain or improve ocean water quality so it is suitable activities such as boating and fishing where there is less bodily contact with the waters;
- Visual amenity – to maintain or improve water quality so that it looks clean and is free of surface films and debris; and
- Aquatic foods – to maintain or improve ocean water quality for the production of aquatic foods for human consumption (whether derived from aquaculture or recreational, commercial or indigenous fishing).

12.4 Method of Assessment

This chapter and the assessments within **Appendix D Water Management Report** have been based on a number of data sources. These included:

- Environment Protection Licence No. 837 and associated Pollution Reduction Programs;
- design, layout and system information for the Project and Site from Caltex;
- information regarding the demolition works methodology and staging from Caltex;
- publicly available Catchment Management Authority (CMA) and NSW Government information including information from the Botany Bay Water Quality Improvement Program, Water Quality Objectives and data on surrounding areas;
- Caltex's Stormwater Management Plan (2012) for the Site;
- existing surface water and wastewater studies of the Site (GHD, 1992, 1993);
- Kurnell Township Flood Study Final Report (WMAwater, 2009);
- Kurnell Floodplain Risk Management Plan, Final Study, April 2012 (WMAwater, 2012); and
- aerial and satellite imagery.

To assess the impacts of the demolition works, the following legislation, guidance and standards were used:

- the statutory planning framework and appropriate legislative context (refer to **Section 12.3** and **Chapter 5 Legislation and Planning Policy**);
- the National Water Quality Management Standards and Guidelines;
- *Floodplain Development Manual – the Management of Flood Liable Land* (DIPNR, 2005); and
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy*, ANZECC 2000.

The Water Management Assessment is predominantly qualitative in nature; however some quantitative data has been used where applicable.

Flooding impacts on the Site have been projected using available information from a flood study conducted of the Kurnell catchment by WMAWater for the Sutherland Shire Council in 2009 (WMAWater, 2009). While detailed topographic level survey information, sufficient to develop contours, was available for the north western portion of the Site (in the vicinity of the wastewater treatment plant (refer to **Figure 4-1**)), for the remainder of the Site there was not enough topographical information to create a model of the existing surface. However, surveyed spot levels were available to allow consideration of the potential for flooding within the Site. Therefore, the Site was divided into two sections for the flood assessment.

12.5 Existing Environment

12.5.1 The Local Catchment

The Site is located on the Kurnell Peninsula surrounded by marine and estuarine surface water bodies, which in addition to land, constitute the receiving environments for surface water discharges from the Site. The main water bodies in proximity to the Site include the Tasman Sea, Botany Bay, Quibray Bay, Weeney Bay, and the Marton Park Wetland area (refer to **Figure 12-1**).

The Site is located within the Botany Bay catchment, which extends across an area of 1,165 km^2. The catchment is part of the Greater Sydney Region of Local Land Service NSW.

The Botany Bay Catchment has four main sub-catchments, based on the major river systems and other areas which drain to it. These are the:

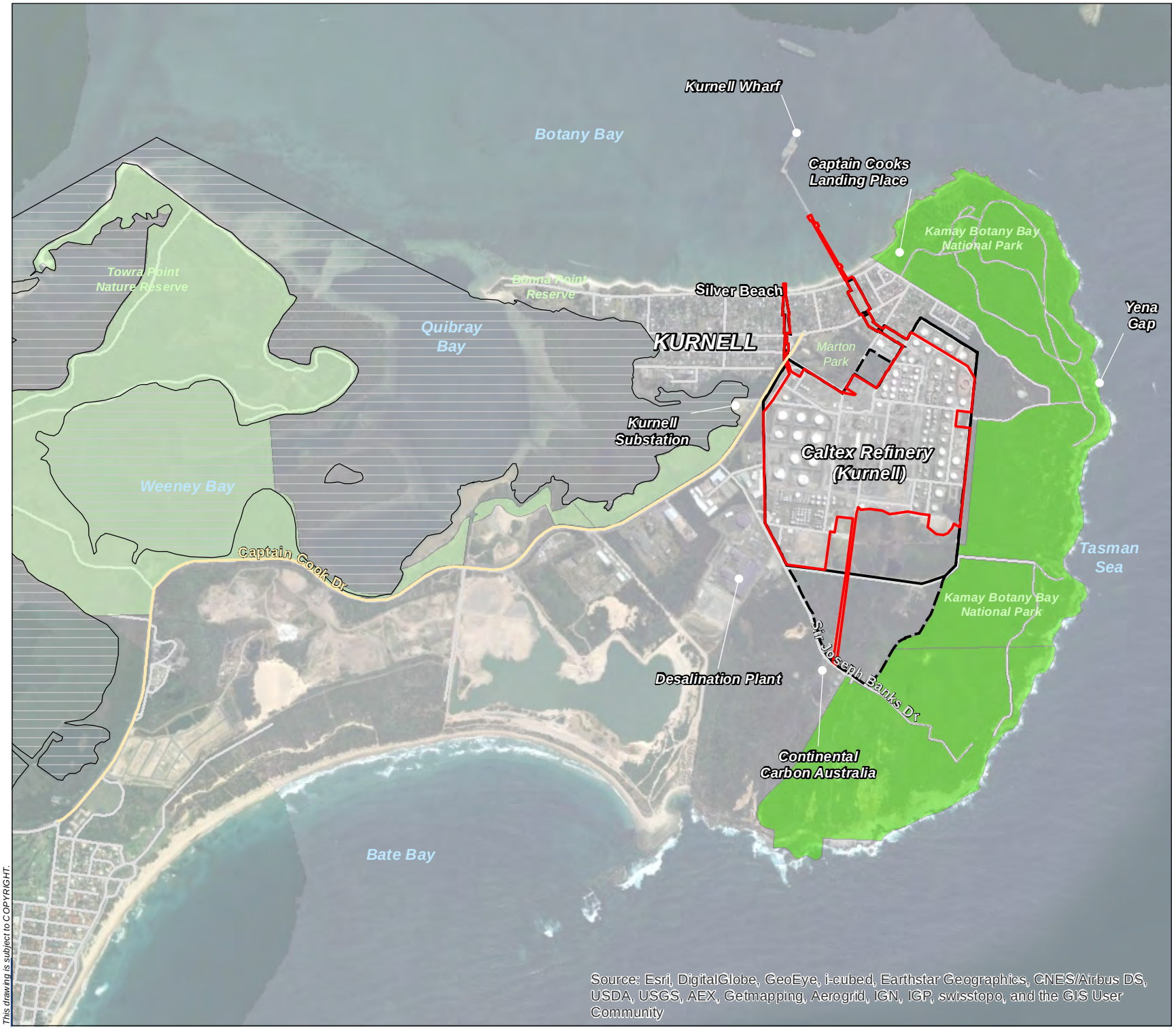
- Georges River catchment;
- Cooks River catchment;
- Woronora catchment; and
- Botany Bay (direct discharge) catchment.

The Site is located in the catchment area that drains directly to Botany Bay. A substantial part of the catchment is highly developed with almost 40% of its area being used for urban, industrial or commercial purposes.

In order to facilitate a more accurate assessment of the potential impacts of the demolition works, the main catchments of Botany Bay have been further divided into sub-catchments, based on smaller drainage areas and drainage lines. Therefore the Site falls within the Kurnell sub-catchment. Information from the Kurnell sub-catchment has been used to understand the existing pollutant loads from the area immediately around the Site.

The surface waters and related environments in proximity to the Site have varying environmental values and sensitivities. The demolition works area is close to areas of ecological value including:

- Botany Bay;
- Quibray Bay;
- Towra Point Nature Reserve (including Ramsar wetland area and SEPP 14 wetlands);
- Towra Point Aquatic Reserve;
- Marton Park Wetland (a Groundwater Dependent Ecosystem); and
- Kamay Botany Bay National Park.



Legend

- Captain Cook Drive
- Demolition Works Area
- The Site
- Caltex Land Ownership
- Minor Roads
- Towra Point Aquatic Reserve ^
- National Park
- Towra Point Nature Reserve

N
W E
S

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 250 500 1,000
Meters

Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers.
^ Office of Environment and Heritage (OEH)
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SITE SETTING AND SURROUNDING ENVIRONMENT

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Figure: **12-1**

Rev. **B** A4

12.5.2 Stormwater Management

Topography within the Site is generally flat, although steeper areas exist toward the eastern Site boundary. Soils within the Site are sandy with sandstone bedrock. Stormwater runoff generally flows from the eastern boundary through pipes and open channels towards the northwest into the Quibray Bay, Botany Bay, and Marton Park Wetland. Some stormwater flows onto the Site across the eastern Site boundary from the Kamay Botany Bay National Park.

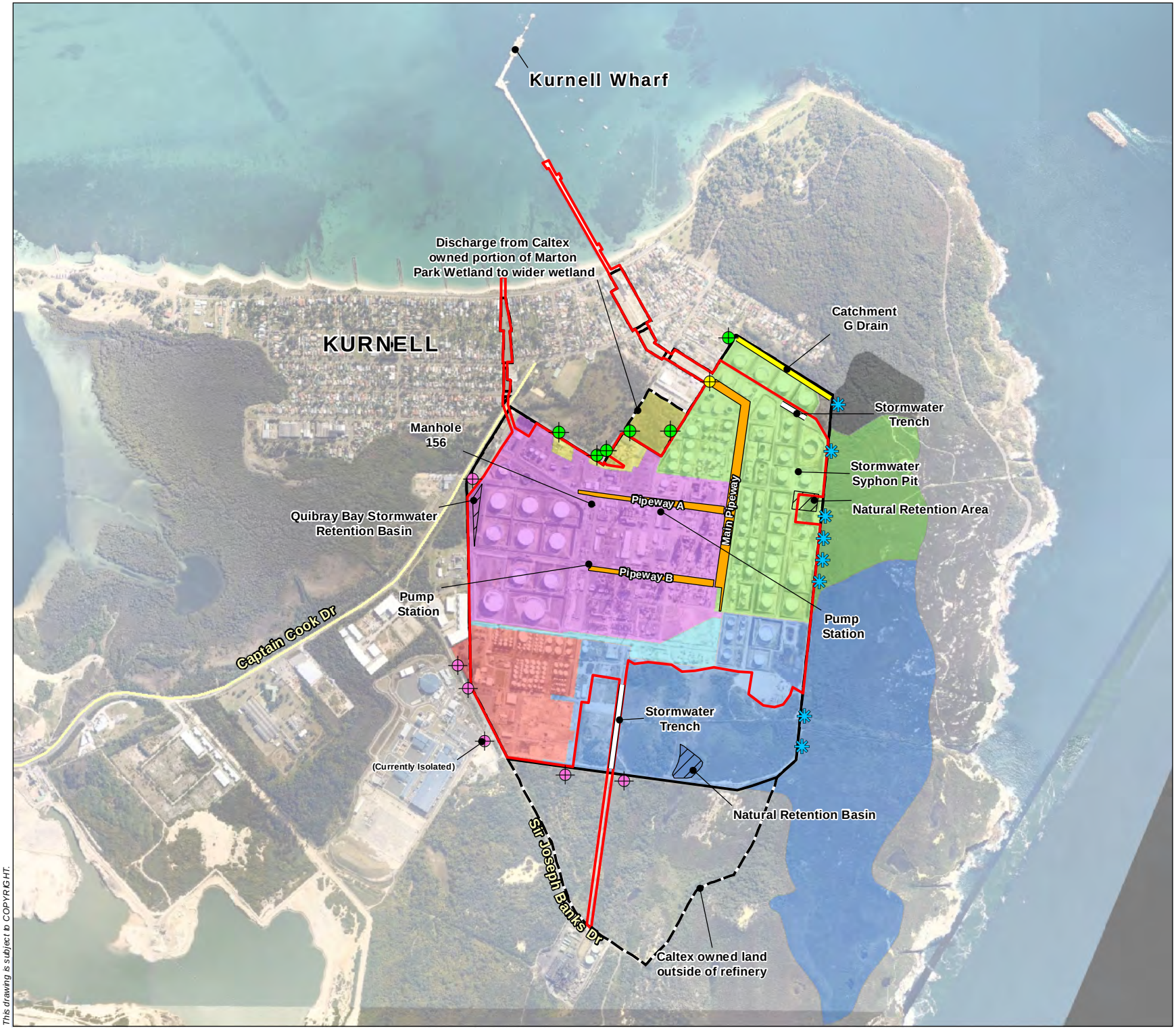
Stormwater generated on the Site is collected in the Site's stormwater system. The stormwater system only collects runoff from areas of the Site that have been designated low risk with respect to interaction with petroleum products, including primarily the 'non-process' areas of the Site, such as roadways and building roofs. Stormwater is discharged offsite into three receiving water bodies, Quibray Bay and Botany Bay, or Marton Park Wetland.

The Site has a separate oily water system to handle water that is or may be impacted by petroleum products, including a proportion of stormwater runoff collected from areas where there is or may be interaction with petroleum products such as tanks, bunds and refinery process areas. This water is treated at the Wastewater Treatment Plant (WWTP) prior to being discharged to the Tasman Sea.

There are seven main catchment areas on the existing Site, as shown in **Figure 12-2** and described in **Table 12-1**.

Table 12-1 Stormwater Drainage System Catchments

Catchment	Location Description
A	Eastern and northern area of the Site which includes the large eastern tank area.
B	Central area of the Site which contains majority of the refinery process areas as well as offices, cafe, workshops and store houses; and western part of the Site which contains wastewater treatment plant, western tank area, LPG loading area and storage plant, the Quibray Bay Stormwater Retention Basin and parking area.
C	Northern corner of the Site which includes main offices, former staff houses, gardens, employee car park and wetland.
D	An area between the Caltex Lubricating Oils Refinery (CLOR) and the refinery which contains a flare stack and concrete channel.
E	South western corner of the Site occupied by the now decommissioned CLOR, and which contains yard office, workshop, laboratory, maintenance, process units and tank compounds.
F	South eastern corner of the Site, which predominately comprises relatively undeveloped land and a small area of tank compound, the landfarm area (which is a bioremediation site), a recycling area, and a sludge lagoon.
G	North eastern undeveloped area mostly outside of the Site boundary, which is part of the Kamay Botany Bay National Park.



Legend

- Demolition Works Area
- The Site
- Caltex Land Ownership
- Pipeway
- Stormwater Trench
- Catchment G Drain

Inflow Pt

- From Kamay Botany Bay National Park

Discharge:

- To Botany Bay
- To Marton Park Wetland
- To Quibray Bay

Catchments

- Catchment A
- Catchment B
- Catchment C
- Catchment D
- Catchment E
- Catchment F
- Catchment G

N
W E
S

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

0 100 200 400
Metres

Aerial Imagery - Nearmap 30/06/2014

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DRAWN: STB/SB APPROVED: RO DATE: 22/10/2014

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

EXISTING STORMWATER CATCHMENT AREAS AND DISCHARGE AND INFLOW POINTS

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There are various retention, retarding and treatment systems incorporated into the Site's stormwater system. The specific stormwater retention, treatment and disposal systems in each catchment are discussed in detail in **Table 3-3** of **Appendix D Water Management Report**.

The main Site catchments with the potential for interaction between petroleum products and stormwater are Catchments A and B (including Catchment D[12]), primarily along the pipeways. These are also the catchments in which the majority of the demolition works would occur.

The systems incorporated into the stormwater system to regulate flow and discharge rates and prevent discharge of impacted stormwater from the Site are summarised as follows:

- provision for isolation of drainage in pipeways;
- installation of manually operated skimmer pumps at pump transfer points (pumping to the oily water sewer system);
- ability to redirect stormwater to the intermediate sewer (Catchment B (including Catchment D) only);
- retention in an onsite retention basin (Catchment B (including Catchment D) only);
- discharge via siphon systems; and
- treatment in API oil/water/solids separators.

As the CLOR has ceased operation and has been demolished, runoff from this area is no longer treated prior to offsite discharge. The only exception is water that collects in the former CLOR oily water sewer system, which is now pumped to the Refinery/Terminal oily water sewer system.

Activities and infrastructure in Catchment C and part of Catchment F are not dissimilar to those generally in commercial urban areas. Catchment G and much of Catchment F is undeveloped land. Runoff from these areas is, consequently, similar to urban or undeveloped land runoff and is discharged off-site without on-site treatment.

Stormwater from the Site is discharged, ultimately, to three receiving environments. These include:

- discharge by open drainage lines to Quibray Bay through a narrow strip of the Towra Point Nature Reserve and the mangrove wetland;
- discharge into Botany Bay at Silver Beach near the wharf; and
- discharge to Marton Park Wetland primarily by infiltration.

Due to incidents of localised flooding on-site which resulted in oily water being discharged from the Site on three separate occasions in June 2010, March 2011 and April 2012, Caltex prepared a Stormwater Management Plan (SMP) which was submitted to the EPA on

[12] Catchment D is no longer a separate catchment, and is now part of Catchment B. It was originally a separate catchment that drained to an infiltration area in the west of the Site. This area is now occupied by a tank and the drainage was modified to accommodate its construction. It has been maintained as a separate catchment within this report for consistency with the Stormwater Management Plan for the Site.

5 October 2012. The SMP has now been partly implemented by Caltex and implementation is ongoing. Caltex continues to work with the EPA to implement the ongoing stormwater improvement strategy to prevent localised flooding.

Catchments A and B, the main Site catchments in which the review and improvement measures contained within the SMP are focussed, are the main areas where the demolition works would take place. The SMP is further discussed in **Section 12.5.6**.

12.5.3 Stormwater Quality

The current stormwater treatment systems are designed to address suspended solids (settleable) and phase separated petroleum hydrocarbons. The key water quality management strategy adopted by the Site has been to prevent, to the extent practicable, interaction between petroleum hydrocarbons and stormwater.

The main stormwater quality threats arise from Catchments A and B. The remaining catchment areas have a lower risk of impacting significantly on stormwater quality. It is expected that when stormwater flows are within the hydraulic and treatment capacity of the Site's stormwater treatment systems, the stormwater quality would exhibit similar characteristics to stormwater runoff from the surrounding urban areas. This assessment is based on:

- the nature of the Site's existing infrastructure, products, and activities within the stormwater system catchments;
- the fact that the Site's stormwater management system separates stormwater and oily water; and
- the reduced risk of discharging impacted stormwater as a result of retention treatment of stormwater for the removal of oil and sediment.

12.5.4 Oily Water Management

The existing Oily Water Management System (OWMS) at the Site collects process effluent and rainfall runoff from areas of the Site where there is potential for interaction of water streams with petroleum products. Oily water is collected in the OWMS and is transferred to the wastewater treatment plant.

Oily water is treated in the WWTP. The treatment process utilises physical, chemical and biological treatment to treat the oily water. Under the current EPL conditions, all wastewater must be treated using the biotreator in the WWTP or the oil-water separators/induced air floatation system prior to discharge at Yena Gap. **Section 5.2.3** of **Appendix D Water Management Report** describes the WWTP treatment process.

Following the shutdown of the refinery, the overall oily water volume and contaminant load would reduce substantially. As discussed in the assessment for the conversion works, the WWTP will continue to operate under the existing EPL until the Project is completed.

12.5.5 Flood Risk

The Site lies at south eastern portion of the Kurnell township catchment. According to the *Kurnell Township Flood Study Final Report* (WMAwater, 2009), prepared on behalf of

Sutherland Shire Council, Kurnell is susceptible to flooding from both rainfall and tidal inundation. Its localised depression and low lying topography can make it vulnerable to extensive flooding (WMAwater, 2009).

Flooding within the Kurnell Catchment may occur as a result of the following factors, which can occur in combination or in isolation:

- high tide or storm surge which causes water levels to elevate in Botany Bay and Quibray Bay;
- intense rainfall which causes water levels to elevate within the open channel that runs beside Captain Cook Drive and along roads and through private property. The rise in water level may also be affected by constrictions, e.g. culverts, blockages, fences and buildings;
- local runoff ponding in low lying areas that has limited potential for drainage. Flooding may be exacerbated by inadequate or blocked local drainage provisions and restricted overland flow paths; and
- tsunami impact on the east coast of Australia from a tsunami arising from subduction zone earthquakes in the Pacific.

The proximity of the Site to Quibray Bay means flood behaviour for the Site is influenced by storm tide effects. Flooding of the Site can be caused by:

- high rainfall over the catchment;
- elevated tidal levels at the drainage outfalls; or
- a combination of both.

Flooding of land from surface water runoff is usually caused by intense rainfall events. No flood modelling for the Site has been completed. The *Kurnell Township Flood Study Final Report* (WMAwater, 2009) provided flood modelling for the township of Kurnell but excludes the Site. This study concluded that Captain Cook Drive, near the western boundary of the Site will be overtopped during the 1% year (also known as a 1 in 100 year) Annual Exceedance Probability (AEP) flood. Similarly provisional hydraulic hazard mapping of the Kurnell Township indicated that most of the areas which were classified as 'High Risk' from flooding are wetlands (including part of the Quibray Bay wetlands and Marton Park wetlands) located near the western and northern boundaries of the Site.

The impacts of flood events on the Site were not directly assessed in the WMAwater study (2009) for the Sutherland Shire Council (SSC). The Site is generally elevated above the surrounding low lying areas on the western and northern boundaries, and the on-site bunding around petroleum products storage areas effectively increases the flood height that would need to be present for any interaction between petroleum products and flood waters to occur.

12.5.6 Stormwater Management Plan

As previously discussed, there have been occasions of oily water discharge from the Site during periods of very high rainfall. This is known to have resulted from flooding in Catchment B with the discharge having occurred through the cooling water outfall into Botany Bay. In response to stormwater quality impact issues regarding the Catchment B stormwater system,

the EPA imposed a requirement under the previous EPL PRP condition (PRP U24.1) for Caltex to prepare a Stormwater Management Plan (SMP) to prevent the discharge of contaminated waters from the Site at all times. This SMP was to be implemented in a staged manner. This plan was prepared and submitted on 5 October 2012.

The various elements of the strategy are outlined in **Section 3.2.6** of **Appendix D Water Management Report**. The SMP has now been partly implemented by Caltex and implementation is ongoing. The key actions that have been taken to date include:

- All major stormwater infrastructure on the Site was inspected by CCTV and cleaned in 2013.
- A number of specific stormwater system improvement projects have been implemented, including:
  - Modification of the Main Pipeway siphon system and installation of a new oil skimmer to improve performance of these systems.
  - Construction of retention walls to prevent stormwater from the Main Pipeway in Catchment A from entering Pipeway A and B in Catchment B.
  - Increase in the bund height of some Oily Water System infrastructure to reduce the potential for interaction between this system and stormwater.
  - Diversion of runoff from a contractors carpark in Catchment B to Catchment C to reduce load on Catchment B systems; and
  - Hydraulic improvement to stormwater retention and treatment systems in Catchment B to reduce the potential for flooding in this area.
- Design of a National Park Stormwater Diversion system has been completed. This involves intercepting some of the Kamay Botany Bay National Park stormwater inflows in Catchment A at the eastern Site boundary and diverting these via a relined pipeline inside the refinery's northern and western perimeter directly to the lower part of the catchment where stormwater flows into the main pipeway. This project is currently being implemented and is planned to be completed in the first quarter of 2015.
- Stormwater flow monitoring to improve understanding of current Site stormwater flows has commenced.

The actions within the SMP will continue to be implemented concurrently with the Project.

12.5.7 Water Supply and Usage

In 2010/11, the Site consumed approximately 6 ML of potable water per day for process operations and 1 ML per day for amenities. At this time, the refinery was in full operation (though the CLOR was no longer operating) and the Site workforce was up to a maximum of about 1,385 persons. As the conversion works progress, the process and amenities water usage will decline.

The refinery will have shut down by the end of 2014, and at that stage, a substantial portion of the potable water usage as process water (about 6 ML/d in 2010/11) would have ceased. It has been estimated that a maximum of 1ML/d would be required for the ongoing operation of the terminal.

The domestic type water usage (drinking, toilets, showers, lunchroom, etc.) would decline significantly with the decrease in employee and contractor workforce.

The predicted overall potable water usage post conversion works, as discussed in the conversion works EIS, is predicted to be less than 10% of the 2010/11 usage, i.e. less than 1 ML/d.

The Site has a comprehensive fire protection system, which (amongst many other features) includes an extensive fire water ring main and fire hydrant system. Two firewater storage tanks at capacity of 8 ML each are available from the north and south (R4Risk, 2012).

The Site's firewater is supplied by municipal potable water. Firewater will still be required for the terminal.

12.6 Impact Assessment

12.6.1 Stormwater

Demolition Works

The demolition works would be staged and would occur in all catchments, although the majority of the works would be within Catchments A and B (refer to **Figure 12-2**).

Potential impacts to stormwater associated with the demolition works include those arising from demolition and ground disturbance works (i.e. potential impacts to stormwater run-off quality), as well as potential changes to the operation of stormwater catchments in the short and longer term (i.e. catchment hydraulics).

Stormwater quality impacts could arise from:

- erosion and entrainment of dust, soil and other material in stormwater from areas where ground disturbance works and excavation are required;
- leaks of fuel and hydraulic fluid from various plant items required for the demolition works potentially impacting on stormwater quality;
- leaks of residual matter from within redundant plant and equipment prior to removal, which could impact rainwater runoff quality; and
- impact on stormwater quality arising from interaction with contaminated soils potentially exposed by demolition and/or excavation works.

Catchments A and B both have controls in-place that remove suspended solids from stormwater by sedimentation and remove oil by gravity separation. These would remain in place throughout the duration of the demolition works. Given that the demolition works are only planned to proceed following the deinventoring, depressurisation and cleaning of redundant plant etc., it is expected that only minor amounts of hydrocarbon residues would potentially be present prior to the demolition works occurring.

The demolition of tanks and process unit areas to grade has the potential to unearth contaminated soils, which if exposed, could impact stormwater runoff quality.

The management of potential impacts on stormwater runoff quality during the demolition works would be detailed within a Demolition Environmental Management Plan (DEMP). The DEMP

would include specific management plans including a Contamination Management Plan and a Soil and Water Management Plan. The measures documented within these plans would be implemented to avoid or mitigate potential stormwater quality impacts from the demolition works. The measures that would be included within the DEMP are discussed in more detail in **Section 12.7**.

Post Demolition

Surface Water Management

The existing stormwater management system at the Site would remain intact once all of the demolition works are complete. The Site stormwater receiving environments would also not change.

The main ongoing potential impact on catchment yields following the demolition works are on Catchment B, where the refinery process units are located. These areas would be disconnected from the oily water sewer system and some bunding and oily water sewer system connection infrastructure would be removed. Infrastructure above grade, and some foundations and concrete slabs would also be removed.

The removal of this infrastructure in the refinery process area would increase the effective area of Catchment B, and hence stormwater yield. However, the increase in yield would not be expected to be proportional to the increase in area. This is because the removal of the hard surface areas within the refinery process area would decrease the amount of runoff generated compared to when the area previously discharged to the oily water sewer system. Overall, the impact on the system hydraulics is not expected to be significant but this would be confirmed by the modelling to be conducted for the SMP.

Following the demolition phase, bunded tank farm areas would remain connected to the OWMS, regardless of whether they contain tanks. Bunds would be drained by manual drain valve operation.

The quality of stormwater arising from the Site during and following the demolition works would be of a similar character as is currently the case. Potentially contaminated water would be directed to the OWMS and managed in accordance with the EPL. Stormwater would be managed with existing systems.

Overall, the change in volume and quality of stormwater discharged from the Site, arising from the demolition works is not expected to be significant. The Site stormwater system would continue to be reviewed and improved in line with the requirements of the SMP.

12.6.2 Oily Water Management

During the demolition works, the refinery process area would be disconnected from the OWMS and some of the infrastructure would be removed from beneath the refinery process units. The OWMS in remaining areas including the eastern and western tank farm areas would be kept in service throughout the conversion works, and stormwater runoff from these bunded areas would continue to be routed to WWTP, regardless of the removal of some of the tanks. Tank bunded areas and tank water drains would remain largely unchanged and flow from these areas would continue to be treated in the WWTP. The Site would continue to handle ballast and pipe wash water, though the quantities may vary from those currently handled.

In addition, with the shutdown of the cooling water system, the intermediate sewer system would be directed to the OWMS. This potential increase in load on the system would be more than offset by the significant reduction in load arising from the shutdown of the refinery.

Following the shutdown of the refinery during the conversion works, the overall oily water volume and contaminant load would reduce substantially. This would be slightly offset by an increase arising from the redirection of the intermediate sewer system from the cooling water system to the OWMS during and after the demolition works. The WWTP would continue to operate under the existing EPL until the Project is complete. The treated wastewater effluent generated during and after the demolition works, would continue to be discharged to Yena Gap in accordance with the current EPL.

12.6.3 Flooding

The risk profile of the Site with respect to the ability to accommodate high rainfall events and/or broader flooding events would not significantly change from that which currently exists during and following the demolition works. The existing tank farm bunds would be left intact, even if the tank within it is removed. While some redundant infrastructure would be removed the existing ground levels would essentially be the same, and hence there would be no significant change in the flooding risk profile.

12.6.4 Water Supply and Usage

Water supply would be required during the demolition works for a range of uses including:

- dust suppression;
- general cleaning; and
- general workforce amenities.

This water would be potable water supplied by Sydney Water. Existing supply infrastructure would be utilised. Some onsite water supply infrastructure, particularly in the refinery process area, would be removed during demolition works. The firewater system would be supplied by potable water only. The overall Site water demand during the demolition works would be significantly lower than current usage, but marginally higher than when the Project is complete. Water demand during the demolition works is estimated at 1 ML/d.

The demolition works would result in peak increase of approximately 230 employees and contractors at the Site. This corresponds to about 173 kL/d potable water usage above the amount anticipated for when the Project is complete.

The demolition works would utilise the existing domestic wastewater infrastructure. Reductions in domestic wastewater volumes would be approximately proportional to workforce reductions. There would be no other significant changes to domestic wastewater management on the Site arising from the demolition works. It would continue to be pumped to the Sydney Water sewerage system for treatment at the Cronulla Treatment Plant.

12.7 Mitigation

12.7.1 Demolition works

Stormwater

Measures to manage potential impacts to stormwater runoff quality during the demolition works would documented within DEMP. The DEMP would include a Contamination Management Plan and a Soil and Water Management Plan. Where relevant, these plans would include measures that are consistent or similar with those detailed within the Conversion Works CEMP.

A number of management and mitigation measures would be used to minimise soil erosion, sedimentation and contamination of nearby surface waters. Measures that would also avoid or manage potential impacts on soils and groundwater have been detailed in **Chapter 9 Soils, Contamination and Groundwater** and are not repeated here. These measures would help manage potential impacts on surface water receptors. Key amongst these would be to complete the demolition works in line with 'The Blue Book' *Managing Urban Stormwater – Soils and Construction Volume 1 and 2* (Landcom, 2004).

Although the total area affected by ground disturbance work is significant, the works would be staged, effectively minimising the area of ground disturbing activities at any one time. The demolition works would be undertaken in a manner to minimise the potential for soil erosion and sedimentation.

Measures to be implemented during the demolition works to protect stormwater quality include:

- Stormwater or groundwater ponded in excavations would be sent to the WWTP, unless it is tested and is of suitable quality to be directed to stormwater;
- Installation and maintenance of silt fencing and/or alternate sediment control measures around soil stockpiles and disturbed areas or areas where dust suppression is being undertaken as required;
- Regular inspection of soil stockpiles/excavation areas, including following rainfall events; and
- Regular inspections of stormwater drains down hydraulic gradient of disturbed areas.

Some oily water sewer infrastructure connecting process units and from beneath the refinery process areas is to be removed as part of the demolition works. Stormwater previously directed to the oily water sewer would then flow to the stormwater system, infiltrate into the ground or evaporate. If during the demolition works, stormwater quality is impacted, the potential for diversion of stormwater to the intermediate sewer system exists and would be used as required.

Flooding

A small section of the north west of the Site is classified as medium flood risk, based on SSC criteria. This area has been subject to some localised flooding in the past, in response to which Caltex has assessed, identified, and is in the process of implementing, a range of improvement measures, including:

- implementation of the SMP, which is in part specifically focused on addressing flooding in this area;
- completion of a review of all electrical equipment, which had identified the need to increase the height of a substation and switchroom in the medium risk area, which has now been implemented; and
- modifications to the wastewater treatment system and infrastructure that would follow the completion of the Project.

The SMP will improve the ability of the Site to handle stormwater and as a result will reduce the risk of catchment flooding. The monitoring component of the SMP will inform a stormwater model, which in turn will provide the basis for identifying future stormwater management improvements, where required. Further consideration of the flood risk along the north eastern boundary is required. The implementation of the SMP and further changes to the stormwater system following completion of the Project and following future remediation works would result in changes to flood risk on the Site. As such, Caltex will reassess the flood risk during the remediation works to ensure that future flood risks to the Site are understood and appropriately managed. A management and mitigation measure addressing this issue has been agreed in consultation with SSC and included in **Table 12-2** below.

12.8 Summary

This assessment has sought to identify and assess the potential surface water impacts resulting from the demolition works. The assessment concluded that the demolition works are likely to result in negligible or minor and short term impacts on the environment provided adequate management measures are implemented.

Potential impacts related to stormwater include those arising from demolition and ground disturbance works (i.e. impacts to storm water run-off quality), as well as potential changes to the operation of stormwater catchments in the short and longer term. These potential impacts can be managed by implementing a number of existing management and mitigation measures.

The existing Site stormwater system with its stormwater retention and treatment systems would remain intact once all of the demolition works are complete. The Site stormwater receiving environments would also not change. Overall, the impact on the system hydraulics resulting from demolition works including the removal of infrastructure and paved surfaces is not expected to be significant but this would be confirmed by the modelling to be conducted for the SMP.

The demolition works would not be expected to change the flood risk profile nor would it change the ability to accommodate high rainfall events and/or broader flooding events from that which currently exists.

The management of stormwater and flooding at the Site would continue to be studied and improved as the measures within the SMP are completed and implemented. The key measure to manage and mitigate future stormwater impacts on the Site would be the successful implementation of the SMP in consultation with EPA. Equally, wastewater discharges from the WWTP would remain within existing EPL limits.

Table 12.2 presents the relevant management and mitigation measures for this chapter. Additional relevant measures are detailed in **Chapter 9 Soil, Groundwater and Contamination**, **Chapter 10 Human Health and Ecological Risk** and **Chapter 11 Waste Management**.

Table 12-2 Management and Mitigation Measures- Surface Water, Wastewater and Flooding

Management and Mitigation Measures	Demolition	
	Design	Demolition
A Soils and Water Management Plan would be developed as a sub plan to the DEMP. Measures to be included in the plan and implemented during the demolition works to protect stormwater quality would include: • ***Stormwater or groundwater ponded in excavations would be sent to the WWTP, unless it is tested and is of suitable quality to be directed to stormwater;*** • ***Silt fencing and/or alternate sediment control measures would be installed around soil stockpiles and disturbed areas or areas where dust suppression is being undertaken;*** • ***Regular inspection would be undertaken of soil stockpiles/excavation areas, including following rainfall events;*** • ***Regular inspections would be undertaken of stormwater drains down hydraulic gradient of disturbed areas; and*** • ***If stormwater quality is impacted during the demolition works in areas that have been disturbed, water would be diverted to the intermediate sewer system.***		✓
Caltex would continue to implement the measures within the Stormwater Management Plan for the Site. This plan has been produced in response to Environment Protection Licence No. 837, PRP U24.1: Stormwater Catchment and Management Plan. The SMP has committed Caltex to implementing a Stormwater Management Strategy and completing a number of stormwater management measures in a staged manner. Measures include: • Ongoing maintenance of the existing stormwater system; • Implementation of a number of projects to improve the infrastructure, reduce the potential for the refinery to flood, and prevent contaminated stormwater leaving the refinery premises; • Working with the NSW Office of Environment and Heritage (OEH), NSW EPA and Sutherland Shire Council to divert to flow of stormwater from the National Park away from the Site's stormwater system to the Sutherland Shire Council's stormwater infrastructure; • Carrying out stormwater flow monitoring; and • Updating the Site's stormwater system performance model to account for the changes to the stormwater system infrastructure that can then be used as a tool to assess future modifications, as necessary.	✓	✓

Management and Mitigation Measures	Demolition	
	Design	Demolition
• This work would be completed in consultation with NSW EPA.		
Discharges from the Wastewater Treatment Plant would be within existing EPL limits during ***demolition,*** construction and operation. Any required change to this Oily Water Management System would be discussed and agreed with NSW EPA.		✓
The measures and processes currently in place at the Site to prevent any loss of contaminant would be maintained throughout the ***demolition***, construction and operation phases of the Project. All bunds on tanks which are retained in service would meet the capacity requirements of Australian Standard AS1940 during the operation of the Project.		✓
Caltex undertakes a flood study, commencing within 3 months of completion of demolition works that assesses potential flood risks from the Site to the Kurnell township, with a particular emphasis on the impacts from surface water entering the Site from land to the east and south of the Site and whether current diversion methods are appropriate. Caltex to remain in consultation with Sutherland Shire Council throughout the flooding investigation works to identify a mutually acceptable solution to potential flood risks along the north eastern boundary of the Site. The timing and form of consultation is to be mutually agreed by both parties (Caltex and Sutherland Shire Council) and outlined within a written document to be produced by Caltex prior to commencement of the flood study. It shall include regular reporting updates and milestone meetings, for example, at the Scope of Works, concept design, at the issuing of the draft report to discuss results and recommendations as a result of the study.		✓

13 NOISE AND VIBRATION

13.1 Introduction

The following chapter assesses the potential noise and vibration impacts generated by the demolition works. A Noise and Vibration Impact Assessment (NVIA) was undertaken by acoustic consultants Wilkinson Murray and is provided in full as **Appendix E Noise and Vibration Impact Assessment**. The results from the NVIA have been summarised in this chapter.

13.2 Scope of the Assessment

The SEARs (refer to **Appendix A SEARs and Application documentation**) requests that this assessment provides the following:

- *"Noise and Vibration – including an assessment of all potential noise and vibration impacts on surrounding receivers."*

The EPA provided additional requirements related to the noise and vibration and requested that the SEE include the following:

- identification and assessment of all potential noise sources associated with the demolition and removal of redundant infrastructure. This may include the use of heavy machinery (bulldozers and excavators), crushing, grinding or separating activities and any proposed blasting activities;
- if there is likely to be any vibration impacts associated with the demolition works, the SEE should also include an assessment of the predicted vibration impacts associated with the project;
- identify the locations of all sensitive receptors;
- the proposed hours of demolition activities;
- an assessment of compliance with the existing licence conditions and appropriate construction noise criteria as determined using the above guidelines; and
- any proposed noise mitigation, monitoring (continuous and/or attended) and management measures which are necessary to achieve the above outcome.

The key objectives of this assessment are to:

- address the above requirements and provide an assessment of potential noise and vibration impacts resulting from the demolition works ; and
- recommend reasonable and feasible measures to mitigate potential noise and vibration impacts.

13.3 Glossary of Technical Terms

A range of acoustic parameters and technical terms are used in this assessment. To assist in understanding the technical content, a brief description of the acoustic terms used within this chapter is provided below:

- dB (Decibel): A unit of sound level measurement that uses a logarithmic scale.
- "A" Frequency Weighting: The method of comparing an electrical signal with a noise measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. The symbol to show this parameter has been included in the measurement is "A" (e.g. LA_{eq}).
- Background Noise: Background noise is the term used to describe the level of noise measured in the absence of the noise under investigation. It is measured statistically as the A-weighted noise level exceeded for ninety per cent of a sample period. This is represented as the L_{A90} noise level. The measurement sample time may be indicated in the form L_{A90},t where t is the measurement sample time i.e. $L_{A90,15\ min}$.
- Assessment Background Level (ABL): The background level representing each assessment period (day, evening and night) which is determined for each 24-hour period of monitoring.
- Rating Background Level (RBL): The overall background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30dB(A), then it is set to 30dB(A).
- L_{Aeq}: A weighted equivalent continuous noise level that is used as the constant level of noise that would have the same energy content as the varying noise signal being measured. The letter "A" denotes that the A-weighting has been included and "eq" indicates that an equivalent level has been calculated. This is referred to as the ambient noise level. The measurement sample time may be indicated in the form $L_{Aeq,t}$ where t is the measurement sample time e.g. $L_{Aeq,15\ min.}$
- Tonality: Noise containing a prominent frequency and characterised by a definite pitch.
- Peak Particle Velocity (PPV): The instantaneous sum of the velocity vectors (measured in millimetres per second) of the ground movement caused by the passage of vibration from blasting.
- Linear Peak (LIN Peak): The maximum level of air pressure fluctuation measured in decibels without frequency weighting (see 'A Frequency Weighting' above).
- Perception of Sound: Audible sound ranges from the threshold of hearing at 0dB to the threshold of pain at 130dB and over. A change of 1dB or 2dB in the level of a sound is difficult for most people to detect, whilst a 3dB to 5dB change corresponds to small but noticeable change in volume. An increase of about 8 – 10dB is required before the sound subjectively appears to be significantly louder.
- Sound Pressure (SPL): Sound pressure is the measure of the level or loudness of sound. Like sound power level, it is measured in logarithmic units. The symbol used for sound pressure level is SPL, and it is generally specified in dB. 0dB is taken as the threshold of human hearing. Some examples of SPL are provided in **Table 13-1**.

Table 13-1 Sound Pressure Levels of Some Common Sources

Sound Pressure Level (dB)	Sound Source	Typical Subjective Description
120	Riveter; rock concert, close to speakers; ship's engine room	Intolerable
100 – 110	Grinding; sawing, Punch press and wood planers, at operator's position; pneumatic hammer or drilling (at 2 m)	Very noisy
70 – 80	Kerbside of busy highway; shouting; Loud radio or TV	Noisy
50 – 60	Office, department store, restaurant, conversational speech	Moderate
40 – 50	Private office; Quiet residential area	Quiet
30 – 40	Unoccupied theatre; quiet bedroom at night	
20 – 30	Unoccupied recording studio; Leaves rustling	Very quiet
0 – 10	Hearing threshold, excellent ears at frequency of maximum sensitivity	

13.4 Legislation and Planning Policy

13.4.1 NSW Protection of the Environment Operations Act 1997

The *NSW Protection of the Environment Operations Act 1997* (PoEO Act) includes a single licencing arrangement for a range of pollutants including noise. Under this Act certain scheduled activities are licenced, as is the case of the current Site operation. These activities require the operator to obtain an Environmental Protection Licence (EPL). The current operation is subject to approved noise limits as presented in the Site's Environment Protection Licence (EPL. 837). This licence defines operating noise limits that must be observed when working on the Site. This Act therefore serves to regulate noise pollution.

13.5 Method of Assessment

13.5.1 Overview

This assessment has been undertaken in accordance with the guidance noted below and has involved:

- review of the applicable noise and vibration criteria, legislation and the SEARs;
- understanding the existing acoustic environment of the study area;
- identification of noise and vibration sensitive receptors;
- setting of specific noise criteria for the demolition works;
- prediction of demolition noise and vibration levels and comparison with the nominated criteria; and
- recommendation of necessary mitigation measures.

13.5.2 Guidance

Potential noise and vibration impacts associated with the demolition activities have been assessed in accordance with the following guidelines:

- *NSW Interim Construction Noise Guidelines* (DECC 2009) (ICNG) for the assessment of the noise from the demolition works;
- *Assessing Vibration: A Technical Guideline* (DEC, 2006) for the assessment of the vibration from demolition works;
- German Standard *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures;* and
- *NSW Road Traffic Noise Policy* (EPA, 2011) (RTNP) for the assessment of the off-site traffic noise on public roads.

13.5.3 Noise and Vibration Assessment Criteria

13.5.3.1 Demolition Noise Criteria

The ICNG is used to guide the noise assessment of construction activities. The ICNG can also be used to guide noise assessments for demolition activities and is therefore, is relevant for the assessment.

As discussed above, the criteria set out in the ICNG have been used as a basis for the assessment of potential noise impacts from the demolition works. The ICNG was developed by the NSW EPA and took into consideration the fact that construction and demolition activities are temporary, noisy and difficult to ameliorate. Therefore, the ICNG was developed to identify and utilise a range of feasible work practices that are most suited to minimising noise arising from such activities, rather than only focusing on achieving a specific noise level. **Table 13-2** summarises the construction noise specified in the guideline.

Table 13-2 Construction Noise Criteria - Noise at Residences

Time of Day	Management Level $L_{Aeq\ (15\ min)}$	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10dB (A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB (A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

Time of Day	Management Level $L_{Aeq\ (15\ min)}$	How to Apply
Outside recommended standard hours	Noise affected RBL + 5dB (A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB (A) above the specified noise affected level, the proponent should negotiate suitable work arrangements and mitigation measures with the community.

For commercial or industrial land the ICNG provides the following noise management levels:

- industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dBA; and
- offices, retail outlets: external $L_{Aeq\ (15\ min)}$ 70 dBA.

13.5.3.2 Demolition Noise Management Levels

The noise and vibration assessment for the conversion works (SSD 5544) identified construction noise limits that were consistent with the ICNG, based on previous background noise monitoring at various sensitive receptors (Wilkinson Murray, 2013). These construction noise limits now form Condition of Consent C16 of SSD 5544.

As Caltex is currently progressing with the conversion works, the background noise levels are subject to change. Consequently, the assessment adopted the construction noise limits for the conversion works. These limits are considered appropriate for assessing the demolition works as these limits were established using the typical minimum background levels. These limits are provided in **Table 13-3**.

Table 13-3 Construction Noise Limits (SSD 5544)

Location	Construction Noise Limits	
	Daytime $L_{Aeq,15\ hour}$	Evening $L_{Aeq,15\ hour}$
R2 – 30D Cook Street	46[1]	40
At any other residence or other noise sensitive receivers	50	45

[1]-SSD 5544 incorrectly identified the construction noise criterion for R2 as 45dBA. This should be corrected to 46dBA if the modification is approved.

13.5.3.3 Traffic Noise Criteria

Noise criteria for assessment of road traffic noise are set out in the NSW Government's *NSW Road Noise Policy* (RNP). The relevant applicable criteria used in the assessment are summarised in **Table 13-4.**

Based on the RNP, the goal noise levels at the residential receptors for the demolition works are:

- $L_{Aeq,15hr}$ day 60 dB(A); and
- $L_{Aeq,9hr}$ night 55 dB(A).

Theses limits only apply to off-site road traffic noise, and do not apply to vehicle movements within the Site. For the purpose of this assessment noise generated by on-site vehicle movements is considered as demolition noise and assessed in accordance with the ICNG.

Table 13-4 RNP Criteria for Road Traffic Noise

Type of Development	Assessment Criteria – dB(A)	
	Daytime (07:00-22:00)	Night (22:00-07:00)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,1\ hour}$ 50 (external)

Where the criteria are already assessed as exceeding as a result of existing traffic, any increase in the total traffic noise level should be limited to 2 dB above the existing traffic noise levels. A 2 dB increase is not typically considered to be a noticeable change in noise levels.

13.5.3.4 Vibration Criteria

The effects of ground vibration on buildings resulting from demolition may be split into the following categories:

- Human comfort – disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed; and
- Effects on building structures – vibration in which the integrity of the building or structure itself may be prejudiced.

Assessing Vibration: A Technical Guideline (DEC 2006) considers impacts from vibration in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). The guideline gives “preferred” and “maximum” vibration levels at buildings exposed to continuous and impulsive vibration. The acceptable values of human exposure to continuous vibration are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in **Table 13-5**.

Table 13-5 Criteria for Exposure to Continuous and Impulsive Vibration

Place	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

In relation to building damage from vibration, suitable levels are determined from German Standard *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures*.

For the purpose of this assessment, the limits interpreted from this standard have been simplified and are included in **Table 13-6.**

Table 13-6 Structural Damage Criteria

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and / or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note: * For frequencies above 100Hz, at least the values specified in this column shall be applied.

13.5.4 Noise Modelling

The 'Cadna A' computer acoustics model program using ISO 9613 noise prediction algorithm was used to model the acoustic impacts of the demolition works. The Cadna A modelling software is accepted by the EPA for use in environmental noise assessments.

The noise modelling undertaken for the demolition works takes into consideration the following factors:

- equipment sound level emissions and location;
- receiver locations/ ground topography;
- noise attenuation due to geometric spreading;

- ground absorption; and
- atmospheric absorption.

Noise levels at surrounding residential receivers have been predicted based on indicative types and locations of plant throughout the demolition works. This is discussed further in **Section 13.7**.

13.6 Existing Environment

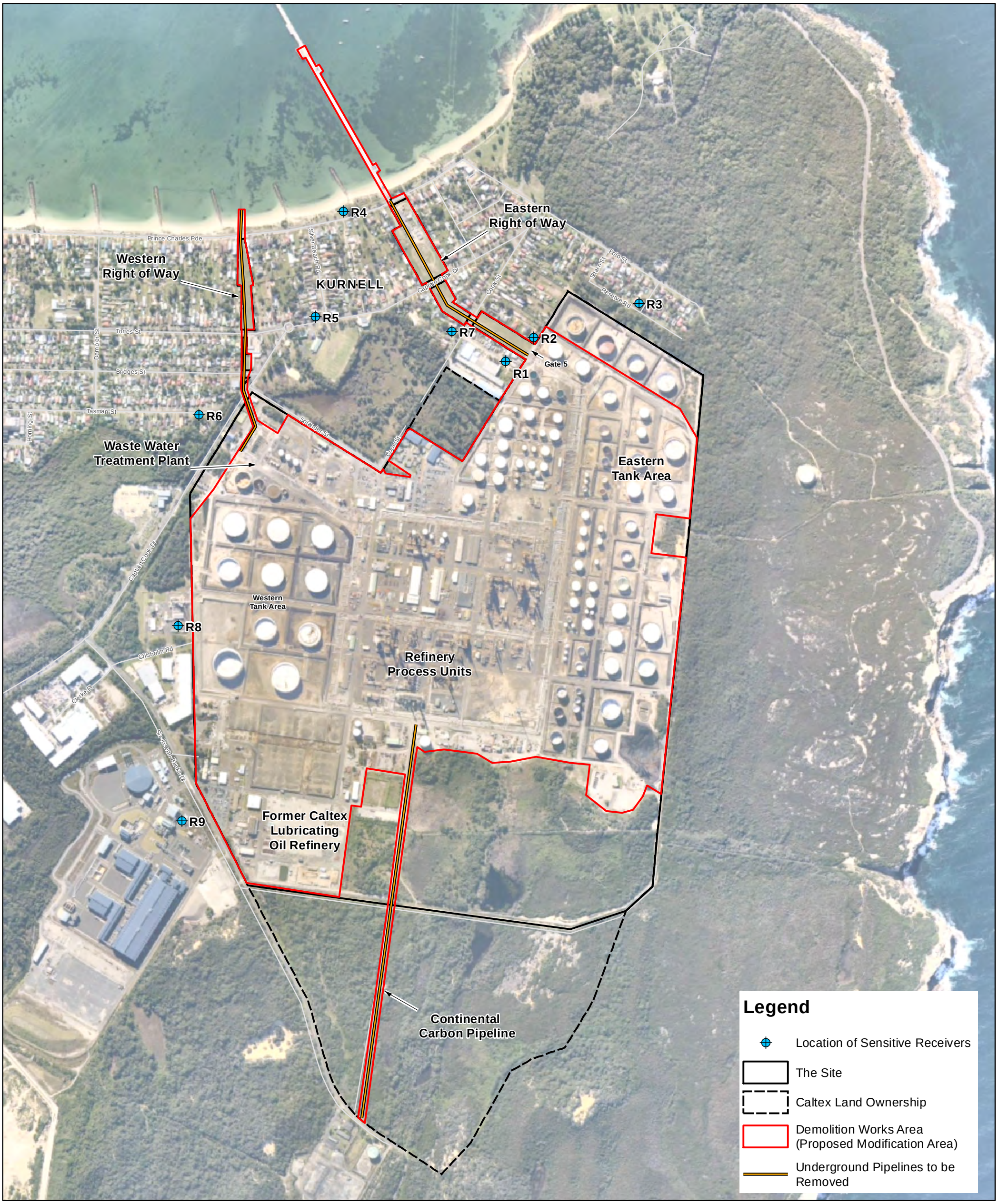
13.6.1 Noise monitoring data

The existing physical environment on the Site is outlined in **Chapter 2 Project Location and Existing Environment**. The acoustic environment on the Kurnell Peninsula is characterised mainly by industrial sources, however other potential noise contributors include marine activities in Botany Bay and aircraft noise from the Sydney (Kingsford Smith) Airport. Other noise sources include local traffic, ocean waves and local fauna. As noted in **Section 13.5.3**, the background noise level surrounding the Site is currently changing as the conversion works progress.

13.6.2 Sensitive receptors

Sensitive noise receptors were identified based on those identified for the conversion works. In addition, industrial receptors were identified to the south west of the Site, as the demolition works involves activities in the south of the Site. The following groups of receptors were identified and are shown on **Figure 13-1**:

- Receiver R1 – 44-64 Cook Street (Industrial Premises) Industrial premises adjacent to the Site to the west and sharing a common boundary.
- Receiver R2 – 30D Cook Street (Residential) Residential property adjacent to the Site to the west and sharing a common boundary.
- Receiver R3 – Reserve Road (Residential) Residential properties north of the Site.
- Receiver R4 – Prince Charles Parade (Residential) Residential properties close to the eastern right of way.
- Receiver R5 – Corner of Captain Cook Drive and Silver Beach Road (Residential) Residential properties north of the Site.
- Receiver R6 – Tasman Street (Residential) Residential property west of the Site.
- Receiver R7 – 35 Cook Street (Residential) Residential property west of the Site.
- Receiver R8 – End of Chisholm Road (Industrial Premises) Industrial premises adjacent to the Site to the west and sharing a common boundary.
- Receiver R9 – Sir Joseph Banks Drive (Industrial Premises) Industrial premises on the other side of Sir Joseph Banks Drive to the west of the Site.



Source: Aerial Imagery - Nearmap 2014

CALTEX
REFINERIES
(NSW) PTY LTD

KURNELL REFINERY
CONVERSION MODIFICATION

**LOCATION OF
SENSITIVE RECEIVERS**

URS

File No: 43177915.018.mxd Drawn: STB Approved: WM Date: 10/10/2014

Figure: **13-1**

Rev. **A** A4

13.7 Impact Assessment

13.7.1 Overview

The demolition works have been assessed in two separate stages as they would typically impact different receptors:

- the removal of the redundant pipelines from the Eastern and Western ROW, the road reserves, Silver Beach and Kurnell Wharf; and
- works within the main Site and the removal of the Continental Carbon Pipeline.

It should be noted that the works would not occur in both Rights of Way at once.

As outlined in **Chapter 4 Proposed Modification**, the working hours for demolition works would be in line with the Conditions of Consent for the conversion work (SSD 5544), in particular Conditions C18, C19 and C20. In summary:

- Works to be completed between 7.00 am and 10.00 pm seven days a week (Condition C18);
- High noise generating works would be confined to less sensitive times of the day and not outside the hours of 7.00 am to 6.00 pm Monday to Saturday (Condition C19); and
- Works outside those hours would only be undertaken in certain circumstances as defined in Condition C20, namely:
  - Works that are inaudible at the nearest sensitive land receivers;
  - Works that are consistent with Caltex's existing maintenance procedures and are in accordance with the existing EPL;
  - Works agreed to in writing by the EPA or the Department;
  - For the delivery of materials required outside these hours by NSW Police Force or other authorities for safety reasons; or
  - Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

As the pipeline removal works within the ROWs would occur close to residential receptors these works would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19.

13.7.2 Demolition Impacts

13.7.2.1 Demolition Noise Criteria

Table 13-7 presents the demolition noise criteria specific for the identified receptors associated with the demolition works.

Table 13-7 Demolition Noise Management Levels

Receptor Number	Receptor Location	Day 0700-1800h $L_{Aeq,15min}$ (dB(A))	Out of hours 18:00h 22:00h $L_{Aeq,15min}$ (dB(A))
R1	Cook Street (Industrial Premises)	75	-
R2	30D Cook Street (Residential Premises)	46	40
R3	Reserve Road (Residential Premises)	50	45
R4	Prince Charles Parade (Residential Premises)	50	45
R5	Corner of Captain Cook Drive and Silver Beach Road (Residential Premises)	50	45
R6	Tasman Street (Residential Premises)	50	45
R7	Cook Street (Residential Premises)	50	45
R8	End of Chisholm Road (Residential Premises)	75	-
R9	Sir Joseph Banks Drive (Industrial Premises)	75	-

13.7.2.2 Demolition Noise Impacts

The likely acoustic impact of the demolition works was based on the type of plant that is anticipated to be used and the frequency with which the plant would be used during the demolition works. **Table 13-8** provides details of this proposed plant and its anticipated usage factor (e.g. the oxycutter would be used 50% of the time during the demolition works).

Table 13-8 Typical Demolition Plant Sound Levels

Item	Overall $LA_{eq(15\ minutes)}$ Sound Power Level (dB(A))	Usage Factor (%)
Plant and Equipment used on Site		
Large Shearer	105	10
Oxycutter	101	50
Mobile 130T Crane	104	16
Vacuum Truck or Trucks	93	20
Concrete Crusher	110	50
Concrete Saw	105	10
Large Excavator	105	20
Jackhammer	110	5

Item	Overall $LA_{eq(15\ minutes)}$ Sound Power Level (dB(A))	Usage Factor (%)
Pipeline Removal Plant and Equipment[1]		
80T mobile cranes	93	20
Excavator 13 T-/ Backhoe	88	20
Vacuum Truck or Truck	93	20
Oxycutter	101	50
Road Repair Plant and Equipment[1]		
Small Vibratory Roller	104	20
Trucks	93	20
Excavator 13 T-/ Backhoe	88	20
Kurnell Wharf Pipe Removal		
Boat and Barge	105	20
Barge Crane	104	16
Oxycutter	101	50
Vacuum Truck or Trucks	93	20
Pipe Removal from Silver Beach[1]		
Excavator 13 T-/ Backhoe	88	20
Oxycutter	101	50
Trucks	93	20
80T mobile cranes	93	20

[1] Low noise equipment consistent with the Eastern ROW Kurnell B Line Upgrade Project.

Based on **Table13-7** and **Table 13-8** and the description of the works provided in **Chapter 4 Proposed Modification**, the predicted level of acoustic impact of the demolition works for each identified receptor is presented below.

Refinery Site Works

Noise emissions from the main Site have been modelled for a typical worst-case demolition scenario assuming all plant and equipment used on Site, as identified in **Table 13-8**, would operate concurrently.

The scenario assumes the following concurrent activities:

- the refinery process units and associated pipework, foundations and services being demolished and removed;
- redundant tanks within the Eastern and Western Tank Areas being demolished;
- removal of the Continental Carbon pipeline;
- redundant buildings being demolished; and
- concrete crushing.

Given this assumption, **Table 13-9** below presents the predicted noise levels at each identified receptor during demolition works within the main Site. It also shows whether the predicted noise levels comply with the daytime and night-time criteria present in **Table 13-7**.

Table 13-9 Predicted Leq Noise Levels, dB(A) for Site Demolition Works

Receptor	Description	Predicted L_{Aeq} Noise Level	Day 0700-1800h $L_{Aeq,15min}$ (dB(A))	Out of hours 18:00h 22:00h $L_{Aeq,15min}$ (dB(A))	Complies (Yes/No)
R1	Cook Street (Industrial Premises)	50	75	-	Yes/-
R2	30D Cook Street (Residential Premises)	50	46	40	No/No
R3	Reserve Road (Residential Premises)	40	50	45	Yes/Yes
R4	Prince Charles Parade (Residential Premises)	38	50	45	Yes/Yes
R5	Corner of Captain Cook Drive and Silver Beach Road (Residential Premises)	40	50	45	Yes/Yes
R6	Tasman Street (Residential Premises)	42	50	45	Yes/Yes
R7	Cook Street (Residential Premises)	43	50	45	Yes/Yes
R8	End of Chisholm Road (Residential Premises)	43	75	-	Yes/-
R9	Sir Joseph Banks Drive (Industrial Premises)	45	75	-	Yes/-

The demolition noise levels are predicted to be below the daytime demolition noise criteria at all receivers except at R2 where a minor exceedance of 4dbA is predicted. For out of hours demolition work (which would be restricted to the Conditions of Consent for SSD 5544) noise levels are predicted to be below evening and night noise criteria at all receivers except at R2, where an exceedance of up to 10dBA has been predicted in the evening.

The highly noise affected management level (75dB (A)) for daytime Site demolition works was not exceeded at any of the residential receptors.

It should be noted that a worst case scenario of all of the activities within the main Site would be occurring concurrently was assumed for modelling purposes. As such, these noise predictions are conservative.

Reasonable and feasible mitigation measures to manage this potential exceedance are presented in **Section 13.9** below.

Removal of Pipelines

For the removal of redundant pipelines within both ROWs, the noise levels experienced by any receptor would be influenced by the distance from the activity and shielding between the activity and the receptor (e.g. fencing).

Appendix E Noise and Vibration Impact Assessment presents the noise contours for the works within the ROW, Silver Beach and Kurnell Wharf. These identify that the predicted noise levels for pipeline removal works are likely to exceed the demolition noise management levels (refer to **Table 13-7**) at the closest receptors adjacent to the ROWs.

The predicted noise levels for the pipeline removal works at Kurnell Wharf and Silver Beach are also likely to exceed the demolition noise management levels at the closest residential receivers when the works are close to shore.

However, the predicted noise levels do not exceed the highly noise affected 75dBA noise criterion from the ICNG. Equally the works within the ROWs and along the wharf are linear works, i.e. they would move reasonably quickly along the ROW and the wharf. The potential impact on an individual receptor would not be continuous and would be expected to occur for no more than approximately two weeks at any one time. As such, the noise exposure period at the nearest sensitive receptors would be temporary.

Section 13.9 outlines reasonable and feasible mitigation measures for managing this potential impact.

13.7.3 Demolition Traffic Impacts

During demolition works, vehicles would access the Site from Captain Cook Drive, which is the major access road to the Kurnell Peninsula on the southern shore of Botany Bay and connects the Site to the wider Sydney road network.

In addition to private vehicles movements, the demolition works are likely to result in approximately 2,675 additional heavy vehicle movements to and from the Site between the second quarter of 2015 and 2017. This equates to approximately 6 heavy vehicle movements a day on average with a peak of 30 additional movements on any one day.

The existing traffic noise levels along the Captain Cook Drive already exceed the noise criteria of 60 and 55 dB(A) for the day and night, respectively. Captain Cook Drive east of Gannons Road had an average annual daily traffic flow of 38,810 (two-way) vehicles per day in 2012. Given these traffic volumes, the additional noise contribution from traffic generated by the demolition works would be negligible at residences on Captain Cook Drive (that is, less than a 2dB increase).

13.7.4 Demolition Vibration Impacts

Several plant and equipment proposed to be used during demolition works have been identified as potential sources of ground vibration (refer to **Appendix E Noise and Vibration Impact Assessment**). The nearest receivers are residences at Cook Street, which are located approximately 50 m from the closest point where demolition works would occur. The list of vibration intensive plant likely to be used and indicative vibration levels at these receivers are provided in **Table 13-10**.

Table 13-10 Typical Plant Vibration Levels

Activity	Peak Particle Velocity Vibration Level (mm/s) at Distance		
	10m	20m	30m
Truck over smooth road surface	0.05	<0.01	-
Jackhammer	0.2	<0.1	-
Excavator (Earthmoving)	0.5-0.2	0.1	<0.1
Heavy Hydraulic Hammer	2.5	0.5	0.2

Based on **Table 13-10**, vibration levels would not likely exceed the criteria for human comfort at all the nearest receivers. Equally the typical vibration levels for the demolition works are unlikely to result in levels that cause damage to buildings as structural damage criteria are substantially higher than human exposure criteria.

In addition to the off-site receivers, as outlined in **Appendix H Heritage Impact Assessment**, there are buildings which would be retained on-site with medium or high heritage significance which potentially could be affected by vibration. Therefore measures to manage this potential impact have been included in **Section 13.9**.

13.8 Cumulative Impacts

As discussed in **Section 4.3** of **Chapter 4 Proposed Modification** there would be an overlap between the start of the demolition works and the end of conversion works (i.e. tank conversions). Thus, there is potential for cumulative noise impacts between mid-2015 and December 2016.

Table 13-11 provides the predicted construction noise levels for the conversion works and the predicted noise levels for the demolition works as well as the cumulative noise levels.

Table 13-11 Cumulative Construction Noise Levels for Conversion and Demolition Works – $L_{Aeq,15minutes}$

Receptor	Description	Conversion Works - Predicted L_{Aeq} Noise Level	Demolition Works - Predicted L_{Aeq} Noise Level	Cumulative L_{Aeq} Noise Level	Day Criteria 0700-1800h $L_{Aeq,15min}$ (dB(A))	Out of hours Criteria 18:00h 22:00h $L_{Aeq,15min}$ (dB(A))	Complies (Yes/No)
R1	Cook Street (Industrial Premises)	44	50	51	75	-	Yes/-
R2	30D Cook Street (Residential Premises)	40	50	50	46	40	No/No
R3	Reserve Road (Residential	49	40	50	50	45	Yes/No

Receptor	Description	Conversion Works - Predicted L_{Aeq} Noise Level	Demolition Works - Predicted L_{Aeq} Noise Level	Cumulative L_{Aeq} Noise Level	Day Criteria 0700-1800h $L_{Aeq,15min}$ (dB(A))	Out of hours Criteria 18:00h 22:00h $L_{Aeq,15min}$ (dB(A))	Complies (Yes/No)
	Premises)						
R4	Prince Charles Parade (Residential Premises)	34	38	40	50	45	Yes/Yes
R5	Corner of Captain Cook Drive and Silver Beach Road (Residential Premises)	36	40	42	50	45	Yes/Yes
R6	Tasman Street (Residential Premises)	38	42	44	50	45	Yes/Yes
R7	Cook Street (Residential Premises)	39	43	45	50	45	Yes/Yes
R8	End of Chisholm Road (Residential Premises)	40[A]	43	45	75	-	Yes/-
R9	Sir Joseph Banks Drive (Industrial Premises)	40[A]	45	47	75	-	Yes/-

[A] Estimated

As indicated in **Table 13-11**, the cumulative conversion and demolition works noise levels are predicted to be below the daytime construction/demolition noise criteria at all receivers except at R2 where a minor exceedance of 4dBA is predicted. For out of hours demolition work, noise levels are predicted to be below evening noise criteria at all receivers except R2 and R3. To manage this potential additional impact, working hours would be restricted to the conditions of consent for SSD 5544, specifically:

- High noise generating works would be confined to less sensitive times of the day and not outside the hours of 7.00 am to 6.00 pm Monday to Saturday (Condition C19); and
- Works outside those hours would only be undertaken in certain circumstances as defined in Condition C20, namely:
  - Works that are inaudible at the nearest sensitive land receivers;

- Works that are consistent with Caltex's existing maintenance procedures and are in accordance with the existing EPL;
- Works agreed to in writing by the EPA or the Department;
- For the delivery of materials required outside these hours by NSW Police Force or other authorities for safety reasons; or
- Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

In addition, the proposed completion of the Kurnell Port and Berthing Facility Upgrade Works is also due in Q2 of 2015. However the only part of this project which would overlap with the demolition works relates to works for the new breasting island at the far end of the wharf in Botany Bay and the majority of the work has already commenced. These works will largely be complete by the time that the demolition works commence and are highly unlikely to result in a cumulative impact.

13.9 Mitigation

To mitigate and manage potential noise exceedances generated by the demolition works a Noise and Vibration Management Plan (DNVMP) would be developed. This plan would form part of the DEMP. This DNVMP would be updated as detailed design and programming of works are progressed and finalised.

The DNVMP would contain the following mitigation measures:

- Pipeline removal works would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19 (for SSD 5544);
- Demolition works on the main refinery Site that are occurring within 500 m of 30D Cook Street would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19. Demolition works further than 500 m from 30D Cook Street are likely to comply the evening construction/demolition noise limits;
- Plant and equipment with low noise emission levels would be used where practicable;
- Community consultation with local residents and building owners would be completed to assist in the alleviation of community concerns. The community may be willing to endure higher construction noise levels for a shorter duration if they have been provided with sufficient warning in the place of intermittent but extended periods of construction noise at lower levels. The existing 24 hour Community Concerns Hotline would continue to be operated for the Project;
- A suitable complaints register would continue to be maintained. Should noise complaints be received, noise monitoring can be considered at the locations concerned. Reasonable and feasible measures would be implemented to reduce noise impacts. All complaints would be managed through the existing feedback process at the Site;
- Demolition noise monitoring would be undertaken to ensure compliance with demolition noise criteria;
- Demolition staff would be educated and trained to be aware of potential noise impacts. Strategies should focus on:

  - Ensuring works occur within approved hours;
  - Locating noisy equipment away from sensitive receivers;
  - Ensuring plant and equipment is well maintained and not making excessive noise; and
  - Turning off machinery when not in use.
- Caltex would ensure that the noise generated by the demolition works does not exceed the criteria defined in Table 2 (from Condition of Consent C16 of SSD 5544) unless the reasonable and feasible noise mitigation strategies outlined within the DNVMP have been implemented.
  - Table 2: Construction Noise Criteria (dB(A)).

Location	Day $L_{Aeq,15minutes}$	Evening $L_{Aeq,15minutes}$
R2 – 30D Cook Street	46[1]	40
At any other residence or other noise sensitive receivers	50	45

[1]-SSD 5544 incorrectly identified the construction noise criterion for R2 as 45dBA. This should be corrected to 46dBA if the modification is approved.

- The DNVMP would describe where demolition noise limits from Table 2 (from Condition of Consent C16 of SSD 5544) are likely to be exceeded and what reasonable and feasible noise mitigation would be employed to minimise noise.
- To help ensure that the structures on Site that are to be retained with high or medium heritage significance are protected from potential vibration impacts, the DNVMP would also:
  - utilise **Appendix H Heritage Impact Assessment** to identify the medium to high heritage significance buildings to be retained;
  - identify where works to demolish redundant structures are occurring within 20 m of a medium to high significance heritage building and the requirement to undertake vibration monitoring and management for these buildings to protect their integrity; and
  - outline general monitoring and management measures to monitor vibration and manage buildings if they are being affected.

Implementation of the DNVMP and the measures within it would help minimise and manage the potential noise and vibration impacts from the demolition works.

13.10 Summary

The proposed mitigation and management measures to be implemented during the demolition works are summarised in **Table 13- 12**.

Table 13-12 Management and Mitigation Measures - Noise and Vibration

Management and Mitigation Measures	Demolition	
	Design	Demolition
The CEMP***/DEMP*** for the Project would include a Noise ***and Vibration*** Management Plan. The NVMP would outline: • The locations of noise sensitive receptors; • Construction noise monitoring procedures; and • Construction equipment maintenance to ensure good working order.		✓
Low-noise plant and equipment would be selected, where practicable, in order to minimise potential for noise and vibration. All equipment would be regularly checked to ensure that the mufflers and other noise reduction equipment are working correctly.		✓
Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register is maintained and managed in line with the existing feedback process at the Site.		✓
Any noise complaint(s) would be investigated immediately. Reasonable and feasible measures would to be implemented to reduce noise impacts.		✓
Construction***/demolition*** equipment would be located to reduce noise emission to sensitive receptors, where practicable.		✓
The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site.		✓
Construction***/Demolition*** staff and contractors would undergo training in environmental noise issues including: • minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered; • avoiding any unnecessary noise when carrying out manual operations and when operating plant; and • switching off any equipment not in use for extended periods during construction work. • ***ensuring works occur within approved hours.***		✓
Pipeline removal works would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19 (for SSD 5544).		✓

Management and Mitigation Measures	Demolition	
	Design	Demolition
Demolition works near 30D Cook Street (i.e. within 500m) would be confined to 7.00am to 6.00 pm Monday to Saturday as per Condition C19.		✓
Demolition noise monitoring would be undertaken when necessary to ensure compliance with demolition noise criteria.		✓
Caltex would ensure that the noise generated by the demolition works does not exceed the criteria defined in Table 2 (from Condition of Consent C16 of SSD 5544) unless the reasonable and feasible noise mitigation strategies outlined within the DNVMP have been implemented.		✓
The DNVMP would describe where demolition noise limits from Table 2 (from Condition of Consent C16 of SSD 5544) are likely to be exceeded and what reasonable and feasible noise mitigation would be employed to minimise noise.		✓
To help ensure that the structures on Site that are to be retained with high or medium heritage significance are protected from potential vibration impacts, the DNVMP would also • ***Utilise Appendix H Heritage Impact Assessment to identify the medium to high heritage significance buildings to be retained;*** • ***Identify where works to demolish redundant structures are occurring within 20 m of a medium to high significance heritage building and the requirement to undertake vibration monitoring and management for these buildings to protect their integrity; and*** • ***Outline general monitoring and management measures to monitor vibration and manage buildings***		✓

14 AIR QUALITY AND ODOUR

14.1 Introduction

This chapter presents the air quality assessment undertaken to understand potential air quality impacts associated with the demolition works, and identify suitable mechanisms to manage the potential emissions.

14.2 Scope of the Assessment

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requests that this assessment provides the following:

- "*an assessment of all potential air quality and odour impacts on surrounding receivers; and*
- *a greenhouse gas assessment and consideration of ways to minimize energy consumption and greenhouse gas emissions*".

Given the nature of the demolition works, specifically excavation of potentially contaminated soil and concrete crushing, the air quality assessment has focused on activities with the potential to generation air emissions of Volatile Organic Compounds (VOCs), odour and dust.

This assessment has been informed by similar previous works that have been undertaken on the Site including:

- demolition of the Propane De-asphalting Unit (PDU) No. 2 (Undertaken 2013);
- demolition of the former Caltex Lubricating Oil Refinery (CLOR) (Undertaken 2012); and
- upgrade of the Kurnell Jet Fuel B Line pipeline (Undertaken 2012).

The works were undertaken using a range of air quality management measures. Consistent with this previously adopted approach, Caltex propose to address the potential air quality impacts of the demolition works using a management approach. Accordingly, this assessment has incorporated the following scope of works with regard to air quality:

- a review of the existing environment, sensitive receivers and background air quality;
- a summary of the works being performed and the potential air emissions associated with specific processes and / or activities; and
- the nomination of mitigation measures and monitoring requirements proportionate to the scale and type of activity.

The greenhouse gas emission sources from the demolition works are primarily confined to fuel combustion emissions associated with the operation of mobile plant and equipment. As such the approach to managing greenhouse gas emissions would be through the implementation of a number of relevant mitigation strategies.

14.3 Legislation and Planning Policy

14.3.1 Protection of the Environment Operations Act 1997

The primary instrument for the regulation of air emissions in NSW is the POEO Act, under which the *Protection of Operations (Clean Air) Regulation 2010* (CAR) is made. This regulation addresses a range of activities that generate air emissions, and also contains emission standards for a range of industrial activities and plant. The regulation addresses:

- Domestic Solid Fuel Heaters;
- Control of Burning;
- Motor Vehicles and Fuels;
- Emissions of Air Impurities from industrial activities and plant items.
- Control of volatile organic liquids.

The applicability of the CAR to the demolition works is limited to broad conditions that relate to motor vehicles, which require that vehicles are operated and maintained in a fit and proper manner using CAR compliant fuels.

The applicability of scheduled activities (under the POEO Act) of *Contaminated Soil Treatment* and *Crushing, Grinding and Separating* have been considered. A review of the relevance of these clauses of the POEO Act is detailed in **Chapter 5 Legislation and Planning Policy**.

14.4 Method of Assessment

This air quality assessment has adopted the following methodology:

- review existing environment, receivers and background air quality;
- summarise the relevant demolition works being performed and the air emissions likely to be generated from the specific processes and / or key activities;
- review similar construction and demolition works conducted by Caltex on or close to the Site; and
- establish suitable mitigation measures and monitoring requirements for the scale and type of activity to ensure air impacts are appropriately managed.

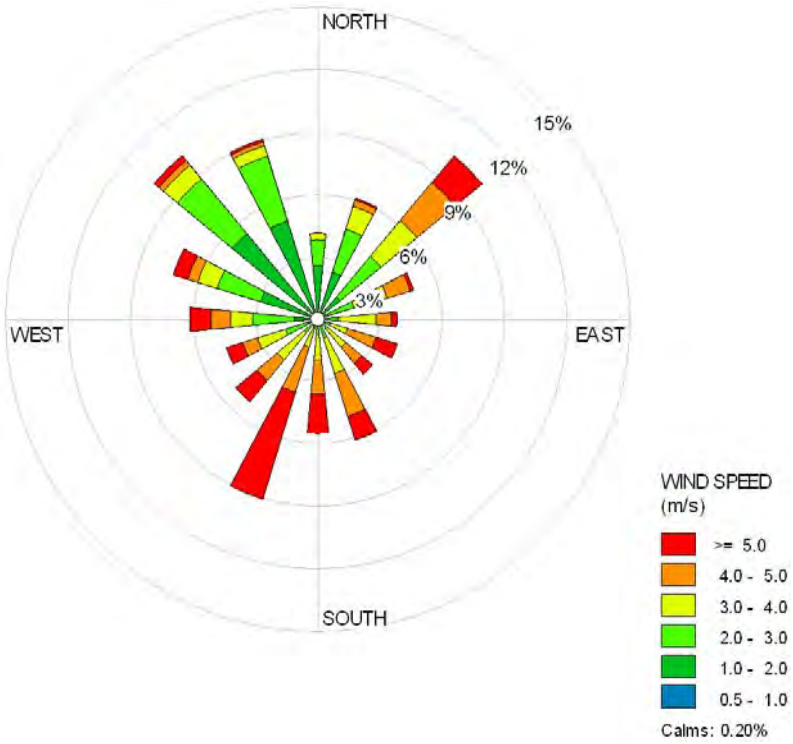
14.5 Existing Environment

14.5.1 Climate and Meteorology

As discussed in **Chapter 2 Project Location and Existing Environment**, the Site is located on the Kurnell Peninsula. Terrain across the Kurnell Peninsula is generally low-lying with the exception of the eastern-most portion of the headland where a ridge runs on a north/south alignment. The eastern boundary of the Site is bound by this ridge where elevations reach approximately 40 m above sea level. Winds at the Site are typical for coastal winds in the Sydney region, however higher than average wind speeds may be present due to the exposed nature of the Peninsula. Some sheltering of easterly winds has potential to be present due to the ridge to the east of the Site. **Figure 14-1** shows the wind rose for the Site from 2008.

Winds are shown to be well distributed in all directions, with the slight accentuation of north easterly sea breezes, south-south westerly and north-westerly winds, as common to the coastal areas of Sydney.

Figure 14-1 Wind rose for 2008

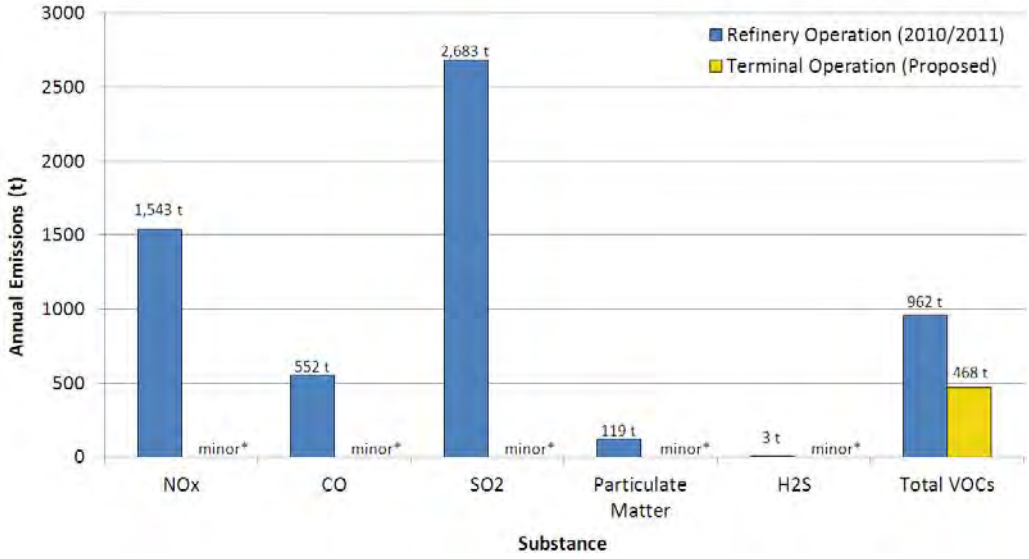


14.5.2 Background Air Quality

Given the coastal location and isolation from main roads, local air quality on the Kurnell Peninsula, up until 2014, has been primarily influenced by emissions from existing refinery operations within the Site. Such emissions include combustion products (e.g. oxides of nitrogen, oxides of sulphur, carbon monoxide) and VOCs arising from both fugitive process emissions, and combustion processes.

It is noted that the air emissions from the Site are progressively reducing during the closure and conversion of the refinery to a terminal (the refinery will be completely shut down by the end of 2014). Shutdown of the refinery is anticipated to result in total VOC emissions halving in quantity. Equally, emissions of NO_x, carbon monoxide, sulphur dioxide, particulate matter and hydrogen sulphide would all significantly reduce following the cessation of refining at the Site. This reduction is illustrated in **Figure 14-2** below from the EIS for SSD 5544. Refer to Appendix G Air Quality Impact Assessment of the EIS for SSD 5544 (URS, 2013) for more detail.

Figure 14-2 Change in Emissions Profile with Conversion of the Site



14.5.3 Receptors

The nearest sensitive receptors identified for the demolition works are within the village of Kurnell. The distance of these receivers from the demolition works varies depending on the location of activities (refer to **Figure 12-1**).

The key demolition activities are generally contained within the following four areas (refer to **Figure 4-1**):

- the Western ROW: an easement containing the cooling water outlet pipeline that runs between the main refinery site and Botany Bay;
- the Eastern ROW: an easement that containing various pipelines that run between the main refinery site and Kurnell Wharf;
- the main Site: comprising the refinery process units, tanks and associated infrastructure; and
- the continental carbon pipeline: located to the south of the main site.

The proximity of the various receptors to the demolition works in these areas is discussed below.

Western and Eastern ROW

Both the Western ROW and the Eastern ROW are bordered by residential properties. The Western ROW has a variable width ranging from approximately 10 m – 40 m. The Eastern ROW is slightly wider, with a variable width ranging from approximately 30 m – 50 m.

Main Refinery Site

As shown in **Figure 4-1**, demolition and excavation works would occur throughout the Site. The closest demolition works to the community of Kurnell on the main Site includes the removal of storage tanks in the north of eastern tank farm. The Site office area and Marton

Park Wetlands provide a buffer between the demolition works associated with the refinery process units and the community of Kurnell.

Material stockpiling and recycling would also be undertaken at the former CLOR site. The closest receptor to the CLOR area is the Desalination Plant, which is located to the west of the Site.

Continental Carbon

The Continental Carbon facility, located adjacent to proposed excavation works on the Continental Carbon pipeline, is not currently operational, thus is not considered a sensitive receiver. No other sensitive receivers are located in close proximity to this area.

14.6 Impact Assessment

14.6.1 Emissions to Air

The demolition works would include removal of redundant infrastructure within the areas shown **Figure 4-1**. Activities that may generate air emissions include for each of the key areas include:

- demolition works within the main area of the Site including the demolition of the refinery process area, tanks within the Eastern and Western Tank Areas, various buildings and associated infrastructure (refer to **Figure 4-1**). These demolition activities would also include:
  - the removal of concrete/foundations and services from the refinery process area and associated with buildings being demolished; and
  - soil excavation associated with removal of underground and above ground pipework from within refinery process area and Eastern and Western Tank Area.
- soil excavation from the Eastern and Western ROW, removal of pipework and soil reinstatement;
- handling of materials generated during the demolition works, which would be re-processed for use on-site. Specifically, concrete is proposed to be recycled during the final stages of the works; and
- asbestos handling and disposal.

An estimated 150,000 tonnes of soil would be excavated as a result of the demolition works, however this disturbance would occur in stages, so at any one time only a small amount of soil would be stockpiled. The areas of potential ground disturbance shown in **Figure 9-4**. Where possible excavated soil will be re-used on-site. This is discussed further in **Chapter 9 Soils, Groundwater and Contamination**.

For each of the four demolition areas listed above, **Table 14-1** presents the key demolition activities that could result in adverse air quality impacts on surrounding receivers. **Table 14-1** also provides the approximate duration of the works in each area. Although the duration for works in each area is generally of a 2-3 year period, the works would occur progressively through each area, effectively minimising the amount of ground disturbance at any one time.

Table 14-1 Summary of Key Activities and Air Emissions

Area	Duration	Activity	Air Emission	Key Air Quality Considerations
Works within the main area of the Site (including the demolition of the Refinery Process Area, tanks within the Eastern and Western Tank Areas, buildings and associated redundant infrastructure (refer to **Figure 4-1**)	Staged over 2.5 years (2015-2017)	Vehicle movements	Dust from roads and VOCs from exhaust	The potential for dust, VOCs and odour emissions from exposed surfaces impacting on residential and commercial receptors in Kurnell. This is based on the activities to be undertaken and the known and potential contamination within this area presented (refer to **Table 9-1** in **Chapter 9 Soils, Groundwater and Contamination**)
		Removal of concrete and cutting / grinding works	Dust emissions from the handling/removal of concrete
			Fumes and fine particulate emissions from cutting/grinding
		Emplacement of Material	Dust during placement
		Removal of underground piping and infrastructure	Dust emissions from the handling/removal of concrete/infrastructure
			Fumes and fine particulate emissions from cutting/grinding
		Removal of contaminated soil	VOC and odour emissions
		Handling and transfer of soil	Dust during handling and stockpiling
		Back filling excavated areas	Dust during backfilling
		Stockpiling of material	VOC and odour emissions and windblown dust
Concrete recycling, (including stockpiling material for recycling) at the CLOR	3 months (end 2017)	Handling of stockpiled material	Windblown dust	The potential for dust impacts on commercial receptors (Desalination Plant)
		Processing of Material	Dust emissions
		Vehicle movements	Dust from roads and VOCs from exhaust
Eastern ROW and Western ROW (pipeline removal and soil excavation and handling)	Staged over 6 months (end 2016)	Removal of underground piping and infrastructure	Dust and VOCs emissions from the handling of concrete/soil/infrastructure	The potential for dust, VOCs and odour emissions from trenching and backfilling impacting on residential and commercial receptors in Kurnell. This is based on the activities to be undertaken and the known and potential contamination within this area presented (refer to **Table 9-1** in **Chapter 9 Soils, Groundwater and Contamination**)
			Fumes and fine particulate emissions from cutting/grinding
		Back filling excavated areas	Dust during dumping
		Stockpiling of material	VOCs and odour emissions and windblown dust
		Vehicle movements	Dust from roads and VOC from exhaust
Continental Carbon Pipeline (Removal of pipeline)	Staged over 6 months (end 2017)	Stockpiling of material	Windblown dust	The potential for dust, VOCs and odour emissions from trenching and backfilling. There are no residential or commercial receptors nearby
		Pipe Cutting	Fumes and particulates emissions
		Back filling excavated areas	Dust and VOC emissions from the handling of soil

14.6.1.1 Excavation Works within the Main Refinery Site

As outlined in **Table 14-1**, and described in **Section 14.6.1**, removal of foundations, redundant slabs and redundant infrastructure (e.g. the oily water sewer) associated with the refinery process units would require the excavation of soil and concrete which may extend down to 2 mbgl. This work would be progressive and staged across a 2 year period. As the excavation work is completed in each location this area would be brought back to grade and levelled. Towards the end of the demolition works, crushed concrete would be spread across the refinery process area.

Ground disturbance associated with the removal of above ground storage tanks would extend to a maximum of 1 mbgl. This ground disturbance would be primarily associated with the removal of small pipelines/infrastructure within the bunded tank areas. The tank bunds would remain intact. This work would be staged across a 2.5 year period.

Ground disturbance associated with infrastructure and building demolition would extend to a maximum of 1mbgl. This work would be staged across a 1.5 year period.

Spoil would be temporarily stockpiled in designated areas within the main refinery site prior to reuse or being transported to the CLOR. This is discussed in detail in **Chapter 9 Soil, Groundwater and Contamination**.

As identified in **Table 14-1,** there is a potential for dust, VOCs and odour emissions from exposed surfaces to result in adverse air quality impacts on residential and commercial receptors during the demolition works in the main refinery area of the Site. Potential impacts would be managed through the implementation of the management and mitigation measures outlined in **Section 14.7**.

14.6.1.2 Concrete Recycling

The concrete crushing plant would operate within the final three months of the demolition works. This would be located within the former CLOR site.

Caltex have estimated that the maximum volume of concrete that would require crushing would be approximately 2000 m^3. Based on this maximum volume, it is estimated that an average of approximately 70 tonnes per day of concrete would be processed[13].

This crushed concrete would be used on-site, as it serves a suitable base for providing ground compaction in areas where excavation has taken place on-site.

The process of crushing concrete could potentially result in dust impacts on commercial receptors to the south west of the Site. Emissions associated with the process would be managed through the implementation of the management and mitigation measures outlined in **Section 14.7**.

[13] *Assuming works occur over 5.5 working days per week, this equates to 71.5 days within the proposed 3 month period of crusher operation. Assuming a density of 2.4t/m3, 2000 m3 equates to 4,800t. 4,800t, divided by 71.5 days equates to an average of 67t/day, as based on the maximum estimated concrete crushing volume.*

14.6.1.3 Excavation Works within the Eastern ROW and Western ROW

The demolition works for the Western ROW and Eastern ROW would involve the removal of redundant underground pipes via trenching. This would entail excavation of soil along the pipeline easements to a depth of approximately 2 mbgl. This would be undertaken in a progressive and staged manner over a 6 month period. Works would not occur within both ROWs at once.

Spoil would be temporarily stockpiled in designated areas along the ROWs prior to reuse or being transported to the former CLOR site. This is discussed in detail in **Chapter 9 Soil, Groundwater and Contamination**.

As presented in **Table 14-1** and **Table 9-1** in **Chapter 9 Soil, Groundwater and Contamination**, there is potential for volatile petroleum hydrocarbons to be present in the soil, which could give rise to odour and VOC emissions.

In addition, the removal of cooling water inlet pipes has the potential to generate odours, should significant biological matter be present on the internal surface of the pipes. This would be managed through the implementation of the management and mitigation measures outlined in **Section 14.7.**

It is noted that dust generation during excavation works within the ROWs was considered during the Kurnell B Line Upgrade Project (URS, 2011). Preliminary dust modelling undertaken during the B-line works showed that up to 10 µg/m^3 of particulate matter (as PM_{10}) may be generated at a distance of between 10 m and 15 m from the excavation area. These concentrations were shown to be transient and could be mitigated through controlled excavation rates and water suppression measures. These measures have been included in **Section 14.7**.

14.6.1.4 Excavation of the Continental Carbon Pipeline

The Continental Carbon Pipeline that runs southward from the main refinery area towards the former Continental Carbon facility (refer to **Figure 4-1**). The Continental Carbon Pipeline is approximately 1.1 km long and has a diameter of 0.5 m.

Excavation to a depth of approximately 2 mbgl would be required to remove this pipeline. This work would be staged across a 6 month period.

Spoil would be temporarily stockpiled in designated areas along the easement prior to reuse or being transported to the former CLOR site. This is discussed in detail in **Chapter 9 Soil, Groundwater and Contamination**.

As presented in **Table 14-1** and **Table 9-1** in **Chapter 9 Soil, Groundwater and Contamination**, there is for volatile petroleum hydrocarbons to be present in the soil, which could give rise to odours and VOC emissions. However, there are no commercial or residential receptors close to these works. However, the mitigation measures provided in **Section 14.7** would help ensure that cumulative impacts with other emissions from the demolition works would be avoided.

14.6.1.5 *Asbestos*

The majority of the asbestos in the infrastructure to be demolished would have been removed as part of the decommissioning process, prior to the demolition works.

However, asbestos is known to occur in sections of the units that cannot be accessed until they are demolished. Asbestos is also described as being present in various forms, including small fragments and fibres, and in surface soil layers. **Table 9-1 Chapter 9 Soils, Groundwater and Contamination** shows the CMZs where asbestos is most likely to be encountered.

The asbestos that is to be removed as part of the demolition works would be managed in accordance with the Site's Safety Management Plan (SMP) which would be modified to include specific requirements for the demolition works. The SMP would include handling provisions, containment plans and air monitoring requirements of asbestos. Management and mitigation measures for inclusion in the modified SMP have been presented in **Section 14.7**.

Asbestos in soil and managing asbestos to minimise potential impacts on human health and ecological risk have been discussed in **Chapter 9 Soils, Groundwater and Contamination** and **Chapter 10 Human Health and Ecological Risk,** respectively.

14.6.1.6 *Other Activities*

As identified in **Table 14-1**, dust may be generated by vehicle movements on unsealed roads. Vehicle movements for the demolition works would primarily be on existing sealed refinery roads, minimising dust generation. However, vehicles would access unsealed areas such as the ROWs and the Continental Carbon Easement. These impacts would be minor and temporary and effectively minimised through the implementation of the mitigation measures proposed in **Section 14.7**.

Table 14-1 also noted that adverse air emissions may be generated from plant and equipment used for the demolition works. These impacts would be effectively mitigated through the implementation of the measures proposed in **Section 14.7**.

14.7 Mitigation Measures

14.7.1 *Excavation Works*

The primary air emission that would potentially result in an adverse impact on sensitive receivers during the demolition works is the excavation of contaminated soil/concrete and the subsequent release of odorous VOCs. The EPL requires that no offensive odours occur beyond the Site boundary. To ensure the release of adverse odours are avoided or minimised, these works would be managed by:

- **Conducting odour and VOC monitoring**. Regular odour and VOC monitoring during concrete excavation and soil excavation would be completed in line with existing Caltex procedures. The monitoring would need to be undertaken close to the excavation areas and would include the use of monitoring equipment to measure VOC concentrations as well as odour surveys.
- **Storing contaminated soils away from receptors.** Soils or concrete with significant hydrocarbon staining or obvious hydrocarbon odours would be transported to the former

CLOR area and stored appropriately. Stockpiles of contaminated soil stored on-site would need to be covered to prevent odorous VOC emissions and windblown particulate emissions.

- **Excavation conducted in appropriate weather**. Where practicable, excavation of concrete and soil should not be undertaken during calm or stable weather as potential odours are less likely to disperse effectively. As such excavation works should be minimised before 8 am and after 4 pm, when stable weather conditions are more likely to occur, unless weather forecasts predict conditions outside these hours that are conducive to dispersing odours.
- **Managing soil exposure**: If contaminated soils are exposed (e.g. through concreate removal or excavation) there may be an initial temporary spike in odorous VOCs before emissions reduce. During ground disturbance works, if odour monitoring, demolition workers or the community indicate an unacceptable level of odour or VOC impact, measures to manage these impacts would be implemented. These could include covering exposed soils or reducing the exposure rate of soils to help manage emissions.

14.7.2 Other Activities

A number of additional dust suppression measures were suggested for the conversion works. These measures included monitoring for dust as excavations took place and covering soil on the back or trucks. These measures would also be employed to avoid dust impacts from the demolition works.

Excavation and stockpile management would be undertaken in line with the measures identified in **Chapter 9, Soil, Groundwater and Contamination**. These measures would help avoid and mitigate impacts associated with dust and particulate matter.

Where biological matter is present within cooling water inlet pipework, the pipework would be removed as soon as possible. This would help to minimise the potential for odour issues associated with the degradation and then exposure of the biological matter.

All demolition plant would be maintained and operated in line with the manufacturer's specifications in order to minimise the emission of air pollutants and offensive odours. Plant and construction vehicles would be turned off when not in use.

The crushing of concrete, asphalt and aggregates with be undertaken using a jaw crusher. The jaw crusher will be located in the former CLOR site. Crushing would occur at the end of the demolition, over a three month period during the day shift. During crushing, a number of dust suppression measures would be implemented including regular watering of stockpiles and use of dust curtains. In addition real-time monitoring of particulate matter (TSP and / or PM_{10}) at the boundary is recommended during the start-up of the concrete crushing operation to ensure particulate matter is adequately controlled.

14.7.3 Air Quality Management Plan

An Air Quality Management Plan (AQMP) would be prepared and implemented for the demolition works. The AQMP would be prepared as a sub-plan to the DEMP.

As well as the specific measures outlined in **Section 14.7.1** and **14.7.2**, the following mitigation would be documented in the AQMP and/or DEMP and implemented for the demolition works:

- procedures for handling complaints;
- procedures for informing local residents of air quality issues related to the works;
- describe the measures that would be implemented on-site to ensure:
  - the control of air quality and odour impacts of the demolition works;
  - that these controls remain effective over time;
  - that all reasonable and feasible air quality management practice is employed;
  - the air quality impacts are minimised during adverse meteorological conditions and extraordinary events; and
  - compliance with the relevant conditions of this consent.
- describes the air quality and odour management system(s);
- includes an air quality monitoring program that:
  - is capable of evaluating the performance of the proposal;
  - includes a protocol for determining any exceedances and responding to complaints; and
  - evaluates and reports on the effectiveness of the air quality management system during the demolition works; and
- includes how demolition workers inducted on-site will be informed about, air quality impacts and management in relation to the demolition works; and
- Include all reasonable and feasible measures to minimise energy use and greenhouse gas emissions during the demolition works. This would include:
  - Turning off demolition plant and vehicles when not in use;
  - Inspecting and maintaining plant and vehicles to ensure that they are operating efficiently; and
  - Looking for opportunities to use local supplies, facilities and/or plant to minimise transport related energy use.

14.8 Summary

Table 14-2 provides a suite of mitigation measures that would be incorporated in to the AQMP and implemented during the course of the demolition works. The AQMP would provide further details on the monitoring commitments. Adherence to the proposed monitoring requirements and mitigation measures would allow adverse air quality impacts to remain minimal and temporary.

Table 14-2 Management and Mitigation Measures - Air Quality

Management and Mitigation Measures	Demolition	
	Design	Implementation
Dust emissions from the construction phase of the Project *and* ***during the demolition works*** would be monitored by construction/***demolition*** staff. ***When required, during activities likely to cause high dust levels or adverse weather conditions etc.,*** a designated worker would ensure emissions that may impact the community or local residents are regularly monitored and call a halt to activities if sensitive receivers are likely to be affected by airborne particulate matter. Should significant impacts be likely, appropriate measures would be taken to mitigate adverse air quality impacts.		✓
Within the refinery, vehicles would only travel on designated roads ***where possible*** and would be limited to a maximum speed of 10 km/hr in ***offroad*** areas, and 25 km/hr elsewhere.		✓
Where there is the potential for dust or odour generation from trucks carrying spoil, the loads would be covered and all tailgates would be securely fastened. Vehicles would not be loaded higher than the sides and tailboard.		✓
Construction *and* ***potentially dust generating demolition*** activities would be limited during high wind events if sensitive receivers are likely to be significantly impacted.		✓
All plant would be maintained and operated in line with the manufacturer's specifications in order to minimise the emission of air pollutants and offensive odours. Plant and construction vehicles would be turned off when not in use.		✓
Stockpiled material would be assessed for the potential for causing odorous or particulate emissions. If air pollutants and offensive odours are likely, controls would be put into place to monitor and manage adverse impacts.		✓
All concrete cutting and coring would to be undertaken using "wet tools".		✓
An odour reduction program would be implemented in accordance with the existing EPL.		
Caltex's Leak Detection and Repair (LDAR) Program would continue in accordance with the Environment Protection Licence.		
All reasonable and feasible measures would be implemented to minimise dust and odour emissions during the demolition works	✓	
VOC and Odour Monitoring would be undertaken by demolition workers and monitoring equipment during excavation activities where potential hydrocarbon contamination is present.		✓
Soils or concrete with significant hydrocarbon staining or obvious hydrocarbon odours would be transported to the former CLOR area and stored appropriately. Stockpiles of contaminated soil stored on-site would be managed to prevent odorous VOC emissions and windblown		✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
particulate emissions.		
Excavation would be staged to manage potential VOC and odour emissions. Where practical, excavations would not commence prior to 8am nor after 4pm as weather conditions at these times are generally conducive to adverse odour air quality situations from fugitive emissions.		✓
In unfavourable weather conditions (e.g. dry and windy conditions) or where dust sources are present near sensitive receivers, water sprays would be used to dampen down soils prior to excavation, handling and/or loading/unloading materials. All exposed surfaces (from recent excavations) and stockpiles (of excavated material) would also be watered, sprayed or covered where required, to minimise nuisance dust and odours.		✓
During adverse meteorological conditions and extraordinary events, such as events where elevated background dust is present, additional mitigation measures would be considered to prevent and minimise air quality impacts from demolition works. These measures would include, but not be limited to implementing the following during high wind events (e.g. > 8m/s hourly average): • ***Reducing working surface area*** • ***Commencing excavation during favourable wind conditions*** • ***Increase wetting agents for exposed surfaces*** • ***Increase covering of exposed surface areas***		✓
Surface disturbance would be minimised. Exposed ground would be rehabilitated as soon as practicable.		✓
During adverse weather conditions, dust monitoring would be undertaking during the operation of the concrete crusher. Detail of this monitoring (and associated response actions) would be incorporated into the AQMP for the demolition works.		✓
During crushing, a number of dust suppression measures would be implemented. These could include regular watering of stockpiles, dust curtains and other measures as appropriate.		✓
Where biological matter is present within cooling water inlet pipework, the pipework would be removed be as soon as possible. This would help to minimise the potential for odour issues associated with the degradation and then exposure of the biological matter.		✓
Where visible dust emissions are observed appropriate management actions would be implemented to prevent impact.		✓

15 TRANSPORT AND ACCESS

15.1 Introduction

This chapter provides an assessment of the potential traffic and access impacts of the demolition works. It was prepared based on input by Parking and Traffic Consultants.

15.2 Scope of the Assessment

With regards to traffic and access, the SEARs (refer to **Appendix A SEARs and Application Documentation**) require that the SEE include an '*assessment of additional traffic movements associated with the proposed modification, and updated site access plans*.'

In order to understand the effect the demolition works could have on the road network around the demolition works area (i.e. the 'study area'), the existing transport environment was investigated and analysed. Following this, a transport impact assessment was completed to assess the likely impacts associated with the demolition works.

15.3 Method of Assessment

The potential impact of the demolition works on the surrounding road network has been assessed in accordance with the *Guide to Traffic Generating Developments* (R&M, 2002).

For the purposes of this assessment, the existing traffic conditions within the study area have been established using the existing traffic volumes and construction phase traffic predictions provided within the assessment undertaken as part of the EIS for the conversion works (URS, 2013).

As presented in **Section 4.3.1**, there would be an overlap between the conversion works and the demolition works in 2015 and 2016. When the demolition works commence, the only conversion works still being completed will relate to the conversion of certain tanks across the Site. The refinery will have also ceased operation. Therefore this assessment has considered the cumulative traffic impacts associated with both the demolition works and the remaining tank conversions.

15.3.1 Level of Service

In accordance with the NSW Roads and Maritime (R&M) *Guide to Traffic Generating Development*, the efficiency of the existing road network was determined using 'Level of Service' (LOS) as the performance standard. LOS is defined in the *Guide to Traffic Engineering Practice – Roadway Capacity* (Austroads 1988) as a qualitative measure of features that include speed, travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort, convenience and operating costs. LOS is used to describe the performance of an intersection or midblock location. LOS ranges are defined as falling between A, which indicates good intersection performance, to F, which indicates saturated conditions with long queues and delays. Road and Maritime Services have categorised LOS into the following five ranges as presented in **Table 15-1**.

Table 15-1 LOS Criteria (Based on R&M Guide to Traffic Generating Development)

LOS	Two Way Flows (veh/hr)*		Definition
	Minimum Flow	Maximum Flow	
A	0	1,800	Good operation
B	1,800	2,800	Good with acceptable delays and spare capacity
C	2,800	3,600	Satisfactory
D	3,600	4,400	Operating near capacity
E	4,400	5,600	At capacity
F	>5,600		Operating beyond capacity

*The two way flows presented represent the carriageway accommodating two traffic lanes in each direction and represents a suburban environment.

15.3.2 Traffic Generation

Traffic generation during the demolition works was estimated using vehicle volumes provided by Caltex. Further, traffic associated with the demolition staff members was based on number of staff assuming a worst case traffic generation of one person per vehicle.

In order to determine the impact of the demolition works on the surrounding road network, the projected traffic activity associated with the demolition works was added to existing traffic volumes and conversion works traffic predictions provided within the assessment undertaken as part of the EIS for SSD 5544 (URS 2013). The reduction of workers at the Site following the shutdown of the refinery was also taken into consideration.

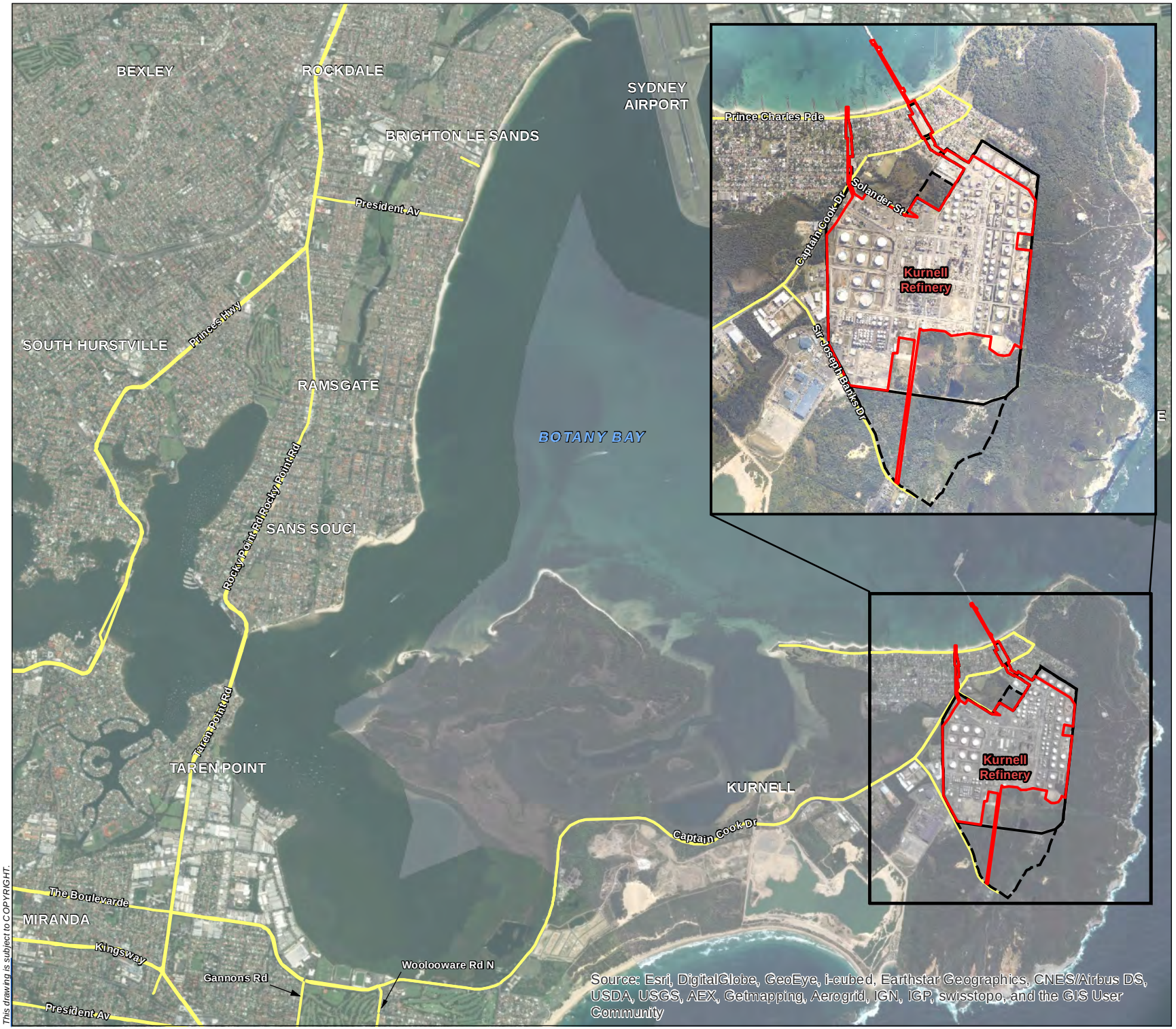
This information was then compared to the predicted traffic volumes of the surrounding road network during the year of the demolition works (i.e. in 2015). The key road that was considered in this assessment was Captain Cook Drive (east of Gannons Road). This assessment compared the predicted LOS of this road in 2015 against the predicted LOS for the road plus the demolition works in 2015. This comparison was used to assess the traffic impact of the demolition works.

15.4 Existing Environment

15.4.1 Road Hierarchy

The Site is located within the suburb of Kurnell on the southern shore of Botany Bay and is accessed by a main arterial road and local streets. The main arterial road that is located adjacent to the Project is Captain Cook Drive.

Captain Cook Drive is the major access road to the Kurnell Peninsula on the southern shore of Botany Bay from the wider Sydney road network. It connects Taren Point Road to the west (and further to the Princes Highway via The Boulevard) with Prince Charles Parade to the east and the suburb of Kurnell. It has three lanes in each direction west of Gannons Road with a median strip separating each carriageway, reducing to two lanes in each direction and divided carriageways between Gannons Road and Woolooware Road. It further decreases to an undivided carriageway with one lane in each direction east of Woolooware Road to Kurnell. A location plan showing the surrounding road network can be found in **Figure 15-1**.



Legend

- Demolition Works Area
- The Site
- Caltex Land Ownership
- Roads

N
W E
S

0 0.5 1 2 Kilometers

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers and Neamap Hypertiles. Map compiled using MapInfo StreetPro data. © 2011 MapInfo Australia Pty Ltd and PSMA Australia Ltd. URS Australia, MapInfo Australia or PSMA Australia do not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that these companies shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

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CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

LOCAL ROAD NETWORK

URS

Figure: 15-1

Rev. A A4

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy as follows:

- State Roads - Freeways and Primary Arterials (R&M managed);
- Regional Roads - Secondary or sub arterials (Council managed, part funded by the State); and
- Local Roads - Collector and local access roads (Council managed).

The road network serving the Site includes:

Captain Cook Drive west of Gannons Road is classified as a State Road. To the east of Gannons Road, Captain Cook Drive is classified as a Regional Road. Captain Cook Drive provides primary vehicular access to the Site and connects Taren Point Road with the Kurnell Peninsula on the southern shore of Botany Bay. Within the vicinity of the Site, the carriageway is divided and comprises one traffic lane in each direction. A section of Captain Cook Drive between Woolooware Road and Elouera Road is being upgraded to two traffic lanes in each direction. Sutherland Shire Council[14] states that this upgrade is scheduled for completion in 2015.

Taren Point Road is classified as a State Road and follows a north-south alignment. Within the suburb of Taren Point, Taren Point Road is aligned parallel to and east of the Princess Highway and provides an alternate route. Generally, the carriageway is divided and comprises three traffic lanes in each direction with auxiliary turning lanes.

Solander Street is classified as a Local Road and provides vehicular access to the Site. It connects the car park with Captain Cook Drive. The carriageway comprises one traffic lane in each direction.

15.4.2 Public Transport

The Site is serviced by the Route Number 987 bus service that is operated by Veolia. This service connects Kurnell to Cronulla train station. This service operates on weekdays between 6am-6pm and during peak time it operates with a frequency of one service every 40 minutes. On weekends, this service operates between 8am-6pm and during peak time it operates with a frequency of one service every 60 minutes.

15.4.3 Existing Traffic Volumes

The Traffic Impact Assessment (TIA) undertaken for the EIS for the conversion works (URS, 2013), predicted that the peak hour mid-block two way traffic volumes along Captain Cook Drive, east of Gannons Road would be 3,983[15] vehicle movements per hour in 2014 (the peak construction year for the conversion works). Additionally, based on the Census results, the TIA assumed an annual growth rate of 1.3% per annum.

Table 15-2 provides the impact assessment summary from the EIS for the conversion works (URS, 2013, Table 16-4).

[14] http://www.sutherlandshire.nsw.gov.au/Building_Development/Works_and_Projects/Projects/Captain_Cook_Drive_Upgrade- Accessed on 22/07/14

[15] *Caltex Kurnell Refinery Conversion Environmental Impact Statement*, URS 2013, Table 16-5

Table 15-2 Impact Assessment Summary (Conversion Works EIS)

Road	Pre-Construction		During Construction Phase		
	2014 Background Peak Hour Volume (two-way)	*LOS*	*Peak Hour Trips Generated by Construction Activities*	*Total 2014 Peak Hour Volume*	*LOS*
Captain Cook Drive	3,983	D	144	4,127	D

There are a number of factors that affect the existing traffic volumes which have been used as the baseline for this assessment:

- **Commencement of works:** The EIS for the conversion works (URS, 2013) used a predicted 2014 peak hour volume (two way) as this corresponded to the commencement of conversion works. The demolition works are proposed to commence in 2015 therefore, in order to project the peak hour volume (two way) for 2015, the growth rate of 1.3% has been applied to the 2014 peak hour traffic flows which results in the following:
  - 2015 peak hour volume (two way) - 4,035.
- **Exclusion of refinery workforce traffic:** The predicted 2015 peak hour volume (two way) includes the traffic activity associated with the operation of the refinery which will be shutdown in Q4 of 2014. During peak operations the refinery employed a maximum of 885 staff members (excluding maintenance shutdown periods, refer to **Table 4-2**). It has been assumed that
  - all personnel arrived at the Site during the AM Peak Hour and departed during the PM Peak Hour; and
  - personnel utilised their own private vehicle with no use of car-pooling or public transport.
- **Inclusion of terminal workforce:** The EIS for the conversion works (URS, 2013) stated that the final operational workforce was being determined for the operation of the terminal. However, it was anticipated approximately 100 employees would provide routine operational or supporting services to the terminal. Although these employees would operate in a shift arrangement 24 hours a day, 7 days a week, the same assumptions were made as for the refinery workforce traffic generation outlined above.

These considerations have been taken into account to estimate the traffic volumes for 2015 (the year when the peak demolition workforce will be present on-site). These estimates are shown in **Table 15-3**.

Table 15-3 Predicted Total 2015 Peak Hour Volume

2015 Estimate for Existing Road Network *Road*	*2014 Background Peak Hour Volume (two-way)*	*2015 Background Peak Hour Volume (two-way)*[1]	*Additional Peak Hour Volume*		*Redundant Peak Hour Volume*	*Total 2015 Peak Hour Volume*[6]
			Generated by Conversion Works Construction Activities[2,5]	*Generated by the Terminal Operation Workers*[3,5]	*Generated by the Refinery Operation Workers*[4,5,7]	
Captain Cook Drive	3,983	4,035	144	100	885	3,394
LOS	D	-	-	-	-	C

*1 Calculated by assuming the same growth as in the Conversion Works EIS of 1.3% : 4,035*1.013*

2 Caltex Kurnell Refinery Conversion Environmental Impact Statement, URS 2013, Table 16-5.

3. Caltex Kurnell Refinery Conversion Environmental Impact Statement, URS 2013, Section 16.5.4.

4 Caltex Kurnell Refinery Conversion Environmental Impact Statement, URS 2013, Section 16.4.2.

5 Assumptions:

- *all personnel would arrive to Site during the AM Peak Hour and depart during the PM Peak Hour; and*
- *personnel would utilise their own private vehicle with no use of car-pooling or public transport.*

6 Calculated by adding additional traffic and subtracting redundant traffic: 4,035+144+100-885.

7. Excluding maintenance shutdown.

15.4.4 Existing Intersection Operation

Table 15-3 presents a predicted 2015 peak hour volume (two way) of 3,394 vehicle movements per hour as a representation of the potential traffic volumes during the demolition works. Based on the table above, the traffic flows along Captain Cook Drive represents a LOS of C, indicating that following the shutdown of the refinery in 2014, the road network will be operating at a 'satisfactory' level in 2015.

15.5 Impact Assessment

15.5.1 Traffic Generation

The traffic generated by the demolition works would incorporate a mix of demolition plant vehicles, delivery vehicles and demolition personnel movements. A summary of the vehicle mix includes:

- Demolition works personnel – a maximum of 230 additional personnel (460 daily return trips) on average would be required at the Site during the demolition works.
- Heavy vehicles:
  - 2,675 heavy vehicles would be required to access the Site, resulting in approximately 6 heavy vehicles per day (12 daily return trips); and
  - at any one time there would be a peak of approximately 30 heavy vehicle per day (60 daily return trips) required to access the Site.

In order to present a robust assessment, a worst-case scenario has assumed that all demolition workers arrive in the morning peak period and depart during the afternoon peak

period and that a car occupancy rate of one person per car applies, thus, resulting in one vehicle movement per demolition worker.

During the demolition works, a maximum of 230 demolition workers would travel to the Site. The use of the maximum number of demolition workers in this assessment results in a total of 230 additional vehicle movements during each peak period, i.e. staff arriving during the morning peak period and leaving the Site during the evening peak period.

A summary of the additional traffic likely to be generated for the demolition works is provided in **Table 15-4**.

Table 15-4 Staff and Plant Requirements for Demolition

Description		*Daily Movements (return trips)* [1]	*Peak Period Trips* [2]
Heavy Vehicles	Equipment/Material Delivery / Disposal Vehicles (peak)	60	12
Private Vehicles	Demolition Personnel*	460	230
TOTAL		***520***	***242***
Heavy Vehicle Proportion		*12%*	*5.2%*

Assumptions:

1.

- *all personnel would arrive to Site during the AM Peak Period and depart during the PM Peak Period;*
- *personnel would utilise their own private vehicle with no use of car-pooling or public transport;*

2.

- *heavy vehicle movements have used the worst case scenario of 30 vehicles /day (i.e. a total of 60 vehicle trips);*
- *heavy vehicle movements would be evenly distributed throughout the hours of operation (10 hour workdays) resulting in 6 heavy vehicle movements per hour;*
- *As discussed below the 'peak period' is considered to be 2 hours in length in both the AM and PM, resulting in 12 heavy vehicle movements for the peak period.*

15.5.2 Demolition Works

As discussed in **Section 15.4**, Captain Cook Drive provides primary vehicular access to the Site. In order to assess the impact of the demolition works we have added the projected traffic activity associated with the works to the 2015 total peak hour traffic volumes along the Captain Cook Drive (refer to **Table 15-3**).

In completing this assessment it is noted that it is highly likely that the demolition works would commence before 7 am and that a number of shifts maybe operating on-site. Therefore to conservatively account for this consideration, we have assumed the peak period trips shown in **Table 15-4** would be split over a two hour period in the morning from 7:00 to 9:00 and in the evening from 16:00 to 18:00. To reflect this in the assessment we have assumed 50% of the demolition personnel would arrive at the Site during 7:00-8:00 and the remaining 50% will arrive between 8:00-9:00. This means that 115 demolition personnel trips per peak hour would be expected, plus an addition 6 heavy vehicle movements, resulting in 121 demolition works movements per peak hour.

In 2015, Captain Cook Drive (east of Gannons Road) is predicted to carry a two way flow of 3,394 vehicles per hour. This data was added to the 121 demolition works movements per

peak hour to understand the likely impact of the demolition works. This assessment is presented in **Table 15-5**.

Table 15-5 Impact Assessment Summary

Road	Pre Demolition Works		During Demolition Works		
	Total 2015 Peak Hour Volume	*LOS*	*Peak Hour Volume Generated by the Demolition Works[1,2]*	*Total 2015 Peak Hour Volume*	*LOS*
Captain Cook Drive	3,394	C	121	3,515	C

1. *The demolition personnel would arrive and depart the Site across a two hour time period commencing at 07:00 in the morning and 16:00 in the afternoon. Therefore it is assumed that of the 230 demolition workers arriving or departing each day that 115 will arrive or depart in the first peak hour and 115 will arrive and depart in the second peak hour.*
2. *The 60 heavy vehicle movements per day have been evenly distributed throughout the hours of operation (assumed 10 hour workdays) resulting in 6 heavy vehicles per peak hour*

During the demolition works, the section of Captain Cook Drive east of Gannons Road would carry a total peak hour volume of 3,512 vehicle movements and would operate with a LOS C.

Therefore, it is expected that the Captain Cook Drive would continue to operate similarly to the existing conditions, indicating the traffic activity associated with the demolition works would have no detrimental impact on the operation of surrounding road network.

Following the cessation of the demolition works, and as presented in the EIS for SSD 5544 (URS,2013), with the reduction in employees from approximately 900 to approximately 100 and cessation of routine road haulage, the number of vehicles generated by the Site following the conversion and demolition works would be significantly reduced. This would result in a net reduction in traffic volumes along Captain Cook Drive. Therefore it can be concluded there would be an improvement to the local traffic environment and a beneficial transport impact.

A small portion (<5%) of the demolition plant and demolition personnel would need to access some areas outside the Site but within the demolition works area. This would be for works in the road reserves, Kurnell Wharf, Silver Beach and Botany Bay. Whilst these works would not be on the main part of the Site, these workers would still need to use Captain Cook Drive to access the demolition works area and therefore this LOS assessment is still valid. However, measures to manage wider traffic related issues are outlined in **Section 15.6**.

15.6 Mitigation

The transport and access impact assessment and associated mid-block traffic analysis concluded that Captain Cook Drive would continue to operate similarly to the predicted conditions identified in **Section 15.4**. It has also concluded that the demolition works would have no detrimental impact on the operation of the surrounding road network.

However, there would be an increase in the number heavy movements on the road network during the demolition works and there would be a requirement for traffic management during the removal of pipelines from within the road reserves. Therefore, to ensure safe, continuous and efficient movement of traffic for both the general public and demolition workers, a Traffic Management Plan (TMP) would be developed and would include the following:

- hours of permitted vehicle activity;
- designated routes for demolition traffic and defined access points to the demolition works area;
- designated staff and contractor parking locations;
- duration of works;
- permitted demolition vehicle types;
- a community consultation plan to ensure residents in close proximity to the Site are informed of upcoming demolition activities and have a point of contact during demolition activities;
- designated areas within the demolition works area for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the demolition works area in a forward direction;
- sequence for implementing traffic management measures; and
- procedures and/or principles for demolition vehicle speed limits and the safe operation of demolition vehicles.

Development and implementation of the TMP would be undertaken in consultation with R&M and SSC as required. The TMP would form part of the DEMP and would be a working document with flexibility to address traffic issues as they arise during the demolition works.

As discussed with SSC, works within the road reserves in Kurnell would not take place during certain major public events at Kurnell. These include:

- Australia Day (January);
- The Festival of Kites (May); and
- The Boree Regatta (October).

Works within the road reserves would not take place during these events.

The works within the road reserves would be carefully managed and the approach to the work would be agreed with SSC in advance through their 'Road Opening Application' process. This application would be submitted to SCC alongside the TMP and a schedule of works. The works within the road reserve would aim to keep one lane open as works progressed to maintain some traffic flow along each street. No work within the road reserve would be started until the road opening application is approved.

15.7 Cumulative Impact Assessment

This section considers other relevant developments that have been placed on exhibition, but are not yet approved or approved but not yet commissioned, and which are located within a 1 km radius of the Site. Such projects, could give rise to cumulative impacts in combination with the Project-generated (conversion works and demolition works) traffic. **Table 15-6** provides the details of the development identified for consideration in the cumulative impact assessment.

Table 15-6 Relevant Cumulative Developments

Project Name	Location	Description	Expected Construction Dates
Kurnell Port and Berthing Facility Upgrade Works	Botany Bay / Kurnell	Upgrade to the Kurnell port and berthing facility	Q3 2013 – Q2 2015

Sutherland Shire Council and R&M were contacted requesting the details of any additional developments that should be considered as part of this assessment. Neither authority was aware of any additional relevant developments within the surrounding area.

The construction stage of the Kurnell Port and Berthing Facility Upgrade Works commenced in 2013 and will continue to Q2 2015. The EIS produced for the Kurnell Port and Berthing Facility Upgrade Works (SSD-5353) noted one period of time when there would be a number of trucks accessing the Kurnell Wharf. There would be nine days between Q3 2014 and Q2 2015 when there would be 100 concrete pouring trucks accessing the Wharf. There could be up to 25 trucks on one day with the remaining days seeing up to nine trucks in one day (URS, 2012).

By the time there is a potential for a cumulative impact of construction/demolition traffic between the two projects, the refinery operations at the Site would have ceased (second half of 2014) and the number of workers accessing the Site would have begun to reduce. There would be additional demolition traffic accessing the Site, however, traffic generation from the Project would be significantly lower than at present and the potential for a cumulative impact associated with the construction stage of the Kurnell Port and Berthing Facility Upgrade Works and the Project would be negligible. Therefore no cumulative traffic impacts are expected.

15.8 Summary

The mitigation measures outlined in **Section 15.7** are summarised and outlined below in **Table 15-7**.

Table 15-7 Management and Mitigation Measures - Traffic and Access

Management and Mitigation Measures	Demolition	
	Design	Demolition
Local Authorities and Kurnell residents would be informed of work which would affect the road network.		✓
A Traffic Management Plan would be developed for the construction/***demolition*** phase. The Traffic Management Plan would comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network. The Transport Management Plan would include: • hours of permitted vehicle activity; • designated routes for construction ***and demolition*** traffic and defined access points to the Site and ***demolition works area***; • duration of works; • ***permitted demolition vehicle types***; • designated areas within the Site ***and demolition works area*** for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the Site ***and demolition works area*** in a forward direction; • sequence for implementing traffic management measures should these be required; and • procedures and/or principles for construction ***and demolition*** vehicle speed limits and the safe operation of construction ***and demolition*** vehicles.		✓
Works to remove pipelines from under the road reserves in Kurnell would not take place before a road opening application has been approved by Sutherland Shire Council and on the days the following events are taking place: • ***Australia Day (January);*** • ***The Festival of Kites (May); and*** • ***The Boree Regatta (October).***	✓	✓

16 HERITAGE

16.1 Introduction

A Heritage Impact Assessment (HIA) was undertaken by Australian Museum Consulting (AMC) to address the heritage issues associated with the demolition works. This chapter provides a summary of the findings of the HIA and includes relevant information from the previous HIA for the Conversion Works EIS (AMC, 2013) and the subsequent Heritage Management Strategy (HMS) (AMC, 2014). The HIA for the demolition works is provided in full in **Appendix F Heritage Impact Assessment**.

16.2 Scope of the Assessment

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requests that this assessment provides the following:

- *"an assessment of the potential impacts on Aboriginal and non-Aboriginal heritage (including movable cultural heritage) values."*

This chapter and **Appendix F Heritage Impact Assessment** address this requirement.

It is noted that the HIA does not include an Aboriginal Heritage Due Diligence Assessment. This is because:

- the HIA for the EIS for SSD 5544 (AMC, 2013) assessed the Site for Aboriginal Heritage Values. Due to the disturbed nature of the Site it was deemed highly unlikely that any Aboriginal Heritage items remained and that the conversion works would be unlikely to affect any Aboriginal sites or places;
- the Continental Carbon Pipeline easement (which extends beyond the Site boundary that was identified in the EIS for SSD 5544) was previously excavated to install the pipe. The works to remove the pipeline would be wholly within the existing cleared and disturbed easement; and
- the Silver Beach shoreline and the associated pipeline easements which would be disturbed as a result of the demolition works have been previously excavated to install the pipelines that are proposed to be removed. As such, these areas are unlikely to contain Aboriginal heritage objects.

16.3 Legislation and Planning Policy

16.3.1 Commonwealth Legislation

16.3.1.1 Australian Heritage and Commission Act 1975

The Australian Heritage and Commission Act 1975 (AHC Act) established the Register of National Estate (RNE). The RNE now exists as a non-statutory archive of heritage items.

Items in the vicinity of the demolition works area that are listed on the RNE are listed below in **Section 16.6**.

16.3.1.2 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) contains provisions for protecting and managing Matters of National Environmental Significance (MNES) including heritage items and places listed in the Commonwealth Heritage List (CHL) and the National Heritage List (NHL).

The CHL protects heritage items, and places owned or managed by Commonwealth agencies. The NHL protects places that have outstanding value to the nation. Approval from the Federal government is required for actions that would have an impact on items listed on the CHL or the NHL. Items in the vicinity of the demolition works area that are listed on the CHL or the NHL are listed below in **Section 16.6**.

16.3.2 ***State Legislation and Policy***

16.3.2.1 *Heritage Act 1977 (NSW)*

The *Heritage Act 1977* contains provisions for the protection of heritage places, buildings, works, relics, moveable objects and/or precincts that are of significance in NSW. Where these items have particular importance to the State they are listed on the State Heritage Register (SHR). Items in the vicinity of the demolition works area that are listed on the SHR are listed below in **Section 16.6**.

16.3.2.2 *National Parks and Wildlife Act 1974 (NSW)*

The *National Parks and Wildlife Act 1974* (NPW Act) contains objectives and provisions to conserve, protect and manage natural and historical features within the Office and Environment and Heritage (NSW OEH) Estate. The NPW Act also provides for the protection of all Aboriginal places and objects throughout NSW. Aboriginal objects reported to NSW OEH are registered on the Aboriginal Heritage Information Management System (AHIMS).

Items in the vicinity of the demolition works area that are registered on the AHIMS are provided in the conversion works EIS (refer to **Section 16.2**).

16.3.2.3 *State Environmental Planning Policy: Kurnell Peninsula 1989*

The *State Environmental Planning Policy: Kurnell Peninsula 1989* (SEPP (Kurnell Peninsula)) contains provisions for managing development on Kurnell Peninsula. The SEPP (Kurnell Peninsula) aims to conserve the natural environment and "*ensure that development is managed having regard to the environmental, cultural and economic significance of the area*".

Sections 23A-23D of the SEPP (Kurnell Peninsula) has provisions for the protection of local heritage items, relics and archaeological sites. Schedules 2 and 3 of the SEPP (Kurnell Peninsula) contain the archaeological sites and heritage items covered by this policy.

Items in the vicinity of the demolition works area that are included in the SEPP (Kurnell Peninsula) are listed below in **Section 16.6**.

16.4 Method of Assessment

16.4.1 Overview

The general objectives of this chapter and **Appendix F Heritage Impact Assessment** are to:

- build on the background information and recommendations contained within the previous HIA undertaken for the conversion works (AMC, 2013) and corresponding HMS to allow for approval to be sought for the demolition works;
- assess the direct and indirect impacts to heritage items and places as a result of the demolition works, including impacts on the heritage significance of the refinery itself, and on the heritage significance of items and places at the vicinity of the Site, such as Kamay Botany Bay National Park;
- provide a suite of mitigation measures for minimising and managing these impacts; and
- provide a Statement of Heritage Impact (SoHI) for the demolition works.

The HIA was undertaken in accordance with the following guidelines and documentation:

- the principles of *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (revised 2013; The Burra Charter);
- *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs & Planning 1996); and
- relevant supplementary publications including Statements of Heritage Impact (revised 2002).

The HIA also addresses the *Matters of National Environmental Significance: Significant impact guidelines 1.1* (Department of the Environment 2013).

The HIA includes an updated review of the following statutory and non-statutory heritage lists and registers:

- CHL;
- NHL;
- SHR;
- Schedules 2 and 3 of SEPP (Kurnell Peninsula)
- National Trust of Australia (NSW) Register;
- National Trust of Australia (NSW) Industrial Archaeological Sites List (IAS); and
- Australian Institute of Architects (AIA) Register of Significant Architecture in NSW.

16.4.2 Assessment of Significance

The assessment of whether an impact is likely to be significant is based on professional judgement and an understanding of how the demolition works would be likely to impact on the historic, aesthetic, scientific, social or spiritual significance of a heritage item, place, or archaeological site, having regard to the context or intensity of the impacts. Heritage significance or cultural heritage value is embodied in the place itself; its fabric, setting, use, associations, meanings, records, related places and related objects.

The assessment of magnitude or severity of potential impacts on heritage value has been based on:

- the extent to which the demolition works would have a substantial and/or long-term effect on one or more heritage values of the place, including the complete or partial loss of a one or more heritage values;
- the likelihood that the demolition works would involve removal, destruction, damage or substantial alteration of the fabric of a heritage item or place, in a manner inconsistent with its heritage values;
- the extent to which the demolition works would enhance or detract from landscape setting, context, or important views associated with a heritage item or place, where the setting, context or views contribute to the heritage values of the item or place;
- the extent to which the demolition works would diminish one or more heritage values of an item or place by restricting or inhibiting significant uses and associations of the place; and/or
- the extent to which the demolition works would diminish the ability of the place to demonstrate creative or technical achievement.

The magnitude and severity criterion is provided in **Table 16-1**.

Table 16-1 Magnitude or Severity Criterion

Rating	Impact Definition
Major positive	The proposed action would substantially enhance the heritage value or integrity of the item or place, by improved conservation of its important fabric, setting, context, views, uses or associations. There would be a major improvement in understanding of the heritage value of the item or place.
Minor positive	The proposed action would have a minor or temporary benefit on the heritage value or integrity of the item or place, through conservation of its important fabric, setting, context, views, uses or associations. There would be a minor or temporary improvement in understanding of the heritage value of the item or place.
Neutral or No impact	The proposed action respects the heritage value and integrity of the item or place. There would be no change or impact as a result of the proposed action.

Rating	Impact Definition
Minor adverse	The proposed action would have a temporary adverse effect on, and/or involve minor damage or changes to an item's important fabric, setting, context, views, uses or associations. There would a minor or temporary reduction in understanding of the item or place. The impact of the action could be removed or reduced through appropriate mitigation measures.
Major adverse	The proposed action would involve permanent changes to, or destruction of an item's important fabric, setting, context, views, uses or associations. There would be a substantial or long-term adverse effect on the heritage value or integrity of the item or place. There would be a major reduction in understanding of the heritage value of the item or place. The impact of the action could be reduced through appropriate mitigation measures, but cannot be fully mitigated.

16.5 Previous Heritage Studies and Management

Following the granting of development consent SSD 5544, a Heritage Management Strategy (HMS) was prepared for the Site in response to the Consent Condition C31. The HMS included:

- a review of the heritage significance of the Australian Oil Refinery site and a revised summary statement of significance; and
- a strategy to minimise or mitigate the loss of the refinery's heritage value during the Project and to manage the Site's heritage during present and future works.

The HMS confirmed the Site's heritage significance and presented a number of recommendations for managing the future works at the Site. The re-assessment of significance and development of management strategies was undertaken in consultation with the Heritage Division of OEH, as delegate for the Heritage Council of NSW. The HMS has since been discussed with SSC and approved by the Heritage Council of NSW.

Caltex has made substantial progress in implementing the strategies outlined in the HMS. Refer to **Appendix F Heritage Impact Assessment** for more details.

16.6 Existing Environment

The Kurnell Peninsula was only formally settled by Europeans in 1815. The peninsula was used for farming, timber in the 1800s and for sand extraction in the early 1900s.

In the 1950s Caltex commenced building Kurnell Refinery. The work to build the refinery involved draining swamps, clearing scrub and installing roads (Captain Cook Drive), water supplies and sewerage facilities. This activity led to the further development of the peninsula and of the village of Kurnell.

There are a number of heritage items and places that are within 2 km of the demolition works area. These are listed in **Table 16-2**.

Table 16-2 Heritage items within 2 km of the Demolition Works Area

Item	Primary Address	CHL	NHL	RNE	SHR	SEPP
Kurnell Peninsula Headland	Kurnell Peninsula		✓			
Kamay Botany Bay*	Kurnell Peninsula		✓			
Cape Bailey Lighthouse	Sir Joseph Banks Dr, Kurnell	✓		✓		
Alpha Farm	Botany Bay National Park				✓	✓
Banks Monument	Botany Bay National Park				✓	✓
Captain Cook's Landing Place	Botany Bay National Park			✓	✓	✓
Commemorative Tree Plantings	Botany Bay National Park				✓	
Cook's Monument	Botany Bay National Park				✓	✓
Cook's Well	Botany Bay National Park				✓	✓
Discovery Centre	Botany Bay National Park				✓	
Forby Sutherland Movement	Botany Bay National Park				✓	✓
Foreshore Pines near Flagstaff	Botany Bay National Park				✓	
Foreshore Sea wall – coursed stones	Botany Bay National Park				✓	
Freshwater Steam Plaque	Botany Bay National Park				✓	
Inscription Point Plaque	Botany Bay National Park				✓	
Issac Smith Memorial	Botany Bay National Park				✓	
Kurnell Meeting Point Precinct	Botany Bay National Park				✓	
Landing Place Memorial	Botany Bay National Park				✓	
Main Flagstaff	Botany Bay National Park				✓	
Prince's Tree memorial	Botany Bay National Park				✓	
Queen Elizabeth II Tree	Botany Bay National Park				✓	
Solander Memorial	Botany Bay National Park				✓	
Trust Wharf Abutment	Botany Bay National Park				✓	✓
Botany Bay National Park	Cape Solander Drive					✓
Kurnell Monuments	Cape Solander Drive					✓
Solander Monument	Cape Solander Drive					✓
Cook's Watering Hole	Cape Solander Drive					✓
Flagpole	Cape Solander Drive					✓
Yena Track	Cape Solander Drive					✓
Muru Track	Cape Solander Drive					✓
Tabbagai Gap cliff site	Tabbagai Gap					✓
Tabbagai Gap house site	Tabbagai Gap					✓
Four wheel drive track	Captain Cook Drive, Kurnell					✓
Australian Oil Refinery	Sir Joseph Banks Drive, Kurnell					✓
Silver Beach and roadway	Prince Charles Parade, Kurnell					✓

*A listing for the Kamay Botany Bay has been nominated for inclusion in the NHL, if included this listing would include all the values currently listed within the Kurnell Peninsula Headland listing within a broader boundary and would recognise additional associative heritage values, thereby superseding the former listing.

Figure 16-1 shows the location of historic heritage items (excluding those in Kamay Botany Bay National Park) that have been recorded on the Kurnell Peninsula.

As shown on **Figure 16-1**, there are four identified historic heritage items or places in the immediate vicinity of the Site. The demolition works area itself forms part of the locally significant 'Australian Oil Refinery' (as listed on Schedule 2 of the SEPP (Kurnell Peninsula)). The locally significant Silver Beach and roadway also falls within the demolition works area.

The locally significant four wheel drive track (Captain Cook Drive) is closely associated with the north-west and south-west boundaries of the Site. However, there is no physical evidence of the track within the boundary of the Site today. The nationally significant Kurnell Peninsula Headland adjoins the eastern boundary of the Site.

Other heritage items on the Kurnell Peninsula are at a distance of at least 150 m or more from the Site and would not be affected by the demolition works. These have not been discussed further in this assessment.

N
W E
S

0 150 300 600 900 1,200
Metres

Datum: GDA94
Grid: MGA Zone 56

Source: Aerial Imagery from Bing Maps © 2010 Microsoft Corporation and its data suppliers.
Heritage Sites and Search Area provided by Australian Museum Business Services (AMBS), 15 January 2012.

CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

RECORDED HISTORIC HERITAGE ITEMS

URS

Figure: **16-1**

File No: 43177915.019.mxd Drawn: STB Approved: RO Date: 25/08/2014 Rev. **A** A4

16.7 Impact Assessment

16.7.1 Overview

Chapter 4 Proposed Modification provides a description of the demolition works. The impact assessment undertaken for the demolition works was based on the areas identified for demolition in **Figure 4-1**.

The demolition works have the potential to impact on five identified historic heritage items or places within the immediate vicinity of the works. The demolition works area itself forms part of the locally significant Australian Oil Refinery and locally significant Silver Beach. The three other heritage items or places are:

- Four Wheel Drive Track (Captain Cook Drive);
- Kamay Botany Bay National Park; and
- Kurnell Peninsula Headland.

16.7.2 Australian Oil Refinery

The heritage curtilage of the Australian Oil Refinery is defined as the property owned and/or managed by Caltex on the Kurnell Peninsula. It includes the following elements:

- the above ground and subsurface components of the refinery plant and associated infrastructure, including industrial, administrative and amenities buildings across the Site; and
- the Kurnell Wharf and pipeline easements between the wharf and the main refinery site.

The curtilage excludes areas of natural bushland in the southern part of the Site and part of the Continental Carbon Pipeline route.

Table 16-3 provides a summary of the potential heritage impacts on the Australian Oil Refinery from the proposed demolition works. For further details refer to **Section 4** in **Appendix F Heritage Impact Assessment.**

Table 16-3 Potential Impacts on the Australian Oil Refinery

Demolition works	Impact	Magnitude and severity of impact
Demolition of the Refinery Process Units	An adverse impact on the physical fabric, historic, technical and research/scientific significance of the Australian Oil Refinery site, and its rarity and representativeness, by profoundly diminishing its ability to demonstrate the principal characteristics of an operational oil refinery, and the development of the oil refining industry in NSW during the twentieth century. The overall historic and physical integrity of the Site would be lost. The landmark value of the Site in the local area would be considerably diminished.	Major Permanent Adverse

Demolition works	Impact	Magnitude and severity of impact
	An adverse impact on the structural integrity of significant buildings that are to be retained on the Site as part of the finished product terminal, particularly older masonry structures, through the potential effects of vibrations from demolition works.	Minor to Moderate Permanent Adverse
	A minor or temporary adverse effect on the social values of the Australian Oil Refinery site for current and former refinery employees.	Minor or temporary Adverse
Demolition of tanks in the Eastern and Western Tank Areas	An adverse impact on the physical fabric, historic and technical significance of the Australian Oil Refinery site and its representative value, by reducing its ability to demonstrate the principal characteristics of an oil refinery tank farm of the mid-twentieth century and the development of the oil refining industry in NSW during the twentieth century. The demolitions would also likely reduce the historic and physical integrity of the original tank farm layout.	Major Permanent Adverse
Removal of original pipelines in the Eastern and Western ROWs, roadways and Kurnell Wharf	An adverse impact on the physical fabric, technical significance and representative value of the Australian Oil Refinery site, and could impact on future understanding of the form and layout of the production areas of the Site.	Major Permanent Adverse
Demolition of Buildings Demolition of 14 moderately significant and 7 highly significant original and early buildings across the Site	An adverse impact on significant physical evidence of Bunning and Madden's architectural design work at the refinery, and the historic integrity and aesthetic value of the Site's overall grouping of modernist architecture.	Major Permanent Adverse
	An adverse impact on the physical fabric, historic and physical integrity and representative value of the Australian Oil Refinery site.	Major Permanent Adverse
Removal of some buildings that detract from the heritage significance of the Site	A positive impact on the landscape setting of significant heritage buildings within this area, including the Main Office and the Group of six houses, and would thereby help to conserve their original, modernist aesthetic character, and the aesthetic significance of the overall Australian Oil Refinery site.	Minor Permanent Positive

The management strategies and specific measures developed to mitigate these impacts are discussed in **Section 16.8** below.

16.7.3 Silver Beach and Roadway

Silver Beach is a long, picturesque white sand beach along the northern side of the Kurnell Peninsula. The below-ground pipelines within the Eastern and Western ROWs on the southern side of Prince Charles Parade and have little visual impact on the setting of the beach and road.

The demolition works to remove the redundant pipelines from the Eastern and Western ROWs, roadways and Silver Beach would involve the excavation and removal of the pipelines and restoration of pipeline trenches (refer to **Chapter 4 Proposed Modification** for further detail).

Table 16-4 provides a summary of the potential heritage impacts of the demolition works on Silver Beach and Roadway.

Table 16-4 Potential impacts on the Silver Beach and Roadway

Demolition works	Impact	Magnitude and severity of impact
Removal of original pipelines from under Silver Beach and the Roadway	An adverse impact on the aesthetic significance and amenity of the local heritage item Silver Beach and roadway.	Minor or Temporary Adverse
	An adverse impact on the physical fabric of an informal sandstone wall alongside the beach, which makes a minor contribution to the aesthetic significance of this local heritage item.	Minor or Temporary Adverse
	An adverse impact on the physical fabric and narrative continuity of an interpretative concrete footpath in front of the entrance to the Kurnell Wharf, which illustrates the early European history of the local area.	Minor or Temporary Adverse

The potential impacts of these works on the Silver Beach and Roadway local heritage item are considered minor and temporary. The management strategies and specific measures developed to mitigate these impacts are discussed in **Section 16.8** below.

16.7.4 Four Wheel Drive Track (Captain Cook Drive)

The Four Wheel Drive Track originally connected Kurnell Village with Cronulla to the southwest, and was largely overlaid in 1953-56 by the construction of Captain Cook Drive, which in turn facilitated construction of the Kurnell Refinery. Much of the alignment of Captain Cook Drive reflects that of the original track. However, a short section of Captain Cook Drive along the western boundary of the Site by-passes the original route of the track where it intersected the refinery property. Construction of the refinery in the 1950s effectively erased this section of the track from the landscape. Considering that there is no physical evidence of the former Four Wheel Drive Track still existing within the Site boundary today, and that the demolition works are limited to the footprint of the Site, the modifications would not impact on significant fabric or the historic significance of the local heritage item.

16.7.5 Kamay Botany Bay National Park and Kurnell Peninsula Headland

Kamay Botany Bay National Park forms part of the State heritage listed Kamay Botany Bay National Park (North and South) and Towra Point Nature Reserve. The Kurnell Peninsula Headland forms the southern part of Kamay Botany Bay National Park. The Kurnell Peninsula Headland covers approximately 325 ha, extending from the southern headland of Botany Bay to Doughboy head in the south, and adjoins part of the eastern boundary of the Site.

Table 16-5 provides a summary of the potential heritage impacts of the demolition works on the Kamay Botany Bay National Park and Kurnell Peninsula Headland.

Table 16-5 Potential Impacts on the Kamay Botany Bay National Park and Kurnell Peninsula Headland

Demolition works	Impact	Magnitude and severity of impact
Demolition of the Refinery Process Units	Positive impact on the landscape setting of the Meeting Place Precinct by reducing the vertical scale and prominence of the Site in significant views of the headland, thereby enhancing the natural beauty of the headland and its symbolic importance to the State of NSW and to the Nation. Demolition and removal of the Refinery Process Units would likely improve the aesthetic significance and natural landscape setting of the Cape Bailey Lighthouse, which is a local landmark along the coast, and views from the coastal walking track within Kamay Botany Bay National Park.	Major Permanent Positive
	Adverse impact on visitors' experience of the Kurnell Peninsula Headland and the general amenity of the place during the demolition works, which could temporarily diminish the landscape setting, social and symbolic value of the place.	Minor Temporary Adverse

16.7.6 Vibration

Excessive vibration has the potential to cause structural damage to historic buildings and other structures. Significant heritage buildings (particularly the masonry structures) that are to be retained on the Site as part of the finished product terminal could be at risk of damage due to increased vibration during the demolition works. **Chapter 13 Noise and Vibration** provides management and mitigation measures to minimise the potential for vibrations to adversely impact on the remaining high to medium heritage significance structures.

16.7.7 Statement of Heritage Impact

The demolition works would have a significant adverse impact on the physical fabric, historic, technical and research/scientific significance of the locally listed Australian Oil Refinery site, and its rarity and representativeness. The demolition works would diminish the Site's ability to demonstrate the principal characteristics of an operational oil refinery, and the development of the oil refining industry in NSW during the twentieth century. The overall historic and physical

integrity of the Site would be lost. The landmark value of the Site in the local area would be considerably diminished.

The demolition works would also have a major adverse impact on the aesthetic value of the Site's overall grouping of modernist architecture, including significant physical evidence of Bunning and Madden's architectural design work.

The demolition works would likely generate minor, temporary adverse effects on the aesthetic significance and amenity of the locally listed Silver Beach and Roadway. It would also have a minor adverse impact on the physical fabric of an informal sandstone wall, and on the physical fabric and narrative continuity of an interpretative concrete footpath in front of the entrance to the Kurnell Wharf. These impacts would be mitigated through progressive restoration of these features, using the same or appropriate materials.

The demolition works would not impact on significant fabric of the former Four Wheel Drive Track or the historic significance of this local heritage item.

During the demolition works, there may be minor, temporary adverse impacts on the landscape setting, social and symbolic values of the Kamay Botany Bay National Park and Kurnell Peninsula Headland. However following completion of the demolition works, the removal of the redundant infrastructure from across the Site would likely have a major positive permanent impact on the landscape setting of the State heritage listed Kamay Botany Bay National Park and Kurnell Peninsula Headland.

16.8 Mitigation

16.8.1 Historic Heritage

As mentioned, a HMS (AMC 2013) was prepared following the approval of the conversion works (SSD 5544). The HMS was prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works on the Site. The HMS specifically considered the future demolition works at the Site. Its development helped Caltex to identify which parts of the Site could be retained and reused while maintaining a number of representative examples of heritage structures as the Site. Implementation of the HMS for the Site would provide some mitigation for the loss of heritage value by:

- Preserving a representative sample of significant refinery infrastructure in use as part of the fuel import terminal, including examples of original tanks, workshops, administrative and amenities buildings. These remnant buildings and structures were originally constructed to support the operation of the refinery. Ongoing use of these items in terminal operations is consistent with the identified heritage values of the Site, and would contribute to the conservation of these heritage values into the future.
- Preserving a representative sample of significant original / early modernist buildings in use across the Site.
- Creating a permanent archival collection of records and moveable heritage items that documents the engineering history, social history, and unique character of the Site. A permanent archive would be a basic resource for people wishing to understand or interpret the heritage significance of the Site.

- Communicating the history and significance of the refinery to Caltex staff and the broader community.

Caltex has made substantial progress in implementing the strategies outlined in the HMS and would continue to implement the strategy moving forward. Further details regarding the HMS can be found in **Appendix F Heritage Impact Assessment.**

The following recommendations are specific to managing the potential impact of the demolition works on Historic Heritage:

Australian Oil Refinery

- Continue to implement the strategies outlined in the Kurnell Refinery HMS to mitigate the loss of heritage value arising from the demolition works.
- Develop and implement a long-term strategy for the storage of, conservation of, and public access to the Site's significant industrial heritage records and moveable heritage collections in accordance with the HMS.
- Review opportunities to adaptively reuse redundant buildings identified in the HMS as having high or moderate heritage significance prior to final demolition works.
- Retain and preserve the sculptural panels executed by Bert Flugelman.
- Retain and conserve a representative sample of original tanks on-site, in accordance with the HMS. These would preferably be retained in use as part of the fuel import terminal.
- Monitor the effects of vibration on significant heritage buildings and structures within the vicinity of demolition works (refer to **Chapter 13 Noise and Vibration**).

Silver Beach and Roadway

- Sandstone blocks from the informal sandstone wall along Silver Beach would be set aside in a secure location prior to works, and reinstated in the same location following removal of the cooling water outlet pipeline.
- Implement appropriate mitigation measures to reduce the likely damage to the interpretive footpath in front of the driveway entrance to the Kurnell Wharf. These measures would include:
  - A record should be made of the current state of the pavement prior to works, and the pavement reinstated in the same location following the removal of pipelines leading to/from the wharf; and
  - The pavement would preferably be removed in sections from the area beside the wharf and set aside in a secure location for later reinstatement at the site if practicable. If this is not practicable, a similar pavement treatment and a matching or compatible interpretative design would be reinstated in the footpath following the removal of the pipelines.

Kamay Botany Bay National Park and Kurnell Peninsula Headland

- Implement onsite measures to limit the effects of noise and odour on visitors to the Kamay Botany Bay National Park and Kurnell Peninsula Headland during demolition works (refer to **Chapter 13 Noise and Vibration** and **Chapter 14 Air Quality and Odour**).

Historical Archaeological Relics

- Should historical archaeological relics be unexpectedly found during the demolition works, works in the area of the relics should cease and the Heritage Council of NSW should be notified, in accordance with Section 146 of the *Heritage Act 1977*.

16.8.2 Aboriginal Heritage

As discussed in **Section 16.2**, it is not likely that the demolition works would result in impacts on Aboriginal Heritage given the disturbed nature of the Site and surroundings. The demolition works area has been extensively disturbed previously, and as such there is unlikely to be subsurface archaeology in these areas which pre-dates the history of the refinery.

However, as per provisions in the NPW and EP&A Act, the following measures would be implemented to manage the unexpected discovery of Aboriginal Heritage items during the demolition works:

- A Stop Works procedure would be implemented should any Aboriginal Heritage items be found. Works would cease at the vicinity of the item and OEH would be notified as soon as possible.
- If any human remains are disturbed, all work in the vicinity of the remains would stop immediately and the remains would not be further disturbed or moved. Works would cease at the vicinity of the item and OEH and NSW Police would be notified as soon as possible.
- Prior to works commencing, all personnel and contractors involved in ground disturbance works would be briefed on these statutory requirements.

16.9 Summary

The potential impact of the demolition works on historic heritage items would include the Australian Oil Refinery, Silver Beach and Roadway, Kamay Botany Bay National Park and Kurnell Peninsula Headland.

Table 16-6 outlines the management and mitigation measures that would be put in place to minimise impacts on existing and potential historic heritage items affected by the demolition works. The potential discovery of unexpected Aboriginal and/or Historic heritage items would also be managed in accordance with the mitigation and management measure listed below.

Where not already covered in the HMS, the measures in **Table 16-6** would be included in a Heritage Section in the Demolition Environmental Management Plan (DEMP).

Table 16-6 Management and Mitigation Measures – Heritage

Management and Mitigation Measures	Demolition	
	Design	Demolition
If any further heritage items were discovered throughout the Project, work would cease until an assessment is carried out by a qualified heritage professional.		✓
The Heritage Management Strategy (HMS) and the management strategies within it would continue to be implemented.	✓	✓
Opportunities to adaptively reuse redundant buildings identified in the HMS as having high or moderate heritage significance would continue to be reviewed prior to final demolition works.	✓	✓
The sculptural panels by Bert Flugelman would be retained and preserved.	✓	✓
Sandstone blocks from the informal sandstone wall along Silver Beach would be set aside in a secure location prior to works, and reinstated in the same location following removal of the cooling water outlet pipeline.	✓	✓
Appropriate mitigation measures would be implemented to reduce the likely damage to the interpretive footpath in front of the driveway entrance to the Kurnell Wharf. Measures would include: • ***Making a record of the current state of the pavement.*** • ***Removing the affected pavement in sections and storing these sections in a secure location.*** • ***Reinstating the pavement in the same location following the removal of pipelines;*** • ***If this is not practicable, a similar pavement treatment and a matching or compatible interpretative design would be reinstated.***	✓	✓
If historical archaeological relics are unexpectedly found during the demolition works, works in the area of the relics would cease and the Heritage Council of NSW would be notified.		✓
A Stop Works procedure would be implemented should any Aboriginal Heritage items be found. Works would cease at the vicinity of the item and OEH would be notified as soon as possible		✓
If any human remains are disturbed, all work in the vicinity of the remains would stop immediately and the remains would not be further disturbed or moved. Works would cease at the vicinity of the item and OEH and NSW Police would be notified as soon as possible.		✓
Prior to works commencing, all personnel and contractors involved in ground disturbance works would be briefed on the procedures to follow if human remains or unexpected heritage items are found.	✓	✓

Management and Mitigation Measures	Demolition	
	Design	Demolition
As part of the DEMP, a Heritage Management Section will be developed. This will incorporate previous Management and Mitigation Measures that are not already included in the HMS.	✓	✓

17 ECOLOGY

17.1 Introduction

A Flora and Fauna Assessment and a Marine Ecology Assessment were undertaken to assess the potential impacts of the demolition works. These assessments were completed by Biosis Pty Ltd and Cardno (NSW/ACT) Pty Ltd respectively. This chapter provides a summary of the two assessments which are provided in full in **Appendix G Ecology**.

17.2 Scope of the Assessments

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requests that this assessment provides the following:

- *"an assessment of the potential impacts on terrestrial, aquatic and riparian ecology, including impacts to the surrounding Botany Bay National Park, Towra Point Nature Reserve Towra Point Aquatic Reserve, watercourses, riparian land, wetlands and groundwater dependent ecosystems."*

Additional requirements were provided by NSW Fisheries, which included the importance of avoiding and/or mitigating potential impacts on seagrass habitat in the area. They also noted that the assessment must include:

- an accurate description of the works – especially in describing the areas of excavation below the mean high water mark, spoil deposition and the type of material to be used for infill below the mean high water mark;
- appropriate erosion and sedimentation measures must be used to ensure that nearby seagrasses are not impacted by turbidity from these works; and
- an assessment of potential acid sulphate soil issues and mitigation measures.

Additional requirements were provided by the EPA including the need to assess the potential impacts of:

- Disturbance and suspension of sediments/contaminants within the water of Botany Bay related to the removal of the cooling water outfall from Botany Bay; and
- Acid sulfate soils within the Kurnell area and sediments of Botany Bay. This should be considered for all excavations and rehabilitation activities.

The objectives of this assessment to:

- determine ecological impacts that may result due to the demolition works;
- undertake background research to determine the likelihood for NSW and/or Commonwealth threatened biota to be present within the demolition works area and within a 5 km radius of the demolition works area;
- describe the flora and fauna present within the demolition works area and understand its general condition;
- map vegetation and other habitat features (rocky outcrops, noxious weeds, water bodies, hollow-bearing trees, etc.);

- determine presence or absence of threatened NSW and Commonwealth listed threatened biota, listed under the TSC Act, FM Act or EPBC Act considered with the potential to occur. From prior Site/area experience the target species will likely include threatened flora, frogs and birds; and
- identify potential implications of the demolition works and provide recommendations to assist with mitigating any potential impacts.

Appendix G1 Ecology Impact Assessment was undertaken by Biosis Pty Ltd (Biosis). A supplementary report was undertaken by Cardno (NSW/ACT) Pty Ltd (Cardno)) to assess the potential impacts of the removal of the cooling water outfall from the low tide mark into Botany Bay only (refer to **Figure 17-1** and **Figure 17-2**) and is presented in **Appendix G2 Marine Ecology Assessment**.

17.3 Legislation and Planning Policy

Appendix G Ecology reviewed legislation and policy in relation to the ecological implications of the demolition works. A review of the applicable legislation and policy is summarised in this section.

17.3.1 Commonwealth Legislation

17.3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and activities that have the potential to impact on Matters of National Environmental Significance (MNES) protected under the Act. **Appendix G Ecology** identified a number of MNES that are relevant to the demolition works and concluded that the demolition works would not cause significant impacts to these values.

17.3.2 NSW State Legislation and Policies

17.3.2.1 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and conserve biodiversity in NSW through a number of provisions. Schedules 1 to 3 of the TSC Act contains threatened species, populations and communities, critical habitats, and key threatening processes protected under the Act. Impacts to these matters must be assessed through the Assessment of Significance (AOS) process under Section 5A of the EP&A Act.

Appendix G Ecology identified a number of threatened species, populations and communities; critical habitats; and Key Threatening Processes (KTPs) listed in the TSC Act that are relevant to the demolition works. These biota and are described in **Section 17.5** and where relevant the impact assessment in **Section 17.6** summarises any impacts on these values. The assessment concludes that the demolition works would not result in significant impacts on the values listed in the TSC Act.

17.3.2.2 *Fisheries Management Act 1994*

The *Fisheries Management Act 1994* (FM Act) contains provisions for the protection and conservation of aquatic species and habitats in NSW. Schedules 4 to 6 of the FM Act contains threatened species, populations and communities and KTPs that are protected under this Act. Any impacts on these biota must be assessed through the AOS process under Section 5A of the EP&A Act.

Appendix G Ecology determined that one endangered ecological community (EEC) listed under the FM Act could potentially be affected by the demolition works. KTPs under the FM Act have also been considered and would not be impacted by the demolition works.

As presented in **Section 17.6**, the assessment concluded that no known threatened species or populations under the FM Act are likely to be affected by the demolition works provided the recommended mitigation measures are implemented.

17.3.2.3 *Noxious Weeds Act 1993*

The *Noxious Weeds Act 1993* (NW Act) was executed to reduce the detrimental impact of weeds on the economy, agriculture and the natural environment. The NSW Act contains provisions for identification, classification and control of weeds defined as 'noxious'. Noxious weeds are species listed by the NSW Department of Primary Industries (DPI) in the noxious weed declarations for each local government area (LGA). An occupier (other than a public authority or a local control authority) must take all reasonable steps to control noxious weeds in accordance with the noxious weed declarations for the relevant LGA.

Appendix G Ecology identified four noxious weeds within the demolition works area that should be controlled in accordance with the noxious weed declarations for Sutherland Shire LGA. Details of the noxious weeds found are contained in **Section 17.5**.

17.3.2.4 *State Environmental Planning Policy (Kurnell Peninsula) 1989*

The *State Environmental Planning Policy (Kurnell Peninsula) 1989* (SEPP KP) aims to conserve the natural environment of the Kurnell Peninsula and ensure that development is appropriately managed. For the purposes of the **Appendix G Ecology**, Clause 20F Groundwater vulnerability and Clause 21 Consideration of environmental effect—protection of wetlands have been considered as relevant to the demolition works.

17.4 Method of Assessment

17.4.1 *Study Area*

In order to complete the ecological impact assessment a 'study area' was defined by Biosis. This 'study area' is largely contiguous with the demolition works area and provided the boundary for the site investigations. Therefore in this chapter the term 'study area' refers to the study area defined by Biosis in **Appendix G1 Ecology Impact Assessment.**

In addition Biosis also completed a desktop review of a number of ecological databases. This review gathered information from a 5 km catchment around the study area (the 'local area').

A study area was also developed for the marine ecology assessment (refer to **Appendix G2 Marine Ecology Impact Assessment**. This study area is specific to the works at Silver Beach and therefore be referred to the 'marine study area'.

17.4.2 Desktop review

Database searches were undertaken for flora and fauna from within 5 km of the study area from the following sources:

- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the EPBC Act;
- Department of Primary Industries (DPI) Threatened & Protected Species – Records Viewer for Sydney Metro CMA;
- NSW Bionet Atlas of NSW Wildlife, Office of Environment and Heritage (OEH);
- PlantNET for Rare or Threatened Australian Plant information (The Royal Botanic Gardens and Domain Trust, 2014); and
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (BA);
- Ocean Shores to Desert Dunes: Vegetation of NSW and the ACT (Keith, 2004);
- Native Vegetation of the Sydney Metropolitan CMA Area (Sydney Metropolitan CMA, 2009);
- Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (SCIVI) (Tozer et al. 2006);
- Seagrass mapping by Cardno Ecology Lab, 2008-2011; and
- Acid Sulfate Soil mapping by Sutherland Shire Council.

Additional information was collected from previous reports and other published material relevant to the local area (refer to **Appendix G Ecology**).

The results of the literature and database review were used to assess the likelihood of threatened biota occurring within the local area. Those species which were considered to have a medium or high likelihood of occurrence were given further consideration during a field inspection and, if necessary, the impact assessment.

17.4.3 Site Investigation

Flora survey

An initial flora survey was completed on 30 October 2012. A second survey was conducted on 20 June 2014 by a qualified and licenced botanist and zoologist to assess additional areas that would be covered by the demolition works. During these surveys, the entire study area was traversed by a qualified and suitably licenced botanist using a combination of random meanders (Cropper, 1993), vegetation association (Specht, 1970) and transects to identify and determine the vegetation assemblage.

On 18 September 2014, additional flora surveys were undertaken by a qualified and experienced ecologist on vegetated areas between Prince Charles Parade and the Silver Beach low tide mark (north of the Eastern and Western ROWs).

For all three surveys, the general condition, structure and connectivity of native vegetation was recorded. Notes were made on specific issues such as noxious weeds, evidence of management works and general impacts. Habitat features were also searched for including hollow-bearing trees, coarse woody debris, natural waterbodies, etc.

The surveys targeted the threatened Coast Groundsel *Senecio spathulatus* (endangered, TSC Act) as well as Threatened Ecological Communities (TEC) (such as *Sydney Freshwater Wetlands in the Sydney Basin Bioregion*) to determine whether such biota was present within the study area, or whether suitable habitat exists based on NSW Office of Heritage (OEH) data. Further information on the flora surveys can be found in **Appendix G1 Ecology Impact Assessment**.

Fauna survey

Fauna surveys were undertaken on 30 October 2012, 20 June 2014 and 18 September 2014 to determine if potential habitat for threatened fauna existed within the study area.

All species of fauna observed during the surveys were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks, woody debris and artificial debris, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. A detailed description of the survey methods used is provided in **Appendix G1 Ecology Impact Assessment**. Fauna species were recorded with a view to characterising the values of the study area. The investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the study area over time. The field inspection aimed to identify potential habitat for threatened fauna species. However, no targeted surveys were undertaken.

Mapping was compiled using hand-held (uncorrected) Global Positioning System (GPS) units (WGS84) and aerial photo interpretation. Locations of pest species and/or areas of ecological sensitivity were recorded using hand-held (uncorrected) GPS units (generally ± 7 metres accuracy).

17.4.4 Reporting and Assessment

Habitat Suitability Assessment

Following the completion of the desktop reviews and Site investigations, an assessment of the potential habitats present within the study area was undertaken for those threatened species, populations and ecological communities predicted to occur in the local area. This assessment focused on TSC Act, FM Act and EPBC Act listed species, populations and ecological communities and is provided in **Appendix G1 Ecology Impact Assessment**. This technique aids in the determination of the potential for listed species, populations or communities to occur within the study area rather than relying solely on one-off surveys that are subject to seasonal and weather limitations and provide only a snapshot of ecological assemblages present. Threatened biota were ruled out from the assessment if suitable habitat did not exist within the study area.

Evaluation of Impact

Assessments of State and Commonwealth listed threatened biota that could be potentially impacted by the demolition works have been completed. Assessments of threatened biota

listed under the NSW TSC Act and FM Act are addressed using the criteria provided in *Threatened Species Assessment Guidelines*, the *Assessment of Significance* (AOS) (DECC, 2008b). Assessments of threatened biota listed under the EPBC Act have been addressed using the criteria provided in DEWHA's (2009) '*Matters of National Environmental Significance, Significant Impact Criteria (SIC) assessment guidelines*'. These assessments are shown in full in **Appendix G1 Ecology Impact Assessment**.

Key Threatening Processes (KTPs) were also considered during the impact evaluation process. KTPs that are relevant to the demolition works are discussed in **Section 17.6.3**.

Mitigation measures have been proposed in **Section 17.7** to address potential adverse impacts of the demolition works.

17.5 Existing Environment

17.5.1 Ecological Overview

The Site is located on the Kurnell Peninsula south of Botany Bay. The original vegetation has been extensively cleared on the Kurnell Peninsula. Only remnant patches of vegetation remain in some of the areas of more significant ecological value including:

- Botany Bay;
- Marton Park Woodland and Wetlands (a Groundwater Dependent Ecosystem which includes fringing Swamp Oak Floodplain Forest);
- Towra Point Nature Reserve (Ramsar wetland);
- Towra Point Aquatic Reserve; and
- Kamay Botany Bay National Park.

The location of key ecological features, including vegetation areas, seagrass habitat, threatened biota records and noxious weeds in relation to the demolition works area is shown in **Figure 17-1**.

The majority of the demolition works area is devoid of any vegetation and fauna habitat and has been highly modified by past and current disturbance related to the development of Kurnell Refinery since 1953.

17.5.2 Flora

Appendix G1 Ecology Impact Assessment noted that 113 flora species were recorded within the study area, including 54 native species and 59 exotic species. Four exotic species were classed as noxious weeds. No threatened flora species, ecological communities or Rare or Threatened Australian Plants (ROTAP) were recorded.

Appendix G2 Marine Ecology Impact Assessment identified a number of marine flora that are known to occur within the proximity of the marine study area that have been considered in the assessment (refer to **Section 17.6**).

Within the intertidal and subtidal waters offshore from Silver Beach are large beds of seagrass. These are the key marine flora identified within the marine study area that have

been considered in this assessment. Patches of three species of seagrass occur seaward of the demolition works area including the FM Act listed seagrass TEC *Posidonia australis in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie* (refer to **Figure 17-2**). The distance between the demolition works area and the patches of seagrass is approximately 21.5 m.

Patches of seagrass consisting of low to medium density *Zostera capricorni* and *Halophila ovalis* are located more than 40 m to the north and north-west of the demolition works area. Two additional patches of mixed *Posidonia australis*, *Zostera capricorni* and *Halophila ovalis* are located more than 40 m to the northwest of the demolition works area. The main, contiguous beds of seagrass are located more than 500m to the west of the demolition works area and are separated by four intervening groyne structures.

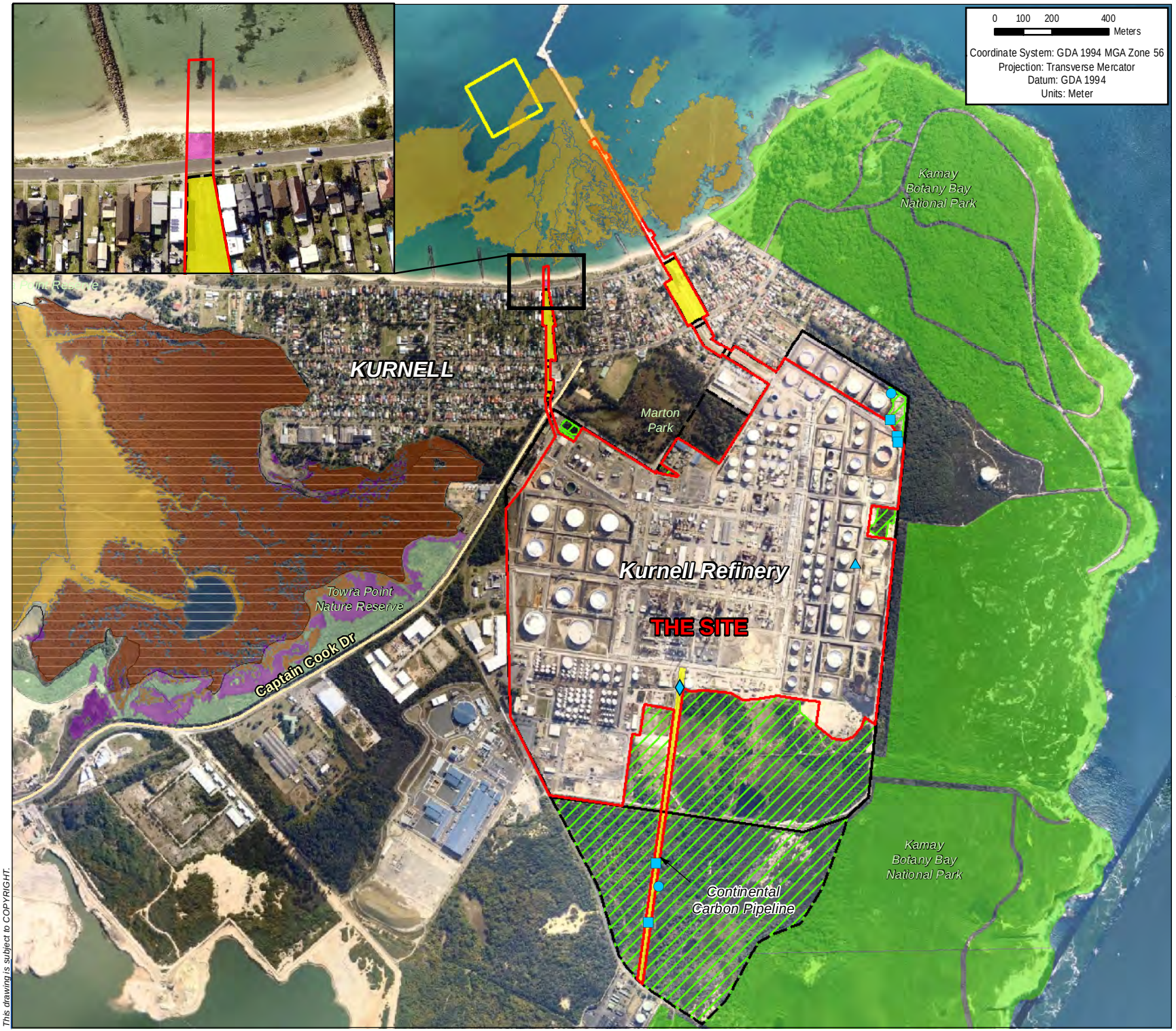
The location of aquatic vegetation in the proximity of the demolition works area is presented on **Figure 17-2**.

17.5.3 Fauna

Appendix G1 Ecology Impact Assessment noted that 40 fauna species were recorded within the study area, including 37 bird species, two amphibians and one reptile. Three bird species were introduced species. One threatened species and one migratory species were recorded within the study area during surveys.

The desktop review in **Appendix G1 Ecology Impact Assessment**, identified a number of threatened fauna species as having been previously recorded within close proximity to the study area. The high number of species is likely as a result of the proximity of the Site to the surrounding Ramsar Wetland, National Park and Nature Reserve, all of which provide substantial habitat for a range of threatened species. The demolition works area itself provides limited habitat resources for threatened biota, given the overall lack of intact vegetation, lack of typical habitat resources, and ongoing disturbance and activities at the Site.

In addition, **Appendix G2 Marine Ecology Impact Assessment** identified a number of migratory marine fauna that have been recorded within the proximity of the marine study area. These species have been considered in the impact assessment below (refer to **Section 17.6**).



Legend

- Demolition Works Area
- The Site
- Caltex Land Ownership
- Silver Beach Aquaculture
- Towra Point Aquatic Reserve[1]
- National Park
- Towra Point Nature Reserve
- Captain Cook Drive
- Mangrove[2]
- Saltmarsh[2]
- Seagrass[2]

Vegetation

- Exotic Grassland[3]
- Silver Beach Foreshore Vegetation[3]
- Vegetation Exclusion Zones[3]

Noxious Weeds

- *Chrysanthemoides monilifera subsp. rotunda*
- *Lantana camara*
- *Ludwidgia peruviana*
- *Ricinus communis*

Source: *Aerial Imagery - © NearMap '23 October 2013' Streets and Protected Area - © Mapinfo Australia Pty Ltd and PSMA Australia Ltd*

[1] *Office of Environment and Heritage (OEH)*

[2] *NSW DPI 2008*

[3] *Biosis, 'Conversion Works' report 2012 and 'Demolition Works' report 2014.*

within the study area', 02 October 2014.

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FILE NO: 43177915.022b

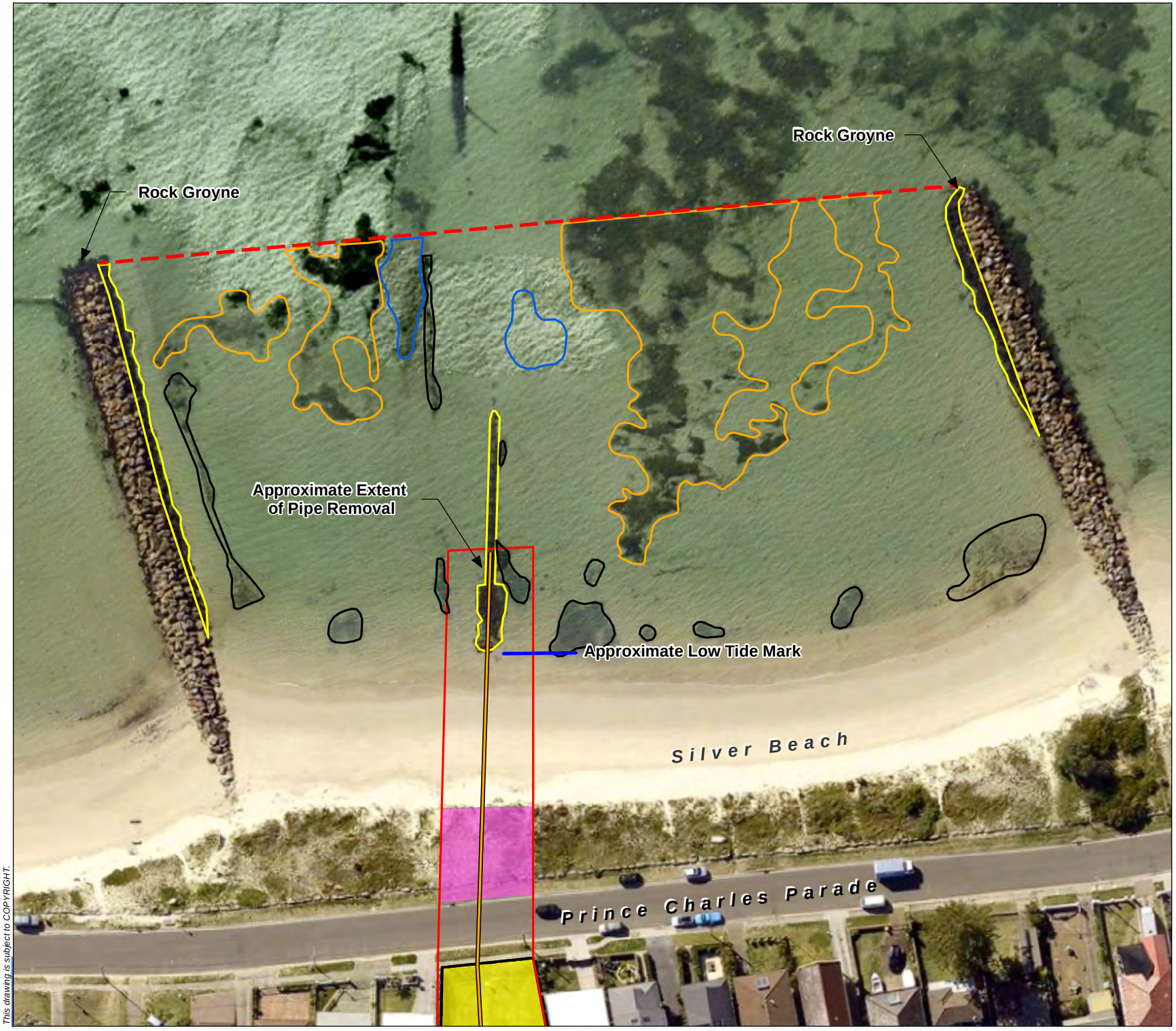
DRAWN: STB **APPROVED: RO** DATE: 4/11/2014

CALTEX REFINERIES
(NSW) PTY LTD

KURNELL REFINERY CONVERSION MODIFICATION

ECOLOGICAL CONSTRAINTS

URS Figure: **17-1** Rev. **A** A4



Legend

- Demolition Works Area
- The Site
- Caltex Land Ownership
- Limit of Cardno Mapping
- Underground Pipelines to be Removed
- Approx Low Tide Mark[1]

Vegetation

- Exotic Grassland
- Silver Beach Foreshore Vegetation

Aquatic Vegetation Type and Density[1]

- Algae
- Patchy low/med Halophilia/Zostera
- Patchy med/high Posidonia & low/med Halophilia/Zostera
- Wrack

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

0 10 20 40 Meters

Source: *Aerial Imagery - © NearMap '23 October 2013'*
Streets and Protected Area - © Mapinfo Australia Pty Ltd and PSMA Australia Ltd
Vegetation and Noxious Weeds - Biosis Pty Ltd, Figure 6 - 19 November 2012.
[1] Traced from Cardno 'Figure 4-1', Marine Ecology Assessment, Drawn 8/10/14.
[2] NSW DPE 2008

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CALTEX REFINERIES (NSW) PTY LTD

KURNELL REFINERY CONVERSION DEMOLITION

AQUATIC VEGETATION

URS Figure: 17-2 Rev. A A4

17.5.4 Terrestrial Vegetation Communities

The Flora and Fauna Assessment undertaken for the conversion works identified three small patches of vegetation on the Site:

- North West Corner Planting;
- Eastern Boundary Disturbed Native Vegetation; and
- North East Corner Revegetation.

The above vegetation patches have been excluded from the demolition works area and no demolition related works would be completed in these areas. These areas are indicated on **Figure 17-1** as Vegetation Exclusion Zones.

The demolition works area supports four patches of vegetation:

- Exotic grassland within the Western ROW;
- Silver Beach foreshore vegetation;
- Exotic grassland within the Eastern ROW; and
- Exotic grassland and native regeneration within the Continental Carbon Pipeway.

A summary of these vegetation patches is provided in **Table 17-1**.

Table 17-1 Vegetation Patches in the Demolition Works Area

Vegetation patch	Description
Western ROW exotic grassland	This area is approximately 0.99 ha in size and contains vegetation predominantly comprised of exotic mown grasses such as Buffalo Grass *Stenotaphrum secundatum*, African Love Grass *Eragrostis curvula*, and Prairie *Grass Bromus catharticus*. The mown nature of this area and lack of shrub or canopy strata means that fauna habitat is restricted to limited foraging resources.
Silver Beach foreshore vegetation	This area is approximately 0.03 hectares in size and, is located to the north of Prince Charles Parade on the primary dune area adjoining Silver Beach and the shoreline. The community is characterised by native dune vegetation such as Australian Saltgrass *Distichlis distichophylla*, Pig Face *Carpobrotus rossii* and Spinifex Spinifex *sericeus* and exotic species such as *Gazania Gazania* sp. This community provides limited foraging habitat for shore birds.
Eastern ROW exotic grassland	This area is approximately 3.07 ha in size and contains vegetation that is predominantly comprised of exotic mown grasses. The mown nature of this community and lack of shrub or canopy strata means that fauna habitat is restricted to limited foraging resources.
Continental Carbon Pipeline exotic grassland	This area is approximately 1.90 ha in size and contains vegetation that is a mixture of exotic grasses and groundcover with limited native regrowth along the boundary fence. Vegetation adjacent to this patch and outside the boundary fence was predominantly native heath and woodland with some wetland communities occurring in scattered patches.

17.5.5 Habitat Features

Potential fauna habitat or foraging related assets within the demolition works area include:

- tall infrastructure such as towers providing nesting and perching habitat for large birds;
- debris such as concrete blocks in areas around the edges of the study area providing sheltering sites for common reptiles and amphibians; and
- Silver Beach foreshore between Prince Charles Parade and the low tide mark to the north of the Western ROW, providing foraging and limited breeding habitat for shorebirds including the Pied Oystercatcher *Haematopus longirostris* and the Little Tern *Sternula albifrons.*

The majority of the demolition works area has been substantially modified and is of negligible habitat value. No hollow-bearing trees, coarse woody debris, rock outcrops or natural water bodies are located within the demolition works area.

Connectivity across the demolition works area is limited. However, given that Kamay Botany Bay National Park surrounds a large portion of the Site, some dispersal is possible. Parts of the stormwater system, such as drainage channels and pipelines that capture and direct stormwater, may also provide dispersal passage for mobile fauna.

17.5.6 Threatened Biota

A number of threatened species, populations and/or ecological communities are predicted or known to occur within 5 km of the study area. Many of these species are considered unlikely to occur within the study area, due to a lack of suitable habitat. The threatened biota considered to have a medium to high likelihood of occurrence are presented in **Table 17-2**.

Table 17-2 Threatened Biota Considered to have the Potential to Occur within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status
Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable
Crinia tinnula	Wallum Froglet	Vulnerable	Not listed
Tyto longimembris	Eastern Grass Owl	Vulnerable	Not listed
Epthianura albifrons	White-fronted Chat	Vulnerable	Not listed
Pandion cristatus	Osprey	Vulnerable	Not listed
Shorebirds	-	Vulnerable	Not listed
Senecio spathulatus	Coast Groundsel	Endangered	Not listed
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner (SSFCF)	-	Threatened Ecological Community	Not listed
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (FW)	-	Threatened Ecological Community	Not listed

A number of protected marine biota are also predicted or known to occur within 5 km of the study area. These biota have varying levels of protection under the EPBC Act, TSC Act and FM Act. These biota include marine habitats, communities, mammals, fish and birds.

As noted in **Section 17.5.2**, patches of three species of seagrass occur seaward of the demolition works area but not within the demolition works area. These seagrass communities include the FM Act listed TEC *Posidonia australis in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie*.

The potential impact of the demolition works on the threatened biota is discussed in **Section 17.6**.

No NSW or Commonwealth listed Threatened Ecological Communities (TEC) were found within the study area. NSW Sydney Catchment Management Authority (SMCMA) (2009) mapping indicated that Coastal Flats Swamp Mahogany Forest occurs within the Site, in three separate patches along the eastern boundary. This SMCMA community, by definition aligns with TSC Act listed TEC, *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* (Swamp Sclerophyll Forest on Coastal Floodplains).

The SMCMA mapping notes that the vegetation in question has not been ground truthed or surveyed and has been interpreted to be present by aerial photograph imagery only. The field survey specifically assessed the potential for the TEC to occur within the Site, in the locations shown on the SMCMA (2009) vegetation mapping. It was determined that the vegetation present within the Site did not comprise the TEC.

No Freshwater Wetlands (FW) TEC was recorded within the study area. However, the community does occur outside the study area in adjoining lands, less than 200 m from the Continental Carbon Pipeline, but outside the pipeline easement. The FW TEC would not be impacted by the demolition works as this TEC is located outside the pipeline easement.

17.5.7 Noxious Weeds

Four noxious weeds listed by NSW DPI for the Sutherland Shire LGA were recorded in the study area. These were:

- Ludwidgia *Ludwidgia peruviana*;
- Bitou Bush *Chrysanthemoides monilifera* subsp. *rotundata*;
- Caster Oil Plant *Ricinus communis*; and
- Lantana *Lantana camara*.

Three of the noxious weeds (Bitou Bush *Chrysanthemoides monilifera* subsp. *rotundata*, Caster Oil Plant *Ricinus communis* and Lantana *Lantana camara*) are defined by the noxious weed declarations as Class 4 weeds. Class 4 weeds are required to be controlled in the following manner; '*the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction*' (NSW DPI).

One Class 3 noxious weed was also identified, namely Ludwidgia *Ludwidgia peruviana*. Class 3 weeds are required to be controlled in the following manner; '*must be fully and continuously suppressed and destroyed in the region in which they are so listed, with the*

purpose of reducing the area of infestation and the negative impact of infestations in those regions' (NSW DPI).

17.6 Impact Assessment

17.6.1 Ecology – Demolition Works area

In general, the demolition works would have no significant impacts on the existing biodiversity within the demolition works area. This is due to the following factors:

- the demolition works would be undertaken in a highly modified and disturbed landscape, largely devoid of any native vegetation or fauna habitat;
- the demolition works would not involve the removal or modification of any remnant native vegetation; and
- there is low likelihood of threatened biota and/or TECs being present within the demolition works area.

The potential ecological impacts from demolition works identified in **Appendix G1 Ecology Impact Assessment** are as follows:

- discharge of stormwater run-off, sediment laden water, contaminated water and oily water off-site and into the groundwater system affecting nearby natural areas and GDEs;
- further spread of existing noxious weed infestations;
- potential impacts on fauna during dispersal including accidental trapping of amphibians in trenches;
- temporary impacts to the Silver Beach foreshore, which is considered potential foraging (and limited breeding) habitat for shorebirds; and
- removal of perching and nesting habitats for large birds.

These impacts would likely be negligible to minor, particularly following implementation of the proposed mitigation measures outlined in **Section 17.7 and 17.8**.

As identified in **Section 17.5.6**, a number of threatened biota have a medium to high likelihood of occurrence in the study area. The likelihood of these biota being found within the study area was therefore investigated further. The results of this investigation are summarised in **Table 17-3** below.

Where the potential remained for biota to access the study area or be affected by the demolition works, Assessments of Significance (AOS) and/or Significant Impact Criteria (SIC) assessments were completed (refer to **Section 17.4.4**). These assessments are provided in full in **Appendix G1 Ecological Impact Assessment**. **Table 17-3** also presents the conclusions of these assessments.

Table 17-3 Threatened Biota Considered to have the Potential to Occur within the Demolition Works Area

Species / TEC name	Listing	Likely to be on affected?	Impact Assessment
Ramsar Site			
Towra Point Nature Reserve Ramsar site	EPBC Act	The demolition works would not result in any direct impacts to the Towra Point Nature Reserve. However, based on historical events there is a risk that during a flood event potentially contaminated waters can escape from the study area and enter the Towra Point Nature Reserve system. It is further noted that the demolition works would contribute to a reduction in industrial activity occurring within the Site, which would reduce the risk of such incidents occurring.	The SIC assessment concluded that the demolition works are unlikely to significantly impact Towra Point Nature Reserve.
Migratory Species			
55 migratory species recorded or predicted to occur in the search area	EPBC Act	While some of these species would be expected to pass over the study area on occasion, and some of them may do so regularly or may reside in the adjacent National Park, Marton Park Wetland or Towra Point Nature Reserve, the demolition works area does not provide important habitat for any migratory species.	No impacts are likely. No SIC assessment required.
TECs			
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner (SSFCF)	TSC Act	Although a TEC equating to the SSFCF has been previously mapped at three separate patches within the Site, surveys have identified one as being unvegetated and the remaining two as not consistent with the final determination of the TEC. Outside of these areas, no potential habitat for SSFCF was identified within the Site.	The AOS determined that the demolition works would not significantly impact this TEC
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (FW)	TSC Act	Freshwater Wetlands TEC was identified as occurring within the Site, adjacent to the Continental Carbon Pipeline easement. It was, however, not recorded within the demolition works area and would not be directly impacted by the demolition works.	The AOS determined that the demolition works would not significantly impact this TEC.

Species / TEC name	Listing	Likely to be on affected?	Impact Assessment
Threatened Fauna			
Green and Golden Bell Frog	EPBC Act and TSC Act	This species has the potential to be found within the demolition works area on occasion during dispersal.	The AOS and SIC assessments determined that the demolition works would not have significant impact on this species. Precautionary measures have been provided in **Section 17.7** to help ensure unlikely risks are mitigated.
Wallum Froglet	TSC Act	This species has the potential to be found within the demolition works area on occasion during dispersal.	The AOS determined that the demolition works would not have significant impacts on this species. Precautionary measures have been provided in **Section 17.7** to help ensure unlikely risks are mitigated.
Eastern Grass Owl	TSC Act	No breeding or preferred foraging resources occur within the demolition works area. Given that this species was recorded approximately 1.5 km south of the demolition works area it is possible that this species would move through the demolition works area to forage, however it is unlikely to be affected by the demolition works.	No impacts are likely. No AOS or SIC assessment required.
White-fronted Chat	TSC Act	No breeding or preferred foraging habitat occurs within the demolition works area. The closest records are approximately 500 m south of the demolition works area. Individuals from this population may enter the demolition works area, however it is unlikely to be affected by the demolition works.	No impacts are likely. No AOS or SIC assessment required.
Osprey	TSC Act	The Osprey was recorded during the 2014 survey. This species has also been recorded as recently as 2011, 5 km to the east of the Site. No foraging or breeding sites occur within the study area. Tall infrastructure on the Site may be used as perching habitat for this species.	No impacts are likely. No AOS or SIC assessment required. Mitigation has been suggested to manage risks associated with potential perching habitat in **Section 17.7**.
Non-breeding Shorebirds	TSC Act	There is a very small area of potential foraging habitat for non-breeding summer migrant shorebirds in the tidal zone of Silver Beach	No impacts expected due to availability of alternative foraging

Species / TEC name	Listing	Likely to be on affected?	Impact Assessment
		north of the Western ROW. Species include Lesser Sand-plover, Greater Sand-plover, Black-tailed Godwit, Terek Sandpiper, Curlew Sandpiper, Great Knot, Sanderling and Broad-billed Sandpiper.	habitat along Silver Beach. No impacts are likely. No AOS or SIC assessment required.
Breeding Shorebirds	TSC Act	A small area of limited potential breeding habitat exists for migrant and resident shorebirds in the vegetated foreshore of Silver Beach north of the Western ROW. Potentially nesting threatened shorebird species include: Pied Oystercatcher and Little Tern.	The AOS assessment determined that no impacts are likely as a result of the demolition works. A precautionary measure has been provided in **Section 17.7** to help ensure unlikely risks are mitigated.
Threatened Flora			
Coast Groundsel	TSC Act	Coast Groundsel has been recorded within the study area recently, however, the accuracy of the record is ~1 km and given the lack of suitable habitat, it is considered highly likely that the record was located in the adjacent National Park.	The AOS determined that the demolition works would not impact this species.

17.6.2 Ecology – Botany Bay

The potential impacts on marine ecology from the demolition works as a result of the removal of the cooling water outlet from the low tide mark on Silver Beach 20 m seaward were identified in **Appendix G2 Marine Ecology Impact Assessment** (also refer to **Figure 17-2)**. The potential impacts include the following:

- elevated levels of turbidity affecting nearby seagrass habitats;
- removal of approximately 20m^2 of Kelp.
- inadvertent discharge of contaminants in the water column;
- short-term disturbance to protected shorebirds using the groynes as foraging or roosting habitat;
- potential spread of the invasive algae *Caulerpa taxifolia;*
- acidification of estuarine waters; and
- dispersion of tributyltin (TBT) in the water column.

These impacts are considered low to negligible, provided that the mitigation measures highlighted in **Section 17.7** are implemented.

A summary of biota within Botany Bay in proximity of the demolition works on Silver Beach and the likely impacts on these as a result of the demolition works is contained in **Table 17-4**

Table 17-4 Threatened Marine Biota with Potential to be in proximity of the Demolition Works on Silver Beach

Ecological Value	Listing	Likely Impact and Justification
Towra Point Nature Reserve (Ramsar Wetland)	EPBC Act	None. Distance from minor works.
Towra Point Aquatic Reserve	NSW DPI (Fisheries)	None. Distance from minor works.
Black Cod *Epinephelus daemelii*	EPBC Act, TSC Act	Estuarine intertidal habitat not suitable for juvenile fish.
Grey Nurse Shark *Carcharias taurus*	EPBC Act, TSC Act	None. Shallow water, unsuitable habitat.
White Bellied Sea-Eagle *Haliaeetus leucogaster* and Little Tern *Sterna albifrons*	EPBC Act	None. Short duration of works
Dugong *Dugong dugon*	EPBC Act, TSC Act	None. Not likely to occur, unsuitable habitat.
New Zealand Fur-seal *Arctocephalus forsteri*	EPBC Act	None. Not likely to occur, unsuitable habitat.

Ecological Value	Listing	Likely Impact and Justification
Australian Fur-seal *Arctocephalus pusillus doriferus*	EPBC Act	None. Not likely to occur, unsuitable habitat.
Southern Right Whale *Eubalaena australis*	EPBC Act	None. Not likely to occur, unsuitable habitat.
Humpback Whale *Megaptera novaeangliae*	EPBC Act	None. Not likely to occur, unsuitable habitat.
Migratory species	EPBC Act	None. Minor works of short duration of short duration undertaken over small spatial scale with respect to occurrence of species.
Posidonia australis in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie	FM Act	Minor impacts. Mitigation measures as provided in **Section 17.7** would ensure patches of this TEC would be protected from potential impacts caused by the demolition works.

The assessment concluded that the demolition works associated with the cooling water outlet pipeline removal are considered to present a low to negligible risk to threatened aquatic species, communities and habitats for the following reasons:

- the proposed pipeline removal works would be in very shallow water with sandy substratum;
- the pipeline removal works would be of short duration (approximately two weeks);
- the pipeline removal works would be staged from land, eliminating potential spills and leaks from boats;
- short-term disturbance would be limited to a relatively small section of Silver Beach/Botany Bay; and
- formal assessment of potential impacts on aquatic ecology undertaken for works of greater duration and involving higher levels of sediment and shoreline disturbance have concluded that impacts on these protected ecological components were unlikely.

The potential impact of the demolition works exposing Acid Sulfate Soils or sediment contamination and the effect of this on marine ecology in Botany Bay has been discussed in **Chapter 10 Human Health and Ecological Risk**. This assessment concluded that Silver Beach is classified in the low risk category (Class 5) for Acid Sulfate Soils. As such it is unlikely that these soils would be exposed and result in significant impacts to marine biota. The assessment also concluded provided appropriate mitigation is employed, the suspension of nearshore sediments, presents little to no likelihood of impacts on marine biota due to the low likelihood of contaminants being present.

17.6.3 Key Threatening Processes

A Key Threatening Process (KTP) is defined under Schedule 3 of the TSC Act as '*a threatening process*' where the process '*threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*'.

KTPs are listed under both the Commonwealth EPBC Act and the NSW TSC Act. The demolition works could potentially affect the KTPs listed in in **Table 17-5**:

Table 17-5 Relevant Key Threatening Processes

KTP	Listing	Potential implications
Anthropogenic climate change	EPBC Act and TSC Act	The demolition works are likely to result in minor greenhouse gas emissions being released into the atmosphere from demolition related traffic. However, these releases would be temporary in nature.
Competition and grazing by the feral European rabbit *Oryctolagus cuniculus*	EPBC Act	Rabbit scats were observed on site during the Site inspection. However the demolition works are unlikely to increase the prevalence of Rabbits within the demolition works area and would not contribute to the increase of this KTP.
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	TSC Act	The demolition works have the potential to cause the spread of this species off-site, through wind and water seed dispersal. Measures to mitigate this potential impact are discussed in **Section 17.7**.
Invasion and establishment of exotic vines and scramblers	TSC Act	Where exotic vines and scramblers are already present within the study area, there is potential for these species to be spread via construction vehicles and natural dispersal into cleared and disturbed areas. Measures to mitigate this potential impact are discussed in **Section 17.7**.

17.7 Mitigation

An overview of the ecological mitigation and environmental management measures has been provided below.

17.7.1 Biodiversity Management Plan

A Biodiversity and Weed Management Plan would be prepared as part of the DEMP to document the ecological mitigation measures for the demolition works. This BWMP would include strategies and measures to avoid, minimise and manage unexpected or potential impacts to native biota. The following strategies and mitigation measures would be incorporated as part of the BWMP:

- protection of existing vegetation;
- fauna management;
- management of sediment, erosion and pollutant run-off;
- management of weeds; and

- protection of marine ecosystems (Botany Bay).

Protection of Existing Vegetation

While minimal vegetation clearing would be required as part of the demolition works, unaffected vegetation areas on the Site and at Silver Beach Foreshore would be protected. These vegetation areas would be clearly marked as 'no-go zones' on all plans and diagrams for demolition works. These areas would be clearly fenced off with boundary tape / orange bunting / flagging prior to the commencement of demolition works, and would remain fenced off until the completion of works. Demolition works related plant and vehicles shall not access these areas at all times. Stockpiling of any material shall not occur in these areas. These areas included but are not limited to the Vegetation Exclusion Zones shown on **Figure 17-1**.

Fauna Management

Several natural and man-made features that could be used as potential fauna habitat would be removed as a result of the demolition works. To minimise potential impacts to native fauna during the disturbance/removal of potential habitat, the following measures would be included in the BWMP:

- Demolition workers would be provided with identification sheets relating to the threatened fauna species predicted to occur within the Site (refer to **Appendix G1 Ecology Impact Assessment**).
- Stop work procedures would be implemented during the works on the chance encounter of any dispersing threatened frogs or the identification of nesting Pied Oystercatcher, Little Tern, Osprey or White-bellied Sea-eagle to avoid death or injury to frogs dispersing across the study area, or disturbance to nesting threatened birds.
- Trenches/holes would be back-filled daily or covered overnight. Where this is not possible, other measures would be considered to prevent and/or mitigate fauna entrapment. Trenches/holes would be inspected prior to works each morning. Injured frogs that become trapped within trenches would be assessed by a veterinarian or ecologist. Uninjured frogs would be captured and released into the nearest suitable habitat to the south of the study area.
- If practicable, works at Silver Beach to remove the cooling water outlet should be completed outside of the known nesting periods for Pied Oystercatcher (August to January) and Little Tern (Spring/Summer). If nesting shorebirds are encountered in the Silver Beach foreshore area in the vicinity of works (within 20 m), works at Silver Beach would cease, a qualified zoologist would be consulted and appropriate actions implemented, prior to works recommencing.
- If practical, works to remove tall structures on-site should be completed outside of the known nesting periods the threatened bird species (July to September for Osprey and June to January for White-bellied Sea-eagle). If not practical then tall structures would be inspected for active nests prior to commencing the demolition works.

Management of Sediment, Erosion and Stormwater Run-off

Sedimentation, erosion and stormwater run-off resulting from the demolition works has the potential to influence water quality and vegetation condition for surrounding communities and catchment areas.

Standard industry measures for sediment runoff on urban developments would be implemented, in accordance with '*The Blue Book Volumes 1 and 2* (Landcom 2004), and *Managing Urban Stormwater: Soils and Construction Volume 1*, (DECC 2008). Specific sedimentation and stormwater runoff controls would be developed to protect sensitive ecological receptors adjacent to the Site, such as Marton Park Wetland, Towra Point Nature Reserve, and Botany Bay National Park. These measures have been included in **Chapter 9 Soils, Groundwater and Contamination** and would be included in the DEMP.

Management of Weeds

Four noxious weeds were recorded within the Site. In addition, numerous other noxious weed species are known to occur within the Sutherland Shire LGA. The BWMP would aim to limit and control the spread of noxious weeds within the Site via the following methods:

- the provision of noxious weed information sheets to demolition contractors to help identification of relevant noxious weeds during demolition;
- strict stockpiling control and eradication of all noxious weeds as per the NW Act for each weed as per NSW DPI specifications for Sutherland Shire LGA;
- target and control noxious weeds as well as areas of potential new outbreaks including soil stockpiles and any other disturbed areas;
- use of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds. Frogs have been found to be very sensitive to some herbicide products and in particular to the surfactants, or wetting agents used to improve the effectiveness of the chemicals (Mann and Bidwell, 1998);
- Wash down protocols to prevent the spread of Ludwidgia *Ludwidgia peruviana* as well as; Lantana *Lantana camara*, Caster Oil Plant *Ricinus communis* and Bitou Bush *Chrysanthemoides monilifera* subsp*. Rotundata* would be implemented in line with existing Caltex controls. These protocols would be modified where required; and
- development of monitoring programs for noxious weeds on Site, during the demolition works.

Protection of Marine Ecosystems (Botany Bay)

A number of potential impacts to marine ecosystems have been identified for the demolition works involving the removal of the cooling water outlet pipeline. The following measures would be included in the BWMP and implemented during demolition works:

- Silt curtains would be installed seaward of the demolition works area but not directly above existing seagrass communities. Options include either one long or two shorter curtains isolating the closest patches of seagrass habitat from the works. Silt curtains would be installed and remain in place until works are completed. Silt curtains would be

used to contain increased sediment in the water column and any spills from demolition plant and equipment.

- All plant and equipment used in the water column would be appropriately prepared, checked and cleaned to avoid potential release of contaminants;
- All plant and equipment would be inspected to ensure fragments of the invasive algae *Caulerpa taxifolia* are not present;
- Spill kits would be used to contain and clean up spills from demolition plant and equipment. Spill kits would be located within 20 m of demolition plant and equipment; and
- Demolition works at Silver Beach (particularly those located in the water column) would be timed such that they do not coincide with high-tide conditions or during significant wave action.

17.7.2 Silver Beach Rehabilitation

Following excavation and the disturbance of Silver Beach, rehabilitation would be required. A Silver Beach Rehabilitation Plan would be developed and implemented to restore the area where the cooling water outlet pipeline has been removed. This plan is discussed is **Chapter 18 Coastal Processes**.

17.8 Summary

Provided the measures outlined above, and summarised in **Table 17-6** below, are incorporated into the BWMP for the demolition works and implemented during demolition, no adverse impacts are likely to occur on the ecological values identified within this assessment.

Table 17-6 Management and Mitigation Measures – Ecology

Management and Mitigation Measures	Demolition	
	Design	Implementation
A Biodiversity and Weed Management Plan (BWMP) would be prepared in order to limit and control the spread of noxious weeds within the Site/***demolition works area***. It would include the following: • measures to target potential new weed outbreaks including soil stockpiles and any other disturbed areas; • outline monitoring programs for noxious and problematic weeds on site and in the surrounding areas; • measures for strict stockpiling control to help eradicate all noxious weeds as per NSW DPI specifications for Sutherland Shire LGA; • include a list of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds; and ensure that only amphibian friendly herbicides are used; • wash down protocols for construction/***demolition*** vehicles and machinery to prevent the spread of root-rot fungus	✓	✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
(*Phytophthora cinnamomi*) ***and noxious weeds***; • all personnel undertaking routine management activities of any noxious weeds should be appropriated trained and all contractors should hold the necessary permits and licenses. ***Noxious weed information sheets would be provided to demolition contractors to help identification of relevant noxious weeds***.		
A BWMP would be prepared in order to limit potential impacts to existing vegetation outside of the area of proposed works, but within the Site. It would include the following: • existing vegetation on Site would be clearly marked on all Site plans and construction diagrams, with clear indications of no-go zones within all vegetated areas; • existing vegetation would be clearly signposted and fenced off prior to the commencement of construction activities, and should remain fenced off until the completion of works (as per the Vegetation Exclusion Zones shown on **Figure 17-1**); and • absolutely all works would be limited to the defined construction/demolition footprint.	✓	✓
To minimise the potential impacts to native fauna during the demolition works the following measures would be included in the BWMP: • ***demolition workers would be provided with identification sheets relating to the threatened fauna species predicted to occur within the Site;*** • ***Stop work procedures would be implemented during the works on the chance encounter of any dispersing threatened frogs or the identification of nesting Pied Oystercatcher, Little Tern, Osprey or White-bellied Sea-eagle to avoid death or injury to frogs dispersing across the study area, or disturbance to nesting threatened birds.;*** • ***Trenches/holes would be back-filled daily or covered overnight. Where this is not possible, other measures would be considered to prevent and/or mitigate fauna entrapment. Trenches/holes would be inspected prior to works each morning. Injured frogs that become trapped within trenches would be assessed by a veterinarian or ecologist. Uninjured frogs would be captured and released into the nearest suitable habitat to the south of the study area.*** • ***If practicable, works at Silver Beach to remove the cooling water outlet should be completed outside of the known nesting periods for Pied Oystercatcher (August to January) and Little Tern (Spring/Summer). If nesting shorebirds are encountered in the Silver Beach foreshore area in the vicinity of works (within 20 m), works at Silver Beach would cease, a qualified***	✓	✓

Management and Mitigation Measures	Demolition	
	Design	Implementation
zoologist would be consulted and appropriate actions will be implemented, prior to works recommencing. • ***If practical, works to remove tall structures on-site should be completed outside of the known nesting periods the threatened bird species (July to September for Osprey and June to January for White-bellied Sea-eagle). If not practical then tall structures would be inspected for active nests prior to commencing the demolition works.***		
The following recommendations, would be contained in the BWMP for managing the potential marine ecology impact and implemented during demolition works: • ***silt curtains would be installed seaward of the demolition works area but not directly above existing seagrass communities;*** • ***all plant and equipment used in the water column would be appropriately prepared, checked and cleaned to avoid potential release of contaminants;*** • ***plant and equipment used in the water column would be inspected to ensure fragments of the invasive algae Caulerpa taxifolia are not present;*** • ***spill kits would be used to contain and clean up any spills from demolition plant and equipment. Spill kits would be located within 20 m of demolition plant and equipment; and*** • ***demolition works at Silver Beach (particularly those located in the water column) would be timed such that they do not coincide with high-tide conditions or during significant wave action.***	✓	✓

18 COASTAL PROCESSES

18.1 Introduction

The demolition works would involve the removal of the redundant cooling water outlet pipeline from under Silver Beach and up to 20 m beyond the low tide mark into Botany Bay. This activity has the potential to affect coastal processes on the intertidal and sub tidal areas of Silver Beach (refer to **Chapter 4 Proposed Modification**). Cardno (NSW/ACT) Pty Ltd (Cardno) was engaged to undertake a Coastal Processes Assessment that specifically investigated the potential impacts of these works. This assessment is provided in full in **Appendix H Coastal Processes Assessment** and is summarised in this chapter.

18.2 Scope of the Assessment

This assessment was undertaken to respond to following requirements from Department of Primary industries (Office of Water and NSW Fisheries) and the EPA. They indicated that the SEE must include:

- an accurate description of the works - especially in describing the areas of excavation below the mean high water mark, spoil deposition and the type of material to be used for infill below the mean high water mark;
- appropriate erosion and sedimentation measures must be used to ensure that nearby seagrasses are not impacted by turbidity from these works;
- describe the proposed mitigation, monitoring and management measures that Caltex intend to apply to minimise the potential impacts associated with the removal of pipelines both on land and within Botany Bay; and
- the rehabilitation process including the source and quality of the replacement material.

The chapter addresses the above requirements and provides an assessment of the potential impacts that could result from the demolition works on coastal processes. Where necessary a number of specific measures for mitigating these impacts have been provided.

18.3 Legislation and Planning Policy

18.3.1 NSW State Legislation and Policies

18.3.1.1 Protection of Environment Operations Act 1997

Part 5.3 of the *Protection of Environment Operations Act 1997* (PoEO Act) contains provisions that related to the pollution of waters and indicates that any action by an individual that leads to the pollution of waters is considered a guilty offence. The demolition works at Silver Beach have the potential to release suspended sediment into Botany Bay. This would be regarded under the PoEO Act as a pollution of waters to which would not be exempted under Chapter 3, Part 1 of the *Protection of the Environment Operations (General) Regulation 2009* (PoEO Regulation) and would not be regulated under an Environment Protection Licence (EPL). Therefore, the potential release of sediment/other contaminants resulting from the demolition works should be effectively addressed, minimised, controlled and managed to comply with the provisions contained in the PoEO Act. Relevant measures are outlined in **Section 18.7**.

18.4 Method of Assessment

18.4.1 Data review

A desktop assessment was undertaken and involved review and use of the following data:

- wave climate and hydrodynamic studies;
- beach profile information; and
- wave and water level parameters.

Wave climate and hydrodynamic studies: A report by Cardno (2012) provides a description of previous wave climate and hydrodynamic studies undertaken to describe wave conditions and current magnitudes in Botany Bay.

Beach profile information: Sydney Ports provided up-to-date beach profile information for the relevant section of Silver Beach and Botany Bay.

Wave and water level parameters: A report by Cardno (2012) combined approximately 20 years of offshore wave data with offshore wave direction data. This wave data set, combined with wave coefficients developed using the SWAN wave model (refer to **Section 18.4.2**), provided the basis for estimating wave time-series at the section of Botany Bay where the cooling water outlet pipeline is proposed to be removed.

18.4.2 Modelling

Several models were used to understand the existing coastal processes at Silver Beach. These were:

- **SWAN numerical wave model system**: used to calculate the significant wave height at the seaward end of the cooling water outlet pipeline by inputting offshore wave data;
- **SBEACH modelling system:** used to understand storm erosion on Silver Beach where the pipeline is proposed to be removed; and
- **Delft3D FLOW model**: used to complete tidal current investigations.

This approach was considered appropriate for the evaluation of the physical processes that are relevant to the proposed cooling water outlet pipeline demolition works.

18.5 Existing Environment

Silver Beach is located on the southern shore of Botany Bay north of the community of Kurnell. It is predominantly located between Prince Charles Parade and Botany Bay and is a white sand beach split into a number of groyne compartments. A small vegetated dune located at the back or the groyne compartments abuts Prince Charles Parade.

The wave conditions at Silver Beach have been modified significantly over the past 60 years as a result of dredging for various purposes within Botany Bay. Rock groynes have been constructed along Silver Beach to prevent longshore sand transport and to protect Prince Charles Parade and Kurnell from shoreline erosion. These structures have also protected the cooling water outlet pipeline (refer to **Figure 17-2**).

Silver Beach is exposed to winds that are predominantly from the northerly sectors. Winds from these directions can occur throughout the year, but are most prevalent in summer from the northeast and in winter from the northwest. Existing grass vegetation covering the upper part (i.e. the dune) of Silver Beach helps protect the beach against wind erosion.

The buried cooling water outlet pipeline extends seaward from the Western ROW into Botany Bay for a distance of approximately 600 m. The demolition works that would remove the pipeline in the intertidal and sub-tidal areas would take place on Silver Beach. The length of pipeline to be removed seaward of Prince Charles Parade is approximately 65 m, of which approximately 20 m is located below the low tide mark (refer to **Figure 17-2**). Refer to **Section 4.2.4** for more details regarding these works.

18.6 Impact Assessment

18.6.1 Seabed Loss and Pipeline Exposure

Survey data for Silver Beach was used in the SBeach storm erosion model to examine the beach profile change that can occur in a 1 in 100 year storm. This was undertaken to determine the erosion risk to the section of cooling water pipeline that is to remain in-situ.

The assessment identified the following:

- only a very short section of the remaining pipeline would be exposed during 1 in 100 year storm;
- a similar level of exposure occurs during low tide currently; and
- sections of the pipeline are likely to be exposed during such storms at the moment.

As such there would be no effect on normal wave and tide conditions as a result of the demolition works and very severe storms would not result in the pipeline that remains being further exposed.

Further, it can deduced that storms currently cause little change to the existing beach profile of groyne compartment which contains the cooling water outlet.

18.6.2 Release of Suspended Sediment and Other Contaminants

Following excavation and removal of the cooling water pipeline from Silver Beach, it has been estimated that approximately 260 m^3 of sand would be required to backfill the exposed pipeline trench from Prince Charles Parade to 20m beyond the low tide mark. Approximately 180 m^3 of this backfill material would need to be placed in the area located below 1m AHD[16].

The process of backfilling the excavated trench below the low tide mark is likely to result in the highest levels of sedimentation in the water column. It is likely that some of the backfill material may be affected by tide and wave processes. It has been predicted that approximately 5% of the backfill material may comprise of fines (<64µm). As such, approximately 9 m^3 of fines may enter the water column in the proximity of the back filling works and form a plume of suspended sediments.

[16] Australian Height Datum - A common national plane of level corresponding approximately to mean sea level.

As described in **Appendix H Coastal Processes,** modelling was undertaken to determine the extent of the sediment plume using the Delft3D model. If unmanaged, the works would potentially result in visible sediment plumes extending up to 60 m from the backfilling activity. This prediction assumes steady state and continuous backfilling, however in practice this would occur with intermittent with back-hoe movements. As such, the predicted extent of visible plume is conservative.

During backfilling, the suspended sediment concentrations are predicted to be very minor (about 15 mg/L at 40m from the pipeline, and then only at the centre line of the plume). Sand placed in the sub-tidal area (below 0 m AHD) would be 'smoothed-out' rapidly by wave action and would not likely be distinguishable from the unaffected seabed within a month.

Although sediment plumes are more likely to occur during backfilling works, some sediment plumes may also form during the excavation works and removal of the pipeline. The sediment concentrations of these plumes are predicted to be similar to or less than the concentrations predicted during backfilling.

Sediment plumes can result in adverse impacts on various aquatic ecosystems. A number of seagrass communities are known to be located in close proximity to the proposed works. The potential impact of the sediment plume on these sea grass communities is discussed in **Chapter 17 Ecology**. Mitigation measures presented in that chapter, including the use of silt curtains to contain the sediment plume would ensure that adverse impacts on the seagrass communities are avoided.

In addition, the pipeline removal works requires the use of plant and equipment within the water column. This raises the potential risk of releasing contaminants from the equipment during the works. **Section 18.7** provides management and mitigation measures to manage this risk.

The pipeline removal works also may result in the disturbance of contaminants within the sediments in Botany Bay. It is unlikely that the sediments at Silver Beach contain contaminated sediments. Therefore the suspension of nearshore sediments as a result of the cooling water outlet pipeline removal works in Botany Bay, together with the use of silt curtains present little to no likelihood of contamination impacts on the marine environment as a result of the demolition works. This is discussed in **Chapter 10 Human Health and Ecological Risk**.

18.6.3 Dune Stability

The removal of the cooling water outlet pipeline has the potential to affect the stability of the sand dunes on Silver Beach. Wind data[17] was analysed to gain an understanding of the wind conditions in the region and how they might influence coastal processes during the removal of the pipeline and subsequent rehabilitation works.

The critical wind speed required to mobilise loose, dry sand typically found in coastal dunes of the Sydney region is between 5 and 10m/s. According to the wind data analysed, a wind speed of 5m/s is equalled or exceeded about 50% of the time and a wind speed of 10m/s is equalled or exceeded about 8% of the time.

[17] Data from the wind station on Caltex Kurnell Wharf (2013)

Given the frequency of winds conducive with mobilising sand are common in Botany Bay, it is highly likely that during the removal of the cooling water outlet pipeline and subsequent rehabilitation works, the disturbed area of sand dunes would be exposed to erosive winds.

Section 18.7 provides management and mitigation measures to manage this risk.

18.7 Mitigation

The management measures for managing sediment plumes from the excavation removal of the pipeline and backfilling process are outlined in **Chapter 17 Ecology**.

The following mitigation measures have been proposed to minimise and manage impacts associated with dune stability and rehabilitation of Silver Beach following removal of the pipeline. These measures would be included in Silver Beach Rehabilitation Plan (SBRP) which would form a sub-plan of the DEMP:

- A detailed survey of the likely extent of the disturbed area would be undertaken prior to commencing demolition works at Silver Beach to ensure that the pre-existing topography is re-established following the works.
- The affected sand dunes (including the back-beach and sub-aerial beach) would be re-instated using the stockpiled overburden sand and if necessary, additional sand. Additional sand used for reinstating sand dunes would be of similar particle size and composition as the overburden sand.
- The affected sand dunes would be restored to match the previously surveyed topography. A smooth profile from the back-beach area to the dune would be re-established to ensure the aerodynamics is as consistent as possible with the undisturbed areas adjacent to the disturbed area. If necessary, liquid sprays or geotextiles would be used to help stabilise the beach and protect against erosion.
- The affected sand dunes would be re-vegetated using indigenous, native flora. The existing vegetation is limited to grasses, with no woody vegetation. The area would be re-planted with similar grass species in a manner that ensures minimal loss of wind-blown sand from the dune while the area is re-vegetating. All re-vegetated areas would:
  - contain signage to highlight these areas as rehabilitation zones that prohibit public and vehicular access;
  - be temporarily fenced, and
  - be maintained and monitored until vegetation is established using approved dune rehabilitation methods.
- Material of a similar sediment size and colour characteristics would be used as back fill material for the trench below the low tide mark. To account for later settling and consolidations, some overfilling would be undertaken to account for later consolidation (approximately 10 % would be recommended).

Rehabilitation works at Silver Beach including the reinstatement of affected sand dunes would be in accordance with this SBRP.

18.8 Summary

Provided that the measures outlined in **Table 18-1** below are implemented it is considered unlikely that the removal of the cooling water pipeline from under Silver Beach would result in significant adverse impacts relating to sediment movement and coastal processes and would not affect the long term integrity of Silver Beach and its dune.

Table 18-1 Mitigation and Management Measures - Coastal Processes

Management and Mitigation Measures	Demolition	
	Design	Implementation
A Silver Beach Rehabilitation Plan (SBRP) would be developed as part of the Demolition Environment Management Plan (DEMP). Rehabilitation works at Silver Beach would be in accordance with this SBRP. The following measures would be included:	✓	✓
A detailed survey of the likely extent of the disturbed area at Silver Beach would be undertaken prior to commencing demolition works to ensure that the pre-existing topography is re-established following the works.		✓
The affected sand dunes (including the back-beach and sub-aerial beach) would be re-instated using the stockpiled overburden sand and if necessary, additional sand. Additional sand used for reinstating sand dunes would be of similar particle size and composition as the overburden sand.		✓
The affected sand dunes would be restored to match the previously surveyed topography. A smooth profile from the back-beach area to the dune would be re-established to ensure the aerodynamics are as consistent as possible with the undisturbed areas adjacent to the disturbed area. If necessary, liquid sprays or geotextiles would be used to help stabilise the beach and protect against erosion.		✓
The affected sand dunes would be re-vegetated using indigenous, native flora. The existing vegetation is limited to grasses, with no woody vegetation. The area would be re-planted with similar grass species in a manner that ensures minimal loss of wind-blown sand from the dune while the area is re-vegetating. Re-vegetated areas would: • ***contain signage to highlight these areas as rehabilitation zones that prohibit public and vehicular access;*** • ***be temporarily fenced, and*** • ***be maintained and monitored until vegetation is established using approved dune rehabilitation methods.***		✓
Material of a similar sediment size and colour characteristics would be used as back fill material for the trench below the low tide mark. To account for later settling and consolidations, some overfilling would be undertaken to account for later consolidation (approximately 10 % would be recommended).		✓

19 CUMULATIVE IMPACTS

19.1 Introduction

As requested by the SEARs, certain technical assessments have considered not only the impacts of the demolition works alone, but also the potential cumulative effects of the demolition works and the conversion works alongside other proposed developments. Where necessary a Cumulative Impact Assessment (CIA) was included in the technical chapters of this SEE. This chapter summarises the findings of those cumulative assessments.

19.2 Scope of Assessment

The SEARs (refer to **Appendix A SEARs and Application Documentation**) requested '*an assessment of the potential impacts of all components and stages of the proposed modification, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes*'.

19.3 Legislation and Planning Policy

19.3.1 Environmental Planning and Assessment Act 1979

Under Part 5 of the EP&A Act there is a duty for a determining authority to consider the environmental impacts of proposed works. The supporting *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) states that '*for the purpose of the EP&A Act, the factors to be taken in to account when consideration is being given to the likely impact of an activity on the environment include…any cumulative environmental effect with other existing or likely future activities*'.

There is no provision in Part 4 of the EP&A Act explicitly requiring a consideration of the cumulative environmental effect in determining a development application. However, when determining a development application, the consent authority is required, under section 79C(1)(b) of the EP&A Act, to take into account the '*likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality*'.

There is also case law where the consideration of cumulative impact assessment has been successfully contested under the EP&A Act.

19.4 Method of Assessment

19.4.1 Introduction

Cumulative Impact Assessment (CIA) is a receptor based assessment, whereby in order to have a cumulative effect two projects or impacts need to affect the same receptor. Therefore, if the demolition works are not affecting a receptor or group of receptors 'alone' then they cannot have a cumulative effect with another project or action. The only exception to this rule is if one of the potential cumulative projects weakens a management or mitigation measure to the point where a residual impact generated by the demolition works becomes significant again. As such, CIA focusses on the residual impacts (i.e. those impacts that remain post mitigation) from a project.

Cumulative impacts can be formed antagonistically[18], synergistically[19] or additively[20]. They are often caused by an action in combination with other past, present, and reasonably foreseeable future human actions[21].

19.4.2 Approach

The first stage of the CIA is to understand the adverse residual impacts of the demolition works. The second stage is to identify other development nearby that may affect the same receptors as the demolition works and/or change the effectiveness of the other's mitigation and management measures. Other relevant projects that may generate a cumulative impact with the proposed demolition works have been identified using the following assessment parameters.

- **Spatial parameter** – The spatial parameter depends on the characteristics of the environmental impact and the likely area over which a residual impact would occur. For example, an air quality impact would potentially affect a wider area than a noise impact and would therefore affect different human or environmental receptors in different ways.
- **Temporal parameter** – The temporal parameter relates to how far into the future or the past the assessment considers cumulative proposals or activities. Projects that are operational have already been considered as they form part of the existing environmental baseline for each environmental aspect assessed in this SEE (refer to **Chapters 8-18**). Projects that are not yet on exhibition have been discounted as their assessments do not contain enough detail on residual effects or final design to allow a robust cumulative impact assessment to take place.

Therefore this CIA has considered the following:

- development applications that are on exhibition;
- development applications that have completed exhibition but are not yet determined; and
- applications that have gained development approval but are not yet fully operational.

In order to identify relevant development, three databases were reviewed in August 2014:

- Major Project Assessments register on the NSW Department of Planning and Environment (DPE) website;
- Development Applications register on the Sutherland Shire Council (SSC) website; and
- public notices and the 'invitations to comment' register on the Commonwealth Department of Environment website.

A review of these databases was considered the most effective way of identifying future projects that are likely to have significant residual impacts, and therefore may have a cumulative effect with the demolition works.

[18] Opposing each other potentially resulting in a lower overall environmental effect.
[19] Where two or more impacts produce a total impact greater than the sum of the individual parts. For example oxides of nitrogen and volatile organic compounds each have impacts on human health, but when they combine they form ozone, their combined impact is potentially greater and of more concern to human health.
[20] For example two sources of equally powerful noise can combine to create a greater overall impact.
[21] Defined by the European Commission 1999.

19.4.3 Guidance and Standards

There is no guidance on undertaking interactive or cumulative impact/effect assessment in NSW or Australia. Therefore, this assessment has made reference to the European Commission (EC) Guidelines for the *Assessment of Indirect and Cumulative Impacts as well as Impact Interactions 1999* and the Canadian Environmental Assessment Agency *Cumulative Effects Assessment Practitioner's Guide 1999*.

19.5 Cumulative Impact Assessment

19.5.1 Cumulative Impact Scoping

As discussed, for a cumulative effect to occur, two impacts need to affect the same receptor. With respect to the demolition works, the key receptors identified in the local area include:

- the community of Kurnell;
- the environmental receptors of Botany Bay, Towra Point Nature Reserve, Towra Point Aquatic Reserve, Kamay Botany Bay National Park and Marton Park Wetlands; and
- Oyster Farming in Quibray Bay and Botany Bay.

The heritage value of the Site was also considered.

The demolition works have the potential to cause a number of environmental impacts. These have been grouped, assessed and discussed under eleven different environmental aspects (refer to **Chapters 8-18**). For the majority of these aspects, there are expected to be no significant residual impacts as a result of the demolition works on any of the identified receptors. Therefore, in most cases a CIA is not required. Provided the proposed management and mitigation measures (refer to **Chapter 20 Revised Management and Mitigation Measures**) are implemented and remain effective, there would be no likely residual adverse impacts for the following aspects given the existing environment:

- Hazards and Risk (refer to **Chapter 8**)
- Soils, Groundwater and Contamination (refer to **Chapter 9**);
- Human Health and Ecological Risk (refer to **Chapter 10**);
- Waste Management (refer to **Chapter 11**);
- Surface Water, Wastewater and Flooding (refer to **Chapter 12**);
- Air Quality and Odour (refer to **Chapter 14**);
- Ecology (refer to **Chapter 17**); and
- Coastal Processes (refer to **Chapter 18**).

For the remaining aspects (Noise, Traffic and Heritage), further investigations have been undertaken as the demolition works would likely generate residual adverse impacts. These aspects are discussed below.

19.5.2 Approved and Committed Development

The following section considers approved and committed developments that are not yet fully operational, which could give rise to potential cumulative impacts in combination with the demolition works. The following developments were identified and reviewed:

- SSD 5353 - Kurnell Ports and Berthing Facility.
- DA12/0476 - Greenhills Beach Residential development Staged Dev. Masterplan-161 Res. Lots-Stage 1 Site Preparation & Subdivision Into Six Super Lots & Assoc. Infrastructure (Greenhills Development).
- DA11/0665 - Greenhills Parklands Staged Dev.-Concept Masterplan for Ten Sporting Fields & Assoc. Fac. 1st Stage-1 Playing Field & Subdivision (Greenhills Parklands Development).
- DA14/0456 - AGL Demolition of Hydrocarbon Extraction Plant (HEP). Hydrocarbon gas stream is piped into the HEP from adjacent Caltex Refinery. The gas stream is processed to recover LPG components with the remainder being returned to the refinery.

The Kurnell Ports and Berthing Facility Project was approved in September 2013 and is scheduled for completion in Q2 2015. The majority of the works have been completed and are located offshore, greatly reducing the potential for cumulative impacts. A review of SSD 5353 and discussions with Caltex resulted in it being determined that this project, in combination with the demolition works, may have potential cumulative effects relating to noise and traffic and access.

The 'Greenhills Developments' (DA12/0476 and DA11/0665) involves subdivision work for new residential and recreational land uses at a location approximately 5 km for the Site. The development applications and supporting information for these developments was reviewed and it was determined that the potential cumulative effects generated by developments at this site, combined with the demolition works, relate to traffic and access.

AGL's Hydrocarbon Extraction Plant is located adjacent to the Site along the western boundary between Captain Cook Drive and Sir Joseph Banks Drive, off Chisholm Road. In May 2014, AGL sought development consent from Sutherland Shire Council to demolish this facility (DA 14/0456). Approval was granted in June 2014. According to the Statement of Environmental Effects for the project, these demolition works are scheduled to commence in January 2015 and will last between six to eight weeks. The demolition works would not overlap with this project and therefore no cumulative impacts are expected.

In addition to the above projects, the cumulative assessment also considered specific elements of the conversion works for the Project (SSD 5544) that were not already integrated into the demolition works assessments.

19.5.3 Evaluation of Magnitude of Impact

The criteria adopted in each of the technical assessments (refer to **Chapters 8-18**) have been used to assess the significance of potential cumulative impacts.

19.5.4 Cumulative Assessment

Noise and Vibration

The acoustic environment surrounding the Site, including the nearest residential receptors at Kurnell, are currently influenced by noise from a diverse range of sources including marine activities occurring in the Botany Bay, aircraft noise from the Kingsford Smith Airport, local vehicle movements and sounds such as wave action and fauna.

The Noise and Vibration Assessment (refer to **Appendix E Noise and Vibration Assessment**) for the demolition works assessed potential impacts related to noise, vibration and the traffic noise. It found that the '*highly noise affected management level*' of 75 dBA was not exceeded at any of the residential receptors during the demolition works. However the 'noise affected management level' for the demolition works would potentially be exceeded at 30D Cook Street during the main Site demolition works and at the residential receptors along the ROWs as the pipelines are being removed. These exceedances would be temporary and would be managed by the reasonable and feasible mitigation measures presented in **Chapter 13 Noise and Vibration**.

Despite this, there is the potential of an in-combination noise impact during the final stages of the conversion works (i.e. ongoing tank conversions) and the final stage of the Kurnell Port and Berthing Facility project (i.e. final works to the new breasting island).

A cumulative assessment of the demolition works with the final stage of the conversion works (i.e. tank conversions) was completed and concluded that '*the cumulative conversion and demolition works noise levels are predicted to be below the daytime construction/demolition noise criteria at all receivers except at R2 where a minor exceedance of 4dBA is predicted.*'

This is the same exceedance for the demolition works alone. Therefore it can be concluded that the same reasonable and feasible management and mitigation measures should be used to manage this temporary impact. These measures are presented in **Section 13.9** in **Chapter 13 Noise and Vibration**.

In regards to the Kurnell Port and Berthing Facility Project, the only part that would overlap with the demolition works relates to works for the new breasting island at the far end of the wharf in Botany Bay. The majority of the work related to this activity has already commenced and will largely be complete by the time the demolition works commence. Equally, whilst the demolition works are scheduled to commence in Q2 2015, for the first six months all works would be limited to the main Site. As such, the works to demolish the refinery process units and the works to finish the new breasting island would not affect the same receptors and therefore cannot result in a cumulative impact.

Transport and Access

While not a significant impact, the demolition works would add a small number of vehicles to the local road network temporarily. However, as described in **Chapter 15 Transport and Access**, the Level of Service (LOS) for 2015 (the year when the most demolition works would be occurring) would remain unchanged. The assessment presented in **Chapter 15 Transport and Access** includes a consideration of the traffic related to the conversion works.

The final stage of the Kurnell Port and Berthing Facility project and the future development of the Greenhills Development may also increase traffic movements along Captain Cook Drive during the time that the demolition works are active. However the closure of the refinery would mean that the Project as a whole would result in a significant positive impact on the local traffic environment as the permanent workforce on-site reduces from approximately 900 to approximately 100. As the Project is likely to result in such a beneficial impact to Captain Cook Drive, it would not result in cumulative adverse traffic impacts with the aforementioned projects.

Heritage

A Heritage Impact Assessment (HIA) (refer to **Chapter 16 Heritage**) assessed the potential impacts on heritage as a result of the demolition works. The HIA identified potential adverse impacts on the following historic heritage items or places:

- Silver Beach;
- Kamay-Botany Bay National Park / Kurnell Peninsula Headland; and
- Australian Oil Refinery.

The HIA determined that the heritage impacts of the demolition works on Silver Beach and Kamay-Botany Bay National Park / Kurnell Peninsula Headland are minor and temporary:

- either involving potentially unpleasant visual, aural and odorous effects that may temporarily diminish the landscape setting, social and symbolic value of these heritage places; or
- resulting in a temporary impact on the physical fabric of an informal sandstone wall, and on the physical fabric and narrative continuity of an interpretative concrete footpath in front of the entrance to the Kurnell Wharf.

These impacts would be temporary and can be affectively managed. Indeed, following completion of the demolition works, there is potential for a long term positive impact on the State-listed Kamay-Botany Bay National Park / Kurnell Peninsula Headland.

In contrast the demolition works would have a significant adverse impact on the physical fabric, historic, technical and research/scientific significance of the locally listed Australian Oil Refinery site, and its rarity and representativeness. As part of the Project, a Heritage Management Strategy (HMS) was developed for the Site to help guide the demolition works and the future operation of the terminal so that heritage impacts would be avoided or mitigated and the Site would retain representative examples of its heritage value.

The HIA considered the recommendations within the HMS and suggested a number of additional measures to specifically address the demolition works. The assessment concluded that whilst a residual heritage impact is likely, implementation of the HMS for the Site would provide some mitigation for the loss of heritage value at the Australian Oil Refinery site.

None of the other cumulative projects identified are likely to affect or change the impacts associated with the historic heritage assessment.

19.6 Conclusions

The majority of the potential impacts related to the demolition works would be avoided or mitigated through the implementation of the measures outlined in **Chapter 20 Revised Management and Mitigation Measures**. The assessments within this SEE have concluded that the demolition works are unlikely to result in significant adverse cumulative impacts on the surrounding community or environmental receptors.

20 REVISED MANAGEMENT AND MITIGATION MEASURES

The preceding chapters of this SEE describe the potential impacts of the demolition works and identify a suite of measures and controls for managing risk and to avoid, mitigate or offset potential impacts. This chapter provides a summary of the proposed management and mitigation measures. These measures would provide a basis for the conditions of consent that would be issued to Caltex should the demolition works be approved.

This chapter details how mitigation and management measures would be implemented and monitored through a Demolition Environmental Management Plan (DEMP) for the demolition works. The approved Construction Environmental Management Plan (CEMP) for the conversion works would be used as a basis for the DEMP. It would be amended where required to be relevant to both the demolition works and remaining conversion works.

20.1 Draft Mitigation and Management Measures

The adoption of the mitigation and management measures discussed in **Chapters 8 - 18** is an important component of the Project and reinforces Caltex's commitment to controlling its potential impact on the environment. These measures would be complemented by an ongoing process of community and regulatory engagement, before and during and after the demolition works.

Based on the construction (conversion) and demolition schedules provided in **Sections 3.3.1** and **4.3.1** respectively, Caltex intends on progressing the Project with some period of overlap between the conversion works, the demolition works, and terminal operations. As a result, the SEARs (refer to **Appendix A SEARs and Application documentation**) requires that a consolidated set of mitigation and management measures be provided in this SEE.

Table 20-1 contains this consolidated set of mitigation and management measures, and confirms the stage at which each measure would be implemented. This table includes:

- Measures that only apply to the conversion works and therefore remain the same as presented in the development consent for SSD 5544;
- Measures that apply to both the conversion works and the demolition works and therefore have been amended from those presented within development consent SSD 5544 (any changes from the mitigation measures as they were presented in SSD 5544 are shown in bold and italicised text); and
- Measures that only apply to the demolition works (shown in bold and italicised text).

If required, these measures may be modified following review of formal submissions received during the SEE exhibition, and as a result of subsequent discussions with NSW Department of Planning and Environment (DP&E) and other stakeholders.

In **Table 20-1** the following acronyms have been used to describe each stage:

- CD – Conversion Design
- Con – Conversion
- Op – Operation
- DD – Demolition Design
- Dem- Demolition

Table 20-1 Consolidated Management and Mitigation Measures

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
General						
A1	Caltex would carry out the proposed works in accordance with the EIS, ***the SEE*** and the approval conditions.	✓	✓	✓	✓	✓
A2	Caltex would implement reasonable and practicable measures to avoid, or minimise impacts to the environment that may arise as a result of the Project.	✓	✓	✓	✓	✓
A3	Caltex would ensure that the Project contractor prepares and implements a Construction Environmental Management Plan (CEMP) ***for the conversion works and a Demolition Environmental Management Plan (DEMP) for the demolition works*** to manage any Project impacts. This would be reviewed and approved by a Caltex Environmental Management Representative (EMR). ***Elements of these plans may be shared as required.***		✓			✓
A4	Caltex would appoint an EMR to monitor the implementation of all required environmental mitigation and management measures. The EMR would ensure that all measures were being effectively applied during the proposed works and that the work would be carried out in accordance with the CEMP, ***the DEMP*** and all environmental approvals and legislative conditions.		✓			✓
A5	Caltex and the various works' contractor personnel would undergo training in accordance with the CEMP, ***the DEMP*** and currently implemented environmental and safety measures agreed as part of the Project approval.		✓			✓
A6	Caltex would provide Sutherland Shire Council the opportunity to review and comment on the CEMP prior to the commencement of conversion works.		✓			
Hazards and Risk						
B1	A program of routine testing, inspection and maintenance would be developed for each new piece of equipment or function of instrumentation to be added to the preventative maintenance program already established for existing plant and equipment.		✓	✓		
B2	The recommendations of the Fire Safety Study would be implemented for the design and operation of the terminal.	✓	✓			
B3	The Process Hazard Analysis Recommendations would be implemented for the design and operation of the terminal.	✓	✓			
B4	The spill response plan for the Site would be updated for the proposed terminal.		✓			
B5	Caltex would review hardware protection in place and proposed to ensure the risk of filling low flash point material into tanks designed for high flash point usage is minimised. Particular attention to human factors issues at	✓	✓			

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	manifolds.					
B6	Caltex would determine need for additional means of communication, e.g. for lone worker on the proposed terminal.		✓			
B7	Caltex would review the procedures used for potentially hazardous manual operation to ensure they are appropriate and sufficient for any increased frequency of use.		✓			
B8	***The bullet pointed measures listed in Section 8.7 of the SEE would be implemented to ensure that the conclusions of Appendix C Hazards and Risks Assessment of the SEE remain valid.***				✓	✓
Soils, Groundwater and Contamination						
C1	A Soils and Erosion Management Plan would be developed as part of the Construction Environmental Management Plan (CEMP) to manage the excavation, testing, stockpiling, reuse and rehabilitation of soils. This plan would outline: • the areas where soil disturbance is likely; • soil testing procedures; • soil handling procedures; • locations where soil would be stockpiled on-site for either removal, treatment or reuse; • procedures to reduce erosion and the spread of dust; • restricting traffic to defined roads or tracks where necessary; and the rehabilitation of bare soil following completion of the construction works.		✓			
C2	All materials would be stockpiled in accordance with 'The Blue Book' *Managing Urban Stormwater - Soils and Construction Volume 1 and 2* (Landcom, 2004). Principal controls would include the following: • silt fences would be installed around stockpiles to reduce erosion and protect vegetation or Site infrastructure as necessary; • silt and sediment traps would be installed across stormwater drains in proximity to excavation areas; • stockpiles would be restricted to cleared areas and not impact any vegetation; • stockpiles would be placed on impermeable sheeting; • stockpiles would be covered and wetted down in order to reduce dust creation; and • stockpiles would not be located in close proximity to any stormwater drainage systems.		✓			✓
C3	The Soils and Erosion Management Plan would also outline the inspection program for any erosion control structures and bunded areas.		✓			

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
C4	Excavated soils would be tested for both contaminants and odour using standard practices (e.g. soil vapour and soil sampling etc.)		✓			
C5	Clean materials would be separated from contaminated materials for reuse as backfill where required.		✓			
C6	A Contamination Management Plan would form part of the CEMP for the Project. This plan would outline measures for testing, classifying, handling, storing and managing contaminated soils and contaminated groundwater.		✓			
C7	Suspected contaminated materials would be assessed and classified in accordance with EPL requirements and NSW (2009) *Waste Classification Guidelines: Part 1: Classifying Waste*, batched, further tested (where required) and disposed by a licenced contractor.		✓			
C8	Disposal of any contaminated soils or groundwater would be in accordance with EPL requirements and NSW DECCW's *Waste Classification Guidelines* and the Contamination Management Plan (CMP) for the Project. Contaminated materials would be sent to appropriately licensed facilities in accordance with the *Contaminated Land Management Act 1997*.		✓			
C9	If Acid Sulfate Soils (ASS) are encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓			✓
C10	A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater intercepted during the construction phase. Measures would include: • the use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site; • bunding of any fuel or chemical storage area at the construction Site; • regular inspection of construction equipment to ensure any leaks are minimised and rectified; • management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system; • appropriate and timely disposal of any contaminated soil, water or waste generated during construction; • regular inspection of erosion control structures and bunded areas; and regular inspection and testing of containment areas, drainage lines and process pipe work.		✓			

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
C11	Any runoff that may accumulate in excavations would be periodically tested for elevated levels of contamination. Water that is found to have elevated levels of contaminants would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established refinery wastewater management procedures.		✓			
C12	Runoff entering any excavations would be limited by using bunds or similar structures as required.		✓			✓
C13	Construction/***demolition*** workers would be instructed in appropriate health and safety and handling protocols for minimising human contact with contaminated soils and groundwater.		✓			✓
C14	During the cleaning of the crude and finished fuel tanks, measures would be implemented in line with Caltex's existing Turnaround and Inspection process to contain and collect any potentially contaminating material for appropriate disposal to the on-site wastewater treatment plant, landfarm or appropriate off-site disposal facilities. This process would be detailed within the CEMP		✓			
C15	Permits would be required to work in the areas where potential soil and groundwater contamination exists. The work permit includes requirements such as monitoring and PPE. No unauthorised entry into these areas is permitted, without a permit.		✓			✓
C16	Appropriate inspection, assessment, maintenance and repair programmes that would be implemented as part of the operation of the Project. These safeguards would be incorporated into the updated management plans for the proposed terminal. The Project would be appropriately licenced under the *Protection of the Environment Operations Act 1997* and would be managed in accordance with EPL requirements.		✓	✓		
C17	***A Contamination Management Plan would be developed to outline measures for monitoring, handling, storing and managing contaminated soils and contaminated groundwater. It would include the following:*** • ***During excavation visual and olfactory indicators of impact would be monitored.*** • ***Excavated soils would be separated into stockpiles according to odours, staining, and other environmental indicators. These soils would be placed into uniquely identified stockpiles and appropriately bunded and managed.*** • ***Where no contamination issues are identified, excavated material would be used as backfill to bring the excavated area back to grade as soon as practicable. If required, certified VENM, ENM or appropriated remediated material would be***					✓

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	used to provide additional backfill material. • ***If excavated material cannot be re-used or managed on-site then it would be removed off-site as waste to an appropriately licensed facility.*** • ***Further, excavated material; would be classified in accordance with EPL condition O5.1 which requires "any liquid and/or non-liquid waste generated and/or stored [at the Site] is assessed and classified in accordance with the NSW (2009) Waste Classification Guidelines: Part 1: Classifying Waste, batched, further tested (where required, for example Toxicity Characteristics Leaching Procedure (TCLP) testing).*** • ***The method of disposal or reuse would be in line with the materials' classification in accordance with specifications set out in a Waste Management Plan (WMP).***					
C18	***The Soil and Water Management Plan would outline management measures for any soils that are excavated or stored on-site during the demolition works and water management requirements. It would identify:*** • ***the areas where soil disturbance is likely;*** • ***how excavations would be staged so that the length of time that excavations are left open and temporary stockpiles are required is minimised;*** • ***locations where soil would be stockpiled on-site for either removal, treatment or reuse;*** • ***that if additional backfill material is required, only certified VENM, ENM or appropriated remediated material would be used;*** • ***procedures to reduce erosion and the spread of dust;*** • ***restricting traffic to defined roads or tracks where necessary;*** • ***measures to protect excavations from increased stormwater runoff (e.g. by using bunds or similar structures where required);*** • ***measures to manage the storage of demolition specific liquids at the Site and the appropriate bunding or containment of demolition related fuel or chemical storage areas;*** • ***demolition equipment is maintained and operated in a proper and efficient condition to reduce the likelihood of spills or leaks;*** • ***measures to manage vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system;*** • ***measures for the dewatering, storage, movement and treatment of groundwater encountered in***					✓

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	excavations. Dewatered groundwater would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established Site wastewater management procedures, unless it is tested and is of suitable quality to be directed to stormwater; • ***procedures for dewatering, including the need to liaise with NOW to ensure the necessary water licences are obtained, if required; and*** • ***how the rehabilitation of bare soil would be managed across the Site once areas are returned to grade.***					
C19	***The Soil and Water Management Plan would also:*** • ***be developed in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004);*** • ***outline the inspection program for erosion control structures and bunded areas; and*** • ***The existing groundwater monitoring program would continue; and*** • ***Include a plan for corrective action should an unexpected increase in COPC be observed in the groundwater monitoring***					✓
C20	***An Asbestos Management Plan would be developed in accordance with the relevant guidelines.*** ***Caltex would utilise existing registers, procedures and plans in place for the Site for the preparation of an Asbestos Management Plan.***					✓
Human Health and Ecological Risk						
D1	Construction/***demolition*** personnel would be made aware of the potential presence of Non Aqueous Phase Liquids (NAPL) and would be shown how to identify its presence. The CEMP/***DEMP*** would include management measures to appropriately deal with any NAPL found on Site.		✓		✓	
D2	Construction/***demolition*** staff would be inducted and provided with training prior to working with potentially contaminated soil as part of the Project, to prevent unnecessary disturbance (e.g. dust generation, asbestos fibre liberation, contaminant mobility and volatilisation).		✓		✓	
D3	The location of potentially contaminated areas would be noted in the CEMP/***DEMP*** and provided to construction/***demolition*** personnel involved in soil excavation and handling. The CEMP/***DEMP*** would also identify the type of contamination found in each area. Where necessary, safety training and appropriate PPE would be provided.		✓	✓	✓	✓
D4	Caltex would continue to monitor groundwater quality in areas that are known to contain impacts to ensure that significant mobilisation of COPC from groundwater to		✓	✓	✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	surface water is not occurring.					
Waste Management						
E1	The Project would be integrated into existing resource efficiency, waste management and handling, emergency response and preparedness plans for the existing ***Site.***	✓	✓	✓	✓	✓
E2	Construction and Operation *Waste and Resource Management Plans* (WRMP) and ***Demolition Waste and Resource Management Plans (DWRMP)*** would be compiled prior to the each phase commencing.	✓			✓	
E3	The WRMPs and ***DWRMP*** would: • identify requirements consistent with the waste and resource hierarchy; • ensure resourcing efficiency is delivered through the design and responsible construction, ***demolition*** and operational practices; • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures (consistent with current management practices relating to Caltex's Kurnell Waste Management System); • identify disposal and management routes consistent with current management practices as adapted for the Project; • set out clear requirements for meeting legislative and regulatory requirements; • define requirements to support Caltex's sustainable procurement objectives through effective, design, construction, operation and procurement; and set out processes for disposal, including on-site transfer, management and the necessary associated approvals.	✓	✓	✓	✓	✓
E4	The WRMP and ***DWRMP*** would incorporate the requirements of the waste and resource hierarchy and cleaner production initiatives.	✓	✓	✓	✓	✓
E5	The WRMP and ***DWRMP*** would include a process for auditing, monitoring and reporting, which would include regular inspections off-site activities and the waste management area(s). The WRMP and ***DWRMP*** would be subject to regular auditing and a system would be used to record and report the types, volumes and management measures for all waste and resource arising from/used for the works.	✓	✓	✓	✓	✓
E6	***Project-***generated waste would be segregated at source and stored in accordance with current Site practices. Site management practices would potentially need adapting to consider additional storage requirements. Regardless, all waste would be stored in suitable containers and designated waste management areas.		✓	✓		✓
E7	Caltex's existing procedures for the disposal of sewage, greywater, hazardous materials, general waste and recyclable materials would be adopted for the Project		✓	✓	✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	(and modified if required). This would include using licensed contractors to remove and transport waste from the Site.					
E8	***A Waste Register would be prepared, used and maintained by the Demolition Contractor to track all wastes generated from demolition works.*** ***The Demolition Contractor would retain waste receipts to indicate evidence of waste disposal.***				✓	✓
E9	***Stockpiled wastes would be:*** • ***appropriately segregated to avoid mixing and contamination;*** • ***clearly labelled;*** • ***contained in bunded areas and if necessary on an appropriate lining;*** • ***less than 5m in height; and*** ***located >40m away from any sensitive receivers, heritage, ecological areas and watercourses.***				✓	✓
E10	***Materials to be re-used would be analysed to ensure material is not contaminated and re-use is appropriate.***				✓	✓
E11	***An Asbestos Management Plan would be prepared and implemented in accordance with relevant legislative and other requirements. This plan would outline proposed methods of managing asbestos waste by the contractor.***				✓	✓
E12	***The Site's existing Asbestos Waste Register would be amended as appropriate, implemented and maintained to track asbestos wastes generated during demolition works.***				✓	✓
E13	***If stored on-site, asbestos wastes would be located away from operational areas and properly sealed and contained to ensure minimise human exposure and clearly labelled. Signage and barriers/fencing would be installed to ensure all employees, contractors and visitors would keep away from the area at all times.***					✓
E14	***The removal and disposal of asbestos wastes would be undertaken by a licenced asbestos contractor.***					✓
E15	***A Decontamination Area would be provided on-site for all authorised personnel handling asbestos.***				✓	✓
E16	***All liquid and non-liquid wastes generated from demolition works would be assessed, classified and managed. Wastes would be disposed of at an appropriately licenced facility.***					✓
Surface Water, Wastewater and Flooding						
F1	The Construction Environmental Management Plan (CEMP) for the Project would include a Soil and Erosion Management Plan. This plan would include the following measures: • All materials would be stockpiled in accordance with		✓			

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004); • Silt fences would be installed around stockpiles to reduce erosion and the movement of suspended solids as necessary; • Soil stockpiles and any polluted materials would be stored in designated areas which are not in close proximity to any stormwater drainage systems; • Erosion control structures, bunded areas, containment areas, drainage lines and interception measures would be subject to regular inspection; • Clean materials would be separated from contaminated materials; and Soil erosion and sedimentation devices would remain in place until the disturbed ground surface is restored. These devices would also capture any gross pollutants.					
F2	***A Soils and Water Management Plan would be developed as a sub plan to the DEMP. Measures to be included in the plan and implemented during the demolition works to protect stormwater quality would include:*** • ***Stormwater or groundwater ponded in excavations would be sent to the WWTP, unless it is tested and is of suitable quality to be directed to stormwater;*** • ***Silt fencing and/or alternate sediment control measures would be installed around soil stockpiles and disturbed areas or areas where dust suppression is being undertaken;*** • ***Regular inspection would be undertaken of soil stockpiles/excavation areas, including following rainfall events;*** • ***Regular inspections would be undertaken of stormwater drains down hydraulic gradient of disturbed areas; and*** • ***If stormwater quality is impacted during the demolition works in areas that have been disturbed, water would be diverted to the intermediate sewer system.***					✓
F3	Caltex would continue to implement the measures within the Stormwater Management Plan for the Site. This plan has been produced in response to Environment Protection Licence No. 837, PRP U24.1: Stormwater Catchment and Management Plan. The SMP has committed Caltex to implementing a Stormwater Management Strategy and completing a number of stormwater management measures in a staged manner. Measures include: • Ongoing maintenance of the existing stormwater system; • Implementation of a number of projects to improve the infrastructure, reduce the potential for the	✓	✓	✓	✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
		CD	Con	Op	DD	Dem
	refinery to flood, and prevent contaminated stormwater leaving the refinery premises; • Working with the NSW Office of Environment and Heritage (OEH), NSW EPA and Sutherland Shire Council to divert to flow of stormwater from the National Park away from the Site's stormwater system to the Sutherland Shire Council's stormwater infrastructure; • Carrying out stormwater flow monitoring; and • Updating the Site's stormwater system performance model to account for the changes to the stormwater system infrastructure that can then be used as a tool to assess future modifications, as necessary. This work would be completed in consultation with NSW EPA.					
F4	Discharges from the Wastewater Treatment Plant would be within existing EPL limits during ***demolition***, construction and operation. Any required change to this Oily Water Management System would be discussed and agreed with NSW EPA.	✓	✓			✓
F5	The measures and processes currently in place at the Site to prevent any loss of contaminant would be maintained throughout the ***demolition***, construction and operation phases of the Project. All bunds on tanks which are retained in service would meet the capacity requirements of Australian Standard AS1940 during the operation of the Project.	✓	✓			✓
F6	Improvements to monitoring would be initiated to ensure that if a loss of containment into a bund occurs it is detected early and contingency actions can be taken promptly. The measures for tanks containing low flash materials include: • explosive vapour detectors within the bunds; • triple infrared scanners on tank roofs; and • CCTV in conjunction with infrared cameras as a confirmation for alarms. All tanks on-site would be subject to: • an automated high level shut off system; and • continuance of a comprehensive inspection/repair program.			✓		
F7	Caltex undertakes a flood study, commencing within 3 months of completion of demolition works that assesses potential flood risks from the Site to the Kurnell township, with a particular emphasis on the impacts from surface water entering the Site from land to the east and south of the Site and whether current diversion methods are appropriate. Caltex to remain in consultation with Sutherland Shire Council throughout the flooding investigation works to identify a mutually acceptable solution to potential flood			✓		✓

Item	Management and Mitigation Measure	Conversion			Demolition	
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	risks along the north eastern boundary of the Site. The timing and form of consultation is to be mutually agreed by both parties (Caltex and Sutherland Shire Council) and outlined within a written document to be produced by Caltex prior to commencement of the flood study. It shall include regular reporting updates and milestone meetings, for example, at the Scope of Works, concept design, at the issuing of the draft report to discuss results and recommendations as a result of the study.					
Noise and Vibration						
G1	The CEMP***/DEMP*** for the Project would include a Noise ***and Vibration*** Management Plan (NVMP). The NVMP would outline: • The locations of noise sensitive receptors; • Construction noise monitoring procedures; and • Construction equipment maintenance to ensure good working order.		✓			✓
G2	Low-noise plant and equipment would be selected, where practicable, in order to minimise potential for noise and vibration. All equipment would be regularly checked to ensure that the mufflers and other noise reduction equipment are working correctly.		✓			✓
G3	Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register is maintained and managed in line with the existing feedback process at the Site.		✓	✓		✓
G4	Any noise complaint(s) would be investigated immediately. Reasonable and feasible measures would to be implemented to reduce noise impacts.		✓	✓		✓
G5	Construction***/demolition*** equipment would be located to reduce noise emission to sensitive receptors, where practicable.		✓			✓
G6	The majority of the conversion works for the Project would typically be completed between 7.00am to 10.00pm seven days a week. Some works consistent with Caltex's existing day-to-day operational and maintenance procedures would occur over a 24 hour period as regulated by the Environmental Protection Licence (No. 837) (EPL) for the Site.		✓			✓
G7	Construction***/Demolition*** staff and contractors would undergo training in environmental noise issues including: • minimising the use of horn signals and maintaining a low volume. Alternative methods of communication should be considered; • avoiding any unnecessary noise when carrying out manual operations and when operating plant; and • switching off any equipment not in use for extended periods during construction work. • ***ensuring works occur within approved hours.***		✓			✓

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G8	Should any unexpected construction activities occur which could potentially generate significant noise not described in this report, monitoring would be undertaken to ensure construction noise emission levels do not exceed EPL limits.		✓			
G9	***Pipeline removal works would be confined to 7.00 am to 6.00 pm Monday to Saturday as per Condition C19 (for SSD 5544).***					✓
G10	***Demolition works near 30D Cook Street (i.e. within 500m) would be confined to 7.00am to 6.00 pm Monday to Saturday as per Condition C19.***					✓
G11	***Demolition noise monitoring would be undertaken when necessary to ensure compliance with demolition noise criteria.***					✓
G12	***Caltex would ensure that the noise generated by the demolition works does not exceed the criteria defined in Table 2 (from Condition of Consent C16 of SSD 5544) unless the reasonable and feasible noise mitigation strategies outlined within the DNVMP have been implemented.***					✓
G13	***The DNVMP would describe where demolition noise limits from Table 2 (from Condition of Consent C16 of SSD 5544) are likely to be exceeded and what reasonable and feasible noise mitigation would be employed to minimise noise.***					✓
G14	***To help ensure that the structures on Site that are to be retained with high or medium heritage significance are protected from potential vibration impacts, the DNVMP would also*** • ***Utilise Appendix H Heritage Impact Assessment to identify the medium to high heritage significance buildings to be retained;*** • ***Identify where works to demolish redundant structures are occurring within 20 m of a medium to high significance heritage building and the requirement to undertake vibration monitoring and management for these buildings to protect their integrity; and*** • ***Outline general monitoring and management measures to monitor vibration and manage buildings***					✓
Air Quality and Odour						
H1	Dust emissions from the construction phase of the Project *and* ***during the demolition works*** would be monitored by construction/***demolition*** staff. ***When required, during activities likely to cause high dust levels or adverse weather conditions etc.,*** a designated worker would continuously monitor downwind emissions to the community or local residents and call a halt to activities if sensitive receptors are likely to be		✓			✓

Item	Management and Mitigation Measure	Conversion			Demolition	
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	affected by airborne particulate matter. Should significant impacts be likely, appropriate measures would be taken to mitigate adverse air quality impacts.					
H2	Within the refinery, vehicles would only travel on designated roads ***where possible*** and would be limited to a maximum speed of 10 km/hr in ***offroad*** areas, and 25 km/hr elsewhere.		✓			✓
H3	Where there is the potential for dust or odour generation from trucks carrying spoil, loads would be covered and all tailgates would be securely fastened. Vehicles would not be loaded higher than the sides and tailboard.		✓			✓
H4	Construction *and* ***potentially dust generating demolition*** activities would be limited during high wind events if sensitive receivers are likely to be significantly impacted.		✓			✓
H5	***All*** plant would be maintained and operated in line with the manufacturer's specifications in order to minimise the emission of air pollutants and offensive odours. Plant and construction vehicles would be turned off when not in use.		✓			✓
H6	Stockpiled material would be assessed for the potential for causing odorous or particulate emissions. If air pollutants and offensive odours are likely, controls would be put into place to manage adverse impacts.		✓			✓
H7	All concrete cutting and coring would to be undertaken using "wet tools".		✓			✓
H8	An odour reduction program would be implemented in accordance with the existing EPL.		✓	✓		
H9	The guidepoles on the EFRTs in gasolise service would be fitted with sleeves.		✓	✓		
H10	Caltex's Leak Detection and Repair (LDAR) Program would continue in accordance with the Environment Protection Licence.		✓	✓		
H11	***All reasonable and feasible measures would be implemented to minimise dust and odour emissions during the demolition works***					✓
H12	***VOC and Odour Monitoring would be undertaken by demolition workers and monitoring equipment during excavation activities where potential hydrocarbon contamination is present.***					✓
H13	***Soils or concrete with significant hydrocarbon staining or obvious hydrocarbon odours would be transported to the former CLOR area and stored appropriately. Stockpiles of contaminated soil stored on-site would be managed to prevent odorous VOC emissions and windblown particulate emissions.***					✓
H14	***Excavation would be staged to manage potential VOC and odour emissions. Where practical, excavations would not commence prior to 8am nor***					✓

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	after 4pm as weather conditions at these times are generally conducive to adverse odour air quality situations from fugitive emissions.					
H15	***In unfavourable weather conditions (e.g. dry and windy conditions) or where dust sources are present near sensitive receivers, water sprays would be used to dampen down soils prior to excavation, handling and/or loading/unloading materials. All exposed surfaces (from recent excavations) and stockpiles (of excavated material) would also be watered, sprayed or covered where required, to minimise nuisance dust and odours.***					✓
H16	***During adverse meteorological conditions and extraordinary events, such as events where elevated background dust is present, additional mitigation measures would be considered to prevent and minimise air quality impacts from demolition works. These measures would include, but not be limited to implementing the following during high wind events (e.g. > 8m/s hourly average):*** • ***Reducing working surface area*** • ***Commencing excavation during favourable wind conditions*** • ***Increase wetting agents for exposed surfaces*** • ***Increase covering of exposed surface areas***					✓
H17	***Surface disturbance would be minimised. Exposed ground would be rehabilitated as soon as practicable.***					✓
H18	***During adverse weather conditions dust monitoring would be undertaking during the operation of the concrete crusher. Detail of this monitoring (and associated response actions) would be incorporated into the AQMP for the demolition works.***					✓
H19	***During crushing, a number of dust suppression measures would be implemented. These could include regular watering of stockpiles, dust curtains and other measures as appropriate.***					✓
H20	***Where biological matter is present within cooling water inlet pipework, the pipework would be removed be as soon as possible. This would help to minimise the potential for odour issues associated with the degradation and then exposure of the biological matter.***					✓
H21	***Where visible dust emissions are observed appropriate management actions would be implemented to prevent impact.***					✓
Transport and Access						
I1	Local Authorities and Kurnell residents would be informed of any Project related work which would affect the road network.		✓			✓

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I2	A Traffic Management Plan would be developed for the construction/***demolition*** phase. The Traffic Management Plan would comply with all relevant Regulations and By-Laws and in particular address safe access and egress to the public road network. The Transport Management Plan would include: • hours of permitted vehicle activity; • designated routes for construction ***and demolition*** traffic and defined access points to the Site and ***demolition works area***; • duration of works; • ***permitted demolition vehicle types***; • designated areas within the Site ***and demolition works area*** for truck turning movements, parking, loading and unloading to allow heavy vehicles to enter and leave the Site ***and demolition works area*** in a forward direction; • sequence for implementing traffic management measures should these be required; and • procedures and/or principles for construction ***and demolition*** vehicle speed limits and the safe operation of construction ***and demolition*** vehicles.		✓			✓
I3	***Works to remove pipelines from under the road reserves in Kurnell would not take place before a road opening application has been approved by Sutherland Shire Council and on the days the following events are taking place:*** • ***Australia Day (January);*** • ***The Festival of Kites (May); and*** • ***The Boree Regatta (October).***				✓	✓
Heritage						
J1	A Heritage Management Strategy would be prepared for the Australian Oil Refinery prior to shut-down of the refinery plant, to provide Caltex with a basic framework for the ongoing management of the Site's heritage during present and future works. The Strategy would include a review of the heritage significance of the overall Site. The review would clarify the extent and relative heritage value of the place by identifying key elements of industrial and built heritage as well as social values of the refinery, and the relative contribution of these elements to the overall significance of the Site. Recommendations would also address the future assessment and management of memorabilia and other significant items of moveable heritage maintained on-site.	✓				
J2	If any further heritage items were discovered throughout the Project, work would cease until an assessment is carried out by a qualified heritage professional.	✓	✓			✓
J3	An archival photographic record of the existing fabric and operations of the Kurnell Refinery would be prepared	✓	✓			

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	while the plant is still operational, and during the decommissioning process. The recording would be undertaken in accordance with the Heritage Council guidelines on *Photographic Recording of Heritage Items Using Film and Digital Capture* (2006). The archival recording would be maintained for the appreciation of present and future generations. To this end, the recording would be lodged with the Sutherland Shire Library and NSW State Library.					
J4	***The Heritage Management Strategy (HMS) and the management strategies within it would continue to be implemented.***				✔	✔
J5	***Opportunities to adaptively reuse redundant buildings identified in the HMS as having high or moderate heritage significance would continue to be reviewed prior to final demolition works.***				✔	✔
J6	***The sculptural panels by Bert Flugelman would be retained and preserved.***				✔	✔
J7	***Sandstone blocks from the informal sandstone wall along Silver Beach would be set aside in a secure location prior to works, and reinstated in the same location following removal of the cooling water outlet pipeline.***				✔	✔
J8	***Appropriate mitigation measures would be implemented to reduce the likely damage to the interpretive footpath in front of the driveway entrance to the Kurnell Wharf. Measures would include:*** • ***Making a record of the current state of the pavement.*** • ***Removing the affected pavement in sections and storing these sections in a secure location.*** • ***Reinstating the pavement in the same location following the removal of pipelines;*** • ***If this is not practicable, a similar pavement treatment and a matching or compatible interpretative design would be reinstated.***				✔	✔
J9	***If historical archaeological relics are unexpectedly found during the demolition works, works in the area of the relics would cease and the Heritage Council of NSW would be notified.***					✔
J10	***A Stop Works procedure would be implemented should any Aboriginal Heritage items be found. Works would cease at the vicinity of the item and OEH would be notified as soon as possible***					✔
J11	***If any human remains are disturbed, all work in the vicinity of the remains would stop immediately and the remains would not be further disturbed or moved. Works would cease at the vicinity of the item and OEH and NSW Police would be notified as soon as possible.***					✔

Item	Management and Mitigation Measure	Conversion			Demolition	
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J12	***Prior to works commencing, all personnel and contractors involved in ground disturbance works would be briefed on the procedures to follow if human remains or unexpected heritage items are found.***				✓	✓
J13	***As part of the DEMP, a Heritage Management Section will be developed. This will incorporate previous Management and Mitigation Measures that are not already included in the HMS.***				✓	✓
Ecology						
K1	A Biodiversity and Weed Management Plan (BWMP) would be prepared in order to limit and control the spread of noxious weeds within the Site/***demolition works area***. It would include the following: • wash down procedures to reduce the spread of weeds via vehicles and machinery; • measures to target potential new weed outbreaks including soil stockpiles and any other disturbed areas; • outline monitoring programs for noxious and problematic weeds on site and in the surrounding areas; • measures for strict stockpiling control to help eradicate all noxious weeds as per NSW DPI specifications for Sutherland Shire LGA; • include a list of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds; and ensure that only amphibian friendly herbicides are used; • wash down protocols for construction/***demolition*** vehicles and machinery to prevent the spread of root-rot fungus (*Phytophthora cinnamomi*) ***and noxious weeds***; • all personnel undertaking routine management activities of any noxious weeds should be appropriated trained and all contractors should hold the necessary permits and licenses. ***Noxious weed information sheets would be provided to demolition contractors to help identification of relevant noxious weeds***.	✓	✓	✓	✓	✓
K2	A BWMP would be prepared in order to limit potential impacts to existing vegetation outside of the area of proposed works, but within the Site. It would include the following: • existing vegetation on Site would be clearly marked on all Site plans and construction diagrams, with clear indications of no-go zones within all vegetated areas; • existing vegetation would be clearly signposted and fenced off prior to the commencement of	✓	✓	✓	✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
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	construction activities, and should remain fenced off until the completion of works (as per the Vegetation Exclusion Zones shown on **Figure 17-1**); and • absolutely all works would be limited to the defined construction/***demolition*** footprint.					
K3	To minimise the potential for impacts to native fauna species, the BWMP would be developed and include following measures: • if any frogs are found within the Project Area, works would cease until frogs have been relocated to areas outside the area of impact; • if any threatened frogs e.g. Green and Golden Bell Frog or Wallum Froglet are identified within the Site, works would cease and active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet; • all trenches would be inspected prior to works each morning. Any frogs that become trapped within trenches would be assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured; • identification sheets would be provided to all construction workers on Site for the two threatened frog species predicted to occur within the Site; • wash down protocols to prevent the spread of Amphibian Chytrid Disease (chytridiomycosis) would be implemented at relevant work areas. Protocols would be consistent with OEH guidelines (DECC, 2008b); • 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO would be used for the control of noxious weeds; and • if fauna are found to be utilising the Site, or a nest, den or roost is found, work in the immediate area is to stop and the animals are to be allowed to move off freely, or relocated by an authorised person to an area outside the construction footprint.	✓	✓	✓		
K4	***To minimise the potential impacts to native fauna during the demolition works the following measures would be included in the BWMP:*** • ***demolition workers would be provided with identification sheets relating to the threatened fauna species predicted to occur within the Site;*** • ***Stop work procedures would be implemented during the works on the chance encounter of any dispersing threatened frogs or the identification of nesting Pied Oystercatcher, Little Tern, Osprey or White-bellied Sea-eagle to avoid death or injury to frogs dispersing across the study area, or disturbance to nesting threatened birds.;***				✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
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	• ***Trenches/holes would be back-filled daily or covered overnight. Where this is not possible, other measures would be considered to prevent and/or mitigate fauna entrapment. Trenches/holes would be inspected prior to works each morning. Injured frogs that become trapped within trenches would be assessed by a veterinarian or ecologist. Uninjured frogs would be captured and released into the nearest suitable habitat to the south of the study area.*** • ***If practicable, works at Silver Beach to remove the cooling water outlet should be completed outside of the known nesting periods for Pied Oystercatcher (August to January) and Little Tern (Spring/Summer). If nesting shorebirds are encountered in the Silver Beach foreshore area in the vicinity of works (within 20 m), works at Silver Beach would cease, a qualified zoologist would be consulted and appropriate actions will be implemented, prior to works recommencing.*** • ***If practical, works to remove tall structures on-site should be completed outside of the known nesting periods the threatened bird species (July to September for Osprey and June to January for White-bellied Sea-eagle). If not practical then tall structures would be inspected for active nests prior to commencing the demolition works.***					
K5	***The following recommendations, would be contained in the BWMP for managing the potential marine ecology impact and implemented during demolition works:*** • ***silt curtains would be installed seaward of the demolition works area but not directly above existing seagrass communities;*** • ***all plant and equipment used in the water column would be appropriately prepared, checked and cleaned to avoid potential release of contaminants;*** • ***plant and equipment used in the water column would be inspected to ensure fragments of the invasive algae Caulerpa taxifolia are not present;*** • ***spill kits would be used to contain and clean up any spills from demolition plant and equipment. Spill kits would be located within 20 m of demolition plant and equipment; and*** • ***demolition works at Silver Beach (particularly those located in the water column) would be timed such that they do not coincide with high-tide conditions or during significant wave action.***				✓	✓
Coastal Processes						
L1	***A Silver Beach Rehabilitation Plan (SBRP) would be developed as part of the Demolition Environment***				✓	✓

Item	Management and Mitigation Measure	Conversion			Demolition	
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	Management Plan (DEMP). Rehabilitation works at Silver Beach would be in accordance with this SBRP. The following measures would be included:					
L2	***A detailed survey of the likely extent of the disturbed area at Silver Beach would be undertaken prior to commencing demolition works to ensure that the pre-existing topography is re-established following the works.***					✓
L3	***The affected sand dunes (including the back-beach and sub-aerial beach) would be re-instated using the stockpiled overburden sand and if necessary, additional sand. Additional sand used for reinstating sand dunes would be of similar particle size and composition as the overburden sand.***					✓
L4	***The affected sand dunes would be restored to match the previously surveyed topography. A smooth profile from the back-beach area to the dune would be re-established to ensure the aerodynamics are as consistent as possible with the undisturbed areas adjacent to the disturbed area. If necessary, liquid sprays or geotextiles would be used to help stabilise the beach and protect against erosion.***					✓
L5	***The affected sand dunes would be re-vegetated using indigenous, native flora. The existing vegetation is limited to grasses, with no woody vegetation. The area would be re-planted with similar grass species in a manner that ensures minimal loss of wind-blown sand from the dune while the area is re-vegetating. All re-vegetated areas would:*** • ***contain signage to highlight these areas as rehabilitation zones that prohibit public and vehicular access;*** • ***be temporarily fenced, and*** • ***be maintained and monitored until vegetation is established using approved dune rehabilitation methods.***					✓
L6	***Material of a similar sediment size and colour characteristics would be used as back fill material for the trench below the low tide mark. To account for later settling and consolidations, some overfilling would be undertaken to account for later consolidation (approximately 10 % would be recommended).***					✓

20.2 Environmental Management

20.2.1 Overview

Current operations at the Site comply with relevant legislative and regulatory requirements including EPL no. 837. This EPL is regularly updated to ensure the management of the Site meets certain environmental requirements. As the operations on the Site change the EPL will continue to be updated to ensure that it remains relevant to the activities being completed on-site.

In order to maintain compliance with relevant legislative and regulatory requirements, Caltex implements an Environmental Management System (EMS). The EMS consists of a suite of internal policy documents and plans. The EMS is overseen by a dedicated member of the Caltex Environment Team.

The SEE has outlined a suite of measures that would assist in avoiding, mitigating or managing the anticipated impacts associated with the demolition works. These measures would be incorporated into the modified conditions of consent for the Project and during demolition would be implemented through a Demolition Environment Management Plan (DEMP).

The DEMP would cover all environmental aspects associated with the demolition works and would include the mitigation measures and controls identified within **Chapters 8 -18** of this SEE.

The DEMP would help ensure that:

- all work complies with all relevant environmental legislation, regulations and standards;
- environmental factors are taken into account for each activity;
- maintenance of environmental compliance and performance is achieved through ongoing environmental monitoring and reporting; and
- regular audits are performed to confirm compliance with environmental policies and standards.

Any operational measures included in the SEE would be incorporated into the existing management plans and operating procedures currently in place at the Site.

20.2.2 DEMP Outline

The DEMP outlines the procedures that would be implemented to address and manage environmental impacts associated with demolition works for the Project. The DEMP would be prepared by Caltex prior to commencement of demolition works.

The primary purpose of the DEMP is to provide a reference document outlining the relevant safeguards and mitigation measures that are in line with the conditions of consent, and ensure that these are implemented and maintained. The DEMP would outline the key steps to be taken by personnel and contractors to manage the environmental hazards and risks associated with the demolition works and to effectively minimise the potential for environmental harm. The DEMP would be subject to ongoing review throughout the demolition period.

The DEMP shall include the following:

- a description of the proposed demolition works;
- an outline of the proposed demolition program;
- relevant statutory requirements – including applicable licences and approvals;
- standards and/or performance measures for the relevant environmental issues associated with the demolition works;
- a description of what actions and measures would be implemented to mitigate the potential impacts associated with the demolition works and ensure that these works would comply with the relevant standards and/or performance measures;
- a description of the procedures to ensure all personnel and contractors are trained in regards to their responsibilities under the DEMP;
- a description of the procedures that would be implemented to register, report and respond to complaints during the demolition works;
- a description of the procedures that would be implemented to manage environmental incidents and associated reporting requirements;
- identification of key personnel who would be involved in the demolition works, and provide their contact numbers;
- monitoring procedures and a description of the process to be followed if any non-compliance is identified; and
- detailed sub-plans including:
  - Soil and Water Management Plan;
  - Asbestos Management Plan;
  - Contamination Management Plan;
  - Noise and Vibration Management Plan (NVMP);
  - Air Quality Management Plan (AQMP);
  - Traffic Management Plan (TMP);
  - Biodiversity and Weed Management Plan (BWMP);
  - Silver Beach Rehabilitation Plan (SBRP);
  - Demolition Waste and Resource Management Plan; and
  - Acid Sulfate Soils Management Plan.

Where a sub-plan is not required, a specific section of the DEMP will be used to document additional management and mitigation measures.

These items are consistent with the management measures presented in **Table 20-1**.

As noted above, the CEMP would form the basis for the DEMP and its sub-plans.

21 EVALUATION AND JUSTIFICATION

This chapter provides an evaluation of the proposed demolition works and the outcomes of this SEE, including a discussion of the justification for proceeding with the demolition works. The chapter also provides:

- an environmental risk assessment (ERA);
- an assessment of the demolition works against the principles of Ecologically Sustainable Development (ESD);
- a description of the demolition work's benefits;
- consideration of the consistency of the demolition works with the objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act); and
- the justification for the demolition works.

21.1 Environmental Risk Assessment

The following ERA provides an analysis of the environmental risks that have been identified and outlined as part of this SEE.

An initial qualitative environmental scoping exercise was completed in **Chapter 7 Environmental Scoping Assessment**. This exercise identified the key environmental issues for the demolition works, described them and categorised them according to their risk of impact.

The SEE process has confirmed the potential environmental impacts associated with the demolition works, proposed mitigation measures for those impacts and potentially significant residual environmental impacts which still exist after the application of the proposed mitigation measures.

This ERA was undertaken using the methodology described below to determine the risk associated with each environmental issue. The ERA has been based upon the methodology outlined in Standards Australia's document *HB 203:2006 Environmental Risk Management – Principles and Process*, *Australian Standard AS/NZ 4360:2004 Risk Management*, and *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*.

The analysis categorised levels of risk for a given event based on the significance of effects (consequences) and the manageability of those effects (likelihood). The measures of likelihood categories and the measures of consequences categories as well as the risk ranking matrix are detailed in **Tables 21-1**, **21-2** and **21-3** below.

Table 21-1 Measures of Probability Categories for ERA

Rank	Probability	Description
A	Almost Certain	Happens often and is expected to occur
B	Likely	Could easily happen and would probably occur
C	Possible	Could happen and has occurred elsewhere
D	Unlikely	Unlikely to happen but may occur
E	Rare	Could happen, but only in extreme circumstances

Table 21-2 Measures of Consequence Categories for ERA

Rank	Consequence	Description
1	Extreme	Permanent and catastrophic impacts on the environment; large impact area; reportable incident to external agency; large fines and prosecution; operational constraints; substantial community concern.
2	Major	Permanent and detrimental impacts on the environment; large impact area; reportable incident to external agency; may result in large fines and prosecution; operational constraints; high level of community concern.
3	Moderate	Substantial temporary or minor long term detrimental impacts on the environment; moderate impact area; reportable incident to external agency; action required by reportable agency; community interested.
4	Minor	Minor detrimental impacts on the environment; small impact area; reportable incident internally; no operational constraints; some local community interest.
5	Low	Nil or temporary impacts on the environment; small or isolated impact area; not reportable incident; no operational constraints; uncontroversial project no community interest.

Table 21-3 Risk Matrix for ERA

		CONSEQUENCES				
		1 Extreme	2 Major	3 Moderate	4 Minor	5 Low
Likelihood	A (Almost Certain)	VH	VH	H	H	M
	B (Likely)	VH	H	H	M	M
	C (Possible)	H	H	M	M	L
	D (Unlikely)	H	M	M	L	L
	E (Rare)	H	M	L	L	L

Risk Matrix is defined as follows: VH = Very High, H = High, M = Medium and L = Low.

Taking into account the location and nature of the demolition works, the mitigation measures described in **Chapters 8 – 18**, the Cumulative Impact Assessment in **Chapter 19** and the commitments provided in **Chapter 20 Revised Management and Mitigation Measures**, **Table 21-4** provides an assessment of the mitigated risks associated with the demolition works, or the residual risk analysis. This has been completed for each potential environmental impact identified in **Table 21-4** based on the likelihood of occurrence and potential environmental consequence.

Table 21-4 Environmental Risk Analysis

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Hazards and Risks **Chapter 8**	Damage to adjacent plant or equipment due to uncontrolled or unplanned falling of infrastructure, object or crane collapse.	D	1	H	A number of recommendations have been presented in **Chapter 8 Hazards and Risk**. These include: demolition activities would be coordinated with terminal activities. Demolition works plan to include framework for considering the demolition of individual tanks in shared tank farm areas	E	2	M
	Damage to live pipework during removal of pipes	D	1	H		E	2	M
	Failure to isolate process equipment	D	2	H		E	2	M
	Introduction of an ignition source to the Site.	D	2	H	Additional precautions would be undertaken for floating roof tanks where pontoons may entrap flammable material which may not be detected during normal gas testing.	E	2	M
Soils, Groundwater and Contamination **Chapter 9**	Erosion of soils resulting in sedimentation of stormwater during demolition.	A	3	H	A Soils and Water Management Plan would form part of the DEMP for the Project. This plan would outline management measures for soils that are excavated or stored on-site during demolition works. Specific mitigation measures are contained in **Chapter 9 Soils, Groundwater and Contamination**.	D	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Mobilisation of contamination from soils during excavation works.	B	3	H	A Soil and Water Management Plan would form part of the DEMP for the Project. This plan would outline measures for managing contaminated soils and contaminated groundwater. Specific mitigation measures are contained in **Chapter 9 Soils, Groundwater and Contamination**.	D	4	L
	Disruption of Acid Sulfate Soils (ASS) during excavation works.	D	3	M	ASS Management Plan would be prepared in accordance with the *ASS Manual (ASS Management Advisory Committee 1998)* if ASSs were encountered during demolition works.	D	5	L
	Spills and leaks from demolition equipment and run-off from stockpiles potentially contaminating soil and groundwater.	B	3	H	A Soil and Water Management Plan would be included in the DEMP. This plan would recommend measures for management of spills and leaks. Other measures to be included in this plan are outlined in **Chapter 9 Soils, Groundwater and Contamination**.	D	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Increased infiltration of groundwater during removal of hardstand/concrete areas.	B	3	H	A Soil and Water Management Plan would be included in the DEMP. This plan would outline measures to help to prevent the infiltration of contaminated run off. It would also require annual groundwater monitoring to continue during the demolition works and contain a corrective action plan for if COPC increases are identified.	D	4	L
Human Health and Ecological Risk **Chapter 10**	Asbestos in the form of small fragments and fibres has been recorded on-site in various places including in surface soil layers. This has the potential to cause a health risk to workers working with excavated soil.	C	2	H	Demolition staff would be inducted and provided with training prior to working on the Site, to prevent unnecessary disturbance. These measures would be outlined in the DEMP. **Chapter 10 Human Health and Ecological Risk** provides further detail.	E	2	M
	Potential soil contamination may pose a vapour risk for workers (e.g. in a building or a deep trench).	C	3	M	The location of potentially contaminated areas would be noted and provided to demolition personnel. Safety training would be provided, including assessment of PPE requirements.	D	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Waste Management **Chapter 11**	The demolition works could create additional waste streams that require management.	A	4	H	A Waste and Resource Management Plan would be incorporated into the DEMP to manage waste streams and ensure that the maximum resource efficiency is maintained. A full list of mitigation measures are contained in **Chapter 11 Waste Management**.	C	5	L
Surface Water, Wastewater and Flooding **Chapter 12**	Potential impacts on stormwater such as erosion, sedimentation impacts.	C	4	M	Management of stormwater and stockpiled soils would be in accordance with *The Blue Book* (Landcom, 2004). Stormwater captured on-site would be managed through the existing systems (e.g. if impacted it would be diverted via the WWTP). A full list of mitigation measures are contained in **Chapter 12 Surface Water, Wastewater and Flooding**. These would also be contained in a Soil and Water Management Plan for the demolition works.	D	5	L
	Interaction of stormwater with hydrocarbon impacted soils.	C	4	M		D	4	L
	Stormwater contaminated by leaks and spills from demolition vehicles, plant and equipment.	D	4	L		D	4	L
	Potential adverse impacts to stormwater flows and discharge.	C	4	M		D	4	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Noise and Vibration **Chapter 13**	Demolition works could cause acoustic impacts at identified sensitive receptors.	C	3	M	Working hours and noise limits would be limited to within those specified in the conditions of consent for SSD 5544. A full list of mitigation measures are contained in **Chapter 13 Noise and Vibration**. These would also be contained in a Demolition Noise and Vibration Management Plan for the demolition works.	D	4	L
Air Quality and Odour **Chapter 14**	Demolition works could potentially generate air quality impacts such as dust, VOC emissions and odour.	B	3	H	Mitigation measures outlined in **Chapter 14 Air Quality and Odour** would be incorporated in an Air Quality Management Plan (AQMP).	D	4	L
Transport and Access **Chapter 15**	Demolition traffic could impact the local road network.	B	5	M	A Traffic Management Plan would be incorporated into the DEMP to manage the traffic impacts during the demolition works. A full list of mitigation measures are contained in **Chapter 15 Transport and Access**.	E	5	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Heritage **Chapter 16**	The demolition works would have an impact on the locally significant Oil Refinery Site.	A	2	VH	A Heritage Management Strategy has been prepared for the Australian Oil Refinery site prior to shut-down of the refinery plant, to provide Caltex with a framework for the ongoing management of the Site's heritage during present and future works on Site. A full list of mitigation measures are contained in **Chapter 16 Heritage**.	A	4	H
	The demolition works would potentially impact the heritage amenity values of Silver Beach and Roadway including interpretative concrete footpath at Kurnell Wharf.	B	3	H	Specific mitigation measures with regards to Silver Beach are contained in **Chapter 16 Heritage**.	D	4	L
Ecology **Chapter 19**	Potential impacts to natural features and man-made structures that are potential fauna habitat.	D	3	M	A Biodiversity and Weed Management Plan would be developed and implemented as part of the DEMP. This plan would include specific measures such as protocols prior to works which may affect potential fauna habitat.	E	3	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
	Discharge of stormwater run-off, sediment laden water, contaminated water and oily water off-site and into the groundwater system affecting nearby natural areas and GDEs;	C	4	M	Implementation of Soil and Water Management Plan. This plan would include measures to manage stormwater run-off.	E	4	L
	Demolition works increase spread of noxious weed infestations.	C	4	M	A Biodiversity and Weed Management Plan would be developed and implemented as part of the DEMP. This plan would include specific measures related to the control of noxious weeds.	E	4	L
	Release of sediments and/or contaminants, potentially impacting to marine ecology during removal of the Cooling Water Outlet Pipeline at Silver Beach.	A	3	H	A Biodiversity and Weed Management Plan would be developed and implemented as part of the DEMP. This plan would include specific measures such as installation of silt curtains to avoid and mitigate potential impacts.	D	3	M
	Disturbance to shorebird habitat during removal of the Cooling Water Outlet Pipeline at Silver Beach.	B	5	M	A Biodiversity and Weed Management Plan would be developed and implemented as part of the DEMP. This plan would include specific measures to be followed if shorebirds are nesting.	C	5	L

Environmental Issue	Potential Impacts Based On Unmitigated/ Inherent Risk	Probability	Consequence	Potential Risk Before Mitigation	Actions/Proposed Mitigation Measures	Residual Probability	Residual Consequence	Residual Risk Post Mitigation
Coastal Processes **Chapter 18**	Impacts to Silver Beach during removal of the Cooling Water Outlet Pipeline.	A	4	H	Implementation of Silver Beach Rehabilitation Plan. This plan would include specific actions for reinstatement and rehabilitation of affected sand dunes.	C	4	L

21.1.1 Summary of Risk Analysis

The Environmental Risk Assessment in **Table 21-4** illustrates how the assessments and mitigation measures contained within **Chapters 8 – 19** have helped understand the proposed demolition works and reduce the potential environmental risks. Certain risks related to the adverse impacts on the heritage values of the main refinery site and Silver Beach, have been identified as high risks post mitigation. The implementation of the identified mitigation measures in **Chapter 20 Revised Management and Mitigation Measures**, and careful management would help avoid and mitigate potential impacts as far as possible.

In addition to these risks the demolition works will also create a safer and more viable Site and would result in a positive impact on the heritage values of the Kamay-Botany Bay National Park and Kurnell Peninsula Headland.

It can therefore be concluded that, provided the management and mitigation measures presented in **Chapter 20** are implemented, remaining residual impacts would be negligible.

21.2 Ecologically Sustainable Development

21.2.1 The Principles

This section provides a review of the demolition works, their impacts and associated safeguards against the principles of ESD in accordance with the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The principles, as listed in the Section 7 of the EP&A Regulation, are as follows:

1. *"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;*

2. ***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;*

3. ***Conservation of biological diversity and ecological integrity** - namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration; and*

4. ***improved valuation, pricing and incentive mechanisms** - namely, that environmental factors should be included in the valuation of assets and services."*

These principles are discussed below.

21.2.2 Precautionary Principle

The precautionary principle deals with certainty in environmental and technical decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

A modification application undergoes a public process that allows for better examination of the potential effects of proposed activities or development. Thus, the assessment process can be

defined as precautionary in nature. The requirement to assess the impacts of the demolition works is a form of regulation designed to identify and address uncertainty about the effects of these activities.

Caltex has commissioned specialists to conduct detailed assessments on a range of environmental aspects identified during the Environmental Risk Assessment process as outlined in **Chapter 7 Environmental Scoping Assessment**. These assessments provide sufficient scientific understanding of the demolition works, their interactions with the surrounding environment and implications they may have to enable a decision to be made that is consistent with this principle. The precautionary principle has driven the development of a number of management and mitigation measures presented within this SEE.

Modification Objectives

The demolition works would be undertaken in a manner that reduces the severity of potential impacts and to reduce likelihood of potential impacts occurring. The demolition works would also comply with environmental criteria, community expectations, as well as relevant statutory requirements. This is achieved through appropriate design, and the proposed management and mitigation measures.

Demolition Works Safeguards

A number of safeguards specific to the demolition works would ensure mitigation of impacts would be undertaken in a manner that would satisfy ESD principles. These include:

- **Spatial limits of the demolition works footprint**: the area to be affected by the demolition works would not extend beyond the boundary of the demolition works area. The potential impact of these works within this boundary has been assessed and mitigation measures provided to mitigate the potential impact.
- **Preparation and implementation of a Demolition Environmental Management Plan**: Should the demolition works be approved, a number of the safeguards and management and mitigation measures included in this SEE would form the basis of a Demolition Environment Management Plan (DEMP).

21.2.3 Inter-Generational Equity

Inter-generational equity requires that the present generation pass onto the next generation an environment that does not limit the ability of those future generations to attain a quality of life at least equal to that of the current generation.

Through the implementation of mitigation and management measures for avoiding and minimising any short-term or long-term environmental impacts, and the proposed rehabilitation of any disturbed areas, inter-generational social equality impacts have been addressed. Examples of matters that are relevant to the demolition works are described below.

Modification Objectives

The demolition works are critical for completing the conversion of the Site into a safe and viable liquid fuel depot. The demolition works would ensure the Site could continue to be safely used for the distribution of petroleum products.

Demolition Works Safeguards

The proposed demolition works would maintain inter-generational equity by ensuring components of the existing bio-physical, social and economic environment available now would also be maintained for future generations. Aspects of the demolition works that would assist in achieving inter-generational equity include the following:

- no ecological features would be significantly impacted as a result the demolition works;
- potential contamination risks would be reduced by managing pollution risks during demolition works;
- maintaining agreed noise limits during demolition works;
- preservation of the nominated heritage values of the Site despite the demolition of redundant infrastructure, via the implementation of the Heritage Management Strategy;
- continued use of the Site as a liquid fuel depot in a safe manner; and
- ongoing consultation and engagement with the local community to provide an opportunity to ask questions and identify and manage areas of concern.

21.2.4 Conservation of Biological Diversity and Ecological Integrity

This SEE includes an assessment of the ecological impacts of the demolition works against the requirements of NSW Legislation. The Flora and Fauna Assessment concluded that the demolition works would not be likely cause significant ecological impacts provided that certain mitigation measures were followed.

Demolition Works Safeguards

The following features of the demolition works would effectively minimise impacts on the biodiversity and ecological integrity of the locality:

- Provided the measures within the BWMP and SBRP for the demolition works are implemented, no adverse impacts are likely to occur on the ecological values identified within this assessment.

21.2.5 Improved Valuation and Pricing of Environmental Resources

This ESD principle is premised on an assumption that all resources should be appropriately valued and that the value of environmental resources should be considered alongside any economic or cost benefit analysis for the life of the project.

Modification Objectives

The demolition works would allow for the continued safe operation of the finished product terminal at Kurnell, thereby allowing the Site to operate efficiently into the future.

Conclusion

The value placed by Caltex on environmental resources is evident from the extent of site-specific investigations, planning and environmental safeguards and measures that have been undertaken and which would be implemented to prevent irreversible damage to the local environment.

21.2.6 Compatibility with the Principles of ESD

The approach taken in undertaking the demolition works has been multi-disciplinary, involving consultation with various stakeholders including government agencies and the community (refer to **Chapter 6 Consultation**). Emphasis has been placed on the avoidance of impacts through careful design as well as management and mitigation measures to minimise potential negative environmental, social and economic impacts, during the demolition works. The principles of ESD have been incorporated into the proposed demolition works.

21.3 Objects of the Environmental Planning & Assessment Act 1979

As required by the SEARs issued for the demolition works, consideration has been given to the consistency of the demolition works 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 demolition works would allow for the safe and continued use of the Site in line with existing land use designations.

ii. the promotion and co-ordination of the orderly and economic use and development of land.

The SEPP (Kurnell Peninsula) provides for the land use and zoning in the area. Pursuant to the SEPP, the Site falls within zone 4(c1) (Special Industrial (Oil Refining) Zone. The objectives of zone 4 (c1) are to recognise land used for oil refinery, liquid fuel depot and liquefied petroleum gas extraction purposes, and to ensure that development has regard to environmental safety planning principles. As the demolition works would ensure the Site would continue to be used as a liquid fuel depot, this proposed land use is identified as permissible under the land use zones in this SEPP and therefore is in line with orderly and economic use and development of land.

iii. the protection, provision and co-ordination of communication and utility services.

The demolition works would not directly impact on the provision and co-ordination of communication and utility services.

iv. the provision of land for public purposes.

The demolition works would not permanently impact on the provision of land for public purposes. Specific measures have been incorporated into this SEE to manage the temporary

impact of the demolition works on the road reserves in Kurnell and Silver Beach. These impacts would be temporary and can be appropriately managed to ensure that these public areas are restored.

v. the provision and co-ordination of community services and facilities.

The demolition works would not impact on the provision of existing or future 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.

The mitigation measures outlined within this SEE, would allow for the protection of of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.

vii. ecologically sustainable development.

An assessment of the demolition works against the principles of ESD has been undertaken in **Chapter 20 Project Evaluation and Justification**.

viii. the provision and maintenance of affordable housing.

The demolition works would not impact on the provision or maintenance of affordable housing.

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

The demolition works is to be assessed as modification to a State Significant Development under Part 4 of the EP&A Act by the Department of Planning and Environment (DPE). In preparing to assess the demolition works, the DPE request input from relevant stakeholders including state government agencies and local council to the SEARs. Sutherland Shire Council provided input into the SEARs for the demolition works and remains an important stakeholder during the ongoing consultation effort.

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

Caltex undertakes regular consultation with the community through quarterly meetings. Proposed developments at the Site are presented to and discussed with the local community. This consultation is summarised in **Chapter 6 Consultation**.

The SEE will be placed on public exhibition by the NSW DPE for a minimum of 14 days. In accordance with the requirements of the EP&A Act, stakeholders and the public are invited to make submissions. This process provides further opportunity for public involvement and participation in the environmental planning and assessment process for the demolition works.

21.4 Project Justification

The demolition works are the next step in the evolution of the operation of the Site. The Site was developed as an oil refinery and terminal facility and is now being converted to only manage finished petroleum products as a terminal facility.

Following a number of internal investigations, the first public step in the Project was to seek development approval for the conversion of the refinery to a finished product terminal. The 'conversion works' were deemed State Significant Development (SSD) and an Environmental Impact Statement (EIS) was produced to support the Development Application for this Project (the approved Project SSD 5544). The approved Project was granted development consent in January 2014.

The demolition works are intrinsically linked to the ongoing process of converting the Site from an operation that contains both oil refining and liquid fuel depot land uses to a safe and viable operation where the dominant land use becomes 'liquid fuel depot' alone. The demolition works form a critical stage in completing the conversion of the Site and are therefore important in ensuring the objectives of the Project are met.

The SEE provides a comprehensive assessment of the demolition works and includes investigations regarding all relevant environmental issues.

Potential impacts have been assessed and strategies to avoid, minimise and mitigate those impacts form a key part of the SEE. The SEE includes a number of commitments to manage environmental impacts during the demolition works.

The demolition works has, to the extent feasible, been designed to address the issues of concern to the community and Government. Caltex has also considered impacts on the surrounding environment and community of Kurnell. Caltex firmly believes it can undertake the demolition works in a manner which would safeguard local environment and public amenity in the area.

This SEE has concluded that the demolition works should proceed because they would:

- result in no long term adverse impacts to the environment or local community;
- ensure the primary objectives of the Project continue to be achieved; and
- satisfy the principles of Ecologically Sustainable Development as described in the EP&A Regulation.

This SEE has highlighted a range of issues which would be addressed through the careful undertaking of the demolition works.

On the basis of the findings detailed within this Statement of Environmental Effects, the demolition works are considered to be justified.

22 GLOSSARY

Term	Description
"A" Frequency Weighting	The method of comparing an electrical signal with a noise measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. The symbol to show this parameter has been included in the measurement is "A" (e.g. LAeq).
Acid Sulphate Soils	Refers to a soil or soil horizon which contains sulfides or an acid soil horizon which is affected by oxidation of sulphides.
Aquifer	An underground layer of water bearing permeable rock, sediment or soil that yields water.
Assessment Background Level (Abl)	The background level representing each assessment period (day, evening and night) which is determined for each 24-hour period of monitoring.
Background Noise	Background noise is the term used to describe the level of noise measured in the absence of the noise under investigation. It is measured statistically as the A-weighted noise level exceeded for ninety per cent of a sample period. This is represented as the LA90 noise level. The measurement sample time may be indicated in the form LA90,t where t is the measurement sample time i.e. LA90,15 min.
Btex	Refers to a group of compounds, namely benzene, toluene, ethylbenzene and xylenes. These compounds are volatile organic compounds found in petroleum products such as gasoline.
Btex Compounds	Refers to benzene, toluene, ethyl benzene and xylene compounds. These are some of the volatile organic compounds found in petroleum derivatives (e.g. petrol).
Bunded Areas	Refers to the bunded impermeable areas surrounding oil-filled tanks to prevent spills.
Bunding	Area within a structure designed to prevent inundation and prevent spillage from tanks.
Caltex's land ownership	This is the land owned by Caltex on the Kurnell Peninsular.
Chart Datum	A fixed height taken from measuring the tides in and around Australia.
Closed-Loop Recycling	System in which the waste or byproduct of one process or product is used in making another product.
Combustion Emissions	Emissions that arise upon combustion of a substance.
Contaminants Of Potential Concern	Refers to chemicals that are potentially site-related and whose data are of sufficient quality for use in a quantitative risk assessment.
Crude Oil	Refers to a mixture of hydrocarbons that exist in liquid phase in natural underground reservoirs and remain in liquid state at atmospheric pressure after passing through surface separating facilities.
Db (Decibel)	A unit of sound level measurement that uses a logarithmic scale.
Dispersion Modelling	Is a mathematical simulation of emissions as they are transported throughout the atmosphere. It is undertaken to determine the likely impacts the Project would have on air quality.

Term	Description
Dosing Pump	Refers to a low volume fluid pump with a controllable discharge rate, used to inject chemical additives to the mixing or pumping system.
Easement	Is a right given to another person or entity to trespass upon land that person or entity does not own.
Eastern Right of Way (ROW)	The Eastern Right of Way (ROW) contains various pipelines that run between Kurnell Wharf and the Site. These pipelines are buried and include the cooling water intake lines and a number of product lines.
Eastern Tank Area	The Eastern Tank Area contains finished product tanks and the Oil Movements Centre.
Ecological Communities	Networks of Interacting Species
Effluent	Refers to an outflowing of water from a natural body of water or from a human made structure.
Effluent Water	Refers to the outflowing of water from a natural body of water or from a human made structure.
Environmental Planning Instruments	Collective name for Local Environment Plans and State Environmental Planning Policies. The provisions of environmental planning instruments are legally binding on both government and developers.
Estuary	An enclosed or semi-enclosed body of water having an open or intermittently open connection to coastal waters and in which water levels vary in a periodic fashion in response to ocean tides.
Finished Fuel Terminal	Installation where finished fuel is transferred from one conveyance to another.
Finished Product	Refers to finished fuel as opposed to crude oil products which need to be refined.
Firewater	Water designated for use in the event of a fire emergency.
Footprint	Area in which site activities take place.
Foreshore	The area of shore between low and high tide marks and land adjacent thereto.
Fugitive Volatilisation	Process by which chemicals are quick to evaporate under room normal conditions.
Garnet Grit	Small loose particles of garnet.
Ground Truthed	Refers to information collected on location.
Groundwater Dependant Ecosystems	Ecosystems that require access to groundwater to meet all or some of their water requirements to maintain their ecological processes.
Hot Work Permit	A permit to undertake work that can be a source of ignition where flammable material is present or can be a fire hazard.
Hydraulic Hazard Mapping	Refers to the mapping of hazards resulting from hydraulic processes, ie. A liquid moving in a confined space under pressure.
Import Terminal	Large storage facility from which fuel is distributed to retailers, distributors and end users.
Individual Risk Contours For Fatality And Injury Risk	a graphical representation of “individual risk” that uses the risk values at each point to construct iso-risk contours.

Term	Description
Infrared Radiation	The part of the electromagnetic spectrum which is characterized by wavelengths just longer than those of ordinary visible red light and shorter than those of microwaves or radio waves.
Inter-Generational Equity	requires that the present generation pass onto the next generation an environment that does not limit the ability of those future generations to attain a quality of life at least equal to that of the current generation.
Intertidal	Pertaining to those areas of land covered by water at high tide, but exposed at low tide.
Jet Fuel	comprises both gasoline and kerosene type jet fuels meeting specifications for use in aviation turbine power units
Key Threatening Processes	Under the *Environment Protection and Biodiversity Conservation Act 1999*, it refers to a process that threatens the survival, abundancy or evolutionary development of a native species or ecological community
Kurnell Wharf	The 1 km structure located off the Kurnell Peninsula that is used by ships delivering petroleum products and crude oil (feedstock) to the Kurnell Refinery.
L_{aeq}	A weighted equivalent continuous noise level that is used as the constant level of noise that would have the same energy content as the varying noise signal being measured. The letter “A” denotes that the A-weighting has been included and “eq” indicates that an equivalent level has been calculated. This is referred to as the ambient noise level. The measurement sample time may be indicated in the form LAeq,t where t is the measurement sample time i.e. LAeq,15 min.
Level Of Service	is a performance measure used to describe the performance of an intersection or midblock location
Linear Peak (Lin Peak)	the maximum level of air pressure fluctuation measured in decibels without frequency weighting (see ‘A Frequency Weighting’ above).
Lithic Fragments, Feldspar, Mica And Clay Pellets	Minerals and fragments of pre-existing rock, found in sedimentary rock.
Mercaptans	Also called thiols. Refers to an organosulphur compound. Many mercaptans have a strong garlic odour and are used as odourants to detect natural gas (which is odourless in pure form). Thiols react with mercury to form mercaptides.
Meteorological	The science that deals with the phenomena of the atmosphere.
Midstorey	Layer of vegetation in in a forest in which tree heights are in between the smallest and the tallest trees.
Non-Aqueous Phase Liquids	Refers to a liquid contaminant that (like oil) does not dissolve readily in water. There are two types: Light Nonaqueous Phase Liquid **(**less dense than water so spreads across the surface of the water table forming a layer) and Dense Nonaqueous Phase Liquid (more dense than water, so sink vertically through sand and gravel aquifers to the underlying layer).
Noxious Weeds	A noxious weed is a plant species that has been designated by country, state, provincial, or national agricultural authority as one that is injurious to agricultural and/or horticultural crops, natural habitats and/or ecosystems, and/or humans or livestock.
Oily Water Management System (OWMS)	Existing system at the Site that collects process effluent and stormwater from areas of the Site where potential for interaction of water flows with petroleum products.

Term	Description
Outfall Pipeline	A pipeline that empties into a water source. In this case, the pipeline would empty into the Ocean at Tabbigai Gap.
Oxidising Biocide	Refers to an agent such as chlorine which will kill bacteria via oxidation.
Particulate Emissions	Refers to the emission of solid particles of carbon and unburnt hydrocarbons.
Peak Particle Velocity (Ppv)	The instantaneous sum of the velocity vectors (measured in millimetres per second) of the ground movement caused by the passage of vibration from blasting.
Perception Of Sound	Audible sound ranges from the threshold of hearing at 0dB to the threshold of pain at 130dB and over. A change of 1dB or 2dB in the level of a sound is difficult for most people to detect, whilst a 3dB to 5dB change corresponds to small but noticeable change in volume. An increase of about 8 – 10dB is required before the sound subjectively appears to be significantly louder.
Petroleum Hydrocarbons	Organic compounds found in petroleum, primarily composed of carbon and hydrogen.
Petroleum Product	Useful materials derived from refining crude oil.
Pipeways	The racks of pipelines that cross the Site and connect different components together. A number of pipes will be removed from the pipeway areas.
Polyaromatic Hydrocarbons	Are atmospheric pollutants that occur in oil, coal and tar deposits and are by-products of fuel burning. Some compounds have been identified as carcinogenic, mutagenic and teratogenic. Naphthalene is the simplest example of a polycyclic aromatic hydrocarbon.
Polychlorinated Biphenyls	Consists of chlorine atoms attached to biphenyl (molecule composed of two benzene rings). Used as dielectric and coolant fluids.
Ponding	Refers to a body of water smaller than a lake, which is sometimes artificially formed.
Potable Water	Refers to water that is of a high enough quality that it can be safely consumed or used without risk to short or long-term health.
Precautionary Principle	provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.
Process Hazard Analysis	Analysis of hazards associated with processes undertaken at the Site.
Pumphouse	Refers to a house in which pumps are installed and operated.
Putrescible	Refers to the potential of a substance to decompose when in contact with air and moisture at normal temperature. Liable to become putrid.
Quaternary Sands	Sands which were formed during the Quaternary period.
Ramsar	The Convention on Wetlands of International Importance, especially as Waterfowl Habitat. This is an international treaty for the conservation and sustainable utilisation of wetlands.

Term	Description
Rating Background Level (Rbl)	The overall background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30dB(A), then it is set to 30dB(A).
Receptor	Receivers of impacts under the proposed works.
Refinery Process Units	The refinery process units are located in the centre of Site. This area contains all of the process plant that was used to refine crude oil to finished petroleum product and a number of associated buildings
Residual Risk Assessment	Refers to an assessment undertaken on any impacts that may exist after mitigation and management measures are implemented.
Rock Groyne	Rock structure usually built approximately perpendicular to the shoreline intended to retard longshore drift of sediments and hence reduce foreshore erosion.
Run Down Lines	A line which connects one piece of equipment to another.
Seawater Cooling System	Cooling system by which seawater is employed as the cooling agent.
Semi-Volatile Organic Compounds	An organic compound which has a higher boiling point than water and may vaporise when exposed to temperatures above room temperatures. They include phenols and polynuclear aromatic hydrocarbons.
Shotcrete	A concrete (or mortar) applied at a high velocity to a surface via a hose.
Silt Fences	A fence which acts as a temporary sediment control device to prevent silt from entering nearby water bodies.
Slop	Slop or slop oil is a petrochemical industry term for the odds and ends of oil produced in a refinery. This by-product is usually subject to further processing to make it suitable for sale and use.
Sludge Lagoon	Lagoon that receives sludge that has been removed from a wastewater treatment facility.
Societal Risk F-N Curve For Off-Site Population	a “societal risk” measure that communicates the potential for hazardous scenarios to cause multiple fatalities by plotting the frequency of “N or more fatalities” (F) against the number of fatalities (N).
Sound Pressure (Spl)	Sound pressure is the measure of the level or loudness of sound. Like sound power level, it is measured in logarithmic units. The symbol used for sound pressure level is SPL, and it is generally specified in dB. 0dB is taken as the threshold of human hearing.
Static Dissipater	Used in order to dissipate built up static electricity.
Strike And Dip	Refers to the orientation of a geological feature. The strike is a line formed by the intersection of the horizontal plane with the surface of a layer of rock or another geological body set in an inclined or vertical position The dip is a line on the plane of a layer or another geological body that extends perpendicularly to the strike in the direction of the inclination of the layer, which is the line of greatest steepness.
Sub-aerial Beach	Commonly, that part of the beach above the water line that dries.
Sulphur Recovery Unit	Unit in which sulphur emissions (as a gaseous hydrogen sulfide) are recovered in order to prevent them from escaping into the atmosphere.

Term	Description
Tailwater	Refers to water located downstream from a hydraulic structure
Tank Nozzle	Refers to the spout attached to the tank, used to control the velocity of the fluid.
Tank Water Draws	Event in which water is extracted from a tank
Test Pit	Refers to an excavation from which soil samples are taken and groundwater depth is determined.
The conversion works	The previously approved works to convert the Kurnell Refinery to a finished product terminal. These works were approved as SSD 5544.
The demolition works	The works for which Caltex are seeking a modification to development consent SSD 5544. These works relate to the demolition, dismantling or removal of refinery process units, redundant tanks, redundant pipelines, redundant services and redundant buildings as well as associated minor civil works and waste management activities.
The Project	The conversion of the Caltex Refinery in Kurnell for future use as a viable and sustainable terminal to receive and distribute refined petroleum product.
The Proponent	Caltex Refineries (NSW) Pty Ltd (Caltex)
The Site	The Caltex Refinery on the Kurnell Peninsular, land owned and occupied by Caltex Refineries (NSW) Pty Ltd.
The Study Area	The area in which environmental studies have been undertaken to assist in determining the impacts of the demolition works. The parameters of any study area will vary depending on the environmental study being completed.
To Tank Internals	Refers to the interior area of a tank.
Tonality	Noise containing a prominent frequency and characterised by a definite pitch.
Topography	Refers to the study of distribution, position and elevation of natural and man-made features of a landscape.
Total Organic Carbon	Refers to the amount of carbon bound in an organic compound, often used as an indicator of water quality.
Total Petroleum Hydrocarbons	Any mixture of hydrocarbons found in crude oil.
Tributyltin (TBT)	An organic compound present in the marine environment due to its use as antifoulants.
Turbidity	A measure of the ability of water to absorb light.
Ultra Low Sulphur Diesel	Diesel fuel with substantially lowered sulphur content. The shift to lower sulphate content is expected to allow for a reduction in emissions of particulate matter from diesel engines.
Volatile Organic Compound (Voc)	Organic chemicals that have a higher vapour pressure in room-temperature conditions. This is due to a lower boiling point , causing many of the molecules to evaporate and enter the surrounding air.
Volatile Total Petroleum Hydrocarbons	Refers to total petroleum hydrocarbons which are easily evaporated at normal temperatures.

Term	Description
Washwater	Refers to water that is contacted with process streams (liquid or gas), packed beds, or filter cakes to flush or dissolve impurities.
Waste Streams	The complete flow of waste from domestic or industrial areas through to final disposal
Well-Sorted Marine Quartz Sand	Sand of marine origin, predominantly composed of quartz mineral, with particles that are approximately the same size.
Western Right of Way (ROW)	The Western Right of Way (ROW) contains the cooling water outlet line that runs between the Site and Botany Bay. This pipeline is buried.
Western Tank Area	The Western Tank Area previously included tanks to store crude oil but now is used to store finished petroleum product. This part of the Site also includes the Waste Water Treatment Plant.

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