6 LAND CONTAMINATION

An assessment of potential land contamination within the area of the LNG Facility on Curtis Island has been undertaken[1], based on publically available data supplemented by field works. A summary of the assessment methodology and key outcomes is provided in this Chapter. The complete *Phase I and II Environmental Site Assessment* report is included as *Appendix 5.4.*

The Project environmental objective for land contamination is: to protect land from contamination arising from Project activities and ensure that any existing contaminated land is not disturbed, or if disturbed is appropriately managed and/or rehabilitated.

An acid sulfate soil (ASS) assessment is discussed in detail in *Volume 5, Chapter 4*.

Contamination risks associated with the storage/spillage of water or waste are discussed in *Volume 5, Chapter 9*.

6.1 PHASE I ENVIRONMENTAL SITE ASSESSMENT

A Phase I and limited Phase II Environmental Site Assessment (ESA) covering the LNG Facility site was undertaken, as well a Phase I ESA along mainland route from Friend Point to approximately 3.5 km east along the proposed pipeline route. Tenures assessed are indentified in *Table 5.6.1*.

Table 5.6.1 Site Identification

Site Location – LNG Facility	Curtis Island - Lots 10 and 27 on Plan DS220
Site Location – Roads, Pipelines and Bridges	Curtis Island – Lots 7, 11 and 28 on Plan DS220 Mainland – Lots 40 and 108 on Plan DS289 and Lot 2 on Plan RP613702

Background information was obtained from field observations made during a site walkover between 8 and 9 October 2008 and from field activities undertaken from 4 to 6 November 2008. Available information from these activities and the following sources were reviewed during investigations:

- Queensland Department of Natural Resources and Water (NRW) Registered Bore Search

1 Environmental Resources Management Australia (2009) Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure: Phase I and II Environmental Site Assessment.

- Historical title searches
- Queensland NRW available historical aerial photographs
- Queensland Government - Environmental Management Register (EMR) and Contaminated Land Register (CLR) and Historical title search
- Site photographs.

Detailed outcomes are provided in the complete Phase I and II ESA report included as *Appendix 5.4*.

6.1.1 Adjacent Land Use

The LNG Facility site and surrounding land is currently used for pastoral grazing of cattle. The historical land use, from the 1940s to 1970s, included dairying.

Sites considered on the mainland covered mud flats, undeveloped land and land used for agriculture.

6.1.2 Visible Surface and Underground Utilities

No visible surface infrastructure was identified on the LNG Facility site that could result in potential impact, with the exception of a historic cattle tick dip site.

There was no evidence of stressed vegetation on-site or in the immediate vicinity of the site that could impact the subsurface.

There were no underground structures identified at the site such as tanks and pipelines.

6.1.3 Groundwater Bores

Information obtained from the former Queensland NRW indicated that there are two registered groundwater bores on Curtis Island and 14 on the mainland within a 10 km radius of Lot 27 on DS220. The main purpose of the wells is for water supply.

Reference to the former Queensland Department of Mines (now Department of Employment, Economic Development and Innovation) 1*:2,500,000, Groundwater Resources of Queensland Map* (1987) showed aquifer lithology within the vicinity of the site to be unconsolidated sediments (e.g. sands and gravels) and metamorphic rocks.

Groundwater recharge rates are < 5 L/sec and water quality is suitable for most purposes but marginal for human consumption and low salt tolerant crops.

6.1.4 Certificates of Title

The results of a search of the site land title deeds undertaken 21 November for Lots 7, 10, 11, 27 and 28 on Plan DS220 located on Curtis Island and Lots 40 and 108 on Plan DS289 and Lot 2 on Plan RP613702 are summarised in *Table 5.6.2*.

Table 5.6.2 Summary of Historical Certificates of Title

Year	Details of Title
Curtis Island – Lots 7, 10 11, 27 and 28 on Crown Plan DS220	
1983 – 1989	Lease to Jack Richie as a Grazing Homestead Perpetual lease – Vol 7653 Folio 63 (the lease includes also Lots 12 and 13 on Plan DS220)
1989 – 1993	Lease transferred to Giusepe Emanuele
1993 – Current	Lease transferred to Ross William Graving, Colin Grant Graving and Mark Jon Graving as tenants in common as equal tenants (1/3 each) – Title reference 17653063
Main Land – Lot 108 on Crown Plan DS289	
2006 - Current	The State of Queensland (Represented by the department of natural Resources and Water). Title Reference 47015438
Main Land – Lot 40 on Crown Plan DS289	
1982 - 2008	Donald William Davey – Vol. C 496 Folio 212 (Includes also Lots 41 and 42 on Plan DS289)
2008 - Current	Queensland Energy Resources Limited – Title Reference 30496212
Main Land – Lots 2 on Crown Plan RP613702	
1974 – 1976	Andrew Ivanoff – Vol. C 412 Folio 093.
1976 - 1980	Peter Kozloff and Riasa Kozloff – Vol C434 Folio 192
1980 - 1988	Transfer to Nicholas Kozloff – Vol C467 Folio 118
1988	Nicholas Kozloff, Dasha Kozloff and Alexi Gasteresky
1988 - Current	Dasha Kozloff has become tenant in common – title reference 30580025

No further information was available from the historical title deeds as to the nature of the activities that occurred on these sites prior to the initial dates shown.

6.1.5 Historical Aerial Photographs

A review of selected historical aerial photographs of the LNG Facility site and the surrounding area is summarised in *Table 5.6.3.* Copies of photographs are provided in an annex to the Phase I and II ESA Report.

Table 5.6.3 Summary of Historical Aerial Photographs

Year	Description
1961	The site at Curtis Island appears undeveloped as bushland. On the mainland some agriculture land use is identified west from the mudflats where the road, pipeline and bridge to Curtis Island will be developed.
1970	No changes were observed from previous aerial photograph register.
1975	No changes were observed from previous aerial photograph register.
1980	The site at Curtis Island remains undeveloped as bushland. On the mainland, an expansion of agricultural land use is evident. A wharf was constructed west from the site at Yarwun.
1989	No significant changes were observed from previous aerial photograph register.
1996	Some tracks were observed to be opened on Curtis Island. Some future developments were observed at the wharf at Yarwun.
2007	No significant changes were observed at Curtis Island. On the mainland no changes were observed at the mudflats and the adjacent lots located where the future roads and pipelines will be constructed. The wharf at Yarwun was redeveloped and it appears to be filled. Industrial development appears west from the wharf.

6.1.6 Environmental Management Register

A search was conducted of the Queensland EPA Environmental Management Register (EMR) and Contaminated Land Register (CLR) to identify whether the subject properties have been listed due to either historical or current activities.

The search results indicated that the designated lots are not on either the EMR or CLR.

6.1.7 Former Cattle Tick Dip Site

A former cattle dip site (refer to *Plate 5.6.1)* was identified and located at Lot 27 on Plan DS 220 (UTM coordinates 56K 0316533 east 7370038 south), within the bounds of the LNG Facility site.

Plate 5.6.1 Former Cattle Dip

Given the potential for contamination of subsurface materials by organic and inorganic compounds arising from cattle tick dip activities, a limited Phase II ESA was undertaken to identify potential sources of contamination and any associated potential pollutant linkages from this activity.

6.2 LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT

The objective of the limited Phase II ESA was to provide data on the soil conditions of the former cattle dip site identified on the LNG Facility site during the Phase I ESA site walkover.

6.2.1 Methodology

A limited intrusive sampling program was undertaken consisting of six soil bore holes to a maximum depth of 3.8 m using the Geoprobe push-tube method. Groundwater was not intersected during the drilling activities and, therefore, groundwater monitoring wells were not installed.

A total 25 soil samples, including two duplicate Quality Control (QC) samples, were collected and submitted for analysis

Samples were analysed for Organic Chlorinated Pesticides (OCPs); Organic Phosphorated Pesticides (OPPs) and a suite of metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).

Figure 5.6.1 shows the indicative location of the boreholes in relation to the physical site features of the cattle dip. Borehole logs and soil analytical results (including certified laboratory results) are included in *Appendix 5.4* as well as Quality Assurance/Quality Control (QA/QC) protocols and outcomes.

6.2.2 Data Evaluation Criteria

The soil analytical results were compared against:

- Queensland Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (1998)[2]
- NEPM[3] Health investigation level F (HIL-F) – commercial/industrial.

6.2.3 Summary of Results

6.2.3.1 *Metals*

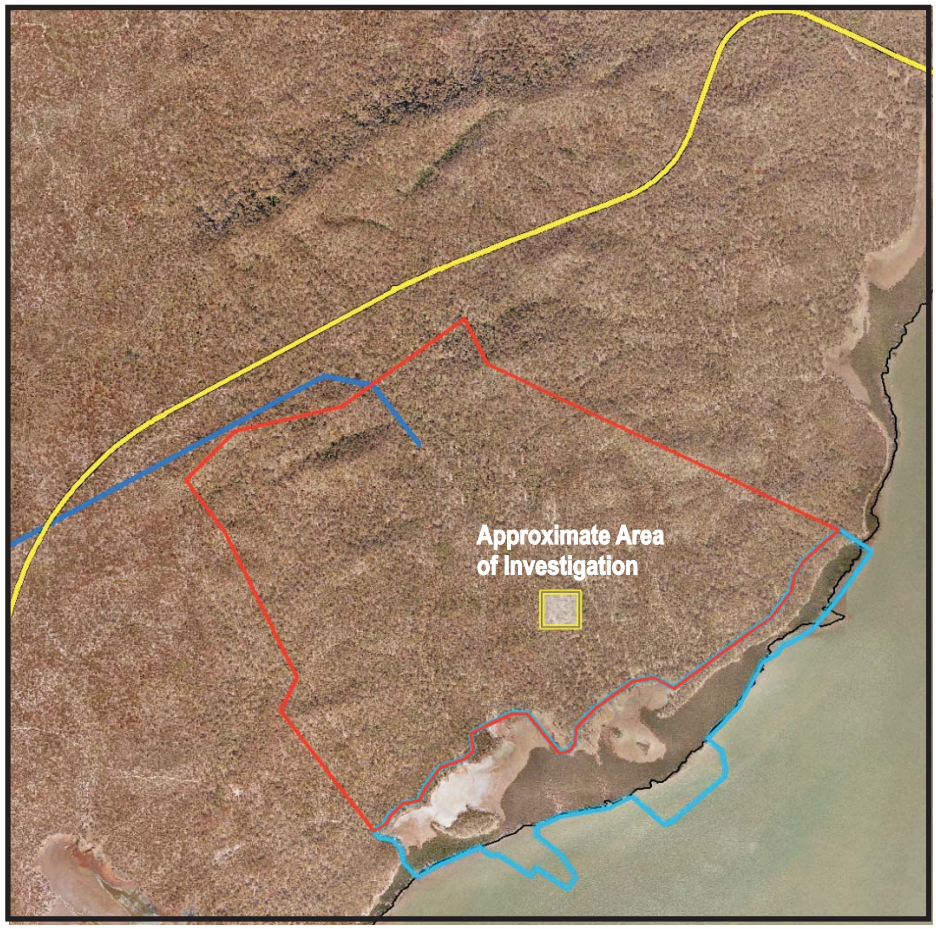
The analytical results for metals in soil indicated that concentrations of metals were below the relevant environmental criteria in all samples.

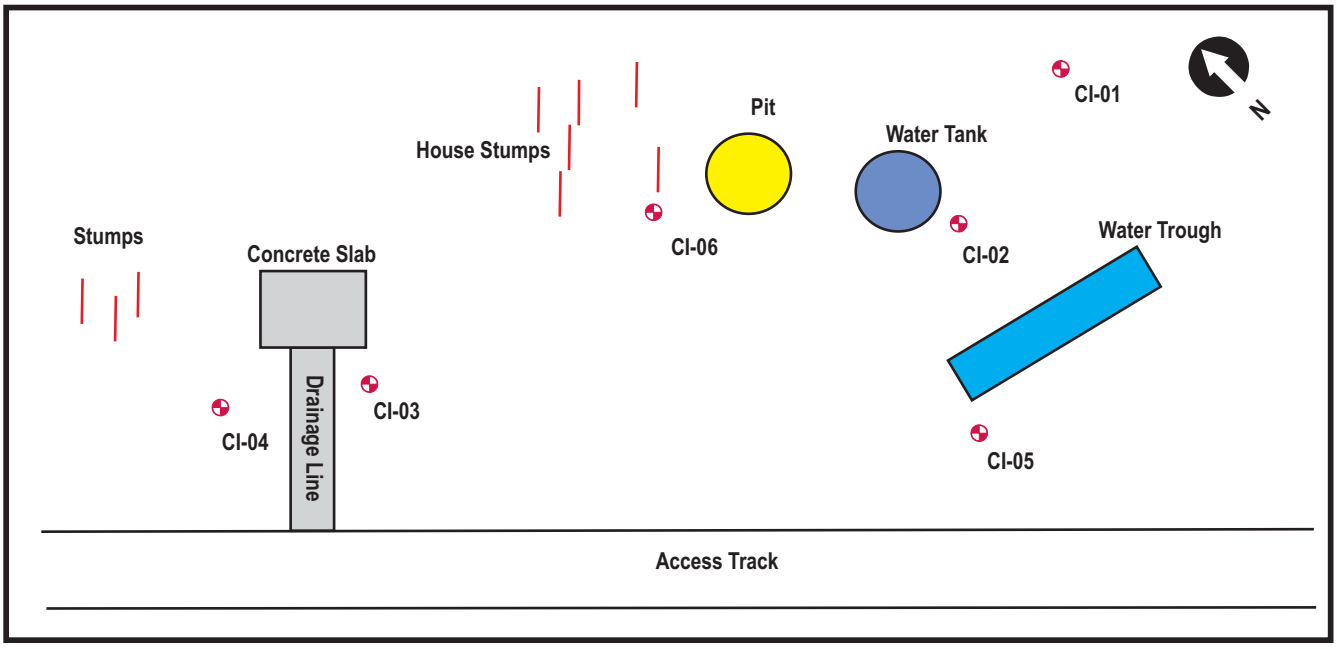
6.2.3.2 *Organic Chlorinated (OC) and Organic Phosphorated (OP) Pesticides*

The analytical results for organic chlorinated (OC) and organic phosphorated (OP) pesticides for soil indicated concentrations for all compounds below the analytical detection limits in soil samples (practical quantitation limit of 0.5 mg/kg for all OC and OP pesticides analysed).

2 Queensland Government EPA (1998). *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland 1998*

3 National Environment Protection Council (NEPC) 1999. *National Environment Protection (Assessment of Site contamination) Measure 1999*, Schedule B (7a) Guideline on Health-Based Investigation Levels





Legend

- Soil Bore Sample Locations
- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor

Source:

Aerial - Department of Inafrastructure and Planning for QCLNG Project Curtis Island Road/ Bridge Corridor - Connel Wagner Environmental Resources Management Australia, 2009.
Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure: Phase I and II Environmental Site Assessment. Unpublished report for BG / QGC, Report Reference 0086165/11 – Phase I and II_R01.V0, April 2009

QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title: Indicative Soil Sample Locations and Former Cattle Dip Site Features
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn JB	Volume 5 Figure 5.6.1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved KR	File No: 0086165b_EIS_LC_CDR001_F5.6.1	
	Date 11/06/09	Revision 1	

6.3 MANAGEMENT AND MITIGATION

Based on the results from the Phase I and II ESA, there is no indication of existing environmental contaminants due to former activities and no specific management and mitigation measures to address existing contamination are, therefore, proposed.

Acid sulfate soils are addressed separately (refer *Volume 5, Chapter 4*).

Contamination may arise from storage and handling of hydrocarbons and chemicals on the site during Project construction and operations. To minimise the potential for soil, groundwater and receiving water contamination, storage of all fuels and chemicals will comply with relevant legislation governing the storage and handling of materials that may adversely impact the environment if released (ie *Queensland Dangerous Goods Safety Management Regulations, 2001*).

This includes the use of bunded areas, installation of oil/water separators and monitoring of groundwater and surface waters to ensure that any releases are identified and remediated as soon as practicable. Wastes will be classified, transported and disposed of in accordance with Queensland *Environmental Protection (Waste Management) Policy 2000* and *Environmental Protection (Waste Management) Regulation 2000.* Refer to *Volume 5, Chapter 17* for additional discussion on waste management.

6.4 CONCLUSION

A Phase I and limited Phase II ESA was conducted for the LNG Facility site, and a limited Phase I ESA for the Curtis Island Road and Mainland Road and Bridge Approach. Results indicate no existing environmental contaminants due to former activities. On this basis, no specific management and mitigation measures to address existing contamination are proposed.

The construction and operation of the LNG Facility poses a risk of soil, groundwater and receiving water contamination from the storage and handling of hydrocarbons and chemicals and from the ablution facilities and sewage treatment works.

Storage and handling of hydrocarbons and chemicals will comply with relevant legislation. Mitigation and monitoring measures are proposed to reduce contamination risks. A summary of the impacts outlined in this chapter is provided in *Table 5.6.4* below.

Table 5.6.4 Summary of Impacts for Land Contamination

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct impacts to soil, groundwater and receiving waters potentially leading to secondary impacts to terrestrial and marine ecosystems
Impact duration	Short-term provided contaminated sites are remediated effectively
Impact extent	Local
Impact likelihood	Unlikely

Overall assessment of impact significance: Minor, due to the localised impact in the unlikely event of a spill. This is provided that proposed mitigation measures are implemented effectively to reduce the risk of land contamination, recommended monitoring is undertaken and sites are remediated if land contamination does occur.