



Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report Generated at: 10:55:03AM, 23/03/2015



This response relates to a search request received for:

Crown Reserve 11648
Barrow Island WA 6712

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Environment Regulation records, this land has been reported as a known or suspected contaminated site.

<p>Site Name</p>	<p>Crown Reserve 11648 Barrow Island WA 6712</p>
<p>Site ID / File Address</p>	<p>Crown Reserve 11648</p>
<p>Report Status</p>	<p>Classification: 01/12/2006 - Contaminated - remediation required</p> <p>Nature and Extent of Contamination:</p> <p>Terminal Tanks Facility - It is estimated that between 300,000 and 900,000 litres of crude oil may be located above the watertable in the vicinity of the Terminal Tanks covering an area of approximately 18 hectares. A bioremediation facility is also located within a section of this Terminal Tanks Facility. Petroleum hydrocarbons have been identified to be migrating towards the marine environment.</p> <p>Airport Facility - Petroleum hydrocarbons have been identified in soil and groundwater in the vicinity of the Airport Facility.</p> <p>B34 Flowline Leak - Petroleum hydrocarbons have been identified in soil and groundwater in the vicinity of B34 flowline.</p> <p>Z56 Flowline Leak - Petroleum hydrocarbons have been identified in soil and groundwater in the vicinity of Z56 Flowline.</p> <p>L71 Liquid Waste Evaporation Facility - Petroleum hydrocarbons and arsenic, copper, lead, nickel, mercury and zinc have been identified in groundwater in the vicinity of the L71 Facility. The extent of soil contamination has not been determined.</p> <p>R73 Inert Waste Disposal Site - Petroleum hydrocarbons and copper, lead and zinc have been detected in groundwater in the vicinity of the former solid waste landfill R73. The extent of soil contamination has not been determined.</p>

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Satellite Station A - Petroleum hydrocarbons have been identified in soil and groundwater in the vicinity of A Station. Heavy metals copper, chromium, barium and arsenic are present in soils in the vicinity of Station A.

Satellite Station B - Petroleum hydrocarbons have been identified in soil and groundwater in the vicinity of B Station. Heavy metals chromium, barium and arsenic are present in soils in the vicinity of Station B.

Satellite Station C - Petroleum hydrocarbons and barium, zinc and arsenic have been detected in soils in the vicinity of satellite station C. There is a potential for groundwater contamination also in this area.

Satellite station D - Petroleum hydrocarbons have been detected in soils in the vicinity of D Station. There is a potential for groundwater contamination also in this area.

Satellite Station M - Petroleum hydrocarbons have been detected in soil and groundwater in the vicinity of M Station. Barium has been detected in soil in the vicinity of M Station.

Satellite Station R - Petroleum hydrocarbons have been detected in soil and groundwater in the vicinity of R Station.

Water Flood Station 1, 3 and 5 - Petroleum hydrocarbons and contamination associated with corrosion inhibitors and drilling mud may be present in soil and groundwater at each water flood station.

Restrictions on Use:

Since residual soil contamination remains at the site any soil-disturbing activities should be restricted until the material has been chemically analysed to ensure any remaining contamination does not pose a risk to human health and the environment. As groundwater beneath the site has been shown to be contaminated, groundwater abstraction should be restricted until chemical analyses is undertaken to confirm that it is suitable for its intended use.

Reason for Classification:

This site was reported to the Department of Environment and Conservation (DEC) prior to the commencement of the Contaminated Sites Act 2003. The site classification is based on information submitted to the Department between December 1997 and November 2006.

Barrow Island is a Class A Nature Reserve (Reserve No. 11648) which has been the site of an active oilfield since 1964, an industry that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2001).

Historical practices within the oil and gas industry along with the layout of operation and storage facilities on Barrow Island have resulted in a number of areas across the Island impacted by hydrocarbon contamination. DEC is aware of a number of contamination

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assessments for the 13 known areas of hydrocarbon soil and groundwater contamination on Barrow Island as a result of the Barrow Island oilfield operations (BWI oilfield) and there is the potential for other areas of the Island to be impacted by the operations.

Terminal Tanks Facility

A contamination assessment was conducted within the Terminal Tanks Facility as a result of the failure of a product recovery program initiated upon the identification of oil on the watertable during routine shallow drilling in 1981. It is estimated that between 300,000 and 900,000 litres of crude oil may be located above the watertable covering an area of approximately 18 hectares. In 1981 soil beneath the site was identified as being contaminated by total petroleum hydrocarbons at concentrations exceeding the Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003) and 'Dutch C Guidelines for Soil and Groundwater Protection' (Dutch Environmental Law, 1993). The current status of soil contamination is unknown and further investigations should be completed to determine the nature and extent of soil contamination at the site and appropriate remediation strategies.

Groundwater investigations identified a phase separated hydrocarbon plume and a dissolved phase hydrocarbon plume beneath the Terminal Tanks Facility. Total petroleum hydrocarbons have been detected in groundwater beneath the Terminal Tanks Facility however no guidelines are currently available for these compounds. Total polycyclic aromatic hydrocarbons have been detected in groundwater, at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003)) and 'WA Water Quality Guidelines for Fresh and Marine Waters, Summary Guidelines for the Protection of Aquatic Ecosystems' (Environmental Protection Authority of WA, 1993).

The current Site Management Plan for the Terminal Tanks Facility involves a product recovery system, biannual groundwater monitoring program and biennial nearshore marine environment monitoring. Approximately 571 litres of crude oil per year is being extracted from beneath the Terminal Tanks Facility from the product recovery system. Groundwater monitoring results from May 2006 and August 2006 reported by Chevron in their Annual Environmental Report (July 2005 - June 2006) identified total petroleum hydrocarbons in a number of coastal monitoring bores adjacent to the high tide water mark indicating that the plume is migrating towards the marine/coastal environment. The Terminal Tanks Facility also contains a bioremediation facility which has been in operation since 1998 to remediate hydrocarbon contaminated soils and tank bottom sludges associated with the operation of the BWI oilfield.

Airport Facility

A contamination assessment was conducted on the Barrow Island Airport Facility following the detection of aviation fuel losses in 1997 during a routine site assessment. Investigations identified a phase separated hydrocarbon plume beneath the Airport apron and a dissolved phase hydrocarbon plume adjacent to the aircraft hanger. Total petroleum hydrocarbons have been detected in groundwater in the vicinity of the Airport Facility;

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however no guidelines are currently available for these compounds. The full extent of soil and groundwater hydrocarbon contamination at this site is unknown. An oil recovery system was trialled between 1998 and 2001 and a total of 6,272 litres of aviation fuel was recovered during this time. A Site Management Plan for this site has been developed which outlines a proposed phase separated hydrocarbon recovery system and ongoing groundwater monitoring program to confirm the extent of groundwater contamination at the site and potential impacts to marine environment. Further investigation of the extent of soil contamination at the site is currently being conducted.

B34 Flowline Leak

A contamination assessment was conducted at B34 oil well site following the report of a flowline leak of approximately 500 litres of crude oil and 300 litres of saline water, 150 metres west of the B34 well site. The flowline leak site is located approximately 40 metres north of Bandicoot Bay on the southern portion of the Island. Total petroleum hydrocarbons have been detected in soil at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Dissolved phase hydrocarbons and phase separated hydrocarbons have been detected in groundwater in the vicinity of B34 well site. Total petroleum hydrocarbons have been detected in groundwater in the vicinity of B34 leak site; however no guidelines are currently available for these compounds. Total polycyclic aromatic hydrocarbons have been detected in groundwater in close proximity of B34 Well Site, at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). The proposed remediation strategy for the site is in situ remediation of groundwater by monitored natural attenuation, which is currently being reviewed by DEC.

Z56m Flowline Leak

A contamination assessment was conducted upon detection of a flowline leak in May 2001, approximately 800 metres south of the Z56m lease area. Approximately 20,000 litres of oil and 14,304 litres of saline water leaked over an area of 300 square metres. The site is approximately 500 metres southeast of Whites Beach and 400 metres southeast of a natural groundwater seep. The area was initially treated with gypsum and nitrogen to enhance bioremediation. Initial soil investigations have estimated that 20 cubic metres of surface soil (0.0 - 0.1 metres) contain total petroleum hydrocarbon concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). Residual soil contamination remains in situ to a depth of 0.1 metre however the impact of hydrocarbon contamination to underlying limestone has not been determined.

Groundwater investigations at the site have detected a phase separated hydrocarbon plume (PSH) covering an area of approximately 7000 square metres with a thickness of 0.25 metres. A dissolved phase hydrocarbon plume has been detected at a distance of 20 metres down gradient of the edge of the PSH plume. Total petroleum hydrocarbons have

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been detected in groundwater in the vicinity of the Z56m flowline leak; however no guidelines are currently available for these compounds. Total polycyclic aromatic hydrocarbons have been detected in groundwater at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). In 2002 product recovery trials were initiated from two wells utilising a vacuum truck, however significant product recovery was not considered feasible. Proposed remediation strategies for the site are passive removal of phase separated hydrocarbons, currently being trialled at the site, and in situ remediation of groundwater by monitored natural attenuation. Additional monitoring wells will also be installed if the PSH plume moves out of the existing network and active remedial options will be investigated where the plume poses a risk to the natural groundwater seep and/or Whites Beach. These options are currently being reviewed by DEC.

L71 Liquid Waste Evaporation Facility

A contamination assessment was conducted upon detection of a leaking seal between the concrete washdown pad and the first stage of the drainage ponds at L71, in November 2001. This leak impacted 18 square metres of soil, however the extent of soil contamination has not been determined.

Groundwater investigations and ongoing monitoring as required by the EP licence detected the presence of total petroleum hydrocarbons and xylene; however no guidelines are currently available for these compounds. The presence of heavy metals including arsenic, copper, mercury, nickel, lead and zinc were also detected at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). This facility is currently monitored on a quarterly basis as part of the Barrow Island Groundwater Monitoring Plan as a requirement of the Environmental Protection Act (EP licence).

R73 Inert Landfill Disposal Site

A contamination assessment was conducted to determine potential groundwater impacts associated with the landfill operations. The assessment did not include any soil samples and therefore the current status of soil contamination at the site is unknown.

Groundwater investigations and ongoing monitoring as required by the EP licence revealed the presence of heavy metals copper, lead, and zinc at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). Total petroleum hydrocarbons were detected in May 2006; however no guidelines are currently available for these compounds. This facility is currently monitored on a quarterly basis as part of the Barrow Island Groundwater Monitoring Plan as a requirement of the EP licence.

Satellite Stations

Contamination assessments were conducted at these stations as part of the Satellite Stations rationalisation program. The rationalisation involved the removal of separator

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vessels, standby tanks and other infrastructure, with manifolds, pipework and limited tankage remaining in use at each site. All excavated contaminated soil was transported to the Terminal Tanks Bioremediation Facility on the Island for remediation. Backfill material, utilised as fill material for any excavation areas, contained levels of chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Satellite Station A

Station A is located within G block and sited approximately three kilometres north of Bandicoot Bay and five kilometres east of the BWI west coast. Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons, barium, chromium, lead and zinc at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works were conducted in December 2004 and October 2005 and involved the excavation of approximately 13,251 cubic metres of soil from the A Station area. Further excavations could not be completed due to the underlying limestone geology and close proximity of existing infrastructure. Residual hydrocarbons have been detected in limestone below the A Station area. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons, chromium, copper, arsenic and barium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site is required to be delineated.

Groundwater investigations detected a phase separated hydrocarbon plume (PSH) with an estimated thickness ranging from 0.06 metres to 0.27 metres and a dissolved phase hydrocarbon plume beneath A Station. Total petroleum hydrocarbons, ethylbenzene and xylene have been detected in groundwater; however no guidelines are currently available for these compounds. Total polycyclic aromatic hydrocarbons have been detected in groundwater in close proximity to A Station, at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). Further groundwater investigations are required to determine the nature and extent of hydrocarbon contamination in groundwater in the vicinity of A Station and appropriate remediation strategies.

Satellite Station B

Station B is located within F block and sited approximately six kilometres from the east, west and south coasts of BWI. Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons, barium and chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works were conducted in December 2003 and September 2005, involving the

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excavation of approximately 5,357 cubic metres of soil from the B Station area. Further excavations could not be completed due to the underlying limestone geology of the area. Residual hydrocarbons have been detected in limestone below the B Station area. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons, chromium, arsenic and barium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site should be delineated.

Groundwater investigations detected a phase separated hydrocarbon plume with an estimated thickness ranging from 0.380 metres to 0.844 metres. Further investigations are required to determine the extent of hydrocarbon contamination in groundwater beneath B Station and appropriate remediation strategies.

Satellite Station C

Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons and chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works conducted throughout 2005 involved the removal of approximately 2300 cubic metres of soil from the facility footprint to the level of the underlying limestone. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, zinc, barium and arsenic at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site should be delineated prior to the scheduled station rebuild.

Groundwater investigations have not been conducted at this station and therefore the current status of groundwater is unknown and groundwater investigations are required.

Satellite Station D

Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons and chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works conducted throughout 2005 involved the removal of approximately 500 cubic metres of soil from the facility footprint to the level of the underlying limestone. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site should be delineated prior to the scheduled Station rebuild.

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Groundwater investigations have not been conducted at this station and therefore the current status of groundwater is unknown and groundwater investigations are required.

Satellite Station M

Station M is located within B block and sited approximately 600 metres north of Bandicoot Bay. Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons, barium, chromium, copper, nickel and zinc at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works conducted in December 2003 and October 2005 involving the excavation of approximately 7,918 cubic metres of soil from the M Station area. Further excavations could not be completed due to the underlying limestone geology of the area. Residual hydrocarbons have been detected in limestone below the M Station area. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons and barium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site is required to be delineated.

Groundwater investigations detected a phase separated hydrocarbon plume with an estimated thickness of 0.01 metre. Total petroleum hydrocarbons, ethylbenzene and xylene have been detected in groundwater, however no guidelines are currently available for these compounds. Total polycyclic aromatic hydrocarbon have been detected in groundwater in close proximity to M Station, at concentrations exceeding the current Aquatic Ecosystems - Fresh/Marine guidelines as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, (2003). Further groundwater investigations are required to determine the nature and extent of hydrocarbon contamination in groundwater in the vicinity of M Station and appropriate remediation strategies.

Satellite Station R

Station R is located within Q block and sited approximately three kilometres east of Turtle Bay. Soil investigations conducted in October 2003 identified the presence of total petroleum hydrocarbons and chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment, 2003).

Remedial works conducted in December 2003 and September 2005 involving the excavation of approximately 1,982 cubic metres of soil from the R Station area. Further excavations could not be completed due to the underlying limestone geology and close proximity of existing infrastructure. Residual hydrocarbons have been detected in limestone below the R Station area. Validation samples collected following excavations revealed the presence of total petroleum hydrocarbons and chromium at concentrations exceeding the current Ecological Investigation Levels, as published in 'Assessment Levels for Soil,

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Sediment and Water' (Department of Environment, 2003). The extent of residual soil contamination at the site is required to be delineated.

Groundwater investigations detected total petroleum hydrocarbons; however no guidelines are currently available for these compounds. Biannual groundwater monitoring is currently being undertaken at R Station. Further groundwater investigations are required to determine the nature and extent of hydrocarbon contamination in groundwater in the vicinity of R Station and appropriate remediation strategies.

Water Flood Stations No. 1, 3 and 5

A contamination assessment was conducted at three water flood stations to determine the potential impacts to soil and groundwater from these decommissioned stations. These three water flood stations form part of a closed network of water extraction and water injection wells used for increasing oil production on BWI. Preliminary investigations have revealed that total petroleum hydrocarbons and contamination associated with corrosion inhibitors and drilling mud may be present in soil and groundwater at each water flood station. The preliminary investigation is currently being reviewed by DEC.

As this site has 13 known areas of contamination, and remediation is required to ensure a risk to human health, the environment or any environmental value is not present, the site is classified as 'contaminated - remediation required'.

Since residual soil contamination remains at the site any soil-disturbing activities should be restricted until the material has been chemically analysed to ensure any remaining contamination does not pose a risk to human health and the environment. As groundwater beneath the site has been shown to be contaminated, groundwater abstraction should be restricted until chemical analyses is undertaken to confirm that it is suitable for its intended use.

The Department of Environment and Conservation has classified this site based on the information available at the time of classification. It is acknowledged that the contamination status is likely to have changed since initial investigations, and as such the usefulness of this information may be limited. If groundwater is likely to be abstracted, in accordance with Department of Health advice, the Department of Environment and Conservation recommends that analytical testing of groundwater should be undertaken to confirm that it is suitable for its intended use.

Under the Contaminated Sites Act 2003, this site has been classified as "Contaminated - remediation required". For further information on the contamination status of this site, please contact the Contaminated Sites Branch of the Department of Environment & Conservation.

Type of Regulatory Notice: Nil

Date Issued: Nil

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General

No other information relating to this parcel.

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