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8. LAND CONTAMINATION

This section addresses Section 3.2.5 of the ToR. It describes the relevant State and Federal regulatory frameworks, the identified potentially contaminated sites within the Project area, the impacts of the Project in relation to these matters, and mitigation measures to manage potential impacts. This desktop contaminated land investigation has identified potentially contaminated sites based on a search of contaminated land databases, a review of current and historical aerial photography and an unexploded ordnance map search. A site inspection will be required to confirm the presence of these sites and to enable a schedule for further investigations to be developed.

8.1. Description of environmental situation

8.1.1. Regulatory framework

Legislative requirements covering contaminated land in Queensland are primarily contained in the *Environmental Protection Act 1994* (EP Act) and subordinate policies and regulations. The methodology used in this assessment is based largely on the following guidelines:

- The National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council 1999 ("the NEPM Guidelines"); and
- Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland, Department of Environment, 1998 ("the Draft Guidelines").

These guidelines provide a framework for assessing and managing contaminated soil and/or groundwater based on an evaluation of three components in the risk chain, identified below. Each of these components must be present and form a pollutant linkage for a risk to exist:

a) contamination (source): Soil and/or groundwater contamination must be present. Contamination is the release of a hazardous contaminant into the environment that is likely to cause serious or material environmental harm because of its physical, chemical, infectious characteristics or concentration;

b) receptors: Humans and/or a receiving environment must be present and be potentially impacted by the identified contaminants; and

c) pathways: The contamination must be able to contact receptors by means such as:
   - humans – e.g. ingestion, skin contact, inhalation; and
   - environment – e.g. seepage into waterways, wind-blown deposition on plants, root uptake, ingestion, skin contact and inhalation by various life forms.

In June 2007, the National Environment Protection Council (NEPC) initiated a variation to the NEPM which is currently undergoing public consultation. Once the variation is accepted by the Department of Environment and Resource Management (DERM), the new guidelines will require consideration during any remediation required prior to construction.

8.1.2. Methodology

This investigation has defined the dam and surrounds as land which includes the water storage area, the clay extraction areas, the dam construction area and road construction areas. Land investigated along the pipeline route is defined by a 300 m buffer either side of the proposed trunk pipeline.

A desktop study was undertaken to identify, where possible, sites within the Project area with the potential for contamination and included a review of:

- DERM's Environmental Management Register (EMR) and Contaminated Land Register (CLR);
- recent aerial photography for the dam and surrounds and pipeline route (2004);
- historic aerial photography for the dam and surrounds; and
- residual Unexploded Ordnance (UXO) potential based on maps from Department of Defence (DoD).

Following the completion of the desktop study, a qualitative risk assessment was undertaken to establish the need for further investigation, and identify appropriate mitigation measures. A schedule of further investigation, as required, has been developed and is described in Section 8.2.

8.1.2.1. EMR/CLR review

The principal source of land-use planning data for contaminated land in Queensland is the EMR/CLR database administered by DERM. The EMR is a land-use planning and management register for land that has been or is being used for a notifiable activity, or has a hazardous contaminant. Notifiable activities are those that are considered by DERM as likely to cause contamination.

The CLR is a register of 'risk' properties which have been identified (through scientific investigation) as contaminated land which is causing or may cause serious environmental harm (Section 17 of the EP Act). Land is recorded on the CLR when scientific investigation shows it is contaminated and action is required to remediate or manage the contamination found on the land.

It is important to note that the EMR does not provide a definitive list of contaminated or potentially contaminated properties. Thus, the absence of a property from the EMR does not necessarily mean that the property has not been used for a notifiable activity or another activity which may result in contamination or is in fact contaminated. Conversely, being listed on the EMR does not necessarily mean that the property is contaminated.

8.1.2.2. Recent and historical aerial photograph review

A review of historical aerial photography was undertaken to identify, where possible, potential land uses within the dam and surrounds with the potential to cause contamination. Post 1950 historical aerial photography from several photo runs was available for the dam and surrounds. A review was also undertaken of recent aerial photography on Google Earth ™ (Cnes/Spot Image, 2004) for the dam and surrounds and the proposed pipeline route.

Land parcels where notifiable activities may have been undertaken or have a hazardous contaminant were identified based on specific information observed in the photography, including but not limited to:

- the presence of stockyards. If identified on a land parcel, it was assumed that the land parcel has the potential for livestock dip or spray race operation to be present, on the basis that the land parcel is being used for grazing activities;
- the presence of farm buildings (e.g. large sheds, buildings, and farm houses). If identified on a land parcel, it was assumed that the land parcel had a high probability of containing chemical and or fuel storage and a septic tank (It should be noted that septic tanks are not a notifiable activity. Septic tanks are considered a public health aspect, and are regulated under the *Public Health Act 2005)*;
- the presence of large disturbed areas. If evident on a land parcel, it was assumed that the land parcel had a high probability of a landfill, farm dump, quarry or mining activities occurring on the property; and
- railway corridors/land.

8.1.2.3. Review of residual unexploded ordnance potential

Land parcels which are known or suspected of having been used for military activity are categorised according to the assessed potential for UXO on that site. The Department of Defence (DoD) has reviewed UXO maps provided for the Project study area and advised on the potential for UXO within the study area. The advice provided by the DoD is summarised in Section 8.1.3.3 and Section 8.1.4.2.

8.1.3. Dam and surrounds

8.1.3.1. EMR/CLR review

Search results for the land parcels within the dam and surrounds identified:

- one land parcel within the 100 yr flood level (flood buffer) was listed on the EMR under the notifiable activity 'Livestock Dip or Spray Race'; and
- no land parcels were listed on the CLR.

8.1.3.2. Current and historical aerial photograph review

Two stockyards were observed within the Full Supply Level (FSL) of the proposed water storage. An additional seven stockyards were identified above (within 325 m horizontal) the FSL. One of the yards was within the flood buffer.

A farm building is present within the FSL that is associated with one of the stockyards. Many farm buildings were identified outside the FSL; the majority of these were located near to the stockyards.

An area of disturbed land was observed in photography from 1984 (Appendix 8-A) in the bend of the river at the western end of the water storage area.

The Glebe Weir Camping Reserve is located on Lot 2 Plan LE284 in the central part of the water storage area. The camp site contains a septic tank however this is unlikely to have resulted in significant contamination and is not a notifiable activity.

The locations of these potentially contaminating activities have been provided in Figure 8-1 and aerial photography of these activities is provided in Appendix 8-A.

8.1.3.3. Review of residual unexploded ordnance potential

No potential for UXO was identified by the DoD, within the dam and surrounds.

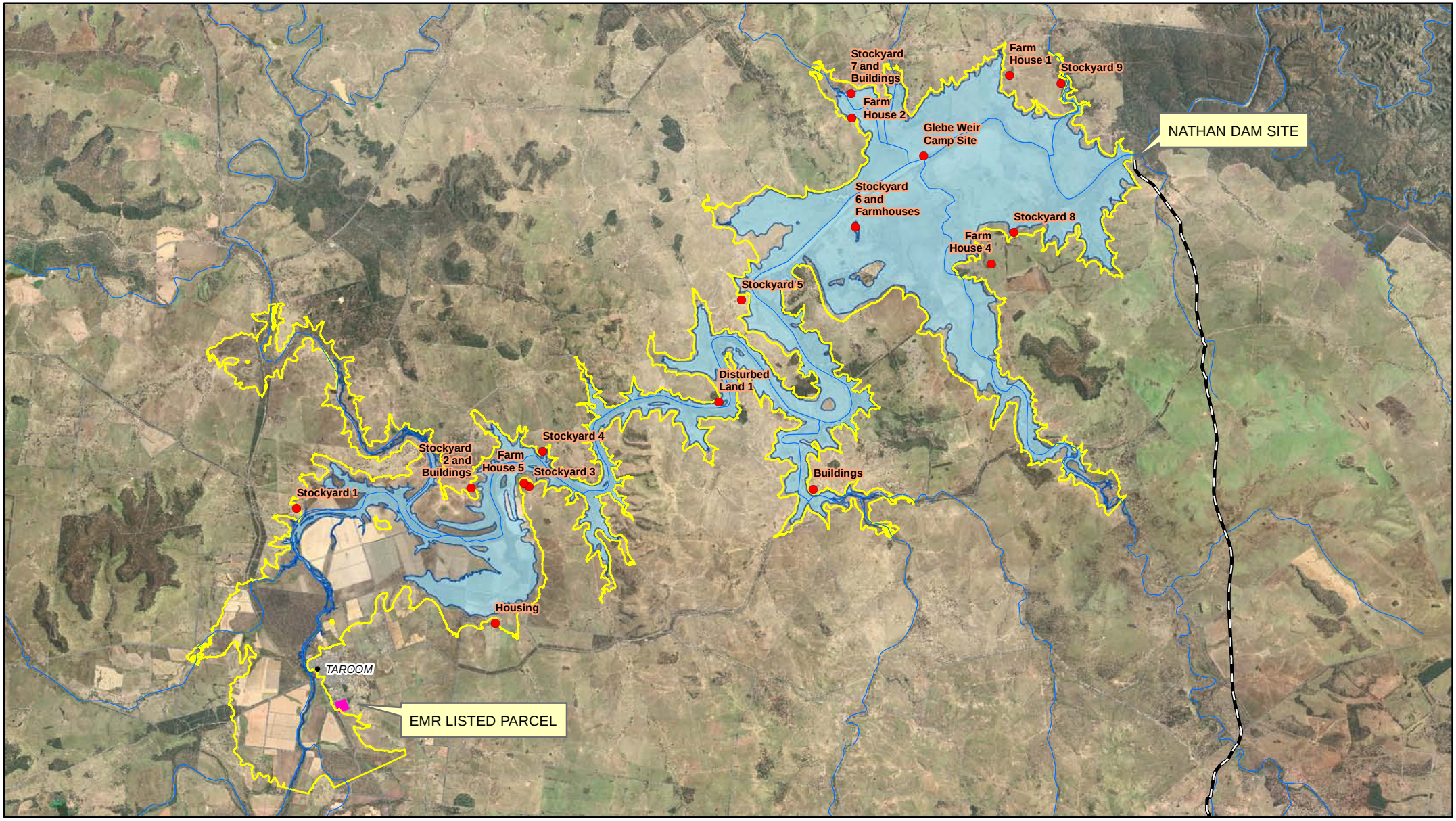
8.1.3.4. Summary of dam and surrounds

Table 8-1 provides a summary of the higher risk sites for each of the land parcels within the dam and surrounds. The locations of the potentially contaminated sites are presented in Figure 8-1.

Table 8-1 Summary of current and historical review for the dam and surrounds

Activity and Map Label	Land Parcel	Listed on EMR/CLR	Location of Potential Notifiable Activity
Livestock Dip or Spray Race	Lot 2 RP32433	Yes	Approximately 950 m east of water storage area and within flood buffer
Stockyard 1	Lot 11 Plan LHDT40331	No	Approximately 325 m west of water storage area and 55 m west from flood buffer
Stockyard 2 and Buildings	Lot 5 Plan LE135	No	Approximately 235 m west from water storage area and 60 m west from flood buffer
Stockyard 3 and Farm House 5	Lot 83 Plan FT 625	No	Approximately 325 m southwest from water storage area and 135m southwest of flood buffer
Stockyard 4 (historical)	Lot 182 Plan SP147005	No	Approximately 85 m north from water storage area and 20 m west from flood buffer
Stockyard 5	Lot 2 Plan LE246	No	Approximately 320 m west from water storage area and 300 m west from flood buffer
Stockyard 6 and Farm House	Lot 15 Plan FT2	No	Within water storage area
Stockyard 7 and Buildings	Lot 2 Plan LE284	No	Within water storage area
Stockyard 8	Lot 14 Plan FT1	No	Approximately 80 m south from water storage area and within flood buffer
Stockyard 9	Lot 9 Plan LE68	No	Approximately 270 m west from water storage area and 220 m west from flood buffer
Disturbed Land 1	Lot 1 Plan LE38	No	Within water storage area
Farm House 1	Lot 9 Plan LE68	No	340 m west of water storage area and 270 m east from flood buffer
Farm House 2	Lot 2 Plan LE284	No	150 m south of water storage area and 100 m southeast from flood buffer
Farm House 4	Lot 14 Plan FT1	No	600 m southeast of water storage area and 480 m southeast from flood buffer

Activity and Map Label	Land Parcel	Listed on EMR/CLR	Location of Potential Notifiable Activity
Buildings	Lot 3 Plan F4037	No	Approximately 250 m east from water storage area and 170 m east from flood buffer
Housing	Lot 2 Plan SP134995 & Lot 1 Plan SP134995	No	Approximately 250 m south from water storage area and 130 m south from flood buffer
Glebe Weir Camping Reserve	Lot 2 Plan LE284	No	Within water storage area



LEGEND

- Towns
- Potential Contaminated Sites
- Proposed Pipeline
- Watercourses
- Full Supply Level (183.5m AHD)
- 1 in 100 AEP Inundation Extent (with Dam)
- Cadastre
- EMR Listed Livestock Dip or Spray Race

Projection: GDA94 Zone 56

Figure 8-1

0 1 2 4
Kilometres

N

Scale 1:200,000 (at A4)

SKM SunWater Making Water Work

NATHAN DAM AND PIPELINES EIS

Location of identified potentially contaminated sites within the dam and surrounds area

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8.1.4. Pipeline

8.1.4.1. EMR/CLR review

A search of the EMR/CLR register was undertaken on land parcels intersected by and adjacent to the 30 m wide pipeline corridor including those which will be used for pump stations and balancing tanks. It should be noted that the actual location of the contaminating activity within the EMR listed land parcels is not known and will be identified during further investigations as discussed in Section 8.2.2. Properties which were listed on the EMR are summarised in Table 8-2.

Table 8-2 DERM information relating to EMR listed sites

Map Label	Land Parcel	Notifiable Activity	Location of Property
Site 1	Lot 48 Plan FT815	Livestock Dip or Spray Race	Adjacent to pipeline route
Site 2a Site 2b	Lot 71 Plan FT952 Lot 164 FT980	Landfill	Intercepted by pipeline route (along parcel boundary)
Site 3	Lot 70 Plan FT237	Livestock Dip or Spray Race	Adjacent to pipeline route
Site 4	Lot 242 Plan SP116402	Petroleum Product or Oil Storage	Intercepted by pipeline route
Site 5	Lot 176 Plan LY010	Livestock Dip or Spray Race	Adjacent to pipeline route
Site 6	Lot 273 Plan SP116408	Hazardous Contaminant	Intercepted by pipeline route
Site 7	Lot 241 Plan SP116406	Hazardous Contaminant	Intercepted by pipeline route
Site 8	Lot 4 Plan RP210311	Chemical Storage	Adjacent to pipeline route
Site 9	Lot 221 Plan SP116405 Lot 201 Plan SP116404	Hazardous Contaminant	Intercepted by pipeline route
Site 10	Lot 161 Plan SP129782 Lot 33 Plan SP134002 Lot 151 Plan SP129781	Hazardous Contaminant	Intercepted by pipeline route
Site 11	Lot 25 RP865876	Petroleum Product or Oil Storage	Adjacent to pipeline route
Site 12	Lot 22 Plan SP133997 Lot 1 Plan SP176725	Hazardous Contaminant	Adjacent pipeline route
Site 13	Lot 305 Plan AG2097	Gun; Pistol or Rifle Range	Intercepted by pipeline route
Site 14	Lot 158 Plan AG4303	Landfill	Intercepted by pipeline route
Site 15	Lot 21 Plan SP122108 Lot 20 Plan SP122106 Lot 178 Plan SP122107	Hazardous Contaminant	Intercepted by pipeline route

8.1.4.2. Review of residual unexploded ordnance potential

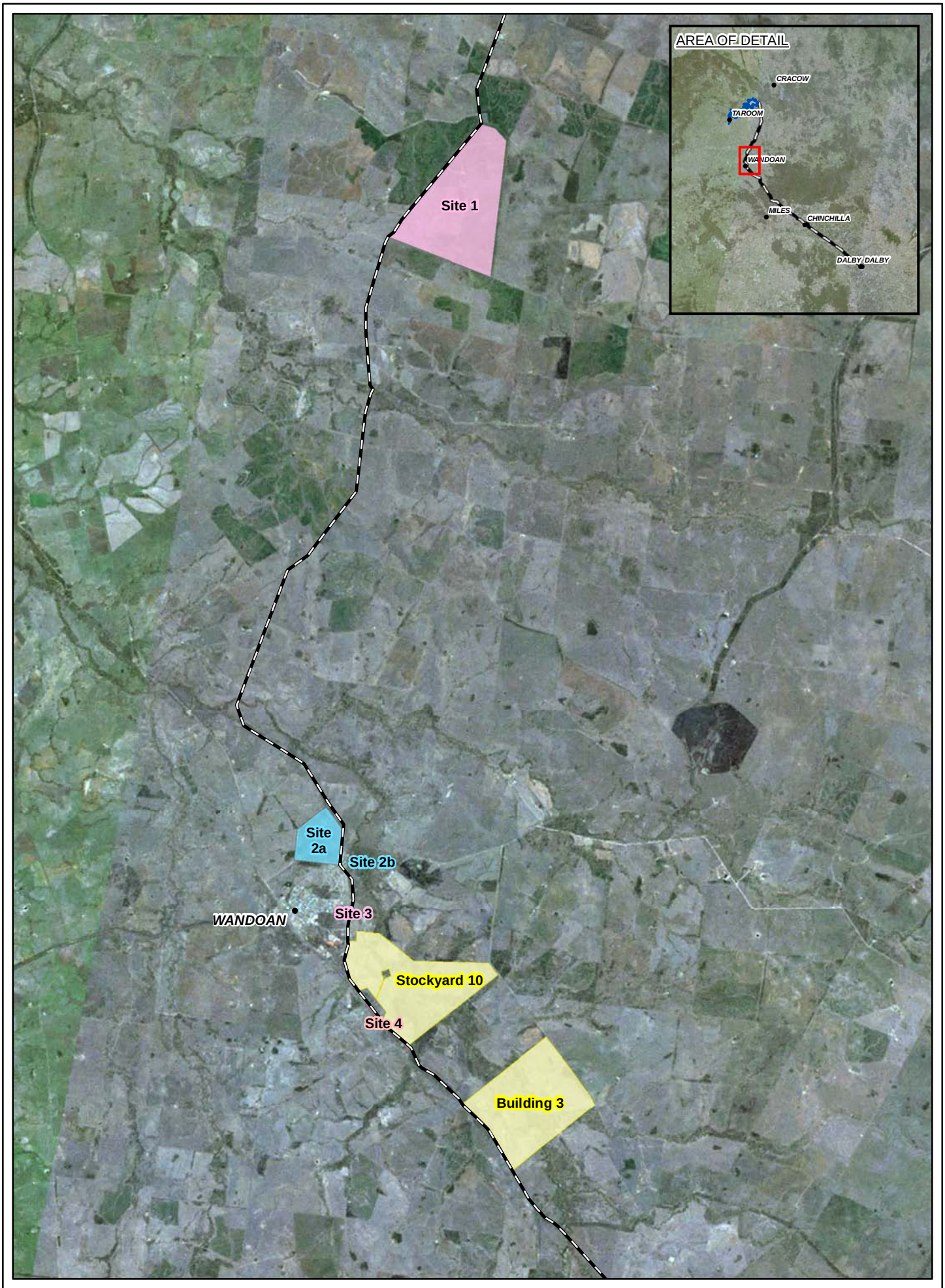
No potential for UXO was identified by the DoD along the pipeline. The closest site is approximately 5 km south-west of Lot 26 Plan BWR178. Its description is "Large Ammo Site WWII Chemical (not Columboola Station)".

8.1.4.3. Summary of pipeline

Table 8-3 provides a summary of the higher risk sites for the land parcels intercepted by the pipeline which are not listed on the EMR/CLR. The locations of the potentially contaminated sites are presented in Figure 8-2A and Figure-8-2B, and aerial photography of these sites is provided in Appendix 8-B.

Table 8-3 Summary of historical review for the pipeline

Activity and map label	Land parcel	Listed on EMR/CLR	Location of property
Stockyard 10	Lot 2 Plan SP106043	No	Intercepted by pipeline route
Building 3	Lot 2 Plan FT913	No	Intercepted by pipeline route



LEGEND

- Towns
- Proposed Pipeline
- Full Supply Level (183.5m AHD)
- Historic Contaminated Sites

EMR - Notifiable Activity

- Hazardous Contaminant
- Chemical Storage
- Gun, Pistol or Rifle Range
- Landfill
- Livestock Dip or Spray
- Petroleum Product or Oil Storage

Projection: GDA94 Zone 56

Figure 8-2A

0 0.5 1 2
Kilometres

N

Scale 1:120,000 (at A4)

SKM SunWater Making Water Work

NATHAN DAM AND PIPELINES EIS

Location of identified potentially contaminated sites along the pipeline

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LEGEND

- Towns
- Proposed Pipeline

EMR - Notifiable Activity

- Hazardous Contaminant
- Chemical Storage
- Gun, Pistol or Rifle Range
- Landfill
- Livestock Dip or Spray
- Petroleum Product or Oil Storage

Note: EMR Points shown are indicative of the location of the land parcel listed on the EMR Register.

Projection: GDA94 Zone 56

Figure 8-2B

0 2 4 8
Kilometres

N

Scale 1:350,000 (at A4)

SKM SunWater Making Water Work

NATHAN DAM AND PIPELINES EIS

Location of identified potentially contaminated sites along the pipeline

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8.2. Potential impacts and mitigation measures

Potential contaminated land impacts fall into three categories. These are:

1) potential impacts to construction workers from exposure to contaminated materials during construction;
2) potential impacts to human health and/or the environment from the accidental release of substances during construction or operation; and
3) potential impacts to dam water quality and aquatic organisms from pollutant linkages with contaminated sites during operation of the dam.

The following provides a summary of the potential impacts and mitigation measures associated with the Project for the dam and surrounds and pipeline route.

8.2.1. Impacts

8.2.1.1. Dam and surrounds

No potentially notifiable activities were identified within the dam construction footprint. Therefore contaminated land is not likely to be encountered during the construction of the dam.

Activities with the potential to cause contamination which were identified within the water storage area include stockyards (potential cattle dips), and chemical storage, fuel storage and septic tanks in association with farm buildings which generally have a lower risk of causing contamination. The potential contaminants and risk posed by these sites to the environment are described as follows.

- Cattle dips

Cattle dip sites within and near to the water storage area have the potential to impact on the aquatic organisms and water quality. Potential contaminants associated with the operation of cattle dips include:

- arsenic (As);
- organochlorine pesticides (OCPs, e.g. DDT);
- organophosphate pesticides (OPPs); and
- to a lesser extent synthetic pyrethroids and carbamates.

Of these, arsenic, OCPs, and OPPs are considered to be the key contaminants of concern on the basis that they were more commonly used, and are more persistent in the environment.

Cattle dip sites which are located outside the water storage area also have the potential to impact on water quality and aquatic organisms within the dam. Impacts could be potentially associated with the erosion and deposition of contaminated sediments into the dam, or the leaching and migration of contaminants in groundwater into the dam.

This risk will be influenced by a range of factors including:

- the distance from the contaminated site to FSL;
- the erosion potential of the contaminated site (ground cover and soil stability); and
- the leaching potential of contaminants and groundwater conditions at the site.

Water quality and aquatic fauna surveys did not detect any evidence of contamination or impact in the rivers and creeks of the area so while this does not rule out the potential for future impact, the risk is assessed as low.

Other impacts associated with contaminated sites outside the water storage area (within the land acquisition boundary) include potential impacts to construction worker health and future users of the land due to dermal contact or ingestion of contaminated soil.

- Farm buildings

Potential contaminants of concern that may be associated with chemicals and petroleum products stored in farm buildings include:

- petroleum hydrocarbons, including total petroleum hydrocarbons (TPH) and benzene, toluene, ethyl benzene and xylene (BTEX);
- polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAH);
- phenolic compounds;
- OCPs and OPPs (pesticides); and
- metals such as arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

Buildings and the Glebe Weir Camping Reserve may also contain asbestos and septic tanks.

It is considered that any contamination present within farm buildings would be minor and unlikely to affect water quality post inundation.

- Disturbed land

An area of disturbed land was observed on Lot 1 Plan LE38 and will require visual inspection to ascertain whether the disturbance related to an activity with the potential to cause contamination.

8.2.1.2. Pipeline

Activities with the potential to cause contamination which were on properties intersected by the pipeline included stockyards, and to a lesser extent chemical storage, fuel storage, and septic tanks in association with buildings. Properties with notifiable activities are intersected by the pipeline. The notifiable activities included livestock dips, landfill, petroleum product and oil storage, chemical storage, hazardous contaminant (confirmed contaminated sites), and rifle range.

These notifiable activities are likely to have a confined footprint within the lot on which they reside. Pre-construction inspections will be undertaken to confirm whether the pipeline intersects the part of the lot identified as contaminated.

Contaminated soil and/or groundwater, if encountered at the sites, has the potential to impact on persons involved with pipeline construction (e.g. through dermal contact, ingestion, and inhalation). Where the pipeline is placed directly in contaminated soil and/or groundwater there is potential, under certain circumstances, for contaminants to degrade pipeline seals (e.g. hydrocarbons can attack rubber ring joints).

The potential contaminants associated with the sites intercepted by the pipeline are described as follows.

Cattle dips and farm buildings

Potential contaminants are the same as those discussed in Section 8.2.1.1

Landfills

Potential contaminants of concern associated with landfills are largely associated with the types of waste materials received by the landfill. Potential contaminants associated with landfills include:

- petroleum hydrocarbons, including total petroleum hydrocarbons (TPH) and benzene, toluene, ethyl benzene and xylene (BTEX), and other volatile organic compounds;
- polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAH);
- phenolic compounds;
- OCPs and OPPs;
- metals such as arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc;
- asbestos;
- ammonia and other nutrients;
- organic acids; and
- landfill gases (methane, carbon dioxide, hydrogen sulphide).

Petroleum product and oil storage, chemical storage

Potential contaminants associated with petroleum product and oil storage, and chemical storage will depend on the products or wastes which have been stored. Potential contaminants include:

- petroleum hydrocarbons, including total petroleum hydrocarbons (TPH) and benzene, toluene, ethyl benzene and xylene (BTEX), and other volatile organic compounds;
- polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAH);
- phenolic compounds;

- OCPs and OPPs;
- metals such as arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc; and
- acids and alkalis.

Rifle range

Potential contaminants associated with rifle ranges mainly include lead and to a lesser extent other metals such as chromium, copper, nickel, and zinc.

8.2.2. Mitigation measures

A site inspection of the dam and surrounds and the pipeline will be undertaken to confirm the presence of sites identified in this investigation. Additional sites with the potential for contamination may be identified during this inspection. Further investigations will be undertaken at the identified potentially contaminated sites within the dam and surrounds and along the pipeline based on the requirements of the Draft Guidelines and the NEPM (and amendments to the NEPM approved by DERM). Identified properties will be listed on the EMR in accordance with the EP Act.

An appropriate remediation strategy for the identified contaminated sites will be developed following the completion of further investigations.

There are a number of options for how contaminated sites could be managed. These include:

- do nothing if the site investigation and assessment of risk determines that no action is necessary;
- on-site treatment/remediation to reduce contamination;
- capping of contaminated sites;
- excavation and off-site disposal to an appropriate landfill; and
- excavation and on-site disposal to a suitable location within the Project area, with appropriate engineered controls (e.g. liner, cap).

A decision on an appropriate remediation strategy will be made following further investigation of the sites. A disposal permit from DERM may be required for the offsite disposal of construction spoil originating from land parcels listed on the EMR. Remediation may not include removal of the sites from the EMR.

8.2.3. Unforeseen contamination and prevention of contamination

Should land contamination be encountered or occur as a result of the construction or operation of the Project, appropriate procedures and measures will be put in place for the notification, mitigation, investigation, remediation, and validation of the contaminated land. The procedures are documented in the Draft EMP which is provided in Chapter 29. Detailed procedures will be provided in the construction EMP to be prepared by the construction contractor and operational EMP to be prepared by SunWater.

During the construction and operation of the Project there is potential for land contamination to occur, for example from the accidental spillage of hazardous materials. These materials will be stored appropriately to minimise the risk of environmental impact. Chemical storage will comply with Australian Standards and Material Safety Data Sheets (MSDS)

requirements for the materials being stored. All such documentation will be readily available to employees and contractors.

Smaller quantities of chemicals, fuels and oils will be stored in self-bunded pallets, within a bunded area in the workshop, or in a bunded container on the site. Bulk quantities of diesel will also be kept in double skinned tanks (self-bunding) or within an appropriately bunded area.

Waste products, (e.g. oil/water separator waste, sludge and residue), will be contained within weatherproofed, sealed and bunded areas to ensure stability of the waste containment receptacles and prevent any leakages or spills causing environmental harm to soils, surface water or groundwater. Regular inspections will be carried out of the tanks, bunds and storage areas to maintain their integrity.

It should be noted that storage of hydrocarbons and/ or large quantities of chemicals associated with construction and operation of the Project may result in the site being listed on the EMR.

The following provides an outline of the mitigation measures that will be undertaken, to reduce risk to human and health and the environment, during the construction phase of the Project:

- preparation of a Construction Occupational Health and Safety Plan (OH&S Plan) by the construction contractor which includes measures to manage exposure of construction workers to potential contaminants in soil and/or water; for example through the wearing of personal protective equipment and the control of dust during construction; and
- preparation of a Contaminated Land Management Procedure prior to the commencement of construction which includes, but is not limited to:
  - identification of the likely forms of contamination that could occur during the Project (fuels, oils, paints, etc.)
  - procedures for appropriate storage of hazardous materials in compliance with relevant standards;
  - the prevention of land contamination during construction;
  - the identification, investigation and management of unforeseen contamination;
  - spill response and remediation;
  - listing properties on the EMR in accordance with the EP Act;
  - the management, remediation and disposal of contaminated soil and/or spoil generated from properties listed on the EMR/CLR;
  - post construction management and/or monitoring requirements; and
  - as required, approval and disposal permits will be obtained from DERM for the removal of contaminated soil in accordance with the EP Act.

8.2.4. Impact assessment and residual risks

This section provides a qualitative assessment of the potential risk from contaminated land, and the mitigation measures proposed to minimise those risks.

The methodology used for risk assessment and management is discussed in Section 1.8. The risk assessment is of the Project as described in Chapter 2, in which a range of risk reduction and mitigation measures have been incorporated. Table 8-4 presents the assessment of both the risks with controls and the residual risks after mitigation.

Based on this assessment, the following conclusions are made:

- while the construction and operation of the Project will use products and produce wastes that pose a potential risk to the environment, appropriate management of these materials will reduce the risk to Low;
- feasible management actions to minimise contamination risks are described and these will be reflected in the Construction EMP (Chapter 29) and/or the Proponent commitments (Appendix 30-A); and
- based on this risk assessment, the impacts to the environment from potentially contaminated land can be effectively managed and the residual risk is acceptable.

Table 8-4 Risk assessment results - construction

Hazards	Factors	Impacts	Project Description Controls & Standard Industry Practice	Risk with controls			Additional Mitigation Measures	Mitigation effectiveness	Residual risk		
				C	L	Current risk			C	L	Mitigated risk
Contact/exposure to potentially contaminated material.	Notifiable activities have not been identified within construction areas.	Persons involved with construction have the potential to be exposed to contaminants in disturbed soil.	The OH&S Plan to contain procedures for potential worker exposure protection including ingestion of soil and inhalation of dust. The EMP to contain procedures for the correct disposal of any potentially contaminated soil, if encountered, during excavation activities.	Minor	Unlikely	Low	Where potentially contaminated soil is encountered, materials will be managed in accordance with the Draft Guidelines and in consultation with DERM.	Significant	Minor	Rare	Low

Hazards	Factors	Impacts	Project Description Controls & Standard Industry Practice	Risk with controls			Additional Mitigation Measures	Mitigation effectiveness	Residual risk		
				C	L	Current risk			C	L	Mitigated risk
Soil, groundwater and surface water contamination from spillage or on-site disposal of contaminants during dam and pipeline construction.	Possible chemical spillage during construction of the Project.	Contamination is likely to be limited in extent in areas where spillage/leakage is likely to occur (e.g. machinery workshops and storage sheds).	Management of hazardous materials will be in accordance with Australian Standards and guidelines (e.g. DERM Guidelines and MSDS). Should a significant spill occur, DERM will be notified, and the site will be investigated and appropriately managed in accordance with the EP Act 1994. Wastewater from areas potentially containing contaminants (e.g. washdown and workshop areas), will be contained and directed to detention ponds.	Minor	Unlikely	Low			Minor	Unlikely	Low

Table 8-5 Risk assessment results - operations

Hazards	Factors	Impacts	Project Description Controls & Standard Industry Practice	Risk with controls			Additional Mitigation measures	Mitigation effectiveness	Residual risk		
				C	L	Current risk			C	L	Mitigated risk
Contamination of dam water supply following inundation.	Residual impacts from earlier construction activities. Residual impacts from inundation of contaminated sites within FSL.	If actual contamination is confirmed at any currently identified potentially contaminated sites, it could pose a risk to the environment.	Potentially contaminated sites will be investigated and managed if necessary prior to inundation. Schedule of further investigation and remediation/management activities that will be conducted through staged approach based on the Draft Guidelines and in consultation with DERM.	Minor	Unlikely	Low			Minor	Unlikely	Low

Hazards	Factors	Impacts	Project Description Controls & Standard Industry Practice	Risk with controls			Additional Mitigation measures	Mitigation effectiveness	Residual risk		
				C	L	Current risk			C	L	Mitigated risk
Limitation to land use surrounding the dam.	Residual impacts from earlier construction activities.	Contamination at identified potentially contaminated sites would not be widespread.	Potentially contaminated sites have been indentified outside the water storage area (within the land purchase boundary).	Minor	Unlikely	Low			Minor	Unlikely	Low
		Contamination is unlikely to affect land use.	Schedule of further investigation and remediation/management activities that will be conducted through staged approach based on the Draft Guidelines and in consultation with DERM.								

8.2.4.1. Cumulative risks

On the basis that the Project will not result in the contamination of land, it is unlikely that there would be detrimental impacts to the condition of the land within the Project area providing that the Environmental Management Plan (EMP) is followed during construction. The Project will involve the remediation of land where required which would be of benefit to the environment and future site users.

8.3. Summary

The EIS identified one land parcel intersected by the flood buffer that contains a cattle dip or spray race that is listed on the EMR. In addition, seven potential cattle dip sites and seven groups of farm buildings outside of the water storage area have the potential for contamination. Two of the potential cattle dip sites were located within the FSL and one potential cattle dip site was located within the flood buffer. Two farm buildings were located within the FSL. An area of disturbed land was located within the FSL. No sites were identified within the dam construction area. Further investigation of these sites will be undertaken to establish the extent and significance of contamination and remediation requirements.

The pipeline intersects nine properties listed on the EMR for notifiable activities including:

- livestock dip or spray race;
- landfill;
- petroleum product or oil storage;
- chemical storage;
- hazardous contaminant; and
- gun, pistol or rifle range.

A site inspection of the dam and surrounds, the pipeline and associated infrastructure will be undertaken to identify sites with the potential for contamination which may not have been identified within the scope of this study. Further investigations will be undertaken at the identified potentially contaminated sites within the dam and surrounds and the pipeline based on the requirements of the Draft Guidelines Draft Guidelines and the NEPM (and amendments to the NEPM approved by DERM). Identified properties will be listed on the EMR in accordance with the EP Act.

Identified properties will be listed on the EMR in accordance with the EP Act.

If required, remediation of contaminated sites will be undertaken prior to inundation of the water storage area or construction of the pipeline. Remediation may not include removal of the sites from the EMR.

If required, disposal permits will be obtained from DERM for the removal of contaminated soil in accordance with the EP Act.

A Draft EMP has been prepared which includes measures to prevent the contamination of land and water, and the management of unforeseen contamination. The risks to human health and the environment during construction are detailed in Table 8-5. A construction health and safety plan will be prepared to manage exposure to potentially contaminated sites during construction following the completion of further investigations of the potentially contaminated sites.