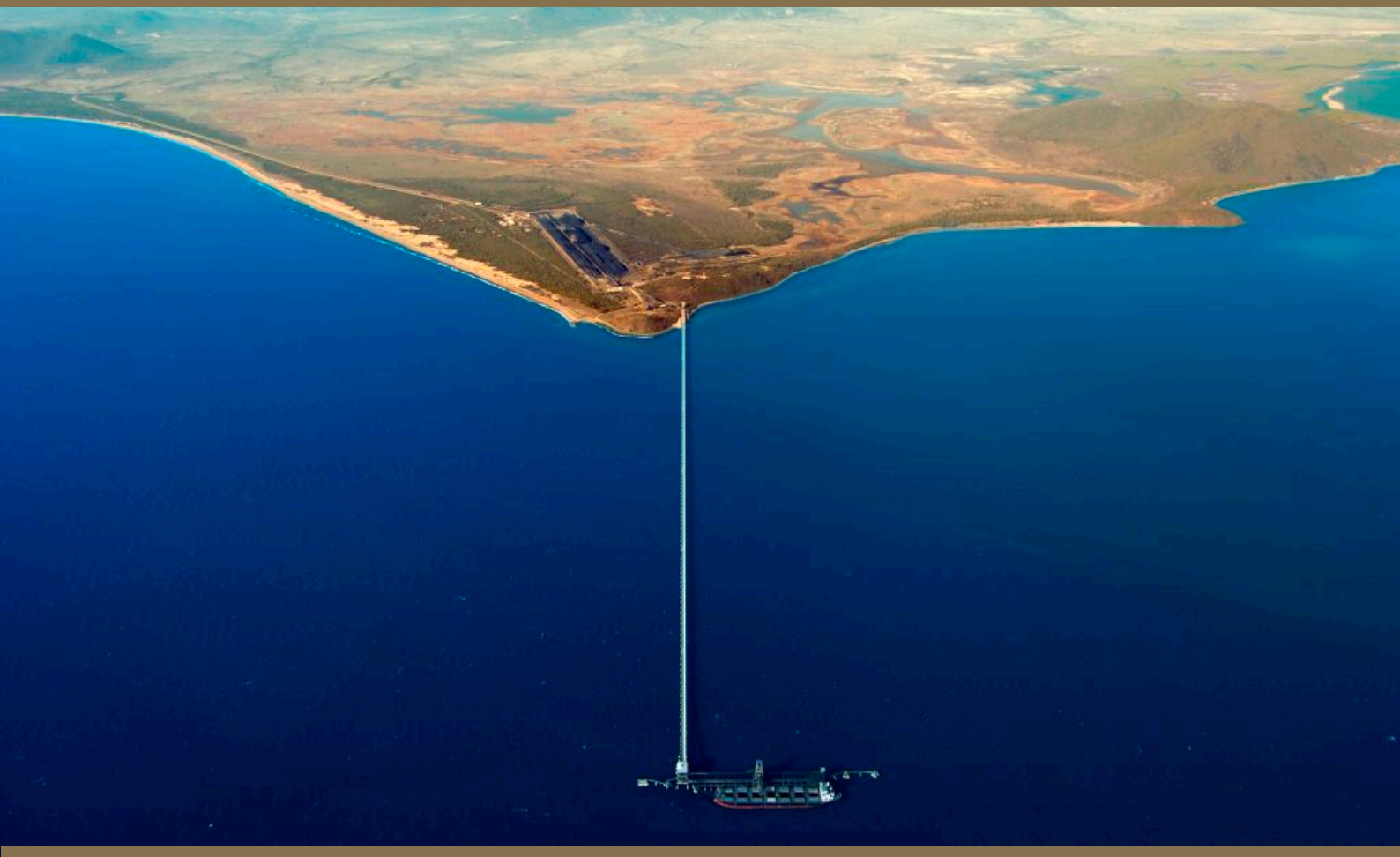
Appendix D

DMCP Consequence Category Assessment



Advisian
WorleyParsons Group

Queensland Government

TECHNICAL MEMORANDUM

DATE 22 July 2015 **PROJECT No.** 1525905-017-TM-Rev0

TO Project Manager
Department of State Development

ABBOT POINT GROWTH GATEWAY
DEHP CONSEQUENCE CATEGORY ASSESSMENT OF THE
DREDGED MATERIAL CONTAINMENT PONDS

Consequence Category Assessment

The Consequence Category Assessment (CCA) of the proposed dredged material containment ponds (DMCP) located within the Abbot Point Growth Gateway referral area was carried out in accordance with the recently revised *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*[1] (The Manual). The result of the CCA guides the DMCP design requirements and will be an input into the project environmental risk assessment.

The proposed capital dredging for T0 at Abbot Point is expected to remove approximately 1,050,000 m^3 of in-situ seabed material. Onshore storage of dredged material will require the construction of the DMCP to contain the bulked material and to treat the tailwater to a standard where it can be discharged back to the ocean.

The DMCP involves excavation of in-situ material and placement as an earth embankment with geomembrane liner installed on the inside batters. The DMCP is intended to be operated with dredged material and associated seawater for the duration of dredging, expected to be for a period of 3-4 months. Post-dredging, the DMCP embankments and the dredged material landform will be reconfigured such that the stormwater is directed approximately as per pre-DMCP landform hydrology.

Accordingly, due to the short duration of operating life, the DMCP is not a typical case for consequence category assessment, and has been considered from a perspective of good engineering practice.

Documentation and Data

The following documentation/data was considered:

1) CDM Smith, 2013, Final Environmental Impact Statement Volume 1

2) Australian Government Department of the Environment, 2014. *Protected Matters Interactive Mapping System*, available at http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protectedl accessed November 2014.

3) Queensland Government Department of State Development, Infrastructure and Planning, 2014. *SPP Interactive Mapping System*, available at http://www.dsdip.qld.gov.au/about-planning/spp-mapping-online-system.html accessed November 2014.

[1] Department of Environmental and Heritage Protection (DEHP), 2014. *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures,* EM635 Version 4. Queensland.

Golder Associates Pty Ltd
147 Coronation Drive, Toowong, Queensland 4066, Australia (PO Box 1734, Milton BC, QLD 4064)
Tel: +61 7 3721 5400 Fax: +61 7 3721 5401 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America
A.B.N. 64 006 107 857

4) Australian Government Department of Sustainability, Environment, Water, Population and Communities, Referral of Proposed Action: Abbot Point Growth Gateway Project, April 2015.

Failure Event Scenarios

The consequence category of the structure was assessed against the following failure event scenarios:

- **Failure to contain – seepage** – spills or releases to ground and/or groundwater via seepage from the floor and/or sides of the DMCP embankment.
- **Failure to contain – overtopping** – spills or releases from the DMCP that result from loss of containment due to overtopping and/or sides of the DMCP embankment.
- **Dam break** – collapse of the DMCP embankment due to any possible cause.

The consequence category of each failure event scenario was determined by assessing the environmental harms in Table 1 of the Manual.

Environmental Harms

Harm to Humans

The potential risk associated with harm to humans was assessed with regards to the surrounding land uses and also downstream water users for the sites. The downstream land is state-owned and unoccupied. There are no surface water supply sources within the downstream vicinity, according to visual inspection of aerial photography.

There is one groundwater borehole within the downstream region that is registered with the Queensland Department of Natural Resources and Mines' (DNRM) online database[2]. The purpose of the borehole is not specified, however it is unlikely to be for water supply. The register number of the borehole is 125271.

Therefore, failure of the structure is unlikely to contaminate any water sources for water consumption.

General Environmental Harm

General environmental harm was assessed by considering the potential for contamination of Significant Values such as aquatic ecosystems, flora, fauna and groundwater within the environment surrounding the DMCP. Commonwealth and Queensland mapping of significant environmental features were used to characterise the environmental values downstream of the structure.

The structure is to be located adjacent to the 'Abbot Point – Caley Valley' nationally important wetland area. The wetland is a complex of subtidal and intertidal marine and estuarine wetlands, with a large fresh and brackish water wetland within and artificial impoundment occurring closest to the structure. The wetland provides important habitat for migratory and other water birds, and the vulnerable Australian Painted Snipe and also supports ecosystems important for fisheries.

Approximately 7 km downstream from the structure, the wetland flows into the waters of the Great Barrier Reef World Heritage Area.

There are no threatened Commonwealth or Queensland ecosystems located downstream of the structure; however all native plants within the wetland are classified as Marine Plants and are protected under the Queensland *Fisheries Act 1994*.

The consequence category assessment has found that a failure to contain seepage from the facility, or overtopping of the facility during high flow events would not result in consequences of significant environmental harm. This is based on consideration of:

- Installation of a pond liner on the embankment walls, such that seepage volumes will be minimal and unlikely to enter areas of ecological value
- Pond design, including freeboard, to contain a 1 in 20 year ARI event.

[2] https://www.business.qld.gov.au/business/support-tools-grants/services/mapping-data-imagery/queensland-globe/coal-seam-gas (Accessed July 2015)

The assessment has found that a dambreak failure would likely result in significant environmental harm, specifically adverse effects on the downstream wetlands due to scouring, the mobilisation of contained solids and subsequent deposition of those solids in the wetland. In relation to mobilization of solids, it is noted that the pond base (RL 3.0m RL) is generally below natural ground level which ranges from:

- 2.5m to 4.5m RL along the western embankment
- 3.0 to 5.5 m RL along the southern embankment.

As a result, a failure in the pond embankments is unlikely to result in a complete loss of sediments from the pond.

There is a significant proportion of the natural ground outside the southern and western embankments which are above the structure's floor elevation. Therefore, the effects of a dambreak occurring at these locations of higher elevation are likely to be reduced due embankment failure resulting in only a portion of the total contained solids being mobilised.

There is one groundwater borehole within the downstream region that is registered with the Queensland Department of Natural Resources and Mines' (DNRM) online database[3]. In the event of a dam failure, groundwater contamination through the borehole is possible, albeit unlikely. The register number of the borehole is 125271.

General Economic Losses or Property Damage

General economic losses or property damage was assessed by examining the location with respect to third party assets downstream of the hydraulic structure, which may be potentially damaged in a failure event scenario.

Infrastructure that would likely be affected during a dambreak scenario includes the existing Aurizon rail balloon loop to the east of the structure. The rail line is located directly adjacent to the embankment on the southern end of the structure. Additional major infrastructure that could be affected includes Terminal 1 (T1) adjoining to the existing rail line.

There are existing infrastructure located along the structure's eastern embankment which is associated with T1, and a causeway and associated road to the north-west of the structure could be affected during a dambreak scenario.

Summary Results

The consequence category assessment is tabulated in Attachment A, such assessment being based on the current site knowledge set. The consequence category tables are colour coded to clearly identify the assessment result. A consequence category assessed as significant is coloured orange and a consequence category assessed as low is coloured green.

For each applicable failure event scenario our assessment documents the potential for each of the following to occur:

a) the failure of a structure placing lives at risk due to dwellings or workplaces being in the spill impact reach

b) downstream consequences, including but not limited to, failure of other structures that may be affected by any flooding

c) the consequences of such cascade failure for other structures

d) the impact to both on-site and off-site environmental values

e) long term potential adverse effects due to release of contaminants to groundwater systems and soil profiles

f) potential consequential effects on surface water systems

[3] https://www.business.qld.gov.au/business/support-tools-grants/services/mapping-data-imagery/queensland-globe/coal-seam-gas (Accessed July 2015)

g) storage releases that may chemically interfere with waters used as sources of drinking water.

The structure's consequence category is classified as the highest consequence category determined under any of the assessment criteria for each failure event scenario. The overall consequence category for the DMCP is 'significant,' see Table 1.

Table 1: Consequence Category Summary

	Failure Event Scenario		
Environmental Harm	**Failure to contain - Seepage**	**Failure to contain - Overtopping**	**Dambreak**
Harm to humans	Low	Low	Low
General Environmental Harm	Low	Low	Significant
General Economic Losses or Property Damage	Low	Low	Significant

All structures assigned as 'significant' or 'high' are consequently classified as a regulated structure. The Manual provides criteria for the hydrological performance for regulated structures.

Hydrological Performance Criteria

The hydrological performance objectives for hydraulic structures that are regulated are directly related to the assessed consequence category for each failure event scenario. As such, with the current assessment, the DMCP are only required to satisfy the 'dambreak' performance objectives, see Table 2.

Table 2: Hydrological Performance Requirements

Failure Event Scenario	Consequence Category	Performance Objectives required?[(a)]
Failure to contain - Seepage	Low	No
Failure to contain - Overtopping	Low	No
Dambreak	Significant	Yes

Note: (a) Only structures assigned a 'significant' or 'high' consequence for the specific failure event scenario are subjected to performance objectives

The following sections provide more detail regarding performance objectives.

'Failure to Contain – Seepage' Performance Objectives

Regulated structures must be designed to ensure appropriate containment of contaminants in accordance with a specified standard based on the assessed consequence category of the 'failure to contain – seepage' scenario. Based on the initial assessment of 'low', no mandatory requirements for the design of containment measures, leak detection and monitoring systems as well as provision for rectification apply.

'Failure to Contain – Overtopping' Performance Objectives

Regulated structures must be designed to ensure appropriate containment of contaminants in accordance up to a specified probability of exceedance criteria based on the assessed consequence category of the 'failure to contain – overtopping' scenario.

No performance objectives are required for the DMCP because it is assigned a 'low' consequence. This means there are no mandatory requirements for the Design Storage Allowance (DSA), Extreme Storm Surge (ESS) and Mandatory Reporting Level (MRL) storage values.

'Dambreak' Performance Objectives

Spillways of structures that are regulated structures must be designed so that they can successfully pass a flood event up to specified probability exceedance criteria such that the structure will survive without significant damage.

Performance objectives are required for the DMCP for this scenario because it is assigned a 'significant' consequence, see Table 3.

Table 3: 'Dambreak' Performance Objectives for 'Significant' Consequence Structures

Design Parameter	Criteria
Spillway	1:100 annual exceedance probability (AEP) to 1:1000 AEP
Flood level for embankment crest levels	Spillway design flood peak level + wave run-up allowance for 1:10 AEP wind

SUMMARY

This assessment, based on the knowledge Golder currently has of the site and the DMCP, has indicated the following with regards to design details for the DMCP:

- The initial assessment of 'low' for the 'failure to contain – seepage' scenario indicates that no specific performance requirements for containment systems such as liners are mandated.
- The initial assessment of 'low' for the 'failure to contain – overtopping' scenario indicates that no specific performance requirements for containment of stormwater are mandated. A stormwater management plan for the operational facility incorporating water quality guidelines and associated storage requirements for potential discharge would still need to be compiled and adhered to.
- The initial assessment of 'significant' for the 'dambreak' scenario indicates that specific design criteria for spillway and embankment crest levels are required. These have been assessed by Golder and are documented under separate cover.

MP/RDM/mp

Attachments: Consequence Category Assessment

j:\des\2015\1525905\correspondence out\1525905-017-tm-rev0-dehp consequence category assessment of dmcp.docx

CONSEQUENCE CATEGORY ASSESSMENT

This calculation document follows the methodology outlined in the Department of Environmental and Heritage Protection's (DEHP) *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (Version 4, November 2013).

Author:	MP	**Date:**	17/07/2015
Review:		**Date:**	
File name:	1525905-017-C-Rev0-CCA.xlsx		
Status:	For Use		

1.0 General Details

- Structure name: Abbot Point Beneficial Reuse Area Containment Ponds
- Approx. pond catchment area (ha): 79
- Approx. surface area at full supply (ha): 79
- New or Existing: New

2.0 Summary Assesment Results

Exemption Check

- Structure exempt from requirements of DEHP manual? No — *See section 3.0 of this calculation document for details*

Consequence Categories for Failure Event Scenarios

- 'Failure to contain - seepage': **Low** — *See section 5.1 of this calculation document for details*
- 'Failure to contain - overtopping': **Low** — *See section 5.2 of this calculation document for details*
- 'Dam break': **Significant** — *See section 5.3 of this calculation document for details*

Regulated Structure

- Regulated structure? Yes — *Note: A structure is regulated if at least one consequence cateogory is "high" or "significant*

3.0 Exemption Check

Structures are automatically not exempt from requirements in the manual if they comply with any of the following:

		Yes/No
(a)	More than ten metres in height with a storage capacity of more than 1500 Mega litres (ML).	No
(b)	More than ten metres in height with a storage capacity of more than 750 ML and a catchment area that is, more than three times its maximum surface area at full supply level.	No

Note: See point 3 of Section 1.2 of DEHP Manual

Strucures are exempt from requirements in the manual if they comply with any of the following:

		Yes/No
(a)	Contain waste for no longer than 24 months.	No
(b)	Constructed to contain less than 2.5ML, are not used to contain fracc flowback wastes, and have been constructed to minimise passage of wetting front.	No
(c)	Constructed to contain greater than 2.5ML but less than 5ML, are not used to contain fracc flowback wastes, are constructed to minimise the passage of wetting front and have either a site specific or pro-forma certification of a design plan.	No
(d)	Constructed to contain less than 2.5ML, are used to contain fracc flowback wastes, and have either a site-specific or pro-forma certification of liner (to minimise the passage of the wetting front.	No
(e)	constructed to contain greater than 2.5ML but less than 5ML, are used to contain fracc flowback wastes, and have either a site specific or pro-forma certification of a design plan (which includes containing the wetting front).	No

Note: See Section 1.1 of DEHP Manual

4.0 Hydraulic Performance Criteria

Part 2 of the DEHP manual provides hydraulic performance objectives for structures which are assessed as a regulated structure. The objectives are directly related to the assessed consequence cateogry for each failure event scenario.

4.1 Objectives of failure event scenario: Failure to Contain - Seepage

4.1.1 Hydrological Design Criteria

Consequence Category:	Low	*Only applicable for structures with High and Significant consequence for the 'Failure to Contain - Seepage' scenario*
Applicable to structure?	No	

Design Criteria	Objective
Containment	Consequence category is Low, therefore no objective applicable.
Leak detecting and/or monitoring	Consequence category is Low, therefore no objective applicable.
Rectification	Consequence category is Low, therefore no objective applicable.

Note: *Leak detection and/or monitoring requirements will be required by conditions on the environmental authority. Consistent with the requirements of this table, additional monitoring may also be required For example, groundwater bores may be required to be monitored in the vicinity of some dams ('failure to contain – seepage') if the groundwater systems are identified as potentially at risk, or if there is uncertainty about the impacts from seepage from the regulated dam. Conditions, including conditions about monitoring are imposed under the provisions of the EP Act.*

While rectification measures are not a design requirement, this does not remove any subsequent obligations imposed by the administering authority to require rectification or decommissioning of a dam if dam failure is believed to have caused, or about to cause, environmental harm.

4.1.2 Contaminant Criteria

Consequence Category:	Low	*Only applicable for structures with High consequence for the 'Failure to Contain - Seepage' scenario*
Applicable to structure?	No	

Contaminant	Limit
pH	pH < 5
Electrical Conductivity	60 000 µS/cm

4.2 Objectives of failure event scenario: Failure to Contain - Overtopping

Consequence Category:	Low	*Only applicable for structures with High and Significant consequence for the 'Failure to Contain - Overtopping' scenario*
Objective applicable?	No	

Storage	Required?	Design Criteria
Design Storage Allowance (DSA)	No	N/A
Extreme Storm Storage (ESS)	No	N/A
Mandatory Reporting Level (MRL)	No	-

4.3 Objectives of failure event scenario: Dambreak

Consequence Category:	Significant	*Only applicable for structures with High and Significant consequence for the 'Dambreak' scenario*
Applicable to structure?	Yes	

Design Criteria	Objective
Spillway capacity	1:100 AEP to 1:1000 AEP
Flood level for embankment crest levels	Spillway design flood peak level + wave runup allowance for 1:10 AEP wind

5.0 Failure Event Scenarios - Consequence Assessment

Note: See Section 1.2 of DEHP Manual

5.1 Failure Event Scenario: 'Failure to Contain - Seepage'

Note: Assessment only required for new structures and does not apply to structures approved prior to development of version 4 of DEHP manual.

The 'failure to contain - seepage' failure scenario was assessed to the following consequences:

(a) Failure of the structure placing lives at risk due to dwellings or workplaces being in the failure impact zone.
(b) Downstream consequences, including but not limited to failure of other structures that may be affected by any flooding.
(c) The consequences of such cascade failure for other structures.
(d) The impact to both on-site and off-site environmental values.
(e) Long term potential adverse effects due to release of contaminants to groundwater systems and soil profiles.
(f) Potential consequential effects on surface water systems; and
(g) Storage releases that may chemically interfere with waters used as sources of drinking water.

Each consequence was assigned a 'High', 'Significant' or 'Low' value. See below.

				Evaluation: Failure to Contain - Seepage							
Environmental Harm	**High**	**Significant**	**Low**	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**Comment**
Harm to Humans	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 20 or more people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 10 or more people but less than 20 people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of less than 10 people being affected	Low	N/A	Low	N/A	Low	Low	Low	Seepage from the structure is unlikely to contaminate any water sources for human consumption. There are no drinking water sources at a lower elevation to the structure.
General Environmental Harm	Location such that: **a)** Contaminants may be released to areas of MNES, MSES or HEV waters that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment (Significant Values); and **b)** Adverse effects on Significant Values are likely; and **c)** The adverse effects are likely to cause at least one of the following: **i)** Loss or damage or remedial costs greater than $50,000,000; or **ii)** Remediation of damage **iii)** permanent alteration to existing ecosystems; or **iv)** The area of damage (including downstream effects) is likely to be at least 5 km².	Location such that contaminants may be released so that adverse effects (that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment) either: **a)** Would be likely to be caused to Significant Values but those adverse effects would not be likely to meet the thresholds for the High Consequence category and instead would be likely to cause at least one of the following: i) Loss or damage or remedial costs greater than $10,000,000 but less than $50,000,000; or ii) Remediation of damage is likely to take more than 6 months but less than 3 years; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 1 km² but less than 5 km². or **b)** Would be likely to be caused to environmental values classed as slightly or moderately disturbed waters, wetland of general ecological significance, riverine areas, springs or lakes and associated flora and fauna (Moderate Values), and the adverse effects are likely to cause at least one of the following :i) Loss or damage or remedial costs greater than $20,000,000; or ii) Remediation of damage is likely to take more than 1 year; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 2 km².	Location such that either: **a)** Contaminants are unlikely to be released to areas of Significant Values or Moderate Values; or **b)** Contaminants are likely to be released to those areas, but would be unlikely to meet any of the minimum thresholds specified for the Significant Consequence Category for adverse effects.	N/A	Low	Low	Low	Low	Low	N/A	The structure is located adjacent to the 'Abbot Point - Caley Valley' nationally important wetland area. The water contained within the pond is likely to be more saline than the wetland water quality, however due to the liner installed on the floor of the pond, only small seepage volumes are expected. The water is not expected to reach the wetland due to evaporation. Therefore, contaminants are unlikely to meet the minimum thresholds for the Significant Consequence for adverse effects.
General economic loss or property damage	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $10 million or greater in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $1 million and greater but less than $10 million in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require less than $1million in rehabilitation, compensation, repair or rectification costs.	N/A	Low	Low	N/A	Low	Low	N/A	Seepage from the structure is unlikely to harm any third party assets.

See Table 1 in DEHP Manual

Overall consequnce for 'failure to contain - seepage' assessment:	**Low**

Analysis not required for existing structures

5.2 Failure Event Scenario: 'Failure to Contain - Overtopping'

Note: Assessment required for both new and pre-approved structures.

The 'failure to contain - overtopping' failure scenario was assessed to the following consequences:

(a) Failure of the structure placing lives at risk due to dwellings or workplaces being in the failure impact zone.
(b) Downstream consequences, including but not limited to failure of other structures that may be affected by any flooding.
(c) The consequences of such cascade failure for other structures.
(d) The impact to both on-site and off-site environmental values.
(e) Long term potential adverse effects due to release of contaminants to groundwater systems and soil profiles.
(f) Potential consequential effects on surface water systems; and
(g) Storage releases that may chemically interfere with waters used as sources of drinking water.

Each consequence was assigned a 'High', 'Significant' or 'Low' value. See below.

				Evaluation: Failure to Contain - Overtopping							
Environmental Harm	**High**	**Significant**	**Low**	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**Comment**
Harm to Humans	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 20 or more people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 10 or more people but less than 20 people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of less than 10 people being affected	Low	Low	Low	N/A	Low	Low	Low	Overtopping of the structure is unlikely to contaminate any water sources for human consumption. There are no drinking water sources at a lower elevation to the spillway.
General Environmental Harm	Location such that: **a)** Contaminants may be released to areas of MNES, MSES or HEV waters that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment (Significant Values); and **b)** Adverse effects on Significant Values are likely; and **c)** The adverse effects are likely to cause at least one of the following: **i)** Loss or damage or remedial costs greater than $50,000,000; or **ii)** Remediation of damage **iii)** permanent alteration to existing ecosystems; or **iv)** The area of damage (including downstream effects) is likely to be at least 5 km².	Location such that contaminants may be released so that adverse effects (that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment) either: **a)** Would be likely to be caused to Significant Values but those adverse effects would not be likely to meet the thresholds for the High Consequence category and instead would be likely to cause at least one of the following: i) Loss or damage or remedial costs greater than $10,000,000 but less than $50,000,000; or ii) Remediation of damage is likely to take more than 6 months but less than 3 years; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 1 km² but less than 5 km². or **b)** Would be likely to be caused to environmental values classed as slightly or moderately disturbed waters, wetland of general ecological significance, riverine areas, springs or lakes and associated flora and fauna (Moderate Values), and the adverse effects are likely to cause at least one of the following :i) Loss or damage or remedial costs greater than $20,000,000; or ii) Remediation of damage is likely to take more than 1 year; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 2 km².	Location such that either: **a)** Contaminants are unlikely to be released to areas of Significant Values or Moderate Values; or **b)** Contaminants are likely to be released to those areas, but would be unlikely to meet any of the minimum thresholds specified for the Significant Consequence Category for adverse effects.	N/A	Low	Low	Low	Low	Low	N/A	The structure is located adjacent to the 'Abbot Point - Caley Valley' nationally important wetland area. Water overflowing from the spillway may reach areas within the important wetland area, however the quality of the overflow water with regards to chemical constituents is likely to be similar to the water within the receiving wetlands. Therefore, contaminants are unlikely to meet the minimum thresholds for the Significant Consequence for adverse effects. A management plan to address solids constituents of overflow water is anticipated from the dredging contractor / operator.
General economic loss or property damage	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $10 million or greater in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $1 million and greater but less than $10 million in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require less than $1million in rehabilitation, compensation, repair or rectification costs.	N/A	Low	Low	N/A	Low	Low	N/A	Overtopping from the structure is unlikely to harm any third party assets.

See Table 1 in DEHP Manual

Overall consequnce for 'failure to contain - overtopping' assessment:	**Low**

5.3 Failure Event Scenario: 'Dambreak'

Note: Assessment required for both new and pre-approved structures.

The 'dambreak' failure scenario was assessed to the following consequences:

(a) Failure of the structure placing lives at risk due to dwellings or workplaces being in the failure impact zone.
(b) Downstream consequences, including but not limited to failure of other structures that may be affected by any flooding.
(c) The consequences of such cascade failure for other structures.
(d) The impact to both on-site and off-site environmental values.
(e) Long term potential adverse effects due to release of contaminants to groundwater systems and soil profiles.
(f) Potential consequential effects on surface water systems; and
(g) Storage releases that may chemically interfere with waters used as sources of drinking water.

Each consequence was assigned a 'High', 'Significant' or 'Low' value. See below.

				Evaluation: Dambreak							
Environmental Harm	**High**	**Significant**	**Low**	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**Comment**
Harm to Humans	Location such that people are routinely present in the failure path and if present loss of life to greater than 10 people is expected.	Location such that people are routinely present in the failure path and if present loss of life to 1 person or greater but less than 10 people is expected	Location such that people are not routinely present in the failure path and loss of life is not expected	Low	Low	Low	N/A	N/A	Low	Low	There are no habitants living within the failure path, therefore the loss of life is not expected.
	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 20 or more people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of 10 or more people but less than 20 people being affected.	Location such that contamination of waters (surface and/or groundwater) used for human consumption could result in the health of less than 10 people being affected	Low	Low	Low	N/A	Low	Low	Low	Released water is unlikely to contaminate any water sources for human consumption. There are no drinking water sources at a lower elevation to the structure.
General Environmental Harm	Location such that: **a)** Contaminants may be released to areas of MNES, MSES or HEV waters that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment (Significant Values); and **b)** Adverse effects on Significant Values are likely; and **c)** The adverse effects are likely to cause at least one of the following: **i)** Loss or damage or remedial costs greater than $50,000,000; or **ii)** Remediation of damage **iii)** permanent alteration to existing ecosystems; or **iv)** The area of damage (including downstream effects) is likely to be at least 5 km².	Location such that contaminants may be released so that adverse effects (that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment) either: **a)** Would be likely to be caused to Significant Values but those adverse effects would not be likely to meet the thresholds for the High Consequence category and instead would be likely to cause at least one of the following: i) Loss or damage or remedial costs greater than $10,000,000 but less than $50,000,000; or ii) Remediation of damage is likely to take more than 6 months but less than 3 years; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 1 km² but less than 5 km². or **b)** Would be likely to be caused to environmental values classed as slightly or moderately disturbed waters, wetland of general ecological significance, riverine areas, springs or lakes and associated flora and fauna (Moderate Values), and the adverse effects are likely to cause at least one of the following :i) Loss or damage or remedial costs greater than $20,000,000; or ii) Remediation of damage is likely to take more than 1 year; or iii) Significant alteration to existing ecosystems; or iv) The area of damage (including downstream effects) is likely to be at least 2 km².	Location such that either: **a)** Contaminants are unlikely to be released to areas of Significant Values or Moderate Values; or **b)** Contaminants are likely to be released to those areas, but would be unlikely to meet any of the minimum thresholds specified for the Significant Consequence Category for adverse effects.	N/A	Significant	Significant	Significant	Significant	Significant	N/A	The structure is located adjacent to the 'Abbot Point – Caley Valley' nationally important wetland area. The adverse effects caused by the release of water and mobilised solids would not likely meet the thresholds for the High consequence category; however, remediation of the wetlands due to scour damage and solids deposition may take greater than six months (but less than three years). There is one groundwater borehole within the downstream region that is registered with the Queensland Department of Natural Resources and Mines' (DNRM) online database . In the event of a dam failure, groundwater contamination through the borehole is possible, albeit unlikely. The register number of the borehole is 125271. Online DNRM database: https://www.business.qld.gov.au/business/support-tools-grants/services/mapping-data-imagery/queensland-globe/coal-seam-gas (accessed July 2015)
General economic loss or property damage	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $10 million or greater in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require $1 million and greater but less than $10 million in rehabilitation, compensation, repair or rectification costs.	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require less than $1million in rehabilitation, compensation, repair or rectification costs.	N/A	Significant	Significant	N/A	Low	Low	N/A	Released water and mobilised solids may harm existing Aurizon rail line infrastructure located to the east of the structure, Terminal 1 and associated infrastructure to the east, and a causeway and associated road to the north-west of the structure.

See Table 1 in DEHP Manual

Overall consequnce for 'dambreak' assessment:	**Significant**