

HAZID STUDY Details / HSE in Design Risk Management Register

Project Name: T15-1692A Rapid Creek Flood Mitigation Works  
 Project No.: IW110800  
 Date: 17/02/2017

Severity		Likelihood	
1	Insignificant	A	Almost certain
2	Minor	B	Probable
3	Moderate	C	Possible
4	Major	D	Unlikely
5	Severe	E	Very unlikely

Ref. No.	Hazard	Consequence	Severity (1 - 5)	Likelihood (A,B,C,D,E)	Risk Level	Design Controls	Status of Design Control	Severity (1 - 5)	Likelihood (A,B,C,D,E)	Residual Risk Level	Additional Construction / Operational Phase Controls	Party Responsible for Action
CONSTRUCTION PHASE												
C1	Construction activities on and adjacent to live vehicle and pedestrian traffic	Collision between vehicle /pedestrian traffic and plant / construction personnel resulting in injury and damage to plant and vehicles	3	C	H	Tender documents will include a requirement for the contractor to produce a detailed Traffic Management Plan (TMP)	Incomplete	3	D	M	Contractor to have TMP prepared and approved by DIPL and Road Networks Division prior to the commencement of construction. The plan should include consideration of emergency vehicle access requirements and pedestrian movements.	Contractor
C20	Groundwater / flooding in excavation	Basin / drain may become flooded, making it unsafe for workers and resulting in injury or death	5	C	H	-	-	-	-	-	Project programme should be scheduled such that works are completed prior to wet season. Contractor to use appropriate dewatering techniques.	DIPL / Jacobs Contractor
C3	Contractor encounters unknown underground services during mechanical excavation	Damage to infrastructure, and injury to operator	4	C	H	Jacobs to obtain DBYD information and confirm service locations through GPR. Service locations to be included in tender documents.	Complete	4	D	M	Contractor to locate services on site. Contractor to coordinate with DIPL with regards to the treatment of existing services during construction.	Contractor
C4	Working in existing drainage paths to Rapid Creek	Soil disturbed during construction may be deposited downstream in Rapid Creek, degrading the natural creek environment	3	B	H	Jacobs to produce Erosion Sediment Control Plan (ESCP) for inclusion in tender documents. Contractor to include sediment and erosion control in Contractor's construction environmental management plan	Complete	3	E	M	Contractor to adhere to ESCP.	Contractor
C5	Working in proximity to known sacred sites (5073-140B and 5073-140A) and unknown sacred sites	Damage to protected sites, resulting in community anger, project delays, large fines and a loss of culturally significant land	2	C	M	The drain to the east of Henry Wrigley Drive is to be located to the north of the sacred sites. Sacred site locations to be included in tender documentation.	Complete	2	C	M	DIPL to obtain AAPA clearances for the entire site prior to construction	DIPL
C6	Working in proximity to natural vegetation, including protected cycads.	Damage to existing bush and protected cycads	2	C	M	The detention basin has been located in the north-east corner of the site to limit disruption to the native vegetation. Clearing limits are shown on construction drawings.	Complete	2	E	L	Contractor to adhere to clearing limits, and limit works outside of the detention basin area to an absolute minimum.	Contractor
C7	Working with contaminated material (potentially placed at the site following Cyclone Tracy)	Harmful exposure to hazardous materials (through direct contact or contamination of Rapid Creek) resulting in impairment. Pollution resulting in damage to the environment.	4	D	M	Geotechnical investigation to be undertaken to determine whether there is contamination present at the site.	Complete	4	E	M	Contractor to take appropriate care during excavation.	Contractor
C8	Excavation/embankment collapses during construction	Damage to property, injury and death	5	C	H	Depths for installation of culverts are not excessive and normal good construction practices should ensure safety. Technical Specification to specify the appropriate construction requirements to ensure trench collapse does not occur.	Complete	4	D	M	Contractor to construct the works in accordance with the Technical Specification.	Contractor
C9	Personnel and machinery working at the top of the embankment / excavation	Personnel or machiner may fall down the slope, causing injury, death or damage.	4	C	H	Batters designed with 1:4 slope	Complete	2	D	L	-	-
C10	High velocity channels	Person or machinery can fall into fast moving water causing injury or damage	3	C	H	Design drains and culverts to reduce velocities where possible.	Complete	2	D	L	-	-
C11	Extreme weather	Risk of injury or death from extreme weather such as cyclones	4	D	M	-	-	-	-	-	Stop work in times of extreme weather and follow OHS procedures	Contractor
C12	Accidents on site	Risk of injury or death, project delays and cost implications	4	C	H	-	-	-	-	-	Induction to new comers will be implemented. Signage and appropriate lighting will be in place. PPE to be worn at all times. Development and implementation of an appropriate SEQ plan.	Contractor
C13	Work at height during construction	Risk of damage, injury or death to equipment and persons who fall from top of culvert	4	C	H	-	-	-	-	-	Contractor to follow appropriate WHS procedures.	Contractor
C14	Reinforced concrete culverts	Risk of injury or damaged to persons, machinery or materials if RCBC is dropped while being craned into place.	4	C	H	-	-	-	-	-	Contractor to use appropriate machinery under safe lifting loads in conjunction with appropriate WHS procedures and legislation.	Contractor
C16	Existing services (general)	Damage to infrastructure and injury to operator.	4	C	H	Jacobs to obtain DBYD information and confirm service locations through GPR and potholing. Service locations to be shown in tender documentation.	Complete	4	D	M	Contractor to locate services on site. Contractor to coordinate with DIPL with regards to the treatment of existing services during construction.	Contractor
C17	Changes or modifications to the design during construction	Changes are introduced that could have safety implications	2	C	M	-	-	-	-	-	Contractor should not make any changes to the design without first consulting with the designer and seeking their approval for the change.	Contractor
C18	Damage to existing infrastructure and surrounding road network	Damage to existing infrastructure may have safety implications for road users	4	C	H	-	-	-	-	-	Contractor to limit heavy vehicle loads to legal limit. Contractor to implement proper planning and phasing of works.	Contractor
C19	Construction site not secure	Construction site can be accessed by the general public, leading to property damage or injury	2	C	M	Design to specify a construction fence.	Complete	3	D	M	Contractor to provide appropriate fencing and signage to clearly alert all members of the public that area is a working construction site with no unauthorised access allowed. Contractor to close off site access points outside of working hours.	Contractor
C20	Site inspection around heavy machinery and vehicles	Possible collision between personnel and vehicles/machinery.	3	B	H	-	-	-	-	-	Contractor to prepare and implement safety management plan. All personnel to undertake site induction.	Contractor
OPERATIONAL PHASE												
O1	Public trapped in basin during a large flood event	Risk of injury or death	4	C	H	Design the basin to have flat batters such that it is easy to get out of. Design batter slopes to be 1:6 such that the basin is easy to get out of. Design specifies warning signs located around the basin.	Complete	2	D	L	-	-
O2	Public or maintenance person in drain during a large flood event	Risk of injury or death	4	C	H	Drains are designed with mild batters (generally 1 in 6, minimum 1 in 4) - easy to get out of	Complete	2	D	L	Operational crews not to attempt drain or culvert maintenance works when extreme weather is predicted, especially if Wadham Lagoon is already at a high level.	DIPL
O3	Public sucked into culverts during a large flood event	Risk of injury or death	4	C	H	Reinstate fencing to discourage persons from approaching close to the outlets	Complete	2	D	L	-	-
O4	Catastrophic failure of the basin	Damage to property, injury and death	5	C	H	Design the embankment in line with ANCOLD Guidelines	Complete	4	E	M	-	-

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O5	Person on top of the embankment falls into the basin	Risk of injury or death	4	C	H	Batters designed with 1:6 slope. Safety fences at top of headwalls and along wingwalls	Complete	2	D	L	-	-
O6	Outlets to Rapid Creek are eroded over time	Bank stability may be reduced and soil deposited downstream in Rapid Creek, degrading the natural creek environment.	2	C	M	Jacobs will produce an Erosion Sediment Control Plan (ESCP) to be included in tender documents.	Complete	2	D	L	-	-
O7	The basin embankment may form a roadside hazard	Risk of vehicle veering into the embankment, resulting in vehicle damage, injury or death	4	C	H	The embankment will not encroach on the Henry Wrigley Drive or McMillans Road reserves. Jacobs to assess the road safety.	Complete	1	E	L	-	-
O8	Long culvert lengths	Risk of injury to maintenance personnel attempting to maintain the culvert. Risk that the culvert will not be appropriately maintained.	4	C	H	Design includes multiple access points to the southern most culvert.	Complete	2	E	L	-	-
O9	Vehicle may veer off Henry Wrigley Drive into the newly formed drainage channel	Risk of damage to vehicle, injury or death	4	C	H	Culverts extend beyond water retaining embankment such that errant vehicle inclear zone will not enter culvert. New culvert intake headwalls fence across top and down wingwalls too						
O10	Permanant water in the detention basin may become stagnant	Increase mosquitos and birds in close proximity to the airport - increase the risk of bird strike	2	C	M	Basin to be designed such that it virtually empties within 24 hours after it reaches its peak height for all but the rarest of floods.	Complete	2	E	L	-	-
O11	Persons driving into the basin following the establishment of vegetation cover	Damage to basin and risk of injury and harm to persons and vehicles	3	C	H	Design to specify warning signage.	Complete	3	D	M	-	-
O12	Large storm events	Gross pollutants will collect at locations along the drainage channel to the east of Henry Wrigley Drive and within the basin (most likely at the culvert crossing of Henry Wrigley Drive) and reduce the efficiency of the system.	1	C	L	Locations of lowest velocity are placed where most accessible to allow inspection and periodic removal of debris, rubbish or sediments	Complete	1	D	L	DIPL will inspect the basin, in particular the culverts, following significant rainfall events and remove debris as required.	DIPL
O13	Regular clean outs of the drainage channel and removal of GPs at the culverts following significant rain events	Risk of injury or harm to maintenance personnel or machinery	2	C	M	-	-				Ensure drain is dry before maintenance occurs. Identify and implement appropriate lifting techniques.	DIPL
O14	Public or maintenance person in drain during a large flood event	Risk of injury or death	4	C	H	Drains are designed with mild batters (gerenally 1 in 6, minimum 1 in 4) - easy to get out of	Complete	2	D	L	Operational crews not to attempt drain or culvert maintenance works when extreme weather is predicted, especially if Wadham Lagoon is already at a high level.	
O15	Slippery road surface	Inadequate skid resistance on road surface. Possible fatal consequences to road users.	3	B	H	Specify use of road surfacing materials in accordance with current design standards and practices.	Complete	2	C	M	Contractor to test materials on site during construction to ensure compliance with specification.	Contractor
DEMOLITION PHASE												
D1	Unknown details to assist with demolitions and modifications - lack of information available on constructed works	Injury to demolition personnel and additional cost of site investigations	3	C	H	-	-				Contractor to provide "as constructed" information to the DIPL prior to practical completion	Contractor
D2	Demolition of culverts	Risk of injury or harm to persons or machinery involved in demolition	3	C	H	-	-				Understanding and implementation of standard practices in regards to the demolition of small scale concrete structures.	Contractor engaged to undertake demolition

### Description of Severity Levels

Level	Consequence Types					
	Profit Reduction	Health and Safety	Natural Environment	Social / Cultural Heritage	Community / Government / Reputation / Media	Legal
1	<US\$10k	No medical treatment required.	Minor effects on biological or physical environment.	Minor medium-term social impacts on local population. Mostly repairable.	Minor, adverse local public or media attention or complaints.	Minor legal issues, non-compliances and breaches of regulation.
2	US\$10k-100k	Objective but reversible disability requiring hospitalisation.	Moderate, short-term effects but not affecting ecosystem functions.	On-going social issues. Permanent damage to items of cultural significance.	Attention from media and/or heightened concern by local community. Criticism by NGOs.	
3	US\$100k-1M	Moderate irreversible disability or impairment (<30%) to one or more persons.	Serious medium term environmental effects.	On-going serious social issues. Significant damage to structures / items of cultural significance.	Significant adverse national media / public / NGO attention.	Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.
4	US\$1M-10M	Single fatality and/or severe irreversible disability or impairment (>30%) to one or more persons.	Very serious, long-term environmental impairment of ecosystem functions.		Serious public or media outcry (international coverage).	Major breach of regulation. Major litigation.
5	US\$10M-100M	Multiple fatalities, or significant irreversible effects to > 50 persons.				Significant prosecution and fines. Very serious litigation including class actions.

### Description of Likelihood Levels

Level	Descriptor	Description	Indicative Frequency
A	Almost certain	The event will occur on an annual basis.	Once a year or more frequently.
B	Likely	The event has occurred several times or more in your	Once every three years.
C	Possible	The event might occur once in your career.	Once every ten years.
D	Unlikely	The event does occur somewhere from time to time.	Once every thirty years.
E	Rare	Heard of something like this occurring elsewhere.	Once every 100 years.

### Level of Risk:

Likelihood	Consequences				
	1	2	3	4	5
A Almost Certain	M	H	H	VH	VH
B Likely	M	M	H	H	VH
C Moderate	L	M	H	H	H
D Unlikely	L	L	M	M	H
E Rare	L	L	M	M	H