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DESIGN HAZARD ELIMINATION & RISK REDUCTION REGISTER

Document Number: 7694-CCA2_3-P3-REG-CV-JAC-0003

Project Title: East Coast Railway - Phase 3 - CCA2 & CCA3

Project Number: D3658302

Client: Iarnród Éireann Irish Rail

Project Manager: Damien Keneghan

Design Manager Jon Denner

Local HSEiD Advisor

Revision	Issue Date	Revision Description	Prepared By	Checked By	Reviewed By	Approved By
A.1	5-Jan-24	Draft for Concept Stage	David Thomas	Rita Martins	Jill Gambrill	Jon Denner
A.2	7-Oct-24	Emerging Preferred Scheme Concept	Emily Marshall	Jill Savory	Jill Savory	Jon Denner
A	12-Aug-25	FIRST ISSUE	Emily Jennings	Jill Savory	Jill Savory	Damien Keneghan

Introduction

This provides a means of identifying design hazards and recording design mitigation and risk reduction actions taken.

All foreseeable design hazards for each discipline will be entered into the Design Hazard Elimination & Risk Reduction Register (DHERRR) by the Designers.

A single point of contact will be responsible for coordinating design stakeholder input to the DHERRR to ensure that there are no gaps in design information knowledge exchange.

The discipline lead designer(s) will be responsible for ensuring completeness and consistency of their design discipline across the project.

The full completed DHERRR shall form part of the design record for this project.

Drawings and documents which contain significant risks shall reference this document in the drawings or document notes.

Hazard / Risk Register completion		
Column 1	Risk ID	Enter the Hazard/ Risk number, this should be sequential.
Column 2	Design Hazard Review Activity Description	State what activity the design hazard was identified (from pull down menu): • Design • Interactive Design Safety Session • Hazop Meeting • Hazid Meeting • Routine Design Team Meeting • Design Stage Meeting • Pre-Tender Design Review Meeting • Construction Phase Design Revision • HSE in Design Review
Column 3	Phase	Identify what phase of the project the Hazard applies to (from pull down menu): • P - Pre-construction • C - Construction • M - Maintain / Clean • U - Use as a workplace • D - Demolish/Decommission
Column 4	Activity	Describe the Activity to be undertaken where a Hazard may be present
Column 5	Potential Hazard	Describe the Hazard associated with the described activity
Column 6	Who is at Risk	Identify who is at risk against each associated activity (from pull down menu): • Construction • Commissioning • Operations • Maintenance • Decommissioning • Demolition • Public
Column 7	Probability	Determine the Probability of the **unmitigated** Hazard (from pull down menu). • 1 - Highly Unlikely • 2 - Unlikely • 3 - Possible • 4 - Likely • 5 - Highly Likely

Column 8	Worst Potential Severity (WPS)	Determine the Worst Potential Severity (WPS) of the **unmitigated** Hazard (from pull down menu). • 1 - Nil or slight injury / illness, property damage or environmental issue. • 2 - Minor injury / illness, property damage or environmental issue • 3 - Moderate injury or illness, property damage or environmental issue • 4 -Major injury or illness, property damage or environmental issue. • 5 - Fatal or long term disabling injury or illness. Significant property damage or environmental issue. • 10 - Multiple fatalities and catastrophic event
Column 9 Severity	Initial Risk Rating	Calculates the Initial Risk Rating of the **unmitigated** hazard (Probability x WPS) Automatic RAG for status 1 - 5 - Green 6 - 10 - Amber <10 - Red
Column 10 Risk	Designer	Select the design discipline raising the hazard (amend to suit in the 'Reference' tab) • Architect • Mechanical • Electrical • Civil/Structural • Environmental • Control / Instrumentation • Piping • HVAC • Commissioning • Non Jacobs Designer • Client • User entry • All Disciplines

Column 11	Design Measures To Eliminate Hazard	Describe the Design Measures to be implemented to Eliminate the Hazard as a FIRST CHOICE
Column 12	Design Measures To Reduce Risk	Describe the Design Measures to be implemented to Reduce the Risk associated with the Hazard SECOND CHOICE
Column 13	Residual Probability	Determine the Probability of the **residual risk** from the hazard (from pull down menu). Selection per column 7
Column 14	Residual WPS	Determine the Severity of the **residual risk** from the Hazard (from pull down menu). Selection per column 8
Column 15	Residual Risk Rating	Calculates the Residual Risk Rating from the hazard (Probability x WPS) Automatic RAG for status
Column 16	Residual Risk Description	Describe clearly the Residual Risk associated with the Hazard to be managed by those using the Design
Column 17	Included in Drawing No(s)	List the documents where the Residual Risk has been communicated to those using the Design
Column 18	Action By	State who the action is to be taken/completed (Name or Role)
Column 19	Target Date	Insert the initial target completion date here. This date should not be revised
Column 20	Revised Target Date	Insert the latest revised target completion date here.
Column 21	Date Action Complete	Insert the date the Action was completed - or was transferred to a subsequent action
Column 22	Tracker Status	Automatic RAG rating for status. GREEN indicates that the action is ongoing with time in hand. AMBER is imminently due and RED indicates due or overdue
Column 23	Comments	Insert comments here relating to current status, whether the action is fully closed out, or is subsumed into another action etc
Column 24	Primary Legislation	Identify the primary legislation in the country where the design hazard relates to (where applicable).

The HSE in Design Review shall confirm that the Design Hazard Elimination and Risk Reduction process has been completed and that the Residual Risks are acceptable to the Project.

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Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

DESIGN HAZARD ELIMINATION & RISK REDUCTION
REGISTER OF DESIGN REVIEWS

DESIGN REVIEW DESCRIPTION	DATE HELD	MINUTES REFERENCE

CRITICAL RISK SUMMARY REPORT

Project Number: D3658302 **Project Title: East Coast Railway - Phase 3 - CCA2 & CCA3**

Project Manager: Damien Keneghan

Design Manager Jon Denner

Date of Issue: 12/08/25

OVERVIEW OF CRITICAL RISKS ASSOCIATED WITH THE PROJECT. This identifies the top 20 hazards/risks associated with design, construction, operation, maintenance and demolition of the project.

Comments		Residual Risk Summary	
. Number of completed Mitigation Actions over latest reporting period		Number of 'High' risks	11
. Number of revised Mitigation Actions over latest reporting period		Number of 'Medium' risks	5
. Number of new risks over latest reporting period		Number of 'Low' risks	21
. Number of closed risks over latest reporting period			
. Number of risks with modified scores over latest reporting period			

Suggested areas / topics for comment:
. Involvement and competency of project team members with risk management
. Tabling and review of risk register at monthly design team meeting
. Quality and quantity of design mitigation actions in place

1	4	5	12	16	18	22	23
Risk ID	Activity	Potential Hazard	Design Measures to Reduce Risk	Residual Risk Description	Actions By (Name and Role)	Tracker Status	Comments
1	Existing Services	Damage to existing services during construction leading to death or injury to site personnel.	Full services survey to be undertaken during detailed design development.	Damage to existing services during construction leading to death or injury to site personnel.	Designer / Contractor	ONGOING	Full services search to be undertaken at detailed design stage. Contractor to survey location prior to excavation works, where reasonable.
2	Site of vehicles/plant on site - Public	Transportation over foreshore and access ramps, etc. Potential plant overturning leading to potential for injury/death to members of public with access to the foreshore.	Access points to be identified and to be incorporated during design development.	Transportation over foreshore and access ramps, etc. Potential plant overturning, leading to potential for injury/death to members of public with access to the foreshore.	Contractor	ONGOING	Contractor to include appropriate traffic management and works segregation in method statements with mitigation and reduction measures to separate vehicles and public .
3	Site of vehicles/plant on site - Construction Staff	Transportation over foreshore and access ramps, etc. Potentially leading to potential for injury/death to Construction staff resulting from vehicles overturning.	Access points and restrictions to be incorporated at preliminary design stage. At this preliminary stage access points will be restricted, and additional access points will be considered.	Transportation over foreshore and access ramps, etc. Potentially leading to potential for injury/death to Construction staff resulting from vehicles overturning.	Contractor	ONGOING	Contractor to include site access routes and working areas with mitigation and reduction measure in method statements. Detailed design to consider access restrictions (e.g. ramp loading)
4	Unstable ground conditions	Potential for site operatives or plant to become stuck in pockets of soft or low ground. Instability of plant working in area of low soil strength. Risk of suffocation, crash injuries from sinking into ground/loss or damage to plant.	Inform contractor of risk of soft ground from GI and geotechnical analysis in detailed design.	Potential for site operatives or plant to become stuck in pockets of soft ground. Instability of plant working in area of low soil strength. Risk of suffocation, crash injuries from sinking into ground/loss or damage to plant.	Designer / Contractor	ONGOING	Contractor to prepare method statement and safe systems of work. Risk to be updated following completion GI and geotechnical analysis.
5	Storage of rock	Public climbing on rock piles, being trapped in voids or crushed by falling rock.	Avoid stockpiles of rock in publicly accessible areas as far as possible	Public climbing on rock piles, being trapped in voids or crushed by falling rock.	Contractor	ONGOING	Contractor to identify secure area for storage of rock and in accordance with the specification and propose method for storage. Experienced Contractor and subcontractors to be appointed. Rock stockpile within secure and segregated from public.
6	Handling and placement of rock armour	Death/injury to site personnel from loss of control of rocks (movement due to soft ground conditions/dropped by construction plant).	Design has minimised quantity of rock required by increasing the revetment slope within possible. Early design of the rock structures & grading to allow delivery rock delivery to commence early in programme.	Death/injury to site personnel from loss of control of rocks (movement due to soft ground conditions/dropped by construction plant). Risk of injury to eye as a result of rock splinters.	Contractor	ONGOING	Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.
7	Use of concrete or other potentially contaminating materials	Contamination of the environment. Injury to site operatives.	Minimise the volume of insitu concrete. During detailed design, where required, joints to be located closely spaced to allow for preparation, casting and adequate curing within slabs.	Contamination of the environment.	Contractor	ONGOING	designer to minimise concrete insitu works. Contractor to insure experienced and trained personnel to handle potentially contaminating materials. Contractor to provide thorough method statement and safe system of work.
8	Use of concrete or other potentially contaminating materials	Injury of operatives (burn/etc.)	Minimise the volume of insitu concrete. During detailed design, where required, insitu works to be simplified to minimise exposure.	Injury of operatives (burns,...)	Contractor	ONGOING	designer to minimise concrete insitu works. Contractor to insure experienced and trained personnel to handle potentially hazardous materials and provide adequate PPE. Contractor to provide thorough method statement and safe system of work.
9	Lifting operations	Risk of plant overturning during moving or lifting on slope.	The proposed Concept design solutions can be adjusted to reduce the risk following results of the GI and geotechnical analysis. Allowable bearing capacity of slope revetment to be checked and shared with Contractor for temporary works design.	Risk of plant overturning on slope or temporary working platform - Contractor to undertake safe working practices	Designer / Contractor	ONGOING	designer to assess the bearing capacity of the existing concrete structures. Contractor to prepare method statement of lifting and safe temporary working platform.
10	Managing public access to works	Potential for public to become injured if gaining access to the works while being plant are are working.	At detailed design stage contractor to address public safety concerns as part of method statement.	Risk of injury to public due to access gained to site.	Designer / Contractor	ONGOING	Contractor to prepare method statement and safe systems of work. There will ensure that the chance of public access to the site is limited as much as practically possible.
11	Public access to the beach restricted	The rock revetments will have a larger footprint on the beach than the existing structures, thereby reducing the available area of the beach. This could lead to people becoming trapped during changing tides	The footprint of the revetments has been minimised as much as possible at this stage, including buying the toe rather than an exposed toe.	People becoming trapped during changing tides	Designer / Client	ONGOING	designer to review beach access points during detailed design development. Consider installing warning signs at access points to highlight risk to the public
13	Delivery of rock	Risk of barge being grounded.	Stockpiling of rock close to the shoreline to plan rock delivery within tidal window and not work dependent.	Risk of barge being grounded.	Contractor	ONGOING	Contractor to plan rock delivery with tidal restrictions. Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.
14	In temporary state the elements of the construction will be subject to wave and tidal conditions	Failure of partially completed works leading to damage of surrounding structures. Potential failure in temporary condition leading to injury to workers.	The partially constructed new revetment will be subject to the temporary loading in a transient state. The design transient states will be identified and considered in the detailed design Stage. These are considered to be minimal due to the new works adding to existing structures, with no additional damage to existing structures.	Damage to existing structures during construction which impacts their performance identified and considered in the detailed design. Contractor expected to consider protection measures for the partially constructed new structure.	Designer / Contractor	ONGOING	Contractor to have competent experience of working in tidal environment. Contractor to develop safe systems of work in intertidal areas including the provision of appropriate PPE. Contractor to obtain frequent weather reports and be proactive in the assessment of weather conditions and adapt accordingly. Contractor's temporary works design to include storm conditions.
15	Delivery and storage of geotextile material	Risk of falling rolls of geotextile resulting in injury to construction personnel and public.	Safe delivery and storage methods will be defined in the geotextile specification during detailed design.	Risk of falling rolls of geotextile resulting in injury to construction personnel and public.	Designer / Contractor	ONGOING	Contractor to identify secure area for storage of geotextile material and in accordance with the specification and propose method for storage. Experienced Contractor and subcontractors to be appointed.
16	Works between construction phases	Risk of cutting, trip hazard. The precast construction may involve dowel bars on the ground or starter bar protruding out from concrete.	Minimise insitu rebar connections by using precast	Risk of cutting, trip hazard. The precast construction may involve dowel bars on the ground or starter bar protruding out from concrete.	Designer / Contractor	ONGOING	designer to design and minimise dowel connections during detailed design stage. Contractor to provide coloured plastic caps to every protruding bar.
17	Noise/vibration impacts on marine habitat	Disruption to wildlife due to site/plant activities, in relation to noise and vibration caused.	Correct permissions etc obtained in order to complete works. Conditions of permit will allow for protection of habitat/wildlife if required. Works are generally high up the beach and therefore present low of a concern for marine life.	Disruption to marine life.	Designer / Contractor	ONGOING	Contractor to provide thorough method statement and safe system of work tbh provided at detailed design stage.

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design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date

Phase

P	Pre-construction
C	Construction
M	Maintain/Clean
U	Use as a Workplace
D	Demolish

Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

Probability

1: Highly Unlikely
2: Unlikely
3: Possible
4: Likely
5: Highly Likely

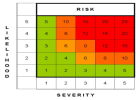
Worst Potential Severity (WPS) of Impact

1: Nil or slight injury / illness, property damage or environmental issue.
2: Minor injury / illness, property damage or environmental issue.
3: Moderate injury or illness, property damage or environmental issue.
4: Major injury or illness, property damage or environmental issue.
5: Fatal or long term disabling injury or illness. Significant property damage or environmental issue.
10. Multiple fatalities and catastrophic event

Risk Rating

NOTE: The purpose of Risk Rating is to determine which risks are significant. It is a subjective assessment and not an absolute or precise determination

High	HSEID risk resulting from design is unacceptably high. Revise design to reduce HSEID residual risk to an acceptable and manageable level.
Medium	HSEID risk resulting from design is permitted with appropriate design controls and management oversight in place.
Low	HSEID risk resulting from design is permitted.



11 Total high risks
5 Total mad risks
21 Total low risks

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Risk ID.	design Hazard Review Stage Description	Phase	Activity	Potential Hazard	Person(s) Most at Risk	Prob	WPS	Initial Risk Rating	designer	design Measures to Eliminate Hazards	design Measures to Reduce Risk	Residual Prob	Residual WPS	Residual Risk Rating	Residual Risk Description	Included on Drawing No(s) or other doc. (give ref.)	Action By (Name or Role)	Target Date	Revised Target Date	Date Action Complete	Tracker Status	Comments	Primary Legislation
1	5: design Stage Review	C	Existing Services	Damage to existing services during construction leading to death or injury to site personnel.	Staff	3	5	15	Civil / Structural	Preliminary identification of services included on Plan drawings. Hazard not eliminated at this design Stage.	Full services survey to be undertaken during detailed design development.	3	5	15	Damage to existing services during construction leading to death or injury to site personnel.	Drawings & Documents [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Full services search to be undertaken at detailed design stage. Contractor to survey location prior to excavation works, where reasonable.	HSA
2	5: design Stage Review	C	Use of vehicles/plant on site - Public	Transportation over foreshore and access ramps, etc. Potential plant overturning leading to potential for injury/death to members of public with access to the foreshore.	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Access points to be identified and to be incorporated during design development.	2	5	10	Transportation over foreshore and access ramps, etc. Potential plant overturning leading to potential for injury/death to members of public with access to the foreshore.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to include appropriate traffic management and works segregation in method statements with mitigation and reduction measures to separate vehicles and public .	HSA
3	5: design Stage Review	C	Use of vehicles/plant on site - Construction Staff	Transportation over foreshore and access ramps, etc. Potentially leading to potential injury/death to Construction staff resulting from vehicles overturning.	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Access points and restrictions to be incorporated at preliminary design stage. At a minimum, existing access points will be maintained, and additional access points will be considered.	2	5	10	Transportation over foreshore and access ramps, etc. Potentially leading to potential injury/death to Construction staff resulting from vehicles overturning.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to include site access routes and working areas with mitigation and reduction measures in method statements. detailed design to consider access restrictions (e.g. ramp loadings)	HSA
4	5: design Stage Review	C	Unstable ground conditions	Potential for site operatives or plant to become stuck in pockets of soft or lose ground. Instability of plant working in area of low soil strength. Risk of suffocation, crash injuries from sinking into groundloss or damage to plant.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	Inform contractor of risk of soft ground from GI and geotechnical analysis in detailed design.	2	5	10	Potential for site operatives or plant to become stuck in pockets of soft ground. Instability of plant working in area of low soil strength. Risk of suffocation, crash injuries from sinking into groundloss or damage to plant.	Drawings & Documents [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe systems of work. Risk to be updated following completion GI and geotechnical analysis.	HSA
5	5: design Stage Review	C	Storage of rock	Public climbing on rock piles, being trapped in voids or crushed by falling rock.	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Avoid stockpiles of rock in publicly accessible areas as far as possible	2	5	10	Public climbing on rock piles, being trapped in voids or crushed by falling rock.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to identify secure area for storage of rock and in accordance with the specification and propose method for storage. Experienced Contractor and subcontractors to be appointed. Main stockpile within secure and segregated from public.	HSA
6	5: design Stage Review	C	Handling and placement of rock armour	Death/injury to site personnel from loss of control of rocks (movement due to soft ground conditions/dropped by construction plant).	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	design has minimised quantity of rock required by increasing the revetment slope within possible. Early design of the rock structures & grading to allow delivery rock delivery to commence early in programme.	2	5	10	Death/injury to site personnel from loss of control of rocks (movement due to soft ground conditions/dropped by construction plant). Risk of injury to eye as a result of rock splinters.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.	HSA

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Latest Meeting Date

Phase

P	Pre-construction
C	Construction
M	Maintain/Clean
U	Use as a Workplace
D	Demolish

Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D36583102
Client:	Iarnród Éireann Irish Rail

Probability

1: Highly Unlikely
2: Unlikely
3: Possible
4: Likely
5: Highly Likely

Worst Potential Severity (WPS) of Impact

1: Nil or slight injury / illness, property damage or environmental issue.
2: Minor injury / illness, property damage or environmental issue.
3: Moderate injury or illness, property damage or environmental issue.
4: Major injury or illness, property damage or environmental issue.
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Risk Rating

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High	HSEID risk resulting from design is unacceptably high. Revise design to reduce HSEID residual risk to an acceptable and manageable level.
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Low	HSEID risk resulting from design is permitted.

11 Total high risks
5 Total mad risks
21 Total low risks

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Risk ID.	design Hazard Review Stage Description	Phase	Activity	Potential Hazard	Person(s) Most at Risk	Prob	WPS	Initial Risk Rating	designer	design Measures to Eliminate Hazards	design Measures to Reduce Risk	Residual Prob	Residual WPS	Residual Risk Rating	Residual Risk Description	Included on Drawing No(s) or other doc. (give ref.)	Action By (Name or Role)	Target Date	Revised Target Date	Date Action Complete	Tracker Status	Comments	Primary Legislation
7	5: design Stage Review	C	Use of concrete or other potentially contaminating materials	Contamination of the environment. Injury to site operatives.	Staff	3	4	12	Civil / Structural	Hazard not eliminated at this design Stage.	Minimise the volume of insitu concrete. During detailed design, where required, joints to be spaced closely spaced to allow for preparation, casting and adequate curing within tides.	2	5	10	Contamination of the environment.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	designer to minimise concrete insitu works. Contractor to insure experienced and trained personnel to handle potentially contaminating materials. Contractor to provide thorough method statement and safe system of work.	HSA
8	5: design Stage Review	C	Use of concrete or other potentially contaminating materials	Injury of operatives (burns,etc.)	Staff	3	4	12	Civil / Structural	Hazard not eliminated at this design Stage.	Minimise the volume of insitu concrete. During detailed design, where required, insitu works to be simplified to minimise exposure.	2	5	10	Injury of operatives (burns,...)	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	designer to minimise concrete insitu works. Contractor to insure experienced and trained personnel to handle potentially hazardous materials and provide adequate PPE. Contractor to provide thorough method statement and safe system of work.	HSA
9	5: design Stage Review	C	Lifting operations	Risk of plant overturning during moving or lifting on slope.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	The proposed Concept design solutions can be adjusted to reduce the risk following results of the GI and geotechnical analysis. Allowable bearing capacity of slope revetment to be checked and shared with Contractor for temporary works design.	2	5	10	Risk of plant overturning on slope or temporary working platform - Contractor to undertake safe working practices	Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	designer to assess the bearing capacity of the existing concrete structures. Contractor to prepare method statement of lifting and safe temporary working platform.	HSA
10	5: design Stage Review	C	Managing public access to works	Potential for public to become injured if gaining access to site works while heavy plant etc are working.	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	At detailed design stage, contractor to address public access concerns as part of method statement.	2	5	10	Risk of injury to public due to access gained to site.	Drawings [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe systems of work. These will ensure that the chance of public access to the site is limited as much as practically possible.	HSA
11	5: design Stage Review	U	Public access to the beach restricted	The rock revetments will have a larger footprint on the beach than the existing structures, thereby reducing the useable area of the beach. This could lead to people becoming trapped during changing tides	Public	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	The footprint of the revetments has been minimised as much as possible at this stage, including burying the toe rather than an exposed toe.	2	5	10	People becoming trapped during changing tides	Documents [to be prepared at DD stage]	designer / Client	Phase 4			ONGOING	designer to review beach access points during detailed design development. Consider installing warning signs at access points to highlight risk to the public	HSA
12	5: design Stage Review	C	Proximity to Trainline	Risk of construction next to trainline - collisions, vibrations, noise	Staff	2	5	10	Civil / Structural	Works are not proposed close to the railway line	Strict regulatory guidelines must be followed. Worker training provision required to advise on hazards of working near trainlines.	1	5	5	Collision with train, vibrations from train causing rock fall	Documents [to be prepared at DD stage]	designer / Client	Phase 4			ONGOING	Client to ensure signage is installed at visible locations along the access points. Signs should also be provided to warn pedestrians of presence of maintenance vehicles	HSA

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P	Pre-construction
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Project Number:	D36583102
Client:	Iarnród Éireann Irish Rail

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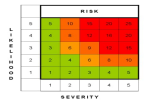

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13	5. design Stage Review	C	Delivery of rock	Risk of barge being grounded.	Staff	3	3	9	Civil / Structural	Bathy survey undertaken and reviewed by construction advisory team and considered acceptable for delivery of rock	Stockpiling of rock close to the shoreline to plan rock delivery within tidal windows and not work dependent.	2	3	6	Risk of barge being grounded.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to plan rock delivery with tidal restrictions. Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.	HSA
14	5. design Stage Review	C	In temporary state the elements of the construction will be subject to wave and tidal conditions	Failure of partially completed works leading to damage of surrounding structures. Potential failure in temporary condition leading to injury to workers.	Construction	3	4	12	Civil / Structural	design does not require removal of any of the existing defences. Hazard not eliminated at this design Stage.	The partially constructed new revetment will be subject to the temporary loading in a transient state. The design transient states will be identified and considered in the detailed design Stage. These are considered to be minimal due to the new works adding to existing structures, with no intentional damage to existing structures.	2	4	8	Damage to existing structures during construction which impacts their performance. Identified and considered in the detailed design. Contractor expected to consider protection measures for the partially constructed new structure.	Drawings & Documents [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to have competent experience of working in tidal environment. Contractor to develop safe systems of work in intertidal areas including the provision of appropriate PPE. Contractor to obtain frequent weather reports and be proactive in the assessment of weather conditions and adapt accordingly. Contractor's temporary works design to include storm conditions.	HSA
15	5. design Stage Review	C	Delivery and storage of geotextile material	Risk of falling rolls of geotextile resulting in injury to construction personnel and public.	Staff	2	3	6	Civil / Structural	Hazard not eliminated at this design Stage.	Safe delivery and storage methods will be defined in the geotextile specification during detailed design.	2	3	6	Risk of falling rolls of geotextile resulting in injury to construction personnel and public.	Specifications [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to identify secure area for storage of geotextile material and in accordance with the specification and propose method for storage. Experienced Contractor and subcontractors to be appointed.	HSA
16	5. design Stage Review	C	Works between construction phases	Risk of cutting, trip hazard The precast construction may involve dowel bars on the ground or starter bar protruding out from concrete.	Staff	3	2	6	Civil / Structural	Hazard not eliminated at this design Stage.	Minimise insitu rebar connections by using precast.	3	2	6	Risk of cutting, trip hazard. The precast construction may involve dowel bars on the ground or starter bar protruding out from concrete.	Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	designer to design and minimise dowel connections during detailed design stage. Contractor to provide coloured plastic caps to every protruding bar.	HSA
17	5. design Stage Review	C	Noise/vibration impacts on marine habitat	Disruption to wildlife due to site/plant activities, in relation to noise and vibration caused.	Environment	3	3	9	Civil / Structural	Hazard not eliminated at this design Stage.	Correct permissions etc obtained in order to complete works. Conditions of permit will allow for protection of habitat/wildlife if required. Works are generally high up the beach and therefore present less of a concern for marine life.	2	3	6	Disruption to marine life.	To be covered in EIA and Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to provide thorough method statement and safe system of work. EIA provided at detailed design stage.	HSA
18	5. design Stage Review	C	Risk of discovery of Unexploded Ordnance (UXO)	Possible presence on site of unexploded ordnance. Loss of life, injury (including hearing damage) due to explosion.	Staff	1	5	5	Civil / Structural	Hazard not eliminated at this design Stage.	UXO Desk study to be undertaken during detailed design development	1	5	5	Possible presence on site of unexploded ordnance. Loss of life, injury (including hearing damage) due to explosion.	Drawings & Documents [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Risk Assessment to be updated after undertaking UXO survey.	HSA

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design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date

Phase

P	Pre-construction
C	Construction
M	Maintain/Clean
U	Use as a Workplace
D	Demolish

Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

Probability

1: Highly Unlikely
2: Unlikely
3: Possible
4: Likely
5: Highly Likely

Worst Potential Severity (WPS) of Impact

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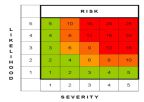

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19	5: design Stage Review	C	Working on the coast. Working in the tidal range. Incoming tide level can rise rapidly.	Tidal working on an exposed coast has a heightened risk of drowning and loss of equipment due to un-expected storms or wave/current regime.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	Construction in tidal zone unavoidable, but minimized and simplified as far as possible.	1	5	5	Tidal working on an exposed coast has a heightened risk of drowning and loss of equipment due to un-expected storms or wave/current regime.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to obtain tidal information to be able to plan work accordingly. Contractor to have competent experience of working in tidal environment. Contractor to develop safe systems of work in intertidal areas including the provision of appropriate PPE and identification of access points. Obtain frequent weather reports to predict tidal conditions. Tidal monitoring to be undertaken.	HSA
20	5: design Stage Review	C	Undermining/stability of existing structures leading to collapse	Collapse of existing structures and or crushing/injury to personnel and plant.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	The proposed Concept design solutions can be adjusted to reduce the risk following results of the GI and geotechnical analysis, during detailed design.	1	5	5	Undermining/stability/overloading of existing structures leading to damage/collapse. Assessment of access routes and temporary works (by Contractor).	Drawings & Documents [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Risk to be updated following completion GI and geotechnical analysis. These data and visual dilapidation combined will support the determination of the tolerable loading.	HSA
21	5: design Stage Review	C	Excavations and Foundations	Rapid ingress of water, causing possible entrapment leading to injury/drowning of site personnel.	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	The toe excavation has been minimised within the required structure stability. The proposed Concept design solutions can be adjusted to reduce the risk following results of the GI and geotechnical analysis, during detailed design.	1	5	5	Rapid ingress of water, causing possible entrapment leading to injury/drowning of site personnel.	Drawings [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe systems of work and plan works to minimise access to the excavated area.	HSA

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design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date

Phase

P	Pre-construction
C	Construction
M	Maintain/Clean
U	Use as a Workplace
D	Demolish

Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D36583102
Client:	Iarnród Éireann Irish Rail

Probability

1: Highly Unlikely
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3: Possible
4: Likely
5: Highly Likely

Worst Potential Severity (WPS) of Impact

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22	5: design Stage Review	C	Delivery of rock navigational hazards	Potential for navigational hazards in shallow waters.	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Construction of temporary tracking routes for movement of rock by land may be required where waters are too shallow. This can therefore avoid a significant potential for navigational hazards. The areas where this is applicable can be identified further at detailed design stage.	1	5	5	Potential for navigational hazards in shallow waters.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe systems of work and plan works to minimise risk of navigational hazards. Experienced Contractor and subcontractors to be appointed.	HSA
23	5: design Stage Review	C	Delivery of rock	Falling rocks leading to injury/death of site personnel. Risk of injury to eye as a result of rock splinters.	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	design has minimised quantity of rock required by increasing the revetment slope within possible. Early design of the rock structures & grading to allow delivery rock delivery to commence early in programme.	1	5	5	Falling objects leading to injury/death of site personnel. Risk of injury to eye as a result of rock splinters.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.	HSA
24	5: design Stage Review	C	In-situ concrete pouring	Risk of unstable formwork and falsework on existing sloping concrete revetment.	Staff	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Minimise the volume of insitu concrete and replace formwork and falsework on slope to permanent precast element.	1	5	5	Risk of unstable formwork remains. Contractor to undertake temp works design and consider staging the concrete pours at detailed design stage.	Contractor Buildability/Method Statement [this is not a Jacobs document] & Temporary works design	designer	Phase 4			ONGOING	designer to minimise volume of insitu concrete during detailed design. Contractor to provide thorough method statement and safe system of work.	HSA
25	5: design Stage Review	C	Lifting operations. Lifting of plant or materials (i.e. precast units) may be carried out in gusty winds	There is a risk of the lifted item becoming out of control with the risk of crushing of personnel. Damage to property and injury to / death of personnel from overhead loads and falling objects.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	Approximate weights and approximate centre of gravity of precast units to be shown in detailed design drawings.	1	5	5	There is a risk of the lifted item becoming out of control with the risk of crushing of personnel. Damage to property and injury to / death of personnel from overhead loads and falling objects.	Drawings [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to prepare method statement of lifting and safe temporary working platform. Contractor to check the unit weight and centre of gravity before any lifting is carried out. Contractor to obtain frequent weather reports and be proactive in the assessment of weather conditions and adapt accordingly.	HSA
26	5: design Stage Review	U	Voids in rock armour	Risk of falling/entrapment to the general public and maintenance staff.	Public	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	Beach access points etc to be considered in the detailed design Stage.	1	5	5	Risk that public could still fall onto / into rock revetment, but this would likely only occur if purposely climbing onto / over the flood walls.	Drawings & Documents [to be prepared at DD stage]	Contractor / Client	Phase 4			ONGOING	Contractor to individually place rocks to minimise deep rock chimneys (voids) as per rock Specifications. Client to plan and undertake maintenance activities to reposition rocks if they become non-interlocked. Client to ensure signage is installed.	HSA
27	5: design Stage Review	U	Voids in rock armour	Risk of falling/entrapment to the maintenance staff.	Staff	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	Beach access points etc to be considered in the detailed design Stage.	1	5	5	Maintenance staff to take care to not climb onto rock revetment.	Drawings & Documents [to be prepared at DD stage]	Contractor / Client	Phase 4			ONGOING	Contractor to individually place rocks to minimise deep rock chimneys (voids) as per rock Specifications. Client to plan and undertake maintenance activities to reposition rocks if they become non-interlocked. Client to ensure signage is installed.	HSA

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design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date	
Phase	

P Pre-construction
C Construction
M Maintain/Clean
U Use as a Workplace
D Demolish

Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

Probability

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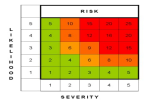

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28	5: design Stage Review	U	Erosion / beach lowering over time	Toe of the rock revetment could become partially exposed leading to trip hazard, or people falling between the rock voids through a very thin beach layer.	Public	3	5	15	Civil / Structural	Hazard not eliminated at this design Stage.	The revetment toe has been designed to account for future beach lowering. Rock specifications during detailed design will specify rock placement to reduce deep rock chimneys (voids).	1	5	5	Slips, trips and fall or people becoming trapped	Documents [to be prepared at DD stage]	designer	Phase 4			ONGOING	Risk to be addressed throughout design development and toe detail updates as required to reduce risk. Contractor to individually place rocks to minimise deep rock chimneys (voids) as per rock Specifications.	HSA

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design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date

Phase

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29	S. design Stage Review	U	Wave overtopping onto the footpath	Injury from large waves overtopping the seawalls onto the footpath.	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Risk reduced by designing front wave walls to minimise overtopping onto footpaths, Footpath heights raised to provide the majority of the public with a clear view of the sea. Overtopping rates onto the footpath to be reviewed during detailed design development	1	5	5	Injury due to waves	Drawings & Documents [to be prepared at DD stage]	designer	Phase 4			ONGOING	designer to undertake further analysis of wave overtopping and geometry of structures during design development	HSA
30	S. design Stage Review	U	Falls from height	Public falling from raised concrete pathways	Public	2	5	10	Civil / Structural	A front kerb has been designined along the seaward face of the raised footpath and below this are access and amenity steps rather than a drop to beach level. At locations where there are access ramps running parralel to the seaward face of the raised footpath and this result in a larger drop, handrails will be installed	A front kerb has been designined along the seaward face of the raised footpath and below this are access and amenity steps rather than a drop to beach level. At locations where there are access ramps running parralel to the seaward face of the raised footpath and this result in a larger drop, handrails will be installed	1	5	5	Falls from height	Documents [to be prepared at DD stage]	designer	Phase 4			ONGOING	designer to undertake further design of walls and stepped revetments during design development to deter people climbing to wall.	HSA
31	S. design Stage Review	U	Change to swimming conditions	Structures within the coastal zone can change currents and swimming conditions which could lead to injury or death due to unexpected conditions to local beach users	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Additional modelling has been undertaken to assess the potential impacts of the proposed works on the current and wave conditions. This has indicated minimal change in the currents	1	5	5	Minor risk of change in swimming conditions	Documents [to be prepared at DD stage]	designer / Client	Phase 4			ONGOING	designer to consider further consider this risk through detailed design.	HSA
32	S. design Stage Review	U	Unstable/soft ground conditions in front of revetment	Risk of entrapment in unstable soft saturated ground in front of revetment - minimal egress points.	Public	2	4	8	Civil / Structural	Hazard not eliminated at this design Stage.	Rock armour at toe reduces the potential for scour and subsequent impact on ground conditions	1	4	4	Risk of entrapment in unstable soft saturated ground in front of revetment - minimal egress points.	Documents [to be prepared at DD stage]	Client	Phase 4			ONGOING	Appropriate signage on promenade warning of risks of accessing beach area.	HSA
33	S. design Stage Review	U	Settlement of the ground	Excessive settlement of the structures resulting in unsafe conditions (e.g. uneven ramp, uneven step heights), or structural failure of the structures. Slips, trips, falls.	Public	2	4	8	Civil / Structural	Hazard not eliminated at this design Stage.	The proposed Concept design solutions can be adjusted to reduce the risk following results of the GI and geotechnical analysis. Settlement values to be estimated at detailed design stage.	1	4	4	Risk that design measures limitation mean that settlement could still result in unsafe conditions. Consider pre loading the ground prior to installation of the top surface structures to mitigate if required.	Drawings [to be prepared at DD stage]	designer	Phase 4			ONGOING	Risk to be updated following completion GI and geotechnical analysis. designer to quantify settlement and consider the settlement in the design detailing.	HSA
34	S. design Stage Review	C	Delivery of rock	Grounding of barge leading to oil spill	Environment	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	Barge is designed to be partially beached. Sensible use at correct tide times can limit the likelihood of grounding significantly.	1	3	3	Risk of barge being grounded.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to plan rock delivery with tidal restrictions. Contractor to prepare method statement and safe system of work. Experienced Contractor and subcontractors to be appointed.	HSA

Jacobs

design HAZARD ELIMINATION AND RISK REDUCTION REGISTER

Latest Meeting Date

Phase

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Update Critical Risk Summary Tab

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

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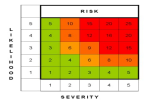

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35	5: design Stage Review	C	Use of Hazardous Materials (cements, grouts,...) for works preparation	Health problems and Environmental damage due to contact with / exposure to cements, grouts etc.	Staff	3	3	9	Civil / Structural	Hazard not eliminated at this design Stage.	Minimise the volume of hazardous materials. During detailed design, where required, insitu works to be simplified to minimise exposure.	1	3	3	Health problems and Environmental damage due to contact with / exposure to cements, grouts etc.	Contractor Buildability/Method Statement [this is not a Jacobs document]	Contractor	Phase 4			ONGOING	Contractor to insure experienced and trained personnel to handle potentially hazardous materials and provide adequate PPE. Contractor to provide thorough method statement and safe system of work.	HSA
36	5: design Stage Review	U	Rock falls from cliffs onto footpath at Killiney	Injury or death to publi dyue to cliff falls onto the footpath	Public	2	5	10	Civil / Structural	Hazard not eliminated at this design Stage.	A detailed review of the cliff stability has been undertaken which indicates the risk of large rock falls is minimal. A catch fence is recommended as a precautionar measure	1	5	5	Minor risk of injurt due to cliff falls	Documents [to be prepared at DD stage]	designer / Client	Phase 4			ONGOING	Designer to review furtehr at detailed design stage	HSA
37	5: design Stage Review	C	Exposing buried/hidden structures during excavation of revetment toe	Risk of injury to site personnel operating plant.	Staff	2	3	6	Civil / Structural	Hazard not eliminated at this design Stage.	Operaters to take care when operating plant on the beach and in tidal zone. At detailed design stage, any pre-existing structures to be addressed and the contractor made aware of these.	1	3	3	Risk of injury to site personnel operating plant.	Drawings [to be prepared at DD stage] Contractor Buildability/Method Statement [this is not a Jacobs document]	designer / Contractor	Phase 4			ONGOING	Contractor to prepare method statement and safe systems of work.	HSA

Jacobs

Project Name:	East Coast Railway - Phase 3 - CCA2 & CCA3
Project Number:	D3658302
Client:	Iarnród Éireann Irish Rail

DESIGN HAZARD ELIMINATION & RISK REDUCTION
SET UP PAGE

PERSON AT RISK	DESIGNER (Amend to suit)
Construction	Architect
Commissioning	Mechanical/ Electrical
Operations	Process
Maintenance	Civil / Structural
Decommissioning	Environmental
Demolition	Control & Instrumentation
Public	Piping
User Entry	HVAC
User Entry	Commissioning
	Non Jacobs Designer
	Client
	User entry
	User entry
	User entry
	All Disciplines

Review List
1: Design
2: Interactive Design Safety Session
3: HAZOP Meeting
4: HAZID Meeting
5: Routine Design Team Meeting
6: Design Stage Review
7: Pre-Tender Design Review
8: Construction Phase Design Revision
9: HSE in Design Review

Phase List	
P	Pre-construction
C	Construction
M	Maintain / Clean
U	Use as a workplace
D	Demolish/Decommission

Severity of Injury	
1	Nil or slight injury / illness, property damage or environmental issue.
2	Minor injury / illness, property damage or environmental issue.
3	Moderate injury or illness, property damage or environmental issue.
4	Major injury or illness, property damage or environmental issue.
5	Fatal or long term disabling injury or illness. Massive property damage or environmental issue.
10	Multiple fatality and catastrophic event

Residual Risk
Yes
No

Probability	
1	Highly Unlikely
2	Unlikely
3	Possible
4	Likely
5	Highly Likely

Jacobs

DE5IGN HAZARD WHEEL

The de5ign Hazard Wheel has been developed to assist technical design teams identify health, safety and environment in design hazards, considering the asset's whole lifecycle.

Refer to the de5ign Manual to download the most up to date interactive version of this tool.