

Project:		Brighton Marina to River Adur FCRM Outline Business Case				Location:		Brighton Marina to River Adur, Sussex			Stage:	Outline Business Case
No.	HAZARD	CONSEQUENCE OF HAZARD (RISK)	RISK LEVEL BEFORE MITIGATION			Risk Owner	Next Formal Risk Review	MITIGATION MEASURE TO BE TAKEN BY DESIGNER	RISK LEVEL AFTER MITIGATION			ANTICIPATED MEASURE THAT COULD BE APPLIED BY THE CONTRACTOR (OR OTHERS)
			Likelihood	Consequence	Index				Likelihood	Consequence	Index	
1	Vehicles getting to site - Movement on the public highway increasing traffic during shingle and material transportation.	Potentially leading to increased number of road accidents involving damage to infrastructure or potential injury/death.	2	5	10	Designer	Detailed Design	Review haulage routes and any interaction with pedestrians. Review ingress and egress points to working areas from highways and plan safe access. Undertake a review of material delivery methods and size of plant required to ensure safe delivery.	1	5	5	Contractor to produce a traffic management plan to reduce risk of traffic related incidents. Contractor to agree access and egress routes prior to start of work. Review use of convoys. Contractor is to carefully manage and police movements on site.
2	Vehicles getting to site - Marine delivery of rock and shingle	Potentially leading to collision with infrastructure, unknown services or potential injury/death.	2	5	10	Designer	Detailed Design	Review shipment locations to reduce potential impacts/interactions. Size of barge and plant required to be considered during detailed design phase.	1	5	5	Contractor to produce navigation route and transhipment area management plan to reduce risk of marine related incidents. Contractor to agree access and egress routes prior to start of work. Contractor is to carefully manage and police movements.
3	Use of vehicles/plant on site - Transportation over uneven ground, e.g., beach, groynes and access ramps, etc.	Vehicles overturning leading to injury/death to members of public with access to the beach.	2	5	10	Designer	Detailed Design	Review access and working areas to reduce possible movements. Size of materials and hence plant required to be further considered during detailed design phase. Specify fencing to limit public access within the contract. Review land and beach levels i.e., avoid where possible/eliminate slopes that will cause plant to overturn.	1	5	5	Contractor to use fencing/signage, use suitable plant warning systems and temporary maintained roadways and suitably qualified personnel (supervision and driver, competent). Appropriate methods of working to limit hazard. Use of appropriate PPE. Know plant limits.
4	Use of vehicles/plant on site - Transportation over uneven ground, e.g., beach, groynes and access ramps, etc.	Vehicles overturning leading to injury/death to members of the Construction staff.	2	5	10	Designer	Detailed Design	Review access and working areas to reduce possible movements. Size of materials and hence plant required to be further considered during detailed design phase. Provide ground type and site investigation data. Review land and beach levels i.e., avoid where possible/eliminate slopes that will cause plant to overturn.	1	5	5	Contractor to use fencing/signage, use suitable plant warning systems and temporary maintained roadways and suitably qualified personnel (supervision and driver, competent). Appropriate methods of working to limit hazard. Use of appropriate PPE. Know plant limits.
5	Use of vehicles/plant on site - Closure/diversion of public right of way / promenade for plant traffic. Potential risk at Kings Esplanade with vehicle access to the beach having to cross promenade.	Creation of diversion leading to potential injury/death to members of the public using unfamiliar access route	4	5	20	Designer	Detailed Design	Review site of main compound and potential satellite compound to reduce vehicle movements and interaction with public access routes. Size of materials and hence plant required to be further considered during detailed design phase.	2	5	10	Contractor to agree access and egress routes prior to start of work. Contractor to use fencing/signage, use suitable plant warning systems and temporary maintained roadways and suitably qualified personnel (supervision and driver, competent). Contractor is to carefully manage and police movements on site.
5	Public access to beach increasing risk of being struck by plant/equipment/materials.	Injury or death to public	2	5	10	Designer	Detailed Design	Design to ensure space to allow safe fencing and beach users to be directed to open areas of beach.	2	5	10	Advance warning to be provided that sections of beach will be closed off to the public. Separation of working area from public with fencing, phasing of works to be considered to minimise impact on overall access for public. Contractor to ensure sufficient notice is provided. All working areas to be managed by the Contractor and is to use segregation measures.
6	Public recreational activities - Recreational activities interference/conflict with construction activities (Hove Deep Sea Anglers club)	Potential conflict with recreational users.	3	4	12	Designer	Detailed Design	Designer to liaise with anglers club regarding proposed works and timing thereof.	1	4	4	Liaise with anglers club throughout duration of construction phase.
7	Shoreham Port - working on private land. Interface with port employees and or operations.	Potential conflict with operations and or employees	2	3	6	Designer	Detailed Design	Continuation of close working with the Port during detailed design phase. Port aware that works should not interfere with Port operations. Works to be segregated wherever possible.	1	3	3	Liaise with Shoreham Port throughout duration of construction phase.
8	Western Esplanade - working on private land. Interface with private residents.	Potential conflict with residents.	2	3	6	Designer	Detailed Design	Proposed works to be agreed with Western Esplanade and works to be segregated wherever possible.	1	3	3	Liaise with Western Esplanade throughout duration of construction phase.
9	Inter-tidal working - Plant and personnel becoming cut off by rising tide.	Injury or drowning of personnel. Potential drowning or hyperthermia. Potential environmental incident and or loss of plant.	3	5	15	Designer	Detailed Design	Tide information and wave data to be provided to Contractor. As far as is reasonably practicable limit the necessity for plant to work in the tidal zone. Designate areas for plant storage to prevent continual tracking along the frontage. Detailed design review to limit excavations and reduce extent of below water working where possible, e.g., toe length for groynes. Timber groynes have sheet piling identified so excavation and requirement for personnel to work in trenches below high water levels is avoided.	1	5	5	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. Obtain frequent weather reports to predict tidal conditions. Contractor to ensure all plant is adequately serviced and maintained.
10	Extreme high tides and storm events - Adverse weather conditions resulting in plant being unable to track along foreshore. Weather (wind, waves, inundation of working areas).	Leading to personnel and plant trapped by tidal conditions. Risk of drowning or hyperthermia to site personnel.	2	5	10	Designer	Detailed Design	Expected tidal ranges to be put on drawings. Controls to be investigated for weather forecast/warnings. Limit need to work near water.	1	5	5	Obtain weather forecast information on a daily basis, prepare emergency escape plan. Provide plant bays and ensure adequate access. Provide appropriate PPE and link up to weather predictions for severe weather warnings.
11	Contaminated land - Health impacts on personnel and/or environmental impacts from release of contaminants.	Potential risk at the Lorry Park. Beach ridge consists of concrete rubble armour with shingle. The area is made up of debris from the demolition of the Portslade Gas Works and, possibly, the Phoenix Brewery. The debris is understood to be contaminated. Potentially leading to injury or environmental incident.	3	4	12	Designer	Detailed Design	Design minimises the amount of excavation work and hence release of contaminants where existing fill material exists. Contaminated land information to be provided to Contractor.	1	4	4	Site Waste management Plan and method statement to be prepared by Contractor. Contractor to arrange for any suspicious materials that become exposed to be tested.
12	Unexploded Ordnance (UXO) - Possible presence on site of unexploded ordnance.	Loss of life, injury (including hearing damage) due to explosion	3	5	15	Designer	Detailed Design	Preliminary desk based assessment indicates MEDIUM risk. Detailed assessment to be obtained at detailed design. Contractor to set out mitigative measures for excavations and piling in method statement. Detailed design review to limit excavation if possible.	2	5	10	Contractor to prepare Appropriate Site Management documentation should be held on-site to guide and plan for the actions which should be undertaken in the event of a suspected or confirmed UXO discovery. UXO Safety and Awareness briefing for all site personnel. Ordnance team to be included on emergency contact list.
13	Existing services - Hitting services with plant during movement or excavations.	Damage to existing services during construction. Risk of electric shock leading to death or injury to site personnel. Known services include wind turbines in Area 7, Southern Water outfall in Area 6, Shoreham Power station and Sewage Treatment works outfalls (Area 2).	3	5	15	Designer	Detailed Design	Utilities search indicates location of known services. Search to be updated at detailed design and mark services on construction drawings. Pass all information to the contractor.	1	5	5	Services search data to be provided in Site Information. Contractor to contact service providers before excavation works commence, trial pits and hand dig in vicinity of services. A cable avoidance tool should be used prior to all excavation work to check for electrical services and plan suitable plant and method to avoid damage to services. Contractor to undertake condition assessment and pre/post construction surveys of existing services, where appropriate.
14	Site Clearance of existing groynes / rock armour	Injury from sharp objects/splinters to public or site personnel.	2	3	6	Designer	Detailed Design	Limit the extent of structure that requires removing by working by section. Review working area/access to areas of structure to be demolished.	1	3	3	Use appropriately experienced contractor. Advise and inform personnel or risk and have procedures in place for obtaining treatment as necessary. Appropriate PPE to be issued and used. Ensure barriers are used to prevent the public gaining access to the site.

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			Likelihood	Consequence	Index				Likelihood	Consequence	Index		
15	Vibration impacts on structures - During timber piling at Kings Esplanade.	Building collapse, crushing, structural cracking, falling masonry, plaster.	2	4	8	Designer	Detailed Design	Size of materials and hence plant required to be further considered during detailed design phase. Select appropriate construction methods.	1	5	5	Survey potential at risk properties. Select appropriate construction methods. Monitor vibrations during construction	
16	Vibration impacts on structures - From dumper trucks at Western Esplanade.	Building collapse, crushing, structural cracking, falling masonry, plaster.	2	4	8	Designer	Detailed Design	Size of materials and hence plant required to be further considered during detailed design phase. Select appropriate construction methods.	1	5	5	Survey potential at risk properties. Select appropriate construction methods. Monitor vibrations during construction	
17	Vibration impacts on structures - Marine delivery of beach material and rock. Potential risk at Kings Esplanade.	Building collapse, crushing, structural cracking, falling masonry, plaster.	2	4	8	Designer	Detailed Design	Size of materials and hence plant required to be further considered during detailed design phase. Select appropriate construction methods.	1	5	5	Survey potential at risk properties. Select appropriate construction methods. Monitor vibrations during construction	
18	Slips, trips and falls	Injury to site operatives from slips, trips and falls.	3	4	12	Designer	Detailed Design	Design out need for working on or close to edge of the sea wall, as done by setting back wall in Area 1. Provide and agree safe ingress/egress routes to prevent temptation to jump from height to gain access to the beach. Minimise need for complex setting out of works through specification of simple beach profiles.	1	4	4	Appropriate working practices to be managed by the contractor. Provide temporary handrailing along seawall during construction and onsite training regarding access/egress routes.	
19	Excavations and Foundations - Collapse during excavations for seawalls, rock revetments, timber groynes.	Suffocation, crush injuries and other potential injuries from excavation/collapse	2	5	10	Designer	Detailed Design	Detailed design review to limit excavations and/or removal of existing structures where possible and/or involves battering back existing defence to create sloped defence. Provide geotechnical information in Contract documents.	1	5	5	Contractor to develop a safe system of working for all operations that involved excavation. All staff to be familiar with safe system of work. No entry to excavations permitted. Use of Banksman/supervisor.	
20	Excavations and Foundations - Rapid ingress of water during excavations for seawalls, rock revetments, timber groynes.	Causing possible entrapment leading to injury/drowning of site personnel	2	5	10	Designer	Detailed Design	As far as is reasonably practicable limit the necessity for plant to work in the tidal zone. Designate areas for plant storage to prevent continual tracking along the frontage. Detailed design review to limit excavations and reduce extent of below water working where possible, e.g. toe length for groynes. Timber groynes have sheetpiles identified so excavation and requirement for personnel to work in trenches below high water levels is avoided. Provide ground water/tidal information and wave data to Contractor.	1	5	5	Contractor to undertake trial pits to confirm level of ground water. Excavations and associated tasks are only to be undertaken at low water. No entry to excavations permitted. Tidal monitoring to be undertaken.	
21	Stockpiling of rock armour - Risk of rocks falling / crushing.	Risk of injury to the general public and construction personnel.	3	5	15	Designer	Detailed Design	Contract docs to state that signage is located at stockpiles warning of the dangers of climbing on rock, etc. Minimise rock size (ie, voids) and quantity as far as is reasonably practicable. Investigate just-in-time delivery of rock to minimise stockpiles. Rock storage areas to be away from public areas.	1	5	5	Contractor to keep storage areas secure (e.g., fenced) and pile rocks in a stable fashion, keeping void sizes to a minimum. Adequate signage. Provide 24hr security.	
22	Delivery of rock armour - Risk of rocks falling / crushing.	Falling objects leading to bodily injury/death of site personnel. Risk of injury to eye as a result of rock splinters.	3	5	15	Designer	Detailed Design	Design to minimise quantity of rock required where possible. Designer to minimise rock size making handling of rocks easier. Designer to agree storage compound location and delivery method with contractor prior to delivery.	1	5	5	Contractor to ensure all operatives are aware of the rock deliveries. Contractor to ensure specified area for delivery of rock. Contractor to use appropriate safety equipment including eye protection.	
23	Handling and placement of rock armour - Risk of rocks falling / crushing. Potential risk during movement of new rock armour to/from stockpile or dismantling of existing rock armour.	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.	3	5	15	Designer	Detailed Design	Minimise quantity of rock to be used. Check that ground conditions are suitable for plant to handle rock armour. Ensure adequate room for plant. Check that adequate plant is available to lift/move armour.	1	5	5	Contractor to use suitable plant for the placement of rock, and provide thorough method statement to minimise risk to an acceptable level. Contractor is to ensure that all staff are appropriately trained and provided with appropriate PPE. Restrict personnel access.	
24	Handling and placement of geotextile	Injury to site personnel	2	4	8	Designer	Detailed Design	Safe delivery and storage methods to be defined in the geotextile specification. Adopt simple geotextile detail to simplify placing.	1	4	4	Contractor to provide thorough method statement to minimise risk to an acceptable level, use only suitable plant with qualified operators and banksman. Use experienced personnel and restrict access. Contractor to identify secure area for storage of geotextile material and in accordance of the specification.	
25	Use of concrete	Concrete burns and/or dermatitis to site personnel	2	3	6	Designer	Detailed Design	Minimise the necessity to use concrete in the marine environment through design, e.g. review construction techniques and consider use of precast units. Limit use of large plant and large shuttering, where possible.	1	3	3	Contractor is to ensure that all staff are appropriately trained and are provided with appropriate PPE. Use pumps if suitable. Use of Banksman/supervisor.	
26	Timber construction, piling for groynes - Unloading, storing, moving, installing timber piles.	Crush/amputation/puncture injuries and other potential injuries to site personnel due to plant and piles	2	5	10	Designer	Detailed Design	Design to consider: EA procurement rules, other similar examples on existing sites, and, to consider lessons learnt etc. Pre-fabricate where possible, provide the minimum strength class required, minimise sections, to reduce hazardous working.	1	5	5	Use experienced and knowledgeable staff, provision of staff training and appropriate safety equipment (e.g. hard hats, work boots, gloves, eye protection and ear defenders). Use of appropriate plant and equipment.	
27	Piling - noise and vibration - Potential risk from timber piling at Kings Esplanade.	Excessive noise and vibration from pile driving if percussion methods are used.	2	3	6	Designer	Detailed Design	Designer to take account of occasional obstructions. Designer to consult Contractor in regards to alternative pile driving techniques e.g. vibration. Auger drilling as an alternative.	1	3	3	Contractor to be consulted regards drivability of piles during construction phase.	
28	Removal of existing defence - Destabilise the structure and compromise the current standard of protection. Potential risk during removal of existing rock armour revetment and installation of new groyne field at Kings Esplanade.	Reduced armour protection or beach width leading to increased risk of erosion and flooding to landward assets.	2	4	8	Designer	Detailed Design	Proposed work approach to work in sections to minimise length of defence affected. Retained height is maintained at all times.	1	4	4	Contractor to maintain standard of defence during construction phase and provide temporary defence in areas where defence level is lowered until new works are completed. Method statement to advise on temporary options.	
<b>Likelihood:</b>		<b>Consequence:</b>				<b>Index:</b>		<b>Likelihood x Consequence (See also CIRIA SP125).</b>					
1 - Improbable - Extremely unlikely to occur in relevant period		5 - Catastrophic - Death or major loss; total systems failure				16-25		Very High Risk - Unacceptable. Re-examine activities to provide lower risk.					
2 - Remote - Unlikely to occur in relevant period		4 - Critical - Major injury, major damage to property/infrastructure, or major environmental effect.				9-15		High Risk - Apply further mitigation measures and/or alter method of work to reduce risk further. Seek Project Manager approval if risk cannot be reduced.					
3 - Occasional - Likely to occur in relevant period		3 - Serious - Lost time injury or illness; minor damage to property/infrastructure or significant environmental effect.				6-8		Medium Risk - Tolerable only if further mitigation is not reasonably practical and there is need to continue activity with identified controls.					
4 - Probable - Likely to occur several times in relevant period		2 - Marginal - Minor first aid incident, or requiring routine maintenance repair.				1-5		Low Risk - Broadly acceptable if all reasonably practicable control measures in place.					
5 - Frequent - Likely regular occurrence in relevant period		1 - Insignificant - Unlikely to have impact on works.											
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