Construction Environmental Management Plan Outline

Appendix F

Table F.1 CEMP outline

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction
1. General	The CEMP would outline the construction conditions and environmental protection measures to manage the impact of construction activities. It would be consistent with the mitigation and management measures documented in section 8 of this report, conditions of the approval, the conditions of any licences or permits issued by government authorities, and ARTC's environmental management system.	Site induction	▸ All employees, contractors and subcontractors would receive an environmental induction which would include: • all proposal specific and standard noise and vibration mitigation measures • relevant conditions of licences/approvals/determinations etc • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • heritage requirements • construction employee areas • designated loading/unloading areas and procedures • construction traffic routes • site opening/closing times (including deliveries) • environmental incident procedures.
		Roles and responsibilities	▸ The CEMP would identify all members of the Inland Rail and construction team, including roles and responsibilities relevant to implementation of the CEMP. ▸ Contact details would be provided, including contacts in the case of emergencies or incidents as well as out-of-hours contacts.
		Reporting and communication	▸ The CEMP would outline reporting requirements for different levels of environment incidents, as well as the required procedure for emergency and incident management, non-compliance management and corrective and preventative actions. ▸ Any additional training requirements would be identified (in addition to

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			the site induction). ▸ Reporting requirements would be included, including for the control of environmental records.
		Monitoring and auditing	▸ The CEMP would identify monitoring, auditing and inspection requirements, and determine the framework for the management of key environmental issues for construction.
		Environmental control maps	▸ The location of sensitive areas (e.g. heritage items and trees/vegetation to be retained) would be clearly identified on environmental control maps, which would be supplied to construction managers and workers.
		Working hours and out of recommended standard working hours protocol	▸ Permissible working hours and activities would be defined. ▸ A protocol for works undertaken outside recommended standard construction working hours (as per DECC, 2009) would be prepared in accordance with the conditions of approval.
2. Soil and water	The soil and water management sub-plan would detail how potential impacts on soils, erosion, sedimentation, watercourses and water quality (surface and groundwater) would be mitigated and managed during construction. The plan would consider site-specific conditions including dispersive soils and potential treatment options during	Erosion of exposed soils and sediment management	▸ Sediment and erosion control devices would be installed to minimise mobilisation and transport of sediment in accordance with *Managing Urban Stormwater, Soils and Construction* (Landcom, 2004). ▸ Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and any subsequent records retained. Sediment would be cleared from behind barriers/sand bags on a regular basis as required and all controls would be managed to ensure they work effectively at all times. ▸ The area of exposed surfaces would be minimised. Disturbed areas would be stabilised progressively to ensure that no areas remain unstable for any extended length of time. ▸ Soil and sediment that accumulates in erosion and sediment control

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	construction. The plan would provide for incident management in relation to potential water quality contamination incidents. It would include procedures to manage the impact of the proposal on soil and water, and would take into account the requirements of relevant guidelines, including: ▸ *Managing Stormwater: Urban Soils and Construction Vol 1* (Landcom, 2004) ▸ *Managing Stormwater: Urban Soils and Construction Vol 2A Installation of Services* (DECC, 2008) ▸ *Managing Urban Stormwater Volume 2C: Unsealed roads* (DECC, 2008) ▸ *Erosion and sediment control on unsealed roads* (OEH, 2012) ▸ *Technical Guideline: Temporary stormwater drainage for road construction* (Roads and Maritime, 2011)		structures would be reused where practicable during site reinstatement, unless it is contaminated or otherwise inappropriate for reuse. ▸ Work would cease where practicable during heavy rainfall events when there is a risk of sediment loss off site or ground disturbance due to waterlogged conditions. ▸ Equipment, plant and materials would be placed in designated lay-down areas where they are least likely to cause erosion. ▸ Erosion control devices would be removed as part of the final site clean-up. This would include removing any sediment in drainage lines that has been trapped by erosion control devices, and restoring disturbed areas. ▸ Exposed surfaces would be stabilised, and final landscaping implemented, as soon as practicable.
		Stockpile management	▸ Stockpiles would be managed by implementing sediment and erosion control devices in accordance with *Managing Urban Stormwater, Soils and Construction* (Landcom, 2004). ▸ No stockpiles of materials or storage of fuels or chemicals would be located within high/medium flood risk areas or flow paths.
		Spill/incident management	▸ Spill kits would be maintained on-site at all times. ▸ Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking. ▸ Refuelling of plant and equipment would be undertaken within designated areas with appropriate controls. ▸ Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) would be undertaken on a regular basis to identify any potential spills.

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	▸ *Guidelines for Controlled Activities on Waterfront Land* (Office of Water, 2012) ▸ *Waste Classification Guidelines* (EPA, 2014).		▸ Vehicle wash down and/or cement truck washout would occur in a designated bunded area or off-site.
		Groundwater	▸ Any groundwater encountered during construction would be managed and disposed of in accordance with the *Waste Classification Guidelines* (EPA, 2014). Groundwater would be managed to ensure it does not cause pollution of waters in accordance with section 120 of the POEO Act. ▸ If dewatering is required during construction: • Groundwater would be pumped into a holding tank or water truck. Pump out events would be supervised at all times, and the pump would be positioned to prevent the discharge of sediment-laden water settled at the bottom of the trench. • Groundwater for discharge to surface water would be tested prior to discharge. Conditions of discharge are likely to include: • No visible sheen or odour is noted. • Water pH is between 6.5 and 8.5. • Total suspended solids are less than 60 mg/L (approximately equivalent to a turbidity level of 50 NTU). Water may be dosed with gypsum, alum or a similar product to reduce sediment levels if required. • All litter and debris must be filtered out and removed prior to discharge. • Water quality would be checked regularly during discharge events to ensure the pH and suspended solids remain within the allowable levels. • Consideration would be given to the hydrological attributes of the receiving water body prior to discharge (ie is sufficient water

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			present to allow dilution etc). • Waste water that does not meet the criteria in the EPL would be disposed of off-site by a licensed liquid waste contractor in accordance with the Waste Classification Guidelines.
3. Contamination and hazardous materials	A contamination and hazardous materials sub-plan would detail how potential and actual contaminated soils and materials would be managed during construction to minimise the potential for significant on and off-site impacts. It would include the listed management measures. The plan would be reviewed and signed-off by a certified practitioner. Construction hazard and risk issues associated with the use and storage of hazardous materials would be addressed through risk management measures developed in accordance with relevant Department of Planning and Environment guidelines, Australian and ISO standards. The plan would take into account the requirements of relevant legislation and guidelines,	Hazardous materials	▸ Any hazardous materials that are to remain on site would be surveyed and recorded on a hazardous building material register. A risk assessment would be undertaken and a management plan implemented, including any remediation measures. The register and management plan would be maintained and updated in accordance with the relevant WorkCover codes of practice. ▸ Where required, any materials classified as Hazardous Waste would be treated, or an immobilisation approval obtained, in accordance with Part 10 of the *Protection of the Environment Operations (Waste) Regulation 2014* prior to off-site disposal. ▸ In the event synthetic material fibres are found on site, they would be handled and disposed of in accordance with the National Code of Practice for the Safe Use of Synthetic Mineral Fibres. ▸ The storage of hazardous materials, and refuelling/maintenance of construction plant and equipment, would be undertaken in clearly marked designated areas that are designed to contain spills and leaks. ▸ The storage of hazardous materials and dangerous goods would be undertaken in accordance with all relevant Australian Standards and regulatory requirements. ▸ Fuels, chemicals and liquids would be appropriately stored, in accordance with the following requirements. • Would be stored on an impervious base that must be able to withstand fuel or chemical spills without degradation • The fuels and chemicals stored must be compatible (i.e. will not

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	including: ▸ POEO Act and the *Waste Avoidance and Resource Recovery Act 2001* ▸ *Waste Classification Guidelines* (EPA, 2014) ▸ *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1*) (NEPC, 2013) ▸ WorkCover NSW ▸ *AS 1940: The Storage and Handling of Flammable and Combustible Liquids.* ▸ AS 3780-2008: The Storage and Handling of Corrosive Substances. ▸ Dangerous Goods (Storage and Handling) Regulations 2012		react with each other). The safety data sheets would be consulted in this regard • For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume, within the bund • The storage facility would be undercover • All containers would be labelled with the details of the contents • Safety data sheets would be available at the site • The storage facility would be inspected for compliance to the above requirements ▸ Spill kits would be kept at fuel, oil and chemical storage locations ▸ The removal, handling and disposal of any asbestos containing materials would be undertaken by an appropriately licensed contractor, and in accordance with: • Code of Practice for the Safe Removal of Asbestos 2005 • Code of Practice for the Management and Control of Asbestos in Workplaces 2005.
		Incident management	▸ Spill kits, appropriate for the type and volume of hazardous materials stored or in use, would be readily available and accessible to construction workers. ▸ All hazardous materials, spills and leaks would be reported to site managers, and actions would be immediately taken to remedy spills and leaks. ▸ Training in the use of spill kits would be given to all personnel involved in the storage, distribution or use of hazardous materials. ▸ Incidents would be managed in accordance with the conditions of approval for the proposal.

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		Unexpected finds	▸ An 'unexpected finds protocol' would be prepared and included in the CEMP to assist with the identification, reporting, assessment, management, health and safety implications, remediation, and/or disposal (at an appropriately licensed facility) of any potentially contaminated soil and/or water. This would include specifying appropriate reporting requirements in accordance with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015). ▸ In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the affected area would cease immediately, and the procedures detailed in the unexpected finds protocol would be implemented. Unexpected soil contamination could include: • unexpected staining or odours • potential asbestos containing materials • underground storage tanks, buried drums or machinery, etc. ▸ The unexpected finds protocol would include the following general approach: • site workers would make the area safe, stop work, and notify the construction supervisor, who would quarantine/fence the area, notify staff on-site and the project manager • the project manager or their representative would notify an appropriately qualified environmental consultant who would carry out an assessment of the nature and extent of the unexpected contamination • remediation would be undertaken as required and as advised by the environmental consultant • works may only recommence at the site after approval has been

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			obtained by the environmental consultant and the project manager. • validation of the remediation would be carried out to assess the success of the remediation works. ▸ Awareness training would be provided for all onsite staff to assist in the identification of potentially contaminated material.
		General contamination management	▸ Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking. ▸ Refuelling of plant and equipment would be undertaken within a designated refuelling point.
4. Traffic, transport and access	The traffic, transport and access management sub-plan would detail how traffic, public transport and access would be managed during construction to minimise the potential for significant impacts. It would include measures relating to construction vehicle and traffic movements, parking and access requirements for construction personnel, safety signage, and training of personnel in traffic management. It would cover all construction zones and worksites, including the construction compounds.	Construction site traffic	▸ Traffic and access would be managed in accordance with *Traffic Control at Work Sites* (RTA, 2010) and in consultation with Roads and Maritime, and local councils. ▸ Adequate road signage would be provided to inform drivers of the work, timing and alternative access arrangements. ▸ Measures to manage traffic flows around the area affected by construction would be provided, including required regulatory and directional signposting, line marking, variable message signs, and all other necessary traffic control devices. ▸ The plan would specify routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and the local community. ▸ Construction vehicles would park within the construction compound where practicable. ▸ The timing of deliveries accessing the site would be programmed to ensure there is sufficient space within the proposal site to accommodate deliveries. ▸ The queuing and idling of construction vehicles would be minimised.

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			▸ Designated queuing and idling areas would be determined near the work site to minimise disruption to the local community. ▸ Adequate sight lines would be provided to allow for safe entry and exit from the construction sites. ▸ Access to all private properties adjacent to the proposal site would be maintained during construction, unless otherwise agreed with relevant property owners. ▸ Contractors, including transport/deliveries contractors, would be provided with a copy of the traffic, transport and access management sub-plan to ensure disruptions to the local community are minimised. ▸ Councils, Roads and Maritime and emergency services would be liaised with at an early stage to establish requirements and measures to be adopted to maintain emergency vehicle movements.
		Pedestrian and cyclists	▸ The plan would include measures to maximise safety and access for pedestrians and cyclists, including details of alternative access arrangements. ▸ Adequate road signage would be provided to inform pedestrians of the work, and ensure that the risk of accidents and disruption to surrounding land uses is minimised. ▸ Adequate road signage would be provided to inform pedestrians and cyclists of the work, timing and alternative access arrangements. ▸ Appropriate controls would be established where vehicles are required to cross footpaths to access construction sites. This may include manual supervision, physical barriers or temporary traffic signals as required.
5. Noise and vibration	The noise and vibration management sub-plan would	Notification and behaviour	▸ Notification undertaken during construction would inform relevant stakeholders of the work locations and timing, and the potential for

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	detail how potential noise and vibration impacts would be mitigated and managed during construction. The plan would be prepared in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework (refer to Appendix E of this report). The requirements of relevant standards and guidelines, including AS 2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* and the *Interim Construction Noise Guideline* (DECC, 2009) would be addressed. The plan would also include reference to the working hours protocol (item 1) and the complaints management procedures specified in the communication and complaints management plan (refer to item 8).		noise impacts. ▸ Construction compounds located within 200 metres of sensitive receivers would be managed to minimise noise generating activities, including unnecessary shouting, loud stereos/radios, dropping of materials from height, throwing of metal items, and slamming of doors, particularly at the start and finish of shifts.
		Construction hours and scheduling	▸ The relevant noise and vibration criteria would be defined. ▸ The Inland Rail Construction Noise & Vibration Management Framework will be implemented where work undertaken in the vicinity of receivers where 'highly noise affected' impacts are predicted..
		Equipment and plant	▸ Quieter and less vibration emitting construction methods would be used where reasonable and feasible. ▸ The noise levels of plant and equipment would have operating sound power or sound pressure levels that comply with the required criteria. ▸ Simultaneous operation of noisy plant within range of sensitive receivers would be avoided. ▸ The offset distance between noisy plant and adjacent sensitive receivers would be maximised, where practicable. ▸ Plant used intermittently would be throttled down or shut down. ▸ Noise-emitting plant would be directed away from sensitive receivers. ▸ Stationary noise sources (such as pumps, compressors, fans etc) would be enclosed or shielded whilst ensuring that the health and safety of workers is maintained. ▸ Consider site topography when situating plant and use structures (such as site shed placement, earth bunds, fencing, noise barriers) to shield receivers from noise.

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		Traffic flow and deliveries	▸ For construction sites located near sensitive receivers, plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. ▸ Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers, and preferably during standard construction hours. ▸ Site access points and roads would be selected to minimise impacts on sensitive receivers. ▸ Where practicable, delivery vehicles would be fitted with straps rather than chains for unloading.
		Measuring and monitoring	▸ Attended vibration measurements would be undertaken at the commencement of vibration generating activities located in close proximity to sensitive receptors to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. ▸ Additional vibration and noise monitoring may be required in response to complaints.
		Vibration	▸ Where construction is required within the safe working buffer distance, alternative work methods would be considered, such as the use of smaller equipment. If no alternative work method is feasible or reasonable, then compliance vibration monitoring would be undertaken. ▸ Trial vibration testing would be undertaken as required, prior to undertaking any high vibration activities. Trials would be undertaken in non-sensitive areas and at a range of distances from the source. The results of the trial monitoring would be compared against predicted vibration levels and the potential for impact refined, if deemed appropriate. ▸ The trial period may also be used to determine the effectiveness of

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			source-based mitigation measures, such as changing the operating speed of the vibratory roller to generate a higher frequency of vibration, which may allow for a higher vibration threshold at the structure. ▸ For identified properties within buffer distances, or where pre-construction monitoring indicates that vibration levels from construction activities would exceed the target levels, a dilapidation survey of potentially affected structures would be undertaken to enable post-construction verification.
6. Heritage (Aboriginal and non-Aboriginal)	The heritage management sub-plan would detail how potential impacts on heritage would be mitigated and managed during construction. The plan would be prepared in consultation with relevant agencies and Aboriginal groups for management of Aboriginal heritage, listed non-Aboriginal heritage items and archaeological areas, and any previously unidentified items/areas of potential heritage significance identified during construction. It would incorporate the results of archaeological subsurface testing and an unexpected finds procedure. The unexpected finds procedure would define requirements relating to potential human skeletal remains, in accordance	General – built and non-Aboriginal heritage	▸ All identified items within and in the immediate vicinity of the proposal site would be marked on the environmental control maps, site plans, fenced off where appropriate, and avoided. ▸ The detailed construction methodologies would take into account mapped heritage items. ▸ Heritage requirements would be included in the site induction.
		Aboriginal heritage	▸ The plan would be prepared in consultation with registered Aboriginal parties, incorporate the recommendations of the Aboriginal Cultural Heritage Assessment of the proposal, the mitigation measures provided in section 8 of this report, and the outcomes of any further investigations following detailed design.
		Unexpected finds	▸ An unexpected finds procedure would be developed and included in the CEMP to provide a consistent method for managing any unexpected heritage items (both Aboriginal and non-Aboriginal) discovered during construction, including potential heritage items or objects, and human skeletal remains. ▸ The procedure would define responsibilities, tasks, reporting requirements, and relevant guidelines and requirements. It would include the following:

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	with relevant guidelines, including: ▸ *Policy Directive: Exhumation of Human Remains* (NSW Health, 2013) ▸ *Manual for the identification of Aboriginal remains* (DEC, 2006c) ▸ *Skeletal Remains: Guidelines for Management of Human Skeletal Remains under the Heritage Act 1977* (NSW Heritage Office, 1998).		• If previously unidentified Aboriginal or non-Aboriginal heritage/archaeological items, relics, burial sites or potential human skeletal remains are uncovered during construction works, all works in the vicinity of the find shall cease and ARTC would be notified. • An appropriate buffer area would be established around the find. • Appropriate advice would be sought from a suitably qualified heritage consultant/archaeologist (and in consultation with the relevant division of the Department of Planning and Environment, as required). • Works in the vicinity of the find would not re-commence until clearance has been received from the heritage consultant/archaeologist and ARTC. ▸ Procedures and notification requirements for potential human remains in accordance with relevant guidelines.
7. Visual amenity	The visual amenity sub-plan would provide measures to minimise the potential impacts of the proposal during construction.	General worksite management	▸ Work sites would be maintained in a clean and tidy condition at all times. ▸ Temporary hoardings, barriers, traffic management and signage would be removed when no longer required. ▸ On completion of construction, all work sites and other land occupied temporarily would be rehabilitated in accordance with the rehabilitation plan.
		Lighting	▸ Directional lighting would be mounted to avoid light spill into adjoining residences. ▸ Lighting would be installed and maintained in accordance with *AS 4282: Control of the Obtrusive Effects of Outdoor Lighting.*
8.	The communication management	Communication	▸ Contact details for a 24-hour project response line and email address

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Communication management plan	sub-plan would provide guidance for the management of communication and consultation during the construction period, including objectives of consultation, stakeholders, contact mechanisms, and protocols. It would be consistent with the consultation plan developed by ARTC, as described in chapter 4 of the EIS. The plan would also include implementation and maintenance of a complaints register and complaints handling and escalation procedures, consistent with ARTC requirements.	and complaints	would be provided for ongoing stakeholder contact throughout the construction period. ▸ Provision of accurate public information signs while work is in progress. ▸ Staging of works would be undertaken to minimise disruption, in consultation with relevant stakeholder groups, to minimise impacts to community activities and functions. ▸ Relevant stakeholders would be notified regarding service disruptions in accordance with the communication management plan. ▸ Complaints would be managed according to the following procedure: • Details of all complaints received will be recorded. • A detailed written response will be provided to the complainant within 14 calendar days.
9. Biodiversity management	The biodiversity management sub-plan would detail how construction impacts on aquatic and terrestrial flora and fauna would be mitigated, managed and monitored.	Vegetation management	▸ Employee education and training including inductions for staff, contractors and visitors to the site would include the biodiversity issues present at the site and so they know their role and responsibilities in relation to the protection and/or minimisation of impacts to native biodiversity. ▸ The CEMP and construction plans would clearly document the location and full extent of clearing required.
		Management of trees to be retained	▸ The management of trees in the vicinity of the construction zone would be consistent with the *AS 4970-2009 Protection of trees on development sites* (incorporating Amendment No. 1 (March 2010)).
		Pre-clearance	▸ Pre-clearance surveys would be implemented within areas of woody

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		surveys – woody native vegetation	native vegetation that are to be cleared. Pre-clearance surveys will be undertaken by suitably qualified and experienced ecologists and involve the following: • The demarcation of areas approved for clearing to reduce risk of accidental clearing/disturbance of surrounding native vegetation. • The likely habitat resources and habitat trees would be identified and marked. Habitat trees are those containing hollows, cracks or fissures and spouts, active nests, dreys or other signs of recent fauna usage. Other habitat features to be identified include fallen timber/hollow logs and burrows. • The potential presence of threatened flora and fauna species, endangered populations and TECs would be identified. • The identification of species or habitat features that are suitable for translocation or salvage. • In areas of koala habitat, visual inspection of trees for koalas prior to clearing.
		Pre-clearance surveys – bridges and culverts (micro-bats)	Pre-clearance surveys would be implemented on the day prior to the disturbance of culverts with the potential to provide roosting habitat for micro-bats, and would involve: ▸ Recording: • roosting species (if identifiable) • count/estimate of the number of roosting individuals • location and time of relocation (if applicable) or other actions taken to discourage the roosting of micro-bats. ▸ If roosting bats are identified, the bats would be left undisturbed until dusk. At dusk, roosting bats can be captured and released at a location to be agreed during pre-clearance surveys.

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			▸ Following removal or departure of all roosting bats, crevices would be removed or blocked off (for example, by covering the entrance with shade cloth).
		Tree-felling	Tree clearing would be completed as close to the completion of pre-clearance surveys as practicable and would include: ▸ All habitat trees would be vigorously shaken with heavy machinery the day prior to clearing. ▸ On the day of habitat tree felling, the following would be undertaken: • all habitat trees would be subject to a visual inspection for threatened species • all reasonable attempts would be made to reduce the impact of felling on all fauna species • the lowering of hollow-bearing trees would be done as gently as possible with heavy machinery • if a native fauna species is identified in a habitat tree on the day of felling, the supervising ecologist or appropriately qualified fauna handler would advise the most appropriate method to minimise potential harm • uninjured animals would be released on the day of capture into nearby suitable secure habitat and would not be held for extended periods of time • injured animals would be taken to the nearest veterinary clinic or wildlife carer as soon as possible for assessment and treatment. ▸ Following felling, habitat trees would be inspected for remaining or injured fauna species and to ensure that no hollows are blocked against the ground. This may require the tree to be rolled to ensure adequate access.

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			▸ All felled habitat trees would remain in place for a least one night to allow any fauna still present to move on.
		Aquatic ecology	▸ Works within the riparian zone would maximise, where practicable, the preservation of any existing vegetation and minimise disturbance. ▸ Designs for works within or near watercourses would provide for the retention of natural functions and maintenance of fish passage in accordance with *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge, 2003). ▸ Management of sediment that has accumulated upstream to avoid sediment mobilisation. ▸ Any large woody debris in the development footprint would be relocated upstream or downstream in consultation with an appropriately qualified specialist.
		Dewatering of pools	▸ A dewatering procedure would be included, detailing methods for collection and relocation of protected fish and euthanasia of pest species. ▸ Any pools in watercourses that would be impacted by construction would be dewatered according to the dewatering procedure.
		Weed management	▸ Weeds would be managed and disposed of in accordance with the requirements of the *Noxious Weeds Act 1993* and/or the Weeds of National Significance Weed Management Guide. ▸ Weed control mitigation and management strategies would be documented and implemented as follows: • vehicles or equipment being brought onto the proposal site and/or travelling around the site must be inspected and cleaned prior to commencing work to limit the spread of seeds and plant material • regular inspections to monitor the spread of weed species

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			• training of environmental personnel on the identification of target weed species. ▸ Any outbreak of noxious weeds will be controlled and eradicated as required under the *Noxious Weeds Act 1993*, and as required by the Local Land Services and other relevant authorities. Weed control and eradication techniques may include: • spraying with herbicides • physical removal e.g. chipping, and/or • reduction of area available for weed infestation, through prompt revegetation of bare areas.

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10. Air quality and dust	The air quality and dust management sub-plan would detail how potential impacts on air quality would be mitigated and managed during construction.	Dust suppression – construction works	▸ Shade cloth would be fastened to the perimeter fence on the proposal site where construction is being undertaken within 100 metres of sensitive receptors to minimise dust transported from the site during construction. ▸ Dust generation would be monitored visually, and where required, dust control measures such as water spraying would be implemented to control the generation of dust. ▸ Dust suppressants would be applied to stockpiled dirt if the pile is inactive for extended periods. ▸ Access points would be inspected to determine whether sediment is being transferred to the surrounding road network. If required, sediment would be promptly removed from roads to minimise dust generation. ▸ Works (including the spraying of paint and other materials) would be suspended during strong winds or in weather conditions where high levels of dust or airborne particulates are likely. ▸ Any exposed surfaces would be stabilised as soon as practicable. ▸ In locations where nearby sensitive receivers may be affected, adopt a site 'shut down and cover up' policy during periods of extreme weather conditions, e.g. high winds.
		Dust suppression – vehicle movements	▸ Vehicle movements would be limited to designated entries and exits, haulage routes, and parking areas. ▸ Materials transported to and from the site would be covered to reduce dust generation in transit.
		Vehicle emissions	▸ All plant and machinery would be fitted with emission control devices complying with relevant Australian Standards. ▸ Machinery would be turned off when not in use and not left to idle for

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			prolonged periods. ▸ Surveillance would be undertaken to identify any vehicle, plant or equipment that is causing visible emissions. If any defective vehicles, plant or equipment are identified, operation of this machinery would cease and service/maintenance would be undertaken.
		Communication	▸ Advance warning would be provided to sensitive receivers in relation any significant dust generating activities undertaken in close proximity to sensitive receptors, including stock.
11. Spoil and waste	The spoil and waste management sub-plan would detail how waste would be managed during construction to minimise the potential for significant impacts. It would include disposal requirements, measures to measures to reduce, re-use or recycle wastes where possible. It would set targets for waste diversion, demonstrate how targets can be achieved, and outline how waste diversion would be tracked and reported. The plan would be prepared in accordance with the *Waste Classification Guidelines* (EPA, 2014).	Waste management	▸ Resource management hierarchy principles would be followed: • avoid unnecessary resource consumption as a priority • avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • disposal is undertaken as a last resort. ▸ Waste material, including soil and spoil to be taken off site, would be classified and managed in accordance with the *Waste Classification Guidelines* (EPA, 2014) and would be disposed of in accordance with the POEO Act. ▸ All waste documentation would be collated and maintained on file in accordance with these guidelines. ▸ Waste material would not be left on site once the works have been completed. ▸ Working areas would be maintained, kept free of rubbish, and cleaned up at the end of each working day. ▸ Any waste material identified as being contaminated would be managed in accordance with the *Contaminated Land Management Act 1997* and other relevant legislation and guidelines. ▸ The removal, handling and disposal of any asbestos containing

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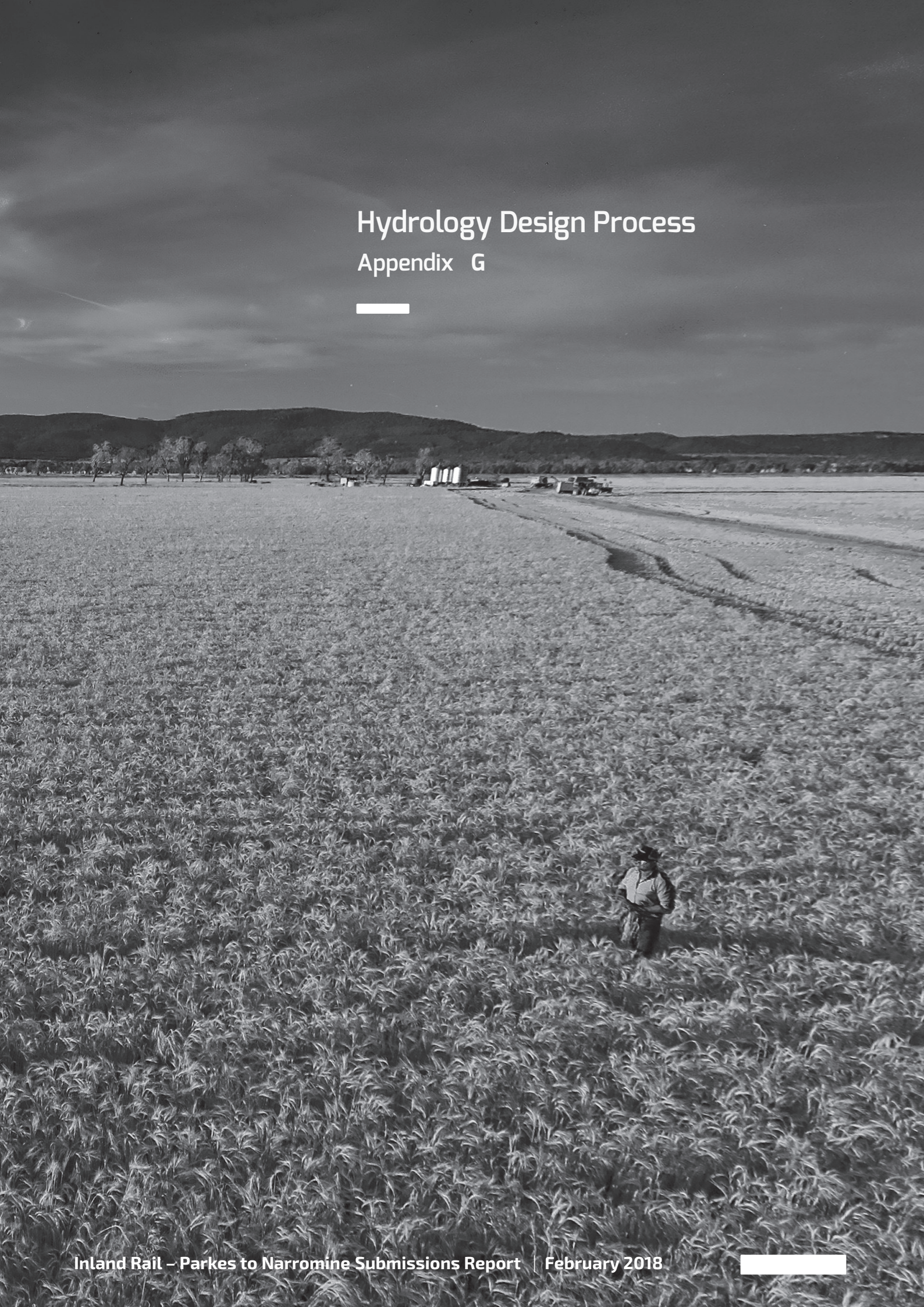
			materials would be undertaken by an appropriately licensed contractor, and in accordance with: • How to Safely Remove Asbestos Code of Practice (Safe Work Australia, 2016) • Code of Practice How to Manage and Control Asbestos in the Workplace (SafeWork NSW, 2016).
12. Hazards, risk and contingency management	The hazards, risk and contingency management sub-plan would be aligned to *ISO/ANZS 31000: 2009 Risk Management* and the Department of Planning Hazardous Industry Planning Advisory papers (where relevant to the proposal), and would provide a systematic pro-active approach of ongoing risk identification and contingency planning. It would identify hazards and risks, and measures to minimise risks and respond to incidents during construction.		▸ Hazards and risks associated with construction activities would be identified prior to construction. ▸ A process for regularly reviewing work practices/procedures would be implemented throughout construction to identify, report, and respond to any new environmental hazards/risks. ▸ Site-specific work health and safety management plans and safe work method statements would be developed and implemented in accordance with work health and safety requirements. ▸ The plan would support the contamination and hazardous materials sub-plan developed as per item 3.
13. Emergency response plan	An emergency response sub-plan would be prepared to address protocols and procedures to be followed during emergency situations (including bushfires, fires, explosions, flooding and inundation).	Emergency response	The plans would include: ▸ Details of traffic management measures to be implemented during emergencies ▸ Design and management measures to address the potential environmental impacts of an emergency situation. ▸ Training programs to ensure that all staff are familiar with the plan.



Hydrology Design Process

Appendix G

Selecting Flood Immunity

Introduction

The design for flooding is an important component of the railway design and this note provides details of flood design criteria and objectives for the proposal..

There are two aspects of these criteria:

- Flood immunity – The probability of railway overtopping during flood events, expressed as an annual exceedance probability (AEP); and
- Flood impact objectives – Construction of a railway across floodplains and water courses will impact on flooding, and these objectives specify the limits on these impacts.

Flood immunity

The design flood immunity adopted for the proposal, which is an upgrade of an existing track, considers the flood immunity for the existing railway is first and then a decision is made on the design flood immunity for the required upgrade.

ARTC has developed an assessment process to allow a safe and efficient determination of appropriate flood immunity across the Inland Rail Programme. The process involves an initial assessment of the existing flood immunity for each water crossing and where this currently has a flood immunity of 1% AEP or higher, this standard is maintained. However where the flood immunity is currently less than 1% AEP, a decision is made on the acceptability of the existing and an appropriate upgrade if required for the design flood immunity.

The implications of adopting a flood immunity lower than 1% AEP are assessed by a risk assessment where a range of risk factors are evaluated to determine if it is feasible to lower the flood immunity while maintaining an acceptable risk of damage to the track and risk of closure by flooding. This risk assessment uses a Multi-Criteria Analysis (MCA) to combine a number of criteria and concludes with an acceptable risk. The increased risk, as a result of lowering the flood immunity, is considered in conjunction with the cost. The MCA considers the following key criteria:

- Risk of rail closure and the duration of closure and thereby disruption to freight transport
- Risk of damage to rail ballast from higher flood levels and high flow velocity
- Depth of flow above the base of ballast
- Availability of alternative diversion routes for trains where the line is closed by flooding
- Ability to forecast the occurrence of flooding

The end result of this analysis is a flood immunity that balances the cost of construction and the risk from a range of criteria.

In regard to the proposal, this will result in either a 1% AEP design flood immunity or a lower flood level if this can be justified by the risk assessment and MCA. This analysis is still underway. In all flood immunity options tested, the flood impact criteria, including impacts on neighbouring properties must be met.

Design Criteria

Introduction

Construction of the railway across floodplains and water courses will have an effect on the flood flow patterns and the design must ensure that these impacts are kept within acceptable limits.

The detailed design hydraulic analysis for the proposal will rely on a two-dimensional hydraulic model where maps of flood levels, depths and velocities for all locations in the inundated area can be overlaid on aerial photographs to determine specific impacts in detail.

The general objective is that the design should minimize the changes on the flow regime and ensure that the design results in a similar flood flow pattern to natural conditions. This is influenced by the fact that there is an existing railway line that has been in place for many years and this has been influencing flooding as compared to natural conditions. The base case for assessment of the impacts of the railway adopted for this design is the current conditions including the existing railway.

There are several components of these potential impacts as follows:

Afflux

Constraining the flow to culverts means that there will be an increase of water level on the upstream side of the constructed railway line and a corresponding decrease on the downstream side, though this is a smaller impact than the upstream increase. An increase in flood level can cause additional damage or disruption to private property or other natural features or infrastructure so any change in flood level needs to be assessed in detail to determine if there are any adverse impacts. For the proposal an afflux criteria has been established with varying values depending on the land use. The desired maximum impact is.

- Residential and commercial buildings – 50mm (15mm limit for above floor level flooding)
- Cropping paddocks –200mm
- Stock paddocks – 200mm
- Newell Highway – 50mm
- Other roads – 100mm
- Public infrastructure (pump stations, sewage treatment plants, health services etc.) for above floor level flooding).

In specific situations, each afflux map will be reviewed individually to assess any points of interest and the allowable maximum afflux may be adjusted as necessary either as a reduction or increase depending on the sensitivity and acceptability of the receptors through consultation.

Velocity

A constriction to the flow by culverts or bridges or even from the rail embankment across the floodplain may cause a change in flow velocity. This is especially a concern if there is an increase on flow velocity that is sufficient to cause scour damage to the flow paths or floodplains. The most important concern with velocity change is any increase in velocity at culvert outlets, where there is a potential scour risk.

The design criterion for change in flow velocity requires that for any location in the flow path or floodplain where the existing flow velocity is less than 1 m/s, this must remain less than 1 m/s. If the existing velocity is more than 1 m/s, the velocity should not change by more than 20%. In all cases, the flood hazard category should not change.

Flood duration

Changes in flooding patterns may have an impact on the duration of inundation when there is water ponded. The flood impact criteria also provide for a maximum change in flood inundation duration.

For buildings, built infrastructure and major highways, where the existing flood inundation is less than 6 hours, it should remain under 6 hours and where the inundation is more than 6 hours, the inundation should not increase by more than 10%.

For agricultural or grazing land, where the existing inundation is less than 12 hours, it should remain less than 12 hours and where it is more than 12 hours; the inundation should not increase by more than 10%.

For minor roads, the duration of inundation should not increase by more than 10%.

In all cases, the design will endeavour to meet these criteria. However there is a possibility that there may be some localized points where the criteria cannot be met, and a detailed assessment will be made of these individual locations and efforts made to develop alternative mitigation measures. Consultation will be undertaken with property owners and relevant stakeholders for each of these individual locations to develop a solution that meets the requirements of all parties. However it is expected though that a compliant solution in accordance with the proposal's flood impact criteria will be possible for all or almost all locations.

Flow diversion

Diversion of flow from one water course to another could have impacts on both communities and the environment therefore an objective of the drainage design is to maintain the natural drainage system to the maximum extent possible so that the impacts on the environment and local property owners are minimised. This objective is met by ensuring that drainage structures are constructed at appropriate locations and are adequate for the flow rates that occur. While

there is no specifically defined objective, the design should consider all locations where diversions may be possible particularly in flat locations which occur in the proposal site.

Environmental criteria

In addition to the community impacts, the design should also meet environmental objectives. These are generally similar to those for community impacts, since the objective is to essentially minimize changes in the flow regime.

In addition to the impacts on flood levels, velocity and duration of inundation, the environmental impacts will also consider allowance for fish passage in water courses where key fish habitat has been identified. This design will be considered individually for the specific water courses and will provide for standard fish friendly culvert design, particularly considering flow velocity, culvert slopes and invert levels.

Conclusion

The major objective of the assessment of flood impacts is that a solution to flood design will be found that is acceptable and meeting the requirements of ARTC and the Inland Rail as well as local land owners and other stakeholders.

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