Construction Flood Emergency Management Sub-Plan

Narrabri to North Star (N2NS) SP1

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Document Control

REPORT TITLE	**CONSTRUCTION FLOOD EMERGENCY MANAGEMENT SUB-PLAN**
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Specific terms and acronyms used throughout this strategy are listed and described in the table below.

Table 1: Terminology

ACRONYM / ABBREVIATION	DEFINITION
AMS	Activity Method Statement
ARTC	Australian Rail Track Corporation
CAD	Computer-Aided Design
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSEMP	Community and Stakeholder Engagement Management Plan
CSSI	Critical State Significant Infrastructure
DPE	Department of Planning and the Environment (Formally DPIE)
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act*
EPL	Environment Protection Licence
EP&A Act	*Environmental Planning and Assessment Act* (1979)
ER	Environment Representative
FEMP	Flood Emergency Management Sub-Plan
GIS	Geographic Information System
GMR	Global Mandatory Requirement
HSEQS	Health, Safety, Environment, Quality and Sustainability
IMS	Integrated Management System
IR	Inland Rail
ISCA	Infrastructure Sustainability Council of Australia
N2NS	Narrabri to North Star (Separable Portion 1)
NSW SES	New South Wales State Emergency Services
NVMP	Noise and Vibration Management Sub-Plan
RMM	Revised Mitigation Measures
RTS	Response to Submissions
SEARs	Secretary's Environmental Assessment Requirements
SEMP	Site Establishment Management Plan
SEP	Site Environmental Plan
SPIR	Submissions Preferred Infrastructure Report
SuMP	Sustainability Management Plan
TRA	Task Risk Assessment

TTAMP	Traffic, Transport and Access Management Sub-Plan
TfNSW	Transport for NSW
WRA	Workplace Risk Assessment

Compliance Matrix

Table 2: EPBC Conditions of Approval

CONDITION REFERENCE	Requirements	WHERE ADDRESSED
PART B - STANDARD ADMINISTRATIVE CONDITIONS		
4	The approval holder must maintain accurate and complete compliance records.	CEMP - Section 8
5	If the Department makes a request in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request.	CEMP - Section 8
Annual Compliance Reporting		
6	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with the annual date that has been agreed with in writing by the Minister. The approval holder must: a) Publish each compliance report on the website within 60 business days following the relevant 12 month period; b) Notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication; c) Keep all compliance reports publicly available on the website until this approval expires;	CEMP - Section 8
Reporting non-compliance		
7	The approval holder must notify the Department in writing of any: incident, non-compliance with the conditions of this approval; or non-compliance with the commitments made in any element of the Construction Environmental Management Plan, (required under Part C- State Infrastructure approval) referred to in condition 1. The notification must be given as soon as practicable, and not later than two business days after becoming aware of the incident or non-compliance. The notification must specify: a) Any condition which is or may be in breach; b) A short description of the incident and/or non-compliance; and c) The location (including co-ordinates), date and time of the incident and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.	CEMP - Sections 8 and 10
8	The approval holder must notify the Department in writing of any: incident, non-compliance with the conditions of this approval; or non-compliance with the commitments made in any element of the Construction Environmental Management Plan, (required under Part C- State Infrastructure approval) referred to in condition 1. The notification must be given as soon as practicable, and not later than two business days after becoming aware of the incident or non-compliance specifying:	CEMP – Sections 8 and 10

	a) Any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future b) The potential impacts of the incident or non -compliance and; c) The method and timing of any remedial action that will be undertaken by the approval holder.	

Table 3: Minister's Conditions of Approval (CoA)

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
A1	The CSSI may only be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Inland Rail – Narrabri to North Star Environmental Impact Statement, Volumes 1-7 (prepared by GHD and dated November 2017), the Inland Rail – Narrabri to North Star Submissions Preferred Infrastructure Report (ARTC, dated December 2019) and (updated BDAR, RtS on the SPIR and RFI responses).	CEMP – Sections 3 and 4
A2	The CSSI must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in in the documents listed in Condition A1 unless otherwise specified in, or required under, this approval.	CEMP - Section 3
A3	In the event of an inconsistency between the documents listed in Condition A1 or any other document required under this approval, and a term of this approval, the term of this approval prevails to the extent of the inconsistency. Note: For the purpose of this condition, there will be an inconsistency between a term of this approval and any document if it is not possible to comply with both the term and the document.	CEMP - Section 3
A4	The Proponent must comply with the written requirements or directions of the Planning Secretary, including in relation to: a) the environmental performance of the CSSI; b) any document or correspondence under the terms of this approval in relation to the CSSI (including the provision of such documentation or correspondence); c) any independent appointment or dismissal made in relation to the CSSI; d) any notification given to the Planning Secretary under the terms of this approval; e) any audit of the construction or operation of the CSSI; f) the terms of this approval and compliance with the terms of this approval (including anything required to be done under this approval); g) the carrying out of any additional monitoring or mitigation measures; and h) in respect of ongoing monitoring and management obligations, compliance with an updated or revised version of a guideline, protocol, Australian Standard or policy required to be complied with under this approval.	CEMP – Sections 3 and 8
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation	Section 3

	with identified parties, evidence of the consultation undertaken must be submitted to the Planning Secretary with the document. The evidence must include: a) documentation of the engagement with the party identified in the condition of approval that has occurred before submitting the document for approval b) a log of the dates of engagement or attempted engagement with the identified party and a summary of the issues raised by them c) documentation of the follow-up with the identified party where engagement has not occurred to confirm that they do not wish to engage or have not attempted to engage after repeated invitations d) outline of the issues raised by the identified party and how they have been addressed e) a description of the outstanding issues raised by the identified party and the reasons why they have not been addressed.	Relevant Sub-Plans and Monitoring Programs NOTE: The Communication Strategy as required under CoA B1 and B2 is being prepared by ARTC. The Communication and Stakeholder Engagement Management Plan (CSEMP) is being prepared by Inland Rail and aligns with the requirements of ARTC's Communication Strategy.
A6	Any document that must be submitted, or approval that must be obtained, within a timeframe specified in or under the conditions of this approval may be submitted within a later timeframe agreed with the Planning Secretary. This condition does not apply to the immediate written notification required in respect of an incident under Condition A41. The Proponent must provide supporting evidence so that the Secretary can consider the need, environmental impacts and consistency of any request. Note: Inaction and/or expedience will not be supported as justifications for need unless it can be demonstrated that there are beneficial environmental impacts associated with the request.	CEMP – Section 8
A16	Ancillary facilities that are not identified by description and location in the EIS; can only be established and used in each case if: d) the establishment and use of the facility can be carried out and managed within the performance outcomes set out in the terms of this approval, including in relation to environmental impacts.	CEMP – Sections 4 and 8
A21	Facilities including lunch sheds, office sheds, material lay down sites, stockpile areas, areas used to assemble infrastructure, and portable toilet facilities can be established and operated where they satisfy the following criteria: (ii) low environmental impact with respect to waste management and flooding.	CEMP – Sections 4 and 8
C4	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies and relevant Councils identified for each CEMP Sub-plan and be consistent with the CEMP referred to in the EIS.	Section 2 Appendix A

	REQUIRED CEMP SUB-PLAN		**RELEVANT GOVERNMENT AUTHORITIES TO BE CONSULTED FOR EACH CEMP SUB-PLAN**	
	(f)	Flood Emergency Management	NSW SES, EES and relevant councils	
C5	The CEMP Sub-plans Listed in Condition C4 must state how: a) the environmental performance outcomes identified in the documents listed in Condition A1, as modified by these conditions, will be achieved; b) the mitigation measures identified in the documents listed in Condition A1, as modified by these conditions will be implemented; c) the relevant terms of this approval will be complied with; and d) issues requiring management during construction (including coordination of concurrent activities of other projects as well as concurrent activities in this CSSI), as identified through ongoing environmental risk analysis, will be managed.			Tables 3 and 4 Section 4 SWMP (Appendix E – Permanent Spoil Mound Checklist) SWMP (Section 7) – Temporary Stockpiling of Materials
C6	The CEMP Sub-plans must be developed in consultation with relevant parties identified in Condition C4. Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including copies of all correspondence from those agencies, must be provided with the relevant CEMP Sub-plan.			Section 2 Relevant Sub-Plan
C7	Any of the CEMP Sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP, but in any event, no later than one (1) month prior to construction.			Noted
C12	The Flood Emergency Management Sub-plan must include measures for managing flood risks during construction and address flood recovery.			Section 4 and Table 6 provides a risk assessment of the flood risks during construction and the mitigation measures for managing the flood risks. Environmental Control Maps Toolbox Talk Induction Site-Specific Flood Preparation Plans Section 16 and Table 16 details responsibilities of key personnel in the implementation of the flood emergency response plan.

		Appendix B provides an example template of a site-specific flood preparation plan.
C13	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Secretary. The CEMP and CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been endorsed by the ER and approved by the Secretary.	Section 1.1
E30	The Proponent must prepare a Flood Emergency Response Plan (FERP) which documents how the risks to life and property within the rail corridor are to be safely managed during a flood. The FERP must detail activities before, during and after a flood, including for staff training and maintenance and updating of the FERP. (a) The FERP must be prepared by an experienced flood emergency response specialist who has extensive experience in preparation of these plans. (b) This specialist must confirm that residual flood risks are acceptable and the procedures within the FERP are consistent with best practice and the requirements of the NSW Floodplain Development Manual. (c) The FERP must be appended to the Flood Design Verification Report. Note: Nothing in this condition prevents the adaptation of an existing flood management or emergency plan to satisfy this condition.	Section 16
E60	Permanent spoil mounds are to be located: b) at least 50 metres from any watercourse or culvert or where the rail formation is predicted to be overtopped during a flood event	Section 4.3 Table 6 Section 12
E61	Spoil mounds are to comply with the following requirements: d) not result in additional changes to the upstream flooding regime beyond those described in the documents listed in Condition A1; e) not affect the downstream flood regime.	Section 12 SWMP (Appendix E – Permanent Spoil Mound Checklist)

Table 4: RMMs

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
HYDROLOGY AND FLOODING		
C7.1 Flooding	Construction planning and the layout of construction work sites and compounds would be carried out with consideration of overland flow	Section 4 Table 6

	paths and flood risk, avoiding flood liable land and flood events where possible.	

Table 5: Environmental Performance Outcomes

REQUIREMENT REFERENCE	SEARS DESIRED PERFORMANCE OUTCOMES	PROPOSAL SPECIFIC ENVIRONMENTAL PERFORMANCE OUTCOMES	WHERE ADDRESSED
8 Flooding	The project minimises adverse impacts on existing flooding characteristics. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.	Construction is undertaken in a manner that minimises the potential for adverse flooding impacts, through staging of works and the implementation of mitigation measures. The proposal makes a positive contribution to local flooding characteristics by replacing existing drainage infrastructure. Structures such as spoil mounds are designed and located such that flows are not significantly impeded. The proposal reduces the length of overtopping of the existing rail corridor. The proposal reduces or does not significantly increase the area subject to flooding.	Section 4 SWMP (Appendix E – Permanent Spoil Mound Checklist) SWMP (Section 7) – Temporary Stockpiling of Materials

1 Introduction

1.1 Purpose and Scope

This Flood Emergency Management Sub-Plan (FEMP) forms part of the Construction Environmental Management Plan (CEMP) for the Narrabri to North Star Separable Portion 1 (N2NS) Project. The CEMP details the key mitigation measures that will be implemented during construction[1] by Inland Rail and its construction contractors in order to minimise and manage any flood impacts during the construction phase.

This FEMP addresses the relevant requirements of the Project Approval and all applicable guidelines and standards specific to emergency management during flooding. It has been developed based on the findings of the Environmental Impact Statement (EIS) which provided an assessment of the likelihood of floods and associated impacts during construction.

The FEMP is consistent with the Inland Rail Environment and Sustainability Policy and ARTC Environmental Policy (refer Appendix A of the Project CEMP).

The CEMP and Construction Monitoring Programs will be submitted to the Secretary for approval no later than one month prior to the commencement of construction as required by Conditions of Approval (CoAs) C7 and C17.

In accordance with CoA C13, construction will not commence until the CEMP and all CEMP Sub-plans have been approved by the Secretary. The CEMP and CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been endorsed by the ER and approved by the Secretary.

The key objective of this FEMP is to ensure that all CoAs, Revised Mitigation Measures (RMMs) and licence / permit requirements relevant to flooding are adhered to, thus protecting environmental values. Supporting objectives and targets to achieve this are outlined below.

[1]For the purposes of this FEMP, construction is defined as:

All works performed by Inland Rail (incl. sub-contractors) that's required to construct the CSSI as described in the documents listed in CoA Condition A1, including commissioning trials of equipment and temporary use of any part of the SSI, but excluding the low impact works listed in Table 1: Terms and Definitions of the CoA.

This FEMP is the key document for managing and minimising risk associated with flooding during the construction phase of the Project.

1.2 Objectives and Targets

The following flood emergency management objectives will apply to construction (as defined in Section 1.1):

- To manage site works and prepare and respond to flood events to reduce the risk to human life, property and the environment;
- To reduce the financial and program impact on the project as a result of flood events;
- To reduce the severity of flood events as a result of construction works;
- Minimise the impact of severe weather on the works under construction on the N2NS Project;
- Reduce the risk profile of the project as a result of sound preparedness for flood events; and
- Ensure a consistent approach to preparing for flood events.

The following flood emergency management targets will apply to construction:

- Ensure sites are suitably prepared prior to a flood event to ensure the Project's activities or physical works do not exacerbate the flood impact to human life, property or the environment;
- Ensure that effective flood risk identification and evaluation occurs that might impact the site;

- Proactively mitigate or minimise the impact of flood-related damage to the project during construction;
- Be properly prepared for, effectively respond to, and recover from all flood events;
- Ensure that flood-related damage risk to plant, equipment and other temporary facilities is eliminated or minimised;
- Apply the appropriate rectification methods to damaged construction works and infrastructure after an event; and
- Ensure that all parties who should be notified of an impending event, or of the actual consequences of an event, are notified.

The implementation of the mitigation measures will ensure the performance targets are achieved. This will be managed through project inductions, specialised training, toolbox talks, inspections, and environmental monitoring and auditing. Project inductions will inform Inland Rail personnel (including subcontractors) of the management measures, while toolbox talks and specialised training will ensure they are reinforced throughout the construction program.

1.3 Environment and Sustainability Policy

Inland Rail aims to protect the environment and heritage during the planning, design, construction, and operation of the Inland Rail Program through avoiding or mitigating harm and leaving an enduring regional asset for future generations. This commitment is described in Inland Rail's Environment and Sustainability Policy which can be found in Appendix A of the CEMP.

1.4 Project Description

The N2NS Project is one of 13 projects that make up the Inland Rail Project. The route is within the Narrabri, Moree Plains and Gwydir Local Government Areas (LGAs) in north west NSW. N2NS extends approximately 173km from north of Narrabri Junction, terminating at North Star and the project is generally within the existing rail corridor. Works over the Gwydir Floodplain are excluded from the N2NS Project.

The N2NS project traverses the Namoi River Basin, Gwydir River Basin and Border River Basin and crosses 20 named waterways. The largest waterway crossings occur at:

- CH. 650 Tycannah Creek which is within the Gwydir Rivers Basin; and
- CH. 735 Croppa Creek within the Border Rivers Basin.

Flood warning times have been estimated for waterway crossings wherever gauged flow data is available. It is noted that the N2NS works does not encroach the Namoi River Floodplain at Narrabri nor the Macintyre River Floodplain at Boggabilla in the North.

2 Community and Stakeholder Engagement

Inland Rail's Community Strategy provides a clear framework for active communication and stakeholder engagement management. The Plan outlines how Inland Rail will meet best practice community and project outcomes by keeping the community and other stakeholders informed, minimising potential impacts and responding to the needs and requirements of stakeholders. The Communication Strategy contains procedures and strategies to manage community and stakeholder engagement activities as they align to the Project delivery program. To the extent practicable, Inland Rail will provide stakeholders with open and transparent consultation.

CoA A5 and C4 require that the FEMP be prepared in consultation with:

- The Department of Planning, Infrastructure and Environment's (DPIE) Environment, Energy and Science (EES) group;
- New South Wales State Emergency Services (NSW SES);
- Narrabri Shire Council;

- Moree Plans Shire Council; and
- Gwydir Shire Council.

As required by CoA C6, details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation can be found in Appendix A. Appendix A also provides an assessment of where comments have been addressed in the FEMP.

2.1 Consultation Summary

A copy of the draft FEMP was sent electronically to the stakeholders listed above on 4th November 2020. Table 5 summarises stakeholder feedback on the FEMP.

Table 6: Summary of Consultation

STAKEHOLDER	REQUIREMENT	STATUS	RESPONSE	DATE
DPIE Environment, Energy and Science	Consultation	Completed	Letter dated 1st February 2021	4th November 2020** Resent on the 22nd January 2021 1st February 2021
NSW SES	Consultation	Completed	Email with comments received	4th November 2020** 12th November 2020
Narrabri Shire Council	Consultation	Completed	Report with comments received 5th February 2021	4th November 2020** 5th November2020* 22nd January 2021*** 5th February 2021
Moree Plains Shire Council	Consultation	Completed	Email with comments received.	4th November 2020** 5th November 2020* 28th November 2020
Gwydir Shire Council	Consultation	Completed	"No Comment" received on the 25th February 2021	4th November 2020** 5th November 2020* 17th February 2021**** 25th February 2021

*Email (from Project Personnel) to alert recipients that the FEMP has been submitted via Aconex.

**FEMP issued to all stakeholders via Aconex.

***ARTC attempted to contact Narrabri Council (2 attempts via phone) regarding a response to the FEMP.

****Follow up email requesting comments.

3 Legal and Compliance Requirements

This section details the relevant legal and compliance requirements for the N2NS project including the Minister's CoAs, Revised Mitigation Measures (RMMs) and the Secretary's Environmental Assessment Requirements (SEARs) environmental performance outcomes (EPOs) and where they are addressed within this Plan.

3.1 Legislation

Legislation considered during the development of the FEMP includes:

- State Emergency and Rescue Management Act (1989)
- Protection of the Environment Operations Act (1997)
- Environmental Planning and Assessment Act (1979)
- Water Management Act (2000)
- Water Act (1912)

3.2 Guidelines

Guidelines and standards relating to flood emergency management associated with construction of the project include:

- Narrabri Shire Local Flood Plan – Narrabri Shire Flood Emergency Sub Plan, November 2015, NSW State Emergency Service 2015
- Moree Plains Shire Local Flood Plan – Moree Plains Shire Flood Emergency Sub Plan, December 2012, NSW State Emergency Service 2012
- Gwydir Shire Local Flood Plan – Gwydir Shire Flood Emergency Sub Plan, January 2013, NSW State Emergency Service 2013
- Floodplain Development Manual: the management of flood liable land, DIPNR 2005
- Floodplain Risk Management Guideline: Practical Consideration of Climate Change, DECC 2007

3.3 Conditions of Approval, Mitigation Measures and Performance Outcomes

As discussed in Section 4 of the CEMP, the N2NS project is a Controlled Action under the EPBC Act (1999) and a CSSI under the EP&A Act (1979). Under Section 45 of the EPBC Act (i.e. the bilateral agreement between the NSW and Federal Governments), the Project has been assessed by DPIE for both State and Federal approvals. The Project has been approved with conditions by both the NSW Minister for Planning and Public Spaces and the Federal Minster for Agriculture, Water and Environment. These conditions of approval relevant to the construction phase and where they have been addressed in this FEMP can be found in the Compliance Matrix at the beginning of this document.

Flood emergency management and mitigation measures were developed and identified in Table 15.12 of the EIS. Following consideration of the issues raised in the stakeholder and community submissions on the EIS and additional assessments undertaken, mitigation measures were updated and included in the SPIR. RMMs relevant to flood emergency management and where they have been addressed in this FEMP can be found in the Compliance Matrix at the beginning of this document. Where relevant to construction, the mitigation measures detailed in the EIS have been considered and addressed in Section 4.2 of this FEMP.

The SEARs identified a number of desired performance outcomes (EPOs) for the N2NS Project (refer to Table 27.6 of the Project EIS for the full list of EPOs). Based on the outcomes of the EIS and the implementation of the RMMs, EPOs have been established for the proposal. EPOs relevant to flooding and where they have been addressed in this FEMP can also be found in the Compliance Matrix Table (Table 4) at the beginning of this document.

In addition, where required an Environment Protection Licence in accordance with the POEO Act. All conditions set by the EPL for the N2NS Works and all relevant licence conditions (i.e. relevant to flood emergency management) will be applied in accordance with this Plan.

In accordance with CoA A28 (d) and C3, this FEMP was endorsed by the Environmental Representative.

4 Environmental Risk Assessment

4.1 Flood Impacts on Construction

A summary of the key findings from the EIS in relation to flood impacts on construction are outlined below. Further detail can be found in the N2NS EIS and associated Technical Report 6 (Hydrology and Flooding Assessment).

The project site is described as being relatively flat land and the existing rail corridor is subject to flooding. Existing level crossings are also inundated during some flood events.

Flood events in the area are generally influenced by two sources:

- Regional flood events associated with the Namoi or Gwydir Rivers (including the Mehi River); and
- Local flooding associated with local catchments draining to an individual underbridge or group of culverts in isolation of the regional flooding behaviour.

During local flood events, modelling shows that the existing rail line can be overtopped by 0.63m to 0.75m for a length of 122m to 11,124m for the scenarios modelled.

Flow velocities during flood events that do not overtop the existing rail line would be low (i.e. less than 2m per second).

It generally takes about nine hours for flood levels to fall to less than 0.1 metres deep at culverts for smaller catchments and up to 36 hours for larger catchments. Regional flood events, which are typically a result of flooding from major rivers and watercourses after rainfall over a significant portion of catchment, can extend for several days or more.

The presence of construction work sites and compounds in floodplains has the potential to impact on surrounding properties.

During construction, there is also the potential for works to be impacted by flooding. The project has been designed to minimise the duration of on-site work in watercourses, which would enable increased flexibility when scheduling works around forecast rain periods.

The impact of construction on flood behaviour is expected to be negligible compared to regional flood levels and behaviour.

4.2 Flood Impacts on Operation

The cross-drainage structures detailed in the IFC Design (Design case) were informed using the hydraulic model/s undertaken in the *Submissions and Preferred Infrastructure Report - Flood Study Report*. In general, the design has adopted a strategy to replace existing culverts with structures that provides an equivalent or greater waterway opening and hydraulic performance. This strategy results in a positive contribution to the local flooding characteristics of the area. In some locations, a track lift is required to provide the required flood immunity to the top of rail formation. Additional cross drainage structures have been provided at these locations to replace the existing overtopping flow hydraulic behaviour. In order to minimise the potential for rail overtopping during flood events the design has been refined to raise the track formation and enhance cross drainage. As a result of these design modifications, modelling of the potential impacts of the design case indicates that there would be no overtopping of the rail corridor during the 1% AEP local flood event. This is a substantial reduction compared to the existing situation where the rail corridor is currently overtopped for a length of 11,124 metres during the 1% AEP flood event.

The revised flooding assessment concluded that based on the design case, the Project's flood management objectives would be met at the majority of locations adjacent to the rail corridor. Predominantly, these exceedances occur on only a small proportion of each affected lot, are localised in nature and largely associated with existing watercourses and drainage paths. Where the flood management objectives are exceeded consultation with affected landowners would occur to assess the sensitivity of their land and activities to the impacts. Mitigation measure D6.1 commits ARTC to continue to further refine the design to not materially worsen existing flooding characteristics, where feasible and reasonable, up to and including the 1% AEP event.

4.3 Risk Assessment and Management

Section 7 of Inland Rail's CEMP contains a project level environmental risk assessment which includes an assessment of flood risks during construction. Any risks pertaining to flooding that were identified within the project-wide risk assessment are summarised in Table 6 below.

In addition to this, the Project EIS made the following commitments:

- Section 15.3 of the EIS noted that further modelling would be undertaken during detailed design to determine what modifications (if any) would be required to achieve the aim of not materially worsening existing flooding characteristics (in terms of property and building inundation). This modelling, which included consideration of downstream changes to flood behaviour, was undertaken during the SPIR. The outcomes of this modelling contributed to development of the preferred infrastructure, as detailed in the SPIR. The results of this modelling are provided in the flood study report undertaken for the preferred infrastructure. This report is provided in Appendix E and summarised in Section 11.2 of the SPIR.
- Mitigation measures listed in Table 5.2 and Section 6.2 of the Project EIS Technical Report 6 - Hydrology and Flooding Assessment have been included in Table 6 below.

Table 7: Flood Risk Assessment

CONSTRUCTION ACTIVITY/ ASPECT	POTENTIAL IMPACT	RISK LEVEL PRIOR TO MITIGATION	INDICATIVE MITIGATION MEASURES	RISK LEVEL FOLLOWING MITIGATION	DOCUMENTS / PROCEDURES / TRAINING REQUIRED
FLOOD EMERGENCY					
General earthworks and construction **Permanent Spoil mounds and stockpiling of other materials** **Laydown areas** **Fuels, chemicals and hazardous materials** **Plant and machinery**	Construction works performed in such a way that it; - Increases the area that is subject to inundation - Increases the time that an area is subject to inundation or.	High	Construction planning and the layout of construction work sites and compounds would be carried out with consideration of overland flow paths and flood risk, avoiding flood liable land, where possible. Ancillary facilities will be located at least 50m from watercourses and outside the 5% AEP flood zone, as per (CoA A21(b)(ii)). Where possible, the permanent drainage arrangement (i.e. longitudinal and transverse drainage) will be installed prior to mainline earthworks occurring. Where this cannot be undertaken, mainline earthworks will not be completed in the locations of new culverts. At these locations, a sufficient break will be left within the	Medium	Flood Emergency Management Plan Environmental Control Maps Toolbox Talk – flood emergency Induction Site-Specific Flood Preparation Plan/s Minor Ancillary Facility Checklist Permanent Spoil Mound Assessment

	- Increases the flood water velocities; resulting in; - Increased scour/erosion risk; - Increased risk to human life (evacuation routes etc.) - Increased risk to destruction of property; - Increased risk to matters of environmental significance (i.e. TEC, threatened flora species, threatened fauna species habitat, heritage items, etc) - Increased risk of contamination from fuels, chemicals, hazardous materials and / or ablution blocks being		embankment, extending beyond the footprint of the proposed culvert to allow adequate flows, those being equal to or better than, pre-construction conditions. No stockpiles of materials, construction equipment or storage of fuels or chemicals within low lying areas, waterways, or drainage lines. All Inland Rail personnel and contractors working on site will be provided with training with regards to flooding, including preparation, mitigation and management and their responsibilities pertaining to the FEMP and FERP. Where possible, long-term stockpiles (>1 month) will be located outside the area impacted by the 5% AEP local and regional flood events. During times of significant rainfall or predicted significant rainfall or flooding, the Inland Rail HSE Manager (or delegate) will be consulted, and work activities reassessed for potential impact to and from flooding. All culvert and bridge demolition and construction would be undertaken in a manner that minimises, as far as practical, the potential flooding on the waterway and surrounding environment. This would be achieved by: ▸ No stockpiling or storage of materials or equipment in the main drainage channel. ▸ Monitoring the weather forecast and associated warnings and removing materials that may restrict flow or cause contamination of floodwaters. ▸ Ensuring a clean water flow is maintained as far as practical.		

	inundated during a flood event.		Prior to the establishment of a permanent spoil mound, approval must be sought from Inland Rail's HSE Manager (or delegate) via the N2NS Permanent Spoil Mound Approval Checklist (Appendix F of the SWMP). Approved spoil mounds must comply with the following: ▸ Be located at least 100m from any watercourse, wetland or culvert and not within an area where the rail formation (or proposed spoil mound location) is predicted to be overtopped or inundated during a flood event up to and including a 1% AEP (or other) flood or severe wet weather event. Suitable site preparation works will occur in accordance with the relevant Site Specific Flood Preparation Plan (Appendix B) in the event that a Flood Watch or Flood Warning is issued by BOM. Contact details of local upstream land holders will be obtained and contacted when works are occurring in the area and when flood and / or severe weather is predicted to determine what flood preparedness works need to be undertaken. All construction traffic, both light and heavy vehicles, will obey road closures due to flooding. Where practical, do not reduce watercourse flow areas. The Site-Specific Flood Preparation Plan (Appendix B) will include a review of the Flood Impact Mapping (Appendix D) from the EIS to determine the areas anticipated to be impacted by a flood event and to ensure the following is considered and where relevant actioned when a Flood Warning is issued by BOM:		

			▸ All stockpiles of materials, plant, machinery and general construction equipment is repositioned to reduce risk of exposure to the pending flood event. ▸ All hazardous materials, chemicals, fuels and ablution blocks are repositioned to reduce the risk of exposure to the pending flood event. ▸ If mainline earthworks have commenced, then sufficient drainage (i.e. cross-sectional area equal to or greater than previous) must be provided at existing culvert locations. The ESC's are reviewed and in consultation with the CPESC improved accordingly. ▸ A review of the environmentally sensitive areas (ESA) in close proximity to the areas shown to convey water (Appendix D) and if required, take additional measures to ensure that construction works do not worsen the impact to these ESAs. These may include: increase stabilisation across the catchment, use rock and other alterative measures to reduce scouring, dewatering post flood event, diversion of flood waters around ESA, etc.		
Temporary Works (incl. temporary waterway crossings, piling pads and instream works (waterway diversions and damming works).	Construction Works performed in such a way that it; - Increases the area that is subject to inundation; or - Increases the time that an area is subject to inundation or;	High	All temporary works performed by Inland Rail's construction contractors will be planned, designed, and constructed in accordance with the following requirements: - All temporary works must be designed by a suitably qualified and experienced Engineer in accordance with any relevant, third party design standards and guidelines. - Relevant temporary works must be constructed in accordance with an approved Task Risk Assessment (TRA) detailing the construction steps, stages and methodology of the works. - Where temporary works may pose a risk to the worsening of flood impacts, it must be peered reviewed by a suitably qualified and	Medium	Temporary Works Design Task Risk Assessment (incl. construction methodology) Site Specific Flood Preparation Plan (Appendix B)

	- Increases the flood water velocities; resulting in; - Increased scour/erosion risk; - Increased risk to human life (evacuation routes etc.) - Increased risk to destruction of property; - Increased risk to matters of environmental significance (i.e. TEC, threatened flora species, threatened fauna species habitat, heritage items, etc) - Increased risk of contamination from fuels, chemicals, hazardous materials and / or ablution blocks being		experienced Hydrologist. NOTE: the Hydrologist is to ensure that the proposed works do not adversely affect flood behaviour, and shall be assessed in terms of their potential impacts on hydraulic hazard both inside or outside the rail alignment during any flood event up to and including a 5% AEP flood event. The proposed temporary works will not commence until the Hydrologist has approved the works to proceed. - A Site-Specific Flood Preparation Plan (Appendix B) has been prepared for all key waterways that includes the temporary works and flood preparation and response measures specific to those works. - If temporary drainage arrangements are required, these will be sufficiently sized for the anticipated flow. - In the event of a Flood Watch or Flood Warning issued by BOM, temporary works (i.e. temporary waterway crossing, etc) are assessed and removed where reasonable and feasible.		

	inundated during a flood event.				

In addition to the above Inland Rail risk assessment, Table 26.3 of the N2NS EIS summarises potential residual impacts for the project with a description of how they would be managed. No residual construction flood emergency impacts were identified.

Indicative mitigation measures identified in Table 6 above are incorporated into the relevant management documents as described in Inland Rail's Environmental Management Framework (refer to Section 8 of the CEMP).

5 Environmental Management Framework

5.1 Inland Rail Environmental Management System

Inland Rail will be utilising an Environmental Management System (EMS) (which is certified to ISO AS/NZS14001) to enhance its' environmental performance on the N2NS Project. This is discussed in detail in Section 8 of the CEMP.

5.2 Roles and Responsibilities

Section 8 of Inland Rail's CEMP details roles and responsibilities for environmental management (including flood emergency management). Inland Rail's Project Director has overall responsibility for the implementation of environmental matters on the Project and Inland Rail's Construction contractor is responsible for field implementation of flood emergency control measures.

5.3 Competence, Training and Awareness

All personnel performing environmental management activities for and on behalf of Inland Rail will be trained, qualified and competent. Personnel performing specified assigned tasks shall be qualified on the basis of appropriate education, training, skills and/or experience, as appropriate. Section 8 of the CEMP details competence, training and awareness and includes:

- Inductions;
- Tool box talks;
- Daily pre-start meetings;
- Resource planning; and
- Inland Rail's Environment Training Program.

5.4 Environmental and Sustainability Inspections

Section 8 of Inland Rail's CEMP details environmental and sustainability inspections, including inspections related to the FEMP. Table 7 lists the details of each type of environmental and sustainability inspection to be undertaken on the Project.

Table 8: Inspection Summary

ACTIVITY	FREQUENCY	RESPONSIBILITY	RECORD
Site inspection	Daily	Supervisor/s	Site Diary
Environmental and Sustainability	Weekly	Environment Coordinator/s	Environmental and Sustainability Checklist (PPW)
Pre & Post Rainfall	Prior to and following rainfall events generating runoff.	Environment Coordinator/s	ESCP Inspection (Soteria)
Event based i.e. flood	As required (triggered by BOM Weather Warning)	Environment Coordinator/s Site Supervisor	Site Specific Flood Preparation Plan (SharePoint)

Joint ER Inspections	Monthly or as otherwise agreed with ER	Environment Manager (or delegate) Site Supervisor ER	ER Inspection Report (SharePoint)

5.5 Compliance Monitoring and Reporting

The Inland Rail Environment Team and Site Supervisors will undertake environmental inspections, audits and reporting to develop and evaluate the effectiveness of flood emergency controls. This will include:

- General observations for flood emergency controls shall be documented in site dairies by the Site Supervisor;
- Regular inspections of flood emergency controls shall be undertaken by the Environmental Coordinator and Site Supervisor using the Environmental Inspection Checklist and uploaded to Horizon 360;
- Effectiveness of flood emergency controls shall be regularly reviewed by the Environmental Coordinator for adequacy having regard for changing circumstances;
- Monthly reporting on flood emergency will be recorded through Project Monthly Reports;
- Six monthly independent environmental audits by a suitably qualified professional (i.e. RPS);
- ER regular monitoring of the implementation of the documents listed in the CoA; and
- The broader EMP auditing process is discussed further in Section 8 of Inland Rail's CEMP.

5.6 Reporting and Communication

Reporting will include monthly internal project reports and Construction Monthly Environmental Reports from Inland Rail's Construction contractor . Compliance monitoring and reporting are discussed in further detail in Sections 8 of Inland Rail's CEMP.

5.7 Environmental Management Procedures, Forms and Other Documents

The Project's EMS procedures, project specific procedures, forms and other documents provide instructions and records related to both environmental and non-environmental activities throughout the Project. These are discussed in detail in Section 8 of the CEMP.

5.8 Communication and Complaints Management

Inland Rail's Community Strategy and Section 9 of the CEMP details communication and complaints management processes and procedures. The Communication Strategy identifies key stakeholder groups that will be consulted and engaged with during the Project and outlines the communication tools that will be used to consult and engage with these groups. During construction, any comments, feedback or complaints relating to flooding issues will be addressed through the Complaints Management System. The Complaints Management System includes a complaints register within the stakeholder database Consultation Manager. The complaints register will be developed in accordance with AS 4269: Complaints Handling.

5.9 Incidents, Emergencies and Non-Conformity

In the event of an environmental, social performance, sustainability heritage or other incident, an Incident and Emergency Response Plan will be implemented. Environmental incidents are required to be reported to Inland Rail (Project Manager and HSE Manager) and managed in accordance with the Inland Rail event management system. Incidents, emergencies, response plans and non-conformities are discussed in detail in Section 10 of the CEMP.

5.10 FEMP Review and Revision Process

This FEMP is a 'live' and 'working' document. As required by Inland Rail's EMS requirements, the HSE Manager will conduct regular reviews of the FEMP and ensure that the FEMP is formally reviewed and updated at least annually, or earlier as change requirements dictate. The CEMP and sub-plans review, and revision process is discussed in detail in Section 12 of the CEMP.

6 Flood Characteristics

A summary of the flood characteristics for key waterway crossings contained within the EIS Technical Report 6 (Hydrology and Flooding Assessment) and the Submissions and Preferred Infrastructure Report - Flood Study Report are presented below.

Whilst the waterway crossings within the N2NS works have relatively small catchments (i.e. < 1000 km^2) they are associated with rather shallow and widespread flooding due to the flat terrain of the region. All waterway crossings are categorised by a 'High Flood Hazard' category meaning that it is unsafe for people and vehicles to enter the waters during a flood.

Table 9: Flood characteristics at key waterway crossings

CH.	WATERWAY NAME	CATCHMENT AREA	FLOOD WARNING TIME (EST.)	1% AEP FLOOD LEVEL	1% AEP VELOCITY[2]	CONSTRUCTION ZONE
586	Bobbiwaa Creek	143 km2	12hr[1]	247 m AHD	1.2 m/s	Narrabri to Penneys Road
600	Ten Mile Creek	229 km2	24hr[1]	239 m AHD	3.0 m/s	
620	Tookey Creek	17 km2	5hrs[1]	225 m AHD	2.0 m/s	
641	Gurley Creek	557 km2	25hrs[1]	218 m AHD	1.5 m/s	Penneys Road to Moree
648	Tycannah Creek	1014 km2	48hrs[1]	219 m AHD	n/a	
716	Gil Gil Creek	178 km2	9.5hrs[1]	280 m AHD	2.7 m/s	Camurra to North Star
735	Croppa Creek	721 km2	42hrs[1]	275 m AHD	2.9 m/s	
740	Yallaroi Creek	281 km2	22hrs[1]	769 m AHD	2.1 m/s	

Note 1: 1% AEP Flood warning time ('Time to Peak') was extracted from the Client Suppled RORB Models

Note 2: 1% AEP Flood velocities obtained from Technical Report 6 (Hydrology and Flooding Assessment). These velocities will be included and considered in the Site-Specific Flood Preparation Plan (Appendix B) for that waterway. These velocities (and associated scour potential) will be considered during flood preparation works and mitigation measures developed with the CPESC to manage the risk as much as reasonably practicable.

7 Streamflow Monitoring Stations

There are three streamflow gauging stations along the rail corridor that may be used to monitor flood levels and anticipate flood warning signals. Inland Rail and its Construction contractors will utilise the data recorded by all three gauges to inform flood warning trigger levels across the region. The 418032 Tycannah Creek at Horseshoe Lagoon gauge will most closely reflect the conditions of the local waterways during construction. Details of the various gauging stations are summarised below in Table 9 below. Real-time water level recordings is available online from the following website: https://realtimedata.waternsw.com.au/

Table 10: Key Monitoring Stations

GAUGE NAME	NARRABRI CREEK AT NARRABRI	TYCANNAH CREEK AT HORSESHOE LAGOON	GWYDIR RIVER AT PALLAMALLAWA

WaterNSW Gauge Number	419003	418032	418001
BoM Gauge Number	054152	553003	553000
Gauge Location	Lat: -30.3271 Long: 149.7811	Lat: -29.6704 Long: 150.0438	Lat: -29.4770 Long: 150.1351
Upstream Catchment Area	25,400 km2	866 km2	12,300 km2
Data Owner	WaterNSW	WaterNSW	WaterNSW
Gauge Zero Level	204.736 m AHD	250.196 m AHD	220.835 m AHD

Conditions at regional waterways (Narrabri Creek and Gwydir River) are important to monitor as well with regards to accommodation, evacuation routes and access between construction zones and site offices which may be cut-off for several days during a regional flood event. For regional waterways, these floodplains may experience multiple flood waves and extended periods of inundation as flood waters from upper reaches of the catchment make their way down the floodplain. This was demonstrated at Narrabri Creek during the February 2012 flood event (Figure 1). The flood risks associated with construction in the Gwydir River floodplain shall be addressed as part of SP2.

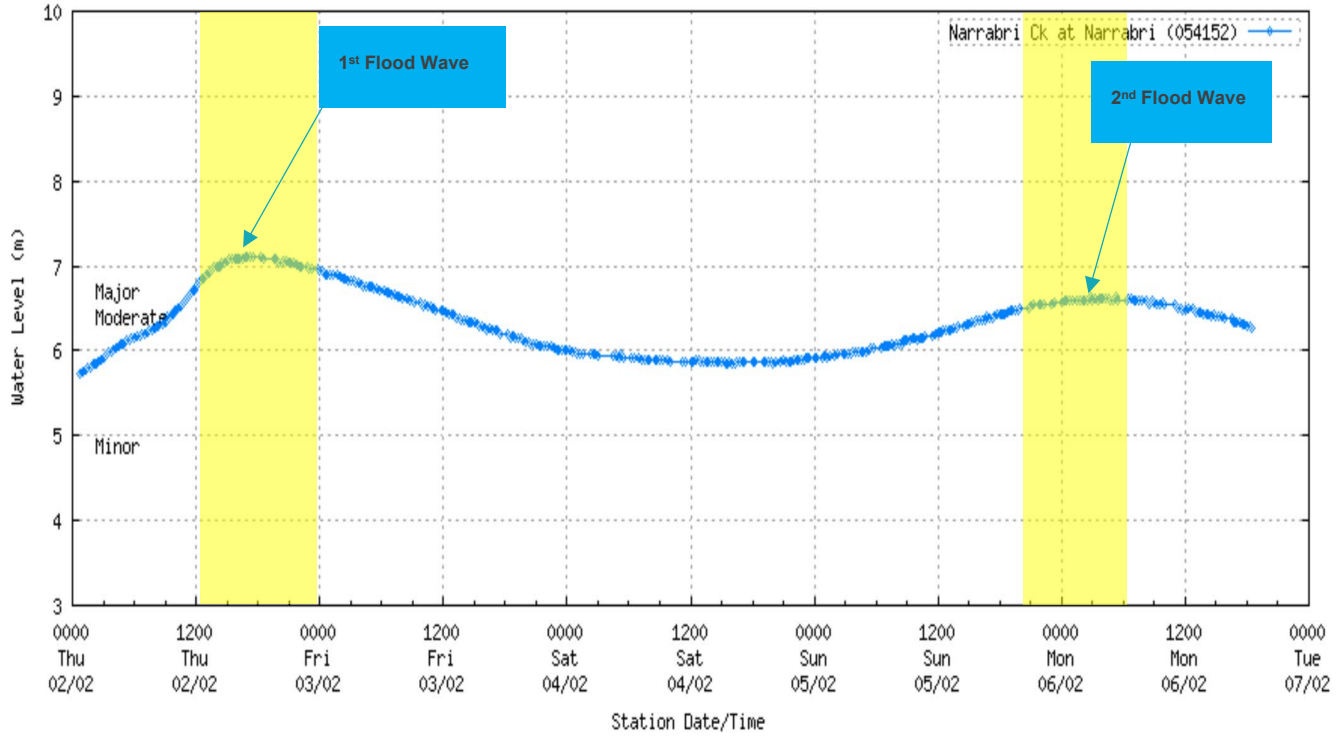

Figure 1: Regional Waterways (Narrabri Creek) Impacted by a Second Flood Wave

8 Flood Warning Time

Flood warning times are evaluated as the lag time between a peak rainfall intensity and a peak flood level occurrence for gauged catchments. Flood warning times for local waterways traversing the alignment are likely to be short (i.e. hours, not days) as the upstream catchment areas are relatively small and the catchment response is fast.

The time it takes for flood water levels to peak within local waterways is estimated to be less than 24 hours. However, the Bureau of Meteorology (BoM) Flood Watches, Flood Warnings and Severe Weather Warnings are generally issued 2-4 days in advance which would allow precautionary action to be taken on site prior to a flood event. Therefore, the emphasis should be on implementing precautionary actions based on BOMs Warnings rather than responding during the actual events. These warnings are summarised below (Source: http://www.bom.gov.au/water/floods/floodWarningServices.shtml).

8.1 Flood Watch

A *BOM Flood Watch* is issued when forecast rainfall information suggests that local and/or riverine flooding is possible across the Flood Watch area. A Flood Watch may cover a large area due to uncertainty associated with the location and amount of forecast rainfall. A flood watch may also make reference to the type of flooding that may be experienced in the catchment being highlighted. The types of flooding that may be referred to include:

Local flooding – For areas without a well-defined river, describes situations where intense rainfall is expected to cause high run-off volumes in small catchments or localised areas with minimal impact on main streams. The areas outlined in a Flood Watch may not be currently covered by a formal flood warning service.

Local and Riverine flooding - For areas with a well-defined river, describes situations where intense rainfall is expected to cause high run-off volumes in small catchments or localised areas with significant impact on the water levels in main rivers and streams.

The areas outlined in a Flood Watch may not be currently covered by a formal flood warning service.

8.2 Flood Warning

A Flood Warning is issued when the BOM is more certain that flooding is expected, often when rainfall has started to fall. Flood Warnings are more targeted and are issued for specific catchments or even sub-catchments in some of the larger river basins. Flood Warnings will generally include specific predictions of the severity of expected flooding.

There will be occasions when a Flood Warning is issued without it being preceded by a Flood Watch, largely due to the complexities of forecasting rainfall accurately. Weather models are excellent at identifying broader scale weather patterns but are not always able to represent the smaller scale features that can cause heavy rainfall, particularly in tropical areas. For this reason there will be times when heavy rainfall leading to flooding occurs but forecast models were not able to accurately identify this beforehand.

9 February 2012 Flood Event

A major flood event occurred in February 2012 where almost 200 mm of rain fell within a 24-hour period in the eastern part of Narrabri Shire at the foothills of Mount Kaputar. A peak flood depth of 8.34 m was recorded at Tycannah Creek Gauge (418032) within 15 hours of a peak rainfall intensity being recorded at nearby Horton Dam Site Gauge (418027). During this event, there was flooding of several houses in the residential area near Doctors Creek in the north of Narrabri. A similar sized event occurred just 3 months earlier in November 2011.

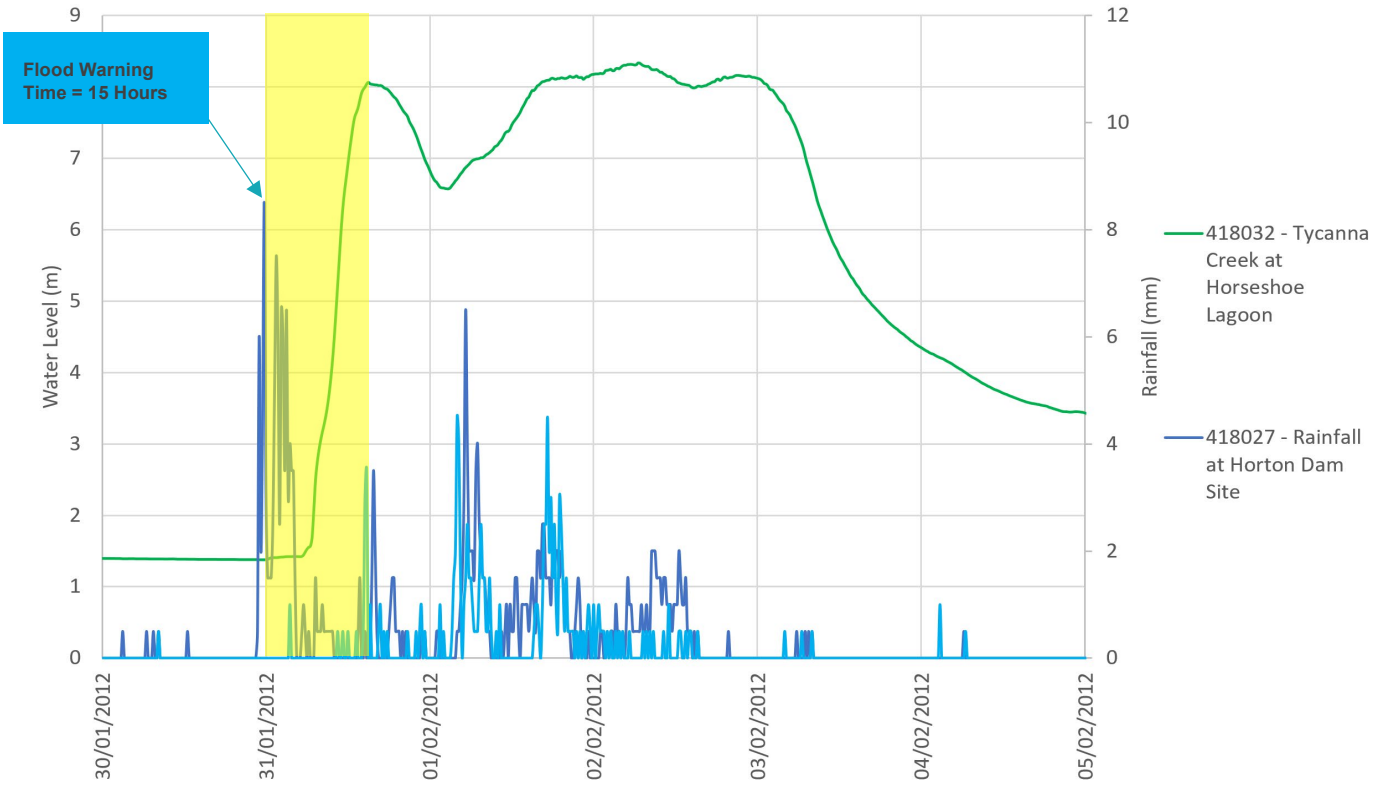

Figure 2: February 2012 Flood Event at Tycannah Creek

10 Rainfall Monitoring Stations

There are several open rainfall gauging stations located within the upper reaches of the Namoi, Gwydir, and Macintyre River regions. Flood forecasting rainfall gauging stations that Inland Rail will use for flood forecasting are those that are included in the BOM Flood Watch Product and are summarised below. The latest rainfall observations for these sites is accessed from the following website: http://www.bom.gov.au/nsw/flood/northwest.shtm/

7-Day rainfall forecasts and significant weather events are mapped by the BoM MetEye Product which can be accessed here: http://www.bom.gov.au/australia/meteye/?loc=NSW_FA001

Table 11: Key Rainfall Monitoring Stations

GAUGE NO.	GAUGE NAME	DRAINAGE BASIN	BOM FLOOD WATCH AREA	CONSTRUCTION ZONE
54084	Caroda	Namoi	40-Namoi River	Narrabri to Penny's Road
054038	Narrabri Airport	Namoi	40-Namoi River	
054013	Delungra	Gwydir	45-Gwydir River	Penny's Road to Moree
054029	Warialda	Gwydir	45-Gwydir River	
054138	Upper Horton	Gwydir	45-Gwydir River	
418027	Horton Dam Site	Gwydir	45-Gwydir River	

054038	Caroda (Palaroo)	Gwydir	45-Gwydir River	
054021	Mt Lindsay	Gwydir	45-Gwydir River	
054039	Keera	Gwydir	45-Gwydir River	
418025	Bingara	Gwydir	45-Gwydir River	
054141 / 418013	Gravesend	Gwydir	45-Gwydir River	
053108	Terry Hie Hie	Gwydir	45-Gwydir River	
053115	Moree Airport	Gwydir	45-Gwydir River	
054121	Bukkulla (RFS)	Macintyre	42-Whalan & Gil Gil Creek	Camurra to North Star
053095	North Star	Macintyre	42-Whalan & Gil Gil Creek	
053018	Croppa Creek	Macintyre	42-Whalan & Gil Gil Creek	
053041	Tulloona	Macintyre	42-Whalan & Gil Gil Creek	

11 Forecast Rainfall Depths and Trigger Levels

The rainfall Intensity Frequency and Duration (IFD) patterns between Narrabri and North Star are effectively the same across the alignment (GHD, 2017). This means that flood warning signals may be represented by a single rainfall depth range (or trigger level) as forecast by one or more regional rainfall gauges within the region.

Bench-mark rainfall depths for the region have been extracted from the BOM website with reference to the approximate midpoint of the alignment at Moree (Lat -29.4898, Long 149.8471). The rainfall depths associated with critical storm durations (i.e. the storm duration that produces the worst-case flooding) are summarised in Table 11 below. The table below indicates that forecast rainfall totals of +47.3 mm or more is expected to generate flooding within local waterway crossings.

Table 12: Rainfall Depths

EVENT ARI	1 IN 1	1 IN 2	1 IN 5	1 IN 10	1 IN 20	1 IN 50	1 IN 100
AEP	**63%**	**39%**	**18%**	**10%**	**5%**	**2%**	**1%**
STORM DURATION	**TOTAL RAINFALL (MM)**						
12-hour	47.3	53.7	74.6	89.3	104	126	143
24-hour (1-Day)	57.5	65.4	91.7	111	130	158	180
48-hour (2-Day)	68.3	78.1	111	135	161	195	222
72-hour (3-Day)	74.6	85.5	122	150	178	215	245

The BoM Flood Warning Systems for the regional river systems suggests that '*50mm in 24 hours over isolated areas, with lesser rains of 25mm over more extensive areas will cause stream rises and the possibility of minor flooding. If lesser rainfalls have been recorded in the previous 24 to 72 hrs, then moderate to major flooding may develop. 50mm in 24 hours will cause isolated flooding in the immediate area of the heavy rain'* (BoM, 2020).

12 Identification of Flood Risk

A key consideration for flooding during the Construction Phase, is to ensure that the locations of construction compounds, site offices, laydown areas, piling pads, temporary waterway crossings and other temporary works are positioned not to exacerbate the existing flooding issues.

Another key consideration is that plant, equipment and other construction materials do not increase or worsen the impacts associated with flooding, nor does the permanent works, as constructed at the time of flood.

Inland Rail is mindful of the increased risk of temporary works elements becoming destabilised at crossings during a localised flood event, and as such have implemented a flood warning strategy as detailed in the following section.

Table 12 assesses the flood failure probabilities for the respective CAFs. Minor ancillary facilities (i.e. laydown areas) will be assessed and approved by the Project ER where they represent a low environmental impact, including flooding.

As required by CoAs E60 and 61, any spoil mounds associated with the project will be:

- Located at least 100m from any watercourse or culvert or where the rail formation is predicted to be overtopped during a flood event;
- Not result in additional changes to the upstream flooding regime beyond those described in the documents listed in Condition A1; and
- Not affect the downstream flood regime.

Table 13: Temporary Works Elements Flood Failure Probabilities

TEMPORARY WORKS ELEMENT	CHAINAGE	FAILURE CONDITION	FAILURE FLOOD EVENT	FLOOD MITIGATION RECOMMENDATIONS
Bellata CAF	CH. 609	Facility becomes flooded.	NA.	NA. Site not affected by flooding. The proposed Bellata CAF location is outside the area impacted by the 1% AEP local and / or regional flood extent.
Moree CAF	CH. 664	Facility becomes flooded.	NA.	NA. Site not affected by flooding. The proposed Moree CAF location is outside the area impacted by the 1% AEP local and / or regional flood extent.

13 Flood Warning Strategy

Weather conditions in the vicinity of the site will be monitored with sufficient warning time of impeding flood producing rain. Weather warnings will need to be disseminated to all construction personnel on site so they can implement precautionary measures and relocate any mobile equipment stored on site outside of the waterways wherever possible.

The following flood warning approach will be implemented:

1. WaterNSW is responsible for the collection and monitoring of flood data along waterways (including Tycannah Creek) and provides the BOM and NSW SES real-time or near real-time river height data for the development of official flood warnings. Access to real-time water level data for the respective gauging stations (Table 9) is available at https://realtimedata.waternsw.com.au/. This website will be checked daily by the Environment Manager, Environment Coordinators, Construction Managers and Site Supervisors or delegate for rainfall events predicted to be >10mm in a 24hour period.

2. WaterNSW provide a freely downloadable app 'WaterLive' which provides access to water level data from a mobile phone. Users can set up 'push notifications' sent straight to their home screen for updates on timely water level information. The push notifications are provided within 30 minutes of the data being recorded at the gauge and may be set up to notify the user of any specified trigger levels. The WaterLive app is available at https://www.waternsw.com.au/waterinsights/waterlive. The Safety Manager, Environment Manager, Environment Coordinators, Construction Managers and / or Site Supervisors or delegate will have this app on their mobile phones.
3. The Naomi, Gwydir and Macintyre River Catchments are included in the BOM Flood Watch / Flood Warning product. This product is issued when flooding is expected in NSW. Lead time for this warning product is usually 2-4 days (or sometimes even longer), with less accuracy the further away from the predicted rainfall event. Early warning messages with flood predictions for the region are disseminated directly to the NSW SES, other State and Local Government Agencies and are published at http://www.bom.gov.au/australia/warnings/. This website will be checked daily by the Safety Manager, Environment Manager, Environment Coordinators, Construction Managers and Site Supervisors or delegate for alerts and rainfall events predicted to be >10mm in a 24hour period.
4. 7-Day rainfall forecasts and significant weather events are mapped by the BoM MetEye Product which can be accessed here http://www.bom.gov.au/australia/meteye/?loc=NSW_FA001. This site will be checked on a weekly basis by Environmental Personnel. The BOM also provide a rainfall radar for the Moree area referred to as the 'Moree Radar Loop'. This site provides a very accurate image of the storm cloud that is occurring over the region at the point in time.
5. Flood Warnings are also available through a recorded voice retrieval system, along with a wide range of other weather related and climate information.

Table 14: Flood Warnings by Phone

FLOOD WARNINGS BY PHONE		
Main Directory	Phone	1900 955 360
Flood Warnings	Phone	1300 659 219

14 Flood Classifications and Flood Trigger Levels

At available flood warning river height gauging stations, the severity of flooding may be described as minor, moderate or major according to the effects caused in the local area or in nearby downstream areas. Terms used in Flood Warnings are based on the following definitions.

Minor Flooding: Causes inconvenience. Low-lying areas next to watercourses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required.

Moderate Flooding: In addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas removal of stock is required.

Major Flooding: In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted

The table below shows the flood classifications for selected river height gauging stations

Table 15: Temporary Works Elements Flood Failure Probabilities

STATION	BOM GAUGE NO.	GET READY	MINOR FLOOD	MODERATE FLOOD	MAJOR FLOOD
Namoi River at Narrabri	419002	+2.0 m	TBC	TBC	TBC
Narrabri Creek at Narrabri	419003	+2.0 m	4.9 m	6.4 m	6.7 m
Tycannah Creek at Horseshoe Lagoon	418032	+2.0 m	Not available	Not available	Not available
Mehi River at Moree	418002	+2.0 m	5.5 m	7.6 m	8.8 m
Gwydir River at Pallamallawa	418001	+2.0 m	6.0 m	9.5 m	10.4 m
Macintyre River at Boggabilla	416002	+2.0 m	5.0 m	11.0 m	12.0 m
Macintyre River at Goondiwindi	416201A	+2.0 m	4.0 m	6.0 m	8.5 m
Macintyre River at Yetman B	416058	+2.0 m	5.0 m	7.6 m	9.1 m

15 Project Personnel Emergency Response and Evacuation

Narrabri, Moree Plains and Gwydir Local Government Areas (LGAs) each have structured Local Flood Plans for the region. These plans identify flood risks in the Shire and presents preparedness, response, co-ordination, and operations for all levels of flooding throughout the region. The Plans each identify evacuation routes based on available flood information. Inland Rail have utilised these plans to inform the FEMP, to develop response measures and evacuation routes for project personnel and will comply with these plans and the directions of the local emergency services should a regional flood event occur. These plans will be consulted on an annual basis and any changes will be incorporated into this FEMP. The local evacuation routes relevant to the Project are summarised in Table 15.

Table 16: Regional Flood Evacuation Routes

LOCATION	FLOOD WARNING TIME	EVACUATION TRIGGER	INDICATIVE EVACUATION ROUTE	INDICATIVE EVACUATE LOCATION
Narrabri Area*	Several Days	Expectation of Moderate or Major Regional Flooding	Kamilaroi Highway (Eastbound only). Newell Highway travelling North or South.	Boggabri Moree Coonabarabran
Moree Area*	Several Days	Expectation of Moderate or Major Regional Flooding	Newell Highway travelling North. Carnarvon Highway travelling Northwest.	Garah Mungindi Boggabilla / Goondiwindi
Boggabilla Area*	Several Days	Expectation of Moderate or Major Regional Flooding	Newell Highway travelling South.	Moree

*Evacuation routes from the abovementioned townships is dependant (and likely to change) on the flood event and the movement of floodwaters across the floodplain. In lieu of the above, Project personnel will adhere to the evacuation advice provided and road closures issued by the NSW SES, LEMO or Police. Live Traffic NSW (*Live Traffic NSW* | *Incident Details*) website and physical road closures will inform suitable and available evacuation routes for personnel.

For Project personnel evacuating the Narrabri region, the Kamilaroi Highway (Eastbound only) and the Newell Highway travelling North and South are anticipated to be the main evacuation routes. This is because the Kamilaroi Highway westbound (Wee Waa Road) will overtop (at 7.3m Narrabri Creek Gauge) prior to the Newell Highway (southbound) in a regional flood event (at 8m Narrabri Creek Gauge). Early evacuation is crucial since local streets within Narrabri are much lower than the highway evacuation routes, so evacuation will need to occur while these roads remain trafficable. Source: Narrabri Shire Local Flood Plan (November 2015), https://www.ses.nsw.gov.au/media/1683/plan-narrabri-shire-lfp-nov-2015-endorsed.pdf.

For Project personnel evacuating the Moree area, the Newell Highway is most readily first cut during any moderate flood event at the Tycannah Creek Floodway (south of the Tycannah Creek) approx. 15km south of Moree. Tycannah Creek can close the Newell for 3 days or more. The Gwydir Highway can also close at several spots between Moree and Collarenebri and between Moree and Warialda – the most notable spots being at the Washpool, “Macquarie” and the Biniguy Break.

The following highways and main roads are subject to flooding at the following locations within the Moree Plains Local Government Area:

> Bruxner Highway (Highway 44) - Between: Boggabilla and Yetman and between Yetman and Tenterfield.
>
> Gwydir Highway (Highway 38) - Between: Moree and Collarenebri and between Moree and Pallamallawa (at The Washpool and Biniguy Break) and between Pallamallawa and Biniguy.
>
> Newell Highway (National Highway 39) - Between: Narrabri and Moree at Tycannah Creek and between Moree and Boggabilla near the Booloroo Bridge.
>
> Carnarvon Highway (Highway 55) - Between: Moree and Garah and Garah and Mungindi (at Wall Murray Bridge, Vyra Causeway, “Milton Ville”, 9 Mile Causeway, 4 Mile, Twin Bridges, and Gravelly Creek).

Source: Moree Plains Shire Local Flood Plan (Dated 19.12.12) - https://www.ses.nsw.gov.au/media/1615/plan-moree-plains-shire-lfp-dec-2012-endorsed.pdf

For the purposes of evacuation preparedness, the Project’s current Workforce Histogram shows 2 peaks in construction personnel on-site. These include:

- July 2021 – Aug 2021, when over 400 project personnel associated with Stage 2 (Penney’s Lane – Moree) will be onsite associated with the earthworks and rail works occurring concurrently; and
- May 2022 – June 2022, when approx. 400 project personnel associated with Stage 1 (Narrabri – Penney’s Lane) will be onsite associated with the earthworks and rail works occurring concurrently.

NOTE: These peaks in workforce may change based on weather, changes to programming or scope or other unforeseen events.

The Project’s workforce will predominantly be accommodated at a 300 room camp constructed in Moree with the remainder being local residents of the region.

In addition to this, the *Australian Disaster Resilience Handbook Collection (ADR) – Guideline 7-2 Flood Emergency Response Classification of the Floodplain* recommends the classification of the floodplain. This classification considers the flood behaviour and its impacts upon access to communities or precincts in a way that informs emergency response management. Classification can be used with information on the full range of flood risk, local topography and evacuation routes, the rate of rise of floodwaters, the effective warning time and the duration of isolation, to inform a range of management decisions.

In accordance with the ADR, classification of a floodplain is undertaken at three levels;

- Primarily classification concentrates on whether the area is flooded by the probable maximum flood, or a similar extreme event.
- For those areas that are flooded:

- Secondary classification examines whether or not a community or precinct area has an exit to community evacuation facilities in a flood-free area outside the broader floodplain during a flood event.
- Tertiary classification relates to the potential consequences of flooding on the area and any limitations of available evacuation routes.

In terms of the management of Project personnel, the major waterways (Namoi River, Narrabri Creek, Tycannah Creek, Mehi River and Gwydir River) has been classified as:

Primary Classification – Flooded (The area is flooded in the Probable Maximum Flood (PMF))

Secondary Classification – Exit Route (Areas that are not isolated in the PMF and have an exit route to community evacuation facilities (located on flood-free land)).

Tertiary classification - Rising Road (Evacuation routes from the area follow roads that rise out of the floodplain)

A classification of Flooded, Exit Route, Rising Road (or FER) has been assigned to the floodplains crossed.

16 Flood Emergency Response Plan

A range of environmental requirements and management measures are identified in the Conditions of Approval (CoA), RMMS and Environmental Protection Outcomes (EPOs). Environmental controls will be implemented to avoid, minimise and manage flood impacts on construction and the community. Controls to address the construction impacts of the Project on flood risk are summarised in Table 16 together with details on resourcing, timing and responsibility.

This Flood Emergency Response Plan (FERP) has been prepared by an experienced flood emergency response specialist in accordance with the NSW Floodplain Development Manual and to satisfy the requirements of CoA E30(a) – (c). NOTE: This FERP has been prepared for the construction phase of Project only.

Table 17: Construction Flood Emergency Response Plan

STAGE	CONSTRUCTION PHASE FLOOD EMERGENCY RESPONSE PLAN	RESPONSIBILITY
Preparation (Get Ready)	**Prepare Site-Specific Flood Preparation Plan** ▸ SPE / EM – A Site-specific flood preparation plan will be developed for all active work sites that intercept a key waterway on the Project (refer to Table 8 for key waterways intercepted by the Project). The Site-specific flood preparation plan are specific to the works occurring, the surrounding environmental constraints and the flood risk. The Site-Specific Flood Preparation Plan (Appendix B) will include any temporary works and flood preparation and response measures specific to those works. ▸ SPE / EM – The Site-specific flood preparation plan will address the methods, timeframes, and responsibilities for securing, removal, mobilisation to higher ground or protection of materials safely from work areas during a flood event. ▸ SPE / EM – The Site-specific flood preparation plan will include information on where to go (evacuation) in the event of a flood, who to call (NSW SES - 132 500) or emergency services (000), where to receive updates and advice (e.g. radio, social media) and triggers, warnings and natural signs of flooding.	Senior Project Engineer (SPE), with the input from: Construction Manager (CM) or delegate General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) Safety Manager (SM) or delegate Environment Manager (EM) or delegate

	▸ SPE / EM - Each Site-specific flood preparation plan will include site specific information such as where plant and equipment (including site amenities and hazardous materials) and stockpiles should be located to minimise the impact of flooding and/or reduce timeframes for removal if required. Where plant and equipment cannot be moved, details of how it will be secured would be detailed in the Site-Specific Flood Response Plan ▸ SPE / EM - Triggers will be included in each flood response plan so as supervisors know when these plans are to be implemented. ▸ DS – Site-specific flood preparation plan will be kept at the activity sites, with the other site-specific documentation. These plans will be regularly reviewed and revised progressively throughout construction as activities and locations change to ensure the preparedness for flood risk.	
Preparation (Get Ready)	**Training and Awareness** ▸ GS / DS / EM – Site-specific flood preparation plan will be the subject of toolbox talks to the work crews to educate the Construction Team about the Flood Emergency Response Plan, and as required as part of emergency drills.	General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) or delegate Environment Manager (EM) or delegate
Preparation (Get Ready)	**Weather Monitoring and Flood Warning Systems** ▸ EM - The EM shall sign up to the Bureau of Meteorology (BoM) Flood Warning Product for respective Flood Watch Area(s). ▸ EM - Flood watch and flood warning notifications and water level trigger alerts shall be set-up on the EMS Mobile Phone using the WaterLive App. ▸ GS / DS / SM / EM - Weather would be monitored daily for construction planning purposes to identify any risk of high rainfall and subsequent flooding events ▸ CSEM / EM - The contact details of local upstream land holders will be obtained and contacted when works are occurring in the area and when flood and / or severe weather is predicted to determine what flood preparedness works need to be undertaken. ▸ SM / EM - Live Traffic NSW (Live Traffic NSW | Incident Details) website and physical road closures will inform suitable and available evacuation routes for project personnel. ▸ ALL – In the event of self evacuation or an evacuation order is issued by the authorities, personnel are to listen and adhere to the advice provided by the relevant authorities (i.e. NSW SES, OEM, LEMO, or Police) with regard to road closures and evacuation routes. Personnel's evacuation plans are to be discussed with the relevant Supervisor / Manager and / or member of the Project's Safety Team. A Journey Management Plan is to be completed for any journeys greater than 2hrs in length.	Senior Project Engineer (SPE) or delegate Construction Manager (CM) or delegate General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) or delegate Safety Manager (SM) or delegate Environment Manager (EM) or delegate Community and Stakeholder Engagement Manager (CSEM) or delegate ALL – All Project personnel

Preparation (Get Ready)	**Temporary Works Measures** ▸ GS / DS - Site specific temporary works such as minor drainage realignments and diversions, bunding and raising or lowering of site platforms may be required to protect temporary and / or permanent works and / or to reduce the flood impact. ▸ CM / SPE / EM / GS / DS - Design and implementation of temporary works / flood mitigation measures shall be determined on a site-by-site basis by Inland Rail's Temporary Works Team. ▸ GS / DS / SPE / EM – Assess all installed temporary works to determine the risk associated with these works and if the works require removal. ▸ PD – Communicate the flood preparation efforts to ARTC.	PD – Project Director or delegate Senior Project Engineer (SPE) or delegate Construction Manager (CM) or delegate General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) or delegate Environment Manager (EM) or delegate
Response (During Flood)	**Immediately Prior to a Flood Event** Immediately prior to a flood event, the following will be undertaken: ▸ PD – Identify and assign relevant Project Personnel responsible for the preparation of sections or stages of the Project site prior to the flood event occurring. This responsibility must be clearly communicated to the relevant personnel to avoid any confusion. NOTE: All areas of the Project site must be included and personnel / resources assigned based on risk. ▸ PD – Communicate the flood preparation efforts to ARTC. ▸ GS / DS - Remove wastewater from site amenities by an authorised transporter for offsite disposal at a licensed facility. ▸ GS / DS - Remove all hazardous items and chemicals to be outside of the flood prone land. ▸ GS / DS - Mobile construction equipment (or excess material) will be removed from waterway or flood prone areas. ▸ GS / DS - Power to any affected sites and equipment will be turned off and alternate power sources to be set-up at the construction site. ▸ GS / DS / EM – All preparation measures detailed in the Site-Specific Flood Preparation Plan must be actioned and documented in the Site Preparation Checklist. ▸ ALL – In the event of self-evacuation and / or an evacuation order is issued by the authorities, personnel are to listen and adhere to the advice provided by the relevant authorities (i.e. NSW SES, OEM, LEMO, or Police) with regard to road closures and evacuation routes. Personnel's evacuation plans are to be discussed with the relevant Supervisor / Manager and / or member of the Project's Safety Team. A Journey Management Plan is to be completed for any journeys greater than 2hrs in length. ▸ PD / PT – Make contact with local Project personnel whose residence may be impacted by flooding and offer accommodation in the camp.	Project Director (or Delegate) or delegate General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) or delegate PT – People Team ALL – All Project personnel

Response (During Flood)	**Monitoring During Flooding** ▸ GS / EM / SM - On-going monitoring of the BoM flood warning products will be undertaken for updated information and expected flood levels. ▸ PD - General on-going monitoring of site flood conditions will be communicated to all personnel. ▸ NSW SES - The NSW SES issues Flood Bulletins during flood events. These are emailed out to key stakeholders and members of the community during flood events and contain important up to date information about the relevant flood event. ▸ PD / ALL – All Project personnel (T4MR and Sub-Contractors) staying in the camp must attend a daily toolbox talk. The purpose of the toolbox talk is to: (a) keep the workforce updated of the unfolding flood event; (b) confirm welfare of project personnel; and (c) assign allocations for the day (i.e. Project works, Community Volunteering, etc)	Project Director (PD) or delegate General Superintendent (GS) or delegate Environment Manager (EM) or delegate Safety Manager (SM) or delegate NSW State Emergency Service (NSW SES)
Response (During Flood)	**Evacuation** ▸ ALL - In the event of a flood, personnel are to gather at the designated muster points which are located outside of the flood prone land. The designated muster points including evacuation routes are to be detailed as part of Inland Rail's Incident Response Plan. ▸ NSW SES / PD - Regarding evacuation arrangements, this shall be considered carefully together with NSW SES. Agreed arrangements shall be included in the local response plans with Site Officers trained to cover the additional sites/areas. The Incident Response Plan shall be available at the site office and awareness raised amongst construction workers. ▸ ALL – All Project personnel will adhere to the evacuation advice of the NSW SES, with any remaining personnel (i.e. those who did not self-evacuate) utilising the accommodation facilities provided at the Moree Camp in the first instance or alternatively a NSW SES or OEM established evacuation facility (as detailed below or in the Local Flood Plan for the Shire). NOTE: The Moree Camp is outside the area impacted by the 1% AEP Flood Event and will remain open for use to accommodate Project personnel where it is safe to do so. The NSW SES would be consulted following the commencement of construction regarding this. ▸ ALL - NSW SES (Ph. 132 500) are to be contacted for emergency assistance during a flood event. NOTE: Evacuation facilities (shelter) have been nominated in the Local Flood Plans for the Shires, these include: Moree Shire Local Flood Plan (Shelters) a. Moree: PCYC and/or Moree East Public School in South Moree. b. Garah: Garah Public School. c. Mungindi: Mungindi Hall.	ALL – All Project personnel Project Director (PD) NSW State Emergency Service (NSW SES)

	d. Boggabilla: Town and Country Club or to Moree. e. Toomelah: Town and Country Club, Boggabilla, or to Moree. Narrabri Shire Local Flood Plan a. The Crossing Theatre in Tibbereena St b. Narrabri RSL Club, 7 Maitland St c. Narrabri Public School in Barwan St. d. Narrabri West Public School in Coomoa Rd. Gwydir Shire Local Flood Plan a. Two Mile Hill, Bingara (north towards Warialda on Fossickers Way). b. All Nations Hill, Bingara (southern entrance to town on Fossickers Way). c. Showground, Warialda d. In the event of isolation at Gravesend, evacuees from rural areas will be directed to the Gravesend Public School	
Recovery (After Flood)	**Recovery** ▸ CM / GS / DS / SM / SPE / EM - Following a flood event, a safety walk will be undertaken to identify unstable or dangerous areas. The recovery team will need to take note of any flood damage to access roads, check for any relocated equipment, stock or debris moved by flood waters. ▸ SPE - The structural integrity of temporary flood mitigation measures (bunds, diversions, platforms, levees) are to be checked. Maintenance / repair actions are to be identified. ▸ SPE / SM / EM - Partially constructed structures within waterways need to be checked for safety hazards, water damage and erosion. Maintenance / repair actions are to be identified. ▸ SPE / SM / EM - Culverts under railway and roads surrounding the site are to be inspected for blockages and potential damage. ▸ SM - Flood markings on buildings or infrastructure are to be recorded wherever available for future reference and insurance purposes. ▸ GS / DS / EM - Any water captured in areas of the site will be dewatered in accordance with the Project Soil and Water Management Plan (SWMP). ▸ EM - Water Quality Monitoring will be carried out in accordance with the SWMP (monitoring after rainfall events). ▸ CM / GS / DS / SM / SPE / EM – Post flood, a lesson's learnt workshop will be undertaken with all key Project personnel. Any findings and / or recommendations will be incorporated into the FERP.	Senior Project Engineer (SPE) or delegate Construction Manager (CM) or delegate General Superintendent (GS) or delegate Discipline (Rail, Earthworks, etc) Superintendent (DS) or delegate Environment Manager (EM) or delegate

	▸ EM – Following a major flood or severe weather event, the Post Severe Weather / Flood Survey (Appendix C) will be distributed to key Project Personnel and requested these be completed. Any findings and / or recommendations will be considered and potentially incorporated into the FERP.	

Appendix A : Evidence of Consultation

STAKEHOLDER COMMENTS & RESPONSE - FEMP				
NSW State Emergency Services (Dated - 13/11/2020)				
No	**Comment**	**Page No**	**Addressed**	**Response**
1	C4, Section 2 in Table 2; Change SES to NSW SES. Please Note: Name in full – NSW State Emergency Service Abbreviation – NSW SES	5	Addressed	Addressed throughout document. New South Wales State Emergency Service to NSW SES.
2	2 - Community and Stakeholder Engagement; Change State Emergency Services to NSW State Emergency Service	10	Addressed	Addressed throughout document. New South Wales State Emergency Service to NSW SES.
3	8 – Flood Warning Time; Does not mention that the Australian Government Bureau of Meteorology (BOM) issues Flood Watches and Flood Warnings. Click on the link below for more details and information. http://www.bom.gov.au/water/floods/floodWarningServices.shtml	19	Addressed	Addressed, 2 new sub-sections added (Section 8.1 and 8.2.
4	13 – Flood Warning Strategy; Number 1- Change SES to NSW SES.	24	Addressed	Addressed throughout document. New South Wales State Emergency Service to NSW SES.
5	13 – Flood Warning Strategy; Number 3- Change NSW State Emergency Service (SES) to NSW State Emergency service (NSW SES)	24	Addressed	Addressed throughout document. New South Wales State Emergency Service to NSW SES.
6	13 – Flood Warning Strategy; Number 3 - Mentions Flood Watches issued by the BOM. Need to also mention Flood Warnings issued by the BOM.	24	Addressed	Addressed in Section 13.
7	14 – Flood Classification and Flood Trigger Levels;Need to change Classification to Classifications in the heading.	26	Addressed	Addressed in Section 14
8	14 – Flood Classification and Flood Trigger Levels;In the second row in the Table 13 change 6,7m to 6.7m in the Major Flood column for Narrabri Creek at Narrabri.	25	Addressed	Addressed in Table 13.
9	Second and third rows of Table 15; Change SES to NSW SES in the last column.	28	Addressed	Addressed throughout document. New South Wales State Emergency Service to NSW SES.
10	The Plan makes no mention of the emergency number for the NSW SES i.e. 132 500 if emergency help from the NSW SES is required during flood events.	29	Addressed	Addressed in Table 15.

11	Detailed and useful information on what to before, during and after a flood event can be found on the NSW SES website at https://www.ses.nsw.gov.au/disaster-tabs-header/flood/	28	Addressed	Addressed in Table 15.
12	The NSW SES issues Flood Bulletins during flood events. These are emailed out to the community during flood events and contain important up to date information about the relevant flood event. If you want me to add you to our email distribution list please contact me.	29	Addressed	Addressed in Table 15.
DPIE EES (Dated 01/02/2021)				
1	The management plan appears to be generic with much of the detail proposed to be included in the site-specific flood action plans.	30	Addressed	Correct, please be advised that the FEMP provides a summary of the existing environment, Project level flood risk, indicative mitigation measures and the management framework. The site-specific measures are provided within the Site-Specific Flood Action Plans (refer template in Appendix B). Noting: 1.Site-specific flood action plans will be developed for all active work sites. The Site-specific flood action plans are specific to the works occurring, the surrounding environmental constraints and the flood risk. 2.Site-specific flood action plans will address the methods, timeframes, and responsibilities for securing, removal, mobilisation to higher ground or protection of materials safely from work areas prior to or during a flood event.
2	The objectives and targets listed in section 1.2 should include how the management plan will have regard to community, environment and human life.	9	Addressed	Section 1.2 updated to suitably address any risk to human life, property or the environment.
3	The management plan should define the “construction phase” so that it is clear when actions cease to be regulated by this plan.	9	Addressed	Section 1.1 updated to include a definition of construction and thus the works covered and managed by the FEMP.

4	The flood emergency response should classify the floodplain or have reference to the classification as per the Australian Disaster Resilience Handbook Collection Guideline 7-2 (2014) – refer to https://knowledge.aidr.org.au/media/1885/guideline-7-2-techinical-flood-riskmanagement.pdf.	29 - 30	Addressed	Section 15 has been amended to include a classification of the floodplains of the major waterways in accordance with the A*ustralian Disaster Resilience Handbook Collection (ADR) – Guideline 7-2 Flood Emergency Response Classification of the Floodplain*.
5	The plan should state whether specific controls are required for high value assets, including biodiversity values, or at least identify or map these assets and the potential impact of construction during flooding on these assets. Generic guidelines like those included in section 12 indicating that spoil mounds will be located at least 50 metres from any watercourse or culvert, may not always be sufficient. Similarly, the plan should include any commitments from the Environmental Impact Statement relating to the minimisation of impacts to individual landholders or public assets due to flooding during construction, including any proposed management or mitigation measures that may be required.	16	Addressed	Table 6 amended to include risks to high valued assets (incl. environmental constraints) and additional mitigation measures applied. Flood Impact Mapping added to Appendix D. Commitments made in the SPIR (RMMs) listed in Table 3 and addressed in Section 4.2 of the FEMP. Commitments made the Project EIS have been listed and addressed in Section 4.2.
6	Table 14 states that Narrabri will be evacuated west to Wee Waa – confirmation is required regarding whether this is correct. The source of information used to develop this table should be provided.	29	Addressed	Section 15 updated to provide evacuation routes informed by the Narrabri and Moree Plains Shire Local Flood Plans. References included.
7	Table 15 lacks clarity regarding which position is responsible for many of the stages in the flood emergency response planning. In an emergency it should be clear who has ultimate responsibility for an event, or at the very least a governance structure should be provided to understand the relative seniority of positions.	31 - 33	Addressed	Table 16 updated to provide responsibilities for each task.
8	The plan does not provide any indication of the number of staff at risk and where they are located – clarification is required whether this level of detail will be included in the site-specific flood action plans. Providing this information to SES will be critical.	29	Yes	Section 15 updated to include indicative workforce numbers and locations.
9	The inclusion of maps of the subject area would provide valuable context, including identifying the main points of interest and potentially addressing some of the issues raised above in a diagrammatic format.	App D	Yes	Flood Impact Mapping included as Appendix D.

Moree Plains Shire Council (Dated - 28/11/2020)				
1	Section 15 - they refer to when the Newell Highway is Cut that Only Trucks have access - This is incorrect - Emergency truck vehicles will have access But general freight trucks will be stopped before the road is cut to light vehicles due to the pavement damage that trucks will do.	27	Addressed	Addressed in Section 15
2	Table 14 - Regional Evacuation Routes – Evacuate to Toomelah is not an option - that is private property	27	Addressed	Toomelah removed.
3	Also the Newell Highway is most readily first cut in any a moderate event at the Tycannah Creek Flood way - just south of the Tycannah Creek 15 km south of Moree.	28	Addressed	Addressed in Section 15
4	Evacuation from Moree is in all directions depending on the rain event and the movement of flood waters which goes from the east to west across the flood plain.	28	Addressed	Addressed in Section 15
5	Table 15 - Weather monitoring - I would suggest that previously the reported noted that there are local stream that do not have gauging stations and do not have a known warning time for flooding. Therefore I would suggest that a Response measures is to ensure that the local upstream land holders contact details are available through the already established Inland Rail Comms team efforts and when working in the area and rain falls they can be contacted to confirm what flood preparedness needs to be undertaken .	28	Addressed	Addressed in Table 6
6	Can you please also ensure that appropriate consultation has occurred with and incorporate any comments and feedback from the NSW SES.	All	Addressed	Refer to NSW SES comments and response above. All comments have been considered and addressed.
Narrabri Shire Council (Dated 05/02/2021)				
1	Peak 1% AEP velocities at Ten Mile Creek would appear to significantly exceed scour velocities. The 'Flood Action Plan' for Ten Mile Creek may need specific measures to minimise the potential for erosion during construction.	20	Yes	These velocities will be included and considered in the Site-Specific Flood Preparation Plan (Appendix B) for that waterway. These velocities (and associated scour potential) will be considered during flood preparation works and mitigation measures developed with the CPESC to manage the risk as much as reasonably practicable.

2	An estimate of the flood warning times should be provided at each crossing. Given the known sizes of these catchments, an 'unknown' warning time is not appropriate.	21	Yes	Table 8 updated using the critical duration/s (i.e. the shortest critical duration from the 1%, 2%, 5% or 10% AEP events) detailed in Table 4.6 of the Submissions and Preferred Infrastructure Report - Flood Study Report.
3	The N2NS section of the Inland Rail within Narrabri Shire is located along the existing Werris Creek to Mungindi rail alignment from about 4 km to the north of Narrabri to about 8.5 km to the north of Bellata. The creeks that cross the rail include Spring Creek, Bobbiwaa Creek, Tarlee Creek (Edgeroi), Galathera Creek, Ten Mile Creek, Bulldog Creek, Boggy Creek, Gehan Creek (Bellata) and Tookey Creek. These creeks have catchment areas that are generally less than 200 km2 and are therefore subject to 'flash flooding' due to intense local storm events. The N2NS rail is not subject to regional flooding from the Namoi River.	N/A	General observation, no amendment required.	NOTE: Est. Flood Warning Times for key waterway crossings in the Narrabri Shire have been provided in Table 8.
4	The Flood Emergency Response Plan (FEMP) in Section 16 of the CFEMP provides information of relevance to the management of flooding. The FEMP summarises the preparation, response and recovery actions that would occur at each active work sites. Comments and recommendations on the FEMP are as follows: -The FEMP states that a 'Flood Action Plan' would be developed for each construction site that outlines the 'triggers' and 'actions' to manage flooding. A typical Flood Action Plan has not been provided and as such it is difficult, if not impossible, to provide comment on whether the measures to manage flooding would be appropriate. It is recommended that a Flood Action Plan for a typical catchment of relevance to N2NS be provided. -The FEMP provides adequate 'responses' when construction staff are on site. However, FEMP is silent on how the site would be prepared at the end of a work-day if a flood warning or heavy rainfall was forecast when no one is on site. It is recommended that the FEMP be updated to include measures when the construction sites are not staffed.	App B	Yes	Appendix B (Template N2NS Project - Site Specific Flood Preparation Plan) has been provided which shows the type of information that will be contained within the Site Specific Flood Preparation Plan/s. General flood preparation / management measures are detailed in Table 6 which will be included (where relevant) in the Site Specific Flood Preparation Plans. Site specific measures (including preparing the site both when staffed and unstaffed) will also be provided in the Site-Specific Flood Preparation Plan. These site-specific measures are largely dependent on site location and flooding risks / characteristics, proximity to waterways and drainage features, scope of works, plant / equipment to be used and construction methodology.

5	The remainder of the CFEMP provides background information and the available rainfall and water level data that should be monitored in the event of a flood event. Minor comments on these sections of the CFEMP are as follows: -Table 7 on page 17 – Peak 1% AEP velocities at Ten Mile Creek would appear to significantly exceed scour velocities. The 'Flood Action Plan' for Ten Mile Creek may need specific measures to minimise the potential for erosion during construction. -Table 7 on page 17 – Penny's Road should be Penneys Road. -Table 7 on page 17 – An estimate of the flood warning times should be provided at each crossing. Given the known sizes of these catchments, an 'unknown' warning time is not appropriate. -Table 9 on page 21 – the rainfall stations listed for the Narrabri to Penneys Road reach are not appropriate. Three of the stations are located over 120 km from the rail (Rocky Glen, Baradine and Walgett) and two (Baradine and Mt Kaputar) are not listed on the tagged website: http://www.bom.gov.au/nsw/flood/northwest.shtml . The Narrabri Airport and Caroda (54084) rainfall stations are the closest and most appropriate to monitor for flood warnings in this reach. -Section 13 point 3 should reference the correct flood warnings web page: http://www.bom.gov.au/australia/warnings/ -Section 15 states that any evacuation from Narrabri would be via the Kamilaroi Highway to the west and Table 14 states that people would evacuate to Boggabri, Wee Waa or Pilliga. These locations are not consistent with the Narrabri Local Flood Plan, which identifies the Newell Highway (both north and south) as the most appropriate road evacuation routes. The Kamilaroi Highway to Wee Waa and Boggabri are flood prone for regional flood events.	Various	Yes	Table 8 - These velocities will be included and considered in the Site-Specific Flood Preparation Plan (Appendix B) for that waterway. These velocities (and associated scour potential) will be considered during flood preparation works and mitigation measures developed with the CPESC to manage the risk as much as reasonably practicable. Table 8 - Penny's corrected to Penneys. Table 8 updated using the critical duration/s (i.e. the shortest critical duration from the 1%, 2%, 5% or 10% AEP events) detailed in Table 4.6 of the Submissions and Preferred Infrastructure Report - Flood Study Report. Table 10 - Rainfall stations updated to Caroda and Narrabri Airport. Section 13 flood warning webpage updated. Section 15 evacuation routes updated based on the Narrabri Shire Local Flood Plan (November 2015), https://www.ses.nsw.gov.au/media/1683/plan-narrabri-shire-lfp-nov-2015-endorsed.pdf
Gwydir Shire Council (Dated 25/02/21)				
1	"No Comment" received on the 25th February 2021			

Appendix B : Site Specific Flood Preparation Plan (Template)

N2NS Project - Site Specific Flood Preparation Plan

Site Name: Chainage:
Drafted by (Area Supervisor): Date:
Approved by (Area Engineer):

Instructions: This Site Specific Flood Preparation Plan is to be prepared prior to mobilisation to site and triggered following a Flood Warning or Flood Watch alert issued by BOM or as directed by the Inland Rail Project Director.

SITE LAYOUT DIAGRAM ***(INSERT)*** **NOTE: THIS SITE LAYOUT DIAGRAM MUST INCLUDE KEY SITE FEATURES, TEMPORARY WORKS, ACCESS ROUTES, ONSITE FLOOD REFUGE (ELEVATED) GROUND, DRAINAGE FEATURES, ETC**	
Flood Evacuation Route ***(Insert)***	

Key Personnel / Response Crew ***(Insert)***	**Name:**	**Phone Numbers:**

Site Preparation Checklist

TASK	COMPLETED
Undertake actions in consultation with the Project Manager – environmental, safety risk assessment / WMS?	
Check perimeter of all building structures for any loose items that need to be secured.	
Isolate dams/water catchments where possible – battering/windrowing	
Secure/remove pumping station where possible – high ground designated area	
Empty and secure effluent tanks to ensure no leakages?	
Move plant/machinery or other equipment to designated 'high ground' areas and secure. Photograph for records.	
Stored fire extinguishers inside buildings?	
Empty rubbish bins and store inside storage/shipping containers?	
Secure all windows on huts on sites?	
Close all air conditioner vents and tie down condensers?	
Empty fridges of all perishable goods?	
Close all internal doors?	
Clear and tidy all office desks?	
Cover all records, drawings and documents etc. in plastic (watertight)?	
Turn off and cover (or remove from site) all computers and hardware?	
Monitor phone and fax until site evacuation?	
Close and lock all external doors?	

Turn off all electrical equipment?	
Secure or store all loose items in office areas and laydown areas?	
Secure gas cylinders, oil and fuel drums?	
Raise materials and equipment that are vulnerable to water damage from the floor?	
Isolate, secure and store all fuel dispensing equipment?	
Bundle and secure all loose debris?	
Secure or remove signs and star pickets?	
Check all ties on buildings and objects?	
Check of high ground that is considered appropriate for holding machinery/material/hazardous substances/chemicals & other equipment in the event of flooding on the worksite – identified on site prior to commencement of works (environmental risk assessment)?	
Remove temporary traffic control devices where possible e.g. traffic cones?	
Ensure clear drainage paths on sites – to accommodate heavy rainfall?	
Monitor and maintain ESC devices?	
Establish stable access/egress points – gravel/rock?	
Separation of dirty and clean water catchments where possible?	
Cover road areas with gravel & seal wherever possible?	
Tasking – team inspections to designated areas for inspection of ESC devices/batters/verges – includes photographs of same – recorded data?	
Site Specific Actions / Measures *(Insert) – Incl. Temporary Works Response Measures*	
1.	
2.	
3.	
4.	
5.	
6.	

Appendix C N2NS Post Severe Weather / Flood Survey

N2NS Project - Post Severe Weather / Flood Survey

Name: Date:

Position: Site:

Instructions: Please complete the following questions and return to your Supervisor, Area Manager or Project Manager. The answers (and any feedback provided) will assist in the review and improvement of the N2NS Project's FEMP.

Note: Please indicate N/A if a question does not relate to you.

1. Had you previously read and understood the Flood Emergency Management Plan or Site Specific Flood Preparation Plan? (Y /N)

2. Did you highlight any questions about the plan to your supervisor prior to the severe weather or flood event?
(Y / N)

3. What was the outcome of your questions?
_____
_____
_____
_____

4. Were you given updates on the status of the severe weather / flood event before and during the event? (Y / N)

5. If so, by whom?
_____
_____
_____

6. Were you given adequate time to carry out your duties in preparation for the severe weather / flood event?
_____
_____
_____

7. How did sub-Contractors cooperate with Contractor's instructions?
_____
_____
_____

8. Were you given adequate time to take care of your family and home prior to the severe weather / flood event (if applicable)?
_____
_____
_____

9. How effective was the communication in relation to severe weather or flood management / evacuation management process?

_____
_____
_____

10. Did procedures provide minimal disruption prior to and during the severe weather / flood event?

_____
_____
_____
_____

11. What are your suggestions on improving the Flood Emergency Management Plan, the Site Specific Flood Preparation Plan and associated procedures?

_____
_____
_____

12. What processes or innovations do you consider may be appropriate to assist in making this plan more effective and efficient?

_____
_____
_____

13. Were you a member of the Response Crew established for the site?

_____
_____
_____

14. Any other suggestions or comments?

_____
_____
_____

Appendix D Flood Impact Mapping (Source: N2NS Project EIS - Technical Report 6: Hydrology and Flooding Assessment)