
Chapter 19

Major Accidents and Disasters

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19. Major Accidents and Disasters

19.1 Introduction

This chapter assesses the potential risk of 'major accidents and disasters' arising from construction and operational phase activities for the Barnesmore Gap Greenway. The assessment is prepared in accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment ("the EIA Directive"). Close co-ordination and discussion between the EIA team has informed the preparation of this chapter to ensure that the major accidents and disasters identified are adequately identified and assessed.

This chapter contains the applicable legislation and guidance used to prepare this chapter (Section 19.2), sets out the methodology adopted to assess the risk of major accidents and disasters (Section 19.3) and finally details the potential of the proposed development to cause major accidents and disasters ('MADs' hereafter), and its vulnerability to MADs during the construction and operational phase (Section 19.4).

This chapter should be read in conjunction with:

- Chapter 4 Description of the Proposed Development.
- Chapter 5 Traffic and Transportation.
- Chapter 6 Population and Human Health.
- Chapter 7 Biodiversity.
- Chapter 8 Land and Soils.
- Chapter 9 Hydrology.
- Chapter 10 Hydrogeology.
- Chapter 11 Air Quality.
- Chapter 12 Climate.
- Chapter 13 Noise and Vibration.

19.2 Legislation, Policy and Guidance

19.2.1 Legislation

Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/54/EU ('the EIA Directive' hereafter) mandates the consideration of MADs in EIA.

The EIA Directive, as amended by Directive 2014/52/EU, requires that the EIAR shall contain:

Article 3 (1) *"The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned"*.

Annex III (1)(f) *"the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge"*

Annex IV (8) *"a description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. [...] Where appropriate, this description*

should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.”

19.2.2 Policy

The assessment of impacts in relation to MADs is a relatively new requirement in the context of EIA, and specific national guidelines have not yet been published in Ireland. The development of the risk assessment methodology has been informed by the following legalisation:

- S.I. No. 291 of 2013 – Safety, Health and Welfare at Work (Construction) Regulations 2013; (hereafter referred to as the Safety, Health and Welfare (Construction) Regulations).
- S.I. No. 209 of 2015 - A Guide to the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015.
- Seveso III Directive.
- EU Regulation 402/2013 on the Common Safety Method on Risk Evaluation and Assessment (CSM-RA) (as amended by Regulation EU 2015/1136).

19.2.3 Guidance

The development of the risk assessment methodology has been informed by the following guidelines and documents:

- IEMA, 2020. *Institute of Environmental Management and Assessment's (IEMA) Major Accidents and Disasters in EIA: A Primer*.
- EPA, 2015. *Draft Advice Notes for Preparing Environmental Impact Statements*
- EPA, 2022. *Guidelines on the Information to be contained in Environmental Impact Assessment Reports*.
- Government of Ireland, 2018. *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*.
- Department of the Taoiseach, 2024. *National Risk Assessment 2024: Overview of Strategic Risks*. (
- EPA, 2014. *Guidance on Assessing and Costing Environmental Liabilities*.
- Department of Environment, Heritage and Local Government, 2010. *A Guide to Risk Assessment in Major Emergency Management*.
- Health and Safety Authority, 2023. *Guidance on Technical Land-use Planning Advice for Planning Authorities and Operators of Establishments under the COMAH establishments*.
- National Disability Authority, 2011. *Safe Evacuation for All: A Planning and Management Guide*.
- Donegal County Council ,2023. *Major Emergency Plan*. Transport Infrastructure Ireland's (TII's) strategies, procedures and reports:
- TII's Business Continuity Management – Process, Plans and Teams.
- TII's Business Continuity Plans.
- TII's Incident Management Plans.

19.3 Methodology

19.3.1 Scope

The scope of this chapter is to complete an assessment of the significant adverse effects of the proposed development in terms of its potential to **cause major accidents and disasters** ('MADs' hereafter), and its vulnerability to potential disasters/accidents including the risk of both natural disasters (e.g. flooding (and) and man-made disasters. In accordance with the Institute of Environmental Management and Assessment (IEMA) guidelines (IEMA, 2020), it considers whether the associated risks are mitigated to a level that is 'as low as reasonably practicable'.

The scope includes sudden events of low likelihood, which may conceivably occur, and which would result in major negative impacts on infrastructure, human health, cultural heritage and/or the environment (or events of "*low likelihood but potentially high consequence*" as described by IEMA (2020; p. 13; Plate 19.1)). Additionally, the understanding of what constitutes a 'significant' effect or impact in this context differs from that of other chapters of the EIAR, which typically apply the standard definitions provided by the EPA guidelines (EPA, 2022). As stated in those guidelines, "*Significance*" is a concept that can have different meanings for different topics" (ibid.; p. 50). In relation to MADs, the IEMA guidelines define a 'significant environmental effect' as one which "*Could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration*" (ibid. p. 6). This definition has been adopted herein.

As recommended by IEMA (2020), minor accident risks of relatively low consequence, e.g., crime/civil unrest, cyber-attacks, and terrorism have been scoped out of the assessment. Such events are addressed, where appropriate, in the relevant specialist chapters of this EIAR.

As per Figure 19-1 below, risks that have a High likelihood of occurring and of High consequence will be assessed, as well as those that have a Low likelihood of occurring, that would have a high consequence.

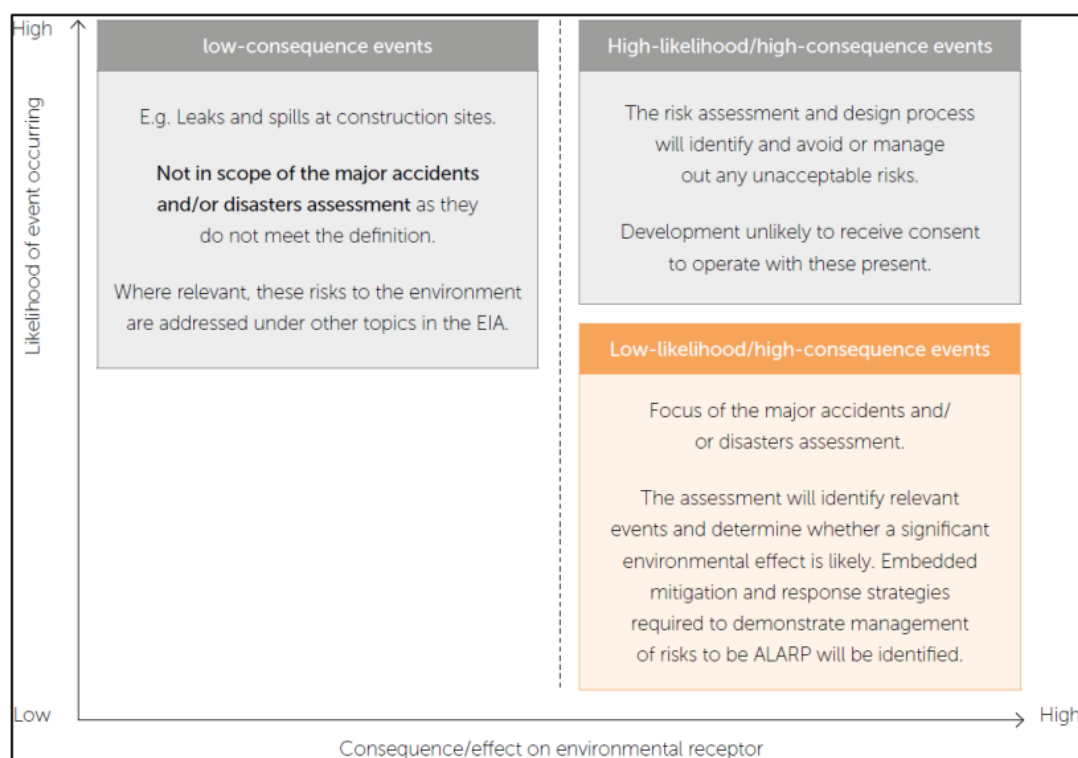


Figure 19-1 - Summary of risk events considered in the scope of the impact assessment in relation to MADs (IEMA, 2020)

This chapter does not deal with the impacts of gradual trends associated with climate change, e.g. sea level rise or increasing annual rainfall volumes. It does, however, address sudden events whose frequency may be increased as a result of climate change related trends, e.g. extreme weather events.

The geographic scope of the assessment shall take in all external features which may present a hazard to the development, even if these are beyond the development boundary, see Table 19-3 for further detail.

19.3.2 Definitions

This assessment is based on the following definitions of key concepts, which have been informed by the IEMA (2020), IPCC (2012) and UN/ISDR (2004) definitions, as well as the relevant sections of the EIA Directive.

**Table 19-1 - Key terminology for the assessment of major accidents and disasters
(adapted from IEMA, 2020)**

Term	Definition	Source
Major Accident	‘Something that happens by chance or without expectation’. Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.	Oxford English Dictionary; IEMA Primer (IEMA 2020)
Disaster	‘A sudden accident or a natural catastrophe that causes great damage or loss of life’. May be a natural hazard (such as an earthquake) or a man-made/external hazard (such as an act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.	Oxford English Dictionary; IEMA Primer (IEMA 2020)
Hazard	Something with the potential to cause harm natural or man-made in nature. Natural hazards include, but are not limited to earthquake, flooding, landslide, high winds/storm, wildfire. Man-made hazards include, but are not limited to structural collapse, building collapse, explosion, terrorism, cyber-attack.	IEMA Primer (IEMA 2020)
Receptor	Environmental receptor is specifically defined as: features of the environment that are subject to assessment under Article 3 of the EIA Directive, namely population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape i.e. a specific component (receptor) of the environment that could be adversely affected if the source of impact affects it e.g. water quality receptors is impacted due to pollution.	IEMA Primer (IEMA 2020)
Vulnerability	Describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to the ‘exposure and resilience’ of the development to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.	IEMA Primer (IEMA 2020)
Sensitivity	The sensitivity of a receptor is a function of its value, and capacity to accommodate change reflecting its ability to recover if it is affected. It is typically defined by the following factors: • Adaptability – the degree to which a receptor can avoid, adapt to or recover from an effect. • Tolerance – the ability of a receptor to accommodate temporary or permanent change.	IEMA Primer (IEMA 2020)

Term	Definition	Source
	Recoverability – the temporal scale over, and extent to, which a receptor will recover following an effect.	
Magnitude of impact	The magnitude of an impact is typically defined by the following factors: • Geographic extent – the area over which the effect occurs. • Duration – the time for which the effect occurs. • Frequency – how often the effect occurs. Severity – the degree of change relative to existing environmental conditions.	Annex III(3) of the EIA Directive IEMA Primer (IEMA 2020)
Adaptive capacity	The capacity of receptors to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.	IEMA Primer (IEMA 2020)
Risk	The likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur.	IEMA Primer (IEMA 2020)
Source-pathway-receptor linkage	For a risk to arise there must be hazard that consists of a 'source' (e.g. high rainfall); a 'receptor' (e.g. people, property, environment); and a pathway between the source and the receptor (e.g. flood routes).	IEMA Primer (IEMA 2020)
Likelihood	A probability (of the hazard occurring) or a frequency, whichever is appropriate for the analysis under consideration.	A National Risk Assessment for Ireland 2017 (Department of Defence 2017)
Significant environmental effect (in relation to major accident and / or disaster assessment)	Could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be remediated through minor clean-up and restoration.	IEMA Primer (IEMA 2020)
As Low As Reasonably Practicable (ALARP)	Involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which risks are typically controlled.	IEMA Major Accidents & Disasters in EIA: A Primer (the IEMA Primer) (IEMA 2020)

19.3.2.1 Receptors

The assessment of significant adverse effects considers all environmental factors defined in Article 3 of Directive 2011/92/EU, as amended. For the purpose of this assessment, an environmental receptor is therefore considered to be any of the following relevant receptors:

- Infrastructure and the built environment;
- Public health
- The natural environment, including:
 - Biodiversity.
 - Land quality, soils and agriculture.
 - Air quality.
 - Water resources (hydrology and hydrogeology).
 - Landscape and visual sensitive receptors.

- The historic environment, including:
 - Archaeology.
 - Built heritage.

19.3.2.2 General Methodology

In Accordance with the IEMA guidelines (IEMA, 2020), this assessment follows a three-stage methodology as follows:

- Stage 1 Screening.
- Stage 2 Scoping.
- Stage 3 Assessment.

19.3.2.3 Stage 1 – Screening

The IEMA (2020) guidelines state that *“During screening it should be sufficient to identify if a development has a vulnerability to major accidents and/or disasters and to consider whether a development could lead to a significant effect”* (p. 10). Questions to consider at this stage include the following (adapted from IEMA, 2020):

- Is the proposed development a source of hazard itself that could conceivably result in a major accident and/or disaster occurring?
- Does the proposed development interact with any sources of external hazards that may conceivably make it vulnerable to a major accident and/or disaster?
- If an external major accident and/or disaster occurred, would the existence of the proposed development conceivably increase the risk of a significant effect to an environmental receptor occurring?

19.3.2.4 Stage 2 – Scoping

If the proposed development is screened in for the assessment of impacts in relation to MADs at Stage 1, the scoping stage aims to determine in more detail whether there is potential for significant effects as a result of MADs in relation to the proposed development.

At this stage, various hazard classes are considered in relation to the proposed development. The UK National Risk Register of Civil Emergencies (2017 Edition) has been used as the primary source to identify hazard classes herein. The baseline (i.e. receiving environment) is described insofar as is relevant to the hazard class in question.

IEMA provide a useful infographic illustrating the scoping decision process to aid at this stage (Figure 19-2).

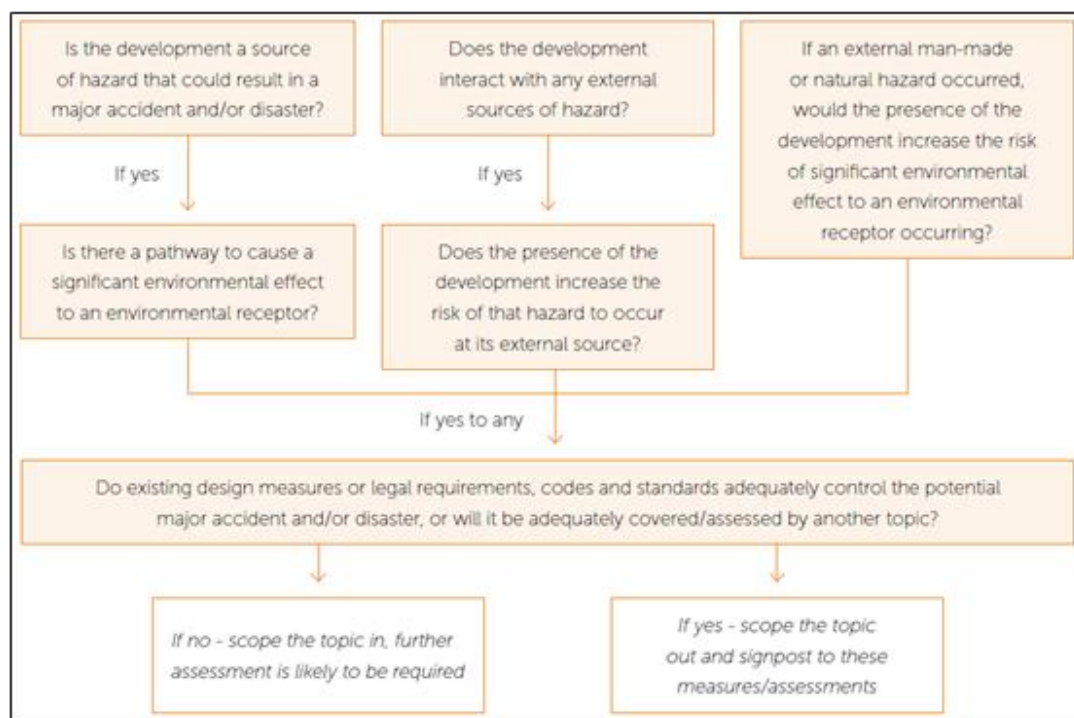


Figure 19-2 - Scoping decision process flow (IEMA, 2020)

It is stated that the assessment of impacts in relation to MADs can be scoped out if it can be demonstrated that:

1. *“There is no source-pathway-receptor linkage of a hazard that could trigger a major accident and / or disaster or potential for the scheme to lead to a significant environmental effect.*
2. *All possible major accidents and / or disasters are adequately covered elsewhere in the assessment or covered by existing design measures or compliance with legislation and best practice.” (IEMA, 2020; p. 12)*

The IEMA (2020) guidelines state “A major accidents and / or disasters assessment will be relevant to some developments more than others, and for many developments it is likely to be scoped out of the assessment” (p. 11).

19.3.2.5 Stage 3 – Assessment

If hazard class(es) are screened in at Stage 2, they are brought forward to Stage 3 for a detailed consideration of the potential for significant impacts to arise. At this stage, the following exercises are carried out (as per IEMA, 2020):

- The potentially affected receptors are identified with as much specificity as is practicable. If no receptors can be identified, the hazard class in question is excluded from further consideration, since there is no valid source-pathway-receptor linkage.
- The reasonable worst-case impacts on the receptors are identified insofar as possible. This exercise is based on a qualitative, professional judgement. Uncertainty at this stage is to be acknowledged. Hazard classes which are not predicted to result in significant impacts under this reasonable worst-case scenario are excluded from further consideration.
- Mitigation by design (where appropriate) is identified and it is determined whether it is sufficient to mitigate the associated risk level(s) to be ALARP.

If, after all of the above-stated exercises have been carried out, there remains hazard classes which may potentially give rise to significant effects as a result of the proposed development or interaction with the proposed development, it is considered whether secondary mitigation

measures can be incorporated into the design of the proposed development which would mitigate the associated risk level(s) to be ALARP.

Risk Classification

Following the completion of Stages 1 and 2, the potential risk of remaining MADs have been evaluated using criteria outlined in Figure 19-3 and Figure 19-4 below, extracted from 'A National Risk Assessment for Ireland 2020' prepared by the Department of Defence (2020), IEMA Primer (IEMA 2020) and guidelines provided in the EPA Guidelines (EPA 2022).

Rating	Classification	Average Recurrence Interval*
1	Extremely Unlikely	100 or more years between occurrences
2	Very Unlikely	51 - 100 years between occurrences
3	Unlikely	11 – 50 years between occurrences
4	Likely	1 - 10 years between occurrences
5	Very Likely	Ongoing/Less than one year between occurrences

*a statistical estimate of the average period of time between occurrences of an event of given scale²⁰

Figure 19-3 - Classification of National Likelihood Criteria (DoD, 2020)

Potential impacts resulting from MADs have been classified under the criteria described in Department of Defence's 'A National Risk Assessment for Ireland 2020'. The EPA Guidelines (EPA 2022) for describing the significance of effects on environment have also been applied, see Figure 19-4. Significant impacts resulting from MADs are adverse impacts that are described as 'Significant', 'Very Significant' or 'Profound' under the EPA Guidelines (EPA 2022).

Impact Category	1 Very Low Impact	2 Low Impact	3 Moderate Impact	4 High Impact	5 Very High Impact
People¹⁶	Deaths less than 1 in 250,000 people for population of interest OR Critical injuries/illness less than 1 in 250,000 OR Serious injuries less than 1 in 100,000 OR Minor injuries only	Deaths greater than 1 in 250,000 people for population of interest OR Critical injuries/illness greater than 1 in 250,000 OR Serious injuries greater than 1 in 100,000	Deaths greater than 1 in 100,000 people for population of interest OR Critical injuries/illness greater than 1 in 100,000 OR Serious injuries greater than 1 in 40,000	Deaths greater than 1 in 40,000 people for population of interest OR Critical injuries/illness greater than 1 in 40,000 OR Serious injuries greater than 1 in 20,000	Deaths greater than 1 in 20,000 people for population of interest OR Critical injuries/illness greater than 1 in 20,000
Environment¹⁷	Simple, localised contamination	Simple, regional contamination, effects of short duration	Heavy contamination localised effects or extended duration	Heavy contamination, widespread effects or extended duration	Very heavy contamination, widespread effects of extended duration
Economic¹⁸	Up to 1% of Annual Budget	Greater than 1% of Annual Budget	Greater than 2% of Annual Budget	Greater than 4% of Annual Budget	Greater than 8% of Annual Budget
Social¹⁹	Limited disruption to community	Community functioning with considerable inconvenience	Community functioning poorly	Community only partially functioning	Community unable to function without significant support

Figure 19-4 - Classification of National Impact Criteria (DoD, 2020)

Risk Evaluation

Using the guidelines prepared by the Department of Defence (Department of Defence, 2020) and amended by the provisions set out in the IEMA Primer (IEMA 2020), and EPA Guidelines (EPA, 2022), the MADs that were scoped in at Stage 2 (see Table 19-3) were evaluated against a risk matrix to determine the level of significance of each risk for each scenario. These have been grouped according to three categories listed below, and as shown in Table 19-2:

- Red Zone: High Risk Scenarios that have an evaluation score of 15 to 25.
- Orange Zone: Medium Risk Scenarios that have an evaluation score of 8 to 12.
- Green Zone: Low Risk Scenarios that have an evaluation score 1 to 6.

Table 19-2 - Evaluation of Level of Significance

Likelihood	5 – V. Likely	5	10	15	20	25
	4 – Likely	4	8	12	16	20
	3 – Unlikely	3	6	9	12	16
	2 – Very. Unlikely	2	4	6	8	10
	1 – Ext. Unlikely	1	2	3	4	5
		1 – Slight	2 – Moderate	3 – Significant	4 Very Significant	5 – Profound
Consequence of Impact						

Categorisation of MADs based on the three aforementioned categories is shown in Table 19-4. As per Figure 19-1, the IEMA Primer (IEMA 2020) recommends that the focus of the MADs assessment is to identify and focus on hazard types which are of low likelihood but potentially high consequence events which are generally represented by the Orange Zone. The Red Zone consists of hazard types / events which are high likelihood and high consequence events. Hazard types within the Green Zone achieved ALARP and did not need to be considered further.

MADs that fall within the Orange and Red Zones have been brought forward for further consideration as shown in Table 19-5, and re-evaluated to take into consideration the secondary mitigation measures proposed.

19.3.3 Study Area

For the purposes of identifying risk of major accidents and disasters the study area includes the extent of the proposed development, as well as any haul routes to and from the proposed development during the construction phase.

Consideration has also been given to sites that have potential for major accident hazard under the Chemical Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No.209 of 2015).

19.3.4 Survey Methodology

Information was obtained from the desktop studies and surveys completed for the environmental factors contained within this other chapters of this EIAR (e.g., Hydrology, Air Quality, etc.,) and they have informed this assessment as appropriate.

19.3.5 Consultation

Consultation and the consideration of feedback from the public and statutory consultees is a key part of the EIA process and integral to informing the design development and this environmental assessment.

The key consultation phases and the associated feedback received that has informed this chapter include:

- Options Selection process.
 - Non-statutory public consultation no.1: Study Area
 - Non-statutory public consultation no.2: Route Corridor Options
 - Non-statutory public consultation no.3: Emerging Preferred Route Corridor
 - Non-statutory public consultation no.4: Preferred Route
- Informal EIA Scoping Report.

Chapter 3 Alternatives of this EIAR includes detail relating to the consultations undertaken during the project. Chapter 1 of this EIAR provides the submissions received from prescribed bodies and stakeholders on the Informal EIA Scoping report. Close collaboration with the project team and other EIA specialists has also informed the assessment.

19.3.6 Difficulties Encountered/Limitations

There were no difficulties encountered when completing this chapter.

19.4 Description of Potential Impacts

19.4.1 Stage 1 – Screening

It is considered that the proposed development, due to its nature, scale and construction duration should screen in for the impact assessment in relation to MADs, since on the basis of a preliminary consideration of the proposed development and receiving environment, it is conceivable (although highly unlikely) that:

- the proposed development could result in a MAD.
- the proposed development could interact with external sources of hazards that could conceivably make it vulnerable to a MAD.
- if an external MAD occurred, the proposed development could conceivably exacerbate the associated risk of significant impacts.

19.4.2 Stage 2 – Scoping

In general, major accident and disaster events, as they relate to the proposed development, will fall into three categories:

1. Events that could not realistically occur, due to the type of development or its location.
2. Events that could realistically occur, but for which the proposed development, and associated receptors, are no more vulnerable than any other development.
3. Events that could occur, and to which the proposed development is particularly vulnerable, or which the proposed development has a particular capacity to exacerbate.

The scoping stage was undertaken primarily to identify this third group of major events, which would then form the shortlist of events to be taken forward for further consideration. The screening exercise undertaken for the long list of events is documented in Table 19-3.

Table 19-3 - Stage 2 Scoping Assessment of Potential Sources of Major Accidents and Disasters (adapted from IEMA, 2020)

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
CONSTRUCTION PHASE					
Transport Accidents					
Major Road Traffic Accidents	Yes	There is a risk of a road traffic accidents occurring during construction stage along haulage routes due to increased levels of Heavy Goods Vehicles (HGVs) on motorways and urban roads.	- Biodiversity. - Hydrology. - Population and Human Health. - Material Assets and Land.	Yes – Chapter 5 Traffic and Transportation and Chapter 6 Population and Human Health. Chapter 9 Hydrology and Chapter 10 Hydrogeology	No
Accidents when working with electrical equipment	No	There is a risk of electrical accidents during construction phase when handling electrical equipment. However, the proposed development is no more vulnerable than any other development. It is very unlikely that the public will come in contact with the electrical equipment as they will be stored appropriately within the construction areas and compounds.	Population and Human Health.	No	No
Infrastructure					
Impact on critical Infrastructure	Yes	There are a number of utilities directly affected by, or running in close proximity to the proposed development including gas pipelines, water supply mains, telephone connections, and particularly, existing ESB overhead lines. Where the proposed development clashes with existing utilities and services, these will be addressed by a combination of permanent diversions, lowering/raising of the service or protection in place.	- Population and Human Health. - Material Assets	Yes –Chapter 18	Yes
Collapse / Damage to structures	Yes	There are buildings and bridge structures in the vicinity of the proposed construction works. Works to existing structures will also be required. There is a risk of structures to be damaged during the adjacent works or when works are to be carried out on structures.	- Population and Human Health. - Material Assets and Land.	Yes – Chapter 4 Description of the Proposed Development defines the compliance with design standards adhered to	Yes

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
Construction Accidents					
Ground Collapse	Yes	The proposed development consists predominantly of earthworks, structures and greenway pavement construction. It is not anticipated that ground collapse will be a major hazard for the project. The greenway will follow the alignment of the former railway and constructed on or near existing ground levels. Where greenway diverges from railway corridor in offline sections, a floating construction technique will be employed.	- Human Health. - Material Assets.	No	No
Building failure/fire	Yes	Only temporary construction portacabins are proposed as part of the development. These will be designed to comply with the necessary Building Regulations.	- Population and Human Health. - Material Assets and Land	Yes	Yes
Release of asbestos	Yes	The proposed development will require the demolition of buildings which may be contaminated with asbestos.	Human Health.	Yes – Chapter 6 Population and Human Health and Chapter 8 Land and Soils	Yes
Fire / explosion	Yes	The proposed development will require the use of flammable substances such as fuel storage areas at construction compounds. However, the proposed development is no more vulnerable than any other development.	- Human Health. - Population and Human Health. - Material Assets and Land.	No	No
Works near surface and groundwater bodies	Yes	The proposed development will require works at, within and over watercourses, namely the, River Eske, Drumrooske Middle Stream, Drumrooske East Stream, Limestone Brook, Clardrumbarren Stream, Carbbeagh Stream, Clogher River, Lowrymore River, Milltown Stream, Mullanalamphry Stream, Keadew Lower Stream, Barrack Hill Stream, Mourne Beg Stream, Cashelnavean Stream, Burn Daurnett, Sessiagh Stream, and the River Finn.	- Population and Human Health. - Hydrology. - Biodiversity.	Yes – Chapter 9 Hydrology and Chapter 6 Population and Human Health	Yes
Industrial Accidents					
Industrial Accidents (works near Seveso site)	No	There are no Seveso Sites within County Donegal or within proximity of the proposed development and therefore there is no risk to the development and construction workers in the event of an explosion/ fire or any other event associated from a Seveso Site.	N/A	N/A	No
Hydrological Disasters					
Extreme Weather	Yes	Both the vulnerability of the project to flooding, and its potential to exacerbate flooding have been assessed in the EIAR, both in terms of the risk to the	Biodiversity.	Yes – Chapter 9 Hydrology	Yes

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
(Flooding) Events		proposed development and increased risk due to the proposed development. The proposed development is crossing a number of streams and rivers which have the potential to flood.	• Material Assets and Land. • Population and Human Health. • Hydrology. • Hydrogeology.		
Groundwater Contamination	Yes	The proposed development will require ground disturbance activities which have the potential to accidentally damage / contaminate water abstraction points such as boreholes, wells and aquifers in the vicinity of the proposed development.	• Human Health. • Population. • Hydrology. • Hydrogeology. • Biodiversity.	Yes – Chapter 10 Hydrogeology	Yes
Spillage or long-term seepage of pollutants into a watercourse	Yes	The proposed development consists of works near and over River Eske, Drumrooske Middle Stream, Drumrooske East Stream, Limestone Brook, Clardrumbarren Stream, Carbbeagh Stream, Clogher River, Lowrymore River, Milltown Stream, Mullanalamphry Stream, Keadew Lower Stream, Barrack Hill Stream, Mourne Beg Stream, Cashelnavean Stream, Burn Daurnett, Sessiagh Stream, and the River Finn. There is potential for accidental pollution / short-term seepage of pollutants into the watercourses during construction.	• Population and Human Health. • Hydrology. • Hydrogeology. • Biodiversity. • Soils and Geology.	Yes – Chapter 9 Hydrology and Chapter 7 Biodiversity	Yes
Disease					
Animal and Plant disease	Yes	Invasive species which are listed on the Third Schedule of the Birds and Natural Habitats Regulations have been identified within the construction work areas. The movement of machinery and equipment to and from the watercourses in the proposed development could cause invasive species to spread between the watercourses in the proposed development boundary and watercourses beyond the study area. Mitigation measures for construction and operation stages to control and eliminate the potential for the spread of animal and plant disease have been included in the EIAR and the NIS.	• Biodiversity.	Yes – Chapter 7 Biodiversity.	Yes
Human disease	Yes	The proposed development is no more vulnerable than any other development.	• Population and Human Health.	No	No

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
OPERATION PHASE					
Transport					
Major Road Traffic Accidents	Yes	There is often some degree of risk in relation to major road traffic accidents, e.g. as a result of human error, associated with developments resulting in an increase in road traffic at operation phase of development. It is conceivable that a road traffic accident could occur on the adjoining roads with the greenway, or as a result of vehicular use along the greenway during maintenance or emergency access. However, overall, it is considered that the design and operational phase procedures of the proposed development are such that the level of risk associated with such an event is mitigated to a tolerable level.	- Population and Human Health. - Hydrology. - Biodiversity.	Yes - Chapter 5 Traffic and Transportation	No
Electrical Accidents	Yes	It is very unlikely that the public will come in contact with the electrical equipment as electrical equipment along the greenway will not be required beyond the construction phase.	Population and Human Health.	No	No
Aircraft Disasters	No	The proposed development does not have the potential to cause such an event. It would not be affected negatively by a major disruption of air travel, nor is it likely to exacerbate such an event.	N/A	NA	No
Maritime Disasters	No	The proposed development is not likely to cause any maritime disasters due to the distance from the sea. It is no more susceptible to maritime disasters than any other project in the locality.	NA	NA	No
Bridge Failure	Yes	The proposed development consists of minor works to existing bridge structures and the construction of new bridge structures. There is a risk of bridge failure during operational phase.	Population and Human Health.	No	Yes
Tunnel Failure / Fire	No	There is no tunnel as part of the proposed development. There are no tunnels that would affect or be affected by the proposed development.	N/A	N/A	No
Dam Failure	No	There is no dam proposed as part of the proposed development. There are no dams that would affect or be affected by the proposed development.	N/A	N/A	No
Flood Defence Failure	No	There are no flood defences proposed as part of the proposed development. There are no existing flood defences that would affect or be affected by the proposed development.	N/A	N/A	No
Mast and Tower Collapse	No	There is no mast or tower proposed as part of the proposed development. There are no masts or towers that would affect or be affected by the proposed development.	N/A	N/A	No

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
Building Failure / Fire	No	No hazards of this type proposed in the operational phase.	• N/A	N/A	No
Power Failure	Yes	The proposed development involves the handling of electrical equipment/infrastructure, such as road lighting, communications, and traffic control systems including traffic signage, which are vulnerable to mishandling or damage risks.	• Population and Human Health. • Material Assets and Land.	Yes	No
Members of the public falling or jumping from overbridges	Yes	The proposed development involves the construction of a new bridge structures for the proposed greenway. There is a risk of members of the public falling or jumping from these bridges.	• Population and Human Health.	No	Yes
Geological Disasters					
Mass Wasting ¹	Yes	The route of the proposed development includes areas, particularly along the Barnesmore Gap, at risk of landslide/ground instability in the form of landslides, rockfalls, bogslides and/or flows. GSI Landslides database recorded three landslide events along the proposed development, with the most recent occurrence in November 2020, similarly a peat flow event was triggered by the construction of a road, in 1963. The primary risk identified is not related to construction induced instability since no significant excavation or slope cutting is required, the main risk stems from the potential for natural rockfall from the steep valley slopes above the greenway alignment.	• Population and Human Health.	Yes – Chapter 8 Land and Soils	Yes
Earthquakes	No	The proposed development does not have the potential to cause an earthquake event. Seismic activity in and around Ireland is typically of low magnitude – although moderately damaging events of higher magnitude do occasionally occur (Blake, 2006). No account could be found of any damage to built infrastructure in Ireland as a result of a seismic event. The site is not in a geologically active area and as such, earthquakes are not considered to be a risk or serious possibility.	• N/A	N/A	No
Sinkholes	No	The proposed development does not have the potential to cause such an event. The geology of the study area is not prone to sinkholes.	• N/A	N/A	No

¹ Landslides, rockfalls, debris flows, mudflows, avalanches, soil creep, etc.

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
Volcanic Eruption	No	The proposed development does not have the potential to cause a volcanic event. There is active or dormant volcanoes in Ireland. It is geologically stable. Indirect impacts i.e. tsunamis and disruption to air travel, are considered separately in this chapter.	• N/A	N/A	No
Hydrological Disasters					
Extreme weather (flooding) events	Yes	Both the vulnerability of the project to flooding, and its potential to exacerbate flooding, are assessed in the EIAR, both in terms of the risk to the proposed development and increased risk due to the proposed development. The proposed greenway development is crossing a number of streams and rivers which have the potential to flood.	• Population and Human Health. • Material assets and Land. • Hydrology. • Hydrogeology. • Biodiversity.	Yes – Chapter 9 Hydrology and Chapter 12 Climate	Yes
Spillage or long-term seepage of pollutants into a watercourse.	Yes	There is a risk of spillage from hazardous loads as a result of a road traffic accident e.g. fuel tankers. However, as these types of vehicles already use the existing roads, the proposed development will not exacerbate the risk of such an event.	• Population and Human Health. • Hydrology. • Hydrogeology. • Biodiversity.	Yes – Chapter 7 Biodiversity and Chapter 10 Hydrology.	No
Tsunami / Storm surge	No	The proposed development does not have the potential to cause a tsunami / storm surge event. Extreme waves events do occur in Ireland's marine and coastal waters, although seldom resulting in major impacts (O'Brien et al., 2013). Future extreme wave events affecting the British Isles are conceivable (Giles, 2020; Ward & Day, 2001). However, as pointed out by O'Brien and co-authors (2013; p. 643), "... these types of events occur very rarely, approximately of the order of thousands of years" and tsunami risk in Ireland is, on the whole, "very low" (ibid; p. 645).	• N/A	N/A	No
Extreme Weather Events					
Extreme weather (Severe snowfall / blizzards / hailstorm) event	No	The proposed development does not have the potential to cause such an event. Severe snowfall / blizzard and hailstorm events could affect the operation of the greenway. However, the risk is no different from other transport developments in Ireland. The proposed development is designed to operate under a range of environmental conditions, in accordance with the relevant standards, including <i>EN 1991-1-4 Eurocode 1: Actions on structures: general actions - Wind actions</i>	• Population and Human Health.		No

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
		and <i>EN 1991-1-5:2003 Eurocode 1 – Actions on structures: General actions – Thermal actions.</i>			
Extreme weather (Gale force winds / storms / tornado / cyclone / hurricane / typhoon) event	Yes	The proposed development does not have the potential to cause such an event. Flooding along the extents of the proposed development which may occur in extreme storm events, is reviewed separately. Although there are gale force winds in Ireland, their destructive force tends to be much less than in other parts of the world.	• Population and Human Health.	No	No
Droughts	No	The proposed development is not especially vulnerable to negative impacts as a result of water supply shortages / restrictions, nor is it likely to exacerbate such an event.	• N/A	N/A	No
Lightning Strikes	Yes	The proposed development does not have the potential to cause such an event. The detailed design will be in accordance with all relevant codes and standards (IS / BS / EN / ISO), including <i>IS EN 62305-1 :2011, Protection against Lightning, General Principles</i> . Accordingly, it is considered that the design of the proposed development is such that the level of risk associated with such an event will be mitigated to a tolerable level.	• Population and Human Health.	No	No
Heat waves	No	The detailed design of the proposed development will be in accordance with the relevant codes and standards, including <i>EN 1991-1-5:2003 Eurocode 1 – Actions on structures - General actions – Thermal actions</i> . The proposed development detailed design will consider the effect of high temperatures; however, the proposed development will be no more vulnerable than any other development, nor is it likely to exacerbate such an event.	• N/A	N/A	No
Wildfires	No	The proposed development does not have the potential to cause such an event. There may be some potential for grassland fires, though the risk is no greater than any other development	• N/A	N/A	No
Air Quality Events	Yes	The proposed development does not have the potential to cause a major air pollution event in the order of a major accident or disaster.	• N/A	N/A	No
Extreme cold weather	Yes	The proposed development does not have the potential to cause such an event. The detailed design of the proposed development will be in accordance with the relevant codes and standards, including <i>EN 1991-1-5:2003 Eurocode 1 – Actions on structures: General actions - Thermal actions.</i>	• N/A	N/A	No

Hazard Type	Relevant for Long list?	Why? (note if risk to the project, or project exacerbates risk)	Potential Receptors	Already covered in relevant EIAR Chapter?	Progress to Stage 3?
Space Disasters					
Impact events and airburst	No	The proposed development is considered to be no more vulnerable to impact events and airburst than any other development.	• N/A	N/A	No
Solar flare	No	The proposed development is considered to be no more vulnerable to solar flare than any other development.	• N/A	N/A	No
Industrial Accidents					
Accidents at Seveso Sites	Yes	There are no Seveso Sites within County Donegal or in proximity to the proposed development therefore there is no risk to the development and construction workers in the event of an explosion/ fire or any other accidents associated from a Seveso Site.	• Population and Human Health. • Material Assets	No	No
Crime / Civil Unrest					
Crime or Civil Unrest	No	No more vulnerable than any other developments.	• N/A	N/A	No
Cyber attacks	No	No more vulnerable than any other developments.	• N/A	N/A	No
Terrorism	No	No more vulnerable than any other developments.	• N/A	N/A	No
Disease					
Human disease	No	The proposed development does not have the potential to cause such an event.	• Population and Human Health.	No	No
Animal and Plant disease	Yes	Spread of invasive species/disease is a risk during the operation phase of the proposed development. International tourism may result in the introduction of new invasives or diseases, in addition to all users risking further spread of established populations of invasives. Mitigations to reduce spread outlined in the Biodiversity chapter include on-lead requirements for pets, dog waste bins, educational signage, quiet zones and mammal-friendly fencing.	• Human Health. • Biodiversity.	Biodiversity	No

19.4.3 Stage 3 – Assessment

Stage 3 of the assessment requires more detailed consideration of the short list of major events developed during Stage 2, though this may only mean that the risk needs to remain on the design risk register until it is closed out through design. Major events that were included on the short list and which have subsequently been considered in more detail are presented in Table 19-4.

Table 19-4 - Assessment of Remaining Risks Associated with the Proposed Development

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
CONSTRUCTION PHASE								
C1	Impact on Critical Infrastructure	Impact on overhead and underground utilities.	- Damage to electrical utilities (underground) resulting in power outage, risk of electrification which can lead to serious injury or death. - Damage to gas mains which can result in supply outage, risk of explosion or gas inhalation which can lead to serious injury or death. - Damage to water piping can lead to supply outage, flooding of construction sites and property damage to nearby buildings. - Damage to foul piping can lead to contamination of construction site, risk of water and soil pollution and other associated environmental impacts.	- All utility services near the proposed development have been identified. - Consultations have been undertaken with all known service providers and their requirements have been identified and incorporated into the design. - Where there is interaction between the proposed development and existing infrastructure, the locations of the interactions have been identified and planned for, and therefore, the potential for any service disruption is limited. - Where interactions are located with the proposed development, these utilities will undergo re-location or diversion works appropriately and as required at the detailed design stage. - The exact locations of the medium pressure gas mains have been determined by surveys which have informed the preliminary design. - Any utilities to be diverted will comply to guidelines below: - Irish Water Code of Practice for Water Infrastructure. - Irish Water Code of Practice for Wastewater Infrastructure. - Gas Network Ireland Code of Practice. - All works involving ESB infrastructure will be carried out in accordance with ESB code of practice and Health and Safety	3 – Unlikely	2 – Moderate	6 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
				requirements to minimise risk of disruption.				
C2	Collapse / Damage to structures	Works to the structures such as the new bridge and underpasses will be required.	- Risk of proposed bridge / underpass collapsing, resulting in injury or death to workers and the general public. - Damage to adjacent occupied buildings resulting in injury or death to the general public.	The design of the proposed development will comply with design standards that include, but are not limited to, the following: - EN 1990 Eurocode - Basis of structural design - EN 1993 Eurocode 3. Design of steel structures - EN 1993-1 Design of steel structures. General rules and rules for buildings - Degree of impact protection. The design of the proposed development will comply with material standards to include, but are not limited to, the following: - I.S. EN 1992-1-1:2005 (Eurocode 2, Part 1-1) – Design of concrete structures – General rules and rules for buildings. - I.S. EN 1993-1-1:2005 (Eurocode 3, Part 1-1) – Design of steel structures General Rules and rules for buildings. - I.S. EN 1996-1-1:2005 (Eurocode 6, Part 1-1) – Design of masonry structures. General Rules for reinforced and unreinforced masonry structures. A Construction Environmental Management Plan (CEMP) and an Incident Response Plan (IRP) will be prepared by the successful contractor to manage the risk of collapse / damage to structures.	1 – Ext. Unlikely	4 – V. Significant	4 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
C3	Building Failure / Fire	The proposed development will require the use of flammable substances such as fuel to be stored at construction compounds	- Fire / explosion at construction site causing injury or death to workers or members of the public - Fire / explosion at construction site leading to damage or collapse to proposed structures and / or nearby property affecting members of the public.	- All construction compounds and construction sites will have appropriate fencing. - Flammable inventory on site will be kept to a minimum and stored securely, away from ignition sources	2 – V. Unlikely	3 – Significant	6 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.
C4	Asbestos	Demolition of farm sheds/cattle crushes and one building	- Exposure of workers to asbestos containing materials. - In extreme cases, an uncontrolled release of asbestos containing materials and the subsequent exposure of the material to the general public.	- Prior to any works, demolition surveys will be carried out. - In buildings where traces of asbestos have been found, a remedial strategy will be developed prior to any construction and demolition works.	3 – Unlikely	2 – Moderate	6 – Low	No – mitigation by design achieves ALARP and will not lead to MADs
C5	Works near surface and groundwater bodies	- Unknown groundwater level or regime. - The excavations for the underpass, associated drainage, and below ground utilities during construction could be vulnerable to groundwater inundation and flooding.	- Death or injury to workers / or the general public. - Release of large quantities of water within construction site.	Preliminary assessments of the geotechnical risks associated with the proposed development will be developed during detailed design.	3 – Unlikely	2 – Moderate	6 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.
C6	Extreme Weather (Flooding) Events	Weather events leading to flooding such as heavy / prolonged rainfall / tidal event.	Extreme flood events can lead to: Hazardous working conditions for workers.	As is normal practice with infrastructure projects, an Environmental Operating Plan (EOP) and CEMP will be prepared by the successful contractor for the proposed development. An Incident	3 – Unlikely	3 – Significant	9 – Medium	Yes

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
		• Prolonged heavy rain / flooding directly over construction sites. • Prolonged heavy rain resulting in breach of embankments in nearby waterbodies. • Extreme / prolonged rainfall events causing sediment runoff during construction. • Extreme / prolonged rainfall events over open or deep excavations.	• Flooding on construction sites. • Damage of construction materials, collapse of temporary and permanent structures. • Sediment runoff / release of contaminants into watercourses from construction sites, specifically those within high flood risk areas.	Response Plan will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of an extreme weather event including but not limited to flood events. events.				
C7	Groundwater Contamination	• Ground disturbance activities which have the potential to accidentally damage / contaminate unknown water abstraction points such as boreholes, wells and aquifers. • Contamination of surface water.	• Contamination of public drinking water supply.	• Local Authorities and landowners have been consulted to identify any private boreholes / wells within 1km of the proposed development. • Further geophysical surveys and ground investigation surveys will be undertaken during detailed design stage prior to construction. • All concrete to be brought to site ready-mixed. RA including measures to prevent discharge of contaminated water to subsoil/groundwater to be completed. • Use of barriers and material quantity records to reduce risk of contamination.	1 - Ext. Unlikely	3 – Significant	3 – Low	No – mitigation by design is sufficient
C8	Spillage or long-term seepage of pollutants into a watercourse	• Works near and over streams and rivers. • Accidental pollution / long-term seepage of pollutants from construction materials	• Impacting the water quality status of watercourses from accidental pollution event / sediment runoff from construction sites into the waterbody.	• Design mitigations include single clear span structures over river channels to avoid instream works and silt mitigation measures, reducing the risk of accidental spillage or long-term seepage or long-term spillage of pollutants into a watercourse during construction. Post-construction water	4 – Likely	2 – Moderate	8 – Moderate	Yes

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
		into watercourses during construction.	- Pollution event on downstream European sites. - Pollution to surface water which connects with groundwater, potentially affecting drinking water supply.	quality monitoring programme shall be developed. As is normal practice with infrastructure projects, an EOP and CEMP will be prepared for the proposed development which will detail measures to be taken on site, such as secondary containment for storage of fuel. An Incident Response Plan will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.				
C9	Animal and Plant disease	Presence of invasive species at construction sites and compounds.	Spread of invasive species during construction works.	Ecological site surveys have been carried out along the extents of proposed development to identify any invasive species present. Invasive species which are listed on the Third Schedule of the Birds and Natural Habitats Regulations have been identified within the construction work areas. invasive species management plan as part of the CEMP has been developed, detailing how the introduction or spread of invasive species will be prevented.	4 – Likely	2 – Moderate	8 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.
OPERATION PHASE								
O1	Bridge Failure	- New bridge structures proposed as part of the development. - Bridge strike by road traffic. - Inadequate / poor design of bridge structure(s).	Death or injury to staff and / or members of the public.	- All structures have been designed to be fully compliant with: - Eurocode I.S. EN 1990 Basis of structural design. - Eurocode I.S. EN 1991-2 <i>Actions on structures – Part 2: Traffic loads on bridges (Including Irish National Annex)</i>.	2 – V. Unlikely	3 – Significant	6 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
		Poor quality of materials used for construction.		- Eurocode I.S. EN 1991-1-7 Actions on structures – Part 1-7: General actions Accidental actions (Including Irish National Annex). - I.S. EN 1992-2 <i>Design of concrete structures – Concrete bridges – Design and detailing rules (Including Irish National Annex).</i> - EN 1990 Eurocode - Basis of structural design. - EN 1993 Eurocode 3. Design of steel structures. - EN 1993-1 Design of steel structures. General rules and rules for buildings. - Degree of impact protection. Compliance with material standards to include, but are not limited to, the following: - I.S. EN 1992-1-1:2005 (Eurocode 2, Part 1-1) – Design of concrete structures – General rules and rules for buildings. - I.S. EN 1993-1-1:2005 (Eurocode 3, Part 1-1) – Design of steel structures General Rules and rules for buildings. - I.S. EN 1996-1-1:2005 (Eurocode 6, Part 1-1) – Design of masonry structures. General Rules for reinforced and unreinforced masonry structures.				
O2	Members of the public falling or jumping from overbridges	Construction of a new overbridge structure over the abandoned rail line.	Risk of injury or death to the members of the public.	The design of new bridge complies with the regulatory requirement for safety of pedestrians as detailed in TII's DMRB DN-REQ-03034 <i>The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges</i>. The new overbridge structures will include parapets.	1 – Ext. Unlikely	5 – Profound	5 – Low	No – mitigation by design achieves ALARP and will not lead to MADs.

No.	Hazard Type	Source and / or pathway receptor linkage	Reasonable worst consequence if event did occur	Mitigation by design & best practice	Risk Evaluation		Level of Significance	Secondary mitigation required?
					Likelihood	Potential Impact		
O3	Mass Wasting	Landslide/ bogslide/ rockfall risk in the valley at present. Natural rockfall is the largest risk. The greenway is unlikely to exasperate this risk.	- Risk of injury or death to members of the public - Risk of damage to infrastructure including the greenway, nearby local and national roads and housing/community facilities	- Minimization of earthworks - Use of floating pavement on soft ground - Use of cut materials for embankments, avoiding soil material import/export	3 – Unlikely	3 – Significant	9 – Medium	Yes
O4	Extreme weather (flooding) events	- Extreme flooding causing breach of embankments of watercourses, specifically River Finn and River Eske. - Extreme or prolonged rainfall events flooding the greenway.	- Construction of associated infrastructure on greenfield lands may affect flood patterns in the area causing more intense flooding on surrounding lands. Flooding is unlikely and mitigation measures in place regarding infrastructure design to reduce flood risk. - Flooding of the roads and surrounding areas may temporarily prevent access at this location.	- New infrastructure has been designed to include allowances for climate change, including extreme weather events and flood risk. - Drainage design includes allowances for climate change.	3 – Unlikely	2 – Moderate	6 - Low	No – mitigation by design achieves ALARP and will not lead to MADs.

Table 19-5 - Assessment of Major Accidents and Disasters with secondary mitigation measures in place

No.	Hazard Type	Receptors	Secondary mitigation	Post Mitigation Likelihood	Post Mitigation Potential Impact	Level of Significance (Residual Effect)
CONSTRUCTION PHASE						
C7	Extreme Weather (Flooding) Events	- Biodiversity. - Material Assets and Land. - Population and Human Health. - Hydrology. - Hydrogeology.	- Monitoring of weather forecasts to ensure that necessary actions will be implemented in time at construction sites prior to prolonged / extreme weather events. - Monitoring of water levels in watercourse, specifically the River Finn and River Eske. - Siting of construction compounds, earthworks and materials will be planned to minimise the potential for surface water runoff or contaminants entering watercourses, particularly during extreme weather events. A CEMP will be prepared detailing the procedures to be undertaken in the event of extreme weather (flooding) events.	3 – V. Unlikely	2 – Moderate	6 – Low
C9	Spillage or long-term seepage of pollutants into a watercourse	- Population and Human Health. - Hydrology. - Hydrogeology. - Biodiversity. - Soils and Geology.	- As is normal practice with infrastructure projects, an EOP and CEMP will be prepared for the proposed development which will detail measures to be taken on site, such as secondary containment for storage of fuel. An Incident Response Plan will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks. - The Environmental Manager will prepare Method Statements for construction works as detailed in the EOP to be undertaken on, over or near water in consultation with Inland Fisheries Ireland (IFI) and other relevant authorities. - Implementation of mitigation measures identified in Chapter 7 Biodiversity, Chapter 8 Land and Soils, Chapter 9 Hydrology, and Chapter 10 Hydrogeology in EIAR Volume 2. - During construction, the following guidance will have to be adhered to for construction work on, over or near water: <i>Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites</i> (Eastern Regional Fisheries Board) <i>CD 529 Standards for Highways Design Manual for Roads and Bridges</i> <i>Standard for Highways: Design of Outfall and Culvert Details</i> <i>Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.</i> <i>CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors.</i> <i>CIRIA C648 Control of Water Pollution from Constructional Sites. Check embedded mitigations for Hydrogeology and NIS include these and any additional there pull over to here</i>	3 – V. Unlikely	2 – Moderate	6 – Low

No.	Hazard Type	Receptors	Secondary mitigation	Post Mitigation Likelihood	Post Mitigation Potential Impact	Level of Significance (Residual Effect)
			○ CIRIA C753 The SuDS Manual ○ CIRIA C698 Site Handbook for the Construction of SuDS ○ Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945 ○ Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes ○ Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters			
OPERATIONAL PHASE						
O3	Mass Wasting	• Population and Human Health	• During the operational phase, repeat geological inspections of the mountainside above the abandoned rail line through Barnesmore Gap will be carried out every 5 years to monitor the stability and safety of the mountain slope, and any necessary further stabilisation measures will be carried out to ensure the ongoing safety of the greenway.	2 – Unlikely	3 – Significant	6 – Low

19.5 Residual Effects

Significant residual effects are not likely to occur during construction or operational phases of the proposed development as following mitigation, there are no identified risk events that would present a sufficient in-combination likelihood of risk and consequence that would lead to a major accident or a disaster.

19.6 References

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