Corrib Pipeline EIS - Draft Review Findings Summary

We provide below a summary of the key findings of AEA's review of the Corrib Pipeline EIS (onshore and offshore). With this table we identify:

- **Aspect.** The general aspect to which the issue(s) relate.
- **Issue.** A brief description of the issue, with more detail provided for each issue in the footnotes (footnotes are identified by the issue row number).
- **Score.** A numeric value (or 'score') of the significance of the issue. This is based on a simplified 3-point version of standard IEMA EIA review criteria as follows:

1	Excellent/good,
2	Satisfactory despite omissions and inadequacies
3	Overall unsatisfactory because of omissions and/or inadequacies

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- **Proposed Additional Information Requirements.** This describes the additional information/studies that AEA considers the Project developer/EIS authors (SEPIL/RPS) need to provide in order to rectify the identified deficiencies/omissions in the EIS and which is required prior to judgements on planning approval being made by DCENR.
- **Proposed Consent Conditions.** This describes for each issue AEA's suggestions for Consent Conditions to be applied should DCENR provide planning approval. Following receipt and review of the requested additional information, amended or addition consent conditions may be required.

	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
1	Project Description	Boundaries of project not fully defined	2	N/A	N/A
2	Description of Site	Some gaps in baseline surveys. See rows 25, 27, 28 and 31 below for specific aspects.	See below	See below	See below
3		Status of Natura 2000 sites unclear in EIS	2	N/A	N/A
4	Scoping	Lack of dedicated and systematic scoping assessment in EIS	2	Provide greater information on leak prevention from hydraulic umbilical lines.	Need to develop soil erosion management plan during construction (may be combined with a soil management plan – see row 37)

	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
5	Consultation	Some issues raised in consultation not addressed in the EIS. Issues include leak from hydraulic umbilical lines (see row 4) values (see also row 14)	2	N/A	N/A
6	Alternatives	Minor issues in presentation of alternatives analysis.	2	N/A	N/A
7	Assessment methods	Approach to assessment of impact significance inconsistent across EIS, including definition of residual impacts. Specific aspects discussed on issue-by-issue basis in rows 10 to 38 below.	See below	See below	See below
8	Environmental management	EMP referred to throughout the EIS but not yet developed.	3	N/A	EMP to be developed by SEPIL and reviewed by DCENR (and other relevant authorities) prior to commencement of construction).
9	Presentation	Some generally minor discrepancies and confusion between main body of EIS and appendices.	2	N/A	N/A

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
10	Community & Socio-economic	Social risks associated with open trenches	3	N/A	Develop risk mitigation measures (e.g. fencing, minimisation of open trenches overnight, escape ladders, security). This should be included in the EMP.
11		Confusion over accommodation for construction workers and associated impacts	3	Need to confirm whether construction workers from outside of the immediate area will commute in or will utilise local accommodation.	Need to develop accommodation and travel plans and also worker code of conduct. These need to be reviewed by local authorities and include consideration of managing impacts on tourist accommodation.
12		Consideration of certain indirect socio-economic impacts are assessed in a limited manner.	2	Confirm whether there any restrictions on work/leisure activities due to exclusion zones during construction. Confirm the status of the oyster fishery in Sruwaddacon Bay. This is unclear from the EIS and this should be clarified with regard to economic impacts.	N/A
13		The assessment of impacts on tourist is limited. See also row 11 above re accommodation.	2	N/A	N/A
14		Assessment of property values not undertaken despite being an issue raised during consultation (see also row 5 above).	3	N/A	We recommend that monitoring of property values in the area is undertaken and the results of these are made available to local authorities so that such effects can be taken into account in local planning.
15		Hours of construction activity not well defined in relation to managing impacts on local communities.	3	N/A	EMP must specify that works must adhere to appropriate hours of operation
16	Traffic	Baseline traffic based on data around festival time.	2	N/A	N/A
17		Some inconsistencies and omissions in the assessment methodology are identified such as haul roads, abnormal loads, assessment of significance of residual impacts etc.	2	N/A	N/A

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
18		Lack of traffic monitoring proposed during construction.	3	N/A	Include in EMP traffic monitoring during construction to ensure that roads/junctions continue to operate within capacity and that impacts are minimal as predicted.
19	AQ & Climate	Minor deficiencies in the AQ assessment have been identified including lack of consideration of 24-hour average PM_{10} levels and the use of significance criteria.	2	N/A	N/A
20		Dust control and monitoring is limited in the EIS.	3	N/A	Dust (and mud on roads) monitoring should be included in the EMP and additional control measures implemented as necessary.
21	Noise & vibration	Noise impacts at certain receptors are assessed as 'major'. Given this and a number of identified uncertainties in the assessment we note the need for construction noise monitoring but this is not addressed in the EIS.	3	N/A	We recommend that noise monitoring be undertaken at critical locations (e.g. locations C and E – see EIS Figure 9.10) during construction activity to ensure that criteria levels are met. This should be included in the EMP.
22	Landscape & visual	A number of minor deficiencies and omissions are identified in the visual impact assessment.	2	N/A	N/A
23		Mitigation measures presented in the EIS during construction are 'recommended' rather than firm commitments.	3	N/A	Since impacts are assessed as 'substantial negative' firm mitigations need to be committed to and these should be included in the EMP.
24	Material Assets	Waste streams identified in the EIS are limited.	3	N/A	The WMP needs to be developed by SEPIL and reviewed by relevant authorities prior to construction.

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
25	Terrestrial ecology	Otter surveys incomplete with portions of route not yet subject to baseline survey.	3	Develop clear plans for identifying breeding holts.	Appoint independent Otter specialist to oversee survey Pre-construction survey along all of affected area, appropriately timed to maximise opportunity to locate holts & reduce elapsed time between survey & works Implement plans for identifying breeding holts.
26		Additional information on detailed mitigation measures for Otters have been provided by the EIS authors. These are welcome, although additional measures to protect otters around access roads should be included.	2	N/A	Appoint independent Otter specialist to oversee mitigation Include the detailed mitigation measures provided by the EIS authors, plus provision for Otters crossing access roads, as a consent condition
27		Ecological baseline surveys have not been undertaken in the affected peatlands, including those in the Glenamoy Bog cSAC and other areas of intact peatland. Additional information provided on monitoring of post-construction recovery at Carrowmore Lake complex SAC indicates some areas of slow re-vegetation.	3	Undertake baseline ecological survey of the intact blanket bog, to include vegetation composition/percentage cover and bare ground. Review/revise practices used at Carrowmore complex to reduce impacts on vegetation composition. These should include soil management (see row 36)	Post-construction monitoring should be carried out over a 5 to 10 year period and include percentage vegetation cover/bare peat (to be included in the EMP) Develop clear thresholds for acceptable re-vegetation (these should be included in the EMP).

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
28		Hydrological baseline surveys have not been undertaken in the affected peatlands, including those in the Glenamoy Bog cSAC and other areas of intact peatland.	3	Undertake baseline ecological surveys/site investigations of the areas of intact bog, including peat depth, description of soils & subsoils, hydrological & hydrogeological regimes etc. Investigations should include characterisation to depths below the bottom of the pipeline trench/stone road. Based on the results of the above survey works additional assessment should be undertaken to: ensure that the proposed construction methods (stone road) are appropriate; develop additional mitigation measures as necessary; confirm that residual impacts on the peatland function are acceptable; and confirm that induced landslip risks are acceptably remote.	N/A
29	Birds/SPA	Noise impacts on the SPA were unclear from the assessment presented in the EIA. However, additional noise contour data provided by the EIS authors indicates that noise impacts are unlikely to be significant.	2	N/A	N/A
30		Disturbance to wintering birds on SPA	2	N/A	EMP should include: • Defined measures to ensure no disturbance at alternative sites nearby • Use of screens to reduce visual disturbance • Timing of work to reduce / avoid disturbance during winter • Monitoring during / after construction • Thresholds & agreed actions if disturbance occurs

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
31		Baseline survey of birds on Inishderry Island in the SPA (Terns & Gulls) is 'post breeding'. The need for a breeding season survey is unclear as the location of the island (and hence whether the island is within the Project's zone of influence) is unclear from the EIS.	3	Need to confirm location of Inishderry Island. If within potential zone of influence of project then a breeding season survey is required.	EMP should include: • Use of screens to reduce visual disturbance • Timing of work to reduce / avoid disturbance during breeding season • Monitoring during / after construction • Thresholds & agreed actions if disturbance occurs
32	Freshwater ecology	Given the potential for the presence of salmonids at or downstream of some river crossings we suggest that further consideration is given to the timing of the river crossings to avoid the most sensitive seasons (e.g. spawning).	2/3	N/A	Timing of the crossings should be to avoid the salmon migration/spawning seasons.
33	Marine environment (inshore)	Likelihood of need for intermediate pit is not assessed in EIS. However, following discussions with SEPIL engineers we understand that the likelihood of encountering woody obstacles is relatively low and, furthermore, that if such instances occur other solutions can be attempted before recourse is made to an intermediate pit.	3	N/A	We recommend that the following hierarchy of options to minimise the need for intermediate pits is confirmed as part of the consent: 1. Micro re-routing of the tunnel to go around encountered obstacles 2. Manned access inside the outer drill sheath to remove the obstacles
34	Marine environment (inshore)	The offshore EIS only provided limited information of the cetacean distribution in the offshore environment and noise impacts from pipeline activities are not fully addressed. However, we do not consider that impacts will be significant.	2	N/A	N/A
35	Soils & geology	See 'Terrestrial ecology' above	See above	See above	See above
36		A timetable for reinstatement and associated monitoring is lacking in the EIS.	3	N/A	The EMP should include details of timescales for reinstatement and monitoring of success.
37		Significant amounts of excavated spoil will be generated during pipeline trenching and the EIS provides limited description of management processes.	3	N/A	A spoil management plan should be developed prior to construction.
37	Archaeology & cultural	There is a current lack of survey work undertaken	3	N/A	Pre-constructions surveys should be

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	Aspect	Issue (and report section reference)	Score	Proposed Additional Information Requirements Prior to Consent	Proposed Consent Condition
	heritage	to characterise the archaeological baseline of significant portions of the pipeline route.			undertaken. Clear guidelines for survey methods and procedures if finds are made need to be developed. These should be reviewed/agreed by the relevant authorities (e.g. DoEHLG and DCENR) prior to construction commencing.

Footnotes

Row 1 Project Description. We find that the onshore EIS provides a generally good description of the proposed project development. The precise boundaries of the onshore project with the other elements of the wider Corrib Gas development, for example the landfall between the onshore and offshore, is not explicitly described. However, we do not consider this to be a significant deficiency and furthermore note that all relevant aspects of the pipeline are addressed between the offshore and onshore EIS.

Row 2 See rows 25, 27, 28 and 31

Row 3 There is some confusion over the status of the Natura 2000 sites in the vicinity of the pipeline route, both within the main EIS document and the Non-Technical Summary. The Glenamoy Bog Complex is variously described within the EIS as either a designated Special Area of Conservation (SAC) and as a candidate SAC (cSAC). Similarly, the Blacksod Bay/Broadhaven is described as both a designated Special Protection Area (SPA) and a proposed SPA (pSPA). AEA understands that neither site is currently designated because of proposed boundary changes.

Row 4 The onshore EIS does not include a dedicated section(s) on scoping and hence no systematic approach to identifying potential impacts (e.g. source-pathway-target approach) is evident within the EIS. We do not identify any major potential impacts that are not addressed in the EIS, although there are a number of noteworthy potential aspects that have been omitted without justification such as chemical/hydraulic fluid leaks from the umbilical pipelines and soil erosion on the pipeline route during construction. Nonetheless these issues should be adequately managed through appropriate mitigation and monitoring practices.

Row 5 The presentation of these issues is high-level and the EIS does not present a systematic demonstration of how each issue has been addressed. Although summary tables of issues raised during consultation are presented in Chapter 2 along with references to subsequent EIS chapters, the responses are not always explicit. Issues of merit include property values (see row 14) and the need to consider risks of hydraulic oil leaks from the umbilical (row 4)

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Row 6	Overall we find that the presentation of the analysis of alternatives is rather high-level and qualitative. However, overall, and taking into account the findings of discussions with the authors, we find that the arguments presented for the route selection are nonetheless generally reasonable.
Row 7	We find that the approach to assigning the significance of impacts (for example as being 'slight', 'moderate' etc. in line with EPA guidelines[1]) is not consistent throughout the EIS and are not always clear. See also rows 10 to 38.
Row 8	The EMP is referred to throughout the project as the working document relating to mitigation measures and monitoring. We note that the EMP must be developed prior to commencement of construction and recommend that it is reviewed by DCENR prior to construction. Specific elements required in the EMP are discussed in the following rows.
Row 9	The presentational aspects of the EIS are general good, although the split of information between the main EIS report and the technical appendices at times makes understanding difficult and there are also some (generally minor) inconsistencies between information presented in the Appendices and the main report.
Row 10	Although potential impacts on community and socio-economic aspects appear to be generally well identified, we find the absence of a structured scoping assessment in the EIS makes it difficult to confirm the comprehensiveness of the assessment. One additional potential impact that we feel merits comment in the EIS (or at least a demonstration as to why it has been scoped out of the assessment) is the need to address safety issues of construction near residential areas. An important (but manageable risk) relates to open trenches near to residential areas and the associated safety risk (examples of child mortality have been recorded on pipeline construction projects around the world where children have fallen into open trenches filled with water, been unable to escape and drowned). This risk and relevant mitigation measures (e.g. fencing, minimisation of open trenches overnight, provision of escape ladders, security personnel etc.) should be described. We suggest that at a minimum such measures should be described in the EMP.
Row 11	It is stated in EIS Chapter 5.10 that construction workers from outside of the local area are anticipated to reside in local rental / B&B accommodation. However, this is contradicted in Chapter 6.4.1.1. This needs to be clarified and if the former then the availability of such accommodation, or increased pressure on other amenities/utilities, in this relatively small community, plus any social disruption/disorder impacts should be addressed (such impacts are not currently addressed in the EIS). We recommend that the SEPIL develops accommodation and transport plans and also a code of conduct for construction workers.
Row 12	Only limited detail is provided in the EIS on certain indirect impacts on community and socio-economy, e.g.:

[1] EPA Guidelines on the information to be contained in EIS (2002)

- Are there any restrictions on work/leisure activities due to exclusion zones during construction? Although the loss of access to agricultural land is discussed in Chapter 11, impacts on, for example, leisure fishing and subsistence shellfish foraging due to exclusion zones need to be confirmed.
- The status of the oyster fishery in Sruwaddacon Bay is unclear from the EIS and this should be clarified with regard to economic impacts.

Row 13 We find that the assessment of potential impacts on the tourist 'visiting population' is rather high-level, although we anticipate that impacts will be temporary and are unavoidable.

Row 14 The assessment of impacts on property values (Chapters 6 & 11) is very brief. Given that this issue has been specifically raised by local residents (EIS Table 2.3) a more robust discussion in the EIS would have been merited. We recommend that monitoring of property values in the area is undertaken and the result of these are made available to local authorities so that such affects can be taken into account in local planning.

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Row 15 In relation to community impacts, the EMP must specify that works must adhere to appropriate hours of operation, (the EIS does not provide clearly defined shutdown times/periods to which construction activities must adhere to).

Row 16 The baseline traffic estimates are based on generally appropriate survey work; although the traffic estimates for August appear to be based on survey work undertaken two days before the start the Belmullet Arts Festival and, as such, may represent an overestimate of typical traffic levels (the EIS incorrectly state that the traffic survey was undertaken after this festival).

Row 17 The traffic impacts are assessed after implementation of mitigation measures as 'imperceptible'. However, discussion on how this assessment has been made is very brief, with no clear description of how the residual impact has been reduced as a result of mitigation. As such it is difficult to confirm our agreement with the significance assessment of imperceptible impacts, although we would not anticipate on the basis of the evidence presented that the residual impacts would not be much greater than this.

Row 18 There is no mention of traffic monitoring during construction to ensure that roads/junctions continue to operate within capacity and that impacts are indeed imperceptible. We suggest that such monitoring should be incorporated into the EMP.

Row 19 Air quality impacts are predicted for the principle pollutants of particulate matter (PM10) and oxides of nitrogen (NOx). The impacts are only presented in terms of affects on annual average concentrations. This is generally appropriate, although we note that for PM10 the 24-hour average levels are more likely to challenge statutory levels (based on review of baseline conditions) and so merit greater consideration may have been included (although we would anticipate that current regulatory standards are still likely to be met).

Row 20 In relation to dust control, we note that additional measures could be proposed such as reducing drop heights, sweeping local roads, minimising soil handling, good house keeping, wheel washing, etc.. In addition we suggest that monitoring to check that

dust management measures are working adequately. These additional measures and monitoring aspects may be included in the EMP.

Row 21 Chapter 9 of the EIS assesses the noise impacts at certain (presumably human) receptors to be 'major'. On the basis of the information presented in the EIS we concur with this significance rating, although we also note that during periods of piling or rock-breaking, impacts may be more severe and potentially challenge the proposed project noise limit criterion of 65dB(A). Given the potential significance of these impacts, we recommend that noise monitoring be undertaken at critical locations (e.g. locations C and E – see EIS Figure 9.10) during construction activity to ensure that criteria levels are met; currently no noise monitoring during construction is described in Chapter 9 of the EIS and this should be included in the EMP.

Row 22 Although we identify a number of minor concerns with the assessment process, overall we find that the assessment of landscape and visual impacts presented in the EIS is appropriate. Construction phase visual impacts are assessed as 'Substantial Negative', which we concur with. Unmitigated operation phase visual impacts are assessed as 'moderate' (EIS Table 10.3) and would agree with this assessment indeed, on the basis of provided photomontages, this may be an over-estimate).

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Row 23 Mitigation measures presented in the EIS during construction are 'recommended' rather than firm commitments. Since impacts are assessed as 'substantial negative' firm mitigations need to be committed to and these should be included in the EMP.

Row 24 Waste streams identified in the EIS are rather limited and not comprehensive (e.g. no mention of chemical wastes from radiophotography of pipeline welds ect). This will need to be covered in the Waste Management Plan (WMP), including detailed lists of wastes and disposal routes. We recommend that the WMP be assessed by DCENR prior to commencement of construction.

Row 25 Some sections of the proposed route have not been surveyed for mammals because of lack of access. This particularly relates to the areas of commonage to the north of Sruwaddaccon Bay and is of particular concern in relation to Otters which are listed under Annex IV of the Habitats Directive. In order to provide a full baseline, we recommend that further survey work be carried out ahead of any planning decision. The EIS additionally states that a pre-construction survey will be carried out. The timing of survey work in winter allows holts to be located more easily but may not be the best time to identify breeding activity. We are further concerned that the use of holts might change in the elapsed time between survey and the start of works. We recommend that consent conditions ensure that the full length of the route is surveyed pre-construction; that the elapsed time between pre-construction survey and works is kept to a minimum and that provision is included for subsequent monitoring of holts in case of breeding activity. An independent Otter specialist would ensure that measures taken are rigorous and reasonable.

Row 26 New information from the EIS authors gives a detailed account of proposed mitigation measures for Otter holts along the proposed pipeline route. There are some inconsistencies between the EIS and the new information. For instance, the EIS states that pre-construction surveys will be undertaken to 50-100m either side of the centre line, whilst the distance given in the

additional information is up to 200m. The new, detailed mitigation measures for inactive, active and breeding holts largely seem to be satisfactory and are in line with the NRA guidelines for new roads. We recommend that these be taken as the basis for conditions should permission be granted. However, additional measures should also be included to protect Otters around access roads associated with pipeline construction. An independent Otter specialist would ensure that measures taken are rigorous and reasonable.

Row 27 Vegetation has not been surveyed over significant portions of the pipeline route. It is of particular concern that there is no baseline data for vegetation composition within the Glenamoy Bog candidate SAC, which is designated under the EU Habitats Directive. We have been supplied with post-construction vegetation data for a similar project carried out at Carrowmore Lake Complex SAC. This relates to survey work carried out about 1 year after construction and suggests that the vegetation is starting to recover. However, there is no baseline for comparison, only presence / absence is recorded (instead of relative cover) and there is no measure of bare ground. Photographs show that there is still a lot of bare ground and that turves were not replaced such that vegetation cover would be fully replaced. We therefore recommend that vegetation composition be surveyed within the candidate SAC to provide a satisfactory baseline and that practices carried out at Carrowmore be fully reviewed to identify possible process improvements (it is possible that identified areas of bare peat either side of the pipeline may have resulted from poor soil management practices, although this needs to be confirmed). Post-construction survey work should be carried out over five to ten years, and should also record relative cover and percentage of bare ground.

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Row 28 A key potential impact on peatlands and bogs relates to the installation of the pipeline. The proposed approach to the construction in most peatland areas is the use of a ‘stone road’. Pipeline construction has the potential to disturb the hydrological flows of the peatlands, for example through interrupting lateral flows, generating longitudinal preferential flow routes, or, if underlying impermeable layers are disturbed, potentially creating vertical flow routes. Potential impacts on peatland hydrology are assessed in the EIS as ‘Very Large’ but reducing to ‘Imperceptible’ with the application of mitigation measures. While the mitigation measures presented in the EIS (e.g. use of clay plugs to prevent the stone acting as a longitudinal preferential flow route) are broadly appropriate, we consider that insufficient evidence is provided to support the residual impact evaluation. In particular, we find that the current lack of geotechnical, peat depth and groundwater information along some peatland sections of the route (e.g. in the Rossport Commange) renders the impact assessment impossible to justify. The EIS states that the stone road method has been ‘used successfully’ on another pipeline in the Eskeragh and Glenturk peatland areas. While this is reassuring, we note that further evidence of the success of this previous application is absent from the EIS. AEA has been provided with additional information on the Eskeragh and Glenturk peatland areas and this indicates reasonable recovery but, some areas of dessication (possibly suggesting loss of surface water). It is difficult to confirm likelihood of this also happening at Glenamoy bog in absence of survey data. Furthermore, without detailed baseline information it is not possible to confirm whether the proposed construction

and mitigation techniques are practicable or achievable for the Corrib pipeline (for example the extent to which the stone road will be excavated into the mineral layer below the peat). Overall, it is our position that the current survey data is insufficient and, given the directions on use of consents in Natura 2000 sites, this needs to be completed before the EIS can be considered adequate and planning consent issued.

Row 29 Available literature suggests that many birds will become habituated to noise and that this therefore may not cause long-lasting disturbance. Background noise may reach levels of 70dB and new information from the EIS authors shows zones of influence above this level occurring only within 10-30m of the mud plants and launch areas at each crossing. We therefore believe that the main sources of disturbance will be from movement and visual impacts (see Row 30).

Row 30 Following from the above point, we believe that visual impacts, including movement, are the most likely factors to cause disturbance to wintering / breeding birds within the SPA. Mitigation measures may be imposed as part of the consent conditions to ensure such disturbance is avoided if possible or, failing that, kept to a minimum. These include screening of the work sites to reduce the likelihood of birds being disturbed by machinery and human movements. The peak times for birds using the site (winter and breeding season) should also be taken into account in timing the works.

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Row 31 Several bird surveys were carried out in the affected area between 2002 and 2007. The majority of these were winter surveys, which is appropriate given that the proposed route passes through a proposed SPA designated under the Birds Directive. However, the SPA designation for Blacksod Bay also refers to breeding terns and gulls on Inishderry Island. One summer survey was carried out in 2007, but during August and September, by which time the majority of birds are likely to have left the site. The EIS states that little is known about the colony, but then concludes that significant breeding would have been detected, given the amount of survey effort in the area. We do not believe this is a satisfactory conclusion. If Inishderry Island is within the expected zone of influence then a breeding season survey should be conducted and appropriate mitigation measures must be drawn up to protect the colony from disturbance during the works.

Row 32 Given the potential for the presence of salmonids at or downstream of some river crossings we suggest that further consideration is given to the timing of the river crossings to avoid the most sensitive seasons (e.g. spawning).

Row 33 Given the sensitivity of the status of the bay as a pSPA and a cSAC, and the potential impacts associated with the intermediate pit it is important that the likelihood of such intermediate pit(s) being required is understood. This is not discussed clearly in the EIS. However, following discussions with SEPIL engineers we understand that the likelihood of encountering woody obstacles is relatively low and, furthermore, that if such instances occur other solutions can be attempted before recourse is made to an intermediate pit, namely: (1) Micro re-routing of the tunnel to go around encountered obstacles (2) Manned access inside the outer drill sheath to remove the obstacles. We recommend that the above hierarchy of options to minimise the need for intermediate pits is confirmed as part of the consent.

Row 34	The offshore EIS only provided limited information of the cetacean distribution in the offshore environment and noise impacts from pipeline activities are not fully addressed. However, based on our previous experience and discussion with the EIS authors, AEA considers that the noise impacts of pipelaying will be spatially limited and that this is highly unlikely to lead to significant impacts as any cetaceans present will be able to avoid the immediate vicinity of the pipelaying barge. Importantly, we note that blasting activities in the nearshore region, which could have had a potentially greater impact on cetaceans is no longer planned.
Row 35	N/A
Row 36	See Row 27.
Row 37	We suggest that the EMP should include details of timescales for reinstatement and, given the amount of excavated spoil generated during pipeline trenching, a spoil management plan.
Row 38	Our main concern in relation to the characterisation of the archaeological baseline is the current lack of survey work undertaken in significant portions of the pipeline route. The EIS rightly assesses the impacts as potentially significant in the light of this uncertain. The EIS proposes that pre-construction surveys are undertaken and states that 'where possible archaeological inspection and resolution will take place in advance of construction of the pipeline'. The use of pre-construction surveys for archaeology is not unusual for projects of this nature, although we suggest that such inspection and resolution should take place prior to construction in order to avoid the potential for construction reworking and to ensure appropriate mitigation measures (including if necessary micro-realignment to avoid archaeological features) are feasible. We note that the approach of pre-construction surveys necessitates need to develop clear guidelines for survey methods and procedures if finds are made and we recommend that these be reviewed by the relevant authorities (e.g. DoEHLG and DCENR) prior to construction commencing. We also note that this approach, if properly designed and implemented, represents a residual risk to the construction schedule and may even necessitate the need for micro-realignment of the pipeline route.

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Appendices

Appendix 1 EIA Review Tables

Abbreviations and Acronyms

DCENR	Department of Communciation Energy and Natural Resources
DoEHLG	Department of the Environment, Heritage and Local Government
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Procetion Agency
NRA	National Road Authority
PDR	Planning and Development Regulations
SAC	Special Area of Conservation
SEPIL	Shel E&P Ireland Ltd
SIA	Strategic Infrastructure Act
SPA	Special Protection Area
WMP	Waste Management Plan

1 Introduction

Shell E&P Ireland Ltd. (SEPIL) is developing the Corrib Gas field off the coast of County Mayo. As part of this development SEPIL proposes to construct a gas pipeline comprising:

- An offshore pipeline section between the wellhead and the landfall
- An onshore pipeline section from the landfall site to a gas terminal that is currently under construction at Béal an Átha Buí (Bellanaboy)

Regulatory approvals for the above developments, and construction activities for the preparation of the onshore pipeline commenced in 2005. However, local residents raised concerns regarding the onshore pipeline and in particular safety aspects associated with the proximity of the proposed pipeline route to residential areas. In the light of these concerns, construction of the onshore pipeline was suspended. Following further independent review and public consultation, SEPIL undertook to evaluate changes to both the pipeline design pressure and the route of the onshore pipeline.

SEPIL has now submitted a planning application for the development of a revised onshore pipeline design and route, including a new Environmental Impact Statement (EIS) for the onshore pipeline. As the proposed new onshore pipeline route utilises the same landfall location as the original route, no changes to the offshore pipeline have been proposed in the new submission. As such the main EIS for the offshore route remains unaltered from the original application, although new supplemental information is provided based on the results of recent baseline surveys.

The Department for Communications Energy & Natural Resources (DCENR) has a statutory duty to assess the EIS for both the proposed onshore and offshore pipeline developments. To assist DCENR in this task, it has engaged AEA Technology (AEA) to assist with the technical review of the EIS and associated documentation for both the onshore and offshore pipeline developments. The initial phase of the AEA review compromises:

- Screening and confirmation of AEA's view as to whether an EIS is required under current Irish and EU legislation
- Examination of the EIS documentation and assessment against Irish and EU legislation and guidelines for adequacy and completeness
- High-level examination of the pipeline design documentation and confirmation that the pipeline design satisfies relevant standards

The findings of these review tasks are presented in this report (Draft Initial Findings), which highlights any legislative deficiencies and fatal flaws[1]. The report structure reflects the reviews tasks undertaken as follows:

Section 2: Screening of EIS Requirement

Section 3: Review of the EIS

Section 4: Examination of the Pipeline Design Documentation

Section 5: Summary and Conclusions

In presenting the results of this review, and for the purposes of clarity and conciseness, it is important to note that the main body of the report focuses on areas of deficiency. As such it does not explicitly describe in detail those areas that are fully adequate/compliant, although these are summarised in the Appendices. In undertaking this review requests have been made to the EIS authors for additional clarifications and information.

During the next phase of the review AEA will review any submissions and observations from the Minister concerning the pipeline construction and operation. In the light of these submissions, and further discussions with the EIS authors and comments from DCENR, AEA will revise the Draft Initial Findings report as necessary and issue as the Final Findings Reports. This Final Findings Report will include recommendations for conditions to attach to Ministerial consent as required.

[1] A fatal flaw is a technical (or legislative) deficiency that would result in financial, legal or reputational risk should the flaw not be resolved

2 Screening of EIS Requirement

2.1 Irish Legislation

2.1.1 Transposition of Community EIA Directives

The EIA Directive (Community Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC) requires that certain developments be assessed for likely environmental effects (commonly known as environmental impact assessment (EIA)) before planning permission can be granted. When submitting a planning application for such a development, the applicant must also submit an Environmental Impact Statement (EIS). In Ireland, the EIA Directive was transposed through the European Communities (Environmental Impact Assessment) (Amendment) Regulations 1989 (S.I. 349 of 1989). These Regulations were subject to relatively minor amendments in 1994, 1996 and 1998 and more substantial amendment in 1999 through the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999 (S.I. 93 of 1999). The latter amendments transposed the requirements of the 1997 amending Directive 97/11/EC.

Irish EIA requirements in the land-use planning sector (the primary development consent system) were consolidated in the Planning and Development Act 2000. The Act consolidates all previous Planning Acts and much of the Environmental Impact Assessment Regulations, and also contains many significant changes and new initiatives. The Planning and Development Regulations 2001 (S.I. No. 600 of 2001) implement the Planning and Development Act 2000 in its entirety, consolidating all previous Regulations made under the 2000 Act and replacing the Local Government (Planning and Development) Regulations 1994-2000.

Community Directive 2003/35/EC was adopted in May 2003, and intends to align the provisions on public participation in accordance with the Aarhus Convention on public participation in decision-making and access to justice in environmental matters. The European Communities (Environmental Impact Assessment) (Amendment) Regulations 2006 (S.I. No. 659 of 2006) were implemented in Ireland to provide for revised procedures to enhance public participation in the environmental impact assessment of projects having transboundary environmental impacts.

The Planning and Development Regulations 2006 (S.I No. 685 of 2006) update and amend the Planning and Development Regulations 2001, making changes and updates to the development management system, and underpinning the new strategic consent procedure established under the Planning and Development (Strategic Infrastructure) Act 2006. The Regulations were made effective from two separate dates: 31 January 2007 for the strategic infrastructure provisions and 31 March 2007 for the development management system provisions.

2.1.2 The Strategic Infrastructure Act

The Planning and Development (Strategic Infrastructure) Act 2006 (The Strategic Infrastructure Act) amends the Planning and Development Act 2000 to provide for the introduction of a 'strategic consent process' for strategic infrastructure of national importance provided by other statutory bodies and private promoters. The Act enables developers to make applications for planning permission directly to An Bord Pleanála in respect of certain proposed developments of strategic importance to the State. These projects include major transport, energy or environmental infrastructure developments, developments of national or regional strategic, economic, or social importance, projects crossing county boundaries or developments by State authorities requiring an EIA.

Within this context the Strategic Infrastructure Act defines a ‘strategic upstream gas pipeline’ as any gas pipeline proposed to be operated or constructed:

(a) as part of a gas production project, or

(b) for the purpose of conveying unprocessed natural gas from one or more than one such project to a processing plant or terminal or final coastal landing terminal,

As such, given the strategic nature of the overall project, the proposed Corrib onshore pipeline falls under this definition.

2.1.3 EIA Screening Procedures

The EIA Directives require that certain developments be assessed for likely environmental effects before planning permission can be granted. Projects requiring environmental impact assessment are listed in Schedule 5 Part 1 of the Planning and Development Regulations 2001 and relate to Annex I projects as set out under Article 4(1) of the EIA Directive.

The Planning and Development Regulations (PDR) 2001 require mandatory EIA for *"Pipelines for the transport of gas, oil or chemicals with a diameter of more than 800 millimetres and a length of more than 40 kilometres*". Gas pipelines falling below these thresholds are captured under Part 2 of the Regulations, which covers projects categorised under Annex II of the EIA Directive that may require an EIA. Whether or not an EIA is required for these projects is decided by the use of mandatory inclusion thresholds and case-by-case assessment for sub-threshold projects. Part 2 of the Planning and Development Regulations 2001 requires a mandatory EIA be undertaken for *"Gas pipelines and associated installations not included in Part 1 of this Schedule, where the design pressure would exceed 16 bar and the length of new pipeline would exceed 40 kilometres".*

When deciding whether an EIA is required for an Annex II project, the EIA Directive requires the screening process take due account of potential impacts on areas classified or protected under Member States' legislation; special protection areas designated by Member States pursuant to Directive 79/409/EEC and 92/43/EEC.

The Strategic Infrastructure Act also requires the developer of a strategic gas infrastructure development to prepare an environmental impact statement and shall apply to the Board for such approval accordingly, indicating in the application whether the application relates to a strategic upstream gas pipeline or a strategic downstream gas pipeline.

2.2 Screening Assessment of the Corrib Pipeline

A screening assessmenthas been undertaken to determine whether an EIS is required under current Irish legislation. This was accomplished by assessing whether the Project, as defined by the EIS within the Project Description, falls within the meaning of relevant current Irish legislation and this is summarised in Table 2-1 below.

Table 2-1 EIA Requirements under the PDR and the SIA

PDR Schedule 5			
	Text	EIA required for Corrib pipeline	Grounds for decision
Part 1	"Pipelines for the transport of gas, oil or chemicals with a diameter of more than 800 millimetres and a length of more than 40 kilometres"	No	Pipeline length greater than 40 km although diameter less than 800 mm
Part 2	"Gas pipelines and associated installations not included in Part 1 of this Schedule, where the design pressure would exceed 16 bar and the length of new pipeline would exceed 40 kilometres"	**Yes**	Design pressure exceeds 16 bar and length exceeds 40 km
SIA			
	Text	EIA required for Corrib pipeline	Grounds for decision
Part 2	[the developer of a strategic gas infrastructure development] shall prepare, or cause to be prepared….. an environmental impact statement in respect of the development.	**Yes**	The onshore pipeline falls under the definition of a strategic upstream pipeline.

On the basis of the above analysis we conclude that an EIS is required for the Corrib pipeline.

3 Review of the EIS

3.1 Review Documentation

The following EIS and associated documentation were reviewed:

- Corrib Natural Gas Field Development (Offshore Field to Terminal): Environmental Impact Statement, 2001
- Corrib Natural Gas Field Development (Offshore Field to Terminal): Offshore Supplementary Update report, 2008
- Corrib Onshore Pipeline Environmental Impact Statement, April 2008
- Corrib Onshore Pipeline Environmental Impact Statement: Non Technical Summary, April 2008
- Corrib Onshore Pipeline Book of Drawings, March 2008.

3.2 Review Approach

The EIS and associated documentation for both the onshore and offshore pipelines have been assessed through:

- High-level compliance review against the scope and requirements of the EIA Directive and relevant Irish regulations. In order to assess this in a systematic manner the EIS has been reviewed against AEA's standard EIA Directive checklist. Following completion of this review, clarification was sought from the EIS developers on identified areas of apparent omission and incompleteness.
- A detailed appraisal of the assessment methods and conclusions of the EIS. This review has been undertaken utilising standard (IEMA) review criteria and the completed review tables are presented in Appendix 1. Under this review process we identify any actual/potential deficiencies, errors and omissions against a systematic set of review criteria. Each identified issue is then graded in terms of its significance using the review grades as defined below:

A	Excellent, no tasks left incomplete
B	Good, only minor omissions and inadequacies
C	Satisfactory despite omissions and inadequacies
D	Parts well attempted, but must as a whole be considered unsatisfactory because of omissions and/or inadequacies
E	Poor, significant omissions or inadequacies
F	Very poor, most task incomplete
N/A	Not applicable

The most significant issues identified through this detailed review process are discussed in more detail in Section 3.3 (for the onshore pipeline EIS) and Section 3.4 (for the offshore pipeline EIS).

In presenting the results of the review, and for the purposes of clarity and conciseness, it is important to note that the report focuses on identified areas of deficiency. As such it does not explicitly describe in detail those areas that are fully adequate/compliant, although these are summarised in Appendix 1. An summary of the key findings of the EIS review is presented in Section 3.5.

The review is undertaken on the basis of the information provided in the EIS and associated documentation. It is beyond the scope of this review to assess information sources beyond those described in Section 3.1. In particular:

- Review of baseline characterisation is based on an assessment of the presented methodology and the relevance and quality of the data/information presented in the EIS. It is beyond the scope of this review to assess the completeness or accuracy of the presented baseline data via comparison with other data sources/literature searches.

- Impact assessments are reviewed in terms of the adequacy of the methods described in the EIS. Calculations to check the results of modelling work presented in the EIS are beyond the scope of this review and have not been undertaken.

Our review only considers the environmental, social and archaeological aspects of the project. While this includes review of aspects relating to the consequences of pipeline leaks, commentary on the detailed design integrity of the pipeline is beyond the scope of this review.

3.3 Detailed Appraisal of Onshore EIS

3.3.1 General approach and structure

- **Description of the development**
  We find that the onshore EIS provides a generally good description of the proposed project development. The precise boundaries of the onshore project with the other elements of the wider Corrib Gas Development, for example the landfall between the onshore and offshore, is not explicitly described. However, we do not consider this to be a significant deficiency and furthermore note that all relevant aspects of the pipeline are addressed between the offshore and onshore EIS.

- **Description of the Site**
  The onshore EIS acknowledges some gaps in baseline surveys along the proposed pipeline route, although the reason for the lack of access to the sections of the route is not provided. Furthermore, the non-surveyed areas are not precisely defined and hence the full significance of this issue is difficult to judge.

  The approach to overcoming this issue is to undertake surveys prior to actual construction and to have specialist ecologists and archaeologists working with the construction teams. Given the uncertainty in the location of the un-surveyed elements of the pipeline route, we agree with the need to undertake pre-construction surveys. We note that SEPIL will need to develop clear guidelines for survey methods and procedures if finds are made and we recommend that these be reviewed by DCENR prior to construction commencing. We also note that this approach, if properly designed and implemented, represents a residual risk to the construction schedule and may even necessitate the need for micro-realignment of the pipeline route.

  There is some confusion over the status of the Natura 2000 sites in the vicinity of the pipeline route, both within the main EIS document and the Non-Technical Summary. The Glenamoy Bog Complex is variously described within the EIS as either a designated Special Area of Conservation (SAC) and as a candidate SAC (cSAC). Similarly, the Blacksod Bay/Broadhaven is described as both a designated Special Protection Area (SPA) and a proposed SPA (pSPA). The status of these areas needs to be clarified.

- **Scoping**
  The onshore EIS does not include a dedicated section(s) on scoping and hence no systematic approach to identifying potential impacts (e.g. source-pathway-target approach) is evident within the EIS. We do not identify any major potential impacts that are not addressed in the EIS, although there are a number of noteworthy potential aspects that have been omitted without justification such as chemical/hydraulic fluid leaks from the umbilical pipelines (although leak risks are addressed in Appendix Q the associated environmental impacts are not discussed) and soil erosion on the pipeline route during construction.

- **Consultation**
  A brief summary of the issues raised by both statutory consultees and local communities is presented in Chapter 2 of the EIS. We find that the presentation of these issues is high-level and the EIS does not present a systematic demonstration of how each issue has been addressed. Although summary tables of issues raised during consultation are presented in Chapter 2 along with references to subsequent EIS chapters, the responses are not always explicit, for example:
    - An Taisce (EIS Table 2.1) apparently raised concerns regarding the potential for leakages from the umbilical pipes. It is stated in Table 2.1 of the EIS that this issue is addressed in

Chapter 4. However, review of the EIS does not identify that such risk have been explicitly assessed (although some discussion is provided in Appendix Q a greater and more explicit discussion in the main EIS is merited).

- Public consultees raised concerns (EIS Table 2.3) over potential impacts on sand dunes in Gleann an Ghad (Glengad). Such issues are purported to be addressed in Section 12. However, we find no explicit discussion of impacts on the dunes. Although we infer that the dunes are not directly impacted by the pipeline as the reception pit for the micro-tunnelling will be located inland of the dunes this needs to be confirmed.

- **Consideration of Alternatives**
  Overall we find that the presentation of the analysis of alternatives is rather high-level and qualitative. The arguments presented for the route selection are nonetheless generally reasonable, although we do note that:
  - The rationale for rejecting options on the basis of apparent technical difficulties with the landfall location (e.g. alternative F) is not sufficiently detailed to be clear.
  - The presentation of arguments related to the proximity of the route to residences (e.g. arguments against landfalls associated with alternatives D and E) and protected areas could be made clearer through greater quantification and better use of maps.

- **Assessment methods**
  We find that the approach to assigning the significance of impacts (for example as being 'slight', 'moderate' etc. in line with EPA guidelines[2]) is not consistent throughout the EIS and are not always clear. While standard methods are utilised and described in some sections of the EIS (e.g. visual/landscape), in other sections (e.g. community and socio-economic impacts) the definition of the significance rankings is not clear.

  The interpretation and use of the term 'residual impact' throughout the EIS is inconsistent and often non-standard. The standard use of the terminology in the context of environmental assessment (e.g. EPA guidleines) is that a residual impact is any impact that will remain following the implementation of proposed mitigation measures. However, in the EIS 'residual impacts' are often seemingly determined only in terms of longer-term, post-construction impacts and, and such, residual impacts (i.e. impacts remaining after application of proposed mitigation measures) during construction are not always clearly assessed.

- **Environmental Management Plan (EMP)**
  The EMP is referred to throughout the project as the working document relating to mitigation measures and monitoring. We note that the EMP must be developed prior to commencement of construction and recommend that it is reviewed by DCENR prior to construction. Specific elements required in the EMP are discussed in the following subsections.

3.3.2 Issue-specific aspects

Community and socio-economy

Overall we find that the EIS provides a comprehensive description of baseline community and socio-economic conditions in the region of the onshore pipeline.

Although potential impacts on community and socio-economic aspects appear to be generally well identified, we find the absence of a structured scoping assessment in the EIS makes it difficult to confirm the comprehensiveness of the assessment. One additional potential impact that we feel merits comment in the EIS (or at least a demonstration as to why it has been scoped out of the assessment) is the need to address safety issues of construction near residential areas. An important (but manageable risk) relates to open trenches near to residential areas and the associated safety risk (examples of child mortality have been recorded on pipeline construction projects around the world where children have fallen into open trenches filled with water, been unable to escape and drowned). This risk and relevant mitigation measures (e.g. fencing, minimisation of open trenches overnight,

[2] EPA Guidelines on the information to be contained in EIS (2002)

provision of escape ladders, security personnel etc.) should be described. We suggest that at a minimum such measures should be described in the EMP.

Potential impacts on communities are assessed as 'slight to moderate' during the construction phase (EIS Chapter 6.4.1), with residual impacts not predicted to have 'any likely and significant impact'. However, we find that it is not clear how the impact significance ratings have been identified, or how the effects of mitigation measures have been taken into account in the determination of the residual impacts. This makes confirmation of the appropriateness of the impact significance assignment difficult. Furthermore, we identify the following concerns with the assessment of community and socio-economic impacts:

- It is stated in EIS Chapter 5.10 that construction workers from outside of the local area are anticipated to reside in local rental / B&B accommodation. However, this is contradicted in Chapter 6.4.1.1. This needs to be clarified and if the former then the availability of such accommodation, or increased pressure on other amenities/utilities (see next bullet), in this relatively small community, plus any social disruption/disorder impacts should be addressed (such impacts are not currently addressed in the EIS).
- Only limited detail is provided in the EIS on certain indirect impacts on community and socio-economy, e.g.:
    - Are there any restrictions on work/leisure activities due to exclusion zones during construction? Although the loss of access to agricultural land is discussed in Chapter 11, impacts on, for example, leisure fishing and subsistence shellfish foraging due to exclusion zones need to be confirmed.
    - The status of the oyster fishery in Sruwaddacon Bay is unclear from the EIS and this should be clarified with regard to economic impacts.
- We find that the assessment of potential impacts on the tourist 'visiting population' is rather high-level and, for example, does not fully address:
    - Visual impacts on tourist enjoyment of the area; the statement that construction may act as a 'focus of curiosity' is glib and inconsistent with EIS Chapter 10 (visual impacts) in which visual impacts during construction are assessed as 'Substantial Negative'.
    - Whether there is insufficient available accommodation due to workforce influx (see above).
    - Whether such impacts may affect the likelihood of affected tourists returning to the area in future.
- The assessment of impacts on property values (Chapters 6 & 11) is very brief. Given that this issue has been specifically raised by local residents (EIS Table 2.3) a more robust discussion of potential short, medium and long term impacts on property values, including post-construction monitoring, is merited.

In relation to community impacts, the EMP must specify that works must adhere to appropriate hours of operation, (the EIS does not provide clearly defined shutdown times/periods to which construction activities must adhere to).

Traffic

The baseline traffic estimates are based on generally appropriate survey work; although the traffic estimates for August appear to be based on survey work undertaken two days before the start the Belmullet Arts Festival and, as such, may represent an overestimate of typical traffic levels (the EIS incorrectly states that the traffic survey was undertaken after this festival).

The EIS appears to identify the key traffic related impacts, although impacts associated with temporary haul roads (and their construction and reinstatement) do not appear to be discussed. The road impacts have been assessed using standard tools (e.g. PICADY), although some aspects of the assessment methodology are not entirely clear, for example:

- The methodology and factors used to calculate theoretical capacity of roads in the study area (EIS Table 7.3) are not fully described
- The potential (and impact) of abnormal loads is not explicitly addressed.

The EIS assesses the significance of traffic impacts using the EPA guideline definitions. The impacts are assessed after implementation of mitigation measures as 'imperceptible'. However, discussion on how this assessment has been made is very brief, with no clear description of how the residual impact has been reduced as a result of mitigation. As such it is difficult to confirm our agreement with the significance assessment of imperceptible impacts, although we would not anticipate on the basis of the evidence presented that the residual impacts would much greater than this.

There is no mention of traffic monitoring during construction to ensure that roads/junctions continue to operate within capacity and that impacts are indeed imperceptible. We suggest that such monitoring should be incorporated into the EMP.

Air Quality and Climate Change

Baseline air quality conditions are presented in the EIS based on EPA regional air quality monitoring data from a range of years up to 2007.

The impact assessment utilises standard air quality assessment tools such as the DMRB (although no version number is referenced). Air quality impacts are predicted for the principle pollutants of particulate matter (PM_{10}) and oxides of nitrogen (NO_x). The impacts are only presented in terms of affects on annual average concentrations. This is generally appropriate, although we note that for PM_{10} the 24-hour average levels are more likely to challenge statutory levels (based on review of baseline conditions) and so merit greater consideration (although we would anticipate that current regulatory standards are still likely to be met).

Impact significance criteria for air quality impacts are based solely on percentage increase above the baseline conditions and the context of the impacts in relation to statutory limits is rather unclear. For example 'very large' increases at some sites are identified in the EIS but later the impacts are summarised as 'negligible to moderate' without defining these latter terms adequately. There are also inconsistencies in the significance terminology used between local air quality and regional air quality impacts. Notwithstanding these concerns, we note that no breaches of statutory air quality limits are predicted.

In relation to dust control, we note that additional measures could be proposed such as reducing drop heights, sweeping local roads, minimising soil handling, good house keeping, wheel washing, etc.. In addition we suggest that monitoring to check that dust management measures are working adequately. These additional measures and monitoring aspects may be included in the EMP.

Noise and Vibration

It is stated in EIS Appendix H that a number of representative sensitive receptors and baseline monitoring locations were identified from aerial photography. However, the details of how the sites were selected are not fully described and, for example:

- It is unclear if all receptors are residential or if some are ecological.
- Receptor house reference Number 47 (see Appendix A) was not selected as a monitoring location even though it is located next to predicted noise impact location E (this is a key noise impact location – see below).
- It is unclear why monitoring sites were selected differently from the sensitive receptor sites.

The noise impact assessment criteria and methods are defined in Chapter 9 and Appendix H of the EIS. However, there appear to be some inconsistencies in the applied standards and methods. For example:

- For construction phase noise, Chapter 9 contains assessment criteria for night-time noise of 35dB(A), which is not mentioned in Appendix H (instead a night-time criteria of 45dB(A) from EPA guidelines is used).

- Night-time Noise levels at sensitive receptors are predicted to exceed the 35dB(A) assessment criteria proposed in EIS Chapter 9.2.1, but have been assessed as 'not significant' (although we note that in some cases the baseline levels exceed 35dB).
- Impacts including rock-breaking and piling are assessed as 'severe' and, at sensitive receptor E, are at the criteria threshold of 65dB. Appendix H (rightly) notes that these are conservative estimates and without rock-breaking and piling the 'everyday' impacts at sites C and E are assessed as Major. We note that only the latter results (which may underestimate maximum noise impacts) are presented in main EIS text (Chapter 9)
- In Appendix H Table 6.3 the compliance assessment criterion is stated as 70dB(A) whereas 65dB(A) was used in the previous Table 6.2.
- It is not clear if overall the impact significance ratings presented in the EIS are after mitigation or if they can be reduced by mitigation. The residual impacts section of Chapter 9 only appears to relate to post-construction phase impacts, rather than post-mitigation impacts.

Chapter 9 of the EIS assesses the noise impacts at certain (presumably human) receptors to be 'major'. On the basis of the information presented in the EIS we concur with this significance rating, although we also note that during periods of piling or rock-breaking, impacts may be more severe and potentially challenge the 65dB(A) criteria (see above). Given the potential significance of these impacts, we recommend that noise monitoring be undertaken at critical locations (e.g. locations C and E – see EIS Figure 9.10) during construction activity to ensure that criteria levels are met; currently no noise monitoring during construction is described in Chapter 9 of the EIS and this should be included in the EMP.

With regards to impacts from construction vibration, it is stated in Chapter 9.4.3 that such impacts are not expected to be significant. However, the rationale for this is not clear; while the EIS states that vibration will dissipate quickly there is no quantification of this with respect to the location of sensitive receptors.

Landscape and Visual

Overall, we find that the assessment of landscape and visual impacts presented in the EIS is appropriate. Construction phase visual impacts are assessed as 'Substantial Negative', which we concur with. Unmitigated operation phase visual impacts are assessed as 'moderate' (EIS Table 10.3) and would agree with this assessment (indeed, on the basis of provided photomontages, this may be an over-estimate).

Not withstanding the generally favourable impression gained of the assessment of landscape and visual impacts we note the following issues:

- It is stated in Chapter 10 that construction-related landscape/visual impacts will be temporary. While we agree this is the case, we note that reinstatement may take several seasons and hence impacts will remain for sometime after completion of construction and this should be recognised in the EIS.
- Residual impacts are only seemingly considered for post-construction (construction impacts after implementation of mitigation measures are not presented). Furthermore, residual impacts (post construction) are only assessed for views from residences (seemingly not from roads or footpaths) and are assessed as 'not significant'. It is unknown why significance criteria for residual impacts are different from those used throughout the rest of the Chapter (i.e. slight, moderate etc.). Furthermore, it is unclear how residual impacts are reduced by mitigation measures.
- Residual impacts during construction (i.e. after implementation of mitigation measures) does not seem to have been assessed (only post-construction impacts are assessed).
- Mitigation measures during construction are only presented in the EIS as 'recommendations'. Since impacts are assessed as 'substantial negative' firm mitigations need to be committed to and these should be included in the EMP.

Material Assets

Waste streams identified in the EIS are rather limited and not comprehensive (e.g. no mention of chemical wastes from radiophotography of pipeline welds etc.) This will need to be covered in the Waste Management Plan (WMP), including detailed lists of wastes and disposal routes. We recommend that the WMP be assessed by DCENR prior to commencement of construction.

Terrestrial Ecology

There is some confusion over the status of the Natura 2000 sites in the vicinity of the pipeline route, both within the main EIS document and the Non-Technical Summary. The Glenamoy Bog Complex is variously described with the EIS as either a designated Special Area of Conservation (SAC) and as a candidate SAC (cSAC). Similarly, the Blacksod Bay/Broadhaven is described as both a designated Special Protection Area (SPA) and a proposed SPA (pSPA). The status of these areas needs to be clarified.

In general we find that significant effort has been input to the characterisation of the existing terrestrial ecological baseline. Nonetheless we note the following issues:

- Not all areas of the pipeline route have been surveyed and pre-construction surveys will be required of these areas (see earlier commentary).
- While individual species of non-avian fauna are selected for specific descriptions of their status within the area, this approach has not been undertaken for birds. Given that the proposed route passes through a (proposed) SPA, we feel that this section would be strengthened by a more in-depth analysis of selected bird species (e.g. light-bellied geese).
- More detailed analysis of vegetation communities (e.g. National Vegetation Classification) would be valuable in contributing to the evaluations of floral habitats.
- The main terrestrial habitat types along the route have been evaluated based on appropriate guidelines from the IEEM and NRA. The criteria and resulting evaluation appear to be largely sound, although the descriptions of some habitats (particularly conifer plantation) do not give satisfactory reasons for their given ecological values.
- Terrestrial fauna are described, but there is no parallel evaluation to that provided for habitats. A similar approach to that taken for habitats to assign value for species based on legal protection, distribution and status (using, for instance, the IEEM guidelines) would have been merited.

The construction-related impacts on fauna are generally assessed in the EIS as imperceptible to slight (exceptions to this include otters and salt marsh species for which potential impacts are assessed as being up to moderate). We find that the assessment of significance is, however, qualitative and in some cases insufficient information is provided to fully justify the impact significance assigned. In particular we consider that the assessment would have benefited from:

- Greater use of quantitative data to illustrate the magnitude of impacts (e.g. area of habitat loss, number of months/years to full recovery etc.)
- Better description (e.g. using graphical visualisations) of temporal and spatial overlaps between constructions activities, their zones of influence (e.g. noise contour around the LVI) and sensitive fauna.

A key potential impact on peatlands and bogs relates to the installation of the pipeline. The proposed approach to the construction in most peatland areas is the use of a ‘stone road’. Pipeline construction has the potential to disturb the hydrological flows of the peatlands, for example through interrupting lateral flows, generating longitudinal preferential flow routes, or, if underlying impermeable layers are disturbed, potentially creating vertical flow routes. Potential impacts on peatland hydrology are assessed in the EIS as ‘Very Large’ but reducing to ‘Imperceptible’ with the application of mitigation measures. While the mitigation measures presented in the EIS (e.g. use of clay plugs to prevent the stone acting as a longitudinal preferential flow route) are broadly appropriate, we consider that insufficient evidence is provided to support the residual impact evaluation. In particular, we find that the current lack of geotechnical, peat depth and groundwater information along some peatland sections of the route (e.g. in the Rossport Commange) renders the impact assessment impossible to

justify. The EIS states that the stone road method has been 'used successfully' on another pipeline in the Carrowmore Lake Complex. While this is reassuring, we note that further evidence of the success of this previous application (none is provided in the EIS). Furthermore, without detailed baseline information it is not possible to confirm whether the proposed construction and mitigation techniques are practicable or achievable for the Corrib pipeline (for example the extent to which the stone road will be excavated into the mineral layer below the peat).

Some of the mitigation measures presented in the EIS are not firmly committed to and these will need to confirmed in the EMP. We suggest that the EMP should also include details of timescales for reinstatement and, given the amount of excavated spoil generated during pipeline trenching, a spoil management plan.

Freshwater Ecology

The baseline freshwater ecology conditions of the affected rivers are generally well assessed, although we do make the following comments:

- The baseline characterisation section would be strengthened by a more in-depth analysis of the ecology of the freshwater habitats.
- Individual species of fish noted in Annex II of the Habitats Directive are discussed in detail. However, few other mentions of fish are made. This section would be strengthened by a more in-depth analysis into whether Leenamore River contains Lamprey as these are protected under Annex II.
- Although otters have been discussed in the EIS, no mention has been made of other non-fish species (e.g. water voles, newts).
- Freshwater habitats are evaluated using a similar set of qualifying criteria to those used for terrestrial habitats. A parallel evaluation of freshwater species would help to make clear which species or populations are considered to be of greatest concern.

On the basis of the baseline characterisation provided, the rivers crossed by the pipeline are of relatively low ecological value at the crossing sites and on this basis the proposed construction methods (dry open cut methods) represent standard industry practice. However, given the potential for the presence of salmonids at or downstream of some river crossings we suggest that further consideration is given to the timing of the river crossings to avoid the most sensitive seasons (e.g. spawning).

Marine Environment

A trenchless pipeline construction method (micro-tunnelling) is proposed for the Sruwaddacon Bay crossings. If this method is successful then direct physical impacts on the bay are avoided. The EIS identifies the potential need for intermediate construction pits within the bay in the event that obstructions prevent entire bay crossings being performed within a single reach. In such an event direct impacts on the bay are predicted to occur including medium-to-long term scour effects of slight-to-moderate significance. Impacts on marine fauna would also occur as a result of an intermediate pit being required (e.g. noise impacts, sedimentation of habitat etc.). While such impacts are identified in the EIS the treatment of the impact assessment is rather high-level and hence full justification of the resultant significance criteria is unclear.

Given the sensitivity of the status of the bay as (proposed) SPA and (candidate) SAC, we suggest that the likelihood of an intermediate pit being required needs to be better quantified. The need for more detailed assessment of the associated impacts on the bay can then be better judged.

Soils & Geology

The issues of main concern relating the EIS assessment of impacts on soils and geology are those associated with construction in peatland and these are discussed under Terrestrial Ecology above. On a more general issue, we suggest that the EMP should include details of timescales for

reinstatement and, given the amount of excavated spoil generated during pipeline trenching, a spoil management plan.

Archaeology and Cultural Heritage

Our main concern in relation to the characterisation of the archaeological baseline is the current lack of survey work undertaken in significant portions of the pipeline route. The EIS rightly assesses the impacts as potentially significant in the light of this uncertain. The EIS proposes that pre-construction surveys are undertaken and states that '*where possible archaeological inspection and resolution will take place in advance of construction of the pipeline*'. We suggest that such inspection and resolution should take place prior to construction in order to avoid the potential for construction reworking and to ensure appropriate mitigation measures (including if necessary micro-realignment to avoid archaeological features) are feasible. Given the uncertainty in the presence of archaeological sites and the potential mitigation measure to be applied, we do not consider the EIS assertion that there will be no residual impacts on archaeology or cultural heritage to be justified.

Where archaeological finds are encountered during the pre-construction surveys potential mitigation measures will need to be agreed with relevant authorities (e.g. DoEHLG). Potential mitigation measures identified in the EIS include:

- Preservation in situ 'where possible' (e.g. by avoidance)
- Full excavation, archiving and publication of results.

We note that the approach of pre-construction surveys necessitates need to develop clear guidelines for survey methods and procedures if finds are made and we recommend that these be reviewed by DCENR prior to construction commencing. We also note that this approach, if properly designed and implemented, represents a residual risk to the construction schedule and may even necessitate the need for micro-realignment of the pipeline route.

3.3.3 Presentational aspects

The presentational aspects of the EIS are general good, although the split of information between the main EIS report and the technical appendices at times makes understanding difficult and there are also some (generally minor) inconsistencies between information presented in the Appendices and the main report (See Appendix 1 for specific issues).

3.4 Detailed Appraisal of Offshore EIS

3.4.1 General approach and structure

- **Description of the development**
  We find that the offshore EIS provides a generally good description of the proposed project development. However, the precise boundaries of the offshore project are not explicitly described. The EIS does not fully describe how the affected sea bed would be expected to develop without the proposal and the future status of the sea bed in the absence of the project. However, we do not consider this to be a significant deficiency and furthermore note that most relevant aspects of the pipeline are addressed between the offshore and onshore EIS.

- **Description of the Site**
  The Area of Influence, direct and indirect, is not defined. The authors state, subsequently, that:

  > *"The study areas for different aspects of the Project vary with the potential areal extent of the impacts. Definitions are not provided, however, study areas covered in each assessment chapter are appropriate to the topic under discussion.*"

However, "study areas" and the Area of Influence are not equivalent. The potential for uncertainty has been discussed in 2001, but the 2008 does not update this. Specifically, the EIS does not fully describe the limitations of baseline surveys.

- **Scoping**
  The offshore EIS does not include a dedicated section(s) on scoping and hence no systematic approach to identifying potential impacts (e.g. source-pathway-target approach) is evident within the EIS. The scoping exercise is not described; further comment has been given by the EIS authors:

  > *"A formal scoping exercise was conducted to establish the range and aspects of the environment to be considered. This exercise was conducted following consultations between the Enterprise (now SEPIL) Project team and a variety of statutory and non-statutory consultees (see Appendices 0.2 and 0.3 of the 2001 Offshore EIS)."*

  However, there is no description of this process.

  We do not identify any major potential impacts that are not addressed in the EIS, although there are a number of noteworthy potential aspects that have been omitted without justification such as the sand martin concern.

- **Consultation**
  A brief summary of the issues raised by both statutory consultees and local communities is presented in Appendix 0.3 of the offshore EIS. We find that the presentation of these issues is high-level and the EIS does not present a systematic demonstration of how each issue has been addressed e.g. the issue of the sand martin.

- **Consideration of Alternatives**
  Overall we find that the presentation of the analysis of alternatives is rather high-level and qualitative. The arguments presented for the route selection are nonetheless generally reasonable, although we do note that the refence to the environmental paramerts of each alternative to be rather cursory. For instance, the EIS does not fully describe the main alternatives to the proposal that have been considered in terms of the advantages and disadvantages of each option in relation to potential environmental effects. The EIS documents partially describe the main environmental effects of the proposed alternatives; but these descriptions lack formal, systematic rigour

- **Assessment methods**
  We find that the approach to assigning the significance of impacts (for example as being 'slight', 'moderate' etc. in line with EPA guidelines[3]) is not consistent throughout the EIS and is not always clear. Also, the interpretation and use of the term 'residual impact' throughout the EIS is non-standard. The information and data used to predict the magnitude of impact are not clearly described. Any gaps or uncertainty are not clearly identified. The methods used to establish magnitude are not clearly described. It is not clear where assumptions or unsupported data have been used in the predictions. Levels of confidence in the estimates are not given

  The geographic extent, duration, frequency, reversibility and probability of occurrence of each effect are not identified and the uncertainty of the effect of mitigation measures on the magnitude and significance of impacts is not explained. The EIS authors have subsequently stated that:

  > *"There are no instances where the effect of mitigation measures on the magnitude and significance of impacts is uncertain."*

  We do not consider this to be credible as there is always uncertainty in such assessments.

- **Environmental Management Plan (EMP)**
  The EIS does not demonstrate a clear commitment to implementing the mitigation measures and indicate how and when these measures will be implemented. For instance, the EIS does not provide details of the time scales of the management plans and their geographical extent. The

[3] EPA Guidelines on the information to be contained in EIS (2002)

EIS does not identify those responsible for the follow-up programme and describe how the results of such a programme will affect the proposal's operation. These aspects should be clearly defined in the EMP.

3.4.2 Presentational aspects

The presentational aspects of the EIS are general good, although the Non-Technical Summary lacks adequate commentary on uncertainties in the predicted impacts and on the general approach to the assessment.

3.4.3 Issue-specific aspects

Human Beings
There are several concerns with the Baseline Conditions, Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). It is usual to carry out specific community surveys in situations like this and it is not clear where the local temporary accommodation that will be used to accommodate offshore construction site workers (not native to the area) will be sited. It is also not clear from where non-native labour will be drawn as little or no quantitative data are provided.

More information is needed about the possible interruption to fishing activities with the licence holders, the likely mitigation measures to be used and the compensation arrangements for consequential losses where mitigation is not possible.

> *"The local fishing industry and angling attractions will remain undisturbed by construction, by ensuring that environmental mitigation measures are implemented appropriately on site."*

However, little or no quantitative data are provided hindering the derivation of meaningful impact significance Specifically in relation to the salmon netting licence holders we note that discussion with those to be affected does not in otself represent mitigation.

In terms of monitoring impacts on human beings the EIS states: "*Close liaisons with Government bodies, Údarás Na Gaeltachta, Mayo County Council and representatives from the community, will be developed to implement the above mitigation measures during the construction of the offshore development and deal with new issues as they arise going forward.*" However, we note that this does not constitute 'Monitoring'.

Flora and Fauna
There are several concerns with the Baseline Conditions, Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). The comments on offshore plankton are derived from the literature of over 40 years ago and in the nearshore is purely descriptive. Fin- and shell- fisheries data are derived from Irish vessel returns, excluding non-Irish fishing vessel catches. This section would also benefit considerably from the use of location maps.

There is no indication of relative or actual impact magnitudes, or of relative significance and it is not clear
how significant impacts are derived. No residual impacts are anticipated by the EIS in the offshore, nearshore or at landfall, whichwe consider to be highly unlikely. There also appears to be no provision for seabird monitoring and this should be included in the EMP.

Geology and Sediments
While the baseline conditions are adequately characterised, there are several concerns with the Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). There is no indication of relative or actual magnitude, or of relative significance and it is not clear how significant impacts are derived. No residual impacts are anticipated in the offshore. The section on mitigation lacks detail of actual measures proposed and residual impact is classified as Minor but it is not clear how this is derived. The monitoring section lacks detail

Water

Whilst the baseline conditions are adequately characterised, there are several concerns with the Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). The principal issue is that the Wastewater Outfall is described in this section yet this is functionally part of the Terminal operation and should be part of the Terminal EIA. Indeed, it is debatable that the Terminal should be permitted without consideration of the outfall. As with other sections of the offshore EIS, there is no indication of relative or actual magnitude, or of relative significance and it is not clear how significant impacts are derived; for example the terms Moderate and Minor are used but are not defined. Furthermore, the presented mitigation lacks detail of actual measures proposed.

Air Emissions
There are several concerns with the Baseline Conditions, Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). Principally, there is little characterisation; the report comments on the lack of "*public sources*". An important purpose of an EIA is to collect such data. Dust from the construction activity during the landfall works is not quantified. There is no indication of how lack of significance has been derived and dust mitigation is poor. No moniroing is proposed.

Noise
There are several concerns with the Baseline Conditions, Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). Larger scale maps indicating property locations would be beneficial. No blasting is now intended offshore. The significance of noise predictions lack derivation.

Landscape and Visual
Overall, we find that the assessment of landscape and visual impacts presented in the offshore EIS is appropriate.

Climatic Impact
Baseline air quality conditions are presented in the EIS and some generalised assumptions are made. There are several concerns with the Prediction of Impact and Impact Significance, Mitigation, Residual Impact and Monitoring (see Appendix 1). A mitigation proposed is via "*...Vessel selection and vehicle management plans"*

This is somewhat aspirational with no indication how this will be achieved.

Heritage
Overall, we find that the assessment presented in the EIS is appropriate.

Material Assets
Overall, we find that the assessment presented in the EIS is appropriate though this section is clearly not consistent with the other sections in terms of writing style

3.5 Summary of Key Findings

Overall we find the EIS documents provide a reasonable assessment of the potential impacts associated with the Corrib pipeline. On the basis of the documentation reviewed we do not identify any impacts that we believe have necessarily been significantly underestimated in the EIS or any impacts that we would view as being unacceptable. However, we do identify a number of areas where we consider that insufficient evidence is provided in the EIS to either:

- demonstrate that all potential impacts have been adequately identified for assessment, or
- confirm that the impact sigificance assigned in the EIS is appropriate.

Of these areas of concern we consider that the following are most significant in terms of either adequacy of the assessment process (including from a regulatory perspective), stakeholder perception, and/or control of significant environmental/social impact:

- The onshore and offshore EIS do not include a dedicated section(s) on scoping and hence no systematic approach to identifying potential impacts (e.g. source-pathway-target approach) is

evident within the EIS. While we do not necessarily identify any major potential impacts that are not addressed in the EIS, there are a number of noteworthy potential aspects that have been omitted without apparent justification.

- We find that the presentation of the analysis of alternatives is rather high-level and qualitative. For instance, the offshore EIS does not fully describe the main alternatives to the proposal that have been considered in terms of the advantages and disadvantages of each option in relation to potential environmental effects.
- We find that the approach to assigning the significance of impactsis not consistent throughout the EIS and is not always clear. The interpretation and use of the term 'residual impact' throughout the EIS is non-standard. The information and data used to predict the magnitude of impact are not clearly described. The geographic extent, duration, frequency, reversibility and probability of occurrence of each effect are not identified and the uncertainty of the effect of mitigation measures on the magnitude and significance of impacts is not explained.

- The EIS acknowledges that ecological and archaeological surveys have not been undertaken over a significant proportion of the onshore pipeline route is acknowledged in the EIS. This raises several important issues:
  - In the absense of such data we find the assessment of residual impacts in the EIS difficult to confirm and greater consideration of uncertainties is required.
  - The approach to overcoming this issue is to undertake pre-construction surveys and to have specialist ecologists and archaeologists working with the construction teams. We note that this approach represents a residual risk to the construction schedule and may even necessitate the need for micro-realignment of the pipeline route.
- Potential impacts on peatland hydrology due to peipeline cosntruction are assessed in the EIS as 'Very Large' but reducing to 'Imperceptible' with the application of mitigation measures. We consider that insufficient evidence is provided to support the residual impact evaluation. In particular, we find that the current lack of geotechnical, peat depth and groundwater data along key peatland sections of the route renders the impact assessment impossible to justify. The EIS states that the stone road method has been 'used successfully' on another pipeline in the Carrowmore Lake Complex. While this is reassuring, we note that further evidence of the success of this previous application (none is provided in the EIS). Furthermore, without detailed baseline information it is not possible to confirm whether the proposed construction and mitigation techniques are practicable or achievable for the Corrib pipeline.
- We support the use of a trenchless pipeline construction method (micro-tunnelling) for the two Sruwaddacon Bay crossings as, if successful, this method avoids direct physical impacts on the bay. The EIS identifies the potential need for intermediate construction pits within the bay in the event that obstructions prevent entire bay crossings being performed within a single reach. In such an event direct impacts on the bay are predicted to occur including medium-to-long term scour effects of slight-to-moderate significance. Impacts on marine fauna would also occur as a result of an intermediate pit being required (e.g. noise impacts, sedimentation of habitat etc.). While such impacts are identified in the EIS the treatment of the impact assessment is rather high-level and hence full justification of the resultant significance criteria is unclear. Given the sensitivity of the status of the bay as (proposed) SPA and (candidate) SAC, we consider that the likelihood of an intermediate pit being required needs to be better quantified. The need for more detailed assessment of the associated impacts on the bay can then be better judged.
- We find the assessment of impacts on property values presented in the EIS to be rather cursory. Given that this issue has been specifically raised by local residents, a more robust discussion of potential short, medium and long term impacts on property values, including post-construction monitoring, is merited.
- It is usual to carry out specific community surveys in situations like this and it is not clear where the local temporary accommodation that will be used to accommodate construction site workers (not native to the area) will be sited.

We also make the following recommendations:

- Clear guidelines for dealing ecological and archaeological finds made in pre-construction onshore surveys should be developed by SEPIL and reviewed and agreed by DCENR and/or other

relevant authorities prior to commencement of construction. We further recommend that propsed measures to deal with each significant find should be agreed by DCENR and/or other relevant authorities prior to implementation.

- More information is needed about the possible interruption to fishing activities with the licence holders, the likely mitigation measures to be used and the compensation arrangements for consequential losses where mitigation is not possible.
- The onshore pre-construction surveys should be undertaken prior to commencement of construction to avoid the potential for construction reworking and to ensure appropriate mitigation measures (including if necessary micro-realignment to avoid archaeological features) are feasible.
- There appears to be no provision for seabird monitoring
- The EMP is referred to throughout the project as the working document relating to mitigation measures and monitoring. We recommend that the EMP should be developed prior to commencement of construction and that it is reviewed by DCENR (and other relevant authorities) prior to construction. The EMP should include firm and precise commitments to mitigation measures and monitoring requirements. Recommendations for specific assessment to be included in the EMP, such as a spoil management plan and seabird monitoirng are described in Section 3.3.2.
- The Wastewater Outfall is described yet this is functionally part of the Terminal operation and should be part of the Terminal EIA. Indeed, it is debatable that the Terminal should be permitted without consideration of the outfall.

4 Examination of the Pipeline Design Documentation

4.1 Information Supplied

The following information had been supplied for the review (see Section 4.5 for a list of reference documents):

- Application for Consent to Construct – Scope and Drawings (Ref 1)
- Application for Consent to Construct – Design Premise (Ref 2)
- Offshore Pipeline Design Basis (Ref 3)
- Onshore Pipelines Design Basis (Ref 4)
- Landfall Valve Installation – Design Overview (Ref 5)
- Design Code Review Onshore Pipeline Section (Ref 6)
- Design Specification Main Umbilical (Ref 7)
- Main Umbilical Cross Section Drawing (Ref 8)

It is important to note that the main emphasis of the supplied information is on *pipeline design premise* and not on *detailed engineering design*. This review cannot therefore reach conclusions concerning the compliance or otherwise of the detailed pipeline design with the relevant applied design codes. The intention of this review is to focus on whether or not the documented design premise is aligned with the requirements of the specified design codes.

4.2 Design Standards

The design standard or standards to be used for the onshore section of the Corrib pipeline have been the subject of debate. Originally the design code was BS 8010 (Ref 9) as reported in an Independent Safety Review from Advantica (termed "the Advantica report") in 2006 (Ref 10). The Advantica report raised several issues concerning pipeline design codes and made recommendations which were considered by the Corrib Technical Advisory Group (TAG). The TAG reported on its deliberations in March of 2006 (Ref 11) stating that:

"(*it is) recommended that the primary pipeline design code be designated to be IS EN 14161, with provisions of IS 328 and PD 8010 to apply where they exceed IS EN 14161. The relevance of this is that all of these codes contain sections dealing with pipeline operation and maintenance, as well as design, construction, testing and commissioning.*

The structure and content of IS EN 14161 with respect to operation and maintenance is very similar to PD 8010, while that of IS 328 is somewhat different. In many (but not all) instances, the provisions of IS 328 are more detailed or prescriptive than those of the other codes."

Consequently the design standard for the onshore section of the Corrib pipeline has become IS EN 14161 (Ref 12) with certain aspects of IS 328 (Ref 13) and BS 8010 (Ref 9) applied where the principal standard is either silent or not as demanding.

In its report (Ref 11) TAG specifically raised concerns about design, construction, testing and commissioning, operations and maintenance of the pipeline stating:

"while the overall design code for the upstream, onshore section of the Corrib project shall be IS EN 14161, construction, installation, operation and maintenance of the onshore section of the pipeline shall be generally in accordance with IS 328, and the inspection and monitoring regime that will be applied to this section of the project will be as per the relevant provisions of IS 328.

Where a case is made by the developer and accepted by TAG, specific provisions of PD 8010 may apply in lieu of the relevant provisions of IS 328"

While in principle adoption of the best parts of a number of design codes is a good idea, it also naturally creates interfaces between code requirements, i.e. areas of potential overlap. Interpretation of these interfaces can lead to omissions or application of less conservative methods in determining key parameters of the pipeline design related to its integrity. As such it was necessary to closely define which parts of each design standard would be adopted for the Corrib pipeline. A review of the codes (Ref 6) set out to closely define the interfaces on a section-by-section basis with reference to the primary design code, i.e. IS EN 14161. The review is very clear and defines the interfaces using the Table replicated below.

Table 1: Tabular format of Exceptions and Supplementary Inclusions to IS EN 14161 (from Ref 6 – green background indicates primary code to be adopted, yellow background indicates supplementary parts to the primary code).

I.S. EN 14161	I.S. 328	PD 8010
1 Scope		Supplement with Section 7.7.1- reference point of demarcation between pipeline and terminal.
2 Normative references		
3 Terms and definitions		
4 General		
4.1 Health, safety and the environment		Supplement with Section 4.3.1- reference to BS EN 14001 Environmental Management System
4.2 Competence assurance		
4.3 Compliance		
4.4 Records		Supplement with Section 4.4 Design Construction - commissioning assurance flowchart
5 Pipeline system design		
5.1 System definition		
5.2 Categorisation of fluids	Code uniquely dedicated to gas	
5.3 Hydraulic analysis		
5.4 Pressure control and over-pressure protection		
5.5 Requirements for operation and maintenance		
5.6 Public safety and protection of the environment	Adopt Section 6.2, 6.3, 6.4 and 6.5	
6 Pipeline design		
6.1 Design principles		
6.2 Route selection		
6.2.1.2 Public Safety	Adopt Section 6.2, 6.3, 6.4 and 6.5	
6.3 Loads		

I.S. EN 14161	I.S. 328	PD 8010
6.4 Strength requirements		
6.4.1 Calculation of stresses		
6.4.1.1 Hoop stress due to fluid pressure	Adopt Sections 6.2, 6.3, 6.4, 6.5	Supplement with Section 6.2.2.2 — Straight pipe under external loading
6.4.1.2 Other stresses		Supplement with Section 6.4.2.3 — Longitudinal Stress and Section 6.4.2.4 — Shear Stress
6.4.2 Strength criteria		
6.4.2.1 General		
6.4.2.2 Yielding	Adopt Sections 6.3, 6.5	Supplement with Section 6.4.3.2 - Allowable equivalent stress
6.4.2.3 Buckling		Adopt 6.4.4 Buckling
6.4.2.4 Fatigue		Adopt 6.4.6 Fatigue
6.4.2.5 Ovality		Adopt 6.4.4.2 for ovality calculation
6.5 Stability		
6.6 Pipeline spanning		
6.7 Pressure test requirements	Refer to SEPIL Document (Onshore Hydrostatic Pressure Testing Report, JPK doc nr 05 2377 01 P 3 020)	
6.8 Other Activities		
6.9 Crossings and encroachments	Supplement with Section 6.9 Pipe cover and impact protection - Fig 3 — Acceptable forms of additional protection for pipelines	Supplement with Section 6.10 —Trenchless Technology
6.10 Adverse groundbed and seabed conditions		
6.11 Section isolation valves		
6.12 Integrity monitoring		
6.13 Design for pigging		
6.14 Fabricated components		
6.15 Attachment of supports or anchors		
6.16 Offshore risers		
7 Design of stations and terminals		
7.1 Selection of location		
7.2 Layout		
7.3 Security		
7.4 Safety		
7.5 Environment		
7.6 Buildings		

I.S. EN 14161	I.S. 328	PD 8010
7.7 Equipment		Adopt Section 7.6 – Equipment as replacement for EN 14161 Section 7.7 - Equipment
7.8 Piping		Adopt Section 7.7.1 – Piping,
7.9 Emergency shutdown system		
7.10 Electrical	Supplement with Section 16.3 - Earthing/equipotential bonding	
7.11 Storage and working tankage		
7.12 Heating and cooling station		
7.13 Metering and pressure control stations		
7.14 Monitoring and communications systems		
8 Materials and coatings		
8.1 General material requirements		
8.2 Linepipe		Supplement this section with reference to PD 8010 Section 8.2.6 – Fatigue.
8.3 Components		Supplement with Section 10. 12.6 - Factory bends
8.4 Coatings		
9 Corrosion management		
9.1 General		
9.2 Internal corrosivity evaluation		
9.3 Internal corrosion mitigation		
9.4 External corrosion evaluation		
9.5 External corrosion mitigation		
9.6 Monitoring programmes and methods		
9.7 Evaluation of monitoring and inspection results		
9.8 Corrosion management documentation		
Annex A		
Annex B	Adopt Section 6.2, 6.3, 6.4 and 6.5	
Annex C		
Annex D		

Furthermore, the review (Ref 6) is explicit in defining the sections of IS EN 14161 which will not apply in accordance with TAG recommendations. The review (Ref 6) lists the sections of the primary design code as below:

- Section 1 – Scope
- Section 2 - Normative reference
- Section 3 – Terms and definitions
- Section 4 – General
- Section 5 - Pipeline System Design
- Section 6 - Pipeline Design
- Section 7 - Design of Stations and terminals
- Section 8 - Materials and Coatings
- Section 9 - Corrosion management
- Section 10 – Construction
- Section 11 – Testing
- Section 12 - Pre-commissioning and commissioning
- Section 13 - Operation, maintenance and abandonment

The review is clear that Sections 10-13 are to be in accordance with the requirements of IS 328 rather than IS EN 14161 as per TAG recommendation.

4.2.1 Current Status of Design Standard Definition

This review considers that the design standard for the onshore section of the Corrib pipeline has been closely defined in Ref 6. However, it is noted that the copy of Ref 6 supplied for this review has the status of “Issued for TAG Review” which implies that the definition is not as yet agreed. It is our recommendation that TAG complete its review (if indeed it has not yet done so) and brings this issue to a conclusion.

4.3 Findings of Review

This review has examined all documentation supplied as listed in Section 1.1 and has the following findings:

I.) The Design Standard definition for the onshore section of the Corrib pipeline is at an advanced stage but does not appear to have been formally agreed by TAG.

II.) TAG recommendations on which sections of which specific design standard are to be adopted appear to have been applied.

III.) This review considers that the exceptions and supplements to IS EN 14161 detailed in Ref 6 represent improvements in the degree of conservatism applied in the design.

IV.) The onshore section will in practice have the same wall thickness as the offshore section and be operated at a much lower pressure. The effective design factor is consequently conservative.

V.) Operation, inspection and maintenance of the pipeline will be in accordance with IS 328 and therefore in full compliance with the accepted standard for onshore gas pipelines.

VI.) The design basis for the onshore section (Ref 2 & Ref 4), together with supporting references and supplemental codes and standards, demonstrate intent to comply in full with the defined Design Standard (assuming TAG approval of Ref 6) for the onshore section of the Corrib pipeline.

It is important to note that the body of evidence reviewed here demonstrates *intent* to comply with the Design Standard rather than actual compliance because no detailed engineering design documentation was included in the review. Indeed it was not the objective of Task 4 to conduct a detailed assessment of code compliance. However, the review has found that all the necessary elements for compliance are in place in the design basis. It is our recommendation that a full independent design review be conducted on the detailed engineering design for the pipeline in order to verify compliance with the Design Standard.

4.4 Conclusions and Summary Recommendations

This review concludes that:

1) A Design Standard for the onshore section of the Corrib Pipeline has been established but remains to be formally agreed by the TAG.

2) The Design Standard is based on IS EN 14161 with exceptions and supplementation from IS 328 and BS 8010. The exceptions and supplementations are clearly identified and represent a conservative approach with respect to the primary design standard.

3) The pipeline design premise demonstrates the intent to fully comply with all elements of the Design Standard.

This review recommends that:

- The established Design Standard should be reviewed by the TAG and approved or otherwise in order to provide a basis for a detailed review of the pipeline engineering design.

- A thorough review of the detailed pipeline engineering design should be conducted to verify that the design is in full compliance with the Design Standard.

4.5 References to Section 4

1. Corrib Field Development Upstream Pipeline. Application for Consent to Construct – Scope and Drawings. Shell E&P Ireland Limited. April 2008.
2. Corrib Field Development Upstream Pipeline. Application for Consent to Construct – Design Premise. Shell E&P Ireland Limited. April 2008.
3. Offshore Design Pipeline Basis plus Addendum no. 1- Doc No. 05-2377-01-P-3-027 (8820/D100-01)
4. Onshore Pipeline Basis of Design - Doc. No. 05-2377-01-P-3-800
5. Landfall Valve Installation – Design Overview - Doc no 05-2377-01-G-3-002
6. Design Code Review Onshore Pipeline Section - Doc No. COR-25-SH-005
7. Design Specification Main Umbilical - Doc No. 36029-KTU–BD-0-11384
8. Main Umbilical Cross Section – Dwg No. 36029-KTU-XC-140160
9. Code of Practice for Pipelines – Part 1: Steel Pipelines on Land, PD 8010-1, 2004
10. Independent Safety Review of the Onshore Section of the Proposed Corrib Gas Pipeline, Report R8391 Issue 1, January 2006
11. Report of the Corrib Technical Advisory Group to Minister Dempsey on an appropriate Inspection and Monitoring Regime for the Corrib Project, available from http://www.dcmnr.gov.ie/NR/rdonlyres/55B9A03F-CD54-4CB9-9737-408A273064E1/0/TAGCorribInspectionandMonitoringRegime.doc

12. IS EN 14161Petroleum and Natural Gas Industries – Pipeline Transportation Systems, 2003
13. IS 328, Code of Practice for Gas Transmission Pipelines and Pipeline Installations, 2003

Appendices

Appendix 1: EIA Review Tables

Appendix 2

EIA Review Tables

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Onshore EIS Review Tables
Offshore EIS Review Tables

Introduction

*IEMA is the UK Institute of Environmental Management and Assessment

INSTITUTE REVIEW GRADES

A	Excellent, no tasks left incomplete
B	Good, only minor omissions and inadequacies
C	Satisfactory despite omissions and inadequacies
D	Parts well attempted, but must as a whole be considered unsatisfactory because of omissions and/or inadequacies
E	Poor, significant omissions or inadequacies
F	Very poor, most tasks left incomplete
N/A	Not applicable ~ the review topic is not applicable or relevant in the context of this statement

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