



Thurrock Flexible Generation Plant

**Environmental Statement Volume 5
Chapter 31: Summary of Inter-Related Effects**

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Environmental Impact Assessment

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Summary

This chapter summarises the inter-related effects taking into account project lifetime and receptor-led effects. The chapter has considered the effects reported in each environmental topic assessment in Volumes 3 and 4 of the Environmental Statement and assessed whether effects are likely to be of greater significance in combination.

Qualifications

This document has been prepared by Clare Russell, an Associate and EIA Practitioner with over 18 years' experience in environmental consultancy focusing on environmental impact assessment and management of construction impacts.

It has been checked by Tom Dearing, a Chartered Environmentalist and full Member of the Institute of Environmental Management and Assessment, who has nine years' experience of environmental impact assessment.

1. Introduction

1.1 Purpose of this chapter

- 1.1.1 This chapter of the Environmental (ES) presents the findings of the Environmental Impact Assessment (EIA) concerning the potential inter-related effects of Thurrock Flexible Generation Plant on environmental receptors.
- 1.1.2 Inter-related effects are effects on receptors which may be affected by different environmental effects generated by the proposed development simultaneously or consecutively. On this basis, this chapter considers:
- environmental effects over the lifetime of the project including the construction, operation and decommissioning phases; and
 - the receptor-led effects which result from a combination of multiple environmental effects on a single receptor or receptor group.
- 1.1.3 The environmental effects of Thurrock Flexible Generation Plant on each topic has been assessed at each stage of the proposed development and is presented in Volume 3, Chapters 6 to 17.
- 1.1.4 The chapter also considers the potential for cumulative inter-related effects based on the information presented in Volume 4, Chapters 18 to 30.

1.2 Planning policy context

- 1.2.1 Planning policy for energy generation Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to inter-related effects, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a).
- 1.2.2 NPS EN-1 includes guidance on what matters are to be considered in the assessment and factors relating to the determination of an application. These are summarised in Table 1.1.

Table 1.1: Summary of NPS EN-1 policy on decision making relevant to this chapter.

Summary of NPS EN-1 policy on decision making (and mitigation)	How and where considered in the ES
Inter-related Effects	
<p><i>“The IPC [Infrastructure Planning Commission: now the Planning Inspectorate (PINS)] should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place.” (paragraph 4.2.6).</i></p>	<p>The environmental effects of Thurrock Flexible Generation Plant on topics are presented in Volume 3, chapters 6 to 17 of the ES. The assessment of inter-related effects draws upon the conclusions of these chapters.</p>

1.3 Consultation

- 1.3.1 Key issues raised during scoping and consultation to date specific to inter-related effects are listed in Table 1.2, together with how details of how these issues have been considered in the production of this ES and cross-references to where this information may be found.

Table 1.2: Key points raised during scoping and consultation to date.

Date	Consultee and type of response	Points raised	How and where addressed
September 2018	PINS Scoping Opinion	PINS identified that in order to assist in the decision making, the application should use tables to identify and collate the relevant inter-related effects.	Where appropriate, tables have been used to identify and collate the relevant inter-related effects likely to occur as a result of the proposed development.

2. Assessment Approach

2.1 Guidance

2.1.1 It is good practice to consider the inter-relationships between topics that may lead to environmental effects. For example, the separate impacts of noise and habitat loss may have an effect upon a single ecological receptor.

2.1.2 The following guidance documents have been considered as part of this assessment:

- Advice Note 9: Rochdale Envelope (PINS, 2018); and
- Design Manual for Roads and Bridges (DMRB) LA 104 (Highways England *et al.*, 2020).

PINS Advice Note 9

2.1.3 The PINS Rochdale Envelope Advice Note (PINS, 2018), states that the ES should:

"...ensure that the assessment of the worst case scenario(s) addresses impacts which may not be significant on their own but could become significant when they inter-relate with other impacts alone or cumulatively with impacts from other development (including those identified in other aspect assessments)."

Design Manual for Roads and Bridges

2.1.4 The DMRB guidance (Highways England *et al.*, 2020) includes inter-related effects within its definition of cumulative effects. It states that *"environmental assessments shall assess cumulative effects which include those from a single project (e.g. numerous different effects impacting a single receptor)"*. It also states that *"cumulative effects should be assessed when the conclusions of individual environmental factor assessments have been reached and reported"*.

2.2 Study area

2.2.1 The study areas for this chapter are taken from the topic specific chapters (Volume 3, Chapters 6 to 17). Study areas reflect the distance that likely effects will be experienced (i.e. the Zone of Influence, Zol). Zols are influenced by the nature of the effect and receptor, and in many cases are informed by industry guidance. The Zols used in this chapter are presented in Table 3.2.

2.3 Inter-related effects methodology

2.3.1 The approach to assessing inter-related effects follows the approach set out in Volume 2, Chapter 4: Environmental Impact Assessment Methodology. It comprises a four staged process as summarised in Table 2.1 and discussed in the following paragraphs.

Table 2.1: Summary of staged approach to the inter-related effects assessment.

Stage	Description
1	The environmental effects of Thurrock Flexible Generation Plant were assessed for individual EIA topic areas within Volume 3, Chapters 6 to 17. Cumulative effects for each EIA topic area are set out in Volume 4, Chapters 19 to 30.
2	The receptor(s) or resource(s) likely to be affected by more than one impact were identified.
3	The potential combination effects on these receptor groups were identified through a review of the topic specific assessments in the ES chapters.
4	An assessment was undertaken on how individual effects may combine to create inter-related effects on each receptor group for: <ul style="list-style-type: none"> • 'project lifetime effects', i.e. during construction, operational and decommissioning phases; and • 'receptor-led effects', i.e. multiple simultaneous effects on a single receptor/resource.

Stage 1: topic-specific assessments

2.3.2 The first stage of the assessment of inter-related effects is presented in each of the individual topic chapters and comprises the individual assessments of effects on receptors across the construction, operation and maintenance, and decommissioning phases of the proposed development.

2.3.3 The findings of these assessments are presented in Volume 3, Chapters 6 to 17 of the ES. The findings of the Cumulative Effect Assessment (CEA) for each topic are presented in Volume 4, Chapters 18 to 30.

Stage 2: identification of receptor groups

2.3.4 Stage 2 involved a review of the assessments undertaken in the topic-specific and cumulative chapters to identify 'receptor groups' requiring assessment within the inter-related effects assessment. The term 'receptor group' is used to highlight that the approach taken for the inter-related effects assessment does not assess every individual receptor assessed at Stage 1, but rather potentially sensitive groups of receptors.

2.3.5 The receptor groups assessed can be broadly categorised as follows:

- landscape and visual resources: designated sites; landscape character; visual receptors (residents; users of public rights of way (PRoWs); other visual receptors);
- historic environment: buried archaeology; designated heritage assets; settings of heritage assets;
- land use, recreation, socio-economics: agricultural land; farm businesses; users of PRoWs and common land; employment levels, housing and other local services; tourism.
- onshore ecology: ecologically designated sites; important habitat features; protected species;
- traffic and transport: road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities);
- noise and vibration: residents, users of PRoWs; users of other land uses (e.g. places of work);
- air quality: residents; places of public amenity/public attractions; places of work; schools/hospitals; species/habitats;
- health: residents in the local area;
- climate change: global climate;
- hydrology and flood risk: surface water bodies; flood risk (residents; other land uses);
- geology, hydrogeology and ground conditions: geologically designated sites; land/soils; groundwater (including aquifers and Source Protection Zones); and
- marine environment: flow conditions; seabed sediments; maritime infrastructure; marine habitats and species; and River Thames water quality.

2.3.6 The potential for inter-related effects was considered in further detail at Stage 3.

Stage 3: identification of potential inter-related effects on receptor groups

2.3.7 Consideration was given to the potential for inter-related effects to arise for each of the identified receptor groups across the three project phases (i.e. project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in Table 2.2. Effects related to the construction and decommissioning phases are considered to be similar in nature, so these effects are considered together.

2.3.8 Consideration was also given to the potential for cumulative inter-related effects to arise for each of the receptor groups as a result of multiple effects on a receptor from multiple developments.

Table 2.2: Definitions of project lifetime and receptor led inter-related effects

Effect Type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if assessed in isolation.
Receptor-led effects	Assessment of the scope for multiple effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, multiple effects on a given receptor such as local residents – construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary, or incorporate longer term effects.

2.3.9 A scoping exercise has been undertaken to identify those topics which are unlikely to result in further inter-related effects due to their nature, location or previous assessment and the results are presented in Table 3.1.

Stage 4: assessment of the inter-related effects on each receptor group

2.3.10 The potential for inter-related effects on the receptor groups identified in Stage 2 have been assessed for both the Thurrock Flexible Generating Plant and cumulative scenarios.

2.3.11 The assessment comprises a qualitative description of the likelihood for individual effects to interact to create a different or greater effect has then been undertaken. The assessment has been undertaken qualitatively and professional judgement has been used to identify whether significant inter-related effects are considered likely.

Assessment criteria and assignment of significance

2.3.12 The assessment does not aim to assign significance levels; instead the assessment is to be used to identify where there is the potential for inter-related effects. A statement is made as to whether the inter-related effects would be worse or better than the effects considered alone, and if so, whether this would be adverse or beneficial.

3. Inter-related effects assessment

3.1 Introduction

3.1.1 This assessment considers receptors or receptor groups, that may be affected by different environmental effects generated from the proposed development simultaneously or consecutively. This may include, for example, particular locations where noise, air quality and visual change may all occur at the same time. All of these effects would be derived from the proposed development.

3.2 Scoping of receptors / resources

3.2.1 This chapter presents those inter-related effects not explicitly addressed elsewhere in the ES. The majority of the ES topic assessments consider the effects of the proposed development on receptors or receptor groups and, as such, many of the inter-related impacts on those receptors are considered within the topic chapters.

3.2.2 For instance, effects on ecological receptors arising from noise, visual disturbance, air quality impacts and water quality impacts are assessed within Volume 3, Chapter 9: Ecology. As such, the potential for inter-related effects is inherent within some topic assessments and these effects are not repeated in this chapter. The topics where this applies are shown in Table 3.1. All other topics are considered within this chapter.

Table 3.1: ES topics included in the inter-related effects assessment

Topic receptor / resource	Scoped into the assessment of project lifetime inter-related effects	Scoped into the assessment of receptor-led inter-related effects	Scoped into the assessment of receptor-led cumulative inter-related effects	Justification for exclusion from further inter-related assessment
Landscape and visual resource	No – landscape Yes – visual resources	No – landscape resources Yes – visual resources	No – landscape resources Yes – visual resources	The impacts of Thurrock Flexible Generation Plant are assessed in Volume 3, Chapter 6: Landscape and Visual Resource and Volume 4, Chapter 19. Some of the landscape resources are also of heritage value, which has been considered in Volume 3, Chapter 7: Historic Environment and does not require further assessment. There is the potential for inter-related effects on visual resources to arise.
Historic Environment	No	No	No	The impacts of Thurrock Flexible Generation Plant on the historic environment are assessed in Volume 3, Chapter 7: Historic Environment. This assessment considers all potential effects on the relevant receptors, namely heritage assets and buried archaeology. This topic has taken into account potential impacts of noise and landscape on historic environment receptors such as the setting of heritage assets.
Land-use Agriculture, and Socio-economics	No – recreation No – socio-economics Yes – agricultural land and farm businesses	Yes – recreation No – socio-economics No – agricultural land and farm businesses	Yes – recreation No – socio-economics No – agricultural land and farm businesses	The impacts of Thurrock Flexible Generation Plant on land use and agriculture are assessed in Volume 3, Chapter 8: Land Use, Agriculture and Socio-economics and Volume 4, Chapter 21. The loss of and disruption to Access Land (registered common land) and the disruption to PRoWs and cycle routes would occur during the construction phase; no impacts on recreational resources would occur during the operation and maintenance phase. Similarly, employment generation would primarily occur during the construction phase, with impacts from employment opportunities during the operation and maintenance phase expected to be minimal. The loss of agricultural land and impacts on farm holdings would occur during the construction and the operation and maintenance phases, and on this basis, potential project lifetime inter-related effects have been considered. Soil resources may have ecological value for mitigation, however it is considered in Volume 3, Chapter 9: Onshore Ecology and do not require further assessment. There is the potential for inter-related effects on users of PRoWs and common land, and socio-economic receptors.
Onshore Ecology	Yes	No	No	The impacts of Thurrock Flexible Generation Plant on onshore ecology are assessed in Volume 3, Chapter 9: Onshore Ecology and Volume 4, Chapter 22. Inter-related effects from the interaction of environmental topics such as water quality (surface water and groundwater), noise and air emissions with ecological receptors have been assessed within these chapters and do not require further assessment. The majority of likely effects (such as permanent habitat loss) would occur during the construction phase and therefore, would not result in project lifetime effects. However, there is potential for some effects (such as disturbance to protected species) to also occur during the operational and maintenance phase.
Traffic and Transport	No	Yes	Yes	The impacts of Thurrock Flexible Generating Plant on traffic are assessed in Volume 3, Chapter 10: Traffic and Transport and Volume 4, Chapter 23. The assessment concludes that the effects of traffic during the construction phase are not considered to be significant. The effects in relation to the operational phase have been scoped out of the assessment as movements will fall below the thresholds under which assessment is required.
Noise	Yes	Yes	Yes	The impacts of Thurrock Flexible Generating Plant on noise sensitive receptors are assessed in Volume 3, Chapter 11: Noise and Vibration and Volume 4, Chapter 24. Noise effects may occur during the construction, and operation and maintenance phases and therefore, there is the potential for project lifetime effects to arise. Noise effects from construction traffic are assessed in the chapter, however there is the potential for inter-related effects on human receptors when other environmental factors are combined.
Air Quality	Yes	Yes	Yes	The impacts of Thurrock Flexible Generating Plant on air quality are assessed in Volume 3, Chapter 12: Air Quality and Volume 4, Chapter 25. Air quality effects may occur during the construction, and operation and maintenance phases and therefore, there is the potential for project lifetime effects to arise. There is also the potential for inter-related effects on human receptors when other environmental factors are combined.

Topic receptor / resource	Scoped into the assessment of project <u>lifetime</u> inter-related effects	Scoped into the assessment of <u>receptor-led</u> inter-related effects	Scoped into the assessment of <u>receptor-led cumulative</u> inter-related effects	Justification for exclusion from further inter-related assessment
Human Health	Yes	No	No	The impacts of Thurrock Flexible Generating Plant on human health are assessed in Volume 3, Chapter 13: Human Health and Volume 4, Chapter 26. Human health effects may occur during the construction, and operation and maintenance phases and therefore, there is the potential for project lifetime effects to arise. The human health assessment draws from all of the other environmental and socio-economic pathways that have the potential to affect determinants of health. Therefore, all potential inter-related effects in relation to human health are considered within Chapter 13 and do not require further assessment.
Climate Change	Yes	No	No	The impacts of Thurrock Flexible Generating Plant on climate change are assessed in Volume 3, Chapter 14: Climate Change and Volume 4, Chapter 27. The effects in relation to climate change could occur across the lifetime of the project. The effect of climate change on rainfall and flood risk has been assessed in Volume 3, Chapter 15. It is not likely that the effects of other environmental topics considered in the ES would contribute to climate change and the release of greenhouse gas (GHG) emissions or climate risks. Therefore receptor-led effects are not considered further.
Hydrology and Flood Risk	Yes	No	No	The impacts of Thurrock Flexible Generating Plant on hydrology and flood risk are assessed in Volume 3, Chapter 15: Hydrology and Flood Risk and Volume 4, Chapter 28. Effects on surface watercourses and risk of flooding may occur during the construction, and operation and maintenance phase, and therefore there is the potential for lifetime effects to occur. Potential interactions with groundwater and contaminated runoff are considered within Volume 3, Chapter 15 and therefore, further assessment of inter-related effects is not required.
Geology and Ground Conditions	Yes	No	No	The impacts of Thurrock Flexible Generating Plant on geology and ground conditions are assessed in Volume 3, Chapter 16: Geology, Hydrogeology and Ground Conditions and Volume 4, Chapter 29. The majority of likely effects would occur during the construction phase, however potential pollution of soils and controlled waters may occur during the operation and maintenance phase. Potential interactions with surface watercourses are considered within Volume 3, Chapter 16 and therefore, further assessment of inter-related effects is not required.
Marine Environment	Yes	No	No	The impacts of Thurrock Flexible Generating Plant on the marine environment are assessed in Volume 3, Chapter 16: Marine Environment and Volume 4, Chapter 30. Effects may occur during the construction, and operation and maintenance phases and therefore, there is the potential for project lifetime effects to arise. All receptor-led inter-related effects are assessed in Volume 3, Chapter 16: Hydrology and Flood Risk and therefore, further assessment is not required.

3.3 Identification of receptors/resources

3.3.1 The potential for inter-related effects (other than those already inherently forming part of the topic-specific assessments where specified in Table 3.1) is limited to the Zols presented in Table 3.2. Unless otherwise clarified, the Zol for the applicable cumulative assessments are the same as those listed in Table 3.2.

Table 3.2: Zones of influence for construction/decommissioning and operational effects

Topic	Construction / decommissioning Zol	Operational Zol
Landscape and Visual Resources	Zone of Theoretical Visibility (ZTV): 10 km buffer from proposed development site (based on a 40 m stack height)	
Land Use, Agriculture and Socio-Economics	Land use: land that would be occupied by, or immediately adjacent to the proposed development Agriculture: farm holdings as a whole which may be affected by the development, based on known ownership boundaries Socio-economics: local authority area of Thurrock.	
Traffic and Transport	Sections of the public highway affected by the proposed development and the Station Road railway level crossing	Scoped out of the assessment
Noise and Vibration	Proposed development site boundary plus a 1 km buffer	
Air Quality	Proposed development site boundary plus 350 m buffer and up to 50 m from roads within 500 m of the site boundary	Selected sensitive receptors properties where pollutant concentrations and/or changes in pollutant concentrations are predicted to be greatest. The operational assessment's study area is approximately 10 km for human-health receptors for point source emissions and up to 200 m from roads for traffic emissions. The study area for ecological receptors is up to 15 km from the stacks.
Human Health	Local authority area of Thurrock and district level. The study area will remain consistent with the technical disciplines which inform the Human Health chapter, namely: Air Quality; Noise and Vibration; Traffic and Transport; and Land Use, Agriculture and Socio-Economics.	
Hydrology and Flood Risk	Up to 250 m for hydrological receptors and 1 km for any existing assets, infrastructure or receptors that have the potential to be affected by the long-term presence of infrastructure constructed above ground in terms of flood risk.	
Climate Change	No specific geographical study area is defined	

Topic	Construction / decommissioning Zol	Operational Zol
Marine Environment	The study area for the assessment of estuarine processes located within the Thames Estuary is referred to as Gravesend Reach, which extends between Grays and Mucking Flats. For marine ecological receptors and water quality, the immediate project footprint associated with the causeway and incorporating the Thames Middle WFD transitional waterbody.	

3.3.2 Table 3.2 identifies overlaps between the defined Zol of environmental topics. Inter-related effects have been considered where the study areas of the respective assessments are shared.

3.3.3 For example, the proposed development site includes areas of agricultural land which are also located within the Zol for dust and noise effects and thus could experience inter-related or combined effects. Conversely, areas of the ZTV which extend up to 10 km from the site boundary are unlikely to experience air quality and noise effects in construction as the construction-phase Zol for these topics only extends 350 m and 1 km from the site boundary respectively, and no inter-related effects are likely in that example.

3.4 Project lifetime effects

3.4.1 Taking into account the scoping of those topics for project lifetime effects assessment carried out in Table 3.1, the lifetime inter-related effects that are predicted to arise during construction / decommissioning and operation of the proposed development are listed in Table 3.3.

Table 3.3: Summary of the potential project lifetime inter-related effects

Topic area	Type of Impact	Significance of individual effect with mitigation during construction/decommissioning	Significance of individual effect with mitigation during operation and maintenance	Project lifetime inter-related effects
Visual Resources	Visual effects on residential receptors	Minor to moderate adverse	Minor to moderate adverse	The visual effects considered in Volume 3, Chapter 6: Landscape and Visual Resources relate to a number of different receptors and the effects vary widely depending on the distance from the proposed development and the sensitivity of the receptor. Over the lifetime of the project, the visual receptors with views to the main development site would see the landscape transform from open fields (with electricity pylons) to the Flexible Generation Plant. The greatest effect is likely to be during the construction phase when both the partially completed Flexible Generation Plant itself and other construction activity within the application boundary such as gas pipeline trenching and construction haul roads would be visible. Visual effects during construction activity are temporary, and the effects during operation will reduce over time as the landscape mitigation planting matures. The combined effect over the lifetime of the project is not likely to exceed the effects assessed for each stage of the project.
	Visual effects on access land, public open space and PRoWs	Minor to moderate adverse (major adverse for at certain locations for users of access land)	Negligible to moderate adverse (major adverse for at certain locations for users of access land)	
	Visual effects on tourist attractions and recreation	Minor to moderate adverse	Minor to moderate adverse	
	Community Facilities	Moderate adverse	Moderate adverse	
	Dynamic Receptors	Moderate adverse	Minor to moderate adverse	
Land use, Agriculture and Socio-economics	Impact on agricultural land quality including permanent loss of agricultural land	Moderate adverse	Moderate adverse	The construction and operation of Thurrock Flexible Generation plant will result in the temporary and permanent loss of agricultural land and the subsequent effects on farm businesses. Agricultural land temporarily used for the gas pipeline installation and the construction laydown area would be restored at the end of the construction process and therefore, the effects are unlikely to extend beyond the initial phase of the project. The effects of the permanent loss of agricultural land would occur in both the construction and operation/maintenance phases of the project. The effect has been assessed as moderate adverse but is not considered to be significant as it does not involve the loss of the best and most versatile agricultural land. The combined effect over the lifetime of the proposed development is not likely to be greater than the moderate adverse effect assessed for the construction and operational/maintenance phases.
	Impact on farm holdings	Negligible	Negligible	
Onshore Ecology	Airborne pollutant effects on and designated sites and habitat sites	Negligible adverse	Negligible to minor adverse	Effects resulting from airborne pollutants may occur as a result of construction/decommissioning activities and during the operation and maintenance phase of Thurrock Flexible Generation Plant. Air emissions during operation would be regulated by an Environmental Permit and the environmental effect on designated sites is predicted to be no more than minor adverse. Runoff, noise and lighting effects are likely to be greater during the construction/decommissioning phase and are unlikely to exceed negligible adverse significance during operation and maintenance. The combined effect over the lifetime of the project is not likely to exceed the effects assessed for each stage of the project.
	Runoff pollutant effects on designated sites and habitats	Negligible to minor adverse	No change	
	Noise, lighting and visual disturbance effects on breeding and wintering birds	Minor adverse	No change to negligible adverse	
	Lighting effects on foraging bats	Negligible adverse	Negligible adverse	
Noise and Vibration	Noise from construction activity	Negligible to minor adverse	N/A	Noise sensitive receptors in the vicinity of Thurrock Flexible Generating Plant are likely to be affected by noise during the lifetime of the project. The source, nature and sound levels are different for each project stage. The effect of greatest significance is likely to occur during the operation and maintenance phase where moderate adverse effects are predicted, however this is not considered to be significant as the noise level would not exceed the SOAEL (significant observed adverse effect level). Effects of construction traffic and activities are predicted to be of lower significance. No project lifetime effects of greater significance than those already assessed are predicted.
	Operation of the proposed development	N/A	Minor to moderate adverse	

Topic area	Type of Impact	Significance of individual effect with mitigation during construction/decommissioning	Significance of individual effect with mitigation during operation and maintenance	Project lifetime inter-related effects
Air quality	Increase in suspended particulate matter concentrations	Negligible	N/A	The types of effects related to air quality differ across the lifetime of the project. During construction/decommissioning the main effects would be related to dust while during operation they would be due to NO ₂ emissions from the gas engines. These effects have been assessed in Volume 3, Chapter 12: Air Quality as negligible and minor adverse respectively and not significant. Due to the differing nature of the impacts and the small effect they would have, no project lifetime effects of greater significance than those already assessed are predicted.
	Increase in NO ₂ concentrations	N/A	Minor adverse	
Human health	Changes to air quality	Minor adverse	Minor adverse	The combined effects of air quality, noise, transport and socio-economics over the lifetime of the proposed development could result in inter-related effects. The health effects from these sources are likely to differ between the construction and operation and maintenance phases. Traffic and socio-economic effects are likely to occur principally during the construction phase and air quality emissions from the proposed development would occur principally during the operational phase; therefore, resulting in no significant additional project lifetime effects. Noise effects could occur throughout the lifetime of the project however the noise health effects are not considered to be greater when considered across the lifetime of the project compared to the construction and operational phases in isolation.
	Changes to noise exposure	Minor adverse	Minor adverse	
Climate change	Direct and indirect emission of greenhouse gases (GHGs)	Negligible	Beneficial	Direct and indirect emissions of greenhouse gases would be released during the construction/decommissioning and operation and maintenance phases, however the combined effect of the emissions would not lead to project lifetime effects of greater significance compared to those assessed in Volume 3, Chapter 14: Climate Change.
Hydrology and flood risk	Pollution impacts on surface water bodies	Minor adverse	Minor adverse	Pollution incidents would be mitigated using pollution prevention measures during construction and a surface water drainage scheme (incorporating pollution measures) would be implemented during the operational phase. Pollution incidents are therefore not likely to occur. These measures are considered sufficient to ensure no lifetime pollution effects would occur.
	Flood risk associated with a change to the runoff rates	Negligible to minor adverse	Minor adverse	Flood risks effects could occur over the lifetime of the project, however as the effect would occur concurrently, the project lifetime effects are not likely to be greater than that assessed for each phase.
Geology and Ground Conditions	Pollution of soils and controlled waters	Negligible to minor adverse	Negligible to minor adverse	The implementation of good environmental practices during construction and the implementation of a suitable drainage strategy during operation would ensure no significant lifetime effects would occur.
Marine Environment	Long term/permanent habitat loss due to construction and presence of causeway	Minor adverse	Minor to moderate (significant in the localised context) for loss under causeway footprint Negligible to minor (not significant) for change of mudflat to saltmarsh	The loss and change in habitat due to the construction and presence of the causeway would result in different effects during the lifetime of the project. During construction the effects would be <u>loss</u> of habitat and disruption to surrounding habitat from construction activities. However, during operation the effects are more related to the potential <u>change</u> in habitat from possible natural succession of mudflat to saltmarsh where there is sediment accumulation in the causeway lee. Therefore, the project lifetime effects would not be greater compared to the construction and operational phases in isolation.
	Changes in flow conditions through construction and presence of causeway	Negligible	Negligible	The changes in flow conditions and sediment transport would occur when the causeway is constructed (physically in place) and then persist while it remains in

Topic area	Type of Impact	Significance of individual effect with mitigation during construction/decommissioning	Significance of individual effect with mitigation during operation and maintenance	Project lifetime inter-related effects
	Changes in sediment transport processes through construction and presence of causeway	Negligible and locally minor adverse	Negligible	place (during the operational phase). The effect would therefore be long term and has been assessed as such in the Marine Environment chapter.

3.5 Receptor-led inter-related effects

3.5.1 The scoping exercise in Section 3.2 of this report identifies those topic receptors where there is potential for interaction of multiple effects on a receptor to arise. Table 3.1 considers the potential for inter-relationships to occur for each receptor group and considers whether any potential effects have already been assessed within the individual topic chapters of the ES. For example, noise effects from construction traffic are considered in Volume 3, Chapter 11: Noise and Vibration.

3.5.2 The topics that could result in additional inter-related effects (that have not been already assessed) are:

- visual resource;
- recreation (construction only);
- traffic and transport (construction only);
- noise and vibration; and
- air quality.

3.5.3 The effects identified for these topics have the potential, when occurring at the same time, to affect the same receptors, which could result in a greater effect than if they occurred on their own. The receptor groups that are likely to experience multiple effects are limited to the receptors located in the Zol identified in Table 3.2. Based on the assessments included in Volume 3, Chapters 6 to 17 and Volume 4, Chapters 19 to 30, the following receptor groups have been identified which could experience effects from multiple environmental topic areas:

- People (long term - residents, users of schools and community facilities, places of work).
- People (short term or intermittent - traveller, pedestrians/cyclists, users of PRoW and common land).

3.5.4 Due to the distance to European designated ecological sites and the mitigation provided for impacts on habitats and protected species directly affected by the proposed development's land-take (with net biodiversity gain predicted to be achieved), no significant inter-related effects on ecology receptors are predicted.

3.5.5 For each receptor group Table 3.4 lists the potential effects on these receptors.

Table 3.4: Receptor groups and potential impacts

Receptor Group	Potential Impacts
Long term receptors: people living at dwellings and users of schools, community facilities and work places	<ul style="list-style-type: none"> • Potential impacts from dust soiling surfaces, particularly window sills, cars and laundry; • Changes to air quality; • Change to the level of traffic; • Changes to the noise environment and vibration; and • Changes to views.
Short term or intermittent receptors: people using PRoWs and common land and local road network	<ul style="list-style-type: none"> • Changes to the PRoW network and other linear routes; • Change to the level of traffic; • Changes to the noise environment; • Changes in air quality; and • Changes to views.

Long term receptors

3.5.6 There are a number of residential areas and properties within the Zol of Thurrock Flexible Generating Plant. The eastern edge of Tilbury is approximately 720 m west of the main development site, the village of West Tilbury is approximately 1.05 km to the north and East Tilbury village is approximately 2.09 km to the east. In addition, there are a number of individual or small groups of houses within around 800 m of the main development site boundary, the nearest being:

- Walnut Tree Farm, Havers Lodge and Low Street (580 m north east);
- Condovert Cottages (730 m north east);
- Polwicks (740 m north east);
- St James Church (790 m north);
- Byron Gardens (640 m west);
- Brennan Road (700 m west); and
- Sandhurst Road (730 m west).

Construction/Decommissioning

3.5.7 **Noise:** the noise assessment has considered receptors within 1 km from the site boundary. The assessment identified that the highest predicted noise increase during construction is likely to occur at Walnut Tree Farm as a result of general activities and HDD drilling within Zone C, which would result in an impact of negligible magnitude. Noise levels at all other receptors (including residential properties, Gateway Academy school and St James' Church) are predicted to represent a negligible magnitude of impact and a negligible or minor adverse effect. Works would be undertaken in

accordance with the Code of Construction Practice (CoCP, application document A8.6)) which requires best practicable means to be used to control construction noise.

3.5.8 In terms of noise from construction traffic, a noise change of up to 2 dB (representing a minor adverse magnitude of impact), would be experienced by noise sensitive receptors along local, low trafficked roads: Fort Road, Turnpike Lane, Gun Hill Road, Cooper Shaw Road, Church Road and Station Road, subject to routing. These impacts would result in effects of minor adverse significance.

3.5.9 Dust: the study area for the dust assessment is 350 m from the construction activities and 50 m from roads. No significant dust effects (negligible) were identified within this area with management in accordance with the CoCP (application document A8.6).

3.5.10 Visual: the largest visual impacts likely to be experienced are from receptors located on:

- the Chadwell St. Mary – West Tilbury – East Tilbury ridgeline (in particular, residents on the east side of Lea Road, Chadwell with south east facing elevations; and those on the south side of Rectory Road on Gun Hill with south east facing elevations);
- Biggin Lane and the farm track to Gun Hill Lane (in particular, those residents with south/south east facing elevations e.g. 1 to 9 Biggin Lane);
- the eastern edge of Tilbury (in particular, residents on the north end of Ford Rd with rear elevation aspects facing south eastwards; and
- properties that line the waterfront at Gravesend (in particular, the residents on the upper floors with north facing views).

3.5.11 These receptors may experience effects up to moderate adverse, however these are not considered significant. Community facilities are anticipated to experience moderate adverse effects, which is not considered to be significant.

3.5.12 Traffic and transport: predicted traffic flows along the majority of links to be used by construction traffic were below the threshold which required an assessment of the likely environmental effects. The predicted traffic flows would lead to a negligible magnitude of impact and a negligible adverse effect. The exception was the Coopers Shaw Road/Church Road/Station Road link between Gun Hill Road and East Tilbury junction. Predicted traffic flows were above the threshold for assessment and whilst the link would only be used in circumstances where the Fort Road access was not available, the environmental effects were assessed for robustness. The assessment concluded that the effects on this link were negligible.

3.5.13 Taking into account the above, there is the potential for adverse inter-related effects to occur during the construction phase with some residential receptors temporarily

experiencing visual, noise and dust effects. However, these effects would be managed through measures set out in the CoCP (application document A8.6). Any inter-related effects are unlikely to exceed the level of significance reported for the individual effect.

Operation

3.5.14 Visual: the visual effects on residential receptors during operation are likely to be similar to the construction phase, with the same residential and community receptors experiencing the greatest effect of up to moderate adverse (not considered significant).

3.5.15 Noise: the impact of the proposed development at long term receptors has been assessed as up to moderate adverse for medium sensitivity receptors in the vicinity of Buckland and Havers Lodge. With consideration of context, these effects were not predicted to be significant and the noise level is below the significant observed adverse effect level (SOAEL). It is predicted that all other receptors would experience a minor adverse effect. During the daytime and evening periods when Thurrock Flexible Generation Plant is most likely to operate, the maximum noise change predicted is below the threshold of perception. In terms of the absolute noise level assessment, sound from Thurrock Flexible Generation Plant will not contribute to or give rise to adverse impacts on noise sensitive receptors during the daytime or evening. Noise levels would be managed through the environmental permit for the Thurrock Flexible Generation Plant.

3.5.16 Air quality: emissions from the Flexible Generation Plant have been assessed for both long term and short term periods. The minor adverse effects predicted in the long term are not considered to be significant. Air emissions would be managed through the environmental permit for the Thurrock Flexible Generation Plant.

3.5.17 Taking into account the above, there is the potential for inter-related effects to occur as a result of visual, noise and air quality effects. Up to moderate adverse, non-significant effects have been predicted at the closest receptors for visual and noise impacts. Minor adverse effects are predicted for air quality. Thurrock Flexible Generation Plant will be regulated by an environmental permit that will require the management and/or monitoring of noise and air emissions. Landscape mitigation planting will mature over time and may reduce visual impacts. Overall, the inter-related effects are unlikely to exceed moderate adverse and are not considered significant.

Short term or intermittent receptors

Construction/Decommissioning

3.5.18 Recreation: The provision of replacement common land/access land in Zone E would mitigate for the permanent loss of common land in Zone A and the short-term disruption to the use of land in Zone D and Zone F1/F2 during construction. In addition, a new

- permissive footpath created between Zone E and Fort Road would improve access to the replacement common land and Parsonage Common. The replacement common land would be available for use prior to construction commencing. Taking into account these measures, the significance of effect on common land is predicted to be minor beneficial.
- 3.5.19 The route of the Thames Estuary Path (FP146) and National Cycle Route (NCR) 13 would remain along its current alignment throughout the construction of the causeway and access road for construction traffic. Traffic management measures would be put in place to manage the interface between users and construction traffic. A temporary diversion of a short section of footpath FP200 while the gas pipeline crossing is constructed may be required and the effect would be minor adverse.
- 3.5.20 Visual: The users of the replacement common land in Zone E are predicted to experience minor visual impacts during construction of moderate adverse significance. Access land either side of Gun Hill Lane, Cooper Shaw Road and Fort Road would remain open during construction. Moderate adverse effects are predicted in locations where views are already compromised by pylons and cables (e.g. Parsonage Common). Major adverse effects are predicted which are significant, where existing views contain less pylon and overhead cable infrastructure.
- 3.5.21 Users of the Thames Path/Two Forts Way/FP146 are predicted to experience minor changes in views from the section of path beyond the land raising operations, where there are slightly elevated views across the open farmland to the proposed development in Zone A. The effect is considered to be moderate adverse.
- 3.5.22 Views gained from footpaths on the Chadwell to East Tilbury ridge vary considerably. Of those footpaths that are still open and passable, the magnitude of impacts ranges from no change to minor. Those most affected are from elevated locations with views of the construction site (e.g. short sections along footpaths 72 and 200). Moderate adverse effects are predicted. Visitors to tourist attractions and dynamic receptors are predicted to experience minor to moderate adverse visual effects
- 3.5.23 Noise: it is considered that noise impacts from construction activity associated with the Thurrock Flexible Generation Plant on users of PRowS would be negligible resulting in a minor adverse effect. While users of the PRowS may experience elevated noise levels for short periods, it is unlikely to be significant.
- 3.5.24 Traffic and transport: the number of HGVs using the local road network would increase during the construction phase but the effect on pedestrian delay and amenity have been assessed as negligible and is not likely to contribute to inter-related effects.
- 3.5.25 Taking into account the above, there is potential for inter-related effects on short term receptors to occur as a result of recreational, visual, noise and traffic effects. Recreational effects are predicted to be minor adverse or no change. The exception is for users of common land who may experience minor beneficial effects as a result of greater access but a moderate adverse effect on some views. Therefore, recreational users would not experience a loss of recreational resource, but the amenity value may be affected. Inter-related effects are considered unlikely to be of greater significance than the effects considered by the ES chapters in isolation.
- Operation**
- 3.5.26 Visual: as for the construction phase, most users of PRowS, common land and tourist areas would experience negligible to minor changes in views, with the greatest changes predicted at locations closest to Thurrock Flexible Generation Plant, at elevated locations, or where there is minimal screening from buildings or vegetation. A major adverse effect is predicted for views from the areas of existing access land along the edge of Fort Road, where the proposed development would result in a moderate change in the view. Moderate adverse visual effects are predicted at all other locations, which are not considered significant.
- 3.5.27 Noise: noise impacts from the operation of the proposed development on users of PRowS would be negligible. While users of these PRowS might experience elevated noise levels for short periods when walking within these areas, this is not considered a significant effect.
- 3.5.28 Air quality: No significant effects have been identified in relation to air quality during the operational phase. Emissions from the proposed development are therefore not likely to contribute to inter-related effects for short term or intermittent receptors.
- 3.5.29 Taking into account the above, inter-related effects on short term or intermittent receptors using the area around the proposed development could arise from combined noise and visual effects. Volume 3, Chapter 11 considers that although users of the PRowS and access land may experience some adverse noise effects they are not likely to be significant. Combined with the change in views which could be considered significant at some receptors, in the context of the local area and the intermittent nature of receptors experiencing the effects, the change in amenity of short term receptors is not likely to be greater than the effects already assessed in the ES chapters.
- Receptor-led Cumulative Inter-related Effects**
- 3.5.30 Cumulative effects for each topic chapter have been identified in Volume 4 of the ES. These chapters have been reviewed against the receptor-led inter-related effects in this chapter to identify the potential for any cumulative inter-related effects to arise.

- 3.5.31 Inter-related effects may occur for short-term and long-term human receptors during the construction and operation of Thurrock Flexible Generating Plant. These effects may arise from a combination of visual, noise, air quality and traffic effects. In isolation these effects are minor to moderate adverse and are not considered significant. The combination of these effects would not increase the level of significance.
- 3.5.32 Where potential cumulative effects have been identified with other developments, the assessments from Volume 4 have concluded that Thurrock Flexible Generation Plant is unlikely to make a material contribution to the overall cumulative effect. On that basis, any potential cumulative inter-related effects are unlikely to increase the level of significance reported for the inter-related effects.

4. Summary and conclusions

- 4.1.1 This chapter has considered the potential for inter-related effects arising from the construction, operation and maintenance and decommissioning stages of Thurrock Flexible Generation Plant on a range of receptor groups. It draws from the assessments of individual effects presented in the topic-specific ES chapters in Volume 3 and Volume 4. The identification of potential inter-related effects has been based on a largely qualitative assessment using expert judgement, noting that inter-related effects have already been accounted for, in many instances, within the assessments in the topic chapters.
- 4.1.2 There is scope for project lifetime effects to occur over the course of the construction, operation and decommissioning of the proposed development. The inter-relation of effects in the construction or decommissioning and operation phases (project lifetime inter-relationships) is not considered to increase the significance of effects, mainly arising due to noise and visual impacts, that are reported for each of these phases.
- 4.1.3 With regard to receptor-led inter-related effects, i.e. the combination of multiple environmental effects on a single receptor group, the combined impact of environmental pathways on ecology, heritage and landscape receptors and human health is inherently considered in the topic-specific assessments in Volume 3. Long- and short-term inter-related effects have been further considered in this chapter for human receptors.
- 4.1.4 While additional adverse inter-related effects may arise at some locations from noise, traffic and visual effects during construction, these are considered unlikely to alter the significance of effects predicted individually and would be managed through measures set out in the Code of Construction Practice (application document A8.6). The main inter-related effects in operation are likely to result from noise, visual and air quality effects, which are perceived differently and not together. It is not considered that the minor to moderate adverse noise and air quality effects at receptors affected by minor to moderate adverse visual effects would increase the significance of effect, nor that non-significant noise and air quality effects at the closest residential receptors would become significant in combination.
- 4.1.5 Thurrock Flexible Generation Plant makes no material contribution to cumulative inter-related effects with other development.

5. References

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