Thurrock Flexible Generation Plant

Environmental Statement Volume 2
Chapter 2: Project Description

Date: April 2020

Environmental Impact Assessment

Environmental Statement

Volume 2

Chapter 2

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Summary

This document provides a description of the proposed development’s design, nature of its operation, temporary and permanent road access options, and construction programme with an overview of the construction techniques and plant to be used.

Qualifications

This document has been prepared by Tom Dearing, a Chartered Environmentalist and full Member of the Institute of Environmental Management and Assessment, who has ten years’ experience of environmental impact assessment.

It has been checked by Dan Smyth, BSc (Jt Hons), MSc, DIC Environmental Technology, a Senior Director with over 20 years’ experience as an environmental specialist.

1. Site Location and Overview of Development

1.1 Site location and setting

1.1.1 The proposed development is located on land south west of Station Road near Tilbury, Essex (Figure 1.1). The location and order limits are shown in Figure 1.4. The British National Grid coordinates are TQ662766 and the nearest existing postcode is RM18 8UL. It is within the administrative area of Thurrock Borough Council and lies in the Thurrock Green Belt.

1.1.2 The main development site (see definition in the following Section 1.2) currently comprises open, flat fields crossed by drainage ditches and three overhead power lines with steel lattice electricity pylons. It is immediately to the north of the existing Tilbury Substation and site of the decommissioned Tilbury B coal fired power station, with the River Thames further to the south. To the north is a section of the London, Tilbury and Southend Railway known as the Tilbury Loop, used mainly for commuter passenger services between central/east London and locations in Essex.

1.1.3 Within the main development site and other land within the order limits are areas of registered Common Land, discussed in Volume 3, Chapter 8: Land Use, Agriculture and Socio-Economics.

1.1.4 A photograph of the main development site in its baseline condition, looking north from close to Tilbury Substation, is shown in Figure 1.1.

Figure 1.1: Main development site baseline photograph – looking north from Tilbury Substation.

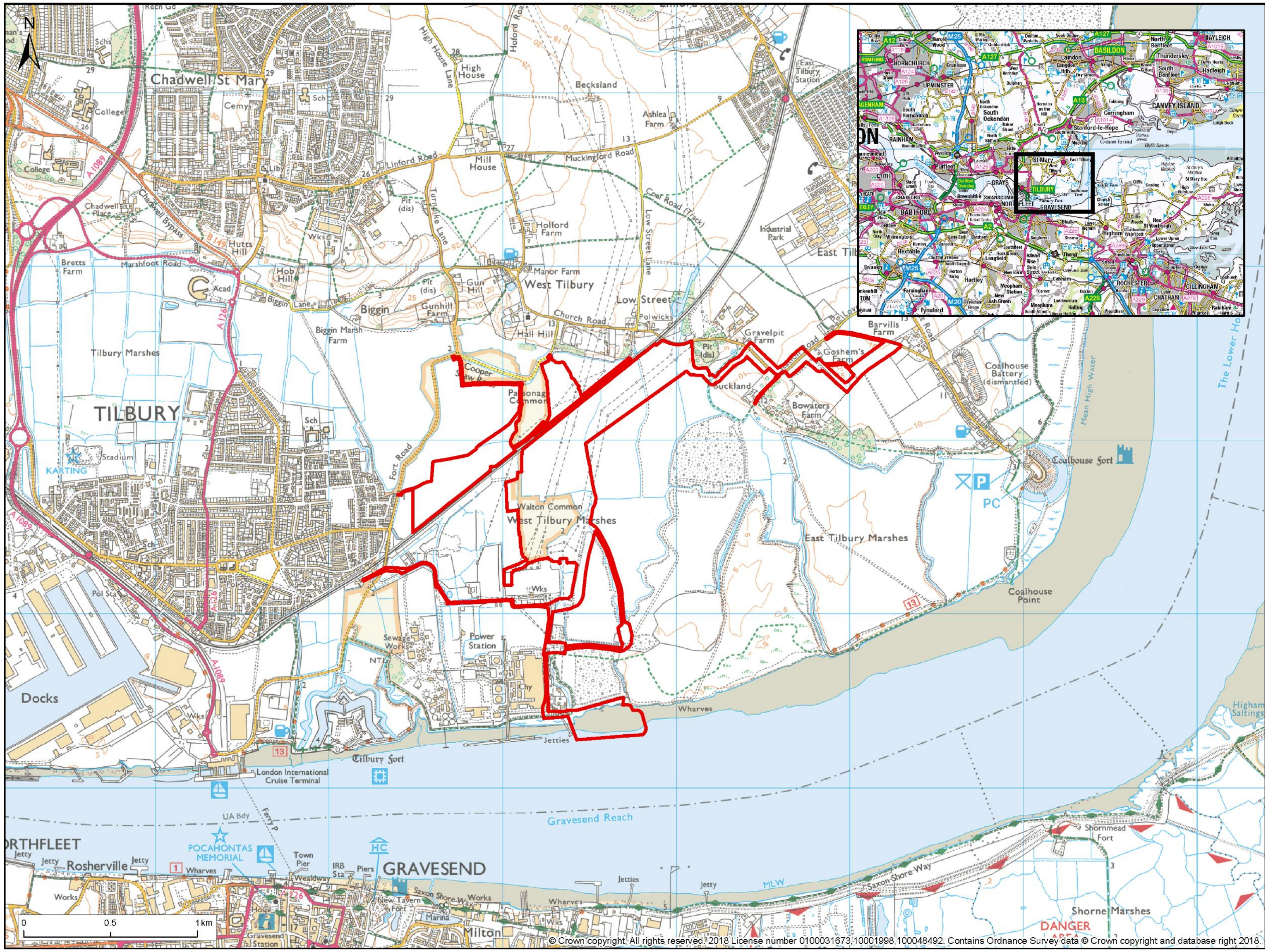
1.1.5 Substantial development is occurring and proposed in the area, with the consented extension of Tilbury Port to the west and the proposed Lower Thames Crossing major highway scheme to the east and north. Further details of other proposed developments are given in Volume 4, Chapter 18: Cumulative Developments and Screening.

1.1.6 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);
- Condovers 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).

1.1.7 The nearest European designated site is the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, approximately 2.4 km east of the main development site. The nearest Scheduled Monuments are Tilbury Fort (970 m south west) and 'Earthworks near church, West Tilbury' (730 m to the north).

1.1.8 Details of the baseline environment and sensitive receptors of the development site and its setting are given in each environmental topic chapter in Volume 3. Overviews of the site setting illustrating environmental sensitivities are shown in Figure 1.3 and Figure 1.4.



Legend

Order Limits

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Thurrock Flexible Generation Plant
Development boundary

rps THURROCK POWER

Figure 1.2: Site Location.

Figure 1.3: Site Sensitivities – Small Scale.

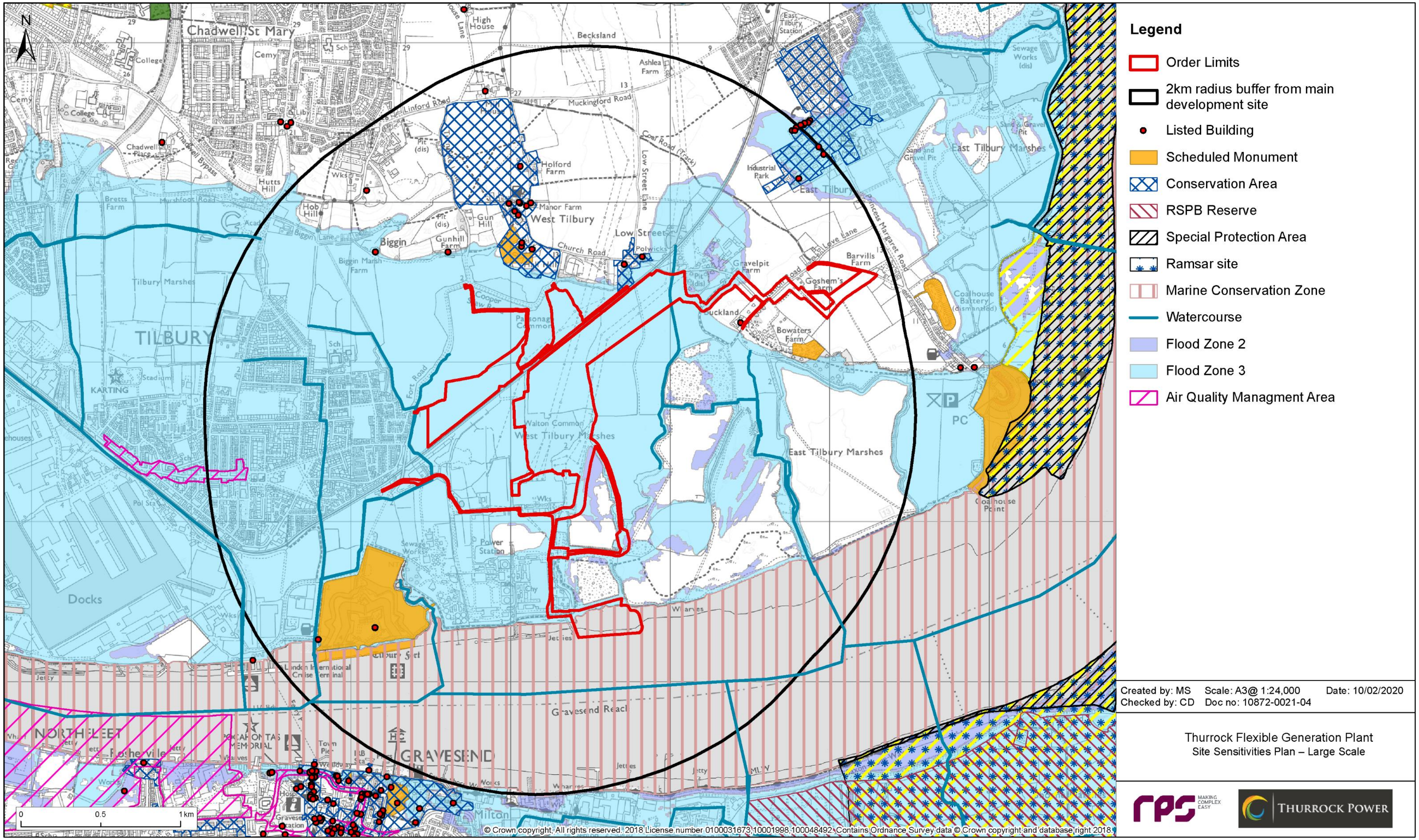

Figure 1.4: Site Sensitivities – Large Scale.

1.2 Development overview

1.2.1 In overview, the proposed development comprises the construction and operation of:

- reciprocating gas engines with rated electrical output[1] totalling 600 MW;
- batteries with rated electrical output of 150 MW and storage capacity of up to 600 MWh[2];
- gas and electricity connections;
- creation of temporary and permanent private access routes for construction and access in operation, including a permanent causeway for the delivery of abnormal indivisible loads (AILs) by barge; and
- designation of exchange Common Land and habitat creation or enhancement for protected species translocation and biodiversity gain.

1.2.2 The proposed development will be designed to operate for up to 35 years, after which time ongoing operation and market conditions will be reviewed. If it is not appropriate to continue operating after that time, one or both generating and storage elements of the development (gas engines or batteries) will be decommissioned.

1.2.3 The applicant requires flexibility in the Development Consent Order (DCO) for the design of a number of elements of the development. For example, the number and size of gas engines and batteries to provide the electricity generation and storage capacity specified would vary depending on the technology provider and equipment models selected. Flexibility in options for construction access and haul routes (described in Section 3.3) and the gas pipeline route and micro-siting of the gas above-ground installation (AGI) for connection to the National Transmission System (NTS) is also required.

1.2.4 A 'Rochdale envelope' approach to assessment has therefore been taken, whereby maximum design parameters are defined for assessment. These maximum parameters would not be exceeded by the proposed development's final design, in terms of its physical dimensions, nature of construction and operational activities, or significance of environmental effects. The overall design envelope is discussed in further detail in Section 2.14. Within each ES topic chapter in Volume 3, design envelope parameters specific to that assessment are given (where applicable) in Section 2.6 of the chapters.

1.2.5 For descriptive purposes, land within the order limits has been divided into zones, labelled as follows. These zones are illustrated in Figure 1.5. Table 1.1 lists the works (as defined in Schedule 1 of the draft DCO, application document A3.1) in each zone.

1.2.6 Further details of the development design within these zones are given in Section 2.

Zone A

1.2.7 The 'main development site' immediately north of Tilbury Substation, within which the principal buildings or structures of the proposed development will be constructed. The gas engines, batteries, electrical switchgear (customer substations), runoff attenuation, control room and staff parking will be within zone A. This zone also includes land reserved for Carbon Capture Readiness (CCR).

Zone B

1.2.8 This is the existing National Grid Tilbury Substation. The proposed development will connect to the 275 kV circuit at this substation via underground cables crossing from zone A into zone B.

Zone C

1.2.9 Zone C is a corridor of land south of the railway line in which a permanent access road and underground gas pipeline will be constructed, between Station Road (which is at the north-eastern edge of this zone) and the main development in zone A. The route of the access road and gas pipeline within this corridor will be defined following detailed design. Up to two hectares of zone C may also be used for laydown or temporary construction compounds, if required.

Zone D

1.2.10 Zone D comprises sections of agricultural fields within which the gas pipeline and National Grid gas connection compound (AGI) will be constructed. The existing NTS 'Feeder 18' high pressure pipeline crosses zone D3.

Zone E

1.2.11 This zone north of the railway, currently agricultural land, is the area in which exchange Common Land will be provided together with a new footbridge connection to Fort Road. A route for access from zone F2 to zone E, across the south of Parsonage Common, is provided for use during work to establish the Common Land and footbridge.

[1] electricity exported at the point of grid connection, including exhaust energy recovery, after parasitic load

[2] i.e. storing up to four hours' power at the rated discharge capacity

Zone F

1.2.12 Zone F, currently agricultural land in the main with some existing scrub, will be used for habitat creation or enhancement to mitigate for the permanent loss of habitat within zone A and other areas of the proposed development. It is divided into four sub-zones (F1-4) to accommodate the habitat types proposed. Access routes for establishing and maintaining the habitat creation areas are provided from Cooper Shaw Road.

Zone G

1.2.13 This zone includes all of the infrastructure required for delivery of AILs via roll-on roll-off barge and transport to the main development site (zone A). It includes the construction and operation of a permanent causeway on the foreshore of the River Thames, the dredging of a berthing pocket to enable barges to access the causeway, a local modification to the existing sea defences, and a haul road from the causeway to zone A. The proposed haul road will comprise part of the existing private highway infrastructure on RWE's former Tilbury B Power Station site and a new section of purpose-built road to connect to zone A. For part of the haul road route, two options are being considered; flexibility to determine the preferred option prior to construction is required due to recent ground disturbance in this area, discussed further in Section 3.3

Zone H

1.2.14 Zone H comprises an existing private road through the former Tilbury B Power Station site and a re-aligned private road, as consented for the Tilbury2 development, which will provide the primary access route for construction traffic (with the exception of AILs delivered via barge) from the new section of A1089 public highway being constructed for Tilbury2.

Zone I

1.2.15 This section of public highway at Station Road is subject to a Traffic Regulation Order restricting access by vehicles >7.5t in weight, which will be suspended temporarily to allow HGV traffic access for construction of the gas connection compound in zone D3.

Zone J

1.2.16 A temporary public right of way will be created if necessary in this zone along the existing road (where there is an existing marked recreational route). The temporary footpath would provide a diversionary route for Footpath 200 to Station Road if it is necessary for the existing footpath where it crosses zone D1 to be stopped up temporarily during gas pipeline construction.

Table 1.1: Works in each zone

Zone	Work (see Schedule 1 of the draft DCO, application document A3.1)
A	1, 2, 3, 4, 8
B	3
C	4, 6, 7, 8
D	4
E	13, 14
F	2
G	9, 10, 11, 12
H	12
I	n/a
J	n/a

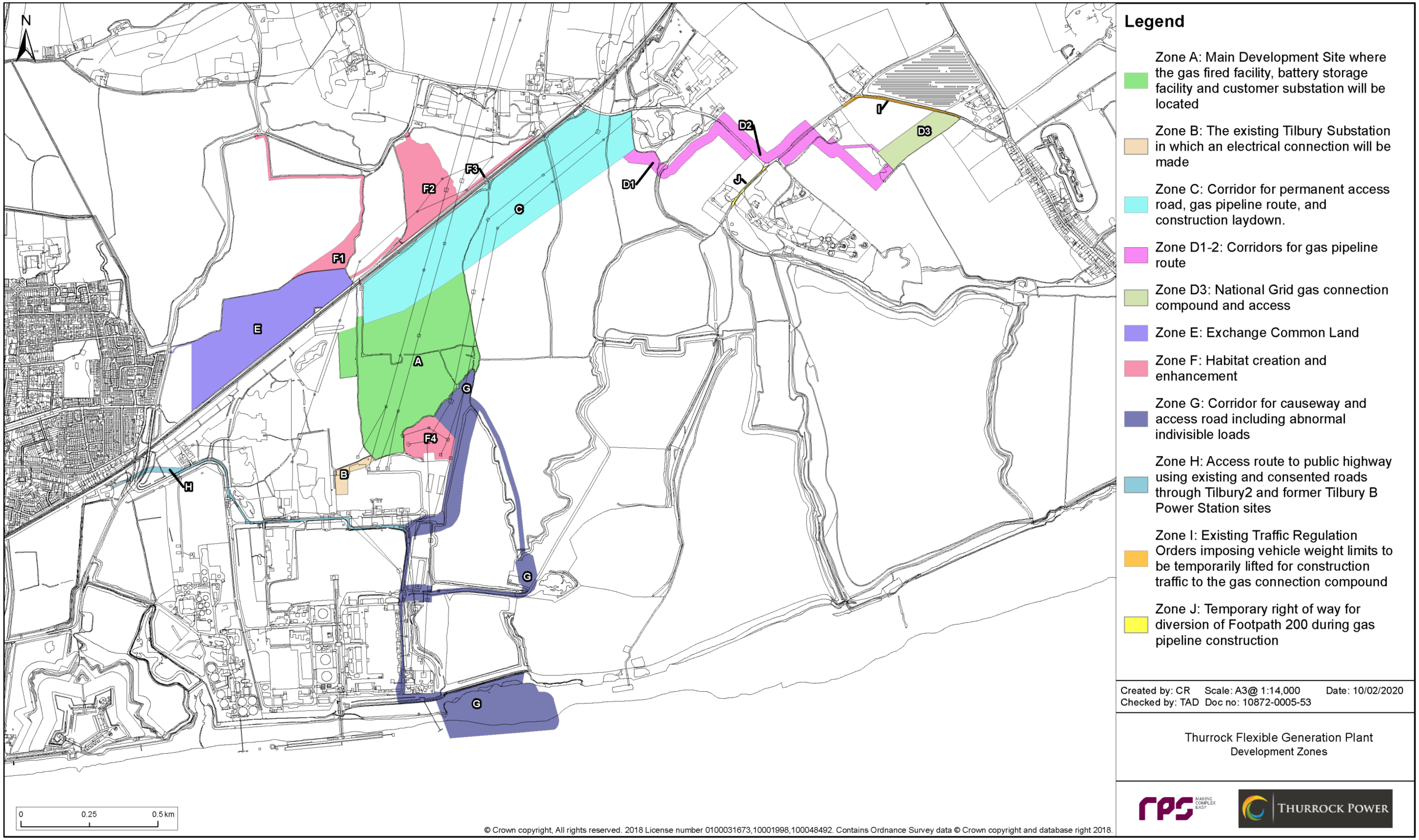

Figure 1.5: Development zones.

2. Development Design

2.1 Main development site – zone A

2.1.1 Within the main development site, the proposed development will comprise a range of buildings, structures and apparatus for the gas engines, batteries, electricity and gas connection points, and staff facilities. These are listed in Table 2.1.

2.1.2 Illustrative layouts for the main development site are shown in Figure 2.1 to Figure 2.4. The final layout is subject to change during detailed design prior to construction. The four illustrative layout options show combinations of two main design parameters that would affect the final site layout: choice of gas engine model (with higher generating capacity models requiring fewer gas engines in total) and choice of containerised battery storage systems or systems housed inside one or more buildings.

Table 2.1: Built development elements on main development site.

Development element	Structures and equipment
Reciprocating gas engines	Up to 48 gas engines and generators with heat exchangers and cooling fans (mounted over one or more of the groups of engines or at ground level) up to 20 m high Up to 48 gas engine exhaust stacks (which may be clustered into fewer groups) up to 40 m high Up to 48 engine exhaust energy recovery systems using a technology to recover heat from gas engine exhausts for electricity generation Engine coolant and lubricant storage and engine selective catalytic reduction (SCR) reagent storage Gas reception compound, control equipment, heating and distribution system Workshop and stores Electrical switchgear
Battery storage	Either: a design based around freestanding prefabricated units consisting of: • a number of battery 'e-houses', in the order of 52 freestanding units similar to double-width shipping containers which may be stacked two high, with roof-mounted air conditioning heat exchangers, the final number and dimensions being subject to detailed design; and • containerised transformer and power conversion system units to provide electrical connection between electricity network and batteries; or, one or more purpose-built buildings containing the above equipment, each option taking up the same space allocated on the site. Electrical switchgear and control equipment
Electrical and other infrastructure	Customer substation equipment comprising 11 kV, 33 kV, 132 kV and 275 kV step-up substations with relays, transformers and associated equipment up to 15 m high Other ancillary structures comprising no higher than the gas engines and generators (20 m) including: • switchgear buildings at 11 kV and 33 kV; • control room and administrative building with welfare facilities; • fire water tank; • lubricating oil and other process consumable storage tanks; and • surface water drainage and runoff controls. Internal access roads and car parking with around 30 spaces Gatehouse, security fencing, lighting and CCTV

2.2 Reciprocating gas engines

2.2.1 The proposed development's fast-start gas engines will be used intermittently, firing up when energy market signals the operator to do so for some or all of the engines. Compared with conventional baseload electricity generation, which cannot easily increase or decrease output quickly, this plant will help to provide National Grid and the UK energy system with the necessary flexibility it needs to manage the transformations with increasing levels of renewable deployment and other measures required to meet the national target for net zero carbon emissions by 2050.

2.2.2 The total electricity export capacity of 600 MWe will be provided by 33 to 48 individual gas engines of between 12.5 and 18.4 MWe capacity (with appropriate de-rating), each comprising the engine itself, electrical generator, air cooling system and exhaust flue. The gas engines will also include a system to generate electricity from exhaust gases, several technologies for which are available. For the purpose of the EIA, use of an organic Rankine cycle system (ORC, i.e. using a non-water working fluid that is efficient at lower temperatures) has been assumed as having the greatest potential for environmental impacts: storage and potential spillage of its working fluid; and exhaust gas temperature drop (affecting exhaust gas dispersion from the stacks).

2.2.3 The gas engines will typically be rated at 52% efficiency[3] overall, including the exhaust heat recovery system, depending on the manufacturer and engine model.

2.2.4 The gas engines, exhaust stacks and associated equipment will be buildings or structures collectively occupying a space up to 135 m wide, 265 m long and 20 m high (for buildings). Illustrative layouts are shown in Figure 2.1 to Figure 2.4.

2.2.5 The engine exhausts may be laid out as individual stacks for each engine or clustered into groups, in either case up to 40 m in height. Individual stacks (in pairs, due to the twin rows of gas engines expected in the illustrative site layout), clusters of four stacks and clusters of six stacks have been assessed as an envelope of design options for the EIA. The outer diameter of each stack is anticipated to be up to approximately 3.2 m for up to the first 30 m of stack height, and up to approximately 2.1 m outer diameter for the remainder. The potentially greater diameter for the lower part of the stack allows for fitting a silencer to the vertical part of the engine exhaust flue if necessary.

2.2.6 The maximum operating time of the gas engines per year could be up to 4,000 hours, subject to agreement with the Environment Agency. A maximum of 4,000 hours has been assessed for the EIA.

2.3 Battery storage

2.3.1 The battery storage system will comprise battery cells, cooling systems, inverters to convert the direct current to alternating current and electrical transformers.

2.3.2 Battery technology, which can import or export large amounts of electricity with no time lag, helps National Grid with the balancing market (balancing transmission requirements as large generation and consumption sources come on- or off-line), the energy market (storing excess generation until it is needed) and with maintaining the narrow frequency range around 50 Hz required for safe transmission network operation.

2.3.3 Depending on the technology provider, the battery systems may be located within a purpose-built building or buildings, or may be freestanding pre-fabricated units similar in appearance to shipping containers, which could be stacked up to two high. In total, batteries with rated electrical output of 150 MWe and storage capacity of up to 600 MWh will be installed.

2.3.4 The battery systems, whether in freestanding containerised units or housed within one or more buildings, will have dimensions in total up to 106 m wide, 106 m long and 10 m high. Illustrative layouts are shown in Figure 2.1 to Figure 2.4.

2.4 Electricity substations and grid connection

2.4.1 The proposed development will connect to the existing National Grid Tilbury 275 kV substation, which is immediately adjacent to the southern boundary of the main development site, via a short section of underground cable(s) lying within the boundary of the main development site and the existing National Grid substation site (zone B).

2.4.2 No changes are proposed to the existing high-voltage overhead lines crossing the main development site or other land within the application boundary. The illustrative development layouts shown in Figure 2.1 to Figure 2.4 take account of safe clearance zones around the existing electricity pylons and overhead wires on the main development site. The existing pylons will remain in place.

2.4.3 Within the main development site will be switchgear, step-up transformers, breakers, disconnectors, current and voltage transformers and relays (collectively the switchgear) to connect the gas engines and batteries to the 275 kV underground export cable(s) that will in turn connect into the National Grid substation adjacent to the south. These will consist of:

- 33 kV switchgear houses, up to two 33 kV to 132 kV step-up transformers and associated switchgear, and up to two 132 kV to 275 kV step-up transformers and associated switchgear for batteries; and
- up to eight 11 kV to 132 kV step-up transformers and associated switchgear, and three 132 to 275 kV step-up transformers and associated switchgear for gas engines.

2.5 Gas connection – zones C and D

2.5.1 A new gas pipeline connection to the existing high-pressure National Grid gas national transmission system (NTS) at Feeder 18 will be required. Feeder 18 is approximately 2 km away from the main development site to the north east. Zones C and D1 provide a corridor for routing the gas pipeline through agricultural land as far as Station Road. In zone D1 the pipeline route will avoid impinging on Low Street Pit local wildlife site and will cross under Public Footpath 200.

[3] lower heating value, ISO3046 test conditions

2.5.2 The pipeline will make two crossings of Station Road in zone D2 and will connect to Feeder 18 where it runs across the field of zone D3. The connection itself will comprise an AGI (National Grid gas compound) for the junction point, with instrumentation kiosks and emergency pressure release valve set in a compound no greater than 50 m square and with structures no more than 5 m in height. It will include a perimeter security fence, screening planting, and access track to the public highway.

2.5.3 The applicant requires flexibility in the DCO for the final location of the NTS connection point, as land along the route of Feeder 18 is subject to a third-party residential development option being agreed with the landowner and is also in proximity to the proposed Lower Thames Crossing development. Zone D3 allows flexibility for the AGI location along the south-eastern boundary of the field. The gas pipeline route corridor in zones C and D has also been designed to allow flexibility in routing the pipeline trench and working area around existing overhead power line pylons/poles and underground utilities including Anglian Water assets that are present.

2.6 Carbon capture readiness

2.6.1 The proposed development is required to be 'Carbon Capture Ready' (CCR) under the Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013, which entails setting aside sufficient land for future carbon capture and storage (CCS) technology to be installed.

2.6.2 Construction of possible future CCS technology on the development site does not form part of the application and current development design. However, as the land reserved for possible CCS is a requirement of the current application, this land-take does form part of the design and is shown in Figure 2.1 to Figure 2.4.

2.7 Drainage

2.7.1 The proposed development will not generate waste water or process effluent during normal operation.

2.7.2 Clean surface runoff will be to the existing watercourse, controlled via sustainable drainage (SuDS) features including runoff attenuation ponds and/or hydrobrake as required. Space for attenuation ponds is shown illustratively on Figure 2.1 to Figure 2.4, consistent with the Conceptual Drainage Strategy (application document A7.3). Flood resilience measures to provide protection of critical infrastructure in the event of a tidal flood defence breach will be provided, which will comprise measures such as raising the floor levels and/or providing bunds for these items.

2.7.3 The proposed development will not have a foul sewer connection. Foul drainage from staff welfare facilities on site will be either to a packaged biological foul treatment plant with discharge to the surface water system or to a storage tank for off-site disposal via road tanker.

2.8 Operation and maintenance

2.8.1 The flexible generation plant may operate continuously or at intervals during the day, evening and infrequently at night, depending on the power generation and storage requirements of National Grid. Subject to agreement with the Environment Agency, the maximum annual operating time of the gas engines is not expected to exceed 4,000 hours.

2.8.2 The facility is expected to have a full-time staff of four to six full-time equivalent (FTE) during operation to undertake inspection, monitoring, maintenance, repairs and make adjustments. The main functions will be controlled remotely. In total there are likely to be 16–20 full-time equivalent (FTE) employees working in shift patterns. Control room, administrative and staff welfare buildings or prefabricated units will be provided for staff on site.

2.8.3 Up to one major maintenance period (duration three weeks) and four minor maintenance visits (duration one week each) are expected per annum, estimated to require up to 20 and six staff daily respectively.

2.8.4 Motion-activated directional security lighting may be used at the main development site and the AGI for gas connection (Zone D3), but full-time external lighting is not proposed. The causeway is likely to require a battery powered navigation safety light. The tallest structures on site during operation will be the exhaust stacks at 40 m above ground level. This is well below the 150 m height at which tall structure lighting is mandated (Article 219 of the UK Air Navigation Order (ANO) 2009) and no requirement for stack lighting has been advised during consultation with the Civil Aviation Authority (CAA), London City Airport or Southend Airport.

2.8.5 Up to 600 m^3 of engine lubricating oil and 60 m^3 of engine coolant (containing glycol antifreeze) will be stored on site. Reagent for the selective catalytic reduction (SCR) air pollution control (APC) system for the gas engines will also be stored on site: depending on APC manufacturer, this may be either urea 24.5% solution aqueous ammonia, with aqueous ammonia the more likely choice. These substances will be stored in double skinned tanks with appropriate containment bunds to ensure no release to soil or the surface water drainage system in the event of a spillage or tank leak, and a leak detection system to alert the operator.

2.8.6 If ammonia solution is used, which is a hazardous substance, no more than 50 tonnes at no more than 25% concentration will be stored on site, i.e. below the threshold at which the proposed development would require a Hazardous Substances Consent (HSC). If urea is used, the maximum storage would be 50 tonnes at 40% concentration.

2.8.7 In the event that an ORC system is chosen as the exhaust heat recovery technology, the working fluid of an ORC system will be subject to further design, but is likely to be either cyclopentane (C_5H_{10}) or a hydrofluorocarbon refrigerant gas such as R245fa. This is expected to be supplied as a sealed, ready-filled system with no storage of working fluid on site or top-up required during maintenance. Cyclopentane is a flammable substance but the quantity required in an ORC system would be well below the applicable lower-tier COMAH threshold of 10t stored (if at a temperature above its boiling point). Other refrigerant gases have global warming effects if released, which as assessed in Volume 3, Chapter 14: Climate Change.

2.8.8 Environmental management of the flexible generation plant will be regulated by the Environment Agency using the facility's Environmental Permit, which will specify operating techniques and will include a regular schedule of audits. The permit will also regulate discharges and emissions from the facility, specifying limits, monitoring and reporting of these. Thurrock Power will implement an ISO14001 or equivalent Environmental Management System (EMS) as required by the Environmental Permit.

2.8.9 Thurrock Power will operate the flexible generation plant in accordance with legislation and regulatory requirements for environmental protection and in accordance with its duties under the Health and Safety at Work etc. Act 1974 as amended and associated statutory instruments. Volume 5, Appendix 2.3: Accident and Emergency Management summarises measures that will be taken as part of the operation of the facility to control the potential for major accident hazards and Thurrock Power's principles for emergency management, including gas safety and fire prevention and control.

2.8.10 Taking into account the existing legislative controls and Thurrock Power's management approach, regulated by the Environment Agency and the Health and Safety Executive, the risk of accidents and disasters is expected to be as low as reasonably practicable. Major accidents or disasters with potential for significant environmental effects are not considered to be likely.

2.8.11 A Flood Evacuation Plan (application document A8.5) has been developed, establishing a response procedure for flood hazard (such as tidal defence breaches) to manage risks to site users.

2.9 Road access

2.9.1 Two permanent road accesses will be provided. The first will be through zone C to the public highway at Station Road. The second will be via zones H and G from the highway at the new section of A1089 when that has been constructed as part of the Tilbury2 development.

2.9.2 As set out above, there will be minimal access for traffic required during normal operation, as the facility will have an on-site staff of four to six FTE. Either or both of the permanent road access routes will be used for operational and maintenance staff (as described above) and for delivery of SCR reagent by road tanker, for which around one vehicle per two to three days is estimated to be required.

2.9.3 Up to 30 car parking spaces will be provided within the main development site.

2.9.4 Section 3.3 details road access during construction and in the event of a major component failure (e.g. transformer) requiring an abnormal load delivery in operation.

2.10 Causeway

2.10.1 A causeway will be constructed to enable delivery by barge of certain abnormal indivisible loads (AILs) that are too large to transport on the highway network. Its construction and use for AIL delivery are described in Section 3.2 and Section 3.3. The causeway will be located at the south of the former Tilbury B power station site, south of the flexible generation plant main development site.

2.10.2 An illustrative design for the causeway is shown in Figure 2.5. The design envelope dimensions used for the assessment of impacts are detailed in Table 2.2.

2.10.3 The causeway will be approximately 195 m long, approximately 12.5 m wide on its top running surface and 24 m wide at its base, sloping upwards towards shore to meet ground level at the top of the foreshore where there is an existing sea defence wall. Its maximum height relative to the existing ground surface would be approximately 2.7 m and its maximum height aOD approximately 4 m. The sides of the causeway will be formed to a stable slope and protected from erosion by tidal currents by rock filled reno mattresses or suitably sized rock riprap. At the river end of the causeway it will terminate in a flat faced gabion wall next to which the delivery barges to be beached in a berthing pocket created by dredging and removing rocks as required. Working platforms for a mobile crane (used to raise and lower the barge ramp) will be provided as part of the causeway at its river end.

2.10.4 The illustrative causeway design is curved in plan in order to accommodate both the causeway and a beached delivery barge within an area of acceptable foreshore gradient. Further out into the river channel, the bed has been dredged for navigation purposes and therefore becomes significantly steeper and unsuitable for beaching a vessel. The causeway and beached barge, when present, will be positioned a safe distance from the navigation channel.

2.10.5 The head of the causeway will meet the base of the existing sea wall. A flood gate consisting of a slot in barrier system with removable posts will be constructed in the sea wall to allow passage of vehicles onto the causeway.

2.10.6 To the east of the causeway, dredged material from its construction will be used to create an area of saltmarsh, extending and enhancing existing saltmarsh to compensate for the area lost due to causeway construction.

2.10.7 The causeway will remain in place as a permanent structure during the proposed development's operating lifetime but will not be in routine use after the construction stage. It will be retained for use in the exceptional circumstance of a major component failure (e.g. a transformer block) during operation and no alternative access being available.

Table 2.2: Causeway and berthing pocket parameters for assessment.

Parameter	Dimension	Notes
Maximum area for causeway, berthing pocket, dredging activities and saltmarsh creation	As shown on the Deemed Marine License Co-ordinate Plan (application document A2.14)	
Causeway – max length, max width & max height	L: 195 m W: 24 m H: 2.7 m	Length of causeway without crane area: 181 m Crane area width (perpendicular to causeway): 14 m Crane area length (perpendicular to causeway): 47.5 m Width of causeway footprint: 24 m Width of causeway running surface: 12.5 m (min) Maximum height is at saltmarsh edge, above existing ground surface
Causeway – area of footprint	5,380 m^2	
Causeway – volume of material to be removed	2,900 m^3	
Causeway – volume excavated above MHW	220 m^3	
Causeway – volume of rock required to build	8,500 m^3	Includes crane area
Causeway – average depth of material removed	0.5 m	Nominal initial design estimate
Causeway – loss of saltmarsh	610 m^2	
Causeway – loss of intertidal mudflats	4,700 m^2	
Causeway – loss of intertidal rock	70 m^2	
Causeway – elevation at sea wall	+4 m aOD	
Causeway – foundation & construction design	Solid foundations, 2 (min) layers of geotextile and crushed rock infill. Nominal 500 mm thick precast concrete pad running surface over well graded gravel bedding layer. Side slopes comprise rock filled reno mattress.	
Berthing pocket – maximum dimensions	L: 200 m W: 70 m	
Berthing pocket – total area to be dredged	13,900 m^2	
Berthing pocket – total area of flat grounding area	6,470 m^2	
Berthing pocket – volume of material to be removed	13,200 m^3	
Berthing pocket – maximum dredged depth	2.1 m	Nominal initial design estimate. Average: 0.95 m
Berthing pocket – side slope angles	1 (v):3 (h)	
Berthing pocket - bathymetry	PLA Nautical Chart 337	
Heavy Lift Barge - dimensions	Deadweight: 2,211 te L (o.a): 80 m Beam: 16 m (max) Max draught: 3.5 m Under keel clearance: 0.5 m	Based on *Terra Marique*
Flood gate – Max width and height	W: 14 m H: 2.8 m	Dimensions subject to detailed design. Width assumes 12.5 m running width and tie-ins to existing sea wall.
Flood gate – crest level	+6.8 m aOD	
Construction – volume deposited locally	11,000 m^3	Material deposited locally to enable saltmarsh creation and/or enhancement

Parameter	Dimension	Notes
Construction – volume requiring WID	5,200 m^3	Based on 16,100 m^3 of dredge in total required
Construction – area created for saltmarsh	11,000 m^2 to 13,000 m^2	

2.11 Resources, residues and emissions

2.11.1 The main natural resource consumed by the flexible generation plant will be natural gas, estimated at up to around 325,000 tonnes per annum with the maximum 4,000 operating hours for the full 600 MWe gas-fired generation capacity.

2.11.2 Annual consumption of engine lubrication oil and coolant is estimated as up to 660 m^3. SCR reagent consumption, either urea or ammonia solution, is estimated as up to 6,000 m^3 per annum of pre-mixed solution.

2.11.3 Process emissions would comprise air pollutants and greenhouse gases released from the gas engine stacks and the noise of the flexible generation plant in operation. These are detailed in Volume 3, Chapter 12: Air Quality, Chapter 11: Noise and Vibration and Chapter 14: Climate Change. There will be no process effluent discharges.

2.11.4 The main residues and wastes will be used lubrication oil and coolant, with quantities no greater than the consumption listed above. These substances will be disposed via a licensed waste carrier to appropriate treatment for each material.

2.12 Design evolution and alternatives

2.12.1 The design has been developed iteratively during environmental assessment process. The design evolution and alternatives studied (including site location and choice of flexible generation plant technology) are detailed in Volume 2, Chapter 3: Consideration of Alternatives.

2.12.2 Several layout options within the main development site in zone A for the gas engines, batteries and substation components have been considered. The alternative layouts have not been found to significantly affect potential environmental impacts, except for the total length of drainage ditch (providing water vole habitat) that will be disturbed.

2.12.3 The proposed layout has been selected primarily on practicality grounds, taking into account the constraints of the existing high-voltage overhead power lines crossing the site. The proposed development areas and internal access roads within the site, shown illustratively in Figure 2.1 to Figure 2.4, have been moved inwards during design iteration to maximise the length of existing boundary ditch that can be retained undisturbed (with suitable standoff distance within which no construction activity will take place).

2.12.4 A number of potential construction access routes to the main development site have been considered and were assessed at PEIR stage. These involved construction of haul roads across agricultural and Common Land, widening and junction improvements for minor public roads for use by heavy vehicles (including AILs) and craning large components across the railway. Subsequently, the withdrawal of previous development proposals for the former Tilbury B power station site have made a construction access route through that site possible, together with use of barge transport for the largest AILs. This reduces the need for haul road construction on agricultural and Common Land and avoids the impact of highway disruption from road delivery of the largest AILs.

2.13 Embedded ('designed-in') mitigation

2.13.1 Details of development design elements that provide embedded mitigation of environmental impacts are given in Section 2.8 of each topic chapter in Volume 3.

2.13.2 All embedded mitigation measures (together with recommended further mitigation, enhancement and monitoring commitments, where required), are set out in Volume 5, Appendix 2.1: Mitigation, Enhancement and Monitoring Commitments.

2.14 Design envelope and limits of deviation

2.14.1 As described in Section 1.2, the applicant requires flexibility in the DCO and a design envelope has therefore been defined for the purpose of EIA.

2.14.2 Assessment parameters have been defined in each topic chapter in Volume 3 that provide a reasonable maximum design envelope relevant to each assessment, based on the design and construction details described in this chapter. These are both physical parameters, such as building dimensions, and other parameters such as duration or timing of activity, methods employed, and options for continued use or decommissioning at the end of the flexible generation plant's initial 35-year design life.

2.14.3 The assessment parameters have been carefully considered to ensure that where design flexibility is sought within the overall design envelope described in this chapter, reasonable maximum impacts and resulting effects have been assessed. Topic-specific limits to parameter ranges are defined in the topic chapters in Volume 3 where appropriate, based on the degree of variation in parameters that would not materially affect the assessment of that topic

2.14.4 Overall limits of deviation, in terms of physical design of the development, are the boundaries of development areas shown in the Works Plans (application document A2.3) and the maximum dimensional envelopes specified in the draft DCO requirements (Schedule 2 of application document A3.1).

Site Plan 12.5MW Engines / Battery Containers

Figure 2.1: Illustrative main development site layout (option 1A).

Figure 2.2: Illustrative main development site layout (option 1B).

Figure 2.3: Illustrative main development site layout (option 2A).

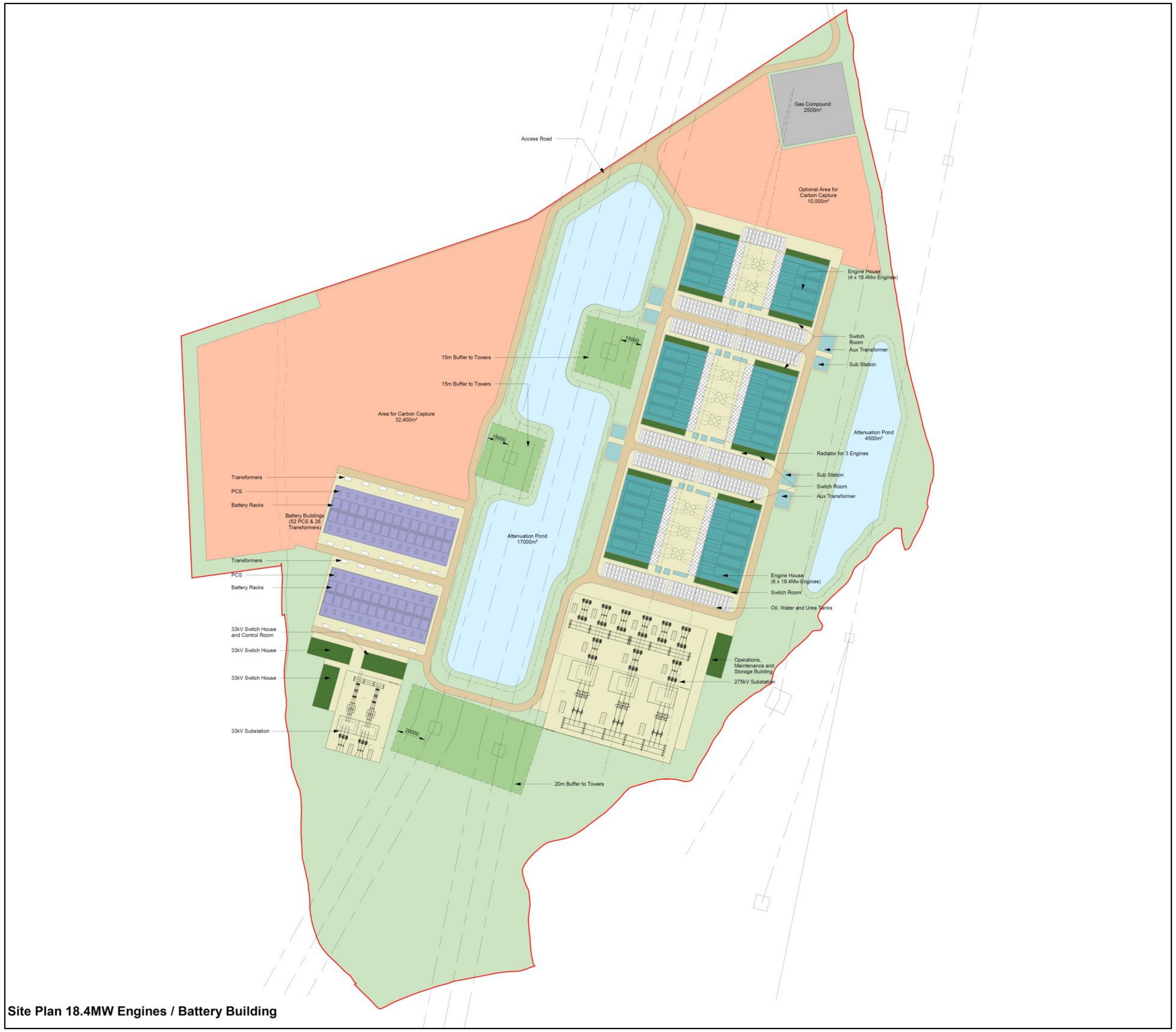

Figure 2.4: Illustrative main development site layout (option 2B).

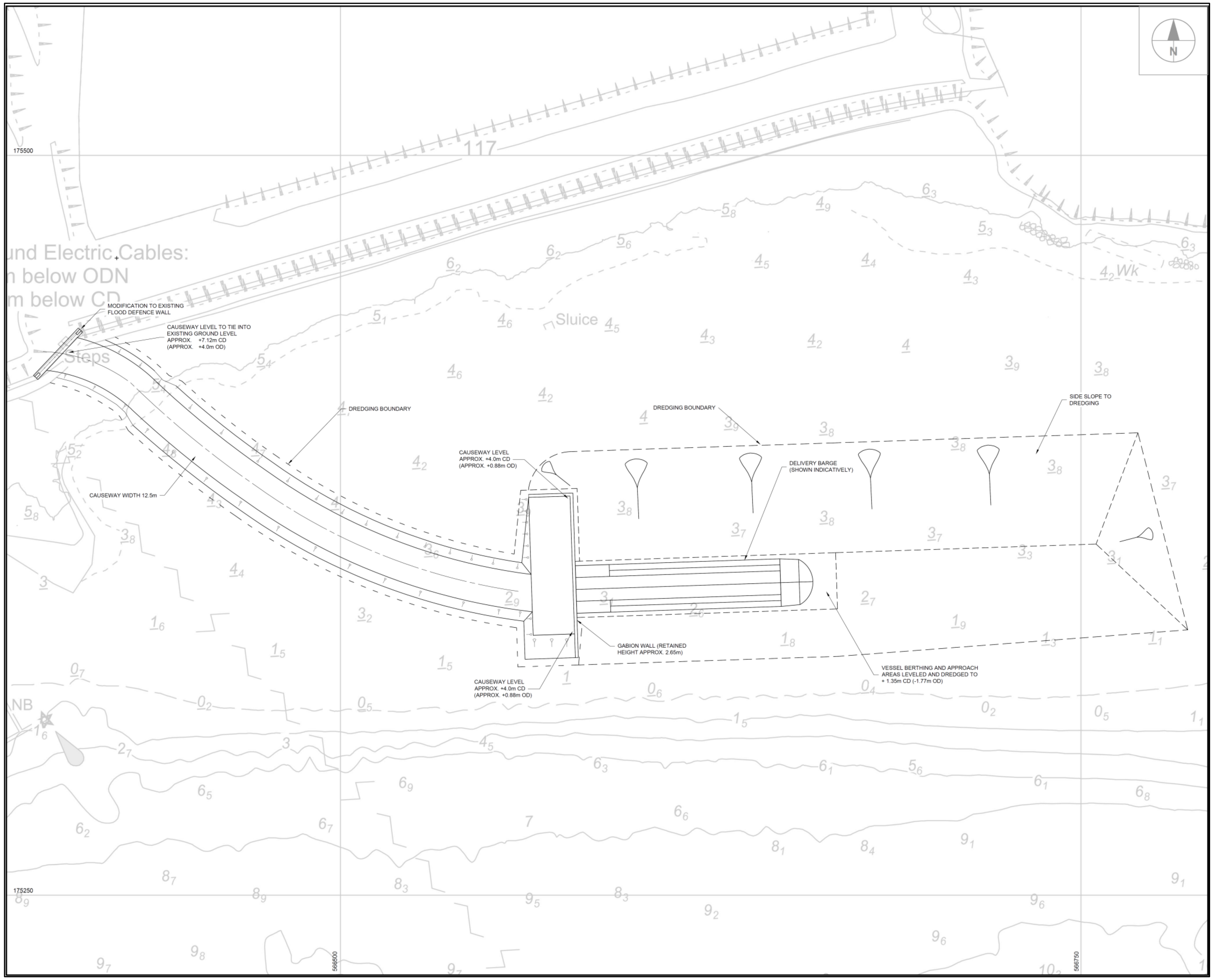

Figure 2.5: Illustrative causeway design.

3. Construction and Decommissioning

3.1 Construction programme

3.1.1 Subject to being granted development consent and subsequent Final Investment Decision, the earliest date of development start would be in quarter two (Q2) 2021.

3.1.2 Advance enabling works that do not require consents or licenses may be undertaken during 2020 to establish the conditions (e.g. through grass mix planting) for providing exchange Common Land, protected species management and habitat creation.

3.1.3 There may also be a further period of preliminary works, following the DCO being made but prior to discharge of all requirements necessary for commencement of the main construction works, to undertake further enabling activities requiring consent such as ditch excavation to establish water vole habitat or geo-environmental and archaeological excavations.

3.1.4 The earliest start of construction work on the main development site (zone A), causeway, roads and gas connection is expected to be Q2 2021.

3.1.5 The proposed development may then be constructed as a whole in a single phase of work or may be split into three phases, subject to the Final Investment Decision.

3.1.6 National Grid intends to have completed the necessary works for the proposed development's electrical export connection within Tilbury Substation by Q1 2022.

Enabling works

3.1.7 Enabling works would be in two stages, the first being works that can be undertaken without consents or licenses provided through the DCO and the second being any further works authorised by the DCO that can be carried out prior to discharge of all requirements:

- 2020 and Q1 2021: advance enabling works to establish conditions for provision of exchange common land and habitat creation / enhancement outside main development site; and
- (if required) Q2-3 2021: preliminary works such as excavation for ditches or site investigation and potential protected species relocation.

Single phase construction

3.1.8 The minimum construction period for a single-phase development is expected to be 12 months and maximum 24 months. Depending on the requirement for preliminary works and time period for discharge of requirements, the start of construction may be in Q2 2021 or later in the year. Assuming a Q2 start and a minimum 12 month programme, this would be generally as follows.

- Q2-Q3 2021: main development site preparation and ground works, construction of causeway and construction access roads, start of gas pipeline trenching;
- Q4 2021: construction/installation of gas engines, batteries and associated equipment; connection of gas supply pipeline and electricity export cables;
- Q4 2021 – Q1 2022: commissioning and energisation; completion of landscaping and permanent access road; and
- end of Q1 2022: facility is available for operation.

Three phase construction

3.1.9 If the proposed development is constructed in three phases, these are anticipated to be as follows. Each phase may last 18 months and the overall construction programme may last four and a half to six years, i.e. each phase may be back to back or there may be a gaps of around nine months between phases, depending on market conditions.

Phase 1

3.1.10 The first 300 MW of gas engines and one on-site substation would be constructed with necessary ground works, drainage, control equipment and internal access roads for that part of the main development site (containing and serving the first 300 MW of gas engines) only.

3.1.11 The causeway, access roads, gas pipeline and electrical export cables with capacity for the full 750 MW development (600 MW gas engines and 150 MW batteries) would all be installed in this first construction phase. All exchange Common Land and habitat creation / enhancement would be established, together with protected species management for the disturbed part of zone A and other areas affected within the order limits during this phase.

Phase 2

3.1.12 The second 300 MW of gas engines, substation and associated equipment would be constructed in the same way as for phase 1.

Phase 3

3.1.13 The 150 MW battery storage facility, substation and associated equipment would be constructed in the same way as for phase 1.

3.2 Construction methods

Construction environmental management

3.2.1 Construction of the proposed development will be managed under a Code of Construction Practice (CoCP, application document A8.6) that sets out the principles of good environmental management to be followed in order to avoid or minimise environmental impacts. This includes principles for management of construction noise, dust, traffic, materials storage and waste management, drainage and ecological protection.

3.2.2 The CoCP will be supported by detailed Construction Method Statements to be produced by the lead construction contractor, which will provide method statements for construction activities detailing how the requirements of the CoCP are met.

3.2.3 An Outline Construction Traffic Management Plan (CTMP) with Outline Construction Worker Travel Plan (CWTP) have been produced; these are application documents A8.8 and A8.9.

Construction activities and plant

3.2.4 In overview, construction activities will comprise:

- pre-construction work to provide ecological management and Common Land exchange;
- construction of causeway, haul routes and laydown areas;
- site clearance and provision of temporary drainage;
- earthworks and construction of foundations;
- trenching for gas pipeline and electrical export cables;
- installation of pre-manufactured components, i.e. gas engines and stacks, batteries, substation and control equipment;
- erection and mechanical and electrical fit-out of buildings or enclosures;
- commissioning; and
- landscaping, restoration of temporary construction areas and ongoing habitat creation and management.

3.2.5 Typical construction plant to be used will include excavators, drilling rigs, graders and haulage vehicles, mobile and tower cranes, heavy and light goods vehicles.

3.2.6 Piling is expected to be required for foundations of certain structures on the main development site and may use impact/driven or vibratory techniques, to be defined following further design and subject to the recommendations of a Piling Risk Assessment to be undertaken prior to construction.

3.2.7 Crossings of watercourses, hedges and other barriers for the gas pipeline route will use trenched or trenchless construction techniques (e.g. horizontal directional drilling, HDD) as appropriate to each location. Crossings and methods are listed in Section 3.3. The maximum trench depth is expected to be 4 m and the minimum burial depth of the gas pipe 1.5 m.

3.2.8 Directional lighting may be required during normal construction hours in winter. Outside normal construction working hours, motion-activated directional security lighting may be used at the main development site (zone A), AGI for gas connection (zone D3) and any laydown area within zone C, but the construction areas will not be lit full-time at night except during any period of continuous working (described in paragraph 3.2.16) or other exceptional circumstances. If cranes of >60 m are used in construction, which is likely for the 40 m stacks, they will be equipped with low intensity steady red lighting as specified in CAA briefing document 'Guidance to Crane Operators on Aviation Lighting and Notification' (March 2014). Cranes of >90 m or >150 m, with additional lighting requirements, are not expected to be used.

3.2.9 The causeway will be constructed as described in the report Concept Design of Causeway for Delivery of AILs (application document A7.8). Construction in November–March inclusive would not be undertaken in order to avoid impacts on wintering birds, unless further evidence supports a conclusion that unacceptable impacts would not occur and/or appropriate mitigation can be agreed with Natural England, as set out in the Habitats Regulations Assessment Report (application document A5.2).

3.2.10 To construct the causeway, the very soft foreshore sediment will be removed at low tide and backfilled with crushed rock fill placed on a geotextile (to prevent the rock sinking into the bed material below). The causeway will then be formed from further crushed rock aggregate, reinforced by one or more further layers of geotextile. The causeway crest will be formed by rock filled gabions or precast concrete pads.

3.2.11 The causeway is expected to be constructed by backhoe excavator working progressively outward from the river bank, replacing the excavated/dredged material with the crushed rock fill, laying the geotextile layers and completing the rock mound to the design level, prior to placing the crest gabions or precast concrete pads. The excavator will form a working platform to support itself as it advances. Geotextile/geogrid will be placed below the rock fill, and further geotextile/geogrid layers placed within the rock fill layer, to raise the tensile strength and assist with spreading the load.

3.2.12 The anticipated dredging method for the barge beaching pocket is by a floating marine dredging plant, which may be a backhoe dredger, trailer suction hoper dredger, cutter suction dredger or a water injection dredger. The dredging method and plant selected will depend on further engineering studies into the properties of the material to be dredged the availability of dredgers within the London area at the time the works are to be constructed. Approximately 16,100 m^3 of material is expected to be dredged. Approximately 11,000 m^3 of this material is expected to be deposited locally for saltmarsh creation or enhancement.

3.2.13 A gated opening in the flood defence barrier at the head of the causeway will be made to allow passage of the AIL vehicles. The flood gate will consist of a slot in barrier system with removable posts.

Construction working hours

3.2.14 Normal construction working hours will be Monday to Friday 08:00–18:00 and Saturday 08:00–13:00. No Sunday, bank holiday or night working is proposed save as described below.

1.3.1 Up to an hour before and after the normal construction working hours, the following activities may be undertaken:

- arrival and departure of the workforce at the site and movement around the main development site that does not require the use of plant;
- site inspections and safety checks; and
- site housekeeping that does not require the use of plant.

3.2.15 Non-noisy activities such as fit-out within buildings may be undertaken outside those hours where these would not cause disturbance off-site.

3.2.16 It is possible that certain construction activities that cannot be interrupted, such as a continuous concrete pour, may be required. Up to 10 days' 24-hour construction working per phase for such continuous activity is assumed (not necessarily consecutive) as a maximum for assessment in this ES.

Construction working areas and laydown

3.2.17 The main construction working and laydown areas will be contained within zone A, the main development site.

3.2.18 Working corridors of up to 20 m width for construction of temporary and permanent access roads and 23 m for the gas pipeline route are assumed (within the Order Limits), to allow for construction plant access, spoil and materials laydown. An illustrative cross-section of the working area for gas pipeline trenching and installation is shown in the Gas Connection Concept Design Report (application document A7.4).

3.2.19 Up to 2 hectares in total may be used for temporary construction compound(s) and materials laydown within zone C.

Construction waste

3.2.20 The proposed development will largely be assembled from components that have been pre-manufactured off-site, such as the gas engines, substation components, batteries and gas pipeline sections. Construction waste from assembling and installing these components on-site would be minimal.

3.2.21 Aside from sections of access route on the former Tilbury B Power Station site and ashfields, the development will be constructed on greenfield land. The desk study and risk assessment of potential ground contamination, reported in Volume 3, Chapter 16: Geology, Hydrogeology and Ground Conditions and its appendices in Volume 6, does not indicate that significant ground contamination requiring remediation or disposal of contaminated spoil is expected.

3.2.22 Construction of the access road in zone G is estimated to require the excavation of between 10,000 m^2 and 22,000 m^2 of spoil, depending on the access road route, from the area of former ash fields that is currently being used for land raising. As well as the road route, the volume of material to be excavated would depend on the height that the land raising has reached at the time of construction. It is expected that the material excavated can be re-deposited within the land raising site either as part of the ongoing land-raising operations under the existing landfill permit or, if necessary, as an additional operation subject to a waste recovery permit.

3.2.23 Dredged material from preparation of the barge beaching pocket and causeway construction will be disposed of in accordance with a Dredging License. As described above, a large proportion of dredged sediment is proposed to be re-used immediately to the east of the causeway for saltmarsh creation. Initial sediment analysis, detailed in Volume 6, Appendix 17.2: Hydrodynamic Modelling and Sediment Assessment, indicates that the dredged material is unlikely to contain contamination of concern.

3.2.24 The CoCP (application document A8.6) includes good practice measures for managing waste generated during construction. All waste generated will be disposed of by a suitably licensed waste contractor.

3.2.25 Potential transport of clean soil from foundation excavations (the most significant quantity of waste that may arise), if this cannot be accommodated on-site, has been allowed for in the estimation of construction traffic which is assessed in Volume 3, Chapter 10: Traffic and Transport.

3.2.26 Taking these points into consideration, construction waste arisings of a nature or quantity to have potential for likely significant environmental effects are not predicted.

3.3 Crossings

3.3.1 The gas pipeline and access road routes will cross a number of landscape features that could be impacted temporarily during construction or long-term where the road is present. A schedule of crossings is shown in

3.3.2 Table 3.1 and Figure 3.1 to Figure 3.5 for watercourses, hedges or areas of woodland, public roads, public rights of way and private roads/tracks.

3.3.3 Open-cut trenches or trenchless construction techniques (using horizontal directional drilling – HDD) are available for installation of the gas pipeline and electricity export cables. HDD can avoid physical disturbance to above-ground or shallow below-ground features by drilling under them, but is typically has a higher cost then open-cut trenching, is most suited to straight sections, and requires land for drilling compounds at the surface. The main construction technique will be open-cut trenching but HDD will be used to avoid impacts to woodland and watercourses where specified below.

3.3.4 Where access roads cross watercourses, a culvert will be provided to maintain flow in the existing channel.

3.3.5 The pipeline and access road routes will also cross a number of underground utilities. Appropriate protective provisions for works affecting utilities are provided in the draft DCO.

Table 3.1: Crossing schedule.

Ref.	Development asset	Feature	Crossing method	Mitigation measures
3a	Gas pipeline	Semi-natural broad-leaved woodland	HDD	Construction plant movements to be routed to avoid this
3b	Gas pipeline	Track	HDD	n/a
5a	Gas pipeline	Track	Trenched	Track to be reinstated post-construction
6a	Gas pipeline	Intact hedge – native species-poor	Trenched	Final crossing point to be determined following pre-construction bat roost and nesting bird surveys; hedge to be reinstated following construction; temporary hedge to be provided while replacement hedge is establishing
6d	Gas pipeline	Station Road	Trenched	Temporary closure of road and traffic diversion for up to 1 week
6e	Gas pipeline	Intact hedge – native species-rich	Trenched	Final crossing point to be determined following pre-construction bat roost and nesting bird surveys; hedge to be reinstated following construction; temporary hedge to be provided while replacement hedge is establishing
7b	Gas pipeline	Station road	Trenched	Temporary closure of road and traffic diversion for up to 1 week
7d	Gas pipeline	Intact hedge – native species-rich	Trenched	Final crossing point to be determined following pre-construction bat roost and nesting bird surveys; hedge to be reinstated following construction; temporary hedge to be provided while replacement hedge is establishing
8a	Gas pipeline	Watercourse	HDD	n/a
8b	Gas pipeline	Footpath FP200	HDD	Footpath 200 temporarily closed and diverted for up to one month through Zone J
8c	Gas pipeline	Woodland	HDD	n/a
8d	Gas pipeline	Watercourse	HDD	n/a
11a	Gas pipeline	Watercourse – EA Main River	HDD	n/a
12a	Gas pipeline	Track	Trenched	Track to be reinstated post-construction
12b	Gas pipeline	Watercourse	HDD	n/a
15a	Gas pipeline	Watercourse	HDD	n/a
16b	Gas pipeline	Watercourse – EA Main River	HDD	n/a
16c	Access – temporary	Watercourse – EA Main River	Culvert	Mammal ledge for water voles to be provided
19a	Gas pipeline	Track	Trenched	Track to be reinstated post-construction
19b	Gas pipeline	Watercourse	HDD	n/a
21a	Gas pipeline	Watercourse	HDD	n/a

Ref.	Development asset	Feature	Crossing method	Mitigation measures
26a	Access – permanent	Track	n/a	Track to be reinstated post-construction
26b	Access – permanent	Watercourse	Culvert	Mammal ledge for water voles to be provided
30a	Access – permanent	Watercourse	Culvert	Mammal ledge for water voles to be provided
40a	Access – permanent	Sea wall	Gateway in wall	Slotted post gate to maintain flood defence integrity while not in use; use only at low tide
40b	Access – permanent	Thames Estuary Path and National Cycle Route 13	At grade	Banksman to manage construction traffic crossing
53a	Access – permanent	Watercourse	Re-route	Short section of ditch to be re-routed, if necessary, along edge of access road
66a	Access – permanent	Watercourse	Culvert	Mammal ledge for water voles to be provided
67a	Access – permanent	Watercourse	Culvert	Mammal ledge for water voles to be provided
68a	Underground cable	Watercourse	HDD	n/a
68b	Access – temporary	Watercourse	Culvert	Mammal ledge for water voles to be provided
69	Access – permanent	Watercourse	Culvert	Mammal ledge for water voles to be provided

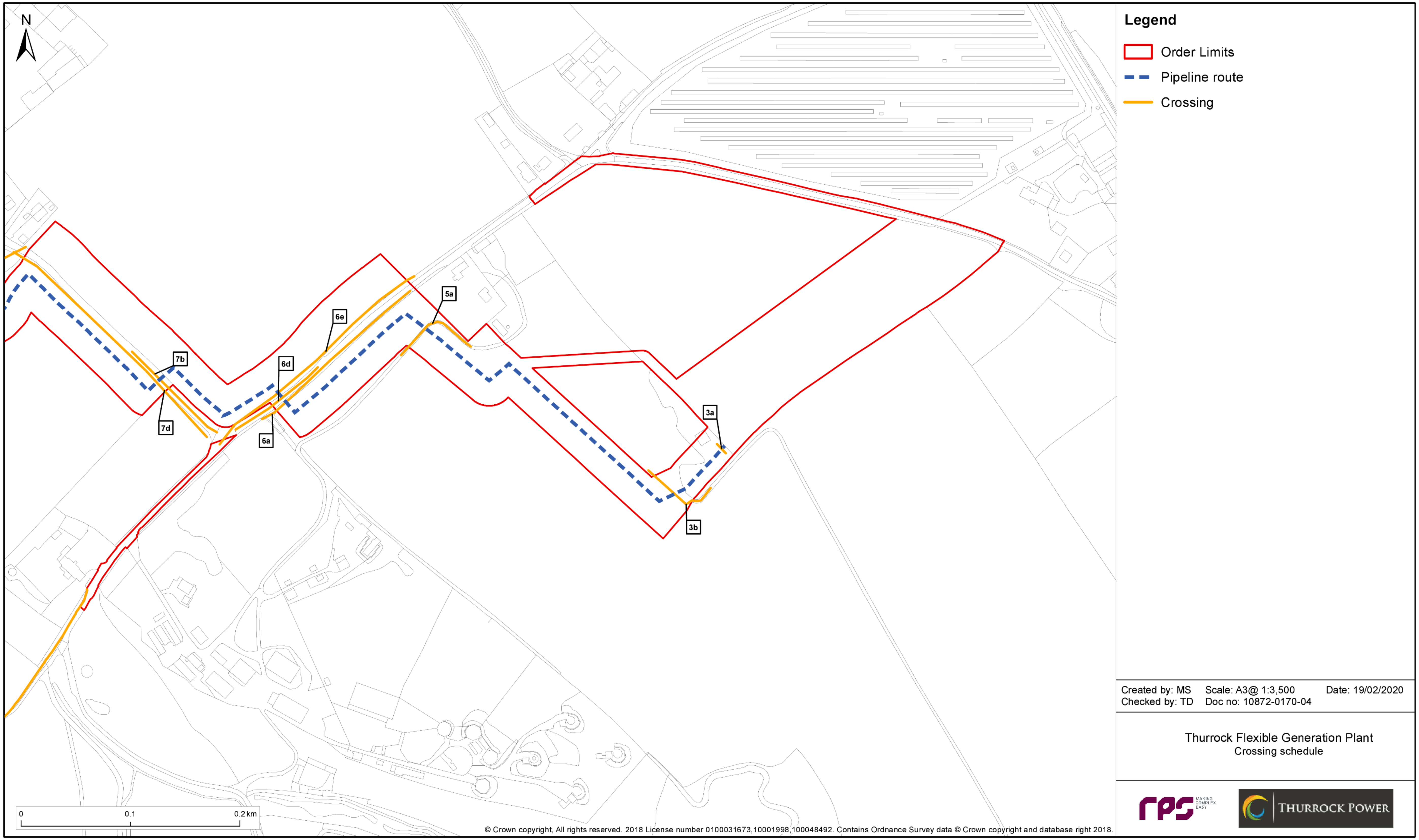

Figure 3.1: Gas pipeline, underground cable and access road crossings – sheet 1.

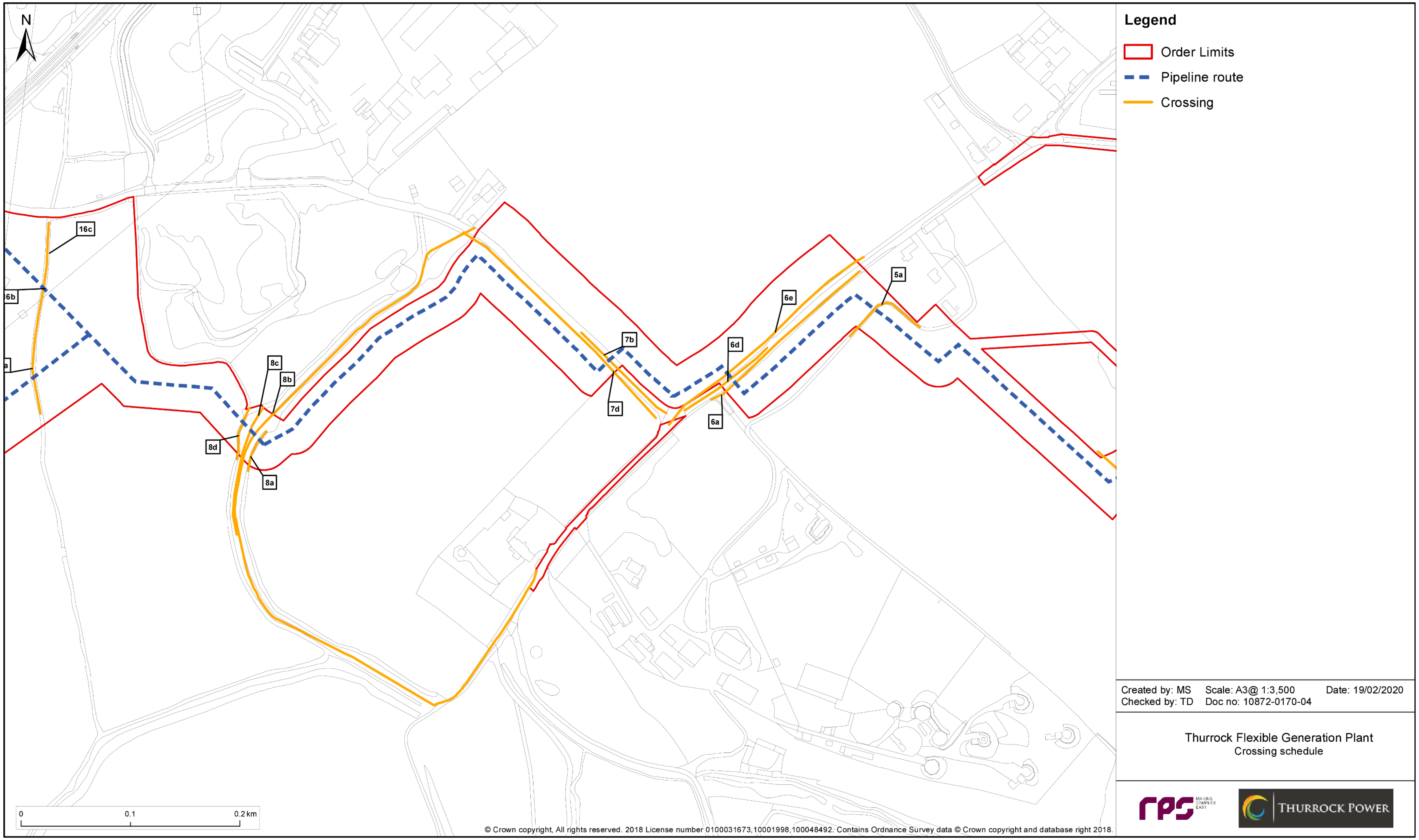

Figure 3.2: Gas pipeline, underground cable and access road crossings – sheet 2.

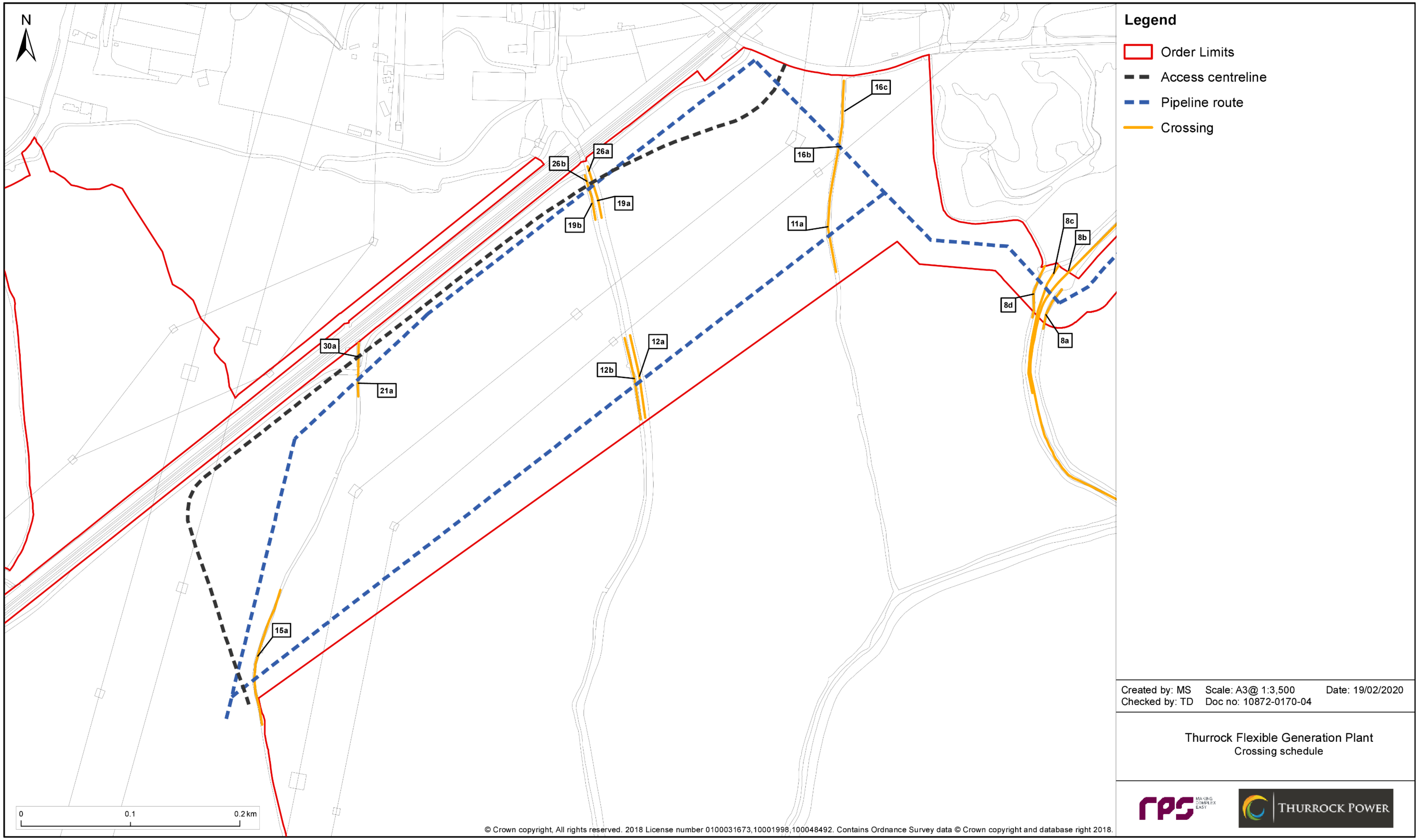

Figure 3.3: Gas pipeline, underground cable and access road crossings – sheet 3.

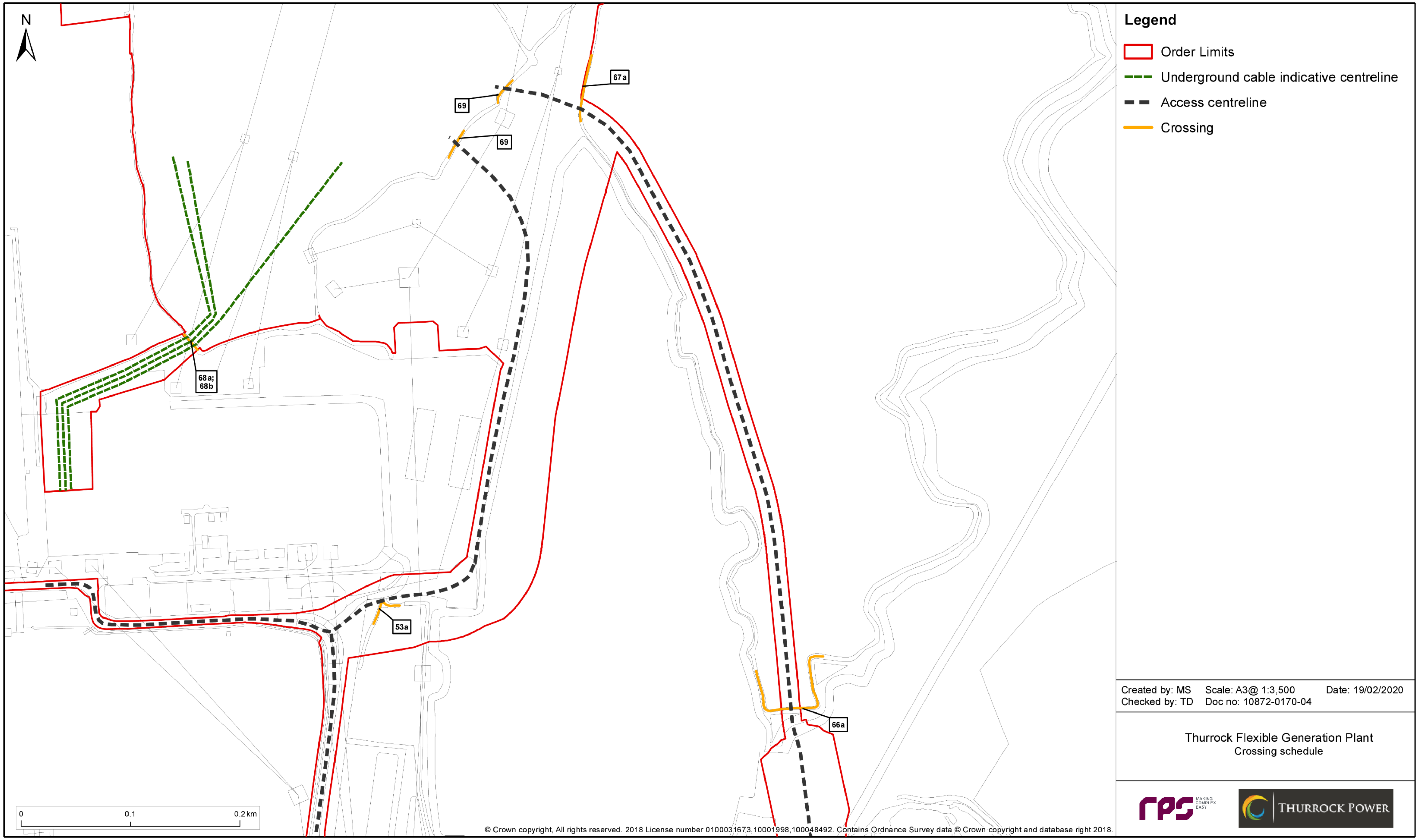

Figure 3.4: Gas pipeline, underground cable and access road crossings – sheet 4.

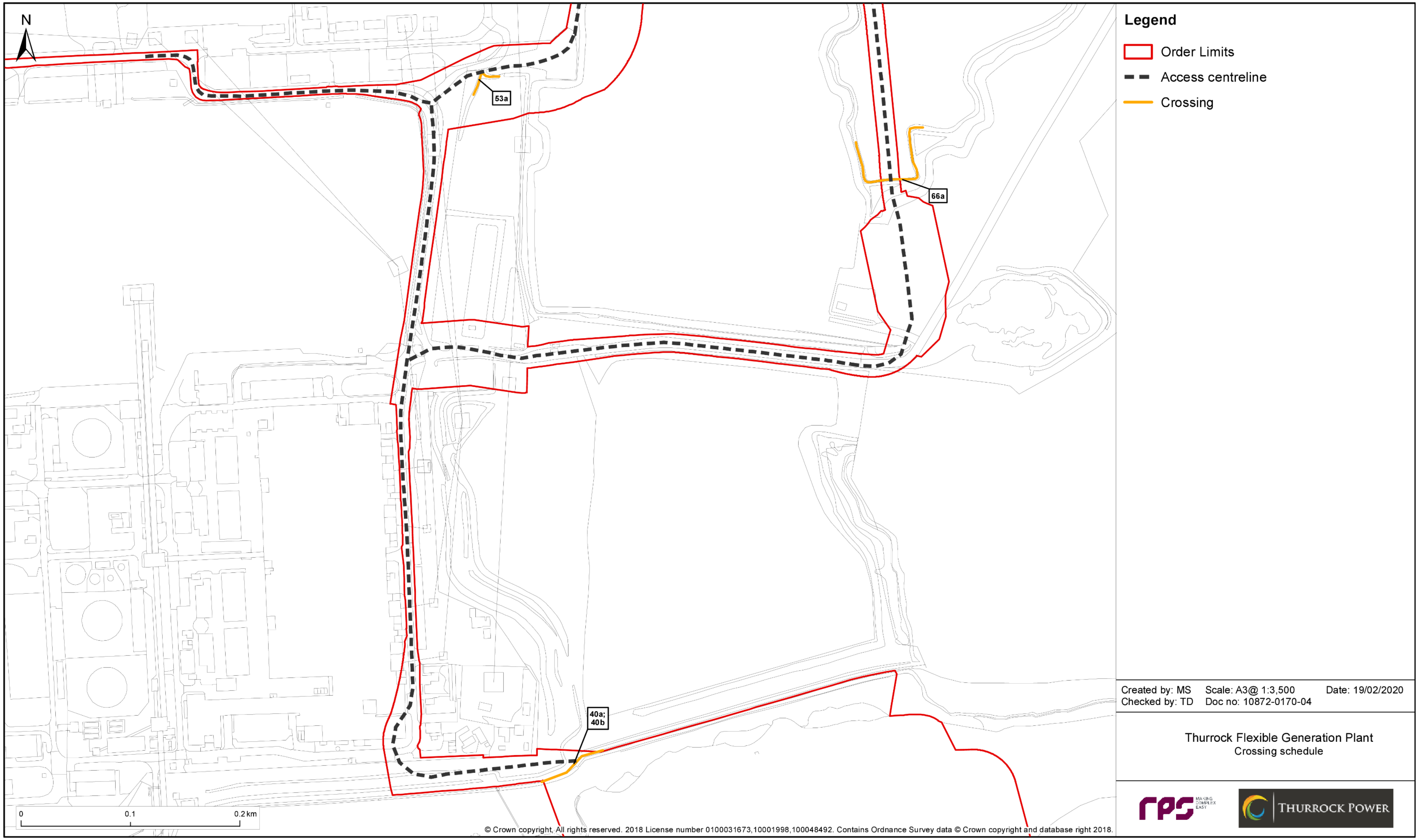

Figure 3.5: Gas pipeline, underground cable and access road crossings – sheet 5.

3.4 Construction access

Construction deliveries overview and constraints

3.4.1 Access will be required for heavy goods vehicles (HGVs), abnormal loads for certain items (gas engine blocks, transformers, large cranes or construction plant) and for construction workforce traffic. Construction traffic generation and abnormal loads are detailed in Volume 3, Chapter 10: Traffic and Transport.

3.4.2 Existing access to the main development site (zone A) is via a farm track through zone C from a junction with Station Road immediately south of the level crossing over the railway.

3.4.3 The applicant has considered a number of potential construction access and traffic routes because of the weight and dimensional limitations on sections of the public highway and the Station Road railway level crossing. These were described in the Preliminary Environmental Information Report (PEIR).

3.4.4 Subsequently, the PEIR-stage options of creating haul routes from Orsett Cock (A13) junction and the St Chad's Road (A126) Gateway Academy roundabout, to the north and west of the main development site, have been discounted. The option of craning AILs across the railway from Parsonage Common to zone C has also been discounted. The preferred and now proposed solutions for construction access are described in the following sections.

3.4.5 It is not possible for the applicant to commit to a single construction access for the DCO application due to these logistical considerations and ongoing discussions with third parties, so all options proposed are included within the design envelope and the impact assessments reported in this ES consider the maximum design scenario in the case of each option.

3.4.6 It is expected that one or a combination of these route options may be used in practice, with impacts no greater than the use of each route assessed individually for the construction traffic generated.

3.4.7 For the purpose of discussion here, construction transport can be divided broadly into four categories: abnormal indivisible loads (AILs); bulk materials such as aggregates; the balance of materials and plant; and the construction workforce.

Largest AILs – delivery by barge

3.4.8 The proposed development will require delivery of certain large indivisible loads that are of a scale that is difficult to transport on the highway network, with the largest gas engine blocks for example likely to weigh approximately 330 tonnes. A particular constraint is crossing the railway: combinations of limited overhead clearance, weight, and approach gradient preclude use of either the Fort Road bridge or Station Road level crossing over the railway for such loads. In addition, height clearance precludes delivery of the largest AILs required via the Tilbury2 access under Fort Road bridge (as redeveloped by Tilbury2).

3.4.9 The largest AILs will therefore be delivered directly by a seagoing roll-on, roll-off (ro-ro) barge to a causeway constructed in the Thames. There will be a maximum of 60 barge deliveries, each of which will transport a single AIL. These deliveries will be at intervals of one to three days or more during the construction programme. The barges are designed to beach at the foot of the causeway, allowing the AIL on transporter vehicle to drive off the barge onto shore via the causeway.

3.4.10 Dredged material for the causeway construction will be transported by barge to a disposal point and will not generate traffic on the highway network.

3.4.11 Unloading of barges via the causeway will be undertaken as follows.

- The loaded barge will arrive during a high tide and will position itself above the required beaching location. As the tidal water level falls, the barge will settle onto the prepared area of river foreshore at the required location.
- A gate installed within the flood defence wall at the top of the causeway will be opened to permit vehicles to pass through the opening.
- A mobile crane will travel down the causeway to one of the crane pads adjacent to the barge. This crane will assist with deployment of the barge ramp to form a transition between the barge and the causeway.
- A self-propelled transporter or trailer will then travel over the barge ramp onto the causeway, along the causeway, through the gate in the flood defence wall, and onward via a temporary haul road to the power station construction site.
- The crane will dismantle the barge ramp and re-stow it on the barge, before returning to shore along the causeway.
- The barge will then await the rising tide and, when the water level is sufficiently high, re-float and sail away from the site.
- The gate in the flood defence wall will be closed.

3.4.12 From the causeway, AILs will travel north to the main development site via a haul road. This will comprise sections of existing private road on the former Tilbury B Power Station site as far as Tilbury Substation, and sections of newly constructed road where none exists between the former power station and the flexible generation plant main development site.

3.4.13 At the south of zone G, as the haul road proceeds westwards from the top of the causeway, regrading of the existing bank inland of the flood defence wall will be required to establish the road.

3.4.14 Where the haul road turns north, widening of the existing private road will be required at the corner to allow for the AIL vehicle turning radius. Thereafter as far northwards as Tilbury Substation, the existing private road can be used with re-surfacing to correct defects.

3.4.15 Between the north of the former Tilbury B power station site and the south of the main development site, a new road will be constructed. At this stage the applicant requires flexibility to pursue one of two possible route options, which are both shown as part of zone G. The first option is immediately east of Tilbury Substation and is the most direct route north from the former Tilbury B power station site to the main development site.

3.4.16 The second option turns east for approximately 460 m from the former power station, following the line of an existing track, and then turns north-west to the main development site across agricultural land. Between these two route options lies an area of former ash fields, now raised land created by removal of the ash and deposit of Crossrail and Thames Tideway Tunnel spoil.

3.4.17 The option of an alternative to the direct route north, next to Tilbury Substation, is required because in September 2019 ground upheaval was observed within Tilbury Substation, which could be associated with the land-raising to the east. Investigation and monitoring of ground stability by the parties concerned is understood to be ongoing. Until the outcome of this is known, it is prudent for an alternative haul road route option further east to be planned for.

Bulk materials and balance of plant

3.4.18 The primary access route for the balance of construction traffic between the main development site and the public highway network will be as shown in zones G and H. This primary route provides a direct connection to the A1089 and will avoid or substantially reduce the need to use minor roads north of the main development site.

3.4.19 The two options for a haul road between the main development site and former Tilbury B Power Station site have been described above. An existing private road aligned east-west along the north edge of the former power station site, immediately south of Tilbury Substation, will then be used as far as the Tilbury2 development to the west.

3.4.20 From this point the route comprises use of a private road west and north through the Tilbury2 development. Tilbury2 includes construction of a new section of public highway linking the existing A1089 to a new junction with Tilbury2. The new section of A1089 runs broadly parallel to the existing Fort Road and joins Tilbury2 with a new junction after passing under an extended Fort Road bridge, the new junction replacing the existing at-grade junction with Fort Road. These road improvements are consented and under construction at the time of writing and are expected with high confidence to be in place prior to construction of Thurrock Flexible Generation Plant.

3.4.21 Major components of the proposed development, excluding the gas engines and substation transformers, are likely to be delivered via either the Port of Tilbury to the west or London Gateway (DP World) port to the east. Other construction delivery and workforce traffic could use a variety of routes on the regional transport network to reach the A1089. The A1089 is a dual carriageway road between the A13 and what is known as the Asda roundabout north of Tilbury Docks, where it then becomes a single carriageway road as far as the Tilbury2 junction.

3.4.22 Should construction traffic access via the private road through Tilbury2 be unavailable for limited periods (due to exceptional operational requirements of Tilbury2 or for other reasons), the secondary construction traffic access route will be from the A1089 to Fort Road, north to Cooper Shaw Road, and then via Church Road and Station Road to the permanent access point in zone C.

3.4.23 The Tilbury2 development includes a new aggregates terminal to be operated by Tarmac. This is a potential source of bulk aggregates delivery that would avoid traffic on the public road network and will be considered by the applicant subject to reaching commercial arrangements. To be conservative, for the purpose of the EIA, it is assumed that any bulk cut and fill material transport is on the highway network.

3.4.24 Access for establishment of the habitat creation and Exchange Common Land in zones F1-3 and zone E is provided from Cooper Shaw Road. Farm machinery to establish the Exchange Common Land will cross the south of Parsonage Common from zone F2 to zone E. No surfaced road or track will be required. Farm machinery to establish the habitat in zone F1 will travel along the edge of the agricultural field from Cooper's Shaw road and again no surfaced track will be required. Zones F2 and F3 will be accessed directly off Cooper Shaw Road from an existing field gate; zone F4 can be accessed from the main development site in zone A.

3.4.25 Access for construction of the AGI (National Grid gas compound) in zone D3 will be via a track established off Station Road. This and the permanent access in zone C will also provide access for construction traffic to the gas pipeline route in zones D1 and D2. Where the gas pipeline route crosses Station Road, this will be managed as a crossing point only for construction plant, and not a junction for site access.

3.4.26 The section of Station Road from which access to the AGI will be gained is subject to a Traffic Regulation Order limiting the weight of vehicles to 7.5t gross vehicle weight. For the duration of construction access to this phase of the development, expected to be no more than 18 months as detailed above, this weight restriction will be suspended via a temporary Traffic Regulation Order.

3.4.27 The total HGV traffic generation for construction of the proposed development, for a single-phase construction (maximum intensity), is expected to be on average 40 HGV movements per day, peaking at up to 80 HGV movements per day.

Construction workforce

3.4.28 The construction workforce is expected to average at 250 full-time equivalent workers (FTE), peaking at 350 FTE, for a single-phase construction programme of up to 24 months. As the maximum for assessment, it is assumed that this would also apply for each phase of a three-phase construction programme.

3.4.29 It is proposed that minibus, coach and car sharing will be used for site access by 90% of construction staff with 10% arriving as a car driver. This will be managed through a Construction Worker Travel Plan (application document A8.9).

3.4.30 Construction workforce traffic will use the primary access route via the A1089 and Tilbury2 as described above for HGVs and may also use the access via Station Road.

3.5 Rights of way

Footpath 200

3.5.1 The gas pipeline will cross under Footpath 200 just south of Low Street Pit local wildlife site, where the footpath runs south-west from Station Road. During construction of this section of gas pipeline it may be necessary to temporarily divert Footpath 200 and provide an alternative route to Station Road. Although the gas pipeline crossing will use a trenchless HDD construction approach, thus not severing the right of way with a trench during construction, temporary closure may nevertheless be needed for safety while construction machinery is operating in this area. The diversion would be in place for up to one month and would follow an existing marked recreational route along the road in zone J.

Coast Path (footpath 146 and National Cycle Route 13)

3.5.2 At the point where the top of the causeway meets the existing flood defence wall it will cross the Coast Path (footpath and cycle route). At this point the top of the causeway will be level with the ground at the base of the flood wall and it will be not a physical impediment to the path. While AILs are being transported, banksmen will be used to safely manage foot or cycle traffic on the path while the AIL vehicle and mobile crane are crossing it. This will occur, as described above, no more than once per three days and on no more than 60 occasions in total.

Access Land

3.5.3 Prior to construction, those parts of Walton Common within the Order Limits will be de-registered, removing the right of public access. Exchange Common Land within zone E will be established. Public access to it will be via Parsonage Common and via a new permissive path to be established between Fort Road and the Exchange Common Land. Further details of the permissive path and conditions under which it will be made available for public access are provided in the Statement of Case, application document A8.3.

Future footpath at land-raising site

3.5.4 There is a proposal to provide a new public footpath from the Coast Path to Walton Common following completion of the land-raising operation (spoil deposit) on former ash fields to the south-east of the common. An illustrative footpath route is marked on the approved restoration plans for this operation (planning consent reference 17/00412/FUL). The illustrative route would be crossed by the eastern construction haul road route option in zone G.

3.5.5 However, the footpath would only be established at the time of restoration, when the land-raising is complete. There is a live planning application (reference 19/00051/CV) to vary conditions to extend the time period for this to 2032. This would be well after the completion of Thurrock Flexible Generation Plant construction works.

3.5.6 The illustrative footpath route terminates at the edge of Walton Common, so would terminate at the outer boundary of Thurrock Flexible Generation Plant main development site (zone A).

Public highway

3.5.7 Station Road will be closed temporarily while trenching for the two gas pipeline crossings of the road is being undertaken. The duration of this work is expected to be up to one week per crossing. During these times, signed diversion routes for traffic to or from destinations east of the crossings (e.g. East Tilbury and Coalhouse Fort) will be via Princess Margaret Road and Muckingford Road.

3.6 Decommissioning

3.6.1 The proposed development has an initial design lifetime of 35 years. Extension of its operation beyond this timescale will be dependent on prevailing market conditions. The assets, if in continuing use, would be upgraded and follow any necessary approvals process in place at that time.

3.6.2 The facility will be developed in a modular fashion and would be capable of being decommissioned and deconstructed non-intrusively. Should the facility be decommissioned, all above ground structures would be removed from the site, with the maximum value being recovered from materials and equipment via re-use or recycling at the time. The decision on how much of the below ground infrastructure (including foundations and concrete pads) would be retained would be agreed with the landowner and any other interested parties, accounting for decommissioning methods and timescales at the time.

3.6.3 Decommissioning activities are therefore expected to give rise to types of potential impact that are similar to construction and which would be no greater in terms of magnitude or duration.

3.6.4 The causeway structure is currently expected to be left in situ permanently even were the flexible generation plant to be decommissioned after 35 years, as the environmental effects of demolishing the causeway would be greater than leaving it in place once its effects on sediment transport and estuary habitat including saltmarsh have become established during the 35-year operating lifetime. This position would be reviewed at the time of decommissioning of the Flexible Generation Plant.