



JETTY SITE ALTERNATIVES REPORT: 7.6

DECARBONISATION

Cory Decarbonisation Project

PINS Reference: EN010128

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Revision A

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1. INTRODUCTION

1.1. INTRODUCTION TO THE APPLICANT

- 1.1.1. Cory Environmental Holdings Limited (hereafter referred to as Cory or the Applicant) is applying to the Secretary of State under the Planning Act 2008 (PA2008) for a Development Consent Order (DCO) in order to construct, operate and maintain a Carbon Capture Facility with associated jetty (the Proposed Scheme) to be known as the Cory Decarbonisation Project. The application will be made to the Secretary of State for Department for Energy Security and Net Zero (DESNZ) and administered by the Planning Inspectorate (PINS).
- 1.1.2. Cory is part of the Cory Group, one of the UK's leading resource management companies, with an extensive river logistics network in London underpinned by a long history and deep connection to the city stretching back to the late 1700s. The Cory Group has invested heavily in London's waste recycling, energy generation and river logistics infrastructure. In addition to its commercial customers, the Group is a trusted partner for several local authorities in London (serving a combined population of approximately 3 million people). It operates essential infrastructure which London relies heavily upon on a day-to-day basis.
- 1.1.3. WSP have been commissioned by the Applicant to prepare this report presenting an evaluation of the site alternatives that have been considered for the development zone in which the Proposed Jetty will be built.

1.2. INTRODUCTION TO THE PROPOSED SCHEME

- 1.2.1. The Applicant intends to construct and operate the Proposed Scheme to be linked with the River Thames. Further detail is provided within **Chapter 2: Site and Proposed Scheme Description** of the **Environmental Statement (Document Reference 6.3)** (ES) but in summary the Proposed Scheme includes:
- The Carbon Capture Facility (and its associated Supporting Plant and Ancillary Infrastructure): the construction of infrastructure to capture a minimum of 95% of carbon dioxide (CO₂) emissions from Riverside 1 and 95% of CO₂ emissions from Riverside 2 once operational, which is equivalent to approximately 1.3Mt CO₂ per year. The Carbon Capture Facility will be one of the largest carbon capture projects in the UK.
 - The Proposed Jetty: A new and dedicated export structure within the River Thames is required to export the CO₂ captured as part of the Carbon Capture Facility.
 - The Mitigation and Enhancement Area: Land identified as part of the **BNG Assessment (Appendix 7.6: Biodiversity Net Gain Report (Volume 3)) (Document Reference 6.3)** to provide habitat mitigation, compensation and enhancement (including potential planting for landscaping). The Mitigation and

Enhancement Area provides a valuable opportunity to improve access for users of the Crossness Local Nature Reserve (LNR).

- **Temporary Construction Compounds:** The use of these areas during construction will include, but not be limited to, office space, warehouses, workshops, open air storage and car parking. The areas will be reinstated to their original use following completion of the construction works for the Proposed Scheme or utilised as part of the Proposed Scheme.
- **Utilities Connections and Site Access Works:** The undergrounding of utilities required for the Proposed Scheme in Norman Road and the creation of new, or the improvement of existing, access points to the Carbon Capture Facility from Norman Road.

1.2.2. Together, the Carbon Capture Facility, the Proposed Jetty, the Mitigation and Enhancement Area, the Temporary Construction Compounds and the Utilities Connections and Site Access Works are referred to as the 'Proposed Scheme'.

1.2.3. The land upon which the Proposed Scheme is to be located is referred to as the 'Site' and the extent referred to as the 'Site Boundary'. Other terms used in this report are defined in the Proposed Scheme **Glossary (Document Reference 1.7)**.

1.3. PURPOSE AND STRUCTURE OF THE REPORT

1.3.1. The Applicant has given careful consideration to the location of the Proposed Scheme, considering alternatives for both the Carbon Capture Facility and the Proposed Jetty. This report, the **Jetty Site Alternatives Report (JSAR) (Document Reference 7.6)**, has been prepared to describe the design evolution process and rationale for the siting of the Proposed Jetty. The report describes a clear process on how the Preferred Scheme location for the jetty was selected and other alternative option discounted. This process was undertaken early in the scheme development process, as a key driving force to assist in the development of the site selection process, layout and design of the Carbon Capture Facility.

1.3.2. The **Terrestrial Site Alternatives Report (TSAR) (Document Reference Number 7.5)** has been prepared to define the process of identifying the chosen development zone for the siting of the Carbon Capture Facility (incorporating all of the Supporting Plant and Ancillary Infrastructure set out in **Chapter 2 Site and Proposed Scheme Description (Volume 1)** of the **ES (Document Reference 6.1)**). The reader may find it helpful to read this JSAR in conjunction with the TSAR.

1.3.3. This report is structured as follows:

- **Section 2** - describes the Proposed Jetty's site assessment process;
- **Section 3** - sets out the base operational and constructability considerations for the Proposed Scheme;
- **Section 4** - Jetty Options – Optioneering Principles Analysis; and
- **Section 5** - Consideration of Analysis of Jetty Options.

2. THE SITE ASSESSMENT PROCESS

2.1. INTRODUCTION TO THE PROPOSED JETTY DEVELOPMENT – REASONABLE ALTERNATIVES

- 2.1.1. This section of the JSAR presents the approach taken through the design evolution, rationale for the siting and the alternatives optioneering assessment process to identify the Proposed Jetty.
- 2.1.2. The **Planning Statement (Document Reference 5.2)** confirms, at paragraph 1.1.3, that the Overarching National Policy Statement for Energy EN-1 (NPS EN-1) provides the primary policy for determination of the DCO application for the Proposed Scheme.
- 2.1.3. At paragraph 4.3.22, NPS EN-1 states:
- ‘Given the level and urgency of need for new energy infrastructure, the Secretary of State should, subject to any relevant legal requirements (e.g. under the Habitats Regulations) which indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives:*
- *the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; and*
 - *only alternatives that can meet the objectives of the proposed development need to be considered.’*
- 2.1.4. Each of these elements of NPS EN-1 policy: the proportionate response to legislative and policy requirements; and identification of the key principles for an alternative to meet the objectives of the Proposed Scheme, are considered below.
- 2.1.5. It is also noted that the Proposed Scheme is development that requires an Environmental Impact Assessment (EIA) under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the ‘EIA Regulations’), the DCO application will be accompanied by an Environmental Statement (ES), which is required to describe the reasonable alternatives considered for the Proposed Scheme and the main reasons for choosing the proposals are brought forward. This report has been prepared to support **Chapter 3** of the **Environmental Statement (Volume 1) (Document Reference 6.1)** in order to enable this requirement to be met.

Proportionate Response

- 2.1.6. This exercise was carried out early in the scheme development process as the Applicant recognised that as marine export is a fundamental aspect of the Proposed Scheme, choosing the jetty location would set the key starting point against which the rest of the scheme development process could then be developed. As such, the optioneering process was primarily a technical one.

- 2.1.7. The Riverside Campus accommodates the Applicant's residual waste management treatment infrastructure: Riverside 1, an Energy from Waste (EfW) facility generating up to 80.5 megawatt (MW) of electricity, which has been operational since 2011¹; and Riverside 2, an EfW facility with a generating capacity of approximately 76MW, that is currently under construction and anticipated to be operational in 2026.
- 2.1.8. The pre-existing Riverside Campus was a primary factor in the identification of the initial siting options for the Proposed Jetty. The production source of carbon is from the Riverside Campus and close proximity would minimise the infrastructure to transfer to the jetty.
- 2.1.9. Middleton Jetty was purpose built alongside Riverside 1 and has sufficient capacity working on a 24/7 basis to operate with Riverside 2, enabling Cory, uniquely within the UK, to substantially use river transport, removing at least 100,000 truck movements from the road each year. Approximately 75% of throughput is brought to the Riverside Campus from the river-based waste transfer stations and recycling facilities located at Smugglers Way in Wandsworth, Cringle Dock in Battersea, Walbrook Wharf in the City of London, Northumberland Wharf in Tower Hamlets and Debden Wharves in Barking.
- 2.1.10. The assessment of the location of a new Jetty has been undertaken in the context that it would not be appropriate to seek to export carbon by vehicle from the site. A typical LCO₂ road tanker, has capacity of between 20 and 30 tonnes and would therefore be inappropriate for the large volume of CO₂ to be captured by the Proposed Scheme. In addition, road export would cause extensive additional traffic movements in the local area and would need to be transported across a large distance leading to additional emissions with consequent detrimental effects. Shipping vessels can hold a vast amount of LCO₂ and are a practical way of moving large amounts of liquid gas. The technology is proven and used in other industries safely and cost effectively.
- 2.1.11. The Carbon Capture Facility would require the acquisition of private land, to be authorised as part of the DCO. The location of the Carbon Capture Facility is partly driven by its ability to connect to the location of the Proposed Jetty, as described in the **Terrestrial Site Alternatives Report (Document Reference 7.5)**. In order to demonstrate a 'compelling case in the public interest' for acquisition powers, a prospective acquiring body must be able to demonstrate that all reasonable alternatives to compulsorily acquiring the land proposed have been explored. As such, describing how the Proposed Jetty has been sited and located is an important part of the overall justification for the acquisition of land that is proposed for the Carbon Capture Facility, i.e. why there is not a reasonable alternative to the Carbon Capture Facility being located where it is proposed. Furthermore, the Proposed Jetty

¹ Pursuant to a ESection 36C Variation issued by the Secretary of State on 17 December 2021, this capacity has now been increased to 80F.5MW.

utilises land that forms part of the River Thames and is owned by the Port of London Authority (PLA), and which is also proposed to be subject to compulsory acquisition powers. Although such powers will be controlled by Protective Provisions in the draft DCO, the compelling case in the public interest test still needs to be made out.

- 2.1.12. With this in mind, the optioneering principles described in Section 2.2 below were developed.

Site alternatives that meet the objectives of the Proposed Scheme

- 2.1.13. The **Terrestrial Site Alternatives Report** sets out the background for the Project Objectives that were developed for the Proposed Scheme. That background equally applies here and is not repeated.
- 2.1.14. However, it is also noted that the jetty site assessment process took place early in the scheme development process as the Applicant recognised that as marine export is a fundamental aspect of the Proposed Scheme, choosing the jetty location would set the key starting point against which the rest of the scheme development process could then be developed. As such, the optioneering process was primarily a technical one in the context of the Project Objectives, prior to the development of Project Principles and Design Principles.

2.2. OPTIONEERING PRINCIPLES

- 2.2.1. As part of the alternatives optioneering assessment outlined in this JSAR, the Applicant has undertaken a focussed exercise, seeking to consider how the different jetty options impact on key factors, in environmental, policy and legal terms; rather than considering every environmental discipline.
- 2.2.2. This focussed exercise was undertaken on the basis that similar conclusions were expected to arise from each of the jetty options considered for other environmental disciplines, given that as a base position, they all involve the construction of a jetty, which would have similar impacts for disciplines as noise, air quality, socio-economics and geology and soils, irrespective of the jetty chosen.
- 2.2.3. The Optioneering Principles that have been considered were therefore:
- **Principle 1.** Impacts to Marine Ecology;
 - **Principle 2.** Impacts to Flood Risk – All options are in Flood Zone 3, but this factor considers if the options could have different impacts on flood risk more generally;
 - **Principle 3.** Impacts to Land Use – Impacts to the existing use of third party land/facilities;
 - **Principle 4.** Impacts to Navigation (including to Cory's existing operations);
 - **Principle 5.** Impacts to Recreational Users of the River and England Coast Path; and
 - **Principle 6.** Meeting the constructability and operational requirements (including sufficient space to incorporate them) set out in Section 3.

2.3. REASONABLE ALTERNATIVES CONSIDERED

2.3.1. Four potential jetty options were identified on the south bank of the River Thames for consideration, in close proximity to the Riverside 1 and Riverside 2 facilities. These are presented below.

JETTY OPTION A

2.3.2. Jetty Option A is located immediately down river of Middleton Jetty and would include the redevelopment or replacement of the currently disused Belvedere Power Station Jetty (approximately 180m length). This option is located immediately to the north of the Iron Mountain building, in front of the existing Belvedere Power Station Jetty. It consisted of a main loading platform, connected to land by an access trestle, with mooring and breasting dolphins positioned either side of the platform.

JETTY OPTION B

2.3.3. The alteration of Middleton Jetty (approximately 280m length). This option involved an extension to both ends of the existing Middleton Jetty, which is actively used as part of the Applicant's existing operations on the River Thames. To segregate the Applicant's operations, the CO₂ export operation would occur at the downstream extension, with all other Applicant's operations moving to the upstream end of the jetty.

JETTY OPTION C

2.3.4. Option C involved the construction of a new jetty structure approx. 200m upstream and in-line with the existing Middleton Jetty. This option also consisted of a main loading platform, connected to land by an access trestle, with mooring and breasting dolphins positioned either side of the platform.

JETTY OPTION D

2.3.5. Option D would involve the demolition and reconstruction of the existing Thames Water Jetty. The Thames Water Jetty is approx. 500m upstream of the Middleton Jetty. The proposed jetty would sit on the same footprint as the Thames Water Jetty, meaning it would protrude the same distance into the channel.

2.3.6. The four jetty options are shown on **Appendix A** (Alternative Development Sites for the Proposed Jetty).

2.3.7. Section 4 of this document sets out an analysis of the above principles applied to each jetty option considered.

2.3.8. Section 5 considers that analysis and explains how the Applicant weighed up the results of it to come up with the final option for the Proposed Jetty which forms the basis of the Proposed Scheme.

3. OPERATIONAL/CONSTRUCTABILITY REQUIREMENTS

- 3.1.1. This Section sets out the operational and construction engineering considerations that needed to be taken into account for the Proposed Jetty and have done so as part of Principle 6.
- 3.1.2. These requirements are as follows:
- Sufficient footprint to accommodate all aspects of the jetty structure as defined in **Chapter 2 of the Environmental Statement (Volume 1) (Documents Reference 6.1)**. This includes essential structural elements such as a loading platform to support LCO₂ pipeline and loading equipment, breasting and mooring dolphins and catwalks are all required for the selected jetty type, and enough space to ensure that each element is able to conform to relevant design codes and standards in order for vessels to berth safely and LCO₂ to be loaded safely.
 - Enabling ease, and as short a length as possible of connections between Riverside 1 and Riverside 2 and the Carbon Capture Facility for LCO₂ pipeline and utilities provision (associated ducting, water supply and power supply).
 - Minimising physical impacts to the operations of Riverside 1 and Riverside 2.
 - Minimising intensive construction requirements such as dredging, demolition and dealing with geotechnical complexities.
 - Enabling construction to take place from both the river and land, including, with reference to the operational requirements of Riverside 1 and Riverside 2, a location which could facilitate adjacent land site access, laydown area and site preparatory works required.
 - Ease of access for vessels and vehicles to support the transportation of CO₂ and for maintenance purposes, in light of the operational requirements of Riverside 1 and Riverside 2 and the potential requirements of third party land interests.

4. JETTY LOCATION OPTIONS – OPTIONEERING PRINCIPLES ANALYSIS

4.1. INTRODUCTION

4.1.1. This section of the JSAR evaluates each of the jetty options against the Optioneering Principles defined in **Chapter 2**. Given its impacts to the Applicant's operations, Jetty Option B was analysed first.

4.2. JETTY OPTION B

OVERVIEW

- 4.2.1. Jetty Option B considered the utilisation of the existing Middleton Jetty currently in use by the Applicant. Riverside 1 had an original processing permit throughput of up to 650,00 tonnes per annum. This volume has been increased to a maximum of 850,000 tonnes per annum for waste and incinerator bottom ash. Upon operation of Riverside 2, up to 805,920 tonnes will be processed across at that facility.
- 4.2.2. The Middleton Jetty is currently primarily used 7am to 7pm (with a preventive maintenance regime in place). Once Riverside 2 is operational this will increase to include overnight operations, thus running 24 hours a day. Middleton Jetty currently accommodates 8 barges at any one time. The containers are handled on the jetty by two gantry cranes capable of operating on either side of the jetty. The cranes offload the containers onto tractor trailer units which transport the waste containers to the energy from waste plant. In its current form, the Middleton Jetty cannot accommodate both the existing container handling operation and the proposed LCO₂ export operation as there is no space for pipework, Marine Loading Arms and adequate berths for mooring of the proposed LCO₂ vessels.
- 4.2.3. The intensive use of the Middleton Jetty (a safeguarded wharf) prohibits any alteration that would result in the reduction of either operating capacity or hours of use. As such, this option would only be possible with an extension to the Middleton Jetty to accommodate the proposed LCO₂ export operation and keep the Applicant's operation at the required throughput.
- 4.2.4. Both operations would require to be segregated on either side of the existing access trestle to ensure safe operation. Also, the proposed LCO₂ vessels require greater water depth than currently available at the Middleton Jetty which only handles container barges. Therefore, dredging would be required with significant jetty structural modifications.
- 4.2.5. Jetty Option B involves an extension to both ends of the existing Middleton Jetty (total approximately 280m together). The LCO₂ export operation would occur at the

downstream extension, with all Applicant's waste operations moving to the upstream end of the jetty. The proposed modifications would consist of:

- Extension of the Middleton Jetty upstream to provide 8 berths for container handling operation with associated dredging.
- Demolition/reconfiguration of Middleton Jetty downstream and extension for new LCO₂ export berth with associated dredging.
- Widening of the existing trestle to allow existing operations and vehicular access to continue, whilst providing space and support for the LCO₂ pipework.
- The Middleton Jetty would have to be split between the current waste and ash regime and the new LCO₂ export processes. The area available for each would be insufficient.

4.2.6. Undertaking such construction activities would cause serious disruption to the operations at Middleton Jetty for an extended period as the Proposed Scheme modifications were brought forward, with a requirement for periods of time where Riverside 1 and Riverside 2 vessels could not stop at the jetty. It has been assumed that, during a 12-month construction phase, current operations (i.e import and export movements by vessels) would be reduced by 25% should Option B be taken forward, this would result in 8,700-13,945 additional HGV movements (depending on the size of the HGV), and 340-600 tonnes CO₂e emitted compared to river operations. This would be an unacceptable impact to the operation of these plants. Further analysis also demonstrated that, for risk purposes:

- the existing operational process cannot be situated within such proximity to the LCO₂ pipeline; and
- the existing Middleton Jetty cranes would likely prohibit the landing of the LCO₂ pipe rack.

4.2.7. As a result of these various constraints, this option was considered unviable and dismissed from the outset.

4.3. JETTY OPTION A

OVERVIEW

4.3.1. Jetty Option A is located in the River Thames approx. 65m east of the Riverside 1 and Riverside 2 facilities.

4.3.2. Jetty Option A is located in the vicinity of the disused Belvedere Power Station Jetty (approximately 180m length), which could either be demolished or retained should it be chosen. This option consists of a main loading platform, connected to land by an access trestle, with mooring and breasting dolphins positioned either side of the platform. This structure sits further into the channel than the Belvedere Power Station jetty, approximately in line with the existing Middleton jetty.

SUMMARY OF ASSESSMENT

- 4.3.3. Jetty Option A would require a new structure, the associated construction work for which would lead to permanent impacts to marine ecology, and impact the flow and sediment regime of the river.
- 4.3.4. Option A would require the smallest volume of dredging in comparison to other options, and would not disrupt any business activities, other than that a section of the Belvedere Power Station Jetty may need removal over the England Coast Path. This removal of the Belvedere Power Station Jetty would require continued maintenance or removal in the future irrespective of the Proposed Scheme.
- 4.3.5. It was initially perceived that the sharp meander in the river downstream from Jetty Option A could reduce visibility for vessels arriving and departing from the Jetty. Although further analysis including ship simulation has been carried out to demonstrate that this risk can be managed subject to risk controls outlined in the **Preliminary Navigational Risk Assessment (Appendix 19-1 of the ES (Volume 3)) (Document Reference 6.3)**, that concern is reflected in table 4.1 below. The location of Jetty Option A would also result in the least interference with existing operations and would not require the relocation of the Applicant's existing infrastructure.
- 4.3.6. Jetty Option A would have no direct impact on the Erith Marshes SINC, Medway Estuary MCZ or Crossness LNR.
- 4.3.7. Jetty Option A would result in temporary adverse impacts for users of the England Coast Path and PRowS FP3 and NCN1, due to potential closures and diversions as well as loss in amenity. This option also requires the addition of a new overhead access trestle to support the pipework which may also adversely affect the experience of users of these PRow.

Table 4.1: Jetty Option A Optioneering Principles Compliance

Optioneering Principle	Analysis
<p>1. Impacts to Marine Ecology</p>	<p>There may be permanent impacts to Marine Ecology within the subtidal section of the River Thames through the presence of a new structure. This could range from loss of subtidal benthic habitats in the form of sediments, to the creation of refuge structure for fish and other marine receptor species.</p> <p>The requirement for both capital and maintenance dredging will result in additional disturbance to marine receptors. This will be in the form of subtidal habitat loss during dredging and construction activities and indirect impacts form changes to water quality in the form of increased sediment loads and remobilisation of sediment bound contaminants.</p> <p>The Medway Estuary MCZ is located approximately >20km downstream and southeast of Jetty Option A. Due to the distance of the MCZ from this option, there will be no direct impacts on habitats and features within the MCZ. There is potential for an indirect impact on the MCZ, to one of its qualifying features (European Smelt) which may lose some potential foraging habitat due to loss of intertidal and subtidal habitats.</p> <p>Option A is located within the Tidal and Tributaries SINC and this is likely to be affected during construction phase and as a result of maintenance dredging.</p>

Optioneering Principle	Analysis
<p>2. Flood Risk</p>	<p>There may be permanent impacts on the flow and sediment regime due to the presence of the new structure and associated capital and maintenance dredging requirements.</p>
<p>3. Impacts to land use</p>	<p>The Belvedere Power Station Jetty has been available on the open market for at least 8 years. It is understood that the jetty has not been used intensively since the now demolished Belvedere Power Station closed in the 1980s.</p> <p>The existing jetty has been maintained and is commercial in its historical use but does not have riparian land attached to it. Further, the existing jetty is not a safeguarded wharf because it has little or no prospect of returning to intensive commercial use.</p> <p>The riverbed to the high watermark is owned by the Port of London Authority ('PLA'), a statutory undertaker, but this zone is south of the navigational channel of the River Thames and is burdened by the jetty that is owned by Aviva.</p> <p>The Proposed Scheme would return this zone to active use after more than 30 years. Jetty Option A does not disrupt any business activities, other than a section of the Belvedere Power Station Jetty may need removal over the England Coast Path, which would be needed in the future irrespective of the Proposed Scheme. Given the section of riverbed is currently burdened by the jetty and outside the navigational channel, it is</p>

Optioneering Principle	Analysis
<p>4. Impacts to River Navigation</p>	<p>considered that this zone can be acquired without serious detriment to the continuation of the PLA's statutory undertaking.</p> <p>Jetty Option A is the furthest downstream of the four options and is positioned clear of the Middleton Jetty. The positioning of Jetty Option A reduces interaction with vessels undertaking operations from the Middleton Jetty and increases the likelihood of a clear approach for arriving vessels.</p> <p>There is a bend in the river (Jenningtree Point) immediately downstream from Jetty Option A. The bend limits sight lines for inbound and outbound vessels on approach to the jetty. This impacts the Masters ability to anticipate the movements of passing vessels and reduces planning / thinking time. This could have particular impact for inbound vessels which will need to cross the authorised channel in order to manoeuvre on to the jetty.</p> <p>Fuel barges of around 79m LOA previously carried black oil back from Shellhaven or Coryton refineries to Belvedere Power Station, arriving and departing from the now disused jetty. Therefore, there is precedent of a marine operation in the area.</p>
<p>5. Impacts to Recreational Users of the River and England Coast Path</p>	<p>There may be temporary adverse impacts for users of the England Coast Path, Footpath 3 (FP3) and National Cycle Network Route 1 (NCN1) routes, due to potential closures and diversions as well as loss in amenity. Given the industrial nature, fishing and recreational activity on the River Thames</p>

Optioneering Principle	Analysis
	<p>activity is low, so construction is unlikely to have any impacts on anglers or other recreational users of the river.</p> <p>The addition of a new overhead gantry may also adversely affect the experience of users of the England Coast Path and Public Rights of Way (PRoWs) (FP3 and NCN1) during operation.</p> <p>Operation could present opportunities to enhance the England Coast Path, FP3 and NCN1 routes to improve user experience as well as new fishing marks and bird watching panels.</p>

6. Constructability and Operational Requirements

Jetty Option A is the furthest downstream of the four options and, due to the bed level along this section of the River Thames, it will involve the smallest volume of dredging to create a suitable berth pocket for a vessel. The bed level in the location of a required berth pocket is between approximately 3.5m and 7m below CD. The proposed dredge depth is yet to be confirmed as it is a direct output of design vessel which is currently unknown; however, it is thought to be in the region of 7m below CD.

Due to its location downstream of Cory's existing operations at the Middleton Jetty, Jetty Option A would result in minimal interference in any current operations, during both its construction and operational phases.

Located approx. 65 west of the current Riverside Campus, Jetty Option A provides the closest viable development when

Optioneering Principle

Analysis

compared to Options C and D. The smaller distance would simplify the engineering complexity of connection to Riverside 1 and 2 by allowing a direct connection and the avoidance of any subterrain development.

Jetty Option A could potentially require the demolition of the decommissioned Belvedere Power Station Jetty. This work would be significant to undertake in advance of any construction for the Proposed Scheme. Alternatively, it could require modification (removing on-shore aspects) to remove the maintenance and port safety implications of having it co-exist with the Proposed Jetty.

4.4. JETTY OPTION C

OVERVIEW

- 4.4.1. Jetty Option C is located in-between the existing Middleton Jetty and Thames Water Jetty to the west.
- 4.4.2. Jetty Option C involves the construction of a new jetty structure immediately upstream and in-line with the existing Middleton Jetty. This would consist of a main loading platform, connected to land by an access trestle, with mooring and breasting dolphins positioned either side of the platform.

SUMMARY OF ASSESSMENT

- 4.4.3. Jetty Option C would require a new structure which would result in additional construction work and lead to permanent impacts to marine ecology, and impact the flow and sediment regime of the River.
- 4.4.4. The location of Jetty Option C between the Thames Water Jetty and Middleton Jetty would also give rise to navigation constraints with naval congestion in authorised channels leading to passing vessels and existing operations.
- 4.4.5. A large amount of dredging would be required in order to create a berth pocket for a suitable vessel.
- 4.4.6. Option C would result in direct impacts to the Tidal and Tributaries SINC, Erith Marshes SINC, Crossness LNR. The Option is located 80m west of Riverside 1 and Riverside 2 site boundary. The required infrastructure to connect the jetty to Riverside 1 and Riverside 2 would result in the permanent development of a LCO2 and associated utilities corridor in the Erith Marshes SINC and Crossness LNR.
- 4.4.7. Jetty Option C would result in temporary adverse impacts for users of the England Coast Path and PRowS FP3 and NCN1, due to potential closures and diversions as well as loss in amenity.

Table 4.2: Jetty Option C Optioneering Principles Compliance

Optioneering Principle	Analysis
<p>1. Impacts to Marine Ecology</p>	<p>There may be permanent impacts to Marine Ecology within the subtidal section of the River Thames through the presence of a new structure proposed under Jetty Option C. This could range from loss of subtidal benthic habitats in the form of sediments, to the creation of refuge structure for fish and other marine receptor species.</p> <p>The requirement for both capital and maintenance dredging will result in additional disturbance to marine receptors. This will be in the form of subtidal habitat loss during dredging and construction activities and indirect impacts form changes to water quality in the form of increased sediment loads and remobilisation of sediment bound contaminants.</p> <p>The Medway Estuary MCZ is located approximately >20km downstream and southeast of this option. Due to the distance of the MCZ from Jetty Option C, there will be no direct impacts on habitats and features within the MCZ. There is potential for an indirect impact on the MCZ, to one of its qualifying features (European Smelt) which may lose some potential foraging habitat due to loss of intertidal and subtidal habitats.</p> <p>This location is also close to the Great Breach Duke North Culvert into the River Thames from Crossness LNR potentially impacting the species and habitat associated.</p>

Optioneering Principle	Analysis
	<p>Although more Terrestrial Biodiversity relevant it is noted that this is the only option that has the potential to lead to a loss of land from the Crossness LNR and Erith Marshes SINC, both of which support avarian habitats.</p> <p>Option C is located within the Tidal and Tributaries SINC and is likely to be affected during construction phase and as a result of operational dredging.</p>
<p>2. Flood Risk</p>	<p>There may be permanent impacts on the flow and sediment regime due to the presence of the new structure and associated capital and maintenance dredging requirements.</p>
<p>3. Impacts to land use</p>	<p>The riverbed to the high watermark is owned by the PLA, a statutory undertaker, but this zone is south of the navigational channel of the River Thames so is it considered that this zone can be acquired without serious detriment to the continuation of the PLA's statutory undertaking. Further, this section of riverbed is not burdened by a jetty, should this be required, the need for dredging and silting considerations would be necessary in conjunction with the Environment Agency and Thames Water.</p> <p>Development of this zone would not require the acquisition or subsequent relocation (or reinstatement) of river-based infrastructure at cost unlike Jetty Options A, and D. It would be downstream of Crossness Sewage Treatment Works but upstream of Middleton Jetty in an area where barges often sit before transfer to Middleton Jetty.</p>

Optioneering Principle	Analysis
<p>4. Impacts to River Navigation</p>	<p>There are numerous navigation constraints and issues with Jetty Option C due to its location slightly upstream from the Middleton Jetty and downstream of the Thames Water Jetty. Barges arrive at the Middleton Jetty from upstream, and the presence of a new jetty and vessel could interfere with their approach. Vessels arriving at the new jetty would also have to consider the presence of the two jetties either side.</p> <p>Locating three operations in close proximity (Cory existing, Thames Water and the Proposed Scheme) could lead to congestion in the authorised channel as vessels await a safe opportunity to make a final approach. This will likely impact on passing vessels as well as existing operations.</p> <p>The Applicant also has some mooring points in the location where the new structure will be built, meaning a new mooring for the barges would be required.</p>
<p>5. Impacts to Recreational Users of the River and England Coast Path</p>	<p>There may be temporary adverse impacts for users of the England Coast Path and PRowS FP3 and NCN1, due to potential closures and diversions as well as loss in amenity. Given the industrial nature, fishing and recreational activity on the River Thames is low, so construction is unlikely to have any impacts on anglers or other recreational users of the river.</p> <p>The addition of a new overhead gantry may also adversely affect the experience of users of the England Coast Path and PRowS (FP3 and NCN1) during operation.</p>

Optioneering Principle	Analysis
	<p>Operation could present opportunities to enhance the England Coast Path and PRowS (FP3 and NCN1) to improve user experience as well as new fishing marks and bird watching panels.</p>
<p>6. Constructability and Operational Requirements</p>	<p>Due to the bed level along this section of the River Thames, a large amount of dredging will be required in order to create a suitable berth pocket for a vessel. The bed level in the location of a required berth pocket is between approximately 1.8m and 3.8m below CD.</p> <p>As opposed to other Jetty Options, this option is the only one which does not involve the redevelopment of an existing jetty.</p> <p>Due to its location upstream of Cory’s existing operations at the Middleton Jetty, Option C could result in major interference in current operations, during both its construction and operational phases as described in the impacts to river navigation section above.</p> <p>Jetty Option C would be located approx. 80m west of the nearest point of the Riverside Campus. This is the third largest distance of the four options.</p> <p>Jetty Option C would make landfall within the Eirth Marshes SINC and Crossness Local Nature Reserve. This would result in construction impact and the permanent loss of land in both designations.</p>

4.5. JETTY OPTION D

OVERVIEW

- 4.5.1. Jetty Option D is situated in the location of Thames Water existing Jetty west of the Riverside 1 and Riverside 2 facilities.
- 4.5.2. Jetty Option D involves the demolition and reconstruction of the Thames Water Jetty as the water depth alongside the existing structure is insufficient to accommodate the proposed LCO₂ vessels. This would consist of a main loading platform, connected to land by an access trestle, with mooring and breasting dolphins positioned either side of the platform. The structure would sit on the same footprint as the Thames Water Jetty, meaning it would protrude the same distance into the channel.

SUMMARY OF ASSESSMENT

- 4.5.3. Jetty Option D may impact on marine ecology through capital and maintenance dredging, but the use of the existing Thames Water Jetty may reduce the loss of habitat and reduced impact on potential marine receptors on account of less work required. Option D would require the largest scale of dredging of all options.
- 4.5.4. Given Jetty Option D's placement between the Middleton Jetty and the Applicant's mooring points, navigation constraints are anticipated and would require a relocation of the existing Applicant's barge moorings to allow adequate vessel manoeuvre room.
- 4.5.5. Jetty Option D would require the acquisition of Third Party Land (Thames Water), this would significantly increase the costs compared to other Jetty options assessed.
- 4.5.6. The location of Jetty Option D means that landside there is only a small corridor of land available for connection to the Riverside Campus which would have insufficient space to accommodate the necessary infrastructure. The connecting infrastructure to the Riverside Campus would also be significantly further than all other Jetty options, increasing construction cost, impacting landscape, and require permanent development across Erith Marshes SINC and Crossness LNR.

Table 4.3: Jetty Option D Optioneering Principles Compliance

Optioneering Principle	Analysis
<p>1. Impacts to Marine Ecology</p>	<p>Use of the existing Thames Water Jetty will reduce the potential loss of intertidal and subtidal habitat within the River Thames. The utilisation of the existing jetty will also reduce the potential of disturbance to marine receptors, through less marine works being required.</p> <p>The use of this jetty may require some capital and maintenance dredging which has the potential to cause disturbance to marine receptors.</p> <p>The use of the existing Thames Water Jetty as Jetty Option D will not impact the Medway Estuary MCZ during operation as no overall loss of intertidal or subtidal habitat would occur, providing no dredging is required. The construction of the jetty has the potential to affect the Medway Estuary MCZ.</p> <p>Option D is located within the Tidal and Tributaries SINC and is likely to be affected during construction phase and as a result of operational dredging.</p>
<p>2. Flood Risk</p>	<p>Use of the existing Thames Water Jetty structure will result in the same footprint as the current structure. There would be a requirement for a deeper berth pocket and access channel. As a result this would require additional dredging. There are potential impacts to the physical regime of the Thames Estuary.</p>

Optioneering Principle	Analysis
<p>3. Impacts to land use</p>	<p>This zone includes an existing jetty which, the Applicant assumes, continues to be actively used as mooring for the ‘Thames Bubblers’ (operated by Thames Water), tasked with injecting 30 tonnes of oxygen into the River Thames a day.² It also supports the operational process of the STW.</p> <p>The riverbed to the high watermark is owned by the PLA, a statutory undertaker, but this zone is south of the navigational channel of the River Thames and is burdened by the existing jetty that, the Applicant understands, is owned by Thames Water.</p> <p>Given the section of riverbed is currently burdened by the jetty and outside the navigational channel, it is considered that this zone can be acquired without serious detriment to the continuation of the PLA’s statutory undertaking.</p> <p>However, it is anticipated that the existing jetty would be subject to Thames Water’s statutory undertaking and the protections of section 127 Planning Act 2008. This would be difficult to overcome where the construction impacts where the jetty would be unusable for their undertaking, and in operation phase, where the Proposed Jetty would need to cater for Thames Water’s movements and those for the Proposed Scheme which</p>

² The New Scientist (2023) “River Thames was pumped full of oxygen in 2022 to prevent fish deaths” [Reference](#))

Optioneering Principle	Analysis
	<p>may not be possible and therefore require a further replacement jetty/compensation for Thames Water to make alternative arrangements.</p>
<p>4. Impacts to River Navigation.</p>	<p>There are navigation constraints and issues with Jetty Option D due to its location slightly upstream from the Middleton Jetty and the Applicant's mooring points. The majority of the Applicant's barges arrive at the Middleton Jetty from upstream, and the presence of a new jetty and associated vessel movements could interfere with their approach.</p> <p>The existing Applicant's barge moorings would need to be relocated to allow adequate room to manoeuvre for vessels on approach to the jetty.</p>
<p>5. Impacts to Recreational Users of the River and England Coast Path</p>	<p>Use of the existing Thames Water Jetty could reduce levels of disruption, however, there may still be some temporary adverse impacts for users of the England Coast Path and PRow FP3 and NCN1, due to potential closures and diversions as well as loss in amenity.</p> <p>Given the industrial nature, fishing and recreational activity on the River Thames activity is low, so construction is unlikely to have any impacts on anglers and other recreational users of the river.</p>

Optioneering Principle	Analysis
	<p>Operation could present opportunities to enhance the England Coast Path and PRowS (FP3 and NCN1) to improve user experience as well as new fishing marks and bird watching panels which are not currently present on the existing jetty, but could be put on the new jetty structure.</p>
<p>6. Constructability and Operational Requirements</p>	<p>The demolition of an existing structure could provide some usable raw materials which could be incorporated into the new jetty construction. The new jetty would be built on the footprint of the existing jetty.</p> <p>Jetty Option D is the furthest upstream of the four options and, due to the bed level along this section of the River Thames, it will involve the most dredging in order to create a suitable berth pocket for a vessel. The bed level in the location of a required berth pocket is between approximately 0m and 3.5m CD.</p> <p>Landside, Jetty Option D would have insufficient space to accommodate the necessary infrastructure, with only a small corridor of land available to connect to the Riverside Campus. The connecting infrastructure to the Riverside Campus would be significantly further than all other Jetty options. This would:</p> <ul style="list-style-type: none"> ● increase construction costs; ● impact the landscape character with elevated pipework connecting facilities; and

Optioneering Principle	Analysis
	<ul style="list-style-type: none"> • result in development across the Erith Marshes SINC situated between Jetty Option D and Riverside 1 and Riverside 2. <p>Option D is located the furthest from the Riverside Campus operations of all four Jetty options. It is approx. 580m between the point of landfall for the Thames Water jetty and the nearest boundary of the Riverside Campus.</p>

4.6. CONSIDERATION OF ANALYSIS OF JETTY OPTIONS

- 4.6.1. Through the analysis of the Jetty Options set out above, it was identified that each of the three options had at least one distinct factor of concern if carried forward and chosen for development as part of the Proposed Scheme.
- 4.6.2. As such, to ensure that a balanced decision on the choice of Jetty Options was reached, the Applicant's decision-making process was informed by considering a comparative analysis for each Optioneering Principle. is set out below.
- 4.6.3. **Table 4.4** below provides a summary of the three remaining Jetty Options in respect to land impacts and on the key constraints which 'fall out' of the Optioneering Principles.

Table 4.4 - Interaction with Key Constraints

	Tidal and Tributaries SINC	Erith Marshes SINC	Medway Estuary MCZ	Crossness LNR	Flood Zone 3	Dredging requirement	Acquisition of Third Party Land	Distance to R1 & R2	Navigational Impact	Impact to Existing Operations
Option A	Yes	No	Yes (Indirect)	No	Yes	Yes	Yes (PLA/BPSJ)	Approx. 65m	No	No
Option B (Not Progressed)	N/A (Yes)	N/A (No)	N/A (No)	N/A (No)	N/A (Yes)	N/A	N/A (Yes) (PLA)	N/A	N/A (Yes)	N/A (Yes)
Option C	Yes	Yes	Yes (Indirect)	Yes	Yes	Yes	Yes (PLA)	Approx. 80m	Yes	Yes
Option D	Yes	Yes	No	Yes	Yes	Yes	Yes (PLA/Thames Water)	Approx. 580m	Yes	Yes

PRINCIPLE 1: IMPACTS TO MARINE ECOLOGY

- 4.6.4. Jetty Options A and C involve the construction of a new structure, this could have permanent impacts to Marine Ecology within the subtidal section of the River Thames, this could range from loss of subtidal benthic habitats in the form of sediments, to the creation of refuge structure for fish and other marine receptor species.
- 4.6.5. The requirement for both capital and maintenance dredging for Jetty Options A and C will result in additional disturbance to marine receptors. This will be in the form of subtidal habitat loss during dredging and construction activities and indirect impacts form changes to water quality in the form of increased sediment loads and remobilisation of sediment bound contaminants.
- 4.6.6. The Medway Estuary MCZ is located approximately >20km downstream and southeast of Jetty Options A and C, there is potential for an indirect impact on the MCZ, to one of its qualifying features (European Smelt) which may lose some potential foraging habitat due to loss of intertidal and subtidal habitats. Developing Jetty Option D will not impact the Medway Estuary MCZ as no loss of intertidal or subtidal habitat would occur.
- 4.6.7. Jetty Option D will utilise an existing Jetty, this will remove the potential loss of intertidal and subtidal habitat within the River Thames when compared to Jetty Options A and C, and will also reduce the potential of disturbance to marine receptors, through less marine works being required.
- 4.6.8. The use of the existing Jetty will either remove or significantly lessen the requirement for capital and maintenance dredging as this is already in operation, reducing the introduction of new impacts to marine ecological receptors.
- 4.6.9. It was considered that Jetty Option D had possessed to small impact to marine ecology compared to Options A and C as it was not located in the subtidal section of the River Thames, have no impact on the Medway Estuary MCZ and utilising an existing jetty structure minimise impacts to marine receptors.

PRINCIPLE 2 IMPACTS TO FLOOD RISK

- 4.6.10. All options are in Flood Zone 3. As Jetty Option D utilises an existing Jetty, this will minimise the impact to the physical regime of the Thames Estuary. However dredging will be required as a far greater extent than compared to Options A and C.
- 4.6.11. Jetty Options A and C involve the construction of a new structure, there may be permanent impacts on the flow and sediment regime due to the presence of the new structure and associated capital and maintenance dredging requirements.
- 4.6.12. The location of all jetty options in Flood Zone 3, coupled with the uses of existing infrastructure but increase dredging resulted in minimal difference between all options on the principle of flood risk.

PRINCIPLE 3 IMPACTS TO LAND USE

- 4.6.13. The riverbed to the high watermark is owned by the Port of London Authority ('PLA') a statutory undertaker, however all options are south of the navigational channel of the River Thames, and are burdened by existing Jetties, it is therefore considered that the zones could be acquired without serious detriment to the continuation of the PLA's statutory undertaking.
- 4.6.14. Jetty Option A is located in the same area as the disused Belvedere Power Station Jetty, which could either be demolished or retained should Option A be chosen. The Belvedere Power Station Jetty has been on the open market for at least 8 years, and has not been used intensively since the 1980s, and has little or no prospect of returning to intensive commercial use. Jetty Option A would not disrupt any business activities, other than a section of the existing jetty may need removal over the England Coast Path, which would be needed in the future irrespective of the Proposed Scheme.
- 4.6.15. Jetty Option C would not require the acquisition or subsequent relocation (or reinstatement) of river-based infrastructure such as jetties or wharves. It would be downstream of Crossness Sewage Treatment Works but upstream of Middleton Dock in an area where barges often sit before transfer to Middleton Dock. The landside connection for Option C would be within Crossness LNR.
- 4.6.16. Jetty Option D includes the existing Thames Water jetty which, the Applicant assumes, continues to be actively used as mooring for the 'Thames Bubblers' (operated by Thames Water). It is anticipated that the existing jetty would be subject to Thames Water's statutory undertaking and the protections of Section 127 Planning Act 2008. This would be difficult to overcome where the construction impacts where the jetty would be unusable for their undertaking, and in operation phase, where the Proposed Jetty would need to cater for Thames Water's movements and those for the Proposed Scheme which may not be possible and therefore require a further replacement jetty/compensation for Thames Water to make alternative arrangements.
- 4.6.17. It is considered that Jetty Option A is the preferred option as it utilises a disused asset and unlike the other two options would not disrupt any business activities, Thames Water assets or Local Nature Reserves.

PRINCIPLE 4 IMPACTS TO NAVIGATION

- 4.6.18. There is a bend in the river (Jenningree Point) immediately downstream of Option A which would limit sight lines for vessels on approach to the jetty. Option A is the furthest downstream of the four options and is positioned clear of the Middleton Jetty which reduces interaction with vessels undertaking operations from Middleton Jetty, and increases the likelihood of clear approach for arriving vessels.
- 4.6.19. Jetty Option C is located downstream of the Thames Water Jetty, and slightly upstream from the Middleton Jetty, causing numerous navigation constraints and issues as the presence of new vessels could interfere with vessels approaching

Middleton Jetty, and would need to consider the presence of the two jetties either side. Additionally, locating a new Jetty here could lead to congestion in the authorised channel as vessels await a safe opportunity to make a final approach, which will likely impact on passing vessels as well as existing operations. The Applicant currently has mooring points where the Option C Jetty would be located, meaning new moorings would be required.

- 4.6.20. Jetty Option D is located slightly upstream from the Middleton Jetty and the Applicant's mooring points, causing numerous navigation constraints and issues as the presence of new vessels could interfere with vessels approaching Middleton Jetty, and the Applicants existing moorings would require relocation.
- 4.6.21. Jetty Option A is considered to be the most suitable option when considering impact on navigation. Option C and D would both result in navigational constraints and issues for vessels using the Middleton Jetty.

PRINCIPLE 5 IMPACTS TO RECREATIONAL USERS OF THE RIVER AND ENGLAND COAST PATH

- 4.6.22. Given the industrial nature of the area, fishing and recreational activity on the River Thames activity is low, so construction of any option is unlikely to have any impacts on anglers and other recreational users of the river.
- 4.6.23. Jetty Options A and C would result in temporary adverse impacts for users of the England Coast Path and PRoWs FP3 and NCN1, due to potential closures and diversions as well as loss in amenity. This disruption could be reduced with the utilisation of an existing jetty (Option D) however this option would still result in potential closures and diversions as well as loss in amenity.
- 4.6.24. All Jetty Options require the addition of a new overhead gantry which may also adversely affect the experience of users of the England Coast Path and PRoWs (FP3 and NCN1) during operation.
- 4.6.25. Operation of the Proposed Scheme could present opportunities to enhance the England Coast Path and PRoWs FP3 and NCN1 to improve user experience as well as new fishing marks and bird watching panels regardless of which option is taken forward.
- 4.6.26. All jetty options would result in a temporary negative impact to recreational uses of the England Coastal Path and FP3 during construction. However all options provide opportunities to improve these facilities as part of the design and operational phase. There was no preferred option for Principle 5 (Impacts to Recreational Users).

PRINCIPLE 6 MEETING THE CONSTRUCTABILITY AND OPERATIONAL REQUIREMENTS

- 4.6.27. Due to their locations on the River Thames each option will require a different amount of dredging to create a suitable berth pocket for a vessel. Jetty Option A would require

the smallest volume of dredging, and Jetty Option D would require the most. The Bathymetry levels for each option are shown below (Figure 4.1).

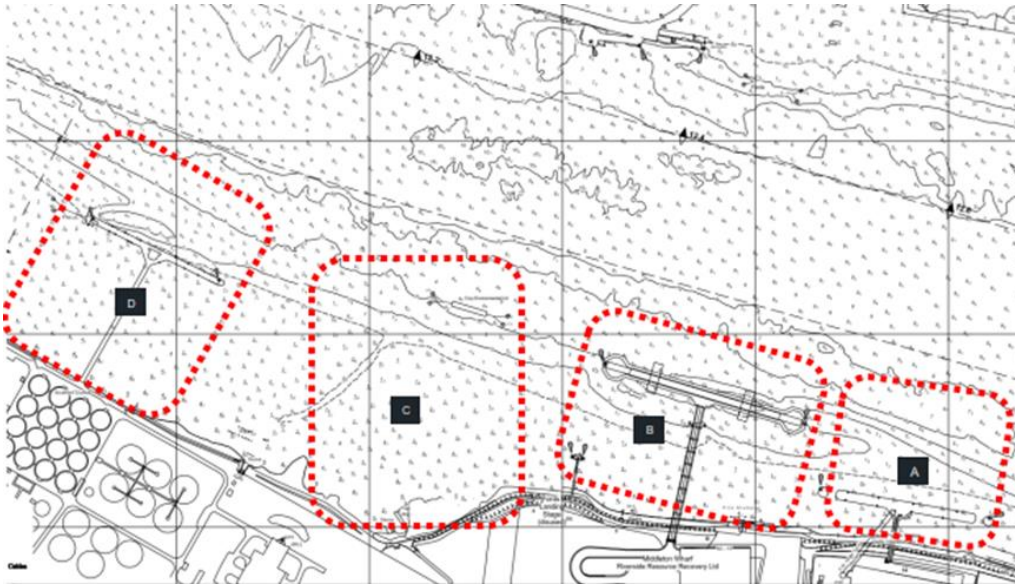


Figure 4.1: Bathymetry levels for each Option

- 4.6.28. Jetty Option A is located downstream of the Middleton Jetty, which is actively and intensively used by the Applicant, a Jetty in this location would result in minimal interference in any current operations, during both its construction and operational phase.
- 4.6.29. Jetty Option A could potentially require the demolition of the Belvedere Power Station Jetty, this would require significant work in advance of the construction of the Proposed Scheme. Alternatively, if Belvedere Power Station Jetty is retained it could require modification.
- 4.6.30. Due to its location upstream of Cory’s existing operations at the Middleton Jetty, Option C could result in major interference in current operations, during both its construction and operational phases. Barges arrive at the Middleton Jetty from upstream, and the presence of a new jetty and vessel could interfere with their approach. Cory also has some mooring points in the location where the new structure will be built, meaning a new mooring for the barges would be required.
- 4.6.31. Jetty Option D requires the demolition and reconstruction of the Thames Water Jetty, this could provide some usable raw materials which could be incorporated into the new jetty construction. However, the location of Jetty Option D means that landside there is only a small corridor of land available for connection to the Riverside Campus which would have insufficient space to accommodate the necessary infrastructure. The connecting infrastructure to the Riverside Campus would also be significantly further (approx. 580m) than all other Jetty options, increasing construction cost, impacting landscape, and require development across Erith Marshes SINC and Crossness LNR.

4.6.32. Jetty Option A was considered to be the preferred option for principle 6, meeting constructability and operational requirement. Option A would have the smallest dredging requirement. It would also have the small distance to connect to Riverside 1 and Riverside 2. As a result of this shortened distance and unlike the other two options, it would not require the acquisition of third party land or temporary or permanent development within Crossness LNR or Erith Marshes SINC.

PRINCIPLE SUMMARY

- 4.6.33. **Jetty Option A**, like all options is anticipated to lead to impacts to marine ecology through the construction of a new structure and the requirement for capital and maintenance dredging. Whilst a navigational risk was identified, it was considered likely that this could be avoided through risk controls, which has now been borne out. The location of Jetty Option A would result in the least interference with existing operations and third party operations and would not require the relocation of the Applicant's existing infrastructure. Option A would require the smallest amount of dredging, of any of the Options. On balance of the Optioneering Principles, Jetty Option A was determined to be the most preferable and is what was taken forward to form part of the Proposed Scheme.
- 4.6.34. Section 4.2 states that **Jetty Option B** was removed as a viable option from an early stage:
- 4.6.35. **Jetty Option C** would require a new structure which would require additional construction work and have a greater impact on marine ecology than Jetty Option D and approx. the same as Jetty Option A. Jetty Option C would also require a large amount of dredging to create a berth pocket for a suitable vessel (3.8m). Furthermore, the location of Jetty Option C, between the Thames Water Jetty and Middleton Jetty, could give rise to navigation constraints with naval congestion in authorised channels leading to passing vessels and existing operations. Jetty Option C would require a landside connection to areas designated in Erith Marshes SINC and Crossness LNR. Therefore, Jetty Option C was discounted.
- 4.6.36. **Jetty Option D** involves the reconstruction of the Thames Water Jetty. Whilst this would require less construction work compared to a new build jetty and subsequently reduce impact on marine ecology, it would require the acquisition of third-party land which would significantly increase the costs compared to other Jetty options assessed. The location of Jetty D also requires the Applicant's moorings to be relocated, and navigational constraints are anticipated. In addition, Jetty Option D provides insufficient space to accommodate the necessary infrastructure landside and would require the longest connection (580m) to Riverside Campus which would be more costly and have impact to Crossness LNR and Erith Marshes SINC. Therefore, Jetty Option D was discounted.

5. CONCLUSION

- 5.1.1. Jetty Option A is the most favourable. Its location downriver of Middleton Jetty would result in the least interference with the existing operations, as vessels navigate predominantly upriver both to and from Middleton Jetty. Being downriver reduces interaction with vessels undertaking operations from the Middleton Jetty and increase the likelihood of a clear approach for arriving vessels. Jetty Option A also does not require the modification or relocating of the Applicant's existing infrastructure (with Jetty Option B requiring an extension to Middleton Jetty, and Jetty Option C requiring the relocation of the Applicant's barge mooring points).
- 5.1.2. Jetty Option A is located in the area of the Belvedere Power Station Jetty which has been on the market for sale for a prolonged period and has not be used for over 30 years for any maritime function. The existing jetty has been maintained and is commercial in its historical use but does not have riparian land attached to it and has little or no prospect of returning to intensive commercial use. The Proposed Scheme would return this zone to active use and preserve a designated River Thames wharf.
- 5.1.3. Jetty Option A is the furthest downstream of the four options and, due to the bed level along this section of the River Thames, it will involve the smallest volume of dredging to create a suitable berth pocket for a vessel.
- 5.1.4. For constructability, Jetty Option A has the advantage of being independent from other structures, which allows it to be designed specifically for the needs of an export jetty, albeit in consideration of the Belvedere Power Station Jetty if retained, this is unlike Jetty Options B and D that would require the modification of the existing jetties.
- 5.1.5. Unlike the remaining Options (C and D), Option B would not result in the permanent loss of Erith Marshes SINC and Crossness LNR.
- 5.1.6. On balance, Jetty Option A was determined to be the most preferable and is what was taken forward to form part of the Proposed Scheme.
- 5.1.7. Despite the favourability of Jetty Option A, the Applicant recognises the potential effects to marine ecology from any development is the River Thames and has continued the requirement for further assessment as scheme design progressed. Through the development of the mitigation measures set out in the **Outline Code of Construction Practice (Document Reference 7.4)**, and environmental design measures secured by DCO Requirements, likely significant effects will be able to be minimised.

Appendices

Appendix A

ALTERNATIVE SITES FOR THE PROPOSED JETTY



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REVISION	DRAWN	CHECKED	APPROVED	DATE



PROJECT TITLE:
CORY DECARBONISATION PROJECT

DRAWING TITLE:
 FIGURE 3-2:
 ALTERNATIVE DEVELOPMENT SITE OPTIONS
 FOR THE PROPOSED JETTY

CONFIDENTIALITY: PUBLIC

DRAWN:	CHECKED:	APPROVED:	AUTHORISED:
NK	DG	SH	JW

SCALE @ A3 SIZE:	DATE:	REVISION:
1:10,000	18/01/2024	P01

DRAWING NUMBER:
 70090329-WSP-06-XX-RP-ENS-0302-P01-AN

Appendix B

BELVEREDERE POWER STATION JETTY TECHNICAL NOTE



BELVEDERE POWER STATION JETTY TECHNICAL NOTE:

DECARBONISATION

Cory Decarbonisation Project

PINS Reference: EN010128

April 2023

Revision A

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Figure 3-2 Belvedere Power Station Jetty Retention Option	Error! Bookmark not defined.

1. INTRODUCTION

- 1.1.1. As part of the Proposed Scheme, it is proposed to construct a new Liquid CO₂ export facility to enable the shore-to-ship transfer of liquefied CO₂ produced at the Riverside 1 and 2 facilities and captured through the Carbon Capture Facility. A new jetty structure is therefore proposed on the River Thames.
- 1.1.2. The Proposed Jetty will be located downstream of Middleton Jetty on the southern bank of the River Thames in front of an existing decommissioned jetty, the former Belvedere Power Station Jetty. The existing structure has been inactive since the 1980's and accordingly has fallen into a state of disrepair. Its positioning will constrain the proposed construction of the new Access Trestle. WSP was therefore commissioned by the Applicant to provide a high-level review of the considerations to be taken into account in considering the various options for the Belvedere Power Station Jetty in that context. The Belvedere Power Station Jetty (disused) is presented in Figure 1-1 below.



Figure 1-1: Belvedere Power Station Jetty - View from the Thames footpath

- 1.1.3. This review covers two options:
- Demolition to facilitate the construction of the Proposed Jetty.
 - Retention of the Belvedere Power Station Jetty but with modifications to facilitate the Access Trestle.
- 1.1.4. This Appendix considers the following criteria:
- Health & Safety

- Security
- Impact on Proposed Access Trestle Construction
- Marine Biodiversity
- Terrestrial Biodiversity
- Cultural Heritage
- Maintenance
- Cost

2. EXISTING STRUCTURE

- 2.1.1. The Belvedere Power Station Jetty is not within Cory ownership as the structure currently is an asset of Aviva. It is located within the intertidal zone within the River Thames and is a non-designated heritage asset. The Belvedere Power Station Jetty is not a safeguarded wharf.
- 2.1.2. The Belvedere Power Station Jetty comprises of the following associated structures, as detailed below and in Figure 2 1:
- Main platform - a reinforced concrete deck supported on a combination of steel and concrete, raked and vertical piles. The structure is approximately 280m long.
 - Dolphins – a reinforced concrete deck supported on a combination of steel and concrete raked and vertical piles.
 - Walkways – timber walkways suspended beneath the main deck.
 - Access trestle – a steel truss structure with a concrete deck, providing access from the land to the main deck.
- 2.1.3. The structure which was originally used for oil import is not currently in operation and has been derelict since the 1980’s.

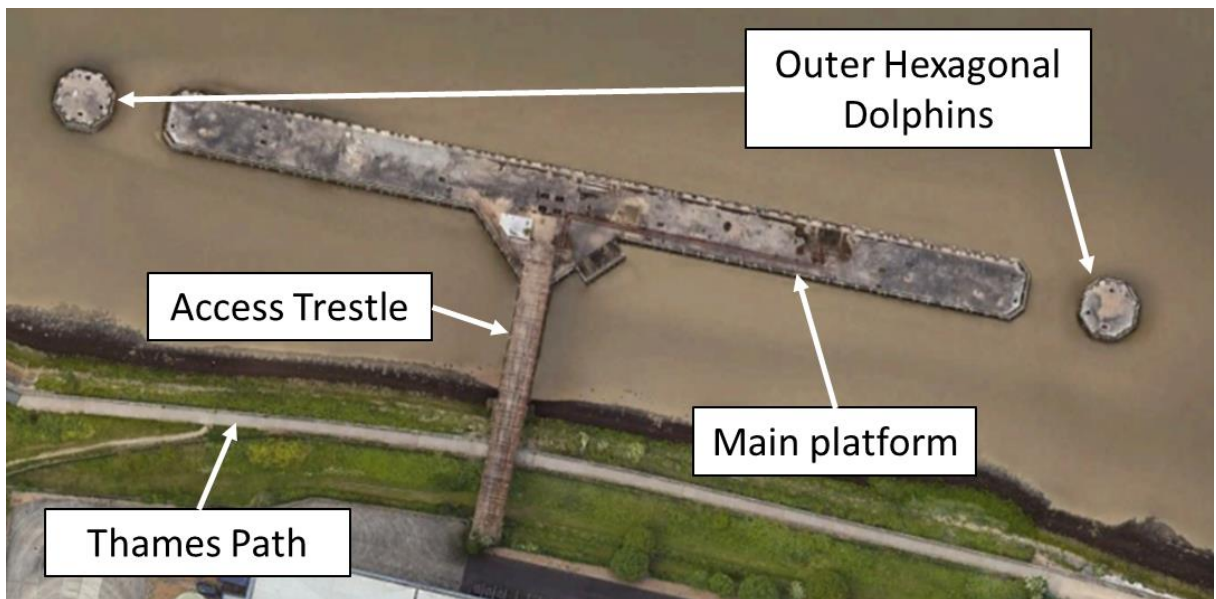


Figure 2-1 Belvedere Power Station Jetty – Layout

- 2.1.4. The overall condition of the structure appears to be fair, but noting the following matters that were noted on a site visit in January 2023 by boat and to the adjacent Thames Path:
- Main Platform: There are no significant visible structural defects on the main deck. Few vertical cracks are in the concrete piles, but minor corrosion is present in the steel piles where the corrosion protection had broken down at high water level. There is significant spalling on the underside of the beams around openings in the deck and on the concrete piles.

- Dolphins - Minor corrosion is present on the steel piles at high water level and there is minor cracking on the concrete piles.
- Timber façade of the main Jetty and dolphins - these are in poor condition with many external panels missing or loose.
- Access Bridge - this is considered to be structurally sound with loss of corrosion protection in many locations but no significant loss of steel thickness. The concrete columns supporting the access bridge at the jetty end are in a fair condition with no observable significant defects. The steel piles supporting the remaining part of the access bridge are also in a fair condition.

3. OPTIONS DESCRIPTION

3.1. DEMOLITION

- 3.1.1. As seen in Figure 3 1, the access bridge for the Proposed Jetty passes over the existing Belvedere Power Station Jetty. As part of this option the main deck, dolphins, walkways, and access bridge would be removed.
- 3.1.2. The superstructure would be removed completely to allow the construction of the proposed export jetty. Piles would be cut back to a level below the riverbed to reduce navigational hazards. Alternatively, piles could be cut above water level to be used to enhance marine habitat in the area.

3.2. RETENTION WITH MODIFICATIONS

- 3.2.1. The proposed access bridge is at a higher elevation than the existing jetty, therefore there is an option to retain the Belvedere Power Station Jetty in its current location and construct the proposed export jetty over it. However, depending on the exact geometry of the Belvedere Power Station Jetty, it may be necessary to remove parts of the existing superstructure (i.e. buildings constructed over the jetty deck) if these clash with the access trestle of the Proposed Jetty.
- 3.2.2. The piles of the proposed access trestle will have to be constructed to not interfere with the existing structure and the access trestle would therefore have to span a greater distance at this location. Alternatively, structural work to the Belvedere Power Station Jetty may be required to enable the retention of the structure.
- 3.2.3. The construction of the Proposed Jetty over it would mean that the Belvedere Power Station Jetty would no longer be operable as a jetty.

4. OPTION CONSIDERATIONS

Item	Demolition Option	Retention Option
<p>Health & Safety</p>	<p>Health & Safety risks (H&S) associated with demolition of the existing structure.</p> <p>Potential navigational hazard if piles are left in place protruding above riverbed.</p> <p>Ease of construction of the Proposed Jetty and reduced H&S risks.</p>	<p>Impact of construction loads and activities of the new access trestle on stability/integrity of the Belvedere Power Station Jetty would need to be managed.</p> <p>Deterioration of the jetty over time could cause debris to enter the river causing navigational hazard, so this would require active management and have associated costs.</p>
<p>Security</p>	<p>No additional risk associated with this option.</p>	<p>Belvedere Power Station Jetty provides an additional access point for trespassing (climbing from existing structure to Proposed Jetty), as such the modifications would need to ensure that connection to land is broken.</p> <p>Introduction of an additional access point for trespassing onto the Proposed Jetty which will need to be addressed under risk assessment as per ISPS (International Ship and Port Facility Security) code to ensure that appropriate mitigation measures are adopted which could add to costs.</p>

Item	Demolition Option	Retention Option
<p>Impact on Proposed Access Trestle Construction</p>	<p>Ease of access for marine plants for construction and lifting into position of main components (piles and deck sections).</p> <p>Piling for Proposed Jetty access trestle – adjustment of the new piles’ location, to avoid clashes with cut back Belvedere Power Station Jetty piles may be required.</p>	<p>Difficult access for marine plants for construction phase with potential obstruction of the existing structure.</p> <p>Proposed access trestle pile spacing will need to be designed to ensure no clashes with existing structure.</p> <p>Requirement for monitoring and potential temporary measures to ensure stability of existing structure during piling activities.</p>
<p>Marine Biodiversity</p>	<p>If the Belvedere Power Station Jetty is removed, it has the potential to result in a net gain of intertidal habitat within the Site Boundary, or reduced loss compared to retention, notwithstanding the installation of the Proposed Jetty. This has the potential to result in a smaller loss of Biodiversity units, and reduced financial cost to provide those compensatory units to achieve 10% net gain.</p> <p>The removal of the Belvedere Power Station Jetty will also result in a minor loss of intertidal artificial structure (and fish refuge/ 3D habitat), quantifiable in the BNG metric, which will count as a small loss of habitat. It is expected this will ultimately be mitigated for by the area of the Proposed Jetty.</p> <p>The removal of the Belvedere Power Station Jetty also has</p>	<p>Retention of the Belvedere Power Station Jetty will result in an overall loss of intertidal habitat within the Site Boundary due to the installation of the Proposed Jetty. This would result in a loss of intertidal biodiversity units.</p> <p>This loss may require the creation of additional habitats onsite, offsite or the purchase of statutory credits to mitigate and achieve BNG.</p> <p>The retention of the Belvedere Power Station Jetty will result in the retention of fish refuge. Due to the potential presence of juvenile European smelt <i>Osmerus eperlanus</i> within the vicinity of the jetty, the retention could be both beneficial (due to the retention of established fish refuge) and non-beneficial (as no additional mudflat is</p>

Item	Demolition Option	Retention Option
	<p>the potential to provide additional foraging habitat for fish, due to the removal of the piles. Due to the potential presence of juvenile European smelt <i>Osmerus eperlanus</i> within the vicinity of the jetty, the removal could be both beneficial (due to the increase in mudflat) and negative (removal of refuge) to a feature of the Medway MCZ.</p> <p>The Environment Agency has provided feedback from the PEIR stage of the project and has suggested it is their preference for the Belvedere Power Station Jetty to be removed in order to allow UKBAP priority habitat (mudflat) to reform.</p>	<p>being created) to a feature of the Medway MCZ.</p> <p>.</p> <p>BNG comparison found retention would require removal of ~0.001ha of intertidal mudflat (~0.01 biodiversity units) when compared to Belvedere Power Station Jetty demolition.</p>
<p>Terrestrial Biodiversity</p>	<p>Demolition of the Belvedere Power Station Jetty will lead to the loss of a small (i.e. used by only a small number of birds) high tide roost site used by wintering birds as a place of rest or shelter. The jetty has also been observed to be used by a single pair of oystercatcher as a nesting site, although it should be noted these remain a common and widespread UK shorebird species. Overall demolition will lead to overall loss of terrestrial habitat used by birds.</p>	<p>Retention presents an opportunity to create up to 0.2ha of habitat on the surface of the Belvedere Power Station Jetty for both breeding and wintering birds by adding suitable aggregate to its surface, creating a more natural space for birds to use as habitat.</p>
<p>Cultural Heritage</p>	<p>The Belvedere Power Station Jetty is a non-designated heritage asset of low heritage significance (value) and local importance dating to the</p>	<p>In the event that the Belvedere Power Station Jetty is retained, the setting of this heritage asset would change as a result of the</p>

Item	Demolition Option	Retention Option
	<p>1950s or 1960s. Its significance is derived from its historic interest as the last surviving element of the former Belvedere Power Station, which lay to the immediate east of the Site Boundary.</p> <p>In NPS EN-1 and NPPF terminology, demolition of the jetty would result in a total loss of significance of the heritage asset of low heritage significance (value).</p> <p>An Historic England Level 2 Historic Building Recording would need to be undertaken prior to demolition (to be agreed with the LPA). This would comprise a descriptive record where the structure will be seen, described and photographed to ensure that an accurate record of the jetty is archived for future research and understanding of heritage value.</p> <p>The pile probing and removal of other buried obstructions, such as foundations, which may be required for the demolition, can also have a considerable impact on adjacent buried and submerged archaeological remains. Should existing piles be left in situ, this may reduce the impact to potential archaeological remains within the foreshore / river channel.</p>	<p>Proposed Scheme. The Proposed Jetty and parts of the Carbon Capture Facility would be visible in views out from and towards the asset. The access bridge connecting the Proposed Jetty to the Riverside Building 1 would pass over the asset. The Proposed Scheme would introduce a new built form into the setting of this heritage asset which would affect its relationship with the River Thames. However, it would not impact its relationship to its riverside location or to the surrounding industrial landscape.</p> <p>In NPS EN-1 and NPPF terminology, the Proposed Scheme would result in less than substantial harm to the asset through changes to the asset's setting.</p> <p>Although the asset is considered to be of low (local) significance only, heritage assets are an irreplaceable resource and once lost cannot be restored. The asset's historic interest is as the last surviving element of the Belvedere Power Station, which provides evidence of the area's long and rich industrial history.</p> <p>With regard to potential below-ground and submerged archaeological remains, this option is preferred as it would not result in direct physical</p>

Item	Demolition Option	Retention Option
		impact from pile probing / removal.
Maintenance	No additional maintenance requirements associated with this option.	Need for regular inspections and maintenance of Belvedere Power Station Jetty.

5. CONCLUSION

- 5.1.1. The Applicant considers that this analysis demonstrates that the differences between the options are marginal and there is no one factor that would determine that a decision should be made either way at this time. As such, the Proposed Scheme will retain this optionality and make a decision at detailed design. This decision will be confirmed via DCO Requirement.



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