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THE MERSEY GATEWAY PROJECT

CONSTRUCTION METHODS

Halton Borough Council
The Mersey Gateway Team
Environment and Development Directorate
Rutland House
Halton Lea
Runcorn
WA7 2GW

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1. INTRODUCTION

1.1 The Project

1.1.1 Halton Borough Council (the “Council”) is promoting Applications and Orders to authorise the construction and operation of a new crossing of the River Mersey known as the Mersey Gateway Bridge (the “New Bridge”). In addition to the New Bridge, the Project (which is known as the Mersey Gateway Project and referred to in this document as the “Project”) includes:

a. Provision of a main Toll Plaza to the north-west of Ditton Junction
b. Improvements to Ditton Junction
c. A new crossing of the Garston to Timperley Freight railway line
d. A new viaduct crossing the Victoria Road area of Widnes
e. A new junction with the Widnes Eastern Bypass, called the Widnes Loops Junction in the application that this document accompanies
f. A new bridge crossing the St Helens Canal
g. A new viaduct crossing the Astmoor Industrial Estate at high level
h. Improvements to Bridgewater Junction
i. Improvements to the Central Expressway
j. Improvements to Lodge Lane Junction
k. Improvements to Weston Link Junction
l. Improvements to the southern section of Weston Point Expressway
m. Improvements to the junction on the north side of the M56 Junction 12
n. Amendments to the carriageway of the existing Silver Jubilee Bridge and
o. Works to the existing Queensway in Widnes

These works are shown on the plan in Appendix B

1.1.2 The Mersey Gateway would be constructed between the A562 Speke Road north of the River Mersey, through South Widnes, across the Upper Mersey Estuary and the Manchester Ship Canal to link with the north end of Runcorn’s Central Expressway at the junction of the A558 and the A553. The Central Expressway would form the major link southwards to the M56 and would require the junctions with the Southern Expressway and Weston Point Expressway to be reconfigured in line with the new traffic priorities. The arrangements for linking with Junction 12 of the M56 would also be modified.

1.1.3 The Project envisages major works, which would be constructed on both banks of the Mersey Estuary to facilitate the new crossing as well as within the estuary itself. These would involve traditional civil engineering techniques required for highway construction in urban areas. The industrial past of the area has resulted in the presence of pollutants and potential contamination in the ground and construction methodologies will address this.

1.1.4 It is necessary for the applications for the relevant orders and permissions required for the Project to be accompanied by an Environmental Statement (the "ES"). The ES will set out and explain the environmental effects of the Project during its construction and operational phases. Because of the scale and cost of the Project, the Council proposes to procure a private sector concessionaire who would construct, maintain and operate the Project. It would be this person or organisation that decides how to build the various infrastructure components that it comprises. This means that the Council cannot at this stage confirm the exact methods required for the construction of the Project.

1.1.5 This report is intended to provide an explanation, for the purposes of the ES, of the possible construction methods that the Concessionaire may adopt. It does not prescribe the actual methods or materials, but makes assumptions as to scenarios so that their likely impacts may be assessed. Similarly, since the final, detailed design and methodology will be proposed in the future, assumed quantities and dimensions should be considered to be realistic approximations. So that decision-makers and the general public may be confident as to the assumptions used, a realistic pessimistic scenario has been adopted. Having done this, mitigation may be designed and required to ensure – so far as possible – that the actual environmental effects of construction of the Project are the same as or more benign than those predicted. The Concessionaire will then as required adopt construction methodologies that are neither significantly different nor worse than the assessed scheme. Similarly, if a range of alternative methodologies could be adopted each is assessed.

1.1.6 In order to ensure that the Project is implemented within the scope of the assessed impacts (i.e. outputs), planning conditions and/or other controls are likely to be imposed on the Project. These would ensure that the outputs produced by the assessed methodologies are achieved. This is explained further in the mitigation part of the ES.

1.2 The Mersey Gateway Bridge

1.2.1 The Mersey Gateway Bridge – the New Bridge - would cross the Mersey Estuary east and upstream of the existing bridges between Runcorn and Widnes at the Runcorn Gap. The New Bridge structure would be approximately 2.13 km long between abutments and include a 1,000m crossing of the tidal river (see Drawing No B4027/4/H/004/01F in Appendix A and Figure 1 below). It is proposed that the ground beneath the New Bridge between abutments (so far as not occupied by new structures and so far as possible) should be maintained in its current condition. For this reason, the number of towers to be located in the tidal river is limited. Similarly, support structures within the saltmarshes on either side of the tidal river will be located so as to minimise interference with the existing system of drains and gullies that criss-cross those marshes. The saltmarshes would be disturbed during construction but would be re-instated to their current condition as far as possible.

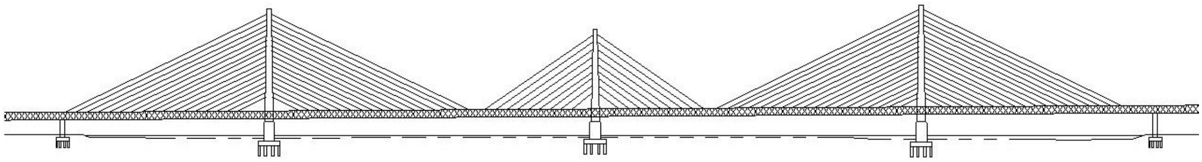


Figure 1 – Elevation of the Reference Design of the Mersey Gateway Bridge over the Tidal River

1.2.2 Deck construction for the New Bridge could be from prefabricated segments or incremental in situ techniques. If prefabricated, deck units are likely to be large and weighty. Transport to the point of erection would need to be capable of dealing with the tidal range of the Upper Mersey Estuary. Within the intertidal zone of the Estuary, the limited depth of water available and the extended periods when sandbanks are exposed mean that an amphibious operation or a land-based operation are the most likely methodologies. These are explained at Section 3.4. The New Bridge adopts a prefabricated modular unit as the most likely construction form for a bridge of this size in this location.

1.2.3 A 1,000m cable stayed section of the New Bridge would span the tidal river supported from three towers. These are envisaged as being a concrete shaft from pilecap to deck level with an upper steel stem mounted between the road decks of the New Bridge incorporating cable anchorages. Deck construction would be by balanced cantilever with the twin decks advancing in parallel. The decks would be joined at the cable anchorage positions with a unit that links the decks and combines their torsional capacities. This permits the installation of cables along the centre of the twin decks. The cables are likely to be of parallel strand design within protective sheaths designed for individual replacement.

1.3 The Silver Jubilee Bridge

1.3.1 Once the new crossing is opened, the existing Silver Jubilee Bridge would be modified to improve the provisions for cycling and walking and reduce the carriageway to two lanes. This would involve re-configuring the road deck layout with new kerbing, re-surfacing and road markings. Traffic arrangements on the approaches would be modified to effect the change to a 'local bridge'. Junctions would be reconfigured to reflect the changed formation and status of the Silver Jubilee Bridge. This would require traffic management measures.

1.4 Other Works

1.4.1 Toll plazas would be constructed on the Speke Road approach to Ditton Junction, on the east facing slip roads of Ditton Junction, on the junction with the Widnes Eastern Bypass and on the northern approaches to the Silver Jubilee Bridge.

1.4.2 The Central Expressway in Runcorn would be upgraded to conform more closely to current highway design standards.

1.4.3 Lodge Lane Junction and Weston Link Junction on the Central Expressway/Weston Link would be modified to accommodate the changed traffic priorities. Also the north side of M56 Junction 12 would be modified to improve its efficiency under anticipated traffic levels.

1.4.4 All of these works are shown on the plan in Appendix B.

2. ROUTE DESCRIPTION AND CONSTRUCTION AREAS

2.1 Route Description

2.1.1 This section of this report provides a more detailed description of the route comprised in the Project and the structures and works that they will include.

2.1.2 The works on the alignment of the New Bridge commence at the A562 Speke Road where a toll plaza would be formed on land that is presently occupied by the highway and a disused golf course. The alignment then swings south to cross the Garston to Timperley Freight railway line, Victoria Road, the St Helens Canal and Widnes Warth Saltmarsh at the Mersey Estuary. The route then passes at high level over the Astmoor Saltmarsh, Wigg Island and the Manchester Ship Canal to reach the south bank before it crosses the Astmoor Industrial Estate to rejoin the existing highway network at the junction of the Bridgewater, Daresbury and Central Expressways. The length of the New Bridge, between abutments, is approximately 2.13 km and the overall length of new highway is 5.0 km from the tie in with Speke Road to the west of the new main Toll Plaza to the improved Bridgewater Junction. The Central Expressway through Runcorn would be upgraded to conform more closely to current highway design standards. The Central Expressway junctions at Lodge Lane and Weston Link would be modified to implement the change in traffic priority of the route. The northern access roundabout to M56 Junction 12 would be modified to improve traffic efficiency through the junction. Details of the route alignment are given on Drawing B4027/4/004/01F in Appendix A.

2.2 Construction Areas

2.2.1 For the purposes of description, the works may be divided into a number of work areas, as shown in Appendix B and described in Section 3.

3. ANTICIPATED CONSTRUCTION METHODS

3.1 Area A - Main Toll Plaza

3.1.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.1.2 The Main Toll Plaza, which would require approximately 4 ha of land to accommodate the northbound and southbound tollbooths, would be at or just above existing ground level. No major earthworks are envisaged because the land at this location is already relatively flat. Where the Toll Plaza is above ground then fill would be imported. Tolling structures would be required, which are likely to comprise canopies providing sufficient headroom over tollbooths and their equipment for normal traffic use.

3.1.3 Extended link roads to the north and south of the Main Toll Plaza carriageway that bypass the tollbooths will be provided to allow access from Speke Road to Ditton Junction for vehicles not wishing to use the Mersey Gateway. The north edge of the north link road will coincide with the northern edge of the existing southbound carriageway of Speke Road.

3.1.4 Because of the historic industrial activity on this site, this area has been assumed to contain residual contamination within the superficial (near surface) made ground deposits[1]. The Main Toll Plaza area would be at, or about, existing ground level and would be formed on a relatively thin layer (approximately 1m average thickness) of imported fill material supported on the superficial deposits that are likely to need to be subjected to ground improvement techniques to control settlement – see paragraph 3.1.12 below.

3.1.5 Excavations would be avoided wherever possible to minimise the need to dispose of arisings that may be contaminated. Drainage and other trench arisings would be incorporated into other areas of fill if possible but would otherwise require to be taken to a licensed tip.

3.1.6 Stewards Brook and a public footpath pass beneath the existing Speke Road in culverts to the west of the proposed tolling areas. These culverts would need to be extended in length to the south to accommodate the increased width of the carriageway at that location.

3.1.7 Balancing ponds may be formed to the south of the new carriageway on either side of Stewards Brook to control the drainage water outfall flow rate into the brook. Other drainage attenuation options may also be suitable.

Site Access

3.1.8 Access to this site would be from Ditton Junction and Ditton Road by means of constructing a haul road along the line of the southern slip road.

1 *The likelihood of contamination and its effects are assessed at Chapter 14 of the ES.*

Site Clearance and Demolition

3.1.9 The first construction activity would be to fence the site and to clear the existing vegetation from the area. On the assumption of near surface ground contamination, a topsoil strip is not envisaged.

3.1.10 There would be no existing buildings or structures to demolish in this area.

3.1.11 There would be no significant service diversions required in this area because few services are present. However, new services would be required for the new tolling facilities.

Construction Methods

3.1.12 The ground that would support new carriageways would be improved by the installation of a grid of vibro-concrete columns (VCCs). These would be on an approximate 2m x 2m grid to an average depth of 6m. These VCCs would be installed by specialist piling rigs that sink a probe into the ground and then inject concrete at pressure as the probe is withdrawn forming a column of concrete. An intense localised ground vibration is part of this technique.

3.1.13 The resulting grid of VCCs would then be overlaid with geotextile membranes and layers of imported granular fill material. This would be delivered in road-going tipper trucks and spread and compacted by bulldozers and rollers.

3.1.14 The carriageway pavement would be constructed directly on top of this granular capping layer.

3.1.15 Culvert extensions would be constructed of precast concrete segments that are produced off-site and delivered to site on lorries and lifted into place with cranes. Alternatively culverts may be cast in situ. The construction of these culvert extensions would involve some excavation of potentially contaminated material that could be disposed in the ground improvement areas.

3.1.16 The toll plaza area would require a drainage system to carry rainwater to the balancing ponds. This would include concrete drainage channels on either side of the main carriageway. These would be formed in situ with minimal excavation.

3.1.17 Finishing works would include street lighting, road marking, safety fencing, road signs and gantries, installing communications equipment and construction of the tolling booths and associated facilities, and the erection of the tolling canopies.

Construction Vehicle Movements

3.1.18 Throughout this report the numbers of construction vehicle movements have been estimated based on a concrete mixer truck that carries $5m^3$ of concrete and a 20 tonne tipper truck for earthwork materials.

3.1.19 The principal construction vehicle movements would be approximately 3,300 concrete mixer trucks for the construction of the VCCs. The granular fill capping layer would involve around 5,000 tipper truck movements, and the carriageway construction would involve a further 1,000 tipper truck movements.

3.1.20 Other construction plant would include 5-10 specialist piling rigs, small handling cranes, dozers, rollers, pavers and general excavation plant.

3.1.21 This site would require a workforce of approximately 40 operatives with welfare and messing facilities over a period of 12 months. A works compound would be contained within the area of the site.

Programme, Phasing and Traffic Management

3.1.22 These works would probably be constructed towards the end of the overall construction period so that completion coincided roughly with the overall project completion. This would allow fill to be obtained from the embankments of the Widnes Eastern Bypass, which would be closed by the time it could be used on this site.

3.1.23 During construction, traffic flows using Speke Road would have to be maintained through the site. This would be achieved by a phased system of construction. The new carriageway areas to the south of the existing Speke Road would be constructed first. Once complete, traffic would be diverted onto a temporary alignment on the new carriageway while the existing carriageway was upgraded. This would all have to be co-ordinated with the traffic management at the adjacent Ditton Junction.

Waste

3.1.24 It is estimated that site clearance will generate approximately 500m^3 of green waste and vegetation.

3.1.25 The excavation of the existing Speke Road carriageway would generate approximately 3,000m^3 of waste road construction materials.

3.1.26 New carriageway drainage would involve the excavation of contaminated materials and it is estimated that approximately 4,000m^3 of this waste would be removed off-site to an appropriate licensed facility for further treatment/disposal. Some of this contaminated material may require pre-treatment before being removed from site.

3.2 Area B - Ditton Junction to Freight Line

3.2.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.2.2 Ditton Junction would be changed from a roundabout to a signal-controlled junction. The new carriageway would increase in level on an embankment as it approaches the new grade separated junction and would be taken over the new ground level link, between Ditton Road and Moor Lane South, on a new, two span bridge.

3.2.3 The southbound on-slip and the northbound off-slip would also feature toll collection facilities.

3.2.4 An embankment of up to 9m high would be formed. This crosses land currently occupied by industrial buildings and a scrap metal yard and it is assumed that these areas will require treatment (owing to contamination) prior to construction of the embankment.

3.2.5 Because of the historic industrial activity on this site, this area contains residual contamination within the superficial (near surface) made ground deposits. Excavations would be avoided wherever possible to minimise the need to dispose of contaminated arisings. Drainage and other trench arisings would be incorporated into other areas of fill if possible but would otherwise require to be taken to a licensed tip. The same would be true of the modifications to the highway links and alignment associated with the amendments to the local road system to tie into the new junction arrangement.

3.2.6 Ditton Road is a long-established corridor for services and many of these would need to be diverted to accommodate the revised highway alignment. These would include diversions of electricity, gas, water, sewage and telecommunications mains. The Scottish Power Manweb electricity substation adjacent to the Anglo Blackwell compound on Ditton Road would require relocation.

Site Access

3.2.7 Access to the site currently occupied by Ditton Roundabout would be from the roundabout itself with a traffic management regime to allow safe entry and egress to the site.

3.2.8 Access to the embankment to the north-west of the existing roundabout would be common with access to the Main Toll Plaza site described in paragraph 3.1.8 above.

3.2.9 Access to the Ditton Road area to the south-east of the existing roundabout could initially be achieved via the established exit from the roundabout, but subsequent access to construct the embankment would have to be via the junction between Ashley Way and Ditton Road.

Site Clearance and Demolition

3.2.10 The new Ditton Junction Bridge can only be constructed once traffic has been diverted off the existing link from Queensway to Speke Road. The existing embankment in the centre of the roundabout would have to be excavated. Initially this would involve the removal of existing landscaping trees and bushes and the removal to store of the Sandstone boulders that are part of the existing landscaping.

3.2.11 The two existing bridge decks would have to be demolished with the road below closed.

3.2.12 The existing electricity substation would be relocated.

3.2.13 A number of the existing business premises along Ditton Road would have to be demolished. These would include the premises currently occupied by Anglo Blackwell, Gussian and the S Evans metal scrap yard. This would generally involve the demolition of single storey masonry buildings, the removal of some concrete foundations, the removal of the heap of scrap metal and the remediation of areas of existing ground contamination. Existing services and drainage would have to be stopped off.

3.2.14 Areas of existing highway carriageway would need to be excavated in places, while in other areas it could be left in place after being perforated to assist future drainage requirements. Bituminous materials would be re-cycled wherever possible.

Construction Methods

3.2.15 The new bridge at the Ditton Junction would be a conventional structure and the deck could be in concrete or steel/concrete composite of either in situ or precast construction. The foundations would either be piled or on a combined system of spread foundations and ground improvement. The pile caps or spread foundations would be below finished ground level and would require excavation and the construction of reinforced concrete elements. The abutment walls and wing walls would be of reinforced concrete. The construction of these elements would involve excavators and a handling crane to move materials and shutters. A truck mounted concrete pump would be likely to be employed for placing concrete. A large mobile crane would be employed for the placing of the bridge beams.

3.2.16 Measures may need to be taken to contain contamination under the approach embankments at Ditton Junction. All fill required for the new embankments is likely to be imported by road. Otherwise, conventional carriageway construction methods will be needed and no exceptional measures are anticipated.

3.2.17 The ground that would support new embankments on either side of the new bridge would be improved by the installation of a grid of vibro-concrete columns (VCCs). These would be constructed using the methods described in paragraph 3.1.12.

3.2.18 The resulting grid of VCCs would then be overlaid with geotextile membranes and layers of imported granular fill material. Embankment fill material would be delivered using road-going tipper trucks and spread and compacted using dozers and rollers.

3.2.19 The new carriageway would be constructed on the embankment.

3.2.20 Finishing works would include street lighting, road marking, safety fencing, road signs and gantries, installing communications equipment and construction of the tolling booths and associated facilities, and the erection of the tolling canopies.

3.2.21 The re-aligned Ditton Road would be constructed beneath the new bridge and traffic signal controlled junctions would be formed with Ashley Way, Ditton Road and both of the new slips roads. These works would include major services diversions.

Construction Vehicle Movements

3.2.22 Site clearance at Ditton Roundabout would require approximately 20 tipper truck movements to remove vegetation and topsoil, some of which may be able to be re-used in the works. The existing embankment fill would be removed using approximately 2,000 tipper truck movements and should be able to be re-used in the construction of the re-modelled embankments. The beams of the existing two bridges and their reinforced concrete substructure would be broken up and the steel would be re-cycled and the concrete debris would be incorporated within the works. Most of these vehicle movements would be on the public highway network.

3.2.23 The principal construction vehicle movements would be approximately 2,500 concrete mixer trucks for the construction of the VCCs. The granular fill capping layer would involve around 1,000 tipper truck movements, the new embankment would involve 5,000 tipper truck movements and the carriageway construction would involve a further 500 tipper truck movements.

3.2.24 Other construction plant would include 5-10 specialist piling rigs, small handling cranes, dozers, rollers, pavers and general excavation plant.

3.2.25 This site would require a workforce common with that for the adjacent Main Toll Plaza site (i.e. approximately 40 operatives); however, there would be an additional 15 operatives for the bridge construction activities. These personnel would share office and messing facilities with the Main Toll Plaza site.

Programme, Phasing and Traffic Management

3.2.26 The main re-modelling works at Ditton Junction would be undertaken late in the overall construction programme to minimise the traffic management disruption when traffic would have to be diverted off the existing carriageway passing over the existing Ditton Roundabout.

3.2.27 Possession of the existing business premises on Ditton Road is likely to be early in the construction programme to allow for demolition, service diversions and the remediation of contaminated ground.

3.2.28 Service diversions may be undertaken early in the Project to minimise their impact on the programme of works.

3.2.29 A traffic management and phasing programme would be required to maintain traffic flows at Ditton Junction during the construction period. Temporary road diversions would be required using both existing and new areas of carriageway.

Waste

3.2.30 It is estimated that site clearance of the existing Ditton Roundabout would generate approximately 50m^3 of green waste and vegetation.

3.2.31 The demolition of the two existing bridges at Ditton Roundabout is estimated to generate approximately 2,500m^3 of waste structural materials (concrete and steel reinforcement).

3.2.32 The demolition of the existing industrial buildings along Ditton Road would generate approximately 15,000m^3 of building waste comprising brick masonry, concrete, reinforcement steel and steel sections.

3.2.33 Pile arisings from the construction of the foundations of the new Ditton Junction Bridge are assumed to comprise of approximately 4,000m^3 of contaminated material that would be removed off-site to an appropriate licensed facility for further treatment/disposal.

3.2.34 The construction of the new structure would generate approximately 100m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.2.35 New carriageway drainage would involve the excavation of contaminated materials and it is estimated that approximately 1,000m^3 of this waste would be removed off-site to an appropriate licensed facility for further treatment/disposal.

3.3 Area C - Freight Line to St Helens Canal

3.3.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.3.2 The following new structures and earthworks would be required in this section of the works:

a. The Freight Line Bridge - a single-span bridge over the Garston to Timperley Rail Freight Line.
b. Victoria Road Viaduct - a high level, multi-span viaduct connecting the Freight Line Bridge to the edge of the Widnes Loops Junction including the crossing of Victoria Road.
c. Two bridges over the new Widnes Loops Junction carriageways.
d. Embankments carrying the new carriageway at high level.
e. A bridge to carry the Widnes Loops Junction southbound on-slip over itself.
f. Toll plazas connecting the Mersey Gateway to the Widnes Eastern Bypass.
g. The St Helens Canal Bridge - the high level bridge crossing the potential development corridor to the north of the St Helens Canal and the crossing of the St Helens Canal itself, which would then land on the north abutment of the Mersey Gateway Bridge.

3.3.3 This area forms the link between the Mersey Gateway and the existing A557 Widnes Eastern Bypass that connects with Junction 7 of the M62 to the north. It would be formed primarily by substantial earthworks formed from excavated arisings from the redundant Widnes Eastern Bypass supplemented by imported fill.

3.3.4 The new road between the Freight Line and the Widnes Loops Junction would be carried on a multi-span reinforced concrete structure. Finishes would be to a high quality specification and the area landscaped upon completion of the works.

3.3.5 The structures within the Widnes Loops Junction would either be portal or box structures in reinforced concrete constructed within the earthworks.

3.3.6 It is also assumed that works may be needed in this area to contain or treat the contamination present in the soils under the footprint of the new earthworks.

3.3.7 The new carriageway would be taken over the St Helens Canal on a new, reinforced concrete structure, integral with the north abutment of the Mersey Gateway Bridge. It would be formed at a height sufficient to permit a further structure to be constructed under it to carry a future light rapid transit (or similar) system at a level to match the possible running surface within the Mersey Gateway Bridge and still preserve the required headroom of 5m for craft using the canal.

3.3.8 During construction of the Mersey Gateway Bridge, it is anticipated that the St Helens Canal area would form the main reception/transition area for the main bridge units that will form the decks. As such, it is assumed that it will be necessary temporarily to infill the canal (maintaining its drainage water transfer function) to provide a working area. On completion, the canal would be reinstated with some minor changes to the alignment. A corridor for the Trans-Pennine Trail cycle and footpath would be maintained throughout the works.

3.3.9 Upon completion of the Project a landscaping scheme would link the new earthworks with the leisure facilities offered by Spike Island, the St Helens Canal and the Trans-Pennine Trail.

Site Access

3.3.10 Access to the site of the Freight Line Bridge would have to be undertaken using agreed methods of working with Network Rail. Railway possessions would be required for constructing the span across the railway and for the installation of the various protection measures that would be required for working adjacent to a live railway.

3.3.11 Access to the site of the Victoria Road Viaduct would be from Victoria Road and Hutchinson Street.

3.3.12 Access to the site of the Widnes Loops Junction and the embankment between this junction and the St Helens Canal would initially be via the entrance to the existing Catalyst Trade Park, then using side roads on the south side of the junction and then finally via the closed alignment of the Widnes Eastern Bypass from the north east.

Site Clearance and Demolition

3.3.13 The new carriageway crosses the Victoria Road area at a height of approximately 10m above existing road level. The area would need to be cleared of its present brick properties and the structures associated with the existing Widnes Eastern Bypass. The arisings from such clearance/demolition would be taken as fill to the Widnes Loops area described in paragraph 3.3.27. Existing services and drainage would have to be stopped off.

3.3.14 The relatively modern light industrial units within the Catalyst Trade Park would be dismantled and the materials would be re-cycled. The concrete foundations would be removed. Existing services and drainage would have to be stopped off.

3.3.15 The ground below the Catalyst Trade Park is known to contain high levels of contamination. Excavation within these areas would be kept to a minimum, but remediation works are assumed to be required.

3.3.16 The existing electricity substation adjacent to the ThermPhos site would have to be relocated.

3.3.17 Areas of existing highway carriageway and embankment of the Widnes Eastern Bypass would need to be excavated. Bituminous materials would be re-cycled wherever possible.

Construction Methods

3.3.18 The new bridge at the Freight Line will be a conventional portal structure and the concrete deck beams cast integral with the reinforced concrete abutment walls. Initially, railway protection fences would be erected to allow work to proceed safely adjacent to the live railway. The foundations would be piled. The pile caps would be below finished ground level and would require excavation and the construction of reinforced concrete elements. The abutment walls and wing walls would also be of reinforced concrete. The construction of these elements would involve excavators and a handling crane to move materials and shutters. A truck mounted concrete pump would be employed for placing concrete. A large mobile crane would be used for the placing of the bridge beams, which would be undertaken during a series of relatively short possessions of the track.

3.3.19 Victoria Road Viaduct would share an abutment with the Freight Line Bridge. Construction would be phased to correspond with the availability of the various sections of the site. Following site clearance, a piling platform would be formed at each pier position and the piled foundations would be installed. The pile caps would then be excavated and the piles would be broken down to the required cut off levels. Piling excavation arisings and the arisings of the pile caps are likely to comprise contaminated material, which would require treatments prior to either re-use in the works or disposal to a licensed tip, depending on classification. The pile caps and the viaduct columns would be of reinforced concrete requiring steel fixing, shuttering, concrete placement and compaction activities. A light-handling crane would be employed for lifting reinforcement and shutters into place.

3.3.20 The deck of Victoria Road Viaduct would be constructed so as to provide a high quality soffit and finishes. This is likely to require casting in situ with reinforced concrete. This would require the erection of a scaffold falsework throughout the entire length of the structure, although this would be installed in phases to suit the availability of the site. Other materials could also be used to achieve the high quality of finishes.

3.3.21 The existing Victoria Road is a principal route for services between the centre of Widnes and West Bank. Most of these should be able to remain in place, although protection measures may be required during construction.

3.3.22 Victoria Road Viaduct would terminate on a large abutment to the east side of Victoria Road. This structure would also act as the west abutment for the Widnes Loops West Bridge. It would be a cellular structure, approximately 28m square in plan and 10m in height, comprising piled foundations, pile caps, abutment walls, wing walls and an in situ concrete deck slab to carry the carriageway. All of these elements would be of reinforced concrete requiring steel fixing, shuttering, concrete placement and compaction activities.

Again, a light-handling crane would be employed for lifting reinforcement and shutters into place.

3.3.23 It is envisaged that the abutments of Victoria Road Viaduct would be faced with brickwork selected to harmonise with the character of Widnes.

3.3.24 Widnes Loops West Bridge would be a two-span bridge approximately 80m long carrying the new carriageway over the low level on and off-slip roads of the junction. This deck would be of similar form to the adjacent Victoria Road Viaduct and would be constructed in situ on a scaffold falsework. The east abutment of the Widnes Loops West Bridge would be a reinforced concrete abutment with wing walls founded on piled foundations.

3.3.25 Towards the centre of the Widnes Loops Junction there would be two single span bridges allowing the on-slip road to pass beneath the main carriageway of the new road (Widnes Loops East Bridge) and the on-slip itself before it merges with the main carriageway (Widnes Loops Slip Road Bridge). These would be box structures with spans of approximately 20m that would eliminate the need to excavate deep foundations into significantly contaminated ground. These would be founded on ground that had been improved using the techniques described in paragraph 3.3.26 to control likely settlements. All of these elements would be of reinforced concrete requiring steel fixing, shuttering, concrete placement and compaction activities. Again, a light-handling crane would be employed for lifting reinforcement and shutters into place.

3.3.26 The ground that would support the new embankments of the Widnes Loops Junction, including the main line embankment up to the St Helens Canal Bridge would be improved by the installation of a grid of vibro-concrete columns (VCCs). These would be constructed using the methods described in paragraph 3.1.12.

3.3.27 The resulting grid of VCCs would then be overlaid with geotextile membranes and layers of imported granular fill material. Embankment fill material would be delivered using road-going tipper trucks and spread and compacted using dozers and rollers.

3.3.28 The new carriageway would be constructed on the embankments.

3.3.29 The new carriageway would cross the St Helens Canal on a three-span structure, terminating on the estuary side of the canal on the North Abutment of the Mersey Gateway Bridge. The St Helens Canal would be temporarily in-filled during construction, although allowance would be required for the maximum drainage flow rate of the canal involving the provision of a large diameter bypass pipe. These works would also involve the realignment of Bowers Brook into a new culvert passing through the spans of the new bridge.

3.3.30 The St Helens Canal Bridge would be founded on piled foundations. These would support reinforced concrete pile caps and columns. The arisings from the excavation of the piles and the pile caps is assumed to be highly contaminated material that would require treatment before either re-use in the works or disposal to a licensed tip, depending on its classification. The deck would be constructed so as to provide a high quality soffit and finishes. This is likely to require casting of in situ reinforced concrete constructed on a scaffold falsework. All of these elements would be of reinforced concrete requiring steel fixing, shuttering, concrete placement and compaction activities. Again a light-handling crane would be employed for lifting reinforcement and shutters into place.

3.3.31 Finishing works would include street lighting, road marking, safety fencing, road signs and gantries, installing communications equipment and construction of the tolling booths and associated facilities, and the erection of the tolling canopies.

Construction Vehicle Movements

3.3.32 Site clearance along Victoria Road and at the Catalyst Trade Park would require approximately 100 tipper truck movements to remove the materials of the existing buildings. The existing embankment fill would be removed using approximately 800 tipper truck movements and should be able to be re-used in the construction of the re-modelled embankments. The beams of the existing two bridges and their reinforced concrete substructure would be broken up and the steel would be re-cycled and the concrete debris would be incorporated into the landscaped embankment areas.

3.3.33 There would be approximately 2,000 concrete mixer trucks for the construction of the VCCs in the Catalyst Trade Park area. The granular fill capping layer would involve around 1,200 tipper truck movements, the embankment construction would involve 9,000 tipper truck movements and the carriageway construction would involve a further 500 tipper truck movements.

3.3.34 Other construction plant would include 5-10 specialist piling rigs, small handling cranes, dozers, rollers, pavers and general excavation plant.

3.3.35 The construction of the five bridges in this area would involve the delivery of materials that would include scaffolding (approximately 50 truck movements), shutters (approximately. 50 truck movements), reinforcement (approximately 120 truck movements) and concrete (approximately 2500 concrete mixer truck movements and 50 concrete pump truck movements).

3.3.36 This site would require a workforce of approximately 50 operatives with office, welfare and messing facilities over a period of approximately 36 months. This compound would be contained within the area of the site.

Programme, Phasing and Traffic Management

3.3.37 The possession and demolition of the existing buildings within the Catalyst Trade Park and along Victoria Road would be undertaken early in the overall construction period to allow for service diversions and the remediation of contaminated ground.

3.3.38 The Freight Line Bridge would require up to 10 track possessions in agreement with Network Rail. These would normally be undertaken at night or at weekends. There would be a programme advantage in the early completion of this bridge as, once complete, it would provide a connection between the two sites either side of the railway.

3.3.39 Advance works could be considered for service diversions to minimise their impact on the programme of works.

3.3.40 The construction of Victoria Road Viaduct would be phased to correspond with the availability of the various sections of the site. The principal constraint would be the availability of the area occupied by the embankment of the existing Widnes Eastern Bypass. This would be available later in the programme once a temporary traffic diversion route for the Widnes Eastern Bypass along Ashley Way had been established.

3.3.41 The section of Victoria Road Viaduct crossing Victoria Road would have either: (i) a scaffold falsework capable of spanning Victoria Road with adequate clearance, or (ii) allow for a temporary diversion of Victoria Road.

3.3.42 The bridges within the Widnes Loops Junction would not require traffic management and could be fairly flexible in terms of programme.

3.3.43 The St Helens Canal Bridge would probably be constructed towards the end of the construction programme. Prior to that, this area of the site would be probably used as a storage area for materials or prefabricated deck units for the Mersey Gateway Bridge.

Waste

3.3.44 It is estimated that site clearance would generate approximately 20m^3 of green waste and vegetation.

3.3.45 The demolition of the existing industrial buildings along Hutchinson Street and within the Catalyst Trade Park would generate approximately 5,000m^3 of building waste comprising brick masonry, concrete, reinforcement steel and steel sections.

3.3.46 The excavation of the existing Widnes Eastern Bypass carriageway would generate approximately 9,000m^3 of waste road construction materials.

3.3.47 Pile arisings from the construction of the foundations of the new Freight Line Bridge, Victoria Road Viaduct, Widnes Loops West Bridge and the St Helens Canal Bridge are assumed to comprise of approximately 10,000m^3 of contaminated material that would be removed off-site to an appropriate licensed facility for further treatment/disposal.

3.3.48 The construction of the new structures would generate approximately 750m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.3.49 New carriageway drainage would involve the excavation of contaminated materials and it is estimated that approximately 2,500m^3 of this waste would be removed off-site to an appropriate licensed facility for further treatment/disposal.

3.4 Area D – Mersey Gateway Bridge

3.4.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.4.2 The Mersey Gateway Bridge would have a total length of 2.13km from abutment to abutment. The bridge crossing would consist of approximately 550m of approach spans from the north abutment to the edge of Widnes Warth Saltmarsh, and 580m from the edge of Astmoor Saltmarsh, over part of Wigg Island, over the Manchester Ship Canal and onto the south abutment within the Astmoor Industrial Estate. The estuary crossing itself would consist of 1,000m of cable-stayed bridge consisting of four spans supported by three towers. The towers would be octagonal with a diameter of about 10m at water level, but would taper to a rectangular shape and include architectural features throughout their height.

3.4.3 Typical span lengths of the approach viaducts are 70-100m with an overall deck depth of around 6m. Both approach viaducts are twin, separate structures supported on their own independent substructure. There would be a total of 30 piers on the saltmarshes. Each pier would be of reinforced concrete of about 2m by 5m and the height would vary between 12m (north) and 23m (south) to suit the vertical profile of the deck.

3.4.4 The three towers of the cable-stayed spans are assumed to be concrete below deck level and steel above. The overall height of the towers would be around 120 -140m above the river level.

3.4.5 The decks of the cable-stayed spans would be twin parallel decks, similar in form to the approach viaducts, connected at positions of cable stay attachment. The cable stays are arranged in pairs in a harp (i.e. parallel) configuration.

3.4.6 The foundations are piled throughout the length of the bridge. The depth to rock is greater at the north side of the estuary. Therefore, foundations for piers will get progressively shallower as they near the Manchester Ship Canal.

Site Access – Saltmarshes

3.4.7 Access across the saltmarshes both north and south of the estuary would be required in order to construct the piers of the approach viaducts and their foundations. However, this access should be to the minimum extent and for the shortest duration reasonably possible.

3.4.8 It is envisaged that a stone haul road would be laid directly over the grasses of the saltmarsh on a separating geotextile fabric. The track would be approximately 5m wide overall and approximately 500mm thick but built to a level that would be above high tide levels for all but the very highest tides. Natural drainage channels would be maintained by piping under the track. Working areas of sufficient size would be created at each pier position using the same formation as the stone haul roads. These are envisaged as being no more than 15m by 15m. The width of the haul road would be kept to a minimum with intermediate passing bays provided at appropriate positions.

3.4.9 A typical section through the stone haul road is shown in Figure 2 below.

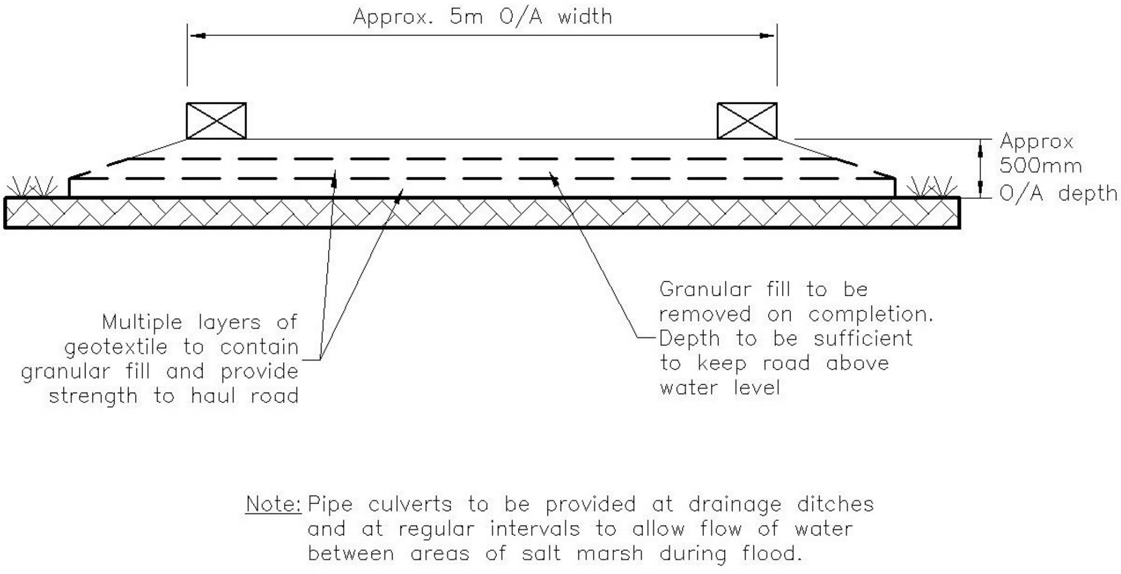


Figure 2 – Stone Haul Road Across Saltmarshes

3.4.10 It is assumed that the access stone haul roads and working areas would be in place for a period of between 2 - 3 years, which would be the normal timescale to construct works of this nature. Following completion of the works, these access tracks would be removed and the saltmarsh would be reinstated to a condition similar to its pre-construction condition.

3.4.11 The stone haul roads would also be used to access the piled jetty (described in paragraphs 3.4.17 and 3.4.18) for works in the estuary.

3.4.12 Local compaction of the areas of saltmarsh below the track would be mitigated by deep ripping operations and subsequent cultivation of saltmarsh vegetation. The deep ripping would involve disturbing the compacted saltmarsh with a device similar to a plough attached to a bulldozer. An area for maintaining a stock of back-up seeds and seedlings may be necessary.

Site Access - Intertidal Zone

3.4.13 The Intertidal Zone is defined as the area of sandbanks and channels between the edges of the saltmarshes. The precise locations of the edges of the saltmarsh are not fixed. It is not anticipated that the New Bridge would affect the natural processes that cause the location of the edges of the saltmarsh to vary from time to time.

3.4.14 Access would be required to the three towers to be constructed in the intertidal zone. Water depths are limited and vary, which affects access for tower and support structure construction. More often than not, sandbanks would surround the towers. However, on the higher tides, they would be in open water for part of the day. The estuary above the Runcorn Gap consists of shifting sands that are exposed on every tide (indeed, on some tides, they are not covered at all).

3.4.15 The cable-stayed spans would be constructed in two distinct phases that would have differing access requirements. The first phase would be the construction of the foundations and towers. This would require reliable access to all three locations of the towers, concurrently. This could be achieved by two piled jetties from the end of the stone haul roads on each of the saltmarshes. The second phase is the construction of the superstructure, during which time access would still be required to the tower locations for personnel and equipment, but a different method would be required for delivering the large and weighty prefabricated deck units (if this option is adopted see paragraphs 3.4.41 and 3.4.42 below) to directly below where they will be lifted into place. It is envisaged that this would be achieved by the use of air cushion plant (see paragraphs 3.4.19 to 3.4.21 below). Both of these phases would be critical to the overall completion of the Project. These forms of access are discussed in the sections below.

3.4.16 The tower bases could be constructed within cofferdams of about 30m diameter with fixed vehicular links (see Figure 3). These cofferdams would require access from the piled jetties.

Site Access - Piled Jetties

3.4.17 Piled jetties serving the tower areas are possible. The routes are shown in Figure 3.

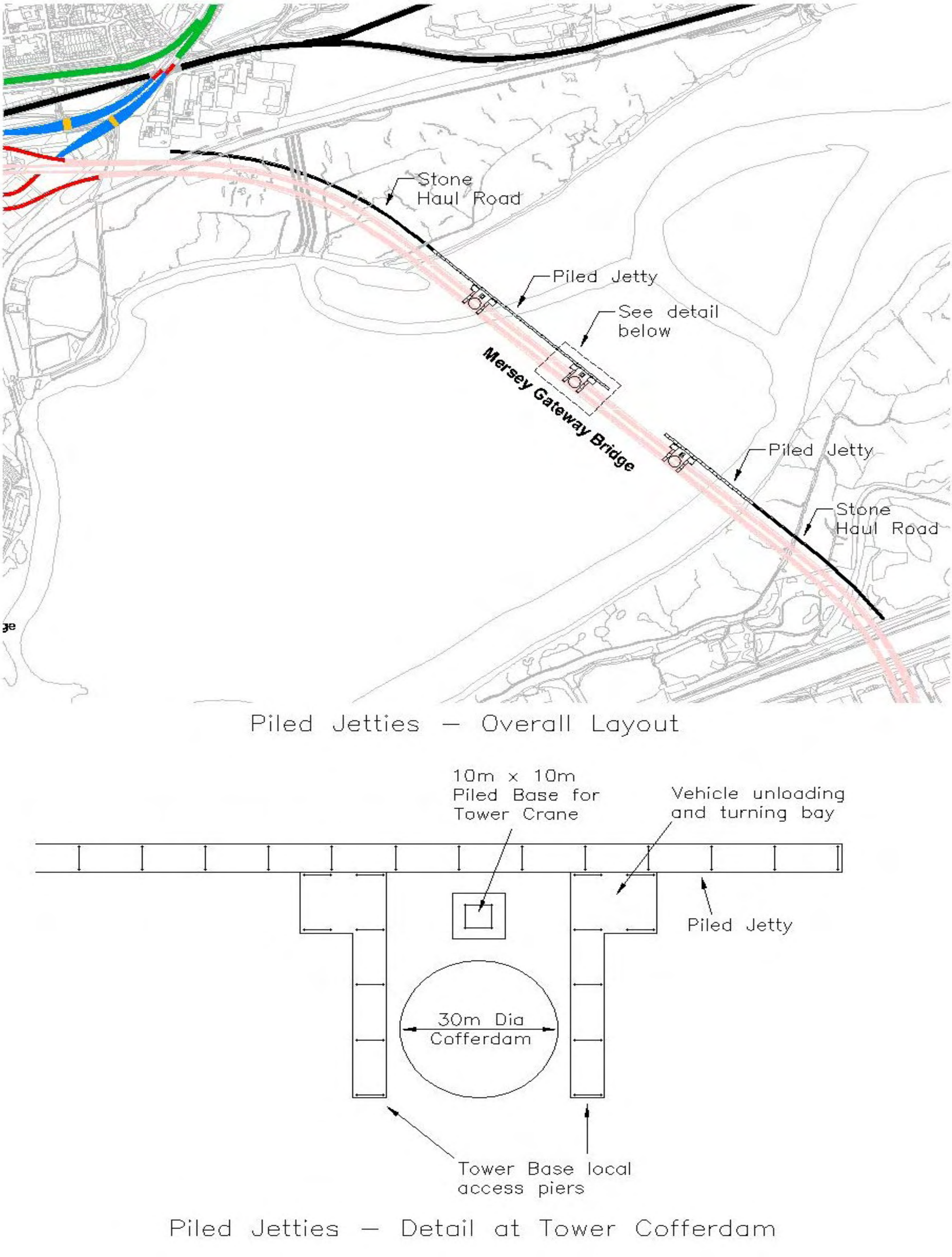


Figure 3 – Route of Piled Jetties

3.4.18 The jetties are likely to be constructed of steel tubular piles, a steel grillage supporting deck and either timber or steel temporary decking units - see Figure 4. The elements would be delivered to site on lorries and assembled with a crane, as illustrated in Figure 5. Construction of a jetty would be incremental with the installation plant supported on the completed jetty. The steel tubular piles would be driven into the bed of the estuary by vibration hammer techniques. During the period when this temporary jetty is in place, navigation along this stretch of the estuary would only be possible in the gap between the centre and south towers. Following completion of the works, the jetties would be removed by lifting them out with cranes and vibrating the piles out of the riverbed. All materials would be removed from the estuary.

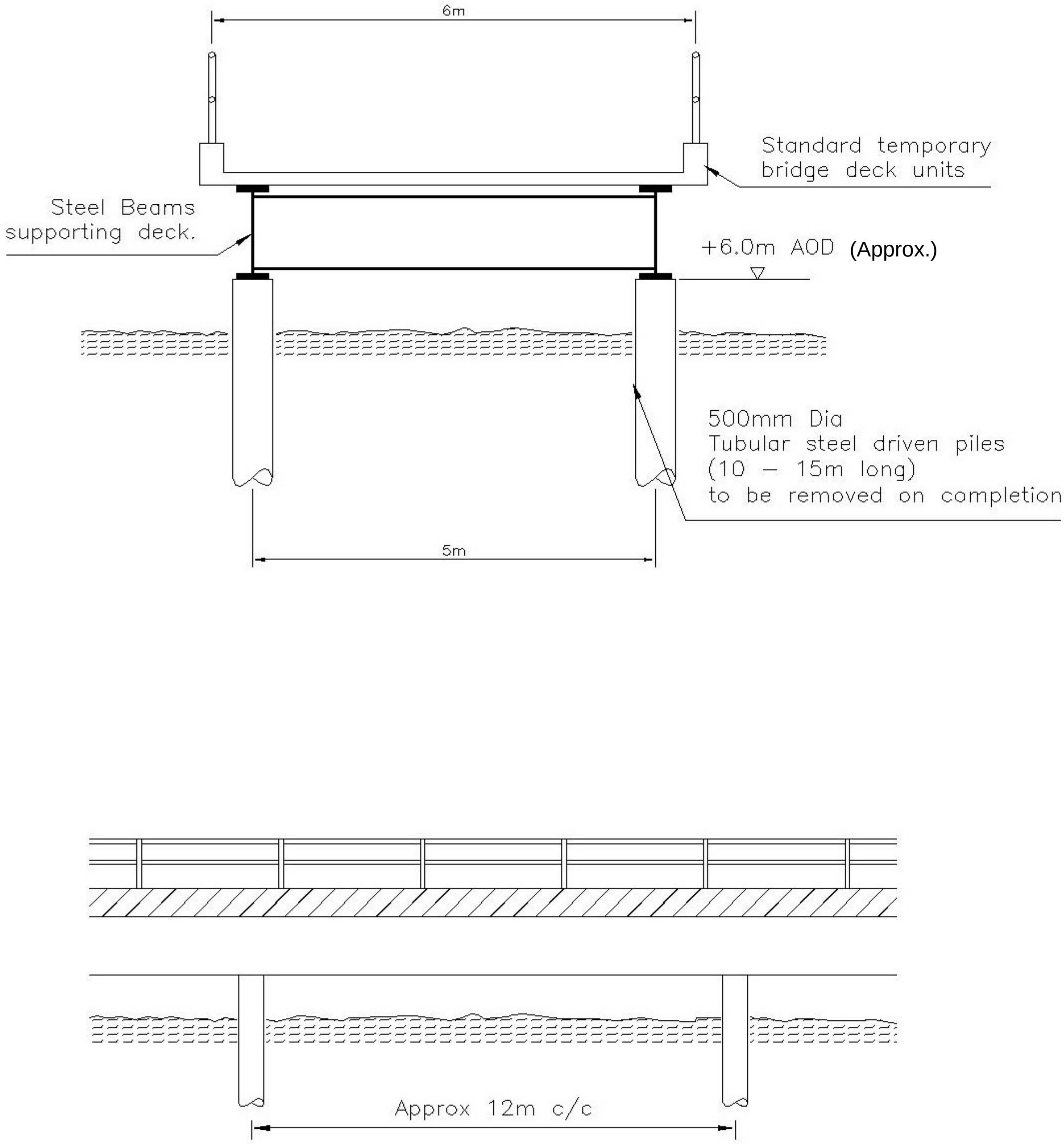


Figure 4 – Piled Jetty

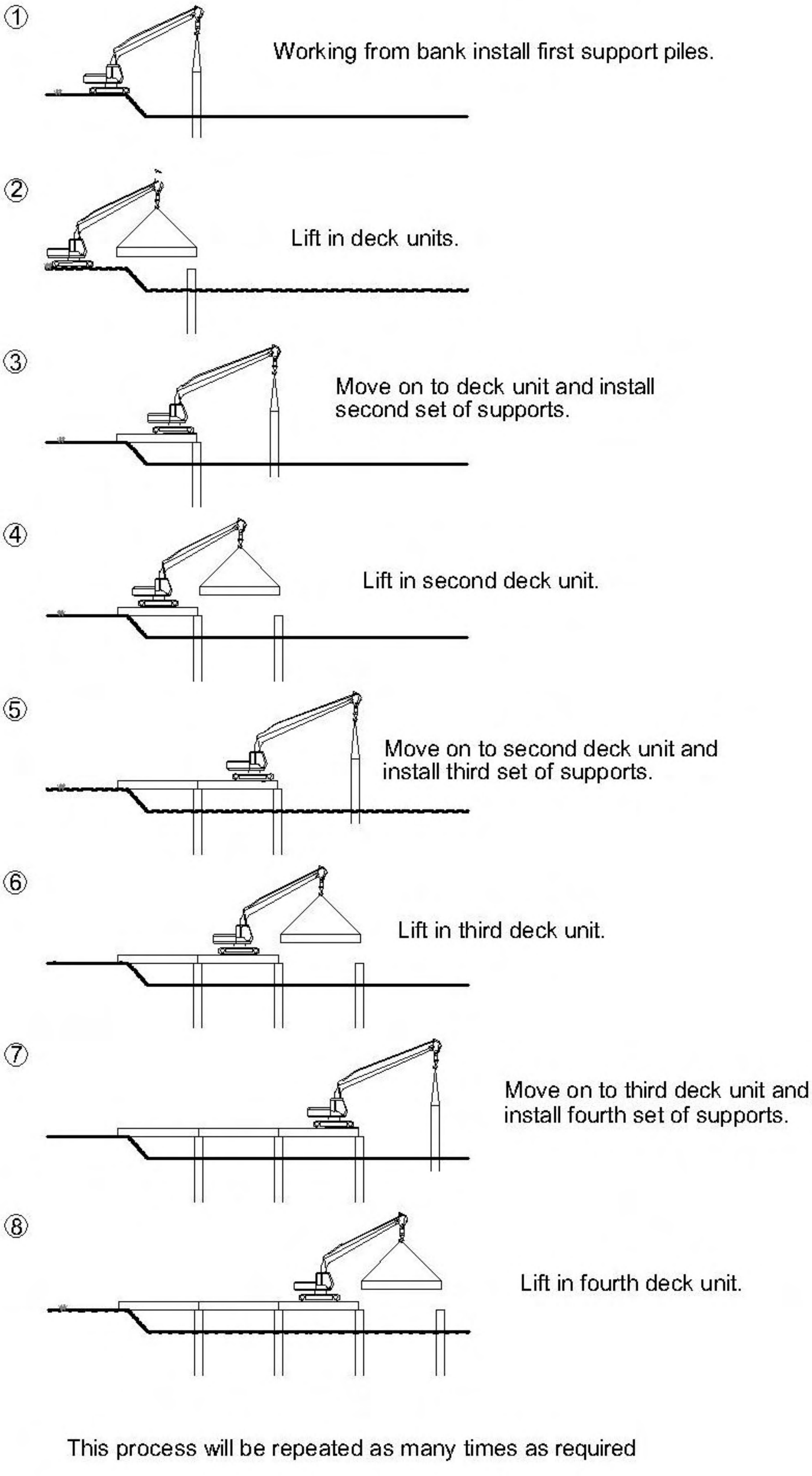


Figure 5 – Construction Sequence of a Piled Jetty

Site Access - Air Cushion Plant

3.4.19 The Upper Estuary is highly mobile and sands are moved on every tide, sometimes considerably. A dredging operation would not be feasible because a stable morphological regime could never be established for a channel to serve the bridge corridor. For these reasons, the use of floating plant and barge borne material delivery has not been assumed for major components within the intertidal zone.

3.4.20 By using air cushion plant, an amphibious operation could be established that could operate on sandbanks or open water and is insensitive to water depth.

3.4.21 Large hover barges with up to 900 tonnes payload are possible and smaller hovercraft could be used to ferry personnel and light loads between the work areas. Figure 6 shows a design for a 125 tonne hover barge. These are specialist pieces of plant that would need to be custom built for this application, but could be procured from established hovercraft manufacturers. This type of air cushion plant could be used to transport the large deck units to the working sites. Air cushion plant have the added advantage of being able to stay on location whatever the river conditions or depth. Where water depths are sufficient, dumb hover barges may be towed by tug. On sandbanks, low ground pressure tractors may be used or a system of fixed winches could be employed for the delivery of large prefabricated deck components.

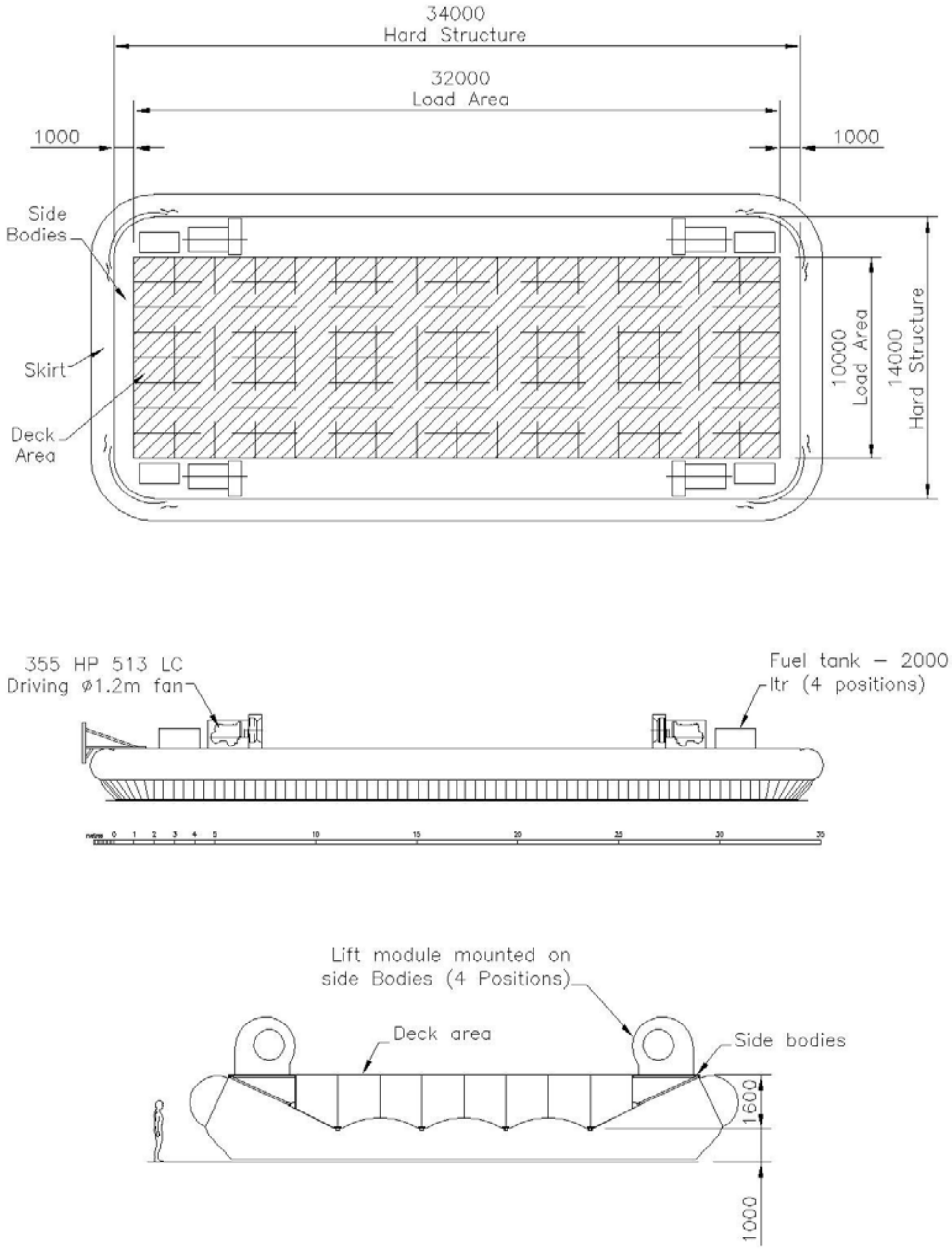


Figure 6 – 125 Tonne Hover Barge

Site Clearance and Demolition

3.4.22 Clearance of vegetation would be required around the footprint of the piers of the south approach viaduct where it crosses Wigg Island.

3.4.23 Light industrial buildings would have to be demolished within the Astmoor Industrial Estate beneath the corridor of the new carriageway to allow the construction of the end span and the south abutment.

Construction Methods – Approach Viaducts

3.4.24 The approach viaduct piers would be supported by groups of replacement piles. On the north bank, the rock head is at depth (16m to 40m below ground level) and it is assumed that the piles would act in friction founded in the higher level glacial tills.

3.4.25 On the south bank, rock head is not so deep (7m to 10m below ground level). Piles would be taken to rock head and the load would be carried principally in end bearing. As the approach viaduct gets further south, the rock head rises. If shallow enough, pad foundations would be constructed within cofferdams.

3.4.26 To construct the piles for the approach viaduct piers, a stone piling platform would be created at each pier position. Temporary pile casings to support the excavation would be driven down, using vibration methods, to the level of the glacial tills or the bedrock. The pile shaft would be excavated using an auger-piling rig. In some locations, where a dry bore cannot be maintained, a supply of bentonite slurry would be required to support the excavation and to keep water out of the pile shaft. Precautions to confine bentonite spillages would have to be put into place. The steel-reinforcing cage would then be introduced followed by concreting of the pile using a tremmie pipe. Finally, the steel casing would be withdrawn using vibration techniques.

3.4.27 Following completion of all piles in a group, a temporary cofferdam of steel sheet piles would be installed to reduce the inflow of ground water. These sheet piles would be installed by vibration techniques. The cofferdam would be of minimum dimensions to allow the construction of the pile caps, i.e. about 12m by 14m, allowing for working space around the perimeter of the permanent pile cap. Ground water would be pumped out of the cofferdam after excavation and for the whole duration of the below ground works.

3.4.28 Excavation would be to a level just below the underside of the pile cap; this would be 4m below existing saltmarsh level to allow for a 3.5m pile cap and 0.5m cover of re-instated saltmarsh material. A thin layer of blinding concrete would be laid and the piles would then be broken down to cut-off level. The pile cap's reinforcement cage would then be fixed, the shutters fitted and the concrete cast. Finally, the top and side surfaces of the pile cap would have a waterproofing membrane applied before backfilling with estuary sands and removing the cofferdam. Surplus excavated material would be incorporated into the main works where possible; otherwise it would be disposed of off site.

3.4.29 Individual reinforced concrete plate piers (approximately 2m by 5m in area) would support each of the twin decks. The piers would be constructed in situ using access scaffold, a handling crane and re-usable shutters.

3.4.30 Materials (steel reinforcement and concrete) would be delivered directly to the work sites using normal road transport vehicles gaining access on the stone haul roads. Details of the piers would be kept constant with only their height varying to cater for the varying deck height.

3.4.31 The bridge superstructure could be of concrete or steel or, as is more likely, a combination of both (the indicated form is for concrete top and bottom slabs forming the flanges of the girders with steel bracing to form the webs). It is anticipated that the viaduct superstructure would be constructed from prefabricated units requiring a temporary support structure. Exact module size would be for the contractor to determine based upon his own assessment of economics and ease of handling. Alternatively, an in situ form of construction adopting balanced cantilever techniques is also an option. The possible construction methods for approaches and main spans are likely to be different and the possibilities are discussed below.

3.4.32 The approach viaduct spans are between 70 and 100m and are mainly situated over the saltmarshes to the north and south of the estuary. They are also curved in plan and of varying width.

3.4.33 The support system will be a large steel temporary structure that would have to span the distance between the piers. The temporary structure would be used to lift, transport and hold the prefabricated deck units in place until all the units were permanently connected together and capable of supporting their own weight. This would be usually provided in the form of a moving gantry system, which would consist of a steel lattice beam fitted with crane systems to lift and handle formwork or prefabricated units. The gantry would be designed to be capable of launching itself from span to span. The gantry straddles the span to be constructed, supported on the piers, and the prefabricated bridge units would be fed onto a crane system that assembles a complete span (see Figure 7). With this method of construction, access for labour, materials and plant would be along the previously completed superstructure thus minimising impacts on the saltmarshes below.

3.4.34 It is anticipated that, in the case of a prefabricated segmental construction, individual units would be brought to established areas close to the abutments for each approach viaduct. In the case of the north approach viaduct, this would be established in the area of the St Helens Canal while, for the south approach viaduct, it would be on the south bank of the Manchester Ship Canal in the Astmoor Industrial Estate. Here the Manchester Ship Canal would form a very effective access route to a facility for storing segments prior to erection on the canal bank. This could include a handling facility (approximately 25m by 25m) for very heavy items. The delivery of segments to the St Helens Canal area would be probably by air cushion plant. Once brought into the base area, units would be lifted to deck level and taken along the completed deck to the erection gantry.

3.4.35 A casting yard for the prefabricated deck units would require a 6 ha site with both waterfront and road access. This casting yard would comprise casting sheds, a concrete batcher plant, material storage areas, and completed unit storage areas, as well as office and messing facilities. A possible layout for a casting yard is illustrated in Figure 8. It has been assumed that the casting yard will be situated on a location remote from the main works at the Project. Arrangements to secure major cast components and locations for their manufacture will be for the Concessionaire to determine.

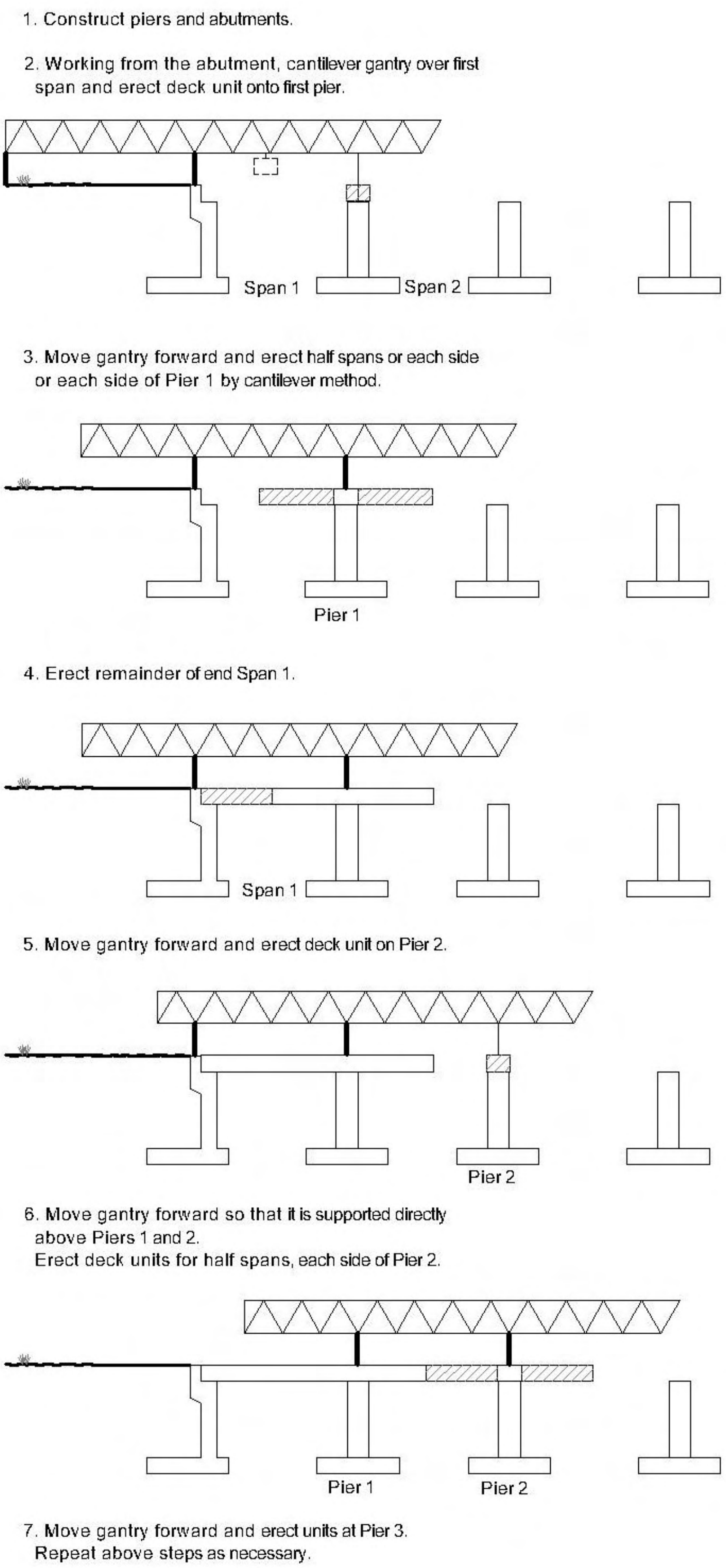


Figure 7 – Construction of Approach Spans by Gantry

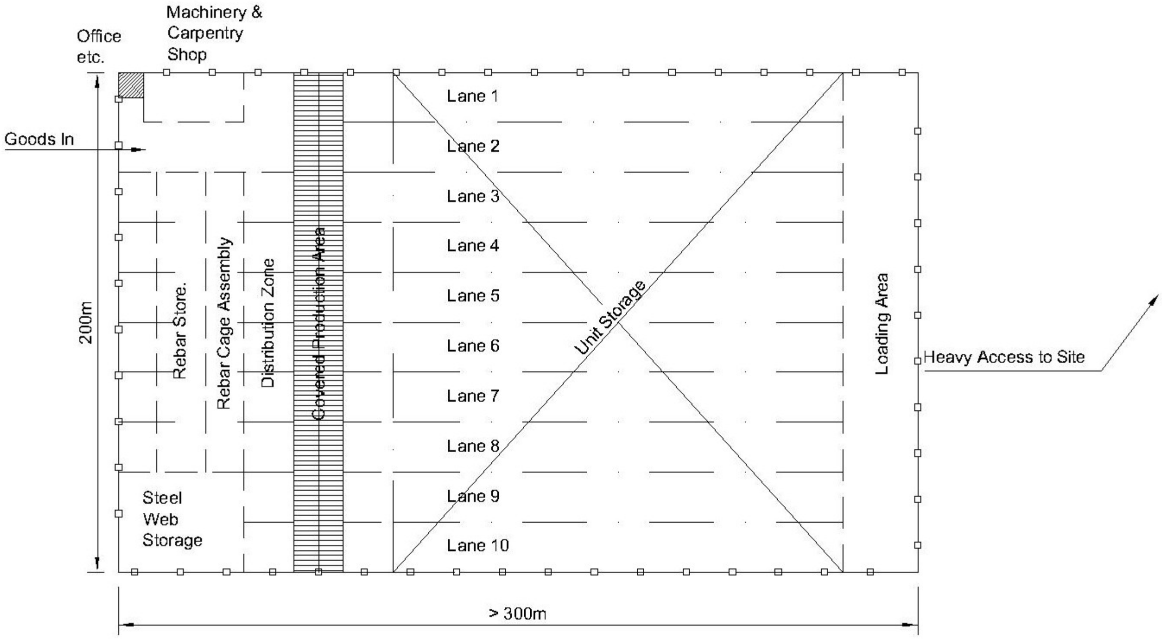


Figure 8 – Casting Yard for Segmental Deck Units

Construction Methods – Towers

3.4.36 The towers would be supported by large diameter piles or rectangular barrettes. Barrettes are large, rectangular piles formed using conventional diaphragm walling equipment and techniques, which can accommodate high horizontal forces, moments and vertical loads. These barrettes would be taken down to rock head within a piled cofferdam. The cofferdams would comprise steel sheet piles constructed with piling plant on the adjacent jetty piers as shown in Figure 3. Initially the cofferdams would be filled with sand to form a platform from which the barrette piling plant would operate. Bentonite slurry would be used during the construction of the barrettes. The barrettes would be excavated by either clam-shell grabs or by a down-the-hole self driving technique such as a Hydrofraise.

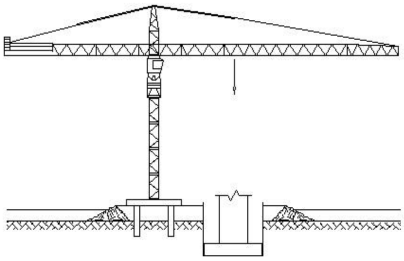
3.4.37 Working areas would need to be created on the jetty piers adjacent to the cofferdams to permit plant operation. Alternatively, the cofferdam could be formed by the foundation itself as a ring diaphragm wall. Because of the need to minimise interference within the water column, the top of pile cap level would be established below the lowest natural channel level within the estuary. An assessment of the scour depth indicates that the top of the pile cap needs to be about 5.0m below the bed level of the channel. This would also require the removal of any cofferdam by extracting the sheet piles once construction of the tower shaft is completed. The cofferdam itself is likely to be circular (approximately 30m diameter) with the sheet piles taken deep enough to permit excavation to approx 5 metres below datum (-5m AOD). The cofferdam would need jetty piers adjacent to the top to allow space for plant, material storage and working areas. Sufficient space would be needed for the erection of the tower cranes that would be used for construction of the tower and installation of cables. A dedicated area of piled jetty could be provided to support the tower crane as shown on Figure 3.

3.4.38 The towers for the cable-stayed spans, plus any temporary works required to build them, would be limited to 150m AOD so that they do not encroach into the approach airspace for Liverpool John Lennon Airport. Construction techniques for towers of this height (see Figure 9) are limited, as is the choice of materials. It is anticipated that the upper section of tower (above the deck level) would be made from high strength steel. These would probably be formed as prefabricated sections (fabricated off-site) and would incorporate the upper cable anchorages. Section sizes would be selected to minimise site welding while keeping unit weights within the capacity of the cranes. These units would be delivered to site by either road transport or brought in by air cushion plant.

3.4.39 Between pile cap and deck level, the tower would be a reinforced concrete shaft. This could be ‘slip’ or ‘jump’ formed, where the shutters are either raised up the shaft continuously or in incremental steps. Materials would be delivered to the tower sites by road going transport along the piled jetties. Concrete would be placed using either a concrete pump or a skip.

1. Construct Tower base in temporary cofferdam.

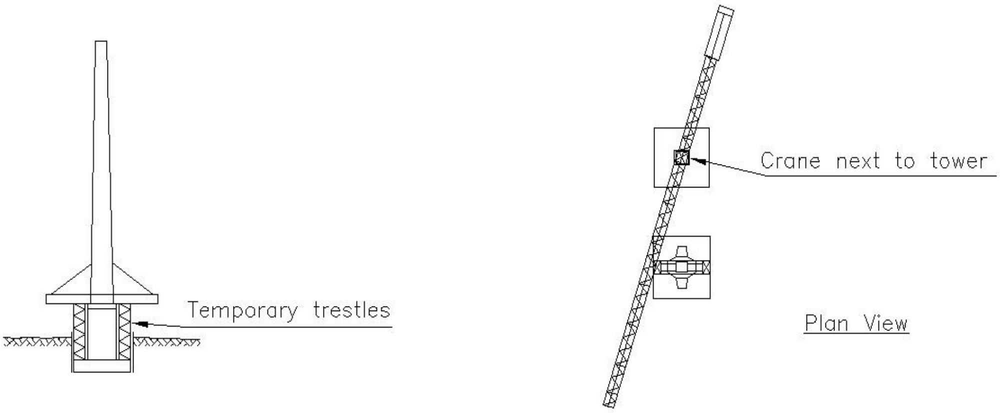
2. Using tower crane, erect tower. All materials to be brought to tower location via haul road jetty/hovercraft (see elsewhere).



3. Once tower is complete, construct deck by cantilevering from each side of the tower.

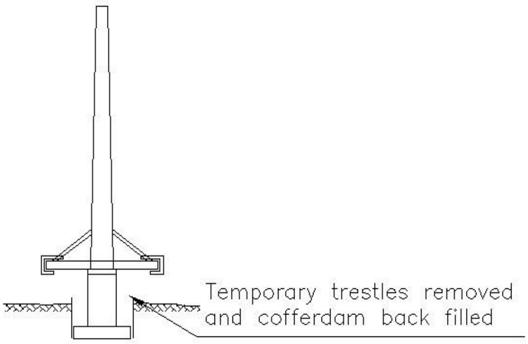
4. STAGE 1.

   Construct deck at tower, off temporary trestles built off tower base.
   Install first cable stay on each side.



5. STAGE 2.

   Working from travelling gantry construct next section of deck and install next cable stays.



6. Move gantry forward and repeat.

7. On completion of deck remove cofferdam or cut back to base level as required.

8. Remove crane.

Figure 9 – Tower Construction

Construction Methods – Cable-Stayed Spans

3.4.40 A cable-stayed bridge is by definition a cantilever structure. It is, therefore, logical for the most common form of construction (particularly for long spans) to employ incremental cantilever techniques. These can either be from a 'fixed' backspan or, when the support is isolated, by extending out either side of the support in a balanced manner. This latter form of construction is assumed to be deployed for the Mersey Gateway Bridge.

3.4.41 Two methods for balanced cantilever construction are possible, either:

a. The components for cantilever extension are brought to the root of the cantilever (in this case, the tower) and taken to deck level for transfer to the working area at the tip of the cantilever. This would generally be the case for in situ construction techniques but could also be adopted for prefabricated segmental construction.

b. Alternatively, complete extension units can be brought to a position below the tip of the cantilever and hoisted into position (see Figure 10).

3.4.42 For large bridges such as the Mersey Gateway Bridge, the second method is likely to be preferred for reasons of programme, quality control and cost.

3.4.43 In the case of the Mersey Gateway, such a choice is influenced by the manner and location of component construction. An off-site yard would require relatively large and heavy units to be delivered to the working area. Almost certainly this implies a marine operation using the tidal estuary and the Manchester Ship Canal. This, in turn, would have an effect on delivery methods and means of access. In situ casting techniques would require materials to be delivered to the working faces via the tower bases. The delivery of materials to the tower bases would be either by marine operations or by vehicle access along the piled jetties.

3.4.44 The assumed design envisages a prefabricated modular approach with complete units approximately 6m long delivered to immediately below their intended position on the bridge, lifted to deck level by special cranes attached to the previously constructed deck, stressed back to the previous deck units before the supporting cable stays are attached. This construction method is illustrated in Figure 10. This is not the only solution, however, and it would be possible to construct the bridge in smaller components assembled in situ or even as a totally in situ concrete deck. The latter would require complex casting gantries to be supported from the end of each deck. In all cases, the cable-stayed decks would be constructed by balanced cantilever methods whereby the total amount of deck on each side of the towers is kept roughly in balance. Such choices affect delivery modes and the capacity of the access arrangements.

3.4.45 The segmental deck units would be constructed in an off-site casting yard at a rate that would ensure a ready supply to the various construction faces. At the peak period of construction there would be 14 active work faces, so a large stock of deck segments would be required to maintain progress on these critical work faces. For the approach viaducts, deck units would be stored near to the two abutments ready for lifting onto the construction gantries. For the cable stayed spans, the deck units would either be stored in the casting yard or at an intermediate handling area maybe on land between the estuary and the Manchester Ship Canal. The Manchester Ship Canal would form a very effective access route for standard waterbourne barges to an entrepot (transit) facility on the canal bank in the vicinity of Old Quay. This would include a handling facility for very heavy items. From this facility, the deck units could be transferred by crane onto air cushion plant moored on the estuary side of the training wall. The air cushion plant would then be used to deliver the units to positions directly below the work faces.

3.4.46 Erection of the superstructure calls for specialist techniques and high levels of skill and understanding of how the bridge would behave in its temporary stages. This would require the Concessionaire to carry out frequent monitoring and analysis of the structures in their various temporary conditions.

3.4.47 Finishing works to the superstructure would include painting, waterproofing, surfacing and the installation of wind shielding, parapets, street lighting, navigation warning lights, signs and road marking. The cable-stayed spans would also incorporate monitoring equipment to assist in the future management of the structure.

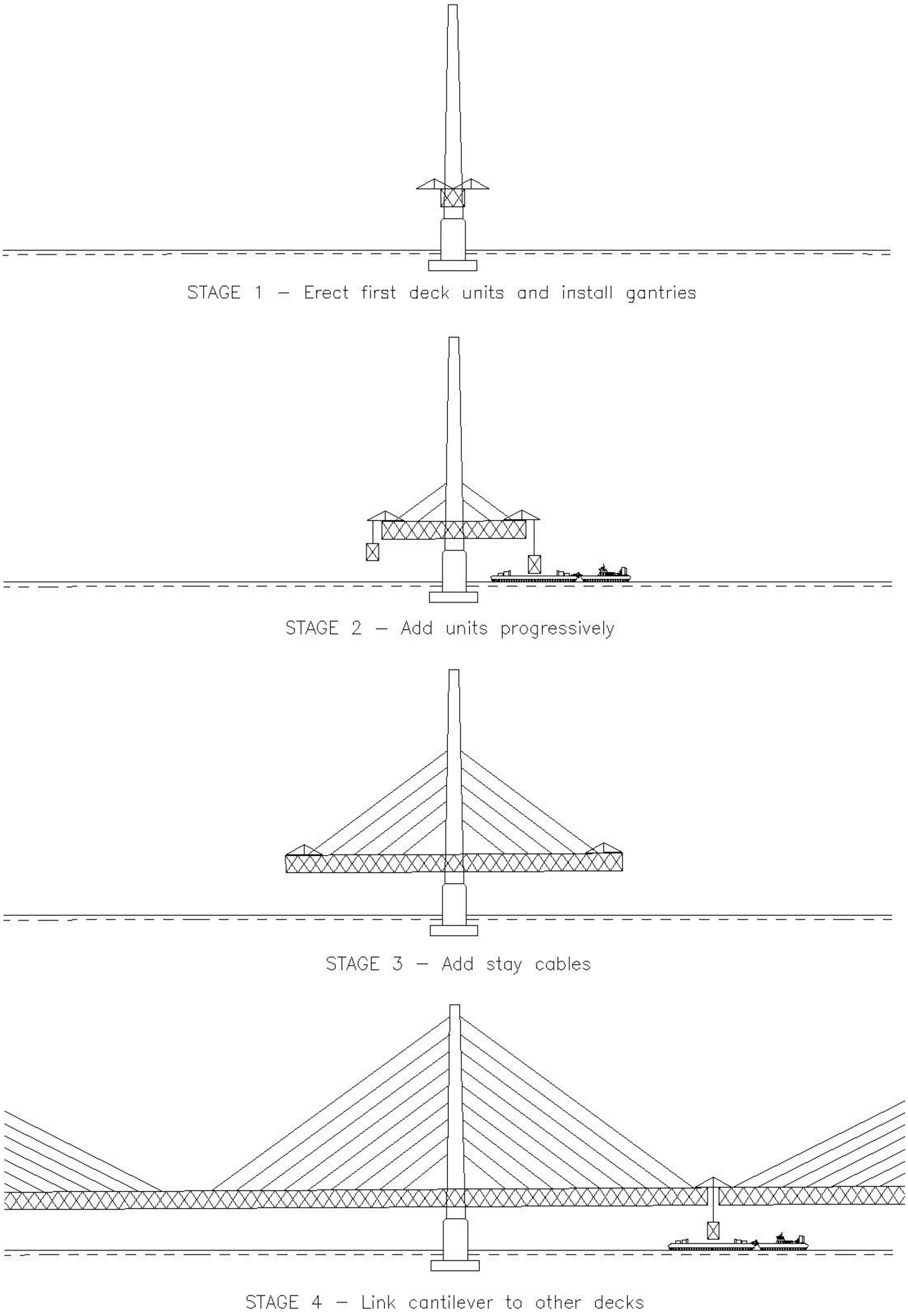


Figure 10 – Balanced Cantilever Construction

Construction Vehicle Movements

3.4.48 The construction of the stone haul road on the saltmarshes will involve approximately 250 tipper truck movements. This stone would be end tipped and spread with a dozer. At the end of construction this stone will be taken up and removed from site or used within the embankment areas. The removal would also involve approximately 250 tipper truck movements.

3.4.49 The construction of the piles, pile caps and piers of the approaches will involve approximately 5,000 concrete mixer truck movements in addition to approximately 250 truck movements of steel reinforcement movements and 60 concrete pump movements.

3.4.50 The piled jetty will involve approximately 150 truck movements for installation, and a similar number for its removal.

3.4.51 The tower foundations, bases and stems will involve approximately 3,000 concrete mixer truck movements in addition to 150 truck movements of steel reinforcement. If concrete batcher plant were to be provided at the bases of the towers then constituent materials (cement, aggregate, clean water and admixtures) would have to be transported to, and stored in, silos on the piled jetties.

3.4.52 The tower stem above deck level will involve some 300 fabricated steel unit deliveries and 150 cable stay strand deliveries.

3.4.53 Any casting yard would require a dedicated concrete batcher plant that would require the deliveries of cement and aggregate. Steel reinforcement and the fabricated structural steel web components would be sourced by component manufacturers.

3.4.54 These working sites would require a workforce of approximately 150 operatives with office, welfare and messing facilities over a period of approximately 36 months. Two compounds would be contained within the area of the site, one on each side of the river. It is anticipated that one of these would be the Concessionaire’s main project office during the construction phase of the Project.

Programme, Phasing and Traffic Management

3.4.55 This section of the works would be sequential in nature and would therefore form the critical path on the programme of the whole scheme. It is particularly important to secure reliable means of access to the estuary work sites for this reason.

3.4.56 The stone haul roads across the saltmarshes would be constructed first followed by the piled jetties.

3.4.57 On the approaches, piling would work sequentially from the shoreline out towards the estuary. Each pier location construction period would be of the order of three months, with up to three cofferdams in use on each approach at any one time.

3.4.58 The three towers would be constructed concurrently. The piled jetties would be in use throughout most of the 3-year construction period. The construction of the three towers in the estuary would present some disturbance to navigation during construction. A fixed temporary access to the towers would significantly restrict the navigable width of the river.

3.4.59 During the construction phase, there would also be some interference with the current unrestricted navigation traffic on the canals. On the Manchester Ship Canal, this is likely to be minor as the deck superstructure would be erected from a gantry. However, the construction of the substructure, erection of the gantry and the general Health and Safety constraints would create some interference. Navigation marking lights would be required on any objects that could temporarily be located within the normal navigation clearance envelope.

3.4.60 Prefabrication techniques for both the tower stem units and the segments deck units would have significant programme advantages in removing these complex and specialist works from the critical path of the programme. There would also be associated quality control benefits.

3.4.61 To avoid any impact on air traffic movements from Liverpool John Lennon Airport, the maximum level of any obstruction during the construction and operation of a new crossing would be limited to 150m AOD[2]. Aircraft warning lights would be required on high elevation items of permanent or temporary works at the tower locations.

Waste

3.4.62 It is estimated that site clearance would generate approximately 200m^3 of green waste and vegetation.

3.4.63 The demolition of the existing industrial buildings within the Astmoor Industrial Estate would generate approximately 500m^3 of building waste comprising brick masonry, concrete, reinforcement steel and steel sections.

3.4.64 Pile and pilecap arisings from the construction of the foundations of the abutments and approach viaducts are assumed to comprise of approximately 28,000m^3 of contaminated material that would be removed off-site to an appropriate licensed facility for further treatment/disposal.

3.4.65 The construction of the new structure would generate approximately 500m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.4.66 The temporary stone piling platforms and the stone haul road laid on the saltmarshes are estimated to contain approximately 22,800m^3 of granular material that will become waste and would be removed to a tip on completion of the works. Alternatively, the granular fill may be sold on for use a general fill on a future project.

2 *See Chapter 18 (Navigation) of the ES*.

3.5 Area E – Astmoor Viaduct

3.5.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.5.2 The new carriageway crosses the Astmoor Industrial Estate at a height of approximately 24m above existing ground level. The area would need to be cleared of existing light industrial buildings. The deck of the new viaduct is likely to be constructed in situ on a temporary scaffold falsework. On completion of the works, the area below the viaduct would be available for future development.

3.5.3 The area between the south abutment of the Mersey Gateway Bridge and Bridgewater Junction would comprise a high-level, multi-span viaduct called Astmoor Viaduct. This would cross the existing industrial park at considerable height linking the high level crossing of the Manchester Ship Canal with the new crossing of Bridgewater Junction.

3.5.4 This elevated structure would vary in width up to a maximum of 60m wide before the southbound slip road splits off onto a separate alignment. The structure splits again at the point where the northbound on-slip road merges with the main line. The main line of the Mersey Gateway would remain at high level while the two slip roads reduce in level to the south to allow the slip roads to tie in with the roundabout at Bridgewater Junction.

3.5.5 The north end of Astmoor Viaduct would land on the south side of the south abutment of the Mersey Gateway Bridge. The south abutment of the Astmoor Viaduct would be approximately 85m wide and would be at three levels. The abutment wall would retain the end of the embankment up to Bridgewater Junction.

3.5.6 The viaduct would be 340m long and would comprise 12 spans; 20m end spans and 30m intermediate spans.

3.5.7 The deck would be supported by reinforced concrete plate piers, approximately 2m long by 5m wide, with four separate piers at each bent (line of support).

3.5.8 Piled foundations have been assumed. However, bedrock is at shallow depth beneath this viaduct and it may be possible to use spread foundations bearing directly on the bedrock in places.

Site Access

3.5.9 Access to this site would be from Astmoor Road.

Site Clearance and Demolition

3.5.10 Demolition of industrial buildings would be required to allow the construction of this structure.

3.5.11 The first construction activity would be to fence the site and to clear the existing vegetation from the area.

3.5.12 The main service routes are in the footpath of Astmoor Road so there would be no significant service diversions required in this area. However, these services would need to be protected during the works. Services to the existing industrial buildings would be stopped off prior to demolition.

Construction Methods

3.5.13 Following site clearance, a piling platform would be formed at each pier position and the piled foundations would be installed. The pile caps would then be excavated and the piles would be broken down to the required cut off levels. Piling excavation arisings and the arisings of the pile caps are not anticipated to include significant levels of contamination and would be re-used in the works. The pile caps and the viaduct columns would be of reinforced concrete requiring steel fixing, access scaffolding, shuttering, concrete placement and compaction activities. Light-handling cranes would be employed for lifting reinforcement and shutters into place.

3.5.14 Although steel composite and precast concrete options are possible, the deck of Astmoor Viaduct is likely to be constructed in situ of reinforced concrete. This would require the erection of a scaffold falsework throughout the entire length of the structure. The soffit shutter would be laid on top of the scaffold falsework. This would be followed by the fixing of the steel reinforcement and the side shutters. The deck would be concreted in stages. Work would probably progress sequentially from the south abutment.

3.5.15 Finishing works would include fitting parapets, kerbing, carriageway construction, street lighting, road marking, safety fencing and road signs.

Construction Vehicle Movements

3.5.16 Site clearance of this area of Astmoor Industrial Park would require approximately 150 tipper truck movements to remove the materials of the existing buildings. Many of the materials would be re-cycled.

3.5.17 The construction of the viaduct in this area would involve the delivery of materials that would include scaffolding (approximately 100 truck movements), shutters (approximately. 50 truck movements), reinforcement (approximately 300 truck movements) and concrete (approximately 5000 concrete mixer truck movements and 50 concrete pump truck movements).

3.5.18 This site would require a workforce of approximately 40 operatives with office, welfare and messing facilities over a period of approximately 36 months. This compound would be contained within the area of the site.

Programme, Phasing and Traffic Management

3.5.19 This structure would have few interfaces with other areas of the works. The viaduct would take approximately 2 years to build. The only interface of note would be at the north end that would form the lifting area for the prefabricated units of the south approach viaduct of the Mersey Gateway Bridge. This would mean that the most northerly end span of Astmoor Viaduct would not be constructed until the lifting operations were complete.

3.5.20 Traffic on Astmoor Road and the Astmoor Busway would have to be diverted locally during the construction of sections of the viaduct that would pass over these roads.

Waste

3.5.21 It is estimated that site clearance would generate approximately 50m^3 of green waste and vegetation.

3.5.22 The demolition of the existing industrial buildings within the Astmoor Industrial Estate would generate approximately 7,500m^3 of building waste comprising brick masonry, concrete, reinforcement steel and steel sections.

3.5.23 Pile and pilecap arisings from the construction of the foundations of the abutments and approach viaducts are assumed to comprise of approximately 12,000m^3 of material that would be removed to a tip or reused in the works.

3.5.24 The construction of the new structure would generate approximately 500m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.6 Area F – Bridgewater Junction

3.6.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.6.2 Like the Widnes Loops Junction, the Bridgewater Junction is a complex of structures and slip roads that provide grade separation and access to and from the Central Expressway (running north-south) and the Daresbury/Bridgewater Expressways (running east-west). The existing through Daresbury/Bridgewater Expressway will be closed and brought into the new roundabout. A two-level interchange is proposed with east-west movements at the lower level and the new road linking to the Central Expressway at the higher level. The lower level would contain the gyratory system, linking slip road movements. The upper level structure is likely to be a five-span steel and concrete viaduct. Similar construction materials would be used for the construction of the new slip road bridges over the Bridgewater Canal. The existing bridges over the Bridgewater Canal would be removed. However, the existing bridges over the Daresbury/Bridgewater Expressway would be retained, although they would no long span across a live carriageway. The construction can be phased to coincide with routine winter closures of the canal. Retaining walls are also proposed to separate the various traffic movements and to limit the land take.

3.6.3 Traffic management of the existing traffic flows during the construction phase would affect construction methods and materials adopted. The safe demolition of the existing structures is an important element. Otherwise, the works are essentially self-contained.

3.6.4 The five-span high-level viaduct would be about 150m long and 27m wide. The substructure would be of piled foundations and reinforced concrete piers. The superstructure would be of prefabricated steel or prestressed concrete beams to allow erection to fit in with the phased traffic management regime that would be required to maintain traffic flows during the works.

3.6.5 High abutment structures would be required at both ends of the new bridge. The south abutment would be on the south bank of the Bridgewater Canal.

3.6.6 The two existing slip road bridges would need to be replaced with two new slip road bridges on the new alignment of the slip road off the new roundabout. These would be single span bridges with prefabricated steel or prestressed concrete beams used to form the decks over the canal.

3.6.7 The existing highway alignment would be re-configured to incorporate the new Mersey Gateway and to change the priority of the existing expressways. The free flow link between the Bridgewater and Daresbury Expressways would be removed and replaced by linking into the new roundabout that would be formed at the centre of the junction.

3.6.8 The embankments between this junction and the Central Expressway would be modified for the alignment of the Mersey Gateway and the re-aligned slip roads. This tie-in between the new carriageway and the existing Central Expressway would be at Halton Brow.

Site Access

3.6.9 Access to this site would be from the existing expressways with entry and exit points being changed to fit in with the various phases of the traffic management regime.

3.6.10 Special access arrangements would have to be made for the works adjacent to and at the level of the Bridgewater Canal. A haul road into the area would have to be formed for access for personnel and light plant. Some of the construction material could be delivered by barge on the canal. Concrete would be pumped and beams lifted in from the higher level.

Site Clearance and Demolition

3.6.11 Existing landscaping vegetation would be cleared where required for the new works.

3.6.12 The existing slip road bridges would be demolished following diversion of the traffic onto the new slip road bridges.

3.6.13 The existing carriageway of the expressway through route would be removed following diversion of traffic onto the new roundabout alignment.

3.6.14 There would be no existing buildings to be demolished in this area.

3.6.15 There would be no significant service diversions required in this area.

Construction Methods

3.6.16 Piling platforms would be formed at each abutment and pier position of all three new bridges. The piled foundations would be installed. The pile caps would then be excavated and the piles would be broken down to the required cut off levels. Cofferdams would be required for the excavations adjacent to the Bridgewater Canal. Piling excavation arisings and the arisings of the pile caps are not anticipated to include significant levels of contamination and would be re-used in the works. The pile caps, abutments, wing walls and piers would be of reinforced concrete requiring steel fixing, access scaffolding, shuttering and concrete placement and compaction activities. Light-handling cranes would be employed for lifting reinforcement and shutters into place.

3.6.17 The areas behind the abutments and wing walls would be filled with imported granular fill material prior to general embankment fill being placed and compacted.

3.6.18 The decks of all three new bridges would incorporate prefabricated steel or prestressed concrete beams to eliminate the need to build scaffold falseworks. These beams would have to be lifted into place either over the canal or during temporary short-term closures of the existing carriageways below. Permanent formwork would be fixed between the beams allowing the deck slab reinforcement to be fixed. The side shutters would be fitted and the deck slabs concreted.

3.6.19 Finishing works would include fitting parapets, kerbing, carriageway construction, street lighting, road marking, safety fencing and road signs.

Construction Vehicle Movements

3.6.20 Site clearance of this area would require approximately 25 tipper truck movements to remove the materials of the vegetation and the existing slip road bridges. Some of the materials of the redundant bridges would be re-cycled.

3.6.21 The construction of the new bridges in this area would involve the delivery of materials that would include shutters (approximately. 20 truck movements), reinforcement (approximately 30 truck movements) and concrete (approximately 350 concrete mixer truck movements and 20 concrete pump truck movements). A large mobile crane would be used for the placing of the bridge beams.

3.6.22 This site would require a workforce common with that for the adjacent Astmoor Viaduct site, i.e. approximately 40 operatives. These personnel would share office and messing facilities with the adjacent Astmoor Viaduct site.

Programme, Phasing and Traffic Management

3.6.23 The main re-modelling works at Bridgewater Junction is likely to be undertaken late in the overall construction programme to minimise the traffic disruption to the existing expressway network. However, for the main bridgeworks to progress a complex multi-phase traffic management sequence would be required.

3.6.24 The Bridgewater Junction would require the sequenced diversion of existing east-west and south traffic movements. The close proximity of the Bridgewater Canal would further complicate the temporary traffic planning as it runs immediately adjacent to the

Bridgewater/Daresbury Expressways. The east-west corridor is the boundary of the industrial/commercial area to the north and the mainly residential area to the south. Temporary traffic measures would be required to maintain two-lane flows in each direction during construction.

3.6.25 A temporary closure of the Bridgewater Canal or a temporary local narrowing scheme would be required to allow the construction of the below ground works adjacent to the canal. These works would where possible be carried out in the winter months when canal traffic is at its lowest and when routine canal maintenance is being carried out.

3.6.26 The Bridgewater Canal is assumed to require a temporary clearance reduction to allow for the temporary works for deck construction, although the regular boats on this canal would be able to cope with a clearance reduction for short periods. It would also be possible to obtain temporary closure during the routine winter maintenance period of the canal. Closures up to two hours may be permitted at other times.

Waste

3.6.27 It is estimated that site clearance would generate approximately 250m^3 of green waste and vegetation.

3.6.28 The demolition of the two existing bridges over the Bridgewater Canal is estimated to generate approximately 2,000m^3 of waste structural materials (concrete and steel reinforcement).

3.6.29 Pile and pilecap arisings from the construction of the foundations of the abutments and approach viaducts are assumed to comprise of approximately 10,000m^3 of material that would be removed to a tip or reused in the works.

3.6.30 The construction of the new structures would generate approximately 250m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.7 Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction

3.7.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.7.2 Improvements would be required to the alignment of the Central Expressway to bring it up to current geometric standards and to manage its interface with the Mersey Gateway Bridge. These should not involve significant earthworks and would be undertaken generally within the existing highway boundary.

3.7.3 The distance between existing junctions along the Central Expressway is too close to meet current merging and weaving standards. The current carriageway configuration would be modified so that the Mersey Gateway passes through this corridor with connections only at Bridgewater Junction and Lodge Lane Junction. This would be achieved by converting the existing hard shoulders into distributor lanes with no direct connection to the Mersey Gateway at Halton Brow and Halton Lea Junctions. The existing hard shoulders would need to be strengthened to carry full highway loading and road markings and barriers would be added to prevent merging movements.

3.7.4 An existing footbridge would be replaced. To the south of the Halton Lea Junction the existing busway bridge would be replaced with a new bridge on an altered alignment.

3.7.5 Lodge Lane Junction would be modified to change the priority of traffic flow from the Southern Expressway to the Weston Link. The junction would be modified to make provision for dual two lanes of through traffic from the Central Expressway to the Weston Link with single lane slip roads for traffic movements to and from the Southern Expressway. These works would comprise the construction of a new single span bridge, along with modifications to the earthworks and highway alignment.

3.7.6 Weston Link Junction would be modified to change the priority of traffic flow from the northbound to the southbound section of the Weston Point Expressway. These works would use most of the existing junction layout; however, a new slip road would be constructed on the north side of the existing Weston Link Slip Road to allow traffic to slip onto the Mersey Gateway from the northern section of the Weston Point Expressway.

Site Access

3.7.7 Access to all of these works would be from the existing expressways. Safe entry and egress from the working areas would be incorporated into the traffic management regime.

Site Clearance and Demolition

3.7.8 Some of existing landscaping along the Central Expressway and at Lodge Lane and Weston Link Junctions would need to be cleared.

3.7.9 The existing substandard hard shoulders would be excavated and re-cycled.

3.7.10 There would be no existing buildings to demolish in this area, but sections of the existing footbridges on the Central Expressway would have to be removed.

3.7.11 There would be no significant service diversions required in this area.

Construction Methods

3.7.12 The works along the Central Expressway would be partial carriageway reconstruction works that would have to be undertaken under a phased traffic management regime. The existing hard shoulders would be excavated and a new carriageway would be constructed. This would involve excavators and tipper trucks and the new road construction would involve rollers and pavement laying plant.

3.7.13 At Lodge Lane Junction, a new bridge would be required. This would involve the formation of either piled or spread foundations. The excavated material is not anticipated to contain significant levels of contamination and would be re-used in the works. The substructure would be of piled foundations and reinforced concrete piers. The pile caps, abutments, wing walls and piers would be of reinforced concrete requiring steel fixing, access scaffolding, shuttering and concrete placement and compaction activities. Light-handling cranes would be employed for lifting reinforcement and shutters into place. The superstructure would be of prefabricated steel or prestressed concrete beams to allow erection to fit in with the phased traffic management regime that would be required to maintain traffic flows during the works.

3.7.14 The road layout of Lodge Lane Junction would be modified to change the priority of the junction. This would require earthworks in the formation of new embankments and highway carriageway construction.

3.7.15 At Weston Link Junction the road layout would be modified to change the priority of the junction. The free flow slip between Weston Link and the southern leg of the Weston Point Expressway would be widened and straightened out to improve the alignment and capacity. A new link would be constructed on the north side of the junction between the northern leg of the Weston Point Expressway and the Weston Link. These works would involve earthworks in the formation of new embankments and highway carriageway construction. The existing bridge between Weston Link and the northern leg of Weston Point Expressway would become redundant.

3.7.16 A new equestrian bridge would be required across the new link on the north side of the junction to maintain an existing bridleway. Also, a new retaining wall would be required along the northern edge of the new slip road so that the works would remain within the existing highway boundary.

3.7.17 Finishing works would include street lighting, road marking, safety fencing, road signs and gantries.

Construction Vehicle Movements

3.7.18 The clearance of landscaping would require approximately 25 truck movements.

3.7.19 The removal of excavated material from the existing hardshoulder and carriageways would require approximately 100 tipper truck movements.

3.7.20 The new carriageway construction would require approximately 250 tipper truck movements.

3.7.21 The new bridge at Lodge Lane Junction and the new retaining wall at Weston Link Junction would involve the delivery of materials that would include shutters (approximately. 10 truck movements), reinforcement (approximately 15 truck movements) and concrete (approximately 150 concrete mixer truck movements and 10 concrete pump truck movements).

3.7.22 This site would require a workforce of approximately 50 operatives. A site compound with office and messing facilities would need to be established close to the works. There are no obvious areas immediately adjacent to the works, but space could be made available at Halton Lea or temporary arrangements might be negotiated with landowners (agricultural or disused chemical industry sites) adjacent to Weston Link or Weston Point Expressway.

Programme, Phasing and Traffic Management

3.7.23 These works must be completed before the new crossing opens but can be left until late in the construction programme. The modification of the Central Expressway and Weston Link Junction would take approximately 12 months, whilst the more extensive works at Lodge Lane Junction would take approximately 18 months to complete.

3.7.24 Again temporary traffic measures and diversions would be required to maintain traffic flows along the expressways during construction of the modified road and junction layouts.

Waste

3.7.25 It is estimated that site clearance would generate approximately 500m^3 of green waste and vegetation.

3.7.26 The excavation of the hard shoulders along the Central Expressway would generate approximately 5,000m^3 of waste road construction materials.

3.7.27 The demolition of the existing bridge over at Lodge Lane Junction is estimated to generate approximately 1,000m^3 of waste structural materials (concrete and steel reinforcement).

3.7.28 Base arisings from the construction of the foundations of the new bridge at Lodge Lane Junction are assumed to comprise of approximately 1,250m^3 of material that would be removed to a tip or reused in the works.

3.7.29 The construction of the new structures would generate approximately 150m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.8 Area H – M56 Junction 12

3.8.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.8.2 The existing roundabout to the north of the M56 Junction 12 would be modified to include a signal controlled link directly across the centre of the existing roundabout for the main line of the new highway, leaving the outer roundabout segments for local turning traffic and for eastbound access to the M56 Junction 12. The works would comprise carriageway realignment and the installation of new traffic signals. A new retaining wall would be required to support the carriageway realignment on the south side of the roundabout.

Site Access

3.8.3 Access to these works would be from the existing carriageway. Safe entry and egress from the working areas would be incorporated into the traffic management regime.

Site Clearance and Demolition

3.8.4 The works would be undertaken within the existing highway boundary. However, additional land is required on the south-east and north-west sides of the existing roundabout. Only minor amounts of site clearance would be required.

3.8.5 There would be no existing buildings to demolish in this area.

3.8.6 Service diversions would be required around the west side of the roundabout as a consequence to the local re-alignment of the roundabout.

Construction Methods

3.8.7 The new retaining wall on the south-east side of the existing north roundabout would be the most significant item of work. This would involve the installation of a line of contiguous 750mm diameter bored concrete piles over a length of 75m and 262m of reinforced earth retaining wall. The changeover in wall type being determined in the design by retained height. The maximum retained height would be approximately 11m.

3.8.8 To undertake the piling, a piling platform would first need to be established for the piling rig to operate on. The excavated arisings from the piling would be re-used as general fill in the works. An area would be required to store reinforcement cages prior to them being installed into the pile shafts. The piles would be concreted.

3.8.9 The main retaining wall stems would be constructed of precast concrete panels. The ground would be excavated to the level of the base and a layer of blinding concrete would be laid to establish a clean and firm working platform. The contiguous piles would be broken down to cut-off level. The base reinforcing steel would be fixed and shutters fitted and concreting of the element would follow. The buried surface of the retaining walls would be waterproofed before backfilling with imported granular fill. A parapet would be attached on top of the wall through its entire length.

3.8.10 The new carriageway arrangements would be constructed by excavating to formation level and by laying and compacting the various levels of carriageway pavement construction.

3.8.11 The new traffic signals would be installed.

3.8.12 Finishing works would include street lighting, road marking, safety fencing and road signs.

Construction Vehicle Movements

3.8.13 The new retaining wall would involve approximately 25 tipper truck movements. Material deliveries would involve approximately 5 trucks for shutters, approximately 70 trucks for steel reinforcement and approximately 250 concrete trucks.

3.8.14 The new carriageway construction would involve approximately 150 tipper truck movements.

3.8.15 This site would require a workforce common with that for the adjacent Central Expressway, Lodge Lane and Weston Link Junction sites (i.e. approximately 50 operatives); these personnel would share office and messing facilities.

Programme, Phasing and Traffic Management

3.8.16 These works must be completed before the new crossing opens but can be left until late in the construction programme. These works would take approximately 12 months to complete.

3.8.17 Again temporary traffic measures and diversions would be required to maintain traffic flows through the works and to Junction 12 of the M56 during construction of the modified road and junction layouts.

Waste

3.8.18 It is estimated that site clearance would generate approximately 100m^3 of green waste and vegetation.

3.8.19 Base arisings from the construction of the new retaining wall at M56 Junction 12 are assumed to comprise of approximately 2,500m^3 of material that would be removed to a tip or reused in the works.

3.8.20 The construction of the new structure would generate approximately 150m^3 of waste construction materials comprising used formwork shutters, reinforcement steel, concrete and empty drums and containers.

3.9 Area I – Silver Jubilee Bridge and Widnes De-linking

3.9.1 This area of the works is shown on the plan in Appendix B.

Description of the Works

3.9.2 The opening of the Mersey Gateway would result in a significant reduction in traffic flow on the Silver Jubilee Bridge. This would allow the downgrading of the carriageway on the existing bridge from two lanes in each direction to a single lane in each direction. This in turn would release space on the deck of the bridge to re-introduce footpaths and to provide a dedicated cycle path. These works would require the re-configuration of the deck layout and would involve kerbing, re-surfacing and the provision of new road markings.

3.9.3 The substandard footpath cantilevered on the east side of the bridge could then be closed, although its structure would be retained as it supports services.

3.9.4 A tolling plaza would be constructed on the existing carriageway of Queensway approximately 330m to the north of the Silver Jubilee Bridge. The embankment and viaduct linking to the Widnes Eastern Bypass would be removed by excavation and the use of concrete breakers. The link to Ditton Junction would be downgraded to comprise just the existing slip road. The main carriageway and structures would be removed between the Queensway tollbooths and Ditton Junction.

3.9.5 The main link between the Silver Jubilee Bridge and Ditton Junction (after passing through the tolling plaza) would be along the existing northbound slip road. This needs only be a two-lane single carriageway. A new signal controlled junction would be needed to replace the one-way off and on slips. The remainder of the existing dual carriageway to Liverpool would be closed to traffic and demolished.

Site Access

3.9.6 Access to this site would be along the existing highway corridors.

3.9.7 It is likely that the Silver Jubilee Bridge would be closed for major repair works once the Mersey Gateway opens. This would provide an opportunity to implement the modifications while the bridge and approaches are free of traffic.

Site Clearance and Demolition

3.9.8 The existing surfacing and verges on the Silver Jubilee Bridge would be removed and recycled.

3.9.9 Both the Widnes Eastern Bypass and Queensway embankments would be closed to allow the construction of the Mersey Gateway at Ditton Junction and near to Victoria Road. The material in these two embankments would be re-used in the works.

3.9.10 There would be no existing buildings to demolish in this area.

3.9.11 There would be no significant service diversions required in this area.

Construction Methods

3.9.12 The deck of the Silver Jubilee Bridge would be planed. The waterproofing would be replaced with an approved propriety system. The kerbs would be laid to define the deck arrangement. The new surfacing would be laid. Finally the road markings and new signs would be installed.

3.9.13 The tollbooths on Queensway would be installed on the existing carriageway. The road markings in the vicinity of the tollbooths would be adjusted.

3.9.14 The existing one-way off slip road from Queensway to Ditton Junction would be converted to a two-way road. This would only involve replacing the road markings.

3.9.15 Finishing works would include street lighting, safety fencing, road signs and gantries, installing communications equipment and the erection of the tolling canopies.

Construction Vehicle Movements

3.9.16 The works to adjust the deck layout on the Silver Jubilee Bridge would require only small numbers of vehicle movements; approximately 75 truck movements to remove existing surfacing materials and a similar number of the construction of the new works.

3.9.17 The new tollbooths and canopies would only involve approximately 25 truck movements.

3.9.18 There would be no significant truck movements required in the works for the re-configuration of the slip road.

3.9.19 The excavation of the Widnes Eastern Bypass and the Queensway embankments would involve approximately 900 truck movements.

Programme, Phasing and Traffic Management

3.9.20 These demolition and de-linking works would be carried out following the completion of the main Mersey Gateway Bridge works. However, the Widnes Eastern Bypass and Queensway embankments would be closed earlier to allow the construction of the Mersey Gateway at Ditton Junction and near to Victoria Road.

3.9.21 The Widnes Loops Junction is on the existing traffic route from Runcorn to Widnes, and the changes in alignment and topography make the management of existing traffic flows unrealistic. The traffic would therefore be diverted onto other existing corridors, although there would be a need for purpose built temporary diversions to maintain the traffic flows on the existing routes.

3.9.22 The closure of the Widnes Eastern Bypass and Queensway embankments would require a major traffic diversion scheme to be implemented. Under this scheme, traffic from Speke Road would be diverted off the existing road over Ditton Junction and down to the roundabout and then along the existing slip roads. Also, traffic that would use the Widnes Eastern Bypass would be diverted along Ashley Way to Ditton Junction and then along the existing slip road.

Waste

3.9.23 The excavation of the existing carriageway on the Silver Jubilee Bridge would generate approximately 1,000m^3 of waste road construction materials.

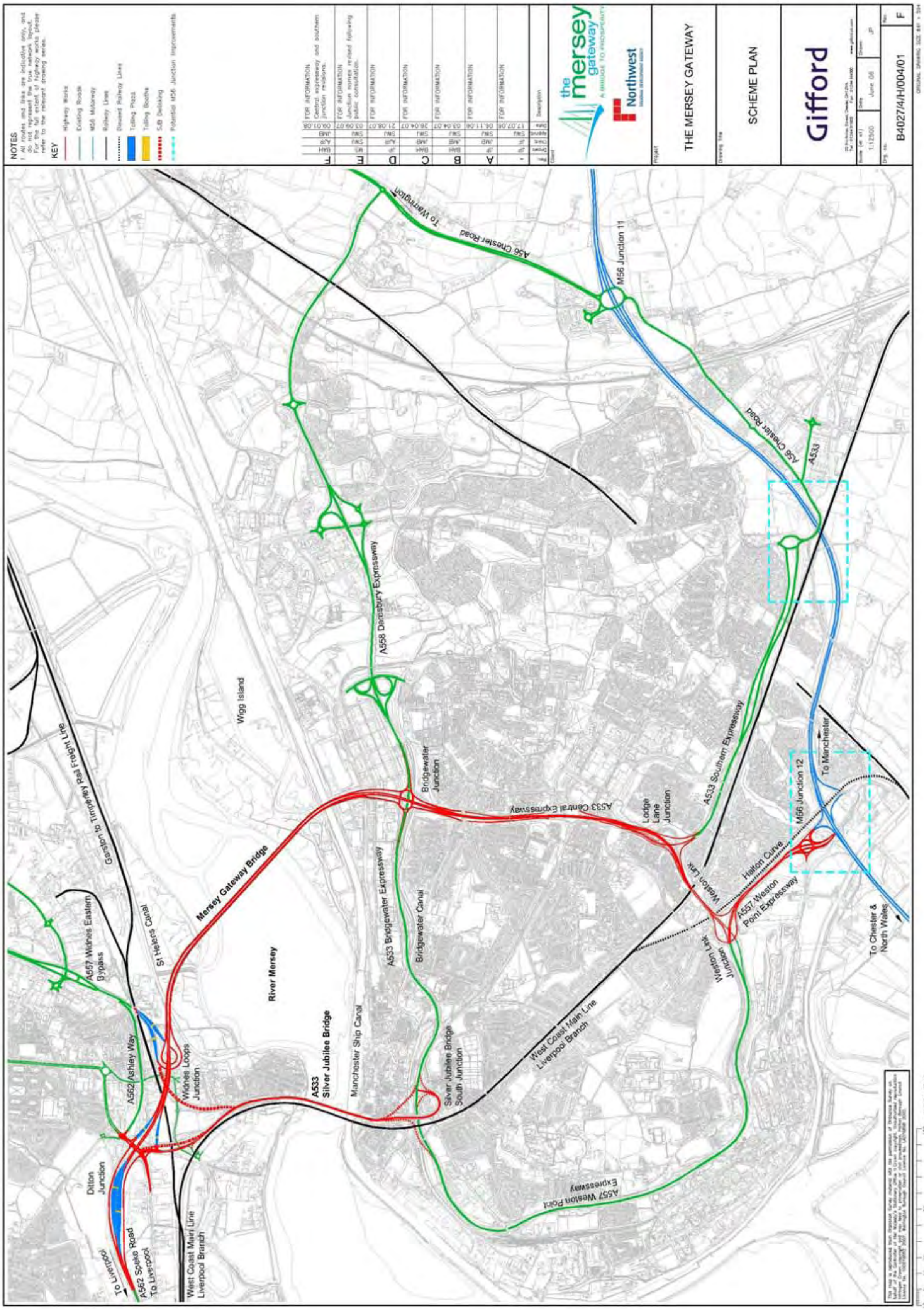
4. ANTICIPATED CONSTRUCTION PROGRAMME

4.1.1 Building the Mersey Gateway would require the coordination of a multitude of complex activities. A simple programme based upon the works identified above is shown in Appendix C although a considerably more complex inter-linked activity programme would be required in practice. The simple programme indicates a completion of the Mersey Gateway site works within three years. This should be seen as being a reasonably ambitious but achievable programme.

4.1.2 It is likely that the Works would be commissioned through a DBFO form of contract. This being the case, a reasonable period needs to be allowed prior to work starting on site for sufficient design detail to be completed. This is anticipated to be a minimum of 6 months.

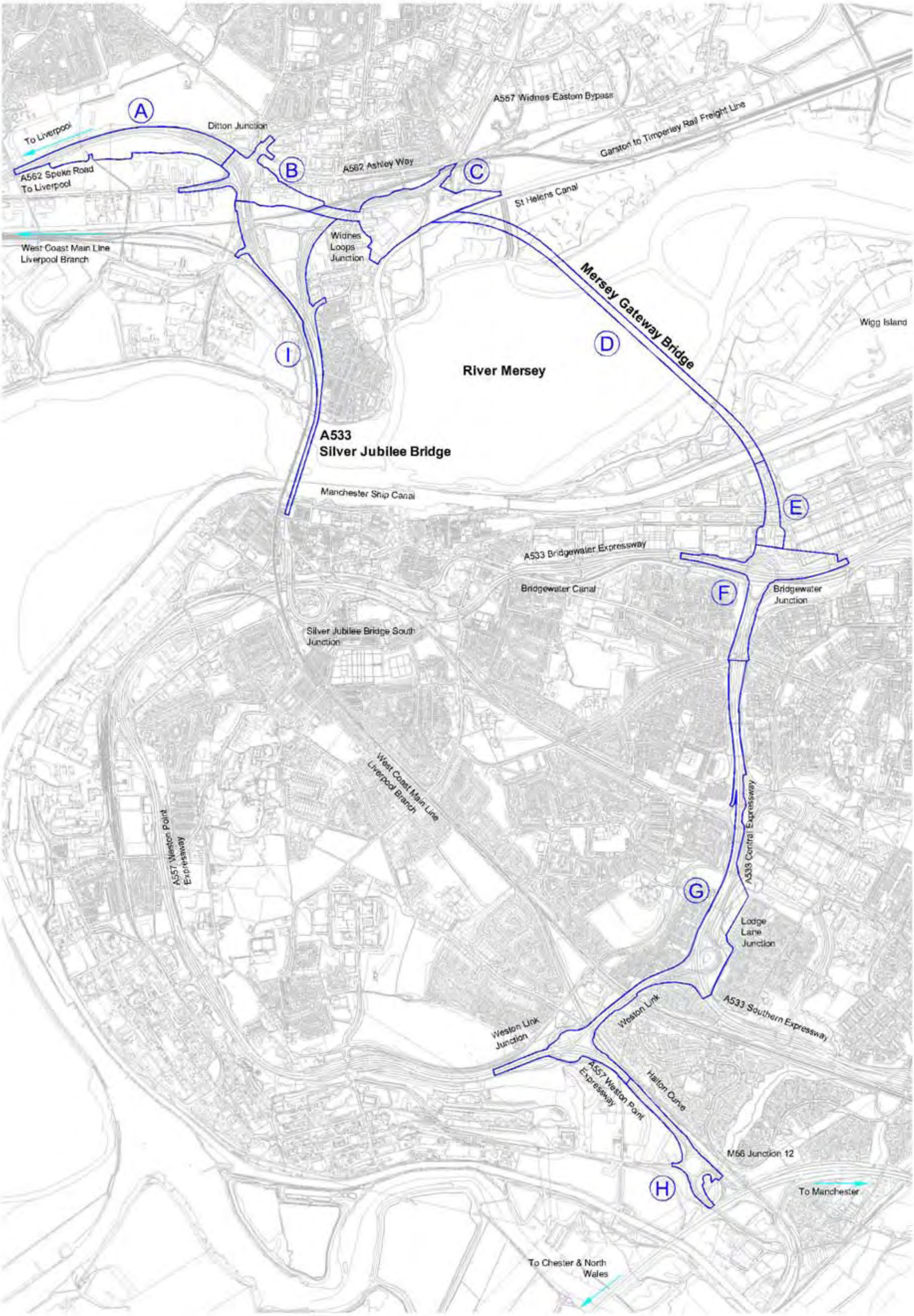
APPENDIX A

SCHEME PLAN
(B4027/4/H/004/01F)


NOTES
KEY
THE MERSEY GATEWAY
SCHEME PLAN
Gifford
B4027/4/H/004/01
Northwest
To Warrington
A56 Chester Road
M56 Junction 11
A533
A558 Daresbury Expressway
Wigg Island
Garston to Timperley Rail Freight Line
A557 Widnes Eastern Bypass
St Helens Canal
Mersey Gateway Bridge
Bridgewater Junction
A533 Central Expressway
Lodge Lane Junction
A533 Southern Expressway
To Manchester
M56 Junction 12
Halton Curve
Weston Link
A557 Weston Point Expressway
Weston Link Junction
To Chester & North Wales
River Mersey
A533 Bridgewater Expressway
Bridgewater Canal
Manchester Ship Canal
A533 Silver Jubilee Bridge
Widnes Loops Junction
A562 Ashley Way
Silver Jubilee Bridge South Junction
West Coast Main Line Liverpool Branch
A557 Weston Point Expressway
Ditton Junction
To Liverpool
A562 Speke Road To Liverpool

APPENDIX B

CONSTRUCTION AREAS


To Liverpool
A
Ditton Junction
A562 Speke Road
To Liverpool
B
A562 Ashley Way
C
A557 Widnes Eastern Bypass
Garston to Timperley Rail Freight Line
St Helens Canal
West Coast Main Line
Liverpool Branch
Widnes
Loops
Junction
Mersey Gateway Bridge
Wigg Island
D
I
River Mersey
A533
Silver Jubilee Bridge
Manchester Ship Canal
E
A533 Bridgewater Expressway
F
Bridgewater Canal
Bridgewater
Junction
Silver Jubilee Bridge South
Junction
West Coast Main Line
Liverpool Branch
A557 Weston Point
Expressway
A533 Central Expressway
G
Lodge
Lane
Junction
A533 Southern Expressway
Weston Link
Weston Link
Junction
A557 Weston Point
Expressway
Halton Curve
M56 Junction 12
H
To Manchester
To Chester & North
Wales

APPENDIX C

INDICATIVE CONSTRUCTION PROGRAMME

MERSEY GATEWAY - INDICATIVE CONSTRUCTION PROGRAMME

ID	Task Name	Duration
1	**Mersey Gateway Project**	**39 mons**
2	Financial Close	0 mons
3	General Mobilisation	6 mons
4	Design Period	6 mons
5	**Area A - Main Toll Plaza**	**16 mons**
6	Site Clearance	3 mons
7	Ground Improvement	9 mons
8	Carriageway Works	3 mons
9	Toll Plaza Infrastructure	3 mons
10	**Area B - Ditton Junction to Freight Line**	**18 mons**
11	Site Clearance	9 mons
12	Ground Improvement	6 mons
13	Construct Embankment	3 mons
14	Ditton Junction Bridge	9 mons
15	Carriageway Works & Toll Plaza	6 mons
16	**Area C - Freight Line to St Helens Canal**	**18 mons**
17	Site Clearance	9 mons
18	Ground Improvement	4 mons
19	Remove Eastern Bypass Embankment	3 mons
20	Construct Embankment	3 mons
21	Freight Line Bridge	6 mons
22	Victoria Road Viaduct	12 mons
23	Widnes Loops Bridge - West	6 mons
24	Widnes Loops Bridges - Central	4 mons
25	St Helens Canal Bridge	6 mons
26	Carriageway Works & Toll Plaza	6 mons
27	**Area D - Mersey Gateway Bridge**	**33 mons**
28	Establish Casting Area	6 mons
29	Unit Storage Areas	3 mons
30	Batching Plants	2 mons
31	Hover Platforms	9 mons
32	Unit Production	18 mons
33	Unit Delivery	13 mons
34	Carriageway Works	4 mons
35	North Abutment	9 mons
36	**North Approach Viaduct**	**27 mons**
37	Access	3 mons
38	Piers	12 mons
39	Gantry Installation	3 mons
40	Deck	18 mons
41	**Intertidal Zone**	**27 mons**
42	Piled Jetty	4 mons
43	Tower 1	12 mons
44	Tower 2	12 mons
45	Tower 3	12 mons
46	Deck 1	9 mons
47	Deck 2	9 mons
48	Deck 3	9 mons
49	**South Approach Viaduct**	**27 mons**
50	Access	3 mons
51	Piers	12 mons
52	Gantry Installation	3 mons
53	Deck	18 mons
54	South Abutment	9 mons
55	Deck Finishes	6 mons
56	Mersey Gateway Opens	0 mons
57	**Area E - Astmoor Viaduct**	**25 mons**
58	Site Clearance	4 mons
59	South Abutment	8 mons
60	Piers	9 mons
61	Deck	12 mons
62	Carriageway Works	3 mons
63	**Area F - Bridgewater Junction**	**12 mons**
64	Canal Bridges	9 mons
65	Remove Existing Bridges	3 mons
66	High Level Bridge	12 mons
67	**Area G - Central Expressway**	**12 mons**
68	Central Expressway Modifications	12 mons
69	Lodge Lane Junction	12 mons
70	Weston Link Junction	9 mons
71	**Area H - M56 J12**	**11 mons**
72	Site Clearance	2 mons
73	Retaining Wall	6 mons
74	Carriageway Works	3 mons
75	**Area I - Silver Jubilee Bridge**	**8 mons**
76	Widnes De-linking	5 mons
77	Modify SJB	3 mons
78	Carriageway Works & Toll Plaza	6 mons