5.0 REPLACEMENT OF STRUCTURES THAT INHIBIT NAVIGATION

This section describes proposals for the replacement or reconstruction of structures between Widnes and St Helens that would inhibit navigation.

Estimated costs of construction are based on current (1995) costs and do not include for any legal, finance or compensation costs.

Forms of Construction

The proposals for the replacement of structures are generally based on the following forms of construction:

- reinforced concrete box culverts
- locks
- steel swing bridges
- steel lift bridges
- steel footbridges

Concrete box culverts are proposed for new road and rail crossings between St Helens town centre and Sankey Bridges, where air draft restrictions are acceptable. They represent a more economical form of construction than bridges and minimise disruption to traffic during construction. The box culvert units would be precast in short lengths to enable them to be moved into position and the construction joints sealed with polysulphide sealant to ensure water tightness. At each end of the completed culvert reinforced concrete head and wing walls would be constructed to retain the backfilled material. Parapets would be installed along each carriageway verge to complete the structure.

The costs for any brick or masonry cladding to these walls have not been included as it is envisaged that such cladding could be applied later and at an additional cost, if required to enhance the appearance of the structure.

All culverts would provide minimum waterway dimensions of 4.8m width, 1.5m water depth and 2.0m air draft, though where sufficient cover allows this would be increased to 2.4m.

The locks would be of reinforced concrete construction with timber lock gates and sills. Each gate would have timber footways cantilevered from the top of the gates to provide access for lock operation. Gate and ground paddles would be

provided for filling and emptying the lock and a by-wash channel at each lock would allow water to pass around the chamber under high flow conditions.

Where footpaths cross the canal, it is proposed that the footbridges would be of steel construction with concrete abutments and access ramps. In preparing minimum engineering proposals, as required, no allowance has been made in the cost estimates for the use of brick or masonry cladding to the concrete, although this would enhance the overall appearance of the footbridge. Ramps would be constructed with a gradient of 5% to allow wheelchair access.

Steel swing bridges are proposed to carry highways over the canal where air draft requirements for masted vessels would preclude the use of a box culvert or where the vertical alignment of the carriageway cannot be satisfactorily regraded. Each swing bridge would be designed to carry full highway loading and would be power operated to facilitate movement and reduce delays to road users.

Steel lift bridges are proposed to replace structures which carry footpaths over the canal where unrestricted air draft is required thus preventing the use of box culverts or footbridges. Each lift bridge would be designed to carry footway loading and would be hand operated.

Description of Proposals

A - Safeway to Corporation Street

(A1) Chalon Court Winding Hole - Chainage 24,450

The canal terminates at the Chalon Court Hotel. A winding hole would be constructed opposite the hotel to allow boats to turn around. This would require the purchase of land in the nearby car park.

(A7A) Temporary Bridge - Chainage 24,390

This single span, temporary steel bridge provides vehicular access to a nearby site which is currently being restored by St Helens Renaissance. As the structure impedes navigation it is proposed that this bridge be removed on completion of the restoration works. An alternative access to this site would be provided by St Helens Renaissance.

(A7) Liverpool-Wigan Railway Embankment - Chainage 24,350

The railway crosses the canal on a high embankment constructed with gabions to replace the original railway bridge, which was in poor condition.

The embankment and any remaining sections of the original bridge would be demolished during a weekend closure of the railway. A precast reinforced concrete box culvert would then be installed and backfilled to allow the railway lines to be relaid. It is anticipated that a 36 hour track possession would be required. The canal air draft at this structure would be 2.4m

At the end of the track possession concrete wing walls would be constructed at each end of the culvert. To the west of the embankment there is a single span structure which comprises concrete beams. This carries the railway over the towpath and would be retained in its existing form. The towpath headroom at this location is 3.0m.

(A10) Weir in Canal - Chainage 24,275

This existing weir spans the full width of the canal and is used to measure the water discharged into the canal at the "Hotties" by Pilkingtons. It prevents navigation and as such it would be demolished. Alternative proposals would be required to measure the water discharge.

(A16) Railway Embankment - Chainage 23,930

The railway, which formerly linked St Helens Junction and Shaw Street stations, crosses the canal at low level. It would have originally been carried on a swing bridge but this was replaced many years ago by an embankment which, obviously, would be an obstruction to through navigation.

The first proposal was to replace the existing earth embankment with a new swing bridge. Railtrack stated that this would be unacceptable as there would be onerous operational and maintenance considerations.

The rail line was most recently used by freight trains to deliver oil to Pilkingtons but discussions have established that an alternative supply route can now be used. Consequently the rail line is no longer in use and there is a possible option to abandon the railway and demolish the structure. Although there are no immediate plans to develop the line, it may have a long term future and therefore

it is not considered appropriate to assume for the purposes of this report that the line can be closed.

The only feasible option is to provide a reinforced concrete box culvert and regrade the railway to allow for the increase in level of the lines over the new structure. This option was presented to Railtrack but no reply was forthcoming. There is no detailed track level information available to clarify whether the regrading option is viable but above the proposed structure the rail tracks would be raised by approximately 1.3m. The regrading of the rail lines would be restricted by the junction with the main line, located 140m west of the structure.

The two BOC pipes located to the north of the structure would be diverted prior to construction of the new box culvert. At each end of the structure concrete wing walls would be provided. The proposed canal air draft would be 2.0m with an unlimited headroom for the towpath, as this would cross the railway lines via a gated level crossing.

(A19) Parr Street Dual Carriageway - Chainage 23,800

At this location the canal is infilled, with the water flow maintained by a pipe which passes under Parr Street dual carriageway.

The electricity sub-station adjacent to the dual carriageway would be demolished and repositioned nearby to allow a precast reinforced concrete twin box culvert to be constructed under the carriageways.

Construction of the culvert would be a two stage operation with traffic diverted onto one carriageway whilst the other is closed to allow the installation of the box culverts. Concrete wing walls would be provided at each elevation. Existing services would be temporarily suspended over the excavation. Where the depth of services is such that they would impede the box culverts they would be diverted prior to construction. Two petrol interceptors would be installed to allow surface water run-off to discharge into the canal. This is necessary because existing road drainage would be severed during construction. The original vertical alignment of the carriageway would be reinstated on completion of the work.

One section of the culvert, with internal dimensions of 5.5m by 3.5m high, would carry the canal and the other, with internal dimensions of 3.0m by 2.0m, would carry the towpath. This allows safe pedestrian access under the busy dual carriageway. The level of the towpath would be the same as water level in the

canal to avoid drainage problems. The additional width of 5.5m for the section which carries the canal would allow the installation of a 0.7m wide walkway, to be used in emergencies. There is a requirement for this walkway because of the substantial culvert length required at this location.

The canal air draft and towpath headroom at this structure would be 2.0m to avoid regrading of the existing carriageways.

B - Corporation Street to Islands Brow

(B1A) Corporation Street Footbridge - Chainage 23,615

A new steel footbridge is proposed at this location to carry the towpath from the east bank to the west bank. Access ramps would be provided at each abutment to allow disabled access over the canal.

(B11) Pocket Nook Street and Technology Campus Access - Chainage 23,220

The canal has been infilled at this location with Pocket Nook Street and a new access road to a Technology Park constructed over the infill. Two pipes laid through the infill currently maintain water flow in the canal.

A reinforced concrete box culvert would be provided with internal dimensions of 5.5m wide by 3.5m deep. The additional width of 5.5m would allow the installation of a 0.7m wide walkway, to be used for emergency egress. There is a requirement for this walkway because of the substantial culvert length, which would be about 87m at this location. Concrete wing walls would be provided at each end of the structure.

Pocket Nook Street is currently subject to a weight restriction and has single file working. The installation of a temporary Bailey Bridge during weekend operations would allow traffic to pass over the excavation during construction of the crossing. To reduce the span of the Bailey Bridge, sheet pile abutments could be installed either side of the excavation and the bridge could be further reduced in size, if the single file working system could be extended to include the temporary bridge.

Prior to construction of the crossing, British Telecom ducts, a high pressure gas main and 33 kv electricity cables would be either diverted around or temporarily suspended across the excavation, depending on the depth of the utility. There are

two 200mm diameter BOC pipes which pass over the proposed culvert at an unknown depth. If possible these pipes would also be temporarily suspended over the excavation, to avoid the requirement to divert them.

The Technology Campus access road would need to be significantly regraded in order to accommodate the canal culvert. This would make temporary bridging difficult and it is suggested that a temporary Bailey Bridge would be installed alongside the existing access road. This may necessitate a temporary realignment of the road partially utilising an existing car park.

On completion of the culvert, Pocket Nook Street would be reinstated to its original vertical alignment. The access road, however, would be regraded as the road level would be increased by 0.75m. The existing road drainage would be severed as a consequence of the regrading and, so, two petrol interceptors would be required to allow surface water run-off to discharge into the canal.

In this location the towpath would be curtailed with pedestrian access provided across Pocket Nook Street via the nearby pedestrian crossing. A twin box culvert was not considered suitable due to the overall length of the culvert.

The canal air draft provided at this structure would be 2.0m to reduce the area of regrading required on the access road.

(B17) Ravenshead Glass Access - Chainage 22,825

This access road links two factory buildings and is constructed on an earth embankment which infills the canal. Water flow is currently maintained by two feeder pipes which pass through the embankment.

A reinforced concrete box culvert with internal dimensions of 4.8m wide by 3.5m deep would be provided through the embankment. To maintain access during construction a temporary steel Bailey Bridge would be installed. On completion of the culvert and the associated wing walls the access road level would be raised by 500mm and suitably realigned.

There are two BOC pipes (Hydrogen and Hydrogen/Nitrogen supply) which cross the proposed structure at an unknown depth. These pipes would be diverted prior to construction along with the existing BT ducts.

The towpath would pass over the access road at this location. The air draft provided to the canal would be 2.0m to keep the change in alignment of the access road to a minimum.

(B26A) Steel Footbridge - Chainage 22,580

The existing steel footbridge would be retained but due to the reduced headroom the abutments would be raised by approximately 600mm.

During construction pedestrian access to the east bank would be via Merton Bank Road Bridge (B26).

(B26) Merton Bank Road Bridge - Chainage 22,425

The existing bridge comprises a reinforced concrete slab with concrete abutments which surmount steel sheet pile training walls. Existing headroom is deficient.

This structure could be demolished and replaced with a single reinforced concrete box culvert which has internal dimensions of 4.8m wide and 3.5m deep. This would provide a canal air draft of 2.0m. A temporary steel Bailey Bridge would be installed sequentially on each lane to maintain vehicular and pedestrian access over the excavation. The 11kV electricity cables in the footways and the two gas pipes adjacent to the existing bridge would be diverted before construction. Concrete wing walls would be provided at each end of the culvert.

It may be possible, following a detailed survey, that the existing bridge substructure could be incorporated into a raised canal crossing.

The original vertical alignment of Merton Bank Road would be raised by 0.9m above the structure. This would sever the existing road drainage and would require the installation of a petrol interceptor to allow the surface water run-off from the road to discharge into the canal. The regrading would extend to adjacent property entrances and side streets.

The towpath would cross the road at this location.

C - Island Brow to Black Brook

(C4A) Park Road Lock - Chainage 21,525

This would be a new lock on the proposed new alignment of the canal between Old Double Lock and Park Road. It is proposed that it should be located at the site of the existing car wash which would need to be relocated. The lock chamber would be of reinforced concrete construction with timber lock gates. A concrete bywash channel would be provided to the chamber.

(C6) Park Road Crossing - Chainage 21,275

South of the new Park Road Lock, a reinforced concrete twin box culvert would be constructed to carry the canal and the towpath under Park Road. Prior to construction, a temporary steel Bailey Bridge would be installed during an off-peak closure of the road. This bridge would allow excavation and construction of the culvert to proceed whilst maintaining traffic flow. Alternatively, temporary, sequential diversions of traffic may be possible on Park Road, as sections of the culvert are completed, thus producing some savings in construction cost.

The canal air draft would be 2.0m with a similar headroom to the towpath. The level of the towpath would be the same as the water level in the canal to avoid drainage problems. The box culvert which would carry the towpath would obviate the need for pedestrians to cross Park Road. The additional width of 5.5m for the section which carries the canal would allow the installation of a 0.7m wide walkway, to be used in emergencies. There is a requirement for this walkway because of the substantial culvert length required at this location, which is about 70m.

A petrol interceptor would be installed to allow surface water run-off to discharge into the canal as the existing highway drainage would be severed by the new structure. BT ducts in each footpath would be temporarily suspended during construction.

Reinforced concrete wing walls would be constructed on each elevation when the box culvert is completed. Minor regrading to the carriageway may be required.

(C6A) Boardmans Lane Crossing - Chainage 21,090

The proposed new alignment of the canal passes under Boardmans Lane where a new reinforced concrete box culvert would be constructed. There is insufficient space between the proposed canal culvert and the existing bridge over Sankey Brook to accommodate a separate culvert for the towpath. Construction would take place in a two stage operation whilst maintaining one way traffic flow with temporary traffic lights. As this road carries only light traffic, a temporary closure of the road may be possible. This would yield some savings in the construction costs.

There are British Gas pipes in the footpath which are at a unknown depth. If possible these utilities would be temporarily suspended over the excavation. If they impede the new structure they would be diverted.

Either side of the new box culvert, reinforced concrete retaining walls would be constructed to retain the earth fill. A canal air draft of 2.0m would be provided at this structure and the towpath would cross the road which has only minor traffic flows. The towpath ramps would require careful design close to the steep river bank.

(C11A) New Junction Lock - Chainage 20,695

This new double lock would be constructed adjacent to the existing Old Double Lock. The lock chamber would be reinforced concrete with timber lock gates. The existing Old Double Lock would be restored and used as a bywash channel to the new lock. A new footbridge would be built onto the copings of the downstream end of the top lock chamber. This footbridge would provide access to towpath users across the chamber to the Blackbrook Branch.

D - Old Double Lock to Engine Lock

(D7) Concrete Pipe Bridge - Chainage 20,395

This existing pipe bridge impedes navigation and is no longer in use according to Statutory Undertakers consulted during this study. Consequently it would be demolished.

(D12) Black Brook Culvert - Chainage 20,075

At this location Black Brook, which originally was culverted under the canal, now discharges into the abandoned canal cut. With the proposals to restore to the canal, a new culvert would be required to carry Black Brook under the canal and into the nearby Sankey Brook.

This culvert would comprise precast concrete pipes with concrete head walls at both the inlet and the outlet.

(D15) Sankey Brook/Canal Footbridge - Chainage 19,995

This steel footbridge carries the towpath over the canal where it currently joins Sankey Brook. The new alignment of the canal here is such that the footbridge is no longer required and would therefore be demolished.

(D18) Engine Lock - Chainage 19,795

The existing lock is substantially infilled and where visible appears to be in a poor state of repair. A full detailed inspection of the remaining sections of the existing lock was not possible. It has been assumed for cost estimating purposes that a new reinforced concrete structure with timber lock gates would be required. A concrete bywash channel would also be provided. The original lock would then be demolished.

However, exploratory excavations may reveal that the lock is capable of being restored and this would result in a cost saving.

E - Engine Lock to Penkford Bridge

(E9) Havannah Flash Footbridge - Chainage 19,285

This new steel footbridge would allow the existing footpaths in the area to cross the canal. The new structure would be constructed adjacent to an existing footbridge over Sankey Brook and would have access ramps to each abutment to allow disabled access.

(E12) Penkford Bridge - Chainage 17,675

This bridge carries the A572, Common Road over the canal. The bridge deck comprises steel beams with concrete jack arches and was constructed in 1935 to replace the original swing bridge.

The canal air draft at the existing structure would be 1.95m with the original proposed pound level of 16.00m (above Ordnance Datum) between Newton Common and Engine Lock. As this is only 50mm less than the minimum air draft requirement of 2m it is proposed that the structure be retained and the pound level reduced accordingly. The nearby weir would ensure that the water in this area of the canal does not exceed this critical level.

(E14) Overhead Pipework - Chainage 17,670

The self-supporting pipe which crosses adjacent to Penkford Bridge has an air draft of 1.85m above the proposed pound level. This is less than the minimum air draft of 2.0 metres stipulated in the Brief. The services carried by this structure are owned by North West Water and would be diverted under the canal and the existing pipe bridge demolished to allow navigation.

F - Penkford Bridge to Bradley Lock

(F4A) Newton Common Bridge - Chainage 17,260

A reinforced concrete box culvert, with internal dimensions of 4.8m wide by 3.9m deep, constructed upstream of Newton Common Lock would maintain vehicular access to the land west of the canal in this location. At present this access is provided by a basic track. On completion of the box culvert the access track would be regraded to accommodate the increase in level over the structure and reinforced concrete wing walls would be constructed on each elevation.

This box culvert would have a canal air draft of 2.4m and the towpath would pass over the access track as this would be only occasionally used by vehicles.

(F4) Newton Common Lock - Chainage 17,225

The original lock has been completely infilled. As the condition (or presence) of the original structure could not be assessed at the time of inspection it has been

assumed for cost estimating purposes that this structure be replaced with a reinforced concrete chamber with timber gates and a bywash channel.

In view of the importance of this lock to the industrial heritage great care would be needed in its design and, for example, it may be that the concrete structure would require stone facing to replicate the original lock. The cost of such heritage additions have not been included in the cost of the structure.

We understand that the lock chamber has now been excavated and appears to be capable of restoration which would result in a cost saving.

G - Bradley Lock to Newton Brook

(G3) Bradley Swing Bridge - Chainage 16,075

The original swing bridge is now fixed in position thereby obstructing navigation. This bridge is in poor condition and would therefore be removed rather than renovated. At Sankey Bridges there is a disused steel swing bridge which would be used as a replacement. The original movement mechanism would be reinstated and a hydraulic and electrical system installed to allow the new bridge to be power operated during use.

(G10) Hey Lock - Chainage 15,185

Hey Lock is partially infilled with water flow maintained through the structure by a feeder pipe. Although the condition of the original structure cannot be established it is proposed that this lock chamber be exposed and repaired. It may be necessary to rebuild sections of the masonry walls and provide a new concrete invert. A new concrete bywash channel would also be provided along with new timber lock gates and cills.

There is a car park to the east of the lock which is regularly used by anglers. A new footbridge would be provided at the downstream end of the chamber to allow access between the towpath and this car park.

(G17) Newton Brook Crossing - Chainage 14,635

Newton Brook, which was originally culverted under the canal, now passes through a section of the infilled canal. Concrete weirs at the upstream end of the structure were used measure flows in the Brook, until it was abandoned as a live

gauging station. Steel sheet piles surmounted by concrete capping beams form the sides of the Brook.

This structure would impede navigation on the restored canal and, consequently would have to be demolished. It would be replaced by a new concrete culvert, sized in accordance with the requirements of the Environment Agency and laid under the canal. Alternatively, it may be possible to incorporate the existing structure into the canal crossing replacement.

This crossing is likely to have a low soffit, and the EA will raise concerns over its effect on flood regime, even though there are no properties at risk upstream. In order to accommodate the scenario of a blockage within the culvert, an emergency overflow from the Brook into the canal would need to be accommodated. The canal would then act as a flood relief channel for a short distance until the next overflow.

H - Newton Brook to Winwick

(H9) Alder Lane Crossing - Chainage 13,365

Alder Lane crosses the infilled canal just above the proposed water level. Consequently a new swing bridge would be required. During construction Alder Lane would be closed and traffic diverted via Watery Lane.

The bridge would be constructed in steel and would be able to carry full HA and HB load in accordance with the requirements of the Department of Transport. The design of the bridge would be subject to the approval of the Technical Approval Authority. The structure would be power operated and would have footways to maintain pedestrian access over the canal. The towpath route would cross from the west to the east bank at this bridge.

(H12) Winwick Lock - Chainage 12,950

A substantial part of the original chamber is infilled therefore it's condition cannot be established. From the condition of the exposed areas of the lock chamber it is proposed that the original lock chamber be exposed and remedial works carried out. This may include reconstructing sections of the masonry walls and constructing a new concrete invert to the chamber. New timber lock gates and cills would be provided along with a new concrete bywash channel.

This lock is currently positioned north of the M62 motorway but there is a possibility, as discussed below, that it would be relocated south of the motorway to facilitate construction of the tunnel through the embankment. In this case a new reinforced concrete lock would be required and the existing lock would be demolished.

(H15) M62 Motorway Crossing - Chainage 12,795

The M62 motorway crosses the infilled canal on a high embankment at Winwick Quay, north of Dallam. To re-open the canal it would be necessary to provide a new waterway crossing of the motorway.

The towpath would be diverted onto an existing public right of way which passes under the motorway through a span of the nearby viaduct. However, the close proximity of existing houses and business properties, including the listed buildings on Old Winwick Quay, and their access roads would appear to prevent the possible diversion of the canal along this alignment.

The only practical alternative at present is to form a new canal crossing through the embankment. This would be approximately 70m long and it is likely that the most economical method of construction would be to use a precast concrete box culvert, jacked through the embankment. With internal dimensions of 5.5m by 3.9m, this would provide a waterway 4.8m wide, with 2.4m air draft and an emergency escape route 0.7m wide.

It is understood that the existing embankment comprises compacted PFA fill material over a drainage layer approximately 1m thick. The level of this drainage layer is not known and can only be established through detailed site investigation work, which would be essential to the detailed design and costing of the crossing.

The height of the embankment is such that the depth of cover above the tunnel would be sufficient for the proper control of surface settlement, which would be a major constraint on the design of the crossing and on the construction method adopted. Surface settlement increases with reducing depth of cover between the surface and the top of a tunnel. However, tunnel construction and the containment of settlements is easier when homogeneous material and dry conditions are encountered throughout the drive.

There could be advantages, therefore, in raising the level of the tunnel so that it lay totally within the PFA fill and above the drainage layer. This would require

the level of the canal to be raised and Winwick Lock to be relocated to the south of the motorway.

There are proposals, currently programmed for 1998, for widening this section of motorway, by adding one lane in each direction, which would increase the length and hence the cost of this crossing. The Highways Agency have been advised of the proposed restoration of the St Helens Canal and the need to construct a new crossing of the motorway. It would be beneficial if the Agency could be persuaded to include, within the motorway widening contracts, measures designed to facilitate future canal crossing and the ground investigation necessary for its design.

When the geotechnical investigation has been completed and the design constraints identified, suitably experienced specialist contractors should be approached to discuss the proposed crossing in greater detail and to confirm the most economical method of construction.

(H15A) Winwick Quay South Bridge - Chainage 12,695

South of the M62 motorway a new reinforced concrete box culvert would be required to allow farm vehicles to gain access to the nearby farm fields. Each elevation of the culvert would have reinforced concrete wing walls and the towpath would pass over this regraded access road.

The internal dimensions of this box culvert would be 4.8m wide by 3.9m deep thereby providing a canal air draft of 2.4m.

J - Winwick to Dallam

(J3A) New Hulme Lock - Chainage 12,055

The existing Hulme Lock is at chainage 12,645m and is substantially infilled. To allow the canal to pass over Sankey Brook it is necessary to raise the pound level of the canal by relocating Hulme Lock south of Sankey Brook. The new lock would be of reinforced concrete construction and would have a bywash channel. A new steel footbridge would span across the downstream end of the chamber to allow the towpath route to cross from the west to the east canal bank.

The existing Hulme Lock would be abandoned and the new proposed canal alignment would pass alongside this structure thereby allowing it to be retained for historical interest.

(J12A) Hulme Aqueduct - Chainage 12,115

Adjacent to New Hulme Lock there would be a reinforced concrete aqueduct which would span Sankey Brook. The reinforced concrete abutments would be constructed in line with the banks of the Brook. Temporary falsework would then be installed between the top of the abutments and shuttering for the concrete superstructure suspended from this. In cross section the aqueduct would comprise a 'U' shaped channel for the canal with cantilever walkways along each side. On completion of the superstructure the falsework would be removed.

During construction the flow in Sankey Brook, therefore would not be impeded. In addition, prior to construction of the aqueduct, the proposed overflow channel upstream would be constructed so that, should a flood occur, part of the brook flow could be diverted around the bridgeworks.

The width of the canal over the aqueduct would be 4.8m and this width would be maintained between the aqueduct and the New Hulme Lock. This would require boats to queue north of the aqueduct when the lock is being used.

(J12) Footbridge 'A' - Chainage 11,875

The new proposed alignment of the canal in this location is parallel to Sankey Brook which is in the original canal cutting. To carry an existing footway over the canal a new steel footbridge would be constructed. Either side of the footbridge the footpath would be regraded as required.

(J13) Cromwell Avenue Bridge - Chainage 11,815

The new canal cutting passes under Cromwell Avenue to the west of the existing two span bridge over Sankey Brook. The new structure would comprise a twin reinforced concrete box culvert. One section would carry the canal whilst the other would accommodate the towpath. This form of construction is required to avoid pedestrians crossing the busy Cromwell Avenue.

A temporary steel Bailey Bridge would be used during construction to maintain traffic flows on Cromwell Avenue. This would be installed during an off peak road closure.

There are no public utilities in this area. The highway drainage would, however, be severed and would therefore require the installation of a petrol interceptor to allow surface water run-off to discharge into the canal.

On completion of the box culverts concrete wing walls would be constructed on each elevation and the carriageway regraded to a new vertical alignment. The proposed canal air draft would be 2.4m and the headroom to the towpath would be 2.0m.

(J15) Footbridge 'B' - Chainage 11,715

South of Cromwell Avenue a footpath crosses the new canal alignment. A steel footbridge would be built here to carry this footpath over the canal. The footpath either side of the new bridge would be regraded.

(J16) Footbridge 'C' - Chainage 11,165

This structure would be similar to Footbridge 'B' (J15) and would carry a footpath over the new alignment of the canal.

K - Bewsey Lock to Liverpool Road

(K4) Bewsey Lock - Chainage 10,460

Bewsey Lock would be retained and remedial work carried out to make the structure operational once again. The existing bywash comprises the overflow (Ref K3) which discharges into Callands Pond nearby. This route is no longer acceptable due to the anticipated large flows around the lock which would cause a severe environmental impact to the pond. A new open channel bywash would be constructed to the east of the lock chamber.

(K4A) Bewsey Lock Footbridge - Chainage 10,460

Bewsey Lock is no longer operational and the lock chamber is spanned by a timber swing bridge which is now fixed in position between the chamber walls.

It is proposed that when Bewsey Lock is renovated the bridge would be removed and replaced with a new steel footbridge. This would span between the chamber walls and would be located at the downstream end of the chamber. The existing bridge cannot be re-used as it is too wide.

(K6) Bewsey Swing Bridge and (K6A) Bewsey Footbridge - Chainage 10,280

The two existing fixed structures at this location impede navigation and would be demolished. Due to the vertical alignment of the existing road a steel swing bridge would be provided. This bridge would carry the carriageway and one footway over the canal maintaining access to the nearby Bewsey Old Hall. During construction vehicular access would be diverted via an alternative route. Pedestrian access would be maintained by constructing a temporary earth bund in the canal.

The bridge would be power operated and its design would be subject to the approval of the Technical Approval Authority. Existing services which currently run alongside the road bridge would be diverted under the canal, away from the new swing bridge.

The towpath would pass over the road along the existing alignment.

(K13) Sankey Way Culvert - Chainage 8,855

The canal currently passes under Sankey Way dual carriageway in a concrete box culvert which has an air draft of 0.68m. To allow navigation it is proposed that this culvert be demolished and replaced with a new reinforced concrete twin box culvert. One section, with internal dimensions of 4.8m wide and 3.9m deep, would carry the canal. The other section would have internal dimensions of 3.0m by 2.4m and would accommodate the towpath.

Construction would be carried out in two phases. At any one time one carriageway would be closed to allow installation of the new box culverts. The other carriageway would remain open to maintain traffic flows. Suitable traffic management procedures would be adopted.

Either side of the culvert, sections of the central reserve would be surfaced to allow installation of the traffic management. With the increase in height of the new structure the carriageways above would be regraded accordingly. Services which pass over the structure would be diverted prior to construction. Petrol

interceptors would be installed as the existing highway drainage would be severed by the new structure.

The canal air draft would be 2.4m and the minimum headroom to the towpath would be 2.3m.

L - Liverpool Road to Fiddlers Ferry

(L1) Liverpool Road Bridge - Chainage 8,155

The existing bridge carries Liverpool Road over the canal and replaced the original lifting bascule bridge. With an air draft of only 0.5m it impedes navigation and would have to be demolished and replaced with an alternative form of construction.

A reinforced concrete box culvert was considered but discounted because it would require the carriageway to be raised by approximately 1.3m. The existing vertical alignment of the carriageway is poor and there are numerous junctions near the canal. Regrading this road would create a potential high risk accident area and would disturb several nearby properties.

To maintain the existing vertical road alignment, a moveable bridge would be required. Both lift and swing bridges were considered. Due to the overall size of the structure, with a 7.3m wide carriageway and two 1.8m wide footways, a swing bridge was selected. This bridge would be power operated and designed to carry full highway loading (HA and HB load). The design of the new bridge would be subject to the approval of the Technical Approval Authority.

To minimise delays to road traffic through opening of the bridge it is suggested that it should not be operated during peak hours ie. 07.00 to 9.00 and 16.00 to 18.00 Monday to Friday.

During construction, road traffic and pedestrians would be diverted over a temporary earth bund constructed in the canal. The existing, presently disused, swing bridge nearby could also be used as a diversionary route. The existing utilities in this area would be diverted prior to construction.

The towpath would cross Liverpool Road via a pedestrian crossing at this location.

(L2) Disused Swing Bridge - Chainage 8,140

It is understood that the swing bridge was used to supplement the original Liverpool Road lift bridge and to act as an alternative crossing during periods of maintenance. It became redundant with the construction of the new fixed bridge carrying Liverpool Road across the canal.

With the proposed new swing bridge for Liverpool Road, an alternative route during maintenance periods would be available via Sankey Way and the existing swing bridge is unlikely to be required.

As the superstructure of this bridge appears to be in good condition, it is proposed that it should be removed and used to replace Bradley Swing Bridge (G3), which is in a poor state of repair.

(L3) Warrington-Widnes Railway Bridge - Chainage 8,035

The existing structure carries the Timperley to Garston railway over the canal and replaced the original swing bridge. The overall construction appears to comprise longitudinal reinforced/prestressed beams which are tied together transversely. These beams are supported on the canal walls. The existing air draft provided is 0.87m thereby impeding navigation.

It was originally proposed that the existing structure be replaced with a railway swing bridge which would have allowed masted vessels access up to Sankey Way. Railtrack, who own the bridge, stated that this would be unacceptable as there would be onerous operational and maintenance considerations.

The railway is currently used by freight trains with typically five or six trains passing each day. We are not aware of any firm proposal to change the status of the line. Should Fiddlers Ferry power station close in the future rail traffic is likely to reduce. For the purposes of this feasibility study we have assumed that this line would stay in use.

Temporary closure of the railway line would be required to allow demolition of the existing bridge and the construction of the new twin culvert crossing. As the railway would be raised by approximately 1.5m to gain the required minimum air draft of 2.4m, the tracks would need regrading over a distance of about 150m either side of the canal crossing.

(L3A) Service Bridge - Chainage 8,040

This service bridge carries 11kV electricity cables and is located upstream of the railway bridge. It impedes navigation and would therefore be demolished and the electricity utilities diverted over the new box culvert.

(L7) Mayers Swing Bridge - Chainage 7,775

The existing structure is fixed in position and would be demolished to allow navigation of the canal. It is proposed that a new steel lift bridge be constructed in its place. This bridge would only be designed to carry footway loading as vehicular traffic would not use the bridge. The lifting mechanism would be hand operated. The North West Water pumping main located next to the structure would be diverted under the canal away from the position of the new structure.

(L9) Penketh Bridge - Chainage 6,335

Penketh Bridge is of recent timber construction and has a hinge mechanism at the west abutment but there is no discernable means of lifting the structure. It is proposed that a hand operated lifting mechanism be installed on the existing bridge to allow navigation.

It is anticipated that this bridge would only be required to carry light vehicular traffic and the structure would need to be assessed to establish a suitable weight limit.

(L11) Fiddlers Ferry Swing Bridge - Chainage 5,835

A new steel swing bridge capable of carrying full highway loading (HA and HB load) is proposed to replace the existing fixed structure. It would be subject to the approval of the Technical Approval Authority. During construction, traffic would be diverted across the nearby Marsh House Bridge (L24). When using this structure it must be ensured that vehicles do not wait on the level crossing next to the bridge. To prevent this suitable warning signs would be required.

The swing bridge would be automated and Norweb cables which are currently attached to the edge beams on the existing bridge would be diverted under the canal away from the structure.

The concrete wall which crosses the canal to the south of the bridge would be demolished during reconstruction of the bridge.

(L24) Marsh House Bridge - Chainage 5,310

This structure is similar to Fiddlers Ferry Swing Bridge (L11) and would also be replaced with a steel swing bridge with full highway load (HA and HB load) capacity in accordance with the requirements of the Department of Transport. This bridge provides access to industrial premises and so to maintain this access during construction a diversion across Fiddlers Ferry Swing Bridge would be established.

British Telecom and North West Water utilities in the existing bridge would be diverted under the canal away from the structure prior to construction.

M - Fiddlers Ferry to Carter House

(M2) Powergen Causeway - Chainage 4,760

This causeway comprises parallel sheet pile walls either side of two slurry pipes which are connected to the Powergen lagoons. Between the sheet pile walls the pipes are covered with earth fill. The structure impedes navigation and it is proposed that the sheet pile walls be removed and the level of the pipes reduced to allow the canal water depth to be restored at 2.0 metres.

(M9) Concrete Wall - Chainage 3,580

This concrete wall crosses the full width of the canal and was constructed by Powergen as part of the slope stability work initiated adjacent to the lagoons. When the new canal channel is constructed along this section, this wall would be demolished to allow navigation.

(M12) Johnsons Lane Culvert - Chainage 3,100

The existing concrete open channel which allows discharge into the River Mersey would be demolished. A new inverted syphon would be provided which would allow the canal channel to pass above with a depth of 2.0 metres.

(M18) Carter House Swing Bridge - Chainage 1,770

The existing fixed timber bridge would be demolished and replaced with a new steel lift bridge which would have a reduced load capacity. Despite this farm vehicles would be able to use the structure. The lifting mechanism would be hand operated. There is a gas main nearby which would be diverted prior to the start of construction.

N - Carter House to Widnes

(N2) Spike Island Bridge - Chainage 600

This fixed, single span timber bridge impedes navigation and would be demolished. It would be replaced with a new steel lift bridge which would have a reduced load capacity. The reduced capacity is acceptable because the bridge would not carry vehicular traffic.

(N3A) Widnes Lock Bridges - Chainage 10

Currently the only means of access to Spike Island is using the timber bridge located at chainage 600 metres. Spike Island is a major recreational venue and as such requires a vehicular access. It is proposed that this access is provided by two new lift bridges next to the existing lock. One lift bridge would span the approach to the lock and the other would span the slipway. Each bridge would be capable of carrying full HA load in accordance with the requirements of the Department of Transport.

New approach roads would be required to these structures. Existing services in this area would be diverted prior to the start of construction.