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MERSEY GATEWAY PROJECT
SURFACE WATER QUALITY MONITORING PLAN

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1. INTRODUCTION

1.1 General

- 1.1.1 As part of the proposals to construct a second road crossing of the River Mersey between Widnes and Runcorn – the Mersey Gateway Project (“the Project”), a series of applications have been made for orders authorising works within the River Mersey and upon land adjacent to the River. ~~These applications have been accompanied by an Environmental Statement (ES).~~
- 1.1.2 A Construction and Operation code of Practice for Environmental management (COPE) has been developed for the Project to define the measures required to mitigate and monitor the construction and operation of the Project including the proposals contained in the Further Applications in relation to an updated reference design (hereafter referred to as the “Project including the Proposals”) to protect the environment. The COPE covers specific regulatory, legislative and best practice requirements. It also provides for measures set out in the Project Further Applications ES. The COPE sits within the framework of the Project Environmental Management Plan (EMP).
- 1.1.3 The Project including the Proposals and their potential impacts on Surface Water Quality have been considered in the Surface Water Quality Chapter of the Further Applications ES.
- 1.1.4 In considering the applications and Further Applications ES, the Environment Agency (EA) and Natural England (NE) have commented on the Project including the proposals. This has resulted in the agreement to secure the monitoring of the characteristics of the Study Area in relation to surface water quality ecology monitoring.
- 1.1.5 Appendix A of the COPE comprises a series of monitoring plans for the Project including the Proposals, of which this document is one, which have been developed as a result of consultation on application and consideration of the Further Applications ES as described above.
- 1.1.6 This document comprises the proposals for the monitoring of surface water quality during both construction and for an appropriate period following completion of the construction of the Project including Proposals. Its contents will be subject to consultation between Halton Borough Council (HBC “the Council”), the EA and NE prior to any approval of its terms.
- 1.1.7 The details set out within these monitoring plans will be secured through relevant planning conditions and/or the implementation of the Construction Environment Management Plan (CEMP) for the Project including the Proposals.

1.2 Proposed Approach

- 1.2.1 The surface water quality monitoring plan for the Project including the Proposals incorporates the Monitoring Framework an Exceptions Plan (Appendix A) and Monitoring Programme (Appendix B). The Monitoring Framework sets out the monitoring required in order to assess the water quality within the Estuary and specified freshwater watercourses likely to be affected by the Project including the Proposals before, during and, for a limited period, after construction.
- 1.2.2 The aim of the Monitoring Framework is to:
- a. Establish a baseline for current water quality in specified freshwater watercourses prior to commencement of the Project including the Proposals.

- b. Ensure that the construction of the [Project including the Proposals](#) will not have a material detriment upon the surface water quality of these identified water bodies.
- c. Confirm that mitigation measures put in place during construction are sufficient in preventing any material detriment to surface water quality in the specified watercourse.
- d. Continue to monitor water quality of the Estuary and the specific watercourses for a specified period once the [Project including the Proposals](#) is in operation to ensure that attenuation methods are successful.

2. WATER QUALITY MONITORING PLAN

2.1 Framework and Stakeholder Involvement

2.1.1 ~~Baseline pre-construction monitoring is expected to start during 2009 and will continue until construction commences.~~ [It is considered that monitoring should be conducted for 2 years prior to construction.](#) The construction phase is expected to last for 3 years and during this time there will be a period of intensive monitoring to ensure that the works do not have a materially detrimental impact on surface water quality. Once operation commences, there will be a period of post-construction monitoring which is expected to last for a further 5 years. Therefore, in total there will be at least 10 years of consecutive monitoring from ~~2009 onwards~~ [the commencement of the pre-construction monitoring.](#)

2.1.2 This document will form part of the mitigation and monitoring requirements for the [Project including Proposals](#). Information produced as part of the monitoring agreement will be supplied to ~~Halton Borough Council (HBC)~~ the Council, Natural England (NE) and the Environment Agency (EA). The information may be supplied on behalf of HBC by the Concessionaire appointed to build and operate the new bridge.

2.2 Water Quality Monitoring Plan

2.2.1 The water quality monitoring plan covers a period of 10 years, including both the pre construction surveys (estimated at 2 years), in-river construction works (estimated at 3 years) and post-construction phases (up to 5 years).

2.2.2 The Monitoring Framework (i.e. this document) outlines water quality monitoring requirements, methods, timescales and frequencies.

2.2.3 The Exceptions Plan consists of procedures, trigger levels and measures that would need to be implemented in order to mitigate effects. Exceedence of the trigger levels identified would result in the initiation of the Exceptions Plan. The exceedance of these triggers would be identified using the results of the surveys undertaken pre, during and after construction.

2.2.4 A summary of the monitoring programme has been provided in Appendix B to illustrate the timings and frequencies of the sampling periods required by the proposed water quality monitoring plan.

2.3 Components of the Monitoring

2.3.1 Water quality of all potentially affected watercourses will be assessed in terms of:

- a. Physico-chemical determinands (dissolved oxygen (DO), pH, salinity, turbidity, ammonia, suspended solids (SS), BOD, total oxidised nitrogen (TON), soluble reactive phosphorus (SRP) and dissolved inorganic nitrogen (DIN);
- b. Pollutant/contaminant determinands (e.g. arsenic, mercury, PAHs) as listed in ~~the EA EQS standards and the draft WFD standards (The River Basin Districts Surface Water~~

~~Typology and Environmental Standards Direction 2008~~. the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Direction 2010.

Location

2.3.2 Water quality monitoring will take place in all watercourses that could potentially be affected by the [Project including the Proposals](#) (Stewards Brook, Bowers Brook, St Helens Canal, Latchford Canal, Bridgewater Canal, Manchester Ship Canal, Halton Brook, Flood Brook and the Mersey Estuary). Watercourses will not be sampled during periods of no flow. Sites will be selected from both upstream and downstream of the works. The exact locations of the sites will be subject to approval by the Local Planning Authority in consultation with the EA.

Purpose of Monitoring

2.3.3 Monitoring will be required in the specified watercourses as they could potentially be at risk from accidental spillages during construction. The purpose of monitoring is set out below.

2.3.4 The water quality of ~~Stewards Brook and~~ Bowers Brook will be monitored for pollution from contaminated sediments entering the watercourses due to the construction of culverts. [Stewards Brook will be monitored in case of surface water run off or spillages at construction compound areas which could be located just inside the Red Line Boundary in the vicinity of the Brook](#). Monitoring will be directed at chlorinated solvents entering freshwater inflows of Bowers Brook from the Catalyst Trade Park as drainage pipes will be closed off before construction of the Widnes Loops Junction commences.

2.3.5 St Helens Canal will be monitored owing to [potentially](#) being temporarily infilled to enable the construction of the [Project including the Proposals](#). Inert material will be used in order to reduce the mobilisation of fine sediments (planning condition 18).

2.3.6 Monitoring will be undertaken within the Mersey Estuary to identify any effects due to scouring action from the construction of cofferdams, towers and the piled jetty and sediments mobilised resulting in contaminant release and increased oxygen demand.

2.3.7 Once operation has commenced, ~~Stewards Brook, St Helens Canal and Flood Brook and the Mersey Estuary~~ are to receive road run off via attenuation systems such as balancing ponds. There will be a requirement to monitor discharge to these watercourses during the first [5] years of the operational phase to ensure mitigation is effective. It may also be necessary to monitor Bowers Brook to ensure that solvent migration has ceased.

Survey Information

2.3.8 Surface water quality will be assessed in terms of a number of physico-chemical determinands to establish a baseline against which to compare construction and operational phase effects. Monitoring data will be compared with the relevant Water Framework Directive Environmental Standards ([The River Basin Districts Typology, Standards and Groundwater threshold values \(Water Framework Directive\) \(England and Wales\) Direction 2010](#)) and the freshwater watercourses will also be compared with the mandatory or guideline values in the EC Freshwater Fish Directive (2006\44\EC), as all freshwater watercourses have the potential to support populations of cyprinid (coarse) fish; [It should be noted that in 2013 the FFD will be repealed and replaced by the WFD](#). The relevant standards for both the freshwater watercourses and the Estuary are outlined in Tables A1 and A2 (Appendix A). Contaminant levels will be assessed using the WFD guidelines for contaminants [including Specific Pollutants and Priority Substances \(The River Basin Districts Typology, Standards and Groundwater threshold values \(Water Framework Directive\) \(England and Wales\) Direction 2010\)](#). If baseline water quality exceeds these guideline values, trigger levels will be based on an exceedance of the baseline range.

Pre Construction Monitoring

2.3.9 Baseline data will be required for the Estuary and all the freshwater watercourses that may be affected by the [Project including the Proposals](#). Monitoring is proposed to take place for a period of two years before construction commences, and will need to be co-ordinated to take place at the same time as the aquatic ecology monitoring program. This will provide a link between the monitoring data for water quality and aquatic ecology of potentially affected watercourses. Hence, once the construction phase has commenced, any subsequent changes to the water quality, or indeed aquatic ecology, can be determined and appropriate mitigation imposed.

2.3.10 It is proposed to monitor baseline levels of both the estuarine and freshwater watercourses between ~~2009 and 2011~~ [2011 and 2013](#).

Freshwater Watercourses

2.3.11 Pre construction baseline monitoring will be required for all watercourses and will comprise the following surveys:

- a. Physico-chemical parameters will be monitored monthly. Water samples will be collected from two sites within each watercourse. They will be analysed for DO, pH, salinity, turbidity, ammonia, suspended solids (SS), BOD, total oxidised nitrogen (TON), soluble reactive phosphorus (SRP) and dissolved inorganic nitrogen (DIN).
- b. Water samples will be analysed for a suite of contaminants that could potentially be released from the sediments such as copper, zinc, arsenic, mercury and PAHs. The exact details of the sampling strategy will be approved by the local planning authority in consultation with the EA.

Mersey Estuary

2.3.12 It is considered necessary to monitor the potential impacts of scour on suspended sediment and oxygen demand, and thus on water quality. Surveys within the Mersey Estuary will comprise the following:

- a. Physico-chemical parameters will be monitored monthly. Water samples will be collected from six sites within the Mersey Estuary. Six sampling periods will be scheduled during

high tide and six sampling periods will be scheduled during low tide annually. They will be analysed for DO, pH, salinity, turbidity, ammonia, suspended solids (SS), BOD and dissolved inorganic nitrogen (DIN).

- b. Turbidity will be continually logged via three submerged mobile data sondes for two week periods covering the tidal cycle from spring to neap. The sondes¹ would be deployed and recovered by Hovercraft, being attached to small moorings for the two weeks. Data download would be manual. The continuous data recorded (15 min intervals) can then be compared against the spot sampling monthly data referred to above. This will be undertaken four times a year (i.e. a two week deployment once per season) for one year prior to when 'in river' construction begins. Three locations are suggested to be used, one downstream of the bridge location, one upstream and one at Fiddler's Ferry. It may be possible to integrate the latter location with that used by the Agency Tide monitor.
- c. Sediment oxygen demand (SOD) is a measurement of the rate at which dissolved oxygen in the overlying water is depleted by the bottom sediment. Sediment oxygen demand (SOD) measurements will be taken at each tower site in situ once every month during peak spring tides using a SOD chamber developed by APEM. This baseline data will help determine the degree of any impacts upon SOD levels observed during and post construction.
- d. In conjunction with SOD, further SS and DO measurements will be taken at each tower site monthly. Water samples will be collected three times at each site over a 1.5 hour period during peak spring tides. These data will provide a baseline against which construction monitoring at the same sites can be compared. This comparison will show any increase in SS and associated decrease in DO that may occur as a result of scour around the tower sites/cofferdams.

Monitoring During Construction

2.3.13 It is estimated that in-river works will take 3 years to complete. During this period, monitoring of water quality will take place alongside the aquatic ecology monitoring programme and will follow a similar methodology to that described in paragraphs ~~2.3.12-13~~ 2.3.9 – 2.3.12.

Freshwater watercourses

- a. Water samples will be collected from the same sites as the baseline survey i.e. two sites from Stewards Brook, Bowers Brook, St Helens Canal, Latchford Canal, Bridgewater Canal, Manchester Ship Canal, Halton Brook and Flood Brook. Physico-chemical parameters will be analysed on a monthly basis throughout the construction phase.
- b. Water samples will be collected and analysed monthly for a suite of contaminants that could potentially be released from the sediments. The exact details of the sampling strategy will be approved by the local planning authority in consultation with the EA.

Mersey Estuary

- a. Physico-chemical parameters will be monitored monthly from six sites in the Mersey Estuary.
- b. Sediment oxygen demand (SOD) will be monitored in situ on a monthly basis during spring tides at each tower site.

¹ The equipment proposed is the RS Hydro - Troll 9500 Professional XP with a factory fitted turbidity sensor. The sonde also measures level, pressure and salinity - hence turbidity can be related to real-time tidal influence. Data logging is internal (either FTU or NTU) and will be set at 15 minute intervals, although higher levels of resolution can be applied (down to 5 seconds if necessary).

- c. Further SS and DO measurements will be taken monthly at each tower site from surface and bottom waters using the same methodology set out in paragraph 2.3.12.
- d. During the construction period, there will be additional data loggers situated within the Estuary. Any relationship between turbidity and suspended solids will be established. Turbidity will be continually logged via three submerged mobile data sondes for two week periods covering the tidal cycle from spring to neap. The sondes would be deployed and recovered by Hovercraft, being attached to small moorings for the two weeks. Data download would be manual. The continuous data recorded (15 min intervals) can then be compared against the spot sampling monthly data referred to above. This will be undertaken four times a year (i.e. a two week deployment once per season) for the period where in-river construction activities occur (currently estimated as 3 years). Three locations are suggested to be used, one downstream of the bridge location, one upstream and one at Fiddler's Ferry. It may be possible to integrate the latter location with that used by the Agency Tide monitor.
- e. It also is recommended to analyse water samples for a suite of contaminants that are likely to be contained within the sediments on a monthly basis. Exact details will be approved by the local planning authority in consultation with the EA.

2.3.14 Frequent monitoring is necessary to ensure that the construction works are undertaken in an environmental sensitive manner and that the mitigation methods employed are sufficient in preventing any detrimental impacts on surface water quality.

2.3.15 In the event of an accidental spillage or exceedance of the specified trigger levels (Appendix A) extra monitoring will be required whereby the standard suite of physico-chemical and contamination parameters listed above will need to be measured. Extra monitoring should take place within one week of an accidental spillage or exceedance of trigger levels and appropriate mitigation will be imposed.

Post Construction Monitoring

2.3.16 There will be a 5 year period of post construction monitoring. Monitoring is to take place monthly for the first 2 years and following review, with the potential to reduce monitoring to quarterly for the remaining 3 years.

2.3.17 ~~Stewards Brook, St Helens Canal and Flood Brook~~ and the Mersey Estuary will be monitored once the new bridge is in operation for a period of five years ~~as they are to receive road runoff via a sustainable drainage system (SuDS)~~. Monitoring will be required to ensure that the mitigation measures (Appendix C) are functional, maintained and fit for purpose.

2.3.18 As it has been proposed to close off the drainage pipes leading from the Catalyst Trading Park to Bowers Brook to prevent solvent migration, monitoring will **also** continue in Bowers Brook for a period of 5 years after operation commences in case of migration of contaminants into the Brook.

2.3.19 Sampling will occur on a monthly basis for five years. Monitoring should follow the same methodology outlined in the baseline monitoring programme.

2.3.20 For the turbidity loggers, one year post construction monitoring would be undertaken (following the same method described for construction monitoring), with subsequent years subject to review. The data collected from this exercise would be reported and discussed on an annual basis with the Acting Conservator for the River Mersey. At the annual discussion, all parties to this element of the monitoring plan will have due regard to the results of the monitoring reported, in deciding the need for monitoring to continue as proposed.

2.4 Reporting

Pre-Construction Reporting

2.4.1 Baseline water quality data collated in the period leading up to the construction of the [Project including the Proposals](#) will be collated with existing baseline information in a pre-construction surface water quality survey report. This information will then inform the mitigation (Appendix C) and provide a baseline against which the effects of construction and success of the mitigation implemented can be measured.

Construction Period Reporting

2.4.2 The results of the water quality survey will be routinely reported to the parties in the Monitoring Plan. Factual reports will be prepared on a quarterly basis, unless the exception plan needed to be implemented, during construction in line with the CEMP requirements. If the exception plan was implemented, immediate contact and/or meetings with the statutory bodies would be required.

Post Construction Reporting

2.4.3 For five years following construction, an annual water quality monitoring report will be prepared. It is proposed that a stakeholder meeting will be held annually to consider the monitoring report and discuss the results.

Exceptions Reporting

2.4.4 Where any exception occurs, this will be reported as soon as reasonably practicable. At this point, the actions proposed will also be notified to parties affected.

APPENDIX A: EXCEPTIONS PLAN

TRIGGER LEVELS

- A1. Mitigation specified in Appendix C should minimise any impacts that the construction or operational phases of the [Project including the Proposals](#) may have on water quality. Water quality will be monitored to ensure that the mitigation techniques employed are sufficient. Trigger levels have been identified, and once exceeded, an Exceptions Plan will be implemented so as to bring specific mitigation measures into effect.
- A2. The trigger levels will be confirmed once pre-construction monitoring has identified the natural baseline levels of the water quality parameters described in the paragraphs 2.3.12-13 and those previously collected, and relevant environmental standards listed in Tables A1 and A2 plus the ~~EQS or draft~~ WFD standards. The baseline for each determinand is defined as being between the upper and lower 95th percentile confidence limit from the data collection during the pre-construction period.
- A3. Environmental standards are based on the relevant Water Framework Directive Standards ([The River Basin Districts Typology, Standards and Groundwater threshold values \(Water Framework Directive\) \(England and Wales\) Direction 2010](#)) and as all the watercourses have the potential to support populations of cyprinid fish, mandatory or guideline values from the EC Freshwater Fish Directive (2006\44\EC) will also be used. The relevant standards for both the freshwater watercourses and the Estuary are outlined in Tables A1 and A2 (Appendix A). Contaminant levels [including Specific Pollutants and Priority Substances](#) will be assessed using the WFD standards ([The River Basin Districts Typology, Standards and Groundwater threshold values \(Water Framework Directive\) \(England and Wales\) Direction 2010](#)).
- A4. The Exceptions Plan will be implemented when:
- Levels of various [physicochemical parameters determinands](#) (e.g. DO, pH, BOD, ammonia, salinity, TON, SRP, DIN, turbidity) [and/or a suite of contaminants](#) are found to be outside the range of values observed within the baseline dataset; AND
 - Failure of relevant standards (Table A1 & A2) *only when baseline levels are consistently found to comply with these standards* i.e. evidence of severe water quality deterioration.
- A5. In some cases, it is expected that baseline levels will exceed these triggers as a number of watercourses have been identified as having poor existing water quality (Stewards Brook, Bowers Brook, Latchford Canal and the Manchester Ship Canal (Chapter 8 of the ES, section 8.5). For those watercourses where existing baseline water quality does not meet these standards, it will **not** be necessary to implement the Exceptions Plan if environmental standards continue to be exceeded during the construction or operational phases. Instead the relevant trigger levels will be based on an exceedance of baseline levels only.

Table A1. Environmental trigger levels for physicochemical parameters in the freshwater watercourses

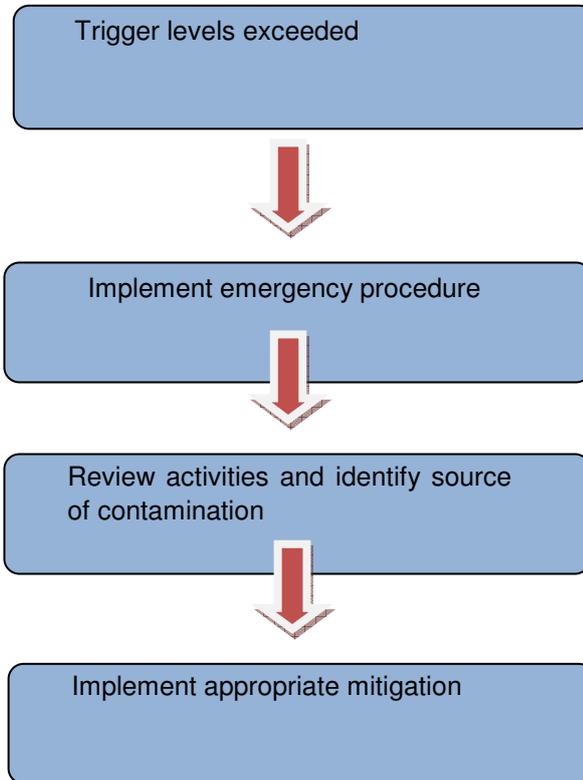
Parameter	Environmental Standards/Targets	Source of Standard
DO (mg/l)	50% \geq 7 mg/l Minimum DO concentration: 4 mg/l	Mandatory level for cyprinid fish (EC Freshwater Fish Directive, (2006/44/EC))
DO (% saturation)	90% \geq 60% saturation	WFD 'Good' status standard for lowland high alkalinity rivers (UKTAG phase 1, 2008) 'Good status' WFD Standards (The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Direction 2010)
BOD (mg/l)	90% \leq 5 mg/l	'Good status' WFD Standards 2010
Total Ammonia (mg/l)	90% \leq 0.6 mg/l	'Good status' WFD Standards 2010
pH	90% 6 to 9	'Good status' WFD Standards 2010
SRP (μ g/l)	Annual mean should not exceed 120 μ g/l	'Good status' WFD Standards 2010
Suspended Solids (mg/l)	\leq 25 mg/l	Guideline level for cyprinid fish (EC Freshwater Fish Directive, (2006/44/EC))
Total Zinc (mg/l)	\leq 1.0 mg/l	Mandatory level for cyprinid fish (EC Freshwater Fish Directive, (2006/44/EC))
Dissolved Copper (mg/l)	\leq 0.04 mg/l	Guideline level for cyprinid fish (EC Freshwater Fish Directive, (2006/44/EC))

Table A2. Environmental trigger levels for the Mersey Estuary

Parameter	Environmental Standards/Targets	Source of Standard
DO (mg/l)	95% \geq 4 – 5.7 5.0 mg/l (depending on salinity)	'Good status' WFD Standards 2010
DIN (μ g/l)	Winter mean should not exceed 30 μg/l 99% \leq 270 μ mol/l (for very turbid waters)	'Good status' WFD Standards 2010

EXCEPTIONS PLAN

- A6. If the exceptions plan is triggered using the above criteria, emergency procedures will follow and activities will be reviewed to order to identify the source of the contamination and implement appropriate mitigation (Appendix C). This procedure should take approximately 10 days.
- A7. If trigger levels are *exceeded*, the following exceptions plan should be implemented:



APPENDIX B: MONITORING PROGRAMME

Table C1: The information below provides an outline of the sampling frequency required by the proposed water quality monitoring plan.

Monitoring Period	Receptor	Parameters measured	Frequency
Pre construction monitoring	Freshwater watercourses	Physico-chemical parameters: DO, SS, ammonia, pH, turbidity, BOD, TON, SRP, DIN	Monthly
	Mersey Estuary	Contaminants listed in WFD standards 2010 e.g. copper, lead, zinc Physico-chemical parameters: DO, SS, ammonia, pH, turbidity, BOD, DIN	Monthly (6 times during high tide, 6 times during low tide annually)
Construction monitoring	Freshwater watercourses	Turbidity sonde monitoring	4 two week periods for one year
		Sediment oxygen demand	Monthly during peak spring tide
		SS and DO at tower sites	Monthly during peak spring tide
		Physico-chemical parameters: DO, SS, ammonia, pH, turbidity, BOD, TON, SRP, DIN	Monthly
		Contaminants listed in WFD standards 2010 e.g. copper, lead, zinc	Monthly
	Mersey Estuary	Physico-chemical parameters: DO, SS, ammonia, pH, turbidity, BOD, DIN	Monthly (6 times during high tide, 6 times during low tide annually)
		Turbidity sonde monitoring	4 two week periods per year
		Contaminants listed in WFD standards 2010 e.g. copper, lead, zinc	Monthly (6 times during high tide, 6 times during low tide annually)
		Sediment oxygen demand	Monthly during peak spring tide
		SS and DO at tower sites	Monthly during peak spring tide
Post construction monitoring	Freshwater watercourses	Physico-chemical parameters e.g. DO, SS, ammonia, pH, turbidity, BOD, TON, SRP, DIN	Initially monthly for 2 years, then potentially quarterly for three years
		Contaminants listed in WFD standards 2010 e.g. copper, lead, zinc	Initially monthly for 2 years, then potentially quarterly for three years
	Mersey Estuary	Physico-chemical parameters e.g. DO, SS, ammonia, pH, turbidity, BOD, DIN	Initially monthly for 2 years, then potentially quarterly for three years
		Turbidity sonde monitoring	4 two week periods per year, initially for one year, the reviewed

Monitoring Period	Receptor	Parameters measured	Frequency
		Contaminants listed in WFD standards 2010 e.g. copper, lead, zinc	Initially monthly for 2 years, then potentially quarterly for three years

APPENDIX C: MITIGATION MEASURES RELATED TO SURFACE WATER QUALITY

Construction Impacts	Impact ID	Effect	Mitigation & Enhancement Measure
Extension of culverts	SWQ1	Water quality in Stewards Brook	Management techniques should be used to mitigate effect on water quality within the brook. A water management plan and pollution control contingency plan should be prepared, particularly for works within watercourses. It will be necessary to ensure that materials within or adjacent to the brook do not enter the brook during construction so as to minimise any pollution incidents from sediments or contaminated materials. It will be necessary to over pump the brook to ensure that the working area is dry which will minimise pollution incidents.
	SWQ2	Water quality in Bowers Brook	
Accidental spillage of pollutants such as fuels, oils, concrete/cement, suspended solids from runoff, etc.	SWQ3	Water quality in Stewards Brook	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in the ES Chapter.
	SWQ4	Water quality in Bowers Brook	
	SWQ5	Water quality in St Helens Canal	
	SWQ6	Water quality in the Estuary	
	SWQ7	Water quality in the Latchford Canal	
	SWQ8	Water quality in the Manchester Ship Canal	
	SWQ9	Water quality in the Bridgewater Canal	
	SWQ10	Water quality in Flood Brook	
Mobilisation of chlorinated solvents into Bowers Brook as a result of the development on the Catalyst Trade Park site.	SWQ11	Water quality in Bowers Brook	Source reduction techniques should be employed to minimise the migration of chlorinated solvents toward Bowers Brook. Other techniques could be used such as the construction of a cut off wall to act as a physical barrier.
Mobilisation of Fines from Stone used to temporarily infill the St Helens Canal to allow construction plant to access the saltmarsh.	SWQ12	Water quality in St Helens Canal	Stone should be chemically inert (such as granite or shale) and pre-washed in a controlled location to minimise the release of fines into the St Helens Canal.
Increased sediment load in the water column from construction of a piled jetty and cofferdams in the Estuary potentially causing mobilisation of sediments and elevating sediment oxygen demand	SWQ13	Water quality in the river.	Management techniques should be used to mitigate effect on water quality within the brook. A water management plan and pollution control contingency plan should be prepared, particularly for works within the river. Physical techniques could include the use of silt nets to be used for piling operations.

Construction Impacts	Impact ID	Effect	Mitigation & Enhancement Measure
(SOD)			
Following removal of the access track along the salt marsh by the action of ripping, loose material may be brought to the surface. Increased sediment load in the Estuary may result from tidal inundation of the area, washing loose material into the Estuary.	SWQ 16	Water Quality in the Estuary.	Ripping action should be avoided during the highest annual spring tides that inundate the salt marsh. Sufficient time should be allowed for re-establishment of vegetation before the area is tidally inundated.
Operational Impacts	Impact ID	Effect	Mitigation & Enhancement Measure
Routine runoff and spillage of chemicals from roads into surface water courses	SWQ14	Water quality in St Helens Canal and Flood brook	Physical measures will be incorporated through control measures will be incorporated into the drainage design such as interceptors, oil traps, gully pots and scum boards to remove contaminants from runoff. These will then pass into a balancing pond or a swale which will remove sediments before discharging into the receiving watercourse.