G6.0 Mitigation and Monitoring

G6.1 The mitigation for impacts to surface water and groundwater impacts will be provided through secondary mitigation (i.e. that in addition to the embedded mitigation) from adoption of the STDC water management and drainage strategy for the whole STDC site that details the required regulations and industry standards required for water and drainage asset design and also through a Construction Environmental Management Plan. The CEMP shall also take of mitigation measures detailed in Chapter H (Ground Conditions and Remediation). The STDC strategy shall be prepared in advance of construction so regardless of the assets which form the detailed design, the design shall comply with the industry standards, regulations and guidance for the design of water management and drainage assets and supply appropriate mitigation for the adverse impacts.

G6.2 The CEMP shall embed best practice guidance to produce the water environment from among others the following:

1. Environment Agency (EA) Principles and Practice for the Protection of Groundwater (GP3);
2. A Pollution Prevention Guidance (PPG) Notes (as referenced in Section G2.4) :
3. Construction Industry Research and Information Association (CIRIA) Report C532: Control of Water Pollution from Construction Sites;
4. CIRIA Report C502: Environmental Good Practice on Site;
5. CIRIA Report 515: Groundwater Control – design and practice; and
6. CIRIA Report C697: The SuDS manual.

G6.3 The STDC strategy is currently being discussed and developed with STDC (due July 2020) and so at present there are no details available. However, in light of NPPF, RCBC Local Plan and the Regulations noted above in the Policy section of this chapter, the following details of the strategy can be noted:

a. the design shall be prepared in line with the requirements of:
   i. CIRIA The SuDS Manual C753
   ii. Sewers for Adoption (Northumbrian Water currently use version SfA6 but will likely migrate to SfA8 during the time of the development of the design for the site.
   iii. Local Authority SuDS Officer Organisation. Non statutory technical standards for sustainable drainage: Practice Guidance
   iv. Tees Valley Local Authorities Local Standards for Sustainable Drainage
b. there is an aspiration for blue/ green networks across the site - the aspiration for a Water Sensitive Urban Design , which is a land planning and engineering design approach which integrates the urban water cycle including stormwater, groundwater and wastewater management and water supply, into urban design to minimise the cost of infrastructure and environmental degradation.
c. where reasonably practicable the runoff rate from the site shall be reduced as far as possible in light of the large extent of low permeability surfaces.
d. hydraulic modelling will be required as part of the site specific design of drainage and overland and exceedance flow paths
e. the design shall take account of climate change projections and comply with current best practice.

f drainage channels and/or networks will be lined with a geomembrane to prevent connection of surface water with contaminated ground material.

a any harvested rainwater will need to be protected for re-use so that it is not contaminated.

G6.4 As has been explained within this chapter, this STDC is currently being drafted and therefore the specific nature of the design is yet to be determined.. Where possible and achievable the detailed design of the scheme should take into account the aspirations for blue green networks. However, regardless of the assets which form the detailed design, the STDC strategy shall be prepared in advance of construction so that the detailed design will comply with the industry standards, regulations and guidance for the design of water management and drainage assets and supply appropriate mitigation for the adverse impacts.The below table sets out the proposed mitigation and monitoring measures for the construction and operational phase of development.

Table G 17: Rationale for incorporation of environmental measures

Receptor	Potential Impact	Design Mitigation - Construction	Design Mitigation - Operation
River Tees estuary Holme Beck tributary, Knitting Wife Culvert and the Cleveland and Lackenby Channels (flooding)	Increased risk of flooding from increased surface runoff reaching watercourses.	No works are planned to the existing shore / bank of the Tees A plan for surface water management (as recommended in Chapter H for Land Management and Contamination) will be incorporated into site specific drainage design Consideration and appropriate measures shall be required to manage the pockets of pluvial flooding at high rainfall events until the ground surface is constructed.	The development will incorporate a Water Management and Drainage Strategy appropriate to the site to improve the management of water compared to the baseline conditions, whilst also taking into account potential changes in rainfall from climate change. This strategy will be signed off via the Environmental Permit process It is anticipated that in addition to the outfall to the Tees from the Lackenby Channel there would be additional discharges to the Tees from blue green networks. At present it is not yet known whether there is a flap on the outfall to control the tidal influences, however it is anticipated that discharges to the Tees will be regulated under an environmental permit.
River Tees estuary, Holme Beck tributary, Knitting Wife Culvert, Cleveland and Lackenby Channels, and discharges (surface water flows)	Increased runoff to watercourses and drains due to increased roadways and areas of hardstanding could affect channel morphology.	The timing of excavation and re-placement of ground materials shall be sensitive to avoiding poor weather conditions.	The potential effects of the scheme will seek to be minimised by the water management and drainage strategy by reducing the runoff rate from the site as far as possible in light of the large extent of low permeability surfaces. The drainage design will take account of climate change. Holme Beck is an Ordinary Watercourse, therefore, proposed discharge rates (if any) must be agreed with the LLFA and if required confirmation obtained for capacity of discharge to Northumbrian Water systems.

	Change in water quality from increased sediments in surface runoff.	It is assumed the site is cut and fill neutral. Any ground material would be retained within the site, or alternatively within the wider STDC site and activities for movement of material would be covered in the CEMP to account for the contaminated nature of ground material. The timing of excavation and re-placement of ground materials shall be sensitive to avoiding poor weather conditions.	The proposed drainage system will include consideration of design features to remove silt and other suspended solids, as well as capture any spills/oil and grease, prior to discharge. The large extent of low permeability surface proposed for the site will 'cap' underlying contaminated land. Once the site design and the water management and drainage strategy are available, a WFD Assessment shall be undertaken. The water management strategy will not include infiltration SuDS such as soakaways, in order to limit mobilisation of contamination. The suggested blue green networks for the water management and drainage strategy will be tested to see if they are achievable within the development site. Where Blue Green Networks are achievable conveyance and storage features will be lined with a geomembrane to prevent connection of surface water with contaminated ground material and consider the risk of contamination of local groundwater through increased percolation. In addition, any harvested rainwater would need to be protected for re-use so that it is not contaminated. Discharges to the Tees will require an environmental permit and should lead to an improvement in the water quality.
	Change in water quality from a change in land use or drainage patterns at consented discharge locations.	Placement of oil-water interceptors at outfalls from the site	The proposed drainage system within the site boundary means that no overall changes to local drainage patterns around discharge locations are anticipated. If additional discharge points are proposed from blue green networks, consultation will be required with the LLFA and the EA for direct discharges to the Tees.
	Potential pollution from silt and accidental spills or leaks.	A range of environmental measures will be implemented during construction to deliver adherence to the EA's PPG notes, CIRIA guidance into Construction Method Statements and other current best practice. These will be set out in a Construction Environmental Management Plan (CEMP) Measures to reduce the risk of silt pollution and contamination from chemicals/oils include:	Effluent from welfare facilities on the site will either be taken off site for disposal and treatment or routed to the local sewer network.

		-Minimising the amount of exposed ground and soil stockpiles from which water drains and the period of time such water drains; -Storage of all chemicals and oils within areas of hard standing and installation of secondary containment, such as a bund wall. Storage areas shall be located at least 10m away from any surface watercourses and areas at risk of flooding; -Plant and machinery used during the construction phase would be well maintained to minimise the risks of oil leaks or similar. In these designated areas, contingency plans would be implemented so that the risks of spillages are minimised. Placing a drip tray beneath plant and machinery during re-fuelling and maintenance would contain small spillages; and -Locating plant and wheel washing facilities in a designated area of hard standing at least 10m from any watercourse or surface water drain. Groundwater and surface water monitoring shall be carried out associated with any site investigation programme. This would continue throughout the construction phase and would include a contingency plan, detailing actions to be taken should a departure from the established baseline be identified. Relevant guidance and monitoring guidelines would be set out in the CEMP. An emergency response protocol will be developed by contractors and incorporated into the CEMP so that any accidental spillages are intercepted and that there are procedures for site staff to follow. Spill containment equipment (e.g. absorbent material) will be provided on site.	

	Potential failure of wastewater infrastructure to cope with additional flows from the development resulting in a deterioration in the quality of surface waters and groundwater (affecting WFD chemical status).		The proposed development provides the opportunity to replace/improve all existing surface water drainage infrastructure where reasonably practicable. This will be required for infrastructure that is part of the site that does not currently have the required capacity as identified in the strategy and site design. The feasibility of this will be tested as part of a detailed drainage strategy for the site and each development plot. New drainage will be designed to current standards with allowances for additional rainfall and surface water flows under a climate change scenario. Permits shall be obtained for works and signed off by the Environment Agency Water management and drainage strategy will need to ascertain whether there is a groundwater input to the culverts and if so how to accommodate this in the site drainage strategy and design. A WFD Assessment will need to be undertaken once the site design and the water management and drainage strategy is developed.
Secondary Aquifers (groundwater recharge)	Groundwater recharge to the Secondary Aquifers may be reduced as a result of the increase in roadways, and areas of hardstanding.		
Secondary Aquifers (groundwater quality)	Groundwater quality may be impacted by changes in pathways of soils during excavation and re-placement of materials.	It is assumed the site is cut and fill neutral. Any ground material would be retained within the site, or if not possible, with the wider STDC site and activities for movement of material would be covered in the CEMP to account for the contaminated nature of ground material. Such details are available in Chapter H.	As above, the risk of potential mobilisation of contaminants is likely, prior to excavation this would be managed through a contaminated land remediation strategy. The water management strategy will not include infiltration SuDS such as soakaways, in order to limit mobilisation of contamination.
	Beneficial changes to the groundwater system during the operation phase		The remediation strategy and the drainage strategy shall reduce the mobilisation of contaminant on site due to reduction in recharge.
Surface waters and groundwater	Potential for mobilisation (e.g. leaching) of contaminants from soils encountered	It is assumed the site is cut and fill neutral. Any ground material would be retained within the site, or where not possible, within the wider STDC site and activities for	

	during construction phase.	movement of material would be covered in the Construction Waste Management Plan to account for the contaminated nature of ground material. Disposal of any surplus materials shall be undertaken in accordance with the Waste Management Licensing Regulations 1994 and Duty of Care requirements in accordance with the Environmental Protection Act 1990. Potential effects from the interaction of contamination with utilities services including sewers and water supplies will be mitigated through the contaminated land strategy.	
	Beneficial changes to the groundwater - surface water system during the operation phase		If it is possible for the drainage strategy to incorporate blue green networks. The design of these features should consider the use of a liner to minimise the incorporation of contaminants into drainage water and protect the aquifer,.
	Piling	Any piling work will be subject to a piling risk assessment	