Construction Techniques Factsheet

Programme

The construction and commissioning of the facility and its associated development is programmed to take 3½ years to complete from 2024 with most of the construction activities being carried out in the first 2½ years of the programme.

In order to better describe and programme the construction activities for the new facility the construction phase has been split into 4 phases, these are as follows:

1. Site set up and enabling works
2. Construction and assembly
3. Wet and dry commissioning of the new works
4. Decommissioning of the existing works

Phase 1 - Site set up and enabling works

Site compounds

To manage the construction phases outlined above a main site compound will be built during site set up in Phase 1, its exact location within the indicative boundary is yet to be established but it will fall outside of the earth bank screen which will encircle the facility. It is likely that we will also need to establish satellite compounds at the existing Cambridge facility, at the shaft locations on the transfer tunnel, and at the discharge chamber adjacent to the River Cam. These satellite compounds will be smaller compounds and will provide offices, welfare and storage areas in order to limit movements between the main compound and the above locations.

The main compound will be established as soon as we commence works on the site and will remain for the duration of the construction phase. The satellite compounds will remain only for the period of the construction work they are managing.

Temporary construction access

It is anticipated that the temporary construction access will be via Horningsea Rd, as shown in the phase 2 consultation leaflet. The option selected for the permanent access will determine how long the temporary access will be required. As with the permanent site access, the temporary construction access will be designed to minimise impacts on both motorised and non-motorised users of the local road network, including where the access crosses Low Fen Drove Way. Sufficient parking and storage areas will be provided so that our site operations do not impact the local area.

Phase 2 – Construction and Assembly

Delivery of the works

When developing our plans and the methods to construct and commission the works we will adopt best practices that reduce our impact on the community and the environment. Examples of ways in which we can reduce our impact locally and also reduce our carbon emission and subsequent impact on climate change include:

- The reuse of excavated soils on site to minimise waste production and need for removal from the site.
- Specifying the works materials so that we can use recycled products.
- Reusing and recycling plant and equipment from the existing Cambridge facility.
- Offsite fabrication and assembly to reduce traffic movements and time on site.

We have set ourselves a challenging 70% target to reduce our carbon impact when compared to a baseline delivery model. We are also looking at our construction energy and water needs and how these can be reduced and/or provided by renewable methods. You can read more about our proposals around Carbon and reducing our impact on climate change as well as constructing a climate resilient facility on www.cwwtpr.com.

We understand that our chosen construction and assembly methods have the potential to impact on the local community and surrounding environment during the construction phases. Impacts such as a result of noise, odour, emissions to air such as dust, poor construction traffic management and excessive illumination have the potential to have an adverse impact on the local community if they are not mitigated and managed robustly. As part of our commitments to minimising environmental, social and economic impacts and in line with our ambitions and best practice in the construction industry, we will develop a suite of management plans which will be implemented and adhered to during the construction phases, including:

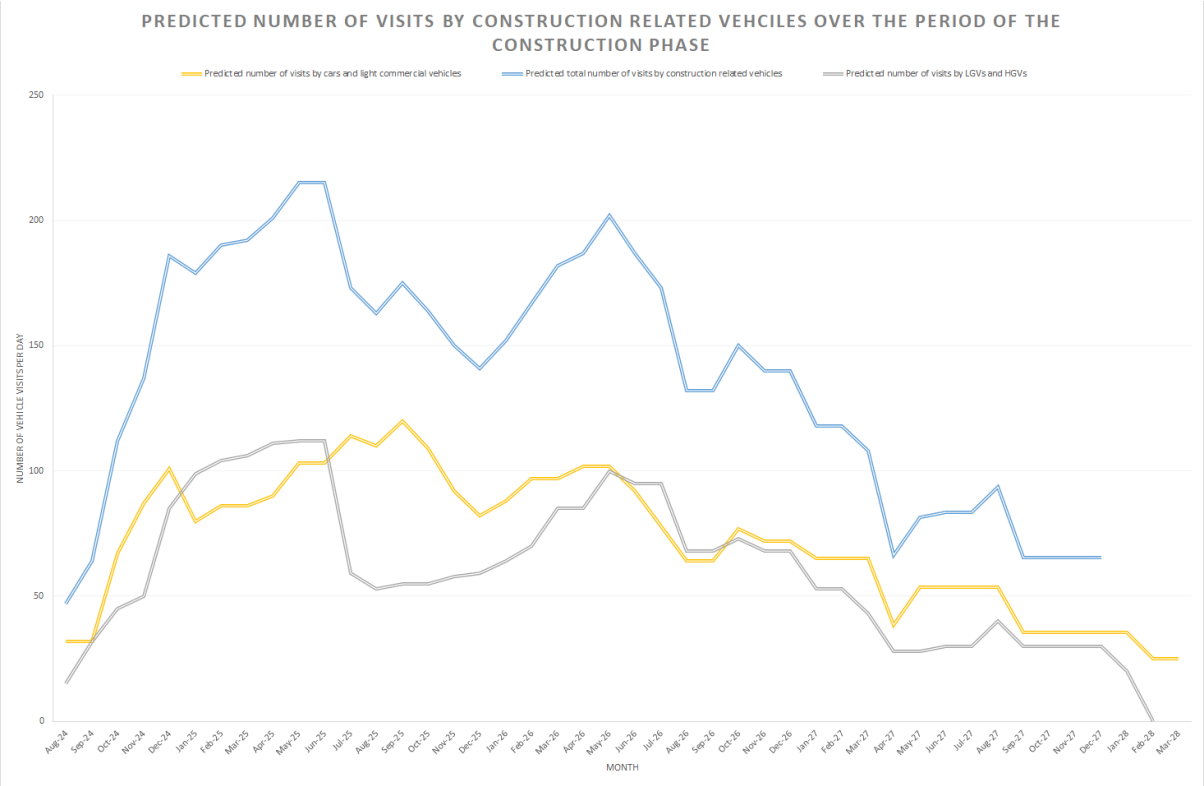
- a Construction Environment Management Plan (CEMP) to outline how we will avoid, minimise or mitigate effects on the environment and surrounding area during the construction phases.
- a Health Safety and Welfare Plan to manage health safety and welfare risks on site.
- a green Transport Plan to reduce our transport needs, promote sustainable travel options and reduce potential impacts on the local area.
- a Community Engagement Plan to drive better communications and integration with the local community.

Our site will be fully compliant with current Health, Safety and Environmental regulations. We intend to use construction techniques which are considered industry best practices that minimise the risk to the health and welfare of our neighbours, workforce and visitors. We will be regularly inspected and audited by regulators in this field and will welcome their comments and observations.

During the construction phase all vehicle and pedestrian movements will be managed by a Construction Traffic Management Plan (CTMP) which will be developed with input from key stakeholders such as the local highways authority and the local community. We will adopt best practices and look to reduce both heavy goods vehicle and private car use by our workforce wherever possible. The design of both the compounds and their access roads will be sympathetic to the local surroundings and take into account how the local community use the surrounding highway network.

Predominant vehicle types and construction traffic volumes will differ across the construction phases and will be influenced by the construction activities being undertaken at the time. Predicted visit frequencies (a visit calculated as arrival and departure) over the course of the construction programme are indicated in the graph below.

Predicted construction traffic visits over the period of the construction phase



For our satellite compounds we will follow a similar approach, working with the local highway authorities and key local stakeholders to develop the best solution.

As well as developing temporary construction accesses into the main and satellite compounds we are also planning to establish a construction crossing on the Horningsea Road to link the construction compound to the new discharge point and the discharge chamber. This crossing will operate whilst we construct the new treated effluent pipeline and the discharge chamber. The health, safety, and welfare of both existing users and our workforce will be paramount when designing this and all other access points.

Construction of the new Facility

The facility itself will be encircled by an earth bank screen to visually screen all but the tallest elements of the waste water treatment process from view. It envisaged that the earth bank will be constructed solely from material excavated from the works (including the pipelines) in order to prevent the need to import additional material. Detailed below is a summary of the key elements of the facility and an indication of both the construction techniques used and if they will be constructed insitu or assembled offsite.

Bases, Walls and ground and suspended slabs

Reinforced insitu cast concrete will be used to construct the bases, walls and slabs of the tanks and chambers that form the structural elements of each of the above ground process tanks. Where possible, and with the added benefit it provides from an economic and construction programme perspective together with health safety, welfare and environmental benefits, we may seek to replace insitu concrete techniques with either precast concrete or an alternative material, such as

recycled plastic. These alternative techniques are often used to form smaller chambers, or for the walls and suspended slabs within the process tanks.

For smaller above ground tanks, glass coated steel tanks sitting on a concrete slab will be used. These will be brought to site in segments and assembled in their final location.

Pipework

Between the process tanks there will be below and above ground interconnecting pipework. The below ground pipework will generally be constructed using open cut techniques. The pipe materials have not yet been selected but could be made from concrete, ductile iron, Un-plasticised Poly Vinyl Chloride (UPVc) or Glass-fibre Reinforced Polyester (GRP). The above ground pipework will be supported on galvanised steel frames and depending on use, could be made from stainless steel, ductile or plastic. Some of the above ground pipework will be clad in insulation to protect it from freezing.

Access, mechanical and electrical equipment Platforms

To support mechanical and electrical equipment and provide access to the tanks, galvanised steel walkways and platforms will be constructed. These will be fabricated off site and imported to site for installation.

Process and control buildings

Some of the mechanical equipment and the electrical control panels will require housing in process buildings or kiosk. These buildings will be in the form of Kiosks or galvanised steel frame structures with profiled steel cladding. The choice of is dependent on the size and type of equipment housed within it. For the kiosk solution these will be fabricated off site and imported to site as a complete unit or as segmental units which will be assembled on site. For the steel framed solution, they will be fabricated offsite before being imported to site where they will be erected and cladding panels installed once the structure is complete and self supporting.

Mechanical equipment

The mechanical equipment required for each process within the facility will be manufactured offsite and delivered for installation into or adjacent to the process tanks and buildings noted above. They will be installed on site by specialised sub-contractors.

Electrical Equipment

As with the mechanical equipment, the primary electrical equipment and control panels will be assembled and tested off site and then imported to site and installed (e.g. Motor Control Center (MCC) panels). Smaller electrical components which have to be fitted and connected locally to mechanical equipment will require insitu installation.

Cabling

Both high and low voltage electrical cables are required to link mechanical and electrical equipment together. Above ground cables will be supported on steel cable trays. Below ground cables will generally be installed in cable ducts. Some High voltage cables may be laid directly into the ground.

Phase 3 - Wet and dry commissioning

Once a process unit is assembled and the civil, mechanical and electrical works are complete the unit is ready to be tested. Three types of test are usually required, namely water testing, dry testing and wet commissioning.

The water test checks that the tank or pipe will hold water at the design pressure and not leak. This can involve large volumes of water standing in the tanks for a number of days. The water used for these tests is often extracted from a local water course or from a temporary lagoon constructed for this purpose. However, due to the challenges that Climate change brings to the water cycle in Cambridgeshire, we shall also be investigating an option to use final effluent, produced at the existing Cambridge facility which will be transferred to the new works via the newly constructed transfer main. The source of this water will be agreed as part of a commissioning plan but due to the quantity required, the need to use water other than final effluent will be kept to a minimum.

Dry testing checks that the mechanical and electrical equipment has been installed correctly and works when required, producing its anticipated output e.g. air flows for blowers, switch limits for control panels.

Wet Commissioning is when the plant starts to treat the effluent as it is designed. This is a planned sequence of activities that seeds the process tanks with the biological enzymes and the sludge centre with sludge that each process can treat. This operation will start to turn the flows from the existing works to the new works and on completion we will look to start the process of closing down the existing works. To speed up the process biological enzymes can be taken from the existing Milton works, this can have multiple benefits from a cost, time and odour perspective.

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The sewage transfer main from the existing Cambridge facility to the new site

To transfer the sewage and storm water flows from the existing Cambridge facility to the new facility we will construct a 2.6km long, 2.4m diameter pipe around 15-20m below the ground. To do this we have selected pipe jacking[1] techniques over traditional tunnelling methods. This method of tunnelling was selected after reviewing the available techniques against a number of environmental and programme criteria.

To use the pipe jacking method we will need to construct 5 shafts, 3 of which will be temporary, with 2 installed as permanent structure for inspection and maintenance purposes. The temporary shafts will be used to install the 2.4m diameter pipes. Once the pipes are installed these temporary shafts will be removed. The 2 other shafts will be part of the permanent works design.

As part of our drive to reduce waste and reuse material where we can the soil arising from the pipe jack and shaft construction will be moved from the shaft compounds and taken to the main works

[1] Pipe jacking is a technique for installing underground pipelines, ducts and culverts. Powerful hydraulic jacks are used to push specially designed pipes through the ground behind a shield at the same time as excavation is taking place within the shield.

for reuse. Material which will be used to refill the temporary shafts will be appropriately stored close to the shaft location to minimise vehicle movements.

Treated effluent pipeline to the River Cam

The treated effluent main will be installed using traditional pipelaying techniques and, generally, the three 1.5m diameter pipes will be installed within an open excavation. The excavations will vary in depth as the ground level varies.

Prior to laying the pipes a working easement will be established up to 40m wide and fenced on both sides. The easement width will allow for a sufficient area to stockpile topsoil, sub soil, allow room to string out the pipes and provide a working area to lay the pipes whilst also allowing access to the rest of the pipeline and the outlet chamber. The easement will be accessed from the compound on the main site.

Adjacent to the River Cam there will be a discharge structure built into the existing flood embankment. It is envisaged that it will be constructed using insitu cast or precast concrete and is likely to be built within a sheet pile cofferdam (an enclosure built within a body of water). The cofferdam will be designed to maintain the flood protection levels currently provided by the flood embankment. Only when the new structure is complete and connected to the flood embankment will the temporary protection be removed. The discharge structure will be accessed along the pipeline easement from the main construction compound.

Phase 4 – Decommissioning

Following the successful wet commissioning of the new facility we will then be able to start to decommission the existing site at Milton. The decommissioning will happen in different stages that we will define throughout the project development. The existing plant is regulated under permits issued to us by the Environment Agency. As part of the decommissioning, all parts of the existing works (Water Recycling Centre (WRC) and Sludge Treatment Centre (STC)) will need to be made electrically and mechanically safe to prevent risk of hazards to Health & Safety for the demolition, visitors or trespassers. The demolition of the site will be undertaken by future developers and therefore will not fall within the scope of the Development Consent Order (DCO).

One of the steps which Anglian Water will need to carry out prior to any demolition works being undertaken and after the closure of the existing facility is to surrender all permits including the Industrial Emissions Directive (IED) permit. As part of the surrender process, we are obligated to carry out decontamination works. This will include all remaining liquids processed on site being exported for decontamination or transferred to the new facility for processing, any surplus chemicals being decanted and reused or disposed and the removal of chemical, contaminated media and other elements outlined in our IED permit. The decontamination process will remove all hazardous liquids.

All of the process tanks and units will be drained in accordance with Anglian Waters operating and maintenance procedures. Final cleaning will be completed by a specialist contractor using a jet/vac vehicle typically a rigid Light Goods Vehicle (LGV) but may be an articulated LGV. Once the existing facility is no longer treating flows, it is likely that the jet/vac vehicles will discharge back at the new

facility. This operation will repeat until the tanks and process units are safe to enter and free from sludge or detritus.

We will also carry out the testing and analysis of air, ground and water samples before the permit can be surrendered to make sure we are in accordance with the IED stipulations.

Where possible during the decommissioning process, we will look to reuse or relocate suitable process or mechanical equipment in line with the waste hierarchy principles of rethink, reduce, reuse and recycle. Where mechanical equipment cannot find another use elsewhere, it will be made electrically and mechanically safe. Where appropriate some of the mechanical equipment may be sent for recycling.