

6 NON-TECHNICAL SUMMARY

In the autumn of 2022, the first of two tunnel boring machines (TBMs) will launch from the Bromford tunnel east portal (BTEP) and begin the excavation of a 5.70km long twin-bore tunnel section. An influx of slurry is required to maintain hydrostatic pressure at the TBM cutter face to seal the bore during excavation. The slurry comprises a water-based fluid containing approximately 42% ultrafine solid particulates. This slurry mixes with the arisings generated by the excavation – these comprising clean, natural arisings of the Mercia Mudstone Group. This soil slurry mixture may also contain bentonite and trace quantities (<0.000005%) of chemicals associated with the operations of the TBM, such as cutter grease, which may come into contact with the slurry at the cutter face. This mixture of slurry and arisings is defined by the Environment Agency as a waste material, and is pumped via a hydraulic circuit within sealed, steel pipelines directly to the separation plant of a slurry treatment plant (STP) located at the BTEP construction compound. The purpose of the STP is to remove the arisings mixed within the waste slurry, regenerate the slurry, and recycle it back into the TBM to provide a constant influx to maintain pressure at the cutter face. In doing so, the STP outputs the solid components of the waste slurry in the form of gravels, sands and silts which are conveyed from the STP to external stockpiles where they are stored prior to reuse in the construction of landscaped areas. The reuse of the recovered solids, the management of the stockpiles and the operation of the conveyor are outside the scope of this permit application.

The quantity of regenerated slurry required by the TBM varies depending on the boring progress. Excess quantities of slurry must therefore be dealt with appropriately. This is achieved by dehydrating excess slurry within the filter presses of the STP. This dehydration process produces clean water which is recycled back into the STP, and filter cakes which are composed of the compressed, separated solid constituents of the excess regenerated slurry. These filter cakes are stored temporarily in dedicated storage bays beneath the filter presses before being reused in the construction of landscaped areas. The TBMs operate at a slight water deficit to ensure that all the waters recovered by the dehydration process are recycled within the STPs. There is, however, the potential for excess quantities of treated waters to be discharged to the neighbouring sewers or watercourses via the site-wide surface water management system in the instance that the slurry treatment plant stores a greater volume of water than is required by the TBM, for example if the TBM were to cease operations for a sustained period for maintenance.

Another TBM is due to launch from the Long Itchington Wood (LIW) north tunnel portal in the autumn of 2021 and will excavate a 1.60km long twin-bore tunnel section over the course of the following one to two years. Once complete, this tunnel boring machine and its associated infrastructure, which includes a STP, will be relocated to the BTEP and will re-launch at the new location in the winter of 2022 or 2023 to assist in the completion of the Bromford tunnel section. Each of the two TBMs located at the BTEP will supply waste slurry to its own dedicated STP. The STP assigned to the TBM due to launch from the BTEP in autumn 2022 is given the designation STP1. The STP assigned to the TBM which will relocate from the LIW north tunnel portal and launch from the BTEP in the winter of 2022 or in 2023 is given the designation STP2. The operations of both STPs are covered by this permit application.

The Environment Agency (EA) defines the mixture of slurry and arisings generated by the operation of the TBMs as a waste material (EWC code 17-05-04). The STP operations are therefore designated as a non-hazardous waste management activity, non-listed under Section 1 of the environment permitting (England and Wales) regulations of 2016 (EPR) due to the operations constituting the physico-chemical treatment of non-hazardous waste for the purposes of recovery.

This bespoke environmental permit application is therefore submitted on behalf of the Balfour Beatty VINCI joint venture – an unincorporated joint venture comprising the partnership of the Balfour Beatty Group Ltd, VINCI Construction Grands Projects, VINCI Terrassement UK Ltd and VINCI Construction UK. It must be stressed that this permit relates only to the operation of the STPs and that other operations which are undertaken at the BTEP construction compound, including the operation of water treatment plants (WTPs), the operation of TBMs, the management, conformity testing and reuse of recovered solids, the operations of the site-wide surface water management system, and the discharge of treated waters to sewers and neighbouring watercourses, are outside the scope of this permit application.

The slurry treatment processes can be summarised by three salient functions: separation, slurry management and dehydration. Separation involves the removal of solid constituents from the waste slurry and is undertaken within the separation plant of the STP. A rotating trommel first separates solid matter exceeding 6mm in diameter from the incoming slurry. These gravels are collected by a conveyor which transports them to an outdoor stockpile outside the permitted area. The remaining slurry is desanded, and then desilted by two systems of cyclones. These sands and silts are collected on a conveyor which transports them to an external stockpile. The conveyance and reuse of the recovered solid constituents and the management of the external stockpiles is outside the scope of this permit application. The recovered sands, silts and gravels are reused in the construction of landscaped areas in accordance with the CL:AIRE definition of waste code of practice (DoWCoP). The slurry which is outputted from the separation plant undergoes slurry management.

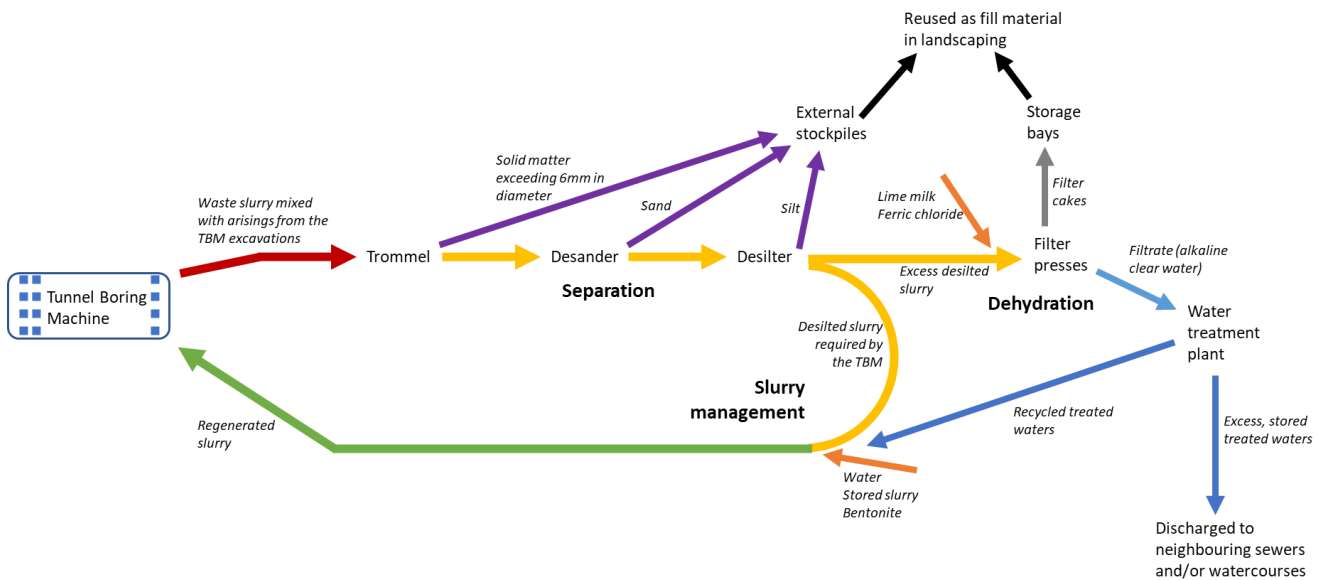
During slurry management the rheological characteristics of the slurry are altered to ensure that the regenerated slurry is suitable for reuse in the tunnel boring process irrespective of the quality of the incoming slurry from the TBMs. It should be noted that the outputs of the separation plants, namely the desilted slurry and the recovered sands, silts, and gravels, are not defined as waste materials, rather as products designated for reuse. As such it can be stated that no waste materials will be stored within the permitted area.

Slurry which has undergone slurry management is considered to be regenerated. Specific quantities of regenerated slurry are required by the TBMs and this varies depending on the boring progress. The exact quantities of regenerated slurry required by the TBMs are calculated within the STPs and regenerated slurry is recycled into the TBMs. Excess quantities of regenerated slurry undergo dehydration.

During dehydration, excess regenerated slurry is treated with a filter aid in the form of lime milk solution before the being fed into filter presses. The filter presses separate and compress the solid constituents of the treated slurry to form filter cakes, and recover filtrates which comprise strongly alkaline, clear water. The filter cakes are deposited in storage bays beneath the filter presses where they are stored until their suitability for reuse in accordance with the DoWCoP is confirmed. The key parameter to ensure their compliance with the DoWCoP is the water content of the filter cakes which must be within a predetermined range to attain the required engineering properties for landscape placement. The pH of the filter cakes is also controlled by the addition of ferric chloride to the lime milk solution which is injected into the treated slurry before it enters the filter presses. Testing of the filter cakes to confirm their suitability for reuse occurs outside the permitted area at a UKAS accredited laboratory.

The filtrates recovered by the dehydration process are fed into the STP's associated WTP. The WTP outputs clean, treated waters which are recycled back into the STP for reuse in slurry management. The operations of the WTPs are outside the scope of this permit application. During normal operations the TBMs operate at a slight water deficit to ensure that all the waters recovered as a result of the dehydration process are recycled, however there is the potential for discharges of excess waters via the site-wide surface water management system in the instance that the STP contains a greater volume of stored water than is required by the TBMs, for example in the instance that the TBMs shut down for an extended period for maintenance.

A flow chart illustrating the simplified movement of materials throughout the STPs and the associated infrastructures is presented below. Detailed flowsheets illustrating the operations of both STPs are presented along with their performance commitments and the technical manual for STP2 within Appendix D. It must be stressed that this permit application relates only the operation of the STPs. The stockpiling, management and reuse of the solid outputs from separation, the operations of the WTPs and the discharge of excess treated waters are outside the scope of this permit application.



There are no direct emissions to the atmosphere, surface waters, groundwater, sewers or soils as a result of the operations of the STP. Solid outputs of the STP, namely stockpiled sands, silts and coarser material and filter cakes, are reused outside the permitted area in landscaping construction in accordance with the DoWCoP. Filtrates recovered during the dehydration process are treated by WTPs which recycle all waters under normal conditions back into the STPs. Any discharges of excess treated waters are discharged from WTPs via the wide-wide surface water management system, the operations of which are outside the scope of this permit application.

The only waste which will be treated by the STPs is the slurry mixed with arisings generated by the operations of the TBMs. No waste is accepted or treated from other sources and no waste or hazardous materials are stored within the permitted area. The slurry treatment process is a wet process undertaken within sealed watertight tanks and pipelines. The separation plant, which contains most of the sources of noise generated by the STP, is housed within a noise enclosure featuring 100mm thick polyurethane cladding on the walls and ceiling to mitigate the risks posed by excessive noise. As the slurry treatment process is wet and occurs entirely within sealed structures, there is no significant risk of dust generation resulting from the operation of the STPs. The only potential source of dust is the filter cakes, and only in the instance that they are allowed to dry excessively. To mitigate this risk, the filter cakes are produced and maintained in a 30 to 49% wet condition and are stored within covered storage facilities featuring high walls on three sides. The stockpiles are managed to prevent dust generation and are inspected daily. The filter cakes will not be stored for periods exceeding two weeks. There are no potentially odorous materials produced by the operations of the STPs. The STPs do not emit odours, volatile or semi-volatile organic compounds, fibres, vapours, gases or aerosols and there are no potentially odorous organic components to the filter cakes, coarser arisings or recovered filtrates outputted by the STPs.

The STPs are located within the BTEP construction compound. The compound includes numerous other activities including the operations of two TBMs, two WTPs, a large office and welfare compound, laboratories, a grout batching plant, a tunnel segment storage and handling facility, generators and electrical sub-stations, stockpiles of earthworks materials and the undertaking of bulk earthworks operations. As a construction operation, the impact of the STP, in particular in respect to potential pollution resulting from dust or excessive noise, may be considered to be negligible against the backdrop of the other activities being undertaken at the compound.

Chemical additives, raw materials and slurry will be stored on-site in sealed, watertight, steel tanks (except in the case of the storage of ferric chloride and sulphuric acid – which are stored within bunded, plastic silos). The wider BTEP compound utilises a site-wide surface water management system which captures surface run-off and feeds this into the WTPs. The operation of this surface water management system is outside the scope of this permit application. Secondary containment is utilised in storage areas where appropriate.

The TBMs at the BTEP will be in operation for around two years operating on a twenty-four hours per day, seven days per week basis except during a ten-day cessation over the Christmas periods of 2022, 2023 and potentially 2024 depending on the boring progress. During this period the TBMs will excavate a 5.70km long, 8.60m diameter twin-bore tunnel. During their operation, the STPs are expected to process around 662,079m³ of arisings from the tunnel excavations. The STPs are expected to output approximately 487,000m³ of coarse material exceeding 6mm in diameter, 81,000m³ of sand and silt, and 429,000m³ of filter cake.