CROWNHILL TOPSOIL – DRAINAGE STRATEGY

Unit 1009, Caerwent Army Training Estate,
Caerwent

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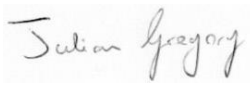
Signature:			

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Site Sensitivity:

Crownhill Topsoil and Aggregates site at Unit 1009 of the Caerwent Army Training Base, is underlain by a Principal Aquifer which is designated as an SPZ1 Source Protection Zone.

Crownhill Topsoil and Aggregates propose to operate an Inert Waste Management Facility at Unit 1009 of the Caerwent Army Training Base. This facility will store and process inert construction and demolition wastes into recycled soils and aggregates

The underlying soils and strata beneath the site have been risk assessed as being permeable and a risk rating in respect of the underlying aquifer, has therefore been assigned to the site as High, without appropriate controls in place to mitigate the risks from the operation of an inert waste management facility.

The site is comprised of 8 large brick and concrete, flat roofed buildings, linked by a concrete haul road, with concrete surfaced hard standings. Crownhill use 6 of these buildings for their operations. Small sections of the site are comprised of compacted stone and some soil stockpiles are set on areas of soil. Please refer to the Site Layout Plan in Appendix A for details on this.

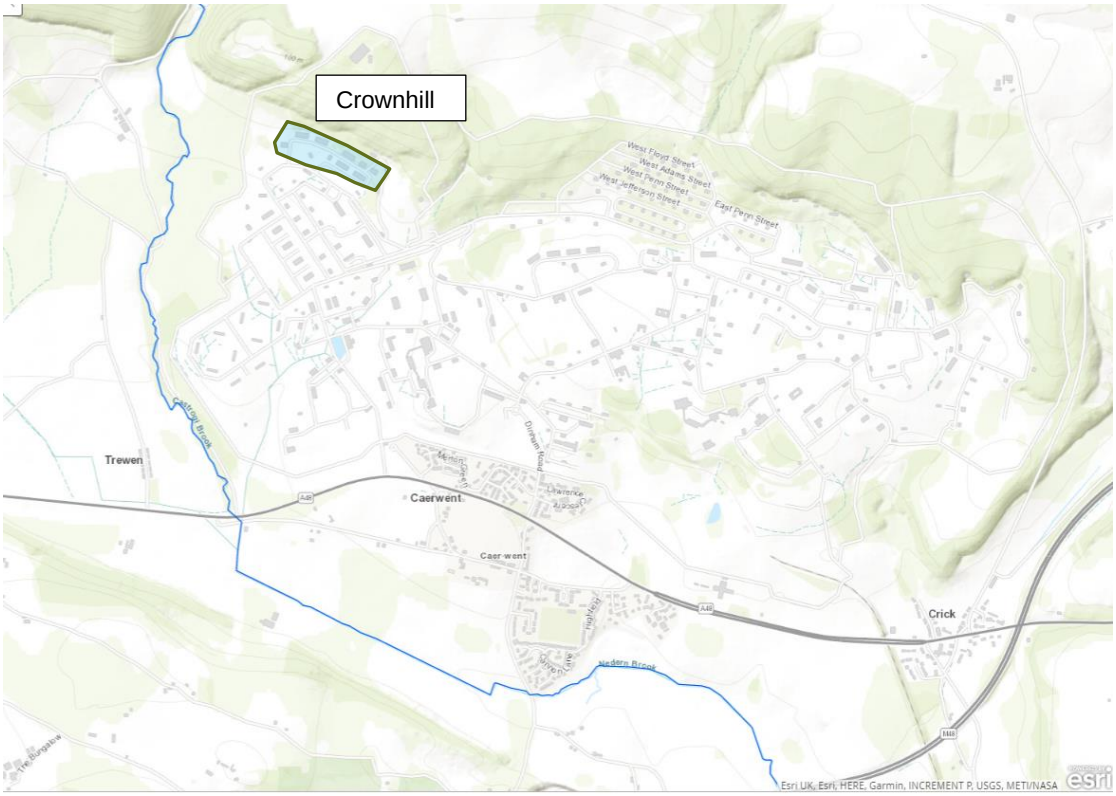
Runoff from the roofs of some of the buildings is captured in tanks for use in dust suppression. The overflows from these are directed to the rear of the building slabs, where the majority of the water will soak away but during high rainfall conditions some of this will return onto the site.

The site slopes gradually from the centre of the site in an east to west and west to east direction. South to north, the site is split into two levels, with surface water runoff running towards the south.

Compacted stone areas of the site have limited permeability and hence the majority of the runoff falling onto the site, flows across the concrete surfaces into drainage channels on the downstream side of the yards / roads and is discharged from these.

Run off is discharged into two sets of attenuation ponds, one for the eastern section of the site and one for the western section of the site. These discharge into an ephemeral drainage ditch, via a full retention hydrocarbon separator.

This drainage channel drains into the Castrogi Brook approximately 450m to the west of the base, via a culvert beneath a section of the Dinham Meadows SSSI to the west of Unit 1009. This merges with the Nedern Brook, which discharges into the Servern Estuary SSS SAC approximately 4.5km to the south.



Route of Castrogi / Nedern Brook

This drainage strategy therefore proposes controls to safeguard the underlying aquifer, the surface water drainage system within the Army Training Base, the Castrogi Brook and downstream controlled waters.

This is to be achieved by, ensuring that silt or hydrocarbon contaminated runoff is captured and channelled to a treatment system which will ensure that runoff can be discharged without impact on the underling aquifer and other controlled waters.

Inert wastes will be stored in the open on impermeable and low permeability surfaces. Runoff from these areas will be treated for suspended solids and hydrocarbons as these are the key identified pollutants. Contaminated wastes will not be permitted on the site and hence there is no potential for soils to leach contaminants. If contaminated wastes are identified, they will be rejected or if already tipped, moved a Quarantine area in Building 1, where the surrounding drainage can be diverted and sent to tanks.

Despite the presence of the SPZ1 underlying the site and the requirements this places on the design and operation of the facility, the site is ideally located in terms of access to the trunk road network and distance from sensitive residential receptors.

Drainage Strategy Rational

This Strategy has been prepared in line with Pollution Prevention Guidelines 3 (PPG3) Use and design of oil separators in surface water drainage systems (this has been withdrawn but much of the information is still relevant) and with the Oil Storage (Wales) regulation. This Strategy should be used in conjunction with Drawing Number EV170606/CHD03 Rev1 – Site Drainage.

Drainage from areas which are not used for the storage or processing of waste and which are not trafficked by vehicles will be diverted away from the site to minimise the volume of water to be treated.

Drainage at the site takes the form of concrete surfaced areas, covering an area of approximately 12,000m^2. The footprint of the buildings is an additional 4,800m^2. These will be considered within the overall drainage calculations as although runoff from the roofs is diverted to tanks for dust suppression, some of it will return to the slabs and enter site drainage. As this volume cannot be quantified, it will be considered that all runoff enters the drainage system. There is a further 4600m^2 of semi-permeable surfacing within the site, from which runoff will enter the drainage system. This gives a total drained area of 21,400m^2.

These areas are drained using pre-cast concrete channel surface drainage. Runoff will flow across the concrete slabs into the channel drains which will direct runoff into the relevant attenuation pond. An open above ground system has been used as a piped system is susceptible to blockage due to the build-up of soils due to the nature of the use of the site.

Crownhill Topsoil took possession of the site following it being vacated by WormTech Ltd, who had used it for the production of compost from biodegradable / green landscape, kitchen and food waste. During operation by WormTech, all of the gullies within the eastern section of the site had been filled with concrete.

Crownhill decided that replacing the pipe and gully drainage system, with a similar system would result in a high maintenance liability, with a high risk of blockage. It was therefore decided to replace this with a robust open drainage system, where flows are visible and blockages quickly identified and easily cleared.

Topsoil and Recycled Aggregates:

Crownhill Topsoil's principal activity is the processing of inert construction excavation and demolition wastes to provide recycled topsoil and aggregates to the construction industry and for the commercial residential market. They provide a range of different quality soils, sands and aggregates to private and commercial customers.

The site also stores small volumes of quarried products which can be supplied in small volumes to local builders and residents who would not be able to receive aggregates in large volumes direct from quarries.

The table below outlines the Waste Codes for materials intended to be processed under this activity:

Waste types accepted by Crownhill Topsoil and Aggregates	
Exclusions **Wastes having any of the following characteristics shall not be accepted:** • **Consisting solely or mainly of dusts, powders or loose fibres** • **Hazardous wastes** • **Wastes in liquid form**	
Waste Code	**Description**
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 04	**wastes from physical and chemical processing of non-metalliferous minerals**
01 04 08	waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	waste sand and clays
10 11	**wastes from manufacture of glass and glass products**
10 11 12	clean glass other than those mentioned in 10 11 11
10 12	**wastes from manufacture of ceramic goods, bricks, tiles and construction products**
10 12 08	waste ceramics, bricks, tiles and construction products(after thermal processing)
10 13	**wastes from manufacture of cement, lime and plaster products and articles and products made from them**
10 13 14	waste concrete only
15	**WASTE PACKAGING**

15 01	**packaging**
15 01 07	clean glass only
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**
17 01	**concrete, bricks, tiles and ceramics**
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 02	**wood, glass and plastic**
17 02 02	clean glass only
17 03	**bituminous mixtures, coal tar and tarred products**
17 03 02	road base and road planings (other than those containing coal tar) only
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF SITE WASTE WATER TREATMENT PLANTS AND PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION / INDUSTRIAL WASTE**
19 12	**wastes from the mechanical treatment of wastes**
19 12 05	clean glass only
19 12 09	minerals (for example sand, stones)
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**
20 01	**separately collected fractions**
20 01 02	clean glass only
20 02	**garden and park wastes**
20 02 02	soil and stones

Inert Construction and Demolition Waste processing into Topsoil and Recycled Aggregates

Process

Most of the raw materials for the process are construction and demolition wastes and excavated soils sourced through construction works. A key control in the process is a duty of care check on the site from which wastes are received. This includes a site inspection for indicators of contamination, a review of any ground investigations undertaken for the site and additional ground investigation, sampling and testing if required.

Once a duty of care check has been undertaken and materials have been proven to be clear of contamination, the materials are imported to the facility. Materials are inspected immediately prior to and following tipping and prior to the tipping vehicle leaving the facility. This inspection includes a visual and olfactory assessment for signs of contamination, i.e. sheens, odours, foreign objects within the materials the inclusion of materials which have potential for contamination, including fly ash, slag, etc.

If materials are suspected of being contaminated they are quarantined, re-loaded onto the delivery vehicle and removed from site. Any costs incurred within this are recharged to the Client as per the standard Crownhill Topsoil Terms and Conditions.

Materials are stored in managed stockpiles to a maximum volume of 40,000 tonnes. Stockpiles of feed materials, soils and aggregates are stored on a combination of permeable, soft covered areas and concrete slabs (the integrity of these concrete slabs cannot be assured, with cracks and possible joint defects noted during surveys and should hence be considered to be permeable). No more than 75,000 tonnes of materials will be accepted on site per annum.

Crushing and screening equipment is then used to grade and blend the materials to form the end products. Processed topsoil is stored within a large building with walls on all sides, which is weatherproof. These are tested to BS5228 for Topsoil and to ensure compliance with the Specification of Highway Works.

This material will then be sold back into the construction industry, either collected from the facility by the client or delivered directly using our own fleet of vehicles.

Contaminants of concern from the inert waste area are:

- Silt – mobilised during the storage and processing of materials;
- Hydrocarbons – from diffuse sources, including delivery vehicles and plant operated at the site (considered to be minor but with a high-risk potential if a major spillage or leakage were to occur. Delivery vehicles and most plant movements are confined to concrete surfaced areas;
- Hydrocarbons – from the storage of fuels and oils on site.

Drainage Requirements for Processes and Site Areas:

We have divided the site into two distinct areas across two discharge points. The western side of the site drains to the west and the eastern section to the east. Both sections drain into the ditch running along the western side of the site. For a layout of the drainage, please refer to Drawing Number EV170606/CHD03 – Drainage Plan in Appendix 2.

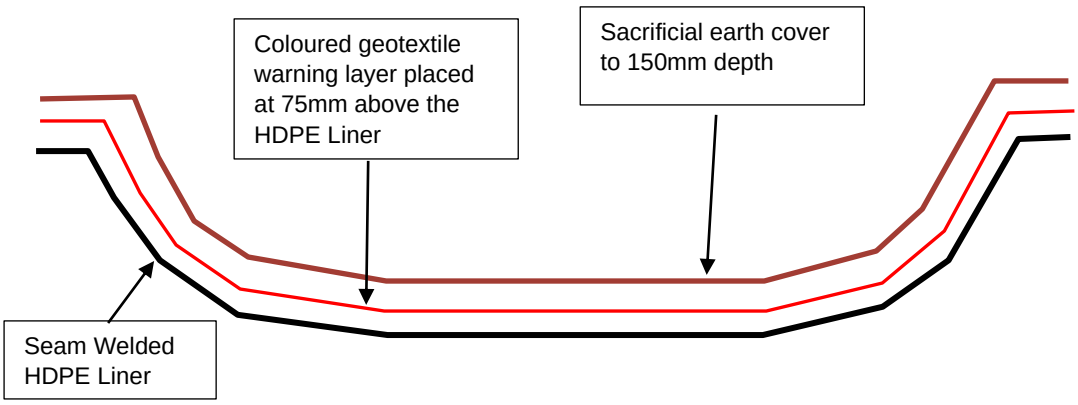
Wastes are to be stored on a combination of impermeable concrete slabs and permeable soft covered areas. Processing and handling of wastes will be undertaken on concrete areas, with soils stockpiles being on permeable soft surfaced areas. Rain falling onto soil stockpiles will infiltrate into the stockpile, or will runoff onto the surrounding land and concrete slabs. This will either infiltrate into the ground or will flow into site drainage. This runoff will be free from contamination, with the exception of silt. For runoff which percolates into the ground, this will be removed from the water as it infiltrates the upper layers of soil.

Runoff from hard surfaced and areas and flowing from stockpiles, will run into drainage gullies along the southern side of the site, which then flow into two attenuation ponds excavated along the southern boundary. These ponds will be lined

with 1mm HDPE liner to prevent the ingress of runoff into the ground. The attenuation ponds will remove suspended solids from site runoff and water will then be discharged into drain flowing through the centre of the site via a hydrocarbon separator to remove hydrocarbons from vehicles and plant at the site.

Attenuation Pond Design

Pond design has been dictated to an extent by the available areas and the topography of the site. Ponds are largely rectangular to prevent short-circuiting and better facilitate removal of accumulated sediment. Due to the sensitivity of the underlying SPZ1 Source Protection Zone, the ponds have been lined using an impermeable HDPE Liner, which has been covered with a 150mm deep sacrificial soil layer. 75mm into this sacrificial layer will be located a red geotextile indicator layer. This will act as a warning to machinery operators during de-silting operations, that they are close to the liner and will prevent puncture of the liner.



Cross Section through sediment pond illustrating HDPE Liner, Coloured geotextile indicator layer and sacrificial earth cover (not to scale)

The Crownhill Topsoil and Aggregates facility accepts a broad range of inert materials. This will result in a wide range of particle sizes being mobilised by works at the site. We have therefore assumed that particles to be settled will be a combination of sand, silts with some clay particles. The ponds have been designed to remove all but the smaller <0.05 microns, particles which will be colloidal and will remain in suspension for a significant period of time.

Water from the ponds will be discharged into a drain which is predominantly dry.

To aid design of the ponds water samples were taken from the inlet to the previous small attenuation pond, installed by WormTech (the previous site tenants), during a period of heavy rainfall on 21/11/16 and settlement tests were undertaken on these. Sample bottles were shaken to ensure all suspended solids were suspended in the

water column. The time taken for the particulates to settle 100mm (the distance a particle is required to sink between the point at which it enters the attenuation pond to prevent it being carried over the outlet) It was found that heavier sand particles settled quickly (4 seconds) whereas smaller silt particles took 16 minutes to settle with colloidal clay taking several days.

For the design of the ponds we have used a rainfall intensity of 6.5mm/hr. The eastern area of the site is approximately 16,000m^2. This will give a maximum runoff of 28.88l/s into the pond. Assuming runoff from the site spreads evenly across the surface area of the pond, to attain a residence period of 16 minutes the pond would need to accommodate 27,733l within the top 100mm of the pond. This would require a pond with a surface area of 277m^2. This is not a precise calculation as it is unlikely that a suspended particulates would spread evenly across the pond and takes not account of movement within the water column due to turbulence or wind effects on the surface. A factor of safety has therefore been allocated of 2. Ponds have been sized to have a surface area of 550m^2.

Interceptor Design:

A Full Retention Hydrocarbon Interceptor has been installed at the discharge point and both the eastern and western ponds discharge into this. The area draining into the eastern drainage system is approximately 16,000m^2 and area draining into the western drainage system is 5,400m2 and hence a Full Retention Separator with a capacity to accommodate runoff from 22,000m^2 has been specified.

This measures 4.4m x 1.56m. The separator is fitted with a solar powered audible alarm and strobe to warn if the oil level is approaching the level when the unit requires maintenance.

Inspection and Maintenance of Site Drainage

Daily checks of site drainage will be undertaken. If any are found to be blocked (for example via siltation or site material) this shall be cleared immediately. These inspections will be recorded on the Daily Site Log.

Monthly checks of the integrity of the drainage channels and surfaces will be carried out to ensure that the non-inert materials processing area remains isolated from the rest of the site drainage. Any cracks or holes in the surface will be broken out, investigated and sealed.

Attenuation Pond Inspection and Dredging:

Periodic Inspection will be undertaken of the attenuation ponds to ensure they are not in danger of overtopping and silt build up is within acceptable limits. It is likely that ponds will need to be periodically dredged to remove accumulated silt. The ponds are lined with a HDPE liner and hence care will be required to ensure that the liner is not damaged. If damage is caused to the liner, this will need to be repaired either using an adhesive patch or a seam welded patch.

Dredging of the ponds will be undertaken over the winter unless the pond has completely dried out over the summer. This will be done to prevent impacts on great crested newts and other amphibians, which may have colonised the ponds. If the ponds contain water, this will be pumped out and discharged into the hydrocarbon separator. Pumping will be undertaken from a pipe and gravel sump to prevent silt being disturbed from the base of the pond.

Silt will be carefully dredged by an excavator using a toothless bucket. Dredged material will be placed in a bund along the edge of the pond, where it will be left in place for 24hrs to allow water to drain and invertebrates within the dredged material to return to the pond.

After 24hrs, dredged materials will be moved to the quarantine area in Building 1, where samples will taken and sent to a UCAS accredited laboratory and tested against the following parameters:

- pH;
- organic matter content;
- heavy metals (As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX);
- asbestos screen

Data from this analysis will be used to assess the materials in line with WM3 to allow the waste to be fully described. If the waste can be deemed inert, it will be included within feedstock materials at the site, ensuring that it is thoroughly mixed as it will contain a high proportion of fines. If it cannot be described as inert, it will be removed to a permitted facility which is able to accept it.

Appendix 1 – Drainage Plan