ENVIRONMENTAL SETTING AND SITE DESIGN

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4.0 SITE REPORT

TABLES

DRAWINGS

The site's conceptual model, environmental setting and installation design are presented as drawings. The drawings, maps or plans presented below have been used to minimise the total number of separate drawings produced to satisfy this requirement.

Dwg No	**ESSD1**	**Scale**	50,000	**Title**	Location
Detail		Site location in relation to surrounding features			
Dwg No	**ESSD2**	**Scale**	10,000	**Title**	Environmental Site Setting
Detail		Installation boundary			
		Residential areas			
		Schools			
		Recreational areas			
		Waterways			
		Water bodies			
		Agricultural areas			
		Urban sites			
		Flood risk map overlay			
		Roads, railways			
		Infrastructure (tanks, hard surfacing, quarantine areas)			
		Topography 500m outside site			
Dwg No	**ESSD3**	**Scale**	25000	**Title**	Cultural and Natural Heritage
Detail		Natural heritage SSSIs, AONBs, National Parks cSACs, cSPAs, Ramsar sites Ancient Monuments			
Dwg No	**ESSD4**	**Scale**	2500	**Title**	Site Layout and Waste Deposition
Detail		Site Infra Structure			
		Non Hazardous Waste Treatment			
Dwg No	**ESSD5**	**Scale**	2500	**Title**	Restoration
Detail					
		Landscape planting proposals			
		Final Contours			

Dwg No	**ESSD6**	**Scale**	2500	**Title**	Site Phasing
Detail		Phases 1 and 2			
Dwg No	**ESSD7**	**Scale**	2500	**Title**	Landfill Gas Management
Detail		In waste monitoring points			
		Perimeter/external monitoring points			

Dwg No	**ESSD8**	**Scale**	50000	**Title**	Regional Geology
Detail		Regional geology (taken from BGS Geological Map)			
		Any appropriate regional cross sections			
Dwg No	**ESSD9**	**Scale**	12500	**Title**	Regional Hydrogeology
Detail		Aquifer classification			
		SPZs			
		Licensed and private abstractions from ground and surface water			
		Regional groundwater contours (for each ground water body)			
		Groundwater vulnerability			
		Off-site groundwater monitoring points (e.g. relevant EA Observation Wells etc)			
Dwg No	**ESSD10**	**Scale**	2500	**Title**	Local Hydrogeology and Hydrology
Detail		Groundwater monitoring points (constructional logs within an Appendix ESSD 7)			
		Groundwater contours			
		Inter-relationship between; site (base and sides), leachate levels, groundwater levels and relevant surface water features			
Dwg No	**ESSD11**	**Scale**	2500	**Title**	Source, Pathways, Receptors
		Met station location (if on site)			
		Receptors			
		Surface water Groundwater Amenity			
		Pathways			
		Air- include wind rose Surface water and surface water monitoring points Groundwater Drains- pipes etc Migration through surrounding strata			
Dwg No	**ESSD12**	**Scale**	2500	**Title**	Site Layout Non-Hazardous Waste Treatment
Detail		Site Infra Structure			
		Non-Hazardous Waste Treatment			

APPENDICES

1.0 INTRODUCTION

1.1 Report Context

Enviroarm Limited were instructed by H Evason and Company, the operators of Dorrington Quarry to prepare an environmental permit application for inert waste landfilling to allow for restoration of the site by way of inert landfill, infilled within designated phases within the environmental permit boundary.

The site will also operate a treatment area accepting construction and demolition wastes, soils etc., and on site for treatment by dry crushing and screening and wet washing of soils and construction and demolition waste.

This report provides a summary to the geological and hydrogeological setting of the site, the wider environmental setting and considers the operational impacts and installation design by inert landfill and the assessment demonstrates compliance the Environmental Permitting (England and Wales) Regulations 2016. Additional assessments include a Site Stability Assessment, Hydrogeological Risk Assessment, Landfill Gas Risk Assessment, and Amenity and Nuisance Assessment.

The site entrance is located at National Grid Reference (NGR) SJ 47554 03875, the centre of the recycling area is SJ 74635 03869 and the centre of the landfill is at SJ 47680 03568, which lies approximately 9km south of Shrewsbury on the northern edge of Dorrington. The site is off the A49.

The site is a former quarry. The site is surrounded with large areas of agricultural land and the A49 is the west and a railway line to the east.

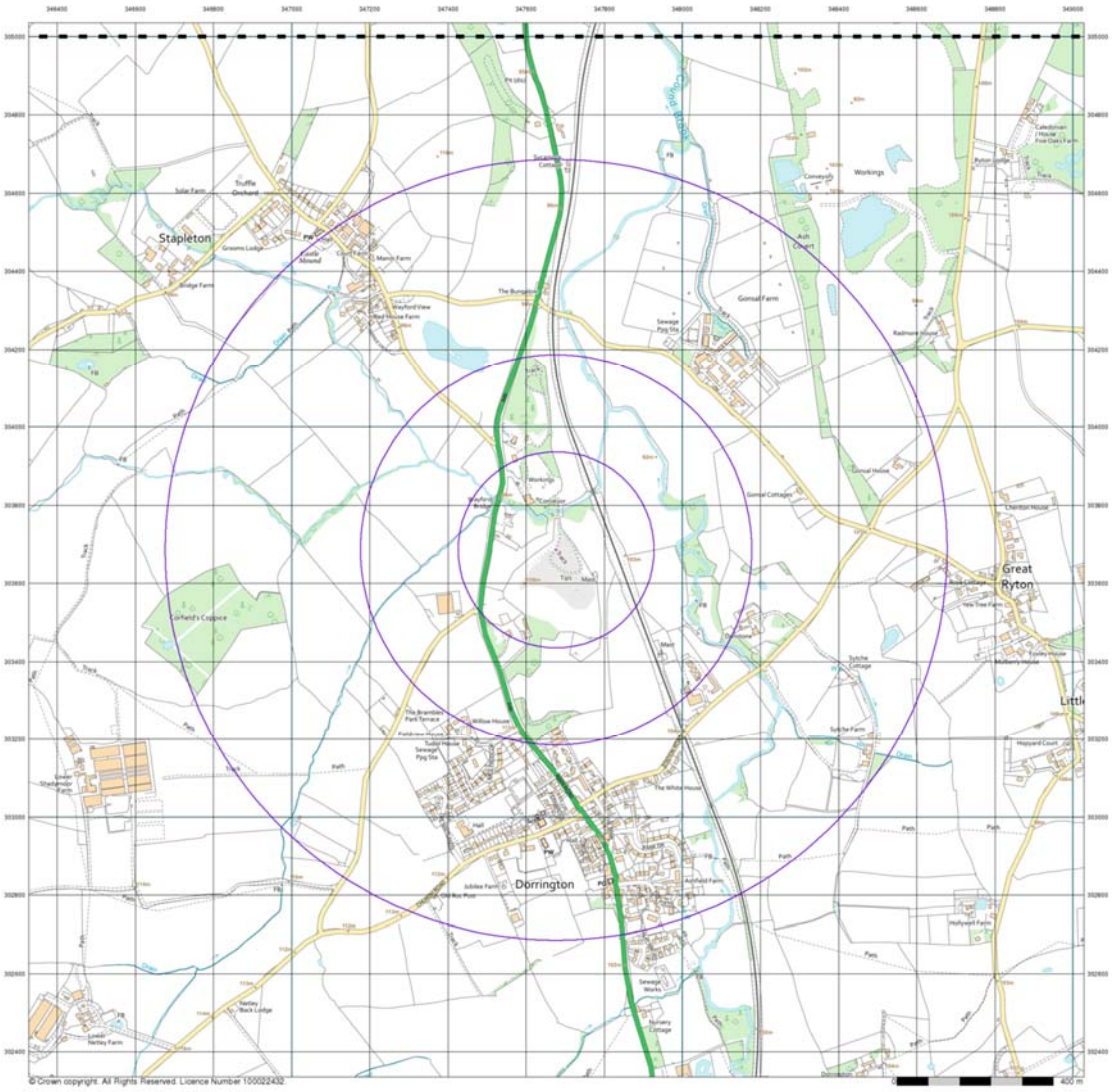
Access to the site is directly off the A49 through lockable steel security gates.

The landfill site covers an area of approximately 31,000m^2 with a capacity of 225,222m^3. The restoration area covers 5,000m^2 and has a void of 15,000m^3.

The site will take up to 25,000 tonnes of inert waste into the landfill in any year and process 25,000 tonnes of waste in the recycling centre.

Dorrington Quarry was operated from the 1920,s as a sand and gravel quarry. Permission was granted by Shropshire County Council for restoration of the site in 1997.

Figure 1: Site Location



The site falls within the control of Shropshire County Council for mineral and waste planning permission and compliance.

This report presents a review of the Environmental Setting and Installation Design in relationship to the surrounding environment.

This report covers all Phases of the site from the advance works to the proposed landfill area and treatment centre through to final restoration and requirements for post closure monitoring.

The site is to be infilled specifically with inert waste, which will also be Tax Qualifying Material as per the Order from HMRC and LFT1 Guidance. The site will also benefit from a front end treatment facility for various construction and demolition materials to allow for re-use and recovery of materials by way of washing, crushing and screening.

A conceptual model is presented and potential contaminant migration pathways have been identified. The conceptual model has been developed on site specific data and local data obtained from the British Geological Survey, The Metrological Office, The Environment Agency, The Coal Authority, MAFF and data obtained from on-site testing, including; soils, groundwater, air and noise. A risk analysis for impacts on identified receptors has been developed at the Dorrington Quarry Landfill Site based on the factual findings.

1.2 Installation Details

The site entrance is located at National Grid Reference (NGR) SJ 47554 03878, the centre of the recycling area is at SJ 47635 03869 and the centre of the landfill is at SJ 47680 03568, which lies approximately 9km from the south of Shrewsbury on the northern edge of Dorrington. The site is off the A49, at Figure 1 and is detail at Drawing ESSD 1.

The Installation Boundary has included all of the area for the inert landfill and waste treatment facility, leading through lockable gates, along a fully concreted road to the site reception area which comprises a concrete reception area and turning area, site offices, weighbridge and wheel wash area, bunded fuel tank area and concreted treatment area before leading to the landfill area. The area covered under the current operations are coloured in yellow on ESSD 2 and the boundary is marked in green.

The permit application boundary is covered under all of the planning permissions listed above in Section 1.1.

Figure 2: Aerial view of site

The entire quarry perimeter is fenced with three strand barbed post and wire fence. The outer limit of the quarry has a hedgerow and tree planting. The site security fencing is considered adequate under the provisions of the Mines and Quarries Regulations 1999 in the location. The site has a substantial access to the site fitted with lockable gates. The site is within the entire ownership of H Evason and Company.

The gates at the site entrance are locked outside operating hours, and the site has offices and a wheelwash, inert treatment facility comprising a washing plant, mobile crusher and mobile screen.

All of the receptors have been identified on Drawing ESSD 2 and have been summarised on the Table ESSD 1, and this has identified the receptors, there elevation and distance from the landfill boundary, within a 500 metre radius of the site.

A request was also made to Natural England, the Environment Agency and Shropshire County Council to identify all habitat sites etc. located within a specified radius of the centre of the site.

Table ESSD 1: Receptor List identified on ESSD 2.

Type of Receptor	Receptor Name	Location to site	Elevation m AOD
Domestic Dwelling Receptor	**DR1**	Properties Wayford House and Lower Wayford next to the entrance and shielded by a tree belt	95m AOD
Domestic Dwelling Receptor	**DR2**	Wayford Lodge ios near to brook which runs through the site off the A49.	95m AOD
Domestic Dwelling Receptor	**DR3**	Wayford House is off the A49 and is just to the west the site behind a tree belt.	103m AOD
Domestic Dwelling Receptor	**DR4**	Small cottages 500 metres east of the site with the railway track and fields between it and the site	100m AOD
Domestic Dwelling Receptor	**DR5**	Dunstone and Sundial; Cottages east south east of the site with railway track and fields between them and the site.	100m AOD
Domestic Dwelling Receptor	**DR6**	Dorrington village south west of the site with trees between Dorrington and site	108-104m AOD

Domestic Dwelling Receptor	**DR7**	The Brambles/Pasrk Terrace south west of site 400 metres from site.	112m AOD
Domestic Dwelling Receptor	**DR8**	Houses in Stapleton north west of the site.Grass and trees between site and Stapleton	97m AOD
Domestic Dwelling Receptor	**DR9**	The Bungalow north of the sue off A49.	98m AOD
Surface Water Receptor	**SW1**	Tributary of Cound Brook that runs through the site.	90m AOD
Surface Water Receptor	**SW2**	Cound Brook which runs northwards and enters the Severn	89m AOD
Surface Water Receptor	**SW3**	A lake in a former sand pit to the north west of the site just before Stapleton	88m AOD
Major roads and highways	**HA1**	A49 which runs nrth and south of the site Cornets End Lane Road leads directly from the access and is the main road used for the site and is a link road onto the A4526.	96m AOD to the north of the site 103m AOD at site and 108m to the south
Commercial Activity	**IR1**	Gorse Farm RSPCA Centre with track fields and trees between it and site.	95m AOD
Commercial Activity	**IR2**	AT Wildes plant hire. Land and track between Wildes and site. Site to the south east of landfill.	98m AOD
Commercial Activity	**IR3**	Dorrington Business Park , south of site. Fields between site and BP.	112m AOD
Commercial Activity	**IR4**	Bulk Freight on west side of A49 to west of the site.	100m AOD
Railway Track	**R1**	Shrewsbury ot Hereford line.	95m AOD

The site is not within a Source Protection Zone, but is on a Secondary A Aquifer. The indicative flood plain map shows the site to have Zone 3 risk from flooding.

The site has no recorded RAMSAR, SAC or SPA designations and there are no recorded monuments near to the site.

2.0 SOURCE TERM CHARACTERISATION

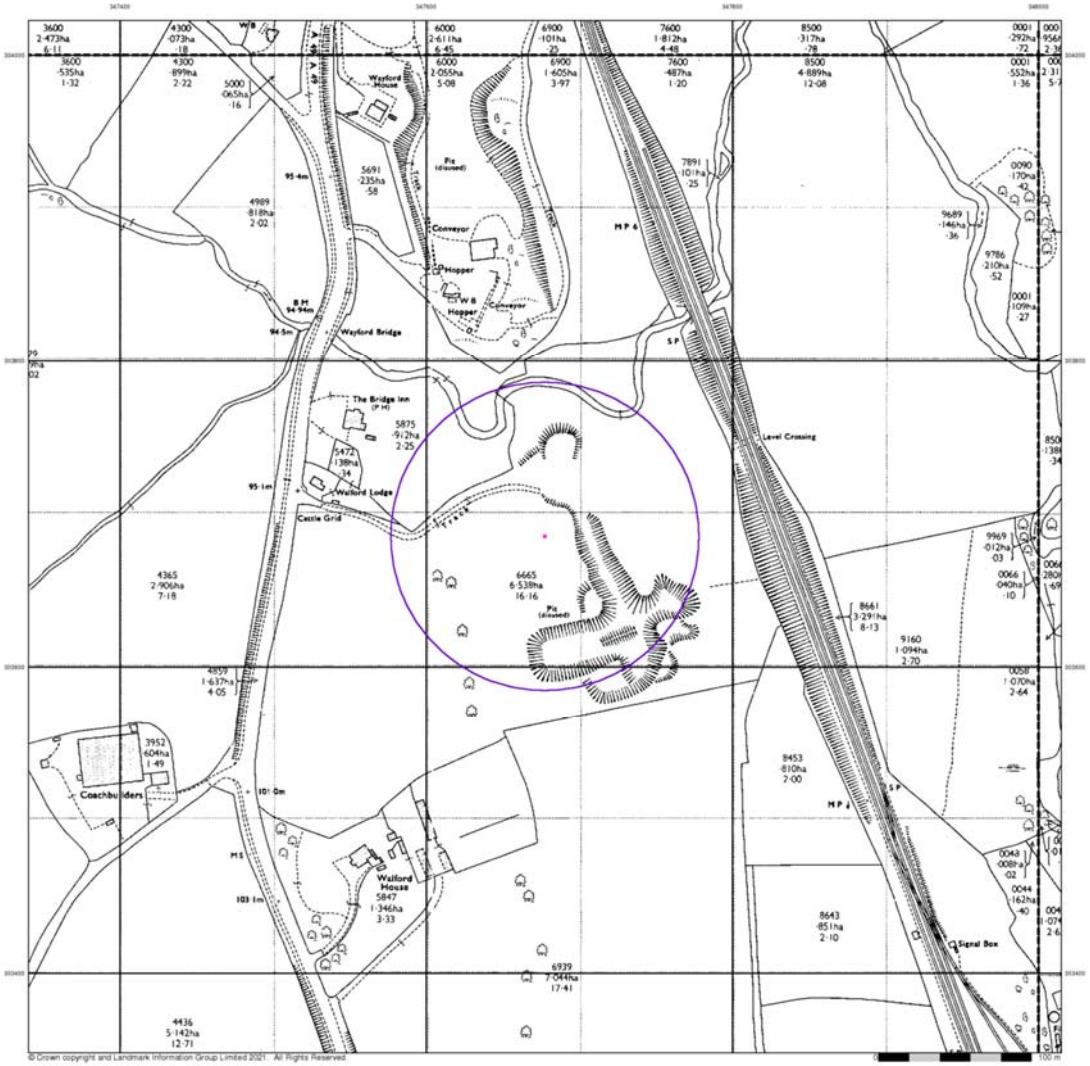
2.1 The Development of the Installation

All details refer to the appropriate tables, drawings or appendices attached to the report.

2.1.1 Historical Development

The site has been historically operated as a number of sand and gravel workings dating back to 1920 with the first recorded operations shown in the northern part of the site. This was then expanded by 1967 with further expansion and extensions southwards. The plant development for washing appears around 1990 for more development and the whole site was operational around 1996. The OS maps for the site our presented at Appendix ESSD1.

Figure 2: Initial quarrying in 1937



Quarry and Landfill development is shown in Figures 3 to 8.

Figure 3: Quarrying in 1999

Figure 4: Landfill in 2009

Figure 5: Landfilling in 2015

Figure 6: Landfill in 2018

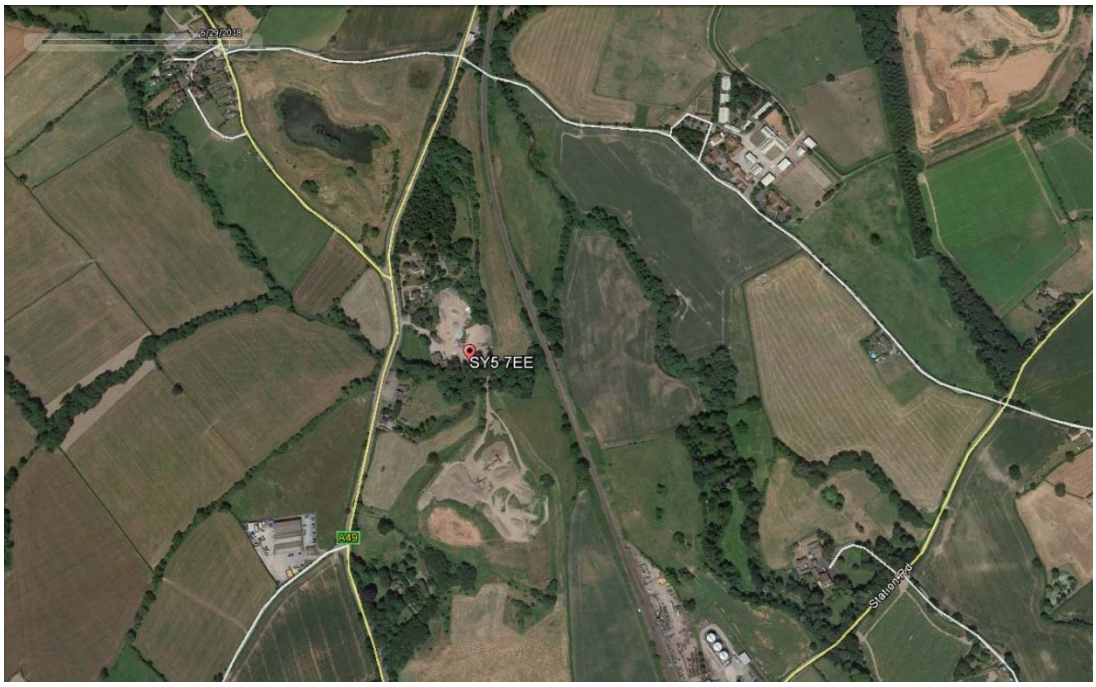
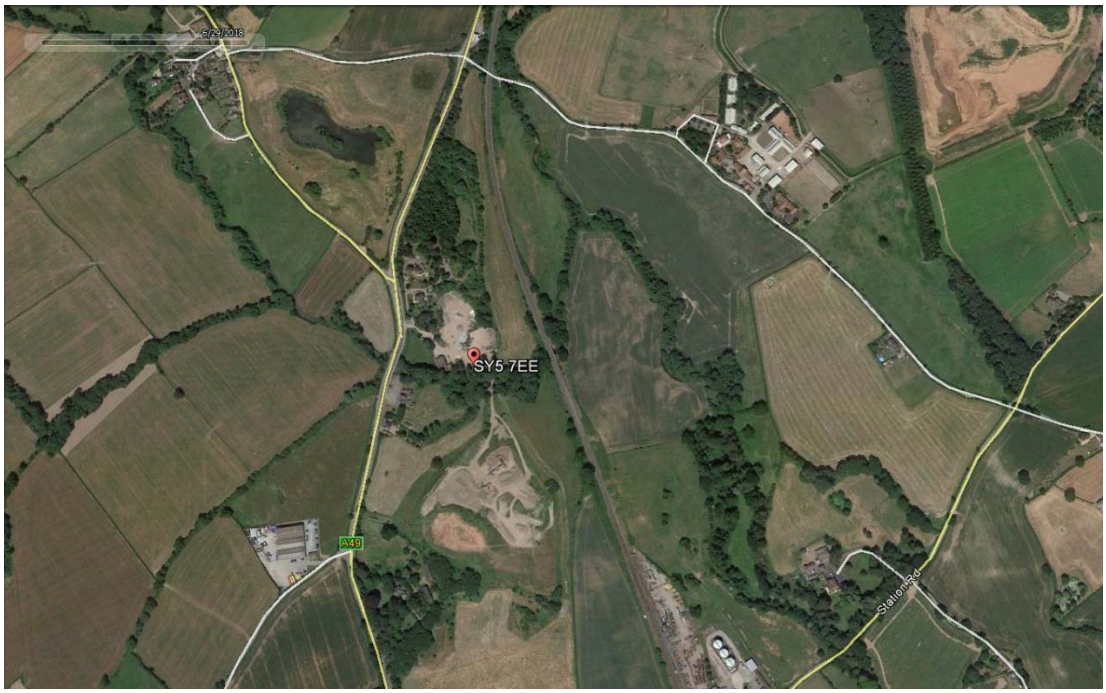


Figure 7: Landfill in 2020



2.1.2 Proposed Development

This includes details relating to the following.

- The proposed waste types for the landfill area be inert non-reactive wastes which include Tax Qualifying Exempt Materials.

- A non-hazardous waste treatment facility will be operated to process construction and demolition wastes, soils and to recovery secondary aggregates, which will also involve the use of crushers and screens and use of a barrel wash plant. The detailed layout is presented at Drawing ESSD13.

- A skip will be located on site for load rejection.

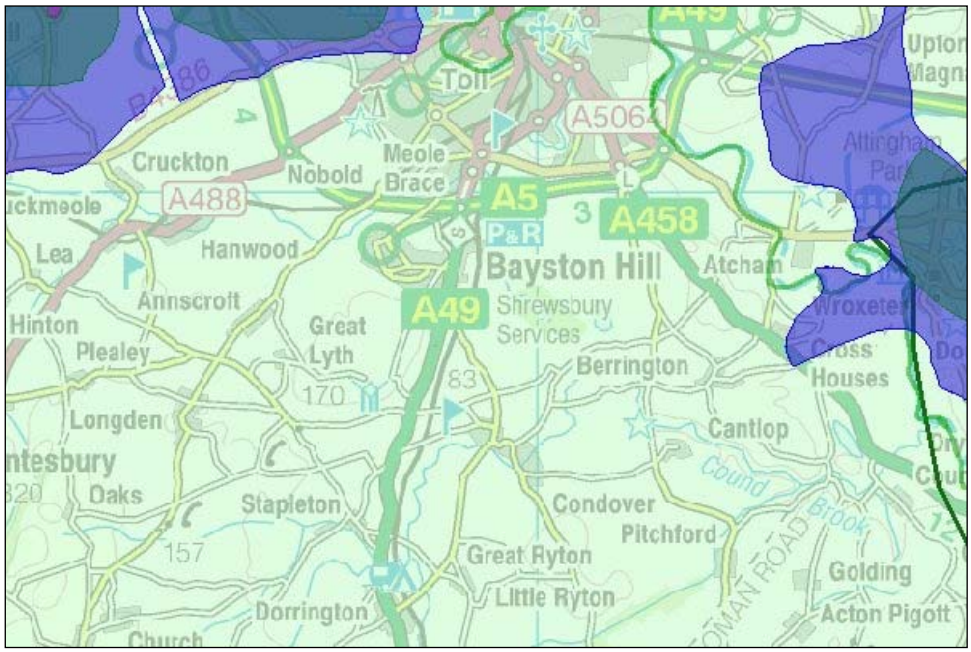
- The site will have 2 operational phases in the base and one operational phase above ground to complete the landfill final landform. The time taken for all mineral extraction, lining, infilling and restoration is 15 years.

- The site has valid planning permission until 2042.

- The final landform and end use is open space and woodland in accordance with Local Development Framework prepared for Shropshire County Council.

- The site permit boundary requires an engineered geological barrier for all of the landfilling.

- No groundwater pumping occurs near to the site and the nearest licensed abstraction is at Wroxeter.



- The site is not within a Source Protection Zone and the site will be designed and operated on the principles of hydraulic containment.

- The proposed final landform is to form a dome so as to encourage surface water run-off from the capped and restored areas and is presented at Drawing ESSD 5

2.2 Installation Engineering

2.2.1 Groundwater Management System

Groundwater management is not required for landfilling operations or in the inert recycling area.

2.2.2 Basal Lining System

It is proposed to use inert soils brought to site to form the geological barrier which will be rolled. The Source Testing of the Clay Permeability is presented at Appendix ESSD 2 for Phase 1 at 2 metres on the base.

The Construction Quality Assurance Plan is presented at Appendix ESSD 2 detailing the method of construction and the standards and testing frequency.

The cells construction shall consist of a basal and side wall seal constructed above the prepared formation level from suitable low permeability material placed and compacted in layers. The thickness of mineral lining shall be a minimum of 1.0m.

The lining material shall be free of unsuitable material and a summary of the design specification is required to meet the following requirements:

i) Permeability ≤1 x10^{-7} m/s BS: 1377: 1990: Part 6: Method 6
ii) Plasticity Index <65% BS: 1377: 1990: Part 2: Methods 4.3 and 5.3
iii) Plasticity Index >10% BS: 1377: 1990: Part 2: Methods 4.3 and 5.3
iv) Clay Content (0.002mm) >8% BS: 1377: 1990: Part 2
v) Percentage Fines >20% BS: 1377: 1990: Part 2
vi) Maximum particle size >187mm* BS: 1377: 1990: Part 2
vii) Percentage Gravel(>5mm) ,≥30% BS: 1377: 1990: Part 2
viii)Liquid Limit <90% BS: 1377: 1990: Part 2: Methods 4.3 and 5.3
ix) Shear Strength >50kN/m^2 BS: 1377: 1990: Part 9

2.2.3 Side Slope Lining System

It is proposed to use inert soils brought to site to form the geological barrier which will be rolled. The Source Testing of the Clay Permeability is presented at Appendix ESSD 1. The Source Testing of the Clay Permeability is presented at Appendix ESSD 1.

The Construction Quality Assurance Plan is presented at Appendix ESSD 2 detailing the method of construction and the standards and testing frequency.

The cell construction shall consist of a side wall seal constructed above the prepared formation level from suitable low permeability material placed and compacted in layers. The thickness of mineral lining shall be a minimum of 1.0m.

The lining material shall be free of unsuitable material and a summary of the design specification is required to meet the following requirements:

i) Permeability ≤1 x10^{-7} m/s BS: 1377: 1990: Part 6: Method 6
ii) Plasticity Index <65% BS: 1377: 1990: Part 2: Methods 4.3 and 5.3
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iv) Clay Content (0.002mm) >8% BS: 1377: 1990: Part 2
v) Percentage Fines >20% BS: 1377: 1990: Part 2
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vii) Percentage Gravel(>5mm) ,≥30% BS: 1377: 1990: Part 2
viii)Liquid Limit <90% BS: 1377: 1990: Part 2: Methods 4.3 and 5.3
ix) Shear Strength >50kN/m^2 BS: 1377: 1990: Part 9

The side slope stability has been assessed as part of the Stability Risk Assessment for the permit application presented at Appendix C supporting the application.

2.2.3 Leachate Drainage System

A leachate drainage system is not required at an inert landfill site.

2.2.4 Capping System

An engineered capping system is not required at an inert landfill site.

2.2.5 Restoration and Aftercare

Sub soils and top soils or soil substitutes will be placed directly above the finished inert landfilling and placed in accordance with the requirements set out in Planning Permissions for the site.

Soil placement and restoration is a requirement set out in Planning Permissions and is to be placed to the satisfaction of the Mineral Planning Authority, Shropshire County Council and the Environment Agency.

The final restoration of the site is to grassland and tree planting, see Drawing ESSD 5.

2.3 Leachate Management and Monitoring Infrastructure

2.3.1 Leachate Generation

Leachate monitoring is a not a requirement at inert landfill sites. The site is designed as a fully hydraulically contained landfill within the saturated zone.

2.3.2 Leachate Management

The Hydrogeological Risk Assessment has demonstrated that the site is unlikely to generate significant leachate that will have no detrimental impact on groundwater quality.

2.4 Landfill Gas Management and Monitoring Infrastructure

2.4.1 Landfill Gas Generation

The likelihood of gas production based on the Landfill Gas Risk Assessment is very low and it is recommended that internal gas monitoring points are constructed by retro drilling once each phase is completed.

There is no requirement for gas extraction due to the low organic fraction nature of the inert waste and therefore there will be little gas production and not enough gas for gas engines or flaring.

2.4.2 Landfill Gas Management

There is no proposed collection and extraction of landfill gas due to the inert nature of the waste and based on the Landfill Gas Risk Assessment.

There is no requirement for treatment and disposal of the landfill gas including the utilisation plant.

No gas will be flared or utilised on site. No landfill gas will emitted via sidewalls or the cap.

2.4.3 Landfill Gas Monitoring Infrastructure

Gas monitoring boreholes have been constructed around the outside of the landfill site and the locations are shown on Drawing ESSD 7. Gas monitoring will be carried out on a quarterly basis at each of the external gas monitoring points using an infra-red gas analyser.

External gas monitoring is from the seven combined groundwater and gas boreholes.

Internal gas monitoring points are presented on Drawing ESSD 7 and are based on 2 monitoring points per Phase due to the low risk proximity of the site in a rural surrounding.

Sampling will be undertaken by staff appropriately trained in environmental monitoring procedures, and who are familiar with the equipment and its limitations. The Company warrants that the personnel engaged in monitoring activities are trained to undertake the task. These will comprise the companies own technical personnel, the site manager or nominated deputy, following appropriate training by technical personnel. All monitoring staff undergo a period of job training and in addition external courses are used to supplement internal training. Results will be validated by the sampling personnel detailed above.

Gas monitoring boreholes and gas monitoring points are summarised in Table ESSD 4 below:

Table ESSD 2: The nature and location of perimeter gas monitoring points

Phase 1	**MP1.1-1.2**	Monitoring Point in waste	Design detail on ESSD 7
Phase 2	**MP2.1-2.2**	Monitoring Point in waste	Design detail on ESSD 7
Perimeter	**BH 1-7**	Monitoring Borehole outside waste. Combined gas and groundwater	Design detail on ESSD 7

2.4.4 Gas Monitoring

The gas monitoring frequency and determined range has been developed based on the landfill gas risk assessment and is summarised below in Table ESSD 3.

Table ESSD 3: Monitoring frequencies for landfill gas

Determinands	Monitoring Frequencies	Units and Accuracies
Methane (CH_4)	Monthly	%v/v ±0.5%
Carbon Dioxide (CO_2)	Monthly	%v/v ±0.5%
Oxygen (O_2)	Monthly	%v/v ±0.5%
Atmospheric Pressure	Monthly	±1 mb
Differential pressure	Monthly	±0.1 mb
Meteorological Data	Monthly	-

2.4.5 Making and submission of records

Records will be kept on site of determinands analysed, date of sampling, sampler, results, units.

A copy of the results of sampling and analysis will be forwarded to the Agency within 1 month of being carried out.

2.5 Surface Water Management System

Surface water monitoring is set out in Table ESSD4.

Table ESSD4: Surface water monitoring

Parameter	Landfilling Phase SW1, SW2, SW3		Closure/ Aftercare Phase SW2 only
	Quarterly	Annually	Six Monthly
pH	•	•	•
Electrical conductivity 20°C	•	•	•
Ammoniacal nitrogen	•	•	•
Chloride	•	•	•
COD	•	•	•
DO	•	•	•
Nickel	•	•	•

2.6 Groundwater Management and Monitoring

It is essential to monitor groundwater adjacent to the site for quality to assess the integrity of the performance of the site and to ensure that there is no impact on groundwater.

2.6.1 Groundwater Level and Quality Monitoring

Boreholes are located both up and down hydraulic gradient. Borehole locations are presented on Drawing ESSD 10. The nature and location of the groundwater monitoring boreholes is set out on Table ESSD 5.

Table ESSD 5: Groundwater Monitoring Borehole Locations

Perimeter	**BH 1**	Perimeter Down Hydraulic Gradient	Level and Quality
Perimeter	**BH2**	Perimeter Down Hydraulic Gradient	Level
Perimeter	**BH 3**	Perimeter Down Hydraulic Gradient	Level and Quality
Perimeter	**BH 5**	Perimeter Down Hydraulic Gradient	Level and Quality

It is recommended that the compliance limits are reviewed on an annual basis or as appropriate. If, for example, the trigger levels are exceeded on three consecutive times, then this should be highlighted and discussed within any annual review of monitoring data. Such an occurrence may be the result of contaminant breakthrough or a change in the up-gradient groundwater quality.

The groundwater sampling regime is set out in Table ESSD 6 and is based on the Environment Agency Regulatory Position Statement-Landfill monitoring and reporting standards.

Table ESSD 6: Groundwater Monitoring Parameters

Parameter	Landfilling Phase		Closure/ Aftercare
	Quarterly	Annually	Annually
Water Level	•	•	•
pH	•	•	•
Electrical conductivity 20ºC	•	•	•
Ammoniacal nitrogen	•	•	•
Chloride	•	•	•
Sulphate	•	•	•
Alkalinity	•	•	•
Sodium	•	•	•
Potassium	•	•	•
Calcium	•	•	•
Magnesium	•	•	•
Iron	•	•	•
Cadmium	•	•	•
Copper	•	•	•
Chromium	•	•	•
Lead	•	•	•
Nickel	•	•	•
Zinc	•	•	•
Mercury	•	•	
Hazardous Substance Scan		Annual for first six years	Six Yearly

Sampling will be undertaken by staff appropriately trained in environmental monitoring procedures, and who are familiar with the equipment and its limitations. The Company warrants that the personnel engaged in monitoring activities are trained to undertake the task. These will comprise the companies own technical personnel, the site manager or nominated deputy, following appropriate training by technical personnel. All monitoring staff undergo a period of job training and in addition external courses are used to supplement internal training. Results will be validated by the sampling personnel detailed above.

2.6.2 Submission of Data

All data from the groundwater monitoring will be stored on the in house electronic database. This database will enable reports to be issued detailing trigger breaches and standard quarterly and annual reports plus laboratory reports.

Reports will be provided in a standard PDF format to the Environment Agency.

2.7 Post Closure Controls

Groundwater and Leachate

Completion relating to hydrogeological risks will have been achieved when there is no unacceptable risk of pollution from the landfill, i.e. when the site can comply with the requirements of the Groundwater Regulations without the need for any active site management and during the three year post closure monitoring the results show the groundwater quality remains at or below the trigger levels.

The modelling has assumed 3 years of management after site completion.

Groundwater monitoring will continue for the period based on an annual sampling rounds from the four boreholes and the downstream surface water monitoring point.

Landfill Gas

Landfill gas utilisation and flaring is not considered necessary at the site long term based on the Landfill Gas Risk Assessment and again only requires monitoring for the three years post closure monitoring.

The nature of the waste should only allow for a nominal amount of settlement and the pre and post settlement levels are set as one and the same. Any low spots that form will be made good with importation of additional soils.

Gas monitoring will be carried out on a monthly basis for at least three years post closure.

Stability and Settlement

The final surcharged and post-settlement restoration levels are shown in Drawing ESSD 5 which is one and the same due to the inactive nature of the waste. A surcharge to accommodate settlement will therefore not be required.

The remainder of the post closure based on the risk assessments is for monitoring to ensure that the waste mass remains stable and that the leachate head does not increase above the design limit and therefore that no leachate removal is required.

Annual site surveys will be carried out using fixed settlement locations to measure settlement of the site once the site is completed.

Mining Subsidence

Likelihood of mining related subsidence is not considered an issue and was reviewed as part of the Stability Risk Assessment.

Restoration, Aftercare and Completion Phase

The site will be restored in accordance with the planning permission and maintained under a five year aftercare program under the Town and Country Planning Act 1991.The grassland and tree planting areas after the five years are completely self- sustaining without requirement for any further aftercare provision.

Monitoring

Features to be monitored for the purpose of closure include
Landfill Gas
Settlement Rate-Annual
Stability Observations
Groundwater Level
Groundwater Quality

3.0 PATHWAY AND RECEPTOR TERM CHARACTERISATION

3.1 Climate

The climate of the+ Midlands region is varied, ranging from cool and wet in the north-east Staffordshire and the Welsh Borders to warm and dry in Warwickshire and east Worcestershire, often reflecting changes in topography.

The nearest weather station to the site is at Shawbury, some 18km NNEof the site.

The average rainfall (as per the period 1971 to 2005) is around 650mm per year, the drier months generally being Spring, Appendix ESSD 4

Wind roses from the Meteorological Office at Birmingham Airport are shown in Appendix ESSD 4. They indicate winds predominately from the south-west, which are particularly strong in winter. The long-term average potential evapotranspiration, obtained from the Met Office data presented at Appendix ESSD 4 indicates evapotranspiration at 516mm per annum and a total rainfall of 695 leaving a total annual rainfall of 179mm per annum.

Surface water flow from the land around the site is governed by the topography with falls generally towards Cound Brook.

3.2 Geology

REGIONAL GEOLOGY

General

Quaternary superficial deposits cover most of the Dorrington area, predominantly of broad spreads of till and glaviofluvial outwash laid down during the Late Devensian glaciation.

During the Late Devensian Substage, an ice sheet originating from the centres in the west of Scotland and the Lake District, advanced into the Shropshire/Staffordshire lowlands from the Irish Sea Basin. At its maximum extent, the ice margin lay just to the south of the district. The resulting glaciogenic sediments cover much of the area with till, sandstone, gravel outwash and glaciolacustrine deposits.

The oldest rocks lie beneath the Late Devensian and the site lies in the Halesowen Formation in which grey measures predominate over red beds.

Structure

In this area there is a fault line trending north-south running through the site, downthrown to the east.

LOCAL GEOLOGY

The site has been worked for Quarternary superficial deposits. The site was operational in the 1960,s

The local geology is also presented at Figure 3 for reference below. The solid geological map is presented at Drawing ESSD 8

Figure 3: Bedrock Geology

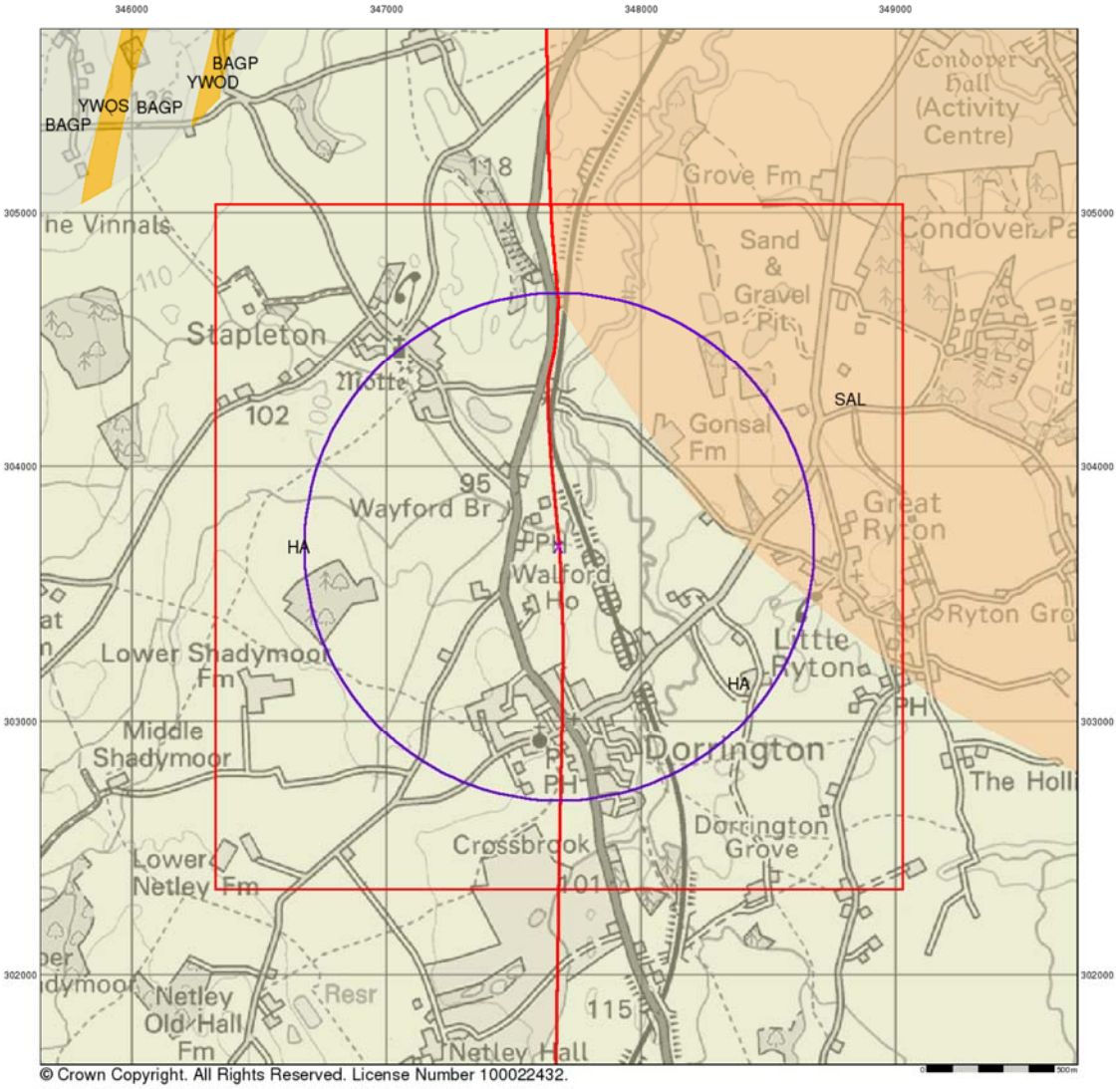
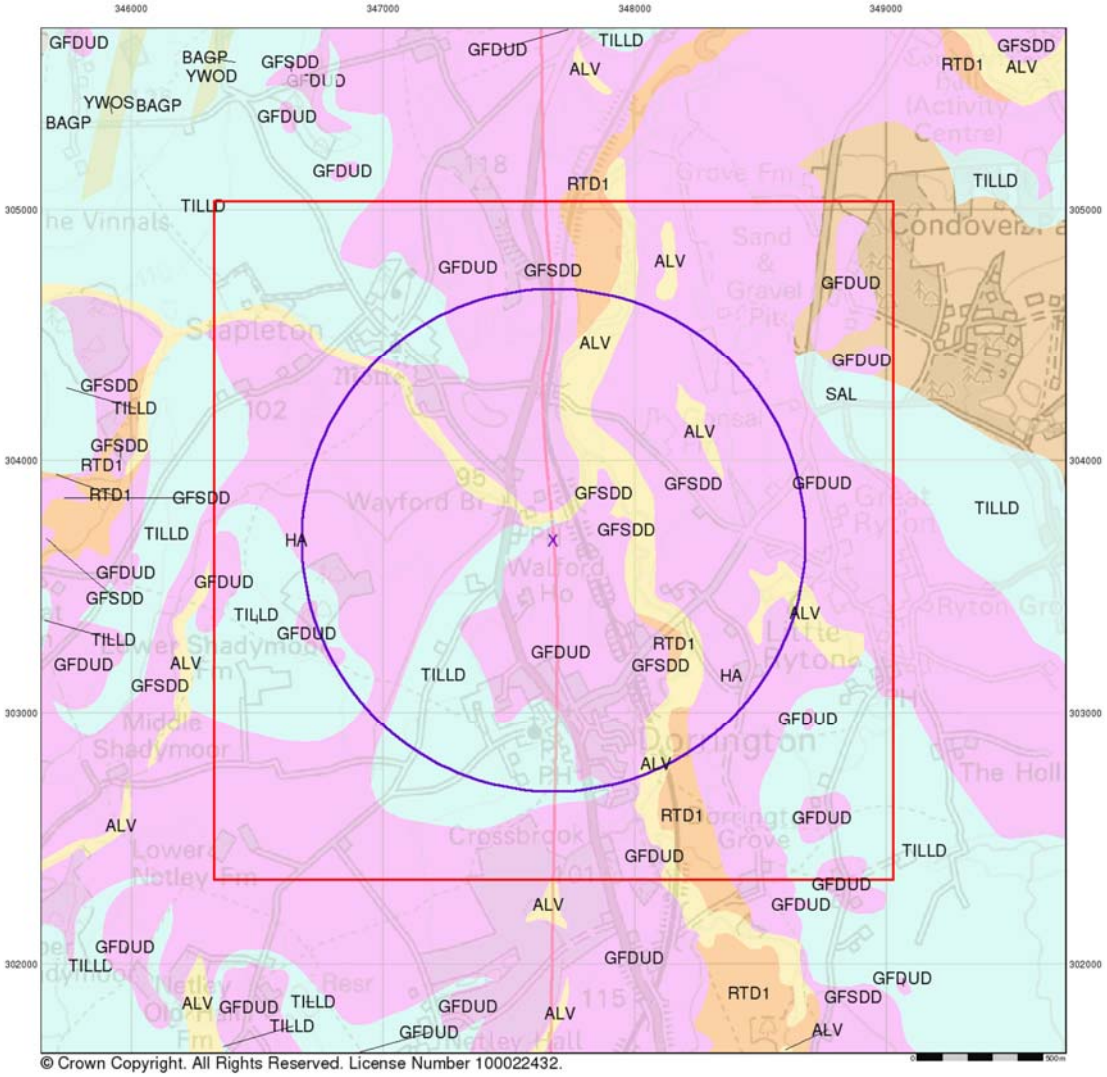


Figure 3 shows the site to consist of Halesowen Formation beds covered with glaciofluvial deposits.

The superficial geological map is presented at Figure 4.

Figure 4: Superficial Geology



The Superficial Geological Plan is presented at Drawing ESSD 8.

The investigation identified a varying thickness of sand/silt/clay is now above the water table onsite and in the surrounding areas. The clay has been tested for permeability. The results show a permeability of up to 4.6 x 10^{-6}m/s, and an level of 1.82 x 10^{-5}m/s at the lowest flows all based in soakaway testing carried out on site and produced at Appendix 4. A permeability test for the sand/clay was carried out by Geochem to assess the permeability of the sand /clay and is presented at Appendix 5.

A conceptual geological cross-sectional plan is presented as Drawing ESSD 11.

3.3 Man-made Subsurface Pathways

The following man made subsurface pathways have been identified;

- No field drains exist in any of the fields around the site.
- Mine workings do not occur in the area of the site

3.4 Hydrology

There is a small brook that runs through the site but ois between the landfill and the recycling area.

The brook runs eastwards before turning northwards, where is flows into the Cound Brook. The Cound Brook itself flows generally in an easterly direction through Condover and Cound before joining the River Severn some 9km east of the site (NGR SJ566063).

To the west of the A49, two smaller watercourses, flowing generally is a north-easterly direction, run into the brook, draining a large tract of agricultural land running to the south and west of the site.

Surface Water Ponds

The surface water body is located to the north west of the site and is in a void created by sand and gravel extraction and established around 1985.

3.5 Hydrogeology

3.5.1 Aquifer Characteristics

General Hydrogeology

From 1st April 2010 new aquifer designations replace the old system of classifying aquifers as Major, Minor and Non-Aquifer. This new system is in line with our Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) and is based on British Geological Survey mapping.

The site is located on a Secondary A aquifer with superficial deposits of variable permeability forming a Secondary A Superficial aquifer.

The site is not located within a Source Protection Zone (SPZ). The nearest outer SPZ (SPZIII) is located circa. Aquifer summary data is presented at Appendix ESSD 5.

Figure 5: Aquifer designation map for Solid Geology

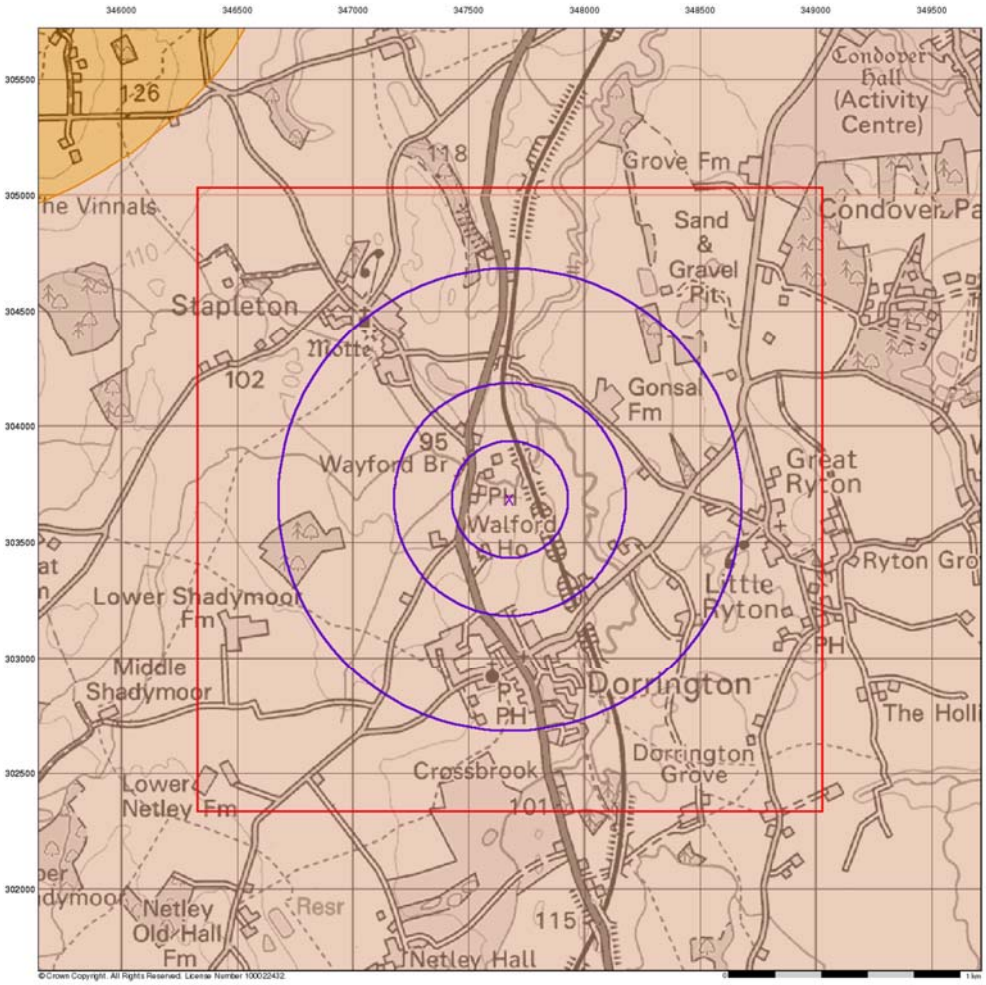


Figure 6 shows that the site has a superficial deposit aquifer designation. A shallow groundwater gradient of 0.001875m/m has been calculated from the available groundwater elevations, with the prevailing groundwater flow direction to the north from 95.9mAOD at BH5 top 91.4m AOD at BH3. Groundwater elevations and interpolated potentiometric surface plots are presented on Drawing ESSD 11 and the monitoring data is presented at Appendix ESSD 7. Borehole logs for the new groundwater and landfill gas boreholes are presented at Appendix ESSD 8.

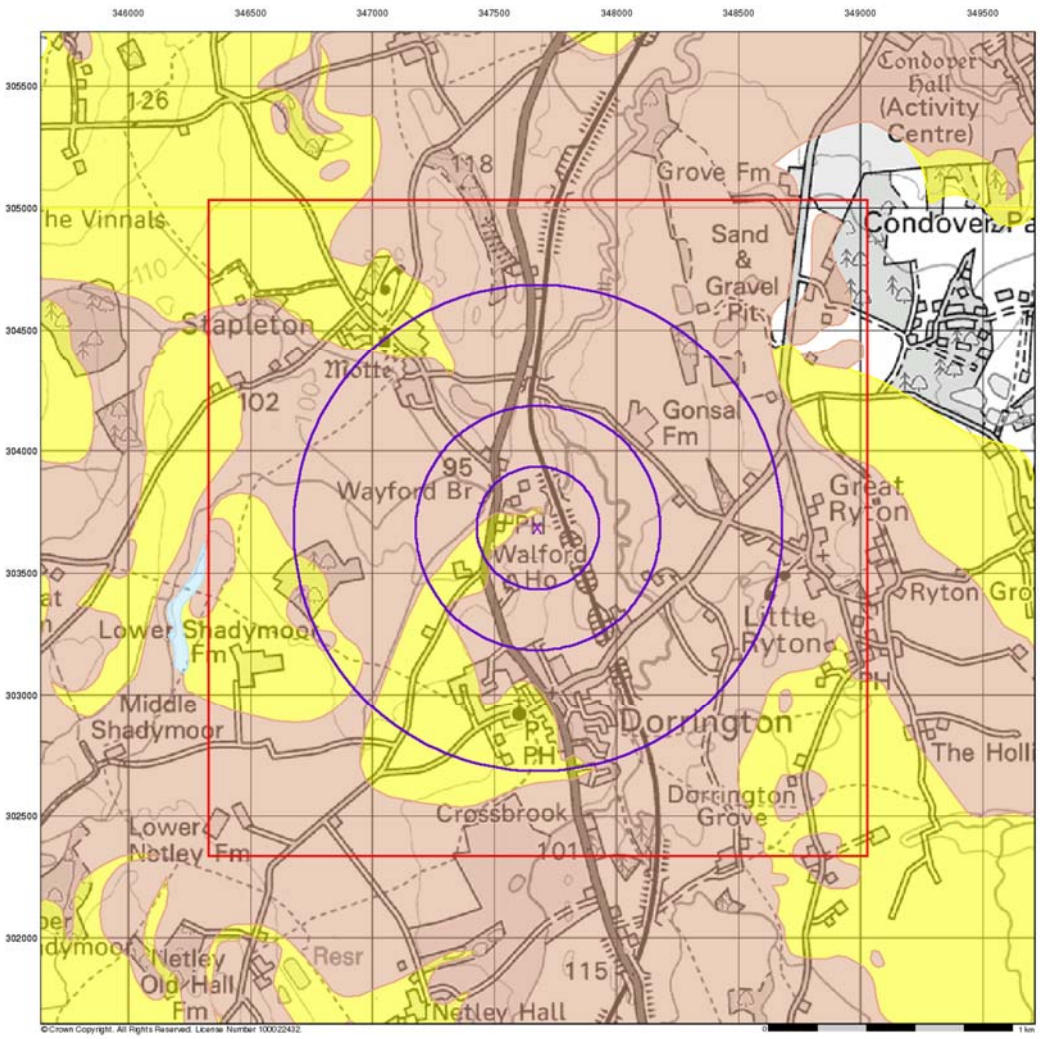
Evaluation of the hydraulic conductivity of the Secondary Aquifer has been made to inform assessment of the impact of the Proposed Development.

Table ESSD7: Groundwater Boreholes

PIEZO ID	Easting	Northing	Level	Water Table
BH1	347582.448	303653.492	101.34	91.73
BH2	347761.522	303652.392	105.36	93.17
BH3	347728.129	303708.132	101.71	91.40
BH5	347654.800	303445.156	106.03	95.90

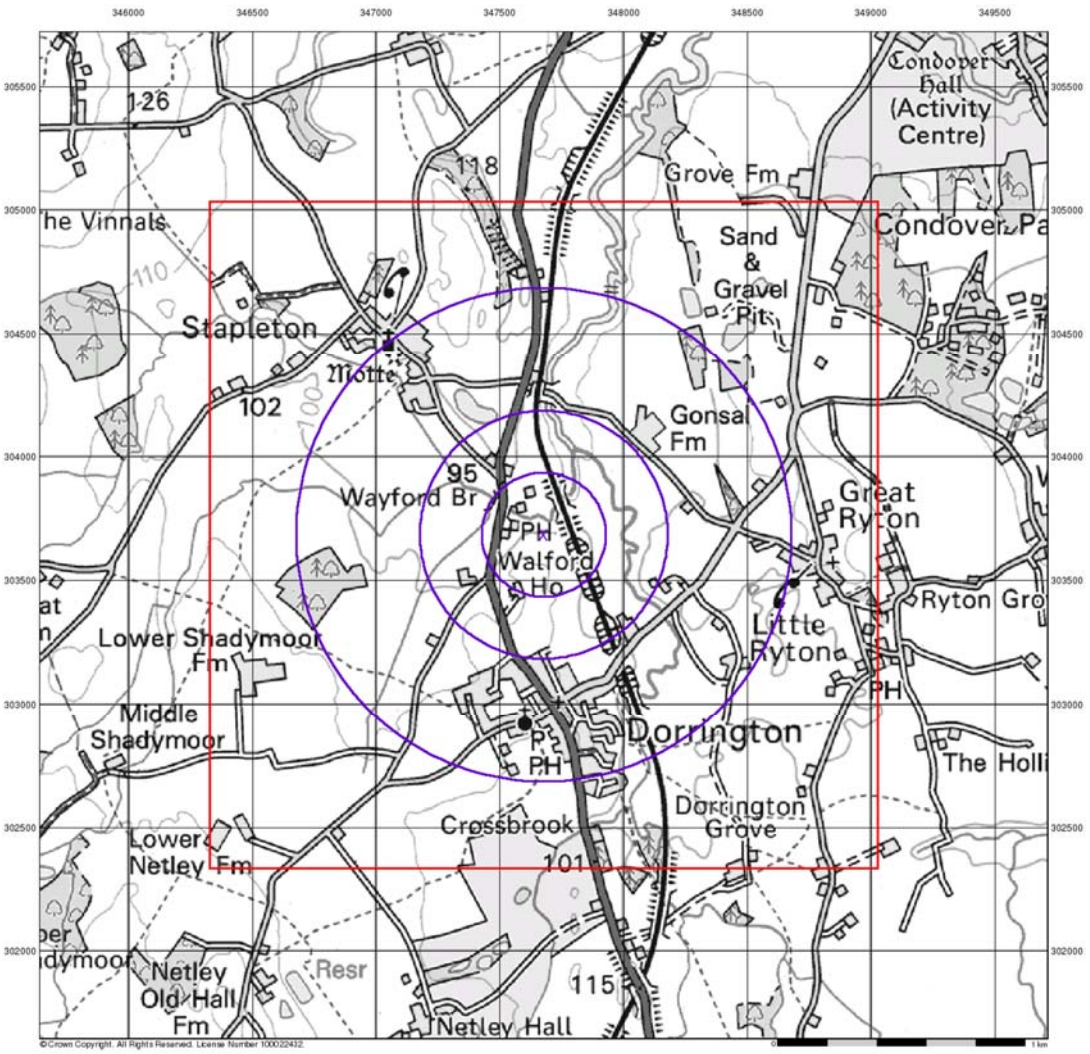
The reported permeability of the geological barrier is significantly lower than is specified by the Landfill Directive for inert waste landfills. Based on the observed low permeability of the geological barrier, a 1.0m mineral liner design thickness is recommended for base and side walls. This should afford the requisite degree of hydraulic containment for inert waste leachate and hence protection to the shallow groundwater body (principal receptor). It should be noted that sensitivity analysis demonstrated little benefit of installing a 1m thick mineral liner.

Figure 6: Aquifer designation map for superficial geology



The regional supplies come from the Sherwood Sandstone in the Trias. The water resources are administered by Severn Trent Water. In the Trias, the Kidderminster Formation, and all sub-units form a single aquifer, although it may contain aquicludes.

Figure 7: Source Protection Zones



3.5.2 Groundwater Flow

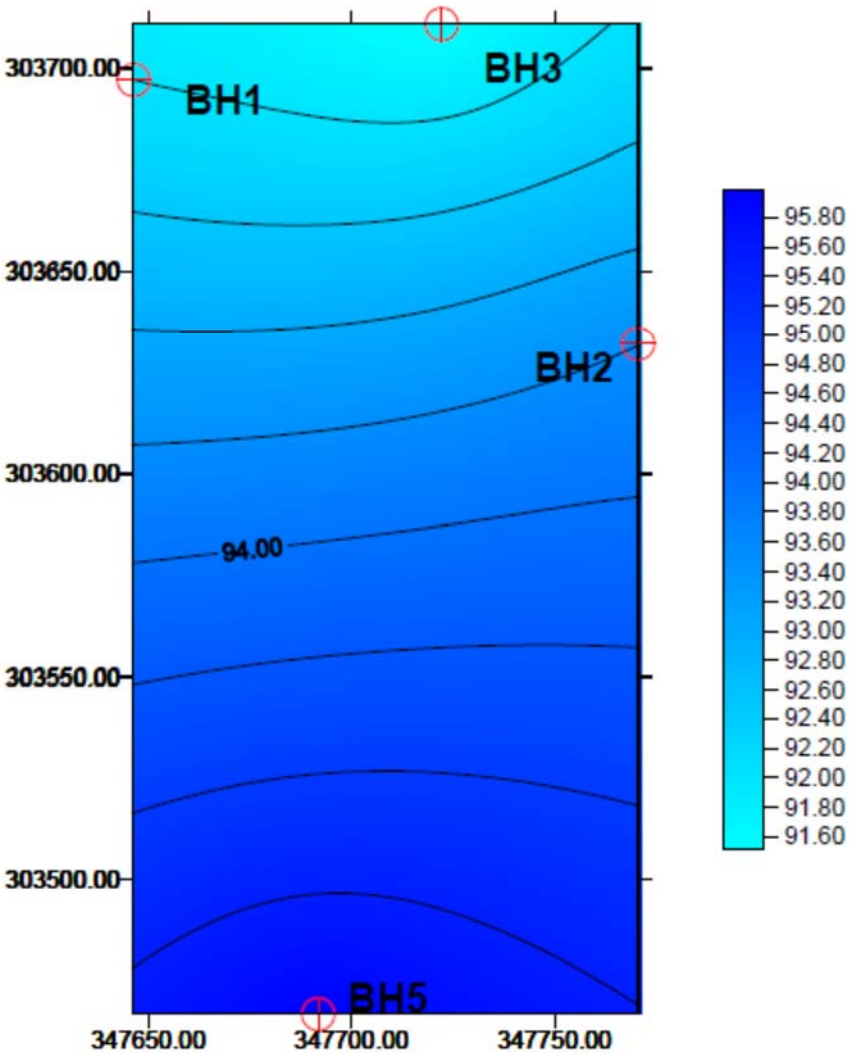
Groundwater levels have been monitored on site since the initial installation of the boreholes and the results are presented in the HRA and are summarised as a hydrograph at Appendix ESSD 7.

The groundwater flow is northwards and is presented at Figure 8 and the groundwater flows are presented at Drawing ESSD 11.

Groundwater at the south is at approximately 96m AOD and 92m AOD at the northern end of the site. The site base is at 95m AOD in the northern part and will be down to 98m AOD in the southern part.

The flow of the groundwater is northwards. The regional groundwater is 0.01875m/m falling from 95.9m AOD to 91.4m AOD.

Figure 8: Groundwater average contour model



3.5.3 Groundwater Quality

In accordance with the requirements for compliance levels as defined in Paragraph 4(c) of Annex III of the Landfill Directive, control and compliance limits have been established for all non-hazardous substances, with compliance limits set for hazardous substances.

The compliance levels for the hazardous organic substances are defined by the limits of analytical detection. This means that is not technically feasible to employ control limits for. Compliance limits are set at 0.01 µg/l for napthalene and 0.1 mg/l for phenol.

The compliance limits are set at the average results plus three times the standard deviation. It is noted that a further six data sets will be used to finalise the Compliance Limits prior to issue of the permit.

Compliance limits will be reviewed on a regular basis in accordance with the requirements of the permit and routine reporting.

Table ESSD8: Compliance Limits for Groundwater

Determinand	Unit		
		BH1	BH3
Ammoniacal Nitrogen	mg/l	1.008	0.157
Chloride	mg/l	23.32	29.08
Sulphate	mg/l	8	62.48
Cadmium	mg/l	0.000128	0.00004
Zinc	mg/l	0.00401	0.002

The groundwater quality results and the compliance limit calculations are presented at Appendix ESSD 9.

3.6 Off-site Landfill Gas Monitoring

Natural background gas concentrations have been carried out over a period of time from the outside groundwater monitoring boreholes to establish a baseline concentration. The boreholes have shown presence of carbon dioxide at very low levels.

Carbon dioxide has been recorded in all of the boreholes. The current data sets will be supplemented during the permit process to obtain trigger levels in accordance with the Industry Code of Practice.

Off-site gas monitoring details are presented at Appendix ESSD 10.

3.7 Receptors and Compliance Points

This section details the specific receptors identified and compliance points that have been set in the various risk assessments.

Groundwater

For Hazardous Substances, the receptor/compliance point will need to be the point at which the substance will enter the groundwater below or adjacent to the site. This can be monitored from Boreholes 1 and 3 which are down hydraulic gradient. Compliance limits have been set and are summarised in Table ESSD 8.

For Non-Hazardous Polluting Substances, the primary receptor/compliance point will normally be the downstream boundary of the site at Boreholes 1 and 3. Compliance limits have been set and are presented at Table ESSD 8.

Surface Water

Surface water is monitored for the recycling facility.

Landfill Gas

The site will accept inert waste which produces extremely low concentrations of methane and low concentrations of carbon dioxide. The global impact is therefore considered as negligible from the waste mass.

Key receptors have been identified and gas monitoring boreholes have been located near to identified receptors based on level of risk.

Amenity (Nuisance and Health Issues).

Due to the site accepting only inert waste for landfill and the crushing screening and washing operations dust monitoring is not considered a requirement for the site.

Noise pollution primary controls are for the screening bunds have been constructed near to identified residential development and the site benefits from a detailed Noise Management Plan developed under the Noise Impact Assessment.

Habitats (where required)

An ecological screening was not requested from the Environment Agency. The site is not designated a Local Wildlife Site, devoid of trees and grass except for the boundary which is to remain unchanged and is not within a RAMSAR,SAC or SPA.

The Cound Brook discharges into the River Severn.

4.0 SITE REPORT

The Environmental Permit Regulations require that a permit application must be accompanied by a (Baseline) Site Condition Report, which describes the condition of the whole site, not just the landfill. Operators are required in particular to "*identify any substances in, on, or under land which may constitute a pollution risk*"

This Site Report gives a factual "baseline" account of the land.

4.1 Introduction and Background Information

Site details

The site entrance is located at National Grid Reference (NGR) SJ 47554 03878, the centre of the recycling area is at SJ 47635 03869 and the centre of the landfill is at SJ 47680 03568, which lies approximately 9km from the south of Shrewsbury on the northern edge of Dorrington. The site is off the A49, at Figure 1 and is detail at Drawing ESSD 1.

The Installation Boundary has included all of the area for the inert landfill and waste treatment facility, leading through lockable gates, along a fully concreted road to the site reception area which comprises a concrete reception area and turning area, site offices, weighbridge and wheel wash area, bunded fuel tank area and concreted treatment area before leading to the landfill area. The area covered under the current operations are coloured in yellow on ESSD 2 and the boundary is marked in green.

The permit application boundary is covered under a number of Planning Permissions issued by Shropshire County Council.

Outline of proposed development

This includes details relating to the following.

- The proposed waste types for the landfill area be inert non-reactive wastes which include Tax Qualifying Exempt Materials.
- A non-hazardous waste treatment facility will be operated to process construction and demolition wastes to recovery secondary aggregates. The site will have a washing plant, mobile crushers and screeners.
- A skip will be located on site for load rejection.
- The site will have 2 operational phases to complete the landfill final landform. The time taken lining, infilling and restoration is 15 years.

- The site has valid planning permission until 2042. The layout of the recycling/treatment area is presented at Drawing ESSD 4 and ESSD13.

- The final landform and end use is to be open space and woodland in accordance with Local Development Framework prepared for Shropshire County Council.

- The site permit boundary requires an engineered geological barrier for all landfill areas.

- The site is not within a Source Protection Zone and groundwater levels are near to rebound and zone of drawdown and recharge is limited and quick and the site will be designed and operated on the principles of hydraulic containment.

- The proposed final landform is to form domes so as to encourage surface water run-off from the restored areas and is presented at Drawing ESSD 5.

Any former land-uses that may give rise to potential sources of non-landfill related contamination

Based on the site investigations and historical research there are former landfill operation located in the southern part of the site which is to be removed as part of this application and the waste will be deposited in the recycling area an d all of the brick and engineering soils will be put through the new system to be installed in the recycling area.

It is therefore reasonable to conclude that the site has considerable influence from around the perimeter of the site, currently and historically.

Sources of Information

i. The Environment Agency;
ii. The British Geological Survey records and publications;
iii. The Ordnance Survey.
iv. Solihull MBC
v. DEFRA Magic Site
vi. National Air Quality Standards
vii. Natural England
viii Envirocheck

Geology and hydrogeology

The Dorrington Quarry Landfill is located in the glaciofluvial deposits of Devensian age and this overlies the Halesowen Formation mudstones, siltstones and sandstones. Superficial deposits remain around the perimeter of the site.

Groundwater monitoring of levels.

The Environment Agency has confirmed that the site is not within source protection area.

Archive search and land-use chronology

The site has been used as quarry for sand extraction since the 1970,s.

The area of the treatment facility was quarried for sand and gravel and backfilled and has been the subject of an inert treatment facility for a considerable time.

Relevant information relating to potential contaminants

Groundwater datasets suggest that former landfilling has not impacted on groundwater quality.

Any history of incidents

There are no records of pollution incidents relating to this facility from the Envirocheck search.

4.2 Objectives of this Assessment

Context within EP regime

Monitoring records for the site have been assessed together with site investigations to define the initial site conditions and to allow for baselines to be set and for action and trigger levels to be set for groundwater, leachate, landfill gas and particulate matter.

Description of general approach

The Environment Agency Template has been used for the “Conceptual Model, Environmental Setting and Site Design” section of the Environmental Permit application for the landfill has been used. It has been designed to describe the conceptual model and setting for the site.

The conceptual model has provided an understanding of the installation in its environmental setting and consideration of the design and operation of the site at the time of the application. This report addresses the source terms of the risk (i.e. waste), all pathways and receptors and has been used as a basis for commencing the risk assessments.

The final conceptual model report has been prepared on the basis of the findings of the component risk assessments (e.g. hydrogeology, stability, landfill gas, nuisance and amenity) required under this EP Application.

Different types of contaminants to be considered

The site will accept non-hazardous waste for treatment principally as demolition and construction materials in the inert recycling area and inert waste will be landfilled at the site. The Groundwater Regulations will therefore apply to this site.

The site area requires the construction of an engineered artificial geological barrier using clay type materials to the base and sides to achieve a minimum target permeability of 1 x 10^{-7}m/s.

4.3 Site Investigation (Data Collection) Details

Description of site investigation and related work activities.

Specific site investigations have been carried out with regard to the local hydrogeology of the site. As part of these site investigations, boreholes have been drilled and borehole logs produced at each stage.

Description of laboratory analysis

This includes permeability of the soil, groundwater quality, groundwater levels, site levels, gas concentrations outside the site, and former testing including drawdown groundwater impact, river flow and hydraulic conductivity testing and falling heads tests

4.4 Summary of Site Investigation and Analysis Findings

On-site observations

Physical observations of the base and sides of the quarry site have been observed during walk over surveys.

Site survey

Detailed groundwater level monitoring has taken place to establish the groundwater levels and full detailed surveys have been carried out of the site to provide detailed topographic information.

Monitoring data

This includes, groundwater level monitoring, groundwater quality testing, permeability testing of the site, noise monitoring, landfill gas monitoring.

4.5 Data Interpretation

Proposal of baseline conditions for the site.

Control and trigger levels for the groundwater are set in the HRA, LFGRA and SRA. Background gas monitoring and groundwater monitoring has been carried out.

4.6 Conclusions

The Dorrington Quarry landfill site to be operated as a non-hazardous treatment facility and an inert landfill site, with the inert wastes deposited into separate engineered cells, within each Phase. The site is to have an engineered Geological Barrier constructed under an approved CQA regime.

The site will also operate as a non-hazardous waste treatment facility processing demolition materials to produce secondary recycled aggregates by way of crushing, screening and washing.

The site is to be operated under a Permit issued under the Environmental Permitting Regulations 2016.