RESTORATION OF MIDDLETON QUARRY

Middleton Quarry

CLOSURE & AFTERCARE MANAGEMENT PLAN

STATUS: FINAL

163407/CAP

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DRAWINGS

APPENDIX

1.0 INTRODUCTION

Overview

1.1 This Closure & Aftercare Management Plan (CAP) describes the management and monitoring of the site once all waste deposit has been completed. The Plan has been developed in accordance with the standards of the Environment Agency (EA)[1]. The Operator is Tetron Contracts Ltd.

1.2 The landfill operation includes:

- Import, of circa 853,800 tonnes of wastes for disposal or restoration; of this
- Disposal in the land raise activities of circa 697,000 tonnes;
- Construction Quality Assured geological separation layer and capping of circa 111,000 tonnes; and
- Restoration soil volume to be confirmed in Restoration Plan, as part of an Improvement Condition, under the Environmental Permit. As a minimum it will be 0.5 m layer calculated as 46,800 tonnes.

1.3 Material for recovery and use on site comprises of the following:

- Subsoil of 0.2 m thickness (40 %); overlain by;
- Top soil of 0.3 m thickness (60 %).

1.4 The site will operate under a Bespoke Permit. The primary purpose of the site is to restore a mineral works using waste. The restoration will take approximately 4-5 years.

1.5 The site operations will include the temporary storage and deposit of non-hazardous waste. The waste will be placed and compacted to allow restoration of the land to create an engineered feature for future amenity land use in accordance with the Planning Permission. Construction of the geological liner, the capping layer and parts of the final formation will utilise site derived non-waste materials.

1.6 The purpose of this plan is to outline the following:

- overview of the sensitivities at the site;
- the closure and after care operations;
- pollution control measures to be put in place on closure;
- how the site will be managed and monitored during the subsequent aftercare phase;
- a risk-based completion criteria which will show the site is in a satisfactory state for permit surrender.

1.7 This plan will be reviewed annually during the restoration works and at least every 4 years following cessation of all activities.

[1] Environmental Permitting Regulations: Inert Waste Guidance Standards and Measures for the Deposit of Inert Waste on Land

2.0 RESTORATION PROFILE AND DRAINAGE

2.1 The site will be constructed in line with the approved permit drawings. The site will be progressively restored during the infilling. Once the waste has been placed to its final level it will be surveyed to ensure that it achieves the required stability. Following completion of the landfilling, the waste will be covered by a CQA capping layer and soils as required in the restoration, to minimise water ingress into the waste, potential for erosion and to permit the seeding to occur as early as potential in the programme. The final seeding and planting is not detailed within this report.

2.2 The waste deposited at the site will be compacted to ensure that it is stable. The waste will be finished and compacted to 0.5 m below final restoration level. The site will be completed with 0.5 m of restoration soil layer of sub-soil and top soil. The restoration contours are shown in drawing 163407/D/005.

2.3 The capping is a human health cap. The top and subsoil will be placed over the restoration cap. The soil quality must be protective of the groundwater and human health. The combined environmental standards are presented in Appendix A.

2.4 The majority of soils will be imported for direct placement. All soils will be imported and placed directly or processed will be tested at a frequency of 1 test per 1000 cu m against the parameters set out in Appendix A.

2.5 Following the placement of each material type, the cap, sub-soil and top soil it will be lightly ripped to remove compaction. The operator will aim to minimise tracking over the soil surface. This is to reduce compaction. The top soil will then be placed carefully over the restored materials.

2.6 Following the placement of each layer an inspection will be undertaken to ensure that all material complies with the specification and oversize and any observed detritus is removed.

2.7 The drainage design is presented in drawing 163407/D/008.

3.0 STABILITY

3.1 The waste will be well compacted during placement and the land raise activities. No significant settlement is anticipated. Prior to the placement of the restoration clays and soils the Construction Quality Assurance engineer will review the placed waste and associated testing results to ensure the design parameters are attained and the risk of rotational slippage is minimised.

3.2 Following the completion of the restoration, a site inspection and topographical levels will be recorded at pre-determined locations, to ensure there are no signs of instability and that the waste mass is stable and not moving. The survey will be undertaken every 2 years until the site is surrendered.

4.0 POLLUTION CONTROL INFRASTRUCTURE

Groundwater and leachate monitoring

4.1 During the landfilling, restoration and closure phases, monitoring of the groundwater will be undertaken at boundary on a routine basis. The frequency of each phase and the parameters are set out in Table 4.1.

4.2 The waste will be fully characterised through the importation process. No leachate monitoring at the site will occur following restoration.

Table 4.1 Groundwater monitoring		
Determinant	**During landfilling**	**Post completion**
Dissolved Organic Carbon	Quarterly	Quarterly for 2 years then TBC with the EA
Total Dissolved Solids		
Arsenic (total)		
Barium (total)		
Cadmium (total)		
Chromium (total)		
Copper (total)		
Mercury (inorganic)		
Nickel (total)		
Lead (total)		
Molybdenum (total)		
Antimony (total)		
Selenium (total)		
Zinc (total)		
Chloride (total)		
Fluoride (total)		
Sulphate (as SO4)*		
Phenols (total)		
BTEX (TPH C5-C10)		
TPH Speciated (Aliphatic / Aromatic)		
PCB		
PAH Speciated 16		

4.3 The results will be assessed against the baseline values and appropriate agreed standards. In the unlikely event of a sustained deteriorating trend in the boreholes the Environment Agency will be notified and additional monitoring and remedial controls assessed.

Ground Gas monitoring

4.4 The site has been subject to baseline gas. For details, refer to the Landfill Gas Risk Assessment. The potential for landfill gas to be generated in significant quantities, to pose a risk to nearby properties is considered low.

4.5 After restoration phase is completed, in-waste monitoring probes will be installed into the waste deposit. The post restoration monitoring points will be installed at a frequency of circa 2 boreholes per hectare.

4.6 Ground gas monitoring will be in accordance with the Landfill Gas Risk Assessment

4.7 Following 2 years of monitoring, the requirement for, and frequency of, ground gas monitoring will be agreed with the Environment Agency.

Surface water

4.8 There is no direct pathway to surface water. No surface water management or monitoring system is considered necessary. The surface drainage will be in accordance with the Surface Water Management Strategy and maintenance plans.

5.0 RISK ASSESSMENT

5.1 The post-restoration site has been assessed in the context of the baseline setting. The resulting matrix and associated mitigation is presented in Appendix B.

6.0 RECORDS

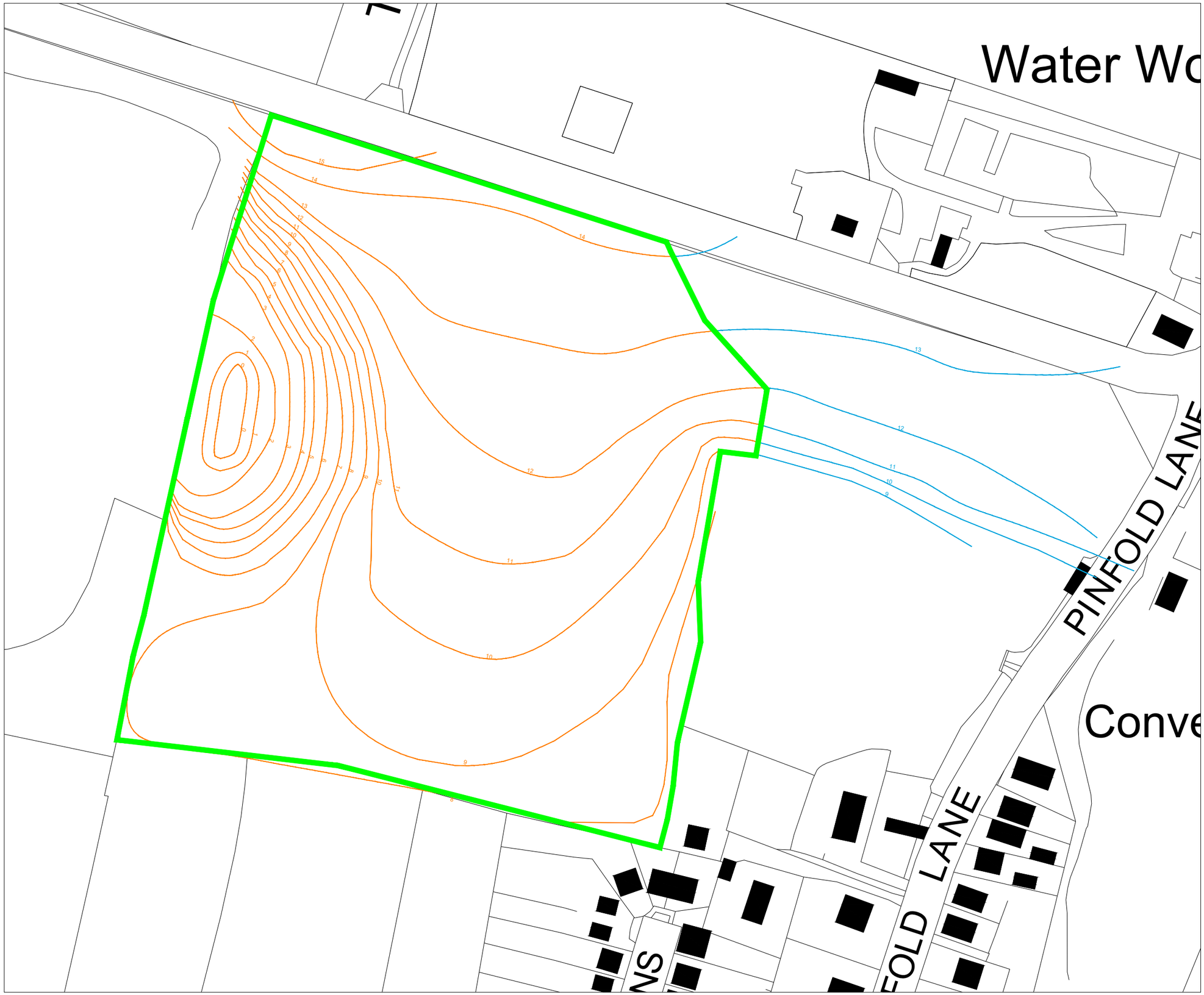
6.1 All records required by the Permit will be held by the Operator. The operator will keep all records relating to the site at the main office.

6.2 Following the completion of the restoration, all survey plans will be maintained and kept accessible.

6.3 A copy of the Permit, all management plans and the supporting documents, will be kept available on site for reference when required by all site staff carrying out work under the requirements of the Permit.

6.4 The CAP will be reviewed at least every four years. Other triggers for the review of the plan would include any proposed changes to the phasing of the landfill.

Drawings



Key:

- Permit Boundary
- Restoration Contours
- Restoration Contours (Non-Waste Activity - not relevant to the landfilling operations.)

Rev.	Details	Drawn / Chkd.	Date

Project

Middleton Quarry, Pollington

Title

Restoration Plan

AA Environmental Ltd
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Scale	Date	Drg. No.	Rev.
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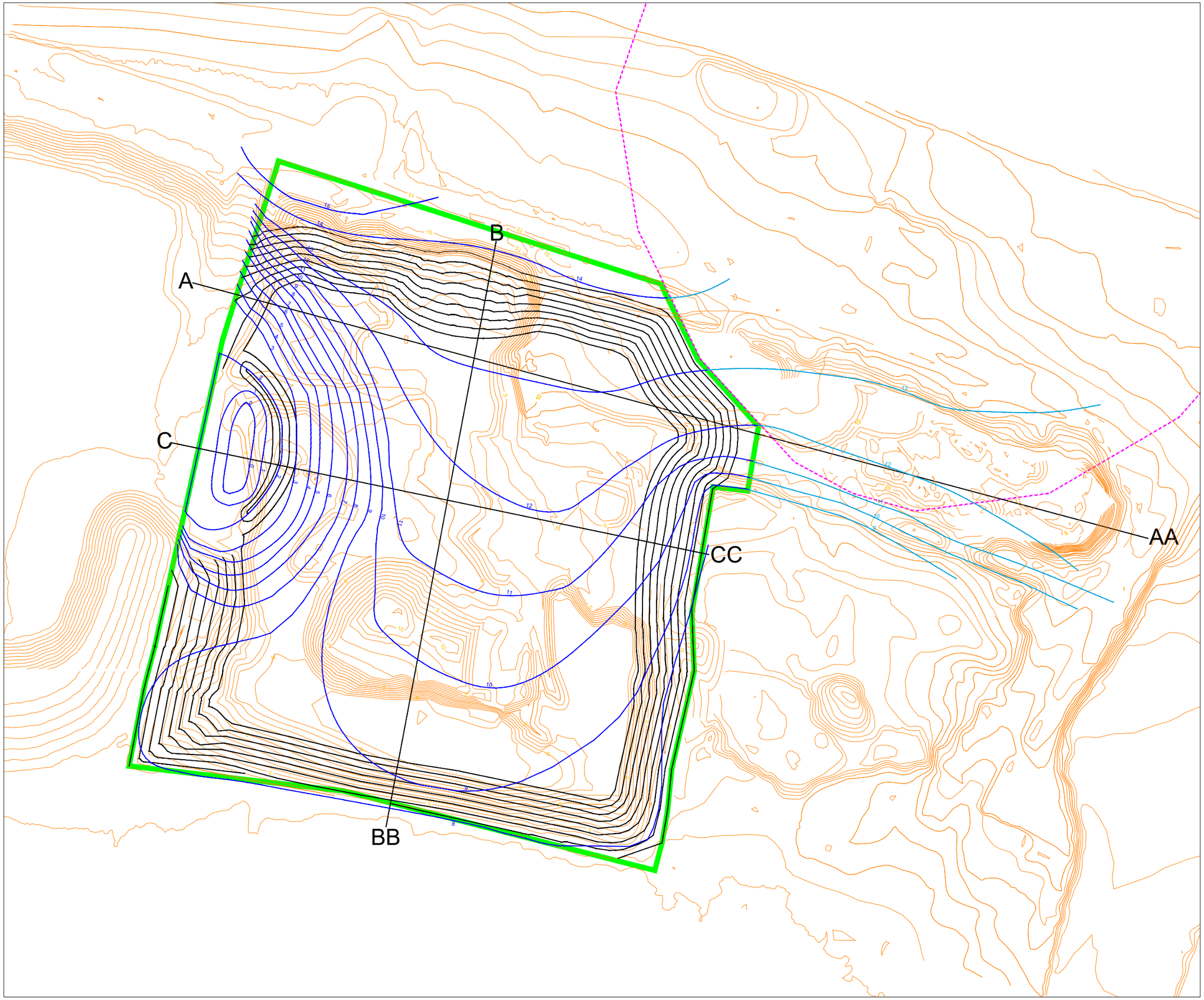
Drawn	Chkd.
KW	EB



Key:

- Site Boundary
- Source Protection Zone 1
- Existing Contours (m AOD)
- Geological Separation Layer Contours (m AOD)
- Restoration Contours (m AOD)
- Restoration Contours (Non-Waste Activity - not relevant to the landfilling operations)
- A——AA Section Line

Rev.	Details	Drawn / Chkd.	Date

Project

Middleton Quarry, Pollington

Title

Cross-Section Overview Plan

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Scale	Date	Drawn	Chkd.	Drg. No.	Rev.
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Vert. 1:500

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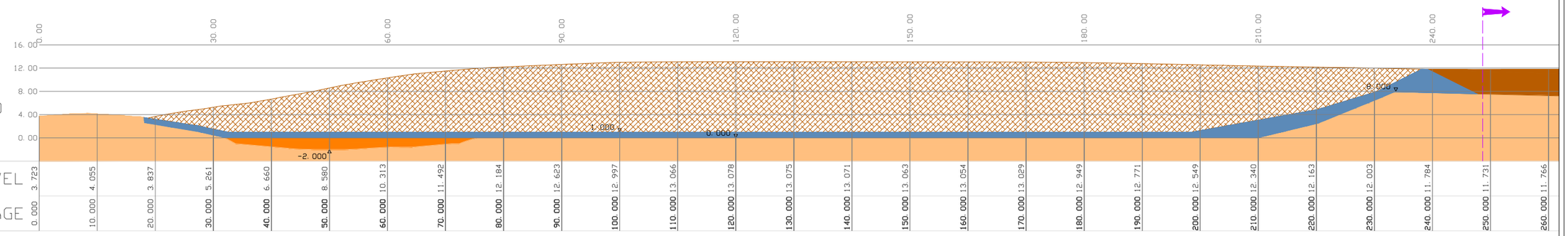

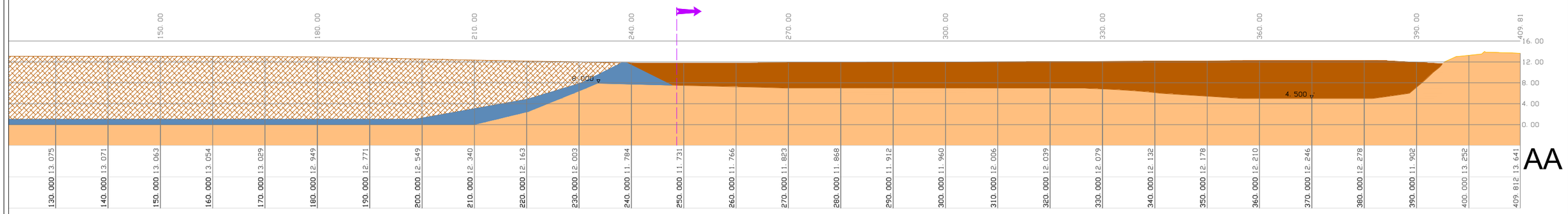

Key:

- Source Protection Zone 1
- Sandstone
- Clean Natural Arising Fill Material
- Geological Separation Layer
- Inert Waste
- Clean Natural Arising Fill Material - non-waste activity and not relevant to the landfilling operations

Rev.	Details	Drawn / Chkd.	Date

Project

Middleton Quarry, Pollington

Title

Cross-Section Plan
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Scale	Date	Drg. No.	Rev.
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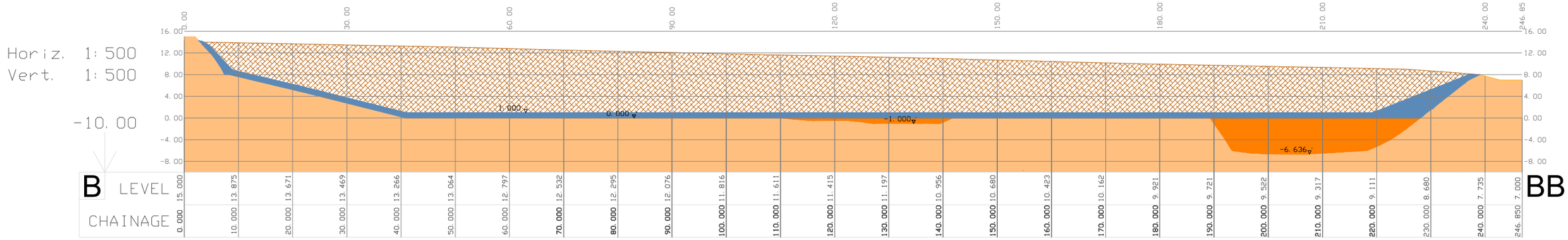

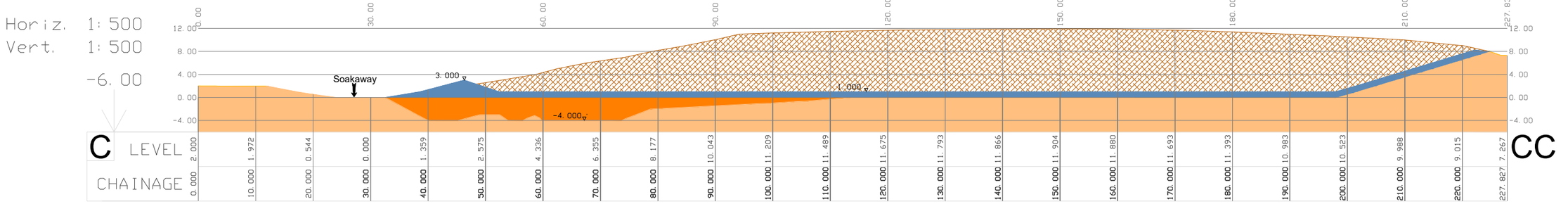

Key:

- Sandstone
- Clean Fill Material
- Geological Separation Layer
- Inert Waste

Rev.	Details	Drawn / Chkd.	Date

Project

Middleton Quarry, Pollington

Title

Cross-Section Plan
B-BB & C-CC

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Scale	Date	Drg. No.	Rev.
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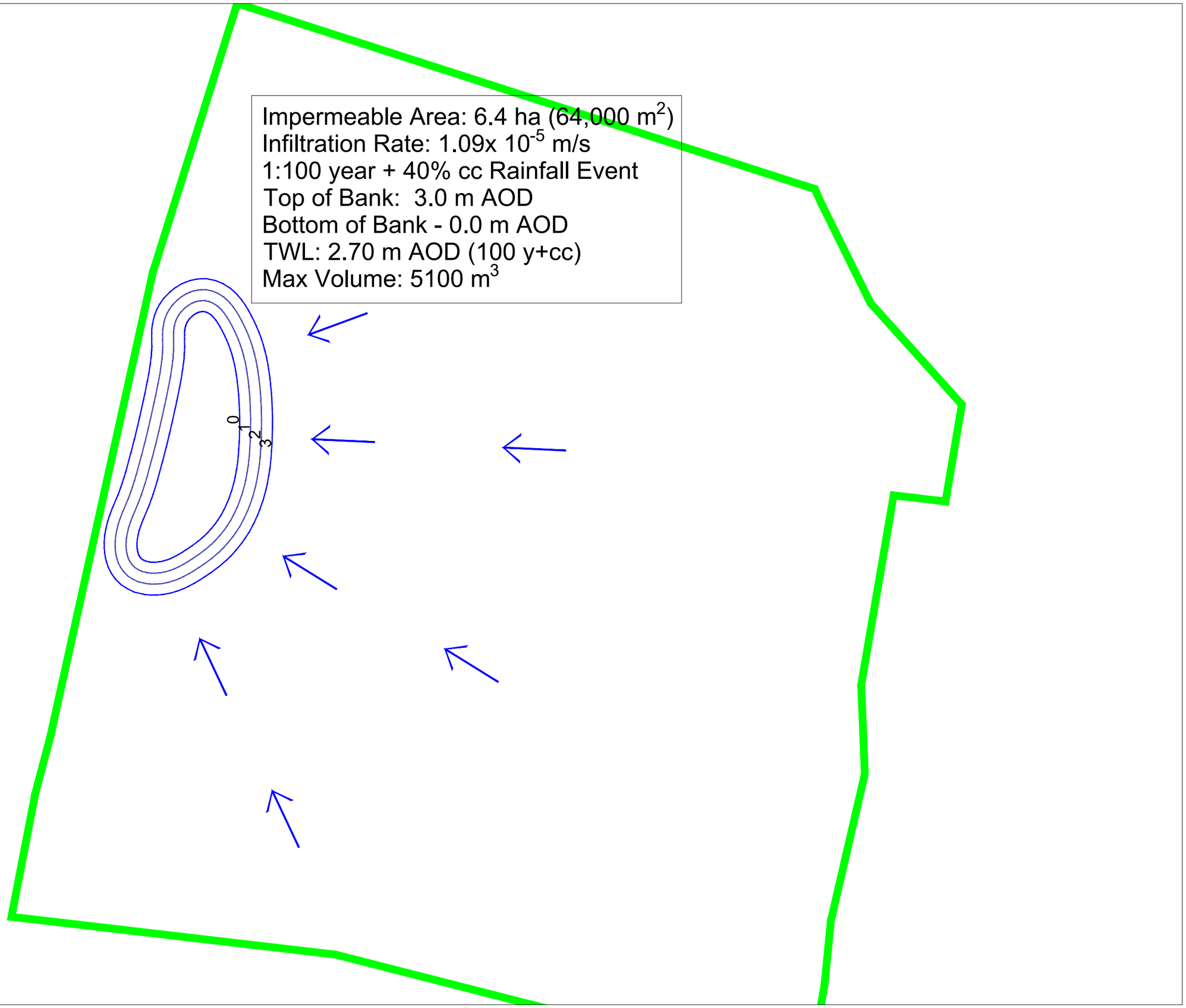
Drawn	Chkd.
KW	EB



Key:

Permit Boundary

Overland Flow

Rev.	Details	Drawn / Chkd.	Date

Project

Middleton Quarry, Pollington

Title

Drainage Plan

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Scale	Date	Drg. No.	Rev.
1:1,000@A3	Jul'24	163407/D/008	

Drawn: KW Chkd.: EB

Appendix A
TESTING REQUIREMENTS

A.1 *Waste acceptance& groundwater protection*: To demonstrate acceptability, all materials will be tested in accordance with Table A1.

Table A1. Waste Acceptable Criteria

Determinant	WAC Leachate Criteria (LS=10l/kg) (mg/kg)	Solid results (mg/kg)	Notes
Arsenic (total)	0.5		
Barium (total)	20		
Cadmium (total)	0.04		
Chromium (total)	0.5		
Copper (total)	2.0		
Mercury (inorganic)	0.01		
Nickel (total)	0.4		
Lead (total)	0.5		
Molybdenum (total)	0.5		
Antimony (total)	0.06		
Selenium (total)	0.1		
Zinc (total)	4.0		
Chloride (total) [1]	800		
Fluoride (total)	10		
Sulphate (as SO4) [1]	1000		
Phenol (total)	1.0		
TDS[1]	4000		
DOC	500[2]		
TOC		3% w/w[2]	
BTEX (TPH C5-C10)		6	BTEX concentration must not exceed the soils total value
TPH Speciated (Aliphatic / Aromatic)		500	Speciated TPH concentrations must not exceed soils total value
PCB		Not permitted	
PAH Speciated 16		100	Speciated 16 PAH concentration must not exceed soils total value
VOC / SVOC / Pesticides / Herbicides	To be considered and extended as appropriate based on knowledge of the source material. If found to be present (above the limit of detection), a quantitative risk assessment should be carried out to determine thresholds for identified contaminants which are protective of Controlled Waters. No import permitted until a revised standard has been agreed with the Environment Agency.		
Notes 1. The values of TDS can be used instead of Cl or SO4. 2. TOC may be superseded by DOC. TOC, LOI & DOC will not apply to soils used in the restoration			

A.2 *Human health assessment*: All soils within the top 0.5 m of the restoration must meet the human health limits as defined in Table A3; as well as the standards in A1. The standards are based upon the public open space (residential) values available from the Environment Agency, DEFRA Level 4 Screening Values and LQM/CIEH Generic Assessment Criteria. Cyanide level has been set at the Atrisk residential cyanide limit.

Table A2. Human Health Criteria

Parameter	Human Health limit (top 1 m) (units mg/kg)	
Arsenic	79	
Cadmium	120	
Cyanide (total)	34 (Atrisk Soils – Residential Threshold)	
Chromium VI	7.7	
Chromium	1500	
Copper	12000	
Lead	630	
Inorganic Mercury	120	
Nickel	230	
Selenium	1100	
Zinc	81000	
Aliphatic (5-6)	570000	TPH limited to 500 mg/kg total
Aliphatic (6-8)	600000	
Aliphatic (8-10)	13000	
Aliphatic (10-12)	13000	
Aliphatic (12-16)	13000	
Aliphatic (16-35)	250000	
Aliphatic (35-44)	250000	
Aromatic (5-7 benzene)*	72	
Aromatic (7-8 toluene)	56000	
Aromatic (8-10)	5000	
Aromatic (10-12)	5000	
Aromatic (12-16)	5100	
Aromatic (16-21)	3800	
Aromatic (21-35)	3800	
Aromatic (35-44)	3800	
Naphthalene	4900	PAH limited to 100 mg/kg
Acenaphthene	15000	
Acenapthylene	15000	
Fluorene	9900	
Anthracene	74000	
Fluoranthene	3100	
Phenanthrene	3100	
Pyrene	7400	
Benzo(a)anthracene	29	
Chrysene	57	
Benzo(b)fluoranthene	7.1	
Benzo(k)fluoranthene	190	
Benzo(ghi)perylene	640	
Benzo(a)pyrene	5.7	
Dibenzo(ah)anthracene	0.57	
Indeno(123-cd)pyrene	82	
Total Phenol	760	Limited to 1 mg/kg

A.3 *Sub-soil and topsoil characteristics*: All soils within the top 0.5 m must meet the multi-purpose parameters as defined in Table A3, in accordance with BS 8601 and BS3882. This is to ensure potential phytotoxic elements are not present in the soil.

Table A3. Topsoil and sub-soil characteristics

Potentially phytotoxic elemtns (by soil pH) (mg/kg dry solids)	**Multi purpose and specific purpose subsoils**		
	Soil pH < 6	Soil pH 6 - 7	Soil pH > 7
Zinc (Nitric acid extractable	< 200	< 200	< 300
Copper (Nitric acid extractable)	< 100	< 135	< 200
Nitrogen (Nitric acid extractable	< 60	< 75	< 110
Other Contaminants			
< 2 mm	< 0.5%. Not applicable in areas fenced off from public access.		
sharps	0 in 1 kg air dried soil. Sharps <0.5 %. Not applicable in areas fenced off from public access.		

Appendix B
Risk Assessment

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
Odour	Residential within 20 m to the south.	Nuisance and loss of amenity value.	Atmospheric (fugitive). Air transport then inhalation.	Low	Medium	Medium	Waste types placed will predominantly be from construction sites and will not include odour generating wastes (putrescible waste).	Controls on the type of waste streams accepted. Waste will be capped by a 0.50 m restoration soils.	Very Low
Ground gas	Residential within 20 m to the south. The surrounding land is predominantly agricultural or industrial land.	Nuisance and loss of amenity value.	Atmospheric (fugitive). Air transport then inhalation.	Low	Medium	Medium	Waste types placed will predominantly be from construction and demolition activities and will not include odour generating wastes (putrescible waste).	Controls on the type of waste streams accepted. Waste will be capped by a 0.50 m restoration soils. Monitoring will be undertaken in accordance with the CAP.	Low
Noise	Residential within 20 m to the south. The surrounding land is predominantly agricultural and industrial land.	Levels of noise that cause loss of amenity and nuisance to users and residents in the locale.	Airborne.	Low	Medium	Medium	Once finished levels have been achieved, all plant machinery will demobilise from the site.	No requirement for plant machinery once closed. Area restored to public open space.	Very Low
Dust	Residential within 20 m to the south. The surrounding land is predominantly	Harm to human health, respiratory irritation and illness. Nuisance – deposition on cars.	Airborne then inhalation and/or deposition.	Low	Medium	Low	Once finished levels have been achieved, all plant machinery will demobilise from the site.	Seeding and vegetation will be undertaken to ensure no windblown mobilisation of fugitive dusts.	Very Low

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
	agricultural and industrial land. Deciduous woodland priority habitat to the east of the site. Heck & Pollington Lane < 10 m to the north								
Surface water run off		Passive leaching to ground or existing land drains, from contamination or spillages on hardstanding surface and directly entering drainage system.	Land then surface water drainage systems.	Low	High	Medium	Proposed drainage will be in accordance with 163407/D/008. Controls on the types of restored soils accepted.	All catchments will be vegetated to minimise erosion.	Low
Infiltration of surface water runoff to soakaway.	Potentially isolated and localised groundwater underlying site.	Pollution to aquifer.	Land infiltration through free draining sub soil and topsoil.	Medium	High	Low	Proposed drainage will be in accordance with 163407/D/008. Controls on the types of restored soils accepted. Controls on the types of wastes accepted – not anticipated to generate leachate.	Series of swales and an attenuation pond will be constructed to minimise overland flow and potential mobilisation of silts during construction. All catchments will be vegetated to minimise erosion. Monitoring to be in accordance with the CAP.	Low
Direct physical contact /	Human health, fauna, and flora.	Bodily harm.	Direct contact.	Low	High	High	Inert and asbestos	Waste deposit will be capped	Low

Hazard	Receptors	Harm	Pathway	Probability of Exposure	Consequence	Magnitude	Justification	Risk Management	Residual Risk
exposure to waste deposit							containing waste will be sealed beneath a clay cap. Breaking pathway for asbestos containing material . to potentially cause risk to human health.	by 0.5 m of restoration soils. Restoration soils will comply to Appendix A of the CAP.	
Loss of stability	Humans and livestock.	Bodily harm to humans or livestock. Loss or damage of geological strata.	Slippage of waste and restoration soils mass.	Low	High	High	All waste and restored soils will be compacted upon placement to minimise void space.	Once placed and compacted, the areas will be seeded / vegetated as soon as practically possible. A topographical survey will be undertaken every 2 years before surrender to monitor mass movement.	Low