FCC ENVIRONMENT LIMITED

SPECIFICATION FOR LEACHATE WELL DRILLING OF LMW4NBR at PWLIFAWATKIN LANDFILL SITE

Document Reference: WR7981/01/02 Rev 1
October 2023

Project Quality Assurance

Report Reference : WR7981/01/02 Rev 1

Report Date : October 2023

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Rev	Date Issued	Amendment Details	Author	Reviewer
0	31/08/2023	Issued to FCC for review	IY	AC
1	13/10/2023	Additional text inserted into Section 3.7 regarding well bentonite seal.	IY	AC

Purpose

This document was prepared as a Specification for the Retro-Drill Leachate Well Drilling of LMW4NBR at Pwlifawatkin Landfill Site for FCC Environment. Sirius Environmental Ltd accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

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1 GENERAL REQUIREMENTS

1.1 Introduction

FCC Environment (FCC) are seeking to retro drill LMW4NBR leachate well at Pwlifawatkin Landfill Site.

Sirius Environmental Ltd has prepared a detailed Specification for the retro drilling works. FCC will appoint a third party independent Construction Quality Assurance (CQA) to provide supervision for the duration of the drilling and well installation works on FCC's behalf. A representative of the CQA Manager, the CQA Inspector, shall supervise the works and shall advise the Contractor with regard to the onsite and off-site testing requirements if required.

The Construction Quality Assurance Plan and Specification for the leachate retro drilling works to be undertaken has been prepared in accordance with the Environmental Permit.

This document, when read in conjunction with the CQA Plan WR7981/01/01 Rev 0 details the requirements for the leachate drilling and installation works to be undertaken by the Contractor and the quality control procedures that will be followed during the works by the CQA Inspector to demonstrate that the works have been undertaken in accordance with the Specification.

1.2 Facilities

1.2.1 Contractor's Compound

The location and layout of the Contractor's compound shall be agreed with FCC prior to commencement of any works on site. The Contractor shall submit his proposals to FCC for mess facilities, plant standing, and maintenance areas. The Contractor shall site his plant standing, maintenance and refuelling areas so that no pollution will occur. The Contractor shall also take into account the storage and mess requirements of his sub-contractors, if appropriate.

No lodgings or caravans will be allowed on site.

The Contractor shall ensure that adequate provision is made within the compound area for parking of all the plant, equipment and any private vehicles owned by operatives/subcontractors and visitors. Parking will be permitted in any other areas of the landfill site.

The Contractor shall be responsible for the security of the works, all the Contractor's offices, plant, materials, services and machinery.

1.2.2 Contractor's Offices and Welfare Facilities

The Contractor shall be responsible for the provision and maintenance of welfare facilities for himself and any sub-contractors. These facilities shall be as prescribed in the Working Rule agreement published by the Civil Construction Conciliation Board for Great Britain. The sanitary accommodation and disposal arrangements shall comply with the requirements of the local Environmental Health Authority. The Contractor's personnel shall not be permitted access to FCC's mess, shower and toilet facilities.

1.2.3 Fuel and Oil Installations

The Contractor's fuel and oil installations within the site shall only be provided at locations approved by FCC, such approval not to be unreasonably withheld or delayed.

All fuel and oil installations provided by the Contractor shall be contained within an impermeable bund capable of containing 110% of the tank capacity in the event of a spillage; 'self-bunded' items will be permitted, subject to the Contractor being able to substantiate their efficacy.

The Contractor shall designate an area within his compound for carrying out plant maintenance and repairs. The Contractor shall ensure that all routine maintenance and repairs take place within this area. Any fuel or oil spillages will be remediated and a safe and controlled manner by the Contractor and at his expense.

1.2.4 Facilities for CQA Inspector (If required)

Where required, the Contractor shall provide, service and maintain one high-security steel ISO container, or as otherwise provided for, for the sole use of the CQA Inspector within the agreed location of his compound, subject to the approval of the CQA Inspector, which shall not be unreasonably delayed or withheld. The Contractor shall ensure that the container is provided with power supply, sufficient electricity power sockets, electric lighting and space heating, such that it will be ready for use by the CQA Inspector on the first day that CQA work is required. The Contractor shall be responsible for the maintenance of these facilities throughout the duration of the works.

All keys for the CQA Inspector's facilities shall be handed to the CQA Inspector.

1.3 Landfill Leachate Management Systems

FCC has installed landfill leachate management systems across the Site. FCC shall inform the Contractor which systems are to remain undisturbed during the period of the works, and which can be, or have been, decommissioned.

Should the Contractor subsequently damage or disturb any operational system, he shall immediately inform the CQA Inspector and FCC. Only if required by FCC, the Contractor shall carry out such reasonable remedial measures as are deemed necessary by FCC to reinstate any damaged or disturbed system to the same condition as immediately prior to commencement of the works, otherwise FCC shall provide for the remediation to be completed within a timescale to be agreed with the Contractor.

1.4 PPC Permit

The area of the works is encompassed by the existing Permit (PPC) for the current landfill operations. The Contractor shall not directly or indirectly compromise FCC's ability to carry out its operations in accordance with the PPC Permit, a copy of which shall be provided by FCC on request.

2 CONSTRUCTION REQUIREMENTS

2.1 Regulations and Site Safety

The works come under the Construction (Design and Management) Regulations of 2015 and the Main Contractor will also be appointed as the Principal Contractor.

The Contractor shall comply with the safety requirements set out in the following documents:

- FCC - Health and Safety Policy;
- FCC - Site User Safety Instructions;
- FCC - General Policy Statement for Contractors Conditions of Contract and Safety Rules;
- FCC - Health & Safety Site Plan.

A copy of these documents is available for inspection at the landfill site office.

The Contractor shall adhere to the site Health and Safety Rules and the DSEAR Regulations dated 2002. The Contractors performance with respect to these rules will be reviewed at each progress meeting.

2.2 CDM Area

The extent and location of the CDM area shall be agreed with FCC prior to any works commencing on-site, and ‘works’ shall include the delivery of any plant, equipment, materials and/or accommodation.

The agreed area shall be demarcated on site and once demarcated, the Principal Contractor shall ensure that the requirements of the CDM Regulations 2015 are adhered to at all times within it.

2.3 CQA Plans and Risk Assessments

The Contractor shall submit to FCC for the approval, prior to commencement of the works, CQA Plans and risk assessments detailing the proposals for all the works to be undertaken.

2.4 Substances Hazardous to Health

A substance hazardous to health shall only be used or generated in or about the works where specified in the Contract or with the consent of the CQA Inspector.

Where any substance hazardous to health is so used or generated during the works the Contractor shall provide the CQA Inspector with:

- A copy of the assessment of the risks created by the use of that substance; and
- Details of the measures to be taken to prevent or adequately control the exposure of the persons working with or those who may be affected by the substance.

The information required in the above shall be provided to FCC at least 14 days prior to the use of or incorporation into the works of substances hazardous to health or where appropriate at the commencement of the works where this is less than 14 days.

The Contractor shall advise FCC of the information, instruction, training and supervision to be provided for the Contractor's personnel and any other person likely to enter the area in which the hazard exists. The Contractor is to ensure that provision is made for monitoring health.

Where the measures referred to necessitate the use of protective clothing or other safety apparatus the Contractor shall:

- Provide FCC and his staff with sufficient and suitable items of protective clothing and safety apparatus if not previously supplied;
- Arrange for the proper storage, maintenance and regular testing and replacement of the items provided to the Employer and his staff; and
- Arrange for appropriate training or instruction for FCC and his staff in the use of such items.

2.5 Noise

The Contractor shall comply with any site specific noise limits and the following specific requirements:-

- No work other than the operation of plant and equipment for the control of the groundwater shall take place outside the permitted hours except in case of emergency. FCC shall be informed of any such emergency immediately.

- All mobile plant, equipment and vehicles under the control of the Contractor, his sub-Contractors and suppliers, and in use or calling at the site, shall be fitted with appropriate silencing equipment and shall be maintained to manufacturers' standards.

2.6 Naked Flames and Smoking

Naked flames are prohibited within the working area on site at all times. Smoking will only be permitted in areas approved by FCC.

The Contractor shall obtain a permit to work from FCC for any 'hot works'. The works are to be carried out away from the landfill area and at a location agreed with FCC.

2.7 Mobile Plant

All Contractors vehicles (plant and operatives vehicles) shall be fitted with flashing amber beacons for vehicle awareness. Green flashing beacons to indicate that seat belts are in operation shall also be fitted to all construction plant. These beacons shall be located in a visually prominent position and shall be used whenever vehicles are on site. No Contractors vehicles will be allowed on site without the use of a flashing amber beacon.

All mobile plant shall be assessed for restricted rear view vision and action agreed, dependent upon the outcome of this assessment, which may result in suitable equipment being fitted in order to minimise the potential risk to within acceptable limits.

2.8 Dust Nuisance

The Contractor shall take all necessary steps to eliminate the generation of dust nuisance during the works.

Existing highways, site and access roads used by the vehicles and plant of the Contractor or of his sub-Contractors or suppliers of materials, shall be kept clean and clear of all dust and mud dropped by the vehicles in any form. All dust and mud from the works spreading onto highways, site and access roads shall be immediately cleared by the Contractor by use of mechanical plant to the approval of FCC.

Compliance with this clause shall not relieve the Contractor of any responsibility for complying with the requirements of any Highway Authority in respect of keeping roads clean.

2.9 Communication Systems

The Contractor shall obtain the approval of FCC prior to the commissioning of any communication equipment and, following approval, shall ensure that it does not interfere with any existing systems on the site.

2.10 Access

The general arrangement of the site is shown on the respective site layout drawings. The only entrances to the works for the use of the Contractor are via the main site entrance, no other site entrances are to be used unless stated in the Specification. Areas for site offices, welfare facilities and plant standing areas will be arranged with FCC.

The main access road is to be kept clear at all times, as it will be used primarily by FCC's operations traffic.

The specified speed limits within the landfill site shall be observed at all times. Non-compliance may result in the exclusion of any offender from the site.

All vehicles leaving the site must be free from mud and debris. The Contractor will be responsible and will pay for the removal of debris and any damages arising from mud and debris that leaves the site as a consequence of the works.

Working on Sundays and Bank Holidays will not be allowed unless approved beforehand by FCC.

2.11 Control of Leachate

The Contractor shall carry out all necessary operations for the control of leachate, within the CDM area to enable the construction of the works, and by doing so shall prevent damage to the works, the site, or adjoining properties. Where these actions include measures to prevent the in-flow of leachate from the site, these works shall be approved by FCC before commencement.

Any leachate collected shall only be discharged outside the CDM area and/or off-site following the receipt of approval by FCC.

2.12 Disposal of Exhumed Waste

In the event that it is necessary to excavate waste in order to achieve any element or elements of this Specification, the excavated waste will be disposed of in the operational area of landfill, or as otherwise directed by FCC.

2.13 Protection of Boreholes

The Contractor shall locate and adequately protect existing deep ground water and landfill monitoring boreholes within the works area from damage during the works. The location of the boreholes are to be confirmed with FCC.

2.14 Confidentiality

The whole of the Tender Documents and all information provided by FCC for the purpose of or in connection with the Contract shall be dealt with by the Contractor as confidential to him and not be disclosed by him other than to his employees, sub-contractors or agents as appropriate for the sole purpose of the Contract.

The Contractor shall not, except with the prior consent in writing of FCC:

i) Publish or advertise or permit to be published or advertised any photograph, drawing or written matter concerning the Contract or the works.

ii) Use or permit the use of the name of FCC in any publication or advertisement.

iii) Place any advertisement on any part of the works.

The Contractor shall refer all press representatives to FCC. Photographs for publication shall not be made of any part of the works without the prior written authorisation of FCC. Such authorisation if granted shall be in the form of itemised approvals for each exposure concerned.

3 SCOPE OF THE LEACHATE DRILLING WORKS

3.1 General Description

The design concepts for the drilling work and well installation works were developed to accord with the permit for the site.

Leachate well drilling works will involve

- The retro drilling of one leachate well, namely LMW4NBR;
- Installation of 244mm steel casing, the lower 3m of casing being perforated;

- Installation of a 20/40mm clean hard gravel pack too 1000mm above the casing perforations;
- Installation of a 100mm dry bentonite layer above the placed gravel pack;
- Installation of a 500mm sand layer above the dry bentonite layer;
- Installation of a 100mm dry bentonite layer above the placed sand layer;
- Installation of a hydrated bentonite seal placed above the dry bentonite layer too ground level; and
- Provision and installation and installation of a temporary flexible seal headworks by drillers, permanent headworks to be installed and connected into sites leachate management system by FCC within 7 days of well completion.

3.2 Specification

Prior to the commencement of drilling the CQA Supervisor shall identify whether active gas extraction within a 75m radius is taking place. If active gas extraction on wells is noted to be taking place, the CQA Supervisor shall inform the Client. If the Client chooses not to take appropriate action by switching the extraction off, the CQA Supervisor shall make a note in the daily diary that shall be countered singed by the Client.

The well shall be drilled through waste at a diameter of 450mm, at the location marked out by the Engineer or his surveyor as per zone definitions given below, and depths as per drilling table given below. A schematic of the installation is shown in **Appendix A**.

Waste from the drilling shall be removed to the uncapped areas of site, designated by FCC site staff, at the end of each day and covered to prevent odour. On closed site the waste will be transferred to a skip and removed from site on completion of works. An odour control system will be used if required.

If any well cannot be completed in one day, it shall be sealed overnight to prevent oxygen ingress. This is normally achieved by inserting the barrel of the drill rig into the well to a minimum distance of 2m and surrounding the barrel in hydrated bentonite.

Each well will be temporarily capped to prevent the ingress of air and foreign objects and prevent the emissions of gas prior to installation of permanent head works.

3.3 Zone Drilling Definitions

Zone 1
This is a zone where the site operator is confident that there is no possibility of the barrel penetrating the containment engineering. Standard drilling operations to be undertaken, e.g. the barrel to be removed for waste extraction when it is full, i.e. in 3m increments. A barrel auger is normally used in this zone.

Zone 2
This is a zone where there is a medium possibility of a barrel penetrating the containment engineering. To alleviate this risk, temporary steel 406mm casing (slowly being advanced into the waste mass) and a flight auger may be used instead of a barrel to drill in 300mm increments. The flight auger will be examined during clearing of waste for evidence of drainage material, flexible membrane or engineered clay liner. During drilling operations the Lead Driller will be aware of variations in the response of the rig, e.g. vibration and torque measurements, that could indicate that the casing or flight auger is no longer in waste but penetrating a drainage layer or clay.

Zone 3
This is the most critical zone where there is a high probability that a barrel could penetrate the containment engineering. To alleviate this risk, temporary steel 406mm casing (slowly being advanced into the waste mass) and a flight auger must be used to drill in 150mm increments or less. The flight auger is to be removed after penetrating 150mm of material and the waste arising to be examined during extrusion for evidence of drainage material, flexible membrane or engineered clay liner. During drilling operations the Lead Driller will be aware of variations in the response of the rig, e.g. vibration and torque measurements, that could indicate that the casing is no longer in waste but penetrating a drainage layer or clay.

3.4 Temporary Outer Casing Installation

Initial drilling will be with a 450mm barrel auger.

Once the zone 1 depth has been achieved, or it is not possible to remove any more waste with the barrel auger, the outer steel casing will be installed as per zone 2 / zone 3 procedures above

1. The barrel will be removed and 406mm outer casing will be driven into the well.
2. A smaller barrel / flight auger sized to fit through the outer casing should be used to drill out the waste at the bottom of the casing (and slightly further than the depth of the outer casing), opening a void for the outer casing to be driven into.
3. A drive head should be fitted to the outer casing and the casing drilled into the void to advance it further into the waste.
4. This process MAY be required to be repeated several times until the outer casing has achieved depth to install to the inner casing.
5. Once depth has been achieved, the outer 406mm casing will be removed.

3.5 Inner Casing Installation

The inner casing shall be inserted into the well to the bottom depth, with the bottom, slotted section fitted first followed by the plain sections. 244mm diameter steel well casing will be used to form the well. The upper section of each well shall be constructed of plain casing with height above ground as determined in the table below. Lower sections of the well shall be perforated. Perforations to give 5% open area, maximum 10mm drilled holes or slots. A welded end cap shall be installed at the base of the well casing.

3.6 Gravel Installation

The CQA Inspector shall check the depths of the stone annulus installation to ensure the correct depths are achieved by means of a dip tape.

The amount of gravel installed into the annulus will be recorded by the CQA Inspector. Gravel to be used 20-40mm or 20mm single sized non calcareous (typically less than 10%) smooth gravel. The actual will be compared to the theoretical at the time of installation.

The theoretical tonnage of gravel to be used may be calculated thus:

$((\pi r^2 (w) - (\pi r^2 (c)) \times g (l) \times 2$

(Drilled well radius (in metres) squared, multiplied by 3.14159) MINUS

(Casing radius (in metres) squared, multiplied by 3.14159) MULTIPLIED

(Required length of gravel in well (in metres) in the well) MULTIPLIED By 2(OR the known bulk density of the gravel given by the supplier)

Example: 160mm casing, 400mm diameter barrel, 10m of gravel required

Radius of well = 0.2m

(.2 x .2 x 3.14159) = 0.1256636 = area of well

Radius of casing = 0.08m

(.08 x .08 x 3.14159) = 0.020106176 = area of casing

Area of well – area of casing = (0.1257-0.02011) = 0.10556

Volume of gravel = (0.10556 x 10) = 1.0556 metres cubed of gravel

Tonnage required = 1.05 x 2 = 2.1 tonnes

The CQA Inspector will record the quantity (approximate volume) of gravel taken from a 2 tonne bucket used to load the gravel. This information will be recorded in the summary table within the validation report, and the theoretical quantity compared to the actual quantity, thus indicating the degree of well collapse or bridging incurred.

100 mm of dry bentonite, 500mm sand layer followed by another 100mm dry bentonite layer shall be installed above the gravel to minimise bleed of hydrated bentonite into the gravel.

3.7 Bentonite Installation

The hydrated bentonite seal shall be installed from the top of the sand/dry bentonite layer through the geomembrane capping layer and terminating at ground level, creating a seal through any capping material used. The CQA Inspector shall always be present to check the correct depth of bentonite fill is achieved and will check that the bentonite is fully hydrated on installation. Hydration will be undertaken by premixing the water and bentonite into a slurry before introducing it to the annulus. When pre-mixing slurry great care must be taken not to over-wet the mixture as this will result in shrinkage and slumping after installation. Approximately 2 (or more) bags of dry granular bentonite or sand should be installed on to the top of the gravel (prior to introducing hydrated bentonite) to provide an additional dry seal to prevent bentonite slurry running in to the annulus. The CQA Inspector will record the number of bags of bentonite used during the installation of the bentonite seals. Photographs of the bentonite installation will be taken, identifying well number.

3.8 Daily Journal

The Contractor will be required to keep a detailed daily journal recording the information detailed below. The Contractor will give FCC reasonable access to the daily journal which will, if necessary, be made available to FCC. The NRW or any other Authority during and after completion of the Works if required. The Contractor will forward copies of the daily journals on a weekly basis to the FCC.

This information shall be recorded in an acceptable form of daily journal which shall include the following:

- date of shift;
- names of personnel in attendance during the shift;
- weather conditions, including ambient temperature;
- type of plant used; plant breakdowns and hours;
- drilling works completed for the day including any drilling delays;
- additional works, reasons and reference;
- deliveries;
- details of meetings and other correspondence;
- details of remedial works; and
- any other relevant information.

4 DRILLING DEPTHS

4.1 Drilling Depths

Important Note – these figures in Section 4.0 are a guide only.

Table 1 – Estimated Drill depths

Proposed well	Easting	Northing	(mAOD) Ground Level.	Assumed Cell Base (mAOD)	Waste Depth (m)	Stand off (m)	Approx. Drill Depth (m)
LMW4NBR	269865.957	208962.163	190.940	158.700	32.240	0.3	31.940

Notes:

1. Confidence in basal data for the wells shows as GREEN. The base is clay, LMW4BNR has a herring bone leachate drainage system and therefore basal drainage stone may not be identified, cease drilling at target depth.
2. Wells to be surveyed in no more than 7 days before drilling operations.
3. Wells to be drilled to 0.3m above the engineered cell base, or to the top of basal drainage layer if present (no concrete target pad exist).
4. It is of paramount importance that the incremental drilling zones are adhered too at all times.

Table 2 - Casing, Bentonite and Gravel Specification

Proposed well	244mm Perf Steel Casing	244mm Plain Steel casing	Gravel	Bentonite
LMW4BNR	3.0	29.94	4.0	27.94

(All depths are given in metres). Figures take into account 1m of plain casing stick up above ground

Table 3 - Drilling Zones

Proposed well	Drilling to (m) Zone 1	Drilling to (m) Zone 2	Drilling to (m) Zone 3	Notes
LMW4BNR	0-29.940	29.940-30.940	30.940-31.940	

(All depths in metres)

Notes:

Zone 1 is standard drilling using a barrel auger (typically 3m increments)
Zone 2 is standard drilling using a flight auger with 300mm increments
Zone 3 is standard drilling using a flight auger with 150mm increments

5 REPAIR CONTINGENCY PLAN

Introduction

The retro drilling of wells in a landfill site will inevitably pose some risk to the containment engineering, as it is imperative that the borehole is located within the drainage layer but does not penetrate the liner. Every effort has been made to mitigate the possibility of drilling into basal containment system and specific contingency plans/procedures are supplied by the drilling contractor to manage and repair any potential breach of liner.

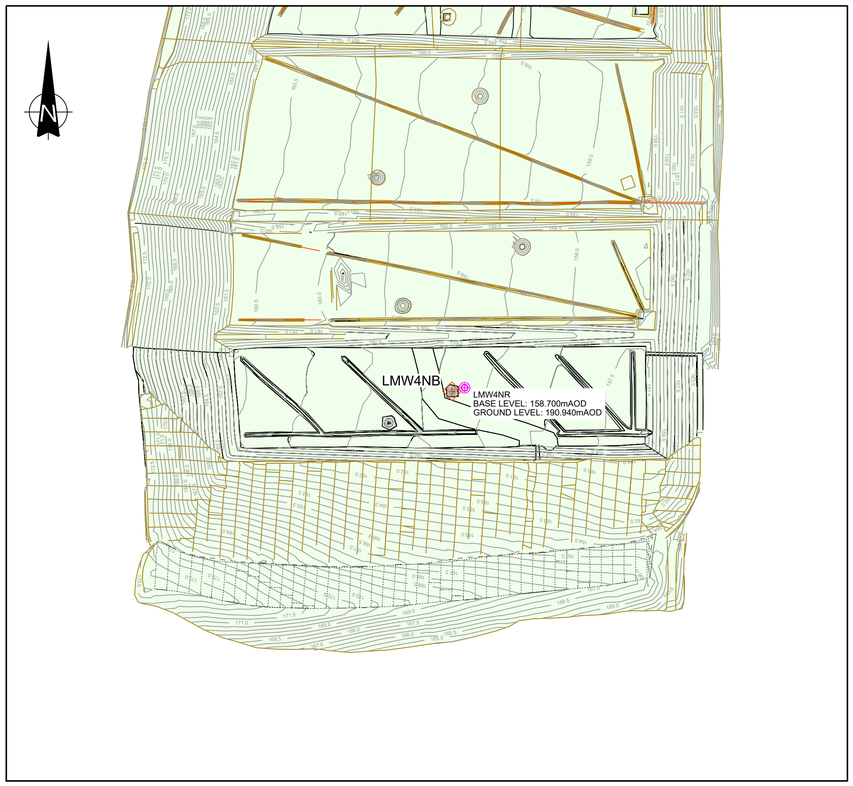
The drilling contractors detailed contingency plans are presented within **Appendix D.**

Any materials outlined within the contingency plan for the use within potential repairs should be delivered to site, and be ready use if required.

APPENDIX A
DRAWINGS

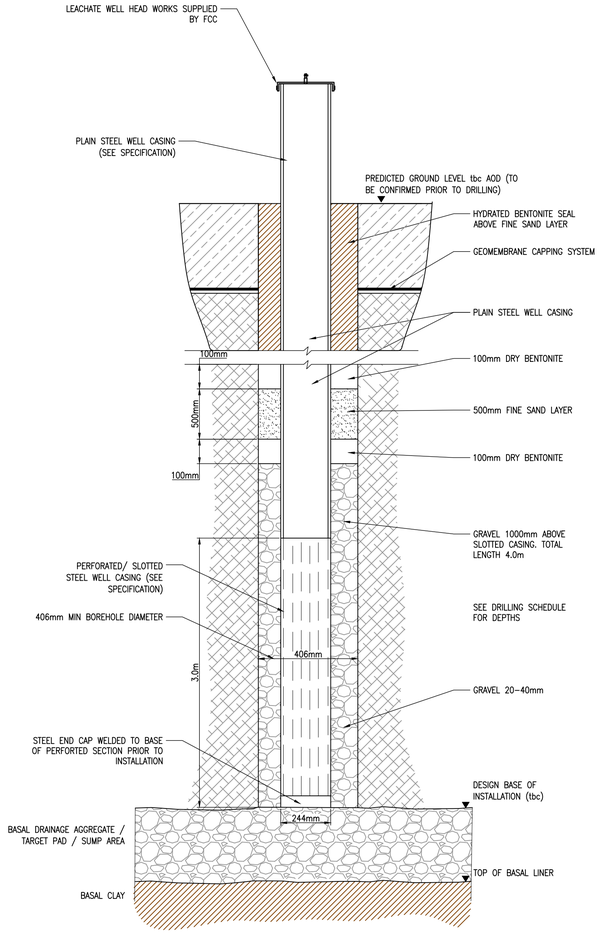
LAYOUT SHOWING PROPOSED LEACHATE WELL USING CURRENT SITE SURVEY

SCALE 1:1250



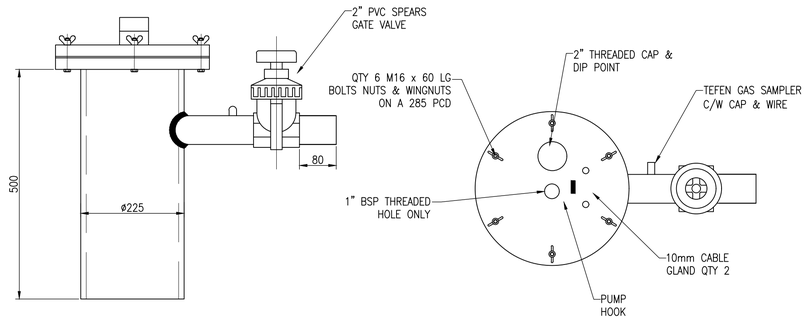
LAYOUT SHOWING PROPOSED LEACHATE WELL REDRILL INSTALLATION LOCATION OVERLAIN ON BASAL AS BUILT INFORMATION

SCALE 1:1250



PROPOSED RETRO DRILLED LEACHATE COLLECTION WELL

NTS



PUMPING & GAS WELLHEAD

NTS

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

KEY

PROPOSED REDRILL LOCATION

PIT BASE CONFIDENCE

DATA FROM IN-HOUSE SURVEYS

DATA FROM THIRD PARTY SURVEYS

NO INFORMATION AVAILABLE OR EXTRAPOLATED DATA

REV	DESCRIPTION	DATE	BY
1	INSTALLATION DETAIL AMENDED	13.10.23	MCC

CLIENT

FCC Environment

FCC Environment (UK) Limited
6 Sidings Court, White Rose Way, Doncaster. DN4 5NU

Sirius Environmental

4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

PWLLFAWATKIN LANDFILL SITE PROPOSED LEACHATE WELL REDRILL WORKS

DRAWING TITLE

LAYOUT OF PROPOSED SUMP REDRILL LOCATION AND INSTALLATION DETAILS

DRAWN	DATE	APPROVED	DATE
M.C	08/08/2023	I.Y	08/08/2023

SCALE	SHEET	DRAWING NUMBER	REVISION
As Shown	A1L	WR981/01/01	1

APPENDIX B
DRILLING SCHEDULE

PWLIFAWATKIN LANDFILL SITE
Retrodrilled Leachate Monitoring Well 2023 - CONTRACT Drilling Schedule

Borehole #	Easting	Northing	Existing Ground Level * (m AOD)	Confirmed Basal Level (mAOD)	Confirmed Basal Stand-off (m)	Target Drill Depth (m)	Required Slotted Casing (m)	Finished Casing Height Above GL (m)	Required Solid Casing (m)	Required Bentonite Grout (m)	Required Gravel Surround (m)
LMW4NBR	269865.957	208962.163	190.940	158.700	0.30	31.940	3.00	1.0	29.94	27.94	4.00
Totals						**31.940**	**3.0**		**29.94**	**27.94**	**4.00**

Notes
***Depths to be Confirmed Prior to Drilling, no greater than 7 days from drilling commencement**
Site Base Level : Varies
Drill Hole Diameter : 450mm Minimum
Well Casing Material : Steel
Well Casing Outside Diameter : 244mm
Well Casing Standard Diameter Ratio : n/a; thickness = 12mm
Slotted Well Casing Open Area : 5%
315mm x 12mm Spreader Plate to be Fitted to Base of Well
Stone surround : 20-40mm Hard Clean Gravel

APPENDIX C
CQA PROFORMAS

Materials Received

Site:		**Sheet No:**	
CQA Engineer:		**CQA Plan Ref:**	

Delivery Date	Material Description & Number of Units	Dimensions (mm/m) L x W x D Weight (Kg)	MQC Data, (If Required) & Date:	Visual Inspection

Daily Site Record Sheet

Date:		Site:	
Weather:		CQA Plan Ref:	

Visitors to Site:	

List of Plant	Hours of Operation	Comments

Prepared by:		Signed:	

APPENDIX D
BASAL LINER PERFORATION EMERGENCY ACTION PLAN

CONTINGENCY ARRANGEMENTS FOR SEALING OF

CONTAINMENT ENGINEERING IN THE EVENT OF

LINER PERFORATION DURING DRILLING OPERATIONS

Introduction

The retrodrilling of leachate wells in a landfill site will inevitably pose some risk to the containment engineering, as it is imperative that the borehole is located within the drainage layer but does not penetrate the liner. The drainage layer would normally be 300mm thick and referral to as built drawings, and survey levels should be undertaken prior to drilling operations commencing.

The method statement and environmental risk assessment contain procedures which minimise the chance of liner perforation. This document is intended to be a written contingency plan for immediate implementation should liner perforation occur.

1. Mobilisation and Setup

1.1 Prior to the commencement of drilling the following, additional, items will be located in the immediate vicinity of the drilling rig:-

i) Bentonite, at least 4 bags

ii) 4 bags of Portland cement

iii) Plunger tool

2. Liner Identification

2.1 Drilling operations in the vicinity of the liner would be carried out in accordance with zone 2 or zone 3 procedures, in the method statement, as

agreed with the Environment Agency (EA). Consequently the Flight auger will be advanced in 300mm or 150mm increments.

2.2 It is anticipated that, if a FML liner has been perforated, that a section of the liner will be recovered to the surface along with waste, conditioning agent if being used and possibly clay. The material will be inspected by the Lead Driller and CQA Engineer for confirmation that the material recovered is a section of the liner.

2.3 If the Lead Driller and CQA Engineer are of the opinion that the material is containment engineering then drilling operations will be immediately suspended.

2.4 The CQA Engineer will notify the client, Dragon Drilling and the EA that there is a possibility that liner has been perforated and that the repair contingency plan has been activated.

3. Repair Contingency Plan

3.1 The Ø406mm steel casing will have penetrated the FML and be embedded into the underlying strata, which may be clay. The steel will form a seal with the surrounding strata, which will limit leachate migration through the perforation.

3.2 A bentonite/cement mix will be prepared in the bentonite mixer, comprising two bags of bentonite and two of Portland cement.

3.3 On completion of hydration and thorough mixing, a procedure that would normally take less than 5 minutes, the mix will be poured into the steel casing.

3.4 The plunger tool will be attached to the drill head using drilling rods. The plunger tool is a circular steel plate with a rubber edge seal which ensures intimate contact between the plunger tool and the wall of the steel casing. The tool has a flap valve which is closed when the tool is lowered into a liquid and opens when the tool is withdrawn.

3.5 By lowering the plunger tool into the steel casing, using the drill head, the bentonite/cement will be delivered directly to the perforation under pressure. This will displace any leachate contained in void spaces and enable the bentonite/cement to permeate into voids that may be present.

3.6 The volume of bentonite/cement added will be approximately 200ltres. The ID of the steel casing will be Ø380mm and the theoretical depth of the plug will be approximately 1.8m.

3.7 The plunger tool will then be disconnected from the drill head and the weight of the plunger tool and drilling rods will maintain pressure on the bentonite.

3.8 The casing connector will then be used to connect the drill head to the top of the Ø406mm steel casing. The steel casing will be withdrawn by 150mm and the bentonite will enter any voids due to pressure caused by the weight of the plunger tool.

3.9 After a period of 30 minutes the steel casing will be withdrawn by a further 300mm allowing the bentonite/cement plug to be in contact with the surrounding waste.

3.10 Depending on the amount of bentonite that has been injected into the perforation, and surrounding waste, further bentonite/cement may be added to the borehole after the plunger tool has been fully removed. The flap valve on the tool will open on the upward movement of the tool preventing a vacuum condition.

3.11 The steel casing will continue to be removed, in 300mm increments every 30 minutes, with the addition of further bentonite if necessary until the casing has been retracted by at least 1000mm.

3.12 Review of the situation will be undertaken by the client, Dragon Drilling, the CQA Engineer and the EA regarding the removal of the steel casing and addition of further bentonite and cement.

G.K. Ellison
Dragon Drilling (Landfill) Limited
01/01/2019

APPENDIX E
ON-SITE DRILLING - AGREEMENT OF LEVEL DATA

Project;	
Site;	
Date;	
FCC Responsible Manager	
CQA Consultant	
FCC Regional Surveyor	
CQA Engineer	
Drilling Contractor	

Peg	Easting *	Northing *	FCC SSES Base Level mAOD **	Ground Level mAOD ***	Min Stand Off from SSES m ****	Drilling Depth mbgl *****	Base Level of well mAOD******
1							
2							
3							
6							
Etc							

* Easting, Northing and ground level of proposed Wells surveyed and supplied by;			
Survey/Drawing Ref;		Date:	
No Days before drilling commences;			

** FCC to define nature of SSES “Base Level mAOD”			
Survey/Drawing Ref;		Date:	

**** Minimum stand off from SSES to be set by the CQA Consultant given to the FCC’s Responsible Manager/Drilling Contractor through the CQA plan.

***** & ****** CQA Consultant to calculate drilling depths and base of wells proposed, using the information supplied above to be verified by FCC Regional Surveyor.

Signed By:	Print:	Sign:	Date:
FCC Responsible Manager			
FCC Regional Surveyor			
CQA Consultant			