ENGINEERING
ENVIRONMENTAL
HEALTH & SAFETY

Infinis Energy Services Ltd.

Chirk Landfill Site

Retro Drilling of Gas Wells

Construction Quality Assurance Plan

April 2015

5474

Infinis Energy Services Ltd.

Chirk Landfill Site

Retro Drilling of Gas Wells

Construction Quality Assurance Plan

April 2015

Prepared for

Infinis Energy Services Ltd.

Prepared by

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Document Review

Version No.	Date of Review	Prepared By	Reviewed By	Approved By
1.0	29.04.2015	Richard Furniss	Nigel Cooper	Richard Furniss

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DEFINITION OF TERMS

'Directed' means an oral or written confirmation that an action by the Contractor under the Specification is to be carried out

'CQA' Construction Quality Assurance

'NRW' Natural Resources Wales

'Verify' confirm orally or in writing that an action has been performed in accordance with the CQA Plan

'Record' writing/drawing in an approved format as evidence of work carried out

'Works' the permanent works as shown on the contract drawings

'Agree' agree details orally or in writing before an action is carried out

PARTIES AND RESPONSIBILITIES

There are five parties involved in the development works outlined in this document, and these are:

The Permit Holder – FCC Environment Ltd.

This is the person or company for whom the Works are constructed.

The Main Contractor – Infinis Energy Services Ltd.

This is the person or company appointed by the Permit Holder to execute the construction of the Works. He will be responsible for all matters relating to the site including temporary works, working areas and site safety. The Main Contractor will appoint an Agent who will be responsible for the site and will receive instructions from the Permit Holder and liaise with the CQA Inspector in so far as this is required under the CQA Plan.

The Sub Contractors –

Drilling Works – Magpie Environmental Drilling Ltd.

This is the persons or companies appointed by the Main Contractor to execute the construction of the Works. He will be responsible for the Retro Drilling and subsequent installation works. All drillings operatives shall hold the relevant British Drilling Association (BDA) accreditation. Copies of this certification shall be made available by the Drilling Contractors on request.

Pipework Welding Works – TBC.

This is the persons or companies appointed by the Main Contractor to execute the butt fusion welding portion of the Works. He will be responsible for the butt fusion welding of the HDPE well casing. All welding operatives shall hold the relevant certification for butt fusion welding. Copies of this certification shall be made available by the Welding Contractors on request.

The Designer – Infinis Energy Services Ltd.

This is the person or Company appointed by the Permit Holder to undertake the design of the works, specifically the drilling depths.

The CQA Inspector – Egniol Environmental Ltd.

This is the independent person or company appointed by the Main Contractor to confirm the work carried out by the Main Contractor is in accordance with the CQA Plan. He will be responsible for keeping site records of the Works, verifying the methods of construction used. He shall liaise closely with NRW, the Permit Holder and the Main Contractor and take a proactive approach to matters that may affect the construction and performance of the Works. The CQA Inspector may delegate his duties and responsibilities to representatives on site. The CQA Inspector or any delegated representative shall be approved by NRW prior to their supervising of any works.

1.0 INTRODUCTION

1.1 Description of Works

This CQA Plan appertains to the following works at Chirk Landfill Site. The proposed works include the following activities:

- Installation of 15no. Landfill Gas Extraction wells by means of Retro Drilling in accordance with Table 1 below.

Of the 15no. wells, 5no. are to be installed to capped and restored areas of site with the remaining 10no. to be installad to areas of uncapped waste. All works are to be carried out in accordance with this CQA Plan and FCC Environment Ltd.'s document "*IMS-3-02-LNF*: *On Waste Drilling Procedure"*.

1.2 Supervision

The Sub Contractor is required to have full-time supervision on site whilst any activities are being undertaken. Third party independant experienced CQA personnel will be present on site for all the drilling works to verify the Works are constructed in accordance with this CQA Plan. NRW will be informed 48 hours prior to Works commencing.

The CQA Inspector will compile a daily log of site activities. The log will be kept on site in a notebook during the Contract and will be incorporated into the Validation Report upon completion of the Works. This log will include:

i Weather conditions
ii Site Hours (Time on/off site)
iii Ground level to top of drill location
iv Depth of Drill (Record Sheet)
v Type and depths of waste
vi Drilling machinery employed inside hole
vii Lengths of individual pipework installed
viii Depth of stone installed
ix Depth of bentonite seal installed

1.3 Surveying

The proposed locations and details of each well to be installed are shown in Table 1 overleaf:

Table 1 - Proposed Locations and Drill Depths.

Infinis Well I.D.	Easting	Northing	Ground Level (mAOD)	Base Level (mAOD)	Level Difference (m)	Stand Off from Base (m)	Proposed Drill Depth (m)
PW73R*	329316.438	341760.504	79.385	41.596	37.789	3.789	34.0
PW91R	329292.911	341774.383	80.644	39.141	41.503	3.503	38.0
PW93R	329273.343	341789.735	81.184	44.149	37.035	3.035	34.0
PW21R	329185.988	341773.062	90.406	40.24	50.166	3.166	47.0
PW010R*	329128.27	341816.131	84.521	47.469	37.052	3.052	34.0
PW17R2	329118.999	341734.919	90.186	42.77	47.416	3.416	44.0
PW43R	329167.542	341692.086	89.673	42.521	47.152	3.152	44.0
PW25R2	329158.251	341647.781	87.668	55.756	31.912	3.912	28.0
PW120	329135.394	341678.274	88.976	55.884	33.092	3.092	30.0
PW121	329122.924	341699.956	89.611	51.431	38.18	3.180	35.0
PW122	329136.516	341747.187	90.581	40.731	49.85	3.850	46.0
PW2AR2	329180.14	341714.246	89.892	40.769	49.123	3.123	46.0
PW79R*	329234.915	341655.392	78.77	52.607	26.163	3.163	23.0
PW80R*	329263.826	341664.351	78.652	55.516	23.136	3.136	20.0
PW81R*	329293.754	341668.676	78.502	61.578	16.924	3.924	13.0

All information supplied by Infinis Energy Services Ltd. via email dated 23.04.2015.
*** Well to be installed to capped areas.**

Table 2 – Well Casing Installation Details.

Infinis Well I.D	Plain Casing Below Ground Level (m)	Plain Casing Above Ground Level (m)	Perforated Casing (m)	Minimum Depth Bentonite Seal (m)*	Stone Volume (m^3) (Approx.)#
PW73R**	5.0	1.0	29.0	3.0	2.359
PW91R	5.0	1.0	33.0	3.0	2.664
PW93R	5.0	1.0	29.0	3.0	2.359
PW21R	5.0	1.0	42.0	3.0	3.349
PW010R**	5.0	1.0	29.0	3.0	2.359
PW17R2	5.0	1.0	39.0	3.0	3.120
PW43R	5.0	1.0	39.0	3.0	3.120
PW25R2	5.0	1.0	23.0	3.0	1.903
PW120	5.0	1.0	25.0	3.0	2.055
PW121	5.0	1.0	30.0	3.0	2.435
PW122	5.0	1.0	41.0	3.0	3.273
PW2AR2	5.0	1.0	41.0	3.0	3.273
PW79R**	5.0	1.0	18.0	3.0	1.522
PW80R**	5.0	1.0	15.0	3.0	1.294
PW81R**	5.0	1.0	8.0	3.0	0.761

All information supplied by Infinis Energy Services Ltd. via email dated 23.04.2015.

*** Depth of bentonite seal is to be confirmed on a well-by-well basis. As assessment of the depth of the capping system at each location (where present) is to be undertaken. This is discussed further in Sections 3.1 and 3.2 below.**
**** Well to be installed to capped areas – bentonite seal depth subject to change depending on depth of capping system below ground level to ensure minimum of 1.0m bentonite installed to waste mass below ca.**
 # Theoretical stone volume is based upon each well having a 3.0m bentonite seal installed; this is subject to change depending on the depth of any capping system present at a given location.

The proposed locations may be subject to change prior to the start of the works. All location and drill depth information shall be forwarded to NRW for approval prior to the commencement of the works. Where amendments are made to the proposed locations and/or proposed depths, the revised, approved, data shall be provided to all parties prior to the commencement of the works.

After the Contract, as-built drawings detailing the existing ground levels and levels drilled to at the gas well, along with a plan showing the location of the retro-drilled point will be supplied to the CQA Inspector. These drawings will be issued with a copy of the Validation Report.

1.4 Validation Report

Upon completion of the Works a Validation Report will be completed by the CQA Inspector and forwarded to NRW, The Permit Holder and the Main Contractor. The Report will verify methods implemented during construction together with any additional site-specific data.

2.0 RETRO DRILLING

2.1 Preparation of Working Area

The proposed drilling area shall be trimmed or filled to provide a firm base for the drilling rig where required. The Main Contractor shall set out the position of the proposed gas wells by placing a peg, marked with the well reference number, at each of the locations, with the ground level of each peg to be established by way of surveying prior to the commencement of the works. The Main Contractor shall also advise all relevant parties of the depth, which the Sub Contractor is to drill to following the agreement of existing ground levels. The proposed depth information shall be given in mAOD (Metres Above Ordnance Datum) and mBGL (Metres Below Ground Level).

Prior to the undertaking of any drilling works, the ground levels at the proposed locations shall be surveyed and checked by the Main Contractors appointed surveyor. All well location and depth data is to be checked and approved by the Site Permit Holders representative prior to commencement of the drilling works. Should any amendments be made to the information contained within Tables 1 and 2 of this document, the details of these amendments are to be recorded on the CQA Inspectors Daily Record sheet enclosed in Appendix 2.

Prior to commencement of the Works, the CQA Inspector shall liaise with the Main Contractors representative to ensure that the relevant gas wells within the proximal area shall be shut down to prevent oxygen ingress into the Works.

Prior to movement of the drilling rig, the Sub Contractor shall walk the proposed route with the CQA Inspector to ensure that the route is of suitable dimensions to prevent damage to any underlying layers.

2.2 Drilling Works

The Sub Contractor shall set up the drilling rig at the location identified by the Main Contractor or his representative and shall drill a hole through the waste using a 350mm diameter barrel auger sufficient to install a HDPE pipe of 160mm diameter (or other, where specified) to the proposed drilled depth. The Sub Contractor shall check the verticality of the borehole during the drilling operations on a regular basis, but at least every 5m depth, by using a spirit level on the rig mast. If the borehole goes off line by more than 5° from vertical then the hole will be aborted and re-drilled. All verticality checks will be recorded.

All wells to be drilled and installed during these works are designated as terminating within a "Low Risk Zone – Zone 1"; therefore it is anticipated that incremental drilling will not be required due to the minimum 3.0m stand off from basal level applied to each well by the Main Contractor, based upon the available survey data for the relevant areas of site as supplied and checked by the Main Contractor and Site Permit Holder.

Initially the hole will be formed by augering in order to advance the hole quickly. If wet unconsolidated waste is encountered then bailing tools will be used. The actual selection of tool will be made once the condition and moisture level of the waste has been assessed from the drilling arisings.

In the event that the liquid levels encountered prevent the advancement of the borehole to the target depth, the Main Contractor shall be informed by the CQA Inspector and a decision taken by the Main Contractor as to what depth the well shall be installed to, in line with the methodology described in Section 3 below; the outcome of this will be recorded by the CQA Inspector.

The Sub Contractor and CQA Inspector shall keep an up to date record of the exact length of drilling equipment in the borehole. This information shall be recorded by the CQA Inspector in his notebook.

The borehole depth shall be checked with a weighted, graduated tape from 3m above the target depth. The level of the base of the borehole acheived at this point shall be calculated and compared to the target drill depth to ascertain the depth achieved. Only when the Sub Contractor has agreed the current drill depth and remaining drill distance with the CQA Inspector shall drilling re-commence.

When the target drill depth has been reached, the base of the borehole shall be cleaned out. The CQA Inspector shall observe the cleaning out operation and record the actual depth prior to giving approval for the installation of the new well casing following liaison with the Main Contractor.

If an obstruction is encountered during the drilling operation, the Main Contractor will be notified and a decision taken, dependant on the depth reached, if installation is to proceed at the depth attained or the borehole abandoned as detailed in Section 2.3. In the event of an abandonment, a new location shall be identified by the Main Contractor with the relevant ground levels/drill depth being established and submitted to the Site Permit Holders representative for checking and approval prior to the re-commencement of drilling at the new location; the relevant revised information (and confirmation of approval of this) is to be supplied in writing to all parties.

All arisings from the drilling operation will be removed from the working area to the active tip face of site for disposal; no arisings are to be left at the working area by the end of each working shift.

When drilling operations are completed at the end of each shift, the Sub Contractor shall seal the borehole with a temporary bentonite seal to prevent gas emissions. No holes will be left open over the weekend period or overnight.

The installation of the new HDPE gas well casing will proceed as detailed in Section 3.

2.3 Abandoning Boreholes

If a well is abandoned for any reason, to prevent the ingress of oxygen or rain water into the waste mass and egress of pollutants from the waste mass, the capping system shall be repaired under supervision of the CQA Inspector. The Main Contractor is to be informed of any wells which are to be abandoned.

The restoration soils shall be excavated to a safe profile. The soil material will be handled and stockpiled to prevent any deterioration. The void caused by the drilling operation shall be backfilled with gravel or loose fine soils to a depth of 500mm below the surface of the capping system. The remaining void, to the level of the capping system, shall be filled with hydrated bentonite in accordance with Section 3.2.

Where a geomembrane cap is present a 1mm LLDPE geomembrane patch repair shall be extrusion welded to the capping surface area that has been damaged by the drilling process or caused during the soil removal process. The geomembrane welding personnel shall hold a current third party certificate for welding and installation of flexible membrane liners to a recognized standard such as that of the British Geomembrane Association (BGA) or Thermal Welding Institute (TWI/CSWIP) third party accreditation schemes.

A trial weld shall be completed prior to welding the patch repair. Qualitative destructive testing through tab samples shall be recovered from the trial weld and tested for shear failure and peel adhesion failure on site by the geomembrane welder. The CQA Inspector shall record the pass/fail results.

Any geosynthetic protection layer which is present shall be reinstalled over the geomembrane, where applicable.

Replacement of the restoration soils shall be replaced in such a manner to limit any damage to the underlying geomembrane. The surface of the restoration soils shall be graded into the surfacing surround soil contours.

No deviation from the marked wells will be allowed without specific written instruction from the Main Contractors representative.

2.4 Over-drill Remediation Procedure

In the unlikely event of a borehole being drilled through the entire depth of waste and into the underlying strata, it is intended the following procedure will be used to reseal the base of the borehole.

2.4.1 Remediation of wells using temporary steel casing

Temporary steel casing shall be inserted into the well to the level of the penetration of the strata to form a seal and reduce the risk of leachate migration.

The steel casing shall be dipped to evaluate the presence of any leachate, should leachate be detected, the levels should be reduced if possible with a bailing tool.

For dry wells, a mixture of bentonite and cement will be prepared, comprising two bags of bentonite and two of Portland cement. Mixing of these materials shall be thorough to allow for complete hydration of the bentonite.

The sealing mixture shall be pumped from the base of the well via a tremmie pipe lowered into the steel casing, displacing any leachate and forming a suitable seal at the base of the well.

Approximately 200 litres of the sealing mixture over the calculated volume of the breach shall be placed into the borehole to produce a bentonite plug of approximately 1.8m in depth (based on steel casing with an approximate internal diameter of 380mm).

The plunger tool and drill rods shall be placed above the sealant, with its weight maintaining a pressure on the sealing mixture. Meanwhile, the steel casing shall be withdrawn by approximately 150mm to allow the sealing mixture to enter the area surrounding the base of the borehole and form a further seal directly above the breach.

The steel casing shall be withdrawn gradually in 300mm increments to a total no less than 1000mm to allow the sealing mixture to set.

Upon reaching this depth, the borehole and sealant shall be evaluated by all parties and the Environment Agency as to whether the steel casing can be retracted fully and if any further sealant is required to be added.

2.5 Other Information

Odour management shall be controlled in accordance with the Permit requirements and in close liaison with the Site Operators representatives. This shall include, as a minimum, the following:

- Only one well shall be drilled at any one time unless agreement is sought from all parties;
- Arisings from the drilling operation will be taken to the active tip face of site for disposal;
- When drilling operations are completed at the end of each shift, the Sub Contractor shall seal the borehole with a bentonite seal to prevent gas emissions. No holes will be left open over the weekend period or overnight;
- A mobile odour control system shall be employed at all times during the drilling works.

The installation of the new HDPE gas well liner will proceed as detailed in Section 3.

3.0 GAS WELL INSTALLATION

3.1 Specification

The gas well shall consist of a Butt Fused 160mm diameter SDR11 HDPE pipe as detailed on drawing references 5474.GAS.D01 and 5474.GAS.D02. The upper section shall be plain pipework, with the remainder of the length being perforated, as per the details in Table 2 above and as confirmed by the Main Contractor. Records of any butt fusion welding carried out shall be included within the CQA Report.

A fully automatic butt fusion welding machine shall be used which shall:

- automate trimming of pipe faces;
- automate determination of drag forces during all stages of jointing process;
- automate incorrect heater temperature lock out;
- automate heater plate ejection;
- automate bead formation control;
- warn of and record incomplete cooling times.

In addition, the machine shall be capable of recording and storing weld specific parameters such as heater temperature, bead pressure, heat soak time, fusion pressure and actual and target cooling times. It shall also record the date, time, operator and joint number. This data shall be retrievable by a data capture unit and a digital and printed copy supplied to the CQA Inspector on the following working day.

The lower section of the HDPE gas well liner shall be perforated and fitted with a butt fusion welded end cap.

Gravel Pack

The annulus between the HDPE pipe and waste will be filled with 20 – 40 mm non-calcareous stone to a height below ground level as stated in Table 2 above, sufficient to allow the remaining length of the annulus to be grouted using hydrated bentonite.

Bentonite Seal

During the drilling works, the depth of soils, and the depth of the geomembrane cap below ground level, is to be estimated by the CQA Inspector by way of liaison with the Drilling Sub-Contractor and confirmed with the Main Contractor to allow for an assessment of whether a revision is needed to the proposed bentonite seal depth to ensure that a minimum of 1.0m of hydrated bentonite is installed within the waste mass so that a good seal to the geomembrane cap is produced.

Should the depth of soils and/or geomembrane cap at any of the proposed locations be recorded as such that the installation of the proposed 3.0m depth of bentonite would be insufficient to achieve a minimum of 1.0m of bentonite within the waste mass, the Main Contractor shall instruct the CQA Inspector and the Drilling Sub Contractor to install a bentonite seal of increased depth; this instruction shall be recorded by the CQA Inspector on his daily log sheet along with the confirmed depth of bentonite to be installed.

The bentonite seal shall be prepared prior to its installation within the annulus by way of mixing of bentonite powder with sufficient quantity of water to be fully hydrated. Prior to the installation of the

hydrated Bentonite, one bag of dry bentonite shall be inserted into the borehole to form a blinding layer on top of the gravel pack to prevent downward movement of the hydrated Bentonite.

The gas well installation shall also be carried out in accordance with drawing references drawing references 5474.GAS.D01 and 5474.GAS.D02, copies of which are enclosed within Appendix 1 of this CQA Plan.

3.2 HDPE Pipe Installation

If the HDPE pipe does not achieve the target level, it shall be removed, the hole bailed and the casing re-inserted to the required depth as detailed in section 2.2 above.

Gravel Pack

The well casing shall be centred within the borehole and 20 – 40 mm non-calcareous stone shall be slowly introduced into the annulus between the well casing and borehole sides. The Sub Contractor shall place the gravel pack to a height below ground level, as in Table 2 above, sufficient to allow the remaining length of the annulus to be grouted using hydrated bentonite. The exact depth of stone to be installed is to be confirmed on a well-by-well basis to ensure that sufficient depth is left to allow for the required depth of bentonite seal to be installed (as described in Section 3.1 and as below).

An assessment of the theoretical volume of stone to be placed to well installations is shown in Table 1 and is equivalent to the volume of the annulus between the pipework and the borehole side. The CQA Inspector shall record the amount of stone installed to each well on his daily report sheets to allow for comparison to the theoretical installation volume.

The CQA Inspector shall monitor the stone installation at each well to ensure that bridging has not occurred; as part of this process, rods shall be placed into the annulus during stone placement to agitate the gravel to reduce the risk of bridging.

Bentonite Seal

A bentonite seal shall be formed above the stone placed to ground level (i.e. above the 20-40mm stone) by placement of a pre-mixed bentonite slurry, mixed outside of the borehole and poured into the annulus (See Section 3.1); it is noted that a minimum of 1.0m of bentonite is to be installed to the waste mass and as such, an assessment of the soils depth at each proposed location is required prior to the bentonite installation (See Section 3.1).

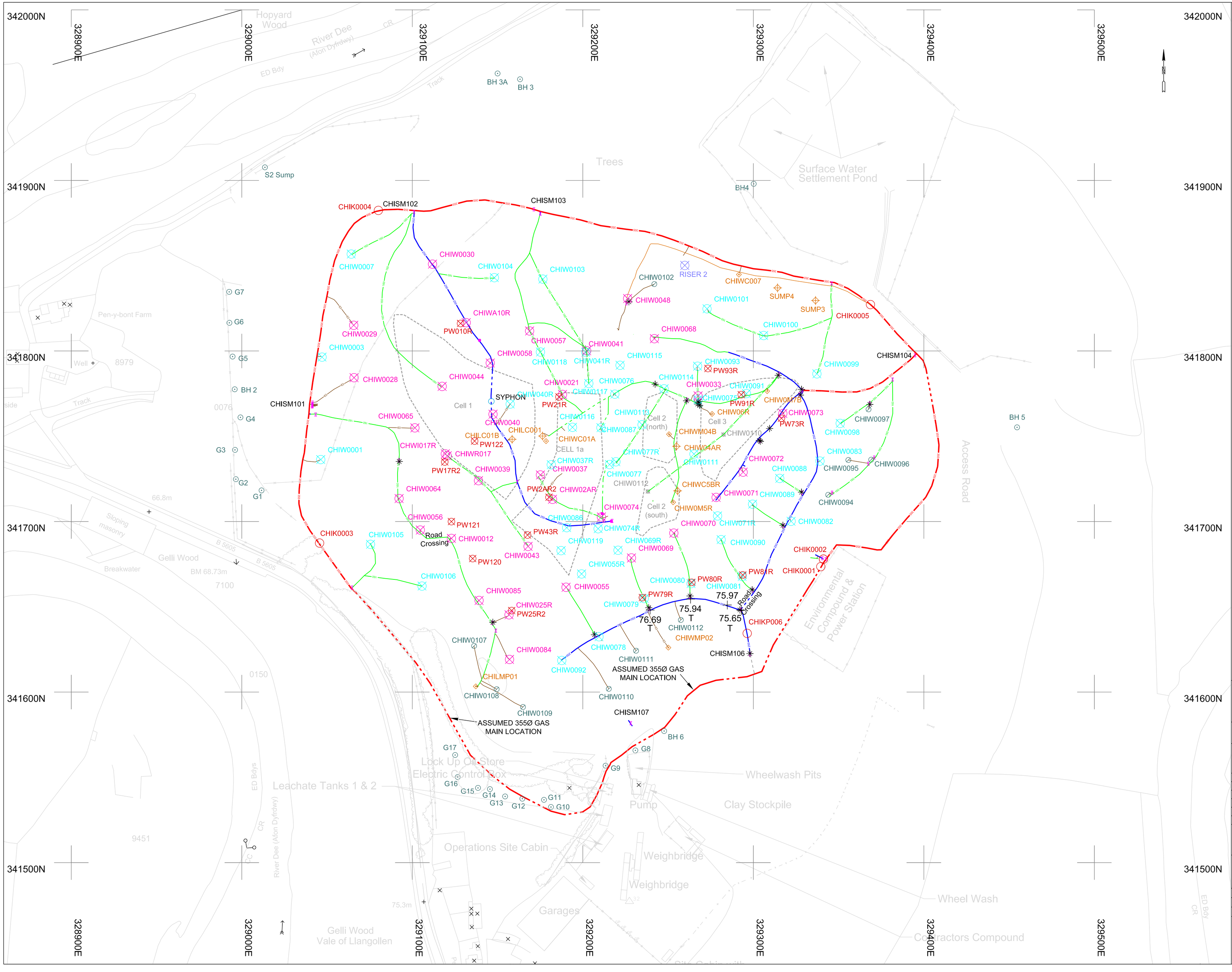
The CQA Inspector shall verify that the bentonite seal is installed as per the prescribed methods above and forms a suitable seal with the surrounding strata; photographs shall be taken of the bentonite installation process and subsequently included within the CQA Report.

Upon completion of the well installation, a temporary push fit end cap shall be securely fastened to the top of well pipework above ground level, pending the installation of the well headworks and connection of the well to the existing gas collection system on site.

No borehole shall be left open over the weekend period or overnight as stated in Section 2.5 above.

Datum levels and co-ordinate location is to be taken on top of the HDPE pipe upon completion for each well.

APPENDIX 1



LEGEND

Monitoring Points

- Landfill Gas Monitoring Borehole
- Landfill Gas Surface Monitoring Point
- Combined Gas/ Groundwater Monitoring Point
- Gas Flare Stack
- Landfill Gas Extraction/ Leachate Monitoring Point
- Condensate Unit (Knock-out Pot)
- Groundwater Monitoring Borehole
- Groundwater Pumping Point
- Surface Water Monitoring Point
- Leachate Collection Point
- Leachate Monitoring Point
- Leachate Recirculation Point
- Valve
- KOP
- PEG
- Manifold
- Finn Drains
- Pinwell

Gas Wells

- Gas Well 63Ø
- Gas Well 90Ø
- Gas Well 110Ø
- Gas Well 120Ø
- Gas Well 160Ø
- Gas Well 180Ø
- Gas Well 225Ø
- Gas Well 250Ø >
- Proposed Gas Well
- Assumed Gas Well

Infrastructure Pipework

Above ground Pipe	Underground Pipe
32mm Gas Pipe	
55mm Gas Pipe	
63mm Gas Pipe	
90mm Gas Pipe	
110mm Gas Pipe	
120mm Gas Pipe	
125mm Gas Pipe	
160mm Gas Pipe	
180mm Gas Pipe	
200mm Gas Pipe	
250mm Gas Pipe	
280mm Gas Pipe	
315mm Gas Pipe	
355mm Gas Pipe	
400mm Gas Pipe	
450mm Gas Pipe	
500mm Gas Pipe	
650mm Gas Pipe	
Leachate Pipe	
Airline Pipe	
Air and Discharge Pipe	
Discharge Pipe	
Condensate Pipe	
Leachate Recirculation Pipe	
Assumed Pipe	

Notes:

1. All dimensions are in metres unless otherwise stated.
2. All survey co-ordinates related to local site co-ordinate system.
3. For Proposed wells ground level and Pitbase level please refer to spreadsheet: 5484_PW13 - Chirk - Proposed Well List - April 2015.xls
4. Background mapping copied from plan: '466A167-2011.dwg'
5. Boreholes copied from plan: "7751-1A.dwg"

Disclaimer

THIS INFORMATION SHOULD NOT BE REGARDED AS ACCURATE AND SHOULD BE USED FOR GUIDANCE PURPOSES ONLY.

UTEC STARNET

GARD ID Prefix: CHI

Files/ Information used:

REVISIONS

No	Description	By	Chk'd	Date

Project:

CHIRK
LANDFILL SITE

Title:

Proposed Wells Plan

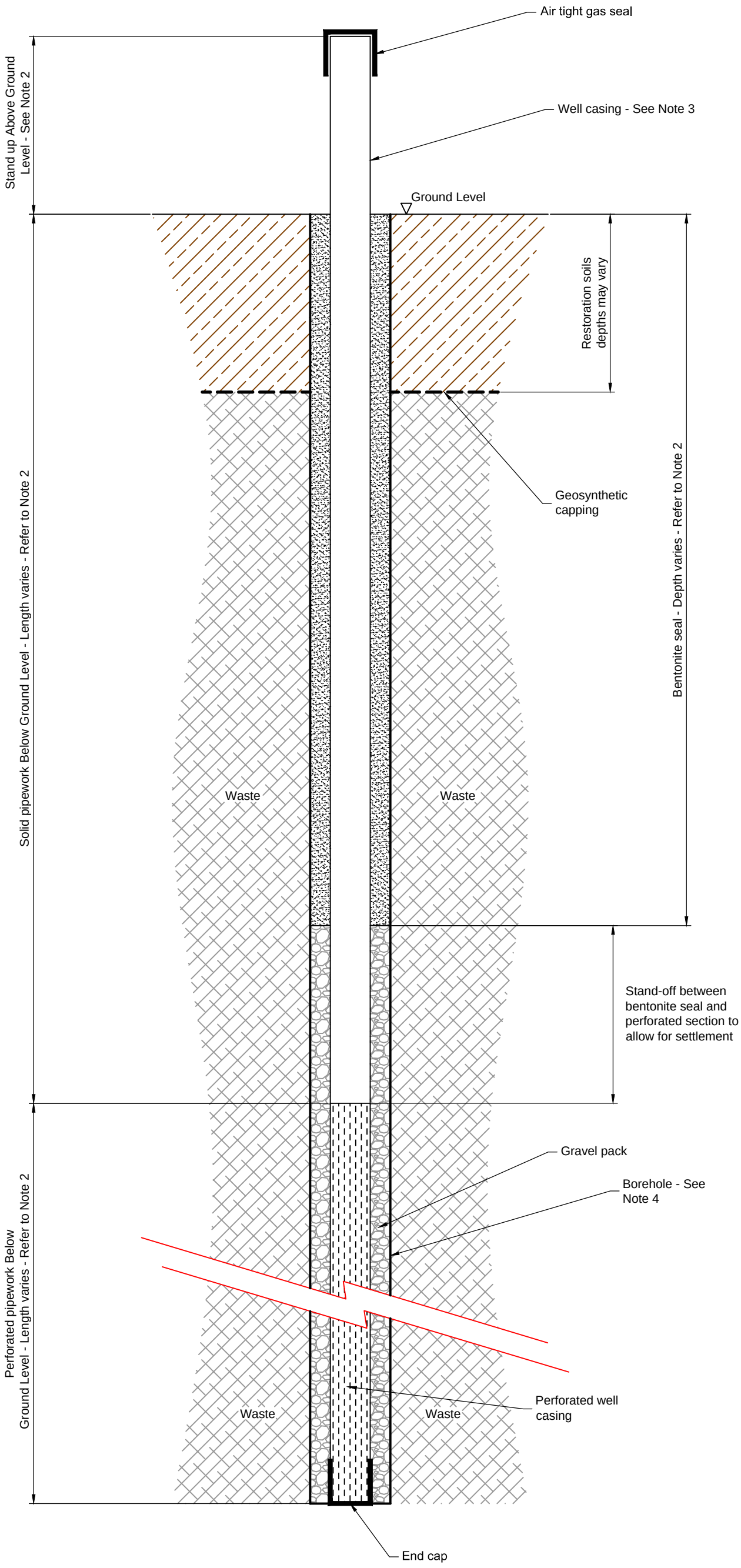
Drawn By	T.R.	Date	22/04/2015
Chk'd By	T.R.	Date	22/04/2015
Scale 1:	1000	Sheet Size	A1

Infinis Limited
First Floor
500 Pavilion Drive
Northampton Business Park
Northampton
NN4 7YJ

infinis

Drawing No: 5484_PW13

Gas Extraction Well for Completed Capping Works



Notes

1. Do not scale from this drawing.
2. For details of pipework installation lengths etc. Refer to the CQA Plan - Ref: 5474 Chirk Landfill Site, Retro Drilling of Gas Wells, Construction Quality Assurance Plan, April 2015.
3. Well casing diameter to be confirmed prior to start of works (Refer to CQA Plan - Ref: 5474 Chirk Landfill Site, Retro Drilling of Gas Wells, Construction Quality Assurance Plan, April 2015).
4. Borehole to be constructed in accordance with the latest approved CQA Plan requirements.

Rev	Modifications	By	Chk	App	Date

Infinis Energy Services Ltd.

Chirk Landfill Site

Gas Extraction Well Detail for Completed Capping Works

Drawn by	Checked by	Approved by
RP	DMD	RF
Date	**Scale @ A3**	**Revision**
24.04.2015	Not To Scale	-

Issue: Information

Drawing Number: 5474.GAS.D01

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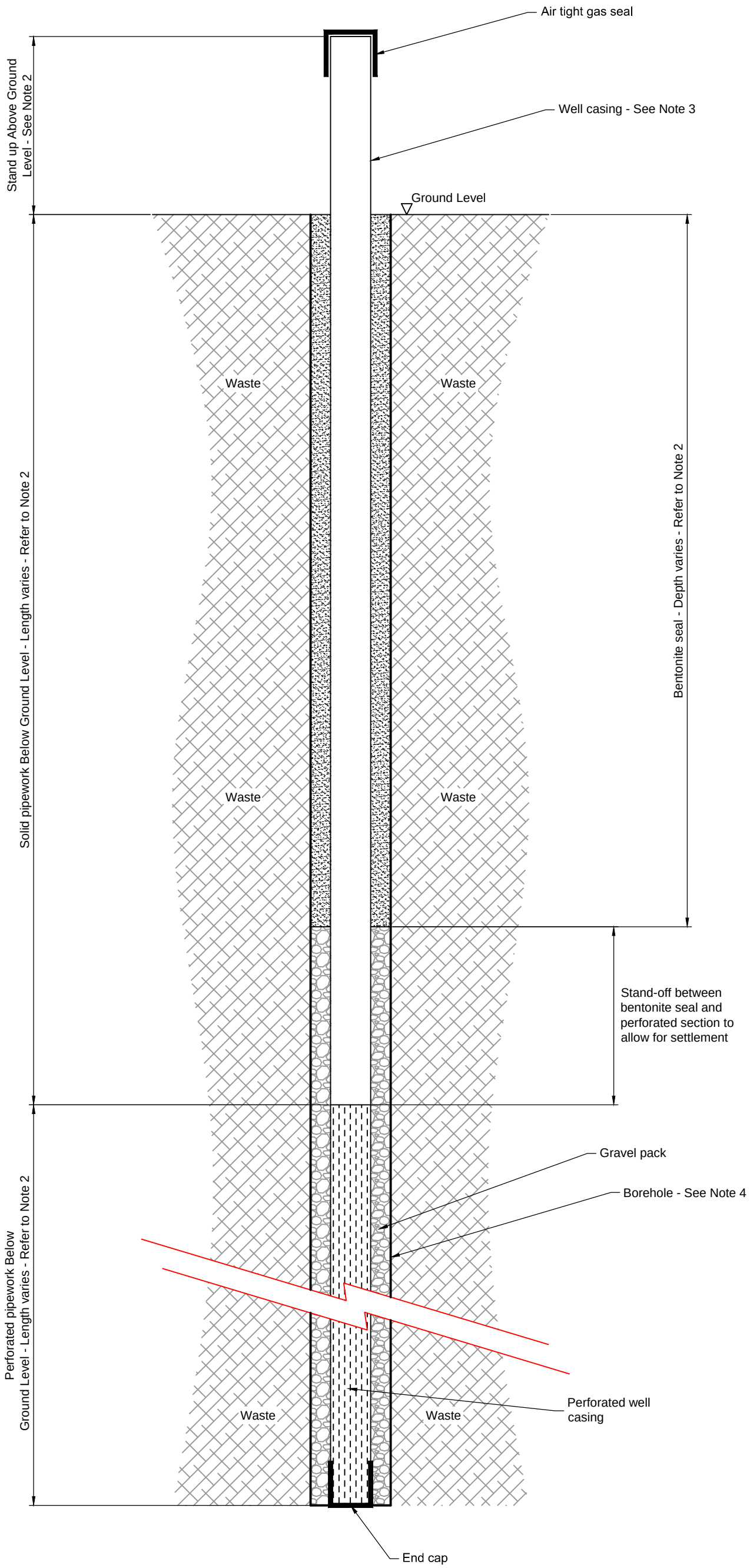
Gas Extraction Well for Waste Profile



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Rev	Modifications	By	Chk	App	Date

Infinis Energy Services Ltd.

Chirk Landfill Site

Gas Extraction Well Detail for Waste Profile

Drawn by	Checked by	Approved by
RP	DMD	RF
Date	**Scale @ A3**	**Revision**
24.04.2015	Not To Scale	-

Issue: Information

Drawing Number: 5474.GAS.D02

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APPENDIX 2

CQA Inspector's Daily Report

Site Name:

Project:

Date		
Weather	Previous Night a.m p.m	
Site Hours: Contractors Arrival Time: CQA Arrival Time: Contractors Departure Time: CQA Departure Time:		
Contractors Plant / Resources Utilised		
Contract Works Undertaken		
Testing Undertaken		
Meetings/ Correspondence		
Health and Safety		
Visitors to Site		
Comments		

For Egniol Environmental Ltd: .....

CQA Inspector's Weekly Report

Landfill Site: .....
Project: .....

Week Ending	
Weather Conditions	
Progress	
Testing Undertaken	
Problems Encountered	
Next Weeks Programme	
Health & Safety	Reported Accidents : Reported Near Misses : Welfare Facilities :
Visitors to Site	

For Egniol Environmental Ltd. .....

DRILLING REPORT					Well Number:
CQA INSPECTOR:-					
CLIENT:					Site:
Date:		Installation Details			Target Depth (m):
Drilling Rig type:		Solid AGL (m):			Actual Depth (m):
Extruder Dimensions:		Solid BGL (m):			Dip Level (mBGL):
Auger Dimensions:		Perforated BGL (m):			Dip Level (mBGL) after 24hrs:
Casing Dimensions:		Bentonite (m):			HDPE Casing Dimensions:
		Gravel (m):			

Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION	STRATA
			m	m
	+1.0	1	+1	+0.5
0.0	0.0	0	0	GL GL
0.0	1.0	1	0	0.5
1.0	2.0	1	1	1.5
2.0	3.0	1	2	2.5
3.0	4.0	1	3	3.5
4.0	5.0	1	4	4.5
5.0	6.0	1	5	5.5
6.0	7.0	1	6	6.5
7.0	8.0	1	7	7.5
8.0	9.0	1	8	8.5
9.0	10.0	1	9	9.5
10.0	11.0	1	10	10.5
11.0	12.0	1	11	11.5
12.0	13.0	1	12	12.5
13.0	14.0	1	13	13.5
14.0	15.0	1	14	14.5
15.0	16.0	1	15	15.5
16.0	17.0	1	16	16.5
17.0	18.0	1	17	17.5
18.0	19.0	1	18	18.5
19.0	20.0	1	19	19.5
20.0	21.0	1	20	20.5
21.0	22.0	1	21	21.5
22.0	23.0	1	22	22.5
23.0	24.0	1	23	23.5
24.0	25.0	1	24	24.5
25.0	26.0	1	25	25.5
26.0	27.0	1	26	26.5
27.0	28.0	1	27	27.5
28.0	29.0	1	28	28.5
29.0	30.0	1	29	29.5
30.0	31.0	1	30	30.5
31.0	32↓	1	31	31.5

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Extruder Dimensions:		Solid BGL (m):		Dip Level (mBGL):
Auger Dimensions:		Perforated BGL (m):		Dip Level (mBGL) after 24hrs:
Casing Dimensions:		Bentonite (m):		HDPE Casing Dimensions:
		Gravel (m):		

Depth From (m)	Depth To (m)	Interval (m)	DESCRIPTION	STRATA
			m	m
32.0	33.0	1	32	32.5
33.0	34.0	1	33	33.5
34.0	35.0	1	34	34.5
35.0	36.0	1	35	35.5
36.0	37.0	1	36	36.5
37.0	38.0	1	37	37.5
38.0	39.0	1	38	38.5
39.0	40.0	1	39	39.5
40.0	41.0	1	40	40.5
41.0	42.0	1	41	41.5
42.0	43.0	1	42	42.5
43.0	44.0	1	43	43.5
44.0	45.0	1	44	44.5
45.0	46.0	1	45	45.5
46.0	47.0	1	46	46.5
47.0	48.0	1	47	47.5
48.0	49.0	1	48	48.5
49.0	50.0	1	49	49.5
50.0	51.0	1	50	50.5
51.0	52.0	1	51	51.5
52.0	53.0	1	52	52.5
53.0	54.0	1	53	53.5
54.0	55.0	1	54	54.5
55.0	56.0	1	55	55.5
56.0	57.0	1	56	56.5
57.0	58.0	1	57	57.5
58.0	59.0	1	58	58.5
59.0	60.0	1	59	59.5
60.0	61.0	1	60	60.5
61.0	62.0	1	61	61.5
62.0	63.0	1	62	62.5
63.0	64.0	1	63	63.5
64.0	65.0	1	64	64.5

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Butt Fusion Record Sheet

Landfill Site:
Project:

Date	Joint Number (from Welding Machine)	Pipework Type		Weld	Test Joints		Failed Joints		CQA Inspector	Remarks
		Diameter	SDR	Good Joint Produced (Y/N)	Good Joint Produced (Y/N)	Incorporated in Works (Y/N)	Retrim/ Reweld (Y/N)	Removed & stored (location)		

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Electro Fusion Record Sheet

Landfill Site:
Project:

Date	Joint Number	Pipe Diameter (mm)	Scraped	Clamped	Fitting Type						Heat Time (secs)		Cool Time (secs)		Status		CQA Inspector	Remarks
					cou	tee	red	sad	elb	other	Target	Actual	Target	Actual	Pass	Fail		

ENGINEERING
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