2200/SH

SWH Design Services Ltd
07587185683

10th May 2022.

FAO Craig Foster
Craig Foster Architects

Dear Sirs
Re: Drainage Statement for Proposed Reserve Power Generation Plant
Moody Lane, Grimsby, DN31 2SW

The site is located on the North Lincolnshire coastline just to the north of Moody Lane in an area known as Pyewipe on the northern outskirts of Grimsby; National Grid Reference TA 25305 11331.

The site is within the former Huntsman Tioxide Plant and is surrounded by industrial development. The site is very low lying at approximately 3.5 to 3.6m AOD and is relatively flat. The site is approximately 0.178 hectares of which approximately 0.045 hectares is to be roof and positively drained with all additional external hard surfacing of 0.045 hectares with falls to permeable areas.

Previous Flood Risk Assessments and Drainage Statements have identified that the existing surface water drainage regime comprises infiltration to ground via a granular (shingle) surface layer and that this regime should be maintained for the general areas of the development. There is no evidence of ponding, saturation, or impeded drainage. The additional surface water generation will be minimal due to the nature of the proposals, however additional storage, and filtration soakaway is proposed for removal of all the generator building roof surface water.

Recent geo-environmental surveys confirmed the presence of up to 0.6m of made ground overlying soft organic clays of the Tidal Flat Deposits to approximately 5.0m depth. The made ground comprised sandy ashy gravel and cobbles of brick, concrete, limestone, and quartz and varied in depth.

Recent in-situ percolation testing concluded that the lower natural soils were generally of relatively low permeability, however, a silty sand layer was encountered in one borehole which presented good infiltration properties. It is unknown whether this layer is an isolated pocket or a continuous seam.

The associated letter report by Geo-Integrity dated 25th April 2017 and is included in Appendix B.

The proposed drainage system has been considered in relation to the National Planning Policy Framework sections for drainage, and the Non-Statutory Technical Standards for Sustainable Drainage Systems and we have followed the sequence of steps that should be considered in relation to the drainage of the site.

We therefore propose to maintain the filtration discharge of surface water via filtration in the form of a soakaway system utilising approximately 10-20 Cored holes with the bund area that will serve as a temporary storage tank for all building roof surface water and the remaining areas to the increased permeable stoned areas created within the site. Infiltration tests for the ground in the location of the proposed soakaway core holes and are to be carried out prior to developing the scheme to confirm filtration rates and number and size considered as a means of disposing of surface water from the site.

The Impermeable area of the generator building is 470m^2 SW discharging to the proposed bunded area at the North of the site, with the remaining site SW to drain naturally to the existing made ground by filtration (0.13Ha). Based on Rainwater data for the site location of 18.8mm/hr the allowance for 100yr storm with a 30% climate change, calculations have been carried out based on very conservative filtration figures of 0.05L/sec , calculations based on this filtration rate into made ground over underlying soft clays suggest a storage capacity of 25m^3 is appropriate however we can confirm the bunded area has a much greater capacity of over 600m^3.

The attached proposed layout drawing C5125-C-100 indicates the drainage proposals to be considered for discharge of planning conditions. I trust this information is helpful and look forward to discussing these proposals in due course.

Yours Faithfully

Stephen Huddleston
IEng AMIStructE
Director

Appendix A.

SWH Design Services
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SWH Design Services Ltd

Project				Job no.	
Reserve Power Site - RWE Grimsby				2200	
Calcs for				Start page no./Revision	
SOAKAWAY DESIGN CHECKS				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
SWH	03/05/2022				

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area	Grimsby
Impermeable area drained to the system	A = **470.0** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.390**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **30** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **1034** mm
Width of pit	w = **4000** mm
Length of pit	l = **6000** mm
Percentage free volume	V_{free} = **100** %
Soil infiltration rate	f = **50.0×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **10344856** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.37;	9.0;	1.89;	17.1;	8.02;	0.16;	7.86
10	0.52;	12.7;	1.95;	24.8;	11.67;	0.31;	11.36
15	0.63;	15.4;	1.99;	30.7;	14.42;	0.47;	13.96
30	0.80;	19.6;	2.03;	39.6;	18.62;	0.93;	17.69
60	1.00;	24.4;	2.01;	49.2;	23.11;	1.86;	21.25
120	1.21;	29.6;	1.97;	58.4;	27.43;	3.72;	23.70
240	1.46;	35.7;	1.92;	68.7;	32.28;	7.45;	24.83
360	1.62;	39.6;	1.89;	75.0;	35.23;	11.17;	24.06
600	1.82;	44.5;	1.85;	82.5;	38.76;	18.62;	20.14
1440	2.28;	55.7;	1.77;	98.7;	46.38;	44.69;	1.69

Required storage volume	S_{req} = **24.83** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **24.83** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 6hr 40min 3s

PASS - Soakaway discharge time less than or equal to 24 hours

Appendix B.

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Our Ref: MB/17-03-03

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1 Osier Way,
Olney,
Buckinghamshire,
MK46 5FP

25th April 2017

For the attention of Mr Matt Law

Dear Matt

Soil Infiltration Rate Investigation – Cummins Power Station, Moody Lane, Grimsby.

Following receipt of your purchase order 021853 for our proposal, reference E00049 and dated the 15th March 2017, we have pleasure in providing you with our interpretative infiltration rate letter report for the site at Cummins Power Station, Moody Lane, Grimsby, DN31 2SW, centred at National Grid Reference TA253113.

1 Introduction

1.1 Objectives

Geo-Integrity Ltd. was commissioned to carry out infiltration rate testing of the natural and manmade ground at the site to help with the design of the sustainable drainage scheme for the site.

1.2 Development Proposals

It is proposed to construct 10 - 14 gas fuelled, electricity reserve engines with the capability of 20 Mwatts, each within a standard 40' metal shipping container. One or two further containers will house controls and electrical switch gear. Up to seven transformers will also be required, in individual containers or GRP enclosures. Concrete support walls will be laid to support the containers and raise them above the existing ground level by 300-500mm. Each container will be supported on 2 walls, running the full length of each container, raising the floor level to 4.2m AOD across the site. The containers do not have guttering or down pipes and storm water is shed down the sides of the container. Infiltration rates of the soil on site are required for drainage design.

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1.3 Published Geology

Reference to the British Geological Survey website and Sheet 90, Grimsby, indicates that the site is underlain by Tidal Flat Deposits of clay and silt from the Quaternary Period, overlying Glacial Till from the Ice Age with solid geology of the Flamborough Chalk Formation from the Cretaceous Period, at depth.

A previous investigation undertaken by ESG, 2017, R6165, indicates that Made Ground was encountered to a depth of 0.50m bgl, overlying firm becoming soft Tidal Flats Deposits with Glacial Till encountered from approximately 4.50m bgl to at least 10.00m bgl.

2 Sitework Information

On the 19th April 2017, we attended site and undertook two continuous tube boreholes and one hand dug pit to undertake infiltration testing on both the Made Ground and Tidal Flats Deposits. The boreholes extended to a maximum depth of 2.00m bgl and the hand dug pit extended to a depth of 0.35m bgl (within the Made Ground). The location of the exploratory holes can be seen on the Exploratory Hole Location Plan attached, along with exploratory hole logs.

3 Ground Conditions and Geotechnical Testing

Made Ground was encountered in all exploratory holes from ground level to a depth of between 0.60m and 0.62m bgl. It consisted of dense red-brown and grey sandy ashy gravel and cobbles of concrete, brick, limestone and quartz.

Tidal Flats Deposits were encountered in both exploratory boreholes from beneath the Made Ground and to the full depth of the investigation in both cases, a maximum depth of 2.00m bgl. It consisted of firm brown and grey mottled very silty clay, with a thin band of loose grey and brown very silty fine sand between 1.90m to 2.00m bgl in BH2.

Groundwater was struck in BH2 at 1.90m bgl and it rose to 0.66m bgl within 5 minutes.

4 Soil Infiltration Comments

Three exploratory holes were tested for their infiltration potential using the methods set out in BRE 365 and CIRIA Report 113. The sheets showing the full results are included in the Appendices:-

BH 1 was located within the Tidal Flats strata. One soakaway test was undertaken in this borehole between the depth of 0.63m and 2.00m bgl. The results of the tests were incalculable as there was no drop in level over the 3 hour test. This value represents the fact that the clay strata have a very low permeability and there is a high groundwater level within these strata.

BH 2 was located within the Tidal Flats strata. Two rising head tests were undertaken, and calculated in accordance with CIRIA Report 113, in this borehole to establish the soil permeability of the silty sand layer between 1.90m bgl to 2.00m bgl. The results of the tests ranged from 5.45 x 10^{-5} m/s and 6.55 x 10^{-5} m/s. This would be considered as a medium infiltration rate, however, it is not established that the sand layer is continuous and, with reference to the previous investigation, it would be considered that these infiltration rates cannot be relied upon.

TP 3 was located within the area of the Made Ground and two soakaway tests were undertaken at a depth of 0.35m, within the ashy gravel/cobble Made Ground material. The results of the tests ranged from 1.54 x 10^{-4} m/s and 1.84 x 10^{-5} m/s. This would be considered as a high infiltration rate.

We trust this information is satisfactory to you. In the event of any queries please contact us.

Yours sincerely

Murray Bateman
Director

Geo-Integrity Ltd.