Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 21.A: Agricultural Land Classification Survey Report

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

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Appendix 21.A: Agricultural Land Classification Survey Report

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Regulation Reference	APFP Regulation 5(2)(a)
Planning Inspectorate Case Reference	TR030008
Application Document Reference	TR030008/APP/6.4
Author	Associated British Ports Air Products BR

Version	Date	Status of Version
Revision 1	21 September 2023	DCO Application

READING AGRICULTURAL CONSULTANTS

June 2023

AECOM Ltd

Agricultural Land Classification and Soil Resources

at

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1 Introduction

1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by AECOM Ltd to investigate the Agricultural Land Classification (ALC) and soil resources of land at the proposed Immingham Green Energy Terminal, Immingham, Lincolnshire by means of a detailed survey of soil and site characteristics.

1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land[1], and summarised in Natural England's Technical Information Note (TIN) 049[2].

1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site conditions and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.

1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use. Grade 2 is very good quality agricultural land, with minor limitations which affect crop yield, cultivations or harvesting. Grade 3 land has moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield, and is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grade 4 land is poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. Grade 5 is very poor quality land, with very severe limitations which restrict use to permanent pasture or rough grazing.

1.5 Land which is classified as Grades 1, 2 and 3a in the ALC system is defined as best and most versatile (BMV) agricultural land.

1.6 As explained in Natural England's TIN049, the whole of England and Wales was mapped from reconnaissance field surveys in the late 1960s and early 1970s, to provide general strategic guidance on agricultural land quality for planners. This Provisional Series of maps was published

[1] **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land*. MAFF Publications.

[2] **Natural England (2012).** *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land*, Second Edition.

on an Ordnance Survey base at a scale of One Inch to One Mile (1:63,360). The Provisional ALC map shows the site as Grade 3. However, TIN049 explains that:

> *"These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended …"*

1.7 TIN049 goes on to explain that a definitive ALC grading should be obtained by undertaking a detailed survey according to the published guidelines, at an observation density of one boring per hectare. This survey of the agricultural land within the site follows the detailed methodology set out in the ALC guidelines. Other data obtained from Ground Investigation logs has also been utilised.

2 Site and climatic conditions

General features, land form and drainage

2.1 The area surveyed extends to approximately 26.8ha of mostly agricultural land in two land parcels, located to the south and south-east of Immingham Dock. The south-western parcel is grassland and has been subject to intensive Ground Investigation works. The north-eastern parcel is in arable cropping. Access for the survey was only available to the western part of the arable field, as shown on Figure RAC/10011/1.

2.2 The area surveyed is largely level between around 2m and 4m above Ordnance Datum (AOD). Drainage of the land is by North Beck Drain which directs water eastward and into the mouth of the Humber.

Agro-climatic conditions

2.3 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 2m AOD, and are given in Table 1. The climate at the site is dry and moderately warm. Moisture deficits are moderately large to large. The number of Field Capacity Days is smaller than is average for lowland England (150) and is favourable for providing opportunities for agricultural field work. There is no overriding climatic limitation to agricultural land quality.

Table 1: Local agro-climatic conditions

Parameter	Value
Grid Reference	TA 20500 14950
Average Annual Rainfall	592mm
Accumulated Temperatures >0°C	1,403 day°
Field Capacity Days	129 days
Average Moisture Deficit, wheat	115mm
Average Moisture Deficit, potatoes	109mm

Soil parent material and soil type

2.4 The underlying geology mapped by the British Geological Survey[3] across both land parcels is the Flamborough Chalk Formation, consisting of white flint-free chalk with marl seams. Superficial tidal flat deposits are mapped across both parcels and include unconsolidated mud and sand.

2.5 The Soil Survey of England and Wales soil association mapping[4] (1:250,000 scale) shows the Newchurch 2 association across both parcels. The main soils of the Newchurch 2 association comprise deep, stoneless, clayey and silty clay soils. Newchurch soils develop on low-lying land and are dependent on drainage measures for efficient groundwater control. In Lincolnshire, the soils may be improved to Wetness Class (WC) II, but otherwise are in WC III or IV[5].

[3] **British Geological Survey (2023).** *BGS Geology Viewer*, https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/

[4] **Soil Survey of England and Wales (1984).** *Soils of Northern England* (1:250,000), Sheet 1

[5] **Jarvis et al (1984).** *Soils and Their Use in Northern England*. Soil Survey of England and Wales Bulletin 10, Harpenden.

3 Agricultural land quality

Soil survey methods

3.1 The land parcel in the south-west has been investigated extensively by a GI contractor[6]. Two profiles were examined in this field parcel by RAC to verify soil textures, colours and structures. Access was available to only part of the north-eastern parcel where another six soil profiles were examined using an Edelman (Dutch) auger for the purpose of the ALC survey. One soil pit was also excavated to examine subsoil structures and stone content. The locations of RAC's observations are indicated on Figure RAC/10011/1.

3.2 At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:

- soil texture;
- significant stoniness;
- colour (including localised mottling);
- consistency;
- structural condition;
- free carbonate; and
- depth.

3.3 Two topsoil samples were submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.

3.4 Soil Wetness Class (WC) was determined from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of Field Capacity Days at the location.

3.5 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

[6] **Ground Investigations Limited (2023).** *AP Ammonia Import Terminal, Report 37312*

Agricultural land classification and site limitations

3.6 Assessment of agricultural land quality has been carried out according to the revised ALC guidelines[1]. Soil profiles have been described according to Hodgson[7] which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.

3.7 Agricultural land quality within the area surveyed is limited by soil wetness to Subgrade 3b.

3.8 There is one main topsoil type within both agricultural land parcels, as shown in the photographs in Appendix 3. The topsoil comprises dark grey or dark greyish brown (10YR4/1 or 10YR4/2 in the Munsell soil colour charts[8]) firm clay or silty clay of 30cm average depth. There are no stones in the topsoil. The structure is moderately well developed and forms medium angular blocky peds. There are many roots but few visible pores. The topsoil is most often faintly mottled, although the mottling is distinct in three profiles (Profiles 4, 5 and 6).

3.9 The upper subsoil is clay which is most often brown (7.5YR4/2) but in the south-east is dark greyish brown (2.5Y4/2 or 10YR4/2). There are no stones. The upper subsoil clay is very firm and formed of coarse angular blocky peds which hinder permeability. The upper subsoil is distinctly or prominently mottled and is slowly permeable.

3.10 Lower subsoil horizons also primarily comprise stoneless clay which is of similar colour to the upper subsoil, or is occasionally brown (7.4YR4/3) or dark grey (2.5Y4/1). The lower subsoil is mottled, gleyed and slowly permeable.

3.11 Extensive particle size distribution analysis undertaken by the GI investigations confirm that the soils within the south-western agricultural parcel comprise clay or silty clay topsoil over predominantly silty clay upper and lower subsoils, with some instances of clay.

3.12 The GI investigations undertaken in disturbed land adjacent to the north-eastern agricultural parcel identified heavy silty clay loam topsoils. In most logs there is a silty clay subsoil with occasional heavy silty clay loam or clay. Five logs indicate there to be a significantly stony subsoil.

3.13 Due to the small number of FCD, the soil profiles are assessed as WC III, even though they are slowly permeable immediately beneath the topsoil. With clay or silty clay topsoil, there is a wetness limitation to Subgrade 3b, as shown in Figure RAC/10011/2.

[7] **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook.* Soil Survey Technical Monograph No. 5, Silsoe.

[8] **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

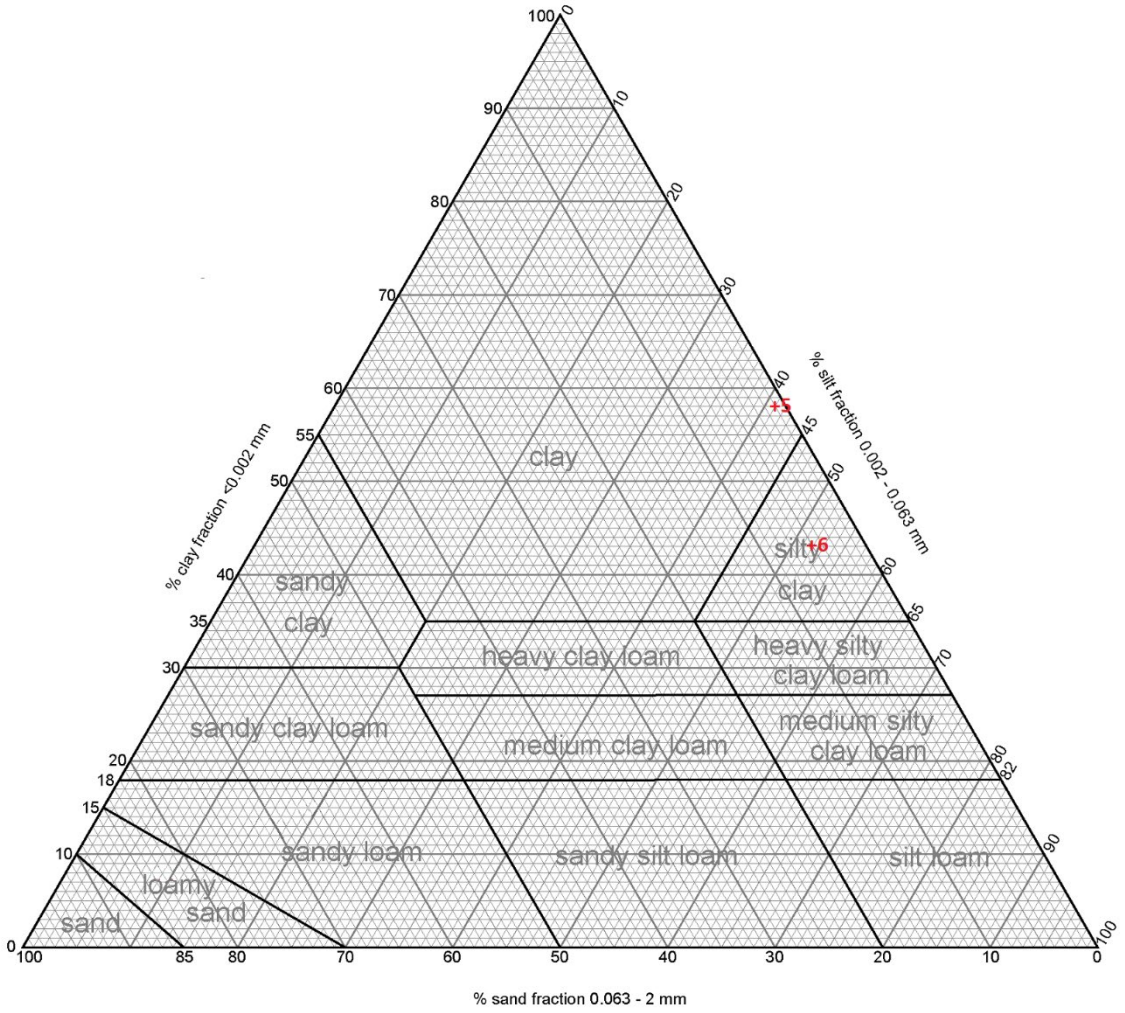
Appendix 1: Laboratory Data

Determinand	Site 5	Site 6	Units
Sand 2.00-0.063 mm	1	5	% w/w
Silt 0.063-0.002 mm	41	52	% w/w
Clay <0.002 mm	58	43	% w/w
Organic Matter	5.2	4.6	% w/w
Texture	Clay	Silty Clay	

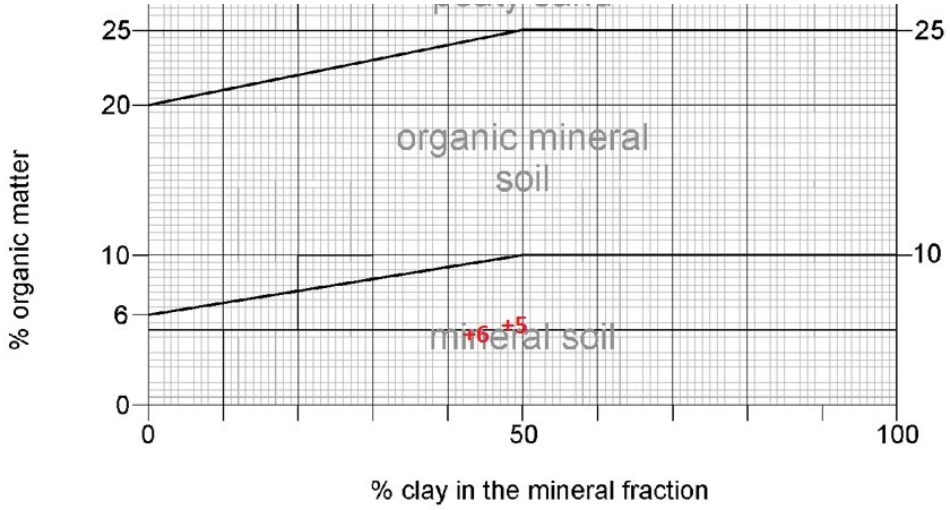
Determinand	Site 5	Site 6	Units
Soil pH	6.9	8.1	
Phosphorus (P)	7.8	7.2	mg/l (av)
Potassium (K)	473	332	mg/l (av)
Magnesium (Mg)	377	404	mg/l (av)

Determinand	Site 5	Site 6	Units
Phosphorus (P)	0	0	ADAS Index
Potassium (K)	4	3	ADAS Index
Magnesium (Mg)	6	6	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness / workability limitations are determined according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types		
%	TAv	EAv
hard	1	0.5
chalk	10	7

Climate Data	
MDwheat	115
MDpotato	109
FCD	129

Wetness Class Guidelines	*II*	*III*	*IV*	*V*
SPL within 80cm, gleying within 40cm	>62cm	<62cm		
SPL within 80cm, gleying at 40-70cm	>43cm	<43cm		
No SPL but gleying within 40cm	coarse subsoil	*I*	other cases	*II*

hard flint & pebble

Maximum depth of auger penetration is underlined

Site No.		Depth cm		Texture	$CaCO_3$	Colour	Mottle colour	abund-ance	stone% hard	stone% chalk	Struct-ure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T	0	29	C		10YR4/2	och	mff				49	49	y	n	*III*	3b	**3b**	WE
		29	47	C		2.5Y4/2	och	mmd			poor	23	23	y	y				
		47	120	C		7.5YR4/3	och& grey	mcp			poor	53	30	y	y				
											Total	**126**	**103**						
											MD	11	-6						
									Droughtiness grade (DR)			2	2						
2	T	0	30	C		10YR4/1	och	mff				51	51	y	n	*III*	3b	**3b**	WE
		30	120	C		10YR4/2	och& grey	cmd			poor	75	52	y	y				
											Total	**126**	**103**						
											MD	11	-6						
									Droughtiness grade (DR)			2	2						
3	T	0	30	C		10YR4/1	och	mff				51	51	y	n	*III*	3b	**3b**	WE
		30	120	C		10YR4/2	och& grey	cmd			poor	75	52	y	y				
											Total	**126**	**103**						
											MD	11	-6						
									Droughtiness grade (DR)			2	2						
4	T	0	26	C		10YR4/2	och	fmd				44	44	n	n	*III*	3b	**3b**	WE
		26	57	C		7.5YR4/2	och	cmp			poor	36	40	y	y				

		57	120	C	2.5Y4/1	och& grey	cmd		poor	44	17	y	y					
									Total	**124**	**101**							
									MD	9	-8							
								Droughtiness grade (DR)		2	2							
5	T	0	32	C	10YR4/2	och	mmd			54	54	y	n	///	3b	**3b**	WE	
		32	120	C	7.5YR4/2	och	ccd		poor	72	49	y	y					
									Total	**127**	**104**							
									MD	12	-5							
								Droughtiness grade (DR)		2	2							
6	T	0	30	ZC	10YR4/2	och	mfd			51	51	y	n	///	3b	**3b**	WE	
		30	120	C	7.5YR4/2	och	cmp		poor	75	52	y	y					
									Total	**126**	**103**							
									MD	11	-6							
								Droughtiness grade (DR)		2	2							
7	T	0	31	C	10YR4/2	och	mff			53	53	y	n	///	3b	**3b**	WE	
		31	65	C	7.5YR4/2	och& grey	cmp		poor	35	44	y	y					
		65	85	hZCL	7.5YR4/3	och	cmp			20	9	n	n					
		85	120	C	7.5YR4/2	och& grey	cmp		poor	25	0	y	y					
									Total	**132**	**105**							
									MD	17	-4							
								Droughtiness grade (DR)		2	2							
8	T	0	31	C	10YR4/2	och	mff			53	53	y	n	///	3b	**3b**	WE	
		31	85	C	7.5YR4/2	och	cmp		poor	49	51	y	y					
		85	120	C	2.5Y4/2	och	mmp		poor	25	0	y	y					
									Total	**126**	**103**							
									MD	11	-6							
								Droughtiness grade (DR)		2	2							

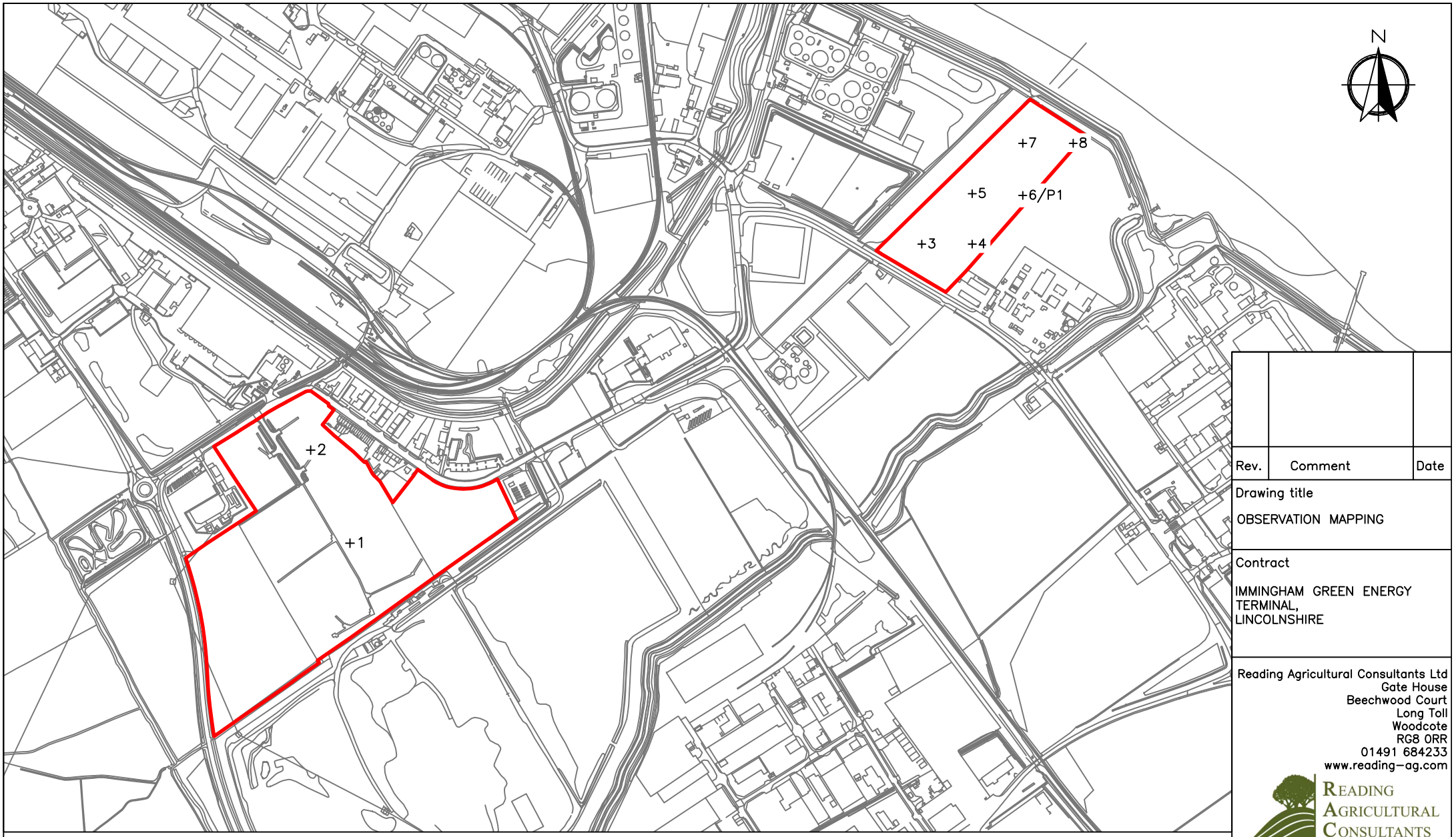
Appendix 3: Photographs

Pit

Site

Subsoil

Topsoil



KEY

Survey boundary

+1 Observations

+P Pit

1:10,000

0 200m 400m

Rev.	Comment	Date

Drawing title

OBSERVATION MAPPING

Contract

IMMINGHAM GREEN ENERGY TERMINAL,
LINCOLNSHIRE

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READING AGRICULTURAL CONSULTANTS

Ref.	Rev.
RAC/10011/1	
Drawn by: AGM	Checked by: AIF
Scales: 1:10,000@A4	Date: 13/06/2023

Rev.	Comment	Date

Drawing title

AGRICULTURAL LAND CLASSIFICATION

Contract

IMMINGHAM GREEN ENERGY TERMINAL, LINCOLNSHIRE

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KEY

Grade 1		Grade 4	
Grade 2		Grade 5	
Subgrade 3a		Non-agricultural	
Subgrade 3b		Not present	

1:10,000

0 200m 400m

Ref.	Rev.
RAC/10011/2	
Drawn by: AGM	Checked by: AIF
Scales: 1:10,000@A4	Date: 13/06/2023