

Agricultural benefit statement for the sediment from the proposed dredging of Monmouth and Brecon Canal

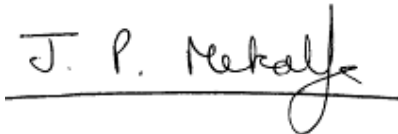
Field: Barn and Dorens Field

1.1 Person with appropriate technical expertise and permit details

- Phil Metcalfe, ADAS Agricultural Engineer
- BSc (Hons) Mechanical Engineering, MSc Agricultural Engineering, HND Supplement Aeronautical Engineering, FACTS qualified, Member Institute of Agricultural Engineers, Chartered Engineer, Chartered Environmentalist
- Has started his 40th year of experience working for ADAS as an Agricultural Engineer providing machinery, cultivation, crop nutrition, fertiliser and waste management (farm and non-farm) advice and consultancy. Experience includes numerous waste to land applications, nutrient, manure and soil management plans and advice for compliance with Nitrate Vulnerable Zone rules. He has research and development experience with Mechanisation, fertilisers and waste processes.
- FACTS Registration No. R/FE/3731

• **Signed by:**

Date: 10th June 2015



Field: Barn and Dorens Field

1.2 Where the waste is to be spread

Farm address:

Mr R.J. Price
Ty-Cooke Farm
Mamhilad
Pontypool
Monmouthshire
NP4 8QZ

Spreading area grid reference:

Field 1. Barn Field: Easting 330939 Northing 204290 (SO 30939 04290)
Field 2. Dorens Field: Easting 331071 Northing 204239 (SO31071 04239)

Area of the receiving land:

Barn and Dorens Fields: total area 6.85 ha, available spreading area 6.54 ha

Quantity to be stored at any one time:

The sediment will not be stored after dredging. Directly after dredging it is spread with a low ground pressure bulldozer.

Total quantity to be spread: estimate 8,000m³ (10,800 tonnes assuming a dredgings density of 1.35t/m³)

Field: Barn and Dorens Field

1.2 Where the waste is to be spread

Location maps showing the field receiving sites and spreading control measures :

- Receiving Sites Location Map -
- Receiving Site Map –

Field: Barn and Dorens Field

1.3 What is the waste to be spread

Waste producer: Land and Water Services

EWC code: 17 05 06 dredging's spoil

Waste description: Sediment dredged from a length of the Monmouth and Brecon Canal with an average dry solids content of 29%.

Field: Barn and Dorens Field

1.4 Operational details

Cropping details:

- The field is currently pasture.
- The field will be reseeded to grass following dredged sediment application.
- The dredged sediment will be applied on the current grass sward.
- Directly after dredging the sediment will be spread with a low ground pressure bulldozer to a depth of about 13cm.
- After the dredged sediments are spread they are allowed to dry out before being thoroughly worked into the existing site topsoil to a depth of 15cm.
- No land drains were noted in the field survey.

Field: Barn and Dorens Field

1.5 Compliance

The field where it is intended to apply the dredged sediment is **not** within a designated NVZ

Recycling of dredged sediments from inland waterways to agricultural land, can provide a number of agricultural benefits including their contribution of available nitrogen needs to be taken into account in fertiliser planning.

The rate of dredged sediment applied will not supply more available nitrogen than crop nitrogen requirement. The farmer cropping the receiving field will be informed of the amount of available nitrogen applied by the dredged sediment, so that this can be considered in his nitrogen planning for the fields.

Field: Barn and Dorens Field**1.6 Benefits and nutrients supplied to the soil or crop from this application****Table 1****Sediment Analysis Summary (average of 18 samples GOL1-18)****Monmouth and Brecon Canal – sediment to be applied to field**

General properties & plant nutrients	Units	Average Result (Range)	Comment
pH	-	6.8 (6.3-8.6)	The pH would present no problems for recycling the sediment to agricultural land.
Moisture Content (30°C)	%	71 (51-77)	
Dry solids (100 – Moisture Content 30°C)	%	29 (23-49)	The average dry solids content is just below the typical range of 30-50% for dredged sediment.
Total Nitrogen	%	0.57 (0.48-0.67)	See Table 5 for information on available nitrogen supplied by the dredgings.
Ammonium-Nitrogen	mg/kg	45 (17-88)	Only a small proportion (about 0.9%) of the total N is present as readily available N.
Nitrate-Nitrogen	mg/kg	7 (5.2-13)	
Available Phosphorus	mg/l	21 (9.2-46)	The average sediment available phosphorus content is the same as one field (Barn) and slightly lower than the other field (Dorens) [see Table 2].
Available Potassium	mg/l	15.3 (9.7-22)	The sediment has a lower level of available potassium than in the receiving field soil (see Table 2).
Available Magnesium	mg/l	13.4 (8.7-19)	The sediment contains a lower level of available magnesium as the receiving field soil (see Table 2).
Organic Matter	%	16 (5.8-21)	The average organic matter content of the sediment is slightly higher than the organic matter content of the soil in the receiving fields (see Table 2).

1.6 Benefits and nutrients supplied to the soil or crop from this application

Proposed receiving fields

Table 2 pH, major plant nutrients and organic matter analysis results

Field	pH	Lime t/ha Grass Arable	Phosphorus ¹ mg/l (Index)	Potassium ¹ mg/l (Index)	Magnesium ¹ mg/l (Index)	Organic Matter ² %
Barn	7.6	0 0	21 (2)	110 (1)	160 (3)	14
Dorens	7.7	0 0	23 (2)	130 (2-)	200 (4)	14

¹ Assuming a soil density of 1 g/cm³ (the results were reported as mg/kg).

² As determined by loss on ignition.

Table 3 Estimated crop nutrient requirement as fertiliser [from Defra's RB209 publications 8th edition (and 7th edition for nitrogen)] without dredged sediment application

Field	2015 crop	Crop to be established after sediment application.	Nitrogen ¹ kg/ha	Phosphate kg/ha P ₂ O ₅	Potash kg/ha K ₂ O	Magnesium kg/ha MgO
Barn	Grass	Grass (for hay and grazing)	160 ²	30	115	0
Dorens	Grass	Grass (for hay and grazing)	160 ²	30	90	0

¹ Soil Nitrogen Supply (SNS) Low (historic fertiliser N use 62.5 kg/ha and no organic manures applied). The soil texture is sandy loam topsoil (20cm deep on Barn / 22cm deep on Dorens) over sandy loam subsoil (RB209 medium soil).

² 100 kg/ha for hay and 60 kg/ha for aftermath grazing.

Table 4 Proposed Sediment application rates

Field	Total weight of fresh sediment ¹ (t)	Dry solids content of sediment (%)	Area to be used for spreading (ha)	Dry solids loading (t/ha)
Barn and Dorens Fields	10,800	29	6.54	479

¹ From 8,000 m³ of fresh sediment assuming a density of 1.35 t/m³.

Nitrogen provided by sediment application

The Defra Guidance document “NVZ action Programme and Application of Dredgings to Agricultural Land” provides an indication of the amount of nitrogen that will be available from dredgings for the following crop. The calculation assumes that 3% of the organic nitrogen and all of the ammonium and nitrate nitrogen will be available to the crop. Using these criteria, an application of 479 t/ha of sediment dry solids from the Monmouth and Brecon Canal will supply c106 kg/ha of available nitrogen for the following crop.

Table 5 Available nitrogen provided by sediment application

Field	Sediment dry solids application rate	Available nitrogen from sediment application	
		kg/t	kg/ha
Barn and Dorens Fields	479	0.221	~106

1.6 Benefits and nutrients supplied to the soil or crop from this application

Although at face value using the average available phosphorus (21mg/l), potassium (15.3mg/l) and magnesium (13.4mg/l) levels for sediment dredged from the Monmouth and Brecon Canal 479 t/ha sediment dry solids would apply about 23 kg available P₂O₅/ha, 9 kg available K₂O/ha & 11 kg available MgO/ha applying sediment to a field is more akin to applying 'soil' than an 'organic manure', for example, so crop requirement for phosphate, potash and magnesium fertiliser following application should be based on the estimated soil phosphorus, potassium and magnesium indices following incorporation of the sediment (or better a soil analysis of the field following incorporation). Table 6 shows the estimated phosphorus, potassium and magnesium indices and Table 7 the requirement for nitrogen, phosphate and potash fertiliser after sediment application.

Table 6 **Estimated available phosphorus, potassium and magnesium levels after sediment application and incorporation**

Field	Phosphorus mg/l (index)	Potassium mg/l (index)	Magnesium mg/l (index)
Barn	21 (2)	87 (1)	125 (3)
Dorens	22.5 (2)	102 (1)	155 (3)

Table 7 **Estimated crop nutrient requirement as fertiliser based on estimated indices after sediment application and incorporation (Table 6)**

Field	2015 crop	Crop to be established after sediment application.	Nitrogen kg/ha	Phosphate kg/ha P ₂ O ₅	Potash kg/ha K ₂ O	Magnesium kg/ha MgO
Barn	Grass	Grass (hay and grazing)	54	30	115	0
Dorens	Grass	Grass (hay and grazing)	54	30	115	0

In summary application of the dredged canal sediment will confer agricultural benefit by reducing manufactured nitrogen fertiliser requirement for grass following application. The dredged sediment application would be predicted not to change the soil available phosphorus (P) Indices and thus not alter the phosphate requirement. The dredged sediment application would be predicted to decrease the soil potassium (K) levels but only decrease the K Index on Dorens Field. On this field an additionally 25 kg/ha potash is required after sediment application. Magnesium (Mg) requirement is nil with or without sediment application. The dredged sediment application would also increase available water capacity by increasing the depth of topsoil.

Fields: Barn and Dorens Fields

1.7 Potential negative impacts to the soil or crop from this application

Table 8 Potentially Toxic Element (PTE) and Organic Substance Analysis Summary for Monmouth and Brecon Canal sediment (average of 18 samples GOL1-18)

Potentially Toxic Elements (PTEs) & Organic Substances								
PTE	Copper	Nickel	Zinc	Cadmium	Chromium	Lead	Mercury	Arsenic
mg/kg Average Range	22 14-29	22 16-30	109 68-180	1.0 0.8-1.1	29 18-38	31 24-42	0.07 0.05-0.11	7.0 4.6-8.1
PTE	Total sodium	Selenium	Boron – water soluble	Chromium (hexavalent)	Fluoride	Barium	Sulphide	
mg/kg Average Range	397 190-1300	<0.6 <0.5-0.9	2.0 1.5-2.4	<1.0 All <1.0	<1.4 <1.0-3.5	142 82-170	166 120-210	
PTE	Sulphur as S	Sulphate as SO ₄	Conductivity					
% (µS/cm for conductivity) Average Range	0.16 0.09-0.22	0.12 0.08-0.16	253 91-510					
Organic substances	Cyanide total	Cyanide free	PAH (total 16 EPA)	EPH (C5-C10)	EPH (C10-C25)	EPH (C25 - C40)	EPH (C10-C40)	Phenol-monohydric
mg/kg Average Range	0.3 0.2-0.5	<0.11 <0.1-0.3	<1.9 <1.6-<6.8	<0.13 <0.1-0.6	<30 <10-65	<44 <10-170	<72 <10-200	1.4 1.0-1.8
Comments	The PTE and organic substance levels do not pose any concern for application to agricultural land. The mixing ratio will be about 1 part sediment dry solids to 3.1 parts soil dry solids.							

Table 9 Field Potentially Toxic Elements levels

Field	Conductivity µS/cm	Total Cu mg/kg	Total Ni mg/kg	Total Zn mg/kg	Total Cd mg/kg	Total Pb mg/kg	Total Hg mg/kg	Total As mg/kg	Total Cr mg/kg
Barn	460	12	14	43	0.3	12	<0.05	2.5	6.4
Dorens	460	14	15	49	0.3	13	<0.05	3.2	9.4
<i>Estimated levels following dredged sediment application</i>									
Barn		14.3	16.0	59	0.46	16.6	<0.055	3.6	12.0
Dorens		15.8	16.8	63	0.46	17.3	<0.055	4.1	14.2
Maximum permissible level following sewage sludge application soil									
pH 5.0-5.4									
		80	50	200	3	300	1	50	400
pH 5.5-5.9									
		100	60	200	3	300	1	50	400
pH 6.0-7.0									
		135	75	200	3	300	1	50	400
pH greater than 7 and calcium carbonate content greater than 5%*									
		200	110	300	3	300	1	50	400
*Barn and Doren soils contain respectively 19% & 22% calcium carbonate and would contain respectively 14.4% & 16.7% after sediment application even if the sediment contains no calcium carbonate.									

- As the sediment contains higher PTE levels than the receiving field soils PTE levels would be expected to increase slightly in the field soils following sediment application. However, the levels remain well below the maximum permissible levels following sewage sludge application. It is noted that PTE levels in all individual sediment samples are below maximum permissible levels following sewage sludge application.

Site topography

- Field 1. Barn field is an irregular shaped permanent pasture field. A fence forms the south-western boundary, with the canal and tow path a short distance beyond. The field is bounded by Croes-Y-Pant-Lane to the north-east with trees and hedges forming the south-eastern boundary. There is a residential dwelling bordering the field to the north-west along with trees and a fence. The southern part of the field slopes fairly steeply towards the canal whereas the northern part slopes gently towards the lane.
- Field 2. Dorens field is an L shaped permanent pasture field. The field is bordered by Croes-Y-Pant-Lane to the north-east and the village of Croes-Y-Pant to the east. The canal and tow path border the south-western boundary with mature trees. Trees and hedges form the south-eastern and north-western boundaries. The south-eastern part of the field slopes steeply towards the canal, whereas the field to the north and east slopes gently towards the lane.
- See photos of both proposed fields below.

Field 1. Showing canal to the south west of the field



Field 1. Showing residential dwelling to the north west of the field



Field 1. Showing northern part of the field



Field 2. Shows slope towards canal



Field 2. Showing northern part of field looking towards Croes-Y-Pant



Field 2. Showing slope of field from the canal



- The canal dredgings will not be stored at the site.
- With regard to impact of the operations on the receiving soil, for example wheel ruts, compaction, structural damage, soil erosion and run-off, impacts on the soil will be minimized by carrying out the spreading with a low ground pressure bulldozer.
- Other potential negative impacts from the operation, for example: traffic management, anti-vandalism measures. Land and Water Services will manage the traffic when plant/machinery is delivered to site. No vandalism is expected.

Field: Barn and Dorens Fields

1.8 Sensitive human and environmental receptors

Sensitive human receptors

- The closest property to Field 1 is <5m to the north-west. The rural settlement of Croes-Y-Pant borders Field 2 to the east.
- A public footpath crosses field 2 and runs from Croes-Y-Pant at the south east then in a northwesterly direction until it meets the hedge line of Field 2. The footpath then continues in an east to southwest alignment on the southern hedge line in Field 2 before connecting with the canal at the south west side of field 2. The canal and towpath borders the southwestern boundary of both fields.
- Mamhilad village is 1.1km southwest of both fields, and Penperlleni village is 1.5km to the east of both fields.
- Odour control - Low odour potential from dredged materials.
- Noise control - Equipment is similar to normal agricultural machinery. The fields are within an agricultural environment. Sensitive spreading periods will be avoided e.g. bank holidays and weekends. Deliveries will be during daylight hours.
- Land and Water Services will ensure that there are buffer areas in place when spreading near the footpaths and water courses.
- There are no known boreholes or springs in these fields.
- Land and Water Services will check the location of any water main services in the vicinity of the works before commencement.

Sensitive environmental receptors

- NRW/Environment Agency 'Groundwater Source Protection Zones'. The fields proposed to be used are not within any Groundwater Source Protection Zones.
- NRW/Environment Agency 'Aquifer Maps - Superficial Deposits Designation'. The field proposed is not within this designation.
- NRW/Environment Agency 'Aquifer Maps - Bedrock Designation'. The fields proposed are not with this designation.
- NRW/Environment Agency 'Groundwater Vulnerability Zones'. The fields proposed to be used are not designated
- NRW/Environment Agency Drinking Water Safe Guard Zone – Field 1 is in a surface water safe guard zone for Pesticides.
- Flooding. From the Environment Agency website, the following risks have been considered:

Flooding from surface waters – Very Low risk.

Flooding from rivers and sea – none.

1.8 Sensitive human and environmental receptors

Flooding from reservoirs – none.

Flood warning areas – none.

- It is not intended to spread near the boundary hedges. A 2.0m, minimum buffer zone will be left free from dredging's adjacent to bushes and hedgerows. No dredgings will be spread beneath tree canopies.
- The contractor proposes to leave buffer strips (10m minimum) free from dredging's adjacent to any watercourses, in this instance the canal that borders both fields 1 and 2.
- A 2.0m, minimum buffer zone will be left free from dredging's both sides of the footpath where it crosses the field. (4m in total)
- The 2.0m buffer requirement for the footpath as it runs along the hedge of Field 2 is addressed by the 2.0m, minimum buffer zone that will be left free from dredging's adjacent to bushes and hedgerows.

A search on MAGIC Map - <http://www.magic.gov.uk/MagicMap.aspx> - found that no statutory and non-statutory designations were **affected**.

A search on MAGIC Map - <http://www.magic.gov.uk/MagicMap.aspx> - found the following statutory and non-statutory designations to be **unaffected**:

Statutory designations:

- National Nature Reserve
- Ramsar Site
- Site of Scientific Interest
- Special Area of Conservation
- Special Protection Areas
- Biosphere Reserves

Non statutory:

- RSPB Reserves

Field: Barn and Dorens Fields

1.9 Practices to reduce the impacts of the operation on identified sensitive receptors

In this section you should set out the measures to be taken to reduce the impact of the operation on the receptors identified for example:

- There is a low odour potential from dredged materials. Sensitive spreading periods e.g. bank holidays and weekends will be avoided.
- Spreading will only be undertaken when weather conditions are suitable.
- There is a low odour potential from dredged materials and therefore odour should not be an issue.
- Buffer strips keeping any operations more than 10 metres from receptors will be put in place
- machinery operations will take account of soil conditions, slope etc
- machinery will be checked daily
- machinery turns will not be executed in the buffer strips
- Waste deliveries to fields will be supervised to minimize impacts
- Spreading restrictions within the 'Code of Good Agricultural Practice' will be adhered to.
- All machinery is regularly serviced and spreading equipment is calibrated.

Fields: Barn and Dorens Fields

2.0 Contingency planning

Tell us about the measures you have in place in the event of

- Machinery breakdown; All Land and Water Services (LAWS) Excavators run on Bio Hydraulic Oil. A team of fitting staff are on standby if required.
- Staffing problems due to sickness, holidays etc.; LAWS Carry Sufficient Staff to cover eventualities.

Waste analysis

- Certificate Number – 15-33599 (Sediment Analysis)

DETS Certificate 15-33599 _Silt analysis



Summary of Chemical Analysis

Soil Samples

Our Ref 15-33599

Client Ref

Contract Title Mon and Brecon Canal

Lab No	803864	803865	803866	803867	803868	803869
Sample ID	GOL1C	GOL2C	GOL3C	GOL4C	GOL5C	GOL6C
X	330212	330206	330171	330301	330273	330587
Y	202132	202531	202889	203208	203496	203995
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Moisture Content 30°C	DETSC 1004*	0.1	%	68	68	69	76	73	70
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	6.2	6.4	4.6	6.4	6.6	6.2
Barium	DETSC 2301#	1.5	mg/kg	170	150	130	160	140	150
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.0	1.7	2.0	2.4	2.0	1.9
Cadmium	DETSC 2301#	0.1	mg/kg	1.0	0.8	0.8	1.0	0.9	1.0
Chromium	DETSC 2301#	0.15	mg/kg	38	30	26	38	34	35
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	21	16	23	20	20
Lead	DETSC 2301#	0.3	mg/kg	31	25	25	31	33	35
Available Magnesium	DETSC 2301*	0.1	mg/l	14	19	15	11	8.9	14
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.06	0.05	0.07	0.05	0.07
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	0.6	0.5	0.7	0.6	0.6
Nickel	DETSC 2301#	1	mg/kg	30	22	22	30	27	28
Available Phosphorus	DETSC 2301*	0.1	mg/l	23	17	20	16	13	30
Available Potassium	DETSC 2301*	0.1	mg/l	15	22	18	13	10	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.7	< 0.5	< 0.5
Sodium	DETSC 2301*	0.1	mg/kg	330	1000	300	370	320	260
Zinc	DETSC 2301#	1	mg/kg	110	90	80	110	94	100
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	190	420	170	380	220	160
pH	DETSC 2008#			6.7	7.0	6.7	6.3	8.6	6.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.4	0.4	0.3	0.2	0.3	0.3
Cyanide Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.1	0.1	0.3
Organic matter	DETSC 2002#	0.1	%	12	14	16	19	20	11
Total Organic Carbon	DETSC 2002	0.1	%	6.8	8.2	9.5	11	12	6.1
Ammoniacal Nitrogen as N	DETSC 2119#	0.5	mg/kg	88	46	37	52	57	82
Fluoride	DETSC 2055	1	mg/kg	3.1	2.5	1.5	< 1.0	1.0	< 1.0
Nitrate as NO3	DETSC 2055	1	mg/kg	6.5	6.2	6.7	5.2	7.5	6.9
Nitrogen	DETSC 2121*	0.01	%	0.49	0.48	0.52	0.66	0.67	0.66
Total Kjeldahl Nitrogen	DETSC 2121*	0.01	%	0.49	0.48	0.52	0.66	0.67	0.66
Sulphide	DETSC 2024#	10	mg/kg	160	170	200	190	210	170
Total Sulphur as S	DETSC 2320	0.01	%	0.17	0.17	0.15	0.22	0.15	0.15
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.12	0.12	0.12	0.16	0.11	0.12
Petroleum Hydrocarbons									
EPH (C5-C10)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
EPH (C10-C25)	DETSC 3311	10	mg/kg	22	20	29	< 10	14	16
EPH (C25-C40)	DETSC 3311	10	mg/kg	21	10	< 10	< 10	< 10	< 10
EPH (C10-C40)	DETSC 3311#	10	mg/kg	43	30	35	< 10	21	21



Summary of Chemical Analysis Soil Samples

Our Ref 15-33599

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X	330212	330206	330171	330301	330273	330587
Y	202132	202531	202889	203208	203496	203995
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
PAHs									
Naphthalene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETS 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH	DETS 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETS 2130#	0.3	mg/kg	1.0	1.1	1.0	1.5	1.6	1.3



Summary of Chemical Analysis Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

Lab No	803870	803871	803872	803873	803874	803875
	GOL7C	GOL8C	GOL9C	GOL10C	GOL11C	GOL12C
Sample ID	330587	330870	331133	331438	331809	331648
X	204203	204085	203851	204133	204350	204647
Y						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Moisture Content 30°C	DETS 1004*	0.1	%	72	77	51	77	74	68
Metals									
Arsenic	DETS 2301#	0.2	mg/kg	7.5	8.1	7.0	7.0	7.5	7.3
Barium	DETS 2301#	1.5	mg/kg	160	160	82	150	140	120
Boron (water soluble)	DETS 2123#	0.2	mg/kg	2.1	1.8	1.5	2.1	2.3	2.0
Cadmium	DETS 2301#	0.1	mg/kg	1.1	1.0	1.0	0.9	0.9	0.8
Chromium	DETS 2301#	0.15	mg/kg	33	35	21	31	28	26
Hexavalent Chromium	DETS 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETS 2301#	0.2	mg/kg	25	23	14	23	21	19
Lead	DETS 2301#	0.3	mg/kg	42	36	27	29	33	26
Available Magnesium	DETS 2301*	0.1	mg/l	16	9.2	17	8.7	12	17
Mercury	DETS 2325#	0.05	mg/kg	0.11	0.10	< 0.05	0.07	0.09	0.06
Molybdenum	DETS 2301#	0.4	mg/kg	0.6	0.7	< 0.4	0.7	0.6	0.6
Nickel	DETS 2301#	1	mg/kg	27	25	16	20	19	17
Available Phosphorus	DETS 2301*	0.1	mg/l	24	21	46	9.2	23	21
Available Potassium	DETS 2301*	0.1	mg/l	19	10	20	9.7	14	20
Selenium	DETS 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.6	0.8	0.5
Sodium	DETS 2301*	0.1	mg/kg	300	430	1300	370	300	280
Zinc	DETS 2301#	1	mg/kg	120	120	68	99	98	88
Inorganics									
Conductivity	DETS 2009	1	uS/cm	360	510	110	260	180	290
pH	DETS 2008#			6.8	6.9	6.7	6.6	6.6	6.8
Cyanide Total	DETS 2130#	0.1	mg/kg	0.2	0.3	0.2	0.4	0.3	0.3
Cyanide Free	DETS 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	0.1	0.1	0.1
Organic matter	DETS 2002#	0.1	%	18	19	5.8	20	21	17
Total Organic Carbon	DETS 2002	0.1	%	11	11	3.3	11	12	10
Ammoniacal Nitrogen as N	DETS 2119#	0.5	mg/kg	65	30	21	51	37	27
Fluoride	DETS 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3.5
Nitrate as NO3	DETS 2055	1	mg/kg	7.3	5.8	6.2	6.0	7.6	6.0
Nitrogen	DETS 2121*	0.01	%	0.66	0.56	0.57	0.57	0.62	0.63
Total Kjeldahl Nitrogen	DETS 2121*	0.01	%	0.66	0.56	0.57	0.57	0.62	0.63
Sulphide	DETS 2024#	10	mg/kg	120	120	150	180	190	160
Total Sulphur as S	DETS 2320	0.01	%	0.21	0.21	0.07	0.14	0.17	0.15
Total Sulphate as SO4	DETS 2321#	0.01	%	0.13	0.15	0.06	0.14	0.13	0.11
Petroleum Hydrocarbons									
EPH (C5-C10)	DETS 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
EPH (C10-C25)	DETS 3311	10	mg/kg	21	28	< 10	23	34	37
EPH (C25-C40)	DETS 3311	10	mg/kg	< 10	< 10	< 10	14	170	63
EPH (C10-C40)	DETS 3311#	10	mg/kg	25	32	< 10	36	200	100

Soil analysis

- Certificate Number 15-35824 (Soil Sample Analysis).

Document: DETS Certificate 15-35824_Soil analysis



Summary of Chemical Analysis

Soil Samples

Our Ref 15-35824

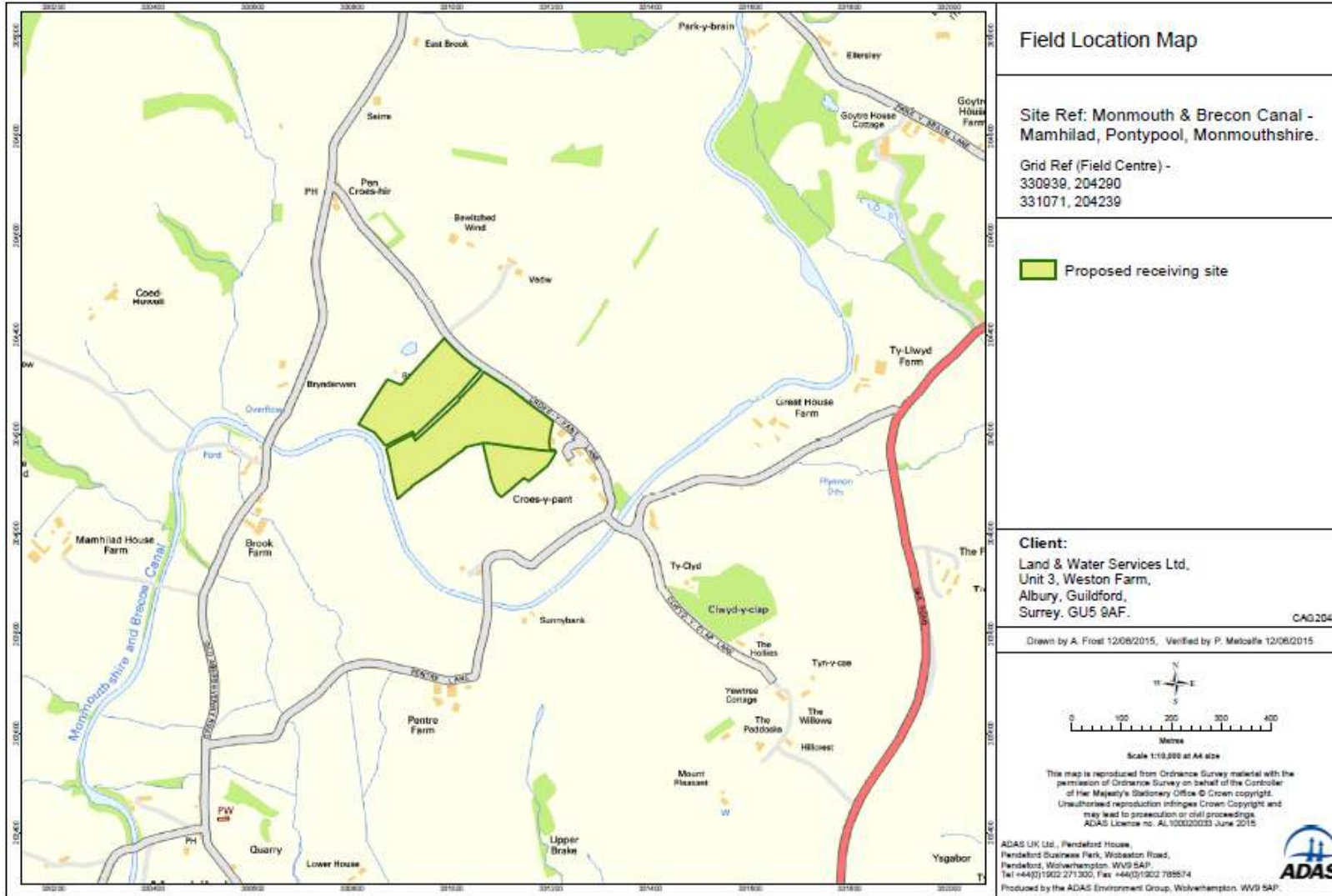
Client Ref SAL 0016005

Contract Title Agricultural Spreading Instruction-Mon

Lab No	815709	815710
	TY-COORE	TY-COORE
	FARM	FARM
	DORENS	BARN
Sample ID	FIELD	FIELD
Depth	150.00	150.00
Other ID		
Sample Type	SOIL	SOIL
Sampling Date	21/05/15	21/05/15
Sampling Time	1100	1200

Test	Method	LOD	Units		
Metals					
Arsenic	DETS 2301#	0.2	mg/kg	3.2	2.5
Boron (water soluble)	DETS 2123#	0.2	mg/kg	2.3	2.1
Cadmium	DETS 2301#	0.1	mg/kg	0.3	0.3
Chromium	DETS 2301#	0.15	mg/kg	9.4	6.4
Copper	DETS 2301#	0.2	mg/kg	14	12
Lead	DETS 2301#	0.3	mg/kg	13	12
Available Magnesium	DETS 2301*	0.1	mg/kg	200	160
Magnesium	DETS 2301*	1	mg/kg	2100	1700
Mercury	DETS 2325#	0.05	mg/kg	< 0.05	< 0.05
Nickel	DETS 2301#	1	mg/kg	15	14
Available Phosphorus	DETS 2301*	0.1	mg/kg	23	21
Phosphorus	DETS 2301*	1	mg/kg	710	600
Available Potassium	DETS 2301*	0.1	mg/kg	130	110
Potassium	DETS 2301*	1	mg/kg	2600	1600
Zinc	DETS 2301#	1	mg/kg	49	43
Inorganics					
Loss on Ignition at 440oC	DETS 2003#	0.01	%	14	14
Soil Density	*	0.1		1/5	1/5
Conductivity	DETS 2009	1	uS/cm	460	460
pH	DETS 2008#			7.7	7.6
Carbonate (as CO2)	DETS 2005	1	%	22	19

Receiving Sites Location Map



Receiving Site Map

