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**LOWER PARKS FARM - MINERAL RESOURCE
EVALUATION**

For

**ENVIRONMENTAL MANAGEMENT SOLUTIONS LIMITED
ON BEHALF OF INTEGRAL UK LIMITED AND
HEREFORDSHIRE COUNCIL**

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Appendix B	Trial pit logs
Appendix C	Laboratory test results – Particle Size Distribution
Appendix D	Planning Permission DCC013281/M
Appendix E	Email dated 17 November 2015 from the Principal Planning Officer at Herefordshire Council

LOWER PARKS FARM - MINERAL RESOURCE EVALUATION

1. INTRODUCTION AND BACKGROUND

GWP Consultants LLP (GWP) has been instructed by Environmental Management Solutions (EMS) on behalf of Integral UK Limited and Herefordshire Council, to undertake a programme of work to evaluate the mineral resource potential of land at Lower Parks Farm, Burghill, Herefordshire.

GWP completed an initial desk study mineral resource evaluation in August 2015. The desk study report is presented in Appendix A. The desk study identified 2 No. potential mineral resource areas located in the southern and northern parts of the site respectively and recommended that the following additional work should be completed in order to investigate further the mineral resource potential of these areas:

- direct site investigation involving trial pitting;
- sampling and laboratory testing of sand and gravel intersected in trial pits;
- review of available documentation relating to the adjacent St Donats Farm located to the south, for which Planning Permission (DCC013281/M) was granted in 2004 for the extraction of sand and gravel but which has never been worked.

This report presents details of the additional work undertaken and the associated findings.

2. SITE LOCATION

The Lower Parks Farm site is located approximately 6km to the north-north-west of Hereford and 1km to the south-west of Wellington.

Drawing No. LOWERPF1512-1 shows the full extent of the Lower Parks Farm site (c. 81ha) and the 2 No. potential mineral resource areas identified by the desk study.

3. INVESTIGATIONS

In addition to the review of available information completed during the desk study, the following investigations have been undertaken:

- Excavation and logging of 7 No. trial pits on 4 November 2015. Trial pit locations are shown on Drawing No. LOWERPF1512-1 and trial pit logs are presented in Appendix B. Table 1 presents a summary schedule of the trial pit results.
- Sampling and laboratory testing of sand and gravel intersected in the trial pits. Sample depths are indicated on the trial pit logs and on Table 1.

11 No. samples were despatched to the laboratory of Geotechnical Engineering Ltd for the determination of Particle Size Distribution. The test results are presented in Appendix C.

- Review of available documentation relating to the adjacent St Donats Farm site located to the south. Information provided by EMS is presented in Appendices D and E and comprises:
 - Planning Permission DCC013281/M (Appendix D).
 - An email dated 17 November 2015 from the Principal Planning Officer at Herefordshire Council (Appendix E);

4. FINDINGS

4.1 Geological Setting

The general geological setting of the Lower Parks Farm site is described in Section 3 of the desk study report presented in Appendix A.

The geology of the 2 No. potential mineral resource areas investigated is described in more detail in the following sections:

4.1.1 *Southern Potential Mineral Resource Area*

Drawing No. LOWERPF1512-1 shows the extent of the southern potential mineral resource area.

Alluvium and Glaciofluvial Sheet Deposits (GSD) were intersected in all 6 No. trial pits excavated within the area and comprised:

- silt and clay (Alluvium) *c.* 0.5 – 2.6m thick (underlying *c.* 0.3m of topsoil/subsoil); overlying
- slightly clayey, silty, sand and gravel with cobbles and occasional boulders (GSD) *c.* 0.9 – over 3.1m thick.

Mineral resource potential is associated with the GSD sand and gravel.

The full thickness of GSD sand and gravel was not determined in 5 No. of the 6 No. trial pits excavated. Trial Pit TP2/2015 intersected mudstone/siltstone bedrock (Raglan Mudstone Formation) beneath *c.* 1.0m of GSD sand and gravel.

Trial pits were dry with the exception of Trial Pits TP4/2015 and TP6/2015 which were damp at depths of *c.* 3.5m and *c.* 4.1m respectively.

It is considered that the GSD sand and gravel intersected is similar in general character to deposits encountered elsewhere in the region including at Wellington Quarry (operated by Hanson) located *c.* 2km to the east.

Based on the results from Trial Pit TP2/2015 and available records for boreholes drilled to the east of the site (see desk study report presented in Appendix A), it is considered unlikely that the maximum thickness of GSD sand and gravel within the southern potential mineral resource area exceeds *c.* 4 – 5m.

4.1.2 Northern Potential Mineral Resource Area

Drawing No. LOWERPF1512-1 shows the extent of the northern potential mineral resource area.

GSD (underlying *c.* 0.3m of topsoil/subsoil) were intersected in the 1 No. trial pit excavated within this area. The material comprised clayey, sandy, gravelly, silt with cobbles and occasional boulders.

The trial pit was dry.

No other trial pits were excavated within this area due to:

- the lack of sand and gravel intersected in Trial Pit TP7/2015;
- the generally unfavourable location of the area (see Section 5.2 below).

4.2 Laboratory Testing

The results of the laboratory testing programme shows the GSD sand and gravel to be well graded with a fines content (silt and clay) ranging from 6 – 14% (average of 8.5% for the 11 No. samples tested).

The fines content is not considered to be unfavourably high, although washing and screening of the as-dug material would be required in order to produce high quality processed aggregate products (as is the case at Wellington Quarry).

4.3 Adjacent St Donats Farm

Planning Permission DCC013281/M was granted in 2004 for the extraction of sand and gravel from the adjacent St Donats Farm site located to the south (see Appendix D).

It is understood that the Planning Permission has never been implemented, that a number of pre-commencement Conditions have not been discharged (see Appendix E) and that the Planning Permission is likely to have lapsed.

It has not proved possible to obtain any information relating to the mineral resource at the St Donats Farm site *e.g.* mineral thickness and quality or resource tonnage.

Importantly within the context of the potential for mineral extraction at Lower Parks Farm, Planning Permission DCC013281/M prohibits site access from the A4110 for any vehicular traffic connected with the St Donats Farm mineral extraction operations. The Planning Permission requires vehicular site access to be directly from the A49 *'in the interests of highway safety and to enable the A49 trunk road to continue to be an effective part of the national system of routes for through traffic'*.

A similar planning restriction imposed in connection with Lower Parks Farm would require site access across neighbouring third party land.

5. MINERAL RESOURCE POTENTIAL

5.1 Southern Potential Mineral Resource Area

An evaluation of the potential mineral resource tonnage associated with the southern area has been made on the basis of the following principal assumptions:

- 1.78m proven average thickness of GSD sand and gravel;
- 3.50m inferred possible average thickness of GSD sand and gravel;
- Excavation losses equivalent to a GSD sand and gravel thickness of 0.2m;
- 10% processing losses;
- 1.7t/m³ conversion factor;
- 25m standoff from site boundaries (50m standoff from the residential property located along the northern boundary).

On the basis of the assumptions made, the recoverable tonnage of GSD sand and gravel (excavated and processed) associated with the southern area is estimated to be:

- c. 145,000t (associated with 1.78m proven average thickness of GSD sand and gravel);
- c. 300,000t (associated with 3.50m inferred possible average thickness of GSD sand and gravel);

The following unfavourable average stripping ratios (overburden thickness (including topsoil/subsoil to GSD sand and gravel thickness) are indicated:

- c. 1.1 (associated with 1.78m proven average thickness of GSD sand and gravel);
- c. 0.6 (associated with 3.50m inferred possible average thickness of GSD sand and gravel);

For the following principal reasons, it is considered that the GSD sand and gravel mineral resource identified within the southern area is extremely unlikely to represent an operationally and economically viable mineral reserve:

- limited mineral resource tonnage;
- unfavourable stripping ratio;
- limited site area available for processing plant, temporary overburden storage *etc.*
- close proximity of a residential property.
- possible/probable site access constraints requiring access across neighbouring third party land.

It is possible that the southern area might represent a marginally viable mineral reserve as a small extension to a larger mineral development comprising the adjacent St Donats Farm site located to the south.

5.2 Northern Potential Mineral Resource Area

It is considered that the northern area offers no mineral resource potential due to the apparent absence of sand and gravel.

The unfavourable location of the area (on high ground) would, in any event, likely impose significant operational (site access) and environmental (highly visible from the surrounding area) constraints on site development.

6. SUMMARY AND CONCLUSIONS

GWP Consultants LLP has undertaken a mineral resource evaluation of land at Lower Parks Farm.

The programme of works has involved an initial desk study followed by further investigation (involving trial pitting and sampling/laboratory testing of intersected sand and gravel) of 2 No.

potential mineral resource areas, identified by the desk study, located in the southern and northern parts of the site respectively.

Based on the findings of the programme of works it is considered that:

- the sand and gravel mineral resource identified within the southern area is extremely unlikely to represent an operationally and economically viable mineral reserve. It is possible that the southern area might represent a marginally viable mineral reserve as a small extension to a larger mineral development comprising the adjacent St Donats Farm site.
- the northern area offers no mineral resource potential.

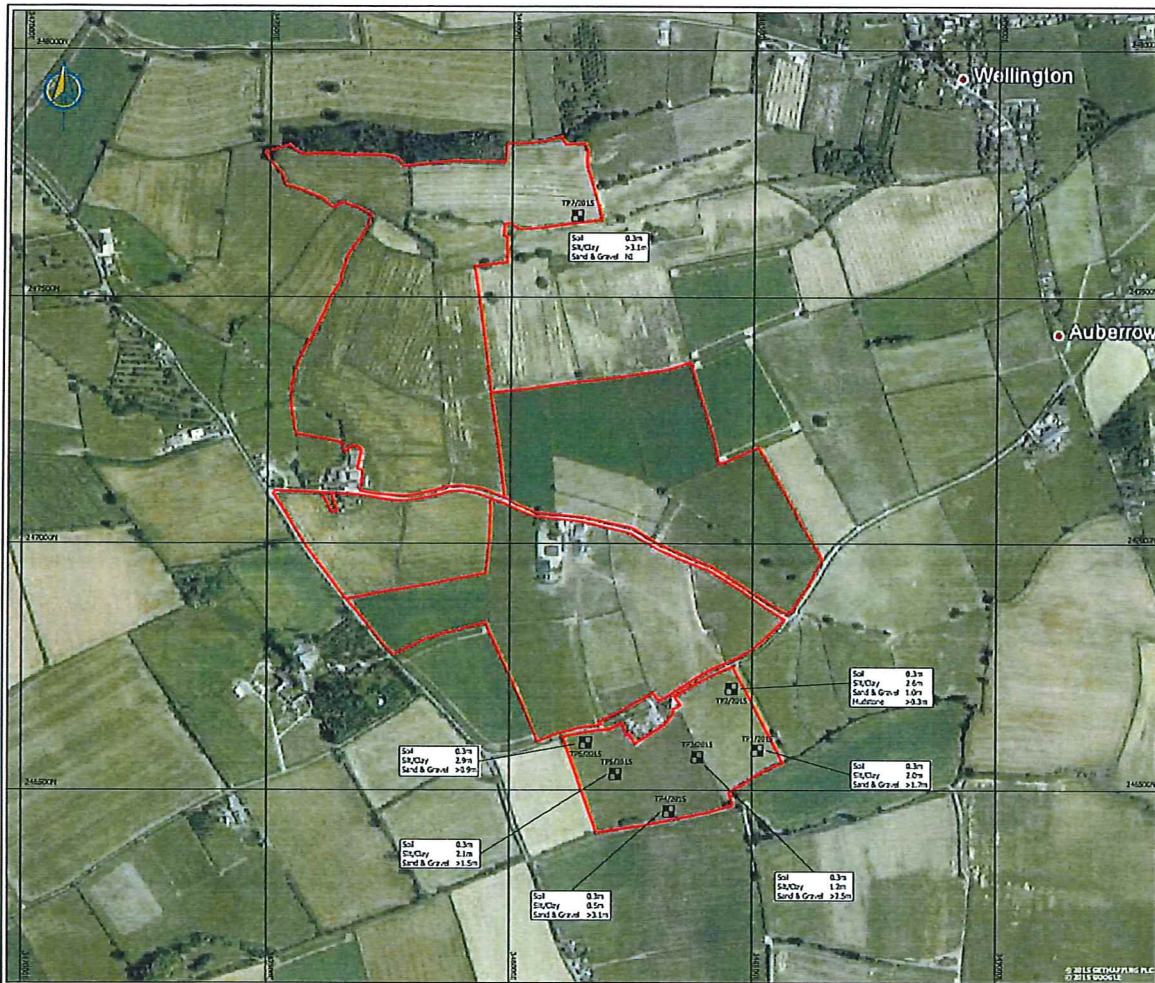
The mineral resource potential of all other parts of the Lower Parks Farm site, which are inferred to be underlain by Glacial Till superficial deposits and bedrock geology comprising interbedded siltstone and mudstone of the Raglan Mudstone Formation, was dismissed during the desk study.

GWP CONSULTANTS
DECEMBER 2015

TABLE 1
Summary Trial Pit Schedule

Trial pit ID		TP1/2015	TP2/2015	TP3/2015	TP4/2015	TP5/2015	TP6/2015	TP7/2015						
Date excavated		04.11.2015	04.11.2015	04.11.2015	04.11.2015	04.11.2015	04.11.2015	04.11.2015						
Easting (mE)		348511	348458	348387	348329	348218	348157	348136						
Northing (mN)		246581	246706	246567	246457	246532	246596	247664						
Ground level (mAOD)		67.19	67.74	67.45	67.20	68.46	68.86	116.59						
Depth of trial pit (m)		4.0	4.2	4.0	3.9	3.9	4.1	3.4						
Topsoil/subsoil thickness(m)		0.3	0.3	0.3	0.3	0.3	0.3	0.3						
Alluvium thickness (m)		2.0	2.6	1.2	0.5	2.1	2.9	>3.1						
GSD (*1) sand and gravel thickness (m)		>1.7	1.0	>2.5	>3.1	>1.5	>0.9							
Raglan Mudstone Formation thickness (m)			>0.3											
Sample ID	Depth (m)	TP1 (1/2)	3.00	TP2 (1/1)	3.70	TP3 (1/2)	3.20	TP4 (1/2)	1.90	TP5 (1/2)	3.30	TP6 (1/2)	3.30	No samples taken.
		TP1 (2/2)	3.90			TP3 (2/2)	4.00	TP4 (2/2)	3.90	TP5 (2/2)	3.90	TP6 (2/2)	4.10	

*1 Glaciofluvial Sheet Deposits



LEGEND

- Land ownership boundary
- Trial pit location

Soil
 Silt Clay (M.U.M.)
 Sand & Gravel (200µm/4.75mm Sieve Deposits)
 Moisture (P₁₀₀ in Moisture Formator)

Thickness of Minerals Indicated (m)

Version	Revisions and completion notes	Date
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Scales and trial pit locations

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 Drawing No: 10/MS/15111 Drawing No: 1 Sheet: 8

