

Technical Note:

Land at Reading Golf Club: Preliminary Mineral Reserve Assessment

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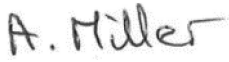
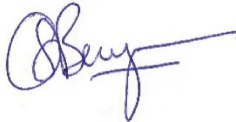
Prepared for Fairfax (Reading) Limited

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1 Introduction

1.1 Instruction and Brief

Stantec UK Ltd (Stantec) has been instructed by Fairfax (Reading) Limited (Fairfax) to undertake a desk-based assessment in support of a preliminary Mineral Reserve Assessment (MRA) for land which forms part of Reading Golf Club (the Site).

It is understood that Fairfax is preparing a planning application for submission to Reading Borough Council (RBC) which will seek consent for residential development at the Site.

During pre-application consultations, RBC provided advice to the applicant which identified that the mineral resource under the Site is indicated to comprise sharp sand and gravel and soft sand. RBC therefore raised the issue of mineral safeguarding and the requirement for an MRA to determine the extent to which the material can be extracted prior to development.

A copy of the advice email and mapping provided by RBC dated 8 January 2020 is provided in Appendix A.

1.2 Report Scope

This report has been produced to act as a preliminary MRA in response to RBC's email dated 8 January 2020 and to support the proposed planning application for the Site. The preliminary MRA comprises the following key elements:

- Desk based review of geological conditions at the Site to provide a preliminary indication of the potential recoverable mineral reserves at the Site;
- Desk based review of prevailing minerals planning policy relevant to the Site; and
- High-level review of constraints pertaining to the commercial and practical viability of mineral extraction at the Site.

The purpose of this preliminary MRA is to provide, in a clear and accessible format adequate information to allow RBC to consider minerals safeguarding and sterilisation in the context of future built development of the Site.

1.3 Site Location

The Site is located off Kidmore End Road on the northern side of Caversham (postcode RG4 8SQ) and within the jurisdiction of RBC. The Site currently forms part of Reading Golf Club which extends to the north of the Site. The local authority boundary between RBC and South Oxfordshire District Council forms the northern boundary of the Site.

For the avoidance of doubt 'the Site' is considered to only comprise the area of the existing Golf Club located within RBC as indicated in Figure 1.1. The Site area is 12.15 hectares (ha).

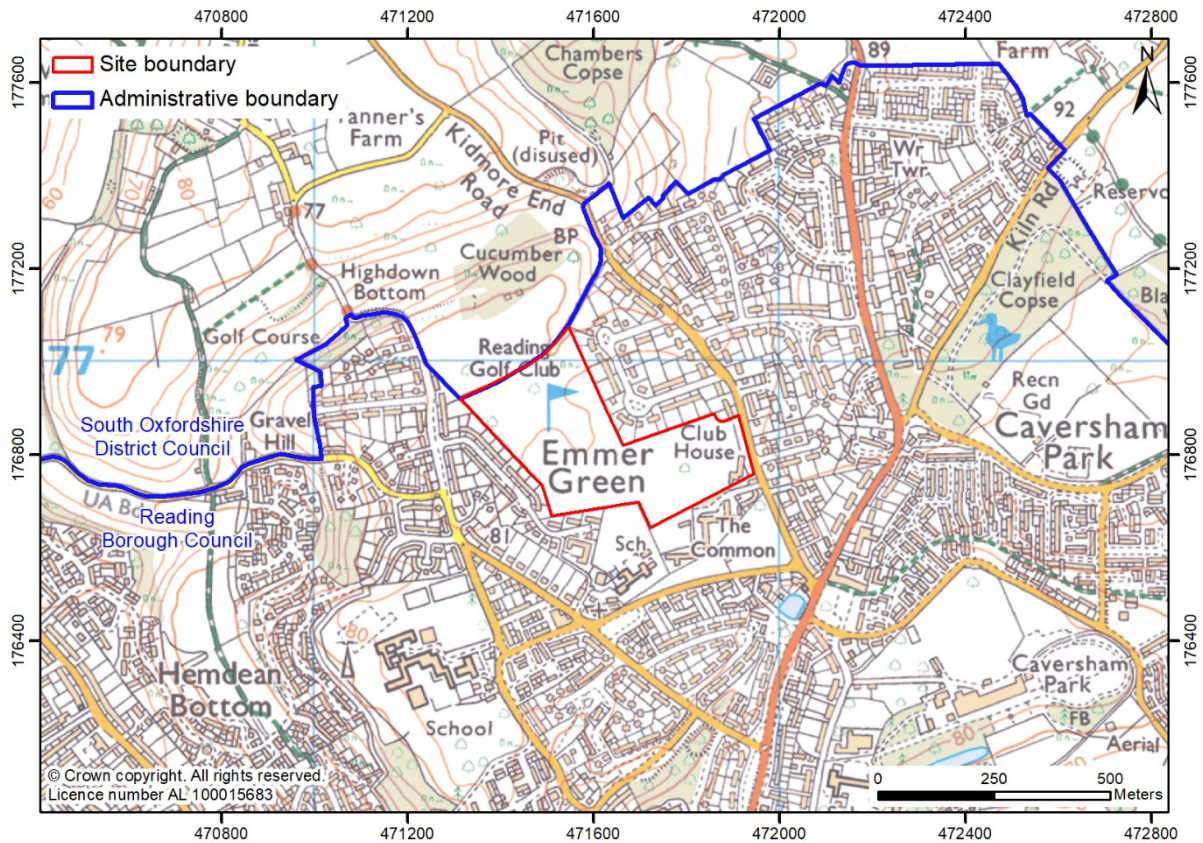


Figure 1.1 Site Location

1.4 Consultations

In order to establish whether RBC would be likely to accept the desk based scope presented in this preliminary MRA, Stantec has sought to consult with RBC through email dated 12 February 2020 to Susanna Bedford (Planning Officer) and Mark Worringham (Principal Planning Officer). Further telephone calls and emails were made on 25 February 2020, on the 28th February Susannah Bedford contacted Stantec to confirm that RBC had no comment at this stage as they don't have in-house minerals specialists. RBC will provide advise once it has reviewed the Preliminary MRA but Susannah confirmed it had no objection to Stnatec's approach, in principle, at this stage.

2 Policy Review

The requirement to assess mineral reserve as part of a proposed development results from current planning policy. A high level review of the relevant planning policy is set out within the following sections.

2.1 National Planning Policy

The National Planning Policy Framework (NPPF) (MHCLG, 2018) sets out the Government's planning policies for England and how these are expected to be applied. The presumption in favour of sustainable development sits at the heart of the NPPF, and this requires that Local Planning Authorities (LPAs) should positively seek opportunities to meet the development needs of their area, and that local plans should meet objectively assessed needs, with sufficient flexibility to adapt to rapid change. The NPPF also states that development proposals that accord with an up-to-date development plan should be approved without delay (Paragraph 11c).

Section 17 of the NPPF sets out the requirements for planning policy to facilitate the sustainable use of minerals, including:

- the requirement to safeguard minerals from sterilisation by non-mineral development (whilst not creating a presumption that the resources defined will be worked) (Paragraph 204c);
- encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place (Paragraph 204d);

It is also noted that Section 17 of the NPPF (Paragraphs 205 and 207) requires that if any mineral development is permitted, impacts on human health, amenity and environmental receptors can be adequately controlled and mitigated.

2.2 Local Planning Policy

Mineral developments are not included in the recently adopted Reading Borough Local Plan (RBC, 2019). This will be the subject of a separate Minerals and Waste Local Plan, which is being prepared jointly with Wokingham Borough Council, Bracknell Forest Borough Council and the Royal Borough of Windsor and Maidenhead. It is understood that the Joint Minerals and Waste Local Plan remains in preparatory stages (Hampshire Services 2020).

It is understood that local minerals planning policy remains as that defined in the Replacement Minerals Local Plan (RMLP) for Berkshire which was last updated and adopted in May 2001 (RBC, 2001).

RBC makes reference to Policy 2 of the RMLP for Berkshire which states:

“The local planning authorities will oppose development proposals which would cause the sterilisation of mineral deposits on the proposed development site, or which would prejudice the future working of minerals on adjacent sites, except where it is demonstrated that

- the mineral deposit is of no commercial interest, and is unlikely to be so in the future; or*
- having regard to all relevant planning considerations, there is an overriding case in favour of allowing the proposed development to proceed without the prior extraction of the mineral; or*
- extraction of the mineral would be subject to such strong environmental or other objection that it would be highly unlikely that it would ever be permitted in any circumstances.”*

3 Geo-Environmental Review

3.1 Summary

Geo-Environmental baseline conditions have previously been interpreted, based on a desk assessment, in a recent Geo-Environmental Assessment prepared by IDOM Merebrook Limited (IDOM, 2019) as reproduced in Table 3.1.

Table 3.1 Geo-Environmental Summary (after IDOM, 2019)

Topography	Topography generally falls from the south to north ranging from c. 84 mAOD in the south-east, falling to c. 75 mAOD in the north-east.
Land Use	Historic plans show that the Site has only been developed as a Golf Course prior to which it was farmland.
Superficial Geology	Superficial drift deposits comprise the Black Park Gravel Member (River Terrace Deposits) which cover the western parts of the Site. British Geological Survey (BGS) (2020) suggests a thickness of between 1 and 6 m and an average of 3 m thickness. This deposit is indicated to be absent in the east of the Site.
Bedrock Geology	Two bedrock formations are indicated to underlie the Site: • Seaford and Newhaven Chalk Formations underlie the northern third of the Site. • Lambeth Group underlies the southern two-thirds of the Site (<i>laterally variable sequence mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate which directly overlies the Chalk</i>). In the Reading area this typically comprises mottled clays and sands.
Made Ground	No artificial ground deposits are shown on the Site, however it is likely that modelling/landscaping of the golf course and installation of drainage and irrigation will have resulted in placement of mounds and trench fill. This is likely to comprise re-worked natural materials.
Hydrogeology	Black Park Gravel Formation is classed as a Secondary A aquifer. The Lambeth Group is also classed as a Secondary A aquifer. The Chalk is classed as a Principal aquifer. The Site is located within a Zone 3 groundwater source protection zone (total catchment). There are however no licensed potable water abstractions within 2 km of the Site. The nearest licensed abstraction is associated with the Golf Club – 106 m to the north of the Site. A BGS borehole record gives a depth to groundwater of 36 m in 1991. There are no other abstraction licences listed to within 1 km of the site.
Hydrology	No surface water features within 250 m of the Site. The Site is located within Flood Zone 1 (<0.1% annual risk of flooding from rivers and the sea). Geological conditions indicate a hazard from groundwater flooding.

3.2 Site Investigation

A programme of intrusive Site investigation was undertaken in October 2019 as reported by IDOM (2019) for the purpose of determining ground conditions to inform development design. Site investigation comprised 3No cable percussion boreholes (MBH1-MBH3) drilled to 8.45 m below ground level (mbgl) and 12No shallow windowless sample probe holes (MWS1 to MWS12) to depths of 1.40 to 5.0 mbgl.

Exploratory borehole locations are shown in Figure 3.1 and Figure 3.2, as well as IDOM Drawing 304-001 (Appendix B). Borehole logs are provided in Appendix C. A programme of geotechnical laboratory testing was performed on selected soil samples obtained from the boreholes (Appendix D).

3.3 Conditions encountered

IDOM (2019) reported that ground conditions were generally in accordance with the published geology. A summary of the ground conditions encountered is presented in Table 3.2. Further description is provided in the following sections which focus on the strata that may comprise a viable mineral reserve, namely superficial deposits of the Black Park Gravel Member and bedrock deposits of the Lambeth Group.

Table 3.2 Geology recorded from borehole logs across the Site

Strata		Depth to top (mbgl)	Thickness (m)
Superficial deposits	Made Ground	0.0	0.40
	Topsoil	0.0	0.20 – 0.40
	Black Park Gravel Member (River Terrace Deposits)	0.20 – 0.40	0.80 – 5.80
Bedrock strata	Lambeth Group	2.70 – 6.00	1.20 - >2.45
	Chalk	1.20 – 6.00	>7.25

3.4 Geology

3.4.1 Superficial Deposits

Superficial deposits in the area comprise alluvial gravels deposited during the Middle Pleistocene glaciation in the Anglian period (Figure 3.1). The only superficial deposit at the Site is the Black Park Gravel Member, consisting of horizontally-stratified gravel with sand channels and abundant angular flint. A second, discontinuous, gravel deposit (Winter Hill Gravel) lies approximately 150 m to the east of the Site.

Strata consistent with superficial alluvial terrace deposits were encountered in all locations during the Site investigation although they displayed variability in clay content across the Site. In boreholes MBH1 and MBH2 strata typically comprised a rusty brown clay matrix-supported sandy flint gravel and cohesive soil of slightly gravelly clay, typical of soils which could informally be described as ‘hoggin’. Locally, such as in MWS2, a slightly clayey sand was dominant and a gravelly sand with little or no clay was described in MWS6. In some areas superficial deposits may represent reworked Lambeth Group materials, comprising mainly clay and silt but indicated by the presence of flint gravel.

The BGS 1:50,000 superficial deposits map (BGS, 2000) records no Black Park Gravel underlying MBH1, however more detailed Site investigation and 3D modelling (see Section 2.6) shows the likely presence of this unit at this location (IDOM, 2019).

Samples at 1 m depth from MBH1 and MBH2 were classified by wet sieve analysis which determined these as “brown very clayey very sandy gravel” and “brown gravelly sandy clay”, respectively. Three samples from MBH1 and MBH2 at 2.0 m below surface and in MBH3 at 1 m below surface were subject to determination of Atterberg Limits which gave plasticity indices of 21- 37% and liquid limits of 41-68%. This indicates medium and high plasticity clay of medium volume change potential.

In situ penetration tests gave SPT N values in the granular layers between 12->50, indicating mainly medium dense and dense ground but with an N value of 6 in MWS3 at 1 m indicating loose conditions. Looser conditions may be anticipated in saturated gravel layers. In the strata logged as predominantly cohesive, N values of 11 to 32 were recorded but with a singular low value of 4 recorded in MWS3 at 2 m. These indicate mainly firm medium strength and stiff high strength clays. It is noted that artificially high values may be returned where a high gravel content or coarse gravel is present.

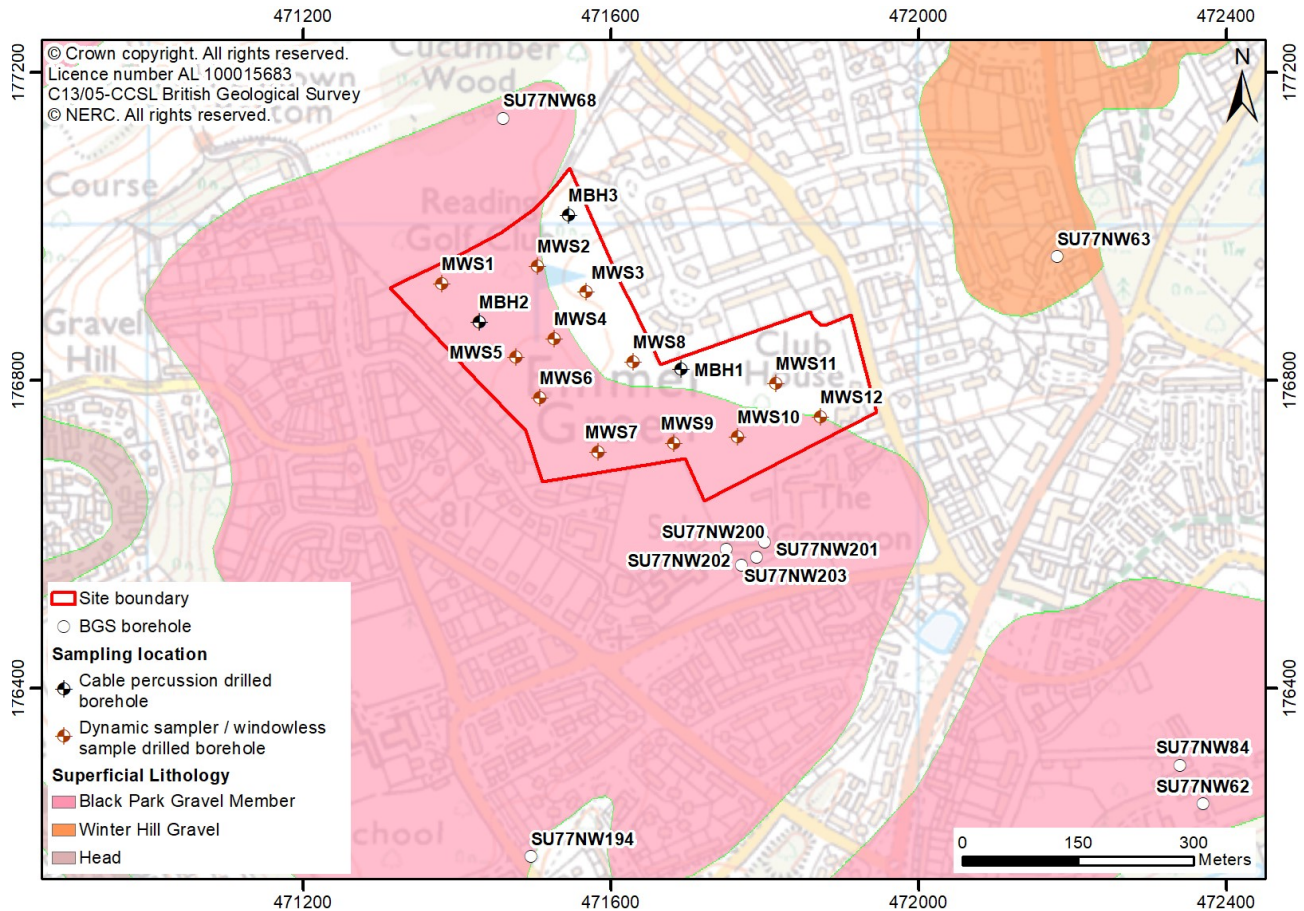


Figure 3.1 Superficial deposits present at the Site and surrounding area

3.4.2 Bedrock Deposits

Bedrock geology at the Site comprises two formations, the Seaford and Newhaven Chalk Formations and the Lambeth Group (Figure 3.2). The Upper Cretaceous Chalk underlies the north-western half of the site and comprises off-white and white chalk with flints. An unconformity separates the older Chalk from overlying Palaeogene clay of the Lambeth Group, which underlies the south-eastern half of the Site.

Strata considered to belong to the Lambeth Group were observed in the eastern and southern areas of the Site and inferred from the absence of flint gravel and the mottled colouration. Borehole log descriptions record variation in clay content across the Site. The stratum is described as a stiff red silty clay, grey clay and silt with grey mottled sandy layers. SPT N values were recorded in the range of 14- 41 indicating firm approaching stiff and very stiff high strength conditions.

Chalk bedrock was identified in three boreholes at the Site, although several other sample pits did not penetrate sufficiently deep to intercept the Chalk. The Chalk was recovered as an off-white silt with medium gravel-sized weak clasts and sparse flint gravel. From the disturbed samples, the composition is indicative of structure Grade Dm Chalk, however, this method of recovery may not provide a fully representative picture of the chalk grade. SPT N values of typically 11-17 in cable percussion boreholes and 21-36 in MWS3 are indicative of a more competent material.

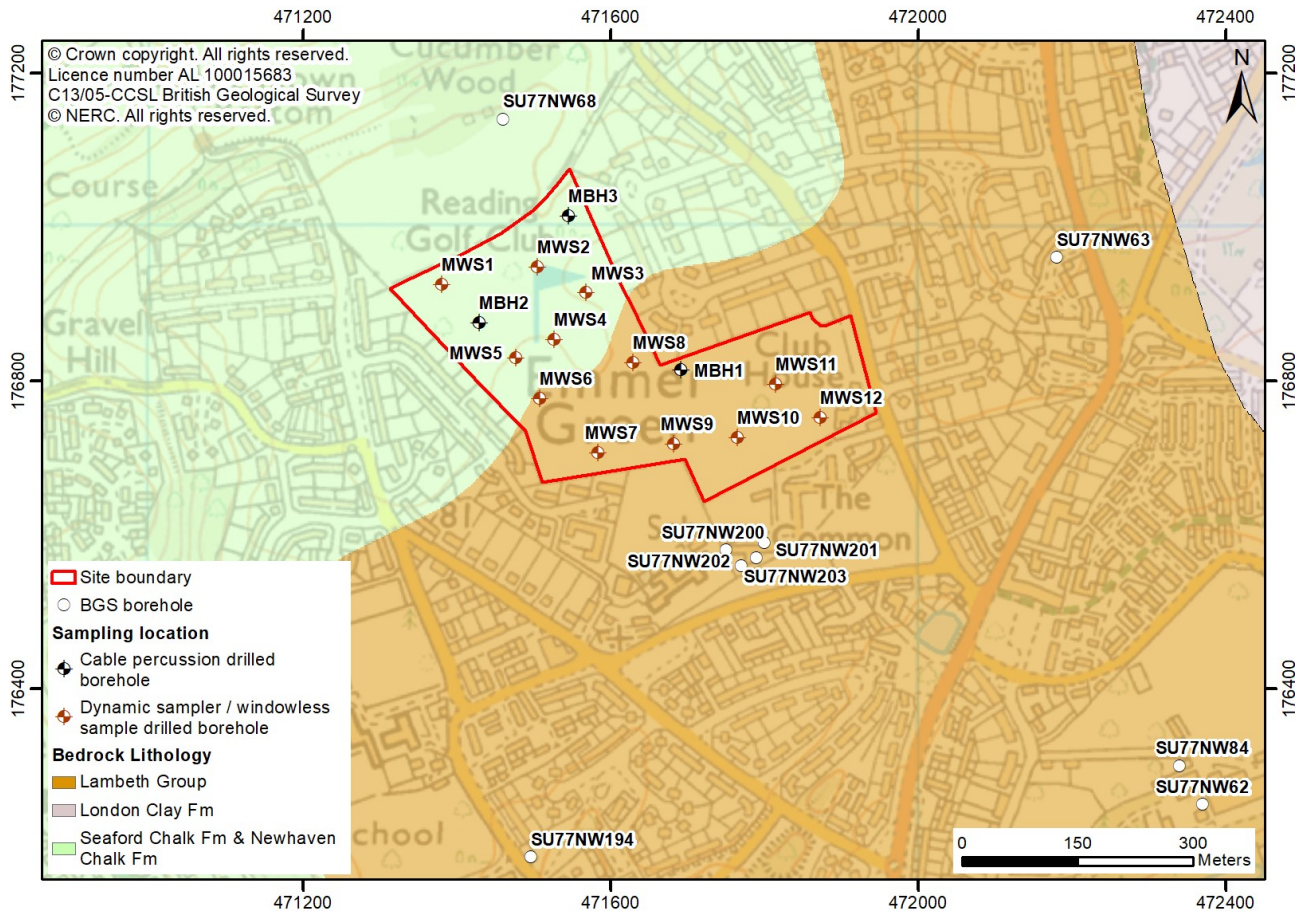


Figure 3.2 Bedrock present at the Site and surrounding area

3.5 Groundwater

Groundwater was not encountered in superficial deposits at the Site. However, wet gravel was observed at four sampling locations:

- MWS6 below 1.2 m;
- MWS5 below 2.0 m;
- MWS10 below 3.95 m; and
- MWS12 below 1.80 m.

Groundwater was not encountered in the bedrock deposits.

4 Mineral Assessment

4.1 Mineral Reserve

It should be noted that the information available from IDOM (2019) is insufficient to complete a detailed assessment of the Mineral Reserve present within the Site. Additional more detailed Site investigation and analysis would be required to better define any Mineral Reserve.

That said, we believe there is sufficient information to address RBC's requirement to assess the Mineral Resource present within the Site in the context of RMLP Policy 2.

4.2 Lambeth Group

RBC provided advice to the applicant that identified that the mineral resource under the Site is indicated to comprise sharp sand and gravel and soft sand (Appendix A). The accompanying resource map contained geological contacts clearly indicating that "sharp sand and gravel" corresponds to the Black Park Gravel Member superficial deposit while "soft sand" corresponds to the Lambeth Group bedrock. Although RBC considers both the Black Park Gravel Member and Lambeth Group to contain potentially economic mineral, this report has discounted the Lambeth Group as uneconomic. This is due to the high clay content of the Lambeth Group underlying the Site and surroundings, as recorded in the borehole logs, with the only coarser material present as sand lenses that do not appear to be continuous across the Site. As a result, this mineral reserve assessment is focused on the Black Park Gravel Member.

4.3 Black Park Gravel Member

4.3.1 3D Geological Model

Subsurface geological modelling software Leapfrog Works (Leapfrog) (Seequent Ltd, 2019), has been used to build 'meshes' and volumes of the superficial and bedrock strata beneath the Site and immediate surroundings.

Downhole lithological data collected from three boreholes and twelve windowless sample holes drilled as part of the Geo-environmental assessment at the Site (Section 3.2) were used to build the 3D geological model. In addition, nine boreholes digitised from BGS borehole scans (BGS, 2020) were used to constrain contact surfaces around the 3D model boundaries. Topographical constraints were made using publicly available Light Detection and Ranging (LIDAR) (1M) data from the Department of the Environment, Food and Rural Affairs (DEFRA), while BGS 1:50,000 geology maps of bedrock and superficial deposits (BGS, 2000 and 2020) were used to constrain surfaces against the topography.

Borehole log data was quality-checked using built-in processes in Leapfrog to check for discrepancies in borehole depth and missing interval data. Surfaces were created either as depositional or erosional features using Leapfrog's implicit modelling algorithms to generate the simplest and most logical surface by 'snapping' to the input data. Each geological unit was analysed in turn and contacts identified using BGS geological mapping, downhole lithological logging and expert geological judgement. Using these drawn points and contact lines, contacting surfaces were created as upper and lower bounds for each unit. These surfaces were then infilled to create a 3D volume model.

Unit thickness was calculated and is shown in Figure 4.1 for the Black Park Gravel Member.

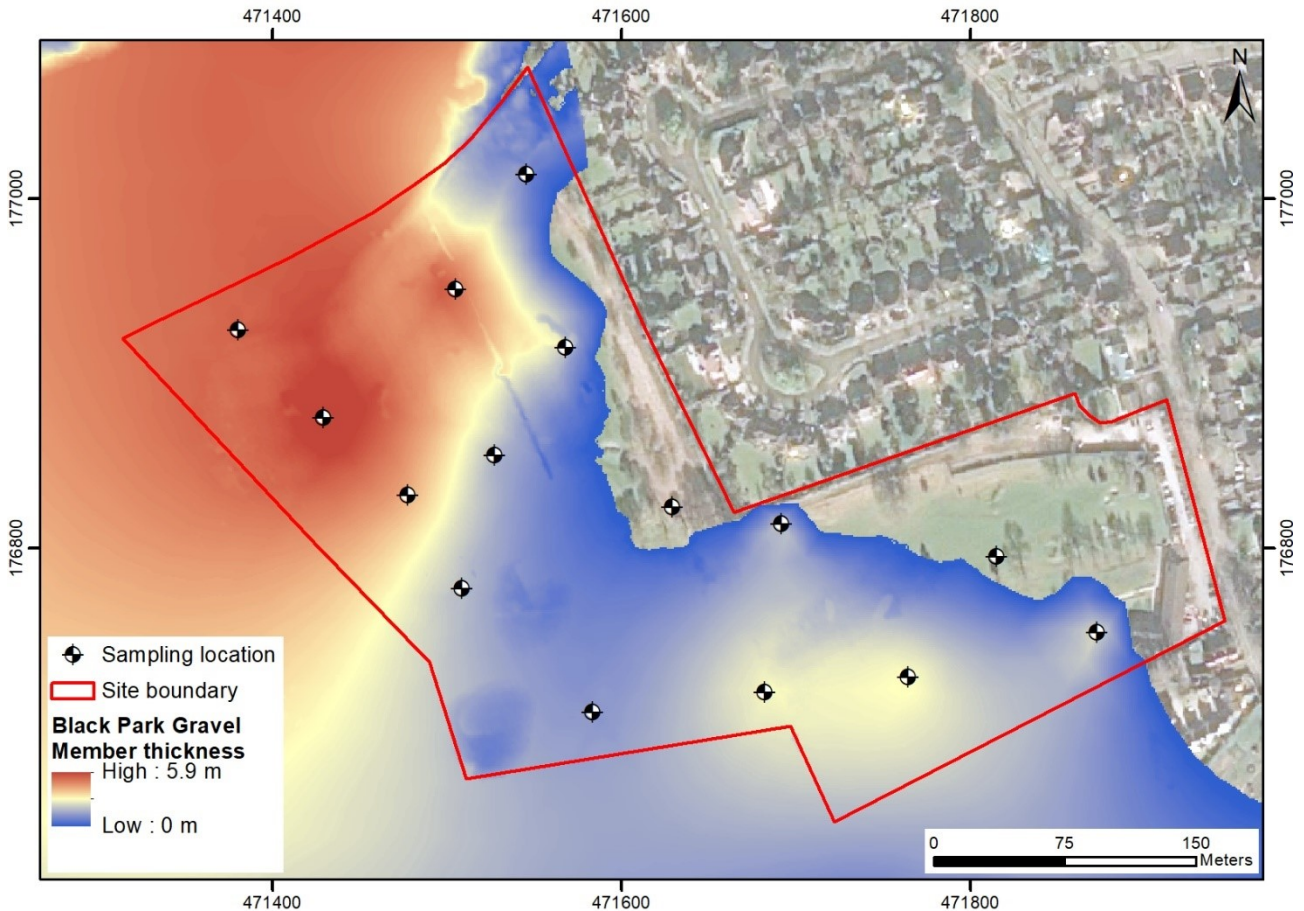


Figure 4.1 Approximate thickness of the Black Park Gravel Member; no colour means unit absent

There are known uncertainties when interpreting geological logs. Interbedded strata of sand, gravel and clay have been combined to form geological units based on lithological descriptions in the borehole logs and expert judgement. The descriptions note the abundance of clay in every unit, however in some boreholes this could be a result of contamination of drill cuttings from overlying strata during the drilling process. An example of potential cross unit contamination can be found in the log for MWS3, where 1.2 m of “grey orange clay” overlies the Chalk, which instead of being recorded as white or off-white is logged as “orangish grey chalk”.

Furthermore, the logs do not state whether much of the sand and gravel is matrix-supported or clast-supported – if the latter then the potential for economic material is increased.

4.3.2 Particle Size Distributions

Two samples have undergone analysis for Particle Size Distribution (PSD) and these results are reported in IDOM (2019) but also provided in Appendix D. One sample is from borehole MBH1 and consists of “brown very clayey very sandy gravel”. The second sample is from borehole MBH2 and contains “brown gravelly sandy clay”. These two samples are assumed to be representative of two end-members, sandy gravel (MBH1) and clay interbeds (MBH2), of the spectrum of grain sizes observed within the Black Park Gravel Member at the Site.

Material from MBH1 logged as “very clayey very sandy gravel” was found to contain approximately 70% sand and gravel and 30% fines of clay or silt (Figure 4.2). Material from MBH2 logged as “gravelly, sandy clay” was found to contain approximately 43% sand and gravel and 57% fines. There is a strong non-uniform distribution of grain size, which ranges from 28 to less than 0.063 mm as fines were not sampled.

Comparing the PSDs and geological logs, it is clear that the entire superficial deposit covering the Site is poorly sorted and contains a high percentage of silt and clay (fines). Clay is present in almost every logged section of the three boreholes and twelve windowless samples (IDOM, 2019). This will require any economic material to undergo further processing and washing to remove the fine fraction.

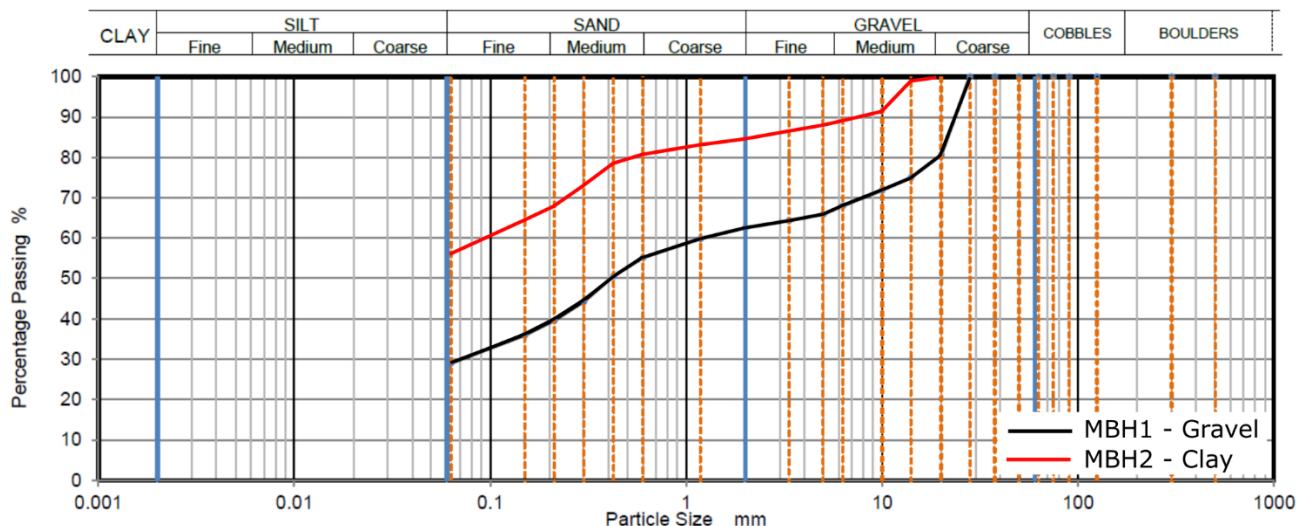


Figure 4.2 Representative particle size distribution (after IDOM, 2019)

4.3.3 Resource Estimate

Geological logs reported in IDOM (2019) were scored for potential mineral resource based on their logged grain sizes and proportion of sand and gravel material. Results are shown in Table 4.1 and displayed in Figure 4.3. The PSDs supported excluding the clay-dominated intervals from the mineral resource. The PSDs also supported classifying intervals comprising mainly sand and gravel but with minor clays as potential mineral resource.

Overall, 66.25 m of borehole logs were analysed. A total of 43.9 m of logs described the potential mineral resource Black Park Gravel Member and interburden (i.e. excluding the Chalk and Lambeth Groups and topsoil/made ground), of which approximately 51% of material was judged to be potential mineral resource.

Table 4.1 Summary of potential mineral resource in samples reported in IDOM (2019)

Borehole ID	Depth (m)	Potential resource interval (m)	Potential resource interval (%)	Dominant unit
MBH1	8.45	1.8	22%	Black Park Gravel / Lambeth Group
MBH2	8.45	5.8	100%	Black Park Gravel
MWS1	5	3.55	74%	Black Park Gravel
MWS2	5	4.65	100%	Black Park Gravel
MWS3	4	1	42%	Black Park Gravel / Chalk
MWS4	2	0.7	44%	Black Park Gravel
MWS5	4	0	0%	Black Park Gravel
MWS6	2	1.7	100%	Black Park Gravel
MWS7	1.4	0.8	73%	Black Park Gravel

MWS9	3.5	0.9	28%	Black Park Gravel / Lambeth Group
MWS10	4	0.6	16%	Black Park Gravel / Lambeth Group
MWS12	2.5	0.7	33%	Black Park Gravel
Total Economic	-	22.2 m	51%	-

As expected, boreholes comprised mainly of Black Park Gravel tend to have a higher percentage of economic material. However, an exception to this is borehole MWS5, where Black Park Gravel deposits are dominated by gravelly clay in this area, resulting in 0% economic material despite being located within an area of potential mineral reserve.

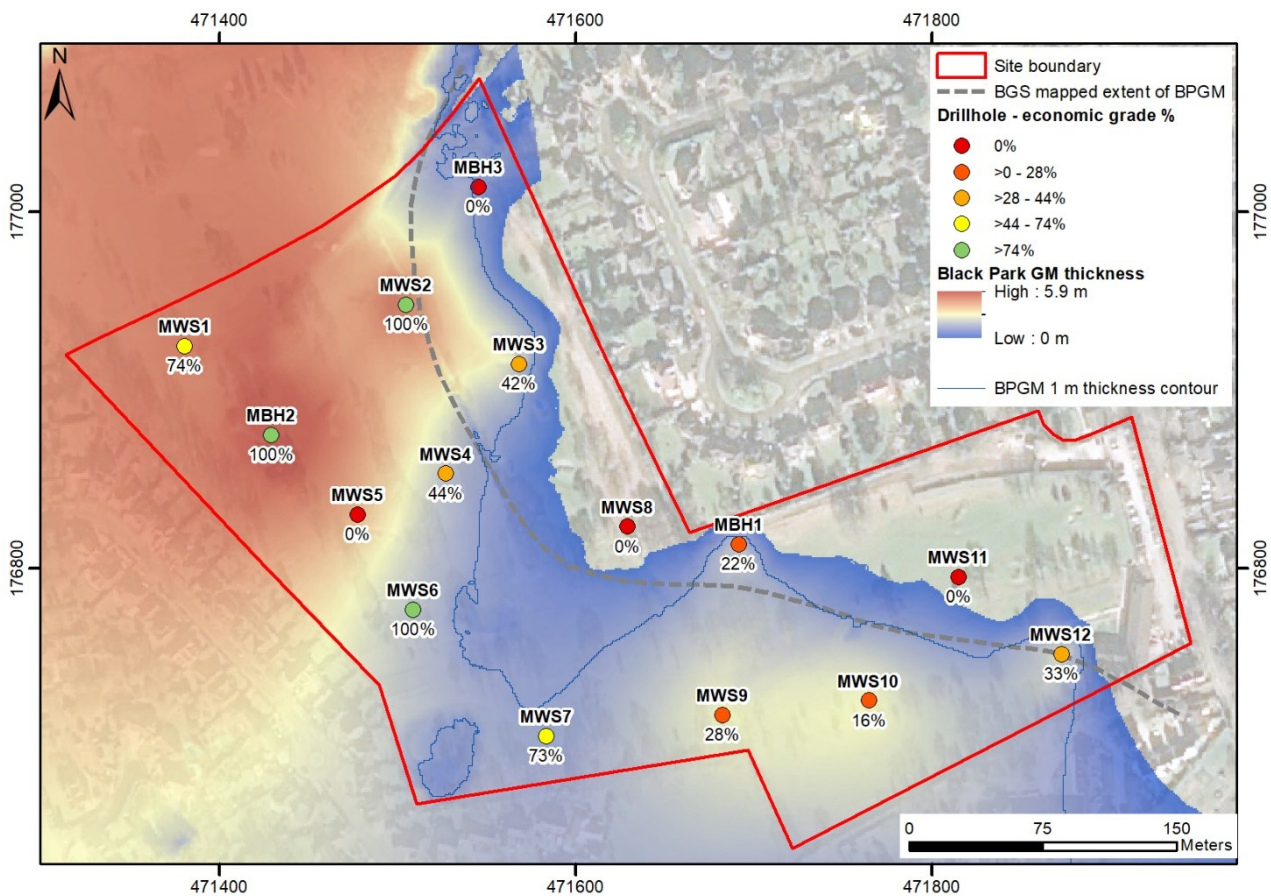


Figure 4.3 Spatial distribution of economic material across the Site

The spatial distribution of potential mineral resource across the Site does not show a uniform trend, although there tends to be a higher volume of potential mineral resource recorded in boreholes in the west and north-west area of the Site (Figure 4.3).

The estimate of total mineral resource across all boreholes (51%) has been applied to volume-based tonnage estimates to produce an estimate for the mineral resource tonnage for the Black Park Gravel Member (Table 4.2). In total, an estimated 171,000 tonnes mineral resource of Black Park Gravel is located within the Site boundary.

Table 4.2 Tonnage estimates within the Site boundary

Strata	Bulk density (kg/m ³)	Approximate volume (m ³)	Gross Tonnage (tonnes)	Mineral Resource Tonnage (tonnes)
Topsoil / Made ground (only area directly overlying Black Park Gravel)	1,600	23,700	37,900	-
Black Park Gravel Member	1,600	209,300	334,900	171,000
Interburden (mainly clay)	1,900	43,100	81,900	-

5 Constraints Review

The assessment of mineral resource has identified an estimated tonnage of 171,000 tonnes however there are constraints which would further reduce the tonnage as well as constraints that could impact the economics of mineral extraction and also have an environmental impact.

A full list of potential constraints is presented in Table 5.1.

Table 5.1 List of constraints

Constraint	Potential impact	Comments	Impact level
Tonnage	The limited mineral resource tonnage is the primary constraint. It is unlikely to be economic to develop a processing facility on-Site. The alternative would be excavation of the mineral and transportation to a processing facility off site.	The mineral resource assessment (Section 4.3.3) estimated approximately 171,000 tonnes of sand and gravel of the Black Park Gravel Member lies within the Site boundary. Typically, a mineral deposit in excess of at least 500,000 tonnes is required to justify the erection of a processing plant.	High
Quality	The borehole logs suggest the Black Park Gravels have a very high silt/clay content which would require processing (washing) in order to recover the mineral. This would result in ~ 50% of the extracted material creating waste fines that would require disposal.	The quality of the mineral resource combined with the relatively low tonnage is unlikely to be of commercial interest to local mineral operators.	High
Traffic	Assuming the mineral resource would have to be removed off site for processing then increased HGV traffic movements would potentially impact air quality and have dust and noise impacts. A Traffic Impact Assessment would be required to understand the impact on the local road network. The nearest mineral washing plant is located 2.7 km south east of the Site and is operated by Tarmac Services Ltd. There would be a requirement for transportation of mineral from the Site to this or another such processing facility in the area.	Logistical constraints are likely to include access arrangements for HGVs to the Site, which is bounded on multiple sides by residential streets. Additional traffic movements would be associated with import of inert materials during Site restoration. There is local precedent for sand and gravel quarrying in the local area. A mineral reserve of 1.86 million tonnes of Kempton Park Gravel Member sand and gravel is currently being extracted and processed at Caversham and Sonning quarry. Abstraction licences currently exist at Caversham and Sonning quarry for mineral washing and concrete processing.	High

Environment	Environmental impacts of potential mineral extraction at the Site could be expected to result in noise, dust and visual impacts in a largely residential area.	The potential need for acoustic bunds to reduce noise impacts could potentially reduce the land area available for mineral extraction.	High
Proximity to human receptors	The proximity of the Site to human receptors such as residential dwellings and schools would be a likely cause of objection for local residents and may result in planning requirements for increased standoff distances.	Approximately 70% of the Site boundary lies within 30 m of residential dwellings on Brooklyn Drive, Eric Avenue, Gorselands or Lyefield Court; a further 7% of the Site boundary borders Emmer Green Primary School.	High
Spatial limitation	Spatial limitation of the potential mineral resource extraction will occur around the Site boundary due to surrounding infrastructure and residential properties. Experience of other operations and policy areas suggest a minimum standoff distance, or buffer zone, of 10 m would be applied to residential housing and public roads. In addition, where the mineral resource is less than 1 m thick it is unlikely to be economic to recover the mineral which would further reduce the spatial extent of the mineral resource.	A stand-off distance of 10 m would result in an area of approximately 8.4 ha where the Black Park Gravel is present and available for extraction; excluding the estimated 49% clay content this corresponds to approximately 156,000 tonnes of mineral resource. In addition several of the boreholes indicate thickness of mineral less than 1 m. This would be further reduced to approximately 147,000 tonnes if the areas where the mineral is less than 1 m thick are excluded from the resource due to the economics of working thin deposits (Figure 4.3).	Medium
Overburden	Overburden would require removal to access the Black Park Gravel Member and would impact upon the economics of the excavation.	Approximately 38,000 tonnes of overburden overlies the Black Park Gravel Member within the Site boundary (Table 4.2), consisting of topsoil and Made Ground. Overburden could be used to create screening or acoustic bunds.	Medium
Interburden	The clay interburden would require excavation in association with the mineral resource, thus reducing the proportion of any mineral recovered from the Site.	The clay interburden is interpreted to lie above and within the Black Park Gravel Member and consists of numerous clay-dominated strata interbedded with the sand and gravels which form the mineral resource. Interburden could be used to create screening or acoustic bunds.	Medium

Restoration	If the mineral was to be excavated for off site processing it would require an equivalent volume of material (209,000 m ³) to be imported to the Site to restore the ground levels. Such an activity would result in additional traffic movements and would need to be regulated by the Environment Agency under a suitable Environmental Permit.	Engineering of the restored landform to provide a development platform would require the importation of suitable material to be placed to meet geotechnical and drainage specifications.	Medium
Water	The high clay content of the mineral will require processing (i.e. mineral washing). If the mineral is processed on-Site then water supply would be a key constraint. However, due to the relatively small tonnage of the mineral resource it is likely that there is insufficient economic justification to build a processing plant on-Site.	Water would still be required on-Site for wheel washing (to prevent lorries from carrying sediment off-site) and dust suppression purposes (particularly over summer). However, the minimum water supply requirement would be unlikely to exceed 20 m ³ /day and therefore an abstraction licence would not be required from the Environment Agency.	Low
Designated sites	Groundwater-dependent designated sites may be dewatered due to water abstraction at the Site for mineral washing.	There are no SACs, SPAs, RAMSARs, SSSIs or NNRS located within 4 km of the Site. Clayfield Copse Local Nature Reserve (LNR) lies 400 m to the east of the Site. This LNR is not a groundwater-dependent site and it is anticipated that mineral extraction would have no effect at this location.	Low

6 Conclusions

In recognition of RBC's letter dated 8 January 2020, this preliminary MRA's conclusions are based on Policy 2 of the RMLP (Section 2.2).

As indicated in Section 4.3.3, an estimated 51% of the Black Park Gravel Member at the Site is considered to comprise the mineral resource (sand and gravel grade). A geological model based on borehole logs and surface mapping indicates that an estimated 171,000 tonnes of Black Park Gravel are located within the Site boundary. However, if standoffs or buffers are considered (Section 5) this may reduce the available reserve to approximately 156,000 tonnes. This could be further reduced to 147,000 tonnes if the mineral less than 1 m thick is excluded from the resource for economic reasons.

The key constraints identified while assessing the opportunity to work the mineral at the Site include: relatively small tonnage, high silt/clay content, increased HGV traffic, requirement to import restoration material, environmental and socio-economic constraints (Section 5).

It is considered that the mineral tonnage would be insufficient to justify on-site processing. Off-site mineral processing may be possible however the high silt/clay content means potentially only ~50% of the processed mineral would be a recoverable. Such a high silt/clay content is unlikely to be of commercial interest to local mineral operators. Off site processing would potentially have additional environmental impacts associated with extraction (noise and dust) and traffic (noise, air quality and traffic movements). Extraction would require import of material for restoration which also would have added impact of additional traffic movements, noise, dust and air quality.

Overall, the mineral within the Site is likely to have limited commercial interest. In addition there are significant constraints and the extraction of the mineral would likely be subject to strong environmental objection. Therefore, when assessed in the context of the prevailing RMLP Policy 2,

- i. the mineral deposit is of no commercial interest, and is unlikely to be so in the future;*

The relatively small tonnage of low quality mineral resource would require significant processing and generate over 50% fines so unlikely to be of commercial interest to a mineral operator.

- iii. extraction of the mineral would be subject to such strong environmental or other objection that it would be highly unlikely that it would ever be permitted in any circumstances*

The close proximity of residential properties and the potential environmental impacts of mineral extraction and export combined with the need to import restoration material is such that there is likely to be significant objection to any mineral extraction.

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Appendices

Appendix A

Reading Borough Council email dated 8 January 2020

Jonathan Walton

From: Bedford, Susanna <Susanna.Bedford@reading.gov.uk>
Sent: 08 January 2020 11:47
To: Jonathan Walton
Subject: FW: Reading golf club minerals resource
Attachments: North Reading sand type query.pdf

Dear Mr Walton,

We currently have a meeting date in the diary for 29th January 2020 to discuss a third further revised layout for the scheme. Please can you inform me of the likely timescales for the submission of this information.

Additionally I attach a map showing the mineral resource under the Reading Golf Club site. The attached 'North Reading sand type query' map shows that the site is split between sharp sand and gravel and soft sand. Part of the resource is soft sand, which is something there is a considerable shortfall in across much of the south east. As such, I am flagging up the issue of mineral safeguarding and the requirement for a Mineral Resource Assessment to determine the extent to which the material can be extracted prior to development.

This is due to Saved Policy 2 of the Replacement Minerals Local Plan for Berkshire says:

The local planning authorities will oppose development proposals which would cause the sterilisation of mineral deposits on the proposed development site, or which would prejudice the future working of minerals on adjacent sites, except "Where it is demonstrated that

(i) the mineral deposit is of no commercial interest, and is unlikely to be so in the future; or

(ii) having regard to all relevant planning considerations, there is an overriding case in favour of allowing the proposed development to proceed without the prior extraction of the mineral: or

(iii) extraction of the mineral would be subject to such strong environmental or other objection that it would be highly unlikely that it would ever be permitted in any circumstances.

I look forward to hearing from you,

Regards,

Susanna Bedford

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