Proposed Recycling Plant at Gill Mill Quarry, Witney

Flood Risk Assessment

Project Ref: 22476/001

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Executive Summary

This Flood Risk Assessment (FRA) has been prepared by Peter Brett Associates (PBA) to support a planning application for a proposed new facility for recycling aggregates at the Gill Mill sand and gravel quarry at Ducklington, Oxfordshire

The report has been prepared in accordance with the guidance set out in Planning Policy Statement 25 Development and Flood Risk (PPS25), Annex E and summarises the methodology and results of the assessment.

In considering the proposals the following key principles have been applied:-

- Vulnerability to flooding from all sources.
- Protection of users of the new development.
- No increased flood risk to third parties as a result of the development.

The analysis undertaken as part of the FRA has confirmed that the site is located within the 'medium probability' Flood Zone 2 (i.e. between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of fluvial flooding), although an area on the north-west end is within Flood Zone 3a (i.e. greater than 1 in 100 (1%) annual probability of flooding.

The EA have confirmed that, since the proposals are for works relating to the existing use, the PPS25 Sequential Test should consist of a sequential approach considering the suitability of the development site within Gill Mill.

The FRA is to be updated with the surface water drainage design, which will demonstrate the proposals will not increase surface runoff and do not cause any potential increase in flood risk to third parties.

In conclusion, the mitigation measures – i.e. (i) flood resilient construction, (ii) flood compensation scheme and (iii) proposed surface water drainage system demonstrate a robust solution that will appropriately manage the risk of flooding to the site and its users, and ensure the proposals do not cause an increase to flood risk to the surrounding area.

As such, the proposed works comply with the guidance in PPS25.

1 Introduction

Peter Brett Associates (PBA), Consulting Engineers have been appointed Smith and Sons (Bletchington) Ltd. to undertake a Flood Risk Assessment (FRA) to support the planning application for a proposed new facility for recycling aggregates at the Gill Mill sand and gravel quarry at Ducklington, Oxfordshire.

PBA are specialists in, amongst other areas, hydraulic and hydrological modelling, surface water drainage design, flood defence and river engineering.

Planning Policy Statement 25 (PPS25) 'Development and Flood Risk' was issued by Communities and Local Government on 7th December 2006. The accompanying 'Development and Flood Risk: A Practice Guide Companion to PPS25' was issued in June 2008. The EA's latest revision of their Flood Risk Standing Advice (FRSA) (version 2.1) was released in January 2009.

The site is shown on the EA's Flood Zone maps as falling within Flood Zone 3a (1 in 100 (1%) or greater annual probability of flooding in any year) and therefore the FRA has been prepared in accordance with the EA Guidance Note 3.

In accordance with clause 3.17 of the PPS 25 Practice Guide, PBA have undertaken this FRA using experienced flood risk management staff under the supervision of senior staff who are chartered with the Institution of Civil Engineers (ICE) and the Chartered Institution of Water and Environmental Management (CIWEM).

Oxfordshire County Council as the Planning Authority will make the final decision with regard to any planning application. Statutory Instrument 2006 No. 2375: The Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006, on 1st October 2006, made the Environment Agency a statutory consultee for planning applications where flood risk is a key issue.

2 Site Description and Location

This section provides a summary of the existing site, its context and the relevant local planning guidance with regard to flood risk.

2.1 Location

The site is located at Gill Mill, a large sand and gravel quarry located near Ducklington, Witney in West Oxfordshire (OS grid reference 437,330m E, 207,500m N, postcode OX29 7PP), as shown on Figures in Appendix 1.

Photo 2.1: View north from across site

The Client has been operating the quarry since 1989, since which time it has extracted significant quantities of aggregates and restored the areas to open water for a range of subsequent uses; principally open water for nature conservation and leisure. These operations add to the extensive existing lakes complex downstream, which reflect the long history of gravel working in the area.

Gill Mill is located within the Lower Windrush Valley. The braided channel of the River Windrush flows south-east through Gill Mill in two main channels, interlinked by smaller drainage channels, with further tributaries outfalling into the system. The watercourses in the vicinity of the site are as follows:

- The River Windrush west arm (Main River) is located approximately 600 metres to the south-west of the site, close to the site entrance, and runs approximately parallel to the Standlake Road;
- The second main channel of the River Windrush (also Main River), the east arm, is located closer to the site, approximately 250 metres to the south-west;
- The principal tributary in the vicinity of the site is the Hardwick Brook (Main River), which flows a short distance to the west of the site (separated by a series of ponds) and then along the south-eastern side of the site. The watercourse continues eastward before outfalling into the River Windrush east arm further downstream;

- A drainage channel also runs along the north-eastern boundary of the site, draining into the Hardwick Brook in the eastern corner of the site;

- The Rushy Common Ditch is located approximately 1 kilometre downstream of the site. This watercourse flows southwards along the Rushy Common area before discharging into the Hardwick Brook (approximately 500 metres upstream of the confluence with the River Windrush).

The site, referred to as 'Area 14', consists of an open area currently used for stockpiling aggregates. A number of large stockpiles exist as the northern end of the site, whilst the southern part contains a series of open sided concrete storage bins.

Photo 2.2: View south-east across site

It is surrounded on all sides either by areas relating to the quarry works (a series of ponds to the south-west) or by open agricultural land. Access into Gill Mill is via the main hard surfaced road off the A415 Standlake Road to the south-west, whilst informal tracks allow access within the works to the site itself (over a bridge in the south-west corner).

2.2 Topographic Survey

A topographic level survey of the site to Ordnance Survey GPS Datum (in accordance with current EA guidance) was undertaken by SLR Consulting in May 2009; a copy of drawing 'Area 14 Survey' is provided in Appendix 2.

The GPS survey was checked against the local OS benchmark at Red Lodge (so that any level information provided in OSBM could be converted if required). As noted in the email dated 29th May 2009 (provided in Appendix 2), the difference between datums was negligible (2mm).

Analysis of the survey indicates that the ground levels over the site vary from 73.8m AOD (in the centre of the site) and 77.1m AOD (on the grassed embankment along the north-eastern side).

The area occupying the southern third of the site is at a level typically between 74.5m AOD and 74.8m AOD. This drops down a bank (see Photo 2.2) to the larger part of the site, where levels are between

73.8m AOD and 75.3m AOD (gradually rising northward to a crest, before dropping slightly to the northern boundary).

Along the length of the north-eastern boundary, the ground rises to the crest of the landscaped embankment. The crest level remains at approximately 77.0 metres for its length.

The ponds along the south-western boundary have water levels of 73.5m AOD (i.e. approximately 1.0 to 1.5 metres below general ground levels).

The proposed development footprint is on ground between 73.8m AOD and 75.5m AOD.

The 1:10,000 scale Figure 2 in Appendix 1 confirms that there is very little variation in level over the vicinity; the 75m AOD contour runs north-east across the valley through the site, whilst spot levels of 74m AOD at Gill Mill and 76m AOD on Standlake Road confirm the flat nature of the area.

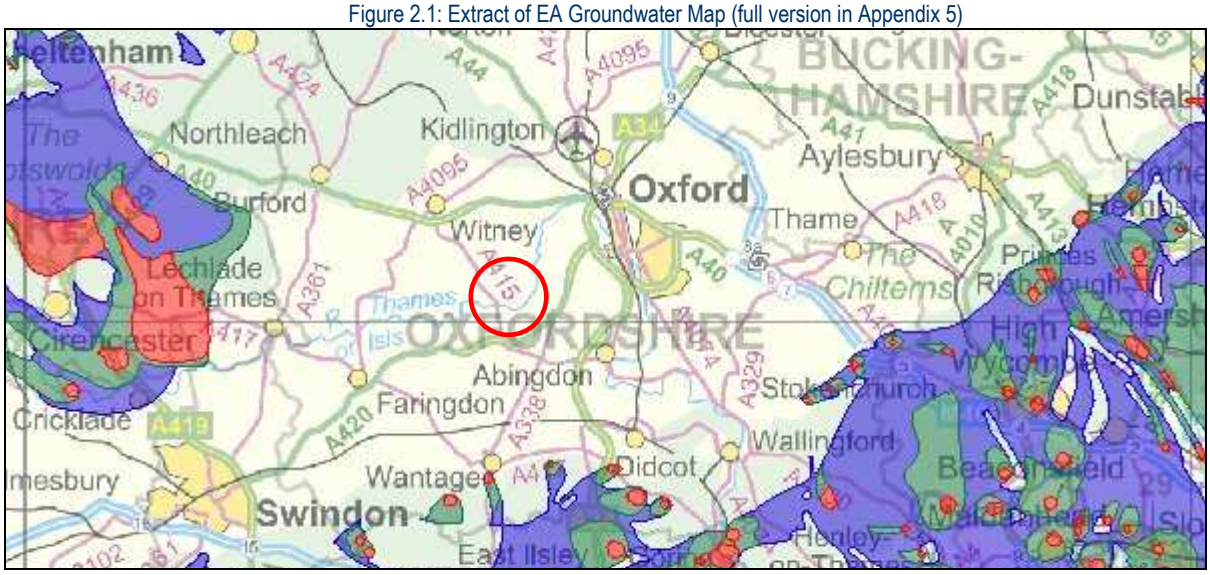
2.3 Existing Surface Water Drainage Arrangements

The site is an open area with no hard surfacing present. As such, existing surface water drainage is by natural means; it is assumed that a large proportion of surface water would infiltrate naturally into the granular surface material and any excess runoff would drain to either the adjacent ponds to the west or to the bordering drainage channels.

2.4 Groundwater

The EA's online groundwater source protection zone maps indicate the risk of contamination to groundwater sources such as wells, boreholes and springs used for public water drinking supply.

Figure 2.1: Extract of EA Groundwater Map (full version in Appendix 5)



The map indicates that the area is outside the catchment area of groundwater sources, so infiltration would not detrimentally impact on any such supplies and would be acceptable to the EA if ground conditions are suitable (see Figure 2.1).

2.5 Local Development Documents

The PPS25 Practice Guide states that '*Local Development Documents (LDDs) should deliver national and regional policy, while also taking account of specific local issues and concerns. The Core Strategy*

LDD should reflect the Council's strategic planning policies and approach to flood risk. Site allocations should reflect the application of the Sequential Test, as well as guidance on how flood risk issues should be addressed at sites allocated within flood risk areas. Flood risk should be factored into LDDs in the detailed allocation of land use types across their area.'

2.5.1 West Oxfordshire Local Plan 2011

Any future development would need to accord with the policies set out in the current WODC planning documents. The current document is the West Oxfordshire Local Plan 2011 (adopted June 2006) and those policies relevant to flood risk and surface water drainage are as follows:

POLICY NE8 - Flood Risk

New development or intensification of existing development will not be permitted within areas at risk from flooding which is likely to:

i. impede the flow of water;
ii. result in the net loss of flood plain storage; or
iii. increase the flood risk elsewhere.

Within areas at risk of flooding an appropriate Flood Risk Assessment must be undertaken when preparing development proposals.

POLICY NE9 - Surface Water

New development or intensification of existing development will not be permitted where the additional surface water run-off would result in adverse impacts such as an increased risk of flooding, river channel instability or damage to habitats, unless appropriate attenuation and pollution control measures are provided.

2.5.2 Strategic Flood Risk Assessment

PPS25 confirms that Regional Planning Bodies (RPBs) or Local Planning Authorities (LPAs) should prepare Strategic Flood Risk Assessments (SFRAs) in consultation with the EA. The SFRA will then be used to refine information on areas that may flood, taking into account other sources of flooding and the impacts of climate change, in addition to the information on the EA Flood Zone Map.

PPS25 paragraph 12 states that *'A SFRA should be carried out by the local planning authority to inform the preparation of its LDDs (Local Development Documents), having regard to catchment-wide flooding issues which affect the area. The SFRA will provide the information needed to apply the sequential approach…Policies in LDDs should set out requirements for site-specific Flood Risk Assessments (FRAs) to be carried out by developers and submitted with planning applications in areas of flood risk identified in the plan, under circumstances set out in this PPS.'*

The 'Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment (including Minerals and Waste Site Allocations' was released in April 2009. The objective of the Level 1 SFRA is '*to collate and review available information on flood risk in the Study Area. Information has been sought from a variety of stakeholders including the Environment Agency (EA), WODC, CDC, OCC, Thames Water Ltd. (TW), Anglian Water Services Ltd. (AWS), Severn Trent Water Ltd. (STW) and the British Geological Survey (BGS)'.* The report is intended to enable the three Councils to apply the Sequential Test to proposed development sites and to assist in identifying whether the application of the Exception Test will be necessary.

The information within the SFRA of relevance to the site is detailed in Section 3.1.

3 Assessment of Risk

The level of detail entered into in any Flood Risk Assessment (FRA) is dependent upon the scale and potential impact of the proposed development (PPS25 Annex E). In this case, the FRA is to support a planning application for a proposed recycling facility at the Gill Mill sand and gravel quarry located near Witney in West Oxfordshire.

This section provides an assessment of the flood risk to the proposed development, based on information obtained from the EA and other parties.

3.1 SFRA Information

As noted in Section 2.4.2, the Cherwell and West Oxfordshire Strategic Flood Risk Assessment was issued in April 2009. The SFRA forms a 'Level 1' report, providing an overview of the flood risk issues across the study area.

The information within the SFRA of relevance to the Gill Mill site is as follows:

- Section 9 of the SFRA provides a flood risk review of information for West Oxfordshire. The report confirms that there have been numerous historical flood events in the catchment. The SFRA states *'On July 20th 2007 extensive areas of the District were affected by flooding as a result of a number of intensive rainfall events which commenced in the morning and subsided in the evening. A daily total rainfall measurement of 126.2mm was recorded at RAF Brize Norton on 20th July. Prior to this event, the largest recorded rainfall event was 79.5mm recorded in 1968'*. WODC compiled a number of flood reports for parishes affected during the event; the report for the Ducklington area is discussed in Section 3.3.2.

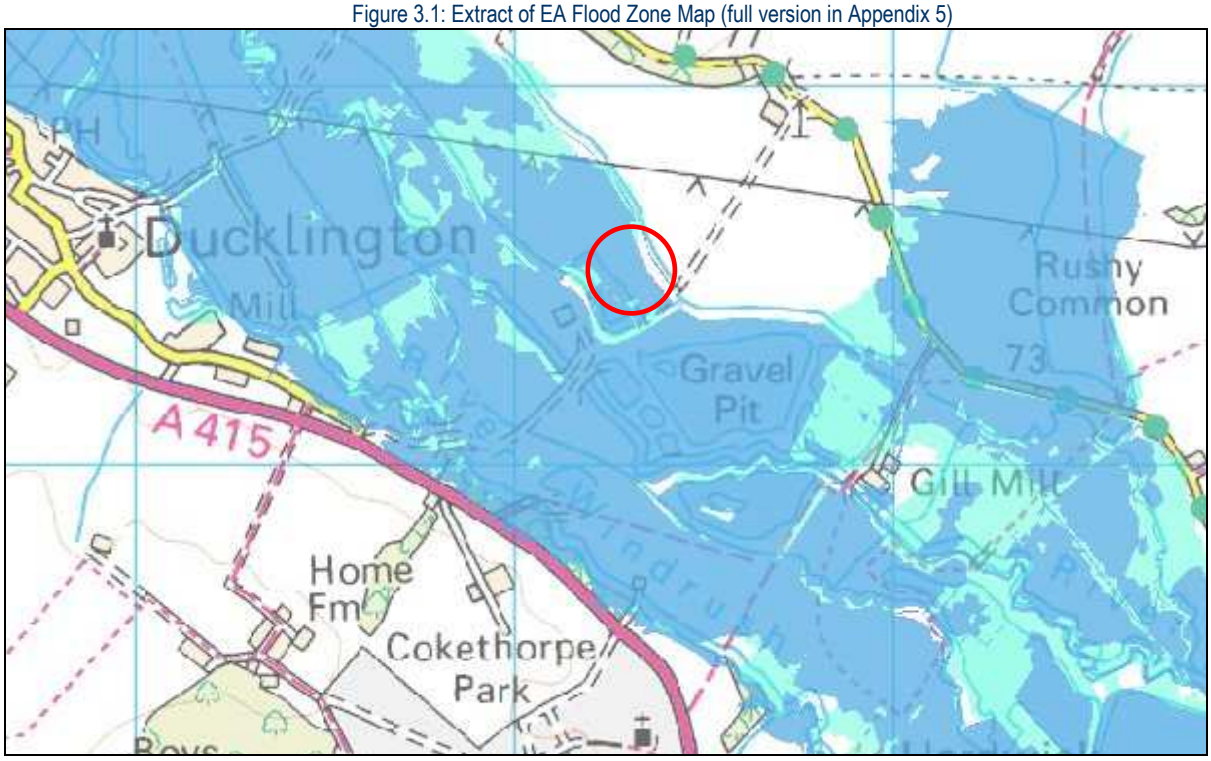
- The SFRA confirms that Witney, upstream of the development site, can act as a potential bottleneck to the Windrush flood flows, stating *'The River Windrush flows through the centre of Witney where some of the area now identified as floodplain was developed in the past. There is a large capacity within the floodplain upstream of Witney in areas of smaller development such as Crawley and Minster Lovell which acts as a natural defence protecting Witney. The Bridge Street crossing in the centre of Witney and buildings downstream heavily restricts the River Windrush at Witney'.*

- The SFRA Flood Map provides copies of the EA Flood Zone maps (see Figures A-1 and A-2 in Appendix 6), which confirm the vicinity of the site is within Flood Zone 3a 'high probability' (although they are at too large a scale to accurately define the boundary of the site).

3.2 Flood Zone

The Environment Agency's website flood zone map, shown in Figure 3.1 overpage, indicates that the site lie in Flood Zone 3 'High Probability' – land assessed as having a greater than 1 in 200 annual probability of sea flooding in any year (>0.5%).

Figure 3.1: Extract of EA Flood Zone Map (full version in Appendix 5)



The online EA Flood Zone maps were originally developed using a very coarse Digital Elevation Map (DEM), and are superseded by a more detailed analysis of modelled flood levels and topographic survey levels. It should be noted that these Flood Zone maps do not differentiate between Zones 3a and 3b.

The Environment Agency Flood Zone Map shows that:

- the majority of the site lies within Flood Zone 3 'high probability' (i.e. 1 in 100 or greater annual probability of fluvial flooding);
- a narrow corridor of land along the north-east side of the site – corresponding to the grassed embankment - lies within Flood Zone 1 'low probability' (i.e. less than 1 in 1000 annual probability of fluvial flooding);
- The southern corner of the site, near the site entrance, is shown as falling within Flood Zone 2 'medium probability' (i.e. between a 1 in 100 and 1 in 1000 annual probability of fluvial flooding);

A more detailed version of the Flood Zone map is provided with the EA response dated 26th May 2009 in Appendix 5.

3.3 Historic Flooding Records

3.3.1 Information from Environment Agency

The EA email dated 26th May 2009 in Appendix 5 confirms they have no record of historic fluvial flooding at the site and there is no record of groundwater flooding in the vicinity. However, the response also states that *'The site lies on the Oxford Clay formation with overlying sand and gravel. These overlying deposits are thin in depth but laterally extensive. Therefore, groundwater within the sand and gravel deposits would be very shallow and localised groundwater flooding is likely. Indeed, existing phases of the works at Gill Mill have been too wet to work during periods of high groundwater levels and heavy rainfall.'*

3.3.2 Information from West Oxfordshire District Council

A request for historic and potential sources of flooding records was made to West Oxfordshire District Council (WODC), as the land drainage authority for the area.

At time of issue of this report, no response had been received from WODC. However, information obtained from their SFRA has been provided in Section 3.1 and a copy of the document 'Parish Flood Report: Ducklington' (November 2008) has been obtained from the WODC website.

The document was prepared to explore the reasons behind the major flooding which occurred in July 2007 and provide an overview of the event itself.

The report states that '*From discussions with local residents it was noted that the Parish of Ducklington has flooded frequently over the previous 50 years….In addition to the residential flooding of 2007 Wesley-Barrell Furniture and Philip Dennis foods, located off Standlake Road, also flooded.'*

These premises are a few hundred metres upstream of the Gill Mill site, as shown on the plan within the Flood Report, included in Appendix 6. The report indicates that flooding to this site occurred due to '*either or a combination of the following: (i) Blocked/Insufficient and/or poorly designed highway drainage. (ii) Overgrown/ partially blocked highway culvert and drainage ditch opposite the new "Banner" housing site. (iii) Overflowing A415 trunk road highway drainage ditches.'*

The report provides a number of options for potentially alleviating future flooding in the Ducklington area, although it is not known what action has been subsequently taken ('*ongoing maintenance'* is recommended to resolve the problems in the above area).

The report makes no reference to the Gill Mill site.

3.3.3 Information from Oxfordshire County Council

A request for flooding information was made to Oxfordshire County Council, as the highways authority for the area.

OCC confirmed that they have no specific flooding records for the area (see email dated 11th May 2009 in Appendix 6), but did provide a copy of their local floodplain maps over the site, which approximately correspond with the EA's Flood Zone maps discussed in Section 3.2 (i.e. the majority of the site is within the floodplain, except for the land along the north-east boundary).

3.3.4 Information from Smiths Bletchington

The Client has advised that a detailed hydrological monitoring scheme for the Gill Mill site agreed with the EA for the monitoring of (i) groundwater levels, (ii) surface water levels and (iii) flows in the surrounding watercourses. This monitoring data is submitted to the EA every year for review and a copy of the latest 'Hydrological Monitoring Review' No. 2 (March 2008), prepared by Mr S. Bennett, has been provided to PBA for information.

The report states that '*planned quarrying operations have been severely hampered by flooding events in January 2007 and again in July. On both occasions the river breached and the works were flooded*'. Although no data was available from July 2007, aerial photos were obtained from January 2007 which indicates that the subject site on 15th January 2007 was not in an area of flooding (this had occurred between the two branches of the Windrush and in the surrounding fields). Copies of the photos are provided in Appendix 6.

3.4 Modelled Flood Levels

The EA provided flood levels from their hydraulic model of the River Windrush catchment ('Minster Lovell to Thames Confluence'), together with the resulting flood extents in the email dated 26th May 2009 in Appendix 5.

Modelled flood levels were provided for the 1 in 5, 20 and 100 annual probability flood events as detailed in Table 3.1 below (levels have been taken from the model nodes on the Hardwick Brook). The EA confirmed that the 1 in 100 annual probability plus climate change event had not been modelled as part of their study.

Table 3.1: Windrush Modelled Flood Levels

Flood Event (Annual Probability)	Fluvial Flood Level (m. AOD GPS)	
	Upstream (node 30.019)	Downstream (node 30.015)
1 in 5 (20%)	74.02	73.27
1 in 20 (5%) functional floodplain	74.22	73.55
1 in 100 (1%)	74.80	74.07
1 in 100 plus allowance for climate change*	75.10	74.37

** - in the absence of a modelled climate change level, an assumed value has been provided based on current EA guidance, by adding 300mm to the current 1 in 100 annual probability flood levels – see EA letter dated 2nd July 2009 in Appendix 5 confirming the acceptability of this approach.*

The EA confirmed that the provided levels were to OS GPS datum (and therefore directly comparable with the GPS survey).

The provided EA modelled flood extents indicate that the site is unaffected by the 1 in 5 and 1 in 20 annual probability flood events, although the majority of the site (except for the areas along the east and southern boundaries) is within the 1 in 100 (1%) annual probability floodplain, indicating that the site falls within Flood Zone 3a 'high probability'. However, by its scale and nature this mapping is based on relatively coarse remote-sensed survey information and is superseded by an analysis using the topographic survey of the area.

PBA drawing 22476/001/001 in Appendix 4 provides a comparison of the modelled EA flood levels with the topographic survey. This indicates that the site is impacted by flooding as follows:

- The site is completely outside the 1 in 20 annual probability 'functional floodplain' extent;
- The site remains largely outside the 1 in 100 annual probability event, although an area of flooding impinges into the northern end of the site (causing flooding up to a maximum depth of approximately 500mm);
- The site is also largely above the 1 in 100 annual probability plus climate change event. This area extends from the northern boundary marginally further than the 'current' 1 in 100 annual probability event (causing flooding up to a maximum depth of approximately 800mm). Furthermore, a corridor of land adjacent to the ponds on the west side is impacted.

The above analysis indicates that, according to PPS25 Table D.2, the majority of the site should be considered as Flood Zone 2 'medium probability' (between a 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding in any year). The PPS25 classification of the site as Flood Zone 3a 'high probability' (a 1 in 200 (0.5%) or greater annual probability of tidal flooding in any year).

3.5 Flood Defences

The EA have confirmed that '*There are no formal flood defences in place at this site'* (see EA email dated 26th May 2009 in Appendix 5).

4 Climate Change

Annex B, paragraph B9, continues to state that '*In making an assessment of the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment, the sensitivity ranges in Table B.2 may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed*.'

Table 4.1: Extract from PPS25 Table B.2 Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

PPS25 requires that consideration is given to the impacts of climate change for the lifetime of the development. A conservative lifespan of 100 years has been considered, implying that the analysis consider a +20% increase in river flows and a +30% increase in peak rainfall intensity. These allowances have been considered in the assessment of the flood storage and the surface water drainage design respectively.

The potential for increased flood probability as the result of possible climate change are addressed in terms of the recommended mitigation measures that are discussed in Section 7.

5 Vulnerability and the Sequential Test

5.1 Sequential Test

PPS25 follows a sequential risk-based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas.

PPS25 Annex D confirms that '*The risk-based Sequential Test should be applied at all stages of planning. Its aim is to steer new development to areas at the lowest probability of flooding…..Within each Flood Zone, new development should be directed first to sites at the lowest probability of flooding and the flood vulnerability of the intended use matched to the flood risk of the site, e.g. higher vulnerability uses located on parts of the site at lowest probability of flooding.'*

The EA were queried on the requirement for the Sequential Test in the instance, given that the proposals are for a recycling facility which will replace existing recycling plant already located in the quarry complex. The EA confirmed the following (see email dated 15th June 2009 in Appendix 5):

"Regarding sequential testing, I think it would be appropriate to test the specific location within the Gill Mill site against the frequency of flooding - i.e. whether it is in the functional floodplain or not. It is quite likely that the specific location was selected without reference to the flooding regime at the site, but the FRA should at least demonstrate that there is no better alternative and that the siting will not adversely affect flood flows"'

A comparison of 'reasonably available sites' as alternative locations are therefore restricted to land within the existing quarry complex. The Gill Mill Complex is comprised of a number of different areas:

- the designated plant site;
- areas of working;
- areas to be worked; and,
- restored areas, or areas to be restored.

The only viable option for siting the proposed development is on the designated plant site area. Within the plant site area this is the only part available with sufficient space to accommodate the proposed plant.

As detailed in Section 3.4, the detailed analysis of the EA modelled flood levels and the topographic survey of the area confirmed that the site is largely within Flood Zone 2 'medium probability'. As such, it is significantly above the functional floodplain extent and is also almost entirely outside the 1 in 100 annual probability extent (with and without allowance for climate change), except for a small area at the northern end.

As such, the proposed development site meets the EA's criteria above and, based on the flood maps provided by the EA, is one of the areas of lower flood risk (compared to other areas of Gill Mill),

It should be noted that the provision of development with recycling capacity is badly needed in the area. The South East Plan, May 2009, sets ambitious targets for recycling facilities in the Region and notes an 'urgency' to provide new waste management facilities. The Oxfordshire Annual Monitoring report, 2008, reviewing recycling capacity notes that relatively little new waste management capacity had been provided in the previous year and that 'significant' new capacity is needed to meet targets. This proposal will retain existing capacity and provide limited additional capacity, all which is essential to meeting the County's and Regional planning targets for recycling.

5.2 Flood Vulnerability

Table D.2 of PPS25 Annex D confirms that '*Sand and gravel workings'* are classified as 'Water Compatible' development. However, the SFRA (page 84) further delineates the vulnerability of different types of mineral working, classifying 'secondary aggregate recycling' as 'less vulnerable' development.

In accordance with Table D.3 of PPS25 Annex D, less vulnerable development in Flood Zone 2 or 3a is considered appropriate and does not require the Exception Test.

6 Detailed Development Proposals

6.1 Site Layout

The proposals for site consist of a proposed new facility for washing and recycling aggregates. This will improve the quality of recovered waste materials, producing higher quality recycling aggregates than the dry crushing/ screening activities currently undertaken on the site.

The facility is proposed to sit on a concrete platform, which the Client has advised would be at a level of no greater than 74.6m AOD.

The details of the proposals are provided on the drawings by ESP in Appendix 3.

6.2 Development Background

A planning application was submitted for the proposed works in December 2008. The EA's formal consultation response dated 5th February 2009 (see copy included in Appendix 5) stated that:

"The FRA submitted with this application does not comply with the requirements set out in Annex E, paragraph E3 of Planning Policy Statement 25 (PPS 25). The submitted FRA does not therefore, provide a suitable basis for assessment to be made of the flood risks arising from the proposed development. As it does not establish these risks, it cannot show how the development will manage these risks to ensure safe operation of the site.

In particular, the submitted FRA fails to;

1. *Use the most up to date available flood data;*
2. *Provide topographical information;*
3. *Establish the route or routes taken by flood water through the site;*
4. *Assess the impacts of surface water run-off from an increase in impermeable area."*

The above information has been provided within this FRA. Further information will be provided with regard to the flood compensation measures and the proposed SUDS surface water drainage arrangements in due course.

7 Mitigation Measures

7.1 Flood Resilient Construction

The proposed works consist of a proposed new facility for washing and recycling aggregates.

The facility is to be located largely outside the EA's modelled 1 in 100 annual probability plus allowance for climate change floodplain (see PBA drawing 22476/001/001). However, to allow for the residual risk of flooding the facility will be of a suitably robust flood resilient construction to ensure that it would not be detrimentally affected by widespread flooding of the area.

7.2 Flood Storage and Flow Routes

Any new such proposal located in the vicinity of a watercourse should be constructed such that it does not reduce the available floodplain storage, on a level-for-level basis, which would otherwise potentially cause an increase in flood levels elsewhere following the loss of floodplain.

The site is largely outside the EA's modelled 1 in 100 annual probability plus allowance for climate change floodplain, but a small area is impacted at the northern end. This indicated the development would not have an impact on flow routes and the floodplain is to be compensated for on a level-for-level basis to ensure the proposals do not have a detrimental impact on flood storage.

The flood compensation scheme is detailed on drawing 22476/001/0002 in Appendix 4 , which confirms that ground lowering along the eastern side of the site will ensure a gain in flood storage in all level bands as part of the works.

Furthermore, the Client is proposing to undertake additional lowering of the ground along the north-eastern boundary which will result in a further gain in the flood storage capacity over the area.

7.3 Surface Water Drainage Scheme

PBA are currently preparing a surface water drainage design for the site to demonstrate that the development does not increase the risk of flooding to third parties through increased run-off and is designed for the lifetime of the development.

As further detailed in Section 8, any design will be in accordance with the Building Regulations H3 hierarchy and will be submitted as part of a subsequent issue of the FRA.

8 Surface Water Management

8.1.1 Building Regulations Surface Water Drainage Hierarchy

The surface water management measures will need to follow the Building Regulations Requirement H3, which stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority:

a) an adequate soakaway or some other adequate infiltration system,
b) a watercourse, or where that is not practicable,
c) a sewer.

Any increase in the impermeable surfacing over an area would represent an increased risk of flooding by increasing the runoff potential and the rate at which surface water rainfall enters watercourses, which would be inappropriate in terms of PPS25.

The EA confirmed in their letter dated 5th February 2009 (included in Appendix 5) that *'The FRA should provide assurance that the development would not increase the risk of flooding through increased run-off to adjacent areas. To do this, it should demonstrate, showing calculations, that the sealed drainage system proposed for the concrete pad would be able to contain the run-off generated by a 1% (1 in 100 year) storm, with a 30% allowance for climate change'.*

PBA are currently preparing a surface water drainage design for the site to meet the above criteria, which will be provided as part of an updated FRA to be issued shortly. The following sections consider the method of surface water drainage in order of the above priority.

8.1.2 Suitability of Infiltration Drainage Measures

The site is not located within an EA Groundwater Source Protection Zone (see Section 2.1), which indicates that infiltration would potentially be feasible (provided the ground conditions were suitable). Furthermore, the nature of the geology across the site (i.e. sand and gravels) would potentially be highly conducive to infiltration drainage.

8.1.3 Suitability of Discharge to Watercourse

Should the initial analysis indicate that infiltration drainage is not considered appropriate at the site, it is proposed that the new development discharge at a controlled rate to one of the watercourses surrounding the site (the Hardwick Brook runs along the southern boundary, whilst another drainage channel runs along the north-eastern boundary of the site, draining into the Hardwick Brook in the eastern corner).

Should the analysis indicate that outfalling to a watercourse is necessary, the discharge will be no greater that the greenfield rate (up to the 1 in 100 annual probability plus 30% allowance for climate change rainfall event).

9 Residual Risks

It is impossible to completely guard against flooding since extreme events greater than the design standard event are always possible, however it is possible to minimise the risk by using suitable construction techniques.

The surface water drainage strategy will be designed in accordance with current guidance to the 1 in 100 annual probability plus 30% allowance for climate change rainfall event. (i.e. over the design lifetime of the development, assuming a conservative 100 years).

As noted in Section 7.1, the proposed facility is to be constructed using flood resilient measures which will ensure it remains operational even if significant depths of flooding occur over the site.

10 Conclusions

The EA Flood Zone map indicates that the Gill Mill site is within Flood Zone 3. However, further analysis of the available data clarifies that the site is largely within Flood Zone 2 'medium probability' (between a 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding. The northern end of the site falls within Flood Zone 3a 'high probability (where the annual probability of river flooding is 1 in 100 or greater).

- The proposal incorporate a flood compensation scheme through ground lowering elsewhere over the site, ensuring there is a level-for-level gain in flood storage up to the 1 in 100 annual probability plus climate change level;

- The Client is proposing to undertake additional lowering of the ground along the north-eastern boundary which will result in a further gain in the flood storage capacity over the area;

- The proposed facility is to be constructed using flood resilient measures which will ensure it remains operational even if significant depths of flooding occur over the site;

- A SUDS surface water drainage strategy for the site will be prepared to ensure there is no increase in flood risk as a result of the development. This will be designed for a 1 in 100 annual probability plus 30% allowance for climate change storm event (based on a conservative assumed design life of 100 years). Should infiltration not be feasible then the site will discharge to one of the surrounding watercourses at a greenfield run off rate and on-site attenuation will be provided.

Appendix 1 – Location Plans

- Figure 1: 1:50,000 Scale Location Plan
- Figure 2: 1:10,000 Scale Location Plan
- ESP Drawing No. GML/003 'Planning Application Boundary' Nov 2008)

Appendix 2 – Topographic Survey

- Drawing no. 001 'Area 14 Survey 26th – 26th May 2009 by SLR (June 2007)
- SLR email dated 29th May 2009 (confirming difference between OSBM/ GPS)

Appendix 3 – Development Proposals by ESP

- ESP Drawing GML/004 – Site Plan (Nov 2008)
- ESP Drawing GML/005 – Illustrative Washing Plant

Appendix 4 – PBA Drawings

- Drawing 22476/001/001 – Modelled Flood Extents
- Drawing 22476/001/002 – Flood Compensation Scheme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Appendix 5 – EA Information & Correspondence

- EA letter dated 5th February 2009
- EA email dated 26th May 2006
    - Modelled Flood Extent
    - Modelled Flood Levels
    - Detailed Flood Zone Map
- EA email dated 15th June 2009
- EA letter dated 2nd July 2009
- EA Flood Zone Map
- EA Groundwater Source Protection Map

Appendix 6 – Other Correspondence/ Information

- SFRA Figures:
    - Figure A-1 – Overview of Potential Constraints to Development (full drawing plus zoomed extract
    - Figure A-2 – Overview of Potential Constraints to Minerals and Waste Sites (full drawing plus zoomed extract
- Extract from WODC Ducklington Parish Flood Report (Nov 08) - Figure 1 'Ducklington parish – Areas Affected by Flooding'
- Oxfordshire County Council email dated 11th May 2009
- Aerial photos from January 2007