

August 2012

**FLOOD RISK ASSESSMENT**

NYMNP/PA

19 JAN 2015

**A171 Guisborough to Whitby  
Park & Ride Facility, North  
Yorkshire**

Submitted to:  
John Smith - Client Manager  
Bridges and Design Team Services  
Highways & Transportation  
Business & Environmental Services  
North Yorkshire County Council  
County Hall, Northallerton  
DL7 8AH

**REPORT**

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**Distribution:**

North Yorkshire County Council - 1 copy  
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## 1.0 INTRODUCTION

Golder Associates (UK) Ltd (Golder) has been requested by North Yorkshire County Council to undertake a site based Flood Risk Assessment (FRA) for the proposed development of a Park and Ride facility near Whitby, North Yorkshire. This report presents the results of the FRA along with recommendations for appropriate mitigation measures.

### 1.1 Background

An ES was prepared by Golder in 2007<sup>1</sup> for the proposed Park and Ride facility (the proposed development) and was subsequently approved for planning in 2008. The application has since lapsed; consequently an update to the planning application is required to address planning policy changes that have occurred since 2007. There have been no fundamental design changes to the proposed development since the initial application was approved.

### 1.2 Objective

The objective of this report is to produce a site-based FRA in accordance with the National Planning Policy Framework (NPPF), including the consideration of the potential risk of flooding from all sources both to and from the proposed development.

## 2.0 SITE DETAILS

### 2.1 Site Location and Existing Site Description

The proposed development site (the Site) is located west of Whitby, within the North York Moors National Park. It comprises a roughly triangular piece of agricultural land adjacent to the intersection of the A171 Guisborough Road and B1460; Bakers Lane runs along the northern boundary of the Site. The grid reference for the Site is NZ 4872, 5100 and the Site extends over an area of approximately 4.2 ha. The Site location is presented in Appendix A.

Site topography varies between 90 mAOD and 100 mAOD and typically slopes towards the east of the Site.

### 2.2 Proposed Development

The proposed development would entail the creation of car parking for approximately 400 cars and associated infrastructure such as sheltered waiting areas and an internal roadway system. A retention pond is also proposed. The proposed development is presented in Appendix A.

### 2.3 Geology and Hydrogeology

The published geological map for the region, sheets 35 and 44 covering Whitby and Scalby (BGS 1998) shows that the site is underlain by Glacial Till, which is described as clay with pebbles and lenses of gravel.

The groundwater vulnerability map for this area (Sheet 9, Groundwater Vulnerability of North East Yorkshire) indicates the solid geology underlying the Site is considered to be a minor aquifer.

The ES (Golder, 2007) states the following '*The National Soil Resources Institute website indicates that soils beneath the site are dominantly slightly acid loamy and clayey soils with impeded drainage. They have a moderate to high fertility.*

### 2.4 Hydrology and Drainage

The Site is located within the catchment of the River Esk, which is approximately 1.5 km south of the Site. The River Esk flows west to east, through Whitby and discharges into the North Sea. According to the Ordnance Survey Landranger Map 94 for Whitby and Esk Dale the nearest watercourse is a tributary of the

<sup>1</sup> Golder, 2007. Environmental Statement - A171 Guisborough to Whitby Park and Ride Facility, North Yorkshire. 05588358.504/A.0. June 2007



## FRA - WHITBY PARK & RIDE

River Esk, which runs parallel to the south of the site, approximately 100 m away. Ground levels at the tributary are approximately 10 m lower in comparison to the Site.

### 2.5 Vulnerability Classification & Flood Zone Compatibility

The proposed development is considered to be 'less vulnerable' (see Table 2 of the NPPF) and the development, according to the Environment Agency (EA) Flood Map, is located in Flood Zone 1. Table 3 of the NPPF illustrates the proposed development is considered 'appropriate' in Flood Zone 1.

## 3.0 FLOOD RISKS

### 3.1 Potential Sources of Flooding

Table 1 provides a summary of the potential flood risks to and from the Site.

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Table 1: Potential Sources of Flood Risk

Type of Flooding	Further Consideration Required	Comments
Fluvial	No	The Site is shown on published EA maps to lie in Flood Zone 1.
Tidal	No	The Site is shown on published EA maps to lie in Flood Zone 1.
Surface Water Runoff	Yes	The proposed development features sealed (impermeable) surfaces, which will increase surface water runoff.
Groundwater	No	The underlying geology and local topography indicate groundwater does not pose a significant risk to the Site. Section 2.3 highlights that infiltration on Site is considered to be impeded by the overlying soils and no basement structures are proposed.

### 3.2 Surface Water Flood Risk & Mitigation

The existing Site is an agricultural field; however the proposed development will feature impermeable surfaces covering a total area of 0.78 ha and comprises the following:

- Internal Roadways = 6,070 m<sup>2</sup>; and
- Pathways = 1,770 m<sup>2</sup>

The parking bays and overspill car park will feature a gravel surface and reinforced grass respectively, consequently, they are not considered to increase surface water runoff.

The proposed site drainage includes a retention pond, located towards the eastern extent of the Site, which will 'polish' water and attenuate flows by controlling discharge from hardstanding areas of the Site. Before entering the retention pond, surface water runoff will flow through oil interceptors. Discharge from the retention pond would enter either the highway drains along the B1460 or the highway drains along the A171. The drains along the A171 discharge into the watercourse south of Cross Butts Farm and eventually flow into the River Esk.





In the ES it was recommended that the retention pond should have the capacity to manage the 1% Annual Exceedance Probability (AEP) design standard rainfall event. However, in accordance with the NPPF, the design standard would now need to be increased to account for climate change. Therefore the retention pond should have the capacity to manage the 1% AEP rainfall event plus 20% to account for climate change. The ES states a letter from the EA, dated 28 September 2006, specified discharge from the retention pond should not exceed 1.4 l/s/ha.

Runoff volumes from the hardstanding have been calculated for different duration 1% AEP and 1% AEP plus 20% rainfall events. The total runoff generated during these storms is then offset against the volume discharged at 1.4 l/s/ha during the duration of the storm. It is assumed that all areas of the Site not covered with hardstanding will discharge at a rate no more than 1.4l/s/ha. The worst case runoff volume is selected to provide design criteria for the capacity of the retention pond.

During a 1% AEP rainfall event the development will generate up to 615 m<sup>3</sup> of runoff in excess of the EA specified 1.4 l/s/ha discharge limit. During a 1% AEP plus 20% rainfall event the development will generate up to 772 m<sup>3</sup> of runoff in excess of the EA specified 1.4 l/s/ha discharge limit. The calculations are presented in Appendix B.

#### 4.0 CONCLUSION

The proposed 'less vulnerable' development lies in Flood Zone 1 and therefore not at risk of fluvial or tidal flooding. In accordance with the NPPF, the development is considered 'appropriate' for its respective Flood Zone.

To mitigate the potential increase in surface water runoff a retention pond will be built towards the eastern extent of the Site which will limit discharge from the Site to 1.4 l/s/ha. The retention pond will feature a permanent pool of water, above which will be a minimum capacity of 772 m<sup>3</sup> to attenuate runoff generated during rainfall events up to and including the 1% AEP plus climate change.

Given the aforementioned mitigation measures the proposed development is not considered to pose a flood risk to the Site or increase flood risk to third parties.





## Report Signature Page

**GOLDER ASSOCIATES (UK) LTD**

Richard Evans  
Hydrologist

R Beal  
Reviewer

Date:

RE/RB/cr

Company Registered In England No.1125149

At Attenborough House, Browns Lane Business Park, Stanton-on-the-Wolds, Nottinghamshire NG12 5BL

VAT No. 209 0084 92

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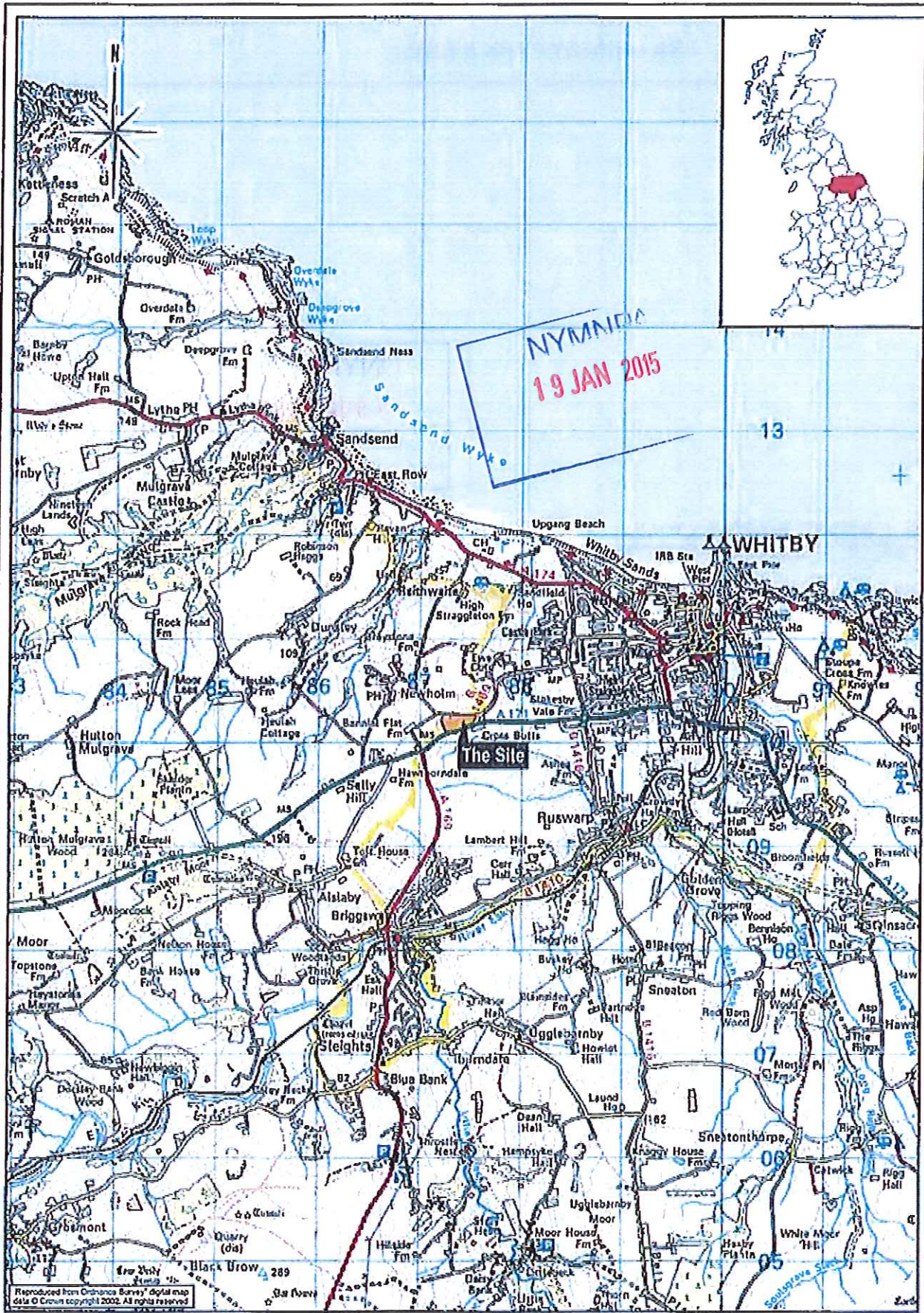
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# APPENDIX A

## Site Location & Proposed Development





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Client  
 Partnering with  
  
 North Yorkshire County Council  
 mouchelparkman

Date	June 2007
Project No.	05588359
Created by	J.W.
File No.	581625

The  
 Site location plan  
 A171 Gulsborough - Whitby  
 Park and Ride

Figure  
 1





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# APPENDIX B

## Surface Water Runoff Calculations

## Storage Volume Calculations

Greenfield Runoff Rate

1.4 l/s/ha

Flow Rate  $Q \text{ (m}^3\text{/s)} = C i A$

where C = coefficient of runoff; i = rainfall intensity; A = catchment area  
then Runoff Volume = Q x Duration



1% AEP		Hardstanding		
Area		7,840 m <sup>2</sup>		
Runoff Coefficient		0.90		
Duration (mins)	Rainfall (mm)	Volume of Runoff (Hardstand) (m <sup>3</sup> )	Existing Volume of Runoff (Greenfield) (m <sup>3</sup> )	Storage Required to Retain Greenfield Rate (m <sup>3</sup> )
15	27.02	191	1	190
30	32.68	231	2	229
60	39.53	279	4	275
120	47.81	337	8	329
240	57.83	408	16	392
360	64.63	456	24	432
720	78.17	552	47	504
1080	87.19	615	71	544
1440	94.22	665	95	570
1800	100.06	706	119	587
2160	105.09	742	142	599
2520	109.55	773	166	607
2880	113.56	801	190	612
3240	115.85	817	213	604
			Maximum	612

1% AEP plus Climate Change		Hardstanding		
Area		7,840 m <sup>2</sup>		
Runoff Coefficient		0.90		
Duration (mins)	Rainfall (mm)	Volume of Runoff (Hardstand) (m <sup>3</sup> )	Existing Volume of Runoff (Greenfield) (m <sup>3</sup> )	Storage Required to Retain Greenfield Rate (m <sup>3</sup> )
15	32.42	229	1	228
30	39.22	277	2	275
60	47.44	335	4	331
120	57.37	405	8	397
240	69.40	490	16	474
360	77.56	547	24	524
720	93.80	662	47	614
1080	104.63	738	71	667
1440	113.06	798	95	703
1800	120.07	847	119	729
2160	126.11	890	142	748
2520	131.46	928	166	762
2880	136.27	962	190	772
3240	139.02	981	213	768
			Maximum	772



At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

Africa + 27 11 254 4800  
Asia + 86 21 6258 5522  
Australasia + 61 3 8862 3500  
Europe + 356 21 42 30 20  
North America + 1 800 275 3281  
South America + 55 21 3095 9500

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

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**Golder Associates (UK) Ltd**  
**Cavendish House**  
**Bourne End Business Park**  
**Cores End Road**  
**Bourne End**  
**Buckinghamshire**  
**SL8 5AS**  
**UK**  
**T: [+44] 01628 851851**

