Balby to Woodfield Cycleway - Path Gradients audit

for: ***Doncaster Metropolitan Borough Council***

Final Draft Dec *2007*

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1.0 Introduction

1.1 This cycle audit has been prepared by Tim Pheby in response to a request made by Stephen King of Doncaster Metropolitan Borough Council (MBC) to Cycling England's Local Authority Professional Support Service. For more details of the service see http://www.cyclingengland.co.uk/engineering.php

1.2 A cycle audit is a check of a proposed scheme to ensure no problems are created for cycling and all opportunities for improving cycling are considered. An Audit can apply to a scheme specifically for cyclists or one that is designed for all road users. Recommendations are put forward to make the scheme more cycle friendly and so increase its potential for encouraging more people to cycle more often, more safely.

1.3 The reason for this audit is to give advice on the acceptable gradients for shared use cycle paths for a section of the Balby to Woodfield cycleway near Conisbrough. Landfill on a disused rail track has created a gradient of 18.5% or 1 in 5.4 which at present is too steep for most cyclists to climb and impossible for a unpowered wheelchair user. This route also uses the spectacular Conisbrough Viaduct which is currently owned by Sustrans. Local Transport Plan funds have been allocated to the scheme and Planning Permission for the path is required as goes through a Site of Special Scientific Interest.

2.0 Methodology

2.1 The work has been undertaken by Tim Pheby of Transport Initiatives in the following manner:

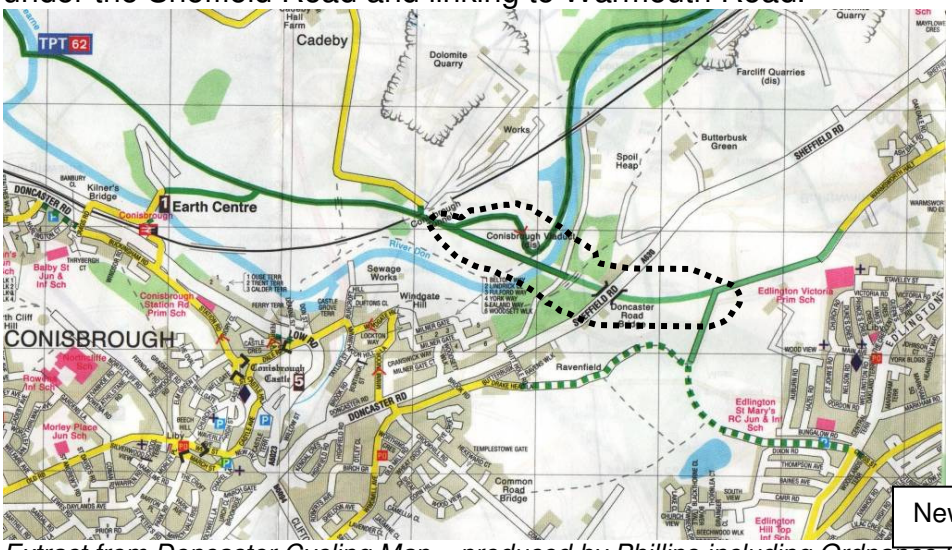
I. **Site visit:** took place on the 29th of November with Suzanne Higham a Transport Planner of Doncaster MBC with responsibilities for cycling. Photos and videos of the site were taken and plans studied of the proposed improved path gradients.

II. **Research:** the following has been studied

- Plans of the Balby Woodfield Cycleway – Gradients Cross sections Drawing Number LA 871/105 Revision E Aug 07 have been studied and extracts used to illustrate points within this report.
- Doncaster cycle map, Google & Virtual Earth for virtual site visits,
- Design advice – Cycling England Design Portfolio C.09 Gradients
  - Inclusive Mobility DfT Section 3.2 Gradients
- OS website for gradients advice

3.0 Background Information

3.1 **Site Description**: this part of the Balby to Woodfield route - see plan below – runs along a disused rail track and is marked as a Bridleway in light green running from the Conisbrough Viaduct over the River Don, under the Sheffield Road and linking to Warmouth Road.



Extract from Doncaster Cycling Map – produced by Phillips including Ordnance Survey data licence number LA076163

3.2 It would link up with the Trans Pennine Trail, a long distance route, which is also part of National Cycle route 62 which runs along the River Don to Doncaster. As the map shows the route could link Conisbrough with new Edlington for short trips and offer an alternative to the busy Sheffield Road which is also fairly hilly.

3.3 This section of the route is useable by foot with appropriate footwear and by fit mountain bikers due to its steep gradient of 1:5 due to landfill materials, rough surface and poor drainage. It would be very difficult to use with a wheel or pushchair.

3.4 Landfill materials have created the steep gradient and would be expensive to remove, requiring a licence from the Environment Agency. It is also a site of special scientific interest having geologically important limestone in the cutting and ecological features – badgers setts and bats nesting in the road bridge arch.

3.5 To complete the link to Conisbrough requires Sustrans to improve the surface and viaduct parapets of the Conisbrough Viaduct which it owns.

3.6 **Cycle data:** no cycle data has been supplied as the advice sought is confined to the issue of gradients. However it would be useful to carry out surveys as there were signs of regular use with worn paths and tyre tracks from cycles and motor cycles

4.0 Relevant Design Advice

4.1 **Gradient advice** for cycling is found in the Cycling England advice note Cycling England Design Portfolio C.09 Gradients
http://www.cyclingengland.co.uk/documents/C.09.pdf

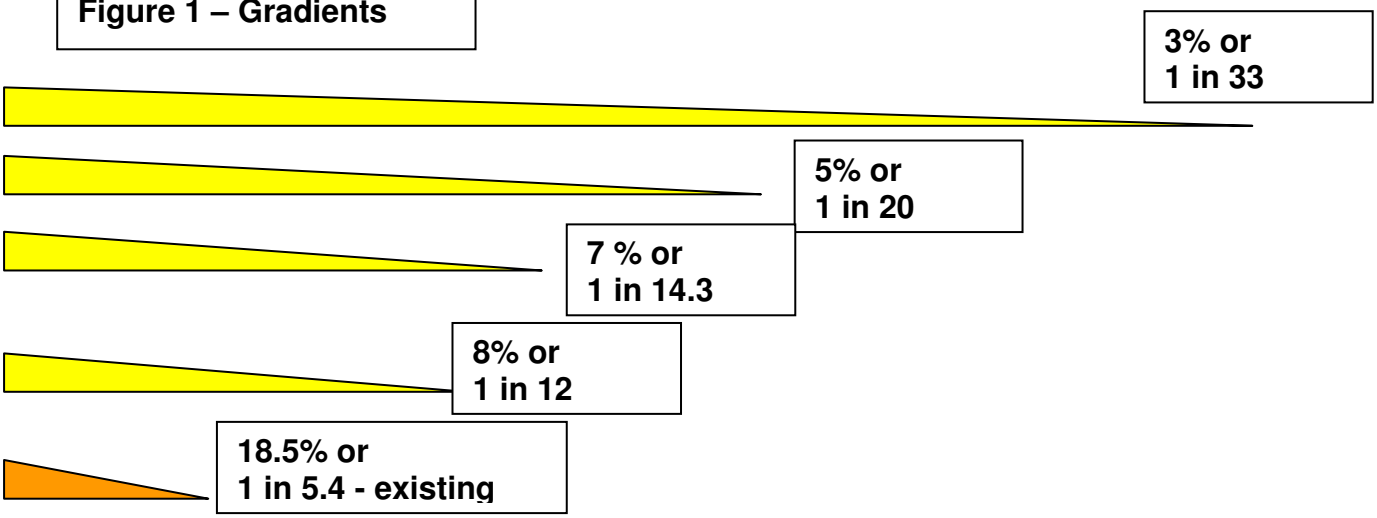
4.2 Gradient advice for other sustainable users is found in a Department for Transport publication Inclusive Mobility Section 3.2 Gradients
http://www.dft.gov.uk/transportforyou/access/tipws/inclusivemobility?page=3#a1009

The key parts of this advice is that designers should aim to achieve

- a recommended maximum gradient of 3% (1 in 33.3)
- an absolute maximum gradient of 5% (1 in 20) for lengths up to 100m.
- Where steeper slopes are unavoidable the limiting gradient is 7% (1 in 14.3) for lengths up to 30m.
- For those with limited mobility – wheelchair users – an absolute maximum gradient of 8% or 1 in 12 is recommended.
- For gradients of paths greater than 5% handrails and landing areas are suggested

4.3 These gradients along with the existing one are illustrated below in **Figure 1** for a rise of 0.5 cm

Figure 1 – Gradients



4.4 As can be seen from the above diagram, the existing slope is fairly steep at 18.5% or 1 in 5.4. Doncaster MBC plans to improve the gradients by providing 2 paths – a straight one with a 1:11 gradient and a curved one with a 1:15 gradient by adding material on top of the landfill. – see **Figures 3 and 4 –** which also show other path options with more gentle gradients,

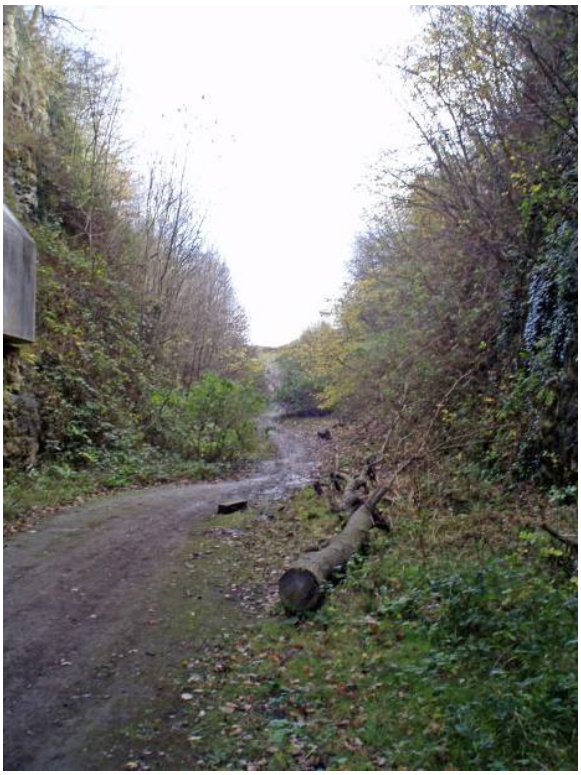
4.5 **Viaduct advice** – to the authors knowledge there is not much information published on converting viaducts to use by cyclists, walkers and horse riders. Advice on bridge parapets may be relevant in that they should be at least 1.4m high for new bridges according to BD 52/93 General Requirements for Highway Bridge parapets. They should also not have large gaps between sections of railings. While most of the Conisbrough Viaduct has brick parapets and passes these requirements one section has wide open railings and while offering great views of the River Don and Conisbrough Castle this is a potential safety hazard especially for horse riders.

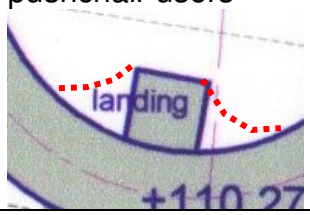
View of the Trans Pennine Trail NCN 62 path along the River Don from the open section of the Conisbrough Viaduct

5.0 Audit of this section of the Woodfield to Balby Path Gradients

5.1 The audit points are numbered in the tables below and shown on the plans of the route in **Figure 2.** *(Photos from site visit have been used to illustrate issues and photos are shown to show some of the recommendations*)

Table 1 – Audit comments on Proposals – see Figure 2 for plan

Plan Ref	Issue	Recommendation
1	Existing ramp gradient at 18.5% or 1 in 5.4 is too steep for comfortable cycling and for other wheeled users. 	Given the site constraints of a deep cutting limiting the width available to curve the path as well as the geological and ecological importance of the site it is not possible to achieve the ideal recommended gradient of 3% and hard to achieve a 5% gradient without considerable landfill which may affect the site's ecology and geology. A gradient of 7.5% or 1 in 15 can be achieved by curving the path to help users get up the hill. This would be a big improvement on the existing gradient. These sections of path would be limited to between 25 to 30m between turns as suggested in design guidance. This may require a handrail on one side as due to the gradient it will be classed as ramp.

Plan Ref	Issue	Recommendation
2	Landing stages on the uphill section shown joining the path at right angles and cyclists and other users will cut the corners to get into them	Show a 2-4m radius in and out of the landing stages to aid entry and exit for cyclists, wheelchair and pushchair users 
3	The proposed straight path with a gradient of 1:11 or 9% may lead to problems of cyclists speeding downhill intimidating other users and also does not leave much room for a rough surface for equestrian users . It may also require a handrail.	Consider not providing the straight path and discourage this movement by planting. This may give a bit more room for the curved path which would make the gradients slightly better. A handrail would also discourage users from taking a straight line downhill.
4	One section of the Conisbrough Viaduct has open railings and a potential safety hazard 	This section of the viaduct is in Sustrans ownership and it is suggested that they be required to provide either a mesh infill or railings with narrower gaps to enable the route to be used safely. *Photo - bridge parapets with narrow railings on a new bridge over the Bingley Bypass* 

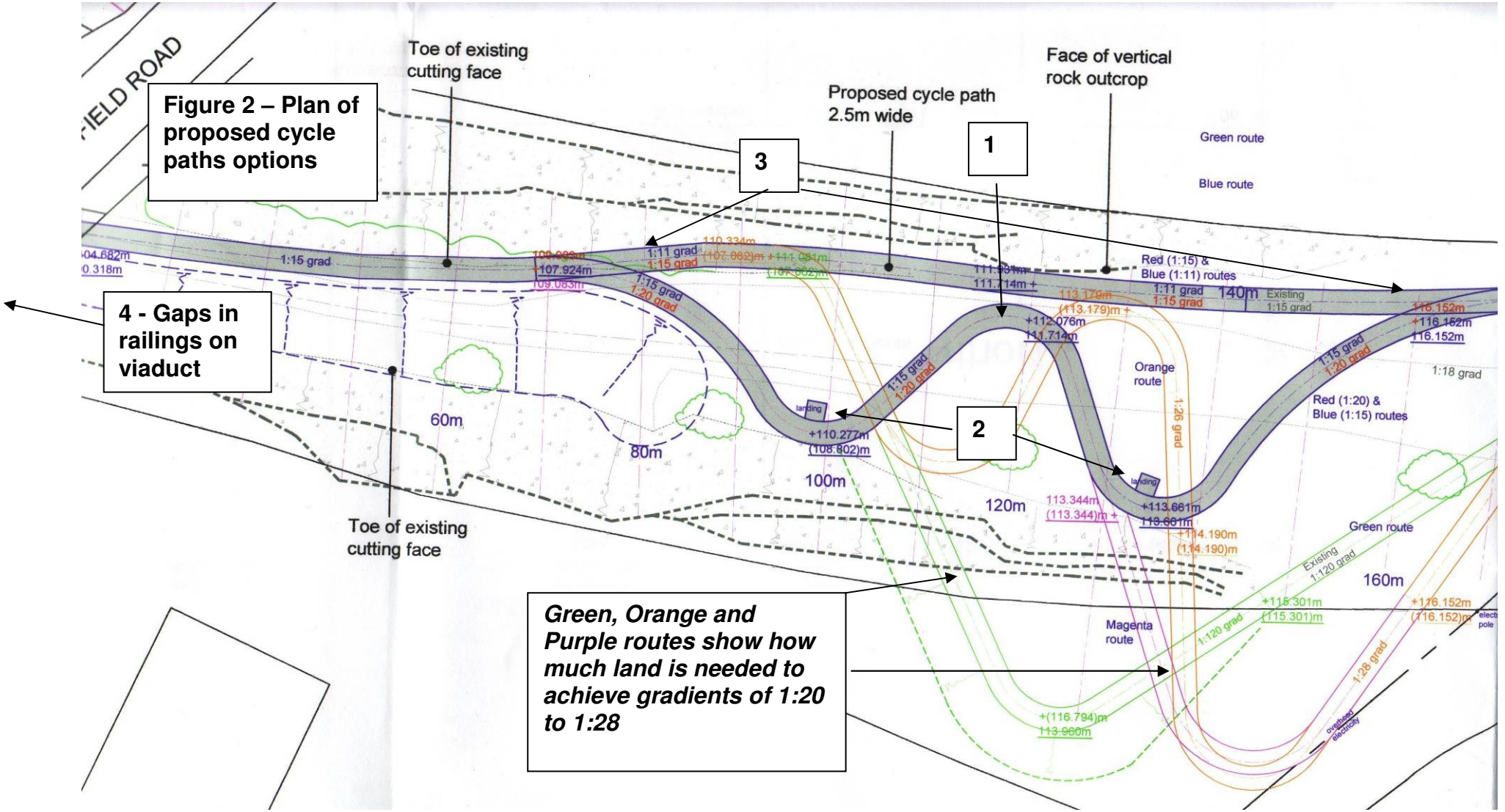
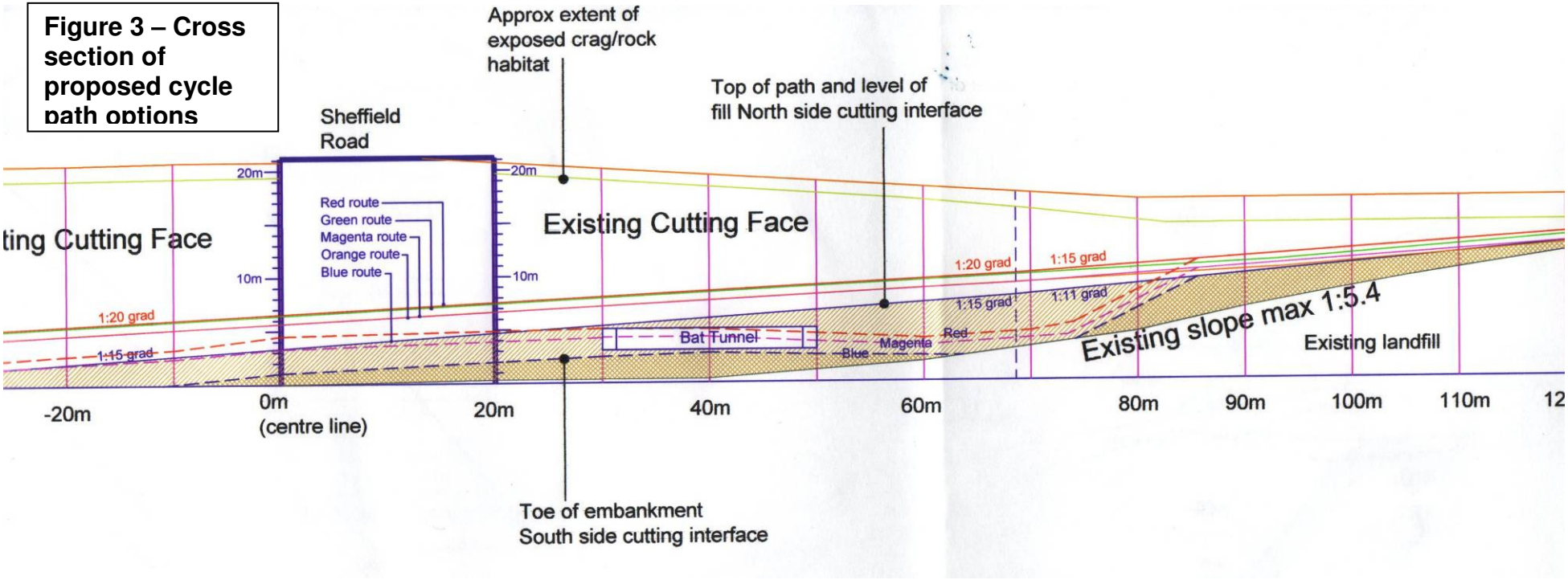


Figure 2 – Plan of proposed cycle paths options
Toe of existing cutting face
Proposed cycle path 2.5m wide
Face of vertical rock outcrop
3
1
2
4 - Gaps in railings on viaduct
Green route
Blue route
Red (1:15) & Blue (1:11) routes
Orange route
Red (1:20) & Blue (1:15) routes
Magenta route
Green route
Toe of existing cutting face
Green, Orange and Purple routes show how much land is needed to achieve gradients of 1:20 to 1:28

Figure 3 – Cross section of proposed cycle path options



6.0 Conclusions

6.1 Improvements to the gradients on this section of the Woodfield to Balby path are possible but limited by a number of factors – the width available between limestone cuttings, the landfill which will be expensive to move and ecological factors of badger and bats nesting.

6.2 While a recommended gradient of 5% would be hard to achieve one of 7.5% can be created by curving the path and this is a considered a good compromise given the limiting factors. It would be a big improvement for all users, especially those with mobility impairments, on the existing gradient which is 18.5%.

6.3 Doncasters plans show two paths – one straight and one curving. The straight one may lead to fast downhill descents by cyclists which could intimidate other users. By only have one curvy path slightly improved gradients could be achieved.

7.0 Recommendations

7.1 From the cycle audit it is recommended that Doncaster MBC consider the following:

1. *Engineering* –

a) Install one curving path with a gradient of 1 in 15 or 7.5% or better instead of one straight path and one curving path.

b) Discuss with Sustrans the need for improvements to make the railings section of the Conisbrough Viaduct safer by installing narrower railings or other measures.

c) Amending the design of the landing stages to provide curved radius entry and exits as in plan ref 2.

2. *Monitoring* – carry out before and after surveys of use to see how the proposed investment affects cycling and use by other modes.

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