APPENDIX 4

CONVEYANCE OF POLYHALITE FROM WILTON TO BRAN SANDS, TEESSIDE

OPTIONS STUDY SUPPLEMENTARY REPORT

Nathaniel Lichfield & Partners
Planning. Design. Economics.

Conveyance of Polyhalite from Wilton to Bran Sands, Teesside

Options Study Supplementary Report

York Potash Ltd

14 August 2015

50303/HS/NM - Rev 2

Nathaniel Lichfield & Partners
14 Regent's Wharf
All Saints Street
London N1 9RL

nlpplanning.com

This document is formatted for double sided printing.

Registered Office:
14 Regent's Wharf
All Saints Street
London N1 9RL

Contents

1.0 Introduction

1.1 On 27 March 2015, the Planning Inspectorate confirmed receipt of an application for a Development Consent Order ('DCO') submitted on behalf of York Potash Limited ('YPL') seeking consent for the creation of new Harbour Facilities at Bran Sands, Teesside.

1.2 The application included the document *"Options Study Report – Conveying of Polyhalite from Wilton to Bran Sands (March 2015)"* (Doc Ref: 6.4 - Environmental Statement Appendix 3.2) which provided an account of the options for the proposed route of a conveyor system that links the YPL Materials Handling Facility ('MHF') at Wilton with the proposed Harbour Facilities. This Supplementary Report (July 2015) is intended to provide further clarification and explanation of some of the issues identified in consultation following submission of the DCO application. It should be read in conjunction with the earlier Options Study Report.

Context

1.3 The DCO application forms part of the wider YPL Project which includes the development of a new mine intended for the winning and working of polyhalite (a form of potash and a natural fertiliser) and its ongoing handling and transport to the national and international marketplace. The DCO relates to proposals for the development of new Harbour Facilities at Bran Sands, Teesside. The development includes an associated conveyor system to facilitate the transport of polyhalite from a Materials Handling Facility ('MHF') within the Wilton International Complex to the quayside. The conveyor system includes an enclosed conveyor bridge crossing over the A1085 and transfer towers (up to a maximum height of 30m).

Structure of Document

1.4 This statement provides the following information:-

- Section 2 (Background) – identifies the key issues identified in the Options Study Report (March 2015) and the scope of the supplementary information provided in this document;
- Section 3 (Key Parameters) – reviews the specific functional requirements and special characteristics associated with the conveyance system;
- Section 4 (Crossing Third Party Interests – Key Issues) – describes a range of third party assets which the conveyance system needs to cross and any specific sensitivities or vertical clearance requirements;

- Section 5 (A Tunnel Alternative – Key issues) – provides information on why a 'Mineral Transport System' ('MTS') similar to that which will be used to transfer the polyhalite from the mine at Dove's Nest Farm to Wilton or other forms of sub-surface conveyor structure cannot be provided to transfer the polyhalite from Wilton to Bran Sands; and
- Section 6 (Summary and Conclusions).

2.0 Background

2.1 This section provides a brief summary of the issues relevant to this Supplementary report and, in particular, explains the background to the scope of the document.

Options Study Report (March 2015)

2.2 The Options Study Report summarises the design development of the conveyor route between the MHF site and the new harbour facilities at Bran Sands. It includes:-

1 A review of ten conveyor route options that were identified in order to select a preferred route;

2 Consideration of the potential routing of the conveyor below ground in a tunnel between Wilton and Bran Sands; and

3 The potential to pass the conveyor under the A1085 rather than in a bridge structure passing over the road.

2.3 The preferred option forms the basis of the conveyor corridor specified in the DCO application for the proposed Harbour Facilities.

2.4 During preparation of the Options Study, and ahead of submission of the DCO application, a series of meetings with Redcar and Cleveland Borough Council ('RCBC') took place from mid-2014 to review the potential design options for the conveyor system. Details were also part of the formal period of consultation conducted in September and October 2014, under s42 and s47 of the Planning Act 2008, and consultation responses were received in respect of the proposals put forward. This process of consultation fed into the outline design for the conveyor included in the DCO submission made in March 2015.

Conveyor System Included in the Draft DCO

2.5 The Proposed Works that form the basis of the DCO are defined in full in the following application documents:-

1 Draft DCO [Document No: 4.1];

2 Explanatory Memorandum [Document No: 4.2];

3 Works Plans [Document Nos: 2.2 to 2.2F];

4 Environmental Statement Section 3 ('Description of the Proposed Harbour Facilities') [Document No: 6.4]; and

5 Parameters Table [Document 6.9].

2.6 Specifically, Works No. 4 specify:

"parallel conveyors on supports to transfer polyhalite from the MHF to the ship loaders and surge bins (situated in Works No 2) [Note – Works No 2 comprises the quay]*, including development of transfer stations;"*

2.7 In addition, Works No. 5 refers to the development of works associated with the harbour facilities; these include conveyor footings and supports and transfer towers.

2.8 The Harbour Facilities development is a significant undertaking that will be brought forward over a number of years on a site with highly variable and difficult ground conditions resulting from many years of industrial development and complex ongoing operations. As a result, a degree of flexibility has been built into the form of development to allow the ability to adapt the detail of the development as it is brought forward. This has been achieved by establishing and fixing a number of clearly defined key scheme parameters or development envelopes; and/or by establishing clear options for key components of the development and establishing how a choice will be made in bringing forward the detailed design.

2.9 In relation to the conveyor system, and whilst the form of the conveyor (two parallel belt conveyors running in a single elevated conveyor bridge) is established, a route corridor has been identified with maximum height parameters, including maximum bridge heights across the A1085, within which the final route of the system and precise location of any transfer stations will eventually be brought forward. This includes two possible options within the Bran Sands site to allow for the conveyor to run to the north or south of the sewage treatment works/lagoon areas.

Post Submission Consultation

2.10 Following submission, consultation has continued with RCBC to seek to reach an agreement on all matters associated with the conveyor. In particular the following has occurred:-

I. A meeting took place on 27 May 2015 between the YPL team and RCBC to present information on the need for the conveyor to pass over the A1085;

II. RCBC issued its letter of representation to the DCO submission on 9 June 2015 which specified a need for additional information on the overhead conveyor and the quality of the design to be made available to the Council and its advisors; and

III. A meeting took place on 20 July 2015 with RCBC's advisors to present additional information on a tunnel option.

2.11 At this latest meeting, RCBC's advisors requested that a number of matters of detail needed to be captured in formal documentation as follows:-

I. Further explanation on the provision of a longer tunnel under the A1085 as an alternative to the overhead conveyor (and why this had been rejected previously); and

II. Further information on the detailed design of the overhead bridge including its clearance and overall dimensions, relationship to the landscape and how its structure could be used as an enhancement and/or be used as a gateway structure. It was suggested that the Design Manual for Roads and Bridges ('DMRB') may provide a useful basis.

Examining Authority's First Round of Questions

2.12 The Examining Authority issued their first set of questions in respect of the DCO application on 27 July 2015 setting out those issues on which they wish to be informed during the Examination. In relation to the conveyor, the following points are relevant:-

PAR 1.2

To: The Applicant

Alternative means of crossing the A1085

Given the Relevant Representation from Redcar & Cleveland Borough Council (RR-018), please provide a full explanation of the issues that are said to rule out routing the conveyor beneath the distributor road and other parallel transport routes.

PAR 1.3

To: The Applicant

Crossing the A1085

A particular design is illustrated for the conveyor bridge over theA1085, but with variant alternative designs also shown. Please justify the choice of intended design and/or indicate the scope for incorporation of alternative design approaches. At what point would the final design selection be envisaged? How would the design approval process be controlled by the DCO?

Summary

2.13 It is the purpose of this Supplementary Report to provide the necessary information to address point (1) as outlined in the meeting with RCBC and matter PAR 1.2 as specified in the Examining Authority's First Round of Questions. All other points identified in this section are addressed in the applicant's responses to the Examining Authorities First Round of Questions.

3.0 Key Requirements for Operational Conveyor System

Polyhalite Product Properties

3.1 The MHF at Wilton will receive Polyhalite mined at Doves Nest Farm in rock form (called Run-Of-Mine or ROM). The MHF at Wilton will crush the Polyhalite mineral to the required size distribution and granulate it for export to market. The final product will be in the form of granules of approximately 5mm diameter.

3.2 The Polyhalite will be exported in a form that can be directly applied to crop fields by the end users, thus making the product extremely valuable as no further refining/value added processes are required. It has the following properties:-

1 Granular in form - 2mm to 5mm balls;

2 No fines;

3 Flows easily for even distribution in farm spreader machinery; and

4 Not very strong (must disintegrate on the crop).

3.3 As a result of the above, the following features are relevant:-

1 The maximum conveyor slope must be no greater than 10 degrees from horizontal (to avoid the product rolling down the conveyor and flooding the lower areas);

2 It must be kept dry; and

3 Transfers must be minimised due to the product's fragility since transfers introduce a vertical drop which causes breakage of the granules and generation of dust (both of which reduce product quality).

Figure 3.1 Granular Polyhalite

Critical Requirements

3.4 The following key requirements are critical to the operation of the conveyance system between the MHF and Bran Sands and, as such, have a direct influence on the scope for alternative transport options to the conveyor system that is the subject of the draft DCO:-

1 The distance between the two locations is 3.6 kilometres and the system must be capable of safely crossing (either, over, under or through) the various infrastructure corridors which criss-cross the route between the two sites;

2 The proposed Harbour operation is 24 hours per day and 7 days per week and ships need to be loaded as soon as possible on arrival at the port to avoid shipping delays and charges. The conveying system has to be able to handle an intermittent material flow which is associated with loading vessels with multiple hatches. When 2 ships are being loaded at the same time, the product will be transferred at a rate of 2 x 3,800 t/h (equivalent to 2 x 200 trucks per hour);

3 The conveyor system must be capable of operating reliably and safely, at full capacity and under all loading conditions. This implies that break downs, spillage and dust generation must be minimised as much as possible and these are all adversely affected by increasing system complexity;

4 The system must be capable of being brought forward in two phases – up to 6.5 million tonnes per annum and, secondly, up to 13 million tonnes per annum to reflect the proposed operational characteristics of the YPL mine. To meet phase 2 capacity requirements, it has been calculated that two parallel conveyance systems are required which each designed for the movement of approximately 3,800 tonnes of product per hour;

5 The conveyance system needs to enclose the product to mitigate dust emissions (nuisance) and to ensure an optimal product export quality (the polyhalite product is sensitive to water); and

6 Areas of land which exist between the MHF and Bran Sands site are within Flood Zones 2 or 3 with a higher risk of flooding. Protection from flooding would need to be secured in any design option as well as ensuring that the available flood storage volume for the area is not significantly affected by the proposals.

Conveyor Technology

3.5 Two curved, parallel troughed belt conveyor systems were selected to provide the most appropriate and feasible technology to meet all of the critical parameters (as described in the March 2015 Options Study Report). Troughed belt conveyors are the industry standard for continuously transporting large volumes of material over distances of several kilometres. They utilise standard components and include recognised, reliable and understood / proven technology.

3.6 There are two alternatives that have been considered by the team prior to making a decision to proceed with the troughed belt conveyor system. The engineering and design issues for both alternatives are briefly reviewed below as background to matters addressed later in this report in relation to the potential to convey the polyhalite in a tunnel between the MHF and Bran Sands.

Pipe Conveyors

3.7 Pipe conveyors are capable of tighter curves than conventional conveyors. They can operate at a steeper ascent/ descent than troughed conveyors with bulk materials which contain fines, however, with the Polyhalite granules they have no such advantage. The structure of the pipe conveyor entails significant extra complexity which results in higher power costs, more noise and greater maintenance.

Steep/Vertical Conveyors

3.8 The commentary below relates to solutions for conveyors which could transfer the polyhalite over steep or vertical angles.

3.9 This could relate, for example, to a solution which could lift bulk material from a relatively deep underground conveyor route to the surface, as would be required for an underground route from the MHF to Bran Sands. Three solutions are considered - “chain bucket elevators”, “corrugated sidewall pocket belt conveyors” and “sandwich belt conveyors”. The description below provides an explanation why none of these solutions are considered feasible for operation as part of the YPL development.

1. Chain Bucket Elevators

3.10 Chain bucket elevators lift material in buckets linked to a chain system. They are relatively complex and are associated with significant product degradation due to high chain speeds and the large number of small buckets which are required to load and unload the material (refer Figure 3.2).

3.11 The largest chain bucket elevators in the world have a capacity of about 2,000 tph. Achieving the vertical lift for the full material flow for the YPL Project would therefore require multiple parallel chain bucket elevators per conveying line plus a system to distribute the material over the chain bucket elevators. Furthermore this option would require an additional basement structure for the transfer and distribution system. All this would severely add to complexity, product degradation, spillage and maintenance issues and this option has therefore been rejected from further consideration by YPL.

Figure 3.2 Unloading section of chain bucket elevator

2. Corrugated Sidewall Pocket Belt Conveyors

3.12 Corrugated sidewall pocket belt conveyors lift material on a rubber belt with sidewalls and pockets. They are very complex and limited in capacity to approximately 2,000tph.

3.13 They produce less degradation than chain bucket elevators (but still significantly more than belt conveyors) due to smoother loading and unloading processes. However they do produce a lot of spillage because it is very difficult to clean the pockets. An additional spillage conveying system would therefore be required to intercept and remove significant spillage in the basement and to return the spillage back into the main product flow.

3.14 Similarly to chain bucket elevators, they would require multiple parallel vertical conveyors to achieve the desired capacity and an extremely deep basement structure because they require a horizontal loading section. All this would add extra complexity, spillage and maintenance issues to the operation and they have therefore been rejected as feasible alternatives.

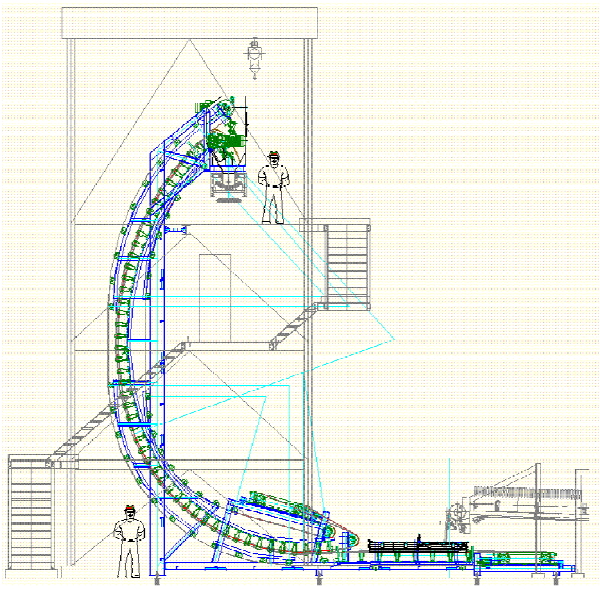
Figure 3.3 Corrugated sidewall pocket belt conveyor

3. Sandwich Belt Conveyors

3.15 Sandwich belt conveyors press a (second) cover belt against the product and belt of a conventional trough conveyor. This encloses the product and allows the underlying trough conveyor to make a steep incline without the need for additional transfer towers/shafts. This conveying technique generally results in relatively low product degradation, without affecting the conveying capacity. However, as Polyhalite granules are relatively free flowing, and low in strength, the “sandwich” forces required would need to be very high which would result in unacceptable levels of product degradation.

3.16 The system is very complex and would be very difficult to maintain inside a long inclined/vertical shaft. Although the application is quite commonly used for self-unloading Handy / Panamax ships, there are no references or available information on high capacity, underground applications. As a result of the complexity and maintenance related issues, sandwich belt conveyors are not considered feasible.

Figure 3.4 Schematic of sandwich conveyor system



Design Restrictions

3.17 The selection of 2 parallel, curved, troughed conveyors by YPL attracts a series of design restrictions which have a significant bearing on the route that can be taken by the conveyance system between the MHF and the dockside:-

1 The conveyor route needs to be as direct as possible with a minimum number of curves and without complex curves (combined vertical and horizontal curves) to minimise spillage and downtime. Tight changes in direction, both horizontal and vertical, can only take place in transfer towers. However, transfer towers introduce additional sources of operational complexity, maintenance, product degradation, noise, potential spillage and dust generation. Their introduction should therefore be minimised;

2 The conveyor 'slope' needs to be low to ensure reliable operation. Notably, the inclination can be no more than 10 degrees to avoid the granulated product rolling down slope and flooding the belt causing spillage (which would require the operation to stop to rectify the problem and clean up the spillage); and

3 The two parallel belt conveyors need to be separated by a maintenance access route (of 1 metre width) with further maintenance access walkways on the outside of the conveyors for inspection and maintenance. The conveyor corridor therefore has a width of around 7.4m. Furthermore, clearance space is required above the conveyor to accommodate lifting of components during maintenance operations. This leads to a minimum height of 3 metres for the conveyor corridor.

4.0 Crossing Third Party Interests – Key Issues

4.1 The Options Study identified the various infrastructure corridors which criss-cross the route between the MHF and Bran Sands and the key stakeholders with whom liaison is necessary relevant to the infrastructure. The schedule is reproduced below for ease of reference:-

Table 4.1 Summary of Third Party Services and Stakeholders

Infrastructure with Major Crossing ('MC') Reference from Options Study
MC1 A1085 Dual Carriageway
MC2 Internal Access Road
MC3 Hot Metal Rail
MC4 Internal Access Road
MC5 National Power Over Head Line
MC6 SSI Road and Rail
MC7 Network Rail
MC8 Northumberland Water Access
MC9 Dabholm Gut Outfall
Other features:-
Buried services inc. large diameter gas mains
Breagh Gas Pipeline
'The Fleet' water course
Surface mounted services and associated structures
GDF Suez Pipeline
BP CATS Pipeline
Bran Sands Landfill
Stakeholders
Sembcorp
BP CATS
GDF Suez
Northumberland Water Limited
SABIC
Huntsman Polyurethanes
RWE
Network Rail
National Grid
Redcar and Cleveland Borough Council
SSI and TATA
M&G Fuels
BDC
PWC
Homes and Communities Agency
Air Products
Ineos Chlor
Akzo Nobel
Ensus

Northern Gas Networks

Source: Option Study Report (March 2015), page 7

4.2 These infrastructure corridors are shown on the Conveyor Route Plans [Document Nos: 3.3A – 3.3O] which have been submitted with the DCO application.

4.3 Each Corridor is subject to a different restriction relevant to how the YPL conveyor system would be able to cross them. Table 2 below captures the relevant information:-

Table 4.2 Summary of infrastructure to be crossed between MHF and Bran Sands

MC Reference	Infrastructure	Stakeholder/ Consultee	Description	Restrictions (where relevant)	Comments/ Additional information
MC1	A1085 Dual Carriageway	RCBC	Dual carriageway running east-west at an elevation of aprox 4 metres above local ground level in the area between the MHF and the Bran Sands site and with planting on either side of the route	At least 4 metres above height of road; the Lord McGowan Bridge is viewed as having local significance	Construction of any crossing requiring the closure of the A1085 would require significant road diversions with resultant adverse effects
MC2	Internal Access Road		Ground level access route	Sembcorp has specified any overhead conveyor must be at least 6 metres above the road to maintain access	
MC3	Hot Metal Rail	SSI/ Tata	Serving local steel works	At least 7.7 metres above infrastructure	In consultation, a strong preference for over rail crossing was identified
MC4	Internal Access Road		Ground level access route	Sembcorp have specified any overhead conveyor must be at least 6 metres above the road to maintain access	
MC5	National Power Over Head Line	National Grid	Located 25 metres above ground level	At least 8 metres needed from the underside of the overhead line	
MC6	SSI Road and Rail	SSI/ Tata	Road and rail access routes linking to the Sahaviriya Steel Industries UK/TATA site to the north/north-east of the MHF site	At least 6 metres above infrastructure; construction works could only occur at night to allow ongoing operation	MC6 and MC7 are located very close together so it is not possible to pass over one and under the other (i.e. a similar crossing solution must be adopted for these two pieces of infrastructure – they should be treated 'as one'); in consultation, a strong preference for over rail crossing was identified
MC7	Network Rail	Network Rail	Rail route running between Middlesborough and Redcar	At least 6 metres above infrastructure; construction works could only occur at night to allow ongoing operation	
MC8	Northumberland Water Access	Northumberland Water			
MC9	Dabholm Gut Outfall		Outfall from sewage works into the Dabholm Gut which is a straight tidal channel of over a kilometre long connecting to the Tees		

MC Reference	Infrastructure	Stakeholder/ Consultee	Description	Restrictions (where relevant)	Comments/ Additional information
- -	Buried services	various	Five gas mains (some of which are of national importance), HV cables, fibre optic cables and drainage systems	Gas mains require a 5 metre easement	Not considered practical to remove or relocate the services due to their number, significance to the network and complexity
- -	Breagh Gas Pipeline	RWE	New pipelines (one 20 inch gas pipeline and one 3 inch Mono Ethylene Glycole pipeline) buried approximately 1.2 metres below ground level bringing natural gas from the new Breagh Field in the North Sea to the Teesside Gas Processing Plant in Seal Sands, Teesside	Exclusion zone of +/- 3 to 5 metres either side of the pipeline. No construction can occur within easement with restrictions on construction outside but close to the easement; buried directly under part of the route of the Hot Metal Rail	Major Hazard pipeline (HSE designation) with national significance
- -	'The Fleet' water course	Environment Agency	Small water course connecting Stainsby Beck with the River Tees		
- -	Surface mounted services	various	Ground level services, pipe gantries and expansion loops	Various clearance zones and access ways which cannot be obstructed	
	Solid Fuels Depot		Site located immediately to the north/north-west of the MHF site	No overhead conveyor to pass over the site	
	GDF Suez 24" Gas and 8" Condensate pipes	GDF Suez	Owned by Enron or Teesside Power LTD prior to GDF. See attached mark up for route. The RWE Breagh assets run parallel alongside the full length of Dabholme Gut		No longer in use

5.0 The Tunnel Alternative – Key Issues

5.1 As detailed in Section 2.0 of this Supplementary Report, RCBC's advisors have requested additional information, to that provided in the Options Study, on the key issues associated with the routing of the conveyor system within a tunnel running from the MHF to Bran Sands. Specifically, this explanation is required to describe why the 'tunnel alternative' has been rejected in preference to the overland conveyor included in the DCO application.

5.2 The key parameters outlined in Sections 3.0 and 4.0 of this Supplementary Report are relevant as background to this explanation.

5.3 Specifically, information has been requested on whether it would be possible to develop a similar underground tunnel to that which will transport the raw material (Polyhalite) from the minehead site to the MHF. A brief description of the Mineral Transport System has been provided as background in this regard.

The Mineral Transport System

5.4 The wider YPL project includes the Mineral Transport System ('MTS'). This primarily consists of a 36.5km long tunnel, containing a series of linked conveyor belts that will transport the polyhalite from an underground point at the Minehead beneath Dove's Nest Farm, to Wilton at Teesside, and three intermediate surface sites along the route at Lady Cross Plantation, Lockwood Beck and Tocketts Lythe to provide access for tunnel construction, ongoing maintenance, ventilation and emergency access.

5.5 The MTS will intersect with the minehead production shaft at a cavern at approximately 360 metres below ground level. It will run underground for 36.5km in length and break ground at a Portal adjacent to the MHF. Once operational, the MTS will contain conveyor and support systems. The intermediate sites will provide required emergency access, egress and ventilation. At Wilton, the proposals involve works associated with the creation of the MTS Portal.

5.6 The tunnel will have an internal finished diameter of approximately 5.7 metres. The excavated diameter will be approximately 6.5 metres for segmental lined sections. The tunnel will accommodate a conveyor, maintenance train track and provision for 2 x 66kV power supply cables. Four caverns will be constructed: one at the intersection with the minehead main shaft (at depth 360 metres) and one at each of the intermediate sites at depths of 340 metres (Lady Cross Plantation), at 345 metres (Lockwood Beck Farm) and 120 metres (Tocketts Lythe).

5.7 For Phase 1 of the Project, the conveyor system will operate at a duty of approximately 1,000t/h on a 1200 to 1400mm wide belt conveyor at between 3-4m/s. For Phase 2 of the Project, additional drives will be installed to cater for the increased duty of approximately 2,000t/h. The belt speed and width will remain at those selected for Phase 1 of the Project.

5.8 The conveyor will be transporting dry mineral.

5.9 The tunnel will accommodate a narrow gauge (900mm) railway to provide access to the proposed conveyors and tunnel for maintenance purposes.

5.10 The MTS Portal area will accommodate the following main infrastructure:-

- Train (or 'loco') shed with tracks and train maintenance;
- Store for conveyor drives;
- Portal and canopy structure (measuring 91m long, 16m wide and 8m high;
- Emergency Run of Mine (ROM) storage building;
- Workshop and control room;
- Portal Head House housing an access shaft and ventilation services; and
- Pump return tank and water treatment works for tunnel drainage.

Review of Issues - Tunnel between MHF and Bran Sands

5.11 A tunnel that transports processed polyhalite from the Wilton MHF to the ship loader at Bran Sands, next to the River Tees would need to meet the requirements outlined in this section.

5.12 The vertical gradient of the tunnel must not exceed 10 degrees (~ 1 in 5.7) to satisfy the operational requirements of the conveyor as outlined in Section 3 of this report. This includes the start and end of the tunnels and so vertical shafts are not feasible. The conveyor would reach the surface through portals, which would need to be around 80m long, 20m wide and 13m deep (See Figures 5.1 and 5.2 below).

Figure 5.1 Long section of the portal structure to the specification

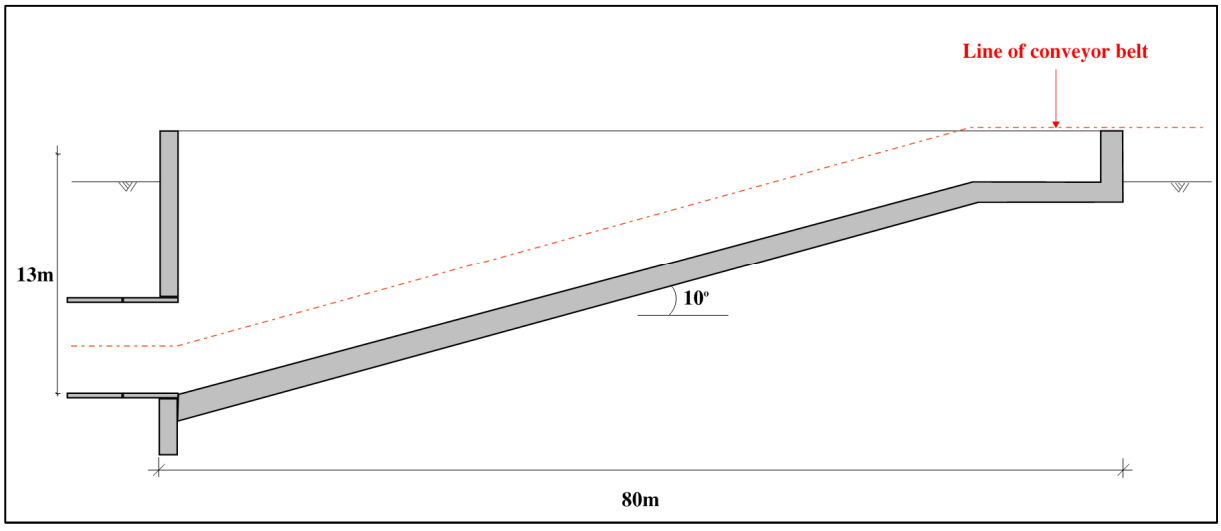
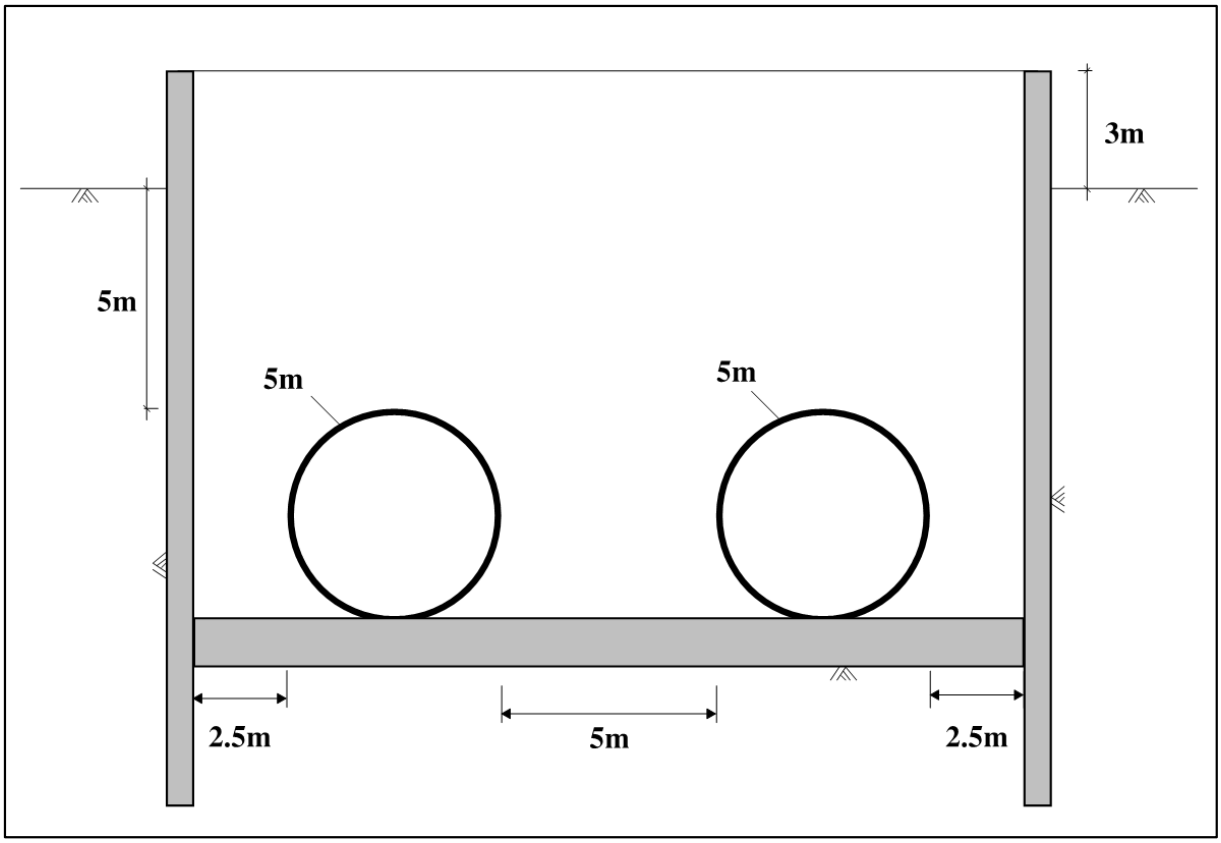
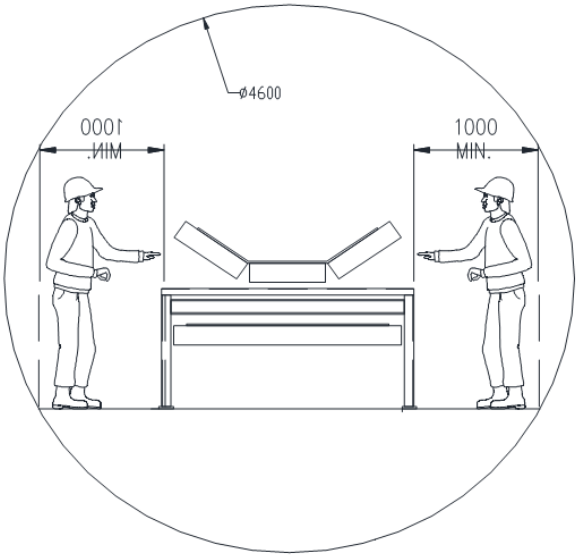


Figure 5.2 Cross-section of portal structure to the specification



5.13 To satisfy the space-proofing requirements outlined in Section 3 of this report, a single bore tunnel of 7.4mID (internal diameter) could house two parallel conveyors with 1m access walkways either side and in between conveyors. Alternatively, twin-bore tunnels of 4.6mID could house a single conveyor each with 1m walkway either side. Figure 5.3 below shows a cross-section of the layout of one of the twin-bore tunnels.

Figure 5.3 Spaceproofing specification of a (twin-bore) tunnel as per Section 3



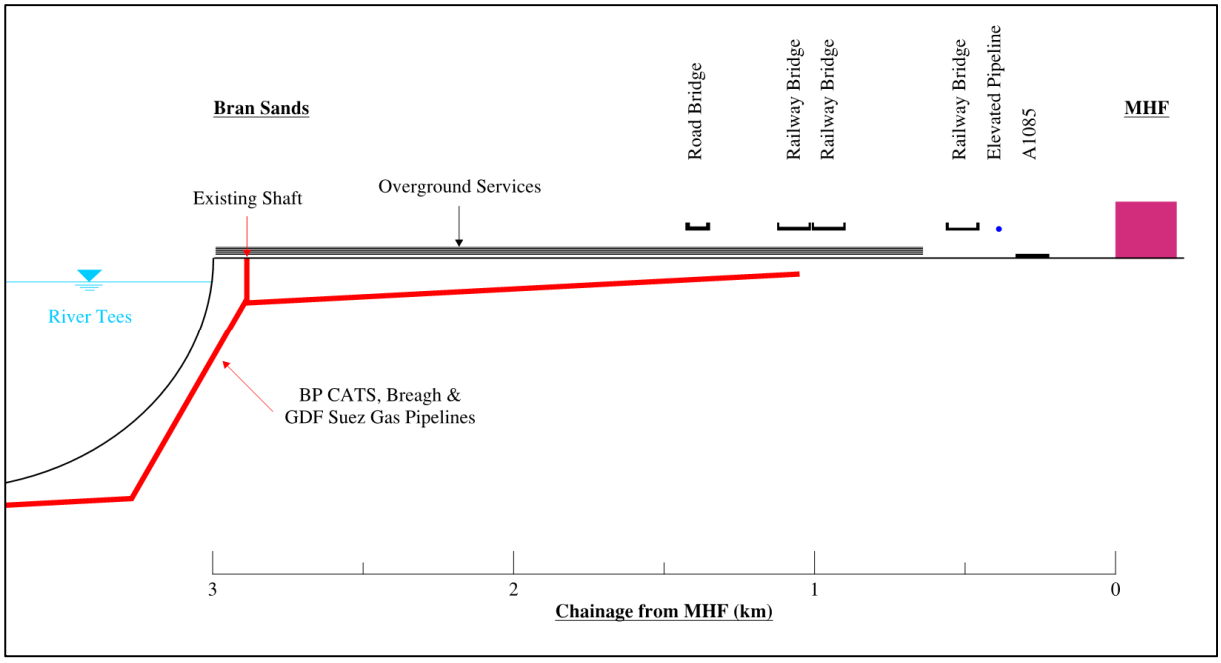
5.14 The tunnel requires protection from flooding for a design flood level of 3m above ground level. A 3 metre high wall to the top of the portal has been assumed as meeting this requirement.

Tunnel Constraints

5.15 Table 4.2 in this report summarises some of the existing infrastructure that a tunnel would need to cross between the MHF and Bran Sands. The tunnel would need to be aligned so that it did not clash with these existing assets and so that the ground movements associated with tunnelling do not damage them.

5.16 Figure 5.4 is an indicative sketch of the long-section along the proposed tunnel alignment highlighting the key pieces of infrastructure that the tunnel would cross.

Figure 5.4 Long-section sketch indicating the existing significant infrastructure between MHF and Bran Sands (looking North)



5.17 The critical obstructions are the three gas pipelines running underground between chainages1km and 3km. These are the BP CATS, GDF Suez and Breagh gas pipelines – these are nationally important gas lines that transport oil and gas from the North Sea oil fields to the processing plant on the west side of the River Tees.

5.18 The operator of the Breagh gas pipeline has confirmed that:

1 The location of the pipelines are broadly correct as shown on the RHDHV drawings PB1586-SK1040 to 1046 (as included as part of the DCO application) - the depth varies from around 2 – 7mBGL before the river crossing;

2 The BP CATS and Breagh pipelines are designated Major Accident Hazard pipelines by the Health and Safety Executive;

3 The asset owners would not accept any tunnelling near the pipelines or any imposed ground movements caused by tunnelling; and

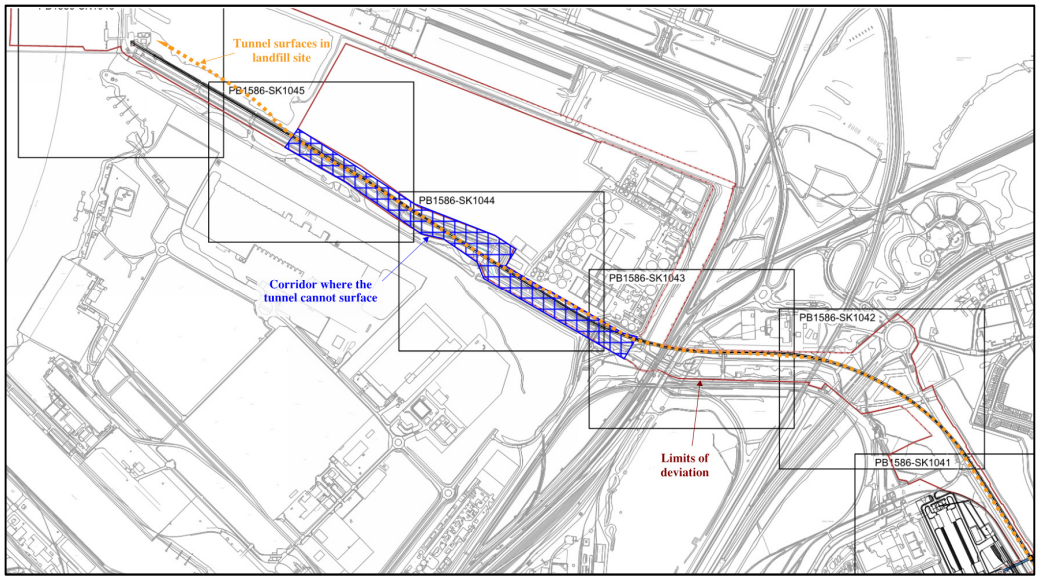
4 Due to the continuous use and national importance of the pipelines, they cannot be diverted.

Portal Locations

5.19 The tunnel will need to surface through a portal to connect the conveyor to the ship loader at Bran Sands. As described in the 'Tunnel Requirements' section, sufficient land would need to be available for a portal 80 metres long, 20 metres wide and 13 metres deep.

5.20 Figure 5.5 shows a plan sketch of the proposed tunnel alignment. The blue hatching indicates a narrow corridor created by the limits of deviation between chainages 1km and 2.5km. RHDHV drawings PB1586-SK1044 to SK1046 (submitted with the DCO application) show the corridor in greater detail and that the three gas pipelines also run along this corridor. It would not be possible to build a portal in this location without the tunnel physically clashing with the existing infrastructure.

Figure 5.5 Plan sketch showing tunnel surfacing at Bran Sands



Source: Basemap from RHDHV

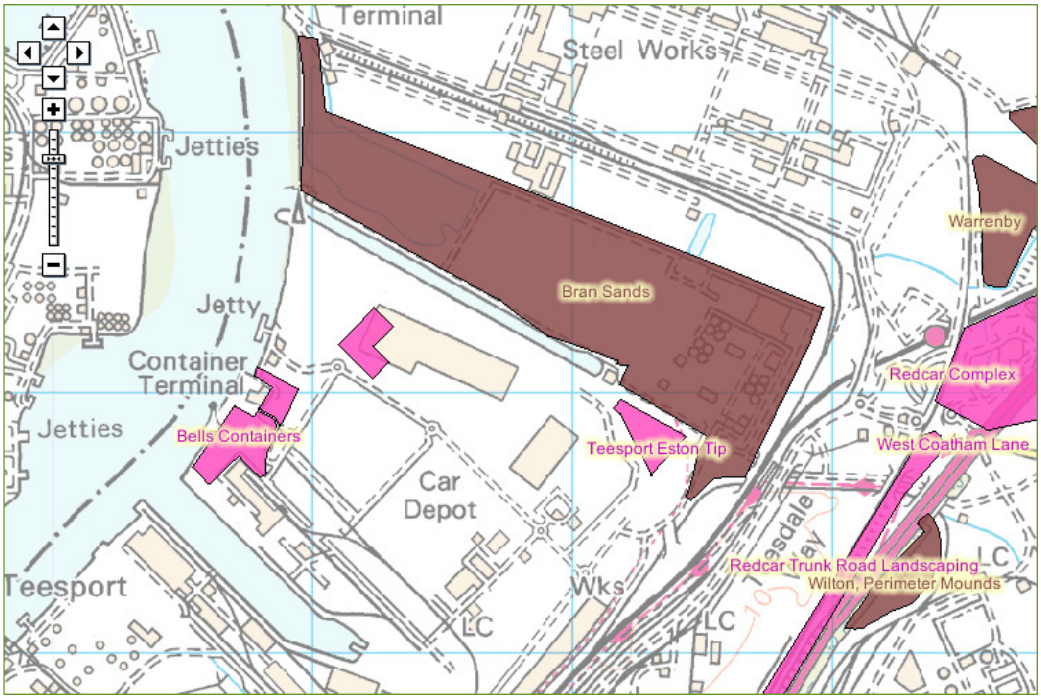
5.21 Closer to the River Tees the limits of deviation widen. This opens up more land to the north of the gas pipelines, where a portal could be positioned. This would allow the tunnel to surface without physically clashing with the gas pipelines. However, this area is registered as a hazardous landfill site. See 'Contaminated Land' below for further details.

Contaminated Land

5.22 The Bran Sands landfill site is adjacent to the proposed tunnel alignment, running from underneath the Bran Sands Sewage Treatment Works to the

River Tees (see Fig 5.6 below). It is listed on the Environment Agency's website as being an authorised landfill site licensed to accept hazardous waste only.

Figure 5.6 Map of landfill sites



Source: Environment Agency

5.23 Tunnelling near landfill sites is a very high risk activity that would require approval from the landfill owner and the Environment Agency. It is understood that it would be unacceptable to both parties to tunnel through the landfill because of the associated risks:

- Methane, produced by the decomposition of waste, is denser than air and can settle in a tunnel during construction or in the permanent structure. The risk of an explosive or asphyxiating atmosphere developing in the tunnel is very high and would require constant ventilation. The presence of methane could contaminate the processed polyhalite.
- Tunnelling near landfill sites can create new pathways for leachates (contaminated water) to pollute the wider environment. Given the hazardous nature of the material in the landfill, this poses a high risk of contamination of the groundwater and River Tees. Such a leak could have catastrophic impacts for the local residents, the River Tees National Nature Reserve and the wider onshore and offshore ecology.
- The excavation, handling and disposal of hazardous waste can be harmful to health and excavating near a landfill site poses a high risk to workers on the project.

Ground Movements

5.24 The ground above and around a tunnel moves in response to the excavation of the soil and the response of the ground to the tunnel lining. The movement of the ground can have an impact on existing structures and sub-structures, which can lead to damage. The amount of movement that can be tolerated varies between assets, however, owners have strict criteria on what could be considered as acceptable, and these are particularly stringent in the case of major hazard facilities such as chemical pipelines.

5.25 Ground movements in sound ground conditions can be minimised using Tunnel Boring Machines, through good quality control and by increasing the depth of the tunnel, but can never be eliminated. Therefore, even using the most sophisticated methodology available, ground movements will occur as a result of tunnelling and will impact the existing assets within the zone of influence of the proposed tunnel.

5.26 As the tunnel must pass through the corridor created by the limits of deviation (Fig. 5.5 above), the gas pipelines would be in the zone of influence of the tunnel for approximately 1.5km. This means that, regardless of the tunnel depth, the excavations will impose movements on the gas pipelines and this is not acceptable to the asset owners.

Summary

5.27 Building a tunnel that could house the conveyors that will transport the processed polyhalite from the MHF to Bran Sands would be unacceptable because:-

- Tunnelling beneath the gas pipelines is unacceptable to the asset owners; and
- Tunnelling and building a portal in the Bran Sands landfill site would cause significant health, safety and environmental risks. These would not be acceptable to the landfill owner, the Environment Agency or YPL.

5.28 Unlike the Mineral Transport System (MTS) tunnel route that links the minehead at Doves Nest to the MHF in Wilton, a Bran Sands tunnel route would have to be located in a congested industrial area with many existing structures and substructures. The tight limits of deviation mean that these existing assets cannot be avoided and pose unacceptable risk to both YPL and the infrastructure owners.

6.0 Summary and Conclusions

6.1 This document has been prepared to provide information as to the reasons why a tunnel between the MHF and Bran Sands is not a feasible solution for the transport of the finished YPL product to the proposed Harbour Facilities.

6.2 This report has provided:-

1 The background to the request for additional information on this issue including recent consultation with RCBC's advisors following submission of the York Potash DCO application;

2 The key parameters relevant to the design of any system to transport the Polyhalite from Wilton to Bran Sands;

3 The various infrastructure corridors which traverse the route between the Wilton site and Bran Sands that must be crossed by any conveyance system between the two sites and the restrictions and issues associated with doing so; and

4 The differences existing between any tunnel solution connecting the two sites and the MTS which transports the raw Polyhalite material from Dove's Nest Farm to the MHF.

6.3 The document identifies the significant difficulties that would need to be overcome to bring forward a feasible underground solution to transport the product to the new Harbour Facilities.

6.4 While it is acknowledged that it would be feasible to implement a tunnel via a portal at Wilton that takes a conveyor beneath the A1085, there is no feasible solution to raise the conveyor on the River Tees side of the road and allow a portal to be provided at Bran Sands.

6.5 It is against this background that the over-ground conveyor design described in the Options Study submitted with the DCO application, has been brought forward and developed by YPL.