REPORT

Lynemouth Coastal Landfill

Feasibility Study

Client: Northumberland County Council

Reference: PB7952-RHD-ZZ-00-RP-Z-0001

Status: 01/S0

Date: 28 February 2020

Royal HaskoningDHV

Enhancing Society Together

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Document short title:	Lynemouth Coastal Landfill
Reference:	PB7952-RHD-ZZ-00-RP-Z-0001
Status:	01/S0
Date:	28 February 2020
Project name:	Lynemouth CL
Project number:	PB9153
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Date / initials:	SR 28/02/2020
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Date / initials:	NJC 28/02/2020

Classification
Project related

Royal HaskoningDHV

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1 Introduction

Royal HaskoningDHV (RHDHV) was appointed by Northumberland County Council (NCC) to provide technical advice on the feasibility of options to manage the risks from eroding colliery spoil and other assorted waste materials from the cliffs and beaches at Lynemouth Bay, Northumberland.

This commission builds upon work previously undertaken as part of the Cell 1 Regional Coastal Monitoring Programme, which has routinely inspected the frontage since 2002, and the Cell 1 Coastal Landfills Study (RHDHV, 2019).

The history of colliery spoil tipping, and its cessation, has been well documented in the Cell 1 Sediment Transport Study, (RHDHV, 2013 & 2014), the Cell 1 Coastal Landfills Study (RHDHV, 2019), published literature (Cooper *et al.*, 2017) and a Contaminated Land Preliminary Risk Assessment (PRA) (Royal HaskoningDHV, 2019). Therefore, it is addressed only briefly in this report.

The present issue is associated with the ongoing erosion of the previously tipped colliery spoil by wave and tidal action throughout the bay and by fluvial flows along the river banks near the mouth of the River Lyne. Specifically, at certain 'hot spot' locations within the tipped spoil, various other waste material was tipped at the time of colliery spoil disposal or has subsequently been tipped / fly-tipped within the site during previous remediation works. This is now becoming exposed by the ongoing erosion and released into the wider environment. This matter has gained considerable public and media attention throughout 2019, and the County Council has stated its commitment to tackling the issue and has sought to explore remediation options.

The scope of the present commission focuses on the following activities:

- Site visit to understand the problem;
- Identification of options to manage the problem;
- Collation and review of existing relevant data and information;
- Outline design and cost estimates for subsequent works at key hot spots;
- Planning, licensing and consenting route map for these works, including advice on waste regulations and contaminated land testing; and
- Advice on potential funding routes for the works.

The original intention was that the Feasibility Study would then inform the need for subsequent Site Investigation (SI) to characterise the geotechnical and chemical properties of the colliery spoil and associated waste materials at the key hot spots. However, due to the urgency with which NCC wishes to progress its understanding of the issues at the site, a decision was made at a meeting on 22nd March 2019 to accelerate progression of a Contaminated Land PRA and develop a specification for a Phase 1 SI. On the basis of these documents, NCC then procured a Contractor (Dunelm Geotechnical & Environmental Ltd.) to undertake the SI and associated laboratory testing, enabling the Feasibility Study to be concluded with a more refined consideration of the available management options and their associated costs.

An Interim Report was produced in March 2019 (Royal HaskoningDHV, 2019) to present the findings from the initial stages of the Feasibility Study. The Interim Report has now been developed into this Feasibility Study Report, incorporating the findings from the SI and a subsequent Contaminated Land Generic Quantitative Risk Assessment (GQRA).

The work undertaken in developing this Feasibility Study has followed the industry best practice *Guidance on the management of landfill sites and land contamination on eroding or low-lying coastlines* published by the Construction Industry Research & Information Association (CIRIA) (Cooper *et al*, 2012; 2013). The Lynemouth Coastal Landfill Feasibility Study is being taken forward by the principal authors of that guide. The following CIRIA guide was also used in specific relation to considerations relevant to asbestos, *Asbestos in soil and made ground: a guide to understanding and managing risks* (Nathanail *et al*, 2014).

2 Site visit to understand the problem

2.1 Background

Site visits were undertaken by RHDHV staff as part of this commission on three occasions prior to the SI, namely on 11th January 2019, 24th January 2019 and 11th March 2019, as well as previously at 2-yearly intervals from 2002 to 2018 as part of the Cell 1 Regional Coastal Monitoring Programme walkover inspections. During the SI, RHDHV staff assisted NCC with supervision of the works, thus also attending site on two further occasions in September and October 2019.

The issue of waste material that is interspersed within the matrix of historically tipped colliery spoil becoming eroded and released into the wider environment has been an ongoing issue for many years. However, it is only during the course of 2019 that the issue has gained widespread media and local interest because the erosion has exposed two particular hot spots containing larger quantities of highly visible waste materials near the mouth of the River Lyne being released onto the beach and at risk of entering the marine environment.

2.2 Physical setting

Lynemouth Bay extends between Snab Point in the north and Beacon Point in the south, passing the small, unconstrained, channel of the River Lyne (**Figure 1**). The beaches in Lynemouth Bay experienced extensive tipping of colliery spoil from 1934 to 2005, resulting in an artificially advanced shoreface, which led to subsequent reclamation and development with the Lynemouth Power Station and coal stocking yard.

At the peak of the recorded tipping, over 1.5m tonnes was tipped and in each year from 1965 to 1983 around 1m tonnes was tipped. In total, it is likely that over 30m tonnes of colliery waste was tipped at Lynemouth over seven decades (Cooper *et al.*, 2017).

The backing sea cliffs to the north of the power station and the backing sand dunes to the south became detached from marine processes and currently are stable, relict features, but the colliery spoil beaches in front of them are actively eroding landwards since cessation of colliery spoil tipping in 2005.

In and amongst the colliery spoil, various other waste materials have been dumped throughout Lynemouth Bay. These are most likely to be concentrated within designated historic landfill sites (**Figure 2**) or defined areas of historic tipping (**Figure 3**), but in practice may have historically occurred unregulated throughout the bay. Furthermore, in the early 2000s, Phase 1 of the Lynemouth Bay Regeneration Scheme was implemented, involving removal of some tipped wastes from exposed locations and re-burial in more landward locations within the bay.

2.3 General issues

Due to the historic legacy of colliery spoil tipping in Lynemouth Bay, there is a general reduction in aesthetics and ecological functioning of the cliffs/dunes, beaches and nearshore sea bed throughout the area. Furthermore, the tipped colliery spoil is now eroding landwards, back towards the natural (pre-tipping) shoreline position. This results in colliery spoil being released into the North Sea, releasing various other wastes as it does so, including bricks, glass, rubber tubing and plastics.

In the north of the bay, the colliery spoil is generally in the form of a beach fronting the natural coastal slopes and cliffs, with a small but distinct 'clifflet' in its profile (**Plate 1**). With progression towards the Power Station, there is both a spoil beach and a near-vertical spoil cliff distinctly present.
Around the Power Station, a rock revetment protects the infrastructure against erosion and sea flooding. Further south of the Power Station, the spoil beaches and cliffs front the natural dunes of Lyne Sands.

Plate 1 - Erosion of bricks and glass from the colliery spoil beach in the north of Lynemouth Bay

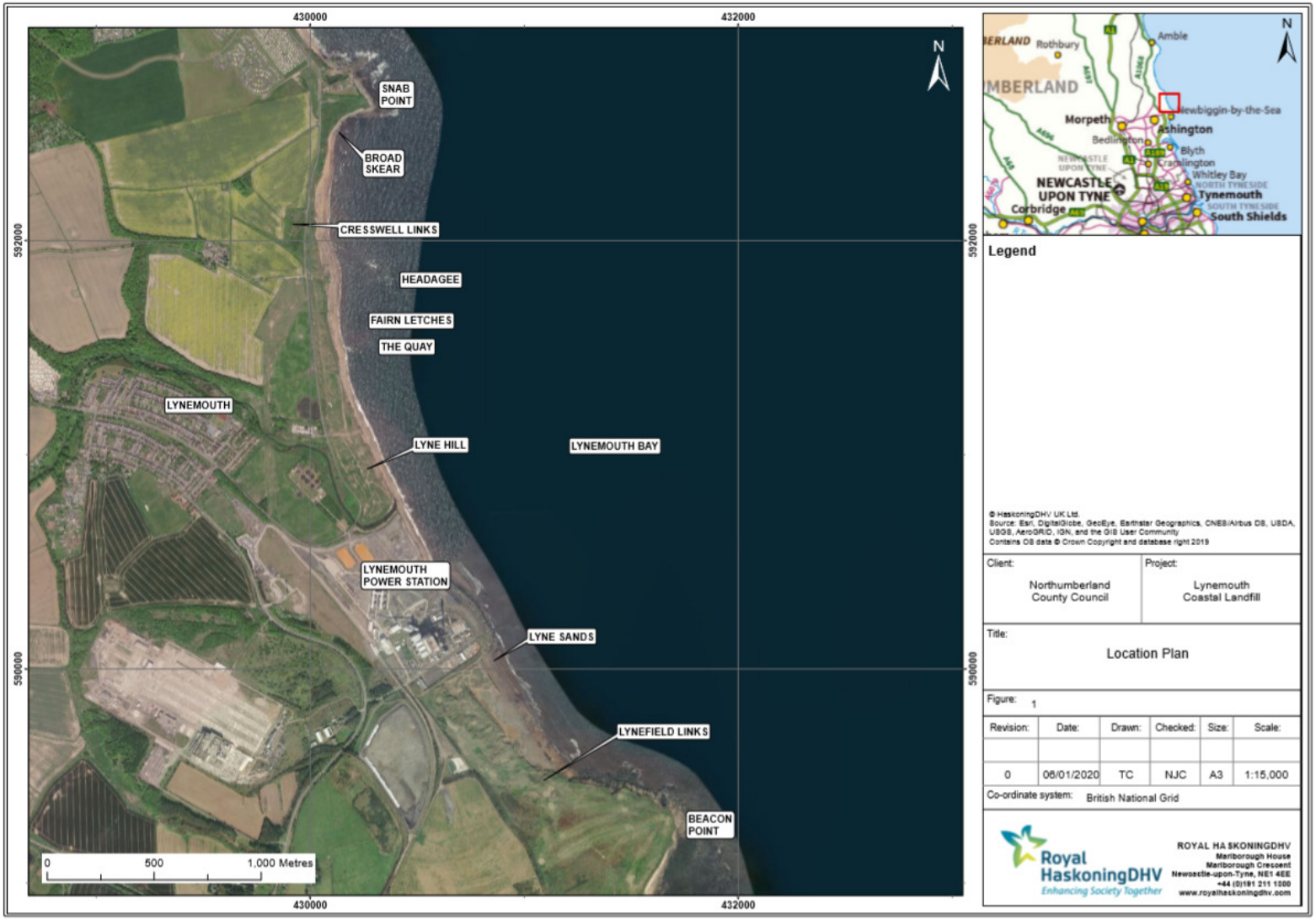

Figure 1 – Location Plan of Lynemouth Bay

Figure 2 – Areas designated as historic landfills in Lynemouth Bay

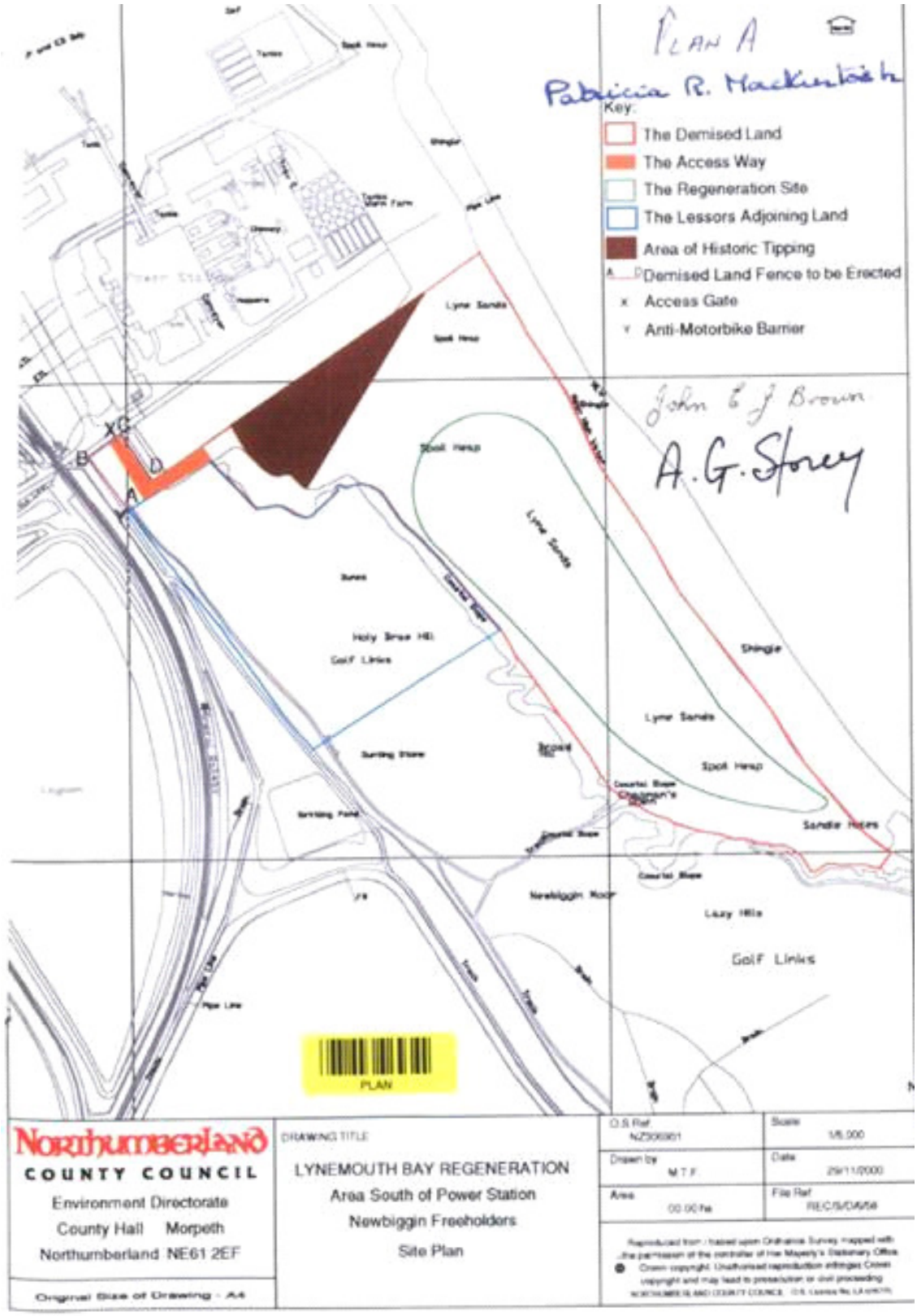

Figure 3 – Area of historic tipping (brown triangle) in south Lynemouth Bay

2.4 Specific 'hot spots'

In addition to the general ongoing erosion of colliery spoil and other occasional wastes within the wider Lynemouth Bay, there are a number of locations where other wastes appear to have been deposited in greater concentrations. Ongoing erosion of these hot spot areas is releasing a range of waste materials, including plastics, rubbers and asbestos, into the wider environment.

At the present time, there are four principal hot spots of other waste release (**Figure 4**), namely:

- Hot Spot 1 – South Bank of River Lyne.
- Hot Spot 2 – Immediate North of River Lyne.
- Hot Spot 3 – North of River Lyne – central frontage of Lynemouth Bay.
- Hot Spot 4 – North of River Lyne – northern frontage of Lynemouth Bay.

Hot Spot 1 is at the mouth of the River Lyne and extends approximately 50 m upstream along its southern bank. At this location, river erosion (or storm wave penetration into the river mouth) has caused the release of material such as brickwork, construction rubble, metalwork and rubber tubing into the river channel (**Plate 2**). It is possible, but unconfirmed, that this material was tipped along the bank of the river in a thin strip, because other than a narrow section at the coast adjacent to the river mouth, there is no evidence of this material in the cliff face along the coast to the south of the river.

Plate 2 – Hot spot #1 - Erosion of brickwork, construction rubble, metalwork and rubber tubing from the colliery spoil river bank at the mouth of the River Lyne

Hot Spot 2 extends along the open coast for around 100 m northerly from the mouth of the River Lyne. At this location, coastal erosion has caused the release of material such as plastics and rubber tubing onto the foreshore (**Plate 3**). It is likely, but unconfirmed, that this material was tipped within the historic Blindburn landfill site and therefore its geographic extent may be confined to within the boundaries of this historic site. The unauthorised open burning of materials on this land is known to have occurred.

Plate 3 – Hot spot #2 - Erosion of plastics and rubber tubing from the colliery spoil coastal bank to the immediate north of the mouth of the River Lyne

Hot Spot 3 is locally confined to the upper coastal cliff at a location around 700 m north of the mouth of the River Lyne. There appears to be a distinct and relatively isolated patch of historic tipping, resulting in the release of various rubble, plastics and rubber tubing onto the foreshore (**Plate 4**).

Plate 4 – Hot spot #3 - Erosion of rubble, plastics and rubber tubing from the apparently isolated patch of colliery spoil coastal bank around 700 m north of the mouth of the River Lyne

Hot Spot 4 is in the spoil beach at a location around 1,100 m north of the mouth of the River Lyne. There is a distinct 'clifflet' in the beach that is eroding landwards, releasing various rubble, plastics and rubber tubing onto the foreshore as it does so (**Plate 5**). The site is close to an area where open burning of materials is known to have historically occurred immediately landward.

Plate 5 – Hot spot #4 - Erosion of rubble and rubber tubing from the colliery spoil beach around 1,100 m north of the mouth of the River Lyne

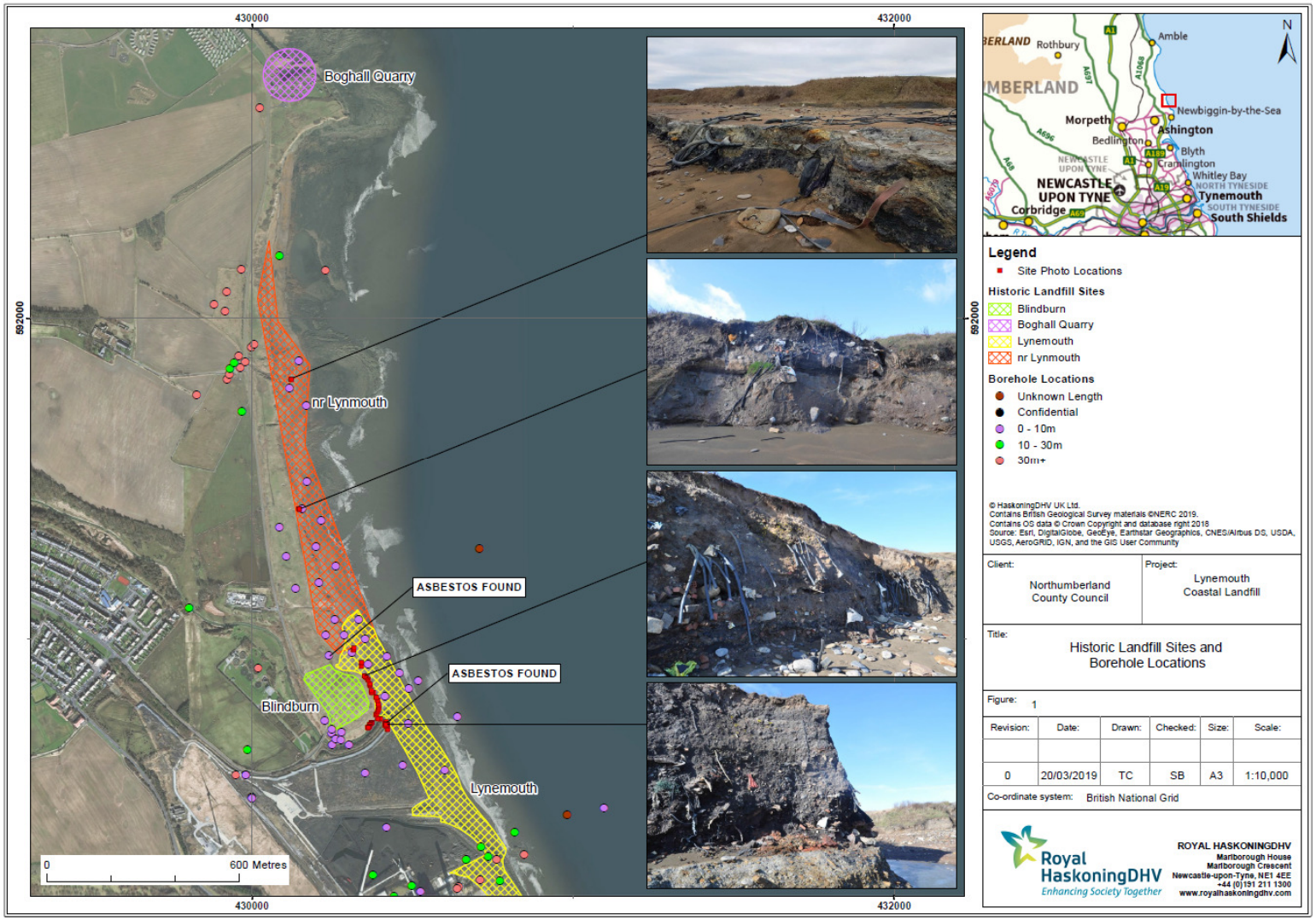

Figure 4 – Hot spots of 'other waste' erosion in Lynemouth Bay

3 Identification of options to manage the problem

The problem being addressed by this Feasibility Report is defined as the unwanted wash-out of waste material from defined hot spots within the colliery spoil into the wider environment; it is not the purpose of this report to address the wider ongoing issues of colliery spoil erosion throughout Lynemouth Bay.

With this in mind, the 'risk model' (**Figure 5**) defined in the Defra & Environment Agency Contaminated Land Report 11 (Defra & Environment Agency, 2004) and the CIRIA industry good practice guidance on management of landfill sites on eroding coastlines (Cooper *et al*, 2013) can be applied. This comprises:

- A **source** of the risk – in this case the assorted waste materials within the matrix of the colliery spoil, known to include brickwork, concrete rubble (some containing asbestos), metalwork, plastics, rubber tubing and glass.
- **Receptors** to the risk – in this case the general public, marine fauna and habitats, and the wider land, air and water environments.
- A **pathway** by which the source of the risk can come into contact with a receptor – in this case the ongoing processes of erosion and exposure of the source in the colliery spoil beach and coastal or river banks.

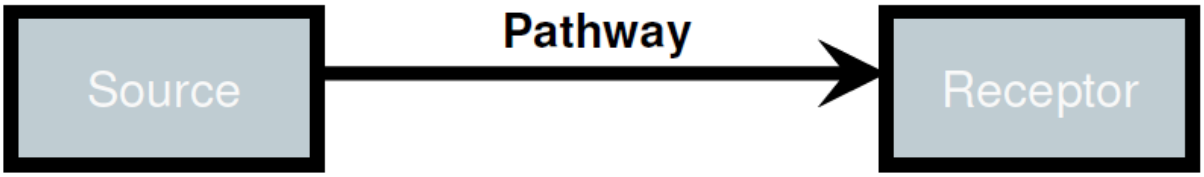

Figure 5 – The risk model

This risk model also forms the basis of the separate Contaminated Land PRA and GQRA, but is also used here in a more simplified form to highlight options available to manage the risks. These include:

- Remove the source of the risk (e.g. excavation and disposal elsewhere or on-site treatment).
- Break the pathway by which the source of the risk can come into contact with a receptor to the risk.
- Remove the receptor (e.g. prevent people from entering the site).

At Lynemouth it will be extremely costly to remove the source or break the pathway, and not entirely practical to remove the receptors. Even restricting public access to the foreshore does not necessarily suitably manage the risk to people since warning signs and fences can easily be ignored. Furthermore, ecological receptors in the marine environment clearly cannot be managed in this manner.

In general, if the extent of waste within a hot spot location is relatively small and contained and if its composition is suitable, then the option of removing the source of the risk is preferable in coastal management terms (subject to waste regulations and costs). This is because it would avoid the need for hard defences which may become unsustainable in the very long term (centuries). Depending on the material composition, it could be removed off-site to a licensed disposal facility or re-buried (and suitably

capped) elsewhere on-site within an area of land that is not at risk of erosion or is protected by coastal defences.

Where the waste occupies a larger extent within the colliery spoil and/or cannot be re-used on site or is prohibitively expensive to take off site, then the option of breaking the pathway between the source and the receptor becomes more likely to be the preferred approach. At Lynemouth this would best be achieved by means of a rock revetment (with suitable geotextile layers) similar to that protecting the Lynemouth Power Station. Consideration would have to be given to tie-in at either end of the area to be defended because the colliery spoil beaches and cliffs either side of the structure will continue to erode landwards.

Before further assessment of the management options could be undertaken, the following tasks were deemed necessary:

- Contaminated Land PRA
- Specification for an intrusive SI and laboratory testing
- Procurement by NCC of a suitable Contractor to undertake the SI
- Mobilisation and SI by Contractor
- Laboratory testing and reporting
- Interpretation and production of a GQRA based on the results.

The above tasks have now been completed and are reported in full in the following key documents:

- Royal HaskoningDHV, 2019. *Lynemouth Coastal Landfill - Contaminated Land Preliminary Risk Assessment (PRA)*. Report to Northumberland County Council, May 2019.
- Dunelm Geotechnical & Environmental Ltd., 2019. *Lynemouth Coastal Landfill Ground Investigation.* Report to Northumberland County Council, November 2019.
- Royal HaskoningDHV, 2019. *Lynemouth Coastal Landfill - Contaminated Land Generic Quantitative Risk Assessment (GRA)*. Report to Northumberland County Council, February 2020.

Outputs from the above has informed the subsequent sections of this Feasibility Study.

4 Collation and review of existing relevant data and information

The following desk-based information sources were reviewed in developing the PRA, which was undertaken in accordance with Contaminated Land Report 11 - Model Procedures for the Management of Contaminated Land (DEFRA and Environment Agency, 2004):

- Envirocheck Report compromising historical maps, environmental sensitivity data and regulatory records;
- British Geological Survey (BGS) online geology viewer;
- BGS Geoindex Onshore & Offshore;
- The Coal Authority interactive online viewer;
- UK Radon Website (Public Health England)4;
- DEFRA environmental data available on the data.gov.uk5;
- Publicly available aerial imagery (Google Earth);
- Cell 1 Coastal Landfills Report (Royal HaskoningDHV, 2019);
- Local knowledge and information on the history of tipping and previous Reclamation Scheme from NCC's David Robinson, David Lathan and Leah Jowett; and

- Lynemouth Bay Reclamation Phase II, Geo-environmental Interpretive Report (Faber Maunsell, 2006).

The documentary research undertaken as part of the PRA has confirmed that Lynemouth Bay has been utilised by a range of industries. Although primarily associated with coal mining, both coal-fired power generation and aluminium smelting have also been undertaken. Of particular concern is the historical deposition of colliery spoil across much of the site, as well as the deposition of other waste materials which are evident in 'hot spot' areas. The full history of landfilling activities taking place in Lynemouth Bay is not reported within the Envirocheck Report or other records and it is believed that some materials have been deposited on Lynemouth beach and its environs illegally and thus often unreported. Therefore, the full extent of anticipated landfilling materials and the nature of deposition on the site is uncertain.

The site is open to public access and is utilised for recreational activities. Furthermore, residential and commercial property is located in close proximity. Other sensitive receptors are also present including Secondary A Aquifers, surface waters and designated ecological sites. Due to this, the PRA developed a preliminary Conceptual Site Model (pCSM) which identified a number of potential plausible pollutant linkages that could represent an unacceptable risk to sensitive receptors. To develop a better understanding of the ground conditions and to facilitate a fuller assessment of risks to sensitive receptors further investigations were recommended in the form of an intrusive SI.

5 Site Investigation and Generic Quantitative Risk Assessment

Prior to undertaking the SI, a Habitats Regulations Assessment (HRA) screening was undertaken, which concluded that there was no realistic potential for the effects of the proposed SI to result in likely significant effect on the qualifying features of European and Ramsar sites located at, or in close proximity to, Lynemouth Bay. Confirmation was also obtained from Natural England that a Section 28H assent would not be required under the Wildlife and Countryside Act 1981 as long as the investigation works were undertaken outside of the overwintering period (November – March inclusive) because adverse impact (direct or indirect) on any Site of Special Scientific Interest (SSSI) interests would not be expected.

The intrusive SI was undertaken in September/October 2019 and comprised a utilities review followed by the drilling of 10 no. boreholes, machine excavation of 23 no. trial pits and hand digging of 25 no. pits across the site to determine the ground conditions and facilitate the recovery of soil samples for environmental testing. Soil samples were analysed for a range of potential contaminants of concern (PCOC) based on the documentary research presented in the PRA. Boreholes were installed with combined groundwater and gas monitoring wells to facilitate the collection of groundwater samples and the monitoring of ground gases. Surface water samples (5 no.) were also taken from the River Lyne.

Based on this site-specific information, a GQRA was undertaken and the pCSM was updated. Key findings from the GQRA are:

- Two distinct types of Made Ground were observed across the site, namely: (i) Made Ground associated with colliery spoil; and (ii) Made Ground composed of unlicensed tipping waste (refuse).

- In the colliery spoil Made Ground, the only PCOC that were detected above Generic Assessment Criteria (GAC) were asbestos (2 samples), arsenic (3 samples) and lead (1 sample). However, the arithmetic mean for all PCOC recorded within the colliery spoil were below their respective GAC values.

- In the waste refuse Made Ground, the only PCOC that were detected above GAC were asbestos (4 samples), benzo(b)fluoranthene (1 sample), benzo(a)pyrene (1 sample) and dibenzo(a,h)anthracene (1 sample). The three poly-aromatic hydrocarbon (PAH) compounds listed were all recorded in the same borehole (RH-BH05). However, the arithmetic mean for all PCOC recorded within the waste refuse were below their respective GAC values.

- In the natural deposits, arsenic was recorded at (marginal) levels above GAC in 6 samples. However, the arithmetic mean was below the respective GAC values.

- In total 110 samples were specifically analysed for asbestos. Bundles of chrysotile fibres were encountered in five samples at depths of between 2.2m and 6.0m below ground level (bgl). A bundle of crocidolite was encountered at a depth of 1.5m bgl in 1 sample. During some of the walkover inspections, asbestos-containing material has been observed on the foreshore in the form of cement bound asbestos fragments (**Plate 6**), although such material was not observed during the SI.

Plate 6 – Cement-bound asbestos fragments on foreshore

- A hydrocarbon odour was recorded within the waste refuse Made Ground of one borehole (RH-BH05) at a depth of 7 – 9m bgl. This corresponds with the PAH compounds recorded in that borehole. No additional visual/olfactory evidence of gross contamination was identified in the remaining exploratory hole locations both within the colliery spoil Made Ground, waste refuse Made Ground, or natural deposits.

- Groundwater strikes were recorded within the Made Ground in four boreholes (RH-BH01, RH-BH02, RH-BH04 and RH-BH05) and one trial pit (TP07) at depths between 4.2m bgl (TP02) and 9m bgl (RH-BH02).

- Groundwater is in hydraulic connectivity with the North Sea and flows indicate that, generally, the groundwater flow direction is to the east, to the North Sea, rather than towards the River Lyne. Any PCOC entering the North Sea would become widely dispersed.

- There were no significantly elevated ground gas concentrations, nor any gas flow.

- Whilst the assessment has identified a limited number of PCOC in the soils, groundwater and surface waters analysed, it is considered unlikely that they represent a significant possibility of significant harm. This assessment has been undertaken with respect with current site use (public open space). Under such conclusions it is recommended that the site need not be classed as Contaminated Land under Part 2A of the Environmental Protection Act 1990.

- It should be noted that the risks from plastics and rubbers within the refuse waste were not assessed as part of the human health risk assessment, however the risk remains to the sensitive ecological receptors on and adjacent to the site from refuse waste in areas where erosion is actively taking place.

Further to the GQRA, a waste classification assessment was undertaken to determine whether the soils would be classed as “Non-hazardous” or “Hazardous” if they become ‘waste’ from any proposed works on the site. Of the 155 samples analysed in this manner, only 14 would be classed as Hazardous in their present state (Probe Environmental Services, Ltd., 2019).

6 Feasible management approaches

6.1 Strategic context

On the basis of the findings from the PRA, SI and GQRA, it is recommended that a two-track approach is adopted to the management of risk at the site.

Firstly, given that the entire bay has been affected by historic colliery spoil tipping and it is known that unregulated waste tipping has also occurred, it is necessary for some proportionate form of management across the whole of the bay. This is recommended in the form of regular walk-over inspections and hand-picking of waste released onto the beach. This needs to be undertaken by appropriately trained staff in accordance with approved Risk Assessments (covering appropriate methods, Personal Protective Equipment, training, reporting, emergency procedures, etc.) since there is the potential for asbestos to be found amongst the spoil or waste.

Secondly, some targeted intervention in each of the four hot-spot areas is recommended. However, the preferred form of intervention is contingent upon:

1. The attitude and stance of the landowners (The Coal Authority and NCC), given the findings of the PRA, SI and GQRA and the commitment given by NCC to address the problem, as well as the potential for commercial liability or land blight.

2. The attitude and stance of the regulators (NCC and Environment Agency), given the findings of the PRA, SI and GQRA and the potential for effects on human health, controlled waters or the marine environment.

In respect of the above considerations, the GQRA has concluded that the Natural Deposits, colliery spoil Made Ground and refuse waste Made Ground do not present a significant possibility of significant harm to human health and controlled waters under present site use. There are no plans for changing the site use in the future.

Notwithstanding the above, given the sampling results from the SI works it is necessary to consider whether further control measures are now required to ensure the risks presented by the presence of asbestos are being managed to a level that is as low as is reasonably practicable. At present, NCC undertakes walkover inspections and hand picks any cement-bound asbestos that is seen on the foreshore. This is deemed a pragmatic approach to avoid the breakdown via diagenesis and erosion processes of the cement-bound asbestos fragments. However, it does not address the (low level) presence of free fibre asbestos underlying the soil cap at depth that has now been identified in some of the samples taken from within the main body of the site.

Given that asbestos only becomes a risk when: (1) it becomes airborne; and (2) people are exposed to the airborne dust, it is considered that further control measures could be implemented, at low cost, to reduce the risk of both of these considerations.

Whilst the Control of Asbestos Regulations 2012 (CAR Regulations) applies to buildings and their curtilage, not to open ground, the basis of managing the risk to the lowest level reasonably practicable is a useful basis for consideration in the present study. At the site, asbestos fibres can become airborne through release via erosion of the beach/cliff face or through digging/ disturbance of the soil. The erosion can occur by wave action, tidal processes or strong winds, but disturbance can also occur by human trampling, digging by pets and disturbance by quadbikes. At present quadbikes are known to use the area, despite previous efforts to prohibit this. Furthermore, the long-distance England Coast Path has recently been opened along this stretch of coastline, crossing the site across several areas where asbestos fibres have been encountered at depth. A simple approach to further reducing the risk from asbestos could be to enforce prohibition of quadbikes on the site and re-divert the England Coast Path to a more landward location (i.e. along the side of the existing road). In addition, some air monitoring (for asbestos fibres) would be useful to provide a baseline understanding and to provide re-assurance to site users of the present situation.

Given implementation of the above measures, the residual risk may be deemed as low as is reasonably practicable, since the beach is infrequently used and as asbestos fibres are most likely to be released by marine erosion, then during such events any fibres present will be immediately dampened and widely dispersed by the tides. It is likely that the asbestos present on site is within discrete and localised patches (caches), e.g. due to illegal tipping. This makes the site easier to characterise and deal with than sites where asbestos containing soils are widely dispersed. Furthermore, humans (via inhalation) are the only receptors of interest in respect of asbestos in soils and Made Ground; there is no evidence that asbestos poses a risk to plants or invertebrates and whilst exposures of vertebrates (e.g. rabbits, foxes, badgers, dogs) may occur these are unlikely to lead to mortality or impairment of ecological function.

Any residual risk from buried asbestos fibres to construction workers on the site, should future management interventions be implemented, can appropriately be managed. In this regard, it is important that the PRA, SI and GQRA are provided to any future Contractors working on the site as part of Pre-Construction Information (PCI) as required by the Construction (Design and Management) Regulations 2015 (CDM Regulations).

From the presence of plastics and rubbers within the refuse waste, one must ask whether there exists a real risk to the natural environment that requires reduction to acceptable levels, or whether the risk is one

of perception. Fundamentally, the legal driver for intervention is the European Environmental Liability Directive 2004 (implemented in the UK via the Environmental Damage Regulations 2009). Under these Regulations, there must be proven damage to protected species, damage to surface water or groundwater or significant risk of adverse effects to human health. Given that the site is already so heavily affected by the colliery spoil tipping (see Box 1), it is extremely difficult to disassociate the deleterious impacts arising from this situation from any additional 'damage' that may be (or is perceived to be) associated with the erosion of the refuse wastes.

Box 1 – Research into the ecological effects of colliery spoil tipping on the marine environment

Hyslop *et al.* (1997) assessed the ecological effects of colliery waste disposal on littoral communities in the northeast of England. A maximum of two species of macroinvertebrates per shore level (low shore, mid shore and high shore levels) were found at sites characterised by soft sediments that were heavily influenced by colliery waste, compared to typical background values on unaffected shores of about eight species. The principal reasons for the low diversity in affected areas were stated to be the large quantities of solid material; the release of inorganic chemicals such as trace metals; the release of organic substances such as coal-derived hydrocarbons; and the attenuation of light in the water column by waste particles.

Given the above, the release of plastics and rubbers from the refuse waste by marine erosion is likely to be one that has greater perceived impact than actual ecological damage, but nonetheless may be a matter that NCC feels compelled to address given its commitment to address issues at the site and to demonstrate high environmental standards in all of its activities.

6.2 Options

NCC must decide whether or not some form of management intervention is required at Lynemouth Bay in light of the findings of this Feasibility Study. The following bullets summarise the possible approaches that could be adopted.

- If it is decided that no management is required, this becomes the **Do Nothing** option.
- If it is decided that existing management (i.e. inspection and clear up) is sufficient and proportional to the risks presented to human health, controlled waters, the marine environment and corporate reputation, this becomes the **Do Minimum** option.
- If it is decided that some form of intervention works are required, the principal options for managing the hot spots of refuse waste within the general colliery spoil at the site are summarised below. Different options could be better suited to different hot spot areas, depending on their size and complexity.

6.2.1 Remove the source of the risk

At present, the refuse waste Made Ground, colliery spoil Made Ground and Natural Deposits are not considered to present a significant possibility of significant harm to human health or controlled waters. It is also extremely difficult to unequivocally prove that the release of the refuse waste, even the plastics and rubbers, is causing damage to protected species. However, it is clear that release of the waste, especially the asbestos, plastics and rubbers, is undesirable. NCC may therefore seek to develop a voluntary scheme to address the ongoing issue, despite not necessarily being compelled to do so under statute.

Since the excavation of all of the refuse waste from the site to offsite disposal facilities would be prohibitively expensive (e.g. £20M), one more pragmatic option is to: (i) excavate the refuse waste; (ii) sort it on site under an appropriate mobile treatment permit (which would need to cover asbestos); and (iii) manage the sorted material in accordance with the Contaminated Land: Applications In Real Environments (CL:AIRE) Code of Practice (CoP) using excavated material, which has the 'in principle' support of the Environment Agency. For the soils, this could lead to re-use of suitable recovered material and dealing with the unsuitable material (e.g. asbestos) in accordance with the waste hierarchy (i.e. considering soil conditioning before landfill). For the plastics, a recycling facility would consider the possibilities of recycling and recoverability (e.g. energy from waste) before landfill.

A decision would need to be made by NCC as to what materials are to be removed in this manner. For example, the concrete blocks and bricks, whist unsightly, do not cause the same (real or perceived) environmental damage as the plastics and rubbers and may be left on site, but with residual aesthetic impact. However, the cost for their excavation, crushing and on-site re-use or off-site removal may become disproportionate to the (negligible) risks they present to the marine environment.

Re-use of excavated material on site would have to comply with the principles of the CoP for the material to be able to be re-used, outside of the regulatory framework. The principles are as follows:

- The proposed use of the material must not cause any harm to human health or the environment;
- The excavated material is suitable for its proposed use, without further treatment;
- The use of the material is certain; and,
- Only a sufficient quantity of material will be used.

In respect of the above, some further geotechnical and chemical testing of the recovered materials may be required to demonstrate its suitability. Furthermore, advice from the Environment Agency suggests that the recovered material would need to be replaced and compacted to a high standard.

The above option is referred to as **Do Something – Waste Management (Excavation, sorting, re-use or disposal).**

In addition, and in the event of any other management measures, the present-day management practice of walkover inspections throughout Lynemouth Bay (not only at hot spot locations) and hand-picking / clear-up of released refuse should continue by appropriately trained staff under strictly controlled Risk Assessments and Method Statements. This should include removal (under appropriate methods) of any cement-bound asbestos 'pebbles' found on the beach.

6.2.2 Break the pathway(s) between the source of the risk and the receptors

A rock revetment, similar to that constructed around the Lynemouth Power Station, could be constructed so that the refuse waste becomes encapsulated and protected against erosion by the sea. This could apply to hot spot #2, with material from other hot spots excavated and re-deposited within the newly defended area. The revetment would need to be constructed so that it can accommodate future projected rates of coastal erosion, currently at around 3 m per year, and therefore would extend landward some considerable distance, necessitating excavation and reburial of considerable refuse, spoil and natural deposits to construct these 'tie-in' sections.

The above is referred to as **Do Something – Coast Protection.**

In addition, and in the event of any other management measures, efforts should be re-doubled to reduce the quadbike activities at the site, which could cause local disturbance to the soil cap at the site and potentially cause any near-surface asbestos fibres to become airborne.

6.2.3 Remove the receptors to the risk

The risk to public health could reasonably be reduced further at the site by improved prohibition of quadbike activities and re-location of the England Coast Path to a more landward location, certainly along the section immediately north of the River Lyne. It is not possible to move sensitive ecological receptors from the site, nor is it possible to entirely remove public from the site, but the residual risk remains low.

6.3 Costs

This section provides outline cost estimates for the two Do Something options under consideration. These have been developed based on our present understanding of the volume and type of refuse material in the site (derived from the Site Investigation) and our prior knowledge of the geotechnical and oceanographic exposure conditions of Lynemouth Bay (having previously undertaken the Lynemouth Power Station defences and defence extension). The costs for the two Do Something options are presented in Table 1.

Table 1 - Cost Estimates for Do Something Options

Cost Element	Option	
	Do Something – Waste Management (Excavation, sorting, re-use or disposal)	Do Something – Coast Protection
Design, Consenting, Investigations[1]	£162k	£220k
Contract Management, Supervision and NCC Staff Costs[2]	£323k	£440k
Construction Costs	£5,391k [3]	£7,337k
Sub-total	£5,876k	£7,998k
Contingency[4]	£1,175k	£1,600k
Total	**£7,051k**	**£9,597k**

Footnotes:
[1] Design fees @ 3% of Construction Costs, Consenting fees @ 3% of Construction Costs and Investigation costs @ 3% of Construction Costs
[2] Contract Management and Supervision @ 3% of Construction Costs and NCC Staff Costs @ 3% of Construction Costs
[3] Assumes 51,000m^3 to be excavated and that 85% of excavated material can be recovered for on-site re-use, with 15% taken off-site (5% as hazardous and 10% as non-hazardous)
[4] Contingency @ 20% of Subtotal

It can be seen from the above that the 'waste management' option of excavation, sorting and re-use or disposal at the four hot spots is preferred from a cost perspective over the construction of coast protection works, which is also less sustainable and less environmentally-acceptable.

With this in mind, early contractor involvement was received from BAM Nuttall and Vertase FLI Limited to help inform budget stage development of the preferred option. In both cases, this confirmed likely Construction Costs in the same order as those calculated by RHDHV and presented in the table above, giving good confidence in the rates that have been used.

However, there remains uncertainty in the total volume of material to be excavated and the proportions of this which can be recovered for on-site re-use or has to be taken off-site. Due to this, further sensitivity testing has been performed on the preferred 'waste management' option to investigate the following scenarios:

- The volume of material to be excavated is 20% less than assumed in the cost estimates
- The volume of material to be excavated is 20% more than assumed in the cost estimates
- Only 80% of excavated material can be recovered for on-site re-use, with 20% taken off-site (8% as hazardous and 12% as non-hazardous)
- Up to 90% of excavated material can be recovered for on-site re-use, with only 10% taken off-site (2% as hazardous and 8% as non-hazardous)

The outcome from the above assessments indicates that whilst the cost estimate based on best present information is £7,051k, the cost range could be between £4,631k and £9,982k (say £5,000k to £10,000k for budgeting purposes).

6.4 Preferred approach

Technically and environmentally, it is feasible to implement methods at Lynemouth Bay to both: (i) remove the sources of the risk posed by the eroding landfill waste that is buried within the colliery spoil (by means of waste management techniques); and (ii) break the pathway between the sources of the risk and the receptors (by means of coastal engineering techniques).

The preferred approach to managing the risks at the four hot spot areas will depend upon a number of factors, *inter alia* the risk attitude and stance of both landowners and regulators, the availability of funding, and securing the necessary permissions, licences and consents.

The recommendation from this Feasibility Study is for NCC (in partnership with the Coal Authority and with the support and guidance of the Environment Agency and Natural England) to adopt the following suite of (voluntary) management approaches:

(1) Continue, throughout the whole bay, NCC's existing regime of walkover inspections and clear-up operations (hand-picking) of any cement-bound asbestos and large plastic / rubber tubing waste that becomes released onto the foreshore by erosion, using appropriately trained personnel working to strict Risk Assessments and Method Statements;

(2) Reduce the risk from the presence of buried asbestos fibres and cement-bound asbestos to the lowest level reasonably practicable by means of restricting public access to the site (e.g. re-diverting the route of the England Coast Path so that it does not cross the site), prohibiting the use of quad bikes on the site to reduce the extent of ground disturbance, and undertake air monitoring for any baseline levels of airborne asbestos fibres; and

(3) Voluntarily undertake 'waste management' works to remove the sources of the risk posed by the eroding landfill waste that is buried within the colliery spoil. This would involve excavation of the waste material from each of the four hot spots and its treatment on site by means of sorting/ screening using a mobile treatment plant that already has an environmental permit. This would separate the plastics and rubber tubing (which would become known as the 'contraries') from the rest of the excavated material. The contraries would be sent off-site and dealt with in accordance with the waste hierarchy. The residual excavated material would be used to backfill / reinstate the land profile, preferably as land improvement works carried out under the CL:AIRE Code of Practice (subject to there being no objection from the Environment Agency or the Local Planning Authority) and in accordance with a Materials Management Plan (MMP). Where residual excavated material cannot be recovered and re-used on site, it would be classed as waste and where landfill is identified as the preferred option would require pre-treatment and (in some situations) Waste Acceptance Criteria (WAC) testing.

It is envisaged that the design and consenting phase could be undertaken throughout 2020, with a view to the works being implemented in 2021.

7 Planning, licensing and consenting route map

7.1 Background

This section provides an overview of the likely consenting process for the feasible options based upon experience of similar schemes elsewhere. It should be noted that no consultation has been undertaken with the Marine Management Organisation (MMO) to confirm the consenting processes, however, initial discussions have been held with the contaminated land team at the Environment Agency in December 2019.

The permissions, licences and consents (as well as the supporting 'environmental' assessments anticipated to be required in support of applications for such consents) predicted to be required for each of the options are summarised in Table 7.1. The 'waste management' assessments and documents that may be required (depending on the preferred waste management route, to be determined through liaison with the Environment Agency's waste specialists) are also presented in Table 7.1. Further detail regarding the legislation likely to be applicable to the various options is provided in Appendix A.

It is recommended that consultation with the regulatory authorities is undertaken to confirm the planning, licensing and consenting requirements for the preferred option once this has been reviewed and confirmed by NCC.

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Table 7.1 Summary of permissions, licences and consents and supporting assessments anticipated to be required for each of the options

Option	Permissions, licences and consents likely to be required					Main assessments / supporting documents likely to be required			Waste management assessments / supporting documents that may be required (dependent on the outcome of liaison with the relevant regulatory and stakeholders to confirm the waste management approach to be adopted)		
	Planning permission	Marine licence	Flood risk activity permit	Environmental permit (waste) [2]	Land owner permission	Environmental Impact Assessment (EIA)	Habitats Regulations Assessment (HRA)	Water Framework Directive (WFD) compliance assessment	Waste hierarchy assessment	Materials Management Plan and risk assessment to support reuse of material on site via the CL:AIRE Code of Practice [3]	Waste Recovery Plan to support an Environmental Permit (Recovery Permit) [4]
Do nothing	X	X	X	X	X	X	X	X	X	X	X
Do minimum – monitoring and clear up	X	X	X	X	√	X	X	X	X	X	X
Do something – waste man (excavation, sorting, re-use or disposal)	√	√ [1]	√	√	√	X[5]	√	√	√	√	√
Do something – coast protection	√	√ [1]	√	√	√	√	√	√	√	√	√
Do something – remove receptors to the risk	X[6]	X	X	X	√	X	X	X	X	X	X

Notes:

1 Assumes construction, deposits or removals will be required below the level of mean high water spring tides.

2 An environmental permit will be required to undertake any works relating to the treatment of waste at the site. This includes any waste activity that includes sorting and screening. Where excavated material is subject to physical or mechanical treatment to remove plastic and rubber tubing etc., it is anticipated that the permitting requirements for this activity would be provided by a mobile contractor operating a mobile treatment plant that already has a permit in place. The CL:AIRE Code of Practice allows for treatment of material at a waste treatment facility or using a mobile treatment facility at the site.

3 Assuming that the Environment Agency's waste specialists and the Local Planning Authority confirm that the use of the CL:AIRE Code of Practice is an acceptable approach.

4 Where the principles of the CL:AIRE Code of Practice cannot be met, the use of excavated material must be carried out under an Environmental Permit. It is possible that the waste could be treated via a bespoke waste recovery permit, for recovery of waste on land. A Waste Recovery Plan must be submitted in support of the permit application.

5 Although EIA is not anticipated to be required, it is highly likely that other non-statutory environmental assessments will be required. These should be agreed with the LPA.

6 Although planning permission is not anticipated to be required, it is predicted that permission from the LPA will be required to permanently relocate the England Coast Path.

7.2 Indicative consenting route map

Figure 6 illustrates a legislative route map which culminates in the submission of applications for consent / licences / permissions. This route map provides an indication of the process likely to be followed, regardless of whether EIA is required for the preferred option. Should the MMO and the local planning authority determine that an EIA is not required, either a number of stand-alone assessments, or assessments presented within a non-statutory Environmental Report are likely to be needed in support of application(s) to comply with the Directives and Acts described in Appendix A. **Figure 6** also highlights other likely associated consenting requirements (i.e. Environmental Permits, land ownership consent, footpath diversions).

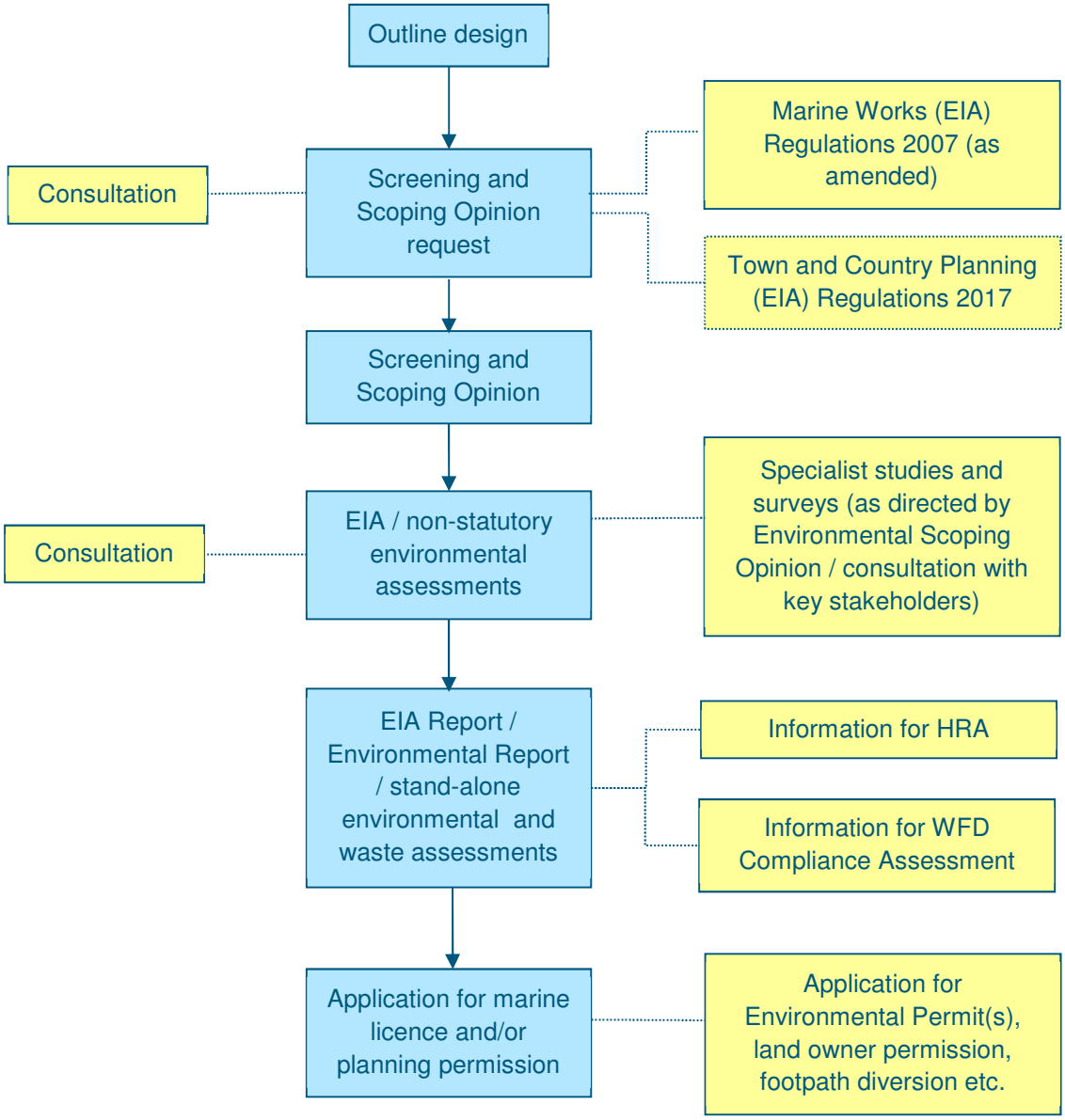

Figure 6 - Indicative consenting route map

8 Potential funding routes

Funding sources for any proposed capital works are limited.

- Under the 'Polluter Pays Principle', the Coal Authority and NCC may have obligations to fund any works in relation to the refuse waste as present-day landowners, since the original polluters are unlikely to be traced.

- Under Environment Agency funding regimes, Flood and Coastal Erosion Risk Management (FCERM) Grant-in Aid and Local Levy are unlikely to be forthcoming with funding, although it is understood that Defra is currently considering funding of works at historic coastal landfills at a national level and therefore this situation may change.

- Opportunities for European Union funding will be closed to the UK in the timescales over which any scheme may be progressed.

The most likely source of funding is therefore from NCC and The Coal Authority as present-day landowners.

9 Delivery risks

The principal risks to project delivery are listed below, with potential risk mitigation measures highlighted.

Ref	Risk Description	Risk Rating	Risk Mitigation	Residual Risk Rating
1	Uncertainty over preferred option.	Medium	Feasibility Study (this document) to evaluate options and recommend a preferred approach.	Low
2	Funding for preferred option	High	Budget provisions for 2020 (design and consenting) and 2021 (construction) by NCC and The Coal Authority. Continued discussions with Environment Agency and/or Defra about emerging funding opportunities for coastal landfill.	Medium
3	Consenting of preferred option (including complexity of waste regulation)	Medium	Early engagement with regulators (e.g. Local Planning Authority, Environment Agency, Marine Management Organisation) and their scientific advisors (e.g. Natural England) about the project and the permissions, licences and consents (and supporting environmental surveys and assessments) that will be needed.	Low
4	Cost certainty over preferred option	High	Early engagement with Contractors over price estimates. Establish a Contract on the basis of doing as much work as possible within a defined budget.	Medium
5	Contamination being worse or more extensive than identified from Site Investigation	High	Establish an on-site method for evaluating the material during construction to determine its fate in the context of the Waste Regs.	Medium
6	Ongoing erosion / release of waste material from the hot spots within the colliery spoil until scheme is constructed	High	Continue existing regime of walkover inspection and clear-up (hand-picking) using specialist Contractors.	Low
7	Presence of asbestos fibres and cement-bound asbestos within the material to be excavated (risk to site workers)	Medium	Pre-Construction Information to Contractors to include the Preliminary Risk Assessment, Site Investigation, Generic Quantitative Risk Assessment and Feasibility Study. Work to be undertaken in accordance with bespoke Risk Assessments and Method Statements.	Low
8	Presence of asbestos fibres and cement-bound asbestos within the material to be excavated (risk to site users)	Low	Continue existing regime of walkover inspection and clear-up (hand-picking) using appropriately trained staff. Restrict public access to the site (re-divert route of the England Coast Path). Prohibit use of quad bikes on the site. Undertake air monitoring for any airborne asbestos fibres (baseline levels).	Low
9	Adverse publicity / reputational damage to Northumberland County Council	Medium	Pro-active public relations engagement	Low
10	Delay to construction due to nesting sand martins in areas of areas of Made Ground capping the colliery spoil cliffs or presence of other key habitats/species.	High	Sand martins: Areas of Made Ground in the colliery spoil cliffs could be flattened during an appropriate window (i.e. non-nesting period) in 2020 (subject to necessary PLCs). Other key habitats/species: See mitigation under Ref 3 and also undertake Phase 1 Habitat Survey at an early stage during the optimal survey period.	Low

10 Conclusions and recommendations

Based upon the findings of a Contaminated Land Preliminary Risk Assessment (PRA), Site Investigation (SI) and Generic Quantitative Risk Assessment (GQRA), the wastes at four hot spot locations within the colliery spoil at Lynemouth Bay are not considered to present a significant possibility of significant harm to human health or controlled waters. As such, it is not recommended that the site is formally designated as Contaminated Land under Part 2A of the Environmental Protection Act 1990.

Notwithstanding this, the following measures could be undertaken in pursuance of reducing the residual risk to human health from exposure of the occasional presence of buried asbestos fibres or cement-bound asbestos within Lynemouth Bay to the lowest levels that are reasonably practicable:

- Continue the existing regime of walkover inspections and clear-up operations (hand-picking) of any cement-bound asbestos released onto the foreshore by erosion, using appropriately trained personnel working to strict Risk Assessments and Method Statements;
- Reduce public access to the site by re-diverting the route of the England Coast Path to adjacent to the highway (rather than crossing the site);
- Prohibit the use of quad bikes on the site to reduce the risk of free asbestos fibres becoming airborne from disturbed ground; and
- Undertake air monitoring for any airborne asbestos fibres to provide an understanding (and public reassurance) of the baseline levels.

The release of plastics and rubber tubing from the four hot spots of waste into the marine environment is an unsightly and undesirable situation which Northumberland County Council (NCC) may wish to manage for ecological and aesthetic reasons. The best method for managing this situation would be to excavate the waste material from each of the four hot spots and treat it on site (by means of sorting/ screening) using a mobile treatment plant that already has an environmental permit. This would separate the ‘contraries’ (i.e. plastics and rubber tubing) from the rest of the excavated material. A ‘deployment form’ (accounting for the presence of asbestos fibres) would have to be agreed in advance by the Environment Agency for use of this approach and the works would have to be undertaken or supervised by qualified asbestos contractors.

The contraries would be sent off-site and dealt with in accordance with the waste hierarchy and the waste duty of care (most likely involving transfer to a materials recycling facility for processing into fuel for use in energy from waste facility). The residual excavated material would best be used to backfill / reinstate the land profile, either as land improvement works (‘recovery’ of materials, rather than ‘disposal’) carried out under the CL:AIRE Code of Practice (subject to there being no objection from the Environment Agency or the Local Planning Authority) and in accordance with a Material Management Plan (MMP), or (less preferred) under a bespoke Environmental Permit for the recovery and deposit of waste, in accordance with a Waste Recovery Plan.

Where residual excavated material cannot be recovered and re-used on site, it would be classed as waste and where landfill is identified as the preferred option would require pre-treatment and (for hazardous waste) Waste Acceptance Criteria (WAC) testing.

The cost estimate of the preferred option for managing the release of plastics and rubber tubing from the four hot spots of waste into the marine environment, based on best present information, is £7,051k. However, due to uncertainty in the total volume of material to be excavated and the proportions of this which can be recovered for on-site re-use or has to be taken off-site the cost range could be between £4,631k and £9,982k (say the median £7,500k for budgeting purposes).

The works are likely to require funding from the present-day landowners, namely Northumberland County Council and the Coal Authority, since funding from Central UK Government or, following Brexit, European Union sources are unlikely to be available.

It is likely that the preferred approach of waste management (excavation, sorting, re-use or disposal of materials) at the four hot spots will require a number of permits, licences of consents (PLCs). These include, but are not limited to:

- Planning permission
- Marine licence
- Environmental permit: Flood risk activity permit
- Environmental permit: Waste
- Landowner permission

Applications for these PLCs would need to be supported by a suite of environmental surveys and assessments, including, but not limited to:

- Environmental impact assessment (unlikely, but to be confirmed by formal EIA screening request)
- Habitats regulations assessment
- Water framework directive assessment
- Waste hierarchy assessment
- Materials management plan and/or Waste recovery plan

The works would take some further time to design and the PLCs time to secure. This should involve early engagement with both a specialist Contractor and the regulators or their scientific advisors (such as the Environment Agency, Marine Management Organisation, Local Planning Authority, Natural England).

It is envisaged that the design and consenting phase could be undertaken throughout 2020, with a view to the works being implemented in 2021. It should be noted that along some sections of Lynemouth Bay, sand martin colonies have established in parts of the Made Ground overlying the colliery spoil cliffs and therefore to avoid construction delay due to nesting sand martins in 2021, these areas of Made Ground could be flattened during an appropriate window (i.e. non-nesting period) in 2020 (subject to necessary PLCs).

11 References

Cooper, N.J., Benson, N., McNeill, A. & Siddle, R., 2017. Changing coastlines in NE England: a legacy of colliery spoil tipping and the effects of its cessation. *Proceedings of the Yorkshire Geological Society*, Vol. 61, pp. 217–229.

Cooper, N.J., Thomas, R., Thomson, E. and Wilkinson, J., 2013. Management of landfills and legacy industrial sites on eroding and low-lying coastlines. *Proceedings Institution of Civil Engineers Coastlines, Structures and Breakwaters*. November 2013.

Cooper, N.J., Bower, G., Tyson, T., Flikweert, J.-J., Rayner, S. and Hallas, A., 2012. *Guidance on the management of landfill sites and land contamination on eroding or low-lying coastlines*. CIRIA C718, London.

DEFRA and Environment Agency, 2004. Contaminated Land Report 11 - Model Procedures for the Management of Contaminated Land, R & D Publication CLR11.

Dunelm Geotechnical & Environmental Ltd., 2019. *Lynemouth Coastal Landfill Ground Investigation.* Report to Northumberland County Council, November 2019.

Faber Maunsell, 2006. Lynemouth Bay Reclamation Phase II, Geo-environmental Interpretive Report. Report to Northumberland County Council, January 2006.

Hyslop, B.T., Davies, M.S., Arthur, W., Gazet, N.J. & Holroyd, S. 1997. Effects of colliery waste disposal on littoral communities in north-east England. *Environmental Pollution*, 96, 383–400.

Nathanail, P., Jones, A., Ogden, R. and Robertson, A., 2014. *Asbestos in soil and made ground: a guide to understanding and managing risks*. CIRIA C733, London.

Probe Environmental Services, Ltd., 2019. *Waste Classification Report*. Report to Royal HaskoningDHV, November 2019.

Royal HaskoningDHV, 2019. *Lynemouth Coastal Landfill - Contaminated Land Generic Quantitative Risk Assessment (GQRA)*. Report to Northumberland County Council, February 2020.

Royal HaskoningDHV, 2019. *Lynemouth Coastal Landfill - Contaminated Land Preliminary Risk Assessment (PRA)*. Report to Northumberland County Council, May 2019.

Royal HaskoningDHV, 2019. *Lynemouth Coastal Landfill - Feasibility Study Interim Report*. Report to Northumberland County Council, March 2019.

Royal HaskoningDHV, 2019. *Cell 1 Coastal Landfills Study*. Report to Scarborough Borough Council, February 2019.

Royal Haskoning, 2014. *Cell 1 Sediment Transport Study – Phase 2: Main Report*. Report to Scarborough Borough Council, July 2014.

Royal Haskoning, 2013. *Cell 1 Sediment Transport Study – Phase 1: Scoping Report*. Report to Scarborough Borough Council, December 2013.

Appendix A

Further information regarding applicable legislation

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Enhancing Society Together

Marine and Coastal Access Act

The Marine Management Organisation (MMO) is responsible for marine licensing in English inshore and offshore areas. Part 4 of the Marine and Coastal Access Act (MCAA) 2009 provides the framework for the marine licensing system for works below the level of mean high water spring (MHWS) tides. There are six categories of activity that may need a licence (unless the works fall under a marine licence exemption). The categories of works that may need a licence are:

- Construction, alteration or improvement of works.
- Dredging.
- Deposits of any substance or object.
- Incineration of any substance or object.
- Removal of any substance or object.
- Scuttling of any vessel or floating container.

Given the nature of the feasible options under consideration, it is considered that a marine licence would be required for at least some of the proposed works (on the assumption that some activities would be undertaken below the level of MHWS).

Town and Country Planning Act

The Town and Country Planning Act 1990 is the principal legislation that governs planning permission and planning law in England. Planning permission will likely be required for feasible options that involve the permanent provision of coastal defence works or placement and encapsulation of material from localised hot spots on land. Pre-application discussions with NCC are recommended to confirm the requirement for planning permission, and to determine the supporting documents that will be required alongside the full planning application, if required (i.e. the local validation requirements).

Environmental Impact Assessment Directive

The process of Environmental Impact Assessment (EIA) in the context of town and country planning in England is governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (T&CP Regulations). EIA in the context of marine works is governed by the Marine Works (Environmental Impact Assessment) 2007, as amended by the Marine Works (Environmental Impact Assessment) (Amendment) Regulations, 2017 (MWRs).

These regulations apply the amended EU Directive “on the assessment of the effects of certain public and private projects on the environment” (usually referred to as the ‘EIA Directive’) to the planning and marine licensing system in England.

None of the feasible solutions fall within the development types listed in Schedule A1 of the MWRs or Schedule 1 of the T&CP Regulations.

However, with regards to Schedule A2 of the MWRs; the relevant category for works required to break the pathway between the source and the receptor by means of a rock revetment is:

'Infrastructure projects, 69. Coastal work to combat erosion and maritime works capable of altering the coast through the construction of, for example, dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works'.

With regard to Schedule 2 of the T&CP Regulations, the relevant category for works required to break the pathway between the source and the receptor by means of a rock revetment is:

'Part 10(m) Infrastructure projects. Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works'.

With regard to the placement of waste material from localised hot spots of contamination of land, the relevant category of development from Schedule 2 of the T&CP Regulations is considered to be:

Part 11(b) Other projects: Installations for the disposal of waste (unless included in Schedule 1).

There is, therefore, the potential for EIA to be required following consideration of the characteristics of the proposed works, its location and the potential for significant environmental impacts. The requirement for EIA would be determined through the production of an EIA screening report and submission of a formal EIA screening request to the MMO and NCC under the relevant EIA regulations. NCC has a statutory period of 3 weeks to provide its EIA screening opinion (unless an extension has been previously agreed), whilst the MMO works to a Key Performance Indicator (KPI) of 8 weeks for provision of an EIA screening opinion. If an EIA is required, it is recommended that a request for an Environmental Scoping Opinion is submitted to the MMO and / or NCC planning department to confirm the scope of environmental assessment.

If EIA is required, an indicative timescale of 6 to 12 months (depending on the need or otherwise for specific surveys and investigations) should be allowed for production of the EIA. Once the EIA has been produced and submitted to regulators alongside consent applications, NCC has a statutory timescale of 16 weeks to determine a planning application supported by an EIA, and the MMO works to a KPI of 13 weeks for determination of a marine licence application.

Regardless of the outcome of the EIA screening process, it is recognised that further (focussed) environmental assessment will likely be required in support of applications for planning permission and/or a marine licence (as required).

Habitats and Birds Directive

The Conservation of Species and Habitats Regulations 2017 (the Habitats Regulations) implement EC Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (the Habitats Directive) in England and Wales. The Habitats Regulations also transport elements of the EU Wild Birds Directive in England and Wales. In accordance with Section 63 of the Habitats Regulations, Appropriate Assessment is required for any plan or project, not connected with the management of a European site, which is likely to have a significant effect on the site either alone or in-combination with other plans or projects. European sites comprise Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Appropriate Assessment is also required as a matter of government policy for potential SPAs (pSPA), candidate SACs (cSAC) and listed Ramsar sites for the purpose of considering development proposals affecting them (ODPM, 2005).

Given the proximity of the feasible options to the boundary of European and Ramsar sites, a Habitats Regulations Assessment (HRA) is likely to be required in support of any consent applications to the MMO and NCC.

Wildlife and Countryside Act

Under the terms of Section 28(4)b of the Wildlife and Countryside Act 1981, as amended by Schedule 9 to the Countryside And Rights of Way Act 2000, any operations within or adjacent to a Site of Special Scientific Interest (SSSI) require assent from Natural England. The footprints of the feasible options do not lie within the boundary of a SSSI; however, they are adjacent to the Northumberland Shore SSSI. Assent under Section 28 of the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act, 2000) would be intrinsic to Natural England's overall response to the marine licence and planning applications, on the assumption that at least one of these permissions be required.

Water Framework Directive

The Water Framework Directive (2000/60/EC) (WFD) establishes a legal framework to protect and restore clean water across Europe to ensure long-term, sustainable use. It applies to waters out to one nautical mile from the baseline from which territorial waters are drawn.

One of the aims of the WFD is to ensure that all European waterbodies are of Good Ecological Status or Potential (for 'heavily modified' and 'artificial' waterbodies) by 2021 by the setting of Environmental Quality Objectives (EQOs), for water chemistry, ecological and hydromorphological quality parameters. The WFD is transposed into English and Welsh law through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

A WFD compliance assessment will be required in support of an application for a marine licence and / or a planning application, if required. The PRA and GRA would be used to inform the assessment.

Waste Framework Directive

A waste assessment focussing on the disposal or recovery options for wastes that would be created in the scheme would cover the requirements of the revised Waste Framework Directive (2008/98/EC) (rWFD), particularly with regards to the application of the waste hierarchy and also the hazardous waste assessment. The main issue would be excavated material, particularly the contaminated colliery spoil or other contaminated wastes.

Environmental Permitting Regulations

Flood Risk Activity Permit

Any activity within 16m of a sea defence structure requires a Flood Risk Activity Permit (FRAP) from the Environment Agency. However, there is an exclusion to this general principle, that if a developer has applied to the MMO for a marine licence for the proposed works, a separate Flood Risk Activity Permit (for the proposed works below the level of MWHS) is not normally required. Consultation with the Environment Agency should be undertaken to confirm that a FRAP is not required.

The Environment Agency's online guidance states that following submission of FRAP application documents, as well as the application forms to the Environment Agency, a decision on the application should be made within two months, if the application relates solely to flood risk activities.

Permitting requirements for the management of excavated materials

An Environmental Permit will be required to undertake any works relating to the treatment of waste at the site. This would include any waste activity that included sorting and screening.

Advice is being sought from the Environment Agency regarding the permitting approach. During a meeting held on 16 December 2019, the Environment Agency representative suggested that on-site reuse of excavated material could potentially be carried out in accordance with the CL:AIRE Code of Practice (CoP). However, it was caveated that this would need further discussion within the 'Waste' team of the Environment Agency.

Furthermore, it was advised that the CoP can only apply to the recovery of waste. It cannot be used where the excavated material would be disposed.

The following represent the relevant scenarios for excavated material, with a summary of permit requirements.

Excavation and off-site management of material that is not suitable for use

This is envisaged where excavated material is not suitable for use as part of any backfill or reinstatement of material in the site.

All excavated material is waste.

The off-site management options would be dictated by the classification of the material as hazardous or non-hazardous.

Where landfill is identified as an appropriate option, there are two main considerations:

1. Pre-treatment; and
2. Waste Acceptance Criteria (WAC)

Waste destined for landfill must be pre-treated in accordance with the three-point test.

Treatment must:

1. Be a physical, thermal, chemical or biological process - which can include sorting
2. Change the characteristics of the waste, and
3. do so in order to:
    a. Reduce its volume; or
    b. Reduce its hazardous nature; or
    c. Facilitate its handling; or
    d. Enhance recovery

All three points must be satisfied, and for point three, a minimum of one of a) to d) must be met.

By separating soil that cannot be used on site from soil which can will satisfy the three-point test. This will also be satisfied by removing any plastic or rubber tubing etc.

For the WAC test, if the excavated material is hazardous, it must be tested in accordance with hazardous WAC chemical test parameters. If the hazardous WAC fails, the material must be treated to bring it within the parameters of hazardous WAC.

Non-hazardous material can be deposited in a non-hazardous class of landfill without chemical WAC testing.

The waste Duty of Care applies to all holders of waste material. The requirements of the waste Duty of Care are implemented by the Waste (England and Wales) Regulations 2011.

This requires several basic considerations:

1. Comply with environmental legislation.
2. Know whether wastes are hazardous or non-hazardous.
3. Know the waste codes for all wastes being held.
4. Store wastes securely to prevent release.
5. Check that the wastes are transferred by only those who hold an appropriate environmental authorisation and received by a facility that holds an appropriate environmental permit or exemption.
6. Provide documentation with any waste transfer to fully describe the waste and identify any special handling requirements that could affect future waste management options on the waste.
7. Keep records of all waste transfers in a register.

Excavation, physical screening of excavated material to remove contraries

Where the excavated material is subject to physical or mechanical treatment by various means to remove ‘contraries’, for example: plastic, rubber tubing etc., this is a waste activity and the activity must be covered by an environmental permit.

It is anticipated that this would be provided by a mobile contractor, operating a mobile treatment plant that already has an environmental permit in place. For example, a SR2008 No 27: mobile plant for treatment of soils and contaminated material, substances or products; or SR2010 No 11: mobile plant for treatment of waste to produce soil, soil substitutes and aggregate.

A ‘deployment form’ would have to be agreed in advance by the Environment Agency. This is a site-specific risk assessment that caters for the type of waste that will be encountered according to the proposed method of treatment. The deployment form must include the potential for asbestos fibres, therefore, the contractor would have to include in their deployment form how excavation and sorting would be managed without causing an unacceptable release of asbestos fibres. For example, screening may take place in a sealed environment with passive ventilation and all operatives will be equipped with appropriate PPE to prevent exposure.

It is likely that qualified asbestos contractors would be required to carry out and / or supervise the activity; and the Environment Agency may wish to consult with the local authority and the Health and Safety Executive about the proposed approach. Therefore, it is recommended that the contractor prepares their deployment form to allow for greater than the normal 25 working days approval period to accommodate additional scrutiny.

This will deliver two general segregated waste streams:

1. Contraries – e.g. plastic, rubber tubing etc, which will be sent off site in accordance with the waste hierarchy and the waste duty of care. Most likely option for this material would be to a materials recycling facility for processing into fuel for use in energy from waste facilities.
2. Excavated material – this would then be assessed to identify whether it is suitable for use (see below).

It is possible that asbestos could be managed via regular and ongoing maintenance in the form of hand picking the cement-bound asbestos fragments that have been observed on the foreshore as pebbles.

This is unlikely to reduce any risk from exposure to fibrous asbestos. Any such hand picking exercise would be required to be undertaken in accordance with the Health and Safety Executive (HSE) guidance by trained operatives wearing appropriate personal protection equipment.

Use of Waste – CL:AIRE Code of Practice

The site is a former landfill, however, there is no active permit in place, hence the site is technically 'land' which has identified pockets of contamination. The improvement of this land could be carried out under the CL:AIRE Code of Practice (CoP). This would have to be without objection from the Environment Agency and also the local planning authority.

The CoP could apply to the use of the excavated material within the project; or another local development scheme, where there is a need for the material and all of the principles in the CoP can be met.

Regular liaison with the regulatory authorities (the Environment Agency and the local authority) is required throughout the process to ensure that all parties are aware of the application of the CoP on the development. Appropriate lines of evidence are required to ensure that the CoP principles can be met.

The CoP requires evidence to demonstrate that the proposals are being carried out in line with a relevant planning permission; or evidence to prove that such permission is not required. Works require permission from the landowner.

Reuse of excavated material on site would have to comply with the principles of the CoP for the material to be able to be reused outside of the regulatory framework. The principles are as follows:

- the proposed use of the material must not cause any harm to human health or the environment;
- the excavated material is suitable for its proposed use, without further treatment;
- the use of the material is certain; and
- only a sufficient quantity of material will be used.

This requires a risk assessment, at the appropriate level of the development area to demonstrate that the use will not create an unacceptable risk to human health or the environment. A risk assessment for the specific end use should follow the principles defined in EA Contaminated Land Report 11, ('CLR11'). A GQRA for the site has already demonstrated that the material would not cause unacceptable harm to receptors.

Any 'hot spot' contaminated material may not be suitable for use immediately after being excavated because of elevated chemical contamination or because it contains 'contraries' (e.g. plastic, rubber tubing etc). However, the CoP allows for the treatment of material at a waste treatment facility; or by using a mobile treatment facility at the site. The principles of the CoP would be applied to the use of the treated material at the site after it has been treated at the waste treatment facility.

The quantity of material required must be known prior to construction. If excess excavated material is deposited this is taken to be an indication that it is being discarded and it would be waste.

The use of the excavated material must form part of the final design, so it can be clearly identified where in the scheme the material would be used; and how much would be used. This requires the production of a Material Management Plan (MMP) by the contractor to illustrate how and where materials on the ground are to be handled, means of a tracking system to monitor any waste/material movements, and any contingency measures in place. The latter may include setting out contractual requirements to define responsible person(s) or parties and an action plan in the instance the material is not suitable for use.

The CoP outlines the minimum standard for an MMP, which provides the control mechanism to ensure compliance with the CoP principles. In summary, the MMP must provide:

- Details of the parties that will be involved with the implementation of the MMP.
- A description of the materials in terms of potential use and relative quantities of each category.
- The specification for use of materials against which proposed materials will be assessed, underpinned by an appropriate risk assessment related to the place where they are to be used.
- Details of where and, if appropriate, how these materials will be stored.
- Details of the intended final destination and use of these materials.
- Details of how these materials are to be tracked.
- Contingency arrangements that must be put in place prior to movement of these materials.
- A Verification Plan to identify how the placement of materials is to be recorded and the quantity of material to be used relate to the design objectives.

The CoP requires that the MMP is independently reviewed by a Qualified Person. The Qualified Person must provide a Declaration that the principles of the CoP have been complied with before the treated material can be used in the proposed construction works.

One fundamental criterion for using the CoP is that the scheme must be considered to be recovery and not disposal of the material. This is demonstrated by proving the reuse of material in accordance with the principles above and including it within the design of the scheme.

Use of waste - Recovery Permit (deposit for recovery)

Where the principles of the CoP cannot be met, the use of the excavated material must be carried out under the auspices of an environmental permit. Given the location of the scheme (close to sensitive receptors and designated areas), this would have to be a bespoke permit, because Standard Rules permit cannot be used in sensitive locations; nor on the site of historic landfills.

It is possible that the waste can be treated via a bespoke waste recovery permit, for recovery of waste on land. A fundamental requirement, amongst others, is a Waste Recovery Plan (WRP) that must be approved/accepted by the Environment Agency before the permit application is submitted.

In order to achieve the definition of recovery, the WRP should show evidence that:

- There is a specific obligation to undertake the work. This is where planning permission requests restoration of a quarry for example, and there may not be a specific obligation for this particular site.
- The waste is suitable for the intended purpose.
- The activity will not cause pollution.

The WRP requires evidence to be provided to present the financial gain by using non-waste materials. This is where the Environment Agency assesses that the scheme would be undertaken if any excavated waste was not available for use. Given the particular circumstances of this scheme, detailed 'Pre application advice' from an Environment Agency waste recovery plan specialist within the National Permitting Team at the EA would be key to establishing if this is a viable option.

If the WRP is approved, the bespoke permit application is provided. This requires a much more rigorous application process and compliance conditions. It requires a dedicated and thorough risk assessment in accordance with the Environment Agency's online guidance on risk assessments for environmental permit. The activities must be operated in accordance with procedures written in an environmental management system under the supervision of a Technically Competent Manager. The management system, which must provide a control system to ensure that the proposed activities will not cause unacceptable harm to human health or the environment. This means higher fees associated with application, subsistence and surrender, because the Environment Agency applies a greater amount of resource to determine the application.

It is not recommended to use the environmental permitting option for the use of excavated material for construction unless strictly necessary because of the bureaucratic and administrative requirements associated with applying for; managing; and surrendering an environmental permit.