Tir John Landfill Site

Restoration Plan V3.2

May 2016

Contents

Tir John Landfill Site

Restoration Plan

1. Introduction

Tir John Landfill Site is situated North of Fabian Way, Port Tennant, Swansea, at National Grid Reference SS 695 936. The whole site comprises an older landfill (Permit Number JP3395FD formerly EAWML 34011) which is situated on the Western section of the site,referred to as Phase 1, and a separated larger eastern section known as Phase 2.

Phase 1 (cells 1 to 4) no longer accepts waste and is moving towards closure and restoration.

Phase 2 (Cells 5 to 17) is currently accepting and disposing of non-hazardous waste at cell 15.

As areas of the landfill are completed to final contours, the site will be progressively capped and restored. Above the cap there is a requirement for a minimum of 1000 mm depth of soils to provide a suitable growing medium for a variety of habitats. This equates to 10,000m3 of soil per hectare, which, in turn, equates to approximately 18,000 – 20,000 tonnes per hectare.

Although this plan is intended for the restoration of the whole of Tir john Landfill, exact quantities, including plans, will be provided to NRW prior to the restoration of each 'phase'. Phase 1 covers an area of 73,200m^2, therefore, at 1m deep and with a conversion factor of 1.8, approximately 131,760 tonnes of material will be required to restore phase 1.

Wherever Possible, Cory Environmental is committed to the use of sustainable / recovered materials and as such and in order to provide the best habitats possible it is intended that selected waste soils and/or soil forming materials be used in the restoration of the site.

Crymlyn Bog

Tir John Landfill is sited adjacent to Crymlyn Bog, which at almost 300 hectares represents the largest lowland fen in Wales. With areas of transition mire and quaking bog, the site is a designated RAMSAR site, SAC, SSSI and National Nature Reserve.

These habitats are becoming increasingly rare and the transition mire and quaking bog at this site are vulnerable to the continuing expansion of common reed *Phragmites australis*, encouraged by trends of increasing site wetness, nutrient-enrichment and lack of grazing. This plan, in conjunction with the surface water management plan, has been developed with the protection of Crymlyn Bog as priority.

2. Materials

The wastes which are intended for use in site restoration are listed in table 1 of the waste acceptance procedures, and have been categorised in relation to their properties and benefits in restoration use. These are as follows:

A - Bulk Fill materials (A)

These materials will provide the bulk of the restoration layer. These wastes tend to be derived from remediation, construction or other industrial projects and are typically low in organic content and other nutrients and so, for habitat creation and to provide a good substrate for growth, they may need to be supplemented with additional materials.
In addition to the chemical criteria set out in table 2, the materials will be free from physical contamination by biodegradable waste, plastics, wood etc., and be suitable for restoration use.

B - Materials for tracks / hard-standing areas

These materials would be for use on access tracks, areas of hard-standing (eg. Car parks) and the surface dressing of footpaths (if required). They may also be utilized for drainage should a need arise.
It is anticipated that no more than 5000 tonnes will be required for these uses within the phase 1 restoration, although if a need is identified, volumes may need to be increased. NRW will be notified, along with justification for any increased use.
The materials should be fit for use and free of contamination, such as paper, plastic, wood etc…, and contain minimal fines.

C - Organic Wastes (C)

All organic matter, regardless of the source, can make a significant contribution to the physical structure of the soil to which it is applied. This can include the lowering of soil bulk density, an increase in soil moisture available to plant roots, an improvement in aggregate stability (and by implication greater resistance to erosion) and an increase in porosity, and consequently aeration, infiltration and drainage. From a biological perspective, the addition of organic materials stimulates soil biological activity, which improves nutrient cycling and soil fertility.

The organic matter content of waste materials varies considerably. Biosolids and paper mill crumble tend to have the highest organic matter content (around 50% dry weight) while others, such as compost and CLO have an organic matter content of between 8% and 40%. The chemical benefits of most recycled organic materials are largely the result of their nitrogen and phosphate content, although levels of potash may be beneficial in some situations.

The aim of adding any of these wastes (if any are required), is to raise the soil's organic content to around 5%, however, as these are to be applied within a sensitive site setting, care must be taken to ensure that nutrients are not added in excess of requirement and that surface water run-off is contained.

As with the other materials, these wastes must also be physically suitable for restoration and free from contamination by paper, plastics etc...

Quantities of organic material applied will be derived from loading of available Nitrogen. Although limits of nitrogen addition imposed for NVZ's are not applicable to non-agricultural land, it seems prudent to adopt the limit of 170kg addition of available nitrogen per hectare annually averaged across the phase of restoration.

As well as nitrogen, the other nutrient of concern is phosphate. While phosphates are not as freely mobile as nitrogen, they can cause significant issues in the form of eutrophication if they enter water bodies. A low phosphorous index of 1 should be aimed for on the Tir John restoration project (10-15 $mgkg^{-1}$), which is perfect for the creation of wildflower meadows.[1]

Ideally, organic materials will be mixed with imported subsoil prior to placement. However, if organic materials are to be placed after the soils, then they are to be spread evenly and incorporated into the top 400mm of soil, using appropriate agricultural machinery, as quickly as possible after spreading. Organic material will not be spread during periods of heavy rainfall or if heavy rain is forecast before the material can be fully incorporated into the soil.

[1] The safe Sludge matrix: Guidelines for the application of sewage sludge to land. ADAS 2001

3. Acceptance Criteria

Material requiring initial analysis will only be acceptable if the waste is non-hazardous, of a type listed in Table 1 and the levels of contaminants and potentially toxic elements (PTE's) are below the parameters listed in table 2.

Table 1 – Acceptable EWC Codes

Waste Type	Category
01 01 02 Wastes from Non metalliferous excavation	A
01 04 08 Waste gravel and crushed rocks	A
01 04 09 waste sand and clays	A
02 04 01 Waste soil from washing Beet	A
03 03 05 De-inked paper sludge and de-inked paper pulp	C
03 03 09 Lime Mud waste	C
10 12 08 Waste ceramics / bricks / Tiles	B
10 13 14 Concrete and concrete sludge	B
17 01 01 Concrete	B
17 01 02 Bricks	B
17 01 03 Tiles and Ceramics	B
17 01 07 Mixture of concrete, tiles, bricks and ceramics	B
17 05 04 Soil and stones	A
17 05 06 Dredging spoil	A
17 05 08 Track ballast	A, B
19 01 18 Biochar from pyrolysis / gasification of wood.	C
19 05 03 Off specification compost	C
19 06 04 Digestate from the anaerobic treatment of municipal waste	C
19 06 06 Digestate from the anaerobic treatment of vegetable and animal waste	C
19 08 02 Wastes from desanding	A
19 08 05 Sludges from treatment of urban waste water	C
19 09 02 Sludges from water clarification	A,C
19 12 09 Minerals	A
19 13 02 Solid waste from soil remediation	A,C
19 13 04 Sludges from soil remediation not containing dangerous substances	A
20 02 02 Soil and stones	A
	A

Table 2 – Restoration material threshold of PTE's (Potentially toxic elements)

PTE	Maximum permissible concentration ($mgkg^{-1}$)
Zinc	745
Copper	370
Nickel	210
Cadmium	7
Lead	750
Mercury	5
Chromium	750
Selenium	7.5
Arsenic	35
pH	>5, <11.5
TPH	1000
PAH's	500

In addition to the above, organic (category C) materials will be tested for available N, P and K prior to addition, to ensure suitability and loading of nutrients. Testing for hydrocarbons on organic material can be difficult, due to interferences so, unless contamination is suspected due to site history, visual or olfactory evidence, these wastes will not be required to have TPH or PAH testing.

The following waste types will not require analysis, however, they still need to be physically suitable and not contain, or be suspected of containing, contamination.

01 04 08	Gravel and crushed Rocks
10 12 08	Waste ceramics, bricks, tiles and construction products (after processing)
10 13 14	Waste Concrete
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of bricks, tiles and ceramics not containing hazardous substances
20 02 02	Soil and Stones (From gardens and parks)

4. Environmental Protection

Environmental Quality Standards (EQS)

Due to the sensitive nature of the surrounding landscape, all waste materials used in the restoration scheme will be tested against the parameters and thresholds listed in table 3, which have been derived from the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Results from all wastes (which require testing) will be scheduled post acceptance as part of the compliance sampling regime. Results will be averaged on a rolling annual basis, but any individual sample which exceeds the maximum allowable concentration (MAC) threshold will be investigated and acceptance of the waste may potentially cease.

On an annual basis, results from in-bog monitoring will be used to re-evaluate the model and adjust the EQS' accordingly.

Substance	Average concentration (ugL^{-1})	Maximum allowable concentration (ugL^{-1})
Arsenic	50	
Chromium (III)	4.7	32
Chromium (VI)	3.4	
Copper	20.93*	
Cyanide[1]	1	5
Zinc	24.77*	
Cadmium	0.15***	0.9***
Lead	1.2*	14
Manganese	1037.5*	
Mercury	0.05	0.07
Nickel	21.15*	34

* Adjusted for bioavailability using the MBAT tool, with the exception of lead for which there is no allowance within the tool.
*** Class 4 water hardness used for this assessment
[1] The figures for cyanide appear to be lower than the laboratories current lower detection limits.

Surface Water Protection

Surface water from the landfill is directed into collection lagoons prior to discharge, as per the approved surface water management plan. Monitoring and quality requirements are laid out in tables 3.2 and 3.9 of the permit (EPR/VP3935AT).

In addition to these requirements, following periods of heavy rain, and subsequent run-off, field tests are carried out for ammoniacal nitrogen and suspended solids prior to discharge.

5. Acceptance on site.

All wastes destined for Cory sites are assessed centrally by a qualified, competent person. If the material is deemed to be acceptable (under this plan) it will be issued a unique disposal authorisation (DA) number be set up on the Gatehouse weighbridge system, which includes relevant information to enable acceptance at site, including a description of the waste, EWC codes, customer and producer details.

Upon arrival at the weighbridge, the customer will present a transfer note, detailing as a minimum; customer, waste producer, waste description, EWC code, sic code and DA number. These details will be checked against those already on the weighbridge software, along with a visual inspection of the waste (if possible). The vehicle will then be weighed and directed to the correct tipping location on site.

Wastes will be visually inspected at the tipping location by suitably trained personnel and any potential non-conformances (visual contamination, hydrocarbon odours / staining etc…) will be reported immediately to site management.

Compliance Sampling.

At the time of setting up a waste stream on the weighbridge software, the frequency of compliance sampling will be entered. This will be determined by factors such as quantity and variability of the waste but will not be less than one sample per thousand tonnes of waste (1 in 50 loads).

The procedure for taking on-site verification samples is as per below:

- The load is visually split into six theoretical sections;
- at four of the six sections, using a scoop, excavate into the stockpile to approximately 0.3m in depth and obtain a sample of the waste;
- place each sub-sample into a sampling pot and finally ensure that the pot is properly sealed;

Samples will be sent to an independent laboratory for analysis and the results reviewed by a competent person, against the parameters set out in this plan.

Non-Conforming loads

Vehicles will only be allowed to tip if the waste stream has been assessed and assigned a valid disposal authorisation (DA) number on the weighbridge software and a transfer note is provided.

If a load is found to contain non-conforming materials, or contamination is suspected then site management will be informed and the Waste Solutions Department contacted.

Upon assessment from a competent person, unsuitable material may ultimately be rejected from site, or diverted to the landfill (if acceptable) with the applicable rate of landfill tax being applied.

If a load has already been tipped when any non-conforming or suspect material is discovered (for example, material buried within a load which might only be observed when plant spreads the material) then the material will be quarantined pending assessment and investigation.

If compliance sampling shows a breach of the limits set out in this plan, then the customer will be required to investigate, which depending upon the results of the investigation and the severity of the breach, may lead to the waste stream being suspended or the frequency of compliance sampling being increased.

Contingency – other scenarios

In the event of materials being unable to tip for other reasons, eg. Inclement weather or breakdown, customers will be contacted to prevent deliveries. Any material en-route or already at site will be tipped at a suitable location where potential for any run-off or contamination will be minimised.

6. Record Keeping and Verification

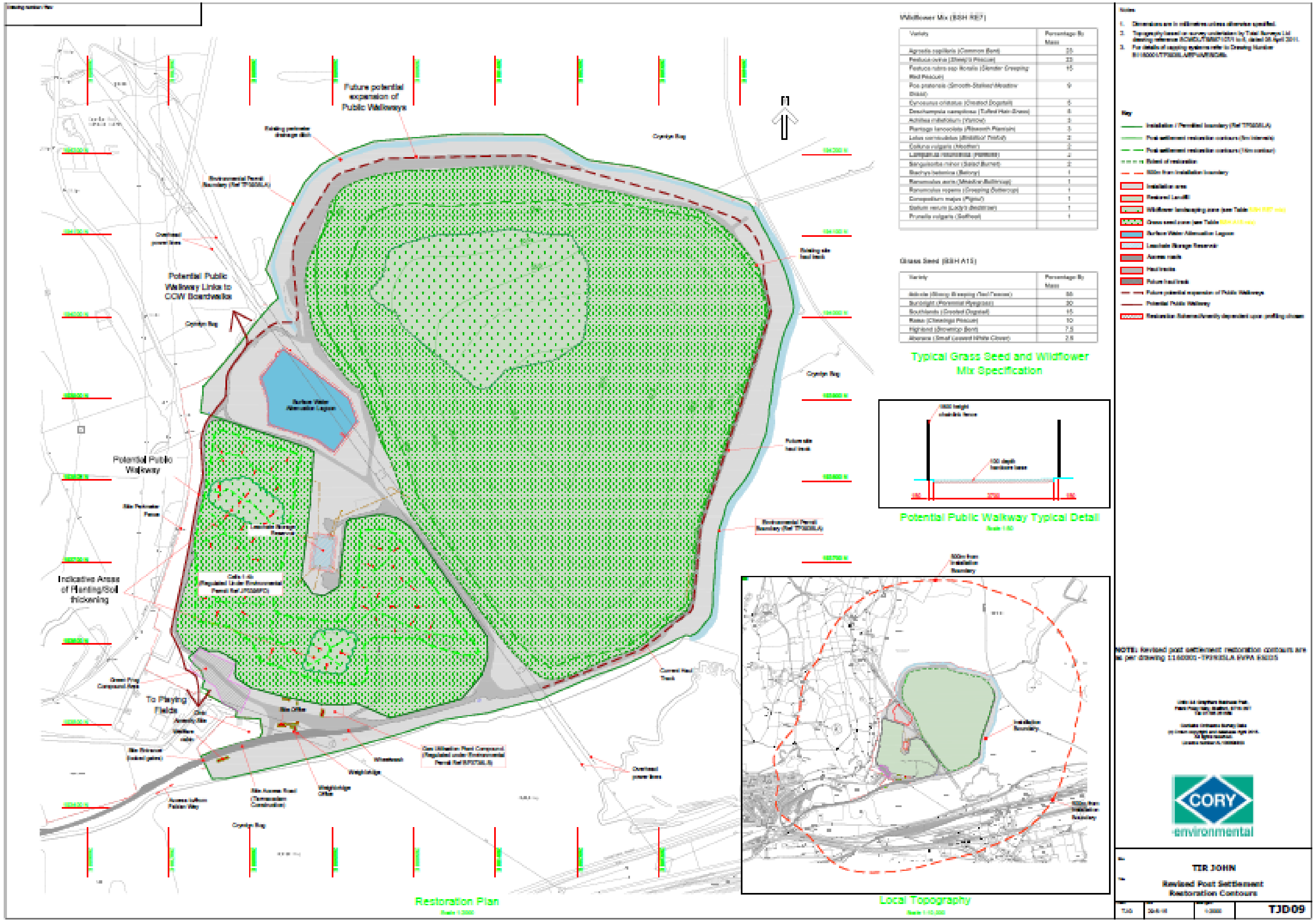
All initial enquiries, quantities delivered of each individual waste stream, weighbridge tickets, compliance and leachate analysis, non-conformances and tipping locations will be used for the production of validation reports and be retained for the lifetime of the site. These will be made available to NRW upon request.

Although this plan will be adopted for the site as a whole, quantities provided are relevant to phase one only, and further specifics will be provided to NRW prior to restoration of each subsequent phase. Likewise, validation reports will be prepared on a phase by phase basis. This will include a plan of the area which has been restored; records of wastes applied and quantities; results of testing; non-conformances and details of any issues encountered.

APPENDIX A

Tir John Landfill Site

Restoration Plan



APPENDIX B

Appendix B – EPR 13 assessments

01 Waste resulting from Exploration, Mining, Quarrying and Physical and Chemical Treatment of Minerals

01 01 02 Wastes from Non metalliferous excavation

01 04 08 Waste gravel and Crushed Rocks

01 04 09 Waste sands and clays

These wastes are likely to include materials such as overburden from quarrying operations and reject materials, such as off specification clay.

Benefits

- Provide a good substrate and fill material to achieve the required restoration contours, habitat creation and landscaping.

Potential negative impacts

- These wastes are likely to have a low nutritional value as a growing medium.

02 Wastes from agriculture, horticulture, forestry, hunting and fishing, food preparation and processing

02 04 01 Waste soil from washing Beet

Benefits

- Good bulk fill material
- Provide substrate for habitat landscaping and creation

Potential negative Impacts

- Low nutritional value
- Potential to introduce pests.

03 03 wastes from pulp, paper and cardboard production and processing

03 03 05 De-inked paper sludge and de-inked paper pulp

03 03 09 Lime Mud waste

Paper sludge is the residue from the preparation of recycled paper prior to its re- use in the paper production process, it may also be from the processing of virgin fibre from a variety of fibre sources such as wood or cotton. Paper sludge contains short cellulose fibres which are not suitable for use in paper production, sludge from recycling also contains printing inks and mineral components such as kaolin, talc, and calcium carbonate. The de-inking and bleaching process means paper sludge can vary in colour, it is typically light grey through to blue-grey but other colours such as pink are possible depending on the types of paper used in the recycling process.
The ink residue from the recycling process is the primary source of PTEs in the sludge, however for many types of paper the PTE content of ink has been significantly decreased over the past 15 years to comply with the food packaging regulations and sludge now contains fewer PTEs.

Potential benefits:

- Good liming value
- Provides a good supply of nutrients, particularly for phosphorus, potassium and sulphur
- Organic matter providing soil conditioning properties such as porosity, moisture retention, structural stability and improve soil bulk density
- increase biological activity in the soil
- improve the size of the microbial and faunal population.

Potential negative impacts:

- High surface application rates to grassland may cause smothering and stock rejection
- This waste stream tends to have a C:N ratio which may cause nitrogen lock up - Nitrogen could be added to sludges to prevent this.
- paper sludge can contain PTEs particularly copper in de-inking sludges from the printing inks
- Organic contamination
- Potential for odours
- Deterioration of soil structure can be caused by elevated sodium content (>2,500 mg/kg) in certain paper sludges.

10 12 08 Waste ceramics / bricks / Tiles

10 13 14 Concrete and concrete sludge

Benefits

- Good for tracks / hardstanding / general fill
- Improved drainage

Possible negative impacts

- Unsuitable on its own as a growing medium

17 Construction and demolition wastes (including soil from contaminated sites)

17 01 01 Concrete

17 01 02 Bricks

17 01 03 Tiles and Ceramics

17 01 07 Mixture of concrete, tiles, bricks and ceramics

Benefits

- Good structural fill for drainage / road construction / hard standing
- Good general fill material

Possible negative impacts

- Not suitable as a growing medium on its own

17 05 04 Soil and stones

Benefits

- Provide a substrate for creating habitats
- Increase soil depths above cap to agreed levels

Possible negative impacts

- Sub-soil has a low organic content
- Possible PTE's
- Possible contamination from other sources, eg. Invasive plants or pathogens

17 05 06 Dredging spoil

Benefits

- Can supply organic material.
- Can be a good supply of nutrients in the form of organically bound nitrogen and phosphate.

Possible negative impacts

- Potential for PTE's
- High suspended solids in run-off

17 05 08 Track ballast

Benefits
- Good drainage
- Good surface for roads etc…

Possible negative impacts
- May contain hazardous substances – Visual inspection essential.

17 08 02 Gypsum

See Previous.

19 Wastes from waste management facilities

19 01 18 Pyrolysis wastes not containing dangerous substances

As waste management technologies advance, so more material is made available for re-use, more EWC codes will be made available for re-use in restoration. Currently this code has been added to allow the acceptance of biochar from waste wood but may be utilised for any future waste streams which might present themselves.

Benefits

- Good source of carbon
- Contains nutrients NPK and trace elements
- Good moisture retention
- Good soil conditioning material

Potential negative impacts

- Potentially dusty
- May contain variable amounts of PTE's

19 05 – waste from the aerobic treatment of waste.

19 05 03 Off specification compost

Composting is a term used to describe the aerobic biodegradation of organic materials under controlled conditions of temperature and moisture. Compost may be produced in open windrows or in enclosed in vessel systems. Food waste must be composted in an in-vessel system and must be compliant with Animal By-Products Regulations (ABPR) as well as the relevant waste legislation. The end result of the composting process is a stable organic residue with high organic matter content and potentially significant quantities of nutrients. The breakdown of the organic material in the feedstock occurs as the compost heats up to its maximum temperature (>50°C) as a result of biological activity. This temperature must be reached to ensure the destruction of pathogens, after which the material must be allowed to mature for a period of several weeks. The final organic matter content of the compost depends largely on the length of this period of maturation; the longer the maturation, the lower the organic matter content. The feedstock must be
turned regularly during this process to ensure that the treatment applies evenly throughout the windrow. In 2007-2008, 2.7 million tonnes of compost were produced in the UK; it is likely that this level of production will increase further in the future.

Benefits

- Excellent source of organic matter and a good soil conditioner
- Moderate levels of nitrogen, phosphorous and potassium.
- Low C:N ratio, giving a net release to the receiving crop

Potential negative impacts

- May contain PTE’s or physical contamination
- Potential for odour
- Variation in composition

19 06 waste from the anaerobic treatment of waste

19 06 04 Digestate from the anaerobic treatment of municipal waste

19 06 06 Digestate from the anaerobic treatment of vegetable and animal waste

Anaerobic digestion is a process whereby organic material is broken down by bacteria in a sealed environment without oxygen. There are two end products, namely biogas and digestate. Biogas may subsequently be used to generate electricity, for heating, transport fuel and fuel cells. Digestate is a nutrient-rich material that can be provided as separated fibre, separated liquor or whole digestate, which is a combination of the two; all forms of digestate can be applied to land. Green waste, food waste and mixed waste can be treated using anaerobic digestion.
The scale of production of digestate in the UK is relatively low at present; in 2006-2007, 86,700 tonnes of digestate were produced. In 2007-2008 no survey data were available. More facilities are being planned, or are under construction, therefore this figure is likely to increase in future.

Benefits

- Excellent source of organic matter and a good soil conditioner
- Moderate levels of nitrogen, phosphorous and potassium.
- Low C:N ratio, giving a net release to the receiving crop

Potential negative impacts

- May contain PTE's or physical contamination
- Potential for odour
- Variation in composition

19 08 Wastes from waste water treatment plants

19 08 02 Wastes from desanding (washed sewage grit)

Benefits
- Improve structure and drainage in heavy soil from the addition of grits and fine sands
- Increase soil depths above cap to agreed levels
- Reduce the need for soil imports to site

Possible negative impacts
- Possible PTE's (Potentially toxic elements) or other dangerous substances, such as oil
- Potential for physical contamination (eg. Paper / plastic)

19 08 05 Sludges from treatment of urban waste water

Wastewater treatment works sludge is produced during the treatment of wastewater, and is either dewatered into a sludge cake or can undergo further treatment. This can include a number of complex treatment processes such as digestion, dewatering, thickening, composting, lime pasteurisation, or thermal drying, to produce a conventional or enhanced biosolids material. These treatment processes reduce the water content of the sewage sludge, reduce its ability to produce gas and render it virtually free from harmful organisms. The resultant biosolids are therefore easily transportable, less odorous and almost 100% pathogen free. Biosolids is a generic term used to describe the various forms of treated sludge. Biosolids are either conventionally treated or enhanced treated materials depending on the level of pathogen kill during the treatment process. They also have different physical characteristics; raw or digested sludge cake has a dry matter content of 25%; lime pasteurised sludge cake has a dry matter content of 40% and a higher pH content than other materials which are typically more or less neutral; sludge compost has a dry matter content of 60% and thermal dried granules or pellets have a dry matter content of 95%. The beneficial effects of recycling biosolids materials to reclaimed land are that it increases organic matter and water retention, improves drainage characteristics within the soil and provides soil nutrients essential for plant growth and land recovery.
Dewatered sludge (either in its raw or digested form) is the most common material used for land restoration within the UK. In 2007 53,000 tonnes (4%) were used directly in land reclamation in the UK out of approximately 1.4 million tonnes in total that were recycled to land. In 2008 the equivalent figures were 34,000 tonnes (3%) and 1.36 million tonnes. Most biosolids (77%) are used in the agricultural sector.

Benefits

- Excellent source of organic matter and a good soil conditioner
- Moderate levels of nitrogen, phosphorous and potassium.
- Low C:N ratio, giving a net release to the receiving crop

Potential negative impacts

- May contain PTE's or physical contamination
- Potential for odour
- Variation in composition

19 09 Wastes from the preparation of water intended for human or industrial use

19 09 02 Sludges from water clarification

This can be split into two main categories, namely Co-agulant sludges, which can be high in metals such as aluminium and iron, and natural sludges from the filtering of raw water.

Benefits

- Improve structure and drainage in heavy soil from the addition of grits and sands
- Increase soil depths above cap to agreed levels
- Reduce the need for soil imports to site
- Replace soils lost to erosion
- Addition of organic material into the soil
- Improved bulk density of existing soils at the receiving site

Possible negative impacts

- Possible PTE's (Potentially toxic elements) or other dangerous substances, such as aluminium
- Potential for physical contamination (eg. Paper / plastic)
- Potential for iron staining on vegetation

19 12 Waste from the mechanical treatment of waste

19 12 09 Minerals

This codes refer to material which has been sorted or subject to treatment in a recycling facility, and in this case minerals. The most likely source of this material is 'bulked soil' from transfer stations.

Benefits
Improve structure and drainage in heavy soil from the addition of grits and sands
Increase soil depths above cap to agreed levels
Reduce the need for soil imports to site
Replace soils lost to erosion

Possible negative impacts
Possible PTE's (Potentially toxic elements) or other dangerous substances, such as oil
Potential for dust

19 13 Waste from soil and groundwater remediation

19 13 02 Solid waste from soil remediation

19 13 04 Sludges from soil remediation not containing dangerous substances

20 02 02 Soil and stones

Benefits

- Provide a substrate for creating habitats
- Increase soil depths above cap to agreed levels

Possible negative impacts

- Sub-soil has a low organic content
- Possible PTE's
- Possible contamination from other sources, eg. Invasive plants or pathogens

APPENDIX C

HAZARDS	Receptor	CONTROL MEASURES (incl. reference to WI's, IMS procedures, training, competencies etc)	RISK RATING (L)	N A E*	(S)	Rating
Dust	Local residents	Dust production to be monitored during deposition of materials and cessation of tipping or deployment of dust suppression equipment if excessive dust observed.	3		2	**6**
		Dusty material not to be tipped during unfavourable weather conditions, eg, strong prevailing wind when hot.				
Contamination of water bodies / local environment	Environment	Analysis provided and assessed prior to waste being accepted	1		4	**4**
		Inputs of PTE's monitored as per tables 2 and 3 of the restoration plan				
		Cory's waste acceptance procedures to be followed at all times				
		Run-off managed via the surface water collection system				
		Monitoring of waste against suitable EQS				
		Routine monitoring of surface water bodies around the site.				
Physical contamination by paper / plastic etc…	Environment	Cory's waste acceptance procedures to be followed at all times	2		2	**4**
Over compaction /rutting of restoration layer	Environment	Materials to be placed in accordance with the approved methods.	3		1	**3**

(L times S = Rating)

> 14= STOP & review controls in place via an improvement plan. > 8= provide specific training &/or brief staff. < 8= risk acceptable with controls inform staff

I confirm this assessment accurately reflects the activity/ process described.		***Comments***
Date Assessed	**14/3/16**	
Assessor's Name & Title	**M Faulkner**	
Assessor's Signature		
Initials of those also involved		

Additional Control Measures Required	Responsibility	Deadline	IP Ref:

Tir John Landfill Site

Restoration Plan

I confirm I am the person responsible for ensuring the control measures are being complied with, and for implementing additional controls detailed on the improvement plan. I will inform the Compliance Department of any control measures that cannot be implemented within the timescales.		***Compliance Department Review***			
Site Manager's Name		Date:		Initials:	
Site Managers Signature		Comments:			
Date Accepted					

THIS ASSESSMENT WILL BE REVIEWED ANNUALLY & FOLLOWING IMPLEMENTATION OF ADDITONAL CONTROLS &/OR A RELEVANT ACCIDENT/ SIGNIFICANT INCIDENT

*** ENVIRONMENTAL ASSESSMENT ONLY – Considered under N = Normal A = Abnormal E = Emergency conditions**

Tir John Landfill Site

Restoration Plan

HAZARDS	Receptor	CONTROL MEASURES (incl. reference to WI's, IMS procedures, training, competencies etc)	RISK RATING (L)	N A E*	(S)	Rating
Potential for contamination by PTE's (potentially toxic elements)	Environment	All waste to be pre-approved as per Cory's waste acceptance procedures	2		2	**4**
		Inputs of PTE's monitored as per table 2 of the restoration plan				
Contamination of water bodies / local environment	Environment	Analysis provided and assessed prior to waste being accepted	2		4	**8**
		Inputs of PTE's monitored as per tables 2 and 3 of the restoration plan				
		Cory's waste acceptance procedures to be followed at all times				
		Monitoring of suitable EQS of incoming wastes				
		Routine monitoring of surface water bodies around the site.				
		Not to be tipped within 10m of any water body				
		Organic material not to be tipped directly on any slope >25 degrees				
		Run-off to be captured by surface water management system				
Odour	Local populace	Agreed methods of placement to be followed	3		2	**6**
		Odour to be continuously monitored during handling and placement				

(L times S = Rating)

> 14= STOP & review controls in place via an improvement plan. > 8= provide specific training &/or brief staff. < 8= risk acceptable with controls inform staff

I confirm this assessment accurately reflects the activity/ process described.		***Comments***
Date Assessed	**14/3/16**	
Assessor's Name & Title	**M Faulkner**	
Assessor's Signature		
Initials of those also involved		

Tir John Landfill Site

Restoration Plan

CORY ENVIRONMENTAL

Additional Control Measures Required	*Responsibility*	*Deadline*	*IP Ref:*

I confirm I am the person responsible for ensuring the control measures are being complied with, and for implementing additional controls detailed on the improvement plan. I will inform the Compliance Department of any control measures that cannot be implemented within the timescales.		***Compliance Department Review***			
Site Manager's Name		Date:		Initials:	
Site Managers Signature		Comments:			
Date Accepted					

THIS ASSESSMENT WILL BE REVIEWED ANNUALLY & FOLLOWING IMPLEMENTATION OF ADDITONAL CONTROLS &/OR A RELEVANT ACCIDENT/ SIGNIFICANT INCIDENT

*** ENVIRONMENTAL ASSESSMENT ONLY – Considered under N = Normal A = Abnormal E = Emergency conditions**

APPENDIX D

Appendix D: Determination of environmental Quality Standards

Environmental quality standards are limits of leachable contaminants as laid out in the water framework directive. For the purpose of this plan, a range of contaminants which were deemed to be the most likely to be present in waste streams being accepted for restoration were chosen. These are represented in table 1 below, along with thresholds set for the fresh water environment.

Substance	Predicted no-effect concentration (PNEC) (ugL^{-1})	Maximum allowable concentration (ugL^{-1})
Arsenic	50	
Chromium (III)	4.7	32
Chromium (VI)	3.4	
Copper	1 – Bioavailable	
Cyanide[1]	1	5
Zinc	10.9 - Bioavailable	
Cadmium	$\leq$ 0.08 (Class 1) 0.08 (Class 2) 0.09 (Class 3) 0.15 (Class 4) 0,25 (Class 5)	$\leq$ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1,5 (Class 5)
Lead	1.2 - Bioavailable	14
Manganese	123 - Bioavailable	
Mercury	0.07	
Nickel	4 - Bioavailable	34

Table 1 - Determinants subject to EQS and relevant PNEC's

Figures for copper, zinc, lead, manganese and Nickel allow for the bioavailable concentrations of these substances to be taken into account. The Bioavailability of a substance can be influenced by parameters such as pH, dissolved organic carbon and alkalinity of the receiving water bodies.
The calculations for modelling bioavailability are complex but fortunately, a tool (MBAT) is available from UKTAG.[2]

In order to determine PNEC's for the selected parameters, MBAT requires the input of some chemical data about the receiving watercourse. Six samples were taken from existing 'ecotransect' monitoring locations in Crymlyn Bog during December 2015 and analysed for pH, Dissolved organic carbon and Calcium. The median result for Doc, the mean for calcium were entered into the model, along with the average pH from the previous three years worth of monitoring data. The results were used to derive PNEC's for copper, nickel and zinc. There is currently no provision to determine a PNEC for lead.

[2] "UKTAG is a partnership of the UK environment and conservation agencies which was set up by the UK-wide WFD policy group consisting of UK government administrations. It was created to provide coordinated advice on the science and technical aspects of the European Union's Water Framework Directive (2000/60/EC)."

The PNEC for cadmium is affected by the hardness of the receiving water body. In this case class four (of water hardness) was used, which is a relatively conservative determination.

Attachments :

Microsoft Excel
Macro-Enabled Wor

MBAT data

APPENDIX E

Appendix E: Methodology for determining application rates of organic material.

- Prior to acceptance, any organic materials (category C) will be tested for organic matter, available nitrogen, phosphorous, potassium, pH and PTE's and the results used to determine suitability and rates of application of organic material.
- If organic materials are coming in the same time as other wastes, before the final profile is achieved, then from any initial and subsequent compliance analysis, a running tally of nitrogen addition will be kept so that a rate of 170kg per hectare per year can be maintained.
- If soils have been imported and the final profile achieved, then the following procedure will be observed, and application rates derived appropriately.
    1. Once soils have been placed, a minimum of 25 samples should be taken from across the area at a depth of 7.5 – 15 cm. A "W" pattern should be followed for collecting samples. These sub-samples will be thoroughly mixed to create one sample for analysis. As nitrogen degrades quickly, samples should be sent to the laboratory as soon as possible after sampling to prevent erroneous results.
    2. The area should be re-sampled after a year to determine whether further applications of organic material are warranted.