

# **SITE MANAGEMENT PLAN**

For

**CONSTRUCTION AND DEMOLITION LANDFILL  
50 LANDFILL ROAD, HAPPY VALLEY, WELLINGTON**

Prepared for:

**BURRELL DEMOLITION LIMITED and  
C & D LANDFILL LTD**

Revision 5 – August 2012

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# **1 INTRODUCTION**

## **1.1 Purpose**

This Site Management Plan (SMP) is for the Construction and Demolition Landfill (C & D Landfill) located at 50 Landfill Road, Happy Valley.

C & D Landfill is operated by Burrell Demolition Ltd and C&D Landfill Ltd.

The SMP is intended to outline the methods by which resource management compliance can be attained, not proof that such compliance has been established. As such it is a management tool by which both the site staff may operate the landfill with confidence that the conditions of the Resource Consents issued will be met, and Greater Wellington Regional Council (GWRC) and Wellington City Council (WCC) may confidently monitor the operation of the landfill and manage the operation of the lease.

This SMP is intended to demonstrate the operational management procedures that are in place to comply with the RMA through conditions of the resource consents, and the terms of the lease of the land between Burrell Demolition Limited (as Lessee) and Wellington City Council (as Lessor),

## **1.2 Scope and Objectives of Management Plan**

### **1.2.1 Scope**

This SMP has been designed as a management tool that will provide direction for the management and operation of C & D Landfill. It outlines the processes and procedures to ensure the safe, environmentally sound and cost-efficient management of the landfill.

### **1.2.2 Objectives**

The objectives of the C & D Landfill Site Management Plan are:

- To ensure compliance with all statutory requirements
- To ensure the safe and cost effective management of the site
- To ensure the maximum life span of the site is achieved
- To ensure the effective closure of the site
- To ensure the preservation and protection of the surrounding environment.
- To provide for ongoing environmental management and monitoring.

The SMP prescribes the requirements and performance standards to be met by the operation of the facility to ensure that the objectives of the SMP are achieved, with specific emphasis on the first and last of these objectives.

Specific issues to be addressed include:

- Stabilisation
- Water pollution control
- Air pollution control
- Safety
- Plant and equipment

- Dust and noise control
- The roles and interactions of the various organisations and individuals.

The SMP describes the appropriate environmental management measures and sets out environmental criteria which the performance of environmental controls and work practices can be measured against and assessed.

It also sets out monitoring regimes to check the adequacy of controls to be implemented during the landfill's lifetime and stipulates auditing of the results of those monitoring tasks.

### **1.3 The Lease Requirement**

The lease is subject to the requirement:

*"The lessee providing to the lessor, at the lessee's cost in all things, a management plan ('the management plan') for the premises, prepared by Connell Wagner. The management plan must identify the works necessary in order to make the premises fully compliant with the Resource Management Act, and must meet the reasonable requirements of the lessor's Environmental Control Business' Unit and the Wellington Regional Council. "*

The lease requirement was partially met by the submission of the C&D Landfill Management Plan prepared by Connell Wagner Limited and dated May 2000 (Reference 4761.73/tn).

Comments from Wellington City Council on the content of this Plan were contained in a letter from Stephanie Livick of Wellington District Council in a letter to Connell Wagner dated 8 June 2000.

There is further comment contained in a report (by David Grant) on Revision 1 of this document by Urban Perspectives Limited, dated 10 September 2008.

The various matters noted in those two documents have been considered and, where appropriate, have been incorporated in this revision of this Site Management Plan.

#### **1.4 Construction and Demolition Landfill**

The C & D Landfill has been operating at this site since 1978. In 1995, resource consents under WGN940057 were obtained from GWRC and WCC under the Resource Management Act 1991.

The Consents issued, together with the conditions attached to them, are included in Table 1 at Section 3 of this Management Plan.

This SMP demonstrates how compliance with these consent conditions is to be achieved.

#### **1.5 Proposals for Resource Consent**

This SMP relates both to the current C & D Landfill operation and proposals for new landfill operations as applied for under 2 separate resource consents applications.

A resource consent to extend the current landfill was applied for to GWRC and WCC. The 'expansion consent application' has the GWRC references WGN090036 [27108], [37109], [27110] and [27111] (first lodged as draft in May 2008, further information received in 2009, 2010, and 2011), and a WCC reference SR215490 (lodged 27/07/2010).

Subsequently in July 2012 resource consents from GWRC and WCC are being sought for additional landfill operation within an area described as 'Zone 4' and other matters relating to the existing landfill operation.

These proposals are located within the area of the lease held with WCC.

The future filling shown in the new consent documentation illustrates the construction of the landfill in a number of stages. It is envisaged that filling will proceed up the gully towards RL 300m in increments, with the lengths of time between each extension increasing as the floor area of the landfill increases.

The actual timing of each extension will depend on the volume of received materials over time, and the stages may be carried out either consecutively or in single stages. Multiple stages may be under construction at any time.

#### **1.6 Relationship with Existing Management Plan**

Granting of the application suite under GWRC references WGN090036 [27108], [37109], [27110] and [27111], and a WCC reference SR215490 (lodged 27/07/2010) **WGN090065** will be taken as acceptance of this Site Management Plan, superseding and replacing all previous Management Plans.

#### **1.7 Review of Site Management Plan**

The Site Management Plan will be reviewed every three years to take account of changes in regulations, operational procedures, or resource consent conditions (refer to Section 11 of this Site Management Plan for specific matters that will be included in those addressed in such a review).

A review of the Management Plan may be initiated by either Greater Wellington Regional

Council or Wellington City Council at any time, should any issues coming to the attention of the Council reasonably appear to require operational changes to be implemented at the landfill.

Copies of the reviewed Site Management Plan shall be supplied to Greater Wellington Regional Council and Wellington City Council.



## 2 REGULATORY FRAMEWORK

### 2.1 Regulatory Control

The principle legislation that applies to the operation of the Landfill is the Resource Management Act 1991.

The regulatory framework focuses on compliance with conditions of resource consents (both granted and applied for) and are attached as Appendix 1. The consents issued for the landfill are the primary controls on the on-going operation of the landfill.

Regulatory controls applicable to the operation of the Landfill include:

|   |  |
|---|--|
| National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health | Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 |
| Greater Wellington Regional Council   | Regional Plan for Discharges to Land<br>Regional Soil Plan<br>Regional Freshwater Plan<br>Regional Air Quality Management Plan                 |
| Wellington City Council   | Operative District Plan<br>C & D Landfill Lease document   |
| Health and Safety in Employment Act 1992  | Health and Safety in Employment Regulations 1995   |

### 2.2 Management Structure

The following table below sets out the parties involved in the management of the environmental effects of the landfill and their various responsibilities.

| Consent Management Structure                   |   |
|--|---|
| Party  | Responsibility  |
| Greater Wellington Regional Council            | Water and air pollution control & regulation;<br>waste management |
| Wellington City Council                        | Land use control and regulation                                   |
| Mr Alex Burrell/<br>Burrell Demolition Limited | Lease Holder  |
| C&D Landfill - Site Manager                    | Ongoing management of all landfill operations                     |
| C&D Landfill - Machinery Operator              | Daily load checking and sorting                                   |

### 2.3 Resource Consents

Resource consents confer rights to operate this landfill; they also include a number of responsibilities on C & D Landfill Ltd and Burrell Demolition Ltd, which are expressed as conditions.

The landfill has the following resource consents in place:

#### 2.3.1 Wellington City Council Resource Consent:

*[To be completed once consents have been issued]*

### **2.3.2 Greater Wellington Regional Council Resource Consents**

*[To be completed once consents have been issued]*

## **2.4 Acceptable and Unacceptable Materials**

### **2.4.1 Status of C & D Landfill**

C & D Landfill is a 'controlled' landfill in that it does not accept the casual tipping of material. Construction and demolition landfill material is typically sourced from contractual relations between Burrell Demolition Limited and land owners or building developer to take waste from construction and demolition sites. The contracts outline that the deposit of waste products is to be acceptable in terms of the Landfill SMP and that are acceptable under the resource consents. Materials not acceptable under the resource consents are not accepted within the terms of the contracts.

It is important to note that new tipping arrangements are made with demolition materials providers for 'one-off'. This arrangement occurs at the C&D Landfill main office (2 Landfill Rd) or at the tip head office. A screening process for acceptable materials is undertaken by the Demolition Material Provider and C & D Landfill Staff, and a tipping load docket with conditions to signed off on is provided before material goes onto the active landfill operations area.

### **2.4.2 Acceptable Materials**

The following materials can be accepted for disposal in the Landfill:

1. Sheet roofing material, generally in the form of galvanised steel, aluminium or zinc pre-formed sheetings, together with flashings, small quantities of which may include a lead-edge.
2. Framing timbers (both treated and untreated), generally as sawn or peeled timbers used for structural members, and timbers used in construction for formwork and shoring.
3. Small amounts of sawdust from construction
4. Wrought and cast iron
5. Steels, in the form of reinforcing rods, tendon and bar used for the pre-stressing of concrete, structural steel sections, pipe and tube
6. Galvanised structural steel section, pipe and tube
7. Concrete, in the form of plain, reinforced and pre-stressed concrete elements
8. Masonry – both brick and concrete, reinforced and un-reinforced
9. Gypsum-plaster based materials used as interior wall and ceiling materials
10. Cellulose-cement materials used as exterior sheetings or pipes
11. Cement-bonded materials used as exterior sheetings or pipes
12. Glass, in the form of glass used in buildings
13. Fibreglass insulation
14. Plastic materials used as electrical fittings
15. Plastic, ceramic and vitreous china materials used as plumbing and drainage fittings
16. Floor coverings that are fixed with adhesives to concrete or timber flooring elements
17. Excavated materials including clays, silts, and rock

18. Small quantities of topsoil's, which may include natural organic and vegetative materials
19. Non-putrescible packaging materials such as polystyrene, polythene, polyurethane and similar products
20. Polystyrene, polythene, polyurethane and similar products as building components, in all forms, as used in construction and demolition activities and for the packaging of construction products.
21. Asphalt, in the form of used road strippings – either as chip seal, plantmix or hotmix.
22. Electrical or electronic wiring removed as part of demolition operations.
23. Floor coverings, in the form of carpet, vinyl or linoleum, fixed to flooring elements.
24. Cardboard and other paper-based products used as packaging in the construction industry
25. Pink bats and insulation (part of demolition)
26. Wet Concrete (it has been a long time practice to allow the concrete trucks to tip their left over wet concrete which dries almost immediately for stabilization of roads and batters. It is all so used on the roads for pot holes etc.
27. Central Heating parts (may be found in demolition)
28. Astro Turf and Loose Carpet (we do not accept loads of Carpet, however if a large roll of carpet is found in a load – we will save for winter months to lay down under truck wheel if the surface gets too muddy.)
29. Clay and Soil Saturated (this is under unacceptable waste.) If the clay and soil are from a clean source we need to be able to accept it. If it has been raining the clay and soil will come in wet)
30. Plastic- rubbish bags, large sheets of plastic that is used to line houses, and buckets.

The following materials are proposed as acceptable materials for recycling collection;

31. Rubber tyres,
32. Glass bottles
33. Steel (in any form, won't be on site for more than six months and will be kept in a designated recycling area – we would like to include car bodies in the scrap steel/metal)

The total quantity of organic materials – trees and vegetative materials, timber, carpets, packagings etc. within the landfill materials shall not exceed 5% by weight of the landfill materials as a whole.

This new list of receivable materials shall not come into operation until new resource consents as described above are granted by GWRC and WCC.

### **2.4.3 Unacceptable Materials**

None of the following materials are to be disposed of in the Landfill:

- liquid waste
- domestic waste in the form of municipal sanitary wastes
- industrial waste
- commercial waste
- hazardous wastes
- contaminated soil
- soil or clay in a saturated condition

- trees
- garden trimmings
- any form of refrigeration or electrical equipment or plant in an assembled state that may contain PCBs or freons.
- asbestos materials that are not cement-bonded

#### **2.4.4 New Tipping Requests**

As discussed in section 2.4.1 C & D Landfill is able to accept construction and demolition waste from previously unknown tipping sources. New providers are advised by C & D Landfill as to their obligations and the process for transporting acceptable construction and demolition landfill materials to the C & D Landfill site. Requests to accept loads on a one-off basis are not a regular occurrence, and do make up the majority of construction and demolition materials volumes arriving at the C&D Landfill site. Vehicles carrying these loads are subjected to a more rigorous and specific inspection and control by C & D Landfill staff.

These vehicles will be required to report at the site office and describe the nature of the fill waste, its origin and its volume. They will then complete a docket (in triplicate) that will contain a list of acceptable and unacceptable waste and a disclaimer as to non-compliance with the terms of the docket (refer to Section 7 of this SMP). If necessary, landfill staff will inspect the load before acceptance.

If, after tipping, a load from a new construction and demolition materials source is found to contain unacceptable materials within its contents, that load will be immediately removed from the landfill site, at the expense of the originator of the load.

#### **2.5 Recycling of Materials**

Some materials are received at the Landfill are suitable for recycling as described under section 2.4.2 above (items 31, 32 and 33).

Materials for recycling are 'pushed up' for sorting by a C & D Landfill machine operator (using a loader). The commencement of sorting a recycling pile is dependent upon factors such as weather conditions, available staff, truck movements within the operational area of the Landfill, and the type of material requiring sorting. Recyclable material would be removed from the site within 6 months which is referenced in the Ministry for Environment Landfill Guidelines (1992).

Preliminary sorting will be carried out at the tip-head, the location of which will change from time to time. Once these items have been removed from the tipped material they will be stored at one side of the tiphead awaiting removal by a scrap metal merchant.

It is proposed that tyres be accepted for shredding at this site as a part of recycling collection facilities. Once shredded the tyres would be removed to another place for disposal. The details of this operation will need to be determined in the light of knowledge at the time that recycling becomes economic and will be the subject of engineering approvals as to containment and the disposal of dirty stormwater, mitigation of discharges to air and any other possible environmental impacts.

#### **2.6 Other Guidance Material**

Various publications can provide guidance in the operation of the C & D Landfill. These include:

- Ministry for the Environment "Landfill Guidelines, including landfill engineering guidelines, 1992",
- Ministry for the Environment - Basis for Landfill Classification System – Final Report - 13 November 2001
- Ministry for the Environment - Landfill Acceptance Criteria for Wastes with Hazardous Properties - Issues and Options - April 2001
- Ministry for the Environment - Land Use Planning Guide for Hazardous Facilities - A resource for local authorities and hazardous facility operators - Hazardous Facilities Screening Procedure Review Group in conjunction with the Ministry for the Environment - February 2002
- Ministry for the Environment - Health and Environmental Guidelines for Selected Timber Treatment Chemicals - Disposal of Timber Treatment Wastes to Landfills - June 1997
- The Ministry for the Environment "Landfill Guidelines, including landfill engineering guidelines, 1992"
- The Ministry for the Environment "Hazardous Waste Management Programme, Technical Working Paper, October 1999"
- US Environmental Protection Agency report "Construction and Demolition Waste Landfills" (1995)

Copies of these documents are available for the information of the C & D Landfill staff. They are provided for guidance and do not form a part of the regulatory framework.

### **3 OPERATIONAL MANAGEMENT**

#### **3.1 C & D Landfill Management Structure**

Management of the C & D Landfill site is the responsibility of Burrell Demolition Limited and C&D Landfill Ltd. Operational site management is under the control of C&D Landfill Ltd

C&D Landfill Ltd will provide a Site Manager with responsibility for the day to day operation of the landfill, including

- The receipt of materials;
- The development of the landfill, including selecting the fill to be placed in specific locations within the landfill;
- Load rejection or partial rejection;
- Acceptance or decline of non-contracted loads
- The placement of the accepted materials in the landfill;
- Determining provisions for surface water (stormwater) drainage;
- Stormwater chemical and biological monitoring;
- Dust management;
- Site rehabilitation, including pest and vermin control measures.
- The preparation, maintenance and operation of an occupational health and safety plan for all persons employed by this Contractor or who are visiting the landfill site, offices and workshops.

The occupational health and safety plan shall be in accordance with the requirements of the Health and Safety in Employment Act (1992) and Regulations (1995). A copy of this plan is kept at the Landfill Office at 2 Landfill Road, and is available freely to all employees and visitors. A copy of the Health & Safety Plan is attached under Appendix 3.

Machine operators employed by C&DLL are responsible for the sorting of the construction and demolition materials waste stream on behalf of the General Manager of C&DLL.

In addition to these staff, C&DLL also employ an assistant to the General Manager, who has responsibility for the operation of the office, record keeping, and the financial aspects of the Company's operations.

#### **3.2 Hours of Operation**

The landfill will open between the hours of 7.30AM to 5.00PM Monday to Saturday. Waste materials that need to be disposed of outside these hours will be received only in the case of operational requirement by a demolition contractor or when an emergency (such as a requirement to dispose of materials from a slip clearance) occurs.

The landfill will also be made available as required if a civil defence emergency is declared either nationally or in the Wellington Region.

#### **3.3 Training**

The Site Manager of C & D Landfill will ensure that all Landfill operations staff are familiar with the requirements of this SMP.

In particular Landfill operations staff will fully understand the methods of load checking for prohibited substances, and for fill placement procedures.

The methods for checking loads are set out in section 3.8 of this SMP will be a key matter covered in staff training sessions.

Fill Placement procedures are set out in section \_\_\_\_?

All C & D Landfill staff will be trained in matters outlined under the Health & Safety Plan and the Emergency Management Plan as attached as Appendices with this SMP.

### 3.4 Plant Requirements

Operation of the C & D Landfill require the following full time plant:

- 2 Tracked Excavator
- 1 Twin axle truck
- 3 30 tonne wheeled loaders

### 3.5 Security

A padlocked gate prevents access to the Landfill as required.

### 3.6 Signage

At C & D Landfill the use of signage is a key method for communicating important information for the efficient operation of the Landfill including;

- Criteria for the acceptance or non-acceptance of material.
- Contact information (address and phone numbers)
- Emergency response information
- Terms and conditions for use of the Landfill
- Operational zones within the Landfill



Figure 1: Sign used at the C & D Landfill main entry at 50 Landfill Rd.

Access into the Landfill is only on the basis of acceptance by the load provider of the C & D Landfill specification of acceptable materials as outlined in section 2.4 of this SMP is fully complied.

### **3.7 Noise**

The Landfill operation area is some 200m distant from Landfill Road. It is also a considerable distance from any current private residences. Noise generated from the site relates to truck movements during their travels up on to the Landfill operational area, and noise from machinery such as excavators or loaders sorting and/or placing fill material. All machinery used by C & D Landfill Ltd for landfill operations is maintained to ensure that noise levels comply the Wellington District Plan and do not create a nuisance.

The C & D Landfill operation has been assessed in terms of the actual or potential noise effects related to the proposal for the Landfill expansion. The assessment undertaken by Hegley Acoustic Consultants in March 2012 concluded that ;

*Noise from the plant associated with the proposed landfill extension has been assessed by predicting noise to the surrounding properties based on measurements of similar plant. This analysis has shown that restricting the locations where the front end loaders and excavator (but not the trucks) can deposit material during night time and on Sundays, noise from the operation, when combined with the noise from the nearby Happy Valley Landfill, will comply with the noise rules of the District Plan. Based on this, it can be concluded that the noise levels will be reasonable and that the effects of noise from the proposal will be no more than minor.*

### **3.8 Waste Stream Inspection Procedures**

The following measures will be implemented at the landfill to ensure that materials accepted for disposal in the landfill are of appropriate quality.

#### **3.8.1 Identification of Source**

The source of each load shall be clearly identified to C & D Landfill by the carrier prior to unloading the truck at the Landfill tiphead.

Waste material from the following types of site are unacceptable without testing:

- Service station site re-developments (buildings only, no fill)
- Timber treatment sites
- Chemical industry sites
- Gasworks sites
- Electrical substations

#### **3.8.2 Load Quality Checking**

Trucks are to back up to the Landfill active tipping face or designated stockpile area as directed by C & D Landfill staff. The load will be inspected by C & D Landfill staff and the truck would be cleared or not be cleared to tip as per this SMP.



Trucks will then tip their load, which will be sorted by the C & D Landfill Machine Operator in accordance with the Landfill Operation section of the SMP.

The C & D Landfill Machine Operator will make an inspection of the load for:

- Obvious staining
- Hydrocarbon or other odours
- Putrescible material
- Asbestos

If material that is not acceptable is identified by the C & D Landfill Machine Operator it will be removed and reloaded on to the truck that brought it in. If the truck has already left the site the C & D Landfill Machine Operator will contact the contractor/driver in order for the truck to return. If the carrier cannot be contacted, or will not return to the site for collection, the material will be removed from the site by C & D Landfill Ltd.

Where unacceptable material has been detected, the carrier driver and contractors details will be recorded on the incident register.

Any recyclable material for which there is a market will be separated from the fill and stored within the landfill area.

### **3.9 Tiphead Inspection Procedures**

After inspection the trucks will be permitted to tip their loads, which will be sorted by the machine operator in accordance with the Landfill Operator section of the SMP.

At this stage any recyclable materials for which there is a market will be separated from the fill and stored within the landfill site.

### **3.10 Litter Control**

The nature of the fill deposited at the landfill means that there will be very little litter created around the site. Safeguards to minimise the impact of litter associated with the Landfill are as follows:

- removing any litter from the property and neighbouring properties;
- removing litter from the access road.

Litter will be disposed of according to its type. Materials that are acceptable in this landfill will be collected and placed in the landfill, and materials that are not acceptable will be collected and removed from the site.

### **3.11 Adequate Staffing and Training**

Staffing numbers and the training of Machine Operators shall each be sufficient to ensure effective management and operation of the Landfill. The Machine Operators will be trained in all procedures required as part of this SMP. The methods for checking loads set out in section 3.8 of this SMP must be a specific subject of staff training sessions.

### **3.12 Pest and Vermin Control**

Due to the nature of the material deposited the landfill does not attract pests in numbers considered to represent a problem for the site or surrounding properties.

### **3.13 Preventing Noise Pollution**

Noise from the Landfill is to comply with the applicable WCC District Plan limit or standard and is not to be identified as a nuisance beyond the boundary of the lease area.

Noise generation from the Landfill relates to the movements of trucks depositing fill, and Landfill machinery sorting and moving fill.

An noise assessment by qualified acoustic consultants has undertaken noise modelling at the site boundaries. The assessment demonstrates that the Landfill and the proposed expansion would operate within the noise standards specified in the WCC District Plan.

## **4 EARTHWORKS AND LANDFILLING ACTIVITIES**

### **4.1 Site Preparation**

All vegetation and topsoil shall be stripped prior to filling. Bulky vegetation shall be removed but shrubs and tree ferns shall be incorporated in the stripped material to encourage soil fertility and plant development.

### **4.2 Placement and Compaction of Loads**

Construction, demolition, and cleanfill materials are to be placed at the direction of the C & D Landfill Site Manager. Separate areas may be designated for demolition material, gravels and topsoil. Stockpiles may be formed for these materials to facilitate their re-use.

The filling pattern is to be consistent with minimising the area of disturbed ground that is exposed, and to allow areas not currently in use to establish grass cover.

The filling is in a valley floor over an existing unnamed stream. The stream has been progressively culverted, as the filling area has developed. The intake of the culvert is to be kept 5m clear of the bottom of the western-sloped end of the landfill at all times. This measure is to prevent the inadvertent filling of the streambed with clean fill.

The general process of filling is in stages, as indicated on the drawings given in Appendix 2 of this SMP. The order in which the construction stages will be built will be flexible, and need not necessarily be consecutive. Further, two or more stages may be under construction at any time, and while the placement of the fill within any stage is flexible, records of where filling has been carried out each week shall be kept.

Weekly record sheets outlining the approximate position in which filling has taken place will be kept to indicate the areas of the filling. This form will be in the form of a drawing, giving the date on which the record sheet was completed, the approximate location of the active landfill place and approximate volume of fill placed as "truck measure" during that week. A different record sheet will be prepared for each stage of construction of the landfill.

All material is end dumped from trucks in layers of between 2 to 5 metres depth, which are progressively compacted by wheel and track loads (vibrating) from trucks and tracked plant.

The entirely random nature of materials deposited within the landfill does not allow for the specification of compaction criteria.

The use of hydraulic backhoes enables the fill to be sorted and placed accurately to a far greater degree than is possible using traxcavators and bulldozers.

Early consolidation and settlement will take place and will then progressively slow down. The finished levels may be progressively topped up throughout the life of the landfill.

### **4.3 Site Records**

The regulation of the activities on the site is carried out from the Site Office, which is located within the leased area and generally within sight of the tiphead and landfill operational areas.

The Site Office is of a transportable nature, and may be moved on the site from time to time. However, it is always located adjacent to the main haul road, and is clearly marked. Daily records are kept at the Site Office, and are taken to the main office in Landfill Road at the close of each day's work.

All site records are available for inspection by appropriate persons at the Landfill Road office.

#### **4.4 Demarcation of Filling area**

The extent of the consented area of the landfill is shown on the drawings included in Appendix 2 to this site management plan. The areas included in each of the construction stages will be marked by survey, including offset pegs or marks from which the location of and lost marks can be re-established.

This survey will form the basis of the filling records plan sheets referred to in Section 4.2 of this SMP.

The filling work will be carried out only within the areas defined.

The machine operator will be made aware of these areas and will carry out the landfilling in such a way as to control the northern, southern and western-boundaries of the consented landfill area.

#### **4.5 Height of Lifts**

The height of any lift is dependent upon the nature of the material at the time of tipping. The fill is progressively benched as it increases in depth. The maximum height of new fill will be 5 to 7m although this will on occasion be exceeded if long concrete members are end dumped.

The maximum length of these members shall not exceed 10 metres.

#### **4.6 Access Roads**

The landfill is accessed via a central main access road with a rising gradient of approximately 1:10. It is concreted from Landfill Road to the site office. There is an edge drain along the south edge of this road that drains down to Landfill Road, and where necessary there are culverts under the road that connect to drains on the opposing side of the road. These drains lead to the stormwater disposal system on the site.

Within the main tipping area there are metalled tracks developed as necessary. These are also generally at 1:10 to limit wheel spin, particularly for articulated vehicles. These tracks are metalled as necessary to prevent surface churning and rutting which lead on to mud problems.

When the access tracks are no longer needed they shall be rehabilitated by covering with fill to achieve levels and gradients compatible with the surrounding finished landfill surfaces and rehabilitated as set out in Section 9 of this SMP.

A "permanent" metalled access track will be established through the rehabilitated area to

enable traffic to access further stages of the landfill, and rehabilitation work will include the metalling and grading of this access road. While gradients for landfill traffic will generally not exceed 1:10 the landfill, after rehabilitation, will not require this restriction and access road gradients of 1:6 will be permitted.

## **4.7 Compaction**

### **4.7.1 Method of Compaction**

The fill material is compacted by the hydraulic excavator used on the site, by the passage of loaded trucks across the fill areas, and by natural consolidation. The nature of the filling tends to allow the formation of voids under sheet materials; these may not be completely removed during compaction but will compact due to failure of the sheetings as further filling materials are placed over them. Natural consolidation will also result in increasing density of the landfill as interstitial voids are "squeezed" by the materials above them.

The dynamic nature of the hydraulically driven tracks on the backhoe encourage the smaller fill items to migrate into the voids left by larger, non compressible materials in close proximity to each other.

The natural consolidation process may take considerable time, and over that time batter slopes that may originally have been quite steep will relax to less steep angles.

### **4.7.2 Filling, Cover and Runoff**

During the filling, greywacke required for roading, covering and blinding of the fill will be excavated from original ground within the C & D landfill area as required.

Material can be removed as required provided that permanent cut batter faces shall not be greater than 50 metres high without benching, cut batter slopes shall not exceed 90° and benches shall not be less than 5 metres wide. It is noted that the operation will require substantial volumes of cover material and that such material will be taken from new areas to be covered. Fill batter slopes within the landfill will vary.

Where fill material is wholly or predominantly sourced from reinforced concrete components it may be placed with a face as steep as 90° from the horizontal i.e. similar to those found in competent but fractured greywacke slopes. Note that the faces of the landfill that face Landfill Road are examples of this type of landfill construction.

Normal mixed material faces are required to be at 80% (nominal) to allow for the free flow of further deposited materials. Unless tipped material can flow there is a risk of the creation of voids within the fill or a need, which would be dangerous, to undermine the tipping face creating a collapse to lower levels.

Finished faces in other demolition materials will be 1:2 or approximately 30° after long-term settlements have taken place. These values should be reduced to 1:3 or 20° after long-term settlements have taken place if the cleanfill consists solely of soil, clay (or other fine grained material). Such a situation should, however, be avoided and concrete rubble covered with greywacke/surface soil should be placed on the fill batters to a minimum layer width of 5 metres.

All fill will be end tipped and moved using a tracked backhoe or similar plant. Fill levels may exceed the existing Resource Consent level of RL 165.0m temporarily until new Resource Consents are granted.

The Landfill Operator will visually monitor the slopes each working day, and more frequently during periods of heavy rain. Any slopes that show signs of instability – particularly cracking in the surface at the top of the slope or small failure circles shall be immediately graded to reduce the temporary slope to a stable slope.

In the foregoing the term “long-term” shall apply to slopes that have been in place for more than three years. Where such slopes have not reached these finished face batters after a period of three years of landfill consolidation they shall be re-cut to provide permanent batter slopes in accordance with the above.

The landfill is, with the exception of the slopes that face Landfill Road and the land below them, graded to the rear of the landfill. This area contains settlement ponds and a culvert inlet structure that will entrain larger items of rubbish – particularly those transported by wind and rain in the area, before it can be discharged into the culvert where it might cause blockage.

The culvert inlet structure (see 5.7 below) and settlement ponds are to be inspected not less than every second day, and more frequently during periods of heavy rain, and the rubbish removed to ensure free flow through the inlet structure. The settlement ponds shall be cleaned out by a loader or digger as debris and silts accumulate in them, and the silts placed safely in the landfill. Debris shall be sorted and may be placed in the landfill if the materials are consistent with those listed as acceptable in this SMP.

#### **4.8 Screening of Landfill Operations**

The Eastern edges of completed areas will be shaped to form bunds to act as visual barriers from Landfill Road.

These bunds will be of a temporary nature, shall be formed from selected demolition material and shall have a height of approximately 3 metres and batters not steeper than 1.5 horizontal to 1 vertical.

The bunds may form part of the staged construction or may be removed prior to the rehabilitation of each stage.

#### **4.9 Final Cover**

Final cover materials shall be generally topsoils with some rock, concrete and clays being permissible in the lower parts.

It is expected that this material will generally be sourced from site clearance and slip clearance works, and that it may contain some organic materials such as trees, shrubs and grasses.

The soils may be amended by the addition of tree shavings, sawdust and shavings from untreated timbers, post peelings, and other organic materials, and for the purposes of

compliance the 5% by weight limit on untreated timber and other organic materials applicable in the landfill materials shall not apply to the final cover materials.

#### **4.10 Rehabilitation**

Rehabilitation will be carried out progressively as indicated in the Landfill Rehabilitation Plan contained in Section 9 of this SMP.

## **5 STORMWATER MANAGEMENT**

### **5.1 Stormwater Management Plan**

Burrell Demolition Ltd and C&D Landfill Ltd operate a construction and demolition landfill at 50 Landfill Road, Happy Valley, Wellington.

Future development of the site relates to a proposal for the continued landfilling of the valley above an existing culvert that acts as the primary path for stormwater from above the landfill. Filling above the culvert will add substantially to the life of the landfill, providing a long term disposal option for the region for construction and demolition waste and will reduce the risk posed by reliance on the existing culvert to manage stormwater on the site.

Future development aims to create an additional 3.5M m<sup>3</sup> of airspace to be filled over a period of perhaps 40 years. Development will occur in up to 13 stages.

As well as extending the life of the landfill the current proposal will also mitigate some of the risk associated with reliance on the 900mm culvert pipe under the landfill that is presently the only control of stormwater arising higher in the landfill catchment. The applicants seek to extend landfilling up the valley extending and covering the culvert to create a final landform that will result in the direction of stormwater into defined overland flow paths. Creating overland flow will progressively relieve reliance on the culvert system.

All stormwater management systems will be designed, constructed and operated to comply with relevant guidelines particularly ARC TP 90, TP 108, TP 10 and the requirements of existing consents and any future consents which may be granted.

Stormwater practices on site will be managed to:

- (i) minimise erosion on site
- (ii) minimise areas of exposed soil
- (iii) minimise silt and sediment movement from the site
- (iv) minimise contamination of natural water sources
- (v) minimise stormwater damage to tracks, roads, drains, haul road and other infrastructure
- (vi) control infiltration into the landfill
- (vii) maximise diversion from areas outside the landfill operational areas
- (viii) allow for future settlement of the landfill

The control of stormwater will be achieved by establishing and maintaining

- (i) control works to separate at source clean and dirty stormwater
- (ii) open drains to intercept stormwater and minimise erosion
- (iii) ponds and wetlands to retain stormwater and allow sediment control
- (iv) perimeter drains around the landfill

### **5.2 Consent Requirements**

#### **5.2.1 Resource Consent Requirements**



The stormwater discharge consents set out a range of conditions for stormwater management on site. Special conditions WGN 940057(01) 11, 19, 20,21, 22, 23,24; WGN 940057(02) 11, 12; WGN 940057(03) 10, 11, 14, 15, 16, 18 19 and 20 are relevant to this report.

| Condition         | Description  |
|-------------------|--|
| WGN 940057(01) 11 | The consent holder within three months of the first exercise of the consent, construct stormwater drainages to divert surface water around the cleanfill   |
| 19                | The discharge of waste on to land from C&D landfill shall not result in (defined) effects in the unnamed tributary of Carey's stream above or below the landfill   |
| 20                | The consent holder shall carry out regular inspections following times of moderate to heavy rain for compliance with condition 19  |
| 21, 22, 23, 24    | The consent holder will undertake a monitoring programme at defined points and for defined parameters to test water quality and if there is significant increase in parameters over time undertake remedial action and report to the Wellington Regional Council |
| WGN 940057(02) 11 | Construction activities to be carried out with as little disturbance to the stream channel as possible   |
| 12                | Any erosion of the stream bed or bank as part of the diversion works will be repaired by the consent holder  |
| WGN 940057(03) 10 | The culverts shall be constructed in accordance with best engineering practice and the manufacturers specifications  |
| 11                | See WGN 940057(02) above   |
| 14                | Works to be confirmed to have been constructed in accordance with design plans/drawings by a suitably qualified person   |
| 15                | The culvert to be laid to existing stream grade as much as possible  |
| 16                | See WGN 940057(02) 12 above  |
| 18                | The consent holder will carry out regular inspections of the culvert inlet and grillage  |
| 19                | See WGN 940057(01) 11 above  |
| 20                | The culvert shall be adequately maintained to perform as designed. Any damage to the culvert from flood flow to be repaired at the consent holders cost.   |

### 5.3 Technical requirements

#### 5.3.1 General

Landfilling will occur to complete the proposed landforms that will provide overland flow paths for stormwater.

At the completion of each stage stormwater will be directed away from the working areas of the landfill to a rock-lined overland flow channel drain and into a stormwater retention pond as shown generally on drawing 9402/01 before discharging into the main tributary (via an energy dissipater).

On completion of the landfill the retention pond will be removed and stormwater will flow directly through the energy dissipater into the main outfall. In the process of filling each

stage cut-off drains at the base of the working face will direct stormwater to temporary silt control ponds before discharging into the culvert.

The detailed design of the culvert extension, overland flow channels and energy dissipater (which is seen as a stilling basin) will be carried out by a Chartered Professional Engineer and shall be approved by Wellington City Council prior to the commencement of construction. This design work may be carried out and submitted for approval in stages.

### 5.3.2 Stormwater quantities

The landfill lies within a catchment of about 83.1 hectares, made up as follows:

| Sub-catchment | Area<br>(Ha) |
|---------------|--------------|
| 1             | 11.6         |
| 2             | 17.0         |
| 3             | 20.5         |
| 4             | 10.8         |
| 5             | 6.1          |
| 6             | 11.3         |
| 7             | 5.7          |
| Total Area    | 83.1 Ha      |

Much of the land is comparatively steep, with natural gradients on the hills perhaps as steep as 40%, and the average gradient on the existing stream bed is of the order of 20%.

The catchment has an area of about 83 ha, and is divided into 7 sub-catchments (refer drawing 9402/01).

The overland flow paths lie at the northern and southern sides of the proposed landfill.

Sub-catchments 1, 2 and part of sub-catchment 3 feed to the southern branch, and the remainder of sub-catchment 3 and sub-catchments 4 to 7 inclusive feed to the northern branch.

Auckland Regional Authority Technical Publication TP 108 "Guidelines for Stormwater Modelling in the Auckland Region" has been used to assess stormwater volume in the catchment.

This document is seen as fairly directly transferable to the Wellington Region for the type of subsurface materials in the natural ground and the nature of the soils and growth likely to occur as the rehabilitated landfill final cover.

NIWA HIRDS V2 software has been used as the means of determining precipitation in the catchment. The 24 hour rainfall depths for 2, 10 and 100 year ARI storm events are:

| ARI<br>(yrs) | Duration<br>24h<br>(mm) |
|--------------|-------------------------|
| 2            | 57.8                    |
| 10           | 75.6                    |
| 100          | 126.6                   |

An increase of 20% has been used to make allowance for the effects of climate change, leading to rainfall depths of

| ARI<br>(yrs) | Duration<br>24h<br>(mm) |
|--------------|-------------------------|
| 2            | 69.4                    |
| 10           | 90.7                    |
| 100          | 151.9                   |

The data provided in TP108 Table 3.2 suggests that the SCS Hydrological Soil Groups for the natural valley are Group C (weathered mudstone and sandstone). Note that the presence of faulting in this material will provide some additional infiltration. Table 2.2c for "Woods" (taken to include scrub) in good condition indicates Runoff Curve No 70.

For the landfill final cover, Table 2.2c for "Brush-brush-weed-grass mixture with brush the major element" in "fair" condition (ie 50 – 75% ground cover) curve number 70 is also indicated. This is not seen as very sensitive as, for "good" condition (>75% cover) curve number 65 is indicated, and for mown meadows curve number 71 is indicated.

From Curve number 70 with rainfall depths as above the runoff depths for a 24 hour storm event are:

| ARI<br>(yrs) | Runoff<br>24h<br>(mm) |
|--------------|-----------------------|
| 2            | 25                    |
| 10           | 45                    |
| 100          | 85                    |

The time of concentration may be calculated as:

$$tc = 0.14CL^{0.66} (CN/(200-CN))^{-0.550} S_c^{-3.0}$$

|      |   |         |
|------|---|---------|
| C=   | channelisation factor - TP108 table 4.2 = | 0.8     |
| L=   | length of catchment in km =               | 0.94 km |
| CN = | SCS curve number =                        | 70      |
| Sc = | catchment slope                           | 0.176   |

hence  $tc = 0.25$  hrs = 15.3 minutes

Time to peak for unit hydrograph = 10.1 minutes

As the time to peak flow is taken as about 10 minutes the SCS Unit Hydrograph shows a total storm length of 5 times the peak flow, leading to minimum critical storm duration of 50.5 minutes.

The 10 year ARI 24-hour storm event hydrograph determined from the SCS Unit Hydrograph is as follows:

For SCS unit hydrograph:  
 24 hour 10 year  
 ARI  
 From TP108 table  
 4.1

| t/t <sub>p</sub> | q/q <sub>p</sub> | time<br>(minutes) | Area under<br>unit<br>hydrograph | Total<br>Flow<br>m <sup>3</sup> | Total<br>Flow<br>Rate<br>cumecs |
|------------------|------------------|-------------------|----------------------------------|---------------------------------|---------------------------------|
| 0.1              | 0.03             | 28.8              | 0.0015                           | 42.0                            | 0.0                             |
| 0.2              | 0.1              | 57.6              | 0.0065                           | 181.9                           | 0.1                             |
| 0.3              | 0.19             | 86.4              | 0.0145                           | 405.9                           | 0.2                             |
| 0.4              | 0.31             | 115.2             | 0.0250                           | 699.8                           | 0.4                             |
| 0.5              | 0.47             | 144               | 0.0390                           | 1091.7                          | 0.6                             |
| 0.6              | 0.66             | 172.8             | 0.0565                           | 1581.6                          | 0.9                             |
| 0.7              | 0.82             | 201.6             | 0.0740                           | 2071.4                          | 1.2                             |
| 0.8              | 0.93             | 230.4             | 0.0875                           | 2449.3                          | 1.4                             |
| 0.9              | 0.99             | 259.2             | 0.0960                           | 2687.2                          | 1.6                             |
| 1                | 1                | 288               | 0.0995                           | 2785.2                          | 1.6                             |
| 1.1              | 0.99             | 316.8             | 0.0995                           | 2785.2                          | 1.6                             |
| 1.2              | 0.93             | 345.6             | 0.0960                           | 2687.2                          | 1.6                             |
| 1.3              | 0.86             | 374.4             | 0.0895                           | 2505.3                          | 1.4                             |
| 1.4              | 0.78             | 403.2             | 0.0820                           | 2295.4                          | 1.3                             |
| 1.5              | 0.68             | 432               | 0.0730                           | 2043.4                          | 1.2                             |
| 1.6              | 0.56             | 460.8             | 0.0620                           | 1735.5                          | 1.0                             |
| 1.7              | 0.46             | 489.6             | 0.0510                           | 1427.6                          | 0.8                             |
| 1.8              | 0.39             | 518.4             | 0.0425                           | 1189.7                          | 0.7                             |
| 1.9              | 0.33             | 547.2             | 0.0360                           | 1007.7                          | 0.6                             |
| 2                | 0.28             | 576               | 0.0305                           | 853.8                           | 0.5                             |
| 2.2              | 0.207            | 633.6             | 0.0487                           | 1363.2                          | 0.4                             |
| 2.4              | 0.147            | 691.2             | 0.0354                           | 990.9                           | 0.3                             |
| 2.6              | 0.107            | 748.8             | 0.0254                           | 711.0                           | 0.2                             |
| 2.8              | 0.077            | 806.4             | 0.0184                           | 515.1                           | 0.1                             |
| 3                | 0.055            | 864               | 0.0132                           | 369.5                           | 0.1                             |
| 3.2              | 0.04             | 921.6             | 0.0095                           | 265.9                           | 0.1                             |
| 3.4              | 0.029            | 979.2             | 0.0069                           | 193.1                           | 0.1                             |
| 3.6              | 0.021            | 1036.8            | 0.0050                           | 140.0                           | 0.0                             |
| 3.8              | 0.015            | 1094.4            | 0.0036                           | 100.8                           | 0.0                             |
| 4                | 0.011            | 1152              | 0.0026                           | 72.8                            | 0.0                             |
| 4.5              | 0.005            | 1296              | 0.0040                           | 112.0                           | 0.0                             |
| 5                | 0                | 1440              | 0.0013                           | 35.0                            | 0.0                             |
| Totals           |                  |                   | 1.33595                          | 37396.01                        |                                 |
| Peak flow rate   |                  |                   |                                  |                                 | 1.612                           |

The sub-catchment flows are:

Sub-catchment flows for 24 hour 10 year ARI storm event

| Sub-catchment No. | Area m <sup>2</sup> | Flow (m <sup>3</sup> ) | Flow rate (cumecs) |
|-------------------|---------------------|------------------------|--------------------|
| 1                 | 116189              | 5228                   | 0.23               |
| 2                 | 170419              | 7669                   | 0.33               |
| 3                 | 205203              | 9234                   | 0.40               |
| 4                 | 108432              | 4879                   | 0.21               |
| 5                 | 61246               | 2756                   | 0.12               |
| 6                 | 112930              | 5082                   | 0.22               |
| 7                 | 56604               | 2547                   | 0.11               |
| Totals            | 831023              | 37396                  | 1.61               |

#### 5.4 Design of overland flow channel

Two design elements have been considered:

- Route Selection, and
- Hydraulic considerations

Comments on these considerations are:

##### 5.4.1 Route selection

The route selected meanders about the centreline of the final landfill cover in plan. This route has been chosen to present approximately equal falls from the landfill edges at constant gradients to ensure that positive drainage of the landfill final surfaces is available and to provide the environmental conditions that will permit habitation by koaro.

The stream channel will be generally built in clays, consolidated using rubber-tyred construction equipment, and lined with rock to provide erosion resistance and a simulation of natural habitat for the koaro.

Because of the nature of the filling materials and the use of natural consolidation (as opposed to controlled engineering fill placement and compaction) within the landfill construction, it is considered likely that there will be some areas where uncontrolled settlements may lead to the formation of ponds – these are not considered out of character in the context of this stream.

There will inevitably be some infiltration of stormwater into the landfill from this channel design – this is to some extent unavoidable and it is considered that the plantings proposed around the stream will provide some evapotranspiration of groundwater, and that evaporation from other areas will deal with the balance of the groundwater over time.

##### 5.4.2 Hydraulic considerations in overland flow channels:

The greatest flow rate in the overland flow channels is calculated above at 0.87 cumecs.

The channel design assumed is a trapezoidal section as shown on the drawings

Justification of this section is undertaken in two conditions:

- (1) New channel, and
- (2) Aged channel with silt allowing weed growth to impede the flows.

Design justification has been undertaken in terms of Auckland Regional Council Technical Publication TP10.

For flow in trapezoidal open channel, generally to ARC TP10 Section 9.6.2:

|  |       |  |             |
|--|-------|--|-------------|
| (a) New Channel, with no grass growth and invert width |       | 2.5 metres   |             |
| side slopes at 1.5:1 and water depth                   |       | 1.55 metres  |             |
| take Manning's n =                                     | 0.7   | (for rock - range of values 0.04 - 0.07 - Chow 1959) |             |
| b =  | 2.5   | m  |             |
| Z =  | 2.00  |  |             |
| d =  | 1.9   | m  |             |
| Cross sectional area =                                 | 11.97 | square metres  |             |
| Hydraulic mean radius =                                | 2.01  | metres   |             |
| Initial hydraulic gradient =                           | 1.0%  |  |             |
| Flow in channel  | 2.65  | cubic metres/sec                                     | (> 1.61 OK) |
| velocity =   | 0.22  | metres/sec   |             |

|  |           |   |             |
|--|-----------|---|-------------|
| (b) For aged channel, with grass growth greater than 150 mm and water depth greater than 60 mm |           |   |             |
| width and depth of channel degraded by silt  | 0.2       | metres each side and at invert due to silting |             |
| take Manning's n =   | 0.0029739 | From TP 10 formula                            |             |
| b =  | 2.1       | m   |             |
| Z =  | 2.00      |   |             |
| d =  | 1.7       | m   |             |
| Cross sectional area =   | 9.35      | square metres                                 |             |
| Hydraulic mean radius =  | 1.68      | metres  |             |
| Initial hydraulic gradient =   | 6.250%    |   |             |
| Flow in channel  | 1110.98   | cubic metres/sec                              | (> 0.87 OK) |
| velocity =   | 118.82    | metres/sec                                    |             |
| implies use channel with invert  |           |   |             |
| width  | 2.5       | m   |             |
| overall depth greater than   | 2         | m   |             |

### 5.4.3 Detention requirements

As the SCS Curve Number is approximately the same for both the original and developed catchment and the gradients remain fairly consistent the pre- and post-development flow rates will also be consistent and therefore no detention of stormwater is indicated.

#### 5.4.4 Capacity of existing 900mm diameter culvert

The capacity of the existing 900mm diameter culvert has been estimated using CPAA publication "Hydraulics of Precast Concrete Conduits" – Colebrook-White formula with  $k = 0.6\text{mm}$ . For a 10% gradient the indicated flow is about 6200 litres/second (6.2 cumecs). This is considerably higher than the indicated maximum flow from the catchment (1.61 cumecs) and stormwater flows will reduce over time as the catchment flows are progressively diverted into the overland flow channels.

Given that the landfill extension will be built in stages that may not be consecutive as to stage number as shown on the drawings, and that multiple non-consecutive stages may be built concurrently, the un-rehabilitated area may be large, and in this case the silt and erosion control measures shall be proportioned according to either Auckland Regional Council Technical Publications TP10 or TP 108 as applicable.

Completed areas of the landfill will be rehabilitated by planting as filling is completed. As a result the area subject to a requirement for silt and erosion control will be limited to approximately 30 hectares.

The original catchment areas that are undisturbed by landfill operations are considered to be comparatively stable in silt and erosion control terms, and are unlikely therefore to contribute to the silt load carried by surface water runoff.

#### 5.4.5 Culvert inlet

The Aurecon New Zealand Ltd Geotechnical Engineering Report – Stability C&D landfill, Landfill Road, Happy Valley Wellington – July 2009 (Appendix 3) indicates a potential threat of blockage of the culvert intake (drawing 270910/04).

The report acknowledges that present management recognise this risk by having machinery permanently available to clear any blockages but suggests that in the event of a major seismic or weather event a risk remains of flooding of the basin and consequent increases in groundwater and ultimately emission onto the main access below. The key considerations of the report concern a need to rectify the vulnerability of the deep hole surrounding the culvert intake and providing secondary flow paths from the main valley. To this end it is proposed to:

- Incorporate a secondary flow path down one margin of the fill and slope benches towards the new drainage course. The secondary flow paths will be shallow channels on one side of the fill. Where flow paths down fill faces are required, non erodable structures such as pipes, fluming etc will be used
- As stated above permanent cut batters to be no more than  $70^{\circ}$  from horizontal, increments of no more than 10m with benches 5m width.
- At the extension of the culvert up to the west valley branch lines will connect with the main secondary valleys. Where the branch lines enter the valleys and there is to be no further filling permanent intake structures will be built and debris/trash screens constructed approximately 10m upstream to catch larger debris that may periodically fall.
- On infilling of the deep hole above the existing culvert may be moved up slope and a manhole/overflow inlet built vertically above and raised successively with increased filling. This will be used as a temporary/emergency flow path until filling

can enable a secondary flow path to the east. This will require detailed engineering assessment to ensure efficient culvert performance. Similarly, any extension of the main culvert up the valley will be accompanied by subsoil drains to draw any groundwater and thereby maintain stability.

Note: these initiatives will require detailing by appropriate professionals.

## 5.5 Sediment & erosion control

### 5.5.1 Typical details

The area delineated as Stage 1 of the landfill development has been taken as typical of the development as a whole, and the typical details for any stage are indicated in this Section of this SMP.

Stage 1 of the landfill development extends the culvert approximately 49m up the valley. Once the culvert is laid fill and cover material is compacted to create a fall towards a temporary silt retention pond as shown in fig 2 – 4 below. As filling continues up the valley stormwater from the base of the working face is directed to the silt ponds as shown below. On completion of the stage the landfill is crowned and capped to divert stormwater to permanent perimeter channels and filling will commence on the next stage to create flow paths to a new retention pond

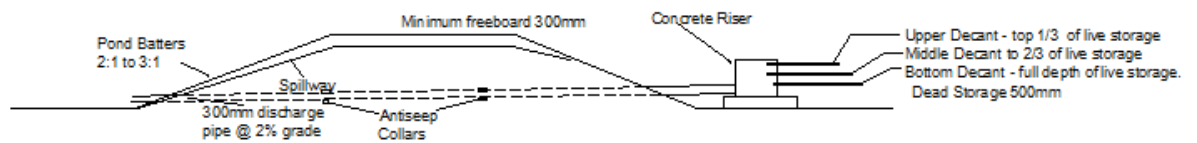


Fig 1 Typical stormwater detention pond

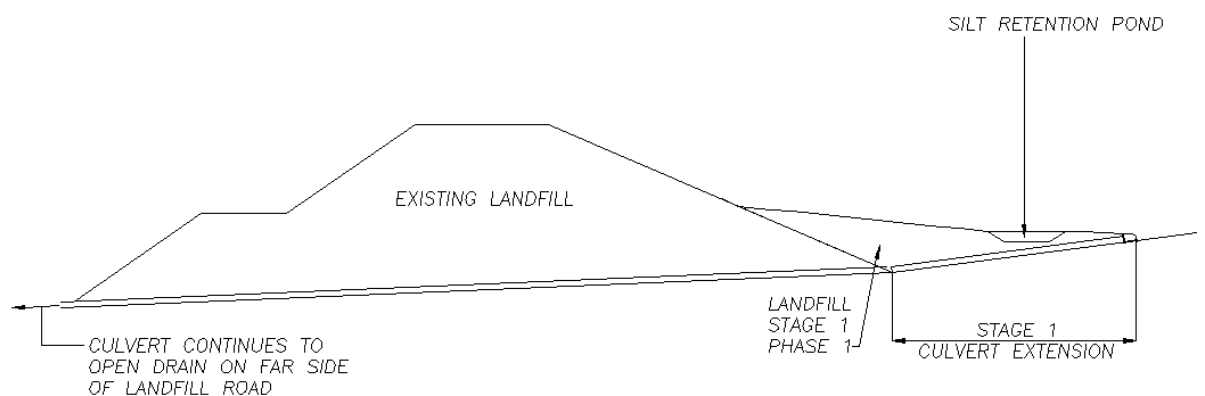


Fig 2 Culvert extension and placement of phase one filling – Landfill extension stage 1



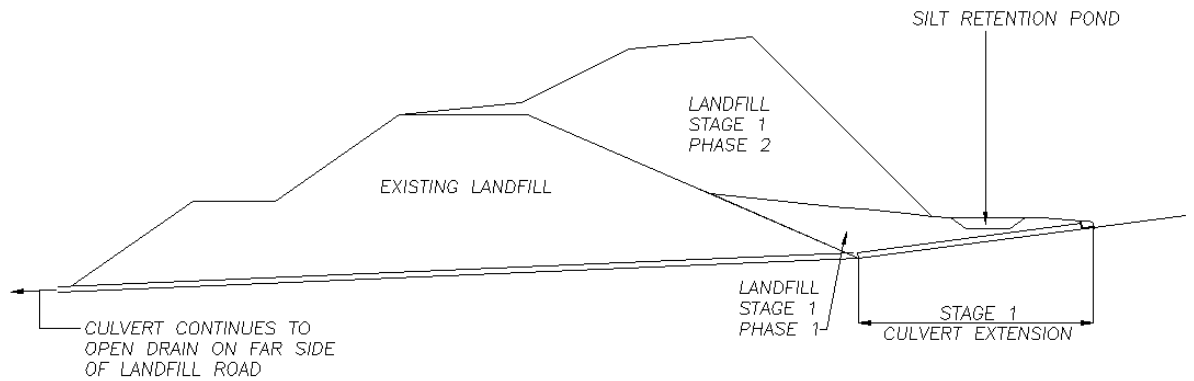


Fig 3 Completion of phase 2 filling ready for Stage 2 construction

Where multiple stages are built the stormwater diversion and silt retention systems shall be designed and built in accordance with the requirements of Auckland Regional Council Technical Publications TP 10 and/or TP108 as appropriate.

### 5.5.2 Sediment retention pond design

Preliminary sizing of the silt retention ponds has been carried out in accordance with the recommendations of ARC TP 90, based on a minimum volume of 3% of the contributing catchment area and side slopes of 1.5 horizontal to 1 vertical. Pond sizes for each stage are as follows:

| Stage | Stage Area (m <sup>2</sup> ) | Required Pond Capacity (m <sup>3</sup> ) | Base Size (m) |            | Depth (m) | Pond Volume (m <sup>3</sup> ) |
|-------|------------------------------|--|---------------|------------|-----------|-------------------------------|
|       |                              |  | width (m)     | length (m) |           |                               |
| 1     | 8280                         | 248                                      | 4             | 16         | 2         | 266                           |
| 2     | 13080                        | 392                                      | 5             | 22         | 2         | 400                           |
| 3     | 20300                        | 609                                      | 7.5           | 27         | 2         | 630                           |
| 4     | 18857                        | 565                                      | 7             | 26         | 2         | 580                           |
| 5     | 17034                        | 511                                      | 6.5           | 25         | 2         | 532                           |
| 6     | 18643                        | 559                                      | 7             | 25         | 2         | 560                           |
| 7     | 8979                         | 269                                      | 4             | 17         | 2         | 280                           |
| 8     | 12690                        | 380                                      | 5             | 21         | 2         | 384                           |
| 9     | 13924                        | 417                                      | 5.5           | 23         | 2         | 442                           |
| 10    | 16524                        | 495                                      | 6             | 25         | 2         | 504                           |
| 11    | 4410                         | 132                                      | 2             | 12         | 2         | 150                           |
| 12    | 11250                        | 337                                      | 5             | 20         | 2         | 368                           |
| 13    | 18988                        | 569                                      | 7             | 26         | 2         | 580                           |

This preliminary sizing will need to be confirmed as the actual un-rehabilitated area contained in each stage is determined by survey as work on each stage of the landfill commences.

## **5.6 Water Quality Monitoring**

### **5.6.1 Surface Water Controls**

Minor water seepage areas represent areas where the ground water table emerges on the ground surface. Such seepages should be noted on a plan and observed during and after heavy rainfall. Where significant discharge occurs from 'springs' at these seepage points, a 'supplementary' subsoil drain should be constructed connecting the spring to the main subsoil drain via edge drains down to the main landfill surface water drainage system.

The finished platform will be graded at 1:100 to the edges as appropriate. The Western platform will be channelled down to the headwaters of the culvert. The southern platform will be drained to the North East and hence by open channel to a silt trap at the gate to the landfill, the discharge from this being directed into the existing runoff drainage down the western edge of Landfill Road.

### **5.6.2 Groundwater Monitoring**

The Greater Wellington Regional Council Resource Consent for Discharge of contaminants to land requires that at least one representative groundwater sample point be monitored for leachate quality.

The seep at the toe of the landfill, identified on page 16 of C&D Landfill's Fourth Schedule Assessment of Environmental Effects as a sampling location, has been monitored quarterly since 23 February 1999.

The Greater Wellington Regional Council Resource Consent for Discharge of contaminants to land requires that groundwater monitoring be carried out quarterly for the first year and annually thereafter.

Groundwater sampling from the southern platform is therefore carried out annually, in accordance with the conditions of this Consent.

Groundwater samples are monitored for the following parameters:

- pH
- Conductivity
- Alkalinity
- COD
- Iron
- Manganese
- Lead
- Copper
- Zinc

There has not been any significant increase in any of the parameters over time. The groundwater monitoring results to date appear to be regarded as satisfactory by the Greater Wellington Regional Council.

## **5.7 Environmental Considerations for Aquatic Fauna**

There are particular considerations for the design of pools to ensure that aquatic fauna are able to reinhabit the overland flow channel system and prosper.

Further requirements of the design are given in the Rehabilitation Plan.

## **5.8 Conclusion**

Sediment control ponds and diversion channels/bunds have been designed to ensure that contaminated stormwater is treated to remove suspended solids for anticipated rainfall events.

The stormwater system is designed to minimise infiltration in to the landfill by diverting rainfall to perimeter channels that will drain to a retention pond while the site is an active landfill before discharging clean stormwater in to the lower part of the catchment. Working areas will be kept as practically small as possible to minimise exposed areas of soil and each working stage will have temporary retention ponds to minimise silt contamination of the unnamed tributary of Carey's stream. Rehabilitation will proceed as soon as practically possible following the completion of each stage. These measures are designed to minimise the amount of suspended solids that can leave the site.

## **6 AIR QUALITY MANAGEMENT**

### **6.1 Air Quality Management Plan**

Air quality management on site shall be in strict accordance with the following Air Quality Management Plan.

**Burrell Demolition Limited  
Construction and Demolition Landfill  
Landfill Road  
Happy Valley  
Wellington**

**Air Quality Management Plan**

**Comment:**

This Air Quality Management Plan forms Section 6 of the Site Management Plan.

## **1 Introduction**

Burrell Demolition Limited (“the Owner”) operate a construction and demolition materials landfill on land owned by Wellington City Council at Landfill Road, Happy Valley, Wellington.

This Air Quality Management Plan outlines steps to be taken to prevent air pollution in the form of dust or odour arising from the landfilling activity on this site from escaping beyond the boundaries of the site.

### **1.2 Dust Management on Site**

The management of dust on the subject properties is achieved by:

- The maintenance of access roads and haul roads on site. This includes the periodic metalling of the main access road from Landfill Road from the main gate at the boundary of the property to the tip head.
- This road is also graded periodically to ensure that the formation of ruts and potholes is kept to a minimum.
- The use of a water cart during dry weather to keep access and haul roads damp.
- The use of rubber-wheeled excavation and loading equipment to ensure that the construction and demolition landfill is kept in a compact condition with minimum specific surface disturbance.
- Stockpiles and overburden are excavated at natural moisture content and finished exposed faces are re-vegetated as quickly as weather and germination conditions allow.
- Vehicle speed signs have been erected on the access roads and are strictly enforced. Haul roads are used by permanent staff and vehicle speeds are limited to below 30 km/hour for operational safety.
- The major contracting companies visiting the site are aware of the need to keep vehicle speeds and respect the speed limit requirements.
- The site is kept under continuous surveillance during operational hours and steps are taken by ordering the use of a water cart or alternative routes as available to ensure that dust nuisance does not occur.
- The equipment used is kept clean and maintained in first class operating condition.

The following control measures will be implemented to manage potential off-site impacts of dust from the landfill:

- the unsealed road will be sprayed with water at a frequency determined by wind conditions (particularly in summer);
- during high wind events, the Machine Operator will be required to manage the tipping of waste to ensure that off-site dust migration is minimised:

### **1.3 Dust Monitoring and Reporting**

There are no requirements for dust monitoring under existing Resource Consent Applications.

If dust monitors are required they shall be Envco Atmospheric Deposition Gauges or equivalent Atmospheric Deposition Gauges, Particulate Fallout, and Precipitation Collectors

that have been developed to collect representative samples of dry and wet atmospheric particulate fallout for subsequent analysis.

The design of the collectors is based on an evaluation of similar equipment in use in various countries, including available wet precipitation collectors for meteorological purposes. In addition to the given performance criteria, factors such as construction materials, ease of handling and transportability determined the shape and dimensions of the collectors. The Fallout Collector has been considered by ISO (International Standardization Organization) for adoption as an international reference collector for particulate fallout. Its design is according to the recommendations of ISO as the present use of materials and procedures permit (ISO/DIS 4222.2).

Gauge Specifications:

The material used for the collectors shall be high density polyethylene, and the mounting stand shall be made of stainless steel.

The diameter of collecting surface: 200 mm (ISO standard)

Collector height (fallout collector): 400 mm (ISO standard)

Height above ground, adjustable: 1.7 m to 2.6 m (ISO standard)

Deposit Dust Gauge testing method is AS3580.10.1. 1991 - *Methods for Sampling and Analysis. Of Ambient Air – Determination of Particulates Deposited Matter – Gravimetric Method*

Where deemed necessary by the Owner dust deposition gauges shall be placed near to the Eastern site boundary. Measurements shall be recorded on the 15<sup>th</sup> day of each month in a logbook held in the Site Management Office.

#### **1.4 Gas and Odour Management on Site**

The landfill will contain some organic materials – principally timbers of varying size and paper as a part of plasterboard wall lining materials, that may decompose either aerobically or anaerobically depending on the availability of oxygen in the area of the landfill in which decomposition is taking place. Both forms of decomposition are the result of bacterial processes.

There may also be fungal attack, resulting in “dry rotting” of untreated timbers where the timbers in the landfill are in a suitably damp condition.

The landfill may also contain limited quantities of materials such as uncured paints and sealant residues that may give rise to minor odours. These are unlikely to be capable of detection at or beyond the property boundaries.

Green wastes and other organic wastes are not received in other than minor quantities at this landfill, and it is expected that the scale of gas and odour production will therefore be much less than would be the case with a landfill that receives municipal wastes.

The result of the decomposition processes may be summarised as follows:

(a) Aerobic decomposition:

Aerobic decomposition involves bacteria that can survive and grow in an environment that has an adequate oxygen supply. Typically a landfill contains relatively significant volumes of entrained air and thus, initially at least, there is sufficient oxygen to sustain aerobic decomposition processes.

The aerobic bacteria produce significant quantities of carbon dioxide and lesser amounts of other simple compounds such as sulphur dioxide and oxides of nitrogen.

These gases will dissolve in water to form acids that are discharged as part of the leachate waters.

A lowered pH of a landfill's leachate may be taken as an indicator that aerobic decomposition is taking place.

(b) Anaerobic decomposition:

Anaerobic decomposition will take place in conditions where there is a limited oxygen supply. In the process of growth anaerobic bacteria produce reduced compounds such as:

- Hydrogen
- Methane (CH<sub>4</sub>)
- Ammonia (NH<sub>3</sub>)
- Phosgene (PH<sub>3</sub>)
- Hydrogen sulphide (H<sub>2</sub>S)

These gaseous compounds are typically toxic to varying extents, may be flammable if present in significant concentrations and/or in confined spaces and may also be significantly odorous.

Timber wastes are largely unaffected by anaerobic digestion as anaerobic bacteria are unable to degrade lignin, which is an integral part of timber cell walls.

It is considered that anaerobic decomposition in a construction and demolition waste landfill will principally arise from the decomposition of material such as plasterboard papers, and the total mass of this material is likely to be a comparatively small proportion of the total landfill mass.

The presence of any odour from the landfill should be taken as an indicator that anaerobic decomposition is taking place. As there is no expectation that such decomposition will occur to any significant extent, if odour is detected there shall be an immediate investigation and sufficient of the landfill must be excavated to find the source of the odour, if practicable.

In carrying out this excavation work the landfill operator must be aware that the presence of methane gas is possible; this and other gases can present both toxic and flammability



hazards, and all personnel involved in excavations shall take suitable precautions to ensure their safety.

Those precautions shall include:

- (i) not working alone
  - (ii) ensuring that proper safety harnesses and lifting gear are available before entering any excavation
  - (iii) using gas testing equipment to determine the level of risk to personnel
  - (iv) using respiratory protective equipment as appropriate
  - (v) advising the Greater Wellington Regional Council of the problem and determining whether their presence at the excavation would be appropriate
  - (vi) removal of the decomposing material to an approved sanitary landfill
  - (vii) logging the incident in the site incident register
  - (viii) providing a full report on the incident to Wellington City Council.
- (c) Fungal Decomposition

Fungal decomposition can occur in “dry”, that is “seasoned” timber. It does not occur in freshly felled timber. This is generally referred to as “dry rot”, and requires the moisture content of the timber to be perhaps 28 – 30% before initiation of the fungal decay process can begin. Fungal decomposition does not result in appreciable quantities of noxious gases, and is suppressed or eliminated in treated timber.

- (d) Air quality control objectives for gases and odours.

The primary air quality control objective for gases and odours is to minimise the introduction of putrescible materials into the landfill and to examine loads in a systematic manner (as discussed in earlier sections of this SMP) to ensure that only designated acceptable wastes are deposited in the landfill. If Burrell Demolition Ltd / C & D Landfill Ltd takes these steps there will be negligible levels of odorous gases produced and released into the surrounding environs of the landfill.

- (e) Measures to be adopted to meet these objectives

Given that the conditions that would promote large-scale aerobic decomposition of timber and other organic materials in the landfill will not generally exist, that anaerobic decomposition does not take place to any significant extent within timbers, and that the presence of putrescible wastes in these landfill material is reduced to the greatest practicable extent the general measures needed to ensure the objectives are met are:

- (1) All loads of incoming waste material are inspected at the tip-head prior to unloading to ensure that they contain no unacceptable material. Unacceptable materials are defined in section 2.4 of this Site Management Plan
- (2) Unacceptable waste materials are declined. A record of loads declined is kept in the site incident register, together with the name of the carrier and the source of the unacceptable waste material.

- (3) The different types of acceptable materials are well mixed throughout the landfill.
  - (4) The landfill materials are placed and thoroughly compacted using a rubber-tyred excavator/loader. Track rolling is not considered acceptable. This is undertaken to reduce the air voids (which may contain stormwater) near to the surface and decrease surface permeability.
  - (5) The suitable placement and compaction of intermediate covering materials.
- (f) Management and monitoring of odour emissions (e.g. identification of potentially high odour producing materials during waste acceptance checks, procedures used to manage these materials (including refusal of acceptance) and monitoring of any actual odour emissions);
- (1) All loads of incoming waste material are inspected at the tip-head. There is also spot-checking at the Office/Weighbridge area.
  - (2) No waste materials that would give rise to odour emissions will be accepted into the landfill.
- (g) Management and monitoring of landfill gas (e.g. routine management of gas emissions, monitoring of gas produced, contingency plans for gas collection and treatment/disposal if necessary);
- (1) The landfill Tiphead operator will continuously monitor the landfill for odours that indicate that the anaerobic decomposition of organic materials is occurring.
  - (2) Since no materials that could be capable of producing odours in appreciable quantities are to be received at the landfill, the presence of any odour shall be regarded with concern and shall be immediately investigated.
- (h) Complaint response procedures and 24-hour contact phone number/s for staff of the consent holder who are responsible for responding to complaints.

Complaints from the public will be taken seriously. A complaint may indicate that a situation where anaerobic decomposition is occurring has been overlooked, and such incidents must be investigated immediately.

All complaints will be logged in the site incident register.

- (i) Site rehabilitation procedures to ensure odour and gas emissions are managed appropriately in the long term.

Given that there is no appreciable production of gas or odour from this type of landfill it is not anticipated that there will be any long-term requirements for landfill gas controls in the site rehabilitation measures, beyond the placement of final cover on the landfill.

## **7 TRAFFIC MANAGEMENT PLAN**

### **7.1 TRAFFIC MANAGEMENT**

Traffic management on site shall be in strict accordance with the following Traffic Management Plan.

**Burrell Demolition Limited  
Construction and Demolition Landfill  
Landfill Road  
Happy Valley  
Wellington**

**Traffic Management Plan**

**Comment:**

This Traffic Management Plan forms Section 7 of the Site Management Plan.

## **1 TRAFFIC MANAGEMENT PLAN**

### **1.1 Traffic Management on Site**

The management of traffic on the subject properties is achieved by:

Limiting public access to the site solely to the main site access from Landfill Road. The use of other access points is not permitted.

Insistence that visitors report to the Site Office and sign in on every visit, before travelling to any other activity on site. Note that some supplies may be delivered directly to the Workshop located near to the Main Office at 2 Landfill Road without reporting at the Main Office.

Insistence that the speed limits set on site must be observed, with the exclusion of any repeated offenders from the Site.

Insistence that speed limits within the haul roads, which are set at 30 km/hr, are strictly observed by all staff.

Requiring all vehicles travelling down gradient to give right of way to vehicles travelling up gradient.

Requiring that all vehicles used for bringing materials for landfilling to the Site are issued with a load docket that includes the terms and conditions of acceptance of the load.

### **1.2 Signage**

Signage at the site is as follows:

- At the main entrance from Landfill Road – Burrell Demolition Limited sign with Occupational Health and Safety notice and brief conditions of acceptance;
- Inside the main gate on the access road from Landfill Road – 30 km/hr sign;
- At the Site Office – “All visitors must report to office” sign.

### **1.3 Access Roads**

The landfill has a central main access road with a rising gradient of approximately 1:10. An edge drain along the south edge of this road drains down to Landfill Road and, where necessary, there are culverts under the road that connect to drains on the opposing side of the road.

Within the main tipping area metalled tracks are developed as necessary. These are also generally at 1:10 to limit wheel spin, particularly for articulated vehicles. These tracks are metalled as necessary to prevent surface churning and rutting which lead on to mud problems.

The site plans in Appendix 2 of this SMP show the layout of the main access road.

## **10 FIRE PLAN**

### **10.1 FIRE MANAGEMENT**

Fire management on site shall be in strict accordance with the following Fire Management Plan.

**Burrell Demolition Limited**  
**Construction and Demolition Landfill**  
**Landfill Road**  
**Happy Valley**  
**Wellington**

**Fire Plan**

**Comment:**

This Fire Plan forms Section 10 of the Site Management Plan.



# 1 FIRE PLAN

## 1.1 Actions for Emergency Priorities

The Actions for Emergency Priorities are:

- Life protection
- Property protection
- Limitation (as far as possible) of any environmental damage beyond the site boundaries.

The following response will be initiated immediately on detection of a fire on this Site:

- 1 (Site Manager/Operations Manager/Foreman) Call 111 and advise the Fire Communications Centre of the following details:

Location of fire (give directions and local reference points)

Material burning (tyres, coal, demolition material, scrub/gorse, grass, pine forest)

Size of fire:

Small- (car size)

Medium - (house size)

Large - (football field size)

If tyres are burning advise the Fire Communications Centre that this is a Hazardous Substance fire.

2. The following additional action (Operations Manager/Foreman) will be taken upon report of fire:

- Warn any persons in the vicinity of the fire who may be affected.
- Ensure that people on the site commence fire-fighting action.
- Advise the controlling Rural Fire Authority
- Advise Greater Wellington Regional Council
- Advise Wellington City Council

- 3 (Operations Manager) Advise all persons on the site of the fire and that a hazardous situation may exist.

- 4 (Operations Manager/Foreman) Request that all Burrell Demolition Limited/C and D Landfill Ltd personnel commence their designated firefighting tasks, and that all other persons on the site leave immediately, leaving any plant or equipment that cannot be immediately removed.

- 5 Burrell Demolition Limited/C and D Landfill Ltd personnel responding will proceed promptly and in a safe manner to the incident and commence their duties in limiting the spread of the fire in a safe manner.

- 6 The immediate fire suppression action to be taken by Burrell Demolition Limited/C and D Landfill Ltd personnel will include:

- Attempt to separate burning material from the waste pile and use a fire extinguisher on the burning material and / or apply water and / or foam to minimise the spread of fire to the remainder of the material.
- Remove all liquid fuel sources (particularly mobile refuelling tankers) from the vicinity of the fire
- Mobilise High Volume Trailer Pump and delivery hose to most appropriate water point
- Deploy fire hoses and monitors and commence fire suppression action by the application of water to material immediately adjacent to that which is on fire as well as to the material on fire. (The purpose of wetting adjacent material is to raise the fuel moisture content and reduce the rate of fire spread.)
- Deploy excavators, bulldozer and other plant as required to isolate the area on fire and restrict the spread of fire (if safe to do so).
- Organise for direction of fire services to the fire site.

## **1.2 Fire in the Construction and Demolition Landfill**

The construction and demolition landfill generally contains quantities of timber within a matrix of non-combustible materials such as brick, rock, clay, plasterboard and other wallboards, and cementitious materials. It is possible, however, that there may be some materials that may become hazardous in the event of a fire – these may include old paint containers, sealant tubes, plastic and rubber-based building components, etc.

The fire residues – ash and particulates within the gas emissions - from burnt timber may contain concentrated residues of timber treatment chemicals and should be regarded as potentially toxic.

A fire in the construction and demolition landfill should therefore be regarded as potentially hazardous.

- In the initiating phases of a fire Burrell Demolition Limited/C and D Landfill Limited personnel will immediately attempt to separate the burning demolition materials from the rest of the landfill.
- Will use water and/or foam to dampen down the area close to the fire where it is not possible to separate burnt and un-burnt materials to reduce the risk of fire spread

This work will be carried out from the “up-wind” side of the bunker and shall only be undertaken if it is judged that it can be carried out safely.

Note that the use of large quantities of water in fire fighting may constitute a pollution risk to Carey’s Stream, and once the fire is under control the landfill staff shall work to contain any surface water before it is discharged to this stream.

## **1.3 Other fires**

Other fires at the site could include vehicle fires, refuelling fires and small electrical, petrol or diesel-powered plant fires

In the initiating phase the equipment should be turned off and the fire treated with carbon dioxide extinguishers. Burrell Demolition Limited/C and D Landfill Limited personnel

should bund the area using excavating equipment and fireclays to limit any spread of contamination.

#### **1.4 Arrangements for Outside Support**

The Department of Conservation as the controlling Rural Fire Authority has the responsibility for arranging outside support measures for fire suppression operations.

In the event that Burrell Demolition Limited/C and D Landfill Limited requires additional fire fighting equipment and/or relief personnel the Principal Rural Fire Officer will be contacted.

#### **1.5 Protection of Fire Origin**

The general area of the origin of the fire, or the suspected origin, will, wherever possible, be protected from disturbance so as to enable a proper investigation as to the cause of the fire to be carried out.

#### **1.6 Training**

Training in the actions to be taken in the event of an emergency at the landfill site will be provided to ALL personnel.

## **9 REHABILITATION OF THE SITE**

### **9.1 REHABILITATION PLAN**

Rehabilitation of the site shall be in strict accordance with the following Site Rehabilitation Plan.

**Burrell Demolition Limited**  
**Construction and Demolition Landfill**  
**Landfill Road**  
**Happy Valley**  
**Wellington**

**Site Rehabilitation Plan**

**Comment:**

This Site Rehabilitation Plan forms Section 9 of the Site Management Plan.

## SITE REHABILITATION PLAN

### 1 Introduction

C & D Landfill is situated adjacent to Carey's Gully on Landfill Road approximately 1 kilometre west of Happy Valley Road and has operated since 1978.

The site is located in a valley some 4 kilometres south west of the Wellington City centre. Hawkins Hill forms the highest point on the landfill catchment boundary at 495 metres above mean sea level (AMSL) while the present landfill base lies at an average level within the valley of 120 metres AMSL. The distance from the top of the valley catchment to its junction with Landfill Road is approximately 1.3km.

The site is part of a substantial area currently used as landfill sites by WCC and is adjacent to the larger WCC municipal landfill at Carey's Gully.

It can reasonably be assumed that the whole site area was mainly in indigenous forest until the advent of European farming although parts may well have been burnt in previous times. The area when taken over by Wellington City Council in the late 1970's was predominantly in grass for sheep but since then has suffered incursion by gorse.

Future development of the site relates to continued landfilling of the valley above the existing culvert. Future development aims to create an additional 3.5M m<sup>3</sup> of airspace to be filled over a period of perhaps 40 years. Development will occur in up to 13 stages progressing up the valley. Details of the works proposed and construction methodologies for the staging are given in Appendix 1 of the Site Management Plan.

As well as extending the life of the landfill the current proposal will also mitigate some of the risk associated with reliance on the 900mm culvert pipe under the landfill that is presently the only route for discharge of stormwater arising higher in the landfill catchment. The applicants seek to continue landfilling up the valley, extending and covering the culvert to create a final landform that will result in the direction of stormwater into defined overland flow paths. Creating overland flow will progressively relieve reliance on the culvert system.

It is estimated that the life of the culvert may be 40 – 50 years. A report on the current condition of the culvert (produced by Wellington City Drainage Engineers) can be found in the attached AEE.

The primary goals of site rehabilitation are:

- (a) To provide an acceptable habitat for fish. Koura (*Paranephrops planifrons*), banded Kokopu (*Galaxias fasciatus*) and Koaro (*Galaxias brevipinnis*) are found in the existing stream. Koaro and koura are both nationally classified as "at-risk, declining" species. The stream above the culvert on this property is the only recent record of koaro in the Owhiro catchment.

The re-creation of a habitat for koura and koaro is therefore considered a primary objective of the rehabilitation work.

{Note that the inclusion of this and other clauses herein relating to on-site aquatic species habitat design and construction will apply only if the on-site rehabilitation is selected. Otherwise, “off-site” rehabilitation will be undertaken outside the scope of this rehabilitation plan.

These provisions may also affect elements of the site stormwater and erosion control plan.}

- (b) To provide silt and erosion control by planting, and
- (c) To provide an aesthetic community amenity.

As discussed, landfilling will take place in stages that may not be carried out either consecutively or in single stages.

Rehabilitation will be carried out in phases .

The first phase will consist of the selective removal and/or spraying of noxious and non-indigenous weeds from the existing landfill area and progressive planting as indicated generally on the drawings attached. This phase will commence as soon as practicable after the granting of resource consents for the landfill extension.

The second phase will consist of the rehabilitation of new landfill areas, and will commence on the completion of areas of the landfill that can be appropriately rehabilitated.

A particular emphasis is to be placed on planting the new overland flow channel to provide replacement habitat. Planting is described elsewhere in this Rehabilitation Plan.

## **2 Rehabilitation Management Principles**

Rehabilitation and revegetation of the site will involve the following principles:

1. Creating landforms that will form a stable topographical profile to allow acceptable drainage
2. Careful management of topsoil to maintain structural and biological properties of a suitable soil profile for plant growth.
3. Creating a stable topsoil surface to provide effective germination and establishment of selected species.
4. Monitoring rehabilitated areas to ensure proper establishment and growth.

## **3 Fish Habitat Implementation**

Koaro are climbers and use their flattened fins to scramble up steep streams and waterfalls in order to reach shady boulder strewn forest streams.

The detailing of the stormwater overland flow channel and discharge system shall be carried out as the construction staging of the landfill is established, and shall include:

- (a) Free passage for the Koaro from the culvert pipe to the stream to the stormwater stilling basin;

- (b) Detailing of the invert of the stilling basin to form a channel with rest pools that will remain wet for as long as possible. This channel will need to be formed adjacent to one side of the stilling basin so that large planting adjacent to the basin will provide shelter for the fish as they transit this area;
- (c) Detailing of the overland flow channel from the stilling basin to provide a koaro-friendly environment;

The overland flow channel detailing shall include the planting of larger species trees adjacent to it, the placement of rocks in the invert to provide flow riffles to promote fish travel, and the construction of resting pools at 6 metre centres over the entire length of the channel.

There appears to be little published data covering specific requirements for the size of riffles, and for the location, size and depths of rest pools for koaro. Accordingly it is suggested that the following be incorporated into the design criteria unless other firm data can be presented to support an alternative design:

- The invert of the stilling basin shall be built to a level 100mm below the invert of the new manhole to be built over the existing culvert.
- The invert and sides of the overland flow channels shall be lined with selected rock, with nominal size 100mm to 300mm, placed to provide erosion protection and to encourage turbulent flow under low stream flow conditions.
- At 10 metre intervals the depth of the channel shall be increased by lowering the invert level by 300mm. On steep slopes these pools shall be so arranged that the nominal horizontal distance between them should not exceed 1.0 metre.
- The sediment detention channel located at the crest of the existing landfill shall be provided with a low flow bypass channel to permit the passage of fish around it.
- The overland flow stream shall be bordered with

(a) Grasses planted on the stream banks on a 0.75m spacing, including:

| <u>Scientific Name</u>    | <u>Māori Name</u> | <u>Common Name</u> | <u>Location - timing</u> |
|---------------------------|-------------------|--------------------|--------------------------|
| <i>Carex flagellifera</i> | manaia            |                    | streamside               |
| <i>Carex secta</i>        | puurei            |                    | streamside               |
| <i>Uncinia uncinata</i>   | matau a Maui      | hook grass         | streamside               |

(b) a margin of small shrubs 6 metres wide from the top of the stream bank, planted on a 1.2m by 1.2m grid, including:

| <u>Scientific Name</u>   | <u>Māori Name</u> | <u>Common Name</u> | <u>Location - timing</u>             |
|--------------------------|-------------------|--------------------|--------------------------------------|
| <i>Phormium cookianu</i> | wharariki         | coastal flax       | Initial planting/<br>close to stream |



|  |            |              |                                      |
|--|------------|--------------|--------------------------------------|
| <i>Cordyline australis</i>                               | ti         | cabbage tree | Initial planting/<br>close to stream |
| <i>Hebe stricta</i><br><i>var. atkinsoni</i>             | koromiko   | koromiko     | Initial planting/<br>close to stream |
| <i>Leptospermum scoparium</i>                            | manuka     | manuka       | Initial planting/<br>close to stream |
| <i>Brachyglottis repanda</i>                             | rangiora   | rangiora     | Initial planting                     |
| <i>Coprosma crassifolia</i>                              |            |              | Initial planting                     |
| <i>Coprosma grandifolia</i>                              | kanono     |              | Initial planting                     |
| <i>Coprosma rhamnoides</i>                               |            |              | Initial planting                     |
| <i>Coprosma robusta</i>                                  | karamu     | karamu       | Initial planting                     |
| <i>Geniostoma rupestre</i><br><i>var. ligustrifolium</i> | hangehange | hangehange   | Initial planting                     |
| <i>Leucopogon fasciculatus</i>                           | mingimingi | mingimingi   | Initial planting                     |
| <i>Macropiper excelsum</i>                               | kawakawa   | kawakawa     | Initial planting                     |
| <i>Ozothamnus leptophyllus</i>                           | tauhinu    | tauhinu      | Initial planting                     |
| <i>Schefflera digitata</i>                               | pate       | pate         | Initial planting                     |
| <i>Solanum laciniatum</i>                                | poroporo   | poroporo     | Initial planting                     |

Note that in the above Initial planting/ close to stream is taken to mean 1m to 2m from stream edge

- (c) the remainder of the site planted in larger-species trees at 2 – 5 metre intervals. These trees shall be selected from the following:

| Scientific Name              | Māori Name   | Common Name | Location - timing  |
|------------------------------|--------------|-------------|--------------------|
| <i>Aristotelia serrata</i>   | makomako     | wineberry   | Initial planting   |
| <i>Aristotelia serrata</i>   |              | wineberry   | Initial planting   |
| <i>Carpodetus serratus</i>   | putaputaweta | marbleleaf  | Initial planting   |
| <i>Hebe parviflora</i>       | taranga      | tree hebe   | Initial planting   |
| <i>Knightia excelsa</i>      | rewarewa     |             | Initial planting   |
| <i>Melicytus ramiflorus</i>  | mahoe        | whiteywood  | Initial planting   |
| <i>Pseudopanax arborea</i>   |              | five-finger | Initial planting   |
| <i>Beilshcmiedia tawa</i>    | tawa         | tawa        | Initial planting   |
| <i>Rhopalostylis sapida</i>  | nikau        |             | Initial planting   |
| <i>Dacrydium Cupressinum</i> | rimu         |             | Secondary planting |
| <i>Myrsine australis</i>     | mapou        |             | Secondary planting |
| <i>Cyathea medullaris</i>    | mamaku       |             | Secondary planting |
| <i>Cyathea dealbata</i>      | ponga        | silverfern  | Secondary planting |

Note that in the above Initial planting/ close to stream is taken to mean 1m to 2m from stream edge, Initial planting is taken to mean between 1.5 from the edge of the stream and for the remaining width of the planting area.

Plants shall be sourced from reputable nurseries to ensure that they are not root bound or stressed before purchase and will need to be ordered at least a year before planting to ensure availability and that they have been sourced from the correct location (eco-sourcing).

Protect the new planting from goats and other vermin and pests as required.

## **4 Planting Implementation**

### **4.1 Soil preparation**

As outlined above landfilling will take place in stages.

Following filling to final contours topsoil is then evenly spread over the capping material. The depth of capping material shall be mixed organic material, topsoil and clays and will, as much as possible, be at least one metre.

When placing the topsoil care should be taken to avoid creating layers which can act as a barrier to root penetration, particularly in soils with high clay content . On steeper slopes the ground should be ripped with tines on the contour to a depth of 100 – 300mm to mix the soil and provide drainage.

Ideally the reconstruction of soil profiles needs to conform to a minimum of Land Capability Class III which is defined as : Land with moderate physical limitations for cultivation; may be used for cultivated cropping, horticulture, pastoral farming or forestry.

As landfilling progresses in each stage topsoil will be placed on the final landfill cap. The rehabilitated areas will be graded to fit with existing landforms with humouring to undisturbed levels at stage boundaries.

Rehabilitation will commence as soon as is practicable in terms of growing conditions following filling to minimise the extent of exposed earth. In general final contouring and planting may occur in spring and autumn to maximise growth of vegetation and to ensure appropriate soil preparation for plant establishment.

### **4.2 Planting Method**

The following method of planting is recommended:

- Plant mainly in the period March through to May if possible
- Remove existing exotic or otherwise unwanted vegetation and spray area to be planted with glyphosate three weeks before planting to provide a clear planting area
- Excavate a hole larger than the root ball of the plant and conserve the topsoil for backfilling
- Add a slow release fertiliser and crystal rain to each planting hole as per manufacturers instruction

- Remove the planter bag from the root ball of the plant and place the plant centrally in the hole making sure that the level of the soil is the same as that of the root ball
- Backfill around the rootball and firm the topsoil around the rootball
- Stake any taller plants that may be affected by strong winds
- If mulch is available spread a minimum of 100mm around each plant avoiding contact with the trunk.

#### 4.3 Maintenance

Regular maintenance of the plantings will be critical for success. The following maintenance schedule is recommended for the first three years:

- Release weeds from around the plants at least twice a year to ensure plants do not compete with weeds
- Spray weeds not in contact with the plants with glyphosate in the case of herbaceous weeds and 'Escort' or a similar proprietary woody herbicide in the case of woody weed species.
- Maintenance and repair of water management structures, including contour drains, waterways and sediment control structures, is essential. Where erosion has occurred remedial action must be undertaken promptly and the area retreated.

#### 4.4 Species Selection

The recent ecological assessment for the site by Wildlands Consultants indicates that the terrestrial vegetation of the site consists of Mahoe dominant forest. The indigenous species identified include the species listed in Section 3 above and other occasional species.

A number of these including the *coprosmas* and *hebes* provide good examples of pioneering species that will provide a basis for other species to develop through natural seeding. Along with these strategic planting of canopy and secondary species (Mahoe, mamaku, nikau, tawa, rimu and rata will start to provide canopy to protect the soils.

The design of the planting shall be undertaken concurrently with the design of the overland flow channels, and shall incorporate such of those guidelines from the Wellington City Council Code of Practice for Land Development as will encourage the habitation by and promote the well-being of aquatic fauna.

#### 4.5 Conclusion

The development of the landfill will involve the destruction of stream habitat for aquatic species (koaro, banded kokopu and koura) and the loss of approximately 9.6 hectares of vegetation that is presently dominated by indigenous species.

The measures given in this Rehabilitation Plan will compensate for the loss of vegetation by replanting with similar and consistent species, and the creation of a replacement fish habitat will permit recolonisation by koaro, banded kokopu and koura.

The measures of this Rehabilitation Plan will therefore mitigate the adverse effects of the landfill.

## **10 MONITORING, RECORDING AND REPORTING**

### **10.1 Monitoring**

The monitoring programme enables the management of the landfill in terms of the requirements of the resource consents conditions, and in so doing forms the basis for accurate and timely reporting to the Councils on the operation of the landfill.

There are a number of parameters that need to be monitored to ensure that the conditions of consent(s) are being met, but in general these parameters may be divided into four broad categories:

- The quantity and nature of the materials received into the landfill
- Recording and reporting on loads that have been rejected as non-compliant
- Landfill monitoring for physical size, shape, height and stability
- Environmental parameters

Proposed monitoring elements within each of these categories are discussed below.

### **10.2 Six Monthly Audit of Landfill Operations**

The Landfill Manager will audit the landfill operation on a 6 monthly basis. This audit will confirm that management practices established within this SMP are being adhered to. The main issues to be addressed include:

- Stability
- Filling within demarcated area
- Records
- Monitoring

The results of this audit shall be made available to Greater Wellington Regional Council on request.

### **10.3 Records and Reporting on the Quantity and Nature of Materials Received into the Landfill**

Reporting procedures to be adopted to ensure that the landfill is operating in accordance with the resource consents are set out below. The reporting procedures and forms to be used are to be in a simple format for ease of recording but are to contain the information necessary for consent authorities to monitor the conditions of consent.

#### **10.3.1 C & D Landfill docket**

As referred to in section 2.4 of this SMP, material arriving at the Landfill must be checked and recorded on standard forms prepared by Burrell Demolition Ltd / C & D Landfill Ltd to insure that each such load meets the conditions of the resource consents. These forms will be modified from time to time as found necessary and appropriate.

Uncontracted fill docket forms are kept at the site office at the landfill, and at the end of each working day will be transferred to the Landfill Road office.

### **10.3.2 Incident register**

An incident register will be kept as part of the site diary in order to record any unusual incidents on site. Incidents include fires, vandalism, rejected loads and any unacceptable wastes reaching the tip face. In addition, the monthly check of the unnamed tributary of Carey's Stream as required by WGN940057(01) condition 17 will be recorded here.

The Incident register will be kept at the Landfill Road office.

### **10.4 Landfill Monitoring for Physical Size, Shape, Height and Stability**

This monitoring comprises an annual survey of the landfill to provide the consent holder with sound information as to the physical location and height of the landfill, with changes that have occurred since the last survey to be clearly indicated. The direct outcomes from this survey will include

- Identification and marking of the lease area boundaries
- Identification and marking of each stage of the landfill
- Preparation of filling record sheets
- Identification of filling heights
- Identification of slopes for use in slope stability analysis as required
- Identification of areas yet to be rehabilitated (as a basis for the annual bond evaluation)
- Identification of areas under silt, sediment and erosion control (as a basis for engineering design of silt retention requirements)
- Identification of overland flow diversion channels (as a basis for planning on a stage by stage basis)
- Calculation of the volume of materials that have been placed in the landfill over the inter-survey period.

The survey will be a process with annual updates and, to that end, continuity of survey personnel and records is seen as an essential part of the consent. How this is to be managed will be agreed between the consent holder and Greater Wellington Regional Council.

One of the primary unknowns that has arisen from the previous consents is that the survey datum is not defined. Given that the lease held by Burrell Demolition Limited employs, in part, the RL 300m contour as a lease boundary it would seem convenient to establish what the datum (thought to be Wellington 1953) intended in the lease is and to adopt that datum as the basis for all future survey work.

The batters on this site can be divided into two categories:

- Batters that have been completed and are part of the permanent landfill, and
- Batters that form part of the temporary works.

Batters that have been completed to date have been identified and have been reported as stable (Aurecon 2009).

Batters that are incomplete and form part of the temporary work in the landfill will include the landfill working faces. These batters are under continuing observation by the landfill

operator and while there is some risk to water quality at the present if a failure were to deposit erodable material at or near to the culvert inlet, the other “normally foreseeable” risks appear to be operational and safety matters that do not include elements of environmental risk.

It is therefore proposed that reporting on the stability of batters will be limited to new batters intended to be permanent on an as-required basis, but no more frequently than once a year. The inspection work and evaluation of slope stability should be carried out by a Chartered Professional Engineer with expertise in geotechnical engineering.

The volume, nature, and location of fill will be recorded in a diagrammatic form on a weekly basis on a fill record sheet. This will enable the location of all fill to be defined. The existing contract records for major construction and demolition contracts will be kept with this record for cross checking purposes.

Fill Record Sheets are kept at the site office at the landfill, and at the end of each working day will be transferred to the Landfill Road office.

## **10.5 Environmental Monitoring**

There are three parts to environmental monitoring:

- Surface water quality monitoring
- Culvert water quality monitoring
- Air quality monitoring

The purpose of environmental water quality monitoring is to establish and implement a more scientifically robust quantification at representative locations of the effects of the discharge coming from the landfill, and the effects of the discharge on the downstream unnamed tributaries of Owhiro Stream.

The purpose of air quality monitoring is to establish whether there is a dust nuisance from the landfill operations and to assist in determining how it can best be controlled.

Drainage design quality will be ensured by the issue of engineering approvals by Wellington City Council.

### **10.5.1 Water quality monitoring**

[The following sub-sections are substantially based on the consent conditions that specify the monitoring requirements for the landfill discharges]

The water quality monitoring programme shall be prepared within six months of the granting of consents, and shall include, but not be limited to, the following:

- The provision of maps and monitoring locations (GPS locations or NZMS 260 grid references) that provide for upstream and downstream control samples from the un-named tributary of Carey’s Stream to which stormwater from this site leads, and
- A monitoring methodology for surface and ground water quality sampling, including, but not limited to:

- The technique used to recover the contaminants from the samples
- The location and area that the sampling will be undertaken over; and
- A comparison with relevant tolerance limits (including method of calculation), guidelines (e.g. surface water quality values against the ANZECC 2000 90% ecosystem protection values for freshwater quality), and the upstream control samples for the protection and maintenance of ecosystems within the Owhiro Stream

All sampling techniques employed with respect to the monitoring of the conditions of this permit shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council. All analyses shall be performed by an International Accreditation New Zealand (IANZ) registered laboratory or otherwise as specifically approved by the Manager, Environmental Regulation, Wellington Regional Council.

The quality of the surface water discharge as sampled under condition 7 of this permit shall be compared with the following tolerance range, determined from *total recoveries*:

| Contaminant and unit                         | Lower tolerance range | Upper tolerance range |
|--|-----------------------|-----------------------|
| pH   | -0.4                  | 0.4                   |
| Conductivity $\mu\text{S}/\text{m}$          |                       | 72.4                  |
| Alkalinity $\text{g}/\text{m}^3$             |                       | 226                   |
| Total suspended solids $\text{g}/\text{m}^3$ |                       |                       |
| COD $\text{g}/\text{m}^3$                    |                       | 21                    |
| Total Hardness $\text{g}/\text{m}^3$         |                       |                       |
| Ammoniacal Nitrogen $\text{g}/\text{m}^3$    |                       | 0.346                 |
| Total Iron $\text{mg}/\text{m}^3$            |                       | 2748                  |
| Total Manganese $\text{mg}/\text{m}^3$       |                       | 1461                  |
| Total Lead $\text{mg}/\text{m}^3$            |                       | 5.9                   |
| Total Copper $\text{mg}/\text{m}^3$          |                       | 4.0                   |
| Total Zinc $\text{mg}/\text{m}^3$            |                       | 130                   |
| Total Arsenic $\mu\text{g}/\text{L}$         |                       | 13.0                  |
| Total Chromium $\mu\text{g}/\text{L}$        |                       | 1.0                   |

The limits for Total Suspended Solids and Total Hardness shall be calculated once the number of samples reaches 10. The same calculations to determine the upper and lower tolerance limits shall be applied as is detailed herein.

Should the tolerance limit for any parameter be exceeded, and where that parameter also exceeds the latest ANZECC Guidelines for Ecosystem Protection (90%) trigger levels, the permit holder shall, within one month of the receipt of the laboratory report:

- Obtain a second sample and analyse this for the exceeded parameter, and
- Obtain a third sample within one month of the second sample being taken, and analyse this for the exceeded parameter
- In these instances, the *dissolved metal* fraction, rather than the total metal fraction shall be tested for
- If the average of these two samples continues to exceed the relevant tolerance limits and the latest ANZECC Guidelines for Ecosystem Protection (90%) trigger

levels, the permit holder shall implement the **adaptive management** conditions as outlined below.

The permit holder shall ensure that a person suitably qualified to the satisfaction of the Manager, Environmental Regulation, Greater Wellington Regional Council prepares and submits a report by 30 June of each year detailing the items as required by the approved water quality management plan

The report shall include, but not be limited to:

- The results and comparisons of the contaminants sampled for with the relevant limits approved under the water quality management plan.
- A comparison of the concentration of contaminants of the latest year of sampling with the base line ecology survey results as required by condition 12 of this permit to determine whether there may have been a degradation in the quality of the aquatic ecosystem as a result of the discharge
- Any other relevant information; and
- Any recommendations for approval to the Manager, Environmental Regulation, Greater Wellington Regional Council, to remedy or mitigate any significant adverse effects that have occurred, or to avoid foreseen significant adverse effects as a result of the discharge of contaminants from the landfill area to the tributaries of Owhiro Stream.

Examples of these could be:

Changes to the management or site acceptance protocols;

- Methods to remedy adverse effects that may have occurred in the Owhiro Stream catchment; and
- Mitigation measures to offset or minimise the significant adverse effects.

Note 1: For the purposes of this condition, 'significant adverse effects' are those effects which are determined to be significant in the professional opinion of the engaged independent expert.

Note 2: Annual reports can be bundled and submitted as one large report, providing that the relevant sections are clearly defined within the one document.

Should any recommendations arise from the report produced under condition 9 of this permit, the permit holder shall undertake to provide for the recommendations in a manner and timeframe that meets the satisfaction of the Manager, Environmental Regulation, Greater Wellington Regional Council.

Note: These activities may require further resource consents.

### **10.5.2 Mixing zones**

The discharges shall not give rise to any of the following effects after reasonable mixing:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials
- Any conspicuous change in colour or visual clarity



- Any emission of objectionable odour
- The rendering of fresh water unsuitable for consumption by farm animals
- Any significant adverse effects on aquatic life; or
- Any visible deposition of iron oxide or other heavy metals

For the purposes of this condition and permit, the discharges shall be reasonably mixed at 100 metres downstream of the discharge point from the stilling basin within the unnamed tributary of Owhiro Stream.

Should any of these effects occur, the permit holder shall commission an updated water quality management plan exploring the relevant treatment methodologies.

### 10.5.3 Adaptive Management Conditions

Should the tolerance limits, the latest ANZECC Guidelines for the protection of aquatic ecosystems (90%) trigger levels and additional sampling show an increase in the level of any one contaminant as described in condition 8 of this permit, the permit holder shall engage a suitably qualified, independent ecologist to provide an assessment of the ecological effects of the discharges from the site.

The qualifications of and methods employed by the ecologist or other suitably qualified person (in the case of recommendations on the practicable treatment of the discharged contaminants) shall meet the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council.

The ecologist or other suitably qualified person shall provide specific assessment, recommendation and implementation of the following:

- A monitoring methodology for *macroinvertebrate* sampling, including, but not limited to:
  - The techniques that will be used to carry out the surveys;
  - The location and area the sampling will be undertaken over;
  - The analysis methodology used to record and present the data; and
  - Other physical habitat quantifications used to assess the local ecosystem.
- An assessment of the potential effects of the discharge of contaminants to the unnamed tributary of Owhiro Stream;
- A recommendation of the number of sampling events that need to be undertaken (along with timeframes) to adequately gauge the effects of the discharges from the site;
- An assessment, once the invertebrate sampling has been undertaken, whether the existing treatment methodology for the discharge to the unnamed tributary of Owhiro Stream is the best practicable option for the treatment of the contaminants arising from either the historical or current land use of the area (i.e. both the fill placed by the permit holder, and the fill that existed on site prior to the operator's activities at the site) to feed back into the Water Quality Management Plan as approved and

- Provide recommendations on methods that could be used to further treat the discharge to ensure they remain within the tolerance limits specified in the consent .
- In the case of the limits for Total Chromium and /or Total Arsenic being exceeded, provide a recommendation as to whether or not the consent holder should cease the disposal of processed timber (both treated and untreated) to the landfill.

Note: Some recommended viable adaptive management measures could include the installation of a treatment wetland, sand filter system or enlargement of the stilling basin.

Note: The consent holder may store treated timber on site in the event arsenic and/or chromium tolerance limits are exceeded; however, all in-ground disposal must cease until informed otherwise.

The recommendations approved from the report prepared under the water quality management plan and ecological assessment undertaken under the conditions of the consents shall be undertaken by the permit holder to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council and within timeframes specified by the manager, Environmental Regulation, Wellington Regional Council.

Note: Further resource consents may be required to undertake the works recommended.

#### **10.5.4 Ground and Surface Water Trigger Levels**

In addition to these records, it is proposed that the records for at least two years of monitoring shall be tabulated and the mean and standard deviation calculated for each potential contaminant.

A trigger level for each contaminant shall be calculated as the sum of the mean plus three standard deviations as

$$\text{Trigger Level} = m + 3s$$

Where  $m$  = calculated mean of the distribution, and  
 $s$  = calculated standard deviation of the distribution.

In the event that a trigger level is exceeded Burrell Demolition Limited will immediately report the exceedance to Greater Wellington Regional Council. They shall also immediately take steps to determine the reason for the exceedance and take all necessary steps to bring contaminant levels below the trigger level.

#### **10.5.5 Groundwater and surface water records**

The existing records from the three monitoring points will continue to be used. Under the conditions of the existing suite of Resource Consents, monitoring is carried out for the following:

- \* pH
- \* Conductivity

- \* Alkalinity
- \* COD
- \* Iron
- \* Manganese
- \* Lead
- \* Copper
- \* Zinc

These records are kept at the Landfill Road office.

#### **10.6 Air Quality Monitoring**

Proposals for air quality monitoring are contained in the Air Quality Management Plan (Section 6 of the Site Management Plan).

#### **11.7 Reporting to Greater Wellington Regional Council**

In addition to the requirements under Clause 11.6 above, Burrell Demolition Limited will report annually to Greater Wellington Council on:

- (a) The areas in which filling has taken place;
- (b) The quantity of fill placed;
- (c) The number of load rejections;
- (d) Rehabilitation measures that have taken place over the year;
- (e) The progression of construction of overland flow and permanent stormwater overland flow diversion channels;
- (f) An annual report on the stability of the batters from a Chartered Professional Engineer;
- (g) The length of new culvert constructed during the year and it's route, and
- (h) The results of the monitoring stormwater and groundwater,

**Burrell Demolition Limited - Construction and Demolition Materials Landfill  
LANDFILL ROAD, HAPPY VALLEY, WELLINGTON**

Note: Please read "Unacceptable Wastes" below prior to completion.

Registration No:

Date:

Address:

Phone:

Source of material to be tipped:

Fill Material: Acceptable Wastes

|                          |   |
|--------------------------|---|
| <input type="checkbox"/> | Cleanfill (with no potential to produce harmful effects on the environment)                                   |
| <input type="checkbox"/> | Natural materials such as clay, soil, rock  |
| <input type="checkbox"/> | Concrete  |
| <input type="checkbox"/> | Brick   |
| <input type="checkbox"/> | Non-combustible demolition products with no more than 5% timber or other non-hazardous construction materials |

**Unacceptable Wastes**

|                          |                                       |
|--------------------------|---------------------------------------|
| <input type="checkbox"/> | Liquid waste                          |
| <input type="checkbox"/> | Domestic waste                        |
| <input type="checkbox"/> | Industrial waste                      |
| <input type="checkbox"/> | Commercial waste                      |
| <input type="checkbox"/> | Hazardous waste                       |
| <input type="checkbox"/> | Contaminated soil                     |
| <input type="checkbox"/> | Soil or clay in a saturated condition |
| <input type="checkbox"/> | Trees                                 |
| <input type="checkbox"/> | Garden trimmings                      |

**Disclaimer: C&D Landfill can only accept wastes noted as 'acceptable wastes'. If the waste in your load is not within this category it cannot be deposited at the C&D Landfill. If you deposit 'unacceptable waste' you will be subject to sanction from Burrell Demolition Limited.**

Signature: \_\_\_\_\_

**Form 2: Incident Register**

**Burrell Demolition limited - Construction and Demolition Materials Landfill  
LANDFILL ROAD, HAPPY VALLEY, WELLINGTON**

(To be completed when an “incident” occurs, and at the end of each calendar month)

**1 Incident**

Nature of Incident:

Date:

Who was notified?

**2 Monthly check of unnamed tributary of Carey’s Stream (WGN940057 (01) Condition 17).**

Date:

Fill found in stream      Yes / No

If yes, date fill removed:

## **11 PROCEDURES FOR REVIEW OF SITE MANAGEMENT PLAN**

### **11.1 Review Provisions**

The Site Management Plan can be reviewed every three (3) years from the date of approval of this document.

The review process will include consideration of:

- The success of the operation over the previous three years in environmental terms
- The nature and composition of materials being received
- The nature of materials being declined
- Any specific ecotoxicity problems being experienced
- Any specific site stability problems being experienced.

The proposed revisions will be submitted to Wellington City Council not less than three months prior to the review date.

A review of the SMP may also be initiated by the GWRC or WCC in terms of matters defined under a condition of resource consent relating to s128 of the RMA 1991.

Wellington City Council at any time, should any issues coming to the attention of the Council reasonably appear to require operational changes to be implemented at the landfill.

Review may also be carried out in the event of a major ecotoxicity event or stability problem that would imperil the quality of natural waters or impede water flows in the unnamed tributary of Carey's Stream.

## 12 DEFINITIONS

### **Amenity:**

As defined in the Resource Management Act 1991 (the Act)

### **Aquifer:**

As defined in the Regional Plan.

### **Attenuation Zone:**

A part of an aquifer adjacent to the tipping area where pollutants in leachate are attenuated by natural processes.

### **Batch:**

Samples taken from one site in one day.

### **Beneficial Use:**

Any use of the environment which is of public benefit including welfare, safety, health or aesthetic enjoyment. It further includes any natural resource.

### **Biodegradable Waste:**

All organic putrescible wastes, including green-waste, and food waste.

### **Biosolids:**

Means the organic matter removed during the treatment of sewage, and includes solids produced as a result of biological decomposition processes.

### **Building and Demolition Waste**

As defined in the Consents

### **Buffer Distance:**

The distance between the tipping area of a landfill site and a segment of the environment to be protected.

### **Cell:**

A section of disposed compacted solid waste that is formed by an earth compartment, compacted and covered in a solid waste landfill.

### **Clean Fill:**

As defined in the Regional Plan.

### **Closure Plan:**

A plan, specifically tailored to be appropriate for an individual site, establishing procedures for the closure of the site.

### **Commercial and Industrial Waste:**

Solid and inert waste generated by businesses and industries (including shopping centres, restaurants and offices) and institutions (such as schools, hospitals and government offices), excluding building and demolition waste and municipal waste.

**Composting:**

The process of the aerobic conversion of organic materials by microorganisms into soil conditioners, compost or humus.

**Clinical and Related Waste:**

Contaminated waste material with the potential to cause infection. Sources include medical, nursing, dental, veterinary, pharmaceutical and similar facilities engaged in treatment, investigation, teaching or research. Contaminated waste includes:

**Sharps:**

Any object capable of inflicting a penetrating injury contaminated with blood and/or body fluids. This includes needles, needle or syringe combinations and any other sharp objects or instruments designed to perform invasive procedures.

**Bulk Body Fluids, Blood and Blood Products:**

Including any vessel, bag or tubing containing body fluids, blood or blood products.

**Disposables and Dressing Linen:**

Heavily soiled with blood and/or body fluid.

**Microbiological and Pathological Waste:**

Including discarded laboratory specimens, cultures, biological reagents and other materials that have come in contact with such waste.

**Tissue:**

Human tissue, organs, body parts, placentas and products of autopsy and animal tissue.

**Cover Material:**

Cleanfill used to cover solid waste at waste disposal depots.

**Cytotoxic Waste:**

Any residual cytotoxic drug remaining after patient therapy or the material associated with the constitution or administration of cytotoxic drugs such as sharps, syringes, intravenous firings sets, ampoules, vials, disposable gowns, caps, gloves and swabs.

**Decomposition:**

The breakdown of organic waste materials by micro-organisms

**Effluent:**

As defined in the Regional Plan.



**Garbage:**

All refuse other than trade waste and effluent.

**Groundwater:**

As defined in the Regional Plan.

**Green Waste:**

As defined in the Regional Plan.

**Hazardous Waste:**

As defined in the Regional Plan.

**Household Organic Waste:**

Means all putrescible domestic wastes excluding green wastes.

**Industrial Waste:**

See commercial and industrial waste.

**Inert Waste:**

Means any non-liquid waste that, when it is disposed of, is not potentially hazardous or capable of undergoing an environmentally significant transformation, and includes building and demolition waste (such as bricks, concrete, glass, plastic, metal, timber, clean natural excavated material and clean fill) that is not contaminated or mixed with other types of waste.

**Landfill Gas (LFG):**

As defined in the Regional Plan.

**Landfilling Equipment:**

Means all machinery and equipment used in the operation of the waste disposal areas,

**Leachate:**

As defined in the Regional Plan.

**Litter:**

Solid waste that has been carelessly discarded or wind blown and is outside the collection and disposal system.

**Materials Recovery Facility:**

A form of resource recovery of wastes otherwise destined for disposal in which the emphasis is on separating and processing waste materials.

**Medical Waste:**

See contaminated waste.

**Methane (CH<sub>4</sub>):**

An explosive, odourless and colourless gas produced in a landfill by organic waste undergoing anaerobic decomposition.

**Organic Waste:**

As defined in the Regional Plan.

**Recycling:**

As defined in the Regional Plan.

**Resource recovery:**

As defined in the Regional Plan.

**Run Off:**

The portion of precipitation that drains from an area as surface flow.

**Run On:**

Where surface water runs off one site and flows onto the site in question (ie the landfill site).

**Site:**

Pt Lot 29398 Gazette 1972 p.733.

**Sludge:**

Semi-liquid waste produced as a by-product of an industrial process.

**Small Vehicles:**

Means cars (sedans and station wagons), cars with trailers, utility trucks, large trailer, and commercial vans.

**Solid Waste:**

As defined in the Regional Plan.

**Special Waste:**

Waste materials that require special handling and disposal procedures, e.g. asbestos.

**Surface Water:**

As defined in the Regional Plan.

**Tipping Face:**

Means that portion of the landfill where vehicles are delivering waste directly to the waste disposal area.

**Transfer Station:**

A waste handling facility used to transfer waste from collection vehicles to a bulk haul vehicle in order to achieve long distance transportation efficiency. It may also be used to sort and redirect waste with the potential to recycle prior to disposal.

**Vector:**

A carrier that is capable of transmitting pathogens between organisms.

**Waste:**

As defined the Act.

**C&D Landfill**

Defined as the area of land within the portion boundaries, as defined on the drawings, including all structures, roads, waste disposal areas etc.

**Water Table:**

The upper surface of the groundwater.

**Appendix 1 – Copy of Resource Consents**

## Appendix 2 – Drawings

The appended drawings are:

MWA Solutions Limited Drawings

| Number  | Title  | Revision |
|---------|--|----------|
| 9402/01 | SITE PLAN OF LANDEFILL DEVELOPMENT                       | D        |
| 9402/02 | SITE PLAN OF LANDEFILL UPPER FINISHED SURFACE            | D        |
| 9402/03 | SITE PLAN OF LANDEFILL CULVERT DRAIN                     | D        |
| 9402/04 | LONGITUDINAL SECTION ON IDEALISED CENTRLINE OF DRAIN     | D        |
| 9402/05 | LONGITUDINAL SECTION ON CENTRLINE OF NORTHERN SPUR DRAIN | D        |
| 9402/06 | OUTLINE DRAINAGE DETAILS                                 | D        |
| 9402/30 | LANDEFILL AERIAL PLAN                                    | A        |

## **Appendix 3 – Health & Safety Plan**

## **Appendix 4 – Emergency Management Plan**