

**BURRELL DEMOLITION LIMITED**

**RESOURCE CONSENT APPLICATION  
TO  
WELLINGTON CITY COUNCIL  
FOR  
DEMOLITION AND CONSTRUCTION MATERIALS  
LANDFILL**

**LANDFILL ROAD  
HAPPY VALLEY  
WELLINGTON**

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Revision 4 – January 2012

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Appendices

- Appendix 1 Certificate of Title, location plans, District Plan Maps**
- Appendix 2 Drawings**
- Appendix 3 USEPA Guidelines for C&D waste**

## **1. INTRODUCTION**

### **1.1 General**

In May 1995 Resource Consents were granted by a Joint Hearings Committee of the Wellington Regional Council and the Wellington City Council to Burrell Demolition Limited to allow the disposal of Construction and Demolition waste at Landfill Road, Happy Valley. These consents concerned waste discharge of contaminants onto the land, diversion of water in an unnamed tributary of Careys Stream and placement of a culvert in the bed of an unnamed tributary of Careys stream.

Since that time a number of issues have arisen that make it prudent to apply for further consents for the site. There are particularly three issues that make up this present application:

The existing landfill has reached the limits on land area included in the 1995 consents.

The consented form of this landfill has effectively created a “dam” across the valley, with drainage of rainfall from higher parts of the valley being dependant on a 900mm diameter reinforced concrete culvert under the landfill for drainage to Carey’s Stream. This culvert will have a finite life, and there is risk associated with long term reliance on it for stormwater drainage from the upper part of the valley.

There is some concern from the consent holder as to the meaning of parts of the existing consents. Particularly these concern the datum used for final levels, the acceptance of soil with some vegetation content (often as a result of roading slip repairs) and, (with changes in the Demolition industry), the definitions of the construction and demolition materials requiring to be managed.

Burrell Demolition Limited wishes to ensure, through this application, that they hold Resource Consents appropriate to the future operation of the landfill.

### **1.2. Site Description**

The present construction and demolition (C&D) landfill, Pt LOT DP 29398, is situated adjacent to Carey’s Gully on Landfill Road approximately 1 kilometre west of Happy Valley Road and has been operating since 1978 by Burrell Demolition Limited.

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.

### 1.2.1 Historical Land Use

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.

### 1.2.2 Geology

The geological setting of the site is within the Carboniferous/Early Cretaceous sedimentary rocks of the Torlesse Supergroup, which are greywacke and argillite partly alternating with graded greywacke. The site exposures indicate heavily fractured and jointed greywacke/argillite with major joint or bedding planes dipping at about 20° to the North West (the exposures referred to are at the site entrance and on the site perimeter.)

The site is bounded on the west by three major active fault lines namely the Wellington Fault, the Ohariu Fault and the Makara Outlier. The presence of smaller faults within the major assembly is not fully known but it is assumed that the C and D gulley itself is on or close to a minor fault line which can be considered to be active in a seismic context. References and visual examination of the site and valley area indicate the absence of karst type, limestone terrain.

The site area is steep and on visual evidence lacking any areas where landslips or landslides or other surface erosion have occurred in the recent past. The thin surface soils and underlying rock of the area appears to be stable and not prone to erosion from frequent flood and seismic events.

### 1.2.3 Climate

The city averages 2025 hours (or about 169 days) of sunshine per year. The climate is a temperate marine one, is generally moderate all year round, and rarely sees temperatures rise above 25 °C, or fall below 4 °C . The hottest recorded temperature in the city is 31.1 °C, while -1.9 °C is the coldest. The city is prone however to southerly blasts in winter, which may make the temperature feel much colder. The city is generally very windy all year round with high rainfall; average annual rainfall is 1249 mm, June and July being the wettest months. Frosts are quite common in the hill suburbs and the Hutt Valley between May and September.

Climate data for Wellington, New Zealand

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Average high °C (°F)</b>	20.3 (69)	20.6 (69)	19 (66)	16.7 (62)	14.2 (58)	12 (54)	11.4 (53)	12 (54)	13.5 (56)	15 (59)	16.6 (62)	18.5 (65)	15.8 (60)
<b>Average low °C (°F)</b>	13.4 (56)	13.6 (56)	12.6 (55)	10.9 (52)	8.8 (48)	6.9 (44)	6.3 (43)	6.5 (44)	7.7 (46)	9 (48)	10.3 (51)	12.2 (54)	9.9 (50)
<b>Precipitation mm (inches)</b>	72 (2.83)	62 (2.44)	92 (3.62)	100 (3.94)	117 (4.61)	147 (5.79)	136 (5.35)	123 (4.84)	100 (3.94)	115 (4.53)	99 (3.9)	86 (3.39)	1,249 (49.17)
<b>Sunshine hours</b>	246	209	191	155	128	98	117	136	156	193	210	226	2,065

Source: NIWA Oct 2007

The Ministry for the Environment has issued the following statement in connection with likely climate changes in the Wellington Region:

*Climate Change in Wellington, Kapiti & Wairarapa*

*Wellington and Kapiti are often windy because of their exposure to disturbed weather systems from the Tasman Sea and the Cook Strait, but apart from this they have relatively few climate extremes with warm summers and coolish winters. The Wairarapa region enjoys predominantly warm dry settled weather in summer and relatively mild winters.*

*A change in our climate as a result of global warming and other influences means we need to think about how we are going to plan for and manage the projected impacts of climate change in Wellington, the Kapiti coast, Wairarapa and New Zealand. But we also need to take appropriate action to reduce our share of greenhouse gas emissions responsible for global warming and climate change impacts.*

*Some of the predicted impacts of a moderate rate of climate change for Wellington, the Kapiti coast and Wairarapa include changes in average temperature, sea level rise and rainfall patterns. In general, the region will be warmer and the west of the region, like much of the west coast of New Zealand, is likely to become wetter.*

*Climate scientists estimate that temperatures in Wellington, the Kapiti coast and Wairarapa could be up to 3°C warmer over the next 70-100 years. This compares to a temperature increase in New Zealand during last century of about 0.7°C. To put this in perspective, the 1997/98 summer, which many New Zealanders remember as particularly long, hot and dry, was only about 0.9°C above New Zealand's average for the 1990's.*

*The west of the region could be up to 20% wetter while eastern areas could be up to 20% drier. The region as a whole is likely to experience more varied rainfall patterns and flooding could become up to four times as frequent by 2070.*

### 1.3 Relationship with Site Management Plan

This application is accompanied by a Site Management Plan (“BURRELL DEMOLITION LIMITED - CONSTRUCTION AND DEMOLITION MATERIALS LANDFILL - LANDFILL ROAD, HAPPY VALLEY, WELLINGTON - SITE MANAGEMENT PLAN - Revision 4 – January 2012”).

The SMP contains a number of plans that are apply to requirements of Consents issued by both Wellington City and Greater Wellington Regional Council, including the Regulatory Framework, Operational Management, Earthworks, Stormwater Management Plan Air, Quality Management Plan, Traffic Management Plan, Fire Management Plan, Rehabilitation Plan and Monitoring, Recording and Reporting together with procedures for the review of the Site Management Plan.

The Site Management Plan (SMP) is intended to provide the landfill operational management and staff with a document that defines what is necessary to operate the landfill in compliance with the conditions of consent. It is therefore taken that matters raised herein will be completely satisfied by the implementation of the appropriate sections of the approved version of the SMP, and that the environmental effects will as a result be less than minor.

## **2 FUTURE DEVELOPMENT**

### **2.1 Landfill development**

Future development of the site relates to continued landfilling of the valley above the existing culvert. This 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 13 stages progressing up the valley. Details of the works proposed and construction methodologies for the 13 proposed stages are given in section 3 of this report and are shown on the drawings included in Appendix 3.

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 Appendix 5 of this report.

### **2.2 Acceptable Wastes**

The site has been used as a landfill for construction and demolition wastes since 1978. Consents for the landfill were gained in 1995 and the landfill has operated under those consents to the present day. As a C&D Landfill the consents define the materials that are able to be landfilled on site and those which may not be accepted and must be disposed of elsewhere. A list of these materials may be found in table 1 below. This proposal seeks to confirm consent conditions with respect to acceptable materials.

The applicants also wish to clarify that the site is operated as a construction and demolition landfill and has done since the 1970's despite the fact that in the resource consents it is defined as a 'cleanfill' with its attendant definitions in the current District Plan

C&D waste is defined in this application as those in the USEPA Accepted Composition of Construction and Demolition Wastes (Appendix 5) and Ministry for the Environment Guidelines.

Construction and Demolition Waste is defined as that which arises from the demolition of buildings, and the construction of new buildings, and from emergency earthworks. The proposed acceptable materials are:

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.

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.

Small amounts of sawdust from construction

Wrought and cast iron

Steels, in the form of reinforcing rods, tendon and bar used for the pre-stressing of concrete, structural steel sections, pipe and tube

Galvanised structural steel section, pipe and tube

Concrete, in the form of plain, reinforced and pre-stressed concrete elements

Masonry – both brick and concrete, reinforced and un-reinforced

Gypsum-plaster based materials used as interior wall and ceiling materials

Cellulose-cement materials used as exterior sheetings or pipes

Cement-bonded materials used as exterior sheetings or pipes

Glass, in the form of glass used in buildings

Fibreglass insulation

Plastic materials used as electrical fittings

Plastic, ceramic and vitreous china materials used as plumbing and drainage fittings

Floor coverings that are fixed with adhesives to concrete or timber flooring elements

Excavated materials including clays, silts, and rock

Topsoils, which may include small quantities of natural organic and vegetative materials

Non-putrescible packaging materials such as polystyrene, polythene, polyurethane and similar products

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.

Asphalt, in the form of used road strippings – either as chip seal, plantmix or hotmix.

Electrical or electronic wiring removed as part of demolition operations.

Floor coverings, in the form of carpet, vinyl or linoleum, fixed to flooring elements.

Cardboard and other paper-based products used as packaging in the construction industry



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.

### 2.3 Materials specifically rejected

Materials that are specifically rejected include any form of refrigeration or electrical equipment or plant in an assembled state that may contain pcb's or freons, putrescible materials not included in the above, and liquid wastes of any type.

### 2.4 **Recycling and re-use of Materials**

C & D waste has been identified as a priority waste in the Ministry for the Environment New Zealand Waste Strategy 2002. This strategy aims to reduce the amount of C&D waste produced and set a target of 50 percent reduction in construction and demolition waste being disposed of to landfills by 2008.

It is common practice for some wastes with commercial value to be recycled rather than landfilled. Some materials received at the landfill are immediately sorted and stockpiled for recycling, including metals – particularly steels, copper, brass and aluminium items. Variations in demand for scrap metals overseas can lead to price fluctuations that can result in the recycling of some metals becoming temporarily unviable and requiring storage for a period of time.

As resource availability and cost changes with time some resources may become commercially viable for re-use and recycling. As an example there has recently been some recycling of cementitious materials (brick, masonry and the like) that are sorted and crushed on demolition sites, and the materials so obtained removed directly to other places for use as filling materials. However, this type of activity has yet to find wide-spread acceptance in New Zealand as the cost of quarried material is generally less than the cost of recycled material, and the time required for carrying out the salvage and breaking down on site tends to hinder completion of the demolition work within currently acceptable timeframes. This position may change if natural aggregates become scarcer and therefore more valuable.

It has been normal in other parts of the world – particularly North America - for demolition contractors to be responsible for the dismantling and demolition of entire industrial plants. While this has yet to become widespread practice here (and as a consequence recycling of plant on site is not part of this application) the managers propose to investigate the storage of some mechanical and electrical equipment as a part of the recycling operations on this site.

The applicants will work, where practicable, to remove recyclable and reuseable elements from the waste stream before landfilling.

### 3. CONSTRUCTION METHODOLOGY AND STAGING

#### 3.1 Overview

The existing landfill lies across a valley in such a manner as to dam stormwater flow from the higher parts of catchment; this stormwater is presently carried by a 900mm diameter concrete culvert that passes under the landfill to discharge to a natural stream located on the northern side of Landfill Road outside the site.

The proposed further development of the landfill will develop stormwater controls that remove dependence on the culvert. This will require the extension of the landfill up the catchment until finished landfill capping levels that permit reliable drainage (including allowance for the effects of future settlements on open channel invert falls) can be established.

The development will create 3.5M m<sup>3</sup> of airspace for landfilling that will be carried out in thirteen stages, which are indicated on the drawings included in Appendix 1 of this Assessment of Environmental Effects.

The stages indicated are schematic only, and the operator may elect to build the landfill in a non-consecutive order and/or to construct more than one stage at any time, and or to build non-consecutive blocks of stages to provide continuance of habitat for aquatic species, and as operational conditions on the site become better known.

The timing of the stages cannot with certainty be determined, because it depends on future commercial conditions.

#### 3.2 Landfill Staging

Indicative staging, together with assessed volumes, is planned as follows:

Stage	Length of Culvert (m)	Assessed Volume (m <sup>3</sup> )
1	49	128200
2	42	149000
3	43	148600
4	40	217300
5	48	309800
6	42	342400
7	73	524600
8	53	117700
9	40	189100
10	40	311900
11	40	344800
12	40	160800
13	212	576900
Totals	762	3521100

This staging is shown in plan developed longitudinal section on the appended drawings. Note that the drawings included in Appendix 1 of this Assessment of Environmental Effects show the

construction of the landfill in up to 13 stages. The stages indicated are schematic only, and the operator may elect to build the landfill in a non-consecutive order and/or to construct more than one stage at any time, and or to build non-consecutive blocks of stages as operational conditions on the site become better known.

The proposed works in each stage will include:

- Extension of the culvert in stages, generally about 40 to 45 metres in length, with completion of the inlet works before the pipe is bedded, haunched and covered, and generally as indicated on the drawings
- Backfilling over the new length of culvert to achieve a safe cover depth to allow machinery operation over the culvert without damaging the pipe.
- The placement of landfill materials to achieve a final stage level before construction of a further length of culvert.
- The progressive construction of overland flow channels to collect stormwater from the catchment.

Stage 1 will also include the establishment of overland flow paths over the southern side of the existing landfill.

### **3.2 Landfill Materials**

The materials received at the landfill for disposal are detailed above in Section 2.2. To reiterate, these materials are generally non-hazardous materials originating in the demolition and construction industries, but will also include some materials removed as debris from slips in the Wellington Region.

The demolition materials include timber and sheet roofing materials together with broken concrete and masonry. They also include soil and clay materials with moisture content varying from fairly dry (such as those soils cut from a building platform in summer) to very nearly saturated (from slip repairs and deep excavations at or near the foreshore).

### **3.3 Fill Placement and Compaction**

Typical landfill operations involve compaction of the incoming refuse with a compactor with weight of over 40 tonnes and trapezoidal “sheepsfoot” rollers that will break up comparatively thin layers (up to about 150mm layer build). These operations require fairly large, and preferably straight, working areas.

This type of compaction equipment cannot operate in highly confined spaces, and because it is wheeled it requires a minimum width of twice the compactor width (perhaps a total minimum width of 6 metres) and a length of about three to four times the compactor length (perhaps 30 metres) to achieve compaction over the whole of the fill surface. There is also a need for the equipment to be “parked” clear of the fill area as additional fill is being placed, leading to a total minimum area for compaction operation of about 9 metres by 30 metres.

This area is not easily available in the lower parts of the landfill, and without compaction of the lower sections of the landfill the compaction of the upper levels will be of limited benefit in the control of settlement. It is thought that settlement in the lower levels of the landfill may lead to loss of compaction in the upper levels, with loss of benefit of compaction of the higher materials.

End-tipping, with a landfill face of up to 30 metres, has been used successfully on this landfill for many years. The tiphead is locally consolidated over, perhaps, the top 5 metres, by the use of rubber-tyred loader equipment, and some effort is made to provide mixing of demolition materials prior to placement. There is some segregation of materials as they are placed, with denser materials (rock, concrete and the like) falling to lower levels of the landfill and lighter materials (particularly sheet materials) lying closer to the surface.

Soils and silts “wash” into any interstices around and within the rock materials. Sheet materials such as roofing iron have some limited capacity to “bridge” between other hard materials before local failure in bending, and again there is likely to be placement of eroded materials under and around these sheet elements.

As a result the compaction of the landfill relies on natural consolidation, with compaction of the lower sections primarily provided by the mass of material above it, and surface compaction from the loader equipment.

Requirements for landfill construction are given in the Site Management Plan.

The question of acceptable slopes in the finished landfill is covered in the Aurecon report appended. In particular the parameters stated are:

*...for a fill face constructed at 10m vertical increments at 2:1 (h/v) face slope with a 5m wide bench at intermediate levels, and assuming a reasonably well drained condition, under major seismic loading the fill will likely remain stable en mass. Under these extreme conditions, localised surface failures could well occur.*

And:

*... Our analysis indicates that for a soil with a friction angle of 40°, ground water levels need to be in the order of 5m deep at the head of the slope and 2.5m deep at its toe or greater, to give a factor safety of approximately 1.0 during the design earthquake. These ground water levels are in our opinion likely to be an upper bound water level applicable to this type of fill material.*

To this end each stage will have maximum fill heights between benches of 10m with a fill slope of 2:1 horizontal/vertical with 20m benches established for every 10m lift. These benches are larger than those recommended in the Aurecon report to facilitate plant access over the landfill.

Considering the site limitations and the nature of the fill materials the landfill will generally be built in stages, each consisting of three phases:

Phase 1: to create a compacted base, using appropriate materials, with falls to direct stormwater to temporary silt retention ponds close to the new culvert intake.

Phase 2:

- (a) Road trucks tipping onto the tip-head area;
- (b) Selection and mixing of materials to achieve, as far as possible, a homogeneous mix of soils and other waste-stream materials after removal of any recyclable materials or again as far as practicable, materials that are not permitted within the waste stream for this landfill;

- (c) Further mixing of the acceptable waste materials as necessary and possible to minimise the placement of excessively wet or dry materials;
- (d) Blading the mixed acceptable wastes over the edge of the tip-head down the working face of the landfill.

Operation (a) is generally carried out by truck drivers who are familiar with the landfill operations procedure and under the supervision of the tip-head staff.

Operations (b), (c) and (d) are carried out by experienced tip-head staff members who understand the requirements.

#### Phase 3:

Rehabilitation of each stage will commence as soon as is practicable once filling of the next stage starts. Each stage will be filled to close to the desired final level and capped with 1.0m of compacted earth or suitable cleanfill material. The compacted cap will reduce permeability and be contoured to direct stormwater to the stormwater channel. This cap will then be covered with approximately 300mm of stockpiled soils to create a suitable substrate for plant growth.

The Rehabilitation Plan is given in the Site Management Plan.

### **3.4 Landfill stability**

The landform of the site comprises steep to very steep terrain typical of this area of Wellington with previous natural erosion exposing the underlying hard bedrock in many places. The appended Aurecon report notes that natural instability due to normal rainfall events is not considered to pose an extreme risk to the catchment area and that deep seated failure would only be likely as a consequence of a major seismic event associated with wet ground conditions. In respect of the landfilled faces the report notes that some of the steep faces (while having been stable for many years) would be likely to fail under strong seismic activity. On most parts of the site such a failure could cause some short term access problems but would not present a threat outside of the site. However, the report notes that the steep face above the culvert entrance presents an “unacceptable risk to the smooth operation of the landfill and/or other parties downstream, certainly in the longer term and to a lesser degree in the short term.”

Filling the northwest valley as proposed will effectively mitigate the risk associated with the steep face above the culvert intake and create secondary flow paths for runoff. On completion of stages 1 and 2 of the project the face will be no more than 30m high with a batter of 2:1.

### **3.5 Stormwater management**

It is considered that the construction of the proposed overland stormwater flow channel in sections, but as early as possible in the filling process, would be beneficial in reducing the demand for service on the 900mm diameter reinforced concrete culvert that lies under the landfill as there will be progressive diversion of stormwater from it as construction proceeds.

Placing the overland flow channel will provide possibilities for a natural and aesthetic stream to be created. A primary concern is for the creation of an environmentally-friendly habitat for koaro.

Filling carried out under Stage 1 will also allow the establishment of the stormwater overland flow path channel over the existing landfill to discharge to the existing culvert at the eastern side of the existing landfill. This arrangement will permit the future extension of the channels over future stages of the landfill development.

A Stormwater Erosion and Silt Control Plan can be found in the Site Management Plan.

Culvert, landfill and drainage channel construction will be carried out in accordance with the information given in the Site Management Plan.

## 4 REGULATORY ISSUES - THE WELLINGTON CITY DISTRICT PLAN

### 4.1 Zoning

The site is located in an Open Space B Environment in the Wellington City District Plan Map No. 2.

### 4.2 Wellington City Planning Issues

The following matters are considered relevant to the proposal.

#### **16.3 Open Space B (Natural environment)**

*Open Space B land is valued for its natural character and informal open spaces. It involves areas that are used for types of recreation that, in the broadest sense, do not involve buildings or structures. The intention is to keep such areas in an unbuilt or natural state. This type of open space encompasses both formal and informal open space elements. It includes walkways, scenic areas and open grassed areas where buildings are inappropriate. Its characteristics are minimal structures, largely undeveloped areas and open expanses of land. Most Open Space B areas are vegetated and often have ecological values or may buffer Conservation Sites.*

#### **16.5 Open Space Objectives and Policies**

##### **Objective**

##### **16.5.1 To maintain, protect and enhance the open spaces of Wellington City.**

##### **Policies**

To achieve this objective, Council will:

##### **16.5.1.1 Identify a range of open spaces and maintain their character, purpose and function, while enhancing their accessibility and usability.**

##### **METHODS**

Rules

Advocacy

National Standard access design criteria

Operational activities (Reserves management, Management Plans)

*People's recreational needs differ, and recreation space must cater for passive as well as active enjoyment of the area. Recreation space often has multiple functions: an area may be used as a sportsfield and also be viewed as part of the landscape. To avoid the reduction of open space quality in general Council will continue to assess proposed recreational structures and buildings in order to determine if they can be located on areas other than open space. For these reasons rules have been included in the Plan to maintain and enhance the open spaces of Wellington.*

*Accessibility to the City's open spaces is an important aspect of their management, to ensure that everyone (including people with mobility restrictions) has equitable access to sportsfields, reserves and other open spaces. The City will promote enhanced accessibility through advocacy and its operational activities.*

*The environmental result will be the continued protection of the open character of such land.*

Comment: The existing character of the subject site will not be adversely affected by approval of the consent sought. Completion of the landfill and appropriate rehabilitation will enhance the landscape, amenity and recreational value of the site. The final landform will be that of undeveloped land with open areas. The final cover will provide a suitable substrate for the planting and regeneration of local indigenous plants.

16.5.1.2 Not applicable.

Not applicable.

16.5.1.3A Not applicable

16.5.1.4 Not applicable

16.5.1.5 Not applicable.

16.5.2 Not applicable.

16.5.2.1 Not applicable.

16.5.2.2 Not applicable.

16.5.2.3 Not applicable.

### **Objective**

**16.5.3 To prevent or mitigate any adverse effects of the storage, use, disposal, or transportation of hazardous substances, including waste disposal.**

### **Policies**

To achieve this objective, Council will:

**16.5.3.1 Require that the storage, use, handling and disposal of hazardous substances are subject to analysis using the Hazardous Facilities Screening Procedure and, where appropriate, the resource consent procedure in order that any potential or actual adverse effects are managed in such a way as to safeguard the environment.**

### **METHODS**

Rules

Other mechanisms (Health Act, Hazardous Substances and New Organisms Act 1996 and its Transitional Provisions, Health and Safety in Employment Act, 1992)

*Council is concerned that the community and environment should not be exposed to unnecessary risk from hazardous substances. The District Plan aims to control use of land in order to prevent or mitigate any potential adverse effects of hazardous substances by considering the appropriateness of the site location and other site requirements to avoid, remedy or mitigate the risk of accidental release. Although these are only two facets of hazardous substances management, others are outside the scope of the District Plan.*

*[The hazardous substance provisions of this Plan work in conjunction with the provisions for hazardous substances under the Hazardous Substance and New Organisms Act 1996. Controls imposed on hazardous substances under the Resource Management Act cannot be less stringent than those set under the Hazardous Substance and New Organisms Act 1996. This requirement is reflected in the rules for hazardous substances in this Plan.]<sup>1</sup>*

*The Regional Council has developed rules in the Regional Plans to control discharge of hazardous substances to land, air and water.*

*The Hazardous Facilities Screening Procedure has been incorporated into the District Plan. Uses which have unacceptable potential effects will be located and contained where their potential adverse effects can be prevented or mitigated.*

*The environmental result will be a safer environment as a result of the safer storage, use and disposal of hazardous substances.*



Comment: The materials contained in the landfill are not hazardous. The Burrell landfill is an activity that has been carried out on this site for approximately 32 years. The landfill is consented to receive construction and demolition waste as described above with hazardous substances expressly excluded from the landfill. Load tracking and recording of loads to ensure compliance is discussed in section four of the Landfill Environmental Management Plan – Appendix 2.

### **16.5.3.3 Control the use of land for end point disposal of waste to ensure the environmentally safe disposal of solid and hazardous waste.**

#### **METHODS**

Rules

Operational activities (Waste Management Strategy)

Designation

Other mechanisms (Regional plans [and Hazardous Substances and New Organisms Act 1996])<sup>2</sup>

*Unrestricted land disposal of waste by landfilling is increasingly less environmentally acceptable as a method of dealing with the City's waste. For this reason, Council wishes to discourage the proliferation of waste disposal sites.*

*Council's Waste Management Strategy, which addresses waste disposal in Wellington City, includes guidelines on the environmentally acceptable management of the hazardous wastes produced in Wellington. The environmental result will be fewer and better-managed waste disposal sites.*

Comment: The site is presently consented to receive Construction and Demolition waste. The proposal will provide the city with many years of disposal at a site already used for this purpose. The consent holders will continue to remove materials from the waste stream that can be reused and recycled to minimise waste to landfill.

## **17. OPEN SPACE RULES**

The following rules apply in the Open Space Area and include the rules for Earthworks (Chapter 30), Contaminated Land (Chapter 32).

### **17.1 Permitted Activities**

The following activities are permitted in Open Space areas provided that they comply with specified conditions.

Where Open Space Areas are situated within the Central Area Boundary as defined on the Planning Maps, the relevant Open Space objectives, policies and rules will apply to those Open Space Areas.

**17.1.8 Rule not applicable.**

**17.1.9 Rule not applicable.**

**17.1.10 Rule not applicable.**

#### **17.1.4 Signs are Permitted Activities provided that they comply with the following conditions:**

**17.1.4.1 For permanent signs:**

Signs may have a maximum area of 1m<sup>2</sup>, except for interpretative or directional signs that relate to the open space site which may have a maximum area of 4m<sup>2</sup> subject to rule 17.1.9.2, the maximum height of free-standing signs is 4m.

**17.1.4.2 For temporary signs:**

The maximum area must not exceed 6m<sup>2</sup>

The maximum height must not exceed 5 metres

Signs must not be erected more than 28 days before and must be removed within 7 days of the completion of the purpose or event for which the sign was erected.

Comment: All Signs will comply with this rule.

**17.1.5. Rule not applicable.**

**17.1.6. Earthworks involving the relocation of earth within the site are Permitted Activities provided that they comply with the following conditions:**

- 17.1.6.1. That the existing ground level is not altered by more than 1.5 metres measured vertically.
- 17.1.6.2. That the ground surface disturbance is less than 100m<sup>2</sup>
- 17.1.6.3. That earthworks do not take place in Hazard (Flooding) Areas.
- 17.1.6.4. That earthworks are not undertaken on slopes of more than 45°
- 17.1.6.5. That no earthworks are carried out within 5 metres of a waterbody or the coastal marine area.
- 17.1.6.6. That no contamination, including siltation, of any waterbody or coastal water occurs.
- 17.1.6.7. Rule not applicable

Comment: Earthworks associated with this landfill will exceed this rule. Earthworks on the scale intended do not fall within the scope of the above, and the proposed activity is therefore not a permitted activity. Earthworks are discussed in detail in the Environmental Management Plan (Appendix 4) and the Technical Specifications (Appendix 6).

**17.1.7. Rule not applicable.**

Rule not applicable.

Rule not applicable.

Rule not applicable.

**17.1.11. Car-parking areas and access drives in Open Space B are Permitted Activities provided that they comply with the following condition:**

Carparks and access drives must not exceed the total net coverage for the site of 200m<sup>2</sup> per hectare.

Comment: Access drives and parking areas associated with the proposal are expected to exceed this rule.

17.1.12. Rule not applicable.

**17.1.13. The storage, use or handling of hazardous substances are Permitted Activities, except in a Hazard Area, provided that they comply with the following conditions:**

17.1.13.1 For those activities which are not specifically exempted (see Section 3.5.2.2) the cumulative Effect Ratio calculated using the HFSP will be used to determine whether or not those other activities should be Permitted Activities according to the table below.

Location	Either Zone	Either Zone Effect Ratio
Effect Ratio	0.002 < ERPC35 "0.02	"0.002
Conditions applying	17.1.13.2 to 17.1.13.12	17.1.13.9, 17.1.13.11 and 17.1.13.12 only

*Activities that do not meet the above Effect Ratio criteria or do not otherwise comply with the applicable conditions will be Discretionary (Unrestricted) Activities.*

- 17.1.13.2 Any area where hazardous substances are used, stored or handled in any manner on-site shall have secondary containment (via bunding or otherwise) using materials that are resistant to the hazardous substances contained on-site. [Secondary containment systems also need to comply with any relevant provisions under the Hazardous Substances and New Organisms Act 1996.] PC35
- 17.1.13.3 Any secondary containment system shall be maintained to ensure that it will perform the functions for which it was designed and contain any spill or accidental release.
- 17.1.13.4 Any area(s) where hazardous substances are loaded, unloaded, packaged, mixed, manufactured or otherwise handled shall have a spill containment system [that is compliant with relevant provisions under the Hazardous Substances and New Organisms Act 1996.] PC35.
- 17.1.13.5 Secondary containment systems shall be designed to contain any spill or accidental release of hazardous substance, and any storm water and/or fire water that has become contaminated, and prevent any contaminant from entering the environment unless expressly permitted under a resource consent or trade waste permit.
- 17.1.13.6 All stormwater grates, collection structures and inspection chamber covers on the site shall be clearly marked as such.
- 17.1.13.7 Any area where vehicles, equipment or containers that are or may have been contaminated with hazardous substances are washed down shall be designed, constructed and managed to prevent the effluent from the washdown area from discharge into or onto land, entry or discharge into the sewerage or stormwater drainage system unless expressly permitted by a rule in a regional plan, trade waste permit or resource consent.
- 17.1.13.8 Underground tanks for the storage of petroleum products shall be designed, constructed, installed, maintained, operated, managed and at the end of their life removed, to prevent leakage and spills. Compliance with [any relevant provisions under the Hazardous Substances and New Organisms Act 1996 and] PC35 the Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems. (1992) is a minimum [requirement.] PC35

Comment: No materials covered by the HSNOA will be accepted at this landfill

#### Signage

- 17.1.13.9 [All facilities must display signage to indicate the nature of the hazardous substances present (compliance with the provisions of the Hazardous Substances and New Organisms Act 1996 and the requirements of the Building Code (F8) or the Code of Practice Signage for Premises Storing Hazardous Substances and Dangerous Goods. of the New Zealand Chemical Industry Council (Nov 2004) is a minimum requirement).] PC35

#### Waste Management

- 17.1.13.10 Any process waste or waste containing hazardous substances shall be stored in a manner which complies with 17.1.13.1 to 17.1.13.9 above.
- 17.1.13.11 Any hazardous facility generating wastes containing hazardous substances shall dispose of these wastes to facilities which, or waste disposal contractors who, meet all the requirements of regional and district rules for discharges to the environment [and also the provisions of the Hazardous Substances and New Organisms Act 1996.] PC35

#### Other

- 17.1.13.12 Council must be informed of the activity's location, the nature of the activity and when the activity commences and ceases.

*[In addition to the provisions of the Plan, all activities which involve the use, storage, handling or transportation of hazardous substances are regulated for onsite and off-site effects by a range of other legislation and regulations, and associated standards and codes of practice which should be complied with. Key pieces of legislation include:*

*the Hazardous Substance and New Organisms Act 1996  
legislation, rules and standards relating to the transportation of hazardous substances (Land Transport Act 1993, Land Transport Rule: Dangerous Goods 1999 and New Zealand Standard 5433:1999  
Building Act 1991  
Health Act 1956  
Fire Service Act 1975  
Health and Safety in Employment Act 1992  
Radiation Protection Act 1965  
Agricultural Compounds and Veterinary Medicines Act 1997]* PC35

Comment: The proposal will comply with these rules. Refer to the Landfill Environmental Management Plan. (Appendix 4)

- 17.1.14. Rule not applicable.

**17.1.15. In Open Space B and Open Space C Areas the modification, damage, removal or destruction of indigenous vegetation is permitted subject to meeting any one of the following conditions:**

- 17.1.15.1 That the vegetation is on land held subject to the Conservation Act 1987 or any Act listed in the First Schedule to that Act.
- 17.1.15.2 That the vegetation is wind thrown trees, standing dead trees that have died as a result of natural causes, or vegetation that has become dangerous to human life or property as a result of natural causes.
- 17.1.15.3 That the activity does not involve modification, damage, removal or destruction of vegetation more than 100m<sup>2</sup> over a 5 calendar year period.
- 17.1.15.4 The activity is associated with the creation and maintenance of pedestrian tracks not exceeding 1.5 metres in width.
- 17.1.15.5 The activity involves pruning around existing structures including utility structures.

*The presence of ecological values is one of the primary purposes of identifying areas as Open Space B in the Plan. Activities affecting indigenous vegetation are permitted where that land is subject to protected area legislation such as the Reserves Act 1977. Activities involving indigenous vegetation are already addressed by protected area legislation and further control is considered unnecessary. Some small scale damage or modification of existing vegetation is permitted as activities on this scale are unlikely to adversely affect the ecological values of a site and are often essential for safety reasons. In Open Space C the removal of vegetation is also governed by the provisions of the Wellington Town Belt Management Plan.*

**Comment:** The site has been operated as a construction and demolition landfill since 1978 and the area covered by the landfill is therefore a highly modified site. Outside of the landfilled areas the site is vegetated in exotic weed species (predominantly gorse) with some pasture and regenerating indigenous scrub. There are some areas of secondary coastal regenerating bush on the lower northern slopes of the ridges. For the purposes of this proposal an ecological assessment of the valley that will be culverted and filled will be undertaken.

**17.1.17.1.1. Rule not applicable.**

## **29 Earthworks Objectives and Policies**

### **Objective.**

**29.2.1 To provide for the use, development and protection of land and physical resources while avoiding, remedying or mitigating any adverse effects of earthworks and associated structures on the environment.**

### **Policies.**

**29.2.1.1 (also Earthworks guidelines clause 19A.2.1.1) Ensure that the design and assessment of earthworks and associated structures is coordinated with future land development and subdivision.**

### **METHODS**

Rules

Design Guide (Subdivision, Residential, Rural Area)

Section 91 RMA (where appropriate) to require further information on Resource Consent Applications

Structure Plans

*Earthworks are a component of most development of land. They are necessary for the construction of roads, driveways, building foundations, the preparation of land for greenfield subdivisions and the maintenance and upgrading of infrastructure such as the National Grid.*

*On occasions applications are made for earthworks in advance of infill or greenfield subdivisions. The appropriateness of earthworks needs to be considered in conjunction with and at the same time as the appropriateness of the proposed future use of the land, enabling a co-ordinated and integrated approach to earthworks and the proposed future subdivision and development of land. The environmental result will be the coordinated design and assessment of earthworks and associated structures, land development and subdivision.*

Comment:

This site is not seen as one on which subdivisional development will take place within the foreseeable future. There are several reasons for this:

The filling materials being placed are subjected only to light compaction on filling, and long term natural consolidation will occur. This will result in long-term settlement of the fill, which might have an undesirable effect on any permanent building or road constructed on it.

The operation of a large air surveillance radar station on nearby Hawkins Hill may produce high levels of electromagnetic radiation within the side lobes that form a part of the transmission pattern. The effects of electromagnetic radiation on the health and wellbeing of people and animals subjected to it may contain negative elements. For the meantime, until either the radar equipment is decommissioned from the near locality or the effects of electromagnetic radiation are better understood it is suggested that subdivisional development on this property would be inappropriate.

It is therefore considered that the site will be rehabilitated at the end of filling for a future use as open recreational space.

**29.2.1.2 Provide for minor earthworks to allow the use and development of land where the risk of instability is minimal.**

**METHODS**

Rules

Advocacy

*Earthworks are an integral part of the development of land. They are associated with the design of subdivisions, the construction of buildings, landscaping and are necessary for the maintenance and construction of farm tracks in the rural environment.*

*The permitted activity conditions provide for minor earthworks that have a low risk of instability, minimal effect on visual amenity and where adverse effects on the environment such as dust and sediment can be managed effectively.*

*In addition, the permitted activity conditions do not seek to control stability in cases where the stability is addressed by other legislation. In some cases, retaining and stabilising structures associated with earthworks will require a building consent under the Building Act 2004. For minor earthworks where a structure to retain the earthworks has been authorised by a Building Consent the District Plan does not seek to address the issue of stability. In these cases stability will be addressed through the Building Consent process for the retaining structure.*

*The environmental result will be the ability to undertake minor earthworks for the use, development and protection of land.*

Comment:

This provision does not apply – while the earthworks can be engineered to present minimal risk of instability the size of the earthworks in total cannot be represented as “minor”.

**29.2.1.3 (also Earthworks guidelines clause 19A.2.1.2) Ensure that earthworks are designed to minimise the risk of instability.**

**METHODS**

Rules

Advocacy

*Poorly constructed earthworks are a threat to people, property and infrastructure. Instability may affect both the site of the development work and neighbouring properties. The District Plan controls earthworks to minimise the risk of instability.*

*When assessing applications that do not comply with the permitted activity conditions the following matters will be taken into consideration:*

*Whether the earthworks have been designed by an appropriately qualified and experienced person, for example, a chartered engineer practicing in the field of civil / geotechnical engineering.*

*Whether this person will supervise the work and certify it upon completion.*

*Whether the nature of the proposal requires a geotechnical assessment of the geology of the site and the surrounding land.*

*Whether a retaining or stabilising structure or building will be used to support or stabilise the earthworks: whether its design can be assessed at a later date under the building consent process. This decision will depend on the nature of the proposal, the site and the surrounding land, and the extent and risk of instability.*

*Whether the earthworks are designed in accordance with “NZS 4404:2004 Land Development and Subdivision Engineering” and “NZS 4431: 1989 Code of Practice for Residential Earthworks”.*

*The environmental result will be earthworks that are designed to minimise the risk of instability.*

Comment:

The question of stability of the filling materials placed on this site can be held to exist in several parts:

Elements of the landfill in which land instability could result in loss of amenity or danger to the public, and

Elements of the landfill in which land instability will have no effect on the public.

Dealing with each of these:

Those elements of the landfill in which land instability could result in loss of amenity (particularly impeding vehicular traffic on Landfill Road and/or the access road to this site) are primarily composed of the existing eastern face of the landfill.

This part of the landfill has been in place for some years now, and the access road that leads up to the higher parts of the landfill forms a bench that enhances stability. Under normal circumstances this structure is seen as stable (refer Aurecon report Appendix 9) and any instability that may occur under major seismic events is expected to be minor and easily repaired.

Those elements of the landfill in which instability will have no effect on the public are the working faces (particularly the western end) of the landfill and are under continuous surveillance to ensure that failure does not affect the proper operation of the landfill or imperil the inlet to the culvert.

The presence of adequate earthmoving machinery on the site with ready access to skilled operators means that any evident instability observed or any failure can be quickly and effectively dealt with.

As far as the stability of the proposed landfill is concerned, the appended Aurecon report indicates parameters for slope stability in terms of a maximum slope of 1 vertical to 2 horizontal, and a maximum height between benches of 10 metres. The proposed design recognises this and noted that the Aurecon report also recommends that these parameters be reviewed by a Chartered Professional Engineer with specialization in geotechnical engineering.

It is not considered that any stabilizing structures (such as retaining walls) will be necessary in the construction of this landfill.

**29.2.1.4 (also Earthworks guidelines clause 19A.2.1.3) Require earthworks to be designed and managed to minimise erosion, and the movement of dust and sediment beyond the area of the work, particularly to streams, wetlands and coastal waters.**

**METHODS**

Rules

Design Guides (Subdivision, Residential, Rural Area)

Technical Guides (*Erosion and sediment control guidelines for the Wellington Region 2003, Erosion and sediment control for small sites 2006*)

Code of Practice for Land Development

Advocacy by disseminating information on best practice e.g *Erosion Dust and Sediment Control for Small Sites 2006* and *Mind the Stream – A guide to looking after urban streams in the Wellington Region 2004* by Greater Wellington Regional Council

*Erosion can take place on exposed or excavated soils. Dust and dirt carried by wind or water or vehicles from an area of earthworks can cause a nuisance to neighbouring properties, on roads and footpaths, in drainage channels and sumps, and in the stormwater system. Sediment carried into streams, wetlands and the harbour and other coastal waters (the coastal marine area) can impact on water quality while multiple earthworks projects can have a cumulative effect on sediment levels within a stream system, the harbour or other coastal waters.*

*The potential effects of dust and sediment can be minimised by requiring those undertaking earthworks for subdivision, construction or other activities, to use the best practical options as recognised by the Council and the Greater Wellington Regional Council. These options include, preventing water running onto the site, the control of erosion, managing dust, and installing sediment control structures and maintaining these structures to ensure their ongoing effectiveness.*

*Earthworks are restricted close to streams, wetlands and the seashore to prevent direct contamination and to protect vegetation cover. Vegetation has an important role in capturing sediment and associated nutrients, which are carried across the ground by rainwater. The effectiveness of streamside areas is dependant on a range of factors including the type of vegetation beside the stream, the slope of surrounding land and amount of pasture or disturbed ground draining to the stream.*

*Erosion, dust and sediment control in relation to streams, wetlands and coastal waters is controlled by rules in both the District Plan and the regional plans administered by Greater*



Wellington Regional Council. The issue is addressed in the District Plan because erosion, dust and sediment are all matters that are a direct effect of earthworks that the District Plan controls. In situations where resource consents are required from both authorities for activities involving earthworks, the Council will work with the Regional Council to ensure a coordinated approach to consent issues.

When assessing applications that do not comply with the permitted activity standards the following matters will be taken into account:

- The extent that vegetation, natural soil structure and natural drainage patterns are retained, to intercept dust or precipitation, filter sediment and to reduce the volume and speed of runoff from the site. Particular consideration will be given to the protection or restoration of vegetation, soils and drainage patterns, adjacent to streams, wetlands and the seashore
- The extent that the work will be designed and managed to address the principles and methods in Greater Wellington Regional Council's "Erosion and sediment control guidelines for the Wellington Region" 2003, or it's "Erosion and sediment control for small sites" 2006
- Whether any special measures are necessary to prevent dust and sediment entering and clogging street channels (gutters), drainage sumps or stormwater pipes
- For large scale earthworks, such as greenfield subdivisions, the extent that the work or subsequent erosion will cumulatively add to existing or expected sediment levels in the relevant stream system, the harbour or other coastal waters
- The extent that the proposal uses 'soft engineering' practices to control erosion, dust and sediment, to prevent short term and long term effects beyond the area of the work, particularly to streams, wetlands and coastal waters.
- The extent that dust or sediment will be a nuisance to residents of other properties or affect the amenities of streets or public places
- The need for an earthworks and construction plan to define acceptable performance standards for environmental and amenity protection and public safety during the construction process. The environmental result will be earthworks that are designed and managed to minimise the effects of erosion, and the movement of dust and sediment beyond the area of the work, particularly to streams, wetlands and coastal waters.

Comment:

In meeting these requirements consideration needs to be given to two aspects:

- The operational areas of the landfill, and
- The finished areas of the landfill

Dealing with each of these in turn:

The operational areas of the landfill are taken as the working faces and the haul (access) roads on the site.

Little can be done to prevent erosion on the working faces. However, as the primary orientation of these faces is within the site the effects of erosion can be minimised by providing silt control fencing at the lower limit of the faces concerned, and silt retention ponds as necessary prior to directing stormwater to the culvert. The working faces will be limited in size to the availability of area for silt control ponds, and if necessary the culvert will be extended beyond the minimum requirement for the construction of any landfill construction stage to accommodate suitable silt control measures.

Wellington City Council publication "Erosion and sediment control guidelines for the Wellington Region 2003" and ARC TP 90 will be used as a basis for the design of all necessary erosion and silt control measures, which shall be designed by a Chartered Professional Engineer with specific

experience in this field. A Stormwater, Erosion and Sediment Control Plan can be found in Appendix 7.

The haul roads will be finished in selected granular rock materials salvaged from the incoming refuse stream or quarried on the site; this measure will minimise erosion and dust generation from these areas.

Little can be done to minimise dust generated from the working faces of the landfill. The addition of water on these faces may increase instability in some instances, and should be generally avoided. However, the working faces of the landfill are located some distance from any residential uses, and while it is considered that dust nuisance from this site is unlikely it is also thought that the provision of two dust monitors, located on the eastern and northern sides of the landfill, would be prudent. Should excessive dust be generated on the haul roads traffic will be slowed and if necessary water will be used to settle the dust.

Insofar as the finished areas of the landfill are concerned, there has been a strong re-growth of weeds and scrub plants from the surrounding areas; this growth is now well established and contributes to the surface stability of the landfill, dust and erosion control.

**29.2.1.5 (also Earthworks guidelines clause 19A.2.1.4) Ensure that earthworks and associated structures do not exacerbate flood events in Flood Hazard Areas.**

**METHODS**

Rules

Code of Practice for Land Development

*Developments involving earthworks will be controlled to ensure that they do not increase the risk of flooding by blocking flood water flow paths and culverts, and diverting flood water to other sites.*

*Matters to consider in assessing applications include:*

*Whether the earthworks and any associated structures will change the flow of flood waters*

*Whether the earthworks and any associated structures will accelerate, worsen or result in the erosion or inundation of the site, or any other site or buildings*

*The extent that the proposed earthworks and associated structures will be designed to use 'soft engineering' practices, which are visually unobtrusive and minimise or enhance the ecology of the stream and the flood-prone area.*

*Whether the earthworks will reduce the risk or effects of flooding.*

*Whether the potential threat to the health and safety of people, property or the environment from flooding is avoided, remedied or mitigated.*

*The environmental result will be earthworks and associated structures that are designed to minimise the hazard risks on flood plains or other flood-prone areas.*

Comment:

This site is not located in a Flood hazard area, and as a result it is not considered that the requirements directly apply.

However, it is considered that the time of concentration (that is, the time for rainfall on this site to be reach its discharge point) of stormwater at the culvert will be reduced progressively as construction of the landfill and the open channel drains proceeds, because:

The open channel drains will have significantly lower hydraulic resistance than the stream they replace, particularly when new although it is expected that there may be some silt buildup in the invert of these drains leading to plant growth and consequently increasing hydraulic resistance.

In any case the culvert will have significantly lower hydraulic resistance than the stream it temporarily replaces, and

The finished landfill surfaces will have lower hydraulic resistance than the natural country they replace.

The natural ground is heavily fractured rock, and some stormwater infiltration will occur into these fractures. However, this needs to be offset against infiltration into the top cover of the landfill and the evapotranspiration that will occur from the rehabilitated top cover surfaces.

To mitigate these effects it is considered that the following measures will be provided:

The steeper channels (with gradients greater than 5%) will be finished with rock lining to promote energy dissipation;

The stormwater system will include a stilling basin prior to discharge into the stormwater culvert near to Landfill Road, and this will provide some storage of stormwater thus mitigating the peak flow.

It is intended that comprehensive engineering details will be provided in support of engineering approval to be sought prior to the commencement of construction of the overland flow channels.

**29.2.1.6 (also Earthworks guidelines clause 19A.2.1.5) Ensure earthworks and associated structure are designed and managed in a way that protects and enhances the character and amenity of streams and wetlands through measures such as:**

- minimising changes to the flow of water in streams or wetlands;
- encouraging riparian management to ensure that rivers and wetlands stay healthy.

**METHODS**

- Design Guides (Subdivision, Residential, Rural Area)
- Code of Practice for Land Development
- Advocacy by disseminating Information eg 'Mind the Stream – A guide to looking after urban streams in the Wellington Region 2004' by Greater Wellington Regional Council

*Many streams that survive in urban areas are in Council parks and reserves. Others, especially smaller streams, flow through private property. While they may not be visible to the general public (or even neighbours) and they are not associated with walking tracks, they are still of value because they are part of a larger stream system and affect the qualities of that system.*

*Earthworks that change the flow of water in streams can adversely affect the character and amenity of streams. Changes to flows may increase flooding, lower dry-weather flows, change the stream substrate, cause bank erosion (with the release of sediments into the stream) and cause channel widening. These changes can lead to a loss of streamside vegetation and increase the need for engineering structures to protect the banks and to control flooding.*

*Earthworks proposals can minimise changes to the flow of streams through measures such as conserving natural soils and mature vegetation, increasing soil permeability and minimising hard*

surfaced areas. 'Soft engineering' practices to capture and slow stormwater runoff from a site, are another approach and they will be viewed as a positive effect of a development proposal.

Proposals can minimise the effects of earthworks by restoring streams or wetlands to a more natural state using measures such as planting riparian margins or 'day-lighting' previously piped sections of stream. Riparian management is a solution that works over the long term to reduce bank erosion and maintain and enhance the amenity of streams. The District Plan addresses the effects that earthworks can have on streams, wetlands and the coastal marine area. The loss or modification of streams and wetlands and their flow characteristics is regulated by regional plans administered by Greater Wellington Regional Council. In situations where resource consents are required from both authorities for activities involving earthworks, the Council will work with the Regional Council to ensure a coordinated approach to consent issues. The environmental result will be avoiding the adverse effects of earthworks on the character and amenity of streams and wetlands.

Comment:

Please refer to comments made under Clause 29.2.1.5 above

Historically, part of the development of this site as a landfill has caused partial destruction and some alteration of the character of the stream that runs in the valley.

As noted earlier, the condition of the culvert has been investigated and found to be adequate for the life of the landfill.

The creation of overland flow paths within the future development of the landfill may be viewed as being in lieu of rehabilitation of the stream that has to date become despoiled.

**29.2.1.7 (also Earthworks guidelines clause 19A.2.1.6) Ensure that earthworks and associated structures are designed and landscaped (where appropriate) to reflect natural landforms and to reduce and soften their visual impact having regard to the character and visual amenity of the local area.**

## **METHODS**

Rules

Design Guides (Residential, Subdivision, Rural Area)

*Earthworks and associated structures can be visually prominent and sometimes visually intrusive. Large scale earthworks should be engineered to reflect natural landforms. The Subdivision and Rural Area design guides provide guidelines. On a smaller scale, careful consideration is needed of how visible earthworks and any associated structures will be once a building is constructed on a site. The policy is concerned with measures that can be used to soften and reduce the visual impact, which include the design of retaining and stabilising structures and landscaping. When assessing applications that do not comply with the permitted activity conditions the following matters should be taken into account:*

*Where the earthworks are associated with an application for subdivision, the extent that the proposed earthworks and any associated structures meet the relevant guidelines of the Residential, Subdivision or Rural Area design guides*

*The extent that the proposed earthworks and any associated structures meet the relevant guidelines of the Residential or Rural Area design guides*

*The extent that the earthworks are designed and engineered to reflect natural landforms and natural features such as cliffs, escarpments, streams and wetlands and avoid unnatural scar faces that detract from the amenity of the area. In situations where bare rock is common, untreated cut faces may be favoured over artificial finishes. In more urban settings well designed retaining walls, which reflect existing older structures, may be an appropriate model for design*

*The extent that existing vegetation can be retained above, below and at the sides of the earthworks and any associated structures*

*The extent that proposed buildings will conceal the view of the earthworks and any associated structures from the street, other public places and other properties*

*The extent that the design and finishing of any retaining or stabilising structure reflects the building or buildings it is associated with*

*Whether the design of any retaining or stabilising structure reduces its apparent size, by using features that break up the surface area of the structure and create patterns of light and shadow*

*Whether the placement of pipes above the surface of the earthworks or structures will visually detract from the appearance of the overall development. Pipes should be buried underground or integrated into the design of a structure as a deliberate and positive part of the design*

*Whether the use of sprayed concrete can be avoided by the use of alternative methods, such as anchored netting*

*Whether landscaping can be used to hide or soften the earthworks or associated structure taking into consideration purpose and the growing conditions of the site. Proposals for landscaping must be supported with a professionally prepared planting plan and specifications at the time of application.*

*The environmental result will be earthworks and associated structures that reflect the visual character of the local area.*

Comment:

By its nature and function, this landfill will substitute a man-made landform for a natural one, and this is unavoidable.

However, some mitigation will be achieved by remediation of the top cover in planting that reiterates the naturally occurring flora of the surrounding hills.

#### **29.2.1.8 Manage earthworks in Open Space and Conservation Site Areas in accordance with the different purpose and use that these recreation and conservation areas have for the City.**

#### **METHODS**

Rules

Reserve Management Plans

*The District Plan identifies a number of different types of Open Space Areas and Conservation Site where each has a different purpose. The areas are managed under the Reserves Act and the District Plan provisions according to that purpose. Active and passive recreation areas have different needs and requirements and therefore different requirements for earthworks. The earthworks provisions that apply have been developed having consideration for the underlying purpose of each of the different types of Open Space Areas and Conservation Sites. When assessing whether earthworks are appropriate within Open Space Areas or Conservation Sites consideration should also be given to the objectives and policies of the different Areas.*

Comment:

As noted under Clause 6.3.1 of this document, the site is located in an Open Space B Environment in the Wellington City District Plan Map No. 2, and the provisions of this Clause therefore apply. Again as noted elsewhere in this document, the long-term use of this land is seen as recreational with public access, with the landfill top cover planted to provide continuity of horticultural character with the surrounding country.

This planting will be carried out on a construction stage-by-stage basis.

It is considered that a landscaping plan is not required to carry out this work.

**29.2.1.9 Control earthworks in the Urban Coastal Edge, areas within the Ridgelines and Hilltops Overlay, Open Space B Areas and Conservation Sites, to protect the character and visual amenity these areas provide to their immediate surrounds and the City.**

**METHODS**

Rules

Rural Area Design Guides (for areas within the Ridgelines and Hilltops Overlay)

Reserve Management Plans (for Open Space B Areas and Conservation Sites)

*The earthworks provisions that apply have been developed having consideration for the visually sensitive nature of these different areas.*

*Open Space B Areas can often be enjoyed and experienced from a distance creating a visual distinction between built and unbuilt areas. Conservation Sites are significant areas of Wellington's natural heritage with high ecological values. Earthworks have the potential to impact on the visual and ecological values these areas provide to the city and therefore the earthworks in these areas will be controlled. However, earthworks are necessary to create tracks for public access within reserve areas and therefore earthworks for the purpose of providing walking and cycling tracks are provided for.*

*Matters to consider within Open Space B and Conservation Sites:*

*Whether the proposed earthworks will have a negative visual impact on the appearance or character of the area*

*Whether the earthworks will detract from the relatively unmodified character of the landscape*

*The extent to which any earthworks can be restored to resemble natural landforms*

*Whether the visibility of earthworks can be mitigated by appropriate planting and/or screening*

*The environmental result will be the protection of the character and visual amenity along suburban coastal roads, within the Ridgeline and Hilltop Overlay and in Open Space B and Conservation Sites.*

Comment:

The finished landfill will be an un-natural form within the context of the surrounding countryside, and as stated earlier it is thought that the best approach to creating as natural an environment as possible would be to provide planting consistent with the surroundings.

**29.2.1.11 (also Earthworks guidelines clause 19A.2.1.5) Ensure the transport of earth or construction fill material, to and from a site, is undertaken in a way that is safe and minimises adverse effects on surrounding amenity and the roading network.**

**METHODS**

Rules

*Larger earthworks projects can cause problems with transport on city streets. Taking material from a site, or bringing it to a site from elsewhere, can adversely effect safety on footpaths and*

*roads and cause congestion. Noise from trucks can also affect the amenity of properties within the vicinity of the work being undertaken and along the route chosen to transport the material. In some instances material will be removed from one site and transported as fill to another site. In these situations it may be necessary to assess the transport effects for both sites, either together or under separate resource consent applications. In order to minimise the adverse effects of moving material it may be necessary to place conditions which define the route, hours of trucking and any other matters that could mitigate the effects.*

*When assessing an application for resource consent the following matters should be taken into consideration:*

*The extent to which the transport of material to or from the site will affect the amenity of surrounding areas having regard to:*

*the type of truck being used*

*the frequency, timing and duration of truck movements*

*the proposed route. The use of Collector, Principal and Arterial Roads and the Motorway, over local roads is preferred*

*the width, sightlines and other characteristics of the streets along the route*

*the presence of sensitive land uses along the route e.g. schools*

*whether the proposal requires the closure of any streets*

*Whether the location of the access to the site under consideration can be sited safely. Measures may be necessary to allow traffic, cyclists and pedestrians to move safely past the site*

*The need for a traffic management plan (as part of a wider earthworks and construction plan) detailing the above matters and how they will be managed, including any procedures for receiving and responding to complaints.*

*The environmental result will be that earthwork material is transported in a way that is safe and does not detract significantly from the amenity of an area.*

Comment:

Unlike usual construction and demolition activities, this site is a continuing operation with trucks delivering waste stream components and returning empty either to collect a further load or to carry out another assignment. In the proposed extension to landfilling it is not intended to increase the current level of truck movements/quantities of waste to be landfilled so there will be no change to the impact of vehicles coming to the site.

For construction demolition and construction waste streams very broadly fall into five categories:

- Waste materials from construction and demolition projects within the Wellington District;
- Waste materials from construction and demolition projects that lie outside Wellington District;
- Waste materials from earthworks construction projects within Wellington District;
- Waste materials from earthworks construction projects that lie outside Wellington District, and
- Waste materials from slip clearance.

As far as construction and demolition and earthworks construction projects that lie within the Wellington District are concerned, it is thought that the effects of traffic on roads within the District will have been considered as a part of the issue of resource and building consents for the work being carried out.

For works being carried out outside Wellington District, it is thought that the majority of travel will be on established major and arterial roads by driver choice, so that the disturbance to communities will be of minimal effect.

The problems of slip clearance, particularly where the slippage occurs over roads, is one that cannot be regulated easily. The loss of amenity to the public from the occurrence of a slip would seem to outweigh the very short term loss of amenity due to truck traffic movements.

The operation of this landfill does therefore not, in itself, effect a loss of amenity to the community from traffic movements.

### **30.1.2 Earthworks in the:**

(ii) Open Space B Areas;

(iv) Ridgelines and Hilltops Overlay (Rural Area); and

- 30.1.2.1** (a) (i) The cut height or fill depth does not exceed 1.5m measured vertically; and  
(ii) The distance between any site boundary; building or structure (above or below ground); and the nearest cut or fill must be at least the same distance as the height of the cut or depth of the fill (measured on a horizontal plane); and  
(iii) The cut or fill is not on an existing slope angle exceeding 34 degrees; and  
(iv) The area to be cut or filled does not exceed 100m<sup>2</sup>.

**OR**

(b) (i) The cut height or fill depth does not exceed 1.5m; and

(ii) The cut or fill is retained by a structure authorised by a building consent (which must be obtained prior to any earthworks commencing); and

(iii) The area to be cut and/or filled does not exceed 100m<sup>2</sup>.

**OR**

(c) For the construction and maintenance of tracks associated with permitted rural activities in the Rural Area:

(i) The cut height and fill depth does not exceed 1.5m; and

(ii) The distance between any site boundary; building or structure (above or below ground); and the nearest cut or fill must be at least the same distance as the height of the cut or depth of the fill (measured on a horizontal plane).

(d) The earthworks are for the construction or maintenance of walking or cycling tracks in Open Space B Areas and Conservation Sites and the track surface does not exceed 1.5m wide (Conditions 30.1.2.2 to 30.1.2.4 do not apply).

**AND**

**30.1.2.2** The cut or fill is no closer than the following to a stream, a wetland or the coastal marine area:



Ridgelines and Hilltops (Rural Area) Conservation Sites Open Space B	20m
All other areas	5m

**AND**

**30 1.2.3** The cut or fill must not be in a Hazard (Flooding) Area;

**AND**

**30.1.2.4** There must be no visible evidence of settled dust beyond the boundaries of the site.

Comment:

These provisions do not appear to apply as the work is not on a ridge or hilltop.

### **6.3.5 Activity Status**

The proposal is a Controlled Activity under this The Wellington District Plan, due to its compliance with all relevant rules.

### **Wellington City Council Earthworks Rules**

The Wellington City Council Earthworks Rules also include the following requirements that are not covered under the various District Plan provisions commented on above:

19A.2.1 To provide for earthworks for the use development and protection of land throughout the city while avoiding, remedying or mitigating any adverse effects of earthworks, landslips and associated structures on the environment.”

#### **POLICIES**

To achieve this objective, Council will:

19A.2.1.7 Protect the character and visual amenity of suburban coastal areas by controlling the effects of earthworks and associated structures, particularly where they are located on steep coastal escarpments and headlands.

#### **METHODS**

- Rules

*Suburban coastal roads and the residential properties, commercial properties and open space areas along these roads are a distinctive component of Wellington City’s landscape character. These areas are a “cultural landscape”; the character resulting from a combination of natural landforms and patterns of building and development. A strong and defining element is the coastal*

*escarpments and headlands that provide a natural backdrop to the houses and other buildings on the coastal terraces.*

*Apart from Oriental Bay there has been very little development of these steep slopes but recent examples demonstrate that such development has a considerable visual impact.*

*Earthworks and associated structures to provide for garages and cable cars on legal road can also detract from the character of the coastal landscape. The Council will consider the effects of the earthworks and associated structures under the earthworks rules and the accessory buildings and other structures under Rule 5.3.5 and the encroachment licence process.*

*The criteria for assessment are designed to rigorously control earthworks and associated structures in the coastal environment. The Plan requires strong justification for earthworks and any associated structures.*

*Matters to consider in assessing applications include:*

- *Whether the proposed earthworks and any associated structures will have a negative visual impact on the appearance and character of areas along coastal roads*
- *Whether mitigation will be effective in addressing the visual effects of the earthworks and associated structures*
- *Whether the design of the project and the materials used for retaining and stabilising structures and landscape planting are of a high quality compared to similar projects in other parts of the city*
- *The extent that indigenous or naturalised species are used in landscape planting. Thin soils, wind and salt spray can make revegetation difficult. Local native plants or wild growing non-native plants offer the advantage of being adapted to the local conditions and help to blend planted areas with existing wild vegetation on coastal cliffs*
- *All relevant matters listed for assessment under Policy 19A.2.1.6*
- *Where the proposed earthworks and associated structures will facilitate the location of a building on a steep coastal escarpment or headland; an existing slope that is steeper than 1.5 horizontal to 1 vertical (approximately 34°); whether the earthworks and associated structures should be declined consent (the building itself cannot be declined under this policy but the earthworks and any associated structures that make its construction possible can be).*

*The environmental result will be the protection of the character and visual amenity along suburban coastal roads.*

Comment in relation to this site:

This site does not lie on or near to the coast, and is not visible from the coast. The provisions under Clause 19A.2.1.7 therefore do not apply.

19A.2.1.8 Ensure the design of structures used to retain or stabilise landslips (where earthworks are not required after the event), reflect the character and visual amenity of the local area.

## METHODS

- Rules

- Design Guides (Residential, Subdivision, Rural Area)

*“Landslips are considered ‘acts of God’ (unless they happen during development work or as a result of other human activities). They are unexpected events, generally beyond human control, and cannot be considered as deliberate work or ‘earthworks’, unless earthworks are required to reshape or clean up the slip. The future stability of land affected by a landslip and the safety of existing buildings and structures are addressed by remedial and retaining work that is likely to require a building consent under the Building Act 2004.*

*A rule has been provided to control the appearance of structures designed to retain or stabilise landslips, by linking these structures to the policies for the visual amenity of earthworks.*

*The environmental result will be that the structures used to retain or stabilise landslips will reflect the character and visual amenity of the local area.*

Comment in relation to this site:

The matter of stability of the landfill is discussed in the Aurecon report appended. Landslip on this landfill may be held to be categorised in three parts:

- Failure of the face of the landfill that faces to Landfill Road;
- Failure of one of the landfill faces that lie in such a manner as to cause the debris to be completely contained within the site, and
- Failure of one of the natural slopes that lie at the margins of the landfill or proposed working areas. These slopes may be either natural slopes or natural slopes that have been modified during the development and operation of this landfill.

Taking each in turn:

The landfill face that faces to Landfill Road contains the access road to the tiphead. This face is one of the first built; its construction includes a large number of large concrete demolition elements such as beams and columns that act to reinforce the smaller elements placed around them. The access roading system – a form of “switchback”, acts as benching albeit that it is not level in the normally accepted form of benched slopes, and there has been a considerable period of natural preconsolidation in the material in this slope.

The remaining landfill faces are arranged in such a way as to fail into the site, and as such they do not pose a threat to the public or community. At the present all of these faces are viewed as work in progress, and as such they are closely monitored throughout the working day and particularly during and after periods of heavy rainfall. The worst effect of a failure of one of these slopes would be the blockage of the entry to the culvert that lies under the landfill - such a blockage can be readily detected and cleared using existing equipment on site.

Similar arguments apply to the natural slopes, with the exception that landslip would likely be of a small scale and would not in themselves imperil the culvert inlet.

No retaining structures are therefore considered necessary or appropriate to stabilize the landfill slopes or those of the natural margins to the landfill.

19A.2.1.10 Protect koiwi (human remains), taonga and Maori and Non-Maori material and archaeological sites, dated from before 1900, by advising applicants of their obligations under legislation and using enforcement powers where appropriate.

#### METHODS

- Archaeological authority process under the Historic Places Act 1993, administered by the New Zealand Historic Places Trust
- Chapter 20: Heritage Objectives and Policies
- Section 17 of the Resource Management Act 1991 – Abatement Notices, Enforcement Orders

*“Maori and non-Maori archaeological sites from before 1900 are protected by the Historic Places Act 1993. An Archaeological Authority may be required from the New Zealand Historic Places Trust to disturb these sites. The Council will work with the New Zealand Historic Places Trust, Wellington Tenth’s Trust and Ngati Toa Rangatira, to make information available to ensure that property owners / applicants are aware of their statutory and cultural obligations.*

*Chapter 20, the Heritage Objectives and Policies, identifies the importance of archaeological values and sites and the requirement under the Resource Management Act to protect them from inappropriate subdivision, use and development. The council has not at this stage identified in sufficient detail particular archaeological sites to enable consideration of whether the district plan should control the effects on such sites using rules (similar to the heritage rules for buildings, objects and areas). This work will be taken in the future.*

*This does not mean that there is no RMA controls on the effects of earthworks on archaeological values. Every person undertaking earthworks has a general duty under Section 17 of the Resource Management Act 1991 to avoid, remedy or mitigate any adverse effects of activities. Where significant archaeological sites are known or discovered during earthworks Council can use its enforcement powers to protect them.*

*The environmental result will be greater protection of Maori and non-Maori archaeological values from inappropriate subdivision, use or development.*

Comment in relation to this site:

The land includes a small watercourse bordered by steeply sloping hills. The topsoil is scant and poor, and the underlying strata is fractured rock – generally greywacke – but with some other materials. Once established in the topsoil layer, the root systems in the bush cover on the slopes find their way into fractures within the rock base, and as the roots grow they tend to prise the surface rocks apart, leading to minor landslip.

This appears to be an entirely natural process, and left to nature it is thought that this process would eventually lead to the total loss of any koiwi, taonga and Maori and Non-Maori material and archaeological sites.

Within the context of the site archaeology, it is believed that the possibility of there being any items of interest is small, but it is also considered prudent to draw attention in the Site Environmental Management Plan to the possibility that such sites may exist, and to provide operational staff with training and an observational and response plan for implementation during such times as disturbance of the natural slopes is undertaken.

### 4.3. Summary of Effects

#### 4.3.1 Positive Effects

Council's Waste Management Strategy aims to create an environment where there will be fewer and better-managed waste disposal sites. In the past there were limited environmental controls placed on the landfill but in recent years the consent holders have adopted an Environmental Management Plan to guide operations. In addition a Stormwater, Silt and Erosion Control Plan is submitted as part of this proposal to further improve environmental quality. The proposal will provide the city with many years of disposal at a site already used for this purpose. The consent holders will continue to remove materials from the waste stream that can be reused and recycled to minimise waste to landfill.

#### 4.3.2 Erosion and Sediment Control

A Stormwater, Erosion and sediment Control plan has been developed for this proposal to maximize silt control on site. This plan can be found in Appendix 7.

#### 4.3.3 Traffic

This site is a continuing operation with trucks delivering waste stream components and returning empty either to collect a further load or to carry out another assignment. In the proposed extension to landfilling it is not intended to increase the current level of truck movements/quantities of waste to be landfilled so there will be no change to the impact of vehicles coming to the site.

For construction demolition and construction waste streams very broadly fall into five categories:

- Waste materials from construction and demolition projects within the Wellington District;
- Waste materials from construction and demolition projects that lie outside Wellington District;
- Waste materials from other earthworks projects within Wellington District;
- Waste materials from earthworks projects that lie outside Wellington District, and
- Waste materials from slip clearance.

As far as construction and demolition and earthworks projects that lie within the Wellington District are concerned, it is thought that the effects of traffic on roads within the District will have been considered as a part of the issue of resource and building consents for the work being carried out.

For works being carried out outside Wellington District, it is thought that the majority of travel will be on established major and arterial roads by driver choice, so that the disturbance to communities will be of minimal effect.

The problem of slip clearance, particularly where the slippage occurs over roads, is one that cannot be regulated easily. The loss of amenity to the public from the occurrence of a slip would seem to outweigh the very short term loss of amenity due to truck traffic movements.

The operation of this landfill does therefore not, in itself, effect a loss of amenity to the community from traffic movements.

#### 4.3.4 Dust

Little can be done to minimise dust generated from the working faces of the landfill. The addition of water on these faces may increase instability in some instances, and should be

generally avoided. However, the working faces of the landfill are located some distance from any residential uses, and while it is considered that dust nuisance from this site is unlikely it is also thought that the provision of two dust monitors, located on the eastern and northern sides of the landfill, would be prudent. Should excessive dust be generated on the haul roads traffic will be slowed and if necessary water will be used to settle the dust.

Insofar as the finished areas of the landfill are concerned, there has been a strong re-growth of weeds and scrub plants from the surrounding areas; this growth is now well established and contributes to the surface stability of the landfill, dust and erosion control.

#### 4.3.4 Noise

The operation of trucks unloading at the landfill is inherently noisy. However, the site is well away from any habitation and is in a valley that naturally contains noise. The applicants do not intend to increase the level of truck movements to and from the site so there will be no increased noise impact from future operations.

#### 4.3.6 Visual Amenity

The existing character of the subject site will not be adversely affected by approval of the consent sought. Completion of the landfill and appropriate rehabilitation will enhance the landscape, amenity and recreational value of the site. The final landform will be that of undeveloped land with open areas. The final cover will provide a suitable substrate for the planting and regeneration of local indigenous plants.

None of the proposed work will occur near a ridge or hilltop

#### 4.3.7 Sites of Cultural, Archaeological and Historical Interest

Within the context of the site archaeology, it is believed that the possibility of there being any items of interest is small, but it is also considered prudent to draw attention in the site management plan to the possibility that such sites may exist, and to provide operational staff with training and an observational and response plan for implementation during such times as disturbance of the natural slopes is undertaken.

#### 4.3.8 Ecological Values

The site has been operated as a construction and demolition landfill since 1978 and is therefore a highly modified site. Outside of the landfilled areas the site is vegetated in exotic weed species (predominantly gorse) with some pasture and regenerating indigenous scrub. There are some areas of secondary coastal regenerating bush on the lower northern slopes of the ridges. For the purposes of this proposal an ecological assessment of the valley that will be culverted and filled will be undertaken.

## 5 CONCLUSION

Future development of the site relates to continued landfilling of the valley above the existing culvert. This 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 13 stages progressing up the valley.

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.

The proposal specifies the materials that may be accepted for disposal and clarifies the final landfill volumes and a final datum for landfilling on site.

## Appendix 1 Title, location plans, District Plan Maps



## 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 LANDFILL 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	LANDFILL AERIAL PLAN	A

### Appendix 3 - USEPA guidelines for C&D waste

#### USEPA Accepted Composition of Construction and Demolition Wastes

The United States Environmental Protection Agency (USEPA) would seem to be one of the foremost authorities on the matter of Construction and Demolition Waste, and it estimated that there were some 1889 C&D landfills within its area of jurisdiction in 1994.

While the composition of C&D wastes in the United States is possibly somewhat broader than has been customary in New Zealand due to the amount of industrial plant handled by demolition contractors (it has been usual to remove such plant before a demolition contractor begins his work in New Zealand) the USEPA report "Construction and Demolition Waste Landfills" defined C&D Wastes as (p. ES1):

#### *"COMPOSITION OF C&D WASTE*

*Information on the composition of C&D waste is presented below. Most of this information was compiled from the literature by the National Association of Demolition Contractors (NADC); a small number of other readily available sources were used as well. These source documents provide only snapshots of the C&D waste stream in specific locations and at specific points (e.g., generation) rather than providing a complete cradle-to-grave picture of C&D wastes nationwide, or of the portion landfilled.*

*C&D waste is generated from the construction, renovation, repair, and demolition of structures such as residential and commercial buildings, roads, and bridges. The composition of C&D waste varies for these different activities and structures. Overall, C&D waste is composed mainly of wood products, asphalt, drywall, and masonry; other components often present in significant quantities include metals, plastics, earth, shingles, insulation, and paper and cardboard.*

*C&D debris also contains wastes that may be hazardous. The source documents identify a number of wastes that are referred to using such terms as "hazardous," "excluded," "unacceptable," "problem," "potentially toxic," or "illegal." It is not necessarily true that all of these wastes meet the definition of "hazardous" under Subtitle C of RCRA [Resource Conservation and Recovery Act], but they provide an indication of the types of hazardous wastes that may be present in the C&D waste stream. They can be divided into four categories:*

*Excess materials used in construction, and their containers. Examples: adhesives and adhesive containers, leftover paint and paint containers, excess roofing cement and roofing cement cans; Waste oils, grease, and fluids. Examples: machinery lubricants, brake fluid, form oil, engine oil; Other discrete items. Examples: batteries, fluorescent bulbs, appliances; and Inseparable constituents of bulk items. Examples: formaldehyde present in carpet, treated or coated wood."*

The report continues (pp2-1 to 2-2) to define the factors that influence the nature and type of demolition materials as:

#### *"FACTORS THAT INFLUENCE C&D WASTE COMPOSITION*

*C&D wastes are categorized in a variety of ways, and each category produces wastes with different composition and characteristics. For example, road C&D waste differs from bridge waste, which differs from building waste. Whereas road C&D generates large quantities of just a few different waste items (mainly asphalt and concrete), building C&D generates many different waste*

items in smaller amounts (with wood as the largest single item). Within the category of building C&D waste, the size and type of the building (e.g., an apartment building versus a single-family house) affects the composition of the waste. Even for one building type (e.g., a single-family house), the waste generated depends on the activity conducted (i.e., new construction, renovation, or demolition). For example, construction generally produces "clean;" unaltered, and separate waste items (e.g., unpainted wood, new concrete) (MVC, 1992). In contrast, demolition wastes may include more items that have been altered or mixed (e.g., wood painted with lead-based paint, concrete with hazardous waste spilled on it) (MVC, 1992).

Thus, three main factors affect the characteristics of C&D waste (MVC, 1992):

Structure type (e.g., residential, commercial, or industrial building, road, bridge);

Structure size (e.g., low-rise, high-rise); and

Activity being performed (e.g., construction, renovation, repair, demolition).

Additional factors that influence the type and quantity of C&D waste produced include (MVC, 1992; McGregor et al., 1993):

Size of the project as a whole (e.g., custom-built residence versus tract housing); Location of the project (e.g., waterfront versus inland, rural versus urban); Materials used in construction (e.g., brick versus wood);

Demolition practices (e.g., manual versus mechanical); Schedule (e.g., rushed versus paced); and Contractors' "housekeeping" practices.

Other factors do not affect the type and quantity of C&D waste produced, but do affect the type and quantity reported in the source documents and therefore in this report. These include:

How state regulations define what is and is not acceptable as C&D waste;

Where in the waste stream the C&D waste is measured (e.g., generation point, recycling station, landfill); and

How the C&D waste is measured (e.g., by volume or weight)...

#### COMPONENTS OF C&D WASTE

Overall, C&D waste streams are comprised mainly of wood products, asphalt, drywall (gypsum), and masonry (e.g., concrete, bricks). Other notable components include metals, plastics, earth, shingles, and insulation. In one county, waste identified by the source document as "hazardous" has been estimated to comprise 0.4 percent of construction waste by weight (Triangle J Council of Governments, 1993)<sup>6</sup>; this is discussed further in the final section of this chapter. Table 2-1 provides a complete list of components of C&D wastes mentioned in the source documents. The bold print denotes the "problematic" components, i.e., components that the source documents refer to as "hazardous," "excluded," "contaminants," "chemical constituents that could affect the use of the waste as fuel," "special," "unacceptable," "problem," "potentially toxic," "nonhazardous restrictive," or "illegal."

In general, wood comprises one-quarter to one-third of the C&D waste stream. Other generalizations are hard to make because (1) different studies address different segments of the

nation's C&D waste stream (e.g., road and bridge waste may be excluded from some studies; information in another study may be for waste from construction only or demolition only) and (2) C&D waste composition varies greatly from one category to another. The graphs and tables in this section provide examples of the composition of portions of the C&D waste stream. Note that they vary with location (e.g., Florida versus Vermont) and category of waste (e.g., construction versus demolition). Viewed together, they provide a good overall picture of the North American C&D waste stream, and show important differences among different categories of C&D waste.

#### *C&D Waste Including Road and Bridge Waste (Vermont)*

Figure 2-1 provides a picture of the composition of Vermont's complete C&D waste stream by weight, based on a comprehensive C&D generation study. Asphalt comprises approximately one-half of the waste stream, wood one-quarter, and concrete one-sixth (Casper et al., 1993).

#### *C&D Waste Excluding Road and Bridge Waste (Florida)*

Figure 2-2 provides an example of the composition by volume of the C&D waste stream received at a C&D recycling facility in Florida. Although the source document (Casper et al., 1993) states that the facility accepts "the complete CID waste stream," it appears that the facility receives the complete building C&D waste stream, but does not receive wood or bridge waste, because asphalt is not listed as a component of the waste. Approximately one-third of the waste volume is wood (Casper et al., 1993). Drywall comprises one-sixth and paper and cardboard together comprise one-sixth of the total volume (Casper et al., 1993).

#### *Construction-only Waste Versus Demolition-only Waste*

Approximately one-third of the construction waste volume in Toronto is wood, and masonry and tile comprise less than one-sixth of the construction waste (Figure 2-3) (THBA, 1991). Demolition waste is also comprised of approximately one-third wood (in the U.S.), but concrete makes up over one-half of demolition waste (Figure 2-4) (Chatterjee-U.S. Army as cited in SPARK, 1991).

#### *C&D Waste by Housing Type*

Table 2-2 compares residential construction waste to commercial construction waste in the Twin Cities, Minnesota. Wood comprises one-fifth to one-third of the waste stream in both cases. Concrete, brick, and steel waste are greater from commercial construction than from residential, as would be expected.

### **COMPONENTS OF C&D WASTE THAT ARE POTENTIALLY "PROBLEMATIC"**

Hazardous wastes comprise a small percentage of the C&D waste stream (McGregor et al., 1993), and can potentially cause adverse effects to human health and ecosystems (Lambert and Domizio, 1993). For example, inhalation of urea formaldehyde (a resin used in insulation and as a wood preservative) has caused a health syndrome called "ultra-sensitive allergies" in demolition workers (Lambert and Domizio, 1993). Creosote (a wood preservative) can potentially leach into ground water and discharge into surface water, possibly adversely affecting drinking water or aquatic life if concentrations reach high enough levels (Lambert and Domizio, 1993).

This section describes the "problematic" components and constituents of C&D waste and, where information was available (i.e., for treated and coated wood), the proportion of those constituents in the waste item. Table 2-3 lists "problematic" components and constituents of C&D waste. These "problematic" wastes are not necessarily wastes that are classified as hazardous under RCRA Subtitle C. Some may be "problematic" simply because they are recyclable (e.g., cardboard) or because they are outside the definition of C&D waste as defined by a particular jurisdiction (e.g., garbage).

*It is also important to note that wastes that some jurisdictions exclude from C&D landfills or recycling centers are sometimes brought to the C&D disposal areas nonetheless. In some cases these wastes are detected and rejected (Casper et al., 1993; Lauer, 1993), but in other cases they may not be screened out (Gates et al., 1993), and evidence shows that they are found in C&D landfills (Piasecki et al., 1990).*

*For discussion purposes, the "problematic" C&D wastes are divided into four categories:*

*Excess hazardous materials used in construction and their containers;  
Waste oils and greases and other fluids from machinery;  
Other discrete items; and  
Incidental constituents that are inseparable from bulk C&D wastes (e.g., wood treatment chemicals).*

#### *Excess Potentially Hazardous Materials*

*Construction activities can produce excess "hazardous" materials and "empty" containers containing small quantities of "hazardous" materials. (The source, McGregor et al., 1993, does not define "hazardous," so these wastes may or may not be defined as hazardous under RCRA Subtitle C.) Adhesives and adhesive containers, leftover paint and paint containers, and excess roofing cement [adhesive] and roofing cement cans are a few examples. In some cases construction workers dump leftover paints or solvents on the ground (McGregor et al., 1993). Others may use sawdust, kitty litter, or masking tape to "dry" up empty paint cans and solvent containers (McGregor et al., 1993). "Hazardous" wastes may be disposed of in a dumpster, left at the construction site for a cleanup contractor, self-hauled to a landfill, or returned to the shop' (McGregor et al., 1993). Table 2-4 characterizes the 46 pounds of wastes referred to as "hazardous" from construction of a typical 1,850 square-foot single-family residence in Portland, Oregon. Assuming that the total waste weight produced by construction of some 1,810 square-foot houses in Oregon is typical, the 46 pounds would comprise less than 1 percent by weight of the total construction waste (including recycled waste), and less than 10 percent of the landfilled waste.*

#### *Machinery Lubricants*

*Waste oils, greases, and machine fluids are also generated by C&D activities. Examples include brake fluid, form oil, and engine oil (McGregor et al., 1993).*