

**Mayo County Council  
Comhairle Chontae Mhaigh Eo**



**Annual Environmental Report for Derrinnumera Landfill**

**Waste Licence W0021-01**

**2008**

**Submitted March 2008**

## **Annual Environmental Report Derrinnumera Landfill**

- **Reporting Period**

This report is the eighth Annual Environmental Report (AER) for the facility. It covers the period from January to December 2008.

- **Details of Activity**

This year the principle activity at the landfill was the placement of waste into the new lined and fully engineered Cell No.2. Waste placement in this new cell began in November 05. Permanent capping on Cell No.1 commenced in November 07 and was completed in May '08. Other activities include the collection of leachate at the leachate collection point, which is situated at the northern end of the site from where it is pumped to three leachate holding tanks. The leachate is removed from the facility by tanker to Castlebar Waste Water Treatment Plant.

Derrinnumera Civic Amenity Centre opened in July 2001 for the recycling and reclamation of materials by members of the public. The numbers of people using the Civic Amenity averaged 5,153 per month in 2008 giving a total of 66,155 users for the year.

A landfill gas management system, which incorporates flaring, is active 24 hours a day at the facility.

- **Quantity and Composition of Waste Received during the Year**

During 2008, 15,715.4 tonnes of waste were accepted at Derrinnumera Landfill. The waste totals are set out in Appendix A.

The civic amenity centre at Derrinnumera Landfill was opened in July 2001. A list of the 1,520 tonnes of materials collected and recycled during 2008 is outlined in Appendix B.

Waste characterisation surveys were not conducted this year as waste tonnages decreased and eventually the landfill was closed. It is hoped that a private waste collector will facilitate these surveys in 2009 once the landfill is re-opened.

- **Total Accumulated Quantities of Waste Deposited**

By the end of 2007 it was estimated that the total quantity of waste deposited at Derrinnumera Landfill was 398,257.19 tonnes. Including waste deposited during 2008 this figure now stands at 413,972.59 tonnes.

- **Calculated Remaining Capacity of the Site**

P.J. Tobin & Co. Ltd. carried out computer generated profiling to calculate the remaining void space of the landfill in March 2008. The estimated material volumes for cell construction and final capping were extracted from the overall figures to determine final estimated waste void space.

The total void space in New Cell 2 was approximately 145,336m<sup>3</sup>. There was remaining void space at the 1/1/08 is 82,297m<sup>3</sup>. Waste deposited in this year used up approx 19,993 m<sup>3</sup> leaving a remaining void space of 62,304 m<sup>3</sup> at 1/1/09.

- **Year in which the Final Capacity is expected to be Reached**

Since the 17/11/08 no waste is being deposited at the landfill due to a decline in tonnages. Once the site re-commences waste deposition, approx July 09, it is estimated that capacity will be reached in 18 months, by the end of 2010 approximately. This assessment is based on the remaining capacity of the site and the volume of waste acceptable under Waste Licence W0021-01 (i.e. 40,000 tonnes).

- **Area Occupied by the Waste**

The area occupied by the waste at the time of compiling this report is estimated at 14,066m<sup>2</sup> for the lined and fully capped Cell No.1. The surface area of new Cell No.2 is 20,140m<sup>2</sup>, of which approx 15,000 m<sup>2</sup> is currently covered with waste. The entire area of Cell 2 is treated as leachate generating. The area contained within the confines of the cut-off wall, which includes Cell 1 and Cell 2 is 92,314.8m<sup>2</sup>.

- **Methods of Deposition of Waste**

From 1<sup>st</sup> January to 15th November '08 waste deposition took in the lined and fully engineered Cell No. 2. The waste hauliers tipped waste in close proximity to the working face and from there it is positioned and compacted by the excavator and compactor. Members of the public do not generally deposit their waste in the main tipping area, a compactor unit and a number of open skips are provided within the Civic Amenity Area for the disposal of household rubbish. The compactor unit and skips are emptied as necessary. From the 17<sup>th</sup> of November as the tip head is closed for all waste, domestic waste accepted at the CA site was removed to Rathroeen landfill site near Ballina for disposal.

- **Summary of Results and Interpretations of Environmental Monitoring**

- (a) **Landfill Gas Monitoring**

GW2 is located within 1m of Cell 1. Levels of methane and carbon dioxide have fluctuated slightly throughout the year; however the gas levels in this borehole are generally high due to its location in the old waste body.

Gas wells GW6, GW8, GW9, GW13 and GW15 are located within 50m of the waste body, outside the cut-off wall. Over the reporting period, gas levels in GW9, GW13 and GW15 followed normal trends for these wells. Little or no gas was detected in GW9. GW15 is closely linked to the actions of the flare, if the flare is running there is little or no gas present in this well however if the flare is not in operation GW15 shows a marked increase in both methane and carbon dioxide as can be seen in the January results.

GW6 exceeded the trigger level for carbon dioxide at 1.5%v/v throughout most of the year. An investigation into the cause of this increase revealed no obvious source. This

borehole will continue to be monitored and investigated in 2008 however it is likely that the low levels of carbon dioxide gas are as a result of emissions from the blanket peat as there is no corresponding level of methane being recorded.

GW8 showed continuous fluctuations in the levels of carbon dioxide. Levels of carbon dioxide in GW8 remained low overall. This borehole will continue to be monitored and investigated in 2008 however it is likely that the low levels of gas are as a result of emissions from the blanket peat as there is no corresponding level of methane being recorded.

GW14, GW16 and GW17 were constructed at the end of 2001. GW16 showed mainly normal levels of oxygen throughout the year and no methane or carbon dioxide. GW14 and GW17 showed slight fluctuations in carbon dioxide throughout the year. However as there is no corresponding methane it is unlikely that the source of this gas is biodegrading waste. GW 17 became waterlogged in April in July which prevented monitoring.

The results of gas monitoring for each well is set out in Appendix C.

**(b) Dust Monitoring**

Annual dust monitoring was carried out in June 2008. The total dust levels in dust gauges D1, D2, D3 and D4 were below the dust limit set out in Waste Licence W0021-01 of 350mg/m<sup>2</sup>/day.

**(c) Noise Monitoring**

Annual noise monitoring for 2008 at Derrinnumera was carried out on July 22nd. Sampling locations N1, N2, N5 and N6 were monitored during the daytime and night-time. The Noise report for Derrinnumera was prepared and submitted to the agency in November.

**(d) Groundwater/Surface Water**

With regard to groundwater emissions some contamination was detected. Upgradient wells MW-1A, MW-5 showed little or no contamination. MW2S, MW2D, MW4S, MW4D, MW8D, MW9, MW3 and MW7 showed little or no contamination. Monitoring wells MW8S, MW17-MW19 located both inside and outside the cut-off wall show evidence of leachate contamination. MW20-MW23 and MW28 showed medium to gross contamination by leachate. The Wellpoint system installed in 2005 and in operation 24 hours per day 7 days per week. This system is having an effect in reducing the contamination levels in these wells, (evident from the tables in Appendix D) this system will continue to operate during 2009.

Surface water quality showed little or no contamination throughout the year. SW-1 and SW-6 are background wells showed little or no contamination. SW-2 SW-3, SW4 and SW5 showed little or no contamination.

The results for both groundwater and surface water sampling from the more important wells/ locations is set out in Appendix D.

**(e) Biological Monitoring**

Biological monitoring is carried out by the EPA on the Glaishty river each year. The results of the 2008 monitoring have not yet been made available.

**(f) Leachate Monitoring**

Analysis of leachate during the reporting period showed high levels of ammonia, BOD, COD, chloride, conductivity, suspended solids, total phosphorous and ortho-phosphate. High sodium: potassium ratios were also found which is typical of leachate.

The amount of leachate transported off-site during the reporting period was 129,403.85m<sup>3</sup>. Leachate is transported off-site to Castlebar Waste Water Treatment Plant by means of tankers. A month by month summary of the loads received by Castlebar Waste Water Treatment Plant is contained in Appendix E.

**• Resource Consumption Summary**

**Diesel**

An estimate of diesel consumed during the reporting period is 55,173 litres. This total consisted 1,407 litres of white diesel used for the site jeep. Operation of the Bomag compactor consumed 19,490 litres of the green diesel total, the excavator used 22,156 litres and the remainder 12,120 litres was used for the tractors, Skidsteer and a diesel generator. Approximately 64 litres of petrol was also consumed, for a generator, lawnmower, strimmer and a con saw.

**Electricity**

The number of units of electricity used on-site during 2008 was approx 1,288,737 units. The supplier of Electricity to the site is Airtricity who provide green energy from renewable resources.

**Water**

During 2008 it is estimated that the total volume of water consumed was 1,292 m<sup>3</sup>. Of this total 910 m<sup>3</sup> was used for dust control, 182 m<sup>3</sup> for control building and approx 200 m<sup>3</sup> was used for the wheelwash. Approximately 134.06m<sup>3</sup> of water was imported into the site when storage tank levels were low.

**• Report on development works undertaken during the reporting period**

The following works have been completed during the reporting period:

The permanent capping of Cell 1 was completed in May. Leachate recirculation pipework has been installed as part of this contract but is not yet in use.

**• Proposed development works to be undertaken during the coming year**

A considerable amount of the required site development works to ensure the landfill can be run in accordance with the requirements of the waste licence, have been completed. Plans for the final capping of the Southern end of Cell 2 will be submitted in 2009. In order to reduce leachate generation a proposal to cover an area inside the cut off wall

during 2009 is being drafted at present. The current licence is under review and the outcome of this review will determine the nature of further development work on this site.

- **Progress on Restoration of completed Cells/Phases**

Derrinnumera Landfill has been developed as a piggy-back facility where the two new engineered and lined cells are placed on top of the two old unlined cells. Waste deposition into the lined and fully engineered Cell 1 is complete and final capping is completed. Waste deposition will be taking place in the lined and fully engineered Cell No.2 until it reaches capacity.

- **Site Survey showing existing levels.**

The annual site survey was undertaken in March 2008, and was submitted to the agency.

- **Estimated Annual and Cumulative Quantity of Landfill Gas/Methane Emitted from the site.**

No records of waste deposition exist for Derrinnumera until January 2000, and with that from January until September 2000 only a record of the type of vehicle entering the site was kept. Therefore no accurate records exist with regard to the tonnage of waste accepted up to September 2000. Previous years estimates of the annual cumulative quantity of gas produced estimated the volumes of waste that may have placed previous to the installation of a weighbridge. It is estimated that from 1974 to 2008, 413,972 tonnes of waste was deposited at Derrinnumera.

Generally when in operation the flow rate per hour as recorded on the flaring unit averages 150m<sup>3</sup>/hr. The flaring unit automatically shuts down when the flow rate falls below 25m<sup>3</sup>/hr in order to ensure that emissions remain below the limits set under W0021-01.

This year consultants were employed for the task of calculating the amount of landfill gas and methane generated on-site using a model. The computerised gas model GASSIM was used to determine emissions as specified by the agency. A full report on this model including the emissions from this site was submitted to the agency in 2008. The predicted total amount of LFG emissions for 2008 is 1,056 tonnes of methane and 3,077 tonnes of Carbon dioxide. (These figures do not take account of LFG burned via the flare system)

- **Monthly Water Balance Calculation and Interpretation**

Most of the rainwater falling onto the waste body permeates through to the base of the cells, the majority of which drains to the leachate collection point from where it is pumped to three leachate holding tanks. The waste absorbs some of this rainwater. The amount, which is absorbed, is, for the purpose of determining the monthly water balance, termed the Available Absorptive Capacity "C" and the theoretical formula for this is

$$C = (H \times 0.1) + (T \times 0.05) - RA \text{ where}$$

H = the mass in tonnes of household and commercial waste placed in the cell during the month.

T = the mass of inert waste placed in the cell for the month.

R = the effective rainfall for the month – actual rainfall minus evapotranspiration.

A = the uncovered area of the cells into which the rain is falling.

For the leachate generation calculation it is the area inside the cut-off wall, which is used as the surface area generating leachate. The area within the cut-off wall is 92,314.8m<sup>2</sup>. The old Cell No.1 lies beneath the fully capped and engineered Cell 1, and therefore can be regarded as being completely covered.

With regard to the composition of waste received at Derrinnumera it is not possible to calculate the amount of household waste and inert waste accepted. Therefore all waste must be regarded as household waste for this calculation.

A meteorological station was set up on-site at end of September 2001. The actual rainfall recorded during 2008 was 1,593.8 mm. Evaporation was calculated as 0.25.

The water balance sheet for Cell No1 is attached in Appendix G.

The amount of leachate generated on-site is estimated at 104,592.27m<sup>3</sup> (Appendix F) and that which was transported off site was 129,403.85 m<sup>3</sup> (Appendix E), the difference being 24,811.58m<sup>3</sup>. The conclusion which has been drawn regarding the difference in volume of water removed from the facility and that generated is that the remainder of the leachate was still on-site following the high levels of rainfall recorded late in the year. The leachate added by the Wellpoint system is also not taken into account in the leachate generation calculation.

- **Meteorological Report**

The total rainfall recorded at the onsite meteorological station from January 2008 to December 2008 was 1,593.8 mm, which is above average for the area.

Temperatures ranged between -5.12 – 23.96 and degrees celcius.

Atmospheric pressure ranging between 940.58 mbar and 1028.61 mbar. As weather data is recorded on an daily/hourly basis it has not been included in an appendix, but can be made available if requested.

A summary of the monthly rainfalls for the site are set out in Appendix H.

- **Schedule of Environmental Objectives and Targets for the forthcoming year**

The Schedule of Environmental Objectives and Targets will be submitted for agreement with the Agency in 2009.

- **Report on the progress towards achievement of the Environmental Objectives and Targets.**

The Schedule of Objectives and Targets was submitted in July 2008 with the Environmental Management System. All the targets outlined were achieved by year end. New objectives are being set for 2009 with leachate reduction and gas collection the main target areas.

- **Written Summary of any procedures Developed by the licensee in the year which relates to the operation of the facility**

There were no major changes to the Environmental Management System (EMS) during 2008, it will be reviewed during 2009 and submitted for agreement with the Agency. The EMS sets out all procedures drawn up in relation to operations at the facility.

- **Reported Incidents Summary**

There were 29 category 3 incidents reported during 2008, the majority of these (24) related to the results of the monthly groundwater sampling showing evidence of historical leachate contamination and the monthly gas monitoring showing breaches of the threshold limits for CO<sub>2</sub> in the monitoring boreholes.

There was 1 incidents involving the level of leachate in Cell 2 being in breach of the 1m threshold, this incident occurred to allow leachate levels in the lagoon to be dealt with due to high rainfall.

There was 1 incident reported of an odour complaint received from a local resident. Capping of Cell 1 in 2008 reduced odours from the site and it is hoped that further capping in 2009 will reduce any odours further.

- **Complaints Summary**

There were 3 complaints received during 2008 in relation to the facility, one complaint related to odour. Complainants were contacted by the deputy manager to address their concerns if contact details were available. A tour of the site is offered to all complainants of environmental issues to allow those concerned to view at first hand the activities of the site.

- **Report on Financial Provision made under the licence**

Derrinnumera Landfill charges were €135/tonne, exclusive of the €15/tonne landfill levy (increased to €20 on 1<sup>st</sup> July) until 15<sup>th</sup> October. As waste was declining the charge was then reduced to €120, exclusive of the levy until the site closed. Bags of domestic refuse are charged at €5 per bag. Use of the Civic amenity for recycling is €2 to the public for all items except WEEE, batteries and textiles which are accepted free of charge.

The estimated cost of operating Derrinnumera Landfill for the year 2008 was €2.2m.

- **Report on Management and Staffing Structure of the facility**

The staffing arrangements on-site at Derrinnumera Landfill have not changed since the submission of the Management Structure in June 2005.

- **Report on the Programme for Public Information**

Records of all monitoring results and reports are maintained at Derrinnumera Landfill. In 2008 there were no requests from any member of the public seeking information pertaining to the landfill monitoring. Requests received mainly pertain to information on recycling and waste management. A number of requests for information were received from students both secondary and third level in relation to project work. All requests for information were replied to and invitations given to visit the facility if so required.



## APPENDIX A

| 2008 Monthly Landfill Waste Return (tonnes) |               |                |                |                |            |                      |                      |                |
|---|---------------|----------------|----------------|----------------|------------|----------------------|----------------------|----------------|
|   | Hospital      | CA Site        | Domestic       | Commercial     | Industrial | *Council<br>clean up | *Street<br>cleanings | Total          |
| <b>Jan</b>                                  | 25.42         | 285.64         | 1124.23        | 279.64         | 25.8       | 4.86                 | 59.42                | <b>1805.01</b> |
| <b>Feb</b>                                  | 45.36         | 266.8          | 984.72         | 302.68         | 35.66      | 9.36                 | 54                   | <b>1698.58</b> |
| <b>Mar</b>                                  | 34.96         | 263.4          | 1057.13        | 275.34         | 32.82      | 6.96                 | 53.58                | <b>1724.19</b> |
| <b>Apr</b>                                  | 44.18         | 271.56         | 933.58         | 279.74         | 23.3       | 40.38                | 69.52                | <b>1662.26</b> |
| <b>May</b>                                  | 38.34         | 295.46         | 869.58         | 288.66         | 10.44      | 10.1                 | 84.3                 | <b>1596.88</b> |
| <b>Jun</b>                                  | 35.76         | 265            | 783.49         | 272.94         | 24.94      | 2.72                 | 75.98                | <b>1460.83</b> |
| <b>Jul</b>                                  | 34.46         | 284.84         | 786.64         | 220.7          | 23.4       | 3.82                 | 76.82                | <b>1430.68</b> |
| <b>Aug</b>                                  | 42.12         | 340.48         | 615.39         | 188.8          | 21.92      | 1.85                 | 88.8                 | <b>1299.36</b> |
| <b>Sep</b>                                  | 31.52         | 258.83         | 519.25         | 115.22         | 17.3       | 5.28                 | 69.32                | <b>1016.72</b> |
| <b>Oct</b>                                  | 37.5          | 252.32         | 749.79         | 133.6          | 13.24      | 11.14                | 69.62                | <b>1267.21</b> |
| <b>Nov</b>                                  | 7.32          | 103.1          | 480.43         | 101.2          | 14.18      | 13.2                 | 34.28                | <b>753.71</b>  |
| <b>Dec</b>                                  | 0             | 0              | 0              | 0              | 0          | 0                    | 0                    | <b>0</b>       |
| <b>Total</b>                                | <b>376.94</b> | <b>2887.43</b> | <b>8904.23</b> | <b>2458.52</b> | <b>243</b> | <b>109.67</b>        | <b>735.64</b>        | <b>15715.4</b> |

## APPENDIX B

| <b>Civic Amenity Totals<br/>2008</b> |                                  | <b>(Tonnes)</b> |              |               |               |               |              |               |               |              |               |            |                |
|--------------------------------------|----------------------------------|-----------------|--------------|---------------|---------------|---------------|--------------|---------------|---------------|--------------|---------------|------------|----------------|
|                                      | <b>Jan</b>                       | <b>Feb</b>      | <b>Mar</b>   | <b>Apr</b>    | <b>May</b>    | <b>Jun</b>    | <b>Jul</b>   | <b>Aug</b>    | <b>Sept</b>   | <b>Oct</b>   | <b>Nov</b>    | <b>Dec</b> | <b>TOTALS</b>  |
| Paper                                | 34.26                            | 21.94           | 24.88        | 35.84         | 24.58         | 38.86         | 36.42        | 38.1          | 8.92          | 40.02        | 21.68         | 36.9       | <b>362.42</b>  |
| Cardboard                            | 26.08                            | 9.1             | 24.58        | 19.78         | 26.6          | 10.58         | 20.8         | 11.06         | 26.94         | 9.88         | 18.72         | 20.8       | <b>224.9</b>   |
| Glass                                | 19.54                            | 9.4             | 12.8         | 11.74         | 16.38         | 6.42          | 13.52        | 16            | 15.16         | 10.32        | 11.9          | 8.58       | <b>151.76</b>  |
| Car Batteries                        | 3.04                             | 3.64            | 0            | 0             | 5.02          | 2.36          | 1.22         | 1.92          | 1.98          | 0.98         | 4.66          | 0          | <b>24.82</b>   |
| Household batteries                  | 0.42                             | 0               | 0            | 0             | 0.9           | 0.28          | 0            | 0.18          | 0.2           | 0            | 0.34          | 0          | <b>2.32</b>    |
| Clothes                              | 6.7                              | 4.62            | 5.24         | 8.14          | 7.04          | 6.76          | 6.18         | 6.38          | 7.5           | 4.04         | 4.28          | 3.88       | <b>70.76</b>   |
| Electric fence batteries             | 0.38                             | 0               | 0            | 0             | 0             | 0.38          | 0            | 0.36          | 0             | 0            | 0.46          | 0          | <b>1.58</b>    |
| White Goods                          | Figures supplied by WEEE Ireland |                 |              |               |               |               |              |               |               |              |               |            | <b>91.183</b>  |
| Steel Cans                           | 16.14                            | 0               | 10.84        | 0             | 0             | 8.16          | 5.38         | 0             | 0             | 4.1          | 0             | 9.62       | <b>54.24</b>   |
| Scrap Metal                          | 14.35                            | 21.14           | 13.1         | 24.84         | 27.32         | 25.34         | 19.74        | 27.96         | 14.9          | 11.5         | 24.12         | 9.86       | <b>234.17</b>  |
| Aluminium Cans                       | 0                                | 0               | 3.5          | 0             | 0             | 0             | 0            | 0             | 0             | 4.8          | 0             | 1.84       | <b>10.14</b>   |
| Plastics                             | 5.78                             | 3.64            | 6.74         | 1.56          | 0             | 13.2          | 10.4         | 3.54          | 8.2           | 4.7          | 4.82          | 5.64       | <b>68.22</b>   |
| Tetrapak                             | 0                                | 0               | 2.86         | 0             | 0             | 1.5           | 5.14         | 0             | 0             | 0            | 0             | 3.9        | <b>13.4</b>    |
| Timber                               | 25.84                            | 20.9            | 21.06        | 19.56         | 11.44         | 14.42         | 17.06        | 22.42         | 25.92         | 10.12        | 13.48         | 10.6       | <b>212.82</b>  |
| Motor Oil                            | 0                                | 1.28            | 0            | 2.06          | 0             | 1.02          | 1.44         | 0.86          | 0.74          | 0            | 0.72          | 0          | <b>8.12</b>    |
| Oil filters                          | 0                                | 0               | 0            | 0.3           | 0             | 0             | 0.02         | 0             | 0.22          | 0            | 0             | 0          | <b>0.54</b>    |
| Televisions                          | Figures supplied by WEEE Ireland |                 |              |               |               |               |              |               |               |              |               |            | <b>71.628</b>  |
| Mixed WEEE                           | Figures supplied by WEEE Ireland |                 |              |               |               |               |              |               |               |              |               |            | <b>212.562</b> |
| Electrical Goods                     | Figures supplied by WEEE Ireland |                 |              |               |               |               |              |               |               |              |               |            | <b>0</b>       |
| Waste Paints                         | 0                                | 2.22            | 0.56         | 0             | 2.76          | 0             | 2.34         | 1.84          | 0             | 2.6          | 1.02          | 0          | <b>13.34</b>   |
| Fridges/Freezers                     | Figures supplied by WEEE Ireland |                 |              |               |               |               |              |               |               |              |               |            | <b>38.77</b>   |
| Fluorescent Tubes                    | 0.16                             | 0               | 0            | 0.26          | 0.16          | 0.16          | 0.08         | 0             | 0.14          | 0.1          | 0             | 0          | <b>1.06</b>    |
| Farm Plastics                        | 0                                | 0               | 0            | 0             | 0             | 0             | 0            | 0             | 0             | 0            | 0             | 0          | <b>0</b>       |
| Tyres (Stockpiled)                   | 0                                | 0               | 0            | 0             | 2.74          | 4.74          | 0            | 0             | 0             | 0            | 0             | 0          | <b>7.48</b>    |
| Window Glass                         | 0                                | 0               | 0            | 5.94          | 0             | 0             | 7.62         | 0             | 0             | 5.78         | 0             | 0          | <b>19.34</b>   |
| Light Bulbs                          | 0                                | 0               | 0.1          | 0             | 0             | 0             | 0.08         | 0             | 0             | 0            | 0             | 0          | <b>0.18</b>    |
| Waste Medicines                      | 0                                | 0               | 0            | 0             | 0             | 0             | 0            | 0             | 0             | 0            | 0             | 0          | <b>0</b>       |
| Waste Pesticides                     | 0                                | 0               | 0            | 0             | 0             | 0             | 0            | 0             | 0             | 0            | 0             | 0          | <b>0</b>       |
| Aerosols                             | 0                                | 0.24            | 0.14         | 0             | 0             | 0             | 0.22         | 0             | 0             | 0.14         | 0.18          | 0          | <b>0.92</b>    |
| Gas Cylinders                        | 0                                | 0               | 0            | 0             | 0             | 0             | 0            | 0             | 0             | 0            | 0             | 0          | <b>0</b>       |
| Cooking oil                          | 0                                | 0               | 0            | 0.58          | 0             | 0             | 0            | 0             | 0             | 0            | 0             | 0          | <b>0.58</b>    |
| Plasterboard/Gypsum                  | 2.54                             | 2.06            | 1.68         | 2.66          | 1.8           | 5.3           | 6.16         | 4.22          | 2.94          | 1.34         | 0.9           | 2.58       | <b>34.18</b>   |
| Polystyrene                          | 0.52                             | 0               | 0.52         | 0             | 0             | 0             | 0.88         | 0.28          | 0.16          | 0            | 0.34          | 0.24       | <b>2.94</b>    |
| <b>Monthly Totals</b>                | <b>155.75</b>                    | <b>100.18</b>   | <b>128.6</b> | <b>133.26</b> | <b>126.74</b> | <b>139.48</b> | <b>154.7</b> | <b>135.12</b> | <b>113.92</b> | <b>110.4</b> | <b>107.62</b> | <b>114</b> | <b>1520.23</b> |

### APPENDIX C

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW2          | 78.5     | 9.8      | 0.8     | 0         | 0        | 5.2   |
| February  | GW2          | 79       | 7.4      | 1.7     | 0         | 0        | 5.4   |
| March     | GW2          | 70.8     | 7.5      | 1.8     | 0         | 7        | 9.3   |
| April     | GW2          | 77.1     | 6.7      | 0.4     | 0         | 7        | 8.7   |
| May       | GW2          | 77.3     | 12.2     | 0.3     | 0         | 5        | 11.4  |
| June      | GW2          | 66.3     | 13.2     | 1.5     | 0         | 4        | 12.8  |
| July      | GW2          | 37.9     | 12       | 1.6     | 0         | 3        | 17.2  |
| August    | GW2          | 73.2     | 13.3     | 1.1     | 0         | 7        | 19.4  |
| September | GW2          | 77.5     | 12.6     | 0       | 0         | 4        | 12.9  |
| October   | GW2          | 81.3     | 13       | 0.2     | 0         | 9        | 13.7  |
| November  | GW2          | 84.4     | 9.5      | 0       | 0         | 4        | 7.5   |
| December  | GW2          | 79.8     | 8.9      | 0.4     | 0         | 5        | 8     |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW6          | 0        | 4        | 2.4     | 0         | 0        | 6.4   |
| February  | GW6          | 0        | 3.9      | 2.9     | 0         | 0        | 9.2   |
| March     | GW6          | 0        | 3        | 5.1     | 0         | 5        | 11.9  |
| April     | GW6          | 0        | 3.9      | 1.3     | 0         | 5        | 9.4   |
| May       | GW6          | 0.6      | 5.5      | 0.4     | 0         | 4        | 13.4  |
| June      | GW6          | 0        | 11.4     | 2       | 0         | 1        | 12.9  |
| July      | GW6          | 0        | 10.5     | 0.2     | 0         | 4        | 15.8  |
| August    | GW6          | 0        | 10.3     | 0.6     | 0         | 5        | 19.7  |
| September | GW6          | 0        | 6.9      | 1       | 0         | 0        | 13.4  |
| October   | GW6          | 0        | 7.3      | 1.3     | 0         | 8        | 15.9  |
| November  | GW6          | 0        | 3.8      | 6.6     | 0         | 0        | 7.5   |
| December  | GW6          | 0        | 2.6      | 8.5     | 0         | 0        | 8.1   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW8          | 0        | 2.6      | 6.9     | 0         | 0        | 4.6   |
| February  | GW8          | 0        | 2.8      | 5.9     | 0         | 0        | 6.3   |
| March     | GW8          | 0        | 0.7      | 19      | 0         | 5        | 9.7   |
| April     | GW8          | 0        | 1.7      | 12.7    | 0         | 5        | 8.2   |
| May       | GW8          | 0        | 3.9      | 2.3     | 0         | 3        | 10.1  |
| June      | GW8          | 0        | 6.4      | 1.4     | 0         | 1        | 12.3  |
| July      | GW8          | 0        | 7        | 2.2     | 0         | 0        | 14.9  |
| August    | GW8          | 0        | 7        | 2.8     | 0         | 6        | 20.8  |
| September | GW8          | 0        | 4        | 4.8     | 0         | 2        | 12.6  |
| October   | GW8          | 0        | 3.9      | 2.4     | 0         | 4        | 13.8  |
| November  | GW8          | 0        | 2        | 6.8     | 0         | 2        | 7.3   |
| December  | GW8          | 0        | 1.1      | 7.8     | 0         | 0        | 7.1   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW9          | 0        | 0.3      | 20.1    | 0         | 0        | 4.8   |
| February  | GW9          | 0        | 0.3      | 20.3    | 0         | 0        | 8.5   |
| March     | GW9          | 0        | 0.4      | 20.6    | 0         | 0        | 10.3  |
| April     | GW9          | 0        | 0.2      | 20.1    | 0         | 5        | 12.1  |
| May       | GW9          | 0        | 0.1      | 20.8    | 0         | 3        | 15.9  |
| June      | GW9          | 0        | 0.7      | 20.1    | 0         | 0        | 14.2  |
| July      | GW9          | 0        | 0.3      | 19.9    | 0         | 5        | 14    |
| August    | GW9          | 0        | 1.2      | 19      | 0         | 6        | 22    |
| September | GW9          | 0        | 0.8      | 19.9    | 0         | 0        | 14.3  |
| October   | GW9          | 0        | 0.4      | 20.1    | 0         | 5        | 20    |
| November  | GW9          | 0        | 0.5      | 20.3    | 0         | 0        | 7.7   |
| December  | GW9          | 0        | 0.3      | 20.1    | 0         | 0        | 8.2   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW13         | 0        | 0.3      | 20.1    | 0         | 0        | 4.8   |
| February  | GW13         | 0        | 0.3      | 20.3    | 0         | 0        | 8.5   |
| March     | GW13         | 0        | 0.4      | 20.6    | 0         | 0        | 10.3  |
| April     | GW13         | 0        | 0.2      | 20.1    | 0         | 5        | 12.1  |
| May       | GW13         | 0        | 0.1      | 20.8    | 0         | 3        | 15.9  |
| June      | GW13         | 0        | 0.7      | 20.1    | 0         | 0        | 14.2  |
| July      | GW13         | 0        | 0.3      | 19.9    | 0         | 5        | 14    |
| August    | GW13         | 0        | 1.2      | 19      | 0         | 6        | 22    |
| September | GW13         | 0        | 0.8      | 19.9    | 0         | 0        | 14.3  |
| October   | GW13         | 0        | 0.4      | 20.1    | 0         | 5        | 20    |
| November  | GW13         | 0        | 0.5      | 20.3    | 0         | 0        | 7.7   |
| December  | GW13         | 0        | 0.3      | 20.1    | 0         | 0        | 8.2   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW14         | 0        | 2.2      | 18.8    | 0         | 0        | 6.4   |
| February  | GW14         | 0        | 1.9      | 19.6    | 0         | 0        | 6.3   |
| March     | GW14         | 0        | 2.4      | 19.6    | 0         | 4        | 10.7  |
| April     | GW14         | 0        | 3.3      | 18.6    | 0         | 5        | 12.2  |
| May       | GW14         | 0        | 4.3      | 18.1    | 0         | 4        | 13.3  |
| June      | GW14         | 0        | 2.2      | 18.9    | 0         | 1        | 13.4  |
| July      | GW14         | 0        | 1.8      | 19      | 0         | 2        | 16.6  |
| August    | GW14         | 0        | 1.8      | 18.9    | 0         | 3        | 20.3  |
| September | GW14         | 0        | 3.3      | 17.9    | 0         | 1        | 14.2  |
| October   | GW14         | 0        | 4.7      | 17.6    | 0         | 3        | 13.2  |
| November  | GW14         | 0        | 6.6      | 17.3    | 0         | 0        | 7     |
| December  | GW14         | 0        | 3.3      | 19      | 0         | 0        | 9.3   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW15         | 0        | 0.1      | 19.9    | 0         | 0        | 6.2   |
| February  | GW15         | 0        | 0.1      | 20.4    | 0         | 0        | 5.9   |
| March     | GW15         | 0        | 0.2      | 20.4    | 0         | 2        | 9.6   |
| April     | GW15         | 0        | 1        | 18.2    | 0         | 7        | 9.9   |
| May       | GW15         | 0        | 0.5      | 19.7    | 0         | 4        | 13.1  |
| June      | GW15         | 0        | 0.1      | 20.3    | 0         | 1        | 12.3  |
| July      | GW15         | 0        | 0.1      | 20.1    | 0         | 3        | 15.7  |
| August    | GW15         | 0        | 0.1      | 20      | 0         | 4        | 19.6  |
| September | GW15         | 0        | 0.1      | 20.1    | 0         | 0        | 12.8  |
| October   | GW15         | 0        | 0.5      | 19.3    | 0         | 4        | 15    |
| November  | GW15         | 0        | 0        | 20.6    | 0         | 0        | 6.5   |
| December  | GW15         | 0        | 0        | 20.7    | 0         | 3        | 8     |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW16         | 0        | 0        | 20.1    | 0         | 0        | 7.1   |
| February  | GW16         | 0        | 0        | 20.6    | 0         | 0        | 6.5   |
| March     | GW16         | 0        | 0        | 20.6    | 0         | 4        | 10.3  |
| April     | GW16         | 0        | 0        | 20.3    | 0         | 4        | 11.4  |
| May       | GW16         | 0        | 0        | 20.4    | 0         | 4        | 13.8  |
| June      | GW16         | 0        | 0        | 20.4    | 0         | 1        | 14    |
| July      | GW16         | 0        | 0        | 20.2    | 0         | 0        | 16    |
| August    | GW16         | 0        | 0        | 20.2    | 0         | 7        | 21.2  |
| September | GW16         | 0        | 0        | 20.3    | 0         | 3        | 15.2  |
| October   | GW16         | 0        | 0        | 20.4    | 0         | 5        | 13.6  |
| November  | GW16         | 0        | 0        | 20.7    | 0         | 0        | 7.1   |
| December  | GW16         | 0        | 0        | 20.6    | 0         | 1        | 9.4   |

| Month     | Gas Well No. | CH4 %v/v | CO2 %v/v | O2 %v/v | H2S p.p.m | CO p.p.m | Temp. |
|-----------|--------------|----------|----------|---------|-----------|----------|-------|
| January   | GW17         | 0        | 0.2      | 20.1    | 0         | 0        | 6.2   |
| February  | GW17         | 0        | 0        | 20.6    | 0         | 0        | 6.7   |
| March     | GW17         | 0        | 1.3      | 19.8    | 0         | 4        | 10.2  |
| April     | GW17         |          |          |         |           |          |       |
| May       | GW17         | 0        | 1        | 20.1    | 0         | 2        | 15    |
| June      | GW17         | 0        | 2.2      | 19.1    | 0         | 3        | 14    |
| July      | GW17         |          |          |         |           |          |       |
| August    | GW17         | 0        | 3.3      | 18.2    | 0         | 4        | 23    |
| September | GW17         | 0        | 1.8      | 19.2    | 0         | 0        | 14.2  |
| October   | GW17         | 0        | 2.3      | 18.7    | 0         | 0        | 16.6  |
| November  | GW17         | 0        | 2.7      | 18.7    | 0         | 0        | 7.2   |
| December  | GW17         | 0        | 3.1      | 18.6    | 0         | 0        | 9.5   |

**APPENDIX D**

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW17            | January   |                     |                             | 0.14                   |                             | 1.398                               | 7.24 | 1.7                           |                        |                           |               |                       |                     |
| MW17            | February  |                     |                             | 0.07                   |                             | 1.396                               | 7.2  | 1.8                           |                        |                           |               |                       |                     |
| MW17            | March     |                     |                             | 0.05                   |                             | 1.396                               | 6.69 | 1.7                           | 55.9                   | 5.9                       | 172           | 5.7                   |                     |
| MW17            | April     |                     |                             | 0.07                   |                             | 1.363                               | 6.89 | 1.6                           |                        |                           |               |                       |                     |
| MW17            | May       |                     |                             | 0.05                   |                             | 1.377                               | 7.49 | 1.7                           |                        |                           |               |                       |                     |
| MW17            | June      |                     |                             | 0.07                   |                             | 1.443                               | 6.91 | 2.6                           | 52.9                   | 5.1                       | 181           | 9.1                   |                     |
| MW17            | July      |                     |                             | 0.05                   |                             | 1.433                               | 7.57 | 2.2                           |                        |                           |               |                       |                     |
| MW17            | August    |                     |                             | 0.05                   |                             | 1.517                               | 6.69 | 2.2                           |                        |                           |               |                       |                     |
| MW17            | September |                     |                             | 0.05                   |                             | 1.468                               | 7.02 | 2.6                           | 60.7                   | 4.5                       | 199           | 8                     |                     |
| MW17            | October   |                     |                             | 0.06                   |                             | 1.402                               | 6.97 | 1.5                           |                        |                           |               |                       |                     |
| MW17            | November  |                     |                             | 0.06                   |                             | 1.397                               | 6.93 | 1.9                           | 50.1                   | 4.8                       | 185           | 10                    |                     |
| MW17            | December  |                     |                             | 0.05                   |                             | 1.373                               | 6.94 | 1.9                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW18            | January   |                     |                             | 0.05                   |                             | 1.489                               | 7.24 | 8.1                           |                        |                           |               |                       |                     |
| MW18            | February  |                     |                             | 0.13                   |                             | 1.489                               | 6.84 | 7.7                           |                        |                           |               |                       |                     |
| MW18            | March     |                     |                             | 0.05                   |                             | 1.488                               | 6.55 | 7.6                           | 86.1                   | 2.8                       | 202           | 5.4                   |                     |
| MW18            | April     |                     |                             | 0.23                   |                             | 1.502                               | 6.55 | 7.8                           |                        |                           |               |                       |                     |
| MW18            | May       |                     |                             | 0.18                   |                             | 1.51                                | 6.7  | 7.6                           |                        |                           |               |                       |                     |
| MW18            | June      |                     |                             | 0.05                   |                             | 1.512                               | 6.82 | 9.1                           | 83                     | 3                         | 210           | 10                    |                     |
| MW18            | July      |                     |                             | 0.05                   |                             | 1.472                               | 7.06 | 8                             |                        |                           |               |                       |                     |
| MW18            | August    |                     |                             | 0.05                   |                             | 1.498                               | 6.68 | 7.4                           |                        |                           |               |                       |                     |
| MW18            | September |                     |                             | 0.05                   |                             | 1.479                               | 7.28 | 8                             | 93.2                   | 2.6                       | 212           | 8.4                   |                     |
| MW18            | October   |                     |                             | 0.08                   |                             | 1.502                               | 6.63 | 7.9                           |                        |                           |               |                       |                     |
| MW18            | November  |                     |                             | 0.05                   |                             | 1.523                               | 6.77 | 8.4                           | 80.1                   | 2.5                       | 233           | 9.2                   |                     |
| MW18            | December  |                     |                             | 0.05                   |                             | 1.525                               | 6.7  | 8.7                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW19            | January   |                     |                             | 0.05                   |                             | 1.493                               | 7.16 | 7.6                           |                        |                           |               |                       |                     |
| MW19            | February  |                     |                             | 0.14                   |                             | 1.486                               | 7.16 | 7.2                           |                        |                           |               |                       |                     |
| MW19            | March     |                     |                             | 0.05                   |                             | 1.503                               | 6.59 | 7.2                           | 91.8                   | 3.3                       | 204           | 5                     |                     |
| MW19            | April     |                     |                             | 0.11                   |                             | 1.488                               | 6.73 | 7.2                           |                        |                           |               |                       |                     |
| MW19            | May       |                     |                             | 0.08                   |                             | 1.492                               | 6.93 | 7                             |                        |                           |               |                       |                     |
| MW19            | June      |                     |                             | 0.18                   |                             | 1.354                               | 6.51 | 8.5                           | 82.4                   | 3.5                       | 181           | 8.4                   |                     |
| MW19            | July      |                     |                             | 0.74                   |                             | 1.423                               | 6.51 | 6.8                           |                        |                           |               |                       |                     |
| MW19            | August    |                     |                             | 0.05                   |                             | 1.468                               | 6.53 | 6.9                           |                        |                           |               |                       |                     |
| MW19            | September |                     |                             | 0.05                   |                             | 1.476                               | 7.04 | 7.6                           | 93.7                   | 2.9                       | 206           | 7.5                   |                     |
| MW19            | October   |                     |                             | 0.05                   |                             | 1.495                               | 6.54 | 7.5                           |                        |                           |               |                       |                     |
| MW19            | November  |                     |                             | 0.05                   |                             | 1.467                               | 6.62 | 7.8                           | 85.1                   | 2.7                       | 225           | 9.4                   |                     |
| MW19            | December  |                     |                             | 0.05                   |                             | 1.482                               | 6.66 | 8.3                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW20            | January   |                     |                             | 0.24                   |                             | 1.536                               | 7.11 | 44.5                          |                        |                           |               |                       |                     |
| MW20            | February  |                     |                             | 0.31                   |                             | 3.188                               | 7.71 | 155                           |                        |                           |               |                       |                     |
| MW20            | March     |                     |                             | 0.08                   |                             | 1.483                               | 6.83 | 39.2                          | 98.3                   | 23.5                      | 131           | 5.1                   |                     |
| MW20            | April     |                     |                             | 0.11                   |                             | 1.931                               | 7.63 | 65.8                          |                        |                           |               |                       |                     |
| MW20            | May       |                     |                             | 0.41                   |                             | 3.131                               | 7.01 | 144.5                         |                        |                           |               |                       |                     |
| MW20            | June      |                     |                             | 0.45                   |                             | 4.063                               | 6.89 | 238.4                         | 296.9                  | 108.3                     | 437           | 8.8                   |                     |
| MW20            | July      |                     |                             | 0.11                   |                             | 4.064                               | 6.88 | 199.8                         |                        |                           |               |                       |                     |
| MW20            | August    |                     |                             | 0.44                   |                             | 4.162                               | 7.02 | 235.3                         |                        |                           |               |                       |                     |
| MW20            | September |                     |                             | 0.29                   |                             | 4.229                               | 7.05 | 254.3                         | 307.8                  | 117.5                     | 499           | 9.3                   |                     |
| MW20            | October   |                     |                             | 0.05                   |                             | 3.893                               | 7.02 | 204.4                         |                        |                           |               |                       |                     |
| MW20            | November  |                     |                             | 0.2                    |                             | 3.732                               | 7.28 | 18.5                          | 251.3                  | 93.2                      | 410           | 9                     |                     |
| MW20            | December  |                     |                             | 0.72                   |                             | 3.582                               | 7.16 | 199.4                         |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C mS/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW21            | January   |                     |                             | 0.56                   |                             | 2.249                               | 6.95 | 106.3                         |                        |                           |               |                       |                     |
| MW21            | February  |                     |                             | 0.35                   |                             | 3.255                               | 7.64 | 153.5                         |                        |                           |               |                       |                     |
| MW21            | March     |                     |                             | 0.43                   |                             | 2.343                               | 6.78 | 104.8                         | 189.2                  | 44.9                      | 248           | 4.6                   |                     |
| MW21            | April     |                     |                             | 0.13                   |                             | 2.742                               | 7.22 | 129.7                         |                        |                           |               |                       |                     |
| MW21            | May       |                     |                             | 0.25                   |                             | 0.289                               | 7.24 | 149.8                         |                        |                           |               |                       |                     |
| MW21            | June      |                     |                             | 0.54                   |                             | 3.722                               | 6.87 | 198.4                         | 289.7                  | 75.5                      | 407           | 7.3                   |                     |
| MW21            | July      |                     |                             | 0.06                   |                             | 3.758                               | 6.92 | 173.2                         |                        |                           |               |                       |                     |
| MW21            | August    |                     |                             | 0.05                   |                             | 4.024                               | 6.97 | 199.9                         |                        |                           |               |                       |                     |
| MW21            | September |                     |                             | 0.13                   |                             | 3.887                               | 7.22 | 210.6                         | 297.2                  | 83.9                      | 470           | 8.8                   |                     |
| MW21            | October   |                     |                             | 0.07                   |                             | 3.862                               | 7.08 | 184.6                         |                        |                           |               |                       |                     |
| MW21            | November  |                     |                             | 0.1                    |                             | 3.785                               | 7.15 | 345.6                         | 270.2                  | 75.6                      | 455           | 9.4                   |                     |
| MW21            | December  |                     |                             | 0.49                   |                             | 3.702                               | 7.05 | 190.3                         |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C mS/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW22            | January   |                     |                             | 0.29                   |                             | 2.577                               | 7.23 | 114.7                         |                        |                           |               |                       |                     |
| MW22            | February  |                     |                             | 0.5                    |                             | 4.01                                | 7.08 | 234.4                         |                        |                           |               |                       |                     |
| MW22            | March     |                     |                             | 0.3                    |                             | 3.653                               | 6.98 | 175.8                         | 320.7                  | 92.7                      | 385           | 4.8                   |                     |
| MW22            | April     |                     |                             | 0.35                   |                             | 3.842                               | 7.51 | 213.8                         |                        |                           |               |                       |                     |
| MW22            | May       |                     |                             | 0.71                   |                             | 4.667                               | 7.11 | 278                           |                        |                           |               |                       |                     |
| MW22            | June      |                     |                             | 0.86                   |                             | 4.994                               | 7.02 | 337.3                         | 372.5                  | 152.4                     | 542           | 7.8                   |                     |
| MW22            | July      |                     |                             | 0.49                   |                             | 4.993                               | 6.94 | 286                           |                        |                           |               |                       |                     |
| MW22            | August    |                     |                             | 0.6                    |                             | 5                                   | 7.31 | 323.5                         |                        |                           |               |                       |                     |
| MW22            | September |                     |                             | 0.25                   |                             | 3.304                               | 7.32 | 210.2                         | 248.4                  | 96                        | 389           | 8.5                   |                     |
| MW22            | October   |                     |                             | 0.09                   |                             | 4.657                               | 7.11 | 282.3                         |                        |                           |               |                       |                     |
| MW22            | November  |                     |                             | 0.9                    |                             | 4.292                               | 7.24 | 250.8                         | 331.5                  | 135.7                     | 480           | 5.3                   |                     |
| MW22            | December  |                     |                             | 0.05                   |                             | 4.052                               | 7.52 | 250.8                         |                        |                           |               |                       |                     |



| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW23            | January   |                     |                             | 1.11                   |                             | 2.323                               | 7.04 | 157.3                         |                        |                           |               |                       |                     |
| MW23            | February  |                     |                             | 1.06                   |                             | 2.798                               | 7.06 | 185.4                         |                        |                           |               |                       |                     |
| MW23            | March     |                     |                             | 2.44                   |                             | 3.049                               | 7.06 | 138.2                         | 283.2                  | 93.5                      | 294           | 4.4                   |                     |
| MW23            | April     |                     |                             | 0.17                   |                             | 3.174                               | 7.26 | 164.8                         |                        |                           |               |                       |                     |
| MW23            | May       |                     |                             | 1.73                   |                             | 4.729                               | 7.39 | 286.2                         |                        |                           |               |                       |                     |
| MW23            | June      |                     |                             | 1.29                   |                             | 3.711                               | 6.92 | 237.1                         | 273.9                  | 115.9                     | 394           | 8                     |                     |
| MW23            | July      |                     |                             | 0.36                   |                             | 3.324                               | 6.88 | 178.7                         |                        |                           |               |                       |                     |
| MW23            | August    |                     |                             | 0.23                   |                             | 3.181                               | 7.07 | 190.8                         |                        |                           |               |                       |                     |
| MW23            | September |                     |                             | 0.85                   |                             | 3.028                               | 7.02 | 193.3                         | 222.9                  | 93.3                      | 297           | 6.8                   |                     |
| MW23            | October   |                     |                             | 0.17                   |                             | 3.121                               | 6.99 | 177.7                         |                        |                           |               |                       |                     |
| MW23            | November  |                     |                             | 0.85                   |                             | 2.765                               | 7.13 | 154.9                         | 193                    | 82.1                      | 276           | 4.5                   |                     |
| MW23            | December  |                     |                             | 1.07                   |                             | 2.723                               | 7.1  | 168.1                         |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW24            | January   |                     |                             | 0.18                   |                             | 2.998                               | 6.77 | 57.8                          |                        |                           |               |                       |                     |
| MW24            | February  |                     |                             | 0.12                   |                             | 2.832                               | 7    | 50.6                          |                        |                           |               |                       |                     |
| MW24            | March     |                     |                             | 0.05                   |                             | 2.878                               | 6.73 | 55.3                          | 282.5                  | 27.9                      | 409           | 4.5                   |                     |
| MW24            | April     |                     |                             | 0.05                   |                             | 2.863                               | 6.79 | 52.2                          |                        |                           |               |                       |                     |
| MW24            | May       |                     |                             | 0.15                   |                             | 2.845                               | 6.99 | 53.4                          |                        |                           |               |                       |                     |
| MW24            | June      |                     |                             | 0.07                   |                             | 2.957                               | 6.53 | 67.4                          | 249.5                  | 28.2                      | 414           | 8.1                   |                     |
| MW24            | July      |                     |                             | 0.05                   |                             | 2.888                               | 6.54 | 55.3                          |                        |                           |               |                       |                     |
| MW24            | August    |                     |                             | 0.05                   |                             | 2.854                               | 6.73 | 62.3                          |                        |                           |               |                       |                     |
| MW24            | September |                     |                             | 0.05                   |                             | 2.825                               | 6.9  | 54.9                          | 238.9                  | 27.3                      | 404           | 7                     |                     |
| MW24            | October   |                     |                             | 0.05                   |                             | 2.922                               | 6.75 | 57.7                          |                        |                           |               |                       |                     |
| MW24            | November  |                     |                             | 0.05                   |                             | 2.888                               | 6.8  | 72.8                          | 221.5                  | 26.1                      | 435           | 4.8                   |                     |
| MW24            | December  |                     |                             | 0.14                   |                             | 2.927                               | 6.9  | 65.3                          |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW25            | January   |                     |                             | 0.05                   |                             | 0.912                               | 7.16 | 7.2                           |                        |                           |               |                       |                     |
| MW25            | February  |                     |                             | 0.05                   |                             | 0.931                               | 7.04 | 7.1                           |                        |                           |               |                       |                     |
| MW25            | March     |                     |                             | 0.05                   |                             | 0.772                               | 6.66 | 5.8                           | 60.9                   | 3.6                       | 63            | 5                     |                     |
| MW25            | April     |                     |                             | 0.15                   |                             | 0.954                               | 7.1  | 7.8                           |                        |                           |               |                       |                     |
| MW25            | May       |                     |                             | 0.11                   |                             | 0.907                               | 8.25 | 7.6                           |                        |                           |               |                       |                     |
| MW25            | June      |                     |                             | 0.05                   |                             | 0.858                               | 6.79 | 8.3                           | 68                     | 4                         | 82            | 8.9                   |                     |
| MW25            | July      |                     |                             | 0.05                   |                             | 0.791                               | 6.76 | 6.1                           |                        |                           |               |                       |                     |
| MW25            | August    |                     |                             | 0.08                   |                             | 0.916                               | 7.58 | 7.3                           |                        |                           |               |                       |                     |
| MW25            | September |                     |                             | 0.05                   |                             | 0.951                               | 7.04 | 8.5                           | 80.2                   | 4.1                       | 88            | 8.2                   |                     |
| MW25            | October   |                     |                             | 0.05                   |                             | 0.9                                 | 6.92 | 8.3                           |                        |                           |               |                       |                     |
| MW25            | November  |                     |                             | 0.05                   |                             | 0.891                               | 7.12 | 9                             | 69                     | 4.5                       | 81            | 9.7                   |                     |
| MW25            | December  |                     |                             | 0.05                   |                             | 0.95                                | 6.97 | 10                            |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW26            | January   |                     |                             | 0.07                   |                             | 0.694                               | 7.19 | 0.5                           |                        |                           |               |                       |                     |
| MW26            | February  |                     |                             | 0.09                   |                             | 0.717                               | 6.79 | 0.5                           |                        |                           |               |                       |                     |
| MW26            | March     |                     |                             | 0.05                   |                             | 0.662                               | 6.76 | 0.4                           | 40.7                   | 2.7                       | 41            | 5.2                   |                     |
| MW26            | April     |                     |                             | 0.06                   |                             | 0.705                               | 6.86 | 0.6                           |                        |                           |               |                       |                     |
| MW26            | May       |                     |                             | 0.05                   |                             | 0.7                                 | 6.83 | 0.5                           |                        |                           |               |                       |                     |
| MW26            | June      |                     |                             | 0.05                   |                             | 0.708                               | 6.46 | 0.4                           | 42.9                   | 2.4                       | 47            | 8.9                   |                     |
| MW26            | July      |                     |                             | 0.05                   |                             | 0.68                                | 7.36 | 0.8                           |                        |                           |               |                       |                     |
| MW26            | August    |                     |                             | 0.05                   |                             | 0.696                               | 6.8  | 0.6                           |                        |                           |               |                       |                     |
| MW26            | September |                     |                             | 0.05                   |                             | 0.673                               | 8.33 | 0.8                           | 44.7                   | 2.2                       | 63            | 8.3                   |                     |
| MW26            | October   |                     |                             | 0.05                   |                             | 0.69                                | 6.79 | 0.7                           |                        |                           |               |                       |                     |
| MW26            | November  |                     |                             | 0.05                   |                             | 0.698                               | 6.87 | 0.9                           | 40.1                   | 2.2                       | 47            | 9.6                   |                     |
| MW26            | December  |                     |                             | 0.1                    |                             | 0.703                               | 6.75 | 0.6                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW27            | January   |                     |                             | 0.08                   |                             | 0.752                               | 7.48 | 1                             |                        |                           |               |                       |                     |
| MW27            | February  |                     |                             | 0.05                   |                             | 0.769                               | 6.77 | 1                             |                        |                           |               |                       |                     |
| MW27            | March     |                     |                             | 0.05                   |                             | 0.732                               | 6.61 | 1                             | 44.9                   | 3.1                       | 48            | 5.3                   |                     |
| MW27            | April     |                     |                             | 0.05                   |                             | 0.768                               | 6.91 | 0.9                           |                        |                           |               |                       |                     |
| MW27            | May       |                     |                             | 0.05                   |                             | 0.763                               | 6.71 | 1.1                           |                        |                           |               |                       |                     |
| MW27            | June      |                     |                             | 0.05                   |                             | 0.768                               | 6.52 | 1.4                           | 45.6                   | 3.6                       | 52            | 9.8                   |                     |
| MW27            | July      |                     |                             | 0.05                   |                             | 0.76                                | 7.81 | 1                             |                        |                           |               |                       |                     |
| MW27            | August    |                     |                             | 0.05                   |                             | 0.752                               | 6.87 | 1                             |                        |                           |               |                       |                     |
| MW27            | September |                     |                             | 0.05                   |                             | 0.739                               | 6.9  | 1.2                           | 45.9                   | 3.1                       | 69            | 7.8                   |                     |
| MW27            | October   |                     |                             | 0.05                   |                             | 0.742                               | 6.79 | 0.8                           |                        |                           |               |                       |                     |
| MW27            | November  |                     |                             | 0.05                   |                             | 0.757                               | 6.89 | 1.2                           | 41.8                   | 2.9                       | 52            | 9.9                   |                     |
| MW27            | December  |                     |                             | 0.05                   |                             | 0.766                               | 6.76 | 1.1                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW28            | January   |                     |                             | 0.05                   |                             | 0.586                               | 7.26 | 1.5                           |                        |                           |               |                       |                     |
| MW28            | February  |                     |                             | 0.05                   |                             | 0.704                               | 6.75 | 1.4                           |                        |                           |               |                       |                     |
| MW28            | March     |                     |                             | 0.05                   |                             | 0.576                               | 6.41 | 1.7                           | 36.5                   | 1.5                       | 50            | 5.5                   |                     |
| MW28            | April     |                     |                             | 0.07                   |                             | 0.664                               | 6.72 | 1.4                           |                        |                           |               |                       |                     |
| MW28            | May       |                     |                             | 0.05                   |                             | 0.573                               | 7    | 1.5                           |                        |                           |               |                       |                     |
| MW28            | June      |                     |                             | 0.07                   |                             | 0.546                               | 6.4  | 2.5                           | 33.1                   | 1.3                       | 46            | 8.6                   |                     |
| MW28            | July      |                     |                             | 0.05                   |                             | 0.548                               | 6.62 | 2                             |                        |                           |               |                       |                     |
| MW28            | August    |                     |                             | 0.05                   |                             | 0.611                               | 6.57 | 1.5                           |                        |                           |               |                       |                     |
| MW28            | September |                     |                             | 0.05                   |                             | 0.556                               | 7.93 | 2                             | 35.8                   | 1                         | 71            | 8.1                   |                     |
| MW28            | October   |                     |                             | 0.14                   |                             | 0.597                               | 6.56 | 1.5                           |                        |                           |               |                       |                     |
| MW28            | November  |                     |                             | 0.05                   |                             | 0.607                               | 6.77 | 1.8                           | 33.6                   | 1.1                       | 54            | 9.5                   |                     |
| MW28            | December  |                     |                             | 0.05                   |                             | 0.595                               | 6.62 | 1.9                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW8D            | January   |                     |                             | 0.05                   |                             | 0.662                               | 8    | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | February  |                     |                             | 0.05                   |                             | 0.679                               | 7.51 | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | March     |                     |                             | 0.05                   |                             | 0.668                               | 7.43 | 0.2                           | 38.4                   | 4.3                       | 40            | 6.7                   |                     |
| MW8D            | April     |                     |                             | 0.19                   |                             | 0.675                               | 7.53 | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | May       |                     |                             | 0.05                   |                             | 0.682                               | 7.62 | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | June      |                     |                             | 0.05                   |                             | 0.685                               | 7.25 | 0.2                           | 38                     | 4.4                       | 41            | 7.3                   |                     |
| MW8D            | July      |                     |                             | 0.05                   |                             | 0.685                               | 7.37 | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | August    |                     |                             | 0.05                   |                             | 0.72                                | 7.53 | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | September |                     |                             | 0.05                   |                             | 0.743                               | 7.72 | 0.2                           | 41.6                   | 4.1                       | 51            | 8.5                   |                     |
| MW8D            | October   |                     |                             | 0.05                   |                             | 0.785                               | 7.5  | 0.2                           |                        |                           |               |                       |                     |
| MW8D            | November  |                     |                             | 0.05                   |                             | 0.801                               | 7.57 | 0.2                           | 38.6                   | 4.2                       | 60            | 10.4                  |                     |
| MW8D            | December  |                     |                             | 0.05                   |                             | 0.835                               | 7.4  | 0.2                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| MW1A            | January   |                     |                             | 0.05                   |                             | 0.664                               | 7.97 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | February  |                     |                             | 0.05                   |                             | 0.584                               | 7.09 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | March     |                     |                             | 0.05                   |                             | 0.667                               | 6.96 | 0.2                           | 23                     | 2.5                       | 24            | 5.1                   |                     |
| MW1A            | April     |                     |                             | 0.05                   |                             | 0.619                               | 7.97 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | May       |                     |                             | 0.12                   |                             | 0.708                               | 7.2  | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | June      |                     |                             | 0.05                   |                             | 0.773                               | 7.52 | 0.2                           | 26.2                   | 2.4                       | 34            | 9.4                   |                     |
| MW1A            | July      |                     |                             | 0.05                   |                             | 0.756                               | 7.22 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | August    |                     |                             | 0.05                   |                             | 0.716                               | 7.22 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | September |                     |                             | 0.05                   |                             | 0.679                               | 7.3  | 0.2                           | 22.3                   | 1.8                       | 44            | 8.7                   |                     |
| MW1A            | October   |                     |                             | 0.05                   |                             | 0.608                               | 7.19 | 0.2                           |                        |                           |               |                       |                     |
| MW1A            | November  |                     |                             | 0.05                   |                             | 0.589                               | 7.3  | 0.2                           | 20.2                   | 1.5                       | 26            | 10.1                  |                     |
| MW1A            | December  |                     |                             | 0.05                   |                             | 0.548                               | 6.99 | 0.2                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| SW1             | January   | 5                   | 10                          | 0.05                   | 0.03                        | 0.164                               | 5.38 | 0.2                           |                        |                           |               |                       |                     |
| SW1             | February  | 3                   | 10                          | 0.05                   | 0.03                        | 0.149                               | 5.17 | 0.2                           |                        |                           |               |                       |                     |
| SW1             | March     | 2                   | 10                          | 0.11                   | 0.03                        | 0.15                                | 5.12 | 0.2                           | 21.3                   | 0.8                       | 35            | 5.5                   | 41                  |
| SW1             | April     | 2                   | 10                          | 0.15                   | 0.03                        | 0.178                               | 4.92 | 0.4                           |                        |                           |               |                       |                     |
| SW1             | May       | 2                   | 10                          | 0.05                   | 0.03                        | 3.372                               | 4.93 | 0.2                           |                        |                           |               |                       |                     |
| SW1             | June      | 3                   | 121                         | 0.05                   | 0.04                        | 0.191                               | 6.19 | 0.3                           | 22.6                   | 0.9                       | 42            | 9.6                   | 57                  |
| SW1             | July      | 6                   | 10                          | 0.05                   | 0.03                        | 0.139                               | 4.51 | 0.2                           |                        |                           |               |                       |                     |
| SW1             | August    | 2                   | 10                          | 0.05                   | 0.03                        | 0.125                               | 4.56 | 0.4                           |                        |                           |               |                       |                     |
| SW1             | September | 2                   | 10                          | 0.05                   | 0.03                        | 0.118                               | 7.28 | 0.2                           | 15.9                   | 0.2                       | 36            | 8.7                   | 89                  |
| SW1             | October   | 2                   | 10                          | 0.05                   | 0.29                        | 0.11                                | 4.66 | 0.2                           |                        |                           |               |                       |                     |
| SW1             | November  | 11                  | 10                          | 0.16                   | 0.03                        | 0.12                                | 4.74 | 0.2                           | 15.2                   | 0.6                       | 29            | 10.5                  | 62                  |
| SW1             | December  | 3                   | 10                          | 0.05                   | 0.03                        | 0.122                               | 4.79 | 0.3                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| SW2             | January   | 6                   | 10                          | 0.05                   | 0.03                        | 0.21                                | 6.88 | 0.2                           |                        |                           |               |                       |                     |
| SW2             | February  | 4                   | 10                          | 0.05                   | 0.03                        | 0.173                               | 6.52 | 0.2                           |                        |                           |               |                       |                     |
| SW2             | March     | 2                   | 18                          | 0.07                   | 0.04                        | 0.223                               | 6.53 | 0.3                           | 21.2                   | 1.4                       | 33            | 6.1                   | 31                  |
| SW2             | April     | 3                   | 10                          | 0.07                   | 0.03                        | 0.259                               | 7.53 | 0.5                           |                        |                           |               |                       |                     |
| SW2             | May       | 2                   | 10                          | 0.14                   | 0.05                        | 0.153                               | 7.4  | 1.3                           |                        |                           |               |                       |                     |
| SW2             | June      | 3                   | 10                          | 0.05                   | 0.04                        | 0.406                               | 6.84 | 2.3                           | 34.2                   | 2.8                       | 54            | 10.7                  | 31                  |
| SW2             | July      | 3                   | 10                          | 0.05                   | 0.03                        | 0.299                               | 6.95 | 0.5                           |                        |                           |               |                       |                     |
| SW2             | August    | 2                   | 10                          | 0.05                   | 0.03                        | 0.215                               | 6.93 | 0.7                           |                        |                           |               |                       |                     |
| SW2             | September | 5                   | 10                          | 0.05                   | 0.03                        | 0.141                               | 7.16 | 0.2                           | 12.6                   | 0.6                       | 27            | 8.8                   | 67                  |
| SW2             | October   | 5                   | 10                          | 0.05                   | 0.03                        | 0.199                               | 6.93 | 0.5                           |                        |                           |               |                       |                     |
| SW2             | November  | 2                   | 10                          | 0.05                   | 0.03                        | 0.177                               | 7.17 | 0.3                           | 17                     | 1.4                       | 27            | 10.5                  | 37                  |
| SW2             | December  | 2                   | 10                          | 0.05                   | 0.03                        | 0.205                               | 7.03 | 0.4                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| SW3             | January   | 3                   | 10                          | 0.05                   | 0.03                        | 0.172                               | 6.7  | 0.2                           |                        |                           |               |                       |                     |
| SW3             | February  | 2                   | 10                          | 0.05                   | 0.03                        | 0.144                               | 6.42 | 0.2                           |                        |                           |               |                       |                     |
| SW3             | March     | 2                   | 10                          | 0.05                   | 0.04                        | 0.169                               | 6.82 | 0.2                           | 19.9                   | 0.8                       | 34            | 6.2                   | 30                  |
| SW3             | April     | 2                   | 10                          | 0.09                   | 0.03                        | 0.193                               | 7.27 | 0.4                           |                        |                           |               |                       |                     |
| SW3             | May       | 2                   | 10                          | 0.05                   | 0.05                        | 0.345                               | 7.38 | 0.2                           |                        |                           |               |                       |                     |
| SW3             | June      | 2                   | 10                          | 0.05                   | 0.04                        | 0.213                               | 7.04 | 0.2                           | 20.6                   | 0.7                       | 34            | 8.5                   | 32                  |
| SW3             | July      | 2                   | 10                          | 0.05                   | 0.03                        | 0.154                               | 6.63 | 0.2                           |                        |                           |               |                       |                     |
| SW3             | August    | 2                   | 10                          | 0.05                   | 0.03                        | 0.151                               | 7.03 | 0.2                           |                        |                           |               |                       |                     |
| SW3             | September | 4                   | 10                          | 0.07                   | 0.03                        | 0.101                               | 6.32 | 0.2                           | 13.5                   | 0.4                       | 29            | 8.7                   | 85                  |
| SW3             | October   | 2                   | 10                          | 0.08                   | 0.04                        | 0.133                               | 6.94 | 0.2                           |                        |                           |               |                       |                     |
| SW3             | November  | 3                   | 10                          | 0.05                   | 0.03                        | 0.122                               | 6.75 | 0.2                           | 14                     | 0.4                       | 28            | 10.6                  | 43                  |
| SW3             | December  | 2                   | 10                          | 0.05                   | 0.03                        | 0.137                               | 7.01 | 0.2                           |                        |                           |               |                       |                     |

| Sample Identity | Other ID  | BOD Unfiltered mg/l | Total Suspended Solids mg/l | Total Phosphorous mg/l | ortho Phosphate as PO4 mg/l | Electrical Conductivity @ 25C ms/cm | pH   | Ammoniacal Nitrogen as N mg/l | Sodium Unfiltered mg/l | Potassium Unfiltered mg/l | Chloride mg/l | Dissolved Oxygen mg/l | COD Unfiltered mg/l |
|-----------------|-----------|---------------------|-----------------------------|------------------------|-----------------------------|-------------------------------------|------|-------------------------------|------------------------|---------------------------|---------------|-----------------------|---------------------|
| DSW1            | January   | 2                   | 10                          | 0.05                   | 0.03                        | 0.27                                | 7.4  | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | February  | 2                   | 14                          | 0.19                   | 0.03                        | 0.21                                | 7.04 | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | March     | 2                   | 86                          | 0.19                   | 0.05                        | 0.251                               | 7.1  | 0.2                           | 17.4                   | 1.6                       | 28            | 5.6                   | 21                  |
| DSW1            | April     | 2                   | 11                          | 0.11                   | 0.03                        | 0.307                               | 7.15 | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | May       | 2                   | 10                          | 0.05                   | 0.04                        | 0.221                               | 7.56 | 0.3                           |                        |                           |               |                       |                     |
| DSW1            | June      | 2                   | 10                          | 0.1                    | 0.04                        | 0.33                                | 7.43 | 0.2                           | 18.3                   | 0.4                       | 28            | 9.7                   | 15                  |
| DSW1            | July      | 2                   | 12                          | 0.05                   | 0.04                        | 0.395                               | 7.78 | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | August    | 2                   | 10                          | 0.05                   | 0.28                        | 0.312                               | 7.63 | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | September | 2                   | 10                          | 0.05                   | 0.03                        | 0.225                               | 7.75 | 0.2                           | 10.8                   | 0.8                       | 21            | 8.8                   | 39                  |
| DSW1            | October   | 2                   | 10                          | 0.05                   | 0.03                        | 0.272                               | 7.55 | 0.2                           |                        |                           |               |                       |                     |
| DSW1            | November  | 2                   | 12                          | 0.05                   | 0.05                        | 0.265                               | 7.73 | 0.2                           | 13.7                   | 1                         | 28            | 11                    | 18                  |
| DSW1            | December  | 4                   | 10                          | 0.05                   | 0.04                        | 0.259                               | 7.52 | 0.2                           |                        |                           |               |                       |                     |

**APPENDIX E**  
**Volume of Leachate Transported Off-Site 2008**

| <b>MONTH (2008)</b> | <b>Volume m<sup>3</sup> (Tanker loads)</b> |
|---------------------|--|
| January             | 16,572.58m <sup>3</sup> (719)              |
| February            | 16,849.46m <sup>3</sup> (723)              |
| March               | 10,900.68m <sup>3</sup> (466)              |
| April               | 11,592.22m <sup>3</sup> (500)              |
| May                 | 0m <sup>3</sup> (0)                        |
| June                | 3,917.64m <sup>3</sup> (168)               |
| July                | 0m <sup>3</sup> (0)                        |
| August              | 11,054.24m <sup>3</sup> (480)              |
| September           | 16,415.16m <sup>3</sup> (704)              |
| October             | 14,187.72m <sup>3</sup> (609)              |
| November            | 13,412.88m <sup>3</sup> (565)              |
| December            | 14,298.22m <sup>3</sup> (611)              |
| <b>Total</b>        | <b>129,403.85m<sup>3</sup> (5,545)</b>     |

The volume transported by each tanker varies between 20-26m<sup>3</sup>

The total volume of leachate transported in 2008 is 129,403.85 m<sup>3</sup>

## APPENDIX F

### Volume of Leachate Produced and Volume of Leachate Transported off-site Calculation of Leachate Generated 2008

$Lo = [ER(A) + LW + IRCA + ER(l)] - [aW]$  where:

$Lo$  = leachate produced in cubic metres

$ER = 1,195.35\text{mm}$  (rainfall recorded on-site (1593.8) minus evaporation taken as 0.25 (398.45))

$A = 92,314\text{m}^2$  (Area within cut-off wall) +  $3,500\text{m}^2$  (Civic amenity area) -  $7000\text{m}^2$  (Capped Cell 1 averaged over 6 months) =  $88,814\text{m}^2$

$LW = 0$  (no sludge accepted)

$IRCA = 0$ .

$l = 0$  (included in area within the cut off wall)

$a = 0.1\text{m}^3/\text{tonne}$

$W = \text{weight of waste deposited} = 15,715.40\text{ tonnes}$

#### **January to December 2008**

$$\begin{aligned} Lo &= (1.19535\text{m} \times 88,814\text{m}^2) - (0.1 \times 15,715.40\text{t}) \\ &= 104,592.27\text{m}^3 \end{aligned}$$

**Total leachate generated therefore =  $104,592.27\text{m}^3$**



## APPENDIX G

### Water Balance Return Form

**Site:** Derrinnumera Landfill

**Year:** 2008

**Cell No.2:** 20,140 m<sup>2</sup>

| Month     | Household Waste (tonnes) | Inert Waste (tonnes) |   | Effective Rainfall (mm) | Available Absorptive Capacity for Cell (tonnes) |              |
|-----------|--------------------------|----------------------|---|-------------------------|---|--------------|
|           |                          | H                    | T |                         | Month C   | Cumulative C |
| January   | <b>1805.01</b>           | 0                    |   | 204.6                   | -4120463  | -4120463     |
| February  | <b>1698.58</b>           | 0                    |   | 72.2                    | -1453938  | -5574402     |
| March     | <b>1724.19</b>           | 0                    |   | 231.2                   | -4656196  | -10230597    |
| April     | <b>1662.26</b>           | 0                    |   | 53.8                    | -1083366  | -11313963    |
| May       | <b>1596.88</b>           | 0                    |   | 8.8                     | -177072.3                                       | -11491035    |
| June      | <b>1460.83</b>           | 0                    |   | 76.2                    | -1534522  | -13025557    |
| July      | <b>1430.68</b>           | 0                    |   | 62.6                    | -1260621  | -14286178    |
| August    | <b>1299.36</b>           | 0                    |   | 218                     | -4390390  | -18676568    |
| September | <b>1016.72</b>           | 0                    |   | 156.4                   | -3149794  | -21826363    |
| October   | <b>1267.21</b>           | 0                    |   | 220                     | -4430673  | -26257036    |
| November  | <b>753.71</b>            | 0                    |   | 181.8                   | -3661377  | -29918412    |
| December  | <b>0</b>                 | 0                    |   | 108.2                   | -2179148  | -32097560    |

Available Absorptive Capacity "C" is defined as:

$$C = (H \times 0.1) + (T \times 0.05) - (RA) \text{ tonnes where}$$

H = the mass in tonnes of household and commercial waste input to the cell for the month;

T = the mass in tonnes of transfer station and general skip waste input to the cell for the month;

R = effective rainfall

A = original plan area of the cell in square metres

**APPENDIX H**

**2008 Monthly Rainfall Figures.**

**NEWPORT (DERRINUMERA LANDFILL) 2008**

| <b>MONTH</b> | <b>RAINFALL (mm)</b> |
|--------------|----------------------|
| January      | 204.6                |
| February     | 72.2                 |
| March        | 231.2                |
| April        | 53.8                 |
| May          | 8.8                  |
| June         | 76.2                 |
| July         | 62.6                 |
| August       | 218                  |
| September    | 156.4                |
| October      | 220                  |
| November     | 181.8                |
| December     | 108.2                |
| <b>Total</b> | <b>1,593.8</b>       |