

# The Recycling Village Ltd

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## REVIEW OF SOIL & GROUNDWATER RESULTS WEML

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## **1.0 Introduction.**

- 1.1 WEML was commissioned by The Recycling Village Ltd to review the site soil and groundwater sampling results in the context of recommended soil and groundwater standards.
- 1.2 This review of soil and groundwater sampling results has been carried out in response to a written request from the Environmental Protection Agency (EPA) to The Recycling village Ltd, dated 13<sup>th</sup> August 2014 in relation to an application for a licence.
- 1.3 In carrying out this review, WEML referred to the EPA publication, 'Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites, 2013'.

## **2.0 Groundwater Results.**

- 2.1 Groundwater samples were analysed by Fitz Scientific Laboratories, Drogheda, Co Louth and the results forwarded to WEML by The Recycling Village Ltd.
- 2.2 WEML has tabulated the groundwater results and compared them to the groundwater threshold values that are specified in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, SI no 9 of 2010.
- 2.3 Where there are no groundwater threshold values in the above Regulations, WEML has compared the groundwater results to the interim groundwater guideline values specified in the EPA publication, 'Towards Setting Guideline Values For The Protection of Groundwater in Ireland – Interim Report'.
- 2.4 Where two threshold values are available, the value from the Groundwater Regulations, 2010 has been used.
- 2.5 The comparison of the site groundwater results against the above published thresholds are shown in Table 1 below.
- 2.6 Groundwater results that exceed the published threshold guideline values in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, SI no 9 of 2010, are highlighted in yellow.

**Table 1. Groundwater Results.**

Parameter	Unit	Guideline Value(s)	BH 1	BH 2	BH 3
Arsenic	ug/l	7.5 <sup>1</sup>	No Sample taken . BH1 was dry.	1.455	1.434
Barium	ug/l	100*		68.97	61.62
Boron	ug/l	750 <sup>1</sup>		134.2	173.6
Calcium	mg/l	200*		63.97	131.3
Cadmium	ug/l	3.75 <sup>1</sup>		0.18	0.141
Chromium	ug/l	37.5 <sup>1</sup>		5.803	5.377
Copper	ug/l	1,500 <sup>1</sup>		23.96	12.58
Cyanide	ug/l	37.5 <sup>1</sup>		<5	<5
Iron	ug/l	200*		682.6	765.1
Lead	ug/l	18.75 <sup>1</sup>		12.52	1.479
Magnesium	ug/l	50,000*		3.145	10.01
Manganese	ug/l	50*		44.55	60.1
Mercury	ug/l	0.75 <sup>1</sup>		<0.04	0.045
Nickel	ug/l	15 <sup>1</sup>		7.195	3.26
Selenium	ug/l	No published value		1.726	1.792
Silver	ug/l	No published value		<0.33	<0.33
Zinc	ug/l	100*		29.25	11.29
Phenols	ug/l	0.5*		<0.10	<0.10
pH	Units	>6-5, <9.5*		8.4	7.8
Conductivity	uscm@25oC	1875 <sup>1</sup>		476	690
Potassium	mg/l	5*		8.422	10.54
Phosphate	mg/l as P	No published value		0.028	<0.024
Sodium	mg/l	150 <sup>1</sup>		34.68	19.47
Ammonia	mg/l as N	0.175 <sup>1</sup>		0.42	<0.01
Nitrite	mg/l as N	No published value	0.007	<0.002	
Nitrite as NO2	mg/l as NO2	0.375 <sup>1</sup>	<0.050	<0.050	
Nitrate	mg/l as N	No published value	0.990	2.940	
Nitrate as NO3	mg/l as NO3	375 <sup>1</sup>	4.384	13.02	
Dissolved O2	mg/l	No abnormal change*	6.5	9.2	
Alkalinity	mg/l CaCO3	No abnormal change*	30	211	
TOC	mg/l	No abnormal change*	5.76	7.04	
Nitrogen	mg/l as No	No published value	1.00	2.94	
Chloride	mg/l	187.5 <sup>1</sup>	73.59	24.81	
Flouride	mg/l	1*	0.50	0.29	
Sulphate	mg/l	187.5 <sup>1</sup>	112.82	200.63	
F.Coliforms	Cfu/100 ml	0*	0	0	
Coliforms	Cfu/100 ml	0*	0	17	
Phosphate	mg/l as PO4	0.03*	0.086	0.067	

<sup>1</sup>EC Environmental Objectives (Groundwater) Regulations, SI 9 of 2010.

\*Towards Setting Guideline Values For The Protection of Groundwater in Ireland. Interim Report, EPA.

### **3.0 Discussion of Groundwater Results.**

- 3.1 Based on an assessment of the above groundwater laboratory results and comparison to the EC Groundwater Regulations, SI 9 of 2010, the groundwater samples exceeded the guideline threshold values for the following two parameters;
- Ammonia in BH2 (0.42 mg/l - Threshold 0.15mg/l).
  - Sulphate in BH3 (200.63 mg/l - Threshold 187.5mg/l).
- 3.2 The presence of the low levels of ammonia and sulphate in the groundwater samples could indicate the impact of agricultural activity, (the site is adjacent to agricultural land), or indicate decaying organic matter in the soil. This is further evidenced by the presence of coliform bacteria in the groundwater sample from BH 3. Additional groundwater sampling and analysis will help to build up clearer picture of the groundwater quality and characteristics over time.
- 3.3 In addition to ammonia and sulphate, the above groundwater laboratory results exceeded the guideline threshold values for a number of parameters as specified in the EPA Interim Report. However, the EPA threshold guideline values are not proposed restoration target values or clean up levels for groundwater, as these are best derived through a site-specific risk assessment approach.
- 3.4 Consequently, since the groundwater in the immediate vicinity of The Recycling Village Ltd site is not used as a potable source, it is concluded that there is little likely risk of human health impacts associated with the quality of the groundwater as shown by the laboratory analysis detailed in this report.

### **4.0 Soil Results.**

- 4.1 Soil samples were analysed by Fitz Scientific Laboratories, Drogheda, Co Louth and the results forwarded to WEML by The Recycling Village Ltd.
- 4.2 WEML has tabulated the soil sample results and compared them to the following publically available Soil Guideline Value (SGV) Threshold databases;
- UK Environment Agency Soil Guideline Value Thresholds (commercial)
  - CL:AIRE Soil Generic Assessment Criteria (2010)
  - EPA National Soil Database

- 4.3 Where there were no published SGV's in the UK Environment Agency or CL:AIRE databases, WEML has compared the soil results to the average soil values from the EPA National Soil Database.
- 4.4 SGVs are used as a technical tool to assist in the assessment of human health risks from land contamination. SGVs are scientifically based generic assessment criteria that can be used to simplify the assessment of human health risks arising from long-term and on-site exposure to chemical contamination in soil. SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health. They represent "trigger values" – indicators to a risk assessor that soil concentrations above this level may pose a possibility of significant harm to human health.
- 4.5 SGVs do not of themselves represent the threshold at which there is a significant possibility of significant harm, nor do they automatically represent an unacceptable level. However, they can be a useful starting point for assessing the possibility of significant harm and can be used as an indication of chemical contamination in soil below which the long-term human health risks are considered to be tolerable or minimal.
- 4.6 Representative site soil concentrations at or below an SGV indicate that it is unlikely that a significant possibility of significant harm exists.
- 4.7 Representative site soil concentrations above an SGV might represent a significant possibility of significant harm. Further investigation and/or more detailed evaluation of human health risks will usually need to be conducted.
- 4.8 SGVs are derived for three different generic land use scenarios ie;
- residential;
  - allotment;
  - commercial.
- 4.9 The comparison of the site soil results against the published SGV thresholds for commercial land use are shown in Tables 2-4 below.

**Table 2. Soil Results – Borehole 1.**

Parameter & Units	Guideline Value	0m	2.0m	4.0m
PAH (sum) (mg/kg)	No published value	<0.05	<0.05	<0.05
% Dry Matter (%)	No published value	77.97	83.35	90.78
TOC (%)	No published value	2.62	1.534	<1.0
BTEX (mg/kg)	95 <sup>1</sup> (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	0.24 (Total) <sup>1</sup>	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	No published value	<2.5	<2.5	<2.5
Arsenic (ug/kg)	640,000 <sup>1</sup>	3741.7	5540.7	5041.86
Barium (ug/kg)	22,000,000 <sup>2</sup>	49203.6	36572.4	47566.6
Cadmium (ug/kg)	230,000 <sup>1</sup>	324.66	<10.00	164.665
Chromium (ug/kg)	44,500 <sup>3</sup> (average)	8752.76	16940.2	13644.8
Copper (ug/kg)	19,500 <sup>3</sup> (average)	17421.1	15916.8	19565.9
Mercury (ug/kg)	26,000 <sup>1</sup>	81.59	31.03	32.91
Molybdenum (ug/kg)	17,000,000 <sup>2</sup>	982.517	267.593	563.765
Nickel (ug/kg)	1,800,000 <sup>1</sup>	17372.5	23265.4	21835
Lead (ug/kg)	31,400 <sup>3</sup> (average)	14090.4	7859.38	8198.09
Antimony (ug/kg)	7,500,000 <sup>2</sup>	1130.27	505.168	630.34
Selenium (ug/kg)	13,000,000 <sup>1</sup>	2054.42	3064.55	2877.3
Zinc (ug/kg)	70,100 <sup>3</sup> (average)	42300.3	36912.5	32737.9
Chloride (mg/kg)	No published value	11.79	5.91	7.77
Flouride (mg/kg)	No published value	2.10	2.05	2.29
Sulphate (mg/kg as SO4)	No published value	1.39	21.06	3.29

**Table 3. Soil Results – Borehole 2.**

Parameter & Units	Intervention Value*	0m	1.0m	2.0m
PAH (sum) (mg/kg)	No published value	<0.05	<0.05	<0.05
% Dry Matter (%)	No published value	90.09	86.75	81.5
TOC (%)	No published value	<1.0	3.724	<1.0
BTEX (mg/kg)	95 <sup>1</sup> (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	0.24 (Total) <sup>1</sup>	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	No published value	3.52	<2.5	<2.5
Arsenic (ug/kg)	640,000 <sup>1</sup>	2912.43	5886.82	5160.46
Barium (ug/kg)	22,000,000 <sup>2</sup>	36640.7	266276	96145.3
Cadmium (ug/kg)	230,000 <sup>1</sup>	214.277	490.061	293.275
Chromium (ug/kg)	44,500 <sup>3</sup> (average)	8696.86	8527.72	16971.3
Copper (ug/kg)	19,500 <sup>3</sup> (average)	11871.4	19598.6	19702.4
Mercury (ug/kg)	26,000 <sup>1</sup>	9.618	<0.2	<0.2
Molybdenum (ug/kg)	17,000,000 <sup>2</sup>	747.518	478.331	1206.59
Nickel (ug/kg)	1,800,000 <sup>1</sup>	13003.2	23955.7	27264.4
Lead (ug/kg)	31,400 <sup>3</sup> (average)	6306.73	7653.02	9024.64
Antimony (ug/kg)	7,500,000 <sup>2</sup>	<10	474.41	364.859
Selenium (ug/kg)	13,000,000 <sup>1</sup>	1582.64	3250.53	3605.59
Zinc (ug/kg)	70,100 <sup>3</sup> (average)	22248.5	38391.5	47017.5
Chloride (mg/kg)	No published value	7.85	10.58	22.36
Flouride (mg/kg)	No published value	1.98	2.07	1.92
Sulphate (mg/kg as SO4)	No published value	112.32	4.6	15.51

**Table 4. Soil Results – Borehole 3.**

Parameter & Units	Intervention Value*	0m	2.5m	5.0m
PAH (sum) (mg/kg)	No published value	<0.05	<0.05	<0.05
% Dry Matter (%)	No published value	80.72	79.88	83.59
TOC (%)	No published value	<1.0	<1.0	<1.0
BTEX (mg/kg)	95 <sup>1</sup> (Benzene)	<0.5	<0.5	<0.5
PCB's (mg/kg)	0.24 (Total) <sup>1</sup>	<0.005	<0.005	<0.005
Mineral Oil (mg/kg)	No published value	<2.5	6.46	5.55
Arsenic (ug/kg)	640,000 <sup>1</sup>	6738.73	4464.46	6594.04
Barium (ug/kg)	22,000,000 <sup>2</sup>	48674.9	51053.7	9635.96
Cadmium (ug/kg)	230,000 <sup>1</sup>	471.803	345.309	<10.00
Chromium (ug/kg)	44,500 <sup>3</sup> (average)	13175.2	11570.7	1792.88
Copper (ug/kg)	19,500 <sup>3</sup> (average)	22633.8	23632.2	19757.4
Mercury (ug/kg)	26,000 <sup>1</sup>	49.1	77.09	47.47
Molybdenum (ug/kg)	17,000,000 <sup>2</sup>	730.77	481.31	345.197
Nickel (ug/kg)	1,800,000 <sup>1</sup>	24590.9	29380.9	32632.9
Lead (ug/kg)	31,400 <sup>3</sup> (average)	10316.9	12445.6	13362.1
Antimony (ug/kg)	7,500,000 <sup>2</sup>	498.208	354.06	412.68
Selenium (ug/kg)	13,000,000 <sup>1</sup>	3217.35	3153.62	1323.5
Zinc (ug/kg)	70,100 <sup>3</sup> (average)	38621.4	48259.6	32025.6
Chloride (mg/kg)	No published value	7.64	8.85	8.69
Flouride (mg/kg)	No published value	2.51	2.13	2.02
Sulphate (mg/kg as SO4)	No published value	62.16	<1.39	10.89

<sup>1</sup>UK Environment Agency Soil Guideline Value Thresholds (commercial)

<sup>2</sup>CL:AIRE Soil Generic Assessment Criteria (2010)

<sup>3</sup>EPA National Soil Database

## 5.0 Discussion of Soil Results.

5.1 Based on the review and assessment of the above soil laboratory results and comparison to the publically available SGV databases, the soil samples do not exceed any of the published UK Environment Agency or CL:AIRE SGV thresholds.

## 6.0 Conclusion.

6.1 Based on the above review of the site groundwater and soil results against available published quality standards, data and thresholds, it is concluded that;

- There is no evidence of significant soil or groundwater contamination at the site for the parameters detailed in this report.



- The soil and groundwater analysis provides a useful baseline against which to assess future soil and groundwater quality investigations at the site.
- A groundwater monitoring programme should be implemented to ensure that conditions do not change over time and that groundwater status is maintained.
- The soil sample results could be used as the baseline to compare any future site closure programme.

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