



**MULROY**  
environmental

**GALWAY COUNTY COUNCIL  
TULLYVOGHEEN HISTORIC LANDFILL,  
CLIFDEN, COUNTY GALWAY**

**FURTHER INFORMATION –  
HYDROLOGY/TIER 3 GQRA REPORT  
VOLUME II. APPENDICES**

**21<sup>st</sup> November 2019**

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## LIST OF APPENDICES

APP. NO.	DESCRIPTION
1	<ul style="list-style-type: none"> <li>• Table A1.1. Results of S-P-R Linkage Prioritisation Former Landfill At Tullyvogheen, Clifden, County Galway (By Mulroy Environmental)</li> <li>• Details Of S-P-R Linkage Prioritisation On Former Landfill At Tullyvogheen, Clifden, County Galway (By Mulroy Environmental)</li> <li>• Tier 1 Study/Tier 2 Indicative Work Programme &amp; Costing, Comhairle Chontae Na Gaillimhe, Tullyvogheen Landfill, Clifden, County Galway, 16<sup>th</sup> June, 2010.</li> </ul>
2	Q-Index/Water Quality Assessment of the Owenglen River & Tributary (AQUENS Ltd.)
3	Surface Water Sampling Field Monitoring Logs
4	<ul style="list-style-type: none"> <li>• Owenglen River Hydrometric Station 32004 Information &amp; Flow Data <ul style="list-style-type: none"> <li>• 2014 Surface Water Quality Results</li> </ul> </li> <li>• EPA Surface Water Mapping &amp; Q-Index Historical Data <ul style="list-style-type: none"> <li>• WFD Catchment Mapping &amp; Data <ul style="list-style-type: none"> <li>• Hydrometric Data</li> <li>• Meteorological Data</li> </ul> </li> </ul> </li> </ul>
5	<p>Table A5.1. Results of Volatile Organic Compound laboratory analysis on Surface Water Samples taken from SW1-SW7 at Tullyvogheen Historic Landfill, Tullyvogheen, Clifden, County Galway on 30<sup>th</sup> September, 2019</p> <p>Table A5.2. Results of Semi-volatile Organic Compound laboratory analysis on Surface Water Samples taken from SW1-SW7 at Tullyvogheen Historic Landfill, Tullyvogheen, Clifden, County Galway on 30<sup>th</sup> September, 2019</p> <p>Table A5.3. Results of Organo-phosphorus Pesticide laboratory analysis on Surface Water Samples taken from SW1-SW7 at Tullyvogheen Historic Landfill, Tullyvogheen, Clifden, County Galway on 30<sup>th</sup> September, 2019</p> <p>Table A5.4. Results of Organochlorine Pesticides and Acid Herbicides laboratory analysis on Surface Water Samples taken from SW1-SW7 at Tullyvogheen Historic Landfill, Clifden, Co. Galway on 30<sup>th</sup> September, 2019</p> <p>Table A5.5. Major Ion Balance on Surface Water Samples (SW1-SW7) taken from Adjacent Stream at Tullyvogheen Historic Landfill, Clifden, County Galway.</p>
6	<ul style="list-style-type: none"> <li>• Raw Validated Laboratory Analysis Reports from Chemtest Ltd. for Surface Water</li> <li>• Raw Validated Laboratory Analysis Reports from CLS Laboratories for Surface Water Analysis <ul style="list-style-type: none"> <li>• Raw Validated Report from City Analysts Ltd. (Filtration Certificate)</li> </ul> </li> </ul>

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## APPENDIX 1

TABLE A1.1. RESULTS OF S-P-R LINKAGE PRIORTISATION  
ON FORMER LANDFILL AT TULLYVOGHEEN, CLIFDEN,  
COUNTY GALWAY (BY MULROY ENVIRONMENTAL)

DETAILS OF S-P-R LINKAGE PRIORTISATION ON FORMER  
LANDFILL AT TULLYVOGHEEN, CLIFDEN,  
COUNTY GALWAY (BY MULROY ENVIRONMENTAL)

TIER 1 STUDY/TIER 2 INDICATIVE WORK PROGRAMME &  
COSTING, COMHAIRLE CHONTAE NA GAILLIMHE,  
TULLYVOGHEEN LANDFILL, CLIFDEN, COUNTY GALWAY,  
16<sup>TH</sup> JUNE, 2010.

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**Table 1a: Leachate: Source/Hazard Scoring Matrix**

WASTE TYPE	WASTE FOOTPRINT (ha)		
	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	1	1.5
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	5	7	10
Pre-1977 sites <sup>23</sup>	1	2	3
		MAX	10

**<sup>20</sup>Table 1b: Landfill Gas: Source/Hazard Scoring Matrix**

WASTE TYPE	WASTE FOOTPRINT (ha)		
	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	0.75	1
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	3	5	7
Pre-1977 sites <sup>23</sup>	0.5	0.75	1
		MAX	10

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<sup>20</sup> Predominantly inert waste with low biodegradable fraction and/or small industrial waste fraction.

<sup>21</sup> Typically non-hazardous domestic waste (highly biodegradable) with potentially small hazardous waste fraction and/or small industrial waste fraction, e.g. town dump.

<sup>22</sup> Generally industrial waste where hazardous waste was known to have been deposited or there is a strong likelihood that hazardous waste was deposited due to the close proximity of such industries.

<sup>23</sup> Pre 1977 wastes would have been substantially degraded within the landfill.

Table 2a: Leachate Migration: Pathways

Parameters	Points available
<b>GROUNDWATER VULNERABILITY (Vertical pathway)</b>	
Extreme Vulnerability	3
High Vulnerability	2
Moderate Vulnerability	1
Low Vulnerability	0.5
High – Low Vulnerability	2

Table 2b: Leachate Migration: Pathways

Parameters	Points available
<b>GROUNDWATER FLOW REGIME (Horizontal pathway)</b>	
Karstified Groundwater Bodies (Rk) <sup>25</sup>	5
Productive Fissured Bedrock Groundwater Bodies (Rf and Lm) <sup>25</sup>	3
Gravel Groundwater Bodies (Rg and Lg) <sup>25</sup>	2
Poorly Productive Bedrock Groundwater Bodies (Ll, Pl, Pu) <sup>25</sup>	1

Table 2c: Leachate Migration: Pathways

Parameters	Points available
<b>SURFACE WATER DRAINAGE <sup>26</sup> (surface water pathway)</b>	
Is there a direct connection between drainage ditches associated with the waste body and adjacent surface water body? Yes	2
If no direct connection	0

<sup>25</sup> Refer to DEHLG/EPA/GSI 1999, Groundwater Protection Schemes.



**Table 2d: Landfill Gas: Pathway Assuming Receptor Within 250m of Source**

Parameters	Points available
<b>LANDFILL GAS LATERAL MIGRATION POTENTIAL</b>	
Sand and Gravel, Made ground, urban, karst	3
Bedrock	2
All other Tills (including limestone, sandstone etc – moderate permeability)	1.5
All Namurian or Irish Sea Tills (low permeability)	1
Clay, Alluvium, Peat	1

\* Assigned a score of 0 - Residence approx. 400m to the south of site

**Table 2e: Landfill Gas: Pathway Assuming Receptor Located Above Source**

Parameters	Points available
<b>LANDFILL GAS VERTICAL (UPWARDS) MIGRATION POTENTIAL</b>	
Sand and Gravel, Made ground, urban, karst	5
Bedrock <sup>2</sup>	3
All other Tills (including limestone, sandstone etc – moderate permeability) <sup>2</sup>	2
All Namurian or Irish Sea Tills (low permeability)	1
Clay, Alluvium, Peat	1

\* Assigned a score of 0 - Residence approx. 400m to the south of site.

**Table 3a: Leachate Migration: Receptors**

Parameters	Points available
<b>HUMAN PRESENCE</b> (presence of a house indicates potential private wells)	
On or within 50m of the waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km of the waste body	1
Greater than 1 km of the waste body	0

\* Residence approx. 415m to the south of site

**Table 3b: Leachate Migration: Receptors**

Parameters	Points available
<b>PROTECTED AREAS (SWDTE or GWDTE)</b>	
Within 50m of the waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km of waste body	1
Greater than 1 km of the waste body	0
Undesignated sites <sup>24</sup> within 50m of site of the waste body	1
Undesignated sites <sup>24</sup> greater than 50m but less than 250m of the waste body	0.5
Undesignated sites <sup>24</sup> greater than 250m of the waste body	0

\* SAC 002031 The Twelve Bens/Garraun Complex

**Table 3c: Leachate Migration: Receptors**

Parameters	Points available
<b>AQUIFER CATEGORY <sup>26</sup> (resource potential)</b>	
Regionally Important Aquifers (Rk, Rf, Rg)	5
Locally Important Aquifers (Ll, Lm, Lg)	3
Poor Aquifers (Pl, Pu)	1

<sup>24</sup> The term 'Undesignated sites' refers to wetland sites that are not designated under the Habitats or Birds Directive or Wildlife Act but are considered to be important on a local scale. Consultation with NPWS is required to identify such sites.

<sup>26</sup> This element needs to be determined during the site inspection (including walkover survey). The presence of a direct link between surface water drainage from the waste body and any adjacent surface water body implies the existence of a pathway.

**Table 3d: Leachate Migration: Receptors**

<b>PUBLIC WATER SUPPLIES (other than private wells)</b>	
Within 100m of site boundary	7
Greater than 100m but less than 300m or within Inner SPA (SI) for GW supplies	5
Greater than 300m but less than 1km or within Outer SPA (SO) for GW supplies	3
Greater than 1km (karst aquifer)	3
Greater than 1km (no karst aquifer)	0

**Table 3e: Leachate Migration: Receptors**

<b>Parameters</b>	<b>Points available</b>
<b>SURFACE WATER BODIES</b>	
Within 50m of site boundary	3
Greater than 50m but less than 250m	2
Greater than 250m but less than 1km	1
Greater than 1km	0

**Table 3f: Landfill Gas: Receptor**

<b>Parameters</b>	<b>Points available</b>
<b>HUMAN PRESENCE</b>	
On site or within 50m of site boundary	5
Greater than 50m but less than 150m	3
Greater than 150m but less than 250m	1
Greater than 250m	0.5

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**Code of Practice  
Environmental Risk Assessment for Unregulated Waste  
Disposal Sites**

**Tier 1 Study**

**Tier 2 Indicative Work Programme and Costing**

**Comhairle Chontae na Gaillimhe**

**Landfill Site:** Tullyvoheen, Clifden  
**Site Reference:** 5/G

OVERALL RISK RATING	High
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# Contents

1. Site Description and Assessment	3
2. Conceptual Site Model	5
3. Source – Pathway – Receptor Scores	7
4. Tier 2 Work Programme and Costs	8
5. Site Photographs and Maps	10

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# 1. Site Description and Assessment

## Source

The municipal landfill at Tullyvoheen, Clifden has an area of 1.14 Ha. The landfill operated from 1984 to 1999. During this period a maximum of 23,000 tonnes per annum may have been deposited. The site area is 1.14 ha and the total waste body is estimated at 114,000 m<sup>3</sup> or 205,000 tonnes.

The site is located on a byroad uphill from the Clifden to Galway road approximately 2 km east of the town.

The landfill is situated on a comparatively flat area where a valley widens out into upland bog. The stream running through the valley is piped through the landfill. Although some of the landfill maybe located on peat, it is presumed that a substantial amount is in direct contact with the bedrock.

## Pathway

The geology of the area consists of schists and quartzites, with the maps indicating that the site is underlain by psammitic schists. The aquifer vulnerability maps indicate bedrock at surface for the western part of the site (where the stream exits) and extreme (less than 3 meters to bedrock) for the remainder of the site.

The principle pathway for leachate migration is along the bedrock surface, to emerge at the downstream western side of the site.

## Receptors

The piped stream emerges at the west face of the landfill (see Photo E)

### Surface water monitoring:

Since 2008 the EPA have been monitoring the surface water in the stream which flows underneath the landfill. This stream is a tributary of the Owenglin river. Samples are taken from the stream at 3 locations – upstream of the river (SW1), immediately downstream of the landfill (SW2) and further downstream before the stream reaches the Owenglin river (SW3).

## 2. Conceptual Site model

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### 3. Source – Pathway - Receptor Scores

SPR	Maximum Score	SPR Value	Linkages	Normalised Score
1	$10 \times (3+5+2) \times 3 = 300$	$7 \times (3+1+2) \times 3 = 126$	leachate – s/water	42%
2	$10 \times (3+5+2) \times 3 = 300$	$7 \times (3+1+2) \times 0 = 0$	leachate - GWDTE	0%
3	$10 \times (3+5) \times 3 = 240$	$7 \times (3+1) \times 0 = 0$	leachate – private wells	0%
4	$10 \times (3+5) \times 3 = 240$	$7 \times (3+1) \times 0 = 0$	leachate - GWDTE	0%
5	$10 \times (3+5) \times 5 = 400$	$7 \times (3+1) \times 1 = 28$	leachate – aquifer	7%
6	$10 \times (3+5) \times 7 = 560$	$7 \times (3+1) \times 3 = 84$	leachate - PWS	15%
7	$10 \times (3+5) \times 3 = 240$	$7 \times (3+1) \times 3 = 84$	leachate – s/water	35%
8	$10 \times 2 \times 3 = 60$	$7 \times 2 \times 3 = 42$	leachate – s/water	<b>70%</b>
9	$10 \times 2 \times 3 = 60$	$7 \times 2 \times 0 = 0$	leachate - GWDTE	0%
10	$10 \times 3 \times 5 = 150$	$7 \times 2 \times 0.5 = 7$	landfill gas - humans	5%
11	$10 \times 5 \times 5 = 250$	$7 \times 3 \times 0.5 = 10.5$	landfill gas - humans	4%

Risk Classification	Range of Risk Scores
Highest Risk (Class A)	Greater than or equal to 70% for any individual SPR linkage
Moderate Risk (Class B)	Between 40-70% for any individual SPR linkage
Lowest Risk (Class C)	Less than or equal to 40% for any individual SPR linkage

<b>OVERALL RISK RATING</b>	<b>HIGH</b>
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## 4. Tier 2 Exploratory Investigations & Sampling

The principle aim of the Tier 2 study is to confirm the quality of waste present and the nature and size of hazardous waste, if any. The Work Programme consists of gathering further information with a view of making a decision on what is to be done with the site.

Work Programme:

- Excavating a number of trial pits will be required, taking photographs and making detail logs of the pits.
- Place 2 casings in pits and backfill, cap casings. (gas monitoring)
- Use handheld gas detectors and physical observations to assess gas presence.
- Take samples of waste and soil and have them analysed.
- Take surface water samples upstream and downstream of the waste body and have them analysed.
- Take leachate samples (if any)
- Carry out topographic and ecological survey
- Identify previous studies carried out and assess information provided from those studies. Consult with hydrogeologist.
- Write up interpretive report.

<b>Exploratory Investigation &amp; Sampling Costs</b>	<b>€</b>
<b>Trial Pits &amp; Trenches</b> 1 day	1,000
<b>Waste Assessment</b> 1 day	700
<b>Waste Sampling</b> Say 6 samples @ €275 per sample	1,650
<b>Leachate Sampling</b> Say 2-4 samples @ €475 per sample	1,900
<b>Soil Sampling / Waste Sampling</b> Say 10 samples @ €300 per sample	3,000
<b>Surface Water Sampling</b> Say 2 sample @ €300 per sample	600
<b>Groundwater sampling</b> Say 6 sample from bottom of pits @ €300 per sample	1,800
<b>Topographic Survey</b>	1,500
<b>Site Supervision and field sampling</b> Say 3 days @ €700 per day	2,100
<b>Reporting</b>	1,750
<b>Total</b>	<b>€16,000</b>



(A) Access Road to Landfill site.



(B) Entrance to Landfill



( C ) Typical Ground cover



(D)





(E) View of the piped stream as it emerges at the west face of the landfill

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## APPENDIX 2

### Q-INDEX/WATER QUALITY ASSESSMENT OF THE OWENGLLEN RIVER & TRIBUTARY (AQUENS LTD.)

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## Water quality assessment of six sampling sites

AQUENS Ltd were commissioned by Mulroy Environmental to process five invertebrate kick samples from the Owenglin river and its tributary collected on the 28<sup>th</sup> September 2019. Samples were preserved after collection and delivered to AQUENS Ltd for processing.

## Methodology

Prior to processing the samples were stored at 4°C. Each sample was hand washed through a 1000µm sieve and material was placed into a white tray for sorting. Invertebrates were retrieved from an illuminated white tray and placed in respective taxonomic groupings. Invertebrates were identified, with the aid of a microscope (Olympus SZX7), to the lowest taxonomic level possible using standard identification guides.

Once the invertebrates were identified and counted an excel file was prepared. The data was summarized to determine the abundance, taxon richness and representation of the EPT taxa (Ephemeroptera, Plecoptera and Trichoptera). A Q-value was assigned to each site using the Environmental Protection Agency methodology (McGarrigle et al. 2002) (Appendix A). This system is a five-point scale, Q1 (serious pollution) to Q5 (unpolluted) based on the relative abundance of five categories of fauna from pollution sensitive to pollution tolerant macroinvertebrates. Intermediate Q-value classes (e.g. Q 3-4) can also be assigned when sites are not definitely assigned to one of the five Q-values.

## Results

A total of 722 invertebrates were identified from the five 2-minute kick samples collected. A total of 46 taxa were recorded (Table 1) with representatives of most of the groups expected from good status rivers. The Coleoptera, Trichoptera, Ephemeroptera, Mollusca were particularly well represented in abundance, but overall abundances were low compared to typical 2min kick samples. Two samples (KS 4 & 5) were particularly low in abundance and diversity although a lot of substrate and organic material occurred in the sample bags of these two samples. With the taxa assigned to sensitivity groupings most sites were dominated by Group C (Table 2) but most had a good representation of Group B taxa. Where percentages of Group B were relatively high (6-11%) there were several taxa present (Table 3). The percentage EPT values were also relatively high for four of the samples (KS1-4) (KS4 due to the low diversity overall and dominance of *Perla bipunctata*) and absent from sample KS5. A large component (26-49%) of the macroinvertebrate community was thus made up of these more sensitive taxa in 4 of the samples (Table 4). However, the %EPT in KS4 should be interpreted with care as the overall abundance is very low and taxon richness is also relatively low.

**Table 1:** A list of macroinvertebrates recorded at six sampling sites on the Kilcurry River.

Order	Family	Species/Taxa	KS1-01	KS2-01	KS3-01	KS4-01	KS5-01
Mollusca	Hydrobiidae	<i>Potamopyrgus antipodarum</i>	38	74	69		
	Ancylidae	<i>Ancylus fluviatilis</i>	2	3	11		
	Lymnaeidae	<i>Lymnaea pregra</i>	1		1		
	Sphaeriidae	<i>Pisidium</i> spp.	3	4	1		
Hirudinea	Erpobdellidae	<i>Erpobdella octoculata</i>	4	2			
	Glossiphoniidae	<i>Glossiphonia complanata</i>				1	
Crustaceae	Gammaridae	<i>Gammarus duebeni</i>	7	6	30		
Oligochaeta	Lumbricidae	<i>Eiseniella</i> spp.			12		
	Tubificidae	spp. Indet.	1		3	1	
Plecoptera	Perlidae	<i>Perla bipunctata</i>				5	
	Leuctridae	<i>Leuctra fusca</i>			4		
		<i>Leuctra</i> spp.	8	8			
	Nemouridae	<i>Protnemura meyeri</i>			2		
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>	38	49	15		
		<i>Baetis scambus</i>	3				
		<i>Alainites muticus</i>			1		
	Ephemeridae	<i>Serratella ignita</i>			1		
	Heptageniidae	<i>Ecdyonurus</i> spp.			1	1	
	Leptophlebiidae	<i>Leptophlebia</i> spp.				1	
Trichoptera	Polycentropidae	<i>Polycentropus kingi</i>		6	12		
		<i>Polycentropus</i> spp.	4	6			
	Philopotamidae	<i>Philopotamus montanus</i>			1		
		<i>Chimarra marginata</i>	15	9			
	Psychomyiidae	<i>Tinodes waeneri</i>	3	1			
	Hydropsyche	<i>Hydropsyche</i> spp.		4	5		
		<i>Hydropsyche siltalai</i>			8		
		<i>Hydropsyche pellucidula</i>			9		
	Rhyacophilidae	<i>Rhyacophila dorsalis</i>	1	1	8		
	Glossosomatidae	<i>Agapetus</i> spp.		3	2		
	Goeridae	<i>Silo nigricornis</i>		3			
	Limnephilidae	spp. Indet.	5	6	1		
	Leptoceridae	<i>Ceraclea</i> spp.	2	2			
	Sericostomatidae	<i>Sericostoma personatum</i>			12		
	Hydroptilidae	spp. Indet.			1		
Coleoptera	Elmidae	<i>Elmis aenea</i>			2	16	
		<i>Limnius volckmari</i>	3	2	50		5
		<i>Esolus parallelepipedus</i>	1	2	7		
	Scirtidae	<i>Scirtus</i> spp.		2	5		
	Hydraenidae	<i>Hydraena</i> spp.	1				
	Gyrinidae	<i>Orectochilus villosus</i>			5		
Diptera	Chironomidae	spp. indet.	1	9	31		
	Simuliidae	spp. indet.	18	11	2		
	Pediciidae	<i>Dicranota</i> spp.	1	1	1		2
	Eloeophilidae	<i>Eloeophila</i> spp.		1			
	Psychodidae	spp. indet.	1				
Hemiptera	Veliidae	<i>Velia</i> spp.		1			

Based on the percentage composition of the macroinvertebrates recorded at each site (Table 2 & 3), two sites KS1 & KS2 were assigned a Q3 predominantly as a result of the lack of Group A taxa, despite the high representation of Group B taxa in diversity and abundance. One site KS3 was assigned a Q4, largely due to the presence of Group A taxa and good representation of Group B taxa, with high overall % EPT. The two sites KS4 & KS5 on the Owenglin present some difficulty in terms of assigning a Q value. Both samples have too

little biological material present in the sample to allow for a proper Q assessment. However, due to the presence of *Perla bipunctata* site KS 4 is likely to be at least a Q4. KS5 has very little material present and as a result no Q-value can be assigned to this site. All the Q values were assigned on the basis of the invertebrate composition only and the Q values need to be checked on the basis of the physical parameters as listed in Appendix A.

**Table 2:** Summary of the percentage representation of the sensitivity groups used to determine the Q-values for 5 sampling sites on the Owenglin River & tributary.

	KS1-01	KS2-01	KS3-01	KS4-01	KS5-01
<b>Group A</b>	0.00	0.00	0.96	24.00	0.00
<b>Group B</b>	11.18	10.19	6.71	4.00	0.00
<b>Group C</b>	85.71	87.96	86.90	64.00	100.00
<b>Group D</b>	2.48	1.85	0.64	4.00	0.00
<b>Group E</b>	0.62	0.00	0.96	4.00	0.00

**Table 3:** The number of taxa recorded in each of the sensitivity groupings used to determine the Q-values for 5 sampling sites on the Owenglin River & tributary.

	KS1-01	KS2-01	KS3-01	KS4-01	KS5-01
<b>Group A</b>	0	0	2	2	0
<b>Group B</b>	4	5	6	1	0
<b>Group C</b>	16	19	19	1	2
<b>Group D</b>	2	1	2	1	0
<b>Group E</b>	1	0	1	1	0

**Table 4:** Summary of invertebrates recorded, percentage EPT and Q-value assigned to six sampling sites on the Owenglin River & tributary.

Site	Total			Q-value	Interpretation
	Abundance	# Taxa	%EPT		
KS1-01	161	23	49.1	Q3 <sup>a</sup>	Slightly polluted
KS2-01	216	25	45.4	Q3 <sup>a</sup>	Slightly polluted
KS3-01	313	31	26.5	Q4	Unpolluted/ Good status
KS4-01	25	6	28.0	Q4 <sup>b</sup>	Unpolluted/ Good status
KS5-01	7	2	0.0	Q? <sup>c</sup>	Not assigned

<sup>a</sup> Q-value at Q3 due to the lack of Group A taxa, although Group B taxa in high abundance and represented by several taxa.

<sup>b</sup> This assigned as Q4 however taxon richness and overall abundance not suitable for a reliable Q value to be assigned, however *Perla bipunctata* present in good numbers.

<sup>c</sup> This could not be assessed as the sampling did not return enough biological material.

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Appendix A: Macroinvertebrates grouped according to their sensitivity to organic pollution (taken from McGarrigle *et al*

Macroinvertebrates grouped according to their sensitivity to organic pollution					
TAXA	Group A <i>Sensitive</i>	Group B <i>Less Sensitive</i>	Group C <i>Tolerant</i>	Group D <i>Very Tolerant</i>	Group E <i>Most Tolerant</i>
Plecoptera	All except <i>Leuctra</i> spp.	<i>Leuctra</i> spp.			
Ephemeroptera	Heptageniidae Siphonuridae <i>Ephemera danica</i>	Baetidae (excl. <i>Baetis rhodani</i> ) Leptophlebiidae Cased spp. All taxa	<i>Baetis rhodani</i> Caenidae Ephemerellidae Uncased spp.		
Trichoptera					
Odonata					
Megaloptera				Sialidae	
Hemiptera		<i>Aphelocheirus aestivalis</i>	All except <i>A. aestivalis</i>		
Coleoptera			Coleoptera		
Diptera			Chironomidae (excl. <i>Chironomus</i> spp.) Simuliidae Tipulidae		<i>Chironomus</i> spp. <i>Eristalis</i> sp.
Hydracarina			Hydracarina		
Crustacea			<i>Gammarus</i> spp. <i>Austropetamobius pallipes</i>	<i>Asellus</i> spp. <i>Crangonyx</i> spp.	
Gastropoda			Gastropoda (excl. <i>Lymnaea peregra</i> & <i>Physa</i> sp.)	<i>Lymnaea peregra</i> <i>Physa</i> sp.	
Lamellibranchiata	<i>Margaritifera margaritifera</i>		<i>Anodonta</i> spp.	Sphaeriidae	
Hirudinea			<i>Piscicola</i> sp.	All except <i>Piscicola</i> sp.	
Oligochaeta					
Platyhelminthes			All		Tubificidae

Appendix A cont.: Representation of sensitivity groups to assign Q-value status, including other relevant site data (taken from McGarrigle *et al.*, 2002).

<b>Biological Assessment of Water Quality in Eroding Reaches (Riffles &amp; Glides) of Rivers and Streams*</b>						
Biotic Indices (Q Values) and typical associated macroinvertebrate community structure. See overleaf for details of the Faunal Groups.						
Macroinvertebrate Faunal Groups**	Q5	Q4	Q3-4	Q3	Q2	Q1
<b>Group A</b>	At least 3 taxa well represented	At least 1 taxon in reasonable numbers	At least 1 taxon Few - Common	Absent	Absent	Absent
<b>Group B</b>	Few to Numerous	Few to Numerous	Few/Absent to Numerous	Few/Absent	Absent	Absent
<b>Group C</b>	Few	Common to Numerous <i>Baetis</i> dominant often Others: never Excessive	Common to Excessive (usually Dominant or Excessive)	Dominant to Excessive	Few or Absent	Absent
<b>Group D</b>	Few or Absent	Few or Absent	Few/Absent to Common	Few/Absent to Common	Dominant to Excessive	Few or Absent
<b>Group E</b>	Few or Absent	Few or Absent	Few or Absent	Few or Absent	Few / Absent to Common	Dominant
<b>Additional Qualifying Criteria</b>						
<i>Cladophora</i> spp. Abundance	Trace only or None	Moderate growths (if present)	May be Abundant to Excessive growths	May be Excessive growths	Few or Absent	None
<b>Macrophytes</b> (Typical abundance)	Normal growths or absent	Enhanced growths	May be Luxuriant growths	May be Excessive growths	Absent to Abundant	Present/Absent
<b>Slime Growths</b> (Sewage Fungus)	Never	Never	Trace or None	May be Abundant	May be Abundant	None
<b>Dissolved Oxygen</b> Saturation	Close to 100% at all times	80% - 120%	Fluctuates from < 80% to > 120%	Very unstable. Potential fish-kills	Low (but > 20%)	Very low, sometimes zero
<b>Substratum</b> Siltation	None	May be light	May be light	May be considerable	Usually heavy	Usually very heavy and anaerobic
<p>Note occurrence/abundance of groups in above table refers to <u>some</u> but not necessarily <u>all</u> of the constituents of the group. The Additional Qualifying Criteria apply in virtually all circumstances. Single specimens may be ignored. Seasonal and other relevant factors (i.e., drought, floods) must be taken into account.</p>						
<p>* Macroinvertebrate criteria do not apply to rivers with mud, bedrock or sand substrata, very sluggish or torrential flow, head-water or high altitude streams and those affected by significant ground water input, excessive calcification, drainage, canalisation, culverting, marked shading etc.</p>						
<p>** See Further Observations overleaf.</p>						