

APPENDIX 3

Ecology 1998 & Biological Assessment 2003

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**A Floral and Faunal Assessment of the site of the Noble Transfer Station
and Inert Waste Disposal Facility at Fassaroe, Bray, Co Wicklow.**

A report prepared for Bord na Móna - Environmental Division

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Environmental Research and Consultancy (Dundalk) Ltd.**

28/06/1998

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Context

The widespread activities of man over the last century have led to the establishment of many areas of so-called 'waste land' which, though most often small in extent, are extremely varied. Extractive industries, which exploit sand and gravel deposits, can often have localised and intense environmental impacts. This may vary from the localised removal of topographical features to impacts on local water tables and grasslands.

The mining of unconsolidated deposits –such as clays, sands gravels and peat - may be viewed as a mixed blessing from a biogeographical viewpoint. The physical consumption of land produces hollows, which may flood when near the water table. If the extraction takes place in agricultural floodplains there may be a considerable increase in the number of habitats available and a concomitant increase in the number of species. Many disused gravel pits and sand quarries have become local eye-sores, with little attempt to rehabilitate them after extraction has finished. Redundant quarries can become useful semi-natural environments either by allowing them re-vegetate naturally, allowing them to flood to create new wetlands or by in-filling with inert materials - excavation, demolition or construction wastes - to create new grasslands or amenities. Such areas quickly develop ruderal communities which are characterised by relicts of the native flora as well as numerous weeds and casual introductions.

Surveys

Surveys of the flora and fauna of the site took place on the following dates:

15/06/1998	Initial reconnaissance
22/06/1998	Main 'phase I' habitat survey
26/06/1998	follow up survey

Surveying at this time of the year minimises the negative impact of seasonality on the survey

Scoping

The scope and nature of the survey was determined by the following factors :-

- The nature of the proposed development was centred on degraded habitat which had been subject to human influence for a considerable time
- The proposal would –in the long term – lead to new habitat after the site was filled in
- The time available for surveying was limited

Current Ecological Status

The existing environment is not designated as a Natural Heritage Area or a Special Protection Area under the Birds Directive (79/409/EEC) or as a Special Conservation Area in accordance with the Habitats Directive (92/43/EEC) nor is it designated under any of the other nature conservation designations currently used.

Habitats

Four areas of habitat (Fig. 1) can be distinguished in the site:-

1. Sand cliffs
2. Bare waste ground
3. Scrub habitat in older 'lower' quarry
4. Aquatic habitat (fringing stream)

Methodology

The surveying methods adopted involved a Phase I habitat survey (*sensu* Nature Conservancy Council, UK) to provide a general description of habitat/vegetation types within the study area. This is a rapid survey technique which provides a record of semi-natural vegetation and wildlife habitats. This type of survey is largely restricted to vegetation and associated environmental features (e.g. topography and substratum). Because animals are mobile, fugitive and generally small, large scale faunal surveys are not practicable.

This type of survey is adequate for categorising sites on a three point scale:

1. Site of high conservation value
2. Site of lower priority for conservation
3. Site of limited wildlife interest

A limitation of the method is that, because species lists may not be complete, rarities may be missed. However, the method can be suitably employed in degraded areas previously subjected to considerable human interference.

Sampling

Random spot sampling was undertaken along three main transect lines. Small detours from these transects intersected with the aquatic habitats (Fig 2). Animal surveying consisted of transect walking which involved the observation, identification and enumeration of species observed along a set route transversed over a prescribed time period (5 hours). Observations were restricted, in the main, to butterflies and day flying moths, other readily observable insects, birds and animal tracks and signs.

The availability of time was the main limitation which virtually dictated the surveying methods employed.

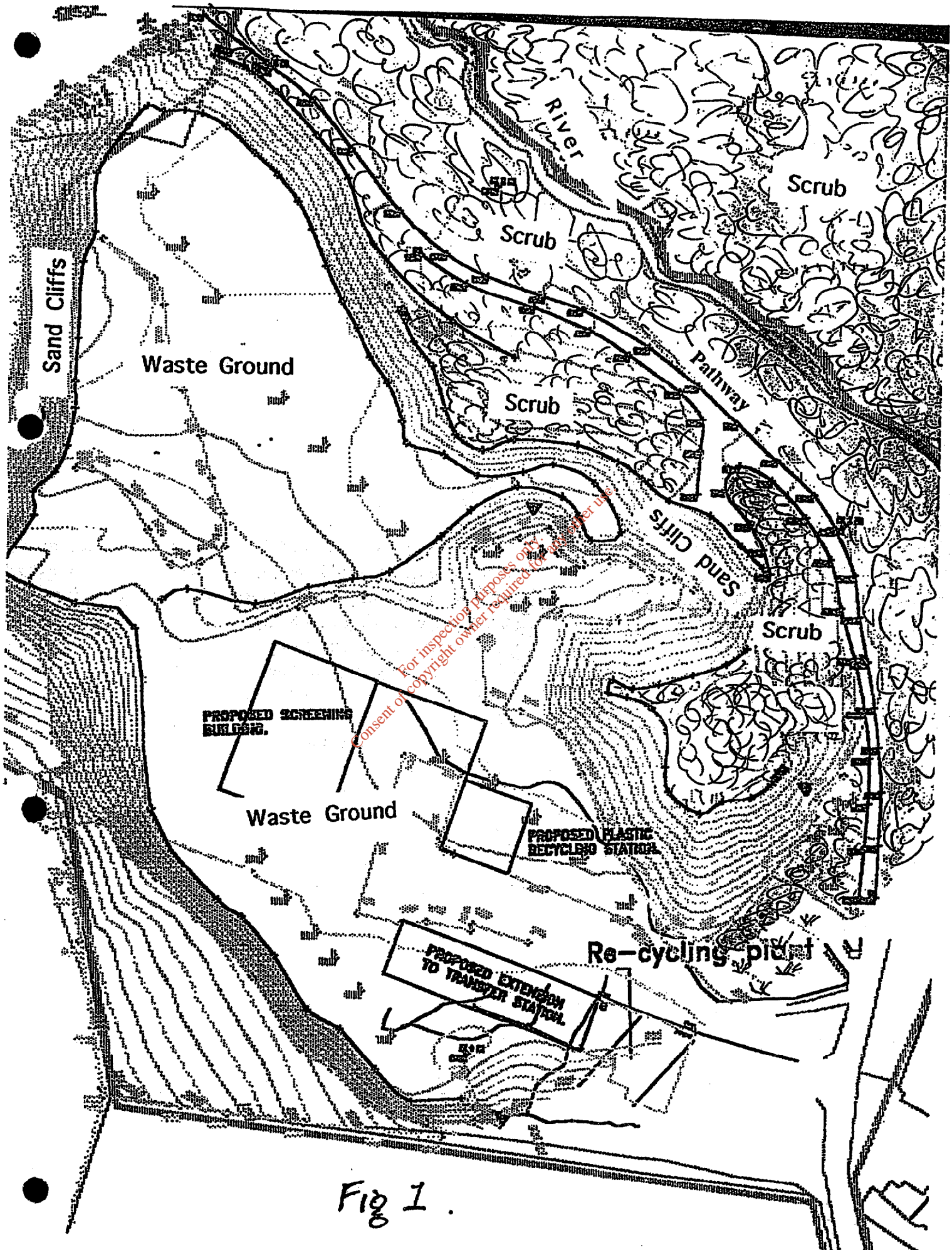
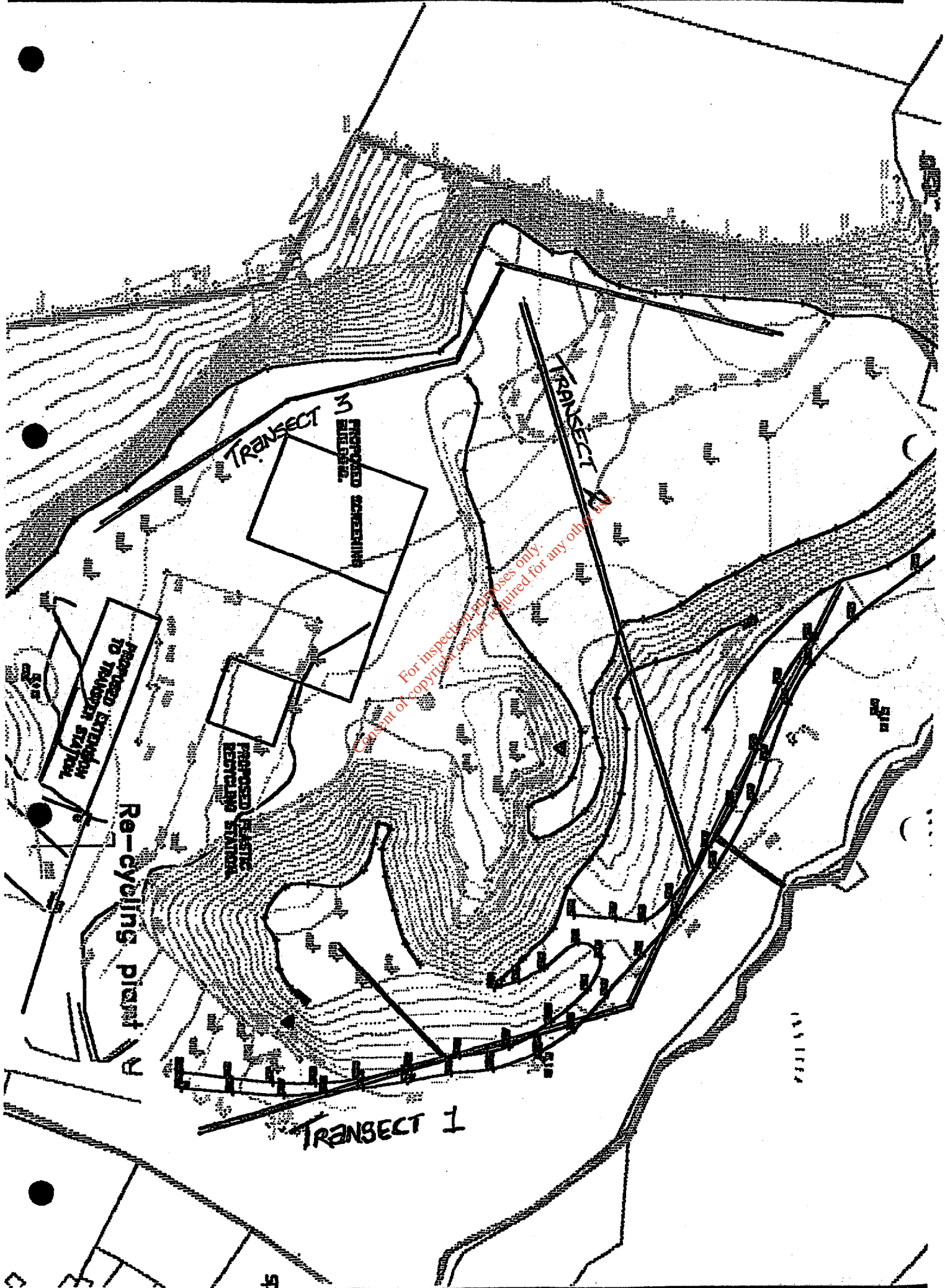


Fig 1 .



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Results of the survey

The species list constructed following the survey is given in Table I. No species of regional, national or international importance was found.

No species on the list of the Flora Protection Order 1987 or on the endangered, vulnerable or rare species lists of the Irish Red Data Book 1 (Vascular Plants) 1988 was found. No species of vertebrate, identified as under threat in the Irish Red Data Book 2 (Vertebrates) 1993 was observed.

The only indication of the presence of a species of international importance were footprints of a badger (*Meles meles*) found in soft earth on the waste ground below the sand cliffs fringing the southern boundary of the quarry. No evidence was found that badgers actually live in the site, but the proposed developmental activity is likely to have little impact on them as a considerable amount of superior badger habitat exists outside the boundary of the site. The threat to badgers is not so much habitat destruction as killing by man.

Communities of note

- Seasonal nesting sand martins (*Riparia riparia*) on fringing sand cliffs along boundary
- Scrub community in 'lower' quarry.

Cover in Scrub area

Species	Status	% Cover /Braun-Blanquet scale	
Ash	common	25%	3
Bramble	frequent	10%	1 - 2
Dog rose	frequent	10%	1 - 2
Elder	common	15%	2
Hawthorn	present	5%	1
Buddlia	Very common	50%	4
Sycamore	present	5%	1

Assessment of the site

The flora and fauna is typical of so-called 'waste land'. It is at an early serial stage characterised by open habitat which allows colonisation by pioneer species. Continued use of the habitat by man prevents any significant secondary succession (except in the scrub area). The area is characterised by the presence of many heliophytes excluded from the surrounding land by agricultural practices and the nearby scrub along the northern boundary of the site.

The area for which the licence is being sought is a degraded environment. The pioneer plants found in this type of habitat are generalists which can tolerate a range of soil

types, temperatures and moistures. It is unlikely that they will disappear during the life of the project. Most are annual plants which can produce a large number of easily dispersed seeds. As a result re-colonisation of the site is likely to be ongoing as in-filling moves from one area of the site to the next leaving previously covered areas fallow for some time.

Site categorisation

Category 3 Site of limited wildlife interest

Impacts

The main impact of the proposed development will be some loss of habitat. This will be temporary for the duration of the landfill project. The impact of the proposed development is likely, in the long term, to be more beneficial than detrimental. Most of the negative impacts on the site have taken place in the past with the removal of sand and gravel. The most serious impact of the present proposal would be the removal of the scrub habitat in the 'lower' quarry area. Scrub is a natural seral community though less species rich than grassland. It contains a variety of shrub species and provides habitat for passerine (perching) birds. Left alone, scrub will eventually change to woodland. In the context of the overall area, however, there is sufficient similar habitat outside the site to minimise the effect of the removal of this area.

The boundary stream to the north of the site is a feeder stream of the river Dargle and care should be taken to ensure that it is not polluted or impeded by the project.

Restoration and Compensation

Given the intention of this project i.e. to in-fill the quarry area with inert material (excavation, demolition and building wastes), the nature of the small area of existing semi-natural scrub-land community may be quickly restored by natural regeneration. The main requirement is to ensure a suitable depth of soil overlying the in-fill material. Sufficient species exist in the adjacent areas to ensure colonisation and to allow natural succession take place rapidly. Re-vegetation may be accelerated by planting with native and naturalised tree species and suitable wildflower mixes.

Noble Site - Species List

Flora

Scientific Name	Common Name
<i>Acer pseudoplatanus</i>	Sycamore
<i>Anagallis arvensis</i>	Scarlet Pimpernel
<i>Anagallis arvensis</i>	Scarlet Pimpernel
<i>Antherinum majus</i>	Snapdragon
<i>Anthyllis vulneraria</i>	Kidney Vetch
<i>Arabis hirsuta</i>	Hairy Rockcress
<i>Aster novi-belgii</i>	Aster (Michaelmas Daisy)
<i>Bellis perennis</i>	Daisy
<i>Brassica rapa</i>	Rape
<i>Buddlia Davidii</i>	Buddlia
<i>Capsella bursa-pastoris</i>	Shepherd's Purse
<i>Centranthus ruber</i>	Red Valerian
<i>Cirsium helenoides</i>	Meadow Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Convolvulus arvensis</i>	Bindweed
<i>Crataegus monogyna</i>	Hawthorn
<i>Dactylorhiza fuchsii</i>	Common Spotted Orchid
<i>Daucus carota</i>	Wild Carrot
<i>Digitalis purpurea</i>	Foxglove
<i>Equisetum pratense</i>	Shade Horsetail
<i>Fagus sylvatica</i>	Beech
<i>Festuca ovina</i>	Sheep's Fescue
<i>Festuca pratensis</i>	Meadow Fescue
<i>Festuca rubra</i>	Red Fescue
<i>Fraxinus excelsior</i>	Ash
<i>Germanium robertianum</i>	Herb Robert
<i>Hedera helix</i>	Ivy
<i>Heracleum mantegazzianum</i>	Giant Hogweed
<i>Heracleum sphondylium</i>	Hogweed
<i>Holcus lanatus</i>	Yorkshire Fog
<i>Juncus sp.</i>	Rush
<i>Lathyrus odoratus</i>	Sweet Pea
<i>Lathyrus pratensis</i>	Meadow Vetchling
<i>Leucanthemum vulgare</i>	Ox-eye Daisy
<i>Linaria purpurea</i>	Purple Toadflax
<i>Lotus corniculatus</i>	Birdsfoot Trefoil
<i>Orchis mascula</i>	Early Purple Orchid
<i>Papaver rhoeas</i>	Common Poppy
<i>Philosella officinarum</i>	Mouse-ear Hawkweed
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Poa annua</i>	Annual Meadow Grass
<i>Prunella vulgaris</i>	Selfheal
<i>Pteridium aquilinum</i>	Bracken
<i>Ranunculus acris</i>	Meadow Buttercup
<i>Ranunculus flammula</i>	Lesser Spearwort
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rosa canina</i>	Dog Rose
<i>Rosa sp.</i>	Garden rose
<i>Rubus fruticosus</i>	Bramble
<i>Rumex alpinus</i>	Monk's Rhubarb

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Rumex crispus
Sambucus nigra
Senecio jacobaea
Senecio vulgaris
Sinapis alba
Sonchus asper
Stellaria graminea
Tanacetum parthenium
Taraxacum officinale
Trifolium pratense
Trifolium repens
Tussilago farfara
Ulex europaeus
Urtica dioica
Veronica officinalis
Veronica persica
Vicia sativa
Vicia sativa

Curled Dock
Elder
Common Ragwort
Groundsel
White Mustard
Prickly Sow-thistle
Lesser Stitchwort
Feverfew
Common Dandelion
Red Clover
White Clover
Colt's Foot
Common Gorse
Common Nettle
Heath Speedwell
Common Speedwell
Common Vetch
Common Vetch

Fauna

Invertebrates

Baetis sp.
Bombus lapidarius
Bombus lucorum
Coccinella 7-punctata
Colias croceus
Cynthia cardui
Eristalis tenax
Formica rufa
Gannarus duebeni
Limax maximus
Lithobius forficatus
Oniscus asellus
Philaenus spumarius
Pieris rapae
Polymmatius icarus
Porcellio scaber
Potamopyrgus jenkensii
Telligoniidae (early instars)
Tipula sp.
Vanessa atalanta

Mayfly
Red-Tailed Bumble Bee
White-tailed Bumble Bee
7-spot Ladybird
Clouded Yellow
Painted Lady
Hoverfly
Wood Ant
Freshwater shrimp
Great Grey Slug
Centipede
Wood Louse
Froghopper
Small White
Common Blue
Wood louse
Freshwater snail
Bush Cricket
Crane Fly
Red Admiral

Vertebrates

Apus apus
Carduelis chloris
Columba palambus
Corvus corone cornix
Corvus frugilegus
Corvus monedula
Erithacus rubecula
Fringilla coelebs
Hirundo rustica
Motacilla alba yarrelli
Parus caeruleus
Parus major

Swift
Greenfinch
Wood Pigeon
Hooded Crow
Rook
Jackdaw
Robin
Chaffinch
Swallow
Pied Wagtail
Blue Tit
Great Tit

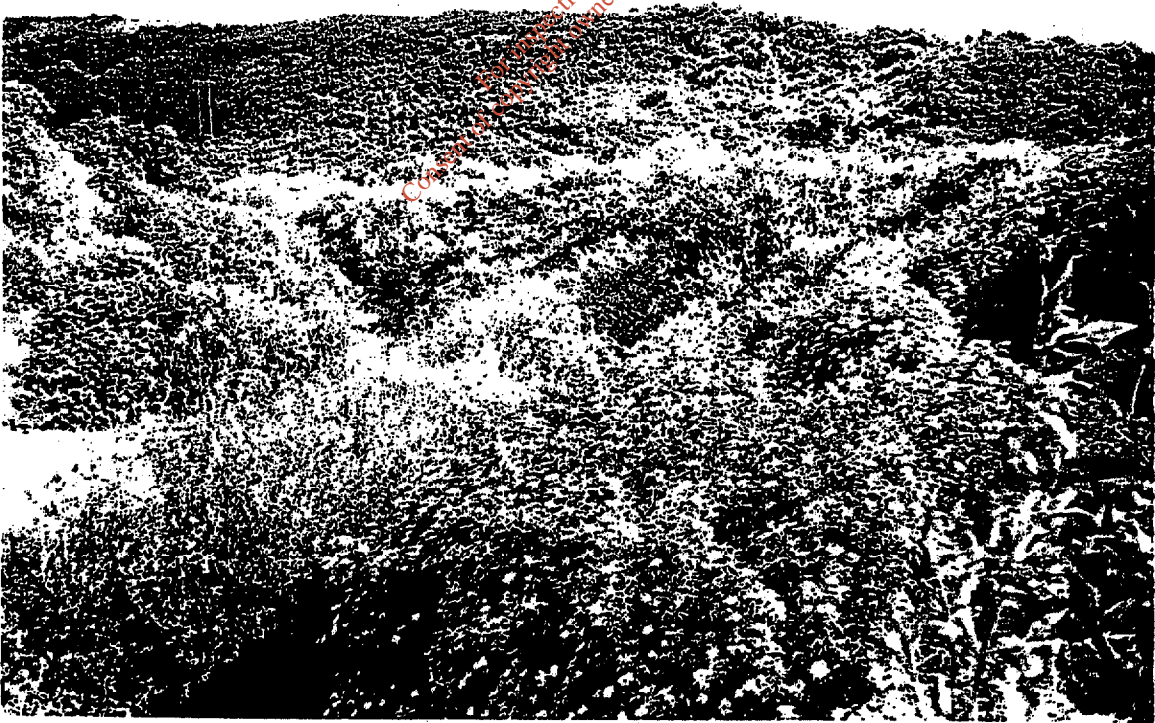
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<i>Passer domesticus</i>	House Sparrow
<i>Pica pica</i>	Magpie
<i>Prunella modularis</i>	Dunnock
<i>Riparia riparia</i>	Sand Martin
<i>Sturnus vulgaris</i>	Starling
<i>Troglodytes troglodytes</i>	Wren
<i>Turdus merula</i>	Blackbird
<i>Turdus philomelos</i>	Song Thrush
<i>Oryctolagus cuniculus</i>	Rabbit
<i>Meles meles</i>	Badger

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Scrub



Scrub

BIOLOGICAL MONITORING REPORT
GREENSTAR MATERIALS RECOVERY LTD

FASSAROE DEPOT

LICENCE NO. 53-2

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Prepared For: -

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Bray,
Co. Wicklow.

Prepared By: -

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2nd October 2003

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1. INTRODUCTION

greenstar is required to undertake biennial biological monitoring of the Glenmunder River as a condition of its Waste Licence (Reg. No. 53-2). This report discusses the first biological monitoring programme carried out at the site in August 2003. The programme included monitoring at two surface water points (SW-1 and SW-4) agreed in advance with the Agency.

The fieldwork was carried out by Ms. Orla Freyne M.Sc. This report was prepared by Ms. Orla Freyne and reviewed by Mr. Jim O'Callaghan M.Sc. The report is accurate and representative of the monitoring completed in August 2003.


Orla Freyne


Jim O' Callaghan

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2. BIOLOGICAL MONITORING

2.1 Monitoring Programme

The first biological monitoring programme was carried out on 25th August 2003. This included a physicochemical inspection and the collection of macroinvertebrate samples for identification at two locations (SW-1 and SW-4). Biological assessments are generally undertaken between June and September when stream or river flows are at their lowest and temperatures are at their highest, thus giving an indication to the worst conditions likely to be imposed on the water body.

The surface water drainage system in and around the site is dominated by the proximity of the nearby Glenmunder Stream, which is to the north-east of the facility. The Glenmunder ultimately drains to the River Dargle, which is a designated salmonid river. The stream runs along the northern boundary of the site, as shown on Figure 2.1. SW-1 is upstream of the site and SW-4 is downstream.

2.2 Physico-Chemical Assessment

The assessment included an inspection of the surface water monitoring points and the banks of the Glenmunder, along the site boundary for potential pollution indicators such as odour, littering, fungal or algal growth. pH, conductivity, temperature and dissolved oxygen levels were also monitored. The results of the in situ monitoring, physico-chemical parameters are presented in Table 2.1 and the biological assessments are presented in Tables 2.2 to 2.7.

The pH and temperature were measured using a Hanna Instruments dual pH and temperature probe. Dissolved oxygen was measured using a Hanna Instruments portable waterproof dissolved oxygen meter. All field equipment was calibrated and tested prior to the sampling programme.

Table 2.1 In-Situ Monitoring Data

	Date	SW-1	SW-4
pH (pH units)	Aug 25 2003	8.32	8.31
Temp (°C)	Aug 25 2003	14.1	14.1
Elec. Conduct. (mS/cm)	Aug 25 2003	0.615	0.617
Dissolved Oxygen (mg/l)	Aug 25 2003	9.7	10.0
Visual Inspection/ Odour	Aug 25 2003	Few suspended solids present. No odour	Few suspended solids present. No odour

2.3 Biological Assessment

Two macroinvertebrate sampling events were carried out at each monitoring point (SW-1 and SW-4) using the 'kick' sampling method. Each sampling event was carried out over a period of 3 minutes in a riffle area that was typical of the stream. The samples were collected at two separate sections of the stream bed. A hand net, 250 mm width with a 1 mm mesh size, was used over an area of approximately 1 m² within the riffle. The macroinvertebrates collected were preserved in 40% formaldehyde solution and were returned to the laboratory for identification using relevant keys.

The findings were compared to the 'Q-value' biological quality rating index which has been developed by the Environmental Protection Agency (EPA). This index is based on the sensitivity of various macroinvertebrates to pollution (particularly organic pollution) and their relative abundance. The indicator groups are divided into five categories ranging from sensitive forms to most tolerant forms: -

- Group A – sensitive
- Group B – less sensitive
- Group C – tolerant
- Group D – very tolerant
- Group E – most tolerant

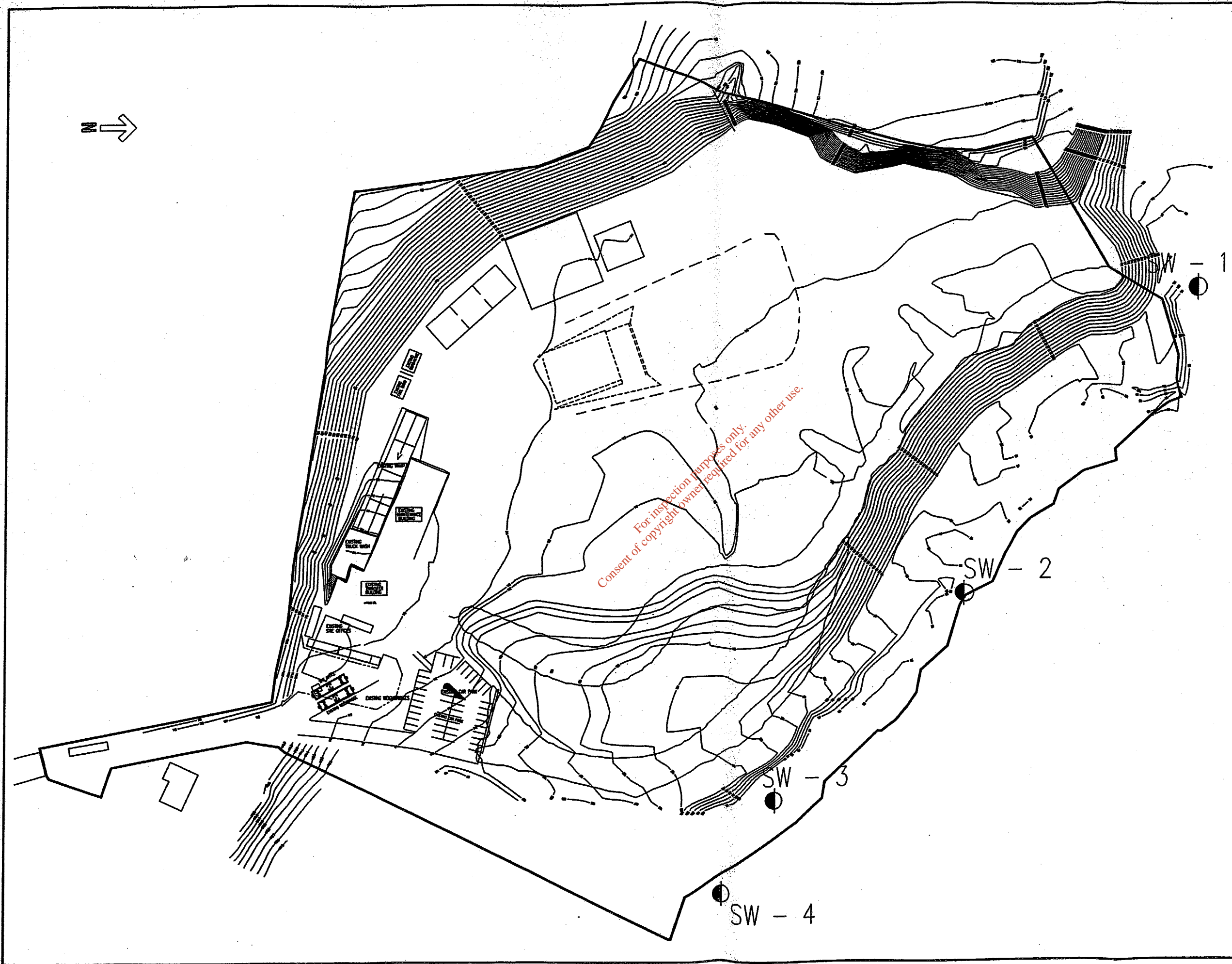
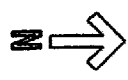
The Q-value is a biotic index devised to determine the relationship between the water quality and macroinvertebrate community structure. Five main categories have been established to provide an indication of the water quality status. These range from a value of Q 5, which indicates unpolluted conditions, to Q 1, which represents gross contamination. These are occasionally sub-divided into intermediate indices, such as Q 3-4, to denote transitional conditions.

NOTES

LEGEND

● Denotes surface water monitoring locations

#	I.D.	EASTING	NORTHING
1	SW-1	324132.36	218322.94
2	SW-2	324247.97	218240.29
3	SW-3	324326.38	218166.72
4	SW-4	324359.53	218124.20



REV	DATE	DESCRIPTION	DRN	CR'D	APP
A	02/10/03	Surfacewater Monitoring Locations	OF	JDC	**

OxM O'Callaghan Moran & Associates.
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SCALE	DRAWING No.	REV.
NTS A1	2.1	A

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2.3.1 Biological Monitoring at SW-1

This monitoring point (approximate Grid Reference: - E 324132, N 218323) is located at the northern boundary of the site in a well shaded area. The stream was relatively narrow and shallow at this location (approximately 2.5 m wide and 20 cm deep). The stream bed comprised mostly gravel and rocks with approximately 20% mud/silt. The water was clear and there were small amounts of filamentous algae present. There was no evidence of fungal growth (e.g. sewage fungus). The physical conditions at both sampling locations were the same.

The flow conditions were moderate to low. A total of three hundred and seventy nine individual macroinvertebrates were recorded (158 in the first assessment and 221 in the second assessment). The percentage averages for the two assessments are presented in Table 2.2 below and the complete biological assessment results are included in Table 2.3 and 2.4.

Table 2.2 Abundance of Macroinvertebrates at SW-1 – Percentage per Group

	Group A (%)	Group B (%)	Group C (%)	Group D (%)	Group E (%)
T 1	1.9	18.99	64.56	13.29	1.27
T 2	0.45	6.33	66.52	7.24	19.46
Average	1.18	12.66	65.54	10.26	10.36

Group C (tolerant) organisms formed the majority of the macroinvertebrates (Dominant - 50 - 75%). Of these, the freshwater shrimp (*Gammarus sp.*) and the mayfly represented the principal fauna.

Group B (less sensitive) were present in common (10 - 20%) numbers. Both Group D (very tolerant) and Group E (most tolerant) were present in fair to common numbers. Group A (sensitive) were present in small numbers (1 or two individuals to <5%).

A Q-value of 3 - 4 was assigned indicating slightly polluted conditions.

2.3.2 Biological Monitoring at SW-4

This monitoring point (approximate Grid Reference:- E 324359, N 218124) is located at the eastern boundary of the site. The channel was narrow and relatively shallow, although deeper than location SW-1 (approximately 2.0 m wide and 30 cm deep). The stream bed was composed of mainly gravel and rocks with approximately 15% mud/silt. The water was clear and there were small amounts of filamentous algae present. There was no evidence of fungal growth. The physical conditions at both sampling locations were the same.

Table 2.3 - Biological Monitoring SW-1

River	Site Number	Date	Temp	Flow	Turbidity
Glenmunder	SW-1 (T 1)	25/08/2003	14.4	Moderate	Low

Group A		Group B		Group C		Group D		Group E	
Name	Number	Name	Number	Name	Number	Name	Number	Name	Number
Plecoptra	3	Ephemeroptera (excl. Heptageniidae, Ephemeridae and <i>B. rhodani</i>)	17	Gammaridae	72	Asellidae	0	<i>Chironomous sp.</i>	0
Heptageniidae	0	Cased Caddis	13	<i>B. rhodani</i>	10	Hirudinea	21	Tubificidae	2
Ephemeridae	0	<i>Rheotanytarsus sp.</i>	0	Simuliidae	3	Sphaeriidae	0	Eristalinae	0
<i>Margaritifera sp.</i>	0	<i>Aphelocheirus sp.</i>	0	Uncased Caddis	6				
				Gastropoda	4				
				Coleoptera	0				
				Astacidae	0				
				Tricladida	0				
				Odonta	0				
				Hemiptera (excl. <i>Aphelocheirus sp.</i>)	0				
				Sialidae	0				
				Hydracarina	0				
				Chironomidae (excl. <i>Chironomous sp.</i> , <i>Rheotanytarsus sp.</i>)	7				
				Tipulidae	0				
				<i>Anodonta sp.</i>	0				
Total # organisms	3		30		102		21		2
Group %	1.90		18.99		64.56		13.29		1.27
Q-value					Q 3-4				

Table 2.4 - Biological Monitoring SW-1

River	Site Number	Date	Temp	Flow	Turbidity
Glenmunder	SW-1	25/08/2003	14.4	Moderate	Low
	(T 2)				

Group A		Group B		Group C		Group D		Group E	
Name	Number	Name	Number	Name	Number	Name	Number	Name	Number
Plecoptra	1	Ephemeroptera (excl. Heptageniidae, Ephemeridae and <i>B. rhodani</i>)	9	Gammaridae	97	Asellidae	0	<i>Chironomous sp.</i>	0
Heptageniidae	0	Cased Caddis	5	<i>B. rhodani</i>	19	Hirudinea	16	Tubificidae	43
Ephemeridae	0	<i>Rheotanytarsus sp.</i>	0	Simuliidae	0	Sphaeriidae	0	Eristalinae	0
<i>Margaritifera sp.</i>	0	<i>Aphelocheirus sp.</i>	0	Uncased Caddis	4				
				Gastropoda	9				
				Coleoptera	2				
				Astacidae	0				
				Tricladida	0				
				Odonta	0				
				Hemiptera (excl. <i>Aphelocheirus sp.</i>)	0				
				Sialidae	0				
				Hydracarina	0				
				Chironomidae (excl. <i>Chironomous sp.</i> , <i>Rheotanytarsus sp.</i>)	13				
				Tipulidae	0				
				<i>Anodonta sp.</i>	0				
Total # organisms	1		14		147		16		43
Group %	0.45		6.33		66.52		7.24		19.46
Q-value					Q 3-4				

Flow conditions at SW-4 were moderate to low. A total of four hundred and seventy six organisms were recorded (265 for the first assessment and 211 in the second assessment). The percentage averages for the two assessments are presented in Table 2.5 and the complete biological assessment results are included in Table 2.6 and 2.7.

Table 2.5 Abundance of Macroinvertebrates at SW-4 – Percentage per Group

	Group A (%)	Group B (%)	Group C (%)	Group D (%)	Group E (%)
T 1	0.38	16.6	76.23	2.64	4.15
T 2	0.95	21.33	62.09	5.69	9.95
Average	0.67	18.97	69.16	4.16	7.05

Group C (tolerant) organisms formed the majority of the macroinvertebrates (Dominant - 50 - 75%). Of these, the freshwater shrimp (*Gammarus sp.*) and the mayfly represented the principal fauna.

Group B (less sensitive) were present in common (10 - 20%) numbers. Both Group D (very tolerant) and Group E (most tolerant) were present in small numbers (<5%) to fair numbers (5-10%). Group A (sensitive) were present in the category scarce/few (<1%).

A Q-value of 3 - 4 was assigned indicating slightly polluted conditions.

2.4 Discussion

Group C were the dominant group in both sample locations (Graph 2.1 below). Sensitive organisms (Group A) were present as one or two individuals and less sensitive organisms (Group B) were recorded in numbers greater than 10% (above the percentage allocated for the Q-value of 3). Consequently, a Q-value of 3 - 4 was assigned indicating slightly polluted conditions at both locations.

Table 2.6 - Biological Monitoring SW-4

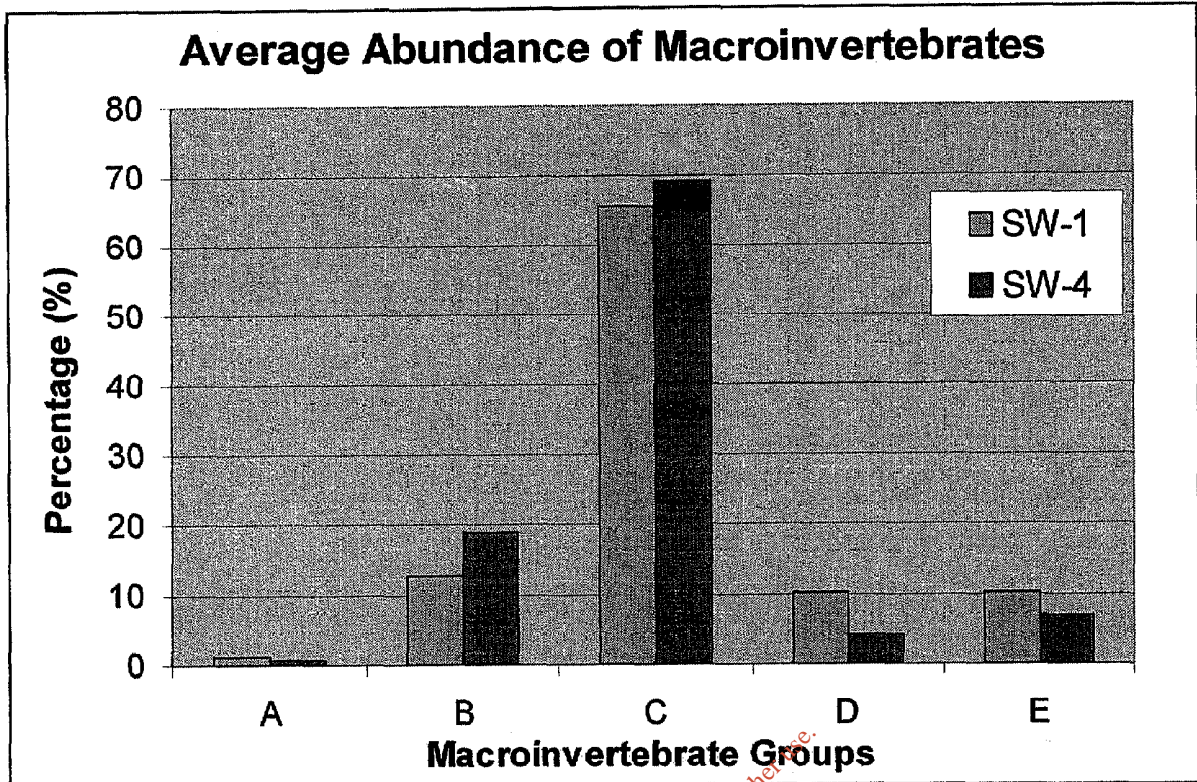
River	Site Number	Date	Temp	Flow	Turbidity
Glenmunder	SW-4	25/08/2003	14.4	Moderate	Low
	(T 1)				

Group A		Group B		Group C		Group D		Group E	
Name	Number	Name	Number	Name	Number	Name	Number	Name	Number
Plecoptera	1	Ephemeroptera (excl. Heptageniidae, Ephemeridae and <i>B. rhodani</i>)	28	Gammaridae	148	Asellidae	0	<i>Chironomous sp.</i>	0
Heptageniidae	0	Cased Caddis	16	<i>B. rhodani</i>	21	Hirudinea	6	Tubificidae	11
Ephemeridae	0	<i>Rheotanytarsus sp.</i>	0	Simuliidae	8	Sphaeriidae	1	Eristalinae	0
<i>Margaritifera sp.</i>	0	<i>Aphelocheirus sp.</i>	0	Uncased Caddis	5				
				Gastropoda	9				
				Coleoptera	0				
				Astacidae	0				
				Tricladida	0				
				Odonta	1				
				Hemiptera (excl. <i>Aphelocheirus sp.</i>)	0				
				Sialidae	0				
				Hydracarina	0				
				Chironomidae (excl. <i>Chironomous sp.</i> , <i>Rheotanytarsus sp.</i>)	6				
				Tipulidae	4				
				<i>Anodonta sp.</i>	0				
Total # organisms	1		44		202		7		11
Group %	0.38		16.60		76.23		2.64		4.15
Q-value					Q 3-4				

Table 2.7 - Biological Monitoring SW-4

River	Site Number	Date	Temp	Flow	Turbidity
Glenmunder	SW-4	25/08/2003	14.4	Moderate	Low
	(T 2)				

Group A		Group B		Group C		Group D		Group E	
Name	Number	Name	Number	Name	Number	Name	Number	Name	Number
Plecoptera	1	Ephemeroptera (excl. Heptageniidae, Ephemeridae and <i>B. rhodani</i>)	33	Gammaridae	84	Asellidae	0	<i>Chironomous sp.</i>	0
Heptageniidae	1	Cased Caddis	12	<i>B. rhodani</i>	11	Hirudinea	12	Tubificidae	21
Ephemeridae	0	<i>Rheotanytarsus sp.</i>	0	Simuliidae	4	Sphaeriidae	0	Eristalinae	0
<i>Margaritifera sp.</i>	0	<i>Aphelocheirus sp.</i>	0	Uncased Caddis	10				
				Gastropoda	6				
				Coleoptera	0				
				Astacidae	0				
				Tricladida	0				
				Odonta	0				
				Hemiptera (excl. <i>Aphelocheirus sp.</i>)	0				
				Sialidae	0				
				Hydracarina	0				
				Chironomidae (excl. <i>Chironomous sp.</i> , <i>Rheotanytarsus sp.</i>)	16				
				Tipulidae	0				
				<i>Anodonta sp.</i>	0				
Total # organisms	2		45		131		12		21
Group %	0.95		21.33		62.09		5.69		9.95
Q-value					Q 3-4				

Graph 2.1 Abundance of Macroinvertebrates at SW-1 and SW-4

While there was a decrease in the percentages of the most sensitive group (A) in SW-4 (0.67%) compared to SW-1 (1.18%), the percentage of less sensitive organisms (B) was higher at SW-4 (18.97%) than SW-1 (12.66%). Furthermore, there was a marked decrease in the more tolerant organisms (C, D and E) at SW-4 (80.4%) compared to SW-1 (86.16%). This indicates that, although the survey has identified the presence of slightly polluted conditions at each location, the conditions are marginally better at the downstream monitoring point. There is no evidence to suggest that the site activities are contributing to the existing water quality conditions.

OCM did not identify any previously established biological quality ratings for the Glenmunder. Water quality ratings assigned to the River Dargle upstream (10/D/01 - Sampling Number 0200) and downstream (10/D/01 - Sampling Number 0250) of the Glenmunder confluence for 2000 were both allocated Q-value of 3. This indicates that the Glenmunder has not negatively impacted on water quality in the River Dargle.