

A REPORT BY AMC: JUNE 2008

**GALWAY CITY COUNCIL**  
**THE REMEDIATION OF ILLEGAL DUMPING IN BARNA**  
**WOODS**

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## 1. INTRODUCTION

Galway City Council was notified of illegal dumping in the Barna Woods area on the 17<sup>th</sup> of July 2006 by means of a letter sent, by a member of the public, to Galway County council, dated the 11<sup>th</sup> of July 2006. Baseline site visits were then carried out by members of the city council and types of waste present at the site documented. After providing an outline proposal for consultancy assistance with regard to the illegal dumping, Andrew Moag consulting was commissioned by Galway City Council in November 2007 to conduct a risk based assessment of the necessary steps required to remediate the illegal dumping site.

Galway City Council is required under the Waste Management Act 1996-2007 to investigate and assess hazardous waste sites and unauthorised activities.

### 1.1 Site Location

The site is situated just south off the R336 coastal road that extends between Barna and Salthill in Co. Galway, Grid Reference, M246234 (Figure 1). A small 3<sup>rd</sup> class road runs along the western boundary of the site connecting the main R336 route to a popular local beach and picnic area. Barna is located approximately 1.2km directly west of the site area and Salthill is located approximately 2.5km directly east of the site.

### 1.2 Site Setting

The site is a mature mixed deciduous woodland area known as Barna woods. It is in close proximity to the shores of Galway Bay and adjacent to an entrance road which leads to one of Galway's most popular and blue flag awarded beaches, the Silver Strand. The site area is enclosed by an old stone wall to the west and southern boundary. The east and south east of the site is surrounded by the shores of Galway Bay. Security fencing extends along the north eastern boundary of the site dividing the woodland from the council owned park depot, formerly a caravan park. The area in which the site is located in a highly designated area including the Galway bay cSAC as well as locally important habitat features.

The site forms part of an area of woodland that is of growing interest from locals for walking and other recreational uses. The City Development Plan zones Barna Woods as an area for recreation and amenity use and a "green way" is shown travelling north south bisecting the site through the woodland. A management plan for the site currently being developed and in principle will allow more controlled access to the woodland through designated routes. The use of designated routes is intended to prevent any impact on the local ruins and well. Locally the site has a large Heronry with reportedly 12 pairs of herons nesting routinely close by. The site lies on the boundary between the County and City limits and provides an important green fringe feature for the city.

Entrance on foot to the site can be gained through gaps in the old stone wall and also through an existing entrance along the road side of the site. This leads to "Tobar Eine", St. Enda's Well which lies just north of the site area (Plate 1).

## 2. ENVIRONMENTAL SETTING

### 2.1 Geology and Hydrogeology

This section gives a description of the geology and hydrogeology of the site and its surrounding area. The following sources of information were used in this report:

- Geological Survey of Ireland (GSI) 2004: Bedrock Geology of Ireland
- Geological Survey of Ireland Online (GSI) 1:50 000 Groundwater map, Galway Bedrock Data
- Geological Survey of Ireland Online (GSI) 1:50 000 Groundwater map, Galway, Drift Geology
- Geological Survey of Ireland Online (GSI) 1:50 000 Groundwater map, Galway Groundwater Vulnerability
- Geological Survey of Ireland Online (GSI) 1:50 000 Groundwater map, Galway Bedrock Aquifer

#### ***Geology***

The bedrock geological map for Galway shows that the site is located in a category GII area in which granites and other intrusive rocks are present (Figure 2).

The Galway drift geology map (western RBD Subsoils) records the presence of till over the site, which is chiefly derived from the underlying granite (Figure 3).

#### ***Hydrogeology***

The hydrogeological map of Galway, places this site in the category of areas that are underlain by bedrock which is generally unproductive except for local zones. It classifies the area as one which is underlain by a poor aquifer (Figure 4).

#### ***Groundwater Vulnerability***

The western interim groundwater vulnerability map shows the site as an area of extreme vulnerability (Figure 5) although with the location of the site close to the bay groundwater resource use for drinking will be limited by saline intrusion and the generally unproductive flow through the formation.

### 2.2 Surface Water

The closest water body to the site area is Galway Bay and the shoreline is located approximately 50-100m from the waste.

The closest waterway to the site is an unnamed watercourse, located less than 300m directly south of the site area, Grid Reference M245233. The closest named waterway to the site is Barna Stream which is located approximately 0.4 km north east of the site, Grid Reference M247238. Both waterways discharge onto the mudflats of Galway Bay.

The closest inland water body to the site is Lough Inch, located approximately 2.9 km north west of the site.

## 2.3 Designations

According to the Galway City Development Board “Galway City Habitats Inventory 2005” prepared by Natura environmental consultants, the area in which the site is located is one with high biodiversity importance and is therefore highly designated. The area around the site is rich in many habitats and supports a diverse and interesting range of species of plants and animals.

The site falls within the following designation categories:

### **A Special Area of Conservation: cSAC**

An internationally important site that has been selected for the protection of habitats and species (other than birds) listed in annexes of the EU Habitats Directive (92/42/EEC).

### **Special Protection Area: SPA**

An internationally important site that has been designated for the protection of bird species, listed in Annex 1 of the EU Birds Directive (79/409/EEC) and their habitats. Annex 1 birds are those that require special conservation measures because they are rare, in danger of extinction, or vulnerable to habitat changes in the EU.

### **Natural Heritage Area: NHA**

Sites are NHAs when formally designated sites, and proposed NHAs or pNHAs, until this happens. NHAs form the national network of protected Areas in Ireland, selected for the protection of habitats and species of national or international importance.

### **Mixed broadleaved woodland: WD 1**

The site contains a mixture of native and non-native trees. It is of high local conservation value due to the structural diversity.

### **Area of high biodiversity value**

Rusheen Bay – Barna Woods - Illaunafonona

### 3. SITE HISTORY

#### 3.1 Illegal Dumping Notifications

Galway County Council was notified of illegal dumping in the Barna Woods area initially in a letter, received on the 17<sup>th</sup> of July 2006, from a concerned member of the public. The letter dated the 11<sup>th</sup> of July 2006 stated that the member of the public came across the discovery of illegally dumped waste whilst walking in the woodland area. The letter was then passed from the county council, to the Environment Section of Galway City Council, which was received on the 25<sup>th</sup> of July 2006. An acknowledgement receipt with regard to the complaint was then sent to both the member of the public and Galway County Council dated the 26<sup>th</sup> of July 2006.

Mary O'Leary, an Environmental Enforcement Officer for Galway City Council, visited the site of the illegal dumping at Barna Woods on the 25<sup>th</sup> of July 2006. Photographs of the site area and waste present on the ground surface were taken on the same day. On the 26<sup>th</sup> of July 2006 Brid Dawson accompanied Mary O'Leary to the site. Several holes were dug by hand in the vicinity of the waste mound and photographs of the excavated waste were taken.

#### 3.2 Waste Origin

During the site visits, Mary O'Leary and Brid Dawson found that the waste consisted of general household waste. The wastes observed on the 25<sup>th</sup> and 26<sup>th</sup> of July 2006 include:

- Old cartons;
- Plastic Bags;
- Milk bottles;
- Alcohol / Beer bottles;
- Crisp Packaging;
- Camping gas canisters;
- Food cans;
- Glass bottles; and
- Oil containers.

#### 4. AMC SITE INVESTIGATION AND FINDINGS

Andrew Moag and Noeleen O'Higgins visited the Barna Woods site on the afternoon of the 4<sup>th</sup> of December 07, accompanied by Mary O'Leary an Environmental Enforcement Officer from Galway City Council. Entrance was gained on foot through an existing entry way along the road side of the site which leads to "Tobar Eine", St. Enda's Well. After walking approximately 100 - 150m south east of the well a large and irregular mound was observed, extending approximately 36m in length and width (Plate 2). The depth of the mound ranged from approximately 2-3m in places which was determined by its level relative to surrounding tree trunks. The mound, fully covered in leaves and overgrown with ground ivy, blended in minimally with the surrounding habitat (Plate 3). On closer inspection however, it was found that the mound surface was uneven and very soft underfoot with some waste visibly surfacing above the ground vegetation (Plate 4).

Numerous hand dug pits excavated a small quantity of waste from within the mound. Types of waste found in the excavated samples include:

- Metal gas cylinders: observed 6 blue cylinders;
- Oil containers: observed 15 Castrol GTX 0.5 Litre containers, no visible oil or grease;
- Food packaging;
- Glass bottles;
- Plastic packaging i.e. Yogurt pots, egg boxes, butter containers;
- Plastic containers i.e. household detergents;
- Polystyrene;
- Plastic bags;
- Aluminium drink cans; and
- Fines i.e. shellfish shells.

Types of waste found during the investigation is provided in Plates 5-8.

From the samples it was found that most of the waste material was enclosed or tied within plastic bags. There was little odour arising from the mound which suggests a limited quantity of residual organic material present within the waste body. No date information was able to be obtained from any of the waste found in the samples as the empty food packages seemed to predate health regulations requiring a sell by date. This, along with the distinct design of some drink cans and bottles and an approximate 10-15cm layer of humus above the waste lead to the conclusion that the wastes dated as far back as 15-20 years. During this period of time a caravan park was in operation in the area, known as Hunters. This caravan park was situated in what is now the council depot, north east from the waste mound. Most of the waste found is typical of holiday picnic food and is likely that the caravan park was the origin for most of the waste which would have been located less than 200 metres away. Evidence of a derelict caravan was observed at the waste mound, with three to four large pieces of the shell, an axle with a wheel, a chassis and jockey wheel present.

The overall composition of the waste mound is difficult to estimate however from the samples retrieved an estimation of the content was made:

- 30% glass;

- 30% plastic;
- 20% plastic packaging i.e. Yogurt pots, egg boxes, Butter containers;
- 15% aluminium / steel; and
- 5% Fines.

Water samples were taken from three sample points located around the waste mound on the 4<sup>th</sup> of December 07, SW1-SW3 (Figure 6) The samples were sent to Alcontrol Laboratories and tested for a variety of parameters. The results are listed in Appendix 1. Results showed no indication of contamination. Typically ammonical nitrogen is used as an indicator of leachate strength along with chloride. However these results show that levels of ammonical nitrogen are below the level of detection, while the chloride levels present are low.

SW1 was taken from a pool of surface water which had collected west of the waste mound (Plate 9). SW2 was taken from a pool of surface water which had collected approximately 30m south of the waste mound (Plate 10) and SW3 was taken from water which had collected within a hand dug pit. Water within the pit was encountered at 30cm from the surface of the ground (Plate 11).

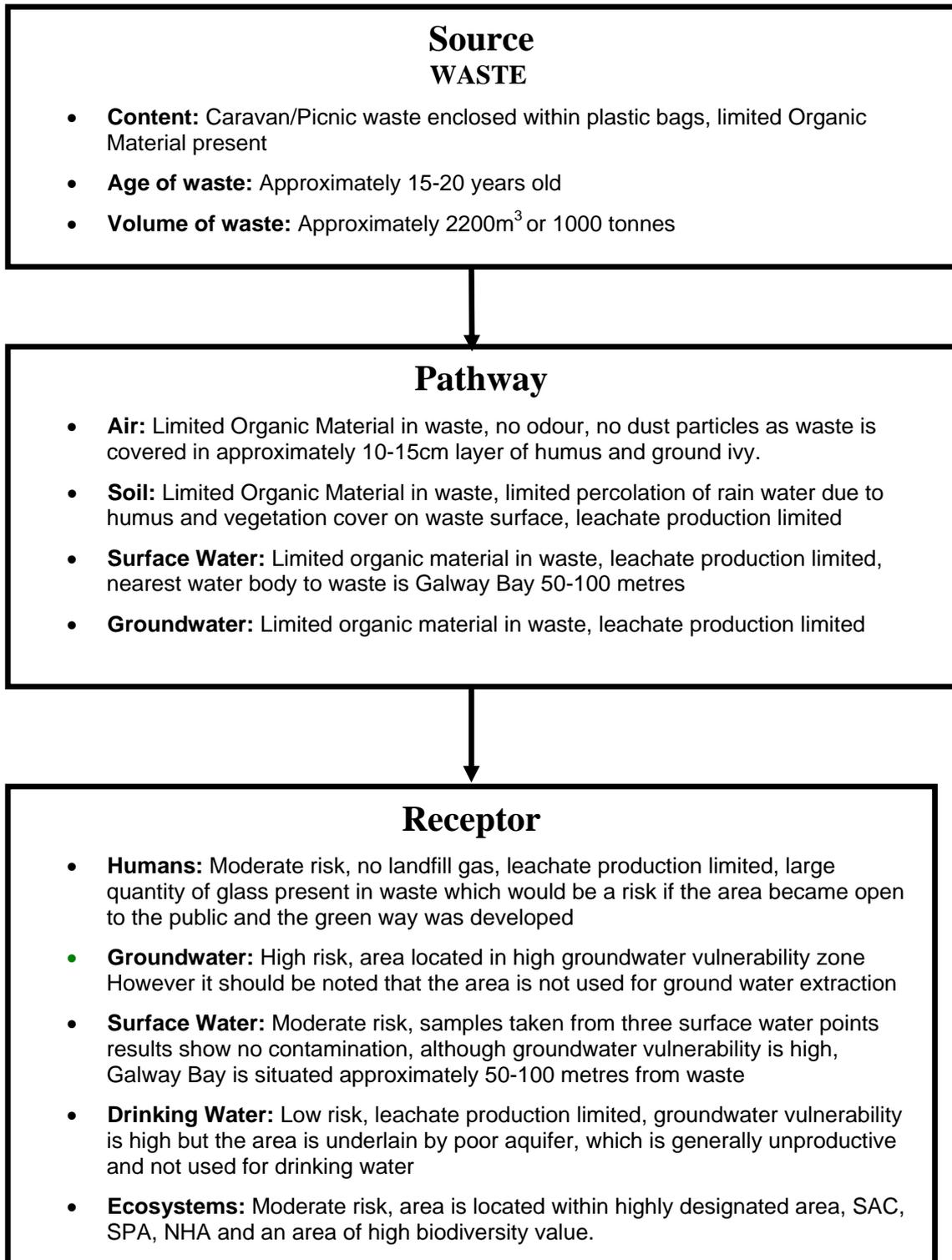
## 5. ENVIRONMENTAL RISK ASSESSMENT

The EPA Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites was consulted during the completion of this section of the report. The code of practice was developed to assist local authorities to comply with the requirements of section 22 of the Waste Management Acts 1996-2007 (WMAs), the Ministerial Direction and any possible subsequent regulations. The production of this code of practice was to ensure a consistent approach to environmental risk assessment by local authorities when assessing the environmental impact and remediation options for historical waste disposal facilities, which ceased before the introduction of a waste licensing regime, and illegal landfills.

Figure 7 below shows a Conceptual Site Model (CSM) indicating the source, pathways and receptors for this site. The source of the contamination, the pathway, which is a route by which a particle of water, substance or contaminant moves through the environment and comes into contact with, or otherwise, affects a, receptor.

## FIGURE 7 CONCEPTUAL SITE MODEL

Source – Pathway – Receptor



## 6. REMEDIAL SITE WORKS

There are two options open to Galway City Council with respect to the illegal waste in Barna Woods:

- To cap and leave the waste mound in place; or
- To remove the waste mound completely

It is possible that site area in which the waste mound is located will eventually be opened up to the public with walkways made throughout the woodland area. Due to the habitat status and the sensitive nature of the woodland and the possibility of the area to be made public, retaining the waste on site would need to be done with a high specification cap to protect those visiting the site. The advantages and disadvantages of the cap and leave option are given in the table below.

**Table 1 Option 1 Cap and Retain**

CAP AND LEAVE OPTION	
Advantages	Disadvantages
Minimal damage to the surrounding habitat	Capping the waste would add another metre onto the mound causing a visual inconsistency
Cost Effective	Potentially damaging to 4-5 tree specimens, which have sections of trunk buried in the waste
No release of potential pollutants caused by moving the waste	Slight risk of pollution if left in place
	Slight risk to mammals inhabiting the area, waste contains a lot of glass bottles which may be detrimental to burrowing mammals
	Slight to Moderate risk to humans walking through the area
	Permits the deterioration of the environmental quality of a designated site by retaining waste on the ground

Leaving the waste on site would seem a practical solution as it is fully degraded after being in place for almost 20 years. It originally had a lower than typical organic content when compared to household type wastes today, so even when it was first dumped it would have had a more limited pollution capacity than the same quantity of today's wastes would have. The source of pollution has therefore diminished and would appear to have limited potential for further release of contamination. The leaching of the waste has in effect already taken place over the past 20 years. Given that the pollutant loading of the waste is now negligible, the risk it presents relates primarily to visual and physical hazards arising from the glass and steel containers, plastic litter and residues.

A small number of mature trees are contained within the waste mound and these have been partly buried up to 2-3m up their trunk section. Although our visit was outside the growing season the trees did not look to be in good health and exhibited some dead boughs and crown death. The woodland area surrounding

the waste is generally unmanaged with approximately 75% of trees significantly covered in ivy. A number of trees have fallen obstructing numerous small paths. These trees, approximately 10-12m in height, have been badly affected by the waste; all boughs 6 metres from the ground are dead.

Retaining the waste on site would do nothing to improve the health of these trees, and if the waste was removed some other trees may make a partial recovery. Those that would not could be replanted with new specimens.

To retain the waste on site would require proper engineered encapsulation with a membrane, soils and replacement forest humus. It would add around 1m in height to this part of the woodland as moving any of the placed waste is not recommended. Some consideration may be given to removing an upper layer to compensate for the cap but it would be preferred to leave the waste entirely untouched.

Sampling of shallow groundwater immediately beside the waste and two surface ponds in the woods near the waste showed no contamination moving in groundwater around the wastes.

Given the status of the site as an important habitat, a green way route for walkers and one of the few remaining native woodlands within the city, the site has a high conservation value. It is therefore considered inappropriate to retain the waste on site and encapsulate it. Regulating this activity within the current legal framework would also be difficult as the containment of the waste could not be fully guaranteed.

### **Option 2 Removal**

The second option is to remove the waste mound completely. To remove the waste completely from the site would involve some tree surgery. Access would be gained through a perimeter fence north east of the waste mound located at the back of council depot. Some trees, overhanging branches and ground vegetation will need to be cleared to allow an entranceway, of approximately 4m in width and 66m in length, to extend from the perimeter fence to the waste area (Figure 8). An adequate security gate would be fixed at the section in the perimeter fence, which would be altered during site works, to prevent unauthorised entry into the council depot area outside working hours.

On completion of the preliminary entranceway to the woodland boards to allow easy access for machinery and prevent added erosion on the woodland floor could be removed. Tree surgery will also be required around the waste mound to allow machinery to manoeuvre easily and safely, although by selecting small plant and labour intensive operations this can be kept to a minimum. Due to the designated and sensitive state of the woodland habitat, small machinery could be employed to remove the waste in order to minimise mechanical damage during removal activities. This however would result in more prolonged site removal process than if larger machinery were to be employed. Advantages and disadvantages of the removal option are given the table below.

The waste removed from site could be sorted at a transfer station to remove the metals and other recyclable materials. Given the composition of the waste which is thought to have a low organic content and high content of container wastes comprising glass, metal and plastic it will be cheaper to landfill residual waste rather than the whole waste stream. The benefits of removing glass and metals are that these are heavy materials and the cost of landfill the residue will be reduced by separating any heavy fractions from the waste stream. Glass and

metals are both readily recyclable and can be removed from mixed wastes by magnetic separation and hand sorting.

**Table 2 Removal Option**

REMOVAL OPTION	
Advantage	Disadvantages
Would fully restore this part of the proposed SAC and eliminate any future liabilities	Option is costly but with increased controlled public access has a cost benefit
Would improve the visual appeal of the area	Some tree damage from clearing waste and creating new access but replanting of mature specimens will offset this damage
Would enhance the tree species partially buried in the waste and may allowing them to recover	Slight damage to the forest floor

The case for Option 2 is driven by the need to preserve and enhance the habitat and the plans for increased access through the green way path. The cost would have to be borne entirely by the Local Authority and the main reason for moving the waste is not to control further ground pollution which has been shown to now be negligible but to limit physical exposure to animal and humans. The removal of the waste on site eliminates any future liabilities and preserves the habitat intact for future generations to enjoy. Costs for the preferred option are present in Table 3.

## Cost Assessment

**Table 3 Removal of waste from site and reinstate woodland**

Item	Details	Cost estimate
<b>Clear access road of trees and fencing</b>	Tree surgery works to clear access and remove any dangerous boughs	€1,500
<b>Access boards for site</b>	Supply of access boards for 1 month	€2,300
<b>Clearance of waste and removal off site to car park for loading</b>	Mini excavator and manual labour – reduced cost for use of inhouse labour	€6,000
<b>Mobilisation of plant and preliminaries</b>	Allow €1000	€1,000
<b>Removal of waste to transfer station</b> <b>Previous comments re: disposal to be reflected here</b>	1000 tonnes of waste at €120/tonne  (taking account of sale of scrap and recovery of glass)	€120,000
<b>Supervision and reporting of works by AMC</b>	Allow for 4 days on site, reporting on final restoration and auditing works, preparation of contract included in previous works	€5,000
<b>Total</b>		€135,800

We have assumed that the residual landfill waste will be removed off site with council staff assistance. A rebate of all landfill levy can be obtained for remedial works such as these. We have endeavoured to use rates that prevail in the locality and make realistic estimates of the time needed.

## Health and Safety Assessment

The delivery of the capping works would require a simple health and safety assessment from the contractor. This would be submitted prior to award of contract and need to cover the following issues;

- Removal of trees: tree surgery, employ tree surgeons;
- Ensure all PPE gear is worn; and
- Ensure contractors are trained and competent including machine certificates for drivers.

## 7. CONCLUSIONS

The waste at Barna Woods has been in place for over 20 years and is well degraded by now. The organic content was originally much lower than that for household waste so presents a lower risk of pollution. The waste arose from the caravan site beside the woods.

The waste is almost fully degraded and only inert containers, glass and some residual plastics and metals remain. Sampling of surface water and groundwater around the waste shows no signs of contamination.

The site forms part of a larger designation for the Galway Bay area, and although this part of the site has no especially important species recorded it is close to the SAC and part of the area zoned for conservation and recreation. The site is used informally by the public for walking and has a number of undeveloped ruins and heritage features such as a historic well. The site will become more formally recognised as an amenity resource in future. The groundwater resources on site are not likely to be affected by the waste and it is unlikely, given the proximity of the sea to the site, that the groundwater resources are exploitable.

The greatest risk presented by the waste is as a physical hazard to humans and animals who could cut or injure themselves through contact with the glass or metal containers. There is a substantial quantity of waste on site circa 2200m<sup>3</sup> in a mound approximately 2-3m deep in places.

Given the use of the site as an area for walkers, part of an area of land adjacent to an SAC it is recommended that the waste is taken off site and disposed of after treatment at a recycling site. The processing of the waste on the site or adjacent to the site can not be done without an authorisation and for the small volumes on site it is recommended that the waste is taken to an authorised facility capable of processing the waste.

Any activities affecting an SAC require consent from the DEHLG prior to implementation and this report identifies the key issues needed to assess and removing the waste.

## FIGURES

## APPENDICES

### 1. ALCONTROL WATER CHEMISTRY RESULTS

## PLATES

THE REMEDIATION OF ILLEGAL DUMPING IN BARNA WOODS

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