INSPECTORS REPORT
WASTE LICENCE REGISTER NUMBER 101-1

(1) Summary:

The proposed facility is a landfill in a worked out open-cast mine some 1.2km west of Silvermines Village in Co. Tipperary. The proposed landfill is approximately 300 by 500m in size and is 70m deep. It has an estimated capacity of 6,988,600m^3 and proposes to accept household, commercial, construction and demolition and non-hazardous industrial wastes. The area of the facility is some 52.35 hectares which includes associated infrastructure. It is proposed that waste, other than that arising in north Tipperary would be delivered to the landfill by an adjacent rail-link. A discharge licence for treated groundwater has been issued to the applicant by Tipperary North Riding County Council but has been appealed to An Bord Pleanala. As part of my assessment of this application, I visited a number of landfill sites operated by the applicant in Northern Ireland and England, including one where waste was delivered by rail. I was impressed by the high standards to which these facilities were constructed and operated.

Name of Applicant	Waste Management Operations Ireland Ltd.
Facility Name (s)	Silvermines Landfill Facility
Description of Principal Activity	Landfill
Quantity of waste (tpa)	100,000 in Year 1 rising to 450,000 by Year 7
Environmental Impact Statement Required	Yes
Number of Submissions Received	**2,033**
INSPECTOR'S RECOMMENDATION	The proposed decision as submitted to the Board be approved.

Notices	Issue Date(s)	Reminder(s)	Response Date(s)
Article 14 (2) (b) (i)	Not Applicable		
Article 14 (2) (b) (ii)	Not Applicable	Not Applicable	Not Applicable
Article 14 (2) (a)	7th September 1999		

Article 16 (1)	3rd September 1999	Not Applicable	30th November 1999

Planning Permission status and date granted (if appropriate)	Refusal by local authority, under appeal to An Bord Pleanala and Oral Hearing to be held.
Date Application received:	26th April 1999
Confidential Information Submitted	No
Location of EIS in Application	Stand Alone Document

FACILITY VISITS:

DATE	PURPOSE	PERSONNEL	OBSERVATIONS
7/9/99	Check site notice	T Nealon	Site notice complies with Article 8
19/5/00	Site visit	T Nealon	Assessed site and surrounds
14/7/00	Site visit	M Doak	Assessed site and surrounds

(2) Class/Classes of Activity

The class(es) of disposal activities for which the applicant has applied are listed and described below:

Third Schedule;

Class 1 Fill material to be used to raise the level under the liner from 64m A.O.D. to 90m A.O.D.

Class 4 Leachate collected from the cells is stored in the leachate holding lagoons, HDPE lined lagoon, before it is treated in the leachate treatment plant.

Class 5 The proposed landfilling activities consist of waste being placed in lined cells which will be capped when completed and isolated from the environment.

Class 6 Treatment of leachate.

Class 7 Settlement and aeration of leachate in the leachate storage lagoons prior to treatment. Precipitation and settlement of the groundwater in the proposed groundwater treatment plant.

Class 11 Sludge may be mixed with other wastes during the landfilling process to ensure that the waste body is as homogenous as possible

Class 12 Materials deposited in the waste inspection area may need to be sorted and repackaged prior to landfilling.

Class 13 Waste arriving at the site will need to be checked and classified before deposition. Emergency storage will be provided for this purpose.

Recommendation:

I recommend that all the above activities, for which the applicant has applied for a waste licence, be refused for the following reasons:

1. I am not satisfied that emissions from the waste activities will not result in the contravention of any relevant standard, including any standard for an environmental medium, or any relevant emission limit value, prescribed under any other enactment due to the risk of subsidence and potential liner failure and due to the risk of instability and potential liner failure;
2. I am not satisfied that the activity concerned, carried out in accordance with such conditions as may be attached to a licence, will not cause environmental pollution due to the risk of subsidence and potential liner failure and due to the risk of instability and potential liner failure;
3. I am not satisfied that the best available technology not entailing excessive costs will be used to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned due to the following;
    - uncertainties which persist as to the viability of installing the sub-horizontal shafts for the control of groundwater from the base of the facility because of the geology of the area,
    - the use of a Geosynthetic Clay Liner, (GCL), on the side slopes of the landfill as the thickness of the material is in the order of 8mm, the side slopes may be unstable, the surface water and groundwater draining under the liner may affect the integrity of the liner, and the quantities and types of waste will take many decades to stabilise,
    - the classification of the aquifer and the vulnerability of the groundwater at this location,
    - the risk of subsidence and potential liner failure, and
    - the risk of instability and potential liner failure.

(3) Facility Location

Appendix 1 contains a location drawing and a layout drawing showing the significant features of the facility.

The proposed facility is an open-cast mine operated by Magcobar between 1963 and 1993 which produced up to 450,000 tonnes of barytes per annum. The surrounding area comprises non-intensive agricultural pasture, heath, disturbed soil and exposed rock. The nearest residential properties are located to the north and west of the facility some 260 to 300m of the boundary of the proposed landfill area.

(4) Activity Summary

No waste activites are currently carried on by the applicant at the facility. Prior to the development of the landfill it would be necessary to dewater the open-cast mine. The applicant proposes to treat the water and discharge it to the Fiolborig Stream. Development of the lined cells would be done in 14 phases. It is proposed to collect the leachate in each cell and pump it to the Leachate Treatment Plant prior to treatment and discharge to the Kikmastulla River. The potential operational life of the facility is estimated as 22 years.

(5) Facility Operation/Management

- **Waste Acceptance Procedures**
  The facility proposes to accept household, commercial and non-hazardous industrial waste only. The proposed landfill is classified as a Landfill for Non-Hazardous Waste in accordance with the landfill directive 1999/31/EC. It is proposed that all waste being delivered to the site, other than that arising in North Tipperary, will be delivered by rail. A rail link exists, to the north of the R499, which was formerly used for the transport of ore from the mine. The waste is proposed to be transferred from the rail terminus, across the R499, to the landfill in trucks.

- **Nuisance Control**
  Appropriate nuisance control measures are proposed in the application.

- **Hours for Waste Acceptance**
  The proposed opening hours for waste acceptance are 06.00 to 18.00 Monday to Friday and 06.00 to17.00 on Saturdays

(6) Facility Design

- **Infrastructure;**
  It is proposed to install appropriate infrastructure such as a weighbridge, wheelwash etc, and to erect fencing to provide for security. Leachate and groundwater treatment plants are also proposed. Landfill gas control and utilisation plant are also proposed. Two sub horizontal shafts are proposed to be drilled through the northern face of the opencast mine to enable the installation of drains to dewater the mine and transport the water to the proposed groundwater treatment plant to the north of the landfill. No specific investigations have been carried out to determine the feasibility of drilling these shafts and therefore it is not possible to assess the likelihood of their successful installation. Failure to install such shafts would seriously impact on, if not prevent, the proposed activities from being carried out.

Due to these uncertainties, I am not able to satisfy myself that the proposal complies with BATNEEC.

- **Liner System;**
  The lining system proposed comprises 0.5m of Bentonite Enhanced Soil, (BES), overlain by a 2.0mm thick High Density Polythethylene (HDPE) liner at the base. The base of the open cast mine is proposed to be first backfilled to a level of 90mAOD with rock and the side slopes engineered to the required gradients. A groundwater drainage layer, compacted to prevent settlement, is proposed for under the base and sides which would consist of 500mm of crushed stone. A geotextile, overlain by the BES and the HDPE is proposed to be lain on the drainage stone to provide protection to the BES. It is proposed to line the sides of the facility with a similar system replacing the BES with a Geosynthetic Clay Liner, (GCL). I am not satisfied that the use of a GCL on the side slopes of the landfill represents BATNEEC as the thickness of the material is only of the order of 8mm, the side slopes may be unstable, the surface water and groundwater draining under the liner may affect the integrity of the liner, and the quantities and types of waste will take many decades to stabilise.

(7) Restoration and Aftercare

It is proposed to restore the facility to pasture and agricultural use.

(8) Hydrogeology

The geology of the area consists mainly of limestone belonging to the stratigraphic unit called the Waulsortian Reef Limestones, (WRL) which overlies the Argillaceous Bioclastic Calcarenite, (ABC). This upper unit is between 30m and 155m thick. The upper part of the WRL is described as highly weathered and dolomitised. The proposed facility also lies on the fault bound southern limb of the broad asymmetric Birdhill Syncline, which trends and plunges to the eastnortheast. Several trends of faulting are present in the area. The dominant trend is westnorthwest, dipping to the north. In general the faults are tight, gouge filled structures, rarely more than 1m in width. The Silvermines fault, a major fault, passes to the south of the facility. A zone of cavities has been recorded in the western part of the facility which are recorded as being karstic in origin

The WRL aquifer has been classified as a Regionally Important Aquifer, in accordance with the Groundwater Protection Schemes published by the Department of the Environment and Local Government, the Environmental Protection Agency and the Geological Survey of Ireland, in the neighbouring counties of Limerick, Tipperary South Riding, and Cork. The aquifer has been classified as a Locally Important Aquifer which is generally unproductive except for local zones (LI) in County Offaly

and as a Locally Important Aquifer which is generally moderately productive (Lm) where the aquifer is dolomitized. The WRL aquifer in Tipperary North Riding should be classified as a Regionally Important Aquifer due to the presence of dolomitized, karstified, and faulted and fractured zones.

The applicant proposes that the detailed site investigation in the area of the facility indicates, that in the area of the proposed facility, the aquifer should be classified as a Locally Important Aquifer. However, the upper horizons of the WRL which are exposed on the north face of the open-cast mine are highly fractured, weathered and dolomitized. A zone of more intense fracturing and weathering is present in the north-western corner of the mine which may be related to the present of a fault. Cavities were also encountered during underground mining to the west of the open-cast mine which also indicates the presence of karstified limestone and the existence of a Regionally Important Aquifer. In addition, site investigation boreholes carried out during the preparation of the application encountered substantial thicknesses of dolomitized limestone. The applicant has not proven that a zone of low permeability rock exists at the facility which would provide cause for the aquifer there to be treated as other than a Regionally Important Aquifer.

Due to the lack of any soil cover and the excavation of the open-cast mine into the bedrock which constitutes the aquifer, the vulnerability of this aquifer must be classified as extreme.

The type of aquifer and the degree of vulnerability means that the proposal to locate a non-hazardous waste landfill at this location is not BATNEEC.

(9) Emissions to Air

Potential emissions to air include landfill gas and dust. Mitigation measures have been proposed by the applicant and these are considered satisfactory for landfill gas. Additional dust control measures would have to be required if a licence were granted.

(10) Noise Emissions

There are two potential main sources of noise at the facility, noise generated during construction of the facility and noise generated by the operation of the facility which includes trains and vehicles transporting the waste from the rail link to the working face. Some blasting might be required during the construction of the landfill. Noise control measures were proposed in the application which included noise barriers, both to screen noise from the rail siding and from the access route by the vehicles. The application also proposed to control vibration, by limiting the explosive charge, during blasting to ensure no structural consequences in nearby residences and to minimise any disturbance.

(11) Emissions to Sewer

There are no emissions to sewer proposed.

(12) Emissions to Surface Water

It is proposed to discharge surface water and both treated groundwater and leachate to surface water. Surface water, which did not come in contact with waste, would be collected and channelled to the Foil-Boirig Stream and the Kilmastulla River. The surface water discharge from the facility would represent an increase from the present situation as much of the surface water currently drains into the open-cast mine

The treated groundwater is proposed to be discharged to the Kilmastulla River. The groundwater is anticipated to have a low pH and elevated heavy metals and suspended solids. The water in the opencast pit and the groundwater in the area are very hard (255 to 1045 mg/l) and elevated sulphate, ranging from 284 to 822 mg/l, and magnesium levels were also recorded. Elevated metal levels were recorded which are probably due to the mineralisation in the area and to the existence of previous mine workings. The elevated metals include; aluminium, iron, manganese, nickel, copper, zinc, cadmium and lead.
The proposed treatment would include pH adjustment, a sedimentation module and a sand filter. The anticipated maximum discharge rate for the treated groundwater is some 2,000 m^3/day.

It is proposed to collect and treat the leachate and discharge it to the Kilmastulla River. There is some risk that the surface water run-off from the railway sidings might be contaminated by exposure to waste. Therefore, it is proposed to collect the surface water run-off from the railway sidings, divert it to the leachate treatment plant, and treat and discharge it with the leachate. The run-off is calculated to comprise in the order of 18,000m^3/year. The estimated quantities of leachate to be generated by the facility, including that from the railway sidings, range from a minimum 30,000m^3/yr to a maximum of over 100,000m^3/yr, as the quantities of waste landfilled increase, over a twenty-five year period.

The estimated dry weather flow in the Kilmastulla River is 0.15m^3/s, the average flow in the river over the period 1975 to 1993 was 2.13m^3/s with the 95 percentile flow being 0.26m^3/s.

(13) Other Significant Environmental Impacts of the Development

13.1 Subsidence

There is a considerable risk of subsidence in the area due to the presence of dolomitised limestone, karstic features in the limestone, fault zones and old mine

workings. The extent of the karstic limestone has not been delineated but subsidence in the area has been recorded and karstic zones have been encountered during investigations and mining in the area. Such subsidence could have major impacts on the lining of the landfill leading to the development of failures, in the BES, the HDPE and the GCL.

Underground workings, beneath the proposed facility, exist which were accessed from the base of the open-cast mine. An adit portal, or entrance, at a level of approximately 91m AOD, is located in the south-western corner of the pit which extended down to the workings. These underground workings covered an area of some 0.9ha, at levels mainly between about 60m AOD and 75m AOD. The extent of these workings and other underground workings are shown in Drawing No. 2 " Local Underground Mine Workings (supplied by Magcobar (Ireland) Limited)" and Drawing No. 1 "Regional Underground Mine Workings" received by the Agency on 30th November 1999 in response to an Article 16 notice of September 3rd 1999. As can be seen from these drawings, the extent of underground workings under the proposed facility and in the general area are considerable. Due to the height of the workings, the thickness of the overlying rock and the location of these workings, the applicant considers that the principle risk of subsidence which would impact on the facility from these underground workings is confined to the adit portal. The applicant proposes to assess this potential and carry out any necessary remediation once the open-cast mine is emptied of water.

However, there is considerable evidence of subsidence in the area, both to the west and north of the proposed facility. It is unclear whether this results solely from old mine workings or whether there is an interaction between karstic cavities and the old mine workings or whether there may also be some impact from faults and fractures in the area. These questions of potential interactions leading to subsidence are also unanswered in relation to the underground mine workings in the vicinity of the proposed facility. Due to the risk of subsidence and potential liner failure, I am not satisfied that emissions from the proposed waste activities would not result in the contravention of any relevant standard. Due to the level of uncertainty involved, I am also not satisfied that the proposed waste activities would not cause environmental pollution, regardless of compliance with such conditions relating to the design and construction of the facility as might be attached to a licence. Furthermore, due to the uncertainties involved, I am not satisfied that the proposal constitutes BATNEEC.

13.2 Stability

A related, but separate issue, relates to the stability of the side slopes. Again, due to the presence of dolomitisation and karstic features, faults and fractures, and old mine workings, there is a possibility that the side slopes may not be stable. Records exist of collapses occurring at the western margin of the open cast mine. In addition, the dewatering process itself may well contribute to the instability of the side slopes as fractures and zones that are currently saturated become dry. Such instability could also

be triggered by a subsidence event in the vicinity of the facility. Furthermore, the application states that the stability of the existing slopes and of all excavated surfaces needs to be investigated and assessed prior and subsequent to construction respectively. Obviously any slippage of the side slopes subsequent to lining could result in the failure of the liner. The lack of information available, partly due to the submerged nature of the facility, means that I am not able to satisfy myself as to the stability of the side slopes. Due to the risk of instability and potential liner failure, I am not satisfied that emissions from the proposed waste activities would not result in the contravention of any relevant standard. Due to the level of uncertainty involved, I am also not satisfied that the proposed waste activities would not cause environmental pollution, regardless of compliance with such conditions relating to the design and construction of the facility as might be attached to a licence. Furthermore, due to the uncertainties involved, I am not satisfied that the proposal constitutes BATNEEC.

(14) Waste Management, Air Quality, Water Quality Plans and the Report of the Investigation into the Presence and Influence of Lead in the Silvermines area of County Tipperary.

Tipperary, North Riding, County Council adopted their Waste Management Plan this year. The plan refers to the fact that a waste licence application has been made for the facility.

The Water Quality Management Plan for the Lower Shannon Catchment was adopted in March 1990. The Plan recommends water quality criteria for a number of inorganic pollutants for the Lower Shannon Catchment which includes and rivers and streams in the area of the proposed facility. The pollutants which have such criteria specified and which have been identified in the groundwater and surface waters of the area include; Aluminium, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Sulphate and Zinc.

The Report of the Investigation into the Presence and Influence of Lead in the Silvermines area of County Tipperary has demonstrated the presence of heavy metals in the sediments of the Foilborrig and Kilmastulla rivers. Significant discharges are proposed from the facility into these watercourses. Insufficient assessment has been carried out of the potential impacts of these proposed discharges on the sediments to enable me to be satisfied that these discharges would not result in environmental pollution being caused.

(15) Submissions/Complaints

A total of two thousand and thirty three submissions were received in relation to the facility. An overview of all the submissions received is provided which includes a summary of all of the issues raised.

A refusal of the application for the waste licence will resolve all those issues relating to the proposed facility which were raised in the submissions.

A number of standard letters were submitted as submissions. These have been grouped A to F. They are dealt with below. In addition, a number of individual submissions were also received and these are dealt with after the standard letters.

15.1 STANDARD SUBMISSIONS

a) Submission Type A
Each submission contained the following text:

- Effect on water quality, drinking water, fish life etc.
- Air Quality (would affect people with asthma)
- Dust
- Noise
- Birth defects on present and future generations
- Traffic hold-ups
- Tourism
- Vermin, rats, flies etc.
- Smells
- Rubbish blowing about
- Reduction in property values
- Damage to property caused by birds etc.
- General health effects

b) Submission Type B

The submission comprises the following bullet points:

- Water pollution
- Dust, Noise, Vermin
- Tourism
- The site is in a porous limestone area.
- Toxic fumes and harm to the unborn

c) Submission Type C
The main concerns of the individuals were listed as the following bullet points:

- Detrimental effect on water quality
- Smells/air pollution
- Increase in vermin
- Bird damage
- Health and dust issues
- Proximity to school and village
- Property devaluation
- Traffic

In addition the letter wished the Agency to consider the recent Inter-Agency report 'Investigation into the presence and influence of Lead in the Silvermines area of Co. Tipperary'(June, 2000).

d) Submission Type D – Nenagh Tidy Towns Committee

The contents of these submissions were listed as the following bullet points:

- Water pollution
- Air Pollution
- Noise
- Smells and Dust
- Vermin

e) Submission Type E – New York Tipperary Association Against Superdump in Silvermines.

The contents of these submissions consist of the following:

- Silvermines beauty will be affected by the superdump
- Property value will deteriorate. The association will not return home to this part of Ireland.
- The standing of Waste Management USA is questioned where the submissions question this company's practise in other countries.

15.2 INDIVIDUAL SUBMISSIONS

The individual submissions are categorised into issues and are described below.

a) Water

The main issues highlighted were as follows:

- Detrimental effect on water quality in the area.
- Water pollution.
- Watercourse contamination could lead to gastrointestinal disease.
- Contamination would jeopardise the recent recovery in fish stocks.

b) Air

The main issues highlighted were as follows:

- Greater detail should have been included with respect to landfill gases to include modelling.
- Rural population is often more sensitive to SO_2
- Landfill gas and health effects. 10% of total gas (waste acceptance 450,000 t per annum) at proposed facility would be equal to North Tipperary's total current landfill gas budget.
- Air quality deterioration; asthma risk and chest infections. Dry eye syndrome.

c) Ecology

Ecological issues included the following:

- Land adjacent to the river valleys could be disturbed.
- Wildlife of mountain region and corncrake may be affected.
- Hedgerows will be damaged.
- Stronger guarantees are needed in relation to aquatic ecology.
- The site is gradually being re-colonised since mining stopped in 1982. This re-colonisation is under threat from a new landfill.

d) Noise

Noise issues included the following:

- Noise pollution from extra trains and traffic. The noise from trucks gearing down should be considered.
- 59dB (A) for proposed truck traffic is already above the 55dB standard EPA figure.
- Quarry faces and architecture exacerbate noise in vicinity of immediate housing. One house lies 10m from the site. An illegal crushing operation at the site created so much noise that the residents had to move to the back of the house.
- Associated structural damage from trucks.

e) Existing Pollution (Tailings pond)

In general the submissions are concerned that people have to live beside an already polluted area susceptible to dust blows and acid mine drainage, (AMD), run-off.

f) Landscape/Visual

The submissions are concerned that the proposed landfill will inhibit the beauty and natural setting of the Silvermine Mountains area and Keeper Hill.

g) Leachate

The principal issues were:

- Treated leachate is to be pumped from landfill via pipeline to the Kilmastulla River, which has already undergone extensive pollution from historical mining operations, rendering monitoring of leachate disposal impossible.
- Kilmastulla River discharges to the river Shannon at Parteen upstream of the water intake for Limerick City. Assimilative capacity of the Shannon is questioned.
- There are no details of the leachate re-circulation system.
- The EIS raised the risk of leachate leakage being noticed within 24 hours. There should be no leachate spillage whatsover.

h) Soils/Geology, Groundwater, Geological Stability/Subsidence

The issues raised included the following:

- Deep weathering at one area in Silvermines extends to a depth of over 150m.
- The mine at Silvermines must be considered wet although it is hosted by low permeability strata since it had a pumping rate of about 12,000m^3/day when in operation.
- Groundwater flows are closely related to geological structure; there is a complex horsetail fault which is broadly ENE trending with associated WNW branch faults. The main faults rarely exceed 1m in width and are gouge filled.
- There is often additional solution of the carbonate limestone bedrock in the vicinity of orebodies where acid water is generated by the weathering of iron and other sulphides, which attacks the carbonate rock and increases the permeability.
- Voids or mines in the area are open to sudden water inflow since there is widespread dolomitisation, karstification and deep weathering. (Groundwater inflows are variable and could be viewed as a river with flood system).
- If the groundwater table is reduced (this is planned during construction) actual recharge may be increased as a larger proportion moves downward to streams. This increase in recharge will increase the volume of water in the groundwater system.

- The Phase 1 BMA (BJ Murphy & Associates) report concludes that 'The vulnerability of the aquifer to contamination must be considered to be extreme due to the complete lack of natural cover of the rock surfaces in the pit. Based on these factors (regionally important aquifer and extreme vulnerability) the site would be considered to be unsuitable. It may be noted that the (GSI) guidelines are designed to discourage developments in disused quarries'.
- There are numerous diamond drill holes which show fractured rock and 'liquid soil' on the West side of the proposed site.
- Historic blasting during mining has shattered rock faces and weakened the general rock structure.
- The exact locations of the mine workings in the maps provided to date by the applicants may not be complete. There is inherent risk in locating a landfill in such close proximity to known and unknown underground workings.
- Directly beneath the opencast pit is a deep shaft mine operated up to 1982, and would be very close to the proposed landfill site.
- The proposed underground groundwater drainage pipes from the landfill to surface lie in an area with extremely complex geology and disturbed mining ground. The hydraulic gradient provided by the groundwater drainage system is to maintain groundwater level below the existing level. This assumption is solely dependent on the groundwater drainage system to be put in place by the applicant which has not yet been designed or tested. Reliability is a key concern.
- Proposed site is similar to a cobweb consisting of cavities and fractured rock which are constantly caving in.
- Photographic evidence exists for subsidence at the lip of the quarry and certain new features of subsidence.
- The placing of further material at the base of the pit might de-stabilise the honeycombed network.
- The risk of siting the proposed landfill in a location where extensive mining on surface and underground has occurred has not been quantified.
- Slippage of the waste facility (mass movement) is an unquantified risk.
- Regional geology descriptions are very limited and in particular there is a lack of information on Quaternary (subsoil) deposits.
- No information has been provided on the spoil heaps surrounding the site and the acid rock drainage leaching from them.
- Profile 3 of geophysical survey shows a bedrock anomaly along the road to the north of the site which is not explained. It is suggested that the anomaly represents underground workings.
- The large subsidence features to the west of the pit have not been discussed by the applicant. The implications of the processes, still creating these features, for the proposal to construct a landfill are not discussed.
- No attention appears to have been given to the long-term stability of the underground workings, especially those beneath and adjoining the proposed landfill site (Geological Survey of Ireland). A risk analysis should be carried out and the following established:

The long-term *ie* 50 years, probability of subsidence occurring;
The effect of subsidence on the long-term integrity of the containment and other elements of the site which could be effected;
The consequences of any such effects;
Appropriate mitigation measures.

- The impact of the mining operations in the area on the natural hydrogeological regime are not adequately described. Mine plans for Mogul and Macobar (underground) should have been presented in order to identify potential pathways for contaminants.
- Extrapolation of Aquifer category for the site has been based on information from distant areas, which is unsuitable.
- The Geological Survey of Ireland considers that the boundaries between the locally and regionally important sections at the proposed landfill site have not been established, and it has not been demonstrated that the aquifer as a whole would not be affected if local contamination should occur. A wider investigation would be more appropriate, together with modelling to support the conclusion that the regional aquifer is not at risk.
- Groundwater recharge and discharge points have not been identified.
- The potential for Acid Rock Drainage (ARD) should be addressed and the implications for pumping groundwater from the pit and surrounding area should have been considered in some detail.
- The basis for stating that there is an upward gradient and artesian heads in the base of the open pit should be explained using a conceptual model of groundwater flow regime.
- The rock walls of the open pit are heavily weathered and may well have slumped after submergence. Such slumps can only be recognised after water is abstracted from the pit.

In addition one submission made the following comments on the reply to the further information required by the Agency on 3 September 1999 under Article 16 (1) of the Waste Management (Licensing) Regulations:

- That in response to Questions 1 and 2 asked by the Agency, the company has not carried out a site investigation report as requested by the Agency. For a project involving about 800m of pipeline in an area of intensely disturbed ground, this would normally involve drilling at least six boreholes along the line of the pipelines to depths that at least confirmed solid and stable ground.

- That in response to Question 3, the developer has provided a certain amount of information either in a textual or drawing form. However, the four specific questions asked by the Agency have not been answered. In their description of the site the developers have omitted the following which we believe are relevant to the stability of the proposed landfill site. They are;

a) The Mogul of Ireland mine workings surround the Magcobar pit to the west, north and east. It is estimated that about 10% of the mine was backfilled. As a result one of the upper levels in the mine collapsed into a lower level. This is the cause of most of the visible subsidence that is evident to the west of the Magcobar pit,
b) There is another smaller area of subsidence that has been developing since about 1996. This subsidence hole is located to the north of the Magcobar pit, just beside the R499 road. The hole is reported to be still subsiding indicating that subsidence is still active in the area,
c) The Waulsortian limestones in the Silvermines area are dolomitised which generally leads to the development of joints. These joints are often enlarged to form cavities. Cavities have been detected in boreholes drilled in the western part of the pit. It is not surprising therefore that the Waulsortian limestones in the area show evidence of karstification,
d) There is evidence of subsidence in the western side of the Magcobar pit. The underground section of this mine is located in the western part of the pit. There was pyrite in the ore horizon underground. The presence of pyrite is considered to have lead to the development of cavities. Cavities also developed in the cap rock for the same reason. This feature is referred to as the Cavity Zone on mine plans and is approximately 50m wide,
e) There is weathered rock above the Cavity Zone in the western wall of the pit. Mullane (1994) shows an area of karst collapse in cherty limestones below Bench 2 in the western side of the pit,
f) About 190,000tonnes of ore (90% extraction) was taken out of the underground section of the mine. It is reported that the pillars in the underground section of the mine were irregularly spaced (due to quality of rock) and that no backfill was placed underground. Barite is a relatively soft rock and cracking was evident in some pillars. It is also reported that two months after the mine closed, a bench in the opencast part of the mine collapsed into the pit,
g) That the Magcobar pit and the Mogul mine workings area are possibly connected. The removal of large volumes of water from underground may reactivate subsidence and therefore is another potential source of ground instability,
h) The developers have only considered that the Magcobar underground workings within the site are the only potential source of instability. This is an overly simplistic approach in such an extensively altered and excavated area.

- In response to Question 4, the applicant provided information on barite reserves to the northeast of the pit. They conclude that "some reserves could be sterilised". They estimate that the maximum potential loss of barite would be of the order of 32,000 tonnes of reserves. However, Ennex International carried out a mineral exploration programme work to the south (late 1980's) and the north (1991-1992)

of Silvermines Village. The results showed that significant metal deposits (lead and zinc) still remained in this area. The developer does not refer to the possible development of these or any other minerals in the area. The Silvermines area is the location of extensive base metal and other mineralisation. Exploration work has shown that there are still unmined minerals in the Silvermines area and some are located quite close to the Magcobar pit. There may also be other minerals as yet undetected or possibly recoverable with new techniques in the future.

- In answer to Question 5, a short assessment of the aquifers is provided. "Drawings delineating the extent of the locally important aquifer, described as occurring in the area of the proposed facility and its boundaries with any regionally important aquifers in the region" have not been provided. The comment is made that "there is very little hydrogeological information in this area and thus the boundary cannot be defined definitively". For a large development such as that proposed, with significant potential for groundwater contamination, the necessary information should have been obtained. The proposal to drain the water from the pit, including any leakages of leachate will only be in place for the life of the development and for some maintenance period after closure. Thereafter the position is less certain. It is inevitable that at some time in the future the natural groundwater regime will either partially or completely re-assert itself. At this time there will be a potential threat to the beneficial use of this aquifer. The migration of any contaminants would be difficult to predict owing to the interconnection of the mines and the hydrogeological regime.

i) Gas

- Indication of height of flare stack should be made.
- It is planned to only burn off 70% of the landfill gas budget. There is a planned release of uncovered landfill gas of 1200m^3/hour.
- The EIS states that the landfill will form 4% of current national methane emissions

j) Vermin, Flies, Litter, Birds. Negative impact on agriculture

The submissions are concerned that an increase in all these items will affect agricultural practice. The development will attract vermin and insects/flies to the area

k) Dust and Odour

The submissions include the following issues:

- Dust will lodge on nearby house exteriors and will blacken clothes and curtains.
- Strong odour will move downwind to nearby residences and the school/village.

l) Roads, Traffic, Accidents

Road accidents concerns relating to the operation of the facility were highlighted in a number of submissions. The following issues were also raised:

- The rail spur is 1 km from the proposed landfill and does not run direct to the site. It will necessitate the unloading and reloading of all waste brought by rail and transported to the site by a convoy of trucks, six days per week, twelve hours per day.
- A new set of traffic lights will reduce the local residents traffic flow and will cause undue delays for the residents. The suggested crossing numbers of 50 per day at ten minute intervals is 'staggering'.
- Unsuitability of the proposed facility.
- Concerns regarding road safety adjacent to the facility.
- Concerns expressed in relation to thousands of vehicles travelling past the facility.

m) Health & Safety (Present & future generations)

Many of the individual submissions referred to health and safety concerns relating to the operation of the facility. The main items of concern are listed below.

- Concerns for human health and health of children; there could be birth defects.
- Baseline studies on human health in the vicinity of the facility
- Fears for the community in relation to the potential spillages or leakages.
- Opposition to the proposal on grounds of health and environmental hazards.
- The health and safety aspects of the proposal.
- Location proposed is described as "a time bomb" and that the life or health of one person should not be put at risk.
- Complaints of smells in the area.

n) Negative impact on property values

Many of the individual submissions suggested that the landfill development would reduce property values in the area.

o) Tourism/Heritage and National Mining Centre

Many of the individual submissions highlighted or indicated tourism/environment concerns relating to the operation of the facility.
The main issues raised were as follows:

- The proposed landfill is to be located in an area described in many of the submissions as one of scenic beauty.
- The proposed facility as it will devalue property nearby.
- Ringfort under existing spoil heap. If spoil heap to be removed archaeological mitigation would be required.
- The proposed startup for the landfill coincides with the proposed operation of the Shallee.
- No comprehensive industrial archaeological survey has been made of the site (surface and underground), nor the surround mineral district.
- There could be many un-recorded old mine workings in the proximity of the Magcobar Mine, which could have an impact on groundwater flow.
- The development will jeopardise the development of the proposed National Mining Centre, which is to get government funding, and could threaten the granting of 25 jobs.

p) Fitness of Waste management Ireland to hold a Waste Licence

Several individual submissions were concerned with the applicant's history as landfill operators (WM) in the USA by mainly addressing the following issue:

- In the past 15 years WM has been fined over $50 million in the US of which 22 cases were environmental civil cases.
- Overall WM have a poor environmental record.

q) Tonnages to be accepted

Several individual submissions were concerned with volume of waste to be accepted, noting that the volumes intended are very large for a landfill and higher than the needs of the County Council itself.

r) E.I.S

Several of the individual submissions highlighted or indicated issues with the EIS. The submissions indicated that the EIS lacked certain detail. Other issues raised included the following:

- The unsuitable location of the proposed facility which the submitters state is a breach of the Tipperary NR County Development Plan.
- The past record of the owners of the facility in relation to the activities at the facility is highlighted in a number of submissions.

- Concerns relating to the content of the EIS and questions its compliance with EPA guidance notes.
- Scoping for the proposal was a breach of EIS regulations
- That the public was excluded from participation.
- There are many references to missing drawings and diagrams. Certain tables within the text lack detail.

s) Monitoring

This issue was raised in a number of submissions which questioned whether monitoring once the site had been granted a licence would be sufficient.

t) Elevation of site

This issue was raised in several submissions which questioned the proposed position of the site in the context of a scenic hillside.

u) Right of way cut off

This issue was raised in a number of individual submissions. It deals specifically with the proposed location of a weighbridge which will block a right of way.

v) Hazardous waste

Hazardous domestic waste is not excluded from the landfill application.
Demolition/construction waste and municipal sludge may contain hazardous substances.

w) Potential for mining

The Minister for Marine & Natural Resources submitted that the potential interaction between the proposed landfill and the former underground mining operations should be fully addressed.

x) Rail line inadequate

The rail spur is 1 km from the proposed landfill and does not run direct to the site. It will necessitate the unloading and reloading of all waste brought by rail and transported to the site by a convoy of trucks, six days per week, twelve hours per day.

Signed: _____ Dated : _____

Dr T Nealon

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