

Uranium Mining in Donegal

- Economic Bonanza or Environmental Blight -

Presented in Part Fulfilment

for the Degree of Master in Science in Environmental Protection

by

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ABSTRACT

This Thesis discusses the inherent conflict that exists between development of potential mineral - resources and protection of the environment. It specifically reviews the Uranium exploration that took place in County Donegal in the late Seventies and early Eighties, and highlights various milestones that occurred, and also a number of shortfalls in the decision making process that happened on both sides.

The body of Legislation and Regulations as it existed then is examined, and also its evolution by way of the E.P.A. Act, EIA / EIS process and the Integrated Pollution Control Licensing requirements.

The interface between the Community, Developer and Planning Authority is analysed as well as the role that politics plays in such situations in Ireland.

Finally, a number of recommendations are put forward in order to help streamline the decision - making process, not only in the possible case of future Uranium - Mining in Donegal, but also other extractive minerals development in other parts of Ireland.

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CHAPTER 1 Uranium Mining

1:1 Introduction

Mining in the past has caused damage to the environment to some degree , whether through lack of regulation , lack of knowledge of environmental consequences, careless or ill-conceived practises or simply greed. There is also a public perception of inevitable pollution, associated with mining, that generates a genuinely held fear of the unknown and consequently provokes objection (Robinson,1994)

Add the Uranium - factor into the mining equation and a further Chernobyl - esque vision of barren, lunar-like landscapes flashes across one's mind.

Along with agriculture, mining is one of the two basic industries which has led to the development of modern civilisation . It supplies us with raw materials for our building, cars and appliances; with fossil - fuels for energy-production, and precious stones and jewellery for us to enjoy. Both metals and minerals are of pivotal importance to modern lifestyles and this situation will continue for the foreseeable future. (Smyth 1995).

Also, the fact that metals and minerals are exhaustible and relatively rare in nature makes them a significant source of wealth to any country. They are also of considerable strategic importance to every nation as minerals that do not occur naturally where they are needed must be imported. In the context of the Irish economy, mining (excluding quarries) contributes approx. £100m to gross output per annum and provides in the region of 1000 jobs.

Notwithstanding the desirability of encouraging mining exploration and development it is also in the national interest to consider the effect mining has on our environment. Mining activity does not automatically mean irreparable damage to the environment but a balance is necessary between the growth of the industry and the protection of our environment for future generations.

Accordingly, mining operation must conform with environmental standards which are among the strictest in the world. (National Minerals Policy Review Group 1995)

1:2 Aims of the Thesis

The aim of this Thesis is to examine objectively the effect of the Uranium prospecting which was carried out in Donegal between 1978 and 1981, to highlight shortfalls in the decision making process and the consequent action/inaction that occurred on all sides, and to propose a framework that will help eliminate these should the situation ever arise again.

It will also provide a credible and transparent basis on which the public and private sectors can operate so that the public has confidence that the environmental issues are being comprehensively addressed.

Apart from Uranium - mining specifically, it is hoped that this framework will also serve as a balanced mechanism by which other hazardous mineral substances (e.g. Mercury, Cadmium and Molybdenum) in other Counties, and their possible commercial extraction in an environmentally protective way, can be fully examined.

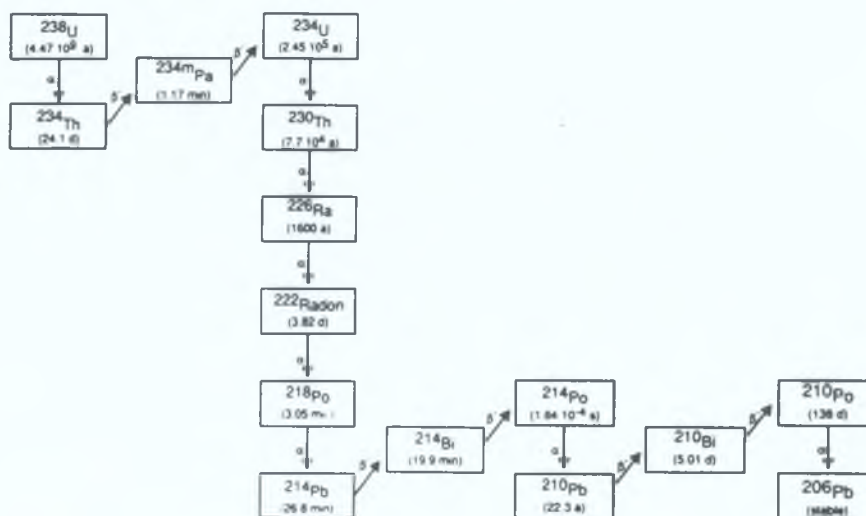
1:3 Scientific Background - Uranium and its properties

Uranium was discovered in the mineral pitchblende by the German chemist Klaproth in 1789. Its radioactive properties were first demonstrated in 1896 by the French physicist Becquerel and subsequently by Pierre and Marie Curie. It is a naturally occurring radioactive element and is found in trace amounts in all rocks and soils - usually at a few parts per million.

In itself, Uranium is only mildly radioactive and it can be handled safely wearing only a pair of cotton gloves for protection. (N.E.B. 1981).

It is poisonous and as such its use must be strictly controlled. Its radiological impact is also complicated by the fact that it decays to the stable element, Lead, in 14 stages (see fig. 1)

Figure 1
Radioactive Decay Chain for Uranium-238



Two of its 'daughter' elements - Radium and Radon Gas - are hazardous substances. Radium is highly radio-toxic whilst Radon Gas if inhaled / ingested over a long period is regarded as a carcinogen.

Radioactivity in air resulting from Radium is measured in becquerels per cubic metre (Bq/m^3). This unit of measurement indicates that Radon is present at a concentration that emits one particle of radiation per second in a cubic metre of air. When addressing the question of human exposure to ionising radiation it is important to realise that we live in a naturally radioactive world, and that approximately 90% of the total annual radiation dose received by the general public is derived from natural sources.

The single largest component of this dose is that due to irradiation of human tissue following inhalation of the radioactive gas, Radon and its short lived decay products in the indoor environment. On the basis of current Irish data, Radon contributes over 50% of the total radiation dose received by the Irish population. The highest annual average radon concentrations found in domestic dwellings in Ireland to date also indicate that, in the context of radiological protection, indoor radon is the source of greatest individual personal dose, excluding certain medical applications {R.P.I.I., 1994}.

Using the most recently revised exposure - dose conversion factor {I.C.R.P., 1994}, exposure from radon in the home at the average Irish value of 60 becquerels per cubic metre (Bq/m^3) (-McLaughlin, 1990),

gives rise to an estimated annual radiation dose of 1.5 millisievert (mSv). In regulating activities involving radiation, the Radiological Protection Institute of Ireland (R.P.I.I, formerly the Nuclear Energy Board - N.E.B. - up to 1990) requires the activity to be justified and carried out in such a way that any radiation exposures are kept as low as reasonably achievable. In addition, any exposure to a member of the public must not exceed a dose limit of 1mSv, as laid down in statutory Instrument S.I. 43 of 1991. The dose limit for members of the public was 5 mSv prior to the establishment of the R.P.I.I, but was subsequently reduced on the recommendations of the International Commission on Radiological Protection (I.C.R.P.), published in 1990.

For comparison purposes, it is worth noting that the annual average radiation dose to the typical Irish consumer of fish and shellfish, as a consequence of caesium - 137 discharges from Sellafield into the Irish sea, is estimated to be of the order of 0.001 mSv - [Mc Garey *et al*, 1994]. The highest seasonally - corrected indoor radon level found by the R.P.I.I. in the dwellings they surveyed was 2399 Bq/m^3 , which is twelve times the reference level of 200 Bq/m^3 and corresponds to an annual radiation dose - to occupants of the house of 60 mSv - three times the maximum dose which radiation workers are allowed to receive under internationally accepted standards [I.C.R.P. 1991].

was a constantly recurring one which apparently was never adequately addressed. A prior baseline - study, undertaken by the R.P.I.I. - of both indoor radon levels of houses in the Fintown / Doochary area as well as general levels of ambient radiation levels at selected outdoor locations - would be an important exercise in generating trust with the community.

Mines and mining

1:4

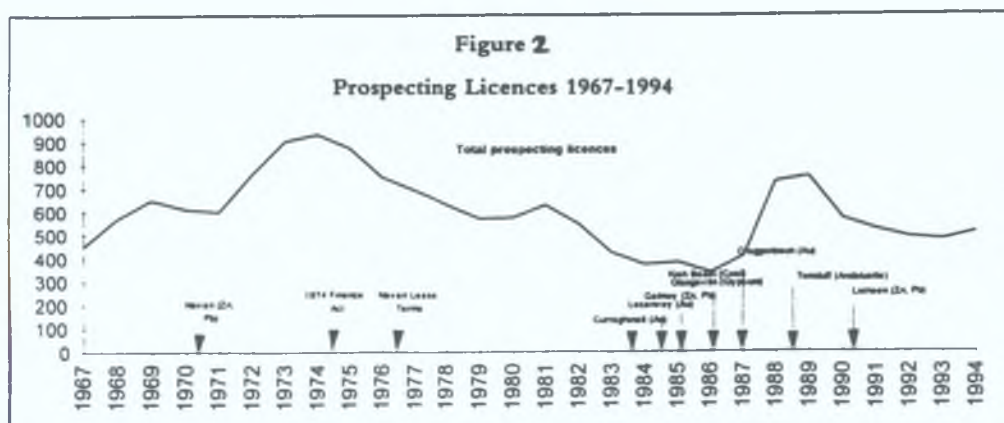
The mines and Quarries Act, 1965 defines a mine as “ an excavation or system of excavations made for the purpose of or in connection with the getting wholly or substantially by means involving the employment of persons below ground, of minerals (whether in their natural state or in solution or suspension) or products of minerals “. Normally, though a mine refers to the extraction of minerals as listed in the schedule of the minerals development , 1940, regardless of whether it is by opencast or underground method. Down and Stocks (1977) describe mining as the removal of minerals from the earth’s crust for use in the service of man.

Matthew’s (1976) defines minerals as chemical elements or compounds which occur naturally within the earth. They are inorganic and have a definite chemical composition. They have an orderly internal arrangement of atoms, a crystalline structure and certain other distinct physical properties such as colour, hardness and specific gravity.

Donegal granite is mostly composed of the minerals quartz, feldspar, and mica. (see : Geology - Chapter 3.2) An ore body is a body of commercially valuable minerals that is capable of being exploited.

The objective of mining is to extract and process ore profitably. However, minerals are not readily accessible, and are becoming increasingly difficult to find, furthermore, not all mineral deposits become mines.

As can be seen from the following graph (fig.2) prospecting licences granted by the Department of Transport Energy and Communications to companies has been running at an average number of 600 every year.



Source: EMD, Department of Transport, Energy and Communications.

Of approximately 40 base metal ore-bodies discovered in Ireland, only 6 or 7 have developed into viable mines (N.M.P.R.G. 1995). Mining is therefore a high risk business and the mining company does not often achieve its objectives despite expending a great deal of money and effort.

Johnson (1997) has categorised the main phases of mining:-

- (1) Exploration
- (2) Pre-Development and Planning
- (3) Extraction and processing of ore
- (4) Closure and Decommissioning.

(1) Exploration

Exploration is usually divided into 3 stages. The first stage involves a search for areas of possible mineralisation. This reconnaissance may be car borne, Airborne and / or by satellite imagery.

To proceed to the second stage of on-site exploration of promising areas, the exploration company must obtain a Prospecting Licence from the Department of Transport, Energy and Communications. This permits the company personnel to enter upon lands and prospect for minerals. The objective at this point is a preliminary determination of the prospective area and the most promising locations for drilling.

The purpose of the third stage, the drilling phase, is to determine the extent of mineralisation. A variety of methods are used depending on the depth and other geological characteristics of the deposit. The samples obtained from drilling are used to determine the appropriate technology which will be employed to recover the Ore.

(2) Pre-Development and planning

If explorations have been successful a determination of the mine's profitability must be made. This determination is usually accomplished in two steps. Step one is a quick assessment of the method of extraction based on current price projections, the average grade of Ore and other rules-of-thumb. Step two is a detailed feasibility study of the project. This study involves a determination of the best technology to employ and the scale of the operation.

Marketing studies are also made during this period to estimate the likely price of the commodity and access to markets. Preliminary negotiations with potential buyers are initiated to determine quality and quantity characteristics which may be the basis for long term contracts. This information is combined with the engineering studies to make a determination of the mine's profitability.

If it is estimated that the investment will be sufficiently profitable, the firm must then proceed to raise funds to cover the development of the mine by way of contract negotiations and financial arrangements. At this stage, detailed plans (required for Planning Permission) are drawn - up as well as Baseline Monitoring, Scoping Studies, Environmental Impact Statement,

Integrated Pollution Control licence application and an application for a State Mining Facility

Loans are an important part of the investment process since the major funds must be arranged at least three to five years before any cash / flow is generated.

(3) Extraction and Processing of Ore

Once all the financial, planning and licensing arrangements are in place, the firm can proceed to construct the plant. Before any Ore is extracted the company must invest in constructing the mine and providing surface facilities such as a processing plant, transportation facilities and storage areas. Only when all the surface facilities are in place is the firm in a position to begin extracting Ore. This phase could take 1.5 to 2.5 years to complete. The sales which result from extraction and processing generate the firm's cash-flow. The firm can use this cash-flow either to repay debts to reinvest the funds in the current operation. or recompense shareholders

(4) Closure and Decommissioning

In the older days, this phase would probably have been more accurately described as 'Abandonment' and in a lot of cases left environmental legacies which were never fully addressed (Johnson 1997).

Nowadays mining companies are required to submit a "Mine Closure and Rehabilitation Plan" along with its Environmental Impact Assessment (E.I.A) / (E.I.S.) at its Planning stage.

Arcon Mines Ltd at Galmoy Co. Kilkenny have £4M fund allocated towards their eventual decommissioning. (Mc Nair, 1997).

The Planning Permission granted to them by Kilkenny County Council in 1993 included 7 specific conditions dealing with this aspect and included such items as :

(a) operations, maintenance and monitoring of the replacement water - supply scheme,

(b) demolition and rehabilitation of the various structures and locations,

(c) permanent, environmental 'real-time' monitoring in order to achieve and provide for a 'walk-away' or 'passive-care' status. (- Grennan 1994.)

1.5 Uranium Mining - the process.

1.5.1 Mining

Mining of uranium is carried out using similar techniques to those that are used in mining other metals such as tin or lead but with the important difference that precautions must be taken to safeguard the workers and the population against the well recognised potential hazards of radiation.

The principal radiological hazard in mining uranium is the inhalation by the miners of radioactive Radon and dust containing radioactive particles

These particles may originate from the crushing of uranium or some of its daughters such as Radium or they may come from the decay of radioactive Radon gas. There is ample evidence that radioactive dust and Radon have caused lung cancers - sometimes known as "mountain Sickness" - among uranium miners until relatively recent times.

The nature and extent of the hazard was not appreciated then and hence the precautions were not adequate. Effective ventilation, dust suppression and the application of strict radiation protection procedures have been made compulsory in all uranium mines. As a result it is possible to mine uranium without significant effect on the health of miners or the local population.

Results of on-going health studies in mining areas, in France, for example, confirm this - (Nuclear Energy Board, 1981)

The Canadian and French situation, as regards uranium mining, would equate with the possible likely scenario of uranium mining in Donegal. Similar pegmatite ores have been commercially processed in Canada, France, and Africa as primary ores of uranium.

In 1981, the Madawaska uranium Mine at Bancroft, Ontario was the only Canadian operator but, during the 1950's, two other producers, Dyno and Bicroft Mines also had mills and produced uranium. The Canadian mines are underground mining operations and the uranium is leached with sulphuric acid in an oxidising medium. After a liquid / solid separation step, the solution is upgraded by ion exchange and the uranium precipitated as "Yellowcake" (magnesium diuranate) which is dried and shipped to the Eldorado Nuclear Limited, Port Hope, Ontario refinery.

The approach to pegmatite uranium metallurgy in France has been similar. The French also use a sulphuric acid leach, an extraction and the final precipitation of the uranium as "Yellowcake".

Other types of granitic ores are the low grade ores at Rossing in South West Africa, which have been mined (open cast) and milled at very large tonnages and the by - product production of uranium from the Phalaborwa Copper Ores of South Africa.

A problem that has plagued the commercial exploitation of pegmatite ores has not been the metallurgy but rather, the fact that pegmatite ore bodies can be erratic in uranium content. This erratic nature can dilute the mill feed so the ore cannot support the capital cost of a metallurgical plant and waste disposal facilities. The first commercial attempt to preconcentrate a pegmatite ore and discard a waste

product cheaply was made at the Bicroft Mine in the Haliburton area of Ontario, Canada.

Bicroft developed a radiometric sorter, known as the K and H Radiometric Sorter. This machine sorted -6" x 2" material by radiometric means into mill feed and waste. Similar equipment was used in France. The advantage of an ore sorter is that erratic ore bodies may be mined and the waste sorted. The small, upgraded fraction can then be treated at the metallurgical facility. The rejected rock can be returned underground as backfill or, because it is a screened fraction with the fines removed, it can be heap leached at the site if it contains minor uranium and an upgraded solution sent to the metallurgical facility.

The use of heap leaching to recover uranium from low grade ores or sorter rejects, has been practised in France, The United States of America and Canada. Heap leaching, as a primary process, is being used in Canada at the Agnew Lake Mine on conglomerate ore and in the United States on sandstone ores.

The techniques are well known and are generally organised so that the material is leached at the mine site and the up-graded solution transported to the mill, alternatively the uranium can be precipitated and the crude yellowcake transported to the mill for final treatment and packaging. Any feasibility study of a metallurgical plant should include an evaluation of radiometric sorting, to the control leach plant feed grade and aid in environmental protection. (Lendrum, 1981)

Milling - uranium flowsheet options

There are various options open for the design of an acid leach uranium flow sheet. The following discussion will aid the company in laying out the metallurgical test work required to evaluate the options available in design and produce a modern efficient mill. A typical flowsheet, with the options, is shown in Fig. 3.

1) Primary crushing.

The primary crush will probably take place underground to facilitate hoisting. The crush will produce a nominal - 6" product which will be delivered to the coarse ore bin adjacent to the head frame.

2) Radiometric Sorting.

Radiometric sorting should be attempted on the -6" (150mm) + 1" (13mm) material. On a Haliburton granite, radiometric sorting of the - 6" + 1" product indicated that 50% of the weight could be discarded, carrying only 6% of the total uranium.

The upgraded fifty percent of the tonnage would proceed through the normal uranium milling process. The fifty percent rejected, may be returned underground as backfill or it may be discarded on surface with less environmental hazard than disposing of it as a fine, ground material in a tailings pond. If the uranium can be extracted by heap leaching, this method should be investigated to evaluate the economics.

3) Crushing

Test work should be carried out to determine if the ore is amenable to autogeneous or semi - autogeneous grinding (SAG). Autogeneous grinding would eliminate the need for a crushing plant with its attendant dust problems. The crushing, if required will be such that it will produce a ball mill feed or a nominal - ½ " product.

Obviously if a sorting plant is successful, the size of the crushing plant will be reduced by one - half. The crushed ore will then be delivered to the mill's fine ore bin.

FIG. 3

MINE

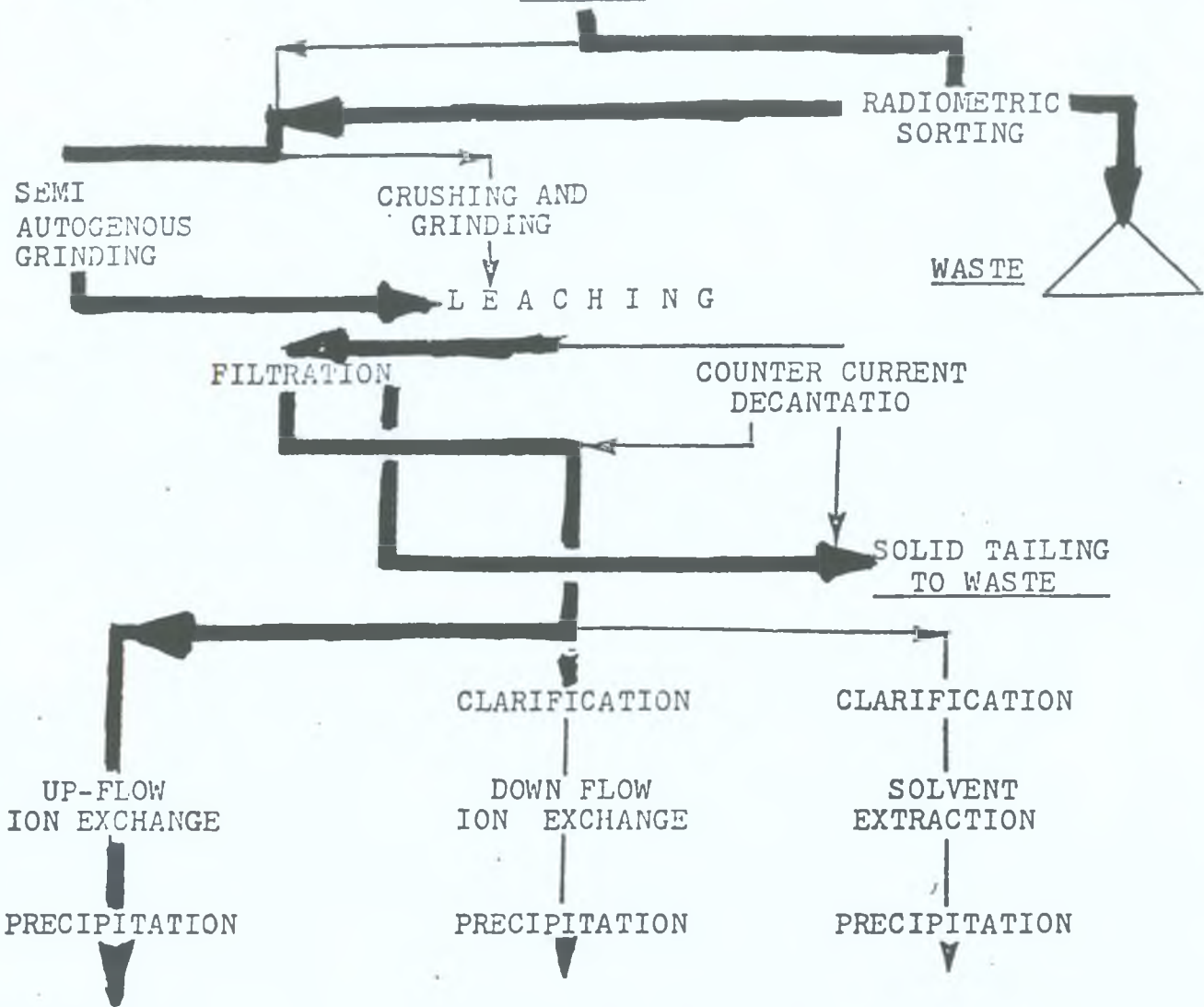


FIGURE 3 :

URANIUM FLOWSHEET OPTIONS

SUGGESTED **—————**

ALTERNATE —————

ANGLO UNITED DEVELOPMENT CORPORATION LIMITED

URANIUM ORE

Source : F. CLYDE LENDRUM CONSULTING LIMITED

4) Grinding

Considerable test work should be carried out on the grind. The indications from preliminary work is that coarse grind is sufficient and if the material is ground to 41% -200 mesh, extraction will be in excess of 95%.

Test work will be required to develop the work indices. As discussed above, autogenous or semi - autogenous grinding may be possible on this ore, thereby eliminating the crusher house with it's dust problems. For this work, a representative -6" sample will be required for test purposes.

5) Leaching

A dewatering step may be required between the grind and the leach stages to provide the leach with a consistent, regulated pulp density. This regulated density is necessary to maintain consistent chemical strength and minimise chemical usage. The water separated from the pulp in the dewatering step, is recycled to the grinding circuit, minimising the amount of fresh water required. The Donegal pegmatite ore leaches easily with only sulphuric acid in an oxidising environment. Further test work will be required to optimise the acid and oxidation levels required for maximum extraction but, this test work indicates a sulphuric acid leach at a pH of 1.8 is sufficient and retention time need only be 24 hours. This is similar to the Haliburton granites. In the test work, oxidation of the iron, in solution, to ferric iron, was by sodium chlorate. It may be more economical and more expedient to maintain this oxidation by the use of bacteria in a system such as the South African Bacfox process. This process needs only compressed air and eliminates the use of a hazardous chemical such as sodium chlorate, or a pollutant like manganese dioxide.

6) liquid / Solid Separation

Modern uranium technology has not yet developed a reliable solution upgrading procedure that does not require a liquid / solid separation step. The solids can be separated from the pregnant solution by filtration or counter current decantation (CCD)

The initial test work indicates the use of filters could be the more economical route to follow. The solids must be washed and discarded as a mill tailing in a waste management area. It is the tailings pond that has been giving environmental concerns and obviously, if a sorter plant can be used to sort the ore efficiently

prior to leaching then the tailings pond will be much smaller in size and easier to maintain and rehabilitate.

The pregnant solution will contain the uranium along with various impurities and detailed test work will be required on this solution before the choice of a process to upgrade the uranium and recover it as a uranium diuranate is made.

7) Solution Upgrading

The original Canadian and French flowsheets used downflow ion exchange. The resin was stripped with either common salt or ammonium nitrate solution. Downflow ion exchange requires that the solution be first clarified. This system is still used at Madawaska Mines in Canada and could probably be considered the classic process.

Some of the French properties used a solvent extraction (SX) process with similar results. The solvent extraction process requires even better clarification than downflow ion exchange but, it has an advantage, the molybdenum can be stripped from the solvent, if required. If sufficient molybdenum is available, it may be recovered commercially. A disadvantage of solvent extraction is the fire hazard from the large volumes of kerosene required to carry the solvent. There are also some concerns regarding the toxicity to fish by the solvent on downstream waters.

A more modern approach to the upgrading and precipitation of uranium from solutions is to use upflow ion exchange as is practised at the Agnew Lake Mine in Canada and at uranium mines in South Africa. The upflow ion exchange does not require a clarification step and gives higher grade eluate solution than the older downflow ion exchange equipment. Upflow ion exchange unlike downflow, can strip molybdenum off the resin continuously. Precipitation of the uranium is usually with ammonia or magnesium.

One of the highest grade uranium precipitates produced in the 1980's was that of Agnew Lake which used upflow ion exchange, stripped with sulphuric acid and treated the sulphuric acid eluate with a small solvent extraction plant to produce a very pure ammonium diuranate. In Agnew Lake's case, the ammonia was recovered by an ammonia recovery plant. This approach has had very good reception from environmentalists.

(Lendrum, 1981)

Chapter 2 Literature Review

Most of the information regarding the search for Uranium in Donegal was gleaned from media reports published in the local and national press during the period in question 1978 to 1982, and also from a number of personal communications. I also had access to the results of a survey undertaken by a local student for the 'Aer Lingus Young Scientists Exhibition 1997', which examined the Donegal Uranium issue from a social and behavioural aspect, and was the recipient of several prizes in its category (Social and Behavioural science)

The technical - data used in this thesis came from a number of scientific and mining journals so referenced, as well as a number of individual reports which are also referenced . A number of leaflets, newsletters issued by the anti-Uranium side and the replies to same by the mining companies were also studied.

Finally, I sourced some of the newer and up-to-date policy as regards mining and environmental matters from various abstracts and papers given at recent seminars and conferences. On a number of items arising from these, I would have followed up by way of personal communication with the particular speaker/ author.

In early September 1979, Munster Base Metals - a subsidiary of Anglo United Development Corporation of Toronto - issued a statement confirming significant concentrations of uranium present at Fintown, County Donegal. Of the six shallow holes drilled during the summer, concentrations of up to 8 pounds of uranium per ton were reported and an average yield of 2 pounds per ton (Donegal Peoples Press, 14th Sept. 1979)

At around the same time, two groups formed and met just north of the locality and took a strong anti-nuclear, anti-uranium mining stance. One was described as the Belfast based Nuclear Discussion Group and had members from Australia, U.S.A., Europe as well as Cork and Dublin. The other was the Atlantis Community of Burtonport (sometimes referred to as the 'Screamers' because of their use of primal vocalisations as a means of alternative - therapy), led by an English - woman Jenny James.

It should also be noted that the near - disaster at the Three-Mile Island reactor at Harrisburg, USA, occurred less than 6 months previously in March 1979, and the images of 200,000 people fleeing their homes were still pretty fresh in people's minds.

Also, less than two years previous the then Minister for Energy published a Government Green Paper - 'Energy Ireland' - advocating that the Irish economy must have nuclear power if it was to have an adequate supply of energy in the 1990's. With this in mind, the E.S.B. made plans to site their first nuclear powered electricity - generating station at Carnsore, County Wexford. National opposition to this was organised by the Irish Campaign for Nuclear Disarmament, with the internationally - respected Mr. Sean Mc Bride as its President.

In 1978 and 1979, an annual anti-nuclear rally took place at the proposed site in Carnsore, and with its 'festive'-like atmospheres, it gained widespread attention and a high media profile. Despite this, the last quarter of 1979 saw the mood locally in Donegal as being undecided. The Fintown community found itself in a dilemma in that the mining exploration companies had brought much needed employment (albeit on a small scale) to the area and the prospect of an economic bonanza lay ahead. Coupled with this was a concern for the radiation effects on people's health, on their livestock, on water-supply and on future generations. (Irish Independent, 17.12.79).

This is borne out by A. Mac Gaoithín's survey in the 1997 'Aer Lingus Young Scientists' in which he found that the majority (65%) of the 'pro' - mining cited economic benefits as their reason for doing so, with the balance stating de-population reversal. On the other hand, the 'anti' - side cited human health, environmental damage and effects on livestock as their main concerns. An interesting finding of his was that a majority of males favoured the prospecting activities but, equally so, - that the females made up the majority of those opposed to it locally at the time. At the public meeting held in Fintown, just prior to Christmas 1979, a seven-man watchdog committee was elected to examine the effects of uranium drilling would have on the environment of County Donegal.

The local Development Association decided that none of its members would act on this committee on the grounds it did not have enough information on the subject (Donegal People's Press 21.12.79).

3.2 1980 and opposition grows

This watchdog committee was formalised the following month-January 1980 - as the Donegal Uranium Committee (D.U.C.)

In January, Donegal County Council discussed the possibility of funding an Environmental Impact Report, to be carried out by an Foras Forbartha, but no agreement was reached on its approval. January also saw confirmation of their encouraging results in Anglo United's 1979 Annual Report and news that another Canadian company, Northgate Exploration through its Irish subsidiary, Irish Base Metals- was about to commence drilling shortly in Donegal.

Towards the end of February, a small but significant incident occurred in the townland of Gleann Leathan, Fintown. Here a number of local people confronted the drilling crew as they were about to commence operations near the source of their water-supply. The residents requested that an alternative supply be provided for the 7 or 8 families in the area. Apparently when this was not forthcoming, the Local Development Association (Coiste Oibre Bhaile na Finne), which heretofore had adopted a neutral stance, joined the protesters and succeeding in blocking drilling operations in the area (Donegal People's Press 8.3.80).

March 1980 saw the then Tánaiste and Minister for Energy, (G. Colley) declaring that a 'decision on nuclear power is now less urgent' (Irish Times. 10.3.80), and that the Nuclear Energy Board had advised him that there was no evidence of radiation hazards arising out of prospecting operations (Donegal Democrat 21.3.1980). However, when the N.E.B. announced that they were to investigate the matter further, it added further fuel to the 'Anti' - side, and it would be nearly a further year (Feb. 1981) before the North-Western Health Board would report comprehensively, based on the N.E.B.'s findings, that there was no health-risk attached to Uranium prospecting (Derry Journal, 27.2.81).

Opposition to the Uranium mining increased both locally and nationally throughout the spring of 1980. A large protest rally of 2,000 people assembled at Gweebarra Bridge, west Donegal (Evening Herald, 31.3.80) Tensions apparently were running quite high in the area and machinery belonging to the drilling companies were set on fire despite round-the-clock Garda surveillance. Estimated damage of £300,000 was caused in several arson attacks on stores and equipment (Evening Herald, 2.4.80). In another significant happening, Northgate Exploration-parent company of Irish Base Metals - released its 1979 Annual report in April 1980 stating "high background levels of uranium (in Donegal) do not in themselves indicate the presence or the potential for economic deposits of Uranium". April also saw the V.E.C. organised Uranium seminar held in Glenties. The general view of the experts was that Uranium mining posed no health problems and that there was no alternative to the energy-crisis outside of nuclear power.

In May, the D.U.C. sent a deputation to the Donegal County Council and requested that they undertake to carry out an environmental study. Midsummer 1980 saw a number of prospecting licences granted in Inishowen, North East Donegal.

A public-opinion poll carried out by second-level students in the peninsula reported local opposition at 64%, to the proposed uranium exploration ('Stop', D.U.C. Bulletin, August 1980). National opposition was further evident when a two-day conference was held at the end of June in Lettermacaward, West Donegal, to strengthen and improve the campaign against Uranium prospecting. Tensions again were quite high locally, when £8,000 worth of damage to a drill was reported at Doochary (Derry People and Donegal News, 7.6.80).

In July, a Mr. Martin Stott of the Political Ecology Research Group (-P E R G -), Oxford was in Donegal doing preliminary research for an impact study at the request of the D.U.C.

August saw the third annual Carnsore rally, in Co. Wexford, with the focus shifting from the music-festive atmosphere of the two previous events to a more exhibition / workshop - type of event, with emphasis on the issue of Uranium-mining. Numbers had dropped to 5,000 people attending (previous years: 20,000 and 15,000) but this was explained partly by the fact that the Government had to an extent defused the nuclear power issue with statements from the Minister for Energy outlining other possibilities in energy-sources. - (Irish Independent, 14/6/80 and 18/8/80).

One of the prospecting companies- Munster Base Metals - found itself at odds with the County Council because it had not applied for planning permission for a number buildings it was using.

August/September also saw the other exploration company - Irish Base Metals - entering the public-relations arena in a more pro-active manner. In conjunction with Munster Base Metals, it published an information booklet (see appendix B), outlining various facts about Uranium and its mining, and also as a reply to the D.U.C.'s 2 bulletins the first published the previous February and the second in July (see appendix C). They also gave lectures to senior pupils in a number of Secondary schools, and held talks with representatives of the I.F.A. and Macra na Feirme in the Doochary / Fintown area. A number of site visits were also organised and availed of by members of An Taisce, the Donegal Uranium Committee, County Councillors, and journalists. At their A.G.M, in October, An Taisce members stated that one of their main efforts in future would be the opposition to Uranium-mining.

The Donegal County Council agreed to pay for an independent uranium study. A sum of £15,000 had been allocated in their 1980 Estimates towards this. November saw a forthcoming bye-election in Donegal and the two mining companies became embroiled in controversy over money donations to party political funds. (Irish Times, 3.11.80). This episode helped to move most of the local representatives / politicians that may up to then have been neutral or balanced about the Uranium issue very much over to the 'anti'-prospecting side.

Also in November, the Department of Health decided to set-up its own unit in order to monitor Uranium mining and nuclear development

(Irish Independent, 14.11.80) Northgate Exploration (Irish Base Metals being its subsidiary) indicated towards mid November that it was disappointed with results it was getting in Donegal and would be scaling down its operation there. The mine at Tynagh was coming near its completion and so offsetting exploration costs against the Tynagh profits was rapidly becoming a non-option (Sunday Independent, 23.11.80).

At the end of November, Donegal County Council passed a motion calling for the cessation of Uranium mining (Donegal Democrat, 28.11.80).

3.3 1981 - Activities grind to a halt

In January 1981, Donegal County Council requested the Department of Energy not to issue any new licences and to revoke the existing ones. This was turned down. Also the Council decided to contribute £6,000 to the D.U.C. towards the cost of a survey to be carried out by P.E.R.G. (Oxford) into uranium prospecting and mining in the county. (A summary of its main points is attached in appendix D). A proposal to have it carried out by an Foras Forbartha was not carried (Derry People & Donegal News, 31.1.81). In February the Nuclear Energy Board in its report to the N.W.H.B. outlined that there was no significant hazard to health from radiation as a result of prospecting activities. In early March 1981, Irish Base Metals scaled down explorations considerably and by end of month both exploration companies had halted activities, with all drilling equipment having been removed from their Doochary / Fintown bases. (Sunday Tribune, 29.3.81).

In Northgate Exploration's Annual report (1980), its then chairman is quoted "while there were no major economic intersections obtained, the ground holdings have considerable unexplored areas for locating potential economic targets". He also stated that mineralization was generally, impersistent along the controlling structures and is "erratically distributed" (Donegal Democrat, 21.4.81).

The parent company of Munster Base Metals, Anglo United in its 1980 Annual report, published mid 1981, started... "with less than 15 per cent of the total strike-length of the Main Radioactive Zone in the Donegal Uranium prospect and half of the most promising surface-detected targets so far tested, it would be surprising if substantially better and more persistent mineralisation did not exist in the remaining and so far untested 85 per cent of the zone" (Irish Press, 9.6.81).

All in all what these statements are really saying is with the limited exploration that took place no viable or economic discovery was made but that there was always the possibility that there could be in the remaining and much larger unexplored tract.

Mr. Fintan O'Toole writing in the "In Dublin" magazine of 6/19 March '81 reports of recent statements by Tanaiste and Minister for Energy Colley in a falling-off in projected energy demand allowing for the Carnsore (Nuclear Power Station) project to be shelved and an apparent greater emphasis on energy conservation and alternative sources. (A summary schedule of events is attached in **appendix A**)

Chapter 4 The Geology of County Donegal

4.1 Rock Deposits

The geology of Donegal is both dramatic and very complex - vast cliffs, huge faults, distinctive mountain peaks, - with representatives of rocks spanning close on one thousand million years.

The dominant control by rocks of the landscape and land-use is nowhere better demonstrated than in County Donegal. Mountain ranges, valleys and lowlands are all determined by the trend of the rocks and their past history. Topography, which results from geology, has a dramatic impact on climate, affecting such basic parameters as rainfall amount and wind-shelter. The use to which the land can be put, be it pasture or tillage, forestry or moorland is also largely as a consequence of the differing types of rocks. Five major groupings of geological deposits occur in Donegal.

1. the ancient metamorphic rocks.
2. the granites
3. the carboniferous series.
4. the tertiary dykes.
5. the glacial overburden.

Rocks are aggregates of minerals, and may be solid ('consolidated') or loose ('unconsolidated'), in which case they are more accurately referred to as sediments. There are two main groups of rocks - Sedimentary and Igneous, with a third Metamorphic, resulting due to the interaction of heat and/or pressure on the parent (Igneous or Sedimentary) rock (Aldwell, 1985).

Sedimentary rocks are formed as a result of the accumulation and lithification of rock fragments, minerals and organisms near the earth's surface or as result of direct precipitation of chemicals from water.

Igneous rocks form as a result of the cooling of magma - molten rock - on or close to the surface of the earth. The magma originates deep within the earth's crust and upper mantle as a result of the earth's internal heat. Where the magma is ejected onto the earth's surface through volcanoes during volcanic eruptions or through fissures in the earth's surface as lava flows the rocks cool quickly and the products are known as extrusive or volcanic igneous rocks. Where the magma moves slowly towards the earth's surface, leaving time for the rocks to cool slowly, the rocks are known as intrusive or plutonic igneous rocks

Igneous rocks are classified by two broad criteria - the amounts and kinds of mineral constituents and their texture which is due to their speed of cooling. **Granite** is a coarse grained rock which cooled very slowly below the ground surface. It contains free quartz and potassium feldspar. It is usually light in colour.

Diorite is rather similar to granite but is without free quartz and contains sodic feldspar and often hornblende. It is darker than granite in colour. The two types merge to give granodiorite (free quartz, sodic feldspar and hornblende).

Dolerite is a dark fine grained rock with calcic feldspar and magnesium and iron rich minerals. It usually occurs in dykes or sills. It has a characteristic ring when struck by a hammer.

Basalt is a fine grained dark lava found in volcanic sills, dykes and lava flows. Its composition is close to dolerite. It forms the Giants Causeway, in County Antrim.

4.2 Geological History of Donegal

The geological history of Donegal can be described in ten great chapters of events dating back some 900 million years:

1. The deposition of great thickness of Moinian and Dalradian sediments subsequently to be greatly altered.
2. Next came a huge volume of basic magmas which were intruded as sills of varying thickness.
3. About 500 million years ago began a series of major tectonic and metamorphic events. The result was the folding and uplift of existing deposits and their conversion to metamorphic forms of the original igneous and sedimentary rocks. This Caledonian orogeny produced the distinctive NE-SW structure of this region.
4. During and after the deformation a varied suite of minor intrusions were emplaced into the metamorphic complex over a wide area.
5. After the major structural and metamorphic events came granite plutons. Most recent dating of the Donegal Granite puts it at about 400 million years in line with other major Irish granites. Geologists divide the Donegal Granite into eight different units exhibiting a variety of mechanisms of emplacement and producing as a result different contact effects on the rocks into which they were intruded.
6. At about the same period the older rocks were at least in part overlain by sediments derived from occasional flooding during predominantly desert climatic conditions. These old Red Sandstone rocks today are only seen in a small area of the Fanad peninsula.

7. After the emplacement of the granite and before the start of Carboniferous deposition, perhaps about 380 million years ago, Donegal was subjected to major faulting aligned to the Caledonian NE-SW trend. Some dozen major ones are recognised running for tens of kilometres with the largest one, the Leannan fault appearing to follow through into Scotland and joining up the Great Glen Fault.

8. One probable consequence of the faulting was a down sagging which led on to the laying down of the Carboniferous strata starting some 350 million years ago. Today these strata are confined in Co. Donegal to the Southwest with one possible occurrence in the North. They probably however covered a much wider area but have been worn away since. The south western Carboniferous basin rocks are quite varied and show clearly that land at the time of deposition was to the north. Coarse deposits formed of material obviously carried from nearby high ground pass southwards to sandstones of river delta type and then shales and limestones of a shallow sea. We now come to a lone gap in our succession record in Donegal of over 200 million years. Rocks filling this time gap are found elsewhere in the North of Ireland. Maybe they were laid down also in Donegal and have been eroded away. We do not know for certain.

9. The next period is the Tertiary starting some 60 million years ago. These are dykes of basaltic volcanic rock and are contemporaneous with the large scale igneous activity in Antrim and Derry and also in Scotland. Their distribution is variable. They are most numerous in the granite, less so in the metamorphosed sedimentary rocks and occur as isolated thick solitary units in the Carboniferous basin. The main trend of the dykes is NW-SE using regional joints and other old fractures. The faults seem to have acted as barriers to the dykes as if each block acted independently to the stresses which opened the joints. There are so many dykes that it is obvious there was major volcanic activity. The possibility of much wider spread volcanic rocks having been once in Donegal is enhanced by the existence of three pluglike masses of volcanic rock near Inver, Donegal Town and Cranford which could have been major vents to the surface for molten lava. A feature of the early Tertiary was a tropical climate which produced large scale weathering of all rocks except perhaps quartzite. Major lowering of the land surface can be envisaged and is one obvious period for the removal of some of Donegal's missing rocks.

10. Next, the Ice Age which was not a single event but a succession of alternating cold and warm climatic periods. There also is clear evidence of ice caps about 13 million years ago. Our recent or Pleistocene Ice Age started about 600,000 years ago and the first major build-up of ice in Ireland is believed to have been about 200,000 years ago. The effects of the Ice Age were of major importance in sculpting our present landscape, determining our soils and modifying our natural drainage pattern. The most recent cold stage started some 70,000 years ago and alternating cold and warm periods produced a last cold snap which ended about 10,000 years ago. (Aldwell, 1985).

4.3 The Donegal Granites and Associated Uranium Mineralization

In county Donegal, eight major separate granitic plutons were emplaced by varied intrusion mechanisms into regionally metamorphosed and deformed Dalradian metasediments (Pitcher and Berger, 1972) (see fig.5).

Granite bodies vary in texture and composition and also cause changes in the rocks into which they intrude. Three main minerals generally can be seen.

: **Quartz** (glassy and irregular in shape)

: **Feldspar** (Opaque, white or pink with flat, sometimes shiny surfaces)

: **Mica** (shiny black or silvery flakes)

Other minerals may be present usually in very minor amounts. In the late stages of solidifying of granite veins with large mineral crystals called pegmatites are found.

1. The **Thorr** Pluton is very variable and contains many rafts of metasediments within it. An average composition is some 15% quartz, 75% feldspar and 10% mica and basic minerals. It has outcrop area of some 150km² ranging from Bloody Foreland to areas south of Dungloe. It is thought to be the oldest granite in Donegal.

2. The **Fanad** Pluton occurs as an isolated remnant on three northern peninsulas. Away from the immediate contacts it is a fairly uniform quartz diorite quartz up to 15%. It covers about 10km².

3. The **Ardara** Pluton is a granodiorite intrusion with typically 20% quartz, 70% feldspar and 10% mica and basic minerals. The surrounding sediments show high grade contact metamorphism with minerals such as andalusite, sillimanite and staurolite. The Ardara pluton has a diameter of about 8km and is located north of Ardara towards Clooney and Maas.

4. The **Toories** Pluton is restricted in outcrop to Aranmore and a few small islands.

5. The **Rosses** Pluton consists of four successive granites ranging from fine to medium grained to coarse. Some striking pegmatities are present. An average composition is quartz 30%, feldspar 65% with micas 5%. Beryl occurs near Dungloe. Its diameter is about 8.5km with an area of about 60km².

6. The **Barnesmore Bay** Pluton includes the Blue Stack Mountains. Quartz averages about 28% with feldspar about 69% and mica about 3%. In places the feldspar tends to redden. Many dykes cut this granite. Its area is some 52km².

7. The **Trawenagh Bay** Pluton is fairly homogeneous, medium to coarse grained with biotite. Garnets are present. The area is about 50km².

8. The **Main Donegal Pluton** covers some 450km². It is highly variable. The main rock type shows a broad variation from medium grained biotite-granodiorite (dark) on the Southeast side to a coarser grained granodiorite with variable biotite content (light) in the Northwest.

Figure 5. Sketch-map of the granites of Donegal (source: Pitcher, Berger 1972)

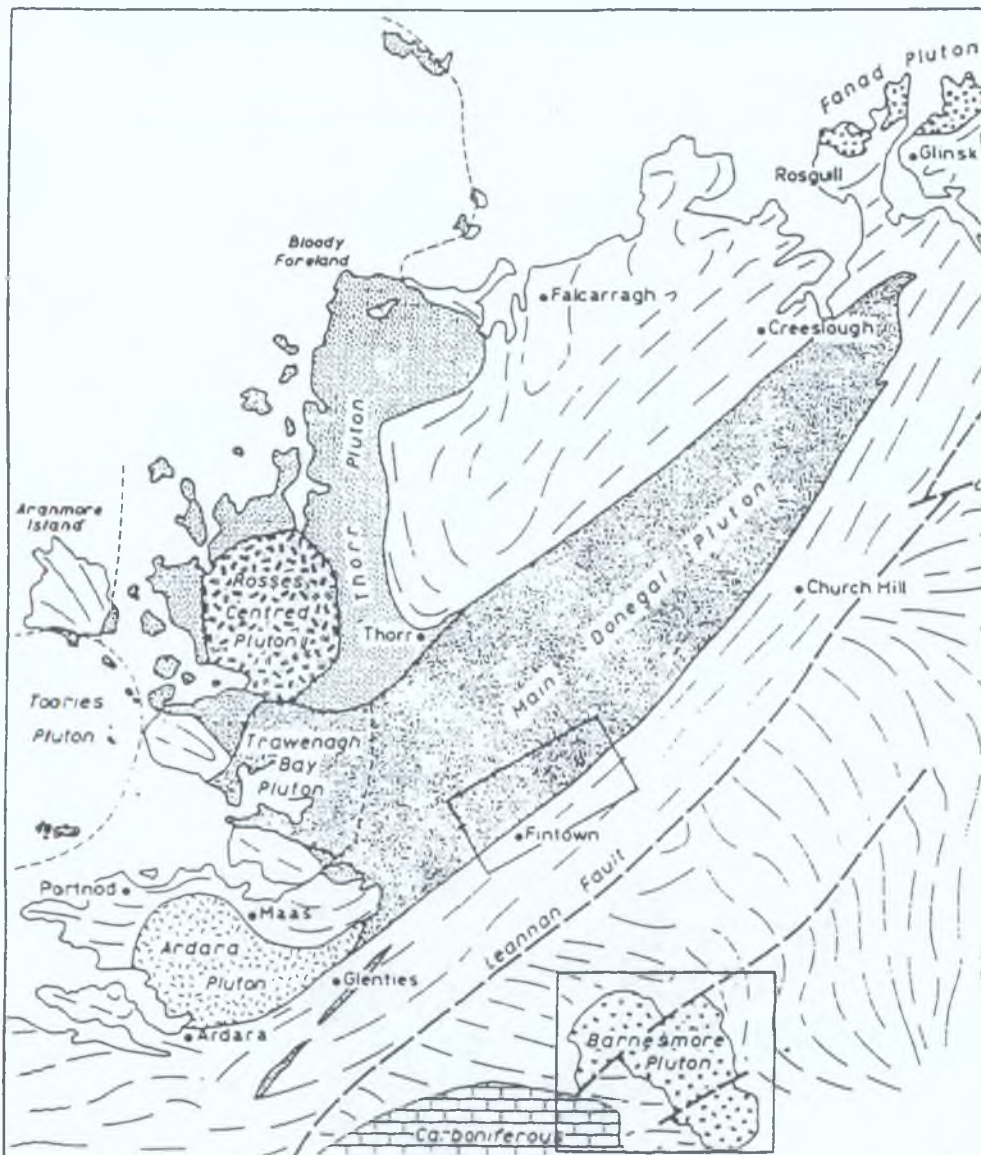


Figure 5 The granites of Donegal, northwest Ireland (after Pitcher and Berger 1972).

4.4 Uranium Mineralization

The main Donegal Pluton is considered (with the Trawenagh Bay pluton) to be the latest member of the Donegal granite suite; it has been accommodated in a major transcurrent sinistral shear zone during continuing deformation.

The elongate form of the pluton (fig. 5) is partly a consequence of its location in an active shear zone; contacts with the envelope rocks are fairly steep and broadly concordant, though locally they are discordant.

The main Donegal pluton thermally disharmonious with its envelope rocks, which are highly deformed, regionally metamorphosed Dalradian (late Precambrian and Lower Cambrian) schists. The schists, which had attained a greenschist and epidote-amphibolite facies MP2 metamorphic pressure peak, were retrogressed prior to granite emplacement (regional D6), and the superimposed synkinematic aureole has kyanite, K-feldspar and sillimanite in its inner zone. (Pitcher, Berger 1972.)

Chemical data for the pluton are given in fig. 7. Radioelement abundance data in fig. 8. for the granite determined by epithermal neutron activation analysis show it to have a low average U content of 2.5 ppm and an average Th content of 12.9 ppm when compared with the Clarke of these elements for granite. The associated minor granitoid dykes have similar low radioelement contents away from mineralised sites. The radioelement abundance of representative Dalradian lithologies (limestone, pelite, and quartzite) are given in fig. 8.

U and Th in Donegal rocks^{8,11}

Fig. 8

Chemistry of Main Donegal Granite*			
	Content, %	Content, ppm	Ratio
SiO ₂	70-75		
TiO ₂	0.1-0.4		
Al ₂ O ₃	13.7-15.7		
FeO	0.8-2.8		
MnO	0.04-0.07		
MgO	0.2-0.8		
CaO	0.5-2.2		
Na ₂ O	3.0-4.6		
K ₂ O	3.0-5.5		
P ₂ O ₅	0.01-0.14		
Zn		15-55	
Rb		100-150	
Sr		200-500	
Y		5-20	
Zr		50-200	
Nb		2-20	
Ba		400-1200	
Rb/Sr			0.8-4.0
K/Rb			180-360

* Twenty-seven whole-rock samples analysed by Philips 1400 XRF at Leeds University.

	n	U	Th
Main Donegal pluton	(27)	2.5	12.9
Dark variety	(15)	3.1	14.9
Light variety	(12)	1.8	10.5
Aplites	(4)	7.3	7.1
Pegmatites	(4)	5.5	10.0
Microgranites	(2)	14.3	10.4
Microgranites	(2)	2.4	13.2
Trawenagh Bay pluton	(4)	5.0	10.1
Thorr pluton	(12)	3.1	13.0
Ardara pluton	(9)	4.4	13.2
Rosses pluton	(4)	5.6	10.6
Barnesmore pluton	(3)	8.1	25.1
Irish Caledonian plutons	(94)	3.6	12.1
Dalradian metasediments, Donegal			
Limestone	(5)	0.8	2.2
Pelite	(4)	2.8	17.3
Quartzite	(3)	1.5	5.1
Dalradian metasediments, Scotland			
Pelite psammite	(46)	2.3	17.2

All analyses by epithermal neutron activation analyses at Risley, England. Errors are 0.5 ppm or 10%, whichever is greater for both U and Th. (n, number of samples analysed.)

The data for the Dalradian pelites from Co. Donegal are almost identical with those reported for Scottish Dalradian pelites. U and Th do not appear to have been mobilised to any appreciable extent in Donegal (or Scotland) during prograde regional or contact metamorphism of the Dalradian metasediments. None of the Dalradian lithologies analysed from Donegal shows high radioelement contents, so neither melting (partial or complete) nor assimilation of these sediments during magma formation and emplacement would have led to radioelement enrichment. No obvious or significant correlation that would support the assimilation of crustal rocks is evident for the Main Donegal Granite when U, TH and Sr values are plotted against initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of individual whole-rock samples (O' Connor, 1982.) Radiometric anomalies in the Main Donegal Granite tend to be disposed as discrete elongate northeast-southwest zones that strike parallel to the foliation of the pluton and the internal raft trains. The radiometrically anomalous zones reflect mainly the distribution of biotite-pegmatites and, to a lesser extent, muscovite-pegmatites and microgranite dykes. The biotite-pegmatites tend to be concentrated at or near external and internal (i.e. within raft trains) contacts of the pluton, though not all biotite-pegmatites are mineralised. (O'Connor, Long 1984)

4.5 The Main Radiometric Zone (MRZ)

This is the name given to a sub-region of the Main Donegal Pluton lying approximately half-way between the villages of Fintown and Doochary, County Donegal, in which both pegmatites - hosted and vein type uranium mineralization are associated with it. (See fig. 9.) Its total strike length is over 9km with an average width of 20 metre.

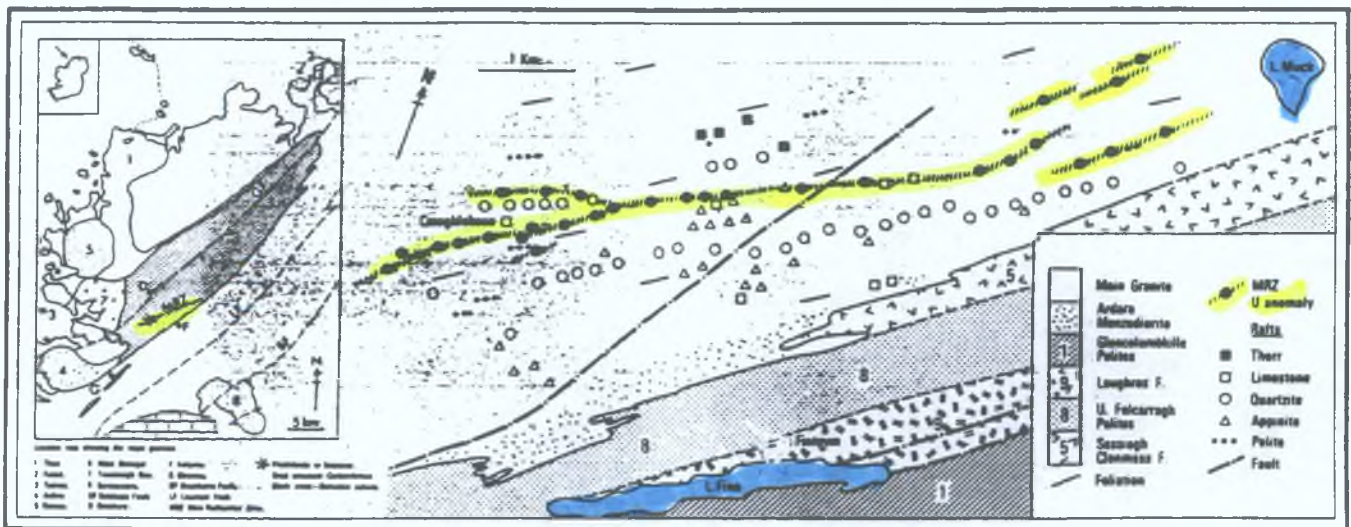


Fig. 9 Simplified geology of Fintown area, Main Donegal Granite (after Pitcher and Berger³) showing distribution of raft trains and location of Main Radiometric Zone and pitchblende locality (inset)

A low-thorian uraninite is the main ore mineral in the mineralised biotite-pegmatite whilst the vein - type material consists of pitch blende formed under low - temperature hydrothermal conditions (O'Connor, Long, Basham, Swainbank, Beddor-Stephens 1984). Munster Base Metals, when they had halted exploration activity in early 1981 had drilled 63 holes and tested approximately half of the more promising surface- detected targets - representing about 15% of the total strike length of the 'MRZ'. However, despite gradings of 0.3 kg/t of U₃O₈ over a width of 8.7 m along 520m of the strike - length, prediction of the extent and location of the higher - grade mineralization within the zone was not possible. (Anglo UTD, reports 1980 & 1981).

Chapter 5 Mining in Ireland: 1940 - 1990's

5.1 Legislative Background

The main piece of legislation covering mining or mineral development (which would include the possibility of uranium mining) here in Ireland is contained in the Minerals Development Act, 1940, the Petroleum and Other Minerals Development Act 1960, the Minerals Development Act 1979, and 1995, and are normally cited together as the Minerals Development Acts 1940 to 1995

The 1940 Act outlined the list of minerals in full (see Appendix E) whilst the 1979 Act excluded stone, gravel, sand or clay (including peat) from being described as a ' mineral '.

It is interesting to note that 'Radioactive Minerals' is one of the listed minerals in the 1940 Schedule and also when EEC Directive 80/68 of 1979 (Protection of Groundwater caused by certain Dangerous Substances - List 11) is examined, Uranium is specifically mentioned as a substance having a potentially harmful effect on groundwater. - see Appendix F

This particular Directive is considered to be implemented in Irish law under the following enactment's:-

- The Local Government (Water Pollution) Act of 1977- '90.
- The European Communities (Waste) Regulations of 1979.
- The European Communities (Toxic and Dangerous Waste) Regulations of 1982 (Thorn, 1990).

Up to May 1994, mining proposals were subject to Air and Water Pollution licences (issued by the Local Authority) as well as Planning Permission, and the EIA/EIS is process. Mineral extraction and processing is a scheduled activity under the Environmental Protection Agency (E.P.A) Act 1992 and is subject to application for an Integrated Pollution Control (I.P.C.) licence to the E.P.A. under Part 4 of the Act. Any new process subject to I.P.C. will no longer require licences under the Local Government (Water Pollution) Acts 1977-'90, the Air Pollution Act 1987 or permits under various Waste Regulation (Scannell, 1995).

Instead for new mining activities applying after 16th May 1994, licences are issued by the E.P.A., and are multi-media permits. They seek to control the introduction of potentially harmful matter into the three environmental media of air, water, and soil by :

- Preventing emissions (liquid, odour, noise and vibration, waste)

- Substitution of harmful materials by newer, cleaner type
- Waste minimisation / reduction (3 R's - reduce, re-use, recycle) (- Derham, 1997).

5.2: Protection of the environment - pre - E.P.A. (ie up to 1992)

No doubt the greatest single influence on the development of the Irish environmental law and policy, especially as it relates to pollution control, has been the European Union (EU) in the environmental sphere. The Council of Ministers declared, in November 1973, that in order to promote “harmonious development of economic activities “ and a “ continued and balanced” expansion (Article 2 of the Rome Treaty) then this achievement “ cannot now be imagined in the absence of an effective campaign to combat pollution and nuisances or of an improvement in the quality of life and the protection of the environment” and went on to state that these objectives are “ among the fundamental tasks of the Community” and that “ it is therefore necessary to implement a Community environment policy “. (Community here refers to European Economic Community - EEC, nowadays referred to as ‘EU’ or European Union).

Following this, the First Programme of Action of the European Community on the environment was adopted for the period 1973 - ‘76, and consequently a further four have followed-

- The Second Programme 1977 - ‘81
- The Third Programme 1982 - ‘86
- The Fourth Programme 1987 - ‘92

The (current) Fifth Programme 1993 - ‘2000.

The First Programme concentrated primarily on prescribing solutions for serious problems caused by pollution (e.g. the Groundwater Directive referred to in 5.1) and specifically proposed actions to be carried out in different sectors of the environment under various headings.

Eleven principles were laid out in the First Action Programme and these have been also incorporated in subsequent Action Programmes -

- Prevention is better than cure
- Environmental effects should be taken into account at the earliest possible stage in all decision making processes.

- Exploitation of Nature or of natural resources causing significant damage to the ecological balance must be avoided. The natural environmental conservation and improvement and to combat pollution and nuisances.
- The Polluter Pays Principle.
- Activities carried out in one state should not cause environmental degradation in another.
- The environmental policies of Member States must take account of the interests of developing countries.
- The Community and Member States should participate in international organisations dealing with environmental matters.
- Conditions and detailed efforts should be made to raise the level of environmental awareness since the protection of the environment is a matter for everyone.
- The principle of the appropriate level i.e. for each category of pollution, it is necessary to establish the appropriate level of action (local, regional, national, international) best suited to the type of pollution and the geographical zone to be protected.
- National environmental programmes and policies should be co - ordinated and harmonised within the EU without hampering progress at national level.

The Third and Fourth Programme concentrated more on preventative policies and set out an overall strategy for environmental protection and for the integration of environmental policies into other economic and social policies. The current 5th Action Programme 1993 – 2000 focuses on the theme of sustainable development and gives priority to the following

- Sustainable management of natural resources
 - Integrated pollution control and prevention of waste.
 - Reduction in the consumption of non - renewable energy,
 - measures to improve environmental quality in urban areas,
 - improved public - health and safety. (-Scannell, 1995)

The concept of sustainability and sustainable development was defined by Brundtland in 1987 as 'development which must meet the needs of the present without compromising the ability of future generations to meet their own needs'. This was further endorsed as the Earth Summit in 1992, in Rio de Janeiro, by the one - hundred and fifty signatories (including Ireland). EC Directive 85/337/EEC on the assessment of the effects of public and private projects on the environment came into force in July 1988 though it was not substantially implemented in Ireland for many developments until the Local Government (Planning and Development) Regulations 1990 came into force on February 1st 1990. These were subsequently replaced by the 1994 Regulations of the same name, which makes E.I.S. (Environmental Impact Statement) mandatory for both scheduled activities subject to Planning Application and also I.P.C. licensing.

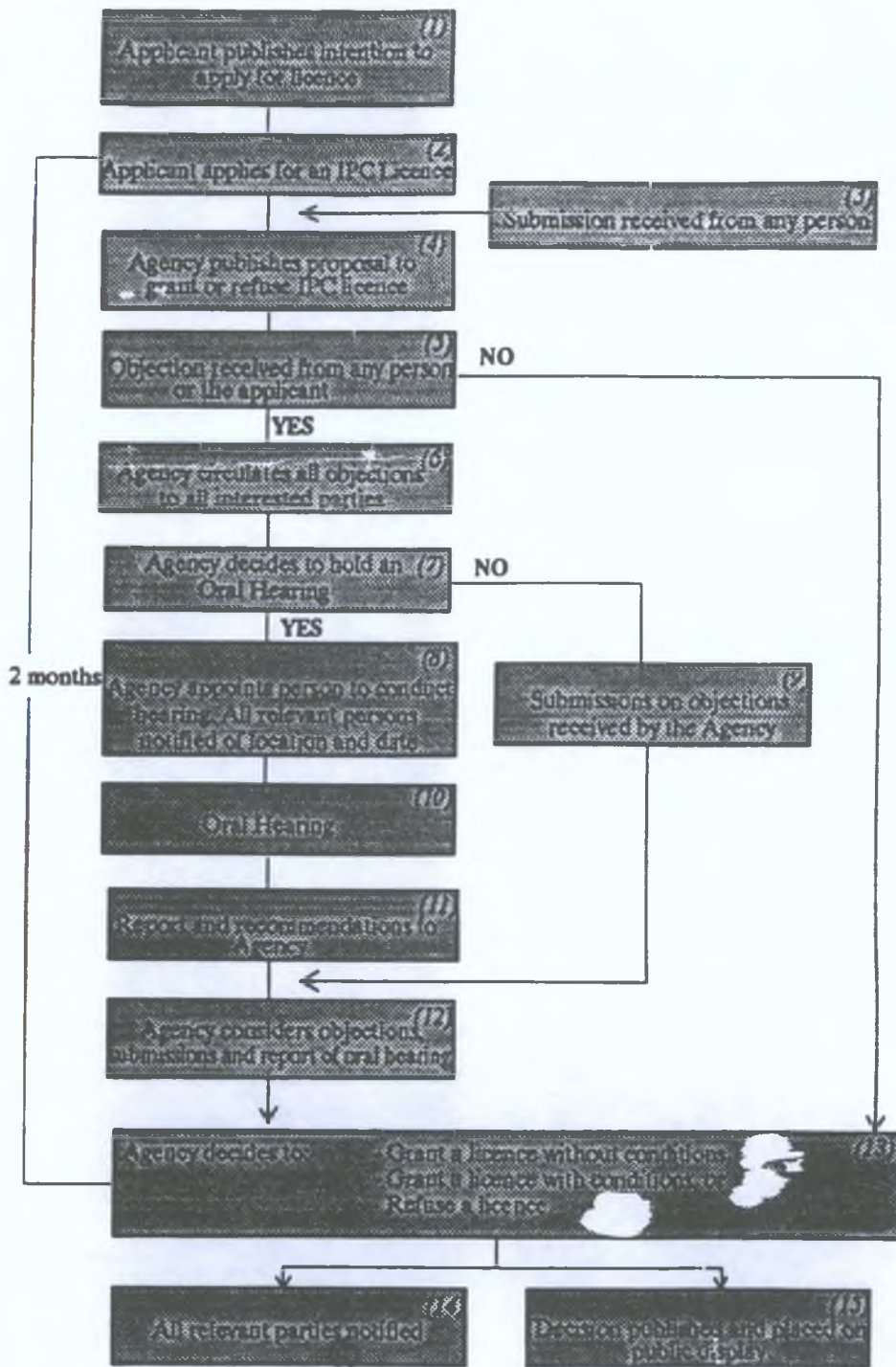
This arose out of an anomaly created by the Environmental Protection Agency (E.P.A.) Act of April 1992, which stipulated that a Planning Authority has no power to refer to environmental conditions in Planning Permissions and, equally as important it omitted to require that an applicant for an I.P.C. licence submit an E.I.S. to the E.P.A. (Moloney, 1994).

5.3 The E.P.A. and current thinking on Environmental Protection viz a viz mining development.

The Environmental Protection Agency (EPA), which was established on 26th July 1993 under the provisions of the EPA Act of April 1992, is in the forefront of the proactive implementation of environmental policies in Ireland. The EPA Act formally incorporates the principles upon which EU and Irish environmental policies are based into Irish legislation. The EPA is an independent public body whose objective is to ensure that a proper balance is achieved between the protection of the environment and the development of the infrastructure and the economy. One of its major responsibilities is the licensing and regulation of activities with significant polluting potential. Licences as based on Integrated Pollution Control (IPC), and cover all aspects of air, water, soil and waste in one integrated licence. It encourages the application of technical solutions through the use of Best Available Technology Not Entailing Excessive Costs (BATNEEC). The technology in question should be Best at preventing pollution and Available is the sense that it is procurable by the industry concerned. Technology itself is taken as the techniques and the use of the techniques, including training and maintenance etc. NEEC addresses the balance between environmental benefits and financial expense. Since 16th May 1994 all new mining proposals in the state have to apply to the EPA for a licence to operate. The Minister has yet to set a commencement date for established activities (i.e. mines / mining activities prior to May '94).

- See fig. 10 IPC Licensing procedure.

INTEGRATED POLLUTION CONTROL: LICENSING PROCEDURES



Source: Environmental Protection Agency

In the identification of BATNEEC, emphasis is placed on pollution prevention techniques, including cleaner technologies and waste minimisation, rather than end - of - pipe treatment

(- see Appendix G- BATNEEC Guidance Note, Class 1.3,

Extraction and Processing of Minerals

Draft form, May 1997)

The impact of EU Directives, particularly the Surface and Groundwater Directives, will continue to be significant for mining operations. As mentioned in 5.1, these Directives include a range of substances / materials / chemicals in two lists appended to each Directive and the EPA has a legal obligation to prevent the introduction of List 1 substances and limit the introduction of List 11 substances. The post - closure phase of a mine has therefore significant implications in this regard in that for as long as emissions from mine waste storage facilities (under - and over - ground) contain listed substances at appreciable concentrations then the facility will continue to remain under the control of the licence obligations (Derham, 1997).

It is interesting to note that Arcon / Galmoy - the first new Lead - Zinc mine in Ireland in over twenty years - submitted an E.I.S. as part of its Planning Application, that is regarded in the industry as one of the most comprehensive ever produced in the state. Planning permission, atmospheric and effluent discharge licences were granted by Kilkenny County Council in 1994. The conditions attached to these require extensive environmental monitoring and control technologies covering the construction, operation and post - closure phases of the mine. Many of the conditions in the discharge licences are based on commitments made by Arcon in the E.I.S. and set new standards in environmental monitoring and control for the Irish mining industry.

These include

- an environmental protection programme for 2 endangered life - forms: the fresh - water pearl and the crayfish
- the use of specially - designed closed - in trucks and storage facilities,
- continuous de - watering of the mine itself thus making it a 'dry' mine and avoiding ground water contamination,
- the provision of both a Regional Water - Supply Scheme (to provide drinking water) and a Water - Augmentation Scheme (Maintenance and daily - care of the systems are also borne by the company itself)
- the provision of an Environmental Information office, which is easily accessible and open to the public, and
- a £4m bond, which will fund the decommissioning or post - closure phase, expected to happen in around 15 years time (Mc Nair, 1997).

Minorca / Lisheen is another new lead - zinc mine in Tipperary which has recently become the first mining development in the state to be issued with a IPC licence. Its after care fund is currently set at £9.5m with a further £1.5m allocated towards raising finance, should the post - closure phase extend towards a longer than expected period. (- Derham, 1997).

This is an interesting development in that cognisance is taken of the fact that the operators may never be relieved of their licence obligations!

5.4 Exploration, mining and the Department of Transport, Energy and Communication.

The Minister for Transport, Energy and Communications is responsible for policy and the regulation and promotion of mineral exploration and development in Ireland. Under this mandate the role of the Department of Transport, Energy and Communication is :

- To encourage and facilitate minerals exploration.
- To promote the responsible development of mineral resources for the economic benefit of the State.
- To administer the regulatory framework.
- To advise and assist the public in geoscience matters.
- To undertake geoscientific mapping and disseminate data through maps and publications.
- To provide a geoscience database, including drillcore.

Within this Department the Exploration and Mining Division deals with minerals policy, the administration of the State mining and prospecting system, and the promotion of mineral exploration in the country. A sister division The Geological Survey of Ireland , is the provision of earth science information and advice. - (Dept. of Transport, Energy and Communications, 1996.)

Prospecting Licences (PL), give the holder the right to explore for specific facilities. A PL covers some 35 sq.km., and (since 1994) is issued for 6 years with renewal if required. Prior to this the maximum licence period was 2 years. Since 1994, all PL's have the following 2 conditional clauses attached to them:

Protection of aquifers

(i) Where drilling or trenching is undertaken in the Licensed area, the Licensee shall take all necessary precautions, including appropriate sealing of boreholes, to ensure that neither the integrity of any aquifer or any Groundwater shall in any way be impaired.

Protection of the Environment and Preservation of amenities:

(ii) The Licensee shall carry out all operations within the Licensed area so as to avoid damage to the environment and the amenities of the Licensed area and to avoid or minimise disturbance of persons resident in the Licensed area. The Licensee shall comply with the relevant requirements of the :

The Local Government (Planning and Development) Acts 1960 to 1993;

The Local Government (Planning and Development) Regulations, 1994;

The Local Government (Water Pollution) Acts, 1977 to 1990;

The Wildlife Act, 1976 and Ministerial Orders made thereunder; and National Monuments Acts, 1930 to 1987.

All rights granted under this licence are subject to the relevant requirements of the above and such other law as may be applicable.

It is interesting to note the reference to the Planning Acts.

Normally, mineral exploration should not of itself have a long - term planning implications or significant environmental pollution potential, and therefore would be considered exempt from planning.

However, part of the problem that arose in Doochary and Fintown, during the uranium exploration, was that the companies did not apply for Planning permission for their stores and offices.

This, of course, proved great propaganda ammunition for the anti - mining side and , naturally enough, would also have been a source of annoyance for the planners and local representatives. Moloney (1994) reported a similar problem that Burmin Exploration encountered with an unauthorised roadway near Croagh Patrick in the late 1980's, when exploring for gold there. In addition the Licensee must abide by the Guidelines for 'Good Environment practice in Mineral Exploration', which are issued by the Department of Transport, Energy and Communications (see Appendix H).

These Guidelines cover such issues as:

- Agreements with landowners and supervision of works.
- Drilling, including location relative to geological features and water sources; construction of boreholes and their sealing after completion; site management; water discharges.
- Trenching, including location relative to sensitive features; fencing and security; water discharges reinstatement.
- Protection of water sources; water discharges.
- Pump and other Groundwater tests.
- Geophysical surveying.
- Restrictions on exploration within Nature Reserves, National Monuments and archaeological sites.

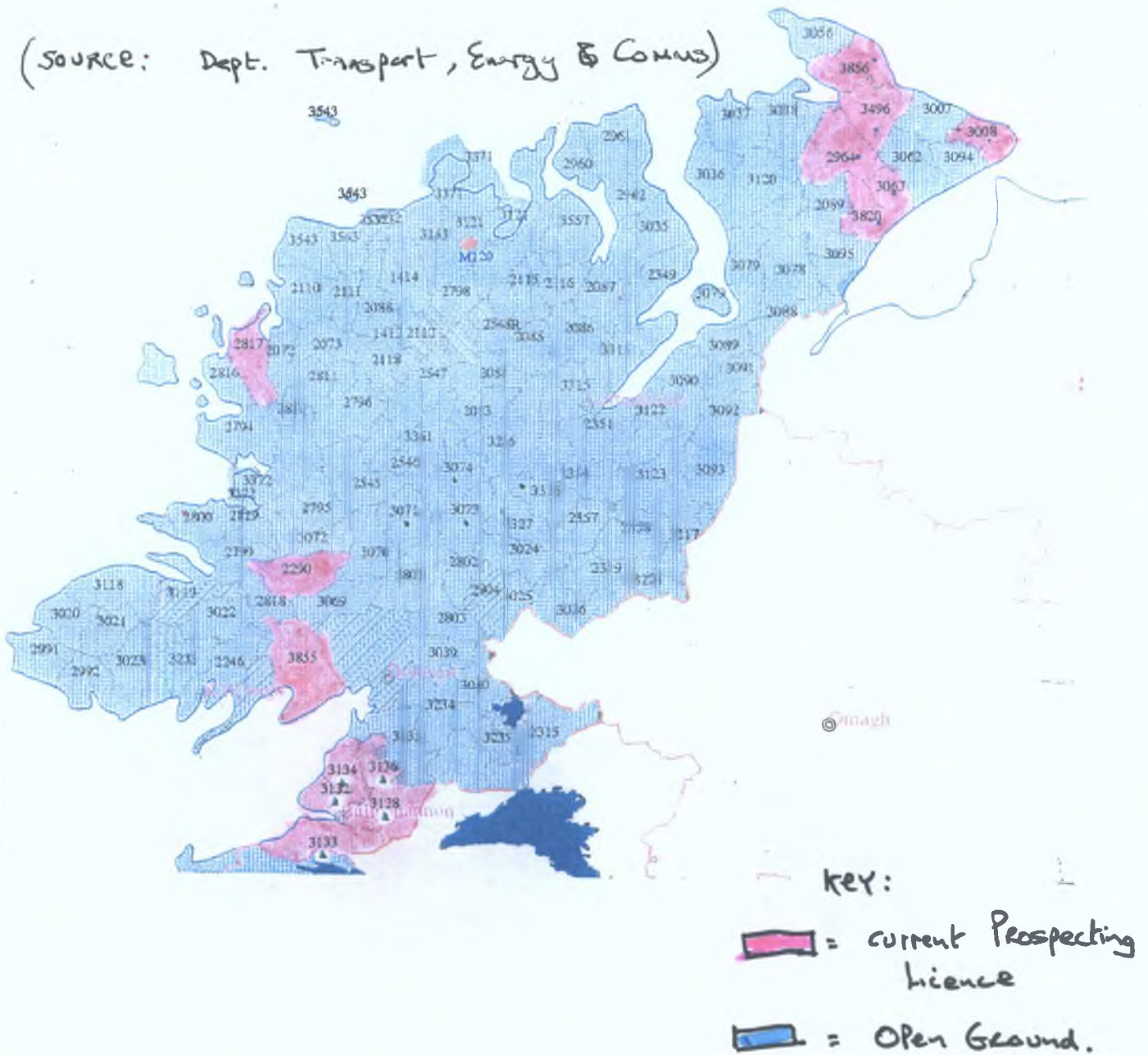
A licensee must indemnify also the Minister for Transport, Energy and Communications against claims arising as a result of activities of the licensee by nominating the Minister as an interested party on the licensee's Third Party and Employer's Liability Insurance. It is important to note that only persons who comply with the requirements of their prospecting licence will be considered for State Mining facilities within the licence area. Mining facilities are either as Mining / leases for State- owned minerals, or Mining Licences for privately - owned minerals. It is also interesting to note that there are currently 3 companies in Donegal with exploration rights to 14 Prospecting Areas, and that one of them - Cambridge Mineral Resources PLC. has a Restricted Prospecting Licence for beryl and gem minerals in an area just north of Dungloe, in the Rosses Pluton (PL 2817 - issued August 1996) - see fig. 12 - Map of Prospecting Areas of Donegal.

Two uranium localities, Meenmore and Skesinarone, are listed by the GSI (1985) and are situated within PL2817. O'Connor (1985) states that uranium is associated with beryl, but that the primary uranium mineralization here would not be as significant as in the Main Donegal Pluton (i.e. the MRZ, north of Fintown). Nevertheless, given the fact of this association of the two minerals, it will be interesting to see how the company intends to ' separate' one from the other!

FIG. 12

MAP of Prospecting Areas of DONEGAL. (Nov '96)

(source: Dept. Transport, Energy & Comms)



5.5 The Radiological Protection Institute of Ireland.

The R.P.I.I. was established in April 1992 in accordance with the provisions of the Radiological Protection Act, 1991. Its functions include the provision of advice, the regulation of activities relating to the use of ionising radiation, the preparation of safety codes and the promotion of knowledge, proficiency and research in nuclear science and technology.

Other functions are to monitor and measure levels of radioactivity in the environment, to assess their significance, to maintain a national laboratory for this purpose, and to assist in the development of national plans for emergencies arising from nuclear accidents.

The Radiological Protection Act, 1991 provided for the dissolution of the Nuclear Energy Board and the subsequent transfer of its functions and net assets to a new body to be known as the Radiological Protection Institute of Ireland - (R.P.I.I.) The Nuclear Energy Board was dissolved on April 1st 1992. (- R.P.I.I., 1996)

In operating and maintaining the national radiation monitoring system, the institute has 12 continuous gamma radiation monitoring sites, 10 air sampling sites and 12 rainwater sampling sites. Malin Head, located at the very northern - most tip of County Donegal has both gamma and rainwater sampling but no air sampling to date. (the nearest being Clones, in County Monaghan).

The European Communities (Ionising Radiation) Regulations, 1991 lays down a maximum annual dose limit of 1 millisievert (mSv) from and radiation exposure for a member of the public and 20mSv for an employee (i.e. in the case of an exploration or mining company). As mentioned previously in chapter 1.3, in the case of domestic radon situation, a background reference - level of 200 Bq. / m³ equates with an annual radiation dose of 5 mSv.

Compare this with the U.K's Sellafield (occupational) exposure limit of 50 mSv (max) for any year, and a total 5 year limit of 100mSv (pers. comm., J. Madden, 1997) and it is seen that the Irish limits are well within established standards.

Incidentally. to put these figures in a health - risk context, Anderson (in 1991) reports that the National Research Council in the USA estimated that non - smoking uranium miners, who work for 40 years from age 20, and receive an annual dose level of 15mSv, will increase their lifetime risk of contracting lung cancer, from about 11 in 1000 to 15 in 1000. Granted this is a 36% increase, but the figures are again put in context when by the same calculations, smokers ordinarily (non uranium miners) have a lifetime risk of 250 in 1000 (i.e 1:4).

No figures are available for uranium - miners who also happen to be smokers, but allowing for the above percentage would definitely take it past 1:3 and probably closer to 1:2. If further exploration or indeed uranium mining were to take place

in Donegal, then the Radiological Protection Institute of Ireland would be involved in issuing a licence and the above limits of 1mSv (public health) and 20mSv (occupational) would apply as they exist under the current "Ionising Radiation Regulations S.I. 43. It is unclear as to how monitoring / breaches would be regulated other than via a full time monitoring / sampling station.

Also, the question of Air Pollution arises (i.e. Radioactive particulates) and the absence of criteria for same under a possible I.P.C. licence, from the E.P.A. Neither is any mention of this made in the Draft Batneec Notes - class 1.3 - "Extraction and Processing of Minerals".

As an Air Pollutant, we have already seen previously (chapter 5.1), that since May 1994 mining and mineral extraction / processing are no longer subject to an Air Pollution Licence from the Local Authority because the I.P.C. licensing control is now encapsulated in this activity. Whilst it is accepted that the R.P.I.I. are indeed the authority in these matters, nevertheless it is the author's opinion that an anomaly exists currently from the point of view that this particular form of air pollution is not regarded as part of the overall 'integrated' (i.e. I.P.C.) licence.

Furthermore, ionising radiation being an obvious health and safety hazard, presents the Health Board and the National Authority for Occupational Safety and Health (i.e. the Health and Safety Authority) with another anomaly - will they be monitoring (separately) according to the existing Ionising Radiation Regulations (S.I. 43), or according to their own particular set of regulations, as set down under their own existing legislation (i.e. the 'Health Acts, and 'Safety, Health and Welfare at Work Act') ?

5.6 Various Other Bodies with Environmental Protection Responsibility.

Under Article 20 of the Environmental Protection Agency (Licensing) Regulations 1994 a number of listed bodies must be given prescribed information relating to IPC licensing and also copies of submitted EIS's where available.

These include:

- the Commissioners of Public Works,
- the Health and Safety Authority,
- the Central Fisheries Board,
- the Local / Sanitary Authority ,
- the Minister for Transport, Energy and Communications,
- the Health Board,

- An Taisce,
- Bord Fáilte,
- Teagasc,
- the National Monuments Advisory Council.

At the time of writing (April 1997), the SAC (Special Areas of Conservation) Regulations have been enacted by the Minister of Arts, Culture and the Gaeltacht and it is very likely that such prescribed information will also have to be submitted to him.

It is also of note that since February 1978, all Government Ministers are required by Government decision to ensure that the environmental effects and implications of policies , programmes and projects prepared or undertaken by their Departments or by bodies reporting to them were fully considered before decisions were taken and that any decisions taken took due account of environmental policy (Scannell, 1995) Whilst the ultimate aim at the heart of this concept is very commendable, nevertheless it does allow for political intervention at a particular Minister's whim. Last year (1996) the Masonite Timber Project in County Leitrim was an example of this in action when they had submitted their Planning Application and EIS to the appropriate bodies Minister Higgins (Arts, Culture and the Gaeltacht) initially made a very public objection to the proposals.

Moloney (1994), reporting on gold mining in the West of Ireland, states that the 1940 Minerals Development Act gives extreme power to the Minister (Transport, Energy and Communications) in that he has 'absolute discretion' in regard to refusing a licence. He also reports that the Minister banned mining development on Croagh Patrick on religious and cultural grounds which was perfectly at his discretion. Currently there are no qualifications or conditions to this absolute discretionary power. In the case of a mining development, which is subject to Planning Permission and E.I.S., the Local Authority cannot attach Planning Conditions pertaining to environmental protection, as it is deemed to be independently dealt with by the E.P.A. in the E.I.S. / E.I.A. process.

This same line of thought should now be embraced with regard to Ministerial power i.e. by revoking the 1978 'Ministerial Responsibility for Environmental Matters' and the absolute discretionary power, which the Minister for Transport, Energy, and Communications has under the 1940 Minerals Development Act.

Incidentally, also at the time of writing the Government has just announced the National Strategy for Sustainable development (21st April, 1997) which reportedly took a year or so to negotiate between the Departments of Environment, Enterprise and Development, Energy, and Tourism and Trade - each of which have very differing sets of criteria and agendas. Under the strategy, a new framework designed to achieve objectives such as the establishment of an independently chaired National Sustainable Development Council “to facilitate participation by economic, social and environmental interests”.

The Council would include wide representation from the social partners and environmental NGO’s (non - Governmental Organisations) and its role would be to advise the Government on “ the implementation of policies and actions under this strategy and assist in the monitoring and review process”. (Irish Times, 22nd April -97). At a precursory and initial glance, it appears to be incorporating, Planning, Agriculture, Forestry, the Marine, Energy, Industry, Transport, Tourism and Trade into every level of decision making and attempts the integration of both development and environment.

On the global stage, this summer (June - July 1997) sees UNGASS (the United Nations General Assembly) coming together in New York to review AGENDA 21 and the concept of sustainable development which was first aired at the 1992 Earth Summit in Rio de Janeiro.

Chapter 6 The role of Local Government: economic Development versus environmental protection:

6.1 Local Government

The Irish Local Government system is largely that inherited from the British and much of the original legislation still applies. The first County Councils were established just under a hundred years ago, with the passing of the Local Government (Ireland) Act, 1898, and the 1925 Local Government Act introduced the Management System which was subsequently extended by the County Management Act, 1940. (I.P.A., 1995).

Local Government is said to exist for two reasons:

- firstly, as a provider of important services, such as housing, roads, water and sewerage, and planning.
- secondly, it enables local people to decide on their priorities, their level of taxation and their level of services.

O'Donnell (as in I.P.A. 1995) points out ... “ Local Government furnishes a means by which local communities and the people who form part of them can fairly readily participate in the process of Government and Administration “.

Article 3 of the European Charter of Local Self - Government (1985) States: “ Local Self - Government denotes the right and the ability of Local Authorities, Within the limits of the law, to regulate and manage a sustainable share of public affairs under their own responsibility and in the interests of the local population. ” Although responsibility for the protection of the environment lies primarily with the Department of the Environment execution or administration of much environmental legislation is the responsibility of Local Authorities.

Donegal County Council plays a leading role in ensuring that the environment enjoyed by the people of Donegal - the quality of air, water and land - is up to the highest standards. It does this by supplying water for domestic, industrial and agricultural use, by disposing of wastes, and ensuring that National and European environmental regulations are adhered to.

6.2 The County Council and the Development Plan

In Ireland, the main planning legislation is the Local Government Planning and Development Act 1963 and its various amendments. Under this legislation the starting point of the planning process is in the preparation of the Development Plan by the Planning Authority (i.e. in Donegal this would be Donegal County Council).

Justice Mc Carthy (as reported by Thorn 1995) described the development plan as “ an environmental contract between the Planning Authority, the Council and the Community,

embodying a promise by the Council that it will regulate development in a manner consistent with the objectives stated in the Plan and, further, that the Council itself shall not effect any development which contravenes the Plan materially...”

Donegal’s current Development Plan dates back to 1988, whilst a Draft Plan is currently being prepared and expected to be adopted in July 1997 (prs.comm. E. Quinn). By law, Development Plans are meant to be reviewed every 5 years but Scannell (1995) reports that a survey carried out by an Foras Forbartha found that, nationally, over one third of all Planning Authorities had plans that were over five years old.!

The Donegal Development plan contains the following policy relating to Rural Development Control vis a’ vis mining / mineral extraction.:-

“ 2.7.7. Quarries and Mineral workings which have been abandoned will require planning permission to be re - opened.”

Moloney (1994) reported that Mayo County Council inserted a ban on mining in their Development Plan but that Justice Blayney found it illegal because its negative stance was a block on development. Grennan (pers. comm.) reported a similar attempt by Offaly County Council to ban mining and minerals extraction in their Development Plan. Contest this with Tipperary’s (North Riding) Development Plan (where the new Minorca - Lisheen zinc - lead mine had recently commenced) which will “encourage and safeguard existing and future mineral extraction in the area and will also facilitate subject to appropriate conditions, the exploration of any future mineral deposits that may be found in any part of the County...” and that it will also ...” ensure that all mineral activities current or future will not result in damage to the environment”.

With 14 Prospecting Licences (PL) currently granted in Donegal and the potential over the next 10 years for this to ‘mushroom’. it is imperative that the new Development Plan for Donegal has both a positive and balanced framework that will address both aspects (i.e. development .v. environment) of this sensitive issue.

6.3 Agenda 21 and Donegal County Council

'Agenda 21', is the United Nations programme for Sustainable Development for the 21st century which evolved initially from the 1988 publication by the World Commission on Environment and Development chaired by the Norwegian P.M. Ms Gro Harlem Brundtland and which was subsequently further developed at the 1992 Earth Summit in Rio.

In essence environmental sustainability is determined by the impact of human numbers, the impact of specific human activities, the impact of the scale of specific human activities and human population locations.

In the broadest terms sustainable development is achieved through minimisation of energy and raw material consumption, minimisation of the degradation of the environment by not exceeding the assimilative capacity of ecosystems. Some of the specific tools that can be used to help achieve these aims include stabilisation and control of point and diffuse emissions, population control, combating desertification and drought, management of the function of harvesting of ecosystems, e.g. agriculture, fisheries, forests etc., increasing the efficiency of transportation systems, management of waste, energy management and research (- Thorn, 1995)

It's basic catchphrase - " Think Globally, Act Locally" sums up the concept behind it.

In County Donegal a number of events have occurred over the last 2 years by "Agenda 21" -

- the implementation of the 'Towns / Villages Renewal Programme' using Local Area Teams (comprising of a partnership between the County Council, local development organisations and local representatives)
- the delivery of the Council's services (e.g. Roads, Housing, Sanitary, Planning) on an electoral area basis where both Council staff and the public representatives meet to discuss / organise / review each programme section proposals and plans.

The author has first hand experience of the above and is of the opinion that this 'bottom - up' approach to decision - making has greatly assisted in consensus development between all bodies.

This concept could also be used if / when the debate arises regarding uranium mining or indeed the whole issue relating to exploration / mining / minerals development and protection of the environment (assuming the Development Plan contains a balanced policy statement to this effect).

Another positive result from this would be the disappearance of political interference, as groups or various bodies, having already reached consensus, would no longer require the need to lobby their public representatives -

Although Donegal County Council has been to the forefront as regards overhauling its system of Local Government, the Minister for the Environment announced in February 1997 “ Better Local Government - A Programme for Change” in which he set out a national blueprint to enhance local democracy (through stronger community involvement and partnership between Local development and Local Government) and to improve on the quality of services (by better co - ordination and integration leading to a more ‘Customer Friendly’ delivery).

It is expected that all County Council’s will follow over the next 2 ½ years so that the target date of 1st January 2000 can be achieved for the integration of local government and local development (I.P.A. Feb. ’97).

This follows on from the 3 principles of ‘Trust” currently being promulgated in serving the public. i.e.

- openness
 - transparency
 - accountability
 - excellence.
- (to which now can be added)

6.4 **Scoping**

Scoping is regarded as the initial or preliminary phase to the EIA / EIS process and its purpose is to identify the likely issues of relevance in an environmental impact assessment or, to put it simply, it is an exercise which sets out to establish a detailed brief / terms of reference for the EIA.

Davies (1990) states several other objectives in establishing the ‘scope’ of an EIA. :-

- it provides an opportunity for public involvement.
- it saves time
- it facilitates the efficient preparation of the EIS

Thorn (1995) reports that if the EIA / EIS is to be accepted by all the parties involved with or affected by the development then it follows that determination of the issues that are to be addressed in the EIA / EIS should be as broadly based as possible and involve not just the Planning Authority or the project proponent. The US Council on Environmental Quality (C.E.Q) introduced in 1978 regulations established scoping as a formal requirement in the EIA / EIS process. In both Canada and the Netherlands, responsibility for scoping lies with a panel of experts who undertake the task on behalf of the competent authority.

The EC Directive (85/337) on EIA / EIS is not clear on the extent to which public consultation must be a part of the process. In view of the sensitive nature of mining and minerals extraction, it may actually be better to have a formal or specific regulation on this aspect in Ireland. It is also interesting to note the CEMP scoping study undertaken in 1989 on behalf of Gold EIA in relation to proposed mining of gold in the West of Ireland.

Gold EIA was a Non - Aligned or Neutral committee comprised of various bodies (e.g. An Taisce, Bord Failte, County Councils, Fisheries, Agriculture) who commissioned an independent study to be undertaken by the Centre of Environmental Management and Planning (CEMP), at the University of Aberdeen.

Davies (1990) reports on a number of benefits to be gained from the wide involvement of the public in the 'scoping' meetings:

- they provide the proponents with questions and concerns expressed by the local people and other agencies and which might not have been evident from discussions involving only the developer and planning authority.
- they provide the developer to explain informally the project in a non - adversarial atmosphere.
- they allow possible contentions issues to be discussed in an 'open - forum' format.

The CEMP study generated a large amount of information, from widely ranging sources and in widely ranging forms. Following the data gathering exercise an analysis of the concerns was undertaken and eventually assimilated into 4 main areas:-

- tourism
- fisheries and mariculture
- employment
- cultural / religious aspect.

As previously mentioned, Moloney (1994) reports that despite various to - ing and fro - ing regarding "banning / un - banning" in the Mayo Development Plan and also some skirmishing as to Unauthorised Development contravention's, it ultimately fell to the Minister (for Transport, Energy, and Communications) to refuse the granting of the licence on the 'cultural / religious' aspect that was highlighted in the initial study.

From interviews of those that lived through the Uranium Campaign in Doochary / Fintown and also from analysing the literature review which reported on the public meetings at the time, the main concerns expressed can be summarised as follows:-

- the Biohazard - risk to human life, livestock, fisheries and herbage,
- Air, Ground, and Water Contamination,
- loss of visual amenity - landscape,
- Socio - economic concern - loss of quality of life,

These will be addressed in more detail as part of the next chapter.

Chapter 7: Politics and the Environment

7.1 Public perception : risks and fears.

In the past mining companies have made more enormous mistakes with regard to their environmental impacts but it must be remembered that usually the companies were then acting with the best knowledge and technology available at that time (B. A. T.). Nowadays, the body of knowledge about mining and the environment has substantially grown and the impacts of mining on the environment are more controllable and predictable.

Allowing for those genuinely concerned about certain projects, there has always been a certain element of the NIMBY (NOT IN MY BACK YARD) - syndrome attached to the likes of mining / minerals Development Burke (1997) states also that the “It” factor (Irish temperament : rugged contempt for authority and an unwillingness to suffer even minor inconvenience for the greater good of the community) may indeed lead onto NOTE (Not Over There Either) or ultimately BANANA! (Build Absolutely Nothing Anywhere Near Anybody). However he comes up with a forum or framework aimed at consensus development and which could be described as a combination of the ‘scoping process, previously mentioned in chapter 6.4, and something similar to the recently announced (April 1997) National Sustainable Development Council, which aims to integrate the environment into very level of decision making.

We do not have to go to Canada, Africa or Australia to find examples of both good and bad as regards mining. Tara Mines at Navan, County Meath is universally regarded as a model mine in terms of the environmental protection measures it has in place; approximately £250,000 per year is spent on environmental protection, and there are a number of full time employees on site for the purpose of environmental management (-Moore 1996)

Compare this with Tynagh Mines in County Galway, which opened in 1965 and closed fifteen years later leaving 2,000 acres of land unusable due to the quantities of heavy metals to be found in the soil (Moore 1996). People are inherently suspicious of that which they do not understand, so unless communication is entered into, claim and counterclaim will mount and conflict is likely to arise. Risk perception is central to people’s reactions to developments, and unless they accept a project, it is likely to be dogged by protests. As well as encouraging and developing more open interaction with the public mining companies / developers can improve the image of their industry by insisting on proper accreditation for all aspects of their workings and also, ultimately , EMAS registration or ISO 14001 certification, as regards their environmental management systems.

7.2 Politics and political issues.

Environmental protests rely for their power on mass support. Public support can swing for and against groups. The media are an essential tool for environmental groups and provide a way of reaching a mass audience. Industry tends to shy away from the media, afraid of negative publicity.

Allen and Jones as reported in Moore (1996) states the importance of local grassroots activity in the form of politics. Writing in 1990 about the Donegal uranium exploration. ' while the DUC (Donegal Uranium Committee) members individually might have supported various other political campaigns such as the CND and the Anti - Nuclear movement, they saw the success against uranium mining in Donegal would result from a single issue, locally based and respectable campaign : the DUC was trying to get the support of the local community, was trying to get the County Council on their side and this wasn't going to happen if your going to have people running around burning JCB's '. Also the DUC secretary was also quoted (in Allen and Jones, 1990): " It was the mass support of the public that really won the campaign ... there was I think , 276 landowners in the locality and 274 signed a petition to the prospecting companies to stay off their land. Now with that kind of support, the mining companies can't operate, and that's what won the campaign in the end".

Whilst the author agrees with the facts as reported , nevertheless several other situations happened to coincide around 1980 - '81, which also had a bearing on the uranium exploration being discontinued in Donegal in early 1981. As previously reported, the exploration companies stated in their latest findings ' encouraging results' with 15% of the Main Radiometric Zone (MRZ) explored to date. They also admitted that their progress or lack of progress was due to the organised counter - activities of the anti - uranium group.

It is also interesting to note that the commodity price of uranium shot up ten fold in the seventies only to fall back in the early 80's to half of this. There was also a major change of government policy as regards energy production between 1977 and 1982. In 1977, the then Minister for Energy advocated that Ireland must have nuclear power if it is to have an adequate supply of energy for the 90's (Irish Times, 24/7/80). In 1978, natural gas production began its first deliveries from Marathon's Kinsale field and by 1983 natural gas reached Dublin. In early 1981, a new Minister for Energy advocates a grater emphasis on conservation and alternative sources which allows for the shelving of the Carnsore Nuclear Station. On the European front also, the political borders were being widened with new members about to be welcomed into the expanding EEC. This would have eased any worries regarding internal sources of energy supply that the EEC would have had as in the 1973 - 74 oil crisis. It is the authors contention that it was a combination of both National / Global politics and local / grassroots politics which allowed the Donegal uranium exploration to be shelved.

Another interesting phenomenon which is currently very topical is the idea of putting forward political candidates on a particular issue in a General Election i.e. in Donegal South West constituency there is an anti - M.M.D.S. candidate selected. It is also this authors contention that situations like these can be avoided by the 'scoping' process, and by involving the general public in comprehensive discussions and participation in the decision making

By so doing, this avoids the 'confrontational / adversarial ' nature of the grass - roots and thus the undermining of rural politics, which can happen when these sensitive issues arise at or near re - election time ! (footnote:- T. Gildea T.D., Independent / Anti - MMDS, elected June 1997).

7.3 Economic Bonanza or Environmental Blight

7.3.1 Jobs

The prospect of jobs and steady employment is always a very emotive topic whenever it arises. The twenty or so jobs created in Doochary / Fintown from 1978 - 1981, during the initial exploration stage, in an area with very little or no industry, provided a bonanza, even if it was indeed rather short lived. If mining were to go ahead, at some future time, and given the relatively short construction stage normally envisaged for such projects (1.5 to 2 yr), it is a safe estimate that up to 200 workers would be required during this stage, based on recent mine - construction projects in Ireland.

Even allowing , optimistically, that half of these can be taken up locally, it means that either commuting and / or come to live in the region for the duration. The spin off for the 'B & B' trade would be reasonably substantive in an area that up to now has not at all benefited economically from the tourist - accommodation trade. Also if / when production started it may be conservatively estimated that between 50 to 100 jobs would be created, for a period of between 10 to 15 years. Allowing a figure of 20% of these would be specialised (management, scientific) then it can also be safely assumed that another influx of new residents will take place into the area.

In an area of Donegal which has seen a steady decline over the last number of decades (Donegal Development Plan 1988) then this expected impact of de-population reversal would be much welcomed. On the other - hand, if it were the case that say 300 - 500 jobs were to be the projected figure for the mining stage, it could also be argued that a sudden and large influx of new residents would dramatically alter the socio - economic balance that exists, and thereby impact on the quality of rural life currently enjoyed by inhabitants.

7.3.2 Infrastructural Improvements

Recent mining Developments (e.g. Arcon / Galmoy) have had to provide new water - supply schemes and the strengthening and improvements of the public road system. Applied to the Fintown - Doochary locality this could mean a complete new water supply scheme for the region and the upgrading of the Doochary / Fintown / Glenties Regional Roads (R252 and R250), assuming that Killybegs would be the probable port of export of the ore. Another possibility is that the disused Fintown - Glenties railway line could be promoted as an alternative means of transport.

Also any dwellings or buildings which are identified as liable to an increased level of Radon arising from the possibility of it being along an infiltration - pathway, may require remedial - works in order to reduce the levels or prevent its ingress. As already mentioned, the expected influx of workers and new residents would require a substantial number of new dwelling - houses to be built which in turn would necessitate the 2 villages (Fintown & Doochary) being supplied with adequate sewerage - schemes.

7.3.3 Blots on the Landscape

In the past, mining and particularly open - cast mining, has had tremendous and detrimental visual impact on the global environment. The hills of central Donegal have remained intact for hundreds of thousands of years. They remain a source of joy and wonderment for both inhabitants and passers by, and an interesting challenge for walkers and climbers.

Even allowing for underground mining and the best laid - out screening / planting proposals, it is generally accepted that there is always going to be a certain amount of general visual intrusion, what with the likelihood of natural subsidence in places and the placing of over ground facilities.

Also as the area has great potential in the leisure - tourism market (i.e. walking, cycling, fishing), there is the distinct possibility that this would be restricted or its growth impeded if mining were to go ahead in the future.

7.3.4 Air, Ground, Soil and Water Contamination

As would be expected, this is one of the main issues that kept recurring during the Uranium campaign during 1978 -'81 and would naturally appear again if / when any future scoping - study were to be carried out.

With the possible exception of the radioactive - element, the current E.P.A. requirements regarding E.I.S. and I.P.C. licensing would be deemed adequate to address the environmental - pollution concerns.

Also, newer and changing mine technology presents the possibility of reducing the risk of impacts on the environmental. Indeed, a developer equally concerned with reducing / minimising environmental pollution, may opt for BAT rather than BATNEEC and, furthermore, base his strategy according to the Precautionary Principle i.e.

- eliminating and preventing polluting emissions discharges where there is reason to believe that damage or harmful effects may be caused even where there is inadequate scientific evidence to establish a causal link .

To go back to the EIS, the EPA regards the geosphere as an important receptor of contamination and, as such , require detailed studies / models dealing with hydrology , hydrogeology and geochemistry in the EIA / EIS process. Indeed for I.P.C. licensing an Environmental Fate and Toxicological report is now becoming a normal aspect of the procedure (-Derham, 1997).

Another issue which arose during the Donegal Uranium Campaign was the tailings pond, its stability and its perceived long term high risk - status. Concern regarding the ' radioactive' nature of the waste is the fundamental fear here, and if with appropriate control - technology this can be proved to be kept to acceptable natural background levels, then the issue reverts to the overall question of stability of the structure and permeability of the liners or lining systems.

7.3.5 The Biohazard

Mac Gaoithín (Aer Lingus, Young Scientist Project, 1997) in his survey identified this as the main negative concern among the inhabitants (with job prospects being the corresponding ' positive ' interest). Although, Chernobyl - which occurred 5 or 6 years after the Donegal Uranium Campaign was at it's height - was cited and Sellafield, as reasons (in 1996) for people's concern against minerals development in the locality, Mac Gaoithin also reports that when asked why there were against the drilling, and exploration activities at the time (i.e. 1978 - 81) a high number of respondents (90%) cited " danger to livestock " as their main concern.

The respective figures for quotes for ' human - health danger ' and ' environmental damage ' are 75% and 70%. The area in question has a high level of sheep farming, and it is very understandable that any activity which would even be regarded as having the remotest effect on people's livelihood would be regarded in a very negative manner. It would be imperative and highly desirable that the various bodies with responsibility in this area - the R.P.I.I., the Health Board and the Department of Agriculture - would liaise at a very early stage (even pre - 'scoping') to establish a bench - mark initially in order to carry - out a baseline study as regards all biological parameters involved.

Chapter 8 Conclusion

8.1 Review

Possibly part of the title of this Thesis is somewhat misleading : Uranium mining (up to now) never happened in County Donegal , merely a very preliminary survey which accounted for 15% of the Main Radiometric Zone (MRZ) before operations ceased. No feasibility - studies were ever carried out either. It is very unlikely that this specific issue will ever arise in the medium - term (20 years hence), with Government and E.U. energy policies concentrating more so on alternative ‘ greener ‘ sources.

The present targets set by the Department for such sources are : 6% by the year 2000, increasing to 14% by 2010. Politically, also the threat of nuclear - war has receded practically into oblivion with improved relations between East and West, which has resulted in a dismantling of some of the nuclear arsenal and a dramatic drop in demand for uranium and such products world wide.

However a recent study by Dr. Craig Bond Hatfield (as reported in ‘ Nature ‘ magazine , Irish Times - 9May 1997) has calculated that global oil - reserves will be depleted by 2036, with severe supply - difficulties being experienced in the preceding 15 to 20 years. If this turns out to be so, and if the ambitious alternative targets are not reached, then the situation may again revert to what happened in the mid 70’s i.e. a huge push to quickly identify and mine any viable uranium ore bodies discovered.

Both the literature reviews and the interviews of participants in the 1978 - 81 “ Campaign “, clearly show what happens when there is no scoping carried out and also a general lack of openness / transparency for various reasons on all sides involved.

The setting up of the Environmental Protection Agency, the requirements for E.I.S. and I.P.C. licence have indeed improved the situation from the regulatory side, all but a number of small but important anomalies remain to be addressed at a number of various interfaces (see following recommendations). The analysis of the campaign also points out the necessity of Consensus Development, particularly at the ‘ grass roots ‘ or bottom up interface with the developer, leading then to a liaison stage with Planning Authority and other bodies such as An Taisce, Department of Arts, Culture and the Gealtacht . In advocating an approach like this to the situation, a framework is presented which provides a solution to a recurring problem that is inherent, if not peculiar, here in Ireland : That is taking the environment out of the political arena, or put simply - a de - politicising of the environment. Donegal according to the G.S.I. Minerals Localities Map, has vast potential for minerals extraction. However, a framework must be put in place to allow an open and transparent discussion by one and all and a systematic approach advocated which will streamline all levels of decision making in the process, which may ultimately provide a balanced, scientific and environmentally conscious solution. The study presented here could equally be applied to any number of other (equally as polluting) commodities, which occur in Donegal

Beryllium,
Arsenic,
Molybdenum,
Copper,
Gold,
Asbestos, or Lead / Zinc.

It could equally as well be applied to a possible Talc - Mine in Mayo or Calcite in Clare.

Finally, recommendations are listed in bullet form for the sake of clarity.

8.2 Recommendations

At a local level:

- **Communities and other NGO's to be widely consulted prior to EIA/EIS by means of Comprehensive Scoping Exercise.**

Consensus Development

- **Planning Authorities to develop more formally the idea of Local - Area Councils, as mooted in current Local Government reforms, where closer / more direct partnership would exist between technical and administrative staff and local representatives .**

Developers / Exploration & Mining Companies

- **Should have highest accreditation values achievable in order to engender trust and prove excellence e.g. certification to ISO 14001, EMAS.**
- **Employ highly competent Environmental Scientists and Managers**

Planning Authorities

- **Should ensure their Development Plan include a pro - active, balanced policy statement re: Mining / Mineral Development and the protection of the Environment.**
- **Should also employ qualified, and experienced, Environmental Officers in order to competently assess EIS's and advise on environmental matters.**

Department of Energy / R.P.I.I. / E.P.A.

- **Should address anomaly re: ' radioactive minerals ' i.e. Draft ' BATNEEC Notes and I.P.C. licensing system do not take account of radioactive particulate and / or radioactive contamination.**

- **Department of Energy, at exploration stage, to monitor more formally the Developer’s activities through a Local Liaison Committee (comprising Local Community, Planning Authority, and Exploration & Mining Division)**
- **Should clarify what roles other bodies like Health Board and ‘ Health and Safety Authority ‘ would have as regards public and occupational exposure to Radiation, and what mitigating actions they would propose taking under various scenarios.**

Ministerial Responsibility

- **Revoke “ Ministerial Responsibilities for Environmental Matter“ (1978) which all Government Ministers have, and leave environmental - protection entirely with the E.P.A.**
- **Revoke that section of the 1940 Minerals Development Act, which gives the Minister for Transport Energy & Communications absolute discretionary power.**

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APPENDIX A

Summary Schedule / Timetable of Events

- 1973 / 74 :** Oil / Energy crisis
- 1976 / 78 :** EEC - funded Uranium exploration in Ireland
- September 1979:** Munster Base Metals and Anglo Utd. announce Uranium occurrence in Fintown.
- September 1979:** Opposition groups formed.
- January 1980:** Donegal Uranium Committee formed.
- January 1980:** Donegal Co. Co. disagree on environmental report being carried out by an Foras Forbartha.
- February 1980:** The Gleann Leithin confrontation: locals and Exploration Company fail to agree on alternative water - supply.
- March 1980:** Gweebarra protest rally
- March/April/May 1980:** Arson attacks on company property.
- August 1980:** ' Carnsore Rally' issue switches from anti - nuclear to anti Uranium.
- July/August/Sept. 1980:** Munster Base Metals being pursued on account of unauthorized development by Co. Council.
- August / Sept. 1980:** Companies become more P.R. conscious.
- October 1980:** Donegal Co. Council agree to pay towards independent study.
- November/Dec. 1980:** Companies accused of slush - funding politicians in run up to Bye - Election
- January 1981:** Donegal Co. Council request (unsuccessfully) Department not to issue any more Prospecting Licences.

- January 1981:** Donegal Co. Council contribute £6,000 towards the 'Political -Ecology Research Group' of Oxford for their study.
- March/April 1981:** Uranium Exploration ceases.
- Through mid 80's :** Exploration for other minerals (Lead,Zinc,Barytes) continues.

uranium
exploration-
the facts

This booklet has been issued by the companies currently exploring for uranium in Donegal. It attempts to explain the companies' activities and allay any fears which may exist.

We hope that you will take the time to read it and that you will give careful consideration to its contents.

the facts

- * Uranium occurs naturally and is to be found in most rocks and natural waters of the earth. It is more abundant than silver and less abundant than lead.
 - * Uranium decays slowly and naturally through a number of steps finally ending up as lead. It is the step through radon gas which has caused the greatest concern.
 - * Rocks containing uranium are naturally exposed and further exposure is constantly caused by a wide range of domestic and industrial activities. These exposures regularly release radon gas to the atmosphere.
 - * Radon gas is a natural element to which we are all constantly exposed in varying measure.
 - * Radon gas released from newly exposed ground reduces to a steady rate of release over a period of 30 days. The initial release will have decayed to other elements during that period.
-

-
- The activities of the prospecting companies expose only minute additional areas of uranium bearing rock. The whole planned drilling programme in Donegal will create less radioactivity than the preparation of foundations for 10 conventional houses.
 - Even if prospecting activity is brought to a halt, uranium, perhaps in very high concentrations, will still be there.
 - The discovery of an economic uranium ore body would bring significant economic benefits to Donegal and particularly to the area in which mining takes place.
 - Uranium mining can now be conducted in safety and to high environmental standards.
 - If uranium mining were to take place in Donegal, it would be subject to standards imposed by national and international regulatory authorities.

introduction

The people of Donegal have heard much on the subject of uranium exploration in recent months.

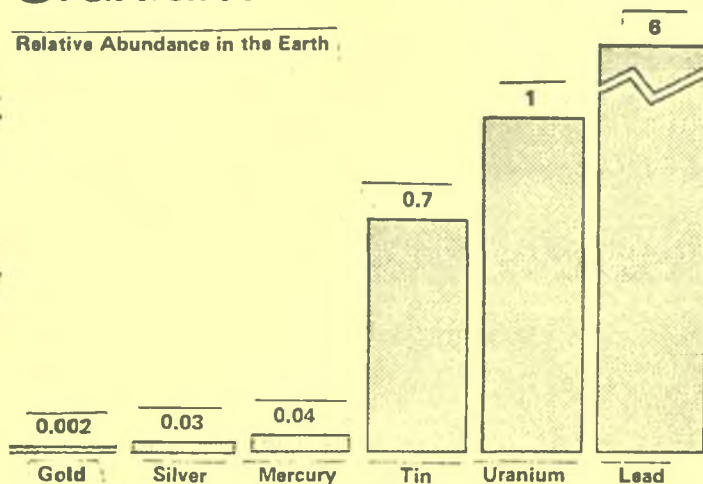
Most of this information has come from individuals and groups opposed to uranium prospecting and mining and many of the arguments have been exaggerated and overdramatised. Uranium exploration and the atomic bomb have been frequently linked - an argument similar to condemning electricity because of the existence of the electric chair. Groups from outside Donegal, who have been active in opposing the development of a nuclear power station in Ireland, are now directing their arguments against the activities of companies exploring for uranium. They are not deterred by the fact that exploration for uranium represents a totally different situation or that the companies involved are, at this stage, simply trying to define the extent of something which already exists.

Uranium—a very common substance

Uranium is one of the more common heavy elements in the earth's crust. It is in most rocks and soils as well as rivers and oceans. Traces can be found in food and human tissue. Concentrations of uranium vary from substance to substance and place to place. Granite, which makes up 60% of the earth's crust, averages four parts per million (ppm) uranium, and some phosphate rock (used for fertiliser) is as high as 400 ppm. About 3 ppm is also present in coal. The abundance of uranium in the earth in relation to some other elements is indicated in the chart below.

Uranium

Relative Abundance in the Earth



Uranium in its natural state goes through a process of decay in the course of which it forms a variety of other elements. It finally stabilises as lead. Two of the elements produced during the decay process are radium and radon gas.

Much has been said about Radon gas and the dangers associated with it. Here are some important facts about it.

- * Radon gas can be released every time the surface of the ground is disturbed in any way. So, ploughing of agricultural land, for example, can release comparatively large quantities of radon gas.
- * Radon gas disperses rapidly once it comes in contact with the atmosphere and decays very quickly to a steady state.
- * The quantity of Radon gas released to the atmosphere by exploration or even by uranium mining activities is miniscule compared to that released by other more 'normal' forms of land disturbance.

uranium in donegal - widespread and very old

Uranium has been present in the rock structures around Fintown and Doochary and indeed throughout Donegal, for literally millions of years.

Natural processes and all kinds of day to day activities cause redistribution of uranium bearing material. Natural erosion, quarrying, road and house building, well drilling, turf harvesting or any activity requiring excavation in the natural environment all contribute to this process.

Baseline environmental studies already carried out over a large section of Donegal, have shown the presence of concentrations of radioactive material in streams, bogland, beachsands and bedrock. Levels vary considerably from place to place. To date, no deposits which would justify mining have been outlined.

the options

What should the people of Donegal do about this potentially valuable material which their area has in greater abundance than elsewhere?

One thing is certain – ignoring it will not make it go away. There is no escaping the fact that the area has a higher than normal amount of radioactive material. Prospecting activity will show, in due course, where the highest concentrations are and, hopefully, will define sectors which have sufficient uranium to allow an economic mining operation.

In any event, the activities of the prospecting companies present no risk to people in the locality and extensive testing, including sampling of water throughout the area, has shown this clearly.

exploration

The search for uranium involves many talents. First geologists identify those areas where the geology favours the concentration of uranium. Concentrations of uranium within such areas can then be located by using instruments to detect the natural radioactivity of uranium and its associated elements. One instrument, a Geiger Counter, contains a tube of gas which produces an electric current when radiation travels through it. Another more sensitive instrument, a Scintillometer, makes use of the property of some crystals (e.g. sodium iodide) to produce flashes of light when ionising radiation strikes them.

Large areas can be surveyed by sensitive radiation detectors carried in aircraft flying in low altitude search patterns. After areas of interest are defined, prospectors go on foot to examine rocks, soil, stream sediments and water. If further exploration is warranted, drilling provides samples of rock from beneath the surface. The samples are analysed for concentration and distribution of uranium oxides. Trenching is another method for obtaining such samples and involves removing small sections of overlying peat or soil to expose the bedrock.

Exploration causes very little disturbance to the environment. Only very small quantities of water and soils are required for analysis. Trenching involves no greater excavation than a normal drainage trench or turf bank. Drilling involves the boring of a hole no more than 3" in diameter – smaller than a normal water bore and much smaller than a water well. Exactly the same techniques are employed for base metal exploration as for uranium exploration. Base metal exploration has been in progress throughout Ireland for the past 25 years.

why search for uranium

In view of the series of oil crises in recent years it is clear that we can no longer continue our very high level of dependence on oil as an energy source. Uranium, which has the ability to provide a plentiful electricity supply for future generations, is one of a number of alternative energy sources being actively investigated.

Apart from being a source of energy, a native uranium mine would provide us with a valuable currency with which to purchase the commodities we need. It would create significant economic advantages in the area in which it is mined and greatly strengthen Ireland's economic standing within Europe.

A uranium discovery would put Ireland on the road to greater energy independence.

radiation - a fact of life.

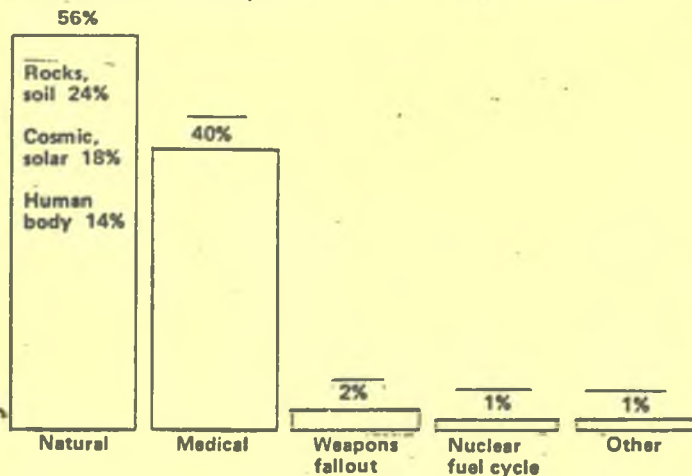
Everyone is constantly exposed to ionising radiation from many sources. For example, the earth is continuously bathed in radiation from outer space. Life would not survive without the protection from constant radiation afforded by such things as the earth's atmosphere and its magnetic field. Nonetheless a significant amount of cosmic radiation reaches the earth's surface. Substantial amounts of ionising radiation from the sun also penetrate our atmosphere.

The amounts of cosmic and solar radiation reaching us vary primarily according to altitude - every 100 meters up increases exposure by about 2%.

Radiation from space, the sun and other sources make up the "background radiation" to which we are all exposed. Medical radiation, of course, varies from person to person. Our bodies are all radioactive; an unstable potassium isotope within us contributes 10% of our background radiation. Other sources of radiation include such things as T.V., bricks, foods and drinks.

Your Radiation Exposure

Sources of Radiation Exposure



The chart above is the result of studies recently carried out in Canada and the U.S.A. showing the various contributors to ionising radiation in humans. The nuclear fuel cycle, which, in the case of Canada and the U.S.A., includes many nuclear reactors as well as uranium mining activity, contributed less than 1% of the total annual radiation to which the population was exposed. Medical sources, on the other hand - X-rays in the main - made up 40% of total radiation.

community information service

Exploration activity is generally welcomed in Ireland wherever it takes place mainly because it generates a certain amount of immediate local employment and provides the prospect of significant industrial development should it prove successful.

It has not been the practice of companies involved in exploration in Ireland to develop formal information structures during the exploration stage because of the uncertainties attaching to the extent and time scale of such activities as well as their outcome. Mineral exploration is being carried on daily throughout Ireland in over 100 different locations. Because of the nature of the work, the results generally prove negative or, at best, inconclusive and so, after a while, the prospector moves on to a new location.

The prospector on the ground is obliged to explain the purpose of his activities to land owners over whose property he is operating, and companies licensed by the Government to explore have a statutory obligation to file all data derived from exploration with the Geological Survey of Ireland.

The exploration companies operating in Donegal recognise that major misgivings have been aroused by their recent search for uranium and that positive action must be taken to put these misgivings to rest.

This information booklet is the first step in this process. Over the coming months, contact will be made with a wide range of local organisations and individuals who have an interest in this issue or who have expressed concern about it. It is to be hoped that those currently opposed to exploration will have sufficiently open minds to give careful consideration to the arguments put forward.

Slip 1. insertion of uranium

black or white

If you require any further
information on uranium
exploration, please phone

Doochary 9

Appendix C

2 Bulletins published by D.U.C.

(source; Donegal Uranium Committee)

DUC STOP!

Price 10p

JST 1980

BULLETIN OF DONEGAL URANIUM COMMITTEE



Lettermacaward demonstration against prospecting

PHOTO — DEREK SPEIRS

THE CAMPAIGN TO STOP URANIUM EXPLORATION IN COUNTY DONEGAL IS RECEIVING WIDESPREAD AND INCREASING SUPPORT LOCALLY, NATIONALLY AND FROM ABROAD. THE PROTEST MARCH AND RALLY AT LETTERMACAWARD, ATTENDED BY OVER 1500 PEOPLE, WAS REPRESENTATIVE OF ALL PARTS OF DONEGAL AND CLEARLY DEMONSTRATED PEOPLES' RESOLVE NOT TO HAVE URANIUM EXPLOITATION IMPOSED ON THE COUNTY.

Despite official efforts to allay peoples' fear of the inevitable health hazards from environmental pollution, and concerted efforts to smear and intimidate the D.U.C., public opposition continues to be declared by concerned organisations and individuals.

Many local anti-uranium support groups have been formed whose function is, partly, to continue the task of informing the public of the detrimental effects of uranium mining, to monitor prospecting developments and to organise the local opposition in their areas.

Political parties have begun to reflect grass roots concern and some have made opposition to uranium development official party policy. The forthcoming Bye-election in the county will be a further opportunity for people to make known their opposition.

Many landowners do not permit uranium exploration activities and most of those who did, while unaware of environmental repercussions, regret having done so. The Nuclear Energy Board tests show that water in Cloghercorr was contaminated as a result of trenching and blasting uranium bearing rock. An exploration company representative assured a local farmer that he was right not to allow the company to work near his water supply.

Prospecting for uranium, and therefore mining can be stopped if people refuse permission to mine. Apparently when permission is refused by the owner of land, the exploration companies employees have instructions to return to base.

At national level, many organisations are actively opposed to uranium exploration throughout Ireland. The Anti-Nuclear movement has taken up the issue in earnest with such emphasis on uranium at the annual Carnsore Rally and the organising of a country wide anti-uranium day.

STOP URANIUM MINING

Cont. Page 8



NEWS AND VIEWS

STOP! NO. 1

In February we published our first bulletin. So far about 5,000 copies are in circulation, and we have a second printing now available, which can be had by sending a stamped addressed envelope to the Secretary.

The news section was small as the campaign was only getting under way. No official had at that stage even visited the area. We gave details of the various types of health problems caused by radiation from uranium mines - damage to unborn children; hereditary damage; damage to the wider population who eat the plants and animals which have concentrated the radioactive particles; and the history of cancer "epidemics" among uranium mine workers. We referred to mines in Europe and N. America where cancer rates varied from 25 - 65%, and one case where it is expected to ultimately reach 100%.

Speculation about the actual hazards from a Donegal mine is difficult until such time as the companies choose to table formal proposals. This of course is used as an excuse for silence and inaction on the part of the authorities. But we know enough about the variety of mine types throughout the world, and about the Donegal environmental conditions, to know roughly what to expect. In "Stop! No 1" we outlined the stages of the likely mining process. In short, this would end up with a vast open quarry, a mountainous pile of radioactive sand and rock waste, and a concrete lake of radioactive water. These would provide problems from the leakage of pollutants anywhere, but on the side of a Donegal mountain, and with our climate, these would be magnified. As with all "tailings" heaps the danger would remain for nearly $\frac{1}{2}$ million years.

We pointed out that exploration is being increasingly recognised as mining on a small scale, and therefore, potentially hazardous.

V.E.C. SEMINAR

The Vocational Education Committee held a two-day seminar in Glenties on 18th - 19th April, which was to be neutral and informative. It was hailed as the opportunity for everyone to finally make up their minds on the issue.

Despite early assurances of full communications on all developments in the planning of the programme, it was not until two weeks before the event that the final programme was leaked to us. It contained no known opponent of uranium mining, and all of the speakers were members of state bodies. Both these features were totally contrary to the spirit of early agreements made at a meeting on 1st February between V.E.C. officials and interested parties. We protested, and as a result, a last minute attempt was made to produce a balanced programme. Not surprisingly only one anti-uranium speaker could, at such short notice, be found.

As it turned out, one speaker with a good case is better than six with a weak one. Several hundred people attended, but in the final debate on Saturday night not one speaker from the floor supported the pro-uranium case. It had been all too clear that none of the "experts" had the expertise that counted. There was no one who could speak with experience and authority on the environmental management of a uranium mine, and there was no medical expert. Without such people, why hold the seminar at all? Perhaps the lone anti-uranium speaker, Professor Robert Blackith had the answer. His speech concentrated on the utter failure of the responsible authorities, throughout the world, mainly through their gross over-confidence, to identify radiation hazards and to take the necessary steps to eliminate them. If such was the case in Britain, America, France and Germany, why should Ireland be any better. On the performance of the Irish authorities so far, it shouldn't.

LETTERMACAWARD MEETINGS (June 28th)

The morning meeting was confined to groups and individuals from County Donegal and made the following decisions.

- (1) The local support groups gave the D.U.C. their mandate to continue with its central function of controlling and organising all countywide anti-uranium activity.
- (2) The D.U.C. will periodically bring representatives from support groups together.
- (3) The D.U.C. will supply information for distribution by the local groups.
- (4) The local groups will set up means to distribute information throughout their areas.
- (5) They will monitor developments within licence blocks.
- (6) They will make contact with landowners in advance of developments.
- (7) The Falcarragh group will produce a leaflet on landowners' rights.

The afternoon meeting had representatives from all national groups opposed to uranium development. The meeting was also addressed by Rosemary Jarrett on the situation in Orkney re: uranium exploration.

The conclusions which met with general approval were

- (1) that Hiroshima Day, Aug 6, co-ordinated by C.N.D., be used as a day of information on uranium.
- (2) that everyone present should write to their T.D.
- (3) that a petition campaign be co-ordinated at National level and that a group be nominated at Carnsore to do it.
- (4) that the D.U.C. write an open letter to the Finglas group on how uranium development is affecting the livelihood of Donegal people.

An invitation was issued to the D.U.C. and other Donegal Groups to participate in the Annual Carnsore Anti-Nuclear Rally to publicise their case and to organise a national anti-uranium day.

The D.U.C. will be represented at the Carnsore Rally.

THE BENEFIT CONCERT

The concert, on June 27th, attracted an audience of over 550 people. The D.U.C. would like to thank all people who contributed finance, help, and resources particularly the artists David Hammond, Mick Hanley, Donal Lunny, and Christy Moore. The D.U.C. Raffle was drawn at the concert and the winners were

FIRST PRIZE -	£100	Joseph Kiggins, Pullduleh, Dunkineely, Co. Donegal.
SECOND PRIZE -	£50	Dennis J. Gallagher, Beagh, Ardara, Co. Donegal.
THIRD PRIZE -	£25	Seamus Sweeney, Cranashallog, Dungloe, Co. Donegal.
AND SELLER'S PRIZE -	£20	

The funds generated from the concert, the draw and other activities will be used particularly to fund an environment impact study. There is, at the time of writing an official from ~~the Environmental Protection Agency~~, in Donegal, who is doing preliminary research for an impact study. The D.U.C. is committed to having the study carried out if the County Council decides not to do it. A delegation from the D.U.C. has met with the General Purposes Committee of the Council and has impressed on them the need for a study. However, to date no decision has been made.

WORLD FOCUS

BRITISH COLUMBIA

British Columbia's Social Credit government announced a seven year ban on uranium exploration and mining in February of this year. In announcing the moratorium, which is a reversal of policy, the Prime Minister said: "It is clearly the mood of the people of this province that they are not prepared to live with uranium mining at this time". He spoke of the "very real fears that uranium mining and exploration activity will do irreversible harm to the environment".

British Columbia's Royal Commission - the Bates Inquiry had issued an Interim report which highlighted the hazards of Uranium prospecting. The final report is due in October. The campaign against uranium mining was led by the province's Medical Association and included such organisations as the West Coast Law Association, the United Church, the B. C. Federation of Labour and over 200 other groups.

A typical mining company reaction to the seven year moratorium came from Frederick Higgs, Manager of the B. C. and Yukon Chamber of Mines, who said, "Does one just listen to the babble of the ignorant mob?".

NEW MEXICO

In July, 1979 a dam collapse at the Church-rock uranium mine in New Mexico allowed millions of gallons of radioactive tailings to enter a nearby river. Cattle were slaughtered along the contaminated river, but the eventual cost in human lives has not been estimated. This tailings retention facility was considered to be of superior design yet within 6 months of construction, cracks appeared and were either not noticed because it was not inspected, or noticed and unreported. The clean-up procedure involved people with buckets and shovels attempting to recover the unrecoverable.

Over 90% of the uranium used in the U.S. is used for the production of nuclear weapons. Under the current S A L T II agreement the U.S. will be building 4,500 new strategic weapons: 4.9 weapons every day.

LABRADOR

A development license is being withheld from a mining company in Labrador by the Government in Newfoundland. This became known on May, 29th., when the Prime Minister, Brian Peckford disclosed to Parliament that his government had accepted the main recommendation of the Environmental Assessment Board report which stated:

"Our principal conclusion is that Brinex should not be permitted to mine and mill uranium ore until it satisfies government that it can, and will, safely and permanently dispose of the waste materials".

The report also describes Brinex's social impact statement as "woefully inadequate".

Despite the narrow scope of the terms of reference of the Environmental Assessment Board, the opposing groups did trojan work in refuting the mining company's case. 90% of the people who spoke at the hearings outside Happy Valley - Goose Bay opposed the development. Some residents of the immediate area favoured the project as there is an unemployment rate of between 30% and 40% in a population of 7,000 people.

The questions of who controls and who benefits from the uranium mining were repeatedly addressed by the protesting groups. The company's method of tailings disposal was scrutinized and fears expressed regarding the emissions of radon gas in the air and contamination of local water systems.

Brinex, which is a close relation of R.T.Z. proposed to allocate a mere 10 million dollars for the permanent monitoring and management of the tailings in ponds and dams. Newfoundland hadn't been totally forgotten by the developers - they would surrender 5% of the profits which would amount to 2 to 3 million dollars per year for the province.

HARRISBURG

Thirteen babies have been born near Harrisburg in Pennsylvania with an abnormal thyroid condition since the accidental radioactive leaks in March, 1979 at the Three Mile Island nuclear reactor. Pennsylvania health authorities said an investigation would be launched to see if this unusually high number was related to the radiation leaks last year. The abnormal condition, including under-production of hormones by the thyroid gland and called hypothyroidism, can lead to mental retardation.

Authorities said the expected figure for that area should have been only three cases during the last nine months of last year. But nuclear regulatory commission specialists have said that the escaped radioactivity was too weak (8 to 20 millirems) to affect a foetus.

LOW LEVEL RADIATION — HEALTH HAZARD

"Scientists have in the past greatly underestimated The Biological (Health) Hazard of small amounts of radioactivity in the environment" (Dr. Ernest J. Sterglass, Prof. of Radiation Physics, University of Pittsburgh). Human and animal studies of high exposure rates to radiation indicated at first that there might be a safe threshold dose below which there would be no observable health damage. This was thought to be so up until the early 1950's.

In 1958, Dr. Alice Stewart of Oxford University published large-scale epidemiological studies on the effects that abdominal X-Rays of the mother during pregnancy had on babies exposed to those X-Rays while in the womb. She showed that these babies had twice the risk of developing leukaemia and other cancers before the age of 10 years, after exposure to only a few diagnostic X-Rays, than children not exposed.

When infants were exposed during the first three months of pregnancy the incidence of disease was greatly increased. At John Hopkins University, a large-scale prospective study added to the Oxford findings additional evidence of damage to babies immune systems, which rendered them twice as susceptible to death from diseases of the lungs and digestive systems.

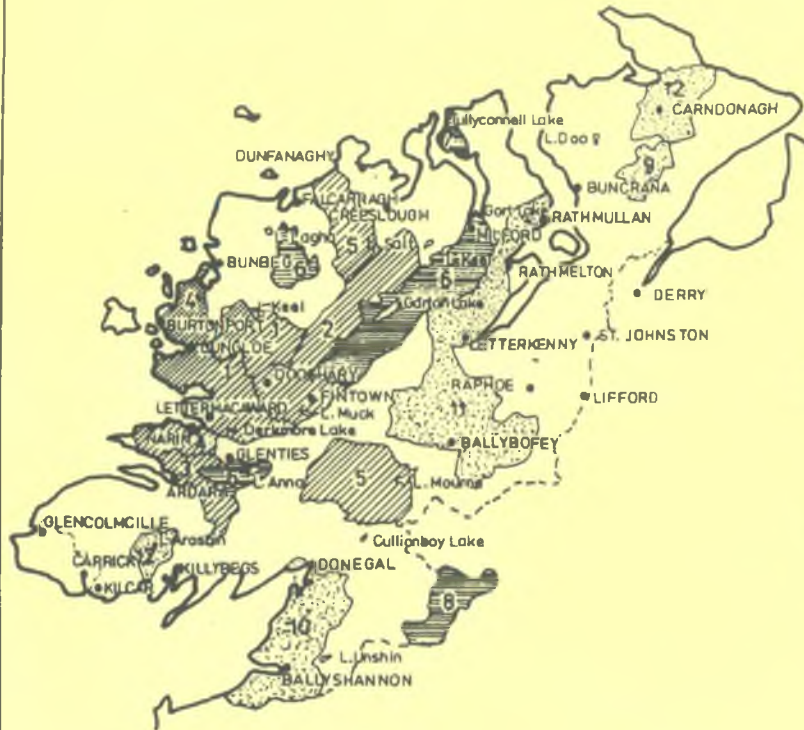
Recent studies by Dr. Abram Patkau at the Canadian Atomic Energy Laboratories in 1972, suggest that the cause of this damage to the cells in our bodies is an interaction between radiation and the oxygen surrounding the cells, which changes the oxygen in such a way that it damages the cell wall. Small continuous doses of radiation are more efficient at causing this change in the oxygen surrounding body cells. This change can occur whether it be heart cells, blood cells, or any other cells of the body that are exposed to radiation. This explains why people who are exposed to low-level radiation over lengthy periods are more prone to diseases affecting almost every organ in the body than are others not so exposed.

That the Irish people have already suffered increased death rates as a result of increased exposure to radiation in the last twenty five years can be shown by the statistics for cancer of the pancreas, which show a dramatic rise following the atmospheric testing of nuclear devices in the U.S.A. between 1950 - 1959 and the Windscale reactor releases. That we should now add to these statistics by Uranium mining with its resulting pollution of the atmosphere, water and soil of this county of Donegal by highly dangerous long lived radioactive materials is unthinkable.

(Further reading recommended "A Nuclear Ireland" obtainable from I.T.G.W.U., Dublin.)

Co. Donegal

Showing 1. Areas for which prospecting licences are granted 2. Principal towns and their water sources



- URANIUM MAIN INTEREST
- 1 IRISH BASE METALS & TARA PROSPECTING
- 2 MUNSTER BASE METALS LTD.
- 3 NORANDA EXPLORATION IRELAND LTD.
- 4 RIO TINTO
- 5 MAUGH LTD
- URANIUM & OTHER MINERALS
- 6 IRISH BASE METALS LTD.
- 7 DRESSER MINERALS INTERNATIONAL INC.
- 8 OLIVER PROSPECTING & MINING CO. LTD.
- CURRENT INTEREST —
- OTHER MINERALS
- 9 IRISH BASE METALS LTD.
- 10 DRESSER MINERALS INTERNATIONAL INC.
- 11 AMERICAN SMELTING & REFINING CO. LTD.
- 12 TARA PROSPECTING LTD.

TOWN	WATER SOURCE	TOWN	WATER SOURCE	TOWN	WATER SOURCE
GLENTIES	L. ANNA	DUNLOE	L. KEEL	BALLYSHANNON	L. UNSHIN
ARDARA		BURTONPORT		DONEGAL	CULLIANBOY LAKE
NARIN		BUNBEO		KILLYBEGS	L. AROSHIN
FINTOWN		L. MUCK		FALCARRAGH	L. AGHER
RATHMULLAN	GORT LAKE	BALLYBOFEY	L. MOURNE	BUNCRANA	L. DOO
LETTERKENNY	L. SALT	RAPHOE		CARNDONAGH	OWENNABINDERG R.
	and	LIFFORD		GLENCOLMCILLE	SPRING
	L. KEEL	ST. JOHNSTON		LETTERMACAWARD	DERKMORE LAKE

URANIUM MINING AND YOU

URANIUM

"I hear it's bad news but I don't know much about it myself".

The subject of course is Uranium. It is strange that this quotation keeps cropping up after two or three years of uranium exploration in the County, when it is well known that the development of uranium mining threatens all that is dear to us - our health, our children's health, the fresh water they drink, the clean air they breath, the food they eat. Our attitude tends to be "Isn't it a great opportunity for Fintown, a poor area with little to loose. Even if there are pollution problems, they will be confined to Fintown and the financial gains to the county will far outweigh the disadvantages."

The following non-technical paragraphs attempt to explain how uranium mining in this county can affect you - the public. Your comments and queries are welcomed so that various aspects of the subject may be dealt with in more detail in future issues of STOP or at public meetings.

ORIGIN AND EXTENT

From the map above we see that a diagonal strip right across the county has been licenced out for uranium exploration while other areas are of interest both for uranium and other base metals. These areas are of interest due to their geological origins. Basically what happened was that some time after the original rocks (limestones etc.) were formed, earthquakes and volcanoes twisted and distorted the base rock into mountains forging hot molten rock into the folds, fissures and cracks. This hot rock cooled to form the Donegal granites but while it was still hot it "cooked" some of the minerals which were already in the base rock. The result, in our case, was uranium deposits. These deposits are normally found in fissured or faulted areas in the base rock. So far most of the exploration activity in Donegal has been focussed along the Gweebarra fault which by the way, extends right across to Scotland. All this took place about 4,500 million years ago and since then much of the surface base rock has been eroded away leaving the granite exposed or thinly covered by peat.

RADIOACTIVITY

That property which makes uranium a source of energy, - its radioactivity - is also the property that causes most concern - even at the mining stage. A radioactive substance is one that radiates energy in the form of fine high speed particles of matter (alpha and beta particles) or as a form of invisible light (gamma radiation). It ejects these particles in an effort to become more stable. This process is irreversible and takes place at a constant rate for any one element. In uranium's case it throws out an alpha particle and becomes a different mineral known as Thorium. This too throws out a particle and changes to a new mineral. These are known as decay or daughter products of uranium. There are in fact fourteen of them, the final one being lead and the only one that is not radioactive. In any "old" ore body (Donegal's is old) equilibrium will have been reached and all thirteen elements will exist in constant proportions - the fourteenth, lead, will accumulate very slowly.

END USES

Man's interest in this mineral grew with the development of nuclear weapons. The "Arm's Race" alone supported the uranium mining industries of the U.S., South Africa and Australia but following the scaling down of nuclear tests in the 1960's the industry collapsed. Abandoned mines and tailings gave rise to massive pollution problems for the local authorities who had neither the resources or the inclination to tackle the problem. e.g. Pollution downstream (for 1,000 miles) of the Rum Jungle mine and mill in Australia was the subject of a water pollution report as recently as 1977. The demand for uranium has increased again within the last seven years. This arises from its use as a substitute for oil in the generation of electricity but an ever increasing amount is being diverted to the production of the new second generation nuclear "deterrents" to be deployed around Europe.

HOW IT CAN AFFECT US

Radioactivity affects all living matter be it plant, bacteria or animal because it affects the basic component of each - the living reproducing cell. When cellular matter is exposed to radiation these tiny packages of energy can do one of three things.

- (a) Pass through the cell doing no damage.
- (b) It may kill the cell outright and unless many cells are killed in this way the body will replace the cell and no great damage is done.
- (c) It may strike the cell and be absorbed into it merely damaging the structure. In this case the cell may lay dormant for a long period and then for reasons not clearly understood the cell may go wild reproducing copies of the damaged cell at several times the normal rate producing cancerous tumours, leukaemia etc. in mammals. If reproductive organs are affected, faulty genes may be passed on to the next generation.

In an open cast mine situation, the overlying waste rock is removed by ripping or blasting and stockpiled. The ore is then blasted and excavated and dumped in high, medium or low grade stockpiles. It is then hauled to a mill where the ore is ground down to sand and dust. Water is then added to make a mud or slurry. Because uranium and the associated "heavy" metals are in fact heavy most of the uranium can be separated by allowing the slurry to settle. The waste is piped to a "tailings" lagoon. Various chemicals and acids are then added to separate the uranium from the other heavy metals. At each stage chemical wastes are added to the lagoon until finally "yellowcake" or uranium oxide is produced. This is then dried, packed into drums and lorried off the site. What remains in the "tailings" lagoon includes vast quantities of acidified and contaminated water, various chemicals added during treatment, heavy metals normally associated with uranium (lead, cadmium, molybdenum, mercury etc.) and the thirteen radioactive decay products mentioned earlier. These decay products actually represent 85% of the total radioactivity originally present in the ore.

Some of these deserve special mention. Radium for example when treated with acids will form very soluble compounds and the problem of

containing a few pounds of radium becomes one of containing millions of gallons of water per year.

Radium itself eventually decays to Radon which is a radioactive invisible gas. This is blown by the wind with no guarantees of dilution and in no definite direction. This gas is already present in the atmosphere but at minute concentrations. Undoubtedly, mining would have to be on a very large scale in order to increase the Country wide annual average concentrations in the atmosphere but local concentrations would be functions of weather conditions and outside man's control.

Unfortunately, associated with radon are two shortlived (highly radioactive) daughter products which are solids, i.e. what left the mine as a gas has now become a solid many miles away. Therefore, as we breathe in radon gas we also breathe in a certain proportion of these other products, which are so fine, they are not trapped by the lungs natural filtering system. They lodge on the walls of the lung where they irradiate the unprotected soft tissue of the lung wall. This gives rise to lung cancer some time after a critical dose (not determined yet) has been received. The latency period is of the order 15 - 20 years but may be reduced by inhalation of dust and/or cigarette smoking.

Therefore, in an open pit mine radioactive emissions come in the form of

- (i) dust and gas - from drilling, blasting, crushing, trucking and scrubbing operations, from the tailings, lagoon, ore stockpiles and even from the waste rock.
- (ii) contaminated water: rainwater running through the mine pit and from the stockpiles will absorb radioactive material; rainwater falling on the tailings lagoon which will have to be disposed of (over 6 1/2" p.a. on an area probably over 200 acres in extent); seepage of highly contaminated liquors under the wall of the dam.

Although modern technology has undoubtedly improved working conditions in mines, evidence from abroad (Canada and Australia in particular where public enquiries have made quite a lot of valuable data and studies available to the public) suggests that little progress has been made towards protecting the environment and the public.

Among pollution control problems are the following

- (a) Once contaminants have been released and dispersed, isolated readings cannot give a complete picture as to distribution and total quantities.
- (b) The full extent of a release may not become apparent for several years. Similarly, remedial action may produce no results for a similar period.
- (c) When an effect is noted, (whether it be a sudden rise in concentration of radium, a drop in pH levels or the discovery of radioactive fish) it is very difficult to trace the cause to any particular operation or defect at the mine.
- (d) These radioactive contaminants are stored and concentrated in the food chain. So although the level of dust fallout or radium contaminated water absorbed by a particular field may be small, we humans who drink the milk or eat the meat of the animal that grazed that field are building up respectable concentrations of contaminants in our bodies. i.e. even small emissions will cause problems which may not become noticeable for years.

It is noteworthy that a Royal Commission was established in British Columbia (a large province on the west coast of Canada) in 1978 to hold a public enquiry into uranium prospecting/mining in that province. The British Columbian Medical Association were (among others) strongly opposed to uranium mining and presented a report to the enquiry. In March of this year, all exploration and mining for uranium in the province has been halted - for seven years.

PUBLIC OPPOSITION

IRISH CAMPAIGN FOR NUCLEAR DISARMAMENT (C.N.D.)

President: Sean MacBride; Vice Presidents:
 John Carroll,
 Stella M. B. Webb,
 L.L.B.

June 28th, 1980.

Dear Friends,

The Irish Campaign for Nuclear Disarmament sends its warmest greetings to the Donegal Uranium Committee (this weekend), and wishes it every success in future campaigning.

Because of the intrinsic link between the mining of uranium, and the extraction of weapons-grade uranium for use in nuclear weapons, and the eventual use of reactor-grade uranium, when it is turned into plutonium, in the manufacture of plutonium weapons, this campaign is vigorously opposed to uranium prospecting in Ireland, or anywhere else.

Irish C.N.D. has called for a moratorium on uranium prospecting in Ireland, has called for a full public inquiry on uranium, separate from the promised nuclear inquiry, and with the Nuclear Safety Association has asked the Minister for Energy for a meeting to discuss uranium prospecting and its links with the proliferation of nuclear weapons.

Twenty nine groups or organisations have now expressed support for the submission to the Minister for Foreign Affairs which included the following demand: "As Ireland's obligations through the membership of the European Economic Community would require the equitable supply to all EEC partners, including Britain and France, of any uranium mined in Ireland, thus providing Britain and France with uranium which they could enrich to weapons-grade uranium, we strongly argue that all uranium prospecting should cease immediately, and that the mining of Irish uranium deposits should not proceed".

Patrick Comerford
 (Chairperson).

INISHOWEN POLL SAYS NO TO URANIUM EXPLORATION

On the week-end of the 10th May, a public opinion poll was carried out by thirty second level pupils throughout Inishowen. Each interviewer asked ten persons at random "if he/she wanted exploratory drilling for uranium carried out in County Donegal". The result of the survey was as follows:

Answers	Number	%
No	191	63.7
Yes	2	0.66
Don't know	107	35.7

TRADE UNION ANTI-NUCLEAR CAMPAIGN

The Trade Union Anti-Nuclear Campaign which was founded on March 22, 1980, adopted, among others, the following resolution

"This meeting resolves to launch a campaign aimed at securing active opposition of the whole trade union movement to a nuclear power programme including the eventual blacking of any proposed nuclear power installations. The campaign will also aim to commit the strength of the unions to have uranium prospecting licences withdrawn and a ban declared on uranium mining".

GROWS

PRESS RELEASE FOR INDEPENDENT FIANNA FAÍL PARTY

Statement issued by the Independent Fianna Fáil Republican Party as a result of the Comhairle Dáil Ceanntar meeting in the Butt Hall on Monday, 14th July, 1980.

The Independent Fianna Fáil Republican Party demands that the government should stop all uranium exploration until such time as it has been established that such exploration is not unsafe.

LABOUR SAYS: STOP THE URANIUM EXPLORATION

Uranium mining is not like ordinary mining; it involves more than just digging a hole in the ground. Evidence from Australia, where uranium exploration and mining is actively opposed by the Trade Union Congress and by the Australian Labour Party, shows this all too clearly.

In south Australia, an official Ministry for Health report found that workers at one uranium mine there had a rate of cancer four-and-a-half times the national average.

Giving evidence before a public inquiry on uranium mining in British Columbia, Canada, earlier this year Professor Charles Kerr of Sydney University described how the radioactive waste or 'tailings' leftover from a uranium mine in Australia's Northern territories had polluted the Finnis River system there for 1,000 miles downstream and had rendered an area the size of Ireland uninhabitable for centuries. The result of this public inquiry was a seven-year ban on uranium mining in British Columbia.

The Irish Labour Party demands that all uranium exploration in this country be halted until such a time as we have a full and fair public inquiry into the question of nuclear energy in all its aspects; and that this inquiry be followed by a referendum, so that the voice of Irish men and women can be heard on an issue which not only gravely affects them, but future generations of Irish people to come.

Seamus Pattison, T.D.,
 Labour Party Spokesman
 on Energy,
 Dáil Éireann.

Anno Wilkinson,
 Secretary,
 Donegal Labour Party,
 Constituency Council,
 Woodlands,
 Letterkenny.

FINE GAEIL - ASPECTS OF ENERGY POLICY, MAY, 1980.

Uranium Mining Hazards

Radioactive fissile materials such as U235 break down spontaneously into other stable or fissile elements, releasing various forms of radiation in the long process of decay. One such product, radon gas, is trapped in uranium bearing ores, only to be released when the ore is disturbed or milled. Other radioactive materials are washed away in the mill process water. To radon gas in particular is attributed lung cancer among uranium miners and uranium salts are known to cause damage to the arteries, kidneys and liver. Much of the radioactivity remains in the waste or 'tailings' resultant from the milling process. As in earlier coal mines, the mortality and incidence of serious illnesses amongst uranium miners was very high. It remains to be seen whether a new safety code currently being devised by the World Health Organisation and others for world-wide implementation in uranium mines will be implemented and will prove effective.

UC STOP!

Price 5p

FEBRUARY 1980

BULLETIN OF DONEGAL URANIUM COMMITTEE

DONEGAL URANIUM COMMITTEE

SINCE THE MAJOR REVELATION OF URANIUM DEPOSITS IN DONEGAL, BY ANGLO UNITED IN 1979, THE PUBLIC HAS BEEN GREATLY ALARMED BY THE HAZARDOUS HEALTH AND ENVIRONMENTAL REPERCUSSIONS ENTAILED IN URANIUM MINING. REPORTS FROM THE MEDIA DEALING WITH URANIUM HAVE SHOWN THAT THIS LETHAL SUBSTANCE HAS DEADLY EFFECTS. THESE REPORTS HAVE LED TO THE HOLDING OF PUBLIC MEETINGS, FROM WHICH A FORMALLY ELECTED COMMITTEE EMERGED, TO ENSURE THAT THE HEALTH AND WELL BEING OF THE PEOPLE OF DONEGAL WILL NOT BE IMPAIRED BY THE MINING OF URANIUM AND ITS ASSOCIATED ACTIVITIES. AFTER INVESTIGATION INTO THE HAZARDS RELATED TO URANIUM AND ITS BY-PRODUCTS, THE DONEGAL URANIUM COMMITTEE FEEL THAT SINCE URANIUM CANNOT BE MINED SAFELY, EXPLORATION SHOULD CEASE.

THE AIM OF THIS FIRST BULLETIN IS TO INFORM PEOPLE IN DONEGAL AND ESPECIALLY THOSE IN THE MOST THREATENED AREAS OF THE DANGERS OF URANIUM MINING.

URANIUM

URANIUM IS THE FUEL USED IN NUCLEAR POWER STATIONS AND THE RAW-MATERIAL FOR MAKING ATOMIC BOMBS. CONTACT WITH URANIUM CAN CAUSE SICKNESS, CANCER, STILL BIRTHS, DEFORMITIES, AND OTHER DISEASES. NOT ONLY MINING, BUT EXPLORATORY DRILLING, RELEASES RADIOACTIVE DUST AND GAS WHICH IS LOCKED IN URANIUM BEARING ROCKS. RADIOACTIVE MATERIAL IS NOT ONLY A DANGER TO THE PERSONS EXPOSED, OR WHO EAT IT OR DRINK IT OR BREATHE IT, BUT ALSO TO THEIR CHILDREN AND THEIR FAMILIES. WASTES, WHETHER IN THE FORM OF DUST OR GAS, CAN BE CARRIED FROM THE URANIUM MINING AND PROCESSING AREA BY WATER, WIND, FOOD, PEOPLE AND TRANSPORT. THE HUGE WASTES LEFT BEHIND REMAIN RADIOACTIVE FOR THOUSANDS OF YEARS. THERE EXISTS NO TECHNOLOGY TO DESTROY OR CONTAIN THIS RADIOACTIVITY.

THE LETHAL WASTES GENERATED IN URANIUM MINING WERE FOR MANY YEARS IGNORED. GOVERNMENTS AND MINING COMPANIES FAILED TO HAVE STUDIES CARRIED OUT ON THE POTENTIAL DANGERS FROM RADIOACTIVE TAILINGS.

AT FIRST, IT WAS DENIED THAT TAILINGS POSED ANY SERIOUS DANGERS TO PUBLIC HEALTH. SUBSEQUENTLY, PUBLIC ENQUIRY AND RESEARCH WAS OFTEN BLOCKED. MINING WORKERS WERE LED TO BELIEVE THAT WORKING CONDITIONS WITHIN MINES WERE SAFE BUT NOW ADMIT TO BEING DECEIVED. TAILINGS WAS USED IN CONSTRUCTION WORK AND AS FILL ROUND BUILDINGS DESPITE THE FACT THAT AUTHORITIES KNEW IT WAS RADIOACTIVE.

THE PRESENT SITUATION

THE CONFIRMATION BY ANGLO UNITED OF FURTHER URANIUM FINDS IN TWO REPORTS THIS YEAR, AND THE ANNOUNCEMENT BY NORTHGATE EXPLORATION LTD. THAT IT IS DRILLING FOR URANIUM IN AN ADJACENT LICENCE BLOCK, HAS INCREASED PUBLIC CONCERN. THE DECISION BY DONEGAL COUNTY COUNCIL NOT TO FINANCE THE ENVIRONMENTAL MONITORING PLAN, PREPARED FOR IT BY AN FORAS FORBATHA, MUST BE DEPLORED. PUBLIC REPRESENTATIVES MUST INFORM THEMSELVES OF THE POTENTIAL DANGER TO THE COUNTY AND HAVE A DUTY TO PLACE PUBLIC SAFETY BEFORE PROFIT AND ECONOMIC CONSIDERATIONS. ENVIRONMENTAL CONTAMINATION IS NOW TAKING PLACE FROM DRILLING, BLASTING, QUARRYING AND CRUSHING OF URANIUM BEARING ROCK. WHO IS RESPONSIBLE FOR MONITORING, WORKER SAFETY, AND PUBLIC HEALTH?

IT IS IMMORAL THAT MINING COMPANIES ARE GRANTED LICENCES TO PROSPECT FOR A MINERAL AS DEADLY AS URANIUM UNDER THE GUISE OF MINERALOGICAL EXPLORATION. THE LICENCING AUTHORITY MUST KNOW OF THE DAMAGE CAUSED BY URANIUM MINING IN OTHER COUNTRIES. THE TRAGIC CONSEQUENCES OF URANIUM MINING, MOST OF WHICH ONLY APPEAR AFTER THE COMPANIES HAVE GONE, SHOULD BE A DIRE WARNING TO PEOPLE. THERE WILL BE NO LONG TERM EMPLOYMENT OR SOCIAL BENEFIT FROM URANIUM MINING FOR DONEGAL.

THE DECISION WHETHER TO MINE URANIUM IN DONEGAL IS NOT UP TO THE MINING COMPANIES NOR THE E. B. C. NOR THE GOVERNMENT. IT IS A DECISION THAT CAN AND MUST BE MADE BY THE PEOPLE AND ESPECIALLY THE PEOPLE OF THIS COUNTY. THAT DECISION IS NOT DIFFICULT ONCE PEOPLE HAVE STUDIED ALL THE HAZARDS OF URANIUM. WE ALREADY KNOW THE DAMAGE DONE IN OTHER COUNTRIES. OPPOSE URANIUM EXPLORATION AND MINING.

Drilling Stopped

RESIDENTS OF GLENLEIGHAN, NEAR FINTOWN, SUCCESSFULLY PICKETED AND STOPPED MUNSTER RARE METALS LTD., A SUBSIDIARY OF ANGLO UNITED DEVELOPMENT CORPORATION, FROM COMMENCING TO DRILL FOR URANIUM ON SATURDAY, 24TH FEBRUARY, 1980. IT WAS FEARED THAT THE TOWNLAND'S WATER SUPPLY, WHICH SERVES SEVEN FAMILIES NEAR THE DRILLING SITE WOULD BE CONTAMINATED.

ANGLO UNITED HAS REPORTED THAT IT EXPECTED VERY PROMISING RESULTS FROM THIS SITE. THE DRILLING RIG HAD BEEN POSITIONED DESPITE THE PROTESTS AND FEARS OF LOCAL PEOPLE.

THE PROTESTERS HAVE THE SUPPORT OF COISDE OIBRE BAILE NA FINNE AND THE DONEGAL URANIUM COMMITTEE.

URANIUM PROTEST

ANTI-URANIUM DEMONSTRATION

AT

ST. BRIDGET'S HALL LETTERMACAWARD

Sunday March 30th - 3:00pm

PLEASE ATTEND



DAMAGE TO HEALTH

RADIATION FROM URANIUM MINING, INCLUDING EXPLORATION, MILLING, PROCESSING AND TAILINGS (WASTES) WILL BE A HAZARD TO HUMAN HEALTH.

In America the Tri-state Survey's results of a nine-year study of the correlation between radiation exposure and various diseases in a population of 13 million people, was published last year. Its research team, funded by the U. S. National Cancer Institute, proved official assumptions to be wrong.

The new study shows that people exposed to very low levels of radiation (levels considered safe within present legal limits) are just as much at risk from cancer and leukemia, and even more so if that exposure is continuous, than from single larger doses. The Tri-State study also suggests that radiation may be linked to other diseases such as heart disease, glaucema, diabetes, hardening of the arteries, rheumatic fever, and various allergies. In fact, these specialists have concluded that there is no safe level of radiation at all, and that radiation may be a factor in aging.

DAMAGE TO UNBORN

Some radioactive substances can be taken in by the mother and passed through the placenta from the mother's blood into the blood of the foetus, where it may kill a cell responsible for the development of an organ, e.g. the heart, brain etc., causing gross deformities to occur in the developing foetus, IN THE SAME WAY AS THALIDOMIDE CAUSED ITS EFFECTS.

HEREDITARY DAMAGE

Radiation causes mutations in the egg or sperm cells of the individual who is exposed, and therefore, in his or her offspring, and in subsequent generations. THERE ARE OVER 200 GENETIC DISEASES SUCH AS MONGOLISM AND CYSTIC FIBROSIS THAT MAY BE CAUSED BY EXPOSURE EVEN TO LOW DOSES OF RADIATION. If a gene damaged by radiation, is dominant, the baby may be deformed or may be born dead. If the gene is "recessive" it will be passed on and may only show itself in a later generation. This is why deformed children are still being born in Hiroshima, 35 years after the Atom bomb was dropped, even though the environmental contamination has largely disappeared. Cystic fibrosis the most common inherited childhood disease is controlled by a recessive gene. One person in twenty carries that gene. Radiation will increase this number. The long-term result may be that "we may have to get used to living only 20 or 30 years, instead of 70 or 80", says Dr. Helen Caddicott.

ENVIRONMENTAL DAMAGE

Radiation can affect wildlife and livestock, plants and aquatic life as well as humans. Water, air and soil provide pathways by which radiation can reach people.

Radioactive dust and gas are released in uranium mining operations. The debris such as radium can be washed into streams, lakes, and reservoirs thus contaminating water supplies.

SO DANGEROUS IS RADIUM, THAT AS LITTLE AS ONE MILLIONTH OF A GRAM CAN CAUSE BONE CANCER. Radium remains radioactive for a very long time since its half life is 1622 years. In the environment, radium accumulates and is concentrated in crops and animals.

RADON GAS RELEASED INTO THE AIR, CAN BE INHALED AND IT IS POSSIBLE FOR POPULATIONS UP TO A THOUSAND MILES FROM THE SOURCE TO BE EXPOSED.

Radon gas is highly radioactive and is responsible for so many lung cancers in uranium miners. It rarely causes problems until the rock is broken and brought to the surface for crushing and grinding to fine sand. Then the radon gas escapes into the air. A study by the U. S. Environmental Protection Agency estimates that between 60 and 200 people can be expected to die every century for at least the next 10,000 years as a result of inhaling the radon gas given off by a 250 acre tailings pond.

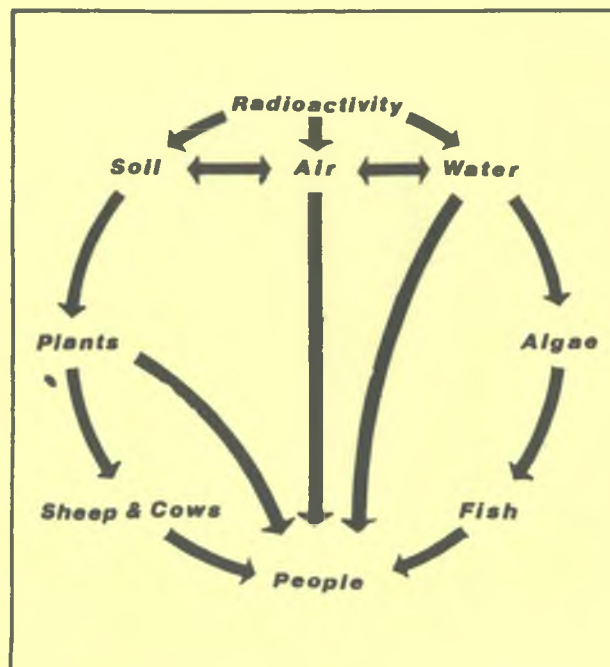
DAMAGE TO WORKERS

COMMUNITIES CLOSEST TO THE SOURCES OF RADIOACTIVITY WILL BE THE MOST AT RISK. URANIUM MINERS, IN PARTICULAR, FACE DEADLY RISKS. In his book, "The Great American Bomb Machine", (1971), Roger Rapoport reported a study of uranium miners on the Erzgebirge Mountains of Germany and Czechoslovakia in the 1930s. Scientists documenting the study showed that 65% of the 5,000 miners were dying of lung cancer. A later study showed that half of the miners deaths between 1935 and 1939 were from lung cancer, and 80% of the remainder from lung disease like tuberculosis, silicosis, emphysema, and chronic bronchitis.

Between 1946 and 1960, some 6,000 American miners were "significantly exposed to radioactive gasses present in the air of uranium mines," according to the leading U. S. "think tank", the Rand Corporation. One hundred and eighty men have since died of lung cancer, and between 600 and 1,100 are expected to die prematurely.

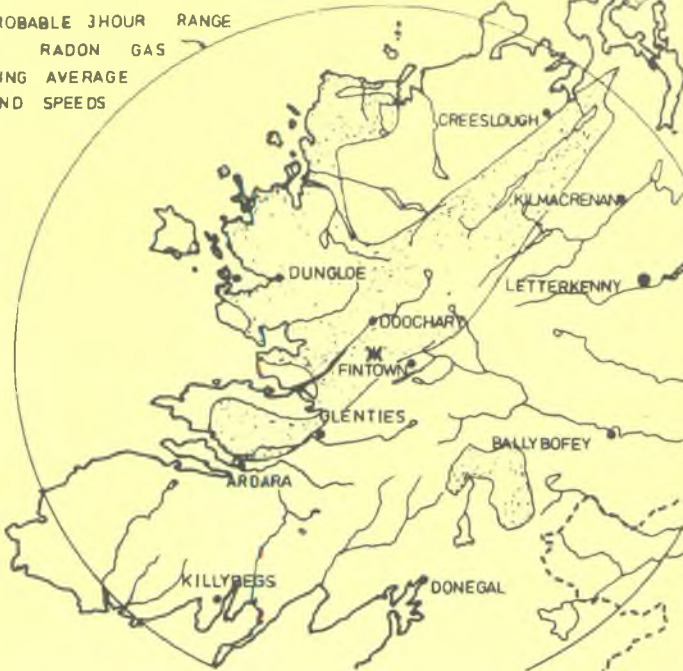
During the last year a rush of lawsuits against the U. S. government have been filed which seek compensation for deaths said to have arisen from low levels of radiation.

A Canadian Royal Commission on the Health and Safety of Workers in Mines (Ontario) showed that at least 81 miners have died of lung cancer at Elliot Lake and blamed radon gas for their deaths.



Donegal Granites
 * Probable Mine

PROBABLE 3 HOUR RANGE
 OF RADON GAS
 USING AVERAGE
 WIND SPEEDS



Co Donegal

Showing Granites, Towns
 and Waterways

Regulatory Commission the total radiation from the tailings "becomes the dominant contribution to radiation exposure from the nuclear fuel cycle, far surpassing nuclear reactors or high level radioactive waste disposal". Radioactive tailings particles can easily be carried by water and air for great distances. The sludge is left to settle in lagoons in the neighbourhood of the mine. When the water is removed the remaining solids still contain a considerable proportion of the original uranium and virtually all the other radioactive elements and will go on generating radiation for an infinity of time.

The Waste is in a finely ground condition with the metals now mobilised, i.e. capable of being leached out by rain water. Some of it could indeed be returned to the mine workings, but because it "bulks up" on grinding, the maximum that could be disposed of in that way would be two thirds. Between times it would all be left lying around the countryside. Attempts might be made to prevent leach water escaping by lining the area with clay, impounding the waste behind tailings dams, and to reduce radon escape by covering the tailings with thick layers of earth, but such piles would need costly management as long as they existed i.e. for ever, in the absence of which the containment would suffer erosion to liberate the mess into the environment.

URANIUM MINING — NO!

Uranium prospecting licences have been granted to four companies, covering the granites of Donegal, - North of Dungloe, In the Ardara Area, Bluestack Mountains and the Gweebarra fault line extending from Glenties to Creeslough (See Maps). Prospecting has been going on for about two years. The most advanced exploration is in the Cloghercorr/Clogherachullion area about three miles South/West of Doochary. The two companies operating here, in adjacent licence blocks, are, Anglo United, through its wholly owned Irish subsidiary, Munster Base Metals, and Northgate Exploration, through its subsidiary, Irish Base Metals. Anglo United has bored at least 21 test holes as well as having carried out much surface trenching. Northgate has placed a drill in position, carried out surface trenching and quarried holes about 20 feet wide and 10 feet deep. Northgate also has blasted, quarried and crushed rock.

PROSPECTING IS GENERALLY EXEMPT FROM PLANNING CONTROLS, SO WHO IS RESPONSIBLE FOR HEALTH AND THE ENVIRONMENT BOTH NOW AND LATER SHOULD A MINE BE DEVELOPED?

Increasing world demand for Uranium, the decision of some countries not to allow uranium mining and decreasing reserves will make Donegal's low grade ore viable in the future. There could be up to 50,000 tons in Donegal. At an average ore grade of 0.06%, 2 million tons of ore would have to be quarried each year, to produce about 1,300 tons which is considered about economic. This does not take into account the over burden and waste rock which would have to be removed to reach the ore. Moreover, richer grades are normally stockpiled to be mixed with lower grades later on, in order to feed a uniform material to the treatment plant. In volume, the rock to be mined each year would cover 80 acres to a depth of 6 feet. A CONTINUOUS FALL OF RADIOACTIVE DUST AND GAS WOULD BE RELEASED TO SETTLE ON A WIDE AREA OF SURROUNDING COUNTRYSIDE. NO TECHNOLOGY EXISTS TO PREVENT RADIOACTIVE BY-PRODUCTS FROM GETTING INTO THE ENVIRONMENT FROM THE MINING AREA.

THE WASTE FROM MINING CALLED TAILINGS IS GREATER IN QUANTITY THAN THE ORE MINED. IT CONTAINS OVER 85% OF THE RADIOACTIVITY PRESENT IN THE ORE AND WILL REMAIN RADIOACTIVE FOR MORE THAN ONE MILLION YEARS. In the words of the Nuclear

EXPLORATION HAZARDS

Any exploration activity which uncovers radioactive rock is a hazard to those exposed and to the environment.

As drilling is part of the exploration process, the possibility exists that a drill will intersect an underground water source, and poison it with radioactive dust and contaminated water which is used to cool the drill. In Colorado, the public body in charge of water asked for Uranium exploration to be halted because it was concerned that drinking water could become contaminated. Trenching exposes radioactive rock. At the exploration sites near Doochary, these trenches are left open and unfenced. Blasting, quarrying, and crushing of uranium bearing rock, which has taken place at Cloghercorr, is mining on a small scale. Holes, up to 20 feet wide and 10 feet deep have been excavated.

These exploration techniques must be increasing the levels of radiation in the environment. Once radioactivity is released into the environment it can never be retrieved or destroyed. While no money is being spared on exploration, there is none available for meaningful studies to determine the uranium exploration effects on public health and the environment.

Say NO to Uranium
 Exploration and
 Mining

Support the Donegal Uranium Committee

CONTACT YOUR PUBLIC REPRESENTATIVE. ASK HIM/HER TO WORK AT STOPPING URANIUM EXPLORATION.

GET YOUR CLUB, ASSOCIATION OR UNION TO DISCUSS THE ISSUE AND TO SPEAK OUT OFFICIALLY AGAINST URANIUM EXPLORATION.

IMPRESS ON COMMUNITY LEADERS THE URGENCY OF THIS PROBLEM, THE NEED TO ACT NOW ON THE HAZARDS OF URANIUM EXPLORATION AND MINING.

ASSIST IN FORMING A LOCAL GROUP IN YOUR AREA TO HOLD DISCUSSIONS, ORGANISE LECTURES AND FILM SHOWS, CIRCULATE INFORMATION, INVOLVE OUR YOUTH AND RAISE FUNDS.

DISPLAY ANTI URANIUM MINING POSTERS.

SHOW YOUR SUPPORT BY ATTENDING ANY DEMONSTRATIONS.

PASS ON THIS LEAFLET TO A FRIEND.

SUBSCRIBE TO THE DONEGAL URANIUM COMMITTEE'S FUND.

THE TIME TO SPEAK OUT, TO ACT, TO SUPPORT THIS CAMPAIGN IS NOW.

Those with vested interests will spare no money or effort in making a case for mining uranium. The Donegal Uranium Committee needs support and help to oppose and stop uranium mining. If you would like to help, you should contact any committee member. If you would like to contribute funds, do so, to the treasurer or any committee member or use bank giro facilities (hand in a sum of money at your local bank, to be credited to the Donegal Uranium Committee, Giro No. 06001051, Allied Irish Bank, Ballyshannon, Co. Donegal, Éire).

COMMITTEE MEMBERS

BRIAN FLANNERY, (Chairman), Straboy, Glenties.
 RALPH SHEPPHARD, (Secretary), Carnowen House, Raphoe.
 VINCENT HERRON, (Treasurer), West End, Ardara.
 JOHN MCLOONE, Cornagrilla, Glenties.
 JOHN MCLOONE, Mully, Glenties. (Interim).
 MICHAEL GALLAGHER, Corr Point, Lettermacaward.
 BRIAN CANNON, Lettermacaward P. O.
 DR. DERMOT CAMPBELL, Hillhead, Ardara.
 BILL SIDA, Dooy, Lettermacaward. (Interim).

**Oppose Uranium
Exploration
Oppose Uranium Mining**

Appendix D

The Perg (Political Ecology Research Group, of Oxford) Report

Background

By the spring of 1980 opposition to Uranium development was widespread in the county, and increasingly well organised with 17 local committees affiliated to the DUC. It was decided that something more than even this expression of mass public concern was required. However well - researched and soundly - based the protests were the Government would continue to ignore it unless authoritative and independent backing could be produced, so this report from perg was commissioned. Their brief was to assess the current scientific arguments on the impacts of Uranium mining and prospecting and where possible to relate these to the conditions in Donegal. No conditions were imposed which would compromise the integrity and independence for which PERG had built up a considerable reputation.

The cost of the report has been remarkably little for the work that has gone into it. But it still represented a large commitment for the people of Donegal who paid for it. To them and to Donegal County Council for their most generous support the D.U.C. offer their thanks.

The PERG Report

The report has 10 chapters which deal with the usual issues covered by any inquiry into a mining proposal. They concentrate on these factors which relate specifically to Donegal and also with the additional problems to be expected with Uranium development. These chapters tend also to be based on official reports and policies as it is they provide the basis on which “ current best practice “ and our own Government policy is formulated. So it is necessary to read these chapters in the light of the further information given in the appendices.

The chapter heading are as follows:

1. Donegal: A Geographical Introduction
2. A general outline of the geology of Donegal
3. An introduction to the geology of Donegal
4. Uranium bearing potential of the Donegal area
5. Outline of mining and milling processes
6. Social and economic impact
7. The impact on natural resources

8. Radiological impacts of mining and milling.
9. Radiological impacts of Uranium prospecting.
10. National and international policy considerations.

There are 10 appendices which are equal in length and importance as the 10 chapters. These deal with essential background issues. Low level radiation and the controversy surrounding it, which of course features little in the 10 chapters, is here given full treatment.

The titles of the 10 appendices are as follows:

- A1) Biological effects of low level radiation
- A2) Selected studies on the effects of low level radiation
- A3) Estimating genetic effects from low level radiation
- A4) Estimating somatic risk for low level radiation
- A5) Regulatory procedures in exposure to radiation
- A6) The radiation risk to the workforce in mining and milling
- A7) Offsite dose calculations from the US MRC Generic Environmental Impact Statement on Uranium Milling
- A8) Mitigation of radiological impacts
- A9) Monitoring programmes
- A10) Non - radiological hazards of Uranium mining and milling

What the report says about the health of the workforce

The figures from the US Nuclear Regulatory Commission indicate that a worker will now experience a **14%** increased risk of developing cancer over a normal career in Uranium mining (para 8.14). However, other authorities increases this figure by **10** times for non smokers and **3.5** times for smokers (appendix para 6.08). PERG conclude in their summery that “ Uranium mining and milling has the potential for significant damage to the health of the work force even within the bounds of current best practice “

Radiation to the public from mine and mill

A small development at the site of current exploration would add **significantly** to the health risk of the people living in Fintown, Doochary and the Gweebarra valley. Beyond that the impact would be slight, although a larger development would extend the risk area (para 8.32). Also of significance is the fact that the assumptions from which these conclusions are based include **control of ground water**. PERG suggests that in West Donegal this would be difficult, and it is likely that the Gweebarra system would be contaminated by radium which would accumulate in **game** fish such as trout and salmon (para 8.42).

Radiation from tailings.

Radon released from tailings presents a problem. The report says “to date, management programmes have not seriously addressed this problem and the majority of tailings piles constitute a long term source of doses to regional and global populations” (para 8.38). Failure of tailings dams also presents a major risk to public health and to the natural environment (para 8.37)

Prospecting

So little work has been done on prospecting that hard evidence of ill effects has not been established (para 9.03). Chapter 9 lists many potential problems which would require specific attention if the health of workers is to be assured and contamination of the environment is to be avoided. The work done by the Nuclear Energy Board has not been presented in a manner which would permit any conclusions, but PERG believe that if the information gathered by the NEB and the exploration companies was put together, then it may still be possible to provide the necessary base line for proper monitoring (para 9.15).

Social and Economic Effects

A single mine and mill can be expected to employ perhaps 500 people. About 250 of these, and their families, would come into the area from outside (para 6.41). As the life time of a mine would be limited, a severe unemployment problem would ultimately be inherited. The development would put a strain on local services and while many people would undoubtedly benefit economically, many others would suffer a reduction in their quality of life. In fact, it appears that large construction projects have such an impact on local wage levels and labour supply that they can actually prevent the growth of employment in more stable industries (para 6.13). How these pros and cons would balance is a matter for speculation, but PERG provides details of several similar cases of heavy industry being brought to rural areas do not give grounds for optimism.

Apart from the more general problems of integrating large numbers of outside workers into a rural community, there would in this instance be the viability of the Irish language and culture to consider. The report predictably finds that areas such as the Uranium bearing area in West Donegal “lacks sufficient population in internally integrated village systems either to maintain the language or be a sufficiently large base for industrial development without further encroachment of English speaking workers and their culture”. (para 6 40)

Tourism

PERG refer to the National Coastline Study by An Foras Forbartha which claims that our local tourist industry is seriously under developed. They state that “ the future tourist potential of Donegal is significantly influenced by the state of the central upland region” (para 7 20). In this area, one mine and mill could generate 30,000 truck loads of ore per year (para 7 21). Both the physical and the psychological disruption that a Uranium development would create would have far reaching repercussions on fishing and general tourism, whatever the ultimate radiological effects (para 7 23).

Low Level Radiation

One of the strong points of the report is the extensive coverage they give to the controversy surrounding the effects of radiation at very low levels. For example, 19 different types of cancer are dealt with in appendix 1, and evidence is presented on the degree to which each of them is known to be linked to radiation. Most of the significant studies on how radiation affects large populations are reported in detail and critically reviewed. These include studies often referred to in the campaign for example, Hiroshima, the Hanford Nuclear Workers etc and several recent studies which have yet to have their full impact on the regulatory bureaucracies such as the International Commission on Radiological Protection (appendices 2 and 6).

The report tends not to attempt summaries or conclusions at the end of long chapters. But it is quite clear that current standards do not take proper account of the many detailed studies which show the risks of low level radiation to have been seriously underestimated. It is not light reading, but for anyone who have been following the details of the debate so far it is not impossible, and not all the chapters are technical. Its great value is in bringing together between two covers the wide range of issues (not all of them mentioned in this short account) which must be considered by anyone involved on either side of the debate. The detail which it provides will be of enormous value to many special interest groups: the medical profession; those concerned with development and servicing the rural areas anywhere in Ireland; many departments of Government (Energy, Environment , Fisheries, Foreign Affairs); the mining industry, and last but not least, the public.

The PERG report stresses the importance of effective participation by the public in arriving at what can be regarded as “ acceptable exposure limits “. This is surely the one lesson above all others which must be learned from the campaign so far. The effects of Uranium development on our Country and our descendants would be so profound that we must have a major say in any decision which is made. It is our health, wealth, environment, culture and peace of mind which are at stake.

(:- Source: D.U.C).

APPENDIX E

Minerals Development Act, 1940

SCHEDULE

List of Minerals

Alum Shales	Fireclay	Nickel, ores of
Anhydrite	Flint and Chert	Oil Shale
Antimony, ores of	Flourspar	Platinum, ores of
Apatite	Ganister	Potash Mineral Salt
Arsenic, ores of	Gem minerals	Quartz rock
Asbestos minerals	Gold, ores of	Radioactive Minerals
Ball Clay	Graphite	Refractory Clays
Barytes	Gypsum	Rock Phosphates
Bauxite	Iron, ores of	Rock Salt
Bismuth, ores of	Laterite	Serpentinous Marble
Bitumens	Lead, ores of	Silica Sand
Calcite	Lignite	Silver, ores of
Chalk	Lithomarge	Strontium, ores of
China Clay	Magnesium, ores of	Sulphur, ores of
Chromite	Magnesite	Talc and Steatite
Coal	Manganese, ores of	Soapstone
Cobalt, ores of	Marble	Tin, ores of
Copper, ores of	Mercury, ores of	Titanium, ores of
Corundum	Mica	Tripoli
Cryolite	Mineral Oils	Tungsten, ores of
Diatomaceous Earth	Mineral Pigments	Witherite
Dolomite	Molybdenite	Zinc, ores of
Dolomitic Limestone	Monazite	
Felspar	Natural Gas	

Article 22

This Directive is addressed to the Member States.

Done at Brussels, 17 December 1979.

For the Council

The President

S. BARRETT

ANNEX**List I of families and groups of substances**

List I contains the individual substances which belong to the families and groups of substances enumerated below, with the exception of those which are considered inappropriate to list I on the basis of a low risk of toxicity, persistence and bioaccumulation.

Such substances which with regard to toxicity, persistence and bioaccumulation are appropriate to list II are to be classed in list II.

1. Organohalogen compounds and substances which may form such compounds in the aquatic environment
2. Organophosphorus compounds
3. Organotin compounds
4. Substances which possess carcinogenic, mutagenic, or teratogenic properties in or via the aquatic environment¹
5. ~~Mercury~~ and its compounds
6. ~~Cadmium~~ and its compounds
7. Mineral oils and hydrocarbons
8. Cyanides.

APPENDIX F

List II of families and groups of substances

List II contains the individual substances and the categories of substances belonging to the families and groups of substances listed below which could have a harmful effect on groundwater.

1. The following metalloids and metals and their compounds:

1. Zinc

11. Tin

2. Copper

12. Barium

3. Nickel

13. Beryllium

4. Chrome

14. Boron

5. Lead

15. Uranium

6. Selenium

16. Vanadium

7. Arsenic

17. Cobalt

8. Antimony

18. Thallium

9. Molybdenum

19. Tellurium

10. Titanium

20. Silver

2. Biocides and their derivatives not appearing in list I.
3. Substances which have a deleterious effect on the taste and/or odour of groundwater, and compounds liable to cause the formation of such substances in such water and to render it unfit for human consumption.
4. Toxic or persistent organic compounds of silicon, and substances which may cause the formation of such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances.
5. Inorganic compounds of phosphorus and elemental phosphorus.
6. Fluorides.
7. Ammonia and nitrites.

APPENDIX G:

ENVIRONMENTAL PROTECTION AGENCY

BATNEEC GUIDANCE NOTE

Class 1.3

EXTRACTION AND PROCESSING OF MINERALS

(DRAFT 3)

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1. INTRODUCTION

This Guidance Note is one of a series issued by the Environmental Protection Agency and is designed to provide guidance to those applying for integrated pollution control licences under the EPA Act. It should also be read in conjunction with *Application Guidance Notes*, available under separate cover.

It should be noted at the outset, that noise is not included within the scope of this work and guidance on this parameter has been issued separately.

This Guidance Note is comprised of seven main sections and an appendix. Following this introduction, Section 2 contains a general note on the interpretation of BATNEEC. The industrial activity covered by the terms of this note is given in Section 3. In Section 4, the technologies to control emissions are tabulated and in Section 5 the specific emission limit values (ELVs) are given. Section 6 contains comments on compliance monitoring requirements, while the principal references are given in Section 7.

The Appendix gives the main sources of emissions, and the principal releases from such sources.

All applicants for Integrated Pollution Control licences, in the sector covered by this note, should carefully examine the information laid down in this Guidance Note, and should use this information to assist in the making of a satisfactory application for an Integrated Pollution Control licence to the Agency. It should be clearly understood that achieving the emission limit values does not, by itself, meet the overall requirements in relation to IPC. In addition to meeting such values the applicant will also be required to demonstrate that waste minimisation is a priority objective and to put in place particular abatement measures to reduce overall mass emissions and pollutant load where this is necessary to protect the ambient environment.

The technologies and the associated emission limit values (ELVs) identified in this Guidance Note are, at the time of writing, regarded as representing BATNEEC for new activities. BATNEEC is not a static quality and will change as technologies, environmental factors and costs alter with the passage of time. The Agency may amend or update the guidance contained in this note should such amendments seem appropriate. The information contained in this Guidance Note is intended to be used only as a tool to assist in determining the BATNEEC for an operation in this sector and should not be taken to be a definitive authority on the BATNEEC for this sector. This Note should not be considered as a legal document.

2. INTERPRETATION OF BATNEEC

BATNEEC means '*the best available technology not entailing excessive costs*'. The technology in question should be **Best** at preventing pollution and **Available** in the sense that it is procurable by the industry concerned. **Technology** itself is taken as the techniques and the use of the techniques, including training and maintenance etc. **NEEC** addresses the balance between environmental benefit and financial expense.

The objective of the Best Available Technology Not Entailing Excessive Costs (BATNEEC) Guidelines is to provide a list of technologies which will be used by the EPA to determine BATNEEC for a scheduled activity. The BATNEEC identified in this Guidance Note is used as a basis for setting emission limit values. It is intended to update these guidelines as required in order to incorporate technological advances as they occur.

In the identification of BATNEEC, emphasis is placed on pollution prevention techniques, including cleaner technologies and waste minimisation, rather than end-of-pipe treatment.

Technologies identified in the BATNEEC guidelines are considered to be current best practice for the purposes of setting emission limit values. These technologies are representative of a wide range of currently employed technologies appropriate to particular circumstances. However, the guidance issued in this note in respect of the use of any technology, technique or standard does not preclude the use of any other similar technology, technique or standard which may achieve the same emission. The entire range would not necessarily be appropriate in specific cases. The specific choice depends on a wide range of circumstances but the crucial factor is that the selected regime achieves BATNEEC. In applying BATNEEC, Environmental Quality Objectives (EQOs) must be respected where set. Measures such as in-plant changes, raw material substitution, process recycling and improved material handling and storage practices, may also be employed to effect reductions in emissions. As well as providing for the installation of equipment and the operation of procedures for the reduction of possible emissions, BATNEEC will also necessitate the adoption of an on-going programme of environmental management and control, which will focus on continuing improvements aimed at prevention, elimination and/or progressive reduction of emissions.

As described in the EPA Act of 1992, BATNEEC will be used to prevent, eliminate or, where that is not practicable, limit, abate, or reduce an emission from an activity which is listed in the first schedule to the Act. The use of BATNEEC is construed in the Act to mean the provision and proper maintenance, operation, use and supervision of facilities which are the most suitable for the purposes.

In determining BATNEEC for an activity, regard shall be had to :

Extraction & processing of minerals - BATNEEC

- the current state of technical knowledge;
- the requirements of environmental protection;
- the application of measures for these purposes, which do not entail excessive costs, having regard to the risk of significant environmental pollution which, in the opinion of the agency, exists.

For existing facilities, additional regard shall be had to :

- the nature, extent and effect of the emission concerned;
- the nature and age of the existing facilities connected with the activity and the period during which the facilities are likely to be used or to continue in operation, and
- the costs which would be incurred in improving or replacing these existing facilities in relation to the economic situation of activities of the class concerned.

The technologies and the associated emission limit values (ELVs) identified in this Guidance Note are regarded as representing BATNEEC for a *new* activity. However, it is also generally envisaged that *existing* facilities will progress towards attainment of similar emission limit values, but the specific ELV requirements and associated time frames will be identified on a case by case basis when the licence application is being processed. Furthermore, for *all* facilities, additional and more stringent requirements may be specified on a site-specific basis whenever environmental protection so requires. Hence the BATNEEC guidelines are not the sole basis on which licence emission limit values are to be set, since information from other sources will also be considered, including site-specific environmental and technical data, plant financial data and other relevant information.

3. SECTOR COVERED BY THIS GUIDANCE NOTE

This Guidance Note covers SECTOR 1.3 of the activities specified in the First Schedule to the EPA Act, 1992. These are:

1.3 *The extraction and processing (including size reduction, grading and heating) of minerals within the meaning of the Minerals Development Acts, 1940 to 1979, and storage of related mineral waste.*

Note: This note refers primarily to base metal mining and to mineral quarrying and should only be used as a general guide for other activities. Specific advice should be sought from EPA for such other cases.

4. CONTROL TECHNOLOGIES

4.1 INTRODUCTION

As explained in Section 2, this Guidance Note identifies BATNEEC but obviously does so in the absence of site-specific information. Accordingly, it represents the requirements expected of any new activity covered by the Note, but does not exclude additional requirements which may form part of the granting of a licence for a specific site.

The approach to be used in selecting BATNEEC is based on the following hierarchy:

- Process design / redesign changes to **eliminate** emissions and wastes that might pose environmental problems.
- **Substitution** of materials (e.g. process chemicals) by environmentally less harmful ones.
- Demonstration of waste **minimisation** by means of process control, inventory control and end-of-pipe technologies etc.

The existing or possible measures for reducing and controlling emissions are described in this section. These range from relatively simple containment measures to sophisticated recovery and end-of-pipe technologies and include:

- (i) Load minimisation
- (ii) Containment
- (iii) Recovery/recycle
- (iv) Emission reduction
- (v) Waste treatment and disposal.

The technical feasibility of the measures listed below has been demonstrated by various sources. Used singly or in combination, the measures represent BATNEEC solutions when implemented in the appropriate circumstances. The circumstances depend on plant scale, chemicals used, nature of the products made, number of different products produced, etc. A summary of the treatments for various emissions is given at the end of the section.

Note that where flammable/explosive vapours or dusts are handled, safety procedures (acceptable to HSA) should be adopted and nothing in this note should be construed as advice to the contrary.

4.2 TECHNOLOGIES FOR LOAD MINIMISATION

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

- Tailings system selection to minimise dust emissions (e.g. flooded tailings, crusting agents).
- Consideration of acid generation potential from all sources.
- Wet dust suppression for stockpiles, tailings, yard surfaces etc.
- Optimisation of water usage.
- Separation of storm water and process effluents of different origin in order to permit appropriate treatment options.
- Enclosed delivery and offloading points for dusty materials with extraction to bag filter.
- Wheel and body washing for vehicles (both site and off-site vehicles).
- Suitable locations for vent raise discharges.
- Modelling (validated) of ground water systems.
- Selection of frequency and size of blast-charges.
- Wet processing where appropriate (BPEO) to minimise dust emissions.
- Paste backfill technology.
- Pyrite removal/isolation.
- Press rather than drier technology.
- Determination and provision of appropriate closure options at design stage.
- Specification of cut-off grade for mill house operations.

4.3 CONTAINMENT OF EMISSIONS:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

- Enclosure of all handling, processing and product storage within a suitable building or underground.
- Closed transfer systems for milled material, raw materials etc.
- Bunding of tanks.
- Overground pipelines and transfer lines.
- Overfilling protection on bulk storage tanks.
- Local extract systems as appropriate.
- Minimisation of tank filling losses by e.g. vapour return systems.
- Cemented backfill to be used as appropriate.

4.4 TECHNOLOGIES FOR RECOVERY AND RECYCLE:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

- Reuse in another facility.
- Reuse of collected dusts.
- Reuse of recovery filtrate.
- Reusable containers for process chemicals.

4.5 TECHNOLOGIES FOR TREATING AIR EMISSIONS:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

(Symbols refer to Table 4.1)

- Filtration (fabric filters normally adequate) (T1).
- Wet scrubbers (T2).

4.6 TECHNOLOGIES FOR TREATING WATER EMISSIONS

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

(Symbols refer to Table 4.2)

4.6.1 Primary Treatment

- pH Correction/neutralisation (F1).
- Coagulation/flocculation/precipitation/oxidation(F2).
- Sedimentation/filtration/flotation (F3).
- Centrifugation (F4).

4.6.2 Secondary Treatment

- Biofilters/activated sludge (F5).
- Aeration lagoons (F6).

4.6.3 Tertiary Treatment

- Post-lagooning (F7).
- Wet lands (F8).
- Sand-Filtration (F9).

4.7 TECHNOLOGIES FOR THE TREATMENT AND DISPOSAL OF WASTES:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints).

4.7.1 Sludge Treatment

- Gravity thickening.
- Centrifugation.
- Belt-pressing.

4.7.2 Disposal

- Tailings pond disposal.
- Engineered landfill of wastes.
- Reuse in downstream processing.
- Backfill (underground mines).

**Table 4.1 - Summary of Technologies for Treating Air Emissions
(Symbols refer to Section 4.5)**

Technology	Emission
T1	Dust Fumes (Drill rigs, size reduction and classification, physio-chemical extraction dryers) conveyors, indoor stockpiles)
T2	Dust (Dryers)

**Table 4.2 - Summary of Technologies for Treating Water Emissions
(Symbols refer to Section 4.6)**

Technology	Emissions
F1	Acids/Alkalis
F2	Organics/BOD Oils/Fats/Greases Suspended Solids
F3	Suspended Solids Dissolved Inorganics
F4	Suspended Solids
F5	BOD
F6	Oxygen and CO ₂ gas balancing
F7, F8, F9	Final effluent - treatment Metal removal/precipitation Reduction in S.S.

5. EMISSION LIMIT VALUES

5.1 REFERENCE CONDITIONS

The reference conditions for concentrations of substances in emissions to air from contained sources are:

For non-combustion gases:

Temperature 273 °K; Pressure 101.3 kPa; no correction for water vapour content.

For combustion gases:

Temperature 273°K; Pressure 101.3 kPa; dry gas; oxygen content 3% for liquid and gaseous fuels and 6% for solid fuels.

These units and reference conditions may not be suitable for continuous monitoring methods and may, by agreement with the Agency, be converted, for day to day control purposes, into values more suitable for the available instrumentation.

5.2 INTERPRETATION OF COMPLIANCE

Unless otherwise detailed in the licence, the following interpretation of compliance with limit values should apply:

5.2.1 Air emissions

For **continuously monitored** emissions, the following will be required for compliance with measurements based on 30 minute mean values (unless otherwise stated):

- (i) 97% of all 30 minute mean measurements shall be below 1.2 times the emission limit.
- (ii) No 30 minute mean measurement shall exceed 2.0 times the emission limit.
- (iii) All daily mean values shall be less than the emission limit.

Where **periodic monitoring** is used to check compliance, all samples should meet the consent conditions.

5.2.2 Emissions to waters

The limit values for discharges to water are based on 24 hour flow proportional composite samples unless otherwise specified.

5.3 EMISSIONS TO AIR

Emission Limit Values representing BATNEEC are given in Table 5.1 below.

Table 5.1 - Emission Limit Values for Emissions to Air

Emission	Limit Value
Particulates	1 mg/m ³
Metals	As per T.A. Luft
Hydrogen sulphide	0.01 mg/m ³

Note 1: Achievement of ELV concentrations by the introduction of dilution air is not permitted.

5.4 Releases to Water

Effluent should be minimised by recovery of materials wherever practicable. The use of lower quality water may be possible for some parts of the process rather than fresh water.

All releases to waters are subject to a licence from the Agency. However any discharge to sewer will require the consent of the sanitary authority. BATNEEC to minimise the release of substances will generally include minimisation at source and either specific treatment of contaminated waste streams to remove particular substances or co-treatment of combined effluent streams or both. The Emission Limit Values for effluent discharges to waters are set out in Table 5.2.

Notwithstanding the Limit Values specified for particular parameters in the totality of the process and other effluents due regard shall be paid to the overriding principal of maintenance of the relevant environmental quality objectives in the receiving systems.

In this regard particular attention should be paid to the maximum acceptable concentration standards (wherever relevant and applicable) for the chemical parameters of;

- (a) S.I. 293 of 1988 - European Communities
(Quality of Salmonid Waters) Regulations, 1988
- (b) S.I. 294 of 1989 - European Communities
(Quality of Surface Water intended for Abstraction of Drinking Water intended for Human Consumption) Regulations, 1989.
- (c) Technical Memorandum No. 1 for those parameters not covered by (a) and (b) above.

Table 5.2 - Emission Limit Values for Discharges to Water*

Constituent Group or Parameter	Limit Value	Notes
pH	6 - 9	4
BOD	90% removal or 25 mg/l	1,4
Suspended solids	90% removal or 35 mg/l	1,4
Toxic Units	5	2,4
Total Nitrogen (mg/l as N)**	> 80% Removal or 15 mg/l	4
Total Phosphorus (mg/l as P)**	>80% Removal or 2 mg/l	4
Total Ammonia (mg/l as N)	5	4
Oils, Fats and Grease (mg/l)	25	4
Fish Tainting	No Tainting	3,4
Mineral Oil (Interceptor) (mg/l)	100	4
Mineral Oil (Effluent) mg/l	1	4
Thallium	0.13	4

* All values refer to daily averages, except where otherwise stated to the contrary, and except for pH which refers to continuous values. Limits apply to effluent prior to dilution with uncontaminated streams, e.g. stormwaters, cooling waters, etc.

** Only applicable to waters subject to eutrophication. One or both limits may apply depending on the sensitivity of the receiving waters.

Notes for Table 5.2:

1. The daily raw waste load for BOD and Suspended Solids is defined as the average daily mass arising for treatment over any three month period.

Calculations of the removal rates for BOD and Suspended Solids should be based on the differences between the waste loads arising for disposal and those discharges to the receiving waters. The amounts removed by treatment (physical, chemical, biological) may be included in the calculation.

2. The toxicity of the effluent shall be determined on an appropriate aquatic species. The number of Toxicity Units (TU) = $100/96 \text{ hr LC}_{50}$ in percentage vol/vol. so that higher TU values reflect greater levels of toxicity.
3. No substances shall be discharged in a manner which, or at a concentration which, following initial dilution causes tainting of fish or shellfish, interferes with normal patterns of fish migration or which accumulates in sediments or biological tissues to the detriment of fish, wildlife or their predators.
4. Consent conditions for these parameters for discharge to municipal treatment plants can be established with the Licensing Authority, and different values may apply.
5. Reduction in relation to influent load. Total nitrogen means the sum total of Kjeldahl-nitrogen plus nitrate-nitrogen plus nitrite-nitrogen.
6. Metal analysis by established A.A. or I.C.P. methods.

6. COMPLIANCE MONITORING

The methods proposed for monitoring the emissions from these sectors are set out below.

6.1 EMISSIONS TO AIR

1. Periodic monitoring of dust and metals as per licence.
2. Baseline and ongoing determination of dust and metals in deposition, soils and vegetable as per licence.

6.2 WASTE WATER DISCHARGES:

1. Establish existing conditions prior to start-up, of key emission constituents, and salient flora and fauna.
2. Daily monitoring of flow and volume, continuous monitoring of pH. Monitoring of other relevant parameters as deemed by the Agency taking account of the nature, magnitude and variability of the emission, and the reliability of the control technologies.
3. Monitoring of influent and effluent from the waste water treatment plant to establish % BOD and Suspended Solids reduction and early warning of any difficulties in waste water treatment plant, or unusual loads.
4. The potential for the treated effluent to have tainting or toxic effects should be assessed and if necessary measured by established laboratory techniques.

6.3 SOLID WASTE MONITORING:

1. The recording in a register of the types, quantities, date and manner of disposal of all wastes.
2. Leachate testing of sludges and other material as appropriate being sent for landfilling.
3. Annual waste minimisation report showing efforts made to reduce specific consumption together with material balance and fate of all waste materials.

7. PRINCIPAL REFERENCES

7.1. Ireland

- 7.1.1 Local Government (Water Pollution) Act 1977;
(Control of Hexachlorocyclohexane and Mercury Discharges)
Regulations (S.I. 55 of 1986).
- 7.1.2 Local Government (Water Pollution) Act 1977;
(Control of Cadmium Discharges) Regulations (S.I. 294 of 1985).
- 7.1.3 European Communities (Quality of Salmonid Waters) Regulations,
(S.I. 293 of 1988).
- 7.1.4. European Communities (Quality of Water Intended for the Abstraction of
Drinking Water) Regulations (S.I. 294 of 1989).
- 7.1.5. Wildlife Act 1976 (Protection of Wild Animals) Regulations
(S.I. 112 of 1990).
- 7.1.6. Local Government (Water Pollution) Regulations
(S.I. 271, 1992).

7.2. U.S.

- 7.2.1. Field and Laboratory Methods Applicable to Overburden and Minesoil
(U.S. Department of Commerce, March 1978, PB-280 495).
- 7.2.2. Progress in Ground Water Protection and Restoration
(U.S. EPA, February 1990, EPA 440/6-90-001).
- 7.2.3. Estimating Releases and Waste Treatment Efficiencies for the Toxic
Chemical Release Inventory Form (U.S. EPA, December 1987, Contract
No. 68-02-4248).

7.3. E.C.

- 7.3.1. Study of Noxious Effects of Dangerous Substances Recorded in List II
(Council Directive of 4 May 1976). Dangerous Substances Discharged
into the Aquatic Environment of the Community (Biokon A115, Final
Report, 1979 (Env/223/74-EN, Rev.3).

7.4. Canada

- 7.4.1. The Use, Characteristics and Toxicity of Mine Mill Reagents in the Province of Ontario (Ontario Ministry of the Environment, 1977).

7.5. Germany

- 7.5.1. T.A. Luft (1986).

APPENDIX 1

MAIN EMISSIONS

1 INTRODUCTION:

In this section, the major sources of emissions to air and water are identified, as are the principal sources of waste from the sector. It should be borne in mind that the identified list of sources is not all encompassing, nor will every plant falling within an individual sector have every one of the emissions which are associated with the sector as a whole.

Emissions are considered under the following headings: open cast mining; underground mining (construction and development) and underground mining (operation). Where sources are considered to have little potential environmental significance they are designated as minor (m). (However, obviously there could be specific mines where this designation of minor may not be correct. Such emissions must then be examined on a one-off basis).

2 SOURCES OF EMISSION TO AIR FROM: (SYMBOLS REFER TO TABLE A1)

2.1 Open Cast Mining:

- Drill rigs (S1).
- Blasting (S2).
- Quarry surfaces (S1).
- Stockpiles (S1).
- Filling, transport and emptying of load haul dump trucks and front end loaders (S1).
- Mechanical size reduction (S1).
- Mechanical classification (S1).
- Physio-chemical extraction (S3).
- Filtering (m).
- Dryers (S4) (existing plant only)/Press Filter (new plant).

- Conveyors (S1).
- Off-site transport (S1).

2.2 Underground Mining - Construction and Development

- Blasting (S2).
- Earthmoving (S1).
- Waste and storage (S1).
- Temporary mineral storage (S1).

2.3 Underground Mining - Operation

- Primary crushing (normally underground) (S1).
- Vent raises (S5).
- Mineral transport to surfaces (m).
- Tailings (S1).

3. SOURCES OF EMISSIONS TO WATER FROM: (SYMBOLS REFER TO TABLE A2)

3.1 Open Cast Mining

- Contaminated stormwaters (E1).
- Machinery area (E2).
- Leaching from open surfaces and stockpiles (E1 & E3).
- Site dewatering (E1).
- Vehicle wheel and body wash (E1 & E2).
- Tailings (E1, E3 and E4)

3.2 Underground Mining - Construction and Development

- Water table reduction (E1 & E5).
- Site water control (temporary lagoons, sedimentation ponds, stormwater control) (E1).

3.3 Underground Mining - Operation

- Recovery filtrate (E1).
- Vehicle wheel and body wash (E1 & E2).
- Site water control (E1).
- Abatement systems (E1).
- In-mine dewatering (E1 and E2 & E5).
- Tailings (E1, E3 & E4).
- Backfill run-off (E1 & E3).
- Laboratory effluent (m).
- Domestic sewage (m).
- Leaching from open surfaces and stockpiles (E1 & E3).

4. SOURCES OF WASTE

- Sludges from WWTP (W1).
- Contaminated drums, equipment, packaging and protective clothing (W2)
- Dust from abatement plant (W3).
- Tailings (W4).
- Spent adsorbents (W5).

**Table A1 - Summary of Sources and Emissions to Air
(Symbols refer to Section 2 in Appendix)**

Source	Emissions
S1	Dust
S2	Dust Explosive Fumes (minor)
S3	Minerals Chemicals (minor) Impurities (minor)
S4 (Press Filter)	Dust
S5	Dust Truck and Compressor Exhausts (minor) Blasting Fumes (Hydrogen sulphide)

**Table A2 - Summary of Sources and Emissions to Water
(Symbols refer to Section 3 in Appendix)**

Sources	Emissions
E1	Suspended Solids Dissolved Inorganics
E2	Lube Oils
E3	Acids/Alkalis
E4	Organics
E5	Oxygen deficient/CO ₂ Rich

**Table A3 - Summary of Other Releases
(Symbols refer to Section 4 in Appendix)**

Source	Emission
W1	Organics (BOD) and/or Inorganics (incl. suspended solids and minerals) Oils/Fats/Grease
W2	Process and Treatment Plant Chemicals Mineral Dust Contamination
W3	Mineral Dust
W4	Mineral Dust Process Chemicals
W5	Activated carbon Zeolite Resins

GUIDELINES FOR GOOD ENVIRONMENTAL PRACTICE IN MINERAL EXPLORATION

The following 'Guidelines for Good Environmental Practice' are intended to amplify and supplement the specific requirements contained in Prospecting Licences and other provisions as issued by the Exploration and Mining Division, Department of Transport, Energy and Communications.

GENERAL PRINCIPLES

- Environmentally responsible management should be an integral component of all exploration programmes.
- Those involved in exploration activities should make themselves fully aware of any ecological or cultural areas of interest within the boundaries of their prospecting licence.
- There should be compliance with all relevant Government laws and regulations for the protection of the environment. Where such laws and regulations do not adequately protect the environment, best contemporary practice in environmental management standards shall be maintained in conjunction with effective exploration, regardless of the location of operations.
- The environmental consequences of each exploration activity should be considered and planned for. Any needed changes to technique and practice should be made in order to conform with these Guidelines.
- Every effort should be made to avoid pollution of the environment during exploration, arising either through inappropriate waste disposal or waste management.
- Holders of Prospecting Licences should take responsibility for ensuring that all contractors and employees are fully informed of these Guidelines and legislative requirements and should ensure that adequate insurance cover is in place prior to entry.
- There should be full consideration and close liaison with relevant landowners and regulatory authorities.
- Any damage to vegetation, land surface or landowner property that may occur as a result of exploration

activities should be minimised and corrected without undue delay.

COMMENCEMENT AND SUPERVISION OF WORK

Where practicable, agreement should be obtained from landowners before entering onto lands for geological mapping, geochemical or geophysical surveying, trenching or drilling. There should be due regard for agricultural activities of landowners, and exploration programmes should be appropriately scheduled so as to cause minimum or no disturbance to such activities. Where disturbance of land or farming activity is expected e.g. during trenching or drilling, compensation must be agreed with the farmer or landowner beforehand. Where disturbance exceeds that which was agreed with the landowner and agreement on the damage cannot be achieved, Teagasc, or another agreed party, should act as arbitrator.

With respect to drilling or trenching, there should be a field supervisor whose name, company address and telephone number are given to the landowner. The field supervisor should be acquainted with relevant local regulations (control of crop or stock disease, quarantine regulations, etc.). The exploration company will accept responsibility for the actions of their contractors and of their subcontractors and of all persons employed by them in connection with the works, except for actions carried out expressly at the request of the owner or occupier of the land.

Field equipment, other than drill rigs and heavy excavation machinery needed to be left in place overnight, should not be left unattended in fields or by roadsides. On the completion of work, care should be taken to ensure that no equipment or materials are left behind which may cause injury to persons or animals.

With regard to any drilling or excavation works, the field supervisor should, before work is initiated, discuss and identify with the landowner suitable entry points, watering points for stock, power and telephone cables, pipelines, etc. Particular attention should be paid to sensitive areas (crop harvesting, etc.), livestock management (calving, foaling, etc.), disease spread and spread of noxious weeds. Target areas should also be checked for sensitive ecological sites or



any archaeological features and measures taken to prevent any damage.

The field superior should also inform the landowner as to the remedial measures that would be immediately undertaken in the event of water or land pollution, and should inform the relevant landowners and appropriate regulatory bodies immediately in the event of any pollution incident.

It should be noted that planning permission may be required for certain activities such as construction of access roads.

DRILLING

Both groundwater and surface environmental concerns must be considered, and the location planned so as to minimise or avoid interference with water or pollution sources. Where possible, drillholes should be located downhill from water sources and karst features, and uphill from any pollution sites. There should be full compliance with requirements under the Local Government (Water Pollution) Acts, 1977 to 1990. A photographic record should be kept for all sites, showing the situation before, during, on completion and after a suitable rehabilitation time has elapsed. For certain environmentally sensitive areas (e.g. wetlands), it may be necessary to use modified vehicles for minimum access damage.

Vehicle access ways to the site should be agreed in advance with the landowner.

Where there is a possibility of artesian conditions, precautionary steps should be taken to handle the water flow. If artesian conditions are encountered, the flow must be shut off within the lithological unit in which such conditions arise. If the drillhole is collared in unconsolidated overburden likely to contain an aquifer, the casing should be kept at least 300mm above ground level and the return water prevented from entering the casing area. If groundwater pollution is a potential problem or if there is any groundwater flow from drilling operations, the drillholes should be fully sealed. Where future re-entry of a drillhole is envisaged, secure and lockable caps should be fitted.

Since both fuel and hydraulic oils are used by drilling and pumping equipment, fail-safe storage and anti-vandal spillage precautions should be taken. Bulk tanks should be kept locked and in secure locations well away from areas where spillage could affect people or stock. Fuelling procedures should be specified for contractors and separate containers kept in the vicinity of unattended rigs or pumps should be made secure. Pumps should be located far enough back from water sources so that any pollution can be contained. In case of spillage, contingency provisions should be on hand (e.g. straw bales), and remedial action immediately undertaken. The exploration company is totally responsible for all materials, liquids or other substances brought onto the land and any consequential damage resulting from these materials.

As regards drilling water, the following procedures should be adopted:

(a) Check pumping location relative to downstream abstractions for potable or animal drinking water. If significant abstraction impact is likely, users should be notified, where possible, and their agreement sought, especially in periods of low flow; (b) Where the water quality is suspect it should be analysed, and contaminated water must not be used. Should bacterial contamination be suspected during drilling, the drillhole should be disinfected (chlorinated) before abandonment; (c) Return water should be treated by settling to minimise the possibility of solids being made available to grazing animals; (d) Return water, even after settling, should not be discharged directly into a watercourse. Discharges should be allowed to percolate to the watercourse, allowing further filtering of the return water.

Care should be taken to minimise damage to vegetation, and on cessation of drilling and clearance of the site, rehabilitation should be commenced at the earliest appropriate time.

Noise problems can arise when drilling in proximity to residential areas. Where drilling and pumping must take place in such locations, care should be taken to reduce noise emissions, at source, to acceptable levels and activity should not be permitted during unsociable hours.

In addition, drilling and pumping sites should be securely fenced to exclude grazing animals; drill rods should be stacked in the safest possible manner, inside the site; all oils and greases should be securely stored and at no time should grease be accessible to livestock; the highest possible standard of housekeeping should be insisted upon on the drilling site, storage and assembly areas and meticulous clearance carried out when work is completed; on completion of the work the site and the access routes should be restored to their condition prior to commencement, or as close thereto as possible; in any event, the restoration should be to the satisfaction of the landowner, and if compensation or rehabilitation is required it should be finalised without delay.

EXCAVATIONS

Similar concerns with regard to surface aspects of groundwater and drilling apply to excavations, and the same approach should be used. If possible the work should be done in dry weather, and surface runoff diverted around the trench or trial hole. A photographic record should be kept for all sites, showing the situation before, during, on completion and after a suitable rehabilitation time has elapsed. Care in planning the actual trench work is also needed from a safety aspect, information regarding which is obtainable from the Health and Safety Authority, Hogan Place, Dublin 2. Excavation should not take place adjacent to streams or rivers which are potential spawning grounds for fish species

If possible, excavations should also be avoided in fields with old 'french drains': if encountered they should be correctly replaced.

A temporary fence should be erected around any excavation, equipment and spoil heaps. The fence should be at an appropriate distance beyond the opening, and no chemicals/petroleum-based products should be kept in this area. Unless otherwise agreed with the landowner the fence should be adequate for the purpose of excluding any livestock kept on adjoining land. All temporary fencing should be erected in position before excavation commences and subsequently maintained until reinstatement of land is completed.

If pumping is necessary to prevent excavations from becoming waterlogged, the discharge should be directed into suitable drains or onto stable slopes, and not directly into receiving waters.

All topsoil should be kept separate and stacked to one side of the working area and kept free from the passage of vehicles and plant. In sensitive areas of vegetation, sods should be taken and carefully preserved for reinstatement. Subsoil and hard-core materials should be kept separate from topsoil. Contaminated soil should be clearly identified and remediated.

Reinstatement of land should be carried out without delay, according to best contemporary environmental practice. After backfilling, the topsoil should be carefully replaced, and additional topsoil provided if reasonably required for proper reinstatement. Care should be taken to restore ground to a condition at least equivalent to that existing before the commencement of the works. This should involve the topsoil being left in a loose and friable condition; appropriate levelling off of the ground so as to present a neat appearance (the level of the trench area should be the same as that of the undisturbed surrounding ground one year after restoration is completed); the removal of all stones in excess of 50mm (2") in diameter from the surface; and the reseeded of the area in consultation with the landowners. The rate of seeding and time and method of sowing including application of fertiliser, should be in accordance with good agricultural practice.

On completion of the works the company should remove all temporary buildings, fences, roadways, all surplus soil, stones or gravel and any debris such as trees, brushwood, etc. and any other matter that does not naturally belong to the site. The site should be left clean and tidy, to the satisfaction of the landowner, and if required by the landowner, the company should plant shallow-rooted trees, shrubs, or hedging to replace any which have been removed. If compensation is required, it should be finalised without delay. Follow up visits should be made after 6 months to assess the quality of restoration, and any required remedial work undertaken to the satisfaction of the landowner.

If it is intended to keep open excavations after completion of prospecting and exploration work, it may be necessary to get planning permission, either on a temporary or a permanent basis, as appropriate. Advice should be sought from the Local Authority.

WATER SERVICES

All necessary precautions should be taken to protect all watercourses and water supplies against pollution attributable to any exploration activity. Where excavations are adjacent to watercourses, care should be taken to ensure that no debris or soil enters the watercourse either inadvertently or by flooding during periods of high water discharge. All proper steps should be taken to reduce to a minimum any interference with water supplies.

Before trenching or drilling operations commence, the company or its agents should acquaint themselves with the position, type and size of all underground services in the selected location. In the event of a water pipe or supply being severed, the company or its agents should effect an immediate repair or provide alternative supplies. In the event of a well or other private water supply being permanently affected or destroyed by any exploration activity, the company should construct an alternative supply (e.g. a well) as soon as possible; in the meantime, alternative supplies should be provided.

PUMPING AND OTHER GROUNDWATER TESTS

Where such testing is required, relevant landowners in the area should be notified, and there should be a continuous emergency telephone service and suitable emergency facilities in place to ensure that a wholesome, potable water supply is continuously available to any affected parties. The relevant Local Authority should be made aware of such proposed tests and the arrangements, and any needed approvals obtained from them. The arrangements for such tests should include appropriate controls to avoid adverse impacts arising from disruption of existing water supplies and disposal of pumped waters, and suitable records of water quality and monitoring aspects should be kept. Such information should be made available to the relevant Local Authority on completion of the work. Where required, a licence under the Local Government (Water Pollution) Acts, 1977 to 1990 must be obtained.

GEOPHYSICAL SURVEYS

Cables should not be left unattended in areas where livestock are present. If necessary, arrangements should be made with the landowner to remove livestock at a mutually convenient time for the duration of the work.

RECORD OF WORK

Suitable records of all excavation work or work relating to groundwater testing should be kept by the company, including a complaints register (and action taken) for inspection by officials of the Department of Transport, Energy and Communications and the relevant Local Authority as required. After completion of the work, a summary report, including relevant data, should be furnished to the Department and the relevant Local Authority.

RESTRICTED AREAS

Companies should bear in mind that it is necessary to ascertain the occurrence of National Monuments, National Nature Reserves, Areas of Scientific Interest, Natural Heritage Areas and gas pipelines within the licence area to

ensure that there is no interference with such sites or features. With regard to:

(a) National Nature Reserves, no access is permitted without the prior approval of the Minister for Arts, Culture and the Gaeltacht, and no trenching or drilling is to be undertaken without the prior approval of the Minister for Transport, Energy and Communications;

(b) Sites indicated on the Sites and Monuments Record Constraint maps (available for inspection at County Libraries or the Local Planning Authority), such sites are not to have any exploration work undertaken on or adjacent to them without prior approval of the Minister for Arts, Culture and the Gaeltacht;

(c) Gas pipeline routes, no trenching or drilling is permitted within 30m of the pipeline without the prior approval of Bord Gáis Éireann.