EXPLORATION IN IRELAND
1960 - 2003

By

John A Clifford
Presentation Outline

- Pre-1960: A Forgotten History
- 1960 - 1970: The Decade of Discovery
- 1970 - 1980: Treading Water
- 1980 - 1990: Gold and the Base Metals Recovery
- 1990 - 2003: Drilling Deeper
  - Brownfield Exploration
- Post-2003: What Next?
## A Forgotten History

![Image from Mining Heritage Trust of Ireland](image)

### Geologic Time

<table>
<thead>
<tr>
<th>Element</th>
<th>Pre-1960</th>
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<td>Zn - Pb</td>
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### Prospect

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<th>Element</th>
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### Geologic Time

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After AHM 1979

Image from Mining Heritage Trust of Ireland

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1960 - 1970

The Decade of Discovery
Tynagh Zn - Pb

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Tynagh Zn - Pb

Zinc Soil Geochemistry

10,000 ppm
4,000 ppm
500 ppm

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Tynagh Zn - Pb

• Host - Waulsortian Reef

• Reserves:
  - 9 Mt @ 14.1% Zn + Pb

• Operated: 1965 - 1980
Silvermines Zn - Pb

Ref: Inter Agency Report 2000


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Silvermines Zn - Pb

General Geology

Lead Geochemistry 1963

Ref: Inter Agency Report 2000

400 ppm
5,000 ppm
> 40,000 ppm

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Silvermines Zn - Pb

Lead Geochemistry

Zones B and G

Ref: Inter Agency Report 2000

Ref: SRK 2002

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Silvermines Zn - Pb

• Host:
  – B & G Zones: Waulsortian Reef
  – Lower G Zone: Basal Carboniferous and Devonian

• Resources:
  – 17.7Mt @ 6.43% Zn, 2.53% Pb, 23g/tAg

• Operated: 1968 - 1982
(Cu,Fe)$_6$Hg$_2$S$_5$

Gortdrum Cu - Ag - Hg

Stream Sediment Anomaly

Mineralised Outcrop

Soil Anomaly

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Gortdram Cu-Ag-Hg

>40 ppm THM

Mineralised Outcrop

IP Anomaly

Pit Outline
Gortdrum Cu - Ag - Hg

• Host:
  - Basal Carboniferous, Devonian, Lower Palaeozoic.

• Resources:
  - 3.8Mt @ 1.19% Cu, 25g/t Ag

• Operated: 1967 - 1975
Ballinalack Zn - Pb

Calp

Waulsortian

Lower ABL

Syngenore Exploration
Ballinalack Zn - Pb

Syngenore Exploration

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Navan Zn - Pb

Zinc Soil Geochemistry

Upper Dark Limestone
Waulsortian Limestone
Argillaceous Bioclastic Limestone
Navan Group Beds
Lower Palaeozoic
Felsic Intrusive

200 - 300 ppm Zn
100 - 300 ppm Zn
<100 ppm Zn
500 - 20,000 ppm Zn
300 - 500 ppm Zn

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Navan Zn - Pb

- Host: Basal Carboniferous shallow water carbonates
- Resources - Initial:
  - 70Mt @ 10.1% Zn, 2.6% Pb
- Production to end 2002:
  - 55.2Mt @ 8.4% Zn, 2.1% Pb
- December 2002:
  - Reserves: 18.0Mt @ 9.3% Zn, 2.0% Pb
  - Resources: 21.2Mt @ 7.3% Zn, 2.2% Pb
- Operation: 1977 - To-date
### Geologic Time

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### Prospect

- ▲ Small
- ✤ Medium
- 😊 Mine

### 1960-1970 Prospecting Licences

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1970 - 1980

Treading Water
Post Navan Problems

- Flaws in Mineral Legislation
- Resources Protection Campaign
- Oil Crises of early-mid 1970’s
- Shallow Soil Geochemical Coverage
1970 - 1980 Solutions

- Deep Overburden Sampling
- Uranium
- Lithium - Tin - Tungsten
- Industrial Minerals
- The Move Overseas

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Deep Overburden Sampling

• Technical Successes

• References
  – Prospecting in Areas of Glaciated Terrain 1979

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Uranium

Tullow Anomaly

- Water: Max 36ppb
- Steam Sediment: Max 300ppm
- Peat: Max 8,000ppm
- Resource: 26 - 42t U

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## Element

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### Prospecting Licences 1960-1980

- **Pre-1960**: Light yellow bars
- **1961-1970**: Dark yellow bars
- **1971-1980**: Yellow bars

- **Cenozoic**
- **Mesozoic**
- **Permian**
- **Carb**
- **Dev**
- **Sil**
- **Ord**
- **Camb**

### Geologic Time

- **Cenozoic**: 0-65 million years ago
- **Mesozoic**: 251-66 million years ago
- **Permian**: 251-208 million years ago
- **Carb**: 208-359 million years ago
- **Dev**: 359-443 million years ago
- **Sil**: 443-541 million years ago
- **Ord**: 541-635 million years ago
- **Camb**: 635-915 million years ago

### Symbols

- **Zn - Pb**: Light yellow triangle
- **Cu**: Light green triangle
- **Au**: Bright red triangle
- **Gypsum**: Light blue triangle
- **Barite**: Dark blue triangle

### Mine

- **Small**: Bright red diamond
- **Medium**: Yellow diamond
- **Mine**: Smiley face

---

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1980 - 1990

- Gold
- Lithogeochemistry
- Base Metal Revival

Gold Price 1968 - 1980

Images: National Museum website
Gold

3,600 ppb
80 ppb
30 ppb
10 ppb

Resource:
400,000 t @ 18g/t Au

Deep Overburden Sampling
50m by 20m
Lithogeochemistry

- Halo values can be encountered which, if intersected in an exploration drill hole, would be encouraging
- Given two, or more, holes vectors can be detected and used to guide drilling.
Galmoy Zn - Pb

Lead Geochemistry
Galmoy Zn - Pb

- Host: Waulsortian Reef
- Resources - Initial:
  - 6.5Mt @ 12.9% Zn, 1.3% Pb
- Production to end 2002:
  - 3.1Mt @ 10.6% Zn, 1.1% Pb
- December 2002
  - Reserve: 3.3Mt @ 11.0% Zn, 2.1% Pb
- 2003 R Zone Discovery
  - 2.3Mt @ 19.0% Zn, 7.2% Pb, 66g/t Ag
- Operation: 1997 - To-date

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Lisheen Zn - Pb

Summary
Geology of the
Lisheen Area

Legend
- Crosspatrick Fm
- Waulsortian Reef
- ABL Limestones
- Fault
- Orebody projected to surface

500 m
Lisheen Zn - Pb

1990 Chevron Soil Survey
18” Auger

Zn (ppm) - Gridded
Pb (ppm) - Contour @50ppm

Legend
- Crosspatrick / Waulsortian contact
- Waulsortian / ABL contact
- Fault
- Onebody projected to surface

Drill Hole
IP survey station

60 ppm
100 ppm

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Lisheen Zn - Pb

- **Host:** Waulsortian Reef
- **Resources - Initial:**
  - 22Mt @ 11.5% Zn, 1.9% Pb, 26g/t Ag
- **Production to end 2002:**
  - 3.57Mt @ 11.34% Zn, 2.55% Pb
- **December 2002:**
  - Reserve: 12.8Mt @ 11.26% Zn, 1.96% Pb
  - Resource: 2.3Mt @ 9.9% Zn, 1.2% Pb
- **Operation:** 1999 - To-date

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1990 - 2003

Going Deeper

Brownfield Exploration
1990 - 2003

- Drilling Deeper
- Geological Models
- Geophysics
- Zinc Price

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Exploration and Zinc Price

Prospecting Licences
1960-2003

Zinc Price US c/lb
Constant 1996 US $
### 1960 - 2003

#### Element
- ▲ Zn - Pb
- ▶ Cu
- ➥ Au
- ▲ Gypsum
- ▫ Barite

#### Prospect
- ➥ Small
- ◆ Medium
- ☺ Mine

#### Geologic Time
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What Next?

- Database
- Geology
- Lithogeochemistry
- Geophysics
- IQ will get you there, but NQ will find it (Sig Muessig, 1979)
- Environmental Baseline