

SECTION B.14

ASSESSMENT AND MANAGEMENT OF RISKS RELATING TO COVERS FOR METAL LEACHING AND ARD MITIGATION

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By:

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Review of Cover Purpose:

- Access
- Physical Isolation
- Erosion Protection
- Vegetation Establishment
- Oxygen (oxidation) Control
- Infiltration (leaching) Control

Suitability of Cover Types:

	Water	Simple	Complex	Depends on
Access	Boat only	<input type="checkbox"/>	<input type="checkbox"/>	Tailings strength, Slope
Isolation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Depth, Biota
Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Climate, Slope & Mat
Vegetation	NA	<input type="checkbox"/>	<input type="checkbox"/>	Climate
Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	?	H ₂ O, Barometric pumping!
Infiltration	<input type="checkbox"/>	?	<input type="checkbox"/>	Climate, Settlement

- can be achieved
- ? may be achieved
- difficult to achieve

Time Dependency of Risk

During Design:

- Access on very soft slimes
- Slimes consolidation
- Erosion protection
- Biotic intrusion
- Partial saturation (oxygen and infiltration flux)
- Barometric pumping

During Construction:

- Access on soft slimes
- Access on steep slopes

Time Dependency of Risk

Long Term Durability:

- Weathering
 - wastes effecting strength
 - rip-rap
 - geosynthetics
- Perpetual forces:
 - wind & water erosion
 - frost action
 - desiccation
 - biota
- Extreme events

High Risk Elements of Cover Performance

Potential Problems	Tailings			Waste Rock		
	Risk in Design	Risk during Construction (slimes)	Long-term Risk of Disruption	Risk in Design	Risk during Construction (slopes)	Long-term Risk of Disruption
Access	✓✓	✓✓			✓✓	
Slumping					✓✓	✓✓
Erosion	Sheet Channel		✓			✓✓
Consolidation	✓✓		✓			✓
Biota	✓✓		✓✓		✓✓	
Infiltration	✓		✓		✓	
Oxygen Flux	✓		✓	✓✓		✓✓

Managing Risk

1. Materials

- Maximize use of natural, durable materials
- Minimize use of geosynthetics which deteriorate
- Rip-rap control of erosion in dry climates

2. Climate

In dry climates:

- consider evaporative cover designs
- increase use of rip-rap for erosion protection
- provide for sedimentation control

In wet climates:

- consider infiltration cover designs
- consider water covers

Managing Risk

3. Biota

- Beaver (beaver control or wide channels)
- Burrowing animals (bio-intrusion layers)
- Ants & insects (bio-intrusion layers)
- Anthropogenic activity (institutional control)
- Roots (control vegetation species)

4. Monitoring & Maintenance

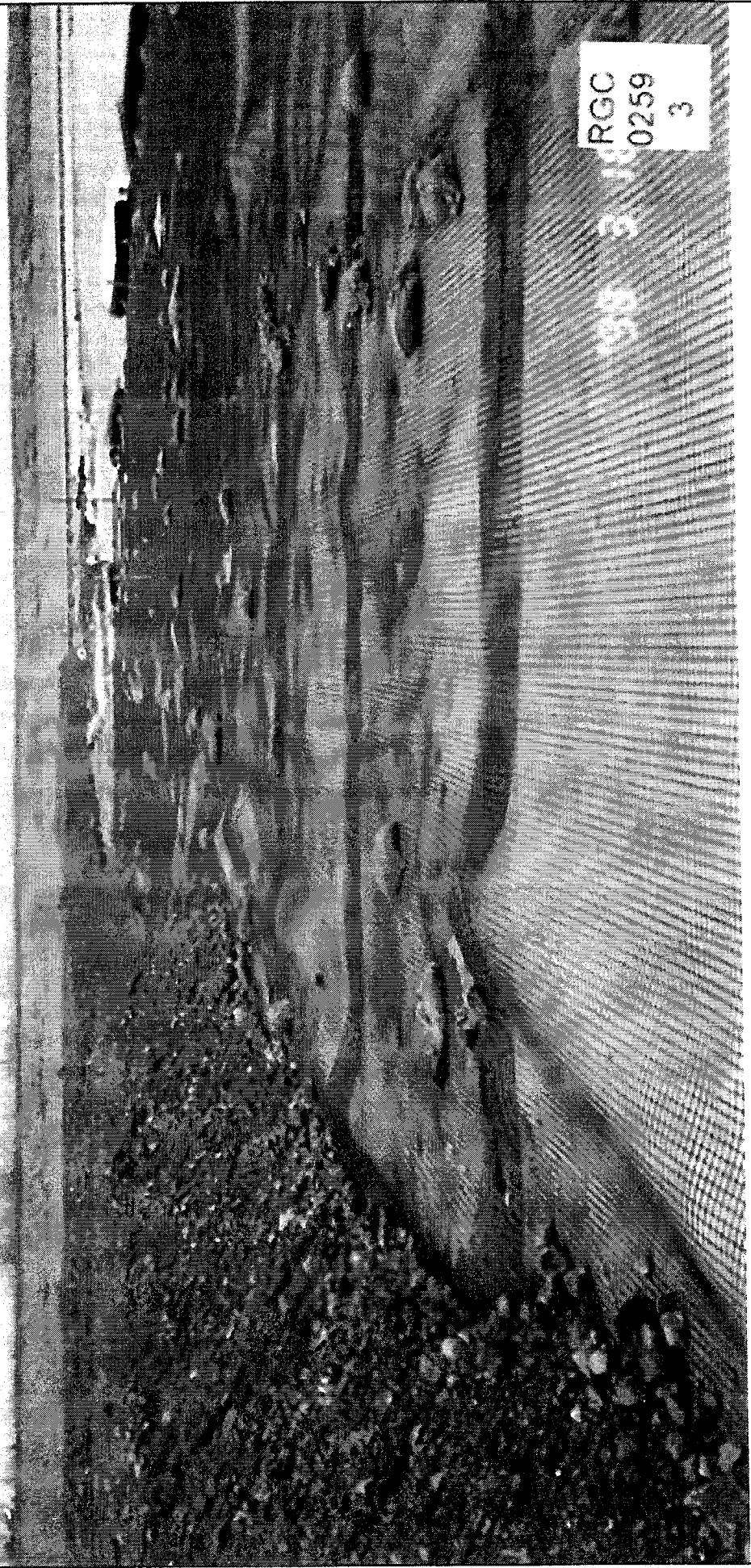
- Erosion
- Settlement
- Sedimentation (& Glaciation)
- Biotic factors
 - Fauna
 - Flora
 - Man

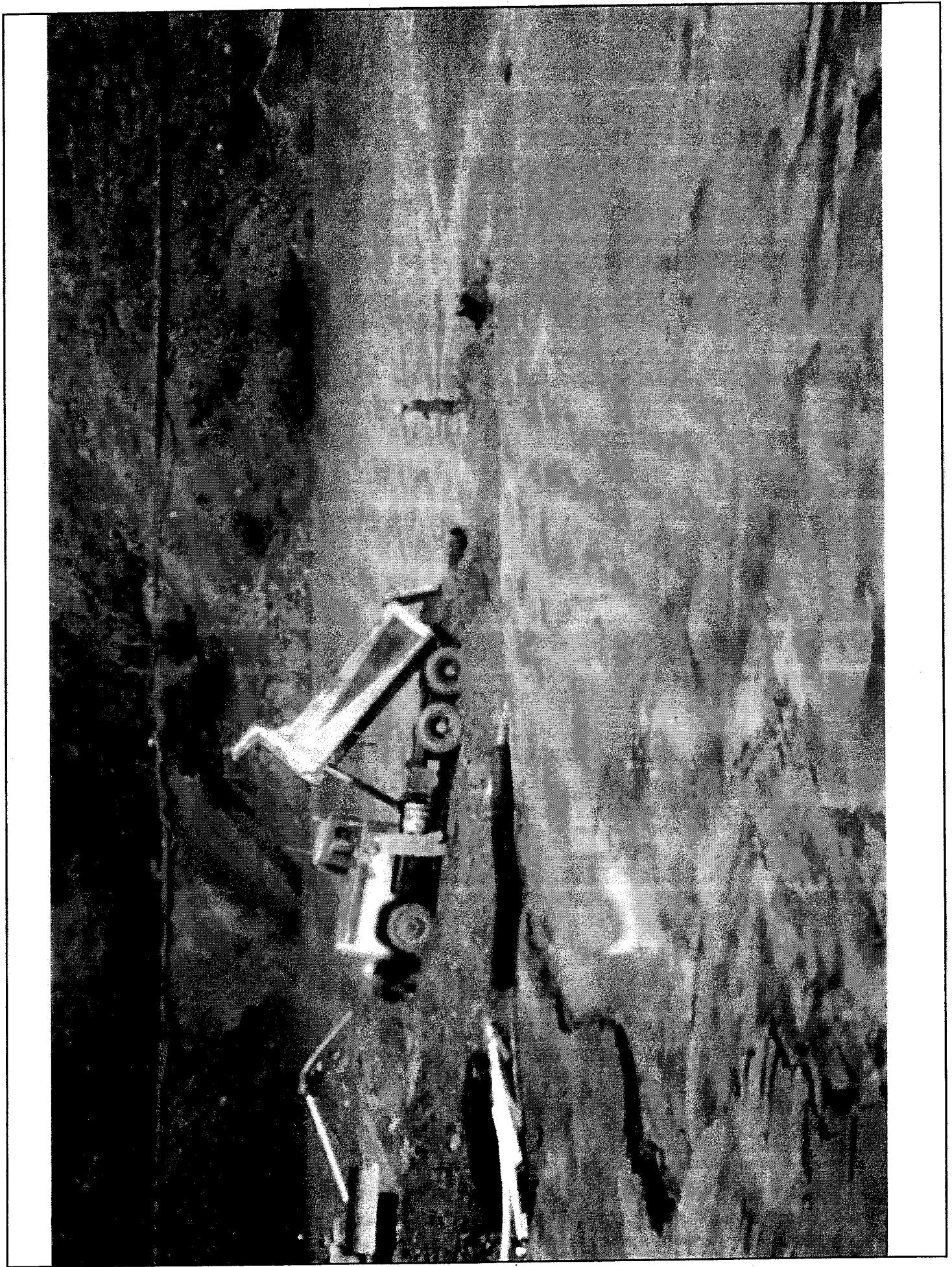
Cost of Risk Mitigation:

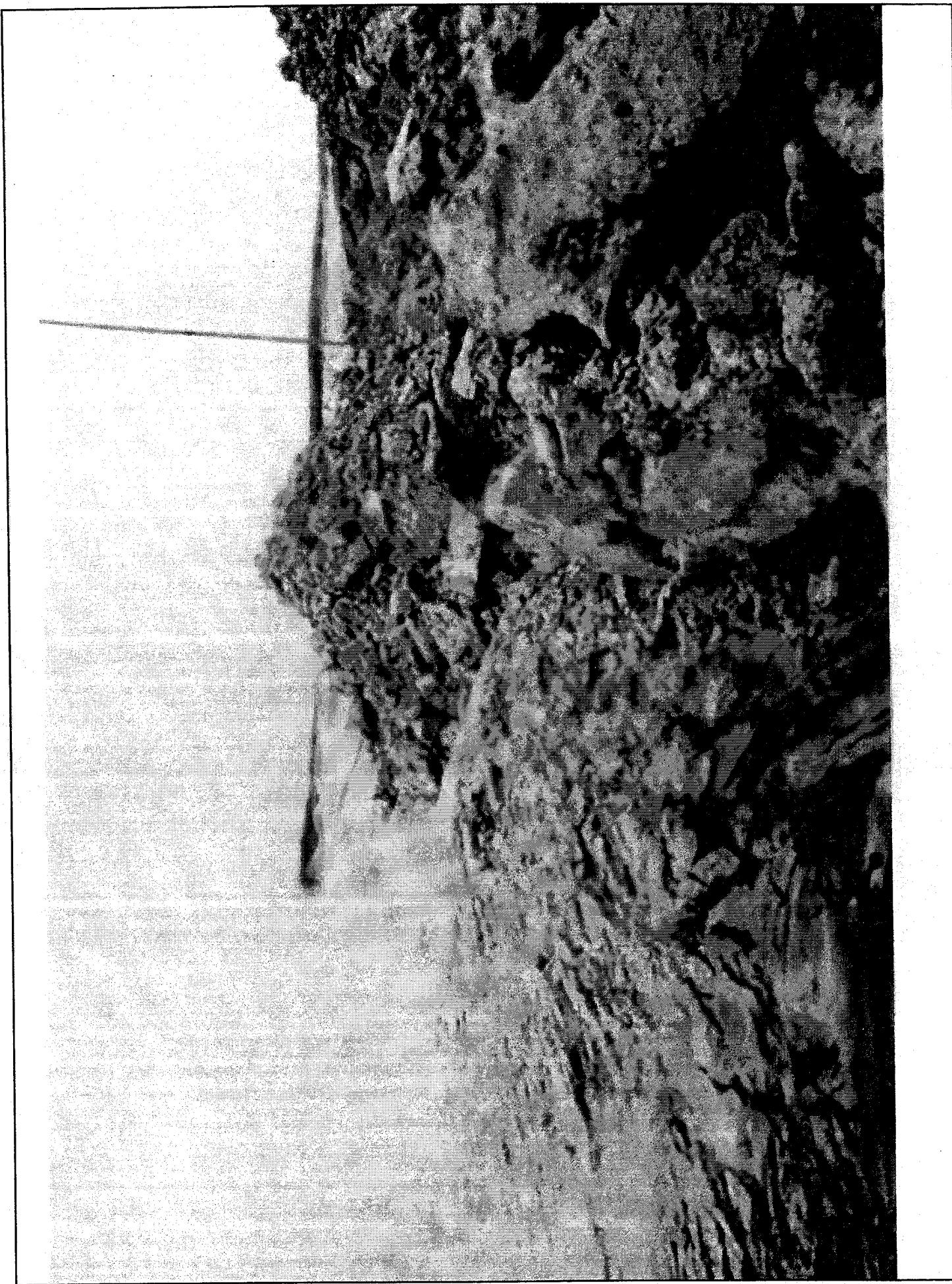
- Capital cost of mitigation (closure measures)
- Operating costs of mitigation (monitoring and maintenance)

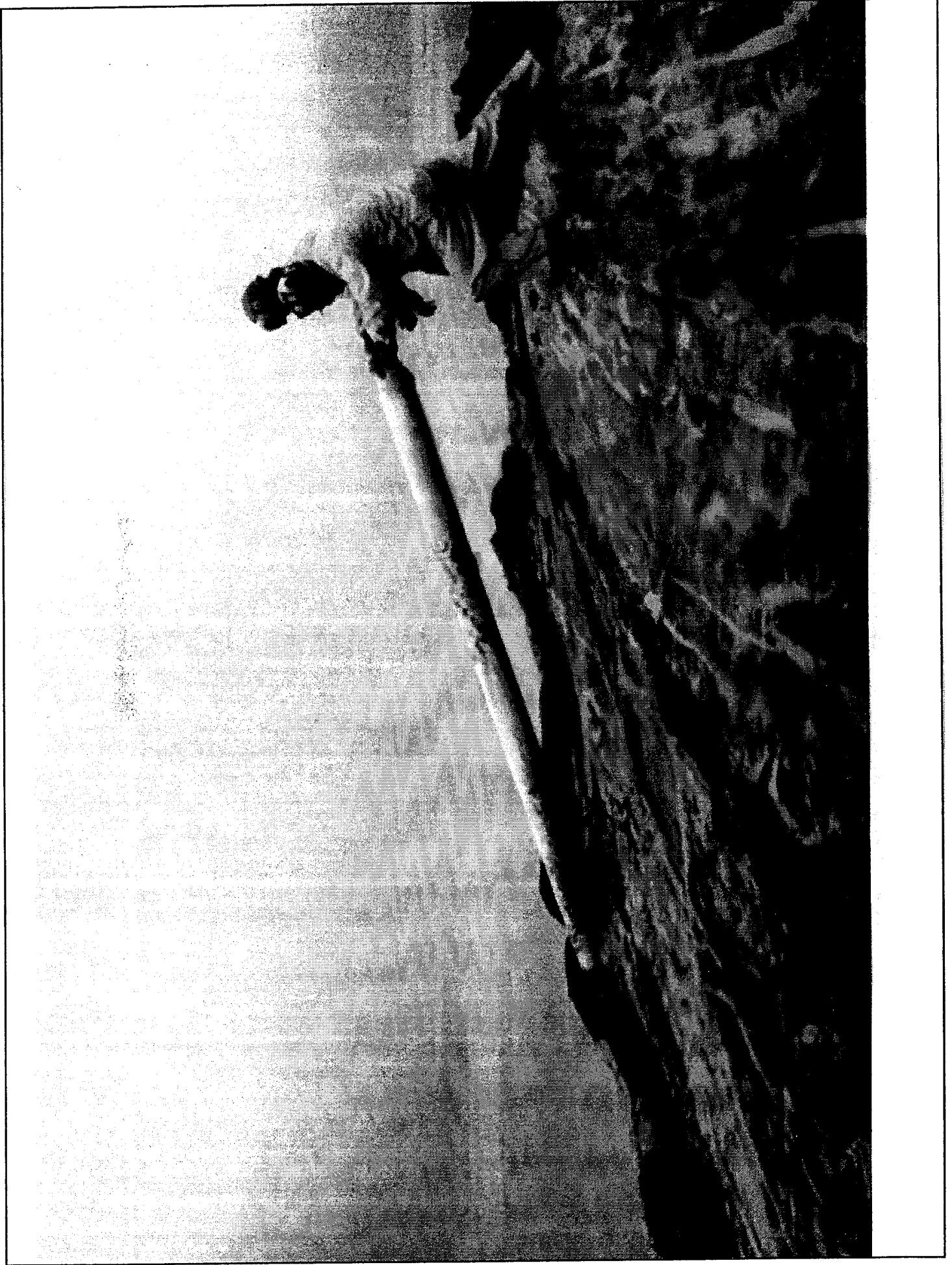
The present value of the long term operating costs of risk mitigation are often much much less than the capital cost of mitigation to acceptable risk levels.

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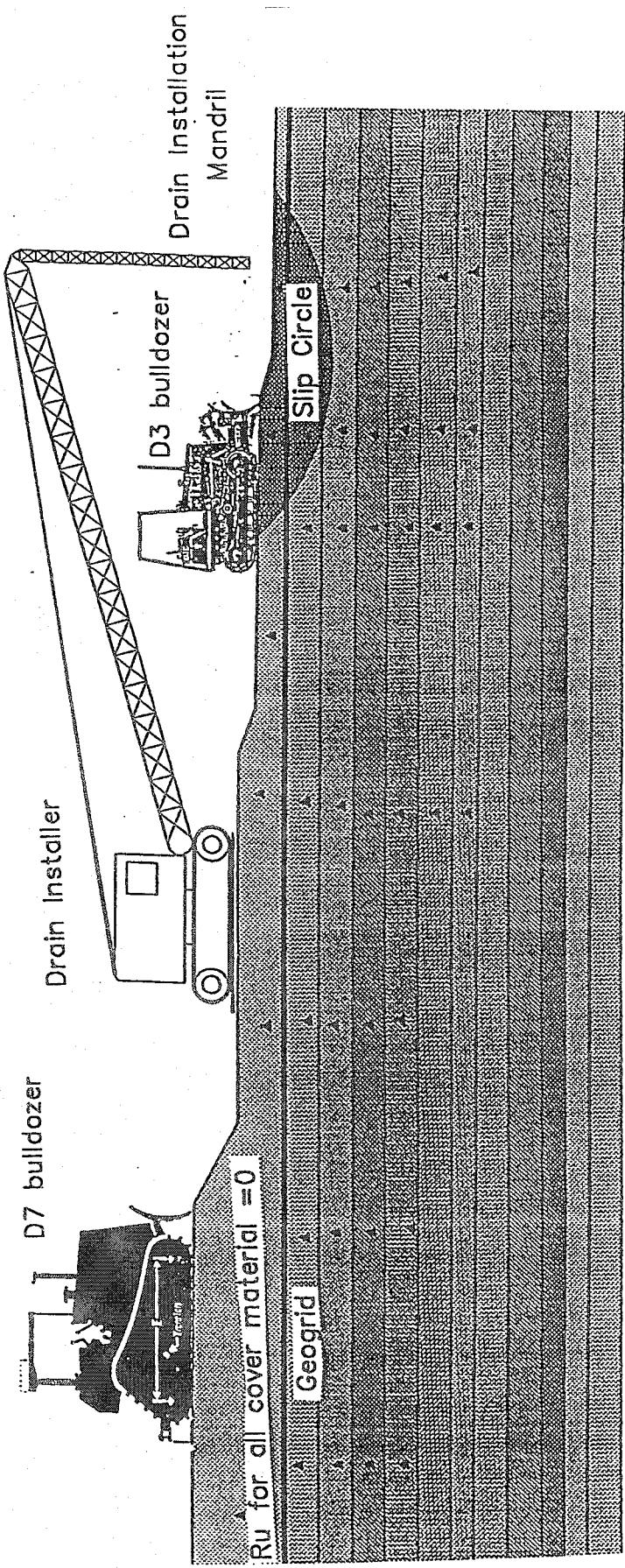
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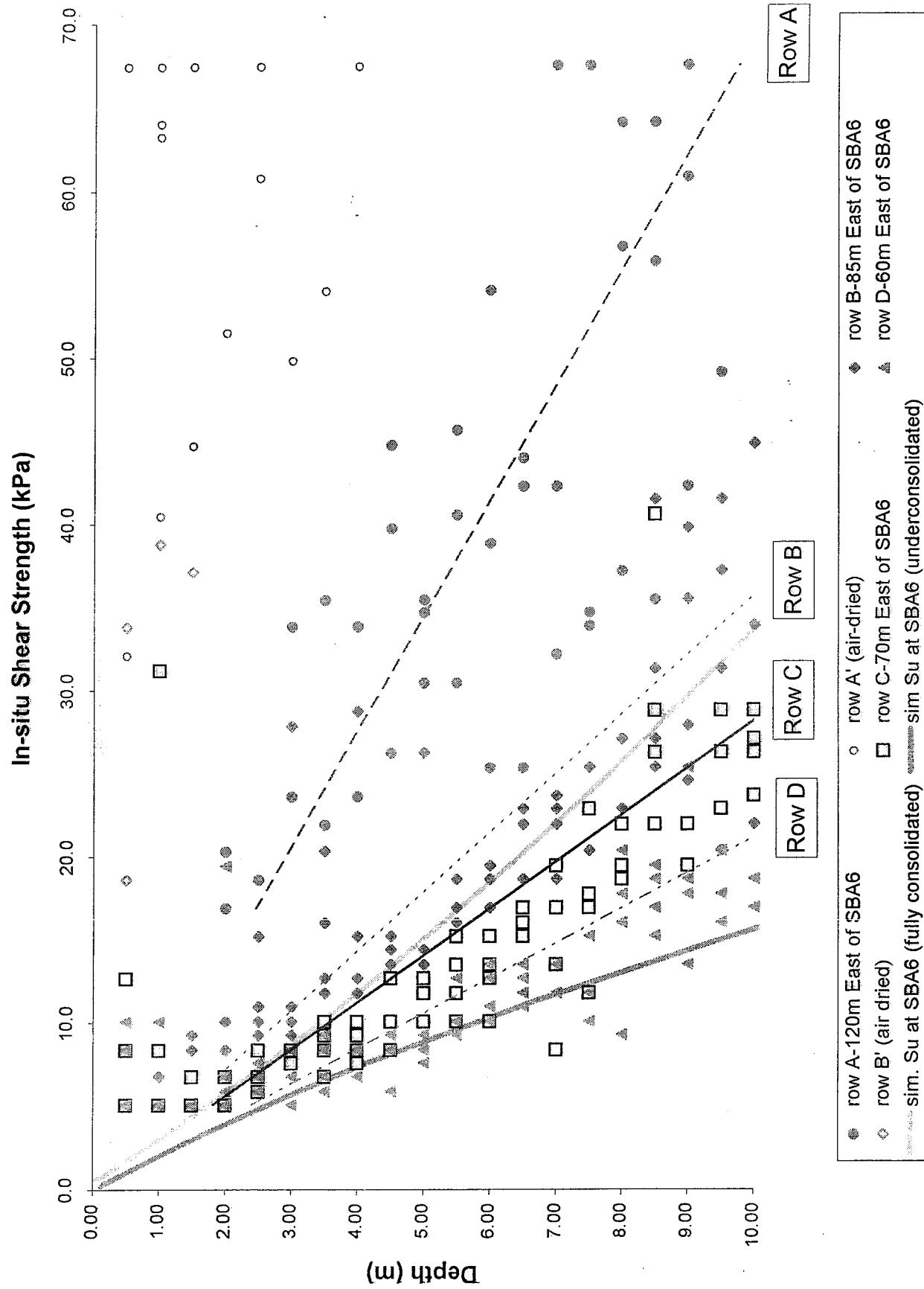
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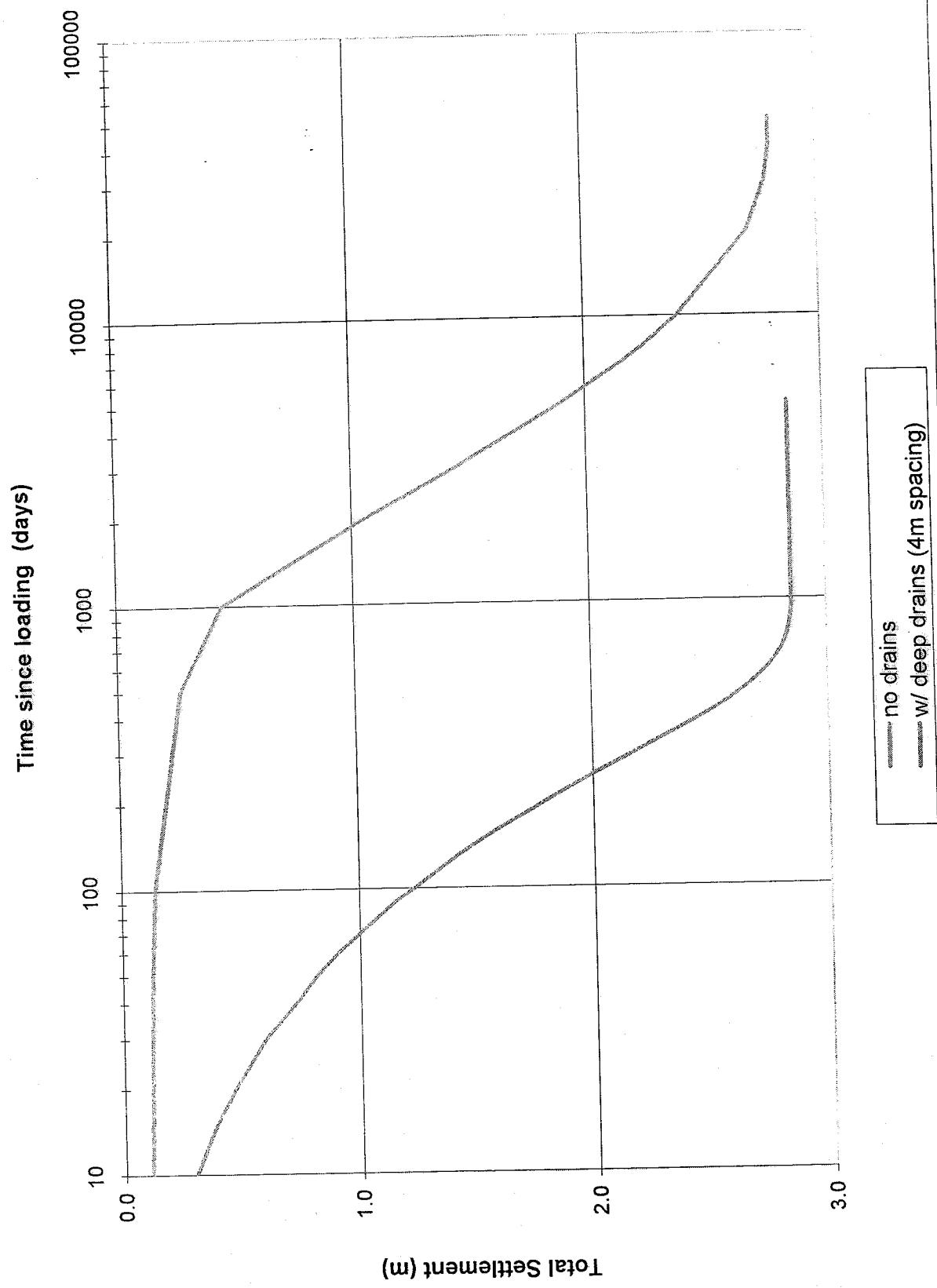
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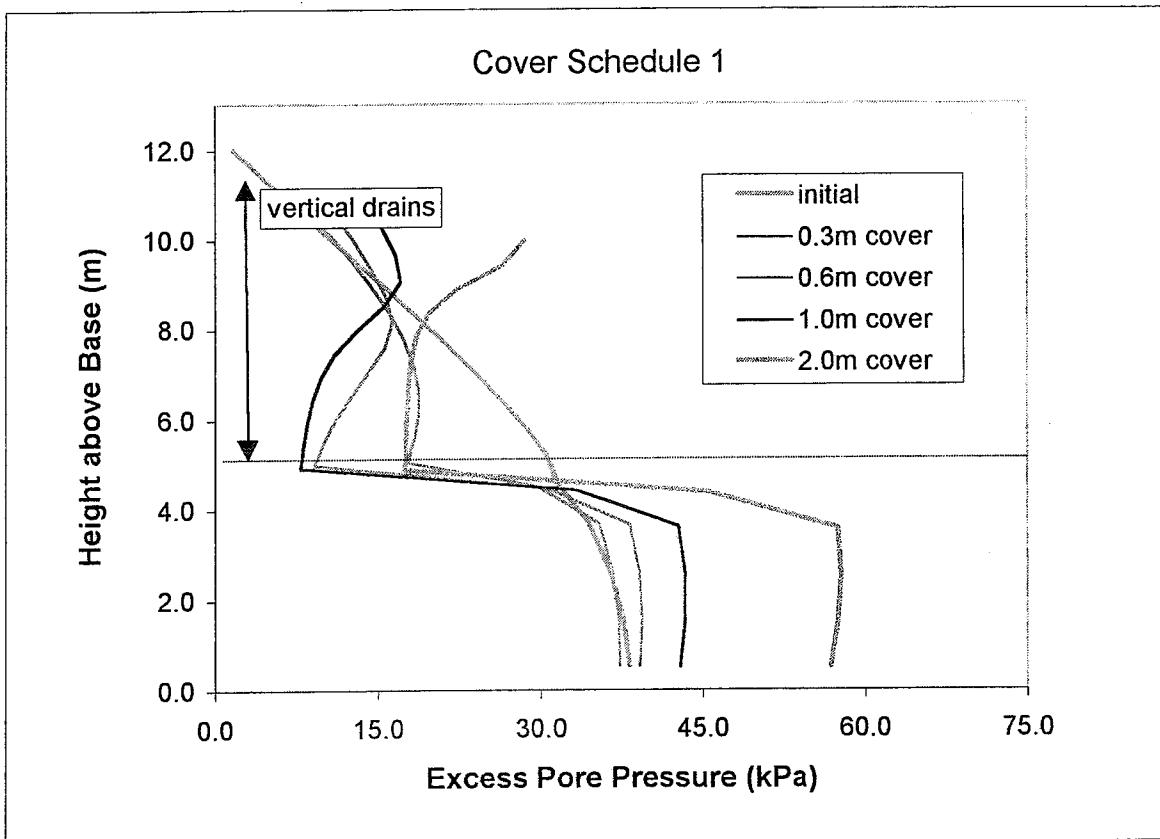
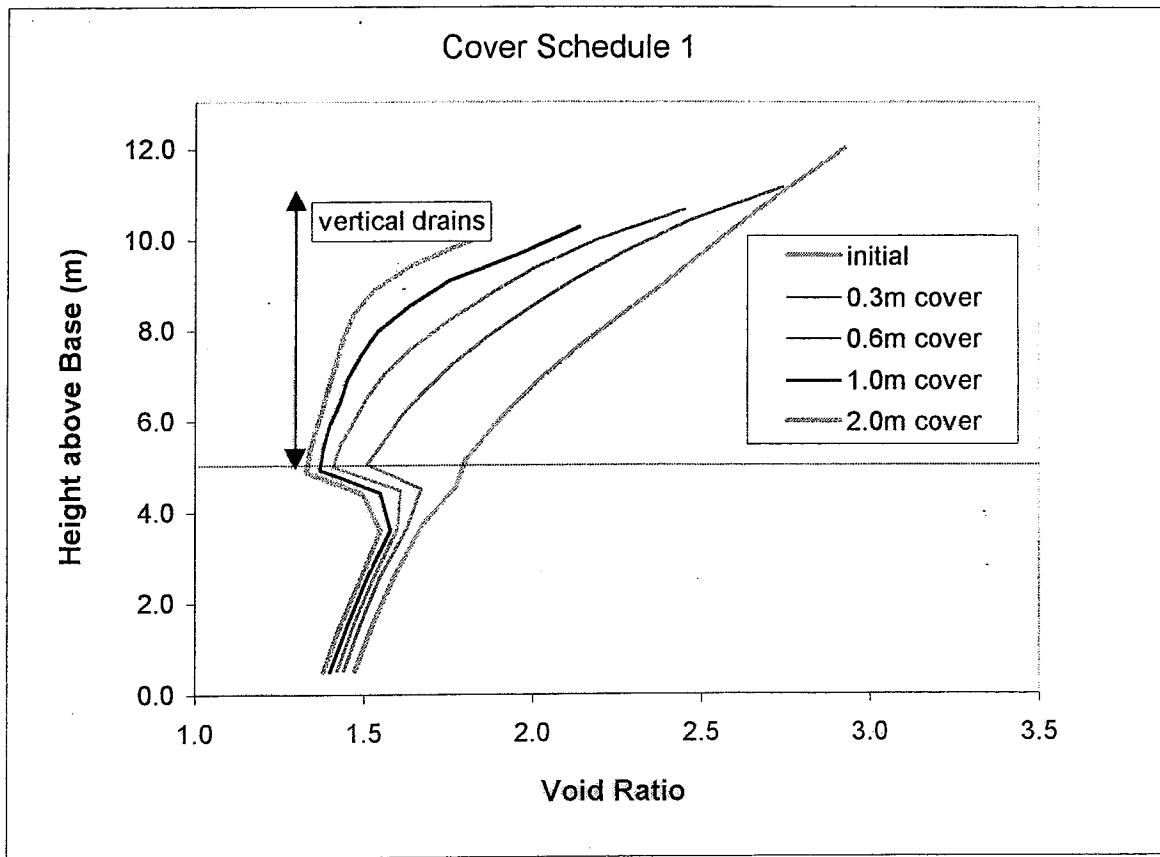




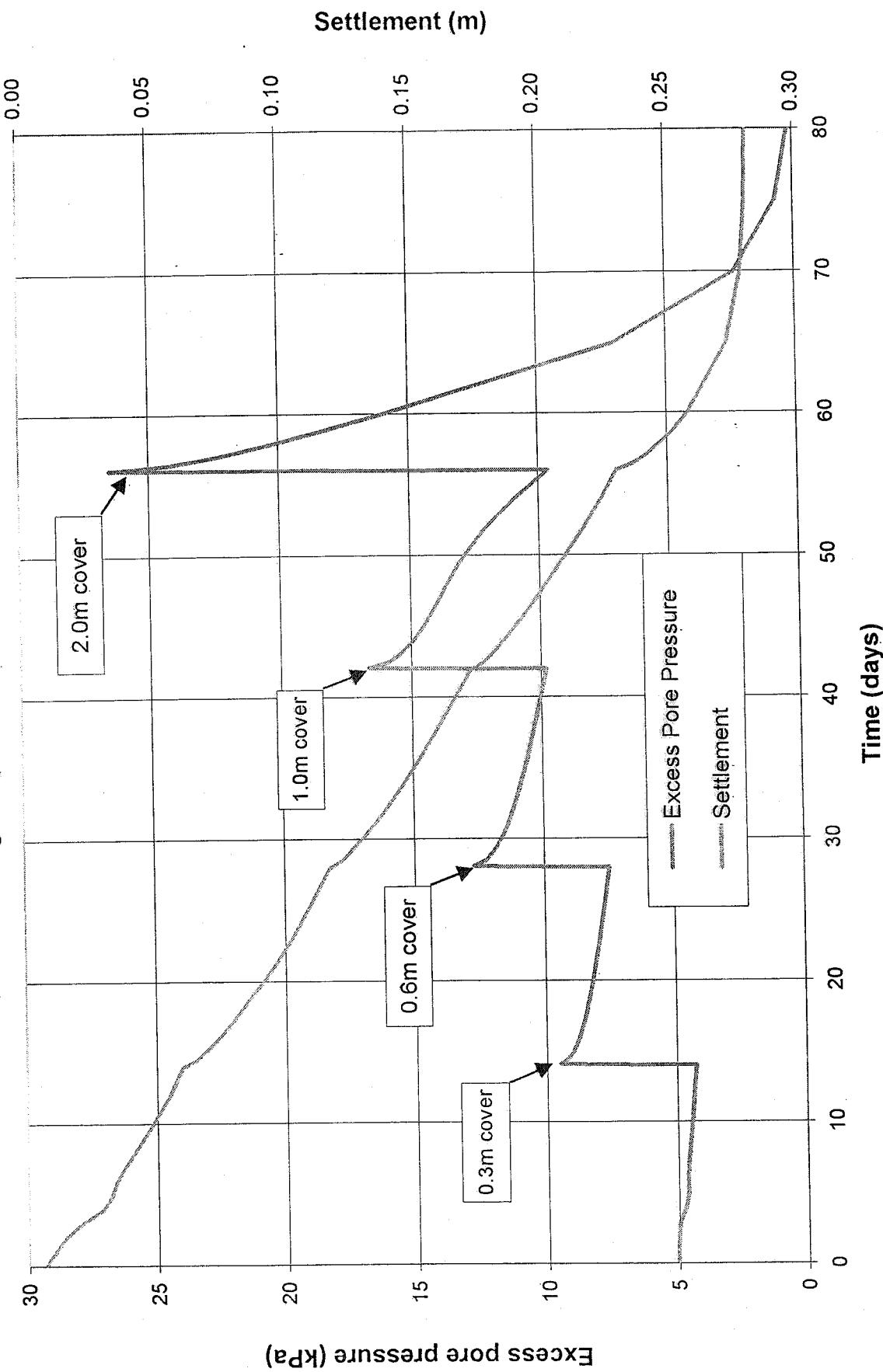


Drain Comparison Chart 3





Consolidation during Staged Cover Construction (near-surface)



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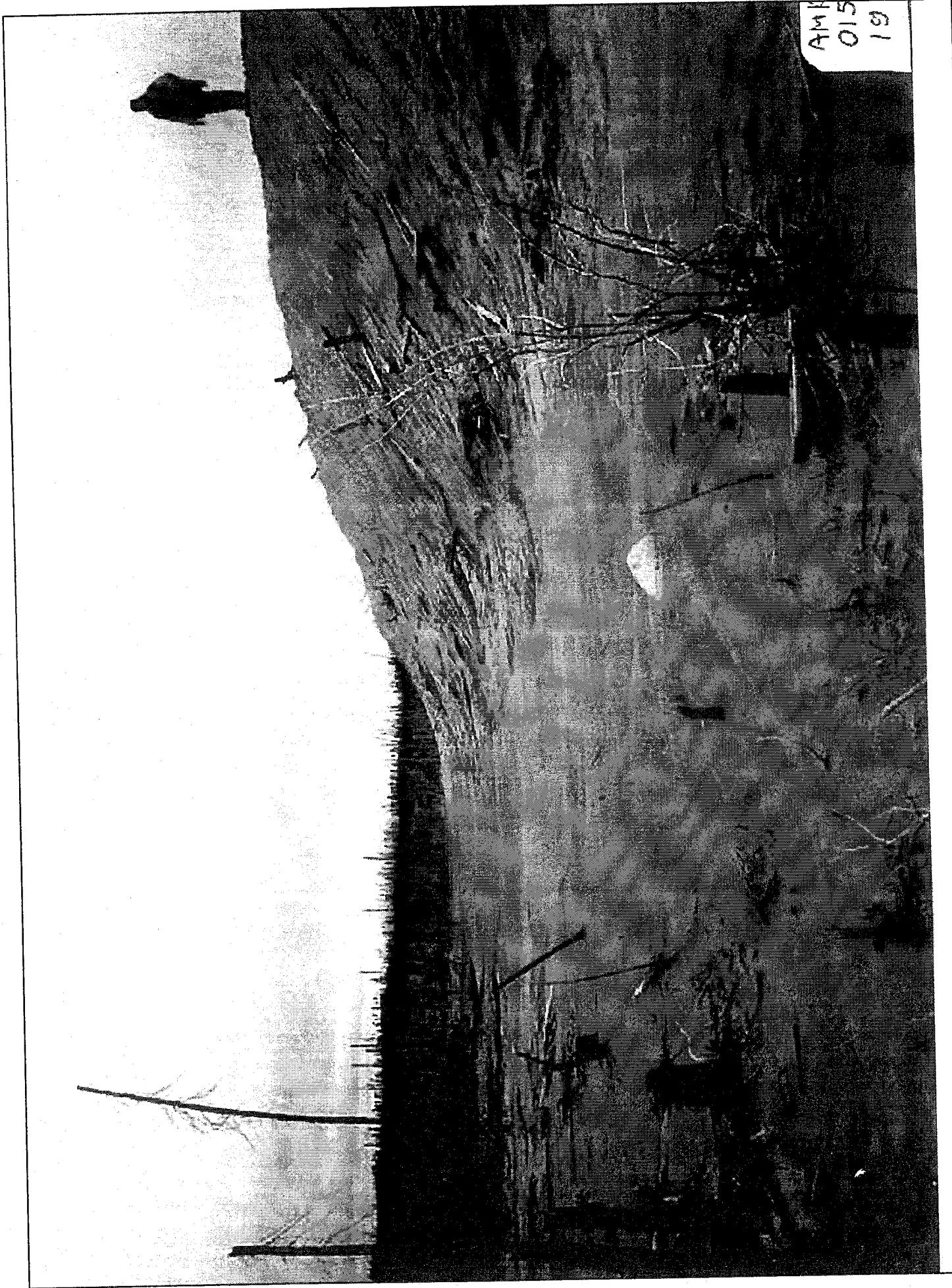


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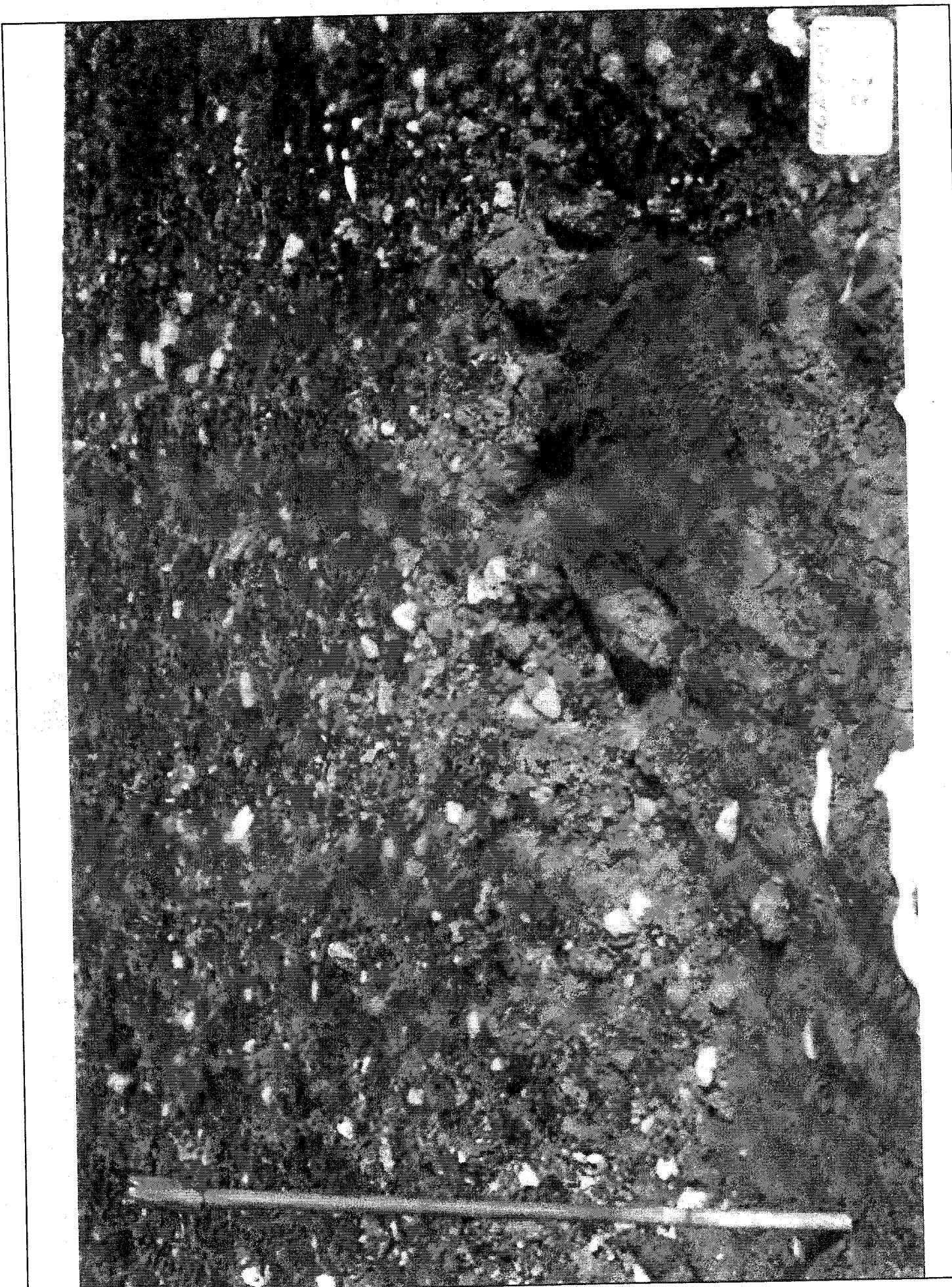
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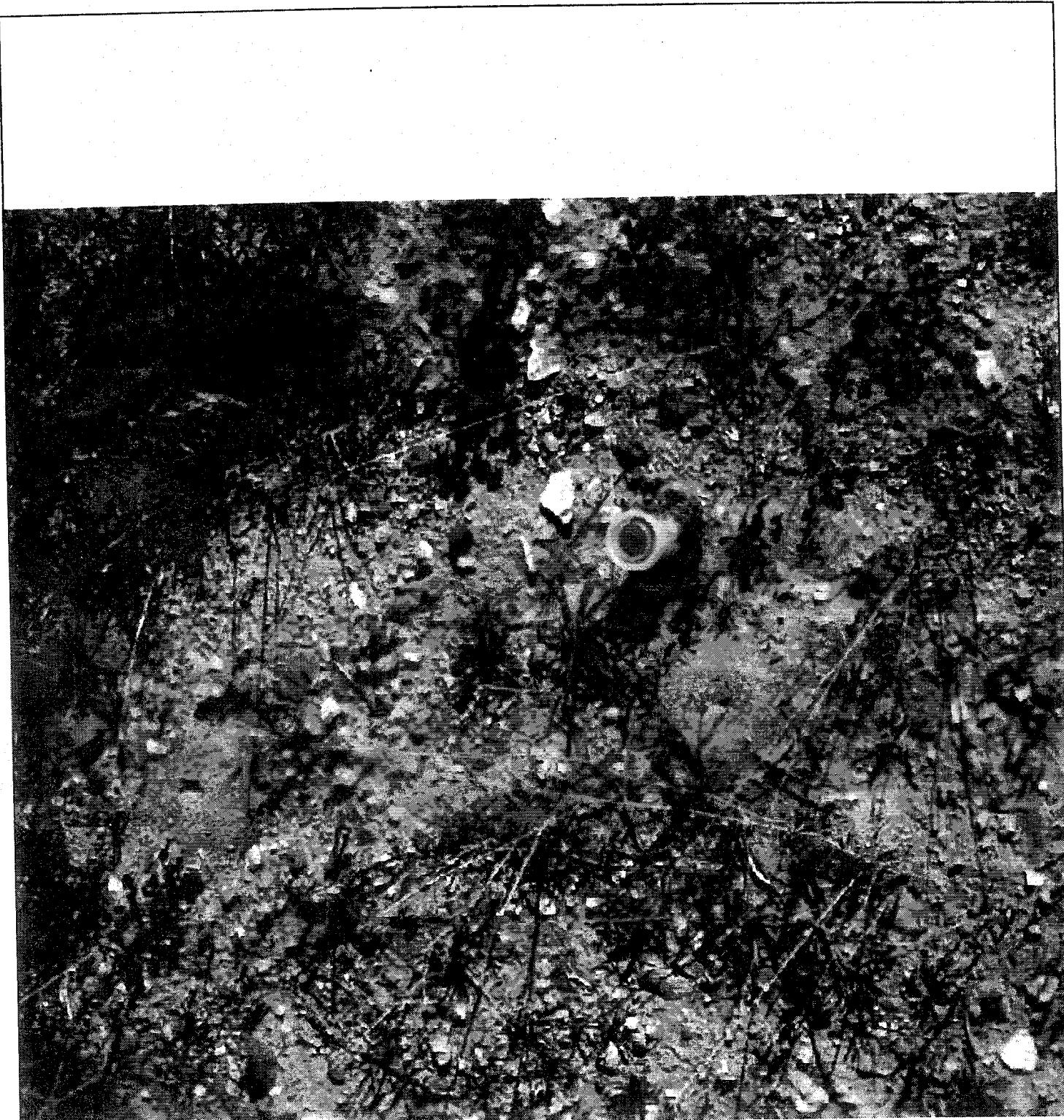




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