

An understanding of the effect of soil properties on the environment provides horizons for careers in soil

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Part 2



Acid Sulfate Soil

Acid sulfate soil of most concern are recent Holocene sediments deposited during the last 10,000 years.

These soils occur in wave-protected mangrove and salt marshes, outer barriers, backswamps and tidal lakes and in areas where these landforms are not obviously present.

As long as the sulfides remain in reduced conditions below the water table these soils pose no problems but are potential acid producing soil (PASS)



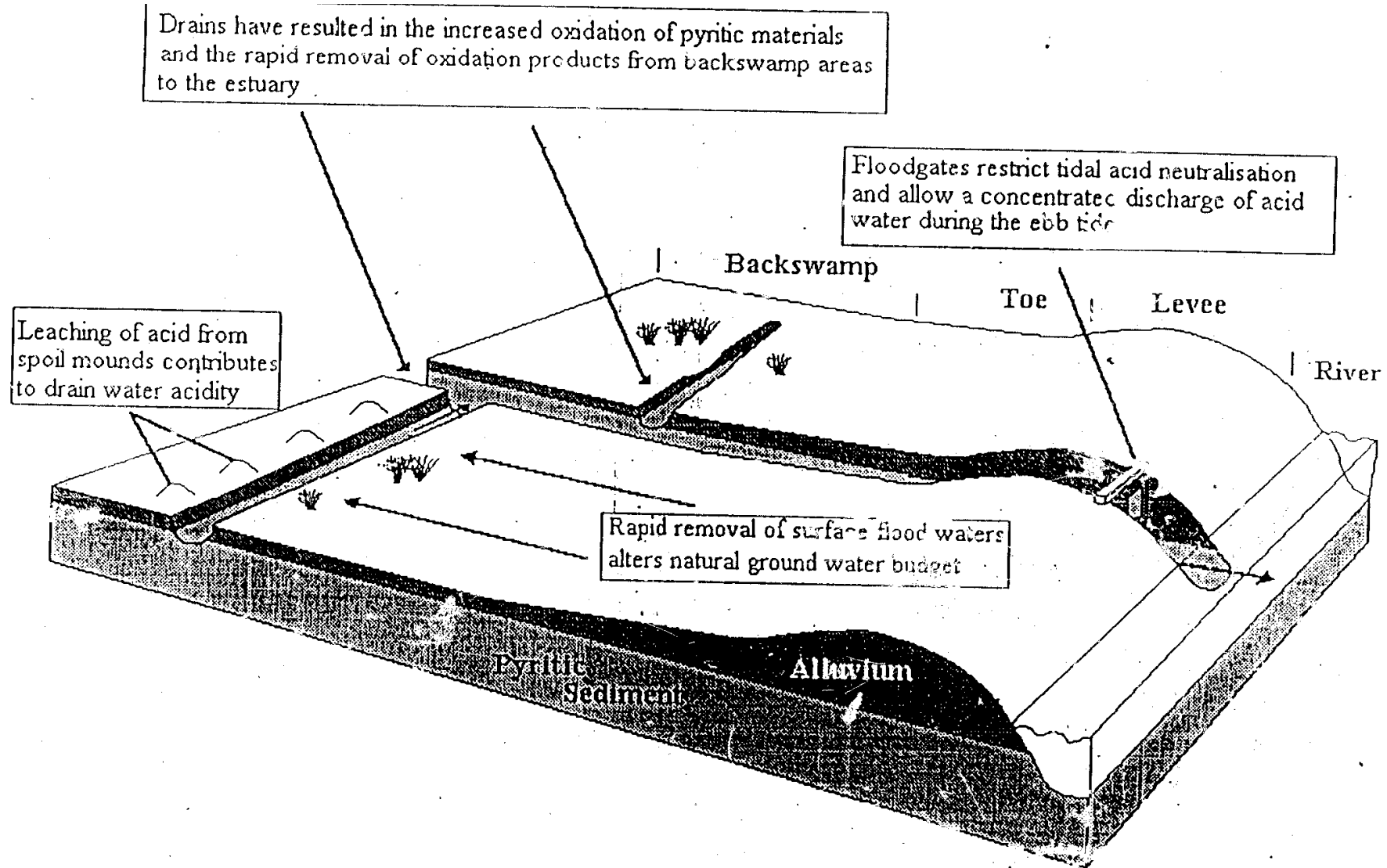
ENGINEERING PROBLEMS

- Due to exposure of acid sulfate soil during excavation oxidation occurs, concentrated sulfuric acid is released and pH rapidly falls below 4.5 releasing aluminium ions
- The potential hazard is directly related to rate that actual acidity is released
- Problems for engineering and urban development include concrete corrosion, structural degradation of house foundations, infrastructure failures of roads and pipelines are common
- Management must be undertaken using specific acid sulfate soil guidelines which are continually updated.

EXCAVATION OF ACID SULFATE SOIL

Excavation of sites where acid sulfate soil occurs can be the result of:

- construction and
infrastructure development
- excavation of blocked drains in agricultural areas (see following slide)



- Schematic cross-section of a backswamp to levee landform showing a simplification of the processes leading to estuarine

ENVIRONMENTAL PROBLEMS

- some environmental problems which can result from oxidation of acid sulfate soils
- fish, prawn kills
- clogging of drains increasing risk of flooding
- inability to revegetate sites
- loss of vegetation leading to erosion problems





Challenges for Urban Soil

Challenges remain especially in landscaping once urban development has occurred.

- Urban soils develop properties which impact on root growth and establishment that need to be understood (what can we learn/apply from soil management in areas such as in mine site rehab or agricultural soils).
- Stockpiling of soils during the construction phase leading to the degradation of critical soil properties such as soil organic carbon (SOC) and structural stability and also problems of soil heterogeneity. These properties reflect the stability of urban soils and their capacity to support urban trees and vegetation.

Urban Development

Development of areas resulting in land use change can also occur in:

- Contaminated land
- Undisturbed locations within which are critically endangered vegetation communities, plants and habitats
- Land used or modified for agriculture or industry
- Reclaimed land

What is Contamination?

- Contamination can take a variety of forms:
 - Chemical;
 - Biological;
 - Radioactive;
 - Physical;
 - Aesthetics?.



Types of contamination

- Disposal of wastes (controlled or uncontrolled);
- Onsite filling or leveling of land;
- Accidental spillage;
- Leakage during plant operation;
- Mining processes;
- Air fallout from an adjoining chimney;
- Migration of contaminants into a site from neighboring land, either as a vapour, leachate or movement of liquids through the soil; and
- Use of agricultural chemicals.

Soil Survey Information

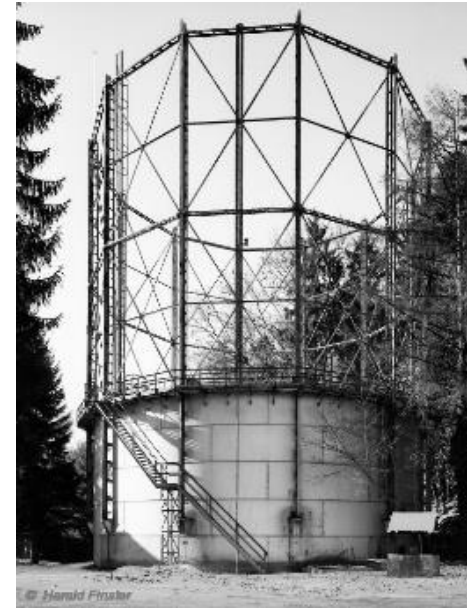
Once an area is released for development the site should be inspected and soil surveyed possibly in conjunction with a drilling and drainage evaluation program to depths commensurate with the intended use of the site

Some specific industry types associated with contamination

- Gas works
- Landfill sites
- Service stations
- Iron & Steel works
- Metal treatment
- Oil production & storage



- Engine works
- Railway yards
- Paint formulation & manufacture
- Power Stations
- Smelting & refining
- Mining & extractive industries
- Agriculture/ horticulture



Various Remediation Methods

Soil

- Bioremediation
- Chemical or thermal degradation
- Dig and Dump
- Cap and Contain
- Immobilisation
- Phytoremediation

Ecological Problems

Identification of the relationship between soil type and vegetation can be a significant factor in determining the outcome of land use change for developers and planners.

Endangered Ecological Communities and Urban Development

- Conservation of heritage and the biodiversity of vegetation
- Effect of the potential loss of EECs due to urban development
- Legal implications
- Land use planning
 - *Planners- is the area suitable for urban development?
- Will the EEC be a problem for design and development?
- Will the presence of the new development be cost effective if there is an EEC ?
- Could the EEC be incorporated into landscape design by means of conservation corridors?

Economic and Legal Implications of an EEC

- For a Land and Environment Court Judgment (Local Council vs Developer) a developer is required to provide a detailed map showing the location of EECs to determine whether a development could occur. The location of the EECs could also determine the design and number of dwellings constructed
- To this end, following substantial field work, a soil report is required to be prepared to assist ecologists in the preparation of a vegetation species map of the site delineating the possible presence of EECs

Conservation and Protection of Threatened Species

- Threatened Species Conservation Regulation 2010 now replaced by the Biodiversity Conservation Regulation 2017

To be eligible for listing as threatened, a species, population or ecological community must, in the opinion of the Scientific Committee, meet one or more of the relevant Clauses specified in the Regulation.

ENDANGERED ECOLOGICAL COMMUNITY

- For an area to meet the criteria for a listed endangered ecological community (EEC):
- all 3 components described in determination (soil type/ vegetation/ landform) need to be present (Preston and Adams)
- This provides clarity to land owners, developers and assessors

EEC of FRESHWATER WETLANDS

From the Final Determination

“They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains”

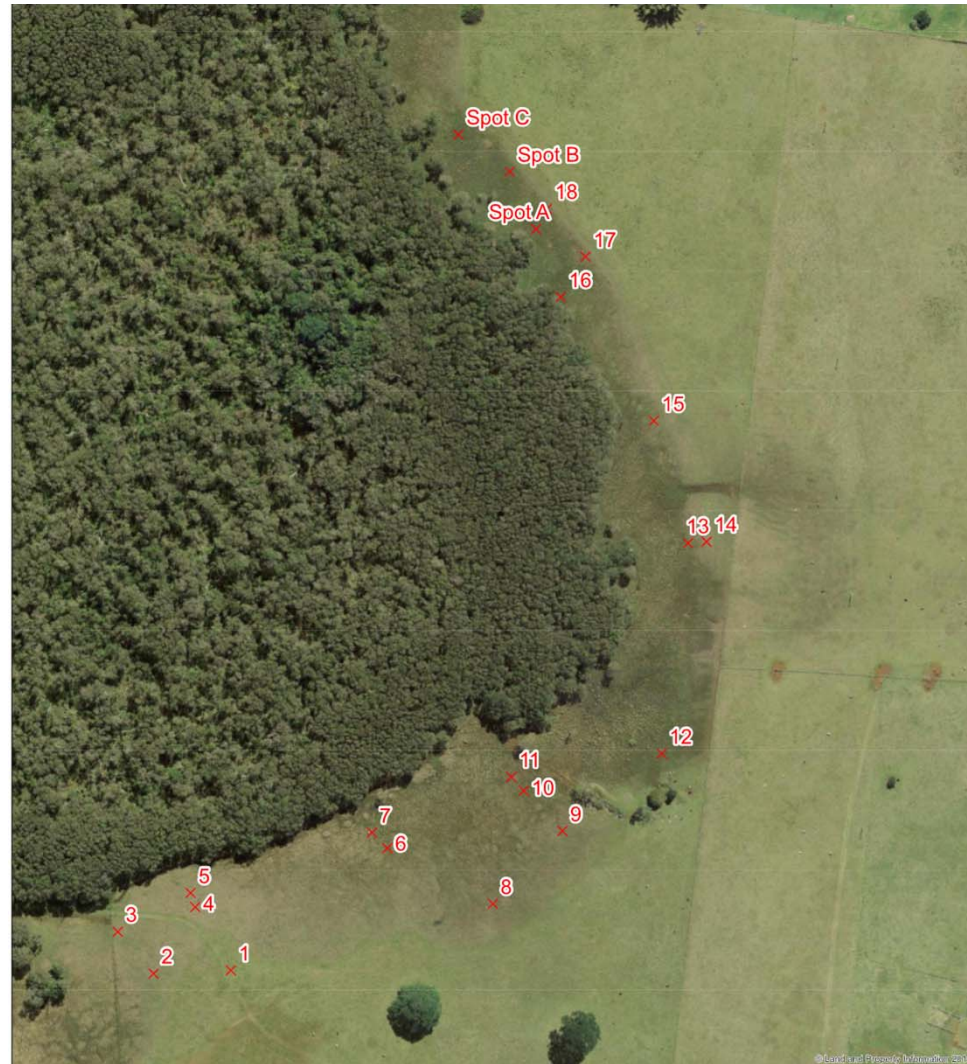
Mapping of Soil Boundaries Prior to a Development Application

- To determine the presence of the EEC for Fresh Water Wetlands which would need to be conserved and require setbacks to be determined prior to design and the submission of the development application.
- The following slides show pits which were excavated as part of a delineation boundary for a developer. The soil in Pit 1 is weathered from of the basalt flow

The soil in Pit 6 met the criteria for the EEC

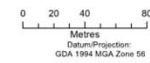






Legend

× Soil pit locations



Conclusions

The link between the geosphere, atmosphere, hydrosphere, biosphere and soil shows its unique position in the world in which we live ie our environment

- Soil does influence and can be degraded by human activities
- Hence an understanding of the effect of soil properties in the environment is an attribute which can be of significant value to many other professionals and multidisciplinary teams.