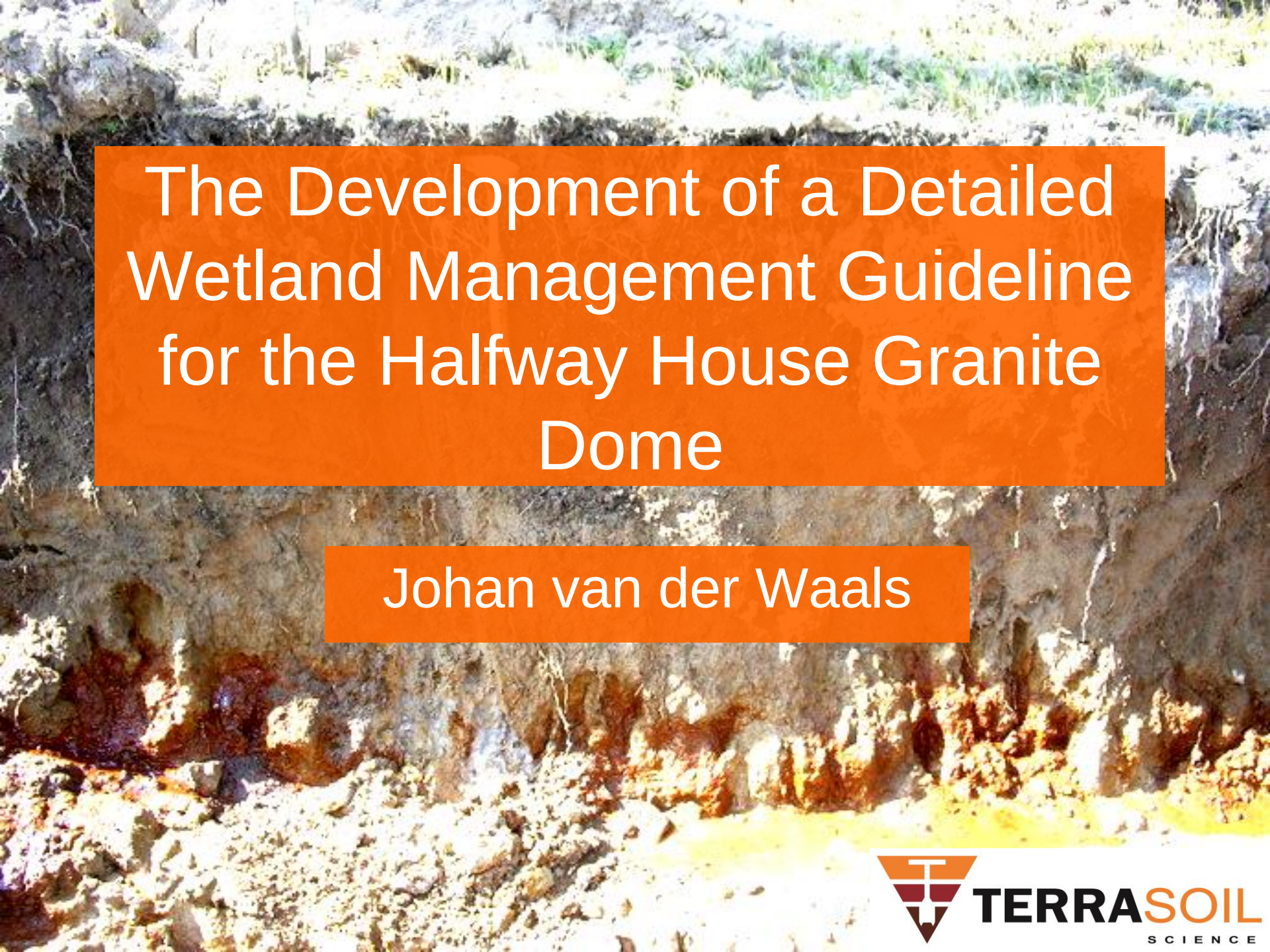


The Development of a Detailed Wetland Management Guideline for the Halfway House Granite Dome

Johan van der Waals

TERRASOIL SCIENCE


Limpopo
North West
Mpumalanga
Gauteng
Free State
KwaZulu-Natal
Northern Cape
Eastern Cape
Western Cape
City of Tshwane
Mogale City
Randfontein
City of Johannesburg
Ekurhuleni
Westonaria
Merafong City
Lesedi
Emfuleni
Midvaal

Why do we end up with “bleeding” wetlands?

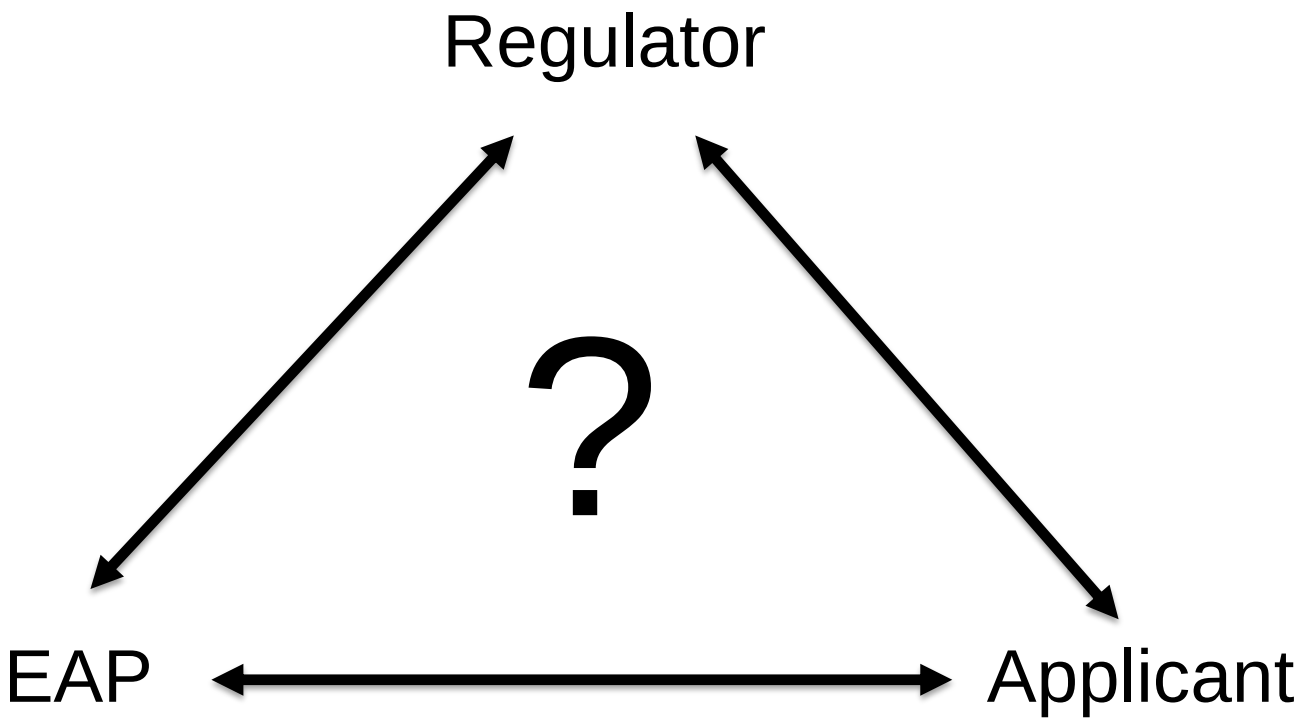

2008 09 07
Keverel Rd

Why do we end up with destroyed wetlands?


Pan African Parliament Site Wetland
Grass Owl

Why do we end up with eroded wetlands?

Challenging Process!



Regulation in a context of insufficient information and understanding!

Challenging Process!

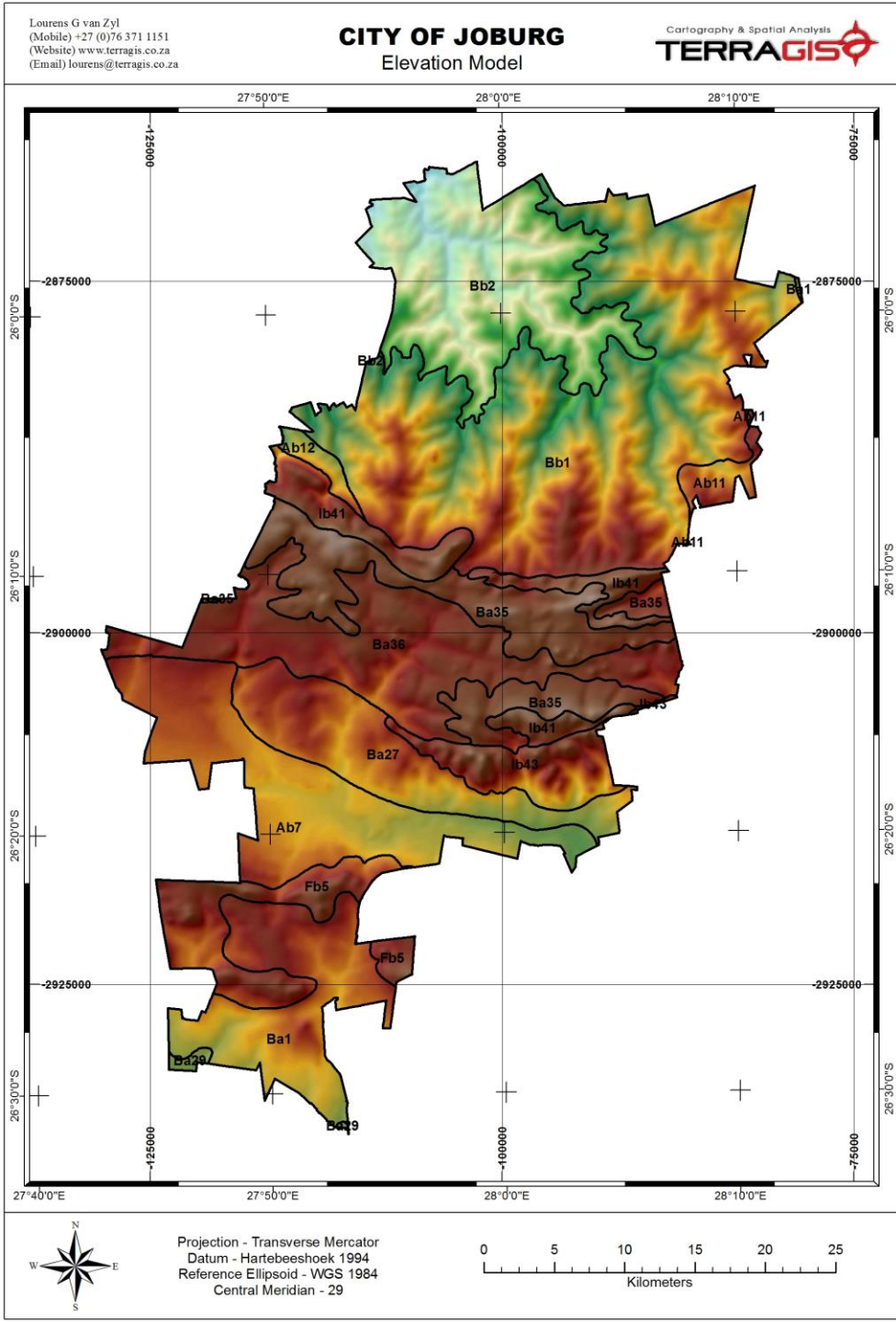
- Regulator
  - Responsibility ito existing legal framework
  - What happens if there are gaps?
- Client
  - Wants to develop/use
  - Economic imperatives
- EAP
  - Responsibility to elucidate science
  - Guide process ito science, best practice and legal framework

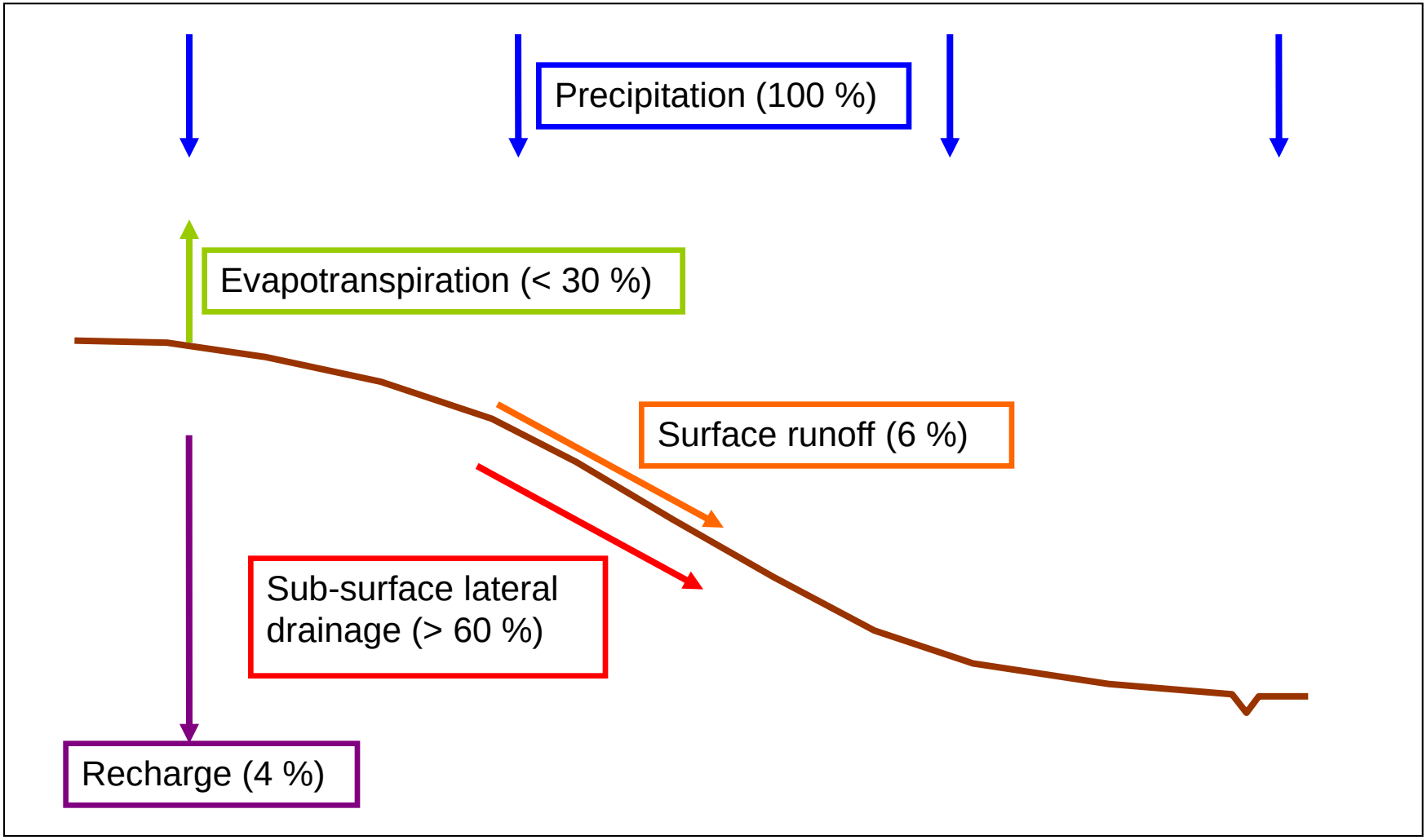
Identification of Gaps

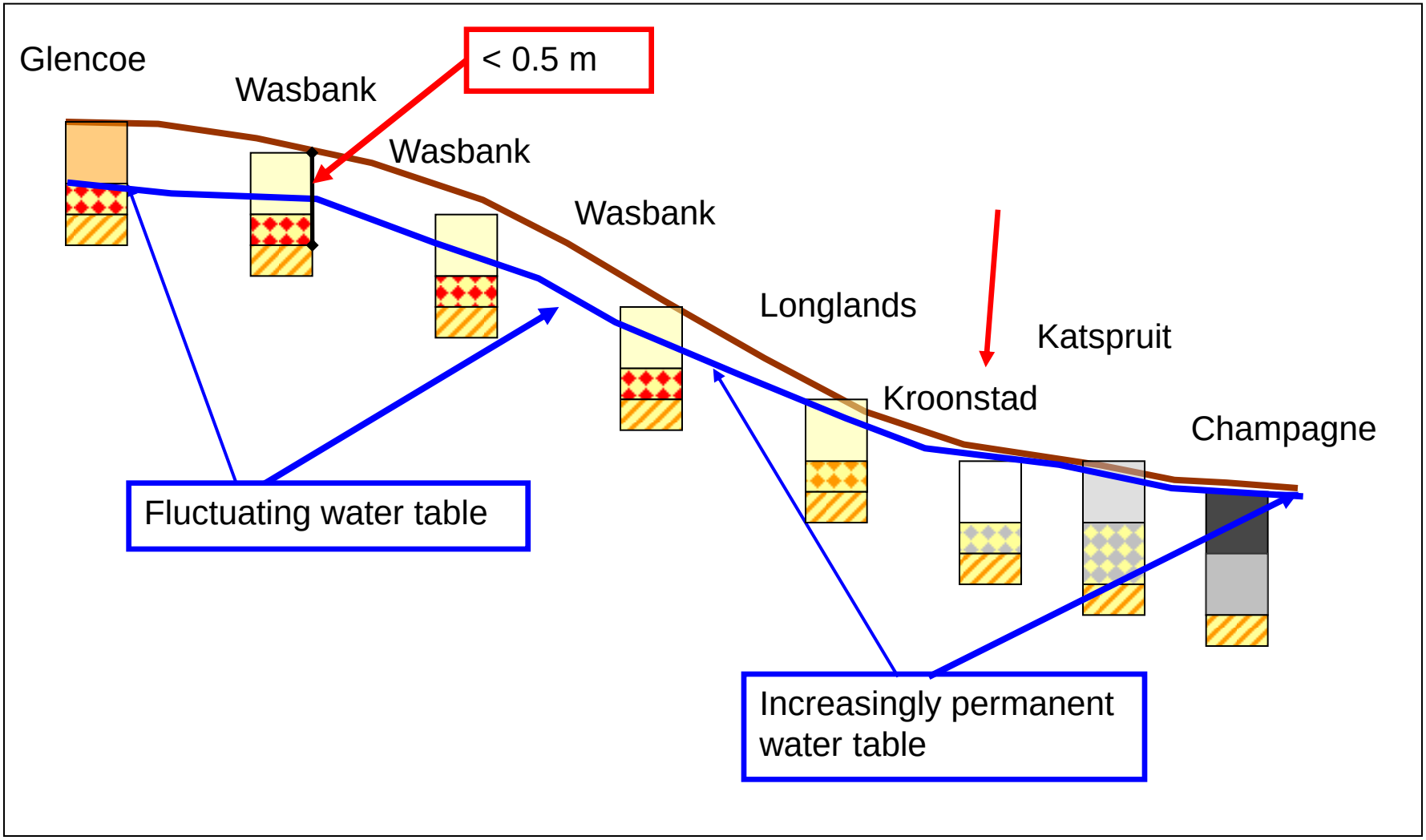
- Urban wetlands need to be considered in an urban context
- Ecological parameters are challenging at best and will change with development
- Wetlands cannot be considered in isolation wrt hydrological drivers
- Major knowledge gap exists in wetland assessment process to account for hydrological drivers!

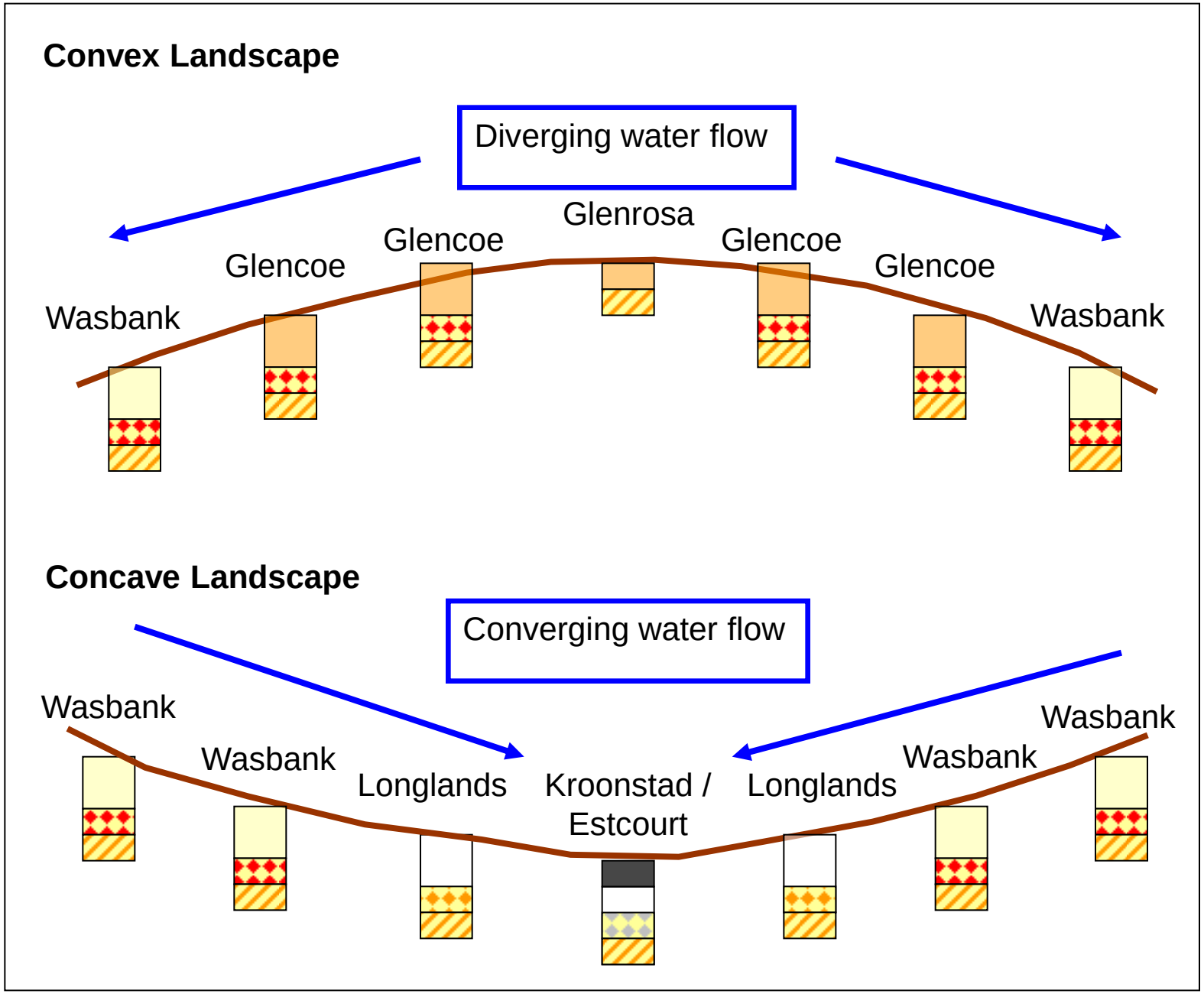
Example

- Wetland delineation guidelines
  - Four indicators
  - Soil wetness indicator not defined ito context
- Variable identification of wetland parameters
- Land types
  - Bb 75%
  - Ba 12%
  - Ab < 2%

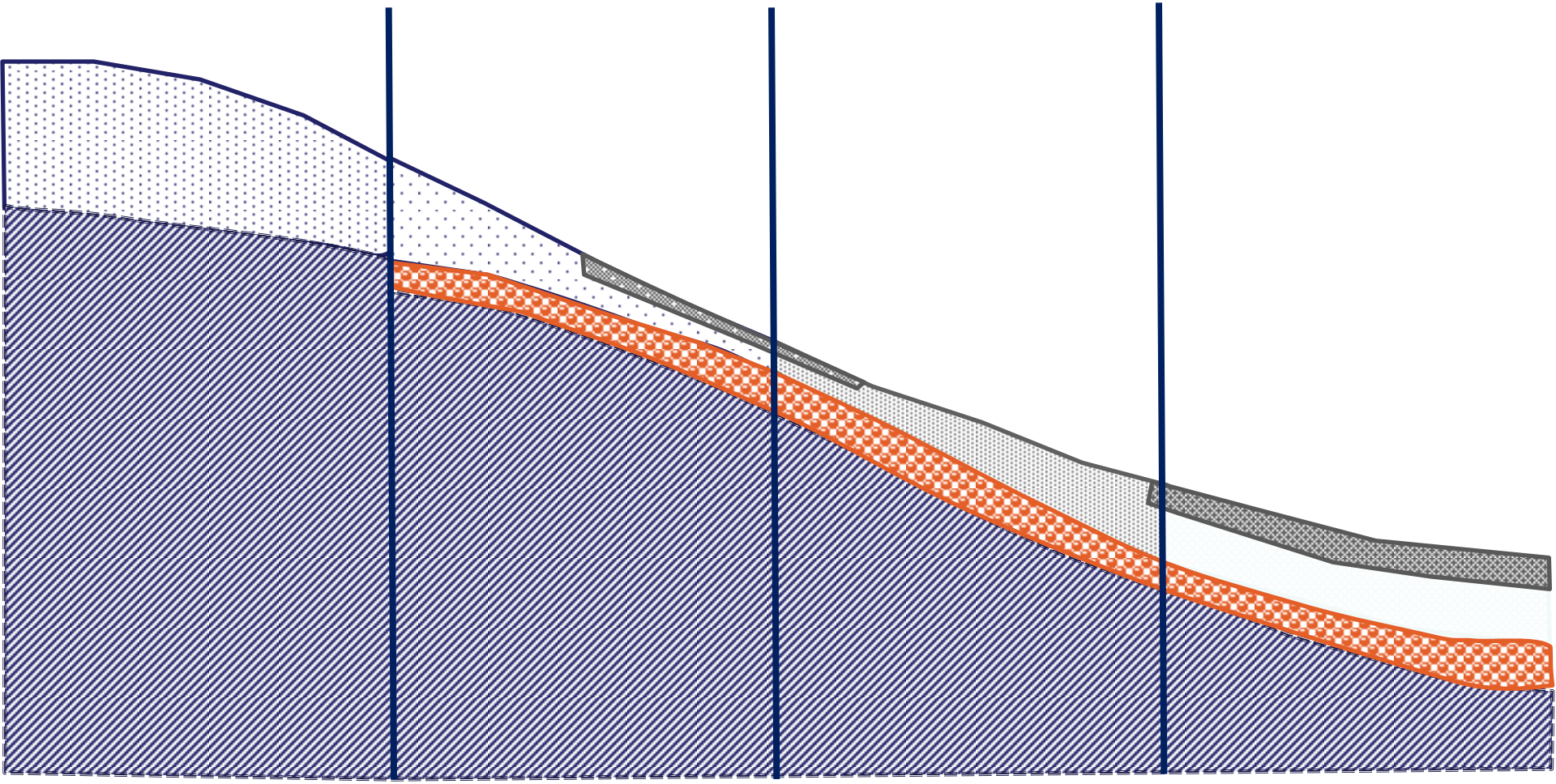



Precipitation (100 %)
Evapotranspiration (< 30 %)
Surface runoff (6 %)
Sub-surface lateral drainage (> 60 %)
Recharge (4 %)


Glencoe
Wasbank
< 0.5 m
Wasbank
Wasbank
Longlands
Katspruit
Kroonstad
Champagne
Fluctuating water table
Increasingly permanent water table


Convex Landscape
Diverging water flow
Wasbank
Glencoe
Glencoe
Glenrosa
Glencoe
Glencoe
Wasbank
Concave Landscape
Converging water flow
Wasbank
Wasbank
Longlands
Kroonstad /
Estcourt
Longlands
Wasbank
Wasbank

Soil hydrological zones

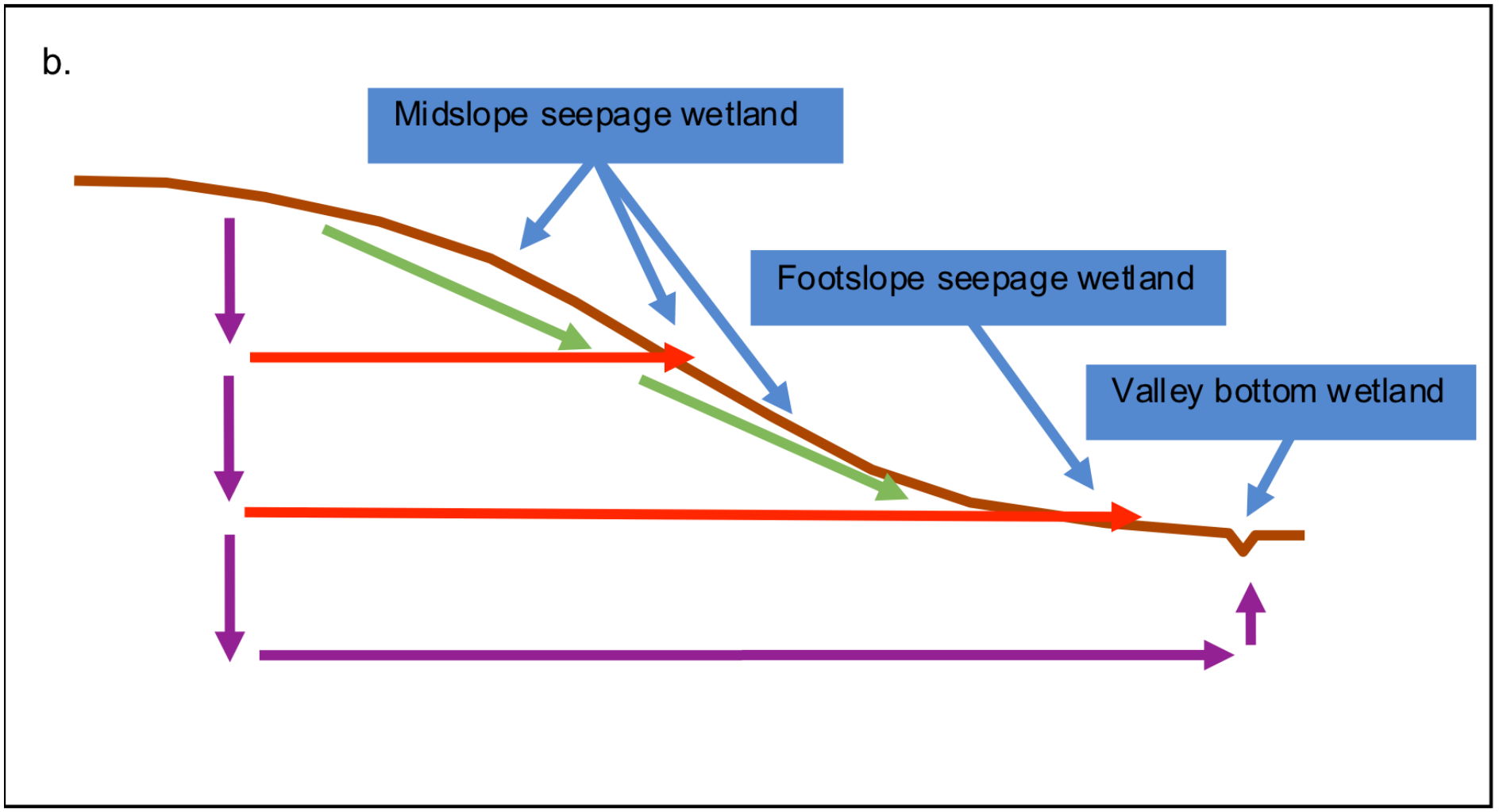


Convex
Recharge Zone

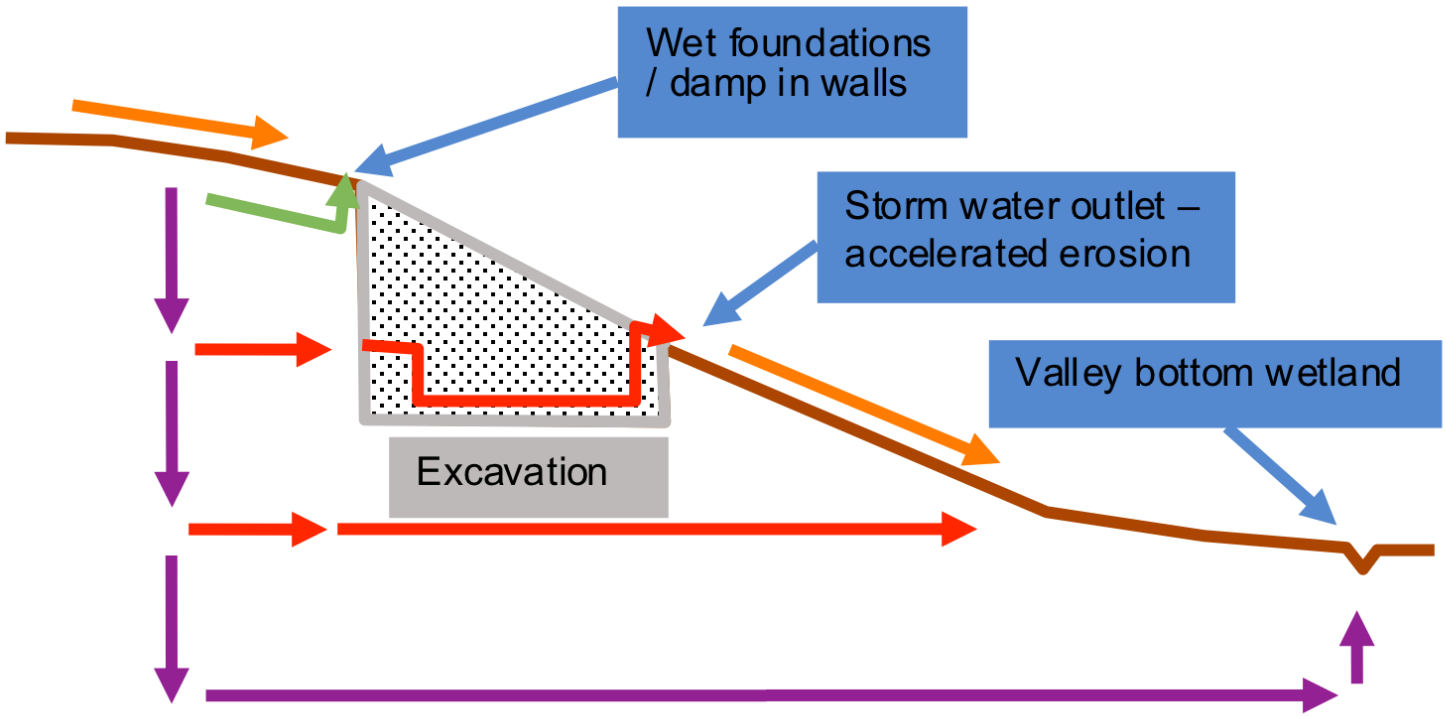
Convex
Shallow Interflow /
Return Flow Zone

Concave
Thicker Interflow
Zone

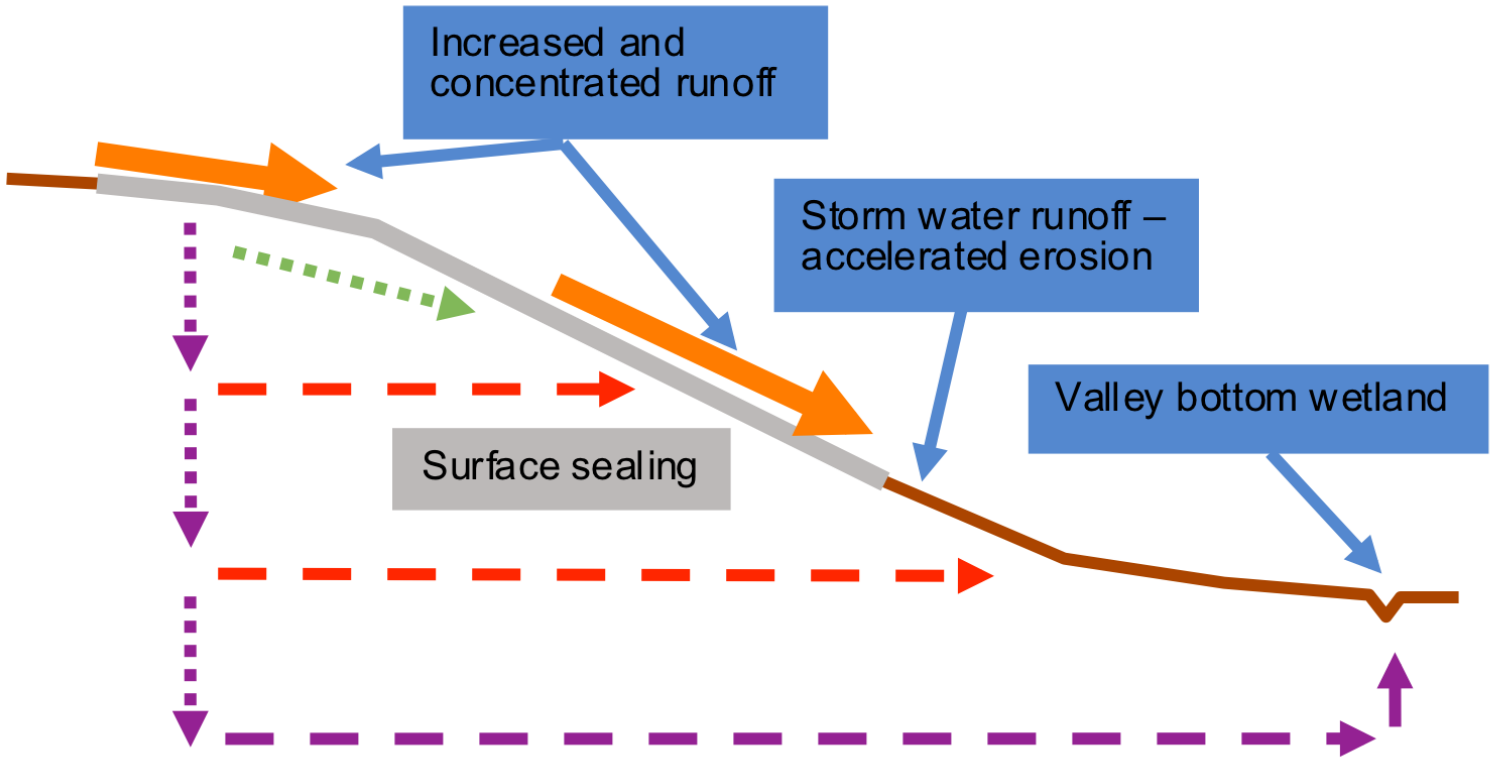
Concave
Thick Interflow /
Deposition Zone


b.
Midslope seepage wetland
Footslope seepage wetland
Valley bottom wetland

b.


Wet foundations / damp in walls
Storm water outlet – accelerated erosion
Valley bottom wetland
Excavation

b.


Increased and concentrated runoff
Storm water runoff – accelerated erosion
Valley bottom wetland
Surface sealing

Anatomy of a Wetland Disaster

- Step 1: Identification of site for development
- Step 2: Delineation of wetland conducted predominantly on ecological parameters (no consideration to landscape hydrological drivers!)
- Step 3: Regulator issues ROD and requires 30m buffer on wetland
- Step 4: Site is developed, 30 m outside wetland
- Step 5: Poorly or non-mitigated storm water destroys wetland within 5 years – nothing left of original wetland (impirical proof of concept already conducted)
- What are the implications and who is responsible?

Anatomy of a Wetland Disaster

- Wetlands on the HHGD cannot attenuate floods!
- Wetlands are in equilibrium with natural conditions (before human impacts)
- Erosion sets in with runnof increasing by as little as 5 %
- The wetland soils are:
  - Dispersive due to dominant clays
  - Often sandy with no cohesion between soil particles
  - 100 to 500 % more erodible once saturated with water

Solution! How??

- Proper understanding of biophysical context with hydrology being the key
- Focus on integration of hydrological assessments – hydropedology
- Must be accessible by public, regulator and assessors/specialists alike!

Hydropedology?

- Integration of the disciplines of hydrology and pedology (understanding, description and classification of soils)
- Soils influence hydrology (texture, structure, etc.) but also provide indicators of hydrology (redox morphology, soil physics, etc.)
- Soils are therefore both indicators and participators in landscape hydrology = ideal tool for description

Draft Guidelines

- Statutory context of wetlands and delineation (criminal vs administrative law)
- Biophysical context
  - Soils
    - Morphology and classification (Hydropedology)
    - Topography and erosion susceptibility
    - Description of hydrological drivers
  - Hydrological changes due to human activities
- Post development context
  - Storm water management as part of a broader environment
- Case Studies

Case Studies

- Erosion of wetlands
  - Storm water planning problems
  - Regulatory problems – by-laws and storm water release authorization
- Wetland delineation problems
  - Soil classification
  - Interpretation of hydromorphology
- Artificial modifiers not considered in assessments
- Reference state not considered for PES
- Inconsistent application of regulations


Kosmos Rd
Ardglass St
Manikle St
Image © 2009 DigitalGlobe
© 2009 Tele Atlas
© 2007
Google
7.02" S 28°06'25.66" E
Streaming 100%
Eye alt

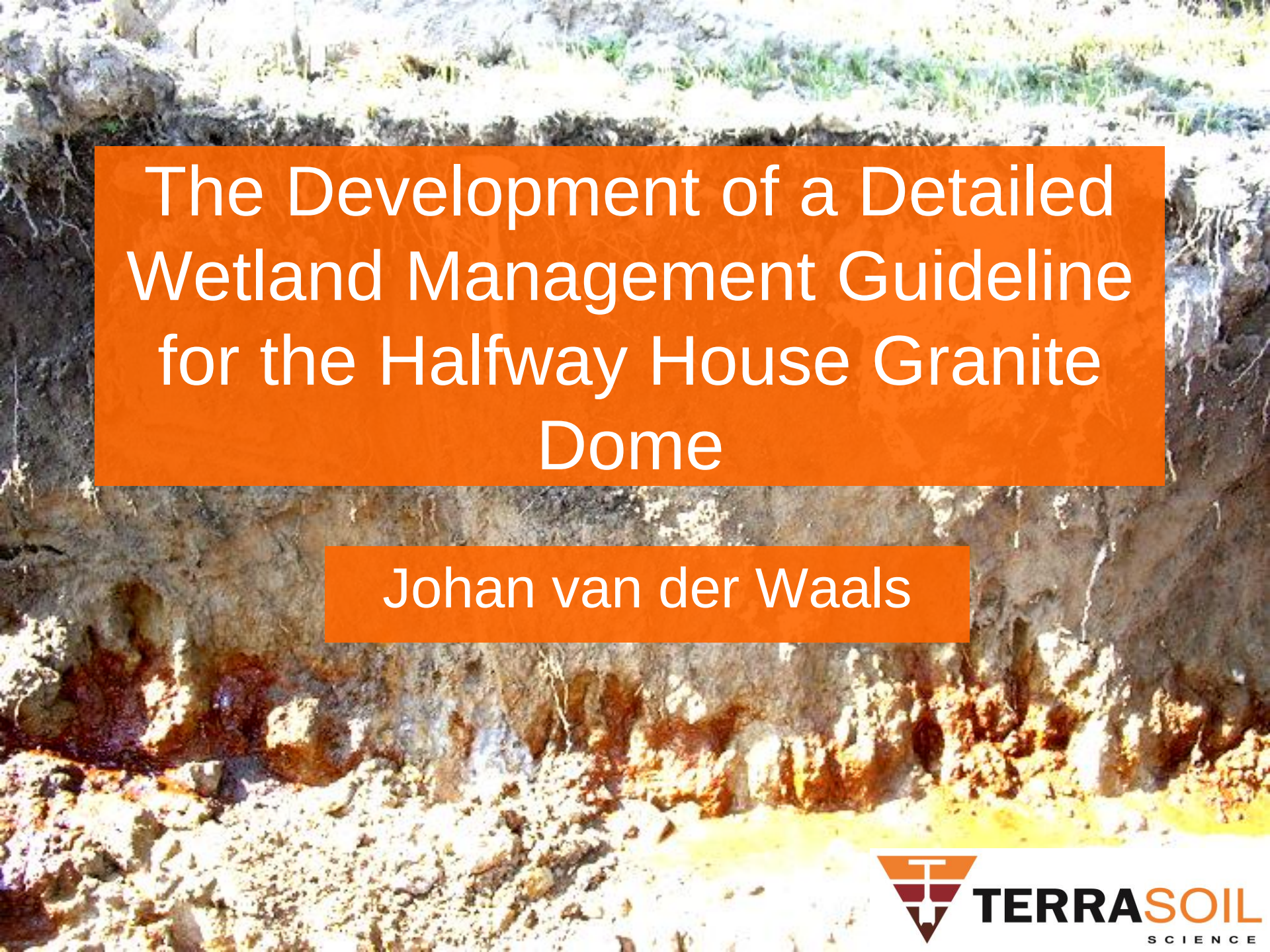
Site
2873000
2874000
2875000
2876000
Silvertree Street
Gelantus Road
Lourens Drive
Lark Lane
Krause Road
Jutlander Road
Dahlia Road
Jacaranda Road
Cactus Road
Maple Road
Crocus Road
Paperbark Rd
Mustang
Merwell Road
Palomino Road
Voortrekker Street
Arthur Avenue
Neptune Avenue
Jupiter Street
Edward Avenue
Surrey Road
Whiskin Avenue
Pluto Avenue
Weston Road
Guildford Road
Lyncon Road
Ethel Avenue
Spitz Road
Rena Road
Oak Road
Zinnia Road
Macintyre Road
Mc Intyre Road
Quinnsland Road
Begonia Road
Hawthorn Road
Kenilworth Street
Goodwood Street
Norfolk Road
Palm Close
Springwell Avenue
Derby Crescent
Monte Carlo Crescent
Lachlan Road
Acacia Road
Holbolt Road

Conclusions

- HHGD wetlands
  - Under siege
  - Highly erodible
  - Cannot attenuate floods!!!!
- Landscape (entire) and wetland assessment currently inadequate
  - PES – “reference state”!?
  - Artificial modifiers identification and elucidation?
  - Integrated hydrology assessment
    - Groundwater hydrology
    - Surface water hydrology
    - Interflow / Vadose zone hydrology

Conclusions

- Delineation challenging
  - Decide on context and relevance!
  - Solution – hydropedology of entire catchment?
- Landscape (entire) and wetland management currently inadequate
  - Storm water management
  - By-laws governing storm water release authorization
  - Buy-in by developers
  - Latent liabilities (Section 28 NEMA?)



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