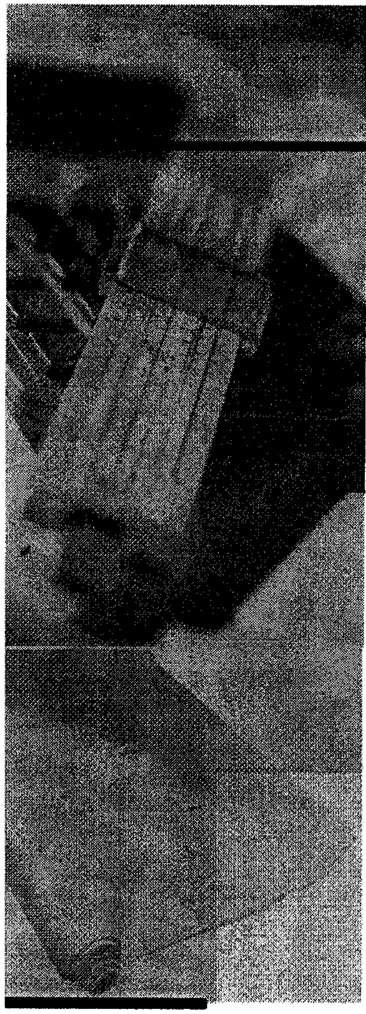

TVA Kingston Fossil Plant

Gypsum Disposal Pond
Sizing and Development of Design

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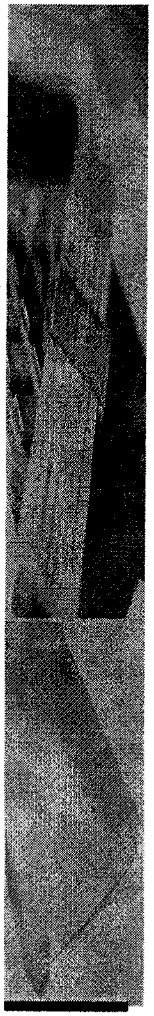

Comments on Hyrdogeology

- Surface is evident of Karst features, but no cavities evident in overburden beneath these features, only clay
- Some solutioning of the bedrock along bedding planes and formation contacts; some cavities noted in the rock with the largest in borehole N66 which had a cavity of about 8 ft
- Does not appear to be an "active" karst system even though there is some openings in the rock ;these solution openings are probably in the 10's of millions of years old
- Water table follows topography and water levels monitored since 2003 with continuous monitoring
- Groundwater flows to the southeast toward the river
- Seasonal high water levels are between 767ft (sideslope) and 749 ft (site area) MSL
- River stage is about 741 ft MSL
- 100-year flood is mapped at 747.6 ft MSL

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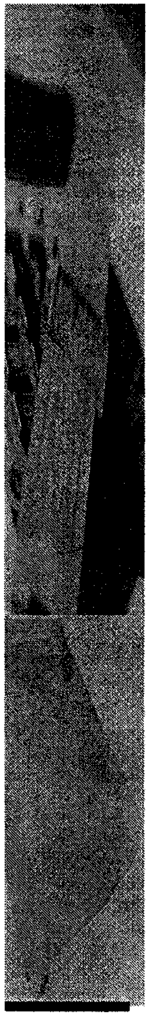

Starting Point and Site Constraints

- July 2005 potentiometric elevation in area of disposal area is 741
- Statistical high is 749
- Based on need to provide a 5' min separation to groundwater, lowest subgrade elevation of 752' ~ 754' EL was selected for preliminary layouts

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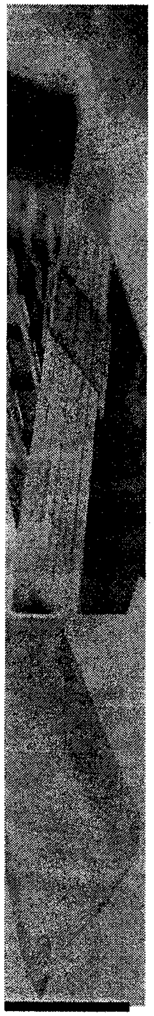

Need for Interior Drainage

- Blanket drain is recommended beneath initial soil starter dikes; however, a continuous blanket is not likely needed to address stability issues
- In subsequent lifts, outer gypsum dikes are expected to be permeable providing adequate drainage (note: as a safeguard, lateral drainage pipes will also be integrated into gypsum dikes)
- Central Drainage Corridor is recommended for the following reasons:
  - Provides relief to hydrostatic pressure on clay layer (minimizing the risk of blowout and activation of karst)
  - Eliminates need for second stormwater pond by providing a conduit for Phase II decant
  - Will likely require a sump/lift station at outlet

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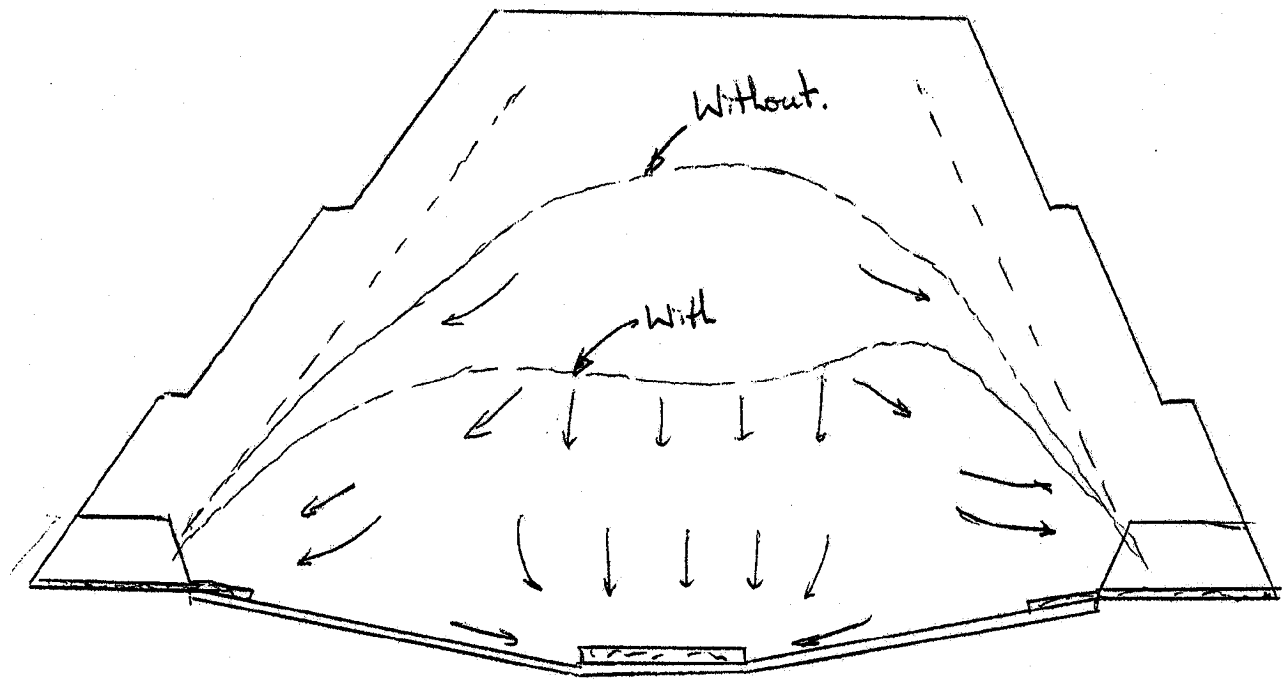

Probable Influence of Interior Drainage.

SEEPW Runs to Confir.

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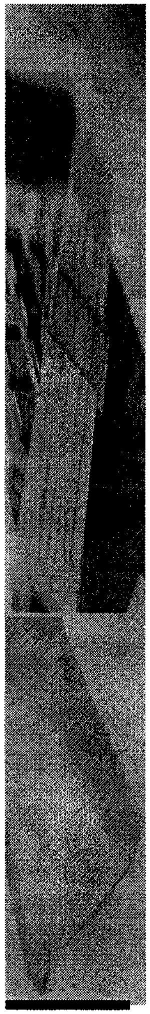

Gypsum Properties

- Based on Cumberland Fossil Plant Gypsum and Bull Run calculations
- Three groups of Gypsum properties:
  - Cast (γ = 120 pcf; ϕ' = 43°)
  - Sedimented (γ = 116 pcf; ϕ' = 40°)
  - Dry placed (γ = 107 pcf; ϕ' = 35°)
- Sedimented Gypsum will be modeled as undrained at end of construction

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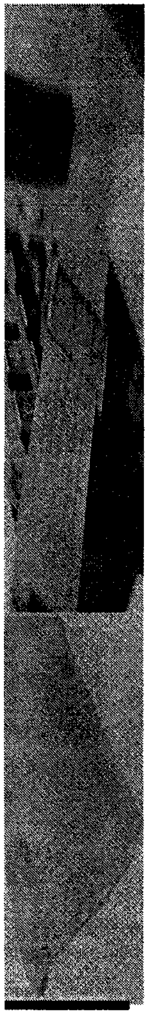
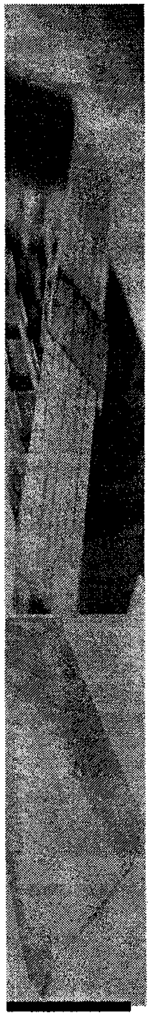


Natural/Alluvial Clay Soil

- 30 to 50 ft of natural soil above bedrock
- Primarily silty clay (SPT N~10)
- 5 to 15 ft of soft sandy to sandy/clayey silt residuum exists above the bedrock with SPT blowcount equivalent to WOH to 2 bpf
- Triaxial test data available?
- Water table at 741' MSL to 781' MSL; increase toward project north



Natural/Alluvial Clay Soil (cont.)

- Undrained shear strength of N~10 silty clay, s_u = 1950 psf (Ref. Parsons calculation package and draft triaxial tests)
- Additional estimate of undrained shear strength to be obtained from CPT borings on-site

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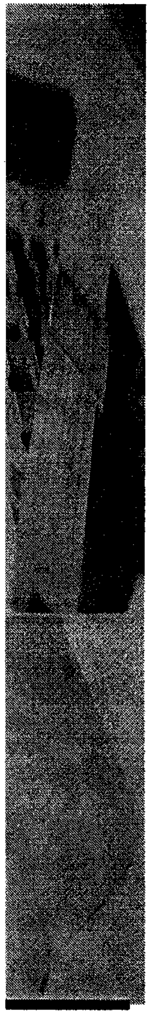

Critical Cross Sections

- Cross-sections cut at maximum grade (average max grade of 1V:3.3H) through maximum height of stack
- Similar to Parsons critical cross-section A-A’ including information from borings B-22, NB-45, NB-47, NB-59, NB-65, and NB-73 (etc.)
- Similar to Parsons cross-section B-B’ through Borings B-12, B-13, NB-39 and NB-44 (etc.)

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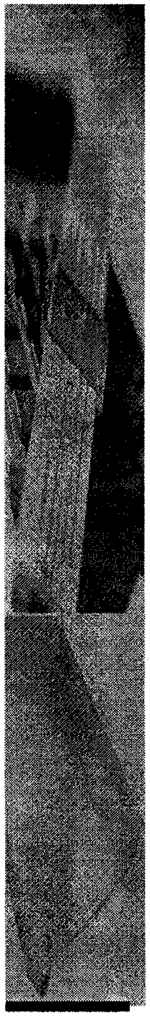

Basis for Size (re-work of Parsons calculation)

- Parsons assumed 385,000 ton/yr production (based on 2.5# coal)
- Using a design coal of 3.2#, assumed production becomes 492,800 ton/yr
- Assume operation as a wet pond for first 2 yrs; base capacity on full by-pass
- Assume 67 lb/cf density for settled gypsum (0.90ton/cy)
- 547,500 cy/yr of settled gypsum
- 1,095,100 cy for 2 years = 680 ac-ft
- Approximate interior footprint of Phase I is 45 ac
- Approximate depth required (not incl. freeboard or 5 ft deep settling zone) = 680 ac-ft / 45 ac = 15 ft

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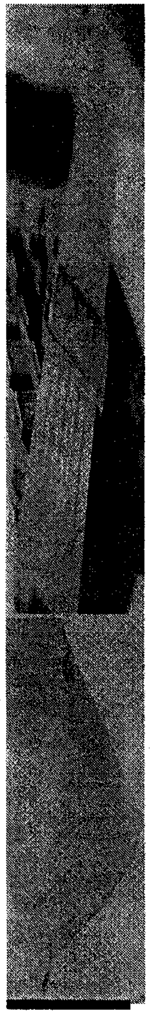
GeoSyntec – Initial Layout



- GeoSyntec developed an initial layout incorporating:
  - Initial soil starter dike with max height around 20 ft
  - 1% slope around top perimeter (for future use as surface water drainage ditch)
  - Sloping base with approximately 0.3% slope
  - Central drainage gallery
- Operational Question
  - At this configuration, initial storage volume is only 212,000 cy (say 2 months) [note: accounts for site topography and disposal area orientation]
  - Is it feasible to start wet cast operations at low end to raise dikes rather than constructing massive starter dikes?
  - Options
    - Commence wet cast operations at low end early
    - Raise elevation of initial soil starter dikes (expensive, eats into airspace)
    - Compromise (i.e., size initial pond for less than 2 years)

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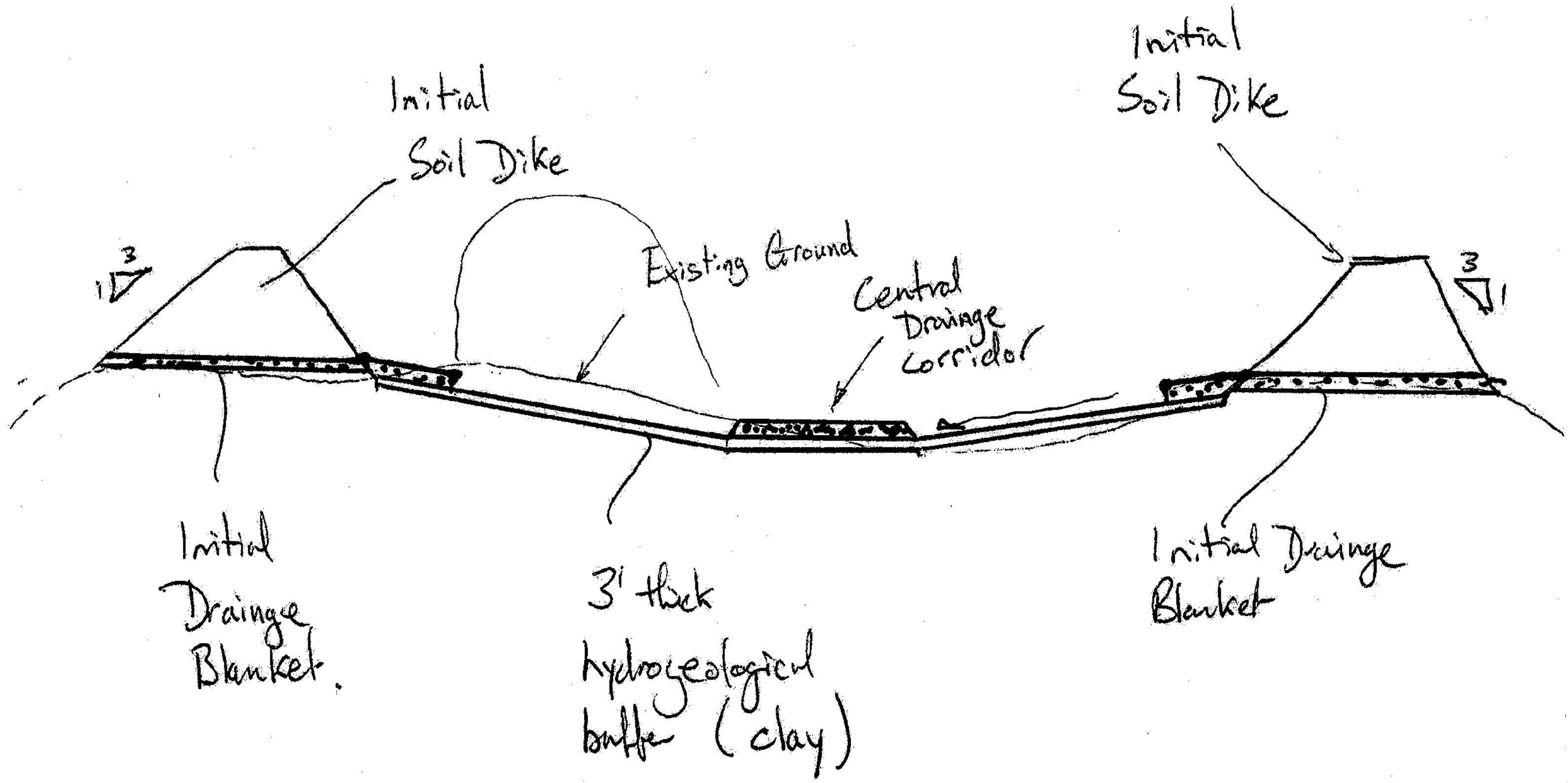

Stage 1 - Initial Starter Dikes.

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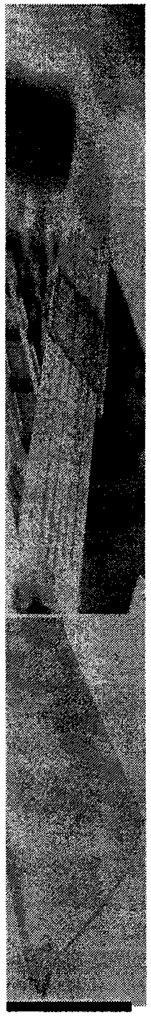

[Note]

- {Developing a series of slides to illustrate filling operations and transition to Rim Ditch operation}

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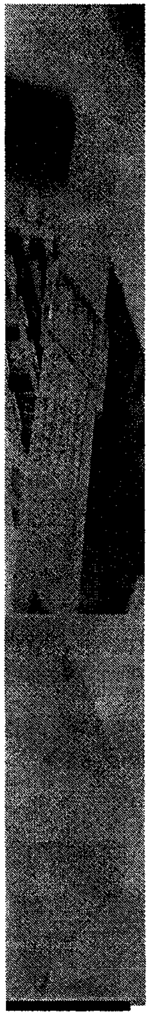

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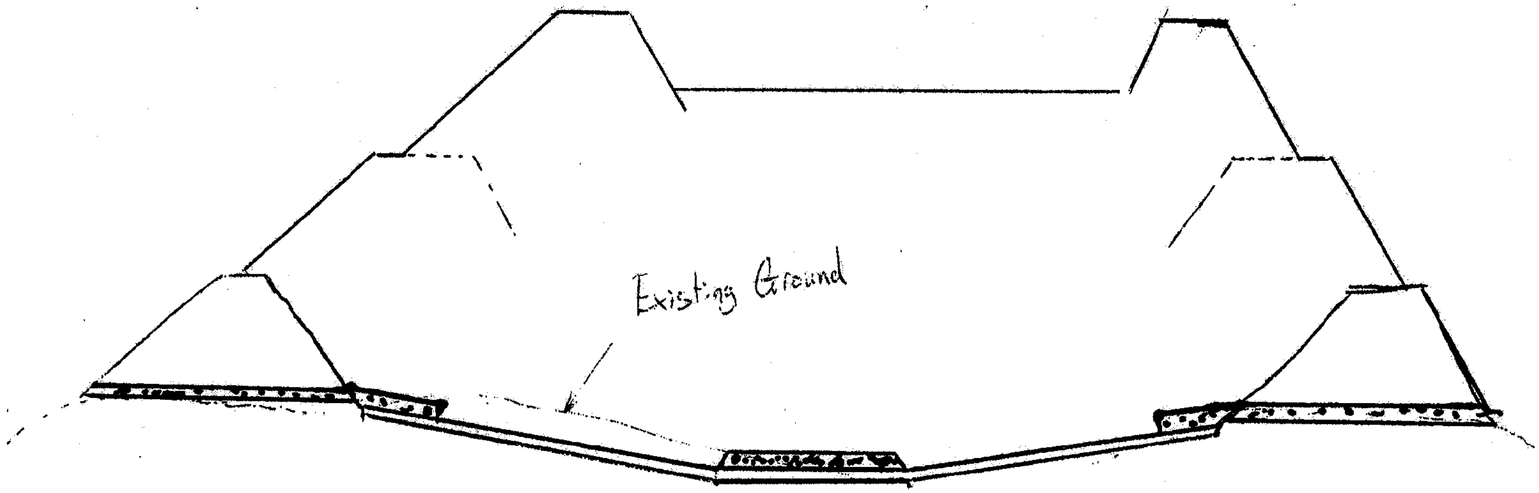

Stage 2 - Transition To Wet Cast Dike.

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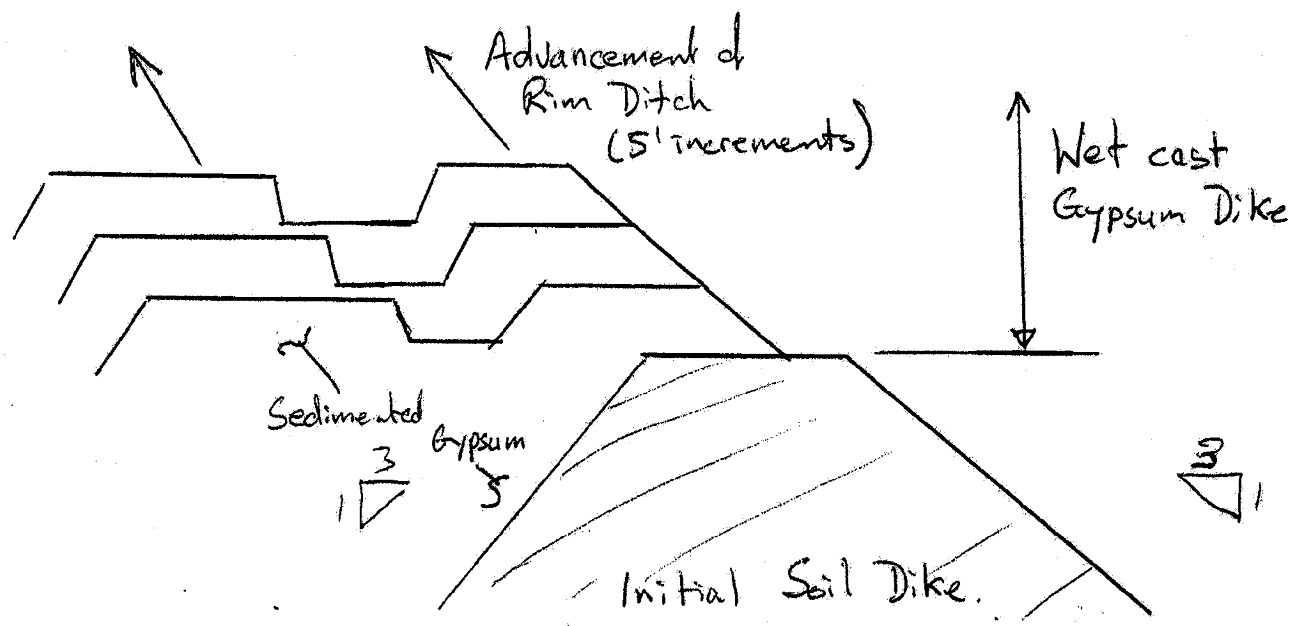

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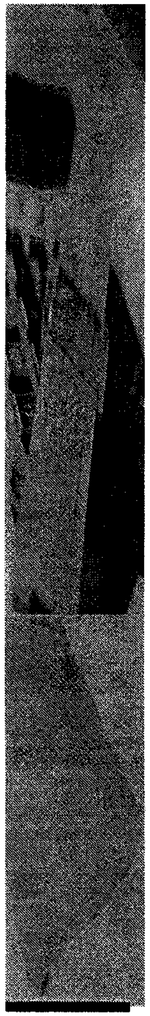

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Surface Water Pond Sizing (approx.)

Purpose
- Takes run-off from design storm event
- Takes decant from gypsum slurry operations

Stormwater (sizing)
- Estimated runoff:
  - 100 yr, 24 hr storm gives 5.25 in over 91 acres
  - 6 acres at 7 in
  - Needed capacity = 44 ac-ft.

Decant
  - Assume 5# coal; gives 1190 gpm flow (from Parsons, seems reasonable if approximately a 30% slurry)
  - Requires approx. 5.25 ac-ft

Min Capacity
  - 44 + 5.25 = 50 ac-ft
  - For a berm El of 768’ and base EL of 754’ (14 ft)
  - With 3 ft freeboard, gives available capacity of 6 ac x 11 ft = 66 ac-ft

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