# Geologic Stability and Hydrologic Isolation at the WCS Site, Andrews County, TX

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## The WCS site is One of the Most Characterized Sites in the U.S.

- 20,000 pages in reports to TCEQ related to the geologic and hydrologic conditions at the site
- These studies show that
  - The site has been and will continue to be geologically stable
  - Radioactive and hazardous wastes will be hydrologically isolated from usable water resources
- The following summarizes some important conclusions of these studies



Low-Level License Application

# Subsurface Characterization Activities at WCS Have Been Extensive

Approximately, 596 wells/soil borings, including:

- 448 monitoring wells
- Over 130 uncased soil borings.
- 18 instrumented boreholes

Numerous geologic/hydrologic investigations, including:

- 15 major geologic studies
- 18 major hydrogeologic studies
- Nine geophysical investigations



### The WCS site is Geologically Stable



### The WCS site is Unaffected by Salt Dissolution



Rustler and Salado Formation Salt Beds Show Regional Continuity and No Changes Indicating Dissolution

### The WCS site is Unaffected by Salt Dissolution



CP-975 Core Slabs Show No Brecciation Above Salt or Mudstones Equivalent to Salt-bearing Beds

### The WCS site is Unaffected by Salt Dissolution

Trench Study of Caliche - "V-shaped" Fractures Claimed As Evidence of Dissolution



-1 ft--2 ft--3 ft-

No "V-shaped" fractures found

# Two Hydrologic Units are Important to the WCS Site – *The Dockum Group*



Mudstones/Claystones – Ancient soils containing swelling clays

Siltstones/Sandstones – Discontinuous stream deposits

Trujillo Formation

# Two Hydrologic Units are Important to the WCS Site – *The OAG*

Sand

Gat



Thin veneer of silts, sands, and gravels - Occupies erosional depressions on the Dockum Group

Trujillo Formation

### The Dockum is a Low Permeability Medium

- 168 measurements of Dockum hydraulic conductivity (core and well tests) show:
  - Vertical effective hydraulic conductivity of 1.2×10<sup>-9</sup> cm/s (two orders of magnitude lower than required for a clay liner)



### Dockum Red Beds are Unsaturated



- 1,303 measurements of *in situ* water potential on core samples from 12 boreholes indicate unsaturated conditions
- No vertical flow from the surface to depth

### Water Flow in the Dockum is Slow *Playa Observations -*



- Water table conditions existed in the OAG under the playa for at least 18,000 years
- Currently ~ 7 feet of water in the OAG at the playa
- Borehole B-133 was drilled into the playa and sampled
- Water has only moved between 23 and 29 feet into the Red Beds in 18,000 years
- Water is very slow moving

### The OAG has Been Extensively Characterized



- 259 wells
- 157 dry wells
- OAG is only a few feet thick in near the WCS facilities and thickens to the north and south
  - The average OAG thickness is 13.5 feet
- The average saturated thickness in the northern part of the facility is 2.7 feet

#### The Base of the OAG is the Dockum



Top of Dockum is an ancient land surface that predates the OAG

# OAG water is Discontinuous and Controlled by Dockum Topography



These puddles accumulate, then dry out

## Summary

- The site is geologically stable
- The site is hydrologically isolated
- The site is ideal for disposal of hazardous, byproduct and low-level radioactive waste