



OCD CASE NOS. 14784 AND 14785

IPANM Petition to amend Title 19, Chapter 15,  
part 17 (The PIT Rule)

May 14 – 18, 2012

**IPANM exhibit 6**  
**Slide presentation by Mullins**  
- Ten (10) pages -

# Pit Release Modeling

Temporary Drilling Reserve Pit Risk Assessment Modeling for  
New Mexico Rule 17 Modifications

Case # 14784 (NMOGA)

Case # 14785 (IPANM)

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May 2, 2012

Prepared for the Independent Petroleum Association of New Mexico

# Risk Assessment

Saturated Flow of water is different from Unsaturated Flow. Focus is on diffuse natural recharge.

Utilized similar assumptions and conservative modeling parameters used by the NMOCD during the 2007 and 2009 Pit Rule Hearings

Existing presence of “Salt Bulge” in current soil profile verifies little salt migration through the Vadose zone over the past 10,000 to 16,000 years.

Infiltration rates can be as low as 0.03 mm/yr to 0.1 mm/yr (Walvoord and Scanlon, 2004)

Modeling includes horizontal transport (100 feet) in the aquifer.

Model drives flux down, does not support negative flux.

# Predictive Models

## **Hydrologic Evaluation of Landfill Performance (HELP) Model**

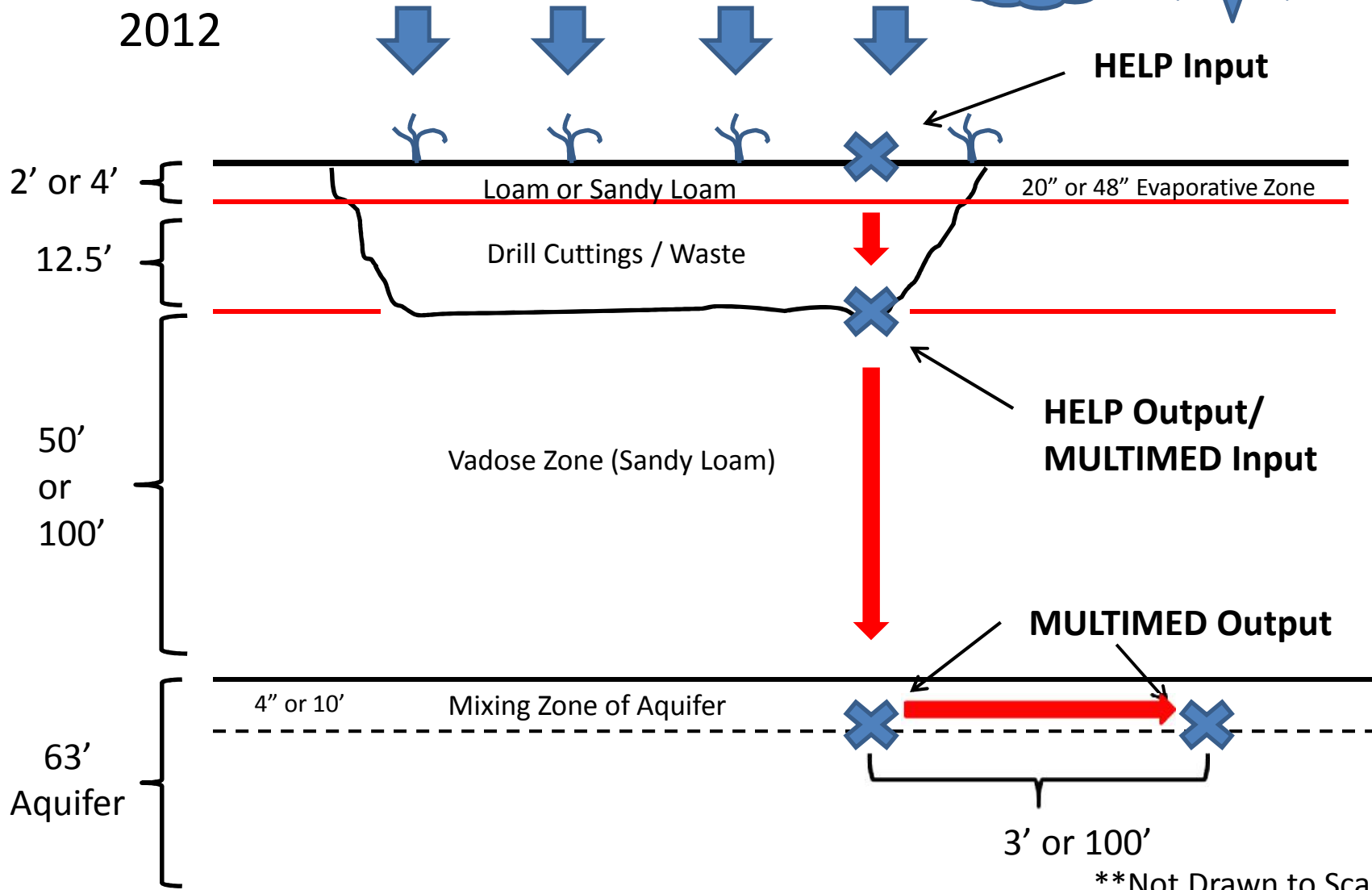
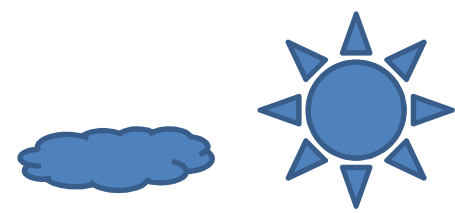
- US Army Corp of Engineers for the EPA
- Water balance model that includes:  
Surface Storage, Snowmelt, Runoff, infiltration,  
Evapotranspiration, Vegetative Growth, Soil Moisture Storage,  
Lateral Subsurface Drainage, Unsaturated Vertical Drainage,  
Leakage through Soil, Geo-membrane or Composite Liners
- Used by many States and within Industry

## **Multimedia Exposure Assessment (MULTIMED) Model**

- 2-Dimensional EPA Model
- Vadose Zone and Aquifer Transport
- Determines release concentrations over time at bottom of  
Vadose Zone and in the Aquifer

2007  
2009  
2012

# Conceptual Model



HELP Input

HELP Output/  
MULTIMED Input

MULTIMED Output

\*\*Not Drawn to Scale

# HELP Model

## Model Input Parameters

### Weather Data

Daily Precipitation & Wind Speed  
Daily Temperature & Humidity  
Daily Solar Radiation Indexes  
Daily Evaporation Indexes

### Soils Data

Number of Layers	Type of Layer
Layer Thickness	Soil Types
Soil Porosity	Soil Field Capacity
Soil Wilting Point	Initial Soil Moisture
Hydraulic Conductivity	Quality of Liner Installation
Type of Cover Material	Slope of Cover Material
Evaporative Zone Depth	

# MULTIMED Model

## Model Input Parameters

### **Vadose Zone Variable**

Thickness	Saturated hydraulic conductivity
Effective porosity	Residual Water Content
Long. Dispersivity	Percent Organic Matter
Bulk Density of Soil	Biological Decay coefficient

### **Source specific variables**

Infiltration Rate (HELP)	Area of waste disposal
Duration of Pulse	Initial Concentration (100,000 mg/l)

### **Aquifer specific variables**

Effective Porosity	Bulk Density
Thickness	Conductivity
Gradient	Dispersivities
Well Distance from site	

# HELP Conceptual Model

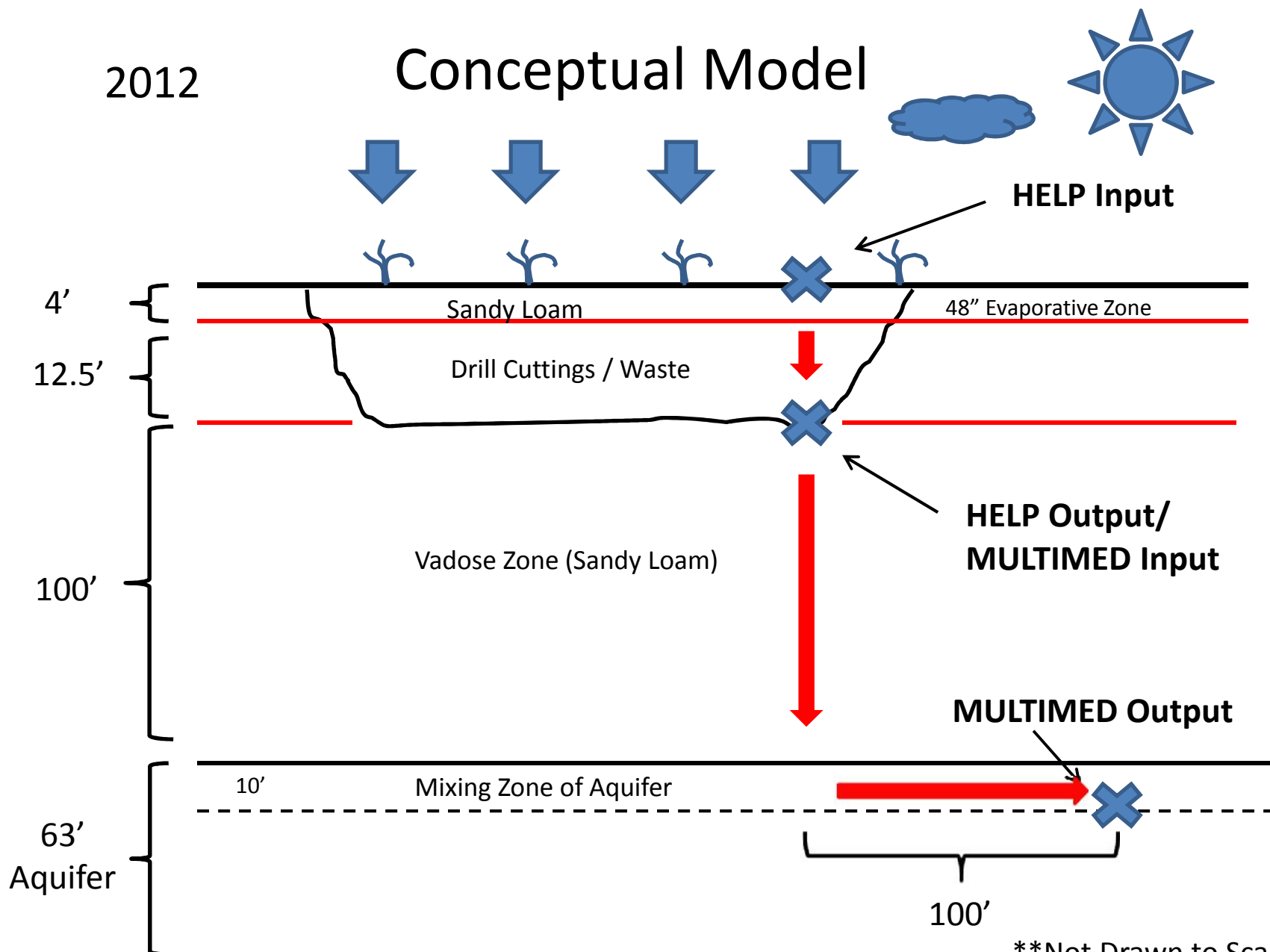
## Model Input Parameters

- Evaporative Zone Depth limited to top (48 inches) – IPANM
- Precipitation Values utilized for Hobbs, Maljamar, Roswell, Carlsbad, & Artesia.
- NMOCD utilized 50 years of data from Hobbs, NM & Dulce, NM in prior Hearings (1951 to 2000) to create synthetic forecasts.
- IPANM utilized 50 year synthetic models based upon Roswell, NM temperature and solar profile with actual monthly average precipitation for multiple locations in Southeast New Mexico, adjusted solar effect for Latitude.
- Utilized 4' of Soil Cover in all instances, with Liner on bottom of Pit.



2012

# Conceptual Model



\*\*Not Drawn to Scale

# Southeast New Mexico Focus

48" Evaporative Depth	Carlsbad	Roswell	Artesia	Maljamar	Hobbs
Annual Average Precipitation:	14.1"	13.4"	13.4"	16.1"	18.2"
Elevation (m):	950	1,106	1,035	1,266	1,115
HELP Model Infiltration Rates Liner (mm/yr):	1.53	1.17	1.06	0.51	1.42
Years until reaching 100' Lateral @ 100' depth:	3,100	4,050	4,400	9,200	3,300
Years until max Cl:	4,500	5,750	6,200	12,800	4,800
Max Cl (mg/l) @ 100' lateral distance:	68	40	33	8	58

# Conclusions

4' of Soil Cover protective in all instances.

No liner necessary on top of pit.

100' Siting Requirement is protective of public health & environment

Precipitation and Evaporative zone depths drive Infiltration Rates

Based upon HELP modeling and MULTIMED modeling of Chloride most mobile source, there is negligible risk to human health, the environment, the public, or accessible groundwater from 10 percent chloride leachate.

No testing of pit contents is necessary where GW is greater than 100'.