PITS AND BELOW-GRADE TANKS

OIL CONSERVATION COMMISSION HEARING

CASE 14784 January 23, 2012

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Soil Science Society of America — Soils Sustain Life

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(copied from the society's web page)

BOOKS WITH "SOIL PHYSICS" IN THE TITLE

Los Alamos National Laboratory library, 2007

Title	Author/editor	Publisher	Year
Soil Physics	Jury & Horton	Wiley	2004
Principles of Soil Physics	Lal & Shukla	Dekker	2004
Soil Physics Companion	Warrick	CRC Press	2002
Chemical Soil Physics	*anon.*	Sandia NL	1999
Environmental Soil Physics	Marshall et al	Cambridge U	1996
Soil Physics with BASIC	Campbell	Elsevier	1985
...Techniques in Soil Physics	*various*	IAEA	1983
Applied Soil Physics	Hanks & Ashcroft	Springer	1980
Fundamentals of Soil Physics	Hillel	Academic	1980
Applications of Soil Physics	Hillel	Academic	1980
Soil Physics	Baver, et al	Wiley	1972
Physics of the Soil	Nerpin	*transl.*	1970

The statement "there is no science behind the pit rule" has been repeated in the press. This testimony will review a portion of the science behind the pit rule.

This testimony will focus on chloride. If releases of chloride were restricted, releases of sodium and other toxic chemicals, ignored by the rule, might be partially controlled.

Chlorides also serve as a tracer for monitoring the possible transport of other chemicals .

NMCCA&W Ex.5 pg. 5

If the vadose zone, the region between ground surface and the water table, is contaminated, the entire environment suffers and eventually the water will also be contaminated.

In most cases, if no release occurs to the vadose zone, water *and* the soil are both protected.

Therefore, we focus on contaminants in or on the ground, as soil under pits or wastes in burial units.

NMCCA&W Ex.5 pg. 6

This presentation will focus mainly on chloride. Sodium, other chemicals, and organic compounds can also create environmental damage. However, chlorides serve as a tracer for the transport of other chemicals, so it is especially important to limit releases of chloride.

The proposed rule changes would eliminate practical limits on chloride releases.

OUTLINE

1. **What is in the pits?**
2. **What are the effects in or on the soil?**
3. **What are the chemical effects on biota?**
4. **If it moves, how fast, how far?**
5. **What is the big picture of the proposed rule?**

(We are not identifying linguistic adjustments.)

1. WHAT IS IN THE PITS?

A brief review of sampling of pits ready for closure.

Sampling by industry

Sampling by the OCD

INDUSTRY SAMPLING
AVERAGE OF 3 PITS EACH REGION

	NORTHWEST Average mg/kg	NORTHWEST Range mg/kg	SOUTHEAST Average mg/kg	SOUTHEAST Range mg/kg
ANION				
CHLORIDE	3,926	280 - 15,000	126,278	0 - 420,000
SULFATE	3,324	0 - 11,000	33,056	0 - 72,000
CATION				
CALCIUM	2,814	140 - 15,000	14,903	0 - 31,000
POTASSIUM	2,156	380 - 5,200	6,409	0 - 38,000
SODIUM	5,717	1,900 - 11,000	75,928	6,400 - 250,000
HYDROCARBONS				
GRO	45	0 - 160	477	1 - 2,500
DRO	1,727	110 - 8,000	7218	17 - 26,000
OIL & GREASE	2,673	0 - 26,000	4992	240 - 19,000

INDUSTRY PIT SAMPLING -- NORTHWEST
AVERAGES IN A SINGLE PIT

Pit	Aver. Chloride mg/kg	Range mg/kg	Aver. DRO mg/kg	Range mg/kg	Aver. O&G mg/kg	Range mg/kg
SJC-1	1342	330-2600	1151	200-2300	982	250-2200
SJC-2	6083	2200-14000	597	110-2500	1595	0-11,000
SJC-3	4072	960-6100	3433	720-8,000	5443	320-26,000
landfarm closure standards.	500 or 1000		GRO+DRO 500		TPH 2500	

OCD PIT SAMPLING -- NORTHWEST

Sample	TPH mg/kg	Chloride mg/kg	Sodium mg/kg	Na/Cl atomic ratio
DP3 -01 Soil	<10	704	1570	3.44
DP3 -03 Soil	957	417	2900	10.72
DP3 -08 Soil	1280	962	2080	3.33
DP3 -09 Soil	598	927	3270	5.44
DP3 -10 Soil	1280	5290	5290	1.54
PP3 -01 Soil	848	1990	3460	2.68
Landfarm closure	*2500*	*1000*		

	TPH mg/L	Chloride mg/L	Sodium mg/L	Na/Cl atomic ratio	TDS mg/L
T3 - 01 Water	385	2050	2330	1.75	17200
DP3 - 04 Water	329	7810	4540	0.90	16800
DP3 -05 Water	84.8	3400	2150	0.97	8170
DP3 - 02 Water	10.2	1210	2780	3.54	6135
DP3 -06 Water	277	4280	2130	0.77	8000
DP3 -07 (dup.06)	419	3940	2170	0.85	7860

2. PHYSICAL EFFECTS OF SALT ON SOIL AND PLANT LIFE

UNSATURATED HYDROLOGY

a) Porous structure of the soil

b) Moisture potential (suction)

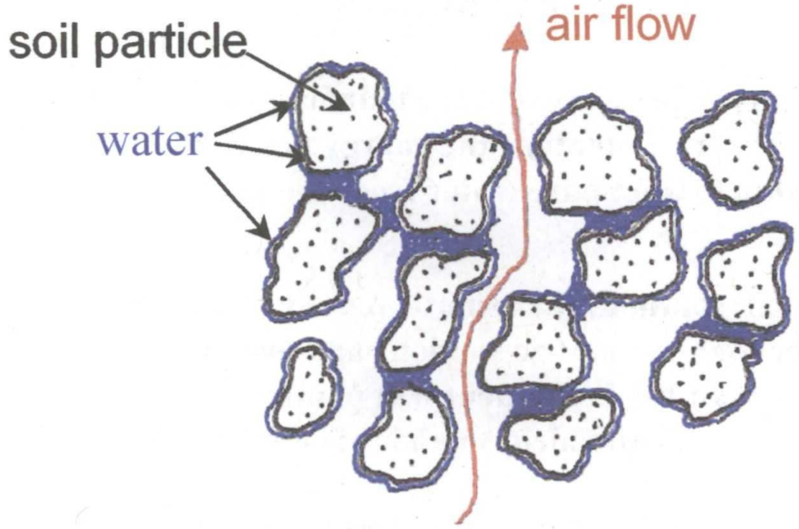
c) Osmotic presssure, matric suction and flow

d) *Transport of water and contaminants*

(How far, how fast can it go?)

NMCCA&W Ex 5_pg 13

POROUS STRUCTURE OF THE SOIL

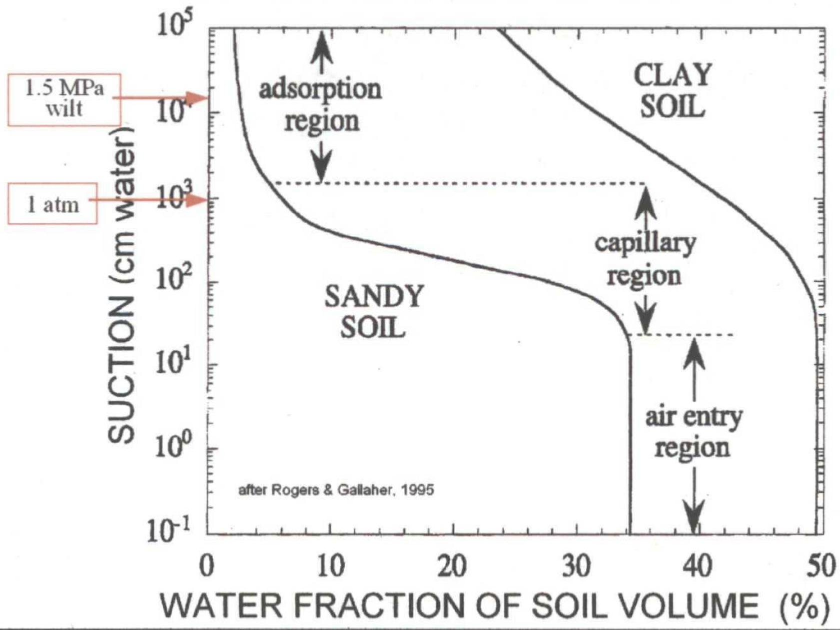


VOLUMETRIC MOISTURE: fraction of ***total volume*** occupied by water.

SATURATION: fraction of ***pore volume*** occupied by water.

NMCCA&W Ex 5 pg 14

MOISTURE POTENTIAL (MATRIC SUCTION)



SALT IN WATER CAUSES OSMOTIC PRESSURE

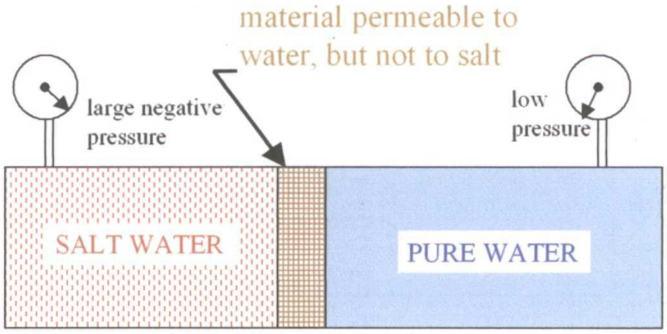
The osmotic pressure and the matric suction add to form the total potential--the energy per volume needed to extract pure water from the porosity of the soil.

For a salt solution, the osmotic pressure may be much greater than the matric suction--and even much greater than the permanent wilt point of 1.5 MPa (15 atmospheres, equivalent to about 500 ft. head).

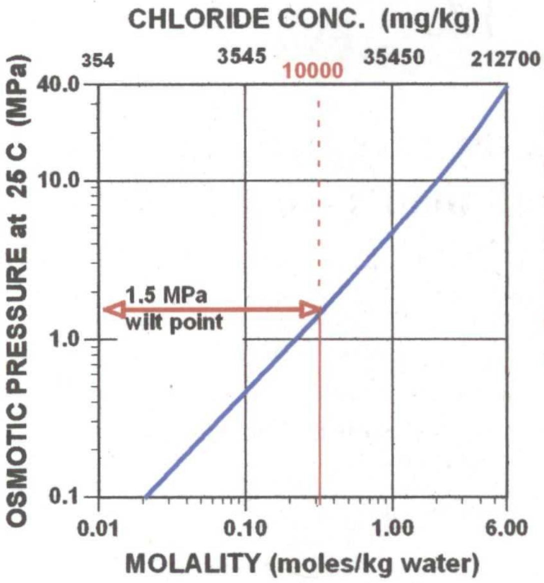
Osmotic pressure kills plants, but in most soils, the osmotic pressure is INEFFECTIVE for causing flow.

OSMOTIC PRESSSURE

Although chloride is chemically toxic, and sodium is more toxic to various plant species, a major effect of salt in the pore water is to increase the osmotic pressure, making it difficult or impossible for a plant to acquire water.



OSMOTIC PRESSURE OF A NaCl SOLUTION



Soil with 1,000 mg/kg chloride at 15% volumetric moisture has 10,000 mg/kg (roughly mg/liter) chloride in the pore water.

3. CHEMICAL EFFECTS OF SALT ON PLANTS and SOILS (*SALINITY* and *SODICITY*)

SALT TOLERANCE OF PLANTS

ELECTRICAL CONDUCTIVITY (EC) AS AN INDICATOR

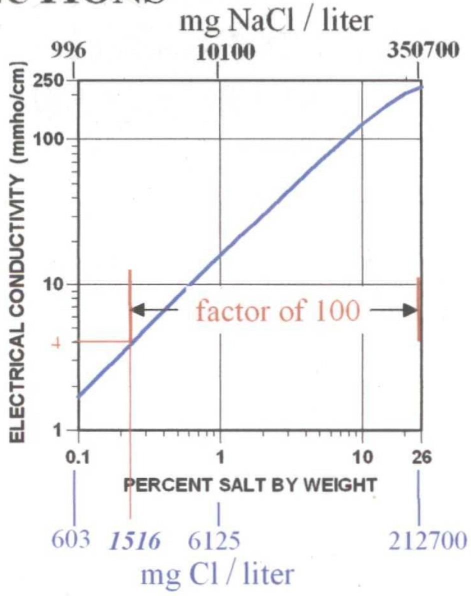
EC GENERATED BY CHLORIDE CONCENTRATION

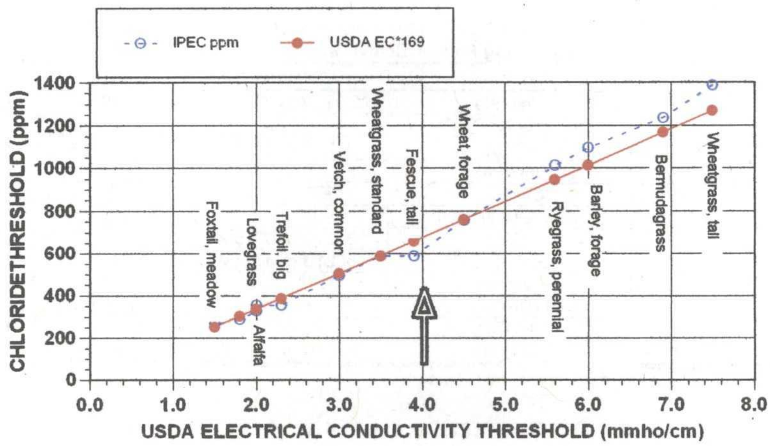
EC

"The traditionally accepted objective criteria ... for all plants ...has been to decrease the salinity ... to less than 4 mmhos/cm ..."

American Petroleum Institute, Publication 4663, "Remediation of Salt-Affected Soils at Oil and Gas Production Facilities" (1997).

ELECTRICAL CONDUCTIVITY OF SALT SOLUTIONS





Threshold for chloride damage to grasses, expressed as EC of saturated paste by the U.S. Department of Agriculture or as soil chloride content by IPEC. The graph suggests that the two data sets have a common origin.

Chloride: Integrated Petroleum Environmental ConsortiumEC: USDA G. E. Brown Salinity Laboratory, http://www.ussl.ars.usda.gov/pls/caliche/SALTT42B

At what level is it damaging?

Salt is damaging to plants when the EC of saturated paste exceeds 4 (roughly 600mg/kg dry soil). Much of the damage is due to osmotic pressure added to the matric suction; therefore plants are more sensitive to salt in dry soils. Almost no plants survive overnight exposure to 1.5 MPa of pore and osmotic pressure approximately 1,000 mg/kg of soil at 15% moisture.

Sodium is toxic, but also damages to soil structure when the *sodium absorption ratio* **exceeds 15. In clay soils, SAR should be no more than 5.**

Table I, 19.15.17.13 NMAC
Closure Criteria for Soils Beneath
Pits, Drying Pads & Below Grade Tanks

Groundwater Depth	Constituent	Method	Limit
≤50 feet	Chloride	EPA 300.1	5,000 mg/kg
	TPH (GRO/DRO)	8015M	100 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg
>50 feet-100 feet	Chloride	EPA 300.1	10,000 mg/kg
	TPH (GRO/DRO)	8015M	1,000 mg/kg
	BTEX	8021B or 8015M	50 mg/Kg
	Benzene	8021B or 8015M	10 mg/kg
> 100 feet	Chloride	EPA 300.1	20,000 mg/kg
	TPH (GRO/DRO)	8015M	5,000 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg

Per EPA SWA 846 or other EPA Approved Methods

The EC=4 guideline for vegetation from the American Petroleum Institute would be equivalent to 600 mg/kg.

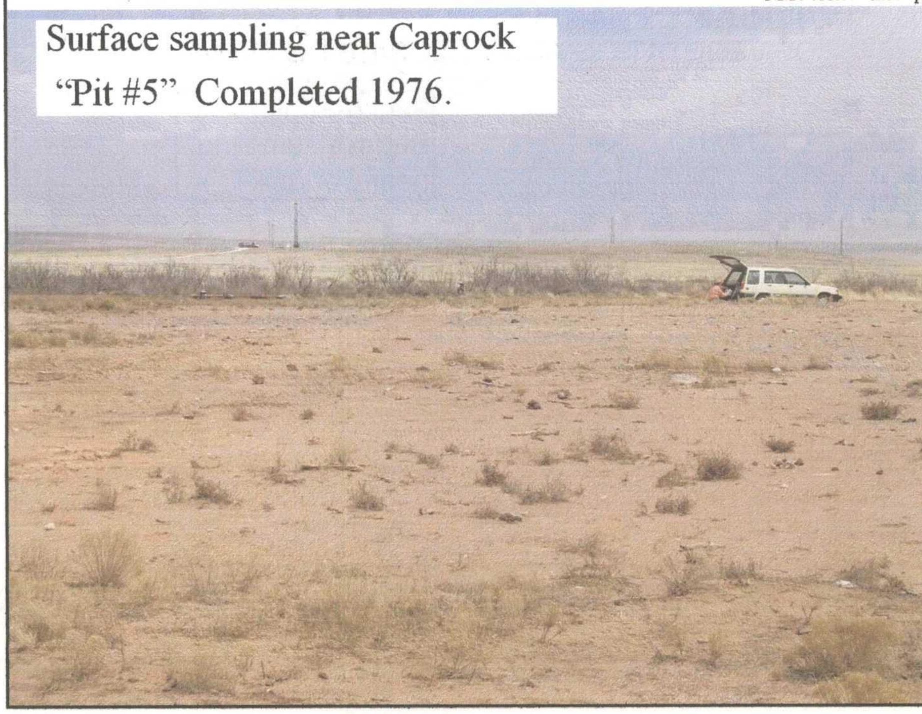
The chloride criteria could rarely be exceeded. 20,000 mg/kg is equivalent to replacing the normal pore water of soil with brine, a concentration in a *composite* sample achievable only by a major release or by operation without a liner.

DOES THE EXPECTED SALT DAMAGE COMPARE WITH REALITY?

Vegetation damage is consistent with the results of field exercises to test surface soils for chloride.

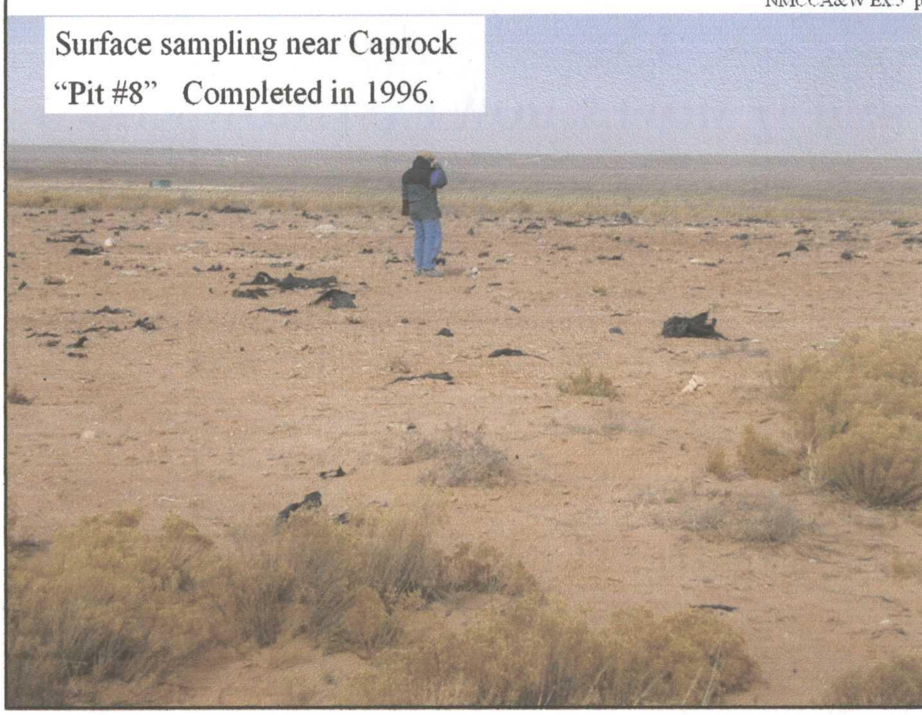
Surface sampling near Caprock, March-April, 2006

NMCCA&W Ex 5 pg 25



Surface sampling near Caprock
"Pit #5" Completed 1976.

NMCCA&W Ex 5 pg 26



Surface sampling near Caprock
"Pit #8" Completed in 1996.

NMCCA&W Ex 5 pg 27

NUMBER OF SAMPLES IN EACH CATEGORY OF VEGETATION AND CHLORIDE CONTENT

March-April, 2006
Surface sampling near Caprock

CHLORIDE (mg/kg)	dead area	edge of snake weed	sparse snake weed	dense snake weed	sparse grass	dense grass	undis-turbed grass
4000 to 2000	3	1					
2000 to 1000			1				
1000 to 400							
400 to 250	1		2	1			
250 to 100		2	2		1		
100 to 0		5			5	1	1

VEGETATION

NMCCA&W Ex 5 pg 28

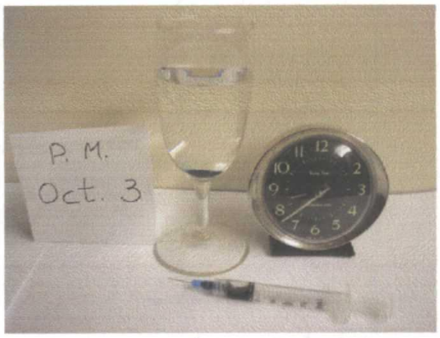
4. IF IT MOVES, HOW FAST, HOW FAR?

Diffusion through pore water is a slow, but absolutely certain, process.

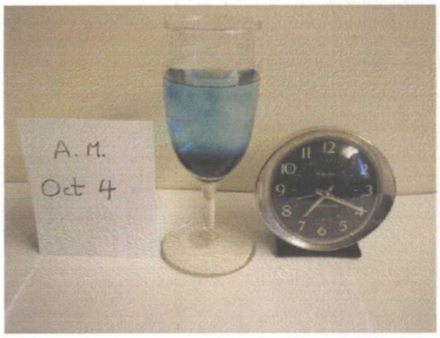
However, the natural motions of pore water or saturated flow after rainfall can move contaminants much faster.

Motion can be upward, downward, or horizontal--whichever way the combination of suction plus gravity pulls.

NMCCA&W Ex 5 pg 29



DIFFUSION OF CONTAMINANTS THROUGH WATER



NMCCA&W Ex 5 pg 30

CHARACTERISTIC DISTANCES FOR DIFFUSION OF SALT through WATER

Distance	**Time**
1 cm	**18 hours**
1 m	**21 years**

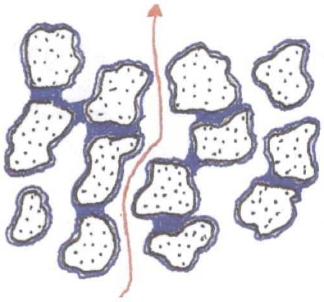
Time increases with the square of the distance.

Conclusion: Over decades, diffusion can move salt a significant distance through pore water, even in the absence of water motion.

diffusivity = 1.5E-9 m^2/s

NMCCA&W Ex 5 pg 31

Transport of water and contaminants



Saturated flow

Unsaturated flow

Diffusion of water vapor

Evaporation & condensation of water

Diffusion of contaminants

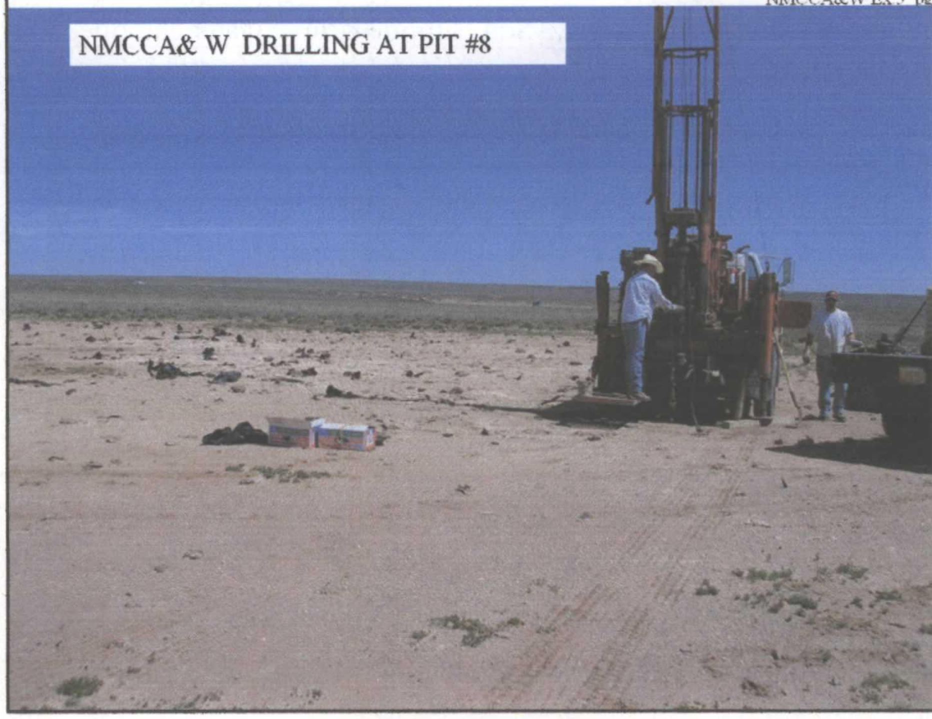
NMCCA&W Ex 5 pg 32

SUBSURFACE SAMPLING TO TRACE THE VERTICAL MOVEMENT OF CHLORIDE

Subsurface sampling near Caprock, April 3, 2007

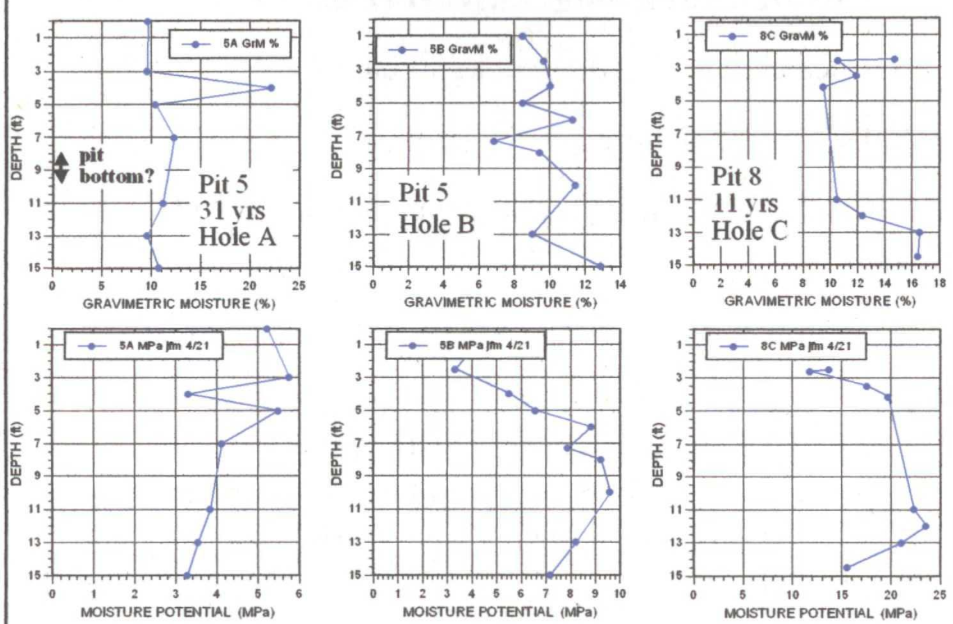
Subsurface sampling near Loco Hills, June 30, 2007 supported by Marbob Energy Corp.

NMCCA&W Ex 5 pg 33



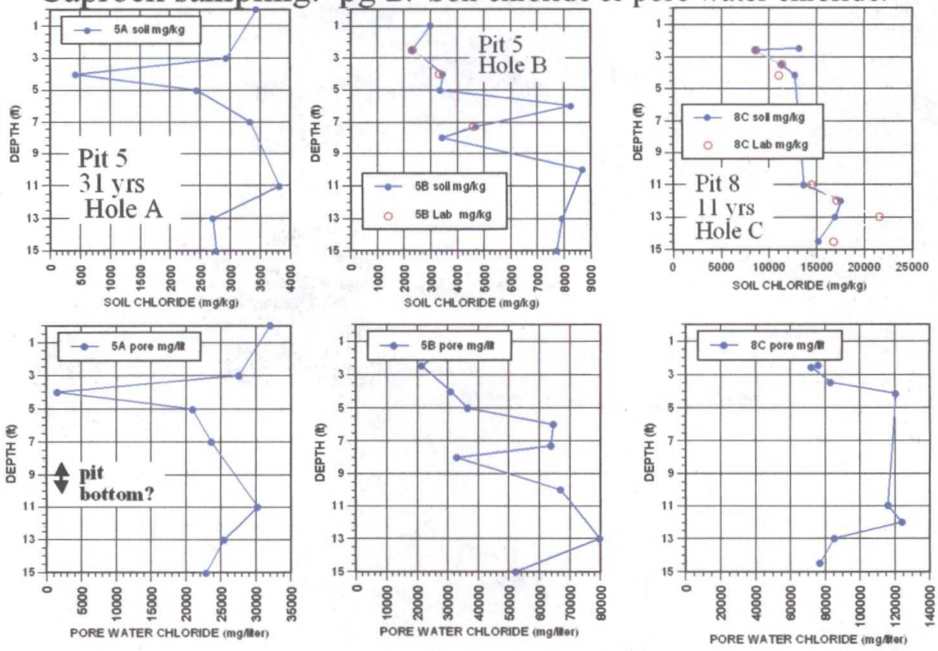
NMCCA&W Ex 5 pg 34

Caprock sampling. **Gravimetric moisture & potential.**



NMCCA&W Ex 5 pg 35

Caprock sampling. pg 2. Soil chloride & pore water chloride.



NMCCA&W Ex 5 pg 36

Caprock sampling. SUMMARY

Surface chloride ~3,000 mg/kg in bare area.

Subsurface moisture appears normal.

Chloride shows no sign of a plume bottom at 15 ft.

Moisture potentials are consistent with matric potential + NaCl osmotic pressure.

A new monitor well (2006-2007) approx. 150 ft south of Pit #5 shows approximately 2400 mg/liter chloride in groundwater at 30 ft. The source of contamination had not been officially established. A tank spill occurred nearby.

NMCCA&W Ex 5 pg 37

Sampling near Loco Hills.

Burch Keely Unit #49, spudded Oct. 1979.

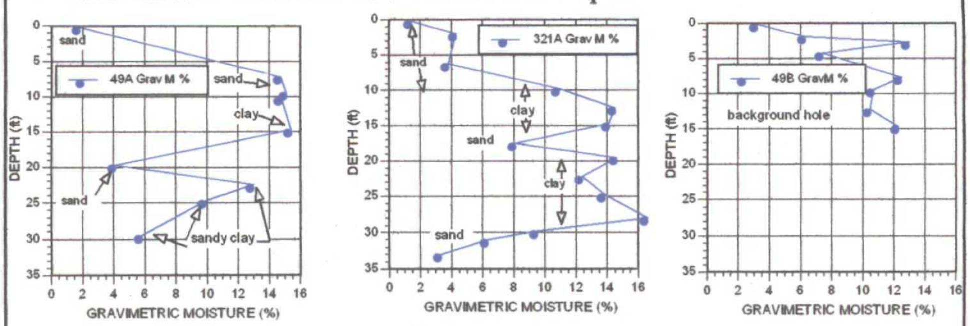
NMCCA&W Ex 5 pg 38

Loco Hills (Burch Keely Unit) sampling results pg. 1

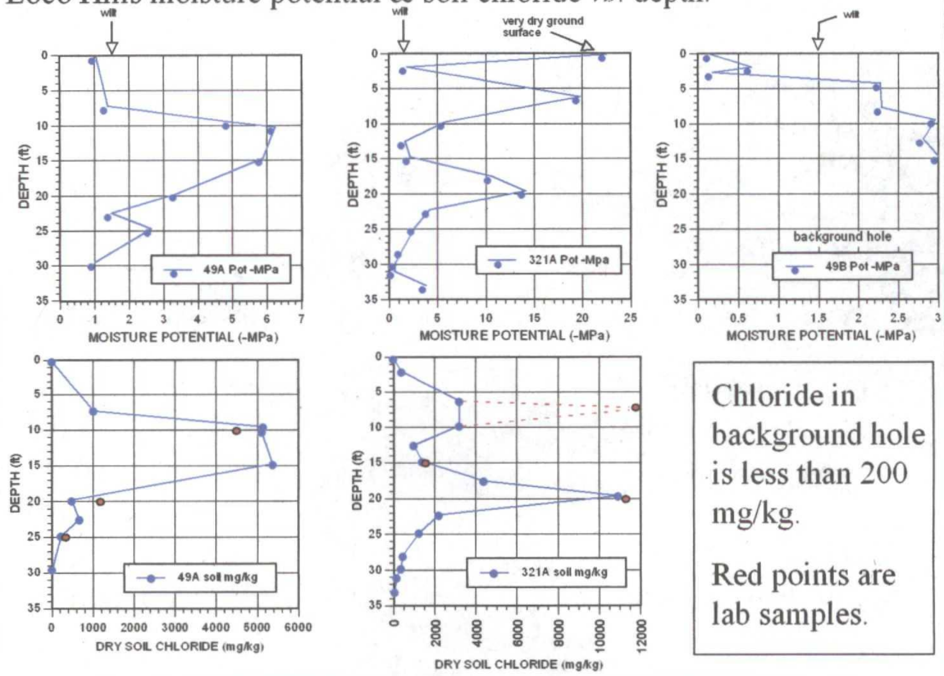
Well 49 spudded 10/1976. Unlined pit 31 years old.

Well 321 spudded 11/2001. Lined pit 6 years old.

Gravimetric moisture as a function of depth.



Loco Hills moisture potential & soil chloride *vs.* depth.



Chloride in background hole is less than 200 mg/kg.

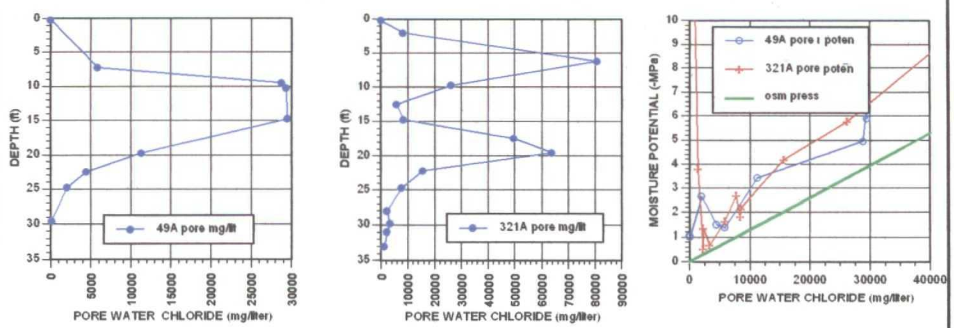
Red points are lab samples.

Loco Hills: Pore water chloride vs. depth.

Moisture potential vs. pore water chloride.

Note penetration of chloride to 30 ft.

Comparison of potential with osmotic pressure of NaCl suggests presence of additional dissolved substances, as found in the industry and OCD sampling of current pits.



Caprock and Loco Hills sampling CONCLUSIONS

Both the older and newer pits confirm that chlorides are not retained by the pit material, or even by the liner used in 2001, but can move several meters in a time scale of decades.

Caprock: Chloride concentrations extend past 15 feet total depth at pits #5 and #8, which were 31 and 11 years old, respectively.

Loco Hills: Pit #49 was 30 years old and Pit #321 was 6 years old. Sandy surface soils were not contaminated. Both pits showed a leading edge of chloride plume at 25-30 feet.

NUMERICAL SIMULATIONS TO INVESTIGATE THE TRANSPORT

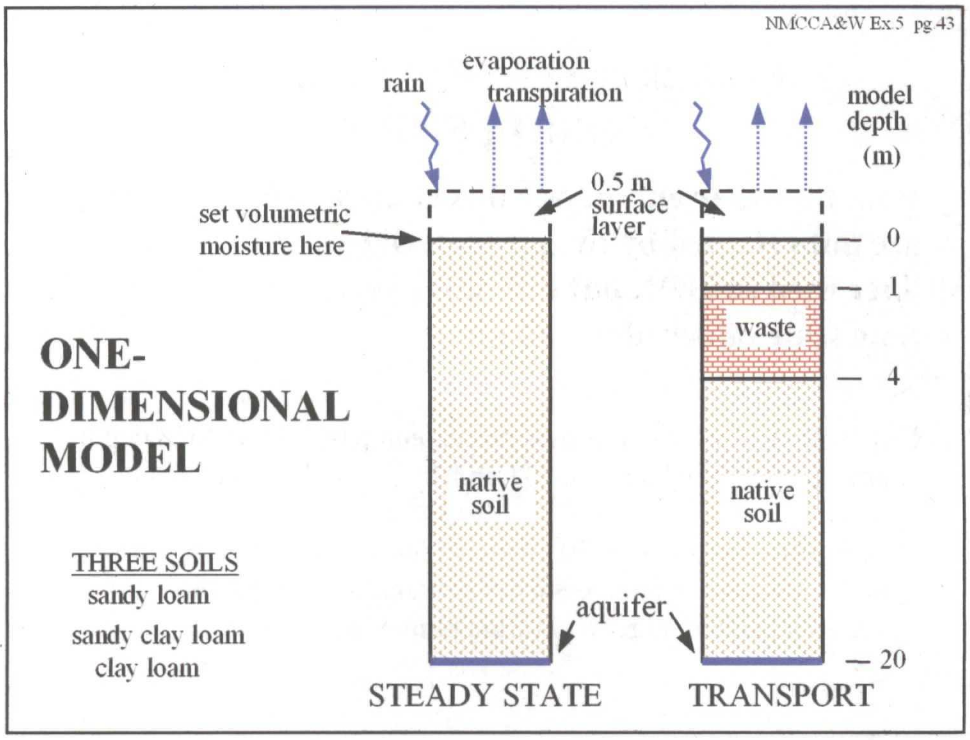
One-dimensional, unsaturated flow

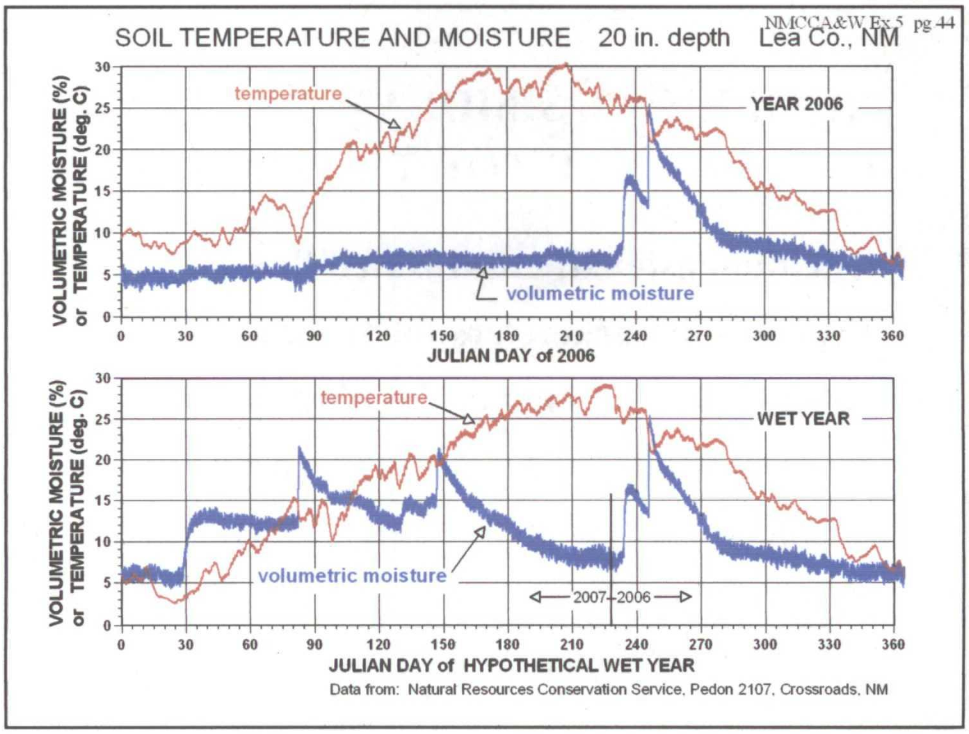
Typical soil parameters for three soils

Measured soil moisture data input

Ignoring colligative (solution) effects

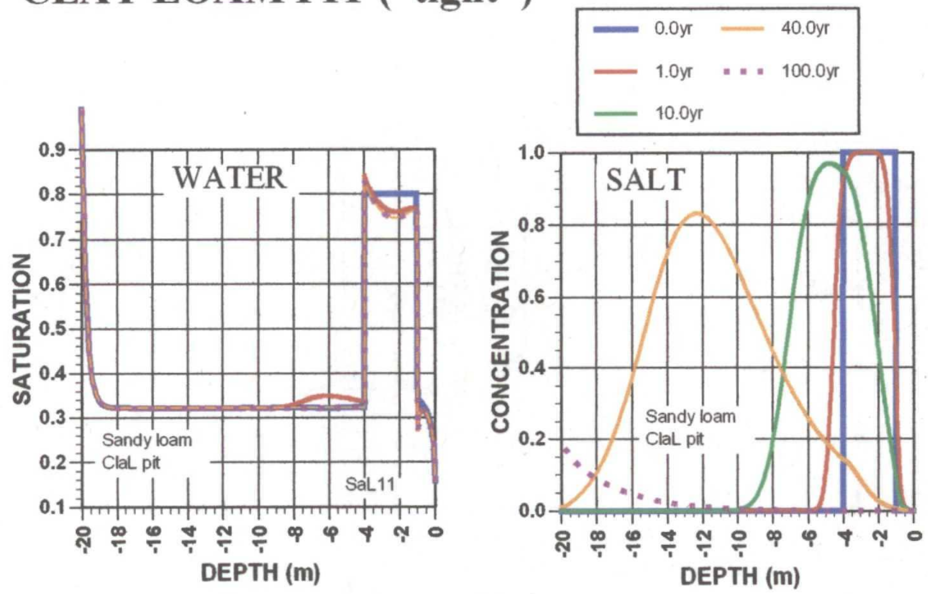
Simulation reveals that chlorides move preferentially ***downward*** in sandy soils and ***upward*** in clay-like soils.


NMCCA&W Ex.5 pg 43
evaporation
rain
transpiration
model
depth
(m)
0.5 m
surface
layer
set volumetric
moisture here
0
1
waste
4
ONE-
DIMENSIONAL
MODEL
native
soil
native
soil
THREE SOILS
sandy loam
sandy clay loam
clay loam
aquifer
20
STEADY STATE
TRANSPORT


NMCCA&W Ex.5 pg 44
SOIL TEMPERATURE AND MOISTURE 20 in. depth Lea Co., NM
VOLUMETRIC MOISTURE (%)
or TEMPERATURE (deg. C)
temperature
YEAR 2006
volumetric moisture
JULIAN DAY of 2006
temperature
WET YEAR
volumetric moisture
2007-2006
JULIAN DAY of HYPOTHETICAL WET YEAR
Data from: Natural Resources Conservation Service, Pedon 2107, Crossroads, NM

NMCCA&W Ex 5 pg 45

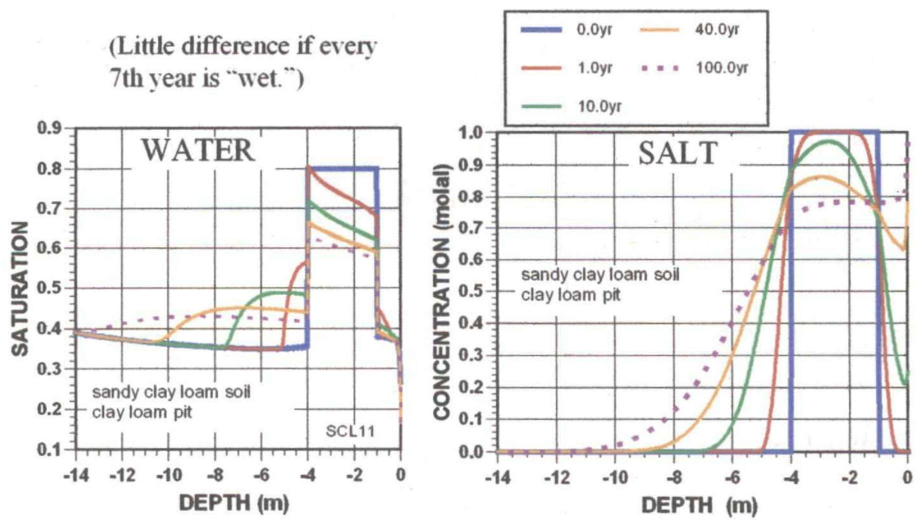
SANDY LOAM SOIL ("loose")
CLAY LOAM PIT ("tight")



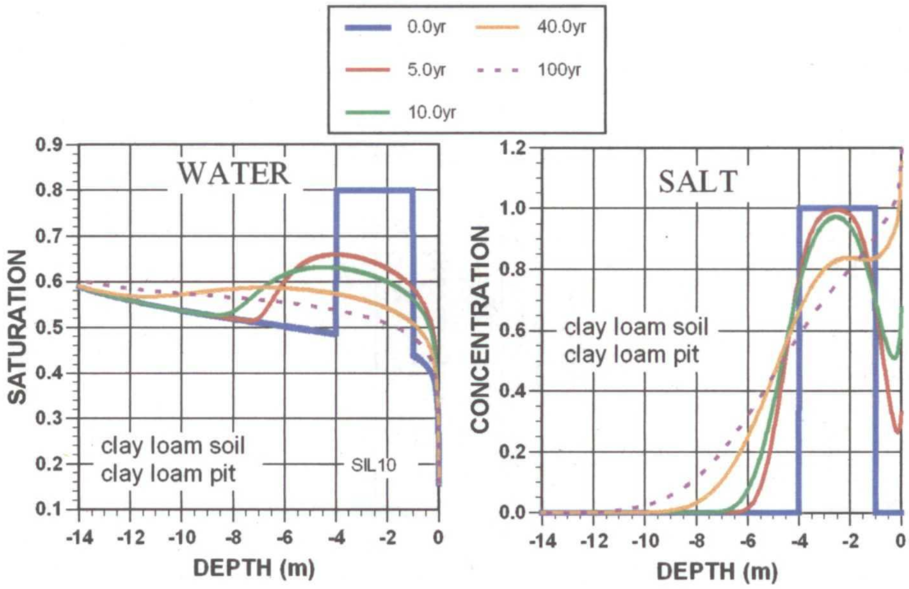
NMCCA&W Ex 5 pg 46

SANDY CLAY LOAM SOIL ("moderate")
CLAY LOAM PIT ("tight")

(Little difference if every 7th year is "wet.")



CLAY LOAM ("tight") SOIL & PIT



RESULTS OF THE SIMULATIONS

In loose soil, chloride travels from a pit to groundwater at 52 ft below the wastes in 40 years, and to groundwater at 101 ft below the wastes in 100 years.

In moderate soil, the chloride reaches 16 ft below the wastes in 40 years and 20 ft below the wastes in 100 years.

In tight soil, the chloride reaches 13 ft below the wastes in 40 years and 20 ft in 100 years, BUT CONCENTRATES ABOVE THE PIT.

NMCCA&W Ex.5 pg.49

RESULTS REGARDING MOISTURE

In loose soil, the calculated recharge at 67 ft is between 1.4 and 3.5 inch/yr, depending on details of moisture input. In moderate and tight soils, the recharge is less than 0.05 inch/yr.

NMCCA&W Ex.5 pg.50

HOW REALISTIC IS THIS MODEL?

The model provides the size and time scales of activity--how much, how far, how fast. It does not provide exact quantitative estimates, which are sensitive to the numerical values of parameters (e.g. permeability).

The measured volumetric moisture at 20" depth injects and withdraws water. The NRCS data from deeper measuring points suggests the instruments are in loose soil. A tighter soil with greater suction would have shown greater volumetric moisture. Therefore, the model probably has too little moisture in the subsurface profile of moderate and tight soils, leading to an UNDERESTIMATE of chloride transport.

HOW REALISTIC ...?

Three-dimensional dispersion from a pit would allow chloride to move horizontally, creating a broader, initially faster plume, less impeded by the assumed low permeability of the pit material.

2007 had greater rainfall than 2006. We used 2006 as a supposedly typical year of rainfall. Higher average soil moisture would increase rate the chloride transport. However, insertion of a wetter year at 7-year intervals had little effect on long-term transport in the moderate and tight soils.

HOW REALISTIC ... ?

The model did not include the colligative influences on surface tension, vapor pressure, vapor diffusion, density, viscosity, and osmotic pressure in thin films of liquid. These effects might have slightly INCREASED the chloride transport beneath the wastes, and significantly INCREASED the transport toward ground surface.

We did not attempt detailed modeling of the region near ground surface. The model confirms that, except in loose soils, chloride accumulates in significant concentrations in the two feet of soil immediately beneath ground surface.

NMCCA&W Ex 5 pg 53

CONCLUSION FROM SAMPLING OF PITS, GROUND SURFACE, THE SUBSURFACE, AND SIMULATION

Chloride concentrations in the wastes are many times the toxic limits for biota.

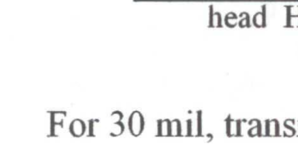
ONLY AN INTACT, IMPERMEABLE, SEALED LINER CAN PREVENT CONTAMINATION OF THE VADOSE ZONE AND GROUND WATER BY CHLORIDES AND OTHER SOLUBLE CONTAMINANTS DURING TIME SCALES FROM DECADES THROUGH CENTURIES.

but is there a perfect liner?

NMCCA&W Ex 5 pg 54

WHAT PROTECTION IS OFFERED BY LINERS?

Example: permanent pit liner 19.15.17.11 G(3)



Thickness **D** = 30 mil PVC (0.0762 cm)
or 60 mil HDPE (0.1524) cm

K = hydraulic conductivity = **$1x10^{-9}$** cm/second

T = 1 year = $31.5x10^6$ sec

$$\frac{\text{transmission in time T}}{\text{head H}} = \frac{(K*H)}{D} * \frac{T}{H} = \frac{K*T}{D}$$

For 30 mil, transmission/head = 0.414, or 41% of depth

For 60 mil, " = 0.207, or 21% of depth

NMCCA&W Ex 5 pg 55

SIGNIFICANCE OF THE LINER EXERCISE

20-mil liners buried in pits or trenches are not secure forever.

Estimated lifetimes of liners are quoted for *unstrained* materials. Burials settle in time, or move when equipment (a track-hoe) drives over the closed entombment.

NMCCA&W Ex 5 pg 56

The rule removes restrictions on pit slopes.

THE OBJECTIVE OF PART 17 IS PROTECTION OF THE ENVIRONMENT

This discussion, and this regulatory action, result from the petroleum industry's exemption from RCRA.

The broad challenge is to protect the environment, including the soil and the vadose zone.

The proposed rule changes reduce setbacks from wells, streams, and ground water, increasing the short-term threat. The allowed burial concentrations would assure eventual sterility of the vadose zone.

Much of our producing areas are grassland or scrub.

Some say we are trying to protect a "desert wasteland."

But death, even of overgrazed grass and scrub, leads to true desertification and dust bowl. Can pits do this?

Yes. A big concern is the eventual *many* burial units, resulting in a toxic landfill "almost everywhere."

For human use, or for ecological survival the value of the land is degraded by allowing an unmarked toxic burial every few hundred yards.

NMCCA&W Ex 5 pg 57

Can liner strain be avoided during trench burial?

NMCCA&W Ex 5 pg 58

THE BIG PICTURE

REVIEW OF THE PROPOSED RULE

NMCCA&W Ex 5 pg 61

Burial units "almost everywhere."

At 40-acre well spacing, the longest distance to a burial unit could be 311 yards.

(At 160-acre spacing it's 622 yards.)

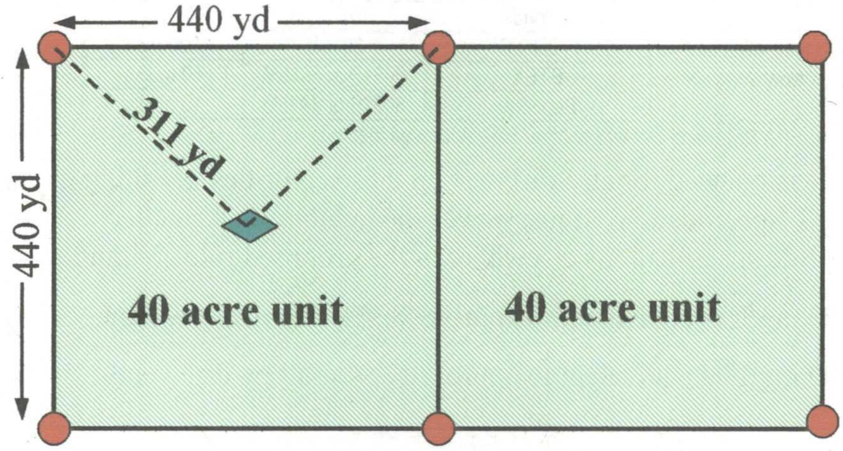


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Table I, 19.15.17.13 NMAC
Closure Criteria for Soils Beneath
Pits, Drying Pads & Below Grade Tanks

Groundwater Depth	Constituent	Method	Limit
≤50 feet	Chloride	EPA 300.1	5,000 mg/kg
	TPH (GRO/DRO)	8015M	100 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg
>50 feet-100 feet	Chloride	EPA 300.1	10,000 mg/kg
	TPH (GRO/DRO)	8015M	1,000 mg/kg
	BTEX	8021B or 8015M	50 mg/Kg
	Benzene	8021B or 8015M	10 mg/kg
> 100 feet	Chloride	EPA 300.1	20,000 mg/kg
	TPH (GRO/DRO)	8015M	5,000 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg

Per EPA SWA 846 or other EPA Approved Methods

600 mg/kg is equivalent to the EC=4 guideline for vegetation from the American Petroleum Institute.

20,000 mg/kg is equivalent to nearly saturated brine in normal pore water of the soil.

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Table II, 19.15.17.13 NMAC
Closure Criteria for Wastes Left in Place in Temporary Pits & Burial Trenches

Groundwater Depth	Constituent	Method	Limit
25-50 feet below trench/pit	Chloride	EPA 300.1	2,500 mg/L
	TPH (GRO/DRO)	8015M	100 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg
> 50 - 100 feet below trench/pit	Chloride	EPA 300.1	5,000 mg/L
	TPH (GRO/DRO)	8015M	1,000 mg/kg
	BTEX	8021B or 8015M	50 mg/kg
	Benzene	8021B or 8015M	10 mg/kg

Per EPA SPLP and SW 846 or other EPA Approved Methods

There is no need for an SPLP test on these chlorides, resulting in a mg/L specification. It just makes the number look smaller. Chloride specifications elsewhere in the proposed rule are mg/kg.

2,500 mg/L is equivalent to approx. 8.9% salt by dry weight.

5,000 mg/L is equivalent to approx. 17.9% salt by dry weight.

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DEPTH TO GROUND WATER

In the absence of site-specific data, the proposed rule allows approximate methods.

Approximations may not be crucial for depths exceeding 100 feet, but methods are very crucial for the 25-foot depths proposed between ground water and burial units, or the 10-foot separation for tanks.

We oppose any burial with a separation less than 100 feet, but in any case the burden of proving depth should be on the applicant.

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CONFINED AQUIFER

By the proposed rule, pits and burial units must be separated from unconfined ground water by the 25- or 50-foot intervals. Below-grade tanks must be separated by a 10-foot interval.

"Confinement" means a low-permeability geologic layer exists above the top surface of the water. That does not imply contamination cannot enter the ground water. Furthermore, what is confined now may soon be unconfined, as when artesian pressure is lost due to overpumping, but the burial units will be in place for the geologic future. The distinction of "confined" or "unconfined" ground water should not be in the regulations.

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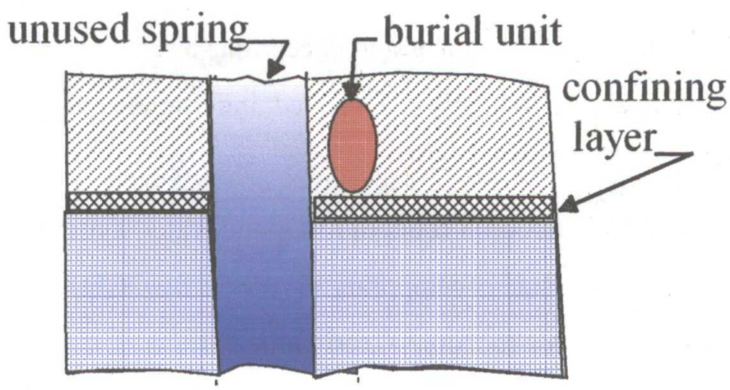
To be protected, ground water must be "unconfined."

To be protected,* a spring must be "used."

This rule makes a mockery of environmental protection.



* except at permanent pits

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RECLAMATION 19.15.17.13 F

Only "interim" reclamation is required. (noted by OCD)

"... reclamation ... shall be considered complete when ... all disturbed areas have been either ... compacted, covered, paved, or otherwise stabilized ... or ..."

Nothing more than grading and compaction is required--regardless of the size of the disturbance.

Lack of restoration, especially compaction, is environmental destruction not protection.

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WHAT'S MISSING IN THE PROPOSED RULE?

Evaluation

Registration in place of permitting.

"Shall approve" alternatives, variances, exceptions.

Comment on variances and exceptions by interested persons only.

Standard plans "remain approved: indefinitely (noted by OCD).

Limits

No limits on burial if depth to ground water is more than 100 ft.

No limit to size of temporary pit (noted by OCD).

Setback from "occupied" residence only.

Setback only from "used" spring.