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December 5, 2007

Mr. Mark Fesmire, Chairman
Oil Conservation Commission
NM Energy Minerals and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

Dear Mr. Fesmire,

My name is I. Keith Gordon, P.E., and I have been previously qualified by the Commission as an expert in landfill and waste facility design, operations and permitting. A concise resume is included as **Attachment 5**. I had previously intended to present testimony on behalf of the City of Lovington. Instead, I am submitting this Letter Report and Attachments; including a red-line/strikeout of the Proposed Rule. I respectfully request the Commission's consideration of these findings.

1.0 INTRODUCTION

There are shortcomings in the draft OCD Pit Rule that relate to the siting, design, closure, and monitoring of pits, and permanent waste repositories that are called "on-site closure methods" in the proposed Rule. The siting and design standards are inadequate to protect surface and groundwater, and closure requirements are not protective of fresh water, public health and the environment.

The most onerous provision is the "exception" or "option" allowing for permanent on-site waste disposal without post-closure monitoring. Scattering thousands of dumpsites across the New Mexico landscape, with inadequate liners and no post-closure care and monitoring, will leave a legacy of contamination for future generations to manage. Future residents will be at risk of exposure or releasing the waste from unmarked and undocumented dumpsites whenever new wells, foundations, roads, or basins are installed.

Testimony of OCD witnesses asserts that deep trench burial can delay, but not prevent impacts to groundwater. Proper disposal practice requires either that deep trench burial be engineered for permanent containment, or, deep trench burial be prohibited in favor of disposal at a permitted landfill that is engineered for permanent containment. Operators of permanent waste disposal facilities have long-term obligations for post-closure care and monitoring for at least 30 years.

The proposed deep trench burial standards are contrary to all other modern regulatory initiatives in waste containment; which focus on centralized facilities that are well sited, highly engineered,

and monitored well beyond closure. Nationally, the number of municipal solid waste (MSW) landfills has been reduced from over 10,000 in 1990, to approximately 1,600 today. In New Mexico, there were over 100 landfills in 1990; and there are 35 today. The new landfill regulations (August 2007) will likely force at least 15 of these facilities to close because they can't meet modern standards.

There are approximately 20 New Mexico RCRA Subtitle D sites that have been engineered for permanent waste disposal, and which are equipped with composite liners, leachate extraction, and environmental monitoring systems. No leakage has been detected at any of them.

Although the smaller number of compliant landfills has increased the cost of hauling waste, it has reduced the cost of cleaning up contaminated sites.

2.0 SITING STANDARDS

The siting standards for pits and deep trench burial are not protective of fresh water, public health and the environment. In New Mexico, landfills must make technical demonstrations for compliance with 17 siting standards vs. 9 for on-site closures under the proposed Rule. A 50' vertical setback from the water table has historically proven to be ineffective at protecting groundwater resources. The common standard, even when composite liners are used, is 100' (i.e., municipal solid waste). Specific methods for establishing compliance with siting standards are not identified (i.e., site-specific drilling to confirm depth to groundwater). All domestic water wells deserve the same level of protection (i.e., 1000' horizontal setback) regardless of the number of households served. No setback from property lines is established, and 300' to existing structures is below other comparable regulatory standards; particularly when permanent on-site dumpsites may not be fenced, marked, or monitored.

3.0 DESIGN SPECIFICATIONS

The design specifications for pits and deep trench burial do not conform to waste containment industry standards and other comparable regulatory requirements. Temporary pits and on-site disposal facilities are not subject to the professional engineering (P.E.) site-specific design standards comparable to those for permanent pits and landfills. The risk is that site specific conditions or waste types will not be addressed by boiler-plate designs, and the collective benefits of waste containment engineering experience is nullified. For instance, although either 60 mil HDPE or 30 mil PVC is allowed as the primary liner material for landfills, knowledgeable P.E.'s do not specify 30 mil PVC because of its poor track record.

Permanent waste repositories typically have composite liners (i.e., two layers), leachate collection systems and environmental monitoring networks to detect leaks. The industry standard for waste disposal liner systems is 60 mil HDPE over a 2' thick compacted soil or

equivalent geosynthetic clay (GCL) secondary liner, protected from waste and equipment by a 2' thick protective soil layer (PSL). Even when the GCL option is used, and ignoring the compacted subgrade and PSL layer, the effective barrier thickness of over 300 mils is more than 15 times the proposed 20 mil LLDPE liner thickness.

Linear low-density polyethylene (LLDPE) is a particularly poor choice for lining temporary pits and on-site closures. It is relatively easy to puncture; 20 mil LLDPE has a puncture resistance of about 35 lbs vs. 108 lbs for 60 mil HDPE. It is also easy to tear, with a tear resistance of about 18 lbs vs. 33 lbs for 60 mil HDPE.

LLDPE has a poor compatibility profile, with constituents regularly detected in the waste stream; and thus is subject to degradation by the waste. **Attachment 1** highlights the poor chemical resistance of LLDPE vs. HDPE; and **Attachment 2** shows that LLDPE has either "limited" or "not satisfactory" resistance to many of the constituents of concern. In addition, the sampling and testing requirements for pit contents before placement in a "burrito" are insufficient for an adequate characterization of the wastes and their potential impacts on the liner and the environment.

There is very little data on LLDPE used for this type of application. Its effective longevity is likely less than 100 years even under optimum conditions. The "Koerner White Paper" (Geosynthetic Institute Paper #6, 06/07/05) has been cited by at least two witnesses in an effort to predict the functionality of LLDPE over time. Unfortunately, the study was specific to HDPE and specifically acknowledges that there is little laboratory or field data for LLDPE; and that it is not in common use for waste containment applications (**Attachment 3**):

> *"How much is uncertain since no data is available, but it is felt that the lifetime of LLDPE will be somewhat reduced with respect to HDPE."*
>
> *"This White Paper has described research on the geomembrane type which has had the majority of research effort, that being nonexposed HDPE used in landfill applications.*
>
> *"Other geomembrane types (LLDPE, PVC, EPDM and CSPE) have had essentially no focused effort on lifetime prediction of the type described herein. All are candidates for additional research in this regard."*

In addition, the thickness of the liner material is a key factor in its functional longevity. Even if LLDPE were as effective at containment as HDPE (which it is not), a 20 mil liner would have about one-third of the durability of a 60 mil liner (i.e., 90 years vs. 270 years). This calculation ignores that fact that, for landfills, there is a clay layer beneath the HDPE.

Most importantly, 20 mil LLDPE is far too flimsy to withstand the projected conditions in the field. Neither compaction of the subgrade is specified in the proposed Rule, nor compliance with manufacturer's recommendations. The manufacturer Polyflex specifies:

> *"Prior to liner installation the subgrade shall be compacted in accordance with the project specifications. Weak or compressible areas which cannot be satisfactorily compacted should be removed and replaced with properly compacted fill. All surfaces to be lined shall be smooth and free of all foreign and organic material, sharp objects, or debris of any kind. The subgrade shall provide a firm, unyielding foundation with no sharp changes or abrupt breaks in grade. Standing water or excessive moisture shall not be allowed.*

It is important to note the reference to "no sharp changes or abrupt breaks in grade" (emphasis added) because vertical trench walls will create exactly that condition. The liner material is not capable of making 90° transitions that will be present and provide failure zones at all corners.

Materials that pass the Paint Filter Test for deep trench burial can be semi-solid at best, providing a poor foundation for the LLDPE cap and soil cover. Soils and wastes can contain over 50% moisture and still pass the Test, performing more like sludges or slurries than solids. When the soil cover is compacted over an unstable surface, particularly with the presence of the failure zones, the probability of an immediate breach in the liner is very high.

Specialized personnel, equipment, and construction quality assurance (CQA) are necessary for proper liner installation. Typically, third-party professionals are retained to ensure proper installation.

4.0 CLOSURE AND POST-CLOSURE REQUIREMENTS

The closure and post-closure requirements for deep trench burial are insufficient to protect groundwater, surface water, and public health. There are no requirements for stormwater management, specifically run-on and run-off controls, to protect surface water and prevent waste contact water from infiltrating to the groundwater. Compacting the required soil cover over the LLDPE, and a potentially unstable waste mass, could compromise the cap for on-site closures. The instability of the underlying materials will make compaction difficult, resulting in loose cover soils vulnerable to subsidence over time. The soil cover could become a natural conduit for infiltration with consolidation of the waste mass for on-site closures, and no crowning is required to shed water. The adjacent unconsolidated, uncompacted drill pad could also become a natural conduit for infiltration into the burrito.

Site restoration and revegetation standards are not well established in the proposed rule, and two years is insufficient to ensure establishment of vegetation. Post-closure care by the operator (i.e., maintenance of the cover, vegetation, etc.) is typically specified for at least 30

years following closure. No provisions address the potential disruption of the waste mass and related risk of human exposure for on-site closures. Permanent disposal sites are typically provided with fencing, signage, and permanent deed records to protect future land users.

5.0 SUMMARY

In summary, the proposed rules do not meet prevailing regulatory or industry standards for waste containment facility siting, design, closure, and monitoring. Without leachate collection, leak detection, or groundwater monitoring, it is impossible to confirm that the waste containment systems are functioning properly. There is significant risk for the contamination of groundwater, and that permanent disposal sites will require remediation in the future.

Properly engineered and permitted landfills are the only appropriate locations for permanent disposal of oil field wastes. Centralized disposal at landfills dedicated to that purpose, with provisions for long-term care and monitoring, is far more environmentally sound than having hundreds or thousands of unmonitored legacy sites.

The modern New Mexico regional landfills are high capacity facilities that typically have 20 to 100 years of airspace. They are also designed for the safe and efficient flow of traffic; and specifically trucks of the type that deliver oil field waste. For instance, there has been testimony regarding capacity limitations for the San Juan County Regional Landfill (SJLF). I am the Engineer-of-Record for SJLF, and was responsible for its 10-year Permit issued by NMED in 2005. SJLF receives about 1,500 tons of solid waste per day, averaging 300 delivery vehicles per day. The waste from 1,000 pits, at 500 cubic yards per pit, would consume less than one year of SJLF's projected 30 year capacity; and testing of each load is not required.

I respectfully appreciate the opportunity of submitting these recommendations for the Commission's consideration.

Very truly yours,
Gordon Environmental, Inc.

I. Keith Gordon, P.E.
President

List of Attachments

1. Chemical Resistance Information (Polyflex)
2. LLDPE Applications and Properties
3. GRI White Paper No. 6 (Koerner 2005); excerpts
4. Red-line/strikeout of the Proposed Rules
5. Professional Resumé: I. Keith Gordon, P.E.

ATTACHMENT 1

POLYFLEX Chemical Resistance Information

CHEMICAL RESISTANCE INFORMATION

CHEMICAL CLASS	CHEMICAL EFFECT	PRIMARY CONTAINMENT (LONG TERM CONTACT) HDPE	PRIMARY CONTAINMENT (LONG TERM CONTACT) LLDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) HDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) LLDPE
CARBOXYLIC ACID	1				
- Unsubstituted (e.g. Acetic acid)		B	C	A	C
- Substituted (e.g. Lactic acid)		A	B	A	A
- Aromatic (e.g. Benzoic Acid)		A	B	A	A
ALDEHYDES	3				
- Aliphatic (e.g. Acetaldehyde)		B	C	B	C
- Hetrocyclic (e.g. Furfural)		C	C	B	C
AMINE	3				
- Primary (e.g. Ethylamine)		B	C	B	C
- Secondary (e.g. Diethylamine)		C	C	B	C
- Aromatic (e.g. Aniline)		B	C	B	C
CYANIDES (e.g. Sodium Cyanide)	1	A	A	A	A
ESTER (e.g. Ethyl acetate)	3	B	C	B	C
ETHER (e.g. Ethyl ether)		C	C	B	C
HYDROCARBONS	3				
- Aliphatic (e.g. Hexane)		C	C	B	C
- Aromatic (e.g. Benzene)		C	C	B	C
- Mixed (e.g. Crude oil)		C	C	B	C
HALOGENATED HYDROCARBONS	3				
- Aliphatic (e.g. Dichloroethane) +A4		C	C	B	C
- Aromatic (e.g. Chlorobenzene)		C	C	B	C
ALCOHOLS	1				
- Aliphatic (e.g. Ethyl alcohol)		A	A	A	A
- Aromatic (e.g. Phenol)		A	C	A	B
INORGANIC ACID					
- Non-oxidizers (e.g. Hydrochloric acid)	1	A	A	A	A
- Oxidizers (e.g. Nitric Acid)	2	C	C	B	C
INORGANIC BASES (e.g. Sodium hydroxide)	1	A	A	A	A
SALTS (e.g. Calcium chloride)	1	A	A	A	A
METALS (e.g. Cadmium)	1	A	A	A	A
KETONES (e.g. Methyl ethyl ketone)	3	C	C	B	C
OXIDIZERS (e.g. Hydrogen peroxide)	2	C	C	C	C

Chemical Effect (see discussion on Chemical Resistance)

1. No Effect—Most chemicals of this class have no or minor effect.
2. Oxidizer—Chemicals of this class will cause irreversible degradation.
3. Plasticizer—Chemicals of this class will cause a reversible change in physical properties.

Chart Rating

A. Most chemicals of this class have little or no effect on the liner.
Recommended regardless of concentration or temperature (below 150° F).

B. Chemicals of this class will affect the liner to various degrees.
Recommendations are based on the specific chemical, concentration and temperature.
Consult with Poly-Flex, Inc.

C. Chemicals of this class at high concentrations will have significant effect on the physical properties of the liner.
Generally not recommended but may be acceptable at low concentrations and with special design considerations.
Consult with Poly-Flex, Inc.

The data in this table is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. Consult with Poly-Flex, Inc. for specific chemical resistance information and liner selection.

ATTACHMENT 2

LLDPE Chemical Resistance Table

CHEMICAL RESISTANCE

LLDPE							
CHEMICAL	**CONC.**	**20 C**	**60 C**	**CHEMICAL**	**CONC.**	**20 C**	**60 C**
Acetaldehyde	100%	S	NS	Calcium carbonate	Sat. sol	S	S
Acetic acid	10%	S	S	Calcium chlorate	Sat. sol.	S	S
Acetic acid	60%	S	L	Calcium chloride	Sat. sol.	S	S
Acetic anhydride	100%	L	NS	Calcium hydroxide	Sat. sol.	S	S
Acetone	100%	L	NS	Calcium hypochlorite	Sol.	S	S
Adipic acid	sat. sol.	S	S	Calcium nitrate	Sat. sol.	S	S
Allyl alcohol	96%	-	-	Calcium sulfate	Sat. sol.	S	S
Alums	Sol.	S	S	Calcium sulfide	Dil. sol.	-	-
Aluminium Chloride	Sat. sol.	L	NS	Carbon dioxide, dry gas	100%	-	-
Aluminium fluoride	Sat. sol.	S	S	Carbon disulfide	100%	NS	NS
Aluminium sulfate	Sat. sol.	S	S	Carbon monoxide	100%	S	S
Ammonia, dry gas	100%	S	S	Carbon tetrachloride	100%	NS	NS
Ammonia, liquid	100%	L	L	Chlorine, dry gas	100%	L	NS
Ammonia, aqueous	Dil. sol.	S	S	Chlorine, aqueous	Sat. sol.	NS	NS
Ammonia, chloride	Sat. sol.	S	S	Chloroacetic acid	Sol.	-	-
Ammonia, fluoride	Sol.	S	-	Chloroform	100%	NS	NS
Ammonia, nitrate	Sat. sol.	S	S	Chromic acid	20%	-	-
Ammonia, sulfate	Sat. sol.	S	S	Chromic acid	50%	-	-
Ammonia, sulfide	Sol.	S	S	Citric acid	Sat. sol.	S	S
Amyl acetate	100%	NS	NS	Copper chloride	Sat. sol.	S	S
Amyl alcohol	100%	L	L	Copper nitrate	Sat. sol.	S	S
Aniline	100%	NS	NS	Copper sulfate	Sat. sol.	-	-
Antimony tri-chloride	90%	-	-	Cresylic acid			
Aqua regia	HCI/HNO3=3/1	NS	NS	(methyl benzoic acid)	Sat. sol.	-	-
Arsenic acid	Sat. sol.	S	S	Cyclohexanol	100%	S	S
Barium carbonate	Sat. sol.	S	S	Cyclohexanone	100%	NS	NS
Barium chloride	Sat. sol.	S	S	Decahydronaphthalene	100%	L	NS
Barium hydroxide	Sat. sol.	S	S	Dextrin	Sol.	S	S
Barium sulfate	Sat. sol.	S	S	Diethyl ether	100%	NS	NS
Barium sulfide	Sol.	S	S	Dioctyl phthalate	100%	L	NS
Beer	-	S	S	Dioxan	100%	-	-
Benzaldehyde	100%	L	NS	Ethandiol	100%	S	S
Benzene	100%	NS	NS	Ethanol	40%	S	L
Benzoic acid	Sat. sol.	S	S	Ethyl acetate	100%	L	NS
Borax	Sat. sol.	S	S	Ethylene chloride	100%	NS	NS
Boric acid	100%	S	S	Ferric Chloride	Sat. sol.	S	S
Bromine, dry gas	100%	NS	NS	Ferric nitrate	Sol.	S	S

1. **S: Satisfactory, geomembrane is resistance to the given chemical at the given concentration and temperature. No mechanical or chemical degradation is encountered.**
2. **L: Limited, geomembrane may be attacked by some factors, concentration, pressure and temperature should affect the performance of geomembrane.**
3. **NS: Not Satisfactory, geomembrane is not resistance to the given chemical, concentration and temperature. Mechanical or chemical degradation is encountered.**

CHEMICAL RESISTANCE - cont.

LLDPE							
CHEMICAL	**CONC.**	**20 C**	**60 C**	**CHEMICAL**	**CONC.**	**20 C**	**60 C**
Bromine, liquid	100%	NS	NS	Ferric sulfate	Sat. sol.	S	S
Butane, gas	100%	-	-	Ferrous chloride	Sat. sol.	S	S
Butanol	100%	S	L	Ferrous sulfate	Sat. sol.	S	S
Butyric acid	100%	L	L	Fluorine gas	100%	L	NS
Fluorosilicic acid	40%	S	S	Sodium ferricyanide	Sat. sol	S	S
Formaldehyde	40%	S	S	Sodium ferrocyanide	Sat. sol	S	S
Formic acid	50%	S	S	Sodium hydrogen carbonate	Sat. sol	S	S
Formic acid	90-100%	S	S	Sodium hydrogen sulfite	Sol	S	S
Furfuryl alcohol	100%	L	NS	Sodium hydroxide	40	S	S
Gasoline, petroleum	-	L	NS	Sodium hydroxide	Sol	-	-
Glucose	Sat. sol.	S	S	Sodium hypochlorite	15	-	-
Glycerol	100%	S	S	Phosphoric tri-chloride	100	S	L
Glycolic acid	Sol.	S	S	Picric acid	Sat. sol	S	L
Heptane	100%	NS	NS	Potassium bicarbonate	Sat. sol	S	S
Hydrobromic acid	50%	S	S	Potassium bisulfide	Sol	S	S
Hydrobromic acid	100%	S	S	Potassium bromate	Sat. sol	S	S
Hydrochloric acid	Conc.	S	S	Potassium bromide	Sat. sol	S	S
Hydrocyanic acid	10%	S	S	Potassium carbonate	Sat. sol	S	S
Hydrofluoric acid	4%	S	S	Potassium chlorate	Sat. sol	S	S
Hydrofluoric acid	60%	S	L	Potassium chloride	Sat. sol	S	S
Hydrogen	100%	S	S	Potassium chromate	Sat. sol	S	S
Hydrogen peroxide	30%	S	L	Potassium cyanide	Sol	S	S
Hydrogen peroxide	90%	S	NS	Potassium dichromate	Sat. sol	S	S
Hydrogen sulfide, gas	100%	S	S	Potassium ferrocyanide	Sat. sol	S	S
Lactic acid	100%	S	S	Potassium fluoride	Sat. sol	S	S
Lead acetate	Sat. sol.	S	S	Potassium hydrogen carbonate	Sat. sol	S	S
Magnesium carbonate	Sat. sol.	S	S	Potassium hydrogen sulfate	Sat.sol	S	S
Magnesium chloride	Sat. sol	S	S	Potassium hydrogen sulfide	Sol	-	-
Magnesium hydroxide	Sat. sol	S	S	Potassium hydroxide	10	S	S
Magnesium nitrate	Sat. sol	S	S	Potassium hydroxide	Sol	S	S
Maleic acid	Sat. sol	S	S	Potassium hypochlorite	Sol	S	L
Mercuric chloride	Sat. sol	S	S	Potassium nitrate	Sat. sol	S	S
Mercuric cyanide	Sat. sol	S	S	Potassium orthophosphate	Sat. sol	S	S
Mercuric nitrate	Sol	S	S	Potassium perchlorate	Sat. sol	S	S
Mercury	100	S	S	Potassium permanganate	20	S	S
Methanol	100	S	L	Potassium persulfate	Sat. sol	S	S

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2. **L: Limited, geomembrane may be attacked by some factors, concentration, pressure and temperature should affect the performance of geomembrane.**
3. **NS: Not Satisfactory, geomembrane is not resistance to the given chemical, concentration and temperature. Mechanical or chemical degradation is encountered.**

CHEMICAL RESISTANCE - cont.

LLDPE							
CHEMICAL	**CONC.**	**20 C**	**60 C**	**CHEMICAL**	**CONC.**	**20 C**	**60 C**
Milk		S	S	Potassium sulfate	Sat. sol	S	S
Mineral oils		NS	NS	Potassium sulfide	Sol	S	S
Molassess	Work.conc	S	S	Propionic acid	50	-	-
Nickel chloride	Sat. sol	S	S	Propionic acid	100	-	-
Nickel nitrate	Sat. sol	S	S	Pyridine	100	-	-
Nickel sulfate	Sat. sol	S	S	Quinol (hydroquinone)	Sat. sol	S	S
Nicotinic acid	Dil. sol	S	L	Salicylic acid	Sat. sol	S	S
Nitric acid	25	S	S	Silver acetate	Sat. sol	S	S
Nitric acid	50	L	NS	Silver cyanide	Sat. sol	S	S
Nitric acid	75	NS	NS	Silver nitrate	Sat. sol	S	S
Nitric acid	100	NS	NS	Sodium benzoate	Sat. sol	S	S
Oil and fats		L	NS	Sodium bromide	Sat. sol	S	S
Oleic acid	100	L	NS	Sodium bicarbonate	Sat. sol	S	S
Orthophosphoric acid	50	S	S	Sodium bisulfide	Sat. sol	S	S
Oxalic acid	Sat. sol	S	S	Sodium chlorate	Sat. sol	S	S
Oxygen	100	S	L	Sodium chloride	Sat. sol	S	S
Ozone	100%	L	NS	Sodium cyanide	Sat. sol	S	S
Phenol	Sol	S	S	Sodium fluoride	Sat. sol	S	S
Sodium nitrate	Sat. sol	S	S	Toluene	100	NS	NS
Sodium nitrite	Sat. sol	S	S	Triethanolamine	Sol	S	-
Sodium ortophosphate	Sat. sol	S	S	Urea	Sol	S	S
Sodium sulfate	Sat. sol	S	S	Urine		S	S
Sodium sulfide	Sat. sol	S	S	Vegetable oils		S	L
Stearic acid	Sat. sol	S	L	Vinegar		S	S
Sulphur dioxide, dry	100	S	S	Water		S	S
Sulphur trioxide	100	NS	NS	Wines and spirits		S	S
Sulphuric acid	10	S	S	Xylene	100	NS	NS
Sulphuric acid	50	S	S	Yeast	Sol	S	S
Sulphuric acid	98	L	NS	Zinc carbonate	Sat. sol	-	-
Sulphuric acid	Fuming	NS	NS	Zinc chloride	Sat. sol	S	S
Sulphurous acid	30	S	S	Zinc oxide	Sat. sol	S	S
Tannic acid	Sol	S	S	Zinc sulphate	Sat. sol	S	S
Thionyl chloride	100	NS	NS				

1. **S: Satisfactory, geomembrane is resistance to the given chemical at the given concentration and temperature. No mechanical or chemical degradation is encountered.**
2. **L: Limited, geomembrane may be attacked by some factors, concentration, pressure and temperature should affect the performance of geomembrane.**
3. **NS: Not Satisfactory, geomembrane is not resistance to the given chemical, concentration and temperature. Mechanical or chemical degradation is encountered.**
4. **Sat. sol: Saturated aqueous solution, prepared at 20 C.**
5. **Sol: Aqueous solution at a concentration higher than 10%, but not saturated.**
6. **Dil. sol: Dilute aqueous solution at a concentration is equal to or lower than 10%.**
7. **Solution concentration listed are expressed as a percentage by weight, in general in the table, common chemical names are used.**

The data in all tables is intended as guides only and is not intended as a warranty or guarantee. Permathene Ltd. reserves the right to change the specification contained herein without notice.

ATTACHMENT 3

Selected pages from:
GRI Whitepaper #6 on
Geomembrane Lifetime Prediction

Geosynthetic Institute
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GRI White Paper #6

- on -

Geomembrane Lifetime Prediction:
Unexposed and Exposed Conditions

by

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2.5 Lifetime of Other Covered Geomembranes

By virtue of its widespread use as liners for solid waste landfills, HDPE is by far the widest studied type of geomembrane. Note that in most countries (other than the U.S.), HDPE is the required geomembrane type for solid waste containment. Some commentary on other-than HDPE geomembranes (recall Table 1) follows:

2.5.1 Linear Low Density Polyethylene (LLDPE) geomembranes

The nature of the LLDPE resin and its formulation is very similar to HDPE. The fundamental difference is that LLDPE is a lower density, hence lower crystallinity, than HDPE; e.g., 10% versus 50%. This has the effect of allowing oxygen to diffuse into the polymer structure quicker, and likely decreases Stages A and C. How much is uncertain since no data is available, but it is felt that the lifetime of LLDPE will be somewhat reduced with respect to HDPE.

2.5.2 Plasticizer migration in PVC geomembranes

Since PVC geomembranes necessarily have plasticizers in their formulations so as to provide flexibility, the migration behavior must be addressed for this material. In PVC the plasticizer bonds to the resin and the strength of this bonding versus liquid-to-resin bonding is significant. One of the key parameters of a stable long-lasting plasticizer is its molecular weight. The higher the molecular weight of the plasticizer in a PVC formulation, the more durable will be the material. Conversely, low molecular weight plasticizers have resulted in field failures even under covered conditions. See Miller, et al. (1991), Hammon, et al. (1993), and Giroud and Tisinger (1994) for more detail in this regard.

3.3.2 Comparison between field and Xenon Arc weatherometer

The light source of the Xenon Arc weatherometer simulates almost the entire sunlight spectrum from 250 to 800 nm. Depending of the age of the light source and filter, the solar energy ranges from 340.2 to 695.4 W/m^2, with the average value being 517.8 W/m^2.

The time of exposure to reach 50% elongation at break

= 4416 hr. of light
= 15,897,600 seconds

Total energy in MJ/m^2 = 517.8 W/m^2 × 15,897,600
= 8232 MJ/m^2

The solar energy in the field is again estimated based on data collected by the South Florida Testing Lab in Arizona. For 26 months of exposure, the accumulated solar energy (295-800 nm) is 15,800 MJ/m^2, which is much higher than that from the Xenon Arc weatherometer. Therefore, direct comparison of halflives obtained from the field and Xenon Arc weatherometer is not anticipated to be very accurate. However, for illustration purposes the acceleration factor based on Xenon Arc weatherometer would be as follows:

Field = 26 Months vs. Xenon Arc = 6.1 Months : Thus, the acceleration factor is 4.3.

4.0 Summary and Recommendations

This White Paper has described research on the geomembrane type which has had the majority of research effort, that being nonexposed HDPE used in landfill applications. While this material promises service lifetime of hundreds of years, the elevated temperatures of exposed or nearly exposed geomembranes in other applications (dams, canals, reservoirs, etc.) is expected to be greatly reduced. It was shown that HDPE decreases its predicted halflife from 449-years at 20°C, to 73-years at 40°C. Other geomembrane types (LLDPE, PVC, EPDM and CSPE) have had essentially no focused effort on lifetime prediction of the type described herein. All are candidates for additional research in this regard.

ATTACHMENT 4

NMAC Title 19, Chapter 15, Part 17
(Redline-Strikeout)

TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 15 OIL AND GAS
PART 17 PITS, CLOSED-LOOP SYSTEMS, BELOW-GRADE TANKS AND SUMPS

19.15.17.1 ISSUING AGENCY: Energy, Minerals and Natural Resources Department, Oil Conservation Division.
[19.15.17.1 NMAC - N, / /07]

19.15.17.2 SCOPE: 19.15.17 NMAC applies to persons engaged in oil and gas development and production within New Mexico.
[19.15.17.2 NMAC - N, / /07]

19.15.17.3 STATUTORY AUTHORITY: 19.15.17 NMAC is adopted pursuant to the Oil and Gas Act, NMSA 1978, Section 70-2-6, Section 70-2-11 and Section 70-2-12.
[19.15.17.3 NMAC - N, / /07]

19.15.17.4 DURATION: Permanent.
[19.15.17.4 NMAC - N, / /07]

19.15.17.5 EFFECTIVE DATE: _____, 2007, unless a later date is cited at the end of a section.
[19.15.17.5 NMAC - N, / /07]

19.15.17.6 OBJECTIVE: To regulate pits, closed-loop systems, below-grade tanks and sumps used in connection with oil and gas operations for the protection of public health, welfare and the environment.
[19.15.17.6 NMAC - N, / /07]

19.15.17.7 DEFINITIONS:

A. "Alluvium" means detrital material that water or other erosional forces have transported and deposited at points along a watercourse's flood plain. It typically is composed of sands, silts and gravels; exhibits high porosity and permeability; and generally carries fresh water.

B. "Closed-loop system" means a system that uses above ground steel tanks for the management of drilling or workover fluids without using below-grade tanks or pits.

C. "Division-approved facility" means a division-permitted surface waste management or injection facility, a facility permitted pursuant to 20.6.2 NMAC, a facility approved pursuant to 19.15.9.712 NMAC or other facility that the division specifically approves for the particular purpose. The division shall not approve any facility not otherwise permitted unless it finds that the facility's use for the specified purpose will protect fresh water, public health and the environment and comply with other applicable federal or state statutes, federal regulations, state rules and local ordinances.

D. "Emergency pit" means a pit that is constructed as a precautionary matter to contain a spill in the event of a release.

E. "Permanent pit" means a pit, including a pit used for collection, retention or storage of produced water or brine that is constructed with the conditions and for the duration provided in its permit, and is not a temporary pit.

F. "Restore" means to return a site to its former condition, in the manner and to the extent required by applicable provisions of 19.15.17 NMAC.

G. "Re-vegetate" means to seed or plant a site with plant species that are predominantly native in a quantity that controls erosion.

H. "Sump" means an impermeable vessel, or a collection device incorporated within a secondary containment system, with a capacity less than 500 gallons, which remains predominantly empty, serves as a drain or receptacle for de minimis releases on an intermittent basis and is not used to store, treat, dispose of or evaporate products or wastes.

I. "Temporary pit" means a pit, including a drilling or workover pit, which is constructed with the intent that the pit will hold liquids for less than six months and will be closed in less than one year.
[19.15.17.7 NMAC - Rp, 19.15.2.7 NMAC, / /07]

19.15.17.8 PERMIT REQUIRED:

A. A person shall not construct or use a pit or below-grade tank except in accordance with a division-issued permit. Only an operator may apply for a division-issued permit. Facilities permitted pursuant to 19.15.36 NMAC or WQCC rules are exempt from 19.15.17 NMAC. After _____, 200_ [effective date], an unlined permanent pit is prohibited and the division shall not issue a permit for an unlined permanent pit.

B. In lieu of using a pit or below-grade tank in accordance with 19.15.17 NMAC, an operator may use a closed-loop system or other division-approved alternative method. However, an operator may not conduct operations using a closed-loop system or other proposed alternative method except in accordance with a division-issued permit. An operator requesting a permit for a closed-loop system that uses a temporary pit shall comply with the requirements for temporary pits specified in 19.15.17 NMAC.

[19.15.17.8 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.9 PERMIT APPLICATION:

A. An operator shall apply to the division for a permit to construct or use a pit, closed-loop system, below-grade tank or other proposed alternative method to which 19.15.17 NMAC applies, using form C-144, submitted either separately or as an attachment to a permit application for a facility with which the pit, closed-loop system, below-grade tank or other proposed alternative method will be associated. For upstream facilities, the operator may submit form C-144 separately or as an attachment to an application for a well permit (form C-101 or C-103).

B. The permit application shall include a detailed engineering design plan.

(1) Permanent pits. A registered professional engineer shall certify engineering design plans for permanent pits. The engineering design plan shall include:

(a) a quality control/quality assurance construction and installation plan;

(b) operating and maintenance procedures;

(c) a closure plan;

(d) a hydrogeologic report that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the environmental bureau in the division's Santa Fe office to evaluate the actual and potential effects on soils, surface water and ground water;

(e) detailed information on dike protection and structural integrity; and leak detection, including an adequate fluid collection and removal system;

(f) liner specifications and compatibility;

(g) freeboard and overtopping prevention;

(h) prevention of nuisance or hazardous odors, including H_2S;

(i) an emergency response plan, unless the permanent pit is part of a facility that has an integrated contingency plan;

(j) type of oil field waste stream;

(k) climatological factors, including freeze-thaw cycles;

(l) a monitoring and inspection plan;

(m) erosion control; and

(n) other pertinent information the environmental bureau in the division's Santa Fe office requests.

(2) Temporary pits. A registered professional engineer shall certify an engineering design plan for a temporary pit using appropriate engineering principles and practices and following applicable manufacturers' recommendations. The engineering design plan shall include operating and maintenance procedures, a closure plan and a hydrogeologic report that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the appropriate division district office to evaluate the actual and potential effects on soils, surface water and ground water.

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Deleted: An engineering design plan for a temporary pit may incorporate by reference a standard design for multiple temporary pits that the operator files with the application or has previously filed with the appropriate division district office.

(3) Closed-loop systems. An engineering design plan for a closed-loop system shall use appropriate engineering principles and practices and follow applicable manufacturers' recommendations. The engineering design plan shall include operating and maintenance procedures and a closure plan. An engineering design plan for a closed-loop system may incorporate by reference a standard design for multiple projects that the operator files with the application or has previously filed with the appropriate division district office.

(4) Below-grade tanks. An engineering design plan for a below-grade tank shall use appropriate engineering principles and practices and follow applicable manufacturers' recommendations. The engineering design plan shall include operating and maintenance procedures, a closure plan and a hydrogeologic report that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the appropriate division district office to evaluate the actual and potential effects on soils,

surface water and ground water. An engineering design plan for a below-grade tank may incorporate by reference a standard design for multiple below-grade tanks that the operator files with the application or has previously filed with the appropriate division district office.

C. Closure plans. A closure plan that an operator submits in an engineering design plan, or any other closure plan required pursuant to 19.15.17 NMAC, shall describe the proposed closure method and the proposed procedures and protocols to implement and complete the closure.

(1) An operator of an existing unlined, permitted or registered permanent pit, or an existing lined or unlined, permanent pit not permitted or registered, identified under Paragraphs (1) or (2) of Subsection A of 19.15.17.13 NMAC, shall submit the respective closure plan required under the transitional provisions of Subsection B of 19.15.17.17 NMAC to the environmental bureau in the division's Santa Fe office.

(2) An operator of an existing unlined, temporary pit or an existing below-grade tank, identified under Paragraphs (3) or (4) of Subsection A of 19.15.17.13 NMAC, shall submit the respective closure plan required under the transitional provisions of Subsection B of 19.15.17.17 NMAC to the appropriate division district office.

(3) An operator shall include in the permit application an engineering design plan with an attached closure plan.

D. Filing of permit application.

(1) Permanent pits and exceptions requested pursuant to 19.15.17.15 NMAC. An operator shall file an application, form C-144, and all required attachments with the environmental bureau in the division's Santa Fe office to request approval to use or construct a permanent pit or request an exception pursuant to 19.15.17.15 NMAC and shall provide a copy to the appropriate division district office.

(2) Temporary pits, closed-loop systems and below-grade tanks. To request approval to use or construct a temporary pit, closed-loop system or below-grade tank, an operator shall file an application, form C-144, and all required attachments with the appropriate division district office.

[19.15.17.9 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.10 SITING REQUIREMENTS:

A. Except as otherwise provided in 19.15.17 NMAC.

(1) An operator shall not locate a temporary pit or below-grade tank:

(a) where ground water is less than 100 feet below the bottom of the temporary pit or below-grade tank;

(b) within 300 feet of a continuously flowing watercourse, or 200 feet of any other watercourse, lakebed, sinkhole or playa lake (measured from the ordinary high-water mark), unless the appropriate division district office approves an alternative distance based upon the operator's demonstration that surface and ground water will be protected;

(c) within 1000 feet from a permanent residence, school, hospital, institution or church in existence at the time of initial application;

(d) within 1000 horizontal feet of a private, domestic fresh water well or spring that less than five households use for domestic or stock watering purposes, or within 1000 horizontal feet of any other fresh water well or spring, in existence at the time of initial application;

(e) within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended, unless the municipality specifically approves;

(f) within 500 feet of a wetland;

(g) within the area overlying a subsurface mine, unless the appropriate division district office specifically approves the proposed location based upon the operator's demonstration that subsurface integrity will not be compromised;

(h) within an unstable area, unless the operator demonstrates that it has incorporated engineering measures into the design to ensure that the temporary pit's or below-grade tank's integrity is not compromised; or

(i) within a 100-year floodplain.

(j) within 300 feet of a property boundary.

(2) An operator shall not locate a permanent pit:

(a) where ground water is less than 100 feet below the bottom of the permanent pit;

(b) within 300 feet of a continuously flowing watercourse, or 200 feet of any other watercourse, lakebed, sinkhole or playa lake (measured from the ordinary high-water mark), unless the

Deleted: (1) If the operator proposes an on-site closure method, the operator shall also propose other methods to be used if the initial method does not satisfy the on-site closure standards specified in Subparagraph (d) of Paragraph (2) of Subsection F of 19.15.17.13 NMAC or, if applicable, other on-site closure standards that the environmental bureau in the division's Santa Fe office approves.¶

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environmental bureau in the division's Santa Fe office approves an alternative distance based upon the operator's demonstration that surface and ground water will be protected;

(c) within 1000 feet from a permanent residence, school, hospital, institution or church in existence at the time of initial application;

(d) within 1000 horizontal feet of a private, domestic fresh water well or spring less than five households use for domestic or stock watering purposes, or within 1000 horizontal feet of any other fresh water well or spring, in existence at the time of initial application;

(e) within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended, unless the municipality specifically approves;

(f) within 500 feet of a wetland;

(g) within the area overlying a subsurface mine, unless the environmental bureau in the division's Santa Fe office specifically approves the proposed location based upon the operator's demonstration that subsurface integrity will not be compromised;

(h) within an unstable area, unless the operator demonstrates that it has incorporated engineering measures into the design to ensure that the permanent pit's integrity is not compromised; or

(i) within a 100-year floodplain.

(j) within 300 feet of a property boundary.

(3) An operator shall not locate material excavated from the construction of the pit:

(a) within 300 feet of a continuously flowing watercourse, or 200 feet of any other watercourse, lakebed, sinkhole or playa lake (measured from the ordinary high-water mark), unless the division approves an alternative distance based upon the operator's demonstration that surface and ground water will be protected;

(b) within 500 feet of a wetland; or

(c) within a 100-year floodplain.

B. An emergency pit is exempt from the siting criteria of 19.15.17 NMAC.

19.15.17.11 DESIGN AND CONSTRUCTION SPECIFICATIONS:

A. General specifications. An operator shall design and construct a pit, closed-loop system, below-grade tank or sump to contain liquids and solids and prevent contamination of fresh water and protect public health and the environment.

B. Stockpiling of topsoil. Prior to constructing a pit or closed-looped system, except a pit constructed in an emergency, the operator shall strip and stockpile the topsoil for use as the final cover or fill at the time of closure.

C. Signs. The operator shall post an upright sign not less than 12 inches by 24 inches with lettering not less than two inches in height in a conspicuous place on the fence surrounding the pit, closed-loop system or below-grade tank, unless the pit, closed-loop system or below-grade tank is located on a well site that the operator controls. The operator shall post the sign in a manner and location such that a person can person can easily read the legend. The sign shall provide the following information: the operator's name; the location of the site by quarter-quarter or unit letter, section, township and range; and emergency telephone numbers.

D. Fencing.

(1) The operator shall fence or enclose a pit or below-grade tank in a manner that prevents unauthorized access and shall maintain the fences in good repair. Fences are not required if there is an adequate surrounding perimeter fence that prevents unauthorized access to the well site or facility, including the pit or below-grade tank. During drilling operations, the operator is not required to fence the edge of the pit adjacent to the drilling rig.

(2) The operator shall fence or enclose a pit or below-grade tank located within 1000 feet of a permanent residence, school, hospital, institution or church with a chain link security fence, at least six feet in height with at least two strands of barbed wire at the top. The operator shall ensure that all gates associated with the fence are closed and locked when responsible personnel are not on-site. During drilling operations, the operator is not required to fence the edge of the temporary pit adjacent to the drilling rig.

(3) The operator shall fence any other pit or below-grade tank to exclude wildlife and livestock, with at least four strands of barbed wire in the interval between one foot and five feet above ground level. The appropriate division district office may approve an alternative to this requirement if the operator demonstrates that

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(1) where ground water is less than 50 feet below the bottom of the waste;¶

(2) within 300 feet of a continuously flowing watercourse, or 200 feet of any other watercourse, lakebed, sinkhole or playa lake (measured from the ordinary high-water mark), unless the division approves an alternative distance based upon the operator's demonstration that surface and ground water will be protected;¶

(3) within 300 feet from a permanent residence, school, hospital, institution or church in existence at the time of initial application;¶

(4) within 500 horizontal feet of a private, domestic fresh water well or spring less than five households use for domestic or stock watering purposes or within 1000 horizontal feet of any other fresh water well or spring, existing at the time the operator files the application for exception;¶

(5) within incorporated municipal boundaries or within a defined municipal fresh water well field covered under a municipal ordinance adopted pursuant to NMSA 1978, Section 3-27-3, as amended, unless the municipality specifically approves;¶

(6) within 500 feet of a wetland;¶

(7) within the area overlying a subsurface mine, unless the division specifically approves the proposed location based upon the operator's demonstration that subsurface integrity will not be compromised;¶

(8) within an unstable area, unless the operator demonstrates that it has incorporated engineering measures into the design to ensure that the on-site closure method will prevent contamination of fresh water and protect public health and the environment; or¶

(9) within a 100-year floodplain.¶

[19.15.17.10 NMAC - Rp, 19.15.2.50 NMAC, / /07]¶

an alternative provides equivalent or better protection. The appropriate division district office may impose additional fencing requirements for protection of wildlife in particular areas.

E. Netting. The operator shall ensure that a permanent pit or a permanent open top tank is screened, netted or otherwise rendered non-hazardous to wildlife, including migratory birds. Where netting is not feasible, the operator shall routinely inspect for and report discovery of dead migratory birds or other wildlife to the appropriate wildlife agency and to the appropriate division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

F. Temporary pits. The operator shall design and construct a temporary pit in accordance with the following requirements.

(1) The operator shall design and construct a temporary pit to ensure the confinement of oil, gas or water to prevent uncontrolled releases.

(2) A temporary pit shall have a properly constructed foundation and interior slopes consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. The operator shall construct a temporary pit so that the slopes are no steeper than two horizontal feet to one vertical foot (2H:1V). The appropriate division district office may approve an alternative to the slope requirement if the operator demonstrates that it can construct and operate the temporary pit in safe manner to prevent contamination of fresh water and protect public health and the environment.

(3) The operator shall design and construct a temporary pit with a geomembrane liner. The geomembrane liner shall consist of 30-mil string reinforced HDPE or equivalent liner material that the appropriate division district office approves. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. The liner material shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.

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(4) The operator shall minimize liner seams and orient them up and down, not across a slope. The operator shall use factory seams where possible. The operator shall overlap liners four to six inches before seaming, and orient seams parallel to the line of maximum slope, *i.e.*, oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. Qualified personnel shall perform field seaming.

(5) Construction shall avoid excessive stress-strain on the liner.

(6) Geotextile is required under the liner where needed to reduce localized stress-strain or protuberances that may otherwise compromise the liner's integrity.

(7) The operator shall anchor the edges of all liners in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.

(8) The operator shall ensure that the liner is protected from any fluid force or mechanical damage at any point of discharge into or suction from the lined temporary pit.

(9) The operator shall design and construct a temporary pit to prevent run-on of surface water. A berm, ditch or other diversion shall surround a temporary pit to prevent run-on of surface water. During drilling operations, the edge of the temporary pit adjacent to the drilling rig is not required to have run-on protection if the operator is using the temporary pit to collect liquids escaping from the rig.

(10) The size of a temporary pit shall not exceed 10 acre-feet, including freeboard.

(11) The part of a temporary pit used to vent or flare gas during a drilling or workover operation that is designed to allow liquids to drain to a separate temporary pit does not require a liner, unless the appropriate division district office requires an alternative design in order to protect surface water, ground water and the environment.

G. Permanent pits. The operator shall design and construct a permanent pit in accordance with the following requirements.

(1) Each permanent pit shall have a properly constructed foundation consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear. The operator shall construct a permanent pit so that the inside grade of the levee is no steeper than two horizontal feet to one vertical foot (2H:1V). The levee shall have an outside grade no steeper than three horizontal feet to one vertical foot (3H:1V). The levee's top shall be wide enough to install an anchor trench and provide adequate room for inspection and maintenance.

(2) Each permanent pit shall contain, at a minimum, a primary (upper) liner and a secondary (lower) liner with a leak detection system appropriate to the site's conditions. The edges of all liners shall be anchored in the bottom of a compacted earth-filled trench. The anchor trench shall be at least 18 inches deep.

(3) The primary (upper) liner and secondary (lower) liner shall be geomembrane liners. The geomembrane liner shall consist of 60-mil HDPE liner, or an equivalent liner material the environmental bureau in

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the division's Santa Fe office approves. The geomembrane liner shall have a hydraulic conductivity no greater than 1×10^{-9} cm/sec. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. The liner material shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.

(4) The environmental bureau in the division's Santa Fe office may approve other liner media if the operator demonstrates to the satisfaction of the environmental bureau in the division's Santa Fe office that the alternative liner protects fresh water, public health, safety and the environment as effectively as the specified media.

(5) The operator shall minimize liner seams and orient them up and down, not across a slope. The operator shall use factory seams where possible. The operator shall ensure field seams in geosynthetic material are thermally seamed (hot wedge) with a double track weld to create an air pocket for non-destructive air channel testing. A stabilized air pressure of 35 psi, plus or minus one percent, shall be maintained for at least five minutes. The operator shall overlap liners four to six inches before seaming, and orient seams parallel to the line of maximum slope, *i.e.*, oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. There shall be no horizontal seams within five feet of the slope's toe. Qualified personnel shall perform field seaming.

(6) At a point of discharge into or suction from the lined permanent pit, the operator shall ensure that the liner is protected from excessive hydrostatic force or mechanical damage. External discharge or suction lines shall not penetrate the liner.

(7) The operator shall place a leak detection system between the lower and upper geomembrane liners that consists of two feet of compacted soil with a saturated hydraulic conductivity of 1×10^{-5} cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed drainage and collection and removal system placed above the lower geomembrane liner in depressions and sloped to facilitate the earliest possible leak detection. Piping used shall be designed to withstand chemical attack from oil field waste or leachate; structural loading from stresses and disturbances from overlying oil field waste, cover materials, equipment operation or expansion or contraction; and to facilitate clean-out maintenance. The material the operator places between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe. The slope of the interior sub-grade and of drainage lines and laterals shall be at least a two percent grade, *i.e.*, two feet vertical drop per 100 horizontal feet. The piping collection system shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80. The operator shall seal a solid sidewall riser pipe to convey collected fluids to a collection, observation and disposal system located outside the permanent pit's perimeter. The operator may install alternative methods that the environmental bureau in the division's Santa Fe office approves.

(8) The operator shall notify the environmental bureau in the division's Santa Fe office at least 72 hours prior to the primary liner's installation so that a representative of the environmental bureau in the division's Santa Fe office may inspect the leak detection system before it is covered.

(9) The operator shall construct a permanent pit in a manner that prevents overtopping due to wave action or rainfall and maintain a three foot freeboard at all times.

(10) The size of a permanent pit shall not exceed 10 acre-feet, including freeboard.

(11) The operator shall maintain a permanent pit to prevent run-on of surface water. A permanent pit shall be surrounded by a berm, ditch or other diversion to prevent run-on of surface water.

H. Closed-loop systems.

(1) The operator shall design and construct a closed-loop system to ensure the confinement of oil, gas or water to prevent uncontrolled releases.

(2) An operator of a closed-loop system that uses temporary pits shall comply with the requirements for temporary pits specified in 19.15.17 NMAC.

(3) An operator of a closed-loop system with drying pads shall design and construct the drying pads so as to include the following:

(a) appropriate liners that prevent the contamination of fresh water and protect public health and the environment;

(b) sumps to facilitate the collection of liquids derived from drill cuttings; and

(c) berms that prevent run-on of surface water.

I. Below-grade tanks. The operator shall design and construct a below-grade tank in accordance with the following requirements.

(1) The below-grade tank's side walls, where the tank's bottom is below-grade, shall be open for visual inspection for leaks. The below-grade tank's bottom shall be equipped with an underlying mechanism to

divert leaked liquid to a location that can be visually inspected. A below-grade tank not meeting these conditions shall be in a vault or have a double wall that will contain any leaked liquids.

(2) A below-grade tank shall have secondary containment and leak detection.

(3) The operator of a below-grade tank constructed prior to _____, 200_ [effective date] that does not have secondary containment and leak detection shall test its integrity annually. If the existing below-grade tank does not demonstrate integrity, the operator shall promptly install a below-grade tank that complies with Paragraph (2) of Subsection I of 19.15.17.11 NMAC. In any event, the operator shall equip or retrofit such below-grade tank with secondary containment and leak detection, or close it, within five years after _____, 200_ [effective date].

(4) The operator shall ensure that a below-grade tank is constructed of materials resistant to the below-grade tank's particular contents and resistant to damage from sunlight.

(5) A below-grade tank system shall have a properly constructed foundation consisting of a level base free of rocks, debris, sharp edges or irregularities to prevent punctures, cracks or indentations of the liner or tank bottom.

(6) A below-grade tank system shall consist of either a double wall system with the capability to detect leaks or a tank placed within a geomembrane lined collection system, or an alternative system that the appropriate division district office approves based upon the operator's demonstration that an alternative provides equivalent or better protection.

(7) The operator shall design and construct a below-grade tank system in accordance with the following requirements, if the below-grade tank system consists of a tank placed within a geomembrane lined collection system.

(a) The operator shall install a geomembrane liner upon the constructed foundation, specified in Paragraph (5) of Subsection I of 19.15.17.11 NMAC, prior to the placement of the collection system and tank. The installed geomembrane liner shall extend above the existing grade. The liner shall consist of 60-mil HDPE liner, or an equivalent liner material that the appropriate division district office approves. The geomembrane liner shall have a hydraulic conductivity no greater than 1×10^{-9} cm/sec. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. The liner material shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.

(b) The operator shall install slotted or perforated drainage pipe (lateral) on the geomembrane liner with the drainage pipe sloped at least one inch per 10 feet towards the collection system. The drainage pipe shall be at least one inch in diameter.

(c) The operator shall cover the drainage pipe with sand, gravel or other material with sufficient permeability to convey fluids to the drainage pipe.

(d) The operator shall install the tank upon the lined collection system and connect a riser pipe to the collection system. The riser pipe shall be at least two inches in diameter.

(e) The operator shall secure the secondary liner to the tank above the ground surface in a manner that prevents rainwater from entering the space between the tank and liner.

(8) The operator shall construct a below-grade tank to prevent overflow and the collection of surface water run-on.

19.15.17.12 OPERATIONAL REQUIREMENTS:

A. General specifications. An operator shall maintain and operate a pit, closed-loop system, below-grade tank or sump in accordance with the following requirements.

(1) The operator shall operate and maintain a pit, closed-loop system, below-grade tank or sump to contain liquids and solids and maintain the integrity of the liner, liner system or secondary containment system, prevent contamination of fresh water and protect public health and the environment.

(2) The operator shall dispose of all drilling fluids in a division-approved facility or recycle, reuse or reclaim all drilling fluids in a manner that prevents the contamination of fresh water and protects public health and the environment.

(3) The operator shall not discharge into or store any hazardous waste in a pit, closed-loop system, below-grade tank or sump.

(4) If the integrity of the pit liner is compromised, or if any penetration of the liner occurs above the liquid's surface, then the operator shall notify the appropriate division district office within 48 hours of the discovery and repair the damage or replace the liner.

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Deleted: . **J.** . On-site deep trenches for closure. The operator shall design and construct an on-site deep trench for closure, specified in Paragraph (2) of Subsection B of 19.15.17.13 NMAC or Paragraph (2) of Subsection D of 19.15.17.13 NMAC, in accordance with the following requirements.¶

(1) The operator shall locate the trench to satisfy the siting criteria specified in Subsection C of 19.15.17.10 NMAC and Subparagraph (e) of Paragraph (2) of Subsection F of 19.15.17.13 NMAC and excavate to an appropriate depth that allows for the installation of the geomembrane bottom liner, geomembrane liner cover and the division-prescribed soil cover required pursuant to Paragraphs (2) and (3) of Subsection G of 19.15.17.13 NMAC.¶

(2) An on-site deep trench shall have a properly constructed foundation and side walls consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear.¶

(3) Geotextile is required under the liner where needed to reduce localized stress-strain or protuberances that may otherwise compromise the liner's integrity.¶

(4) An on-site deep trench shall be constructed with a geomembrane liner. The geomembrane shall consist of a 20-mil string reinforced LLDPE liner or equivalent liner that the appropriate division district office approves. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. The liner material shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.¶

(5) The operator shall minimize liner seams and orient them up and down, not across a slope. The operator shall use factory seams where possible. The operator shall overlap liners four to six inches before seaming, and orient seams parallel to the line of maximum slope, *i.e.*, oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. Qualified personnel shall perform field seaming.¶

(6) The operator shall install sufficient liner material to reduce stress-strain on the liner.¶

(7) The operator shall ensure that the outer edges of all liners are secured for the placement of the excavated waste material into the trench.¶

(8) The operator shall fold the outer edges of the trench liner to overlap the waste material in the t... [1]

(5) If a lined pit develops a leak, or if any penetration of the liner occurs below the liquid's surface, then the operator shall remove all liquid above the damage or leak line from the pit within 48 hours and repair the damage or replace the liner.

(6) The operator shall install a level measuring device in a lined pit containing fluids to monitor the level of the fluid surface, so that the operator may recognize unanticipated change in volume of fluids.

(7) The injection or withdrawal of liquids from a lined pit shall be accomplished through a header, diverter or other hardware that prevents damage to the liner by erosion, fluid jets or impact from installation and removal of hoses or pipes.

(8) The operator shall operate and install a pit, below-grade tank or sump to prevent the collection of surface water run-on.

(9) The operator shall install, or maintain on site, an oil absorbent boom or other device to contain and remove oil from a pit's surface.

B. Temporary pits. An operator shall maintain and operate a temporary pit in accordance with the following additional requirements.

(1) Only fluids used or generated during the drilling or workover process may be discharged into a temporary pit. The operator shall maintain a temporary pit free of miscellaneous solid waste or debris. The operator shall use a tank made of steel or other material to contain hydrocarbon-based drilling fluids that the appropriate division district office approves. Immediately after cessation of a drilling or workover operation, the operator shall remove any visible or measurable layer of oil from the surface of a drilling or workover pit.

(2) The operator shall maintain at least two feet of freeboard for a temporary pit.

(3) The operator shall inspect a temporary pit containing drilling fluids at least daily while the drilling or workover rig is on-site. Thereafter, the operator shall inspect the temporary pit weekly so long as liquids remain in the temporary pit. The operator shall maintain a log of such inspections and make the log available for the appropriate division district office's review upon request. The operator shall file a copy of the log with the appropriate division district office when the operator closes the temporary pit.

(4) The operator shall remove all free liquids from a drilling pit within 30 days from the date that the operator releases the drilling rig. The appropriate division district office may grant an extension of up to three months.

(5) The operator shall remove all free liquids from a workover pit within 15 days from the date that the operator releases the workover rig. The appropriate division district office may grant an extension of up to three months.

C. Permanent pits. An operator shall maintain and operate a permanent pit in accordance with the following requirements.

(1) The operator shall maintain at least three feet of freeboard for a permanent pit.

(2) No oil or floating hydrocarbon shall be present in a permanent pit.

D. Below-grade tanks. The operator shall not allow a below-grade tank to overflow or allow surface water run-on to enter the below-grade tank.

E. Sumps. The operator shall maintain and operate a sump in accordance with the following requirements.

(1) The operator shall test a sump's integrity annually and promptly repair or replace a sump that fails the integrity test.

(2) An operator shall test a sump that can be removed from its emplacement by visual inspection. The operator shall test other sumps by appropriate mechanical means.

(3) The operator shall maintain records of sump inspection and testing and make the records available for the appropriate division district office's review upon request.

[19.15.17.12 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.13 CLOSURE REQUIREMENTS:

A. Time requirements for closure. An operator shall close a pit, closed-loop system or below-grade tank within the time periods provided in 19.15.17.13 NMAC, or by an earlier date that the division requires because of imminent danger to fresh water, public health or the environment.

(1) An existing unlined, permitted or registered permanent pit shall be closed within two years after _____[the effective date of 19.15.17 NMAC].

(2) An existing lined or unlined, permanent pit not permitted or registered shall be closed within 60 days after _____, 200_ [effective date].

(3) An existing unlined, temporary pit shall be closed within three months after _____, 200_ [effective date].

(4) An existing below-grade tank that is not equipped with secondary containment and leak detection shall be closed within five years after _____, 200_ [effective date], if not retrofitted with secondary containment and leak detection in accordance with Subsection I of 19.15.17.11 NMAC.

(5) Any other permitted permanent pit shall be closed within 60 days of cessation of operation of the permanent pit in accordance with a closure plan that the environmental bureau in the division's Santa Fe office approves.

(6) Any other permitted temporary pit shall be closed within six months from the date the operator releases the rig. The appropriate division district office may grant an extension not to exceed three months.

(7) A closed-loop system permitted under 19.15.17 NMAC or in operation on _____, 200_ [effective date], shall be closed within six months from the date the operator releases the rig. The appropriate division district office may grant an extension not to exceed six months.

(8) A permitted below-grade tank shall be closed within 60 days of cessation of the below-grade tank's operation or as required by the transitional provisions of Subsection B of 19.15.17.17 NMAC in accordance with a closure plan that the appropriate division district office approves.

B. Closure methods for temporary pits. The operator of a temporary pit shall remove all liquids from the temporary pit prior to implementing a closure method and dispose of the liquids in a division-approved facility or recycle, reuse or reclaim the liquids in a manner that the appropriate division district office approves. The operator shall close the temporary pit by one of the following methods.

(1) Waste excavation and removal.

(a) The operator shall close the temporary pit by excavating all contents and, if applicable, synthetic pit liners and transferring those materials to a division-approved facility.

(b) The operator shall test the soils beneath the temporary pit to determine whether a release has occurred. The operator shall collect, at a minimum, a five point, composite sample; collect individual grab samples from any hot spot; and analyze for BTEX, TPH and chlorides to demonstrate that the benzene concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 0.2 mg/kg; total BTEX concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 50 mg/kg; the TPH concentration, as determined by EPA method 418.1 or other EPA method that the division approves, does not exceed 100 mg/kg; and the chloride concentration, as determined by EPA method 300.1 or other EPA method that the division approves, does not exceed 250 mg/kg, or the background concentration, whichever is greater. The operator shall notify the division of its results on form C-141. The division may require additional delineation upon review of the results.

(c) If the operator or the division determines that a release has occurred, then the operator shall comply with 19.15.3.116 NMAC and 19.15.1.19 NMAC, as appropriate.

(d) If the sampling program demonstrates that a release has not occurred or that any release does not exceed the concentrations specified in Subparagraph (b) of Paragraph (1) of Subsection B of 19.15.17.13 NMAC, then the operator shall backfill the temporary pit excavation with compacted, non-waste containing, earthen material; construct a division-prescribed soil cover; and re-vegetate the site. The division-prescribed soil cover and re-vegetation requirements shall comply with Paragraphs (1) and (3) of Subsection G of 19.15.17.13 NMAC and Subsection H of 19.15.17.13 NMAC.

(2) Alternative closure methods. If the environmental bureau in the division's Santa Fe office grants an exception approving a closure method for a specific temporary pit other than as specified in Paragraphs (1) or (2) of Subsection B of 19.15.17.13 NMAC, then the operator shall close that temporary pit by the method that the environmental bureau in the division's Santa Fe office approves.

C. Closure method for permanent pits.

(1) The operator shall remove all liquids and BS&W from the permanent pit prior to implementing a closure method and shall dispose of the liquids and BS&W in a division-approved facility.

(2) The operator shall remove the pit liner system, if applicable, and dispose of it in a division-approved facility. If there is on-site equipment associated with permanent pit, the operator shall remove the equipment, unless the equipment is required for some other purpose.

(3) The operator shall test the soils beneath the permanent pit to determine whether a release has occurred. The operator shall collect, at a minimum, a five point, composite sample; collect individual grab samples from any hot spot; and analyze for BTEX, TPH and chlorides to demonstrate that the benzene concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 0.2 mg/kg; total BTEX concentration, as determined by EPA SW-846 methods 8021B or 8260B or other

Deleted: (2) On-site deep trench burial. The operator shall demonstrate and comply with the closure requirements and standards of Subsection F of 19.15.17.13 NMAC if the proposed closure method of a temporary pit involves on-site deep trench burial.¶

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EPA method that the division approves, does not exceed 50 mg/kg; the TPH concentration, as determined by EPA method 418.1 or other EPA method that the division approves, does not exceed 100 mg/kg; and the chloride concentration, as determined by EPA method 300.1 or other EPA method that the division approves, does not exceed 250 mg/kg, or the background concentration, whichever is greater. The operator shall notify the division of its results on form C-141. The division may require additional delineation upon review of the results.

(4) If the operator or the division determines that a release has occurred, then the operator shall comply with 19.15.3.116 NMAC and 19.15.1.19 NMAC, as appropriate.

(5) If the sampling program demonstrates that a release has not occurred or that any release does not exceed the concentrations specified in Paragraph (3) of Subsection C of 19.15.17.13 NMAC, then the operator shall backfill the excavation with compacted, non-waste containing, earthen material; construct a division-prescribed soil cover; and re-vegetate the site. The division-prescribed soil cover and re-vegetation requirements shall comply with Paragraphs (1) and (3) of Subsection G of 19.15.17.13 NMAC and Subsection H of 19.15.17.13 NMAC.

D. Closure methods for closed-loop systems. An operator of a closed-loop system that uses a temporary pit, in lieu of a drying pad, shall comply with the closure requirements for temporary pits specified in Subsection B of 19.15.17.13 NMAC. The operator of a closed-loop system shall close the system by one of the following methods.

(1) Waste removal.

(a) The operator shall transfer the waste and the drying pad liner to a division-approved facility.

(b) The operator shall substantially restore and re-vegetate the impacted area's surface.

(2) Alternative closure methods. If the environmental bureau in the division's Santa Fe office grants an exception approving a closure method for a specific closed-loop system other than as specified in Paragraphs (1) or (2) of Subsection D of 19.15.17.13 NMAC, then the operator shall close that drying pad associated with a closed-loop system by the method the environmental bureau in the division's Santa Fe office approves.

E. Closure method for below-grade tanks.

(1) The operator shall remove all liquids and sludge from a below-grade tank prior to implementing a closure method and shall dispose of the liquids and sludge in a division-approved facility.

(2) The operator shall remove the below-grade tank and dispose of it in a division-approved facility or recycle, reuse, or reclaim it in a manner that the appropriate division district office approves.

(3) If there is any on-site equipment associated with a below-grade tank, then the operator shall remove the equipment, unless the equipment is required for some other purpose.

(4) The operator shall test the soils beneath the below-grade tank to determine whether a release has occurred. The operator shall collect, at a minimum, a five point, composite sample; collect individual grab samples from any hot spot; and analyze for BTEX, TPH and chlorides to demonstrate that the benzene concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 0.2 mg/kg; total BTEX concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 50 mg/kg; the TPH concentration, as determined by EPA method 418.1 or other EPA method that the division approves, does not exceed 100 mg/kg; and the chloride concentration, as determined by EPA method 300.1 or other EPA method that the division approves, does not exceed 250 mg/kg, or the background concentration, whichever is greater. The operator shall notify the division of its results on form C-141. The division may require additional delineation upon review of the results.

(5) If the operator or the division determines that a release has occurred, then the operator shall comply with 19.15.3.116 NMAC and 19.15.1.19 NMAC, as appropriate.

(6) If the sampling program demonstrates that a release has not occurred or that any release does not exceed the concentrations specified in Paragraph (4) of Subsection E of 19.15.17.13 NMAC, then the operator shall backfill the excavation with compacted, non-waste containing, earthen material; construct a division-prescribed soil cover; and re-vegetate the site. The division-prescribed soil cover and re-vegetation requirements shall comply with Paragraphs (1) and (3) of Subsection G of 19.15.17.13 NMAC and Subsection H of 19.15.17.13 NMAC.

G. Soil cover designs.

(1) The soil cover for closures where the operator has removed or remediated the contaminated soil to the division's satisfaction shall consist of the background thickness of topsoil or one foot of suitable material to establish vegetation at the site, whichever is greater.

(3) The operator shall construct the soil cover to the site's existing grade and prevent ponding of water and erosion of the cover material.

H. Re-vegetation requirements:

Deleted: (2) On-site deep trench burial. The operator shall demonstrate and comply with the closure requirements and standards of Subsection F of 19.15.17.13 NMAC if the proposed closure method of a drying pad associated with a closed-loop system involves on-site deep trench burial.¶

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Deleted: F. On-site closure methods. The following closure requirements and standards apply if the operator proposes a closure method for a drying pad associated with a closed-loop system or a temporary pit pursuant to Paragraph (2) of Subsection D of 19.15.17.13 NMAC or Paragraph (2) of Subsection B of 19.15.17.13 NMAC that involves on-site deep trench burial, or an alternative closure method pursuant to Paragraph (3) of Subsection D of 19.15.17.13 NMAC or Paragraph (3) of Subsection B of 19.15.17.13 NMAC and Subsection B of 19.15.17.15 NMAC.¶

(1) General requirements.¶

(a) The operator shall demonstrate, at the time of initial application for the permit, that the site where the operator proposes to implement an on-site closure method is not located within a 100 mile radius of a division-approved facility or an out-of-state waste management facility. If the operator demonstrates that neither a division-approved facility nor an out-of-state waste management facility is available within the prescribed distance, then the operator may pursue the on-site closure method.¶

(b) Any proposed on-site closure method shall comply with the siting criteria specified in Subsection C of 19.15.17.10 NMAC.¶

(c) The operator shall obtain the surface owner's w ... [2]

Deleted: (2) On-site deep trench burial.¶

(a) The operator shall demonstrate and comply with the provisions of Paragraph (1) of Subsection F of 19.15.17.13 NMAC.¶

(b) The operator shall use a separate on-site deep trench for closure of each drying pad associated with a closed-loop system or temporary pit.¶

(c) Unless the contents of the drying pad associa ... [3]

Deleted: (2) The soil cover for on-site deep trench burial shall consist of a minimum of four feet of compacted, non-waste containing, earthen material. The soil cover shall include either the background thickness of topsoil or one foot of suitable material to establish vegetation at the site, whichever is greater.¶

(1) Upon completion of closure, the operator shall substantially restore the impacted surface area to the condition that existed prior to oil and gas operations, by placement of the soil cover and re-vegetation of the site, and maintain the cover established by re-vegetation, which shall not include noxious weeds, through two successive growing seasons.

(2) The operator may propose an alternative to the re-vegetation requirement if the operator demonstrates that the proposed alternative effectively prevents erosion, and protects fresh water, human health and the environment. The proposed alternative shall be agreed upon by the surface owner. The operator shall submit the proposed alternative, with written documentation that the surface owner agrees to the alternative, to the division for approval.

I. Closure notice.

(1) The operator shall notify the surface owner by certified mail, return receipt requested, that the operator plans to close a temporary pit, a permanent pit, or below-grade tank. Evidence of mailing of the notice to the address of the surface owner shown in the county tax records is sufficient to demonstrate compliance with this requirement.

(2) The operator of a temporary pit or below-grade tank shall notify the appropriate division district office verbally or by other means at least 72 hours, but not more than one week, prior to any closure operation. The notice shall include the operator's name and the location to be closed by unit letter, section, township and range. If the closure is associated with a particular well, then the notice shall also include the well's name, number and API number.

(3) An operator of a permanent pit shall notify the environmental bureau in the division's Santa Fe office at least 60 days prior to cessation of operations and provide a proposed schedule for closure. If there is no closure plan on file with the environmental bureau in the division's Santa Fe office applicable to the permanent pit, the operator shall provide a closure plan with this notice. Upon receipt of the notice and proposed schedule, the environmental bureau in the division's Santa Fe office shall review the current closure plan for adequacy and inspect the site.

J. Closure report. Within 60 days of closure completion, the operator shall submit a closure report on form C-144, with necessary attachments to document all closure activities including sampling results; information required by 19.15.17 NMAC; a plot plan; and details on back-filling, capping and covering, where applicable. In the closure report, the operator shall certify that all information in the report and attachments is correct and that the operator has complied with all applicable closure requirements and conditions specified in the approved closure plan.

[19.15.17.13 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.14 EMERGENCY ACTIONS:

A. Permit not required. In an emergency an operator may construct a pit without a permit to contain fluids, solids or wastes, if an immediate danger to fresh water, public health or the environment exists.

B. Construction standards. The operator shall construct a pit during an emergency, to the extent possible given the emergency, in a manner that is consistent with the requirements for a temporary pit specified in 19.15.17 NMAC and that prevents the contamination of fresh water and protect public health and the environment.

C. Notice. The operator shall notify the appropriate division district office as soon as possible (if possible before construction begins) of the need for such pit's construction.

D. Use and duration. A pit constructed in an emergency may be used only for the emergency's duration. If the emergency lasts more than 48 hours, then the operator shall seek the appropriate division district office's approval for the pit's continued use. The operator shall remove all fluids, solids or wastes within 48 hours after cessation of use unless the appropriate division district office extends that time period.

E. Emergency pits. 19.15.17.14 NMAC does not authorize construction or use of a so-called "emergency pit". Construction or use of any such pit requires a permit issued pursuant to 19.15.17 NMAC, unless the pit is described in a spill prevention, control and countermeasure plan the EPA requires, the operator removes all fluids from the pit within 48 hours and the operator has filed a notice of the pit's location with the appropriate division district office.

[19.15.17.14 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.15 EXCEPTIONS:

A. General exceptions.

(1) The operator may apply to the environmental bureau in the division's Santa Fe office for an exception to a requirement or provision of 19.15.17 NMAC other than the permit requirements of 19.15.17.8

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NMAC; the exception requirements of 19.15.17.15 NMAC; or the permit approval, condition, denial, revocation, suspension, modification or transfer requirements of 19.15.17.16 NMAC. The environmental bureau in the division's Santa Fe office may grant an exception from a requirement or provision of 19.15.17 NMAC, if the operator demonstrates to the satisfaction of the environmental bureau in the division's Santa Fe office that the granting of the exception provides equivalent or better protection of fresh water, public health and the environment. The environmental bureau in the division's Santa Fe office may revoke an exception after notice to the operator of the pit, closed-loop system, below-grade tank or other proposed alternative and to the surface owner, and opportunity for a hearing, or without notice and hearing in event of an emergency involving imminent danger to fresh water, public health or the environment, subject to the provisions of NMSA 1978, Section 70-2-23, if the environmental bureau in the division's Santa Fe office determines that such action is necessary to prevent the contamination of fresh water, or to protect public health or the environment.

Deleted: the closure requirement of Subparagraph (c) of Paragraph (1) of Subsection F of 19.15.17.13 NMAC;

(2) The operator shall give written notice by certified mail, return receipt requested, to the surface owner of record where the pit, closed-loop system, below-grade tank or other proposed alternative is, or will be, located, and to such other persons as the environmental bureau in the division's Santa Fe office may direct by certified mail, return receipt requested, and issue public notice. The operator shall issue public notice by publication one time in a newspaper of general circulation in the county where the pit, closed-loop system, below-grade tank or other proposed alternative will be located. Required written and public notices require the environmental bureau in the division's Santa Fe office's approval. The environmental bureau in the division's Santa Fe office may grant the exception administratively if either the operator files with the environmental bureau in the division's Santa Fe office written waivers from all persons to whom notice is required or the environmental bureau in the division's Santa Fe office receives no objection within 30 days of the time the applicant gives notice. If the environmental bureau in the division's Santa Fe office receives an objection and the director determines that the objection has technical merit or that there is significant public interest, then the director may set the application for hearing. The director, however, may set any application for hearing. If the environmental bureau in the division's Santa Fe office schedules a hearing on an application, the hearing shall be conducted according to 19.15.14.1206 through 19.15.14.1215 NMAC.

(3) If the director does not determine that a hearing is necessary due to an objection's technical merit, significant public interest or otherwise, then the environmental bureau in the division's Santa Fe office may grant the exception without a hearing notwithstanding the filing of an objection. If, however, the environmental bureau in the division's Santa Fe office determines to deny the exception, then it shall notify the operator of its determination by certified mail, return receipt requested, and if the operator requests a hearing within 10 days after receipt of such notice shall set the matter for hearing, with notice to the operator and to any party who has filed an objection to the proposed exception.

B. Alternative closure methods. The operator of a temporary pit or a closed-loop system may apply to the environmental bureau in the division's Santa Fe office for an exception to the closure methods specified in Paragraph (1) of Subsection B of 19.15.17.13 NMAC or Paragraph (1) of Subsection D of 19.15.17.13 NMAC. The environmental bureau in the division's Santa Fe office may grant the proposed exception if all of the following requirements are met.

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(1) The operator demonstrates that the proposed alternative method provides equivalent or better protection of fresh water, public health and the environment.

(2) The operator shall remove all liquids prior to implementing a closure method and dispose of the liquids in a division-approved facility or recycle or reuse the liquids in a manner that the environmental bureau in the division's Santa Fe office approves.

(3) The operator demonstrates to the of satisfaction the environmental bureau in the division's Santa Fe office that any proposed alternative closure method will implement one or more of the following practices as approved by the environmental bureau in the division's Santa Fe office: waste minimization; treatment using best demonstrated available technology; reclamation; reuse; recycling; or reduction in available contaminant concentration; and such conditions as the environmental bureau in the division's Santa Fe office deems relevant in order to protect fresh water, public health and the environment.

(4) The provisions of Subsection A of 19.15.17.15 NMAC shall apply to applications for exceptions pursuant to Subsection B of 19.15.17.15 NMAC.

[19.15.17.15 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.16 PERMIT APPROVALS, CONDITIONS, DENIALS, REVOCATIONS, SUSPENSIONS, MODIFICATIONS OR TRANSFERS:

A. The division shall review all applications to permit facilities subject to 19.15.17 NMAC, and may approve, deny or approve an application with conditions. If the division denies an application or approves the application subject to conditions not expressly provided by the Oil and Gas Act or in 19.15 NMAC, then the division shall notify the applicant by certified mail, return receipt requested, and shall set the matter for hearing if the applicant so requests within 10 days after receipt of such notification.

B. Granting of permit. The division shall issue a permit upon finding that an operator has filed an acceptable application and that the proposed construction, operation and closure of a pit, closed-loop system, below-grade tank or other proposed alternative will comply with applicable statutes and rules and will not endanger fresh water, public health, safety or the environment.

C. Conditions. The division may impose conditions or requirements that it determines are necessary and proper for the protection of fresh water, public health, safety or the environment. The division shall incorporate such additional conditions or requirements into the permit.

D. Denial of application. The division may deny an application for a permit if it finds that the application and materials that the operator submitted for consideration with the application do not sufficiently demonstrate that the operator can construct, operate and close the proposed pit, closed-loop system, below-grade tank or other proposed alternative without detriment to fresh water, public health, safety or the environment.

E. Revocation, suspension or modification of a permit. The operator may apply to the division for a modification of the permit pursuant 19.15.17 NMAC. The operator shall demonstrate that the proposed modification complies with the applicable provisions of 19.15.17 NMAC. The division may revoke, suspend or impose additional operating conditions or limitations on a permit at any time, after notice and opportunity for a hearing, if the division determines that the operator or the permitted facility is in material breach of any applicable statutes or rules, or that such action is necessary for the protection of fresh water, public health or the environment. The division shall notify the operator by certified mail, return receipt requested, of any intended revocation, suspension or imposition of addition conditions, and the operator shall have 10 days after receipt of notification to request a hearing. The division may suspend a permit or impose additional conditions or limitations without hearing in an emergency to forestall an imminent threat to fresh water, public health, safety or the environment, subject to the provisions of NMSA 1978, Section 70-2-23, as amended.

F. Transfer of a permit. The operator shall not transfer a permit without the division's prior written approval. The division's approval of an application to transfer a well or other facility with which a permitted pit, below-grade tank or closed-loop system is associated shall constitute approval of the transfer of the permit for the pit, below-grade tank or closed-loop system. In all other cases, the operator and the transferee shall apply for approval to transfer the permit to the division office to which permit applications for the type of facility involved are directed.

G. Division approvals. The division shall grant or confirm any division approval authorized by a provision of 19.15.17 NMAC by written statement.

[19.15.17.16 NMAC - Rp, 19.15.2.50 NMAC, / /07]

19.15.17.17 TRANSITIONAL PROVISIONS:

A. After _____, 200_ [effective date], unlined temporary pits are prohibited.

B. An operator of an existing operation that is required to close pursuant to Paragraphs (1), (2), (3) or (4) of Subsection A of 19.15.17.13 NMAC shall submit a closure plan pursuant to Subsection C of 19.15.17.9 NMAC to the division not later than 30 days after _____, 200_ [effective date].

C. An operator of an existing lined, permitted or registered, permanent pit shall comply with the construction requirements of 19.15.17 NMAC within two years after _____, 200_ [effective date]. Prior to complying with the construction requirements of 19.15.17 NMAC, an operator of an existing lined, permitted, permanent pit shall request a modification pursuant to Subsection E of 19.15.17.16 NMAC; and an operator of an existing lined, registered, permanent pit shall apply to the division for a permit pursuant to 19.15.17 NMAC.

D. An operator of an existing below-grade tank shall comply with the permitting requirements of 19.15.17 NMAC within 90 days after _____, 200_ [effective date]. Prior to complying with the construction requirements of 19.15.17 NMAC, an operator of an existing below-grade tank shall request a permit modification pursuant to Subsection E of 19.15.17.16 NMAC.

E. An operator of an existing pit or below-grade tank permitted prior to _____, 200_, [effective date of 19.15.17 NMAC] may continue to operate in accordance with such permits or orders, subject to the following provisions.

(1) An operator of an existing lined, permitted or registered, permanent pit shall comply with the operational and closure requirements of 19.15.17 NMAC.

(2) An operator of an existing permitted or registered, temporary pit shall comply with the operational and closure requirements of 19.15.17 NMAC.

(3) An operator of an existing below-grade tank shall comply with the operational and closure requirements of 19.15.17 NMAC.

(4) The operator shall bring an existing below-grade tank that does not comply with the design and construction requirements of 19.15.17 NMAC into compliance with those requirements or close it within five years after _____, 200_ [effective date].

F. The operator may continue to operate an existing closed-loop system without applying for a permit, but the operator shall close such system in accordance with the closure requirements of 19.15.17.13 NMAC.

G. An operator of an existing sump shall comply with the operational requirements of 19.15.17 NMAC.

[19.15.17.17 NMAC - Rp, 19.15.2.50 NMAC, / /07]

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J. On-site deep trenches for closure. The operator shall design and construct an on-site deep trench for closure, specified in Paragraph (2) of Subsection B of 19.15.17.13 NMAC or Paragraph (2) of Subsection D of 19.15.17.13 NMAC, in accordance with the following requirements.

(1) The operator shall locate the trench to satisfy the siting criteria specified in Subsection C of 19.15.17.10 NMAC and Subparagraph (e) of Paragraph (2) of Subsection F of 19.15.17.13 NMAC and excavate to an appropriate depth that allows for the installation of the geomembrane bottom liner, geomembrane liner cover and the division-prescribed soil cover required pursuant to Paragraphs (2) and (3) of Subsection G of 19.15.17.13 NMAC.

(2) An on-site deep trench shall have a properly constructed foundation and side walls consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear.

(3) Geotextile is required under the liner where needed to reduce localized stress-strain or protuberances that may otherwise compromise the liner's integrity.

(4) An on-site deep trench shall be constructed with a geomembrane liner. The geomembrane shall consist of a 20-mil string reinforced LLDPE liner or equivalent liner that the appropriate division district office approves. The geomembrane liner shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. The liner material shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.

(5) The operator shall minimize liner seams and orient them up and down, not across a slope. The operator shall use factory seams where possible. The operator shall overlap liners four to six inches before seaming, and orient seams parallel to the line of maximum slope, *i.e.*, oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. Qualified personnel shall perform field seaming.

(6) The operator shall install sufficient liner material to reduce stress-strain on the liner.

(7) The operator shall ensure that the outer edges of all liners are secured for the placement of the excavated waste material into the trench.

(8) The operator shall fold the outer edges of the trench liner to overlap the waste material in the trench prior to the installation of the geomembrane cover.

(9) The operator shall install a geomembrane cover over the excavated material in the lined trench. The operator shall install the geomembrane cover in a manner that prevents the collection of infiltration water in the lined trench and on the geomembrane cover after the soil cover is in place.

(10) The geomembrane cover shall consist of a 20-mil string reinforced LLDPE liner or equivalent cover that the appropriate division district office approves. The geomembrane cover shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Cover compatibility shall comply with EPA SW-846 method 9090A.

[19.15.17.11 NMAC - Rp, 19.15.2.50 NMAC, / /07]

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F. On-site closure methods. The following closure requirements and standards apply if the operator proposes a closure method for a drying pad associated with a closed-loop system or a temporary pit pursuant to Paragraph (2) of Subsection D of 19.15.17.13 NMAC or Paragraph (2) of Subsection B of 19.15.17.13 NMAC that involves on-site deep trench burial, or an alternative closure method pursuant to Paragraph (3) of Subsection D of 19.15.17.13 NMAC or Paragraph (3) of Subsection B of 19.15.17.13 NMAC and Subsection B of 19.15.17.15 NMAC.

(1) General requirements.

(a) The operator shall demonstrate, at the time of initial application for the permit, that the site where the operator proposes to implement an on-site closure method is not located within a 100 mile radius of a division-approved facility or an out-of-state waste management facility. If the operator demonstrates that neither a division-approved facility nor an out-of-state waste management facility is available within the prescribed distance, then the operator may pursue the on-site closure method.

(b) Any proposed on-site closure method shall comply with the siting criteria specified in Subsection C of 19.15.17.10 NMAC.

(c) The operator shall obtain the surface owner's written consent to the operator's proposal of an on-site closure method. The operator shall attach the original, signed consent to the permit application.

(d) The operator shall comply with the closure requirements and standards of Paragraph (2) of Subsection F of 19.15.17.13 NMAC if the proposed closure method for a drying pad associated with a closed-loop system or a temporary pit pursuant to Paragraph (2) of Subsection D of 19.15.17.13 NMAC or Paragraph (2) of Subsection B of 19.15.17.13 NMAC involves on-site deep trench burial, or an alternative closure method pursuant to Paragraph (3) of Subsection D of 19.15.17.13 NMAC or Paragraph (3) of Subsection B of 19.15.17.13 NMAC and Subsection B of 19.15.17.15 NMAC.

(e) The operator shall test the soils beneath the drying pad associated with a closed-loop system or temporary pit after excavation to determine whether a release has occurred. The operator shall collect, at a minimum, a five point, composite sample; collect individual grab samples from any hot spot; and analyze for BTEX, TPH and chlorides to demonstrate that the benzene concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 0.2 mg/kg; total BTEX concentration, as determined by EPA SW-846 methods 8021B or 8260B or other EPA method that the division approves, does not exceed 50 mg/kg; the TPH concentration, as determined by EPA method 418.1 or other EPA method that the division approves, does not exceed 100 mg/kg; and the chloride concentration, as determined by EPA method 300.1 or other EPA method that the division approves, does not exceed 250 mg/kg, or the background concentration, whichever is greater. The operator shall notify the division of its results on form C-141. The division may require additional delineation upon review of the results.

(f) If the sampling program demonstrates that a release has not occurred or that any release does not exceed the concentrations specified in Subparagraph (e) of Paragraph (1) of Subsection F of 19.15.17.13 NMAC, then the operator shall backfill the excavation with compacted, non-waste containing earthen material; construct a division-prescribed soil cover; and re-vegetate the site. The division-prescribed soil cover and re-vegetation shall comply with Paragraphs (1) and (3) of Subsection G of 19.15.17.13 NMAC and Subsection H of 19.15.17.13 NMAC.

(g) If the operator or the division determines that a release has occurred, then the operator shall comply with 19.15.3.116 NMAC and 19.15.1.19 NMAC, as appropriate.

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(2) On-site deep trench burial.

(a) The operator shall demonstrate and comply with the provisions of Paragraph (1) of Subsection F of 19.15.17.13 NMAC.

(b) The operator shall use a separate on-site deep trench for closure of each drying pad associated with a closed-loop system or temporary pit.

(c) Unless the contents of the drying pad associated with a closed-loop system or temporary pit and associated waste meet the closure standards of Subparagraph (d) of Paragraph (2) of Subsection F of 19.15.17.13 NMAC, the operator shall propose a method to treat the contents and associated waste. Any proposed treatment method shall optimize waste minimization and reduce contaminant concentrations in order to protect fresh water, public health and the environment. Proposed treatment methods shall stabilize or solidify the contents to a bearing capacity sufficient to support the final cover.

(d) The operator shall collect at a minimum, a five point, composite sample of the contents of the drying pad associated with a closed-loop system or temporary pit after treatment, if treatment is required, to demonstrate that the TPH concentration, as determined by EPA method 418.1 or other EPA method that the division approves, does not exceed 2500 mg/kg. Using EPA SW-846 method 1312 or other EPA leaching procedure that the division approves, the operator shall demonstrate that the chloride concentration, as determined by EPA method 300.1 or other EPA method that the division approves, does not exceed 5,000 mg/l and that the concentrations of the water contaminants specified in Subsections A and B of 20.6.2.3103 NMAC as determined by appropriate EPA methods do not exceed the standards specified in Subsections A and B of 20.6.2.3103 NMAC, unless otherwise specified above.

(e) The operator shall construct a trench lined with a geomembrane liner located within 100 feet of the drying pad associated with a closed-loop system or temporary pit, unless the appropriate division district office approves an alternative distance and location. The operator shall design

and construct the lined trench in accordance with the design and construction requirements specified in Paragraphs (1) through (8) of Subsection J of 19.15.17.11 NMAC.

(f) The operator shall close each drying pad associated with a closed-loop system or temporary pit by excavating and transferring all contents and synthetic pit liners or liner material associated with a closed-loop system or temporary pit to a lined trench. The excavated materials shall pass the paint filter liquids test (EPA SW-846, method 9095) and the closure standards specified in Subparagraph (d) of Paragraph (2) of Subsection F of 19.15.17.13 NMAC.

(g) If the operator or the division determines that a release has occurred, then the operator shall comply with 19.15.3.116 NMAC and 19.15.1.19 NMAC, as appropriate. The operator may propose to transfer the excavated, contaminated soil into the lined trench.

(h) The operator shall install a geomembrane cover over the excavated material in the lined trench. The operator shall design and construct the geomembrane cover in accordance with the requirements specified in Paragraphs (9) and (10) of Subsection J of 19.15.17.11 NMAC.

(i) The operator shall cover the geomembrane lined and covered, filled, deep trench with compacted, non-waste containing, earthen material; construct a division-prescribed soil cover; and re-vegetate the site. The division-prescribed soil cover and re-vegetation shall comply with Paragraphs (2) and (3) of Subsection G of 19.15.17.13 NMAC and Subsection H of 19.15.17.13 NMAC.

ATTACHMENT 5

Resume
I. Keith Gordon, P.E.

I. KEITH GORDON, P.E.

Principal

Gordon Environmental, Inc.
Consulting Engineers

Fields of Expertise

Environmental and Geotechnical Engineering;
Waste Facility Siting, Design, and Permitting;
Transfer Stations and Materials Recovery Facilities;
Regulatory Compliance and Litigation Support.

Registrations Professional Engineer: AR, AZ, CA, CO, IA, ID, IL, IN, KS, MI, MN, MO, MT, NC, NE, NM, NV, OH, OK, PA, TN, TX, UT, WI, WY

Certifications

OSHA Supervisor's Health & Safety Training
NICET Geosynthetics
National Council of Engineering Examiners
SWANA Certified Solid Waste Facility Manager

Education

BS Civil Engineering (Geotechnical)
Northwestern University, 1977

Professional Summary

Mr. Gordon serves as Principal Engineer and President for Gordon Environmental, Inc. (GEI). He has over 30 years of engineering experience in the planning, design and execution of complex environmental projects. Many of Mr. Gordon's projects are solid, hazardous and radioactive waste management facilities, including landfills, transfer stations, and materials recovery facilities (MRFs); as well as landfill gas control/recovery systems. Successful implementation of these projects routinely involves compliance with an array of regulatory requirements. Mr. Gordon has extensive project experience with USEPA RCRA Subtitle C (Hazardous) and Subtitle D (Solid) Waste Programs; Federal (CERCLA) and State Superfund remediations; and local siting/zoning approvals. He regularly provides expert witness testimony at public hearings and in legal proceedings. Mr. Gordon was appointed to the Technical Advisory Committee providing assistance to USEPA on national solid waste facility siting issues; and was retained as editor for EPA's *"Solid Waste Transfer Stations: A Manual for Decision Making"*.

Professional Affiliations

Solid Waste Association of North America (SWANA)
- Certification Board, Vice Chairman
- Training Committee

National Solid Waste Mgmt. Assoc. (NSWMA) Bd. Of Gov.
American Society of Civil Engineers (ASCE)
NM Society of Professional Engineers (NMSPE)
National Society of Professional Engineers (NSPE)

Select Project Experience

New regulations resulted in the development of regional solid waste management strategies throughout NM. Mr. Gordon served as Project Manager and Engineer-of-Record for:

- Site confirmation and permitting for 12 of the new regional "Subtitle D" landfills.
- The design and construction quality assurance for 40 landfill cells comprising > 500 acres.
- The closure of 12 landfills that could not be upgraded.
- The development of six new transfer stations/MRFs, including the largest transfer station in the state.
- Initial design/upgrades for 10 convenience centers.

The Camino Real Landfill is a full-service 3000 tons/day disposal facility serving El Paso and south central New Mexico. Mr. Gordon supervised the redesign of the facility in order to comply with new state and federal landfill standards. Permits were issued and subsequent tasks have involved permit renewal, certification of 15 constructed liner segments, and permitting/installation of a LFG collection and control system. In 1997, Mr. Gordon and Camino Real were awarded SWANA's Gold Medal for Landfill Excellence.

DOE's Waste Isolation Pilot Plant (WIPP) in Carlsbad, NM disposes of containerized "mixed waste" in a salt tunnel 2150' below ground surface. Mixed waste is classified as containing both hazardous (RCRA Subtitle C) and radioactive waste. WIPP manages defense program legacy residuals that meet this description. Mr. Gordon is the senior review engineer and lead technical expert for:

- NMED (RCRA) and USEPA permitting of the Panel Closure System design.
- Design of Salt Infiltration Controls; 45 acres of geosynthetic containment systems.
- Assistance with permitting for "RH" wastes.

The Circuit Court had determined that DuPage County, IL was not authorized to operate two existing landfills on Forest Preserve property. Mr. Gordon was retained as principal consultant and expert witness to evaluate the economic and environmental impact on the County should the two facilities be closed immediately. The case was favorably resolved such that the facilities were allowed to continue operations.

He has managed several projects for Venezuela's oil and petrochemical industries. Examples include: secure hazardous waste disposal facility design with geosynthetic envelope; land application of refinery by-products; and gypsum waste management systems.

Mr. Gordon routinely provides construction quality assurance for soil/geosynthetic liner systems for solid and hazardous waste disposal facilities. He has certified over 60 lined cells in 8 states comprising 1000 acres.

I. KEITH GORDON, P.E.

Principal

Select Project Experience (cont.)

For Sandoval County, NM (where he resides) Mr. Gordon has been the environmental consultant since 1998. GEI obtained approvals for a 20-yr landfill expansion and a 50 tpd containerized composting system. GEI has also assisted the County with upgrades to its recycling program, contaminated site reclamation, and stormwater compliance at its four transfer stations.

GEI has been selected as the solid waste consultant for the City of Albuquerque since 1998. Mr. Gordon, as Project Director, supervised:

- The re-design and permitting of the 867-acre landfill with 50 years of projected capacity.
- CQA for 40 acres of new cell footprint.
- Upgrades and extensions to the LFG control system.
- Permitting and design input for 2 transfer stations.
- Feasibility analyses for centralized transfer station/MRF.

Mr. Gordon served as principle investigator and expert witness for potentially responsible parties (PRPs) in CERCLA litigation for the Oswald-Dorney Landfill in Allentown, PA. He was responsible for waste allocation formulae, and established the impacts of MSW co-disposal with industrial waste. Mr. Gordon performed similar services for ten other sites in NJ, PA, OH, NY, TX, WI, and IL.

Doña Ana County, New Mexico planned to implement a regional integrated waste management strategy. Mr. Gordon supervised the design, groundwater modeling, and liner CQA for the new Corralitos Regional Landfill. He was also responsible for the design, permitting, and public hearing for the 750 TPD South Central Solid Waste Transfer Station and Recycling Facility. The largest transfer operation in NM won SWANA's bronze medal in 1998.

Lea County, New Mexico (Hobbs) was facing the closure of all MSW disposal sites in the County. Mr. Gordon directed the site characterization and design for the new greenfield regional landfill. The Lea County Landfill has a projected lifespan of over 75 years, and was developed from concept to opening, under budget, in less than two years. Mr. Gordon was responsible for design, permitting, CQA, and construction management of the $2.6 million dollar infrastructure. GEI was then retained by the County to plan four new satellite transfer facilities, and to provide engineering support for the next four landfill cells.

Waste Control Specialist (WCS) operates a hazardous waste processing and disposal facility in Andrews County, Texas. Mr. Gordon has served as Project Manager for:

- License Application for Texas Low-Level Radioactive Waste Compact site.
- Proposal to the United States Enrichment Corporation to site the $2 billion AVLIS nuclear enrichment plant.
- CQA for double composite (RCRA Subtitle C) liners.
- Engineering support with regard to design, operations waste processing, regulatory compliance, etc.

Publications/Presentations

- He is the Technical Editor for USEPA's *"Solid Waste Transfer Stations: A Manual for Decision Making"* (EPA 530-D-01-001) commissioned by the National Environmental Justice Advisory Council (NEJAC).
- Mr. Gordon served as Project Director and Principal Author for *"Solid Waste Transfer in Illinois: A Citizen's Handbook for Planning, Siting, and Technology" (1998).* This 60-page document was commissioned by DuPage County as a public education document.
- As Project Manager, he supervised the preparation of the solid waste "Transfer Station Design Guide" for Waste Management; and a similar manual for Allied Waste.
- Mr. Gordon is Editor-in-Chief and senior trainer for SWANA's Transfer Station Management Course.
- He is chairman of the Facilities Working Group, assisting the N.M. Environment Department in updating the state-wide Solid Waste Plan.
- As Project Director and Principal Author, Mr. Gordon was responsible for a two-volume publication (360 pages) commissioned by the University of Illinois, *"Municipal Solid Waste Landfills in Illinois".*

Mr. Gordon has appeared as a guest lecturer and technical trainer for a variety of technical symposia, regulatory information programs, and community forums, and is an advisor to several state compliance programs:

- Landfill Design & Operations, LFG Control/Recovery
  - Illinois Municipal League
  - Illinois DENR
  - NM Environment Dept.
  - Illinois EPA
  - Gas Research Institute
  - SWANA
  - NSWMA
  - Minnesota PCA
  - Michigan DNR
  - Iowa DENR
- Transfer Station and Material Recovery Facilities
  - NM Environment Dept.
  - IL Recycl. Assoc.
  - Waste Equip/Recycl. Expo
  - SWANA
  - US Conf. of Mayors
  - USEPA
  - Iowa DNR
  - Eng. Soc. Detroit
  - Chicago Dept. of Env.
  - CA Indian M.P.B.

Awards

- SWANA Gold Medal-Landfill Excellence 1986: Miller Road Landfill, Saginaw, MI.
- SWANA Gold Medal-Landfill Excellence 1997: Camino Real Landfill, Sunland Park, NM (El Paso).
- SWANA Bronze Medal-Transfer Station Excellence 1998: South Central Transfer/MRF, Las Cruces, NM.
- SWANA Silver Medal-Landfill Excellence 2000: Cerro Colorado Landfill, Albuquerque, NM.