May 4, 2006

FACT SHEET

EPA is proposing to approve a reissuance of an exemption to the land disposal restrictions for the following injection well facility:

Applicant: MERISOL USA LLC
Greens Bayou Plant
1914 Haden Road
Houston, TX 77015

Permit Numbers: WDW-147
WDW-319

Issuing Office: U.S. Environmental Protection Agency
Region 6
Fountain Place
1445 Ross Avenue
Dallas, TX 75202-2733

Decision

The Environmental Protection Agency (EPA) proposes to approve the MERISOL USA LLC (MERISOL) reissuance request for the following:

1. Re-approve injection well WDW-147 for injection into the Frio A/B/C and Frio E-F Injection Intervals.

2. Redefine the injection interval and injection zone to the following correlative depths in each well:

Well	Injection Zone Depth	Injection Interval Depths (feet) Frio E-F Sand	Frio A/B/C Sands
WDW-147	5135' - 7410'	6564' - 6816'	6826' - 7286'
WDW-319	5134' - 7410'	6580' - 6821'	6830' - 7290'

(WDW-147 depths referenced to 8/27/78 ISF/Sonic Log)
(WDW-319 depths referenced to 8/31/2000 Induction Log)

3. Request a three-whole month volume weighted average specific gravity range of 1.000 to 1.200 at 20 °C/20 °C.

4. Increase the monthly injection volumes average based on the following maximum cumulative injection rates per interval:
Frio E-F: 750 gpm
Frio A/B/C: 750 gpm

Limit the cumulative injection volume of waste with a volume weighted monthly average specific gravity less than 1.091 at 20 °C/20 °C to 3.945 billion gallons. This volume will be tracked by MERISOL and reported annually to EPA Region 6.

5. Extend the operational life from December 31, 2010, to December 31, 2020.

6. Expand the list of exempted waste codes

7. Revise the limiting concentration reduction factor from $1x10^{-8}$ to $1x10^{-12}$.

The following explains the derivation of the proposed decision, which is categorized according to the criteria outlined in 40 CFR Part 148. [53 Fed. Reg., 28118, (7/26/88)]

Summary

The EPA land disposal restrictions promulgated under Section 3004 of the Resource Conservation and Recovery Act prohibit the injection of hazardous waste unless a petitioner demonstrates to the EPA that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. These no migration demonstrations must meet the regulatory standards promulgated in 40 CFR 148 Subpart C. MERISOL successfully demonstrated no migration for injection into the Frio sands for injection well WDW-147 at the Greens Bayou plant effective December 2, 1994. MERISOL received approval for nonsubstantive revisions on September 3, 1997, and August 16, 2000. Effective December 27, 2000. EPA approved a reissuance of the no migration exemption to include well WDW-319, that was drilled and completed into the Frio A-B and Frio C sands in September 2000. However, the December 2000 final decision terminated the exemption for the existing well, WDW-147, for lack of a mechanical integrity test demonstration. A nonsubstantive revision to the 2000 no migration exemption reissuance was approved on November 18, 2003. MERISOL also received a temporary emergency wastestream density variance to the no migration exemption on June 11, 2001, to handle the heavy rainfall from a tropical storm.

The regulations contained in 40 CFR §148.20(e) allow for reissuance of an approved petition if the reissuance also meets the no migration criteria. MERISOL demonstrated reauthorizing WDW-147, expanding the injection zone, redefining the correlative injection interval depths, revising the three-month volume weighted specific gravity range, increasing the injection volumes based on a cumulative injection per interval and limiting the buoyant waste volume, extending the operational life, expanding the list of exempted waste codes, and revising the limiting concentration reduction factor complied with the requirements of 40 CFR Part 148.

In accordance with 40 CFR §148.22(a)(4), MERISOL submitted a signed certification statement from an authorized representative verifying that all submitted materials are true, accurate, and complete.

In addition to the reasonably conservative data and assumptions used in the no migration petition reissuance, the demonstration is even more conservative as it excludes degradation of the hazardous constituents in the injection zone. Examples of degradation which were not considered in the no migration demonstration are adsorption, oxidation, hydrolysis, temperature, and microbiological degradation.

Therefore, after a detailed and thorough review of MERISOL's petition for reissuance of the exemption, the EPA proposes that MERISOL has demonstrated, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. This time period is defined by 40 CFR §148.20 as 10,000 years.

The factors considered in the formulation of this proposed petition decision are described below.

Hydrogeology

According to 40 CFR §148.20(a), a petitioner must submit hydrogeologic information in order to study the effects of the injection well activity. MERISOL provided hydrogeologic information in the petition which demonstrates that Underground Sources of Drinking Water (USDW) are properly protected. The base of the lowermost USDW is at approximately 3070 feet below mean sea level at the facility.

Artificial Penetrations

MERISOL submitted updated information on all artificial penetrations (wells) which penetrated the injection or confining zones within the area of review (area within a 2.0 mile radius of the injection well - 40 CFR §146.63) and the 10,000 year waste plume boundary. MERISOL actually submitted information on all artificial penetrations within a 2.5 mile radius of the injection wells which complies with Texas Commission on Environmental Quality's area of review permit requirement for Class I wells. All of these wells were evaluated and are plugged or constructed so that no waste would migrate from the injection zone due to pressure, buoyancy, or molecular diffusion in an artificial penetration. [40 CFR §§148.20(a)(1) & (2)(i)-(iii)]

Mechanical Integrity Testing (MIT) Information

To assure that the wastes will reach the injection interval, a petitioner must submit the results of pressure and radioactive tracer tests according to 40 CFR §148.20(a)(2)(iv). These tests demonstrate mechanical integrity of a well's long string casing, injection tubing, annular seal, and bottom hole cement. The tests confirm that all injected fluids are entering the approved injection interval and that no fluids are channeling up the wellbore out of the injection zone near the wellbore. This petition for reissuance request demonstrates that Merisol's disposal wells were tested and satisfy the above criteria:

Well Number	Pressure Test	Radioactive Tracer Survey
WDW-147	8/20/05	8/20/05
WDW-319	8/19/05	8/19/05

Regional and Local Geology

Class I hazardous waste injection wells must be located in areas that are geologically suitable. The injection zone must have sufficient permeability, porosity, thickness, and areal extent to prevent migration of fluids into USDWs. The confining zone must be laterally continuous and free of transmissive faults or fractures to prevent the movement of fluids into a USDW and must contain at least one formation capable of preventing vertical propagation of fractures. The MERISOL facility is sited in an area meeting these geologic criteria.

An evaluation of the structural and stratigraphic geology of the local and regional area determined that the MERISOL facility is located at a geologically suitable site. The injection zone is of sufficient permeability, porosity, thickness, and areal extent to meet requirements stated in 40 CFR Part 148. The containment interval is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent the movement of fluids out of the injection zone.

The geologic conditions for the MERISOL site were presented throughout the entire document with extensive discussions of the depositional environments, well logs, cross-sections, well tests, and geologic maps. The geologic cross-sections demonstrated the lateral relationships of the injection and confining zones. This information justified pressure buildup and 10,000 year modeling assumptions. Well pressure falloff tests support the injection zone permeability values used in the modeling.

Approximate depths to the tops of the geologic zones are as follows:

Geologic Zone	WDW-147	WDW-319
Confining Zone:	4760 - 5135 feet	4758 - 5134 feet
Injection Zone:	5135 - 7410 feet	5134 - 7410 feet
Injection Intervals: Frio E-F	6564 - 6816 feet	6580 - 6821 feet
Frio A/B/C	6826 - 7286 feet	6830 - 7290 feet

All WDW-147 depths referenced to the 8/27/1978 Schlumberger ISF/Sonic Log for the well
All WDW-319 depths referenced to the 8/31/2000 Baker Atlas Induction Log for the well

Modeling Strategy

According to 40 CFR §148.21(a)(3), in demonstrating no migration of hazardous constituents from the injection zone, predictive models shall have been verified and validated, shall be appropriate for the specific site, waste streams, and injection conditions of the operation, and shall be calibrated for existing sites. The modeling strategy for Merisol's no migration demonstration consisted of a combination of numerical and analytical models. All the models used were identified as being verified and validated according to the information submitted in the petition for reissuance request. This information consisted of actual model documentation or references of methods or techniques that are widely accepted by the technical community. The petition reissuance document described the predictive models used and demonstrated that the above criteria are met.

According to 40 CFR §148.21(a)(5), reasonably conservative values shall be used whenever values taken from the literature or estimated on the basis of known information are used instead of site-specific measurements. Many variables were required to be quantified in order to use the models used in the petition for reissuance request. All parameters were conservatively assigned to produce worst case conditions for pressure buildup and waste movement.

According to 40 CFR §148.21(a)(6), a petitioner must perform a sensitivity analysis in order to determine the effect of uncertainties associated with model parameters. MERISOL provided this sensitivity analysis in its petition for reissuance request. Through conservative model parameter assignments within this analysis, worst case scenarios for pressure buildup and waste movement were investigated and reported.

MERISOL incorporated two timeframes, the operational and post-operational periods, to complete the modeling demonstration for the petition reissuance request. The operational period included all historical injection and the maximum future injection volumes starting from the end of the historical injection through December 31, 2020, to predict the maximum pressure buildup in each injection interval. The 10,000 year post injection period was modeled to predict the maximum vertical molecular diffusion and the horizontal drift of the waste plumes.

To determine appropriate values to be used in the no migration demonstration, MERISOL reviewed site specific data acquired during the drilling of WDW-147 and WDW-319, annual welltests, and mechanical integrity tests. MERISOL also reviewed offset well information and applicable literature. Appropriate estimation techniques and testing protocols were used in accordance with 40 CFR §148.21(a)(2). A range was assigned to some parameters to maximize their impact on the demonstration. For example, higher permeabilities were assigned to maximize the lateral waste plume movement while lower permeabilities were assigned to maximize the predicted pressure buildup from injection operations in both injection intervals. The Clinton Dome structure located approximately 5 miles northwest of the facility was treated as a sealed boundary for the pressure buildup modeling. The Renee-Lynchburg Field faults located approximately 3000 feet southeast of the facility were modeled as sealing and also modeled as fully transmissive to conservatively address all potential impact on the injection operations.

The pressure buildup demonstration used lower transmissibility values to over-predict well pressures in comparison to historical static and flowing pressure measurements obtained from falloff tests conducted in WDW-147 and WDW-319. The maximum future injection rates were then injected following the historical injection to maximize the predicted pressure buildup in the reservoir.

A conservative 10,000 year plume demonstration was constructed using worst-case reservoir characteristics for each injection interval to project the maximum movement of both the low and high density waste plumes. To maximize plume movement, these demonstrations included thinner net thickness, conservative dip rates, all historical and maximum future injection

volumes, and higher mobilities based on historical pressure transient test results. The low density plume used the low-end of the requested density range and did not include a background gradient to maximize the updip plume movement. The higher density waste stream was modeled using a 1.6 ft/year background gradient to maximize the downdip movement of the waste plume.

A vertical diffusion demonstration was included in this petition for reissuance request that calculated the maximum vertical movement into intact strata and a mud-filled wellbore. The demonstrations (lateral plume and diffusion) demonstrated that the injected waste stream for each interval will not migrate vertically upward out of the injection zone or laterally within the injection zones to a point of discharge or interface with a USDW.

Quality Assurance

According to 40 CFR §148.21(a)(4), the MERISOL petition must demonstrate that proper quality assurance and quality control plans were followed in preparing the petition demonstrations. Specifically, MERISOL followed appropriate protocol in identifying and locating records for artificial penetrations within the area of review (AOR). Information regarding the geology, waste characterization [40 CFR §148.21(a)(1)], hydrogeology, reservoir modeling, and well construction was adequately verified or bounded by worst-case scenarios within the no migration petition reissuance demonstration.

Geochemistry and Injected Waste Compatibility

According to 40 CFR §148.21(b)(5), a petitioner must describe the geochemical conditions of the well site. The physical and chemical characteristics of the injection zone and the formation fluids in the injection zone were described in the petition. This description included a discussion of the compatibility of the injected waste with the injection zone. MERISOL also provided evaluations which demonstrated that the waste stream would not adversely alter the confining capabilities of the injection and confining zones.

Characteristics of Injected Fluids

According to 40 CFR §148.22(a), the characteristics of the injection waste stream must be adequately described. These characteristics are described in the initial petition and petition reissuance and the descriptions are adequate and complete. The demonstration included injectate waste analysis that conformed to the standards outlined in 40 CFR §148.21(a)(1).

Results

1. Operational Life

   End of Operational Life: December 31, 2020

   Maximum Incremental Pressure Buildup:

   Frio E and F: 354 psi (3,173 psi at 6,564 feet reference depth)

   Frio A/B/C: 365 psi (3,319 psi at 6,836 feet reference depth)

2. 10,000 Year Post-Injection Period:

   Background Gradient: 0 ft/yr updip and 1.6 ft/yr downdip

Waste Density Effects Considered: Yes
Movement Due to Hydrocarbon Production: No
Waste Concentration Reduction Factor: $1x10^{-12}$
Maximum Lateral Waste Movement:
Light Plume:

Volumetrically contained by Clinton Dome structure located approximately 5 miles northwest of the plant. Maximum lateral extent approximately 34,750 feet (6.6 miles) updip in a northwest direction from the plant

Heavy Plume:

Approximately 20,000 feet (3.8 miles) downdip in a southwest direction from the plant

Maximum Vertical Waste Movement:

Approximately 334 feet through shale and 1087 feet in a mud-filled borehole.

Proposed Petition Approval Conditions

This proposed petition for reissuance of exemption approval to allow the continued injection of restricted hazardous wastes is subject to the following conditions, which are necessary to assure that the standard in 40 CFR §148.20(a) is met. The proposed petition for reissuance of exemption approval conditions were revised to reflect the changes represented by this 2006 reissuance. Changes in the proposed petition conditions are identified by the underlined portions of the following conditions. Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR §148.24(a)(1). This proposed reissued exemption is applicable to the two existing injection wells, WDW-147 and WDW-319, located at the MERISOL, Greens Bayou Plant in Houston, Texas.

1. Injection of restricted waste shall be limited to the following injection zones:

Well	Depth of Injection Zone
WDW-147	5135' - 7410' KB 8/27/78 ISF/Sonic Log
WDW-319	5134' - 7410' KB 8/31/2000 Induction Log

The injection interval shall be defined by the following correlative log depths:

Well	Injection Interval	Depth of Injection Interval
WDW-147	Frio E-F Sand	6564' - 6816' KB
	Frio A/B/C Sands	6826' - 7286' KB
	(Depths referenced to WDW-147 8/27/78 ISF/Sonic Log)	
WDW-319	Frio E-F Sand	6580' - 6821' KB
	Frio A/B/C Sands	6830' - 7290' KB
	(Depths referenced to WDW-319 8/31/2000 Induction Log)	

2. The volume injected into each injection interval during any given month shall not exceed that calculated by multiplying (injection rate, gpm)(1440 minutes/day)(number of days in that month) based on the following maximum cumulative rate limits:

Injection Interval	Maximum Cumulative Injection Rate
Frio E-F sands	750 gpm
Commingled Frio A/B/C sands	750 gpm

Additionally, the cumulative injection volume of waste with a volume weighted monthly average specific gravity less than 1.091 at 20 °C/20 °C is limited to 3.945 billion gallons. This volume will be tracked by MERISOL and reported annually to EPA Region 6.

3. The facility shall cease injection by December 31, 2020.

4. The characteristics of the injected waste stream shall at all times conform to those described in the 2000 request for petition reissuance. The specific gravity of the injected waste shall be based on a three-whole calendar month volume weighted average specific gravity range of 1.000 to 1.200 at 20 °C/60 °C. The three-month average shall be calculated by multiplying each day's specific gravity value by that day's injected volume, totaling those values for the previous three-whole calendar month period, and dividing by that three-month injected volume. Each day's specific gravity value shall be obtained by at least one representative grab sample.

5. The proposed approval for injection is limited to the following hazardous wastes:
D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043

F001, F002, F003, F004, F005, F006, F007, F008, F009, F010, F011, F012, F019, F020, F021, F022, F023, F024, F025, F026, F027, F028, F032, F034, F035, F037, F038, F039

K001, K002, K003, K004, K005, K006, K007, K008, K009, K010, K011, K013, K014, K015, K016, K017, K018, K019, K020, K021, K022, K023, K024, K025, K026, K027, K028, K029, K030, K031, K032, K033, K034, K035, K036, K037, K038, K039, K040, K041, K042, K043, K044, K045, K046, K047, K048, K049, K050, K051, K052, K060, K061, K062, K069, K071, K073, K083, K084, K085, K086, K087, K088, K093, K094, K095, K096, K097, K098, K099, K100, K101, K102, K103, K104, K105, K106, K107, K108, K109, K110, K111, K112, K113, K114, K115, K116, K117, K118, K123, K124, K125, K126, K131, K132, K136, K141, K142, K143, K144, K145, K147, K148, K149, K150, K151, K156, K157, K158, K159, K161, K169, K170, K171, K172, K174, K175, K176, K177, K178, K181

P001, P002, P003, P004, P005, P006, P007, P008, P009, P010, P011, P012, P013, P014, P015, P016, P017, P018, P020, P021, P022, P023, P024, P026, P027, P028, P029, P030, P031, P033, P034, P036, P037, P038, P039, P040, P041, P042, P043, P044, P045, P046, P047, P048, P049, P050, P051, P054, P056, P057, P058, P059, P060, P062, P063, P064,

P065, P066, P067, P068, P069, P070, P071, P072, P073, P074, P075, P076, P077, P078, P081, P082, P084, P085, P087, P088, P089, P092, P093, P094, P095, P096, P097, P098, P099, P101, P102, P103, P104, P105, P106, P108, P109, P110, P111, P112, P113, P114, P115, P116, P118, P119, P120, P121, P122, P123, P127, P128, P185, P188, P189, P190, P191, P192, P194, P196, P197, P198, P199, P201, P202, P203, P204, P205

U001, U002, U003, U004, U005, U006, U007, U008, U009, U010, U011, U012, U014, U015, U016, U017, U018, U019, U020, U021, U022, U023, U024, U025, U026, U027, U028, U029, U030, U031, U032, U033, U034, U035, U036, U037, U038, U039, U041, U042, U043, U044, U045, U046, U047, U048, U049, U050, U051, U052, U053, U055, U056, U057, U058, U059, U060, U061, U062, U063, U064, U066, U067, U068, U069, U070, U071, U072, U073, U074, U075, U076, U077, U078, U079, U080, U081, U082, U083, U084, U085, U086, U087, U088, U089, U090, U091, U092, U093, U094, U095, U096, U097, U098, U099, U101, U102, U103, U105, U106, U107, U108, U109, U110, U111, U112, U113, U114, U115, U116, U117, U118, U119, U120, U121, U122, U123, U124, U125, U126, U127, U128, U129, U130, U131, U132, U133, U134, U135, U136, U137, U138, U140, U141, U142, U143, U144, U145, U146, U147, U148, U149, U150, U151, U152, U153, U154, U155, U156, U157, U158, U159, U160, U161, U162, U163, U164, U165, U166, U167, U168, U169, U170, U171, U172, U173, U174, U176, U177, U178, U179, U180, U181, U182, U183, U184, U185, U186, U187, U188, U189, U190, U191, U192, U193, U194, U196, U197, U200, U201, U202, U203, U204, U205, U206, U207, U208, U209, U210, U211, U213, U214, U215, U216, U217, U218, U219, U220, U221, U222, U223, U225, U226, U227, U228, U234, U235, U236, U237, U238, U239, U240, U243, U244, U246, U247, U248, U249, U271, U278, U279, U280, U328, U353, U359, U364, U367, U372, U373, U387, U389, U394, U395, U404, U409, U410, U411

6. The facility must petition for approval to inject additional hazardous wastes which are not included in Condition No. 5, above. The facility must also petition for approval to increase the concentration of any waste which would necessitate the recalculation of the limiting concentration reduction factor and the extent of the waste plume. Petition modifications and reissuance should be made pursuant to §148.20 (e) or (f).

7. MERISOL shall annually submit to EPA the results of a bottom hole pressure survey for WDW-147 and WDW-319. Each survey shall be performed after shutting in the well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with §146.68(e)(1). The annual report should include a comparison of reservoir parameters determined from the falloff test with parameters used in the approved no migration petition.

8. Upon the expiration, cancellation, reissuance, or modification of the Texas Commission on Environmental Quality's Underground Injection Control permit for Well Nos. WDW-147 and WDW-319, this exemption is subject to review. A new demonstration may be

required if information shows that the basis for granting the exemption is no longer valid under 40 CFR §148.23 and §148.24.

In addition to the above conditions, this proposed petition for reissuance of exemption approval is contingent on the validity of the information submitted in the MERISOL reissuance request for an exemption to the land disposal restrictions. Any final reissuance decision is subject to termination when any of the conditions occur which are listed in 40 CFR §148.24, including noncompliance, misrepresentation of relevant facts, or a determination that new information shows that the basis for approval is no longer valid.