

December 6, 2013

**MEMORANDUM**

To: Chas Ariss, Wastewater Program Manager  
Erick Neher, Idaho Falls Regional Administrator  
Greg Eager, Idaho Falls Engineering Manager

From: Mazzone, DEQ Idaho Falls

Re: Reuse Permit M-057-04, Mack's Inn municipal wastewater treatment facility, Staff Analysis supporting reuse permit renewal.

**Executive Summary**

Mack's Inn is a Class 1 municipal wastewater treatment facility which reused an average of 38.29 million gallons annually during the last four years: 26.35 MG to 58 acres during the growing season and 11.94 MG to 12 acres during the non-growing season.

The facility is currently undergoing a 50 acre growing season expansion to meet future needs. The expansion is included in this permit under identical requirements for the existing acreage.

Inspections and annual reports during this permit cycle have shown substantial permit compliance. High inflow in 2011 was caused by a landowner who uncovered and broke inlets to a manhole during the winter, causing large inflow at spring melt off. The facility notified the DEQ when they located the problem, along with the resultant over capacity expected in the lagoons and the need to land apply the excess wastewater.

The DEQ recommends this routine permit renewal with a permit period of 10 years based on superior facility management, substantial permit compliance, and the expansion's ability to supply the requirements for future community growth.

**Introduction**

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 for issuing Wastewater Reuse permits. It briefly states the principal facts and significant questions considered in preparing the draft permit and provides a summary of the basis for the draft permit conditions.

The current permit, LA-000057-03, was issued February 24, 2009, and expires on February 24, 2014. In 2013 the facility initiated a 50 acre growing season expansion which will not be completed prior to issuance of the renewed permit.

The facility submitted the permit renewal technical report, including the facility expansion, received by the DEQ on January 16, 2013. The DEQ decided to delay a permit modification and roll the expansion into the permit renewal based on the timeline for expansion completion. The pre-application meeting was held during the facility inspection on September 19, 2013. The application was determined to be complete on October 23, 2013.

## 1. Site Location and Ownership

Site location and ownership are given in detail on the draft permit and the facility permit application (JUB Engineers, Inc., 2013). Appendix 1 of this analysis is a site map.

Location: Approximately 1 mile northeast of Mack's Inn. Township 14N, Ranges 43E, Section 25, and 44E, Section 30. The area is covered by the USGS *Big Springs, Idaho* quadrangle.

The entire treatment site is USDA Forest Service land, with site usage granted to Fremont County through a Term Special Use Permit which was renewed in 2013 and carries a 20 year term.

The facility is managed by Fremont County; the responsible official is the chairman of the Fremont County Commissioners.

## 2. Process Description

A detailed process description is located in the permit application, page 4(JUB Engineers, Inc., 2013).

Influent to this facility has averaged 31 million gallons over the last 4 years and is delivered to the facility via two lift stations.

Wastewater is screened and treated to secondary standards via two aerated lagoons and a facultative lagoon. A fourth lagoon serves as storage.

Growing season slow rate application occurs on two hydraulic management units: 1) a 58 acre forested site via fixed irrigation lines, and 2) a recently constructed fifty acre native vegetation site via two pivot sprinklers. Growing season reuse volumes have averaged 26.35 million gallons over the last four years.

Non-growing season application occurs on 12 acres via two snowfluent towers (snow making). Non-growing season reuse volumes have averaged 11.94 million gallons over the last four years.

The facility also utilizes an evaporator between two lagoons. The evaporator is wind speed, wind vector, and growing season limited. Wastewater which does not evaporate falls back to lagoons for containment. The last four years averaged 5.98 gallons of wastewater to the evaporator; actual evaporated volume is unknown. Evaporation efficiency is difficult to quantify due to dynamic meteorological conditions and difficult measurement techniques, but the facility estimates 25 percent to 50 percent efficiency, for a range of 1.5 to 3 MG evaporated per year. However, the evaporator is permit limited by allowable months of operation, and not limited by volume of wastewater.

All wastewater is chlorine disinfected prior to reuse or evaporation.

## 3. Site Characteristics

### A. Site Management History

The facility has been limited to silviculture since its 1981 inception due to United States Forest Service restrictions on its land leased for use by the facility. As part of the lease agreement, no harvesting has been allowed on the reuse site, with the exception of saplings mowed down during the course of set sprinkler line maintenance. Therefore, site management has been unchanged:

secondary treatment of wastewater and slow rate reuse. Two snowfluent towers were added in the year 2000.

Future site management is discussed below in Section 5.F – *Cropping Plan*.

**B. Climatic Characteristics**

The climatic characteristics are described in detail on page 9 of the permit application (JUB Engineers, Inc., 2013). The nearest weather station is Island Park, ID.

The average total precipitation is 28.84 inches per year; average total snowfall is 211.1 inches per year. The annual average maximum temperature is 51.6 °F and annual average minimum temperature is 22.4 °F. Additional meteorological data can be found at:

<http://www.wrcc.dri.edu/summary/climsmid.html>

The wind direction is from the SSW 50% of the time, and from the south 50% of the time. The average wind speed is 9 mph.

The precipitation deficit (net irrigation water requirement) is 18.0 inches growing season and 36.0 inches non-growing season (Wakagawa, 1996).

**C. Soils**

Soil types present are described in detail on page 10 and in Appendices E & F of the permit application (JUB Engineers, Inc., 2013). Predominant soil types are Perfa and Bootjack soils: deep, sandy loams, and moderately well drained. Additional soil information for the site can be found in the NRCS soil survey for Fremont County:

<http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>.

Soil	Profile	AWC*	Slope
Perfa	0 to 1'': moderately decomposed plant material 1 to 12'': sandy loam 12 to 62'': gravelly coarse sand	Very low; about 1.9 inches	0 to 4%
Bootjack	0 to 2'': moderately decomposed plant material 2 to 5'': silt loam 5 to 17'': loam 17 to 60'': stratified fine sand to coarse sand	Low; about 3.8 inches	0 to 2%

\*Available water capacity

**D. Surface Water**

The nearest surface water is the Henry’s Fork, 0.4 miles from the southwest edge of the snowfluent site. The facility is outside the 100 year flood plain.

**E. Ground Water / Hydrogeology**

Groundwater is first encountered 18 to 25 feet below the ground surface at the facility. Groundwater flow is generally to the south southwest. Sampling conducted at this facility shows no evidence of groundwater contamination due to reuse activities.

#### 4. Wastewater Characterization and Loading Rates

##### A. Wastewater Characterization

Wastewater effluent to reuse is summarized in Table 4A, below.

**Table 4A. Wastewater Volumes, Quality, and Constituent Loading**

Loading Rates					
	Permit	2009	2010	2011	2012
<b>Land Application</b>					
Acres	58	58	58	58	58
Days per year	168	168	168	168	168
Wastewater					
MG	28.35	23.747	20.869	38.058	22.723
ac*in.	1044	874.52	768.53	1401.55	836.81
ac*in/ac	18.0	15.1	13.3	24.2	14.4
Nitrogen:					
NTKN + NNO3 mg/L		19.94	17.05	11.39	13.28
lb/yr		3943	2963	3610	2512
lb/ac*yr		68.0	51.1	62.2	43.3
Phosphorus:					
mg/L		3.93	3.81	2.56	3.23
lb/yr		777	662	811	612
lb/ac*yr		13	11	14	11
TDS:					
mg/L				183	157
lb/yr				57,994	29,722
lb/ac*yr				1,000	512
<b>Snowfluent</b>					
Acres	12	12	12	12	12
Days per year	197	197	197	197	197
Wastewater					
MG applied:	16.000	10.285	9.667	12.089	15.730
MG minus 25% sublimation	12.0	7.714	7.250	9.067	11.798
ac*in.	441.9	284.1	267.0	333.9	434.5
ac*in/ac	36.8	23.7	22.3	27.8	36.2
Nitrogen:					
NTKN + NNO3 mg/L		21.52	23.57	15.65	25.92
lb/yr		1,843	1,897	1,575	3,395
lb/ac*yr		154	158	131	283
Phosphorous:					
mg/L		5.68	5.23	3.57	4.73
lb/yr		486	421	359	619
lb/ac*yr		41	35	30	52
TDS:					
mg/L				176	225
lb/yr				13,263	22,089
lb/ac*yr				1,105	1,841
<b>Evaporator</b>					
Days per year	184				
Wastewater circulated, MG		8.40	8.40	3.2	3.90

##### B. Hydraulic Loading Rates

Historic hydraulic loading rates for each of the reuse fields are shown above in Table 4A.

Note the year 2011 over applied wastewater due to spring melt inflow and infiltration. The facility contacted the DEQ to notify of expected overloading, as well as locating and correcting the cause of the increased inflow and infiltration.

##### C. Constituent Loading Rates

Constituent loading rates are given in table 4A, above.

## 5. Site Management

### A. Buffer Zones

Section 6.5.1 of the *DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* recommends the following buffer distances for Class C wastewater; the facility buffer distances are listed below.

- A land treatment system should not be located closer than 300 feet from the nearest inhabited dwelling.
  - Land was developed north of HMU 1 since the last permit issuance. The county negotiated deed restrictions for the properties which include 300 feet dwelling setbacks from the HMU.
- A land treatment system should not be located closer than 1,000 feet from a public water supply well or 500 feet from a private water supply well used for human consumption.
  - Land was developed north of HMU 1 since the last permit issuance. The county negotiated deed restriction for the properties which include 1200 feet well setbacks from the HMU.
- A minimum buffer of 50 feet should be provided between the wastewater application site and areas accessible by the public.
  - HMU 1 borders the county road providing access to the facility. Consequently, a six feet tall fence was constructed to deny public access.
  - Due to the popularity of snowmobiling in the area, knock down fences surround the HMUs to avoid winter hazards. That excludes the section of HMU 1 along the county road, which has a six feet tall fence.
  - HMU 2, the snowfluent site, has a fence along the north border, and is left unfenced on three sides to avoid winter snowmobile hazards. Signage warns snowmobilers to keep out due to wastewater.
- The distance from the treatment site to permanent or intermittent surface water, other than irrigation ditches and canals, should be 100 feet.
  - There is no permanent or intermittent surface water within 100 feet.
- A 50-foot separation distance should be provided between the land treatment site and temporary surface water and irrigation ditches and canals.
  - There are no temporary surface water features within 50 feet.

### B. Runoff

The facility does not have a runoff management plan. A runoff management plan is required as a compliance activity in this permit renewal.

### C. Seepage Rate Testing

Cell D was relined in the autumn of 2013, and will be seepage tested in 2014. The facility plans to retest all the lagoons in 2014.

Lagoon	Test date	Test approval date	Seepage rate (in./day)	Allowable rate (in./day)	Next seepage test due date
Cell A	2005	(failed)	0.228	0.125	-
	2006	2006	0.02	0.125	2016
Cell B	2005	2005	.012	0.125	2015
Cell C	2005	2005	-0.024	0.125	2015
Cell D	2005	2005	-0.024	0.125	2014

*\*negative values reflect uncertainty at very low seepage rates; these two ponds were relined prior to the (negative value) seepage tests.*

Test procedures for completing seepage tests should be submitted six months prior to the due date shown in the table above.

**D. Waste Solids/Biosolids/Sludge/Solid Waste**

The facility conducted biosolids disposal for Cell D dredgings under a DEQ approved plan in the autumn of 2013. The disposal plan should be updated and resubmitted for approval upon any future need for biosolids disposal.

The facility has a waste solids management plan approved by the DEQ on November 26, 2013.

**E. Nuisance Odors**

A nuisance odor management plan was submitted and approved by the DEQ on November 26, 2013.

**F. Cropping Plan**

The silvicultural practice of cultivating native vegetation at this facility - along with the USDA imposed restriction disallowing harvesting - negated the need for a cropping plan previously. However, with the addition of 50 acres, the facility is requested to submit a cropping plan for all acreage as part of the Plan of Operation update.

**G. Grazing**

Grazing is not allowed at Mack's Inn.

**6. Monitoring**

Monitoring at Mack's Inn has historically shown no constituents of concern as determined by concentrations. Therefore, this facility should be subject to less rigorous monitoring. For example, COD was removed from wastewater monitoring during the last permit renewal, as concentration were well below COD loading limits imposed by the DEQ. Other changes are listed below according to the monitored medium.

**A. Wastewater Monitoring**

Wastewater monitoring is based on Table 7-9 (page 7-53) of the DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater Monitoring*, under the category *Municipal Facility (Guideline Loading Rates)*.

Deviations from Table 7-9 'usually monitored' category include:

- Total Settleable Solids and Total Suspended Solids were replaced with Total Dissolved Solids for both historic consistency as well as potential impact to ground water associated with Total Dissolved Solids.
- Electrical Conductivity was not included as it has never been required of this facility, and considered of little value to operations and management.
- Chloride was not included as it has never been required of this facility, and considered of little value to operations and management.

Deviations from Table 7-9 as 'generally not monitored' include:

- Total Dissolved Solids were included due to potential impact to ground water.
- Total phosphorus is included for calculating yearly phosphorus loading.
- pH was removed as a required monitored constituent due to limited monitoring value.

The following wastewater monitoring is required. Only total coliform has a permit limited maximum concentration: Class C effluent at 23 CFUs total coliform per 100 mL, based on a median average of the last 5 results and a maximum limit of 230 CFUs/100 mL on individual samples.

Sample Type and Frequency	Constituents
Grab/monthly (during periods of use)	- Nitrate + Nitrite, as N - Total Kjeldahl Nitrogen, as N - Total Dissolved Solids - Total Phosphorus
Grab/weekly (during periods of use)	- Total coliform

**B. Soil Monitoring**

Soil monitoring is based on Table 7-5 (page 7-41) of the DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater Monitoring*, under the category *Municipal Facility (Guideline Loading Rates)*.

Deviations from the ‘usually monitored’ category include:

- Ammonium (NH<sub>4</sub>) was removed as the facility does not actively fertilize or manage nutrient levels for crops.
- Texture was not included for historic consistency – it has never been required of this facility.

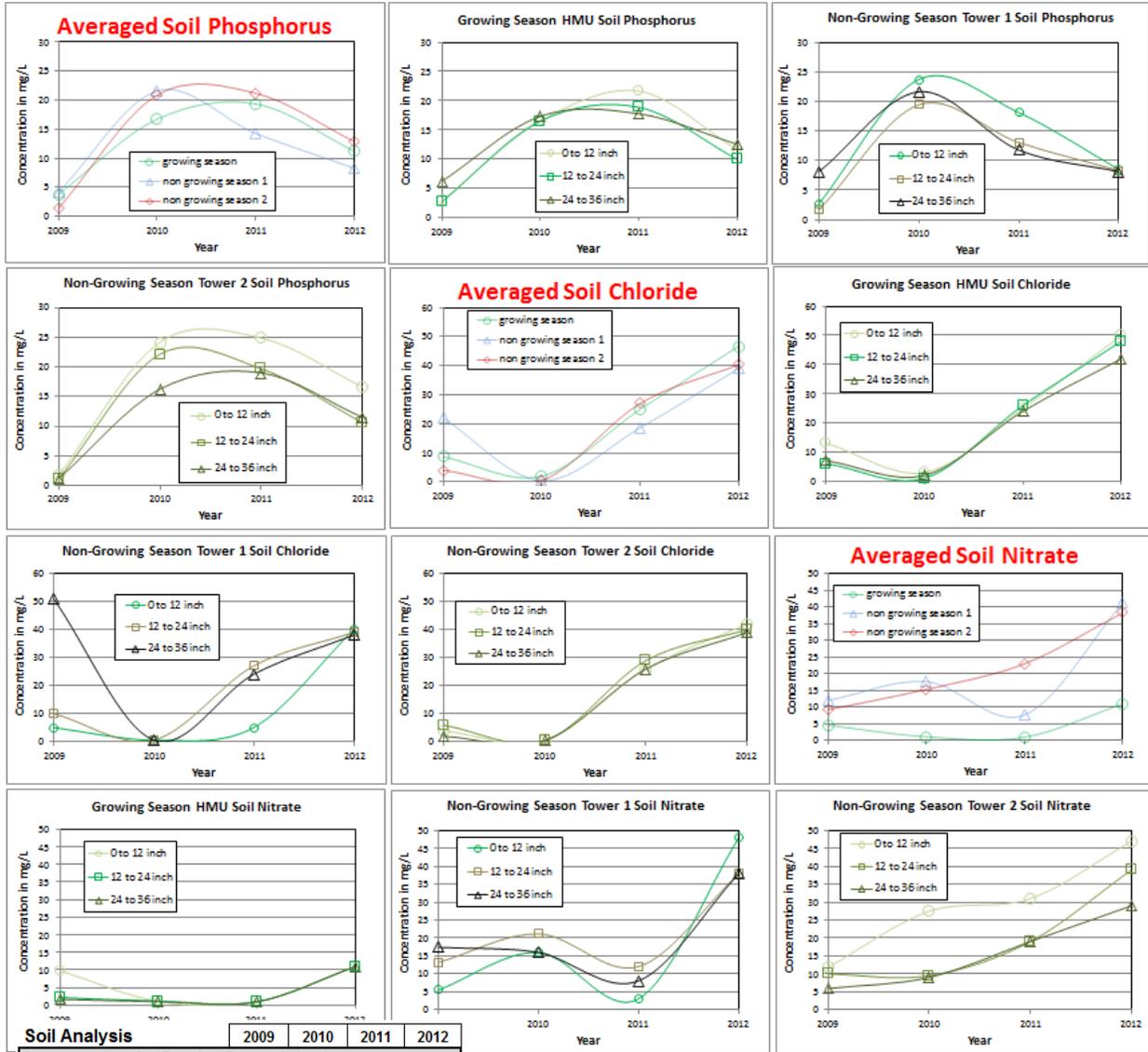
Deviations from the ‘generally not monitored’ category include:

- First year indicators of hydraulic overloading (SAR, DTPA-Mn and DTPA-Fe) were removed due to historically low values showing not only lack of overloading concern, but also less of a concern with the addition of another 50 acres to the facility.
- Electrical Conductivity was removed as Cation Exchange Capacity is required and a viable substitute.

The following soil monitoring is required.

Sample Frequency	Constituents
Annually, June, or as soon as snowmelt allows	Chloride Cation Exchange Capacity (CEC) Nitrate plus nitrite as nitrogen Plant available phosphorus

Soil monitoring results are charted below; a summary table follows the charts.



Soil Analysis	2009	2010	2011	2012
<b>Average values for Growing Season Irrigation</b>				
CEC, cmon(+)/kg; meq/100g	28.4	24.9	28.5	34.2
Cl, mg/Kg	8.7	2.0	25.0	46.7
Ammonia, mg/Kg	1.1	1.6	0.7	0.4
Nitrate, mg/Kg	4.6	1.1	1.0	11.0
P, mg/Kg	3.8	16.7	19.4	11.3
pH	8.7	5.3	5.3	5.2
Fe - DTPA, mg/L	65.7			
Mn - DPTA, mg/L	18.1			
SAR, ppm	11.6			
<b>Average values for SU05702 Snowfluent tower 1 (west)</b>				
CEC, cmon(+)/kg; meq/100g	23.7	18.5	29.2	28.9
Cl, mg/Kg	22.0	0.5	18.7	39.0
Ammonia, mg/Kg	1.4	3.6	1.4	0.6
Nitrate, mg/Kg	12.0	17.7	7.7	41.3
P, mg/Kg	4.2	21.6	14.3	8.3
pH	5.8	5.1	4.9	4.8
Fe - DTPA, mg/L	90.3			
Mn - DPTA, mg/L	29.6			
SAR, ppm	11.2			
<b>Average values for SU05703 Snowfluent Tower 2 (east)</b>				
CEC, cmon(+)/kg; meq/100g	21.6	22.3	27.8	29.0
Cl, mg/Kg	4.0	0.5	27.0	40.3
Ammonia, mg/Kg	1.1	2.8	1.3	0.9
Nitrate, mg/Kg	9.2	15.3	23.0	38.3
P, mg/Kg	1.4	20.9	21.2	12.9
pH	5.7	4.9	5.2	4.9
Fe - DTPA, mg/L	69.3			
Mn - DPTA, mg/L	15.6			
SAR, ppm	11.9			

The charts above and data table left show concern for soil nitrate at the non-growing season snowfluent sites. Soil nitrate and ground water nitrate should be reviewed and interpreted in future monitoring to evaluate increasing concentrations in the soil as well as potential breakthrough to the ground water.

**C. Ground Water Monitoring**

Ground water monitoring is based on Table 7-1 (page 7-17) of the DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater Monitoring*, under the category *Municipal Facility (Guideline Loading Rates)*.

Deviations from the ‘usually monitored’ category include:

- pH was removed as this ‘field parameter’ is typically lower in volcanic soils, and does not indicate operations or management.
- Phosphorus is included to monitor any potential breakthrough of the phosphorus from the soil to the groundwater.

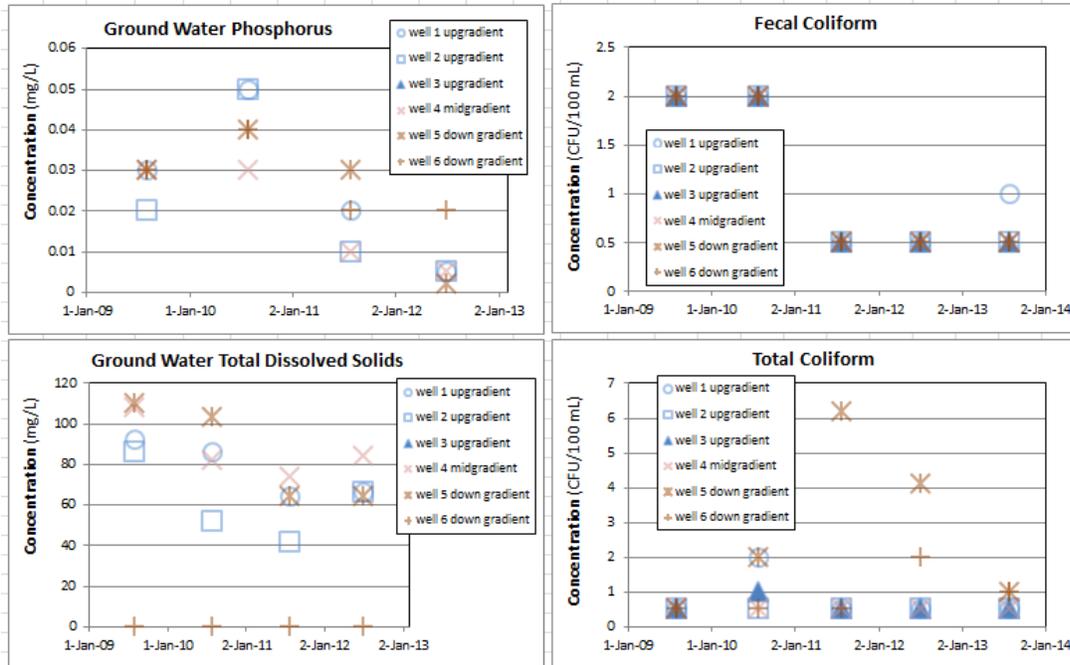
Deviations from the ‘generally not monitored’ category include:

- Total and dissolved Fe and Mn were removed as both are typically high concentration in the volcanic soils of the area, and therefore not indicators of hydraulic overloading.
- Fecal coliform was removed as a monitored parameter, leaving only total coliform, more in line with current ground water sampling protocol.
- Total Dissolved Solids (TDS) were included to monitor ground water impact from wastewater.

The following ground water monitoring is required.

Sample Type	Constituents
Annual unfiltered grab sample	Water table depth and elevation Chloride Nitrate-nitrogen, as N Phosphorus Total coliform

Ground water phosphorus, TDS, and coliforms are charted below. Note that fecal coliform upgradient concentrations are identical to downgradient concentrations, showing the contamination originating off-site (a groundwater flow diagram is located at the end of Appendix I). Total coliform in wells 5 and 6 are suspected to be caused by the leaking Cell D liner which was replaced in 2013. The sample results for 2013 show decreased concentrations, and are believed to be results of the Cell D water level drawn down in preparation for relining.



**D. Supplemental Irrigation Water Monitoring**

This facility does not utilize supplemental irrigation.

**E. Crop Yield and Tissue Monitoring**

This facility does not harvest crop material; therefore, no yield data or tissue monitoring is required. However, if the cropping plan submitted for the new acreage includes tree removal, yield and tissue analysis will be addressed at that time.

**F. Meteorological Monitoring**

Mack’s Inn is wind direction and velocity limited for evaporator use. As stated in the permit, the following limitations exist for the evaporator.

- The evaporator system shall shut down automatically if the wind speed exceeds 5 mph in the direction of the road or buildings. The system shall also shut down automatically when wind speeds are in excess of 20 mph in any direction.

The evaporator is automated to shut down if either of the above two conditions occur.

**G. Calculation Methodologies**

The following methods of calculation are used to determine permit compliance.

- a) Hydraulic volumes
  - Influent volumes are measured by flow meter;
  - Effluent volumes to reuse and evaporation are measured by flow meter;
  - Inches of irrigation are calculated by dividing the total flow by the acreage according to the annual report worksheet.
  
- b) Constituent loading rates
 

Constituent loading rates are determined by applying analyzed concentrations to wastewater volumes and irrigated acreage.

**H. Quality Assurance Project Plan**

A Quality Assurance Project Plan (QAPP) has not been developed for this facility, and is a compliance activity on this permit renewal.

## **7. Site Operation and Maintenance**

System Classification: Wastewater Collection Class III, Treatment Class I. Operators are required to have Class III collection, Class I treatment, and Land Application licensure.

Five Fremont County employees operate the wastewater collection, treatment, and reuse site. Collective licensure among the operators is:

- Treatment: 3 Class II treatment and 1 Class I treatment licenses;
- Collection: 1 Class IV Collection, 1 Class III Collection, and 2 Class II Collection licenses. One employee is soon to upgrade from Class II to Class III.
- Land Application: four operators have land application licenses.
- Operator in Training: one OIT Collection and one OIT Treatment.

## **8. Compliance Activities**

### **A. Status of Compliance Activities in Current Permit**

1. CA-057-01: A Plan of Operation update required the following items.
  - Irrigation schedules for the slow rate application.
    - Status: complete.
  - An Odor Management Plan.
    - Status: complete.
  - A Waste Solids Management Plan;
    - Status: complete.
  - A Runoff Management Plan.
    - Status: incomplete. This requirement is included in the permit renewal as a compliance activity.
2. CA-057-02. Well Locations Survey Report  
Status: complete.
3. CA-057-03. Seepage test  
Status: although this requirement was removed due to the DEQ policy change from 5 year seepage testing frequency to 10 year frequency, the facility will test the newly relined Cell D in 2014, and plans to test all the other cells at the same time.
4. CA-057-04. Collaborative site inspection.  
Status: this requirement was waived by the DEQ due to the US Forest Service restrictions already placed on site management which restrict harvesting and limit vegetation to native flora. Further, the current expansion lease negotiations between the USDA Forest Service and Fremont County detailed all lease expectations and requirements.

### **B. Compliance Activities Required in New Permit**

The following Compliance Activities are specified in the draft permit:

- A Plan of Operation update which includes a Runoff Management Plan and a Cropping Plan is required. The facility is currently preparing an irrigation schedule to include the 50 acre expansion.

- A Quality Assurance Project Plan (QAPP) is required.
- Seepage testing: permit required dates are listed below; the facility plans to test all lagoons in 2014.

<b>Lagoon:</b>	<b>Seepage Test Due Date:</b>
LG-05701/Cell A	August 2016
LG-05702/Cell B	August 2015
LG-05703/Cell C	August 2015
LG-05704/Cell D	September 2014

- Posted signs which include the Spanish language.
- Pre-application workshop.
- Renewal permit application.

## **9. Recommendation**

Staff recommends the draft wastewater reuse permit be issued. The permit specifies hydraulic and constituent loading limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

## **References**

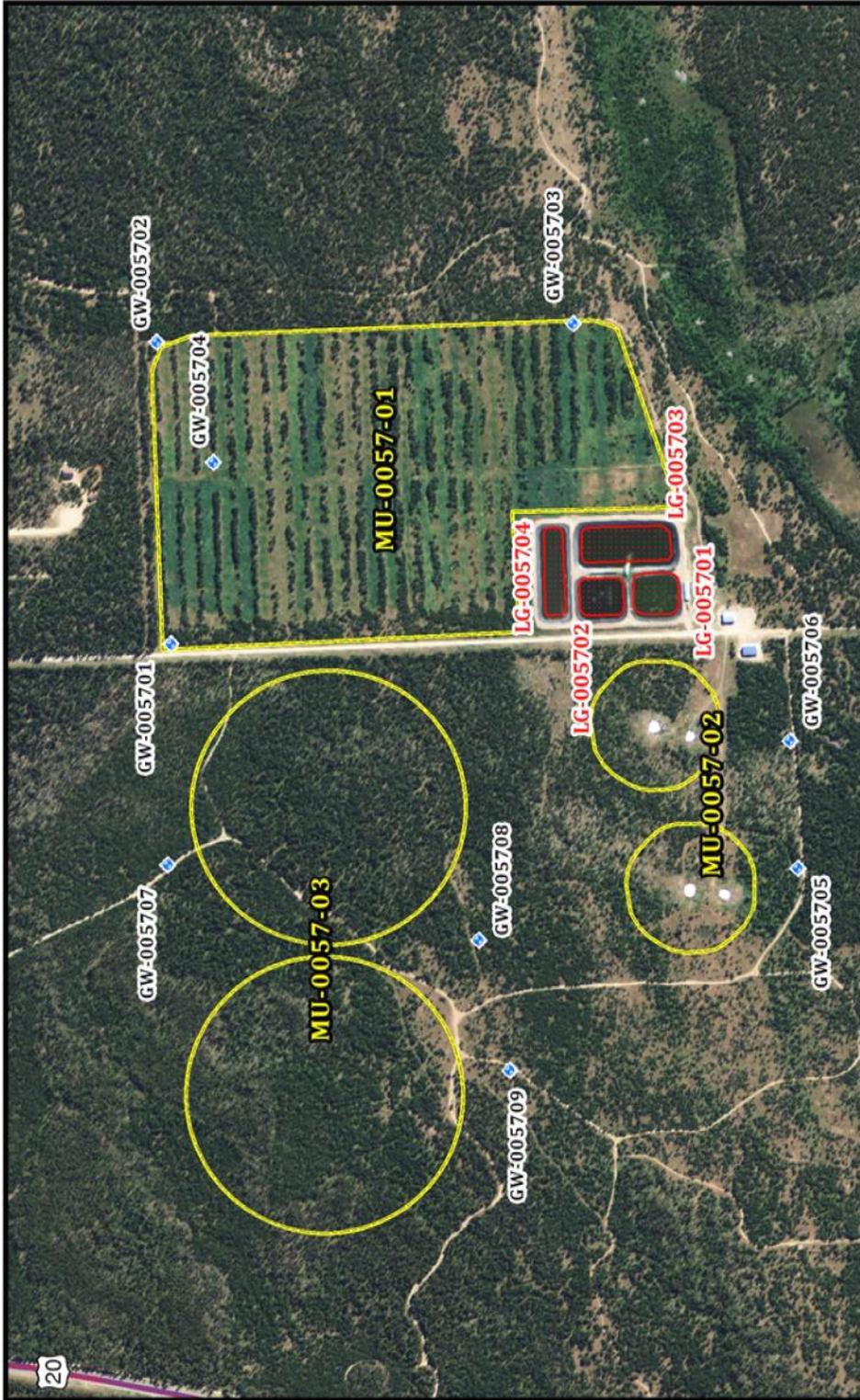
DEQ, 2008, *Permit Renewal Staff Analysis: Mack's Inn Wastewater Treatment and Reuse Facility; LA-000057-3*. July 18, 2008.

DEQ, 2009, *Municipal Wastewater Reuse Permit LA-000057-03*. February 24, 2009.

JUB Engineers, Inc., 2013, *Technical Report for Wastewater Land Application Permit Major Modification*, TRIM no. 2013AGH69. January 2013.

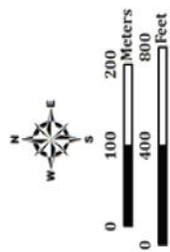
Wakagawa, 1996, *Memo Macks Inn/Island Park Land Application Permit, LA-57*. May 6, 1996.

# Appendix 1 Site Maps



**Legend**

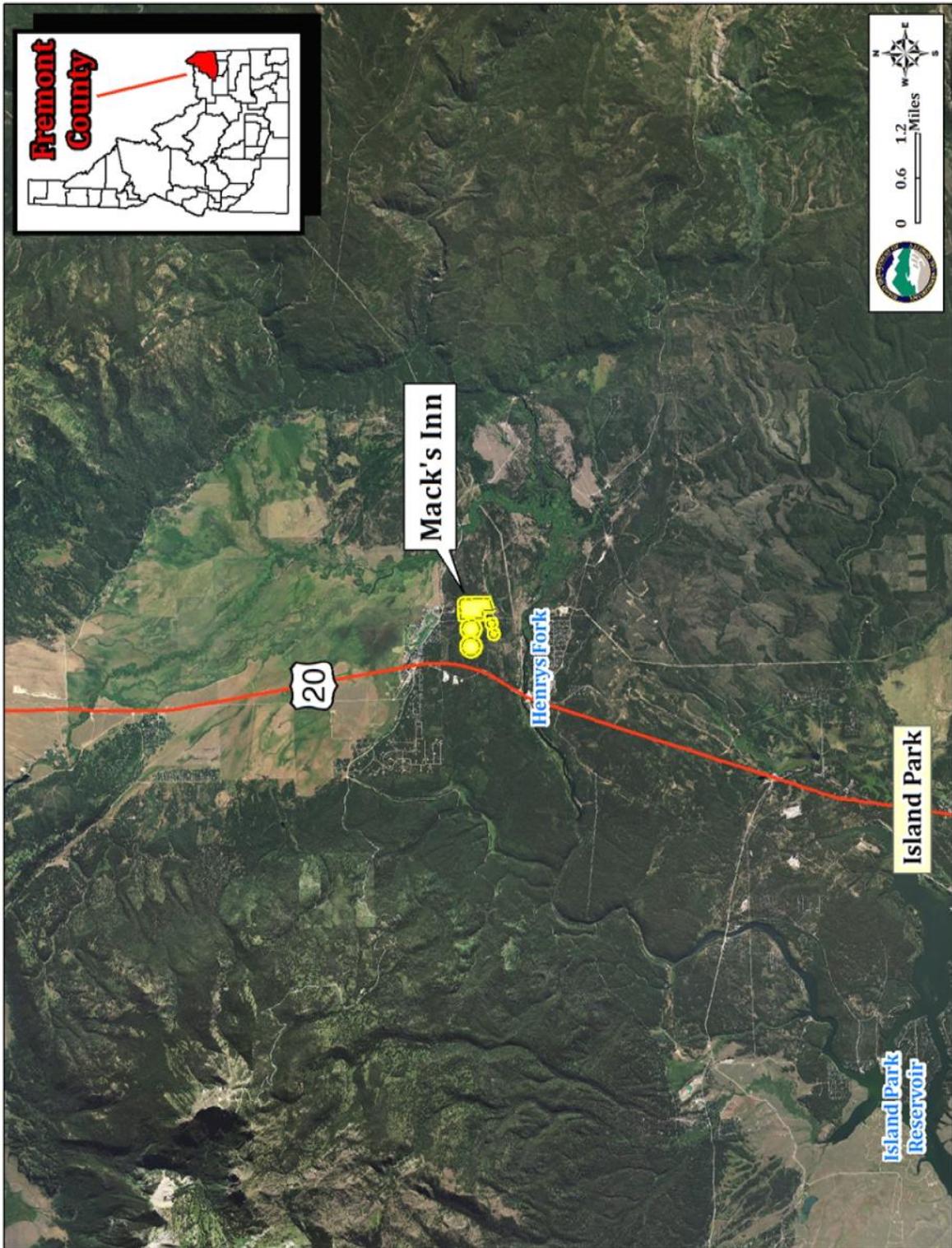
- Monitoring Well
- Highway
- Streams/Canals
- Lagoons
- Reuse Basins

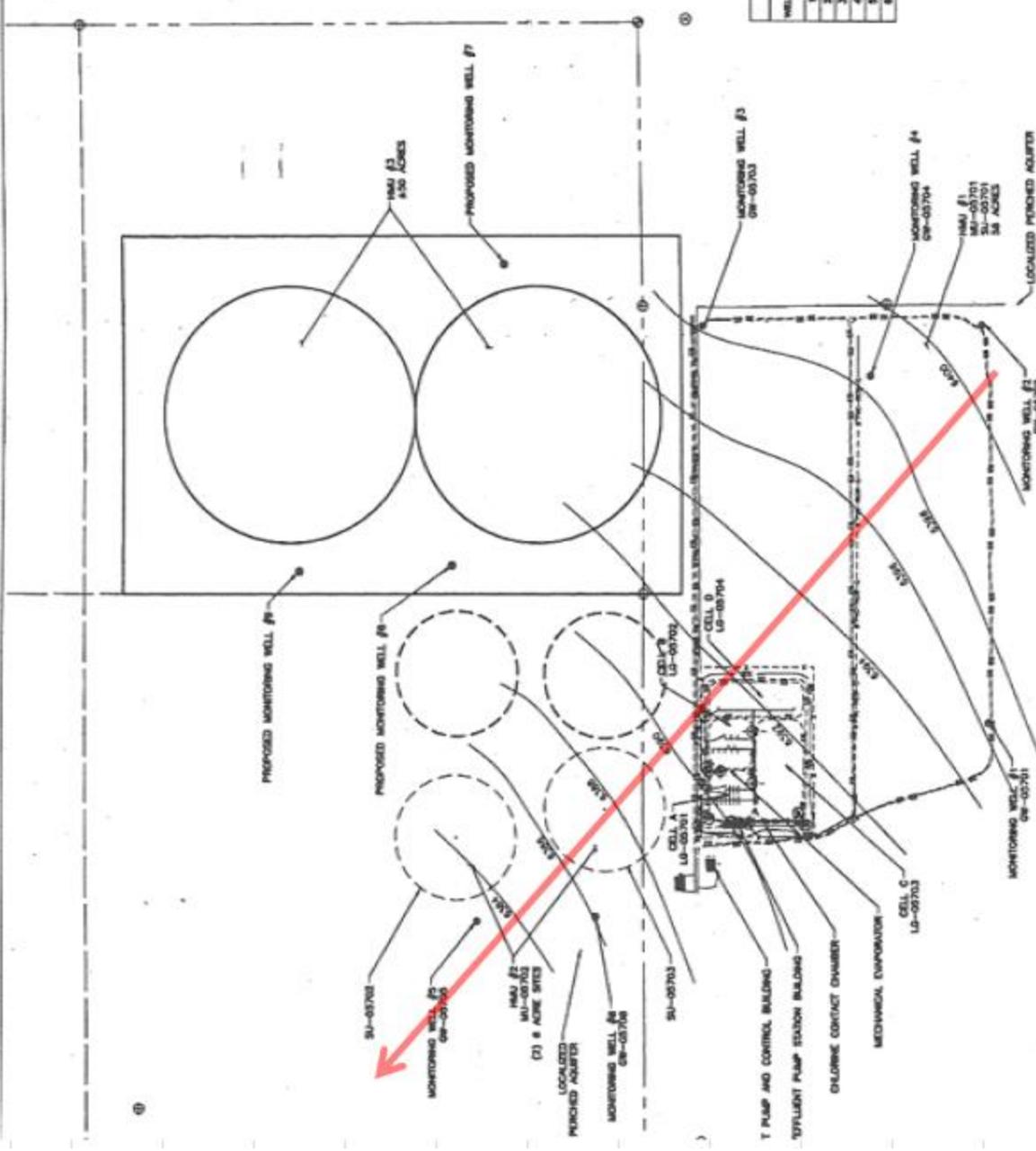


**Mack's Inn**  
**M-057-04**

The logo for Fremont County, Nevada, is shown. To its right is a map of Nevada with a red dot indicating the location of Mack's Inn in the eastern part of the state.

DEQ05114413





JULY 2010			
WELL #	ELEVATION	DEPTH TO WATER	WATER ELEVATION
1	8437.20	42	8395.20
2	8431.72	35	8396.72
3	8436.05	28	8404.05
4	8435.50	29	8406.50
5	8430.12	26	8394.12
6	8418.33	22	8396.33