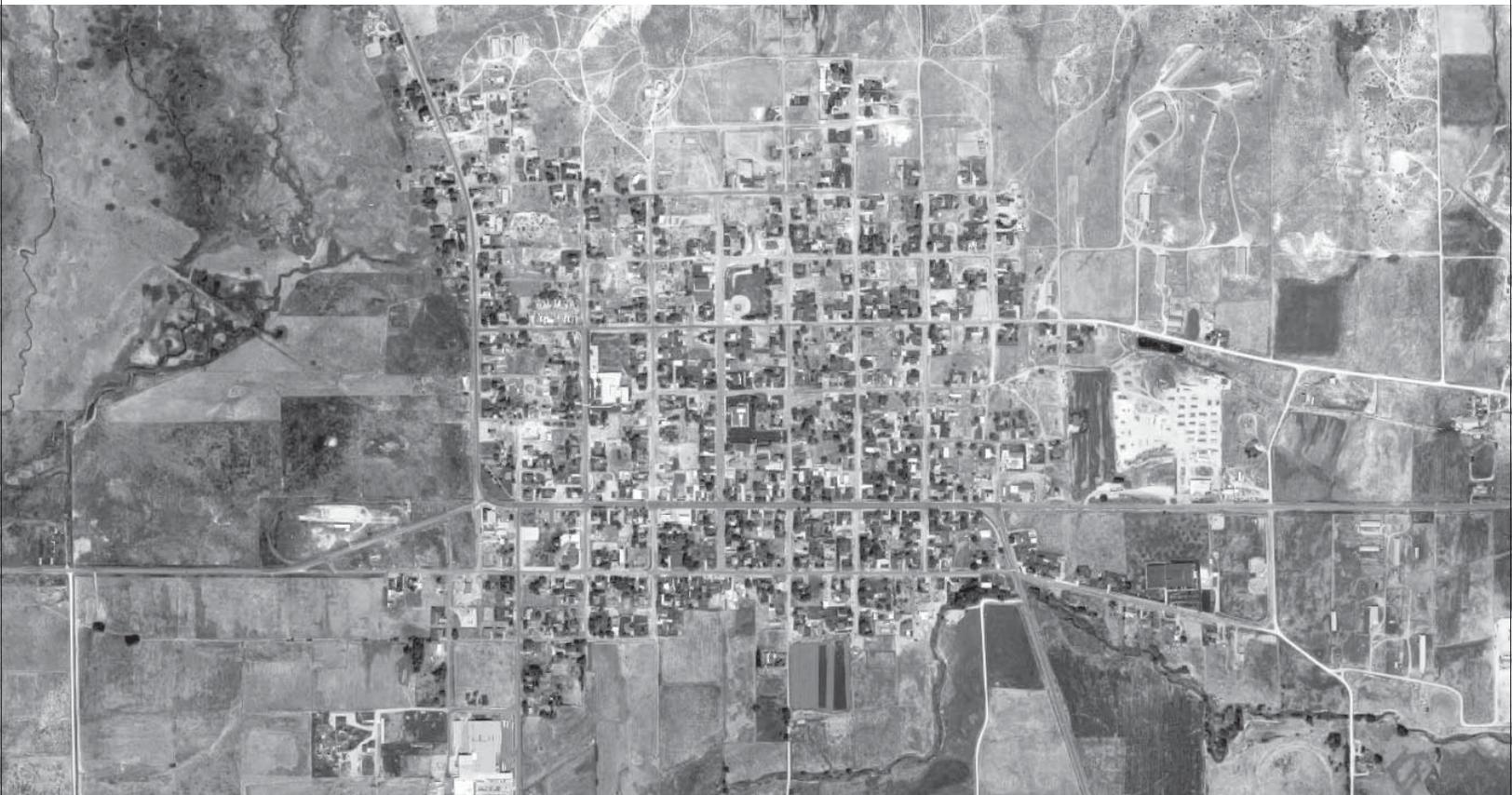


# Moroni Wastewater Treatment Plant

*15 Million Gallon Anaerobic Lagoon Project*

*Groundwater Sampling and Analysis Plan*

December 2016



**MORONI WASTEWATER TREATMENT PLANT  
15 MILLION GALLON ANAEROBIC LAGOON PROJECT  
GROUNDWATER SAMPLING AND ANALYSIS PLAN**



12/23/16

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**1. Project Background and Purpose of Plan**

The purpose of this sampling and analysis plan is to identify potential leaks in the anaerobic lagoon to allow for prompt corrective actions to prevent contamination to the groundwater. This sampling plan is prepared in accordance with the requirements of the associated Ground Water Discharge and Construction (GWDC) Permit (UGW390005) for the lagoon.

**2. Construction and Location of Monitoring Wells**

Based on available data, the flow of the groundwater in the shallow aquifer is best determined to be south-southwest. A total of three monitoring wells will be constructed, with one upgradient of the lagoon, and two immediately downstream of the lagoon. The well locations are shown in Appendix A.

Monitoring wells will be drilled into the shallow aquifer with an approximate depth of 30 feet, terminating before the confining layer separating the shallow aquifer from the deeper aquifer. The depth of the monitoring well is established based on the intent to detect any changes in groundwater quality, which may indicate a leak in the lagoon liner.

**a. Groundwater Monitoring Wells As-Built Report**

Following completion of the wells, an as-built report will be submitted including the following information:

1. Casing: depth, diameter, and type of material
2. Screen: length, depth interval, diameter, material type, slot size
3. Sand Pack: depth interval, diameter, material type, slot size
4. Annular Seals: depth interval, material type
5. Surface Casing and Cap: depth, diameter, material type protection measures constructed
6. Elevation and Location: ground surface elevation, elevation of water level measuring point, latitude and longitude in hours, minutes and seconds

7. Well construction description, well completion description, results of well pump tests or slug tests

**3. Background Concentration**

The GWDC Permit provides a table with an estimated groundwater quality in the area based on Moroni City water supply wells and nearby private wells. To establish current background groundwater quality, the monitoring wells will be sampled quarterly until a minimum of eight (8) samples have been completed.

**4. Monitoring Frequency**

The monitoring wells and anaerobic lagoon shall be sampled at regular time intervals as indicated below.

**a. Groundwater Monitoring Wells**

Once background water quality has been determined from quarterly sampling as described in Part 3, sampling of the wells shall occur on a semi-annual basis. Ideally, this sampling will occur near the end of the monitoring period given in Part H of the GWDC Permit. Each sample shall follow the sampling procedures detailed in Part 5 below and in accordance with the GWDC permit.

**b. Lagoon**

The 15 million gallon anaerobic lagoon performance shall be monitored in two ways: (1) water quality from samples taken directly from the lagoon and (2) liner leak detection.

Water quality samples shall be taken annually, ideally coordinating with one of the semi-annual samplings taken at the monitoring wells. Sampling procedures shall be followed as outlined Part 6 below and in accordance with the GWDC Permit.

Lagoon liner leak detection testing shall be conducted twice during the 5-year permit term: Once at 2 ½ years after permit issuance and the second at 6

months prior to permit renewal. Details regarding this testing is included in the Operations and Maintenance Manual.

**5. Groundwater Monitoring Well Sampling Procedures**

Groundwater samples would be collected using currently accepted and approved techniques and technologies. The protocols for sampling would consist of water level measurements, field measurements and laboratory testing. Samples would be tested using a state certified laboratory. Each sampling protocol is discussed in detail below.

**a. Water Level Measurements**

Water level measurements would be read to the nearest 0.01 foot. Water level shall be sampled with a sounding tape or another approved measuring device.

**b. Water Quality Sampling**

**i. Field Measurements**

Water samples shall be taken using a sampling bailer. Field measurement samples would be collected in a clean beaker once the well was properly purged. All probes or instruments would be kept in designated containers to prevent cross contamination between samples. All instruments would be cleaned per manufacture's recommendations after and prior to taking any measurements. Field measurements and field notes would include:

1. name of collector
2. time of sample
3. weather conditions
4. air temperature
5. date of sample
6. monitoring well identification number

7. water temperature
8. depth to groundwater
9. groundwater elevation
10. pH
11. specific conductance
12. sampling identification number
13. containers used
14. and general comments section.

All this information would be kept in a field notebook. All measurement instruments would be calibrated at the beginning of the day and rechecked after all the sampling was complete to record any possible instrument drift.

## **ii. Laboratory Testing**

Sampling containers and procedures for preparations of samples would be provided by the testing laboratory. Once the samples were collected and prepared to laboratory recommendations, the sample would be immediately labeled, recorded in the field book, and placed in a sampling cooler. The samples would be recorded on a chain-of-custody and remain with the sampler until formally released to another individual.

Custody of the samples would be documented on a chain of custody form. Samples would remain in the custody of the sampler until samples are checked in and relinquished to the laboratory or until they were relinquished for transport to the laboratory.

Constituents to be sampled at the laboratory are as follows:

1. Ammonia (as N)
2. Bicarbonate
3. Chloride

4. Nitrate + Nitrite (as N)
5. pH
6. Sulfate
7. Total Dissolved Solids (TDS)

## **6. Lagoon Water Sampling**

The water samples would be collected using currently accepted and approved techniques and technologies. Samples shall be taken from the weir box, located near the northeast corner of the lagoon. Samples shall be taken upstream of the weir. Samples would be tested using a state certified laboratory. Sampling handling and testing procedures shall be as detailed in Part 5.b above.

Field measurements and field notes shall be as detailed in Part 5.b.i above. Constituents to be sampled at the laboratory are as follows:

1. Total Kjeldahl Nitrogen (TKN)
2. Ammonia (as N)
3. Nitrate + nitrite (as N)
4. Total sulfate
5. Chloride
6. Total Dissolved Solids (TDS)
7. Sodium
8. Potassium
9. Calcium
10. Magnesium
11. Bicarbonate
12. Phosphorus (Total as P)
13. and Oil and Grease (HEM)

## **7. Reporting and Analysis**

### **a. Analysis of Samples**

All data received would be reviewed to assess data validity. Each data report would be checked to insure the following:

- Identification numbers of the samples match.
- Chain of custody and field notes matches the sample information.
- Sample analysis was performed using requested methods and acceptable time limits.
- Reporting limits conform to current detection limits.
- Blank results have been included and are acceptable.
- All QA/QC sampling results are included and acceptable.

If there were any potential problems with the data reports or discrepancies, the laboratory would be notified immediately. If necessary, new samples would be collected and tested. Data would be analyzed based on concentrations of naturally occurring constituents plotted at each well on control charts for that specific well. Each constituent would be analyzed to determine whether groundwater is being impacted.

**b. Reporting**

Reports shall be prepared and submitted in accordance with the Compliance Monitoring Report Schedule given in Part H of the GWDC Permit. The reports shall include the following:

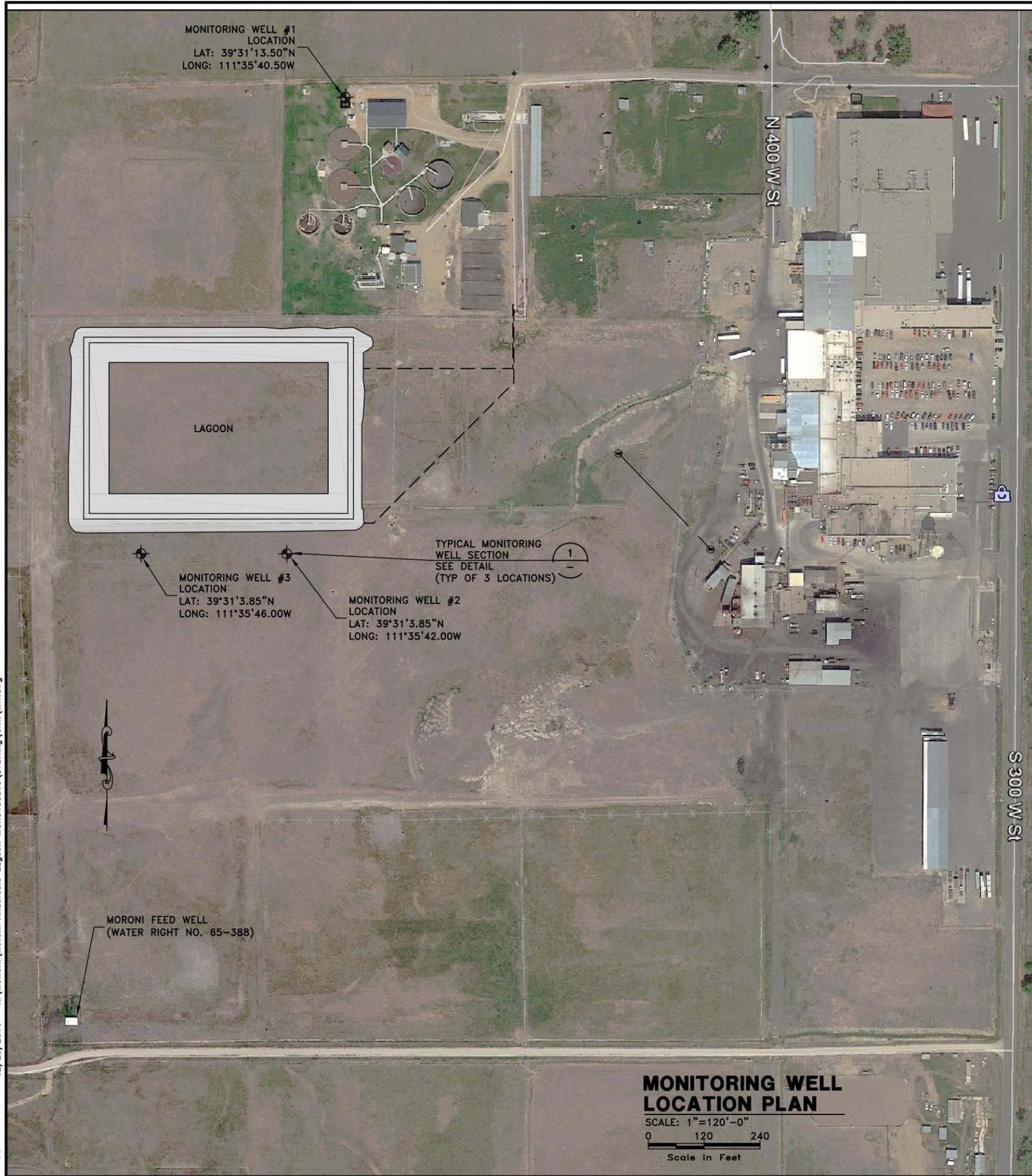
- Description of procedures, including the quality assurance /quality control, followed during the collection of samples.
- Results of field measured parameters.
- Chain of custody and quality assurance /quality control procedures followed by the laboratory.
- Laboratory results with detection limits and testing methods used.
- Statistical analysis of the laboratory results.

Reports shall be submitted in a hard copy format, as well as an electronic format as specified by the Director. Hard copy reports shall be submitted to:

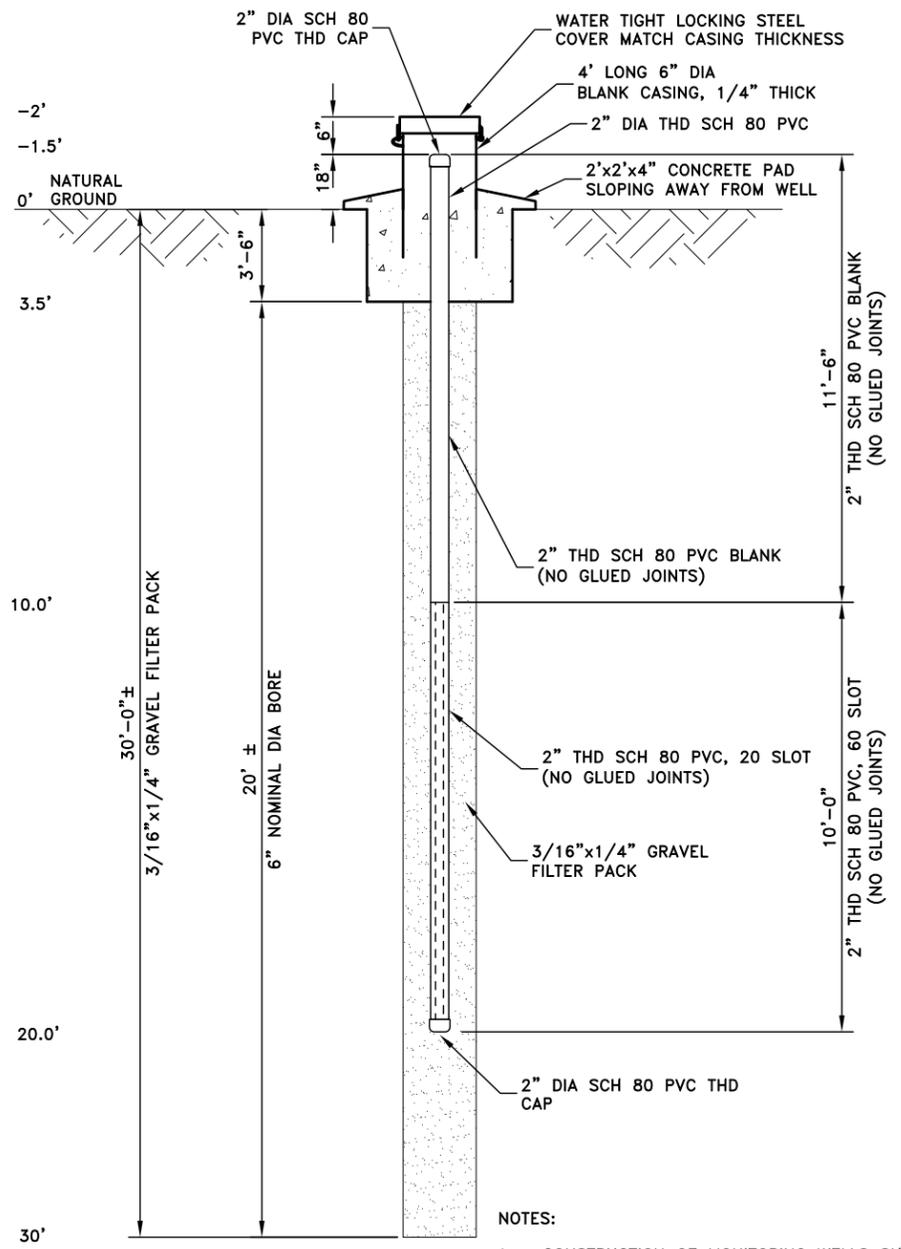
State of Utah  
Division of Water Quality  
P.O. Box 144870  
Salt Lake City, Utah 84114-4870  
Attention: Ground Water Protection Section

12/23/2016 X:\MORONI\Moroni Anaerobic Lagoon MORO150813\Drafting\Civil\MW.dwg

DCH

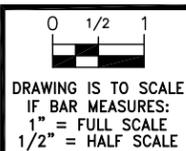


**MONITORING WELL LOCATION PLAN**  
 SCALE: 1"=120'-0"  
 0 120 240  
 Scale in Feet



- NOTES:
- 1- CONSTRUCTION OF MONITORING WELLS SHALL BE IN ACCORDANCE WITH STATE OF UTAH WATER WELL HANDBOOK.
  - 2- REFER TO MORONI FEED WELL LOG, (WELL LOCATIONS SHOWN ON PLAN) FOR ANTICIPATED GEOLOGY.
  - 3- SAMPLES TO BE TAKEN WITH A SAMPLING BAILER AND DEPTH MEASURED WITH A SOUNDING TAPE.

**TYPICAL MONITORING WELL SECTION**  
 SCALE: NTS



NO.	DATE	DESIGN	DRAWN	CHECKED
B	11-08-16	DPS	KRB	JRL
REVISIONS				

MORONI WASTEWATER TREATMENT PLANT  
 15 MG ANAEROBIC LAGOON  
 CIVIL  
 MONITORING WELL LOCATION AND DETAIL

**AQUA**  
 ENGINEERING  
 553 W. 2600 S. SUITE 275, BOUNTIFUL, UT 84010  
 PHONE (801) 299-1327 FAX (801) 299-0153

APPENDIX  
**A**