

US EPA ARCHIVE DOCUMENT

Appendix F

**Proposed Monitoring Plan
(From Section 9 of the Application sent to MDEQ)**

1. Proposed Discharge and Groundwater Monitoring During Operations

Kennecott Eagle Minerals Company (KEMC) will implement a detailed monitoring program for the treated water infiltration system (TWIS) at the Eagle Project Site. The monitoring program will consist of:

- ◆ Real time performance monitoring of the effluent coming from the project's wastewater treatment plant (WWTP).
- ◆ Quarterly monitoring of groundwater monitoring wells at compliance monitoring points located per R 323.2224.
- ◆ Quarterly monitoring at background monitoring wells at locations that are upgradient of the TWIS and main surface facility.

Most of the wells that will be used for compliance and background monitoring at the TWIS have not been installed at this time. They cannot be installed until the review process for the project has progressed sufficiently for KEMC to know that the facility footprint will not be altered as a result of the State's review of the Alternatives Analysis in the Environmental Impact Assessment. At that time Kennecott Eagle Minerals Company (KEMC) will install the proposed compliance wells and complete background monitoring at each designated well. Each well will be sampled six times over a period of six months to one year. The data will be summarized and analyzed via appropriate statistical methods. The updated data on background concentrations and standards will be provided to the Michigan Department of Environmental Quality (MDEQ) and prior to startup of the WWTP and TWIS.

During operations, compliance monitoring reports will be supplied to the MDEQ and USEPA on a regular basis.

1.1 Effluent Monitoring

Effluent monitoring will consist of the following:

- ◆ Real time continuous monitoring of the specific conductance in the treated effluent tank. This monitoring will provide a rapid assessment of RO units performance.

The effluent from the WWTP will be high quality water that contains very little total dissolved solids (TDS). TDS is controlled largely by the concentration of major ions that will primarily be removed by the proposed RO system. Monitoring the TDS (by way of specific conductance) in the treated effluent tank will provide a simple means of continuously monitoring basic system performance. If the measured specific conductance in the treated effluent tank exceeds operational thresholds, the treatment system will be instrumented to automatically send water from the effluent tank back to the lined CWB until system performance is reestablished.

1.2 Groundwater Monitoring

Groundwater monitoring will take place at a variety of monitoring points to assess system performance with regards to infiltration and compliance with groundwater quality standards per the MDEQ requirements of R 323.2223.

1.2.1 Monitoring Wells

This section describes the existing and proposed monitoring wells that will be used to assess system performance and compliance with groundwater quality standards.

1.2.1.1 Infiltration Performance Monitoring

In addition to monitoring wells that will be used for assessing compliance, the design of the TWIS includes the installation of shallow observation pipes within the infiltration cells. The location of the observation pipes are displayed in Figures 1 and 2. The purpose of these observation points is to confirm that water is not building up within the infiltration cells. KEMC will monitor the water levels within the observation pipes on a weekly basis. Existing well QAL031D is located on the down gradient edge to the infiltration system. During the construction phase and through the first year of operations, well QAL031D will be monitored on a weekly basis for groundwater elevation. The purpose of monitoring well QAL031D is to assess mounding of the water table beneath the infiltration system during the initial years of operation.

1.2.1.2 Background Monitoring Wells

Figure 1 displays the location of existing and proposed wells QAL026A, QAL026D, QAL029A, QAL029D, QAL053A, QAL055A and QAL056A. These wells are located upgradient of the TWIS and mine site and will serve as background groundwater monitoring points for the TWIS. Proposed wells will be installed per the MDEQ requirements of R 323.2223 as summarized on the well construction diagram in Figure 1.

1.2.1.3 Compliance Monitoring Wells

R 323.2224(1) requires that compliance wells be: 1) on land leased/owned by the operator; 2) located at points that will allow for effective sampling; and, 3) no more than 150 ft from the point of discharge of the treated water. KEMC is proposing to install compliance monitoring wells at four locations around the TWIS that meet these criteria.

As shown on Figure 1, proposed compliance monitoring wells (QAL008A, QAL008D, QAL050A, QAL051A, QAL051D, QAL052A, QAL057A and QAL057D) will be installed on the east side of the TWIS 150 ft from the infiltration system. The wells will be constructed with 10 ft screens that intercept the existing water table. Piezometer QAL051D and QAL057D will be nested with QAL051A and QAL057D respectively and will be screened at the base of the D Zone per the MDEQ requirements of R 323.2223(4).

1.2.2 Sampling Frequency

Compliance and background monitoring wells will be sampled on a quarterly basis for groundwater quality parameters and groundwater elevation.

1.2.3 Parameters

Table 1-1 provides a list of the groundwater quality parameters that will be included in the quarterly and annual compliance monitoring program.

Table 1-1
Proposed Groundwater Quality Monitoring Program
Parameter List and Sampling Frequency

Parameter	Frequency ¹⁾	Units
Alkalinity, Bicarbonate	Quarterly	mg/l
Ammonia, Nitrogen	Quarterly	mg/l
Antimony	Quarterly	ug/l
Arsenic	Quarterly	ug/l
Barium	Quarterly	ug/l
Beryllium	Quarterly	ug/l
Boron	Quarterly	ug/l
Cadmium	Quarterly	ug/l
Calcium	Quarterly	mg/l
Chloride	Quarterly	mg/l
Chromium	Quarterly	ug/l
Cobalt	Quarterly	ug/l
Copper	Quarterly	ug/l
Iron	Quarterly	ug/l
Lead	Quarterly	ug/l
Lithium	Quarterly	ug/l
Magnesium	Quarterly	mg/l
Manganese	Quarterly	ug/l
Mercury	Quarterly	ng/l
Molybdenum	Quarterly	ug/l
Nickel	Quarterly	ug/l
Nitrite	Quarterly	mg/l
Nitrate	Quarterly	mg/l
Potassium	Quarterly	mg/l
Total Phosphorus	Quarterly	mg/l
Selenium	Quarterly	ug/l
Silver	Quarterly	ug/l
Sodium	Quarterly	mg/l
Sulfate	Quarterly	mg/l
Strontium	Quarterly	ug/l
Thallium	Quarterly	ug/l
Vanadium	Quarterly	ug/l
Zinc	Quarterly	ug/l
Dissolved Oxygen	Quarterly	mg/l
Field pH	Quarterly	su
Groundwater Elevation	Quarterly	ft MSL
Specific Conductance	Quarterly	umhos/cm

¹⁾ Sampling frequency may change per provisions of Michigan Groundwater Discharge Permit

Prepared by: SVD1
Checked by: JSK

1.2.4 Sampling Procedures

The collection and analysis of surface water and groundwater samples will be completed in accordance with the Eagle Project's Quality Assurance Project Plan (North Jackson Company 2004a) and Standard Operating Procedures (North Jackson Company 2004b) which describe the following per the MDEQ requirements of R 323.2223:

- ◆ Well purging procedures.
- ◆ Procedures to prevent cross contamination.
- ◆ QA/QC program including the use of field blanks and duplicates.
- ◆ Procedures for collecting groundwater and surface water field data.
- ◆ Sample preservation, documentation and chain-of-custody procedures.
- ◆ Data validation procedures.
- ◆ Well installation, development and abandonment procedures.

1.2.5 Data Analysis and Presentation

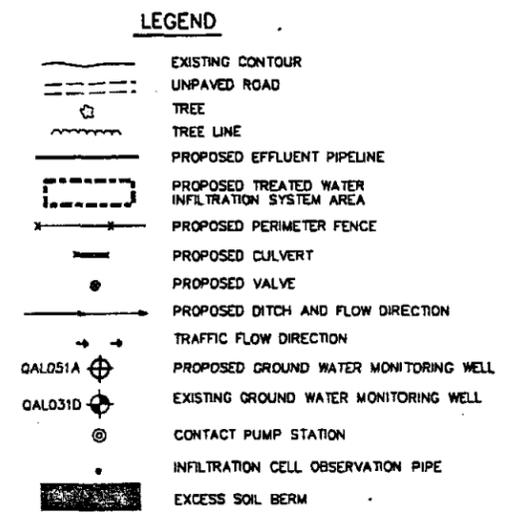
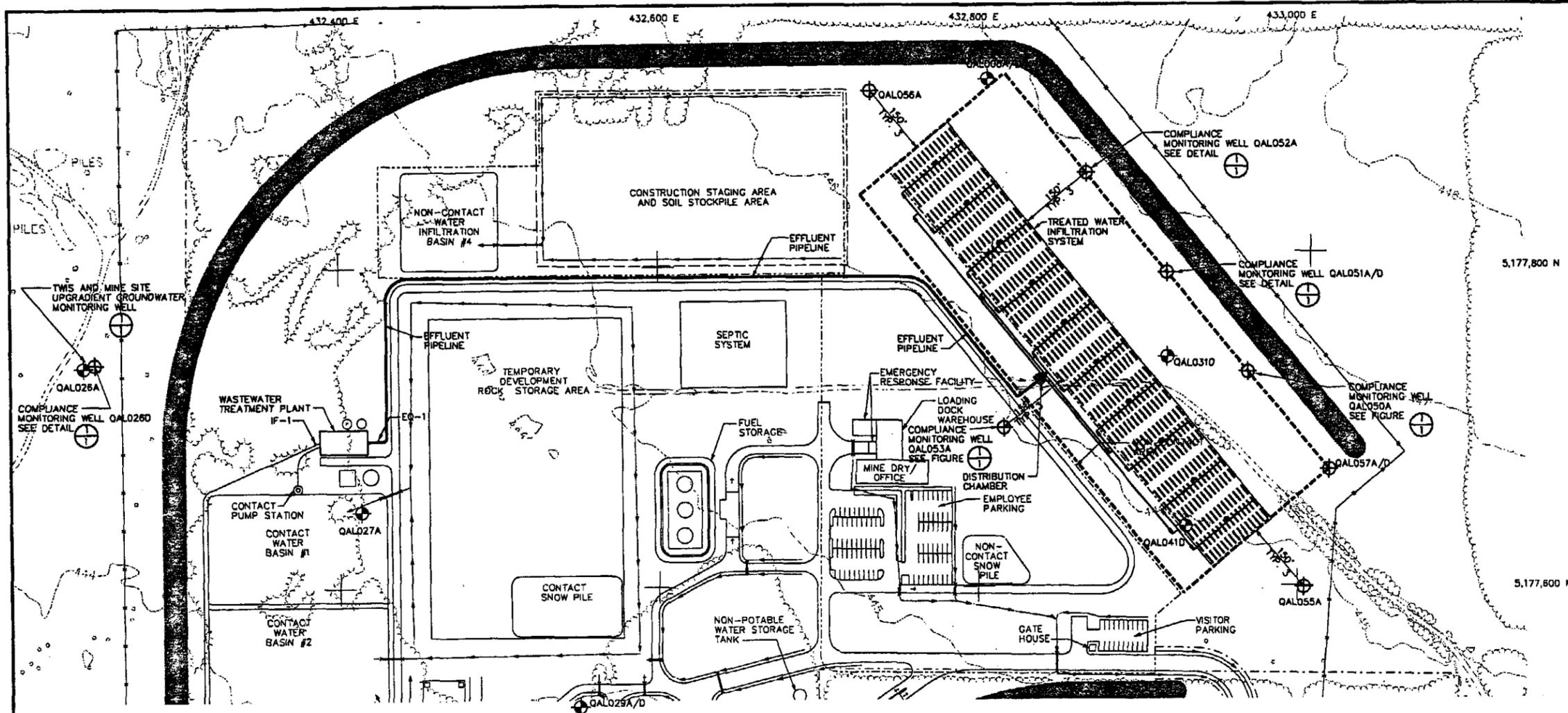
During operations, groundwater quality data will be statistically assessed for distributional changes as a result of site operations. Statistical methods will include testing for trends in water chemistry, and comparing constituent concentration levels to those observed in background or upgradient locations. Appropriate parametric or nonparametric statistical methods will be selected in consideration of the observed data characteristics, namely, the distributional form of the data and the degree of left censoring (amount of data below detection). In addition, sources of variation in the data unrelated to site activities, such as seasonality, will be statistically estimated and controlled. Relevant documents containing guidance for selecting appropriate statistical tests are:

- ◆ MDEQ, 2002. *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*.
- ◆ Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, New York.
- ◆ USEPA, 2000. *Practical Methods for Data Analysis—EPA QA/G-9*, EPA/600/R-96/084.
- ◆ USEPA, 1992. *Statistical Analysis for Groundwater Monitoring Data at RCRA Facilities – Addendum to Interim Final Guidance*, PB89-151047.

On a regular basis, compliance monitoring data will be submitted to the MDEQ and USEPA. Data will be submitted in appropriate electronic formats.

References

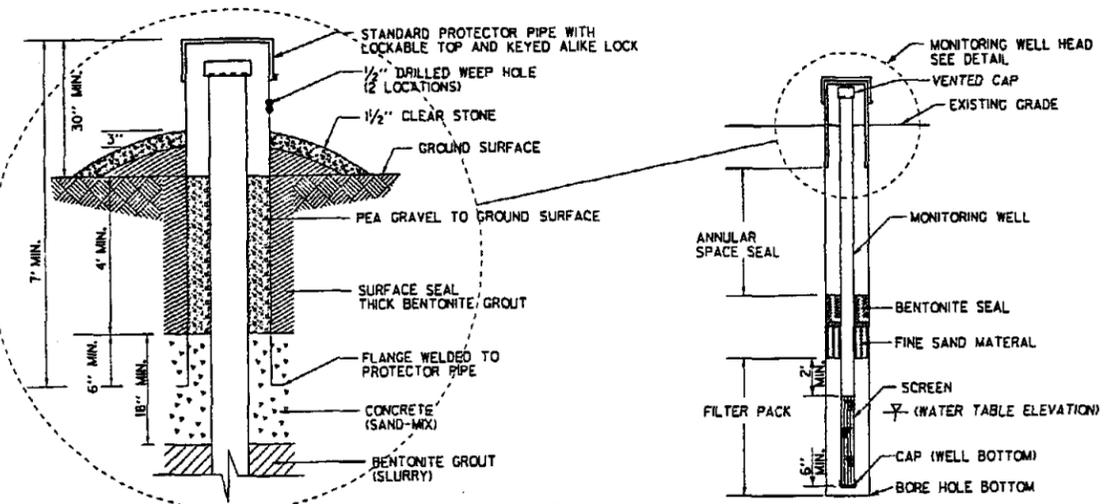
- Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, New York.
- MDEQ, 2002. *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*.
- North Jackson Company, 2004a. *Eagle Project Quality Assurance Project Plan for Stage II Hydrologic Assessments, Version 2.0*.
- North Jackson Company, 2004b. *Eagle Project Hydrologic Assessments Standard Operating Procedures Manual, Version 2.0*.
- USEPA, 2000. *Practical Methods for Data Analysis—EPA QA/G-9, EPA/600/R-96/084*.
- USEPA, 1992. *Statistical Analysis for Groundwater Monitoring Data at RCRA Facilities – Addendum to Interim Final Guidance, PB89-151047*.



TREATED WATER INFILTRATION SYSTEM LAYOUT



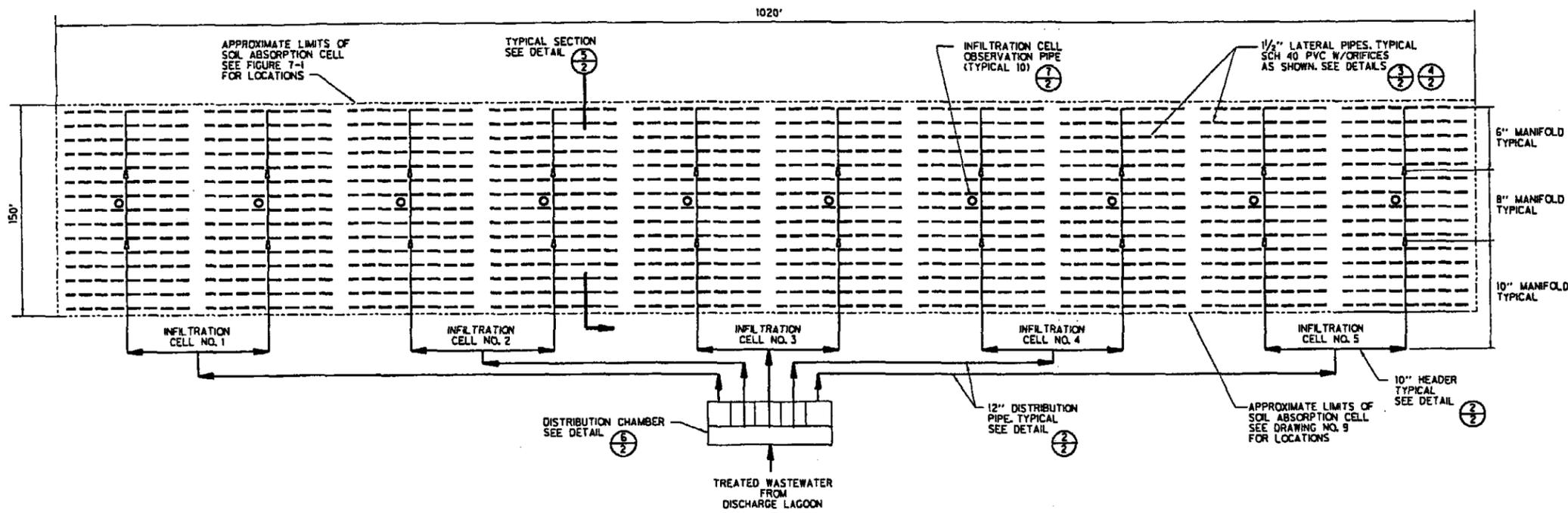
- NOTES:**
1. WELLS QAL041D AND QAL027A TO BE ABANDONED PER R 323.2223 (4)(D)
 2. WELL QAL031D TO BE USED FOR MONITORING GROUNDWATER LEVELS ONLY. QAL031D IS NOT A COMPLIANCE MONITORING WELL.



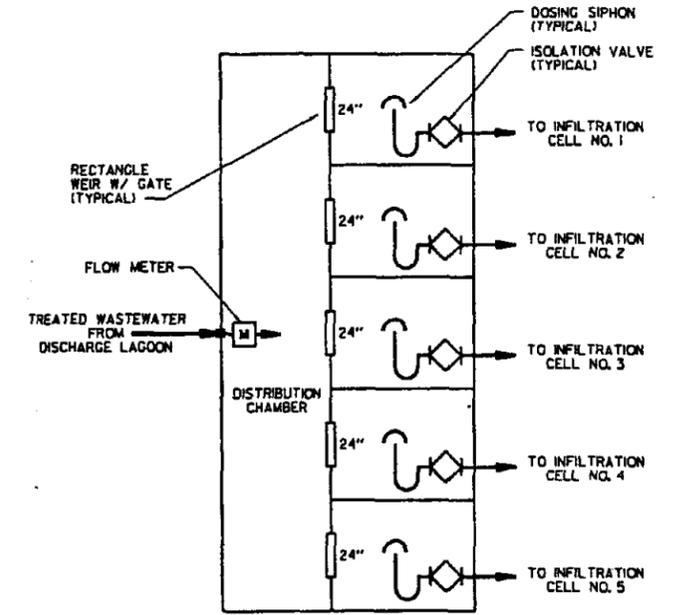
NOTE: MONITORING WELL SHALL BE CONSTRUCTED, DEVELOPED AND DOCUMENTED IN ACCORDANCE WITH ALL CODE REQUIREMENTS

1 MONITORING WELL DETAIL
NOT TO SCALE

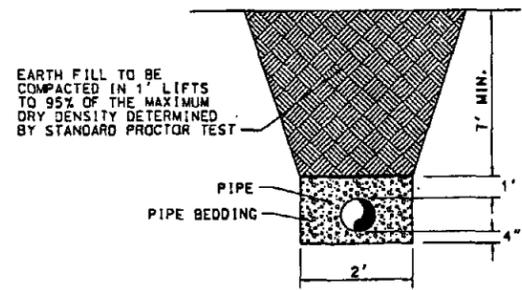
Foth Infrastructure & Environment, LLC					FIGURE 1 TREATED WATER INFILTRATION SYSTEM LAYOUT AND DETAILS
REVISED	DATE	BY	DESCRIPTION		
CHECKED BY:	PAK	DATE:	MARCH '07	Scale:	AS SHOWN
APPROVED BY:	SVDI	DATE:	MARCH '07	Prepared By:	JR82
APPROVED BY:		DATE:		Project No.	04W018



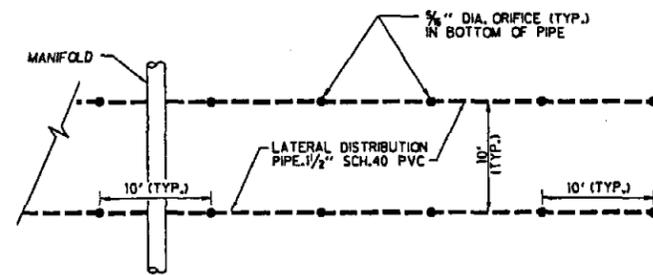
① TREATED WATER INFILTRATION SYSTEM - SCHEMATIC
NOT TO SCALE



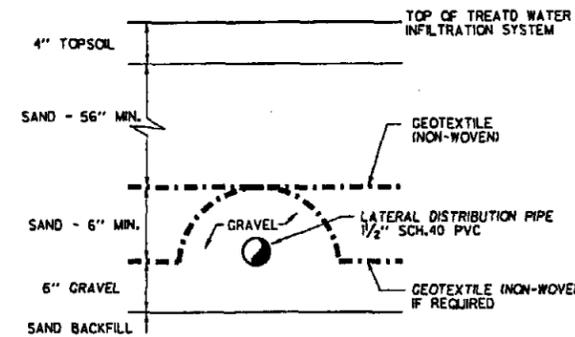
⑥ DISTRIBUTION CHAMBER
NOT TO SCALE



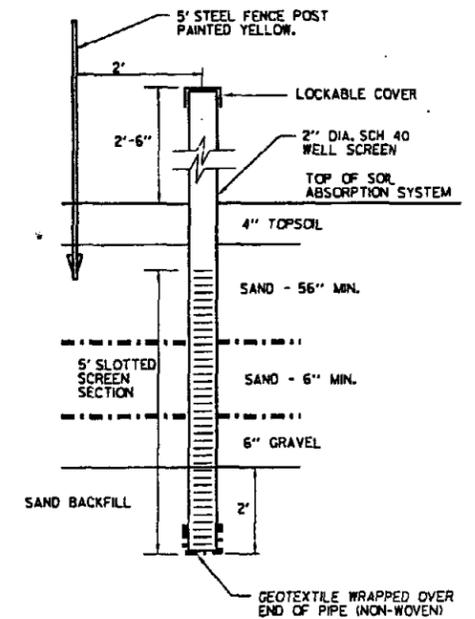
② TYPICAL TRENCH SECTION FOR BURIED PIPELINES
NOT TO SCALE



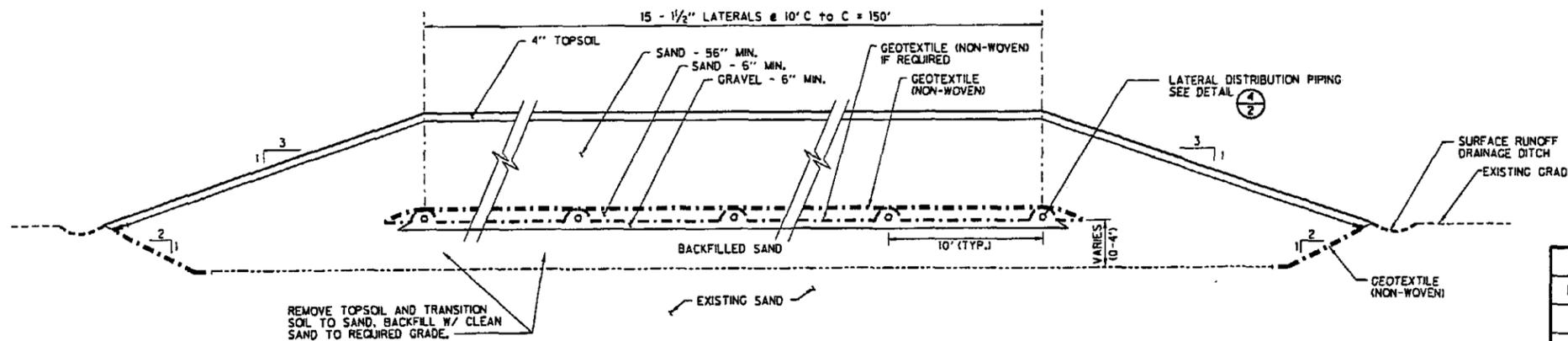
③ LATERAL DETAIL
NOT TO SCALE



④ LATERAL DISTRIBUTION PIPING DETAIL
NOT TO SCALE



⑦ INFILTRATION CELL OBSERVATION PIPE DETAIL
NOT TO SCALE



⑤ TREATED WATER INFILTRATION SYSTEM - TYPICAL SECTION
NOT TO SCALE

Foth Infrastructure & Environment, LLC					
REVISED	DATE	BY	DESCRIPTION		
				FIGURE 2 TREATED WATER INFILTRATION SYSTEM DESIGN AND DETAILS	
CHECKED BY: PAK		DATE: MARCH '07		Scale: NOT TO SCALE	Date: MARCH, 2007
APPROVED BY: SVD1		DATE: MARCH '07		Prepared By: JRB2	Project No. 04W018
APPROVED BY:		DATE:			