INTRODUCTION

Tetra Tech staff conducted field investigations along the Gila River, New Mexico from April 12th through May 5, 2010. The work was implemented in a manner consistent with the Gila River Study Plan (March 4, 2010) which describes the study being undertaken by the New Mexico Interstate Stream Commission (NMISC) and its consultants and collaborators. The field investigation included:

(a) coordinating with the NMISC, collaborators and land owners to arrange access to monitoring locations along the Gila River;
(b) drilling and constructing of monitoring piezometers near the river;
(c) equipping the monitoring piezometers with pressure transducer / dataloggers in order to establish a long-term groundwater elevation monitoring network;
(d) installing and equipping river stage gages at two monitoring locations;
(e) completing a detailed site survey, including river cross-sections and piezometer and stage gage locations and elevations; and
(f) associated field activities such as logging of subsurface geology, and piezometer development.

A summary of the fieldwork and a discussion of the preliminary findings are presented in the following memorandum.

STUDY OBJECTIVES

The objective of this project was to install monitoring equipment at sites along the Gila River (Figure 1) to improve our understanding of groundwater-surface water interactions. This study and the subsequent monitoring of the equipment installed as part of this study will enable the NMISC and collaborators to identify gaining and losing conditions, define the vertical hydraulic gradients, and improve the conceptual understanding of the shallow subsurface flow system.

This project provides the NMISC with the monitoring network and equipment to produce the data necessary to improve existing or future modeling efforts. In addition to the water level data, future hydraulic testing of the piezometer network could provide initial estimates for hydraulic properties of the geologic materials present in the associated alluvial deposits. Inverse modeling could also be employed using the stage and head data (including the deep piezometer) to estimate hydraulic parameters at the site, including the horizontal hydraulic
conductivity, vertical hydraulic conductivity, and potentially specific yield. Improving these estimates and calibrating models to the transient data that will be collected at these installations as part of future work orders would significantly improve the reliability of the models to generate accurate predictions near the sites.

Site Selection
Proposed piezometer locations were visited by Tetra Tech with the NMISC project manager and Nature Conservancy representatives between January 20, 2010 and January 21, 2010. Originally, four sites were selected for monitoring by the NMISC: The Nature Conservancy Site at Lichty Ecological Research Center (TNC Site), a second site on TNC property approximately one mile upstream of the TNC Site, a third site at the Highway 211 bridge on Freeport McMoran property and a fourth site at the Bird Study Area on Forest Service land. Site access was not granted for the Freeport McMoran property and no piezometer was installed at this location.

Although access to the site upstream of Litchy Center was granted, the single piezometer planned for this site was not completed due to drilling equipment limitations in the uneven terrain and very loose and deep sands at this location. After several failed attempts to place the drill rig without becoming stuck in the very loose surface soil, installation of the piezometer was determined to be impractical and a risk to the safety of WDC Exploration and Wells (WDC) staff. However, an additional piezometer was installed at the Bird Area (B-4). The additional piezometer at the Bird Area (B-4, see Figure 3) was requested by NMISC collaborator, TNC, and will not only aid them with their studies but also permit the NMISC to define a local horizontal hydraulic gradient. The TNC Site and Bird Site locations are shown on Figure 1.

The piezometers were placed in a line, perpendicular to the orientation of the river (Figure 2 and Figure 3). The piezometer transects are limited to one side of the river for this phase of the investigation. The piezometer transects include three water table piezometers (i.e. water table is within approximately 10 feet of well screen), and one deeper piezometer with a short (2-foot long) submerged screen. The water table wells permit the water table along the piezometer transect to be plotted on a cross-section and the deeper piezometer permits a vertical hydraulic gradient to be determined for each site. As a result of the addition of B-4, both sites have an additional piezometer down-gradient of the piezometer transect, which permits the determination of a horizontal hydraulic gradient.

Borehole Drilling
All wells were drilled between April 19th and April 27th, 2010 using a track mounted CME 85 drilling rig supplied and operated by WDC under the full-time supervision of Tetra Tech field staff (Photo 1). The boreholes were advanced using hollow stem auger drilling techniques. These techniques were generally found to be effective despite the presence of some cobbles and trace boulders in the subsurface. However, auger refusal was encountered during the installation of the deep piezometer boreholes. A track mounted rig was essential to access sites which frequently required traversing through soft sediments. Access was particularly challenging at the TNC-1 Site where sands were very loose and the terrain was uneven, which prevented the completion of a piezometer at this location.

During drilling activities the geologic materials were continuously sampled with a split-spoon sampler in advance of the auger. The aquifer materials were consistent across the sites and typically were silty fine sand, fine to coarse grained, poorly sorted sand with some gravel (fine) and moderately sorted gravel (fine) with sand, and cobbles. In general, there was minimal vertical anisotropy, although some interbedding of clean well sorted fine sands with the poorly
sorted gravelly sands was evident and a silty clay zone was encountered in B-4. An example of typical aquifer material is shown in Photo 2. As would be anticipated, based on the observations made in the field, all groundwater encountered in the field was under unconfined conditions. The geologic logs are included as part of the exploratory boring log / piezometer completion details included in Appendix A. The secondary grain size information reported in Appendix A uses the following nomenclature: trace (<5%); little (6 to 15%); few (16 to 30%); and some (31 to 49%).

**Piezometer Construction**

The monitoring piezometers were equipped with 2-inch (in) inner diameter (I.D.) polyvinyl chloride (PVC) threaded well screen and casing. The screen slot size was 0.010. A clean 10/20 silica sand was used for filter pack. As a result of flowing sands and an unstable borehole, the filter packs were typically a mix of filter pack material and native material. Surface seals were installed using bentonite chips and bentonite quick grout. Surface seals were installed at all wells to minimize the potential for surface water to enter the wells during flooding. Concrete was placed onto the hydrated bentonite and used to secure the locking steel casings and to provide a 2 foot by 2 foot well pad. Eight inch diameter, heavy gage steel casings were installed to provide maximum protection to the piezometers (Photo 3).

A summary of the piezometer completion information is included in Table 1 and Table 2, and the specific piezometer construction details for all the piezometers can be found in Appendix A. The target depth for the deep piezometer (greater than 30 feet) could not be achieved due to auger refusal and cobbles in the subsurface at 20 feet below ground surface. Similarly, auger refusal was encountered at 27 feet in B-1D.

**Table 1. TNC, Lichty Site Piezometers Completion Summary**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TNC-1S</td>
<td>15</td>
<td>5 to 15</td>
<td>4586.824</td>
<td>4589.626</td>
<td>8.97</td>
<td>4580.656</td>
</tr>
<tr>
<td>TNC-1D</td>
<td>20</td>
<td>18 to 20</td>
<td>4586.824</td>
<td>4589.179</td>
<td>8.21</td>
<td>4580.969</td>
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<tr>
<td>TNC-2</td>
<td>15</td>
<td>5 to 15</td>
<td>4586.581</td>
<td>4589.182</td>
<td>8.89</td>
<td>4580.292</td>
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<td>TNC-3</td>
<td>15</td>
<td>5 to 15</td>
<td>4586.459</td>
<td>4588.355</td>
<td>9.10</td>
<td>4579.255</td>
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<td>TNC-4</td>
<td>12</td>
<td>3 to 13</td>
<td>Not Surveyed</td>
<td>4583.134</td>
<td>5.17</td>
<td>4577.964</td>
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</tbody>
</table>

Notes: Depth to water level measurements reported are from the May 2, 2010 survey event.
Table 2. Bird Area Site Piezometers Completion Summary

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1S</td>
<td>15</td>
<td>5 to 15</td>
<td>4334.434</td>
<td>4337.230</td>
<td>10.64</td>
<td>4326.59</td>
</tr>
<tr>
<td>B-1D</td>
<td>27</td>
<td>25 to 27</td>
<td>4334.434</td>
<td>4337.562</td>
<td>11.07</td>
<td>4326.492</td>
</tr>
<tr>
<td>B-2</td>
<td>17</td>
<td>7 to 17</td>
<td>4335.583</td>
<td>4337.589</td>
<td>11.85</td>
<td>4325.739</td>
</tr>
<tr>
<td>B-3</td>
<td>18</td>
<td>8 to 18</td>
<td>4337.305</td>
<td>4339.299</td>
<td>14.35</td>
<td>4324.949</td>
</tr>
<tr>
<td>B-4</td>
<td>15</td>
<td>Not Surveyed</td>
<td>4328.298</td>
<td>4328.298</td>
<td>9.40</td>
<td>4318.898</td>
</tr>
</tbody>
</table>

Notes: Depth to water level measurements reported are from the May 2, 2010 survey event

**Piezometer Development**

Upon installation of the sand pack the piezometers were developed by GeoSquirt™ submersible development pump and/or hand bailing (Photo 4) to ensure adequate formation contact and that the water level in the wells would reflect those in the screened intervals of the aquifer. All piezometers were purged of at least 10 well volumes except for TNC-2 and B-1D, which were bailed/pumped dry multiple times as a result of lower yields. In all cases at least 3 well volumes were removed. It is not clear why TNC-2 had slower recover responses to purging, as the lithology was largely consistent with the other piezometer installations. Upon completion of the development many wells still had significantly high suspended solids (silt, very fine-grained sand). This is in part due to the amount of native material present in the sand pack, which tended to be poorly sorted. While the level of development is sufficient for collecting water level data, additional purging using a submersible development pump should be completed in order to more completely develop the piezometers (particularly TNC-2) prior to any hydraulic testing (e.g. slug testing) to ensure accurate estimates of hydraulic conductivity.

**Groundwater level monitoring equipment installations**

All permanent monitoring locations were equipped with Solinst Model 3001 Levelogger Junior M5 pressure transducer/data loggers. The transducers read absolute pressure (force exerted by the water column plus barometric pressure) and must be corrected for changes in barometric pressure. The TNC site is equipped with a barologger that continuously monitors barometric pressure at the same interval as Leveloggers and can be used to correct the TNC data. The Bird Site is within 3 miles of the FM-2 Site and can be corrected with the barologger from FM-2 station. The transducers are hung in the wells on Teflon coated, galvanized steel lines provided by Solinst and connected to an eyelet drilled into the surface casing.

The transducer clocks were initially set to the internal clock on the laptop computer used to set the transducer equipment and set to Mountain Daylight Time (MDT). The transducers were set to record a pressure reading every 30 minutes, for a maximum duration of over 600 days (32,000 data points available). During the first data downloading event in early May (completed by Ellen Soles) the sampling interval was changed to be every hour, to be consistent with ongoing monitoring at the other NMISC Gila River monitoring sites.
The pressure rating for this model of transducer is approximately 16.4 feet of water. If a maximum of 3.3 feet is allowed for barometric pressure, the usable range is approximately 13.1 feet of water column, with a typical accuracy of 0.016 feet. The transducers were typically set 7 to 9 feet below the current water table. The depth of the transducers is summarized in Table 3.

### Table 3. Transducer Depths Below Top of Casings for Permanent Monitoring Piezometers

<table>
<thead>
<tr>
<th>Piezometer ID</th>
<th>Transducer Depth [ft btoc]</th>
<th>Piezometer ID</th>
<th>Transducer Depth [ft btoc]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNC1-1S</td>
<td>15.90</td>
<td>B-1S</td>
<td>16.23</td>
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<tr>
<td>TNC-1D</td>
<td>16.56</td>
<td>B-1D</td>
<td>20.66</td>
</tr>
<tr>
<td>TNC-2</td>
<td>16.11</td>
<td>B-2</td>
<td>18.61</td>
</tr>
<tr>
<td>TNC-3</td>
<td>15.47</td>
<td>B-3</td>
<td>18.80</td>
</tr>
<tr>
<td>TNC-4</td>
<td>11.56</td>
<td>B-4</td>
<td>16.53</td>
</tr>
</tbody>
</table>

During installation a performance check of each pressure transducer was completed to ensure that the values recorded by the pressure transducer (corrected for barometric pressure) were within the measurement error of the depth to water level measurement, cable measurements and the accuracy of the pressure transducer readings (~0.01 feet for the barologger and the levelogger). This value was considered to be 0.03 feet.

### Gila River Stage Gage Installations

To compare heads in the shallow groundwater system to the river stage, it was necessary to install stage gages at each site. The Bird Site gage was installed on April 30, 2010 and the TNC Site gage was installed on May 1st and 2nd, 2010. The stage gages consisted of Solinst Model 3001 Levelogger Junior pressure transducers housed in a 1.25-inch diameter perforated steel pipe. The transducer is secured via 1.5-inch diameter steel pipe that is secured to the river bottom using rebar. The pipe was trenched beyond the current stage of the river and secured to the bank using steel pipe (Photo 5). Beyond the bank (or intermediate high point) 2-inch diameter PVC pipe was used to house a direct read cable line that runs through the pipe to a 8-inch diameter PVC casing were the data can be downloaded from the transducer using the optical reader cable (Photo 6). The cables ordered were 100 feet in length. The highest point within 100 feet of the transducer was selected as the best location for the downloading station. These locations range between 50 and 85 feet from the transducer location.

The stage gages were installed adjacent to the well transect, at a location where corresponding flow measurements can be obtained and where vandalism is unlikely. The pressure transducers were located below the water surface at the lowest point that was feasible and that would not likely provide misinterpretations (e.g. were water might pond when the river is dry). An effort was made to select locations where turbulence would be low, and where the slope and river bed materials were representative of typical conditions.

The stage gages had to be installed during relatively high flow conditions in order to meet permit requirements related to the Southwest Willow Flycatcher, which would have prevented the installation of the gages later in May or June when flows might have be lower. Given the relatively high flow conditions, it is likely that the pipe will have to be extended in order to move the transducer further out into the river so that it is appropriately positioned to measure river stage at baseflow conditions.
After the gages were installed, surface water elevation measurements were completed. The location, date, time and measured value for the surface water elevation measurements are included in Table 4.

Table 4. Water surface elevation measurements at the Gila River monitoring stations

<table>
<thead>
<tr>
<th>Monitoring Station</th>
<th>Date / Time</th>
<th>Stage Elevation [ft amsl]</th>
<th>Transducer Elevation [ft amsl]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNC-1</td>
<td>May 05, 2010 / 1000</td>
<td>4580.45</td>
<td>4579.947</td>
</tr>
<tr>
<td>B-1</td>
<td>May 04, 2010 / 1400</td>
<td>4326.71</td>
<td>4325.030</td>
</tr>
</tbody>
</table>

Notes: ft amsl: feet above mean sea level.

The transducers were set to measure stage at 30-minute intervals, the same as the transducers installed in the piezometers. These transducers were also reset by Ellen Soles to have a sampling interval of one hour. While the primary objective of the stage gage is stage elevation, it may also be useful to estimate discharge. Since a rating curve is not currently available, this can be accomplished using Manning’s equation. The detailed cross-sections (Figure 4 and Figure 5) can be used in combination with the stage data and a Manning’s coefficient to estimate discharge.

**Site Survey**

Upon completion of the stage gage and piezometer installations, the locations were surveyed using a Trimble 4800 Base and Rover Receiver Survey-Grade Global Positioning System (GPS). The elevation of the stage gage transducer, the top of casing and ground surface at each piezometer, and a cross-section of the river were all surveyed. The reported accuracies for GPS system utilized are 1 cm +1 ppm horizontally and 2 cm +2 ppm vertically when conducting and RTK survey. Static survey accuracies are 5 mm +1 ppm horizontally and 5 mm +2 ppm vertically. A combination Static / RTK survey were conducted since no published control points were located within reasonable distance of survey areas. The base station was set up to collect data independently of the Rover in order to obtain location information that could then be processed using the NGS’s OPUS system. Once a suitable base station location was obtained, all remaining RTK data could then be processed with a high degree of accuracy. Additional control points were set in order to ensure that any future data collected at the sites could be collected rapidly and efficiently and would conform to accuracy standards. For example, it may be necessary to periodically resurvey the stage gage transducer elevation if maintenance is required after a high flow event.

**Results**

The focus of the current investigation was to install and equip a groundwater and surface water monitoring network at two monitoring sites along the Gila River. The value of this work will be realized through long-term monitoring, data collection and subsequent analysis of the time series data. These long-term observations will greatly improve our understanding of the groundwater-surface water interactions along the Gila River. However, some initial observations can be made based on the conditions present in the field at the time of the fieldwork. A brief summary of some preliminary results are discussed below.
**TNC Site**

Based on the depth-to-groundwater measurements completed on May 2, 2010 and the top of casing survey data, this reach of the river is losing water to the shallow groundwater (Figure 4). The piezometer transect indicates that the water table elevation decreases with increasing distance from the river. However, the river stage on May 2, 2010 ranged from 327 to 371 cubic feet per second (USGS Gila River at Gila Station No. 09430500), which is well above baseflow conditions for the reach. The horizontal hydraulic gradient in the shallow aquifer is 0.0054 ft/ft to the southwest (Figure 6). The vertical gradient measurement (+0.0348 ft/ft) indicates that deep groundwater is flowing upwards to the shallow aquifer. The long-term monitoring data will help understand these dynamics and how irrigation of the adjacent field affects the shallow groundwater flow regime and how the groundwater-surface dynamics change at lower river stages.

**Bird Site**

The data from the Bird site indicates that on May 2, 2010 the river was losing over this reach of the river. The river stage elevation is above the water table elevation of the closest well (Figure 5). Furthermore, the water table elevation decreases along the cross-section with increasing distance from the river. The horizontal hydraulic gradient is estimated to be 0.0025 ft/ft to the southeast (Figure 7). The hydraulic heads at B-1S / B-1D (-0.0061 ft/ft) indicate downward vertical gradients.

**Recommendations for Future Studies**

Pressure transducer equipment must be properly maintained and calibrated according to the manufacturer instructions. To ensure the collection of reliable data from the monitoring network installed as part of this study, it will be essential to keep accurate records of performance checks during each field visit. Necessary data collection includes recording the depth to water, barometric pressure, and the transducer water column readings and ensuring that they continue to agree.

Inverse modeling of large stage changes and the propagation of these changes through the shallow aquifer along the piezometer transect should be completed to estimate hydraulic properties of the shallow aquifer at the sites.

Our understanding of the groundwater-surface water interactions at the sites would improve if additional piezometers were installed to extend the piezometer transects across both sides of the river. This could be done using a track mounted drilling rig during low flow conditions. A mini-piezometer study across the river bed at the transect location could also provide some interesting insights into the spatial variability of the groundwater – surface water interactions across the channel.
New Mexico Interstate Stream Commission

BIRD SITE
GILA RIVER PIEZOMETER INSTALLATION LOCATIONS

Source Imagery: NM Statewide Digital Ortho Quarter Quads (DOQQ), 2005-2006;
UTM NAD83, Zone 13N, UTM meters

Figure 3
A 4577.96 4580.66 4580 4579 4578 TNC-1 TNC-4 TNC-2 TNC-3 TNC-SURFACE GAGE Direction of Groundwater Flow  \( i = 0.0054 \)

New Mexico Interstate Stream Commission
TNC SITE HORIZONTAL HYDRAULIC GRADIENT MAP

Source Imagery: NM Statewide Digital Ortho Quarter Quads (DOQQ), 2005-2006;
UTM NAD83, Zone 13N; Units=meters
1:2,000
1 inch = 167 feet

NOTE: DEPTH TO GROUNDWATER MEASUREMENTS FROM MAY 01 AND MAY 02, 2010
Figure 7

New Mexico Interstate Stream Commission
BIRD SITE
HORIZONTAL HYDRAULIC GRADIENT MAP

NOTE: DEPTH TO GROUNDWATER MEASUREMENTS FROM APRIL 30 AND MAY 01, 2010
PHOTOS
Photo 1. CME Track Mounted Auger Drilling Rig

Photo 2. Typical Aquifer Material
Photo 3. Piezometer Completions

Photo 4. Development Using the GeoSquirt Pump

Photos 3 and 4
Piezometer Installations
Gila River, New Mexico
Photo 5. Stage Gage Installation at the TNC Site

Photo 6. Piezometers and Stage Gage at the TNC Site
APPENDIX A
GEOLOGIC LOGS AND PIEZOMETER COMPLETION DIAGRAMS
**PROJECT NAME:** Gila Piezometer Installation April 2010  
**LOCATION:** N665952.248 E2484378.162  
**FIELD LOGGED BY:** C. Mathews  
**ELEVATION: GROUND SURFACE (msl):** 4334.434 amsl  
**GROUNDWATER ELEVATION (msl):** 4326.492 amsl  
**REMARKS:** Piezometer set at 27 feet bgs due to auger refusal. Project #114-690164  

<table>
<thead>
<tr>
<th>ELEVATION (msl)</th>
<th>BORE HOLE DIAMETER</th>
<th>amount</th>
<th>USCS SYMBOL</th>
<th>PID RESULT (ppm)</th>
<th>DEPTH (log) ft</th>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td>5</td>
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<td>GW</td>
<td></td>
<td>10</td>
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<td>GW</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4305</td>
<td></td>
<td></td>
<td>GW</td>
<td></td>
<td>25</td>
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</table>

**Boring depth = 27 feet**
**Boring Log**

**Project Name:** Gila Piezometer Installation April 2010  
**Location:** N665959.128 E2484378.122  
**Drill Type:** CME 85  
**Drilled By:** WDC Exploration and Wells  
**Field Logged By:** C. Mathews  
**Remarks:** Project #114-690164

**Soil Boring No.:** B-1s  
**Elevation (msl):** 4334.434 amsl  
**Groundwater Elevation (msl):** 4326.59 amsl  
**Date/Time: Hole Started:** 4/14/2010 14:50  
**Date/Time: Completed:** 4/14/2010 15:45

<table>
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<th>Sample to Lab</th>
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<th>Classification and Description</th>
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<td>Sandy Silt: light brown, fine-grained sand with silt, trace gravel, loose, dry</td>
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<tr>
<td>4325</td>
<td></td>
<td></td>
<td>Silt: brown, fines, trace gravel, loose, nonplastic, damp</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gravel and Cobbles: 0% recovery from split spoon sample. Drillers remarks and drill cuttings indicate gravels and cobbles</td>
</tr>
<tr>
<td>4320</td>
<td></td>
<td></td>
<td>Sand: light brown, medium to coarse-grained sand, poorly sorted, loose, subrounded, wet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gravel and Sand: brown, coarse-grained sand with some gravel, poorly sorted, loose, subrounded, saturated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sand: light brown, fine to coarse-grained sand, trace fines, trace gravel, poorly sorted, loose, subrounded, saturated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gravel and Sand: brown, fine to coarse-grained sand with some gravel, loose subrounded, saturated</td>
</tr>
</tbody>
</table>

**Boring Depth:** 15 feet

**USCS Symbol:** SM GM GW SW GM GW

**PID Result (ppm):**}

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Boring depth = 15 feet
**Boring Log**

**Project Name:** Gila Piezometer Installation April 2010  
**Location:** N666193.657.248 E2484929.646  
**Field Logged By:** C. Mathews  
**Drill Type:** CME 85  
**Soil Boring No.:** B-2  
**Drilled By:** WDC Exploration and Wells  
**Remarks:** Project #114-690164

<table>
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<th>Sample to Lab</th>
<th>Sample ID</th>
<th>Classification and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4335</td>
<td></td>
<td></td>
<td>SILT: light brown, fines, trace gravel, moderately well sorted, soft, loose, nonplastic, dry</td>
</tr>
<tr>
<td>4330</td>
<td></td>
<td></td>
<td>SILTY SAND: brown, fine-grained sand, few fines, trace medium to coarse-grained sand, trace gravel, poorly sorted, damp</td>
</tr>
<tr>
<td>4325</td>
<td></td>
<td></td>
<td>GRAVEL AND COBBLES: 10% recovery, light brown, gravel, trace fine to coarse-grained sand, medium dense, damp. Driller's remarks indicate cobbles are likely.</td>
</tr>
<tr>
<td>4320</td>
<td></td>
<td></td>
<td>GRAVEL AND SAND: light brown, alternating zones of fine to coarse-grained sand with some gravel and gravel with some fine to coarse-grained sand, trace fines, some cobbles as indicated by drill cuttings. First occurrence of groundwater at approximately 9.5 feet bgs. Saturated below 11 feet bgs.</td>
</tr>
<tr>
<td>4315</td>
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</tr>
<tr>
<td>4310</td>
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</tbody>
</table>

**Elevation:** GROUND SURFACE (msl): 4335.583 amsl  
**Groundwater Elevation (msl):** 4325.739 amsl  
**Date/Time: Hole Started:** 4/15/2010 9:20  
**Date/Time: Completed:** 4/15/2010 10:30  
**Bore Hole Diameter:** 6 7/8 inches  
**Depth:** 17 feet

**Comment:**
SILT: light brown, fines, trace gravel, moderately well sorted, soft, loose, nonplastic, dry.

SILTY SAND: brown, fine-grained sand, few fines, trace medium to coarse-grained sand, trace gravel, poorly sorted, damp.

GRAVEL AND COBBLES: 10% recovery, light brown, gravel, trace fine to coarse-grained sand, medium dense, damp. Driller's remarks indicate cobbles are likely.

GRAVEL AND SAND: light brown, alternating zones of fine to coarse-grained sand with some gravel and gravel with some fine to coarse-grained sand, trace fines, some cobbles as indicated by drill cuttings. First occurrence of groundwater at approximately 9.5 feet bgs. Saturated below 11 feet bgs.
**PROJECT NAME:** Gila Piezometer Installation April 2010  
**LOCATION:** N666554.177  E2485684.281  
**FIELD LOGGED BY:** C. Mathews  
**ELEVATION: GROUND SURFACE (msl):** 4337.305 amsl  
**GROUNDWATER ELEVATION (msl):** 4324.949 amsl  
**REMARKS:** Project #114-690164

**SOIL BORING NO.** B-3  
**DRILL TYPE:** CME 85  
**HOLLOW STEM AUGER**  
**BORE HOLE DIAMETER:** 6 7/8 inches  
**DRILLED BY:** WDC Exploration and Wells  
**DATE/TIME: HOLE STARTED:** 4/15/2010  11:25  
**DATE/TIME: COMPLETED:** 4/15/2010  13:00

**BORING LOG**

<table>
<thead>
<tr>
<th>ELEVATION (msl) - ft</th>
<th>SAMPLE TO LAB</th>
<th>CLASSIFICATION AND DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4335</td>
<td></td>
<td>SILT: light brown, fines, trace gravel from 0 to 3 feet and 9 to 9.5 feet bgs, well sorted, nonplastic, loose to moderately dense, damp at 3 feet bgs and moist at 9 feet bgs</td>
</tr>
<tr>
<td>4330</td>
<td></td>
<td>SAND: light brown, fine to medium-grained sand, trace coarse-grained sand, trace gravel, moderately well sorted, loose to moderately dense, wet</td>
</tr>
<tr>
<td>4325</td>
<td></td>
<td>SILTY SAND: light brown, fine to medium-grained sand, some fines, few gravels, poorly sorted, nonplastic, moderately dense, saturated</td>
</tr>
<tr>
<td>4320</td>
<td></td>
<td>SAND: light brown, medium-grained sand, trace coarse grains, trace gravel, poorly sorted, loose, saturated</td>
</tr>
<tr>
<td>4315</td>
<td></td>
<td>SAND: light brown, medium to coarse-grained sand, few gravels, poorly sorted, loose, saturated</td>
</tr>
</tbody>
</table>

**USCS SYMBOL**  
**PMT RESULT (ppm)**  
**DEPTH (bgs) - ft**

---

**Boring depth = 18 feet**  

---

**TETRATECH**  
**BORING LOG**  
Page 1 of 1
**PROJECT NAME:** Gila Piezometer Installation April 2010  
**LOCATION:** N663799.401   E2486831.180  
**FIELD LOGGED BY:** C. Mathews  
**ELEVATION: GROUND SURFACE (msl):** Not surveyed ~ 4325.988 amsl  
**GROUNDWATER ELEVATION (msl):** N/A  
**REMARKS:**  
Project #114-690164  

**SOIL BORING NO.** B-4  
**DRILL TYPE:** CMF 85 Hollow stem auger  
**BORE HOLE DIAMETER:** 6 7/8 inches  
**DRILLED BY:** WDC Exploration and Wells  
**DATE/TIME: HOLE STARTED:** 4/15/2010 14:15  
**DATE/TIME: COMPLETED:** 4/15/2010 16:00

<table>
<thead>
<tr>
<th>ELEVATION (msl) - ft</th>
<th>SAMPLE TO LAB</th>
<th>SAMPLE ID</th>
<th>CLASSIFICATION AND DESCRIPTION</th>
<th>USCS SYMBOL</th>
<th>PID RESULT (ppm)</th>
<th>DEPTH (lbs) - ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>4325</td>
<td></td>
<td></td>
<td>SILT: light brown, fines, trace fine-grained sand, moderately well sorted, loose, low plasticity, damp</td>
<td>OL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4320</td>
<td></td>
<td></td>
<td>SILTY SAND: light brown, fine-grained sand with some fines, trace gravels, trace clay (very soft clay with medium plasticity), loose, non plastic, moist</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4315</td>
<td></td>
<td></td>
<td>SILTY CLAY: light brown, stilty clay, trace fine-grained sand, trace gravels, moderately well sorted, soft, medium plasticity, wet</td>
<td>CL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4310</td>
<td></td>
<td></td>
<td>GRAVEL AND SAND: light brown, fine to coarse-grained sand, few gravels, few to some cobbles, trace fines, poorly sorted, medium dense, saturated</td>
<td>GW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BORING depth = 15 feet**
**Gila Piezometer Installation April 2010**

**LOCATION:** N734533.933  E2503544.896

**FIELD LOGGED BY:** C. Mathews

**ELEVATION:** GROUND SURFACE (msl): 4586.824 amsl

**GROUNDWATER ELEVATION (msl):** 4580.969 amsl

**REMARKS:** Piezometer set at 20 feet bgs due to auger refusal.

**SOIL BORING NO.:** TNC-1d

**DRILL TYPE:** CME 85

**DRILLED BY:** WDC Exploration and Wells

**DATE/TIME: HOLE STARTED:** 4/17/2010 14:30

**DATE/TIME: COMPLETED:** 4/17/2010 16:30

**Boring depth = 20 feet**

<table>
<thead>
<tr>
<th>ELEVATION (msl), ft</th>
<th>CLASSIFICATION AND DESCRIPTION</th>
<th>USCS SYMBOL</th>
<th>PID RESULT (ppm)</th>
<th>DEPTH (log) - ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>4580</td>
<td>SANDY SILT: light brown, fines with some fine-grained sand, trace gravel, poorly sorted, nonplastic, very loose, dry</td>
<td>SM</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>GRAVEL AND SAND: light brown, fine to coarse-grained sand, some gravel, poorly sorted, loose, dry</td>
<td>SW</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>SILT: light brown, fines, trace gravel, trace fine to coarse-grained sand, poorly sorted, nonplastic, loose, dry</td>
<td>OL</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>SILTY SAND: light brown, fines with some fine-grained sand (coarse-grained sand from 7 to 7.5 feet bgs), trace to few gravels, trace cobbles, poorly sorted, nonplastic, medium dense, moist</td>
<td>SM</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>4575</td>
<td>GRAVEL AND SAND: light brown, fine to coarse-grained sand, few to some gravels and cobbles, poorly sorted, dense, saturated</td>
<td>GW</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4570</td>
<td>SAND: light brown, fine to medium-grained sand, trace coarse-grained sand, trace to few gravels, medium dense, saturated</td>
<td>SW</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>4565</td>
<td>GRAVEL AND COBBLES: light brown, gravel with some cobbles, few fine to coarse-grained sands, dense, saturated</td>
<td>GW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4560</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4555</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Boring Log

**Project Name:** Gila Piezometer Installation April 2010  
**Location:** N734527.619  E2503544.793  
**Drill Type:** CME 85  
**Drilled By:** WDC Exploration and Wells  
**Field Logged By:** C. Mathews  
**Classification:** USCS Symbol  
**Remarks:** Project #114-690164

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample ID</th>
<th>Classification and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4585</td>
<td></td>
<td>Sandy Silt: light brown, fines with some fine-grained sand, trace gravel, poorly sorted, nonplastic, very loose, dry</td>
</tr>
<tr>
<td>4580</td>
<td></td>
<td>Gravel and Sand: light brown, fine to coarse-grained sand, some gravel, poorly sorted, loose, dry</td>
</tr>
<tr>
<td>4575</td>
<td></td>
<td>Silt: light brown, fines, trace gravel, trace fine to coarse-grained sand, poorly sorted, nonplastic, loose, dry</td>
</tr>
<tr>
<td>4570</td>
<td></td>
<td>Silty Sand: light brown, fines with some fine-grained sand (coarse-grained sand from 7 to 7.5 feet bgs), trace to few gravels, trace cobbles, poorly sorted, nonplastic, medium dense, moist</td>
</tr>
<tr>
<td>4565</td>
<td></td>
<td>Gravel and Sand: light brown, fine to coarse-grained sand, few to some gravels and cobbles, poorly sorted, dense, saturated</td>
</tr>
<tr>
<td>4560</td>
<td></td>
<td>Sand: light brown, fine to medium-grained sand, trace coarse-grained sand, trace to few gravels, medium dense, saturated</td>
</tr>
</tbody>
</table>

**Depth (ft):** 6 7/8 inches  
**Date/Time:** 4/17/2010 16:40  
**Elevation:** 4586.824 amsl  
**Groundwater Elevation:** 4580.656 amsl  
**Remarks:** Boring depth = 15 feet  
**Sample to Lab:**  
**Sample ID:**  

---

**USCS Symbol:**  
**PID Result (ppm):** SM  
**Depth (ft):**

---

**Note:** The table and log entries provide detailed soil classifications and descriptions for the Gila Piezometer Installation project, including elevations, groundwater levels, and sample identification for the boring log.
**PROJECT NAME:** Gila Piezometer Installation April 2010  
**LOCATION:** N734515.460 E2503446.980  
**FIELD LOGGED BY:** C. Mathews  
**ELEVATION: GROUND SURFACE (msl):** 4586.581 amsl  
**GROUNDWATER ELEVATION (msl):** 4580.292 amsl  
**REMARKS:** Project #114-690164

<table>
<thead>
<tr>
<th>ELEVATION (msl) - ft</th>
<th>SAMPLE TO LAB</th>
<th>SAMPLE ID</th>
<th>CLASSIFICATION AND DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4585</td>
<td></td>
<td></td>
<td>SILT: light brown, fines, trace gravel, well sorted, loose, nonplastic, dry</td>
</tr>
<tr>
<td>4580</td>
<td></td>
<td></td>
<td>SILT AND GRAVEL: light brown, fines, some gravel, poorly sorted, medium dense, nonplastic, damp</td>
</tr>
<tr>
<td>4575</td>
<td></td>
<td></td>
<td>GRAVEL AND SAND: light brown, fine to medium-grained sand, some gravel, few cobbles, trace coarse-grained sand, poorly sorted, medium dense, moist</td>
</tr>
<tr>
<td>4570</td>
<td></td>
<td></td>
<td>GRAVEL AND COBBLES: 0% recovery from split spoon sample. Drillers remarks and drill cuttings indicate light gravel with cobbles, very dense, wet</td>
</tr>
<tr>
<td>4565</td>
<td></td>
<td></td>
<td>GRAVEL AND SAND: light brown, fine to coarse-grained sand, some gravels, poorly sorted, medium dense to dense, saturated</td>
</tr>
<tr>
<td>4560</td>
<td></td>
<td></td>
<td>SAND: light brown, fine to medium-grained sand, trace coarse-grained sand, trace gravel, poorly sorted, medium dense, saturated</td>
</tr>
</tbody>
</table>

**SOIL BORING NO.** TNC-2  
**DRILL TYPE:** CME 85  
Hollow stem auger  
**BORE HOLE DIAMETER:** 6 7/8 inches  
**DRILLED BY:** WDC Exploration and Wells  
**DATE/TIME: HOLE STARTED:** 4/17/2010 17:30  
**DATE/TIME: COMPLETED:** 4/17/2010 19:00

**USCS SYMBOL**  
**PID RESULT (ppm)**  
**DEPTH (bgs) - ft**

Boring depth = 15 feet
**PROJECT NAME:** Gila Piezometer Installation April 2010  
**LOCATION:** N73°44'8.877" E250°31'94.847"  
**FIELD LOGGED BY:** C. Mathews

**ELEVATION: GROUND SURFACE (msl):** 4586.459 amsl  
**GROUNDWATER ELEVATION (msl):** 4579.255 amsl  
**REMARKS:** Project #114-690164

**SOIL BORING NO.:** TNC-3  
**DRILL TYPE:** CME 85  
**DRILLED BY:** WDC Exploration and Wells

**DATE/TIME: HOLE STARTED:** 4/17/2010  19:15  
**DATE/TIME: COMPLETED:** 4/17/2010  20:30

<table>
<thead>
<tr>
<th>ELEVATION (msl) - ft</th>
<th>SAMPLE TO LAB</th>
<th>SAMPLE ID</th>
<th>CLASSIFICATION AND DESCRIPTION</th>
<th>USCS SYMBOL</th>
<th>PID RESULT (ppm)</th>
<th>DEPTH (lbs) - ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>4585</td>
<td></td>
<td></td>
<td>SANDY SILT: light brown to brown, very fine-grained sand and some silt, poorly sorted, loose, nonplastic, dry to damp</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4580</td>
<td></td>
<td></td>
<td>SILT: light brown, fines, well sorted, medium dense, nonplastic, damp</td>
<td>OL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4575</td>
<td></td>
<td></td>
<td>SILTY SAND: light brown, fines wit some fine-grained sand, trace to few gravels, larger gravel in cuttings, poorly sorted, nonplastic, moist</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4570</td>
<td></td>
<td></td>
<td>GRAVEL AND COBBLES: 0% recovery from split spoon sample. Drillers remarks and drill cuttings indicate light gravel with cobbles, very dense, wet</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4565</td>
<td></td>
<td></td>
<td>GRAVEL AND SAND: light brown, fine to coarse-grained sand, few gravels, cuttings indicate cobbles, poorly sorted, medium dense to dense, saturated</td>
<td>GW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Boring depth = 15 feet**
### Boring Log

**Project Name:** Gila Piezometer Installation April 2010  
**Location:** 733952.165N 2503447.058E  
**Field Logged By:** C. Mathews  
**Elevation: Ground Surface (msl):** Not Surveyed ~ 4580.884  
**Groundwater Elevation (msl):** 4577.964 amsl  
**Remarks:** Project #114-690164

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample To Lab</th>
<th>Classification and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4580</td>
<td></td>
<td><strong>Silty Sand:</strong> light brown, fine-grained sand, some fines, trace gravel, poorly sorted, very loose, nonplastic, damp</td>
</tr>
<tr>
<td>4575</td>
<td></td>
<td><strong>Gravel and Sand:</strong> light brown, fine to coarse-grained sand with alternating zones of trace to some gravel, cuttings indicate few to some cobbles, poorly sorted, loose to medium dense, First occurrence of groundwater at approximately 3 feet bgs. saturated at 4.5 feet bgs.</td>
</tr>
<tr>
<td>4570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4565</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4555</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Soil Boring No.:** TNC-4  
**Drill Type:** CME 85  
**Drilled By:** WDC Exploration and Wells  
**Date/Time: HOLE STARTED:** 4/18/2010 9:30  
**Date/Time: COMPLETED:** 4/18/2010 11:15  
**Bore Hole Diameter:** 6 7/8 inches  
**Elevation:** 4555 ft (msl)  
**USCS Symbol:** SM  
**Depth (bg):** 25 ft  

**Boring Log:** Boring depth = 13 feet
Job Name: Gila - Forest Service, Bird Area
Job No.: 114-690164  Date: 4/15/2010
Project Manager: Mike Gabora
Well I.D.: B-1d
Field Tech: Christine Mathews
Driller: WDC Exploration and Wells
Equipment: CME 85

Materials

<table>
<thead>
<tr>
<th>Pounds</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>Silica Sand</td>
</tr>
<tr>
<td>100</td>
<td>3/8&quot; chip Hole Plug</td>
</tr>
<tr>
<td>50</td>
<td>Quick Grout</td>
</tr>
<tr>
<td>240</td>
<td>Sakcrete</td>
</tr>
</tbody>
</table>

Feet of native fill/ slough

- 26.53 feet of 2 inch .010 pvc Blank Casing
- 2 feet of 2 inch .010 pvc Slotted Screen
- 5 feet of 8" steel Outer Casing
- 0 feet of Sump/ Silt Trap

Placement Method: Pour

Notes: Casing and screen joint type - flush thread

Development

Method: Hand bailed and pumped (GeoSquirt submersible pvc purge pump)

Date: 4/20/2010

Amount Purged: 15 gallons

Notes: 10 well volumes = 30 gallons, well recharge was slow.
Well purged of 5 volumes. Well was pumped and bailed dry.
Slow recharge likely due to short screen interval.

Steel Casing: 8" diameter
Other:
- +2.5 feet to -2.5 feet
Casing:
- +1.53 ft. to -25 ft.
- 8 inch diameter Borehole:
- 0 ft. to -27 ft.
Outer Casing:
- +2.5 ft. to -2.5 ft.
Concrete:
- approx. 2 sq. ft well pads
- 0 ft. to -3 ft.

Bentonite Seal:
- -3 ft. to -6 ft.
Filter Pack:
- -6 ft. to -27 ft.
Slotted Screen:
- -25 ft. to -27 ft.
Native fill/ slough:
- ft. to ft.
8 inch diameter Borehole:
- 0 ft. to -27 ft.
Sump/ Silt Trap:
- ft. to ft.
Total Depth Borehole (feet):
- 27 feet from ground surface
- 28.53 feet from TOC
Well Completion Diagram

Job Name: Gila - Forest Service, Bird Area
Job No.: 114-690164 Date: 4/14/2010
Project Manager: Mike Gabora
Well I.D.: B-1s
Field Tech: Christine Mathews
Driller: WDC Exploration and Wells
Equipment: CME 85

Materials

<table>
<thead>
<tr>
<th>200 Pounds</th>
<th>Silica Sand</th>
<th>Filter Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Pounds</td>
<td>3/8&quot; chip Hole Plug</td>
<td>Bentonite Seal</td>
</tr>
<tr>
<td>50 Pounds</td>
<td>Quick Grout</td>
<td>Grout</td>
</tr>
<tr>
<td>240 Pounds</td>
<td>Sakcrete</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

Feet of native fill/ slough

<table>
<thead>
<tr>
<th>7.79 Feet of</th>
<th>2 inch</th>
<th>pvc</th>
<th>Blank Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Feet of</td>
<td>2 inch</td>
<td>.010 pvc</td>
<td>Slotted Screen</td>
</tr>
<tr>
<td>5 Feet of</td>
<td>8&quot; steel</td>
<td>Outer Casing</td>
<td></td>
</tr>
</tbody>
</table>

Feet of Sump/ Silt Trap

Placement Method: Pour

Notes: Casing and screen joint type - flush thread

Development

Method: Pumped - GeoSquirt submersible pvc purge pump
Date: 4/20/2010
Amount Purged: 32 gallons

Notes: 10 well volumes = 12 gallons, well recharge was quick so purging was continued to remove sediment from the well.

Steel Casing: 8" diameter

Other:
+3.0 feet to -2 feet

Casing:
+2.79 ft. to -5 ft.

8 inch diameter
Borehole:
0 ft. to -15 ft.

Outer Casing:
+3 ft. to -2 ft.

Concrete:
approx. 2 sq. ft well pads
0 ft. to 15 ft.

Grout:
0 ft. to -2 ft.

Bentonite Seal:
-2 ft. to -4 ft.

Filter Pack:
-4 ft. to -15 ft.

Slotted Screen:
-5 ft. to -15 ft.

Native fill/ slough:

8 inch diameter
Borehole:
0 ft. to -15 ft.

Sump/ Silt Trap:

Total Depth Borehole (feet):
15 feet from ground surface
17.79 feet from TOC
## Well Completion Diagram

### Materials

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 Pounds</td>
<td>Silica Sand</td>
<td>Filter Pack</td>
</tr>
<tr>
<td>50 Pounds</td>
<td>3/8&quot; chip Hole Plug</td>
<td>Bentonite Seal</td>
</tr>
<tr>
<td>50 Pounds</td>
<td>Quick Grout</td>
<td>Grout</td>
</tr>
<tr>
<td>240 Pounds</td>
<td>Sakrete</td>
<td>Concrete</td>
</tr>
<tr>
<td>9.3 Feet of</td>
<td>2 inch pvc</td>
<td>Blank Casing</td>
</tr>
<tr>
<td>10 Feet of</td>
<td>2 inch .010 pvc</td>
<td>Slotted Screen</td>
</tr>
<tr>
<td>5 Feet of</td>
<td>8&quot; steel</td>
<td>Outer Casing</td>
</tr>
<tr>
<td>0 Feet of</td>
<td></td>
<td>Sump/ Silt Trap</td>
</tr>
</tbody>
</table>

### Development

**Method**: Pumped - GeoSquirt submersible pvc purge pump

**Date**: 4/20/2010

**Amount Purged**: 16 gallons

**Notes**: 10 well volumes = 12.54 gallons, well recharge was quick so purging was continued to remove sediment from the well.
Job Name: Gila - Forest Service, Bird Area

Job No.: 114-690164  Date: 4/15/2010

Project Manager: Mike Gabora

Well I.D.: B-3

Field Tech: Christine Mathews

Driller: WDC Exploration and Wells

Equipment: CME 85

Materials

<table>
<thead>
<tr>
<th>300</th>
<th>Pounds</th>
<th>Silica Sand</th>
<th>Filter Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>Pounds</td>
<td>3/8&quot; chip Hole Plug</td>
<td>Bentonite Seal</td>
</tr>
<tr>
<td>50</td>
<td>Pounds</td>
<td>Quick Grout</td>
<td>Grout</td>
</tr>
<tr>
<td>240</td>
<td>Pounds</td>
<td>Sakrete</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

Feet of native fill/ slough

10.2  Feet of 2 inch pvc Blank Casing

10  Feet of 2 inch .010 pvc Slotted Screen

5  Feet of 8" steel Outer Casing

Feet of 8" steel Sump/ Silt Trap

Placement Method: Pour

Notes: Casing and screen joint type - flush thread

Development

Method: Hand bailed

Date: 4/20/2010

Amount Purged: 12 gallons

Notes: 10 well volumes = 9.81 gallons, well recharge was quick.

No draw down was noticed while hand bailing.
Well Completion Diagram

Job Name: Gila - Forest Service, Bird Area

Job No.: 114-690164  Date: 4/15/2010

Project Manager: Mike Gabora

Well I.D.: B-4

Field Tech: Christine Mathews

Driller: WDC Exploration and Wells

Equipment: CME 85

Materials

<table>
<thead>
<tr>
<th>Amount</th>
<th>Material</th>
</tr>
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<tbody>
<tr>
<td>200 Pounds</td>
<td>Silica Sand Filter Pack</td>
</tr>
<tr>
<td>100 Pounds</td>
<td>3/8&quot; chip Hole Plug Bentonite Seal</td>
</tr>
<tr>
<td>50 Pounds</td>
<td>Quick Grout Grout</td>
</tr>
<tr>
<td>120 Pounds</td>
<td>Sakrete Concrete</td>
</tr>
</tbody>
</table>

Feet of native fill/ slough

- 7.31 Feet of 2 inch .010 pvc Blank Casing
- 10 Feet of 2 inch .010 pvc Slotted Screen
- 5 Feet of 8" steel Outer Casing

Placement Method: Pour

Notes: Casing and screen joint type - flush thread

Development

Method: Hand bailed and pumped (GeoSquirt submersible pvc purge pump)

Date: 4/20/2010

Amount Purged: 15 gallons

Notes: 10 well volumes = 13.57 gallons. Draw down was noticed during purging but recharge was moderately quick.

Steel Casing: 8" diameter

Other:
  +2.5 ft. to -2.5 ft

Casing:
  +2.31 ft. to -5 ft

8 inch diameter Borehole:
  0 ft. to -15 ft

Outer Casing:
  +2.5 ft. to -2.5 ft

Concrete: approx. 1.5 ft. square well pad
  ft. to ft

Grout:
  0 ft. to -2.5 ft

Bentonite Seal:
  -2.5 ft. to -4.5 ft

Filter Pack:
  -4.5 ft. to -15 ft

Slotted Screen:
  -5 ft. to -15 ft

Native fill/ slough:

8 inch diameter Borehole:
  0 ft. to -15 ft

Sump/ Silt Trap:

Total Depth Borehole (feet):
  15 feet from ground surface
  17.31 feet from TOC
### Well Completion Diagram

**Job Name**: Gila - TNC-2 Site, Lichty Center  
**Job No.**: 114-690164  
**Date**: 4/17/2010  
**Project Manager**: Mike Gabora  
**Well I.D.**: TNC-1d  
**Field Tech**: Christine Mathews  
**Driller**: WDC Exploration and Wells  
**Equipment**: CME 85

### Materials

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<tr>
<th>Item</th>
<th>Quantity</th>
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<tr>
<td>150 Pounds</td>
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<tr>
<td>50 Pounds</td>
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<td>Quick Grout</td>
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<td>240 Pounds</td>
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<td>Sakrete</td>
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<tr>
<td>Feet of native fill/ slough</td>
<td>19.68</td>
<td></td>
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<tr>
<td>Feet of 2 inch pvc</td>
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<td>Blank Casing</td>
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<td>Feet of 2 inch .010 pvc</td>
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<td>Slotted Screen</td>
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<tr>
<td>Feet of 8” steel</td>
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<td>Outer Casing</td>
</tr>
<tr>
<td>Feet of</td>
<td></td>
<td>Sump/ Silt Trap</td>
</tr>
</tbody>
</table>

**Placement Method**: Pour  
**Notes**: Casing and screen joint type - flush thread

### Development

**Method**: Hand bailed  
**Date**: 4/19/2010  
**Amount Purged**: 21.5 gallons  
**Notes**: 10 well volumes = 21.5 gallons, well recharge was quick. No draw down was noticed during hand bailing.

- **Steel Casing**: 8” diameter  
- **Other**: +2.5 feet to -2.5 feet  
- **Casing**: +1.7 ft. to -18 ft.  
- **8 inch diameter**:  
  - **Borehole**: 0 ft. to -20 ft.  
  - **Outer Casing**: +2.5 ft. to -2.5 ft.  
  - **Concrete**: approx. 2 ft. square well pad  
  - **Grout**: 0 ft. to -2.5 ft.  
- **Bentonite Seal**: -2.5 ft. to -5 ft.  
- **Filter Pack**: -5 ft. to -20 ft.  
- **Slotted Screen**: -18 ft. to -20 ft.  
- **Native fill/ slough**:  
  - **ft. to ft.**:  
- **8 inch diameter**:  
  - **Borehole**: 0 ft. to -20 ft.  
  - **Sump/ Silt Trap**:  
  - **Total Depth Borehole (feet)**: 20 feet from ground surface 21.68 feet from TOC
## Well Completion Diagram

**Job Name**  
Gila - TNC-2 Site, Lichty Center

**Job No.**  
114-690164  
**Date**  
4/17/2010

**Project Manager**  
Mike Gabora

**Well I.D.**  
TNC-1s

**Field Tech**  
Christine Mathews

**Driller**  
WDC Exploration and Wells

**Equipment**  
CME 85

### Materials

<table>
<thead>
<tr>
<th>Pounds</th>
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<tbody>
<tr>
<td>125</td>
<td>Silica Sand</td>
</tr>
<tr>
<td>50</td>
<td>3/8&quot; chip Hole Plug</td>
</tr>
<tr>
<td>50</td>
<td>Quick Grout</td>
</tr>
<tr>
<td>240</td>
<td>Sakrete</td>
</tr>
</tbody>
</table>

### Placement Method

- Pour

### Notes

- Casing and screen joint type - flush thread

### Development

- **Method**  
Hand bailed

- **Date**  
4/19/2010

- **Amount Purged**  
15 gallons

- **Notes**  
10 well volumes = 14.6 gallons, well recharge was quick.  
No draw down was noticed during hand bailing.

### TNC-1s

- **Steel Casing**: 8" diameter
- **Other**:
  - +2.5 feet to -2.5 feet
- **Casing**:
  - +2.0 ft. to -5 ft.
  - 8 inch diameter
- **Borehole**:
  - 0 ft. to -15 ft.
- **Outer Casing**:
  - +2.5 ft. to -2.5 ft.
- **Concrete**:
  - approx. 2 ft. square well pad
  - 0 ft. to -2 ft.
- **Bentonite Seal**:
  - -2 ft. to -4 ft.
- **Filter Pack**:
  - -4 ft. to -15 ft.
- **Slotted Screen**:
  - -5 ft. to -15 ft.
- **Native fill/ slough**:
  - ft. to ft.
- **8 inch diameter**
- **Borehole**:
  - 0 ft. to -15 ft.
- **Sump/ Silt Trap**:
  - ft. to ft.

**Total Depth Borehole (feet)**:  
17.01 feet from TOC

**Borehole**:
- 17.01 feet from ground surface
- 15 feet from ground surface

**Notes**
- Field Tech Christine Mathews
- Driller WDC Exploration and Wells
- Project Manager Mike Gabora
- TNC-1s Well Completion Diagram
- Gila - TNC-2 Site, Lichty Center
- Job Name: Gila - TNC-2 Site, Lichty Center
- Job No.: 114-690164
- Date: 4/17/2010
- Project Manager: Mike Gabora
- Well I.D.: TNC-1s
- Field Tech: Christine Mathews
- Driller: WDC Exploration and Wells
- Equipment: CME 85

**Materials**
- 125 Pounds Silica Sand Filter Pack
- 50 Pounds 3/8" chip Hole Plug Bentonite Seal
- 50 Pounds Quick Grout Grout
- 240 Pounds Sakrete Concrete

**Placement Method**
- Pour

**Notes**
- Casing and screen joint type - flush thread

**Development**
- **Method**
  - Hand bailed
- **Date**
  - 4/19/2010
- **Amount Purged**
  - 15 gallons
- **Notes**
  - 10 well volumes = 14.6 gallons, well recharge was quick.
  - No draw down was noticed during hand bailing.
### Well Completion Diagram

**Job Name:** Gila - TNC-2 Site, Lichty Center  
**Job No.:** 114-690164  
**Date:** 4/17/2010  
**Project Manager:** Mike Gabora  
**Well I.D.:** TNC-2  
**Field Tech:** Christine Mathews  
**Driller:** WDC Exploration and Wells  
**Equipment:** CME 85

#### Materials

| 200 Pounds | Silica Sand | Filter Pack |
| 100 Pounds | 3/8" chip Hole Plug | Bentonite Seal |
| 50 Pounds  | Quick Grout  | Grout |
| 240 Pounds | Sakrete  | Concrete |

**Feet of native fill/ slough**

- 7.25 Feet of 2 inch pvc Blank Casing
- 10 Feet of 2 inch .010 pvc Slotted Screen
- 5 Feet of 8" steel Outer Casing
- 8 Feet of Storage Casing /Sump / Silt Trap

**Placement Method:** Pour

**Notes:** Casing and screen joint type - flush thread

#### Development

**Method:** Hand bailed

**Date:** 4/19/2010

**Amount Purged:** 5 gallons

**Notes:** 10 well volumes = 15 gallons, well recharge was very slow. Purging was stopped after well had been bailed dry several times and recharge was estimated at 1" per 1.14 minutes.

### Technical Details

- **Steel Casing:** 8" diameter
- **Casing:** +2.25 ft. to -5 ft.
- **Filter Pack:** 8 inch diameter
- **Grout:** 0 ft. to -15 ft.
- **Bentonite Seal:** -2 ft. to -4 ft.
- **Concrete:** approx. 2 ft. square well pad
- **Filter Pack:** feet to ft.
- **Slotted Screen:** -4 ft. to -15 ft.
- **Native fill/ slough:** ft. to ft.
- **8 inch diameter Borehole:** 0 ft. to -15 ft.
- **Sump/ Silt Trap:** ft. to ft.
- **Total Depth Borehole (feet):** 15 feet from ground surface 17.25 feet from TOC
Well Completion Diagram

Job Name: Gila - TNC-2 Site, Lichty Center
Job No.: 114-690164 Date: 4/17/2010
Project Manager: Mike Gabora
Well I.D.: TNC-3
Field Tech: Christine Mathews
Driller: WDC Exploration and Wells
Equipment: CME 85

Materials

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<th>Pounds</th>
<th>Description</th>
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<tbody>
<tr>
<td>200</td>
<td>Silica Sand</td>
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<tr>
<td>50</td>
<td>3/8&quot; chip Hole Plug</td>
</tr>
<tr>
<td>50</td>
<td>Quick Grout</td>
</tr>
<tr>
<td>240</td>
<td>Sakrete</td>
</tr>
</tbody>
</table>

Feet of native fill/ slough:
- 7.15 Feet of 2 inch pvc Blank Casing
- 10 Feet of 2 inch .010 pvc Slotted Screen
- 5 Feet of 8" steel Outer Casing
- Feet of Sump/ Silt Trap

Placement Method: Pour
Notes: Casing and screen joint type - flush thread

Development

Method: Hand bailed
Date: 4/19/2010
Amount Purged: 16.5 gallons

Notes: 10 well volumes = 13.79 gallons, well recharge was moderately quick.
Slight draw down was noticed while bailing.

Steel Casing: 8” diameter
Other:
  +2.5 feet to -2.5 feet
Casing:
  +2.15 ft. to -5 ft.
  8 inch diameter
Borehole:
  0 ft. to -15 ft.
Outer Casing:
  +2.5 ft. to -2.5 ft.
Concrete:
aprox. 2 ft. square well pad
  ft. to
Grout:
  0 ft. to -2 ft.
Bentonite Seal:
  -2 ft. to -4 ft.
Filter Pack:
  -4 ft. to -15 ft.
Slotted Screen:
  -5 ft. to -15 ft.
Native fill/ slough:
  ft. to ft.
8 inch diameter
Borehole:
  0 ft. to -15 ft.
Sump/ Silt Trap:
  ft. to ft.
Total Depth Borehole (feet):
15 feet from ground surface
17.15 feet from TOC
Well Completion Diagram

Job Name: Gila - TNC-2 Site, Lichty Center
Job No.: 114-690164  Date: 4/17/2010
Project Manager: Mike Gabora
Well I.D.: TNC-4
Field Tech: Christine Mathews
Driller: WDC Exploration and Wells
Equipment: CME 85

Materials

| 150 Pounds | Silica Sand | Filter Pack |
| 25 Pounds  | 3/8" chip Hole Plug | Bentonite Seal |
| 50 Pounds  | Quick Grout | Grout |
| 160 Pounds | Sakrete | Concrete |

Feet of native fill/slosh

| 5.25 Feet of | 2 inch | pvc | Blank Casing |
| 10 Feet of  | 2 inch | .010 pvc | Slotted Screen |
| 5 Feet of   | 8" steel | Outer Casing |

| Feet of | Sump/Silt Trap |

Placement Method: Pour
Notes: Casing and screen joint type - flush thread

Development

Method: Hand bailed
Date: 4/19/2010
Amount Purged: 17.5 gallons
Notes: 10 well volumes = 17.4 gallons, well recharge was quick.

Steel Casing: 8" diameter
Casing:
+2.5 ft. to -2.5 ft
+8 inch diameter Borehole:
0 ft. to 13 ft
Outer Casing:
+2.5 ft. to -2.5 ft
Concrete: approx. 1.5 ft. square well pad
Grout:
0 ft. to -1 ft
Bentonite Seal:
-1 ft. to -2 ft
Filter Pack:
-2 ft. to -13 ft
Slotted Screen:
-3 ft. to -13 ft
Native fill/slosh:
8 inch diameter Borehole:
0 ft. to -13 ft
Sump/Silt Trap:
Total Depth Borehole (feet):
13 feet from ground surface
15.25 feet from TOC
APPENDIX B
ACCESS AGREEMENTS
March 31, 2010

Estevan Lopez, Director  
NM Interstate Stream Commission  
407 Galisteo St.  
Bataan Memorial Bldg.  
P.O. Box 25102  
Santa Fe, NM 87504-5102

Cc: Craig Roepke

Enclosed is an application for License for Use of TNC's Gila River Preserve. This is associated with the surface/ground water study conducted by consultants managed by Craig Roepke.

Please provide a copy of the License, the Research Conditions, and the Liability form to all of the individuals who will work on TNC's Gila River Preserve (as stipulated in the License).

Please return the signed License to:

Robert M. Findling  
The Nature Conservancy  
212 E. Marcy St., Suite 200  
Santa Fe, NM 87501

Upon receiving the signed License, Mr. Findling will sign the License and send you a copy.

Sincerely,

[Signature]

Martha S. Cooper  
Southwest NM Field Representative  
The Nature Conservancy
LICENSE FOR USE OF
THE NATURE CONSERVANCY’s GILA RIVER PRESERVE

The mission of The Nature Conservancy ("TNC" or "the Conservancy") is to preserve plants, animals, and natural communities representing the diversity of life on Earth by protecting the lands and water they need to survive. In pursuit of this mission, the Conservancy's New Mexico Chapter acquired the Gila River Preserve (the "Preserve") through a series of acquisitions completed in 2005. The Preserve includes an important stretch of the free-flowing Gila River, a largely natural hydrograph that supports one of the highest levels of aquatic and riparian biodiversity in the state of New Mexico. These important natural resources are of value not only to the Conservancy but also to others in the scientific and conservation communities. As such, TNC recognizes that by allowing appropriate research to be conducted on the Preserve by others, the Conservancy's conservation mission can be significantly advanced. In authorizing use of TNC lands for such activities, however, we seek to minimize negative impacts on targeted species and ecological systems, as well as ensure the use of high quality science in TNC-supported research.

To ensure that authorized activities are consistent with both our mission and the needs of our preserve stewards, and are managed to ensure that the resources entrusted to our care are conserved, TNC's New Mexico Program has instituted a permit system for utilization of the Preserve. If you seek permission to utilize the Preserve for scientific or other conservation-related activities, please fill out the application form below. If approved by appropriate TNC staff, this application -- as amended by any changes made by TNC staff -- will constitute your license to use the Preserve for the dates and purposes stated below, pursuant to all the terms and conditions contained herein. Please note that licenses to use the Preserve will only be granted for purposes that further the Conservancy's mission and that are consistent with the New Mexico Program's objectives and goals for the Gila River Preserve.

LICENSE APPLICATION AND AUTHORIZATION REQUEST

1. Name and Address of Institution or Individual Applying for Authorization ("Applicant") (PLEASE PRINT):

Estevan Lopez, Director
NM Interstate Stream Commission
407 Galisteo St.
Bataan Memorial Bldg.
P.O. Box 25102
Santa Fe, NM 87504-5102

Phone: 505 827 6161
Fax: 505-827-6188

2. Name and Phone Number of Principal Contact for this Application (PLEASE PRINT):

Michael Gabora, PG | Senior Hydrogeologist
Office: 505.237.8440 | Cell: 505.515.5740 | Fax: 505.237.8656
Tetra Tech | Complex World, Clear Solutions™
6121 Indian School Road NE, Suite 200 | Albuquerque, NM 87110

3. Brief Description of General Purpose and Nature of Proposed Activities on TNC Property:

4. Briefly explain why you wish to conduct this activity on TNC’s property, and indicate whether alternative sites are available:

Because of location in Cliff/Gila Valley and accessibility.

5. Dates Proposed for Use of TNC Property (this license does not grant permission for access beyond these dates):

April – June 30, 2010

6. Description of Particular Activities that will occur on TNC Property and their Proposed Location (Be Specific; Only those activities listed here will receive approval):

Install 1 shallow well at site south of Box Canyon Campground.
Install 1 deep well and 4 shallow wells at the Gila River Farm.
All wells will be installed with a track-mounted drill-rig as described in the project plan.
Stage gages will be placed in the river channel at each site.
All wells and stage gages will be equipped with recording pressure transducers.

Activities Approved by TNC (TNC Staff to Check Appropriate Box):
YES ______; NO ______; or APPROVED WITH THE FOLLOWING CONDITIONS ___x____:

TNC staff, Martha Cooper will be notified when when drilling will occur so that she can be present. Any significant disturbance by drill rig will be mitigated (i.e. branches dragged to cover tracks, fence rebuilt). A $500 fee, paid in advance, will be required so that TNC can replace the fence (downstream of Campground). Drill rig will be weed-free.

Because Scientific Research Activities are Authorized, Applicant agrees to be bound by the "Gila Preserve Research Conditions," which conditions are to be attached to, and shall be considered incorporated in, the license granted below. In particular, note #20 in the Research Conditions. All installed wells, gages, transducers, and associated equipment will become property of TNC at the conclusion of this study. No debris created during installation will remain on site after installations.

7. How many people will be part of your group for these activities: 1-6 [Insert Number]; Names of individuals in group:

ISC, Craig Roepke, S.S. Papadopulos & Assoc., Inc., Deborah Hathaway, Tetra Tech, Inc., Mike Gabora and authorized subcontractors, Contractor Ellen Soles.

8. Are you requesting authorization to collect samples from TNC’s property? If so, please indicate purpose, need, and proposed collection details (location, numbers, method, etc.):

Yes: Core samples collected during drilling to be provided to TNC after examination and documentation.

Collection Approved by TNC (TNC Staff to Check Appropriate Box):

YES ___X____; NO ______; or APPROVED WITH THE FOLLOWING MODIFICATIONS:

9. If collecting research data, are you willing to share copies (hard or electronic) of your raw data? If so, when and in what form?

Yes. Electronic data collected from wells, staff gages and x-sections on TNC land will be made available no later than June 30, 2010.
GRANT OF NON-EXCLUSIVE PERMISSIVE LICENSE

When signed below by an authorized TNC Representative, Applicant shall be considered to be granted a non-exclusive permissive license to use the Nature Conservancy’s Gila River Preserve (the “Preserve”) for the purpose(s) and date(s) approved herein. Such use shall be limited to the numbers, location(s), and activities stated in the above License Application and Authorization Request (“License Request”) -- as such License Request may have been modified by TNC staff as noted above. Visitors’ use must comply with all of the terms and conditions of the attached use conditions (Gila River Preserve Research Conditions and/or Lichty Center Use Conditions, as applicable).

This use license is personal to the Applicant and to those persons named in the above License Request, and may not be transferred or assigned to any other person(s) or entity(ies) except to the extent approved by the Conservancy in advance in writing.

Applicant acknowledges that it does not and shall not claim any legal or possessory use in the Conservancy's property by virtue of this permissive license or Applicant's occupancy or use hereunder, and Applicant understands that the Conservancy retains the right to use the Preserve and to provide authorization to others to use the Preserve at the same time as Applicant.

Applicant also acknowledges that this license is subject to immediate revocation by the Conservancy, in its sole discretion, including, without limitation, in the event of emergency condition, failure by the Applicant or persons under the Applicant's control to fully comply with the terms and conditions of this license, a determination by the Conservancy that the licensee's activities are creating or are in danger of creating an unacceptable risk to the Preserve's natural values, or management or administrative needs on the part of the Conservancy that make continuation of Applicant's activities impractical.

Each condition and term contained herein shall be binding upon the person signing below and upon all individuals who are authorized by such person to enter on and use the Preserve pursuant to this license. If permission is granted hereunder to an entity, such entity expressly agrees to assume liability and be responsible for the actions of all persons to which such entity is delegating the permission granted herein. Such entity also agrees to provide each such person with a copy of this license and its attachments (Gila Preserve Research Conditions and/or Lichty Center Use Conditions, as applicable), and to require such persons to comply with all the terms herein.

In consideration of the privileges herein granted, Applicant hereby agrees to be responsible for Applicant's acts and omissions, and for the acts and omissions of any person(s) utilizing the Preserve pursuant to this License Request. Applicant agrees, on behalf of him/her/itself, and on behalf of any other persons utilizing the Preserve pursuant to this License Request, to defend, save, hold harmless, release, and indemnify the Nature Conservancy, its officers, directors, employees, volunteers, agents, and representatives, from and against any and all claims, actions, lawsuits, losses, damages, costs, expenses, and demands, of any nature, including without limitation court costs and reasonable attorneys fees, arising out of use of the Conservancy's property pursuant to this license. Applicant agrees that before entering upon the Preserve, Applicant will present to each person utilizing the Preserve under this license a copy of this license, will require such persons to comply with all the terms herein, including without limitation the relevant use conditions incorporated by reference herein, and will obtain from each person and provide to the Conservancy a copy of the "Gila Preserve Release of Liability," signed by each such person. [NOTE TO APPLICANT: A copy of the release form is attached to this License Request. Applicant should make copies for each person utilizing the Preserve as part of your group, obtain the necessary signatures, and submit the complete set of releases to the Conservancy before undertaking any activities on the Preserve]

Applicant acknowledges and agrees, and accepts responsibility for ensuring that, the Conservancy’s Property, including the Preserve and any personal property thereon, will not be used by Applicant, or any person authorized by Applicant, for commercial purposes, nor in any way in connection with efforts to support or oppose the election of any candidate for office, nor in any way in connection with efforts to influence the introduction, enactment, amendment, signature, defeat, or vetoing of federal, state, or local legislation (including, without limitation, ballot initiatives and referenda).
Applicant (or if Applicant is a legal entity or organization, then the representative signing below) represents, warrants, and certifies, by his/her signature below, that all information provided by Applicant herein is true and correct and that Applicant and all persons under Applicant's control will abide by the terms and conditions contained herein and in the applicable use conditions (Gila River Preserve Research Conditions), which are hereby incorporated herein. If executing this form on behalf of an entity or organization, the person signing below hereby certifies that s/he has the power and authority to accept these terms and conditions, to make such certification, and to formally bind such organization or entity.

The waiver of any breach of any term, condition, covenant, obligation, or agreement in this license shall not be construed nor deemed to be a waiver of that or any other term, condition, covenant, obligation or agreement, nor of any subsequent breach thereof.

If these terms are acceptable, please so indicate in the space below. This license shall become effective once the Conservancy has received a signed and dated application from you, an authorized TNC representative has indicated above his/her approval and affixed her/his signature, and the requisite security deposit and administrative/fair market value use fee, if any, have been paid.

SIGNATURE OF APPLICANT/APPLICANT'S DELEGATED REPRESENTATIVE:

[Signature]

PRINTED NAME: Estevan Lopez, Director

DATE: 04/07/10

SIGNATURE OF AUTHORIZED TNC REPRESENTATIVE:

[Signature]

PRINTED NAME: Robert M. Findling, Director of Land Protection & Stewardship

DATE: April 8, 2010

DATE OF TNC RECEIPT OF SECURITY DEPOSIT, ADMINISTRATIVE FEE, AND/OR FAIR MARKET VALUE USE FEE: $500
S.S. Papadopulos and Associates Inc.
c/o Deborah L. Hathaway
3100 Arapahoe Avenue, Suite 203
Boulder, Colorado 80303-1050

Dear Deborah,

This letter will serve as my authorization for your company to install three shallow piezometers at the locations described in your project proposal.

The parameters under which you may proceed include:

- All work must be completed by May 1, 2010.
- Your designated contractor shall meet with my district archeologist at the project site, prior to beginning work. You should contact Bob Schiowitz at 575-388-8440 to make arrangements.
- Your company will provide a copy of all reports and findings to my office.
- Installation shall be at or just below the ground surface.
- All drilling waste will be smoothed out prior to leaving the site.
- Any excess cement or debris will be removed from the site after drilling.
- Drilling equipment shall be removed from the site upon completion of the installation.
- No vehicle access shall be permitted after the installation of the piezometers. Recording will be obtained by walking into the site.
- All equipment used in the drilling process will be power-washed prior to entry into the site, so as to avoid the spread of noxious weeds.

If you have further questions, please feel free to contact me at 575-388-8430.

Sincerely,

RUSSELL D. WARD

RUSSELL D. WARD
District Ranger