Well Testing Report
Prepared for the County of San Diego
Top of Pines TPM 20951

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List of Terms, Acronyms and Abbreviations

Ac-ft	acre-feet (325,900 gallons)
ac-ft/yr/du	acre-feet per year per dwelling unit
CEQA	California Environmental Quality Act
DPLU	Department of Planning and Land Use, County of San Diego
Ft	feet
GIS	Geographic Information System
gpm	gallons per minute
Guidelines	County of San Diego, Guidelines for Determining Significance and Report Format and Content Requirements Groundwater
id	internal diameter
hp	horsepower
MCL	Maximum contaminant level
mg/l	milligrams per liter
NEPA	National Environmental Policy Act
pCi/L	pico curies per liter
TDS	Total dissolved solids (mg/l)
TOC	Top of casing (measuring point)
TPM	Tentative Parcel Map

Executive Summary

This investigation has been completed to provide the San Diego County Department of Planning and Land Use information regarding available groundwater resources for the proposed Top of Pines TPM 20951. Both groundwater quantity and groundwater quality has been investigated to determine if any potential impacts to the groundwater system would result from the proposed project. The project is located just south of the community of Pine Valley California (Figures 1 and 2 and Attachment 1 located in Pump Test Plan Appendix A) and includes a planned residential subdivision of 4 single family lots on 18.26 gross acres. This results in an average overall density of 1 dwelling unit per 4.57 acres. The project will be using groundwater since no imported water is available in this area of the County and the project is located outside the district boundaries of the Pine Valley Mutual Water Company.

To accomplish this objective an 8-hour constant rate discharge test was completed on one well previously identified by the County Groundwater Geologist. The County Groundwater Ordinance and Guidelines allow for shortened pump tests (8 hours versus 24 hour test) when a well is shown to have a production capacity that is greater than .5 gpm/ft of drawdown (Section 3.3 of Attachment A Guidelines for Performing Residential Well Tests). Preliminary water levels indicated that the well might be able to meet this standard for a shortened well test. The completed test complied with this requirement.

Water samples were previously collected by Tim Guishard for nitrate, iron, manganese, total and fecal coliform bacteria, and uranium and gross alpha (and his report is included within Appendix C). Mr. Guishard is a State license water treatment operator and is license to collect these samples. As a result the well was not sampled by me for these elements, however I did collect a sample for TDS at the end of the production test. The lab results for this element is also given in Appendix C.

The production test was completed according to the approved pump test plan dated February 19, 2009 which was approved by Mr. Bennett on February 24, 2009 (Appendix B memo Bennett to Slovick).

Chapter 1

1.0 Introduction

1.1 Purpose of the Report

The purpose of this report is to: 1) document groundwater resource yield potential on the project site to determine if these resources are capable of meeting the projected water demand of the project, 2) identify any adverse potential groundwater resource impacts resulting from the proposed project, 3) evaluate groundwater quality to ensure that the groundwater resources meets all health standards, and/or mitigate significant impacts consistent with federal, state and local rules and regulations including the California Environmental Quality Act (CEQA) and the San Diego County Groundwater Ordinance #9826.

1.2 Project Location and Description

Project Location

The project is located in the unincorporated community of Pine Valley California in the central portion of San Diego County (Figures 1 and 2 located in the Pump Test Plan Attachment A). The project is located just south of community of Pine Valley and just north of Interstate 8 off of Pine Valley Road.

Project Description

The project is a proposed residential subdivision of 4 single family lots on 18.26 acres (Attachment A in Pump Test Plan). This results in an average overall density of 1 dwelling unit per 4.57 acres. The project will be using groundwater since no imported water is available in this area of the County and as a result the project falls under the requirements of the San Diego County Groundwater Ordinance. The project is estimated to use 2.0 ac-ft per year based on the usage of .5 ac-ft per year per residential unit as defined within the County Groundwater Ordinance #9826.

Well sampling and a constant rate discharge test were completed in compliance with the approved *Pump Test Plan, Top of Pines TPM 20951, February 19, 2009* (Appendix A). The pump test plan was reviewed and approved by Mr. Jim Bennett, County Groundwater Geologist prior to initiation of the work.

1.3 Applicable Groundwater Regulations

Federal Regulations and Standards

The proposed action does not include lands under Federal jurisdiction and as such the regulations contained within the NEPA do not apply.

State Regulations and Standards

Since the proposed action includes a discretionary permit application the project falls under the requirements of the California Environmental Quality Act (CEQA). Specifically Appendix G, Title 14, Chapter 3, §15000-15387 gives two questions: 1) will

the project "***violate any water quality standards or waste discharge requirements***?" and 2) will the project "***substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted***)".

Specific direction has been provided by the County of San Diego within the Guidelines to address these issues from the CEQA Guidelines. This report has been completed following those directions.

County Regulations and Standards

Within the County of San Diego groundwater regulations are contained within the San Diego County Groundwater Ordinance #9826. Since the proposed project will be using groundwater, the action falls under the regulations contained within the Ordinance with specific reference to Section 67.722 B (2) where the following finding must be made for the project:

> "***That groundwater resources are adequate to meet the groundwater demands of the project***". (County of San Diego, 2007)

As identified within the Guidelines (Section 4.1 pages 22 to 24) the threshold for determining significance is:

> "***For proposed projects in fractured rock basins, a soil moisture balance, or equivalent analysis, conducted using a minimum of 30 years or precipitation data, including drought periods, concludes that at any time groundwater in storage is reduced to a level of 50% or less as a result of groundwater extraction.***"

Also the Ordinance identifies specific minimum parcel sizes for residential density (Section 67.722 A). These density requirements as identified within the County Groundwater Limitations Map list the project as having greater than 21 inches of average annual rainfall. This rainfall value results in a minimum parcel size of 4 acres (County Groundwater Ordinance Section 67.722 A 1). The proposed project has an average parcel size of 1 dwelling unit per 4.57 acres with a minimum parcel size of 4.16 gross acres.

The Ordinance also identifies specific requirements (Section 67.722 C) for residential well tests. As required by the Ordinance one well was pump tested on the project for water quality and well yield parameters. The selection of the well site for this yield test was approved by Mr. Jim Bennett, San Diego County Groundwater Geologist prior to testing (Appendix B, memo Bennett to Slovick September 3, 2008). The well was pump tested in compliance with the Guidelines for Performing Residential Well Tests. Also as required by the Guidelines a projection of well drawdown to 5 years of continuous production has been completed for this investigation.

Chapter 2

2.1 Well Testing

2.1.1 Guidelines for the Determination of Significance

The project is proposing individual residential wells. As a result according to the Guidelines (page 18) the following thresholds apply:

1. ***Proposed projects requiring groundwater resources for uses associated with single-family residences require well production during the well test to be no less than 3 gpm for each well tested. Proposed projects that cannot meet this requirement will be considered to have a significant impact.***
2. ***Where analysis of a residential well test indicates that greater than 0.5 feet of residual drawdown is projected, the project will be considered to have a significant impact.***
3. ***The analysis of the residential well test must indicate that the amount of drawdown predicted to occur in the well after five years of continual pumping at the rate of projected water demand (a) will not interfere with the continued production of sufficient water to meet the needs of the anticipated residential use(s) and (b) must be less than the saturated depth of water above the pump intake or 100 feet, whichever is less. (The pump intake is assumed to be 50-feet above the bottom of the well). Proposed projects that cannot meet this guideline will be considered to have a significant impact.***

2.2.2 Methodology

As identified by the Mr. Jim Bennett one well, located on the southeastern portion of the project on Lot #1 was selected to be tested for groundwater yield. The well was tested according to the directions provided within the Guidelines and subsequent directions provided by Mr. Bennett (Appendix B).

2.2.2.1 Well Test Description

The well was pump tested for 8 hour period at an average discharge rate of 7.89 gpm with the test beginning at 07:50 on April 1, 2009. During the test maximum drawdown was measured at 6.8 feet. The test was terminated at 15:55 for a total production period of 485 minutes. Over the course of the test 3,827.5 gallons were produced. Recovery was monitored via an installed data logger for 16.3 hours (data logger pulled at 08:20 on April 2, 2009). Full recovery was documented following 3.7 hours of recovery. The test and results are summarized below.

2.2.2.2 Testing Summary

The well was constructed in the southeastern portion of the proposed project on Lot #1 (see Figure 2) at an elevation of approximately 3,810 feet. The well was completed by Morrision Well Drilling which is located in Lake Morena California in 1985 (see California Well Log within the pump test plan, Appendix A). The well was drilled to 525 feet with a 20 foot annular seal and with a 6 5/8 casing to 54 feet. The well log reports

decomposed granite to 30 feet and fractured granite to total depth of 525 feet. The drillers log reports a static water level of 30 feet an estimated well yield of 127 gpm.

The well was set up on Thursday February 26, 2009 using a test submersible pump (with foot valve to prevent backflow) installed to an approximate depth of 380 feet. A 1 inch PVC sounding tube was placed in the well (installed to 380') to allow for the installation of a Global Water Data Logger to collect water level measurements during the test. A ¾ inch water flow meter was calibrated to ensure accurate water production data and a gate value was installed to regulate flow rate during the test. At the time of installation the meter had a total cumulative flow value of 3,668.0 cubic feet. Prior to any production, groundwater depth, as measured from the top of the well casing, was 12.6 feet (measured by electrical water level indicator). The well casing was measured at .8 feet above graded ground surface, and all measured water levels during the test were measured from the top of the well casing. Following installation of the equipment the well was turned on to check the installation and to calibrate the flow rate to about 7.5 gpm or 1 cubic foot per minute. A total of 464 gallons of water was produced to complete this task. Also preliminary water levels were collected to confirm the yield potential of the well. This production resulted in a meter reading at the beginning of the constant discharge test of 3730.1cubic feet.

Also during this process the nearby onsite well was measured for static water level. A measurement of 24.0 feet below TOC was observed. The well had no electrical service thus is currently not in production.

The constant rate discharge test began at 7:50 am on Sunday March 1, 2009. Prior to initiation of the test static water level was monitored with the same equipment and was recorded at 12.9 feet below top casing. This value was .3 feet lower than the value measured three days early and is likely measuring error since two different electrical sounders had been used. The test began at a yield of approximately 7.8 gpm. Water production was also checked periodically using a stop watch and calibrated 5 gallon bucket. The water was directed through garden hoses to the east (down gradient) from the site. Approximately 200 feet of hose was used and the discharge water was directed away from the well.

Production rate was adjusted several times during the test whenever the yield fell below 7.48 gpm (1 cubic foot per minute). During the pumping interval maximum production was approximately 8.0 gpm and averaged about 7.89 gpm. The pumping phase of the test was completed at 15:55 on Monday March 2, 2009 for a pumping period of 485 minutes. At the end of the test a total of 3,827.5 gallons of water (final meter reading of 4,241.8 cubic feet) had been produced for an average discharge rate of 7.89 gpm over the length of the test. For the length of the test the well had a maximum drawdown of 6.8 feet (Figure 3 and Table 4). Thus the specific capacity of the well (gpm/ft of drawdown) was 1.16 gpm/ft.

As requested by Mr. Bennett the onsite domestic well was monitored 3 days before the test, immediately prior to the test and periodically during the test. The well is located 230

feet north of the production well. Prior to the test (morning of Sunday March 1, 2009) the well was measured at 23.7 feet below TOC, or about .3 feet above the level measured on February 26, 2009. Over the course of the 8-hour production test the well had a declining groundwater level with a measurement of 25.1 feet below TOC, or a decline of about 1.4 feet at the end of the production test. This well was also monitored on Monday morning March 2, 2009 when the data logger was removed from the production well. At that time the well had a water level of 24.4 feet below TOC. It is probable that the water level within this well is influenced by production in some other unknown well. It is extremely unlikely that this well would have a residual drawdown of 1 foot following the pump test when the production well had fully recovered after 3.7 hours of recovery. In any case technical evidence is not available to determine the source of drawdown in this second onsite well during the production testing.

In the production well recovery was monitored for almost 16.3 hours to 08:20 on Monday March 2, 2009. Groundwater recovery was very quick with full recovery seen at 3.7 hours of recovery or at a T/T' time of 2.

2.2.2.3 Well Test Analysis

Maximum total drawdown during the test was **6.8 feet**.
Specific Capacity (given as gpm/foot of drawdown) was **1.16** (7.89 gpm/6.8 ft of drawdown).
Residual drawdown as projected on the t/t' curve was **0 feet**.
Transmissivity is calculated using the Cooper-Jacobs approximation to the Theis equation which states:

$$T = \frac{2.3 \times Q}{4 \times \Pi \times \Delta s}$$

Where
T = Transmissivity (feet^2/day)
Q = average pumping rate in feet^3/day
$\Pi = 3.14$
Δs = the change is drawdown over 1 log cycle of time (or recovery as shown on the t/t' plot

Using this equation the value for Transmissivity becomes (**pumping**):

$$T = \frac{2.3 \times 1519}{4 \times 3.14 \times 2.5}$$

T = **111.3 ft^2/day pumping phase**

Using this equation the value for Transmissivity becomes (**recovery**):

$$T = \frac{2.3 \times 1519}{4 \times 3.14 \times 2.7}$$

T = **103.1 ft^2/day pumping phase**

No estimates of storativity can be given since no nearby monitoring well was available for the test.

Calculated predicted drawdown after 5 years of production can be estimated by projecting drawdown out to 5 years or 2,600,000 minutes. As shown on Figure 5 the projected drawdown, at a continuous yield of 7.89 gpm would be 11.5 feet. However this value must be corrected to reflect the continuous yield of 7.89 gpm from the completed pump test. (.31 gpm equals the annual demand of a residential home at an annual demand of.5 ac-ft/yr/home which is used within these calculations.) This correction is given by:

$$\frac{7.89 \text{ gpm}}{11.5 \text{ feet}} = \frac{0.31 \text{ gpm}}{x \text{ (predicted drawdown at 5 years)}}$$

Thus predicted drawdown at 5 years equals **.45 feet.** This value is less than the threshold as identified in the County Guidelines of 100 feet or less for projected drawdown following 5 years of production.

No offsite or onsite well interference problems are anticipated due to the following factors:

1) Predicted drawdown following 5-years of continuous production is estimated at .45 feet within the pumping well. This also assumes no groundwater recharge over the 5-yr period.
2) Drawdown within the aquifer away from the well would be even less than the value of .45 feet at the well (following 5 years of continuous production without recharge). Thus any impacts to surrounding wells or biological resources are very unlikely.

2.2.3 Significance of Impacts Prior to Mitigation

Low Well Yield: The tested well met all thresholds of significance. The well was pumped for an 8-hour period at a yield of greater than 3 gpm. The well recovered so that projected residual drawdown was less than .5 feet. Also projected drawdown following 5 years of continuous projection at .31 gpm met identified thresholds of significance. As such the data support the conclusion for the finding of "***less than significant***" for low well yield.

2.2.4 Mitigation Measures and Design Considerations

Since the well testing showed that low well yield is "***less than significant***" no mitigation measures or design considerations are proposed or required.

2.2.5 Conclusions

The well tested met all threshold criteria. The testing showed that the significance level was "***less than significant***" and no mitigation measures or design considerations are proposed.

Chapter 3

3.0 Water Quality Analysis

3.1 Guidelines for Determination of Significance

According to the Guidelines the following threshold of significance must be met for water quality:

> ***Groundwater resources for proposed projects requiring a potable water source must not exceed the Primary State of Federal Maximum Contaminant Levels (MCLs) for applicable contaminants. Proposed projects that cannot demonstrate compliance with applicable MCLs will be considered to have a significant impact. In general, projects will be required to sample water supply wells for nitrate, bacteria (fecal and total coliform) and radionuclide activity.***

3.2 Methodology

At the end of the projection test (completed on March 1, 2009) a sample was collected for total dissolved solids (TDS). Water samples had previously been collected by Mr. Tim Guishard for nitrate, iron, manganese, gross alpha, uranium, and total and fecal coliform Results for are given in Appendix C and include a report by Mr. Guishard to document his procedures regarding sampling the well.

3.2.1 Sampling Procedures

Sample Handling and Transportation: All sample containers used for the samples were provided from the Environmatrix Analytical Lab. This lab is a certified by the California Department of Health Services. Sample containers for TDS were clean and unpreserved plastic bottles. Chain of custody was directly from me to the lab personnel for all samples.

Analytical Methods: Analytical processes employed for the testing are given in Table 1:

Table 1: Analytical Methods

Analyte	Method	MCL
Total Dissolved Solids	SM 2540 C	500 mg/l recommended

3.2.2 Groundwater Sampling Analysis:

A water samples was collected at the end of the pump test on Sunday March 1, 2009 for TDS and results are given in Table 3. The sample was collected after a production quantity of 3,827 gallons had been pumped from the well.

Table 2: Water Quality Results

Element	Result
TDS[1]	457

[1] Given in mg/l and a recommended MCL of < 500

All samples were analyzed within laboratory holding time for each constituent.

3.3 Significance of Impacts Prior to Mitigation

Samples collected for gross alpha and uranium are within MCL. Samples collected for nitrate and TDS were well less than MCL and the sample for coliform was recorded as "absent" for both fecal and total coliform bacteria (within the third round of testing). In summary all water quality samples met identified thresholds.

3.4 Mitigation Measures and Design Considerations

As given Mr. Guishard's report the results for iron and manganese are above the secondary recommended level. As a result it is proposed that future lot owners be notified prior to purchase of the lots about the high level of these two elements.

3.5 Conclusions

All water quality thresholds have been met and no mitigation measures or design considerations are required (with the exception of notifying future lot buyers). The data supports the finding that impacts to groundwater quality are "***less than significant***".

Chapter 4: Conclusions

Summary of Project Impacts and Mitigation
No significant environmental impacts to groundwater resources were identified within this investigation. Specific results include:

Low Well Yield:
One well was pump tested for an 8 hour interval at a yield of greater than 3 gpm. Recovery within the well indicated full recovery as projected on the t/t' plot. (Figure 4). Also the projected drawdown following 5 years of production, estimated at .45 feet is less than the identified threshold. Thus the well met all thresholds identified by the Guidelines. As such it has been found that the project as proposed met the thresholds set for low well yield and the finding of "***less than significant***" can be support.

Groundwater Quality:
Water quality samples were collected on well by Mr. Tim Guishard. The test results showed that all measured levels met the MCL for the respective elements (with the exception of total coliform). As a result two additional samples were collected for coliform bacteria. The third sample was negative for both total and E Coli bacteria. The test results showed a high level of iron and manganese which exceeds the recommended secondary standards. Future notification of potential buyers of these lots is recommended to address this issue.

As a result the well met all MCL levels for the identified elements. Due to this the finding "***less than significant***" can be made for the project in relationship to potable water quality.

Within this review no threshold was determined to be above any identified threshold and as a result no mitigation or design considerations are proposed. The project as proposed meets all thresholds as identified with the County Guidelines.

Respectfully Submitted

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Table 3: Raw Water Level Data "Production"

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
3/1/2009	07:49:56	94.8	3/1/2009	08:20:02	92.3	3/1/2009	10:59:44	92.5
3/1/2009	07:50:26	92	3/1/2009	08:21:02	92.3	3/1/2009	11:02:31	91.5
3/1/2009	07:50:56	92.6	3/1/2009	08:22:02	92.5	3/1/2009	11:12:31	90.1
3/1/2009	07:51:26	92.5	3/1/2009	08:23:02	92.5	3/1/2009	11:22:31	89.5
3/1/2009	07:51:56	92.5	3/1/2009	08:24:02	92.3	3/1/2009	10:24:44	92.3
3/1/2009	07:52:26	92.5	3/1/2009	08:25:02	92.3	3/1/2009	10:29:44	90.6
3/1/2009	07:52:56	93.3	3/1/2009	08:26:02	92.3	3/1/2009	10:34:44	90.5
3/1/2009	07:53:26	92.6	3/1/2009	08:27:02	92.3	3/1/2009	10:39:44	91.8
3/1/2009	07:53:56	94.3	3/1/2009	08:28:02	92.3	3/1/2009	10:44:44	91.5
3/1/2009	07:54:26	92.8	3/1/2009	08:29:02	92.3	3/1/2009	10:49:44	91.6
3/1/2009	07:54:56	94.6	3/1/2009	08:30:02	92.3	3/1/2009	10:54:44	92.1
3/1/2009	07:55:26	93.5	3/1/2009	08:31:02	92.3	3/1/2009	10:59:44	92.5
3/1/2009	07:55:56	92.6	3/1/2009	08:32:02	92.3	3/1/2009	11:02:31	91.5
3/1/2009	07:56:26	93.8	3/1/2009	08:33:02	91.8	3/1/2009	11:12:31	90.1
3/1/2009	07:56:56	92.6	3/1/2009	08:34:02	92.3	3/1/2009	11:22:31	89.5
3/1/2009	07:57:26	93.6	3/1/2009	08:35:02	92.5	3/1/2009	11:32:31	89.3
3/1/2009	07:57:56	93.6	3/1/2009	08:36:02	92.5	3/1/2009	11:42:31	91.5
3/1/2009	07:58:26	92.6	3/1/2009	08:37:02	91.8	3/1/2009	11:52:31	89.5
3/1/2009	07:58:56	92.5	3/1/2009	08:38:02	92.8	3/1/2009	12:02:31	88.3
3/1/2009	07:59:26	92.5	3/1/2009	08:39:02	92.6	3/1/2009	12:12:31	88.3
3/1/2009	07:59:56	93.5	3/1/2009	08:39:44	92.8	3/1/2009	12:22:31	91.1
3/1/2009	08:00:26	92.3	3/1/2009	08:44:44	92.5	3/1/2009	12:32:31	88.7
3/1/2009	08:00:56	93.3	3/1/2009	08:49:44	91	3/1/2009	12:42:31	90.6
3/1/2009	08:01:26	93.1	3/1/2009	08:54:44	92.6	3/1/2009	12:52:31	90.8
3/1/2009	08:01:56	93.3	3/1/2009	08:59:44	91.1	3/1/2009	13:02:31	90
3/1/2009	08:02:26	92.8	3/1/2009	09:04:44	91.1	3/1/2009	13:12:31	88
3/1/2009	08:02:56	92.5	3/1/2009	09:09:44	91.1	3/1/2009	13:22:31	89
3/1/2009	08:03:26	93.1	3/1/2009	09:14:44	91.1	3/1/2009	13:32:31	89.7
3/1/2009	08:03:56	92	3/1/2009	09:19:44	92.1	3/1/2009	13:42:31	88.2
3/1/2009	08:04:26	92.3	3/1/2009	09:24:44	91.1	3/1/2009	13:52:31	88.5
3/1/2009	08:04:56	93	3/1/2009	09:29:44	91.5	3/1/2009	14:02:31	90.3
3/1/2009	08:05:26	92.3	3/1/2009	09:34:44	91.1	3/1/2009	14:12:31	90
3/1/2009	08:05:56	92.3	3/1/2009	09:39:44	90.8	3/1/2009	14:22:31	88.7
3/1/2009	08:06:26	92.5	3/1/2009	09:44:44	90.6	3/1/2009	14:32:31	90
3/1/2009	08:06:56	93	3/1/2009	09:49:44	91.3	3/1/2009	14:42:31	88.8
3/1/2009	08:07:02	92.8	3/1/2009	09:54:44	91.3	3/1/2009	14:52:31	89.5
3/1/2009	08:08:02	92.3	3/1/2009	09:59:44	91.5	3/1/2009	15:02:31	90
3/1/2009	08:09:02	91.8	3/1/2009	10:04:44	91.5	3/1/2009	15:12:31	90
3/1/2009	08:10:02	93.1	3/1/2009	10:09:44	92.1	3/1/2009	15:22:31	89.3
3/1/2009	08:11:02	91.8	3/1/2009	10:14:44	92.1	3/1/2009	15:32:31	89.3
3/1/2009	08:12:02	92.3	3/1/2009	10:19:44	91.3	3/1/2009	15:42:31	90.6
3/1/2009	08:13:02	92.1	3/1/2009	10:24:44	92.3	3/1/2009	15:52:31	90.5
3/1/2009	08:14:02	92	3/1/2009	10:29:44	90.6	3/1/2009	15:54:11	90.5
3/1/2009	08:15:02	93	3/1/2009	10:34:44	90.5	3/1/2009	15:54:41	90.5
3/1/2009	08:16:02	92.5	3/1/2009	10:39:44	91.8			
3/1/2009	08:17:02	92.5	3/1/2009	10:44:44	91.5			
3/1/2009	08:18:02	92.5	3/1/2009	10:49:44	91.6			
3/1/2009	08:19:02	92.5	3/1/2009	10:54:44	92.1			

Table 4: Raw Water Level Data "Recovery"

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
3/1/2009	15:52:31	90.5	3/1/2009	16:39:10	92.1	3/2/2009	00:39:10	94.5
3/1/2009	15:54:11	90.5	3/1/2009	16:49:10	92.3	3/2/2009	00:49:10	94.6
3/1/2009	15:54:41	90.5	3/1/2009	16:59:10	92.3	3/2/2009	00:59:10	94.5
3/1/2009	15:55:11	90.5	3/1/2009	17:09:10	92.3	3/2/2009	01:09:10	94.5
3/1/2009	15:55:41	89.7	3/1/2009	17:19:10	92.5	3/2/2009	01:19:10	94.5
3/1/2009	15:56:11	89.5	3/1/2009	17:29:10	92.5	3/2/2009	01:29:10	94.6
3/1/2009	15:56:41	90.5	3/1/2009	17:39:10	92.6	3/2/2009	01:39:10	94.6
3/1/2009	15:57:11	90.8	3/1/2009	17:49:10	92.6	3/2/2009	01:49:10	94.6
3/1/2009	15:57:41	91.1	3/1/2009	17:59:10	92.8	3/2/2009	01:59:10	94.6
3/1/2009	15:58:11	91.1	3/1/2009	18:09:10	92.8	3/2/2009	02:09:10	94.6
3/1/2009	15:58:41	91.3	3/1/2009	18:19:10	93	3/2/2009	02:19:10	94.6
3/1/2009	15:59:11	91.3	3/1/2009	18:29:10	93	3/2/2009	02:29:10	94.6
3/1/2009	15:59:41	91.5	3/1/2009	18:39:10	93.1	3/2/2009	02:39:10	94.6
3/1/2009	16:00:11	91.3	3/1/2009	18:49:10	93.1	3/2/2009	02:49:10	94.6
3/1/2009	16:00:41	91.5	3/1/2009	18:59:10	93.3	3/2/2009	02:59:10	94.6
3/1/2009	16:01:11	91.5	3/1/2009	19:09:10	93.5	3/2/2009	03:09:10	94.6
3/1/2009	16:01:41	91.5	3/1/2009	19:19:10	93.5	3/2/2009	03:19:10	94.6
3/1/2009	16:02:11	91.5	3/1/2009	19:29:10	93.6	3/2/2009	03:29:10	94.6
3/1/2009	16:02:41	91.5	3/1/2009	19:39:10	93.6	3/2/2009	03:39:10	94.8
3/1/2009	16:03:11	91.5	3/1/2009	19:49:10	93.8	3/2/2009	03:49:10	94.6
3/1/2009	16:03:41	91.5	3/1/2009	19:59:10	93.8	3/2/2009	03:59:10	94.8
3/1/2009	16:04:11	91.5	3/1/2009	20:09:10	93.8	3/2/2009	04:09:10	94.8
3/1/2009	16:04:41	91.5	3/1/2009	20:19:10	93.8	3/2/2009	04:19:10	94.8
3/1/2009	16:05:11	91.6	3/1/2009	20:29:10	94	3/2/2009	04:29:10	94.8
3/1/2009	16:05:41	91.6	3/1/2009	20:39:10	94	3/2/2009	04:39:10	94.8
3/1/2009	16:06:11	91.5	3/1/2009	20:49:10	94	3/2/2009	04:49:10	94.8
3/1/2009	16:06:41	91.8	3/1/2009	20:59:10	94	3/2/2009	04:59:10	94.8
3/1/2009	16:07:11	91.5	3/1/2009	21:09:10	94	3/2/2009	05:09:10	94.8
3/1/2009	16:07:41	91.6	3/1/2009	21:19:10	94	3/2/2009	05:19:10	94.8
3/1/2009	16:08:11	91.6	3/1/2009	21:29:10	94	3/2/2009	05:29:10	94.8
3/1/2009	16:08:41	91.6	3/1/2009	21:39:10	94.1	3/2/2009	05:39:10	95
3/1/2009	16:09:11	91.6	3/1/2009	21:49:10	94.1	3/2/2009	05:49:10	95
3/1/2009	16:09:41	91.6	3/1/2009	21:59:10	94	3/2/2009	05:59:10	95
3/1/2009	16:10:11	91.6	3/1/2009	22:09:10	94.1	3/2/2009	06:09:10	95
3/1/2009	16:10:41	91.6	3/1/2009	22:19:10	94.1	3/2/2009	06:19:10	95
3/1/2009	16:11:11	91.6	3/1/2009	22:29:10	94.1	3/2/2009	06:29:10	95
3/1/2009	16:11:41	91.6	3/1/2009	22:39:10	94.1	3/2/2009	06:39:10	95
3/1/2009	16:12:11	91.6	3/1/2009	22:49:10	94.1	3/2/2009	06:49:10	95
3/1/2009	16:12:39	91.6	3/1/2009	22:59:10	94.1	3/2/2009	06:59:10	95
3/1/2009	16:14:39	91.8	3/1/2009	23:09:10	94.3	3/2/2009	07:09:10	95
3/1/2009	16:16:39	91.8	3/1/2009	23:19:10	94.3	3/2/2009	07:19:10	95
3/1/2009	16:18:39	91.8	3/1/2009	23:29:10	94.3	3/2/2009	07:29:10	95
3/1/2009	16:20:39	91.8	3/1/2009	23:39:10	94.5	3/2/2009	07:39:10	95
3/1/2009	16:22:39	91.8	3/1/2009	23:49:10	94.3	3/2/2009	07:49:10	94.8
3/1/2009	16:24:39	91.8	3/1/2009	23:59:10	94.5	3/2/2009	07:59:10	94.8
3/1/2009	16:26:39	92	3/2/2009	00:09:10	94.5	3/2/2009	08:09:10	94.8
3/1/2009	16:28:39	92	3/2/2009	00:19:10	94.5	3/2/2009	08:19:10	95
3/1/2009	16:29:10	92	3/2/2009	00:29:10	94.5	3/1/2009	16:02:11	91.5

Table 4: Raw Water Level Data "Recovery" Page 2

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
3/1/2009	16:02:41	91.5	3/1/2009	19:39:10	93.6	3/2/2009	03:39:10	94.8
3/1/2009	16:03:11	91.5	3/1/2009	19:49:10	93.8	3/2/2009	03:49:10	94.6
3/1/2009	16:03:41	91.5	3/1/2009	19:59:10	93.8	3/2/2009	03:59:10	94.8
3/1/2009	16:04:11	91.5	3/1/2009	20:09:10	93.8	3/2/2009	04:09:10	94.8
3/1/2009	16:04:41	91.5	3/1/2009	20:19:10	93.8	3/2/2009	04:19:10	94.8
3/1/2009	16:05:11	91.6	3/1/2009	20:29:10	94	3/2/2009	04:29:10	94.8
3/1/2009	16:05:41	91.6	3/1/2009	20:39:10	94	3/2/2009	04:39:10	94.8
3/1/2009	16:06:11	91.5	3/1/2009	20:49:10	94	3/2/2009	04:49:10	94.8
3/1/2009	16:06:41	91.8	3/1/2009	20:59:10	94	3/2/2009	04:59:10	94.8
3/1/2009	16:07:11	91.5	3/1/2009	21:09:10	94	3/2/2009	05:09:10	94.8
3/1/2009	16:07:41	91.6	3/1/2009	21:19:10	94	3/2/2009	05:19:10	94.8
3/1/2009	16:08:11	91.6	3/1/2009	21:29:10	94	3/2/2009	05:29:10	94.8
3/1/2009	16:08:41	91.6	3/1/2009	21:39:10	94.1	3/2/2009	05:39:10	95
3/1/2009	16:09:11	91.6	3/1/2009	21:49:10	94.1	3/2/2009	05:49:10	95
3/1/2009	16:09:41	91.6	3/1/2009	21:59:10	94	3/2/2009	05:59:10	95
3/1/2009	16:10:11	91.6	3/1/2009	22:09:10	94.1	3/2/2009	06:09:10	95
3/1/2009	16:10:41	91.6	3/1/2009	22:19:10	94.1	3/2/2009	06:19:10	95
3/1/2009	16:11:11	91.6	3/1/2009	22:29:10	94.1	3/2/2009	06:29:10	95
3/1/2009	16:11:41	91.6	3/1/2009	22:39:10	94.1	3/2/2009	06:39:10	95
3/1/2009	16:12:11	91.6	3/1/2009	22:49:10	94.1	3/2/2009	06:49:10	95
3/1/2009	16:12:39	91.6	3/1/2009	22:59:10	94.1	3/2/2009	06:59:10	95
3/1/2009	16:14:39	91.8	3/1/2009	23:09:10	94.3	3/2/2009	07:09:10	95
3/1/2009	16:16:39	91.8	3/1/2009	23:19:10	94.3	3/2/2009	07:19:10	95
3/1/2009	16:18:39	91.8	3/1/2009	23:29:10	94.3	3/2/2009	07:29:10	95
3/1/2009	16:20:39	91.8	3/1/2009	23:39:10	94.5	3/2/2009	07:39:10	95
3/1/2009	16:22:39	91.8	3/1/2009	23:49:10	94.3	3/2/2009	07:49:10	94.8
3/1/2009	16:24:39	91.8	3/1/2009	23:59:10	94.5	3/2/2009	07:59:10	94.8
3/1/2009	16:26:39	92	3/2/2009	00:09:10	94.5	3/2/2009	08:09:10	94.8
3/1/2009	16:28:39	92	3/2/2009	00:19:10	94.5	3/2/2009	08:19:10	95
3/1/2009	16:29:10	92	3/2/2009	00:29:10	94.5			
3/1/2009	16:39:10	92.1	3/2/2009	00:39:10	94.5			
3/1/2009	16:49:10	92.3	3/2/2009	00:49:10	94.6			
3/1/2009	16:59:10	92.3	3/2/2009	00:59:10	94.5			
3/1/2009	17:09:10	92.3	3/2/2009	01:09:10	94.5			
3/1/2009	17:19:10	92.5	3/2/2009	01:19:10	94.5			
3/1/2009	17:29:10	92.5	3/2/2009	01:29:10	94.6			
3/1/2009	17:39:10	92.6	3/2/2009	01:39:10	94.6			
3/1/2009	17:49:10	92.6	3/2/2009	01:49:10	94.6			
3/1/2009	17:59:10	92.8	3/2/2009	01:59:10	94.6			
3/1/2009	18:09:10	92.8	3/2/2009	02:09:10	94.6			
3/1/2009	18:19:10	93	3/2/2009	02:19:10	94.6			
3/1/2009	18:29:10	93	3/2/2009	02:29:10	94.6			
3/1/2009	18:39:10	93.1	3/2/2009	02:39:10	94.6			
3/1/2009	18:49:10	93.1	3/2/2009	02:49:10	94.6			
3/1/2009	18:59:10	93.3	3/2/2009	02:59:10	94.6			
3/1/2009	19:09:10	93.5	3/2/2009	03:09:10	94.6			
3/1/2009	19:19:10	93.5	3/2/2009	03:19:10	94.6			
3/1/2009	19:29:10	93.6	3/2/2009	03:29:10	94.6			

Figure 3
Top of Pines TPM 20951
Production

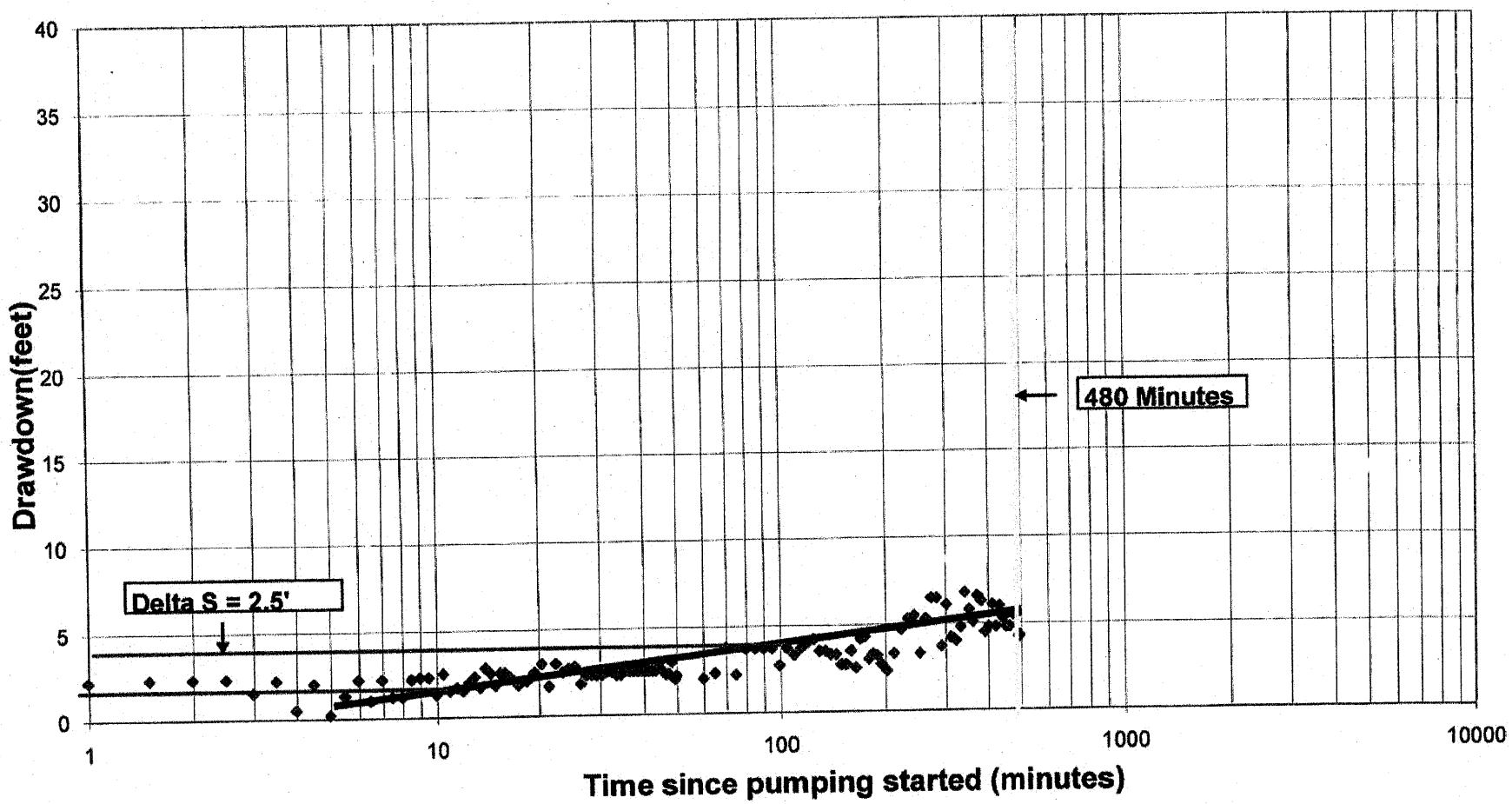

Figure 4
Top of the Pines TPM 20951
Recovery Graph

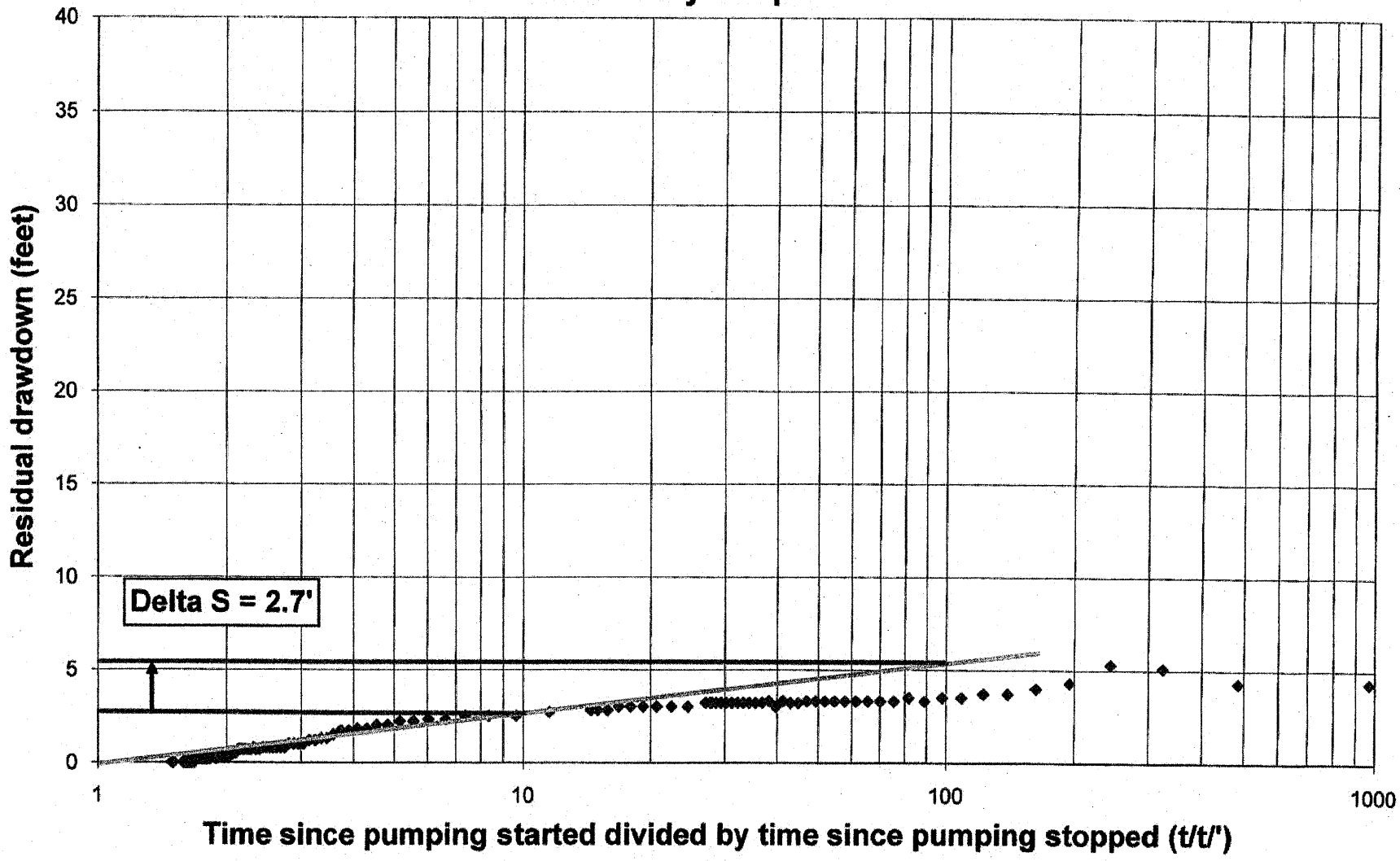
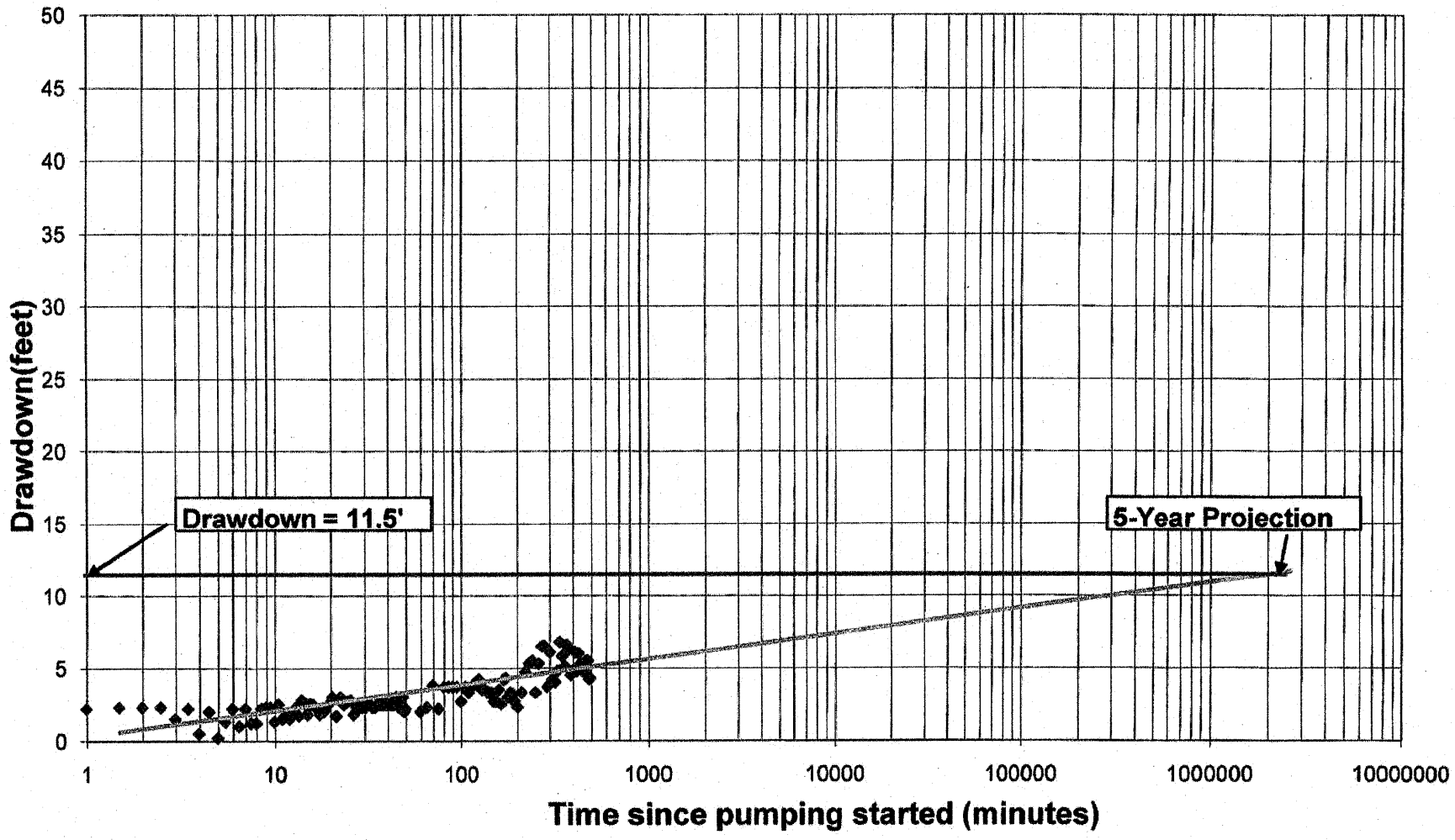
Figure 5
Top of the Pines TPM 20
5-Year Projection