



State of Idaho

DEPARTMENT OF WATER RESOURCES

Western Region, 2735 Airport Way • Boise, Idaho 83705-5082

Phone: (208) 334-2190 • Fax: (208) 334-2348 • Web Site: www.idwr.idaho.gov

November 17, 2009

C. L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Interim Director

State of Idaho
Idaho Fish & Game Commission
PO Box 25
Boise ID 83707

Terry Scanlan
SPF Water Engineering LLC
300 E Mallard Dr Suite 350
Boise ID 83706

RE: Aquifer Pump Test Report—Permit to Appropriate Water #63-32185

Dear Commission & Mr. Scanlan:

Our office recently received the above aquifer test report relating to Permit No. 63-32185-Roswell Marsh. This letter will serve as the approval for the test and report. You have met the permit #6 condition of approval, and project development may continue under the permit elements.

I commend you for a well orchestrated test and report.

Sincerely,

A handwritten signature in black ink that reads "John Westra". The signature is fluid and cursive, with the first name "John" being more prominent than the last name "Westra".

John Westra, Manager

Cc: M.. Maffey, C. Kofoed,



RECEIVED

NOV 12 2009

WATER RESOURCES
WESTERN REGION

November 11, 2009

John Westra
Western Region Manager
Idaho Department of Water Resources
2735 Airport Way
Boise, ID 83705

Subject: Aquifer Pumping Test Report for Permit 63-32185

Dear John:

In accordance with the requirements of Condition No. 6 of permit 63-32185, and your test plan approval letter dated June 23, 2009, please find the enclosed aquifer test report for permit 63-32185. This report is submitted for Idaho Department of Water Resources (IDWR) review and approval.

The report describes drilling, construction, and test pumping of the Roswell Marsh Production Well. The well was test pumped for 24.8 hours at an average pumping rate of 2,679 gpm. There was no detectable drawdown in any of the domestic wells located within ½ mile of the pumping well.

The Idaho Department of Fish and Game (IDFG) is waiting for IDWR approval of this report prior to authorizing installation of power supply and pumping equipment for the well. IDFG would like to begin pumping the well in February 2010 to provide wetland habitat for spring waterfowl migration. Pumping in early spring will also improve habitat for waterfowl nesting in late spring and early summer. We anticipate that 90 days will be required for contracting, equipment delivery, and construction. Therefore, we request that you review, comment, and approve this aquifer test report as soon as possible so that construction can be complete in February.

We look forward to your response.

Sincerely,

A handwritten signature in blue ink that reads "Terry M. Scanlan".

Terry M. Scanlan, P.E., P.G.

Cc: Clair Kofoed – IDF&G Regional Habitat Biologist
Mike Maffey – IDF&G Bureau of Engineering Chief

File: 370.0020

ROSWELL MARSH

WELL CONSTRUCTION AND PUMPING TEST REPORT



November 11, 2009



ROSWELL MARSH

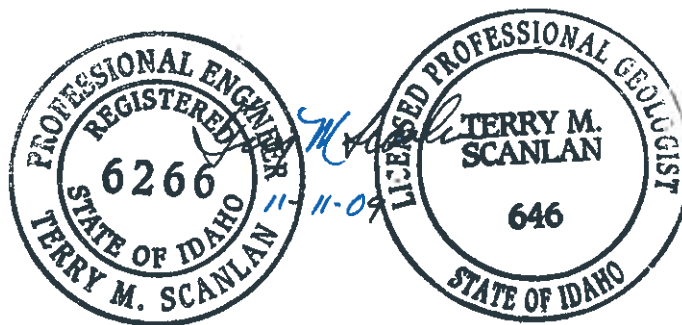
WELL CONSTRUCTION AND PUMPING TEST REPORT

Prepared for

Idaho Department of Fish and Game
Bureau of Engineering
600 South Walnut, P.O. Box 25
Boise, ID 83707

Prepared by

SPF Water Engineering, LLC
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Boise, ID 83706



November 11, 2009

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1. INTRODUCTION

1.1. Background

The Idaho Fish & Game Commission applied in March 2005 for a permit to appropriate ground water at Roswell Marsh for habitat enhancement. The application was approved in October 2008 and authorized the Commission to develop 4.80 cfs (2,154 gpm) of groundwater for wildlife and diversion to wildlife storage purposes. A copy of the permit is provided as Appendix A. The water right permit authorizes diversion from up to three wells.

Condition No. 6 of the permit states the following.

The right holder shall conduct a pump test of at least twenty-four hours for each well used as a point of diversion in connection with this water right. The pump test shall be designed and conducted by a qualified professional, such as a hydrologist, geologist, or engineer, and shall be approved by the Department before being conducted. The pump test shall measure all standard parameters associated with pump tests for the right holder's well(s) being tested and for any observation well(s) used for the pump test. The right holder shall keep records of the data collected during the pump test and shall make it available to the Department upon request. This condition is waived if the right holder provides written notification to the Department documenting unsuccessful attempts to obtain permission for pump test activities from owners of wells located within a one-half mile radius from any point of diversion developed under this right.

SPF Water Engineering prepared a test plan and submitted it to Idaho Department of Water Resources (IDWR) on June 1, 2009. The plan was approved by IDWR letter dated June 23, 2009. Copies of the test plan and follow-up correspondence are provided as Appendix B.

1.2. Purpose

This report describes well construction and presents the result of a 24-hour pumping test. The report includes an as-built well drawing, well driller's report, test pumping data, available information on observation wells, and other pertinent data. Recommendations for the permanent pump and for future water-level monitoring are provided.

2. WELL DRILLING AND CONSTRUCTION

2.1. Site Location and Ownership

The Roswell Marsh well site is reached by traveling approximately 1.7 miles west of Roswell on State Highway 18, then approximately 1000 feet south on Pebble Lane to an access road. The well site is $\frac{1}{4}$ mile southwest from Pebble Lane. The well site is in the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 25, Township 5 North, Range 6 West in Canyon County, Idaho. A vicinity map of the well site is provided as Figure 1.

2.2. Well Drilling

Well drilling equipment was mobilized to the project site in mid August 2009. Riverside, Inc. (Riverside) of Parma, Idaho, was the drilling and test pumping contractor.

Drilling occurred on August 30 and 31, and well construction and development were completed on September 29, 2009. Appendix C includes the approved Application for Drilling Permit.

The well was drilled using the reverse-rotary drilling method. Water supply for drilling was obtained from the adjacent test well. Bentonite was added to the drill water to provide additional fluid weight and viscosity to help lift suspend drill cuttings and support the borehole.

A 28-inch diameter open borehole was drilled to a total depth of 205 feet. The borehole penetrated top soil and clay to 16 feet, sand and pea gravel from 16 to 91 feet and from 95 feet to 165 feet, and blue clay and sandy blue clay from 91 to 95 feet and 165 feet to 205 feet.

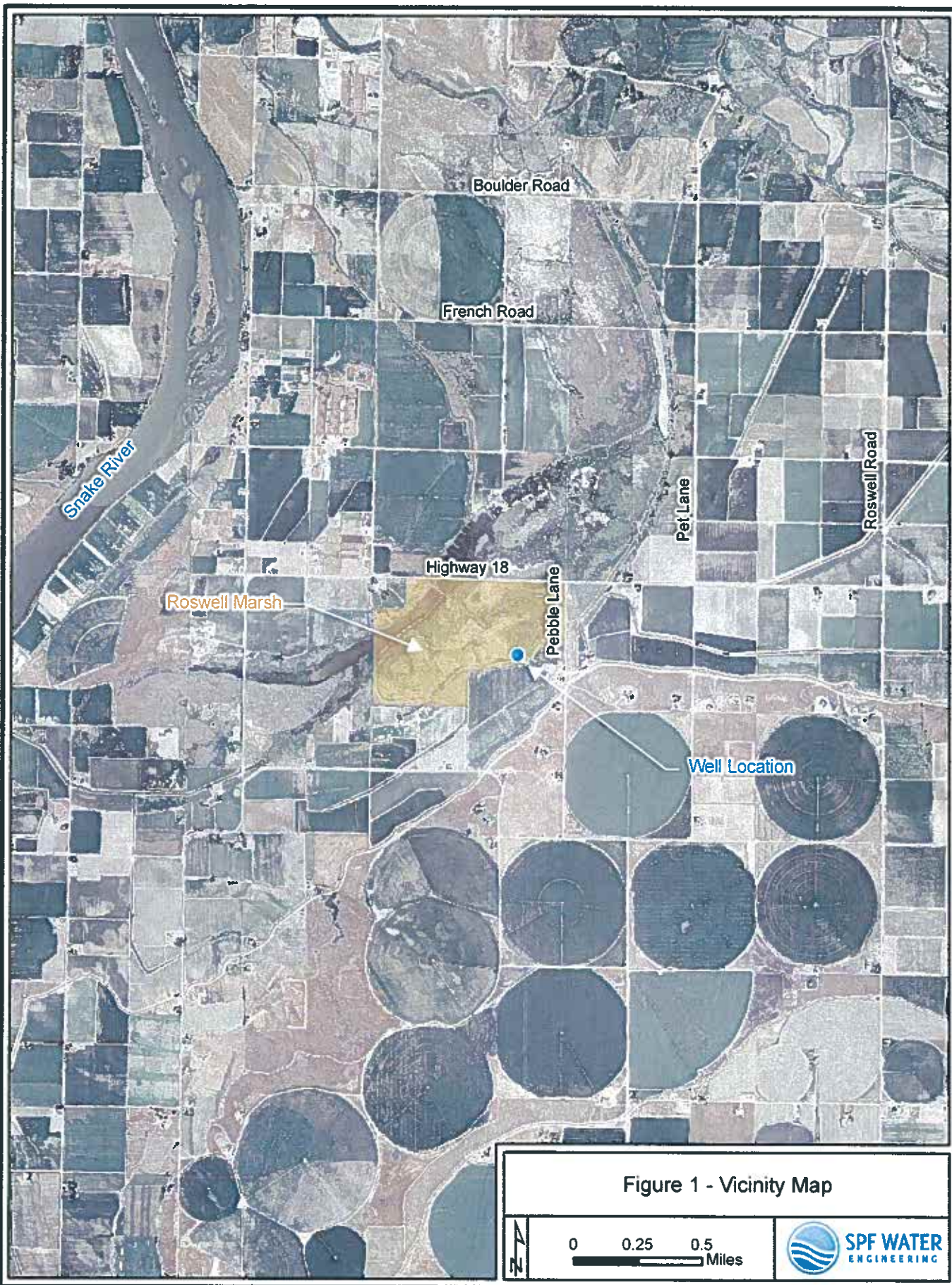
2.3. Well Construction

Based on the materials penetrated by the borehole, the well was completed with 16-inch casing and well screen from +2 feet to 165 feet. The screen interval is 95 to 165 feet. Screen slot size is 0.040-inch. Prior to installing the casing and well screen, the borehole was backfilled to approximately 170 feet with gravel.

A filter pack consisting of 13 cubic yards of No. 6-9 Colorado Silica Sand was installed in the annular space from approximately 70 feet to 170 feet. A bentonite chip surface seal (approximately 14 cubic yards) was installed from 70 feet to ground surface.

Following completion of well drilling, the well was initially developed by air-lift pumping for approximately 8 hours. Final development consisted of pumping and surging the well using the test pump. The water produced at the end of the development period was clear and sand free.

Appendix D includes the Well Drillers Report and as-built drawing of the well.



WELL TESTING

2.4. Well Testing

Well testing consisted of final development pumping, a 2-hour step-rate test and a nominal 24-hour constant-rate test. The static water level prior to testing was approximately 4 feet below ground surface. Water levels were measured with electric-line well sounders in the pumping well and observation wells and also with data logging pressure transducers in the pumping well and adjacent test well. Mike Martin, P.E., supervised test pumping and water-level measurement.

The test pump was a line-shaft turbine with diesel motor and right-angle gear drive. Pump setting depth was approximately 120 feet below ground surface (bgs). Flow rates were measured with a propeller-type flow meter with analog flow indicator and totalizer. During the tests, the flow was adjusted by modulating motor speed. Water was discharged into the East Alkali Drain, approximately 50 feet from the well.

2.4.1. Step-Rate Pumping Test

The step-rate test was conducted on September 21, 2009 and consisted of three 30-minute steps. The step test flow rates were approximately 1200 gpm, 2000 gpm, 2500 gpm, and 3000 gpm.

Static water level at the beginning of the test was 6.94 feet below the top of the measurement point (3.92 feet below ground surface). The pumping water level at the end of the 3000-gpm step was 67.61 feet below the top of the measurement point. Total drawdown was 60.76 feet below the static water level. The specific capacity at each flow rate is summarized in Table 1. The specific capacity was relatively constant at the four tested rates. The constant specific capacity suggests that the well is relatively efficient within the tested flow range.

Table 1 - Specific Capacity Summary.

Flow (gpm)	Specific Capacity (gpm/ft of drawdown)
1200	46
2000	48
2500	49
3000	49

Water levels during the step-rate test were monitored in the test well located 40 feet from the pumping well. Maximum test well drawdown was 10.44 feet.

Appendix E includes a summary of the step-rate test data and graphs.

2.4.2. 24-Hour Constant-rate Test

A 24.8-hour constant-rate pumping test was conducted on September 28 and 29, 2009 at an average pumping rate of 2,679 gpm (based on the totalizer reading). Water levels were measured in the pumping well, test well, and in the seven privately-owned domestic wells that are located within ½ mile of the pumping well. Static water levels were measured approximately one-day prior to the start of pumping, immediately prior to pumping, during pumping, and for approximately one day following cessation of pumping. The distances of the observation wells from the pumping well are listed in Table 2. Appendix F includes a summary of the step-rate test data and graphs.

Table 2 –Distances From Pumping Well to Observation Wells

Well Name/Owner	Distance from Pumping Well (Feet)
Test Well	40 feet
Metheny	870
Little	1210
Barnard	1260
Condie	1990
Story	2350
Ledas Black	2400
Bill Black	2580

Discussion of the responses to well pumping are provided for each well below. Available well driller's reports and an observation well location map are provided as Appendix G.

Pumping Well. The static water level at the beginning of the constant-rate test was 6.78 feet below the top of the measurement point. At the end of the test, the pumping water level was 63.62 feet below the top of the measurement point, for a total drawdown of 56.84 feet. Water-level fully recovered in less than 21 hours after the end of pumping.

A straight-line analysis of the semi-logarithmic drawdown response suggests an aquifer transmissivity of approximately 350,000 gpd/ft. Analysis of the recovery response indicates a transmissivity of approximately 330,000 gpd/ft.

Test Well. The static water level at the beginning of the constant-rate test was 5.41 feet below the top of the well casing. At the end of the pumping portion of the test, the water level was 17.32 feet below the top of the casing, for a total drawdown of 10.3 feet. Water-level fully recovered to less than 0.5 feet below static water level approximately 21 hours after the end of pumping.

A straight-line analysis of the semi-logarithmic drawdown response suggests an aquifer transmissivity of approximately 400,000 gpd/ft. The drawdown response suggests a storativity of approximately 1×10^{-5} .

Analysis of the first 100 minutes of recovery response indicates a transmissivity of approximately 440,000 gpd/ft and a storage coefficient of 1×10^{-5} . The later-time recovery data indicate a transmissivity of approximately 200,000 gpd/ft.

The storativity calculated from the drawdown and recovery responses indicates that the aquifer is highly confined in the vicinity of the pumping and test wells.

Roy Little. The Roy Little well provided one of the best domestic wells for monitoring because it was relatively close to the IDF&G well, easily measured, and the pump was not cycling significantly during the test. When first visited on the morning of test pumping, the well pump was operating for landscape irrigation. Within less than one hour after turning off the sprinklers, the well recovered to within approximately 0.1 feet of the previous day static. Water levels varied by less than 0.25 feet for the remainder of the pumping and recovery periods. Based on these measurements, there was no detectable water-level response at the Roy Little well resulting from pumping of the IDF&G well.

Rick Metheny. The Rick Metheny well is the closest domestic well to the IDF&G well at a distance of 870 feet. Water levels during the test varied by approximately 4 feet throughout the monitoring period due to frequent cycling of the Metheny well pump. As a result of the cycling, it is not possible to detect minor water-level impacts (i.e., less than 0.5 feet) at this well. However, based on the available data, there was no detectable impact from pumping of the IDF&G well at the Metheny well.

Bill Black. Water levels in the Bill Black well were relatively constant during the test period, with a variation of less than 0.5 feet. Water levels measured during the pre-pumping and pumping periods varied by only 0.2 feet. There was no detectable impact from pumping of the IDF&G well at the Bill Black well.

Renee Condie. Water levels in the Renee Condie well varied by 0.73 feet during the monitoring period. Variations are assumed be related to cycling of the Condie well pump. The two lowest measured water levels were prior to the start of pumping at the IDF&G well. The remaining water levels varied within a range of only 0.37 feet. Based on these data, there was no detectable impact at the Renee Condie well from pumping of the IDF&G well.

Ledas Black. Water levels in the Ledas Black well varied 5.0 feet during the monitoring period. Variations are assumed be related to cycling of the Ledas Black well pump. If the two lowest measured water levels are ignored, the remaining five measurements varied by only 0.24 feet. Based on these data, there was no detectable impact from pumping of the IDF&G well on the Ledas Black well.

Greg Story. Five non-pumping water levels were measured at the Greg Story well during the test period. These water levels varied within a range of only 0.40 feet. There was no trend suggesting any impact from pumping of the IDF&G well.

2.5. Discussion

The lack of water-level responses at the domestic wells was surprising, especially considering the low aquifer storativity as calculated at the test well. Based on a 0.00001 storativity (measured at the test well), and an average transmissivity of 350,000 gpd/ft (as measured at the pumping well and at the test well), a significant water-level response (i.e., 3 to 5 feet) should have been detectable at all of the domestic observation wells after the first hour of pumping. Similarly, a total of 6 to 8 feet of drawdown should have been measurable at all of the domestic wells by the end of the pumping test. Instead, no detectable responses were measured at any of the domestic wells after 24 hours of pumping.

At least two possibilities could be considered to explain the lack of measurable drawdown at the domestic wells.

1. A hydraulic boundary may separate the domestic wells from the pumping well. This boundary could be a recharge source (such as the Riverside Canal), or an unknown subsurface feature such as a fault or an aquifer boundary. There was no boundary response detectable in the drawdown data for the pumping well or the test well. The recovery data may suggest a positive hydraulic boundary.
2. Although the portion of the aquifer that is tapped by the Roswell Marsh production and test wells is highly confined with low storativity, overall the aquifer might respond as a completely unconfined aquifer with very high storativity. In such a case, the impact of pumping did not propagate to the domestic wells during the 24-hour pumping period and a longer pumping duration could result in a detectable water-level response. However, under such conditions (i.e., transmissivity=350,000 gpd/ft, storativity=0.2), the magnitude of water-level impact after one year of continuous pumping at 4.8 cfs would likely be minor, and is calculated using the Theis Equation at 3.71 feet at 1,000 feet from the pumping well and 2.43 feet at 2,500 feet from the pumping well. These calculations are highly conservative, as they assume no recharge to the aquifer.

2.6. Conclusions

1. The Roswell Marsh production well is capable of producing the permit authorized diversion rate of 4.80 cfs (2,154 gpm) with a pumping level of 50 feet to 60 feet below ground surface, depending on pumping duration.

2. Based on the measured water-level responses, significant impacts to domestic wells from pumping of the Roswell Marsh well are not anticipated.

2.7. Recommendations

1. The Roswell Marsh production well should be equipped with a 50-hp submersible well pump rated to produce 2150 gpm at 70 feet TDH. The pump should be set at a depth of approximately 84 feet.
2. Water-level monitoring in at least one local domestic well is recommended during the first year of pump operation. Water levels should be measured on an approximate monthly basis, or continuously using a pressure transducer.

Appendix A: Water Right Permit

NO. 63-32185

Maximum Diversion Rate: 4.80 CFS

and a permit is APPROVED for development of water as follows:

[illegible]

State of Idaho
Department of Water Resources

Permit to Appropriate Water

NO. 63-32185

CONDITIONS OF APPROVAL

1. Proof of application of water to beneficial use shall be submitted on or before October 01, 2013.
2. Subject to all prior water rights.
3. Project construction shall commence within one year from the date of permit issuance and shall proceed diligently to completion unless it can be shown to the satisfaction of the Director of the Department of Water Resources that delays were due to circumstances over which the permit holder had no control.
4. Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code and applicable Well Construction Rules of the Department.
5. This right does not grant any right-of-way or easement across the land of another.
6. The right holder shall conduct a pump test of at least twenty-four hours for each well used as a point of diversion in connection with this water right. The pump test shall be designed and conducted by a qualified professional, such as a hydrologist, geologist, or engineer, and shall be approved by the Department before being conducted. The pump test shall measure all standard parameters associated with pump tests for the right holder's well(s) being tested and for any observation well(s) used for the pump test. The right holder shall keep records of the data collected during the pump test and shall make it available to the Department upon request. This condition is waived if the right holder provides written notification to the Department documenting unsuccessful attempts to obtain permission for pump test activities from owners of wells located within a one-half mile radius from any point of diversion developed under this right.
7. If the right holder is notified by the Department and/or by another well owner that use under this right has allegedly injured a well that was constructed and used prior to approval of this right, the right holder shall cease pumping and shall notify the Department in writing. The Department shall require pump testing by the right holder to determine if the use of this right has injured senior right holders. Pumping under this right shall not resume until the Department has issued written notification to the right holder that either (a) the right holder has demonstrated injury has not occurred, or (b) the right holder has demonstrated injury has occurred but the diversion and use under this right have not caused the injury, or (c) the right holder has demonstrated injury has occurred and that the right holder will mitigate the injury. A mitigation plan shall be approved by the Department prior to any mitigation activity.
8. In accordance with sections 42-1710 through 42-1721, Idaho code, a dam or artificial barrier, together with appurtenant works, which is or will be ten (10) feet or more in height or will have an impounding capacity at maximum storage elevation of fifty (50) acre-feet or more, shall be subject to regulation by the Department of Water Resources.
9. After specific notification by the Department, the right holder shall install a suitable measuring device(s) or shall enter into an agreement with the Department to use power records to determine the amount of water diverted from all authorized points of diversion under this approval and shall annually report the information to the Department.

State of Idaho
Department of Water Resources
Permit to Appropriate Water
NO. 63-32185

10. Wildlife use is for the Roswell Marsh Wildlife Habitat Area.
11. The Director retains jurisdiction to require the right holder to provide purchased or leased natural flow or stored water to offset depletion of Lower Snake River flows if needed for salmon migration purposes. The amount of water required to be released into the Snake River or a tributary, if needed for this purpose, will be determined by the Director based upon the reduction in flow caused by the use of water pursuant to this permit.

This permit is issued pursuant to the provisions of Section 42-204, Idaho Code. Witness the signature of the Director, affixed at Boise, this 27th day of October, 2008.


JOHN WESTRA, Western Regional Manager

Appendix B: Test Plan and IDWR Approval

June 25, 2009

File

John Westra
Western Region Manager
Idaho Department of Water Resources
2735 Airport Way
Boise, ID 83705

Subject: Aquifer Test Plan for Permit 63-32185 - Clarification

Dear John:

In response to your letter of June 23, 2009, this letter provides clarification on two points associated with the proposed aquifer test pumping plan for permit 63-32185.

1. **Monitoring Wells.** Owners will be allowed to utilize their wells during the test, but will be encouraged to discontinue significant water uses such as irrigation for at least the day before the test and the day of the test. Most of these wells appear to be completed in permeable aquifer zones, and should recover quickly after occasional cycling on and off for limited domestic use. As such, the data from these wells should be adequate for the intended testing purposes.
2. **Test Procedure.** The test plan calls for the following pumping duration.

"Pumping will continue until a consistent water-level trend is identified in the pumping well and nearby monitoring wells. In no case, will pumping duration be less than 24 hours."

Therefore, the test duration is for a minimum of 24-hours, but can be extended if necessary until a consistent water-level trend develops. The 24-hour minimum test duration was selected as a compromise between optimum test duration and cost of test pumping.

We recognize that 24 hours will not be adequate test duration to allow pumping impacts to fully develop at all wells. In fact, pumping impacts may not be detectable in distant monitoring wells after 24 hours. However, the drawdown trends at the nearest monitoring wells should be sufficiently developed after 24-hours to determine aquifer parameters (transmissivity and storativity) and to extrapolate impacts under sustained pumping. Impacts to distant wells under sustained pumping can be calculated using the test-determined aquifer parameters. These calculated impacts will be conservative because they assume direct hydraulic connection that may or may not exist between the pumping well and distant monitoring wells.

Contractor costs for test pumping using a test pump and diesel test engine are expected to be approximately \$225 per hour. Adding associated monitoring costs, total test pumping cost is expected be approximately \$6,000 per day. Given this cost, I am reluctant to commit to more than 24-hours if adequate data can be obtained with a 24-hour test.

Please contact me with any questions or comments concerning these clarifications.

Sincerely,



Terry M. Scanlan, P.E., P.G.

Cc: Clair Kofoed – IDF&G Regional Habitat Biologist
Mike Maffey – IDF&G Engineering Bureau Chief

File: 370.0020



State of Idaho

DEPARTMENT OF WATER RESOURCES

Western Region, 2735 Airport Way • Boise, Idaho 83705-5082

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C. L. "BUTCH" OTTER
Governor

DAVID R. TUTHILL, JR.
Director

June 23, 2009

Terry Scanlan PE, PG
SPF Water Engineering
300 E Mallard Dr
Boise ID 83706

RE: Aquifer Test Plan for Permit #63-32185 ID Dept. of Fish & Game

Dear Mr. Scanlan:

Thank you for the receipt of the Aquifer Test Plan required under the conditions of approval for the above described permit. My regional staff has reviewed the plan and offers the following comments for your clarification:

-Monitoring Wells

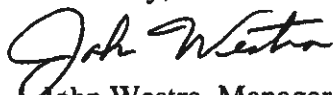
The monitoring wells should be measured in early AM after overnight recovery. prior to the test. Will the owners be allowed to utilize the their wells during the test or will use be prohibited ? What kind of control will be implemented to to establish a static baseline to get accurate data?

-Test Procedure

A 24-hour test is very short for an aquifer test of this nature. Please provide information/arguments to justify this short duration will be sufficient.

This letter will serve as an approval for the submitted test plan. You may proceed with the test at will with the permit holder.

Sincerely,


John Westra, Manager
Western Region



June 1, 2009

John Westra
Western Region Manager
Idaho Department of Water Resources
2735 Airport Way
Boise, ID 83705

Subject: Test Plan for Permit 63-32185

Dear John:

In accordance with the requirements of Condition No. 6 of permit 63-32185, the attached memo outlines a plan for test pumping of the first well proposed under this permit. This test pumping plan is submitted for Department review and approval.

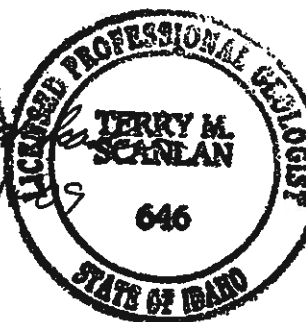
Please contact me with any questions or comments concerning this plan.

Sincerely,

Terry M. Scanlan, P.E., P.G.

Cc: Clair Kofoed – IDF&G Regional Habitat Biologist

File: 370.0020





TECHNICAL MEMORANDUM

DATE: June 1, 2009
TO: Clair Kofoed, IDF&G Regional Habitat Biologist
FROM: Mike Martin, P.E. and Terry Scanlan, P.E., P.G.
RE: Roswell Marsh Well Pumping Test Plan for Permit 63-32185

JOB NO.: 370.0020

The Idaho Fish & Game Commission applied in March 2005 for a permit to appropriate groundwater for wildlife and wildlife storage purposes at Roswell Marsh. The application was approved in October 2008 and authorized the Commission to develop 4.80 cfs (2,154 gpm) of groundwater for wildlife and diversion to wildlife storage purposes. The water right permit (63-32185) authorizes diversion from up to three wells. Condition No. 6 of the permit requires a pumping test of each well used as a point of diversion under the permit, with water-level monitoring at existing wells within a one-mile radius. A pumping test plan must be approved by Idaho Department of Water Resources (IDWR) prior to the pumping test.

This memo summarizes investigation of wells in the vicinity of the Idaho Department of Fish and Game (IDF&G) Roswell Marsh site, including SPF and IDF&G discussions with local well owners, IDF&G's follow-up correspondence with well owners that were unavailable during the site visit, and review of local well driller's reports. Based on these data, a well pumping test plan is provided.

Site Visit Summary

On February 12, 2009, Clair Kofoed (IDF&G), Mike Martin (SPF), and Terry Scanlan (SPF) visited twelve homes in the project vicinity, including seven homes within an approximate ½-mile radius of the proposed well site. Attachment A includes the preliminary site map and information obtained during the site visit. All homes visible on the aerial photo within or near the ½-mile radius were visited to identify existing wells. In addition, the IDWR water right database was queried to determine if any recorded irrigation water rights listing groundwater sources had points of diversion within the ½-mile radius. No groundwater-source irrigation water rights were identified, indicating that there should not be any irrigation wells present within the ½-mile radius.

Kofoed, Martin, and Scanlan obtained contact and well information from well owners at nine of the homes, and determined all nine of the well owners were willing to allow water-level monitoring in their wells during a pumping test of IDF&G's proposed Roswell Marsh production well. The remaining three well owners were not available during the visit. Kofoed visited with these well owners at a later date, and determined that these three well owners were also willing to participate in the test.

Based on these contacts, all seven property owners with wells located within a half mile of the IDF&G test well are willing to participate in the pumping test. All five of the property owners with wells outside the half mile distance are also willing to participate in testing. However, it appears that three of these wells (Keith Allender, Michael Sharkey, and Virgil Story) are currently inaccessible for water-level measurement due to well location or casing size restrictions.

The distance of existing domestic wells within a ½-mile radius from the proposed IDF&G production well range from approximately 900 feet (Rick Metheny) to 2600 feet (Bill Black).

Local Well Driller's Reports and Local Hydrogeology

The IDWR database was queried to identify well driller's reports with legal descriptions that are potentially within ½ mile of the proposed well site. We have correlated the well logs with property owners (current residents) based on the site visit, property ownership data in GIS, property address, and well log information. A table summarizing the surrounding residents from the site visit, possible well log, and pertinent well information is included in Attachment B. Also included in Attachment B are the well logs available from IDWR.

Review of well driller's reports for the area demonstrates that local wells generally draw water from sand and pea gravel layers that overly a thick sequence of blue clay or blue shale. The IDF&G test well penetrates these sand and pea gravel sediments from approximately 20 feet to a depth of 145 feet, interrupted by only 10 feet of blue clay with sand streaks from 100 to 110 feet.

The local wells with identified well driller's reports appear to penetrate to elevations ranging from approximately 2055 feet (IDF&G Test Well) to approximately 2200 feet (Greg Story). Most wells penetrate to depths between 2140 and 2200 feet. The proposed IDF&G production well will likely tap aquifer zones between elevations 2000 and 2125 feet. As a result, the proposed IDF&G production well will tap aquifer elevations below the bottom of most of the nearby wells.

Static water levels depend on location. Most wells in the near vicinity of the IDF&G test well have static water level elevations between approximately 2190 and 2210 feet, although a few wells have higher elevation static levels that may suggest some hydraulic separation in those wells from the aquifer zone tapped the IDF&G test well and other wells.

The driller's logs suggest that the aquifer is likely semi-confined or unconfined with relatively high transmissivity. Typical hydraulic parameters for an aquifer of this nature might range within an order of magnitude of 200,000 gpd/ft transmissivity and 0.02 storativity. Theoretical drawdowns after 24 hours of pumping at 2000 gpm (4.5 cfs) for these aquifer parameters calculated using the Theis Equation are 9.7 feet at a radius of 25 feet (IDF&G Test Well), 1.7 feet at a radius of 900 feet (Metheny), and 0.14 feet at a radius of 2600 feet (Bill Black). After 48 hours of pumping, theoretical drawdowns at these radii increase to 10.51 feet, 2.38 feet, and 0.49 feet, respectively. These calculations demonstrate that the near-well monitoring wells should experience substantially more water-level response to test pumping than the more distant monitoring wells. Furthermore, the near-well water-level responses can be used to project impacts to distant wells under sustained pumping.

Pumping Test Plan

Condition No. 6 of permit 63-32185 states the following.

The right holder shall conduct a pump test of at least twenty-four hours for each well used as a point of diversion in connection with this water right. The pump test shall be designed and conducted by a qualified professional, such as a hydrologist, geologist, or engineer, and shall be approved by the Department before being conducted. The pump test shall measure all standard parameters associated with pump tests for the right holder's well(s) being tested and for any observation well(s) used for the pump test. The right holder shall keep records of the data collected during the pump test and shall make it available to the Department upon request. This condition is waived if the right holder provides written notification to the Department documenting unsuccessful attempts to obtain permission for pump test activities from owners of wells located within a one-half mile radius from any point of diversion developed under this right.

Monitoring Wells. SPF proposes to monitor water levels in all of the eight identified wells located within a half-mile distance of the proposed IDF&G production well. These wells are listed below.

- IDF&G test well
- Roy Little
- Rick Metheny
- Denis Barnard
- Greg Story
- Renee Condie
- Ledas Black
- Bill Black

It is possible that one or more of these wells will not be measurable due to casing obstructions. In such event, impacts to that well can be projected based on measurements in other nearby wells.

Test Procedure. The pumping test procedure is outlined below. SPF will supervise test pumping activities. Water-level and pumping rate measurements will be collected by SPF, IDF&G personnel, and the test pumping contractor.

1. Determine the target pumping rate for the minimum 24-hour duration constant rate pumping test. Pumping rate will be the maximum sustainable rate with the test pump and well, and will be estimated by a step-rate test to determine productivity of the well at various flow rates. The step-rate test will be concluded a minimum of 48 hours prior to the constant-rate pumping test.
2. Measure static water levels in the eight selected monitoring wells. Static water levels will be measured at least twice prior to the 24-hour constant rate test, with one measurement on the day prior to the 24-hour test and the second measurement within 4 hours of the start of the 24-hour test.
3. Conduct a minimum 24-hour duration constant rate pumping test. Water levels will be measured in the pumping well and the eight monitoring wells. Flow rate will be kept

constant throughout the test. Water-level measurements will be obtained on a frequent basis in the pumping well, IDF&G test well, and the two closest observation wells (Metheny and Little). Less frequent measurements will be collected from the more distant monitoring wells. All wells will be measured at least once within 4 hours prior to the end of the pumping portion of the test. Pumping will continue until a consistent water-level trend is identified in the pumping well and nearby monitoring wells. In no case, will pumping duration be less than 24 hours. Temperature and conductivity of the water pumped from the production well will be measured during the pumping test.

4. Measure water-level recovery. Following cessation of pumping, water levels will be measured in the pumping well and any of the eight monitoring wells that demonstrated drawdown during the constant-rate portion of the pumping test. Water-levels will be measured within a few hours of the end of pumping, and again approximately 24-hours following the end of pumping.

Water-level measurements will be obtained using electric-line well sounders, with measurements accurate to within 0.01 feet. Pumping rate measurements will be made using the orifice method (i.e., circular weir and manometer). The constant-rate pumping test will be scheduled to start and end sometime between 10 am and noon, to allow adequate time to measure monitoring well water levels prior to starting and stopping the pump.

Pumping Test Analysis. Following completion of the constant-rate pumping test, the test data will be compiled, analyzed, and presented in a report. The analysis will include calculation of aquifer hydraulic parameters (transmissivity and storativity), estimates of future pumping levels in the production well for various rates and durations of pumping, and estimates of impacts to monitored local wells based on test responses and aquifer hydraulics. The pumping test report will be provided to IDWR within 60 days of completion of test pumping.

Appendix C: Approved Application for Drilling Permit

63
Form 235-1
1/31/03

Drilling Permit No. 908761-857342
Drilling Permit I.D. Tag No. D0055896
Water Right Permit No. 63-32185
Injection Permit No. _____

State of Idaho
Department of Water Resources

APPLICATION FOR DRILLING PERMIT
(FOR THE CONSTRUCTION OF A WELL)

1. Owner (please print): Idaho Department of Fish and Game, Attention: Mike Maffey
2. Mailing Address: P.O. Box 25
City: Boise State: ID Zip Code: 83707 Telephone 208-287-2843
3. Proposed Well Location: Twp. 5N Rge. 6W Sec. 25 1/4 SW 1/4 NE 1/4;
Gov't Lot No. _____ County Canyon Lat. ° ' " Long. ° ' "
Street Address of Well Site 1/4 mile south of Highway 18, 1/8 mile west of Pebble Lane City Roswell
Give at least name of road + Distance to Road or Landmark
Lot, block and subdivision Roswell Marsh Wildlife Habitat Area

4. Proposed Use of Well:

☐ DOMESTIC: The use of water for homes, organization camps, public campgrounds, livestock and for any other purpose in connection therewith, including irrigation of up to % acre of land, if the total use is not in excess of 13,000 gpd; or any other uses, if the total use does not exceed a diversion rate of 0.04 cfs and a diversion volume of 2500 gpd.

Domestic does not include water for multiple ownership subdivisions, mobile home parks, commercial or business establishments, unless the use does not exceed a diversion rate of 0.04 cfs and a diversion volume of 2500 gpd.

NON-DOMESTIC: ☐ Irrigation ☐ Municipal ☐ Industrial
☐ Livestock ☐ Test ☒ Other Wildlife
Type _____ Number Hds. _____ (Describe)

☐ INJECTION:

☐ MONITORING: A well bore schematic and map is required for each blanket permit. No. of proposed wells: _____

5. Well Construction Information:

A. ☒ New well ☐ Modify ☐ Replace
B. Proposed Casing Diameter 16 inch Proposed Maximum Depth 300 ft

C. Anticipated bottom hole temperature:
☒ 85 F or less ☐ 85F to 212F ☐ 212 F or more
(Cold Water Well) (Low Temp. Geo. Well) (Geothermal Well)

6. Construction Start Date: August 10, 2009
7. Anticipated Well Driller: Riverside, Inc. Driller's Lic. No. 333

NOTE: The actual well driller must be identified prior to drilling.

8. Applicant's Signature: Michael Maffey Date 8/6/09
Address (if different from Owner) _____
City: _____ State: _____ Zip Code: _____ Telephone: 287-2843
Title: I.D.F.G. Engineering Bureau Chief
(Owner, Firm Representative, Other)

RECEIVED

AUG 07 2009

WATER RESOURCES
WESTERN REGION

20065896
ACTION OF THE DEPARTMENT OF WATER RESOURCES

This Permit is APPROVED

Date 8.11.09

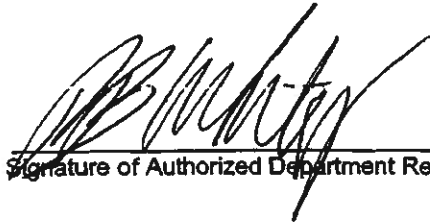
If approved, this permit authorizes the construction or modification of a well subject to the following conditions. **READ CAREFULLY!**

GENERAL CONDITIONS:

1. This drilling permit is valid for two (2) months from the above approval date for the start of construction and is valid for one(1) year from the approval date for completion of the well unless an extension has been granted.
2. This permit does not constitute an approval of the District Health Department or the Idaho Department of Health and Welfare, which may be required before construction of the well. All wells must be drilled a minimum distance of 100 feet from a drain field. Domestic and Public Water Supply wells must be drilled a minimum of 50 feet and 100 feet respectively from a septic tank.
3. The well shall be constructed by a driller currently licensed in the State of Idaho who must maintain a copy of the drilling permit at the drilling site.
4. Approval of this drilling permit does not authorize trespass on the land of another party.
5. This permit does not constitute other local, county, state or federal approvals, which may be required for construction of a well.
6. This drilling permit does not represent a right to divert and use the water of the State of Idaho. If the well being drilled is associated with approved water right(s) use of the well must comply with conditions of said water right(s).
7. If a bottom hole temperature of 85 or greater is encountered, well construction shall cease and the well driller and the well owner shall contact the Department immediately.
8. Idaho Code, S 55-2201 - 55-2210 requires the applicant and/or his contractors to contact "Digline" (DigLine is a one-call center for utility notification) not less than 2 working days prior to the start of any excavation for this project. The "DigLine" Number for your area is 1-800-342-1585.
9. Please be advised that this drilling permit should be considered and treated as a preliminary permit. If you are in disagreement with this preliminary permit you have fourteen (14) days of the service date of this permit to petition the Department for reconsideration pursuant to Section 67-5243, Idaho Code.
10. The well tag for the drilling permit/start card shall be securely and permanently attached to the well casing through welding or by the use of four closed end domed stainless steel pop rivets. The tag attachment will be done at the time of completion of the well, and prior to removing the drill rig from the drill site.

SPECIFIC CONDITIONS:

A final well completion design shall be submitted and approved by IDWR prior to completing this well



Signature of Authorized Department Representative

SENIOR WATER
RESOURCE AGENT

Receipt No. W037780 Received by JH Fee 3200.00 Date 8.7.09

EXTENSION OF DRILLING PERMIT

Extension approved by _____ Approval Date _____

This extension expires: _____

Wav 8/08

Well ID Tag No. D0055896

Request for Waiver of Administrative Rules for Well Construction Standards

This request is made pursuant to IDAPA 37.03.09, Rule 025.01.b for waiver from specific minimum construction requirements identified below. This request is specific to a well to be constructed for the Idaho Department of Fish and Game (the legal well/property owner) and associated with the tag number listed above. This request is made jointly by the licensed well driller and the property owner. The well driller and well owner hereby acknowledge that they concur with this request and understand they are jointly responsible for ensuring that the ground water resources will be protected against waste and contamination. Approval of this request only implies that the construction plan as proposed appears to meet the intent of the Rules and should protect the groundwater from waste and contamination. Approval of this request is not an endorsement by the Department of adequate well construction or completion. Approval does not constitute a waiver of any other standards not identified on this request. The following rule(s) are requested to be waived: (must identify specific Rule(s) by number from IDAPA 37.03.09)

- 1) 37.03.09.025.01 (50-foot set back from surface water bodies)
- 2) _____
- 3) _____

Reason for request: The well site is located on a dike that is less than 100 feet wide. On one side of the dike is a drain ditch. On the other side of the dike is the Roswell Marsh. Therefore, the well will be located within 50 feet of one or both surface water bodies.

Describe additional safeguards being employed to accommodate for variance from the required standard. (Well completion diagram required. Please attach to this application).
A surface seal will extend to a minimum depth of 60 feet. This surface seal will protect the aquifer from contamination. The well will discharge into the Roswell Marsh to maintain water levels for wildlife habitat purposes. The well will not be used for drinking water purposes.

By signing below, the well driller and well owner acknowledge that they have discussed the associated risks and benefits of this proposal, are ultimately responsible for the proper construction of this well, and are in agreement with this request.

Well Driller See Attached Date _____

Well Owner Michael Maffey Date 8/6/09

IDWR Representative [Signature] Date 8-11-09

☒ Approved ☐ Denied

Wav 8/08

Well ID Tag No. D0055896

Request for Waiver of Administrative Rules for Well Construction Standards

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- 2) _____
- 3) _____

Reason for request: The well site is located on a dike that is less than 100 feet wide. On one side of the dike is a drain ditch. On the other side of the dike is the Roswell Marsh. Therefore, the well will be located within 50 feet of one or both surface water bodies.

Describe additional safeguards being employed to accommodate for variance from the required standard. (Well completion diagram required. Please attach to this application). A surface seal will extend to a minimum depth of 60 feet. This surface seal will protect the aquifer from contamination. The well will discharge into the Roswell Marsh to maintain water levels for wildlife habitat purposes. The well will not be used for drinking water purposes.

By signing below, the well driller and well owner acknowledge that they have discussed the associated risks and benefits of this proposal, are ultimately responsible for the proper construction of this well, and are in agreement with this request.

Well Driller Riverside Inc. Date 8/6/09

Well Owner _____ Date _____

IDWR Representative _____ Date _____

☐ Approved ☐ Denied

RECEIVED

AUG 12 2009

WATER RESOURCES
WESTERN REGION

Idaho Department of Water Resources Receipt

Receipt ID: W037780

Payment Amount \$200.00 Date Received 8/7/09 9:46 Region WESTERN
Payment Type Check Check Number 4905
Payer SPF WATER ENGINEERING LLC

Comments APPLICATION FOR DRILLING PERMIT FOR DEPT OF FISH AND GAME 63-32185
DRILLER: RIVERSIDE, INC

D0055896

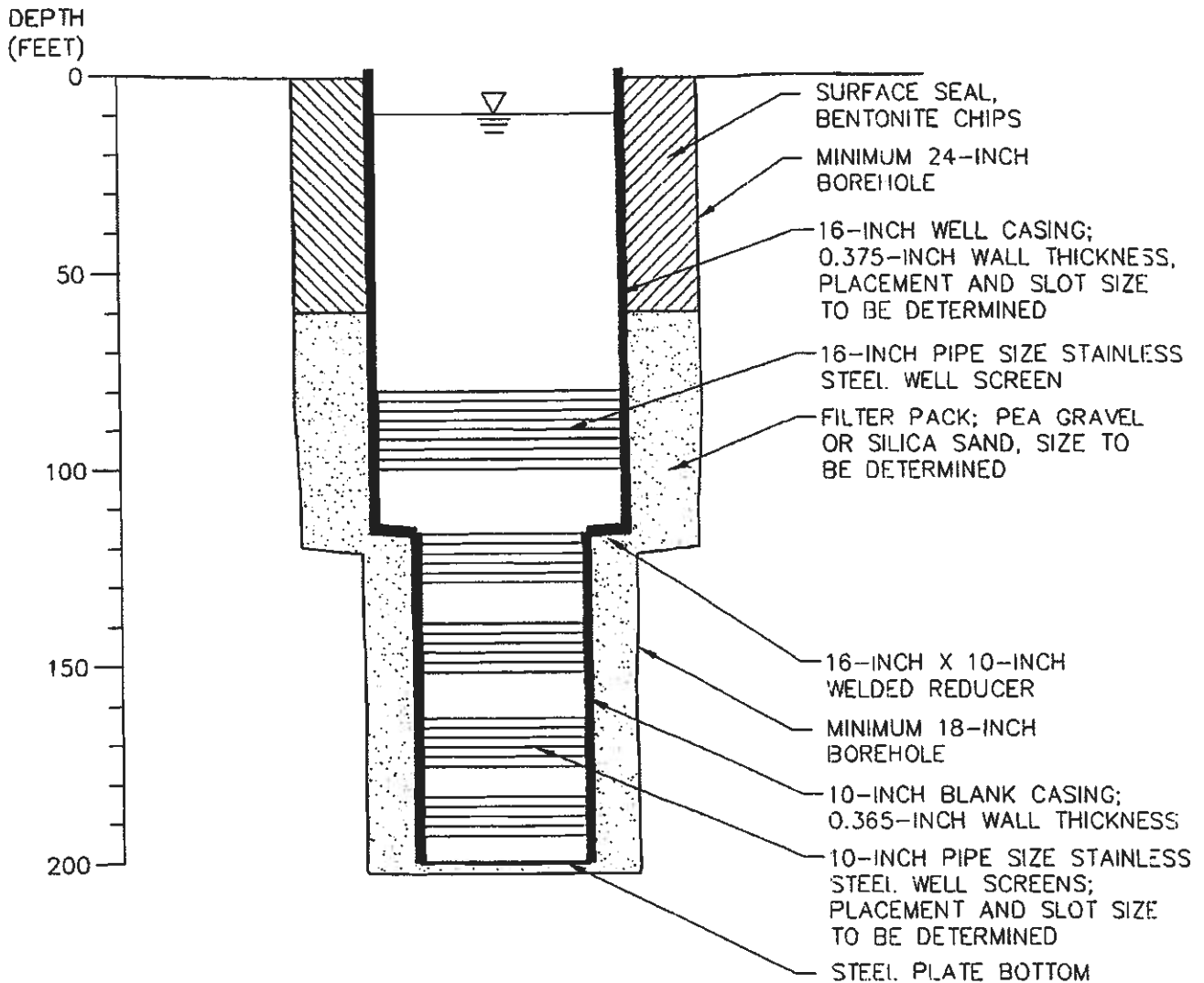
Fee Details

Amount	Description	Fund	Fund Detail	PCA	Subobject
\$200.00	DRILLING PERMITS	0229	21	62134	1205



Signature Line (Department Representative)

Attachment I
D0055896



SPF WATER
ENGINEERING

300 East Mallard Drive, Suite 350
Boise, Idaho 83706
Tel (208) 383-4140 Fax (208) 383-4156

ROSWELL MARSH PRODUCTION WELL
CONCEPTUAL DESIGN

SCALE: NTS

DRAWN BY: SCB

FIGURE 2

PROJECT #370.0030

Appendix D: Well Drillers Report

IDAHO DEPARTMENT OF WATER RESOURCES WELL DRILLER'S REPORT

857342

1. WELL TAG NO. D 0055896

Drilling Permit No. 908761-857342

Water right or injection well # 63-32185

2. OWNER: Idaho Department of Fish and Game

Name _____

Address P.O. Box 25

City Boise State ID Zip 83707

3. WELL LOCATION:

Twp. 5 North ☒ or South ☐ Rge. 6 East ☐ or West ☒

Sec. 25 NW 1/4 SW 1/4 NE 1/4

Gov't Lot _____ County Canyon

Lat. 43 ° 44.686 (Deg. and Decimal minutes)

Long. 117 ° 00.037 (Deg. and Decimal minutes)

Address of Well Site 1/4 mile south of Highway 18, 1/8 mile west of Pebble Lane

City Roswell

Lot _____ Blk. _____ Sub. Name Roswell Marsh Wildlife Habitat Area

4. USE:

☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☒ Other Wildlife

5. TYPE OF WORK:

☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other _____

6. DRILL METHOD:

☐ Air Rotary ☐ Mud Rotary ☐ Cable ☒ Other Reverse

7. SEALING PROCEDURES:

Seal material	From (ft)	To (ft)	Quantity (lbs or ft)	Placement method/procedure
Bentonite Chips	0	70	27,500	Dry Pour

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/Schedule	Material	Casing Liner	Threaded	Welded
16	+2	95	.375	Steel	☒	☐	☒

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) _____

9. PERFORATIONS/SCREENS:

Perforations ☐ Y ☒ N Method _____

Manufactured screen ☒ Y ☐ N Type Johnson Wire Wrap

Method of installation Lowered into hole

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
95	165	.040		16	S.S	

Length of Headpipe N/A Length of Tailpipe N/A

Packer ☐ Y ☒ N Type _____

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft)	Placement method
6-9 Sand	70	170	18,000	Dry Pour

11. FLOWING ARTESIAN:

Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) _____

Describe control device _____

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) 16' Static water level (ft) 6'10"

Water temp. (°F) 62 Bottom hole temp. (°F) _____

Describe access port 1-1/2" Pipe on side

Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
56	2500	24 hrs

Test method:

Pump	Bailer	Air	Flowing artesian
☒	☐	☐	☐

Water quality test or comments: _____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water	
				Y	N
28	0	8	Top soil		X
28	8	16	Tan clay		X
28	16	165	Coarse sand, pea gravel with small clay streak	X	
28	165	205	Blue clay		X

RECEIVED

OCT 14 2009

WATER RESOURCES
WESTERN REGION

NOTE: Backfilled with pea gravel, topped off with bentonite chips from 170'-205'.

Completed Depth (Measurable): 165

Date Started: Aug 27, 2009

Date Completed: Sep 28, 2009

14. DRILLER'S CERTIFICATION:

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Riverside Inc Co. No. 333

*Principal Driller [Signature] Date Oct 12, 2009

*Driller [Signature] Date _____

*Operator II [Signature] Date Oct 12, 2009

Operator I _____ Date _____

* Signature of Principal Driller and rig operator are required.

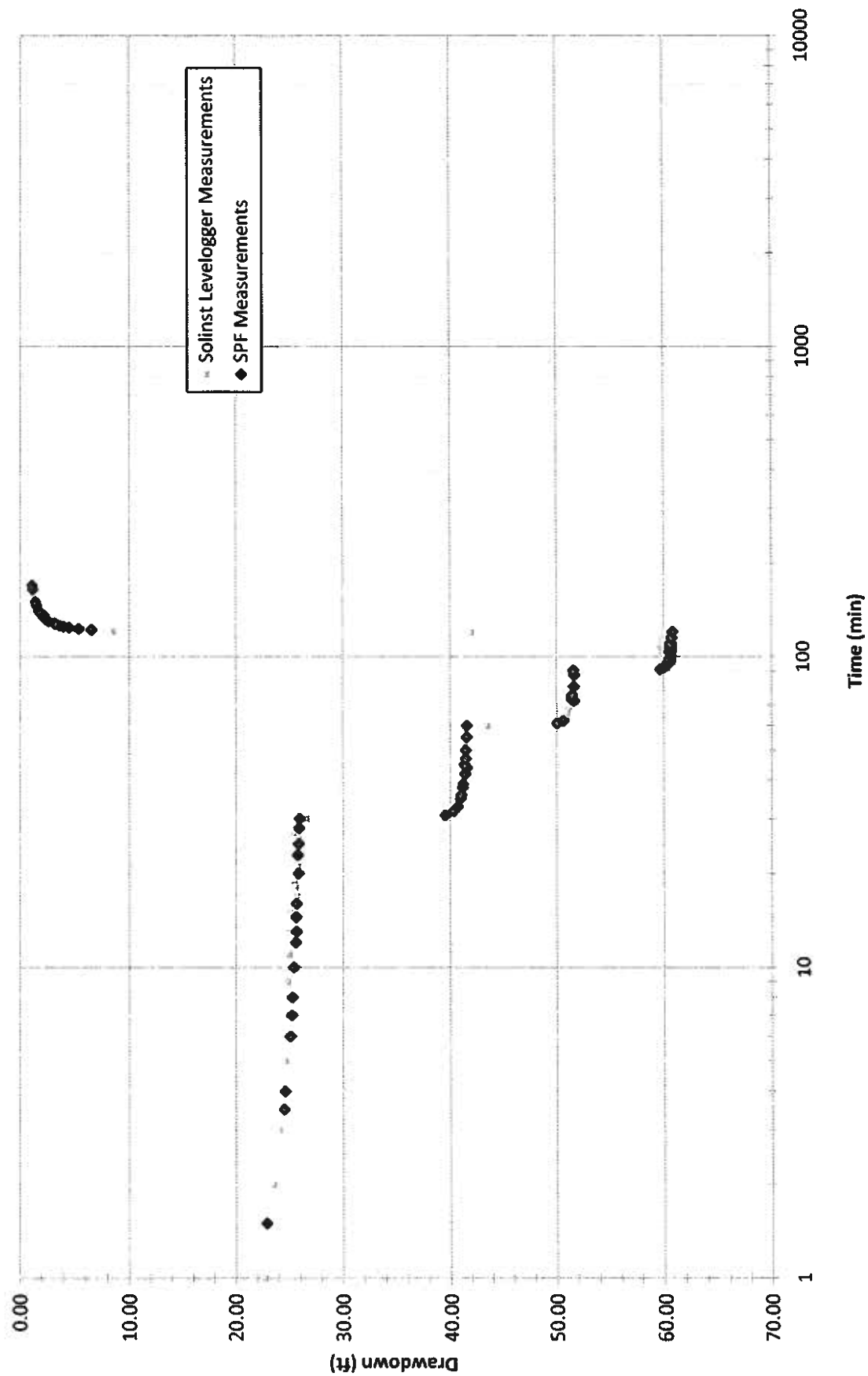
Appendix E: Step-Rate Test Data and Graphs

IDFG Roswell Marsh Well - Step Rate Test									
Test Performed By:		Riverside Inc. and SPF							
Test Pump:		diesel-driven line-shaft turbine set @ 120'							
Measurements Taken By:		Mike Martin (SPF) and Rory (Riverside)							
Flow Measurement:		McCrometer Flowmeter							
Pumping Well Measurement Point:		3.02 feet top of mp							
Test Well Measurement Point:		1.49 feet TOC							
Date	Time	t (min)	Pumping Well			Test Well			Comments
			DTW from top of mp (ft)	DTW bgs (ft)	DD (ft)	DTW from TOC (ft)	DTW bgs (ft)	DD (ft)	
9/21/2009	13:15					5.48	3.99		static
9/21/2009	13:26		6.94	3.92					static
9/21/2009	13:50	0							pump on
9/21/2009	13:51:30	1.5	29.80	26.78	22.86				
9/21/2009	13:52	2				8.14	6.65	2.66	
9/21/2009	13:53	3				8.88	7.39	3.40	
9/21/2009	13:53:30	3.5	31.45	28.43	24.51				
9/21/2009	13:54	4	31.51	28.49	24.57				
9/21/2009	13:54:30	4.5				9.46	7.97	3.98	
9/21/2009	13:55:30	5.5				9.67	8.18	4.19	
9/21/2009	13:56	6	32.00	28.98	25.06				Q~1200gpm
9/21/2009	13:56:30	6.5				9.83	8.34	4.35	
9/21/2009	13:57	7	32.15	29.13	25.21				
9/21/2009	13:58	8	32.20	29.18	25.26				
9/21/2009	13:58:30	8.5				9.98	8.49	4.50	
9/21/2009	14:00	10	32.35	29.33	25.41				clear, Q~1200gpm
9/21/2009	14:00:30	10.5				10.09	8.60	4.61	
9/21/2009	14:01	11				10.13	8.64	4.65	
9/21/2009	14:02	12	32.50	29.48	25.56				Q~1200gpm
9/21/2009	14:02:30	12.5				10.18	8.69	4.70	
9/21/2009	14:03	13	32.60	29.58	25.66				
9/21/2009	14:03	13.5				10.22	8.73	4.74	Q~1200gpm
9/21/2009	14:04:30	14.5	32.56	29.54	25.62				
9/21/2009	14:05	15				10.26	8.77	4.78	
9/21/2009	14:06	16	32.59	29.57	25.65				
9/21/2009	14:07	17				10.32	8.83	4.84	
9/21/2009	14:08	18				10.32	8.83	4.84	
9/21/2009	14:10	20	32.76	29.74	25.82				
9/21/2009	14:11	21				10.40	8.91	4.92	
9/21/2009	14:12	22				10.42	8.93	4.94	
9/21/2009	14:13	23	32.73	29.71	25.79				Q~1200gpm
9/21/2009	14:14	24				10.44	8.95	4.96	
9/21/2009	14:15	25	32.80	29.78	25.86				
9/21/2009	14:16	26				10.47	8.98	4.99	
9/21/2009	14:18	28	32.83	29.81	25.89				Q~1200gpm
9/21/2009	14:19	29				10.50	9.01	5.02	
9/21/2009	14:20	30	32.85	29.83	25.91				increase Q & RPM
9/21/2009	14:21	31	46.50	43.48	39.56				Q~2000gpm
9/21/2009	14:22	32	47.28	44.26	40.34				
9/21/2009	14:23	33	47.65	44.63	40.71				
9/21/2009	14:24	34				12.20	10.71	6.72	
9/21/2009	14:25	35	47.90	44.88	40.96				
9/21/2009	14:26	36	48.00	44.98	41.06				
9/21/2009	14:27	37				12.47	10.98	6.99	
9/21/2009	14:28	38	48.11	45.09	41.17				
9/21/2009	14:29	39	48.13	45.11	41.19				
9/21/2009	14:30	40				12.62	11.13	7.14	
9/21/2009	14:31	41				12.67	11.18	7.19	

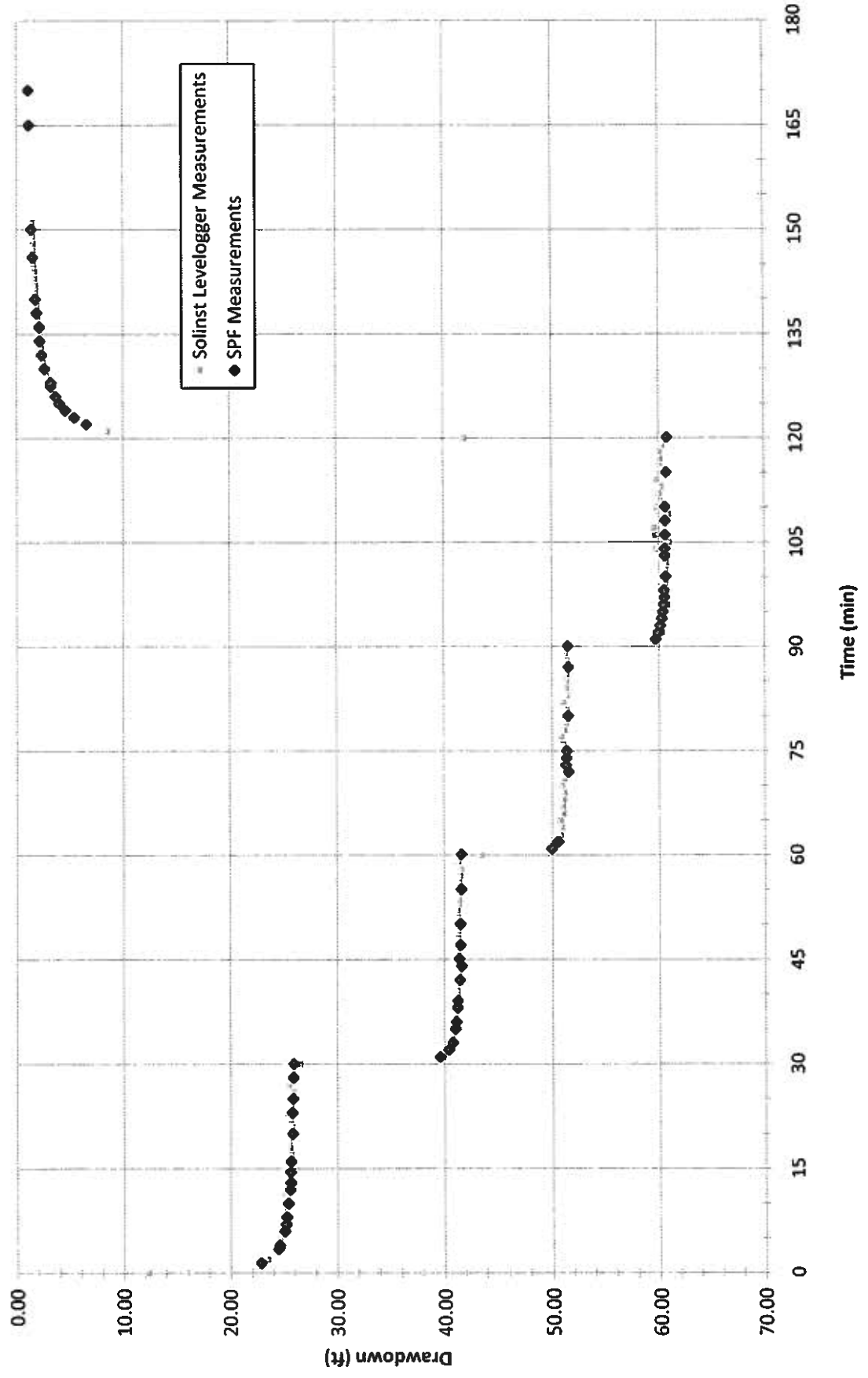
Date	Time	t (min)	Pumping Well			Test Well			Comments
			DTW from top of mp (ft)	DTW bgs (ft)	DD (ft)	DTW from TOC (ft)	DTW bgs (ft)	DD (ft)	
9/21/2009	14:32	42	48.36	45.34	41.42				Q~2000gpm
9/21/2009	14:33	43				12.73	11.24	7.25	
9/21/2009	14:34	44	48.51	45.49	41.57				
9/21/2009	14:35	45	48.27	45.25	41.33				Q~2000gpm
9/21/2009	14:36	46				12.81	11.32	7.33	
9/21/2009	14:37	47	48.39	45.37	41.45				
9/21/2009	14:38	48				12.82	11.33	7.34	
9/21/2009	14:40	50	48.39	45.37	41.45				
9/21/2009	14:41	51				12.88	11.39	7.40	
9/21/2009	14:43	53				12.92	11.43	7.44	
9/21/2009	14:45	55	48.50	45.48	41.56				
9/21/2009	14:46	56				12.95	11.46	7.47	
9/21/2009	14:47	57				12.86	11.37	7.38	increase Q & RPM
9/21/2009	14:50	60	48.50	45.48	41.56				
9/21/2009	14:51	61	56.92	53.90	49.98				
9/21/2009	14:52	62	57.47	54.45	50.53				
9/21/2009	15:01	71				14.29	12.80	8.81	
9/21/2009	15:02	72	58.49	55.47	51.55				
9/21/2009	15:03	73	58.26	55.24	51.32				Q~2500gpm
9/21/2009	15:04	74	58.29	55.27	51.35				
9/21/2009	15:05	75	58.29	55.27	51.35				
9/21/2009	15:06	76				14.42	12.93	8.94	
9/21/2009	15:08	78				14.42	12.93	8.94	
9/21/2009	15:10	80	58.46	55.44	51.52				
9/21/2009	15:17	87	58.50	55.48	51.56				Q~2450gpm increase Q & RPM
9/21/2009	15:18	88				14.55	13.06	9.07	
9/21/2009	15:20	90	58.43	55.41	51.49				
9/21/2009	15:21	91	66.59	63.57	59.65				Q~3000gpm
9/21/2009	15:22	92	66.86	63.84	59.92				
9/21/2009	15:23	93	67.03	64.01	60.09				
9/21/2009	15:24	94	67.18	64.16	60.24				Q~3000gpm
9/21/2009	15:25	95	67.29	64.27	60.35				
9/21/2009	15:26	96	67.34	64.32	60.40				
9/21/2009	15:27	97	67.40	64.38	60.46				Q~3000gpm
9/21/2009	15:28	98	67.38	64.36	60.44				
9/21/2009	15:29	99				15.67	14.18	10.19	
9/21/2009	15:30	100	67.54	64.52	60.60				
9/21/2009	15:31	101				15.71	14.22	10.23	
9/21/2009	15:32	102				15.71	14.22	10.23	
9/21/2009	15:33	103	67.46	64.44	60.52				Q~2950gpm
9/21/2009	15:34	104	67.48	64.46	60.54				
9/21/2009	15:35	105				15.77	14.28	10.29	
9/21/2009	15:36	106	67.50	64.48	60.56				
9/21/2009	15:38	108	67.51	64.49	60.57				
9/21/2009	15:39	109				15.81	14.32	10.33	
9/21/2009	15:40	110	67.50	64.48	60.56				
9/21/2009	15:41	111				15.82	14.33	10.34	
9/21/2009	15:44	114				15.86	14.37	10.38	
9/21/2009	15:45	115	67.61	64.59	60.67				
9/21/2009	15:46	116				15.87	14.38	10.39	
9/21/2009	15:49	119				15.92	14.43	10.44	
9/21/2009	15:50	120	67.70	64.68	60.76				pump off
9/21/2009	15:52	122	13.45	10.43	6.51				
9/21/2009	15:53	123	12.30	9.28	5.36				
9/21/2009	15:53:30	123.5				10.25	8.76	4.77	

Date	Time	t (min)	Pumping Well			Test Well			Comments
			DTW from top of mp (ft)	DTW bgs (ft)	DD (ft)	DTW from TOC (ft)	DTW bgs (ft)	DD (ft)	
9/21/2009	15:54	124	11.44	8.42	4.50				
9/21/2009	15:54:30	124.5				9.28	7.79	3.80	
9/21/2009	15:55	125	10.90	7.88	3.96				
9/21/2009	15:56	126	10.55	7.53	3.61				
9/21/2009	15:56:30	126.5				8.25	6.76	2.77	
9/21/2009	15:57:30	127.5	10.09	7.07	3.15				
9/21/2009	15:58	128	10.10	7.08	3.16				
9/21/2009	15:59	129				7.78	6.29	2.30	
9/21/2009	16:00	130	9.53	6.51	2.59				
9/21/2009	16:01	131				7.55	6.06	2.07	
9/21/2009	16:02	132	9.26	6.24	2.32				
9/21/2009	16:03	133				7.38	5.89	1.90	
9/21/2009	16:04	134	9.07	6.05	2.13				
9/21/2009	16:05	135				7.25	5.76	1.77	
9/21/2009	16:06	136	9.05	6.03	2.11				
9/21/2009	16:07	137				7.13	5.64	1.65	
9/21/2009	16:08	138	8.80	5.78	1.86				
9/21/2009	16:09	139				7.06	5.57	1.58	
9/21/2009	16:10	140	8.66	5.64	1.72				
9/21/2009	16:16	146	8.43	5.41	1.49				
9/21/2009	16:17	147				6.82	5.33	1.34	
9/21/2009	16:20	150	8.31	5.29	1.37				
9/21/2009	16:21	151				6.74	5.25	1.26	pulled pumping well levellogger, reset sample rate to 5 minutes, restart at 16:30
9/21/2009	16:33	163				6.53	5.04	1.05	
9/21/2009	16:35	165	8.04	5.02	1.10				pulled test west levellogger, reset sample rate to 5 minutes, restart at 16:40
9/21/2009	16:40	170	7.99	4.97	1.05				
9/21/2009	16:45	175				6.40	4.91	0.92	

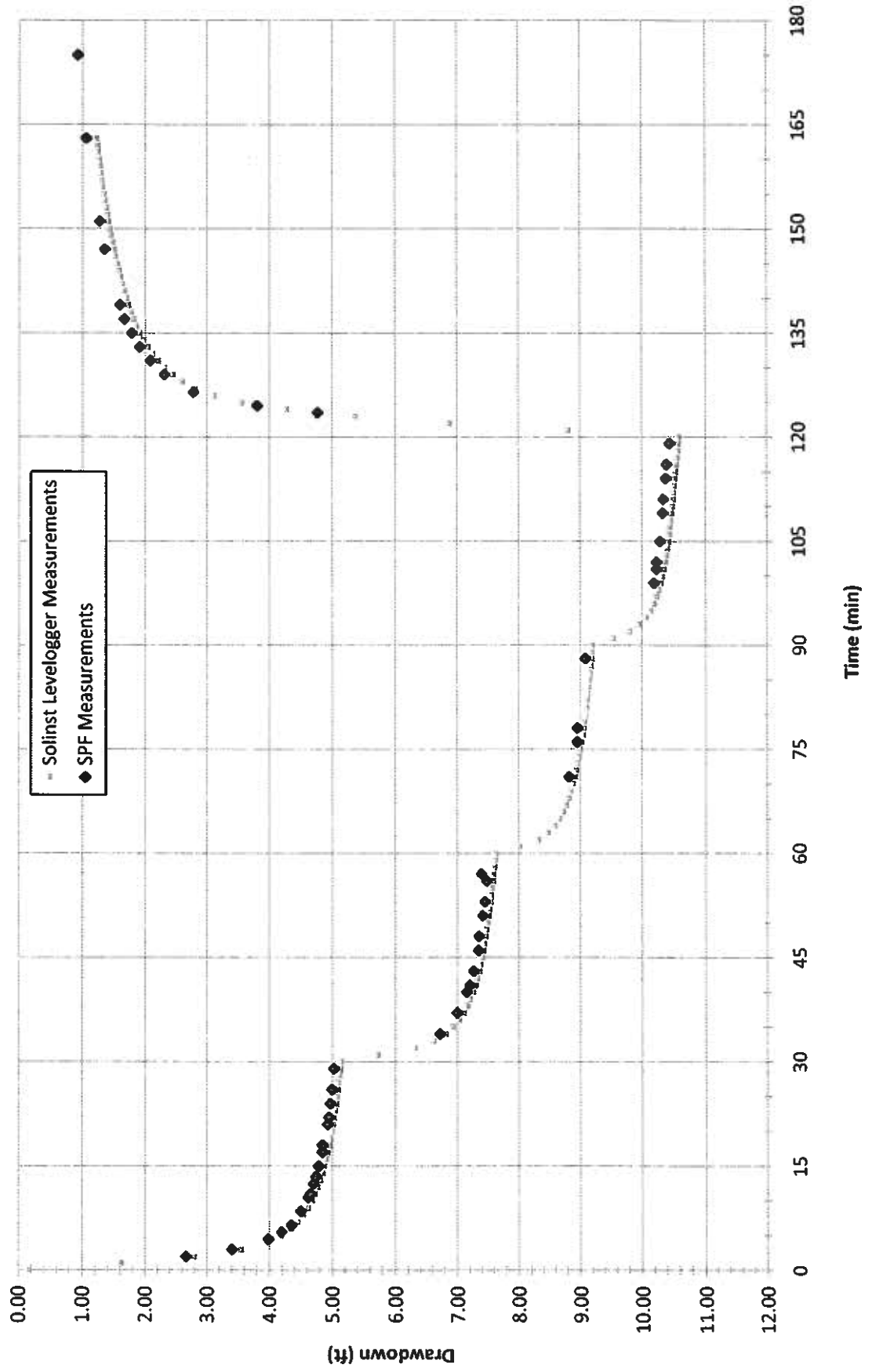
IDFG Roswell Marsh
Step Rate Test - Pumping Well
September 21, 2009



IDFG Roswell Marsh
Step Rate Test - Pumping Well
September 21, 2009

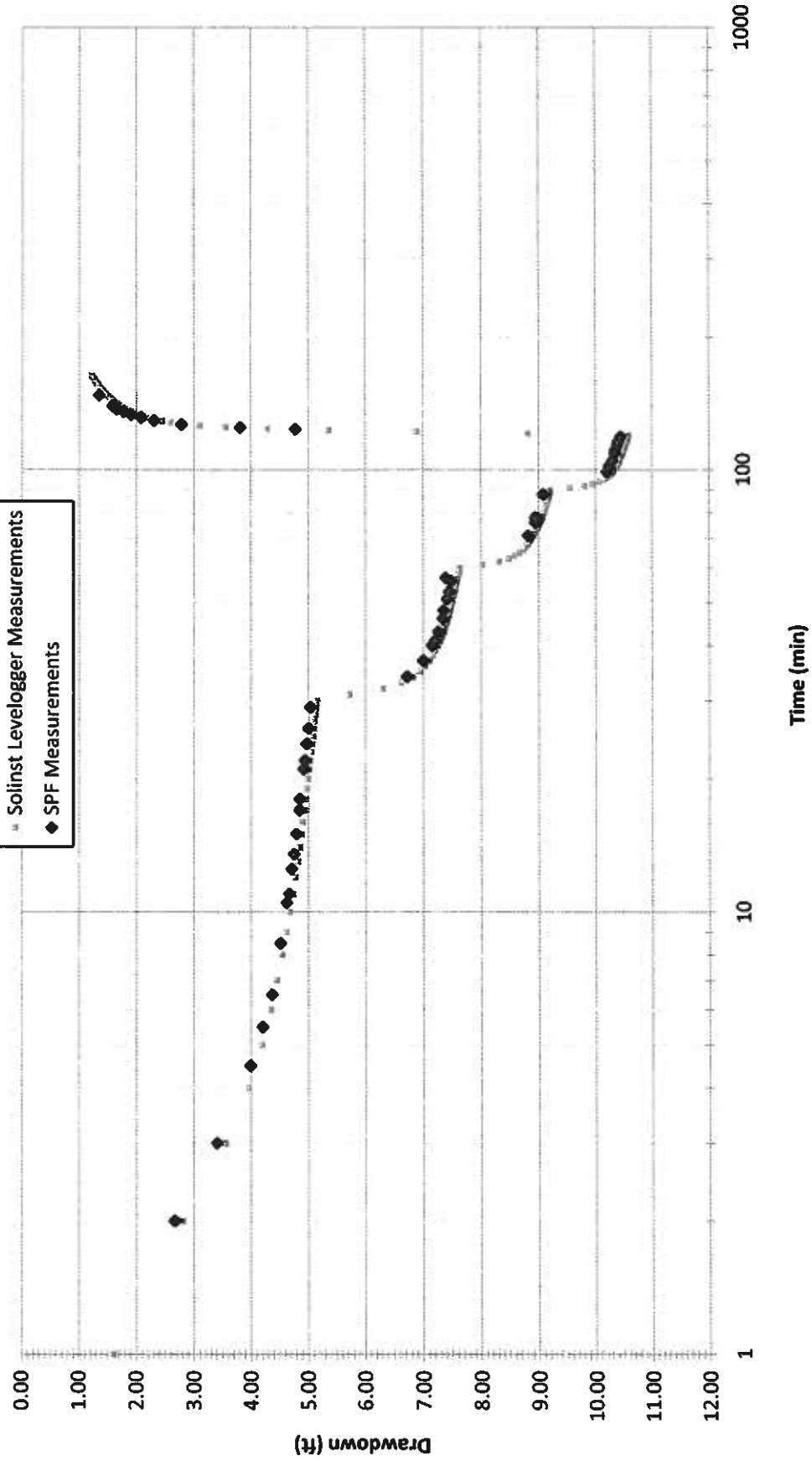


IDFG Roswell Marsh
Step Rate Test - Test Well
September 21, 2009



IDFG Roswell Marsh
Step Rate Test - Test Well
September 21, 2009

■ Solinst Levellogger Measurements
◆ SPF Measurements

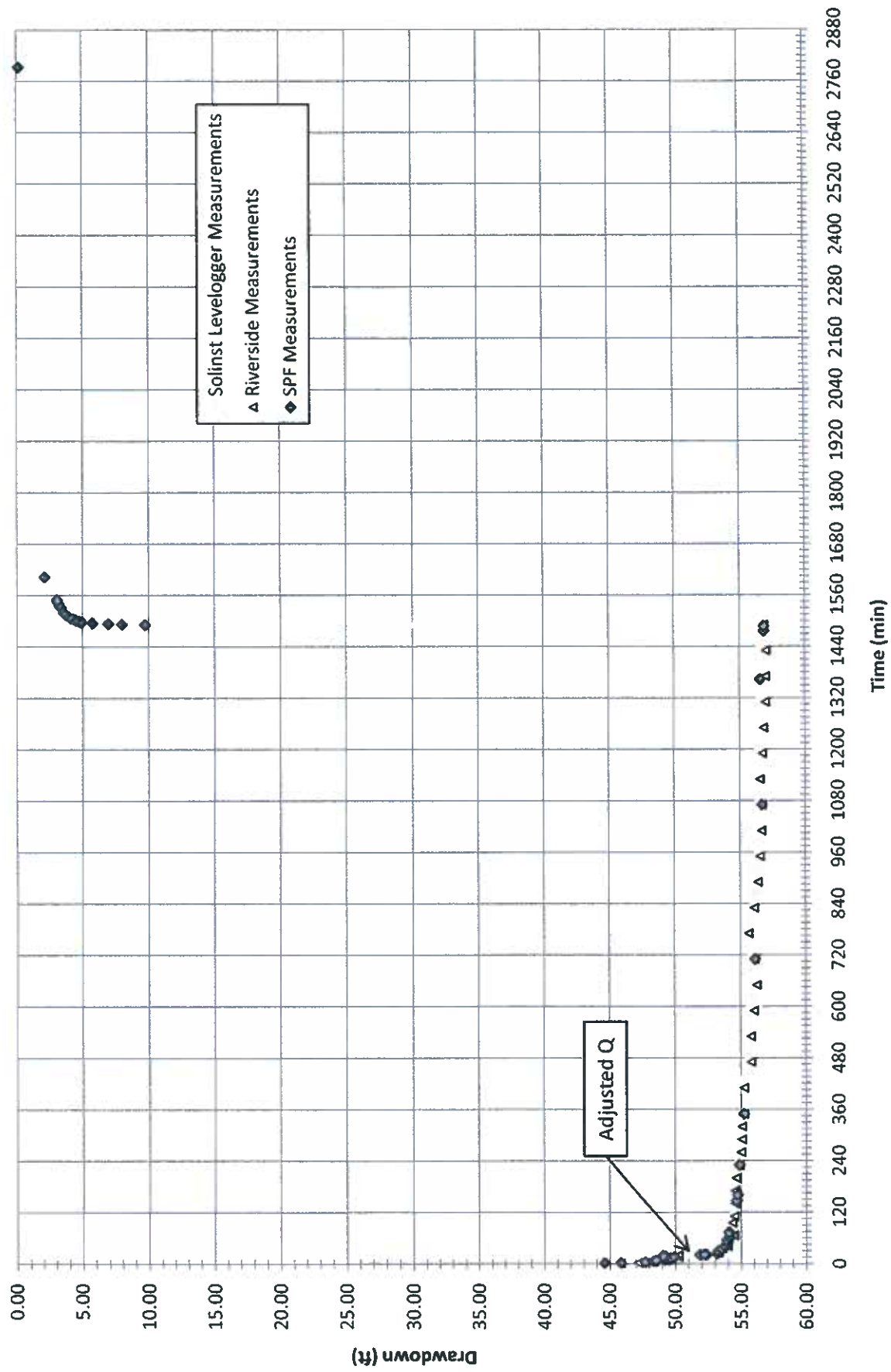


Appendix F: Constant-Rate Test Data and Graphs

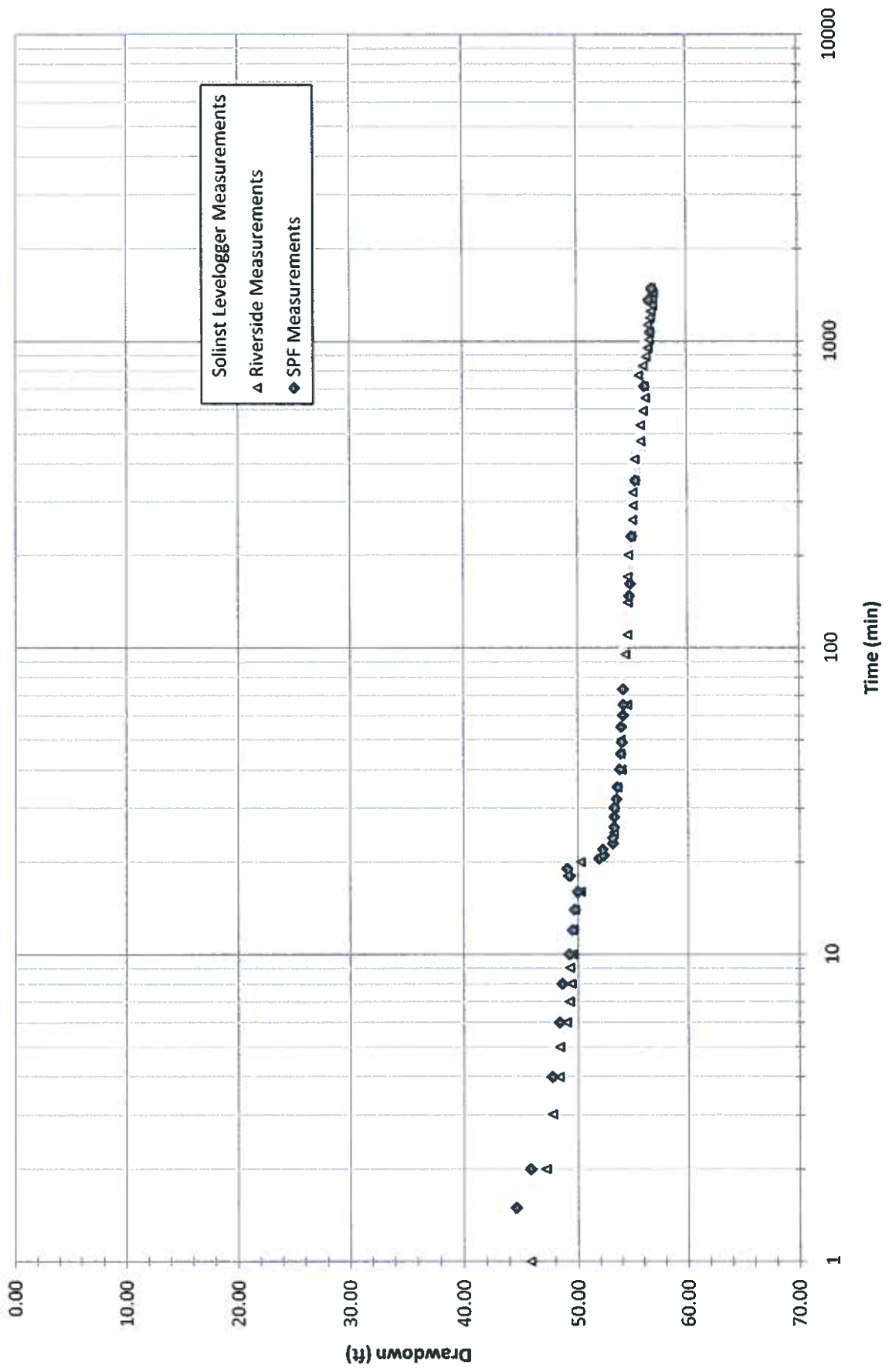
IDFG Roswell Marsh Well - 24-hr Constant Rate Test											
Test Performed By:		Riverside Inc. and SPF									
Test Pump:		Vertical lineshaft turbine pump set @ 120'									
Measurements Taken By:		Mike Martin (SPF) and Rory (Riverside)									
Flow Measurement:		McCrometer Flowmeter									
Pumping Well Measurement Point:		3.02 ' top of mp			1.89 ' top of PVC for PT				1.7 ' TOC		
Test Well Measurement Point:		1.49 ' TOC									
Date	Time	t (min)	t' (min)	t/t'	Pumping Well			Test Well			Comments
					DTW from top of mp (ft)	DTW bgs (ft)	DD (ft)	DTW from TOC (ft)	DTW bgs (ft)	DD (ft)	
9/28/2009	12:05							5.41	3.92		static
9/28/2009	12:06				6.78	3.76					static
9/28/2009	12:10	0									pump on
9/28/2009	12:11:30	1.5			51.39	48.37	44.61				increase Q~2500gpm
9/28/2009	12:12	2			52.62	49.60	45.84				
9/28/2009	12:13	3						10.66	9.17	5.25	
9/28/2009	12:14	4			54.49	51.47	47.71				
9/28/2009	12:15	5						12.15	10.66	6.74	
9/28/2009	12:16	6			55.12	52.10	48.34				
9/28/2009	12:17	7						12.71	11.22	7.30	
9/28/2009	12:18	8			55.34	52.32	48.56				
9/28/2009	12:19	9						13.04	11.55	7.63	
9/28/2009	12:20	10			56.00	52.98	49.22				
9/28/2009	12:21	11						13.01	11.52	7.60	
9/28/2009	12:22	12			56.26	53.24	49.48				
9/28/2009	12:23	13						13.27	11.78	7.86	
9/28/2009	12:24	14			56.44	53.42	49.66				
9/28/2009	12:25	15						13.38	11.89	7.97	totalizer=124448x1000 gallons
9/28/2009	12:26	16			56.73	53.71	49.95				
9/28/2009	12:27	17						13.64	12.15	8.23	
9/28/2009	12:28	18			56.04	53.02	49.26				issue with Powers sounder
9/28/2009	12:29	19			55.85	52.83	49.07				Q~2300-2400gpm
9/28/2009	12:30:30	20.5			58.65	55.63	51.87				increase Q~2500-2600
9/28/2009	12:31	21			59.10	56.08	52.32				
9/28/2009	12:32	22			59.00	55.98	52.22				
9/28/2009	12:33	23			59.91	56.89	53.13				
9/28/2009	12:34	24			59.92	56.90	53.14				
9/28/2009	12:35	25						14.03	12.54	8.62	
9/28/2009	12:36	26			60.02	57.00	53.24				
9/28/2009	12:37	27						14.27	12.78	8.86	
9/28/2009	12:38	28			60.05	57.03	53.27				
9/28/2009	12:39	29						14.33	12.84	8.92	
9/28/2009	12:40	30			60.05	57.03	53.27				
9/28/2009	12:41	31						14.40	12.91	8.99	
9/28/2009	12:42	32			60.24	57.22	53.46				
9/28/2009	12:43	33			60.32	57.30	53.54				
9/28/2009	12:44	34						14.52	13.03	9.11	
9/28/2009	12:45	35									
9/28/2009	12:46	36						14.62	13.13	9.21	
9/28/2009	12:50	40			60.54	57.52	53.76				
9/28/2009	12:51	41						14.65	13.16	9.24	
9/28/2009	12:53	43									
9/28/2009	12:55	45			60.65	57.63	53.87				
9/28/2009	12:56	46						14.71	13.22	9.30	Q~2500-2600gpm
9/28/2009	12:59	49			60.74	57.72	53.96				
9/28/2009	13:00	50						14.76	13.27	9.35	Q~2500-2600gpm
9/28/2009	13:05	55			60.69	57.67	53.91				
9/28/2009	13:06	56						14.85	13.36	9.44	
9/28/2009	13:10	60			60.85	57.83	54.07				
9/28/2009	13:11	61						14.91	13.42	9.50	
9/28/2009	13:15	65			60.89	57.87	54.11				Q~2500-2600gpm
9/28/2009	13:16	66						14.97	13.48	9.56	
9/28/2009	13:22	72						15.00	13.51	9.59	
9/28/2009	13:23	73			60.85	57.83	54.07				Q~2500-2600gpm
9/28/2009	13:25	75									T=17.5
9/28/2009	14:36	146						15.45	13.96	10.04	
9/28/2009	14:37	147			61.43	58.41	54.65				Q~2500-2600gpm, measured distance between Pwell & Twell: 39.5'
9/28/2009	14:50	160						15.50	14.01	10.09	
9/28/2009	14:51	161			61.52	58.50	54.74				

Date	Time	t (min)	t' (min)	t/t'	Pumping Well			Test Well			Comments
					DTW from top of mp (ft)	DTW bgs (ft)	DD (ft)	DTW from TOC (ft)	DTW bgs (ft)	DD (ft)	
9/28/2009	15:59	229						15.71	14.22	10.30	
9/28/2009	16:00	230			61.65	58.63	54.87				Riverside to take measurements
9/28/2009	18:00	350			62.00	58.98	55.22	15.98	14.49	10.57	Riverside meas.
9/29/2009	0:00	710			62.88	59.86	56.10	16.63	15.14	11.22	Riverside meas.
9/29/2009	6:00	1070			63.46	60.44	56.68	17.08	15.59	11.67	Riverside meas.
9/29/2009	10:52	1362						17.25	15.76	11.84	SPF meas.
9/29/2009	10:53	1363			63.34	60.32	56.56				Q~2500-2600
9/29/2009	12:45	1475						17.32	15.83	11.91	
9/29/2009	12:46	1476			63.62	60.60	56.84				Q~2500-2600
9/29/2009	12:57	1487						17.32	15.83	11.91	
9/29/2009	12:58	1488			63.62	60.60	56.84				Q~2500-2600
9/29/2009	13:00	1490	0								Pump off, totalizer=128394x1000
9/29/2009	13:01	1491	1	1491	16.50	13.48	9.72				
9/29/2009	13:02	1492	2	746	14.75	11.73	7.97				
9/29/2009	13:03	1493	3	498	13.72	10.70	6.94				
9/29/2009	13:04	1494	4	374				11.36	9.87	5.95	
9/29/2009	13:05	1495	5	299	12.53	9.51	5.75				
9/29/2009	13:06	1496	6	249	11.70	8.68	4.92				
9/29/2009	13:07	1497	7	214				10.05	8.56	4.64	
9/29/2009	13:08	1498	8	187	11.71	8.69	4.93				
9/29/2009	13:09	1499	9	167	11.54	8.52	4.76				
9/29/2009	13:10	1500	10	150				9.63	8.14	4.22	
9/29/2009	13:11	1501	11	136	11.28	8.26	4.50				
9/29/2009	13:12	1502	12	125	11.28	8.26	4.50				
9/29/2009	13:13	1503	13	116				9.35	7.86	3.94	
9/29/2009	13:14	1504	14	107	11.08	8.06	4.30				
9/29/2009	13:15	1505	15	100				9.24	7.75	3.83	
9/29/2009	13:16	1506	16	94	10.88	7.86	4.10				
9/29/2009	13:17	1507	17	89				9.15	7.66	3.74	
9/29/2009	13:18	1508	18	84	10.78	7.76	4.00				
9/29/2009	13:19	1509	19	79				9.06	7.57	3.65	
9/29/2009	13:20	1510	20	75	10.72	7.70	3.94				
9/29/2009	13:25	1515	25	61	10.47	7.45	3.69				
9/29/2009	13:26	1516	26	58				8.85	7.36	3.44	
9/29/2009	13:30	1520	30	51	10.33	7.31	3.55				
9/29/2009	13:31	1521	31	49				8.74	7.25	3.33	
9/29/2009	13:40	1530	40	38	10.14	7.12	3.36				
9/29/2009	13:41	1531	41	37				8.56	7.07	3.15	
9/29/2009	13:45	1535	45	34	10.01	6.99	3.23				
9/29/2009	13:46	1536	46	33				8.44	6.95	3.03	
9/29/2009	13:50	1540	50	31	9.97	6.95	3.19				
9/29/2009	13:51	1541	51	30				8.41	6.92	3.00	
9/29/2009	13:55	1545	55	28	9.85	6.83	3.07				pulled pumping well PT
9/29/2009	13:56	1546	56	28				8.35	6.86	2.94	
9/29/2009	14:00	1550	60	26	9.84	6.82	3.06				Riverside to pull pump
9/29/2009	14:01	1551	61	25				8.29	6.80	2.88	
9/29/2009	14:50	1600	110	15				7.88	6.39	2.47	
9/29/2009	14:52:30	1602.5	113	14	8.86	5.84	2.08				measurement with 300' orange sounder from PVC for PT
9/30/2009	10:43	2793	1303	2	6.91	3.89	0.13				
9/30/2009	10:44	2794	1304	2				5.86	4.37	0.45	end recovery

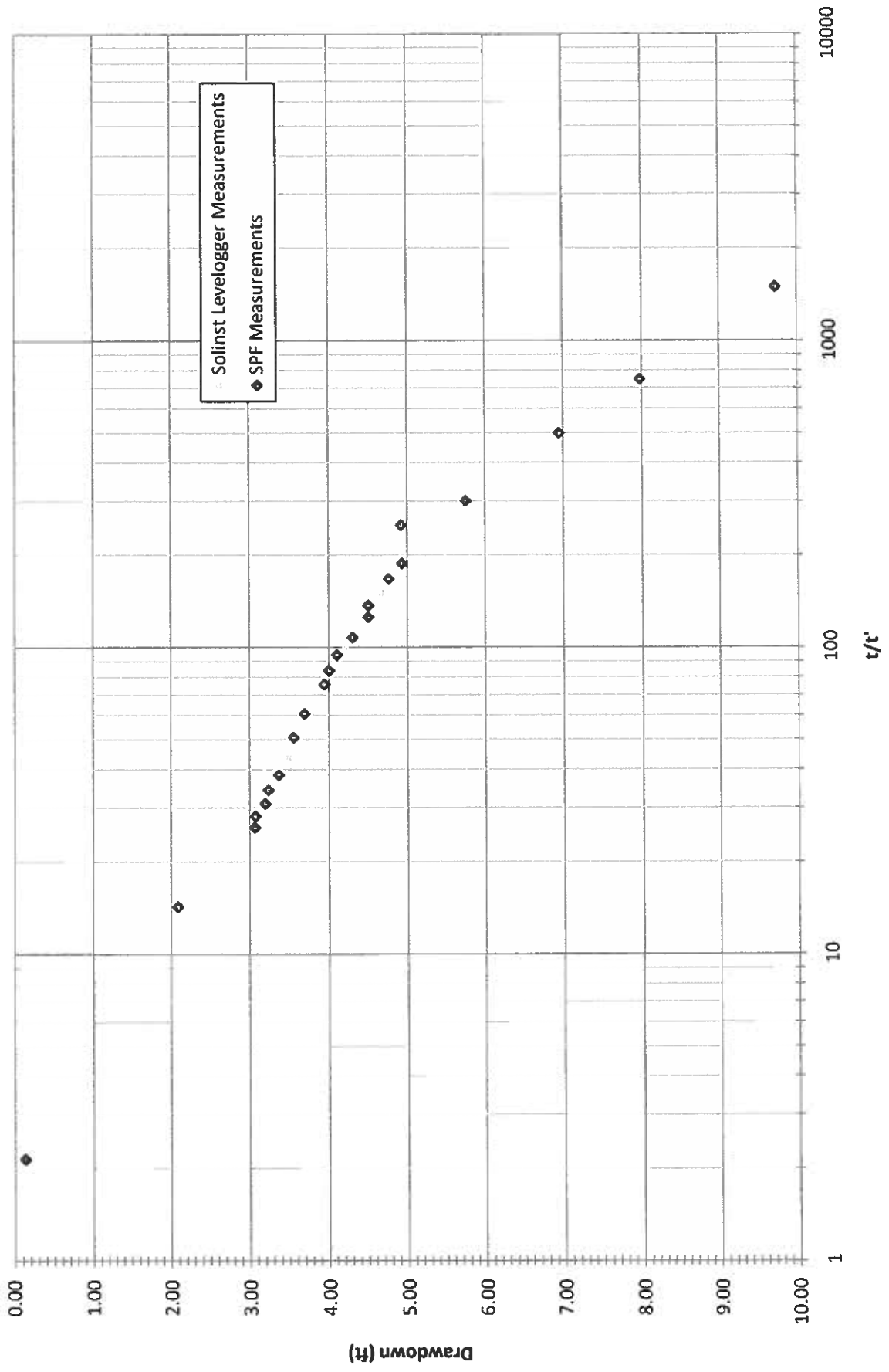
IDFG Roswell Marsh
24-hr Constant Rate Test - Pumping Well
September 28-29, 2009



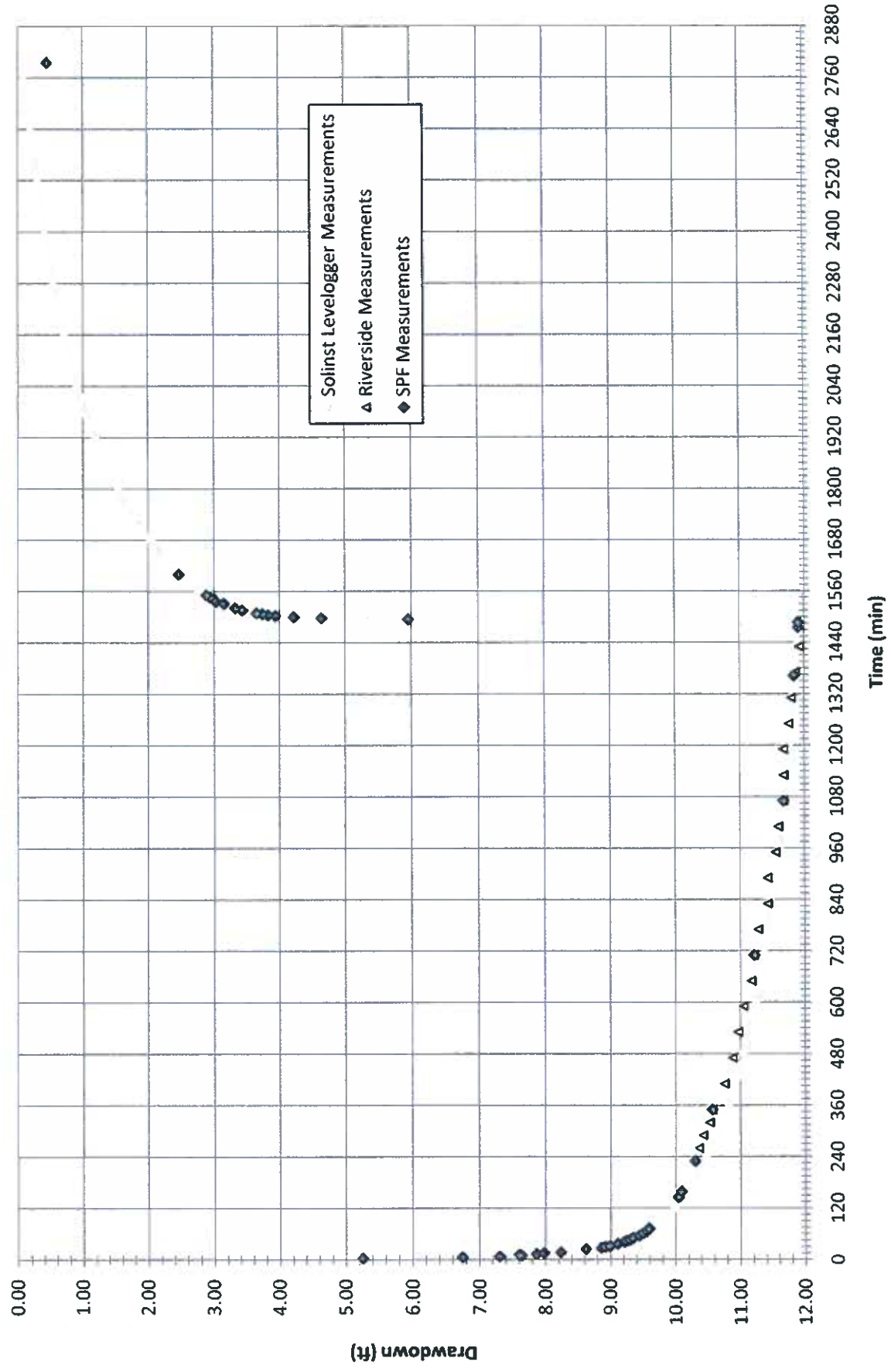
IDFG Roswell Marsh
24-hr Constant Rate Test - Pumping Well
September 28-29, 2009



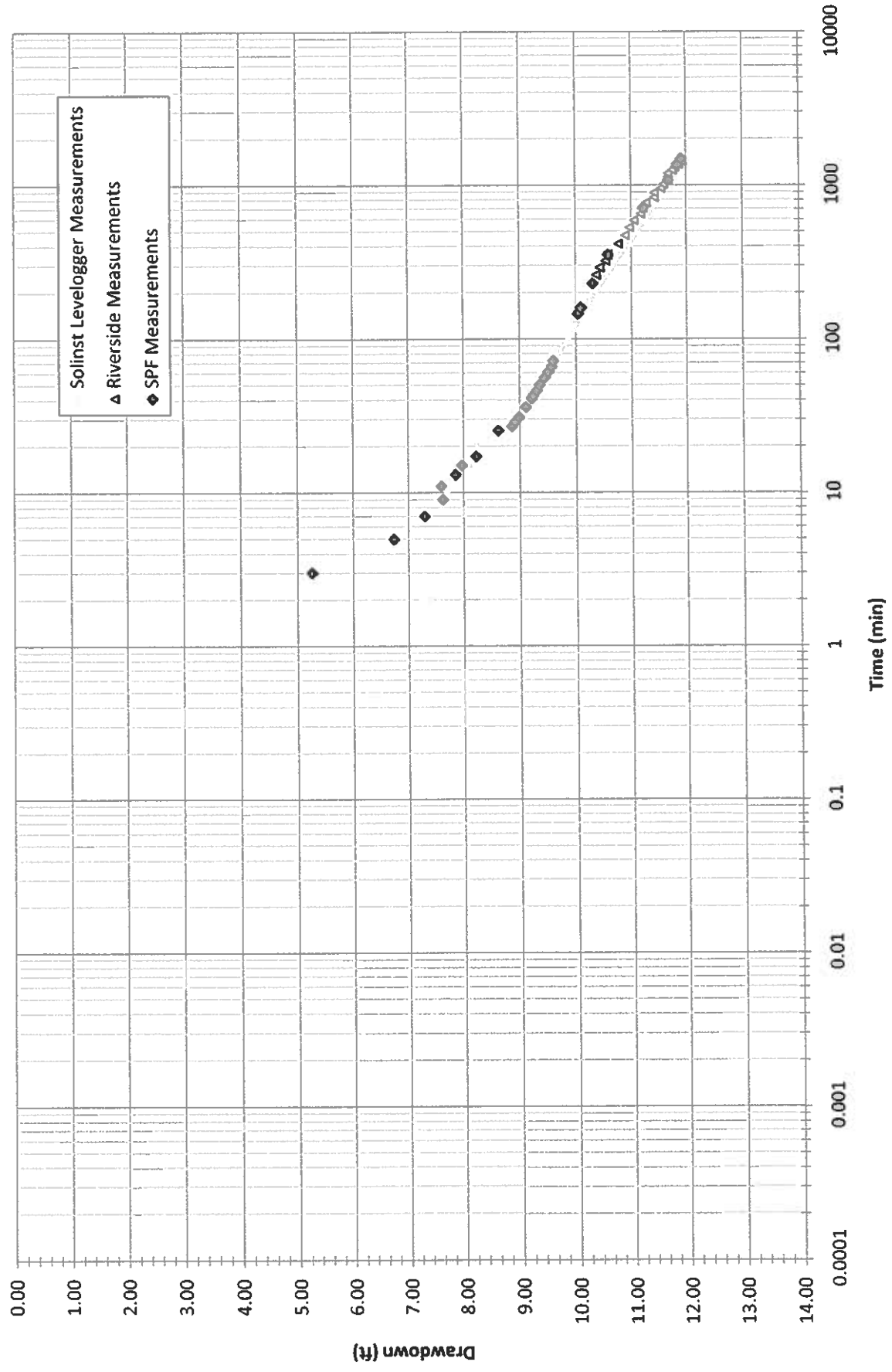
IDFG Roswell Marsh
24-hr Constant Rate Test - Pumping Well
September 28-29, 2009



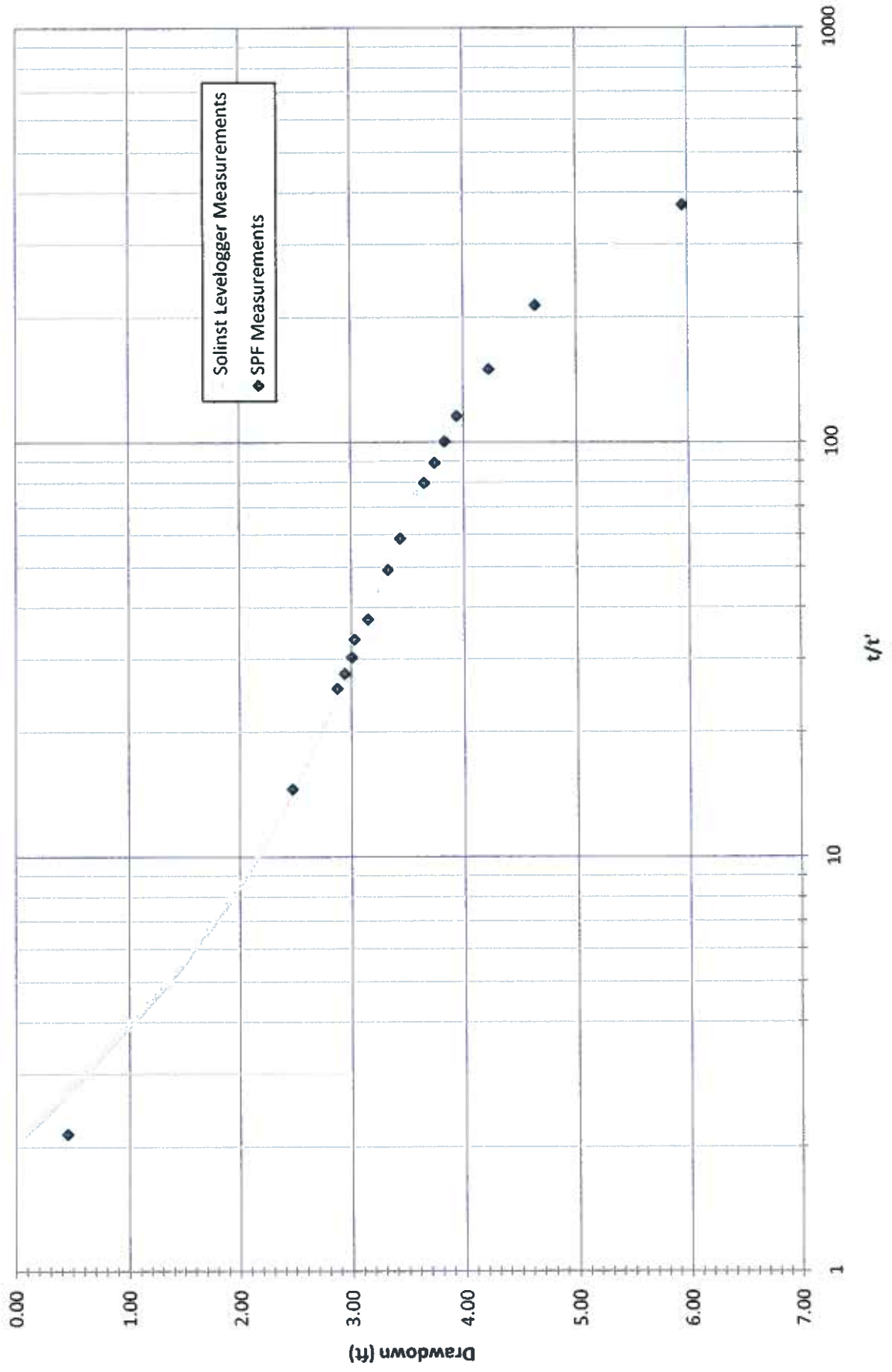
IDFG Roswell Marsh
24-hr Constant Rate Test - Test Well
September 28-29, 2009



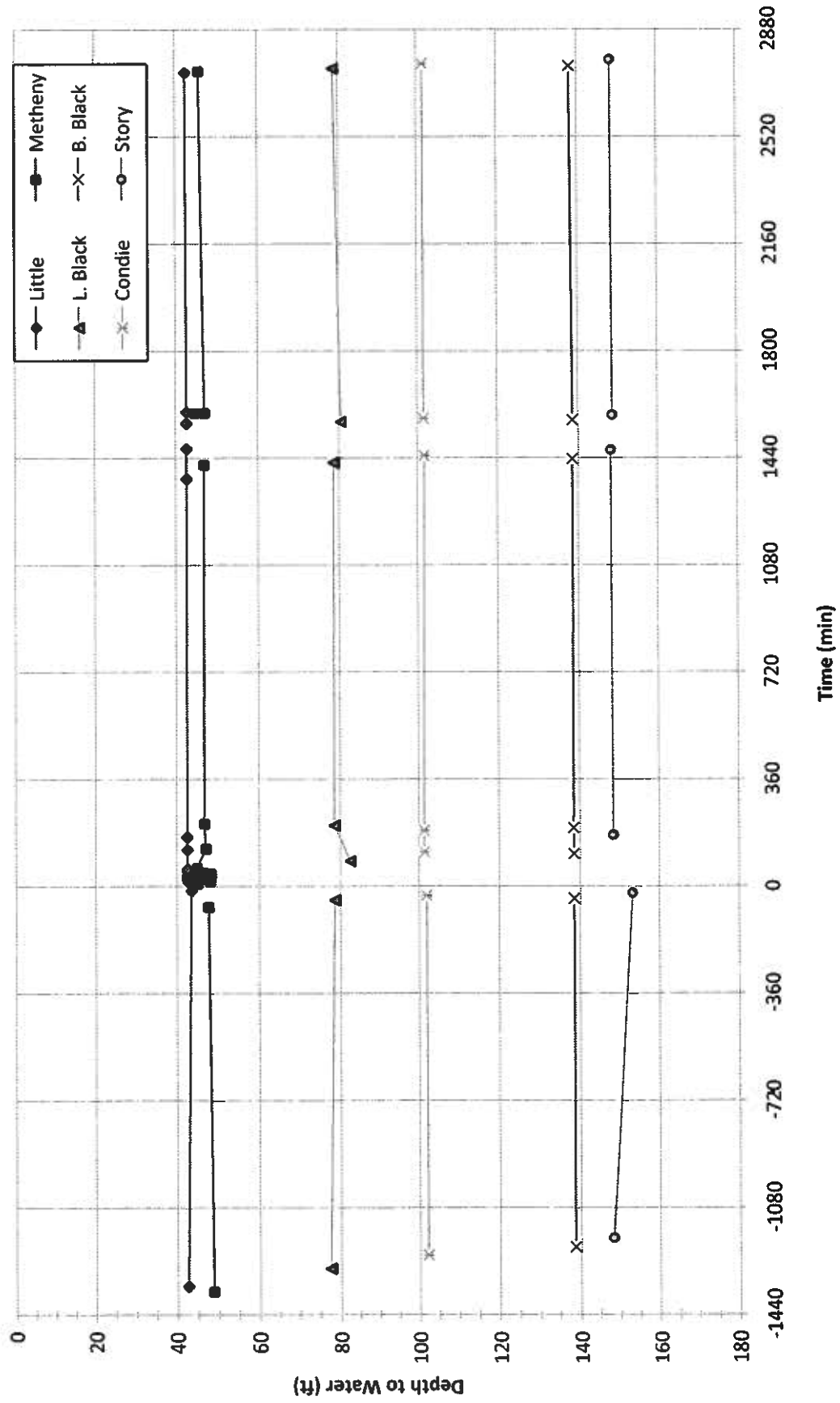
IDFG Roswell Marsh
24-hr Constant Rate Test - Test Well
September 28-29, 2009



IDFG Roswell Marsh
24-hr Constant Rate Test - Test Well
September 28-29, 2009



IDFG Roswell Marsh
24-hr Constant Rate Test - Domestic Wells
September 28-29, 2009



Well ID: Story
Sounder: 500' soil test sounder
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	16:30	148.05	off
9/28/2009	11:48	153.07	on
9/28/2009	12:10		IDFG start test
9/28/2009	15:03	148.29	off
9/29/2009	12:37	148.08	off
9/29/2009	13:00		IDFG end test
9/29/2009	14:35	148.45	off
9/30/2009	10:29	148.21	off

Well ID: Condie
Sounder: 500' Actact sounder
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	15:31	102.01	off
9/28/2009	11:38	101.76	off
9/28/2009	12:10		IDFG start test
9/28/2009	14:05	101.28	off
9/28/2009	15:17	101.28	off
9/29/2009	12:18	101.65	off
9/29/2009	13:00		IDFG end test
9/29/2009	14:23	101.52	off
9/30/2009	10:15	101.46	off

Well ID: Metheny
Sounder: 150' white waterline
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	13:30	48.75	on
9/28/2009	11:02	47.68	on
9/28/2009	12:10		IDFG start test
9/28/2009	12:20	45.04	off
9/28/2009	12:29	48.06	off
9/28/2009	12:35	47.05	off
9/28/2009	12:42	47.03	on
9/28/2009	12:45	44.80	off
9/28/2009	12:52	48.22	off
9/28/2009	12:54	48.20	off
9/28/2009	12:56	46.60	on
9/28/2009	13:00	45.39	off
9/28/2009	13:06	44.93	off
9/28/2009	13:13	44.93	off
9/28/2009	14:18	47.04	on
9/28/2009	15:42	46.72	off
9/29/2009	11:48	46.88	on
9/29/2009	13:00		IDFG end test
9/29/2009	14:41	44.67	off
9/29/2009	14:42	47.03	on
9/30/2009	9:49	45.73	off

Well ID: Little
Sunder: 300' blue waterline
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	13:48	42.52	off
9/28/2009	11:55	43.43	off
9/28/2009	12:10		IDFG start test
9/28/2009	12:26	42.61	off
9/28/2009	12:32	42.61	off
9/28/2009	12:39	42.58	off
9/28/2009	12:48	42.57	off
9/28/2009	13:02	42.51	off
9/28/2009	13:09	42.51	off
9/28/2009	14:14	42.48	off
9/28/2009	14:56	42.47	off
9/29/2009	11:00	42.57	off
9/29/2009	12:41	42.57	off
9/29/2009	13:00		IDFG end test
9/29/2009	14:06	42.56	off
9/29/2009	14:45	42.56	off
9/30/2009	9:43	42.38	off

Well ID: B. Black
Sounder: 500' soil test sounder
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	15:59	138.45	off
9/28/2009	11:30	138.40	off
9/28/2009	12:10		IDFG start test
9/28/2009	14:00	138.35	off
9/28/2009	15:27	138.30	off
9/29/2009	12:07	138.46	off
9/29/2009	13:00		IDFG end test
9/29/2009	14:18	138.50	off
9/30/2009	10:06	138.02	off

Well ID: L. Black
Sonder: 100' sonder
MP: top of casing

Date	Time	DTW (ft)	Comment
9/27/2009	14:47	77.48	off
9/28/2009	11:24	78.63	off
9/28/2009	12:10		IDFG start test
9/28/2009	13:35	82.47	off, turned well off
9/28/2009	15:35	78.55	off
9/29/2009	11:55	78.68	off
9/29/2009	13:00		IDFG end test
9/29/2009	14:12	80.47	off
9/30/2009	9:58	78.71	off

**Appendix G:
Observation Well Location Map and Well Driller's
Reports**

Distance From IDFG Pumping Well to Observation Wells

IDFG Test Well - 40'
 Rick Metheny - 870'
 Roy Little - 1210'
 Denis Barnard - 1260'
 Renee Condle - 1990'
 Greg Story - 2350'
 Ledas Black - 2400'
 Bill Black - 2580'

Pumping Well

Test Well

Roy Little

Rick Metheny

Greg Story

Denis Barnard

Renee Condle

Bill Black

Ledas Black

Observation Well Locations



0 200 400 Feet

N

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTOffice Use Only
Well ID No. 815532
Inspected by _____
Twp _____ Rge _____ Sec _____
1/4 _____ 1/4 _____ 1/4 _____
Lat: _____ Long: _____
☒ Air ☐ Pump ☐ Boiler ☐ Flowing Artesian1. WELL TAG NO. D 0031214
DRILLING PERMIT NO. _____
Water Right or Injection Well No. _____

2. OWNER:

Name Idaho Dept. of Fish & Game
Address P.O. Box 25 600 S. Walnut
City Boise State ID Zip 83724

3. LOCATION OF WELL by legal description:

You must provide address or Lot, Blk, Sub. or Directions to well.

Twp. 5 North ☒ or South ☐
Rge. 6 East ☐ or West ☒
Sec. 25 1/4 SW 1/4 NE 1/4
Gov't Lot _____ County BoiseLat: _____ Long: _____
Address of Well Site Pebble Lane S. Hwy 18
City Boise

Lt. _____ Blk. _____ Sub. Name _____

4. USE:

☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other

6. DRILL METHOD:

☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
<u>3/8 Benbitt</u>	<u>0</u>	<u>18</u>	<u>10 Bags</u>	<u>Dry pour 10"</u>

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 145
Was drive shoe seal tested? ☐ Y ☒ N How? _____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
<u>10" #1.6</u>	<u>145</u>	<u>20</u>	<u>20</u>	<u>Steel</u>	☒	☐	☒	☐

Length of Headpipe _____ Length of Tailpipe _____

Packer ☐ Y ☐ N Type _____

9. PERFORATIONS/SCREENS PACKER TYPE

Perforation Method Halt Air perforation

Screen Type & Method of Installation _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
<u>85</u>	<u>95</u>	<u>8</u>	<u>perforations</u>			☐	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method
<u>1/4" #20</u>	<u>145</u>	<u>20</u>		

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:

10 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____Sanitary Well Cap

12. WELL TESTS:

Yield gal./min.	Drawdown	Pumping Level	Time
<u>45</u>	<u>35'</u>	<u>80</u>	<u>1 Hrs</u>

Water Temp. _____ Bottom hole temp. _____

Water Quality test or comments: _____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
<u>10"</u>	<u>0</u>	<u>3</u>	<u>Top Soil</u>		
<u>10"</u>	<u>3</u>	<u>110</u>	<u>Brown Clay</u>		
<u>10"</u>	<u>110</u>	<u>20</u>	<u>fine sand</u>		
<u>10"</u>	<u>20</u>	<u>78</u>	<u>coarse sand</u>		
<u>10"</u>	<u>78</u>	<u>80</u>	<u>Cemented Sand</u>		
<u>10"</u>	<u>80</u>	<u>100</u>	<u>coarse sand & fine gravel</u>		
<u>10"</u>	<u>100</u>	<u>110</u>	<u>fine clay & sand</u>		
<u>10"</u>	<u>110</u>	<u>127</u>	<u>fine sand & fine gravel</u>		
<u>10"</u>	<u>127</u>	<u>135</u>	<u>coarse sand & fine gravel</u>		
<u>10"</u>	<u>135</u>	<u>145</u>	<u>coarse sand & fine gravel</u>		

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JUL 08 2004
WATER RESOURCES
WESTERN REGION

Completed Depth 145 (Measurable)
Date: Started 5-19-04 Completed 5-25-04

14. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Richmond & Co Firm No. 333Principal Driller _____ Date _____
and _____
Driller or Operator _____ Date 6-25-04
Operator _____ Date _____Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

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USE ADDITIONAL SHEETS IF NECESSARY - FORWARD THE WHITE COPY TO THE DEPARTMENT