

# **APPENDIX L**

## **Well Capacity Study**



September 9, 2021

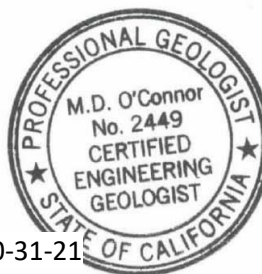
**MEMORANDUM**

TO: Mark Rincon-Ibarra, PE  
Director of Public Works  
City of St. Helena

FROM:



Matthew O'Connor, PhD, CEG #2449, Exp. 10-31-21  
President, O'Connor Environmental, Inc.



SUBJECT: Well Capacity and Sustainability Assessment, Proposed Hunter Subdivision

**Overview**

This memorandum reviews pump test data and information submitted by representatives of the proposed project.

The requirements for this submittal by project representatives, "City of St Helena Well Capacity and Sustainability Assessment for Hunter Subdivision", dated July 20, 2021 (Attachment A), have been met.

Their submittal is comprised of the following:

1. a submittal memorandum from Tim Massey, Managing Director, Hunter Applicant, dated August 26, 2021 (Attachment B, 2 pages),
2. a copy of the County Well Permit, including well construction details and a geologic log (Attachment C, 2 pages), and
3. pump test data including a site map with well location prepared by Les Petersen Drilling & Pump, C57 License #261084 (Attachment D, 5 pages).

My comments and interpretations follow. It is my understanding that the potential environmental effects of this well are to be evaluated by the pending CEQA process for the project.

**Landscape Irrigation Demand**

Per information provided in Attachment B, the estimated annual water demand for landscape irrigation is 17.16 acre-feet per year, ranging monthly from 0.60 acre-feet to 2.7 acre-feet depending on the season with average monthly demand of 1.43 acre-feet. For reference, the County of Napa Water Availability Assessment Guidelines allows for 1 acre-foot per year of groundwater use per acre of land on the Napa Valley Floor; the project parcel is 16.92 acres. The proposed annual irrigation is 1.4% greater than would be allowed by the County of Napa. While it is acknowledged that this is a minimal difference with little significance, it is recommended that the annual groundwater use conform with County policy.



O'Connor Environmental, Inc. [www.oe-i.com](http://www.oe-i.com) (707) 431-2810  
Hydrology & Hydraulics ▪ Hydrogeology ▪ Geomorphology  
P.O. Box 794, Healdsburg, CA 95448

The analysis of Maximum Daily Demand for the project was estimated to be 45,633 gallons per day (0.14 acre-feet) based on an estimated total of 861 gallons per day for each parcel. Based on this estimate of peak demand, a proposed pumping rate of 40 gallons per minute was selected for the well; to satisfy peak daily demand, the well would be pumped a total of about 19 hours. It was stressed that this is a “worst case” scenario for irrigation demand and thought to be extremely unlikely to occur. I believe that the estimate of peak daily demand and the proposed pumping rate are appropriate for this assessment; however, the peak daily irrigation rate per lot appears to me to be relatively high and suggests that landscaping may include plantings that are not drought-tolerant. I recommend that the applicant consider requiring drought-tolerant plantings by homeowners to promote water conservation.

### **Well Construction Details and Aquifer Description**

The County Well Permit (Attachment C) is dated June 14, 1976. The existence of this County Permit exempts this well from the requirements of the City’s well permit program.

The well intercepts groundwater from rocks and deposits of volcanic origin. Well perforations begin at a depth of 80 ft below ground surface and extend to the bottom of the well 410 below ground surface. A 20 ft well seal is in place. The well does not draw water directly from the Napa Valley alluvium, which is believed to be interconnected with surface water of the Napa River. The degree of hydrogeologic connectivity between the underlying volcanic aquifer and the alluvial deposits on the surface of the Napa Valley Floor has not been quantified, but it is likely that withdrawals of groundwater from this deeper aquifer have a less direct effect on surface flow in the Napa River than withdrawals from the shallow alluvial aquifer.

The elevation of the ground surface at the well head was reported to be 201 feet above sea level. This elevation appears inconsistent with US Geological Survey topographic maps. We cross-checked the well head location against publicly-available LiDAR topographic data from 2018 and found the reported well head elevation (per coordinates provided by Petersen) to be 214.9 feet above sea level (NAVD88), +/- 1 foot. This discrepancy is not of particular significance since we were able to determine the well head elevation from the information provided.

### **Pump Test Results and Interpretation**

The static depth of groundwater prior to the pump test and after the pump test ended was reported to be 22 feet below ground surface. Assuming the well head elevation to be about 215 feet above sea level, the static groundwater elevation is about 193 feet above sea level. During the 24-hour pumping test, depth to groundwater was steady at 23 feet below ground surface (about 192 feet above sea level). The groundwater elevation is reasonably consistent with groundwater elevation contour mapping by County of Napa Groundwater Sustainability Annual Reports.

The extremely small pumping drawdown and immediate recovery of water elevation at the conclusion of the 24 hour pumping test is indicative of relatively high aquifer transmissivity and relatively abundant groundwater. The seasonal and long-term effects of the proposed use of this well on groundwater elevations is beyond the scope of this review; however, the pumping test data are indicative of relatively abundant groundwater. I believe that this well is easily capable of supplying landscape irrigation water for the proposed project.



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# **ATTACHMENT A**

2 PAGES

## **City of St Helena Well Capacity and Sustainability Assessment for Hunter Subdivision**

### Introduction

This Well Capacity and Sustainability Assessment is specific to the circumstances of the proposed landscape irrigation water source, which is a well within the City St Helena permitted by the County of Napa prior to the adoption of the City Well Ordinance. The objective of this Assessment is to substantiate that the Project Well has the capacity to supply the quantity of water required for landscape irrigation of the proposed Hunter Subdivision. The City has encouraged project proponents to minimize the amount of water required from the City's drinking water supply, and an existing well on the project site formerly used for irrigation has been identified as a potential water source for landscape irrigation throughout the proposed subdivision.

### Required Information

To perform a Well Capacity and Sustainability Assessment demonstrating that the City's public water supply will only be used for domestic residential (indoor) use and that the Project Well is capable of supplying all landscape irrigation (outdoor use), the City of St Helena requests the following information:

1. Estimated annual and monthly landscape irrigation demand for the Project at full build out
2. Required pumping rate and pumping duration to meet typical maximum daily demand for landscape irrigation; this pumping rate is intended to represent the nominal pumping rate to be used in the required pump test.
3. Well Completion Report for the Project Well; if the WCR is not available, the following information should be provided:
  - a. Well depth and static water elevation
  - b. Well casing material and casing diameter
  - c. Perforated (screened) interval(s) in the well casing
4. Well location (GPS coordinates and map representation)
5. County Well Permit and associated documentation
6. Existing data from prior well tests describing depth to water, pumping capacity and/or water quality
7. Pump test per procedure following. Considering the current extreme drought condition, the water pumped from the well during the test should, if possible, be stored for beneficial use.

### Pump Test

This procedure provides minimum guidelines for a pump test to evaluate well yield. A pump test of 24-hour duration is required. The test should be performed by a qualified contractor experienced with well tests and holding a C-57 license or a Professional Engineer or a Professional Geologist. The City will consider alternative procedures providing comparable data if proposed in writing; the City would need to approve an alternative procedure prior to the pump test.

### Pre-Test Procedure

1. Identify the location of the well, by either the NAD83 California State Plane II or WGS 84 lat./long. or by the measured distance reference to a fixed landmark. Estimate elevation of the well head. Record this information and include it in the pump test summary.

2. Measure and record the static (non-pumping) water level in the well. Provide information on measuring points (top of casing, surface seal, access port, etc.) Measurements should be taken relative to ground level. The measuring point above ground level should be measured and reported in the pump test summary. To establish the static level, the well must not be pumped for at least 24 hours prior to measurement of the static water level; if the well is not in active use, this requirement may be ignored.
3. Record the type of discharge measurement method. Indicate the type and model of flow meter or provide an accurate description of weir or orifice plate set up; report this information in the pump test summary.
4. Calculate the volume of water stored in the well.

#### Pump Test Procedure

1. Remove a volume of water equivalent to the calculated volume stored in the well.
2. Begin pumping at the rate determined in item 2 on page 1. Continue pumping at this rate until the water level in the well stabilizes. If the water level does not stabilize within 3 hours, reduce the pumping rate by 25% and continue pumping; if the water level does not stabilize at the new reduced rate within 1 hour, reduce the pumping rate by 25% of the original rate, and continue to evaluate stability of water elevation. The pump test should be conducted with a steady water elevation; it is understood that this may prove difficult to achieve. (The pump test contractor may wish to conduct a step test prior to the pump test to identify a pumping rate that will allow establishment of a steady water elevation; it is desired that the pumping rate for the test be in the typical operational range expected for the well.)
3. Record the dynamic (pumping) water level and discharge rate using a pressure transducer and data logger to record water elevation at 1 minute intervals as an alternative to the schedule above, which is intended for manual water elevation measurements. Periodic manual water elevation observations using a water level sensor should be collected to validate pressure transducer data.
4. Once the stabilized dynamic water level has been reached, the 24-hour test period may begin. At the end of the pumping test, measure, and record the final discharge rate and dynamic water level. Continue monitoring water elevation in the well over 72-hour period with the pressure transducer and data logger; it is desirable but not required to periodically measure water elevation manually with a water level sensor during the 72-hour recovery period.

Compile the test data in a pump test summary and submit to City of St Helena.

# **ATTACHMENT B**

2 PAGES



August 26 2021

Maya DeRosa  
City of St. Helena

**RE: WELL CAPACITY AND SUSTAINABILITY ASSESSMENT  
PROPOSED HUNTER SUBDIVISION**

Dear Maya:

This submittal has been prepared to address the well capacity and sustainability assessment requested for the proposed Hunter Subdivision by the City in their memorandum dated July 20, 2021. The objective of the assessment was to substantiate that the proposed water source (existing on-site irrigation well) has the capacity to supply the quantity of water required to meet the subdivision's landscape irrigation demands. The following provides the information requested in the memorandum.

1. Estimated Annual and Monthly Irrigation Demand

The estimated annual water demand is 17.16 acre-feet (AF) per year. This equates to an average monthly irrigation demand of 1.43 AF. However, the actual monthly demand will vary seasonally, with nominal amounts of water being used during the winter (less than 0.60 AF/month) and appreciably higher amounts during the spring and summer (1.5 to 2.7 AF/month).

2. Required Pumping Rate and Pumping Duration for Maximum Daily Demand

The following provides a breakdown of the pumping rate and pumping duration derivations for the worst-case scenario (i.e., July irrigation cycle with all irrigation controllers watering at the same time):

- Based on evapotranspiration demand and irrigation application rates, assume 60 minutes of spray irrigation at 8 gallons per minute (GPM) and 127 minutes of drip irrigation at 3 GPM per house. These rates equate to 480 gallons per day (GPD) for spray irrigation and 381 GPD for drip irrigation, which translates to a total daily unit rate of 861 GPD per house.
- Lots 1 - 51, Total number of houses in subdivision = 51 Independent Irr. Controllers
- Lot 52, Affordable Housing Parcel = 1 Independent Irr. Controller

- Public Landscape Along Adams & A Street = 1 Independent Irr. Controller
- Total peak water demand = 53 Irr. Controllers x 861 GPD/controller = 45,633 GPD\*\*
- Proposed design pumping rate of irrigation well = 40 GPM
- Corresponding pumping duration = 1,141 minutes per day

*\*\*Absolute worst case, extremely unlikely to occur.*

3. Well Completion Report – See attached
4. Well Location – See attached
5. County Well Permit – See attached
6. Existing Data from Prior Well Tests – See attached Well Permit/Well Completion Report
7. Pump Test per County Procedure

Documentation compiled as part of the recent 24-hour pump test performed on August 10 and 11, 2021 is attached. Please note that the attached “Test Pump Log” does not fully reflect the start-up provisions. As shown in the “Comments” column, the pump was started at 9:55 AM to dial in the target pumping rate (40 GPM). This task took several minutes to complete, whereupon the pump was shut off to allow time for the static groundwater level to recover. Pumping was reinstated at 10:15 AM to initiate the removal of casing storage, which was calculated to be approximately 1,000 gallons. At a pumping rate of 40 GPM, the required pumping period to remove the casing storage volume was 25 minutes. As such, the actual start time for the 24-hour pump test was 10:40 AM. Please note that the pump was not shut off at the transition from the casing storage removal period and the start of the 24-hour pump test. Groundwater level data was collected using a downhole transducer and datalogger.

The testing protocols require the monitoring of groundwater levels over the course of the 72-hour recovery period. However, full recovery was demonstrated almost instantaneously. Based on this circumstance, the collection of groundwater level data was discontinued after 24 hours.

We trust the information provided herein addresses the requirements stipulated in the July 20, 2021 memorandum. If you should have any questions, please do not hesitate to contact me at (650) 704-3904.

Regards,  
Tim Massey  
Managing Director  
Hunter Applicant

Attachments: Well Permit/Well Completion Report  
Pump Test Results

# **ATTACHMENT C**

2 PAGES

#12.00

WELL LOG

9-030-05

8-5-30

A.P. #

HEALTH DEPT. USE ONLY

FEE: 2595

DATE: 11/14/76

RECEIPT NO:

BY:

NAPA COUNTY HEALTH DEPARTMENT  
DIVISION OF ENVIRONMENTAL HEALTH

RECEIVED

AUG 17 1976

APPLICATION &amp; PERMIT TO CONSTRUCT

A WATER WELL

(ORDINANCE #)

DIVISION OF ENVIRONMENTAL HEALTH

Selviciado Dr. & Pope St.  
6/14/76

NAME

ADDRESS

DATE

(Owner)

(Job Location)

NAME

ADDRESS

(Well Driller)

TYPE OF WORK

NEW WELL

TEST HOLES

TYPE I PERMIT

RECONDITIONING

DESTROYING

TYPE II PERMIT

DEEPENING

OTHER

FEE

PROPOSED USE

DOMESTIC

TEST WELL

INDUSTRIAL

OTHER

INDUSTRIAL

MUNICIPAL

Sewage Disposal On Site (Existing or Proposed) Public Individual Private

Distance from well to any part of nearest sewage disposal system feet.

(Sketch of site to accompany application.)

TYPE OF EQUIPMENT TO BE USED

Rotary

Cable

Hand Dug

Other

CONSTRUCTION PROPOSED

Diameter of casing

Material

Annular Space: Size

Sealed with: Concrete

Grout

Neat Cement

Puddled Clay

Other

Conductor Casing: Yes No

Material

Chlorination By: Owner

Pump Co

Driller

(SIGNATURE OF APPLICANT)

(DATE)

NOTICE TO DRILLER: COMPLETE THIS PORTION AND PROVIDE OWNER WITH THIS COPY.

## CASING

## CONSTRUCTION

Total Depth 410' Ft.

Surface Seal to 20' Ft.

Any Stratas sealed: Yes No X

If yes, depth of Stratas

From Ft. to Feet

From Ft. to Feet

Perforations

From 80' Ft. to 410' Feet

From Ft. to Feet

From Ft. to Feet

## WATER LEVELS

First water at 24' Feet

Static level at 12' Feet

## WELL TESTS

How performed 20 H.P. Sub. Test Pump

Yield 350 GPM with 70' Feet

Drawdown Ft. after Hrs.

## WELL LOG

(Formation; describe by color, size of material, structure)

Ft.	to	Ft.
0	2	Top Soil
2	26	Dark Brn & Blk Clay
26	31	Soft Blk Volcanic
31	49	Gray Clay w/Rh & Imbedded Gravel
49	61	Granular Black Volcanic Rock
61	83	Hard Green & Granular Blk Rock
83	124	Soft Gray & Green Rk w/Imbedded Brkn Rock
124	148	Hard Gr. Granular Rk
148	190	Hard Gr. Rk w/Soft Stringers
		(cont'd. reverse side)

## continuation

## FORMATION:

190	194	Hard <del>Gray</del> Red & Gray Granular Rock
194	242	Hard Red & Gray Rock w/Soft Green Stringers
242	293	Hard Lavender, Gray & Pink Rock w/Fractures
293	319	Black Granular w/Hard Stringers
319	325	Gray, Green & Black Tuffa
325	341	Black Granular Rock
341	362	Gray Tuffa w/Hard Black Stringers
362	379	Green Sand Formation
379	410	Gray Tuffa

# **ATTACHMENT D**

5 PAGES



## Hunter Subdivision

### Well Capacity & Sustainability Assessment

I. Individual performing test: Rich Richardson

II. Type of license/registration, number and expiration date: C57 261084 Exp 12-31-21

III. Location of well:

Address: Hunter subdivision

A.P. #: 009-030-057

IV. Type and model of test pump: Unknown

V. Test pump setting depth: Approximately 231'

VI. Maximum reported yield for this pump type at this setting: Unknown

VII. Type of discharge measurement method: Flow meter

VIII. Type and model of flow meter (or provide an accurate description of weir or orifice plate):

2" Netafim 36WMM2T1

Geographic coordinates (Plane Coordinate Method or distance from fixed landmarks): 38°30'44.97"N 122°27'46.05"W

IX. Estimated elevation of well head: 201'

X. Initial static water level (include measuring points such as top of casing, surface seal, access port): 22' from top of casing approximately 2' above grade

XI. Date & time of initial static water level measurement: 08/10/21 10:00 A a.m./p.m.

A. Discharge Rate: 40-gpm

B. Dynamic Water Level: 23'

C. Specific Capacity: 40.00

D. Pump Test duration: 24-HRS

XII. Immediately after the test take the following measurements:

A. Dynamic water level: 23'

B. Final discharge rate: 40-GPM

XIII. Post - Test Measurement:

A. Dynamic water level: 22'

B. Static water level: 22'

C. Percentage of recovery of final static level: 100%

Testing performed by (signature): [Signature]

Date: 8-17-21

Company: Les Petersen Drilling & Pump Phone Number: 707-545-0246

Approved \_\_\_\_\_ Denied \_\_\_\_\_

Specialist \_\_\_\_\_

Date \_\_\_\_\_





Drilling & Pump Inc.

# Test Pump Log

**JOB:** Redwood Equities **PUMP SIZE:** 20-HP

**LOCATION:** Hunter Subdivision **SETTING:** 231ft

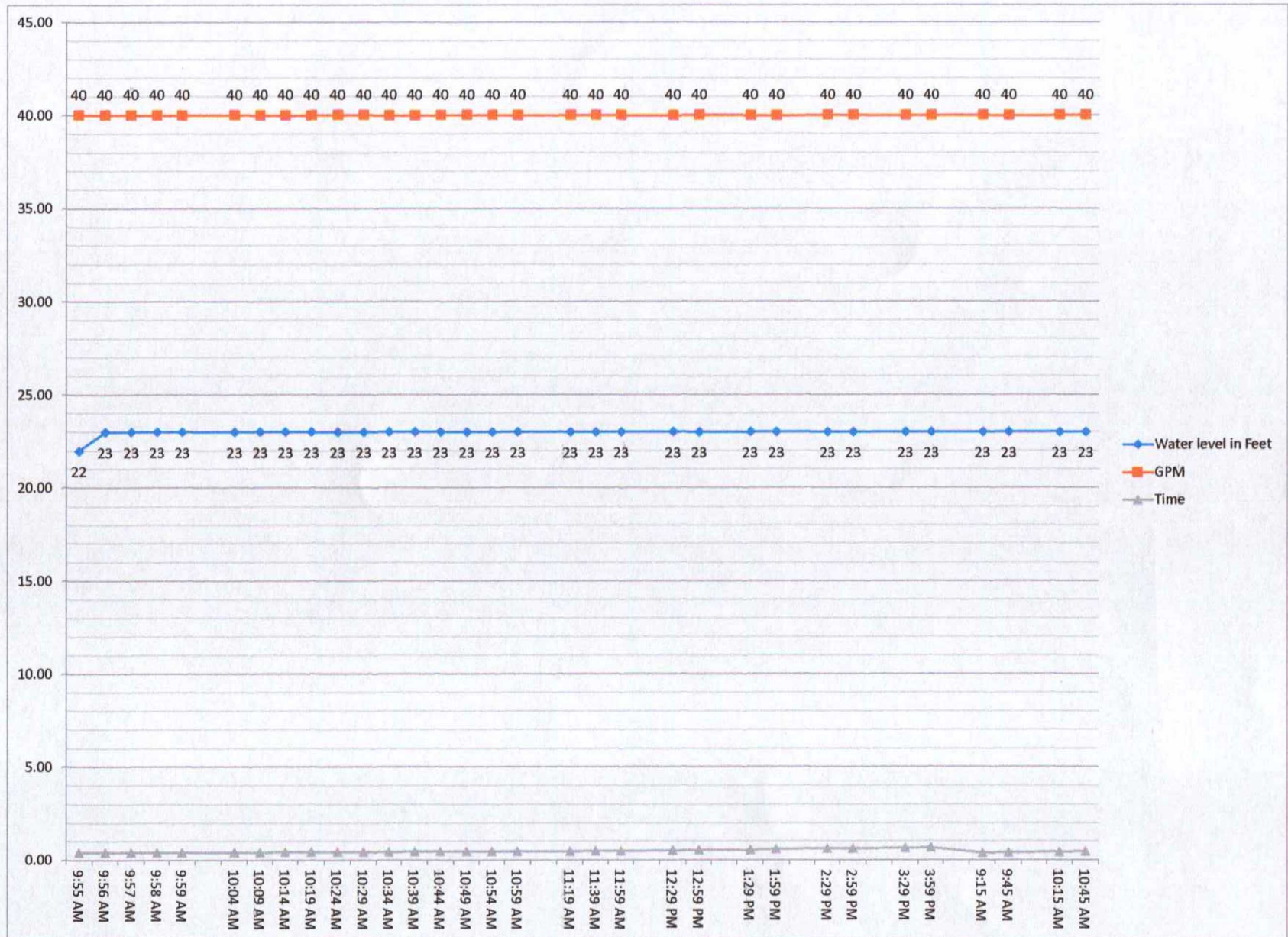
**WELL DEPTH:** 410ft **CASING SIZE:** 8" Steel **STATIC LEVEL:** 22'

**DATE STARTED:** 8/10/2021 **DATE FINISHED:** 8/11/2021 **JOB #**

DATE:	TIME	Interval	TEST DATA				COMMENTS
			LEVEL	G.P.M.			
8/10/21	9:55 AM	1 Min	22	40			Throttled back to 40-gpm
8/10/21	9:56 AM	1 Min	23	40			
8/10/21	9:57 AM	1 Min	23	40			
8/10/21	9:58 AM	1 Min	23	40			
8/10/21	9:59 AM	1 Min	23	40			
8/10/21	10:04 AM	5 Min	23	40			
8/10/21	10:09 AM	5 Min	23	40			
8/10/21	10:14 AM	5 Min	23	40			
8/10/21	10:19 AM	5 Min	23	40			
8/10/21	10:24 AM	5 Min	23	40			
8/10/21	10:29 AM	5 Min	23	40			
8/10/21	10:34 AM	5 Min	23	40			
8/10/21	10:39 AM	5 Min	23	40			
8/10/21	10:44 AM	5 Min	23	40			
8/10/21	10:49 AM	5 Min	23	40			
8/10/21	10:54 AM	5 Min	23	40			
8/10/21	10:59 AM	5 Min	23	40			
8/10/21	11:19 AM	20 Min	23	40			
8/10/21	11:39 AM	20 Min	23	40			
8/10/21	11:59 AM	20 Min	23	40			
8/10/21	12:29 PM	30 Min	23	40			
8/10/21	12:59 PM	30 Min	23	40			
8/10/21	1:29 PM	30 Min	23	40			
8/10/21	1:59 PM	30 Min	23	40			
8/10/21	2:29 PM	30 Min	23	40			
8/10/21	2:59 PM	30 Min	23	40			
8/10/21	3:29 PM	30 Min	23	40			
8/10/21	3:59 PM	30 Min	23	40			
8/11/21	9:15 AM	17Hr 16Min	23	40			
8/11/21	9:45 AM	30 Min	23	40			
8/11/21	10:15 AM	30 Min	23	40			
8/11/21	10:45 AM	30 Min	23	40			End of pump test
8/11/21	10:50 AM	5 Min	22	NA			Recovery = 100%



Hunter Subdivision  
8-10-21





**HUNTER SUBDIVISION 8-10-21**

Initial Static Water Level	22
Post test water level	22 b
Time (MINUTES) of measurement	5 b-1
Stabilized pumping level	23 c
Draw Down	1 d
Recovery	1 e

<b>Percent of Recovery</b>	<b>100.00% f</b>
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**Specific Capacity**

Discharge rate in GPM	40
Draw Down in feet	1

<b>Specific capacity</b>	<b>40.0000</b>
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