



BECHTEL NATIONAL INC.

**CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT**

Contract No. N-68711-92-D-4670

Document Control No.: CTO-0142/0092

File Code: 0308

TO: Contracting Officer  
 Naval Facilities Engineering Command  
 Southwest Division  
 Mr. Richard Selby, Code 57CS1.RS  
 Building 127, Room 112  
 1220 Pacific Highway  
 San Diego, CA 92132-5187

DATE: October 8, 1997

CTO #: 142

LOCATION: MCAS El Toro

FROM:

D. J. Tedaldi  
 D. J. Tedaldi, Ph.D., P.E., Project Manager

DESCRIPTION: Step Drawdown and Step Buildup Test Results (24EX3 and 24IN1)  
DTD October 8, 1997

TYPE:      Contract Deliverable      CTO Deliverable   X   Other  
 (Cost) (Technical)

VERSION:     NA     REVISION #:                     

ADMIN RECORD: Yes   X   No      Category      Confidential       
 (PM to Identify)

SCHEDULED DELIVERY DATE: 10/8/97 ACTUAL DELIVERY DATE: 10/8/97

NUMBER OF COPIES SUBMITTED: 10/3C/3E

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# Bechtel

401 West A Street  
Suite 1000  
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CLEAN II Program  
Bechtel Job No. 22214  
Contract No. N68711-92-D-4670  
File Code: 0308  
**IN REPLY REFERENCE: CTO-0142/0092**

October 8, 1997

Contracting Officer  
Naval Facilities Engineering Command  
Southwest Division  
Mr. Richard Selby, Code 57CS1.RS  
Building 127, Room 112  
1220 Pacific Highway  
San Diego, CA 92132-5187

Attention: G. Steinway, Code 56MC.GS

**Subject: Step Drawdown and Step Buildup Test Results (24EX3 and 24IN1)**

Dear Mr. Selby:

Attached are the results of the step-drawdown aquifer test at extraction well 24EX3 and the step-buildup test at injection well 24IN1. These data were analyzed to help select the pumping rate for the constant-rate test at extraction well 24EX3. Based on a review of the data, the extraction well appears to be capable of sustaining a pumping rate of approximately 15 gallons per minute (gpm) for the two week test. The injection well appears to have a capacity greater than 40 gpm, well above the 15 gpm that will be injected.

If you have any questions or would like to discuss these data further, please contact Pat Brooks at (619) 687-8851, or myself at (619) 687-8780.

Very truly yours,



Dante J. Tedaldi, Ph.D., P.E.  
Project Manager

DJT/sp

Enclosures: Step Drawdown and Step Buildup Test Results (24EX3 and 24IN1)



**Bechtel National, Inc.** Systems Engineers-Constructors

## EVALUATION OF 24EX3 STEP-DRAWDOWN TEST DATA

The step-drawdown test at well 24EX3 was conducted in five steps lasting a total of 2,880 minutes. Decisions regarding elapsed time per step were based on drawdown resulting from different pumping rates. Pumping rates for steps 3 and 4 were decreased to account for rapidly declining water levels. A 30 psi transducer was placed in pumping well 24EX3 and 10 psi transducers were placed in observation wells 24OB1, 24OB2, and 24OB3. Table 1 summarizes the pumping rates and resulting drawdown at extraction and observation wells for each of the five steps.

**Table 1**  
**Summary of 24EX3 Step-Drawdown Test Results**

Step	Flow Rate (gpm)	Time Duration (minutes)	EX3 Drawdown (feet)	OB1 Drawdown (feet)	OB2 Drawdown (feet)	OB3 Drawdown (feet)
1	20	21	10	0.136	0.012	0.251
2	30	459	47	0.386	0.119	2.556
3	25	120	41	0.402	0.135	2.438
4	10	842	5 (buildup)	0.126	0.107	0.608
5	20	1,438	35	0.392	0.198	2.021

The constant rate test pumping rate of 15 gpm was selected by evaluating the step-drawdown test results. Figures 1 through 4 graphically show the step-drawdown test results for extraction and observation wells. A steepening of the Step 2 time/drawdown line indicates a boundary was encountered at approximately 225 minutes (Figure 1). Extrapolation of steps 2, 3, and 5 to two weeks (20,000 minutes) indicates that drawdown at two weeks would exceed the depth of the pump (pump placed between 60-65 feet bgs) for each of the pumping rates. Buildup rather than drawdown is associated with Step 4 indicating that this pumping rate is too low. Step 1 was not considered in this evaluation because it did not last long enough to be affected by the boundary. Based on these data, a pumping rate of 15 gpm was selected because it is a rate in between the rate with buildup (Step 4, 10 gpm) and the lowest rate with drawdown (Step 5, 20 gpm).

fig4-1

**Figure 1**  
**EX3 Step-drawdown Test Results**

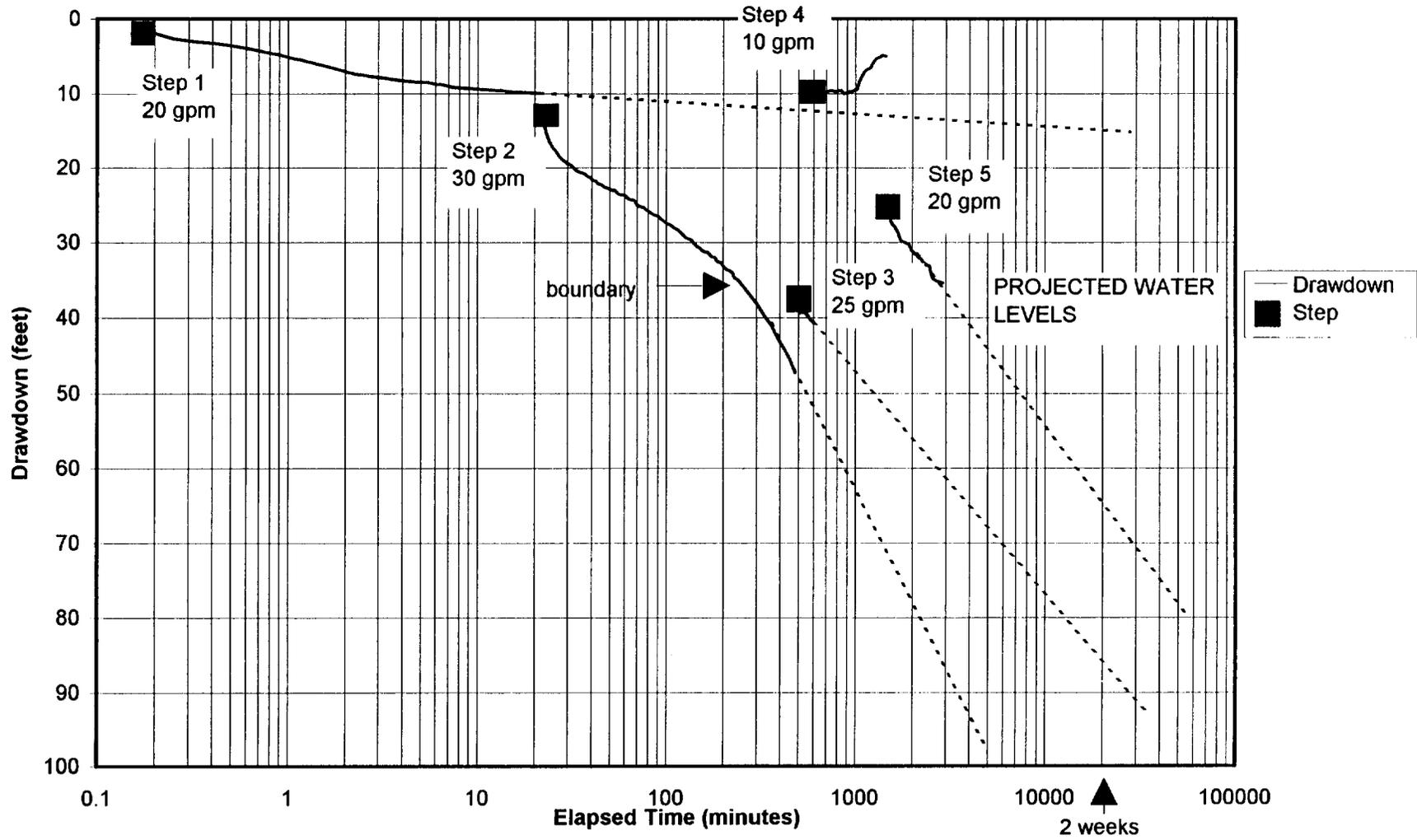
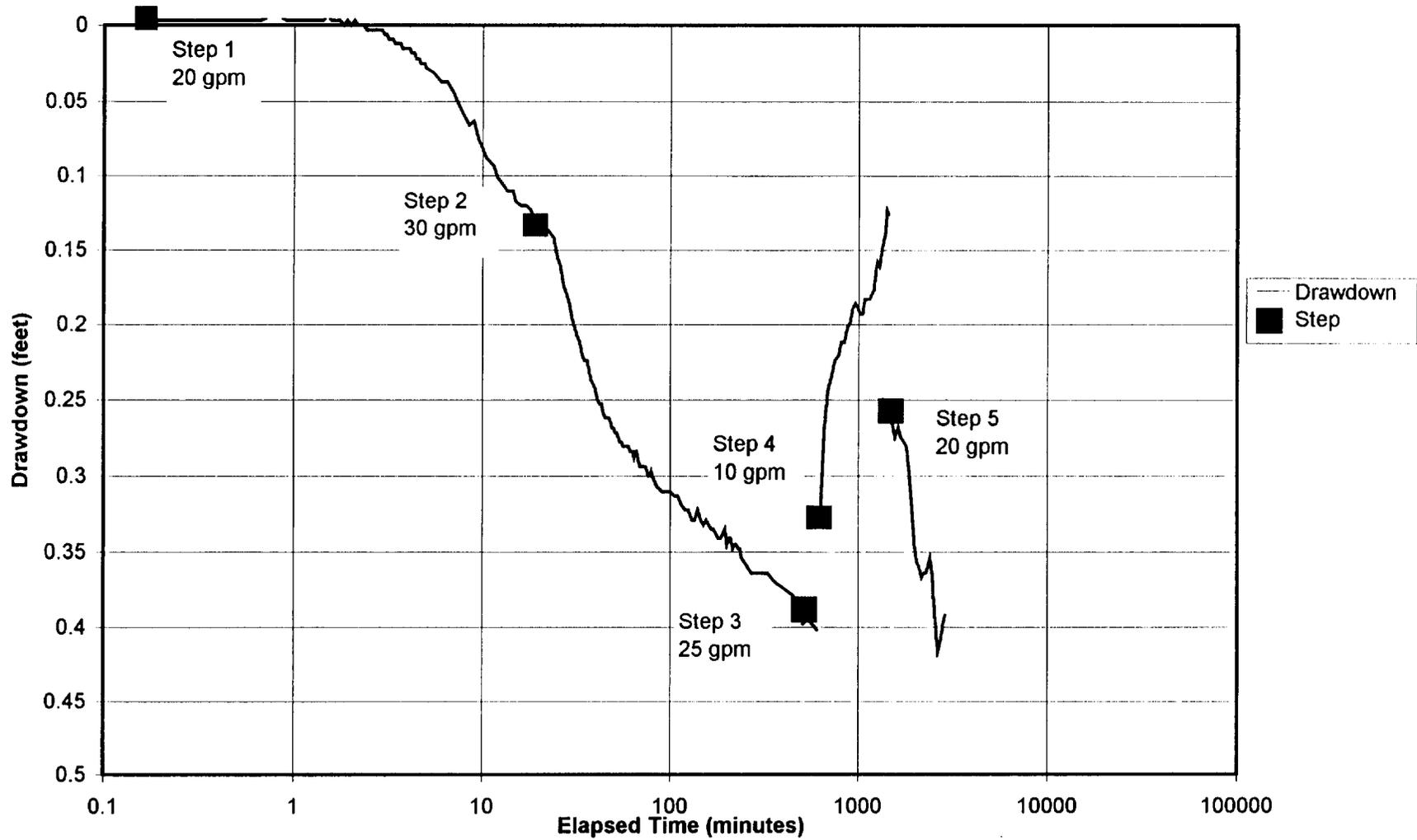
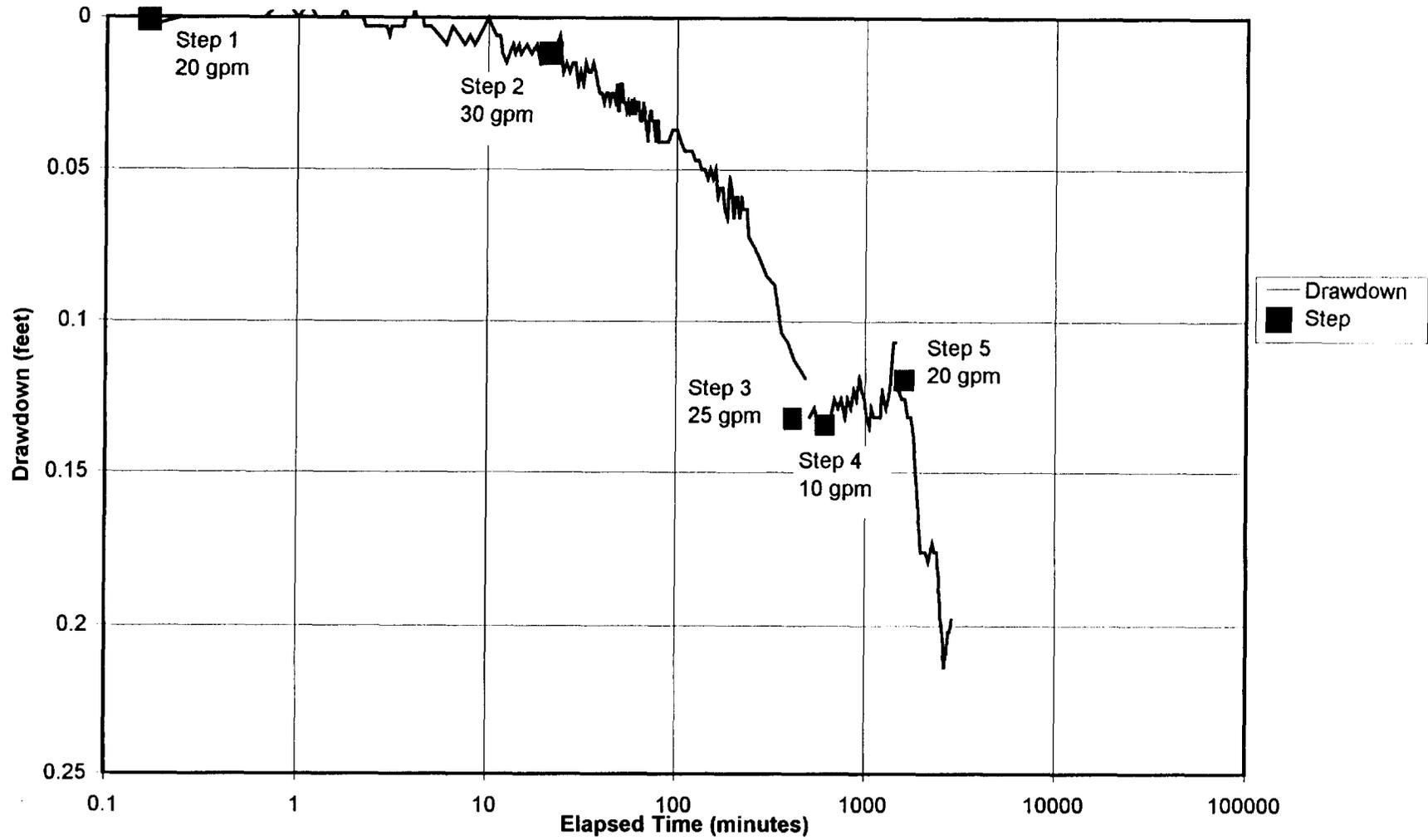


fig4-2

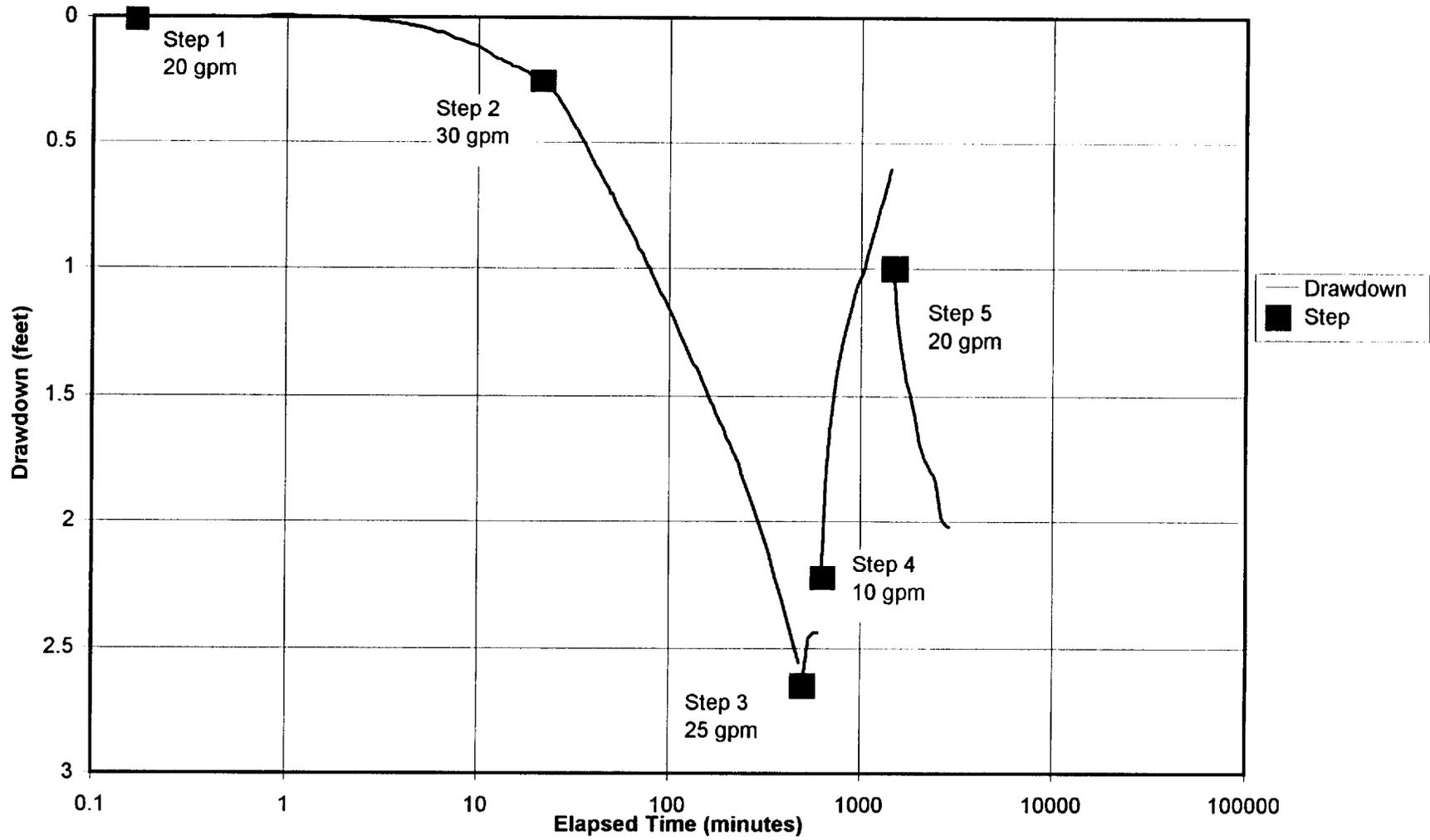
**Figure 2**  
**OB1 Step-drawdown Test Results**



**Figure 3**  
**OB2 Step-drawdown Test Results**



**Figure 4**  
**OB3 Step-drawdown Test Results**



## EVALUATION OF 24IN1 STEP-BUILDUP TEST DATA

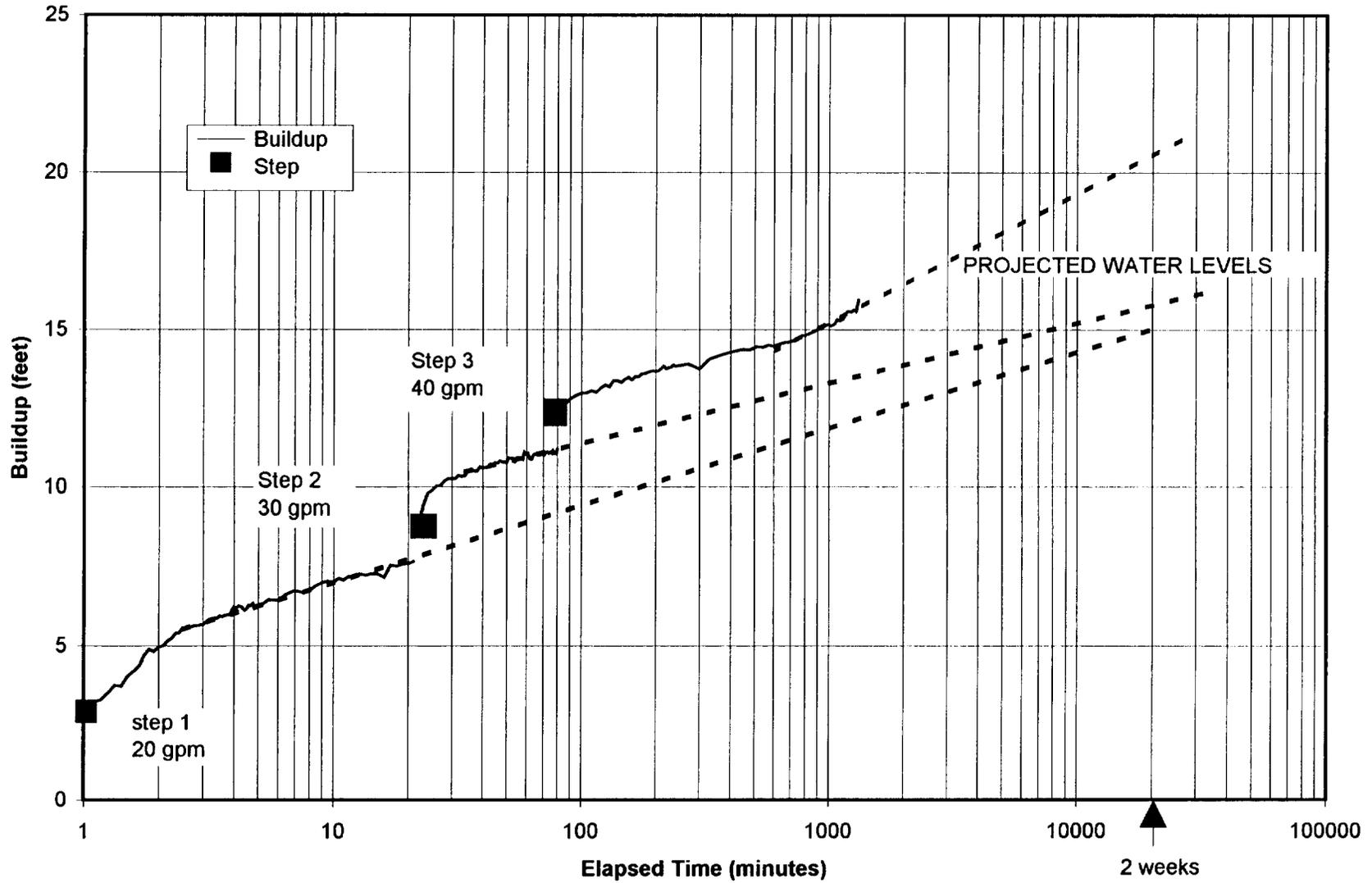
The step-buildup test at well 24IN1 was conducted in three steps lasting a total of 1,320 minutes. Treated water was discharged to 24IN1 via a 2-inch PVC pipe placed approximately 10 feet below static water level at a depth of approximately 115 feet bgs. A 30 psi transducer was placed in 24IN1 approximately 5 feet below static water level. In addition, a transducer was placed in observation well 24IN1OB approximately 10 feet below static water level. Table 1 summarizes the injection rates and resulting drawdown for each of the three steps.

**Table 1**  
**Summary of 24IN1 Step-Buildup Test Results**

<b>Step</b>	<b>Flow Rate (gpm)</b>	<b>Time Duration (minutes)</b>	<b>IN1 Buildup (feet)</b>	<b>IN1OB Buildup (feet)</b>
1	20	21	7.7	0.37
2	30	60	11	1.3
3	40	1,239	16	3.3

The data from the test are graphically shown on Figures 1 and 2 and each curve is extrapolated to two weeks (approximately 20,000 minutes). Based on this extrapolation, it is determined that injection well 24IN1 can sustain an injection rate of 40 gpm for a period of two weeks. The combined injection rate from extraction wells 24EX3 and 24EX4 is expected to be less than 40 gpm; a 15 gpm pumping rate has been selected for 24EX3 and a similar rate is expected to be selected for 24EX4. Since injection well 24IN1 theoretically can sustain an injection rate of 40 gpm and the combined injection rate from 24EX3 and 24EX4 is predicted to be less than 40 gpm, it is anticipated that the effluent from both 24EX3 and 24EX4 can and will be injected into 24IN1 simultaneously.

**Figure 1**  
**IN1 Step-buildup Test Results**



**Figure 2**  
**IN10B Step-buildup Test Results**

