the boundary effect, producing a Q of delta s1 or Q/s10 for the first segment 4.824, greater than the 3.677 observed during the preceding test. Reasons are unknown.

Figure 15 shows the test at 603 gal/min on 11-28-77, bubbler pressure vs log time, the intersection of the two linear data trends at 3399 min Q/s10 for the data following this boundary effect is 6.153 gal/min/psi/log cycle. The recovery data for the preceding (Figure 17) 603 gal/min test shows the intersection at only 1369 min. Some extraneous effects are influencing the drop in the recovery data producing invalid data. These data, are a little suspicious. The Q/s10 is very high 7.179 gal/min/psi/log cycle. These data were Q/s10 and for the intersection time will be eliminated in calculations.

The 650 gal/min test on 1-31-78, (Figure 8), bubbler pressure vs log time, the two lines intersect at 3375 min and a Q/s10 following this intersection of 5.328 gal/min/psi/log cycle. Figure 19 summarizes all the actual test data presented to to this point the solid lines represent actual data and beyond this boundary of about 3500 min extrapolated the data. Presented are the predicted pressure drawdown as a function of time for the 603 gal/min recovery data, the 592 gal/min drawdown data and the 650 gal/min drawdown data. Averaging techniques show predicted drawdown time curves for 400 gal/min, 500, 600, and 700 gal/min.

Graph (Figure) basically indicates the test dates, Q/s10 for the first segment and for the second segment after about 3335 min, the recovery data has a rather large value for Q/s1, and is a little suspicious. Very large Q/Delta s_2 and the intersection time is abnormal. As is the ratio of Q/Delta s.1 is the ratio essentially at this time. We end up with the 3533 min. the increment resulting beyond the time 3533 min. whatever time you want. In this case it's five years. Using this data an equation predicting drawdown where drawdown is .92633 Q. Predicted drawdown is a function of pumping rate and for No. 3 a pump rate of 625 gal/min results in 579 psi drawdown after five years.

Well No. 4 A-B data is presented in Figure . This is double legged hole. A 72 hour test to keep the well warm was flowed at 10 gal/min, Figure 21, the flow was then increased to 25 gpm which would give us an increase in flow of 15 gal/min. The wellhead pressure jumped about 40 psi due to heating up of the water in the wellbore and started to stabilize after about 100 minutes and might have a slight slope decline after this time. Recovery data was obtained for this test. This is correcting wellhead recovery vs time after shutin. The corrected recovery data is based on the extrapolation of the trend for the preceding drawdown. What is done is to take these data, extrapolate it and track from that the observed wellhead pressure and plot a corrected recovery curve. During the first few minutes, water flowed into storage the pipeline, the well was shutin with some steam-air in the line between the wellhead and the control valves and it took a few minutes for that line to fill up before starting recovery.

Using these relatively meager data, predicted drawdowns were ploted as a function of time. Pumping at 100 gal/min, results with over 500 psi drawdown after 36 hours of pumping. This is a very poor well. We really know what is happening in the wellbore as it cools down as a function of time. Well No. 4 is a good candidate for stimulation.

Well No. 5AB--Data is presented in Figure . The 140 gal/min test was a 72 hour test. Hydrologic features of this well are presented in Figure . The capacities after 10 minute range from 3.12 gal/min/psi up to 4.17 gal/min/psi. There is close correlation between the values observed for drawdown and recovery which implies low well losses at least not in this flow range but may be higher when the well flow is increased by increasing rates. The plot for 140 gal/min long term test Figure shows wellhead pressure vs time since production began. The loss of data was because of an instrument failure here after about 45 minutes. It looks like the data was beginning to stabilize which would imply that we have a recharge boundary occurring in the vicinity of 45 to 100 minutes after pumping began. This is questionable do to the instrument failures at the critical times, assuming the up and down data points are level.

The plot of specific capacity (Figure) after 10 minutes vs discharge rate, looks like a slight decrease in specific capacity as a function of the Q. This could be implying that there is some problems with well losses or some other factors are commingling effects between these data, and more data on this well before specifying these effects. The basic summary of the test (Figure) results of our 72 hours testing period shows Q/s10 is generally in the vicinity of 10 gal/min/psi/log cycle. Because few data for recovery for the 40 gal/min, it was expected to have significant density effects occurring after this small flow. Based on the 140 gal/min test data and assuming no boundaries and no interference effects, after 5 years drawdowns expect as per these discharges (Figure). Well 5 was planned to be pumped at 645 gal/min which results in approximately 300 psi of drawdown after 5 years.

Well No. 6--Data highlights are shown on Figure . This is the shallowest cased well for injection or production purposes. Test data ranges from 207 to 800 gal/min. Hydrologic features are shown in Figure . Figure presents the pressure buildup data, wellhead pressure vs time since injection began. This was with the drilling rig on the site and two pumps. It took about 1 minute to get the second pump on-line., after this Q/s10 was 29.63 gal/min/psi/log cycle. The recovery data for this test (Figure) yielded a Q/s10 of 23.52 gal/min/psi/log cycle. A plot of wellhead pressure vs time (Figure) really comes backwards in time, as T increases pressure moves towards the origin. The free flow of 207 gal/min wellhead pressure vs time shows the density effects on the pressure. The pressure declined and then started increasing in head. A simple-minded correction procedure for density effects came out with Q/s10 79.0 gal/min/psi/log cycle using these temperature data. Going back to the recovery data when to shouldn't have too much density effects occurring. Ending up with Q/s10 82.8 gal/min/psi/log cycle. This is rather high values for Q/s10, these higher peaks are not normal. The explanation for this is uncertain, but there are several receiving zones in this well. It could be commingling effects somewhat similar to what was observed on No. 2. This is for a 700 gal/min test (Figure) for injection beginning 1-9-79 and plotting wellhead pressure vs time. Q/s10 during this initial time period was 25.24 gal/min/psi/log cycle. A short pump shutdown in the test, with the pump back on line again. It gave a Q/x10 of 23.17 gal/min/psi/log cycle. These data are displaced downward because of the short break in pumping, and are comparable values. Figure is corrected recovery pressure vs T time (time since the well was shutin. This is for the 700 gal/min preceding test, ending up with Q/s10 21.54 gal/min/psi/log cycle, slightly less than the value of 24 that was noted from the preceding data, but it is in the ballpark. the

700 gal/min injection test beginning 1-10-79 (Figure), took approximately 7 minutes to get Q from 0 to 700 gal/min resulting in the curving data for the first segment. It is questionable as to when time 0 starts and this may have resulted in our unusual Q/s10 of 17.75 gal/min/psi/log cycle for the data segment up to about 100 minutes, and could perhaps be joggled slightly, depending on where decreasing the slope, to Q/s10 42.87 gal/min/psi/log cycle. This implies effects somewhat similar to the recharge boundary resulting in less pressure buildup in the well. Fortunately the HP probe was working and Figure 35 presents the HP data for the preceding (same test as on previous slide) test. Ending with a Q/s10 42.27 gal/min/psi/log cycle. As compared to the preceding one at 42.87. The HP rpboe appears to give good results provided the temperature change is less than .01^{o}F per minute. In temperature chages greater than that the HP probe results in invalid data. There might have been interference effect with RRGI-7, (Figures 36 and 37) these are depth to water level vs time in days. December 1978 through January 1979 injections began on the 9th and 10th and it appears to have a linear data trend and pressure buildup.

Figure 38 continues this extrapolated curve and the difference between this extrapolated linear trend and the observed data is S-prime. We do a plot of S-prime vs time since injection began, it looks like a linear trend occurring for a short period of time after about 100 hours. Extrapolating this linear trend out to 5 years, ends up woth approximately 33 ft. of water (pressure interference between 6 and 7 when injecting at 700 bbl/min.) The basic summary for the tests (Figure) ran at 700 gal/min on January 9 and 10, shows that Q/s10 are running in the vicinity of 22 gal/min/psi/log cycle prior to the occurrence of the boundary. This is the most interference calculated between any wells. This is the only interference that really is based on solid evidence.

Injection pressure buildup for 6, 600 psi head after 6 years, at about 1463 gal/min, at temperature. During these tests, the well losses are about zero. This could be caused by sluffing of the wellbore, maybe perhaps when they first ran the tests on the well (110^{O}F water) drill the well was not properly cleaned which resulted in high well losses, but it does not appear now using higher temperature water (280^{O}F). But, it appears the well has improved with time. I would strongly if it has not improved significantly. The injectability of this well is increasing with time, because of sluffing in the wellbore.

Injection wells No. 7 highlight and Hydrologic are in Figure . The water levels off into the low land surface. There are no good logs of this well, but now continuous injection in the vicinity of 410 gal/min with 600 psi after 5 years Figure is a plot of wellhead pressure vs time. This was while the drill rig was sitting on the hole. Initially injection rates were 840 gal/min and probably cut to 675 and cut again to 475 gal/min. These data on this first step are rather shaky and questionable. The 340 gal/min data gave good results, and a Q/s10 of approximately 3.75 gal/min/ psi/log cycle are low. It is a poor aquifer. We have performed numerous other tests with results shown in Figure . The most believable data is 3.75 and the following tests tend to confirm the good value. Using the preceding test data to determine wellhead pressures after 5 years of pumping (with no interference) is a function of injectionry using 840 gal/min, presently limiting pressure to 600 psi which is approximately 410 gal/min. Another test run on this well was with a Halliburton rig on site not used to construct the data on this graph. Bubbler pressure vs time is shown on Figure , this was for injection at 400 gal/min, putting in 58^{O}F water which is relatively cold, the wellhead pressure actually declined for a short period of time than after about 100 min started a linear trend and Q/s10 of 2.336 which compares quite favorably to the 3.75 which was observed while injecting at 840 gal/min. The following day, the to injected again and it ended up with a considerable randomness in the data falling off of pressures. This was believed to be air entrainment in the pumps while injecting. Some possible interference (Figure) effects appear here. These are the wellhead pressure data at RRGI-6. While performing a 72 hour injection test, it appeared to have been a linear data trend for a short period of time with a slope of point 11.0 psia per day increase in head and that the data deviated.