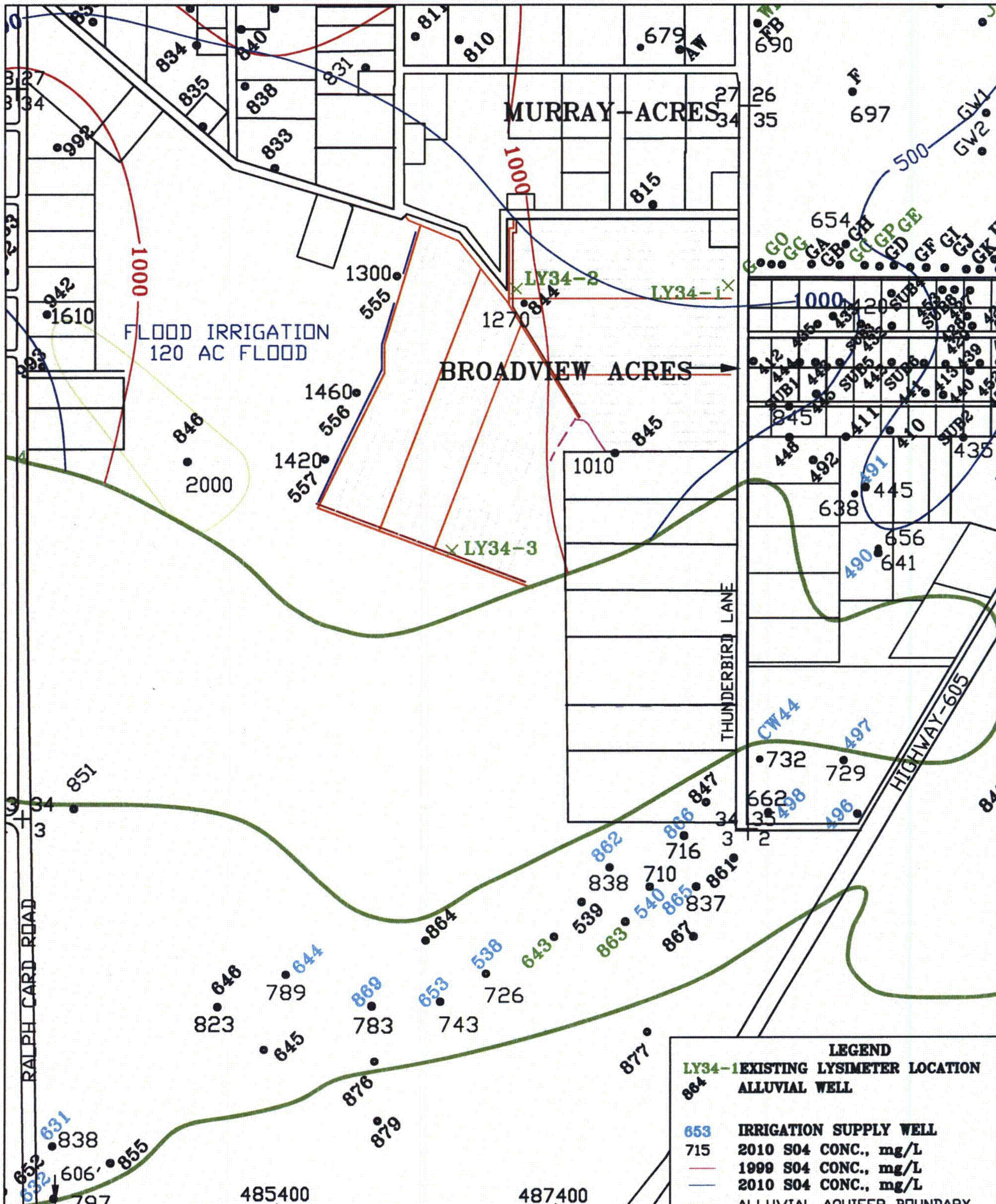
4.3.6 Molybdenum Concentrations

The molybdenum concentrations for 2010 are presented in Figure 4-39. All of these concentrations are less than detection limit for the molybdenum, which is 0.03 mg/l. This figure and Figure 4-40, which shows the molybdenum concentrations with time, shows that no effect on molybdenum concentrations have been observed from the Section 33 irrigation.

4.3.7 Nitrate Concentrations

The nitrate concentrations for 1999 and 2010 are presented in Figure 4-41. This figure shows that the nitrate concentrations approximately ½ mile to the northwest of the Section 33 Center Pivot exist at >10 mg/l during 1999. The highest measured concentration in 2010 in this area was 4.6 mg/l from well 996. The concentration slightly higher concentration in well 996 is likely due to the movement of the slightly higher concentrations from the northwest into this area.

Figure 4-42 presents the nitrate concentrations with time and shows that the nitrate concentrations generally have been fairly steady except for a gradual decline in nitrate concentrations in well 647. These nitrate concentrations do not indicate any observable impacts on alluvial nitrate concentrations as a result of the Section 33 irrigation.



SCALE: 1" = 1000'

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FIGURE 4-1. 1999 AND 2010 SULFATE ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

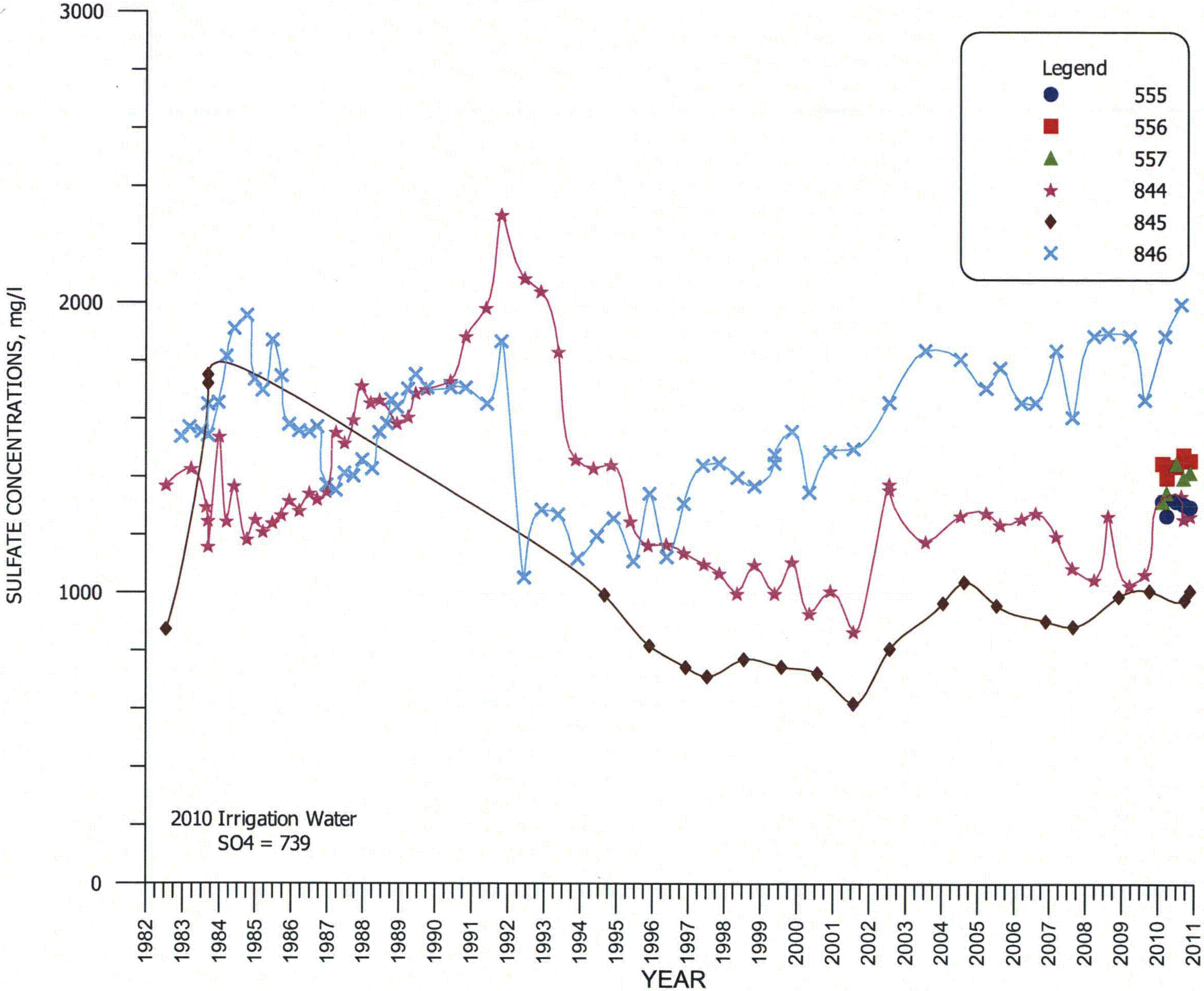
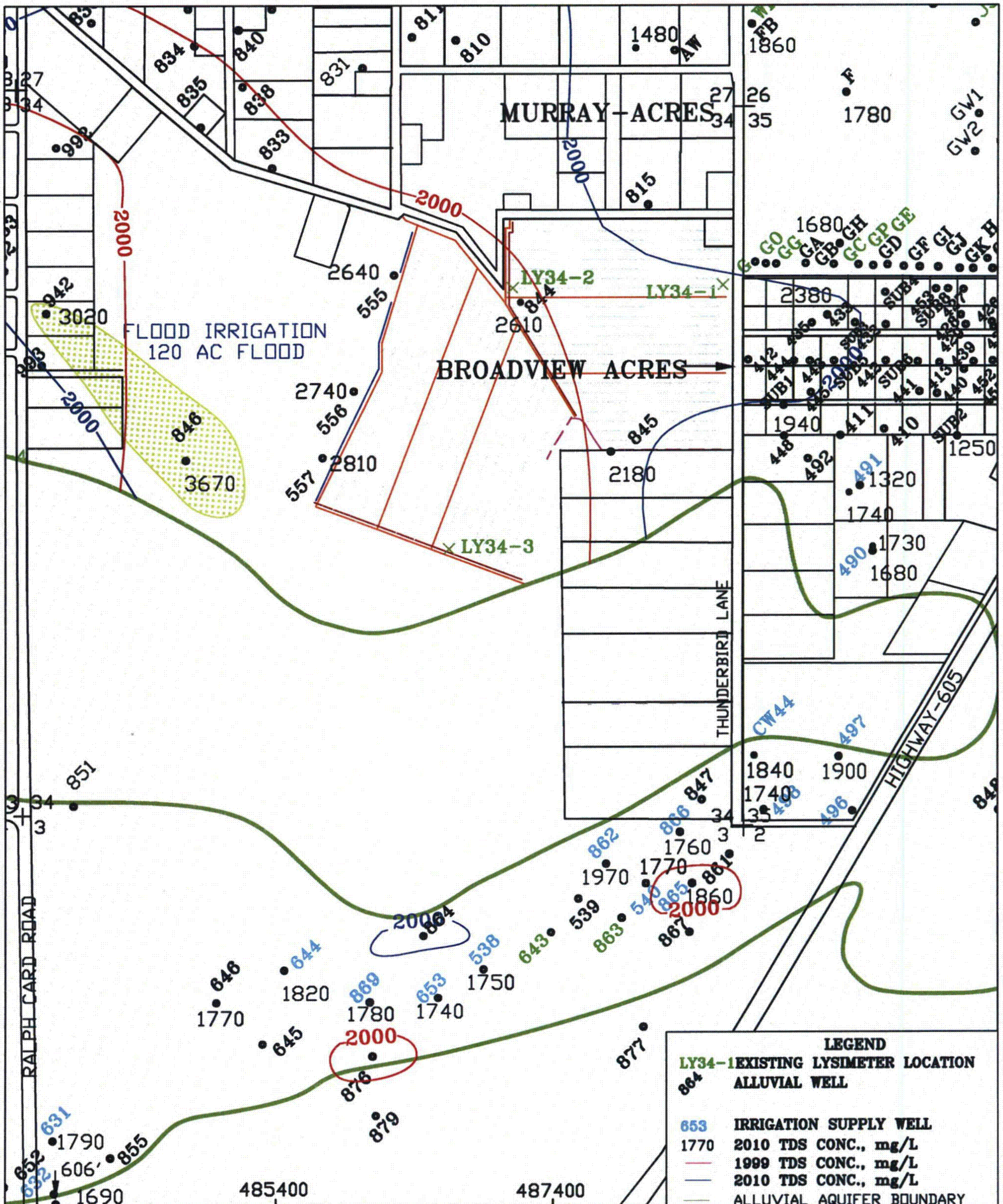


FIGURE 4-2. SULFATE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'	FIGURE 4-3. 1999 AND 2010 TDS ALLUVIAL CONCENTRATION IN SECTION 34, mg/L	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO
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DATE: 1/11/10		

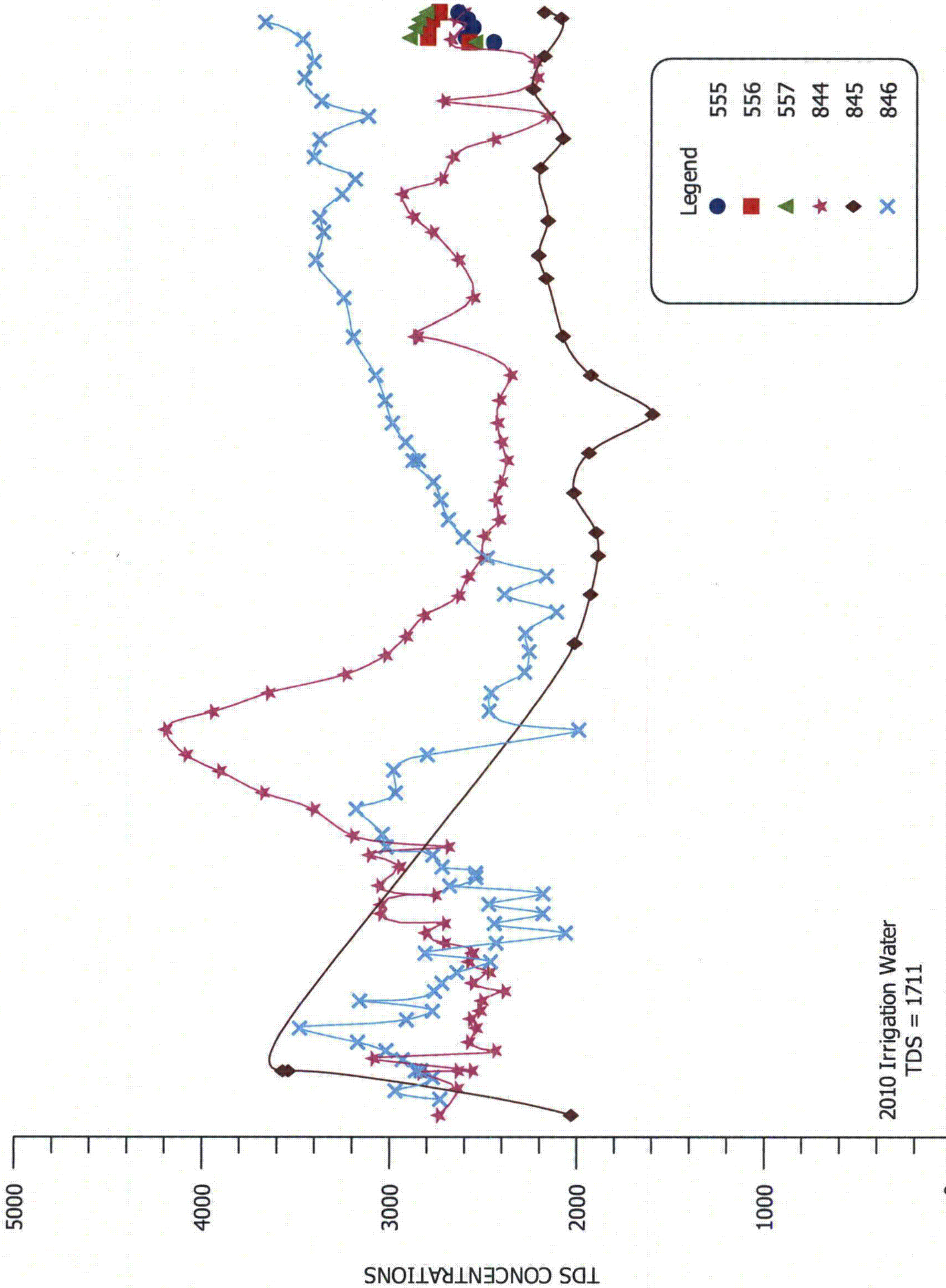
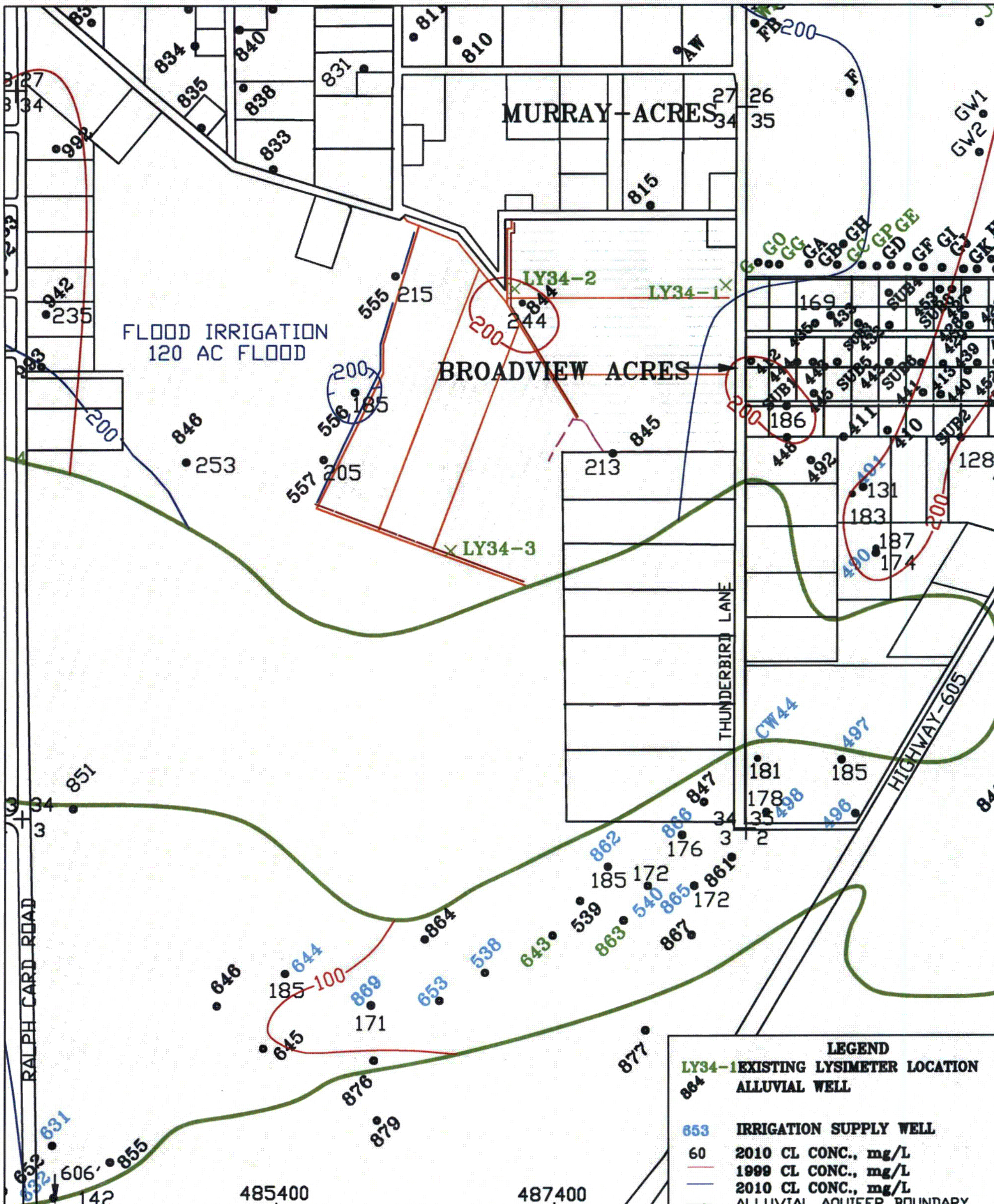


FIGURE 4-4. TDS CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'

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DATE: 1/11/10

FIGURE 4-5. 1999 AND 2010 CHLORIDE ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

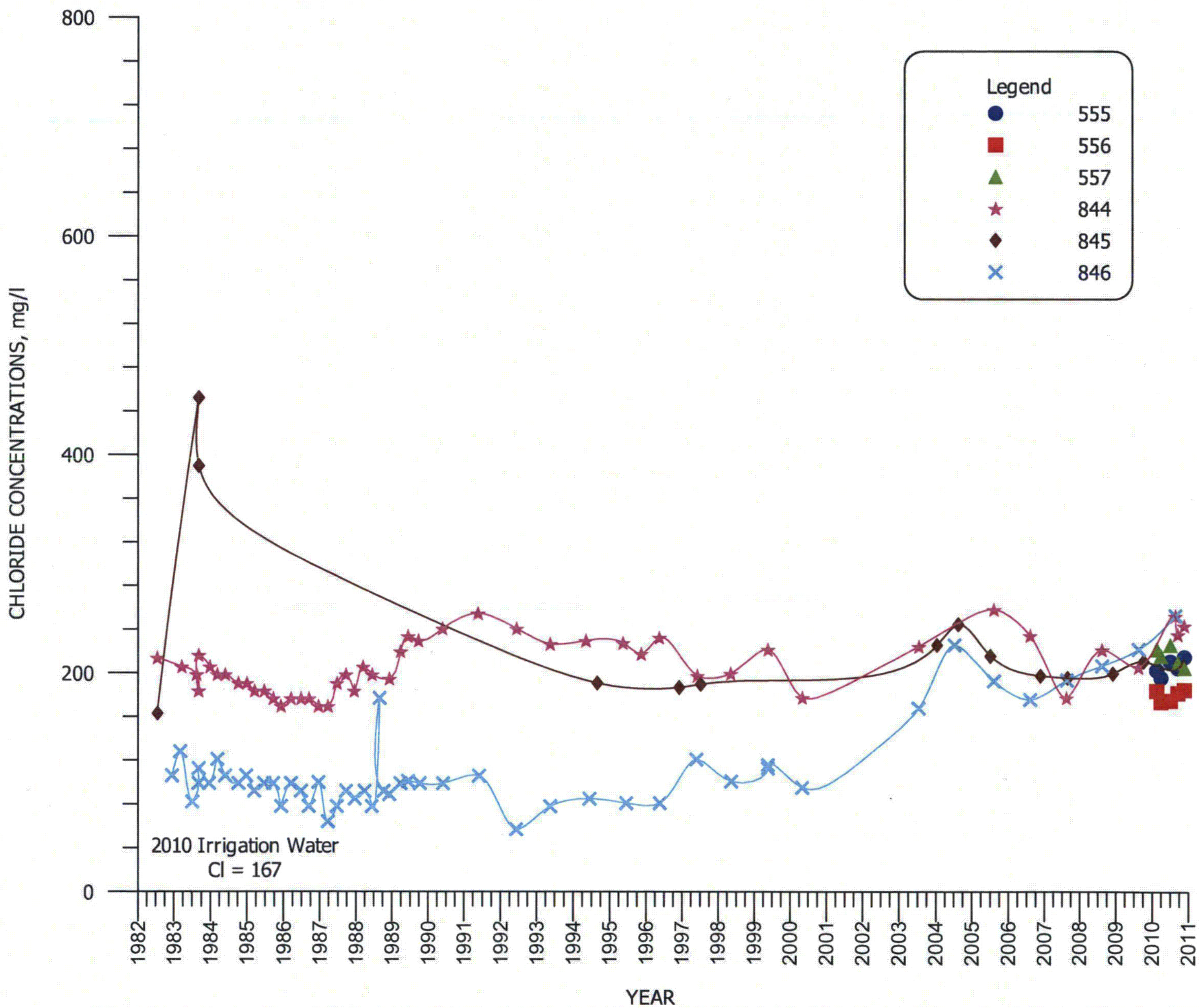
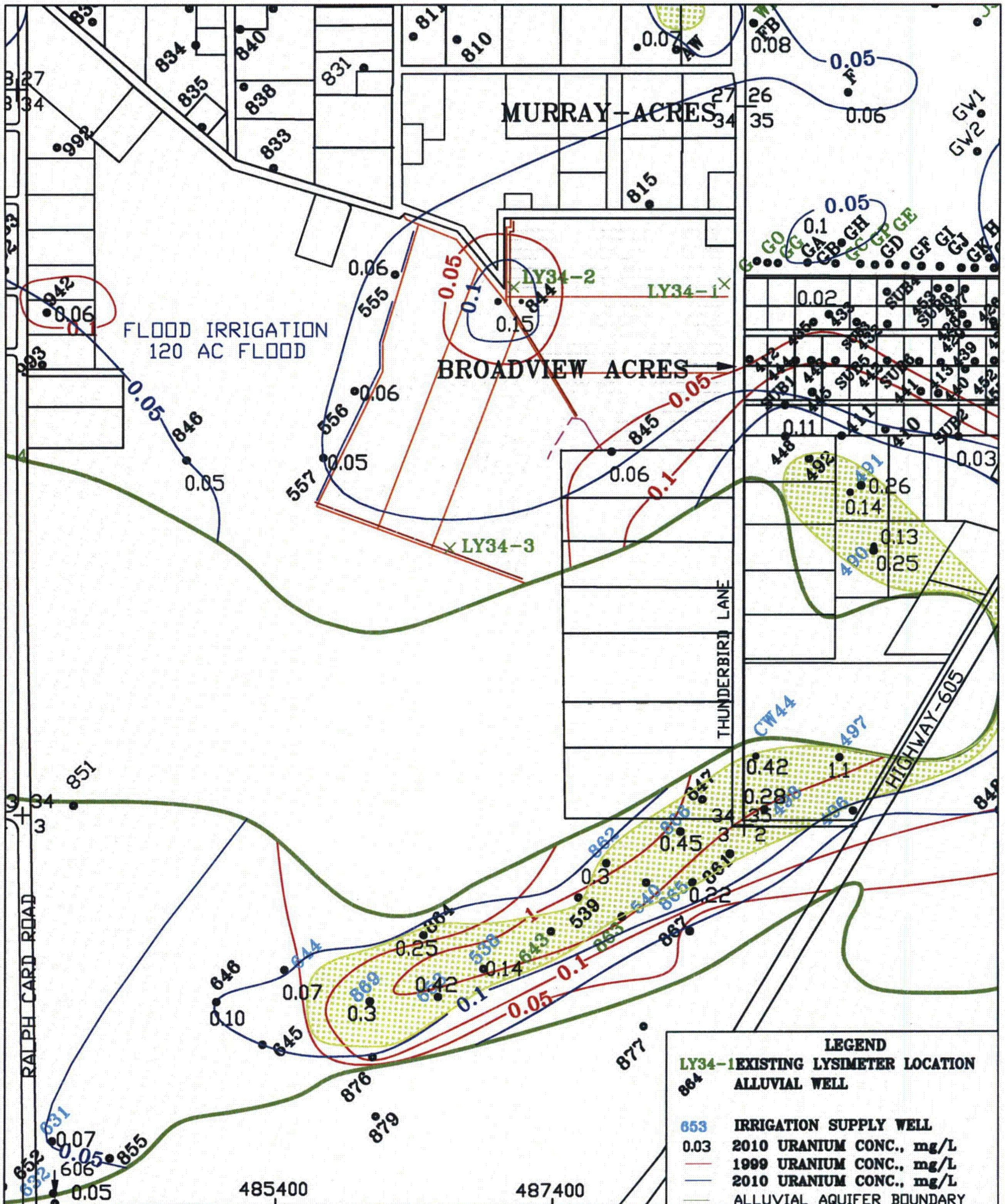


FIGURE 4-6. CHLORIDE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'	FIGURE 4-7. 1999 AND 2010 URANIUM ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO
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DATE: 1/11/10		

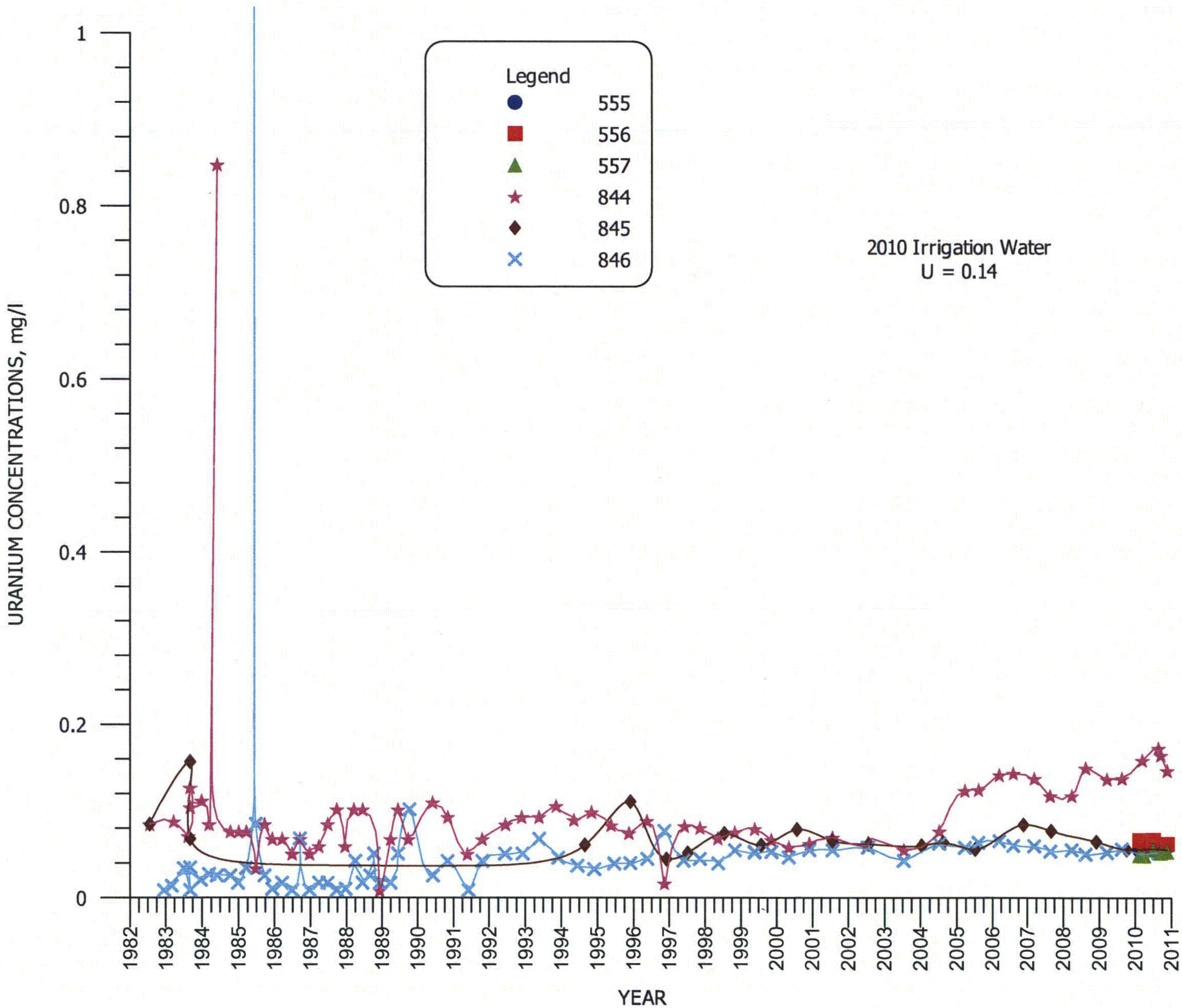
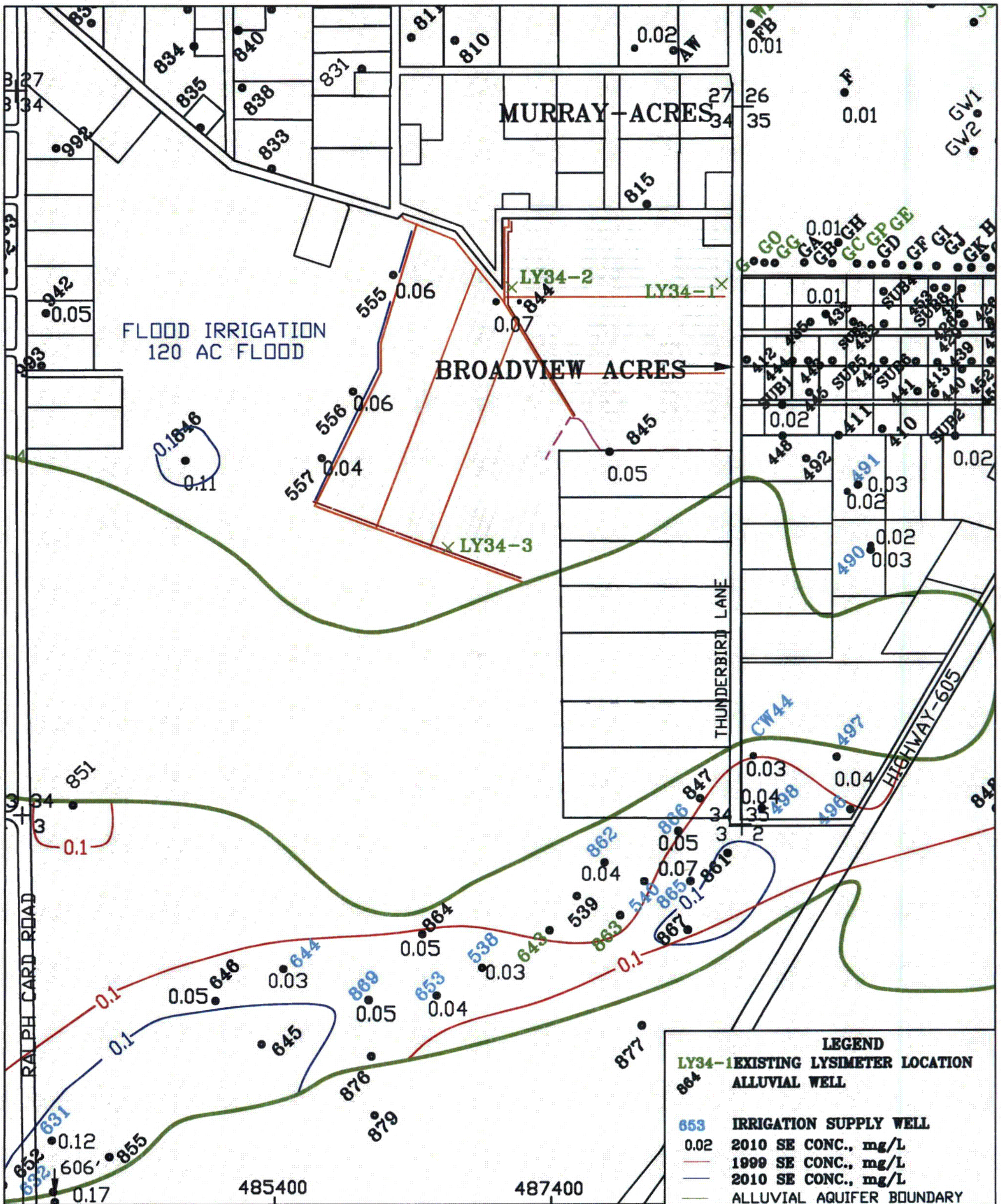


FIGURE 4-8. URANIUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'	**FIGURE 4-9. 2010 SELENIUM ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L**	HOMESTAKE MINING COMPANY
C:\PROJECTS\2010-06\1600QAL10		GRANTS, NEW MEXICO
DATE: 1/11/10		

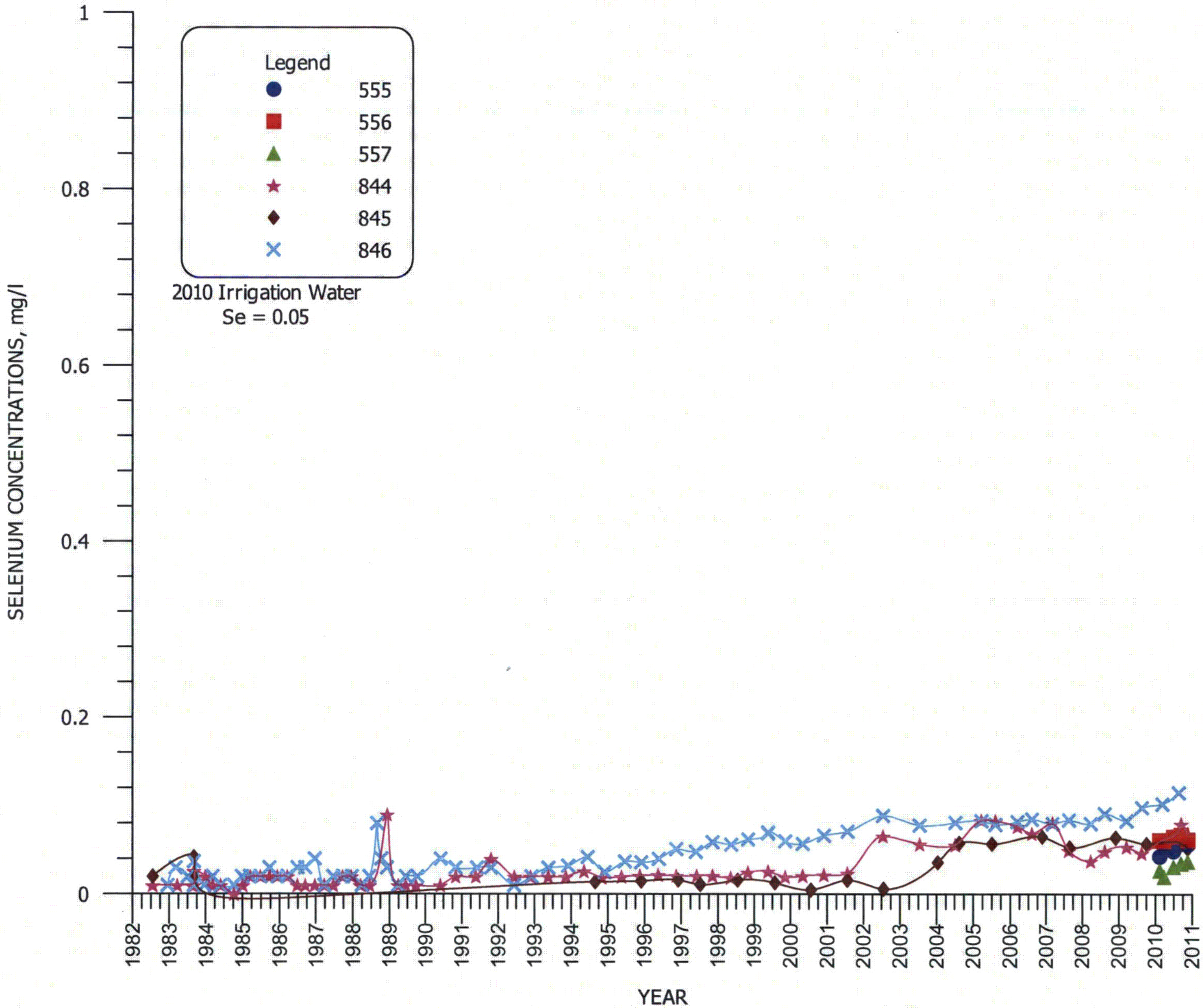
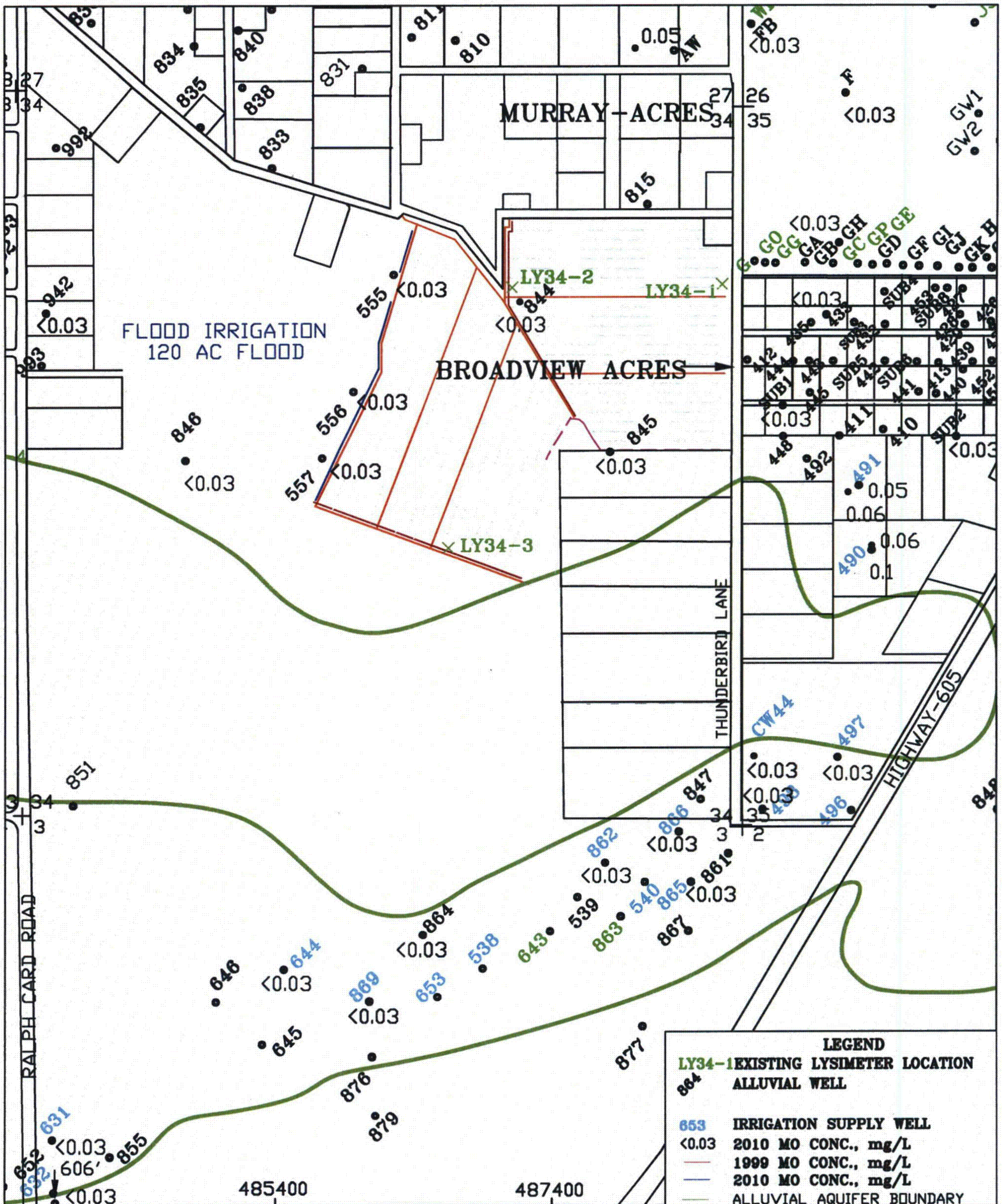


FIGURE 4-10. SELENIUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'

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DATE: 1/11/10

FIGURE 4-11. 2010 MOLYBDENUM ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

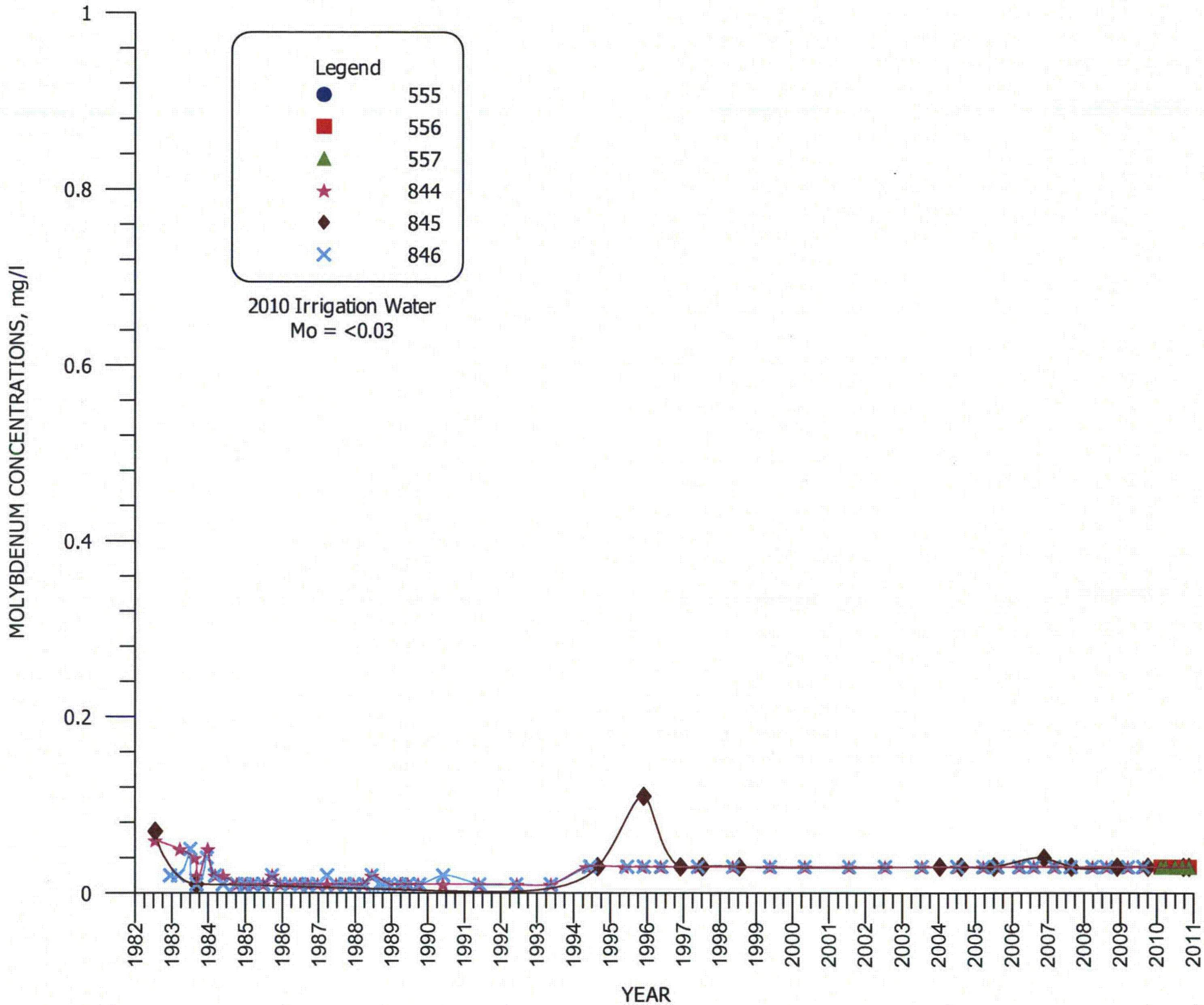
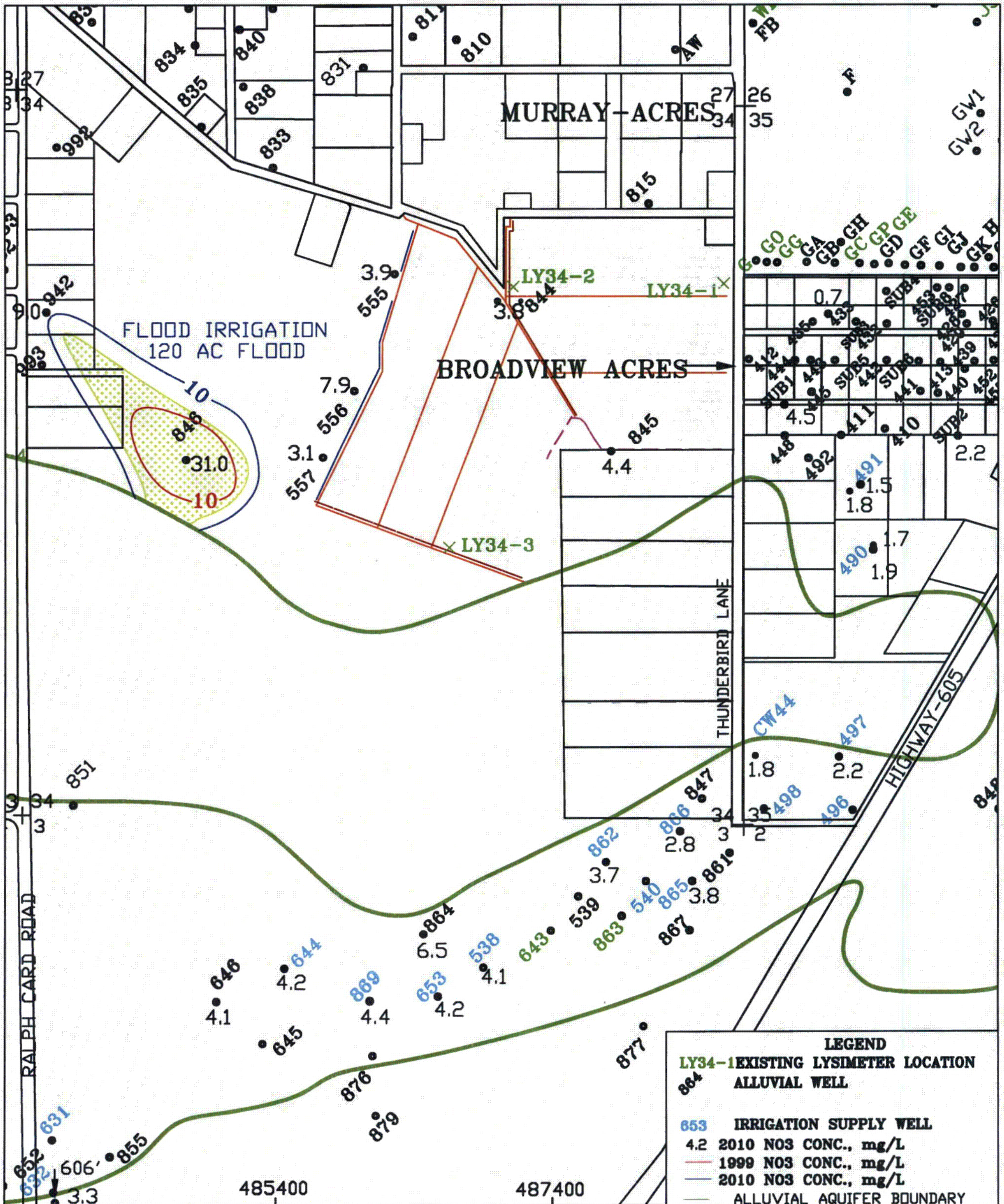


FIGURE 4-12. MOLYBDENUM CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 1000'

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DATE: 1/11/10

FIGURE 4-13. 1999 AND 2010 NITRATE ALLUVIAL CONCENTRATIONS IN SECTION 34, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

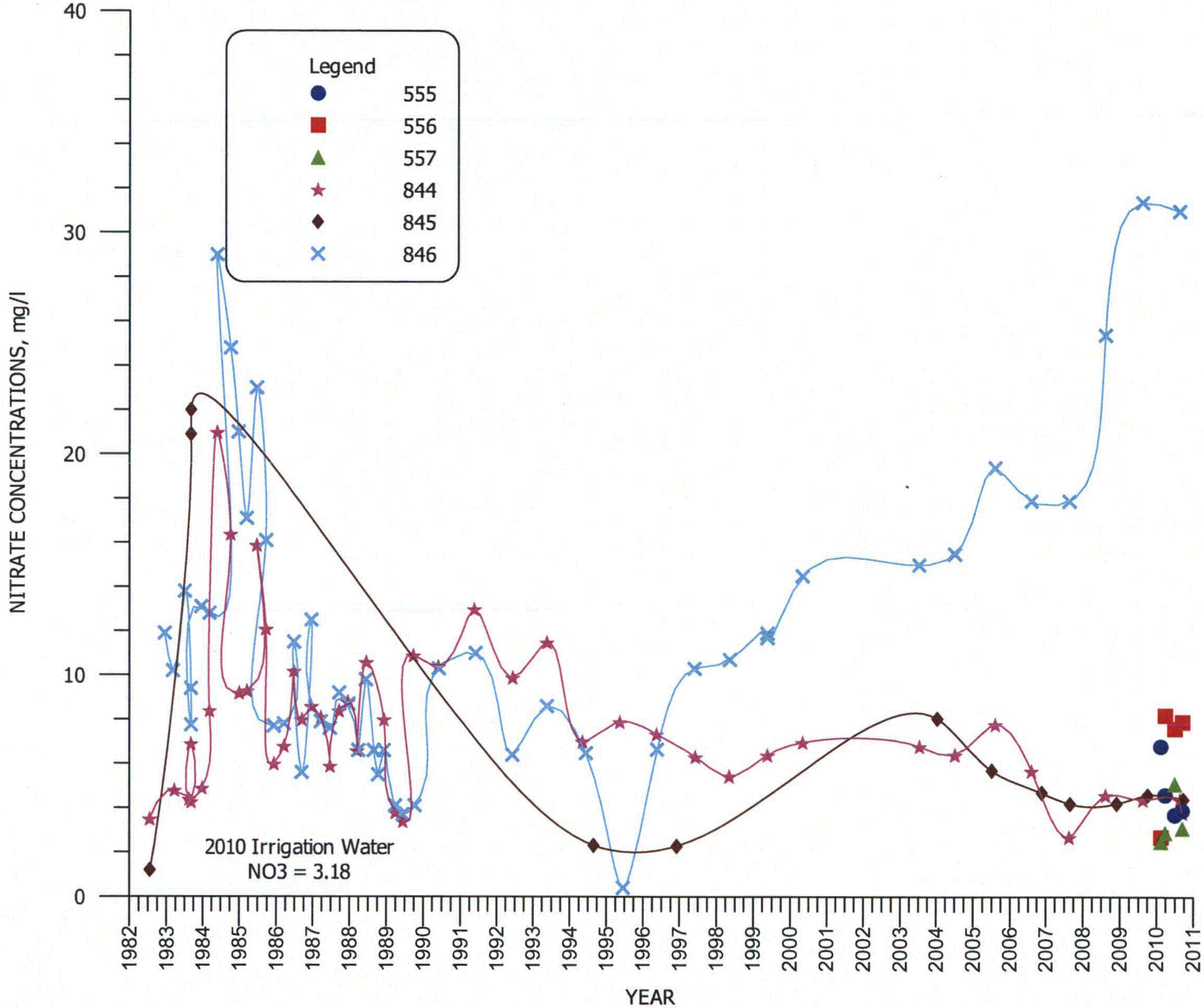
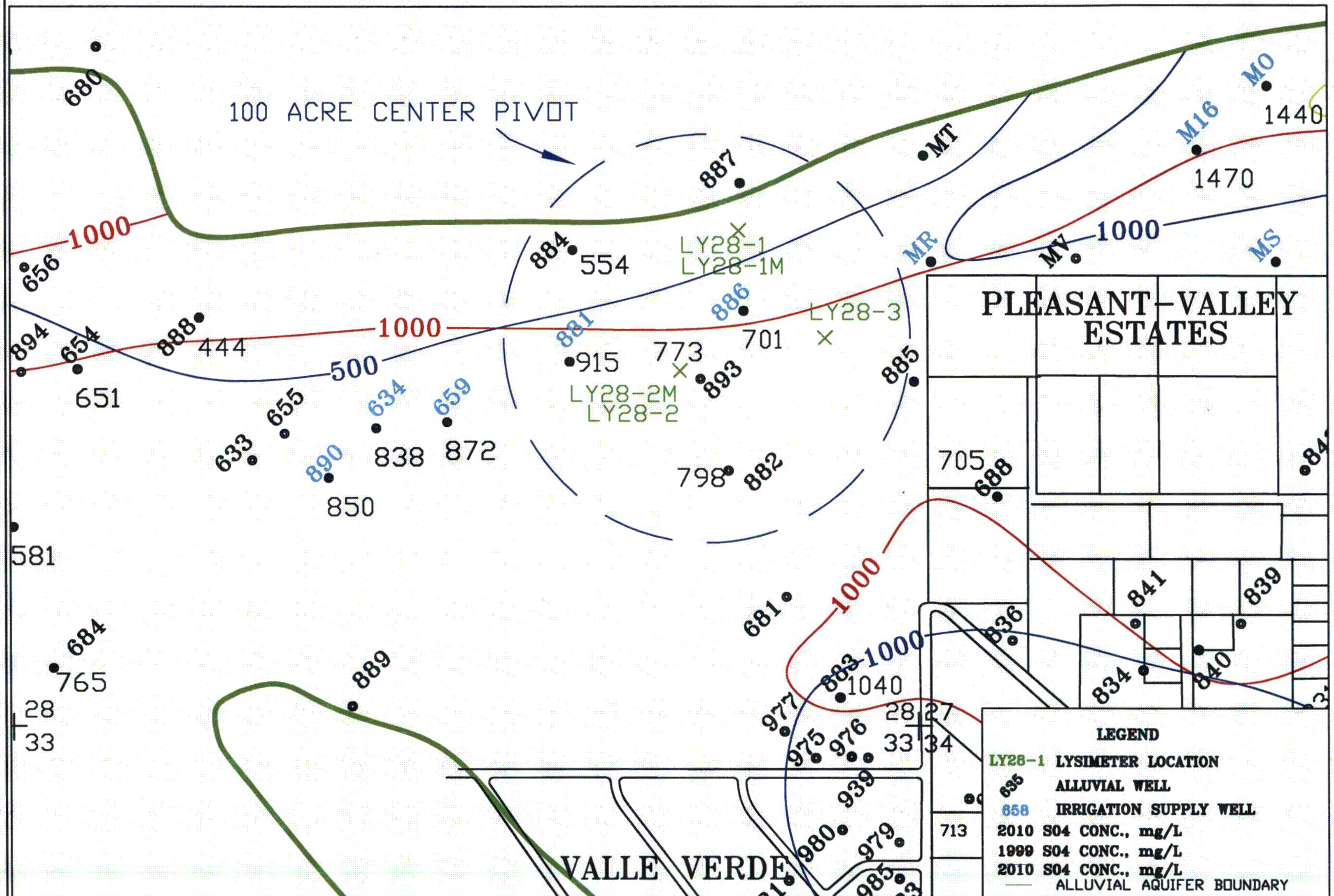


FIGURE 4-14. NITRATE CONCENTRATIONS FOR WELLS 555, 556, 557, 844, 845 AND 846.



SCALE: 1" = 800'

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FIGURE 4-15. 1999 AND 2010 SULFATE ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

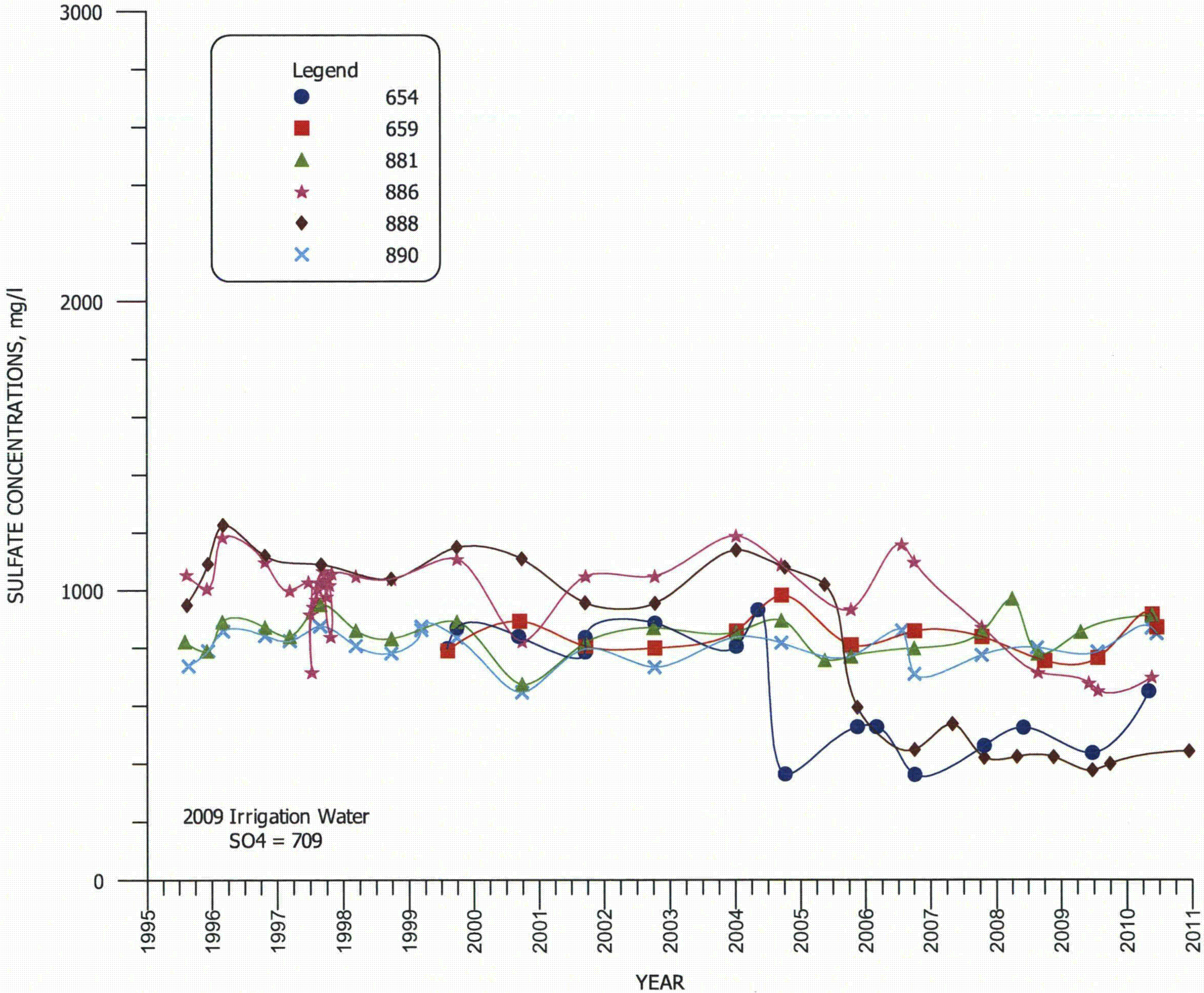
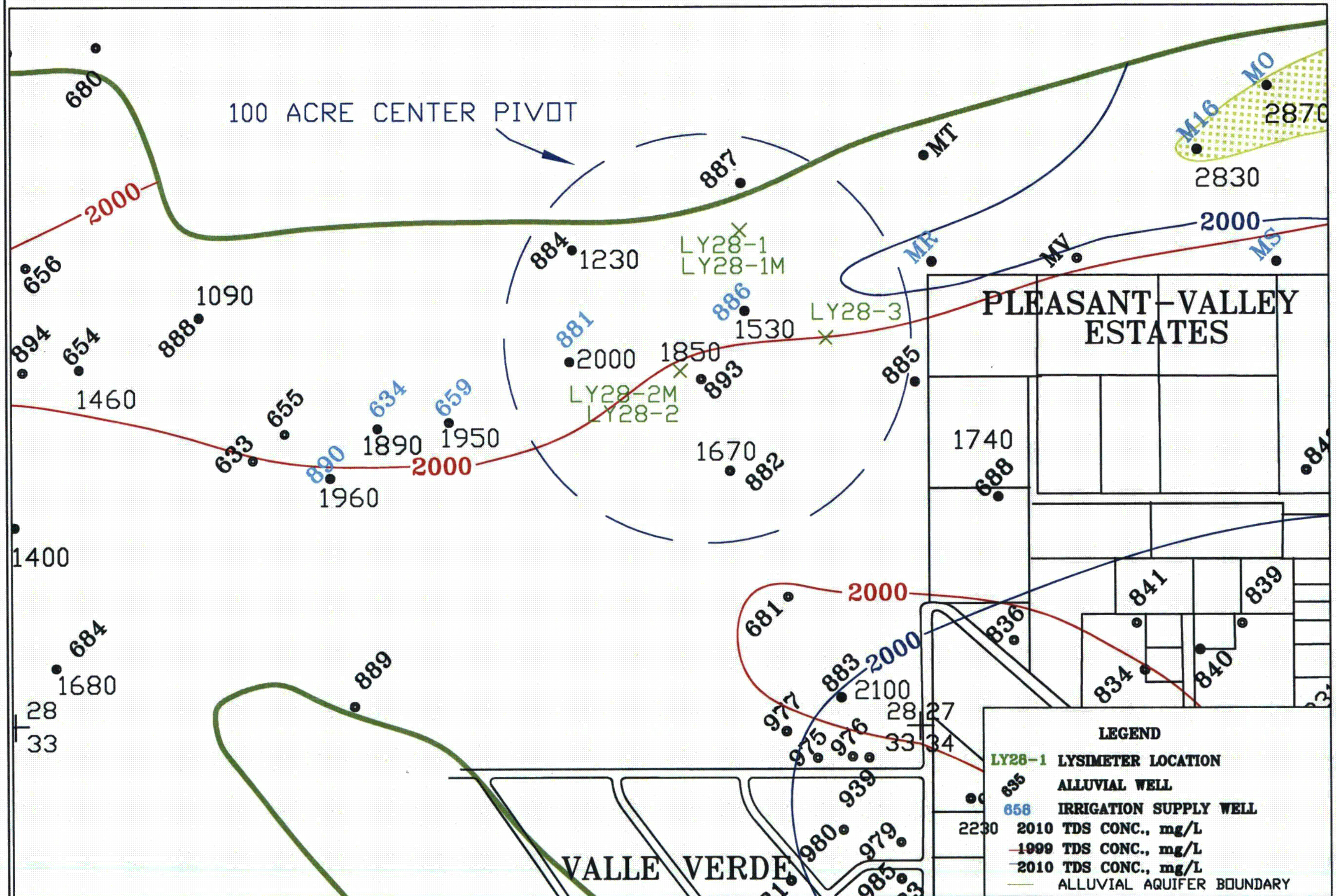


FIGURE 4-16. SULFATE CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800'

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FIGURE 4-17. 1999 AND 2010 TDS ALLUVIAL CONCENTRATION IN SECTION 28, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

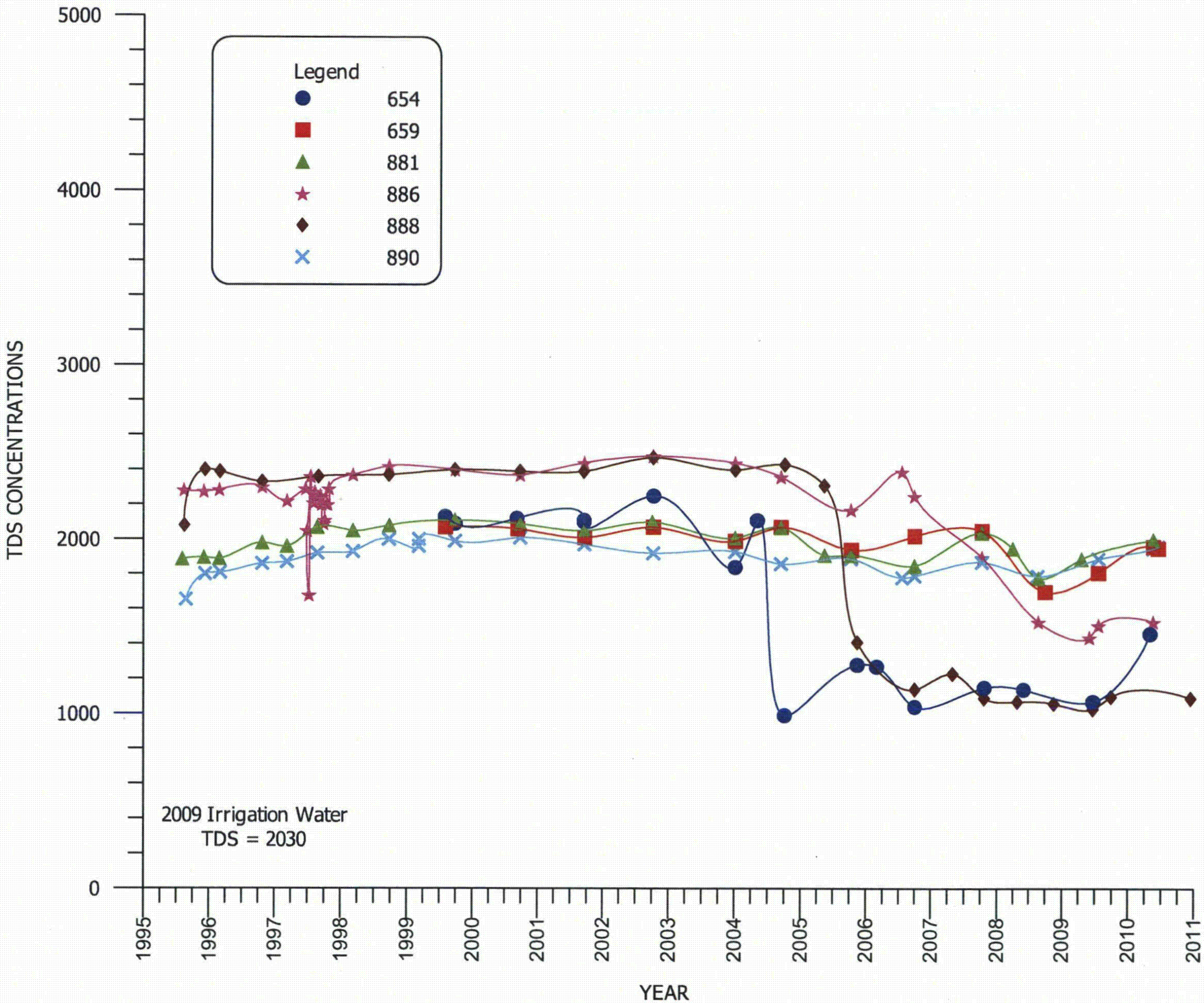
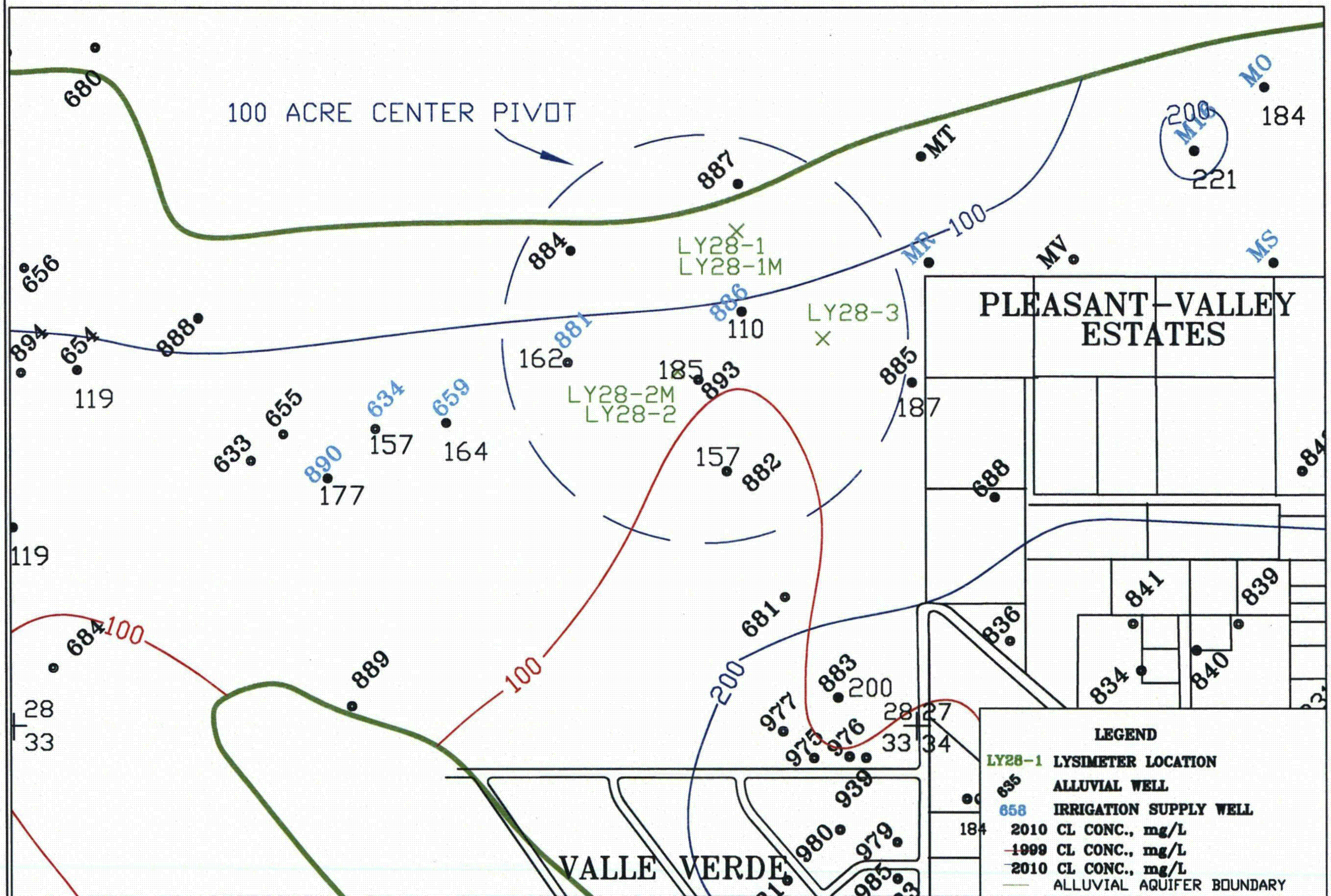


FIGURE 4-18. TDS CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800'

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DATE: 1/10/11

FIGURE 4-19. 1999 AND 2009 CHLORIDE ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

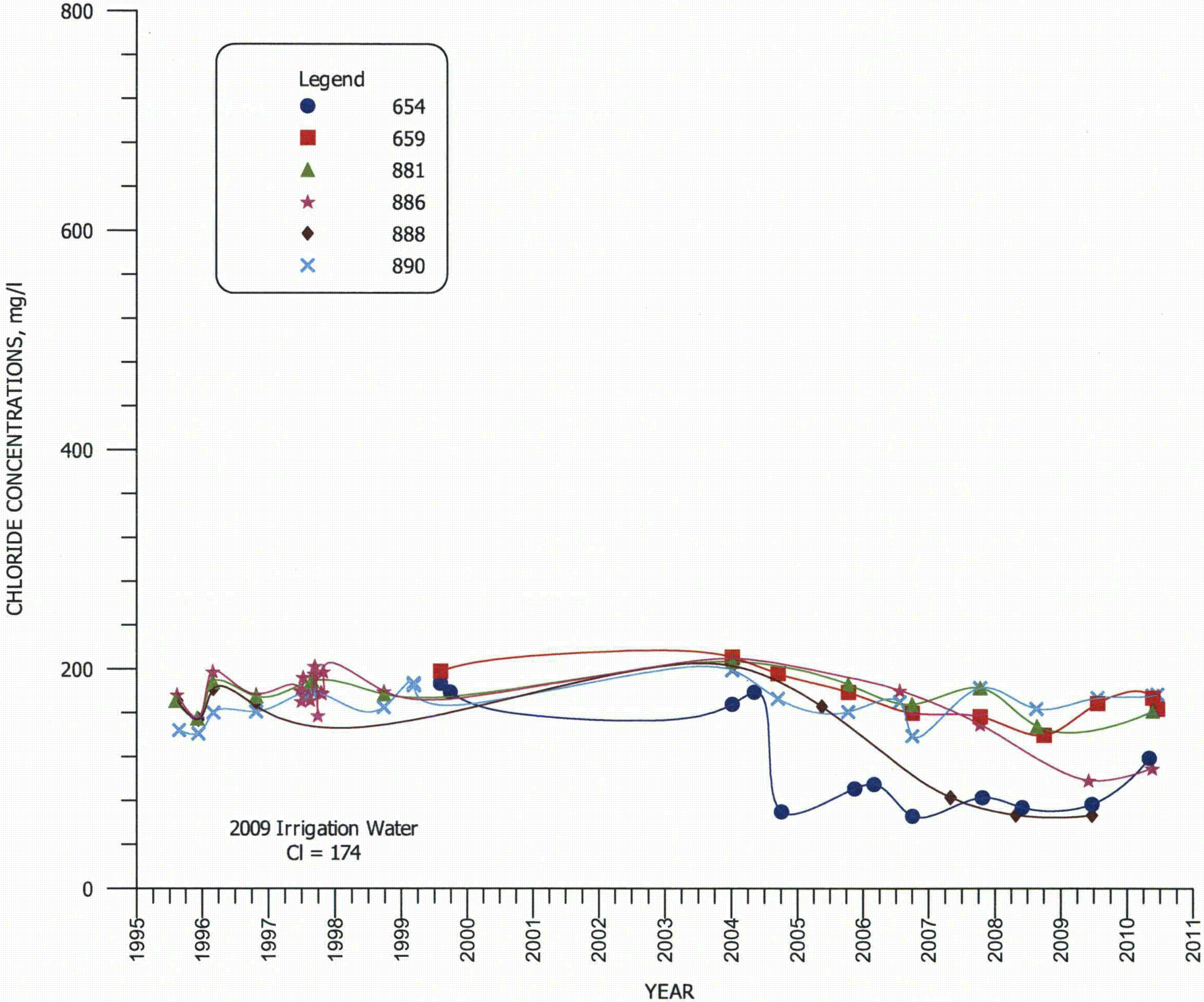
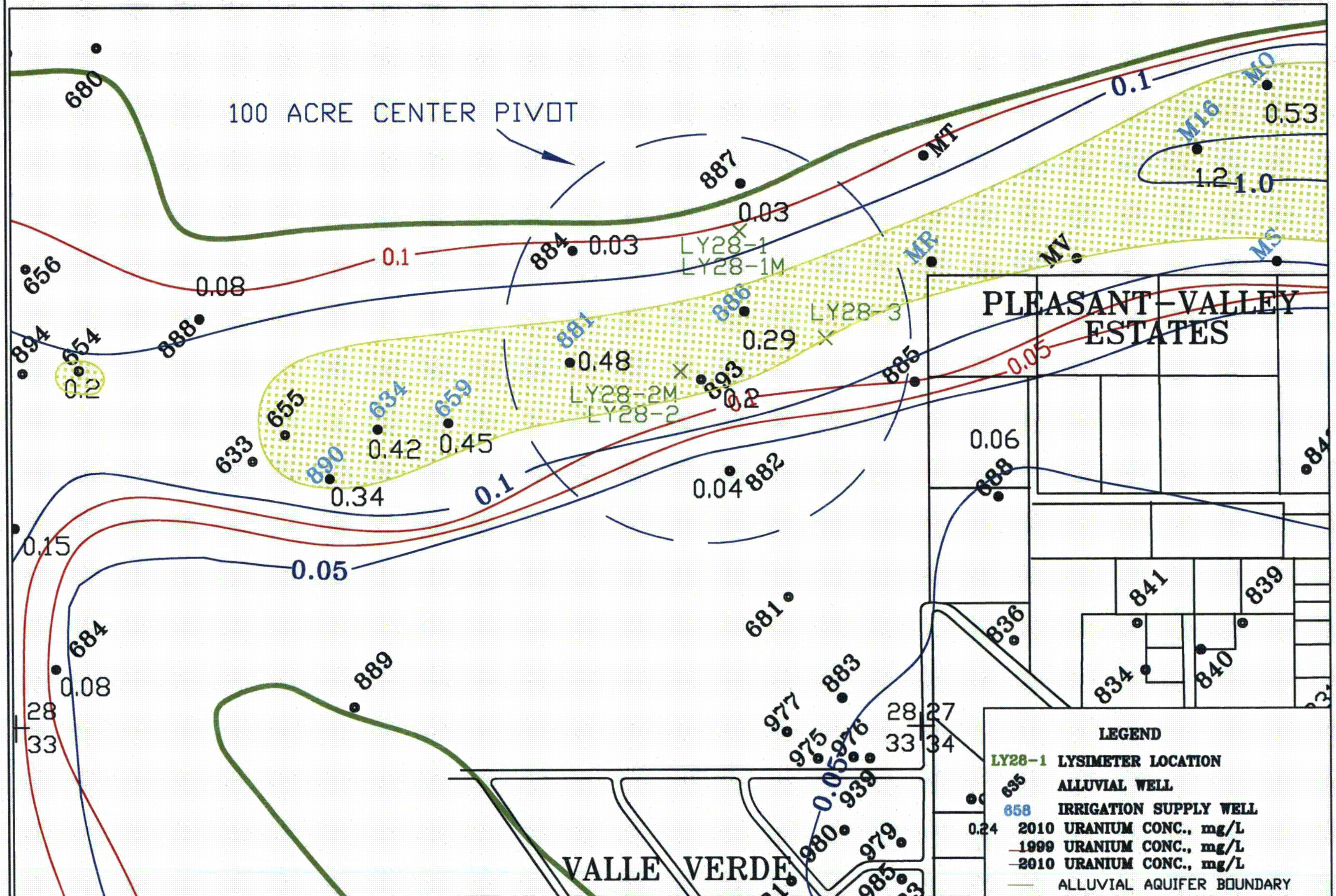


FIGURE 4-20. CHLORIDE CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800'

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FIGURE 4-21. 1999 AND 2010 URANIUM ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

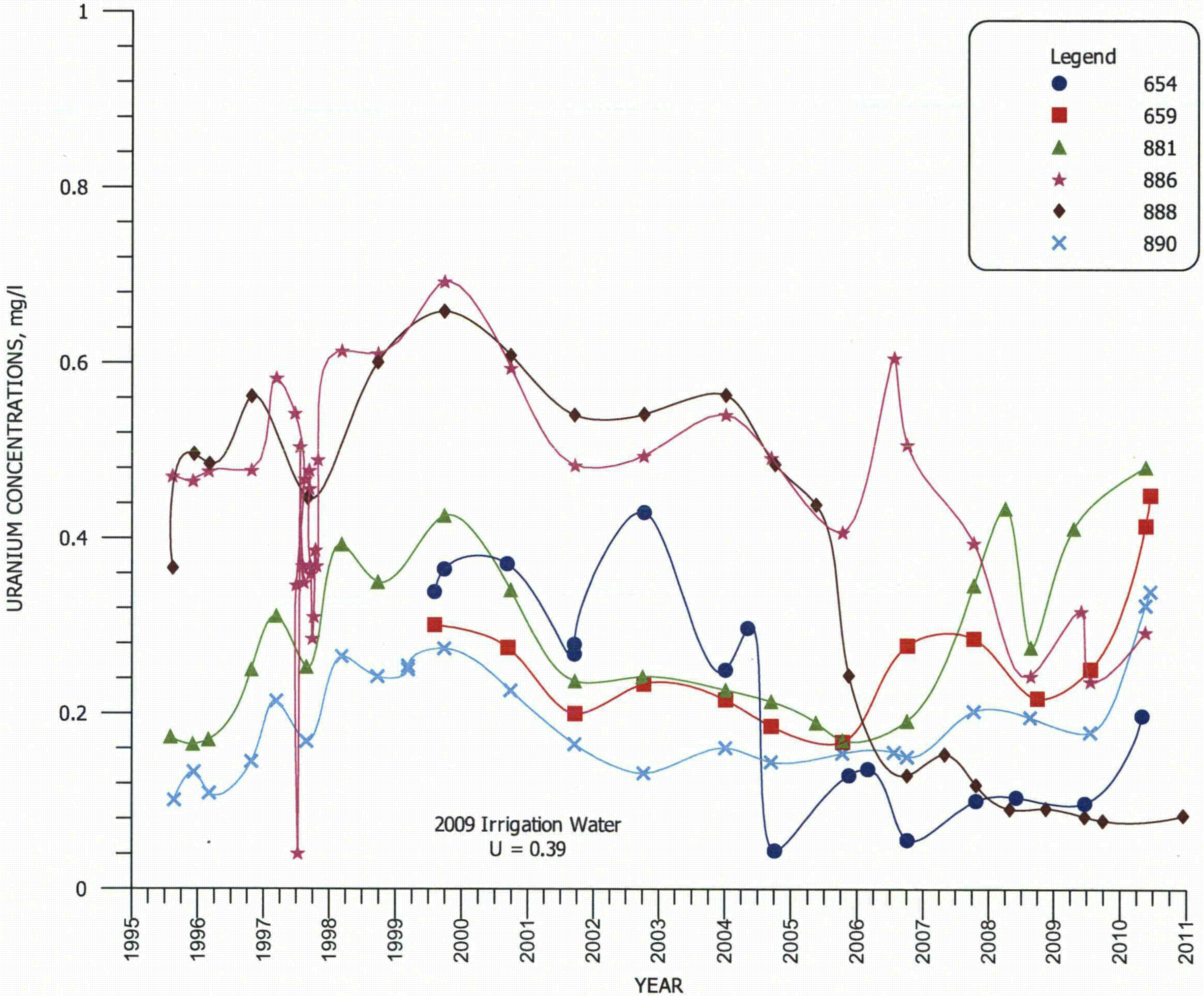
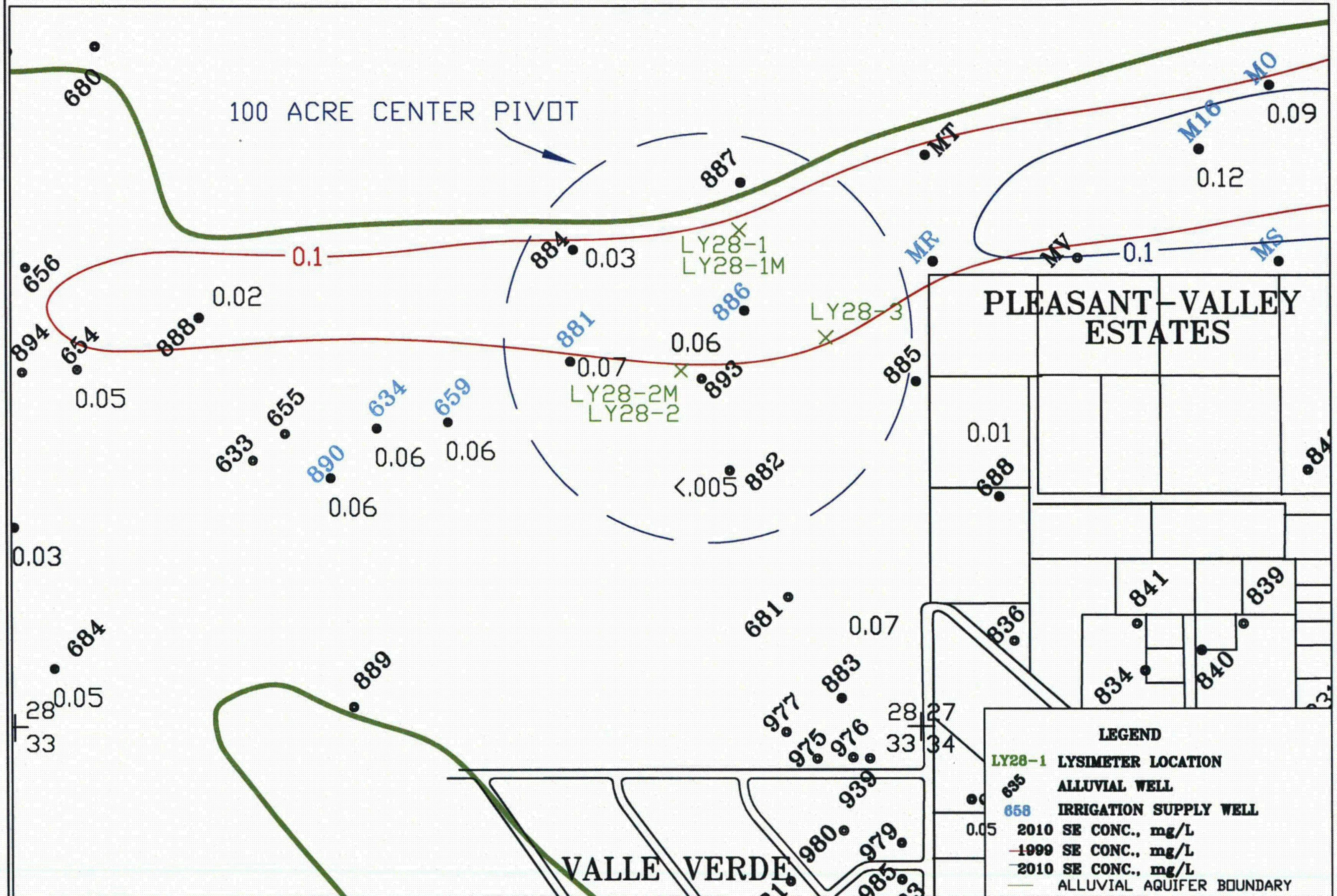


FIGURE 4-22. URANIUM CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800' C:\PROJECTS\2010-06\1600QAL10 DATE: 1/10/11	**FIGURE 5-23. 1999 AND 2010 SELENIUM ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L**	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO

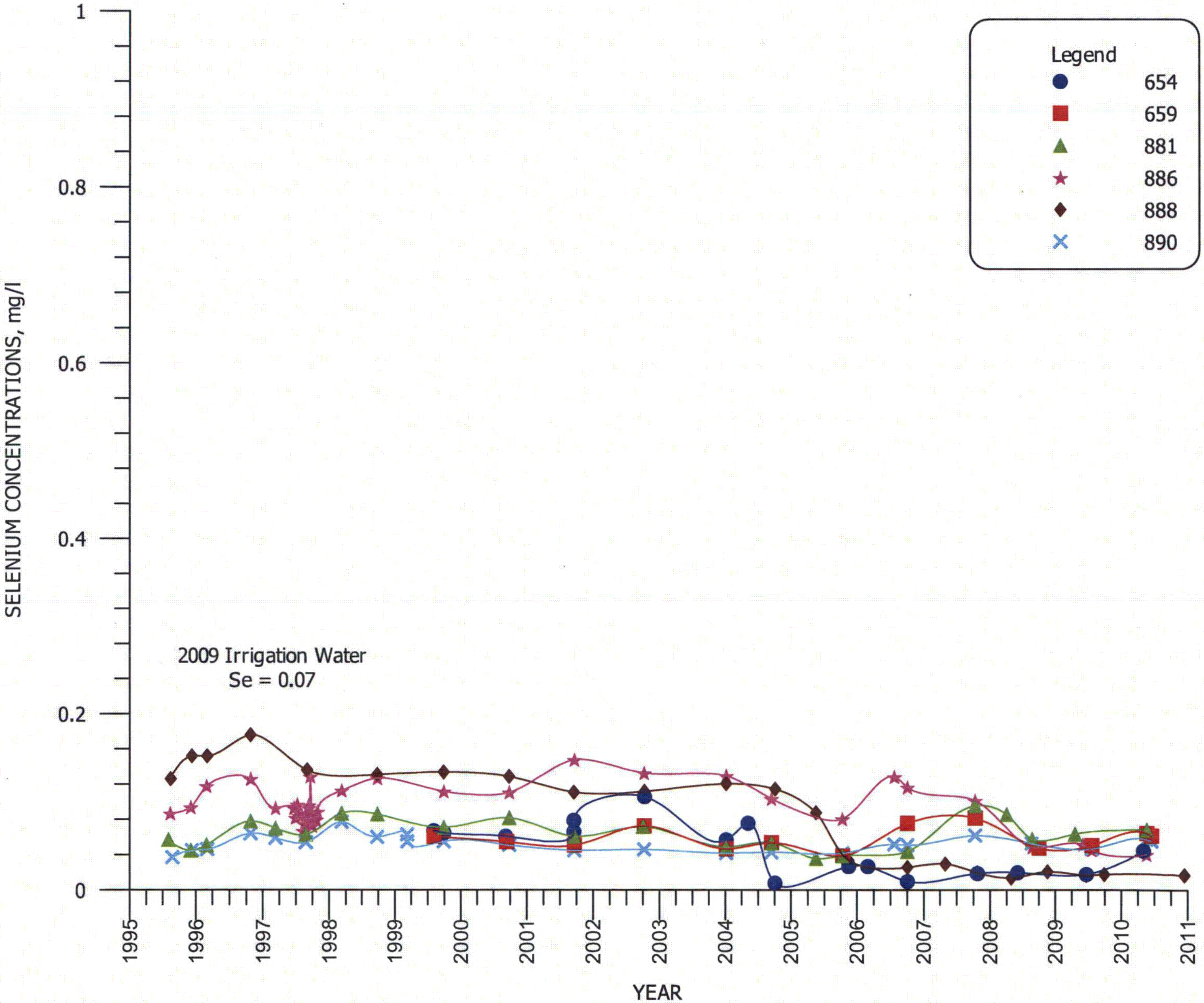
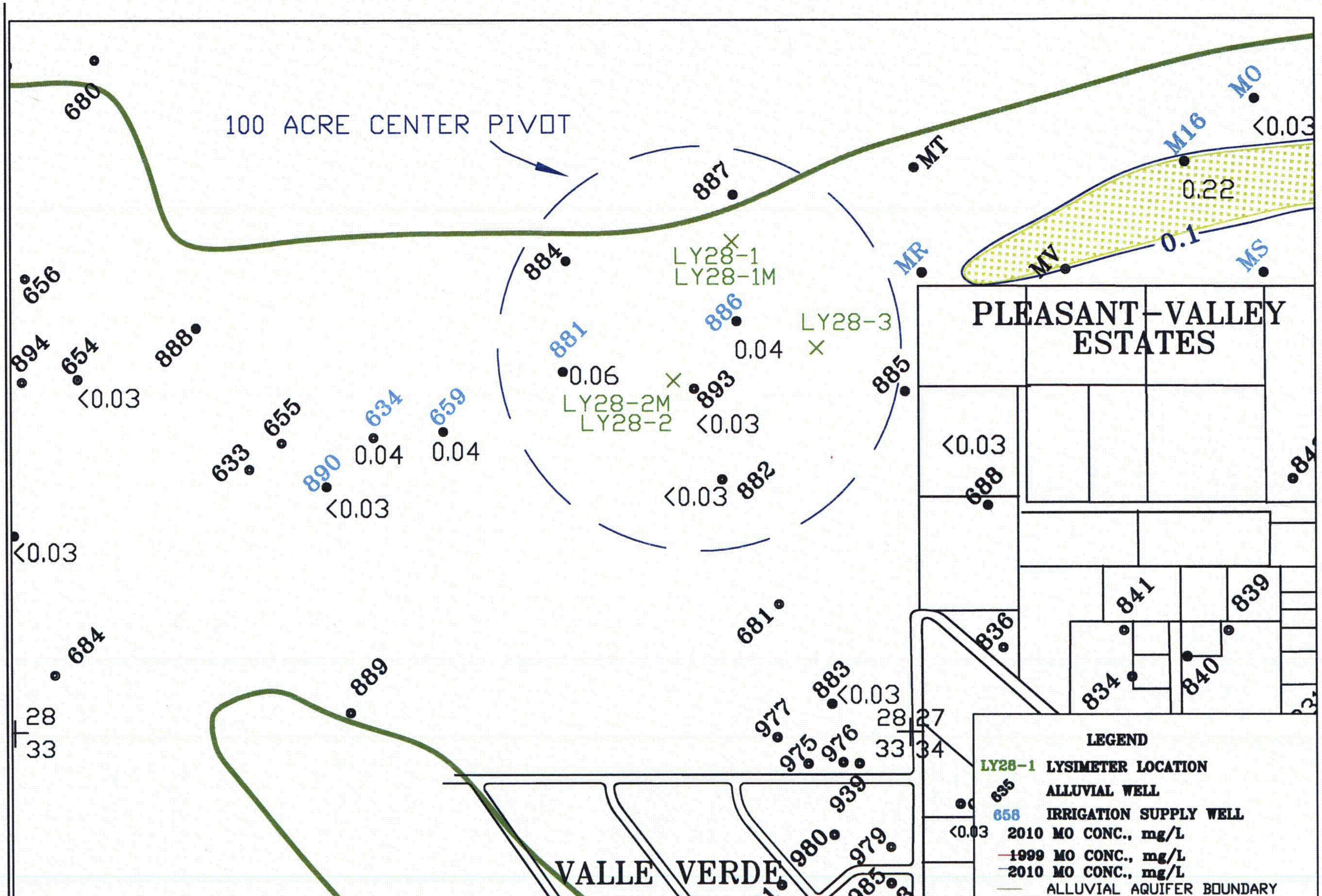


FIGURE 4-24. SELENIUM CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800'

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FIGURE 4-25. 2010 MOLYBDENUM ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

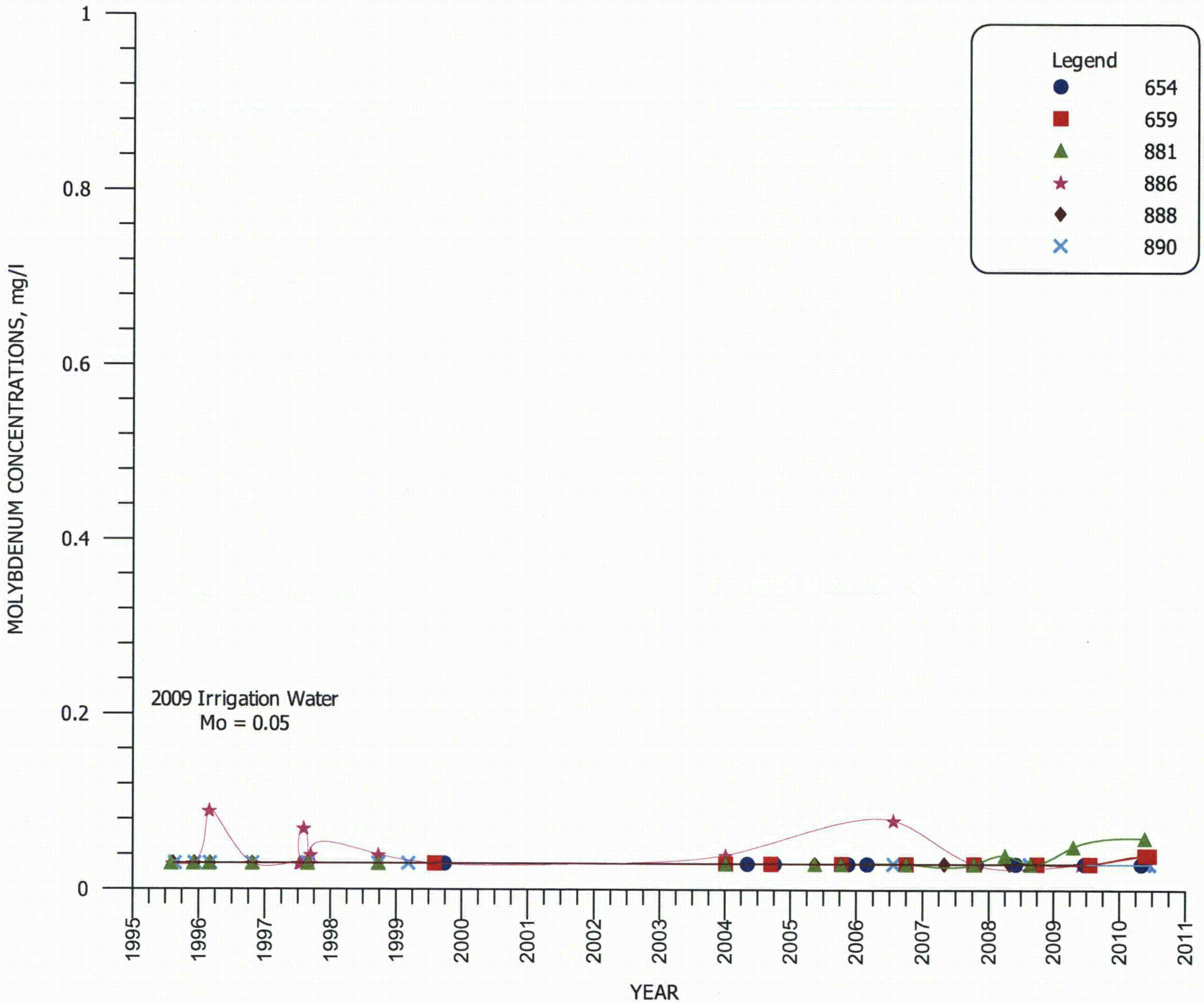
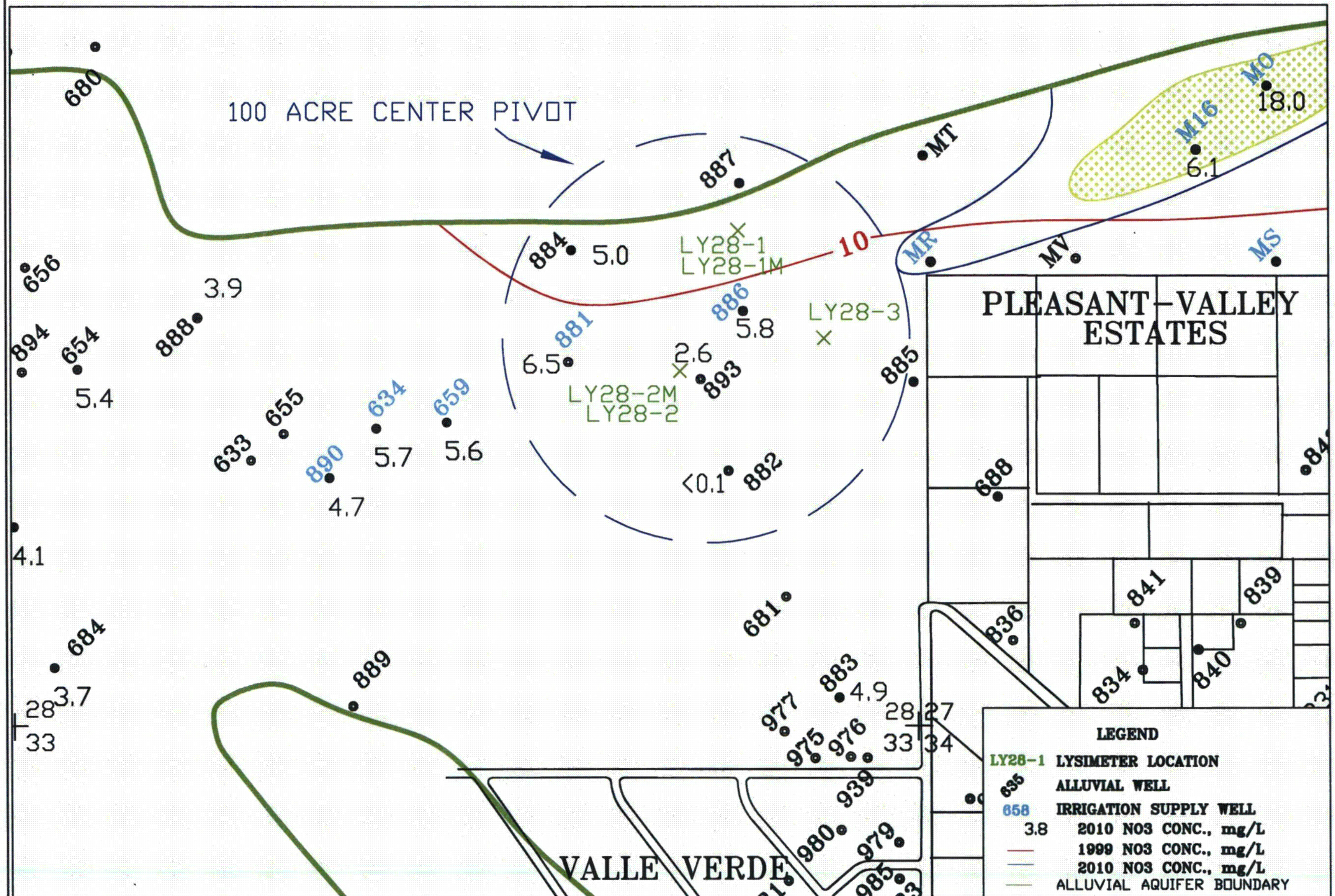


FIGURE 4-26. MOLYBDENUM CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 800'	FIGURE 4-27. 1999 AND 2010 NITRATE ALLUVIAL CONCENTRATIONS IN SECTION 28, mg/L	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO
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DATE: 1/10/11		

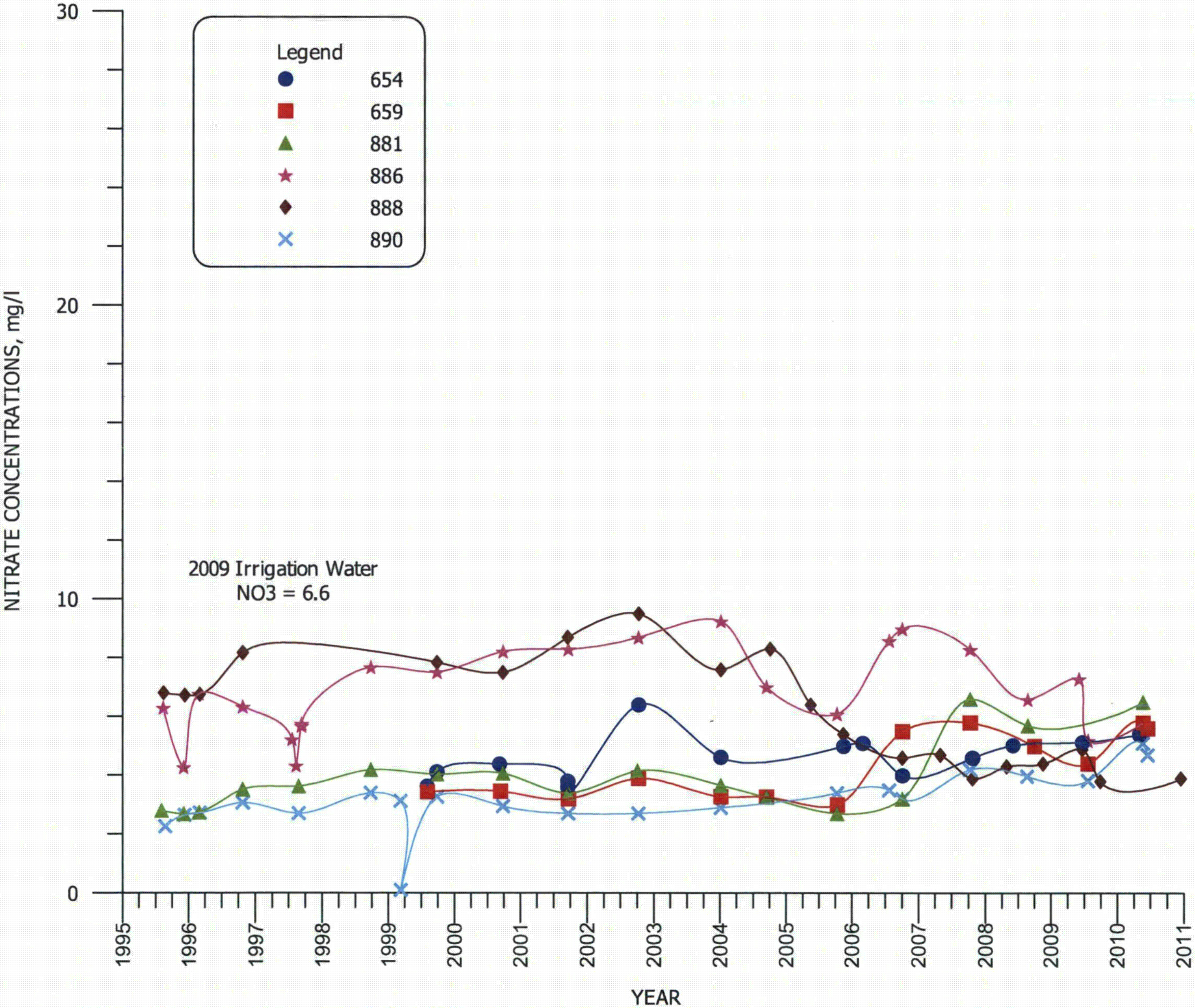
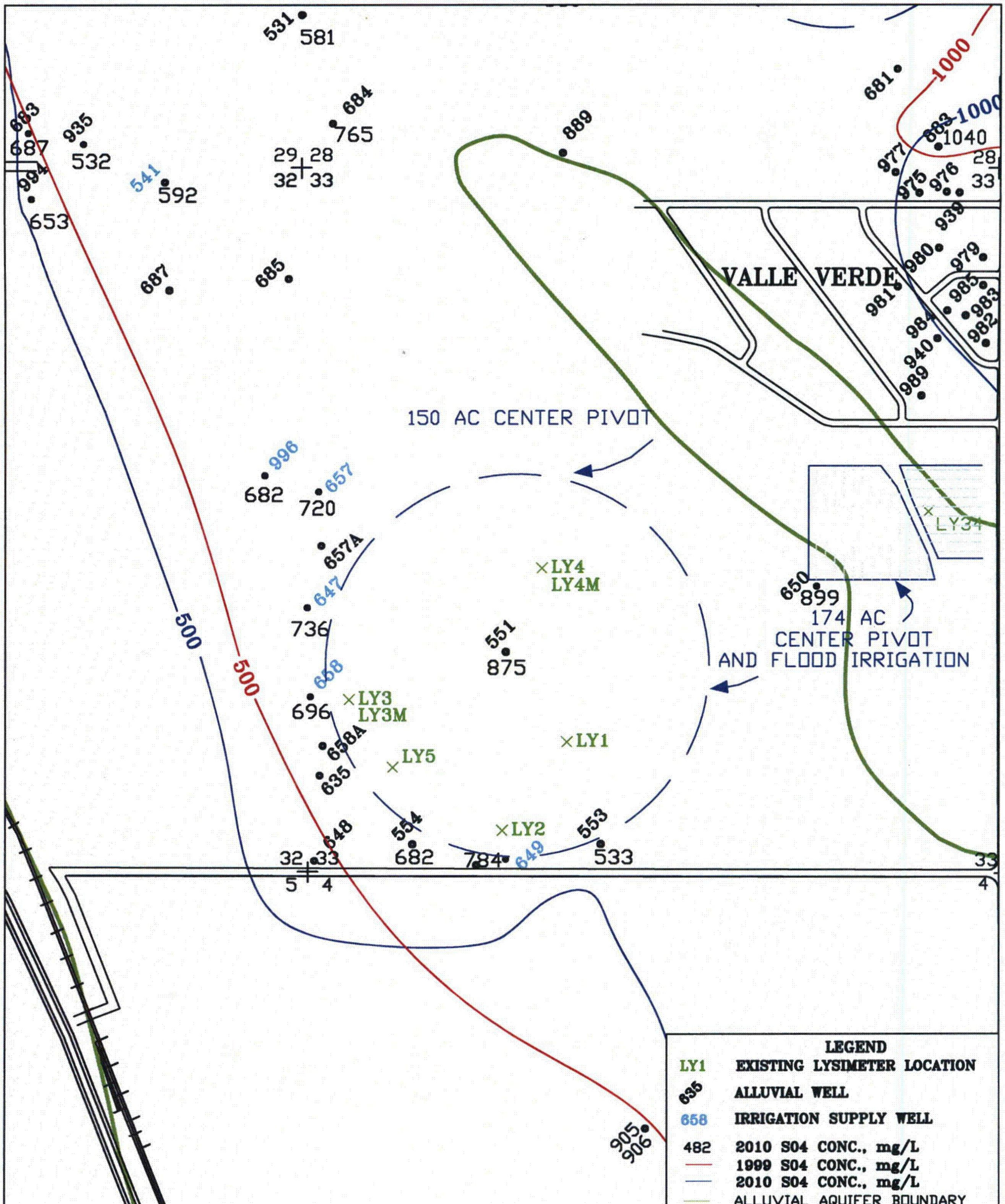


FIGURE 4-28. NITRATE CONCENTRATIONS FOR WELLS 654, 659, 881, 886, 888 AND 890.



SCALE: 1" = 1000'

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DATE: 1/10/11

FIGURE 4-29. 1999 AND 2010 SULFATE ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

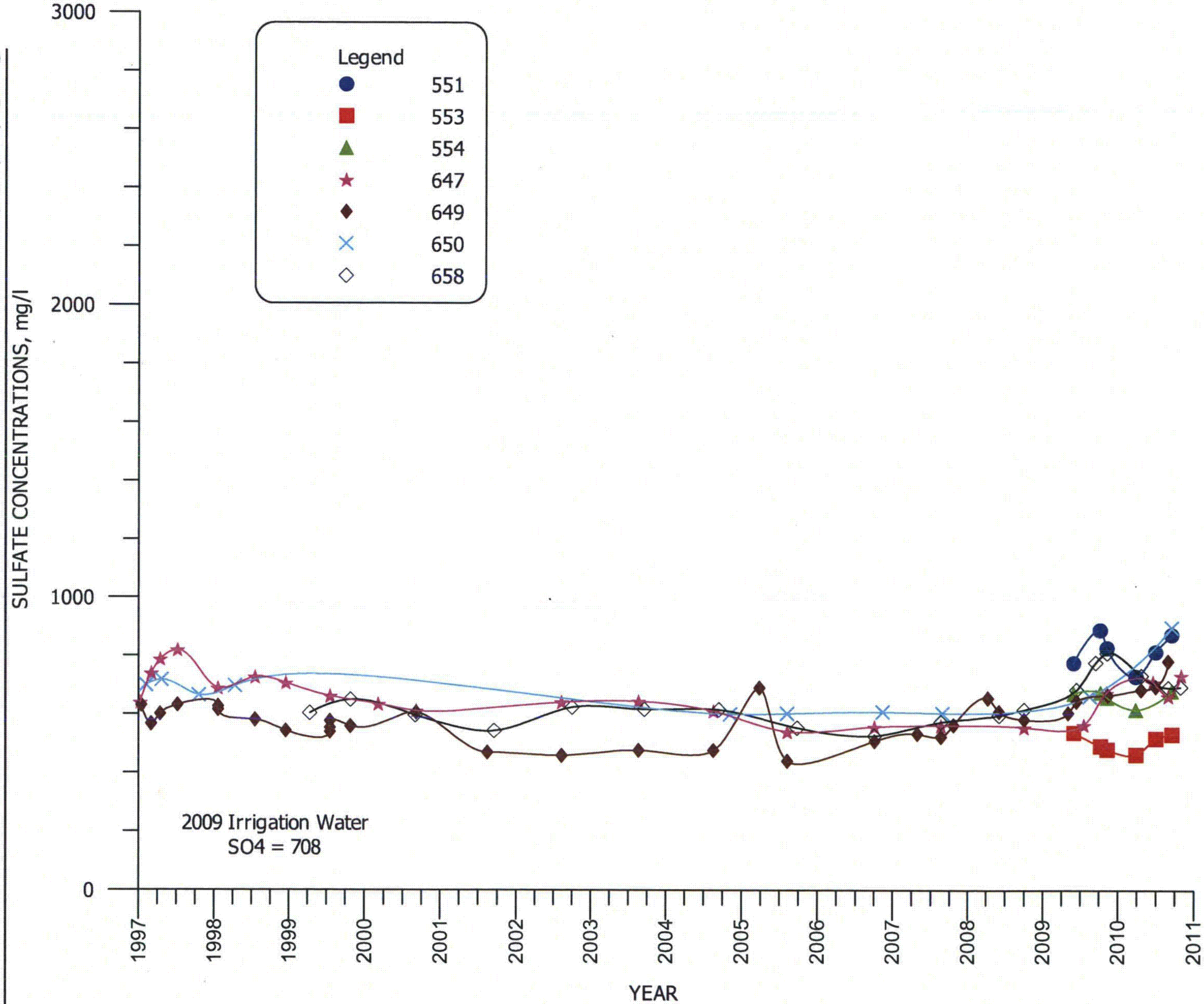
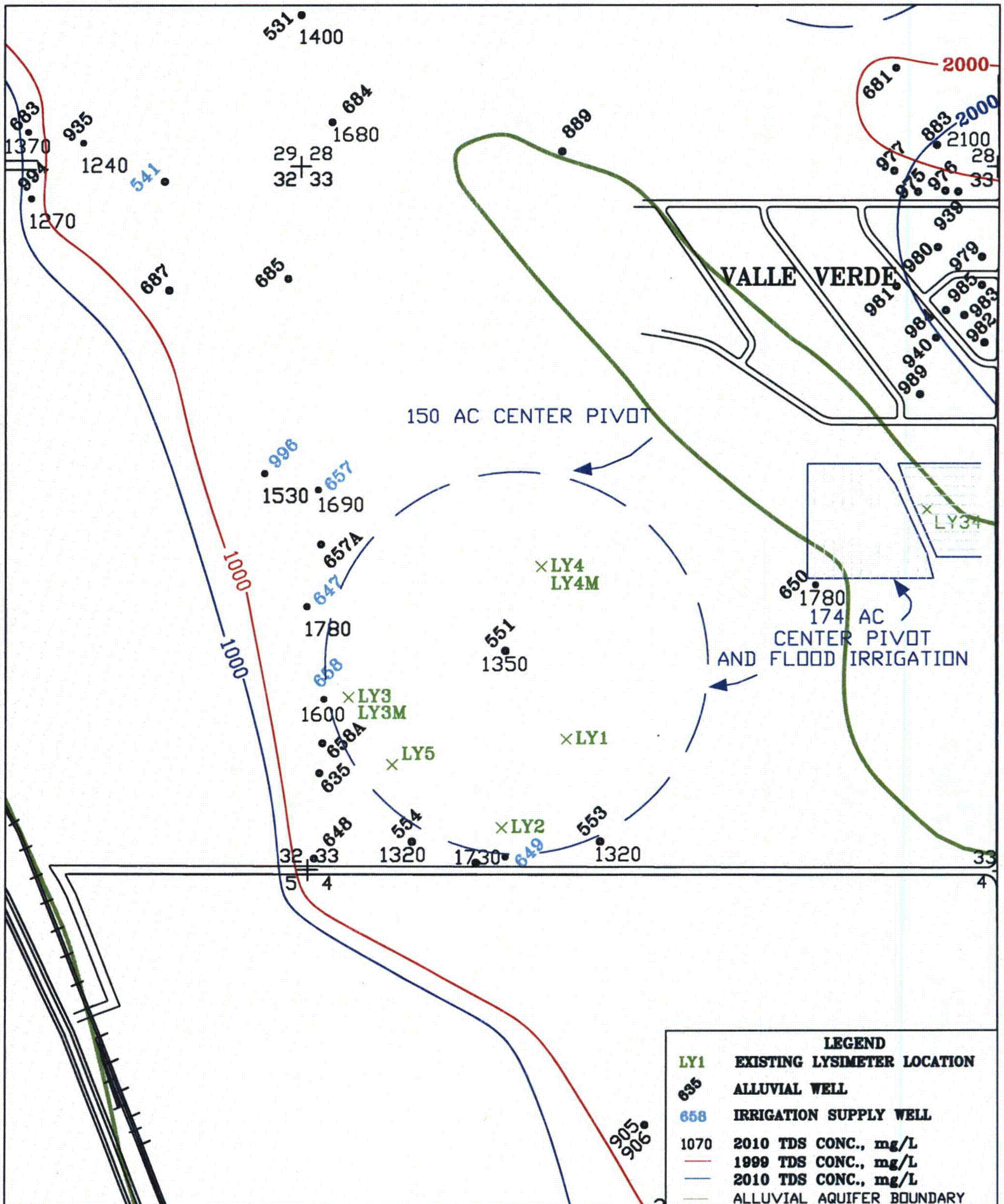


FIGURE 4-30. SULFATE CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000'

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DATE: 1/10/11

FIGURE 4-31. 1999 AND 2010 TDS ALLUVIAL CONCENTRATION IN SECTION 33, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

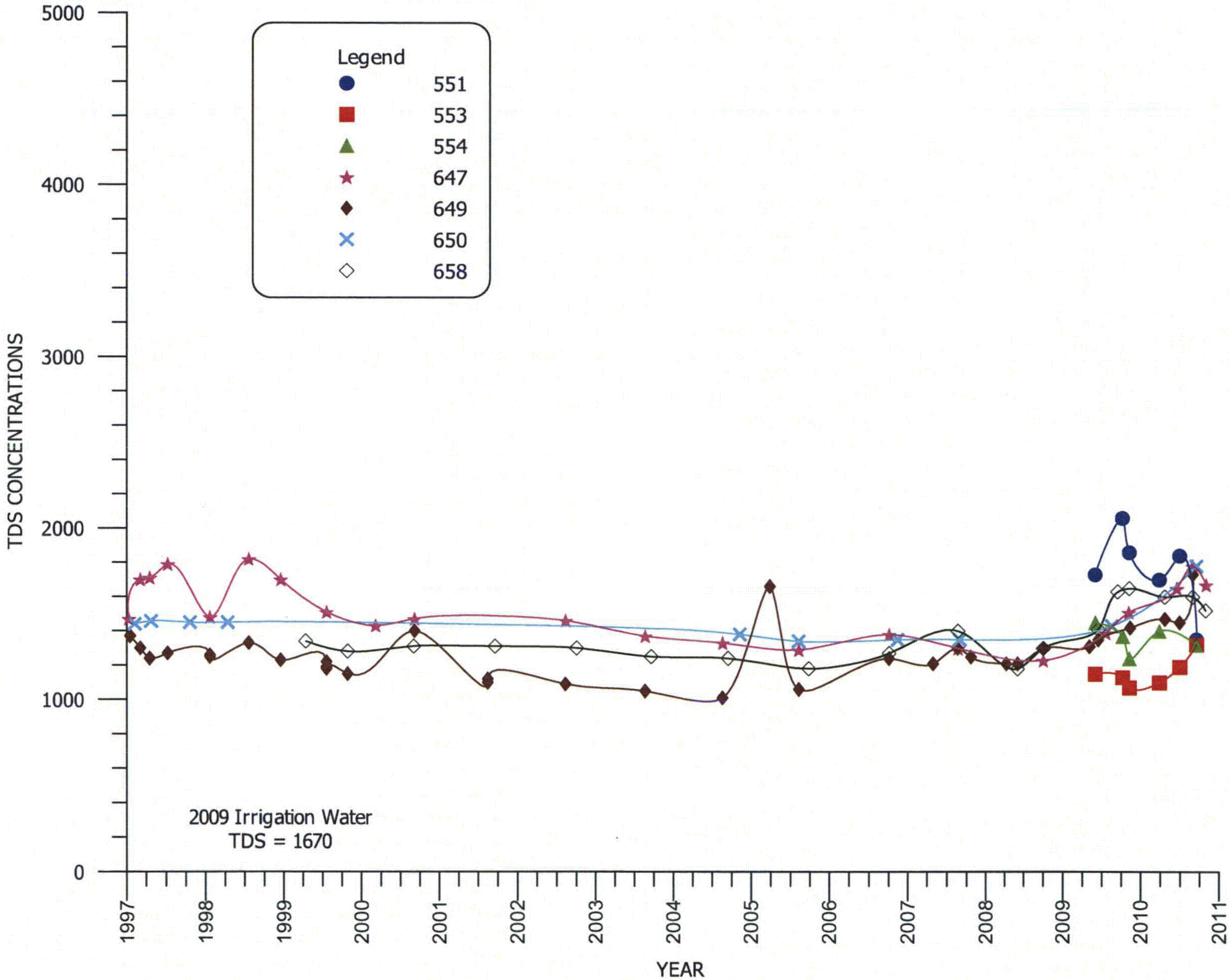
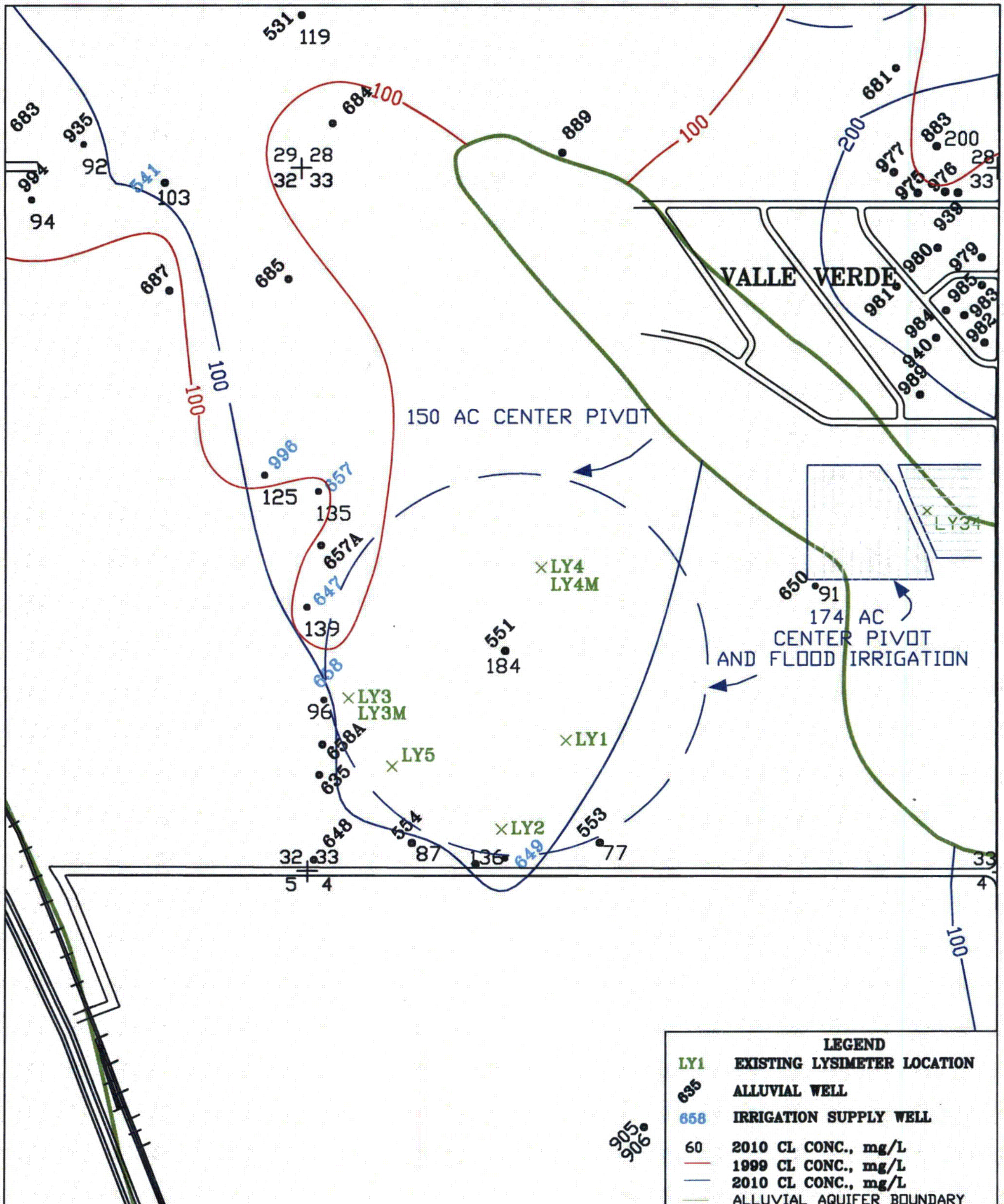


FIGURE 4-32. TDS CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000'

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DATE: 1/10/11

FIGURE 4-33. 1999 AND 2010 CHLORIDE ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

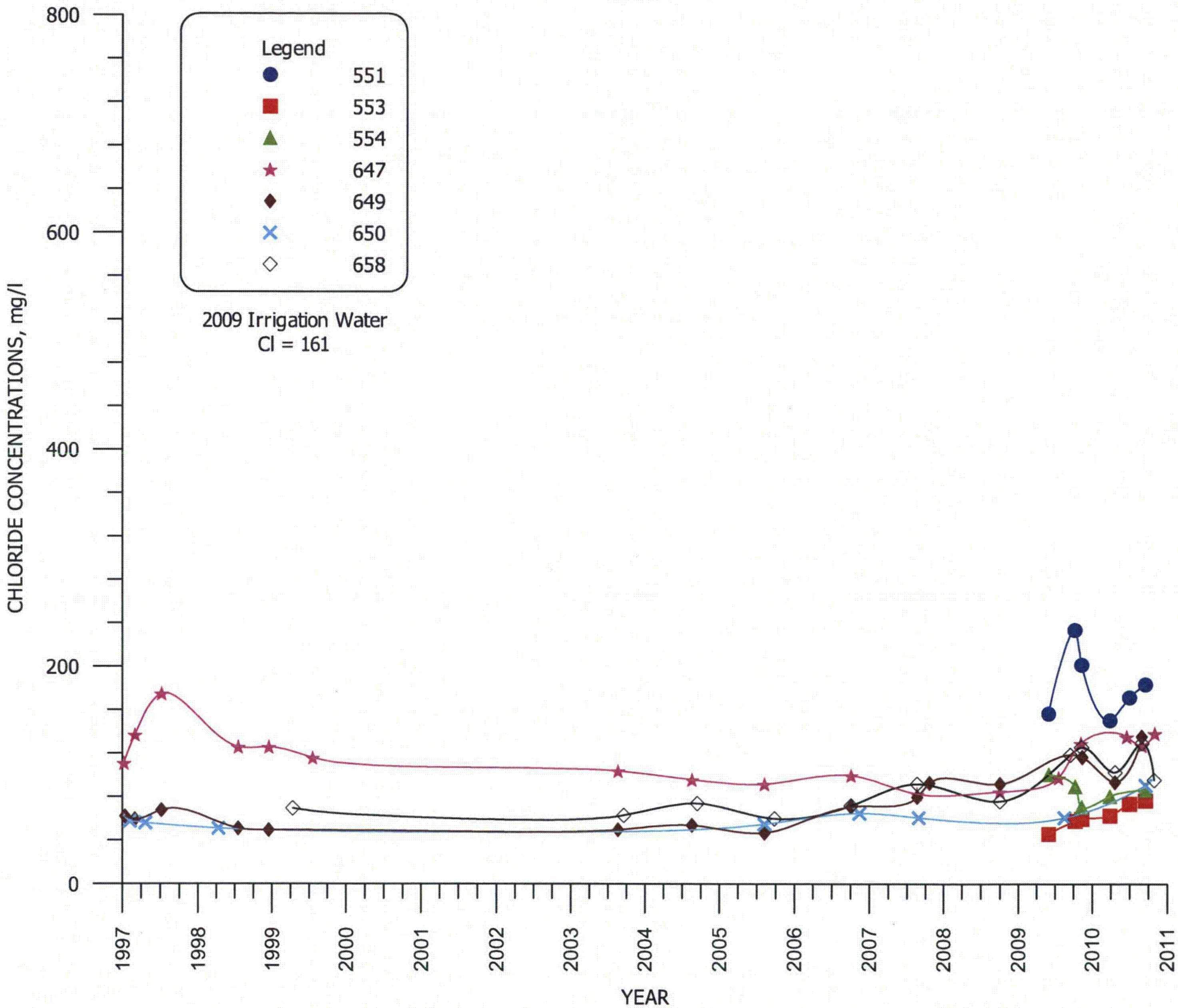
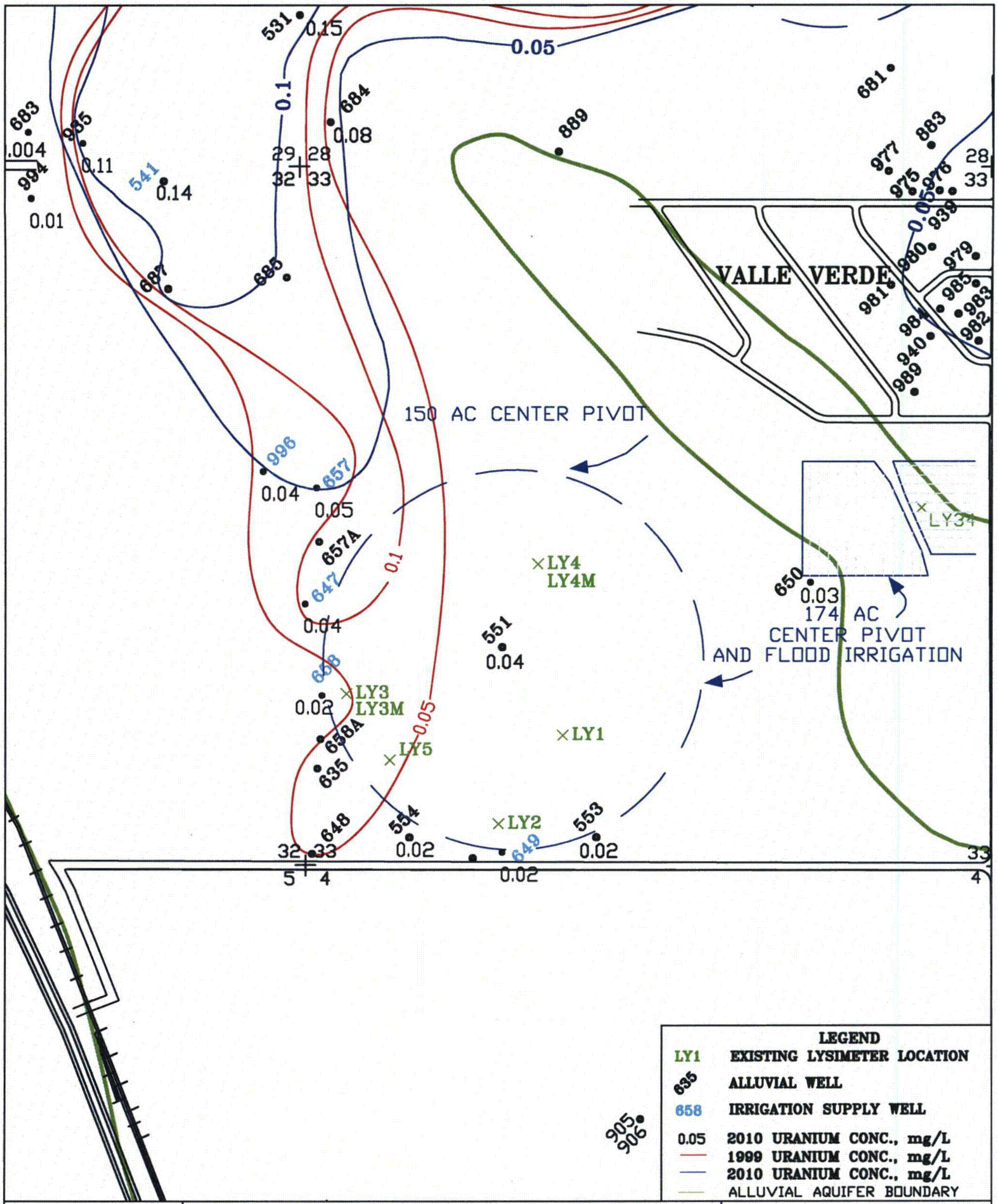


FIGURE 4-34. CHLORIDE CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000'

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DATE: 1/10/11

FIGURE 4-35. 1999 AND 2010 URANIUM ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L

HOMESTAKE MINING COMPANY

GRANTS, NEW MEXICO

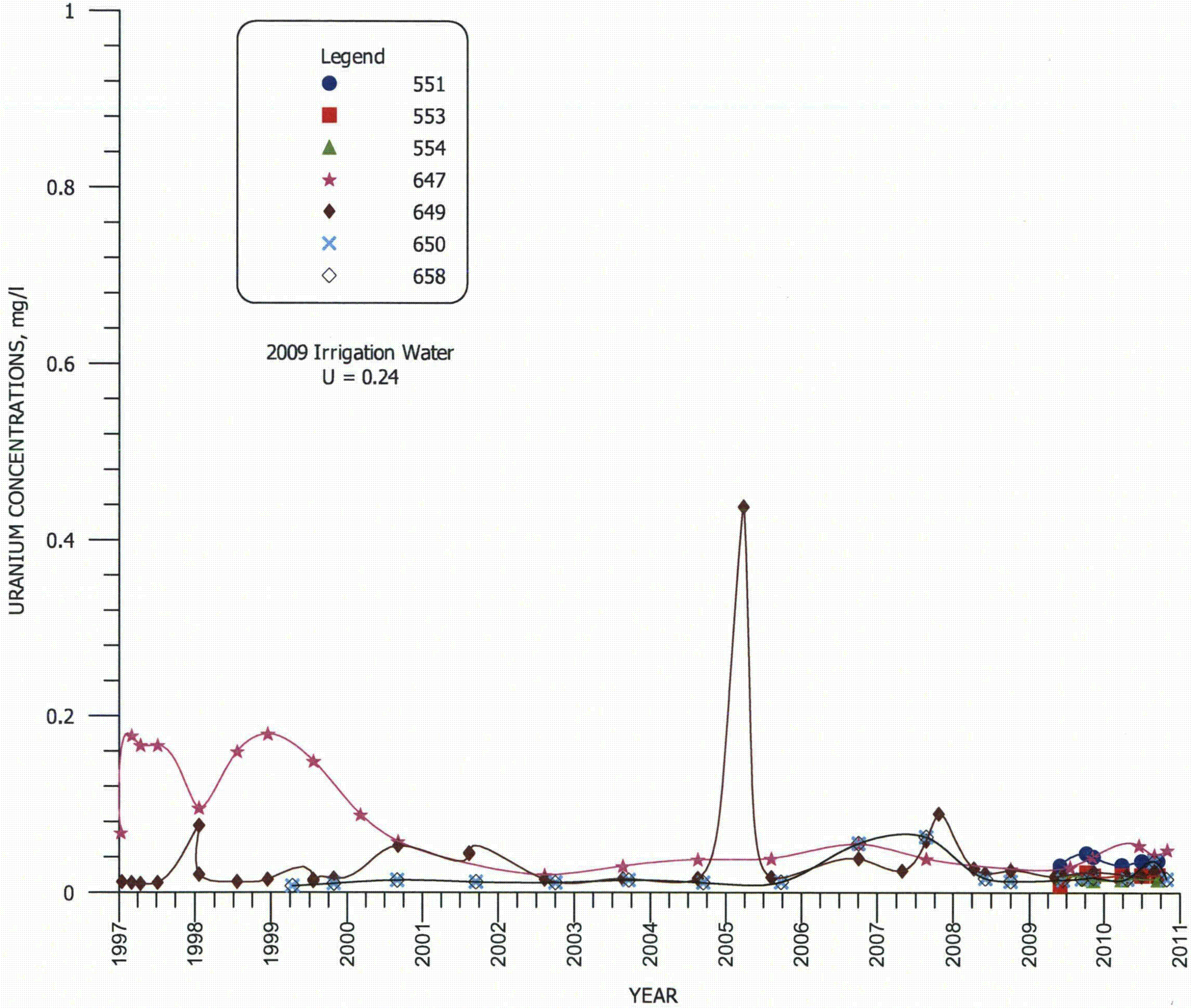
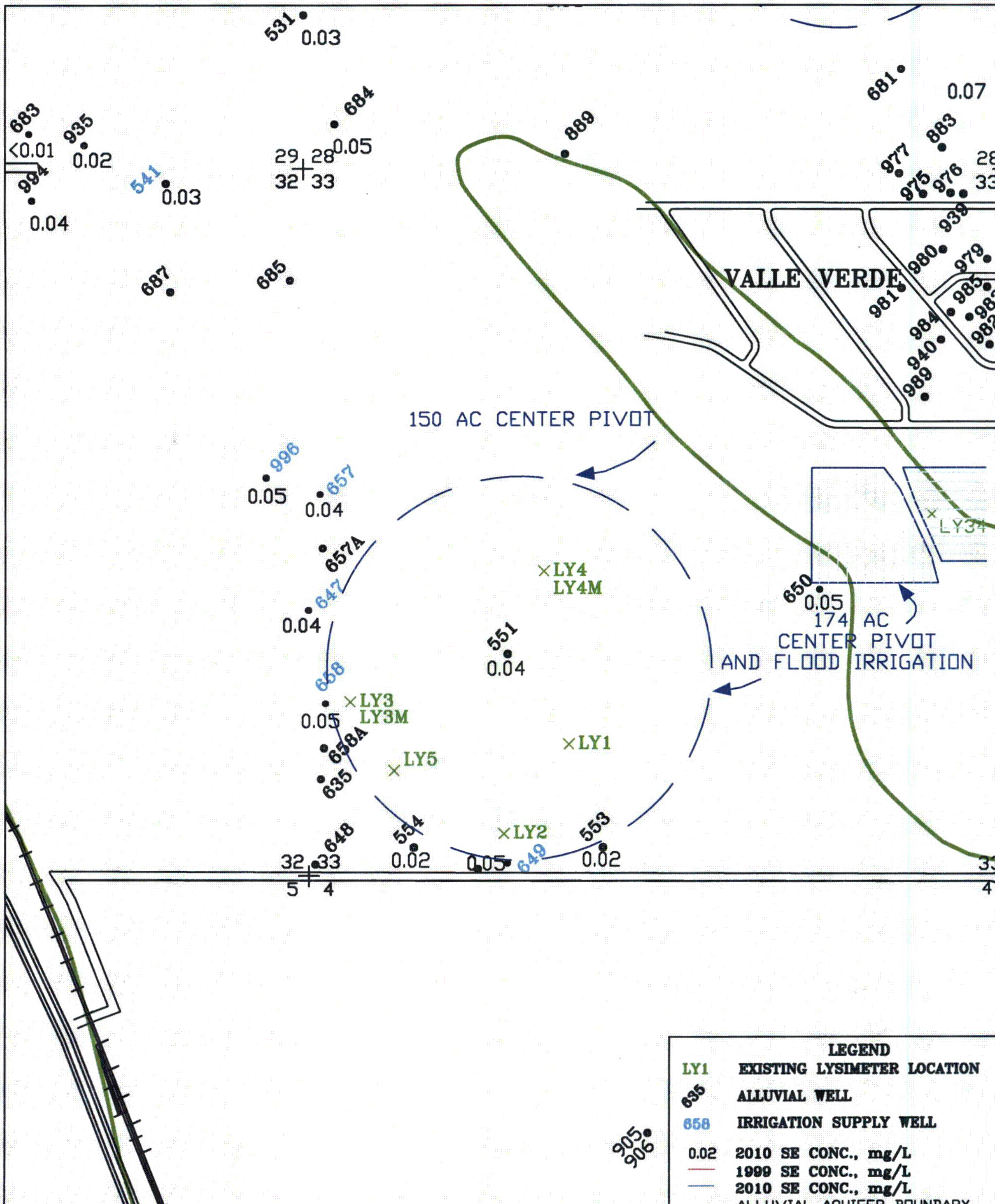


FIGURE 4-36. URANIUM CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000'

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DATE: 1/10/11

FIGURE 4-37. 2010 SELENIUM ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L

HOMESTAKE MINING COMPANY
GRANTS, NEW MEXICO

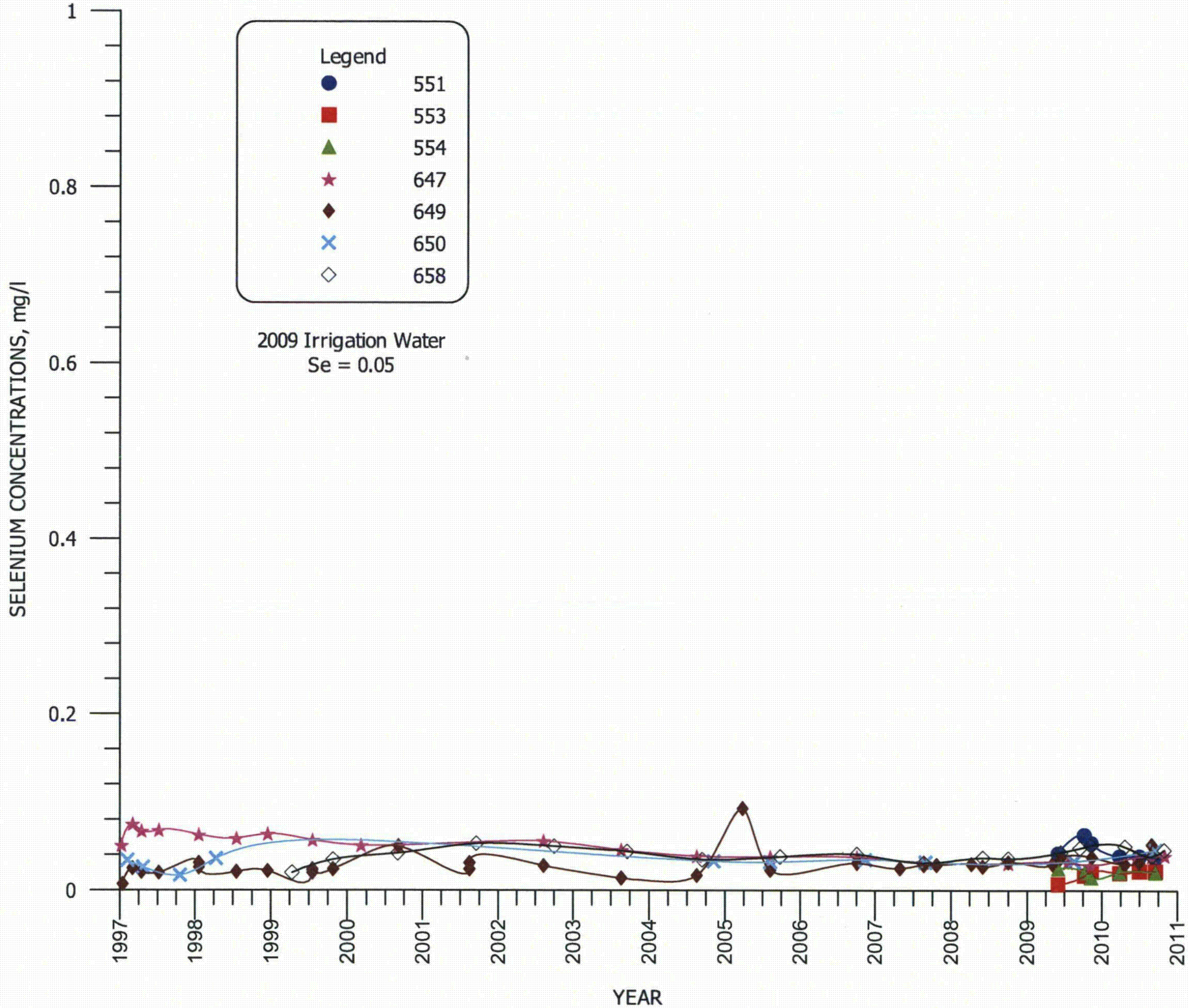
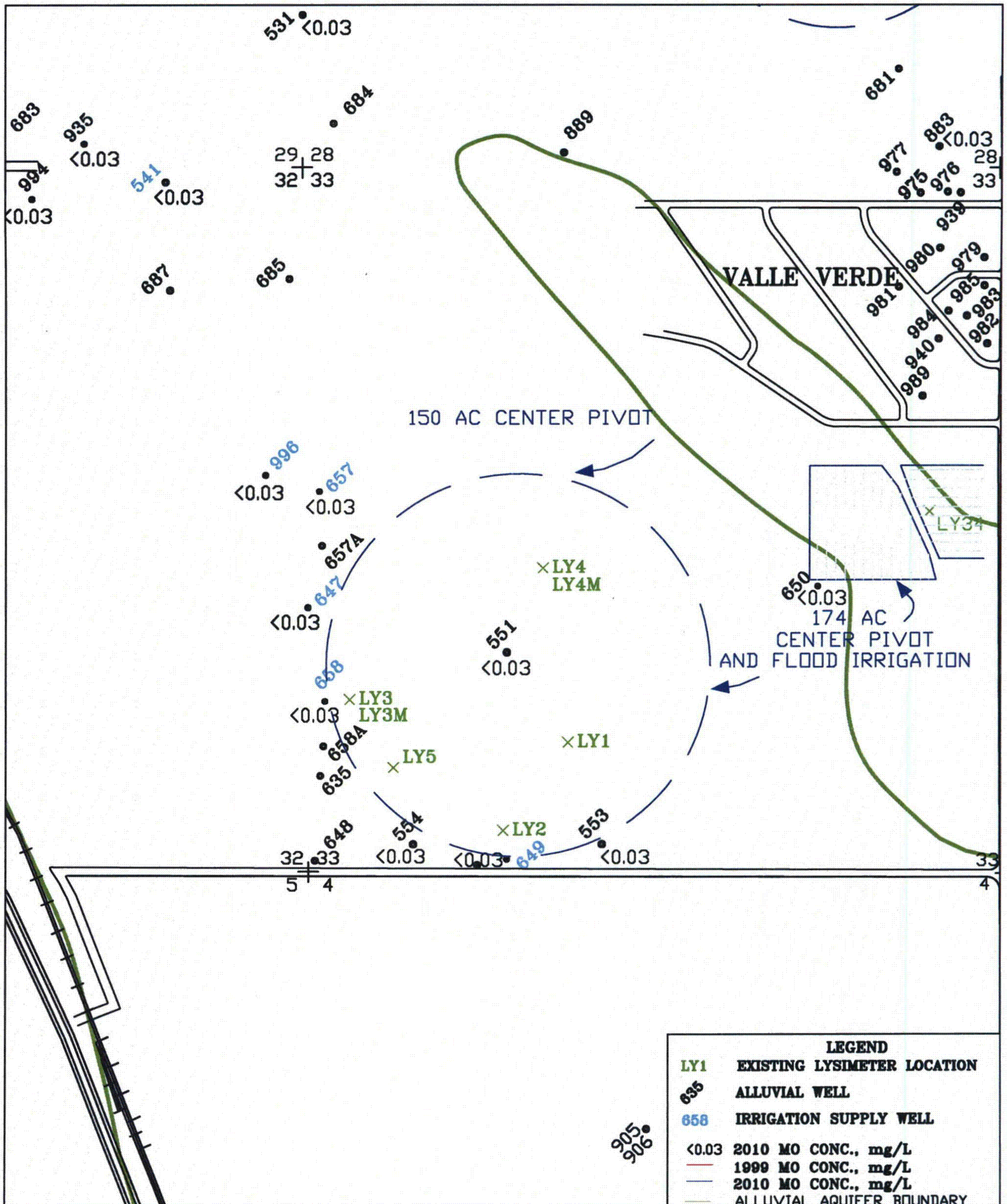


FIGURE 4-38. SELENIUM CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000' C:\PROJECTS\2010-06\1600GAL10 DATE: 1/10/11	**FIGURE 4-39. 2010 MOLYBDENUM ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L**	HOMESTAKE MINING COMPANY GRANTS, NEW MEXICO

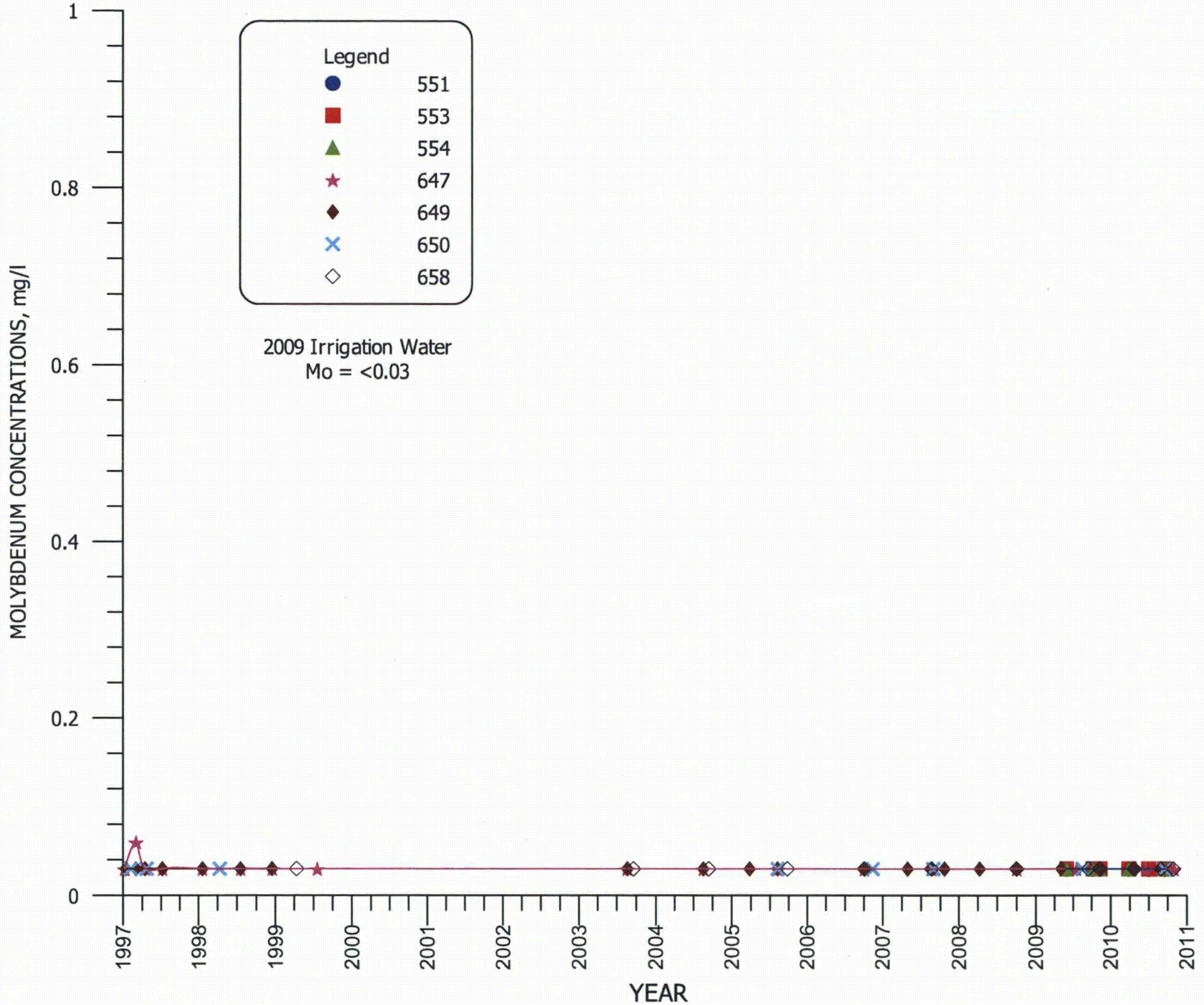
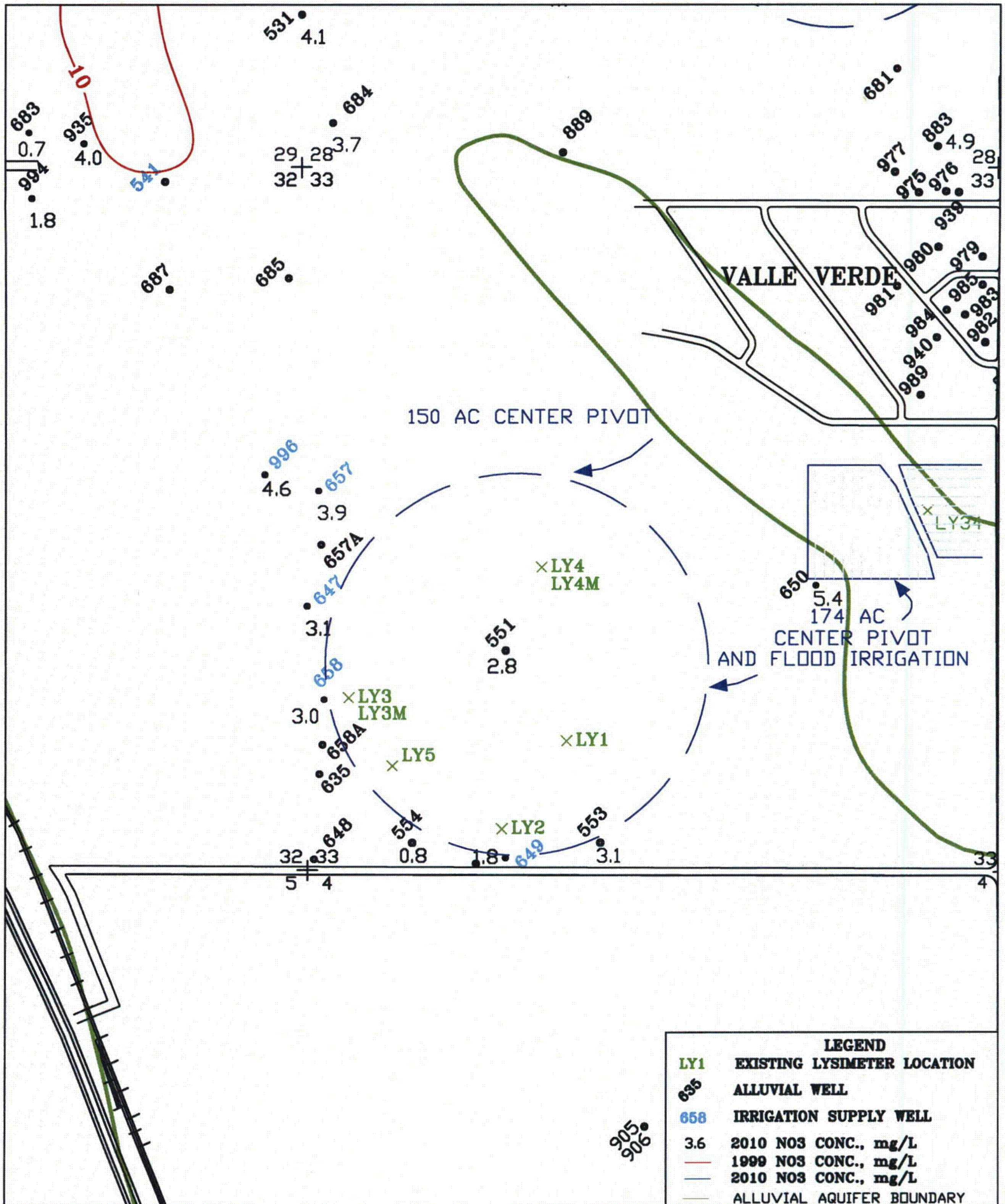


FIGURE 4-40. MOLYBDENUM CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.



SCALE: 1" = 1000'	**FIGURE 4-41. 1999 AND 2010 NITRATE ALLUVIAL CONCENTRATIONS IN SECTION 33, mg/L**	HOMESTAKE MINING COMPANY
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DATE: 1/10/11		

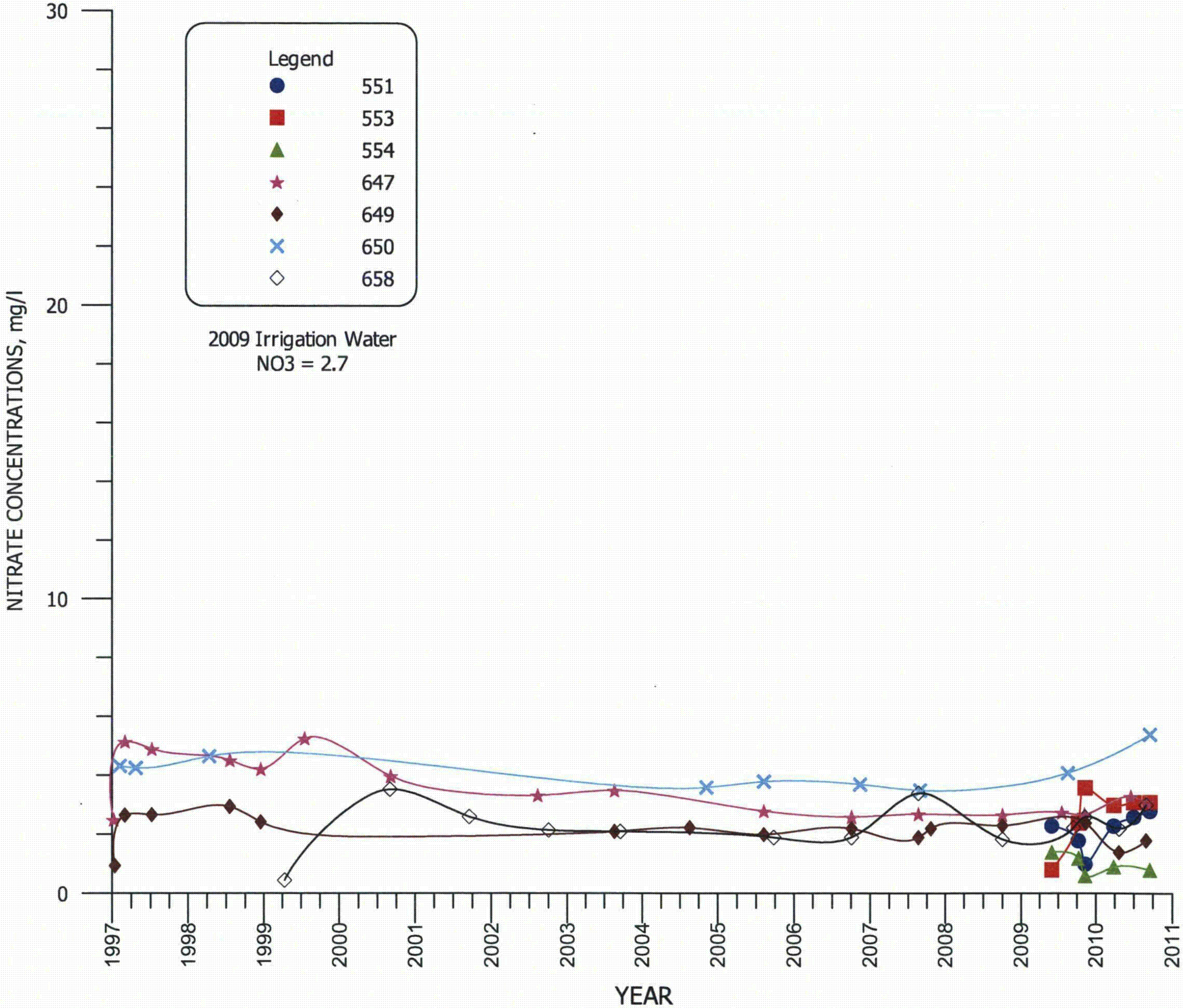


FIGURE 4-42. NITRATE CONCENTRATIONS FOR WELLS 551, 553, 554, 647, 649, 650 AND 658.

5.0 Predicted Ground-Water Concentrations

Predicted ground-water concentrations due to the irrigation restoration may be obtained by analysis of the mixing the ground-water flow in the area with predicted soil moisture drainage through the soil profile. These mixing calculations were made for each irrigation area to estimate the potential change in the ground water quality. These calculations were made in some cases even when the soil moisture modeling did not indicate the migration of constituents to the water table to present a worst-case scenario.

5.1 Section 34

Modeling predictions shows that the soil moisture from irrigation in the Section 34 Flood area should not reach the water table at 35 feet for more than 90 years. Worst-case calculations were made by assuming that the soil moisture TDS does reach the water table even though modeling does not predict this migration. If the soil moisture would reach the water table, the mixing with the ground-water concentrations would result in a small increase in the TDS concentration, which would still be lower than the site standard.

The ground-water flow through the flood area in the alluvial aquifer is estimated to be at a rate of 37.5 gpm based on a transmissivity of 3,000 gal/day/ft, a width of 3,000 ft and a gradient of 0.006 ft/ft. A typical TDS concentration in the flood irrigation area is 2,600 mg/l. The mixing of this ground water with the long-term flux rate of 3 mm/year at a TDS concentration of 7,000 mg/l in this soil moisture (even though modeling does not indicate TDS will reach the water table) would result in an increase of TDS in the ground water to 2,684 mg/l (see Table C-5 in Appendix C for these calculations). This small increase in TDS would be very difficult to detect and is not expected based on the model predictions of TDS movement.

The ground-water flow through the flood area in the alluvial aquifer as presented in the previous discussion is 37.5 gpm. An average sulfate in the flood irrigation area is 1,292 mg/l. The mixing of this ground water with the long term flux rate of 3 mm/year at a sulfate of 3,100 mg/l in this soil moisture (even though modeling does not indicate sulfate will reach the water table) would result in an increase of sulfate in the ground water to 1,327 mg/l. This small increase in sulfate would be very difficult to detect and is not expected based on the soil moisture predictions of sulfate movement.

Even though the soil moisture modeling does not indicate chloride concentrations from the irrigation will ever reach the water table, a worst case assumption was used to see what the effects would be if the soil moisture chloride concentration of 650 mg/l reached the water table. Table C-5 of Appendix C presents the chloride mixing concentrations for Section 34 Flood area. This mixing calculations indicate that the chloride concentration which averages 212 in the ground water now would increase to 220 mg/l if the chloride did reach the water table. Again the modeling does not indicate that these chloride concentrations will reach the water table in Section 34.

Due to the small flux of moisture after irrigation, the potential minimal long-term effects of drainage of water can be estimated based on the above soil moisture drainage rate of 3 mm/year

and a ground-water flow of 37.5 gpm. The average uranium concentration in the ground water in the flood area is 0.076 mg/l. Even though the modeling does not indicate this, an assumed uranium concentration of 0.5 mg/l in the soil moisture reporting to the water table was used to see evaluate potential effect on the ground water. The mixing of the ground-water flow rate of 37.5 gpm with the long-term soil moisture flux of 0.73 gpm in the irrigation area results in a conservative estimate of uranium concentration of 0.084 mg/l. This calculation shows that even if the uranium made it to the water table, which modeling does not predict, a very small increase in the uranium concentration would be observed in the ground water.
Even though the modeling indicates that the selenium concentration will never reach the water table, a comparison of impacts of selenium on the ground water could be made assuming that the a selenium concentration of 0.2 mg/l makes it to the water table with the long-term soil moisture flux. The mixing of the above ground water and long-term flow rates of 37.5 and 0.73 gpm, respectively, with an average ground water selenium concentration of 0.05 mg/l and a soil moisture selenium concentration of 0.2 mg/l, which the model does not indicate, produces a mixed concentration of 0.053 mg/l. This small increase in concentration would not be detectable in the ground water.

5.2 Section 28

The flux of soil moisture during the proposed future irrigation varies but is approximately 120 mm/year or 24 gpm for the Section 28 area. The mixing of this 24 gpm with a TDS concentration of 5,000 in the soil moisture and the ground-water flow of 206 gpm (based on a transmissivity of 30,000 gal/day/ft, a width of 2,360 feet and a gradient of 0.0042 ft/ft, see Table C-6 in Appendix C for calculations) can be used to estimate the resulting TDS of the ground water. Analysis of this mixing of the soil moisture water with the ground-water base flow indicates that the resulting ground-water TDS concentration should increase from 1,762 mg/l to 2,100 mg/l. This prediction indicates that a small effect will occur during the initial years of irrigation in Section 28, but this TDS is still similar to most of the existing concentrations in the Section 28 area.

The modeling indicates that the soil moisture drainage rate into the ground water will rapidly diminish after the irrigation ceases and the long-term rate will be approximately 4 mm/year or 0.81 gpm for the Section 28 irrigation area. Mixing of this soil moisture with a TDS concentration of 5,000 mg/l and the 206 gpm of ground-water flow with a TDS of 1,762 would result in a minor TDS increase to 1,775 mg/l. This increase is not expected to be detectable. A small increase in ground water TDS concentration will result during and shortly after the years of irrigation, but this will occur during the years of restoration of ground water in this area and will likely be difficult to detect due to natural variability in this constituent. The long- term effects on TDS concentration from the drainage of irrigation water should not be detectable.

The flux of soil moisture during the proposed future irrigation varies but is approximately 120 mm/year or 24 gpm from the Section 28 area. Analysis of mixing of this 24 gpm with a sulfate of 2,200 in the soil moisture and the ground-water flow of 206 gpm can be used to estimate the impact of irrigation on sulfate concentration in the ground water. This mixing of the soil moisture water with the ground-water base flow indicates that the resulting concentration should increase the sulfate concentration of the ground water from 797 mg/l to 943 mg/l. This

prediction indicates that a small effect will occur during the initial years of irrigation in Section 28, but this sulfate concentration is still similar to most of the existing concentrations in the Section 28 area.

The chloride mixing calculations were also done for Section 28. The average chloride concentration in Section 28 ground water is 154 mg/l for this area. The soil moisture modeling indicated a chloride concentration of 370 mg/l should reach the water table. A similar mixing calculation is presented for chloride in Table C-6 of Appendix C TDS and sulfate. The chloride concentration is predicted to increase from 154 mg/l to 177 mg/l during the operation of the irrigation program. The long term effects on the chloride concentrations in Section 28 are not significant. The prediction indicates that the chloride concentration would increase from154 mg/l to 155 mg/l which would not be detectable with the natural variations of ground water in the area. The long term effects from the Section 28 irrigation on the ground water are not measurable.

Previous discussions have presented the expected long-term rate of drainage from the Section 28 irrigation area as 0.81 gpm. Mixing calculation of this soil moisture with a sulfate of 2,200 mg/l and the 206 gpm of ground-water flow with a sulfate of 797 indicates that the sulfate would increase only to 802 mg/l or an increase that will not be detectable. A small increase in sulfate concentration in the ground water will result from the years of irrigation but this will occur during the years of restoration of ground water in this area and will likely be difficult to detect due to natural variability in concentrations of this constituent. The long-term effects from the drainage of the irrigation water on sulfate should not be detectable.

Mixing of the soil moisture uranium concentrations and the alluvial ground water was evaluated assuming that the uranium concentration in the long term soil moisture reaches 0.5 mg/l at the ground-water table, even though model predictions do not indicate this mobility. The average restored uranium ground-water concentration is expected to be 0.1 mg/l in the Section 28 pivot area. This analysis indicates uranium concentration in the ground water would increase to 0.102 mg/l after mixing. Even if a significant soil moisture uranium concentration did reach the water table, the increase in the ground water uranium concentration would be insignificant due to the very small amount of long-term soil moisture flux.

The mixing of the soil moisture selenium concentrations in the ground-water calculations were also made to estimate the long-term selenium concentrations due to the Section 28 irrigation. The ground-water selenium concentration after restoration is expected to average 0.04 mg/l. This concentration mixed with a long-term selenium concentration of 0.2 mg/l in the irrigation soil moisture, which is not indicated by the modeling, was used to estimate the potential long-term impacts on the ground water for selenium from the irrigation. This mixing of the ground water and soil moisture indicates that the selenium concentration would increase to 0.0406 mg/l, which is not significant.

5.3 Section 33

The flux of soil moisture during the proposed future irrigation varies but is approximately 40 mm/year or 12 gpm for the Section 33 area. The mixing of this 12 gpm of soil moisture with a

TDS of 3,400 and the ground-water flow of 100 gpm (based on a transmissivity of 10,000 gal/day/ft, a width of 2,885 feet and a gradient of 0.005 ft/ft, see Table C-7 in Appendix C for calculations) can be used to estimate the TDS of the ground water with the effects from the irrigation. This mixing of the soil moisture water with the ground-water base flow indicates that the resulting concentration should increase the TDS concentration of the ground water from 1,540 mg/l to 1,740 mg/l. This prediction indicates that a small effect will occur during the initial years of irrigation in Section 33, but this TDS is still similar to most of the existing concentrations in the Section 33 irrigation area.

The modeling indicates that the soil moisture drainage rate into the ground water will rapidly diminish after the irrigation ceases and the long-term rate will be approximately 4 mm/year or 1.2 gpm for the Section 33 irrigation area. Mixing of this soil moisture with a TDS concentration of 3,400 mg/l and the 100 gpm of ground-water flow with a TDS of 1,540 indicates that the TDS concentration would increase to only 1,562 mg/l. This increase is not detectable. A small increase in TDS concentration in the ground water will result from the years of irrigation, but this will occur during the years of restoration of ground water and will likely be indistinguishable from natural variability. The long-term effects from the drainage of the irrigation water on TDS concentration should not be detectable.

Mixing of 12 gpm of soil moisture flux with a sulfate concentration of 1,500 and the ground-water flow of 100 gpm can be used to estimate the effects of irrigation on sulfate concentration of the ground water. This mixing of the soil moisture water with the ground-water base flow indicates that the resulting concentration should increase the sulfate concentration of the ground water from 718 mg/l to 802 mg/l. This prediction indicates that a small effect will occur during the years of irrigation in Section 33, but this sulfate is still similar to most of the existing concentrations in the Section 33 area.

Previous discussions have presented the expected long-term rate of drainage from the Section 33 irrigation area as 1.2 gpm. Mixing of the soil moisture with a sulfate concentration of 1,500 mg/l and the 100 gpm of ground-water flow with a sulfate concentration of 718 mg/l indicates that the sulfate would increase to only 727 mg/l. This increase is not detectable. A small increase in sulfate concentration in the ground water will result from the years of irrigation but this will occur during the years of restoration of ground water in this area and will likely be indistinguishable from natural variability. The long-term effects from the drainage of the irrigation water on sulfate should not be detectable.

Chloride mixing calculations were also done for the Section 33 pivot; these calculations are presented in Table C-7 of Appendix C. The average chloride concentration in Section 33 ground water is 122 mg/l. The modeling of the soil moisture concentrations indicate that a concentration 300 mg/l should exist in the soil moisture presently at the water table in the Section 33 center pivot. Similar mixing calculations for TDS and Sulfate were made which indicates that the chloride concentration should increase from 122 mg/l to 141 mg/l during the operation of the irrigation in Section 33. This small increase maybe detectable but it will be difficult with the natural variability that is observed in the ground water system. The long term chloride concentration increase after irrigation is predicted to be from 122 mg/l to 124 mg/l. This very small increase will not be able to be detected due to the natural variability in chloride

concentrations in the ground water in Section 33. Therefore there no measurable affects from the Section 33 irrigation should be observed in the long term from the Section 33 irrigation.

A mixing of the soil moisture uranium concentrations and the alluvial ground water was made assuming that the uranium concentration in the long-term soil moisture reaches 0.5 mg/l at the ground-water table, even though our predictions do not indicate this mobility. The average restored uranium ground-water concentration is expected to be 0.02 mg/l in the Section 33 pivot area. This analysis indicates a mixed ground water uranium concentration of 0.026 mg/l. Even if a significant soil moisture uranium concentration did reach the water table, the increase in the ground water would be insignificant due to the very small long-term soil moisture flux rate.

Analysis of the mixing of the soil moisture selenium concentrations with the ground water allows estimation of the impacts of the Section 33 irrigation. The ground-water selenium concentration after restoration is expected to be similar to present concentration with an average of 0.034 mg/l. This concentration mixed with a long-term selenium concentration of 0.2 mg/l in the irrigation soil moisture, which is not indicated by the modeling, was used to estimate the potential long-term impacts on the ground water selenium concentration. This mixing of the ground water and soil moisture indicates that the selenium concentration would increase to 0.036 mg/l, which is not significant.

In conclusion, the soil moisture transport modeling for the Section 33 center pivot irrigation shows that the selenium and uranium concentrations will not reach the water table. Even if significant concentrations of these two constituents eventually reach the water table, their concentrations would not measurably increase the observed concentrations in the ground water due to the low rate of soil moisture flux to the ground-water table.

5.4 Section 33 Flood

The predictions of the Section 34 of soil moisture concentrations areas can be used conservatively for the Section 33 Flood area (see discussion in Section 3.5.3). The section 34 Flood predictions should be conservative for the Section 33 Flood area because irrigation has occurred only four of the eleven years and the basalt in Section 33 is typically 25ft. These predictions indicate that the soil moisture from the irrigation will not reach the water table. Worst case calculations were made by assuming that soil moisture does reach the water table even though the modeling does not predict this migration. If the soil moisture would reach the water table the mixing with the ground water, would result in a small increase in the TDS concentrations.

Table C-8 in Appendix C presents the mixing calculations for the Section 33 Flood area. The ground water flow through the flood area in the alluvial aquifer is estimated to be at a rate of 9.7 gallons per minute based on a transmissivity of 1000 gallons/day/foot, a width of 1400 ft and a gradient of 0.01ft gpm ft. A typical TDS concentration in the Section 33 area ground water is 1540 mg/l. The mixing of this ground water with the long term flux rate of 3 mm/year at a TDS of 7000 mg/l in the soil moisture (even though modeling does not indicate TDS will reach the water table) would result in an increase of TDS in the ground water to 1623 mg/l. This small

increase in TDS would be very difficult to detect and is not expected based on the model predictions of TDS movement.

An average sulfate concentration in the Section 33 area is 718 mg/l and the mixing of this ground water with the long term flux of 3mm/year at a sulfate concentrations of 3100 mg/l in the soil moisture (even though modeling does not indicate sulfate will reach the water table) would result in the sulfate in the ground water to increase to 754 mg/l. The small increase in sulfate would be very difficult to detect and is not expected based on moisture predictions of sulfate movement.

A similar calculation was made for chloride concentrations using an average chloride concentration in Section 33 ground water of 122 mg/l and assuming the soil moisture concentration of 650 mg/l reaches the water table (even though modeling does not indicate that chloride will reach the water table). This would result in an increase in chloride in the ground water to 130 mg/l. This small increase in chloride would be very difficult to detect and is not expected based on the soil moisture predictions of chloride movement.

Due to the small flux of soil moisture after irrigation the potential minimal long term effects of drainage water can be estimated based on the above soil moisture drainage rate of 3mm/year and a ground water flow of 9.7 gpm. The average uranium concentration in the ground water in the Section 33 area is 0.02 mg/l and even though the modeling does not indicate this, we assume the uranium concentration of 0.5 mg/l in the soil moisture reaches the water table. These values were used to evaluate potential effects on the ground water. The mixing of the ground water flow rate of 9.7 gpm with the long term flux of 0.15 gpm in the irrigation area result in a conservative estimate of uranium concentration of 0.027 mg/l. This calculation shows that even if the uranium made it to the water table which modeling does not predict, a very small increase in uranium concentration would be observed in the ground water. It would be very difficult to detect this very small change in the ground water due to the natural variations in uranium ground water concentrations.

Even though the modeling indicates that the selenium concentrations will never reach the water table, a comparison of impacts of selenium on the ground water were made assuming a selenium concentration of 0.2 mg/l makes it to the water table with the long term soil moisture flux. The mixing of the ground water and the long term flux results in an increase from the average ground water selenium concentration of 0.034 to 0.036 mg/l. This small increase would not be detectable in the ground water.

6.0 Vegetation Concentrations and Constituent Uptakes

Alfalfa was grown exclusively as hay crop in the irrigated areas until 2008, except for the outer 40 acres in Section 28, which was planted in grass in 2005. The following changes were made in the irrigated crops in 2008. The field in the western half of the Section 34 flood area was tilled and replanted with triticale. The eastern half also had triticale seeded with the current alfalfa crop, but was not tilled. The 24 acres in the eastern portion of the Section 33 flood area were tilled and replanted with triticale. No crop was obtained from this area in 2008 due to late season planting. The crop in the Section 33 center pivot area had 25 acres of canola and 25 acres of camelina crop seeded into the current alfalfa (see Appendix D).

In 2009 the hay production was limited to the planting of sorghum/sudan grass in the Section 34 flood area. The Section 33 Center Pivot was planted to a permanent pasture in 2009 and a test canola crop was planted in Section 28. The Section 34 flood area was planted in sorghum/sudan grass in 2010 while Section 33 and 28 were planted in winter wheat.

Constituents in soil are known to be taken up by plants. The extent of plant uptake is dependent on many parameters, including the constituent and the plant species. The concentrations of uranium and selenium in each cutting of hay were measured and compared to the soil concentration measured at the end of the growing season. The ratio of the concentration in plants to that in the soil is defined as the transfer coefficient from soil to plant. The transfer coefficients have been calculated and compared to NRC values that are based on published studies. All hay data and transfer coefficients are based on concentrations calculated from dry weights of both soil and vegetation. An analysis and discussion of the production of hay or pasture concludes this section.

6.1 Measured Vegetation Concentrations

The vegetation samples were collected after the hay was cut and prior to the baling of hay. Sections 33 and 28 vegetation samples were collected from the field prior to grazing of these two fields. The samples are collected from a distribution similar to the soil sample site distribution. The vegetation samples were analyzed by an offsite vendor laboratory.

6.1.1 Sections 33 and 34 Flood Areas

In Section 34, ten samples were collected from the first two cuttings in 2001 and eight samples were collected from the third cutting. Six samples were collected from each of four cuttings in 2002. In 2003, twelve, seven and twelve samples were collected from the first, second and third cuttings, respectively. In 2004 and 2005, twelve and six samples were analyzed for the first and second cuttings, while ten and six samples were collected for the first and second cuttings in

2006. Six samples were collected from the first cutting in 2007. Six and twelve samples were collected from the first and second cuttings in 2008. Higher uranium concentrations were observed in the second cutting in 2002 and third cuttings in 2001 and 2003. The highest selenium concentrations for each cutting were similar, and occurred in the first cuttings of 2001, 2003, 2004 and 2005; the second cutting of 2006, and in the fourth cutting in 2002. The hay was not cut on the Section 33 flood area in 2004, 2006, 2007, 2008 and 2009. The 2009 uranium and selenium vegetation concentrations were similar to the previous Section 34 values. The vegetation cuttings produced similar uranium concentrations in 2010. Table 6-1 presents the summary of the uranium and selenium concentrations in the Section 34 cuttings.

6.1.2 Section 28 Center Pivot

Six samples were collected in 2002 from the first hay cutting in the Section 28 irrigation area. Only one cutting was obtained from Section 28 because a crop of millet was used to establish cover over the site prior to alfalfa seeding. Twelve samples were collected from each of the three cuttings in 2003 through 2007. In 2008 and 2009, twelve samples were also collected. Average uranium concentrations have varied from 0.29 to 1.83 mg/kg. Selenium concentrations varied from 0.79 to 1.8 mg/kg. In general, uranium concentrations in the 2009 vegetation samples from Section 28 were similar to those observed in previous years. The 2009 average selenium concentration is slightly higher than previous values and may be due to increased uptake by the canola. The 2010 average uranium concentration is very similar to the 2009 value. Table 6-1 presents the summary of the uranium and selenium concentrations in the Section 28 cuttings.

6.1.3 Section 33 Center Pivot

During the first and second cuttings in Section 33 in 2001, eight samples were taken from various portions of the field. Sixteen samples were collected from the third cutting. Eight samples were taken from each cutting in 2002. Twelve samples were taken from each cutting in 2003 through 2008, but in 2008 only two cuttings were taken. The individual results are reported in Appendix B where the concentrations are reported on a dry-weight basis. The uranium and selenium concentrations were generally slightly higher in the first cutting each year with the exception of 2007 and 2008. Selenium concentrations were generally lower for the second and third cuttings. The average uranium and selenium values from the permanent grass sampled in 2009 and 2010 are similar to the hay values of previous years. Table 6-1 presents the summary of the uranium and selenium concentrations in the Section 33 cuttings.

6.1.4 Background Concentrations in Hay and Special Study

In 2000, a composite sample was prepared from ten samples collected from the second cutting in Section 33 (see Appendix D for data). The sample was split and one of the samples was washed with tap water prior to analysis. The results were 0.62 mg/kg and 0.58 mg/kg for uranium and 1.4 mg/kg and 1.5 mg/kg for selenium. These results indicate that uranium and selenium in the sample did not arise from material deposited on the exterior plant surfaces.

Two samples of baled hay collected from hay fields a few miles to the northwest of the Homestake Mining Company irrigation areas were taken in 2000 for comparison to that grown in this study. While it is not known what the constituent soil concentrations were, it is known that water from the shallow alluvial aquifer near the Grants Project was not used as a source for irrigation. The uranium concentrations were reported as 0.19 and 0.05 mg/kg; the selenium concentrations were 0.2 and 0.1 mg/kg. These data indicate lower levels of uranium and selenium in what is assumed to be background hay samples.

Table 6-1. Summary of Vegetation Analyses

Irrigation Areas										
	Section 33			Section 34				Section 28		
Year	1st Cut	2nd Cut	3rd Cut	1st Cut	2nd Cut	3rd Cut	4th Cut	1st Cut	2nd Cut	3rd Cut
Average Uranium Concentrations (mg/kg)										
2000	1.12	0.62	----	0.73	----	----	----	----	----	----
2001	0.58	0.57	0.30	0.55	0.38	0.71	----	----	----	----
2002	1.32	0.37	0.77	0.92	1.52	0.54	0.88	0.29	----	----
2003	0.73	0.70	0.73	0.89	0.56	1.15	----	0.99	0.98	1.14
2004	1.62	0.51	0.90	1.02	0.88	----	----	1.09	1.17	0.86
2005	0.84	0.64	0.71	1.82	0.88	----	----	1.83	0.94	1.43
2006	0.80	0.62	0.45	0.79	0.78	----	----	1.21	0.77	0.62
2007	1.04	1.18	1.60	1.02	----	----	----	0.90	1.59	1.17
2008	0.47	0.83	----	0.49	0.43	----	----	1.68	----	----
2009	0.73	----	----	0.87	----	----	----	0.92	----	----
2010	0.21	----	----	0.45	----	----	----	0.14	----	----
Average Selenium Concentrations (mg/kg)										
2000	1.10	1.40	----	0.50	----	----	----	----	----	----
2001	1.41	1.05	0.87	1.05	0.82	0.78	----	----	----	----
2002	1.80	1.17	1.81	0.83	1.14	1.06	1.17	0.79	----	----
2003	1.70	1.46	1.54	1.62	0.80	1.11	----	1.62	1.28	1.00
2004	1.24	0.69	1.24	1.19	0.25	----	----	1.03	1.07	1.02
2005	1.25	1.29	1.27	1.90	0.80	----	----	1.50	1.24	1.48
2006	1.25	1.29	1.00	0.75	1.40	----	----	1.17	1.27	0.95
2007	1.30	1.40	1.50	1.43	----	----	----	0.90	1.20	1.33
2008	1.10	1.30	----	1.80	1.30	----	----	1.50	----	----
2009	0.90	----	----	0.70	----	----	----	1.80	----	----
2010	0.9	----	----	0.88	----	----	----	0.9	----	----

Notes:
No cuttings were obtained from the Section 33 Flood in 2004. This was a new field, with no hay production.

6.1.5 Summary of Vegetation Concentrations

Table 6-1 presents a summary of the concentrations observed in hay cuttings from 2000 to 2010. No trends are apparent for uranium or selenium during 2003 to 2010. The data indicate a slight decrease in uranium from the first to the third cutting. No trends are evident for selenium. The average uranium concentrations in the 2009 vegetation cuttings ranged from 0.73 to 0.92 mg/kg. In 2009, the average selenium concentrations in vegetation ranged from 0.7 to 1.8 mg/kg. Prior years' results show a similar range for the upper limit. Recent studies have shown that selenium in cattle diets plays an important role in maintaining cattle health and nutrition. A minimum requirement for selenium in cattle feed appears to be about 0.1 mg/kg and in many regions of the country, selenium is added to feed. The National Research Council (NRC, 2000) has established 2 mg/kg as the Maximum Tolerable Concentration (MTC) for cattle feed. They note that toxicity is possible at levels as low as 5 mg/kg. Since the measured levels are below the MTC, further analysis of selenium in this report is considered unnecessary.

6.2 Measured Uranium Uptake in Vegetation

The uptake of constituents from soil to plants is generally considered to be directly proportional to the concentration in soil. The ratio of the concentration in the plant to that in the soil is called the transfer coefficient. The transfer coefficient from NUREG/CR-5512 for uranium in vegetation is 1.7E-2 pCi/kg-plant/pCi/kg-soil. Since the quantity of uranium is proportional to the activity in units of picoCuries (pCi), the transfer coefficient can also be expressed as 0.017 mg/kg-plant/mg/kg-soil. An estimate of the plant uptake from the application of irrigation water was initially presented in ERG and HYDRO (1999).

To measure an uptake factor in plants, the average soil concentration of the upper three layers was used since mature roots typically extend to a depth of three feet or more. The uranium concentration is tabulated in Table 3-5. Table 6-2 presents the data for the average uranium concentration in soil and hay by section and year. The transfer coefficient from soil to hay is calculated and shown in Table 6-3 for each year.

Table 6-2. Average Uranium Concentrations in Soil and Vegetation

	Avg. Uranium Soil Concentration (mg/kg)			Avg. Uranium Hay Concentration (mg/kg)		
Year	Section 33	Section 34	Secton 28	Section 33	Section 34	Section 28
2000	0.92	2.4	----	0.87	0.73	----
2001	0.69	1.92	----	0.48	0.55	----
2002	0.85	0.52	1.64	0.82	0.97	0.29
2003	1.17	2.23	0.69	0.72	0.87	1.04
2004	1.48	2.7	0.8	1.01	0.95	1.04
2005	1.2	2.66	0.67	0.73	1.35	1.4
2006	1.51	2.78	1.1	0.62	0.79	0.87
2007	1.44	3.27	1.02	1.27	1.02	1.22
2008	1.35	2.93	1.06	0.65	0.46	1.68
2009	1.8	2.82	1.33	0.73	0.87	0.92
2010	1.99	2.5	1.32	0.21	0.45	0.14
				Average:	0.83	

The calculated uranium transfer coefficients have a mean of 0.74 mg/kg-plant/mg/kg-soil and standard deviation of 0.52 mg/kg-plant/mg/kg-soil. This is more than one order of magnitude higher than the published transfer coefficient of 0.017 mg/kg-plant/mg/kg-soil. The fact that the uranium uptake is higher than predicted by the NRC published transfer coefficient might be explained by the fact that the uranium concentration in the soil moisture (and available to the plants) may be significantly higher in fields irrigated with contaminated water than for soil moisture within contaminated soil that is derived from clean groundwater or rain to support plant growth.

Table 6-3. Transfer Coefficient from Soil to Vegetation

Transfer Coefficients (mg/kg hay/mg/kg soil)			
Year	Section 33	Section 34	Section 28
2000	0.95	0.30	----
2001	0.70	0.29	----
2002	0.96	1.87	0.18
2003	0.62	0.39	1.51
2004	0.68	0.35	1.30
2005	0.61	0.51	2.09
2006	0.41	0.28	0.79
2007	0.88	0.32	1.20
2008	0.48	0.16	1.58
2009	0.41	0.31	0.69
2010	0.11	0.18	0.11
	Mean 0.68		
	SDV 0.53		

In 2002, 622 pounds (lbs) of uranium were applied to the sites, based on an average uranium concentration of 0.23 mg/l and 995 ac-ft of water. This is a small amount considering that it was applied over 330 acres. The amount of uranium removed by uptake into the hay can be

estimated based on the typical observed uranium concentration of 1 mg/kg in the hay. The amount of uranium contained in the 480 tons of hay produced in 2002 is about one lb. Thus, less than 1% of the uranium that was supplied to the field in 2002 (622 lbs) was removed by the hay.

The amount of uranium and selenium being removed by the hay is insignificant. In 2002, for example, the amount of selenium contained in the 480 tons of hay produced is estimated at one pound. In 2002, less than one-half of one percent of the selenium applied to the field (243 pounds) is being removed by the hay. Similar calculated results for both uranium and selenium can be obtained for the other years.

6.3 Hay and Pasture Production

The Homestake irrigation program has produced a beneficial hay crop each year. The hay production from the irrigated areas is tabulated in Table 6-4. The production for the initial year was lower due to the initiation of a new alfalfa crop in the 270 acres of initial irrigation. Some decline in the hay production was observed starting in 2002 due to a limited amount of water to apply. A longer decline in the hay production was observed from 2004 through 2008 due to the age of the alfalfa and the non-use of fertilizer on the crops except for the initial application. The bottom half of Table 6-4 presents the fertilizer applications to the irrigated fields. This table shows that each field has only been fertilized during its first year of operation. The hay production would likely have been increased with additional fertilization.

During 2008, a different crop was planted in the Section 34 flood area and this reduced the production. Some test planting of canola in the Section 33 center pivot also was done in 2008 which reduced the production in this area.

The hay production in 2009 was greatly reduced because the Section 33 center pivot was planted in permanent grass for livestock grazing. Therefore no hay production was obtained from this area. The Section 28 center pivot was planted in canola in 2009 and produced an average of 1523 pounds per acre canola from five clippings. This area was also grazed. Herbicides were not used on this area to control weed growth but will be needed in the future if a canola crop is planted. The sorghum/sudan grass planted in the Section 34 flood area in 2009 produced 37 tons of hay. The triticale planted in a portion of Section 33 flood area was not harvested and was eventually mulched into the soil. The crop was only grazed in 2010 and therefore no hay was produced.

Table 6-4. Homestake Irrigation Hay Production and Fertilization

YEAR	ANNUAL HAY (TONS)
2000	230
2001	650
2002	480
2003	370
2004	410
2005	380
2006	350
2007	320
2008	490
2009	*37

FERTILIZER APPLIED TO IRRIGATED FIELDS

IRRIGATED AREA	APPLICATION DATE	FERTILIZER TYPE (N-P-K)	FERTILIZER QUANTITY (POUNDS)
SEC 33 PIVOT & SEC 34 FLOOD	4/2000	0-46-60	74,000
SEC 28 PIVOT (60 AC)	5/2002	8-32-4	20,000
SEC 33 FLOOD	8/2003	20-20-0	4,500
SEC 28 PIVOT (OUTSIDE 40 AC)	5/2004	16-8-8	7,000

Note: N-P-K = Nitrogen - Phosphate - Potash
* = Section 33 converted to permanent pasture and test canola crop was grown in Section 28. Only a portion of Section 34 produced hay while the remainder was graze

7.0 Radiation Dose to Public from Irrigation Activities

This report consists of an assessment of the radiological impacts to the public from irrigation activities as well as from using the land for residential use and farming after HMC irrigation activities have been terminated. The agricultural irrigation program at Homestake Mining Company's Grants Reclamation site (Grants site) consists of irrigating soil with ground water extracted from a contaminated aquifer, as part of a ground water remediation/restoration effort.

Potential radiation doses to the public were evaluated for:

- Residents eating beef that were fed hay grown on the irrigated areas
- A hypothetical resident farmer, living on and farming the Section 34 irrigated area;
- Current residents living near the irrigated areas of Sections 28 and 33 during crop irrigation activities.

7.1 Radiation Dose from Eating Beef

The Committed Effective Dose Equivalent (CEDE) to humans from eating beef initially requires a calculation of the uptake to beef from the vegetation followed by the transfer from beef to human. For radiation dose calculation purposes, we have used the average uranium in hay measurements from 2000 through 2010 (Table 6-2 average concentration 0.83 mg/kg = 562 pCi/kg). The measured natural concentrations of uranium and selenium in hay grown in the region are presented in Section 6.1.4. The analysis that follows does not subtract the natural background concentrations in hay grown on untreated soils from the measured values in this study and therefore overstates the impact to humans.

7.1.1 Vegetation to Livestock Uptake

The uranium concentration in meat (C_{bi}), as a result of cattle eating hay produced from the Grants site irrigation fields can be estimated by multiplying the rate of intake of vegetation by the transfer coefficient, then multiplying by the fraction of food supply and the concentration in the hay.

$$C_{bi} = QF_{bi}(F_{pg}C_{pgi} + F_hC_{hi})$$

Where the values of the parameters are discussed below:

Q = assumed feed ingestion rate, 27 kg(wet weight)/d, NUREG/CR-5512

F_{bi} = Transfer coefficient from vegetation to livestock, 2.0E-4, NUREG/CR-5512

F_{pg} = fraction of the total annual feed requirement

(including pasture and other feed sources) from hay grown in irrigation area = 0.5

C_{pgi} = measured concentration in vegetation(pCi/kg) = 562 pCi/kg

F_h = fraction of the total annual feed requirement not from irrigated hay, = 0.5. Assumed 50% not grown on irrigated area.

C_{hi} = uranium concentration in the other fraction of feed not grown on the irrigated area = 0

C_{bi} = 27 kg/day (2.0E-4) {(0.5) (562) + (0.5) (0.0)} = 1.5 pCi/kg meat

7.1.2 Beef to Human Uptake

Total activity in the human body from eating only meat produced from the irrigated fields for a year can be calculated as follows:

$$I_i = U_{bk} C_{bi}$$

Where:

I_i = annual intake rate (pCi/y)

U_{bk} = ingestion rate of beef for an adult = (0.16 kg/d)(365d/y)

C_{bi} = concentration in meat (pCi/kg)

I_i = (1.5 pCi/kg meat) (0.16 kg/d) (365 day/y)

I_i = 88 pCi/y

The ingestion CEDE is calculated from the following equation:

$$D_{(ing)} = I_i DCF_{(ing)}$$

Where:

$I_{(ing)}$ = ingestion dose, millirem per year (mrem/y)

$DCF_{(ing)}$ = ingestion CEDE conversion factor
= (5 rem/20 µCi, from 10 CFR 20 Appendix B)

$D_{(ing)}$ = (88 pCi/y) (1E-6 µCi/pCi) (5 rem/20 µCi) (1E3 mrem/rem)
$D_{(ing)}$ = 0.02 mrem/y

7.1.3 Results

Uranium is being retained in the upper layers of treated soil. In terms of risk to human health, uranium levels are currently acceptable. The dose to man by from eating beef fed the hay grown on the irrigated land is negligible, at 0.02 mrem/yr. This can be compared to an average dose to the U. S. population from natural background, manmade, and medical exposures of more than 600 mrem/y.

The average increase of uranium in soil appears to be similar to that predicted although distributed to greater depths. The ratio of uranium concentration in the hay to that in the soil (average of 0.68) is approximately 50 times higher than that predicted using the NRC's soil to vegetation transfer coefficient (0.017 mg uranium/kg vegetation per mg uranium/kg soil) as given in Table 6.16 of NUREG-5512. The NRC transfer coefficient may not take into account constituent uptake via water application in addition to soil/vegetation transfer mechanisms. This much larger observed transfer coefficient from water and soil contributions combined still results in negligible radiation doses to the public. Therefore, the use of alluvial water for irrigation of hay fields with slightly elevated concentrations of uranium is not a significant health concern.

No known limit for uranium in animal feed exists. Animals have been grazing on or near uranium mining and processing facilities and natural uranium outcrops for many decades without any observed adverse effects. Therefore studies have not been conducted on which to base an animal feed standard for uranium. Selenium uptakes in the hay are below the recommended upper limit for animal feed.

Selenium retention in soils appears to be independent of time and application. The concentrations are not time-dependent, implying that absorption in soil is not retarding the movement of selenium through the soil.

7.2.1 RESRAD Model

RESRAD is a computer code approved by the NRC and EPA to model the fate and transport of radionuclides in soil. RESRAD uses a pathway analysis method in which the relation between radionuclide concentrations in soil and the dose to a member of a critical population is expressed as a pathway sum, which is the sum of products of "pathway factors". Pathway factors correspond to pathway segments connecting compartments in the environment between which radionuclides can be transported or radiation emitted. Radiation doses account for radioactive decay and ingrowth, leaching, erosion, and mixing. RESRAD uses a one-dimensional ground-water model that accounts for differential transport of parent and daughter radionuclides with different distribution coefficients.

The total dose includes contributions from external gamma rays, inhalation of particulates, radon-222 (radon); and ingestion of soil, plant, meat, milk, and water. The aquatic foods pathway was turned off since there is no potential source of aquatic food at the site. Conservative

RESRAD default parameters were selected along with known irrigation rates. Exceptions to the default parameters are discussed in the following sections.

7.2.2 Parameter Inputs

The radionuclide concentrations were input as follows:

The average concentrations of natural uranium in samples collected from the 0-1 foot interval in treated areas was 4.64 mg/kg. The net concentration of natural uranium at 0-1 foot was 2.64 mg/kg, or 1.79 picocuries per gram (pCi/g). Uranium-238 accounts for 48.9 percent of the activity of naturally abundant uranium, thus the uranium-238 concentration input to the model was 0.88 pCi/g.

The immediate long-lived daughters (half-lives greater than 6 months) of uranium-238; uranium-234 and thorium-230 are assumed in the model to be in secular equilibrium with the parent.

As indicated by the laboratory analysis of the irrigation water, radium-226 is not in secular equilibrium with its parent uranium-238. Radium-226 and its long-lived daughters are assumed in the model to be in secular equilibrium. Steady-state concentrations for unsupported radium-226 and radium-228 in soil were determined as follows:

$$\left[{}^{226}Ra\right]_{soil} = I_{Ra} x \, {}^{1}\!/_{\rho_{soil}} \, x \, {}^{1}\!/_{0.4} \, x 1 x 10^{-3} \qquad \textit{(Equation 1)}$$

Where:

I_{Ra} = Concentration of radium in irrigation water, 0.2 picocuries per liter (pC/L) for Ra-226 and 1.0 pCi/L for Ra-228

P_{soil} = Density of soil, RESRAD default is 1.5 g/cm^3

1×10^{-3} = conversion factor, cm^3 to liters

0.4 = Primary soil porosity, RESRAD default

The irrigation rate was input as 1.67 feet/yr (0.51 meters/year as given in Table 3-7. The irrigation mode parameter in RESRAD was set as ditch irrigation.

The precipitation was input as 0.27 meters/yr, equivalent to 10.5 inches. The area of the contaminated zone was input as 485,640 m^2 (equivalent to 120 acres)

7.2.3 Predicted Dose to Resident Farmer

The output of the RESRAD model provides individual path and total committed doses occurring at 1, 3, 10, 30, 100, 300, and 1,000 years in the future.

The results indicate a gradual decline in the total dose for about 300 years, and then a sharp increase towards 1,000 years. The increase is due to the contributions of water-dependent plant, meat, milk, and fish consumption.

The predicted dose rate for the first few hundred years is approximately 0.2 millirem per year for the first few hundred years with a maximum of 0.7 millirem per year, occurring after 1000 years. The output of the model is in Appendix E.

This dose is insignificant compared to the average radiation dose to the U.S. population from exposure to natural and man-made radiation sources and medical exposures, estimated to be more than 600 mrem/year. The additional 0.2 to 0.7 mrem/year received by the resident farmer is comparable to estimates of the average radiation dose to the public from airborne emissions from coal-fired power plants.

7.3 Exposure to Radon Releases to Current Residents Living Near Irrigation Sites

Release of radon-222 (radon) from water occurs most rapidly from water while it is being aerated or sprayed such as from a shower or spray irrigation system. Measurements of radon release from water bodies have indicated a limited release of radon from the surface (Simonds, 2010). A detailed risk evaluation of existing nearby residents potentially exposed to radon-222 released from the irrigation system was performed using data collected in 2009 (ERG & HYDRO, 2010). The results of the risk analysis concluded that risk to existing residents from potential exposure to radon released from irrigation activities was 1.1 x $^{-10}$, or at negligible levels. The potential radon concentrations have not changed over the years. Thus parameters for calendar year 2009 are similar to the 2010 parameters and the conclusion of negligible risk in 2010 is supported. Another detailed risk evaluation for 2010 is not justified.

7.4 Radiation Dose from Airborne Releases from Irrigation Areas Following the Cessation of Irrigation

If irrigation of the existing sites is discontinued, there is a potential for exposure of nearby residents to airborne uranium contained in dust from the irrigation areas. High spring winds in the area are known to create periods of dusty conditions, which may occur for several days during the months of March, April, and May. Given the measured uranium concentration of 1.79 pCi/g in surface soils in the irrigation area, these soils if suspended in the air as dust would give rise to an additional radiation dose equal to 1 mrem/year for each mg/m^3 of dust in the air, assuming continuous exposure (10 CFR 20 Appendix B, Table 2).

The wind rose data from the meteorological station at the Homestake Site records the average hourly wind speed. The wind rose data for the 2009-2010 two-year period is shown in Figure 7-1. The hourly average wind speed exceeded 8.8 meter/sec (19.7 miles/hour) and 11.1 m/sec (24.8 miles/hour) 4.25 and 1.34 percent of the time. In order to be conservative for risk assessment purposes, we have assumed that significant airborne dust from the site will be generated 4.25 percent of the year.

In order to protect workers from lung diseases such as silicosis, OSHA doesn't allow unprotected workers in areas where the average dust concentration exceeds 15 mg/m^3. At these levels, the dust is visible and certainly high enough that a person would not choose to live in the area if the levels persisted for a large portion of the year. If we assume that for 4.25 percent of the year the dust concentration arising from the previously irrigated fields is 15 mg/m^3, the average annual dust concentration would be approximately 0.64 mg/m^3. Exposures to these levels of dust containing uranium concentrations equivalent to those currently measured in surface soils at the irrigation fields would result in an additional radiation dose of 0.64 mrem per year (0.64 mg/m^3 x 1 mrem/y /1 mg/m^3). This additional radiation dose is insignificant compared to the more than 600 mrem/y that the average U.S. resident receives from medical, man-made, and background sources.

7.5 Summary

Potential radiation doses to the public were evaluated for:

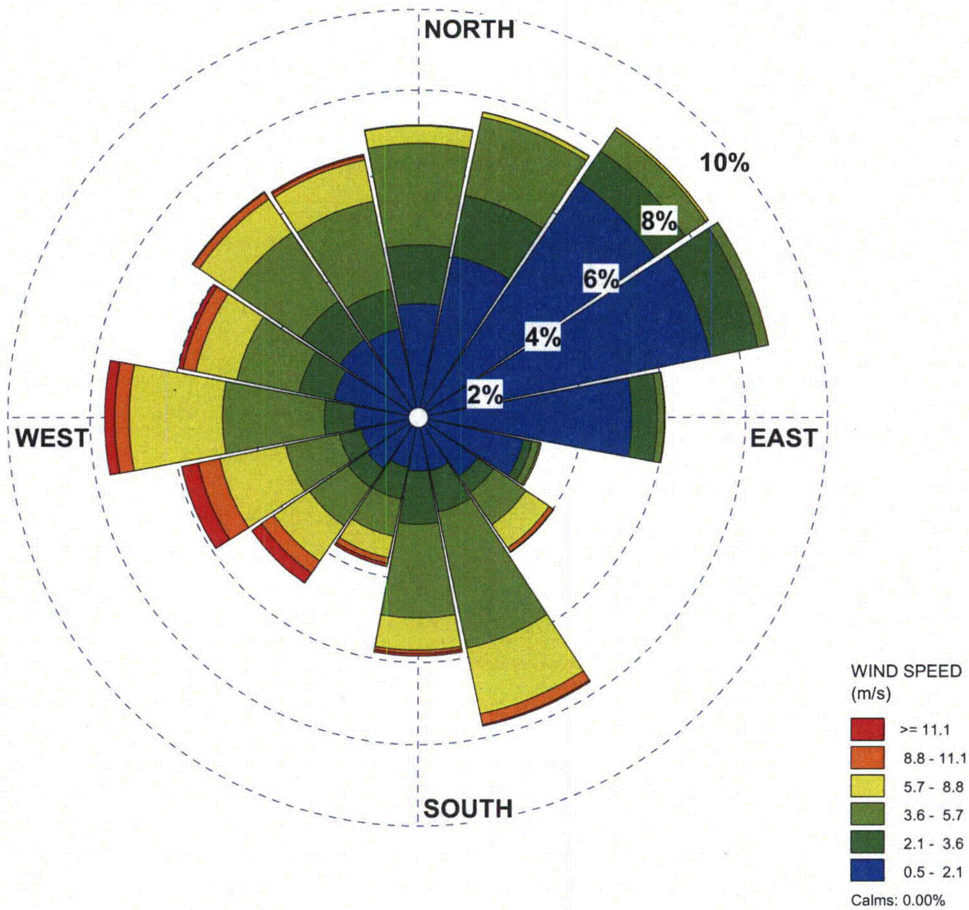
- Residents eating beef that were fed hay grown on the irrigated areas
- A hypothetical resident farmer, living on and farming the Section 34 irrigated area;
- Current residents living near the irrigated areas during and following cessation of crop irrigation activities.

Each analysis shows that the radiological dose to existing or future occupants of the land on and near the irrigation areas is extremely small (less than one percent) compared to the average dose that the population receives from natural background and medical exposures.

Figure 7-1. Grants Project Onsite Wind Rose

WIND ROSE PLOT:
Station #00000 - Onsite Meteorology Station in Grants, NM

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2009-2011** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.00%**	TOTAL COUNT: **16170 hrs.**	
	AVG. WIND SPEED: **3.41 m/s**	DATE: **2/7/2011**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

8.0 Conclusion

Uranium is being retained in the upper layers of treated soil. In terms of risk to human health, uranium levels are currently acceptable. The dose to man by way of food web uptake calculations is negligible, at 0.05 mrem/yr.

The average increase of uranium in soil appears to be similar to that predicted although distributed to greater depths. The increase in concentrations in the hay was approximately 50 times higher than that predicted using the NRC's soil to vegetation transfer coefficient. The NRC transfer coefficient may not take into account constituent uptake via water application in addition to soil/vegetation transfer mechanisms. This much larger observed transfer coefficient from water and soil contributions combined still results in negligible radiation doses to the public. Therefore, the use of alluvial water for irrigation of hay fields with slightly elevated concentrations of uranium is not a significant health concern.

Selenium uptakes in the vegetation are below the recommended upper limit for animal feed. Selenium retention in soils appears to be independent of time and application. The concentrations are not time-dependent, implying that absorption in soil is not retarding the movement of selenium through the soil.

The modeling of the soil moisture migration to the ground water and mixing calculations indicate the following:

1. No ground water impacts should results in the Section 34 flood irrigation.
2. A small increase in TDS and sulfate concentration in the ground water should occur during the irrigation of the Section 28 and 33 center pivots.
3. The long-term TDS and sulfate concentrations in the ground water should be so small that it is not detectable in the Section 28 and 33 Center pivot areas.
4. No increase in uranium and selenium concentrations in the ground water should result from the Section 28 and 33 center pivot irrigation.

The monitoring of concentrations of uranium and selenium will continue as part of the ongoing irrigation program.

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APPENDIX A

1999, 2000 and 2009 Soil Analysis

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Tables

Table A-1. 1999 and 2000 Irrigation Soil Analyses for Section 33

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 33						
33A	10/1/1999	0.36	0.1	<1	7.7	0.350	2.51	0.68	0.28	0.22	13	330
33A1	12/7/2000	0.84	0.6	<1	7.8	1.890	7.84	2.28	10.4	4.62	50	220
33A2	12/7/2000	0.65	0.4	<1	7.7	1.950	8.84	2.55	10.1	4.23	53	210
33A3	12/7/2000	0.62	0.2	<1	7.6	2.170	11.70	3.33	10.0	3.65	49	210
33B	10/1/1999	0.82	0.2	<1	7.7	0.445	3.30	0.73	0.17	0.12	7	40
33B1	12/7/2000	1.05	0.2	<1	7.8	0.576	2.33	0.86	3.18	2.52	14	50
33B2	12/7/2000	0.96	0.5	<1	7.8	1.010	3.75	1.21	5.44	3.45	38	370
33B3	12/7/2000	1.44	0.3	<1	7.6	1.270	5.00	1.24	6.66	3.77	22	210
33C	10/1/1999	0.65	<0.1	<1	7.8	0.474	3.10	0.72	0.15	0.10	35	440
33C1	12/7/2000	0.91	0.3	<1	8	0.495	1.84	0.68	3.42	3.05	13	<50
33D	10/1/1999	0.73	0.2	<1	7.7	0.840	5.48	1.24	0.69	0.37	22	130
33D1	12/7/2000	1.14	0.2	<1	7.6	1.240	9.07	2.64	0.64	0.26	18	<50
	1999 AVG:	0.61	0.12	0.5	7.7	0.423	2.97	0.71	0.20	0.15	18	270
	2000-1 AVG:	0.93	0.37	0.5	7.9	0.987	4.00	1.27	5.67	3.40	26	98
	2000-2 AVG:	0.81	0.45	0.5	7.8	1.480	6.30	1.88	7.77	3.84	46	290
	2000-3 AVG:	1.03	0.25	0.5	7.6	1.720	8.35	2.29	8.33	3.71	36	210

NOTE: 2000 Sample: 1 = 0 - 6 inches, 2 = 6 - 18 inches and 3 = 18 - 36 inches

Table A-2. 1999 and 2000 Irrigation Soil Analyses for Section 34

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. (mmhos/cm)	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
						SECTION 34						
34A	9/29/1999	2.72	0.4	<1	7.7	3.56	17.10	7.40	16.6	4.74	36	1280
34A1	12/7/2000	2.78	0.6	<1	7.7	1.94	8.68	3.29	9.32	3.81	40	350
34A2	12/7/2000	2.49	0.4	<1	7.5	3.13	19.50	6.42	13.2	3.67	52	780
34A3	12/7/2000	1.37	0.2	<1	7.5	2.76	16.30	5.08	12.9	3.95	20	450
34B	9/29/1999	2.36	0.4	<1	7.7	3.89	17.60	7.36	20.3	5.75	54	3470
34B1	12/7/2000	3.61	0.6	<1	7.6	4.01	16.70	7.30	24.3	7.01	72	1020
34B2	12/7/2000	3.04	0.4	<1	7.6	5.03	18.90	9.26	32.8	8.74	159	3490
34B3	12/7/2000	2.02	0.3	<1	7.7	6.27	20.10	7.90	47.0	12.6	106	2220
34C	9/29/1999	1.75	0.3	<1	7.6	5.25	22.90	9.00	29.2	7.31	79	4560
34C1	12/7/2000	3.00	0.4	<1	7.8	1.61	5.46	2.13	9.64	4.95	58	470
34D	9/29/1999	3.60	0.6	<1	7.8	1.40	4.60	2.13	7.28	3.97	36	160
34D1	12/7/2000	3.29	0.5	<1	7.6	3.88	20.20	6.97	21.3	5.78	88	2520
34E	9/29/1999	2.31	0.4	<1	7.8	2.67	12.20	5.24	12.8	4.33	25	690
34E1	12/7/2000	4.21	0.7	<1	7.8	2.26	8.49	3.86	13.8	5.55	44	380
34F	9/29/1999	3.03	0.8	<1	7.7	4.76	22.80	8.80	23.1	5.81	68	5040
34F1	12/7/2000	4.68	1.3	2	7.8	4.18	19.40	9.43	23.0	6.06	66	1140
34G	10/6/1999	1.85	0.3	<1	7.6	1.62	9.39	3.60	1.59	0.62	13	100
34G1	12/7/2000	2.64	0.8	<1	7.6	1.69	8.19	3.50	8.18	3.38	25	150
34G2	12/7/2000	1.13	0.3	<1	7.6	1.55	4.85	2.34	9.73	5.13	24	220
34G3	12/7/2000	1.48	0.4	<1	7.7	1.16	4.50	2.08	6.72	3.70	41	270
34H	10/7/1999	3.38	0.7	<1	8	0.969	3.23	1.13	5.28	3.58	43	520
34H1	12/7/2000	4.23	1.0	<1	7.6	2.75	15.90	4.33	15.0	4.72	52	430
34I	10/7/1999	0.99	0.1	<1	7.8	1.46	4.99	0.89	8.29	4.83	42	480
34I1	12/7/2000	1.73	0.2	<1	7.5	1.03	4.57	1.11	6.72	3.99	59	440
	1999 AVG:	2.44	0.44	0.50	7.7	2.84	12.76	5.06	13.83	4.55	44	1811
	2000-1 AVG:	3.35	0.68	0.67	7.7	2.59	11.95	4.66	14.58	5.03	56	767
	2000-2 AVG:	2.22	0.37	0.50	7.6	3.24	14.42	6.01	18.58	5.85	78	1497
	2000-3 AVG:	1.62	0.30	0.50	7.6	3.40	13.63	5.02	22.21	6.75	56	980

NOTE: 2000 Sample: 1 = 0 - 6 inches, 2 = 6 - 18 inches and 3 = 18 - 36 inches

Table A-3. 2009 Irrigation Soil Analyses for Section 33

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
33PV#1-0-1	10/6/2009	1.76	0.43	3	8	1.940	6.88	3.24	11.10	4.93	104	700
33PV#1-1-2	10/6/2009	2.87	0.53	1	7.9	5.530	24.80	12.70	42.10	9.72	270	2100
33PV#1-2-3	10/6/2009	1.24	0.13	1	7.6	4.150	18.60	9.13	21.50	5.77	272	600
33PV#1-3-4	10/6/2009	1.01	0.09	1	7.7	3.420	13.90	6.95	18.50	5.73	152	450
33PV#1-4-5	10/6/2009	0.88	0.23	1	7.8	3.020	12.70	6.34	16.70	5.41	98	500
33PV#1-5-7	10/6/2009	1.04	0.14	1	7.8	2.390	8.68	4.45	13.90	5.42	86	460
33PV#1-7-9	10/6/2009	1.01	0.46	1	7.7	3.500	20.90	9.60	16.30	4.17	44	550
33PV#1-9-11	10/6/2009	0.99	0.19	1	7.6	3.180	21.00	9.24	12.80	3.29	28	460
33PV#1-11-13	10/6/2009	1.90	0.07	1	7.8	1.030	5.93	2.45	2.68	1.31	24	170
33PV#1-13-15	10/6/2009	0.40	0.06	1	7.9	0.652	3.57	1.37	1.73	1.10	26	170
33PV#1-15-17	10/6/2009	0.53	0.08	1	7.6	1.680	12.20	4.98	2.34	0.79	26	160
33PV#2-0-1	10/5/2009	1.47	0.28	1	7.9	2.450	9.02	4.17	13.70	5.33	96	380
33PV#2-1-2	10/5/2009	1.23	0.20	1	8.0	1.840	5.88	2.75	10.60	5.10	80	490
33PV#2-2-3	10/5/2009	1.44	0.16	1	8.0	2.530	8.32	3.76	14.40	5.86	93	530
33PV#2-3-4	10/5/2009	1.05	0.13	1	8.0	3.230	12.80	5.45	19.40	6.42	62	500
33PV#2-4-5	10/5/2009	1.55	0.19	1	8.0	3.390	13.80	6.58	22.30	6.99	68	640
33PV#2-5-7	10/5/2009	0.65	0.12	1	8.1	4.000	16.20	9.00	26.10	7.35	167	970
33PV#2-7-9	10/5/2009	0.60	0.09	1	8.0	2.550	11.20	7.31	12.20	4.01	99	460
33PV#2-9-11	10/5/2009	0.82	0.24	2	7.7	2.960	22.10	13.30	4.59	1.09	199	510
33PV#2-11-13	10/5/2009	1.01	0.10	2	7.8	2.430	16.30	9.75	1.57	0.43	253	380
33PV#2-13-15	10/5/2009	1.09	0.09	2	7.7	2.050	12.70	7.95	2.27	0.70	227	230
33PV#3-0-1	10/6/2009	2.04	0.49	1	7.8	4.380	17.40	8.18	26.80	7.49	160	1200
33PV#3-1-2	10/6/2009	2.53	0.35	1	7.8	6.350	22.80	11.60	53.60	12.90	350	2400
33PV#3-2-3	10/6/2009	1.40	0.49	3	7.6	6.050	28.30	12.90	32.60	7.18	680	1760
33PV#3-3-4	10/6/2009	1.29	0.50	2	7.5	5.040	30.60	13.00	15.90	3.41	610	870
33PV#3-4-5	10/6/2009	1.44	0.36	3	7.7	3.650	25.60	10.50	6.67	1.57	435	730
33PV#3-5-7	10/6/2009	0.84	0.18	2	7.7	1.890	12.30	4.99	3.16	1.07	132	350
33PV#3-7-9	10/6/2009	0.53	<0.5	2	7.9	0.754	4.44	1.65	1.48	0.84	40	260
33PV#3-9-11	10/6/2009	0.72	0.06	4	7.9	0.674	4.10	1.47	1.41	0.84	32	270
33PV#3-11-13	10/6/2009	0.51	0.06	3	7.9	0.736	4.01	1.46	1.75	1.06	40	390
33PV#4-0-1	10/6/2009	1.96	0.43	1	7.7	5.440	21.90	11.00	32.80	8.09	198	980
33PV#4-1-2	10/6/2009	1.15	0.17	3	7.7	2.550	10.50	3.74	13.00	4.87	90	540
33PV#4-2-3	10/6/2009	1.71	0.24	1	7.6	2.080	8.44	3.88	9.03	3.64	57	430
33PV#4-3-4	10/6/2009	2.28	0.34	3	7.7	4.320	20.80	11.30	24.30	6.07	64	2100
33PV#4-4-5	10/6/2009	1.60	0.33	2	7.8	5.380	21.50	13.90	34.30	8.15	91	2800
33PV#5-0-1	10/6/2009	1.57	0.27	3	7.9	1.430	3.34	1.44	8.59	5.56	150	830
33PV#5-1-2	10/6/2009	1.97	0.22	4	7.9	1.920	4.80	2.02	11.00	5.96	80	650
33PV#5-2-3	10/6/2009	1.66	0.20	2	7.7	5.030	17.70	6.48	31.10	8.94	230	860
33PV#5-3-4	10/6/2009	1.09	0.15	4	7.8	4.100	16.00	5.97	20.40	6.16	251	640
33PV#5-4-5	10/6/2009	0.92	0.17	3	8.0	1.980	5.62	2.42	9.98	4.98	128	380
33PV#5-5-7	10/6/2009	0.88	0.10	2	8.0	1.700	4.27	1.88	9.24	5.27	76	550
33PV#5-7-9	10/6/2009	0.84	0.14	2	8.0	1.590	4.19	1.72	8.41	4.89	80	470
33PV#5-9-11	10/6/2009	0.95	0.15	2	7.7	2.490	14.40	7.68	6.26	1.88	72	590
33PV#5-11-13	10/6/2009	0.92	0.15	1	7.7	1.950	12.30	7.53	2.33	0.74	82	370
33PV#5-13-15	10/6/2009	1.08	0.22	2	7.7	1.830	11.70	7.12	2.10	0.68	87	320
33PV#5-15-17	10/6/2009	1.08	0.19	2	7.7	2.000	13.40	8.26	2.36	0.71	111	340
LY1-1	5/21/2008	2.35	0.44	1	7.8	3.310	14.10	5.69	20.20	6.42	184	1000
LY1-2	5/21/2008	2.32	0.21	1	7.8	2.330	8.39	3.03	14.80	6.19	360	1500
LY1-3	5/21/2008	1.81	0.22	1	7.8	2.030	7.74	2.95	12.10	5.23	190	970
LY1-4	5/21/2008	1.31	0.18	1	7.8	2.220	9.09	3.53	13.40	5.33	330	1400
LY1-5	5/21/2008	1.36	0.26	1	7.7	2.130	9.08	3.83	12.50	4.92	97	700
LY1-5-7	5/21/2008	1.14	0.20	1	7.9	1.655	7.02	3.10	9.03	4.01	52	545
LY1-7-9	5/21/2008	1.17	0.15	1	7.8	1.615	10.26	4.65	5.16	1.87	42	475
LY1-9-11	5/21/2008	0.92	0.13	1	7.7	1.460	10.55	4.72	2.76	1.00	40	305
LY1-11-13	5/21/2008	0.57	0.13	1	7.9	0.805	4.64	2.02	1.99	1.06	60	295
LY1-13-15	5/21/2008	0.53	0.10	1	7.9	1.200	7.03	3.14	3.16	1.41	70	410
LY1-15-17	5/21/2008	0.59	0.14	1	7.8	1.285	8.95	4.21	2.20	0.85	38	240

Table A-3. 2009 Irrigation Soil Analyses for Section 33 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
LY2-1	5/21/2008	1.18	0.29	2	7.8	2.660	12.60	4.98	17.7	5.97	90	700
LY2-2	5/21/2008	1.81	0.32	2	7.9	4.240	16.20	5.97	34.70	10.40	430	2500
LY2-3	5/21/2008	1.45	0.29	2	7.8	4.410	18.20	6.47	33.70	9.60	227	990
LY2-4	5/21/2008	1.17	0.30	1	7.8	4.640	16.30	6.37	35.00	10.40	359	940
LY2-5	5/21/2008	0.73	0.27	2	7.7	3.900	16.75	9.58	26.15	7.21	233	735
LY2-5-7	5/21/2008	0.78	0.26	2	7.7	3.710	15.80	7.09	25.85	7.65	234	625
LY2-7-9	5/21/2008	0.87	0.33	2	7.6	3.905	19.65	9.44	23.50	6.18	167	800
LY2-9-11	5/21/2008	1.49	0.40	1	7.5	2.270	18.10	4.95	7.25	2.11	96	585
LY2-11-13	5/21/2008	1.16	0.24	1	7.5	1.500	12.15	2.96	3.39	1.23	75	575
LY2-13-15	5/21/2008	1.06	0.22	1	7.5	1.455	10.95	2.68	3.80	1.46	82	425
LY2-15-17	5/21/2008	0.79	0.22	1	7.6	1.710	13.20	3.37	4.83	1.69	75	405
LY3-1	5/21/2008	2.04	0.54	1	7.7	4.250	22.70	11.20	30.30	7.36	104	2100
LY3-2	5/21/2008	1.70	0.34	1	7.6	5.650	21.10	13.60	52.20	12.50	251	2000
LY3-3	5/21/2008	1.52	0.37	1	7.9	7.280	20.40	8.93	64.10	16.70	316	1600
LY3-4	5/21/2008	0.73	0.22	1	8.0	6.530	17.70	6.61	60.10	17.20	270	900
LY3-5	5/21/2008	0.65	0.15	1	8.1	4.840	13.90	5.33	37.00	11.90	230	600
LY3-5-7	5/21/2008	0.69	0.19	1	7.9	5.190	15.55	8.85	38.70	11.10	291	860
LY3M20-25	4/7/2009	0.22	0.12	1	8.1	5.860	6.51	3.45	8.44	3.78	35	180
LY3M25-35	4/7/2009	0.24	0.11	1	8.1	1.290	4.41	2.22	1.34	4.03	32	150
LY4-1	4/7/2009	2.37	0.48	1	7.7	3.720	17.90	8.97	20.20	5.51	198	900
LY4-2	4/7/2009	1.33	0.21	1	8.0	1.810	6.67	2.78	10.00	4.60	120	670
LY4-3	4/7/2009	1.77	0.29	1	7.9	1.740	6.82	2.55	10.40	4.80	120	880
LY4-4	4/7/2009	2.13	0.43	2	7.9	1.830	9.22	3.52	9.50	3.76	68	600
LY4-5	4/7/2009	1.70	0.43	1	7.9	2.540	14.30	6.28	12.20	3.80	90	870
LY4-5-7	4/7/2009	1.55	0.38	1	8.0	1.855	8.41	3.25	10.55	4.37	124	1205
LY4-7-9	4/7/2009	0.91	0.16	1	7.9	1.470	6.44	2.27	8.42	4.03	125	885
LY4-9-11	4/7/2009	0.61	0.15	1	9.3	1.570	6.95	2.33	7.77	3.61	135	1610
LY4-11-13	4/7/2009	0.65	0.13	1	9.4	1.690	9.41	2.77	6.32	2.59	46	570
LY4-13-15	4/7/2009	0.66	0.16	1	9.5	1.425	10.55	3.21	3.28	1.30	50	420
LY4-15-17	4/7/2009	1.16	0.32	2	9.3	2.560	23.15	7.29	3.92	1.01	100	580
LY4M20-30	4/7/2009	0.33	0.15	1	7.8	1.370	9.23	3.02	3.26	1.32	42	230
LY4M40-50	4/7/2009	0.16	0.09	1	8.3	0.550	2.52	0.94	1.87	1.42	23	103
LY5-0-1	10/5/2009	3.58	0.49	3	7.9	5.140	20.50	10.60	41.10	10.40	185	1800
LY5-1-2	10/5/2009	1.48	0.34	2	7.9	6.840	23.40	15.80	58.10	13.10	397	1200
LY5-2-3	10/5/2009	1.21	0.37	3	7.8	7.410	27.70	20.80	53.10	10.80	600	1100
LY5-3-4	10/5/2009	1.10	0.32	2	7.8	5.800	25.50	16.00	32.70	7.18	415	710

AVERAGES OF TREATED AREA SAMPLES	DEPTH	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
	1	2.03	0.41	2	7.82	3.472	14.63	6.95	22.75	6.71	147	1059
	2	1.84	0.29	2	7.85	3.906	14.45	7.40	30.01	8.53	243	1405
	3	1.52	0.28	1	7.77	4.271	16.22	7.79	28.20	7.85	279	972.
	4	1.32	0.27	2	7.80	4.113	17.19	7.87	24.92	7.17	258	911
	5	1.20	0.27	2	7.85	3.426	14.81	7.20	19.76	6.10	163	884
	5-7	0.95	0.20	1	7.87	2.799	11.03	5.33	17.07	5.78	145	696
	7-9	0.85	0.22	1	7.83	2.198	11.01	5.23	10.78	3.71	85	557
	9-11	0.93	0.19	2	7.91	2.086	13.89	6.24	6.12	1.97	86	619
	11-13	0.96	0.12	1	7.99	1.449	9.25	4.13	2.86	1.20	83	393
	13-15	0.80	0.14	1	8.03	1.435	9.42	4.24	2.72	1.11	90	329
	15-17	0.83	0.19	1	7.98	1.847	14.18	5.62	3.13	1.01	70	345

Table A-4. 2009 Irrigation Soil Analyses for Section 34 and 33 Flood Area

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
34FA#1 0-1	10/6/2009	3.70	0.87	4	8.0	5.580	24.90	10.90	40.60	9.60	317	3700
34FA#1 1-2	10/6/2009	1.58	0.41	3	7.8	5.310	28.50	11.30	34.10	7.64	350	2900
34FA#1 2-3	10/6/2009	0.56	0.08		7.8	3.770	23.40	8.31	21.00	5.27	95	690
34FA#1 3-4	10/6/2009	0.60	0.08	2	7.8	3.700	25.80	8.60	18.60	4.48	66	670
34FA#1 4-5	10/6/2009	0.41	0.06	<1	7.9	2.950	16.40	5.69	16.60	4.99	49	480
34FA#1 5-7	10/6/2009	0.39	0.07	<1	8.1	1.930	7.10	2.52	12.20	5.56	60	500
34FA#1 7-9	10/6/2009	0.46	0.06	<1	8.2	1.380	4.45	0.99	8.72	5.29	70	580
34FA#1 9-11	10/6/2009	0.62	0.05	1	7.8	2.100	7.46	1.72	13.10	6.11	120	510
34FA#1 11-11.5	10/6/2009	2.15	0.09	<1	7.7	3.460	26.90	11.60	13.90	3.17	41	1500
34FA#1 11.5-13	10/6/2009	0.71	0.07	3	8.1	0.983	2.29	1.04	6.45	5.00	70	650
34FA#2 0-1	10/8/2009	4.02	0.88	<1	8.0	4.850	18.80	10.60	35.00	9.13	240	6100
34FA#2 1-2	10/8/2009	3.09	0.72	<1	7.9	5.990	19.20	9.07	46.70	12.40	384	7400
34FA#2 2-3	10/8/2009	2.44	0.54	<1	7.9	5.320	19.70	6.78	39.10	10.70	351	6800
34FA#2 3-4	10/8/2009	0.92	0.13	<1	7.5	3.560	21.10	5.23	18.00	4.96	57	1500
34FA#2 4-5	10/8/2009	0.51	0.04	1	7.4	2.980	18.00	4.48	13.50	4.03	45	2000
34FA#2 5-7	10/8/2009	0.54	0.04	<1	7.7	2.790	15.70	6.19	12.30	3.72	25	600
34FA#2 7-9	10/8/2009	0.54	0.03	1	7.9	1.610	3.59	1.35	12.10	7.70	90	820
34FA#2 9-11	10/8/2009	1.20	0.07	1	7.4	3.430	23.40	5.96	16.00	4.18	47	1400
34FA#2 11-13	10/8/2009	2.35	0.08		7.5	2.880	19.30	9.15	9.34	2.48	27	7700
34FA#3 0-1	10/8/2009	5.52	1.38	5	7.7	5.100	22.00	10.00	30.40	7.60	303	5500
34FA#3 1-2	10/8/2009	3.40	0.81	4	7.7	4.400	22.40	7.92	25.10	6.45	367	3500
34FA#3 2-3	10/8/2009	2.86	0.80	4	7.6	4.460	25.30	6.98	21.70	5.40	540	2100
34FA#3 3-4	10/8/2009	2.36	0.64	3	7.6	4.640	28.60	7.29	20.50	4.84	550	5000
34FA#3 4-5	10/8/2009	1.18	0.19	2	7.7	3.380	14.40	3.71	17.10	5.68	270	400
34FA#3 5-7	10/8/2009	0.37	0.07	<1	8.0	1.580	6.17	1.75	8.07	4.06	100	370
34FA#3 7-9	10/8/2009	0.33	0.07	<1	8.2	0.840	2.63	0.80	4.39	3.35	40	310
34FA#3 9-11	10/8/2009	0.40	0.23	<1	8.0	0.870	2.93	1.26	4.06	2.81	30	290
34FA#3 11-13	10/8/2009	0.42	0.20	<1	7.9	1.540	9.72	4.43	3.19	1.20	15	330
34FA#4 0-1	10/8/2009	5.32	0.99	5	7.9	5.170	20.30	9.97	34.10	8.77	278	7000
34FA#4 1-2	10/8/2009	2.86	0.55	5	7.8	5.380	21.70	8.60	33.50	8.61	402	5800
34FA#4 2-3	10/8/2009	2.43	0.59	5	7.7	6.020	27.10	8.23	34.10	8.11	960	6900
34FA#4 3-4	10/8/2009	1.84	0.54	8	7.6	6.880	36.10	9.34	35.80	7.51	1330	7700
34FA#4 4-5	10/8/2009	0.66	0.16	<1	7.6	5.780	33.60	8.87	27.70	6.01	497	2500
34FA#4 5-7	10/8/2009	0.21	0.03	<1	7.9	2.920	20.10	5.22	10.10	2.84	118	400
34FA#4 7-9	10/8/2009	0.19	0.03	<1	8.2	1.160	4.52	2.94	4.25	2.20	80	690
34FA#4 9-11	10/8/2009	0.37	0.03	4	8.0	1.780	7.52	6.49	5.64	2.13	30	410
34FA#4 11-13	10/8/2009	0.71	0.10	3	8.0	2.120	10.00	8.85	6.17	2.00	16	310
34FA#5 0-1	10/7/2009	3.85	0.90	3	7.8	5.900	20.60	6.96	42.70	11.50	690	6900
34FA#5 1-2	10/7/2009	2.21	0.61	1	7.6	5.380	22.40	5.12	35.20	9.49	800	6600
34FA#5 2-3	10/7/2009	1.66	0.46	1	7.7	5.410	25.20	4.67	30.80	7.97	760	5100
34FA#5 3-4	10/7/2009	0.52	0.12	<1	7.7	4.120	21.40	4.47	23.40	6.51	92	2400
34FA#5 4-5	10/7/2009	0.27	0.04	<1	7.9	4.050	21.00	6.23	22.70	6.15	58	930
34FA#5 5-7	10/7/2009	0.24	0.04	<1	7.9	3.820	22.40	7.33	16.40	4.25	92	720
34FA#5 7-9	10/7/2009	0.19	0.04	<1	8.1	1.550	6.22	3.66	5.38	2.42	94	179
34FA#5 9-11	10/7/2009	0.20	0.23	<1	8.1	1.340	4.63	3.98	4.85	2.34	71	160
34FA#5 11-13	10/7/2009	1.03	0.21	<1	7.7	4.680	20.40	21.70	15.10	3.29	297	630
LY 34 #1 0-1	10/7/2009	3.44	1.08	3	7.8	3.240	12.70	5.98	18.90	6.18	87	1200
LY 34 #1 1-2	10/7/2009	2.57	0.74	5	7.9	4.690	17.30	9.88	30.30	8.22	197	2500
LY 34 #1 2-3	10/7/2009	1.73	0.49	2	7.8	4.590	19.50	10.80	26.60	6.83	146	3700
LY 34 #1 3-4	10/7/2009	0.58	0.06	4	7.9	1.480	2.96	1.43	9.19	6.20	80	790
LY 34 #1 4-5	10/7/2009	0.75	0.07	2	7.8	3.220	15.50	5.66	15.00	4.61	100	150
LY 34 #1 5-7	10/7/2009	0.22	0.04	<1	8.6	0.738	1.97	0.62	4.06	3.57	30	125
LY 34 #1 7-9	10/7/2009	0.38	0.06	3	8.4	1.225	4.15	1.03	6.96	4.83	90	970
LY 34 #1 9-11	10/7/2009	0.34	0.10	<1	8.3	1.190	2.78	0.82	7.28	5.43	70	700
LY 34 #2 0-1	10/7/2009	4.64	1.22	<1	7.8	5.160	21.70	11.50	31.30	7.68	308	2600
LY 34 #2 1-2	10/7/2009	3.53	0.80	<1	7.8	4.880	20.20	9.64	29.60	7.66	409	4300
LY 34 #2 2-3	10/7/2009	2.20	0.50	1	7.7	5.360	24.70	9.96	32.20	7.73	332	3100
LY 34 #2 3-4	10/7/2009	0.64	0.10	1	7.8	3.080	11.40	5.63	17.60	6.03	120	570
LY 34 #2 4-5	10/7/2009	0.52	0.07	1	8.0	2.740	9.94	4.84	15.30	5.63	120	620
LY 34 #2 5-7	10/7/2009	0.44	0.04	1	8.2	1.165	3.32	1.60	6.65	4.24	95	530
LY 34 #2 7-9	10/7/2009	0.34	0.07	2	8.1	1.213	3.77	1.94	6.46	3.87	105	775
LY 34 #2 9-11	10/7/2009	0.64	0.07	2	7.8	2.065	8.12	4.59	9.46	3.80	95	640
LY 34 #2 11-12	10/7/2009	0.77	0.09	1	7.8	1.950	8.18	4.77	8.06	3.17	100	620

Table A-4. 2009 Irrigation Soil Analyses for Section 34 and 33 Flood Area (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
LY 34 #3 0-1	10/7/2009	4.43	1.00	9	7.8	4.040	20.20	5.10	25.40	7.14	174	2200
LY 34 #3 1-2	10/7/2009	2.33	0.58	4	7.6	3.530	18.70	3.37	20.00	6.02	480	3100
LY 34 #3 2-3	10/7/2009	1.48	0.40	6	7.5	3.320	16.10	2.65	17.40	5.68	550	900
LY 34 #3 3-4	10/7/2009	0.77	0.12	3	7.8	1.090	3.69	0.81	6.10	4.07	74	169
LY 34 #3 4-5	10/7/2009	0.40	0.06	1	8.0	0.857	2.85	0.75	4.66	3.47	63	260
LY 34 #3 5-7	10/7/2009	0.48	0.05	<1	8.2	0.883	2.63	0.96	4.98	3.73	79	540
LY 34 #3 7-9	10/7/2009	0.59	0.05	2	8.1	0.967	2.55	1.30	5.40	3.90	66	365
LY 34 #3 9-11	10/7/2009	0.60	0.10	1	8.0	0.858	2.11	1.09	5.02	3.98	51	440
LY34-4-0-1	10/5/2009	1.62	0.39	1	7.8	2.740	12.90	5.46	14.20	4.69	114	820
LY34-4-1-2	10/5/2009	1.77	0.43	2	7.9	2.050	10.10	3.84	10.90	4.13	100	640
LY34-4-2-3	10/5/2009	0.98	0.24	1	7.7	3.690	26.80	8.31	15.70	3.75	139	970
LY34-4-3-4	10/5/2009	0.36	0.07	2	7.6	2.840	21.00	5.49	11.90	3.27	46	560
LY34-4-4-5	10/5/2009	0.34	0.06	3	7.8	2.020	11.20	3.06	9.56	3.58	40	410
LY34-4-5-7	10/5/2009	0.22	0.04	1	8.0	1.485	7.97	2.02	7.07	3.17	35	345
LY34-4-7-9	10/5/2009	0.24	0.04	1	8.1	1.460	7.90	1.88	6.57	2.98	46	420
LY34-4-9-11	10/5/2009	0.34	0.05	2	8.0	1.635	9.08	2.24	7.51	3.22	38	310
LY34-4-11-13	10/5/2009	0.35	0.00	1	8.2	0.978	4.48	1.24	4.08	2.45	43	310
LY34-4-13-14	10/5/2009	0.61	0.10	2	7.9	1.510	8.60	2.41	5.93	2.53	50	330

AVERAGES OF SECTION 34 TREATED AREA SAMPLES	DEPTH	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
	1	4.06	0.97	4	7.8	4.642	19.34	8.50	30.29	8.03	279	4002
	2	2.59	0.63	3	7.8	4.623	20.06	7.64	29.49	7.85	388	4082
	3	1.82	0.46	3	7.7	4.660	23.09	7.41	26.51	6.83	430	3362
	4	0.95	0.21	3	7.7	3.488	19.12	5.37	17.90	5.32	268	2151
	5	0.56	0.08	2	7.8	3.109	15.88	4.81	15.79	4.91	138	861
	5-7	0.35	0.05	1	8.1	1.923	9.71	3.13	9.09	3.90	70	459
	7-9	0.36	0.05	2	8.1	1.267	4.42	1.77	6.69	4.06	76	568
	9-11	0.52	0.10	2	7.9	1.696	7.56	3.13	8.10	3.78	61	540
	11-13	1.06	0.11	2	7.8	2.515	14.14	8.82	8.55	2.54	77	1629
	13-15	0.61	0.10	2	7.9	1.510	8.60	2.41	5.93	2.53	50	330

SECTION 33 FLOOD TREATED AREA SAMPLE	DEPTH	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
33 FA #3 0-1	10/5/2009	1.17	0.10	<1	8.1	0.493	1.37	0.48	3.03	3.15	120	<50
33 FA #3 1-2	10/5/2009	1.17	0.09	<1	8.1	0.727	1.98	0.85	4.15	3.49	80	<50
33 FA #3 2-3	10/5/2009	0.67	0.08	3	8.2	0.705	2.13	0.98	4.10	3.29	80	500
33 FA #3 3-4	10/5/2009	0.38	<0.05	<1	8.5	0.528	1.23	0.86	2.87	2.81	70	680
33 FA #3 4-5	10/5/2009	0.33	<0.05	<1	8.4	0.538	1.22	1.02	2.81	2.66	50	500
33 FA #3 5-7	10/5/2009	0.35	<0.05	<1	8.4	0.710	1.57	1.57	3.65	2.91	60	500
33 FA #3 7-9	10/5/2009	0.27	<0.05	<1	8.6	0.440	1.01	0.86	2.19	2.26	20	170
33 FA #3 9-11	10/5/2009	0.52	0.06	<1	8.5	0.534	1.13	1.00	2.78	2.69	40	230

Table A-5. 2009 Irrigation Soil Analyses for Section 28

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
28CPTA#1 0-1	10/14/2009	1.30	0.22	<1	7.7	3.480	14.90	7.74	17.90	5.32	84	600
28CPTA#1 1-2	10/14/2009	1.61	0.19	<1	7.8	4.200	24.40	11.80	21.30	5.01	46	890
28CPTA#1 2-3	10/14/2009	1.15	0.17	<1	8.0	5.100	21.20	14.60	32.20	7.61	44	880
28CPTA#1 3-4	10/14/2009	0.37	0.08	<1	8.3	2.480	4.79	4.93	15.90	7.21	34	420
28CPTA#1 4-5	10/14/2009	0.48	0.06	<1	8.0	4.950	22.90	18.70	26.20	5.74	43	630
28CPTA#1 5-7	10/14/2009	0.45	0.03	<1	7.8	4.600	22.90	13.30	21.60	5.08	129	610
28CPTA#1 7-9	10/14/2009	0.28	0.03	<1	7.8	3.110	9.69	4.57	17.80	6.67	236	530
28CPTA#1 9-11	10/14/2009	0.28	0.07	<1	7.7	3.650	13.70	5.17	19.00	6.19	273	440
28CPTA#1 11-13	10/14/2009	0.56	0.31	1	7.8	4.490	17.60	7.05	25.80	7.35	266	460
28CPTA#1 13-15	10/14/2009	0.88	0.68	2	7.8	4.480	17.30	7.38	28.20	8.03	224	790
28CPTA#1 15-17	10/14/2009	0.60	0.43	2	7.7	5.000	24.80	11.20	29.40	6.93	115	900
28CPTA#2 0-1	10/13/2009	1.18	0.28	2	7.6	4.120	24.00	10.90	17.90	4.29	139	1300
28CPTA#2 1-2	10/13/2009	1.30	0.25	1	7.6	3.160	21.30	11.50	8.87	2.19	59	1110
28CPTA#2 2-3	10/13/2009	0.99	0.12	1	7.9	3.040	20.60	12.50	9.31	2.29	8	650
28CPTA#2 3-4	10/13/2009	0.81	0.10	1	8.1	3.440	16.90	13.40	15.90	4.08	7	650
28CPTA#2 4-5	10/13/2009	0.85	0.09	2	8.5	1.960	3.03	2.16	15.50	9.62	70	850
28CPTA#2 5-7	10/13/2009	0.58	0.07	2	8.4	3.060	3.50	3.40	26.20	14.00	100	800
28CPTA#2 7-9	10/13/2009	0.66	0.10	1	8.2	6.430	20.00	20.50	45.40	10.10	125	970
28CPTA#2 9-11	10/13/2009	0.41	0.07	2	8.1	2.980	11.50	5.84	17.80	6.05	76	320
28CPTA#2 11-13	10/13/2009	0.39	0.10	<1	7.9	3.270	18.20	6.85	13.00	3.67	160	290
28CPTA#2 13-15	10/13/2009	0.12	0.57	<1	7.4	2.860	13.30	5.33	11.60	3.80	188	260
28CPTA#2 15-17	10/13/2009	0.22	0.06	1	7.8	1.410	5.48	2.38	5.94	3.00	90	370
28CPTA#3 0-1	10/9/2009	1.66	0.45	2	7.8	5.320	23.30	14.80	30.60	7.01	155	1400
28CPTA#3 1-2	10/9/2009	1.25	0.22		7.8	4.500	22.10	15.30	22.20	5.13	133	1500
28CPTA#3 2-3	10/9/2009	1.21	0.17	2	8.2	4.530	18.50	14.80	27.40	6.71	44	990
28CPTA#3 3-4	10/9/2009	0.85	0.10	1	8.3	3.420	9.98	8.31	22.80	7.56	27	640
28CPTA#3 4-5	10/9/2009	0.87	0.11	<1	8.5	5.540	7.26	5.71	54.40	20.60	201	890
28CPTA#3 5-7	10/9/2009	0.59	0.12	<1	8.6	5.990	5.72	7.69	56.40	21.80	265	700
28CPTA#3 7-9	10/9/2009	0.47	0.15	<1	8.2	5.390	20.20	21.80	28.50	6.22	211	780
28CPTA#3 9-11	10/9/2009	0.50	0.16	1	7.8	6.770	37.20	16.60	24.90	4.80	470	540
28CPTA#3 11-13	10/9/2009	0.27	0.10	<1	8.1	1.460	3.27	1.21	9.52	6.36	142	800
28CPTA#3 13-15	10/9/2009	0.49	0.09	<1	7.8	3.480	15.90	6.95	19.50	5.77	71	670
28CPTA#4 0-1	10/6/2009	1.55	0.35	1	7.7	2.550	13.40	5.76	11.70	3.78	127	480
28CPTA#4 1-2	10/6/2009	1.26	0.21	1	7.7	3.120	26.60	8.70	9.37	2.23	25	940
28CPTA#4 2-3	10/6/2009	1.09	0.26	<1	7.7	3.040	22.10	9.03	10.10	2.55	21	560
28CPTA#4 3-4	10/6/2009	0.98	0.17	2	7.9	2.240	13.00	7.90	5.79	1.79	23	350
28CPTA#4 4-5	10/6/2009	1.53	0.35	3	8.1	3.340	12.50	11.70	17.60	5.06	70	570
28CPTA#4 5-7	10/6/2009	1.01	0.09	2	8.3	2.330	3.89	3.76	16.90	8.64	30	350
28CPTA#4 7-9	10/6/2009	0.59	0.08	<1	8.2	1.640	3.36	2.36	11.40	6.74	37	350
28CPTA#4 9-11	10/6/2009	0.47	0.03	<1	8.3	1.600	1.90	1.64	12.20	9.17	53	600
28CPTA#4 11-13	10/6/2009	0.65	0.07	<1	7.9	2.560	7.67	3.72	17.70	7.42	71	1070
28CPTA#4 13-15	10/6/2009	1.74	0.12	2	7.9	3.580	14.10	6.06	25.20	7.94	49	1130
28CPTA#5 0-1	10/9/2009	1.05	0.29	<1	8.0	2.850	18.40	6.82	10.40	2.93	35	580
28CPTA#5 1-2	10/9/2009	0.78	0.12	<1	8.0	3.760	24.00	13.80	14.10	3.24	48	1010
28CPTA#5 2-3	10/9/2009	0.93	0.13	<1	8.0	3.670	21.70	13.40	15.30	3.65	34	1090
28CPTA#5 3-4	10/9/2009	0.76	0.11	<1	8.2	3.010	12.60	9.31	15.80	4.77	30	530
28CPTA#5 4-5	10/9/2009	0.88	0.07	<1	8.6	1.950	3.95	2.38	14.30	8.04	78	370
28CPTA#5 5-7	10/9/2009	0.46	0.05	<1	8.9	1.410	1.21	0.61	11.70	12.30	79	430
28CPTA#5 7-9	10/9/2009	0.98	0.11	<1	8.2	6.200	19.00	17.60	48.30	11.30	62	1890
28CPTA#5 9-11	10/9/2009	0.73	0.09	<1	8.1	4.800	18.20	14.50	31.60	7.81	41	960
28CPTA#5 11-13	10/9/2009	0.52	0.08	<1	8.2	2.930	8.43	5.31	18.70	7.13	83	520
28CPTA#5 13-15	10/9/2009	1.14	0.16	1	8.1	4.440	18.00	11.20	27.00	7.07	148	1610
28LY#1 0-1	10/8/2009	1.29	0.35	<1	7.8	1.830	7.06	2.37	8.88	4.09	120	750
28LY#1 1-2	10/8/2009	0.58	0.12	<1	7.9	1.620	6.06	2.25	7.87	3.86	70	1000
28LY#1 2-3	10/8/2009	0.60	0.10	1	8.1	1.070	3.11	1.07	5.64	3.90	80	690
28LY#1 3-4	10/8/2009	0.44	0.03	<1	8.3	0.715	1.79	0.57	3.56	3.28	90	710
28LY#1 4-5	10/8/2009	0.52	0.06	<1	8.2	0.702	1.73	0.56	3.67	3.43	100	740
28LY#1 5-7	10/8/2009	0.61	0.06	<1	8.0	0.917	2.65	0.90	4.50	3.38	95	615
28LY#1 7-9	10/8/2009	0.42	0.03	<1	8.1	0.759	2.09	0.86	3.71	3.05	95	770
28LY#1 9-11	10/8/2009	0.41	0.03	<1	8.0	0.988	3.04	1.79	4.23	2.75	80	750
28LY#1 11-13	10/8/2009	0.79	0.03	<1	7.8	1.380	4.89	1.92	6.11	3.35	150	1340
28LY#1 13-15	10/8/2009	1.75	0.08	1	7.9	1.530	5.47	1.81	8.31	4.41	135	1225

Table A-5. 2009 Irrigation Soil Analyses for Section 28 (continued)

Sample Site	Date	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
28LY#2 0-1	10/9/2009	1.46	0.49	1	7.8	5.160	24.20	13.40	27.30	6.30	134	950
28LY#2 1-2	10/9/2009	1.23	0.24	<1	7.9	5.070	23.30	15.60	29.70	6.73	68	1100
28LY#2 2-3	10/9/2009	2.68	0.51	<1	8.2	8.390	21.20	24.90	69.70	14.50	242	2900
28LY#2 3-4	10/9/2009	1.18	0.12	<1	8.2	8.830	20.20	18.60	84.30	19.10	165	1500
28LY#2 4-5	10/9/2009	0.69	0.08	<1	8.1	7.790	18.80	12.90	68.60	17.20	214	1400
28LY#2 5-7	10/9/2009	0.74	0.15	<1	7.6	4.640	21.10	10.59	20.05	5.36	532	620
28LY#2 7-9	10/9/2009	1.35	0.23	<1	7.6	3.650	25.10	12.30	8.04	1.86	344	920
28LY#2 8M	10/12/2009	0.38	0.10	2	8.0	2.630	12.60	5.85	12.00	3.95	67	290
28LY#2 15M	10/12/2009	0.41	0.12	2	8.0	2.710	12.20	5.72	12.90	4.31	70	590
28LY#3 0-1	10/8/2009	3.49	0.85	<1	7.6	4.170	20.20	9.86	20.40	5.26	138	1100
28LY#3 1-2	10/8/2009	0.94	0.13	1	7.7	3.140	17.50	7.45	11.80	3.34	69	540
28LY#3 2-3	10/8/2009	1.25	0.13	<1	7.7	4.210	23.10	10.70	18.80	4.57	46	670
28LY#3 3-4	10/8/2009	0.87	0.07	<1	7.7	3.600	22.10	10.10	13.40	3.34	21	660
28LY#3 4-5	10/8/2009	0.84	0.10	<1	7.7	3.950	21.50	13.30	17.10	4.10	21	810
28LY#3 5-7	10/8/2009	1.27	0.07	<1	7.8	4.370	18.65	8.77	25.75	6.99	42	705
28LY#3 7-9	10/8/2009	1.70	0.09	2	7.8	5.325	20.50	9.41	34.70	8.99	84	1335

AVERAGES OF TREATED AREA SAMPLES	DEPTH	U (mg/kg)	Se (mg/kg)	Mo (mg/kg)	pH (units)	Cond. mmhos/cm	Ca (meq/l)	Mg (meq/l)	Na (meq/l)	SAR (ratio)	Cl (mg/kg)	SO4 (mg/kg)
	1	1.62	0.41	2	7.8	3.685	18.18	8.96	18.14	4.87	117	895
	2	1.12	0.19	1	7.8	3.571	20.66	10.80	15.65	3.97	65	1011
	3	1.24	0.20	1	8.0	4.131	18.94	12.63	23.56	5.72	65	1054
	4	0.78	0.10	1	8.1	3.467	12.67	9.14	22.18	6.39	50	683
	5	0.83	0.12	3	8.2	3.773	11.46	8.43	27.17	9.22	100	783
	5-7	0.71	0.08	2	8.2	3.415	9.95	6.13	22.89	9.69	159	604
	7-9	0.76	0.10	2	8.0	3.904	14.73	10.58	23.32	6.54	140	871
	9-11	0.47	0.08	2	8.0	3.465	14.26	7.59	18.29	6.13	166	602
	11-13	0.53	0.12	1	7.9	2.682	10.01	4.34	15.14	5.88	145	747
	13-15	1.02	0.28	2	7.8	3.395	14.01	6.45	19.97	6.17	136	948
	15-17	0.41	0.20	2	7.8	3.040	14.16	6.43	16.08	4.75	92	620

APPENDIX B

Soil Sodium Risk Assessment

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Appendix B

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Tables

Table B-1. Critical ESP in Soils Where Reduction in Hydraulic Conductivity Occurs

	Critical ESP at Selected Electrolyte Concentrations		
%Clay	1000 umhos/cm	2000 umhos/cm	4000 umhos/cm
10%	27%	33%	44%
20%	22%	27%	37%
30%	17%	23%	31%
40%	12%	18%	25%
50%	7%	13%	18%
60%	3%	7%	13%

Based on 25% reduction in hydraulic conductivity

Table B-2. Water Quality Class vs. Soil Quality for Soil Health Risk Assessment

Class	SAR	EC mmhos	Sandy	Coarse Loamy	Coarse Silty	Fine Loamy	Fine Silty	Fine
C4S1	0-10	>2250	VL	VL	VL	VL	VL	L
C3S1	0-10	750-2250	VL	VL	VL	VL	VL	L
C2S1	0-10	250-750	VL	VL	VL	L	L	L
C4S2	10-18	>2250	VL	VL	VL	L	L	L
C3S2	10-18	750-2250	VL	L	L	L	L	M
C4S3	18-26	>2250	VL	LL	M	M	M	MH
C4S4	26-32+	>2250	VL	L	L	M	M	MH
C2S2	10-18	250-750	VL	M	M	M	M	MH
C1S1	0-10	0-250	VL	M	M	M	M	MH
C3S3	18-26	750-2250	VL	M	M	M	M	H
C2S3	18-26	250-750	VL	M	M	MH	MH	H
C3S4	26-32+	750-2250	L	M	M	MH	MH	H
C2S4	26-32+	250-750	L	M	M	MH	MH	H
C1S2	10-18	0-250	L	M	M	H	H	VH
C1S3	18-26	0-250	L	H	H	H	H	VH
C1S4	26-32+	0-250	L	H	H	VH	VH	VH

Based on modified USDA Handbook 60 and published lieterature sources.

	Soil Textures		
Texture	% Clay	% Silt	% Sand
sand	0-10	0-15	85-100
silt	0-12	80-100	0-20
loamy sand	0-15	0-30	70-90
sandy loam	0-20	0-50	44-80
silt loam	0-27	50-80	0-50
loamy sand	7-27	28-50	33-52
sandy clay loam	20-35	0-28	45-80
silty clay loam	27-40	40-73	0-20
clay loam	27-40	15-52	20-45
sandy clay	35-55	0-20	45-65
silty clay	40-60	40-60	0-20
clay	40-100	0-40	0-45

Soil textural families

Sandy - sand or loamy sand, <15% clay
Coarse loamy - >15% fine sand or coarser and <18% clay
Fine loamy - >15% fine sand and coarser and 18 to 34% clay
Coarse silty - <15% fine sand and coarser and <18% clay
Fine silty - <15% fine sand and coarser and 18 to 34% clay
Fine - 35-59% clay
Very fine - >60% clay

APPENDIX C

LeachP Model Input and Results
And
Soil Moisture and Ground-Water
Mixing Calculation Sheets

Appendix C

Page Number

Tables

Table C-1. LEACHP Section 34 Flood Irrigation Inputs and Results

Elapsed Time Years	Profile Water (mm)	Interval Rain (mm)	Interval Drainage (mm)	Interval Evaporation (mm)	Plant Uptake (mm)
1999	3005.4	0	0	0	0
2000	3026.9	1210	142	170	876
2001	2997.8	1134	121	166	876
2002	3033.6	1271	185	170	880
2003	3034.9	1283	229	170	882
2004	3033.8	1250	197	169	885
2005	3028.1	1219	180	170	874
2006	2950.9	1060	107	163	868
2007	2743.4	563	39	100	632
2008	2925.2	1085	-25	150	778
2009	2764.4	731	20	117	755
2010	2793.7	875	-25	129	741
2011	2859.4	996	-31	150	812
2012	2880.3	996	-14	153	836
2013	2844.9	582	0	239	378
2014	2830.2	582	-13	230	380
2015	2823.8	582	-20	227	381
2016	2821.9	582	-22	230	376
2017	2820.5	582	-22	228	377
2018	2838.1	265	-20	167	101
2019	2852.5	265	-10	155	105
2020	2857	265	-3	158	105
2021	2859.1	265	1	157	105
2022	2860.1	265	2	157	105
2023	2861.2	265	2	157	105
2024	2862.6	265	2	157	105
2025	2863.9	265	2	157	105
2026	2865.3	265	2	156	105
2027	2863.5	265	3	159	105
2028	2862.5	265	4	157	105
2029	2862.9	265	3	157	105
2030	2863.5	265	3	157	105
2031	2861.5	265	3	159	105
2032	2860.3	265	4	157	105
2033	2860.9	265	3	157	105
2034	2861.5	265	2	157	105
2035	2862.4	265	3	157	105
2036	2863.8	265	2	156	105
2037	2864.8	265	2	157	105
2038	2862.7	265	3	159	105
2039	2861.5	265	4	158	105
2040	2862.3	265	3	157	105
2041	2863.9	265	2	156	105
2042	2862	265	3	159	105
2043	2860.5	265	4	158	105
2044	2860.8	265	3	157	105
2045	2861.4	265	3	157	105
2046	2862.4	265	2	157	105
2047	2863.2	265	3	157	105
2048	2864.8	265	2	156	105
2049	2862.8	265	3	159	105
2050	2867.5	265	4	165	91
2051	2862.4	264.9	4.5	163.8	101.8
2052	2859.2	264.9	5.7	157.6	104.8
2053	2858	265	3.7	157.4	104.9
2054	2857.9	264.9	2.8	157.5	104.8
2055	2858.8	264.9	2.2	157	104.8
2056	2859.5	264.9	2.2	157.2	104.8
2057	2858	264.9	2.6	158.9	104.9
2058	2857.5	264.9	3.4	157.2	104.8
2059	2857.8	265	2.6	157.3	104.8
2060	2861	264.9	1.8	154.9	105
2061	2861.1	264.9	1.5	158.6	104.7
2062	2861	264.9	3	157.2	104.8
2063	2861.4	264.9	2.6	157.1	104.8
2064	2862.6	264.9	2.3	156.6	104.8
2065	2863.9	264.9	2.2	156.6	104.8
2066	2865.5	264.9	2.4	156.2	104.8
2067	2867	265	2.7	156	104.8
2068	2864.7	264.9	3.4	158.9	104.7
2069	2863.6	264.9	4.1	157.2	104.8
2070	2863.6	264.9	3.2	156.9	104.8
2071	2864.3	264.9	2.7	156.8	104.8
2072	2862.8	264.9	3.1	158.5	104.7
2073	2861.3	264.9	4.1	157.6	104.8
2074	2861.5	264.9	3.1	156.8	104.8
2075	2862.7	264.9	2.4	156.5	104.8
2076	2863.5	264.9	2.5	156.8	104.8
2077	2864.3	264.9	2.6	156.7	104.8
2078	2865.6	264.9	2.5	156.3	104.9
2079	2864	264.9	2.9	158.9	104.7
2080	2862.9	264.9	4	157.2	104.8
2081	2863.5	264.9	3.1	156.5	104.8
2082	2864.6	264.9	2.6	156.5	104.8
2083	2865.5	264.8	2.7	156.6	104.8
2084	2864.1	264.9	3.2	158.3	104.7
2085	2862.5	264.9	4	157.8	104.8
2086	2862.7	264.8	3.1	156.8	104.8
2087	2860.8	264.9	3.2	159	104.7
2088	2859.5	264.9	3.8	157.7	104.8
2089	2859.7	264.9	2.7	157.3	104.8
2090	2860.3	264.8	2.3	157.2	104.8
2091	2861.5	264.9	2.1	156.8	104.8
2092	2860.1	264.9	2.5	159.1	104.7
2093	2859.3	264.9	3.5	157.5	104.8
2094	2859.8	264.8	2.8	156.9	104.8
2095	2860	264.9	2.4	157.5	104.8
2096	2861.3	264.9	2.1	156.8	104.8
2097	2859.6	264.9	2.7	159.2	104.7
2098	2859	264.8	3.6	157.2	104.8
2099	2865.3	264.9	2.6	165.6	90.4

Table C-2. LEACHP Section 28 Pivot Irrigation Input and Results

Elapsed Time Years	Profile Water (mm)	Interval Rain (mm)	Interval Drainage (mm)	Interval Evaporation (mm)	Plant Uptake (mm)
1999	2001.5	0	0	0	0
2000	2004.9	265	43	219	0
2001	2014.5	265	12	243	0
2002	2245.6	935	8	149	547
2003	2583.9	1048	7	156	547
2004	2892.1	1191	176	158	549
2005	2798.8	991	389	153	542
2006	2777.9	975	299	154	543
2007	2803.3	1003	278	155	544
2008	2885.8	1107	321	157	547
2009	2641.2	829	383	151	540
2010	2374.5	265	153	197	182
2011	2610.4	966	119	433	179
2012	2800.6	966	133	465	178
2013	2419.4	418	318	303	179
2014	2263.7	418	122	272	180
2015	2175.6	418	71	262	173
2016	2117.8	418	48	260	168
2017	2078.1	418	35	258	165
2018	2087.1	265	27	132	97
2019	2083.7	265	21	147	100
2020	2075	265	18	157	100
2021	2067.4	265	15	158	100
2022	2061.3	265	13	159	100
2023	2056.1	265	11	160	99
2024	2053.2	265	10	159	99
2025	2050.7	265	8	160	99
2026	2049.2	265	8	160	99
2027	2044	265	7	164	99
2028	2042.2	265	6	161	99
2029	2040.9	265	6	161	99
2030	2040.9	265	5	160	99
2031	2037.1	265	5	164	99
2032	2036.2	265	5	162	99
2033	2036	265	5	161	99
2034	2035.8	265	5	161	99
2035	2036	265	5	161	99
2036	2037.5	265	4	160	99
2037	2038.8	265	4	160	99
2038	2036	265	4	164	99
2039	2035.5	265	4	162	99
2040	2035.9	265	4	161	99
2041	2036.5	265	4	161	99
2042	2033.8	265	4	164	99
2043	2033.2	265	4	162	99
2044	2033.5	265	4	161	99
2045	2033.9	265	4	161	99
2046	2034.9	265	4	160	99
2047	2035.7	265	4	161	99
2048	2037.8	265	4	159	99
2049	2035.2	265	4	164	99
2050	2039.9	265	4	169	87
2051	2034.5	264.9	4.2	169.8	96.3
2052	2032.5	264.9	4.2	163.4	99.4
2053	2031.9	265	4.2	162	99.3
2054	2032	264.9	4.1	161.2	99.4
2055	2032.4	264.9	4.2	161	99.3
2056	2032.7	264.9	4.1	161	99.4
2057	2030.3	264.9	4.2	163.8	99.3
2058	2030.2	264.9	4.1	161.5	99.4
2059	2030	265	4.2	161.6	99.4
2060	2033.6	264.9	4.1	157.5	99.5
2061	2032.8	264.9	4.2	162.2	99.3
2062	2032.6	264.9	4.2	161.5	99.3
2063	2032.7	264.9	4.1	161.2	99.4
2064	2033.6	264.9	4.2	160.5	99.3
2065	2035.1	264.9	4.1	159.7	99.5
2066	2036.6	264.9	4.2	159.9	99.4
2067	2038.7	265	4.1	159.2	99.4
2068	2036.5	264.9	4.2	163.8	99.2
2069	2036.3	264.9	4.2	161.6	99.3
2070	2036.9	264.9	4.1	160.9	99.3
2071	2038	264.9	4.2	160.4	99.4
2072	2035.2	264.9	4.1	164.4	99.2
2073	2034.7	264.9	4.2	162	99.4
2074	2035.4	264.9	4.1	160.7	99.3
2075	2035.9	264.9	4.2	160.9	99.4
2076	2036.8	264.9	4.2	160.7	99.3
2077	2038	264.9	4.1	160.2	99.4
2078	2040.3	264.9	4.2	159.1	99.4
2079	2037.5	264.9	4.1	164.2	99.3
2080	2036.9	264.9	4.2	162.1	99.3
2081	2037.8	264.9	4.1	160.5	99.4
2082	2038.9	264.9	4.2	160.2	99.4
2083	2040.3	264.8	4.1	159.9	99.4
2084	2038.5	264.9	4.2	163.3	99.2
2085	2037.9	264.9	4.2	162	99.4
2086	2038	264.8	4.1	161.3	99.3
2087	2035.1	264.9	4.2	164.4	99.2
2088	2035	264.9	4.1	161.4	99.4
2089	2035	264.9	4.2	161.4	99.3
2090	2035.4	264.8	4.1	160.9	99.4
2091	2036.3	264.9	4.2	160.3	99.4
2092	2033.9	264.9	4.2	163.9	99.3
2093	2032.9	264.9	4.1	162.2	99.3
2094	2033.3	264.8	4.2	160.9	99.4
2095	2033.7	264.9	4.1	160.9	99.4
2096	2034.2	264.9	4.2	160.8	99.3
2097	2031.6	264.9	4.1	164.1	99.3
2098	2031	264.8	4.2	161.9	99.3
2099	2037	264.9	4.2	168.9	85.8

Table C-3. LECHP Section 33 Pivot Irrigation Inputs and Results with Irrigation 2012

Elapsed Time Years	Profile Water (mm)	Interval Rain (mm)	Interval Drainage (mm)	Interval Evaporation (mm)	Plant Uptake (mm)
1999	2001.5	0	0	0	0
2000	2270.6	963	43	136	515
2001	2468.2	908	12	154	544
2002	2739.5	984	12	155	545
2003	2858.8	1063	241	156	547
2004	2889.9	1134	396	158	549
2005	2875.5	1079	398	153	542
2006	2659.7	856	375	154	543
2007	2888	1137	210	155	544
2008	2885.6	1103	403	156	547
2009	2520.5	701	382	144	540
2010	2286	265	126	193	180
2011	2216.7	387	74	203	180
2012	2164.9	387	53	206	179
2013	2150.4	265	40	143	97
2014	2134.3	265	30	151	100
2015	2120	265	24	156	100
2016	2104.9	265	19	161	99
2017	2093.4	265	16	161	99
2018	2084.6	265	14	161	99
2019	2078.2	265	12	160	99
2020	2070	265	10	164	99
2021	2064.5	265	9	162	99
2022	2060.5	265	8	161	99
2023	2057.6	265	8	161	99
2024	2055.8	265	7	160	99
2025	2054.4	265	7	160	99
2026	2053.6	265	6	160	99
2027	2049.1	265	6	164	99
2028	2047.4	265	6	162	99
2029	2046.5	265	5	161	99
2030	2046.4	265	5	160	99
2031	2042.7	265	5	164	99
2032	2041.4	265	5	162	99
2033	2040.5	265	5	162	99
2034	2040.2	265	5	161	99
2035	2039.9	265	5	161	99
2036	2041.1	265	5	160	99
2037	2042.6	265	5	160	99
2038	2039.3	265	5	164	99
2039	2038.4	265	5	162	99
2040	2038.7	265	5	161	99
2041	2039.3	265	4	160	99
2042	2036.4	265	5	164	99
2043	2035.6	265	4	162	99
2044	2035.5	265	4	161	99
2045	2036	265	4	161	99
2046	2036.3	265	4	161	99
2047	2037.2	265	4	160	99
2048	2038.9	265	5	160	99
2049	2036.2	265	4	164	99
2050	2040.9	265	4	169	87
2051	2035.2	264.9	4.3	170	96.3
2052	2033.8	264.9	4.1	162.7	99.4
2053	2033	265	4.2	162.2	99.3
2054	2032.9	264.9	4.1	161.4	99.3
2055	2032.8	264.9	4.2	161.3	99.5
2056	2032.7	264.9	4.1	161.3	99.4
2057	2030.5	264.9	4.2	163.6	99.3
2058	2030.1	264.9	4.2	161.7	99.4
2059	2029.9	265	4.1	161.5	99.3
2060	2033.7	264.9	4.2	157.3	99.6
2061	2032.2	264.9	4.1	162.8	99.3
2062	2032.4	264.9	4.2	161.2	99.3
2063	2032.5	264.9	4.1	161.1	99.4
2064	2033.7	264.9	4.2	160.1	99.3
2065	2035.2	264.9	4.2	159.9	99.4
2066	2037.1	264.9	4.1	159.4	99.4
2067	2038.6	265	4.2	159.9	99.4
2068	2036.1	264.9	4.1	164	99.2
2069	2036	264.9	4.2	161.6	99.3
2070	2037	264.9	4.1	160.5	99.3
2071	2037.8	264.9	4.2	160.7	99.4
2072	2035.1	264.9	4.2	164.3	99.2
2073	2034.3	264.9	4.1	162.3	99.3
2074	2034.8	264.9	4.2	161	99.4
2075	2035.6	264.9	4.1	160.6	99.3
2076	2036.3	264.9	4.2	160.8	99.4
2077	2037.6	264.9	4.1	160.2	99.3
2078	2039.8	264.9	4.2	159.2	99.4
2079	2037.1	264.9	4.1	164.2	99.2
2080	2036.4	264.9	4.2	162.1	99.3
2081	2037.2	264.9	4.2	160.6	99.4
2082	2038.2	264.9	4.1	160.4	99.3
2083	2039.4	264.8	4.2	160.1	99.4
2084	2037.3	264.9	4.1	163.7	99.3
2085	2036.9	264.9	4.2	161.7	99.3
2086	2037.5	264.8	4.1	160.9	99.3
2087	2034.5	264.9	4.2	164.5	99.2
2088	2034.3	264.9	4.2	161.5	99.4
2089	2034.2	264.9	4.1	161.5	99.3
2090	2034.9	264.8	4.2	160.7	99.4
2091	2036	264.9	4.1	160.2	99.4
2092	2033.4	264.9	4.2	164.1	99.2
2093	2032.5	264.9	4.1	162.2	99.4
2094	2033.2	264.8	4.2	160.6	99.3
2095	2033.4	264.9	4.2	161.1	99.4
2096	2033.9	264.9	4.1	160.9	99.3
2097	2031.5	264.9	4.2	163.9	99.2
2098	2030.9	264.8	4.1	161.9	99.4
2099	2037.1	264.9	4.2	168.8	85.7

Table C-4. Leachp Section 33 Pivot Irrigation Inputs and Results with Irrigation through 2009

Elapsed Time Years	Profile Water (mm)	Interval Rain (mm)	Interval Drainage (mm)	Interval Evaporation (mm)	Plant Uptake (mm)
1999	2001.5	0	0	0	0
2000	2270.6	963	43	136	515
2001	2468.2	908	12	154	544
2002	2739.5	984	12	155	545
2003	2858.8	1063	241	156	547
2004	2889.9	1134	396	158	549
2005	2875.5	1079	398	153	542
2006	2659.7	856	375	154	543
2007	2888	1137	210	155	544
2008	2885.6	1103	403	156	547
2009	2520.5	701	382	144	540
2010	2286	265	126	193	180
2011	2241.8	265	74	138	97
2012	2204	265	53	150	100
2013	2173.5	265	40	156	100
2014	2150.5	265	30	158	99
2015	2133	265	24	159	99
2016	2115.8	265	19	164	99
2017	2103.5	265	16	162	99
2018	2094.3	265	14	161	99
2019	2087	265	12	161	99
2020	2078.4	265	11	164	99
2021	2072.4	265	10	162	99
2022	2068.2	265	9	161	99
2023	2064.2	265	8	162	99
2024	2061.5	265	8	161	99
2025	2060.2	265	7	160	99
2026	2059.1	265	7	160	99
2027	2054.3	265	6	164	99
2028	2052.3	265	6	162	99
2029	2051.1	265	6	161	99
2030	2049.9	265	6	161	99
2031	2046.2	265	6	164	99
2032	2044.8	265	5	162	99
2033	2043.7	265	5	161	99
2034	2043.2	265	5	161	99
2035	2042.8	265	5	161	99
2036	2043.6	265	5	160	99
2037	2044.5	265	5	160	99
2038	2041.3	265	5	164	99
2039	2040.4	265	5	162	99
2040	2040.4	265	5	161	99
2041	2040.9	265	5	160	99
2042	2037.8	265	5	164	99
2043	2036.7	265	5	162	99
2044	2036.8	265	4	161	99
2045	2037.2	265	5	161	99
2046	2037.4	265	4	161	99
2047	2038.4	265	4	160	99
2048	2040.2	265	4	159	99
2049	2037.5	265	4	164	99
2050	2041.9	265	4	169	87
2051	2035.4	264.9	4.3	170	96.3
2052	2033.4	264.9	4.1	163.3	99.4
2053	2032.6	265	4.2	162.1	99.3
2054	2032.4	264.9	4.1	161.4	99.4
2055	2032.4	264.9	4.2	161.3	99.4
2056	2032.7	264.9	4.1	161	99.4
2057	2030.2	264.9	4.2	163.9	99.3
2058	2029.6	264.9	4.2	161.9	99.3
2059	2029.6	265	4.1	161.3	99.4
2060	2033.4	264.9	4.2	157.3	99.5
2061	2032.3	264.9	4.1	162.5	99.3
2062	2032.2	264.9	4.2	161.3	99.4
2063	2032.5	264.9	4.1	161	99.3
2064	2033.5	264.9	4.2	160.3	99.4
2065	2035	264.9	4.2	159.8	99.5
2066	2036.7	264.9	4.1	159.6	99.3
2067	2038.7	265	4.2	159.4	99.5
2068	2036.3	264.9	4.1	164	99.2
2069	2036.2	264.9	4.2	161.6	99.3
2070	2036.6	264.9	4.1	161	99.3
2071	2037.8	264.9	4.2	160.3	99.4
2072	2035.1	264.9	4.2	164.3	99.2
2073	2034.3	264.9	4.1	162.3	99.4
2074	2034.8	264.9	4.2	160.9	99.4
2075	2035.4	264.9	4.1	160.9	99.3
2076	2036.3	264.9	4.2	160.5	99.4
2077	2037.6	264.9	4.1	160.2	99.4
2078	2039.8	264.9	4.2	159.1	99.4
2079	2037.6	264.9	4.1	163.8	99.2
2080	2036.8	264.9	4.2	162.2	99.3
2081	2037.9	264.9	4.2	160.4	99.4
2082	2038.6	264.9	4.1	160.5	99.4
2083	2040.3	264.8	4.2	159.8	99.3
2084	2037.7	264.9	4.1	164.1	99.3
2085	2037.6	264.9	4.2	161.4	99.3
2086	2037.6	264.8	4.1	161.5	99.4
2087	2034.7	264.9	4.2	164.2	99.2
2088	2034.2	264.9	4.2	162	99.4
2089	2034.1	264.9	4.1	161.3	99.4
2090	2034.7	264.8	4.2	160.9	99.3
2091	2035.5	264.9	4.1	160.4	99.4
2092	2033.2	264.9	4.2	163.8	99.3
2093	2032.6	264.9	4.1	161.9	99.3
2094	2032.7	264.8	4.2	161.2	99.4
2095	2033	264.9	4.2	161	99.3
2096	2033.6	264.9	4.1	160.7	99.4
2097	2030.9	264.9	4.2	164.2	99.2
2098	2030.7	264.8	4.1	161.5	99.4
2099	2037.5	264.9	4.2	168.3	85.6

TABLE C-5. MIXING CALCULATION SHEET

SECTION 34 FLOOD

Ground-Water Flow Estimate (GWF)
T = 3,000 gpd/ft
Width (L) = 3,000 ft
Gradient (i) = 0.006 ft/ft
Q = TiL = 37.5 gpm

Soil Moisture Long-Term Model Flux (SMF): = 3 mm/yr
= 0.73 gpm for 120 Ac

TDS: GW TDS = 2,600 mg/l
SM TDS = 7,000 mg/l (model does not indicate)

$$Mixture\ TDS = \frac{GW\ TDS(GWF) + SM\ TDS(SMF)}{GWF + SMF}$$

$$Mixture\ TDS = \frac{2600\ (37.5) + 7000\ (0.73)}{38.23}$$

Mixture TDS = 2684 mg/l

SO4: GW SO4 = 1,292 mg/l
SM SO4 = 3,100 mg/l (model does not indicate)

$$\text{Mixture SO4} = \frac{\text{GW SO4 (GWF)} + \text{SM SO4 (SMF)}}{\text{GWF} + \text{SMF}}$$

$$\text{Mixture SO4} = \frac{1292\ (37.5) + 3100\ (0.73)}{38.23}$$

Mixture SO4 = 1327 mg/l

CL: GW CL = 212 mg/l
SM CL = 650 mg/l (model does not indicate)

$$Mixture\ CL = \frac{GW\ CL(GWF) + SM\ CL(SMF)}{GWF + SMF}$$

$$Mixture\ CL = \frac{212\ (37.5) + 650\ (0.73)}{38.23}$$

Mixture CL = 220 mg/l

U: GW U = 0.076 mg/l
SM U = 0.5 mg/l (model does not indicate)

$$Mixture\ U = \frac{GW\ U(GWF) + SM\ U(SMF)}{GWF + SMF}$$

$$Mixture\ U = \frac{0.076\ (37.5) + 0.5\ (0.73)}{38.23}$$

Mixture U = 0.084 mg/l

Se: GW Se = 0.05 mg/l
SM Se = 0.2 mg/l (model does not indicate)

$$Mixture\ Se = \frac{GW\ Se(GWF) + SM\ Se(SMF)}{GWF + SMF}$$

$$Mixture\ Se = \frac{0.05\ (37.5) + 0.2\ (0.73)}{38.23}$$

Mixture Se = 0.053 mg/l

TABLE C-6. MIXING CALCULATION SHEET

SECTION 28 PIVOT

Ground-Water Flow Estimate (GWF)
T = 30,000 gpd/ft | Width (L) = 2,360 ft
Gradient (i) = 0.0042 ft/ft | Q = TiL =206 gpm

Soil Moisture Model Flux During Irrigation (SMFI): = 120 mm/yr
= 24 gpm for 100 Ac

Soil Moisture Model Flux Long Term (SMF): = 4 mm/yr
= 0.81 gpm for 100 Ac

TDS: GW TDS = 1,762 mg/l
SM TDS = 5,000 mg/l

$$Mixture\ TDS\ During\ Irrigation = \frac{GW\ TDS(GWF) + SM\ TDS(SMFI)}{GWF + SMFI}$$

$$Mixture\ TDS = \frac{1762(206) + 5000(24)}{230}$$

Mixture TDS = 2100 mg/l

$$Mixture\ TDS\ Long\ Term = \frac{GW\ TDS(GWF) + SM\ TDS(SMF)}{GWF + SMF}$$

$$Mixture\ TDS = \frac{1762(206) + 5000(0.81)}{206.81}$$

Mixture TDS = 1775 mg/l

SO4: GW SO4 = 797 mg/l
SM SO4 =2200 mg/l

$$Mixture\ SO4\ During\ Irrigation = \frac{GW\ SO4(GWF) + SM\ SO4(SMFI)}{GWF + SMFI}$$

$$Mixture\ SO4\ During\ Irrigation = \frac{797(206) + 2200(24)}{230}$$

Mixing SO4 = 943 mg/l

$$Mixture\ SO4\ LongTerm = \frac{GW\ SO4(GWF) + SM\ SO4(SMF)}{GWF + SMF}$$

$$Mixture\ SO4\ Long\ Term = \frac{797(206) + 2200(0.81)}{206.81}$$

Mixture SO4 = 802 mg/l

CL: GW CL = 154 mg/l
SM CL = 370 mg/l

$$Mixture\ CL\ During\ Irrigation = \frac{GW\ CL(GWF) + SM\ CL(SMFI)}{GWF + SMF}$$

$$Mixture\ CL\ During\ Irrigation = \frac{154(206) + 370(24)}{230}$$

Mixing CL = 177 mg/l

CL: (continued)

$$Mixture\ CL\ Long\ Term = \frac{GW\ CL(GWF) + SM\ CL(SMF)}{GWF + SMF}$$

$$Mixture\ CL\ Long\ Term = \frac{154(206) + 370(0.81)}{206.81}$$

Mixture CL = 155 mg/l

U: GW U = 0.1 mg/l average after restoration
SM U = 0.5 mg/l (model does not indicate)

$$Mixture\ U = \frac{GW\ U(GWF) + SM\ U(SMF)}{GWF + SMF}$$

$$Mixture\ U = \frac{0.1(206) + 0.5(0.81)}{206.81}$$

Mixture U = 0.102 mg/l

Se: GW Se = 0.04 mg/l average after restoration
SM Se = 0.2 mg/l (model does not indicate)

$$Mixture\ Se = \frac{GW\ Se(GWF) + SM\ Se(SMF)}{GWF + SMF}$$

$$Mixture\ Se = \frac{0.04(206) + 0.2(0.81)}{206.81}$$

Mixture Se = 0.0406 mg/l

TABLE C-7. MIXING CALCULATION SHEET

SECTION 33 PIVOT

Ground-Water Flow Estimate (GWF)
T = 10,000 gpd/ft — Width (L) = 2,885 ft — Gradient (i) = 0.005 ft/ft

Q = TiL = 100 gpm

Soil Moisture Model Flux During Irrigation (SMFI): = 40 mm/yr
= 12 gpm for 150 Ac

Soil Moisture Model Flux Long Term (SMF): = 4 mm/yr
= 1.2 gpm for 150 Ac

TDS: GW TDS = 1,540 mg/l
SM TDS = 3,400 mg/l

$$Mixture\ TDS\ During\ Irrigation = \frac{GW\ TDS(GWF) + SM\ TDS(SMFI)}{GWF + SMFI}$$

$$Mixture\ TDS = \frac{1540(100) + 3400(12)}{112}$$

Mixture TDS = 1740 mg/l

$$Mixture\ TDS\ Long\ Term = \frac{GW\ TDS(GWF) + SM\ TDS(SMF)}{GWF + SMF}$$

$$Mixture\ TDS = \frac{1540(100) + 3400(1.2)}{101.2}$$

Mixture TDS = 1562 mg/l

SO4: GW SO4 = 718 mg/l
SM SO4 = 1500 mg/l

$$Mixture\ SO4\ During\ Irrigation = \frac{GW\ SO4(GWF) + SM\ SO4(SMFI)}{GWF + SMFI}$$

$$Mixture\ SO4\ During\ Irrigation = \frac{718(100) + 1500(12)}{112}$$

Mixing SO4 = 802 mg/l

$$Mixture\ SO4\ Long Term = \frac{GW\ SO4(GWF) + SM\ SO4(SMF)}{GWF + SMF}$$

$$Mixture\ SO4\ Long\ Term = \frac{718(100) + 1500(1.2)}{101.2}$$

Mixture SO4 = 727 mg/l

CL: GW CL = 122 mg/l
SM CL = 300 mg/l

$$Mixture\ CL\ During Irrigation = \frac{GW\ CL(GWF) + SM\ CL(SMFI)}{GWF + SMF}$$

$$Mixture\ CL During\ Irrigation = \frac{122(100) + 300(12)}{112}$$

Mixing CL = 141 mg/l

CL: (continued)

$$Mixture\ CL\ Long Term = \frac{GW\ CL(GWF) + SM\ CL(SMF)}{GWF + SMF}$$

$$Mixture\ CL\ Long Term = \frac{122(100) + 300(1.2)}{101.2}$$

Mixture CL = 124 mg/l

U: GW U = 0.02 mg/l
SM U = 0.5 mg/l (model does not indicate)

$$Mixture\ U = \frac{GW\ U(GWF) + SM\ U(SMF)}{GWF + SMF}$$

$$Mixture\ U = \frac{0.02(100) + 0.5(1.2)}{101.2}$$

Mixture U = 0.026 mg/l

Se: GW Se = 0.034 mg/l average after restoration
SM Se = 0.2 mg/l (model does not indicate)

$$Mixture\ Se = \frac{GW\ Se(GWF) + SM\ Se(SMF)}{GWF + SMF}$$

$$Mixture\ Se = \frac{0.034(100) + 0.2(1.2)}{101.2}$$

Mixture Se = 0.036 mg/l

TABLE C-8. MIXING CALCULATION SHEET

SECTION 33 FLOOD

Ground-Water Flow Estimate (GWF)
T = 1,000 gpd/ft
Gradient (i) = 0.01 ft/ft

Width (L) = 1,400 ft
Q = TiL = 9.7 gpm

Soil Moisture Long-Term Model Flux (SMF): = 3 mm/yr
= 0.15 gpm for 24 Ac

TDS: GW TDS = 1,540 mg/l
SM TDS = 7,000 mg/l (model does not indicate)

$$Mixture\ TDS = \frac{GW\ TDS(GWF) + SM\ TDS(SMF)}{GWF + SMF}$$

$$Mixture\ TDS = \frac{1540\ (9.7) + 7000\ (0.15)}{9.85}$$

Mixture TDS = 1623 mg/l

SO4: GW SO4 = 718 mg/l
SM SO4 = 3,100 mg/l (model does not indicate)

$$Mixture\ SO4 = \frac{GW\ SO4(GWF) + SM\ SO4(SMF)}{GWF + SMF}$$

$$Mixture\ SO4 = \frac{718\ (9.7) + 3100\ (0.15)}{9.85}$$

Mixture SO4 = 754 mg/l

CL: GW CL = 122 mg/l
SM CL = 650 mg/l (model does not indicate)

$$Mixture\ CL = \frac{GW\ CL(GWF) + SM\ CL(SMF)}{GWF + SMF}$$

$$Mixture\ CL = \frac{122\ (9.7) + 650\ (0.15)}{9.85}$$

Mixture CL = 130 mg/l

U: GW U = 0.02 mg/l
SM U = 0.5 mg/l (model does not indicate)

$$Mixture\ U = \frac{GW\ U(GWF) + SM\ U(SMF)}{GWF + SMF}$$

$$Mixture\ U = \frac{0.02\ (9.7) + 0.15\ (0.15)}{9.85}$$

Mixture U = 0.027 mg/l

Se: GW Se = 0.034 mg/l
SM Se = 0.2 mg/l (model does not indicate)

$$Mixture\ Se = \frac{GW\ Se(GWF) + SM\ Se(SMF)}{GWF + SMF}$$

$$Mixture\ Se = \frac{0.034\ (9.7) + 0.2\ (0.15)}{9.85}$$

Mixture Se = 0.036 mg/l

APPENDIX D

Vegetation Analyses

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D.1 2008 and 2010 Vegetation Analyses

The western 120 acres of the Section 34 flood was tilled and replanted in 2008 with triticale. Triticale was also seeded with the alfalfa in the eastern 55 acres of the Section 34 flood area, but this area was not tilled prior to adding the triticale. Vegetation samples 7-12 of Section 34 flood area in the first cutting are from the west side and therefore are from triticale. Samples 1, 2, 5 and 6 of the second cutting are from the east side and were mostly triticale with some alfalfa. Samples 3 and 4 were from the east side were mostly alfalfa with some triticale.

In the south pivot (Section 33) there was 25 acres of canola seeded into the alfalfa in the southeast quarter. Camelina was also seeded into 25 acres of the western half of the south pivot. The 12 samples collected from the south pivot during the first cutting were alfalfa. The 12 samples collected during the second cut of the south pivot were from alfalfa except for sample number 11.

The 24 acres of flood irrigated area in Section 33 were retilled during 2008. Triticale was planted in the eastern portion of this flood area in 2008, but a crop was not obtained from this area due to the later season planting.

The Section 34 flood area was planted in sorghum/sudan grass in 2009 and 2010 after tilling while no additional planting was done in the Section 33 flood area. After tilling in the Section 33 center pivot was planted in permanent grass and a test crop of canola was planted in the Section 28 center pivot. While wheat was planted in all of Section 28 and only half of Section 33 in 2010. Table D-3 and D-4 presents the vegetation analyses from the cutting of the Section 34 crop, the Section 33 grass and the clippings from the Section 28 canola.

Table D-1. 2000 Hay Analyses

Sample	Uranium (mg/Kg)	Selenium (mg/Kg)	Moisture Content (%)	Percent Solids (%)
Homestake Hay				
Section 33 - 1st Cut	1.12	1.1	2.8	93.9
Section 34 - 1st Cut	0.73	0.5	2.9	95.1
Section 33 - 2nd Cut - Unwashed	0.62	1.4	4.6	95.7
Section 33 - 2nd Cut - Washed	0.58	1.5	33.4	95.9
Other Hay				
Carver	0.19	0.2	13.1	96.4
Elkin	0.05	0.1	7.4	95.7

Table D-2. 2001, 2002, 2003 and 2004 Hay Analyses

Irrigation Area	Sample	2001 Uranium (mg/kg)	2001 Selenium (mg/kg)	2002 Uranium (mg/kg)	2002 Selenium (mg/kg)	2003 Uranium (mg/kg)	2003 Selenium (mg/kg)	2004 Uranium (mg/kg)	2004 Selenium (mg/kg)
Section 33	#1	0.460	0.950	0.89	1.40	0.58	2.25	6.90	1.60
- 1st Cut	#2	0.650	1.500	1.60	2.17	0.62	1.73	2.40	1.50
	#3	0.700	1.450	1.51	1.39	0.87	2.08	1.90	1.30
	#4	0.550	1.650	0.99	1.89	0.70	1.56	1.70	1.50
	#5	0.690	1.400	1.10	1.40	0.87	2.01	1.50	1.30
	#6	0.490	1.850	1.45	1.83	0.80	1.16	0.70	1.20
	#7	0.500	0.950	1.21	1.93	0.95	1.52	0.90	0.90
	#8	0.600	1.550	1.81	2.36	0.83	1.59	0.70	1.00
	#9	-----	-----	-----	-----	0.68	0.90	0.70	0.70
	#10	-----	-----	-----	-----	0.63	2.15	0.80	0.90
	#11	-----	-----	-----	-----	0.59	1.02	0.80	1.70
	#12	-----	-----	-----	-----	0.64	2.48	0.50	1.30
	Average	*0.580*	*1.413*	*1.32*	*1.80*	*0.73*	*1.70*	*1.63*	*1.24*
Section 33	#1	0.700	1.500	0.17	0.68	0.67	1.56	0.60	0.80
- 2nd Cut	#2	0.680	1.000	0.31	0.90	0.77	1.75	0.40	0.80
	#3	0.500	1.650	0.32	1.27	0.81	1.44	0.40	1.40
	#4	1.050	1.250	0.38	1.48	0.76	1.26	0.50	1.60
	#5	0.500	0.750	0.51	1.12	0.81	1.68	0.70	0.20
	#6	0.400	0.950	0.33	1.14	0.69	1.98	0.40	<0.2
	#7	0.350	0.550	0.35	1.57	0.57	1.67	0.40	0.60
	#8	0.350	0.750	0.59	1.23	0.39	0.60	0.40	0.70
	#9	-----	-----	-----	-----	0.68	0.99	0.90	0.90
	#10	-----	-----	-----	-----	0.89	2.07	0.50	0.40
	#11	-----	-----	-----	-----	0.82	1.36	0.40	0.50
	#12	-----	-----	-----	-----	0.54	1.22	0.50	0.30
	Average	*0.566*	*1.050*	*0.37*	*1.17*	*0.70*	*1.47*	*0.51*	*0.69*
Section 33	#1 Pivot	0.252	0.990	0.54	1.36	0.49	1.05	0.71	1.10
- 3rd Cut	#2 Pivot	0.286	0.930	0.93	1.68	0.73	1.43	0.73	1.20
	#3 Pivot	0.322	1.260	1.10	1.64	0.90	2.00	0.46	1.10
	#4 Pivot	0.202	1.450	0.96	1.82	0.46	1.15	0.55	0.90
	#5 Pivot	0.289	1.090	0.78	2.12	0.43	1.36	0.67	1.40
	#6 Pivot	0.250	0.820	0.61	2.13	0.58	1.60	0.60	1.00
	#7 Pivot	0.312	0.620	0.69	1.66	0.57	1.59	1.20	1.60
	#8 Pivot	0.479	1.110	0.59	2.07	0.81	0.83	1.31	1.00
	#9 Pivot	0.177	0.510	-----	-----	0.45	1.39	1.39	1.30
	#10 Pivot	0.195	0.680	-----	-----	1.97	3.59	1.09	1.50
	#11 Pivot	0.205	0.680	-----	-----	0.60	1.20	0.92	1.40
	#12 Pivot	0.182	0.660	-----	-----	0.78	1.35	1.18	1.40
	#13 Pivot	0.703	1.080	-----	-----	-----	-----	-----	-----
	#14 Pivot	0.522	0.930	-----	-----	-----	-----	-----	-----
	#15 Pivot	0.263	0.620	-----	-----	-----	-----	-----	-----
	#16 Pivot	0.104	0.460	-----	-----	-----	-----	-----	-----
	Average	*0.296*	*0.868*	*0.78*	*1.81*	*0.73*	*1.55*	*0.90*	*1.24*

Table D-2. 2001, 2002, 2003 and 2004 Hay Analyses (cont.)

Irrigation Area	Sample	2001 Uranium (mg/kg)	2001 Selenium (mg/kg)	2002 Uranium (mg/kg)	2002 Selenium (mg/kg)	2003 Uranium (mg/kg)	2003 Selenium (mg/kg)	2004 Uranium (mg/kg)	2004 Selenium (mg/kg)
Section 34	#1	0.600	0.950	0.73	0.82	0.74	2.02	1.30	1.70
- 1st Cut	#2	0.750	1.250	0.94	1.38	1.40	1.86	1.20	1.50
	#3	0.550	0.950	0.84	0.82	0.61	1.40	0.90	0.90
	#4	0.650	0.600	0.75	0.74	0.92	1.67	1.10	1.30
	#5	0.450	0.750	0.59	0.41	0.92	1.12	1.50	1.30
	#6	0.500	0.800	1.62	0.83	1.06	2.08	0.70	1.20
	#7	0.550	1.950	-----	-----	0.61	1.52	0.90	0.80
	#8	0.400	1.050	-----	-----	0.66	1.68	0.70	0.90
	#9	0.450	1.200	-----	-----	0.49	1.44	1.40	1.50
	#10	0.600	1.000	-----	-----	0.39	1.67	1.00	1.00
	#11	-----	-----	-----	-----	0.97	1.45	1.00	0.90
	#12	-----	-----	-----	-----	1.87	1.53	0.60	1.30
	Average	*0.550*	*1.050*	*0.91*	*0.83*	*0.89*	*1.62*	*1.03*	*1.19*
Section 34	#1 Flood	0.203	0.900	1.63	0.95	0.69	1.18	0.80	<0.2
- 2nd Cut	#2 Flood	0.420	1.420	0.84	1.05	0.47	0.56	1.00	0.30
	#3 Flood	0.318	0.440	3.51	1.48	0.59	1.09	0.80	<0.2
	#4 Flood	0.402	1.050	0.89	0.96	0.44	0.50	0.90	0.30
	#5 Flood	0.358	0.530	0.53	1.28	0.71	0.92	0.70	0.50
	#6 Flood	0.195	0.330	1.72	1.14	0.58	0.54	1.10	0.20
	#7 Flood	0.450	1.120	-----	-----	0.41	0.79	-----	-----
	#8 Flood	0.514	0.660	-----	-----	-----	-----	-----	-----
	#9 Flood	0.408	1.160	-----	-----	-----	-----	-----	-----
	#10 Flood	0.535	0.610	-----	-----	-----	-----	-----	-----
	Average	*0.380*	*0.822*	*1.52*	*1.14*	*0.56*	*0.80*	*0.88*	*0.25*
Section 34	#1 Flood	1.040	1.110	0.81	1.20	1.56	2.32	-----	-----
- 3rd Cut	#2 Flood	0.672	0.712	0.44	1.59	1.36	1.19	-----	-----
	#3 Flood	0.538	0.817	0.32	0.62	1.28	1.40	-----	-----
	#4 Flood	0.489	0.630	0.48	1.00	0.87	0.75	-----	-----
	#5 Flood	0.612	0.530	0.65	1.03	1.18	1.60	-----	-----
	#6 Flood	0.823	0.710	0.53	0.94	1.00	1.19	-----	-----
	#7 Flood	0.586	0.782	-----	-----	1.32	0.62	-----	-----
	#8 Flood	0.948	0.980	-----	-----	1.59	0.74	-----	-----
	#9 Flood	-----	-----	-----	-----	0.80	1.18	-----	-----
	#10 Flood	-----	-----	-----	-----	0.91	0.44	-----	-----
	#11 Flood	-----	-----	-----	-----	1.16	0.92	-----	-----
	#12 Flood	-----	-----	-----	-----	0.74	0.93	-----	-----
	Average	*0.714*	*0.784*	*0.54*	*1.06*	*1.15*	*1.11*	-----	-----
Section 34	#1 Flood	-----	-----	0.80	1.65	-----	-----	-----	-----
- 4th Cut	#2 Flood	-----	-----	0.97	1.09	-----	-----	-----	-----
	#3 Flood	-----	-----	1.29	1.21	-----	-----	-----	-----
	#4 Flood	-----	-----	0.58	0.50	-----	-----	-----	-----
	#5 Flood	-----	-----	0.84	1.48	-----	-----	-----	-----
	#6 Flood	-----	-----	0.83	1.11	-----	-----	-----	-----
	Average	-----	-----	*0.89*	*1.17*	-----	-----	-----	-----

Table D-2. 2001, 2002, 2003 and 2004 Hay Analyses (cont.)

Irrigation Area	Sample	2001 Uranium (mg/kg)	2001 Selenium (mg/kg)	2002 Uranium (mg/kg)	2002 Selenium (mg/kg)	2003 Uranium (mg/kg)	2003 Selenium (mg/kg)	2004 Uranium (mg/kg)	2004 Selenium (mg/kg)
Section 28 - 1st Cut	#1 Pivot 2	-----	-----	0.40	0.81	0.68	1.30	1.16	1.00
	#2 Pivot 2	-----	-----	0.27	0.74	1.50	1.52	1.25	1.00
	#3 Pivot 2	-----	-----	0.28	0.65	1.74	1.18	1.79	1.10
	#4 Pivot 2	-----	-----	0.33	0.86	0.81	1.82	1.07	1.00
	#5 Pivot 2	-----	-----	0.23	0.99	0.86	1.70	1.57	1.40
	#6 Pivot 2	-----	-----	0.25	0.70	0.98	1.82	1.08	1.20
	#7 Pivot 2	-----	-----	-----	-----	0.61	1.54	0.94	1.10
	#8 Pivot 2	-----	-----	-----	-----	0.93	1.89	0.85	0.90
	#9 Pivot 2	-----	-----	-----	-----	1.28	1.53	0.67	0.70
	#10 Pivot 2	-----	-----	-----	-----	0.81	1.70	1.18	1.00
	#11 Pivot 2	-----	-----	-----	-----	0.83	1.87	0.68	1.00
	#12 Pivot 2	-----	-----	-----	-----	0.84	1.52	0.80	1.00
	Average	-----	-----	*0.29*	*0.79*	*0.99*	*1.62*	*1.09*	*1.03*
Section 28 - 2nd Cut	#1 Pivot 2	-----	-----	-----	-----	1.26	1.36	0.80	<0.2
	#2 Pivot 2	-----	-----	-----	-----	0.72	1.45	0.80	0.30
	#3 Pivot 2	-----	-----	-----	-----	0.77	1.14	0.70	0.40
	#4 Pivot 2	-----	-----	-----	-----	0.82	1.37	1.10	1.60
	#5 Pivot 2	-----	-----	-----	-----	1.21	1.31	1.30	1.20
	#6 Pivot 2	-----	-----	-----	-----	0.97	1.80	1.50	1.40
	#7 Pivot 2	-----	-----	-----	-----	0.66	1.15	1.20	1.80
	#8 Pivot 2	-----	-----	-----	-----	0.91	1.41	0.90	1.00
	#9 Pivot 2	-----	-----	-----	-----	0.88	0.84	1.50	1.30
	#10 Pivot 2	-----	-----	-----	-----	1.16	1.28	0.90	1.40
	#11 Pivot 2	-----	-----	-----	-----	0.94	1.08	1.90	1.20
	#12 Pivot 2	-----	-----	-----	-----	1.44	1.18	1.40	1.20
	Average	-----	-----	-----	-----	*0.98*	*1.28*	*1.17*	*1.08*
Section 28 - 3rd Cut	#1 Pivot 2	-----	-----	-----	-----	1.54	1.57	0.73	1.50
	#2 Pivot 2	-----	-----	-----	-----	0.79	0.86	1.12	1.60
	#3 Pivot 2	-----	-----	-----	-----	0.78	1.14	0.96	1.20
	#4 Pivot 2	-----	-----	-----	-----	1.33	1.29	1.12	1.80
	#5 Pivot 2	-----	-----	-----	-----	1.40	0.58	0.63	0.80
	#6 Pivot 2	-----	-----	-----	-----	1.14	1.41	0.79	1.10
	#7 Pivot 2	-----	-----	-----	-----	0.94	0.49	0.91	1.00
	#8 Pivot 2	-----	-----	-----	-----	1.44	0.96	0.49	0.40
	#9 Pivot 2	-----	-----	-----	-----	1.00	0.81	0.83	1.30
	#10 Pivot 2	-----	-----	-----	-----	0.81	0.37	1.20	0.60
	#11 Pivot 2	-----	-----	-----	-----	1.14	1.02	0.58	0.20
	#12 Pivot 2	-----	-----	-----	-----	1.35	1.46	0.84	0.80
	Average	-----	-----	-----	-----	*1.14*	*1.00*	*0.85*	*1.03*

Table D-3. 2005 through 2007 Hay Analyses

Irrigation Area	Sample	2005 Uranium (mg/kg)	2005 Selenium (mg/kg)	2006 Uranium (mg/kg)	2006 Selenium (mg/kg)	2007 Uranium (mg/kg)	2007 Selenium (mg/kg)
Section 33 - Pivot - 1st Cut	#1	0.9	1.5	0.7	1.2	0.7	0.7
	#2	0.8	1.5	1.2	1.4	0.9	1.2
	#3	0.8	0.8	0.1	1.2	1.3	1.6
	#4	1.1	0.8	1.1	1.3	0.7	0.7
	#5	0.7	1.2	0.7	1.5	0.9	1.3
	#6	0.9	1.2	0.9	1.2	1.2	1.5
	#7	0.8	1.5	0.8	1.2	0.8	1.0
	#8	0.8	1.5	0.9	1.1	1.0	1.3
	#9	0.6	1.0	0.6	1.1	1.6	1.8
	#10	1.0	1.1	1.0	1.4	1.1	1.4
	#11	0.9	1.6	0.9	1.2	1.3	1.7
	#12	0.8	1.3	0.7	1.2	1.0	1.1
	Average	*0.84*	*1.3*	*0.80*	*1.3*	*1.04*	*1.3*
Section 33 - Pivot - 2nd Cut	#1	0.6	1.3	0.6	1.4	1.7	1.2
	#2	0.5	1.3	0.7	1.5	0.8	0.6
	#3	0.7	1.4	0.7	1.0	0.9	1.5
	#4	1.3	1.4	0.6	1.8	1.1	1.5
	#5	0.6	1.2	0.5	0.5	1.2	0.7
	#6	0.8	1.1	0.6	2.1	1.2	1.6
	#7	0.6	1.6	0.7	1.1	1.3	1.1
	#8	0.5	1.4	0.5	0.7	0.9	1.6
	#9	0.6	1.0	0.7	1.0	0.8	1.0
	#10	0.6	1.6	0.4	1.6	2.1	2.0
	#11	0.5	1.0	0.7	1.4	0.9	1.6
	#12	0.4	1.2	0.7	1.4	1.2	1.8
	Average	*0.64*	*1.3*	*0.62*	*1.3*	*1.18*	*1.4*
Section 33 - Pivot - 3rd Cut	#1	0.7	1.1	0.5	1.6	1.7	1.2
	#2	0.7	1.3	0.5	1.0	2.0	1.2
	#3	0.4	0.8	0.6	1.0	1.8	1.2
	#4	0.5	0.9	0.4	0.9	1.5	1.9
	#5	0.9	1.2	0.6	0.9	1.5	1.9
	#6	0.8	1.6	0.4	0.8	0.9	1.6
	#7	0.8	1.3	0.3	0.9	1.7	1.7
	#8	0.6	1.2	0.4	1.0	1.5	1.9
	#9	1.0	2.6	0.5	1.2	2.0	1.3
	#10	0.6	1.2	0.3	0.7	1.4	1.5
	#11	0.7	0.9	0.5	1.1	1.3	1.1
	#12	0.8	1.1	0.4	0.9	1.9	1.0
	Average	*0.71*	*1.3*	*0.45*	*1.0*	*1.60*	*1.5*

Table D-3. 2005 through 2007 Hay Analyses (cont.)

Irrigation Area	Sample	2005 Uranium (mg/kg)	2005 Selenium (mg/kg)	2006 Uranium (mg/kg)	2006 Selenium (mg/kg)	2007 Uranium (mg/kg)	2007 Selenium (mg/kg)
Section 33 - Flood - 1st Cut	#1	0.5	0.3	----	----	----	----
	#2	0.3	<0.20	----	----	----	----
	Average	*0.40*	*<0.25*	----	----	----	----
Section 34 - Flood - 1st Cut	#1	2.0	1.8	0.7	0.9	1.3	2.4
	#2	1.8	1.7	1.1	0.9	0.7	1.3
	#3	1.4	2.0	1.2	0.6	0.9	1.0
	#4	0.6	1.7	0.8	0.6	1.2	1.6
	#5	2.4	2.0	0.8	0.7	0.8	1.4
	#6	2.1	1.7	0.7	1.0	1.2	0.9
	#7	1.6	2.5	0.8	0.8	----	----
	#8	3.0	2.7	0.6	0.7	----	----
	#9	2.2	1.7	0.6	0.9	----	----
	#10	2.4	1.5	0.6	0.4	----	----
	#11	1.0	1.9	----	----	----	----
	#12	1.3	1.6	----	----	----	----
	Average	*1.8*	*1.9*	*0.79*	*0.75*	*1.02*	*1.43*
Section 34 - Flood - 2nd Cut	#1	0.7	0.7	1.3	1.1	----	----
	#2	0.7	1.0	0.9	1.3	----	----
	#3	1.0	1.1	0.8	0.9	----	----
	#4	0.9	0.8	0.5	2.5	----	----
	#5	0.8	0.6	0.6	1.9	----	----
	#6	1.2	0.6	0.6	0.7	----	----
	#7	----	----	----	----	----	----
	#8	----	----	----	----	----	----
	#9	----	----	----	----	----	----
	#10	----	----	----	----	----	----
	#11	----	----	----	----	----	----
	#12	----	----	----	----	----	----
	Average	*0.9*	*0.8*	*0.78*	*1.40*	----	----

Table D-3. 2005 through 2007 Hay Analyses (cont.)

Irrigation Area	Sample	2005 Uranium (mg/kg)	2005 Selenium (mg/kg)	2006 Uranium (mg/kg)	2006 Selenium (mg/kg)	2007 Uranium (mg/kg)	2007 Selenium (mg/kg)
Section 28 - Pivot - 1st Cut	#1	1.6	1.4	1.0	0.6	0.7	1.0
	#2	1.6	1.7	1.2	1.1	1.1	1.2
	#3	2.1	1.7	1.0	0.8	0.9	1.2
	#4	1.8	1.8	1.5	1.3	0.9	0.9
	#5	1.8	1.1	1.5	1.3	0.6	0.6
	#6	1.5	1.5	1.3	1.7	0.6	0.7
	#7	1.5	1.6	0.7	1.1	0.6	0.7
	#8	1.9	0.9	1.3	1.5	1.0	0.7
	#9	3.3	1.5	1.3	1.1	1.3	1.0
	#10	1.9	1.5	1.4	1.4	0.7	1.1
	#11	1.7	2.4	1.3	1.2	0.9	1.0
	#12	1.3	0.9	1.0	0.9	0.9	0.9
	Average	*1.8*	*1.5*	*1.2*	*1.2*	*0.9*	*0.9*
Section 28 - Pivot - 2nd Cut	#1	0.8	1.3	0.5	1.5	1.3	1.4
	#2	0.9	1.4	0.9	1.2	0.7	1.0
	#3	1.0	1.4	1.3	1.5	0.8	0.8
	#4	0.8	1.1	0.7	1.7	1.0	1.0
	#5	1.0	1.3	0.6	1.3	0.9	1.0
	#6	0.9	1.3	0.6	1.5	1.5	1.3
	#7	1.1	0.9	0.8	1.0	2.4	1.1
	#8	0.6	1.2	1.0	1.3	1.8	1.6
	#9	0.9	1.3	0.7	0.8	1.3	1.1
	#10	0.9	1.0	0.6	1.2	1.7	1.3
	#11	1.5	1.1	0.7	1.1	2.2	1.1
	#12	0.9	1.6	0.8	1.1	3.5	1.2
	Average	*0.9*	*1.2*	*0.8*	*1.3*	*1.6*	*1.2*
Section 28 - Pivot - 3rd Cut	#1	1.2	1.6	0.8	0.9	1.6	1.8
	#2	1.2	1.8	0.7	0.7	1.1	1.3
	#3	1.0	1.9	0.7	0.7	0.9	1.5
	#4	1.7	1.4	0.9	1.0	0.6	1.0
	#5	1.5	1.4	0.7	1.1	0.8	1.4
	#6	1.5	1.2	0.8	1.1	1.7	1.6
	#7	1.4	1.2	0.9	1.0	1.1	1.3
	#8	1.2	1.3	0.2	1.1	1.2	1.2
	#9	1.8	1.3	0.5	1.0	1.4	1.2
	#10	1.4	1.5	0.3	1.0	1.5	1.3
	#11	1.8	1.2	0.4	0.8	1.2	1.4
	#12	1.4	1.9	0.5	1.0	0.9	1.0
	Average	*1.4*	*1.5*	*0.62*	*0.95*	*1.17*	*1.33*

Table D-4. 2008 through 2010 Hay Analyses

Irrigation Area	Sample	2008 Uranium (mg/kg)	2008 Selenium (mg/kg)	2009 Uranium (mg/kg)	2009 Selenium (mg/kg)	2010 Uranium (mg/kg)	2010 Selenium (mg/kg)
Section 33 - Pivot - 1st Cut	#1	0.3	1.3	0.7	1.0	0.2	0.9
	#2	0.8	1.3	<0.5	1.1	0.2	0.9
	#3	0.8	1.4	<0.5	0.7	----	----
	#4	0.4	1.4	0.7	0.7	----	----
	#5	0.7	1.5	<0.5	0.6	----	----
	#6	0.3	0.8	<0.5	0.6	----	----
	#7	0.5	1.1	<0.5	1.0	----	----
	#8	0.4	0.7	<0.5	1.0	----	----
	#9	0.6	1.0	<0.5	1.3	----	----
	#10	0.2	1.3	<0.5	0.7	----	----
	#11	0.2	0.8	<0.5	1.2	----	----
	#12	0.4	1.1	0.8	0.8	----	----
	Average	*0.47*	*1.1*	*0.73*	*0.9*	*0.21*	*0.9*
Section 33 - Pivot - 2nd Cut	#1	1.7	3.1	----	----	----	----
	#2	1.2	1.1	----	----	----	----
	#3	1.3	1.6	----	----	----	----
	#4	0.8	1.3	----	----	----	----
	#5	0.6	0.7	----	----	----	----
	#6	0.6	0.6	----	----	----	----
	#7	0.4	1.2	----	----	----	----
	#8	0.5	1.2	----	----	----	----
	#9	0.3	0.9	----	----	----	----
	#10	0.7	1.4	----	----	----	----
	#11	0.7	1.3	----	----	----	----
	#12	1.2	1.2	----	----	----	----
	Average	*0.83*	*1.3*	----	----	----	----
Section 33 - Pivot - 3rd Cut	#1	----	----	----	----	----	----
	#2	----	----	----	----	----	----
	#3	----	----	----	----	----	----
	#4	----	----	----	----	----	----
	#5	----	----	----	----	----	----
	#6	----	----	----	----	----	----
	#7	----	----	----	----	----	----
	#8	----	----	----	----	----	----
	#9	----	----	----	----	----	----
	#10	----	----	----	----	----	----
	#11	----	----	----	----	----	----
	#12	----	----	----	----	----	----
	Average	----	----	----	----	----	----

Table D-4. 2008 through 2010 Hay Analyses (cont.)

Irrigation Area	Sample	2008 Uranium (mg/kg)	2008 Selenium (mg/kg)	2009 Uranium (mg/kg)	2009 Selenium (mg/kg)	2010 Uranium (mg/kg)	2010 Selenium (mg/kg)
Section 33 - Flood	#1	----	----	----	----	0.3	0.5
- 1st Cut	#2	----	----	----	----	0.1	0.5
	Average	----	----	----	----	*0.2*	*0.5*
Section 34 - Flood	#1	----	----	0.5	<0.5	1.2	2.0
- 1st Cut	#2	----	----	0.9	<0.5	0.2	0.5
	#3	----	----	0.5	<0.5	----	----
	#4	----	----	0.9	0.8	----	----
	#5	----	----	0.7	0.8	----	----
	#6	----	----	<0.5	<0.5	----	----
	#7	0.3	2.0	1.2	0.6	----	----
	#8	0.2	1.8	<0.5	0.5	----	----
	#9	0.2	1.1	0.8	<0.5	----	----
	#10	1.2	2.2	1.2	0.6	----	----
	#11	0.8	1.8	1.0	<0.5	----	----
	#12	0.2	1.9	1.0	<0.5	----	----
	Average	*0.49*	*1.8*	*0.87*	*0.7*	*0.67*	*1.3*
Section 34 - Flood	#1	0.3	1.2	----	----	----	----
- 2nd Cut	#2	0.2	1.1	----	----	----	----
	#3	0.6	0.6	----	----	----	----
	#4	0.6	1.4	----	----	----	----
	#5	0.2	0.7	----	----	----	----
	#6	0.3	0.7	----	----	----	----
	#7	0.4	0.7	----	----	----	----
	#8	0.5	2.5	----	----	----	----
	#9	0.4	1.3	----	----	----	----
	#10	0.7	1.2	----	----	----	----
	#11	0.3	0.7	----	----	----	----
	#12	0.2	0.9	----	----	----	----
	Average	*0.43*	*1.3*	----	----	----	----

Table D-4. 2008 through 2010 Hay Analyses (cont.)

Irrigation Area	Sample	2008 Uranium (mg/kg)	2008 Selenium (mg/kg)	2009 Uranium (mg/kg)	2009 Selenium (mg/kg)	2010 Uranium (mg/kg)	2010 Selenium (mg/kg)
Section 28 - Pivot - 1st Cut	#1	1.6	1.4	0.6	2.5	0.1	0.7
	#2	1.5	1.4	0.9	2.4	0.2	1.1
	#3	2.3	1.6	1.0	1.3	----	----
	#4	2.2	1.8	0.7	3.2	----	----
	#5	1.5	1.7	1.0	1.8	----	----
	#6	1.3	1.3	0.7	1.1	----	----
	#7	1.3	1.4	0.7	1.0	----	----
	#8	2.3	1.6	0.9	2.7	----	----
	#9	1.2	1.6	0.8	0.8	----	----
	#10	2.0	1.5	<0.5	2.2	----	----
	#11	1.4	1.6	1.4	1.1	----	----
	#12	1.6	1.4	1.4	1.4	----	----
	Average	*1.68*	*1.5*	*0.92*	*1.8*	*0.14*	*0.9*
Section 28 - Pivot - 2nd Cut	#1	----	----	----	----	----	----
	#2	----	----	----	----	----	----
	#3	----	----	----	----	----	----
	#4	----	----	----	----	----	----
	#5	----	----	----	----	----	----
	#6	----	----	----	----	----	----
	#7	----	----	----	----	----	----
	#8	----	----	----	----	----	----
	#9	----	----	----	----	----	----
	#10	----	----	----	----	----	----
	#11	----	----	----	----	----	----
	#12	----	----	----	----	----	----
	Average	----	----	----	----	----	----
Section 28 - Pivot - 3rd Cut	#1	----	----	----	----	----	----
	#2	----	----	----	----	----	----
	#3	----	----	----	----	----	----
	#4	----	----	----	----	----	----
	#5	----	----	----	----	----	----
	#6	----	----	----	----	----	----
	#7	----	----	----	----	----	----
	#8	----	----	----	----	----	----
	#9	----	----	----	----	----	----
	#10	----	----	----	----	----	----
	#11	----	----	----	----	----	----
	#12	----	----	----	----	----	----
	Average	----	----	----	----	----	----

APPENDIX E

Resident Farmer on Section 34 Irrigated Areas RESRAD Results

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Part I: Mixture Sums and Single Radionuclide Guidelines

1RESRAD, Version 6.5 T½ Limit = 180 days 01/10/2011 12:17 Page 2
Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(6)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(7)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(8)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(9)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(10)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(11)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(12)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(13)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(14)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(15)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(16)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(17)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(19)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(20)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(21)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(22)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(23)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(24)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(25)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(26)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(27)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(5)
B-1	U-234	1.320E-01	1.320E-01	DCF2(6)
B-1	U-238	1.180E-01	1.180E-01	DCF2(7)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(8)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(5)
D-1	U-234	2.830E-04	2.830E-04	DCF3(6)
D-1	U-238	2.550E-04	2.550E-04	DCF3(7)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(8)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : RESRAD Default Parameters
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Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	4.856E+05	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	3.300E-04	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	1.670E-03	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): U-238	8.800E-01	0.000E+00	---	S1(7)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(7)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	2.700E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.100E-01	2.000E-01	---	RI
R013	Irrigation mode	ditch	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT

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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.723E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.723E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.410E-03	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.207E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.017E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Summary : RESRAD Default Parameters
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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.017E-06	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.410E-03	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)

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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

```
1RESRAD, Version 6.5      T½ Limit = 180 days        01/10/2011  12:17  Page  10
 Summary : RESRAD Default Parameters
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD
```

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	suppressed
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	suppressed

```
1RESRAD, Version 6.5      T½ Limit = 180 days        01/10/2011  12:17  Page  11
 Summary : RESRAD Default Parameters
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

      Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g
      ----------------------------            ----------------------------------

        Area: 485640.00 square meters                Ra-226     3.300E-04
   Thickness:       2.00 meters                      Ra-228     1.670E-03
 Cover Depth:       0.00 meters                      U-238      8.800E-01
0
                                           Total Dose TDOSE(t), mrem/yr
                                     Basic Radiation Dose Limit = 2.500E+01 mrem/yr
              Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
              --------------------------------------------------------------------------

    t (years):  0.000E+00  1.000E+00  3.000E+00  1.000E+01  3.000E+01  1.000E+02  3.000E+02  1.000E+03
     TDOSE(t):  1.790E-01  1.793E-01  1.777E-01  1.678E-01  1.535E-01  1.298E-01  8.044E-02  7.663E-01
         M(t):  7.159E-03  7.170E-03  7.107E-03  6.711E-03  6.141E-03  5.194E-03  3.217E-03  3.065E-02
0Maximum TDOSE(t):  7.663E-01 mrem/yr   at t = 1.000E+03 years
```

1RESRAD, Version 6.5 T½ Limit = 180 days 01/10/2011 12:17 Page 12
Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0
Water Independent Pathways (Inhalation excludes radon)
0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.190E-03	0.0122	2.783E-07	0.0000	0.000E+00	0.0000	1.553E-03	0.0087	9.186E-05	0.0005	1.097E-04	0.0006	1.293E-05	0.0001
Ra-228	7.148E-03	0.0399	9.160E-06	0.0001	0.000E+00	0.0000	7.955E-03	0.0444	4.658E-04	0.0026	5.637E-04	0.0031	6.777E-05	0.0004
U-238	7.943E-02	0.4438	9.784E-03	0.0547	0.000E+00	0.0000	5.141E-02	0.2873	3.393E-03	0.0190	8.317E-03	0.0465	6.465E-03	0.0361
Total	8.877E-02	0.4960	9.794E-03	0.0547	0.000E+00	0.0000	6.092E-02	0.3404	3.950E-03	0.0221	8.990E-03	0.0502	6.546E-03	0.0366

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

0
Water Dependent Pathways
0

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.958E-03	0.0221
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.621E-02	0.0906
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.588E-01	0.8873
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.790E-01	1.0000

0*Sum of all water independent and dependent pathways.

1RESRAD, Version 6.5 T½ Limit = 180 days 01/10/2011 12:17 Page 13
Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

0
Water Independent Pathways (Inhalation excludes radon)

0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.185E-03	0.0122	2.994E-07	0.0000	0.000E+00	0.0000	1.614E-03	0.0090	9.619E-05	0.0005	1.116E-04	0.0006	1.488E-05	0.0001
Ra-228	8.742E-03	0.0488	2.111E-05	0.0001	0.000E+00	0.0000	7.075E-03	0.0395	4.142E-04	0.0023	4.989E-04	0.0028	6.881E-05	0.0004
U-238	7.924E-02	0.4420	9.761E-03	0.0544	0.000E+00	0.0000	5.129E-02	0.2861	3.384E-03	0.0189	8.297E-03	0.0463	6.450E-03	0.0360
Total	9.017E-02	0.5030	9.782E-03	0.0546	0.000E+00	0.0000	5.997E-02	0.3346	3.895E-03	0.0217	8.907E-03	0.0497	6.533E-03	0.0364

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

0
Water Dependent Pathways

0

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.022E-03	0.0224
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.682E-02	0.0938
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.584E-01	0.8837
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.793E-01	1.0000

0*Sum of all water independent and dependent pathways.

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Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.176E-03	0.0122	3.394E-07	0.0000	0.000E+00	0.0000	1.727E-03	0.0097	1.040E-04	0.0006	1.151E-04	0.0006	1.858E-05	0.0001
Ra-228	9.505E-03	0.0535	3.084E-05	0.0002	0.000E+00	0.0000	5.571E-03	0.0314	3.256E-04	0.0018	3.908E-04	0.0022	6.361E-05	0.0004
U-238	7.886E-02	0.4438	9.714E-03	0.0547	0.000E+00	0.0000	5.104E-02	0.2872	3.368E-03	0.0190	8.257E-03	0.0465	6.419E-03	0.0361
Total	9.054E-02	0.5096	9.745E-03	0.0548	0.000E+00	0.0000	5.834E-02	0.3283	3.798E-03	0.0214	8.763E-03	0.0493	6.501E-03	0.0366

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.140E-03	0.0233
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-02	0.0894
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.577E-01	0.8873
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.777E-01	1.0000

0*Sum of all water independent and dependent pathways.

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Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.143E-03	0.0128	4.589E-07	0.0000	0.000E+00	0.0000	2.061E-03	0.0123	1.271E-04	0.0008	1.254E-04	0.0007	2.964E-05	0.0002
Ra-228	5.531E-03	0.0330	2.114E-05	0.0001	0.000E+00	0.0000	2.385E-03	0.0142	1.391E-04	0.0008	1.661E-04	0.0010	3.249E-05	0.0002
U-238	7.754E-02	0.4622	9.552E-03	0.0569	0.000E+00	0.0000	5.019E-02	0.2991	3.312E-03	0.0197	8.119E-03	0.0484	6.312E-03	0.0376
Total	8.522E-02	0.5079	9.573E-03	0.0571	0.000E+00	0.0000	5.463E-02	0.3256	3.578E-03	0.0213	8.410E-03	0.0501	6.374E-03	0.0380

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
0 Water Dependent Pathways
0

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.487E-03	0.0267
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.274E-03	0.0493
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.550E-01	0.9239
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.678E-01	1.0000

0*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.053E-03	0.0134	6.696E-07	0.0000	0.000E+00	0.0000	2.640E-03	0.0172	1.672E-04	0.0011	1.423E-04	0.0009	4.934E-05	0.0003
Ra-228	5.088E-04	0.0033	1.990E-06	0.0000	0.000E+00	0.0000	2.071E-04	0.0013	1.207E-05	0.0001	1.440E-05	0.0001	2.924E-06	0.0000
U-238	7.389E-02	0.4813	9.103E-03	0.0593	0.000E+00	0.0000	4.783E-02	0.3115	3.156E-03	0.0206	7.737E-03	0.0504	6.015E-03	0.0392
Total	7.646E-02	0.4980	9.105E-03	0.0593	0.000E+00	0.0000	5.068E-02	0.3301	3.336E-03	0.0217	7.894E-03	0.0514	6.067E-03	0.0395

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years
0 Water Dependent Pathways

0 Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.053E-03	0.0329
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.473E-04	0.0049
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.477E-01	0.9622
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.535E-01	1.0000

0*Sum of all water independent and dependent pathways.

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Summary : RESRAD Default Parameters
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\HMCIRR10.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Ra-226	1.766E-03	0.0136	7.859E-07	0.0000	0.000E+00	0.0000	2.878E-03	0.0222	1.854E-04	0.0014	1.426E-04	0.0011	6.156E-05	0.0005
Ra-228	9.765E-08	0.0000	3.820E-10	0.0000	0.000E+00	0.0000	3.972E-08	0.0000	2.315E-09	0.0000	2.762E-09	0.0000	5.610E-10	0.0000
U-238	6.242E-02	0.4807	7.691E-03	0.0592	0.000E+00	0.0000	4.041E-02	0.3112	2.667E-03	0.0205	6.538E-03	0.0503	5.082E-03	0.0391
Total	6.419E-02	0.4943	7.692E-03	0.0592	0.000E+00	0.0000	4.329E-02	0.3334	2.852E-03	0.0220	6.680E-03	0.0514	5.144E-03	0.0396

0
Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
0 Water Dependent Pathways

0 Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.035E-03	0.0388
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.434E-07	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.248E-01	0.9612
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E-01	1.0000

0*Sum of all water independent and dependent pathways.

1RESRAD, Version 6.5 T½ Limit = 180 days 01/10/2011 12:17 Page 18
Summary : RESRAD Default Parameters
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.147E-03	0.0143	5.294E-07	0.0000	0.000E+00	0.0000	1.924E-03	0.0239	1.242E-04	0.0015	9.445E-05	0.0012	4.170E-05	0.0005
Ra-228	2.341E-18	0.0000	9.158E-21	0.0000	0.000E+00	0.0000	9.521E-19	0.0000	5.550E-20	0.0000	6.621E-20	0.0000	1.345E-20	0.0000
U-238	3.855E-02	0.4793	4.753E-03	0.0591	0.000E+00	0.0000	2.497E-02	0.3105	1.648E-03	0.0205	4.040E-03	0.0502	3.140E-03	0.0390
Total	3.970E-02	0.4935	4.753E-03	0.0591	0.000E+00	0.0000	2.690E-02	0.3344	1.772E-03	0.0220	4.134E-03	0.0514	3.182E-03	0.0396

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
0 Water Dependent Pathways

0 Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.332E-03	0.0414
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.437E-18	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.710E-02	0.9586
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.044E-02	1.0000

0*Sum of all water independent and dependent pathways.

1RESRAD, Version 6.5 T½ Limit = 180 days 01/10/2011 12:17 Page 19
Summary : RESRAD Default Parameters
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.535E-04	0.0003	1.170E-07	0.0000	0.000E+00	0.0000	4.253E-04	0.0006	2.744E-05	0.0000	2.087E-05	0.0000	9.217E-06	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	7.137E-03	0.0093	8.817E-04	0.0012	0.000E+00	0.0000	4.635E-03	0.0060	3.059E-04	0.0004	7.494E-04	0.0010	5.826E-04	0.0008
Total	7.391E-03	0.0096	8.818E-04	0.0012	0.000E+00	0.0000	5.060E-03	0.0066	3.333E-04	0.0004	7.703E-04	0.0010	5.918E-04	0.0008

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Dependent Pathways
0

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.396E-03	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	2.749E-04	0.0004	5.303E-05	0.0001	4.654E-05	0.0001	2.507E-03	0.0033
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	5.966E-01	0.7785	0.000E+00	0.0000	0.000E+00	0.0000	1.170E-01	0.1527	9.133E-03	0.0119	2.676E-02	0.0349	7.638E-01	0.9967
Total	5.980E-01	0.7804	0.000E+00	0.0000	0.000E+00	0.0000	1.173E-01	0.1531	9.186E-03	0.0120	2.680E-02	0.0350	7.663E-01	1.0000

0*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.186E+01	1.183E+01	1.178E+01	1.161E+01	1.112E+01	9.559E+00	6.210E+00	2.531E+00
Ra-226+D	Pb-210+D	1.000E+00	1.333E-01	3.529E-01	7.623E-01	1.990E+00	4.194E+00	5.697E+00	3.888E+00	5.066E+00
Ra-226+D	ΣDSR(j)		1.199E+01	1.219E+01	1.255E+01	1.360E+01	1.531E+01	1.526E+01	1.010E+01	7.597E+00
0Ra-228+D	Ra-228+D	1.000E+00	8.720E+00	7.716E+00	6.042E+00	2.567E+00	2.226E-01	4.269E-05	1.023E-15	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.864E-01	2.356E+00	3.471E+00	2.387E+00	2.249E-01	4.317E-05	1.035E-15	0.000E+00
Ra-228+D	ΣDSR(j)		9.706E+00	1.007E+01	9.513E+00	4.954E+00	4.475E-01	8.586E-05	2.058E-15	0.000E+00
0U-238	U-238	5.400E-05	4.656E-06	4.644E-06	4.622E-06	4.545E-06	4.331E-06	3.659E-06	2.259E-06	4.393E-05
0U-238+D	U-238+D	9.999E-01	1.805E-01	1.800E-01	1.792E-01	1.762E-01	1.679E-01	1.418E-01	8.757E-02	8.653E-01
U-238+D	U-234	9.999E-01	1.359E-07	4.070E-07	9.451E-07	2.788E-06	7.717E-06	2.148E-05	3.965E-05	2.557E-03
U-238+D	Th-230	9.999E-01	4.449E-13	2.972E-12	1.533E-11	1.341E-10	1.091E-09	1.058E-08	6.943E-08	3.009E-07
U-238+D	Ra-226+D	9.999E-01	5.081E-15	7.895E-14	9.357E-13	2.478E-11	5.875E-10	1.864E-08	3.544E-07	6.809E-06
U-238+D	Pb-210+D	9.999E-01	2.971E-17	7.907E-16	1.764E-14	1.213E-12	7.215E-11	5.340E-09	1.613E-07	1.071E-05
U-238+D	ΣDSR(j)		1.805E-01	1.800E-01	1.792E-01	1.762E-01	1.679E-01	1.418E-01	8.761E-02	8.679E-01

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.
0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.084E+00	2.051E+00	1.993E+00	1.839E+00	1.633E+00	1.639E+00	2.476E+00	3.291E+00
Ra-228	2.576E+00	2.482E+00	2.628E+00	5.046E+00	5.587E+01	2.912E+05	*2.726E+14	*2.726E+14
U-238	1.385E+02	1.389E+02	1.395E+02	1.419E+02	1.489E+02	1.763E+02	2.853E+02	2.880E+01

*At specific activity limit
0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 1.000E+03 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	3.300E-04	57.5 ± 0.1	1.590E+01	1.572E+00	7.597E+00	3.291E+00
Ra-228	1.670E-03	1.164 ± 0.002	1.008E+01	2.481E+00	0.000E+00	*2.726E+14
U-238	8.800E-01	1.000E+03	8.679E-01	2.880E+01	8.679E-01	2.880E+01

*At specific activity limit

Summary : RESRAD Default Parameters
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.914E-03	3.905E-03	3.889E-03	3.830E-03	3.669E-03	3.155E-03	2.049E-03	8.353E-04
Ra-226	U-238	9.999E-01	4.471E-15	6.947E-14	8.234E-13	2.181E-11	5.170E-10	1.640E-08	3.119E-07	5.992E-06
Ra-226	ΣDOSE(j)		3.914E-03	3.905E-03	3.889E-03	3.830E-03	3.669E-03	3.155E-03	2.050E-03	8.413E-04
0Pb-210	Ra-226	1.000E+00	4.400E-05	1.164E-04	2.516E-04	6.568E-04	1.384E-03	1.880E-03	1.283E-03	1.672E-03
Pb-210	U-238	9.999E-01	2.614E-17	6.958E-16	1.553E-14	1.067E-12	6.349E-11	4.699E-09	1.419E-07	9.421E-06
Pb-210	ΣDOSE(j)		4.400E-05	1.164E-04	2.516E-04	6.568E-04	1.384E-03	1.880E-03	1.283E-03	1.681E-03
0Ra-228	Ra-228	1.000E+00	1.456E-02	1.289E-02	1.009E-02	4.287E-03	3.717E-04	7.130E-08	1.709E-18	0.000E+00
0Th-228	Ra-228	1.000E+00	1.647E-03	3.934E-03	5.796E-03	3.986E-03	3.756E-04	7.209E-08	1.728E-18	0.000E+00
0U-238	U-238	5.400E-05	4.097E-06	4.087E-06	4.067E-06	3.999E-06	3.811E-06	3.220E-06	1.988E-06	3.866E-05
U-238	U-238	9.999E-01	1.588E-01	1.584E-01	1.577E-01	1.550E-01	1.477E-01	1.248E-01	7.707E-02	7.615E-01
U-238	ΣDOSE(j)		1.588E-01	1.584E-01	1.577E-01	1.550E-01	1.477E-01	1.248E-01	7.707E-02	7.615E-01
0U-234	U-238	9.999E-01	1.196E-07	3.581E-07	8.317E-07	2.453E-06	6.791E-06	1.890E-05	3.489E-05	2.250E-03
0Th-230	U-238	9.999E-01	3.915E-13	2.615E-12	1.349E-11	1.180E-10	9.601E-10	9.312E-09	6.110E-08	2.648E-07

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.300E-04	3.293E-04	3.279E-04	3.230E-04	3.093E-04	2.660E-04	1.728E-04	3.819E-05
Ra-226	U-238	9.999E-01	0.000E+00	1.619E-15	4.355E-14	1.593E-12	4.155E-11	1.363E-09	2.616E-08	3.166E-07
Ra-226	ΣS(j):		3.300E-04	3.293E-04	3.279E-04	3.230E-04	3.093E-04	2.660E-04	1.728E-04	3.850E-05
0Pb-210	Ra-226	1.000E+00	0.000E+00	1.008E-05	2.923E-05	8.667E-05	1.899E-04	2.609E-04	1.782E-04	3.939E-05
Pb-210	U-238	9.999E-01	0.000E+00	1.250E-17	9.969E-16	1.166E-13	8.149E-12	6.382E-10	1.958E-08	2.905E-07
Pb-210	ΣS(j):		0.000E+00	1.008E-05	2.923E-05	8.667E-05	1.899E-04	2.609E-04	1.782E-04	3.968E-05
0Ra-228	Ra-228	1.000E+00	1.670E-03	1.478E-03	1.157E-03	4.917E-04	4.263E-05	8.176E-09	1.960E-19	0.000E+00
0Th-228	Ra-228	1.000E+00	0.000E+00	4.760E-04	8.966E-04	6.749E-04	6.429E-05	1.234E-08	2.958E-19	0.000E+00
0U-238	U-238	5.400E-05	4.752E-05	4.741E-05	4.718E-05	4.639E-05	4.421E-05	3.734E-05	2.306E-05	4.268E-06
U-238	U-238	9.999E-01	8.800E-01	8.778E-01	8.736E-01	8.590E-01	8.186E-01	6.915E-01	4.270E-01	7.904E-02
U-238	ΣS(j):		8.800E-01	8.779E-01	8.737E-01	8.590E-01	8.186E-01	6.915E-01	4.271E-01	7.904E-02
0U-234	U-238	9.999E-01	0.000E+00	2.489E-06	7.430E-06	2.435E-05	6.962E-05	1.960E-04	3.630E-04	2.238E-04
0Th-230	U-238	9.999E-01	0.000E+00	1.121E-11	1.006E-10	1.105E-09	9.630E-09	9.573E-08	6.325E-07	2.666E-06

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 4.82 seconds

GRANTS RECLAMATION PROJECT UPDATED CORRECTIVE ACTION PROGRAM (CAP)

APPENDIX K – MONITORING PROGRAM

TABLE OF CONTENTS

INTRODUCTION

The site monitoring program must coevolve with the CAP to ensure that accurate, relevant water quality data is collected to evaluate the ongoing performance of the CAP. Currently, HMC monitors approximately 80 wells to meet federal and state license and permit requirements and voluntarily samples several hundred additional wells to assess the performance of the CAP components and to monitor any changes in the groundwater plume. More information about the current monitoring program can be found in **Section 8**. The site staff follow HMC standard operating procedures for each event, which are provided as **Attachment L-1** in **Appendix L**.

HMC will optimize the monitoring program by following these steps:

1) Identify site wells that are currently being used or may be used as monitoring wells to evaluate the performance of the CAP in a comprehensive table

    - Generate a list of all wells that are sampled at the site

    - Collecting relevant information about each well, including date drilled, total depth, casing diameter, screened interval and formation, location, and potential issues

    - Determine the period of chemical and water level data available and the frequency of sampling during this period

    - Identify the relative location of the well to a potential source (e.g., proximity to LTP)

2) Determine the monitoring objective the well would fulfill if included in the monitoring program

    - Define the specific monitoring objective of the well, including (1) characterization of the contaminant plume, (2) CAP performance evaluation, (3) demonstration of restoration progress, and (4) compliance

    - Identify any changes to the monitoring objectives over the period for which data are available

3) Evaluate historic water quality data from the well to determine whether continued or additional sampling would provide relevant information

    - Compare data from the most recent round of sampling to historic results

- Use simple and widely-accepted statistical tests to characterize both the direction and magnitude of short-term and long-term concentration trends

- Use suitable lines of evidence, including (1) number of samples collected since installation, (2) frequency of detection in recent sampling events, (3) maximum detected concentrations, (4) concentration-time profiles, (5) magnitude of annual concentration change compared to the site standards, and (6) variability of the concentrations over time

4) Based on this evaluation, determine the appropriate parameter list and sampling frequency for the well

- If no statistically significant trend is identified, the well and constituent should be monitored at the current frequency

- If a statistically significant trend is identified, the magnitude of change is compared to the site standard. Wells with rapidly changing concentrations should be monitored at the current frequency. Wells with negligible annual change should be monitored at a less-frequent interval because there is no added benefit to more frequent sampling.

- If the short-term concentration trend is statistically similar to the long-term concentration trend, the well should be monitored at a less-frequent interval because concentrations are predictable and more frequent sampling does not yield additional information

- The final recommendations are subject to a detailed geochemical review to ensure that the proposed sampling program will meet CAP needs and related permit and license requirements.

In summary, the analysis of historic data will be conducted using simple statistical methods and a rule-based decision process to determine whether continued or additional sampling will provide relevant data to characterize CAP performance and/or the contaminant plume. This decision-making process is illustrated in **Figure 2.4.3-1**.

This monitoring program optimization process is commonly followed throughout the industry. Sources listed in the References section can be consulted for additional information.

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GRANTS RECLAMATION PROJECT
UPDATED CORRECTIVE ACTION
PROGRAM (CAP)

APPENDIX L – FIELD AND LABORATORY QUALITY CONTROL PROGRAM

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ATTACHMENT

INTRODUCTION

This appendix provides the standard operating procedure (SOP) currently utilized for the groundwater monitoring program (**Attachment L-1**). The SOP describes the monitoring program schedule (frequency) and includes steps for sample collection, preservation, and analysis. Procedures for analysis and reporting of groundwater data are included, as well as steps for quality assurance and control. This SOP is followed for every monitoring event.

Attachment L-1

SOP HP-15: HMC Groundwater Monitoring Report

HMC GROUNDWATER MONITORING

EQUIPMENT:

Sample containers
Data sheets and pens
Electrical generator with gasoline
Winch
PCV pipe, 1 inch x 10 foot threaded sections sufficient for well depth
Submersible water pump and electrical cable
2 pair channel locks
Duct tape
90° elbow and discharge valve
Watch
3-gallon bucket
Conductivity meter
Shovel
Bailer for low-flow wells
#24 (course) glass fiber 102 mm filter (Schleichers and Schuell) or the equivalent
0.45-micron cellulose nitrate 102 mm filter (Geofilter) or the equivalent

REGULATORY BASIS:

Materials License SUA-1471, Condition 35A states that the Licensee shall:

> "Implement the groundwater monitoring shown in Table 2 (8-99) submitted September 29, 1999, except that under "Reversal Wells," delete Well KF and replace with Well DZ, and except that well CW2 will remain in the sampling program monitored annually for G list of parameters, and Cr is to be deleted from the D and F lists of parameters."

Materials License SUA-1471, Condition 35B states that the Licensee shall:

> "Comply with the following groundwater protection standards at the point of compliance Wells D1, X, and S4 with background being recognized in Well P."
>
> molybdenum = 0.03 mg/l, selenium = 0.10 mg/l, vanadium = 0.02 mg/l, uranium = 0.04 mg/l, radium-226 and 228 = 5.0 pCi/l, thorium-230 = 0.30 pCi/l.

10 CFR 40, Appendix A, Criterion 7A states:

> "The licensee shall establish a detection monitoring program needed for the Commission to set the site-specific groundwater protection standards..."

PROCEDURE:

A. GROUNDWATER MONITORING PROGRAM, SCHEDULE, AND PREPARATION

1. Table 2 (8-99) of the September 29, 1999 submittal presents the well numbers, parameters, and the frequency of the groundwater-monitoring program. Sample size and preservatives may vary according to contract laboratory needs but follow the guidelines outlined in the latest edition of *Standard Methods for the Examination of Water and Wastewater*. Well locations are specified in the latest semiannual report. A schedule shall be prepared that designates the wells, analytical parameters, and monitoring frequency for the program. A standard Analytical Sheet (Form-21) is used for each groundwater sample filling in all information relative to the sample.

2. Obtain the correct size, new plastic sample containers and label with a permanent magic marker the following code:

   Well ID # / month-day-year / military time
   SS-0331/01-07-93/930

3. Each day the conductivity meter is used check the batteries in the meter and check that the meter was calibrated within the last 6-months using the conductivity standards specified in the latest edition of *Standard Methods for the Examination of Water and Wastewater.* Obtain a fresh sample of de-ionized water and check that the conductivity of de-ionized water reads the same as was recorded during the calibration.

B. SAMPLE COLLECTION

1. Using Form-21fill in the *Well Name/I.D.* and *Collection Date.* Additional information for the sample taken will be recorded when the sample is taken.

2. In each monitoring well-sampled measure the water level from the top of the well casing to the top of the water using a water level probe.

3. When collecting samples with the AMS SK3500 Well Management System, use the manufacture's instructions as a guide to lower the submersible pump into the well.

4. Pump the well with the valve wide open until the pump starts sucking air. Close the discharge valve until only water is being pumped. If air is pumped along with water the conductivity measurements will not be accurate. Measure the time, in seconds, required to fill a 3-gallon bucket. Divide the measured seconds by 60 seconds and multiply by 3-gallons to obtain the flow rate in gallons per minute. Record the pumping rate in gallons per minute on the analytical sheet for the well being sampled.

5. Standardize the temperature/conductivity meter according to the manufacturer's instructions.

6. Take continuous temperature and conductivity measurements of the pumped water. Pump the well until the temperature and conductivity stabilize. Removal of at least two well

casing volumes of water from the well is usually required to stabilize the conductivity measurements

7. Rinse out the sample container at least twice with approximately one-third the volume of the container. Fill and cap the sample container.

8. Shut off the pump and pull the pump from the well using the manufacture's instructions as a guide.

9. For monitoring wells that have a pump installed in the well follow steps 4-7 above.

C. BAILING LOW-FLOW WELLS

1. Wells that produce only a few (1-2) gallons per hour need to be bailed because well pumps cannot remove the last few gallons of water in the well. For a low-flow well those few gallons remaining in the well would, if not removed, be a significant percentage, e.g. 10%, of the water sampled from the well.

2. Remove the well cap and verify that the number on the well matches the number on the analytical sheet. Measure the distance from the top of the well casing to the water and record on the analytical data sheet. Position the bailing boom over the well and lower the bailer to the bottom of the well. Pull the bailer out of the well and measure the water volume in a 3-gallon bucket. The bailer typically removes 1.5-gallons of water at a time from a 5-inch well and 0.1-gallons at a time from a 2-inch well. Continue to bail the well until dry and record the total volume of water removed on the analytical sheet.

3. Return to the well approximately 24 hours later, measure the distance from the top of the well casing to the water, and record on the analytical sheet. Bail out 3 additional gallons of water from a 5-inch well and 1-gallon from a 2-inch well. Rinse out the sample container at least twice with approximately one-third the volume of the container. Collect the sample and cap the container.

D. SAMPLE PREPARATION AND ANALYSIS

1. At the end of each day of well sampling bring the water samples to the Analytical Laboratory for filtering. If a water sample contains algae, pre-filter the sample through a #24 (course) glass fiber 102 mm filter (Schleichers and Schuell) or the equivalent. After algae have been removed or if not present filter the water samples through a 0.45-micron cellulose nitrate 102 mm filter (Geofilter or the equivalent). Rinse the filter container with de-ionized water initially and filter using argon gas to pressurize the system.

2. Add the preservative specified in of *Standard Methods for the Examination of Water and Wastewater* and cap the container. If the sample foams, allow the gas to bleed off before tightening the cap on the container. Place the sample in a shipping container to be shipped to the contract laboratory for analysis.

3. The contract laboratory uses standard EPA methods for analysis.

E. INJECTION WELL CLEANING PROCEDURE

1. The injection well cleaning procedure is used on each injection well when injection flow has decreased and the hydrologist deems that they need cleaning.

2. A contract driller is retained to clean the wells using his standard well air development procedures to clean the well screens.

3. Record on the *Injection Well Maintenance Record* (Form-31) the initial flow rate, the final flow rate, the date the well was cleaned, parts replaced, and any observations. Assure that the *Injection Well Maintenance Record* is filed in the individual well files. If injection rates are inadequate, or other problems are evident with function of the well, the Radiation Protection Administrator should be notified.

F. ANALYSIS AND REPORTING OF GROUNDWATER DATA

1. Documentation for inputting analytical data and generating various reports is available in a 3-ring binder labeled ***Groundwater Control – System Documentation.***

   a) MANAGEMENTS

   Managements are entered on a weekly basis with a *Ground Water Status Report* produced using the generated reports.

   b) ANALYTICAL

   Internal data as well as outside lab analytical data is entered as time allows. Data sheets are then filed in individual well files.

2. Prepare for review and submission, by the Radiation Protection Administrator, the following reports specified in the Nuclear Regulatory Commission License SUA-1471 and State of New Mexico Discharge Permits DP-725 and DP-200:

   1) DP-725 to the State of New Mexico, as permit requirement.

   2) Semi-annual DP-200 to the Nuclear Regulatory Commission and the State of New Mexico, as permit requirement.

   3) Annual DP-200 to the Nuclear Regulatory Commission and the State of New Mexico, as permit requirement. Water quality data is transmitted to the Contract Hydrologist for inclusion in this report.

   4) Water usage report to the New Mexico State Engineer, due the 10th of each month.

QUALITY CONTROL:

The Site Manager, or his designee, shall complete the following activities:

1) verify that required groundwater sampling is completed,

2) verify the accuracy of data reflected in groundwater reports,

3) analyze trends in groundwater constituents,

4) assure that injection well are maintained and cleaned as necessary, and

5) implement changes in the program as needed.

REFERENCES:

I. Standard Methods for the Examination of Water and Wastewater - American Public Health Association, Washington DC, 19th Edition, 1995.

APPENDIXES:

A. Table 2 (8-99)
B. Form-21 - Analytical Sheet
C. Form-31 – Injection Well Maintenance Record

REVISIONS:

Original:	02-22-93
Revision 1:	05-18-98
Revision 2:	10-20-03

DISTRIBUTION:

Manager - Grants & Southwest U.S./Radiation Protection Administrator
Utility Operator/Radiation Management
Utility Operator/Water Management

APPROVAL:

____
Alan D. Cox
Manager - Grants & Southwest U.S./Radiation Protection Administrator

APPENDIXES

A. Table 2 (8-99)

B. FORM-21 – ANALYTICAL SHEET

C. FORM 31 – INJECTION WELL MAINTENANCE RECORD

TABLE 2 – Groundwater Monitoring Program (8-99 as modified by Amendment 34)

Well Number	Parameters to be Monitored	Frequency of Monitoring
#1 & #2 Deepwells	**D**	**Annually**
Broadview Acres Wells **446, SUB1, SUB2, SUB3**	**G**	**Annually**
Felice Acres Wells 490, 492, 493, 494	**G**	**Annually**
Murray Acres Wells 802, 844	**G**	**Annually**
Pleasant Valley Wells 688, 846	**G**	**Annually**
Regional Wells 920, 942	**G**	Annually
Site Monitoring Wells F, FB, GH, MO, CW2	**G**	**Annually**
Collection System Wells	**Total Volume**	**Monthly**
Injection System Wells	**Total Volume**	**Monthly**
Reversal Wells B, BA, KZ, DZ*, SO, SP, S1, S2	**Water Level**	**Weekly**
Point of Compliance Wells D1, X, S4	**B, F**	**Annually**
Background Well P	**B**	**Annually**

* Well DZ replaced well KF by Amendment 34 - License Condition 35 A

B = **Water Level, pH, TDS, SO_4, Cl, HCO_3, CO_3, Na, Ca, Mg, K, NO_3, U, Se, Mo, Ra-226**
D = **Ca, Mg, K, Na, HCO_3, CO_3, Cl, SO_4, pH, TDS, Al, As, Ba, Cd, Co, Cu, CN, F, Fe, Pb, Mn, Hg, Mo, Ni, NO_3 as N, Se, Ag, Zn, U, Filtered Ra-226**
F = **V, Ra-228, Th-230**
G = **Water Level, SO_4, U, Se, TDS, Mo**

FORM-21 - ANALYTICAL SHEET

WELL NAME WELL I.D.	COLLECTION DATE____/____/____ MM/ DD / YY TIME:__________ HR:MIN	COLLECTED BY: ADRIAN VENABLE TITLE: UTILITY / RAD	WATER LEVEL CODE: 0013 FILE	PUMPING RATE (gpm) MEASURED CODE: 0058 FILE BAIL VOLUME (gal) CODE: 0017 MEASURED FILE

PUMPING OR BAILING DURATION (min) CODE: 0059 START ________ REMARK STOP: ________ K ________	Q (totalizer reading) CODE: 0054 ________ ___	CONDUCTIVITY TIME________ TIME________ TIME________	CODE 0012 TEMP________ TEMP________ TEMP________	CODE 0051 COND________ COND________ COND________

PREVIOUS WATER LEVEL:________	TOTAL DEPTH (FILE):________ TOTAL DEPTH (MEASURED):________	ANALYSIS REQUESTED: ________ ________ ________ ________

COMMENTS:

Name:	Pump Size
Address:	Casing Diameter:
	Usage:
Telephone Number:	

GRANTS RECLAMATION PROJECT UPDATED CORRECTIVE ACTION PROGRAM (CAP)

APPENDIX M – WELL INVENTORY

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ON-SITE WELL INVENTORY

The following **Table M-1** presents key characteristics of the wells documented to be located on the site within the NRC license boundary. Please note that flow rate data are provided for only the most recent records available for each well. **Table M-2** presents a list of wells that are outside of the NRC license boundary. Complete flow rate data are provided in **Attachment M-1** on CD.

Table M-1: On-Site Well Inventory

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
#1 Deepwell	San Andres	1543307.08	493633.34	T12/R10/S26/242	10	1000	6583.76	Industrial	919/999	--	707	10/6/2010
#2 Deepwell	San Andres	1542423.6	490971.71	T12/R10/S26/322	--	870	6575.66	Industrial	--	--	325	5/9/2011
1A	Alluvium	1543789.75	493768.05	T12/R10/S26/224	5	61	6585.43	Re-Injection	39/51	--	< 1	11/4/2008
1E	Alluvium	1544481.22	494116.36	T12/R10/S26/222	5	51.4	6584.31	Unassigned	34/54	--	< 1	11/4/2008
1F	Alluvium	1544952.36	493830.63	T12/R10/S26/222	5	61.8	6587.38	Unassigned	30/60	--	10	11/5/2008
1G	Alluvium	1545033.67	494170.26	T12/R10/S26/111	5	57.5	6587.07	Unassigned	35/55	--	8	11/4/2008
1J	Alluvium	1541986.08	493695.17	T12/R10/S26/422	5	50.3	6585.4	Unassigned	30/50	--	< 1	1/17/2011
1K	Alluvium	1541991.95	493274.84	T12/R10/S26/421	5	55.6	6584.13	Unassigned	30/55	--	8	12/3/2008
1Q	Alluvium	1541992.72	493618.56	T12/R10/S26/422	5	56	6583.11	--	36/56	26/56	< 1	1/17/2011
1R	Alluvium	1542070.74	493622.99	T12/R10/S26/422	5	56	6585.99		36/56	26/56	< 1	1/17/2011
1S	Alluvium	1541919.73	493614.05	T12/R10/S26/422	5	56	6581.99	Collection	36/56	26/56	< 1	1/17/2011
1T	Alluvium	1541989.59	493656.48	T12/R10/S26/422	5	56	6584.91	--	36/56	26/56	< 1	1/17/2011
1U	Alluvium	1542000.56	493542.05	T12/R10/S26/422	4	44.2	6586.22	--	--	--	< 1	2/21/2011
1V	Alluvium	1541982	493578.6	--	5	61.4	6584.94	Reversal	--	--	5	1/17/2011
ACW	Chinle - Middle	1540235	488070	T12/R10/S27/443	6	325	6563.8	Domestic	265/325	--	10	2/28/2011
AW	Upper Chinle	1540235	488015	T12/R10/S27/443	6	156	6563.43	Unassigned	66/155	--	10	2/28/2011
AW	Alluvium	1540235	488015	T12/R10/S27/443	6	--	6563.43	Unassigned		--	--	--
B1	Alluvium	1542071.41	489370.09	T12/R10/S26/311	5	90.9	6571.65	Unassigned	62/82	--	10.66	7/13/2000
B10	Alluvium	1542517.22	491132.76	T12/R10/S26/144	5	84.8	6576.77	Collection	51/78	--	20	7/14/2008
B11	Alluvium	1542517.05	491328.73	T12/R10/S26/144	5	84.9	6577.39	Collection	42/80	--	58	7/14/2008
B12	Alluvium	1542523.634	488915.017	T12/R10/S26/311	5	100	6573.02	--	30/100	--	10	3/1/2011
B13	Alluvium	1541840.67	490223.292	T12/R10/S26/311	5	80	6570.04	--	30/80	--	10	3/1/2011
B2	Alluvium	1542475.13	489514.88	T12/R10/S26/312	5	83	6574.25	Collection	55/75	--	30	10/17/2006
B3	Alluvium	1542479.62	489730.68	T12/R10/S26/312	5	87	6574.29	Collection	58/78	--	24	7/14/2008
B4	Alluvium	1542471.38	489941.98	T12/R10/S26/312	5	88.8	6574.66	Collection	63/83	--	20	7/14/2008
B5	Alluvium	1542474	490141.18	T12/R10/S26/312	5	91	6573.46	Collection	62/82	--	60	6/29/2009
B6	Alluvium	1542477.66	490340.69	T12/R10/S26/321	5	90	6577.69	Unassigned	63/83	--	20	7/14/2008
B7	Alluvium	1542487.86	490539.85	T12/R10/S26/321	5	87	6574.4	Monitor	53/78	--	20	7/14/2008
B8	Alluvium	1542488.05	490734.33	T12/R10/S26/321	5	87	6575.75	Collection	53/78	--	32	6/29/2009
B9	Alluvium	1542514.42	490934.87	T12/R10/S26/144	5	--	6576.17	Unassigned	51/78	--	--	--
BA	Alluvium	1541834.91	489439.71	T12/R10/S26/312	5	--	6571.58	Reversal	64/78	--	--	--
BP	Alluvium	1541882.38	489841.48	T12/R10/S26/312	4	85.4	6572.3	Monitor	40/85	--	9.8	12/10/2010
C1	Alluvium	1541532.896	490780.466	T12/R10/S26/323	5	76	6571.86	Unassigned	41/68	--	8	7/29/2009
C10	Alluvium	1542182.29	491628.62	T12/R10/S26/322	5	71.6	6585.26	Collection	30/70	--	4	4/13/2011
C11	Alluvium	1542375.51	491844.03	T12/R10/S26/411	5	68.2	6581.38	Collection	35/65	--	4	4/13/2011
C12	Alluvium	1542374.91	492028.9	T12/R10/S26/412	5	63.5	6580.55	Collection	34/64	--	4	4/13/2011
C13	Alluvium	1541394.403	490655.155	T12/R10/S26/323	5	63	6570.01	Monitor	36/70	26/70	8	11/9/2005
C14	Alluvium	1541412.866	490713.052	T12/R10/S26/423	5	63	6569.69	Unassigned	36/70	26/70	8	11/9/2005
C2	Alluvium	1541630.244	490565.712	T12/R10/S26/323	5	76	6565.02	Unassigned	42/67	--	10	7/29/2009
C3R	Alluvium	1541337.861	490472.169	T12/R10/S26/323	5	75	6569.29	Unassigned	43/68	--	0	12/5/2000

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
C4	Alluvium	1541347.613	490674.679	T12/R10/S26/323	5	75	6570.84	Unassigned	46/66	--	0	12/5/2000
C5	Alluvium	1541344.179	490868.797	T12/R10/S26/323	5	72	6569.85	Monitor	43/63	--	10	10/21/2009
C6	Alluvium	1541533.07	491142.23	T12/R10/S26/324	5	80.8	6584.89	Collection	34/74	--	4	4/13/2011
C7	Alluvium	1541734.31	491280.26	T12/R10/S26/324	5	72.4	6584.44	Collection	25/65	--	4	4/13/2011
C8	Alluvium	1541905.95	491415.45	T12/R10/S26/322	5	78.1	6584.49	Collection	31/71	--	4	4/13/2011
C9	Alluvium	1542075.45	491544.76	T12/R10/S26/311	5	77	6584.55	Collection	27/67	--	4	4/13/2011
CE10	Upper Chinle	1541736.99	490177.08	T12/R10/S26/314	6	130	6570.86	Collection	90/130	--	6	12/10/2010
CE11	Upper Chinle	1541486.5	490494.48	T12/R10/S26/323	6	140	6565.42	Collection	100/140	--	4.9	6/27/2011
CE12	Upper Chinle	1541867.04	489641.97	T12/R10/S26/314	6	120	6572.23	Collection	80/120	--	16.2	6/27/2011
CE13	Upper Chinle	1542693.15	490337.73	T12/R10/S26/323	6	129.2	6574.64	Collection	90/130	--	8.11	12/10/2010
CE2	Upper Chinle	1542475.19	490434.304	T12/R10/S26/213	5	119.7	6576.35	Collection	78/118	--	41	6/27/2011
CE5	Upper Chinle	1541453.377	490695.373	T12/R10/S26/323	5	140	6568.55	Collection	100/140	99/140	27	4/25/2011
CE6	Upper Chinle	1541698.16	490432.69	T12/R10/S26/323	6	140	6565.19	Collection	--	--	39	6/27/2011
CE7	Upper Chinle	1542651.7	490079.34	T12/R10/S26/312	6	120	6575.99	Collection	100/140	--	36	4/25/2011
CE8	Upper Chinle	1540703.92	491556.11	T12/R10/S26/431	6	216.6	6569.7	Collection	160/200	--	3	3/2/2011
CE9	Upper Chinle	1538203.06	489458.23	T12/R10/S35/131	6	130	6563.12	Collection	90/130	--	7	3/2/2011
CW1	Chinle - Middle	1545235.03	490295.01	T12/R10/S23/343	5	325	6585.22	Collection	212/323	--	80	6/27/2011
CW13	Upper Chinle	1538349.49	491826.67	T12/R10/S35/213	6	267.7	6576.7	Injection	225/265	--	25.5	6/27/2011
CW14	Chinle - Middle	1538785.76	488883.75	T12/R10/S35/113	6	360.9	6566.09	Injection	278/358	--	18.8	6/27/2011
CW17	Chinle - Middle	1545278.75	487771.03	T12/R10/S22/444	5	108	6589.32	Monitor	83/103	--	8	12/8/2010
CW2	Chinle - Middle	1545211.55	491302.01	T12/R10/S23/443	5	355	6585.48	Collection	306/353	--	38	6/27/2011
CW24	Chinle - Middle	1545773.3	487760.16	T12/R10/S22/443	5	118	6588.67	Unassigned	78/118	--	11.5	9/15/2009
CW25	Upper Chinle	1540802.33	488865.67	T12/R10/S26/331	5	102	6567.2	Injection	62/102	--	1.8	6/27/2011
CW3	Upper Chinle	1545200	493496.31	T12/R10/S23/444	5	235	6587.18	Collection	210/235	--	30	1/31/2011
CW4R	Upper Chinle	1541415.73	490787.3	T12/R10/S26/323	6	138.9	6568.73	Injection	102/142	--	6	6/27/2011
CW5	Upper Chinle	1538729.06	490221.36	T12/R10/S35/321	5	170	6569.34	Injection	135/170	--	12	6/27/2011
CW55	Chinle - Middle	1538282.76	489470.71	T12/R10/S35/131	6	360	6564.16	Monitor	--	--	< 0.5	12/12/2006
D1	Alluvium	1542139.58	489615.42	T12/R10/S26/233	4	89.4	6570.9	Unassigned	58/90	--	10.6	3/15/2011
D2	Alluvium	1542641.16	492106.63	T12/R10/S27/233	5	70	6580.17	Unassigned	40/70	--	0	12/20/1999
D3	Alluvium	1542645.58	491916.89	T12/R10/S27/233	5	80	6580.13	Unassigned	40/80	--	0	12/20/1999
D4	Alluvium	1542651.57	491724.04	T12/R10/S27/233	5	78	6579.43	Unassigned	48/78	--	0	12/20/1999
DA	Alluvium	1542863.66	489487.9	T12/R10/S26/133	5	99.1	6585.55	Monitor	50/100	--	21.5	12/4/1997
DA2	Alluvium	1542881.32	489655.64	T12/R10/S26/431	5	--	6587.29	Monitor	64/74	--	--	--
DA3	Alluvium	1542664.073	489389.65	T12/R10/S26/133	5	81	6574.36	--	30/81	--	20	7/14/2008
DA4	Alluvium	1542597.695	489756.26	T12/R10/S26/134	5	--	6573.97	--	31/81	--	--	--
DAA	Alluvium	1542733.49	492410.95	T12/R10/S26/234	5	62.7	6580.6	Re-Injection	30/60	--	4	12/11/2000
DAB	Alluvium	1542632.52	492398.59	T12/R10/S26/234	5	65.1	6579.88	Re-Injection	30/60	--	9	12/11/2000
DAC	Alluvium	1543218.22	492851.08	T12/R10/S26/232	5	--	6620.36	Monitor	20/30	--	--	--
DB	Alluvium	1542874.46	489841.57	T12/R10/S26/134	5	73.2	6589.48	Unassigned	55/85	--	0	10/5/1998
DE	Alluvium	1542876.74	490192.65	T12/R10/S27/134	5	70.2	6591.35	Unassigned	60/90	--	0	10/19/1998
DF	Alluvium	1542839.39	490868.71	T12/R10/S26/143	5	88.5	6590.59	Unassigned	65/95	--	4.2	5/23/2002
DG	Alluvium	1542838.51	491156.71	T12/R10/S26/144	5	88.9	6591.78	Unassigned	65/95	--	15.2	5/23/2002
DH	Alluvium	1542835.02	491365.03	T12/R10/S26/144	5	--	6591.34	Monitor	65/95	--	--	--
DI	Alluvium	1542820.58	491787.97	T12/R10/S26/233	5	--	6589.62	Monitor	35/85	--	--	--
DJ	Alluvium	1542820.99	491792.61	T12/R10/S26/233	5	--	6589.56	Monitor	35/85	--	--	--

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
DL	Alluvium	1542813.1	492398.12	T12/R10/S26/234	5	64.4	6584.87	Re-Injection	35/55	--	3	12/11/2000
DN	Alluvium	1542775.8	490019.5	T12/R10/S26/143	4	66.7	6576.66	Unassigned	--	--	1.5	3/12/1998
DNR	Alluvium	1542778.67	490030.94	T12/R10/S26/134	4	--	6577.06	Unassigned	--	--	--	--
DO	Alluvium	1542874.1	490048.8	T12/R10/S26/134	5	--	6590.33	Unassigned	65/75	--	--	--
DP	Alluvium	1542754.4	491011.7	T12/R10/S26/144	5	79.8	6579.71	Collection	--	--	10	10/18/2006
DQ	Alluvium	1542591.5	491005.5	T12/R10/S26/144	5	85.3	6576.43	Unassigned	--	--	17	1/24/2002
DR	Alluvium	1542883.75	489965.61	T12/R10/S26/134	5	87.8	6590.83	Collection	65/85	--	0	12/11/2000
DS	Alluvium	1542876.26	490117.6	T12/R10/S26/143	5	87	6588.81	Unassigned	62/77	--	0	8/26/1999
DT	Alluvium	1542871.03	489292.65	T12/R10/S26/331	5	72.3	6583.81	Collection	59/99	--	5	8/2/2010
DU	Alluvium	1542878.87	490379.91	T12/R10/S26/341	5	--	6591.07	Monitor	61/81	--	--	--
DV	Alluvium	1542825.86	490702.46	T12/R10/S26/341	5	80	6585.6	Collection	60/80	--	20	8/28/2006
DW	Alluvium	1542818.18	492029.34	T12/R10/S26/432	5	73.4	6588.66	Re-Injection	45/60	--	4	12/11/2000
DX	Alluvium	1542838.1	491074.44	T12/R10/S26/144	6	90	6591.98	Monitor	60/90	--	6.5	5/23/2002
DY	Alluvium	1542736.93	492270.92	T12/R10/S26/234	5	65.7	6580.61	Re-Injection	15/65	--	4	12/11/2000
E	Alluvium	1540553.49	490187.08	T12/R10/S26/341	4	61.7	6568.94	Injection	44/64	--	19.3	12/11/2000
EE	Alluvium	1542853.08	490522.52	T12/R10/S26/143	5	--	6588.11	Monitor	50/90	--	--	--
G	Alluvium	1538671.77	488889.92	T12/R10/S35/113	4	78.3	6563.09	Unassigned	50/80	--	5.1	4/24/2000
GA	Alluvium	1538657.41	489254.88	T12/R10/S35/113	4		6562.79	Unassigned	45/65	--	4	4/24/2000
GB	Alluvium	1538653.55	489456.44	T12/R10/S35/113	4	65.2	6562.99	Unassigned	45/65	--	7.9	4/24/2000
GC	Alluvium	1538650.42	489653.93	T12/R10/S35/114	4	--	6565.17	Unassigned	60/80	--	2.1	4/24/2000
GD	Alluvium	1538645.99	489854.89	T12/R10/S35/144	4	--	6565.62	Unassigned	55/75	--	--	--
GE	Alluvium	1538637.49	489971.66	T12/R10/S35/144	4	117	6566.27	Unassigned	50/120	--	4	4/24/2000
GF	Alluvium	1538632.34	490097.43	T12/R10/S35/144	4	119.2	6566.01	Unassigned	50/120	--	4.2	4/24/2000
GG	Alluvium	1538661.58	489055.15	T12/R10/S35/113	4	58.7	6563.13	Unassigned	48/68	--	4	4/24/2000
GI	Alluvium	1538630.54	490218.03	T12/R10/S35/123	4	119	6565.85	Unassigned	50/120	--	5.5	4/24/2000
GJ	Alluvium	1538629.16	490381.73	T12/R10/S35/123	4	119.2	6566.15	Unassigned	50/120	--	4	4/24/2000
GK	Alluvium	1538622.37	490482.23	T12/R10/S35/123	4	115.7	6566.76	Unassigned	50/120	--	3	4/24/2000
GL	Alluvium	1538613.5	490701.01	T12/R10/S35/123	4	119.3	6567.15	Unassigned	50/120	--	5.1	4/24/2000
GM	Alluvium	1538605.13	490824.36	T12/R10/S35/123	4	118.2	6567.65	Unassigned	50/120	--	4.2	4/24/2000
GN	Alluvium	1538601.69	490944.04	T12/R10/S35/124	4	116.5	6567.97	Unassigned	50/120	--	10	2/28/2011
GO	Alluvium	1538663.26	488973.23	T12/R10/S35/113	4	122.3	6563	Unassigned	50/120	--	7	4/24/2000
GP	Alluvium	1538649.48	489751.86	T12/R10/S35/114	4	121.4	6564.87	Injection	50/120	--	13.6	12/11/2000
GS	Alluvium	1538596.79	491408.21	T12/R10/S35/213	5	86.4	6574.31	Injection	50/85	--	10	12/11/2000
GT	Alluvium	1538533.59	491565.17	T12/R10/S35/231	5	84	6576.17	Injection	60/84	--	6	12/11/2000
GU	Alluvium	1538366.97	491854.11	T12/R10/S35/231	5	80	6575.65	Injection	60/80	--	3.4	5/21/2002
J	Alluvium	1540173.72	491301.64	T12/R10/S26/344	4	65.6	6570.19	Injection	46/68	--	7.9	12/11/2000
J1	Alluvium	1540081.92	491584.79	T12/R10/S26/431	6	57	6571.85	Injection	50/57	--	13	12/11/2000
J10	Alluvium	1540138.36	491435.51	T12/R10/S27/344	5	66	6570.91	Injection	66	--	8	12/11/2000
J11	Alluvium	1540544.92	490909.1	T12/R10/S27/341	5	66	6569.86	Injection	36/66	--	12.1	12/11/2000
J12	Alluvium	1540826.62	490465.63	T12/R10/S27/341	5	70	6570.3	Injection	40/70	--	16.3	12/11/2000
J13	Alluvium	1540451.313	492217.792	T12/R10/S26/434	5	--	6568.4	--	15/55	5/55	--	--
J14	Alluvium	1540584.786	492367.475	T12/R10/S26/434	5	--	6568.98	--	15/55	5/55	--	--
J15	Alluvium	1540719.206	492520.662	T12/R10/S26/432	4	--	6569.63	--	15/55	5/55		
J2	Alluvium	1540270.75	491012.89	T12/R10/S26/431	6	58	6570.19	Injection	50/58	--	15.8	12/11/2000
J3	Alluvium	1540414.15	490498.84	T12/R10/S26/342	6	70	6569.14	Injection	43/70	--	12	12/11/2000

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
J4	Alluvium	1540643	489974.47	T12/R10/S26/342	6	80	6569.52	Injection	40/70	--	21	12/11/2000
J5	Alluvium	1540727.69	489746.94	T12/R10/S26/341	6	65	6569.79	Injection	50/65	--	16.44	12/11/2000
J6	Alluvium	1540919.04	489220.56	T12/R10/S26/331	6	67	6570.1	Injection	48/67	--	16.4	12/11/2000
J7	Alluvium	1540168.39	491892.4	T12/R10/S26/433	5	61.9	6570.38	Injection	40/60	--	12	12/11/2000
J8	Alluvium	1540318.22	492063.63	T12/R10/S26/434	5	63.2	6570.79	Injection	35/61	--	12.8	12/11/2000
J9	Alluvium	1540101.45	491758.79	T12/R10/S27/433	5	68	6571.2	Injection	36/68	--	6.2	12/11/2000
JC	Alluvium	1540215.3	491239.79	T12/R10/S26/344	5	60	6568.44	Injection	35/55	--	8.4	12/11/2000
K	Alluvium	1540729.6	491590.05	T12/R10/S26/341	4	--	6573.51	Collection	44/64	--	--	--
K10	Alluvium	1541305.478	491638.007	T12/R10/S26/324	5	87	6600.81	Collection	47/87	--	5	2/28/2011
K11	Alluvium	1541324.764	491489.972	T12/R10/S26/324	5	84	6600.61	Collection	64/84	--	6	2/28/2011
K2	Alluvium	1540736.14	491586.94	T12/R10/S26/431	4	58.9	6572.21	Unassigned	46/56	--	5	6/3/2005
K4	Alluvium	1541210.93	492371.17	T12/R10/S26/414	5	86.2	6602.02	Unassigned	65/85	--	5	2/28/2011
K5	Alluvium	1541269.35	491934.79	T12/R10/S26/413	5	86.4	6601.73	Collection	55/85	--	5	2/28/2011
K6	Alluvium	1540688.61	491459.06	T12/R10/S27/342	5	58	6570.07	Injection	33/58	--	7.9	3/6/2002
K7	Alluvium	1541231.591	492236.87	T12/R10/S26/413	5	86	6601.53	Collection	56/86	--	5	2/28/2011
K8	Alluvium	1541249.562	492080.963	T12/R10/S26/413	5	86	6600.49	Collection	66/86	--	4	1/13/2004
K9	Alluvium	1541287.122	491786.754	T12/R10/S26/413	5	86	6600.34	Collection	56/86	--	5	2/28/2011
KA	Alluvium	1540958.79	491330.58	T12/R10/S26/342	5	67.8	6572.19	Unassigned	42/72	--	5.6	7/26/2001
KB	Alluvium	1540893.27	491405.54	T12/R10/S26/342	5	61.8	6571.65	Unassigned	40/70	--	12	9/19/2001
KC	Alluvium	1540825.91	491476.84	T12/R10/S26/431	5	68.6	6570.31	Unassigned	42/72	--	8	12/13/2001
KD	Alluvium	1540627.25	491701.48	T12/R10/S26/431	5	62.1	6570.22	Unassigned	40/70	--	12	4/16/2001
KE	Alluvium	1540565.87	491775.56	T12/R10/S26/431	5	60.8	6572.28	Unassigned	40/70	--	8.46	1/22/2001
KEB	Alluvium	1540570.05	491486.6	T12/R10/S26/431	5	59.9	6569.73	Unassigned	40/60	--	12	2/14/2011
KF	Alluvium	1540869.75	491169.1	T12/R10/S26/342	5	63.5	6570.21	Unassigned	30/60	--	10.6	2/21/2011
KM	Alluvium	1540670.94	491443.51	T12/R10/S26/431	5	52.4	6569.77	Injection	--	--	10.4	3/6/2002
KN	Alluvium	1540733.59	491492.02	T12/R10/S26/431	5	50.1	6569.59	Monitor	--	--	12.3	3/6/2002
KZ	Alluvium	1541099.61	491183.22	T12/R10/S26/324	5	58.4	6571.72	Reversal	--	--	18	2/21/2011
L	Alluvium	1538970.06	492149.63	T12/R10/S35/211	4	67	6574.97	Unassigned	46/66	--	4	4/19/2011
L10	Alluvium	1539250.48	492310.02	T12/R10/S35/212	5	74.2	6576.83	Unassigned	53/73	--	4	4/19/2011
L5	Alluvium	1539945.82	492730.48	T12/R10/S26/434	5	60.2	6576.07	Unassigned	25/55	--	6	4/28/2009
L6	Alluvium	1540526.12	493109.9	T12/R10/S26/441	5	51.1	6574.64	Unassigned	25/55	--	10	6/22/2010
L7	Alluvium	1540113.41	492841.63	T12/R10/S26/434	5	67.8	6576.61	Unassigned	36/66	--	10	6/21/2010
L8	Alluvium	1539772.99	492620.78	T12/R10/S35/212	5	73.9	6576.49	Unassigned	32/72	--	12	4/19/2011
L9	Alluvium	1539508.54	492463.27	T12/R10/S35/212	5	74.9	6577.23	Unassigned	43/73	--	12	4/19/2011
M1	Alluvium	1542797.4	489156.77	T12/R10/S26/133	4	--	6584.97	Monitor	66/106	--	--	--
M10	Alluvium	1543677.12	486722.9	T12/R10/S27/231	5	88	6573.36	Unassigned	58/88	--	8	2/22/2011
M11	Alluvium	1542357.9	486485.61	T12/R10/S27/311	5	118	6573.22	Unassigned	58/118	--	14	12/8/2003
M12	Alluvium	1542173.7	487209	T12/R10/S27/234	5	124	6573.51	Injection	57/124	--	20.2	12/12/2000
M13	Alluvium	1542450	487336.4	T12/R10/S27/234	5	117	6576.16	Injection	57/117	--	14.2	12/12/2000
M14	Alluvium	1542661.3	487216.3	T12/R10/S27/412	5	117	6577.17	Injection	57/117	--	10	12/12/2000
M15	Alluvium	1542872.3	487094	T12/R10/S27/412	5	102	6579.08	Injection	52/102	--	7.1	12/12/2000
M3	Alluvium	1542804.92	489151.41	T12/R10/S26/133	4	105.3	6576.1	Collection	79/99	--	30	7/14/2008
M3R	Alluvium	1542925.892	489078.162	T12/R10/S26/133	5	--	6580.26	Collection	55/115	25/115	--	--
M5	Alluvium	1542359.69	489079.67	T12/R10/S26/311	5	92.3	6575.34	Unassigned	60/90	--	10.3	10/7/2010
M6	Alluvium	1543096.85	486673.9	T12/R10/S27/233	5	110	6575.04	Unassigned	60/110	--	6	2/22/2011

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
M7	Alluvium	1542789.74	486522.54	T12/R10/S27/233	5	83	6572.85	Unassigned	63/83	--	4	2/22/2011
M8	Alluvium	1542959.71	486566.79	T12/R10/S27/233	5	83	6575.23	Unassigned	53/83	--	0	9/27/2000
M9	Alluvium	1543310.43	486699.47	T12/R10/S27/231	5	103	6576.81	Collection	63/103	--	20	2/22/2011
MA	Alluvium	1541289.69	487766.68	T12/R10/S27/324	4	85	6572.22	Unassigned	70/85	--	0	11/6/2000
MB	Alluvium	1541296.19	487512.28	T12/R10/S27/324	4	90	6572.06	Unassigned	60/90	--	8.4	9/27/2000
MC	Alluvium	1541303.98	487263.8	T12/R10/S27/414	4	100	6572.06	Unassigned	70/100	--	7.2	9/27/2000
MD	Alluvium	1541310.81	487049.94	T12/R10/S27/414	4	105	6571.46	Unassigned	75/105	--	3	9/27/2000
ME	Alluvium	1541536.67	486933.54	T12/R10/S27/414	4	105	6570.92	Unassigned	75/105	--	1.3	9/27/2000
MF	Alluvium	1541756.7	486808.34	T12/R10/S27/414	4	110	6572.28	Unassigned	90/110	--	8.1	9/27/2000
MG	Alluvium	1541971.6	486693.67	T12/R10/S27/114	4	110	6573.08	Unassigned	90/110	--	8	9/27/2000
MH	Alluvium	1542207.53	486568.55	T12/R10/S27/114	4	110	6573.92	Unassigned	90/110	--	4	9/27/2000
MI	Alluvium	1542485.81	486412.65	T12/R10/S27/114	4	110	6576.27	Unassigned	90/110	--	2	9/27/2000
MJ	Alluvium	1542681.84	486350.39	T12/R10/S27/332	4	60	6572.94	Unassigned	40/60	--	28.2	9/27/2000
MK	Alluvium	1543372.59	486324.45	T12/R10/S27/233	4.5	57	6573.79	Unassigned	--	--	12	9/27/2000
ML	Alluvium	1543901.57	486691.43	T12/R10/S27/213	5	76	6572.7	Unassigned	56/76	--	3	2/22/2011
MM	Alluvium	1544153.55	486324.39	T12/R10/S27/213	5	63	6577.45	Unassigned	33/63	--	11.1	9/27/2000
MQ	Alluvium	1543173.22	486325.62	T12/R10/S27/233	5	98	6574.3	Collection	58/98	--	30	2/22/2011
MW	Alluvium	1543801.94	486346.34	T12/R10/S27/213	5	85	6574.91	Unassigned	35/85	--	6	2/22/2011
MX	Alluvium	1541287	486243.86	--	5	103	6568.61	Unassigned	63/103	--	10	7/27/2010
MY	Alluvium	1542199.55	486212.66	--	5	112	6573.56	Unassigned	72/112	--	10	11/3/2008
MZ	Alluvium	1543484.98	486756.97	T12/R10/S27/231	5	92	6576.64	Unassigned	60/92	--	7	2/22/2011
N	Alluvium	1545100.62	489664.84	T12/R10/S26/112	4	92	6583.97	Monitor	54/94	--	3	11/3/2008
NA	Alluvium	1544999.67	491488.46	T12/R10/S26/122	5	91.4	6590.98	Monitor	50/90	--	10	10/28/2008
NB	Alluvium	1545000.26	491296.31	T12/R10/S26/122	5	96.4	6593.3	Monitor	50/90	--	1	10/28/2008
NE5	Tailings	1544278.91	492332.18	T12/R10/S26/214	5	156.8	6667	Monitor	50/110	43/112	4.3	4/3/2007
NE5	Alluvium	1544278.91	492332.18	T12/R10/S26/214	5	--	6667	Monitor	135/155	121/155	--	--
NW5	Alluvium	1544407.67	489432.74	T12/R10/S26/111	5	149.8	6657.58	Monitor	119/159	110/159	3	5/29/2007
NW5	Tailings	1544407.67	489432.74	T12/R10/S26/111	5	--	6657.58	Monitor	39/79	32/75	--	--
O	Alluvium	1545060.12	492725.49	T12/R10/S26/212	4	69.9	6587.83	Monitor	40/70	--	10	10/28/2008
P1	Alluvium	1547016.55	491059.64	T12/R10/S23/324	6	105	6592.47	Unassigned	60/105	--	0	1/17/2000
P2	Alluvium	1546554.84	490912.14	T12/R10/S23/324	6	105	6589.79	Collection	60/105	--	31.5	6/27/2011
P3	Alluvium	1546158.6	490785.3	T12/R10/S23/341	5	95	6589.95	Collection	55/95	--	16	6/27/2011
P4	Alluvium	1546504.3	491899.2	T12/R10/S23/413	5	92	6589.52	Collection	52/92	--	21	6/27/2011
PM	Alluvium	1541425.62	490292.46	T12/R10/S26/122	4	81.9	6567.42	Unassigned	--	--	10	8/13/2002
S	Alluvium	1543871.16	488816.06	T12/R10/S26/113	4	72.22	6581.17	Unassigned	52/72	--	1.66	1/12/2004
S12	Alluvium	1543296.701	488628.215	T12/R10/S27/242	5	93	6578.848	--	53/93	--	20	1/12/2011
S3	Alluvium	1542857.35	488714.39	T12/R10/S27/244	5	122.6	6574.78	Unassigned	80/120	--	10	12/9/2010
S5	Alluvium	1543269.32	488923.4	T12/R10/S26/131	5	115	6574.69	Reversal	54/106	--	20.5	12/11/2000
S5R	Alluvium	1543150.218	488938.184	T12/R10/S26/133	5	115	6580.49	Monitor	55/115	30/115	20	7/2/2007
S6	Alluvium	1543515.49	488873.89	T12/R10/S26/131	5	113.2	6580.07	Unassigned	55/105	--	7	10/12/2004
S7	Alluvium	1543762.99	488873.56	T12/R10/S26/131	5	97	6579.89	Unassigned	40/84	--	0	1/13/1999
S8	Alluvium	1543967.9	488878.7	T12/R10/S26/113	5	--	6580.34	Unassigned	12/42	--	--	--
SA	Alluvium	1543122.19	488811.38	T12/R10/S26/113	5	123.7	6580.31	Collection	100/130	--	24	8/6/2008
SB	Alluvium	1543370.76	488811.34	T12/R10/S26/113	5	125	6581.09	Collection	100/130	--	0	12/11/2000
SC	Alluvium	1543616.75	488814.67	T12/R10/S26/131	5	105.4	6578.8	Collection	55/105	--	1	12/11/2000

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
SD	Alluvium	1543490.39	488563.9	T12/R10/S27/242	5	--	6578.31	Monitor	50/110	--	--	--
SD4	Alluvium	1543496.53	488555.93	T12/R10/S27/242	5	--	6578.77	Monitor	45/95	--	--	--
SE	Alluvium	1543300.83	488550.36	T12/R10/S27/224	5	111.8	6577.99	Unassigned	50/90	--	14	2/23/2009
SE6	Alluvium	1543244	488614.8	--	5	92	6578.91	Reversal	--	--	8	1/12/2011
SM	Alluvium	1543748.42	488566.42	T12/R10/S27/242	5	86	6578.74	Reversal	--	--	10	5/19/2008
SN	Alluvium	1543752.49	488716.29	T12/R10/S27/242	4	--	6579.26	Reversal	--	--	--	--
SO	Alluvium	1543652.25	488381.27	T12/R10/S27/242	5	92.34	6578.79	Reversal	--	--	8	5/19/2008
SP	Alluvium	1543630.16	488530.91	T12/R10/S27/242	4	--	6578.66	Reversal	--	--	--	--
SQ	Alluvium	1543507.49	488814.37	T12/R10/S26/131	5	95	6579.2	Collection	55/95	--	16	6/29/2009
SR	Alluvium	1543610.57	488669.15	T12/R10/S27/242	5	95	6579.19	Unassigned	50/90	--	0	11/30/1998
SS	Alluvium	1543373.83	488666.27	T12/R10/S27/242	5	101	6578.38	Collection	51/101	--	1	1/17/2011
ST	Alluvium	1543214.73	488688.48	T12/R10/S27/232	5	97	6579.31	Collection	55/97	--	18	1/12/2011
SU	Alluvium	1542945.9	488952.98	T12/R10/S26/332	5	--	6578.1	Unassigned	50/110	--	--	--
SUR	Alluvium	1542991.346	488967.88	T12/R10/S26/133	5	115	6580.72	--	35/115	--	20	7/14/2008
SW	Alluvium	1543782.74	488811.6	T12/R10/S26/113	6	81.9	6581.29	Monitor	35/80	--	10	5/19/2008
SX	Alluvium	1544509.95	489024.73	T12/R10/S26/111	5	--	6581.49	Unassigned	20/40	--	--	--
SZ	Alluvium	1544366.58	488832.83	T12/R10/S26/113	5	62.6	6581.47	Unassigned	40/70	--	1	1/17/2011
T	Alluvium	1542536.49	492260.1	T12/R10/S26/234	4	70.2	6579.23	Collection	61/71	--	5	4/13/2011
T1	Alluvium	1543285.25	490026.95	T12/R10/S26/132	5	--	6663.91	Monitor	121/171	--	--	--
T10	Alluvium	1543434.08	492790.67	T12/R10/S26/233	5	148	6659.96	Monitor	108/148	100/148	4	3/30/2010
T11	Alluvium	1544584.74	489887.45	T12/R10/S26/112	5	193	6656.81	Monitor	113/193	108/193	20	8/24/2009
T12	Alluvium	1544582.66	490316.97	T12/R10/S26/121	5	200	6657.23	Monitor	120/200	115/200	5	8/26/2010
T13	Alluvium	1544534	490618.8	T12/R10/S26/121	5	--	6657.37	Monitor	120/160	110/160	--	--
T14	Alluvium	1544565	491071	T12/R10/S26/121	5	--	6660.13	Monitor	125/155	115/155	--	--
T15	Alluvium	1544480	491952.7	T12/R10/S26/211	5	150	6665.29	Monitor	120/150	110/150	12	3/17/2010
T16	Alluvium	1544276	492718.1	T12/R10/S26/214	5	--	6659.98	Monitor	120/140	110/140	--	--
T17	Alluvium	1544007.799	489429.863	T12/R10/S26/113	5	183	6656.91	Monitor	143/183	135/183	10	1/21/2011
T18	Alluvium	1543976.72	490333.16	T12/R10/S26/123	5	195	6665.16	Monitor	115/195	110/195	11	4/3/2006
T19	Alluvium	1543958.45	490722.492	T12/R10/S26/123	5	167	6667.76	Monitor	137/167	130/167	3	1/21/2011
T2	Alluvium	1543537.51	489302.51	T12/R10/S26/131	5	186	6664.82	Monitor	100/186	--	12	3/16/2010
T20	Alluvium	1543935.489	491047.937	T12/R10/S26/124	5	170	6670.69	Monitor	140/170	135/170	11	4/4/2006
T21	Alluvium	1543950.569	491881.813	T12/R10/S26/213	5	170	6670	Monitor	140/170	135/170	3	1/21/2011
T22	Alluvium	1543875.58	492311.453	T12/R10/S26/214	5	165	6667.19	Monitor	120/165	128/165	8	8/24/2009
T23	Alluvium	1543901	492804.8	T12/R10/S26/214	5	--	6661.11	Monitor	120/140	110/140	--	--
T36	Alluvium	1543735	489688.1	T12/R10/S26/132	5	--	6655.44	Monitor	130/170	120/170	--	--
T39	Alluvium	1544498	491668.7	T12/R10/S26/132	5	--	6665.31	Monitor	120/150	110/150	--	--
T4	Alluvium	1543339.9	489699.33	T12/R10/S26/132	5	205	6657.74	Monitor	145/205	135/205	20	3/16/2010
T40	Alluvium	1543818.577	491465.698	T12/R10/S26/124	5	170	6670.27	Monitor	140/170	130/170	3.8	1/21/2011
T41	Alluvium	1543278.02	491079.46	T12/R10/S26/142	5	160	6659.96	Monitor	130/160	122/160	10	1/21/2011
T5	Alluvium	1543307.07	490289.35	T12/R10/S26/132	5	182	6657.33	Monitor	122/182	110/182	10	3/17/2010
T6	Alluvium	1543281.99	490654.96	T12/R10/S26/141	5	160	6658.77	Monitor	130/160	120/160	18	1/21/2011
T7	Alluvium	1543271.95	491484.35	T12/R10/S26/231	5	160	6659.67	Monitor	130/160	120/160	15	1/21/2011
T8	Alluvium	1543295.92	491914.2	T12/R10/S26/231	5	162	6661.61	Monitor	132/162	120/162	3	1/21/2011
T9	Alluvium	1543347.28	492336.51	T12/R10/S26/232	5	141	6663.95	Monitor	121/141	110/141	1	3/30/2010
TA	Alluvium	1542470.96	492426.05	T12/R10/S26/412	5	62.4	6580.3	Collection	35/65	--	10	9/20/2010

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
TB	Alluvium	1542351.46	492616.42	T12/R10/S26/412	5	64.4	6583.57	Collection	35/65	--	15	9/20/2010
W	Alluvium	1542301.69	487297.48	T12/R10/S27/412	4	99.3	6572.14	Monitor	58/118	--	11	9/21/2009
W2	Alluvium	1542251.41	486653.63	T12/R10/S27/411	4	79.1	6571.5	Monitor	--	--	0	3/16/1998
WCW	Chinle - Middle	1541045	488520	T12/R10/S27/442	6	307	6567.37	Domestic	257/307	--	18	9/27/2010
WN4	Tailings	1543958.35	489961.19	T12/R10/S26/114	5	142.4	6662.78	Monitor	40/100	33/97	1.6	4/28/2011
WN4	Alluvium	1543958.35	489961.19	T12/R10/S26/114	5	--	6662.78	Monitor	50/190	144/190	--	--
WR10	Alluvium	1542388.5	487960.8	T12/R10/S27/421	5	120.6	6573.19	Injection	60/110	--	8.1	12/11/2000
WR11	Alluvium	1542585.73	487728.08	T12/R10/S27/243	5	120.5	6574.49	Injection	60/110	--	8.2	12/11/2000
WR12	Alluvium	1541279.94	488277.31	T12/R10/S27/424	4	96.7	6568.19	Unassigned	55/85	--	0	11/6/2000
WR13	Alluvium	1541068.12	488860.91	T12/R10/S26/331	5	70	6569.17	Injection	50/60	--	12.4	12/11/2000
WR14	Alluvium	1540638.39	488862.7	T12/R10/S26/331	5	70	6566.91	Injection	50/60	--	8.6	12/11/2000
WR15	Alluvium	1541279.92	488015.92	T12/R10/S27/423	4	70	6571.19	Unassigned	60/75	--	0	11/6/2000
WR16	Alluvium	1543051.19	487495.05	T12/R10/S27/243	5	122.3	6572.78	Injection	40/120	--	24.7	12/11/2000
WR17	Alluvium	1543328.16	487485.05	T12/R10/S27/241	5	124.4	6573.09	Injection	40/120	--	16	12/11/2000
WR18	Alluvium	1543596.59	487465.41	T12/R10/S27/241	5	73.6	6572.91	Injection	20/70	--	6.6	12/11/2000
WR19	Alluvium	1543872.99	487457.78	T12/R10/S27/214	5	87.8	6574.93	Injection	25/85	--	10.2	12/11/2000
WR1R	Alluvium	1541301.85	488535.8	T12/R10/S27/424	5	85	6568.47	Injection	--	--	8.4	12/11/2000
WR2	Alluvium	1541289.82	488677.62	T12/R10/S27/424	5	94.1	6568.59	Injection	65/95	--	7.8	12/11/2000
WR20	Alluvium	1544059.38	487449.45	T12/R10/S27/214	5	102.3	6574.47	Injection	42/102	--	7.2	12/11/2000
WR21	Alluvium	1544241.27	487449.03	T12/R10/S27/214	5	88.9	6576.05	Injection	28/88	--	13.6	12/11/2000
WR22	Alluvium	1544434.35	487461.96	T12/R10/S27/214	5	91.5	6577.89	Injection	30/90	--	16.4	12/11/2000
WR23	Alluvium	1544631.64	487444.56	T12/R10/S27/214	5	94.3	6576.47	Injection	32/92	--	15.7	12/11/2000
WR24	Alluvium	1544938.21	487437.73	T12/R10/S27/212	5	89.2	6588.67	Injection	50/90	--	8.7	12/11/2000
WR25	Chinle - Middle	1545267.03	487429.67	T12/R10/S22/434	5	113.3	6586.46	Unassigned	71/111	--	10	12/8/2010
WR3	Alluvium	1541489.52	488671.42	T12/R10/S27/424	5	82.3	6569.54	Injection	63/93	--	5.8	12/11/2000
WR4	Alluvium	1541788.2	488677.9	T12/R10/S27/424	5	62	6572.81	Injection	--	--	6.2	12/11/2000
WR5	Alluvium	1541813.36	488682.52	T12/R10/S27/424	5	72.4	6571.23	Injection	60/80	--	4.9	12/11/2000
WR6	Alluvium	1541902.36	488566.48	T12/R10/S27/422	5	96.8	6573.03	Injection	55/85	--	4.6	12/11/2000
WR7	Alluvium	1541996.87	488455.83	T12/R10/S27/422	5	97.3	6573.73	Injection	55/85	--	6	12/11/2000
WR8	Alluvium	1542095.07	488327.62	T12/R10/S27/422	5	110.2	6572.6	Injection	50/100	--	8.2	12/11/2000
WR9	Alluvium	1542185.39	488216.64	T12/R10/S27/422	5	111.3	6573.05	Injection	50/100	--	8.9	12/11/2000
X1	Alluvium	1540671.03	492129.09	T12/R10/S26/431	5	54	6573.54	Injection	37/47	--	30.2	12/11/2000
X10	Alluvium	1542352.29	492835.2	T12/R10/S26/412	5	61	6582.43	Injection	30/55	--	31	12/11/2000
X11	Alluvium	1542552.6	492781.6	T12/R10/S26/224	5	57	6582	Re-Injection	17/57	--	2.5	12/5/2000
X12	Alluvium	1542861.1	492852	T12/R10/S26/224	5	57	6583.33	Re-Injection	17/57	--	1	12/11/2000
X13	Alluvium	1543640.3	493665	T12/R10/S26/224	5	56	6586.94	Re-Injection	16/56	--	0	12/11/2000
X14	Alluvium	1544001.5	493776.6	T12/R10/S26/224	5	56	6586.2	Re-Injection	16/56	--	0	12/11/2000
X15	Alluvium	1544222.1	493799.8	T12/R10/S26/224	5	57	6582.91	Re-Injection	17/57	--	0	12/11/2000
X16	Alluvium	1544472.79	493795.08	T12/R10/S26/222	5	47	6584.79	Re-Injection	22/47	--	0	12/11/2000
X17	Alluvium	1544356	493793.23	T12/R10/S26/224	5	55	6585.84	Re-Injection	35/55	--	0	12/11/2000
X18	Alluvium	1544592.87	493569.45	T12/R10/S26/221	5	57	6586.08	Re-Injection	37/57	--	< 1	10/20/2009
X19	Alluvium	1544752.97	493436.91	T12/R10/S26/221	5	63	6585.2	Re-Injection	33/63	--	0	12/11/2000
X2	Alluvium	1540836	492362.98	T12/R10/S26/432	6	53	6571.93	Injection	40/45	--	17	12/11/2000
X20	Alluvium	1544855.41	493255.76	T12/R10/S26/221	5	71	6585.73	Re-Injection	31/71	--	0	12/11/2000
X21	Alluvium	1543606.42	493894.11	T12/R10/S26/242	5	55	6586.33	Re-Injection	35/55	--	0	12/11/2000

Well ID	Aquifer	Northing	Easting	Township/Range/ Section/Quarter Section	Casing Diameter (inches)	Total Depth (ft)	MP Elevation (TOC)	Use	Screen Top/Screen Bottom (ft BTOC)	Sandpack Top/Sandpack Bottom (ft BTOC)	Flow rate (gpm)[a]	Date of Flow Rate Measurement
X22	Alluvium	1543874.44	493945.56	T12/R10/S26/224	5	56	6585.7	Re-Injection	36/56	--	0	12/11/2000
X23	Alluvium	1544063.94	494011.73	T12/R10/S26/224	5	56	6585.94	Re-Injection	36/56	--	0	12/11/2000
X24	Alluvium	1544244.01	494010.56	T12/R10/S26/224	5	56	6585.72	Re-Injection	36/56	--	0	12/11/2000
X25	Alluvium	1544445.47	494041.96	T12/R10/S26/222	5	53	6585.63	Re-Injection	33/53	--	0	12/11/2000
X26	Alluvium	1544692.93	493701.93	T12/R10/S26/221	5	53	6587.64	Re-Injection	33/53	--	0	12/11/2000
X27	Alluvium	1544952.77	493373.88	T12/R10/S26/221	5	71	6585.3	Re-Injection	31/71	--	0	12/11/2000
X28	Alluvium	1540545.354	491970.706	T12/R10/S26/431	5	56	6569.96	Injection	16/56	--	18	12/11/2000
X29	Alluvium	1540735.485	492255.833	T12/R10/S26/432	5	51	6570.03	Injection	11/51	--	24	12/11/2000
X3	Alluvium	1540992.18	492598.5	T12/R10/S26/432	5	52	6573.28	Injection	32/42	--	1.2	12/11/2000
X30	Alluvium	1540896.664	492492.521	T12/R10/S26/432	5	51	6572.53	Injection	11/51	--	5.1	3/6/2002
X31	Alluvium	1541052.181	492731.415	T12/R10/S26/432	5	51	6574.13	Injection	11/51	--	18.7	12/11/2000
X4	Alluvium	1541209.97	492814.08	T12/R10/S26/414	5	54	6576.94	Injection	37/45	--	10	2/5/2002
X5	Alluvium	1541407.62	492820.53	T12/R10/S26/414	6	44	6577.61	Injection	24/36	--	7.8	2/5/2002
X6	Alluvium	1541609.09	492827.86	T12/R10/S26/414	6	46	6578.72	Injection	22/37	--	3.2	12/11/2000
X7	Alluvium	1541808.07	492851.01	T12/R10/S26/412	6	56	6580.43	Injection	32/46	--	4	12/11/2000
X8	Alluvium	1542007.04	492851.57	T12/R10/S26/412	5	61	6581.76	Injection	32/52	--	26	12/11/2000
X9	Alluvium	1542193.61	492852.2	T12/R10/S26/412	5	61	6582.92	Injection	24/52	--	15.3	12/11/2000
Y	Alluvium	1541025.1	491256.2	T12/R10/S26/342	4	60.8	6572.88	Unassigned	54/59	--	10	10/10/2001
Z	Alluvium	1540289.87	490700.56	T12/R10/S26/343	4	73.9	6569.22	Injection	60/70	--	8	12/11/2000

Notes:

[a] Flow rate data provided are only those most recent for each well.

-- = No data available

BTOC = below top of casing

ft = feet

gpm = gallons per minute

TOC = top of casing

Table M-2: List of Off-Site Wells

Well ID	Location	Use	Comments/2009 Status
Off-Site Collection Wells			
482	Felice Acres	A	Currently in use
483	Felice Acres	A	Currently in use
490	Felice Acres	A	Currently in use
491	Felice Acres	A	Currently in use
493	Felice Acres	A	Currently in use
494	Felice Acres	A	Currently not in use
496	Felice Acres	A	Currently in use
497	Felice Acres	A	Currently in use
498	Felice Acres	A	Currently in use
526	west of Broadview Acres	A	Currently not in use
527	west of Broadview Acres	A	Currently not in use
528	west of Broadview Acres	A	Currently not in use
529	west of Broadview Acres	A	Currently not in use
538	Section 3	A	Currently in use
539	Section 3	A	Currently not in use
540	Section 3	A	Currently in use
541	Section 32	A	Currently in use
550	Section 33	A	Currently not in use
551	Section 33	A	Currently not in use
552	Section 33	A	Currently not in use
553	Section 33	A	Currently not in use
554	Section 33	A	Currently not in use
555	Section 34	A	Currently not in use
556	Section 34	A	Currently not in use
557	Section 34	A	Currently not in use
558	Section 34	A	Currently not in use
559	Section 34	A	Currently not in use
560	Section 3	A	Currently not in use
561	Section 3	A	Currently not in use
631	Section 3	A	Currently in use
632	Section 3	A	Currently in use
633	Section 28	A	Currently not in use
634	Section 28	A	Currently in use
641	Section 35	A	Currently not in use
642	Section 35	A	Currently not in use
643	Section 3	A	Currently not in use
644	Section 3	A	Currently in use
646	Section 3	A	Currently not in use
647	Section 33	A	Currently in use
648	Section 33	A	Currently not in use
649	Section 33	A	Currently in use
653	Section 3	A	Currently in use
654	Section 28	A	Currently not in use
655	Section 28	A	Currently not in use

Well ID	Location	Use	Comments/2009 Status
656	Section 28	A	Currently not in use
657	Section 33	A	Currently in use
657R	Section 33	A	Currently not in use
658	Section 33	A	Currently in use
659	Section 28	A	Currently in use
681	Section 28	A	Currently not in use
682	Section 29	A	Currently not in use
685	Section 32	A	Currently not in use
687	Section 32	A	Currently in use
687R	Section 32	A	Currently not in use
844	Section 34	A	Currently not in use
846	Section 34	A	Currently not in use
848	Section 35	A	Currently not in use
851	Section 34	A	Currently not in use
855	Section 3	A	Currently not in use
862	Section 3	A	Currently in use
863	Section 3	A	Currently in use
864	Section 3	A	Currently not in use
865	Section 3	A	Currently in use
866	Section 3	A	Currently in use
868	Section 35	A	Currently not in use
869	Section 3	A	Currently in use
876	Section 3	A	Currently not in use
881	Section 28	A	Currently in use
882	Section 28	A	Currently not in use
883	Section 28	A	Currently not in use
884	Section 28	A	Currently not in use
885	Section 28	A	Currently not in use
886	Section 28	A	Currently in use
887	Section 28	A	Currently not in use
888	Section 28	A	Currently not in use
890	Section 28	A	Currently in use
893	Section 28	A	Currently not in use
894	Section 28	A	Currently not in use
895	Section 29	A	Currently not in use
896	Section 29	A	Currently not in use
943	Section 34	B	Currently in use
951	Section 20	B	Currently in use
996	Section 32	A	Currently in use
CW18	Section 35	B	Currently in use
CW28	Section 35	B	Currently in use
CW29	Section 3	A	Currently in use
CW30	Section 34	A	Currently not in use
CW42	Section 3	A	Currently in use
CW44	Felice Acres	A	Currently in use
CW45	Felice Acres	A	Currently in use
CW46	Felice Acres	A	Currently not in use
CW53	Felice Acres	A	Currently in use

Well ID	Location	Use	Comments/2009 Status
CW58	Felice Acres	A	Currently not in use
CW59	Felice Acres	A	Currently not in use
M16	Section 27	A	Currently in use
M17	Section 27	A	Currently not in use
M18	Section 27	A	Currently not in use
MO	Section 27	A	Currently in use
MR	Section 27	A	Currently in use
MS	Section 27	A	Currently in use
MV	Section 27	A	Currently not in use
Injection Wells and Infiltrate Lines			
Well ID	**Location**	**Use**	**Comments/2009 Status**
482	Felice Acres	C	Currently not in use
483	Felice Acres	C	Currently not in use
490	Felice Acres	C	Currently not in use
491	Felice Acres	C	Currently not in use
493	Felice Acres	C	Currently not in use
494	Felice Acres	C	Currently not in use
496	Felice Acres	C	Currently not in use
497	Felice Acres	C	Currently not in use
498	Felice Acres	C	Currently not in use
526	west of Broadview Acres	C	Currently not in use
527	west of Broadview Acres	C	Currently not in use
528	west of Broadview Acres	C	Currently not in use
529	west of Broadview Acres	C	Currently not in use
538	Section 3	C	Currently not in use
539	Section 3	C	Currently not in use
540	Section 3	C	Currently not in use
541	Section 32	C	Currently not in use
550	Section 33	C	Currently not in use
551	Section 33	C	Currently not in use
552	Section 33	C	Currently not in use
553	Section 33	C	Currently not in use
554	Section 33	C	Currently not in use
555	Section 34	C	Currently not in use
556	Section 34	C	Currently not in use
557	Section 34	C	Currently not in use
558	Section 34	C	Currently not in use
559	Section 34	C	Currently not in use
560	Section 3	C	Currently not in use
561	Section 3	C	Currently not in use
631	Section 3	C	Currently not in use
632	Section 3	C	Currently not in use
633	Section 28	C	Currently not in use
634	Section 28	C	Currently not in use
641	Section 35	C	Currently not in use
642	Section 35	C	Currently not in use
643	Section 3	C	Currently in use
644	Section 3	C	Currently not in use

Well ID	Location	Use	Comments/2009 Status
646	Section 3	C	Currently not in use
647	Section 33	C	Currently not in use
648	Section 33	C	Currently not in use
649	Section 33	C	Currently not in use
653	Section 3	C	Currently not in use
654	Section 28	C	Currently not in use
655	Section 28	C	Currently not in use
656	Section 28	C	Currently not in use
657	Section 33	C	Currently not in use
657R	Section 33	C	Currently not in use
658	Section 33	C	Currently not in use
659	Section 28	C	Currently not in use
681	Section 28	C	Currently not in use
682	Section 29	C	Currently not in use
685	Section 32	C	Currently not in use
687	Section 32	C	Currently not in use
687R	Section 32	C	Currently not in use
844	Section 34	C	Currently not in use
846	Section 34	C	Currently not in use
848	Section 35	C	Currently in use
851	Section 34	C	Currently not in use
855	Section 3	C	Currently not in use
862	Section 3	C	Currently not in use
863	Section 3	C	Currently not in use
864	Section 3	C	Currently not in use
865	Section 3	C	Currently not in use
866	Section 3	C	Currently not in use
868	Section 35	C	Currently in use
869	Section 3	C	Currently not in use
876	Section 3	C	Currently not in use
881	Section 28	C	Currently not in use
882	Section 28	C	Currently not in use
883	Section 28	C	Currently not in use
884	Section 28	C	Currently not in use
885	Section 28	C	Currently not in use
886	Section 28	C	Currently not in use
887	Section 28	C	Currently not in use
888	Section 28	C	Currently not in use
890	Section 28	C	Currently not in use
893	Section 28	C	Currently not in use
894	Section 28	C	Currently not in use
895	Section 29	C	Currently not in use
896	Section 29	C	Currently not in use
943	Section 34	C	Currently not in use
951	Section 20	C	Currently not in use
996	Section 32	C	Currently not in use
CW18	Section 35	C	Currently not in use
CW28	Section 35	C	Currently not in use

Well ID	Location	Use	Comments/2009 Status
CW29	Section 3	C	Currently not in use
CW30	Section 34	C	Currently in use
CW42	Section 3	C	Currently not in use
CW44	Felice Acres	C	Currently not in use
CW45	Felice Acres	C	Currently not in use
CW46	Felice Acres	C	Currently in use
CW53	Felice Acres	C	Currently not in use
CW58	Felice Acres	C	Currently not in use
CW59	Felice Acres	C	Currently not in use
FA1 IL	Felice Acres	C	Currently in use
FA2 IL	Felice Acres	C	Currently not in use
FA3 IL	Felice Acres	C	Currently not in use
FA4 IL	Felice Acres	C	Currently not in use
M16	Section 27	C	Currently not in use
M17	Section 28	C	Currently not in use
M18	Section 29	C	Currently not in use
MO	Section 27	C	Currently not in use
MR	Section 27	C	Currently not in use
MS	Section 27	C	Currently not in use
MV	Section 27	C	Currently not in use
NPV1 IL	Section 28	C	Currently in use
NPV2 IL	Section 28	C	Currently in use
NPV3 IL	Section 28	C	Currently in use
NPV4 IL	Section 28	C	Currently in use
NPV5 IL	Section 28	C	Currently in use
NPV6 IL	Section 28	C	Currently in use
NPV7 IL	Section 27	C	Currently in use
NPV8 IL	Section 27	C	Currently in use
RCR1 IL	Section 3	C	Currently in use
RCR2 IL	Section 3	C	Currently in use
RCR3 IL	Section 3	C	Currently in use
RCR4 IL	Section 3	C	Currently in use
RCR5 IL	Section 3	C	Currently in use
RCR6 IL	Section 3	C	Currently in use
RCR7 IL	Section 3	C	Currently in use
SFA1 IL	Felice Acres	C	Currently in use
SFA2 IL	Felice Acres	C	Currently in use
SFA4 IL	Felice Acres	C	Currently not in use
WFA1 IL	Section 34	C	Currently in use

Use Notes:

A = Groundwater Collection

B = Freshwater Injection Supply

C = Clean/Treated Water Injection