SNWA_EXH_617
ET slideshow

SE 118, pp. 9-10

The Engineer began his calculation of the Spring Valley appropriation with the "estimated average groundwater evapotranspiration (E.T.)," at 84,100 afa. Thus, the perennial yield of Spring Valley is 84,000 afa. ROA 000214. Existing water rights are 18,873 afa and "an additional 4,000 afa is reserved for future growth and development for a total of

22,873 afa of water committed to the basin. Subtracting 22,873 afa from the perennial yield of 84,000 afa leaves 61,127 afa available for appropriation." ROA 000215.

Obviously, any water-well cannot capture all of the E.T., and while pumping and E.T. are both occurring, the water table drops. A reasonable lowering of the water table and death of most of the phreatophytes is a trade-off for a beneficial use of the water. "It is a condition of each appropriation of groundwater acquired under this Chapter that the right of the appropriator relates to a specific quantity of water and that the right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion." NRS 534.110(4). The Engineer specifically found "there is no provision in Nevada water law that addresses time to capture, and no State Engineer has required that E.T. be captured within a specific period of time. It will often take a long time to reach near equilibrium in large basins . . . and this is no reason to deny water right applications." ROA 000090. The Engineer is correct that the time to reach equilibrium is not a valid reason to deny the grant of water, but it may very well be a reason to limit the appropriation below the calculated E.T.

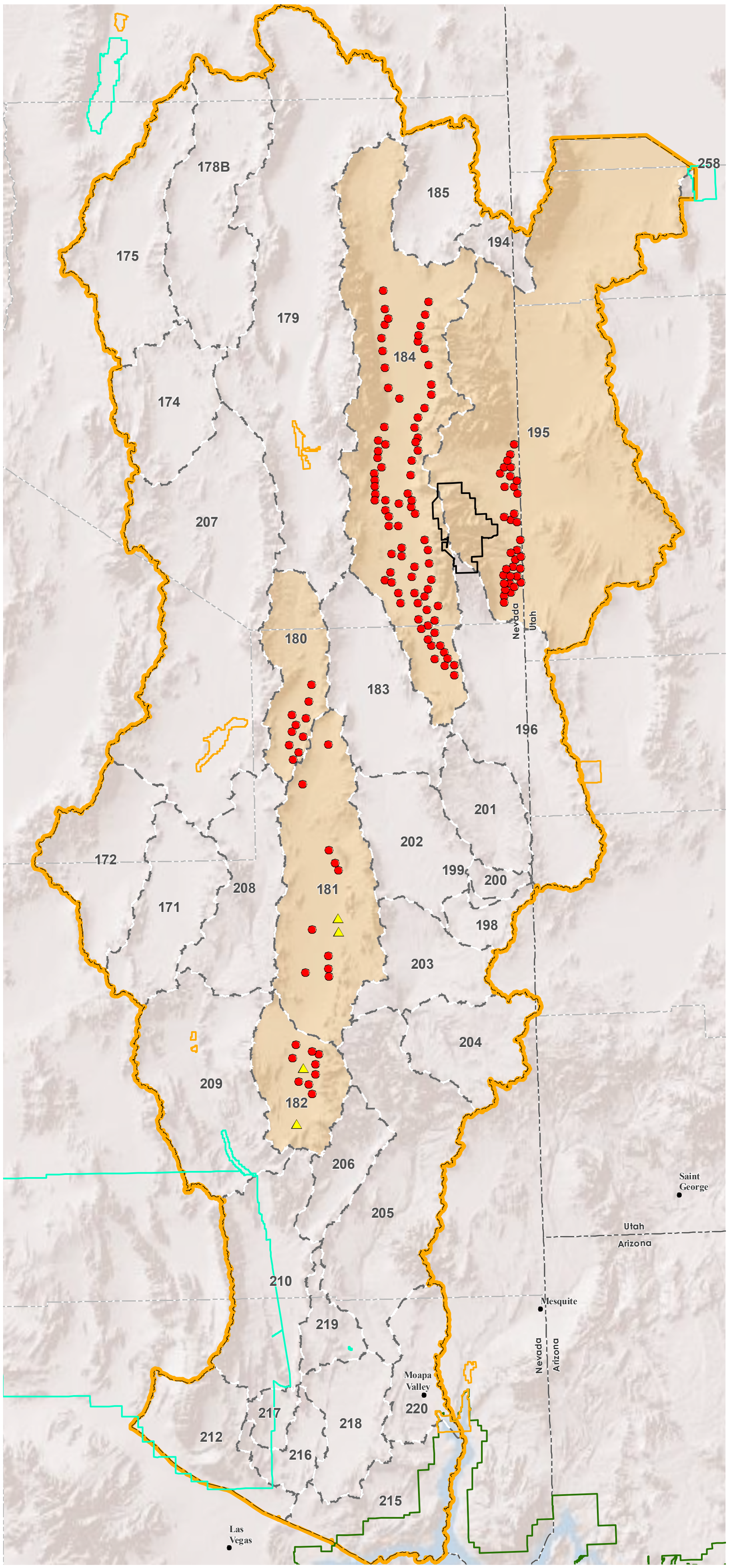
4.5 How would long-term pumping affect water resources in the study area?

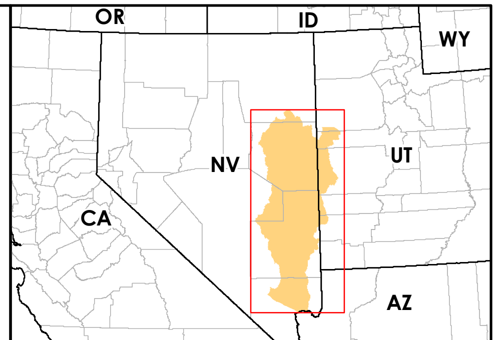
Table ES-11 provides a comparison of the potential impacts to water resources in the region of study associated with the various alternative pumping scenarios.

Table ES-11 Potential Incremental Effects to Water Resources at the Full Build Out Plus 75 Years and Full Build Out Plus 200 Years Time Frame Resulting from the Alternative Pumping Scenarios[1]

Water Resource Issue	Proposed Action	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	No Action
Full Build Out Plus 75 Years							
Drawdown effects on perennial springs: • Number of inventoried springs located in areas where impacts to flow could occur[2]	44	29	54	19	13	19	12
Drawdown effects on perennial streams: • Miles of perennial stream located in areas where impacts to flow could occur[2]	80	58	91	37	4	7	19
Drawdown effects on surface water rights: • Number of surface water rights located in areas where impacts to flow could occur[2]	145	109	141	78	23	60	105
Drawdown effects on groundwater rights: • Total groundwater rights in areas with >10 feet of drawdown • Number of groundwater rights in areas with >100 feet of drawdown	199 2	174 0	1184 8	133 0	27 2	70 0	372 0
Percent reduction in groundwater discharge to evapotranspiration: • Spring Valley • Snake Valley • Great Salt Lake Desert Flow System	7% 28% 48%	51% 23% 34%	66% 18% 37%	37% 15% 24%	18% 4% 10%	52% 0% 21%	7% 3% 5%
Full Build Out Plus 200 Years							
Drawdown effects on perennial springs: • Number of inventoried springs located in areas where impacts to flow could occur[2]	57	46	78	26	31	30	20
Drawdown effects on perennial streams: • Miles of perennial stream located in areas where impacts to flow could occur[2]	112	81	120	59	48	23	52
Drawdown effects on surface water rights: • Number of surface water rights located in areas where impacts to flow could occur[2]	212	151	186	98	56	94	164
Drawdown effects on groundwater rights: • Total groundwater rights in areas with >10 feet of drawdown • Number of groundwater rights in areas with >100 feet of drawdown	264 34	223 2	301 45	171 0	213 6	110 2	409 0
Percent reduction in groundwater discharge to evapotranspiration: • Spring Valley • Snake Valley • Great Salt Lake Desert Flow System[1]	84% 33% 54%	57% 27% 39%	73% 24% 44%	37% 17% 25%	28% 8% 16%	56% 3% 24%	7% 3% 5%

[1]Supporting information used to develop these estimated effects are provided in Appendices F3.3.6 through F3.3.16.
[2]Total located in high or moderate risk areas.





Legend

Pumping Scenario Well Locations[1]

- SNWA Project Well
- Lincoln County Water District Approved Water Right
- Hydrographic Basin
- Pumping Basin
- Water Resources Region of Study
- Great Basin National Park
- Lake Mead National Recreation Area
- National Wildlife Refuge
- State Wildlife Management Area

[1]The SNWA well locations represent the production well locations simulated in the numerical groundwater flow model for evaluating potential impacts. The actual number and location of the wells will be determined after additional field investigations.

Basin #	Basin Name	Basin #	Basin Name
171	Coal Valley	202	Patterson Valley
172	Garden Valley	203	Panaca Valley
174	Jakes Valley	204	Clover Valley
175	Long Valley	205	Lower Meadow Valley Wash
178B	Butte Valley (Southern Part)	206	Kane Springs Valley
179	Steptoe Valley	207	White River Valley
180	Cave Valley	208	Pahroc Valley
181	Dry Lake Valley	209	Pahranagat Valley
182	Delamar Valley	210	Coyote Springs Valley
183	Lake Valley	212	Las Vegas Valley
184	Spring Valley	215	Black Mountain Area
185	Tippett Valley	216	Garnet Valley
194	Pleasant Valley	217	Hidden Valley (North)
195	Snake Valley	218	California Wash
196	Hamlin Valley	219	Muddy River Springs Area
198	Dry Valley	220	Lower Moapa Valley
199	Rose Valley	258	Fish Springs Flat
200	Eagle Valley		
201	Spring Valley		

Proposed Clark, Lincoln, and White Pine Counties Groundwater Development Project

Figure 3.3.2-2

Pumping Distribution Proposed Action

0 5 10 15 20 25 50 Miles
0 5 10 15 20 25 50 75 Kilometers
1:2,000,000

N

Table 2-1
Comparison of SNWA Project Scenarios Before and After NSE Ruling 6164

Factor	Scenario Before Ruling (Used by Court)	Scenario After Ruling (Scenario Needed)
Model	CCRP Model	Model consistent with NSE Ruling
ET Discharge in Spring Valley	75,000 afy (Estimated) 77,000 afy (Simulated)	84,100 afy (Estimated)
SNWA Maximum Production	91,224 afy	61,127 afy
SNWA Scenario Design Objective	Minimize impact to senior water rights and environment	Capture ET within reasonable time
SNWA Well Locations	Predominantly outside of ET discharge area	Inside of ET discharge area

In NSE Ruling 6164, before evaluating the results of the conflicts quantitative analysis conducted by Watrus and Drici (2011) using the CCRP model, the NSE describes the CCRP model, its development, and limitations before concluding that:

> ...the Applicant's model provides a reliable tool to examine potential effects on the groundwater system; however, the model contains many uncertainties that must be kept in mind as it is used to analyze the system (NDWR, 2012a, p. 128).

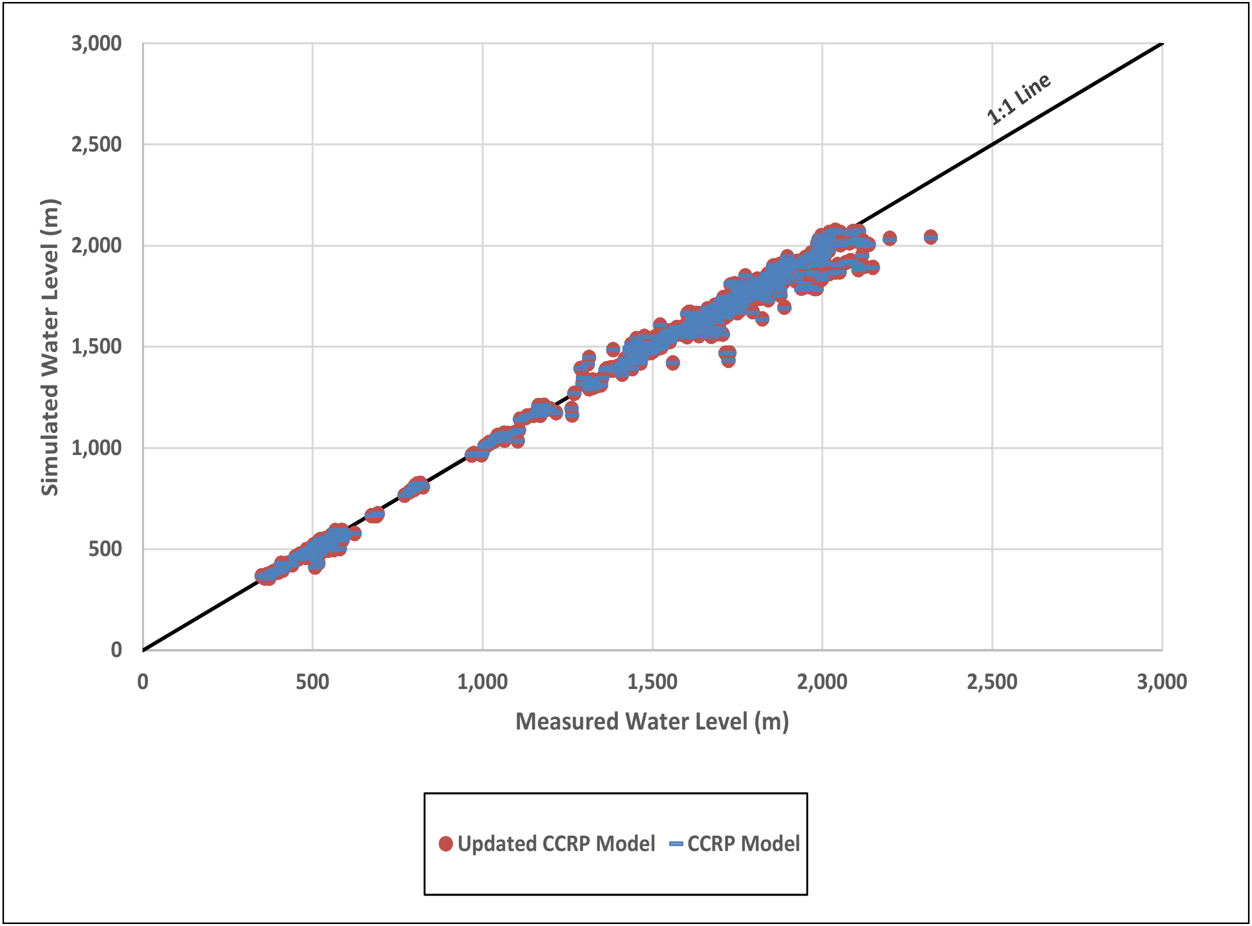


Figure 3-1
Comparison of Water-Level Fit Before and After Model Update

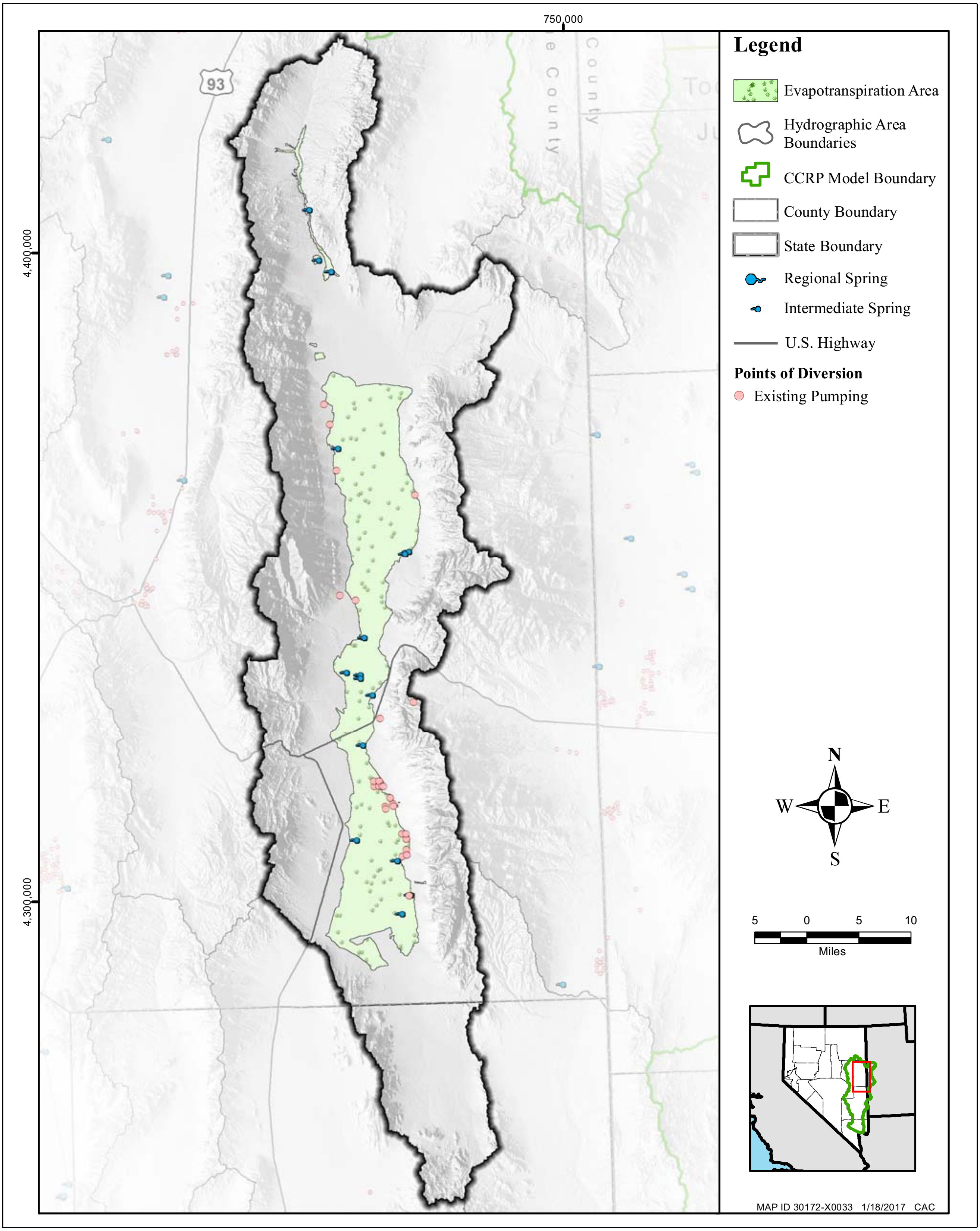


Figure 4-1
Location of Pumping Wells for Baseline Scenario

Table 4-1
ET-Capture Scenario Groundwater Development Schedule in Spring Valley

Years[a]	Development Stage	Production Rate (afy)
2005-2033	Before Development Starts	0
2034-2041	1	38,000
2042-2049	2	50,000
2050-2250	3	61,127

[a]Pumping begins on January 1 for the specified year.

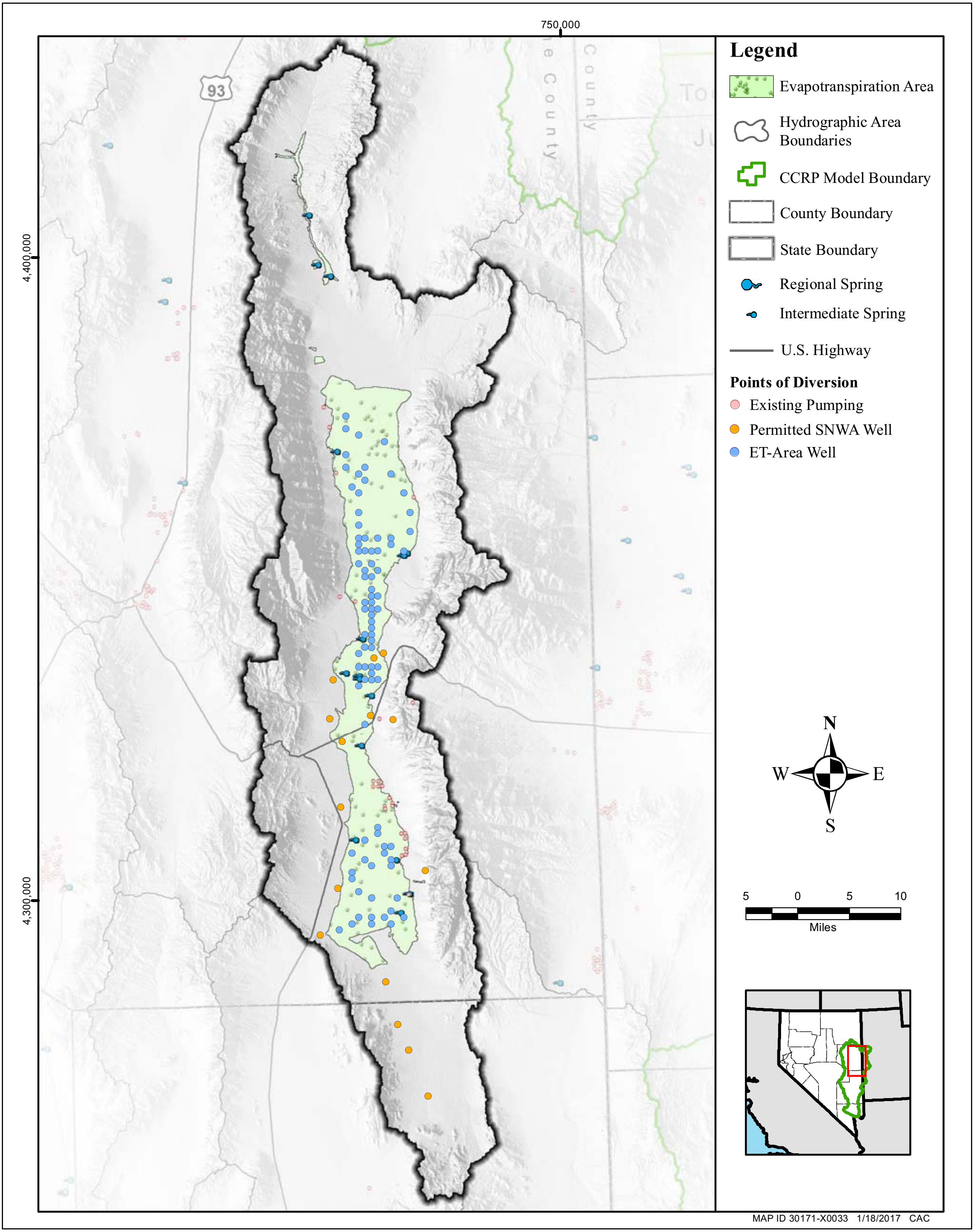


Figure 4-2
Locations of Pumping Wells for ET-Capture Scenario

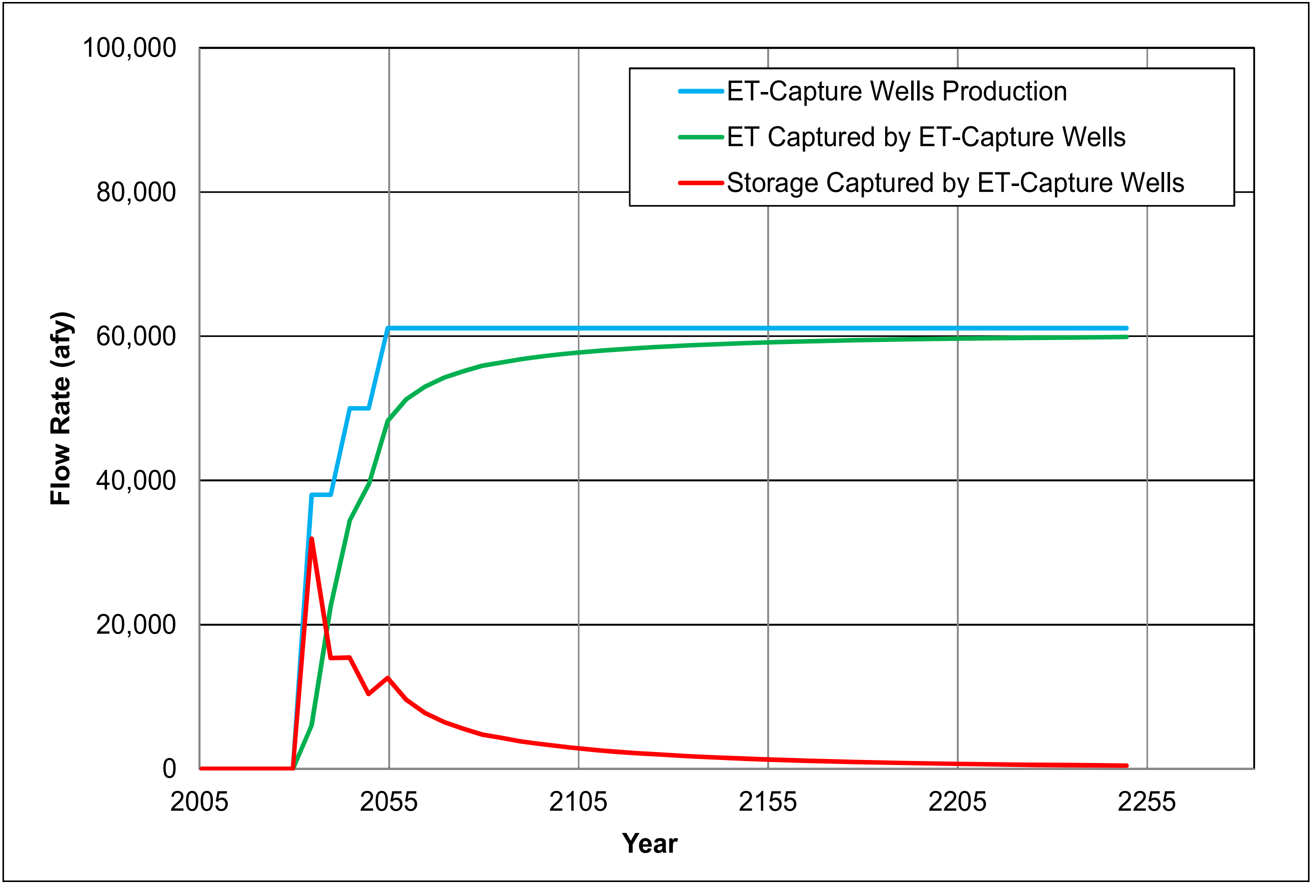


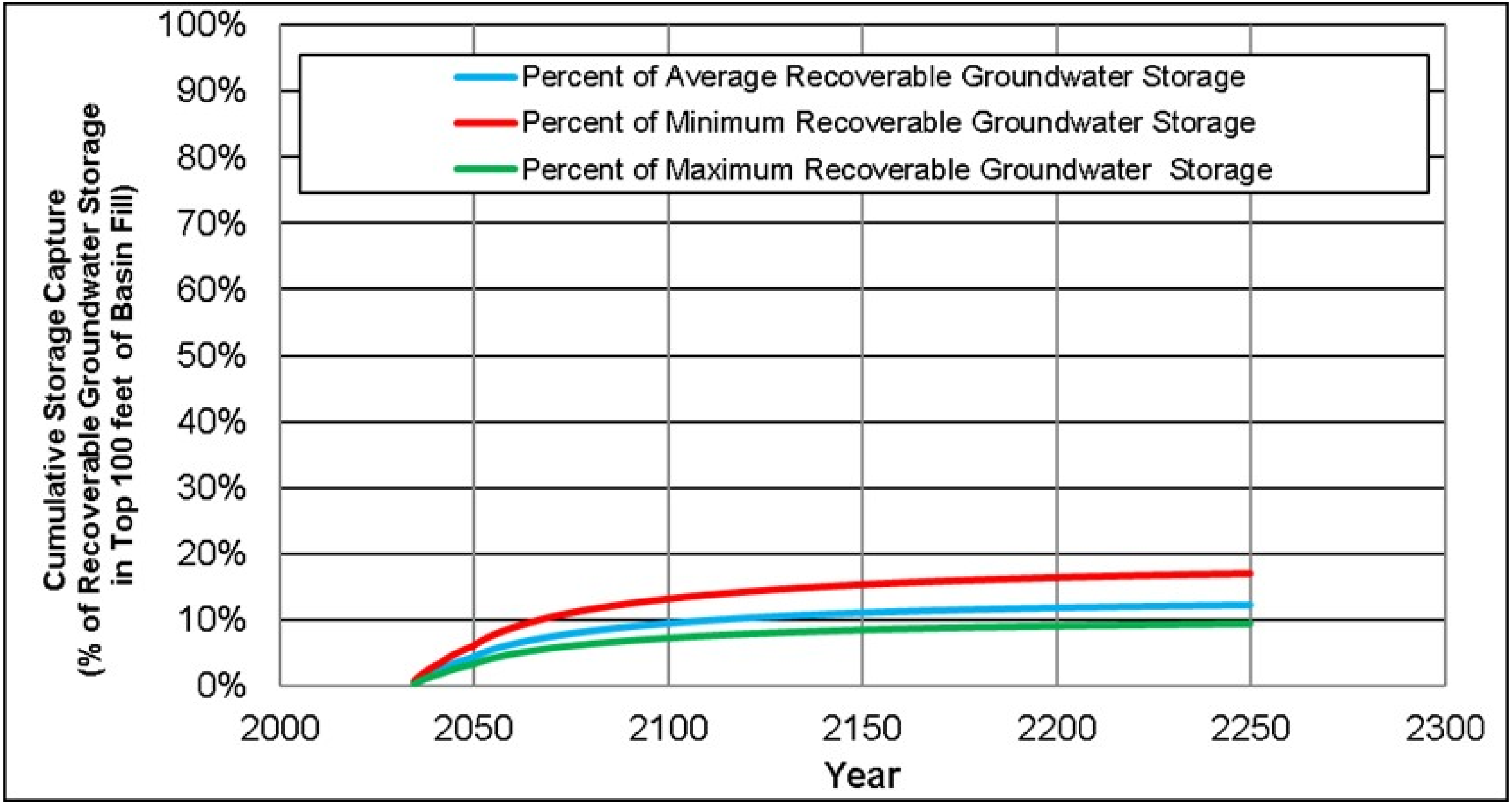
Figure 6-1
ET Discharge and Transitional Storage Capture by ET-Capture Wells as a Function of Time

Table 6-1
ET Discharge and Transitional Storage Captured by ET-Capture Wells at Selected Points in Time in Spring Valley

Item	Description	2125 (+75 years)	2150 (+100 years)	2250 (+200 years)
a	ET-Capture Well Maximum Pumping Rate (afy)	61,127	61,127	61,127
b	Remaining ET under Baseline Scenario (afy)	75,370	75,257	74,982
c	Remaining ET under ET-capture Scenario (afy) [Existing + ET-Capture Wells]	16,890	16,197	15,087
d	ET Captured by ET-Capture Wells (afy)	58,480	59,060	59,894
e	Groundwater Captured by ET-Capture Wells from ET Area (% Maximum Pumping Rate)	96%	97%	98%
f	Storage Captured under Baseline Scenario (afy)	508	434	306
g	Storage Captured under ET-Capture Scenario (afy) [Existing + ET-Capture Wells]	2,539	1,825	751
h	Storage Captured by ET-Capture Wells (afy)	2,031	1,392	445
i	Groundwater Captured by ET-Capture Wells from Transitional Storage (% Maximum Pumping Rate)	3%	2%	1%

Calculations:
d = b – c
e = d / a x 100
h = g – f
i = h / a x 100
Note: For the three times of interest, 1 percent of the well production is captured from boundary flow.

Corrected Figure 6.2 from SNWA 475



Aquaveo Expert Report

1) "Quantifying the safe yield of an aquifer system using a water budget analysis is fundamentally flawed."

USGS Circular 1308

"Water budgets provide a means for evaluating the availability and sustainability of a water supply. The link among all components of a water budget serves as a basis for predicting how a natural or human-induced change to one component, such as ground-water extraction, may be reflected in other components, such as streamflow or evapotranspiration. When viewed with an understanding of the underlying hydrologic processes and the uncertainties associated with quantifying those processes, water budgets form a foundation for evaluating water-resources and environmental planning and management options."

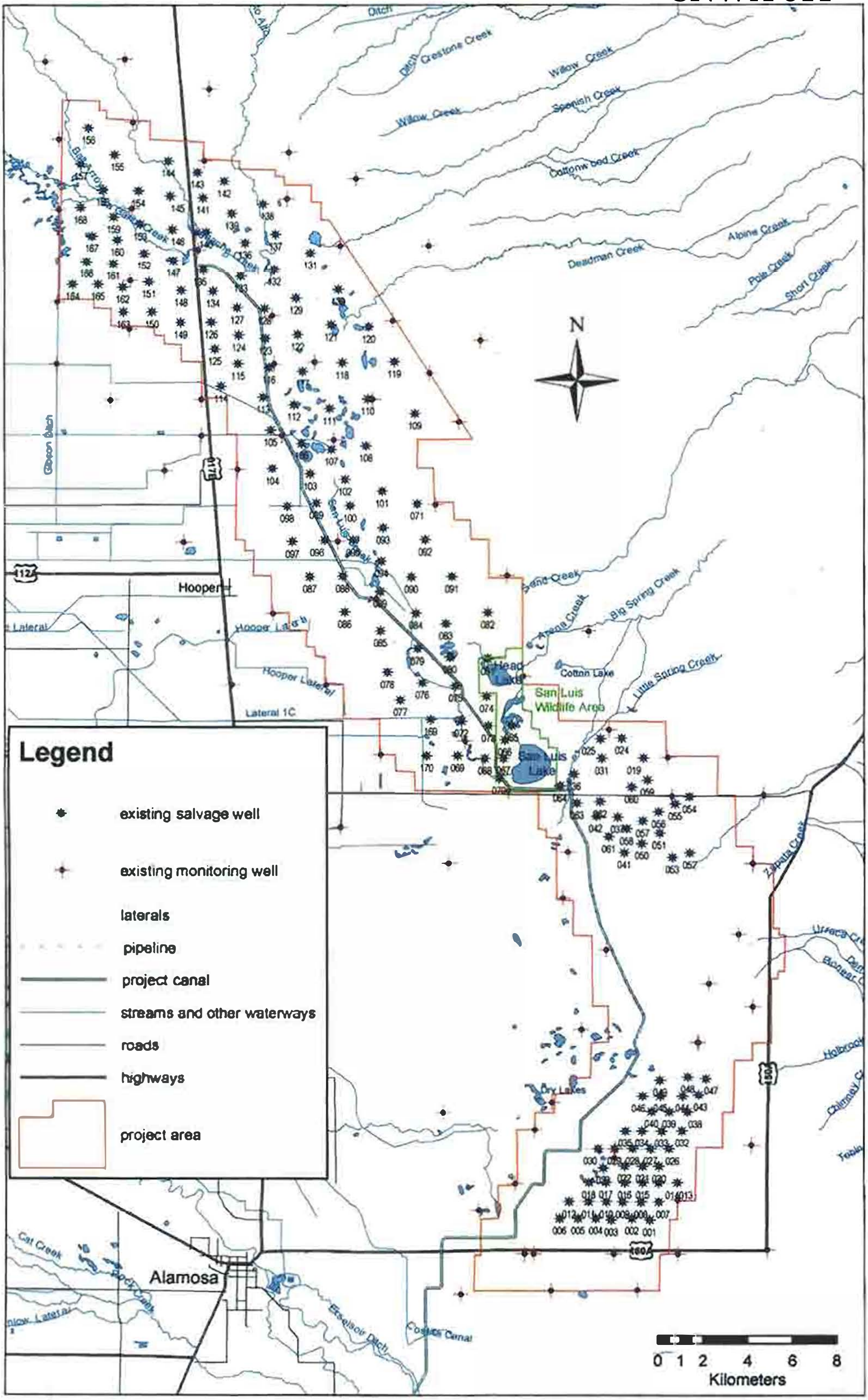


Figure 1-2. Salvage and monitoring well location map

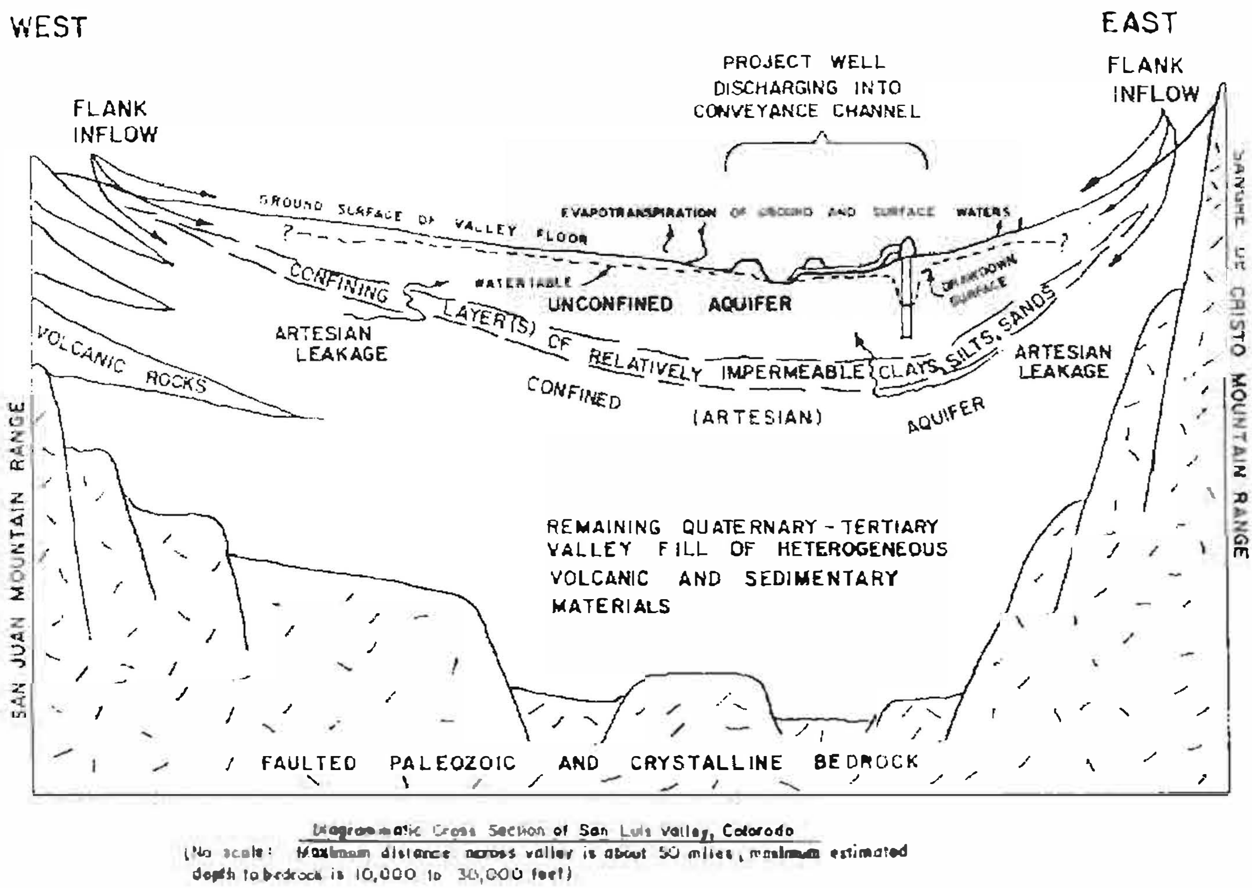


Figure 3-1. Cross-section of the San Luis Valley (from *San Luis Valley Project, Colorado, Closed Basin Division, Facts and Concepts*, Reclamation).