Committed Groundwater Resources within the White River Flow System

PRESENTATION TO THE OFFICE OF THE NEVADA STATE ENGINEER

Prepared for

SOUTHERN NEVADA WATER AUTHORITY

Prepared by

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June 2017

Suggested citation:
Stanka, M.A., 2017, Committed groundwater resources within the White River Flow System: Presentation to the Office of the Nevada State Engineer: Stanka Consulting, LTD., Carson City, Nevada.

Committed Groundwater Resources within the White River Flow System

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Pertaining to:
Groundwater Applications 53987 through 53992 in
Cave, Dry Lake, and Delamar Valleys

June 2017

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ACRONYMS

APP	Application
DLE	Desert Land Entry
ET	Evapotranspiration
HA	Hydrographic Area
MDBM	Mount Diablo Baseline and Meridian
MRSA	Muddy River Springs Area
NDWR	Nevada Division of Water Resources
NIWR	Net Irrigation Water Requirements
NSE	Nevada State Engineer
PBU	Proof of Beneficial Use
PLSS	Public Land Survey System
POD	Point of Diversion
POU	Place of Use
RFA	Ready for Action
RFP	Ready for Action (Protested)
SNWA	Southern Nevada Water Authority
TCD	Total Combined Duty
USGS	U.S. Geological Survey
WRFS	White River Flow System

ABBREVIATIONS

af	acre-feet
afa	acre-feet annually
cfs	cubic feet per second
ft	foot
in.	inch

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EXECUTIVE SUMMARY

On December 13, 2013, the Seventh Judicial District Court (the Court), Judge Robert E. Estes, Senior District Judge presiding, remanded portions of the 2011 Nevada State Engineer (NSE) rulings involving Spring Valley, Delamar Valley, Dry Lake Valley, and Cave Valley on certain issues in Case No. CV1204049 (Court's Decision). The Court's Decision directs the NSE to review the amount of groundwater appropriated for all basins within the White River Flow System (WRFS) to ensure that there is enough water both for the Southern Nevada Water Authority (SNWA) permits in Delamar Valley, Dry Lake Valley, and Cave Valley (DDC basins), as well as the existing water rights in down-gradient basins. Specifically, the Court's Decision directs the NSE to *"[r]ecalculate the appropriations from Cave Valley, Dry Lake and Delamar Valley to avoid over appropriations or conflicts with down-gradient, existing water rights."*

This report is being submitted to the NSE for consideration during a hearing held in response to the Court's Decision. The SNWA permits that are the subject of the hearing and this report are Nos. 53987 through 53992. All of these permits have a priority date of October 17, 1989 and are located in the DDC basins. The DDC basins are located within the 11-basin WRFS. This report quantifies the estimated committed groundwater and springs within the groundwater discharge area in each of those 11 hydrographic areas (HAs). These resources were further analyzed to determine the quantity of committed groundwater and springs within the groundwater discharge area with priority dates prior to October 17, 1989. All 11 of these Nevada Division of Water Resources (NDWR) HAs are located in the east-central portion of Nevada. Four of the basins are within the Colorado River Basin hydrographic region and seven are within the Central Region as defined on the NDWR Designated Groundwater Basins map of Nevada. Figure ES-1 is a map of the 11 HAs analyzed in this report.

Definitions of terms used within this report are included in Appendix ES-1. The purpose of this report is to analyze the existing water rights within the 11 HAs in the WRFS and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.

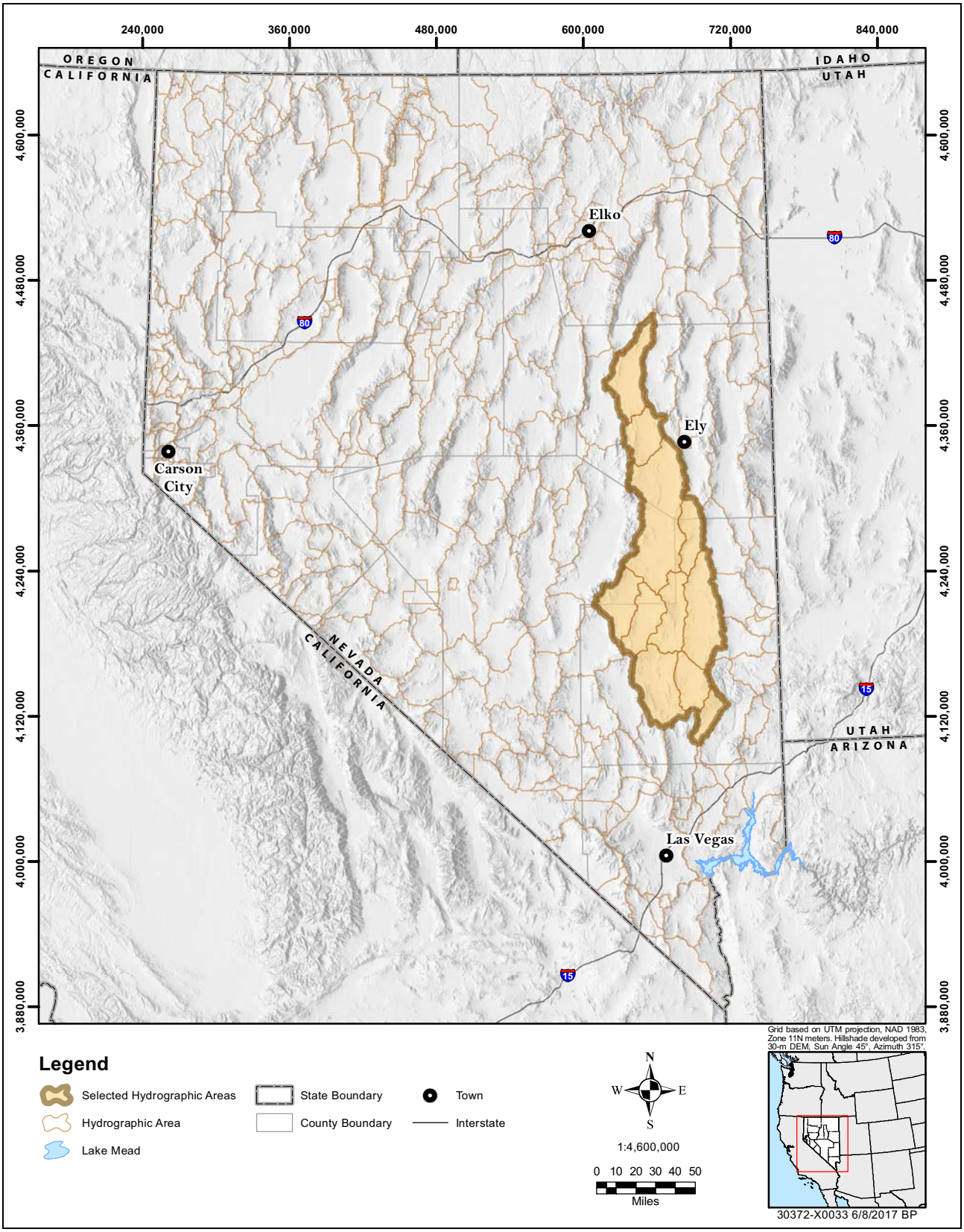

Figure ES-1
NDWR Hydrographic Regions and Analysis Area

- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

Table ES-1 lists the estimated committed groundwater resources per HA resulting from the analysis in this report of the existing groundwater rights and spring rights within the groundwater discharge area. The results of this analysis show that there are approximately 77,753.94 afa of committed groundwater and spring rights within the groundwater discharge area with a priority date prior to, or equal to October 17, 1989. There are a total of 93,148.60 afa of committed groundwater and spring rights within the groundwater discharge area with priority dates prior to, including, and after October 17, 1989. Each of these totals includes the full volume of the SNWA DDC basins permits as granted by the NSE in 2011. Based on the previously accepted estimate of 104,402 afa of water available for appropriation in these HAs, the WRFS is not over appropriated (Ruling No. 6255). This is true even when SNWA DDC basins permits are included. In fact, it appears that additional water is available for appropriation.

Table ES-1
Estimated Committed Groundwater/Groundwater Discharge Area Spring Rights

Basin No.	HA Name	Committed Groundwater and Spring Water Rights (afa)		
		Committed GW and Spring Rights Prior to, and After October 17, 1989	Committed GW and Spring Rights After October 17, 1989	Committed GW and Spring Rights Prior to, or on October 17, 1989
175	Long Valley	601.51	339.05	262.46
174	Jakes Valley	42.95	2.24	40.71
180	Cave Valley	5,759.06	33.60	5,725.46
207	White River Valley	36,536.48	9,127.87	27,408.61
208	Pahroc Valley	52.88	31.54	21.34
172	Garden Valley	920.24	579.33	340.91
171	Coal Valley	65.80	38.94	26.86
181	Dry Lake Valley	12,427.14	746.66	11,680.48
182	Delamar Valley	6,101.24	0.00	6,101.24
209	Pahranagat Valley	29,641.30	3,495.43	26,145.87
206	Kane Springs Valley	1,000.00	1,000.00	0.00
Total		93,148.60	15,394.66	**77,753.94**

GW = Groundwater.

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1.0 SCOPE OF ANALYSIS

The purpose for this chapter is to describe the scope of the analysis for this report, and to provide the rationale for the current understanding of the WRFS used in this report consisting of 11 basins, rather than the traditional 13 basins. On December 13, 2013, the Seventh Judicial District Court (the Court), Judge Robert E. Estes, Senior District Judge presiding, remanded portions of the 2011 Nevada State Engineer (NSE) rulings involving Spring Valley, Delamar Valley, Dry Lake Valley, and Cave Valley on certain issues in Case No. CV1204049 (Court's Decision). The Court's Decision recognized that in basins where groundwater is discharged by flowing from one basin into a down-gradient basin, there is a risk that appropriating groundwater from an up-gradient basin will cause the water to be taken and used before it flows into the down-gradient basins, thereby conflicting with existing rights in those down-gradient basins. Therefore, the Court's Decision directs the NSE to review the amount of groundwater appropriated for all basins within the White River Flow System (WRFS) to ensure that there is enough water, both for the Southern Nevada Water Authority (SNWA) permits in the up-gradient Delamar Valley, Dry Lake Valley, and Cave Valley (DDC basins) as well as for the existing water rights in down-gradient basins. Section VIII of the Court's Decision concluded:

> *After an in-depth review of the record, this Court will not disturb the findings of the Engineer save those findings that are the subject of this Order. This Court remands orders 6164, 6165, 6166 and 6167 for:... 4. [Recalculation of] the appropriations from Cave Valley, Dry Lake, and Delamar Valley to avoid over appropriations or conflicts with down-gradient, existing water rights* (White Pine County and Consolidated Cases v. Jason King, 2013, p. 23).

The Court's Decision recognized that the DDC basins are located within the contiguous WRFS. Therefore, the starting point of this analysis is to determine the basins that should be included in this study to determine whether SNWA's applications will cause an over appropriation. Further, to comply with the Court's Decision, this report identifies the inflow to and outflow from the WRFS, the amount of water available, and the amount of committed groundwater resources.

1.1 Identification of WRFS Basins

The identification of the WRFS as a flow system dates back to the 1960s. The official designation of the WRFS, and the 13 original groundwater basins that made up the WRFS, was documented in a report by Thomas E. Eakin (1966). An overview of the basins within the original WRFS, which shows the generalized flow pattern, as Eakin originally identified it, is shown in Figure 1-1. Eakin's 1966 report showed that the main flows leaving the WRFS exit through Upper Moapa Valley (now referred to as the Muddy River Springs Area [MRSA]). A table listing the 13 original groundwater basins that made up the WRFS is included as Table 1-1.

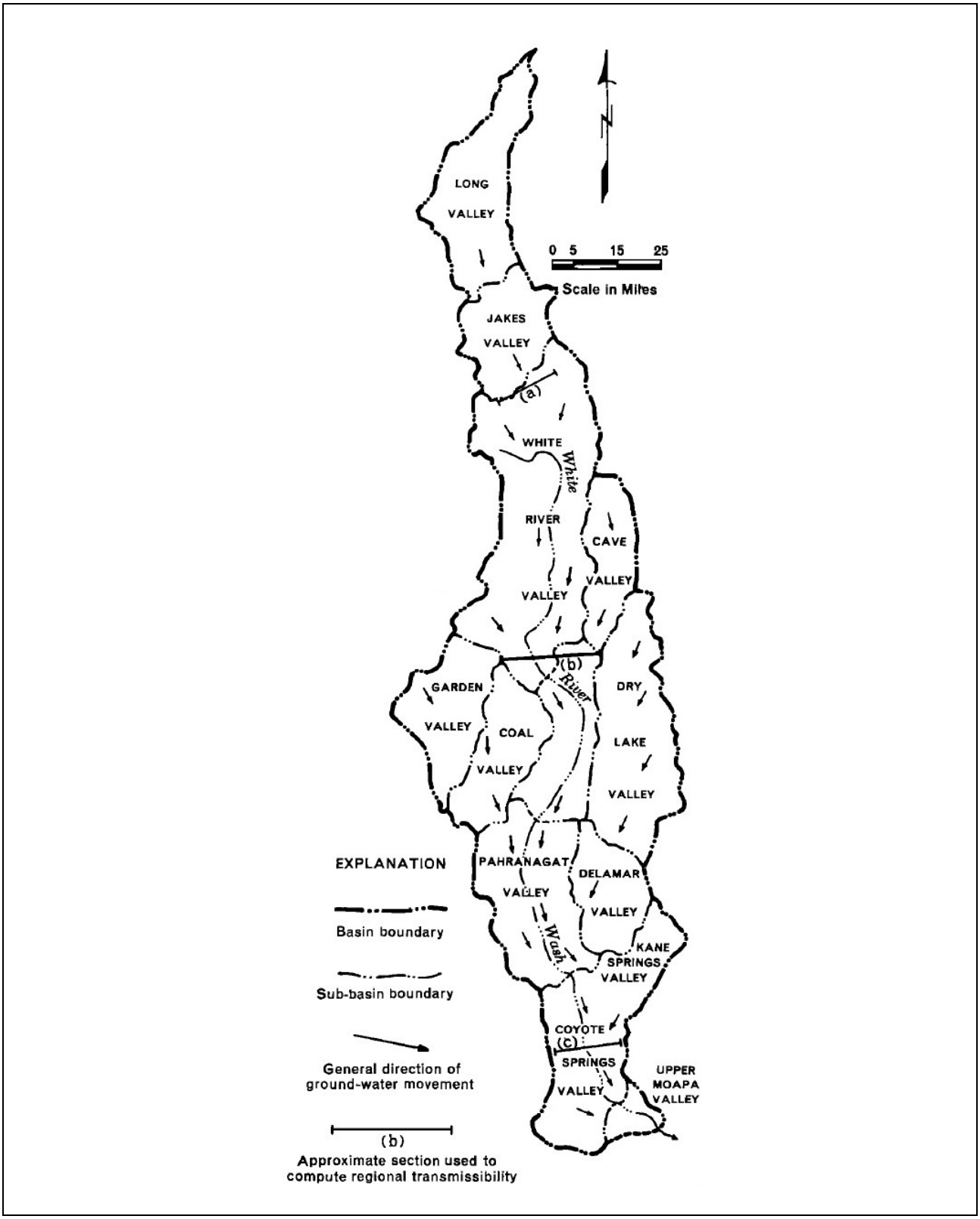

Figure 1-1
Overview of WRFS*, as shown in Figure 6 of the 1966 Eakin Report*

Table 1-1
Thirteen Original WRFS Basins

Basin No.	HA Name
175	Long Valley
174	Jakes Valley
180	Cave Valley
207	White River Valley
208	Pahroc Valley
172	Garden Valley
171	Coal Valley
181	Dry Lake Valley
182	Delamar Valley
209	Pahranagat Valley
206	Kane Springs Valley
210	Coyote Spring Valley
219	Muddy River Springs Area (Upper Moapa Valley)

1.2 Original WRFS Inflow and Outflow

As the Court's Decision did not disturb the NSE's findings in the 2011 Rulings on interbasin flows, this analysis relies on the previously identified interbasin flows utilized by the NSE in those rulings. NSE Ruling No. 6165 states: "*Based on this evidence, the State Engineer adopts the Applicant's 6,700 afa estimate of interbasin flow from Butte Valley to Jakes Valley*" (NDWR, 2012b, p. 64). For this analysis, 6,700 afa of inflow to Jakes Valley, within the WRFS, will be allocated from Butte Valley, outside the WRFS.

NSE Ruling No. 6165 states:

> *The State Engineer finds interbasin flow from Pahranagat Valley to Tikapoo Valley South, for the purposes of the Applicants' recharge solver, is the average of the six estimates cited above, and will use that estimate of 4,100 afa for use in the Excel recharge solver* (NDWR, 2012b, p. 65).

NSE Ruling No. 5465 fully appropriated Tikapoo Valley South, which is located outside the WRFS. NSE Ruling No. 5465 did not include any of the 4,100 afa of estimated outflow from the WRFS in Pahranagat Valley to Tikapoo Valley South when determining the water available for appropriation within Tikapoo Valley South (NDWR, 2005). Therefore, this water has not been previously appropriated in down-gradient basins, and should be available for appropriations within the WRFS.

NSE Ruling No. 6165 states: *"From prior investigations, the Applicant estimated that 8,000 afa flows into the WRFS from the Lower Meadow Valley Wash at the [Muddy River Springs Area]...[Protestants] did not dispute this estimate"* (NDWR, 2012b, p. 68). For this analysis, 8,000 afa of inflow to the MRSA, within the WRFS, will be allocated from the Lower Meadow Valley Wash, outside the WRFS.

NSE Ruling No. 6165 states the following:

> *The Applicant applied this data using Darcy's Law and calculated 9,900 afa of interbasin outflow for this boundary [between Lower Meadow Valley Wash and Virgin River Valley]. In addition, the Applicant also determined that 33,700 afa flows out of the MRSA to California Wash as Muddy River streamflow, and that the source of the streamflow is the groundwater discharge from regional springs located in the MRSA. This brings the total outflow from the WRFS at the MRSA to 43,600 afa. Based on the evidence in the record, the difference between the inflow to and outflow from the MRSA is quantifiable and can be adopted by the State Engineer. The Applicant's estimated inflow to the MRSA was based on a prior investigation, was within the range of previously reported estimates, and was not disputed by any of the Protestants. … Accordingly, the State Engineer finds that the Applicant's estimate of 9,900 afa of interbasin flow to California Wash is sound* (NDWR, 2012b, p. 68-69).

For this analysis, 43,600 afa of outflow from the MRSA (9,900 afa interbasin flow and 33,700 afa of Muddy River stream flow), within the WRFS, will be allocated to California Wash, outside the WRFS.

Based on a review of NSE Ruling No. 6165, it is clear that the NSE used the original definition of the WRFS as consisting of the 13 basins listed in Table 1-1 for the 2011 rulings. A map of the inflows to and outflows from the WRFS, as determined from NSE rulings, as well as citations for the inflows and outflows, is shown in Figure 1-2 (NDWR, 2012b).

1.3 Five-Basin Area

In January of 2014, approximately three years after the NSE Rulings No. 6164 through 6167 were issued, the NSE issued a series of rulings for Coyote Spring Valley, MRSA (also formerly referred to as Upper Moapa Valley), Garnet Valley, Hidden Valley, and the California Wash (Rulings No. 6255 through 6259). NSE Ruling No. 6255 states:

> *The Order 1169 pumping test further supports the conclusion that pumping from any of the five basins with a close hydrologic connection (Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley and California Wash) will have a similar impact on water levels in the five-basin area and on the Muddy River spring flows. Therefore, because these basins share a unique and close hydrological connection, and share virtually all of the same source and supply of water, unlike other basins in Nevada, these five basins will be jointly managed* (NDWR, 2014b).

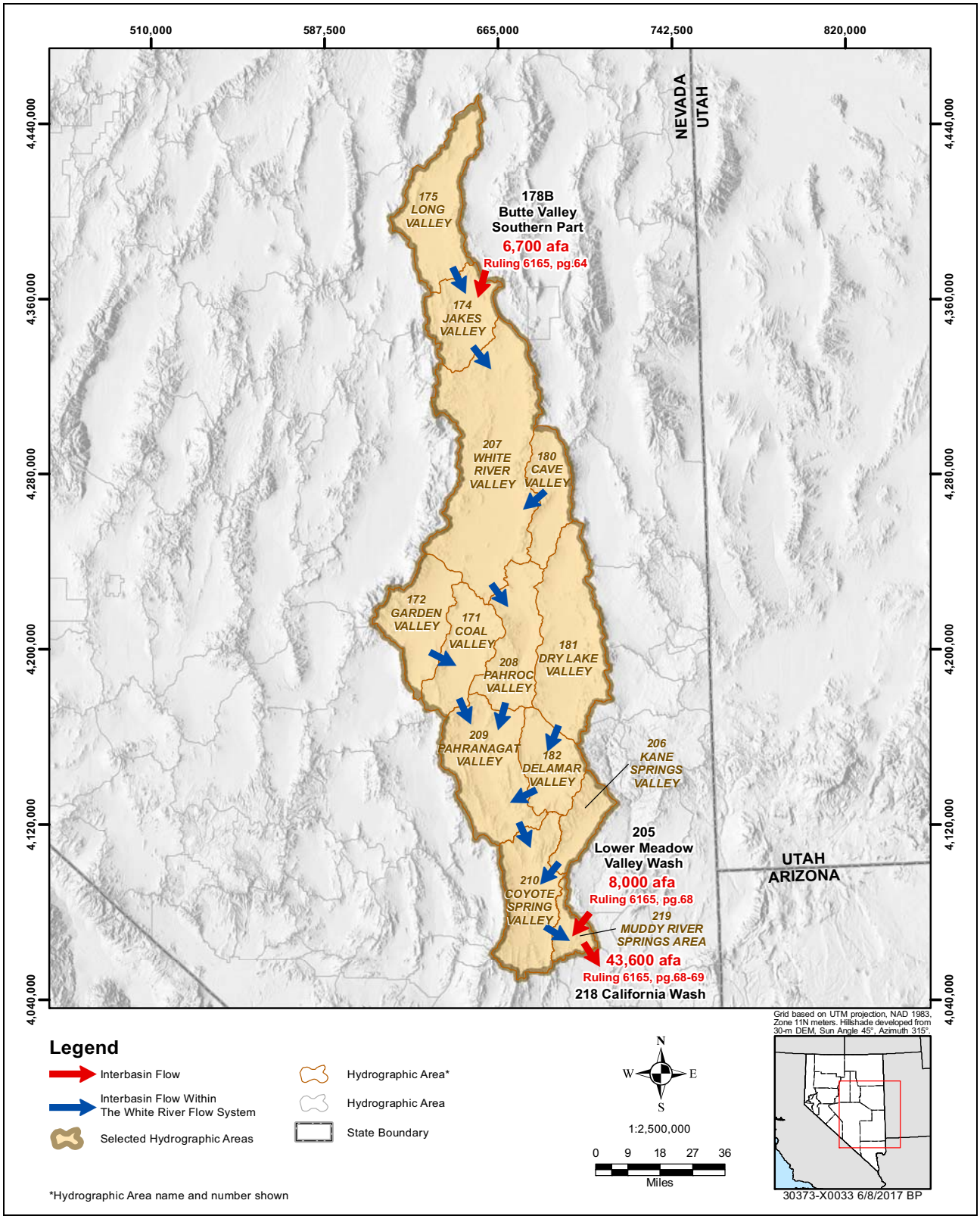

Figure 1-2
Overview of Inflows and Outflows to the Original WRFS

This is significant to the quantification of WRFS committed groundwater resources because two of the original WRFS basins are included in NSE rulings that require those basins to be managed in conjunction with three basins outside of the WRFS.

An overview of the five-basin area is shown in Figure 1-3. The blue arrows depict interbasin flow within the five-basin area, and the red arrows depict interbasin flow from outside of the five-basin area. This conceptual flow diagram is based on a review of NSE Ruling No. 6255.

A map of the five-basin area compared to the original WRFS is shown in Figure 1-4. Basins shown in green are basins that are only part of the original WRFS. Basins shown in yellow are part of the original WRFS, as well as part of the five-basin area delineated in 2014. Basins shown in orange are part of the 2014 five-basin area only.

In Ruling 6255, the NSE determined the quantity of groundwater leaving the upper 11 basins of the original WRFS and entering the MRSA via flow through Coyote Spring Valley to be 39,000 afa (NDWR 2014b, p. 25). Therefore, this analysis assumes that 39,000 afa flows out of the upper 11 basins of the original WRFS. Coyote Spring Valley and MRSA were excluded from the scope of analysis for this report due to the determination in NSE Ruling No. 6255 that these two basins, which were formerly included as part of the original WRFS, would be managed jointly with three other basins that are outside of the WRFS.

NSE Ruling No. 6255 states:

> *SNWA Exhibit No. 452 from the 2011 hearing on Delamar, Dry Lake and Cave Valleys is an Excel workbook that is designed to estimate groundwater recharge for all of the basins contributing to the White River Flow System from the Muddy River Springs Area northward. The exhibit was accepted by the State Engineer with some revisions, and basin recharge and interbasin flows are specified for both Coyote Spring Valley and the Muddy River Springs Area hydrographic basins. From that exhibit, the supply of water to the Coyote Spring Valley is estimated to be approximately 41,000 afa, of which 39,000 is subsurface inflow from upgradient basins and 2,000 afa is derived from in-basin recharge. Prior to groundwater pumping in the region, all of this water flowed in the subsurface to the Muddy River Springs Area* (NDWR, 2014b, p. 25).

For this analysis, NSE's Ruling No. 6255 is accepted and relied upon. Therefore, 39,000 afa of subsurface flow is assumed to come from Pahranagat Valley, Delamar Valley, and Kane Springs Valley. The NSE stated that the five southern basins will be jointly managed after the Court's Decision was issued. Based on the above excerpt from Ruling 6255, it was determined that the WRFS analysis in this report could be performed on the northern 11 basins, so long as 39,000 afa remains available for subsurface flows leaving the 11-basin WRFS and entering Coyote Spring Valley.

Figure 1-5 shows a map of the analysis area for this report, which includes the northern 11 WRFS basins and the inflows and outflows previously identified by the NSE in Rulings No. 6165 and 6255.

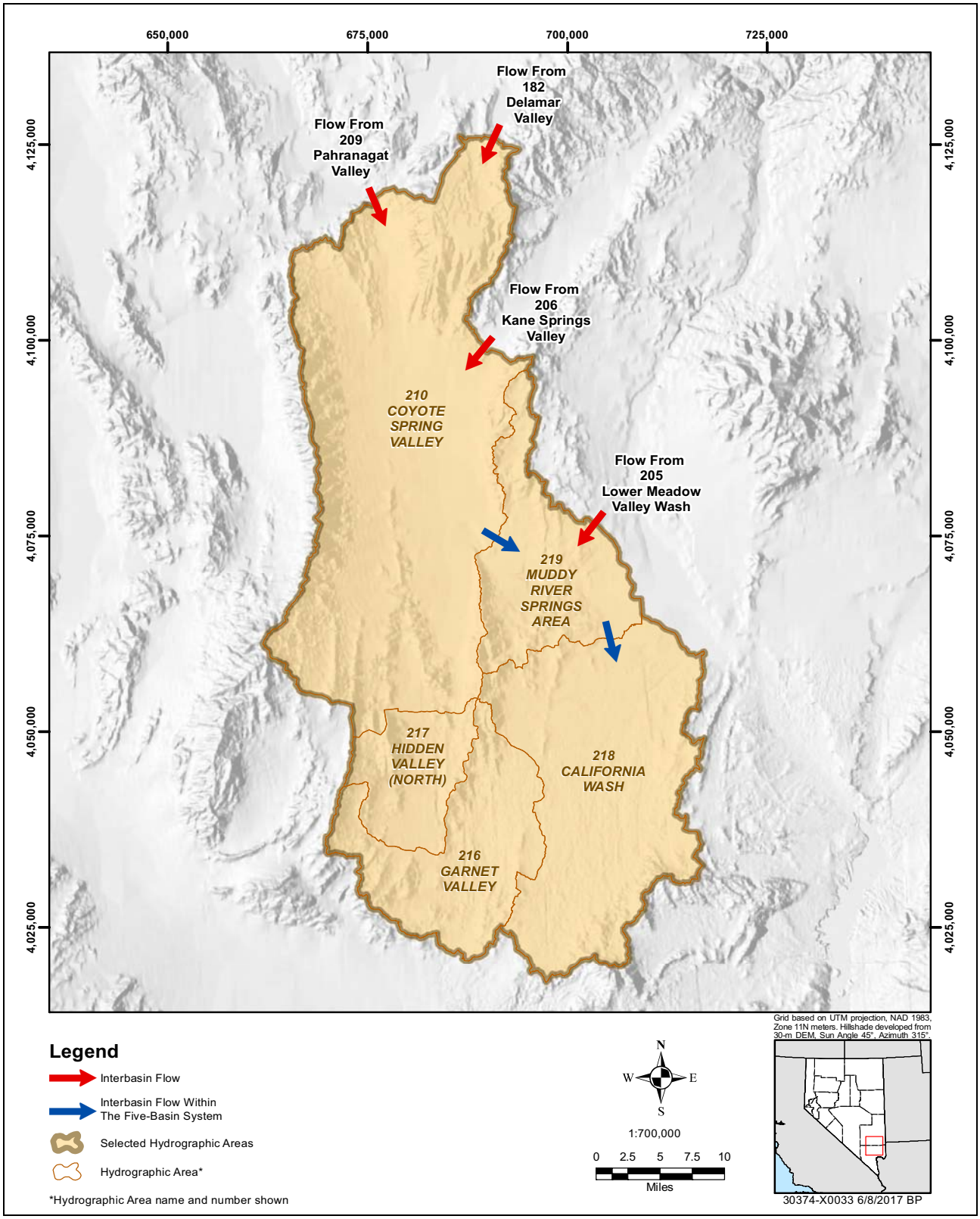

Figure 1-3
Overview of the Jointly-Managed Five-Basin System

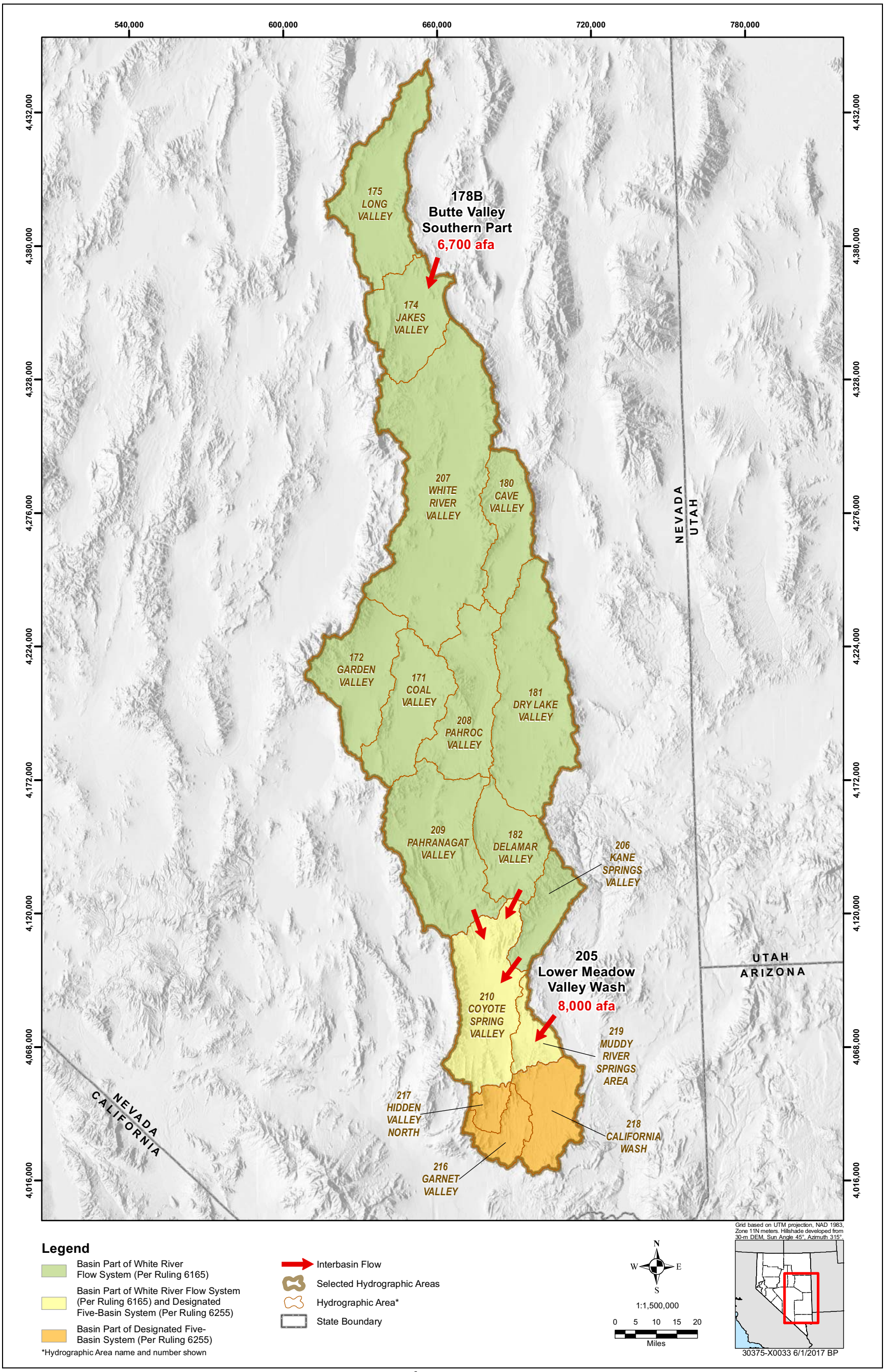

Figure 1-4
Overview of the Original WRFS Compared to the Five-Basin System

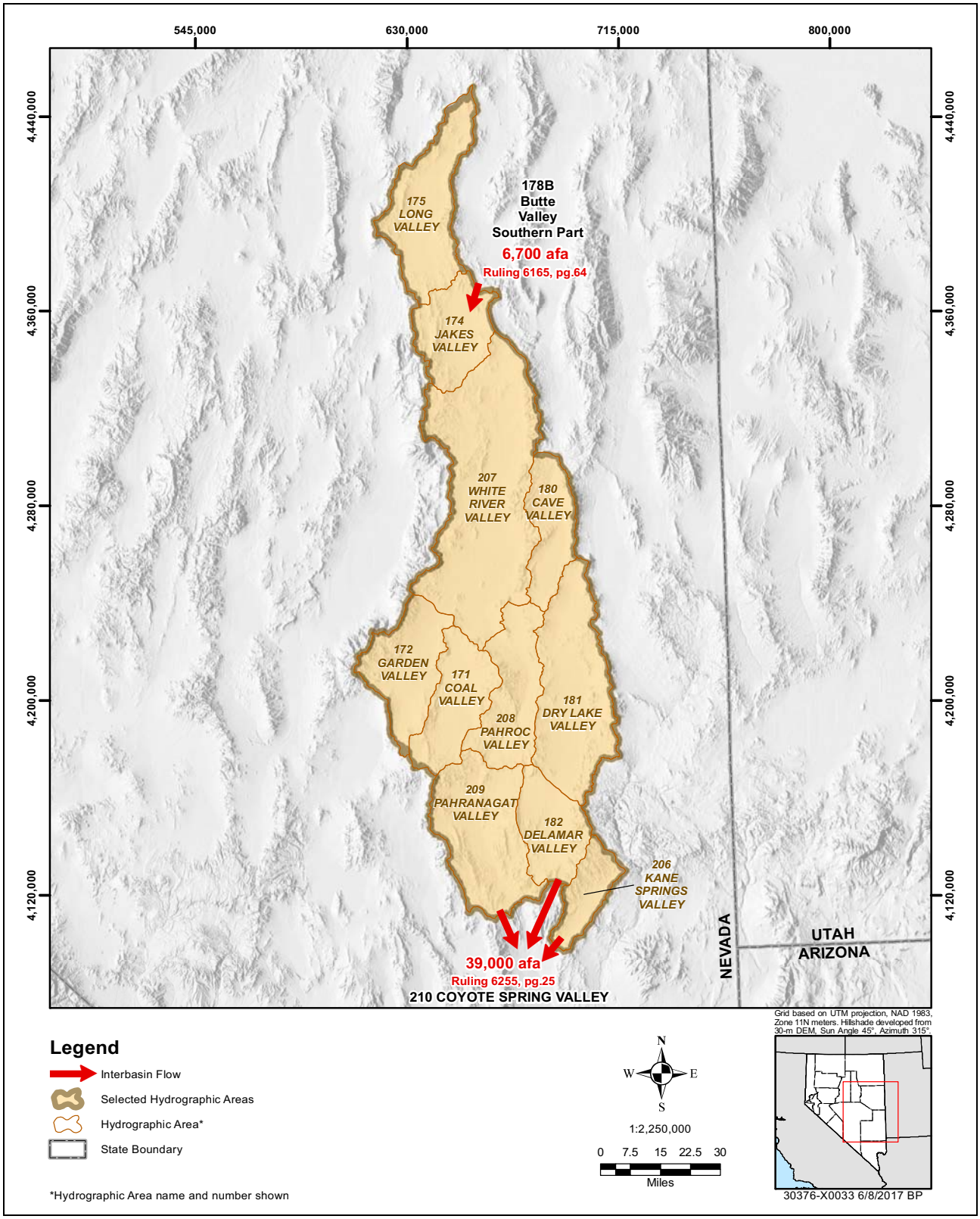

Figure 1-5
Overview of the Northern 11 WRFS Basins used in this Analysis

1.4 Inflow/Outflow of 11-Basin WRFS

The 11-basin WRFS was analyzed using a mass-balance equation in order to determine the water available for groundwater commitments. The analysis includes interbasin flow going into the 11-basin WRFS (inflow), precipitation recharge for each of the 11 basins (inflow), and interbasin flow exiting the WRFS (outflow). Total inflows (WRFS inflow plus precipitation recharge) less total outflows (WRFS outflows) results in the amount of water available for use by committed groundwater resources within the 11-basin WRFS.

Output quantities from the SNWA Excel Solver were used to quantify the amount of precipitation recharge for each of the 11 basins (NDWR, 2014b, p. 25). The Excel Solver, also referred to as the Excel workbook in NSE Ruling No. 6255, is a tool used by SNWA and modified by the NSE to estimate basin recharge and interbasin flows during the 2011 hearings. The quantities for precipitation recharge within the modified Excel Solver for each of the 11 basins were used in this report.

An overview of the inflow/outflow analysis applied to the 11 northern WRFS basins in this report is shown in Table 1-2. Subsurface inflow to the 11-basin WRFS is 6,700 afa, while 39,000 afa is allocated for outflow from the 11-basin WRFS. The precipitation recharge within all 11 basins combined is 136,702 afa. Inflows less outflows results in 104,402 afa available for use by committed groundwater resources within the 11-basin WRFS.

Table 1-2
Overview Inflow/Outflow Values for the 11 Northern WRFS Basins used in this Report

Basin No.	HA Name	Inflow to WRFS (afa)	Precipitation Recharge within WRFS (afa)	Outflow from WRFS (afa)
175	Long Valley	0.00	17,540.00	0.00
174	Jakes Valley	6,700.00	10,833.00	0.00
180	Cave Valley	0.00	12,860.00	0.00
207	White River Valley	0.00	36,109.00	0.00
208	Pahroc Valley	0.00	4,577.00	0.00
172	Garden Valley	0.00	20,701.00	0.00
171	Coal Valley	0.00	3,847.00	0.00
181	Dry Lake Valley	0.00	14,969.00	0.00
182	Delamar Valley	0.00	6,067.00	39,000.00
209	Pahranagat Valley	0.00	5,347.00	
206	Kane Springs Valley	0.00	3,852.00	
Total		6,700.00	136,702.00	39,000.00

2.0 METHODOLOGY

This chapter describes the methods used to estimate the quantity of committed groundwater rights and spring rights within groundwater discharge areas for each of the hydrographic areas (HAs) within the scope of analysis for this report. Each HA was analyzed independently and is presented in separate chapters within this report. Table 2-1 lists the HAs analyzed and their assigned chapter within this report. The terms groundwater and underground water are used interchangeably throughout this report. Also, while the Nevada Division of Water Resources (NDWR) lists the total volume of a permit in acre-feet annually (afa) or acre-feet seasonally (afs), this report quantified rights using afa, rounded to the hundredth place. For reference, definitions of applicable terms are taken directly from the NDWR Water Words Dictionary and are included in Appendix ES-1.

Table 2-1
Hydrographic Areas Analyzed in this Report

Chapter	HA Name	HA Number
3	Long Valley	175
4	Jakes Valley	174
5	White River Valley	207
6	Cave Valley	180
7	Garden Valley	172
8	Coal Valley	171
9	Pahroc Valley	208
10	Dry Lake Valley	181
11	Pahranagat Valley	209
12	Delamar Valley	182
13	Kane Springs Valley	206

Each HA is presented as an individual chapter within this report and each chapter is further divided into individual sections. The same methodology was used to analyze each HA, although some of the steps within this process are not applicable to all HAs. Table 2-2 lists the section titles within each chapter of this report. The following is a summary of the methodology used to quantify committed groundwater rights and spring rights within groundwater discharge areas within each of the HAs. The summary also includes references to the specific sections of each chapter within this report where each method was completed.

Table 2-2
Section Titles

Section Number within Each Chapter	Title for Each Section
1	Introduction
2	Summary of Water Rights
3	Analysis of Groundwater Irrigation Water Rights (Sole Source vs Supplemental)
4	Evaluation of NDWR HA Summary
5	Analysis of Springs Considered as Groundwater for Accounting Purposes
6	Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights
7	Supplemental Analysis of Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights
8	Estimated Crop Consumptive Use
9	Estimated Domestic Water Use
10	Summary

2.1 Quantify and Classify Active Water Rights

The NSE administers water rights within the State of Nevada and retains the records of each individual water right. Every water right is assigned a unique number. The official physical copies of those records are located at the NDWR main office in Carson City, Nevada. Additionally, the NDWR maintains an online water-rights database, including scans of most of the applications, permits, certificates, and maps, as well as ownership and other applicable information. The NDWR online water-rights database has the majority of the pertinent information required for this report. However, the official records were reviewed if the information was not available online.

All active water rights were queried to determine quantity and type. “Active water rights” for this report are those listed as Certificated, Decreed, Permitted, Reserved Rights, or Vested Claims. Water rights with a status of Ready for Action (RFA), Ready for Action - Protested (RFP), and Applications (APP) are not considered active water rights for purposes of this report. This is because these are only applications to acquire water rights or change existing rights that may not become active water rights in the future, and are subject to NSE approval. Some may consider these applications to be “paper water rights,” with the assumption that they are valid, existing rights, but because of the uncertainty regarding their approval, they are not counted as committed groundwater resource in this report.

Active water rights were identified and presented in tables, which include the total number of water rights, number of water rights identified by source, number of water rights identified by status, and number of water rights identified by manner of use. The summary and classification of the rights within each basin is presented in Section 1, *Introduction*, and Section 2, *Summary of Water Rights*, for each basin chapter of this report. The purpose of these sections is to ensure the total number of water rights are included and properly analyzed. All groundwater rights were reviewed to determine the total quantity of rights that are attributed to each manner of use.

Groundwater rights with a manner of use other than irrigation (commercial, domestic, municipal/quasi-municipal, stockwater, wildlife, mining and milling, and other) were analyzed to determine if multiple rights would be considered to have a total combined duty limit. A combined duty is assigned by the NSE as a total duty limit for multiple rights, which can be less than the additive total of the individual rights. For these rights, it is not appropriate to add the total duty for each right, but rather to use the combined duty limitation for each group of rights. These limitations are documented within permit or certificate terms. The permit and certificate terms of groundwater rights with a manner of use listed as commercial, domestic, municipal/quasi-municipal, stockwater, wildlife, mining and milling, and other, were reviewed individually to determine if they had any combined duty limitations.

A vested claim is a claim to a water right created by a pre-statutory use of water, established by diverting and placing the water to beneficial use prior to March 1, 1905 (for surface water), March 22, 1913 (for artesian groundwater), or prior to March 25, 1939 (for percolating groundwater). A vested claim is only a claim to the historical use of a pre-statutory water right. The validity of a vested claim is determined during an adjudication and may result in the establishment of a decreed water right if confirmed by the court. For the purpose of this report, vested claims are typically treated as valid active rights, whether decreed or not. The exception to this consideration is if, based on a review of the vested claim documentation, the date of initial use of the claim is after the statutory requirement to be eligible for a vested claim, or based on review of hydrographs, the amount of water claimed has not been available at the source (e.g., the claim flow is higher than historically measured and therefore may not be available for appropriation).

2.2 Quantify Sole Source Versus Supplemental Groundwater Irrigation Water Rights

All groundwater irrigation rights were reviewed to determine the quantity, if any, of water rights that can be considered supplemental to other groundwater rights. Supplemental groundwater irrigation rights can have different points of diversion (PODs) (e.g., wells), but the same place of use (POU). The junior of these rights would be considered supplemental to the senior right (sole source or non-supplemental). Groundwater supplemental rights are not considered an additional allocation of committed groundwater resources for a basin. This is because the water used to irrigate the POU is not the sum of all the rights within a single POU, but instead is limited by the maximum permitted duty (af/acre) of that POU. In other words, there is a limit to the amount of water used per acre of land, so it is not appropriate to simply add all water rights with the same POU together to quantify committed groundwater rights.

A comprehensive analysis of all groundwater rights was completed in order to determine the quantity of sole source and supplemental groundwater rights in each HA. The POU of each irrigation groundwater right was determined through the review of decrees, certificates, permits, vested claims, and applications, along with their associated maps filed with the NDWR. The groundwater supplemental analysis was completed using POU spreadsheets and also by mapping the water rights. The spreadsheets include the location of each irrigation groundwater right POU by 40-acre subdivision. The acreage and subdivision locations were obtained from the pertinent filed documents. The POU per quarter-quarter (40-acre subdivision) was sorted by location. This sorting process resulted in the identification of all irrigation rights that have a POU within the same 40-acre

subdivision. If none of these rights were within the same 40-acre subdivision, then it was concluded that these rights are all sole source (not supplemental to each other). If it was determined that any of these rights were within the same 40-acre subdivision, then a further analysis was conducted. This further analysis included a review of the proof of beneficial use (PBU) maps to determine if the water rights, in fact, have the same POU and are supplemental.

The result of the analysis of groundwater irrigation water rights was a quantification of groundwater irrigation rights that are considered sole source and those that are considered supplemental to other water rights. Only the groundwater irrigation rights within the duty limit for each POU are included to estimate the total committed groundwater resources per HA. The NDWR has also compiled this information and it is presented in the HA Summary of each area. The quantification of sole source groundwater rights attributed to each manner of use in this report was compared with the NDWR quantifications.

The analysis of supplemental groundwater is presented in Section 3, *Analysis of Groundwater Irrigation Water Rights (Sole Source versus Supplemental),* and a comparison of this analysis with the NDWR HA Summary is presented in Section 4, *Evaluation of NDWR Hydrographic Area Summary,* of each chapter in this report. Variances between this report and the NDWR HA Summary were identified, and potential reasons for the differences are provided.

2.3 Spring Rights Within Groundwater Discharge Areas

Water rights listed as springs or from spring sources could, depending on their source of supply, be considered groundwater commitments for this analysis. For example, if the spring is perched or located within the mountain block, it would not be considered a groundwater commitment in this analysis, but if the spring is located within the groundwater discharge area, it would be considered in this analysis. The SNWA report, *Hydrology and Water Resources of Spring, Cave, Dry Lake, and Delamar Valleys, Nevada and Vicinity* (SNWA, 2011), identified the procedures for delineating groundwater discharge locations. This report used the Excel Solver, which included shapefiles showing where groundwater discharge locations are within the entire WRFS. Based on discussions with SNWA hydrologists regarding the SNWA report and review of that report, it was determined that the shapefiles of the Excel Solver would be utilized to identify springs located within the groundwater discharge locations. These springs, for the purpose of this study, are considered groundwater resources. Throughout this report, rights on springs located within the groundwater discharge locations are referred to as “spring rights within the groundwater discharge area.” The reason these springs can be considered ground water allocations for this analysis is that the flow from the springs supported the plant discharge that was mapped to quantify the water available in the WRFS.

NDWR online resources were used to identify water rights with a source identified as a spring or from spring sources. The spring locations of the corresponding water rights were used in conjunction with the identified groundwater discharge areas to determine those spring water rights that could be considered groundwater resources in this analysis. This was performed on an individual basis for each of the 11 basins. The summary of the analysis of spring rights, that are considered groundwater resources, are included in each chapter as Section 5, *Analysis of Springs Considered as Groundwater for Accounting Purposes.*

Additional analysis was completed to accurately quantify committed groundwater resources from springs for each basin. This additional analysis included an analysis for spring irrigation rights within the groundwater discharge area that are supplemental to groundwater irrigation rights, as well as a determination of combined duty limitations for nonirrigation rights. This analysis used the same process as previously presented in Section 2.2. The summary of the supplemental analysis of spring rights within the groundwater discharge areas and groundwater rights is included in each chapter as Section 6, *Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights.*

2.4 Quantification and Adjustment for Groundwater Supplemental to Surface Water Irrigation Rights

Groundwater and spring rights within the groundwater discharge areas, with a manner of use as irrigation, are considered supplemental to existing surface water irrigation rights if these groundwater rights are appurtenant to the same POU as the surface water rights. Groundwater and spring irrigation rights, within the groundwater discharge areas that are supplemental to surface water rights, are not used to their maximum duties each season. This is because surface water is normally used when surface water is available during spring/early summer snow pack runoff, and groundwater is used only when the surface water is not available. For this analysis, the total groundwater and spring irrigation rights within the groundwater discharge areas supplemental to surface water irrigation rights was quantified, as well as an estimate of the portion of these rights expected to be used in an average year.

The POU of surface water irrigation rights was determined through a review of permits, certificates, vested claims, decrees, and their associated maps. The POU of surface water irrigation rights was input into a spreadsheet, which listed each right and total acreage of the water right POU per township, range, section, quarter, and quarter-quarter. This spreadsheet was merged with the previously discussed groundwater (and springs considered as groundwater resources) POU spreadsheet and sorted by location. All locations where the POU of groundwater and spring irrigation rights within the groundwater discharge area that were within the same 40-acre subdivision as surface water irrigation rights, were identified for additional evaluation.

The POU of surface water irrigation rights were mapped for all township and ranges that also had groundwater or spring irrigation rights within the groundwater discharge areas. The quantity of groundwater or spring irrigation rights within the groundwater discharge areas, considered supplemental to surface water irrigation rights, was determined based on an analysis of the following:

- Merged spreadsheets of groundwater and surface water rights.
- Permits, certificates, vested claims, decrees, and their associated maps.
- Mapped locations of the surface and groundwater irrigation water rights.

This resulted in a determination of the quantity of groundwater and spring irrigation rights within the groundwater discharge areas that are supplemental to surface water rights.

As stated previously, groundwater irrigation rights that are supplemental to surface water irrigation rights are not normally used to their full permitted or certificated maximum duty every year. Surface water is generally preferred because groundwater has additional costs associated with pumping water

from groundwater wells. Spring irrigation rights within the groundwater discharge areas can also be co-located with stream rights. Irrigation from a spring source and stream source at the same location would be limited to the maximum duty per acre allowed and therefore, for the purpose of this report, it is assumed that the stream source would be used to its full availability in conjunction with supplemental spring irrigation rights.

Additional information was reviewed in order to estimate the percentage of supplemental irrigation groundwater rights expected to be used within a specific HA in an average year. The information reviewed included the location and duty of existing surface water rights, existing ground water rights, and hydrographs of stream flow patterns. The specific information and the rationale for estimating the percentage of supplemental groundwater that would be expected to be used is included in each basin summary, if applicable. The percentage of supplemental groundwater estimated to be used in an average year is the amount considered to be the committed groundwater resource for that right. The supplemental groundwater to surface water analysis is presented in each chapter as Section 7, *Supplemental Analysis of Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights*.

2.5 Estimated Crop Consumptive Use

Irrigation rights have a maximum duty (afa of water per acre of land) that can be applied for irrigation per season. A portion of the applied water is consumed by growing the crop, and the remainder is assumed to be returned to the groundwater system and may be available for other uses. The amount consumed by the cultivation minus precipitation is equal to the Net Irrigation Water Requirements (NIWR). The duty in excess of the NIWR is equal to the nonconsumptive portion of the water rights, and is the portion of the water rights that returns to the groundwater system. This portion of groundwater is not included in the committed groundwater resources of the HAs.

The NSE has established NIWR data per basin within Nevada (Huntington and Allen, 2010). Groundwater and spring irrigation rights within the groundwater discharge areas that are not supplemental to other irrigation rights were analyzed to determine irrigated acreage per each specific duty. The consumptive use and nonconsumptive use portion of each water right was then quantified. Only the consumptive use portion of the groundwater rights was considered to be part of the committed groundwater resources within the HA. The consumptive use analysis is presented in each chapter as Section 8, *Estimated Crop Consumptive Use.*

2.6 Estimated Domestic Water Use

“Domestic Water Use” is defined as a use for culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, and is limited to 2.00 afa per household. The State of Nevada does not require a permit for domestic groundwater use. As such, these rights are not listed in the NDWR Hydrographic Summaries.

Information regarding the number of domestic wells, yearly pumping total per well, and the quantity of secondary recharge back to the groundwater system of water from a domestic well (through septic systems) is required to accurately estimate these domestic uses of groundwater in each of the 11

basins within the WRFS. The NDWR well-driller's log database includes a list of all wells that have been reported to NSE. The list denotes wells that have been drilled for domestic use purposes.

A conservative estimate that likely overestimates the amount of water used is that each of these wells corresponds to a domestic well user, each well is using 2.00 afa, and all the water is consumptively used (no return flow to groundwater through septic tanks). Domestic use does not require a permit from the NSE, but well-driller's logs indicate the date a well is completed, and if those wells were drilled for domestic uses. Nevada Revised Statues 534.080(4) gives domestic wells a priority date based on when the well was drilled. However, for the purpose of this report, all domestic rights are assumed as having a priority date before October 17, 1989.

2.7 Summary of Committed Groundwater Resources

The total Committed Groundwater Resources is summarized for each HA. The summary presents committed groundwater resources with priority dates prior to and including SNWA permits (October 17, 1989), as well as after that date. The estimated groundwater commitments are presented in each chapter as Section 10, *Summary*.

2.8 Methodology Flow Diagram

Figure 2-1 shows the steps presented in this methodology section, which are used to estimate the committed groundwater resources of 11 basins within the WRFS.

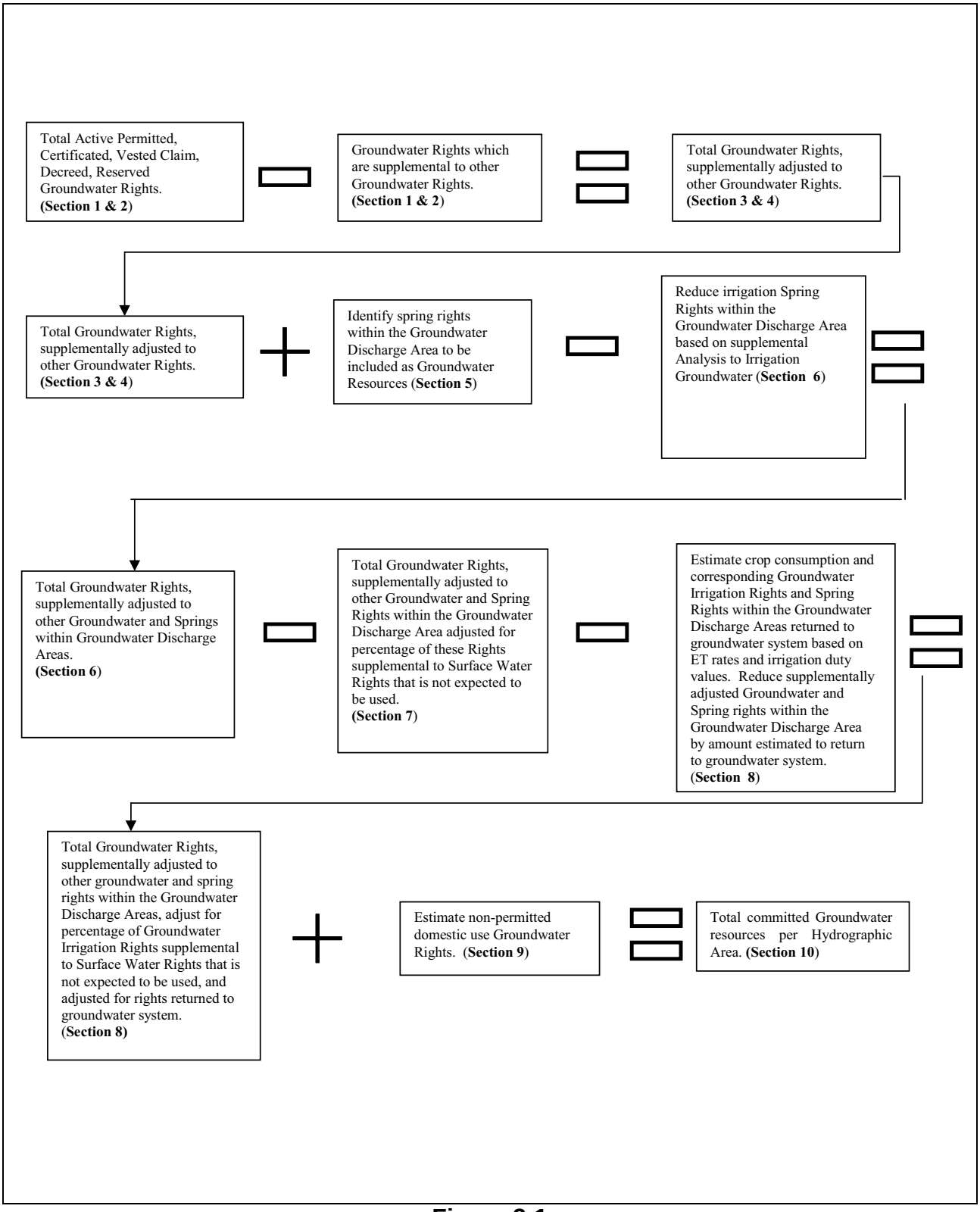

Figure 2-1
Flow Chart Showing Process and Steps to Analyze and Quantify Existing Groundwater Rights

3.0 LONG VALLEY

3.1 Introduction

NDWR HA 175, Long Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Region Hydrographic Region. Figure 3-1, is a map of the location of Long Valley. The purpose of this chapter is to analyze the existing water rights within Long Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the Public Land Survey System (PLSS). Figure 3-2 shows the townships and ranges in Mount Diablo Baseline and Meridian (MDBM) located within Long Valley.

3.2 Summary of Water Rights in Long Valley

Active water rights within Long Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

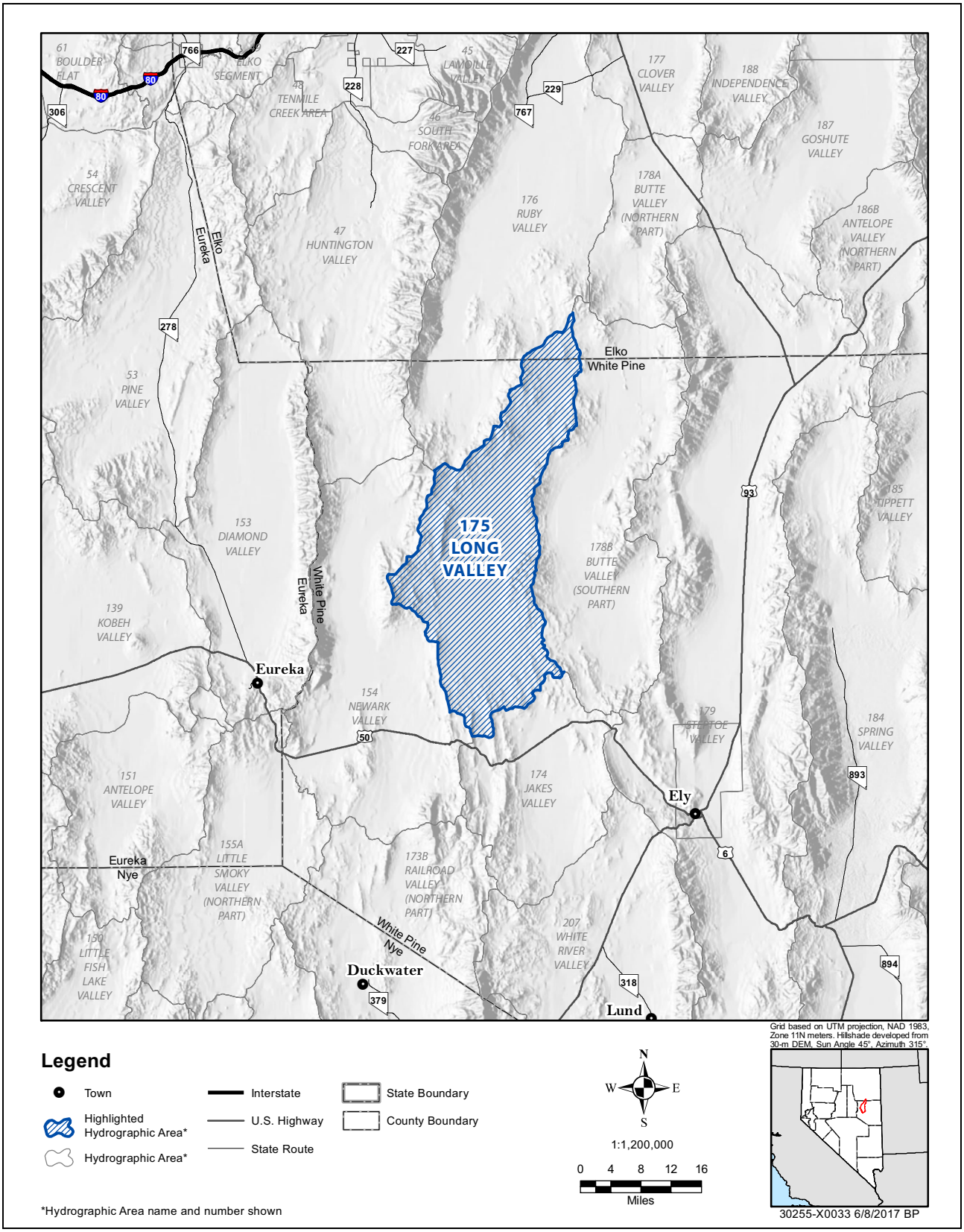

Figure 3-1
Long Valley Hydrographic Area

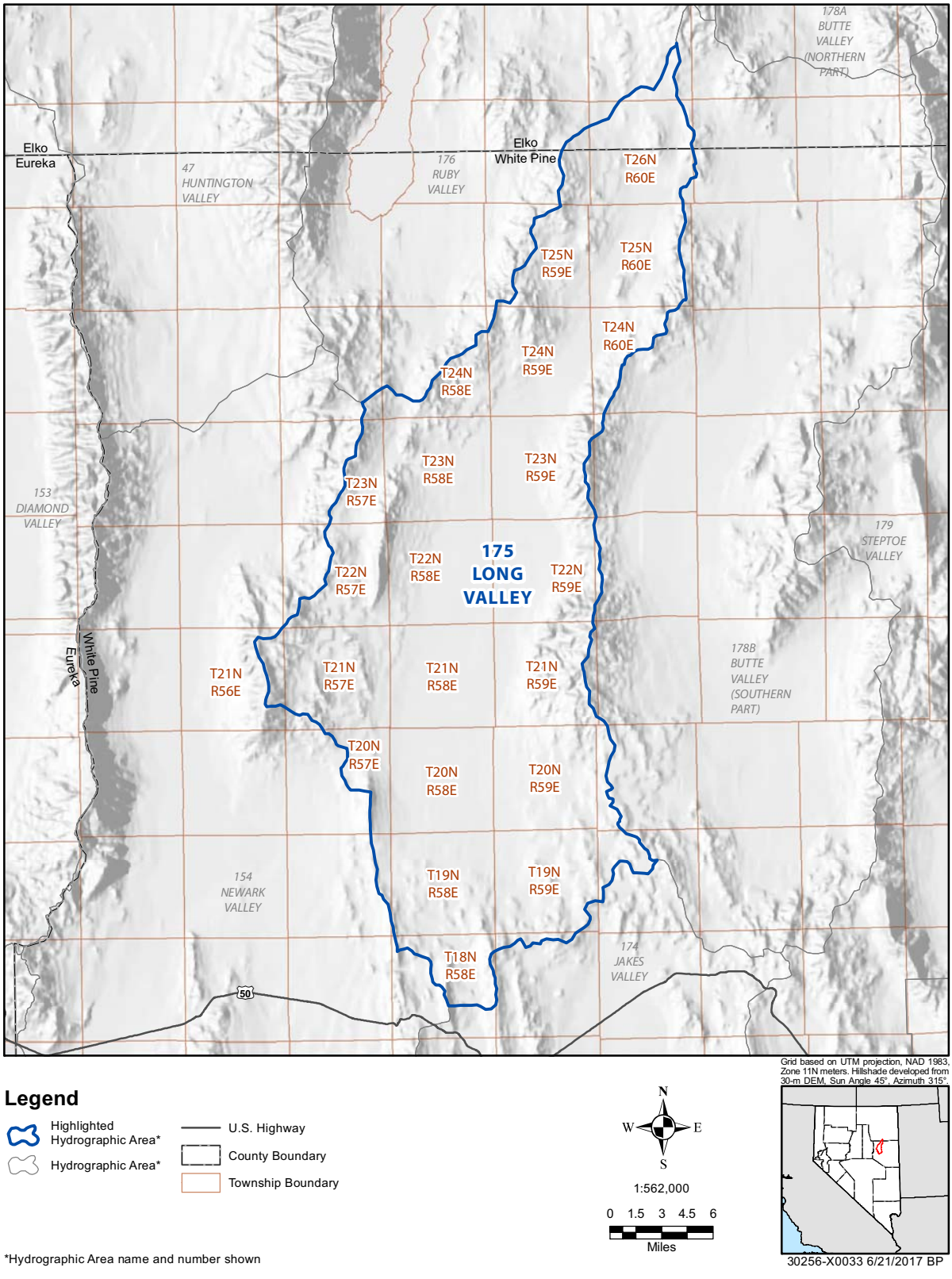

Figure 3-2
Township/Ranges Within Long Valley

The NDWR hydrographic abstract, queried for all active records within Long Valley, is included as Appendix 3-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 49 active water rights that are listed as vested, certificated, and permitted water rights. Appendix 3-2 lists all the active water rights in Long Valley, and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include stockwater, wildlife, mining and milling, and irrigation. Table 3-1 lists the number of records within Long Valley in the NDWR online water-rights database per manner of use and their current status.

Table 3-1
Number of Active Records Listed per Manner of Use and Status in Long Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted
Mining and Milling	8	0	1	7
Stockwater	38	1	37	0
Wildlife	1	0	1	0
Irrigation	2	0	1	1
Total	49	1	40	8

The sources of water for the 49 active water rights and active applications for water rights include spring and underground. Table 3-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 3-2
Number of Active Records Listed per Manner of Use and Source in Long Valley

Manner of Use	Number of Records	Spring	Underground
Mining and Milling	8	0	8
Stockwater	38	23	15
Wildlife	1	1	0
Irrigation	2	1	1
Total	49	25	24

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 3-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Long Valley.

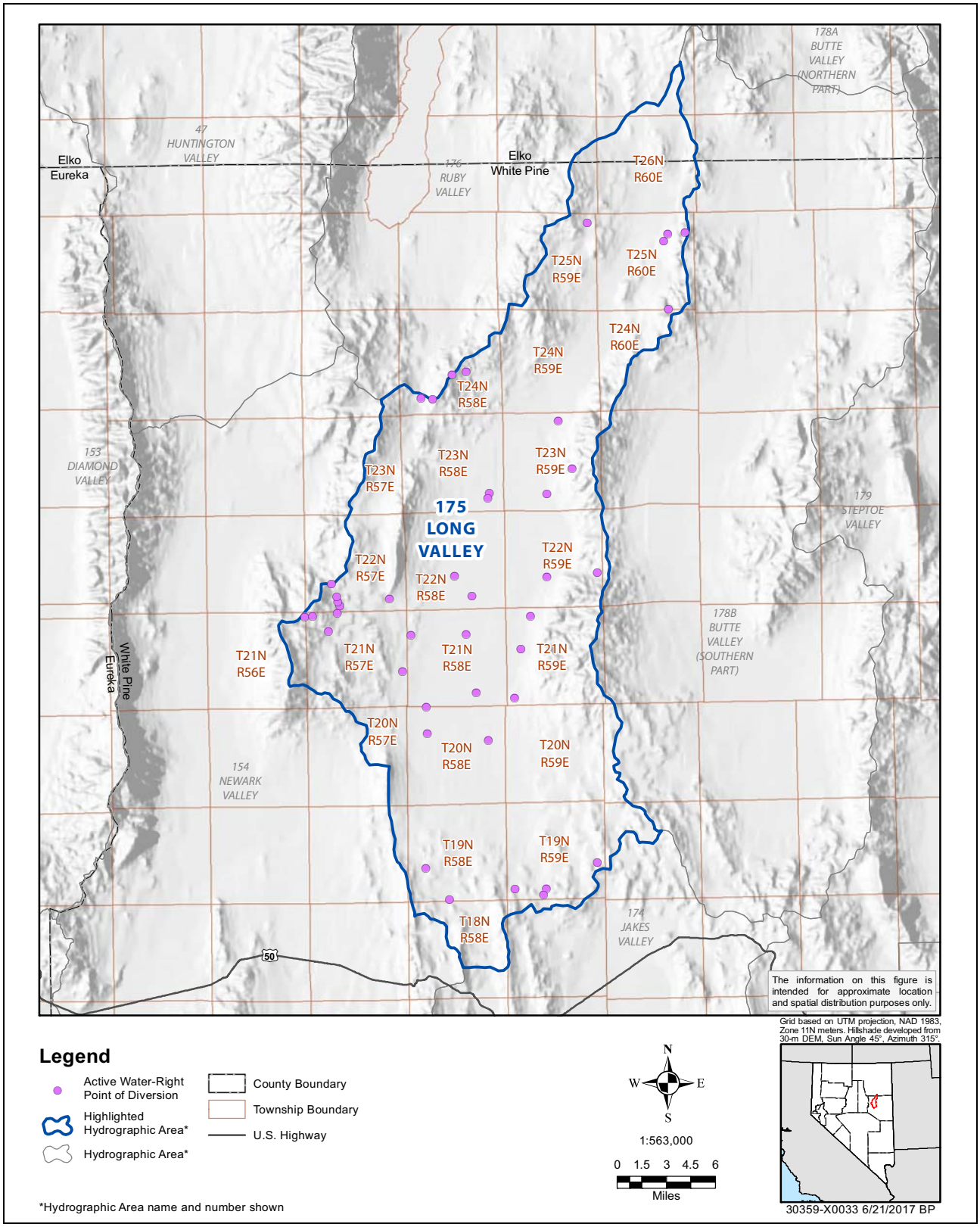

Figure 3-3
PODs for all Active Water Rights Within Long Valley

3.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Long Valley, found in Appendix 3-3, was downloaded from the NDWR online water-rights database. The HA Summary lists the appropriated water from underground sources within Long Valley. It also includes the manners of use of irrigation, mining and milling, and stockwater. The total for these groundwater rights is listed as 4,749.36 afa. The HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

The water rights were compiled and reviewed based on the manner of use (irrigation, mining and milling, wildlife, and stockwater). The following sections include summaries of each manner of use category, with a breakout of groundwater active rights and a comparison of these rights to the NDWR HA Summary totals.

3.2.1.1 Mining and Milling Rights

The NDWR online water-rights database includes eight active records with the manner of use as mining and milling. Appendix 3-4 is a copy of the hydrographic abstract queried by HA (Long Valley - Area 175), manner of use (mining and milling), and status (certificate, decreed, permit, reserved, vested). The sources for all eight of these rights are listed as groundwater.

The eight mining and milling groundwater rights are listed as permitted (7) and certificated (1). All eight mining and milling permits, or their base rights, include the following statement: *"The manner of use of water under this permit is by nature of its activity a temporary use and any application to change the manner of use granted under this permit will be subject to additional determination and evaluation with respect to permanent effects on existing rights and the resource within the groundwater basin."*

NSE ruling No. 5195 states:

> *Many of the mining and milling permits issued within Buffalo Valley are by the nature of their activity a temporary use with the expectation that upon permanent cessation of all activity all water granted will revert back to the source. This requirement, which is clearly stated within the language of the permit terms, allows this temporary use of water to still be considered part of the available groundwater source. However, some of the mining and milling permits do not have language in the permit terms indicating a temporary use of water, and must be considered to be permanent appropriations of water use* (NDWR, 2003).

The eight mining and milling groundwater rights, based on Ruling No. 5195 and the inclusion of the temporary use clause in the permits or their base rights, should not be considered a committed groundwater resource. Therefore, for this analysis, 0.00 afa of mining and milling groundwater rights will be considered committed resources. This differs from the 3,999.85 afa of underground mining and milling rights listed in the NDWR HA Summary, Appendix 3-3. This difference is attributed to the evaluation of the temporary nature of the mining and milling rights.

3.2.1.2 Stockwater Rights

The NDWR online water-rights database includes 38 active records with the manner of use listed as "stockwater." Appendix 3-5 is a copy of the hydrographic abstract queried by HA (Long Valley - Area 175), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (23) and groundwater (15).

All of the 15 groundwater rights are certificated. Based on a review of certificate conditions, these 15 underground stockwater rights have a combined total duty of 269.51 afa. None of these 15 rights appear to be supplemental in nature. This is consistent with the 269.51 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 3-3.

Only one of the groundwater rights (Permit No. 54181) has a priority date after October 17, 1989. The duty for this right is 35.84 afa. Appendix 3-2 lists all the active water rights in Long Valley and identifies the records that have priority dates after October 17, 1989.

3.2.1.3 Wildlife Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "wildlife." Appendix 3-6 is a copy of the hydrographic abstract queried by HA (Long Valley - Area 175), manner of use (wildlife), and status (certificate, decreed, permit, reserved, vested). This right is listed with a source as spring.

The single wildlife right is not from an underground source. The total duty from this analysis for these underground wildlife rights is 0.00 afa. This total is consistent with the 0.00 afa of underground wildlife rights listed in the NDWR HA Summary, Appendix 3-3.

3.2.1.4 Irrigation Water Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "irrigation." Appendix 3-7 is a copy of the hydrographic abstract queried by HA (Long Valley - Area 175), manner of use (irrigation, irrigation-Carey Act, irrigation-Desert Land Entry [DLE], decreed), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (1) and groundwater (1).

A single right is listed as underground. The single underground irrigation water right is listed as permitted. The total duty from this analysis for this irrigation underground right is 480.00 afa. This total is consistent with the 480.00 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 3-3.

The single underground irrigation right has a priority date after October 17, 1989, and a duty of 480.00 afa. Appendix 3-8 shows the POU of the single underground water right.

3.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 3.2 identified all active underground water rights within Long Valley. Because only one active groundwater irrigation right was identified, it was determined that there could be no groundwater irrigation rights that may be considered supplemental to other groundwater irrigation rights.

3.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 3-3, lists supplementally adjusted groundwater rights for commercial, construction, municipal/quasi-municipal, stockwater, recreation, and irrigation in the amount of 4,749.36 afa. Table 3-3 summarizes the volume of existing groundwater rights, supplementally adjusted for Long Valley. Current analysis is divided into rights with priority dates before October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analyses completed in Section 3.2 and Section 3.3 of this report.

Table 3-3
Long Valley Existing Groundwater Rights Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Mining and Milling	3,999.85	0.00	0.00	0.00
Stockwater	269.51	269.51	35.84	233.67
Wildlife	0.00	0.00	0.00	0.00
Irrigation	480.00	480.00	480.00	0.00
Total	4,749.36	749.51	515.84	**233.67**

3.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 3-4 shows the location of rights with a source listed as spring, with a POD located within the groundwater discharge areas, which will be accounted for as groundwater resources in this analysis. A single identified POD is shown as a blue dot. The groundwater discharge areas are identified as green-filled polygons. For this analysis, the single spring that is located within the groundwater discharge area will be considered a groundwater resource. The following sections include a review of this spring right within Long Valley per each manner of use.

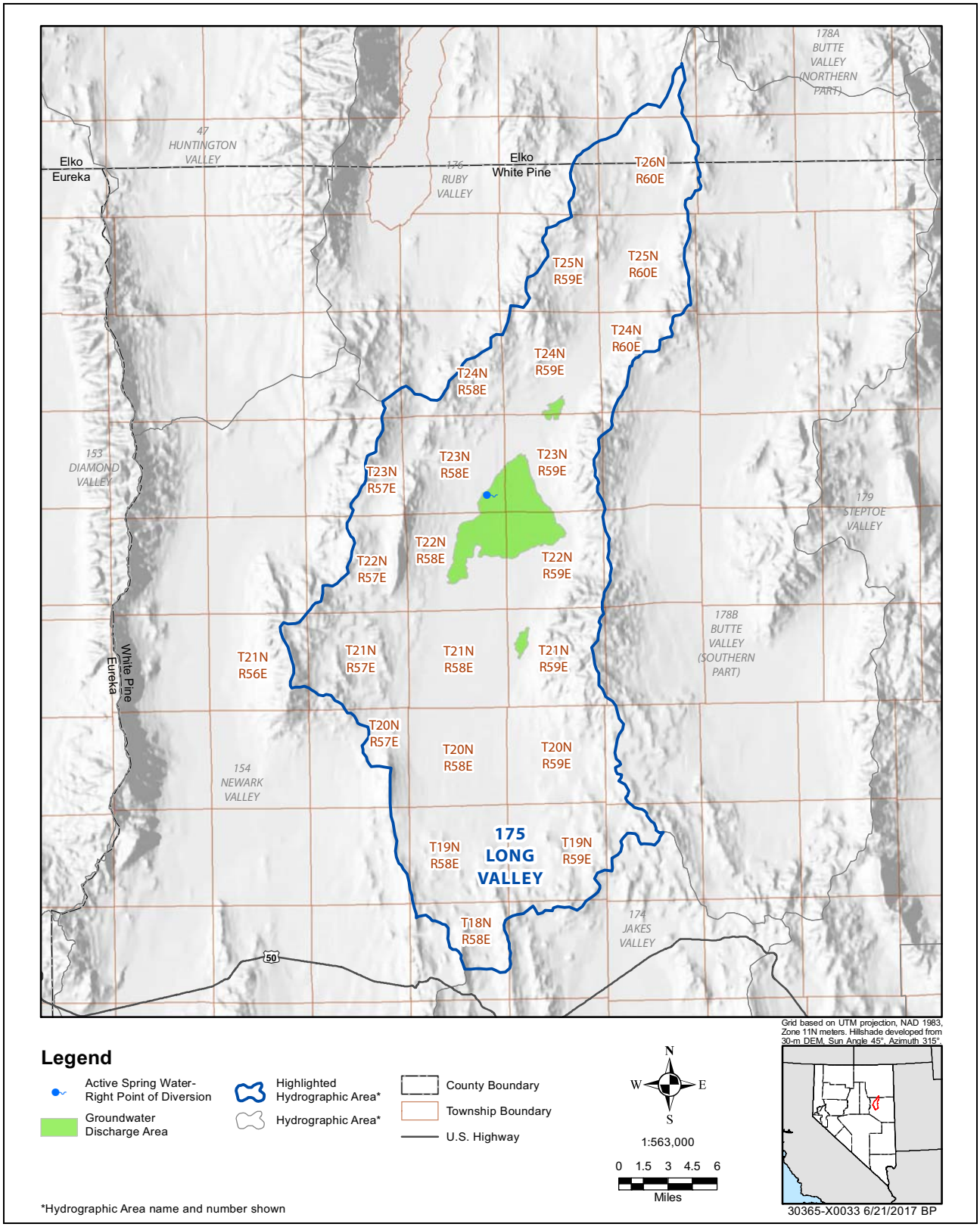

Figure 3-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Long Valley

3.5.1 Stockwater

Review of Appendix 3-5 shows 23 stockwater rights with a source listed as spring. None of these rights are located within the groundwater discharge areas of Long Valley. For this analysis, none of these rights will be allocated as groundwater commitments.

3.5.2 Wildlife

Review of Appendix 3-6 shows one wildlife right with a source listed as spring. This single reserved right is not located within the groundwater discharge areas of Long Valley. For this analysis, this right will not be allocated as a groundwater commitment.

3.5.3 Irrigation

Review of Appendix 3-7 shows one irrigation right with a source listed as spring. This single reserved right is located within the groundwater discharge areas of Long Valley. The single spring irrigation right is certificated right No. 35797, is located within the groundwater discharge area and will be considered a groundwater resource for this analysis. Right No. 35797 has a duty of 30.80 afa and has a priority date prior to October 17, 1989.

3.5.4 Spring Summary

Table 3-4 is a summary of the preceding analysis of spring rights considered to be groundwater resources within Long Valley, listed for each manner of use. The totals for the report's current analysis are divided into rights with priority dates before, on, and after October 17, 1989, as well the total of both. Table 3-4 does not contain a column presenting the NDWR totals for spring rights considered to be groundwater because NDWR does not publish such data.

Table 3-4
Long Valley Spring Rights within Groundwater Discharge Areas Summary

	Current Analysis (afa)		
Manner of Use	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Stockwater	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Irrigation	30.80	0.00	30.80
Total	30.80	0.00	**30.80**

3.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 3.5.3 identified a single spring irrigation right No. 35797, which will be considered a groundwater resource for this analysis; therefore a supplemental analysis of irrigation groundwater and irrigation spring rights is required.

Groundwater rights would be considered supplemental to spring irrigation rights if they are appurtenant to the same POU. The spring right priority date is prior to the groundwater priority date. For this analysis, groundwater is treated as being supplemental to spring water if the POU is in the same location. Because only one active underground irrigation right was identified in Section 3.2.1.4, the process for determining if groundwater rights are considered supplemental was simplified by being able to compare permit, certificates, and POU maps of these two rights. A review of the Application No. 62956, Item 12 states, *"To the extent water from this source will overlap areas already irrigated from a surface source (35797), this water will be supplemental to such prior right"* (NDWR, 1997). Based on this information, it is assumed that for this analysis, all 7.70 acres (30.80 afa) of certificated right No. 35797 will be supplemented by groundwater. For this analysis, a Total Combined Duty (TCD) of 480.00 afa can then be attributed to 35797 and 62956. Appendix 3-9 and Appendix 3-10 show the spring and groundwater irrigation rights mapped by township and range.

3.7 Supplemental Analysis of Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 3.2 identified no permitted irrigation rights in Long Valley with a source listed as surface water. For this reason, supplemental analysis of groundwater and spring irrigation rights versus surface water irrigation rights will not be performed for Long Valley, as it is not applicable.

3.8 Estimated Crop Consumptive Use for Long Valley

Consumptive use of a crop is defined as that portion of the annual volume of water diverted under a water right that is transpired by growing vegetation, evaporated from soils, converted to nonrecoverable water vapor, incorporated into product, or otherwise does not return to the water source. The consumptive use of a crop is equal to the crop evapotranspiration (ET) less the precipitation amount that is effective for ET by the crop. In other words, it is the amount of water that is consumed in the growing of the crop.

The NIWR is equal to the ET actual minus the precipitation, and is the consumptive use portion of the irrigation water rights. When calculating total groundwater commitments in Long Valley, the nonconsumptive use portion of the water right is not included because it is returned to the water source and available for reuse.

The NDWR has established ET data per basin within Nevada. Long Valley is listed as having an ET actual for alfalfa of 3.40 ft and NIWR of 2.70 ft. Appendix 3-11 lists the various ET and NIWR rates for crops grown in Long Valley. Based on this data, the consumptive use portion for irrigation water rights in Long Valley is 2.70 ft.

Table 3-5 lists the total permitted and certificated acreage of irrigation groundwater and spring rights, their corresponding calculated consumptive use ratios, and the total adjusted consumptive use. (Table 3-5 only includes non-supplemental groundwater and spring irrigation rights, as the surface water supplemental analysis reduction has been applied). The nonconsumptive portion of these rights is the duty greater than a total of 2.7 afa per acre for each right.

Table 3-5
Consumptive Use with Varying Duties of Irrigation Groundwater Spring Rights Within Long Valley

				Priority Dates After October 17, 1989			Priority Dates Prior to, or on October 17, 1989		
Duty (af/acre)	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty**	**afa**
4.00	120.0	4.00	480.00	112.3	4.00	449.20	7.7	4.00	30.80
- 1.30 (nonconsumptive)	120.0	-1.30	-156.00	112.3	-1.30	-145.99	7.7	-1.30	-10.01
Total			**324.00**			**303.21**			**20.79**

Table 3-5 shows that if the entire 480.00 afa of groundwater and spring irrigation rights within Long Valley were used in a single season, only 324.00 afa would be consumed, and the remainder would be returned to the groundwater system. Therefore, only the consumptive use portion (324.00 afa) will be carried through in this analysis as a committed groundwater resource.

3.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic water use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring water right applications to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Long Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR and that are located within Long Valley. The list includes a total of 64 records and is included as Appendix 3-12. Each well log filed with the NDWR lists a proposed use of the drilled well. There are four records that list a proposed use as domestic (domestic use is signified with an "H" in the proposed use column).

There are two records for domestic wells drilled prior to October 17, 1989, and the remaining two records are for domestic wells drilled after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.0 afa, that all the water is consumptively used, and that there is no return flow to groundwater through septic tanks. Based on the four domestic wells identified, it is estimated that 8.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

Although half of these domestic wells were installed after October 17, 1989, this analysis will include the entire 8.00 afa as a groundwater commitment with a priority date prior to October 17, 1989.

3.10 Summary

The total committed groundwater rights for Long Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 3-6 presents the summary information derived by this analysis of all active groundwater rights, as well as any spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Long Valley, after supplemental and consumptive use adjustments are applied, is estimated to be 601.51 afa. The committed groundwater rights for Long Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 339.05 afa. The committed groundwater rights for Long Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 262.46 afa.

Table 3-6
Committed Groundwater/Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	8.00	N/A	8.00	0.00	N/A	0.00	8.00	N/A	8.00
Irrigation GW & Spring	480.00	N/A	324.00	449.20	N/A	303.21	30.80	N/A	20.79
Stockwater	269.51	N/A	269.51	35.84	N/A	35.84	233.67	N/A	233.67
Mining and Milling	0.00	N/A	0.00	0.00	N/A	0.00	0.00	N/A	0.00
Total	**757.51**		**601.51**	**485.04**		**339.05**	**272.47**		**262.46**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

4.0 JAKES VALLEY

4.1 Introduction

NDWR HA 174, Jakes Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 4-1 is a map of the location of Jakes Valley.

The purpose of this chapter is to analyze the existing water rights within Jakes Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 4-2 shows the townships and ranges (MDBM) located within Jakes Valley.

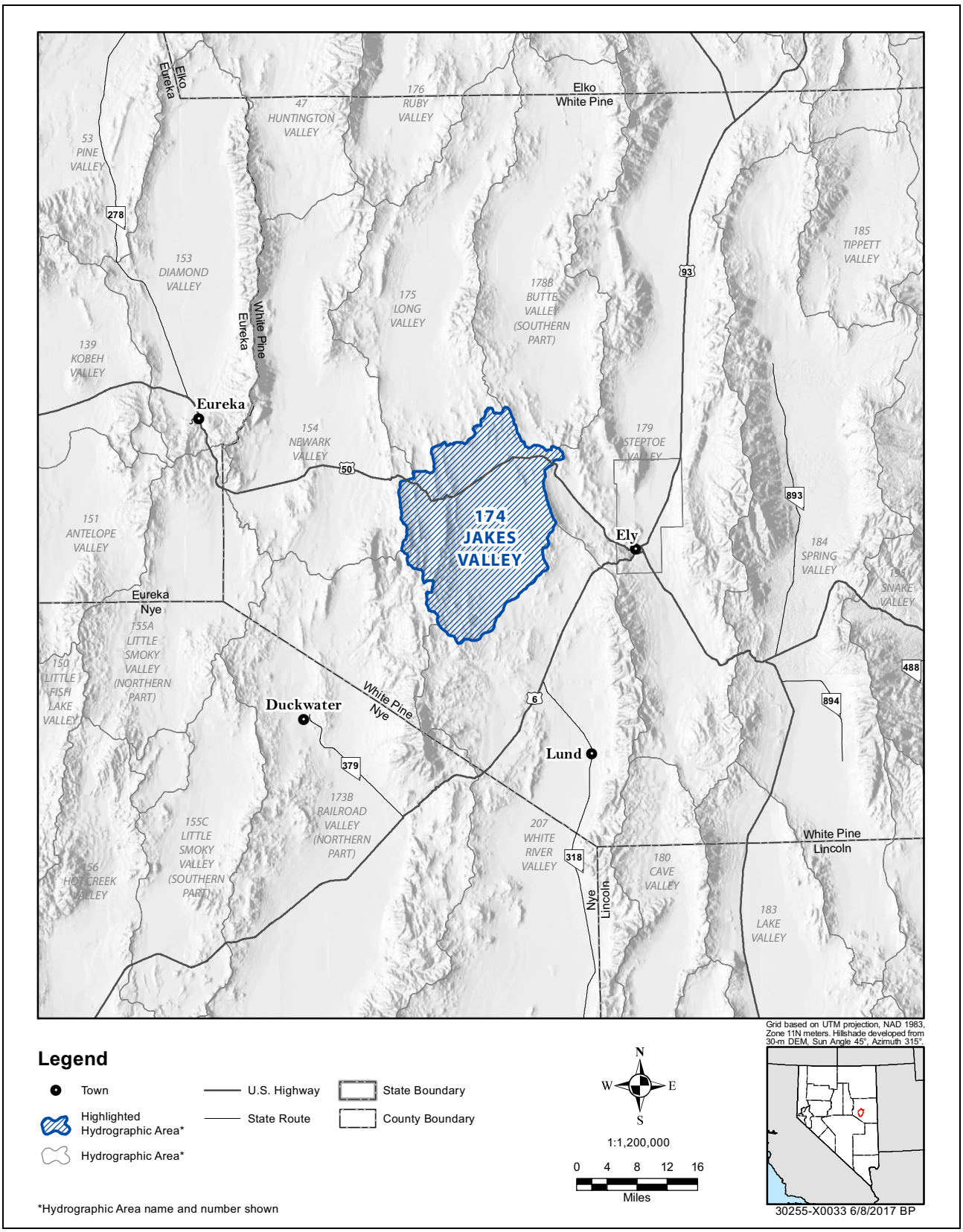

Figure 4-1
Jakes Valley Hydrographic Area

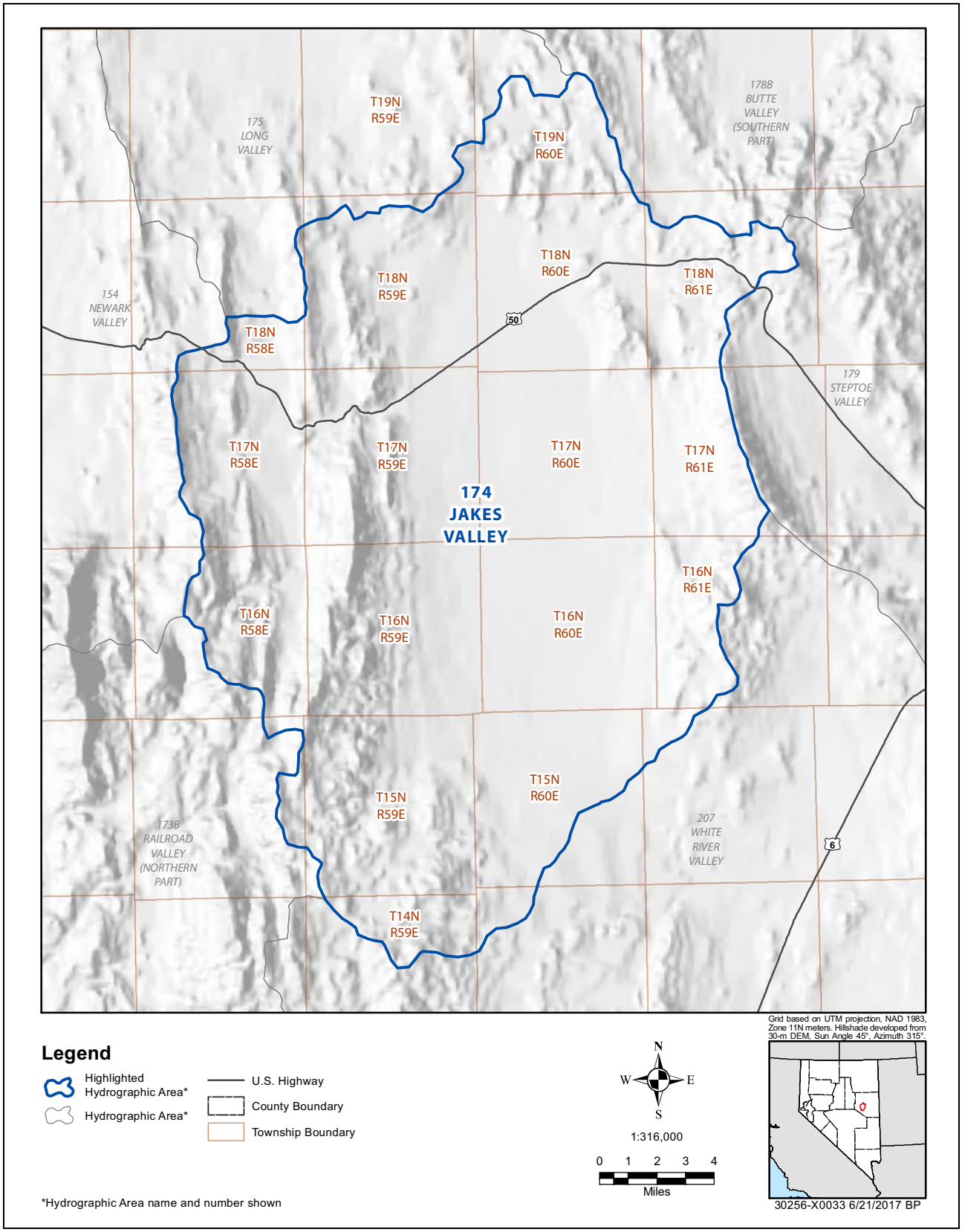

Figure 4-2
Township/Ranges within Jakes Valley

4.2 Summary of Water Rights in Jakes Valley

Active water rights within Jakes Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

The NDWR hydrographic abstract, queried for all active records within Jakes Valley, is included as Appendix 4-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 37 active water rights that are listed as vested, certificated, and permitted water rights. Appendix 4-2, lists all the active water rights in Jakes Valley and contains records that have priority dates before, on, and after October 17, 1989. The manners of use for these water rights include domestic, stockwater, quasi-municipal, storage, and irrigation. Table 4-1 lists the number of records within Jakes Valley in the NDWR online water-rights database per manner of use and their current status.

The sources of water for the 37 active water rights include stream, other surface water, spring, and underground. Table 4-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 4-1
Number of Active Records Listed per Manner of Use and Status in Jakes Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted
Domestic	1	0	1	0
Stockwater	27	8	18	1
Quasi-Municipal	2	0	2	0
Storage	4	0	4	0
Irrigation	3	0	3	0
Total	37	8	28	1

Table 4-2
Number of Active Records Listed per Manner and Source in Jakes Valley

Manner of Use	Number of Records	Stream	Other Surface Water	Spring	Underground
Domestic	1	0	0	1	0
Stockwater	27	6	2	16	3
Quasi-Municipal	2	0	0	2	0
Storage	4	4	0	0	0
Irrigation	3	2	0	1	0
Total	37	12	2	20	3

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 4-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Jakes Valley.

4.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Jakes Valley, found in Appendix 4-3, was downloaded from the NDWR online water-rights database. The HA Summary lists the appropriated water from underground sources within Jakes Valley, and includes the manner of use of stockwater. The total for these groundwater rights is listed as 28.85 afa. The HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

Jakes Valley active water rights were compiled and reviewed based on the manner of use (domestic, stockwater, quasi-municipal, storage, irrigation). The following sections include summaries of each manner of use category, with a breakout of groundwater rights and a comparison of these rights to the NDWR HA Summary totals.

4.2.2 Domestic Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "domestic." Appendix 4-4 is a copy of the hydrographic abstract queried by HA (Jakes Valley - Area 174), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring (1).

The single domestic right is not from an underground source. The total duty from this analysis for domestic underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground domestic rights listed in the NDWR HA Summary, Appendix 4-3.

4.2.3 Stockwater Rights

The NDWR online water-rights database includes 27 active records with the manner of use listed as "stockwater." Appendix 4-5 is a copy of the hydrographic abstract queried by HA (Jakes Valley - Area 174), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (6), other surface water (2), spring (16), and groundwater (3).

Two of the groundwater rights are certificated and one is permitted. Based on review of the permit and certificate conditions, these rights do not appear to have a combined duty limitation. The combined total of these rights is 28.85 afa. This is consistent with the 28.85 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 4-3.

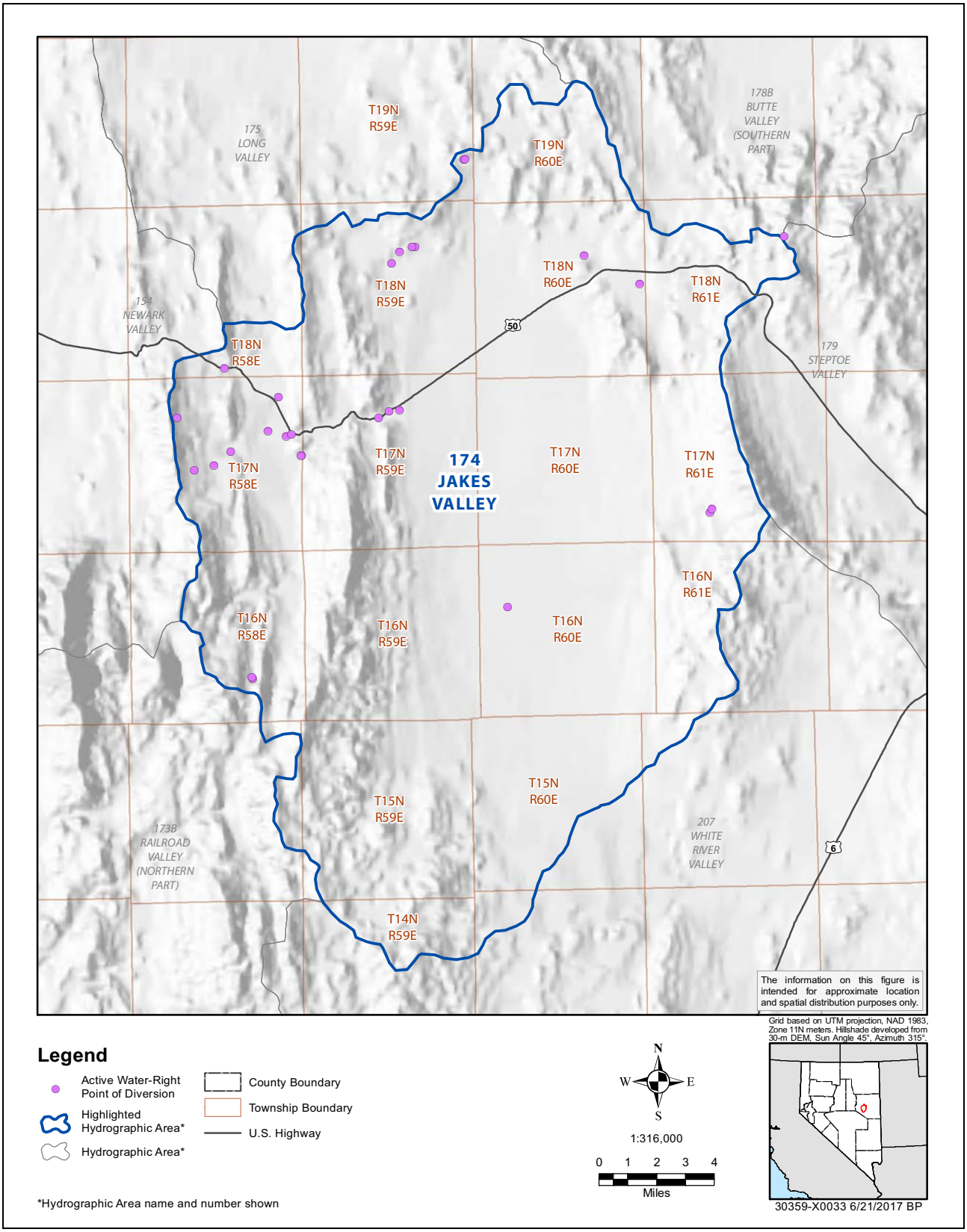

Figure 4-3
PODs for all Active Water Rights within Jakes Valley

One of the groundwater rights (Permit No. 79956) has a priority date after October 17, 1989. The duty for this right is 2.24 afa. Appendix 4-2 lists all the active water rights in Jakes Valley and identifies the records that have priority dates before, on, and after October 17, 1989.

4.2.4 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "municipal/quasi-municipal." Appendix 4-6 is a copy of the hydrographic abstract queried by HA (Jakes Valley - Area 174), manner of use (municipal, quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (2).

None of the municipal/quasi-municipal rights are from an underground source. The total duty from this analysis for municipal/quasi-municipal underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground municipal and quasi-municipal rights listed in the NDWR HA Summary, Appendix 4-3.

4.2.5 Storage Rights

The NDWR online water-rights database includes four active records with the manner of use listed as "storage." Appendix 4-7 is a copy of the hydrographic abstract queried by HA (Jakes Valley - Area 174), manner of use (storage), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (4).

None of the storage rights are from an underground source. The total duty from this analysis for storage underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground storage rights listed in the NDWR HA Summary, Appendix 4-3.

4.2.6 Irrigation Rights

The NDWR online water-rights database includes three active records with the manner of use listed as "irrigation." Appendix 4-8 is a copy of the hydrographic abstract queried by HA (Jakes Valley - Area 174), manner of use (irrigation, irrigation-Carey Act, irrigation-DLE, decreed), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (1) and stream (2).

None of the irrigation rights are from an underground source. The total duty from this analysis for irrigation underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 4-3.

4.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 4.2 identified all active water rights within Jakes Valley. There were no groundwater irrigation rights identified within Jakes Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

4.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 4-3, lists the total amount of supplementally adjusted groundwater rights for stockwater uses as 28.85 afa. Table 4-3 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to or on October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analysis completed in Section 4.2 and Section 4.3 of this chapter.

Table 4-3
Jakes Valley Existing Groundwater Rights Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Domestic	0.00	0.00	0.00	0.00
Stockwater	28.85	28.85	2.24	26.61
Municipal/Quasi-municipal	0.00	0.00	0.00	0.00
Storage	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00
Total	28.85	28.85	2.24	**26.61**

4.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 4-4 shows the location of rights with a source listed as spring, and with a POD located within the groundwater discharge area. Two identified PODs are shown as blue dots (multiple rights utilizing the same springs), and the groundwater discharge areas are identified as green-filled polygons. For this analysis, the two PODs that are located within the groundwater discharge area will be considered groundwater resources. The following sections include a review of these spring rights within Jakes Valley per each manner of use.

4.5.1 Domestic

Review of Appendix 4-4 shows one domestic right with a source listed as spring. This single domestic right is not located within the groundwater discharge area of Jakes Valley. For this analysis, this right will not be allocated as a groundwater commitment.

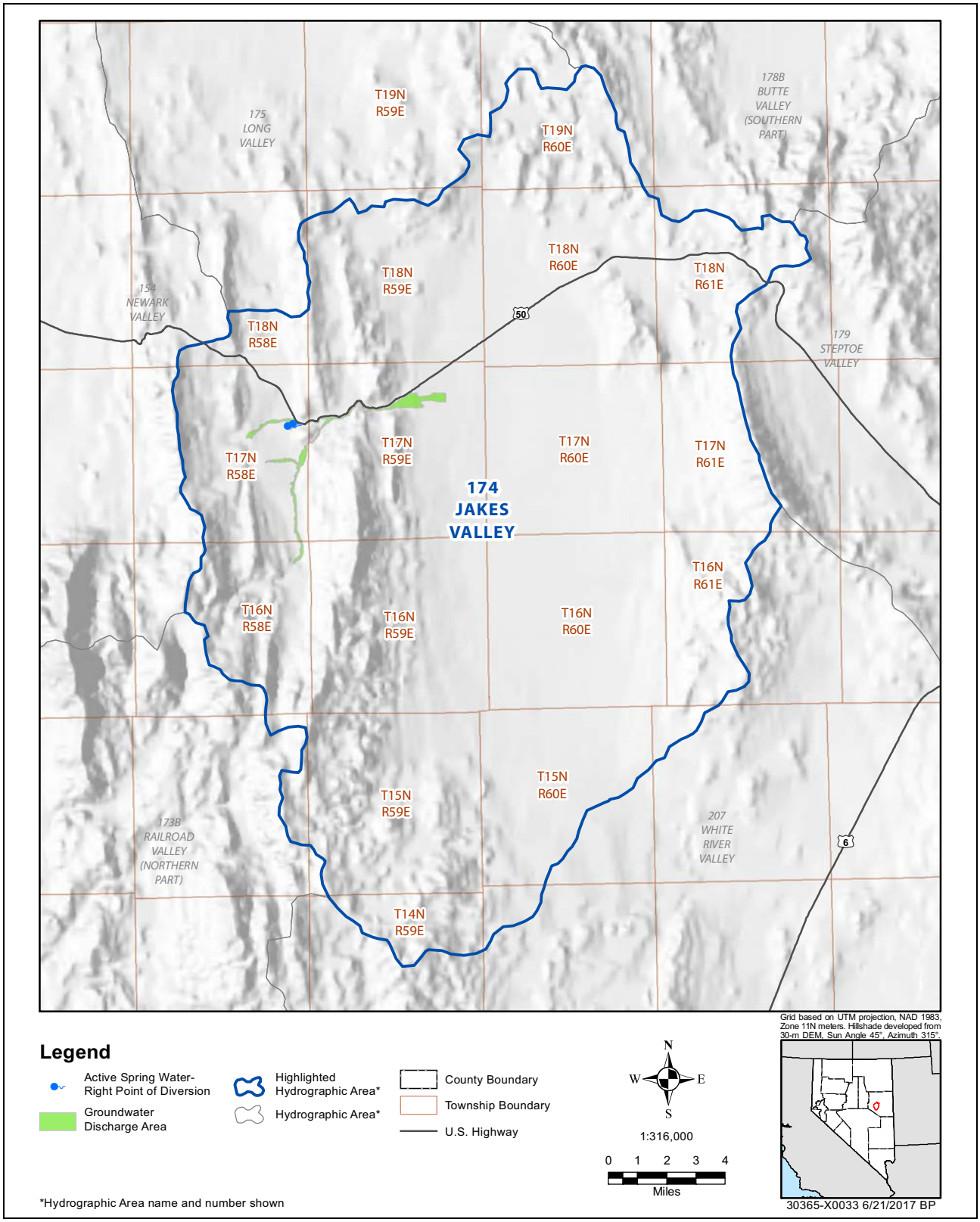

Figure 4-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Jakes Valley

4.5.2 Stockwater

Review of Appendix 4-5 shows 16 stockwater rights with a source listed as spring. Only one of these rights is located within the groundwater discharge area of Jakes Valley. The single spring stockwater right located within the groundwater discharge area is certificated right No. 51858, and it will be considered a groundwater resource for this analysis. Certificated right No. 51858 has a duty of 6.05 afa, and has a priority date prior to October 17, 1989.

4.5.3 Municipal/Quasi-Municipal

Review of Appendix 4-6 shows two municipal or quasi-municipal rights with a source listed as spring. Only one of these rights is located within the groundwater discharge areas of Jakes Valley. The single spring municipal/quasi-municipal right located within the groundwater discharge areas is certificated right No. 51857, and it will be considered a groundwater resource for this analysis. Certificated right No. 51857 has a duty of 6.05 afa, and has a priority date prior to October 17, 1989.

4.5.4 Storage

Review of Appendix 4-7 shows no storage rights with a source listed as spring. Further analysis of spring storage rights is not applicable as there are no spring storage rights within Jakes Valley.

4.5.5 Irrigation

Review of Appendix 4-8 shows one irrigation right with a source listed as spring. This single irrigation right is not located within the groundwater discharge area of Jakes Valley. For this analysis, this right will not be allocated as a groundwater commitment.

4.5.6 Summary

Table 4-4 is a summary of the preceding analysis of spring rights considered to be groundwater within Jakes Valley, listed for each manner of use. The totals for the report's current analysis is divided into rights with priority dates before, on, and after October 17, 1989, as well the total of both. Table 4-4 does not contain a column presenting the NDWR totals for spring rights considered to be groundwater because NDWR does not publish such data.

4.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 4.2 identified all water rights within Jakes Valley. There were no groundwater irrigation rights identified within Jakes Valley. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Jakes Valley, as it is not applicable.

Table 4-4
Jakes Valley Existing Spring Rights Supplementally Adjusted

	Current Analysis (afa)		
Manner of Use	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to or on October 17, 1989**
Stockwater	6.05	0.00	6.05
Municipal/Quasi-municipal	6.05	0.00	6.05
Total	12.10	0.00	**12.10**

4.7 Supplemental Analysis of Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 4.2 identified all active water rights within Jakes Valley. There were no active groundwater/ spring irrigation rights identified within Jakes Valley. For this reason, supplemental analysis of groundwater and spring irrigation rights versus surface water irrigation rights will not be performed, as it is not applicable.

4.8 Estimated Crop Consumptive Use for Jakes Valley

Section 4.2 identified all water rights within Jakes Valley. There were no groundwater irrigation rights identified within Jakes Valley. For this reason, analysis of estimated crop consumptive use for Jakes Valley will not be performed, as it is not applicable.

4.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR Hydrographic Summary, unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Jakes Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR and are located within Jakes Valley. The list includes a total of 11 records and is included as Appendix 4-9.

Each well log filed with the NDWR lists a proposed use of the drilled well. There is one record that lists a proposed use as domestic use (domestic use is signified with an "H" in the proposed use column). The one record for domestic wells was drilled prior to October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.00 afa, all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the one domestic well identified, it is estimated that 2.00 afa would be pumped from the groundwater system through domestic wells, and all of this water would be consumptively used.

This analysis will include the entire 2.00 afa as a groundwater commitment with a priority date prior to October 17, 1989.

4.10 Summary

The total committed groundwater rights for Jakes Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 4-5 presents the summary information derived by this analysis of all active groundwater rights, as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Jakes Valley, after supplemental and consumptive use adjustments are made, is estimated to be 42.95 afa. The committed groundwater rights for Jakes Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 2.24 afa. The committed groundwater rights for Jakes Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 40.71 afa.

Table 4-5
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	2.00	N/A	2.00	0.00	N/A	0.00	2.00	N/A	2.00
Stockwater (Groundwater)	28.85	N/A	28.85	2.24	N/A	2.24	26.61	N/A	26.61
Stockwater (Spring)	6.05	N/A	6.05	0.00	N/A	0.00	6.05	N/A	6.05
Municipal/Quasi-municipal (Spring)	6.05	N/A	6.05	0.00	N/A	0.00	6.05	N/A	6.05
Total	**42.95**		**42.95**	**2.24**		**2.24**	**40.71**		**40.71**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

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5.0 WHITE RIVER VALLEY

5.1 Introduction

NDWR HA 207, White River Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Colorado River Basin Hydrographic Region. Figure 5-1 is a map of the location of White River Valley.

The purpose of this chapter is to analyze the existing water rights within White River Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 5-2 shows the townships and ranges (MDBM) located within White River Valley.

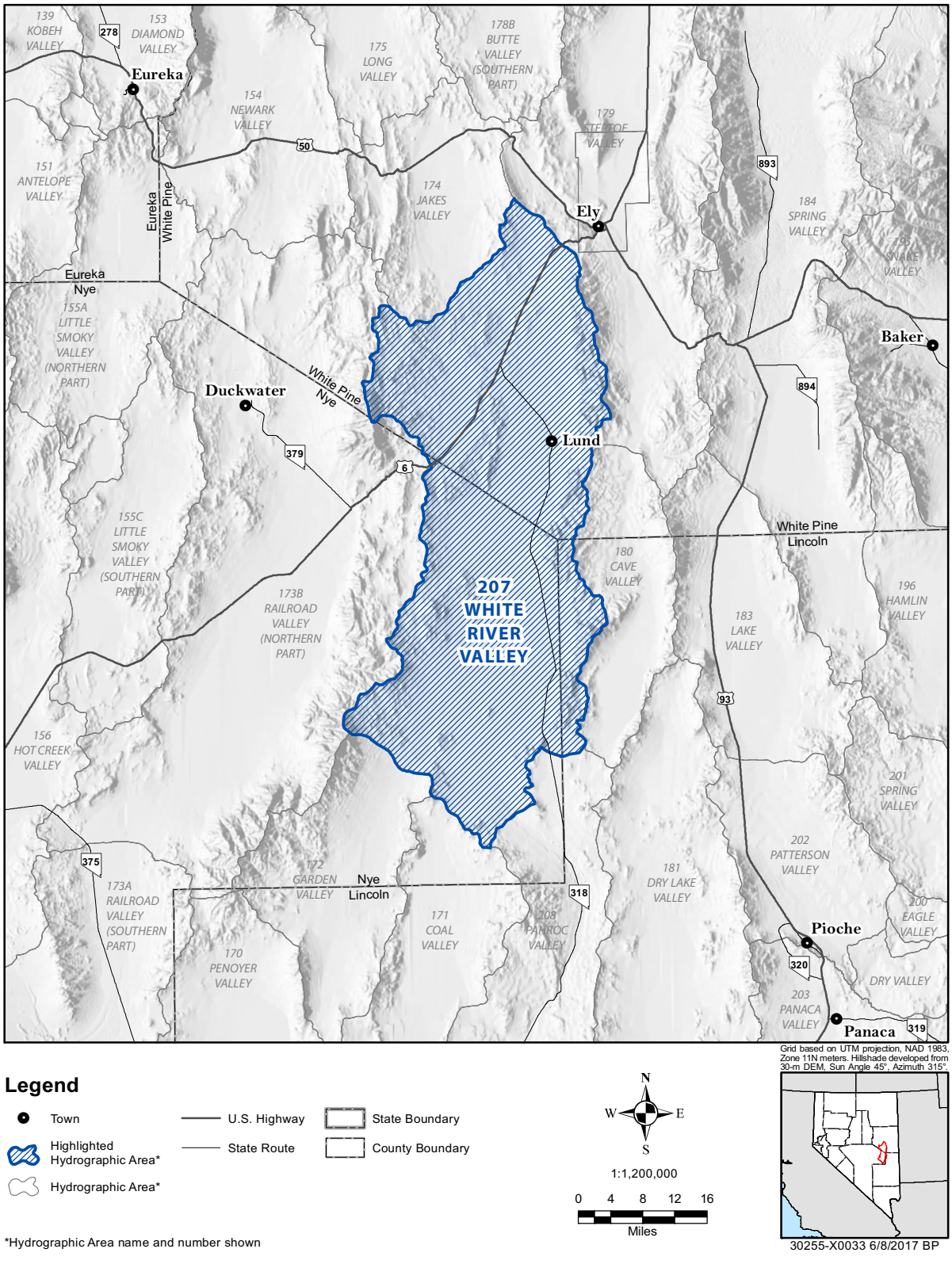

Figure 5-1
White River Valley Hydrographic Area

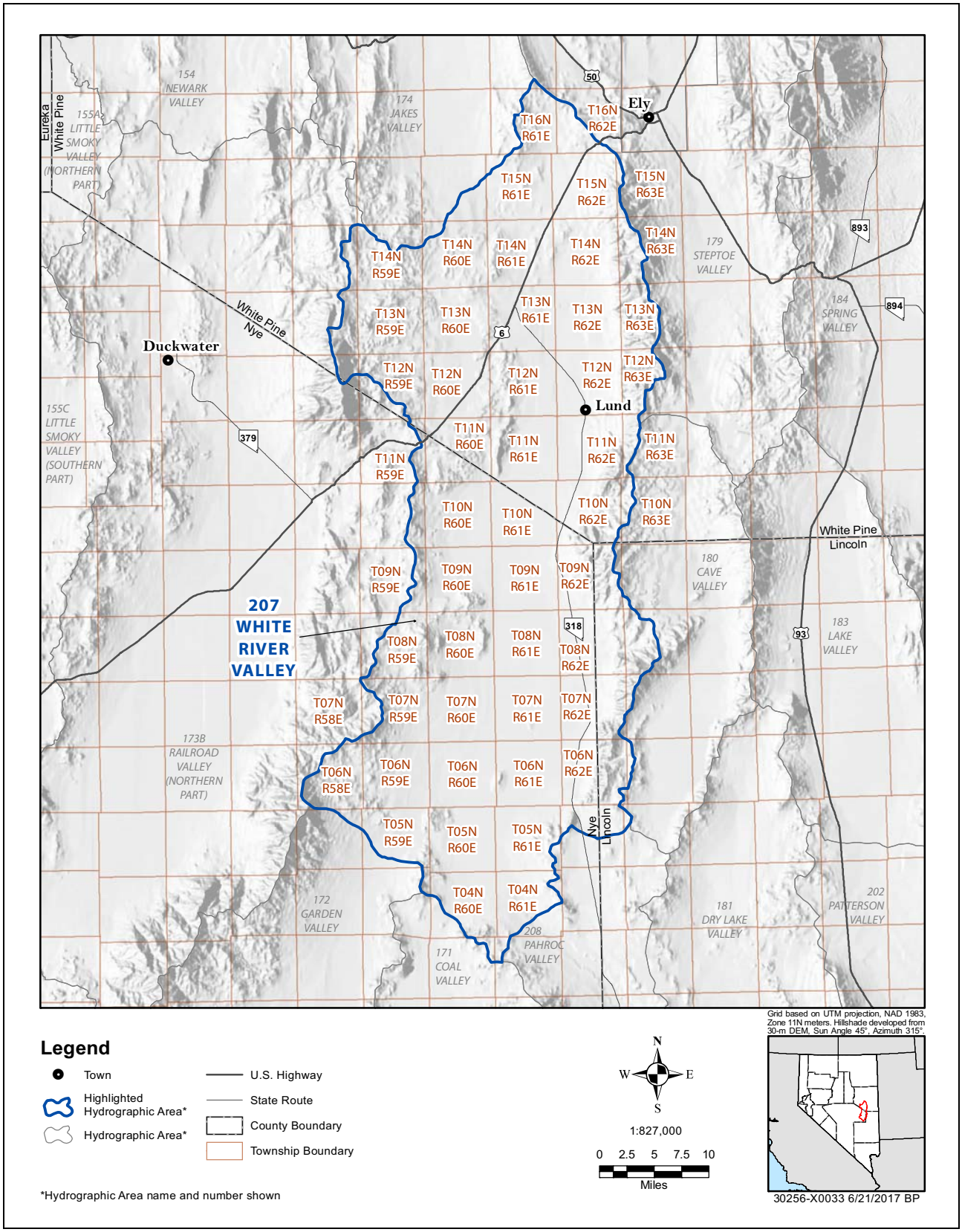

Figure 5-2
Township/Ranges Within White River Valley

5.2 Summary of Water Rights in White River Valley

Active water rights within White River Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

The NDWR hydrographic abstract, queried for all active rights within White River Valley, is included as Appendix 5-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights.

There are currently 383 active water rights that are listed as vested, decreed, certificated, permitted, and reserved water rights. Appendix 5-2, lists all the active water rights in White River Valley and contains records that have priority dates before, on and after October 17, 1989.

The manners of use for these water rights include commercial, domestic, construction, municipal/quasi-municipal, stockwater, industrial, wildlife, recreation, power, mining and milling, and irrigation. Irrigation rights include decreed rights with a manner of use listed as "decreed," which would be "irrigation" based on the language in the decrees. Table 5-1 lists the number of records within White River Valley in the NDWR online water-rights database per manner of use and their current status.

Table 5-1
Number of Active Records Listed per Manner of Use and Status in White River Valley

Manner of Use	Number of Records	Vested Claims	Decreed	Certificated	Permitted	Reserved
Commercial	3	0	0	1	2	0
Domestic	2	0	0	2	0	0
Construction	1	0	0	0	1	0
Municipal/ Quasi-Municipal	15	1	0	10	4	0
Stockwater	159	49	0	86	23	1
Industrial	6	0	0	6	0	0
Wildlife	4	0	0	4	0	0
Recreation	2	0	0	0	2	0
Power	1	0	0	1	0	0
Mining/Milling	1	0	0	1	0	0
Irrigation	189	11	11	127	40	0
Total	383	61	11	238	72	1

The sources of water for the 383 active water rights includes stream, spring, underground, reservoir, other surface water, and lake. Table 5-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 5-2
Number of Active Records Listed per Manner of Use and Source in White River Valley

Manner of Use	Number of Records	Stream	Spring	Underground	Reservoir	Other Surface Water	Lake
Commercial	3	0	0	3	0	0	0
Domestic	2	0	2	0	0	0	0
Construction	1	0	0	1	0	0	0
Municipal/ Quasi-Municipal	15	0	3	12	0	0	0
Stockwater	159	2	72	73	4	6	2
Industrial	6	0	6	0	0	0	0
Wildlife	4	3	1	0	0	0	0
Recreation	2	0	0	2	0	0	0
Power	1	0	1	0	0	0	0
Mining/Milling	1	0	1	0	0	0	0
Irrigation	189	31	47	104	2	4	1
Total	383	36	133	195	6	10	3

White River Valley has decreed rights listed under the Decree titled *In the Matter of the Determination of the Relative Rights in and to the Waters of White River and its Tributaries in White Pine County, Nevada* (White River Decree), dated December 4, 1922.

The rights listed within the decree were cross referenced with the NDWR online water-rights database. Although the majority of the White River Decree rights are listed in the NDWR online water-rights database, five rights were not listed. Three of these rights were for irrigation use from spring sources, and two of these rights are for stockwater and domestic use outside of the irrigation season. Table 5-3 includes a list of the White River Decree rights and decreed water-right numbers as listed by NDWR. The “Assigned Numbers” are numbers given to rights in this report in order to properly track rights in the decree that are not listed in the NDWR online water-rights database throughout this analysis.

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps for water rights in White River Valley. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 5-3 shows the approximate location and spatial distribution of the PODs for all active water rights within White River Valley.

Table 5-3
White River Decree Cross-Reference Table

Original Claimant	Source	Use	Period of Use	Proof No.	Assigned No.
Preston Irrigation Co.	Spring (Preston and Arnoldson)	Irrigation	4-1 to 9-15	V-01161	N/A
Preston Irrigation Co.	Spring (Preston Big Spring)	Irrigation	4-1 to 9-15	V-01161	N/A
Lund Irrigation Co.	Spring (Preston Big Spring)	Irrigation	4-1 to 9-15	V-01163	N/A
Lund Irrigation Co.	Spring (Lund Spring)	Irrigation	4-1 to 9-15	V-01163	N/A
Whithead	Spring (Lund Spring)	Irrigation	4-1 to 9-15	N/A	WRD-01
Hayden	Stream (White River)	Irrigation	4-1 to 9-15	V-01166	N/A
Williams	Stream (White River)	Irrigation	4-1 to 9-15	V-01170	N/A
McQueen	Stream (White River)	Irrigation	4-1 to 9-15	V-01167	N/A
Hermanson	Stream (White River)	Irrigation	4-1 to 9-15	V-01171	N/A
Lee	Stream (White River)	Irrigation	4-1 to 9-15	V-01169	N/A
Adams-McGill	Spring (McQuitty Springs)	Irrigation	4-1 to 9-15	V-01165	N/A
Lund Irrigation Co.	Spring (Preston Big Spring)	Irrigation	9-15 to 4-1	N/A	WRD-02
Adams-McGill	Spring (Preston Big Spring)	Irrigation	9-15 to 4-1	V-01162	N/A
Lund Irrigation Co.	Spring (Lund Spring)	Irrigation	9-15 to 4-1	N/A	WRD-03
Adams-McGill	Spring (Lund Spring)	Irrigation	9-15 to 4-1	V-01164	N/A
Adams-McGill	Stream (White River)	Irrigation	9-15 to 4-1	V-01168	N/A
Four Claimants	Stream	Stock/Domestic	9-15 to 4-1	N/A	WRD-04
Five Claimants	Spring	Stock/Domestic	9-15 to 4-1	N/A	WRD-05

N/A = Not applicable

5.2.1 Water Rights per Manner of Use

The NDWR HA Summary for White River Valley, found in Appendix 5-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within White River Valley, and includes manners of use of commercial, construction, irrigation, irrigation (DLE), municipal/quasi-municipal, recreation, and stockwater.

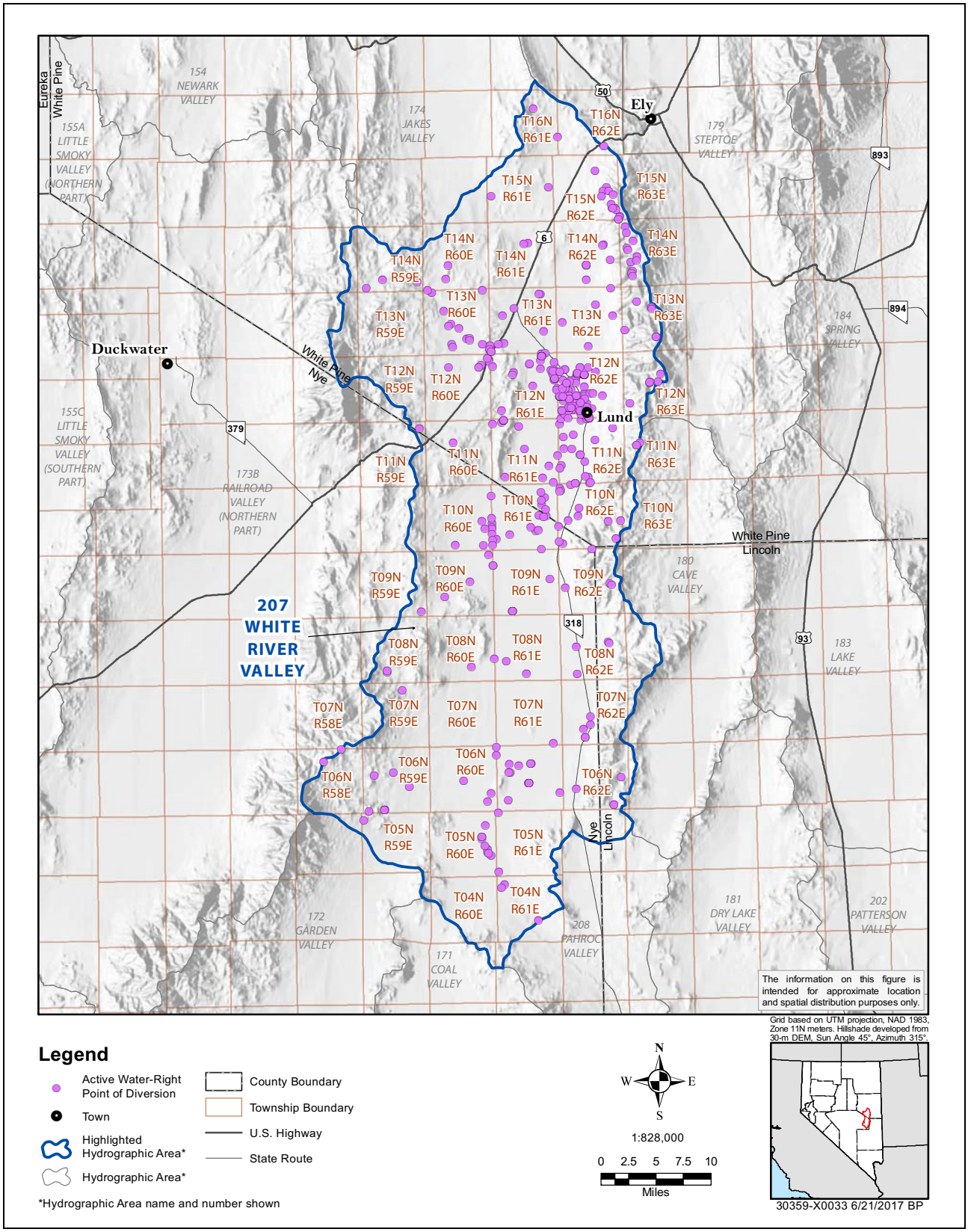

Figure 5-3
PODs for all Active Water Rights Within White River Valley

The total for these groundwater rights is listed as 35,480.07 afa. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR. White River Valley water rights were compiled and reviewed based on the manner of use (commercial, domestic, construction, municipal/quasi-municipal, stockwater, industrial, wildlife, recreation, power, mining and milling, and irrigation). The following sections include summaries of each manner of use category, with a breakout of groundwater rights and a comparison of these rights to the NDWR HA Summary totals.

5.2.1.1 Commercial Rights

The NDWR online water-rights database includes three active records with the manner of use as "commercial." Appendix 5-4 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (commercial), and status (certificate, decreed, permit, reserved, vested). The sources for these rights is listed as underground (3).

One of the groundwater rights is certificated and two are permitted. A review of the permit and certificate conditions shows that certificated right No. 42462 has a combined duty limitation associated with Permit No. 53841. Permit No. 53841 is listed as having a manner of use as quasi-municipal. Therefore Permit No. 42462 will be analyzed in the municipal/quasi-municipal section of this report.

The combined total for the two remaining underground rights is 4.64 afa. This is consistent with the 4.64 afa of underground commercial rights listed in the NDWR HA Summary, Appendix 5-3.

One of the commercial rights (Permit No. 84324) has a priority date after October 17, 1989. The duty for this right is 2.00 afa.

5.2.1.2 Domestic Rights

The NDWR online water-rights database includes two active records with the manner of use as "domestic." Appendix 5-5 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (2). There are also domestic/stockwater rights that are identified in the White River Decree. These decreed rights are from sources listed as stream (4) and spring (5). These decreed rights will be quantified later within this report.

Neither of the two domestic rights are from underground sources. The combined total of underground domestic rights is 0.00 afa. This total is consistent with the 0.00 afa of underground domestic rights listed in the NDWR HA Summary, Appendix 5-3.

5.2.1.3 Construction Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "construction." Appendix 5-6 is a copy of the hydrographic abstract queried by HA (White River

Valley - Area 207), manner of use (construction), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as underground.

The duty total for this permitted underground construction right is 20.00 afa. This total is consistent with the 20.00 afa of underground construction rights listed in the NDWR HA Summary, Appendix 5-3. This underground construction right has a priority date after October 17, 1989.

5.2.1.4 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes 15 records with the manner of use listed as "quasi-municipal." There are no rights listed as "municipal." Appendix 5-7 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (municipal and quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these 15 active records are listed as underground (12) and spring (3).

The 12 groundwater rights have statuses listed as certificated (7), permitted (4), and vested (1). Review of the permit and certificate conditions shows that the majority of the quasi-municipal groundwater rights do not have combined duty limitations. Permit No. 53841 has a combined duty limitation included in the certificate. The combined duty limitation includes Permit No. 42462 previously identified in Section 5.2.1.1 of this report, and that commercial right will be included in this quasi-municipal section for accounting purposes. One of the underground rights is listed as a vested claim. A review of the vested claim shows that it does not include a quantity of water historically used, although it does state the water is used for drinking and cleaning. For this analysis, the amount of 2.00 afa will be used, which corresponds with the amount allowed for the domestic use permitting exemption. The combined total of these underground municipal/quasi-municipal rights (and commercial right being accounted for as a municipal/quasi-municipal resource) is 75.80 afa. This total is not consistent with the 73.80 afa of underground municipal and quasi-municipal rights listed in the NDWR HA Summary, Appendix 5-3. The discrepancy appears to be because the vested claim was not accounted for in the NDWR total.

Eight of the municipal/quasi-municipal rights (Permit Nos. 55620, 63058, 66855, 67921, 71156, 74225, 75607, and 80613) have priority dates after October 17, 1989. The duty for these eight rights is 52.93 afa.

5.2.1.5 Stockwater Rights

The NDWR online water-rights database includes 159 records with the manner of use listed as "stockwater." Appendix 5-8 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (2), spring (72), reservoir (4), other surface water (6), lake (2), and underground (73).

The 73 groundwater rights have statuses listed as permitted (23) and certificated (50). Review of the permit and certificate conditions shows that numerous stockwater rights have combined duty limitations. Appendix 5-9 is a spreadsheet listing the 73 underground stockwater rights and the

method used to analyze and calculate duties and combined duty limitations. The combined total of these underground stockwater rights, taking into account any combined duty limitations, is 497.01 afa. This is not consistent with the 545.95 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 5-3. This discrepancy is due to the fact that this analysis treated Permit Nos. 46680 through 46684 as having a combined duty as shown in their certificate terms, and also because this analysis calculated a different duty for Permit Nos. 66126 and 66127 than the duty listed in the NDWR online water-rights database.

There are 52 underground stockwater rights that have priority dates after October 17, 1989. The combined total of these rights is 368.66 afa. Appendix 5-9 lists these rights by priority date and total rights prior to, on, and after October 17, 1989.

5.2.1.6 Industrial Rights

The NDWR online water-rights database includes six records with the manner of use listed as "industrial." Appendix 5-10 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (industrial), and status (certificate, decreed, permit, reserved, vested). The sources for these six rights are all listed as spring.

None of the six industrial rights are from underground sources. The combined total of underground industrial rights is 0.00 afa. This total is consistent with the 0.00 afa of underground industrial rights listed in the NDWR HA Summary, Appendix 5-3.

5.2.1.7 Wildlife Rights

The NDWR online water-rights database includes four records with the manner of use listed as "wildlife." Appendix 5-11 is a copy of the hydrographic abstract queried by HA (White River Valley-Area 207), manner of use (wildlife), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are all listed as spring (1) and stream (3).

None of the four wildlife rights are from underground sources. The combined total of underground wildlife rights is 0.00 afa. This total is consistent with the 0.00 afa of underground wildlife rights listed in the NDWR HA Summary, Appendix 5-3.

5.2.1.8 Recreation Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "recreation." Appendix 5-12 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (recreation), and status (certificate, decreed, permit, reserved, vested). The sources for both of these rights are listed as underground.

Both of these underground recreation rights are permitted. The combined total of underground recreation rights is 16.07 afa. This total is consistent with the 16.07 afa of underground recreation rights listed in the NDWR HA Summary, Appendix 5-3. These underground recreation rights have priority dates after October 17, 1989.

5.2.1.9 Power Rights

The NDWR online water-rights database includes one record with the manner of use listed as "power." Appendix 5-13 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (power), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring.

This single power right is not from an underground source. The combined total of underground power rights is 0.00 afa. This total is consistent with the 0.00 afa of underground power rights listed in the NDWR HA Summary, Appendix 5-3.

5.2.1.10 Mining and Milling Rights

The NDWR online water-rights database includes one record with the manner of use listed as "mining and milling." Appendix 5-14 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (mining and milling, mining and milling dewatering), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring.

This single mining and milling right is not from an underground source. The combined total of underground mining and milling rights is 0.00 afa. This total is consistent with the 0.00 afa of underground mining and milling rights listed in the NDWR HA Summary, Appendix 5-3.

5.2.1.11 Irrigation Water Rights

The NDWR online water-rights database includes 189 records with the manner of use listed as "irrigation." Appendix 5-15 is a copy of the hydrographic abstract queried by HA (White River Valley - Area 207), manner of use (irrigation, irrigation-Carey Act, irrigation-DLE, decreed), and status (certificate, decreed, permit, reserved, vested).

The sources for these rights are listed as underground (104), spring (47), stream (31), reservoir (2), other surface water (4), and lake (1). These 189 records include a combination of certificated (127), permitted (40), decreed (11), and vested claim (11) rights. The rights listed within the White River Decree were cross referenced with the NDWR online water-rights database and it was found that three irrigation rights were listed in the Decree but not listed on the NDWR online water-rights database. These three decreed irrigation rights are from spring sources and will be quantified later within this report using the assigned tracking numbers listed in Table 5-3.

The 104 groundwater rights have statuses listed as certificated (67) and permitted (37). The combined total for the permitted and certificated underground irrigation water rights, if all rights were simply added together without further analysis, is 37,481.64 afa. This total has not been adjusted for supplemental rights, and has not been subject to a consumptive use analysis, both of which will be completed in subsequent sections of this report. The NDWR HA Summary, Appendix 5-3, lists the total duty for underground irrigation as 34,819.61 afa. The NDWR HA Summary states that this number has been supplementally adjusted.

There are 31 underground rights with a priority date after October 17, 1989. These rights have a total duty of 12,554.82 afa, but this total will be further analyzed in the following supplemental analysis.

5.3 Analysis of Groundwater Irrigation Rights (Sole Source Versus Supplemental)

The groundwater irrigation rights were reviewed to determine the quantity, if any, of groundwater irrigation rights which may be considered supplemental to other groundwater irrigation rights. Multiple groundwater rights from different PODs (wells) may have the same POU. In these instances, the limit for these rights would be based on the cumulative rights for each acre, as long as the cumulative rights do not exceed the maximum allowed irrigation duty. The maximum allowed irrigation duty is normally stated in the permit or certificate. Multiple groundwater rights can be considered supplemental to each other if they share the same POU.

The POUs for these rights were determined through review of certificates, permits, and their associated maps filed with the NDWR. The supplemental analysis was completed using POU spreadsheets and also by mapping the water rights. Appendix 5-16 is a spreadsheet titled *White River Valley: Place of Use of Groundwater Irrigation Rights [Un-Sorted]*, and is organized numerically by application number. The spreadsheet includes the location of each irrigation groundwater-right POU by 40-acre subdivision. This spreadsheet lists the application number, status, source, quarter-quarter, quarter, section, township, range, MDBM, and number of irrigated acres.

Appendix 5-17 is the resulting spreadsheet when the water rights listed in Appendix 5-16 are sorted by location. Appendix 5-17 is titled *White River Valley: Place of Use of Groundwater Irrigation Rights [Sorted]*. Sorting water rights using this criterion allows identification of any possible areas where the POUs overlapped, indicating possible supplemental groundwater rights. Rights highlighted in yellow on Appendix 5-17 share a 40-acre subdivision POU and may possibly be supplemental.

Review of the sorted spreadsheet shows that groundwater irrigation rights are located in 13 township/ranges within White River Valley. Table 5-4 lists the township/range locations for the groundwater irrigation rights and the report appendix number for the mapped water rights within those locations. Figure 5-4 is a map showing the township/range locations of the groundwater irrigation rights in White River Valley.

Sorting all irrigation rights by range, township, section, quarter, and quarter-quarter subdivision (aliquot-part analysis) resulted in the identification of any certificated or permitted rights that are appurtenant to the same 40-acre subdivision location. If multiple rights did not have a POU within the same 40-acre subdivision, then it was concluded that these rights were not supplemental to each other. If it was determined that multiple rights were located within the same 40-acre subdivision, then a further analysis was conducted. This further analysis included a review of permit terms, certificate terms, POU maps, and PBU maps to determine if the water rights are non-supplemental or supplemental to each other. The highlighted rights on Appendix 5-17 are the rights that could possibly be supplemental to each other and were the rights subjected to this further analysis.

Table 5-4
Township/Range of Groundwater Irrigation Rights Within White River Valley

Township	Range	Appendix
5N	60E	5-18
12N	60E	5-19
13N	60E	5-20
4N	61E	5-21
5N	61E	5-22
6N	61E	5-23
10N	61E	5-24
12N	61E	5-25
13N	61E	5-26
10N	62E	5-27
11N	62E	5-28
12N	62E	5-29
13N	62E	5-30

Township and range in MDBM.

All certificated rights were mapped based on their irrigation locations as depicted in their PBU maps. These maps are included in Appendix 5-18 through Appendix 5-30. Review of these compiled maps showed whether certificated rights located within the same subdivision were in fact supplemental to each other.

A permitted right was not considered supplemental if the POU was not listed in the same 40-acre subdivision as any other groundwater right. The proposed POU (acres) of a permitted water right can exceed the maximum permitted irrigated acreage. This is because the water-right owner may not know the specific locations where the irrigation will be applied at the time of filing the application and the proposed POU map. The actual acreage and location of irrigation is not quantified until the PBU for the permitted water rights is prepared and filed with the NDWR. If a permitted right could be placed where it would not be considered supplemental to an existing right, then this right was not considered supplemental for this analysis. Since non-supplemental water rights are not subjected to further reduction based on the supplemental analysis, this assumption likely overestimates the amount of committed groundwater irrigation rights. The permitted groundwater rights were mapped based on the proposed POU maps that accompany the applications as shown in Appendix 5-18 through Appendix 5-30.

Appendix 5-31 is a list of the 104 certificated and permitted irrigation groundwater rights within White River Valley, and shows the supplemental analysis of those rights. The table includes the application number, supplemental analysis notes, and non-supplemental quantity of the 104 rights. Additionally, these rights are split between rights with priority dates prior to, or on October 17, 1989, and after October 17, 1989. Based on the analysis of the POUs of the certificated and permitted groundwater irrigation rights in White River Valley, it was determined that there is approximately 34,657.17 afa of non-supplemental groundwater irrigation rights. Of these rights, 12,311.30 afa have a priority date after October 17, 1989, and 22,345.87 afa have a priority date prior to, or on October 17, 1989.

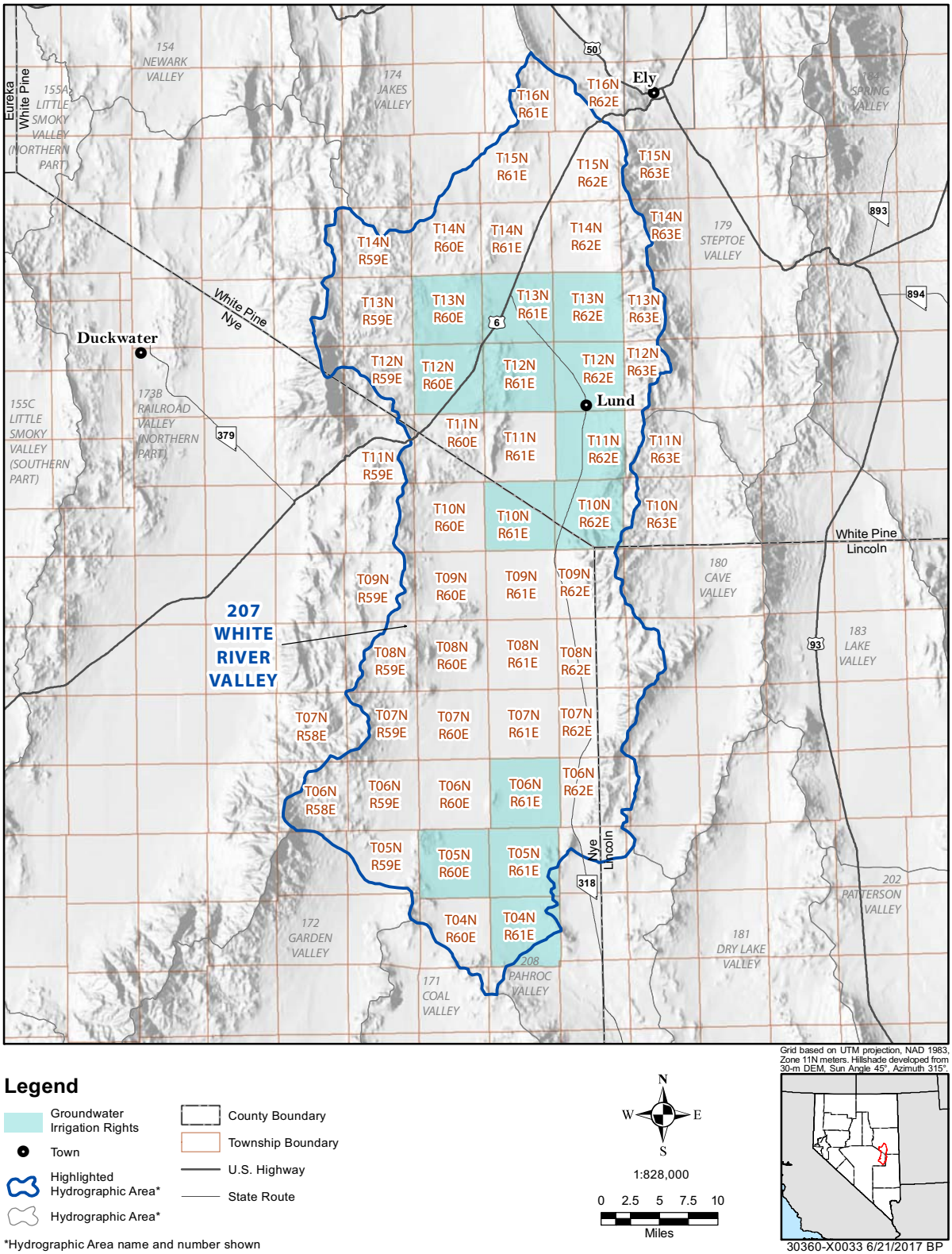

Figure 5-4
Township/Range of Groundwater Irrigation Rights Within White River Valley

The total from this analysis for these underground irrigation rights is 34,657.17 afa. This total is not consistent with the 34,819.61 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 5-3. This 162.44 afa difference is mostly attributed to supplemental analysis and mapping discrepancies.

Table 5-5 lists the individual permits with their quantities of water rights as determined in this analysis which differed from NDWR's analysis. More detailed information regarding this analysis is included in Appendix 5-31.

Table 5-5
Comparison of NDWR Analysis and Current Analysis

Permit	NDWR (afa)	Current Analysis (afa)
15367/23431	710.63	675.99
17928	380.66	372.56
21465	452.88	442.96
23744/23851/27465/59775	984.10	957.72
63891	840.84	815.64
66603	112.16	99.54
73218	28.00	24.94
77468	40.00	34.69
81589	20.00	16.65
81590	20.00	16.65
83917	456.32	425.66
Total	4,045.59	3,883.00

Table 5-6 lists the total amount of non-supplemental irrigation groundwater rights, per individual duty, based on the analysis completed in the preceding sections. These rights are listed by individual duty because these duties will be used for an additional consumptive use analysis to be completed in subsequent sections of this report. These rights are listed with the priority date prior to or on October 17, 1989, and after October 17, 1989.

5.4 Comparison of NSE HA Summary

The NDWR HA Summary, Appendix 5-3, listed the total amount of supplementally adjusted groundwater rights for commercial, construction, municipal/quasi-municipal, stockwater, recreation, and irrigation uses as 35,480.07 afa. Table 5-7 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to, or on October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analyses completed in Section 5.2 and Section 5.3 of this report.

Table 5-6
Non-supplemental Groundwater Irrigation Rights in White River Valley

			With Priority Dates After October 17, 1989		With Priority Dates Prior to, or on October 17, 1989	
Duty (af/acre)	**Total (acre)**	**Total (afa)**	**Acre**	**afa**	**Acre**	**afa**
0.67	452.80	303.40	0.00	0.00	452.80	303.40
3.00	647.64	1,942.91	291.88	875.64	355.76	1,067.27
3.33	303.33	1,010.36	55.76	185.68	247.57	824.68
3.50	126.13	441.44	0.00	0.00	126.13	441.44
3.65	57.67	210.53	0.00	0.00	57.67	210.53
4.00	7,496.02	29,984.09	2,716.38	10,865.54	4,779.64	19,118.55
4.47	84.98	380.00	0.00	0.00	84.98	380.00
4.50	85.43	384.44	85.43	384.44	0.00	0.00
Total	9,254.00	34,657.17	3,149.45	12,311.30	6,104.55	22,345.87

Note: Calculation for duty based on certificate and permit terms. Acre x Duty does not equal total afa exactly due to rounding to nearest hundredth.

Table 5-7
White River Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Commercial	4.64	4.64	2.00	2.64
Domestic	0.00	0.00	0.00	0.00
Construction	20.00	20.00	20.00	0.00
Municipal/ Quasi-Municipal	73.80	75.80	52.93	22.87
Stockwater	545.95	497.01	368.66	128.35
Industrial	0.00	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00	0.00
Recreation	16.07	16.07	16.07	0.00
Power	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00
Irrigation	34,819.61	34,657.17	12,311.30	22,345.87
Total	35,480.07	35,270.69	12,770.96	**22,499.73**

5.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for accounting purposes. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 5-5 shows the location of rights with a source listed as spring, stream (sourced from a spring), and lake (sourced from a spring), with a POD located within the groundwater discharge areas. PODs within groundwater discharge areas are identified as blue dots. The groundwater discharge areas are identified as green-filled polygons. Spring, stream (sourced from a spring), and lake (sourced from a spring) rights located within the groundwater discharge areas will be considered groundwater resources for this analysis. Numerous spring rights within White River Valley are associated with the White River Decree. These rights are within the groundwater discharge areas and will be quantified as groundwater commitments for this analysis. There are also other spring rights not associated with the White River Decree, that are within the groundwater discharge areas for White River Valley, and which will be considered groundwater commitments for this analysis. Additionally, a right with a source listed as stream has a POD associated with Flag Springs which is within the groundwater discharge area. This right will also be included as a groundwater commitment for this analysis. The following sections include a review of the spring rights within White River Valley per each manner of use.

5.5.1 Commercial

Review of Appendix 5-4 shows that no commercial rights are from any sources listed as springs.

5.5.2 Domestic

Review of Appendix 5-5 shows that two domestic rights are from spring sources. Permit No. 10219, in the amount of 7.98 afa, is located within the groundwater discharge area and will be considered a groundwater resource for this analysis. The other domestic water right is not located within a groundwater discharge area, and therefore it will not be considered a groundwater resource for this analysis.

There are additional domestic rights not included in the NDWR online water-rights database but that are included in the White River Decree. The White River Decree states that "*each user shall be entitled to divert sufficient water for stock and domestic use, the amount so diverted not to exceed a flow of 0.025 cfs, such diversion to be made during the non-irrigation season"* (White River Decree, 1922). Based on a review of the White River Decree, there are five users with rights from spring sources, and these spring sources are located within the groundwater discharge areas. Each right equals approximately 9.79 afa for use during the nonirrigation season, or a combined total of 48.95 afa for all five users. The total for domestic spring rights within the groundwater discharge areas is 56.93 afa. All of these domestic spring rights have a priority date prior to October 17, 1989.

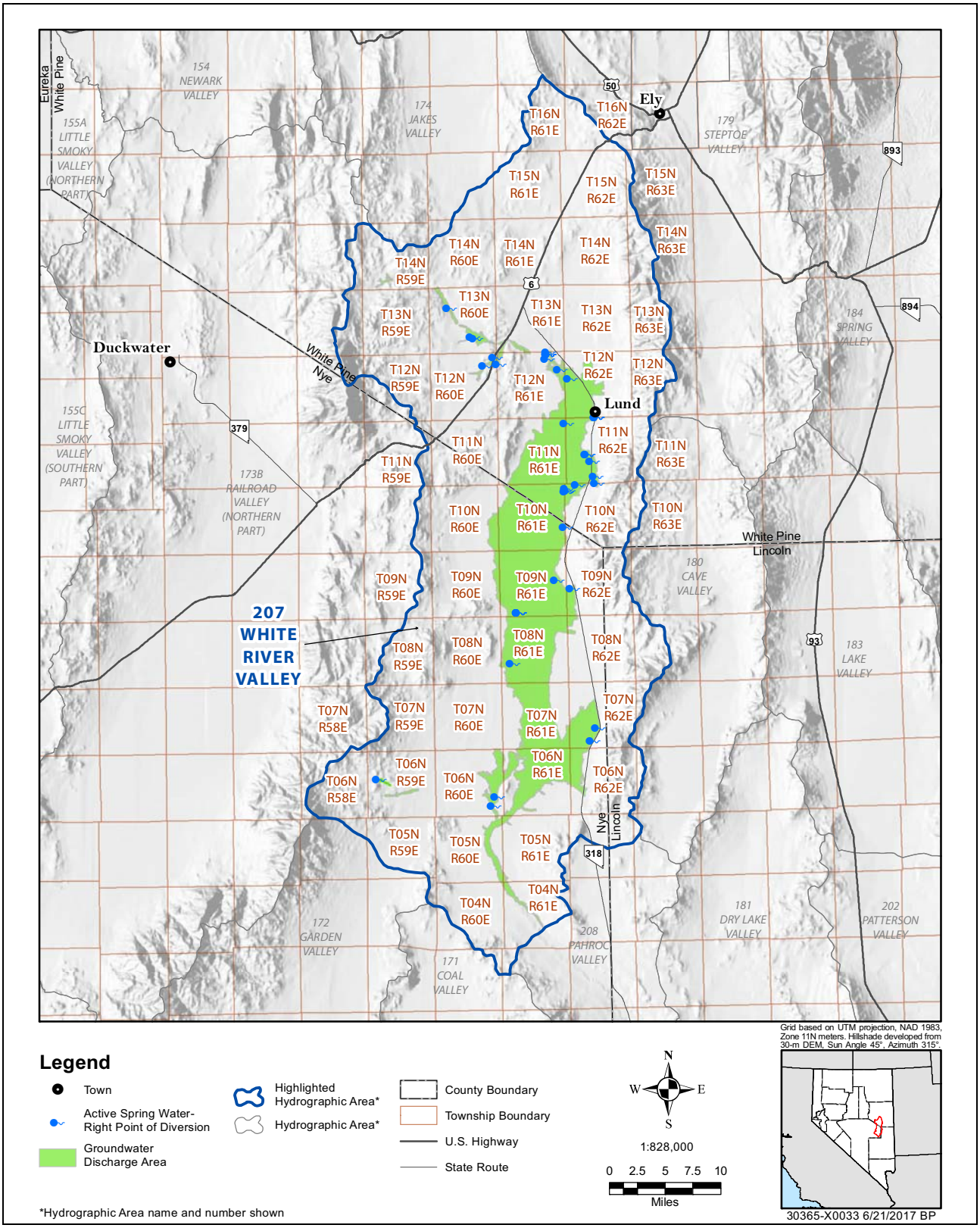

Figure 5-5
Groundwater Discharge Areas and Corresponding Spring Rights Within White River Valley

5.5.3 Construction

Review of Appendix 5-6 shows that no construction rights are from any sources listed as springs.

5.5.4 Municipal/Quasi-Municipal

Review of Appendix 5-7 shows three quasi-municipal rights with a source listed as spring. Two of these rights are not within the groundwater discharge areas and are not considered groundwater resources for this analysis. The remaining certificated right (Permit No. 49476) is located with the groundwater discharge area and will be considered a groundwater resource for this analysis. Permit No. 49476 has a duty of 1.81 afa and has a priority date prior to October 17, 1989.

5.5.5 Stockwater

Review of Appendix 5-8 shows 72 stockwater rights with a source listed as spring. Of these rights, 12 rights are located within the groundwater discharge areas of White River Valley. For this analysis, these rights will be allocated as a groundwater commitment. Table 5-8 lists the 12 rights, total duty, and duty for rights with a priority date prior to, on, and after October 17, 1989.

Table 5-8
White River Valley Stockwater Spring Rights
Within Groundwater Discharge Areas

		Current Analysis (afa)		
Application No.	**Status**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
7979	CER	65.06	0.00	65.06
8306	CER	7.95	0.00	7.95
9805	CER	3.35	0.00	3.35
13423	CER	2.15	0.00	2.15
20329	CER	11.42	0.00	11.42
22882	CER	10.83	0.00	10.83
36649	CER	1.14	0.00	1.14
52867	CER	0.18	0.00	0.18
66360	CER	26.88	0.00	26.88
V02091	VST	7.40	0.00	7.40
V03027	VST	22.59	0.00	22.59
V03287	VST	14.49	0.00	14.49
	Total	173.44	0.00	**173.44**

CER = Certificated.
PER = Permit.
VST = Vested.

5.5.6 Industrial

Review of Appendix 5-10 shows that six industrial rights are from spring sources. None of these six rights are within the groundwater discharge areas and they are not considered groundwater resources for this analysis.

5.5.7 Wildlife

Review of Appendix 5-11 shows that one wildlife right is from a spring source. This right is not within the groundwater discharge areas and is not considered a groundwater resource for this analysis.

5.5.8 Recreation

Review of Appendix 5-12 shows that no recreation rights are from any sources listed as springs.

5.5.9 Power

Review of Appendix 5-13 shows that there is one power right from a spring source. Permit No. 7216 is located within the groundwater discharge area and could be considered a groundwater resource for this analysis. However, review of the permit and certificate shows that this right is for diversion rate only and does not include any consumptive use. Because the right does not consumptively use water, it is not included in this analysis.

5.5.10 Mining and Milling

Review of Appendix 5-14 shows that there is one mining and milling right with a source listed as spring. This right is not within the groundwater discharge areas and is not considered a groundwater resource for this analysis.

5.5.11 Irrigation

Review of Appendix 5-15 shows that there are 47 irrigation rights with a source listed as spring. There are three additional irrigation rights that are not included in the NDWR online water-rights database that are White River decreed rights, and a single stream right that has a POD from a spring. Of these 51 irrigation rights, 40 are within the groundwater discharge areas.

Because these 40 irrigation spring rights within groundwater discharge areas will be considered to be groundwater commitments for accounting purposes, a supplemental analysis of these rights was completed. The same methodology used to analyze groundwater supplemental to groundwater was used, but it analyzed whether a spring irrigation right considered to be groundwater is supplemental to other spring irrigation rights considered to be groundwater. Section 5.3, *Analysis of Groundwater Irrigation Water Rights (Sole Source versus Supplemental),* describes the methodology used.

The list of these 40 irrigation spring rights were input into a spreadsheet with their POUs listed per quarter-quarter subdivision. This spreadsheet is included as Appendix 5-32 and was sorted by location to identify any possible areas of spring irrigation rights supplemental to other spring irrigation rights. Appendix 5-33 is the sorted spreadsheet titled *White River Valley: Place of Use of Spring Irrigation Rights [Sorted]*.

Review of Appendix 5-33 showed that spring irrigation rights considered to be groundwater are located in 11 township/ranges within the White River Valley. Table 5-9 lists the township/range locations of the spring irrigation rights considered to be groundwater and the report appendix number for the mapped water rights within those locations. Figure 5-6 is a map showing the township/range locations of the spring irrigation rights considered to be groundwater in White River Valley.

Table 5-9
Township/Range of Spring Irrigation Rights Within White River Valley and Associated Report Appendix Numbers

Township	Range	Report Appendix
6N	59E	5-34
6N	60E	5-35
13N	60E	5-36
9N	61E & 62E	5-37
12N	61E	5-38
13N	61E	5-39
7N	62E	5-40
10N	62E	5-41
11N	62E	5-42
12N	62E	5-43

Township and range in MDBM.

The mapped POUs of the spring irrigation rights within White River Valley were reviewed to determine if any would be considered supplemental to other spring irrigation rights. This review was completed similarly to the groundwater supplemental to groundwater analysis outlined in Section 5.3. Appendix 5-44 includes a list of all the spring irrigation rights considered to be groundwater and notes regarding the rationale for determining if they are supplemental to other spring irrigation rights. Table 5-10 is a summary of the non-supplemental portion of the spring irrigation rights with those rights listed according to their duty. Table 5-10 also lists these rights with a priority date prior to, on, and after October 17, 1989.

5.5.12 Spring Summary

Table 5-11 is a summary of the preceding analysis of spring rights considered to be groundwater within White River Valley, listed by each manner of use. The totals for the report's current analysis is divided into rights with priority dates prior to, on, and after October 17, 1989, as well the total of both. Table 5-11 does not contain a column presenting the NDWR totals for spring rights considered to be groundwater because NDWR does not publish such data.

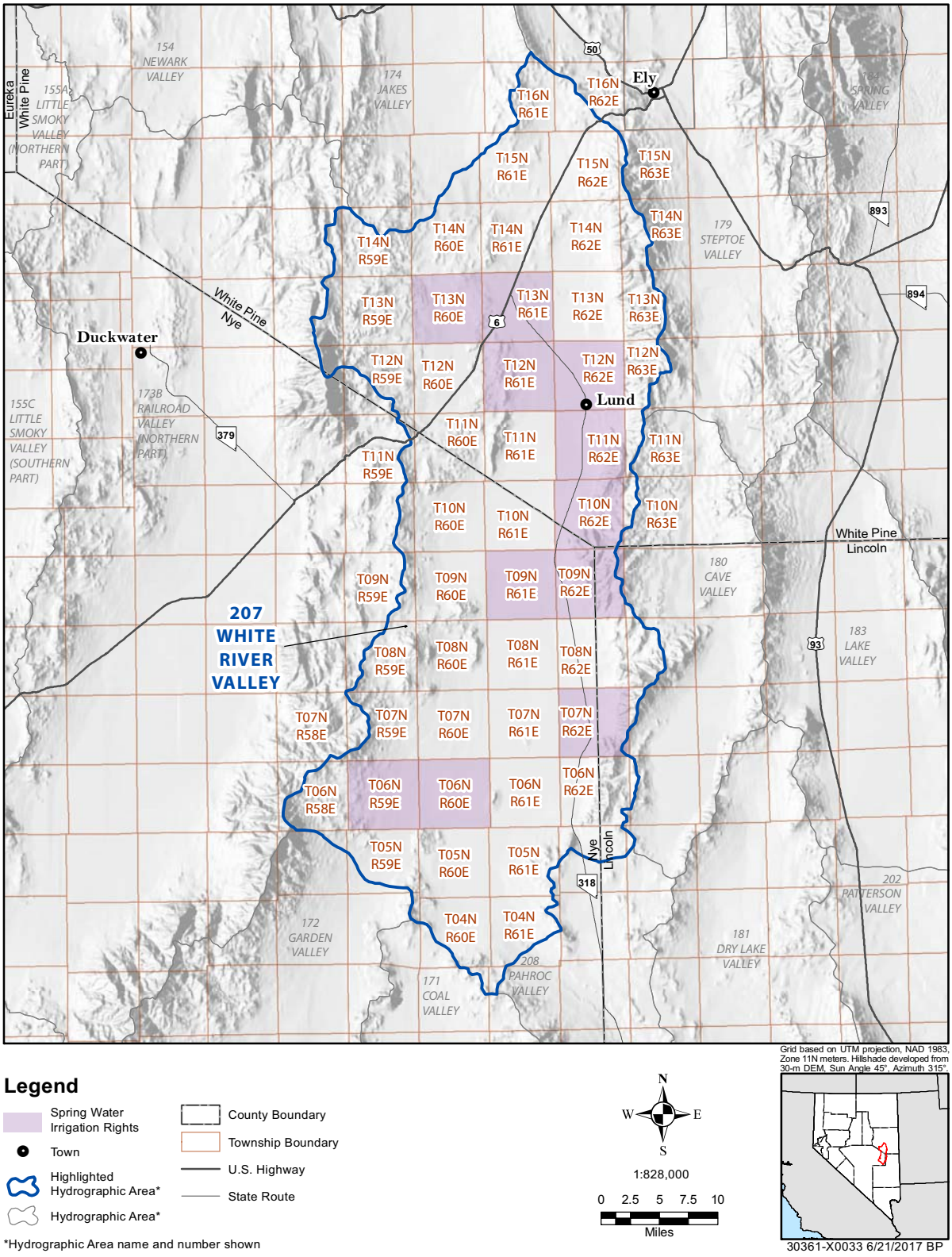

Figure 5-6
Township/Range of Spring Irrigation Rights
Within White River Valley

Table 5-10
Spring Irrigation Rights per duty Within White River Valley
Supplementally Adjusted to Other Spring Irrigation Rights

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (afa/acre)	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**
0.68 (Winter)	277.32	0.68	187.47	0.00	0.00	0.00	277.32	0.68	187.47
0.82 (Winter)	620.72	0.82	507.53	0.00	0.00	0.00	620.72	0.82	507.53
0.89 (Winter)	1,105.05	0.89	980.00	0.00	0.00	0.00	1,105.05	0.89	980.00
1.29 (Winter)	606.14	1.29	784.00	0.00	0.00	0.00	606.14	1.29	784.00
1.50 (Winter)	1,068.00	1.50	1,601.80	0.00	0.00	0.00	1,068.00	1.50	1,601.80
2.10	69.72	2.10	146.41	0.00	0.00	0.00	69.72	2.10	146.41
2.68	5.95	2.68	15.92	0.00	0.00	0.00	5.95	2.68	15.92
3.00	2,336.52	3.00	7,009.62	6.74	3.00	20.27	2,329.78	3.00	6,989.35
3.65	12.00	3.65	43.80	0.00	0.00	0.00	12.00	3.65	43.80
4.00	2,023.46	4.00	8,094.29	0.00	0.00	0.00	2,023.46	4.00	8,094.29
4.26	40.16	4.26	171.00	0.00	0.00	0.00	40.16	4.26	171.00
4.50	73.73	4.50	331.78	0.00	0.00	0.00	73.73	4.50	331.78
Total	8,238.77		19,873.62	6.74		20.27	8,232.03		19,853.35

Table 5-11
Summary of White River Valley Spring Rights within Groundwater Discharge Areas

	Current Analysis (afa)		
Manner of Use	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Commercial	0.00	0.00	0.00
Domestic	56.93	0.00	56.93
Construction	0.00	0.00	0.00
Municipal/ Quasi-Municipal	1.81	0.00	1.81
Stockwater	173.44	0.00	173.44
Industrial	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Recreation	0.00	0.00	0.00
Power	0.00	0.00	0.00
Mining/Milling	0.00	0.00	0.00
Irrigation	19,873.62	20.27	19,853.35
Total	20,105.80	20.27	**20,085.53**

5.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

For the 40 irrigation spring rights considered to be groundwater for accounting purposes, Section 5.5.11 determined the quantity of spring irrigation rights supplementally adjusted to other spring irrigation rights, and the results of that analysis showing the non-supplemental portion were presented per duty in Table 5-10. In addition to determining whether spring irrigation rights were supplemental to other spring irrigation rights, it also must be determined whether any groundwater irrigation rights are supplemental to the spring irrigation rights that are considered to be groundwater.

Groundwater rights would be considered supplemental to spring irrigation rights if they are appurtenant to the same POU. Spring irrigation water right priority dates are prior to groundwater priority dates in almost all locations. Due to their junior status, for this analysis, groundwater is treated as being supplemental to spring water if their POU is in the same location. Figure 5-4 shows the location of groundwater irrigation rights within White River Valley. Figure 5-6 shows the location of spring irrigation rights considered to be groundwater within White River Valley. Figure 5-7 is a map showing the township/range locations where there are both groundwater and spring irrigation rights. There are six township/range locations where there are both spring irrigation rights and groundwater irrigation rights within the same township/range location within White River Valley.

Table 5-12 lists the six townships and ranges where spring irrigation rights and groundwater irrigation rights are both located, as well as the appendix where each map is located.

Appendix 5-16 (groundwater POUS) and Appendix 5-32 (spring POUs) were combined and sorted in descending order by range, township, section, quarter, and quarter-quarter subdivision to identify any possible areas of overlapping POUs of groundwater irrigation rights to spring irrigation rights.

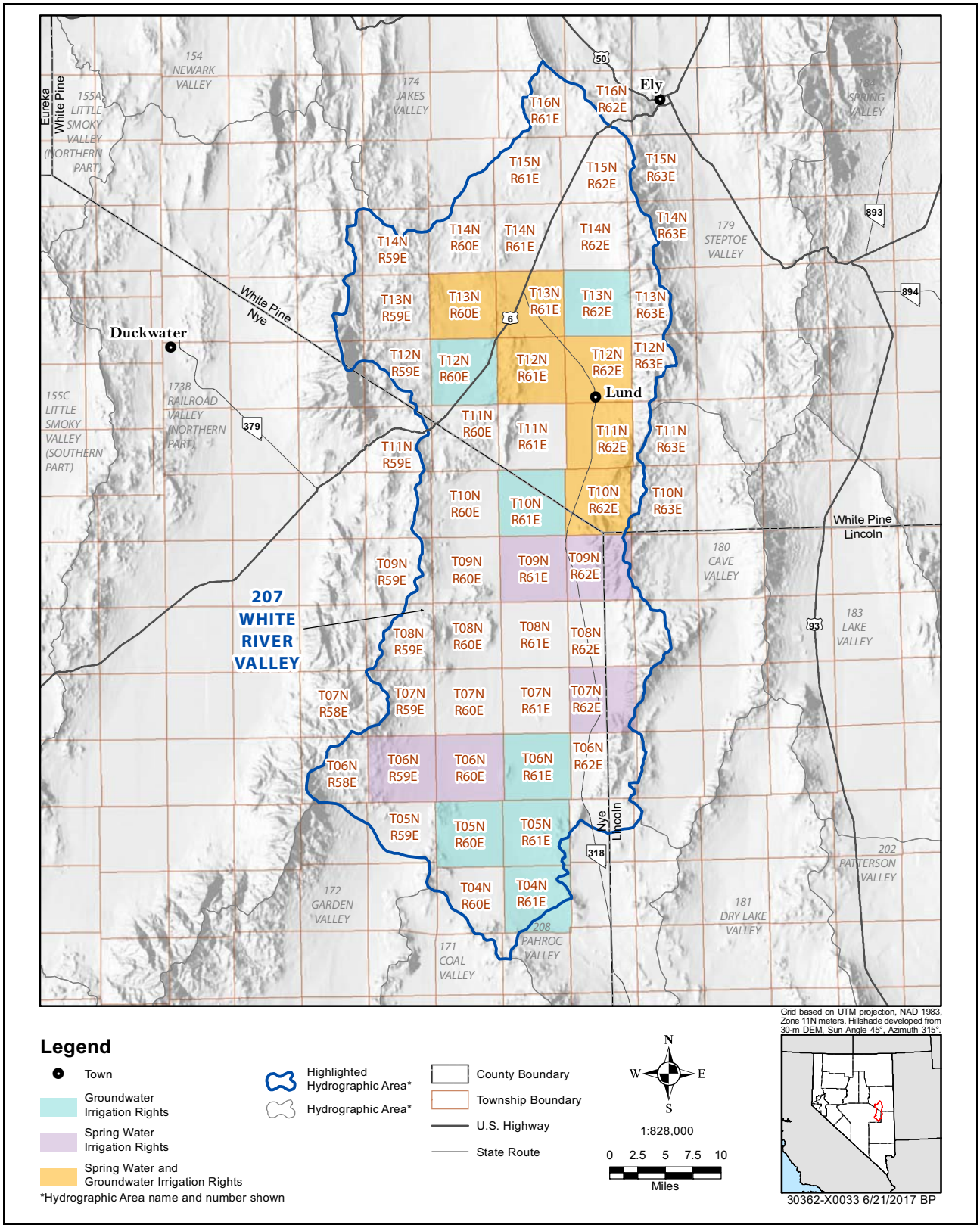

Figure 5-7
Townships/Ranges of Spring Irrigation Rights and Groundwater Irrigation Rights Within White River Valley

Table 5-12
Township/Range of Spring Irrigation Rights and Groundwater Irrigation Rights Within White River Valley and Associated Appendix Numbers

Township	Range	GW only maps Appendix No.	Spring only maps Appendix No.	Spring & GW maps Appendix No.
13N	60E	5-20	5-36	5-45
12N	61E	5-25	5-38	5-46
13N	61E	5-26	5-39	5-47
10N	62E	5-27	5-41	5-48
11N	62E	5-28	5-42	5-49
12N	62E	5-29	5-43	5-50

Township and range in MDBM.
GW = Groundwater.

Appendix 5-51 is the sorted combined list titled *White River Valley: Place of Use of Spring and Groundwater Irrigation Rights [Sorted]*. Locations where groundwater could potentially be supplemental to surface water were highlighted for further review.

Previously within this chapter, both groundwater irrigation rights and spring irrigation rights were mapped. Additionally, the groundwater irrigation maps and spring irrigation maps were combined into a single map per township/range which shows the locations of the spring irrigation rights, groundwater irrigation rights, and areas where groundwater irrigation rights may be supplemental to spring irrigation rights. Table 5-12 also lists the report appendix numbers for these maps.

The spring/groundwater irrigation rights spreadsheet and maps were reviewed to determine which groundwater irrigation rights are supplemental to spring irrigation rights within White River Valley. Appendix 5-52 includes a list of all the groundwater irrigation rights and notes regarding whether they are supplemental to spring irrigation rights. Table 5-13 is a summary of the non-supplemental portion of the groundwater irrigation rights after the spring irrigation rights supplemental analysis was performed.

Table 5-14 is a summary of the combined supplementally adjusted spring irrigation rights and groundwater irrigation rights, listed according to their duty. Table 5-14 also lists the non-supplemental portion of these rights with a priority date prior to, on, and after October 17, 1989.

5.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

A portion of the groundwater and spring irrigation rights could be considered supplemental to surface water irrigation rights within White River Valley if they are appurtenant to the same POU as the surface water rights. For this analysis, groundwater and spring irrigation rights are treated as being supplemental to surface water if their POU is in the same location. Figure 5-7 shows the township/range locations where groundwater and spring irrigation rights are located. The irrigation surface water rights were input into a spreadsheet with their POUs listed per quarter-quarter subdivision. This spreadsheet is included as Appendix 5-53, *White River Valley: Place of Use of*

Surface Water Irrigation Rights [Un-Sorted]. Figure 5-8 shows the township/ranges where surface water irrigation POUs are listed.

Table 5-13
Supplementally Adjusted Groundwater Irrigation Rights to Spring Irrigation Rights Within White River Valley

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (afa/acre)	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**
0.32 in addition to base of 3.0 afa/acre UG	15.56	0.32	4.97	0.00	0.00	0.00	15.56	0.32	4.97
0.33 in addition to base of 3.0 afa/acre UG	41.33	0.33	13.64	10.00	0.33	3.30	31.33	0.33	10.34
1.00 in addition to base of 3.0 afa/acre UG	968.79	1.00	968.79	84.24	1.00	84.24	884.55	1.00	884.55
1.47 in addition to base of 3.0 afa/acre UG	84.98	1.47	124.92	0.00	0.00	0.00	84.98	1.47	124.92
2.50 in addition to base of 1.5 afa/acre UG	194.29	2.50	485.73	0.00	0.00	0.00	194.29	2.50	485.73
3.00 UG	202.73	3.00	608.17	38.78	3.00	116.34	163.95	3.00	491.83
3.32 in addition to base of 0.68 afa/acre UG	2.56	3.32	8.50	0.00	0.00	0.00	2.56	3.32	8.50
3.33 UG	262.00	3.33	872.73	45.76	3.33	152.38	216.24	3.33	720.35
3.50 UG	126.13	3.50	441.44	0.00	0.00	0.00	126.13	3.50	441.44
4.00 UG	6,025.41	4.00	24,101.49	2,632.15	4.00	10,528.50	3,393.26	4.00	13,572.99
4.50 UG	85.43	4.50	384.44	85.43	4.50	384.44	0.00	0.00	0.00
Total	8,009.21		28,014.82	2,896.36		11,269.20	5,112.85		16,745.62

UG = Underground.

Table 5-14
Non-supplemental Spring and Groundwater Irrigation Rights per Duty Within White River Valley

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (afa/acre)	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**	**Acre**	**Duty (afa/acre)**	**afa**
0.32 in addition to base of 3.00 afa/acre UG	15.56	0.32	4.97	0.00	0.00	0.00	15.56	0.32	4.97
0.33 in addition to base of 3.00 afa/acre UG	41.33	0.33	13.64	10.00	0.33	3.30	31.33	0.33	10.34
0.68 in addition to base of 3.0 af/acre Spring	277.32	0.68	187.47	0.00	0.00	0.00	277.32	0.68	187.47
0.82 in addition to base of 3.0 af/acre Spring	620.72	0.82	507.53	0.00	0.00	0.00	620.72	0.82	507.53
0.89 in addition to base of 3.0 af/acre Spring	1,105.05	0.89	980.00	0.00	0.00	0.00	1,105.05	0.89	980.00
1.00 in addition to base of 3.00 afa/acre UG	968.79	1.00	968.79	84.24	1.00	84.24	884.55	1.00	884.55
1.29 in addition to base of 3.0 af/acre Spring	606.14	1.29	784.00	0.00	0.00	0.00	606.14	1.29	784.00
1.50 (Winter) Spring	1,068.00	1.50	1,601.80	0.00	0.00	0.00	1,068.00	1.50	1,601.80
2.10 Spring	69.72	2.10	146.41	0.00	0.00	0.00	69.72	2.10	146.41
1.47 in addition to base of 3.00 afa/acre UG	84.98	1.47	124.92	0.00	0.00	0.00	84.98	1.47	124.92
2.50 in addition to base of 1.50 afa/acre UG	194.29	2.50	485.73	0.00	0.00	0.00	194.29	2.50	485.73
2.68 Spring	5.95	2.68	15.92	0.00	0.00	0.00	5.95	2.68	15.92
3.00 UG	202.73	3.00	608.17	38.78	3.00	116.34	163.95	3.00	491.83
3.00 Spring	2,336.52	3.00	7,009.62	6.74	3.00	20.27	2,329.78	3.00	6,989.35
3.32 in addition to base of 0.68 afa/acre UG	2.56	3.32	8.50	0.00	0.00	0.00	2.56	3.32	8.50
3.33 UG	262.00	3.33	872.73	45.76	3.33	152.38	216.24	3.33	720.35
3.50 UG	126.13	3.50	441.44	0.00	0.00	0.00	126.13	3.50	441.44
3.65 Spring	12.00	3.65	43.80	0.00	0.00	0.00	12.00	3.65	43.80
4.00 UG	6,025.41	4.00	24,101.49	2,632.15	4.00	10,528.50	3,393.26	4.00	13,572.99
4.00 Spring	2,023.46	4.00	8,094.29	0.00	0.00	0.00	2,023.46	4.00	8,094.29
4.26 Spring	40.16	4.26	171.00	0.00	0.00	0.00	40.16	4.26	171.00
4.50 UG	85.43	4.50	384.44	85.43	4.50	384.44	0.00	0.00	0.00
4.50 Spring	73.73	4.50	331.78	0.00	0.00	0.00	73.73	4.50	331.78
Total	16,247.98		47,888.44	2,903.10		11,289.47	13,344.88		36,598.97

UG = Underground.

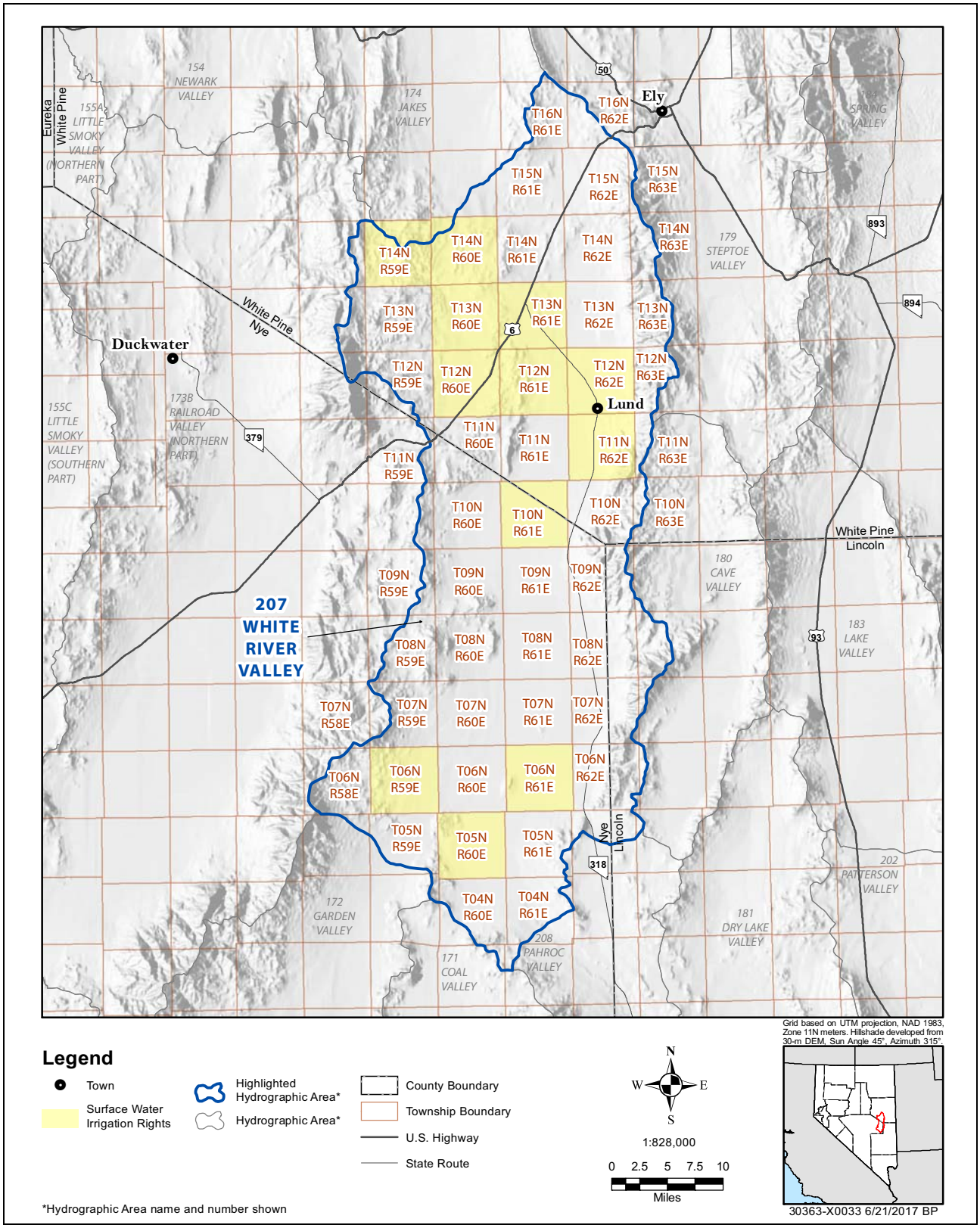

Figure 5-8
Township/Range of Surface Water Irrigation Rights Within White River Valley

There are 13 township/ranges within White River Valley that have surface water irrigation POUs, and 11 out of the 13 also have groundwater/spring irrigation POUs. Figure 5-9 is a map showing the township/range locations where surface water and groundwater/spring irrigation POUs are located.

Appendix 5-51 (spring and groundwater POUs) and Appendix 5-53 (surface water POUs) were combined and then sorted by location. Appendix 5-74 is the combined and sorted list titled *White River Valley: Place of Use of Groundwater/Spring and Surface Water Irrigation Rights (Sorted)*. Locations where groundwater/spring irrigation rights could potentially be supplemental to surface water irrigation rights were highlighted for further mapping review.

Surface water irrigation rights in township/ranges where both surface water and groundwater/spring irrigation rights are located were mapped. Additionally, the groundwater irrigation rights maps, spring irrigation rights maps, groundwater/spring irrigation rights maps, and surface water irrigation rights maps were compiled into a single map per township/range to show the locations where groundwater and spring irrigation rights may be supplemental to surface water irrigation rights. Table 5-15 lists the township/range locations where surface water irrigation rights are located, and the report appendix numbers where the mapped groundwater, spring, and surface water irrigation rights are located.

Groundwater/spring irrigation rights are considered supplemental to surface water irrigation rights if both the groundwater/spring irrigation rights and surface water irrigation rights have the same POU. The same procedures used to analyze whether groundwater/spring irrigation rights were supplemental to other groundwater/spring rights were also used to determine whether groundwater/spring irrigation rights were supplemental to surface water irrigation rights.

Appendix 5-75 shows the results of the supplemental analysis of groundwater/spring irrigation rights to surface water irrigation rights. Review of the groundwater/spring rights show that Permit Nos. 68233, 68234, and 75775 are supplemental to surface water and have priority dates after October 17, 1989. All other groundwater/spring irrigation rights determined to be supplemental to surface water rights have priority dates prior to October 17, 1989.

Table 5-16 lists the total groundwater/spring irrigation rights considered supplemental to surface water irrigation rights based on review of Appendix 5-75.

Table 5-16 shows the total quantity of groundwater/spring irrigation rights considered supplemental to surface water irrigation rights within White River Valley. These rights are divided into groundwater/spring irrigation rights supplementally adjusted to surface water irrigation rights with priority dates prior to, or on October 17, 1989 (4,376.40 afa), priority dates after October 17, 1989 (695.48 afa), and the total of both (5,071.88 afa).

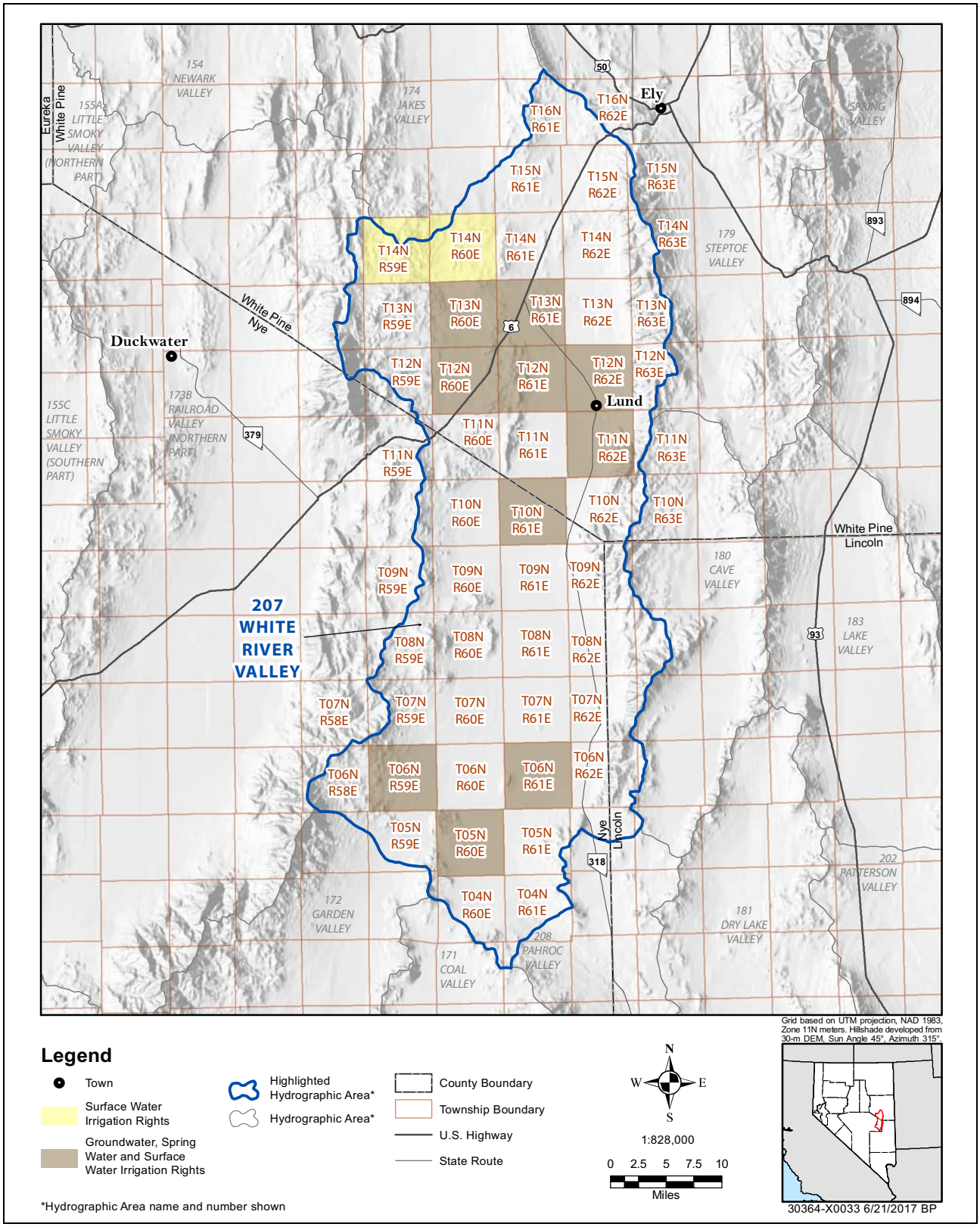

Figure 5-9
Township/Range of Groundwater/Spring and Surface Water Irrigation Rights Within White River Valley

Table 5-15
Township/Range of Surface Water Irrigation Rights
Within White River Valley and Associated Appendix Numbers

Township	Range	GW only maps Appendix No.	Spring only maps Appendix No.	GW & Spring maps Appendix No.	Surface Water Appendix No.	Surface Water & GW/ Spring Appendix No.
6N	59E	N/A	5-34	N/A	5-54	5-64
14N	59E	N/A	N/A	N/A	N/A	N/A
5N	60E	5-18	N/A	N/A	5-55	5-65
12N	60E	5-19	N/A	N/A	5-56	5-66
13N	60E	5-20	5-36	5-45	5-57	5-67
14N	60E	N/A	N/A	N/A	N/A	N/A
6N	61E	5-23	N/A	N/A	5-58	5-68
10N	61E	5-24	N/A	N/A	5-59	5-69
12N	61E	5-25	5-38	5-46	5-60	5-70
13N	61E	5-26	5-39	5-47	5-61	5-71
11N	62E	5-28	5-42	5-49	5-62	5-72
12N	62E	5-29	5-43	5-50	5-63	5-73

Township and range in MDBM.
N/A = Not applicable.
GW = Groundwater.

Table 5-16
Portion of Groundwater/Spring Irrigation Rights
Supplemental to Surface Water Irrigation Rights

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (afa/acre)	Acre	Duty (afa/acre)	afa	Acre	Duty (afa/acre)	afa	Acre	Duty (afa/acre)	afa
3.00	792.85	3.00	2,378.55	0.00	0.00	0.00	792.85	3.00	2,378.55
3.33	103.72	3.33	345.39	0.00	0.00	0.00	103.72	3.33	345.39
4.00	474.56	4.00	1,898.24	88.74	4.00	354.96	385.82	4.00	1,543.28
4.50	99.93	4.50	449.70	75.67	4.50	340.52	24.26	4.50	109.18
Total	1,471.06		5,071.88	164.41		695.48	1,306.65		4,376.40

5.7.1 Adjusted Duty for Supplemental Groundwater/Spring Irrigation Rights in White River Valley

Groundwater/spring irrigation rights, that are supplemental to surface water as identified in Section 5.7 of this report, are not normally used to their full permitted or certificated maximum duty every year. Surface water is generally preferred and used first because groundwater has additional costs associated with pumping water from groundwater wells. In years where surface water supplies

the full amount of water needed for that irrigation season, no supplemental ground/spring irrigation rights would be used. Conversely, in years where there was little surface water to be used, a higher percentage of the supplemental ground/spring irrigation rights would be used. Additionally, permit conditions can require surface water to be used prior to groundwater. An example of this is the following statement in Permit No. 68234: *"All surface water must be used for irrigation prior to the use of any supplemental groundwater"* (NDWR, 2001). For purposes of this analysis, some spring irrigation rights were accounted for as groundwater, so the same assumptions applied to supplemental groundwater also apply to those spring irrigation rights. In order to accurately quantify the amount of groundwater/spring irrigation rights used per season when those rights are supplemental to surface water, the following information would be required:

- Locations of irrigation where groundwater and spring rights are supplemental to surface water.
- Groundwater pumping records over an extended time period.
- Surface water hydrographs showing availability of surface water for irrigation use over an extended time period.

Information is currently not available regarding the actual amount of supplemental groundwater rights used on a well-by-well basis within White River Valley. Therefore, a determination of the actual amount of supplemental water rights used per season could not be completed.

The following approach has been identified to estimate the average percentage of groundwater/spring rights supplemental to surface water rights that would be expected to be used per irrigation season within White River Valley.

5.7.2 White River Valley Hydrograph Analysis

Review of available water flow data revealed several locations with long term monitoring of surface water within White River Valley. Water Canyon Creek near Preston is located in the north-east portion of White River Valley and has flow measurements available from the USGS. White River near Red Mountain is located near Preston, and it also has flow measurements available from the USGS. The USGS data includes individual flow measurements during specific months.

Appendix 5-76 includes the summary spreadsheets of monthly flows from the USGS online database for White River and Water Canyon Creek.

Figure 5-10 is a bar graph based on the USGS data showing the mean monthly flows (cfs) of Water Canyon Creek.

An estimate of the average use of groundwater/spring rights supplemental to surface water rights for Water Canyon Creek was completed using the following assumptions:

- Surface water source is fully appropriated but not over -appropriated.
- Surface water will be used prior to groundwater/spring water.
- An April 1st to October 31st irrigation season (7 months).
- A full irrigation season is used every year.

- April, May, June, August, September, and October will use a combination of surface water and groundwater/spring water. July is the highest average flow and it is assumed that only surface water will be used in July.

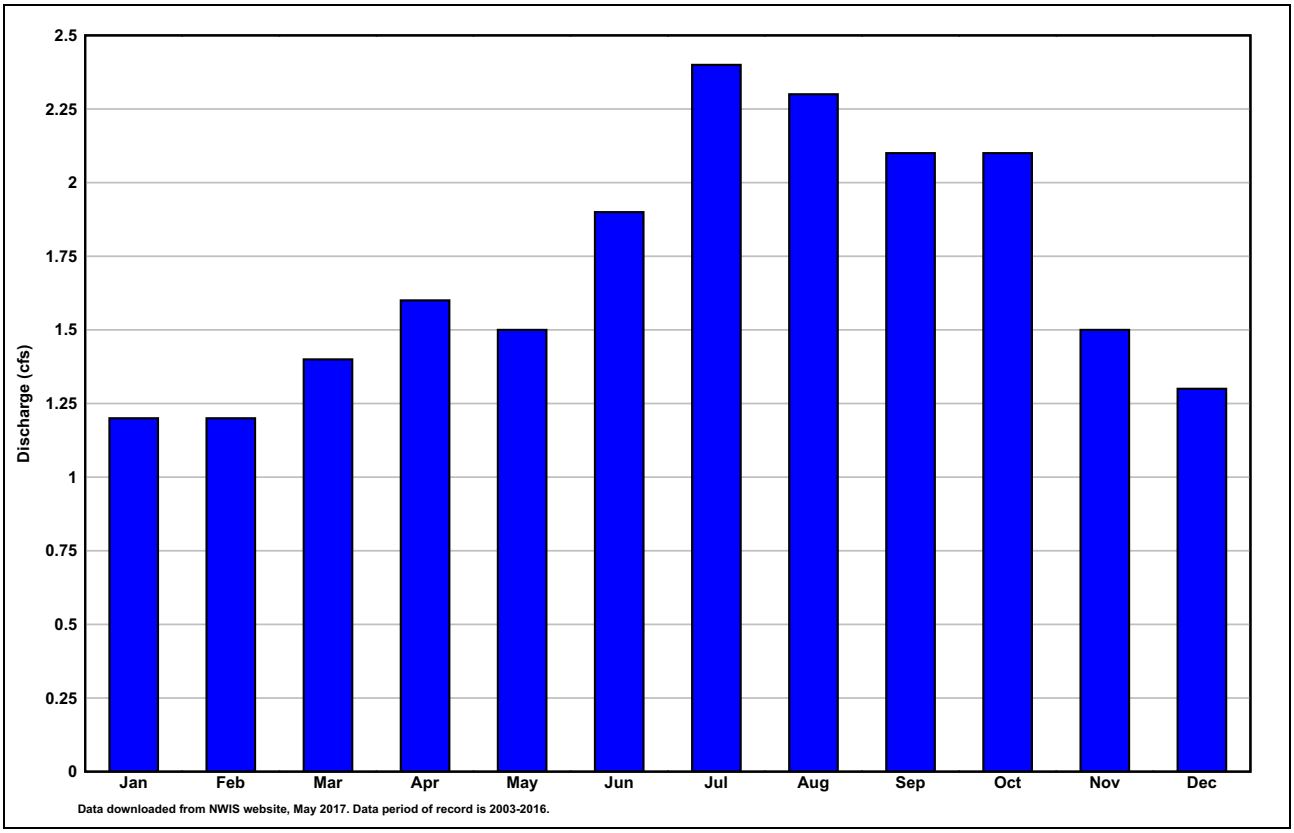

Figure 5-10
Mean Monthly Flow at Water Canyon Creek

Figure 5-11 shows the hydrograph for Water Canyon Creek with the proportional amount of groundwater/springs required to supplement surface water during the months of April, May, June, August, September, and October.

Table 5-17 is based on the Water Canyon Creek hydrograph data. This table shows the percentage of surface water and groundwater/springs that is expected to be used per month during an average irrigation season. Based on the Water Canyon analysis, it is estimated 17.2 percent of total groundwater/spring rights supplemental to surface water rights would be used during an average irrigation season.

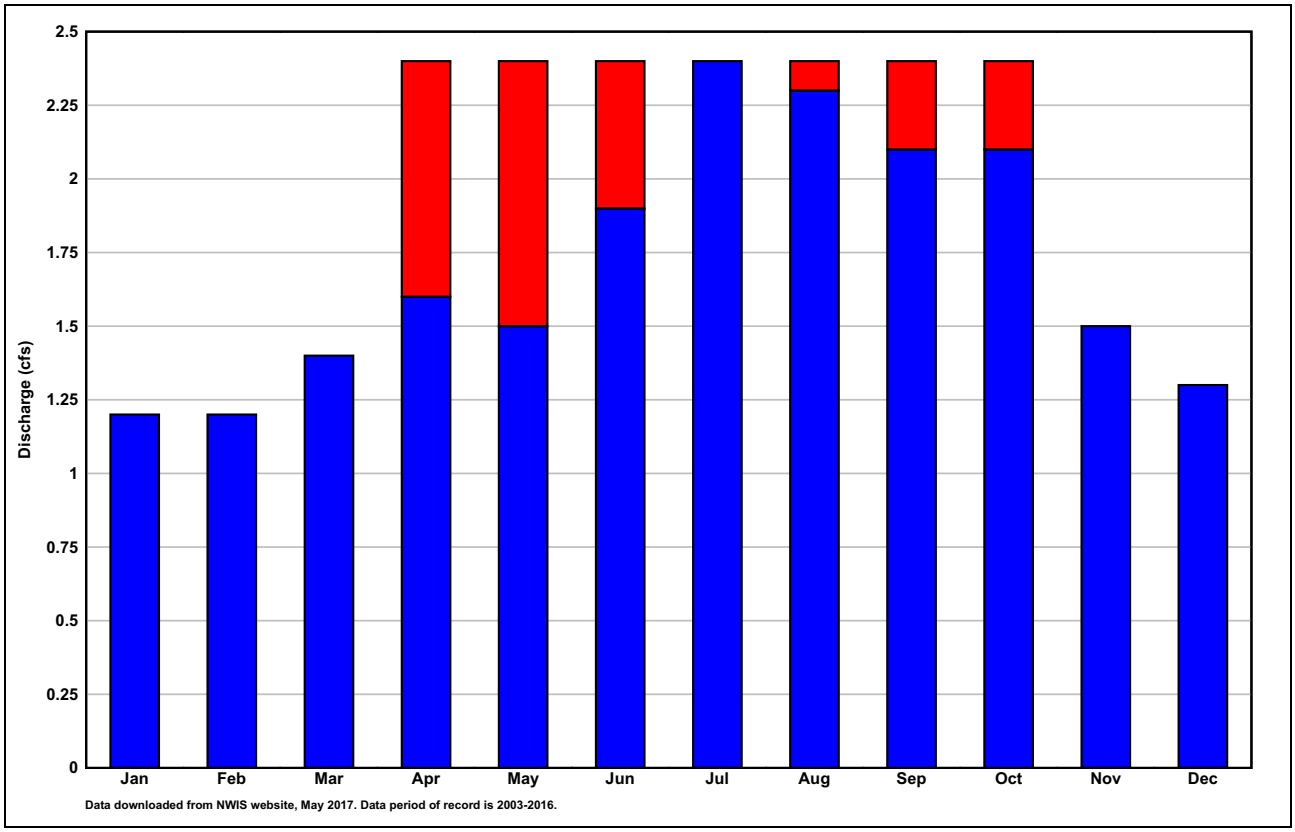

Figure 5-11
Water Canyon Creek Hydrograph with Supplemental Groundwater

Table 5-17
Surface Water and Estimated Percentage of Supplemental Groundwater/Springs used during an Average Year for Water Canyon Creek

Month	Total Supply of Surface Water and Groundwater (cfs)	Monthly Contribution to Total Irrigation Season (%)	Supply of Surface Water (cfs)	Remainder Supplied by Groundwater (cfs)	Supplied by Groundwater (%)
April	2.4	14.28	1.6	0.8	33.3
May	2.4	14.28	1.5	0.9	37.5
June	2.4	14.28	1.9	0.5	20.8
July	2.4	14.28	2.4	0.0	0.0
August	2.4	14.28	2.3	0.1	4.1
September	2.4	14.28	2.1	0.3	12.5
October	2.4	14.28	2.1	0.3	12.5
				Used per average irrigation season	**17.2%**

Figure 5-12 is a bar graph based on the USGS data (Appendix 5-76) showing the mean monthly flows (cfs) of White River, near Red Mountain.

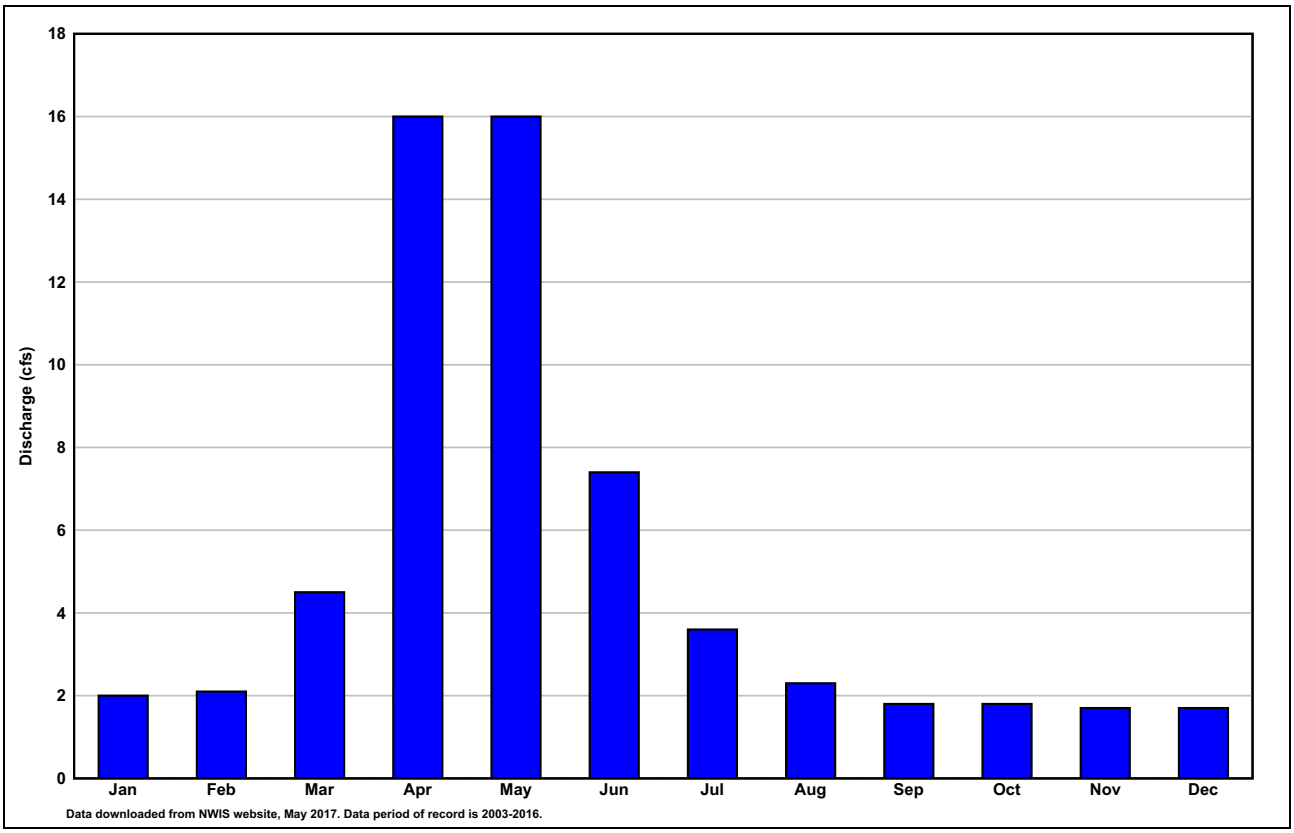

Figure 5-12
Mean Monthly Flow at White River

An estimate of the average use of groundwater/spring rights supplemental to surface water rights for White River was completed using the following assumptions:

- Surface water source is fully appropriated but not over-appropriated.
- Surface water will be used prior to groundwater/spring water.
- An April 1st to October 31st irrigation season (7 months).
- A full irrigation season is used every year.
- June, July, August, September, and October will use a combination of surface water and groundwater. April and May have the highest average flow and it is assumed that only surface water will be used for April and May.

Figure 5-13 shows the hydrograph for White River with the proportion of groundwater/springs required to supplement surface water during the months of June, July, August, September, and October. Table 5-18 is based on the White River hydrograph data. This table shows the percentage of surface water and groundwater/springs that is expected to be used per month during an average irrigation season. Based on the White River analysis, it is estimated that 56.3 percent of total groundwater/spring rights supplemental to surface water rights would be used during an average irrigation season.

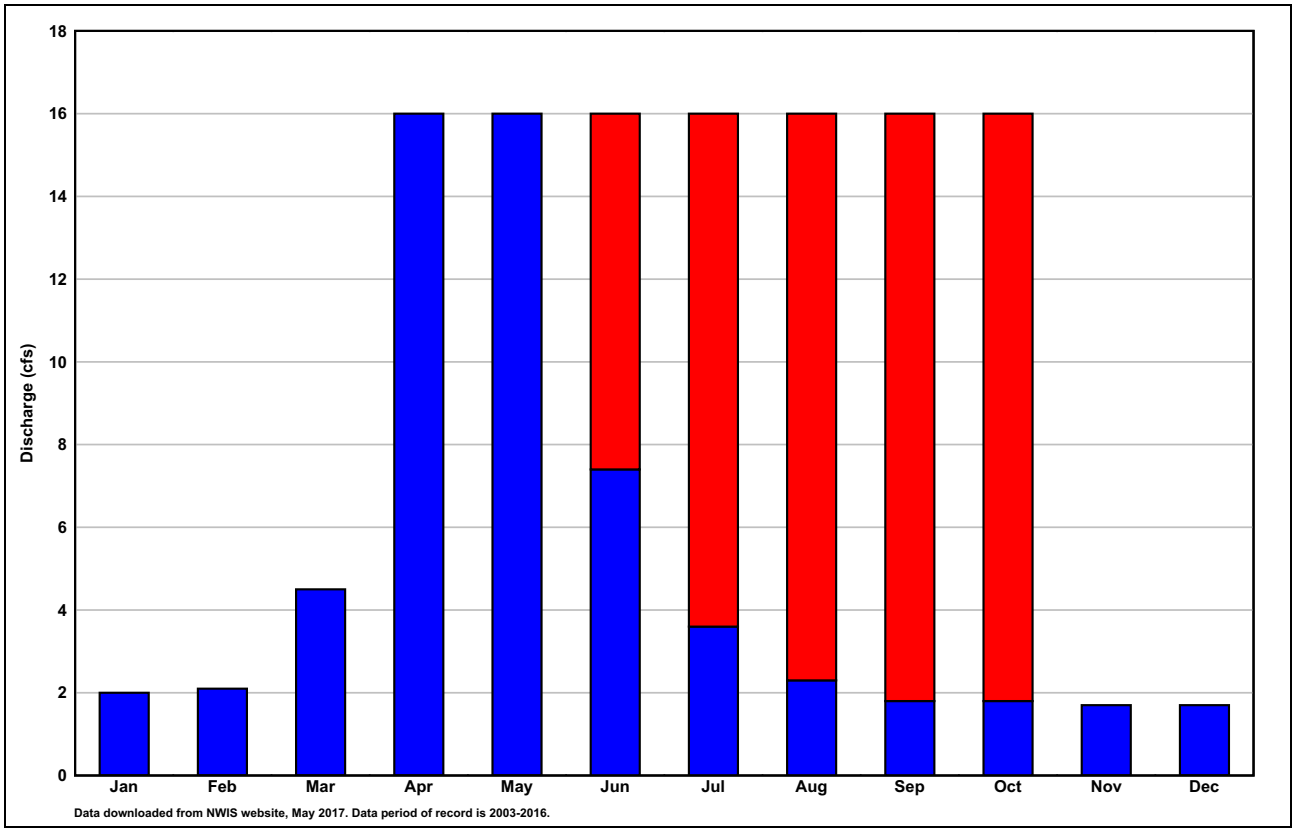

Figure 5-13
White River Hydrograph with Supplemental Groundwater/Springs

Table 5-18
Surface Water and Estimated Percentage of Groundwater used during an Average Year for White River

Month	Total Supply of Surface Water and Groundwater (cfs)	Monthly Contribution to Total Irrigation Season (%)	Supply of Surface Water (cfs)	Remainder Supplied by Groundwater (cfs)	Contribution by Groundwater (%)
April	16.0	14.28	16.0	0.0	0.0
May	16.0	14.28	16.0	0.0	0.0
June	16.0	14.28	7.4	8.6	53.8
July	16.0	14.28	3.6	12.4	77.5
August	16.0	14.28	2.3	13.7	85.6
September	16.0	14.28	1.8	14.2	88.8
October	16.0	14.28	1.8	14.2	88.8
				Used per average irrigation season	**56.3%**

5.7.3 Adjusted Duty Application to White River Valley Supplemental Groundwater Rights

It is reasonable to assume that the effective duty of a supplemental groundwater/spring right is the average amount of the right required to supplement the surface water sources during an irrigation season. Information is not currently available regarding the actual amount of supplemental groundwater rights used on a well-by-well basis within White River Valley. Based on the preceding analysis, the average amount of supplemental groundwater expected to be used in any given irrigation season was estimated to be 17.2 percent (Water Canyon) and 56.3 percent (White River). The average of both streams is 36.8 percent, which will be used for this analysis as the amount of supplemental groundwater/spring water expected to be used in an average year.

Section 5.7 identified 5,071.88 afa of total groundwater/spring rights supplemental to surface water rights. Of the total 5,071.88 afa, it would be expected that only 36.8 percent of those rights, or a maximum of 1,866.45 afa, would be used on average in the irrigation season. Table 5-19 shows the adjusted duty for the supplemental groundwater/spring rights.

Table 5-14 lists the total non-supplemental groundwater/spring irrigation rights within White River Valley as 47,888.44 afa. This quantity is reduced by 3,205.43 afa to 44,683.01 afa as a result of the supplemental analysis of groundwater/spring to surface water irrigation rights.

Table 5-19
White River Valley Adjusted Duty for Supplemental Groundwater/Spring Rights

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (afa/acre)	Acre	Duty (af/acre)	afa	Acre	Duty (afa/acre)	afa	Acre	Duty (af/acre)	afa
3.00	291.77 (36.8% of 792.85 acres)	3.00	875.31	0.00	0.00	0.00	291.77	3.00	875.31
3.33	38.17 (36.8% of 103.72 acres)	3.33	127.10	0.00	0.00	0.00	38.17	3.33	127.10
4.00	174.64 (36.8% of 474.56 acres)	4.00	698.55	32.66	4.00	130.63	141.98	4.00	567.93
4.50	36.77 (36.8% of 99.93 acres)	4.50	165.49	27.84	4.50	125.31	8.93	4.50	40.18
Total	541.35		1,866.45	60.50		255.94	480.85		1,610.52

5.8 Estimated Crop Consumptive Use for White River Valley

Consumptive use of a crop is defined as that portion of the annual volume of water diverted under a water right that is transpired by growing vegetation, evaporated from soils, converted to nonrecoverable water vapor, incorporated into product, or that otherwise does not return to the water source. The consumptive use of a crop is equal to the crop ET less the precipitation amount that is used by ET by the crop. In other words, it is the amount of irrigation water that is consumed in the growing of the crop.

The Net Irrigation Water Requirement (NIWR) is equal to the ET actual minus the precipitation and is the consumptive use portion of the irrigation water rights. When calculating total groundwater commitments in White River Valley, the nonconsumptive use portion of the water right is not included because it is returned to the water source and available for reuse.

The NDWR has established ET data per basin within Nevada. White River Valley is listed as having an ET actual for alfalfa of 4.00 ft and NIWR of 3.20 ft. Appendix 5-77 lists the various ET and NIWR rates for White River Valley. Based on this data, the consumptive use portion for irrigation water rights in White River Valley is 3.20 ft.

Table 5-20 lists the total number of acres in White River Valley with appurtenant permitted and certificated irrigation spring and groundwater rights, the corresponding calculated consumptive use ratios, and the total consumptive use portion of the groundwater/spring irrigation rights. (Table 5-20 only includes non-supplemental groundwater and spring irrigation rights. The non-consumptive portion of these rights is the duty greater than a total of 3.20 afa per acre for each right. Table 5-14 listed the total non-supplemental groundwater/spring irrigation rights within White River Valley as 47,888.44 afa. This quantity was reduced by 3,205.43 afa to 44,683.01 afa as a result of the supplemental analysis of groundwater/spring to surface water irrigation rights in Section 5.7. Table 5-20 shows that if the entire 44,683.01 afa of groundwater/spring irrigation rights within White River Valley were used in a single season, only 35,258.78 afa would be consumed and the remainder would be returned to the groundwater system. Therefore, only the consumptive use portion (35,258.78 afa) will be carried through in this analysis as a committed groundwater resource.

5.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, yearly pumping total per well, and the quantity of secondary recharge of water back to the groundwater system from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in White River Valley.

Because this information does not exist, an alternative approach was used for this analysis, and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells which have been reported to the NDWR located within White River Valley. The list includes a total of 477 records and is included as Appendix 5-78. Each well log filed with the NDWR lists a proposed use of the drilled well. There are 216 records that list a proposed use as domestic (domestic use is signified with an “H” in the proposed use column).

Table 5-20
Consumptive Use with Varying Duties of Irrigation Groundwater/Spring Rights Within White River Valley
(Page 1 of 2)

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (af/acre)	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**
0.32 in addition to base of 3.00 afa/acre UG -0.12 (nonconsumptive)	15.56	0.32	4.97	0.00	0.00	0.00	15.56	0.32	4.97
	15.56	-0.12	-1.87	0.00	0.00	0.00	15.56	-0.12	-1.87
0.33 in addition to base of 3.00 afa/acre UG -0.13 (nonconsumptive)	41.33	0.33	13.64	10.00	0.33	3.3	31.33	0.33	10.34
	41.33	-0.13	-5.37	10.00	-0.13	-1.3	31.33	-0.13	-4.07
0.68 in addition to base of 3.0 af/acre Spring -0.48 (nonconsumptive)	277.32	0.68	187.47	0.00	0.00	0.00	277.32	0.68	187.47
	277.32	-0.48	-133.11	0.00	0.00	0.00	277.32	-0.48	-133.11
0.82 in addition to base of 3.0 af/acre Spring -0.62 (nonconsumptive)	620.72	0.82	507.53	0.00	0.00	0.00	620.72	0.82	507.53
	620.72	-0.62	-384.85	0.00	0.00	0.00	620.72	-0.62	-384.85
0.89 in addition to base of 3.0 af/acre Spring -0.69 (nonconsumptive)	1,105.05	0.89	980.00	0.00	0.00	0.00	1,105.05	0.89	980.00
	1,105.05	-0.69	-762.49	0.00	0.00	0.00	1,105.05	-0.69	-762.49
1.00 in addition to base of 3.00 afa/acre UG -0.80 (nonconsumptive)	968.79	1.00	968.79	84.24	1.00	84.24	884.55	1.00	884.55
	968.79	-0.80	-775.03	84.24	-0.8	-67.39	884.55	-0.80	-707.64
1.29 in addition to base of 3.0 af/acre Spring -1.09 (nonconsumptive)	606.14	1.29	784.00	0.00	0.00	0.00	606.14	1.29	784.00
	606.14	-1.09	-660.69	0.00	0.00	0.00	606.14	-1.09	-660.69
1.47 in addition to base of 3.00 afa/acre UG -1.27 (nonconsumptive)	84.98	1.47	124.92	0.00	0.00	0.00	84.98	1.47	124.92
	84.98	-1.27	-107.92	0.00	0.00	0.00	84.98	-1.27	-107.92
1.50 (Winter) Spring (Fully consumptive)	1,068.00	1.50	1,601.80	0.00	0.00	0.00	1,068.00	1.50	1,601.80
2.10 Spring (Fully consumptive)	69.72	2.10	146.41	0.00	0.00	0.00	69.72	2.10	146.41
2.50 in addition to base of 1.50 afa/acre UG -0.80 (nonconsumptive)	194.29	2.50	485.72	0.00	0.00	0.00	194.29	2.50	485.72
	194.29	-0.80	-155.43	0.00	0.00	0.00	194.29	-0.80	-155.43
2.68 Spring (Fully consumptive)	5.95	2.68	15.92	0.00	0.00	0.00	5.95	2.68	15.92
3.00 UG (-63.2% of 64.54 acres supplemental to SW) (Fully consumptive)	161.94	3.00	485.82	38.78	3.00	116.34	123.16	3.00	369.48

Table 5-20
Consumptive Use with Varying Duties of Irrigation Groundwater/Spring Rights Within White River Valley (Continued)
(Page 2 of 2)

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (af/acre)	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**
3.00 Spring (-71.1% of 728.31 acres supplemental to SW) (Fully consumptive)	1,876.23	3.00	5,628.69	6.74	3.00	20.27	1,869.49	3.00	5,608.42
3.32 in addition to base of 0.68 af/acre UG -0.80 (nonconsumptive)	2.56	3.32	8.50	0.00	0.00	0.00	2.56	3.32	8.50
	2.56	-0.80	-2.05	0.00	0.00	0.00	2.56	-0.80	-2.05
3.33 UG (- 71.1% of 103.72 acres supplemental to SW) -0.13 (nonconsumptive)	196.45	3.33	654.18	45.76	3.33	152.38	150.69	3.33	501.80
	196.45	-0.13	-25.53	45.76	-0.13	-5.95	150.69	-0.13	-19.58
3.50 UG -0.30 af/acre (nonconsumptive)	126.13	3.50	441.44	0.00	0.00	0.00	126.13	3.50	441.44
	126.13	-0.30	-37.84	0.00	0.00	0.00	126.13	-0.30	-37.84
3.65 Spring -0.45 af/acre (nonconsumptive)	12.00	3.65	43.8	0.00	0.00	0.00	12.00	3.65	43.80
	12.00	-0.45	-5.4	0.00	0.00	0.00	12.00	-0.45	-5.40
4.00 UG (-71.1% of 474.56 acres supplemental to SW) -0.80 (nonconsumptive)	5,725.44	4.00	22,901.96	2,576.87	4.00	10,307.46	3,148.62	4.00	12,594.50
	5,725.44	-0.80	-4,580.39	2,576.87	-0.80	-2,061.50	3,148.62	-0.80	-2,518.89
4.00 -0.80 (nonconsumptive)	2,023.46	4.00	8,094.29	0.00	0.00	0.00	2,023.46	4.00	8,094.29
	2,023.46	-0.80	-1,618.77	0.00	0.00	0.00	2,023.46	-0.80	-1,618.77
4.26 Spring -1.06 (nonconsumptive)	40.16	4.26	171.00	0.00	0.00	0.00	40.16	4.26	171.00
	40.16	-1.06	-42.57	0.00	0.00	0.00	40.16	-1.06	-42.57
4.50 UG (-71.1% of 75.67 acres supplemental to SW) -1.30 (nonconsumptive)	37.61	4.50	169.25	37.61	4.50	169.25	0.00	0.00	0.00
	37.61	-1.30	-48.89	37.61	-1.30	-48.89	0.00	0.00	0.00
4.50 Spring (-71.1% of 24.26 acres supplemental to SW) -1.30 (nonconsumptive)	58.40	4.50	262.80	0.00	0.00	0.00	58.40	4.50	262.80
	58.40	-1.30	-75.92	0.00	0.00	0.00	58.40	-1.30	-75.92
Total			35,258.78			8,668.21			26,590.57

SW = Surface water.
UG = Underground.

Of the listed domestic wells, 92 were installed prior to October 17, 1989, and 124 domestic wells were installed after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.0 afa, that all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the 216 domestic wells identified, it is estimated that 432.00 afa would be pumped from the groundwater system through domestic wells, and all of this water would be consumptively used.

Therefore, 432.00 afa is allocated for domestic groundwater commitments within White River Valley. Although the majority of domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

5.10 Summary

The total committed groundwater rights for White River Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 5-21 presents the summary information derived by this analysis of groundwater rights within White River Valley. Table 5-21 contains all active groundwater rights, as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for White River Valley, after supplemental and consumptive use adjustments are made, is estimated to be 36,536.48 afa. The committed groundwater rights for White River Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 9,127.87 afa. The committed groundwater rights for White River Valley, with priority dates prior to October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 27,408.61 afa.

Table 5-21
Committed Groundwater/Spring Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	432.00	n/a	432.00	0.00	n/a	0.00	432.00	n/a	432.00
Irrigation GW & Spring	47,888.44	44,683.01	35,258.78	11,289.47	10,849.93	8,668.21	36,598.97	33,833.09	26,590.57
Commercial GW	4.64	n/a	4.64	2.00	n/a	2.00	2.64	n/a	2.64
Domestic Spring	56.93	n/a	56.93	0.00	n/a	0.00	56.93	n/a	56.93
Construction GW	20.00	n/a	20.00	20.00	n/a	20.00	0.00	n/a	0.00
Municipal/ Quasi-Municipal GW & Spring	77.61	n/a	77.61	52.93	n/a	52.93	24.68	n/a	24.68
Stockwater	670.45	n/a	670.45	368.66	n/a	368.66	301.79	n/a	301.79
Industrial	0.00	n/a	0.00	0.00	n/a	0.00	0.00	n/a	0.00
Wildlife	0.00	n/a	0.00	0.00	n/a	0.00	0.00	n/a	0.00
Recreation	16.07	n/a	16.07	16.07	n/a	16.07	0.00	n/a	0.00
Power	0.00	n/a	0.00	0.00	n/a	0.00	0.00	n/a	0.00
Mining and Milling	0.00	n/a	0.00	0.00	n/a	0.00	0.00	n/a	0.00
Total	49,166.14	44,683.01	36,536.48	11,749.13	10,849.93	9,127.87	37,417.01	33,833.09	**27,408.61**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

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6.0 CAVE VALLEY

6.1 Introduction

NDWR HA 180, Cave Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 6-1 is a map of the location of Cave Valley.

The total committed groundwater rights for Cave Valley were previously analyzed and included in the *Committed Groundwater Resources in Four Nevada HAs: Cave Valley, Dry Lake Valley, Delamar Valley, and Spring Valley* (Stanka, 2011). Section 2.9 of the 2011 Report concluded that the total committed groundwater rights for Cave Valley with priority dates prior to October 17, 1989, was 17.77 afa, and 33.60 afa with priority dates after October 17, 1989, for a total of 51.37 afa.

This chapter is intended to update, amend, and supplement the 2011 Report by identifying changes that have occurred within Cave Valley since the 2011 Report. These changes were identified through a review and comparison of NDWR hydrographic abstract Searches and NDWR HA Summary Reports from the 2011 Report versus NDWR hydrographic abstract Searches and NDWR HA Summary Reports as of April 7, 2017. Any changes are identified in the corresponding sections. If no changes were identified, then the conclusions from the 2011 Report were confirmed in this chapter.

In addition to updating information, some changes were made to the methodology from the 2011 Report. These methodology changes include the following:

- Identification of springs within groundwater discharge areas to be accounted as groundwater resources.
- Revised domestic well identification analysis.
- Inclusion of the additional groundwater rights reserved for future growth within Cave Valley as identified in NSE Ruling No. 6165.
- Revised summary section.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 6-2 shows the townships and ranges (MDBM) located within Cave Valley.

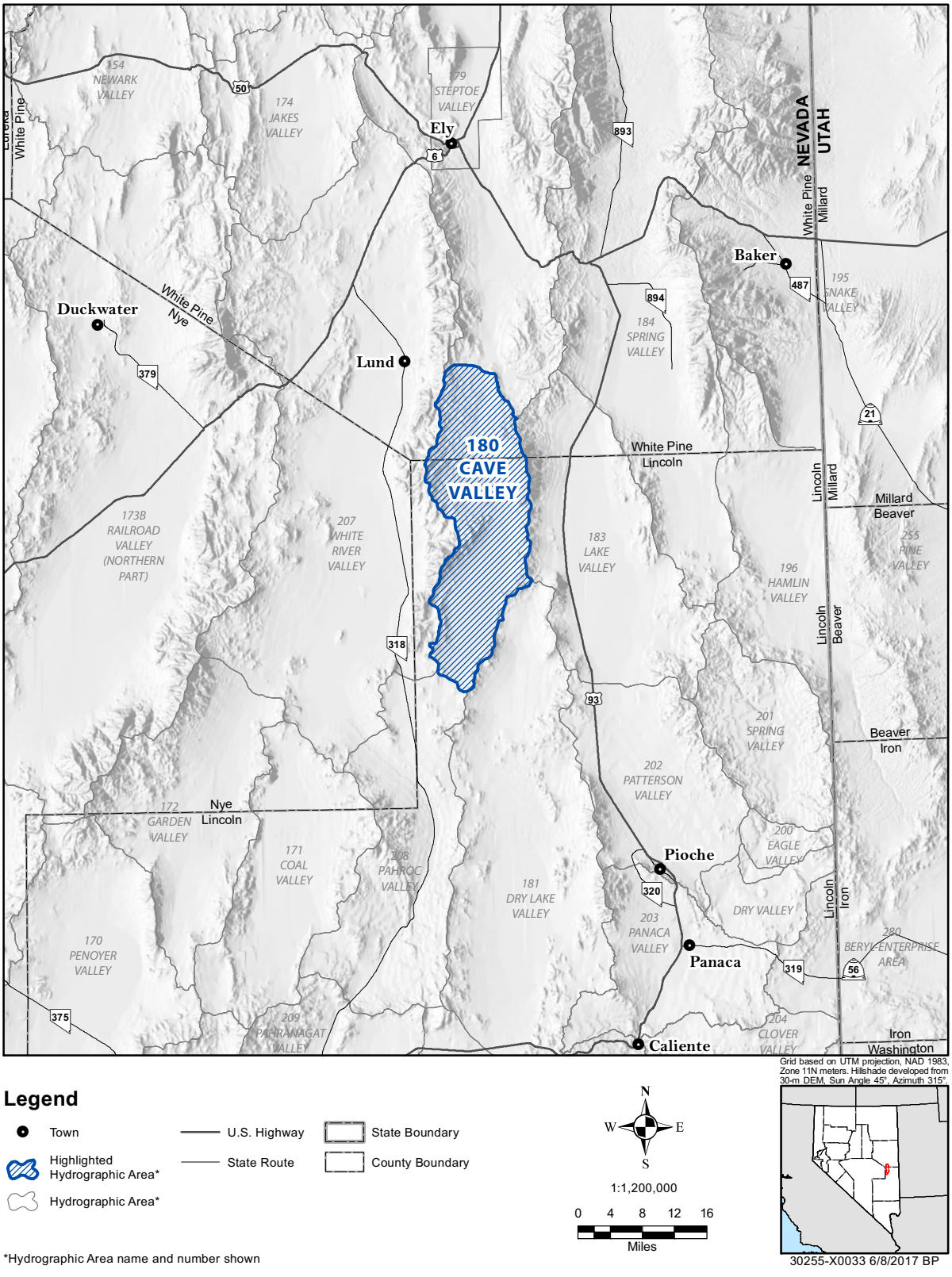

Figure 6-1
Cave Valley Hydrographic Area

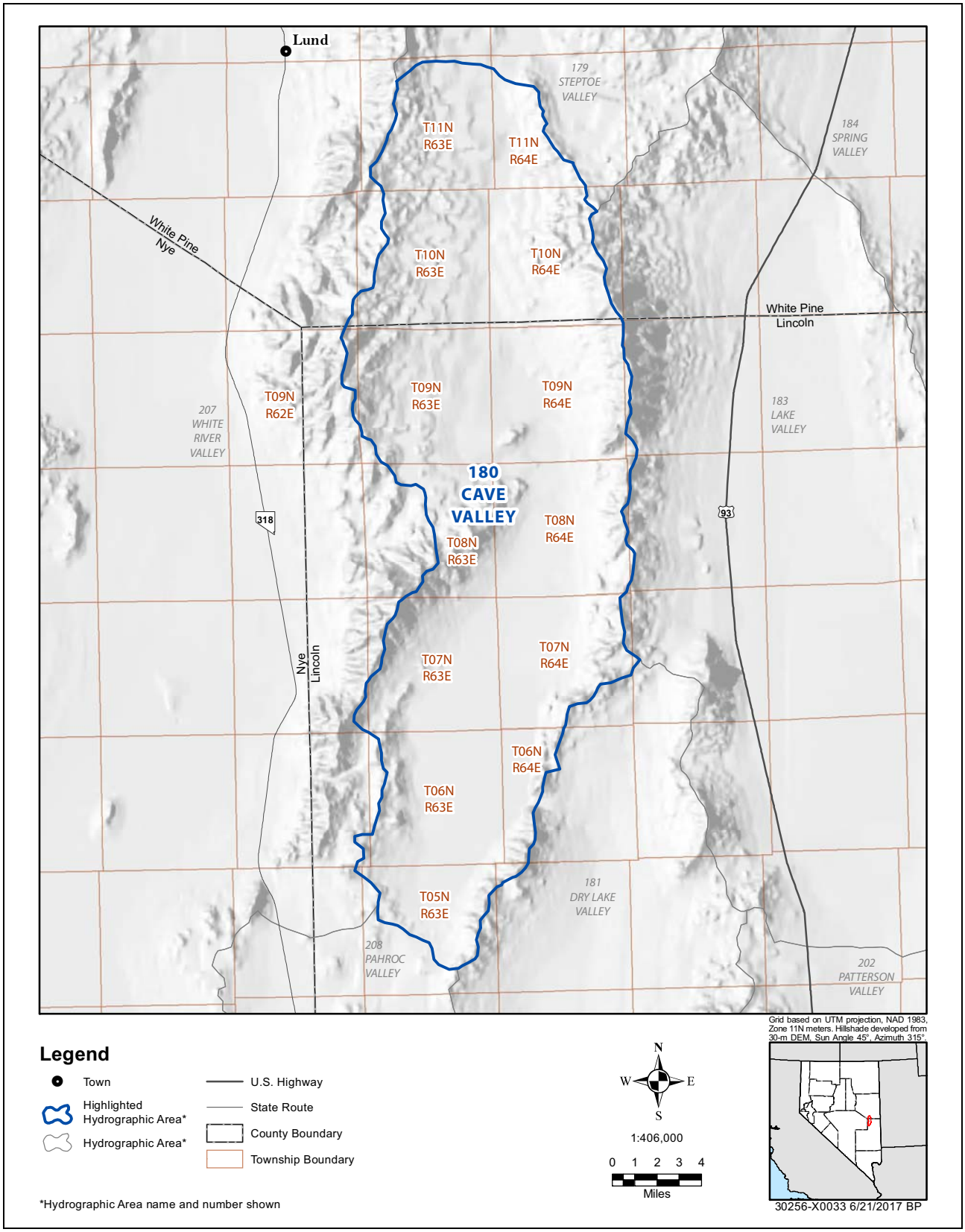

Figure 6-2
Township/Ranges Within Cave Valley

6.2 Summary of Water Rights in Cave Valley

Active water rights within Cave Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

The NDWR hydrographic abstract, queried for all active records within Cave Valley, is included as Appendix 6-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 78 active water rights that are listed as vested, certificated, permitted, and reserved water rights. Appendix 6-2 lists all the active water rights in Cave Valley, and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include domestic, stockwater, municipal/quasi-municipal, and irrigation. Table 6-1 lists the number of records within Cave Valley in the NDWR online water-rights database per manner of use and their current status.

Table 6-1
Number of Active Records Listed per Manner or Use and Status in Cave Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted	Reserved
Domestic	1	0	1	0	0
Stockwater	66	42	18	3	3
Municipal/ Quasi-Municipal	2	0	0	2	0
Irrigation	9	4	5	0	0
Total	78	46	24	5	3

The sources of water for the 78 active water rights include stream, spring, and underground. Table 6-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 6-2
Number of Active Records Listed per Manner of Use and Source in Cave Valley

Manner of Use	Number of Records	Stream	Spring	Underground
Domestic	1	0	1	0
Stockwater	66	6	49	11
Municipal/ Quasi-Municipal	2	0	0	2
Irrigation	9	3	6	0
Total	78	9	56	13

The NDWR online water-rights database includes copies of most of the applications, permits. certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 6-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Cave Valley.

6.2.1 Domestic Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "domestic." Appendix 6-3 is a copy of the hydrographic abstract queried by HA (Cave Valley - Area 180), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring.

This single domestic right is not from an underground source. The total duty from this analysis for domestic underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground domestic rights listed in the NDWR HA Summary, Appendix 6-4.

6.2.2 Stockwater Rights

The NDWR online water-rights database includes 66 active records with the manner of use listed as "stockwater." Appendix 6-5 is a copy of the hydrographic abstract queried by HA (Cave Valley - Area 180), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (6), spring (49), and groundwater (11).

Nine of the 11 groundwater rights are certificated, and the remaining two are permitted. Based on review of the permit and certificate conditions, several of the rights have combined duty limitations. Permit Nos. 66123, 84693 and 84694 have a combined duty limitation of 11.2 afa. Permit Nos. 73168, 73169, and 73170 have a combined duty limitation of 11.2 afa. The other five stockwater rights do not appear to be subject to combined duty limitations. The underground stockwater total, taking into account previously identified combined duty limitations of the listed stockwater rights, is 49.74 afa. This is not consistent with the 60.94 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 6-4. The discrepancy may be due to the NDWR HA Summary not accounting for the combined duty limitations for Permit Nos. 66123, 84693 and 84694.

Five of the groundwater rights (Permit Nos. 66123, 66125, 73168, 73169, and 73170) have a priority date after October 17, 1989. These five groundwater rights have a combined duty limitation of 33.60 afa. Note that Permit Nos. 75231, 84693, and 84694 were permitted since the 2011 Hearing (after October 17, 1989); however, they are being accounted for as water rights reserved for future growth by the NSE in Ruling No. 6165 (refer to Section 6.10, *Groundwater Resources Reserved for Future Growth in Cave Valley*, for additional information on these rights and the application of their priority dates). Appendix 6-2 lists all the active water rights in Cave Valley and identifies any records that have priority dates before, on, and after October 17, 1989.

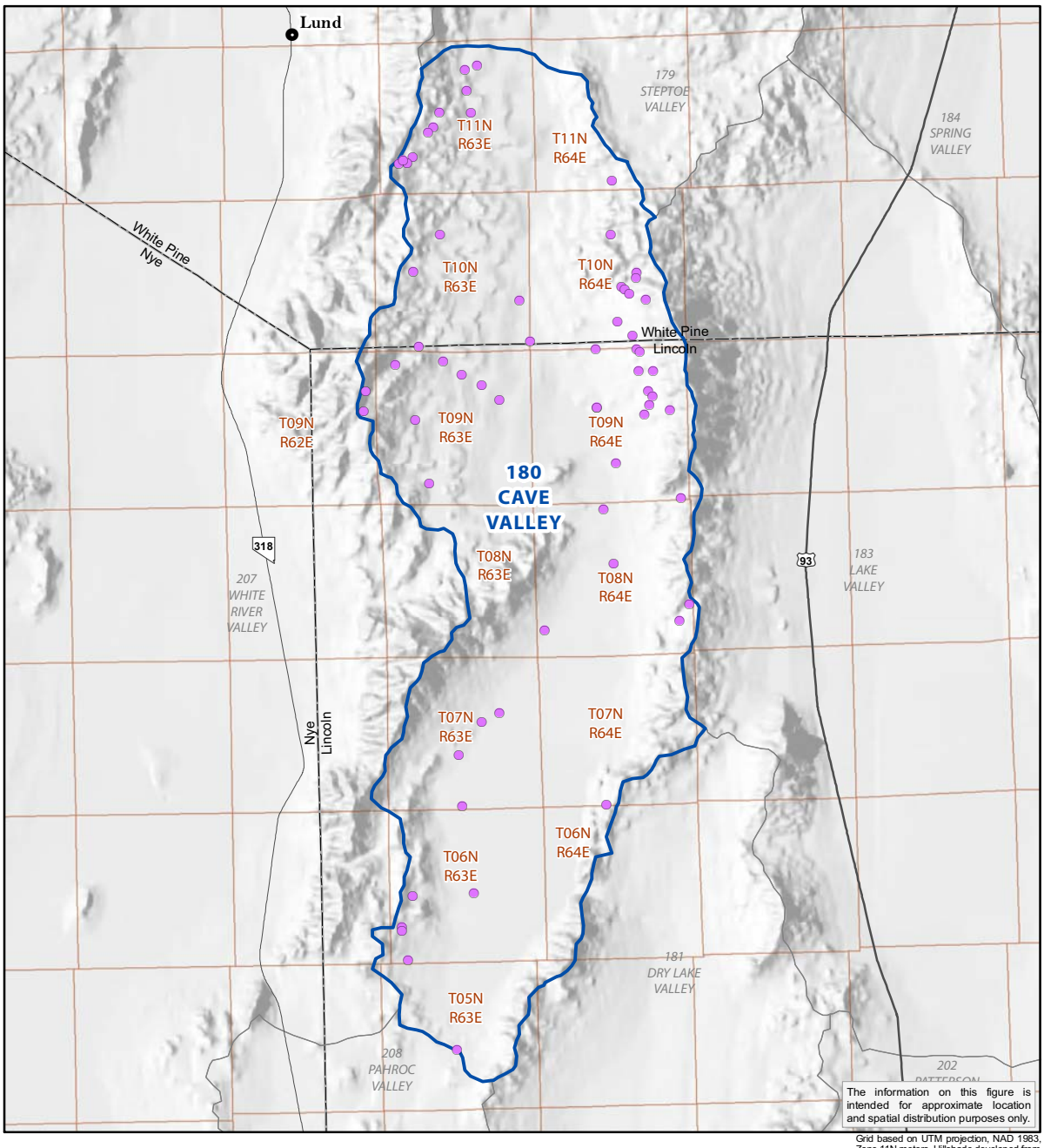

Figure 6-3
PODs for all Active Water Rights Within Cave Valley

6.2.3 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "municipal/quasi-municipal." Appendix 6-6 is a copy of the hydrographic abstract queried by HA (Cave Valley - Area 180), manner of use (municipal/quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these two rights are both listed as underground.

These two groundwater rights are permitted. Based on review of the permit conditions, the combined duty limitation of these two municipal/quasi-municipal groundwater rights is 5,235.00 afa. This is consistent with the 5,235.00 afa of underground municipal/quasi-municipal listed in the NDWR HA Summary, Appendix 6-4.

Both of these groundwater rights (Permit Nos. 53987 and 53988) have a priority date of October 17, 1989. These rights are owned by SNWA, and for accounting purposes for this report, will be considered rights prior to October 17, 1989.

6.2.4 Irrigation Rights

The NDWR online water-rights database includes nine active records with the manner of use listed as "irrigation." Appendix 6-7 is a copy of the hydrographic abstract queried by HA (Cave Valley - Area 180), manner of use (irrigation, irrigation-DLE, irrigation-Carey Act, decreed), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (3), and spring (6).

None of these nine irrigation rights are from an underground source. The total duty from this analysis for irrigation underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 6-4.

6.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 6.2 identified all active water rights within Cave Valley. There were no active groundwater irrigation rights identified within Cave Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

6.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 6-4, lists the total amount of supplementally adjusted groundwater rights for stockwater and municipal uses as 5,295.94 afa. Table 6-3 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report, and the NDWR HA Summary. The report's current analysis shows that there are a total of 5,284.74 afa of groundwater rights within Cave Valley. Of these, 33.60 afa have priority dates after October 17, 1989, and 5,251.14 afa have priority dates prior to or on October 17, 1989. This information is based on the NDWR HA Summary and the analyses completed in Section 6.2 and Section 6.3 of this report.

Table 6-3
Cave Valley Existing Groundwater Rights

Manner of Use	NDWR HA Summary (afa)	Current Analysis (afa)		
		Total	With Priority Dates After October 17, 1989	With Priority Dates Prior to or on October 17, 1989
Domestic	0.00	0.00	0.00	0.00
Stockwater	60.94	49.74	33.60	16.14
Municipal/ Quasi-Municipal	5,235.00	5,235.00	0.00	5,235.00
Irrigation	0.00	0.00	0.00	0.00
Total	5,295.94	5,284.74	33.60	**5,251.14**

6.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 6-4 shows the location of rights with a source listed as spring and with a POD located within the groundwater discharge areas. Five identified PODs are shown as two blue dots (multiple rights utilizing the same springs), and the groundwater discharge areas are identified as green-filled polygons. For this analysis, the five PODs that are located within the groundwater discharge area will be considered groundwater resources for this analysis. The following sections include a review of these spring rights within Cave Valley per each manner of use.

6.5.1 Domestic

Review of Appendix 6-3 shows one domestic right with a source listed as spring. The single spring domestic right is certificated right No. 9001, is located within the groundwater discharge area, and will be considered a groundwater resource for this analysis. Right No. 9001 has a duty of 31.85 afa and has a priority date prior to October 17, 1989.

6.5.2 Stockwater

Review of Appendix 6-5 shows 49 stockwater rights with a source listed as spring. None of these rights are located within the groundwater discharge areas of Cave Valley. For this analysis, none of these rights will be allocated as groundwater commitments.

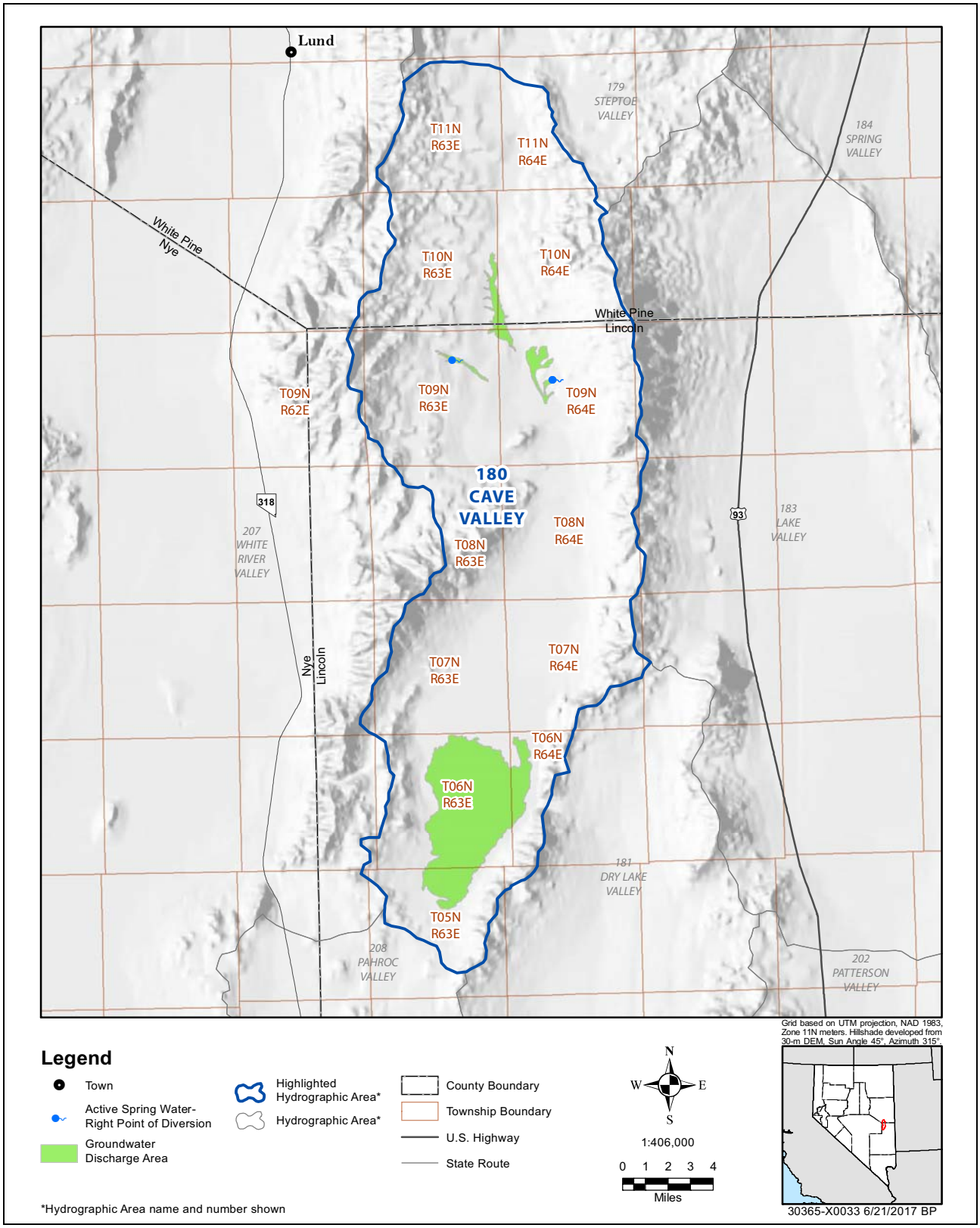

Figure 6-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Cave Valley

6.5.3 Irrigation

Review of Appendix 6-7 shows six irrigation rights with a source listed as spring. Four of these irrigation rights are located within the groundwater discharge areas of Cave Valley, and will be considered groundwater resources for this analysis. The certificated POU of these springs rights were analyzed and their POUs were mapped in Appendix 6-8 and Appendix 6-9. Table 6-4 lists the four rights, total duty, and duty for rights with a priority date prior to or on October 17, 1989, and after October 17, 1989. Note that a review of NDWR permit terms and maps revealed that vested right No. V02694 and Permit No. 25411 share a common POU and should be considered supplemental in nature.

Table 6-4
Cave Valley Irrigation Spring Rights within Groundwater Discharge Areas

		Current Analysis (afa)		
Application Number	Status	Total	With Priority Dates After October 17, 1989	With Priority Dates prior to, or on October 17, 1889
4881	CER	225.57	0.00	225.57
27814	CER	126.00	0.00	126.00
25411	CER	79.20	0.00	79.20
V02694	VST			
Total		**430.77**	**0.00**	**430.77**

CER = Certificated.
VST = Vested.

6.5.4 Spring Summary

Table 6-5 was developed as a summary from the preceding individual analysis of spring rights within Cave Valley. The Current Analysis columns separate the rights with priority dates prior to or on October 17, 1989, from rights with priority dates after October 17, 1989, as well the total of both.

Table 6-5
Cave Valley Spring Rights Summary within Groundwater Discharge Areas

	Current Analysis (afa)		
Manner of Use	Total	With Priority Dates After October 17, 1989	With Priority Dates Prior to, or on October 17, 1989
Domestic	31.85	0.00	31.85
Stockwater	0.00	0.00	0.00
Irrigation	430.77	0.00	430.77
Total	462.62	0.00	**462.62**

As shown in Table 6-5, there are approximately 462.62 afa of spring rights within the groundwater discharge areas that could be considered groundwater commitments.

6.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 6.2 identified all active rights within Cave Valley. There were no active groundwater irrigation rights identified within Cave Valley. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Cave Valley, as it is not applicable.

6.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 6.2 identified all active water rights within Cave Valley. There were no active groundwater irrigation rights identified within Cave Valley; however, revisions to quantification of springs within the groundwater discharge areas for this report require supplemental analysis of irrigation spring rights versus surface water.

Figure 6-5 is a map showing the township/range locations of spring irrigation rights with PODs identified within groundwater discharge areas. Two townships were identified with spring irrigation rights with PODs identified within the groundwater discharge areas (as mapped in Appendix 6-8 and Appendix 6-9). For this reason, surface water irrigation rights with POUs within these two townships were analyzed and mapped as well (Appendix 6-10 and Appendix 6-11).

Based on a review of NDWR permit conditions, certificate conditions, vested claims, POU maps, and PBU maps (as mapped in Appendix 6-12 and Appendix 6-13), two spring rights that are accounted for as groundwater, and share a common POU, were identified as being supplemental to a surface water right. These rights were identified as certificated spring right No. 25411 and vested right No. V02694. A review of background data identified 2.56 acres (10.24 afa) of certificated groundwater right No. 25411 and vested right No. V02694 as being supplemental to surface water rights. These rights have a priority date prior to October 17, 1989.

Table 6-6 lists the total groundwater/spring rights considered supplemental to surface water based on a review of Appendix 6-12 and Appendix 6-13.

Table 6-6
Summary of Groundwater and Springs Supplemental to Surface Water Analysis

			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Duty (af/acre)	Acres	(afa)	Acres	Duty (af/acre)	(afa)	Acres	Duty (af/acre)	(afa)
4.00	2.56	10.24	0.00	N/A	0.00	2.56	4.00	10.24
Total	2.56	10.24	0.00	N/A	0.00	2.56	4.00	10.24

N/A = Not applicable.

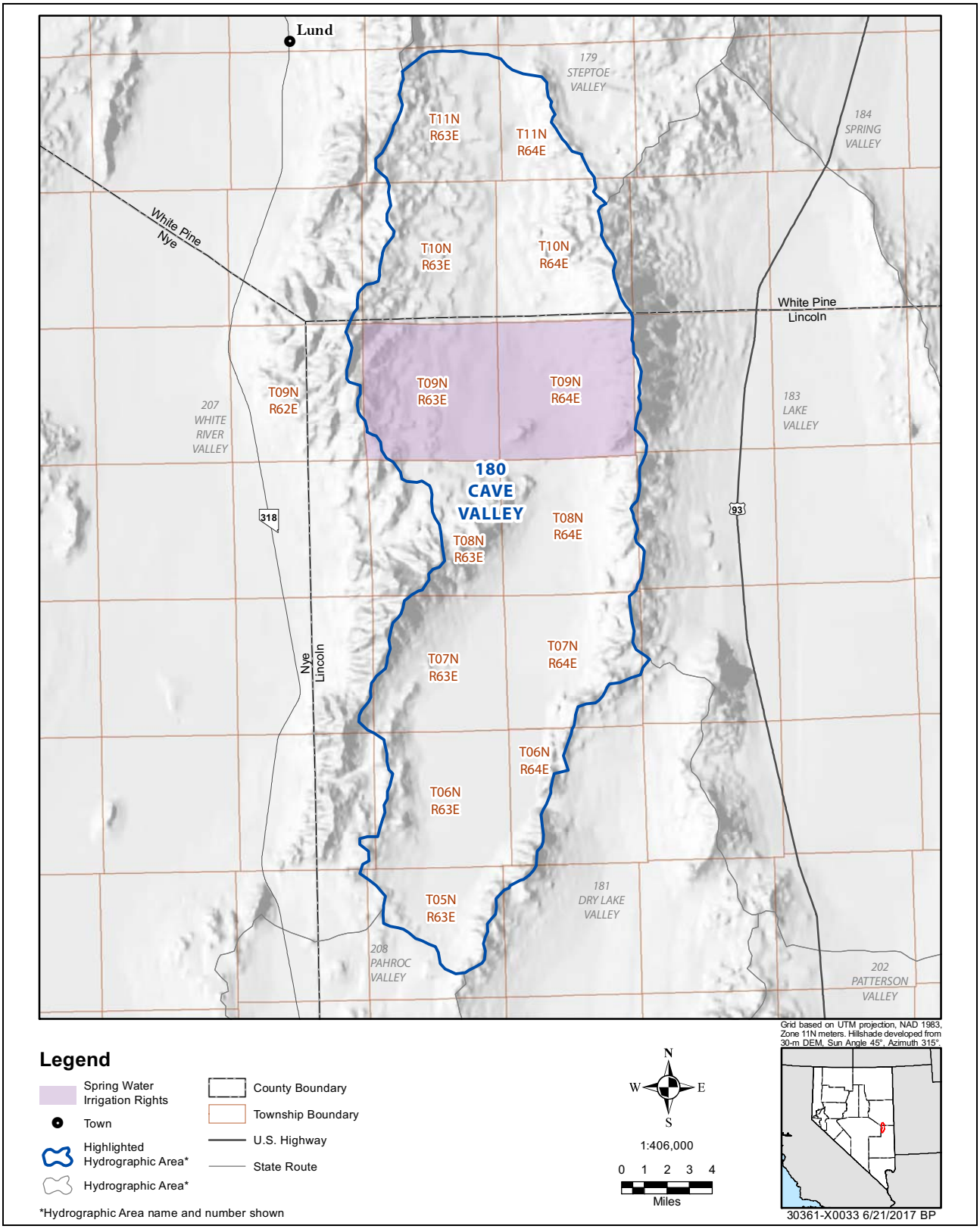

Figure 6-5
Township/Range of Spring Irrigation Rights Within Cave Valley

Table 6-6 shows the quantity of groundwater/spring rights considered supplemental to surface water rights within Cave Valley. These rights are divided into supplemental groundwater/spring to surface water rights with priority dates prior to or on October 17, 1989 (10.24 afa), priority dates after October 17, 1989 (0.00 afa), and the total (10.24 afa).

6.7.1 Adjusted Duty for Supplemental Groundwater and Spring Irrigation Rights in Cave Valley

Groundwater/spring irrigation rights that are supplemental to surface water, as identified in Section 6.7 of this report, are not normally used to their full permitted or certificated maximum duty every year. There were no groundwater irrigation rights identified within Cave Valley, although there were spring irrigation rights within the groundwater discharge areas. These spring rights (with a shared POU) were determined to be supplemental to surface water in the amount of 10.24 afa. The following information is required in order to accurately quantify the amount of groundwater and spring irrigation rights used per season when those rights are supplemental to surface water:

- Locations of irrigation where groundwater and spring rights are supplemental to surface water.
- Groundwater pumping records over an extended time period.
- Surface water hydrographs over an extended time period.

Information is currently not available regarding the actual amount of supplemental spring rights within the groundwater discharge areas used within Cave Valley. Because no pumpage records were available, an additional effort was made to quantify flow data within Cave Valley by searching for any stream hydrograph data that might be available.

A review of potential sources of flow data for Hagety Creek (or Haggerty Creek) in Cave Valley was performed. The United States Geological Survey (USGS) online National Water Information System (NWIS), and the NDWR online Stream and Spring Flow databases were reviewed for flow data for Haggerty Creek (or any other surface water flows) in Cave Valley; however, no flow measurements were found in either database. SNWA has recorded flow measurements in Cave Valley; however, these flow measurements are extremely limited. An alternative estimating approach was required because there was not sufficient flow data available in Cave Valley.

For this analysis, we consulted NSE Ruling No. 6164 (Spring Valley), pages 95-98, for guidance on what the NSE previously used to quantify groundwater irrigation rights supplemental to surface water rights. In Ruling No. 6164, the NSE identified supplemental use between 13 percent and 68 percent, which represents a broad range of values. The NSE also determined that *"An average of all creeks for which such data is available, including Cleve Creek, is 50%. Thus, the analysis of other creeks in the basin justifies the use of 50% of estimated underground supplemental water use…"* (NDWR, 2012a, p. 97). It is acknowledged that NSE Ruling No. 6164 applies specifically to Spring Valley hydrological conditions. In the absence of sufficient data for Cave Valley, 50 percent spring usage within the groundwater discharge areas supplemental to surface water will be used for this analysis.

6.7.2 Adjusted Duty Application to Cave Valley Supplemental Groundwater and Spring Irrigation Rights

It is reasonable to assume that the effective duty of a supplemental spring irrigation right is the average amount of the right required to supplement surface water during an irrigation season. Assuming that no supplemental spring irrigation rights are used would underestimate total groundwater commitments in Cave Valley. Assuming that 100 percent of supplemental spring irrigation rights are used, would be an overestimate. Information is not currently available regarding the actual amount of supplemental spring irrigation rights used within Cave Valley. Based on the preceding analysis, the average amount of supplemental spring irrigation rights expected to be used in any given irrigation season was estimated to be 50 percent of the total duty.

Section 6.7 identified 10.24 afa of total spring irrigation rights supplemental to surface water irrigation rights. Of the total 10.24 afa, it would be expected that only 50 percent of those rights, or a maximum of 5.12 afa, would be used in the average irrigation season. Table 6-7 shows the adjusted duty for the supplemental spring rights.

Table 6-7
Cave Valley Adjusted Duty for Groundwater and Spring Irrigation Rights Supplemental to Surface Water Irrigation Rights

			Priority Dates After October 17, 1989			Priority Dates Prior to or on October 17, 1989		
Duty (af/acre)	Acres	(afa)	Acres	Duty (af/acre)	(afa)	Acres	Duty (af/acre)	(afa)
4.0 (50% of 10.24 af/acre)	1.28	5.12	0.00	N/A	0.00	1.28	4.00	5.12
Total	1.28	5.12	0.00	N/A	0.00	1.28		5.12

N/A = Not applicable.

6.8 Estimated Crop Consumptive Use for Cave Valley

Consumptive use of a crop is defined as that portion of the annual volume of water diverted under a water right that is transpired by growing vegetation, evaporated from soils, converted to nonrecoverable water vapor, incorporated into product, or otherwise does not return to the water source. The consumptive use of a crop is equal to the crop ET less the precipitation amount that is effective for ET by the crop. In other words, it is the amount of water that is consumed in the growing of the crop.

The NIWR is equal to the ET actual minus the precipitation and is the consumptive use portion of the irrigation water rights. When calculating total groundwater commitments in Cave Valley, the nonconsumptive use portion of the water right is not included because it is returned to the water source and available for reuse.

The NDWR has established ET data per basin within Nevada. Cave Valley is listed as having an ET actual for alfalfa of 3.90 ft and NIWR of 3.20 ft. Appendix 6-14 lists the various ET and NIWR rates for crops grown in Cave Valley. Based on this data, the consumptive use portion for irrigation water rights in Cave Valley is 3.20 ft.

Table 6-8 lists the total irrigation spring rights, their corresponding calculated consumptive use ratios, and the total adjusted consumptive use. Table 6-8 only includes non-supplemental spring irrigation rights, as the surface water supplemental analysis reduction has been applied. The nonconsumptive portion of these rights is the portion of the duty that is greater than the 3.20 af/acre of consumptive use.

Table 6-8 shows that if the entire 430.77 afa of spring irrigation rights within Cave Valley were used in a single season, only 385.63 afa would be consumed and the remainder would be returned to the groundwater system.

Table 6-8
Consumptive Use with Varying Duties of Irrigation Rights within Cave Valley

			Priority Dates After October 17, 1989			Priority Dates Prior to, or on October 17, 1989		
Duty (af/acre)	**Acres**	**(afa)**	**Acres**	**Duty (af/acre)**	**(afa)**	**Acres**	**Duty (af/acre)**	**(afa)**
4.00 (-1.28 acre: 50% supplemental to SW)	50.02	200.08	0.00	N/A	0.00	50.02	4.00	200.08
-.80 (nonconsumptive)	50.02	-40.02	0.00	N/A	0.00	50.02	-0.80	-40.02
3.00	75.19	225.57	0.00	N/A	0.00	75.19	3.00	225.57
Total		385.63	0.00		0.00			385.63

N/A = Not applicable.

6.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary, unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Cave Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR and are located within Cave Valley. The list includes a total of 21 records and is included as Appendix 6-15. Each well log filed with the NDWR lists a proposed use of the drilled well. There are five records that list a proposed use as domestic (domestic use is signified with an "H" in the proposed use column). The five listed domestic wells were installed after October 17, 1989, and no listed domestic wells were installed prior to or on October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.0 afa, that all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the five domestic wells identified, it is estimated that 10.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

Therefore, 10.00 afa is allocated for domestic groundwater commitments within Cave Valley and although these domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

6.10 Groundwater Resources Reserved for Future Growth in Cave Valley

NSE Ruling No. 6165, states: "*[t]he amount of committed groundwater associated with the existing rights is 315 afa and the water to be reserved for unforeseen future growth and development is 50 afa"* (NDWR, 2012b, p. 168). The NSE, pursuant to this ruling, reserved 50 afa of groundwater rights for future growth after the issuance of the SNWA municipal rights within Cave Valley. Review of NDWR online resources revealed that three additional groundwater rights that have been permitted since the issuance of NSE Ruling No. 6165. These three groundwater rights are Permit Nos. 75231, 84693, and 84694. Review of permit terms in Section 6.2.2 of this report revealed that Permit Nos. 84693 and 84694 have a TCD term associated with some water rights permitted prior to the issuance of Ruling No. 6165, and are therefore not considered new additional appropriations for accounting purposes. Therefore, Permit Nos. 84693 and 84694 should not be considered part of the 50 afa reserved for future growth. Permit No. 75231 was listed RFA at the time NSE Ruling No. 6165 was issued, and was permitted after the issuance of NSE Ruling No. 6165. Permit No. 75231 has since been certificated in the amount of 3.16 afa. The 3.16 afa associated with Permit No. 75231 should be subtracted from the 50 afa reserved for future growth per Ruling 6165. For this analysis, it is assumed that of the original 50 afa originally reserved for future growth, 3.16 afa has been included as committed stockwater groundwater resources in this analysis, and the remaining 46.84 afa of groundwater rights reserved for future growth will be considered committed groundwater resources for Cave Valley. These future growth reserved rights have priority dates after October 17, 1989. However for the purpose of this report, these rights will be accounted for as prior to, or on October 17, 1989 because they were reserved pursuant NSE Ruling No. 6165.

6.11 Summary

The total committed groundwater rights for Cave Valley were estimated by determining rights with priority dates prior to, or on October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 6-9 presents the summary information derived by this analysis of all active groundwater rights, as well as any spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Cave Valley, after supplemental and consumptive use adjustments are applied, is estimated to be 5,759.06 afa. The committed groundwater rights for Cave Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 33.60 afa. The committed groundwater rights for Cave Valley, with priority dates prior to or on October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 5,725.46 afa.

Table 6-9
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	10.00	N/A	10.00	0.00	N/A	0.00	10.00	N/A	10.00
Domestic (Spring)	31.85	N/A	31.85	0.00	N/A	0.00	31.85	N/A	31.85
Reserved GW for Future Growth	46.84	N/A	46.84	0.00	N/A	0.00	46.84	N/A	46.84
Stockwater	49.74	N/A	49.74	33.60	N/A	33.60	16.14	N/A	16.14
Municipal/ Quasi-Municipal	5,235.00	N/A	5,235.00	0.00	N/A	0.00	5,235.00	N/A	5,235.00
Irrigation (Spring)	430.77	425.65	385.63	0.00	N/A	0.00	430.77	425.65	385.63
Total	5,804.20	N/A	5,759.06	33.60	N/A	33.60	5,770.60	N/A	**5,725.46**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

7.0 GARDEN VALLEY

7.1 Introduction

NDWR HA 172, Garden Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 7-1 is a map of the location of Garden Valley.

The purpose of this chapter is to analyze the existing water rights within Garden Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 7-2 shows the townships and ranges (MDBM) located within Garden Valley.

7.2 Summary of Water Rights in Garden Valley

Active water rights within Garden Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

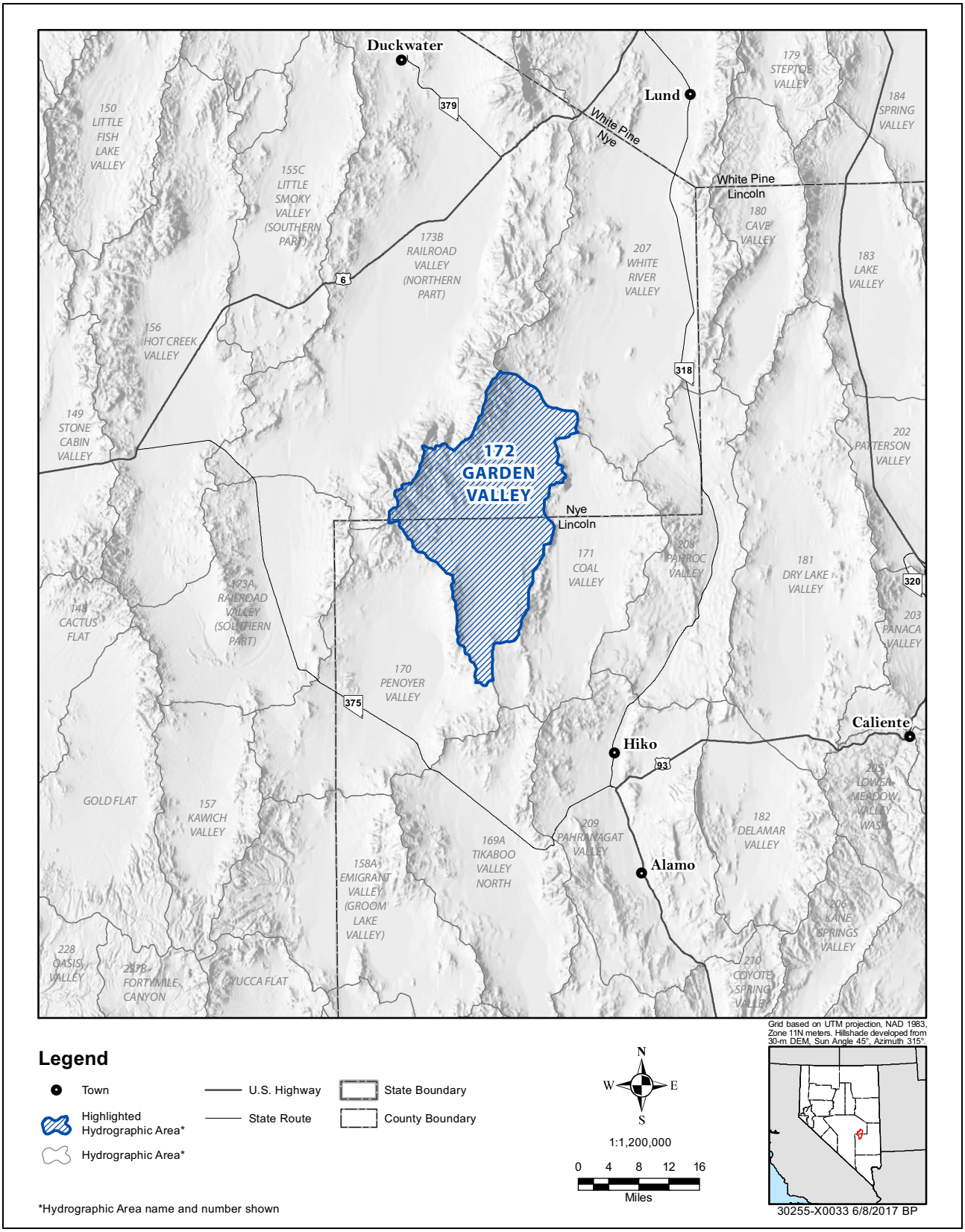

Figure 7-1
Garden Valley Hydrographic Area

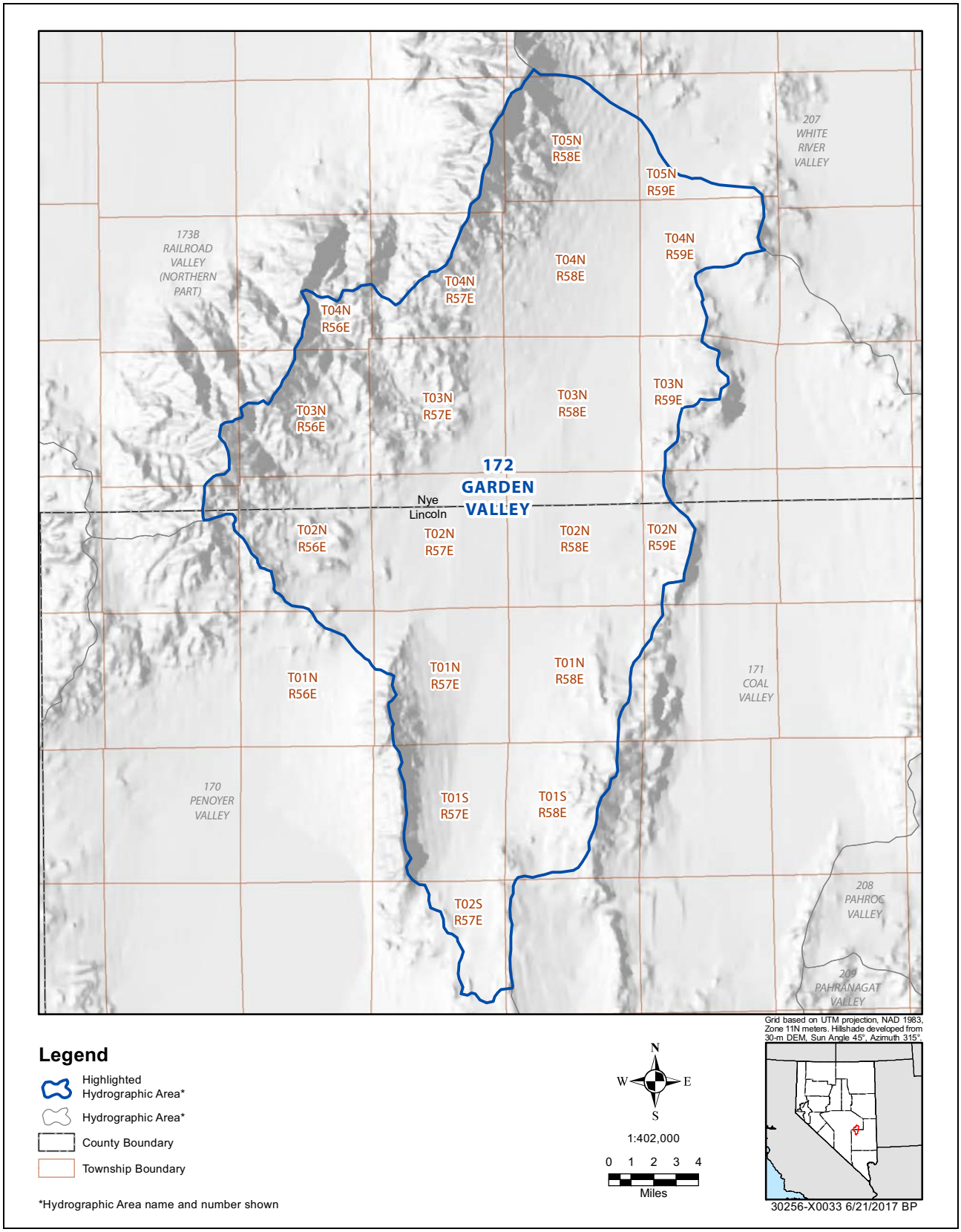

Figure 7-2
Township/Ranges Within Garden Valley

The NDWR hydrographic abstract, queried for all active records within Garden Valley, is included as Appendix 7-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 45 active water rights that are listed as vested, certificated, and permitted water rights. Appendix 7-2 lists all the active water rights in Garden Valley and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include domestic, stockwater, industrial, and irrigation. Table 7-1 lists the number of records within Garden Valley in the NDWR online water-rights database per manner of use and their current status.

Table 7-1
Number of Active Records Listed per Manner of Use and Status in Garden Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted
Domestic	1	0	1	0
Stockwater	22	4	15	3
Industrial	1	0	0	1
Irrigation	21	6	12	3
Total	45	10	28	7

The sources of water for the 45 active water rights include stream, spring, and underground. Table 7-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 7-2
Number of Active Records Listed per Manner of Use and Source in Garden Valley

Manner of Use	Number of Records	Stream	Spring	Underground
Domestic	1	0	1	0
Stockwater	22	3	11	8
Industrial	1	0	0	1
Irrigation	21	15	1	5
Total	45	18	13	14

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 7-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Garden Valley.

7.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Garden Valley, found in Appendix 7-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within Garden Valley, and includes the manners of use of stockwater, industrial, and irrigation. The total for these groundwater rights is listed as 1,043.45 afa. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

Garden Valley active water rights were compiled and reviewed based on the manner of use (domestic, stockwater, industrial, and irrigation). The following sections include summaries of each manner of use category, with a breakout of groundwater rights and a comparison of these rights to the NDWR HA Summary totals.

7.2.1.1 Domestic Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "domestic." Appendix 7-4 is a copy of the hydrographic abstract queried by HA (Garden Valley - Area 172), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring (1).

This single domestic right is not from an underground source. The total duty from this analysis for domestic underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground "domestic" rights listed in the NDWR HA Summary, Appendix 7-3.

7.2.1.2 Stockwater Rights

The NDWR online water-rights database includes 22 active records with the manner of use listed as "stockwater." Appendix 7-5 is a copy of the hydrographic abstract queried by HA (Garden Valley - Area 172), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (3), spring (11), and groundwater (8).

Six of the groundwater rights are certificated and two are permitted. Based on review of the permit and certificate conditions, these rights do not appear to have a combined duty limitation. The combined total of these underground stockwater rights is 52.28 afa. This is consistent with the 52.28 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 7-3.

Two of the groundwater rights (Permit Nos. 82327 and 83197) have a priority date after October 17, 1989. The duty for these rights is 13.09 afa. Appendix 7-2 lists all the active water rights in Garden Valley and identifies the records that have priority dates before, on, and after October 17, 1989.

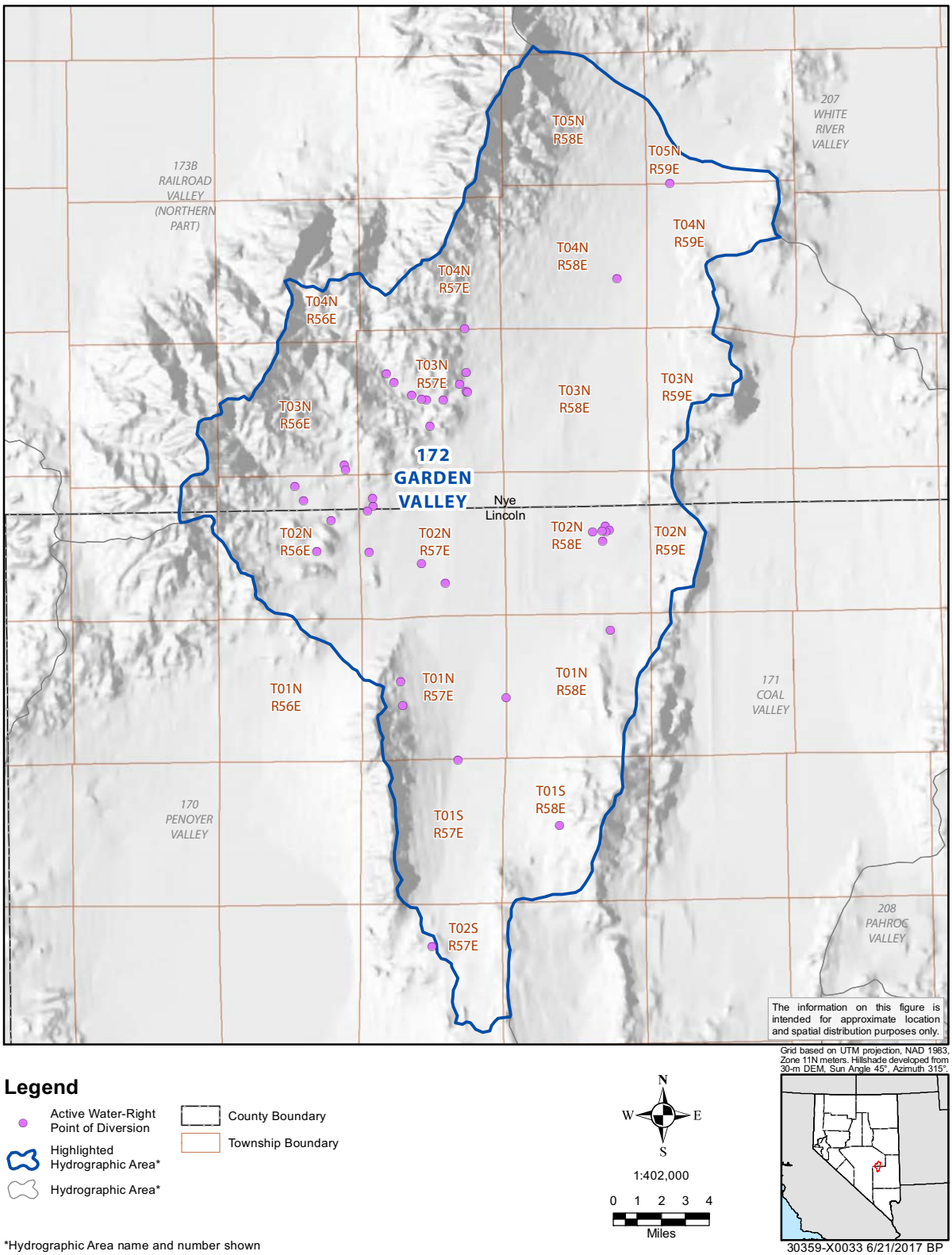

Figure 7-3
PODs for all Active Water Rights Within Garden Valley

7.2.1.3 Industrial Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "industrial." Appendix 7-6 is a copy of the hydrographic abstract queried by HA (Garden Valley - Area 172), manner of use (industrial), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as underground (1).

This single groundwater right is permitted. Based on a review of the permit conditions, the duty of this underground industrial right is 4.76 afa. This is consistent with the 4.76 afa of underground industrial rights listed in the NDWR HA Summary, Appendix 7-3. This single groundwater right (Permit No. 83914) has a priority date after October 17, 1989.

7.2.1.4 Irrigation Rights

The NDWR online water-rights database includes 21 active records with the manner of use listed as "irrigation." Appendix 7-7 is a copy of the hydrographic abstract queried by HA (Garden Valley - Area 172), manner of use (irrigation, irrigation-DLE, irrigation-Carey Act), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (15), spring (1), and underground (5).

Three of the groundwater rights are certificated and two are permitted. The combined total, if all rights were simply added together without further analysis, for these underground irrigation water rights is 986.41 afa. This total has not been adjusted for supplemental rights. A supplemental analysis of groundwater versus groundwater and surface water versus groundwater rights is included in subsequent sections of this report. This unadjusted total is consistent with the 986.41 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 7-3.

7.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

The groundwater irrigation rights were reviewed to determine the quantity, if any, of groundwater irrigation rights that could be considered supplemental to other groundwater irrigation rights. Multiple groundwater rights from different PODs (wells) may have the same POU. In these instances, the limit for these rights would be based on the cumulative rights for each acre, as long as the cumulative rights do not exceed the maximum allowed irrigation duty. The maximum allowed irrigation duty is normally stated in the permit or certificate. Multiple groundwater rights can be considered supplemental to each other if they share the same POU.

The POUs for these rights were determined through review of certificates, permits, and their associated maps filed with the NDWR. The supplemental analysis was completed using POU spreadsheets, and also by mapping the water rights. Appendix 7-8 is a spreadsheet titled *Garden Valley: Place of Use of Groundwater Irrigation Rights [Un-Sorted],* and is organized numerically by application number. The spreadsheet includes the location of each irrigation groundwater right POU by 40-acre subdivision. This spreadsheet lists the application number, status, source, quarter-quarter, quarter, section, township, range, MDBM, and number of irrigated acres.

Appendix 7-9 is the resulting spreadsheet when the water rights listed in Appendix 7-8 are sorted by location. Appendix 7-9 is titled *Garden Valley: Place of Use of Groundwater Irrigation Rights [Sorted]*. Sorting water rights using these criteria allows identification of any possible areas where the POUs overlap, indicating possible supplemental groundwater rights. Rights highlighted in yellow on Appendix 7-9 share a 40-acre subdivision POU and may possibly be supplemental.

Review of the sorted spreadsheet shows that groundwater irrigation rights are located in two township/ranges within Garden Valley. Table 7-3 lists the township/range locations for the groundwater irrigation rights and the report appendix number for the mapped water rights within those locations. Figure 7-4 is a map showing the township/range locations of the groundwater irrigation rights in Garden Valley.

Table 7-3
Township/Range of Groundwater Irrigation Rights Within Garden Valley and Associated Report Appendix Numbers

Township	Range	Appendix
2N	58E	7-10
3N	57E	7-11

Township and range in MDBM.

Sorting all irrigation rights by range, township, section, quarter, and quarter-quarter subdivision (aliquot-part analysis) resulted in the identification of any certificated or permitted rights that are appurtenant to the same 40-acre subdivision location. If multiple rights did not have a POU within the same 40-acre subdivision, it was concluded that these rights were not supplemental to each other. If it was determined that multiple rights were located within the same 40-acre subdivision, then a further analysis was conducted. This further analysis included a review of permit terms, certificate terms, POU maps, and PBU maps to determine if the water rights are non-supplemental or supplemental to each other. The highlighted rights on Appendix 7-9 are the rights that could possibly be supplemental to each other and were the rights subjected to this further analysis.

A certificated groundwater right was not considered supplemental if the POU was not listed in the same 40-acre subdivision as any other groundwater right. There are no instances where the POU of two or more certificated groundwater rights was listed within the same 40-acre subdivision.

A permitted right was not considered supplemental if the POU was not listed in the same 40-acre subdivision as any other groundwater right. The proposed POU (acres) of a permitted water right can exceed the maximum permitted irrigated acreage. This is because the water-right owner may not know the specific locations where the irrigation will be applied at the time of filing the application and the proposed POU map. The actual acreage and location of irrigation is not quantified until the PBU for the permitted water rights is prepared and filed with the NDWR. If a permitted right could be placed where it would not be considered supplemental to an existing right, then this right was not considered supplemental for this analysis. Because non-supplemental water rights are not subjected to further reduction based on the supplemental analysis, this assumption likely overestimates the amount of committed groundwater irrigation rights.

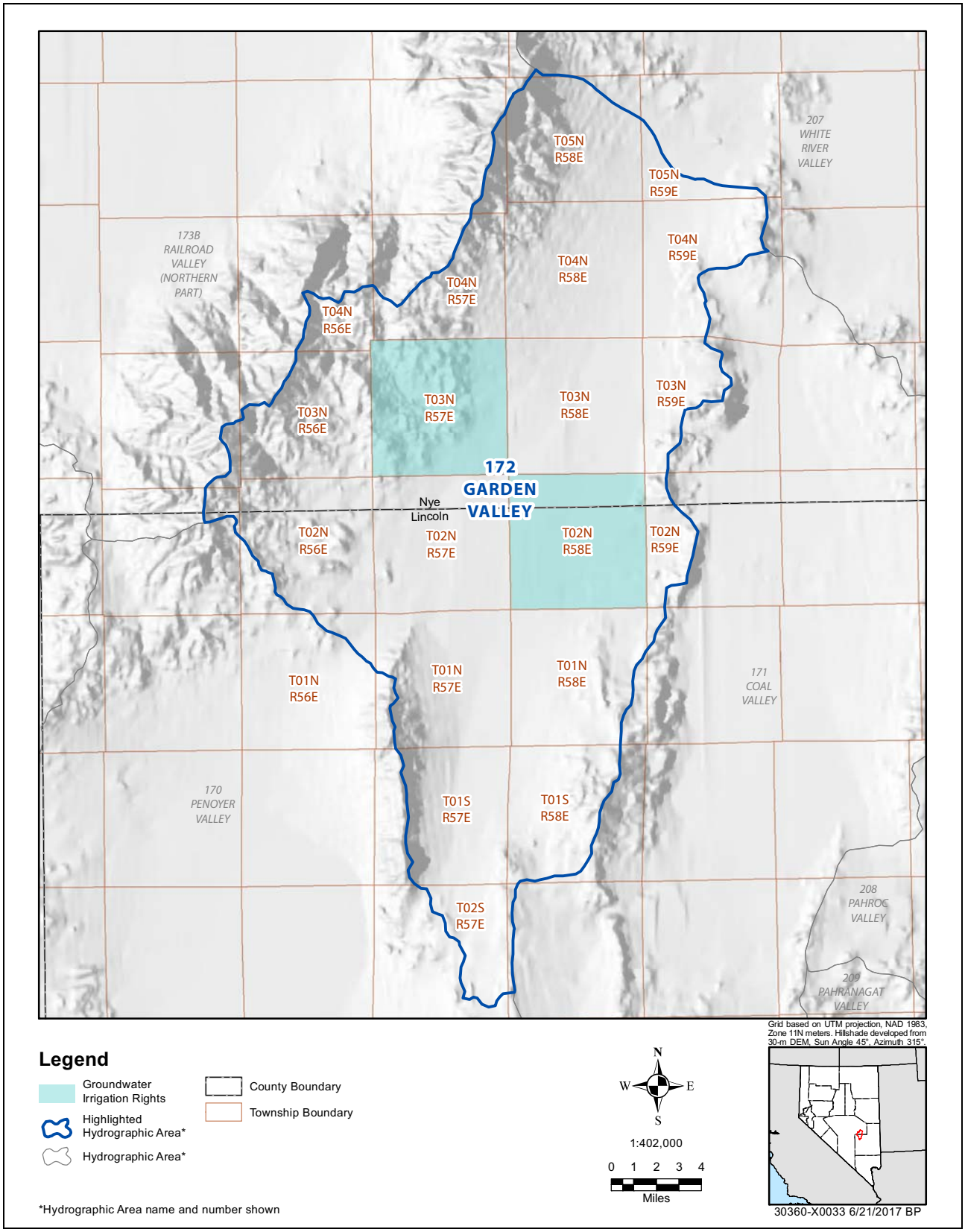

Figure 7-4
Township/Range of Groundwater Irrigation Rights Within Garden Valley

The permitted groundwater rights were mapped based on the proposed POU maps that accompany the applications as shown in Appendix 7-10 and Appendix 7-11. Review of Appendix 7-9 revealed only one potential instance of a groundwater permit supplemental to another groundwater right. However, review of the rights themselves and their POU as mapped in Appendix 7-10 revealed that these groundwater irrigation rights do not appear to be supplemental to other groundwater rights.

Based on review of NDWR permit conditions, certificate conditions, POU maps, and PBU maps, no groundwater irrigation rights of any status were determined to be supplemental in nature. The total supplemental adjusted duty for groundwater irrigation rights, based on the preceding analysis, is 986.41 afa. This total is consistent with the 986.41 afa of underground irrigation listed in the NDWR HA Summary, Appendix 7-3.

Four of the groundwater rights (Permit Nos. 70669, 70982, 71365, and 82962) have a priority date after October 17, 1989. The duty for these rights is 659.15 afa. Appendix 7-2 lists all the active water rights in Garden Valley and identifies the records that have priority dates before, on, and after October 17, 1989.

Table 7-4 lists the total amount of non-supplemental irrigation groundwater rights per individual duty, based on the analysis completed in the preceding sections. These rights are listed by individual duty because these duties will be used for an additional consumptive use analysis to be completed in subsequent sections of this report. These rights are listed with the priority dates prior to, or on October 17, 1989 and after October 17, 1989.

Table 7-4
Non-supplemental Groundwater Irrigation Rights in Garden Valley

	Total		With Priority Dates After October 17, 1989		With Priority Dates Prior to, or on October 17, 1989	
Duty (af/acre)	**Acres**	**afa**	**Acres**	**afa**	**Acres**	**afa**
4.00	221.82	887.26	140.00	560.00	81.82	327.26
4.71	21.05	99.15	21.05	99.15	0.00	0.00
Total	242.87	986.41	161.05	659.15	81.82	**327.26**

Note: Calculation for duty based on certificate and permit verbiage. For calculation table, Acre x Duty might not equal total afa exactly due to rounding to nearest hundredth.

7.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 7-3, lists the total amount of supplementally adjusted groundwater rights for stockwater, industrial, and irrigation uses as 1,043.45 afa. Table 7-5 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to, or on October 17, 1989, rights with priority dates after

Table 7-5
Garden Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to October 17, 1989**
Domestic	0.00	0.00	0.00	0.00
Stockwater	52.28	52.28	13.09	39.19
Industrial	4.76	4.76	4.76	0.00
Irrigation	986.41	986.41	659.15	327.26
Total	1,043.45	1,043.45	677.00	**366.45**

October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analyses completed in Section 7.2 and Section 7.3 of this chapter.

7.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 7-5 shows the location of rights with a source listed as spring, and with a POD located within the groundwater discharge areas. The groundwater discharge areas are identified as green-filled polygons. Only one small groundwater discharge area was identified in Garden Valley, and it is located in T4N, R59E, MDBM. However, no spring sources were identified within the groundwater discharge area. For this reason, no spring sources can be considered groundwater resources within Garden Valley.

7.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 7.5 identified no permitted spring irrigation rights in Garden Valley within groundwater discharge areas. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Garden Valley, as it is not applicable.

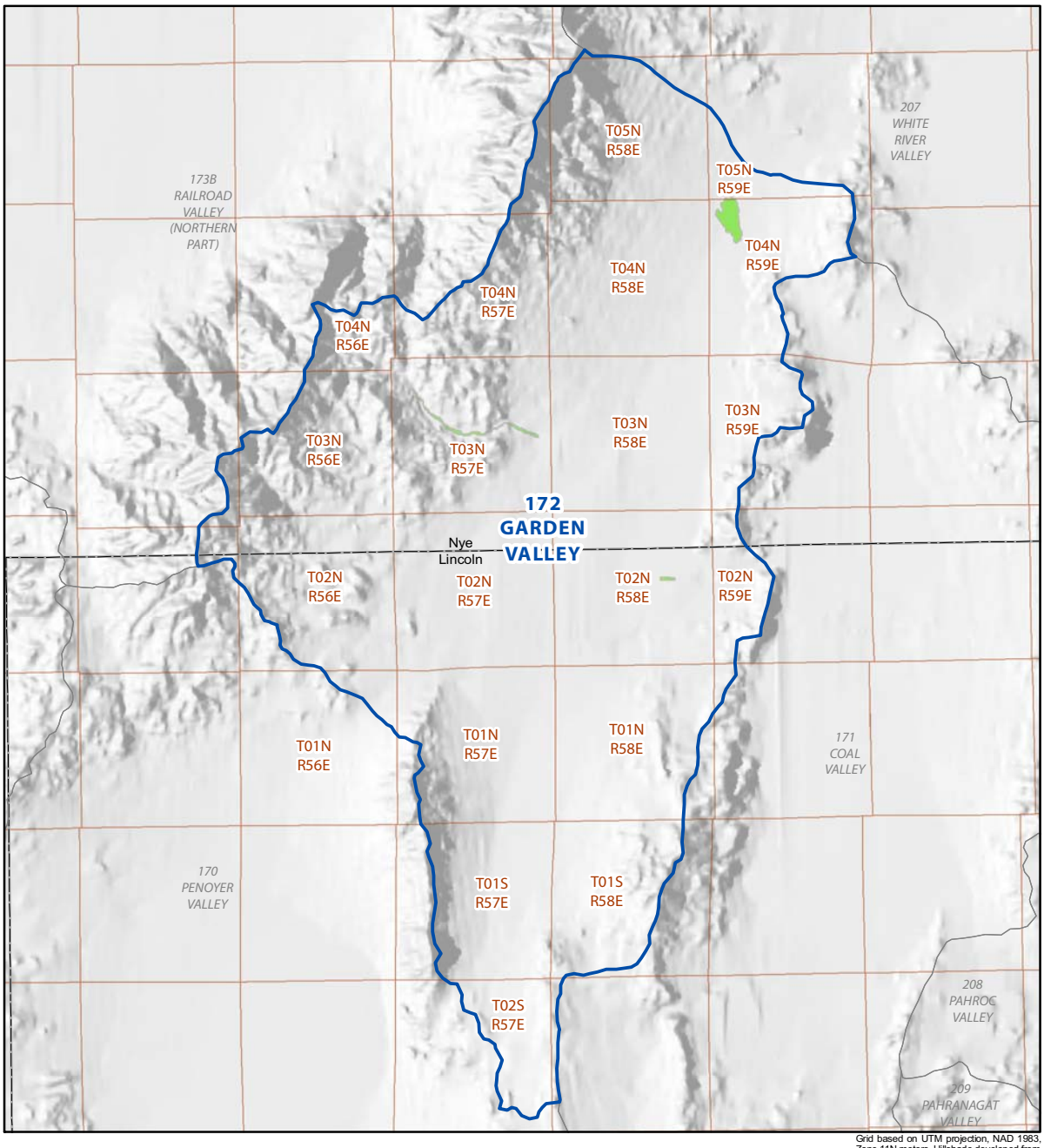

Figure 7-5
Groundwater Discharge Areas and Corresponding Spring Rights Within Garden Valley

7.7 Supplemental Analysis of Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Groundwater and surface water irrigation rights were reviewed to determine the quantity, if any, of groundwater irrigation rights that could be considered supplemental to surface water irrigation rights. A portion of the groundwater irrigation rights could be considered supplemental to surface water irrigation rights within Garden Valley if they are appurtenant to the same POU as the surface water rights. For this analysis, groundwater irrigation rights are treated as being supplemental to surface water if their POU is in the same location. The POUs were determined through review of certificates, permits, and their associated maps filed with the NDWR. Supplemental analysis was completed using POU spreadsheets and also by mapping the water rights. Appendix 7-12 is a spreadsheet listing all the surface water irrigation rights and their locations. The spreadsheet was combined with Appendix 7-8. Appendix 7-13 is the resulting spreadsheet titled *Garden Valley: Places of Use of Surface Water Rights and Groundwater Rights [Sorted]*, and is organized by location to identify any possible areas of supplemental groundwater rights to surface water rights.

A review of Appendix 7-12 identified seven township/ranges with surface water irrigation rights. Figure 7-6 shows the township/ranges where surface water irrigation POUs are listed.

A review of the sorted spreadsheet, Appendix 7-13, showed that groundwater irrigation rights, potentially supplemental to surface water, are located in two township/ranges within Garden Valley. Table 7-6 lists the locations by township/range of the groundwater and surface water rights and the appendix reference location of mapped water rights. Figure 7-7 shows the locations by township/range of the groundwater and surface water irrigation rights.

Table 7-6
Township/Range of Groundwater and Surface Water Irrigation Rights Within Garden Valley and Associated Report Appendix Numbers

Township	Range	Appendix
2N	58E	7-14
3N	57E	7-15

Township and range in MDBM.

The sorted spreadsheet resulted in the identification of any surface water irrigation rights that are appurtenant to the same 40-acre subdivision location as groundwater irrigation rights. If none of these rights were within the same 40-acre subdivision, then it was concluded that these rights are all non-supplemental rights (not supplemental to each other). If it was determined that any of these surface water rights were located within the same 40-acre subdivision as groundwater irrigation rights, then a further analysis was conducted. This further review includes the same procedure that was used previously in the irrigation groundwater supplemental analysis.

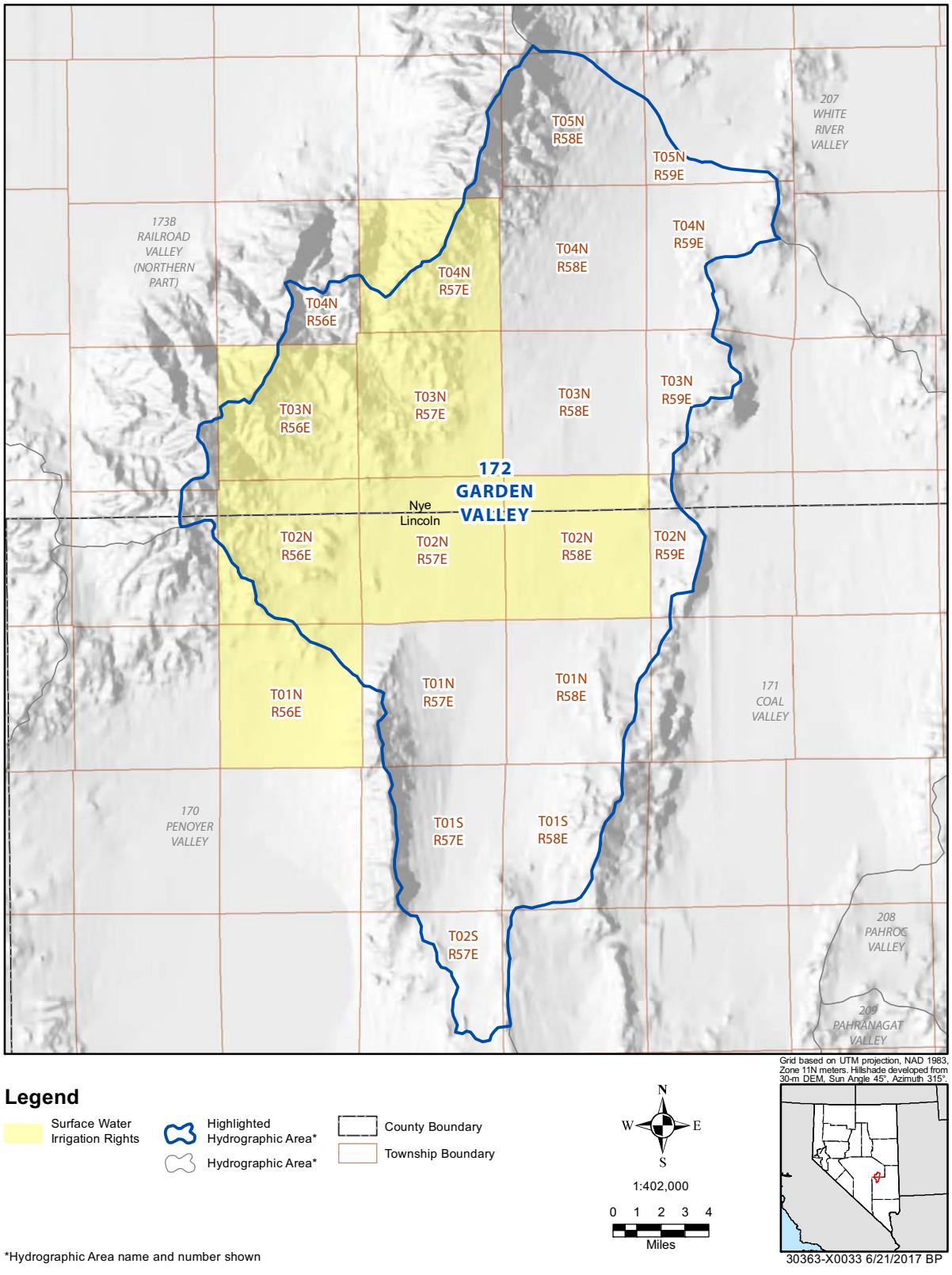

Figure 7-6
Township/Range of Surface Water Irrigation Rights Within Garden Valley

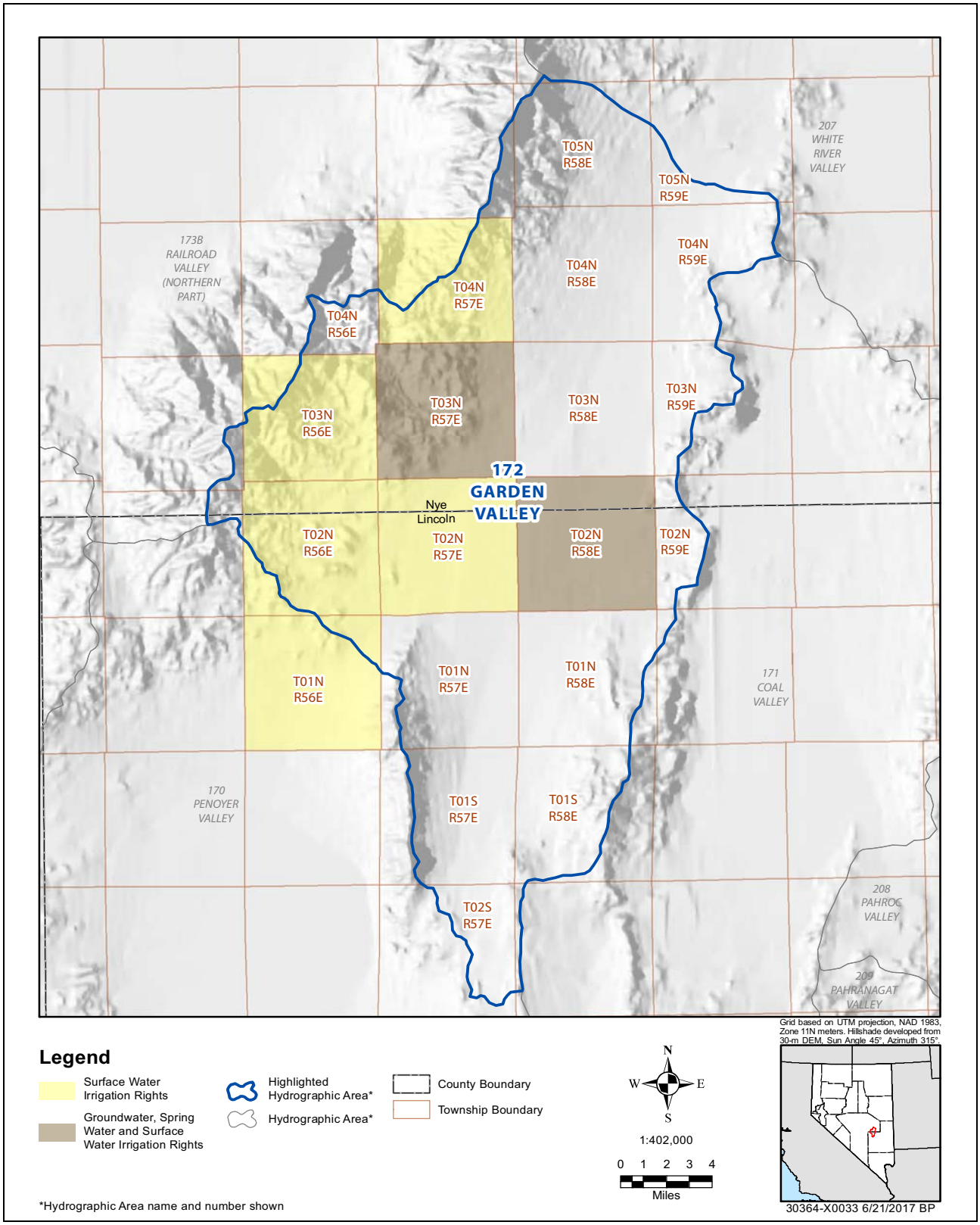

Figure 7-7
Township/Range of Groundwater and Surface Water Irrigation Rights Within Garden Valley

Based on the review of NDWR permit conditions, certificate conditions, vested claims, POU maps, and PBU maps (as mapped in Appendix 7-14 and Appendix 7-15), two groundwater rights were identified as being supplemental to surface water rights. These two rights were identified as Permit No. 18644 and Permit No. 71365. Mapping of these water rights identified 12.43 acres (49.72 afa) of Permit No. 18644 as being supplemental to surface water rights, and 18.60 acres (74.4 afa) of Permit No. 71365 as being supplemental to surface water rights. Permit No. 18644 has a priority date prior to October 17, 1989, whereas Permit No. 71365 has a priority date after October 17, 1989.

Table 7-7 lists the total groundwater/spring rights considered supplemental to surface water based on review of Appendix 7-13 through Appendix 7-15.

Table 7-7 shows the quantity of groundwater/spring rights considered supplemental to surface water rights within Garden Valley. These rights are divided into supplemental groundwater to surface water rights with priority dates prior to, or on October 17, 1989 (49.72 afa), after October 17, 1989 (74.40 afa), and the total of both (124.12 afa).

Table 7-7
Summary of Groundwater to Surface Water Supplemental Analysis

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (af/acre)	Acres	Duty (af/acre)	afa	Acres	Duty (af/acre)	afa	Acres	Duty (af/acre)	afa
4.00	31.03	4.00	124.12	18.60	4.00	74.40	12.43	4.00	49.72
Total	31.03		124.12	18.60		74.40	12.43		49.72

7.7.1 Adjusted Duty for Supplemental Groundwater Rights in Garden Valley

Groundwater irrigation rights that are supplemental to surface water, as identified in Section 7.7 of this report, are not normally used to their full permitted or certificated total duty every year. Only two groundwater rights were determined to be supplemental to surface water in the amount of 124.12 afa. Surface water is generally preferred and is used first because groundwater has additional costs associated with pumping water from groundwater wells. Additionally, permit conditions can require surface water to be used prior to groundwater. An example of this is the following statement in permit No. 71365, *"This permit is partially supplemental to surface water rights under Permit 4635, Certificate 1567, with the understanding that the surface water rights should be used on the supplemental ground before this well is pumped for supplemental use"* (NDWR, 2014a). The following information is required in order to accurately quantify the amount of groundwater irrigation rights used per season when those rights are supplemental to surface water:

- Locations of irrigation where groundwater rights are supplemental to surface water.
- Groundwater pumping records over an extended time period.
- Surface water hydrographs over an extended time period.

Information is currently not available regarding the actual amount of supplemental groundwater rights used within Garden Valley. Because no pumpage records were available, an additional effort was made to quantify flow data within Garden Valley by searching for any stream hydrograph data that might be available.

A review of potential sources of flow data for Cherry Creek in Garden Valley was performed. USGS NWIS and the NDWR online stream and spring flow databases were reviewed for flow data for Cherry Creek (or any other surface water flows) in Garden Valley; however, no flow measurements were found in either database. SNWA has some recorded flow measurements for Cherry Creek; however, these flow measurements are very limited. An alternative estimating approach was required because there was not sufficient flow data available in Garden Valley.

For this analysis, we consulted NSE Ruling No. 6164 for guidance on what the NSE previously used to quantify groundwater irrigation rights supplemental to surface water rights. In Ruling No. 6164, the NSE identified supplemental use between 13 percent and 68 percent (NDWR, 2012a, p. 97), which represents a broad range of values. The NSE also determined that *"An average of all creeks for which such data is available, including Cleve Creek, is 50.0%. Thus, the analysis of other creeks in the basin justifies the use of 50% of estimated underground supplemental water use…"* (NDWR, 2012a, p. 97). It is acknowledged that NSE Ruling No. 6164 applies specifically to Spring Valley hydrological conditions. In the absence of sufficient data for Garden Valley, 50 percent groundwater usage supplemental to surface water will be used for this analysis.

7.7.2 Adjusted Duty Application to Garden Valley Supplemental Groundwater Irrigation Rights

It is reasonable to assume that the effective duty of a supplemental groundwater irrigation right is the average amount of the right required to supplement surface water during an irrigation season. Assuming that no supplemental groundwater irrigation rights are used would underestimate the total groundwater commitments in Garden Valley, while assuming that 100 percent of supplemental groundwater irrigation rights are used would be an overestimate, and would violate many water right permit terms that prohibit sole reliance on supplemental groundwater. Information is not currently available regarding the actual amount of supplemental groundwater rights used within Garden Valley. Based on the preceding analysis, the average amount of supplemental groundwater irrigation rights expected to be used in any given irrigation season was estimated to be 50 percent of the total duty.

Section 7.7 identified 124.12 afa of total groundwater irrigation rights supplemental to surface water irrigation rights. Of the total 124.12 afa, it would be expected that only 50 percent of those rights, or a maximum of 62.06 afa would be used in the average irrigation season. Table 7-8 shows the adjusted duty for the supplemental groundwater/spring irrigation rights.

Table 7-8
Garden Valley Adjusted Duty for Groundwater Irrigation Rights
Supplemental to Surface Water Irrigation Rights

				With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Duty (af/acre)	**Acres**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**
4.00 (50% of 31.03 acres)	15.52	4.00	62.06	9.30	4.00	37.20	6.22	4.00	24.86
Total	15.52		62.06	9.30		37.20	6.22		24.86

7.8 Estimated Crop Consumptive Use for Garden Valley

Consumptive use of a crop is defined as that portion of the annual volume of water diverted under a water right that is transpired by growing vegetation, evaporated from soils, converted to nonrecoverable water vapor, incorporated into product, or otherwise does not return to the water source. The consumptive use of a crop is equal to the crop ET less the precipitation amount that is effective for ET by the crop. In other words, it is the amount of water that is consumed in the growing of the crop.

The NIWR is equal to the ET actual minus the precipitation and is the consumptive use portion of the irrigation water rights. When calculating total groundwater commitments in Garden Valley, the nonconsumptive use portion of the water right is not included because it is returned to the water source and available for reuse.

The NDWR has established ET data per basin within Nevada. Garden Valley is listed as having an ET actual for alfalfa of 4.20 ft and NIWR of 3.70 ft. Appendix 7-16 lists the various ET and NIWR rates for crops grown in Garden Valley. Based on this data, the consumptive use portion for irrigation water rights in Garden Valley is 3.70 ft.

Table 7-9 lists the total permitted and certificated acreage of irrigation groundwater, the corresponding calculated consumptive use ratios, and the total adjusted consumptive use. Table 7-9 only includes non-supplemental groundwater and spring irrigation rights, as the surface water supplemental analysis reduction has been applied. The nonconsumptive portion of these rights is the duty greater than a total of 3.70 af per acre for each right. Table 7-9 shows that if the entire 986.41 afa of groundwater irrigation rights within Garden Valley were used in a single season, only 841.20 afa would be consumed and the remainder would be returned to the groundwater system.

Table 7-9
Consumptive Use with Varying Duties of Irrigation Groundwater/Spring Rights Within Garden Valley

				With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Duty (af/acre)	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**	**Acre**	**Duty (af/acre)**	**afa**
4.00 (-15.52 acre: 50% supplemental to SW)	206.30	4.00	825.20	130.70	4.00	522.80	75.60	4.00	302.40
- 0.30 (nonconsumptive)	206.30	-0.30	-61.89	130.70	-0.30	-39.21	75.60	-0.30	-22.68
4.71	21.05	4.71	99.15	21.05	4.71	99.15	0.00	0.00	0.00
-1.01 (nonconsumptive)	21.05	-1.01	-21.26	21.05	-1.01	-21.26	0.00	0.00	0.00
Total			841.20			561.48			279.72

7.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Garden Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR and are located within Garden Valley. The list includes a total of 28 records and is included as Appendix 7-17. Each well log filed with the NDWR lists a proposed use of the drilled well. There are 11 records that list a proposed use as domestic (domestic use is signified with an “H” in the proposed use column). Two listed domestic wells were installed prior to October 17, 1989, and nine domestic wells were installed after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic-well user, each well is using 2.00 afa, that all the water is consumptively used, and that there is no return flow to groundwater through septic tanks.

Based on the 11 domestic wells identified, it is estimated that 22.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used. Therefore, 22.00 afa is allocated for domestic groundwater commitments within Garden Valley and although the majority of domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

7.10 Summary

The total committed groundwater rights for Garden Valley were estimated by determining rights with priority dates prior to, or on October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 7-10 presents the summary information derived by this analysis of all active groundwater rights, as well as any spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Garden Valley, after supplemental and consumptive use adjustments are made, is estimated to be 920.24 afa. The committed groundwater rights for Garden Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 579.33 afa. The committed groundwater rights for Garden Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 340.91 afa.

Table 7-10
Committed Groundwater/Spring Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. To SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	22.00	N/A	22.00	0.00	N/A	0.00	22.00	N/A	22.00
Stockwater	52.28	N/A	52.28	13.09	N/A	13.09	39.19	N/A	39.19
Industrial	4.76	N/A	4.76	4.76	N/A	4.76	0.00	N/A	0.00
Irrigation	986.41	924.35	841.20	659.15	621.95	561.48	327.26	302.40	279.72
Total	1,065.45		920.24	677.00		579.33	388.45		**340.91**

NA = Not applicable.
GW = Groundwater.
SW = Surface water.

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8.0 COAL VALLEY

8.1 Introduction

NDWR HA 171, Coal Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 8-1 is a map of the location of Coal Valley.

The purpose of this chapter is to analyze the existing water rights within Coal Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 8-2 shows the townships and ranges (MDBM) located within Coal Valley.

8.2 Summary of Water Rights in Coal Valley

Active water rights within Coal Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017. The NDWR hydrographic abstract, queried for all active records within Coal Valley, is included as Appendix 8-1. This abstract does not include applications with a status of RFA, RFP, or APP as these are not active water rights.

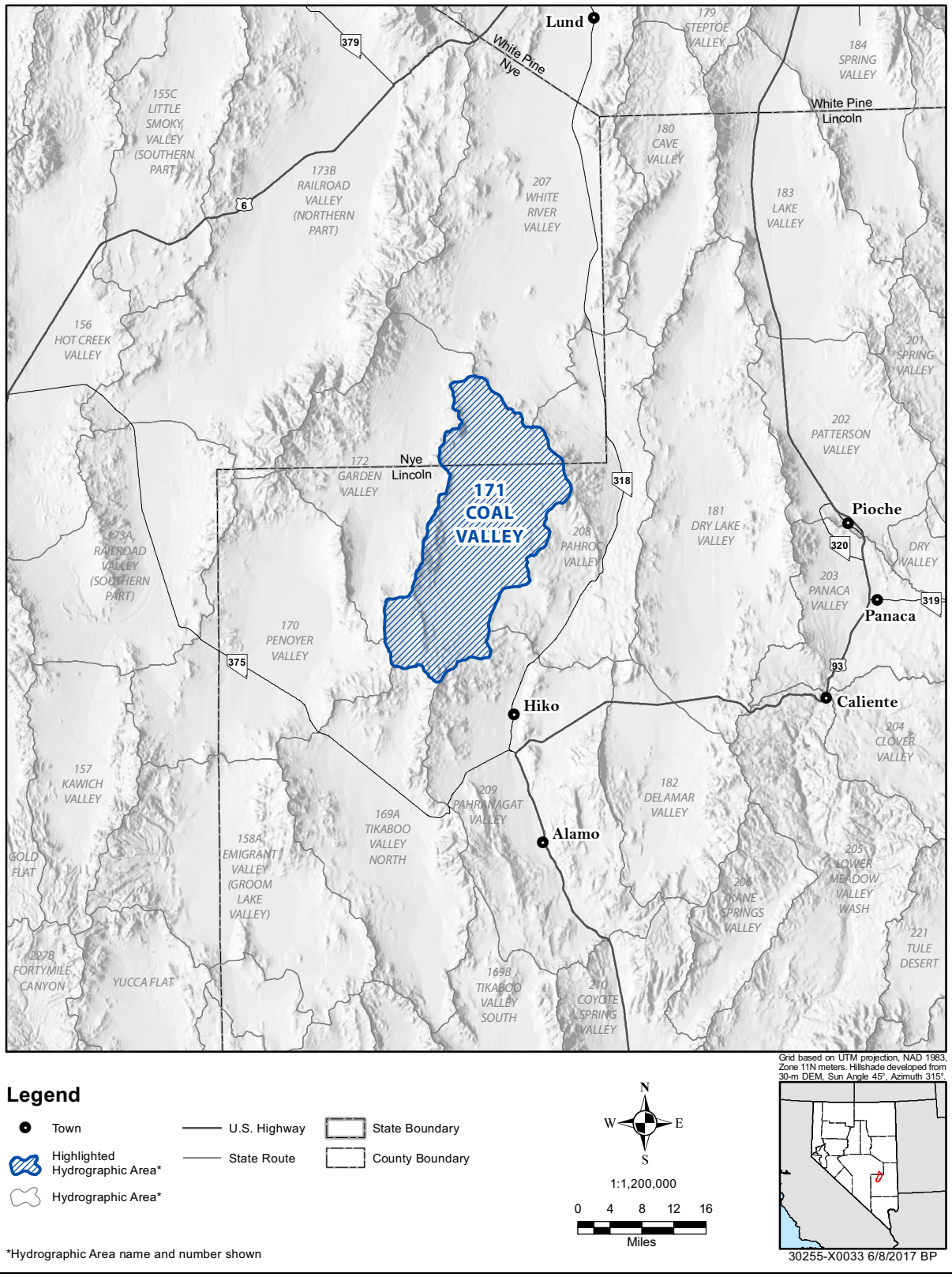

Figure 8-1
Coal Valley Hydrographic Area

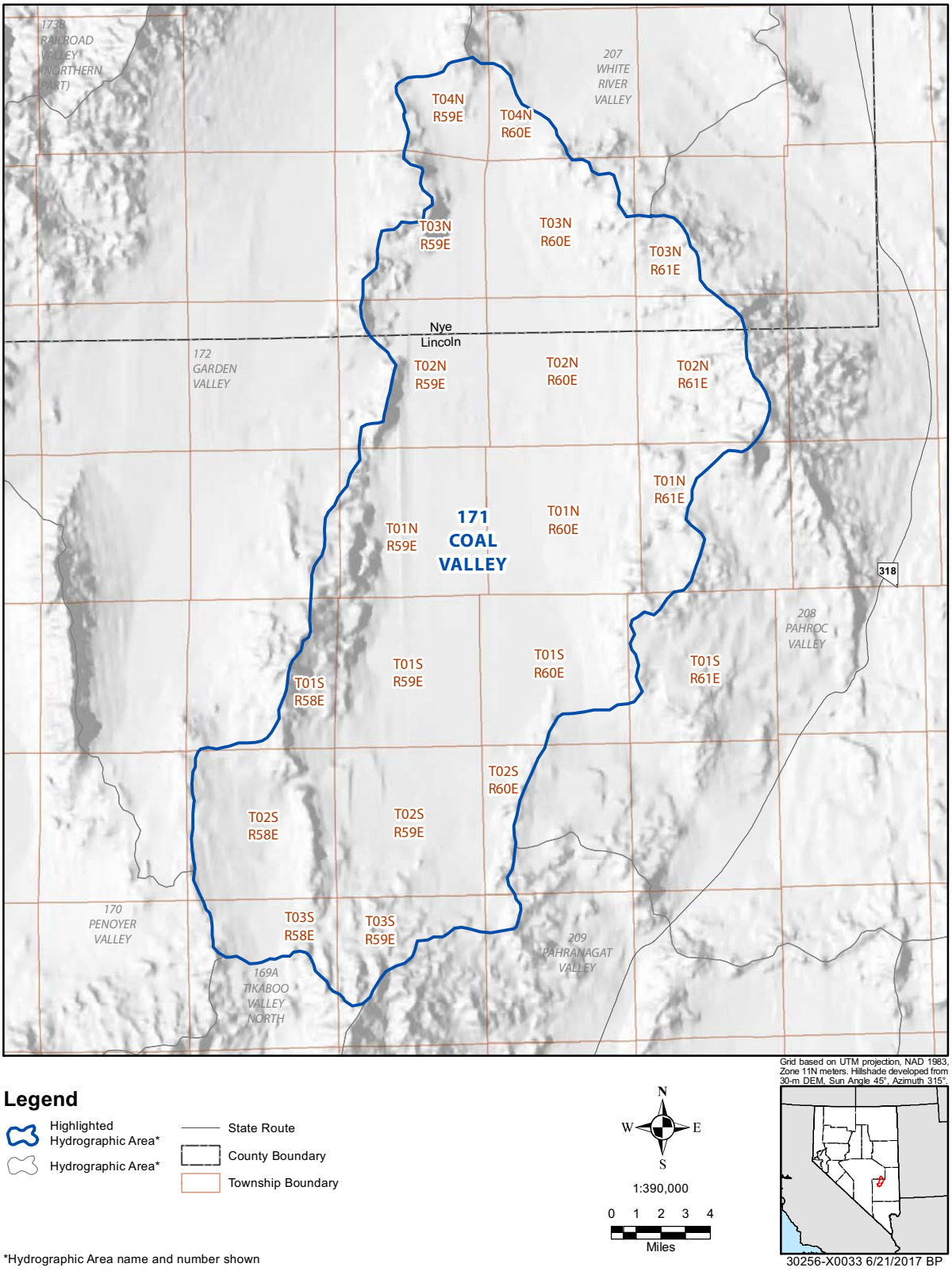

Figure 8-2
Township/Ranges Within Coal Valley

There are currently 18 active water rights that are listed as certificated and vested claim water rights. Appendix 8-2 lists all the active water rights in Coal Valley, and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include only stockwater. Table 8-1 lists the number of records within Coal Valley in the NDWR online water-rights database per manner of use and their current status.

Table 8-1
Number of Active Records Listed per Manner of Use and Status in Coal Valley

Manner of Use	Number of Records	Vested Claims	Certificated
Stockwater	18	6	12
Total	18	6	12

The sources of water for the 18 active water rights includes other surface water, spring, and underground. Table 8-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water. The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 8-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Coal Valley.

Table 8-2
Number of Active Records Listed per Manner of Use and Source in Coal Valley

Manner of Use	Number of Records	Other Surface Water	Spring	Underground
Stockwater	18	1	13	4
Total	18	1	13	4

8.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Coal Valley, found in Appendix 8-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within Coal Valley and includes the manner of use of stockwater.

The total for these groundwater rights is listed as 63.80 afa. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

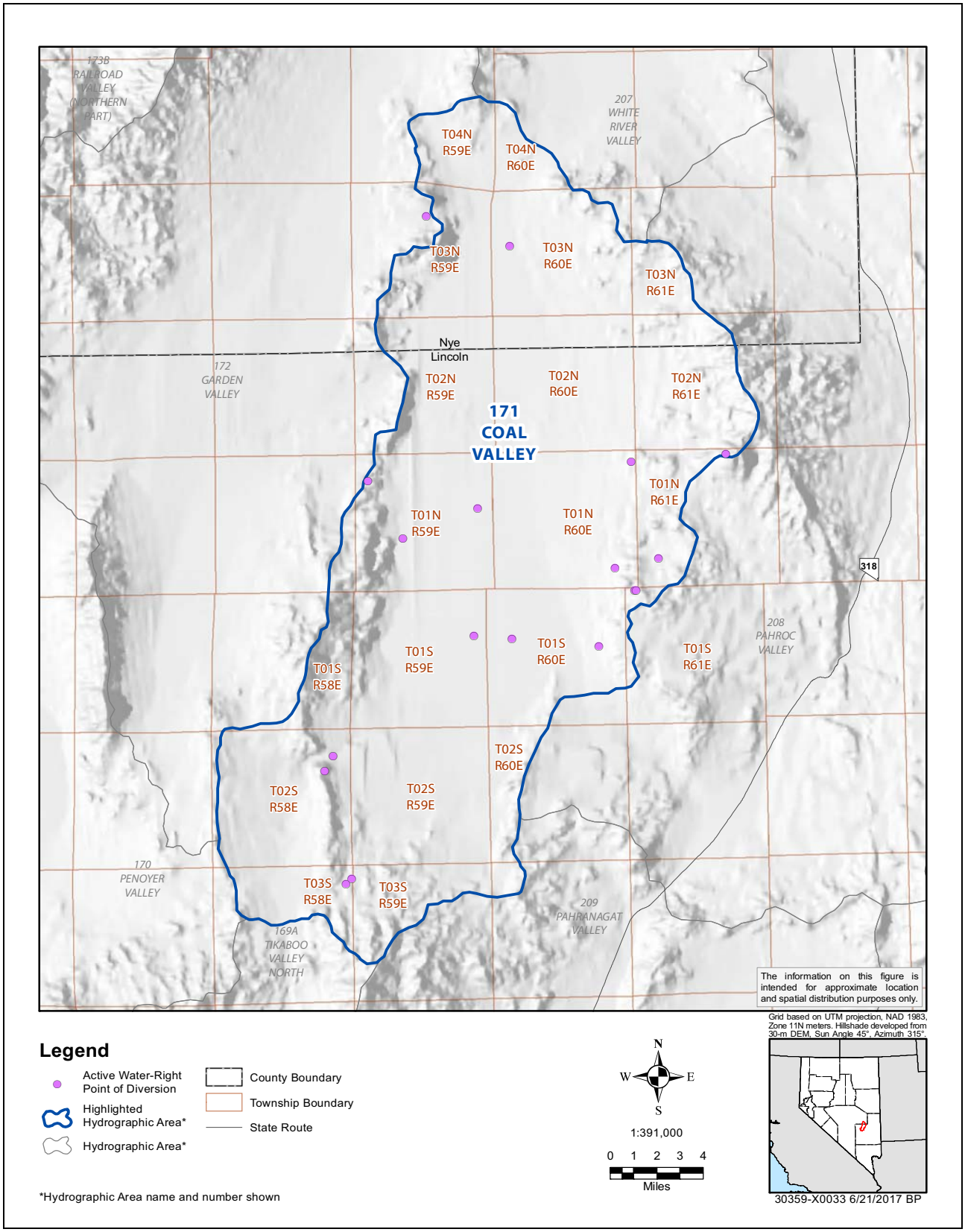

Figure 8-3
PODs for all Active Water Rights Within Coal Valley

Coal Valley active water rights were compiled and reviewed based on the manner of use (stockwater). The following sections include summaries of each manner of use category, with a breakout of groundwater rights and a comparison of these rights to the NDWR HA Summary totals.

8.2.1.1 Stockwater Rights

The NDWR online water-rights database includes 18 active records with the manner of use listed as "stockwater." Appendix 8-4 is a copy of the hydrographic abstract queried by HA (Coal Valley - Area 171), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as other surface water (1), spring (13), and groundwater (4).

All four of the groundwater rights are certificated. Based on review of the permit and certificate conditions, these rights do not appear to have a combined duty limitation. The combined total of these underground stockwater rights is 63.80 afa. This is consistent with the 63.80 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 8-3.

Three of the groundwater rights (Permit Nos. 54216, 81395, and 81396) have a priority date after October 17, 1989. The duty for these rights is 38.94 afa. Appendix 8-2, which lists all of the active water rights in Coal Valley, identifies the records that have priority dates before, on, and after October 17, 1989.

8.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 8.2 identified all active water rights within Coal Valley. There were no active groundwater irrigation rights identified within Coal Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

8.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 8-3, lists the total amount of supplementally adjusted groundwater rights for stockwater uses as 63.80 afa. Table 8-3 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report, and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to, or on October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analyses completed in Section 8.2 and Section 8.2.1 of this chapter.

8.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Table 8-3
Coal Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	NDWR HA Summary (afa)	Total	With Priority Dates After October 17, 1989	With Priority Dates prior to October 17, 1989
Stockwater	63.80	63.80	38.94	24.86
Total	63.80	63.80	38.94	**24.86**

Figure 8-4 shows the location of rights with a source listed as spring, with a POD located within the groundwater discharge areas. No groundwater discharge areas were identified in Coal Valley; therefore, no springs can be considered groundwater resources within Coal Valley.

8.6 Supplemental Analysis of Groundwater and Irrigation Spring Rights

Section 8.2 identified all active water rights within Coal Valley. There were no active irrigation rights identified within Coal Valley. For this reason, supplemental analysis of groundwater and spring irrigation rights will not be performed for Coal Valley, as it is not applicable.

8.7 Supplemental Analysis for Groundwater Irrigation Rights versus Surface Water Irrigation Rights

Section 8.2 identified all active water rights within Coal Valley. There were no active irrigation rights identified within Coal Valley. For this reason, supplemental analysis for groundwater irrigation rights versus surface water irrigation rights will not be performed for Coal Valley, as it is not applicable.

8.8 Estimated Crop Consumptive Use for Coal Valley

Section 8.2 identified all active water rights within Coal Valley. There were no active irrigation rights identified within Coal Valley. For this reason, analysis of estimated crop consumptive use for Coal Valley will not be performed, as it is not applicable.

8.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals. or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

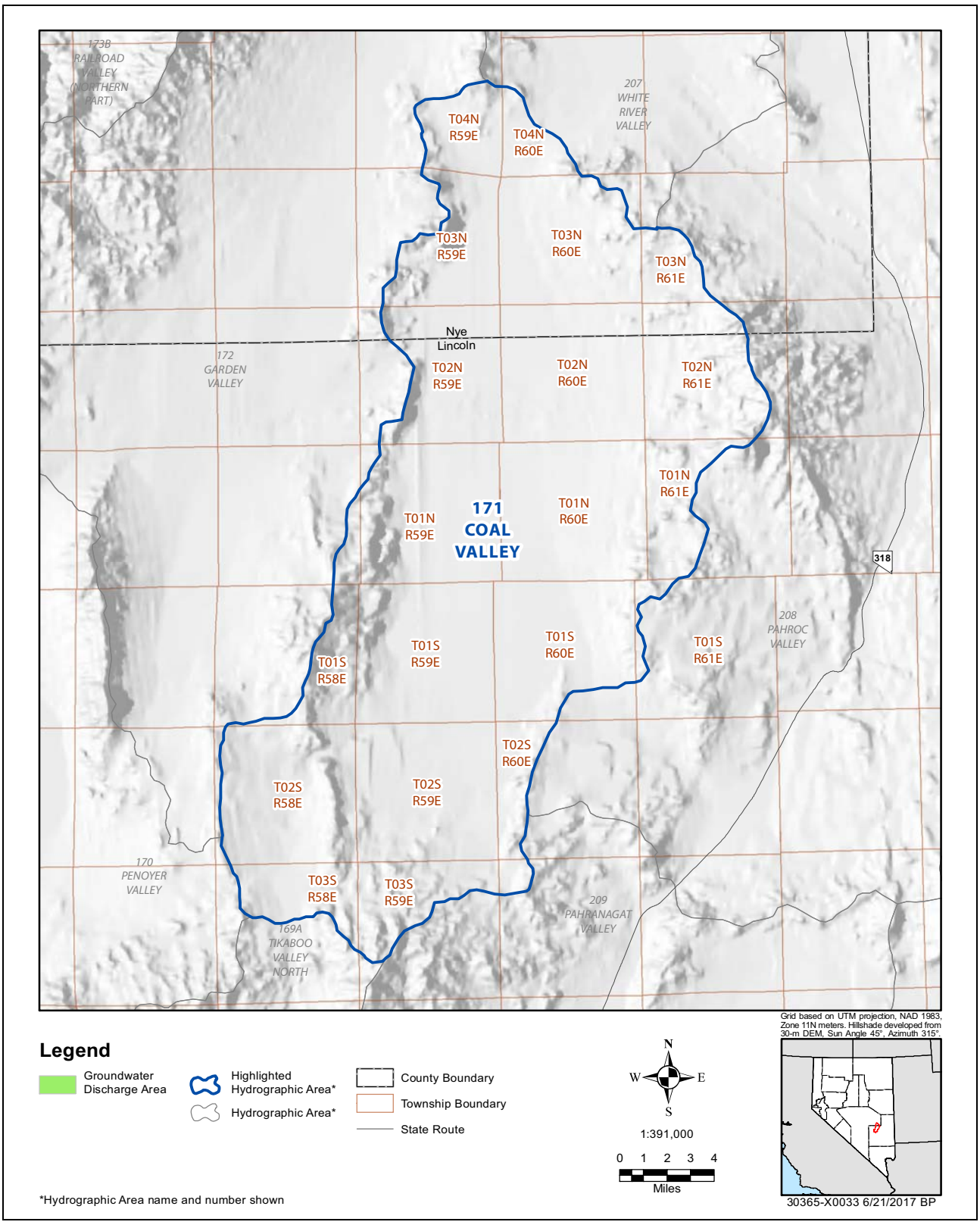

Figure 8-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Coal Valley

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Coal Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells which have been reported to the NDWR located within Coal Valley. The list includes a total of six records and is included as Appendix 8-5. Each well log filed with the NDWR lists a proposed use of the drilled well. There is one record that lists a proposed use as domestic (domestic use is signified with an "H" in the proposed use column). This single domestic well was installed prior to October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each domestic well corresponded to a domestic well user, each well is using 2.00 afa, that all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the one domestic well identified, it is estimated that 2.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

This analysis will include the entire 2.00 afa as a groundwater commitment with a priority date prior to October 17, 1989.

8.10 Summary

The total committed groundwater rights for Coal Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 8-4 presents the summary information derived by this analysis of all active groundwater rights, as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Coal Valley, after supplemental and consumptive use adjustments are made, is estimated to be 65.80 afa. The committed groundwater rights for Coal Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 38.94 afa. The committed groundwater rights for Coal Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 26.86 afa.

Table 8-4
Committed Groundwater/Spring Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	2.00	N/A	2.00	0.00	N/A	0.00	2.00	N/A	2.00
Stockwater	63.80	N/A	63.80	38.94	N/A	38.94	24.86	N/A	24.86
Total	65.80	N/A	65.80	38.94	N/A	38.94	26.86	N/A	**26.86**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

9.0 PAHROC VALLEY

9.1 Introduction

NDWR HA 208, Pahroc Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Colorado River Basin Hydrographic Region. Figure 9-1 is a map of the location of Pahroc Valley.

The purpose of this chapter is to analyze the existing water rights within Pahroc Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 9-2 shows the townships and ranges (MDBM) located within Pahroc Valley.

9.2 Summary of Water Rights in Pahroc Valley

Active water rights within Pahroc Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

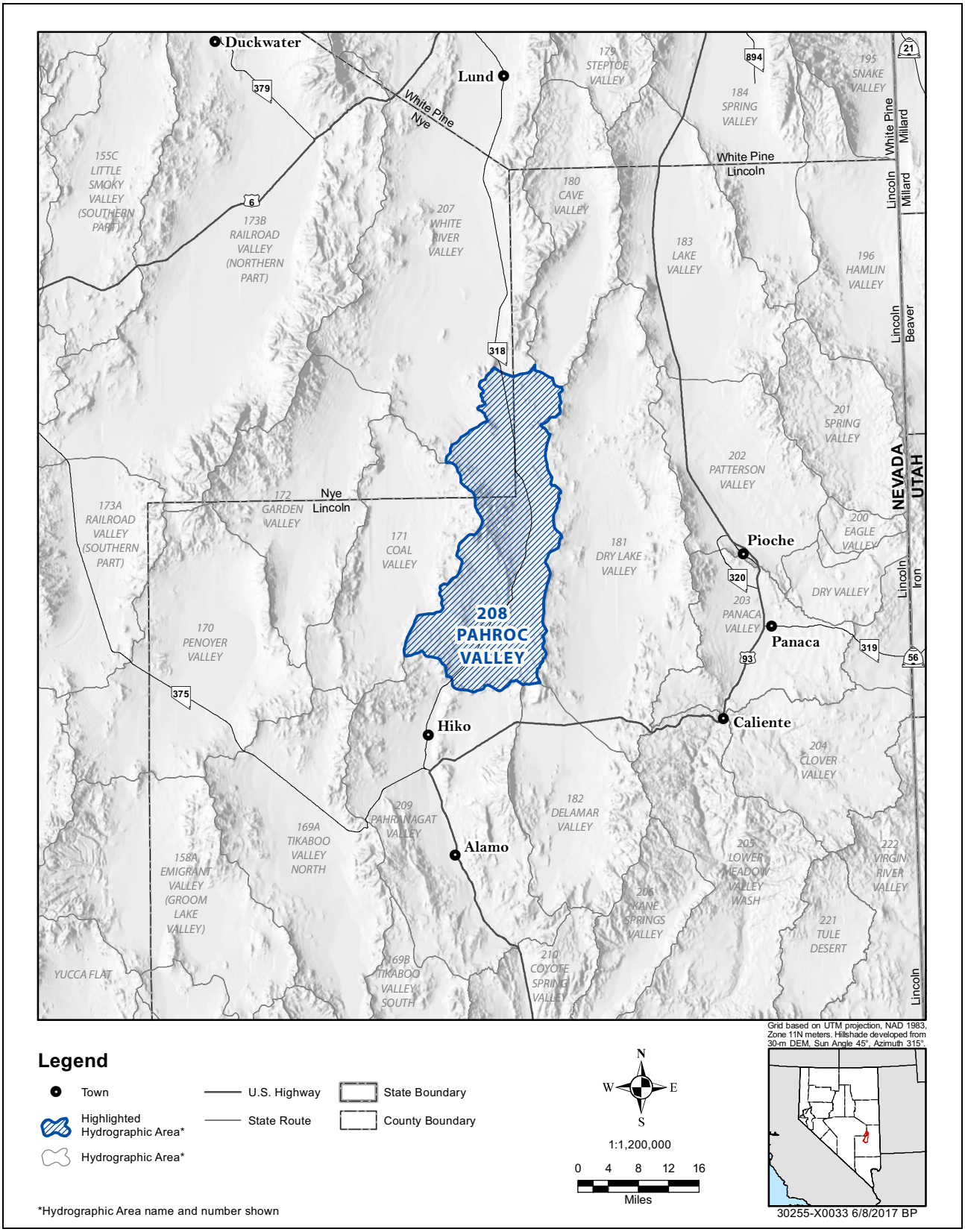

Figure 9-1
Pahroc Valley Hydrographic Area

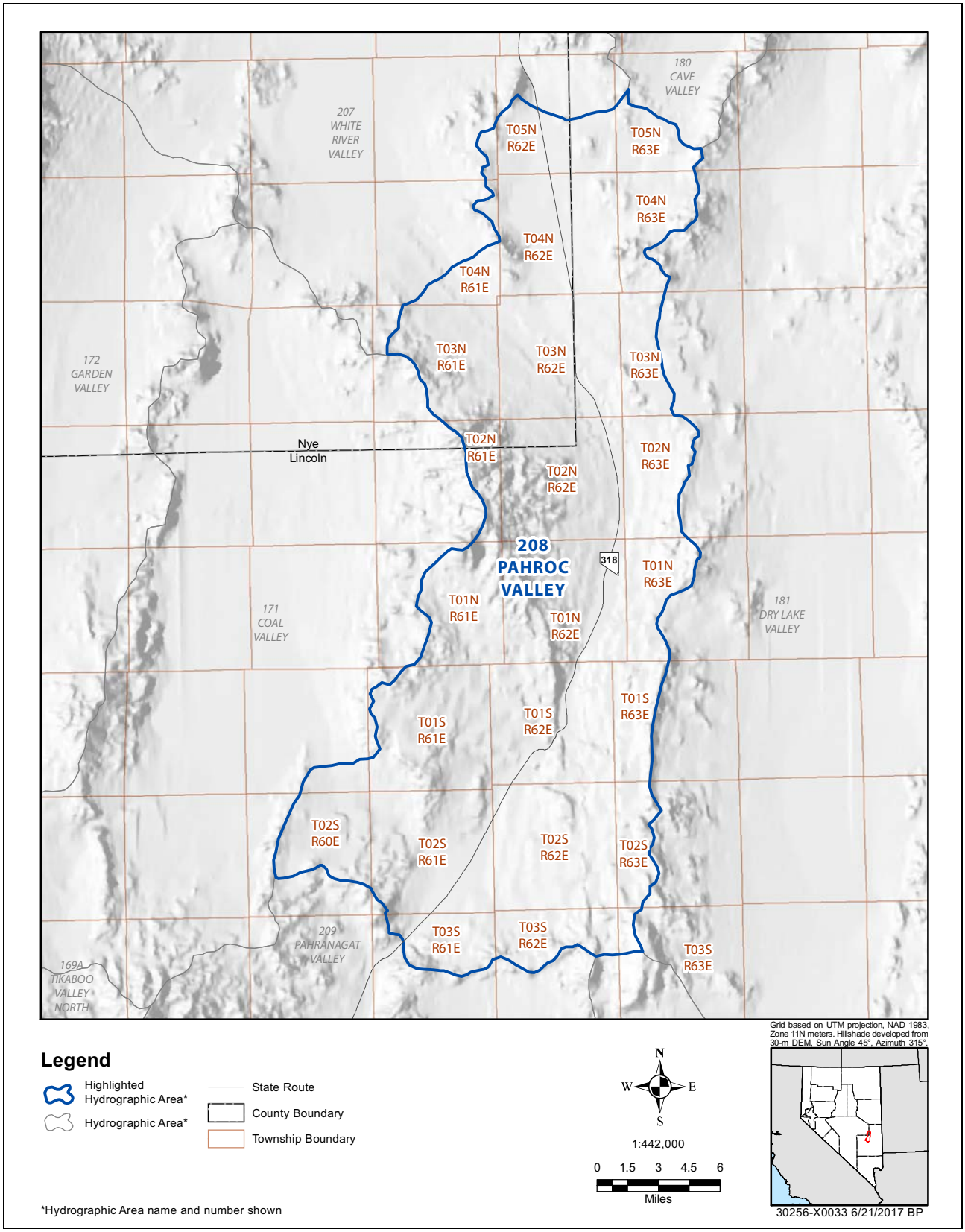

Figure 9-2
Township/Ranges Within Pahroc Valley

The NDWR hydrographic abstract, queried for all active records within Pahroc Valley, is included as Appendix 9-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 16 active water rights that are listed as vested, certificated, permitted, and reserved water rights. Appendix 9-2 lists all the active water rights in Pahroc Valley and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights and applications for water rights include stockwater and "other." Table 9-1 lists the number of records within Pahroc Valley in the NDWR online water-rights database per manner of use and their current status.

Table 9-1
Number of Active Records Listed per Manner of Use and Status in Pahroc Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted	Reserved
Stockwater	15	1	12	2	0
Other	1	0	0	0	1
Total	16	1	12	2	1

The sources of water for the 16 active water rights and active applications for water rights include reservoir, spring, and underground. Table 9-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 9-2
Number of Active Records Listed per Manner of Use and Source in Pahroc Valley

Manner of Use	Number of Records	Stream	Reservoir (Surface Water)	Spring	Underground
Stockwater	15	0	2	8	5
Other	1	0	0	1	0
Total	16	0	2	9	5

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 9-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Pahroc Valley.

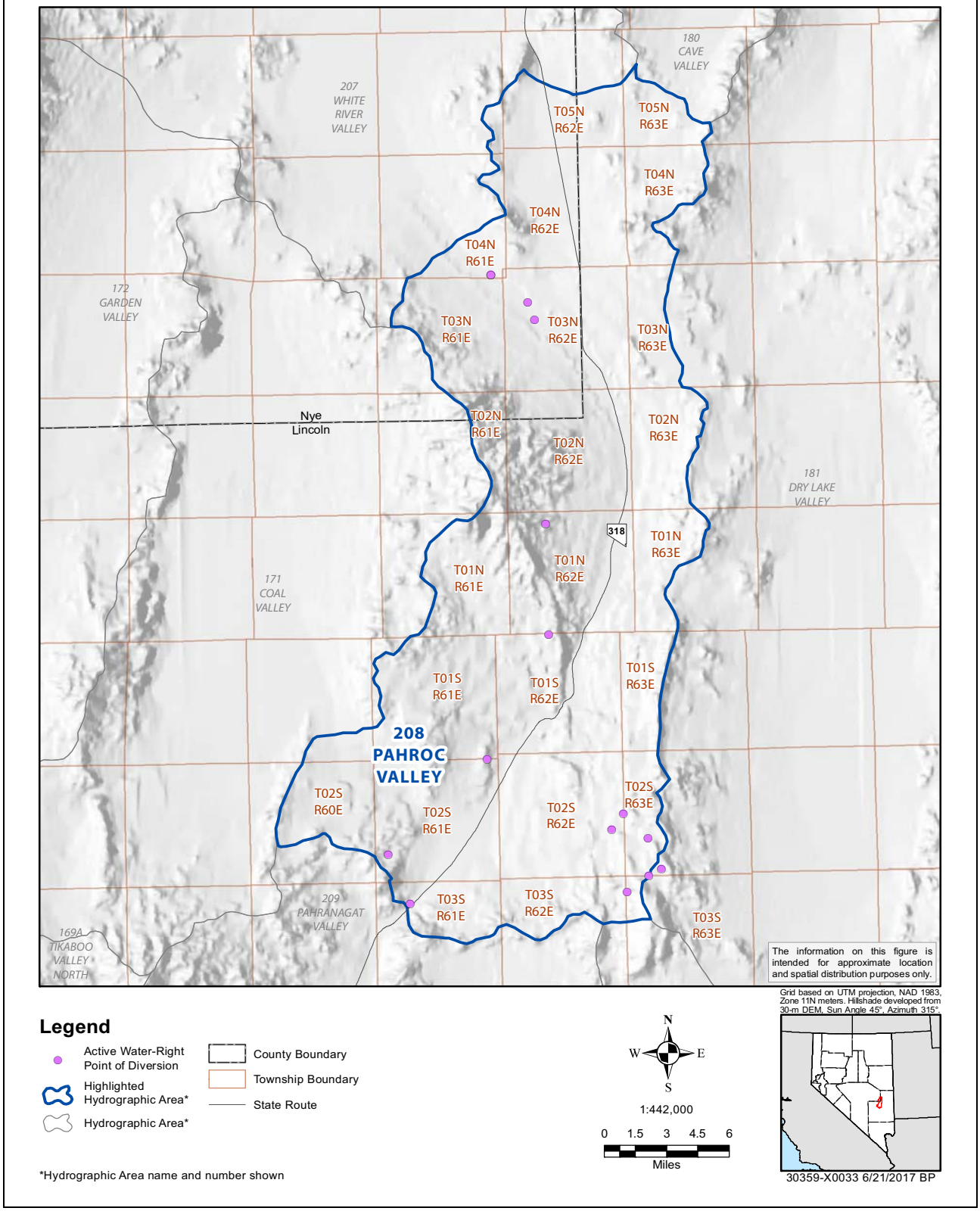

Figure 9-3
PODs for all Active Water Rights Within Pahroc Valley

9.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Pahroc Valley, found in Appendix 9-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within Pahroc Valley, and includes the manner of use of stockwater and other. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

Pahroc Valley active rights were compiled and reviewed based on the manner of use of stockwater and "other." The following sections include summaries of each manner of use category, with a breakout of groundwater active rights and a comparison of these rights to the NDWR HA Summary totals.

9.2.1.1 Stockwater Rights

The NDWR online water-rights database includes 15 active records with the manner of use listed as "stockwater." Appendix 9-4 is a copy of the hydrographic abstract queried by HA (Pahroc Valley - Area 208), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as reservoir (2), spring (8), and groundwater (5).

The five groundwater rights are permitted (1), certificated (3), and vested (1). Based on a review of the permit and certificate conditions, these rights do not appear to have a combined duty limitation. The combined total of these underground stockwater rights is 46.88 afa. This is not consistent with the 38.94 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 9-3. Table 9-3 is a listing of these rights and notes regarding the rationale for determining the current analysis of TCD are included within.

Table 9-3
NDWR HA Summary Totals vs Current Analysis Totals
for Underground Stockwater Use

Application No.	Status	Source	NDWR HA Summary (afa)	Current Analysis (afa)	Notes
7057	CER	UG	7.49	7.49	-
66124	CER	UG	11.29	11.29	-
67151	CER	UG	11.20	11.29	0.0156 cfs diversion rate * 723.97 = 11.29 afa
80226	PER	UG	8.96	8.96	-
V02418	VST	UG	0.00	7.85	3,500 sheep, November – April. Using 0.00625 cfs per 1,000 sheep = 0.021875 cfs for 3,500 sheep. 0.021875 cfs * 723.97 / 365 days per year * 181 days of season = 7.85 afa
		Total	38.94	46.88	

CER = Certificated.
PER = Permit.
UG = Underground.
VST = Vested.

Three of the groundwater rights (Permit Nos. 66124, 67151, and 80226) have priority dates after October 17, 1989. The duty for these rights is 31.54 afa. Additionally, Appendix 9-2 lists all the active water rights in Pahroc Valley and identifies the records that have priority dates before, on, and after October 17, 1989.

9.2.1.2 "Other" Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "other." Appendix 9-5 is a copy of the hydrographic abstract queried by HA (Pahroc Valley - Area 208), manner of use (other), and status (certificate, decreed, permit, reserved, vested). This right is listed with a source as spring. The right listed as "other" is not from an underground source. The total duty from this analysis for these underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground "other" rights listed in the NDWR HA Summary, Appendix 9-3.

9.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 9.2 identified all active water rights within Pahroc Valley. There were no permitted groundwater irrigation water rights identified within Pahroc Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

9.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 9-3 lists the total amount of supplementally adjusted groundwater rights for stockwater uses as 38.94 afa. Table 9-4 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to, or on October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analysis completed in Section 9.2 and Section 9.3 of this chapter

Table 9-4
Pahroc Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to October 17, 1989**
Stockwater	38.94	46.88	31.54	15.34
Other	0.00	0.00	0.00	0.00
Total	38.94	46.88	31.54	**15.34**

9.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater rights for accounting purposes in determining total groundwater commitments for this analysis.

Figure 9-4 shows the location of rights with a source listed as spring, with a POD located within the groundwater discharge areas. No groundwater discharge areas were identified in Pahroc Valley; therefore, no springs can be considered groundwater resources within Pahroc Valley.

9.6 Supplemental Analysis of Irrigation Groundwater and Spring Irrigation Rights

Section 9.2 identified all active water rights within Pahroc Valley. There were no active irrigation rights identified within Pahroc Valley. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Pahroc Valley, as it is not applicable.

9.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 9.2 identified all active water rights within Pahroc Valley. There were no active irrigation rights identified within Pahroc Valley. For this reason, supplemental analysis of groundwater and spring irrigation rights versus surface water irrigation rights will not be performed for Pahroc Valley, as it is not applicable.

9.8 Estimated Crop Consumptive Use

Section 9.2 identified all active water rights within Pahroc Valley. There were no active irrigation rights identified within Pahroc Valley. For this reason, estimated crop consumptive use will not be performed, as it is not applicable.

9.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

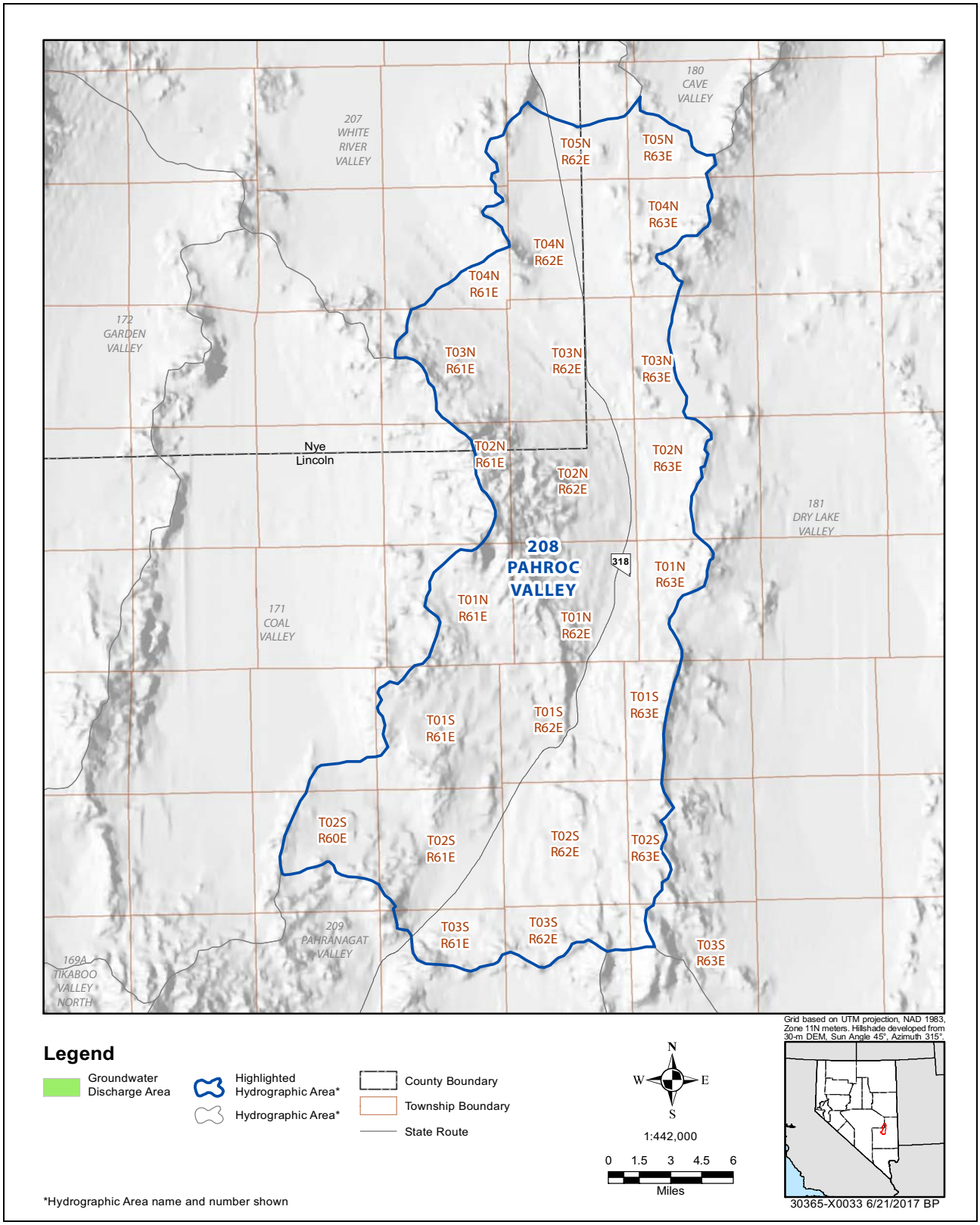

Figure 9-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Pahroc Valley

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Pahroc Valley.

Because this information does not exist, an alternative approach was used for this analysis, and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR located within Pahroc Valley. The list includes a total of 16 records and is included as Appendix 9-6. Each well log filed with the NDWR lists a proposed use of the drilled well. There are three records that list a proposed use as domestic use (domestic use is signified with an “H” in the proposed use column). One listed domestic well was installed prior to October 17, 1989, and two domestic wells were installed after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.00 afa, all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the three domestic wells identified, it is estimated that 6.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

Therefore, 6.00 afa is allocated for domestic groundwater commitments within Pahroc Valley. Although the majority of domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

9.10 Summary

The total committed groundwater rights for Pahroc Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 9-5 presents the summary information derived by this analysis of all active groundwater rights, as well as spring rights, with PODs within the groundwater discharge areas.

The total committed groundwater rights for Pahroc Valley, after supplemental and consumptive use adjustments are made, is estimated to be 52.88 afa. The committed groundwater rights for Pahroc Valley with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 31.54 afa. The committed groundwater rights for Pahroc Valley with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 21.34 afa.

Table 9-5
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	6.00	N/A	6.00	0.00	N/A	0.00	6.00	N/A	6.00
Stockwater	46.88	N/A	46.88	31.54	N/A	31.54	15.34	N/A	15.34
Total	52.88	N/A	52.88	31.54	N/A	31.54	21.34	N/A	**21.34**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

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10.0 DRY LAKE VALLEY

10.1 Introduction

NDWR HA 181, Dry Lake Valley, is located in the east-central portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 10-1 is a map of the location of Dry Lake Valley.

The total committed groundwater rights for Dry Lake Valley were previously analyzed and included in the *Committed Groundwater Resources in Four Nevada Hydrographic Areas: Cave Valley, Dry Lake Valley, Delamar Valley, and Spring Valley,* (Stanka, 2011). Section 3.9 of the 2011 Report concluded the total committed groundwater rights for Dry Lake Valley with priority dates prior to October 17, 1989 was 59.96 afa, and 746.66 afa with priority dates after October 17, 1989, for a total of 806.62 afa.

This chapter is intended to update, amend, and supplement the 2011 Report by identifying changes which have occurred within Dry Lake Valley since the 2011 Report. These changes were identified through a review and comparison of NDWR hydrographic abstract Searches and NDWR HA Summary Reports from the 2011 Report versus NDWR hydrographic abstract searches and NDWR HA Summary Reports as of April 7, 2017. Any changes are identified in the corresponding sections. If no changes were identified, then the conclusions from the 2011 Report were confirmed in this chapter. In addition to updating information, some changes were made to the methodology from the 2011 Report. These methodology changes include the following:

- Identification of springs within groundwater discharge areas to be accounted as groundwater resources.
- Revised domestic well identification analysis
- Inclusion of the additional groundwater rights reserved for future growth within Dry Lake Valley as identified in NSE Ruling No. 6166.
- Revised summary section.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 10-2 shows the townships and ranges (MDBM) located within Dry Lake Valley.

10.2 Summary of Water Rights in Dry Lake Valley

Active water rights within Dry Lake Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

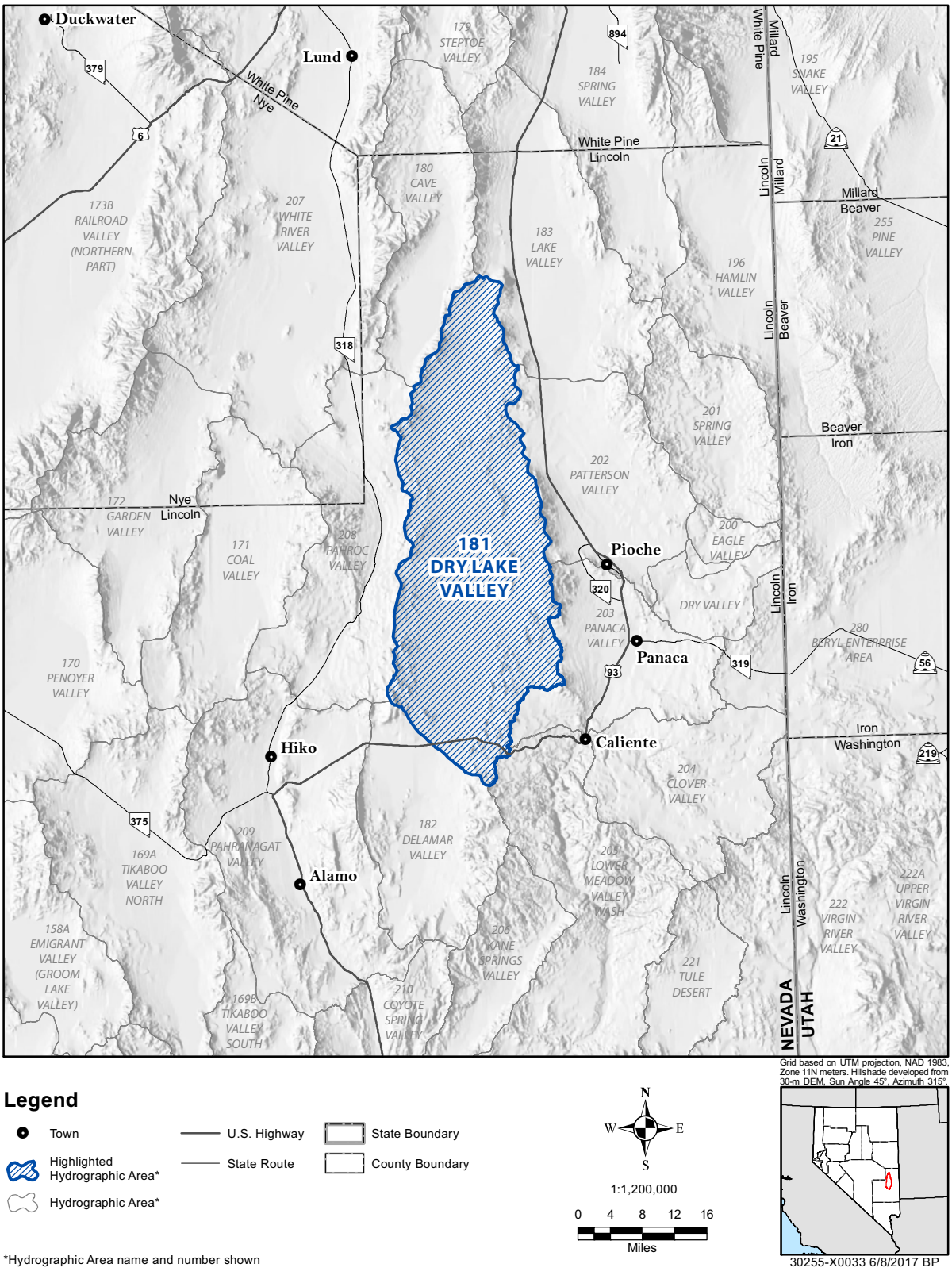

Figure 10-1
Dry Lake Valley Hydrographic Area

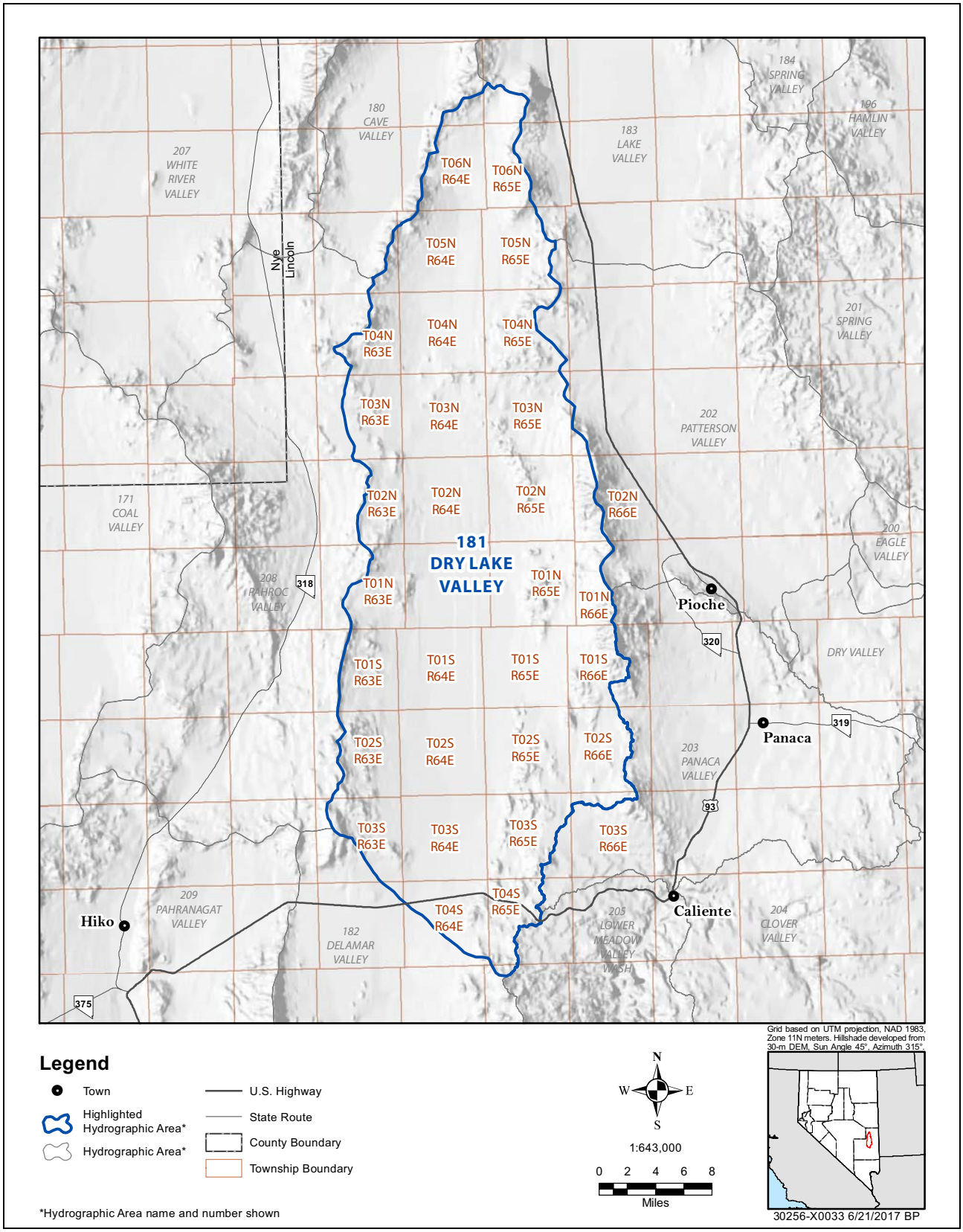

Figure 10-2
Township/Ranges Within Dry Lake Valley

The NDWR hydrographic abstract, queried for all active records within Dry Lake Valley, is included as Appendix 10-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 107 active water rights that are listed as vested, certificated, permitted, and reserved water rights. Appendix 10-2 lists all the active water rights in Dry Lake Valley and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include stockwater, municipal/quasi-municipal, other, and irrigation. Table 10-1 lists the number of records within Dry Lake Valley in the NDWR online water-rights database per manner of use and their current status.

Table 10-1
Number of Active Records Listed per Manner of Use and Status in Dry Lake Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted	Reserved
Stockwater	98	31	65	0	2
Mining and Milling	0	0	0	0	0
Other	1	0	0	0	1
Municipal/ Quasi-Municipal	2	0	0	2	0
Irrigation	6	3	3	0	0
Total	107	34	68	2	3

The sources of water for the 107 active water rights include stream, other surface water, reservoir (surface water), spring, and underground. Table 10-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 10-2
Number of Active Records Listed per Manner of Use and Source in Dry Lake Valley

Manner of Use	Number of Records	Stream	Other Surface Water	Reservoir (Surface Water)	Spring	Underground
Stockwater	98	2	1	9	81	5
Mining and Milling	0	0	0	0	0	0
Other	1	0	0	0	1	0
Municipal/ Quasi-Municipal	2	0	0	0	0	2
Irrigation	6	0	0	0	4	2
Total	107	2	1	9	86	9

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 10-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Dry Lake Valley.

10.2.1 Stockwater Rights

The NDWR online water-rights database includes 98 active records with the manner of use listed as "stockwater." Appendix 10-3 is a copy of the hydrographic abstract queried by HA (Dry Lake Valley - Area 181), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (2), other surface water (1), reservoir (9), spring (81), and groundwater (5).

All five of the groundwater rights are certificated. Based on review of the permit and certificate conditions, no combined duty limitation terms were identified. The combined total of these underground stockwater rights is 38.48 afa. This is consistent with the 38.48 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 10-4.

All five of the groundwater rights (Permit Nos. 5936, 18756, 35770, 35773, and 35774) have a priority date prior to October 17, 1989. These five groundwater rights have a combined duty of 38.48 afa. Appendix 10-2 lists all the active water rights in Dry Lake Valley and identifies any records that have priority dates before, on, or after October 17, 1989.

10.2.2 Mining and Milling Rights

The NDWR online water-rights database includes no active records with the manner of use listed as "mining and milling." Appendix 10-5 is a copy of the hydrographic abstract queried by HA (Dry Lake Valley - Area 181), manner of use (mining and milling), and status (certificate, decreed, permit, reserved, vested).

Per Section 3.2.1.2 of the 2011 Report, a single mining and milling underground, certificated right was identified (Permit No. 6718) for 18.08 afa. Permit No. 6718 was abandoned in 2014 per NSE Ruling No. 6281. Therefore, no active rights for mining and milling use remain in Dry Lake Valley.

Because there are no active rights for mining and milling use, the total duty from this analysis for underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground mining and milling rights listed in the NDWR HA Summary, Appendix 10-4.

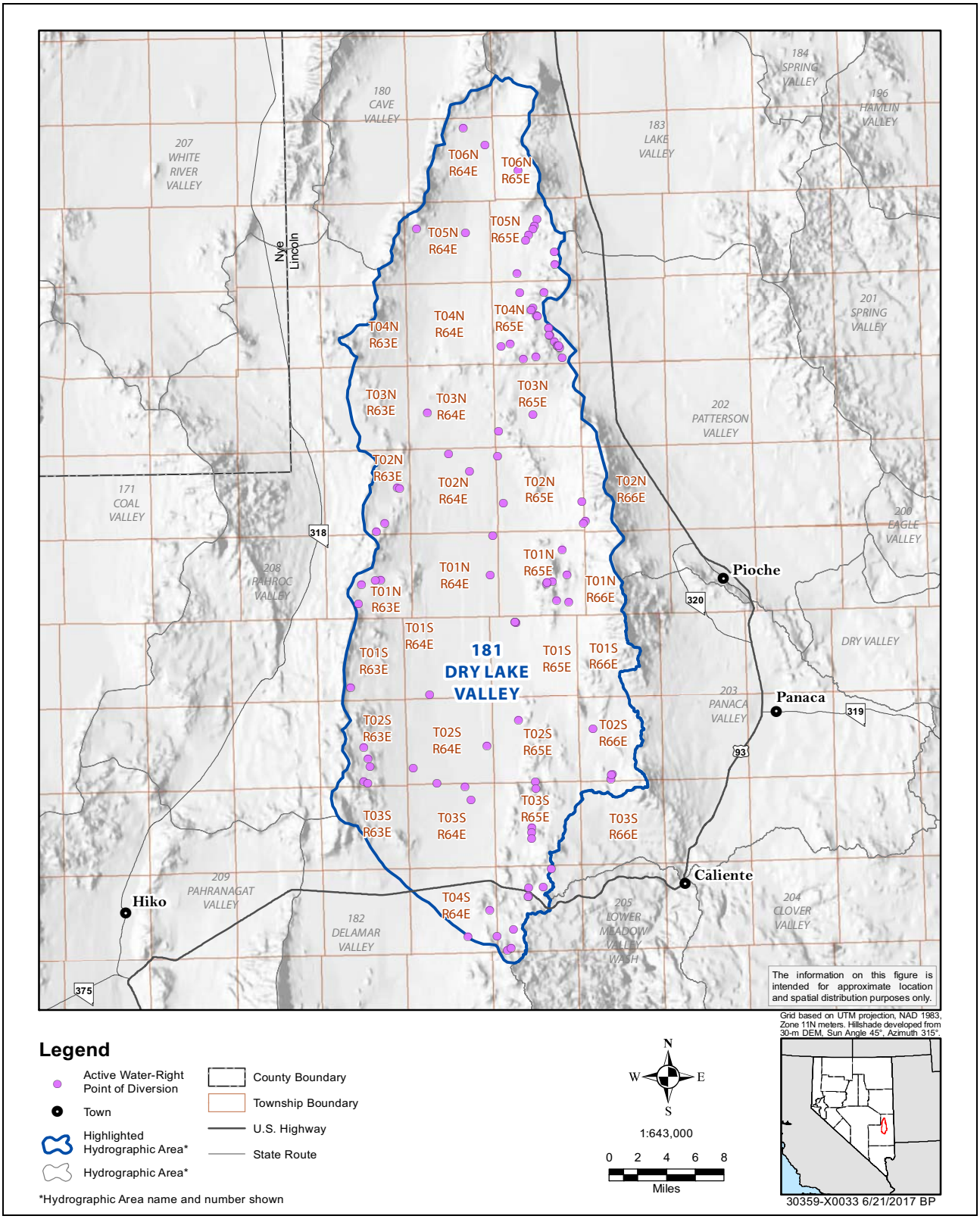

Figure 10-3
PODs for all Active Water Rights Within Dry Lake Valley

10.2.3 Other Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "other". Appendix 10-6 is a copy of the hydrographic abstract queried by HA (Dry Lake Valley - Area 181), manner of use (other), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring.

This single "other" right is not from an underground source. The total duty from this analysis for "other" underground rights is 0.00 afa. This total is consistent with the 0.00 afa of underground "other" rights listed in the NDWR HA Summary, Appendix 10-4.

10.2.4 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "municipal/quasi-municipal." Appendix 10-7 is a copy of the hydrographic abstract queried by HA (Dry Lake Valley - Area 181), manner of use (municipal/quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these two rights are both listed as underground.

These two groundwater rights are permitted. Based on review of the permit conditions, the combined duty limitation of these two municipal/quasi-municipal groundwater rights is 11,584.00 afa. This is consistent with the 11,584.00 afa of underground municipal/quasi-municipal listed in the NDWR HA Summary, Appendix 10-4.

Both of these groundwater rights (Permit Nos. 53989 and 53990) have a priority date of October 17, 1989. These rights are owned by SNWA, and for accounting purposes for this report will be considered rights prior to October 17, 1989.

10.2.5 Irrigation Rights

The NDWR online water-rights database includes six active records with the manner of use listed as "irrigation." Appendix 10-8 is a copy of the hydrographic abstract queried by HA (Dry Lake Valley - Area 181), manner of use (irrigation, irrigation-DLE, irrigation-Carey Act), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (4) and underground (2).

The two groundwater rights are certificated. Based on review of the certificate conditions, the combined duty limitation of these two underground irrigation rights is 1,009.00 afa. This is consistent with the 1,009.00 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 10-4.

Both of these groundwater rights (Permit Nos. 80648 and 80649) have priority dates after October 17, 1989.

10.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 10.2 identified all active water rights within Dry Lake Valley. Two groundwater irrigation rights were identified (Permit Nos. 80648 and 80649). Although certificated groundwater Permit Nos. 80648 and 80649 were only applications at the time of the 2011 Report, the POUs of these permits are the same as their base rights (Permit Nos. 77722 and 77723). Therefore, sole source versus supplemental analysis has not changed since the 2011 report. The 2011 report identified these base rights (Permit Nos. 77722 and 77723) as being non-supplemental. Excluding Permit Nos. 80648 and 80649 (which POU did not change from the base rights) no additional groundwater irrigation rights have been permitted since the 2011 Report; therefore, further supplemental analysis of irrigation groundwater versus surface water is not required for Dry Lake Valley, and the findings from the 2011 Report remain valid.

10.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 10-4, lists the total amount of supplementally adjusted groundwater rights for stockwater, municipal, and irrigation uses as 12,631.48 afa. Table 10-3 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. This report's current analysis shows that there are a total of 12,631.48 afa of groundwater rights within Dry Lake Valley; 11,622.48 afa have priority dates prior to or on October 17, 1989, and 1,009.00 afa have priority dates after October 17, 1989. This information is based on the NDWR HA Summary and the analysis completed in Section 10.2 and Section 10.3 of this report.

Table 10-3
Dry Lake Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	NDWR HA Summary (afa)	Total	With Priority Dates After October 17, 1989	With Priority Dates Prior to or on October 17, 1989
Stockwater	38.48	38.48	0.00	38.48
Mining and Milling	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00
Municipal/ Quasi-Municipal	11,584.00	11,584.00	0.00	11,584.00
Irrigation	1,009.00	1,009.00	1,009.00	0.00
Total	12,631.48	12,631.48	1,009.00	**11,622.48**

10.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered groundwater commitments for this analysis. When a spring right was

identified with a POD located within a groundwater discharge area, it was considered a groundwater resource for accounting purposes in determining total groundwater commitment for this analysis.

Figure 10-4 shows the location of groundwater discharge areas and the location of rights, if present, with a source listed as spring and with a POD located within the groundwater discharge areas. The groundwater discharge areas are green-filled polygons, if applicable. No groundwater discharge areas were identified in Dry Lake Valley; therefore, no springs can be considered groundwater resources within Dry Lake Valley.

10.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 10.5 identified no spring irrigation rights in Dry Lake Valley within groundwater discharge areas. For this reason, a supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Dry Lake Valley, as it is not applicable.

10.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 3.5 of the 2011 Report states, *"[t]here are no surface water rights located in the same Township/Range as any groundwater rights with Dry Lake Valley. Therefore, groundwater rights within Dry Lake Valley cannot be supplemental to any surface water rights"* (Stanka, 2011, p. 3-10). No groundwater irrigation rights have been permitted since the 2011 report (aside from change applications No. 80648 and 80649, which did not change the POU of existing groundwater permits); therefore, the findings from Section 3.5 of the 2011 Report remain valid.

10.8 Estimated Crop Consumptive Use for Dry Lake Valley

Section 3.7 of the 2011 Report states: *"[a]dditionally, Table 3-4 shows that if the entire 1,009.0 afa of groundwater rights within Dry Lake Valley were used in a single season, only 746.66 afa would be 'consumed' and the remainder would be returned to groundwater"* (Stanka, 2011, p. 3-12). Because 1,009.00 afa of sole-source groundwater rights within Dry Lake Valley has remain unchanged, the crop consumptive use has remained valid from the 2011 Report.

10.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, including the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, Domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

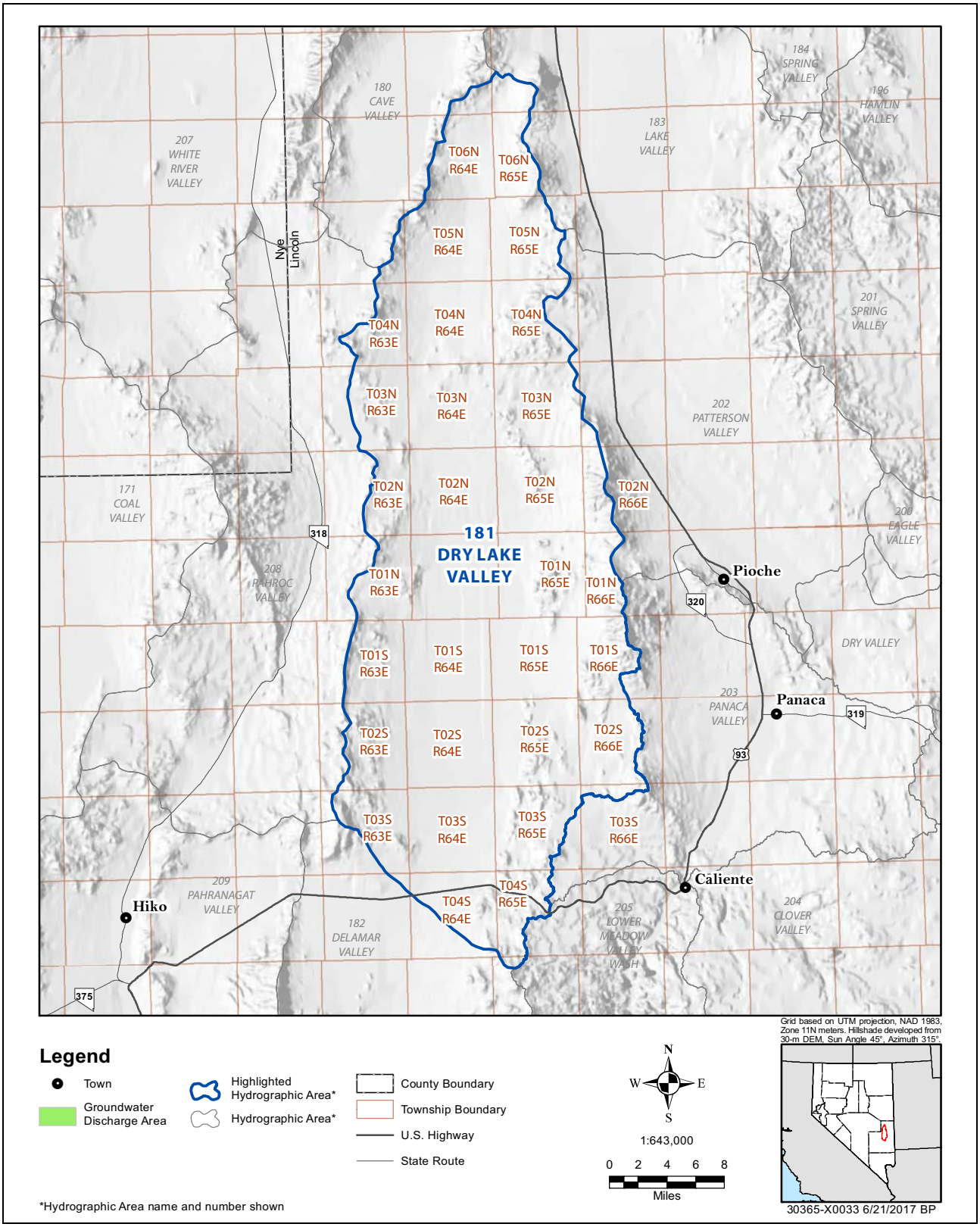

Figure 10-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Dry Lake Valley

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Dry Lake Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR located within Dry Lake Valley. The list includes a total of 23 records and is included as Appendix 10-9. Each well log filed with the NDWR lists a proposed use of the drilled well. There are four records that list a proposed use as domestic (signified with an "H" in the proposed use column). The four listed domestic wells were installed after October 17, 1989, and no listed domestic wells were installed prior to or on October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic well user, each well is using 2.00 afa, all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the four domestic wells identified, it is estimated that 8.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

Therefore, 8.00 afa is allocated for domestic groundwater commitments within Dry Lake Valley, and although these domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

10.10 Groundwater Resources Reserved for Future Growth in Dry Lake Valley

NSE Ruling No. 6166, page 161 states: "*[t]he amount of committed groundwater is 807 afa and 50 afa is reserved for unforeseen future growth and development in the basin"* (NDWR, 2012c). The NSE, pursuant to this ruling, reserved 50.00 afa of groundwater rights for future growth after the issuance of the SNWA municipal rights within Dry Lake Valley. Review of NDWR online resources reveals that no new additional groundwater rights have been permitted since the issuance of NSE Ruling No. 6166 (excludes change applications of previously permitted groundwater rights). For this analysis 50.00 afa of groundwater rights will be considered committed groundwater resources for Dry Lake Valley. It is likely that if new water rights were to be permitted in the future in Dry Lake Valley, the new water rights would have priority dates after October 17, 1989. However, for purposes of this report, the 50.00 afa basin of origin reserve will be accounted for as a prior to October 17, 1989 groundwater commitment because it was reserved pursuant to NSE Ruling No. 6166.

10.11 Summary

The total committed groundwater rights for Dry Lake Valley were estimated by determining rights with priority dates prior to, or on October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 10-4 presents the summary information derived by this analysis of all active groundwater rights as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Dry Lake Valley, after supplemental and consumptive use adjustments are applied, is estimated to be 12,427.14 afa. The committed groundwater rights for Dry Lake Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 746.66 afa. The committed groundwater rights for Dry Lake Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 11,680.48 afa.

Table 10-4
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	8.00	N/A	8.00	0.00	N/A	0.00	8.00	N/A	8.00
Reserved GW for Future Growth	50.00	N/A	50.00	0.00	N/A	0.00	50.00	N/A	50.00
Stockwater	38.48	N/A	38.48	0.00	N/A	0.00	38.48	N/A	38.48
Municipal/ Quasi-Municipal	11,584.00	N/A	11,584.00	0.00	N/A	0.00	11,584.00	N/A	11,584.00
Irrigation	1,009.00	N/A	746.66	1,009.00	N/A	746.66	0.00	N/A	0.00
Total	12,689.48	N/A	12,427.14	1,009.00	N/A	746.66	11,680.48	N/A	**11,680.48**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

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11.0 PAHRANAGAT VALLEY

11.1 Introduction

NDWR HA 209, Pahranagat Valley, is located in the south-eastern portion of the State of Nevada, within the WRFS and the Colorado River Basin Hydrographic Region. Figure 11-1 is a map of the location of Pahranagat Valley.

The purpose of this chapter is to analyze the existing water rights within Pahranagat Valley, and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 11-2 shows the townships and ranges (MDBM) located within Pahranagat Valley.

11.2 Summary of Water Rights in Pahranagat Valley

Active water rights within Pahranagat Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

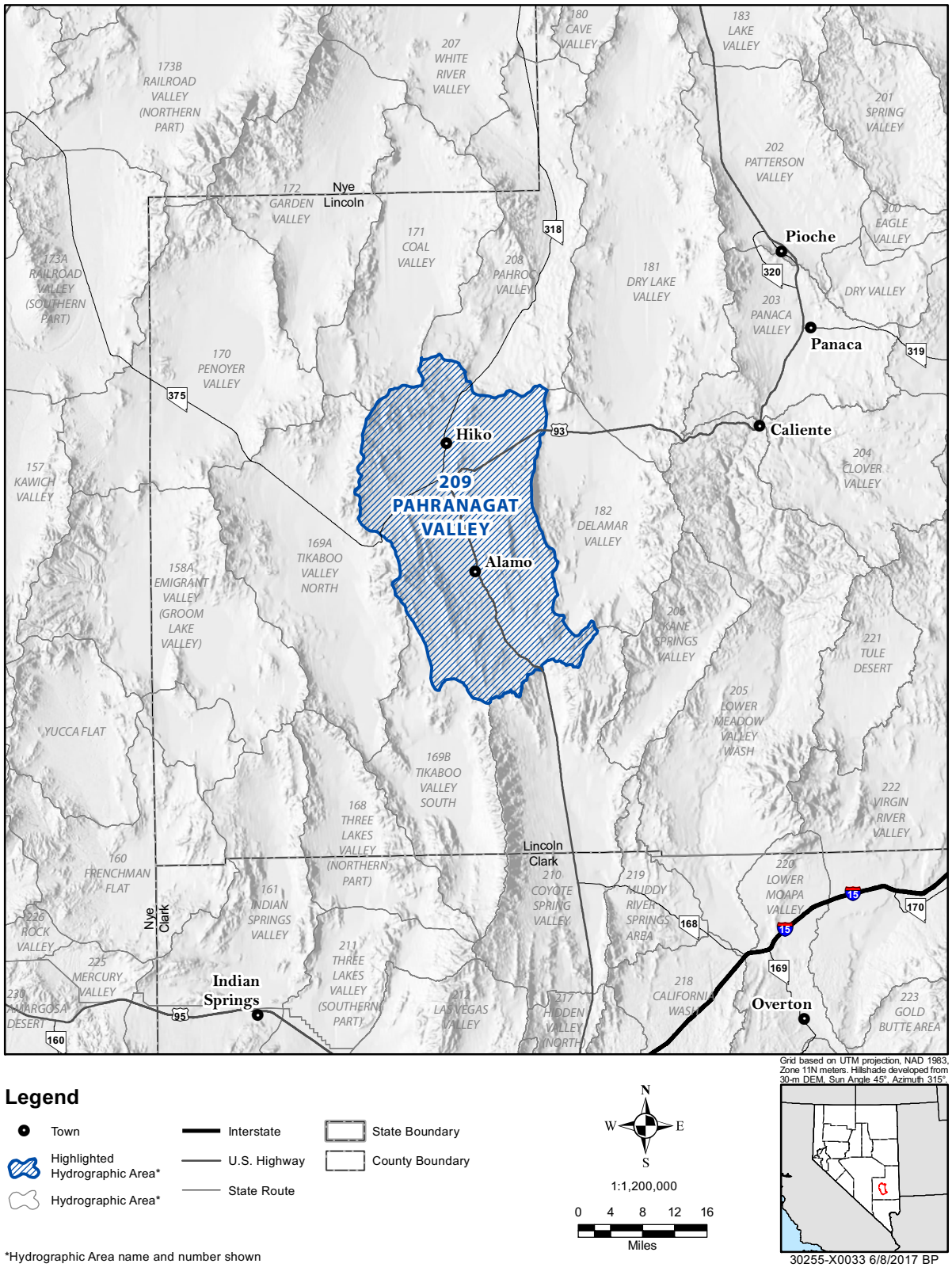

Figure 11-1
Pahranagat Valley Hydrographic Area

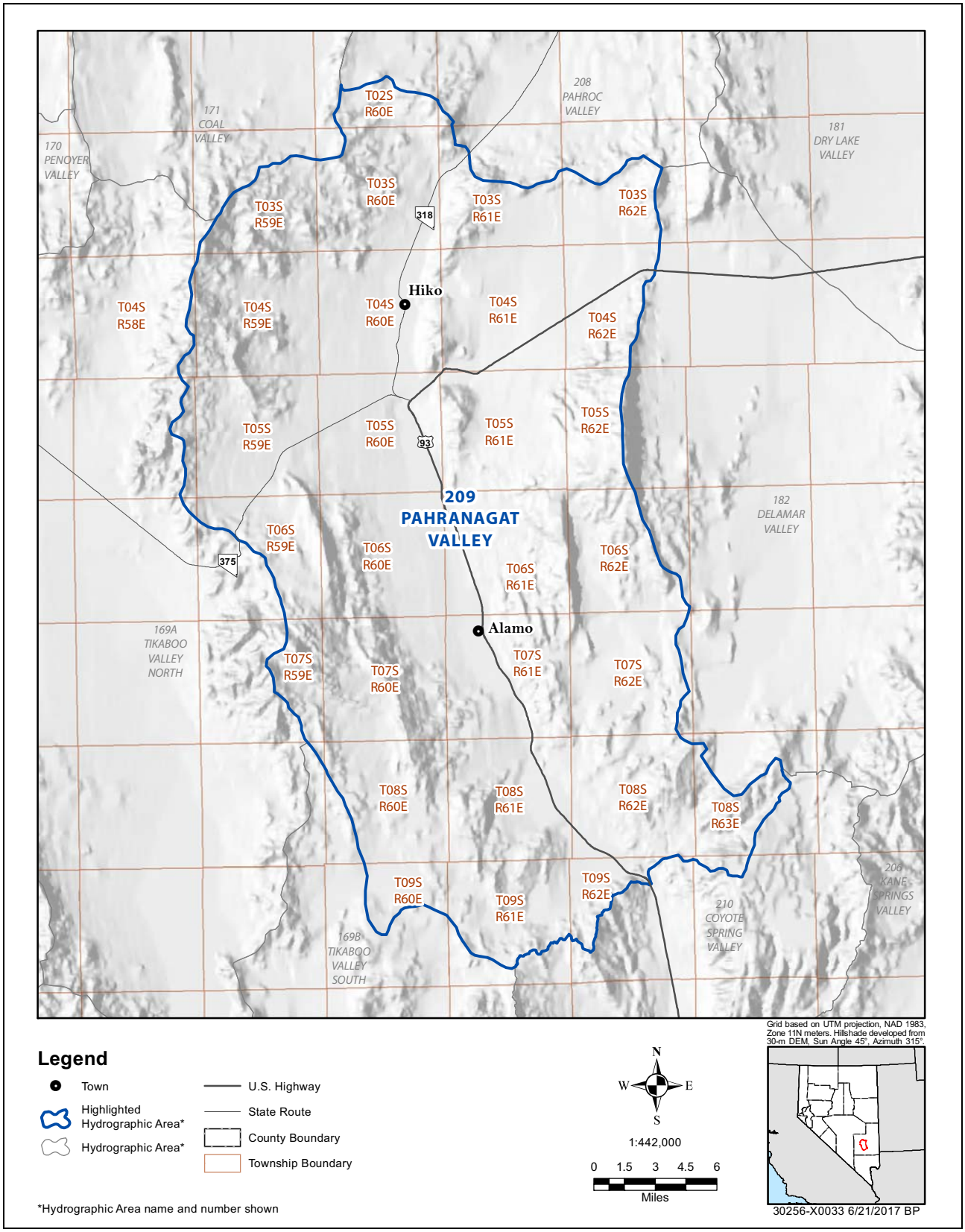

Figure 11-2
Township/Ranges Within Pahranagat Valley

The NDWR hydrographic abstract, queried for all active records within Pahranagat Valley, is included as Appendix 11-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights.

There are currently 137 active water rights that are listed as vested, decreed, certificated, permitted, and reserved water rights. Appendix 11-2 lists all the active water rights in Pahranagat Valley, and identifies records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights include commercial, domestic, municipal/quasi-municipal, stockwater, wildlife, other, and irrigation. Irrigation rights include decreed rights with a manner of use listed as "decreed," which would be "irrigation" based on language in the decrees. Table 11-1 lists the number of records within Pahranagat Valley in the NDWR online water-rights database per manner of use and their current status.

Table 11-1
Number of Active Records Listed per Manner of Use and Status in Pahranagat Valley

Manner of Use	Number of Records	Vested Claims	Decreed	Certificated	Permitted	Reserved
Commercial	5	0	0	3	2	0
Domestic	1	0	0	1	0	0
Municipal/ Quasi-Municipal	12	0	0	4	8	0
Stockwater	26	11	0	15	0	0
Wildlife	11	0	0	1	10	0
Other	2	0	0	0	0	2
Irrigation	80	2	19	42	17	0
Total	137	13	19	66	37	2

The sources of water for the 137 active water rights includes stream, spring, underground, and lake. Table 11-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Pahranagat Valley has decreed rights listed under the Decree titled *In the Matter of the Determination of the Relative Rights in and to the Waters of Pahranagat Lake and its Tributaries in Lincoln County, State of Nevada* (Pahranagat Lake Decree), dated October 14, 1929. This decree will be referred to as the Pahranagat Lake Decree for the remainder of this report. The rights listed within the decree were cross referenced with the NDWR online water-rights database. It was confirmed that all rights listed within the Pahranagat Lake Decree are listed within the NDWR online water-rights database. The NDWR online water-rights data does not include rights identified when the Pahranagat Lake Decree was amended on March 2, 1966, to include water deliveries during selected nonirrigation months for the purpose of "Washing Mineral Salts." This water use would not be considered a consumptive use because water used for this purpose would return to the source and therefore is not quantified in this report.

Table 11-2
Number of Active Records Listed per Manner of Use and Source in Pahranagat Valley

Manner of Use	Number of Records	Stream	Spring	Underground	Lake
Commercial	5	0	0	5	0
Domestic	1	0	0	1	0
Municipal/ Quasi-Municipal	12	0	3	9	0
Stockwater	26	1	12	8	5
Wildlife	11	0	5	3	3
Other	2	0	2	0	0
Irrigation	80	3	25	50	2
Total	137	4	47	76	10

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office. Figure 11-3 shows the approximate location and spatial distribution of the PODs for all active water rights in Pahranagat Valley.

11.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Pahranagat Valley, found in Appendix 11-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within Pahranagat Valley, and includes manners of use of commercial, irrigation, municipal/quasi-municipal, stockwater, and wildlife. The total for these groundwater rights is listed as 10,743.76 afa. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted, relative to other groundwater rights only.

Pahranagat Valley water rights were compiled and reviewed based on the manner of use (commercial, domestic, municipal/quasi-municipal, stockwater, wildlife, other and irrigation). The following sections include summaries of each manner of use category, with a breakout of groundwater active rights and a comparison of these rights to the NDWR HA Summary totals.

11.2.1.1 Commercial Rights

The NDWR online water-rights database includes five active records with the manner of use listed as "commercial." Appendix 11-4 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley - Area 209), manner of use (commercial), and status (certified, decreed, permit, reserved, vested). The sources for these rights is listed as underground (5).

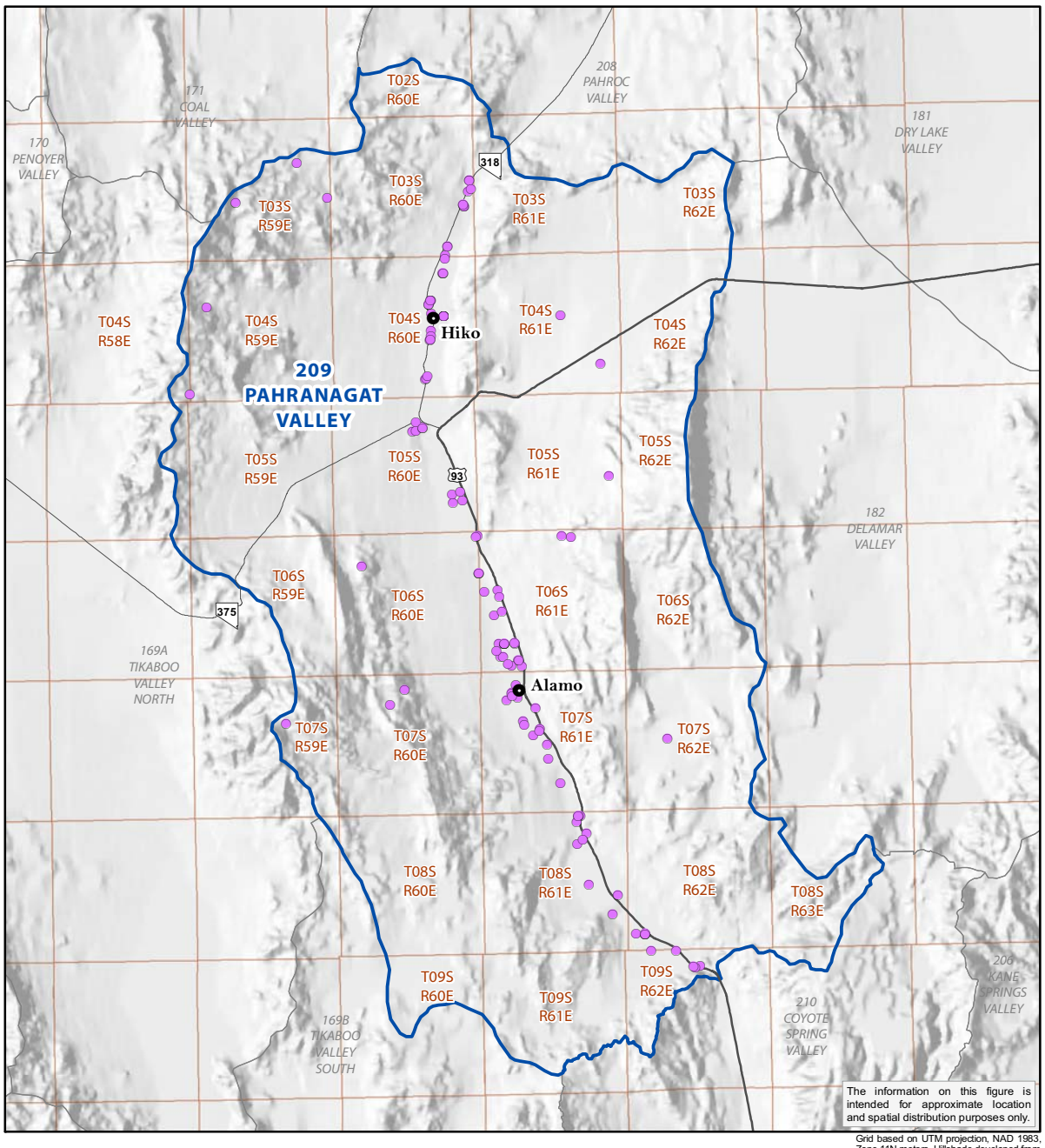

Figure 11-3
PODs for all Active Water Rights Within Pahranagat Valley

Three of the groundwater rights are certificated and two are permitted. A review of the permit and certificate conditions show that Permit Nos. 63238 and 67699 have a combined duty limitation, and Permit Nos. 68412 and 78844 have a combined duty limitation as well. The total of all underground commercial rights is 39.19 afa, after taking into account total combined duties as applicable. This is consistent with the 39.19 afa of underground commercial rights listed in the NDWR HA Summary, Appendix 11-3.

Four underground commercial rights (Permit Nos. 63238, 67699, 68412 and 78844) have priority dates after October 17, 1989. The total duty for these four rights is 26.19 afa.

11.2.1.2 Domestic Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "domestic." Appendix 11-5 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley - Area 209), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). This right is listed with a source as underground (1).

This single groundwater right is certificated. The duty total for this certificated underground right is 96.30 afa. This total is not consistent with the 0.00 afa of underground domestic rights listed in the NDWR HA Summary, Appendix 11-3. Further review has shown that this right is part of a combined duty quasi-municipal right. Therefore, the duty will be included in the quasi-municipal groundwater rights total described in Section 11.2.1.3. This groundwater right does not have a priority date after October 17, 1989.

11.2.1.3 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes 12 records with the manner of use listed as "municipal/quasi-municipal." Appendix 11-6 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley - Area 209), manner of use (municipal and quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as underground (9) and spring (3).

The nine groundwater rights have a status listed as permit (8) and certificate (1). Review of the permit and certificate conditions shows that the majority of municipal groundwater rights have combined duty limitations. The combined duty limitations include the domestic groundwater right identified in Section 11.2.1.2 (not one of these 12 records listed as municipal/quasi-municipal); therefore, that right will be included in this section for accounting purposes. The combined total of these underground municipal/quasi-municipal rights (and domestic right being accounted for as a municipal/quasi-municipal resource) is 1,091.14 afa. This is consistent with the 1,091.14 afa of underground municipal and quasi-municipal rights listed in the NDWR HA Summary, Appendix 11-3. Four of the municipal/quasi-municipal rights (Nos. 55533, 67150, 78582, and 81758) have priority dates after October 17, 1989. The duty for these four permitted rights is 434.73 afa.

11.2.1.4 Stockwater Rights

The NDWR online water-rights database includes 26 records with the manner of use listed as "stockwater." Appendix 11-7 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley - Area 209), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as stream (1), spring (12), lake (5), and groundwater (8).

The eight groundwater rights have a status listed as certificated (3) and vested claim (5). Four of the vested groundwater claims (V-03154, V-03155, V-03160, and V-03161) are each for a duty of 11.88 afa. Review of these vested claims shows that they appear to be for the watering of the same 500 cattle and 30 horses, and therefore could be subject to a combined duty limitation. For this report, these four vested claims will be considered to have a combined duty limitation of 11.88 afa. The remaining vested claim (V-08964) is from a groundwater source that was constructed from 1989 to 1993. Per NRS 534.100, a vested right is a water right or underground water acquired prior to 1913 or 1939. Vested claim V-08964 is not included as a water right for this analysis because it does not appear to meet the statutory requirements for a vested groundwater right, and would likely be rejected in adjudication.

The three certificated rights' total is 12.34 afa and the four vested claims' total, taking into account the combined duty limitation of these water rights as explained in the previous paragraph, is 11.88 afa. The combined total of these underground stockwater rights is 24.22 afa. This is not consistent with the 60.52 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 11-3. This discrepancy may be due to the interpretation of the combined duty limitation of the four vested claims.

One of the groundwater rights (Permit No. 70509) has a priority date after October 17, 1989. The duty for this right is 2.24 afa.

11.2.1.5 Wildlife Rights

The NDWR online water-rights database includes 11 records with the manner of use listed as "wildlife." Appendix 11-8 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley-Area 209), manner of use (wildlife), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as spring (5), lake (3), and underground (3).

One of the groundwater rights is certificated and the other two are permitted. Based on review of the permit and certificate conditions, these rights do not appear to have a combined duty limitation with other groundwater rights. These rights do have a combined duty limitation with spring rights which are discussed later in this chapter. The combined total of these underground wildlife rights is 2,092.05 afa. This total is consistent with the 2,092.05 afa of underground wildlife rights listed in the NDWR HA Summary, Appendix 11-3. These underground rights do not have a priority date after October 17, 1989.

11.2.1.6 Other Rights

The NDWR online water-rights database includes two records with the manner of use listed as "other." Appendix 11-9 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley - Area 209), manner of use (other), and status (certificate, decreed, permit, reserved, vested). Both of these rights are listed with a source as spring.

None of the two "other" rights are from underground sources. The combined total of underground "other" rights is 0.00 afa. This total is consistent with the 0.00 afa of underground other rights listed in the NDWR HA Summary, Appendix 11-3.

11.2.1.7 Irrigation Rights

The NDWR online water-rights database includes 80 records with the manner of use listed as "irrigation." Appendix 11-10 is a copy of the hydrographic abstract queried by HA (Pahranagat Valley-Area 209), manner of use (irrigation, irrigation-Carey Act, irrigation-DLE, decreed), and status (certificate, decreed, permit, reserved, vested).

The sources for these rights are listed as "underground" (50), spring (25), stream (3), and lake (2). The 80 records include a combination of certificated (42), permitted (17), decreed (19), and vested claim (2) rights. Pahranagat Valley has decreed rights listed under the Pahranagat Lake Decree.

Fifty records are listed with a source as underground, and are a combination of certificated and permitted rights. The combined total for the permitted and certificated irrigation water rights, if all rights simply were added together without further analysis, is 8,876.31 afa. This total has not been adjusted for supplemental rights. The NDWR HA Summary, Appendix 11-3, lists the total for underground irrigation rights as 7,460.87 afa. The NDWR HA Summary states that this number has been supplementally adjusted.

Eighteen underground rights have a priority date after October 17, 1989. These rights have a total duty of 2,638.18 afa. Underground irrigation rights will be further analyzed in the following supplemental analysis.

11.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

The groundwater irrigation rights were reviewed to determine the quantity, if any, of groundwater irrigation rights that may be considered supplemental to other groundwater irrigation rights. Multiple groundwater rights from different PODs (wells) may have the same POU. In these instances, the limit for these rights would be based on the cumulative rights for each acre, as long as the cumulative rights do not exceed the maximum allowed irrigation duty. The maximum allowed irrigation duty is normally stated in the permit or certificate. Multiple groundwater rights can be considered supplemental to each other if they share the same POU.

The POUs for these rights were determined through review of certificates, permits, and their associated maps filed with the NDWR. The supplemental analysis was completed using POU spreadsheets, and also by mapping the water rights. Appendix 11-11 is a spreadsheet titled *Pahranagat Valley: Place of Use of Groundwater Irrigation Rights [Un-Sorted]*, and is organized numerically by application number. The spreadsheet includes the location of each irrigation groundwater right POU by 40-acre subdivision. This spreadsheet lists the application number, status, source, quarter-quarter, quarter, section, township, range, baseline meridian, and number of irrigated acres.

Appendix 11-12 is the resulting spreadsheet when the water rights listed in Appendix 11-11 are sorted by location. Appendix 11-12 is titled *Pahranagat Valley: Place of Use of Groundwater Irrigation Rights [Sorted]*. Sorting water rights using these criterion allows identification of any possible areas where the POUs overlap, indicating possible supplemental groundwater rights. Rights highlighted in yellow on Appendix 11-12 share a 40-acre subdivision POU and may possibly be supplemental.

Review of the sorted spreadsheet shows that groundwater irrigation rights are located in six township/ranges within Pahranagat Valley. Table 11-3 lists the township/range locations for the groundwater irrigation rights and the report appendix number for the mapped water rights within those locations. Figure 11-4 is a map showing the township/range locations of the groundwater irrigation rights in Pahranagat Valley.

Table 11-3
Township/Range of Groundwater Irrigation Rights
Within Pahranagat Valley and Associated Report Appendix Number

Township	Range	Appendix No.
3S	60E	11-13
3S	61E	11-13
4S	60E	11-14
5S	60E	11-15
6S	61E	11-16
7S	61E	11-17

Township and range in MDBM.

Sorting all irrigation rights by range, township, section, quarter, and quarter-quarter subdivision (aliquot-part analysis) resulted in the identification of any certificated or permitted rights that are appurtenant to the same 40-acre subdivision location. If multiple rights did not have a POU within the same 40-acre subdivision, then it was concluded that these rights were not supplemental to each other. If it was determined that multiple rights were located within the same 40-acre subdivision, then a further analysis was conducted. This further analysis included a review of permit terms, certificate terms, POU maps, and PBU use maps to determine if the water rights are non-supplemental or supplemental to each other. The highlighted rights on Appendix 11-12 are the rights that could possibly be supplemental to each other and were the rights subjected to this further analysis.

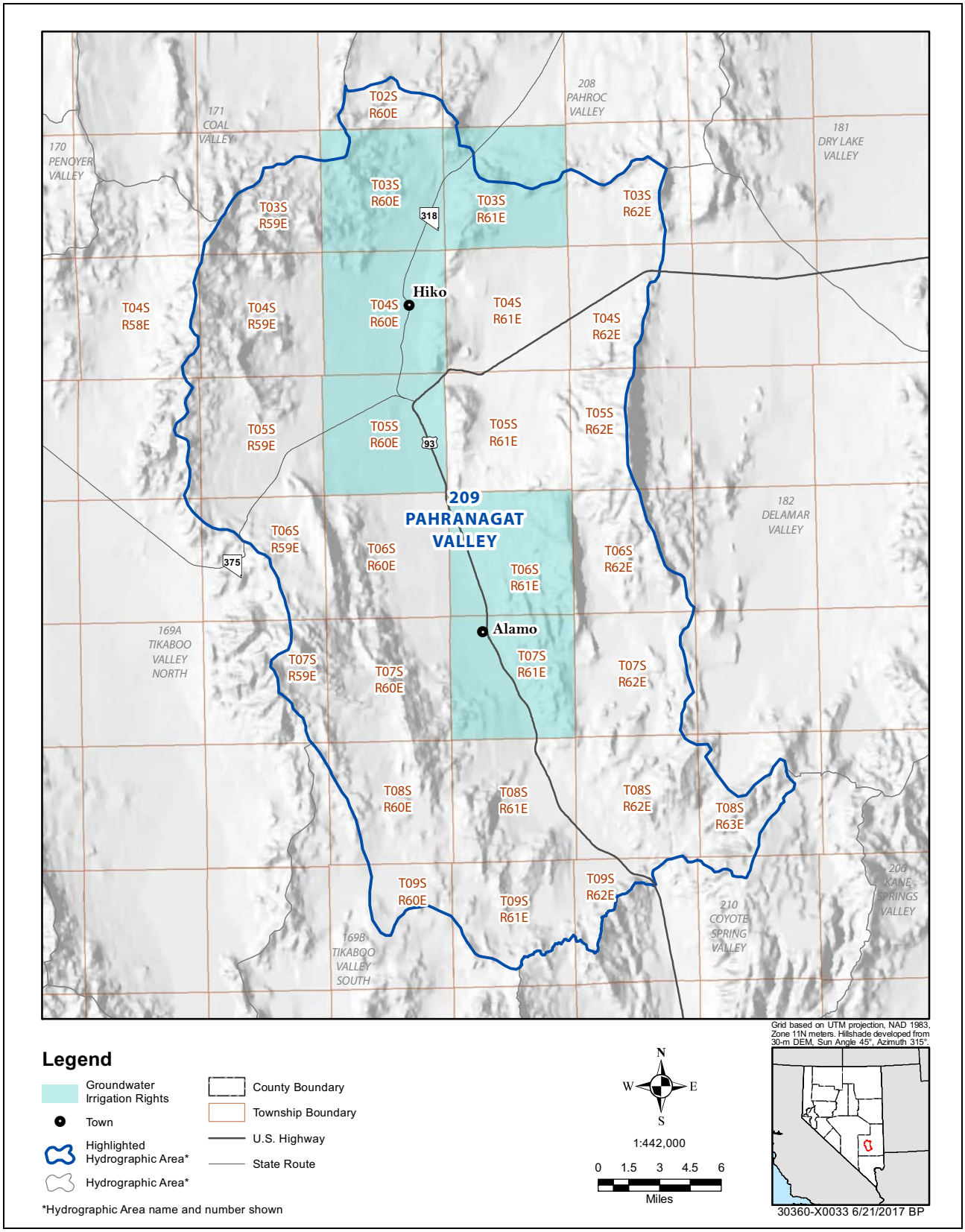

Figure 11-4
Township/Range of Groundwater Irrigation Rights Within Pahranagat Valley

All certificated rights were mapped based on their irrigation locations as depicted in the PBU maps. These maps are included in Appendix 11-13 through Appendix 11-17. Review of these compiled maps showed whether certificated rights located within the same subdivision were in fact supplemental to each other.

A permitted right was not considered supplemental if the POU was not listed in the same 40-acre subdivision as any other groundwater right. The proposed POU (acres) of a permitted water right can exceed the maximum permitted irrigated acreage. This is because the water right owner may not know the specific locations where the irrigation will be applied at the time of filing the application and the proposed POU map. The actual acreage and location of irrigation is not quantified until the PBU for the permitted water rights is prepared and filed with the NDWR. If a permitted right could be placed where it would not be considered supplemental to an existing right, then this right was not considered supplemental for this analysis. Since non-supplemental water rights are not subjected to further reduction based on the supplemental analysis, this assumption likely overestimates the amount of committed groundwater irrigation rights. The permitted groundwater rights were mapped based on the proposed POU maps that accompany the applications as shown in Appendix 11-13 through Appendix 11-17.

Appendix 11-18 is a list of the 50 certificated and permitted irrigation groundwater rights within Pahranagat Valley, and shows the supplemental analysis of those rights. The table includes the application number, supplemental analysis notes, and non-supplemental portion of the 50 rights. Additionally, these rights are split between rights with priority dates prior to, or on October 17, 1989 and after October 17, 1989. Based on the analysis of the POU of the certificated and permitted groundwater irrigation rights in Pahranagat Valley, it was determined that there are approximately 7,460.87 afa of non-supplemental groundwater irrigation rights. Of these rights, 2,501.80 afa have a priority date after October 17, 1989, and 4,959.07 afa have a priority date prior to or on October 17, 1989. The total from this analysis for these underground irrigation rights is 7,460.87 afa. This total is consistent with the 7,460.87 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 11-3.

Table 11-4 lists the total amount of non-supplemental irrigation groundwater rights, per individual duty, based on the analysis completed in the preceding sections.These rights are listed by individual duty because these duties will be used for an additional consumptive use analysis to be completed in subsequent sections of this report. These rights are listed with the priority date prior to, or on October 17, 1989, and after October 17, 1989.

11.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 11-3, lists the total amount of supplementally adjusted groundwater rights for commercial, municipal/quasi-municipal, stockwater, wildlife, and irrigation uses as 10,743.76 afa. Table 11-5 summarizes the volume of existing groundwater rights, supplementally adjusted by each manner of use, based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to or on October 17, 1989, and rights with priority dates after October 17, 1989, as well the total of both. This information is based on the NDWR HA Summary and the analysis completed in Section 11.2 and Section 11.3 of this report.

Table 11-4
Non-supplemental Groundwater Irrigation Rights in Pahranagat Valley

	Total		With Priority Dates After October 17, 1989		With Priority Dates Prior to, or on October 17, 1989	
Duty (af/acre)	**Total (acre)**	**Total (afa)**	**Acre**	**afa**	**Acre**	**afa**
2.30	29.00	66.83	0.00	0.00	29.00	66.83
4.00	129.72	518.88	0.00	0.00	129.72	518.88
5.00	1,374.63	6,875.16	500.36	2,501.80	874.27	4,373.36
Total	1,533.35	7,460.87	500.36	2,501.80	1,032.99	4,959.07

Note: Calculation for duty based on certificate and permit verbiage. For calculation table, Acre x Duty might not equal total afa exactly due to rounding to nearest hundredth.

Table 11-5
Pahranagat Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Commercial	39.19	39.19	26.19	13.00
Domestic	0.00	0.00	0.00	0.00
Municipal/ Quasi- Municipal	1,091.14	1,091.14	434.73	656.41
Stockwater	60.52	24.22	2.24	21.98
Wildlife	2,092.05	2,092.05	0.00	2,092.05
Other	0.00	0.00	0.00	0.00
Irrigation	7,460.87	7,460.87	2,501.80	4,959.07
Total	10,743.76	10,707.47	2,964.96	**7,742.51**

11.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered to be groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 11-5 shows the location of rights with a source listed as spring, stream (sourced from a spring), and lake (sourced from a spring), and with a POD located within the groundwater discharge areas. PODs within groundwater discharge areas are identified as blue dots.

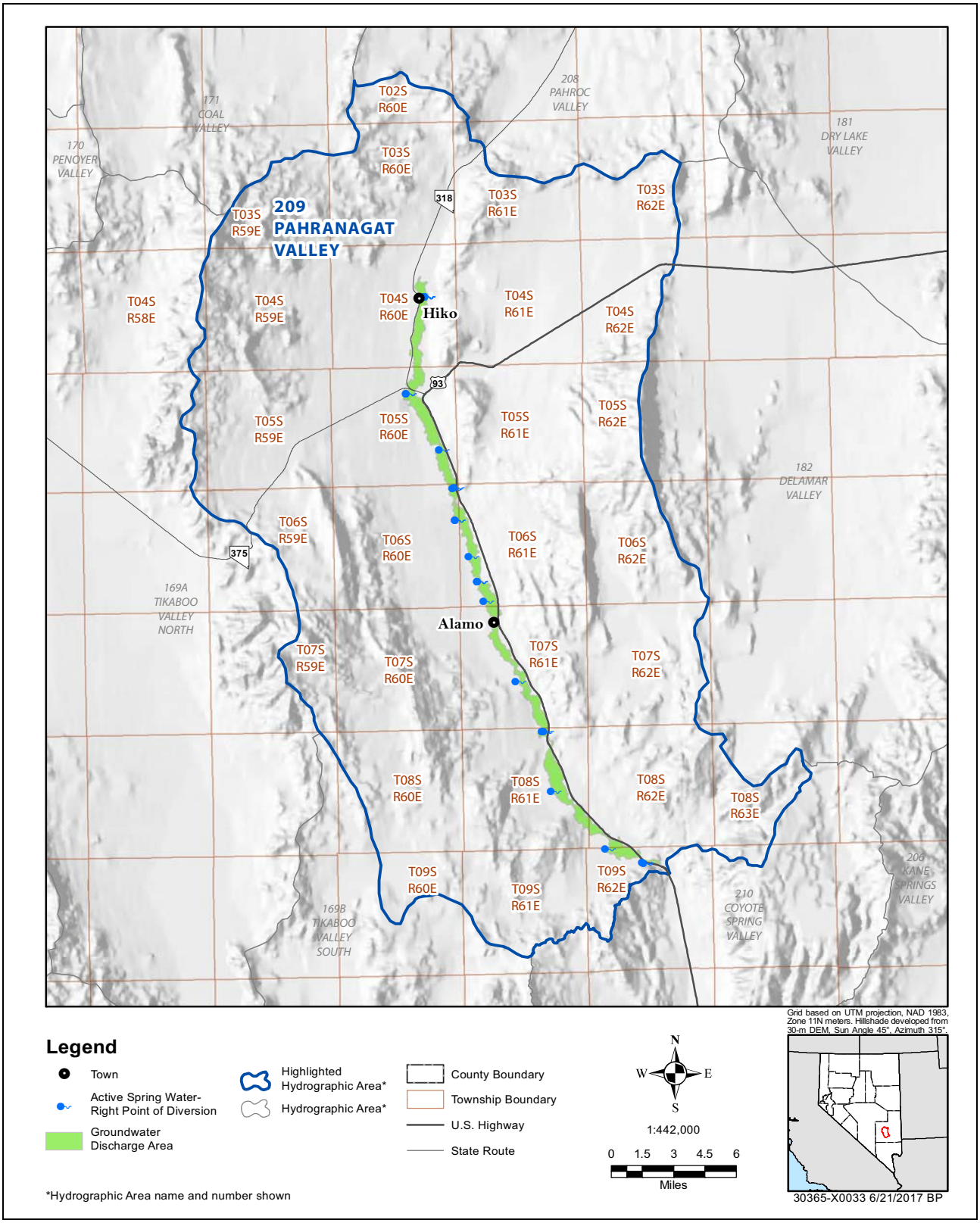

Figure 11-5
Groundwater Discharge Areas and Corresponding Spring Rights Within Pahranagat Valley

The groundwater discharge areas are identified as green-filled polygons. Spring, stream (sourced from a spring), and lake (sourced from a spring) rights located within the groundwater discharge areas will be considered groundwater resources for this analysis. The following sections include a review of the spring rights in the groundwater discharge area within Pahranagat Valley per each manner of use.

11.5.1 Commercial

Review of Appendix 11-4 shows that no commercial rights are from any sources listed as springs, streams, or lake.

11.5.2 Domestic

Review of Appendix 11-5 shows that no domestic rights are from any sources listed as springs, streams, or lake.

11.5.3 Municipal/Quasi-Municipal

Review of Appendix 11-6 shows three quasi-municipal rights with a source listed as spring. All three of these rights are from Ash Springs, which is within the groundwater discharge areas of Pahranagat Valley. These rights total 14.18 afa and for this analysis, these rights will be accounted for as groundwater commitments.

Table 11-6 lists the three quasi-municipal spring rights, the total duty, and the duty for rights with a priority date prior to or on, and after October 17, 1989. The total for spring quasi-municipal rights to be considered as groundwater for this analysis, with a priority date prior to or on October 17, 1989, is 14.18 afa.

Table 11-6
Pahranagat Valley Quasi-Municipal Spring Rights
Within Groundwater Discharge Area

Application No.	Status	Duty (afa)	With Priority Dates After October 17, 1989 (afa)	With Priority Dates Prior to, or on October 17, 1989 (afa)
23730A01	CER	8.20	0.00	8.20
23730A02	CER	2.98	0.00	2.98
45452	CER	3.00	0.00	3.00
Total		14.18	0.00	**14.18**

CER = Certificated.

11.5.4 Stockwater

Review of Appendix 11-7 shows 18 stockwater rights with a source listed as spring, stream, or lake. Five of these rights are located within the groundwater discharge areas of Pahranagat Valley. These

five rights are all vested claims for stockwater rights and were filed by a single entity. These vested claims are V-03156, V-03157, V-03158, V-03159, and V-03162. Each of these rights is for 500 cattle and 30 horses. These rights are similar (same owner, same number of stock, filed same day) to the four groundwater vested claims that were already quantified in Section 11.2.1.4 of this chapter. Therefore, these spring stockwater rights that could be attributed to groundwater commitments within Pahranagat Valley will be considered supplemental to the groundwater commitments listed as V-03154, V-03155, V- 03160, and V-03161.

11.5.5 Wildlife

Review of Appendix 11-8 shows eight wildlife rights with a source listed as spring, stream, or lake. All of these rights are permitted and are located within the groundwater discharge areas of Pahranagat Valley. For this analysis, these rights will be accounted for as groundwater commitments. Permit Nos. 62434 through 62438 have a combined duty limitation associated with groundwater permit Nos. 62439 and 62440, and therefore the duty of these spring rights has been reduced to reflect the combined duty restrictions. Wildlife rights may not be fully consumptive based on actual use of the water. For the purpose of this analysis, it is assumed that this right is fully consumptive, although this most likely overstates the allocation.

Table 11-7 lists the eight wildlife spring rights, the total duty, and the duty for rights with a priority date prior to or on, and after October 17, 1989. The total for spring wildlife rights to be considered as groundwater for this analysis, with a priority date prior to or on October 17, 1989, is 3,817.67 afa.

Table 11-7
Pahranagat Valley Wildlife Spring Rights
Within Groundwater Discharge Areas

Application No.	Status	Total (afa)	With Priority Dates After October 17, 1989 (afa)	With Priority Dates Prior to, or on October 17, 1989 (afa)
62431	PER	543.00	543.00	0.00
62432	PER	144.80	144.80	0.00
62433	PER	144.80	144.80	0.00
62434	PER	3,817.67	0.00	3,817.67
62435	PER			
62436	PER			
62437	PER			
62438	PER			
Total		4,650.27	832.60	**3,817.67**

PER = Permit.

11.5.6 "Other" Rights

Review of Appendix 11-9 shows two "other" rights with a source listed as spring. Both of these reserved rights are located within the groundwater discharge area of Pahranagat Valley. For this analysis, these rights will be accounted for as groundwater commitments.

Table 11-8 lists the two "other" spring rights, the total duty, and the duty for rights with a priority date prior to or on, and after October 17, 1989. The total for spring "other" rights to be considered groundwater for this analysis, with a priority date prior to, or on October 17, 1989, is 3.59 afa.

Table 11-8
Pahranagat Valley "Other" Spring Rights
Within Groundwater Discharge Area

Application No.	Status	Total (afa)	With Priority Dates After October 17, 1989 (afa)	With Priority Dates Prior to, or on October 17, 1989 (afa)
R05992	RES	1.35	0.00	1.35
R05993	RES	2.24	0.00	2.24
Total		3.59	0.00	**3.59**

RES = Reserved.

11.5.7 Irrigation

Review of Appendix 11-10 shows 30 irrigation rights with a source listed as stream (3), spring (25), and lake (2). All of these rights are located within the groundwater discharge areas of Pahranagat Valley. For this analysis, these rights will be accounted for as groundwater commitments. The irrigation rights on a spring source located within the groundwater discharge area will be analyzed to supplementally adjust these irrigation spring rights to other irrigation springs rights. Further analysis will be completed to supplementally adjust groundwater irrigation rights to spring irrigation rights. The methodology was previously used to analyze groundwater supplemental to groundwater in Section 11.3.

The list of these 30 irrigation spring rights were input into a spreadsheet with their POUs listed per quarter-quarter subdivision. This is included as Appendix 11-19 in a spreadsheet titled *Pahranagat Valley Place of Use of Spring Irrigation Rights [Un-Sorted]*. This spreadsheet was sorted in descending order by range, township, section, quarter, and quarter-quarter subdivision to identify any possible areas of overlapping POUs of spring irrigation rights to other spring irrigation rights. Appendix 11-20 is the resulting sorted spreadsheet titled *Pahranagat Valley: Place of Use of Spring Irrigation Rights [Sorted]*. The highlighted rights on Appendix 11-20 are the rights that could possibly be supplemental to each other, and were rights subjected to further mapping analysis.

Review of Appendix 11-20 showed that spring irrigation rights considered to be groundwater are located in seven township/ranges within Pahranagat Valley. Table 11-9 lists the township/range locations of the spring irrigation rights considered to be groundwater and the report appendix number

Table 11-9
Township/Range of Spring Irrigation Rights
Within Pahranagat Valley and Associated Report Appendix Number

Township	Range	Appendix No.
4S	60E	11-21
5S	60E	11-22
6S	60E	11-23
6S	61E	11-24
7S	61E	11-25
8S	61E	11-26
8S	62E	11-27

Township and range in MDBM.

for the mapped water rights within those locations. Figure 11-6 is a map showing the township/range locations of the spring irrigation rights considered to be groundwater in Pahranagat Valley.

The mapped POUs of the spring irrigation rights within Pahranagat Valley were reviewed to determine if any would be considered supplemental to other spring rights. This review was completed similar to the groundwater supplemental to groundwater analysis outlined in Section 11.3.

Appendix 11-28 includes a list of all the spring irrigation rights and notes regarding the determination whether that they are supplemental to other spring irrigation rights. The majority of the rights listed in Appendix 11-28 are decreed rights from the Pahranagat Lake Decree. Table 11-10 is a summary of the non-supplemental portion of the spring irrigation rights, with those rights listed according to their duty. Table 11-10 also lists these rights with a priority date prior to or on, and after October 17, 1989.

Table 11-10
Spring Irrigation Rights per duty Within Pahranagat Valley, Supplementally Adjusted to Other Spring Irrigation Rights

				Priority Date After October 17, 1989			Priority Date Prior to, or on October 17, 1989		
Duty (af/acre)	Acre	Duty (af/acre)	afa	Acre	Duty (af/acre)	afa	Acre	Duty (af/acre)	afa
2.00	1,184.23	2.00	2,368.46	0.00	0.00	0.00	1,184.23	2.00	2,368.46
3.03	10.50	3.03	31.82	0.00	0.00	0.00	10.50	3.03	31.82
3.71	41.20	3.71	152.80	0.00	0.00	0.00	41.20	3.71	152.80
4.00	3,282.96	4.00	13,131.84	0.00	0.00	0.00	3,282.96	4.00	13,131.84
4.80	4.65	4.80	22.32	0.00	0.00	0.00	4.65	4.80	22.32
Total	4,523.54		15,707.24	0.00		0.00	4,523.54		15,707.24

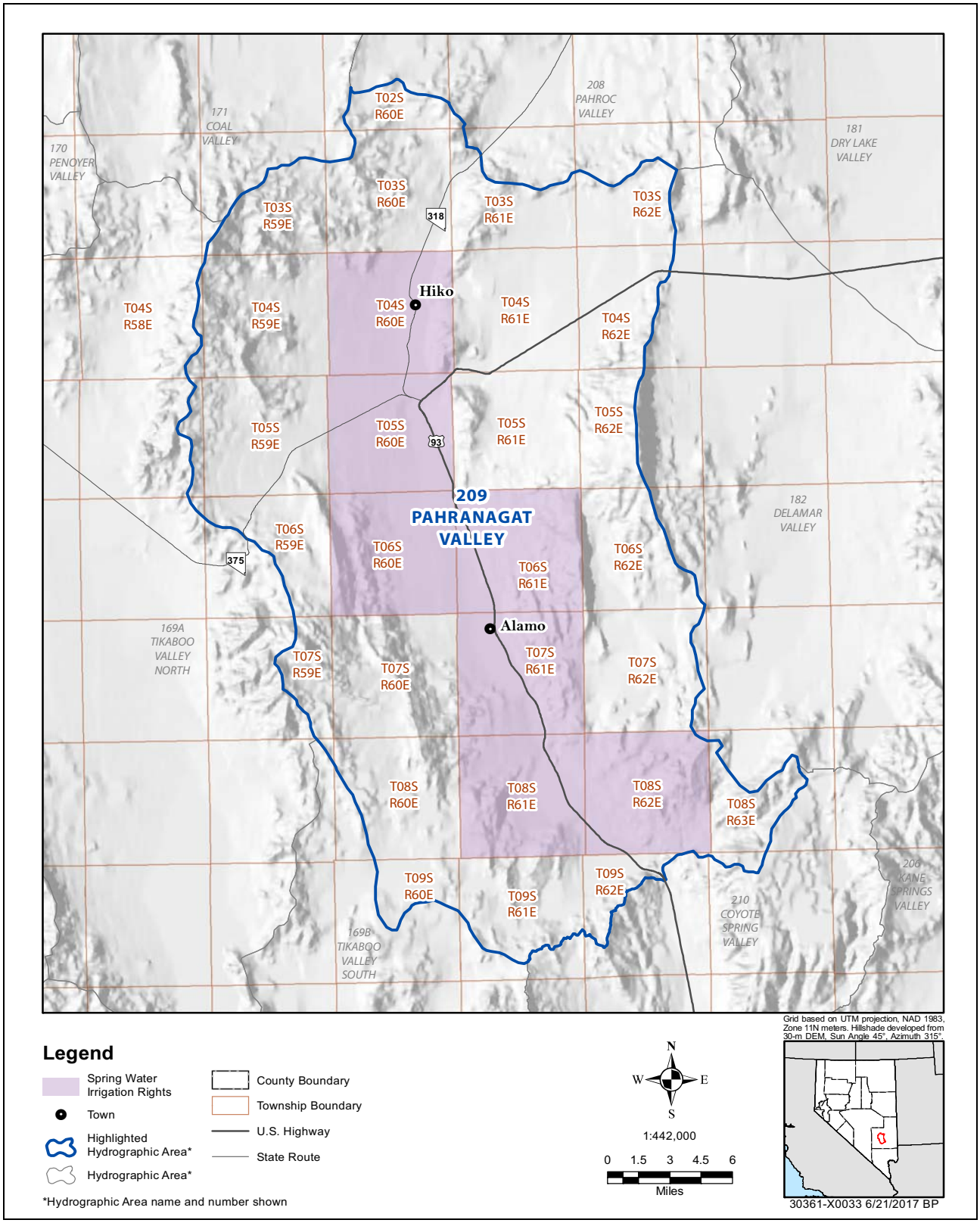

Figure 11-6
Township/Range of Spring Irrigation Rights Within Pahranagat Valley

11.5.8 Spring Summary

Table 11-11 is a summary of the preceding analysis of spring rights considered to be groundwater within Pahranagat Valley, listed for each manner of use. The totals for the report's current analysis is divided into rights with priority dates prior to or on, and after October 17, 1989, as well the total of both. Table 11-11 does not contain a column presenting the NDWR totals for spring rights considered to be groundwater because NDWR does not publish such data.

Table 11-11
Pahranagat Valley Spring Rights within Groundwater Discharge Area Summary

	Current Analysis (afa)		
Manner of Use	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Commercial	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Municipal/ Quasi-Municipal	14.18	0.00	14.18
Stockwater	0.00	0.00	0.00
Wildlife	4,650.27	832.60	3,817.67
Other	3.59	0.00	3.59
Irrigation	15,707.24	0.00	15,707.24
Total	20,375.28	832.60	**19,542.68**

11.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 11.5.7 determined the quantity of spring irrigation rights supplementally adjusted to other spring irrigation rights. The results of that analysis showing the non-supplemental portion were presented per duty in Table 11-10. In addition to determining whether spring irrigation rights were supplemental to other spring irrigation rights, it also must be determined whether any groundwater irrigation rights are supplemental to spring irrigation rights that are considered groundwater in this analysis. Groundwater rights would be considered supplemental to spring irrigation rights if they are appurtenant to the same POU. Spring irrigation water right priority dates are prior to groundwater right priority dates in almost all locations. Due to their junior status, for this analysis, groundwater is treated as being supplemental to spring water rights if their POU is in the same location. Figure 11-4 showed the location of groundwater irrigation rights within Pahranagat Valley. Figure 11-6 showed the location of spring irrigation rights considered to be groundwater within Pahranagat Valley.

Figure 11-7 is a map showing the township/range locations where there are both spring irrigation rights and groundwater irrigation rights. There are four township/range locations where there are both spring irrigation rights and groundwater irrigation rights within the same township/range.

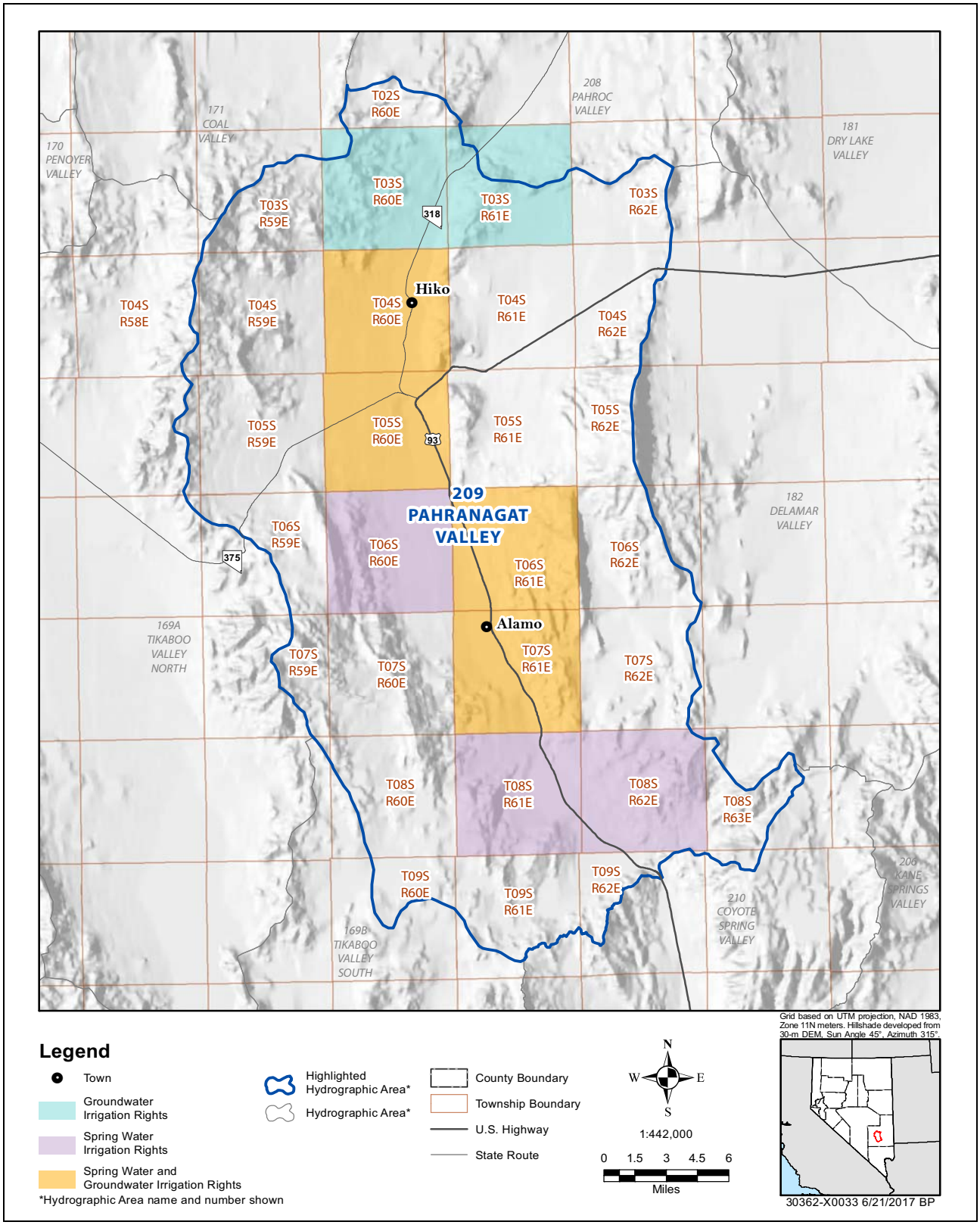

Figure 11-7
Township/Range of Locations where there are Spring Irrigation Rights and Groundwater Irrigation Rights Within Pahranagat Valley

Table 11-12 lists the four township/range locations where spring irrigation rights and groundwater irrigation rights are both located, and the report appendix numbers for the mapped water rights within those locations.

Table 11-12
Township/Range of Spring Irrigation Rights and Groundwater Irrigation Rights Within Pahranagat Valley and Associated Report Appendix Number

Township	Range	GW only Map Appendix No.	Spring only Map Appendix No.	Spring & GW Map Appendix No.
4 S	60 E	11-14	11-21	11-29
5 S	60 E	11-15	11-22	11-30
6 S	61 E	11-16	11-24	11-31
7 S	61 E	11-17	11-25	11-32

Township and range in MDBM.
GW = Groundwater.

Appendix 11-11 (groundwater POUs) and Appendix 11-19 (Spring POUs) were combined and then sorted in descending order by range, township, section, quarter, and quarter-quarter subdivision to identify any possible areas of overlapping POUs of groundwater irrigation rights to spring irrigation rights. Appendix 11-33, is the sorted combined list titled *Pahranagat Valley: Place of Use of Spring and Groundwater Irrigation Rights [Sorted]*. Locations where groundwater irrigation rights could potentially be supplemental to spring irrigation rights were highlighted for further mapping review.

Previously, both groundwater irrigation rights and spring irrigation rights were mapped. Table 11-12 lists the report appendix numbers for these maps. Additionally, the groundwater irrigation maps and spring irrigation maps were combined into a single map per township/range that shows the locations of the spring irrigation rights, groundwater irrigation rights, and areas where groundwater irrigation rights are supplemental to spring irrigation rights.

The spring and groundwater irrigation rights spreadsheet and maps were reviewed to determine which groundwater irrigation rights are supplemental to spring irrigation rights within Pahranagat Valley. It was estimated, based on the supplemental analysis completed, that 6,573.94 afa of groundwater irrigation rights were not supplemental to spring rights, and that the remaining 886.93 afa were supplemental to spring irrigation rights. Appendix 11-34 includes a list of all the groundwater irrigation rights and notes regarding the supplemental analysis to spring irrigation rights. Table 11-13 lists the summary of the total amount of non-supplemental groundwater irrigation rights after the spring irrigation rights supplemental analysis was performed. Table 11-13 also lists the non-supplemental totals with a priority date prior to or on, and after October 17, 1989.

Table 11-13
Non-supplemental Groundwater Irrigation Rights (Supplementally adjusted to Spring Irrigation Rights) per duty Within Pahranagat Valley

	Total		With Priority Dates After October 17, 1989		With Priority Dates Prior to, or on October 17, 1989	
Duty (af/acre)	**Acre**	**afa**	**Acre**	**afa**	**Acre**	**afa**
1.00 (GW)	230.54	230.54	3.67	3.67	226.87	226.87
2.32 (GW)	14.04	32.57	0.00	0.00	14.04	32.57
3.79 (GW)	2.15	8.15	0.00	0.00	2.15	8.15
4.0 (GW)	129.72	518.88	0.00	0.00	129.72	518.88
5.0 (GW)	1,156.90	5,783.80	496.69	2,482.45	660.21	3,301.35
Total	1,533.35	6,573.94	500.36	2,486.12	1,032.99	**4,087.82**

GW = Groundwater.

11.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

This section is not applicable for Pahranagat Valley because no groundwater irrigation rights were identified supplemental to surface water irrigation rights. All irrigation spring rights were considered groundwater commitments for this analysis.

11.8 Estimated Crop Consumptive Use for Pahranagat Valley

Consumptive use of a crop is defined as that portion of the annual volume of water diverted under a water right that is transpired by growing vegetation, evaporated from soils, converted to nonrecoverable water vapor, incorporated into product, or that otherwise does not return to the water source. The consumptive use of a crop is equal to the crop ET less the precipitation amount that is used by ET by the crop. In other words, it is the amount of irrigation water that is consumed in the growing of the crop.

The NIWR is equal to the ET actual minus the precipitation and is the consumptive use portion of the irrigation water rights. When calculating total groundwater commitments in Pahranagat Valley, the nonconsumptive use portion of the water right is not included because it is returned to the water source and available for reuse.

The NDWR has established ET data per basin within Nevada. Pahranagat Valley is listed as having an ET actual for alfalfa of 4.80 ft and NIWR of 4.40 ft. Appendix 11-35 lists the various ET and NIWR rates for crops grown in Pahranagat Valley. Based on this data, the consumptive use portion for irrigation water rights in Pahranagat Valley is 4.4 ft.

Table 11-14 lists the total number of acres in Pahranagat Valley with appurtenant permitted and certificated irrigation spring and irrigation groundwater rights, the corresponding calculated consumptive use ratios, and the total consumptive use portion of the irrigation spring and irrigation groundwater rights. Table 11-14 only includes non-supplemental groundwater and spring irrigation rights as a surface water supplemental analysis reduction was not required because there was no surface water irrigation identified within Pahranagat Valley. The nonconsumptive portion of these rights is the duty greater than 4.40 afa per acre for each right. The consumptive use rate is equal to the consumptive use (4.4 afa) divided by the duty of the right. If the duty was less than the consumptive use, then the consumptive use rate was 100 percent. Table 11-14 shows that if the entire 22,281.18 afa of groundwater irrigation rights within Pahranagat Valley were used in a single season, only 19,260.99 afa would be consumed, and the remainder would be returned to the groundwater system. Therefore only the consumptive use portion (19,260.99 afa) will be carried through in this analysis as a committed groundwater resource.

Table 11-14
Consumptive Use with Varying Duties of Irrigation Groundwater/Spring Rights within Pahranagat Valley

Duty (af/acre)	Total (acre)	Total (afa)	Consumptive Use Rate (%)	With Priority Dates After October 17, 1989 (afa)	With Priority Dates Prior to, or on October 17, 1989 (afa)
1.00 (GW)	230.54	230.54	40	1.07	90.75
2.00 (Spring)	1,184.23	2,368.46	100	0.00	2,368.46
2.32 (GW)	14.04	32.57	100	14.04	32.57
3.03 (Spring)	10.50	31.82	100	0.00	31.82
3.71 (Spring)	41.20	152.80	100	0.00	152.80
3.79 (GW)	2.15	8.15	100	0.00	8.15
4.0 (GW)	129.72	518.88	100	0.00	518.88
4.0 (Spring)	3,282.96	13,131.84	100	0.00	13,131.84
4.8 (Spring)	4.65	22.32	92	0.00	20.53
5.0 (GW)	1,156.90	5,783.80	88	2,184.56	2,905.19
Total	6,056.89	22,281.18	-	2,199.67	**19,260.99**

GW = Groundwater.

11.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as

an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water back to the groundwater system from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Pahranagat Valley.

Because this information does not exist, an alternative approach was used for this analysis, and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR and that are located within Pahranagat Valley. The list includes a total of 269 records and is included as Appendix 11-36. Each well log filed with the NDWR lists a proposed use of the drilled well. There are 133 records that list a proposed use as domestic use (domestic use is signified with an "H" in the proposed use column). Of the listed domestic wells, 48 were installed prior to October 17, 1989, and 85 domestic wells were installed after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that if each of these wells corresponded to a domestic-well user, each well is using 2.00 afa, that all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the 133 domestic wells identified, it is estimated that 266.00 afa would be pumped from the groundwater system through domestic wells, and all of this water would be consumptively used.

Therefore, 266.00 afa is allocated for domestic groundwater commitments within Pahranagat Valley. Although the majority of domestic wells were installed after October 17, 1989, this analysis will account for these wells as groundwater commitments with priority dates prior to October 17, 1989.

11.10 Summary

The total committed groundwater rights for Pahranagat Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 11-15 presents the summary information derived by this analysis of groundwater rights within Pahranagat Valley. Table 11-15 contains all active groundwater rights, as well as spring rights with PODs within the groundwater discharge area.

The total amount of committed groundwater rights for Pahranagat Valley, after supplemental and consumptive use adjustments are made, is estimated to be 29,641.30 afa. The committed groundwater rights for Pahranagat Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 3,495.43 afa. The committed groundwater rights for Pahranagat Valley, with priority dates prior to or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 26,145.87 afa.

Table 11-15
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	266.00	N/A	266.00	0.00	N/A	0.00	266.00	N/A	266.00
Irrigation (GW and Spring)	22,281.18	N/A	21,460.66	2,486.12	N/A	2,199.67	19,795.06	N/A	19,260.99
Commercial (GW)	39.19	N/A	39.19	26.19	N/A	26.19	13.00	N/A	13.00
Municipal/ Quasi-Municipal (GW)	1,091.14	N/A	1,091.14	434.73	N/A	434.73	656.41	N/A	656.41
Municipal/ Quasi-Municipal (Spring)	14.18	N/A	14.18	0.00	N/A	0.00	14.18	N/A	14.18
Stockwater (GW)	24.22	N/A	24.22	2.24	N/A	2.24	21.98	N/A	21.98
Wildlife (GW)	2,092.05	N/A	2,092.05	0.00	N/A	0.00	2,092.05	N/A	2,092.05
Wildlife (Spring)	4,650.27	N/A	4,650.27	832.60	N/A	832.60	3,817.67	N/A	3,817.67
Other (Spring)	3.59	N/A	3.59	0.00	N/A	0.00	3.59	N/A	3.59
Total	30,461.82	N/A	29,641.30	3,781.88	N/A	3,495.43	26,679.94	N/A	**26,145.87**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

12.0 DELAMAR VALLEY

12.1 Introduction

NDWR HA 182, Delamar Valley, is located in the south-eastern portion of the State of Nevada, within the WRFS and the Central Hydrographic Region. Figure 12-1 is a map of the location of Delamar Valley.

The total committed groundwater rights for Delamar Valley were previously analyzed and included in the report *Committed Groundwater Resources in Four Nevada Hydrographic Areas: Cave Valley, Dry Lake Valley, Delamar Valley, and Spring Valley,* (Stanka, 2011). Section 4.9 of the 2011 Report concluded that the total committed groundwater rights for Delamar Valley with priority dates prior to October 17, 1989, was 8.27 afa, and 0.00 afa with priority dates after October 17, 1989, for a total of 8.27 afa.

This chapter is intended to update, amend, and supplement the 2011 Report by identifying changes that have occurred within Delamar Valley since the 2011 Report. These changes were identified through a review and comparison of the NDWR hydrographic abstract Searches and NDWR HA Summary Reports from the 2011 Report versus the NDWR hydrographic abstract searches and NDWR HA Summary Reports as of April 7, 2017. Any changes are identified in the corresponding sections. If no changes were identified, then the conclusions from the 2011 Report were confirmed in this chapter. In addition to updating information, some changes were made to the methodology from the 2011 Report. These methodology changes include the following:

- Identification of springs within groundwater discharge areas to be accounted as groundwater resources.
- Revised domestic well identification analysis, inclusion of the additional groundwater rights reserved for future growth within Delamar Valley as identified in NSE Ruling No. 6167.
- A revised summary section.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 12-2 shows the townships and ranges (MDBM) located within Delamar Valley.

12.2 Summary of Water Rights in Delamar Valley

Active water rights within Delamar Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

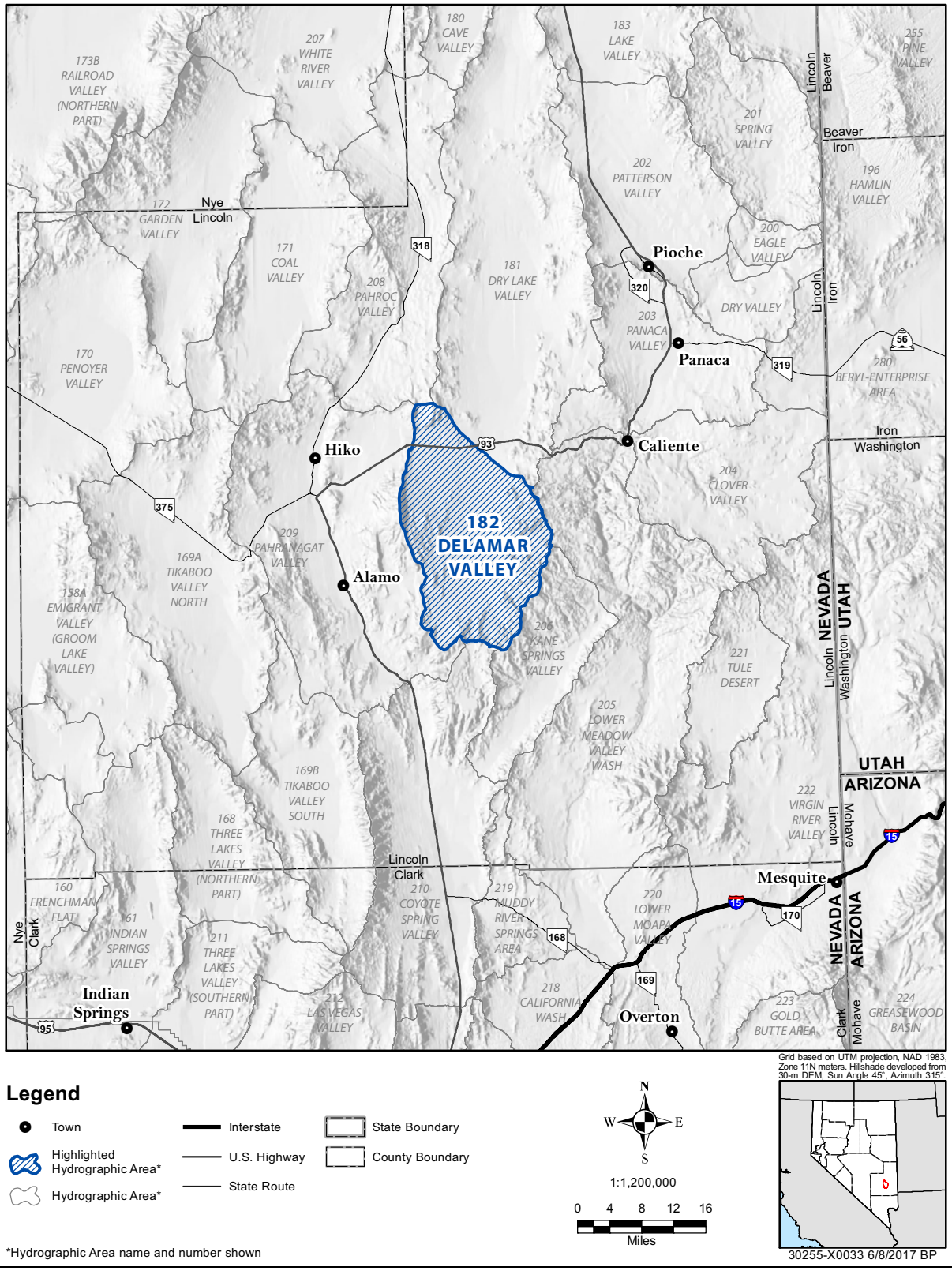

Figure 12-1
Delamar Valley Hydrographic Area

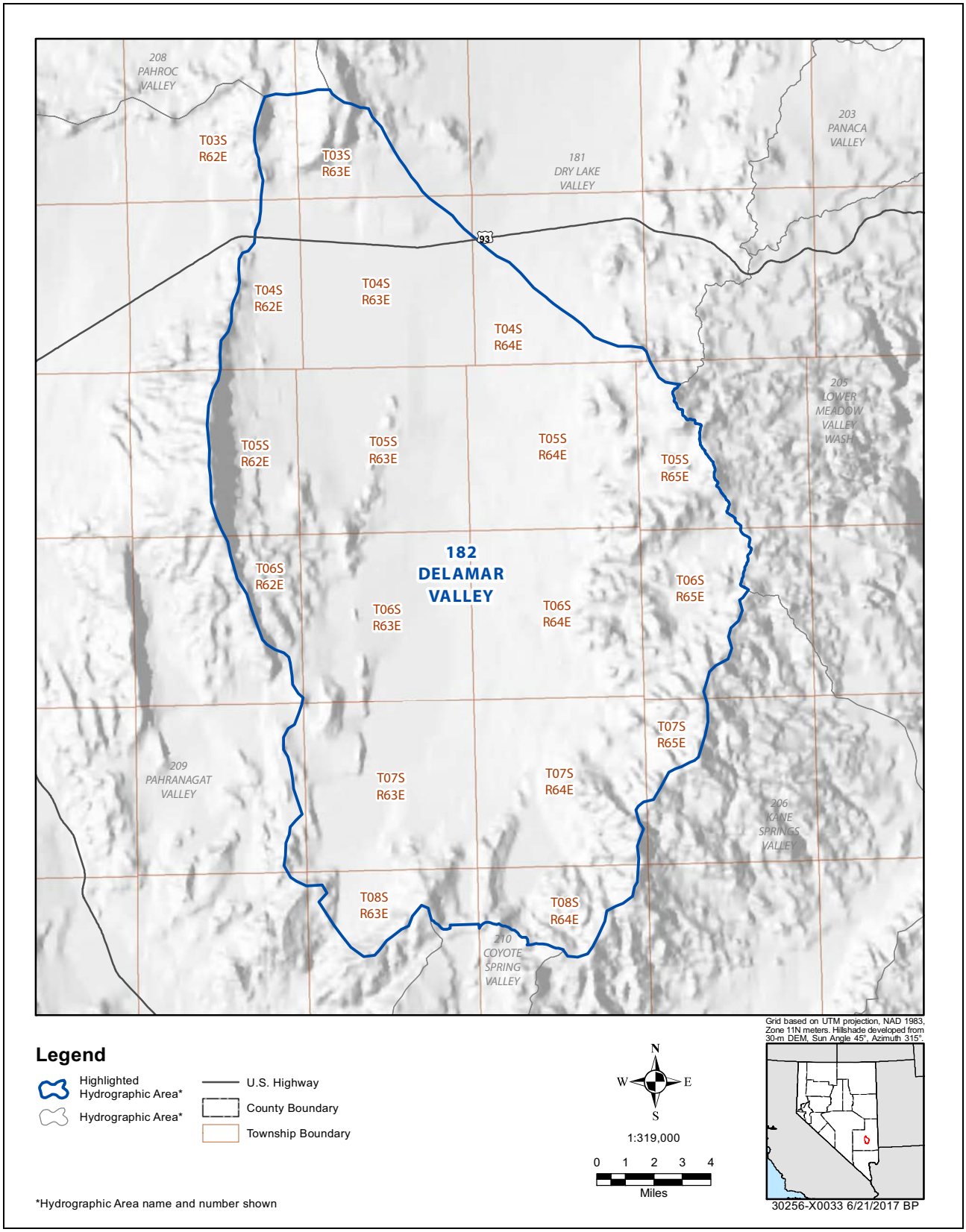

Figure 12-2
Township/Range within Delamar Valley

The NDWR hydrographic abstract, queried for all active records within Delamar Valley, is included as Appendix 12-1. This abstract does not include applications with a status of RFA, RFP, or APP, as these are not active water rights. There are currently 64 active water rights that are listed as vested, certificated, permitted, and reserved water rights. Appendix 12-2 lists all the active water rights in Delamar Valley and contains records that have priority dates before, on, and after October 17,1989.

The manners of use for these water rights include stockwater, domestic, mining and milling, other, municipal/quasi-municipal, and irrigation. Table 12-1 lists the number of records within Delamar Valley in the NDWR online water-rights database per manner of use and their current status.

Table 12-1
Number of Active Records Listed per Manner of Use and Status in Delamar Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted	Reserved
Stockwater	57	17	40	0	0
Domestic	1	0	0	1	0
Mining and Milling	1	0	1	0	0
Other	2	0	0	0	2
Municipal/ Quasi-Municipal	2	0	0	2	0
Irrigation	1	0	1	0	0
Total	64	17	42	3	2

The sources of water for the 64 active water rights include other surface water, reservoir (surface water), spring, and underground. Table 12-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 12-2
Number of Active Records Listed per Manner of Use and Source in Delamar Valley

Manner of Use	Number of Records	Stream	Other Surface Water	Reservoir Surface Water	Spring	Underground
Stockwater	57	0	4	10	42	1
Domestic	1	0	0	0	1	0
Mining and Milling	1	0	0	0	1	0
Other	2	0	0	0	2	0
Municipal/ Quasi-Municipal	2	0	0	0	0	2
Irrigation	1	0	0	0	1	0
Total	64	0	4	10	47	3

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 12-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Delamar Valley.

12.2.1 Stockwater Rights

The NDWR online water-rights database includes 57 active records with the manner of use listed as "stockwater." Appendix 12-3 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as other surface water (4), reservoir (10), spring (42), and groundwater (1).

The single groundwater right is certificated. Based on review of the permit and certificate conditions, no combined duty terms were identified. This single stockwater right is 7.24 afa. This is consistent with the 7.24 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 12-4.

The single groundwater right (Permit No. 51261) has a priority date prior to October 17, 1989, and a duty of 7.24 afa. Appendix 12-2 lists all the active water rights in Delamar Valley and identifies any records that have priority dates before, on, or after October 17, 1989.

12.2.2 Domestic Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "domestic." Appendix 12-5 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (domestic), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring.

This single domestic right is not from an underground source. The total duty from this analysis for underground domestic rights is 0.00 afa. This total is consistent with the 0.00 afa of underground domestic rights listed in the NDWR HA Summary, Appendix 12-4.

12.2.3 Mining and Milling Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "mining and milling." Appendix 12-6 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (mining and milling), and status (certificate, decreed, permit, reserved, vested). The source for this right is listed as spring (1).

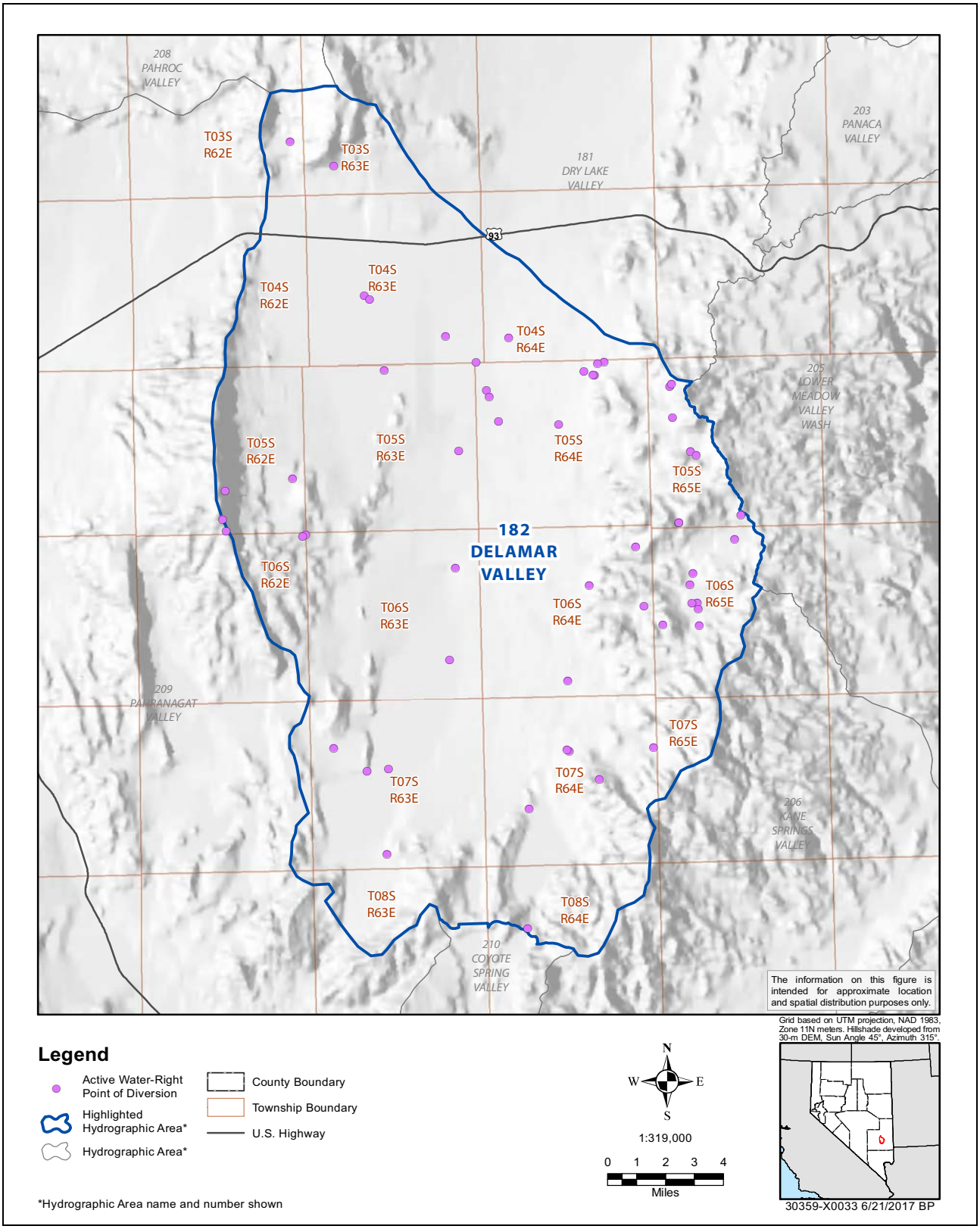

Figure 12-3
PODs for all Active Water Rights Within Delamar Valley

This single mining and milling right is not from an underground source. The total duty from this analysis for underground mining and milling rights is 0.00 afa. This total is consistent with the 0.00 afa of underground mining and milling rights listed in the NDWR HA Summary, Appendix 12-4.

12.2.4 Other Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "other." Appendix 12-7 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (other), and status (certificate, decreed, permit, reserved, vested). The source for these rights is listed as spring.

These two "other" rights are not from an underground source. The total duty from this analysis for underground "other" rights is 0.00 afa. This total is consistent with the 0.00 afa of underground "other" rights listed in the NDWR HA Summary, Appendix 12-4.

12.2.5 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes two active records with the manner of use listed as "municipal/quasi-municipal." Appendix 12-8 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (municipal/quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these two rights are both listed as underground.

These two groundwater municipal/quasi-municipal rights are permitted. Based on a review of the permit conditions, the combined duty limitation of these two municipal/quasi-municipal groundwater rights is 6,042.00 afa. This is consistent with the 6,042.00 afa of underground municipal/quasi-municipal listed in the NDWR HA Summary, Appendix 12-4.

Both of these groundwater right (Permit Nos. 53991 and 53992) have a priority date of October 17, 1989. These rights are owned by SNWA and, for accounting purposes for this report, will be considered rights prior to October 17, 1989.

12.2.6 Irrigation Rights

The NDWR online water-rights database includes one active record with the manner of use listed as "irrigation." Appendix 12-9 is a copy of the hydrographic abstract queried by HA (Delamar Valley - Area 182), manner of use (irrigation, irrigation-DLE, irrigation-Carey Act, and decreed), and status (certificate, decreed, permit, reserved, vested). The sources for this right is listed as spring (1).

This single irrigation right is not from an underground source. The total duty from this analysis for underground irrigation rights is 0.00 afa. This total is consistent with the 0.00 afa of underground irrigation rights listed in the NDWR HA Summary, Appendix 12-4.

12.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 12.2 identified all active water rights within Delamar Valley. There were no active groundwater irrigation rights identified within Delamar Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

12.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 12-4, lists the total amount of supplementally adjusted groundwater rights for stockwater and municipal uses as 6,049.24 afa. Table 12-3 summarizes the volume of existing groundwater rights supplementally adjusted by each manner of use based on this report and the NDWR HA Summary. The total for the report's current analysis shows that there are a total of 6,049.24 afa of groundwater rights within Delamar Valley. Of these, 6,049.24 afa have priority dates prior to, or on October 17, 1989, and 0.00 afa have priority dates after October 17, 1989. This information is based on the NDWR HA Summary and the analyses completed in Section 12.2 and Section 12.3 of this chapter.

Table 12-3
Delamar Valley Existing Groundwater Rights, Supplementally Adjusted

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to, or on October 17, 1989**
Stockwater	7.24	7.24	0.00	7.24
Domestic	0.00	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00
Municipal/ Quasi-Municipal	6,042.00	6,042.00	0.00	6,042.00
Irrigation	0.00	0.00	0.00	0.00
Total	6,049.24	6,049.24	0.00	**6,049.24**

12.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis.

Figure 12-4 shows the location of groundwater discharge areas and the location of rights, if present, with a source listed as spring and with a POD located within the groundwater discharge areas. The groundwater discharge areas are identified as green-filled polygons. No groundwater discharge areas were identified in Delamar Valley; therefore, no springs should be considered groundwater resources within Delamar Valley.

12.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 12.2 identified all active water rights within Delamar Valley. There were no active groundwater irrigation rights identified within Delamar Valley. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Delamar Valley, as it is not applicable.

12.7 Supplemental Analysis for Groundwater and Spring Irrigation Rights versus Surface Water Irrigation Rights

Section 12.2 identified all active water rights within Delamar Valley. There were no active groundwater irrigation rights identified within Delamar Valley, and Section 12.5 identified no spring irrigation rights in Delamar Valley within groundwater discharge areas. For this reason, supplemental analysis for groundwater and spring irrigation rights versus surface water irrigation rights will not be performed for Delamar Valley, as it is not applicable.

12.8 Estimated Crop Consumptive Use for Delamar Valley

Section 12.2 identified all active water rights within Delamar Valley. There were no active groundwater irrigation rights identified within Delamar Valley. Therefore, the estimated crop consumptive use analysis for Delamar Valley will not be performed, as it is not applicable.

12.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes, such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water right application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Delamar Valley.

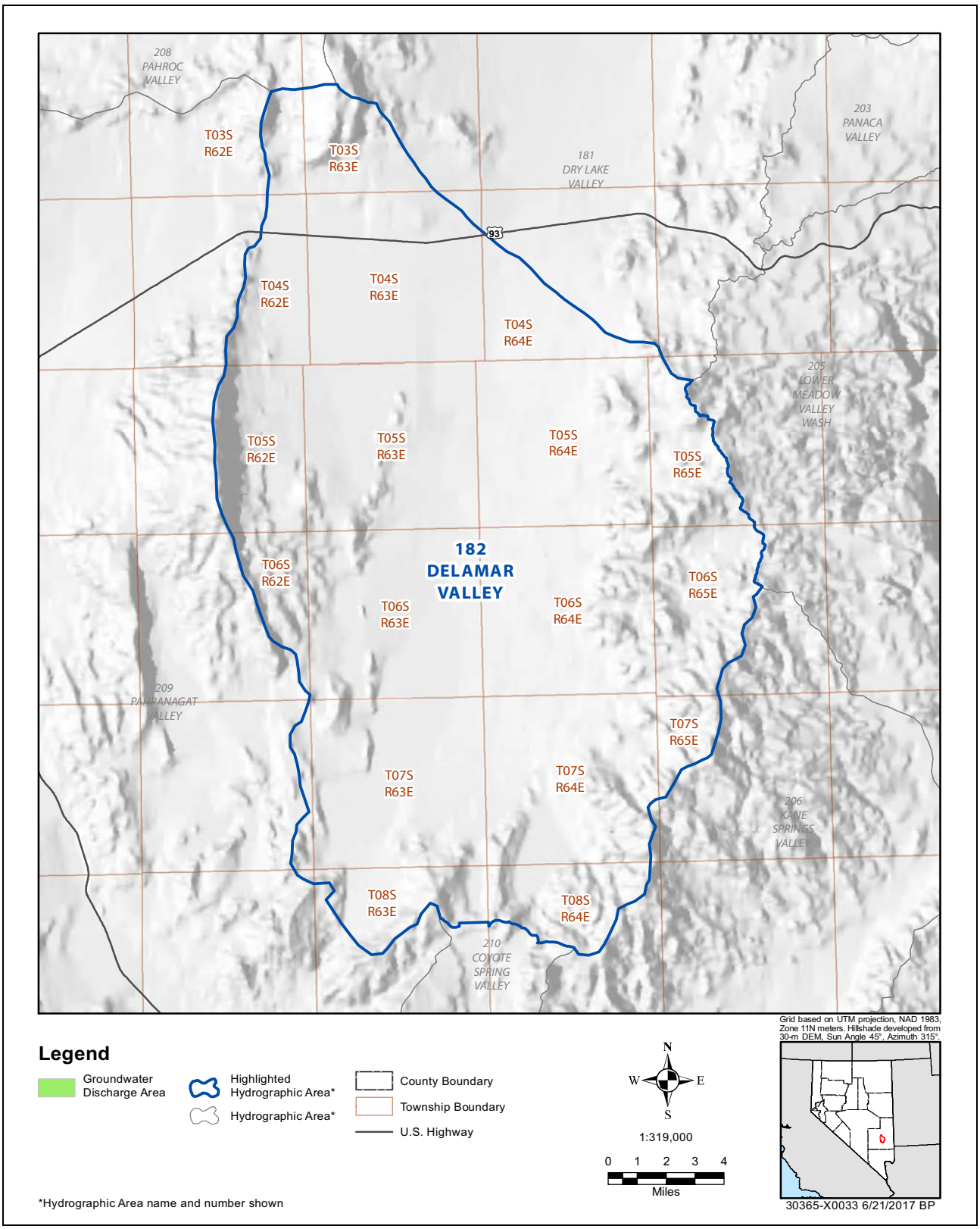

Figure 12-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Delamar Valley

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR located within Delamar Valley. The list includes a total of 13 records and is included as Appendix 12-10. Each well log filed with the NDWR lists a proposed use of the drilled well. There is one record that lists a proposed use as domestic (domestic use is signified with an "H" in the proposed use column). The single listed domestic well was installed prior to October 17, 1989, and no listed domestic wells were installed after October 17, 1989.

A conservative estimate that likely overstates the amount of domestic water used would be that, if each of these wells corresponded to a domestic well user, each well is using 2.00 afa, all the water is consumptively used, and there is no return flow to groundwater through septic tanks. Based on the one domestic well identified, it is estimated that 2.00 afa would be pumped from the groundwater system through domestic wells and all of this water would be consumptively used.

Therefore, 2.00 afa is allocated for domestic groundwater commitments within Delamar Valley and is considered a commitment prior to October 17, 1989.

12.10 Groundwater Resources Reserved for Future Growth in Delamar Valley

NSE Ruling No. 6167 states: "*[t]he amount of committed groundwater associated with existing rights is 8 afa and the water to be reserved for unforeseen future growth and development is 50 afa"* (NDWR, 2012d, p. 159). The NSE, pursuant to this ruling, reserved 50.00 afa of groundwater rights for future growth after the issuance of the SNWA municipal rights within Delamar Valley. Review of NDWR online resources reveals that no new additional groundwater rights have been permitted since the issuance of Ruling No. 6167. For this analysis 50.00 afa of groundwater rights will be considered committed groundwater resources for Delamar Valley. It is likely that if new water rights were to be permitted in the future in Delamar Valley, the new water rights would have priority dates after October 17, 1989. However, for purposes of this report, the 50.00 afa basin of origin reserve will be accounted for as a groundwater commitment prior to October 17, 1989, because it was reserved pursuant Ruling No. 6167.

12.11 Summary

The total committed groundwater rights for Delamar Valley were estimated by determining rights with priority dates prior to, or on October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 12-4 presents the summary information derived by this analysis of all active groundwater rights, as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Delamar Valley, after supplemental and consumptive use adjustments are applied, is estimated to be 6,101.24 afa. The committed groundwater rights for Delamar Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 0.00 afa. The committed groundwater rights for Delamar Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are applied, is estimated to be 6,101.24 afa.

Table 12-4
Committed Groundwater/Spring Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Domestic (exempt from permitting)	2.00	N/A	2.00	0.00	N/A	0.00	2.00	N/A	2.00
Reserved GW for Future Growth	50.00	N/A	50.00	0.00	N/A	0.00	50.00	N/A	50.00
Stockwater	7.24	N/A	7.24	0.00	N/A	0.00	7.24	N/A	7.24
Municipal/ Quasi-Municipal	6,042.00	N/A	6,042.00	0.00	N/A	0.00	6,042.00	N/A	6,042.00
Total	6,101.24	N/A	6,101.24	0.00	N/A	0.00	6,101.24	N/A	**6,101.24**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

13.0 KANE SPRINGS VALLEY

13.1 Introduction

NDWR HA 206, Kane Springs Valley, is located in the south-eastern portion of the State of Nevada, within the WRFS and the Colorado River Basin Hydrographic Region. Figure 13-1 is a map of the location of Kane Springs Valley.

The purpose of this chapter is to analyze the existing water rights within Kane Springs Valley and complete the following:

- Summarize all existing water rights.
- Quantify all existing groundwater rights.
- Determine quantity of irrigation groundwater rights supplemental to other irrigation groundwater rights.
- Quantify sole source irrigation groundwater rights.
- Determine if spring rights are located within groundwater discharge areas which are considered groundwater allocations for the purposes of this analysis.
- Determine quantity of all spring rights within the groundwater discharge areas.
- Determine quantity of irrigation groundwater rights supplemental to irrigation spring rights within groundwater discharge areas.
- Determine quantity of irrigation groundwater and spring rights supplemental to existing surface water rights.
- Adjust irrigation groundwater and spring rights based on the supplemental analysis to surface water.
- Adjust irrigation groundwater and spring rights based on consumptive use analysis.
- Determine the quantity of domestic rights not subject to NDWR permitting.
- Determine total quantity of existing committed groundwater allocations, adjusted based on the supplemental and consumptive use analysis, and with priority dates before, on, and after October 17, 1989.

The PODs and POUs for water rights on file with the NDWR are located within a 40-acre subdivision of a section, township, and range of the PLSS. Figure 13-2 shows the townships and ranges (MDBM) located within Kane Springs Valley.

13.2 Summary of Water Rights in Kane Springs Valley

Active water rights within Kane Springs Valley were obtained from the NDWR online water-rights database. All information within this report is current as of April 7, 2017.

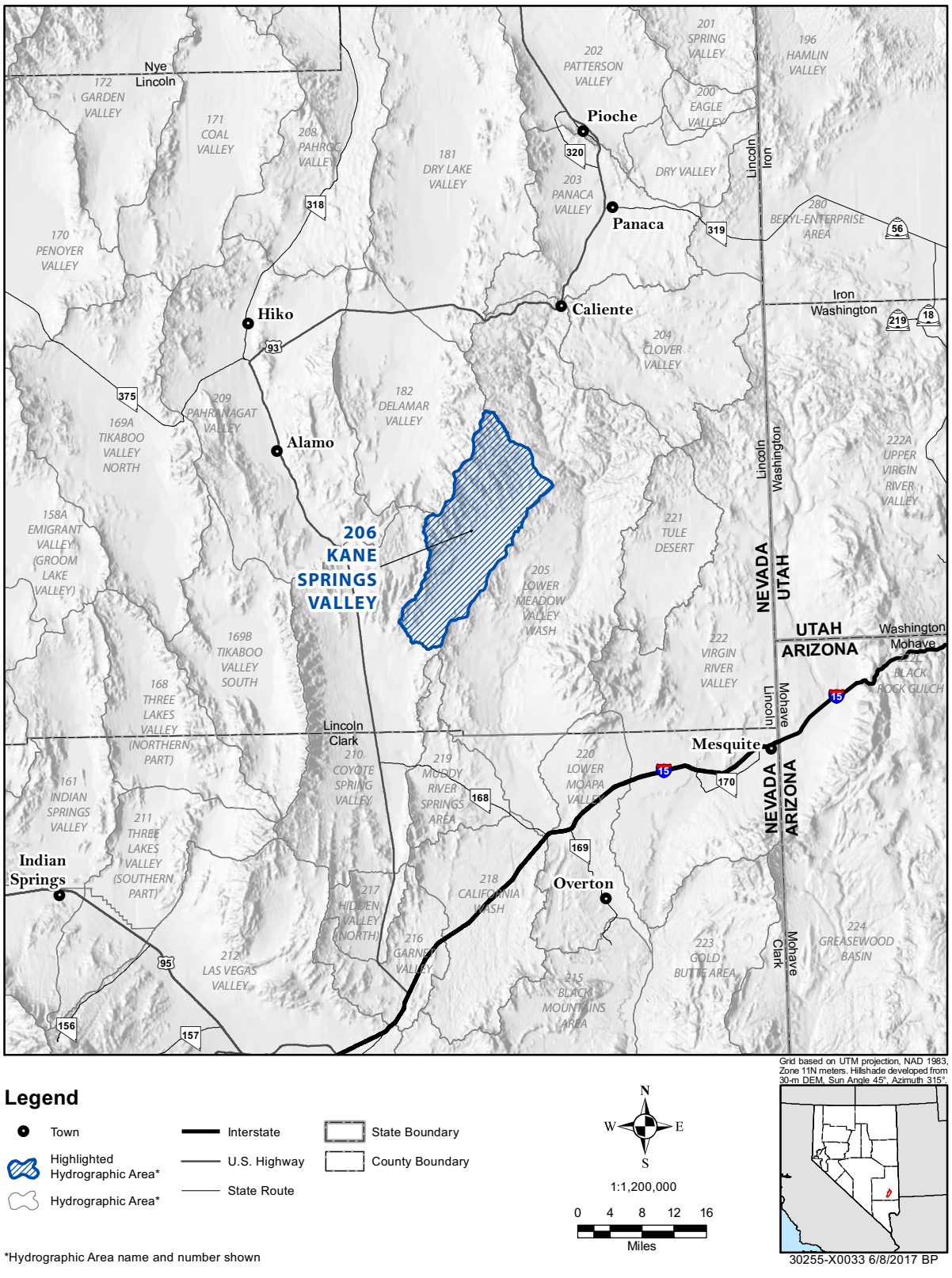

Figure 13-1
Kane Springs Valley Hydrographic Area

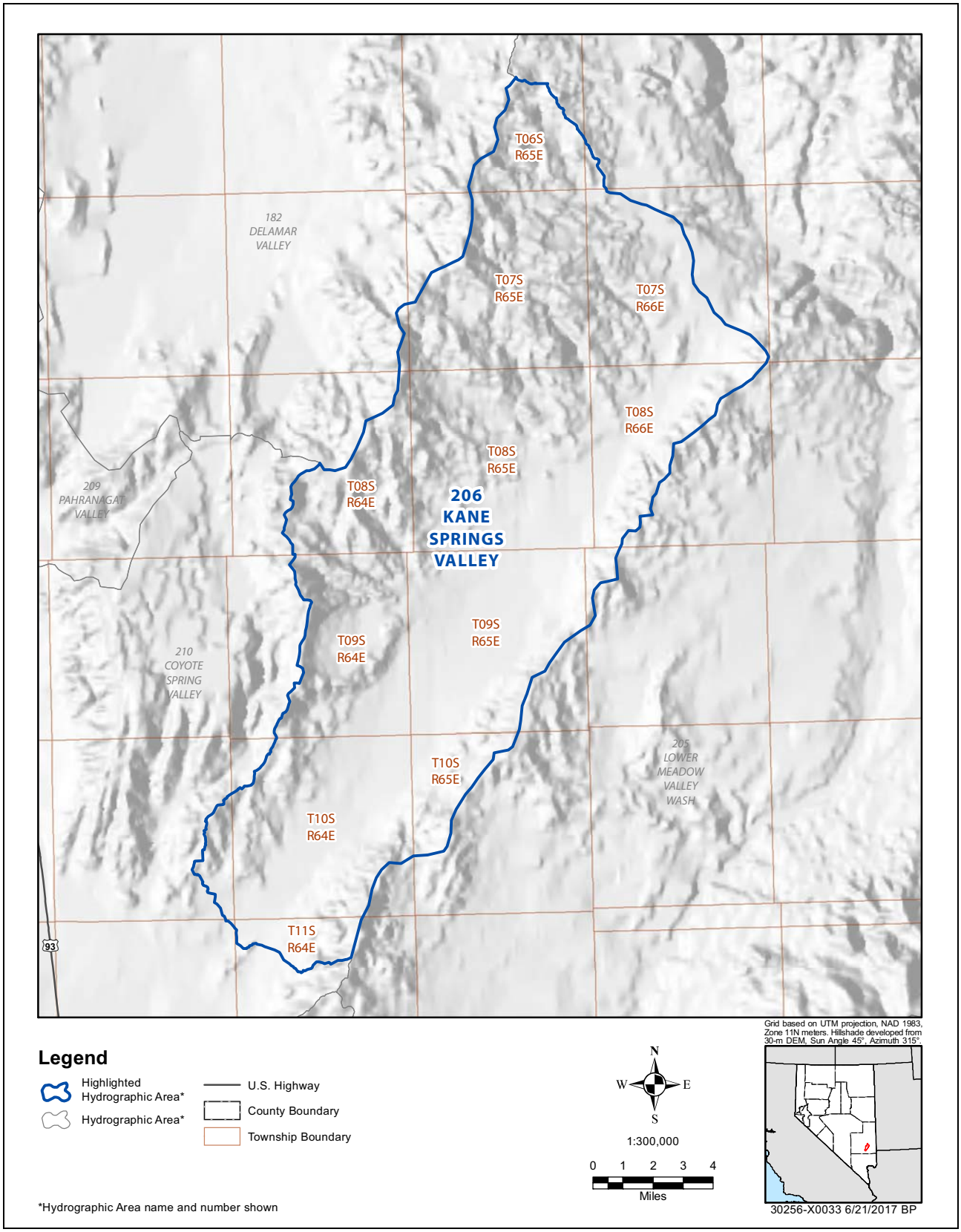

Figure 13-2
Township/Ranges Within Kane Springs Valley

The NDWR hydrographic abstract, queried for all active records within Kane Springs Valley, is included as Appendix 13-1. This abstract does not include applications with a status of RFA, RFP, or APP as these are not active water rights. There are currently 21 active water rights that are listed as vested, certificated, permitted, or reserved water rights. Appendix 13-2 lists all the active water rights in Kane Springs Valley and contains records that have priority dates before, on, and after October 17, 1989.

The manners of use for these water rights and applications for water rights include stockwater and municipal/quasi-municipal. Table 13-1 lists the number of records within Kane Springs Valley in the NDWR online water-rights database per manner of use and their current status.

Table 13-1
Number of Active Records Listed per Manner of Use and Status in Kane Springs Valley

Manner of Use	Number of Records	Vested Claims	Certificated	Permitted	Reserved
Stockwater	17	6	10	0	1
Municipal/ Quasi-Municipal	4	0	0	4	0
Total	21	6	10	4	1

The sources of water for the 21 active water rights and active applications for water rights include reservoir, spring, and underground. Table 13-2 lists the number of records in the NDWR online water-rights database by manner of use and their source of water.

Table 13-2
Number of Active Records Listed per Manner of Use and Source in Kane Springs Valley

Manner of Use	Number of Records	Stream	Reservoir (Surface Water)	Spring	Underground
Stockwater	17	0	1	16	0
Municipal/ Quasi-Municipal	4	0	0	0	4
Total	21	0	1	16	4

The NDWR online water-rights database includes copies of most of the applications, permits, certificates, application maps, and PBU maps. Additionally, the database includes general information, ownership, maps, due dates, and abrogation information. Information not available online was obtained through research of the physical files located at the NDWR Carson City office.

Figure 13-3 shows the approximate location and spatial distribution of the PODs for all active water rights within Kane Springs Valley.

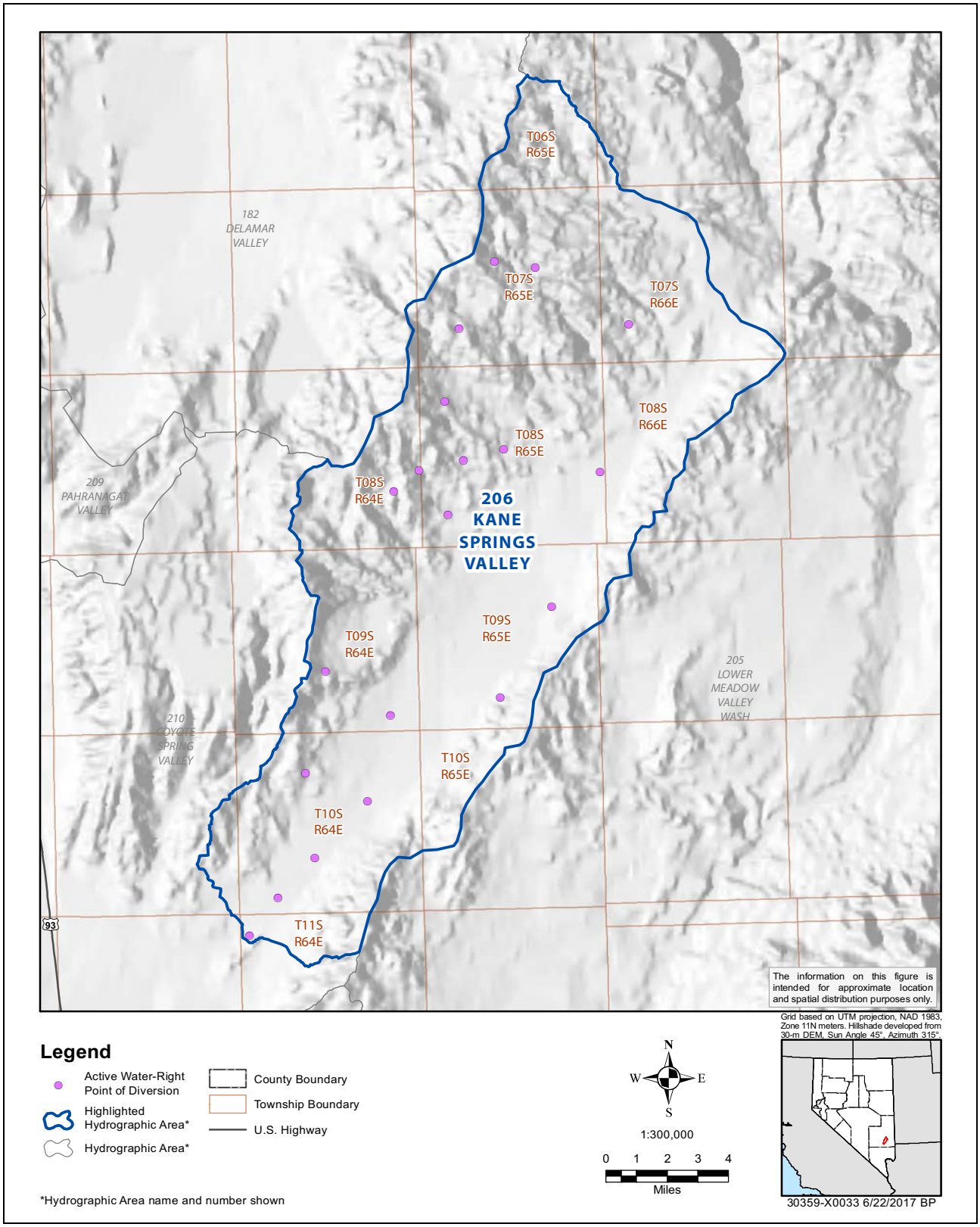

Figure 13-3
PODs for all Active Water Rights Within Kane Springs Valley

13.2.1 Water Rights per Manner of Use

The NDWR HA Summary for Kane Springs Valley, found in Appendix 13-3, was downloaded from the NDWR online water-rights database. The NDWR HA Summary lists the appropriated water from underground sources within Kane Springs Valley, and includes the manner of use of municipal. The NDWR HA Summary shows that these groundwater rights have been supplementally adjusted by the NDWR.

Kane Springs Valley active water rights were compiled and reviewed based on the manner of use (municipal/quasi-municipal and stockwater). The following sections include summaries of each manner of use category, with a breakout of groundwater active rights and a comparison of these rights to the NDWR HA Summary totals.

13.2.1.1 Municipal/Quasi-Municipal Rights

The NDWR online water-rights database includes four active records with a manner of use listed as "municipal/quasi-municipal." Appendix 13-4 is a copy of the hydrographic abstract queried by HA (Kane Springs - Area 206), manner of use (municipal/quasi-municipal), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as groundwater (4).

The four groundwater rights are all permitted. Each of the four permitted water rights have a duty of 500.00 afa associated with them; however, review of the permit conditions show a combined duty limitation for all four permits. The combined total for the permitted underground rights (active water rights municipal/quasi-municipal) is 1,000.00 afa. This total is consistent with the 1,000.00 afa of underground municipal/quasi-municipal rights listed in the NDWR HA Summary, Appendix 13-3.

All four of the municipal/quasi-municipal rights have priority dates after October 17, 1989. The duty for these four applications is 1,000.00 afa. Additionally, Appendix 13-2, which lists all the active water rights in Kane Springs Valley, identifies the records that have priority dates before, on, and after October 17, 1989.

13.2.1.2 Stockwater Rights

The NDWR online water-rights database includes 17 active records with the manner of use listed as "stockwater." Appendix 13-5 is a copy of the hydrographic abstract queried by HA (Kane Springs Valley - Area 206), manner of use (stockwater), and status (certificate, decreed, permit, reserved, vested). The sources for these rights are listed as reservoir (1), and spring (16).

None of the stockwater rights are from an underground source. The total duty from this analysis for these underground stockwater rights is 0.00 afa. This total is consistent with the 0.00 afa of underground stockwater rights listed in the NDWR HA Summary, Appendix 13-3.

13.3 Analysis of Groundwater Irrigation Water Rights (Sole Source Versus Supplemental)

Section 13.2 identified all active water rights within Kane Springs Valley. There were no permitted irrigation rights identified within Kane Springs Valley. For this reason, analysis of groundwater irrigation water rights (sole source versus supplemental) is not required.

13.4 Evaluation of NDWR HA Summary

The NDWR HA Summary, Appendix 13-3, lists the total amount of supplementally adjusted groundwater rights for municipal/quasi-municipal uses as 1,000.00 afa. Table 13-3 summarizes the volume of existing groundwater rights based on this report and the NDWR HA Summary. The totals for the report's current analysis is divided into rights with priority dates prior to or on October 17, 1989, rights with priority dates after October 17, 1989, and the total of both. This information is based on the NDWR HA Summary and the analyses completed in Section 13.2 and Section 13.2.1 of this chapter.

Table 13-3
Kane Springs Valley Existing Groundwater Rights

		Current Analysis (afa)		
Manner of Use	**NDWR HA Summary (afa)**	**Total**	**With Priority Dates After October 17, 1989**	**With Priority Dates Prior to October 17, 1989**
Municipal/ Quasi-Municipal	1,000.00	1,000.00	1,000.00	0.00
Stockwater	0.00	0.00	0.00	0.00
Total	1,000.00	1,000.00	1,000.00	**0.00**

13.5 Analysis of Springs Considered as Groundwater for Accounting Purposes

As previously outlined in the methodology chapter of this report, water rights sourced from springs may or may not be considered as groundwater commitments for this analysis. When a spring right was identified with a POD located within a groundwater discharge area, it was considered a groundwater right for accounting purposes in determining total groundwater commitments for this analysis. Figure 13-4 shows the location of rights with a source listed as spring, with a POD located within the groundwater discharge areas. No groundwater discharge areas were identified in Kane Springs Valley; therefore, no springs can be considered groundwater resources within Kane Springs Valley.

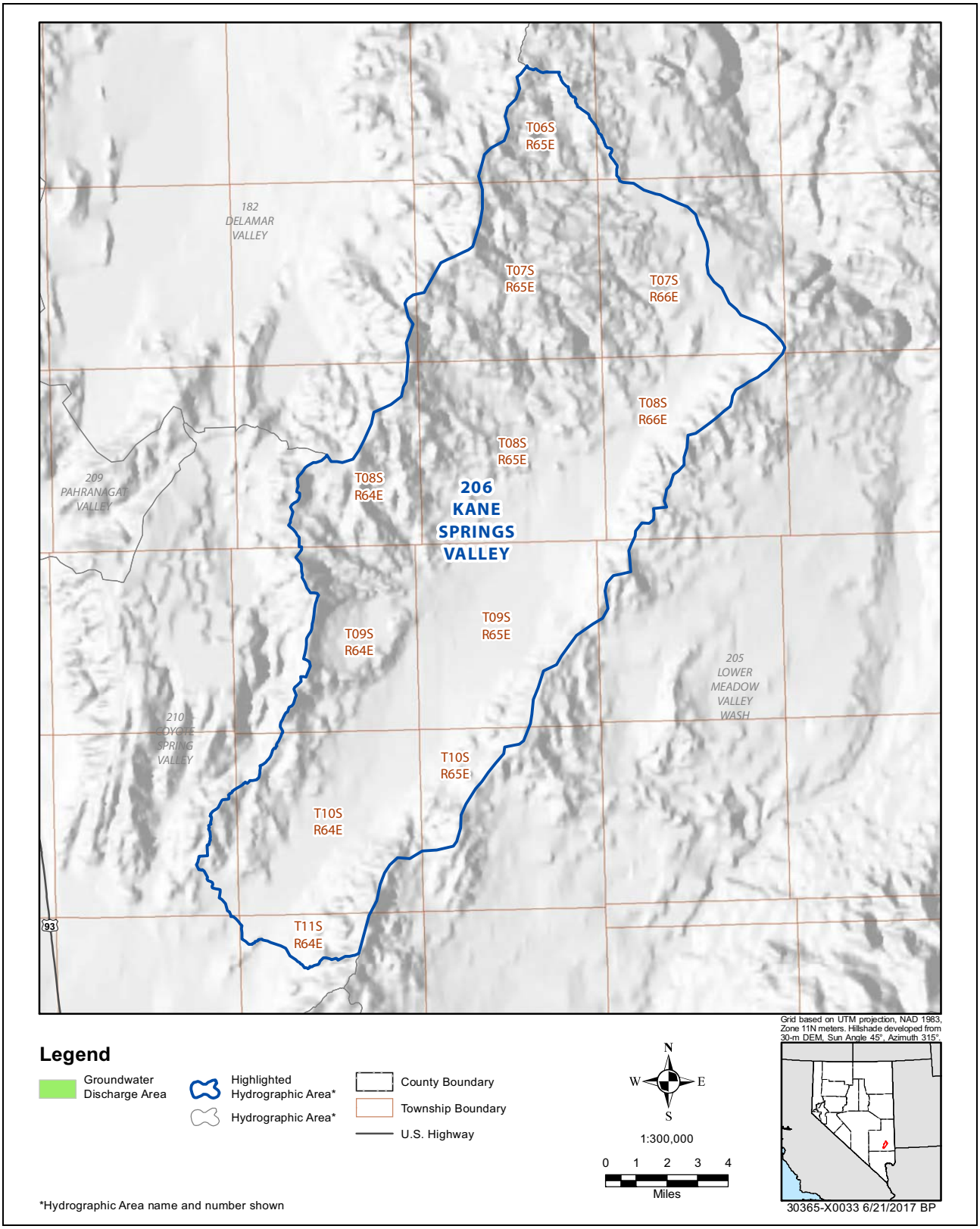

Figure 13-4
Groundwater Discharge Areas and Corresponding Spring Rights Within Kane Springs Valley

13.6 Supplemental Analysis of Irrigation Groundwater and Irrigation Spring Rights

Section 13.2 identified all active water rights within Kane Springs Valley. There were no active irrigation rights identified within Kane Springs Valley. For this reason, supplemental analysis of irrigation groundwater and irrigation spring rights will not be performed for Kane Springs Valley, as it is not applicable.

13.7 Supplemental Analysis of Groundwater Irrigation Rights versus Surface Water Irrigation Rights

Section 13.2 identified all active water rights within Kane Springs Valley. There were no active irrigation rights identified within Kane Springs Valley. For this reason, supplemental analysis of groundwater irrigation rights versus surface water irrigation rights will not be performed for Kane Springs Valley, as it is not applicable.

13.8 Estimated Crop Consumptive Use

Section 13.2 identified all active water rights within Kane Springs Valley. There were no active irrigation rights identified within Kane Springs Valley. For this reason, an analysis of consumptive use for irrigation rights in Kane Springs Valley will not be performed, as it is not applicable.

13.9 Estimated Domestic Water Use

Nevada law allows up to 2.00 afa for domestic use, which includes culinary and household purposes such as the watering of a family garden, lawn, and the watering of domestic animals, or household pets, without requiring a water rights application to be made to the NSE. Therefore, domestic groundwater use of 2.00 afa or less does not require a permitted water right. This manner of use is not accounted for as a committed groundwater right in the NDWR HA Summary unless it is included as an additional manner of use for another permitted use, or unless a water user applies for a domestic water right despite the permitting exemption.

Because domestic use under 2.00 afa is not regulated by the NSE, information regarding the number of domestic wells, annual pumping total per well, and the quantity of secondary recharge of water from a domestic well (through septic systems) does not exist. However, this information would be required in order to calculate actual totals for domestic use of groundwater in Kane Springs Valley.

Because this information does not exist, an alternative approach was used for this analysis and it included a review of the NDWR online well-driller's log database. The NDWR online well-driller's log database includes a list of all wells that have been reported to the NDWR located within Kane Springs Valley. The list includes a total of two records and is included as Appendix 13-6. Each well log filed with the NDWR lists a proposed use of the drilled well. Neither of these two records list a proposed use as domestic use (domestic use is signified with an “H” in the proposed use column).

Therefore, 0.00 afa is allocated for domestic groundwater commitments within Kane Springs Valley.

13.10 Summary

The total committed groundwater rights for Kane Springs Valley were estimated by determining rights with priority dates prior to October 17, 1989, priority dates after October 17, 1989, and the total of all rights. Table 13-4 presents the summary information derived by this analysis of all active groundwater rights, as well as spring rights with PODs within the groundwater discharge areas.

The total committed groundwater rights for Kane Springs Valley, after supplemental and consumptive use adjustments are made, is estimated to be 1,000.00 afa. The committed groundwater rights for Kane Springs Valley, with priority dates after October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 1,000.00 afa. The committed groundwater rights for Kane Springs Valley, with priority dates prior to, or on October 17, 1989, after supplemental and consumptive use adjustments are made, is estimated to be 0.00 afa.

Table 13-4
Committed Groundwater Rights, Adjusted for Supplemental and Consumptive Use

	Total			With Priority Dates After October 17, 1989			With Priority Dates Prior to, or on October 17, 1989		
Manner of Use	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**	**Current Analysis (afa)**	**Adjusted for GW Sup. to SW (afa)**	**Adjusted for Consumptive Use (afa)**
Municipal/ Quasi-Municipal	1,000.00	N/A	1,000.00	1,000.00	N/A	1,000.00	0.00	N/A	0.00
Total	1,000.00	N/A	1,000.00	1,000.00	N/A	1,000.00	0.00	N/A	**0.00**

N/A = Not applicable.
GW = Groundwater.
SW = Surface water.

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14.0 SUMMARY

Table 14-1 lists the estimated committed groundwater resources in the WRFS per HA resulting from the analyses of the existing groundwater rights and spring rights within the groundwater discharge areas. It is estimated that 104,402 afa of groundwater is available for appropriation in the WRFS. The results of this analysis show that there are 77,753.94 afa of committed groundwater rights and spring rights within the groundwater discharge areas with a priority date prior to or on October 17, 1989. There are a total of 93,148.60 afa, of committed groundwater rights and spring rights within the groundwater discharge areas with priority dates prior to, on, and after October 17,1989.

Therefore based on this analysis, no reduction of SNWA DDC permit volumes needs to be performed, as there is more than enough water in the 11-basin WRFS both for SNWA DDC permits and down-gradient water rights. This analysis shows that there is no over-appropriation of water rights within the 11-basin WRFS. In fact, it appears that additional water is available for appropriation.

Table 14-1
Estimated Committed Groundwater/Groundwater Discharge Area Spring Resources in WRFS

Basin No.	HA Name	Committed Groundwater and Spring Water Rights (afa)		
		Before and After October 17, 1989	After October 17, 1989	Before October 17, 1989
175	Long Valley	601.51	339.05	262.46
174	Jakes Valley	42.95	2.24	40.71
180	Cave Valley	5,759.06	33.60	5,725.46
207	White River Valley	36,536.48	9,127.87	27,408.61
208	Pahroc Valley	52.88	31.54	21.34
172	Garden Valley	920.24	579.33	340.91
171	Coal Valley	65.80	38.94	26.86
181	Dry Lake Valley	12,427.14	746.66	11,680.48
182	Delamar Valley	6,101.24	0.00	6,101.24
209	Pahranagat Valley	29,641.30	3,495.43	26,145.87
206	Kane Springs Valley	1,000.00	1,000.00	0.00
	Total	93,148.60	15,394.66	**77,753.94**

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