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Title: Construction Plan Caliente Rail Corridor

Supplier DI#: NRP-R-SYSW-CP-0008-03

Supplier Rev.: 03

Supplier Date: 05/15/07

Reference #: NVT-CD-00152

NVM Nevada Transportation Manager Gene Allen
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1. Supplier/Subcontractor Name:	Purchase Order/Subcontract No. and Title:	
Nevada Rail Partners	NN-HC4-00239	
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Subcontractor:	Item Number/Title/Revision:	Submittal Date:	SRCT No.:
Nevada Rail Partners	T14/Construction Planning Support – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-03, Rev. 03, Exhibit I, Item Number 16k, RFP Reference Exhibit D-2.14a.2	May 15, 2007	06-00014

Section I. Submittal Information (includes above information)

Submittal Description and Revision Summary for Entire Submittal:

The document included in this submittal is revised from the previous Rev. 02A submittal in January 2007. The redline changes submitted as Rev. 02A for this document have been accepted by BSC. The new changes shown in the PDF file containing the Rev. 03 redlines resulted from the comment resolution process for the Rev. 02A submittal.

In addition, changes to the Beatty Wash and Busted Butte alignments were submitted in 2006 as part of the final plan and profile sheets. These alignment changes resulted in earthwork changes to CS6 and BC3 that are reflected in this Rev. 03 submittal.

Construction Plan, Caliente Rail Corridor is a DEIS-related report that includes descriptions of major material requirements, temporary construction facilities, environmental considerations and the program schedule. Information is intended to outline a construction approach supportive of a program schedule with a 2014 operation date.

Special Instructions:

For a complete copy of the document, print the T14_CRCConstructionPlan_Final_Rev03.pdf.

Section II. Data File Information (Add lines below if needed for additional files. Indicate "Last item" or "End of list" after last line used.)

Filename	Rev.	File Size	Description (File description and revision summary for file)	Application and Version/ Add-in or Extension and Version
T14_Cover.ppt	03	709 KB	Report cover for *Construction Plan, Caliente Rail Corridor*, NRP-R-SYS-CP-0008-03, Rev. 03	Microsoft Powerpoint 2003
T14_CRC_Construction Plan_FINAL_Rev 03_15May07.doc	03	10,557 KB	Main text with all graphics – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-03, Rev. 03	Microsoft Word 2003
T14_CRC_Construction Plan_FINAL_Rev 03_15May07.pdf	03	25,772 KB	Scanned final version of the complete document with all imbedded graphics and appendices – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-003, Rev. 03	Adobe Acrobat 7.0 Standard Version
T14_CRC_Construction Plan_FINALReadonly_Rev03_15May07.doc	03	10,558 KB	Main text (Read Only) with all graphics – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-03, Rev 03	Microsoft Word 2003
T14_CRC_Construction Plan_FINALredlines_Rev03_15May 07 .pdf	03	21,617 KB	Scanned redline version of the complete document with all imbedded graphics and appendices – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-03, Rev.03	Adobe Acrobat 7.0 Standard Version
AppendixA-F_Quarries_FINAL_Rev03.doc	03	8,181 KB	Appendices A through F: Shannon & Wilson, Inc.: field evaluation for six selected quarry sites.	Microsoft Word 2003
AppendixA-F_Quarries_FINALReadonly_Rev03	03	8,181 KB	Appendices A through F (Read only): Shannon & Wilson, Inc.: field evaluation for six selected quarry sites	Microsoft Word 2003
AppendixG_ConstructionCamps_FINAL_Rev03.doc	03	8,284 KB	Appendix G: Aerial photography of construction camp locations.	Microsoft Word 2003
AppendixG_ConstructionCamps_FINALReadonly_Rev03	03	8,284 KB	Appendix G (Read only): Aerial photography of construction camp locations	Microsoft Word 2003

Subcontractor:	Item Number/Title/Revision:	Submittal Date:	SRCT No.:
Nevada Rail Partners	T14/Construction Planning Support – *Construction Plan, Caliente Rail Corridor* – NRP-R-SYSW-CP-0008-03, Rev. 03, Exhibit I, Item Number 16k, RFP Reference Exhibit D-2.14a.2	May 15, 2007	06-00014

AppendixH_WaterRequirements_FINAL_Rev03.doc	03	8,727 KB	Appendix H: Detail maps of potential well locations	Microsoft Word 2003
AppendixH_WaterRequirements_FINALReadonly_Rev03	03	8,727 KB	Appendix H (Read only): Detail maps of potential well locations	Microsoft Word 2003
AppendixI_AccessRoads_FINAL_Rev03.doc	03	7,053 KB	Appendix I: Detail maps of potential access roads	Microsoft Word 2003
AppendixI_AccessRoads_FINALReadonly_Rev03	03	7,053 KB	Appendix I (Read only): Detail maps of potential access roads	Microsoft Word 2003

****************Last Item*********

Section III. Metadata

☒ **GIS Metadata** All GIS data is preferred in ArcGIS9.1 UTM, NAD1983, Zone11, Feet.	Projection:	
	Datum:	
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☐ **CAD Metadata** CAD drawings are preferred in **Bentley MicroStation V8 and/or InRoads** and should adhere to established **CAD standards**.	Level descriptions:	
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Section IV. Data Screening (Completed by BSC personnel)

Acceptable for Review?	Screener Name:	Signature:	Date:
☒ Yes* ☐ No	Cathy Stettler	Cathy Stettler	5/14/07

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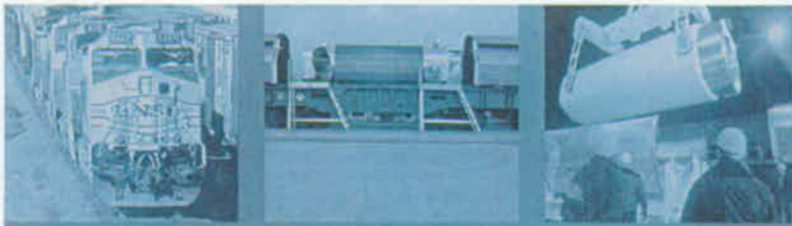
Comments: (*Justification for returning submittal is* **required**; *other comments are optional.*)

Rev 03 05-15-07

Section V. STR/STR Support Disposition of Submittal

Process for Review?	** If "No", date returned:	Comments:	
☒ Yes ☐ No**			
STR/STR Support Name: Gene Allen		Signature: EC Allen	Date: 5/15/07

5/14/07



Construction Plan
Caliente Rail Corridor

Task 14: Construction Planning Support

Rev. 03

Document No. NRP-R-SYSW-CP-0008-03

prepared by:

NEVADA RAIL PARTNERS

prepared for:

BECHTEL SAIC COMPANY, LLC

Nevada Rail Line Conceptual Design

Subcontract NN-HC4-00239

May 15, 2007

Construction Plan
Caliente Rail Corridor

Task 14: Construction Planning Support
Rev. 03
Document No. NRP-R-SYSW-CP-0008-03

Nevada Rail Line Conceptual Design
Subcontract NN-HC4-00239
15 May 2007

Prepared for:
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Las Vegas, NV 89119

Table of Contents

Tables

Figures

List of Acronyms

ADT	Average Daily Traffic
AREMA	American Railway Engineering and Maintenance-of-Way Association
BC	Bonnie Claire
BLM	Bureau of Land Management
BSC	Bechtel SAIC Company, LLC
CMF	Cask Maintenance Facility
CFR	Code of Federal Regulations
CS	Common Segment
CRC	Caliente Rail Corridor
DOE	U.S. Department of Energy
EIC	Employee-in-Charge
EIS	Environmental Impact Statement
EOL	End-of-Line
FCC	Federal Communications Commission
GF	Goldfield
GROA	Geologic Repository Operations Area
GV	Garden Valley
HLW	High-level Radioactive Waste
kW	Kilowatt
MOU	Memorandum of Understanding
MOW	Maintenance-of-Way
mph	Miles per Hour
NAC	Nevada Administrative Code
NDEP	Nevada Department of Environmental Protection
NRL	Nevada Rail Line
NRP	Nevada Rail Partners
NRS	Nevada Revised Statues
NTP	Notice-to-Proceed
NTTR	Nevada Test and Training Range

OV	Oasis Valley
PBX	Private Branch Exchange
PSTN	Public Switched Telephone Network
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-Way
S&W	Shannon & Wilson, Inc.
SNF	Spent Nuclear Fuel
SR	State Route
SR2 or SR3	South Reveille 2 or South Reveille 3
SWB	Solid Waste Branch
TCC	Train Control Center
UPRR	Union Pacific Railroad
USAF	U.S. Air Force
VHF	Very High Frequency
VSAT	Very Small Aperture Terminal
WWTF	Wastewater Treatment Facility
yd^3	Cubic Yard

1.1 INTRODUCTION

This document represents the construction planning support for the Nevada Rail Line (NRL) and incorporates comments received on the 3 December 2004, 27 May 2005, and 13 April 2006 documents. This document outlines the approach to construction of the Caliente Rail Corridor (CRC)[1] that achieves a completed and operationally functioning rail line by the end of year 2014. It is predicated on initial construction activities commencing by October 2009, with actual track construction commencing by July 2011. This report is one of several prepared to support and provide initial input to the first draft of the rail alignment environmental impact statement (EIS). Each report covers a specific topic for a specific purpose. Accordingly, each report utilizes data from various sources in varying levels of detail and precision as appropriate, as well as in different contexts. While the reports are consistent in overall conceptual design, it is possible that numerical values for certain parameters may vary between the reports. This is a result of the conceptual nature of the reports and their distinct areas of focus – it should not be considered an abnormal situation or an indication of error.

1.2 PURPOSE

The CRC is a proposed nominal 331-mile railroad in central and southern Nevada. This new rail line, which has been proposed by the U.S. Department of Energy (DOE), would include a new single track roadbed and ancillary supporting facilities. The CRC would interconnect with the Union Pacific Railroad (UPRR) tracks near Caliente, Nevada, and would terminate at the DOE Geologic Repository Operations Area (GROA) at Yucca Mountain. Figure 1-A shows the general location of the CRC.

The objective of this construction planning document is to provide the EIS team with a conceptual-level description of the construction process and technical activities needed to implement the CRC. Discussion of the commercial aspects of construction, such as contractual terms and conditions, are not included. This work product includes:

- Project Location Map
- Alignment Description
  - Earthwork Quantities
  - Major Bridge Construction
  - Operations Support Facilities
  - Signal and Communications Facilities
- Significant Material Considerations
- Facilities Necessary for Construction
  - Construction Camps
  - Water Requirements
  - Access Roads
  - Communications Systems
- Construction Contract Protocols
- Environmental Considerations (including waste disposal)
- Schedule

Most activities described in this document are typical in that they are common to most other Class I freight railroad construction projects executed in rural environments. Certain activities described are

[1] Many of the construction functions described in this report would be administered in a similar manner along any given alignment. Therefore, the term "NRL" is used to describe aspects of rail construction that are not particular to a specific alignment, and the term "CRC" is used only where specifically applicable to the Caliente Rail Corridor.

unique to the CRC because construction activities are required in very remote areas that lack access and services. The information is also independent of alignment, meaning that alignment fine-tuning, which is expected as alternate routes are screened and a basis for analysis[2] is identified, would not impact the data provided.

Figure 1-A. Caliente Rail Corridor

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[2] Throughout this and other Nevada Rail Partners (NRP) reports, the phrase "basis for analysis" is used to provide a frame of reference for NRP's evaluations of the alignment's construction engineering and operational characteristics. Except for *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007e), NRP reports provide data for all alignment segments so that consideration of other alternative alignment segment combinations may be accomplished.

2.1 DESIGN CRITERIA

The NRL would be designed based on criteria directed toward meeting transportation requirements, safe operation, and feasible cost for design, construction, capital facilities, operating expense and efficient energy consumption. It is consistent with freight railway standards for safety of operations and ease of maintenance. The basis for analysis alignment is approximately 331 miles long. However, different combinations of common segments and alternate alignment segments would produce rail lines of different lengths. The longest and shortest potential routes are outlined in *Alignment Development Report, Caliente Rail Corridor* (NRP 2007b). Some of the major parameters, as outlined in *Alignment Development Report, Caliente Rail Corridor* (NRP 2007b), are:

- Loading for Structures: Cooper E-80
- Maximum Design Speed: 60 miles per hour (mph)
- Maximum Vertical Grades: Two percent (curve compensated)
- Maximum Horizontal Curves: Six degrees (mainline); 10 degrees (yards and sidings)
- Lateral Clearance: 10 feet minimum (from centerline)
- Rail Type: 136 RE[3]
- Cross Ties: prestressed concrete

The standard embankment for the NRL is a 31-foot-wide crown for single track inclusive of a 12-inch subballast layer and a minimum of 12 inches of ballast below the cross ties. Track centers in multiple track conditions are 25 feet apart.

2.2 EARTHWORK

The 331-mile-long basis for analysis alignment has been separated into eight distinct zones based on terrain. Table 2-1 lists the earthwork quantities required to construct the segments within each zone. The quantities shown are preliminary numbers subject to further engineering analysis. Shannon & Wilson, Inc.'s (S&W) *Preliminary Geotechnical Report* (S&W 2005b) was utilized to identify the types of excavation activities and quantities.

Table 2-1. Earthwork Quantities for the Basis for Analysis Alignment

Zone	Length (miles)	Excavation (cubic yards [yd³])				Fill (yd³)	
		Common	Rippable Rock	Drill and Blast	Borrow (Mixed)	Place Embankment	Excess Excavation
Caliente Segment and Common Segment 1(CS1) – Bennett Pass and Pahroc Summit	55.50	8,974,000	131,000	2,127,000	–	6,775,000	2,744,000
CS1 – White River 1	26.34	1,593,000	–	–	–	1,150,000	–
Garden Valley 8 (GV8) and CS2	53.36	1,158,000	–	400,000	–	680,000	941,000

[3] RE indicates a specification of the American Railway Engineering and Maintenance-of-Way Association (AREMA).

Table 2-1. Earthwork Quantities for the Basis for Analysis Alignment

Zone	Length (miles)	Excavation (cubic yards [yd³])				Fill (yd³)	
		Common	Rippable Rock	Drill and Blast	Borrow (Mixed)	Place Embankment	Excess Excavation
South Reveille 3 (SR3) and CS3 – East	42.36	2,133,000	493,000	266,000	–	2,171,000	682,000
CS3 – West	39.92	557,000	28,000	–	–	548,000	–
Goldfield 3 (GF3) and CS4	38.23	581,000	433,000	2,293,000	2,359,000	6,159,000	–
Bonnie Claire 3 (BC3) and CS5	37.20	471,000	339,000	82,000	1,860,000	2,241,000	–
Oasis Valley 1 (OV1) and CS6	37.96	5,563,000	612,000	1,581,000	882,000	4,567,000	3,724,000
Project Totals	**331.00**	**21,030,000**	**2,036,000**	**6,749,000**	**5,101,000**	**24,291,000**	**8,091,000**

2.3 BRIDGES

There are numerous bridges that would be required along the alignment, most of which would be standard railroad concrete trestle-type structures. Twenty-six of these structures are located in the first 55 miles of the CRC, beginning within the town of Caliente, Nevada, and must be completed during earthwork activities to support follow-on track work activities. Similar activities for the balance of the alignment would be required during those earthwork efforts. At Beatty Wash, a 1,027-foot-long bridge, 165 feet high, would be required with a two-year construction duration expected.

2.4 SIGNAL SYSTEM

The signal system proposed for the NRL is a conventional signaling system with continuous dispatcher control referred to as centralized traffic control. The system would include wayside signals spaced out about two to three miles apart for the entire length of the line. The signals would be ground-mounted wayside signals located back to back. Interlocking control would be used at the ends of all siding locations. Switches would be electrically powered and remotely controlled by the train dispatcher. Train and infrastructure defect detectors would be incorporated into the system to stop trains if a defect is detected. Track circuits would be required for the entire length of the line to detect track occupancy, transmit vital signal information, and provide broken rail detection.

The signal system would include a dispatcher's control console to allow control of the signals and switches. A track model board would be incorporated to display signal and switch indications to the dispatcher. A wayside control house would be located at each power switch to control the signals and switches. A wayside control case would be located at each wayside signal location to house the track circuit equipment and control the signal. A data communications system would be installed to communicate between the wayside control house and the central control office where the dispatchers are located.

2.5 COMMUNICATIONS SYSTEM

A communications system would be installed to allow communications between the trains and the train control center (TCC). The communication system required to support railroad operations would utilize four distinct communication technologies: synchronous optical network fiber-optic backbone, very high frequency (VHF) land mobile radio, geosynchronous satellite dispatch radio, and, potentially, satellite telephone. During preliminary grading, construction communications would be provided via short-wave radio and satellite phone. At the TCC, the system would be configured to allow the dispatcher easy access to all of the various communication modes available, including the ability to patch modes together if required. A fiber-optic cable would be laid along the length of the alignment within the right-of-way (ROW) for that purpose and to allow for antennas to be positioned within the ROW for proper coverage of train-to-dispatch radio communications. In order to support the operations described, much of the fiber-optic and radio equipment would be located along the NRL ROW. In general, these communications sites would consist of an equipment room that houses the radio and fiber-optic electronics and a monopole radio tower to hold the elevated antenna structure.

2.6 FACILITIES

There are several rail facilities identified that are required to support the operations of the spent nuclear fuel (SNF) and high-level radioactive waste (HLW) trains, other commercial freight trains and the maintenance-of-way (MOW) equipment. At the east end of the alignment near Caliente would be a rail yard adjacent to the UPRR mainline for set-out of interchange traffic. The interchange traffic would be marshaled to the staging yard for preparation to transit the NRL. At the western terminus (Yucca Mountain) is the end-of-line facility (EOL) where trains are received for transfer to the GROA. Both the staging yard and the EOL facility are designed to also handle the expected volume of general freight traffic and would be equipped with locomotive servicing facilities.

At both the staging yard and the EOL facility, ROW has been identified to accommodate the cask maintenance facility (CMF). This facility encompasses a series of buildings and tracks to support the national fleet of equipment for the SNF and HLW trains.

In addition to the operational facilities, there would be two MOW facilities to support rail operations on the CRC. A location for the MOW headquarters facility has been identified approximately five miles south of Tonopah. An MOW trackside facility site has been identified approximately 18 miles south of US 6 at the intersection of the CRC alignment and AR 504 (the northern paved access road to the Nevada Test and Training Range [NTTR]). The trackside facility would have the capabilities to perform routine maintenance of NRL rolling stock and facility maintenance equipment.

The following list identifies the major facilities contemplated, and the total capacity of 60-foot cars that could be stored at each facility:

- UPRR Interchange Yard – total capacity = 226
- Staging Yard at Caliente – total capacity = 593
- EOL Facility at the GROA – total capacity = 603
- MOW Trackside Facility – total capacity = 222

These facilities are basically rail yards to support train operations. The staging yard and EOL facility would also incorporate locomotive servicing areas in the yard layouts. Additional details on the CRC facilities are included in *Facilities–Design Analysis Report, Caliente Rail Corridor* (NRP 2007d).

2.7 SIDINGS

It is expected that 12 sidings, located an average of about 25 miles apart, would be constructed along the alignment. Proposed siding locations are identified in the *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007e). Each siding would be 7,000 feet long with accommodations for maintenance equipment and bad order car set-out, except at the summits of Bennett Pass, Pahroc, Warm Springs, and

Goldfield. These sidings would be 10,000 feet to 12,000 feet long due to steep grades and mountainous terrain. During construction these siding locations would be used as staging areas and temporary rail yard locations. An additional area of eight to 16 acres would be required along the sidings for the staging areas (50 to 100 feet wide by 7,000 feet long). If commercial operations occur, then there may be a need for additional sidings to be constructed.

3.1 BALLAST REQUIREMENTS AND QUARRIES

3.1.1 Introduction and Data Sources

Ballast for rail construction would be obtained from new quarries developed along the NRL alignment. The quantity of ballast required is estimated to be 3,469,000 net tons. Quarry development would allow ballast requirements to be met in close proximity to the construction alignment, thereby reducing transportation costs. Dedicated quarry facilities would also help to ensure supply; acquiring ballast from outside sources could introduce uncertainty should NRL not have primary access to ballast sources.

Data and information on quarry sites were obtained from S&W (S&W 2005a). S&W conducted a series of field investigations in November 2005 to determine the topographic and geologic suitability of potential sites for quarry development. The results of the S&W field investigations are included in Appendices A-F (S&W 2006). Each field report provides information on site features, deposit features, and environmental features, as well as pictures of the general area.

3.1.2 Ballast Quantity Requirements

Track Ballast[4] – Ballast to be used for NRL construction would conform to the specifications outlined in AREMA's *Manual of Railway Engineering*, Volume 1, Chapter 1, Part 2 "Ballast" (AREMA 2005). A total of 3.5 million tons of ballast would be required for track construction. Each quarry facility is anticipated to produce approximately 3,400 tons of useable ballast per day. All ballast would be processed–crushed, screened, and washed–at the quarry site(s). Any quarry site developed along the NRL alignment would be utilized solely for ballast requirements during construction and would be reclaimed during the post-construction activities. Therefore, ballast requirements that arise once the NRL is operational would be met through existing commercial sources.

Subballast – Approximately 75 percent of the rock from each pit would be processed into usable ballast. The remaining 25 percent would result in fines and other waste. Some of the remaining material may be suitable for subballast or road construction.

Sand and Gravel – Total sand and gravel quantities have not been estimated. These materials would be derived from on-site excavation and other commercially available sources near the proposed corridor.

3.1.3 Quarry Requirements

Personnel – Each quarry facility is anticipated to operate continuously for two years, 250 days per year. However, the entire lifespan would be five years to complete site development, operations, and reclamation. The five-year lifespan also includes contingencies. Personnel required to operate each quarry facility include administrators, inspectors, equipment operators, scale operators, maintenance personnel, truck drivers, and utilities personnel. Approximately 30 people would be necessary to operate each quarry facility during the peak output years. All personnel could be housed at the construction camps. Reference Section 4.1. Construction Camps for detailed information on housing and personnel availability. Workers would be transported by bus along the alignment each day for their respective shifts.

[4] Ballast is defined as crushed rock laid in a railroad bed to distribute train weight uniformly across the bed. Subballast is defined as broken stone that does not have to meet the ballast specifications, layered beneath the ballast as a transition between the ballast and the compacted subgrade.

Facility Components – All of the considered quarry sites are located on land under the jurisdiction of the Bureau of Land Management (BLM). Use of these sites is available through the BLM mineral materials leasing program. Reference Section 6.1. Permitting for detailed information on BLM permitting requirements. Each site is anticipated to total between 80 and 120 acres.

Each quarry facility would be comprised of three primary components: an operations plant, the quarry and production area, and a railroad siding (Figure 3-A. Typical Quarry Facility Site Plan). The operations plant would include an office and administration complex, parking areas, services for fueling and maintenance, and sanitary facilities. Portable sanitary systems would be provided on-site; no water supply or wastewater treatment facilities would be provided at the quarry sites. The quarries would be in close enough proximity to construction camps that on-site residential facilities would be unnecessary.

The quarry and production area would include the pit, waste dump, ballast stockpile, production area, settling ponds, emergency generators, water well, and weigh scale. Each pit would be approximately 80 feet deep, with a rectangular footprint of approximately 10 acres. Each waste dump would be approximately 40 feet tall with a 14-acre footprint. The well would supply water for aggregate washing and dust suppression, and the settling ponds would allow recycling of the aggregate wash water. The railroad siding would include a track segment, ballast stockpile and loading facility and would cover approximately 10 acres. Each siding would be sized to accommodate a unit ballast train; however, additional capacity may be required based on construction sequencing and distance from the quarry pit.

Each quarry facility would be accessed by quarry access and/or haul roads. Haul and access roads would be improved to a two-lane cross section with 12-foot-wide travel lanes and 2-foot-wide shoulders. Refer to Section 4.2 Access Roads for detailed information on access road lengths. All haul and access roads would be developed in accordance with the parameters of local, rural roads as defined by Nevada Department of Transportation and American Association of State Highway and Transportation Officials.

If a quarry facility is not located along the mainline, the siding would be separated from the operations plant and the quarry by a haul road. Excavation, production and administration would be conducted away from the alignment and the finished ballast product would be trucked, or transported by mechanical conveyor, to the mainline. Under these conditions, the BLM permit would need to cover the footprint of the plant, the quarry, and the access to the mainline. For quarry facilities located along the mainline, all three features would be in closer proximity and extended haul and access roads would not be necessary. It is anticipated that some of the overburden at each quarry may be used for the stockpile and access road base layers.

Utilities – Each quarry facility would require power and water. As part of the construction activities, new power lines would be installed to provide power to the camps, quarries, water wells, and other features requiring power. The new power lines would connect at local electric grids along the alignment and each quarry facility would tap into the new lines for power capabilities. Each quarry would use a power substation to access the buried lines; the substation area is anticipated to be 50 feet by 50 feet, or 0.06 acre. Backup generators would be available at each quarry for emergencies. Under this scenario, each quarry facility is expected to use 27,600 kilowatt (kW) hours per day. Energy use at each quarry facility during the peak output years would approach 10,074,000 kW hours per year.

Water requirements at each quarry facility may vary depending on the contractor's selected wash process. Water would be used to wash the excavated rock intermittently during the crushing and screening processes. One scenario uses approximately 11 gallons of water per ton of ballast produced. Based on a 3,400-ton ballast production rate, each quarry would need 37,400 gallons of water per day, or about 13,700,000 gallons per year.

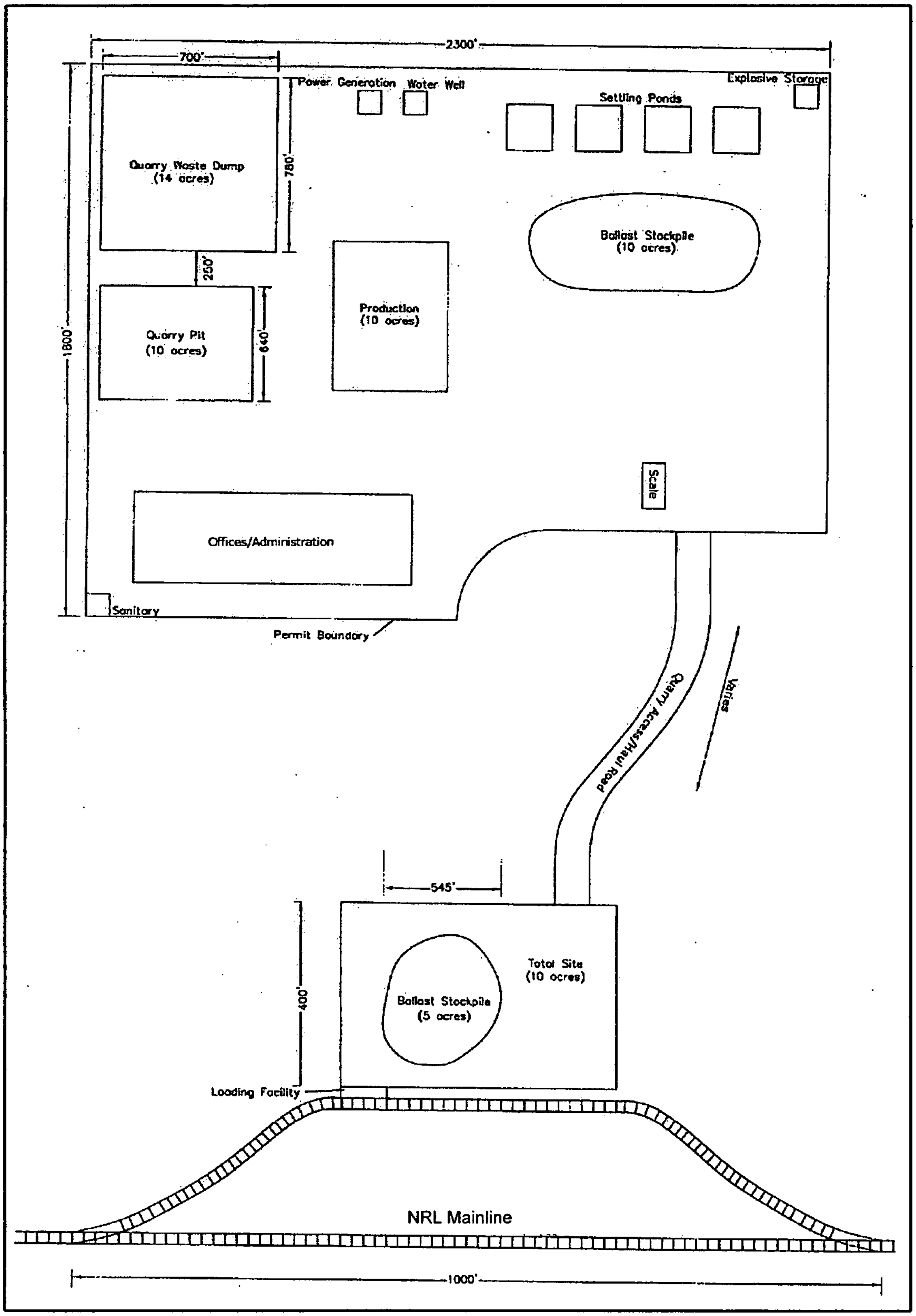

Figure 3-A. Typical Quarry Facility Site Plan
(Developed by S&W – Not to Scale)

Reclamation – Reclamation activities would be in conformance with the BLM *Solid Minerals Reclamation Handbook* (BLM 2002). On-site tasks include the abandonment of wells and the removal of temporary office, shop, production, and power-generation facilities. Terrain restoration tasks include regrading, replacing and grading topsoil, and scarifying and/or revegetating the quarry site as appropriate. The access roads would be demolished by pavement and drainage structure removal, slope and ditch flattening, and scarifying and/or revegetating the impacted areas. All materials reclaimed from the quarry sites and access roads would first be subject to salvage. Any unsalvageable materials would be conveyed to a commercial disposal or recycling facility as appropriate.

3.1.4 Recommended Quarry Sites

Thirteen areas were selected as potential candidates for ballast material production. The potential quarry locations were prioritized by material availability, environmental impact, and location. After the completion of field surveys, five areas were determined to contain either insufficient quantities of material for ballast production or materials of insufficient quality for ballast production. The eight remaining candidate areas were determined to contain sufficient topographic and geologic characteristics to accommodate quarry facilities. There are no significant differences in material quantity or quality between the eight quarry sites referenced above. However, two areas were determined to have a higher level of environmental impact due to closer proximity to private land and biological resources. Therefore, six areas, illustrated in Figures 3-B through 3-F, are presented as potential quarry locations subject to further environmental analysis. Therefore, barring any significant environmental impacts, location and proximity to the alignment would direct the selection of quarry sites. Proximity to the rail line improves the logistics of transporting ballast to the alignment. Selecting one quarry site at the beginning of the CRC (near the town of Caliente) and one quarry site midway along the CRC (south Reveille Valley or Goldfield) would help to reduce construction costs associated with transporting the finished ballast product. Field evaluations for each of the six sites are attached in Appendices A-F.

Two of the six locations would be developed on an as-needed basis. In the eastern part of the alignment, quarry site CA-8B is available in the Caliente area (Figure 3-C). Quarry sites NN-9A and NN-9B, in the south Reveille Valley, could be developed regardless of the chosen alignment (Figure 3-D). A quarry facility site could also be located in the Goldfield area. Quarry site ES-7 could be developed if the Goldfield 4 alignment is selected (Figure 3-F); quarry site NS-3A or NS-3B could be developed if either of the other Goldfield alignments is chosen (Figure 3-E).

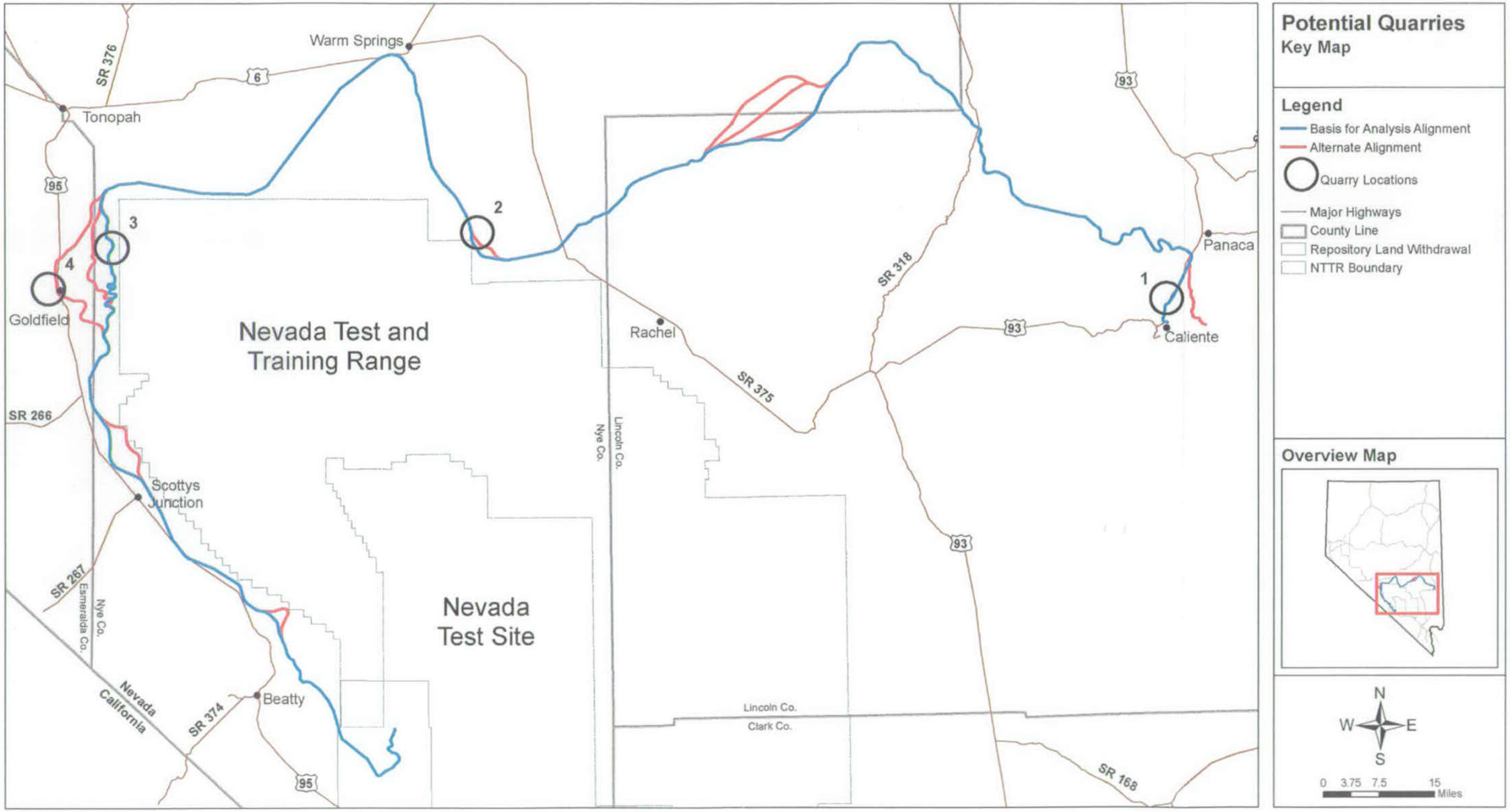

Figure 3-B. CRC Quarry Location Key Map

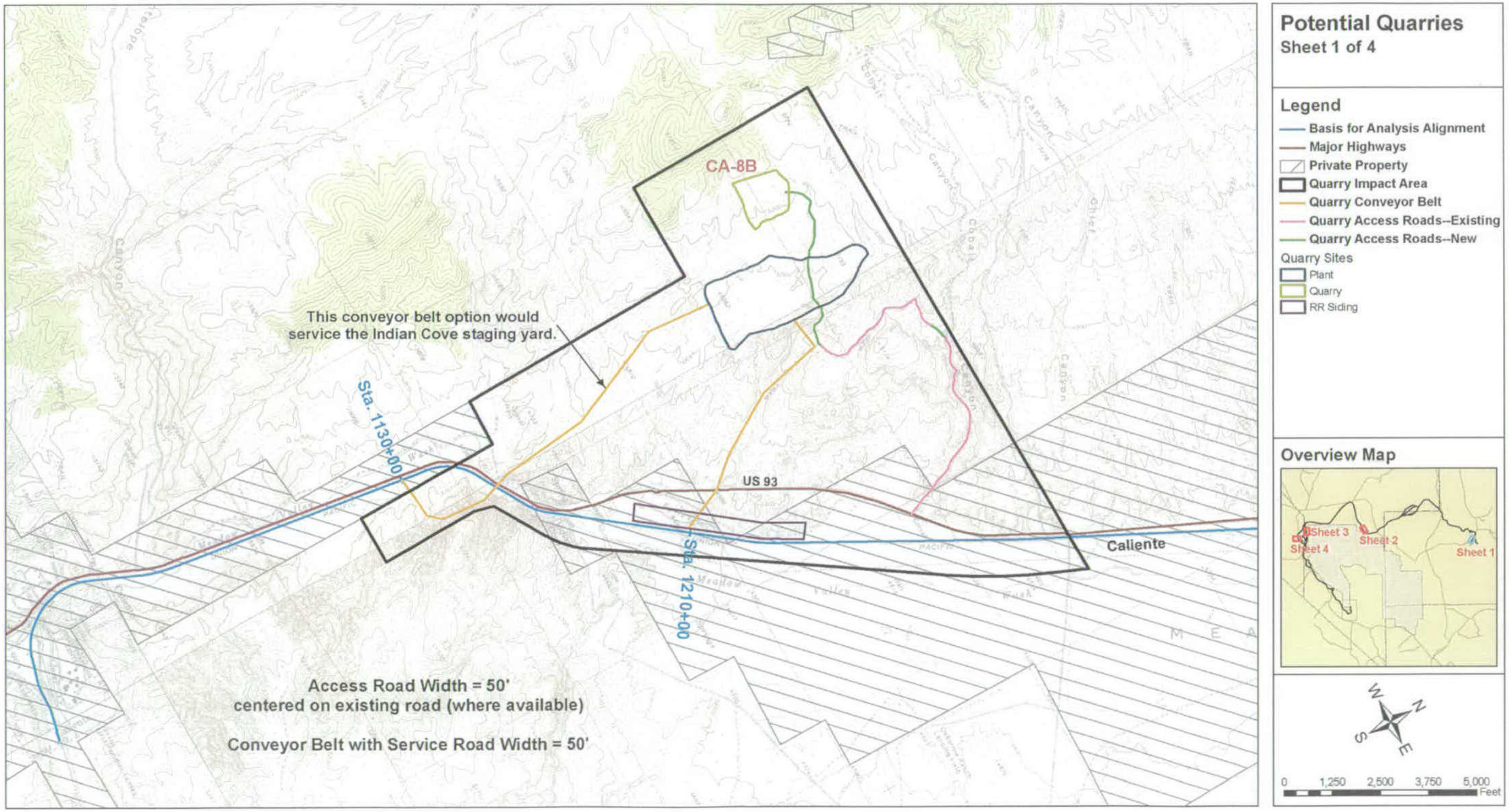

Figure 3-C. Quarry Site CA-8B Northwest of Caliente

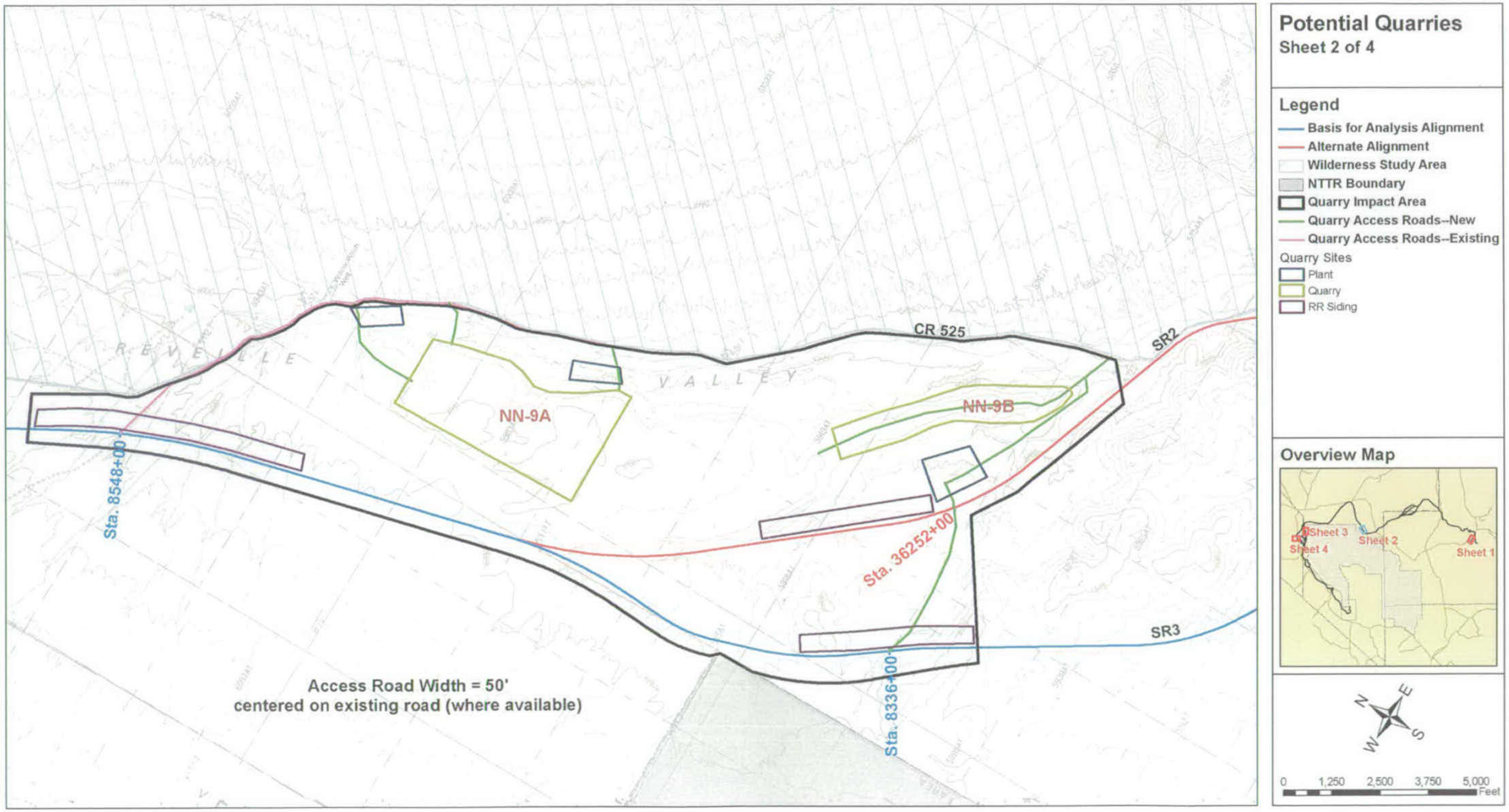

Figure 3-D. Quarry Sites NN-9A and NN-9B in the South Reveille Valley

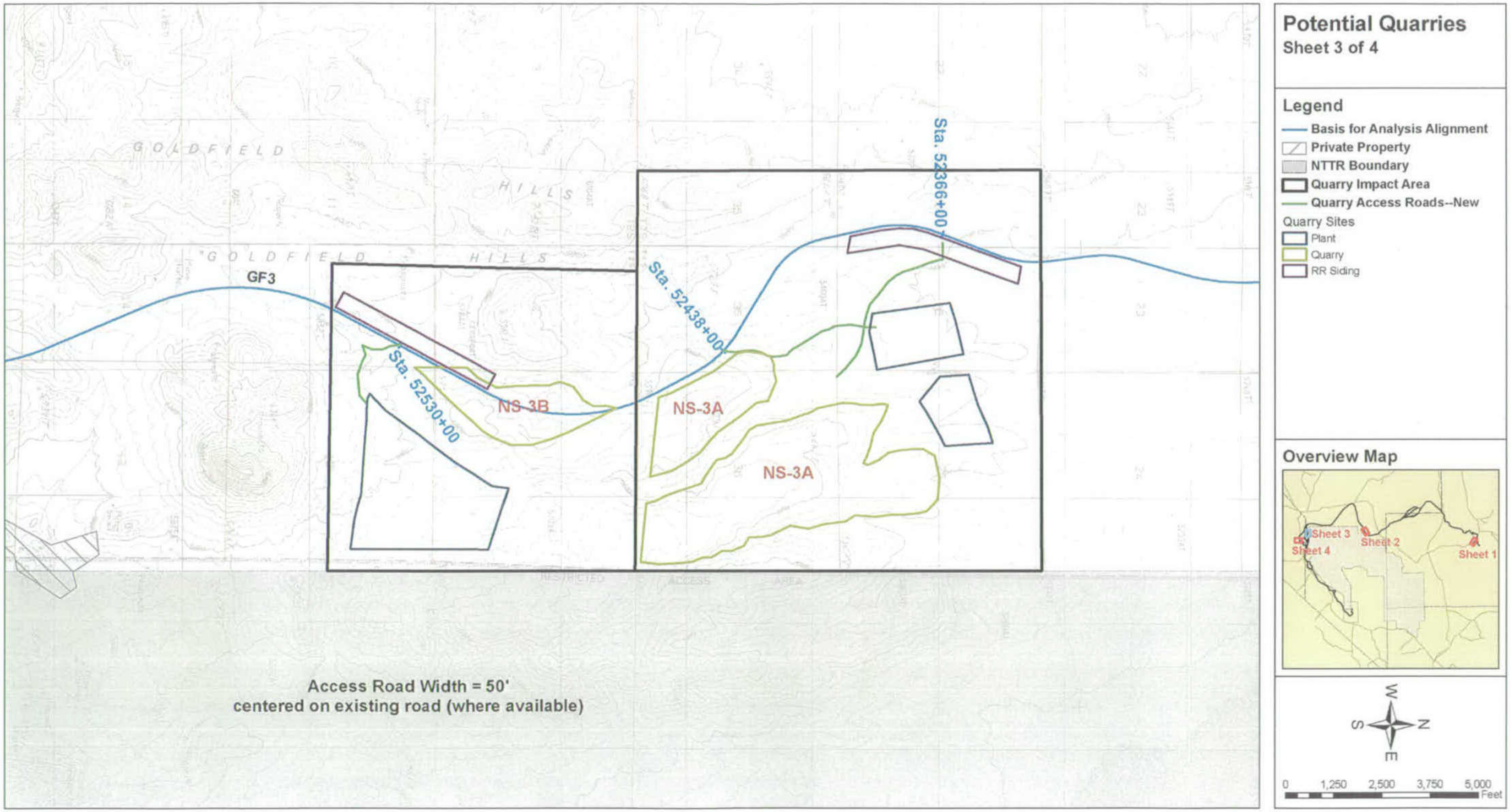

Figure 3-E. Quarry Sites NS-3A and NS-3B Northeast of Goldfield

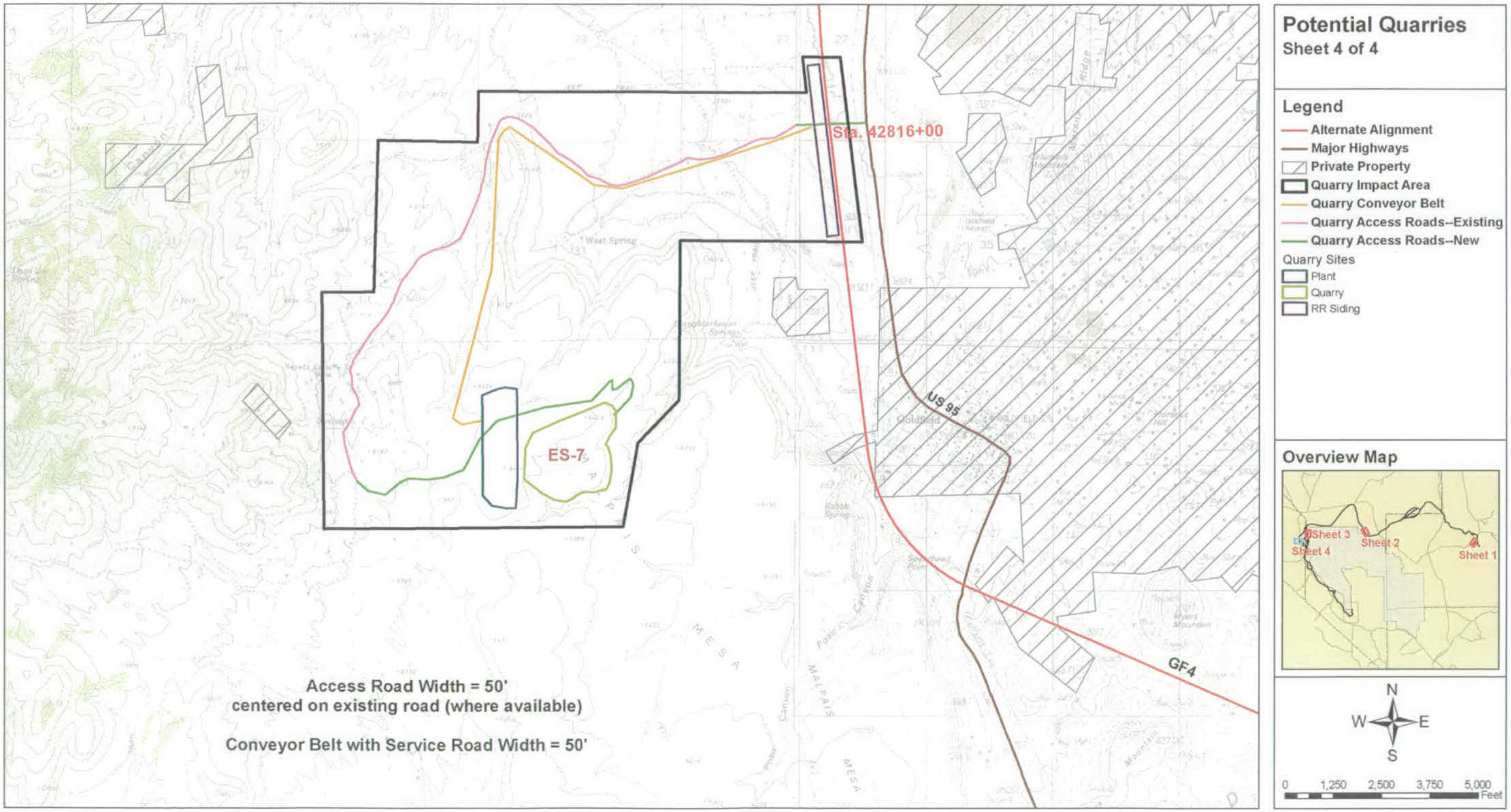

Figure 3-F. Quarry Site ES-7 West of Goldfield

3.2 CONCRETE TIES

Concrete ties are currently identified as the type of cross tie for use on the NRL based on the best cost and life-cycle value. Both standard cross ties and switch ties would be concrete. The estimated quantity of concrete cross ties is 1,020,000 (24 inch center-to-center) for standard track construction and over 100 sets of switch ties for the turnouts at sidings and yard tracks. Commercially available manufacturers should be able to supply these quantities over the two year delivery requirement to meet track construction production rates. It is also possible that a tie producer (or a contractor) could establish a dedicated tie production facility in Caliente (or other area) for the CRC project. Delivery by rail to Caliente is anticipated as the primary location for marshalling ties over the CRC alignment. (Note: wood cross ties and switch ties are not precluded from use on the NRL based on cost and life-cycle value assessments at the time construction actually occurs.)

3.3 RAIL

Rail for the NRL would be 136 RE welded rail. The nominal CRC alignment of 331 miles; plus sidings and yard tracks, approximates 2,834 strings, 1,440 feet long. It is anticipated that 80-foot-long rails would be delivered by rail from the rail manufacturing plants to Caliente for welding into the 1,440-foot-long strings, and to be distributed along the CRC by dedicated welded rail trains. A portable welding plant would initially be set up at Caliente and later relocated along the alignment at 50 to 100 mile increments to weld the 80-foot-long rail into strings. Alternatively, offline welding of the rail is possible, but would require dedicated welded rail trains to support track construction activities. These trains would be subject to the same conditions outlined above for movement of ballast over the UPRR.

3.4 CONCRETE

Concrete for site placement activities at the various bridges, as shown on the plan and profile drawings, would be obtained from portable batch plants set up near the construction sites. All aggregate and cement is anticipated to be trucked from the portable batch plants to those locations. Pre-cast concrete bridge elements would be manufactured at existing commercial sources off the project and trucked to the bridge sites.

3.5 STEEL

Steel required for the bridges would be supplied from existing commercial fabricators. Transporting of the bridge steel to the project would be by rail and/or truck depending upon size and weight considerations.

4.1 CONSTRUCTION CAMPS

4.1.1 Camp Locations and Criteria

The alignment traverses areas with low population densities. A local workforce is not available along the majority of the route. Of the limited options for bringing workers to the vicinity of the alignment, only construction camps reduce commute time and allow workers to devote more of their shift to construction and less to travel. Bussing workers to the alignment or allowing them to drive their personal vehicles on a daily basis requires more time spent traveling and may create safety hazards on long repeated trips.

The camps would be located along the alignment and would be linked by the alignment access road that would be graded during the preconstruction activities. The recommended speed on a graded, unpaved road is approximately 30 mph for a commuter bus. A commute of approximately 30 minutes at a speed of 30 mph yields a maximum distance of 15 miles from each camp. Therefore, the camps would be located approximately 30 miles apart. This distance would be adjusted for local conditions such as access to public roads and site topography. Up to 12 camps would be constructed along the length of the CRC under this scenario (Figure 4-A. CRC Construction Camp Key Map).

To minimize the need to create new roads, the construction camps would be accessed by a combination of existing public roads and alignment access roads. Camps would be sited as close as possible to the intersection of an existing public road and the alignment access roads within the constraints of local topography. The suggested dimensions for a construction camp are approximately 2,400 feet by 400 feet for a total of approximately 25 acres (Figure 4-B. Typical Construction Camp Site Plan). The long, narrow layout would allow the camp to remain between the alignment and anticipated ROW boundary. Table 4-1 identifies the selected locations of the construction camps and each primary access point. Appendix G contains aerial coverage of each selected location.

Table 4-1. Construction Camp Locations

Camp No.	Approximate Station	Primary Access Point
1	Eccles: 20499+00 Caliente: 1492+00	Unnamed Road
2	3127+00	Rattlesnake Road
3	4726+00	Unnamed Road
4	57036+00	Freiburg Road
5	7639+00	State Route (SR) 375
6	9214+00	Unnamed Road
7	10770+00	Unnamed Road
8	12147+00	Unnamed Road
9	13809+00	Unnamed Road
10	15176+00	Unnamed Road
11	16391+00	Fleur de Lis Road to Cat Canyon Road
12	17760+00	Unnamed Road

Note: Construction Camp 1 would serve either the Caliente segment or the Eccles segment.

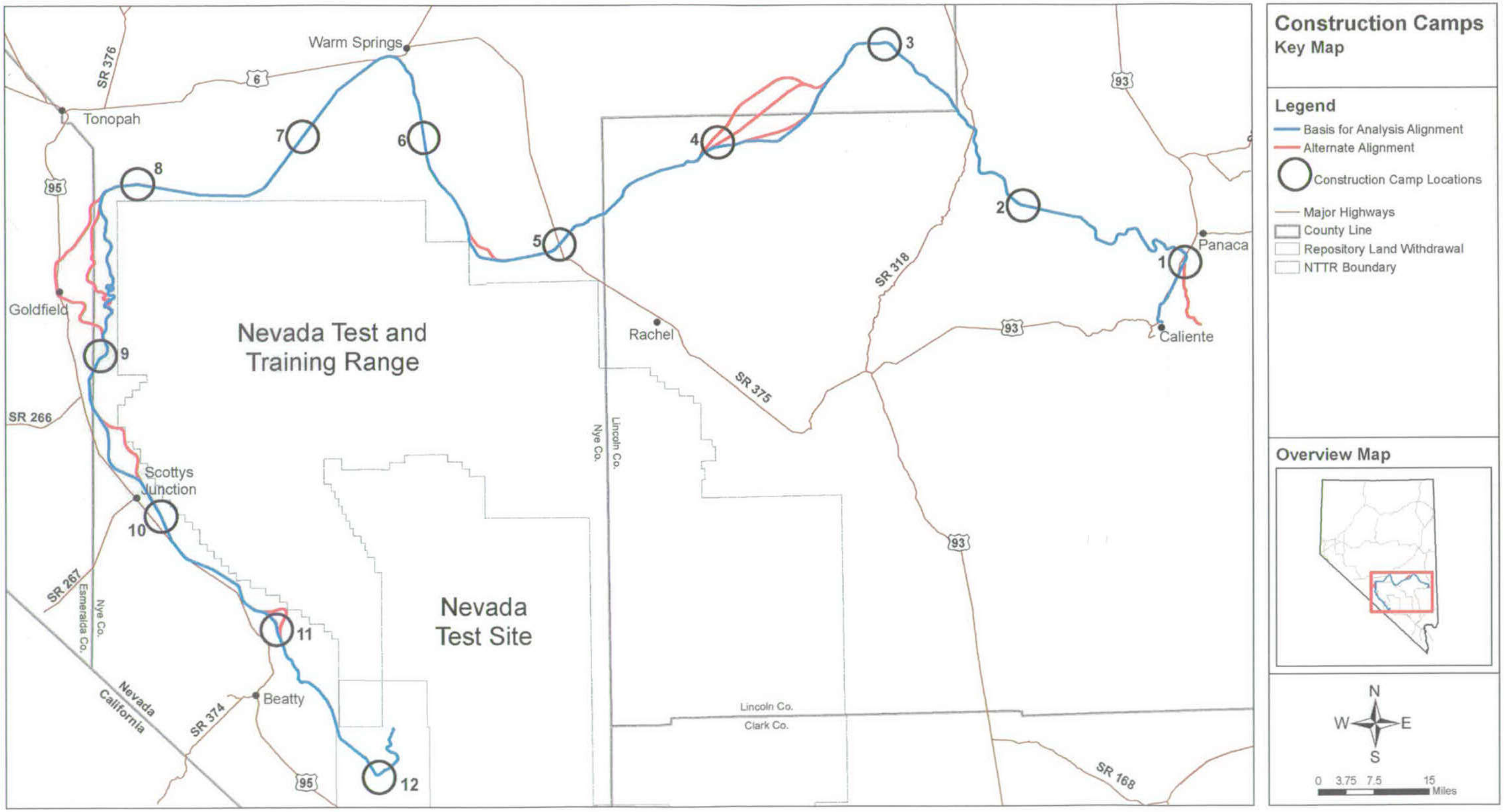

Figure 4-A. CRC Construction Camp Key Map

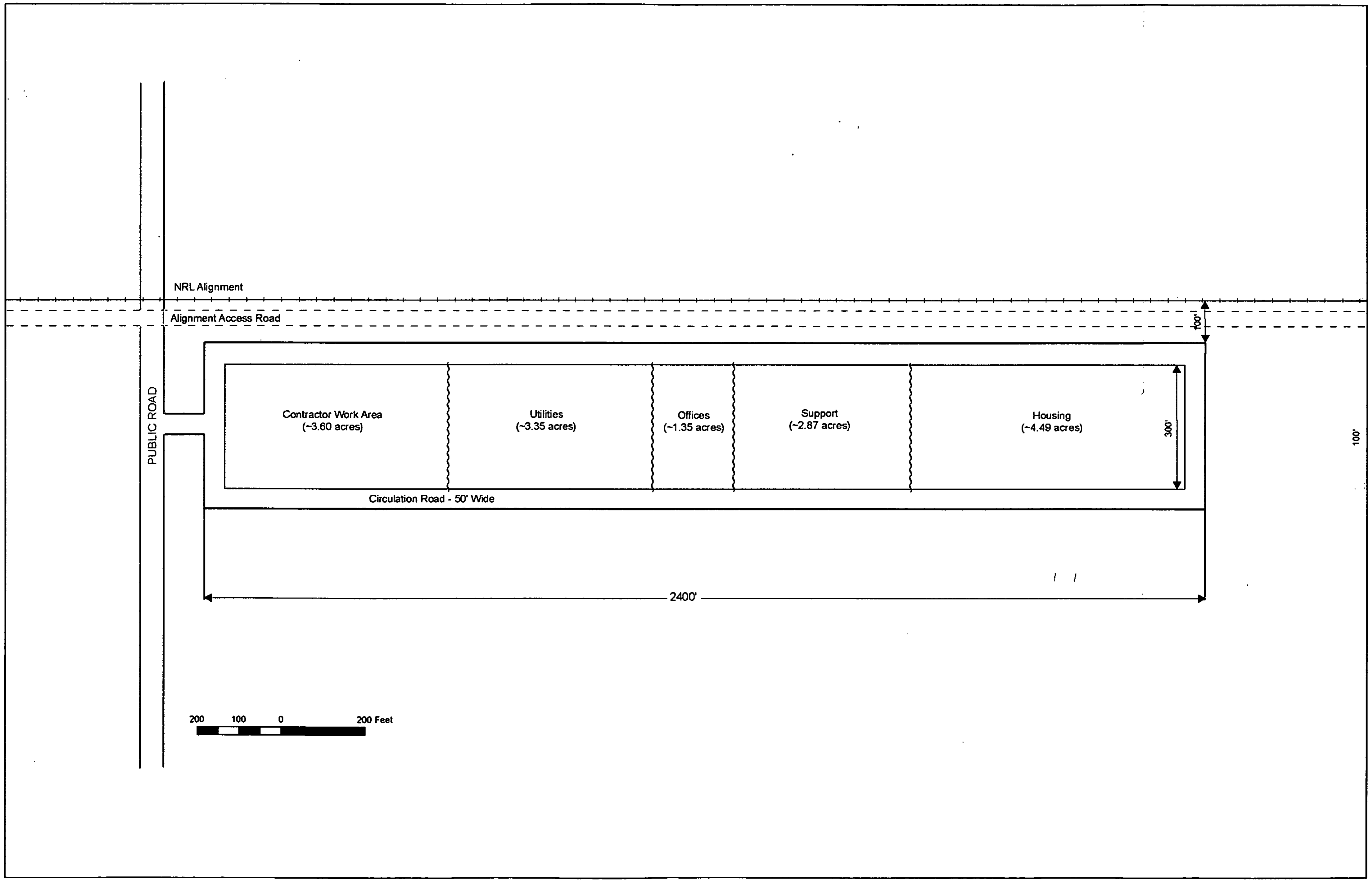

Figure 4-B. Typical Construction Camp Site Plan

Each construction camp would include housing, offices, support facilities, utilities, and a contractor work area, as well as auxiliary components such as fencing, gates, lighting, parking, and roads. It is anticipated that each camp would be built in a six-month period and would have a lifespan of approximately five years. The camps would be built in advance of, and remain open after, CRC construction to provide contractor laydown areas, and support services (e.g., fuel and medical services) during all phases of construction. Impacts and activities at each camp will peak when construction is within 15 miles of either direction of a given camp. Construction within 30 miles of each camp is estimated to last approximately one year. Cost estimates for construction of the camps are provided in *Comparative Cost Estimates, Caliente Rail Corridor* (NRP 2007c). In addition, it is assumed that the construction camps would be the total responsibility of the contractor, subject to the development of a final procurement program.

4.1.2 Camp Components

Personnel and Housing – Each construction camp would be designed to accommodate approximately 360 people: 254 contractor employees and 106 employees for such functions as construction administration, utilities, emergency services, and support. The maximum personnel at each camp would include 40 professional staff, 20 clerical staff, and 300 craftsmen. A minimum of 50 people would reside at each camp during off-peak periods. For an overview of CRC staffing requirements, reference Table 1, Appendix D of *Air Quality Emission Factors and Socioeconomic Input, Caliente Rail Corridor* (NRP 2007a). Specific personnel requirements per camp are listed in Table 4-2.

Table 4-2. Personnel Breakdown Per Camp

Type of Personnel		Number
Contractor	**Subtotal**	254
Construction Administration	DOE	3
	Nevada Representative	1
	County Representative	1
	Management Consultants	5
	Resident Engineer	1
	Administrative Assistants	2
	Surveyors	3
	Materials Testing Technicians	2
	Safety and Oversight Specialists	3
	Construction Inspectors	3
	Visitors	6
	Subtotal	30
Utilities	Water	1
	Sewer	1
	Electricity	1
	Subtotal	3
Emergency Services	Fire	3
	Police	6
	Medical	4
	Licensing	1
	Subtotal	14

Table 4-2. Personnel Breakdown Per Camp

Type of Personnel		Number
Support	Service Station	4
	Janitorial and Housekeeping	36
	Commissary	3
	Food Service	16
	Subtotal	59
	Typical Personnel Per Camp	360

Under this scenario, construction and support workers would work for two weeks and have one week off. Three groups of workers (two on and one off) would rotate to fill the construction schedule. It is assumed that all workers would drive their personal vehicles to the camps for their two-week stay. Parking would be distributed across the various sectors of each camp. Construction workers would then be bussed along the alignment to their respective work sites. Some contractor employees, construction administration personnel, and outside vendors would drive their assigned work vehicles daily to the camps and construction sites.

Under one camp layout scenario, all personnel would be housed in pre-fabricated double-wide trailers. Each single-story trailer would be constructed to house 12 individuals in separate rooms with one bathroom per room. Housing the estimated personnel would require a total of 30 trailers. Each trailer measures approximately 28 feet by 70 feet. Adding in a buffer for sidewalks and access that are compliant with the Americans with Disabilities Act brings the total footprint per trailer to 50 feet by 100 feet (5,000 square feet).

Another camp layout option incorporates a motel structure of pre-fabricated "wings" of sleeping rooms attached to a center support facility. The support facility would be similar to that described in the support component. Each wing would include 36 rooms for a total of 10 wings. The footprint would differ slightly by incorporating some support facilities into the overall structure. However, all 10 wings would cover approximately the same area as the 30 trailers described above and the footprint would not change to overall construction camp site plan.

The housing facilities at each construction camp would cover approximately 150,000 square feet (3.44 acres). Associated parking needs increase the total housing area to approximately 4.6 acres.

Support – The support sector of each camp would encompass a commissary, kitchen, cafeteria, and indoor and outdoor recreation facilities, a service station and fueling area, and medical facilities.

The center of the support sector would be the commissary, cafeteria, and indoor recreation facility. The commissary would include laundry facilities as well as a drug store and market for non-perishables. Constructed of pre-fabricated, modular components, this building would also include a commercial kitchen for meal preparation. Both the indoor and outdoor recreation areas would be constructed to contractor specifications; these areas have been included in the footprint to provide a more accurate picture of the camp footprint. The commissary, kitchen/cafeteria, and recreation areas are each anticipated to measure 100 feet by 100 feet (40,000 square feet total), for a total of 0.92 acre.

The service station and fueling area would include a pumping island, above-ground fuel tanks, vehicle bays, storage and parking. The pumping island would measure 80 feet by 45 feet (3,600 square feet), the fuel tank area would measure 80 feet by 30 feet (2,400 square feet), and the bays/storage/parking would measure 80 feet by 60 feet (4,800 square feet). The entire area would measure 80 feet by 135 feet

(10,800 square feet), or 0.25 acre. In addition, a pumper truck with a water tank trailer would be stored at the service station to respond to fire emergencies in each camp.

A single-story double-wide trailer would be used as the health services center. Four rotating medical personnel would work at each camp. In addition, the construction camp site layout allows for the potential to construct a metal helipad adjacent to the health services center. Helicopter access would allow patients with life-threatening conditions to be transported to Reno, Nevada or Las Vegas, Nevada for more extensive medical care. Helipad operations would approximate two take-offs and two landings per day. Over-the-counter health and medical supplies would be available at the commissary. Space allotted for each helipad would measure 200 feet by 200 feet (40,000 square feet), or 0.92 acre. The trailer would cover 5,000 square feet, or 0.11 acre, for a total of 1.03 acres used for medical facilities.

The support facilities at each construction camp would cover 2.21 acres; associated parking requirements would bring the total to 2.88 acres.

Offices – Prefabricated double-wide trailers would also be used for offices in each camp. A total of nine single-story trailers would be necessary for: the contractor (2), DOE (1), construction management (1), technical support and surveyors (1), safety and oversight (1), material testing lab (1), and visitors (1). The visitor offices would also house a conference room. An additional trailer would be used for the support offices. The camp facilities and all support functions would be administered in the office sector.

The office facilities at each construction camp would consist of nine trailers covering 45,000 square feet (1.03 acres). Associated parking requirements would bring the total to 1.35 acres.

Utilities – The utilities sector of each construction camp would include areas dedicated to power, wastewater treatment, water treatment, and trash. The peak output calculations for each utility below are based on the anticipated per person daily use multiplied by 360. The construction camps are anticipated to have a lifespan of approximately five years. However, only one of those years should require peak output of any given utility. Demand is expected to rise as each camp opens to peak output and fall as each camp closes. Communications capabilities are anticipated to be implemented per a satellite protocol.

As part of the construction activities, new power lines would be installed to provide power to the camps, quarries, water wells, and other features requiring power. During roadbed construction, an underground, high-voltage 25-kilovolt distribution cable would be placed under the roadbed constructed for the CRC alignment in areas where power will be required during construction and/or operations. Fiber-optic cable, encased in a PVC duct, would be placed in the same trench. The new power lines would connect at local electric grids along the alignment and each camp would tap into the new lines for power capabilities. Energy demands would be met by portable generators until an interconnection with the existing power distribution system is established.

Each camp would use a power substation to access the buried lines; the substation area is anticipated to be 50 feet by 50 feet, or 0.06 acre. Backup generators would be available at each camp for emergencies. Under this scenario, each person is expected to use 150 kW hours per day. Energy use at each camp during the peak output year would approach 54,000 kW hours per day, or 19,710,000 kW hours per year.

Potable and non-potable water needs would be met by drilling wells at each camp. Reference Section 4.4. Construction Water Requirements for detailed information regarding well excavation, construction, and production. A portable water treatment facility would be installed to meet water needs which, under this scenario, are 80 gallons per day per person. Water consumption at each camp during the peak output year would approach 28,800 gallons per day, or 10,512,000 gallons per year. Water would be stored in tanks on-site for camp use. The well, treatment facilities, and water storage tank(s) are anticipated to cover 1.0 acre. Depending upon the final design, the water treatment process would result in the production of minor amounts of sludge.

A portable wastewater treatment facility (WWTF) would be installed at each camp. Under this scenario, each person is expected to account for 70 gallons of wastewater per day (Nevada Administrative Code [NAC] 444.8312). Wastewater production at each camp during the peak output year would approach 25,200 gallons per day, or 9,198,000 gallons per year. It is anticipated that WWTF effluent (i.e., grey water) produced at the camps would be used in soil compaction and dust suppression activities. The estimated acreage for the wastewater treatment area is 1.0 acre. The wastewater treatment process would result in the production of biosolids (i.e., sludge). This sludge would be disposed at a licensed facility in accordance with state and federal laws.

Temporary trash storage would be provided in each camp. A commercial garbage contractor would periodically service the camps, hauling trash off-site to landfills along the alignment. It is anticipated that a recycling program would be instituted by the construction camp contractor. Reference Section 6.2. Waste for detailed information regarding anticipated waste streams and landfill construction and permitting protocols. Under this scenario, each person is expected to produce 10 pounds of solid waste per day. Solid waste production at each camp during the peak output year would approach 3,600 pounds per day, or 1,314,000 pounds per year. The trash storage area is anticipated to cover 150 feet by 150 feet, or 0.52 acre.

The utilities sector at each construction camp would cover 2.58 acres; associated parking requirements would bring the total to 3.35 acres.

Contractor Work Area – The contractor work area would encompass sections for maintenance, parts storage, and materials storage. The maintenance area would be 100 feet by 100 feet (0.23 acre). The parts storage area would be 100 feet by 200 feet (0.46 acre). The materials storage area would be 300 feet by 300 feet (2.07 acres). Additional staging and storage/lay down areas would be available at the Caliente yard, the GROA, the two MOW facilities near Tonopah, and the track-sidings locations along the alignment. The contractor work area at each construction camp would cover 2.75 acres; associated parking requirements would bring the total to 3.60 acres.

Auxiliary Components – Other features of the construction camp design include the circulation road, parking, the main gate, fencing, and lighting.

A roadway with a 50-foot-wide cross section would encircle each camp to provide vehicle access to the facilities in each sector. Parking would be provided for 360 personal vehicles as well as support or vendor vehicles and supply trucks that arrive on a daily basis. Parking spaces are estimated to measure 12 feet by 35 feet. Approximately 3.75 acres would be available for parking, distributed within the five sectors of each camp.

Access to each camp would be provided via a main gate. Security personnel would be stationed at the main gate and would administer badging and licensing requirements as necessary. Only personnel affiliated with NRL construction would be permitted to enter the camps and all entrants would require a badge. Each camp would be fenced outside the perimeter of the circulation road. Lighting would be positioned on each building and as necessary in the utility sector and along the fenceline to enhance the safety and circulation for both motorists and pedestrians in the camps.

4.1.3 Area of Disturbance Summary

Table 4-3 lists the acreage for each sector included in the construction camp design.

Table 4-3. Acreage Breakdown of Each Construction Camp Sector

Sector	Facility	Dimensions (feet by feet)	Total Square Feet	Acreage
Housing	Trailers (30)	50 x 100	150,000	3.44
	Parking	As needed		1.15
	Subtotal			**4.59**
Support	Commissary	100 x 100	10,000	0.23
	Kitchen/Cafeteria	100 x 100	10,000	0.23
	Indoor Recreation	100 x 100	10,000	0.23
	Outdoor Recreation	100 x 100	10,000	0.23
	Health Services Center	50 x 100	5,000	0.11
	Helipad	200 x 200	40,000	0.92
	Above-Ground Fuel Tanks	80 x 30	2,400	0.06
	Fueling Island	80 x 45	3,600	0.08
	Bays/Storage/Parking	80 x 60	4,800	0.12
	Parking	As needed		0.67
	Subtotal			**2.88**
Office	Trailers (9)	50 x 100	45,000	1.03
	Parking	As needed		0.32
	Subtotal			**1.35**
Utilities	Power Substation	50 x 50	2,500	0.06
	Wastewater		43,560	1.00
	Water		43,560	1.00
	Trash	150 x 150	22,500	0.52
	Parking	As needed		0.77
	Subtotal			**3.35**
Contractor Work Area	Maintenance	100 x 100	10,000	0.23
	Part Storage	100 x 200	20,000	0.46
	Materials Storage	300 x 300	30,000	2.07
	Parking	As needed		0.84
	Subtotal			**3.60**
Circulation Road	Roadway	50 x 5,348	267,400	6.14
			Typical Construction Camp Disturbance Area	**21.91**
			Contingency Acreage	**3.09**
			Grand Total	**25.00**

4.2 EQUIPMENT LAYDOWN AREAS

The yard facilities at either end of the alignment are viewed as staging areas for the contractor. Additionally, the MOW trackside facility would also provide a major area for temporary storage of construction-related materials. Secondary lay down areas are anticipated at the NRL track-sidings locations along the alignment.

4.3 TEMPORARY FACILITIES

Throughout the length of the NRL alignment construction, haul roads would be developed within the ROW to support the various construction activities. In various locations existing unpaved roads would be improved to provide access for construction personnel and materials delivery. Road improvements would be undertaken in select locations between existing paved roads and the NRL alignment. Upon completion of construction activity these roads can be left in place for future maintenance access to the NRL alignment.

At the major bridge construction sites, batch plants to support concrete placement activities would be set up for the duration of that work. Likewise, at the major rock excavation sites, portable rock crushers to produce subballast would be set up including areas to stockpile the material developed from that operation.

Borrow areas would be developed along the alignment to support embankment operations. These areas would tend to be linear excavations paralleling the embankment work to minimize haul distances. Typical ditch cross sections would be widened to develop sufficient volumes of material.

Portable welding plant(s) would be set up to weld the 80-foot-long rail into 1,440-foot-long strings. This activity would require a 2,000-foot-long level area sufficient to store the 80-foot rail and accommodate a rail train for loading of the 1,440-foot-long strings. Therefore, yard and siding areas are likely candidate sites for this type of facility.

The siding locations would be utilized as staging areas. As work progresses to the west, it is envisioned that the contractor would move staging areas to the next forward siding location. Consequentially, the embankment areas would be widened to accommodate temporary tracks and laydown areas. ROW considerations will take this approach into account in establishing land requirements.

During the course of constructing the railroad, numerous work trains would operate over the alignment. To manage dispatching of those trains and their maintenance, an operations control center for construction would be required. For construction progressing from the Caliente end westward, the yard area at Caliente would be the logical location for this activity.

4.4 CONSTRUCTION WATER REQUIREMENTS

4.4.1 Introduction

Water requirements for the project during construction fall into four general categories: water for earthwork compaction, water for construction personnel, water for dust control, and water for ballast quarry operations. The total amount of water required for these activities is estimated to be 6,100 acre-feet. This estimate is based on cut and fill quantities derived from 5-foot contour mapping. The source of water is planned to be from wells drilled along the alignment in proportion to the localized demand from each of the activity categories. Approximately 230 potential wells have been identified for the basis for analysis, the alternate alignments, the construction camps and the quarries. However, for cost estimation purposes, approximately 170 wells are anticipated to be drilled to support construction of the basis for analysis. Data and information on well locations and development were obtained from Converse Consultants (Converse Consultants 2006). Exact well data is contained in *Hydrologeologic DEIS Analysis Report, Rev. 0* (Converse Consultants 2006). Demand quantities were developed from *Engineered Plan & Profile Drawing Set, Caliente Rail Corridor* (NRP 2006), *Facilities–Design Analysis*

Report, Caliente Rail Corridor (NRP 2007d) and *Comparative Cost Estimates, Caliente Rail Corridor* (NRP 2007c). Ongoing engineering work utilizing 5-foot contour mapping since the development of those documents may result in changes to the final quantities used to develop the demand forecasts. Trending of the earthwork analysis is to a reduced quantity demand; therefore, demand quantities used for this report are viewed as a bounding condition.

4.4.2 Quantity Requirements

Earthwork Compaction – The largest use of water for this project would be for the compaction of approximately 27,020,000 cubic yards of alluvial fill material to construct the embankment areas of the roadbed and facilities. This total is based upon the basis for analysis (Figure 4-C. CRC Hydrologic Basins). Alternate alignment selections have also been analyzed for water demand and their individual selection and substitution would cause the total demand quantity to vary accordingly. Current compaction practices in southern Nevada utilize, on average, 90 gallons of water per cubic yard of alluvial fill material, including appropriate dust control during placement. This activity would thus require 1.786 billion gallons or 5,500 acre-feet of water.

Construction Personnel – Domestic water for support of the labor force is the second highest demand. It is estimated that at a rate of 80 gallons per person per day for a work force of 2,100, the daily demand would be 168,000 gallons. For a two-year full employment schedule (168,000 gallons/day x 360 days/ year x 2 years), the total amount of water would be 121,000,000 gallons or 370 acre-feet of water. The 2,100 workers represent an average aggregate of work force personnel for a four-year construction duration. Therefore, the bounding condition for water consumption by construction personnel is 168,000 gallons per day.

Dust Control – Dust control along access roads requires the third highest amount of water. Various existing gravel roads would be utilized for access to the alignment during construction. Approximately 60 miles of roads are anticipated to be in active use at any one time. The duration of activity would span a cumulative timeframe of three years, and the rate of application of water would be 60,000 gallons per day. These parameters yield a requirement of approximately 65,000,000 gallons or 200 acre-feet of water over a three-year period.

Ballast Quarry Operations – The last demand source is water for the operation of a ballast quarry. Water would be used primarily for washing the ballast and would be recirculated through settling ponds. This activity would require approximately 10,000,000 gallons or 30 acre-feet of water.

4.4.3 Water Demand By Basin

The water sources for project construction are located in 20 hydrologic basins (Figure 4-C). Table 4-4 details the demand for water by basin for the basis for analysis. The quantities shown in Table 4-4 were used as the basis for the total project demand of approximately 6,100 acre-feet. Table 4-5 details the demand for water by basin for the alternate alignment segments. The water demand totals include the water required for construction of the interchanges and staging yards, the MOW trackside facility, the MOW headquarters, and the EOL facility. Footnotes indicate in which hydrologic basin each facility is located. For specific water requirements for facility construction and operation, reference *Facilities–Design Analysis Report, Caliente Rail Corridor* (NRP 2007d). The Caliente Upland location is the basis for analysis of the staging yard.

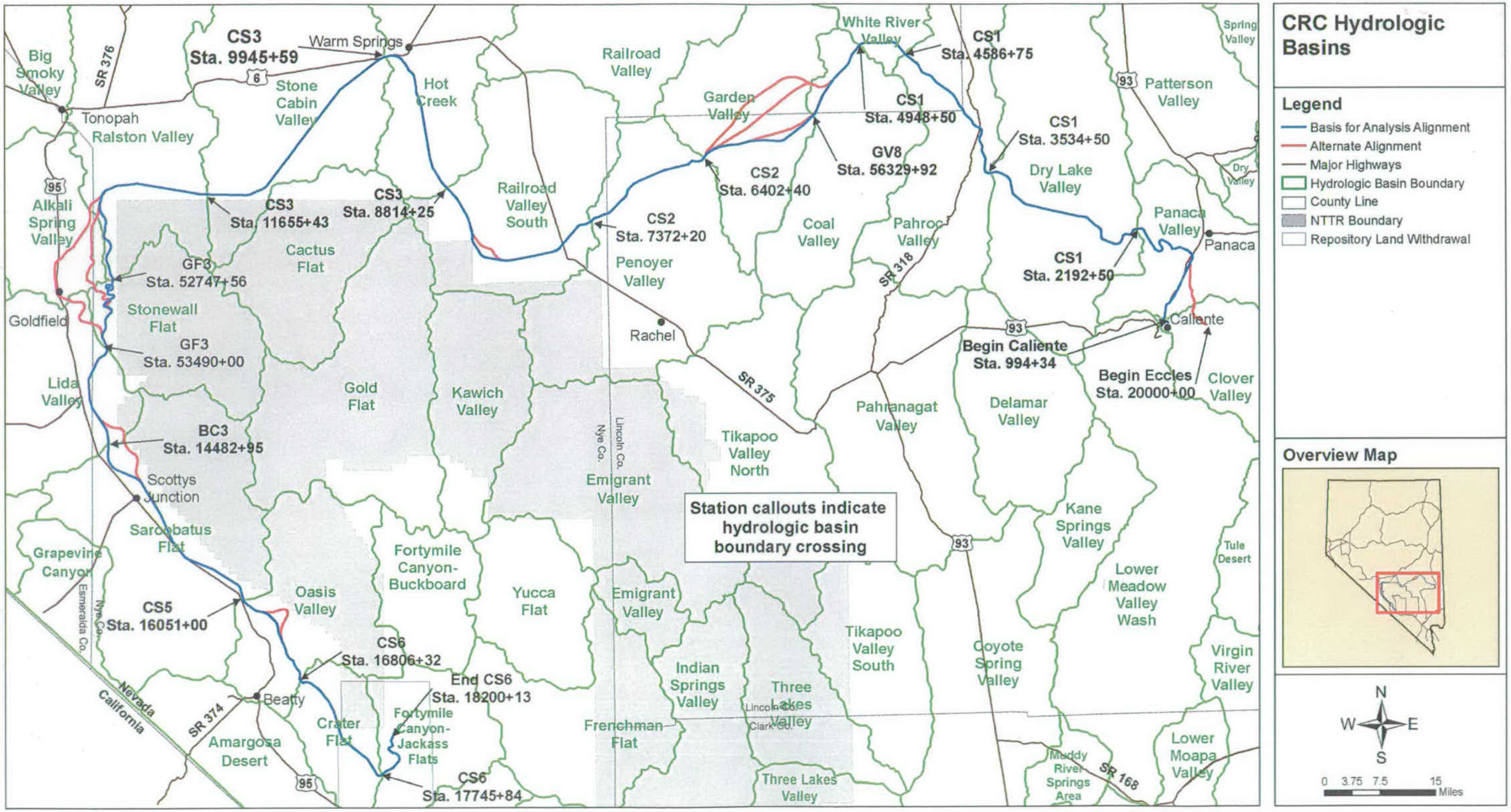

Figure 4-C. CRC Hydrologic Basins

4.4.4 Water Source Availability

In each water basin, water availability was reviewed to determine well siting to meet demand as shown in Tables 4-4 and 4-5. As a bounding condition, well production capacities were calculated at a flow rate of 50 gallons per minute. The combination of the demand locations and production parameters resulted in the need for 232 potential wells to satisfy demand. The number of new well sites by basin is listed in Table 4-6. Well Sites by Hydrologic Basin. Proposed locations of new well sites are shown in Appendix H. Of the 232 wells, 180 are located within 500 feet of the alignment centerline, 39 are located beyond 500 feet of the alignment centerline, and 13 are located at quarry sites. The actual number of wells required for the project would vary based upon the actual flow rate of successfully drilled wells. As mentioned in Section 4.4.1, approximately 170 wells are anticipated to be drilled to support construction of the basis for analysis. Well depths are expected to range from 200 feet to 2,000 feet, with an average in-use depth of 400 feet. Portable WWTFs would be provided as necessary where potable water is required.

At well sites located beyond 500 feet of the alignment centerline, a 250-foot by 250-foot drilling activity area would be set up. Once the well has been drilled, the site would be reclaimed in accordance with DOE and BLM requirements. Access roads would be required to reach the sites and to accommodate four- to six-inch-diameter temporary pipelines constructed to transport the water to the alignment ROW. The temporary pipelines would be constructed on top of the ground next to an existing road or a new 10 -foot-wide maintenance road. At the outfall of each pipeline a temporary reservoir, approximately 100 feet by 100 feet by 10 feet, would be constructed to hold the daily production of each well. A reservoir would allow the well production rate to be equalized with daily demand for water at the demand location.

Well sites identified within 500 feet of the alignment centerline are approximate and are subject to final design and field reconnaissance for final siting within the ROW. These wells would also have temporary reservoirs built adjacent to them to allow for equalization of the well production rate to the daily construction activity demand. In the event that more than one well at a particular demand location is necessary, the above dimensions for a holding reservoir may be modified.

Following the completion of construction, some well locations could remain in operation to supply permanent facilities that may be located near sidings, yards, etc. Wells not needed for operation of the rail line would be properly abandoned in compliance with State of Nevada regulations, and the sites and access roads reclaimed.

Table 4-4. Water Requirements by Hydrologic Basin for the CRC Basis for Analysis[5]

Hydrologic Basin	Segment	Beginning Station of Basin	Ending Station of Basin	Segment Length within Basin (miles)	Earthwork Water Requirements[6] (acre feet)	Other Water Requirements[7] (acre feet)	TOTAL BY BASIN (acre feet)
Clover Valley[8]	Caliente	994+33	1047+39	1.0	13.7	1.8	**15.5**
Panaca Valley[9]	Caliente	1047+39	1591+88	10.3	60.4	19.0	**452.1**
	CS1	1600+00	2120+63	9.9	354.6	18.1	
Dry Lake Valley	CS1	2120+63	3449+71	25.2	429.4	46.3	**475.7**
Pahroc Valley	CS1	3449+71	4600+92	23.7	904.8	43.6	**948.4**
White River Valley	CS1	4600+92	4951+07	6.6	51.5	12.2	**63.7**
Coal Valley	CS1	4951+07	5231+49	5.3	34.4	9.8	**127.5**
	GV8	56000+00	56329+92	6.3	71.8	11.5	
Garden Valley	GV8	56329+92	57199+81	16.5	111.2	30.3	**141.9**
	CS2	6390+00	6402+40	0.2	-	0.4	
Penoyer Valley	CS2	6402+40	7372+20	18.4	133.6	33.8	**167.4**
Railroad Valley South	CS2	7372+20	8000+00	11.9	53.8	21.9	**177.9**
	SR3	8000+00	8650+00	12.3	55.4	22.7	
	CS3	8650+00	8807+64	3.0	18.6	5.5	
Hot Creek	CS3	8807+64	9945+59	21.6	380.0	39.7	**419.7**

[5] This analysis is based on the *Engineered Plan & Profile Drawing Set, Caliente Rail Corridor* (NRP 2006).
[6] These quantities are based on 75 gallons of water per cubic yard of embankment, plus a contingency of 20 percent for a total of 90 gallons of water per cubic yard of embankment.
[7] These quantities are based on 600,000 gallons of water per mile. Water requirements for construction personnel (61 percent), access road dust control (31 percent), and quarries (6 percent) have been equalized per mile.
[8] The earthwork water requirements for the Caliente segment in the Clover Valley hydrologic basin include the water required to construct the Caliente UPRR interchange.
[9] The earthwork water requirements for the Caliente segment in the Panaca Valley hydrologic basin include the water required to construct either the Caliente Upland or the Caliente Indian Cove staging yard.

Table 4-4. Water Requirements by Hydrologic Basin for the CRC Basis for Analysis[5]

Hydrologic Basin	Segment	Beginning Station of Basin	Ending Station of Basin	Segment Length within Basin (miles)	Earthwork Water Requirements[6] (acre feet)	Other Water Requirements[7] (acre feet)	TOTAL BY BASIN (acre feet)
Stone Cabin Valley	CS3	9945+59	11655+43	32.4	153.2	59.6	**212.8**
Ralston Valley[10]	CS3	11655+43	12349+23	13.1	61.9	24.2	**581.0**
	GF3	52000+00	52747+50	14.2	468.9	26.0	
Big Smoky Valley[11]	MOW headquarters	NA	NA	NA	0.8	0.0	0.8
Stonewall Flat	GF3	52747+50	53457+36	13.4	449.8	24.7	**474.5**
Lida Valley	GF3	53457+36	53640+85	3.5	22.8	6.4	**163.0**
	CS4	13880+00	14259+17	7.2	67.5	13.2	
	BC3	14250+00	14489+89	4.5	44.7	8.4	
Sarcobatus Flat	BC3	14489+89	14901+92	7.8	158.1	14.4	**459.6**
	CS5	14901+92	16051+00	21.8	247.1	40.0	
Oasis Valley	CS5	16051+00	16214+16	3.1	38.3	5.7	**400.6**
	OV1	16195+95	16520+16	6.1	172.7	11.3	
	CS6	16520+16	16806+32	5.4	162.6	10.0	
Crater Flat	CS6	16806+32	17745+84	17.8	223.1	32.7	**255.8**
Forty Mile Canyon[12]	CS6	17745+84	18200+13	8.6	556.2	15.8	**572.0**
Water Requirement Totals for the Basis for Analysis				331.0	5,500.8	609.0	**6,109.9**

[10] The earthwork water requirements for CS3 in the Ralston Valley hydrologic basin include the water required to construct the MOW trackside facility.

[11] No wells are planned for, and no CRC segment is located in, the Big Smoky Valley hydrologic basin. It is anticipated that the water demand to construct the MOW headquarters will be met through existing municipal sources.

[12] The earthwork water requirements for CS6 in the Forty Mile Canyon hydrologic basin include the water required to construct the EOL facility.

Table 4-5. Water Requirements by Hydrologic Basin for the CRC Alternate Alignments[2]

Hydrologic Basin	Alternate Segment	Beginning Station of Basin	Ending Station of Basin	Segment Length within Basin (miles)	Earthwork Water Requirements[3] (acre feet)	Other Water Requirements[4] (acre feet)	TOTAL BY BASIN (acre feet)
Clover Valley[13]	Eccles	20000+00	20200+00	3.8	76.6	7.0	**83.6**
Panaca Valley[14]	Eccles	20200+00	20608+10	7.7	174.9	14.2	**189.1**
Coal Valley[15]	GV1	5523+15	5733+76	4.0	22.2	7.3	**29.5**
Coal Valley	GV2	28017+79	28347+02	6.2	74.9	11.5	**86.4**
Coal Valley	GV3	29789+15	29998+80	4.0	23.0	7.3	**30.3**
Garden Valley	GV1	5733+76	6670+01	17.7	239.8	32.6	**272.4**
Garden Valley	GV2	28347+02	29190+78	16.0	116.1	29.4	**145.5**
Garden Valley	GV3	29998+80	31032+20	19.6	167.8	36.0	**203.8**
Railroad Valley South	SR2	36000+00	36618+42	11.7	83.7	21.6	**105.3**
Ralston Valley	GF1	12334+64	12553+11	4.1	21.0	7.6	**28.6**
Ralston Valley	GF4	42000+00	42229+84	4.4	30.8	8.0	**38.8**
Alkali Spring Valley	GF1	12553+11	13141+44	11.1	134.4	20.5	**154.9**
Alkali Spring Valley	GF4	42229+84	43003+14	14.7	541.7	26.9	**568.6**
Stonewall Flat	GF1	13141+44	13745+38	11.4	284.1	21.0	**305.1**
Stonewall Flat	GF4	43343+14	43558+61	4.1	40.5	7.5	**48.0**
Lida Valley	GF1	13745+38	13881+89	2.6	11.7	4.8	**16.5**
Lida Valley	GF4 – Segment 1	43003+14	43343+14	6.4	121.7	11.8	**158.0**
Lida Valley	GF4 – Segment 2	43558+61	43723+45	3.1	18.8	5.7	

[13] The earthwork water requirements for the Eccles segment in the Clover Valley hydrologic basin include the water required to construct the Eccles UPRR interchange.
[14] The earthwork water requirements for the Eccles segment in the Panaca Valley hydrologic basin include the water required to construct the Eccles North staging yard.
[15] Coal Valley, Garden Valley, Ralston Valley, Alkali Spring Valley, Stonewall Flat, and Lida Valley each have more than one alternate for a given segment located within the same basin.

Table 4-5. Water Requirements by Hydrologic Basin for the CRC Alternate Alignments[2]

Hydrologic Basin	Alternate Segment	Beginning Station of Basin	Ending Station of Basin	Segment Length within Basin (miles)	Earthwork Water Requirements[3] (acre feet)	Other Water Requirements[4] (acre feet)	TOTAL BY BASIN (acre feet)
Lida Valley	BC2	44000+00	44662+24	12.5	133.2	23.1	**156.3**
Sarcobatus Flat	BC2	44284+00	44662+24	7.2	77.1	13.2	**90.3**
Oasis Valley	OV3	46001+43	46520+16	9.8	339.4	18.1	**357.5**

Table 4-6. Potential Well Sites by Hydrologic Basin

Basin	Need	Number of Sites	Number of Wells
Clover Valley	Alternate alignment	1	2
	Basis for analysis	0	0
Panaca Valley	Alternate alignment	2	2
	Basis for analysis	7	8
	Construction camp	1	1
	Facility	2	2
	Quarry	1	1
Dry Lake Valley	Basis for analysis	5	9
	Construction camp	1	1
Pahroc Valley	Basis for analysis	11	17
White River Valley	Basis for analysis	1	1
	Construction camp	1	1
Coal Valley	Alternate alignment	3	4
	Basis for analysis	2	3
Garden Valley	Alternate alignment	7	13
	Basis for analysis	2	3
	Construction camp	2	3
Penoyer Valley	Basis for analysis	4	6
Railroad Valley South	Alternate alignment	2	3
	Basis for analysis	3	5
	Construction camp	1	2
	Quarry	2	2
Hot Creek Valley	Basis for analysis	3	7
	Construction camp	1	1
Stone Cabin Valley	Basis for analysis	4	7
	Construction camp	1	1
Ralston Valley	Alternate alignment	2	4
	Basis for analysis	7	13
	Construction camp	1	1
	Facility	1	1
	Quarry	3	6
Alkali Spring Valley	Alternate alignment	5	10
	Quarry	2	4
Stonewall Flat	Alternate alignment	1	2
	Basis for analysis	6	12
Lida Valley	Alternate alignment	7	13
	Basis for analysis	3	6
	Construction camp	1	1

Table 4-6. Potential Well Sites by Hydrologic Basin

Basin	Need	Number of Sites	Number of Wells
Sarcobatus Flat	Alternate alignment	1	2
	Basis for analysis	6	11
	Construction camp	1	1
Oasis Valley	Alternate alignment	5	10
	Basis for analysis	12	19
	Construction camp	2	3
Crater Flat	Basis for analysis	3	7
	Construction camp	1	1
Forty Mile Canyon	Basis for analysis	0	0
	Totals	140	232

4.5 ACCESS ROADS

4.5.1 Existing Road Network

Because the alignment traverses remote and often uninhabited areas, paved roads are uncommon and are connected by a web of unpaved, public roads. The primary paved highways in the project vicinity are US 93 and SR 318 in the eastern portion, SR 375 in the central portion, and US 6 and US 95 in the western portion. Three additional paved roads are located near the CRC alignment: Cedar Pipeline Ranch Road in the south Reveille Valley and two NTTR access roads. One NTTR access road is approximately 12 miles east of Tonopah off of US 6, the other is off of US 95 between Scottys Junction and Beatty. The access roads to provide reliable access to the ancillary facilities along the CRC alignment such as construction camps, wells, and quarries are shown on Figure 4-D.

4.5.2 Selection Criteria

The primary access road for the NRL during operations will be the alignment access road – a parallel roadway located adjacent to the NRL. However, the alignment access road will be constructed in segments along with the rail line, so additional access roads would be necessary during construction to reach construction camps, quarries, wells, or other segments of the alignment. The construction camp and quarry access roads have been selected based on the shortest distance between a given facility and the nearest existing paved road. The most direct routes from existing paved roads were determined based on the existing road network and population centers. Access roads to wells were selected based on existing roads between the NRL alignment and well sites or new access roads were identified, where necessary, based on the shortest distance between the NRL alignment and well sites.

Access roads to existing paved roads were selected to avoid, where possible, using the alignment access road. Providing additional access roads to the NRL alignment limits the amount of surplus traffic adjacent to the alignment as construction progresses, and provides shorter routes to reach certain segments of the NRL. Relying solely on the alignment access road would require longer travel distances to reach certain segments of the NRL.

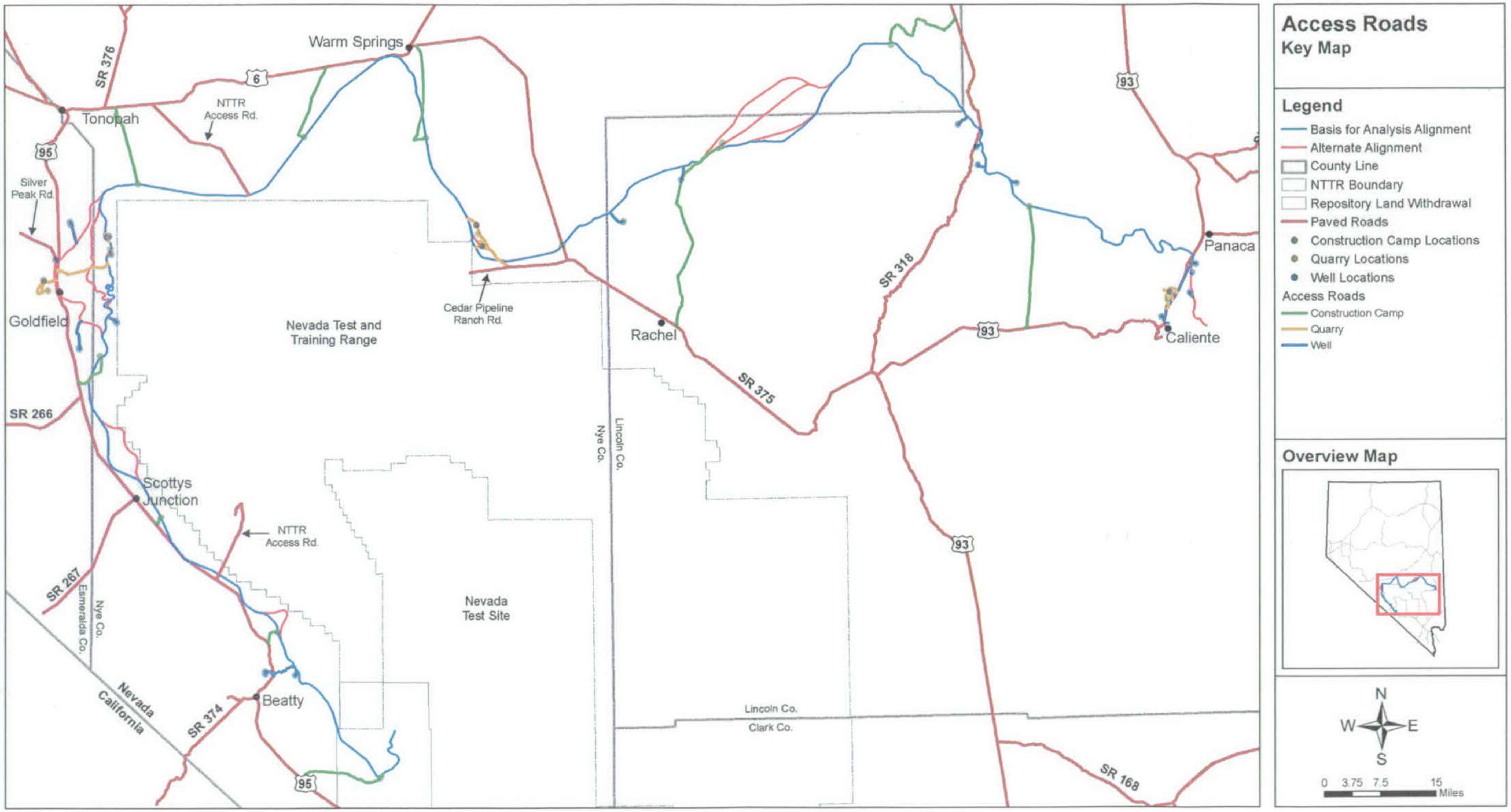

Figure 4-D. CRC Access Road Key Map

The majority of the access roads are graded and drained with a natural surface. A few segments are either bladed but rough, or two-track.[16] Average daily traffic (ADT) counts for the existing unpaved roads are unavailable; however, the ADT for these roads is estimated to be very low (less than 100 vehicles per day).

4.5.3 Design Criteria

All access roads would be improved in accordance with the parameters for rural roads as defined by the Nevada Department of Transportation and the American Association of State Highway and Transportation Officials. In addition, roadway improvements would comply with BLM requirements as listed in BLM Manual Handbook H-9113-2, *Roads; Inventory and Maintenance* (BLM 1985). The typical section for an access road would be two 12-foot-wide travel lanes. Shoulders are not anticipated to be constructed on the access roads. Roadside drainage ditches would be excavated on both sides of the roadway as necessary. Locally available materials from ditch excavation, such as dirt and gravel, would be used to widen or stabilize the roadway surface as necessary. All access roads, except for well access roads, are anticipated to have gravel surfaces. The locally available material would be supplemented by crushed rock screenings as necessary to provide a serviceable roadway surface. Well access roads would be graded as necessary to provide a bladed surface without the additional layer of gravel. Dip sections would be used to convey ephemeral flows across the road surface. Additional design information is described for each access road in Section 4.5.5 Summary Table. Typical sections for paved and gravel roads are included in *Route Sections and Structures–Typical Concepts of Structural Features, Caliente Rail Corridor* (NRP 2007f).

The summary table includes quantities for earthwork and disturbed areas. Assumptions used for the general-use alignment access road are as follows: (1) two 24-foot-wide gravel roads (one on each side of the rail line) with a 3-foot-deep roadbed and 3:1 side slopes and (2) ditches excavated adjacent to each gravel road create a total width of disturbance of 80 feet on each side of the rail line. Specific-use access roads to the construction camps and quarries would be 24 feet wide with a 1.5-foot-deep roadbed and 3:1 side slopes. Improvements to existing roads are assumed to disturb a width of 30 feet. The construction of new quarry roads is assumed to disturb a width of 50 feet. All specific-use well roads, including those to wells outside of the ROW, are assumed to be 10 feet wide with a 1.5-foot-deep roadbed and 2:1 side slopes. All well roads are assumed to disturb a width of 16 feet.

4.5.4 Use

General Use – A general-use alignment access road would be constructed adjacent to the rail line for the length of the alignment. This alignment access road would be used to shuttle workers from the construction camps to work locations as well as for supply vehicles servicing the camps or other ancillary facilities along the alignment. This alignment access road would not be reclaimed and would remain during operations to serve several functions. Because the alignment access road would be constructed on both sides of the rail line, it would serve as a firebreak as well as providing access to maintenance and other rail crews. Also, the alignment access road would provide access to grade crossings along the rail

[16] Sources of information used for the names, current conditions, ownership, and maintenance of access roads identified for project construction include geographic information systems files provided by Bechtel SAIC Company, LLC (BSC), BLM topographic maps, internet searches, and the *Nevada Road & Recreation Atlas* (Benchmark Maps 2003). Site reconnaissance has not been undertaken at the access road locations.

line. ADT along the alignment access road is expected to be very low, similar to existing traffic volumes on the unpaved roads that currently intersect the alignment.

Specific Use – Other access roads would be utilized to access the ancillary facilities from either existing paved roads or from the alignment. Appendix I contains detailed maps of the access roads needed to access each facility from an existing paved road. The majority of the specific-use access roads would be developed by improving existing unpaved, public roads. No new roads would be developed to access the alignment. Each construction camp would be accessed by improving existing unpaved, public roads that intersect the alignment. Only Construction Camp No. 1 would be accessed solely using the alignment access road. Construction Camp No. 5 is located at the intersection of the alignment and SR 375; therefore, no roadway improvements are anticipated for access. Construction Camp No. 12 may require a small segment of new access road; however, this segment would be located within the 1,000-foot rail line boundary. Any conflicts between personnel and construction traffic would be addressed during the design phase.

Each quarry facility would include an access road from the alignment to the quarry. Some new road segments would be constructed to provide access to the interior of each quarry facility. Quarry facilities utilizing conveyor belts would also include an access road adjacent to the conveyor belt. The majority of the wells would be accessed via existing unpaved, public roads. Only the well sites requiring the use of access roads (i.e., well sites located outside of the 1,000-foot rail line boundary) are called out in Appendix I. Well Site Numbers 1, 2, 6, 13, and 14 would require the construction of new road segments to access each well from the alignment.

4.5.5 Summary Table

Table 4-7 summarizes design, use and reclamation information for each identified access road leading to the CRC alignment or to an ancillary facility. New road segments are indicated as such next to the road length. The remaining roads are existing unpaved, public roads. Disturbed area, earthwork, and gravel quantities for the access road to Construction Camp No. 1 are not included in the totals because they are covered in the alignment access road quantities. As mentioned in Section 4.5.3, roadway improvements would comply with BLM requirements as listed in *Roads; Inventory and Maintenance* (BLM 1985). The quantities in the table are approximate and the concepts are those anticipated to support CRC construction.

Table 4-7. Access Road Design, Use and Reclamation Summary

Road Name / Station (Destination)	Currently Owned and Maintained By	ROW Requirements (feet)	Estimated Length (miles)	Improvement Concept	Gravel Volume (yd^3)	Designation	Traffic Use During Construction	Earthwork Quantities (yd^3)	Disturbed Area (acres)	Service Life	Reclamation Concept
Alignment Access Road	–	Within 1,000 feet of rail line ROW	331.00	Grade existing terrain adjacent to rail line; use locally available material from drainage ditches to construct 24-foot-wide roadbed, construct new gravel surface	1,025,306	Permanent	General - Personnel, supply and maintenance vehicles; construction equipment	12,827,971	6,419.39	Life of rail line	Permanent alignment access road; no reclamation planned
Unnamed Road / 20499+00 (Eccles) / 1492+00 (Caliente) (Construction Camp No. 1)	–	No new requirements – improvements would stay within existing ROW	1.49	Grade existing unpaved road, construct new gravel surface on new base layer as necessary	2,308	Semi-permanent	Specific to construction camp traffic - Personnel, supply and maintenance vehicles	28,873	14.45	5 years	No reclamation anticipated on existing unpaved roads
Rattlesnake Road / 3127+00 (Construction Camp No. 2)	Lincoln County / maintenance unknown	"	16.84	"	26,082	"	"	71,132	61.24	"	"
Unnamed Road / 4726+00 (Construction Camp No. 3)	Unknown (not Nye County)	"	14.54	"	22,520	"	"	61,417	52.87	"	"
Freiburg Road-Joe Barney Pass Road-Shadow Road / 57036+00 (Construction Camp No. 4)	Lincoln County	"	28.97	"	44,869	"	"	122,369	105.35	"	"
Unnamed Road / 9214+00 (Construction Camp No. 6)	Nye County	"	15.20	"	23,542	"	"	64,205	55.27	"	"
Unnamed Road / 10770+00 (Construction Camp No. 7)	Nye County	"	10.87	"	16,835	"	"	45,915	39.53	"	"
Unnamed Road / 12147+00 (Construction Camp No. 8)	Tonopah Airport maintains existing paved segments; owner/maintainer of unpaved segment is unknown	"	9.29	"	14,388	"	"	39,241	33.78	"	"
Unnamed Road / 13809+00 (Construction Camp No. 9)	Unknown (portion in Nye County is not county-maintained)	"	5.84	"	9,045	"	"	24,668	21.24	"	"
Unnamed Road / 15176+00 (Construction Camp No. 10)	Unknown (not Nye County)	"	1.38	"	2,137	"	"	5,829	5.02	"	"
Fleur de Lis Road-Cat Canyon Road / 16391+00 (Construction Camp No. 11)	Nye County	"	2.70	"	4,182	"	"	11,405	9.82	"	"
Unnamed Road / 17760+00 (Construction Camp No. 12)	Unknown (not Nye County)	"	12.55 (0.25 is new)	"	19,437	"	"	53,011	45.64	"	"
Unnamed Road / 1210+00 (Caliente Quarry)	Unknown	"	2.71	"	4,197	"	Specific to quarry traffic - Personnel and maintenance vehicles; construction equipment	11,447	9.85	"	"

Table 4-7. Access Road Design, Use and Reclamation Summary

Road Name / Station (Destination)	Currently Owned and Maintained By	ROW Requirements (feet)	Estimated Length (miles)	Improvement Concept	Gravel Volume (yd^3)	Designation	Traffic Use During Construction	Earthwork Quantities (yd^3)	Disturbed Area (acres)	Service Life	Reclamation Concept
	–	50	3.36 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 24-foot-wide roadbed, construct new gravel surface	5,204	Temporary	"	28,385	20.36	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion
CR 525 / 8110+00 (SR3) / 36182+00 (SR 2) (South Reveille Quarries)	Nye County	No new requirements – improvements would stay within existing ROW	9.49	Grade existing unpaved road, construct new gravel surface on new base layer as necessary	14,698	Semi-permanent	"	40,086	34.51	"	No reclamation anticipated on existing unpaved roads
	–	50	4.37 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 24-foot-wide roadbed, construct new gravel surface	6,768	Temporary	"	36,918	26.48	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion
Unnamed Road / 52603+00 (Northeast Goldfield Quarries)	Unknown (portion in Nye County is not county-maintained)	No new requirements – improvements would stay within existing ROW	8.01	Grade existing unpaved road, construct new gravel surface on new base layer as necessary	12,406	Semi-permanent	"	33,834	29.13	"	No reclamation anticipated on existing unpaved roads
	–	50	2.24 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 24-foot-wide roadbed, construct new gravel surface	3,469	Temporary	"	18,924	13.58	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion
Unnamed Road / 42816+00 (West Goldfield Quarry)	Unknown	No new requirements – improvements would stay within existing ROW	4.10	Grade existing unpaved road, construct new gravel surface on new base layer as necessary	6,350	Semi-permanent	"	17,318	14.91	"	No reclamation anticipated on existing unpaved roads
	–	50	5.15 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 24-foot-wide roadbed, construct new gravel surface	7,976	Temporary	"	43,507	31.21	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion
Beaver Dam Road / 20300+00 (Well Site No. 1)	Lincoln County	No new requirements – improvements would stay within existing ROW	0.83 (0.17 is new)	Grade existing unpaved road	0	Semi-permanent	Specific to well traffic - Personnel and maintenance vehicles; construction equipment	3,068	1.61	"	No reclamation anticipated on existing unpaved roads
Unnamed Road / 20448+00 (Well Site No. 2)	–	50	0.17 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 10-foot-wide roadbed with bladed surface	0	Temporary	"	628	0.33	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion

Table 4-7. Access Road Design, Use and Reclamation Summary

Road Name / Station (Destination)	Currently Owned and Maintained By	ROW Requirements (feet)	Estimated Length (miles)	Improvement Concept	Gravel Volume (yd^3)	Designation	Traffic Use During Construction	Earthwork Quantities (yd^3)	Disturbed Area (acres)	Service Life	Reclamation Concept
Unnamed Road / 20499+00 (Well Site No. 3)	Unknown	No new requirements – improvements would stay within existing ROW	0.93	Grade existing unpaved road	0	Semi-permanent	"	3,437	1.80	"	No reclamation anticipated on existing unpaved roads
Unnamed Road / 3374+00 (Well Site No. 4)	Unknown	"	0.87	"	0	"	"	3,216	1.69	"	"
Unnamed Road / 3613+00 (Well Site No. 5)	Unknown	"	1.23	"	0	"	"	4,546	2.39	"	"
Unnamed Road / 3790+00 (Well No. 6)	–	50	0.73 (new)	Grade existing terrain; use locally available material from drainage ditches to construct 10-foot-wide roadbed with bladed surface	0	Temporary	"	2,698	1.42	"	Remove roadway materials; restore terrain to original topography; rip soil to reduce compaction; replace topsoil; seed reclaimed areas with a mix of native plants; replant cacti and yucca; apply mulch or other materials as necessary to prevent soil erosion
Unnamed Road / 3941+00 (Well No. 7)	Unknown	No new requirements – improvements would stay within existing ROW	1.64	Grade existing unpaved road	0	Semi-permanent	"	6,061	3.18	"	No reclamation anticipated on existing unpaved roads
McCutchen Spring Road / 6562+00 (Well Site No. 8)	Lincoln County	"	1.89	"	0	"	"	6,985	3.67	"	"
Unnamed Road / 7217+00 (Well Site No. 9)	Unknown	"	2.42	"	0	"	"	8,944	4.69	"	"
Unnamed Road / 42484+00 (Well Site No. 10)	Unknown	"	2.97	"	0	"	"	10,977	5.76	"	"
Silver Peak Road / 42670+00 (Well Site No. 11)	Esmeralda County	"	0.31	"	0	"	"	1,146	0.60	"	"
Unnamed Road / 13473+00 (Well Site No. 12)	Unknown (Not Nye County)	"	1.47	"	0	"	"	5,433	2.85	"	"
Unnamed Road / 43260+00 (Well Site No. 13)	Unknown	"	4.10 (0.35 is new)	"	0	"	"	15,154	7.95	"	"
Unnamed Road / 16685+00 (Well No. 14)	Unknown (Not Nye County)	"	5.06 (1.01 is new)	"	0	"	"	18,702	9.81	"	"
Beatty Wash Road / 16707+00 (Well Site No. 15)	Unknown (Not Nye County)	"	0.80	"	0	"	"	2,957	1.55	"	"
Total Access Road Mileage			514.03		1,269,412	Total Access Road Quantities		13,651,535	7,078.48		
Total Mileage for Construction Camps, Quarries, and Wells Access Roads			183.03		244,106	Total Quantities for Construction Camps, Quarries, and Wells Access Roads		823,564	659.08		

4.6 COMMUNICATION SYSTEMS FOR CONSTRUCTION

4.6.1 Introduction

The construction of the NRL is a complex undertaking requiring a high quality modern communication system to facilitate the efficient execution of the construction work. These requirements can be summarized into seven categories as described here:

- Data communications from the camp to the construction contractor's home offices
- Voice communications from the camp to the home offices of other project entities (contractor, DOE, construction manager)
- Close-proximity voice communications for routine purposes in and around each construction camp
- Close-proximity voice communication among crew members working at a distance from the camp but in relatively close proximity to each other
- Wide-area voice communications from construction camps to crews working at a distance from the camp
- Public safety and emergency communications with responding agencies and the U.S. Air Force (USAF)
- Personal communication for members of construction crews living at the camps

This section discusses how these needs would be met.

4.6.2 General Requirements

The construction forces would be organized into multiple construction camps spread along the NRL alignment, and each camp would support a number of construction crews that would perform work along the rail alignment.

Each of the camps would include a self-contained remote office facility with multiple computer systems and support equipment operating on a local area network. Standard telephone communication would be required between the camps and the contractor's home office, as well as the project office and for general use by the construction employees.

Each construction or service crew would be led by an employee-in-charge (EIC) who would require voice communication back to the camp that is available essentially at all times. Members of construction crews would also have the need to talk to each other if conducting work operations outside of the immediate area.

Safe movement of construction train movements will be managed using a temporary dispatch system based upon a form of train orders such as track warrant control or direct traffic control. Movement authorities will be delivered to the EIC via the voice communication system. Grade-crossing warning systems may be installed at major roadways if required by the safety plan and can operate on an independent basis.

In general, all external project communication will be handled through each camp communication coordinator including but not limited to: camp support (deliveries) etc., external services, medical responders, USAF, etc. Imbedded medical teams, as well as certain key entities such as the USAF, will be issued appropriate communication equipment based upon the safety plan.

The communication systems for construction described herein will be designed to not interfere with other licensed services operating in the same geographic areas and they will be retained in place until the communication systems for rail operations are in place and commissioned. The communication systems will consider the *Communications System Description Document* (BSC 2005) and use it as a guide to establish requirements that drive the design of the communications system and associated sub-systems.

In order to facilitate efficient operation and to avoid the need to monitor unnecessary communications, the voice communication system would need to provide a means to segregate conversations to those employees who need to be involved, with the recognition that some employees may have the need to monitor a broad range of conversations. These communication relationships are depicted in Figure 4-E.

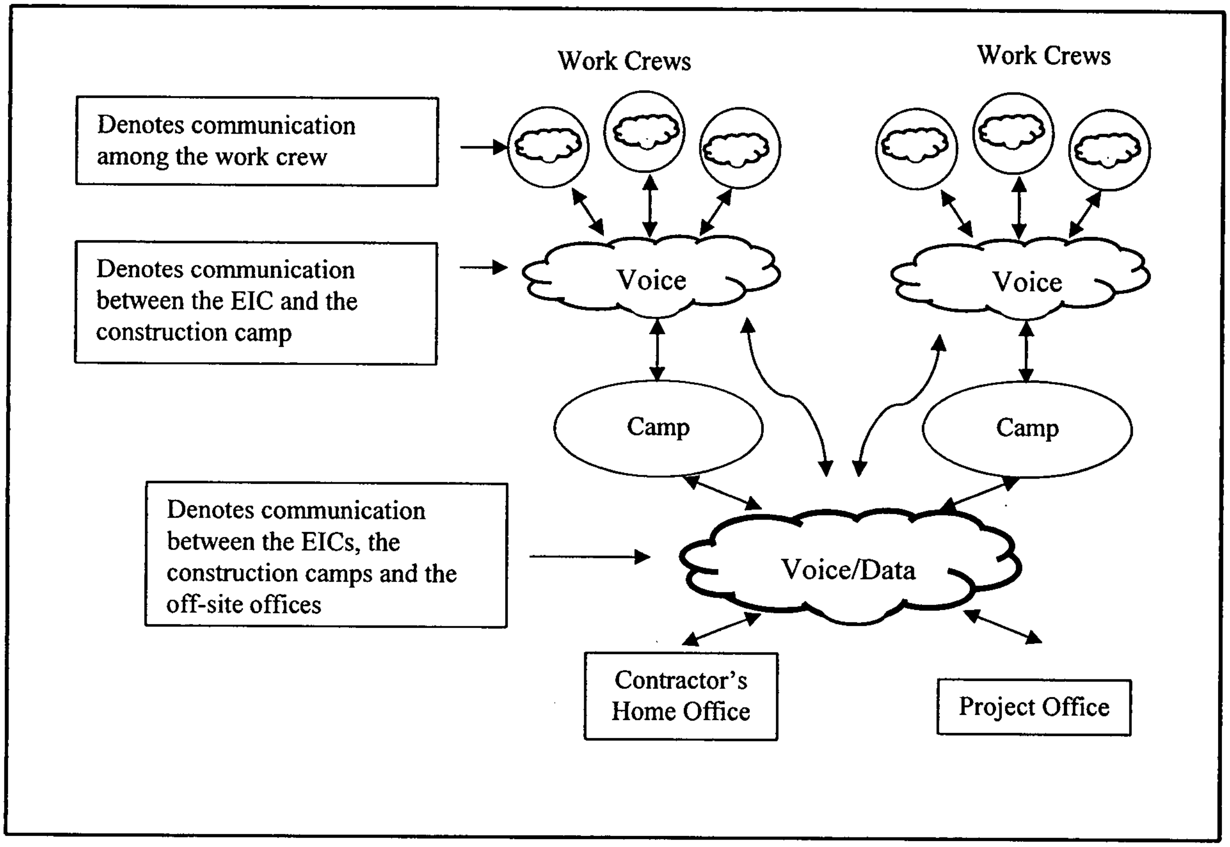

Figure 4-E. Communication Relationships

4.6.3 Technical Approach Trade-Offs and Impacts

The discussion of the communication requirements for construction demonstrates that there is a clear need to provide quality voice and data connectivity between the camps, the construction crews and other associated entities.

One approach would be to provide connectivity of the same general character that is anticipated for railroad operations by constructing the communications system under a separate contract in advance of the construction of the railroad, so that it could be used as a resource by the railroad construction contractor.

Such an approach would require that the fiber-optic cable be directly buried and generally parallel to the track alignment, but well separated to avoid damage by construction activities. Communication equipment enclosures would be installed at their final locations along the alignment, requiring care by the rail construction crews to avoid damage.

The fiber system, in conjunction with leased-line circuits, would provide core telephone communications and broadband connectivity between the construction camps and the construction company home office. The fiber system would also provide the necessary connectivity to operate the VHF radio system of base stations from a remote central control facility to support construction activities.

While this approach would provide all the necessary elements of communication, due to the remote location and rugged terrain, installation of the communication system would require a significant mobilization not unlike what would be required for the construction of the rail line itself.

Certainly that task is less challenging than the construction of the rail line itself; however, it is clear that communication construction crews would face many of the same logistical and terrain issues as the rail construction crews. In addition, there would be long-term impacts from this approach as well. Among the issues are the following:

- Installation of the fiber-optic cable requires access to the full alignment.
- While the fiber cable can be installed following the prevailing contours, access for the installation equipment is hindered or, in some cases, made impossible due to rugged terrain.
- In areas of cut and fill, special care would need to be taken to locate the fiber where it would not be impacted by final construction.
- Some communication equipment sites may need to be relocated after construction of the railroad, since the most appropriate site may not exist until final grading is accomplished.
- The final route of the fiber cable could vary considerably from the rail alignment making future maintenance difficult. For example, the rail line may be elevated on a bridge while the cable follows the terrain below, or worse, the cable may be ultimately covered by significant fill making future access impossible.

Accordingly, based upon evaluation of observed conditions and upon consideration of these issues, the communication system for rail operations should be constructed after the final grading is completed in the conventional manner.

This approach has the distinct benefit of removing all access and location issues from a communication standpoint since all such matters would have to be resolved for the basic construction activities. In addition, as the grading is accomplished for the rail alignment, it can likewise be accomplished to facilitate fiber cable installation at the optimum location, without concern for construction damage.

Notwithstanding that decision, it remains necessary to provide high quality communication services in support of construction operations. The solution is to deploy satellite-based technologies augmented with terrestrial radio and cross banding that can provide the required connectivity without the need to deploy extensive terrestrial infrastructure in the construction area.

4.6.4 Voice and Data Communications to Contractor's Home Office

Each of the construction camps would house a small office with computers, a local area network, and a number of telephones likely operating on a small private branch exchange (PBX). Each camp would be linked to the contractor's home office computer and telephone systems via satellite.

Very small aperture terminal (VSAT) is technology that can provide relatively high speed data communications to link the network systems at the construction camps back to the computer and telecommunication systems at the home office of the construction contractor. Since it is satellite-based, it can be put up quickly and moved if necessary. The service can be scaled to provide necessary bandwidth to support camp operations, but since it is a service, there is an ongoing cost associated with the amount of bandwidth utilized. Nevertheless, since construction activities only exist for a limited time, it is anticipated that the service costs would be an equitable trade.

The home office is connected to the service provider's ground station by a series of leased lines. The ground station establishes a link to a geosynchronous satellite that in turn communicates with a VSAT located at each camp. Various configurations of service are available. All of the available configurations create a virtual connection between the remote camp and the home office to provide seamless connectivity, albeit at a slower–but quite adequate–data rate for a remote operation.

The telephones in the field at the camps could be extensions off the home office PBX and can dial anywhere in the world via the home office connection to the public switched telephone network (PSTN). This approach is graphically illustrated in Figure 4-F.

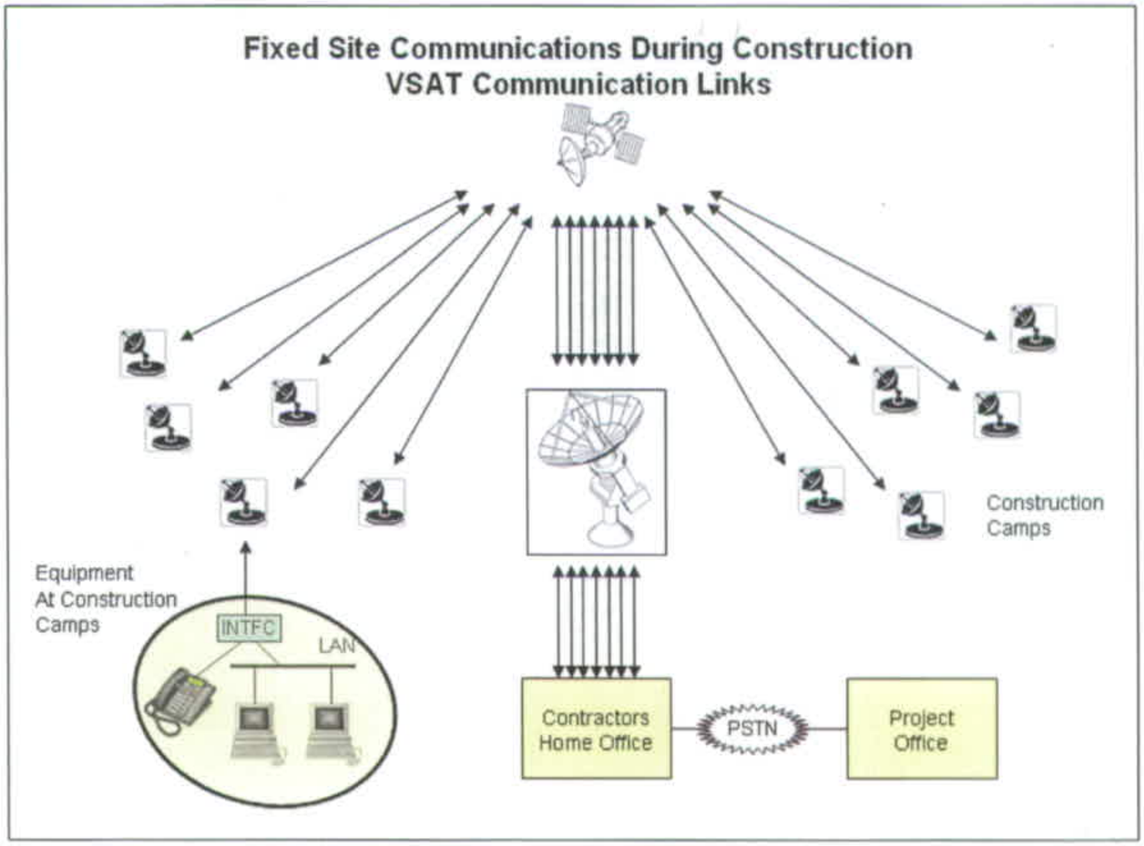

Figure 4-F. VSAT Communication System

4.6.5 Close Proximity Voice Communications

In any construction project there is a requirement for general communications in and around the construction areas as well as in and around the camps themselves. These requirements can be met quite adequately with licensed frequencies in the railroad VHF band or itinerant frequencies in the business band utilizing open channel communications. Mobile units would be installed in construction vehicles and handheld walkie-talkie instruments would be issued to crew members as required by (to be established) safety procedures. These units would operate in "talk-around" mode without base stations. In addition, basic communications could be augmented if necessary using unlicensed radio services such as Family Radio Service for very short range communication needs. These types of communications are limited by the relatively short range of the mobile and handheld units.

4.6.6 Primary Wide Area Voice Communications

Effective management of the construction activities, as well as timely and effective emergency response capabilities, requires an effective, wide area two-way communication system between the EIC of each crew and the staff coordinating work from the construction camps.

This requirement would be met utilizing a geosynchronous satellite-based dispatch radio system that requires no ground infrastructure other than the radios themselves and is not limited by distance. The radios can be divided in to talk groups so that voice traffic for a given camp and its crews can be isolated from the other camps.

To initiate a call, anyone in the talk group can depress the push-to talk-button; after about a second of set-up time the system would respond with a tone to indicate that the user can begin speaking.

The voice message is transmitted to the satellite, which re-broadcasts it across the footprint where it is received by the other members of the talk group. At the end of the message, the chirp tone indicates that another member of the talk group may speak and conversation can continue for an indefinite period of time. A long period of silence causes the system to deactivate the talk group and further communication would require the set up period.

Supervisory personal can be part of multiple talk groups so that communication can be appropriately monitored across the project. Ancillary functions exist that make it possible for home office management personnel or other project personnel to dial into a talk group from a common telephone or mobile telephone via an 800 number and a security code. Such a user would use one of the number keys on the telephone as a push-to-talk button giving him/her access to the system.

Likewise a call out number can be assigned that can be quickly activated in the event of an emergency to rapidly add the appropriate response personnel to the communication link.

It is also possible, with additional equipment and a process known as "cross-banding," to allow an EIC to connect his/her VHF mobile radio to the satellite dispatch radio and access the satellite system via a walkie-talkie while s/he is away from the vehicle.

With the ancillary connectivity features previously described, a truly seamless network can be established that extends from the crews on the ground to the executive management of the project and the construction firm. This configuration of equipment is depicted in Figure 4-G.

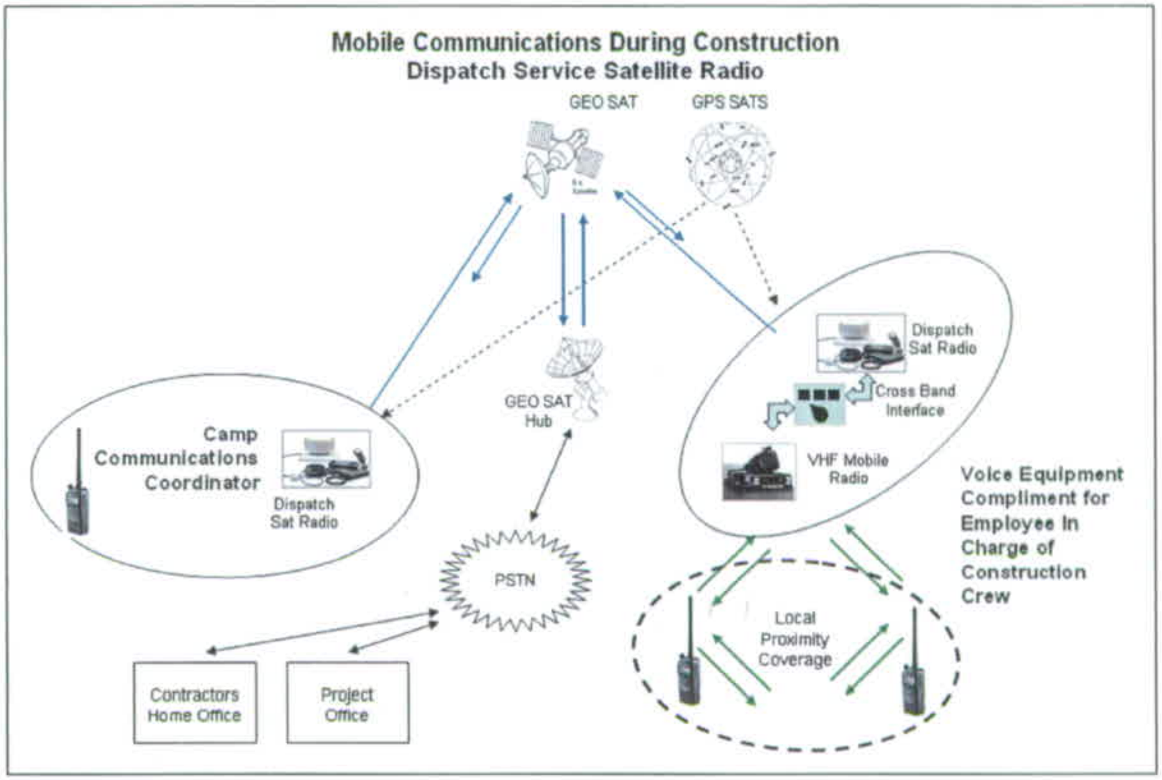

Figure 4-G. Primary Wide Area Voice Communications Scheme

4.6.7 Secondary Wide Area Voice Communications

As a back up, the EIC of each crew and others in accordance with the safety plan would be issued a satellite telephone to be used in the event of a service outage of the main satellite system.

These units communicate directly to the satellite without the need for ground infrastructure in the construction area. These systems operate in a manner analogous to terrestrial cellular telephone systems, with the distinction that the provider's equipment is orbiting overhead. From the user's perspective, the operation is virtually identical to the cellular telephone model. The service provider's ground station interconnects to the PSTN, allowing calls to be made to telephones anywhere in the world from a satellite phone (including other satellite and cellular mobile phones).

This service would be based upon either a low earth orbit satellite system or a geosynchronous system. In any case, this service would utilize satellites completely independent from the satellites that provide the dispatch radio service to avoid common points of failure. This configuration of equipment is depicted in Figure 4-H.

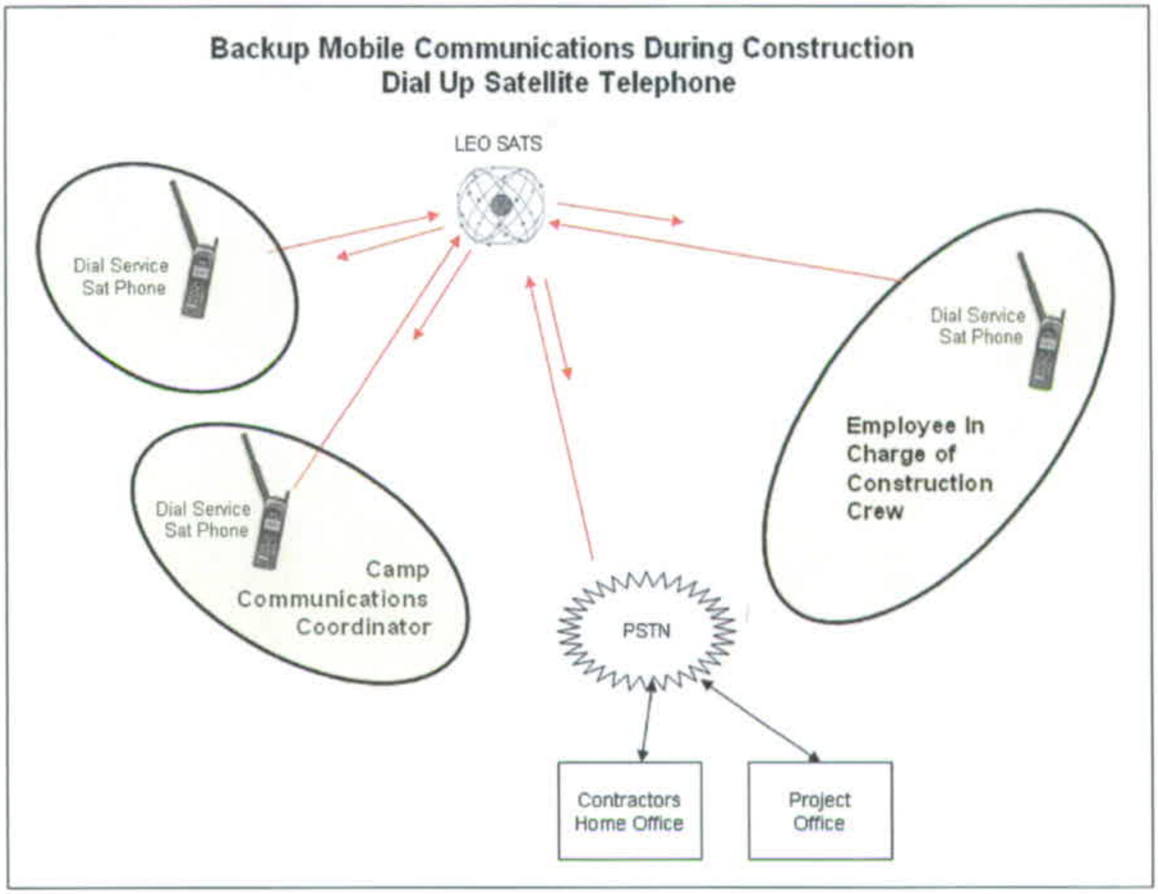

Figure 4-H. Secondary Wide Area Voice Communications Scheme

4.6.8 Summary

The primary advantage of using the satellite services during construction is communications operation without a ground-deployed infrastructure. A secondary but important consideration is that all of the communications can be procured by the contractor as part of the construction overhead costs. Certainly, the communications costs would be built into the construction pricing, but no advance investment is required on the part of the project.

5.1 CONTRACT REQUIREMENTS

Construction protocols include the areas of environmental health and safety, quality control, quality assurance, mobilization and train operations. This would include compliance with permitting, mitigation requirements, and shareholder agreements. Each of these areas would be defined and parameters specifically identified at the time when procurement documents for a construction contractor are developed.

5.2 TRAIN OPERATIONS DURING CONSTRUCTION

Train operations would require interface protocols between the construction contractor and the UPRR, and between the construction contractor and the NRL operator. The UPRR agreement with the DOE would outline the UPRR's obligations culminating with construction material and equipment deliveries. At a point during construction the commissioning of the NRL would begin. As segments of the alignment are completed, the NRL operator would assume operational control. Operations protocols for this interface would be outlined in the procurement documents for both the construction contractor and the NRL operator. Refer to Figure 7-A. CRC Construction Schedule and Section 7.6. Operations Commissioning for relevant construction stages and milestones.

6.1 PERMITTING

The permitting process during construction would focus on several areas requiring contractor input, initiation, monitoring and reporting. Basically, a stormwater pollution plan, a spill prevention plan, a dust control plan and a construction plan would be required of the contractor for regulatory agency approval to initiate and conduct construction activities. Nevada Public Utilities Commission approval would be required to work in state ROW to construct grade separations and grade crossings. Similarly, county approvals would be required to work in county ROW to construct grade crossings of county roads. Construction labor camps would be subject to various permitting requirements for septic systems, water supply systems, utility support installations, and access road construction and maintenance. In parallel to governmental permitting requirements, coordination with the UPRR is also critical. A memorandum of understanding (MOU) would be necessary to outline the required commitments of the railroad and DOE for construction of the interchange tracks along the UPRR mainline and operational interchange protocols.

Acquiring the requisite permits has important scheduling implications. Some permits are anticipated to take longer than 24 calendar months to acquire while others are anticipated to require shorter timeframes. Table 6-1 identifies a variety of permits that would be necessary for construction of the rail line. The "Months to Acquire" column includes preparation time for applications.

Table 6-1. Permits for Construction

Permit	Months to Acquire	Contractor Responsibility
UPRR MOU	24+	
Water Appropriations Permits	24+	
Air Quality Operating Permits	24	
Permits for Highway Crossings	18	
ROW Reservations	15	
Clean Water Act Section 404 permit	15	
Free Use Permits for Gravel	15	
Cultural Resources Programmatic Agreement	15	
Federal Communications Commission (FCC) License	12	
Working in Waterways Permit	9	
Endangered Species Act	9	
Water Quality Certification	9	
Public Water System Permits	6	X
Septic/Sewage System Permits	6	X
Building Permits	6	X
Stormwater Discharge Permits	3	X
Construction Camp	3	X
Hazardous Material Storage	2	X
Hazardous Waste Generation	1	X

Note: Permits for operations and maintenance are listed in the *Operations and Maintenance Report, Caliente Rail Corridor* (NRP 2007e). Additionally, no permits for quarry operations are included. If a quarry is pursued, a 36-month time frame is likely to secure all licenses and permits.

The necessary FCC license for communications would take approximately 12 calendar months to acquire. It should be noted that this licensing process occurs prior to construction of the roadbed. The fiber-optic trunk line would be installed during roadbed construction, with satellite telephone and short-wave radio providing communications during construction.

6.2 WASTE

6.2.1 Introduction and Data Sources

The types of waste and hazardous materials that would be generated and used during construction and operational activities are summarized within this section. All wastes would be handled in accordance with applicable environmental, occupational safety, and public health and safety requirements to minimize the possibility of adverse impacts from construction to plants, animals, soils and water resources, inside or outside of the region of influence. Because solid wastes and hazardous materials would be handled in accordance with applicable regulations and best management practices, no significant releases or impacts to resources would be expected.

Landfill information is found primarily in the State of Nevada *2004 Solid Waste Management Plan* (Nevada Department of Environmental Protection [NDEP] 2004). Available information includes type and class of landfill, remaining capacity, and number of remaining years until the landfill expected to be full.

6.2.2 Rail Construction Waste and Hazardous Materials

The construction of the proposed rail line would require materials such as concrete and wood ties, steel rail, rock ballast, fuel, oils, lubricants and coolants for heavy machinery, and compressed gasses (e.g., oxygen and acetylene) for welding. The DOE would order construction materials in correct sizes and number, resulting in very small amounts of waste (DIRS 152540-Hoganson 2000). In addition, some of the residual material from the proposed rail line construction would be saved for reuse or would be recycled. Solid waste would be disposed of in appropriately permitted solid waste landfills. In accordance with NAC 444.585, wastes generated during demolition and construction activities are considered to be an industrial waste. This waste would be comprised generally of three types of waste – municipal/solid waste, hazardous materials/waste, or special waste.

<u>Municipal Wastes</u> – Solid wastes that may be generated during the construction of the rail line include asphalt, concrete, broken tools and parts, scrap lumber, cardboard, bags, and plastic containers. Scrap metals and other materials would be recycled as appropriate. Solid wastes also include wastes that would be generated at the construction camps from daily activities such as food services and typical household living wastes. Solid wastes would be disposed in accordance with Nevada Revised Statues (NRS) 444.440.

<u>Hazardous Materials/Waste</u> – The proposed rail project will use hazardous materials typically found in industrial projects. Hazardous materials such as paints, aerosols, diesel fuel, gasoline, batteries, adhesives, and solvents will be stored and used during construction and operation. These materials will be stored in accordance with applicable federal and state regulations. A spill prevention and response program will be implemented to minimize environmental impacts in the event of an accidental spill.

The construction and operation of the proposed rail project will generate typical non-hazardous and hazardous wastes. Potential wastes include refuse, rubbish, vegetative debris, concrete, scrap metal, scrap lumber, paint, non-empty/non-working aerosol cans, used oil, used antifreeze, spent batteries, and lamps.

These wastes will be characterized as either solid or hazardous waste and managed in accordance with State of Nevada regulations. Where possible, waste such as scrap metal, used oil, used anti-freeze, spent batteries, and lamps will be recycled.

Special Wastes – Special wastes are those that require special handling or disposal because of their physical, chemical or biological characteristics. Special waste types of general concern include waste tires, vehicle batteries and motor oil, household hazardous waste, infectious waste, liquid waste, petroleum-contaminated soil, appliances, junk automobiles and electronic wastes. For the most part, Nevada's municipal waste programs have developed suitable facilities and procedures for managing these wastes (NDEP 2004).

During construction of the rail line, special wastes such as tires, vehicle batteries, used oil and antifreeze would be generated. These wastes would require segregation and disposal at an appropriate facility. Similar wastes would be expected during operation, although in much smaller quantities.

Clearing and Grubbing Waste – Vegetation would be cleared and grubbed prior to construction of the rail segments. During clearing and grubbing activities, cacti and yuccas would be salvaged prior to land-disturbing activities as required by state laws and BLM requirements. In accordance with BLM requirements, yuccas (*Yucca* spp.) taller than 2.4 meters (8 feet) and cholla cacti (*Opuntia* spp.) taller than 1 meter (3 feet) do not need to be salvaged as they are not likely to survive this process.

Waste from clearing and grubbing locally available materials would be used to construct fill slopes and contours within the ROW. Non-locally available materials (i.e., concrete or asphalt) would be taken to a local solid waste disposal or appropriate recycling facility. Restoration of the area impacted by construction activities would be completed in accordance with BLM requirements.

Recyclable Materials – The state legislature has established a 25% recycling rate goal. Minimum recycling services are also required by law (NRS 444A.070). Counties having populations greater than 100,000 must have residential curbside collection service, while those between 25,000 and 100,000 must set up recycling drop-off centers. The NDEP Solid Waste Branch (SWB) coordinates recycling efforts throughout the state, provides public education and information and provides technical assistance to local government recycling programs. The NDEP also fosters recycling programs through funding assistance to local government entities and non-profit organizations (NDEP 2004).

Recyclable materials that may require collection during construction activities are variable between counties. Clark County has the largest population, and the most extensive recycling requirements. Recycling requirements are placed on newspaper, glass, oil and lubricants, paper, plastic, cardboard and scrap metal. The smaller counties, including Nye, Esmeralda and Lincoln, have fewer recycling services. For example, Nye County provides recycling services for aluminum, cars, car batteries, toner cartridges, cell phones, oil, radiators, scrap metal and phone books. Lincoln County has recycling services for car batteries, toner cartridges, cell phones, phone books and yard waste. Pick up services for recycling are limited within these counties. Prior to construction activities, each county would need to be contacted to determine specific recycling requirements.

6.2.3 Construction Camp Wastes

Each construction camp would include a number of trailers with food services, entertainment and residences for up to 360 personnel. The construction camps are estimated to be used for a five-year period. The camps are proposed to be fully staffed for two years, with a mobilization and buildup period before and a slow down and demobilization period afterward. The maximum number of construction camps is currently estimated to be 12 camps, although it is not expected that all 12 would be open and operating concurrently. Each of these camps would have water, wastewater,[17] and waste handling and disposal requirements.

The construction contractor would be responsible for adhering to applicable disposal and storage requirements for hazardous materials, municipal/solid wastes, and hazardous wastes. Construction requirements are applicable to all facilities including the construction and operation of construction camps, food service facilities, service stations, operational facilities and demolition of existing facilities.

Municipal/Solid Waste – The generation rate of municipal/solid waste from construction camps would be expected to peak at 940 metric tons (1,000 tons) per year and would be disposed of in a permitted landfill (DIRS 155970-DOE 2002, pp. 6-37). Nevada has 24 operating municipal landfills with a combined capacity to accept more than 11,000 metric tons (12,000 tons) of waste per day (DIRS 174663-NDEP 2005 and DIRS 174041-NDEP 2004). A list of Clark, Esmeralda, Lincoln and Nye County landfills is provided as Table 6-1 (NDEP 2004).

For comparison, the California Integrated Waste Management Board estimates a typical residence generates 12 pounds of waste per day. This translates into approximately 810 tons per camp, per year using the residential scenario. A typical restaurant would generate 1 pound, per seat, per day, and a fast food restaurant would generate 17 pounds of waste per employee, per day (California Integrated Waste Management Board 2005a and 2005b).

Wastewater – The wastewater treatment process of would result in the production of biosolids (e.g., sludge). This sludge would be disposed at a licensed facility in accordance with state and federal laws.

Hazardous Materials/Wastes – Typical hazardous materials that would be used on-site by employees residing in the construction camp include pesticide sprays, household cleaning materials, lighter fluids, petroleum products, oils and lubricants.

Special Wastes – Each construction camp would have an associated service station. Materials such as grease and oil, tires, and solvents would require proper disposal for special wastes. Grease and food-based oils from food service activities would require specialized services to remove and recycle these materials.

Recyclable Wastes – Wastes would be recycled in accordance with county requirements.

6.2.4 Facilities Waste and Hazardous Materials

The construction of the facilities[18] includes the staging yard, interchange facility, transportation operations center, two MOW facilities, and the EOL facility. All facilities would be constructed concurrently with the rail line and wastes would be handled as described in Section 6.2.2. The construction of the interchange facility may require demolition and removal of existing structures. The demolition of these facilities would create additional waste disposal requirements.

Operation of these facilities would create additional quantities of municipal, hazardous, and special wastes. Municipal wastes would be typical of those created in a business office and would include papers, toner cartridges, and so forth. Hazardous materials would include petroleum products, oils and lubricants. Special wastes would include solvents, tires, grease, and used oils. These waste streams are

[17] Wastewater volumes, collection and treatment methods are discussed in the section describing construction camps (Section 4.1).
[18] Facilities include the UPRR interchange yard, the MOW facilities, and the EOL GROA interface yard. No estimates of wastes arising from the CMF would be presented.

expected to be very small in comparison to other waste streams created by the project and in the counties, and would be handled in accordance with Nevada regulations.

Wastes produced on the NTS or at Yucca Mountain Area 25 would need to be disposed of at the Area 10 landfill on the NTS.

6.2.5 Landfill Regulations

Regulations governing the disposal of solid waste facilities are outlined in NAC 444.570 through 444.7499 for Class I, II and III facilities. A Class I disposal site is comprised of at least one municipal solid waste landfill unit, including all contiguous land and structures, other appurtenances and improvement on the land used for the disposal of solid waste; and is not a Class II or Class III site. Class I facilities may not have any Class II or Class III characteristics.

A Class II disposal site:

- Is comprised of at least one municipal solid waste landfill unit
- Accepts less than 20 tons of solid waste per day on an annual average
- Has no evidence of contamination of ground water originating from the site
- Serves a community that has no other practicable alternatives for waste management
- Is located in an area which receives no more than 25 inches of precipitation annually

The term includes all contiguous land and structures and other appurtenances and improvements on the land used for the disposal of solid waste.

A Class III disposal site accepts only industrial solid waste. Industrial solid waste means solid waste derived from industrial or manufacturing processes as defined in NAC 444.585. NAC 444.585 includes construction, refurbishing or demolition of buildings or other structures. Industrial wastes do not include wastes generated by the mining, oil and gas industries.

Locations of available facilities and projected capacities are provided in Table 6-2. The facilities listed are within Clark County and the three counties where CRC construction would occur – Lincoln, Nye and Esmeralda. Tables 6-3 and 6-4 summarize, by waste category and county, respectively, the anticipated waste levels from CRC construction and operation.

Table 6-2. Estimated Landfill Capacity in Clark, Esmeralda, Lincoln and Nye Counties

County	Facility Name	Landfill Class	Capacity (yd^3)	Projected Closure	Remaining Life (years)
Clark	Apex	I & II	81,000,000	2147	41
Clark	Boulder City	I	Not provided	2036	30
Clark	Laughlin	I	5,974,000	2019	13
Esmeralda	Goldfield	II	282,815	2023	17
Lincoln	Crestline	II	720,000	2049	43
Lincoln	Mesquite	I	1,785,000	2008	2
Nye	Round Mountain	II	698,100	2028	22
Nye	Tonopah	II	144,504	2011	5
		Total	~90,000,000		173

Table 6-3. Summary of Waste Created by Construction and Operation of CRC in Tons/Year

Category of Waste	Construction		Operation			
	Camp – Food Service and Domestic	Camp – Service Station	MOW – Trackside (Nye County)	MOW – Headquarters (Esmeralda County)	EOL (Nye County)	Interchange Facility/ Staging Yard (Lincoln County)
Municipal/Solid Waste	618	3	10	24	38	35
Hazardous/Special Wastes	Household Hazardous Materials Not Regulated	2	5	12	19	17
Recyclable Waste (25%)	202	2	5	12	19	17
Vegetation	0	0	0	0	0	0
Total	**820**	**7**	**20**	**48**	**76**	**69**

Table 6-4. Summary of Waste by County

County	Waste Generation Rates (tons/day)			Waste Generated over the Life of the Project	
	Existing Conditions	Construction Activities	Operational Facilities	Tons	Cubic Yards
Lincoln	104	16	0.2	20,000	40,000
Nye	279	10	0.2	15,000	30,000
Esmeralda	4	0	0.1	2,000	4,000

Each county has a solid waste management plan approved by the SWB, as required by law. There is also a general state plan, and a special waste plan for used tire management. The SWB provides technical assistance to local governments as staff resources permit. Due to changes in solid waste requirements, the number of operating landfills in Nevada has declined. These changes have led to the addition of transfer stations and waste bin facilities to consolidate wastes prior to disposal at the appropriate landfill facility. Three facilities (Lockwood, Storey County; Mesquite, Lincoln County; and West Wendover, Elko County) are currently involved in importing wastes from neighboring states and counties due to available capacity, and as a source of additional income. Figures 6-A through 6-D provide locations of existing landfills and waste bins.

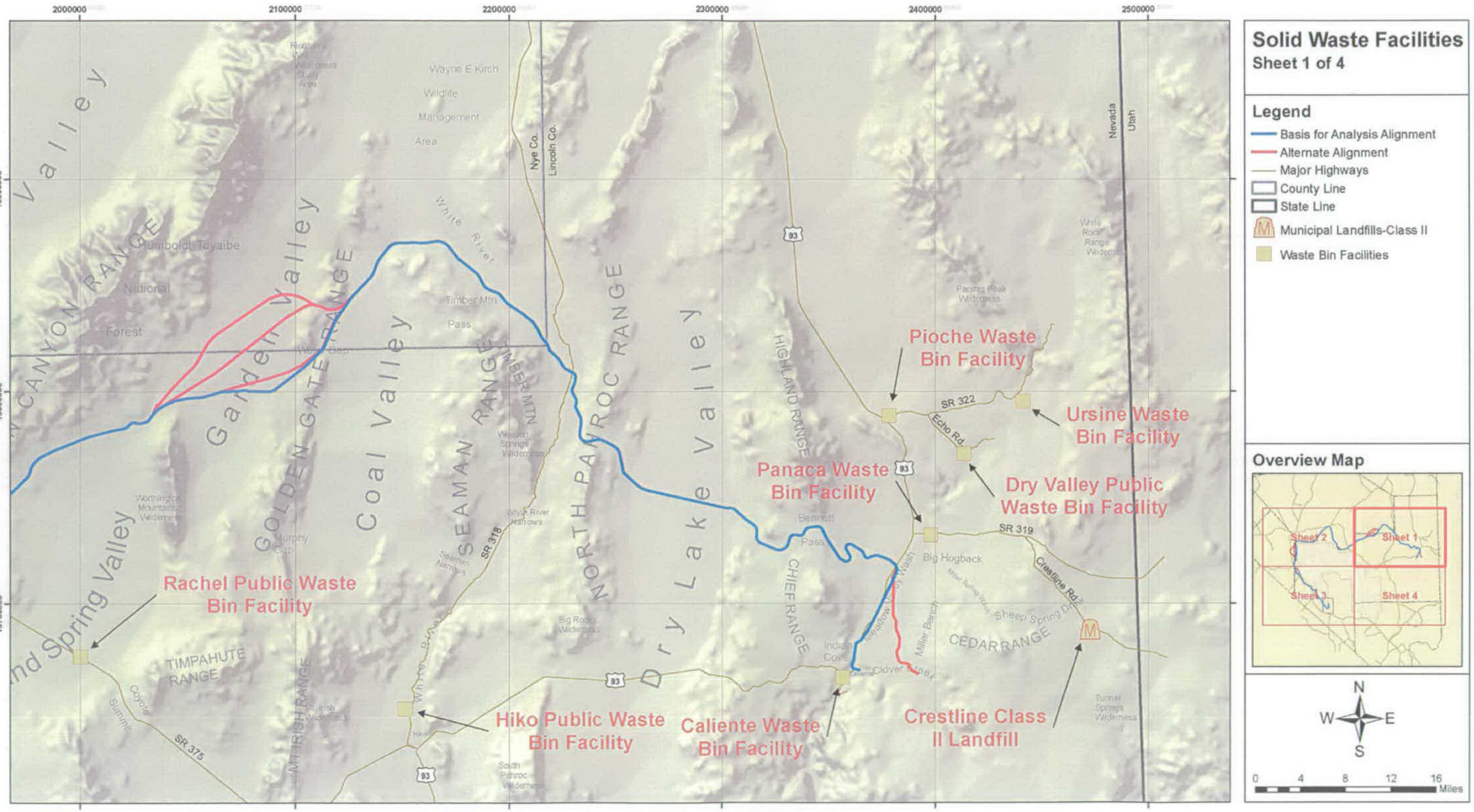

Figure 6-A. Solid Waste Facilities in the Crestline-Caliente Area

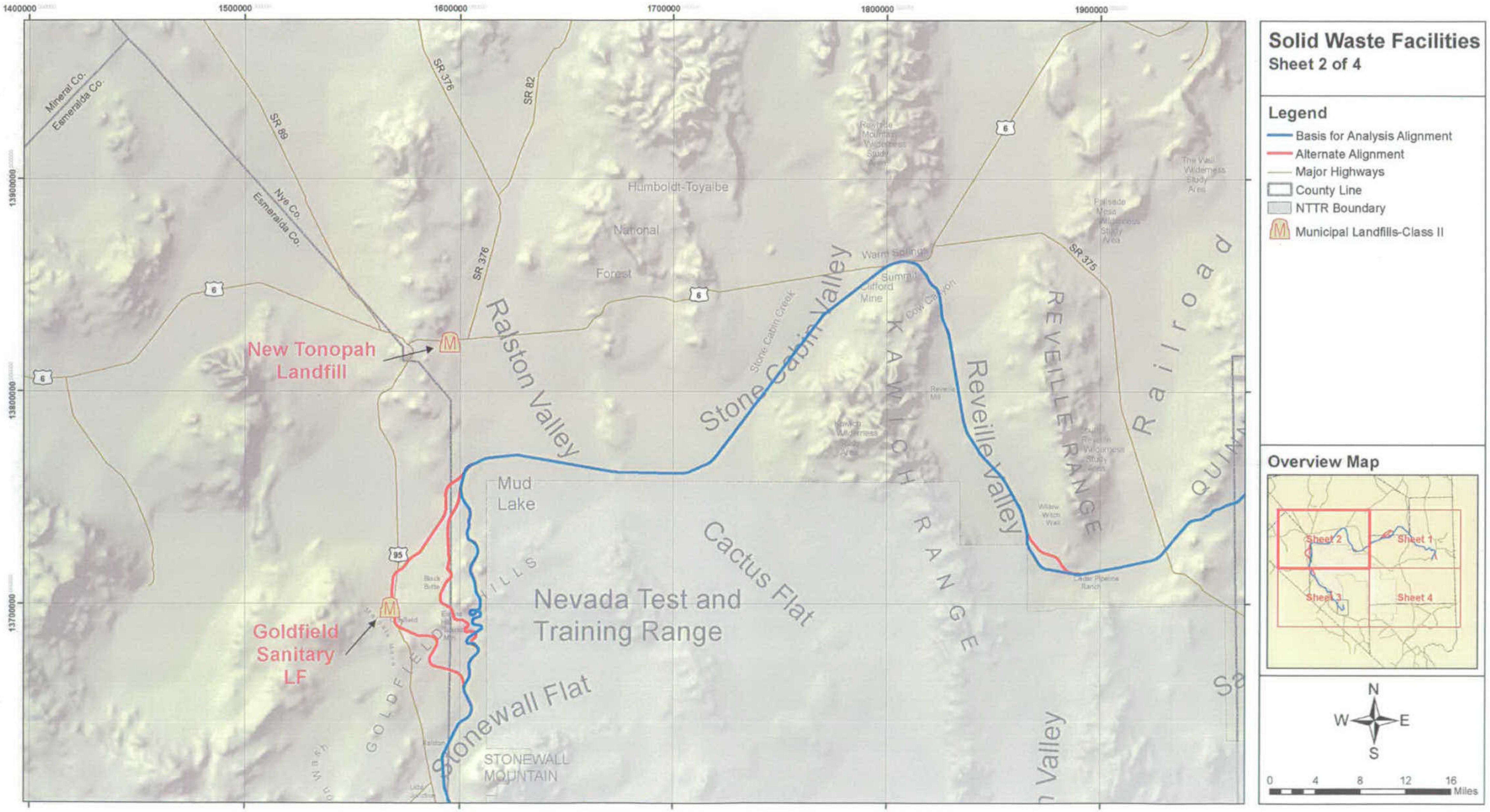

Figure 6-B. Solid Waste Facilities in the Tonopah-Goldfield Area

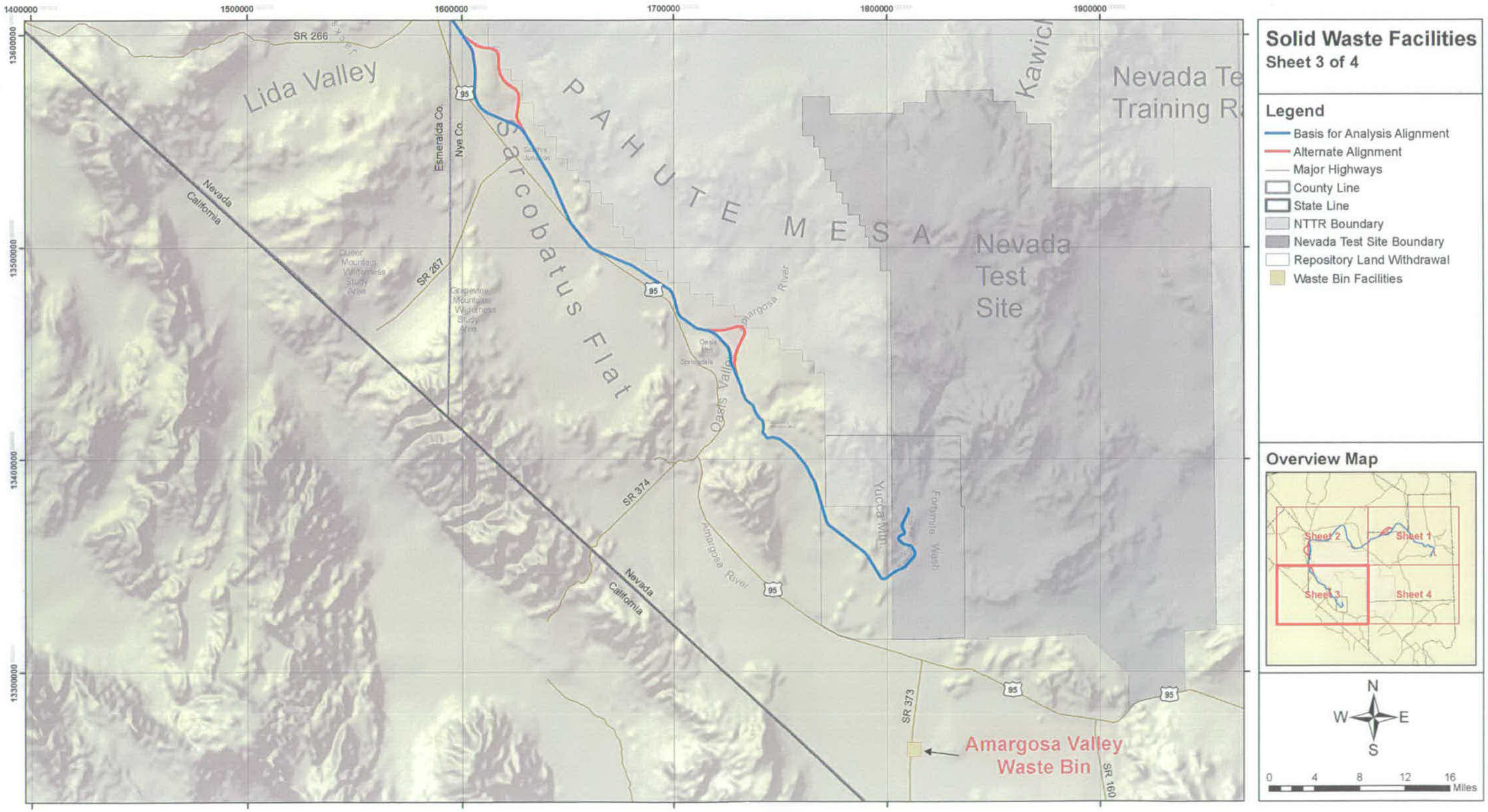

Figure 6-C. Solid Waste Facilities in the Busted Butte Area

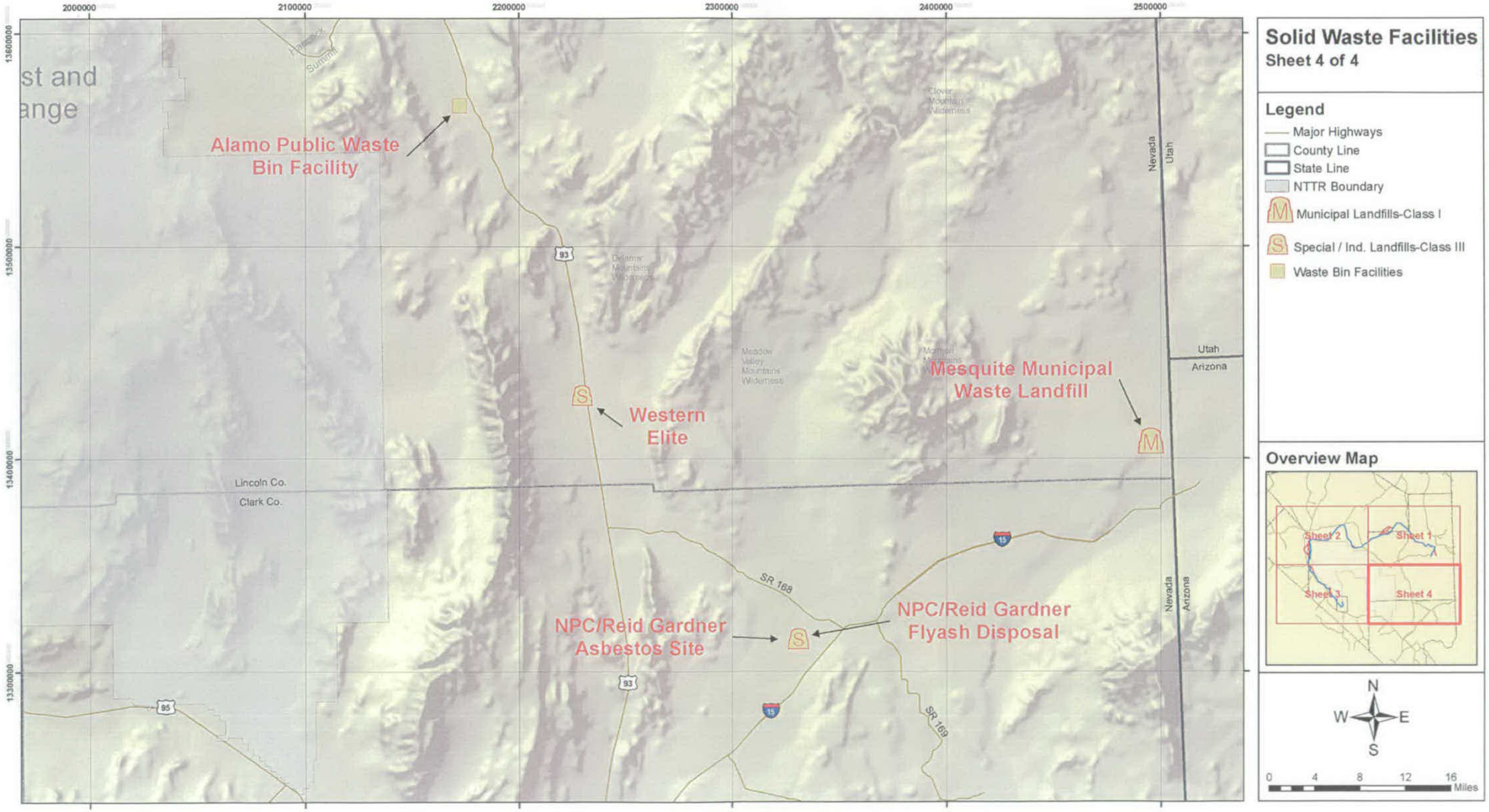

Figure 6-D. Solid Waste Facilities in the Mesquite Area

6.2.6 Conclusion

The estimated generation rate of all wastes (municipal, hazardous, and special) would not place stress on the current landfill capacities of Clark, Esmeralda, Lincoln or Nye counties.

Construction activities, including the construction camps, would generate industrial and municipal wastes. The counties where rail construction activities are scheduled have the capacity to accept wastes generated during construction. Special wastes would require coordination with local facilities for disposal, treatment or recycling. Municipal wastes would be collected and trucked to a local transfer station or landfill. Depending upon county requirements, a recycling program may be required. The recycling may include cardboard, aluminum, steel, plastic, or other recyclable materials.

Due to the number of personnel and the potential locations, each county may establish regular pickup of recyclable materials. Otherwise, each construction camp would need to segregate recyclable materials from solid wastes and provide for transport to the county recycling locations.

Landfills could be constructed to support the rail construction activities. However, the BLM may be required to take responsibility for the landfill permitting process which includes a 30-year post-closure period. Due to the numerous BLM, NDEP, and U.S. Environmental Protection Agency permitting requirements, this may be an arduous process. The BLM would need to be contacted to address their willingness to allow landfills on federal lands, and to begin the siting and permitting process as soon as possible.

Based on the construction (2009 through 2014) and operational periods (2014 through 2064), several of the existing landfills listed in Table 6-2 would close prior to the end of operations. The Tonopah and Mesquite landfills are scheduled to be closed in 2011 and 2008, respectively. The Goldfield landfill has a remaining lifespan of 17 years (2023). Due to the location of the operational facilities, an alternative landfill location would be required. It is possible that the State of Nevada may address this issue in a forthcoming Solid Waste Plan. Another option is to negotiate with Esmeralda or Tonopah county authorities to expand the existing landfills to provide future services for the operation of the rail facilities.

6.3 EQUIPMENT

Drilling equipment would be used to establish the water wells necessary for construction. Support equipment for that activity would be standard to industry practice including temporary storage tanks and pumping equipment.

Standard construction equipment for earthwork activities is anticipated. Likewise, rock excavation equipment would be that which is typical for drilling and blasting operations and, where geological conditions exist, equipment for ripping rock. Rock excavated from the site would provide the source material for subballast processing, thus requiring portable crusher equipment for that effort.

Bridge construction activities and concrete culvert construction activities would be supported by standard construction equipment. Batch plant equipment would need to be mobilized to the larger construction sites to support concrete activities and would require water supplies and waste disposal.

Quarry development and operations would utilize industry standard excavation equipment. The processing equipment to crush the rock and wash the final product would be common to this type of operation.

Track construction equipment would be both on-track and standard trucking and rubber-tired construction equipment. Numerous construction work trains would be employed to marshal materials to the rail head. Complimenting the material distribution activities would be track tampers and regulators to complete the track construction.

Portable rail welding plants are anticipated to develop the 1,440-foot-long rail strings. Typically, such welding units are powered by diesel engines that generate 375 kVA; however, power can be obtained from the existing utility grid where available. A typical generator is rated at 480 volts and produces 790 amps.

Completion of the communications system and installation of the signal system would be supported by standard construction equipment and hi-rail equipment.

6.4 ACTIVITY LEVELS

Numerous construction sites would be active simultaneously. Initial activities would focus on the establishment of the construction camps and construction water wells. In the first 18 months, construction activities at several bridge locations would begin. Likewise, at several major excavation and embankment sites, roadbed construction activities would commence.

Near the end of the first year of construction activities, track construction-related activities would begin. All forms of construction activity would be active during the second year of construction. Mostly track construction activities would be in progress after the initial two years of construction until the completed signals and communications activities are complete.

In most cases, seven-day-a-week daylight construction work is anticipated to support the project schedule. Additionally, track tamping and regulating activities are anticipated to be performed at night, as is activity associated with equipment maintenance and materials movement.

Quarry activities along the alignment are anticipated to support the project quantity requirements. This operation(s) would commence within two months of notice-to-proceed (NTP) for the rail line contractor or prior to NTP if performed by a separate quarry operations contractor.

No prescriptive weather-related shut-downs of construction activities are anticipated (e.g., winter freeze). Summer heat may require some track construction activities to be performed at night such as welded rail adjustments. Wind speeds above 25 mph may be noted in air permits requiring reduced construction activity.

6.5 STABILIZATION AND REHABILITATION

The proposed project would include constructing the roadbed in general accordance with BLM standard operating procedures for range improvements and vegetation restoration. The slope and ditch areas would be maintained as a fire break. A program would be implemented to:

- Identify the methods of restoration required on lands disturbed during NRL construction
- Restore and revegetate disturbed lands not required for NRL operation
- Monitor restoration progress
- Remediate revegetated areas as required

This program would meet DOE and BLM requirements for restoration of disturbed sites and would include the aspects listed below. Another program would be implemented to prevent the spread of noxious and other invasive weeds during construction and operation of the rail line. This program would be developed in coordination with the BLM. An inventory of noxious and invasive weeds would be conducted prior to construction as part of the development of this program.

- Reclamation inventories would be conducted and site-specific restoration plans would be developed prior to construction. Separate plans would be developed for each land cover type or vegetation community along the rail line. Plans would include recommendations for topsoil salvage depth, topsoil stockpile placement and stabilization, vegetation salvage, recontouring, and native seed mixes.
- Cacti and yucca would be salvaged, as required by Nevada state law, prior to ground-clearing activities, maintained at nurseries, and replanted after construction. Salvage and replanting activities would occur when plants are most likely to be dormant (e.g., October through March, depending on the species).
- Topsoil would be stockpiled, as required, onsite and managed to prevent erosion and maintain soil viability and protect seeds. Seeding would occur in the fall or early winter (October through December).
- On disturbed lands no longer required for construction or operation of the rail line, facilities and structures would be removed, soil would be ripped to reduce compaction, and topsoil would be replaced. Those sites would then be seeded with a mix of native plants. As necessary, mulch or other materials would be applied to prevent soil erosion.
- Restored sites would be monitored periodically to evaluate soil erosion, the presence of invasive species, and plant growth. Sites would be remediated as required to reduce erosion and the presence of invasive species, and to increase the abundance of native plants. Monitoring to assess the restoration is anticipated to last approximately six years.

A conceptual schedule outlining the major decisional and construction activities is shown in Figure 7-A. CRC Construction Schedule. This schedule only shows critical path activities and other major activities. The first set of critical path activities are those elements required to allow trackwork construction to commence. Project construction has been segmented into eight zones for design efficiency, as shown in Figure 7-B. Construction Milepost Key Map.

7.1 PRE-CONSTRUCTION FIELD ACTIVITIES

During the design phase of the schedule, field investigations would be necessary to support design development. A comprehensive geotechnical drilling program would be required to facilitate design of embankments, excavations, bridges and structures. Drilling rigs and support equipment would be transported throughout the NRL alignment for this purpose.

7.2 ROADBED AND STRUCTURES

Large earthwork concentrations and major bridges largely influence the set-up of the construction schedule. In the alignment description included in this document (Section 2.2), eight zones of excavation and embankment activity are identified. Each of those zones would take approximately six months to one year to construct the roadbed prior to commencing track construction. In each case, the following sequence of activities is anticipated:

1) Permitting – Applicable per Table 6-1.
2) Clearing and Grubbing – Top soil would be windrowed along alignment for follow-on embankment construction and, where appropriate, at select excavation sites.
3) Excavation – Place material in embankment or spoil areas within the ROW (where excess materials are generated).
4) Embankment – Material from excavation or borrow (where insufficient material is generated by excavation activities).
5) Placement of Top Soil – Where applicable on embankments and select excavations.

Note: Erosion monitoring and mitigation activities are included in activities two through five.

The 1,027-foot-long bridge at Beatty Wash would take two years to construct. This bridge is 165 feet in height over Beatty Wash. Activities necessary to support track construction in the first 55 miles of the CRC are shown on the schedule. All other bridges west of that point have sufficient time to be constructed without impeding further track construction.

7.3 TRACK

Track construction for this schedule approach is calculated at a rate of 24,000 track-feet per week (five days a week at 4,800 track-feet per day). For purposes of production calculations, 2,400 concrete cross ties would be placed on the roadbed each day (for five days of the week) with the balance of each week for unforeseen conditions mitigation. Concrete cross ties would be trucked from stockpile to railhead and unloaded utilizing a jig, allowing four ties per minute (10 hour day = 600 minutes) to be placed on the roadbed. These concrete cross ties would be manufactured at a commercial tie plant and delivered to the Caliente end of the project for distribution over the alignment. It is also possible that a tie producer (or a contractor) could establish a dedicated tie production facility in Caliente or another area.

Weekly production of weld rail strings would support the tie distribution rate with the production of 34 1,440-foot-long strings each week. Welding 80-foot-long rails together at a rate of five minutes per

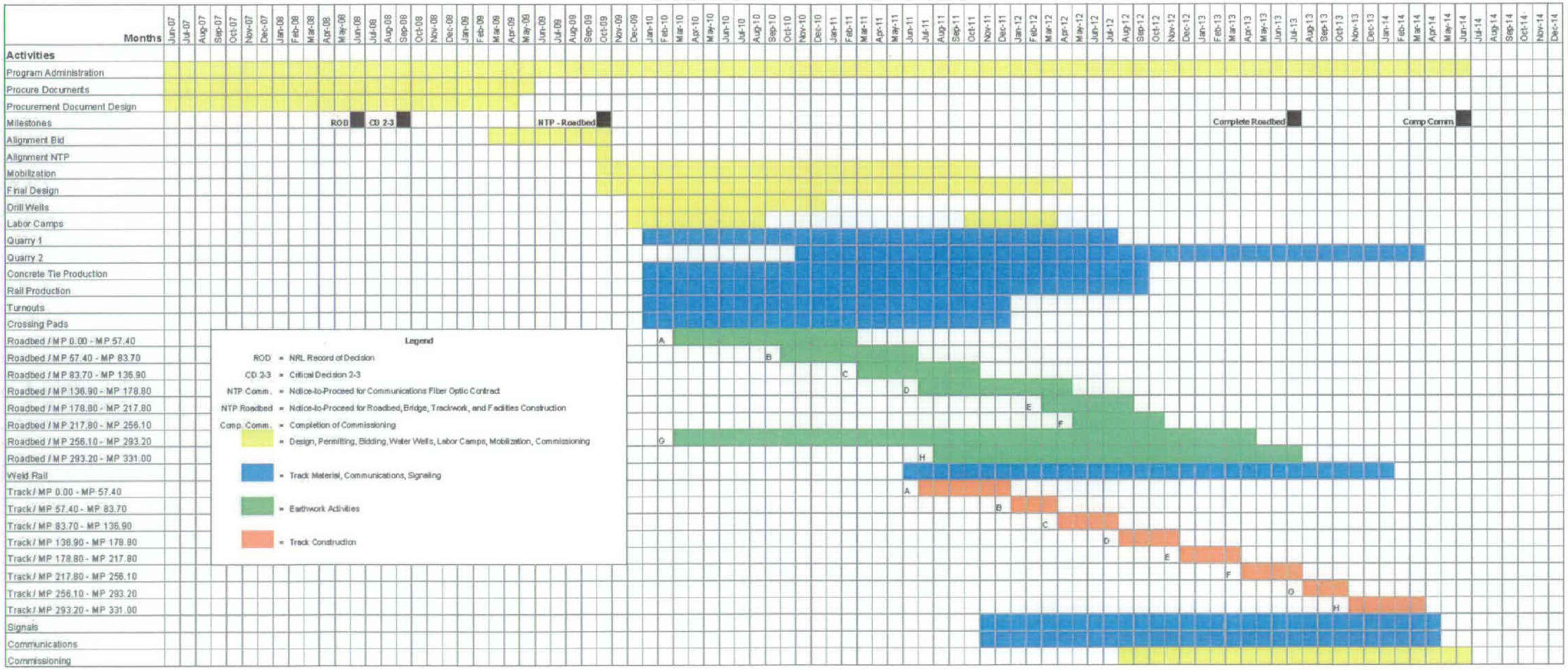

Figure 7-A. CRC Construction Schedule

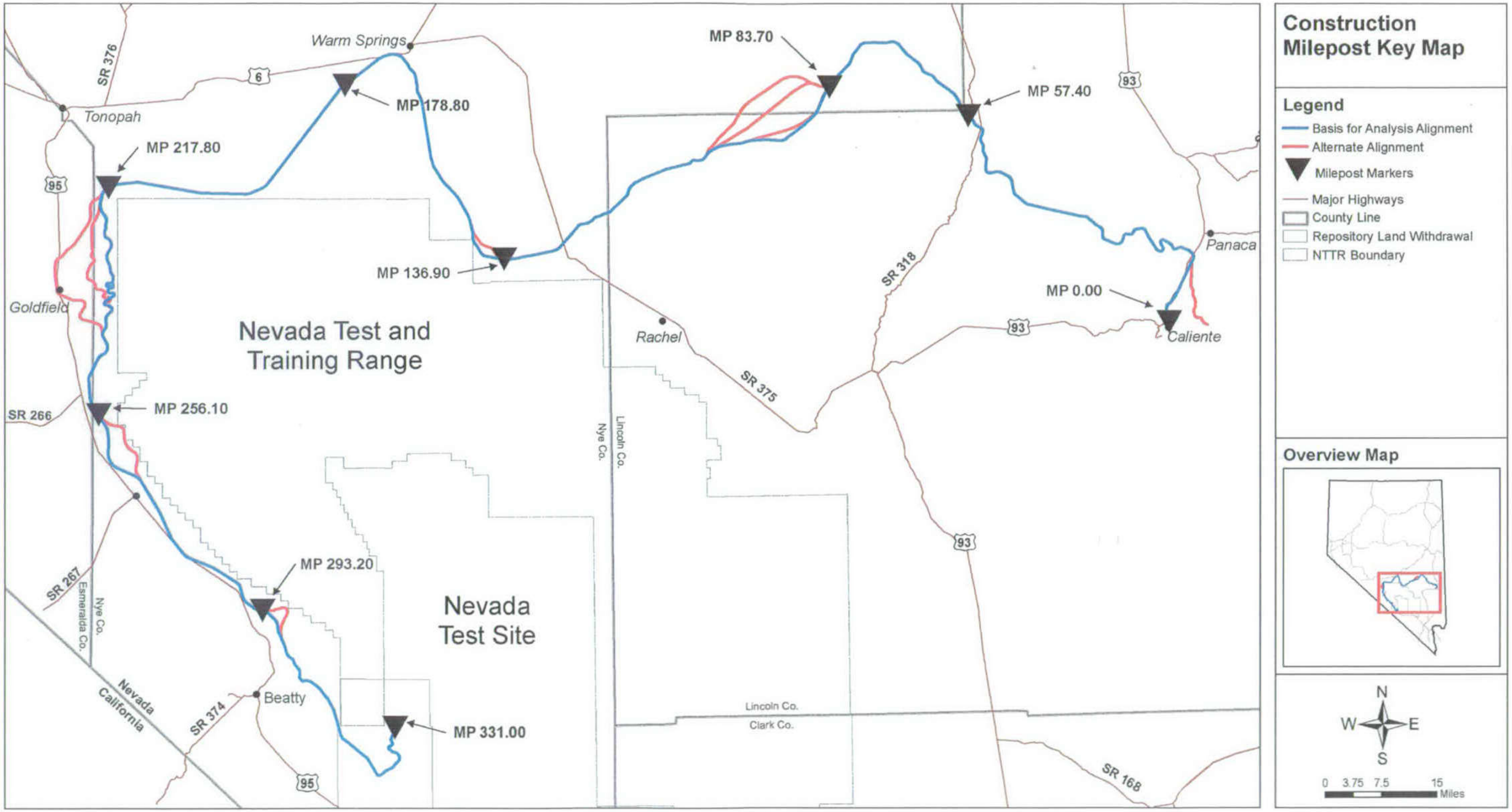

Figure 7-B. CRC Construction Milepost Key Map

weld allows for 120 welds per day produced from a portable welding plant. Since 17 welds are required per 1,440-foot-long string, the daily production would yield seven strings. Five days of welding activity would support 50,400 linear feet of welded rail which is greater than the 48,000 linear feet of rail to be laid on the concrete tie placement weekly production (24,000 track-feet requires 48,000 linear feet of rail). Rail trains loaded with up to 20 strings would be utilized on two separate days to distribute the rail.

Ballast requirements for the track are estimated at 1.70 net tons per track foot. At that rate, ballast distribution of approximately 8,000 net tons would be required each day of track construction (4,800 track-feet x 1.70 net tons = 8,160 net tons). With the rail and concrete cross ties constructed on the finished roadbed, the first distribution of ballast would be at a rate of one ton per track-foot. Upon initial tamping and ballast regulating, the remaining 0.70 net tons per track-foot would be distributed to obtain the design cross section. This activity translates into the requirement of 100 cars of ballast (80 tons-per-car average) to support the daily rate of completed track construction.

7.4 FACILITIES AND SIDINGS

The staging yard facility and interchange track roadbed and building construction is included in the roadbed work at Caliente. The respective track work is included in the trackwork segment between MP 0.00 and MP 57.40. The MOW trackside facility would be constructed during the roadbed work between MP 178.80 and MP 217.80. Track work is included in that line of the schedule. Siding work is distributed to the various zones noted in the schedule and would be accomplished during the mainline work efforts. The EOL facility work for roadbed and structures is included in the final roadbed construction time frame.

7.5 SIGNALS AND COMMUNICATIONS

As track construction is initiated, the signals and communications installation would commence. Interlocking equipment (at siding locations) would be a primary focus along with wayside signal installations. Completed track is required to make final connections and conduct system and integrated testing.

The communication system utilizes a fiber-optic cable backbone laid throughout the alignment. This cable would be installed during construction of the roadbed.

7.6 OPERATIONS COMMISSIONING

Once the track construction is completed and the signals and communications systems are installed and tested, integrated testing would commence utilizing train equipment to validate all components are operating as designed. Successful testing would result in final jurisdictional inspection and commissioning of the rail line for normal operations. Segments of the alignment progressing from east to west can be commissioned prior to the entire alignment being completed.

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Appendix A
Field Evaluation of Quarry Site CA-8B

QUARRY FIELD EVALUATION CHECKLIST

QUARRY DESIGNATION: CA-8B
FIELD TEAM: Q1—Art Geldon and Matt Grizzell
November 29 and 30, 2005

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

Hilly, with washes incised into hills. Road grades commonly 7 to 10 percent (see log), with stretches ≤19 percent. Benches adjacent to north part of area CA-8B considered for facilities have gradients of ≤5 percent. Road for SE approach to quarry site.

B. Surface Water (near stream/river?), what flow?, intermittent)

Mostly has grades of <3 percent. None at site. Deeply entrenched washes carry ephemeral flow from precipitation events of unknown frequency. About 2 miles SE of the northern part of CA-8B, Meadow Valley Wash is an intermittent stream, with water use subject to water rights.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

Very little room. Benches and flats just outside of the north boundary of Area CA-8B could be used (see map). However, a SE approach to the quarry is recommended (see map). Location of facilities at the southeast site would require leveling.

D. Existing Access roads (where are they?, can they be improved? show on maps)

Primitive roads (rocky, rutted, narrow tracks) lead 2.5 to 3.0 miles from US-93, in and just south of Cobalt Canyon to the part of area CA-8B examined. Roads will require paving, side hill cuts, and fill. Fill with culverts required to cross canyon to preferred facilities site (see map).

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

Very little room, considering private property issues, but with land acquisition, there is adequate room for a siding/loading facility (see map).

F. Room for Waste Dump (need □flat to □gently sloping topo)

Very little room. Benches and flats just outside of the north boundary of Area CA-8B could be used (see map). A gently sloping bench, which would require leveling, offers more room for a dump and is the preferred site. The preferred site is reached by a SE approach (see map).

G. Access Roads (to highway and RR alignment)

i. Topographic conditions for new road

Hills with narrow canyons incised.

ii. Cut slopes (soil/rock)

Cut slopes in rock could approach 1 Horizontal to 1 Vertical (1H:1V). Tertiary fanglomerate/tuff beds hold steep slopes in canyons, but they would require slopes about 0.5 to 0.75H:1V.

2. DEPOSIT FEATURES

A Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

The Cobalt Canyon stock in area CA-8B is in T3S, R67E, S17 and 20. Only that part in S17 was examined.

B. Tonnage (provided in this deposit [W x L x H])

1,000 x 1,000 x 200 ft = 2 x 108 ft^3 = 7,400,000 yd^3 x 2.16 tons/yd^3 = 16,000,000 tons. Dimensions arbitrarily assumed the deposit within area CA-8B is much larger, and as shown on the map, it extends far beyond area CA-8B in S18 to 20, 29, and 30.

C. Overburden (note thickness/type)

Grass and soil with vegetation (see below). Bedrock has substantial exposure. Overburden thin to none.

D. Deposit Features

i. Rock Type/Description (use S&W rock descriptions)

Oligocene Cobalt Canyon stock is a zoned intrusion. Where examined in T3S, R67E, S17, the stock appears to range from Monzonite to Granodiorite: very high strength, gray to pink, phaneritic, fresh to slightly weathered. Weathers largely by exfoliation and grus development. Minerals: Plagioclase ≥ K-Spar > quartz, with 10 to 15 percent mafics (mostly pyroxene) that are purely or largely altered chloride + epidote. Less alteration and fresher toward top of exposure.

ii. Thickness/Depth (need minable thickness)

Assume ≥200 ft, based on reported thickness of about 1,000 feet by Rowley and others (1994).

iii. Rock Structure (block sizes/joint or fracture spacing)

Commonly rectangular, closely to widely spaced fractures. Locally, certain sets are dominant, but no set is dominant throughout the area.

	Block Size Distribution (%)			
Waypoint	**2 to 6 feet**	**1 to 2 feet**	**6 inches to 1 foot**	**< 6 inches**
AG-22	5	50	45	5
AG-24	25	40	25	10
AG-25	25	60	10	5
AG-26	30	50	15	5

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

Thin intervals observed on bench between AG-24 and AG-25 of altered/weathered rock. Poor exposure, but intervals appear to be thin, interstratified with sand and rock.

E. Rock Quality

RQD probably ≥80 percent.

i. Samples for testing (100 pounds minimum; describe sample; taken)

≥100 pounds, collected at AG-22, -23, -24, -25, and -26. Composite sample is depth integrated, extending up a drainage at the head of which is Peak 5734.

ii. Rock hammer test

Very high strength.

iii. Schmidt hammer test

AG-22: 50 to 63, avg. = 54
AG-24: 51 to 56, avg. = 53
AG-25: 52 to 62, avg. = 55
AG-26: 50 to 60, avg. = 52

F. Groundwater – Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No evidence of groundwater. Probably deep because of the type of rock at the site—granitic. Perched water might be available in fractures at variable depths throughout the area.

G. Future Explorations

i. Drill rig access

Roads to northern boundary of site would allow access for a track rig. Canyon required to cross on SE approach could make access by a track rig difficult. A road might be needed to cross this canyon. Helicopter access should be considered.

ii. Type of rig

Track rig

iii. Locations and depths of borings

A minimum of four borings in projected quarry area needed to determine variations in composition, alteration, and fracturing of the rock mass.

iv. Geophysics alignments

Surface Geophysics might be needed to locate zones of excessive alteration, especially near major faults.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

Pinon and juniper woodland; juniper trees are moderately abundant; pinon pine is subordinate. Much desert scrub covers the area: mesquite, scrub oak, Mormon tea, sage, and other various shrubs.

B. Visibility (would quarry be visible from road?)

Although hills are present between the quarry and the facilities and US-93, it is possible that part of the quarry operation might be visible from US-93.

4. OTHER FEATURES

A. Power (is power nearby or need on-site generation)

Power lines are 1 to 2 miles from the proposed quarry area by US-93. On-site generators should be considered.

B. Water (groundwater studies by others)

No water is available at the site. Groundwater in Meadow Valley is shallow, but availability from wells is subject to water rights issues.

C. Consider using fan alluvium of Antelope Canyon.

Moderately to well-consolidated conglomerate, gravelly sandstone, sandstone, and subordinate tuffaceous sediments and possibly tuff beds—for fill. Rock has medium-high to high strength, locally moderate strength, and should be rippable.

ROAD LOG TO NORTHERN PART OF AREA CA-8B

Mileage

0.0 Junction of US-93 with road up a Cobalt Canyon, which is a 4WD dirt track.
0.1 Road forks under a power line that parallels US-93. Take the left fork, which is rocky, rutted, and narrow.
0.6 Road forks. Take left fork.
0.7 On fan alluvium of Antelope Canyon (Tfa).
1.1 Road forks. Take the right fork.
1.3 Road forks. Take the right fork. Left fork leads to potential quarry access from the SE (see auxiliary road log).
2.0 Road gradient ahead is 7 percent, gradient behind is > 9 percent.
2.3 Crossing splay of Chief Canyon Fault Zone. Road is on Cambrian Highland Peak. Formation limestone.
2.4 Road forks. Take left, poorly defined fork.
2.5 Still on Ch, gradient is 19 percent.
2.55 Road forks. Take right fork.
2.6 Waypoint AGU. Road is on a bench underlain by Ch. To the south is the boundary of Area CA-8B. Inside this area, Tce crops out as hills, the highest visible being Peak 5734. Road grade below is 9 percent, although grade on individual benches is ≤ 5 percent.
2.7 Road forks. Take left fork.
2.75 Waypoint AG-20; Tce granodiorite outcrops in wash.
3.0 Waypoint AG-21; just west of Peak 5734, on Old Democrat Fault, rock is prominently jointed Tce granodiorite.

AUXILIARY ROAD LOG (TO SE ACCESS TO POTENTIAL QUARRY)

Mileage

0.0 Junction of US-93 with Cobalt Canyon Road.
1.1 Road forks. Take right fork.
1.3 Road forks. Take left fork, a 4WD road, south.
1.4 Road forks. Take left fork past a butte.
1.7 Grade of road behind = 2 to 3 percent. Road ahead dips, curves, and is rocky, but the road is relatively flat.
1.9 Road has been on a bench, which begins to drop off here. Directly ahead (west) is a drainage bordered by cliffs, with Peak 5734 at its head. The drainage turns from a SE trend to a northerly trend here. The northerly segment is in a deeply incised canyon related to the Chief Canyon Facilities. This canyon must be crossed to reach the potential quarry site. Fill derived from nearby fan alluvium of Antelope Canyon (Tfa) can be used to span the canyon, with culverts installed at the base of the fill for drainage in the canyon. Outcrops of granitic rock (tonalite?) are present throughout the area of this bench.

PHOTOGRAPHS

Photo 1: (waypoint AG19) – Benches underlain by Ch (Highland Peak Formation)

Photo 2: (waypoint AG19) Outcrop of Cobalt Canyon Stock on Peak 5734

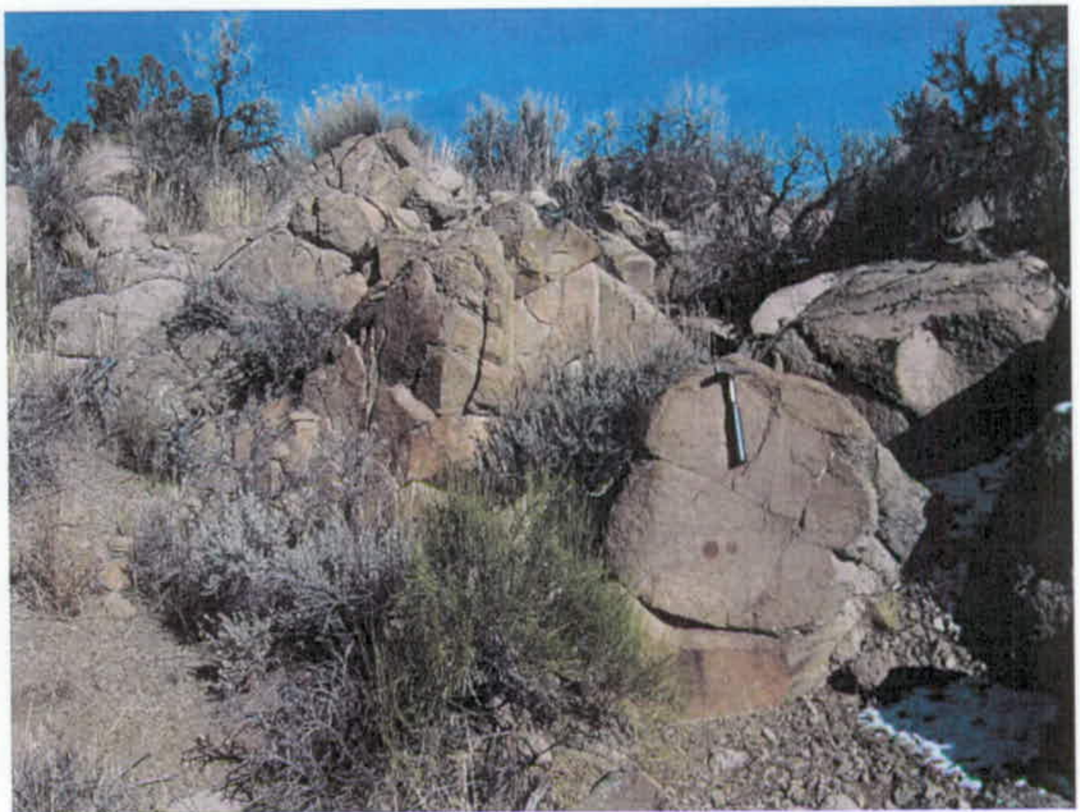


Photo 3: (waypoint AG20) Outcrop of Cobalt Canyon Stock

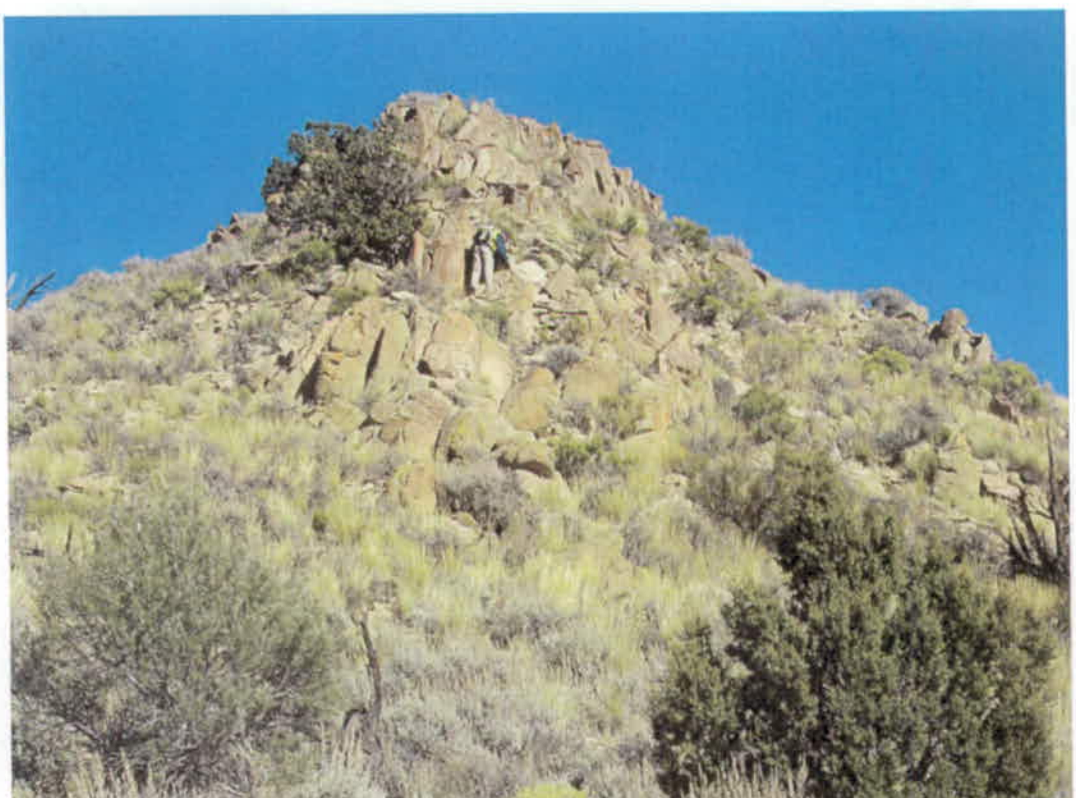


Photo 4: (waypoint AG21) Outcrop of Cobalt Canyon Stock on Peak 5734

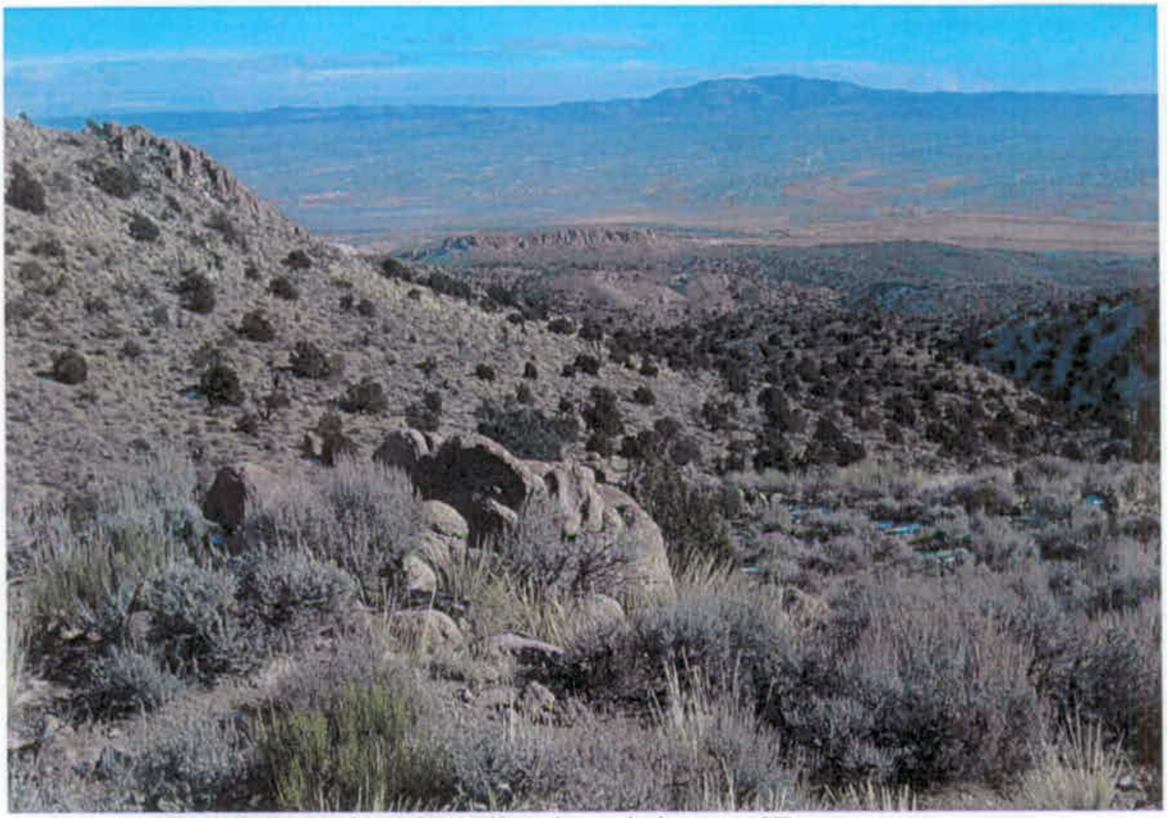


Photo 5: (waypoint AG21) View down drainage to SE quarry access area

Photo 6: (waypoint AG21) View east of Peak 5734

Photo 7: (waypoint AG22) Outcrop of Cobalt Canyon Stock

Photo 8: (waypoint AG23) Outcrop of Cobalt Canyon Stock

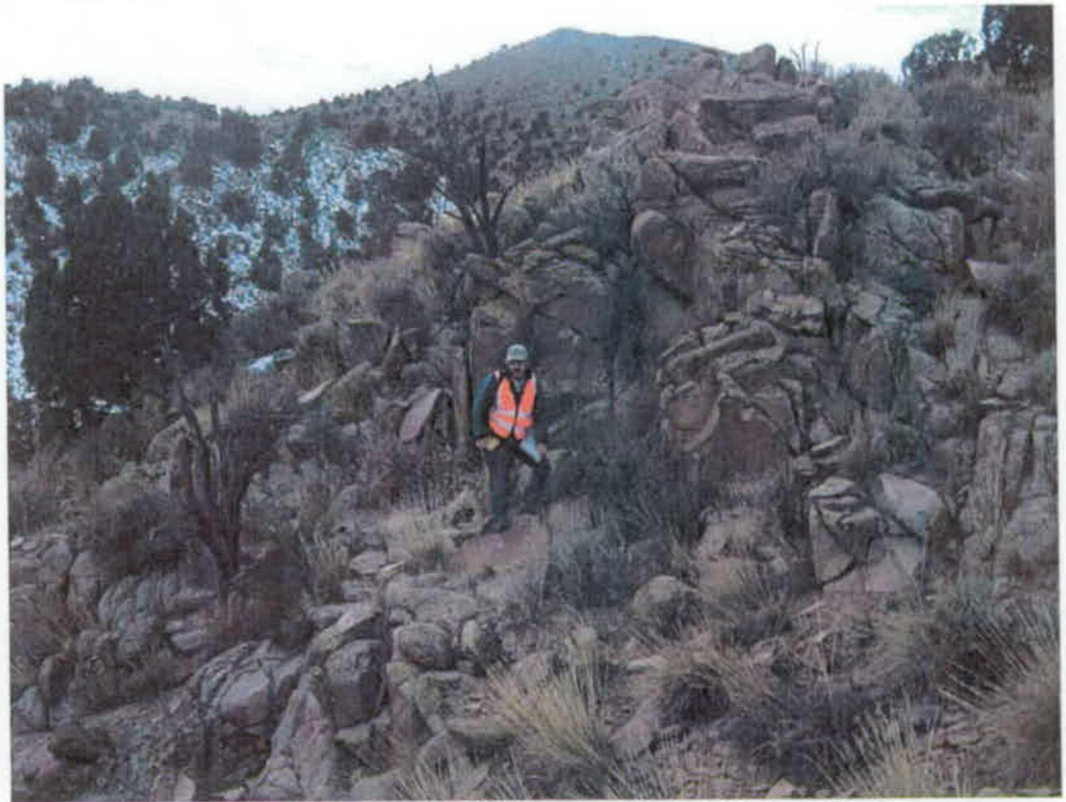


Photo 9: (waypoint AG24) Outcrop of Cobalt Canyon Stock

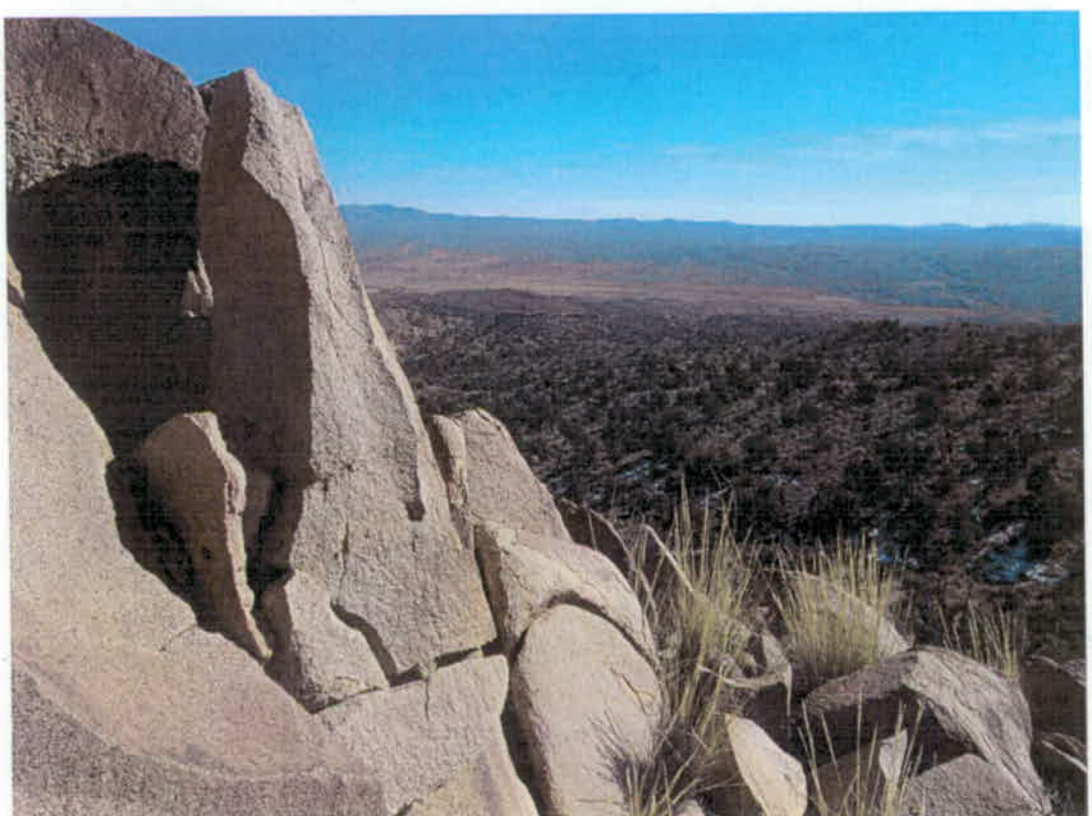


Photo 10: (waypoint AG25) Outcrop of Cobalt Canyon Stock and Meadow Valley

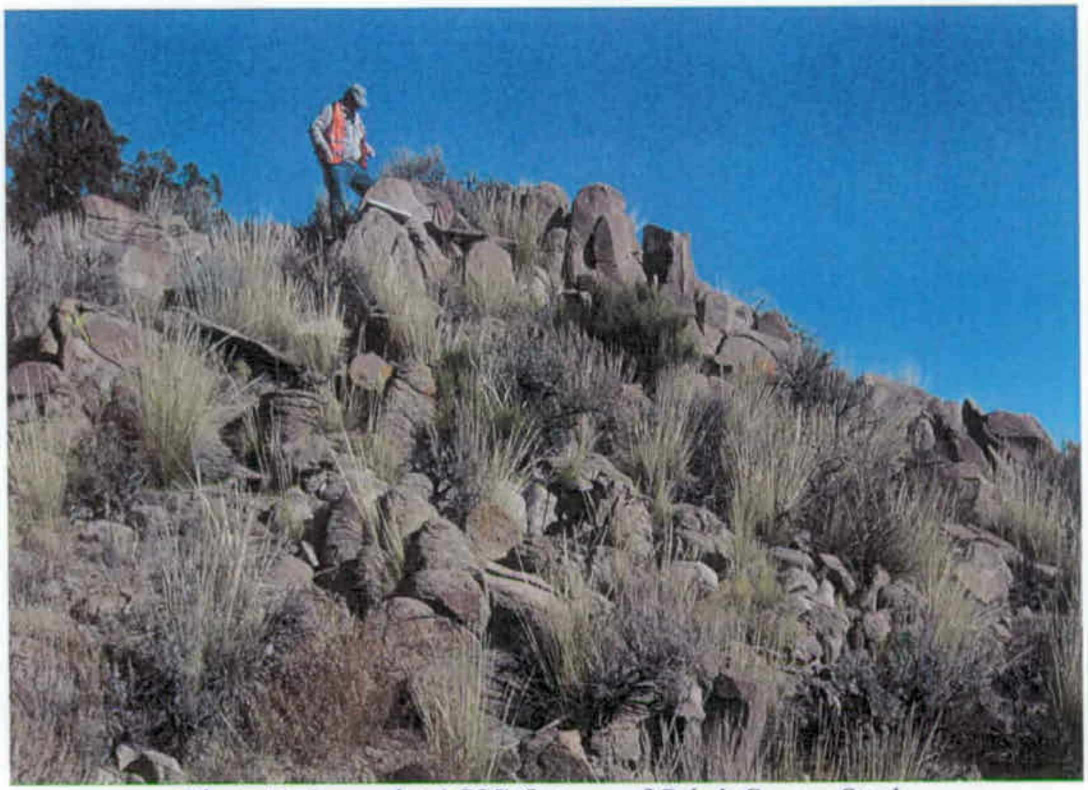


Photo 11: (waypoint AG25) Outcrop of Cobalt Canyon Stock

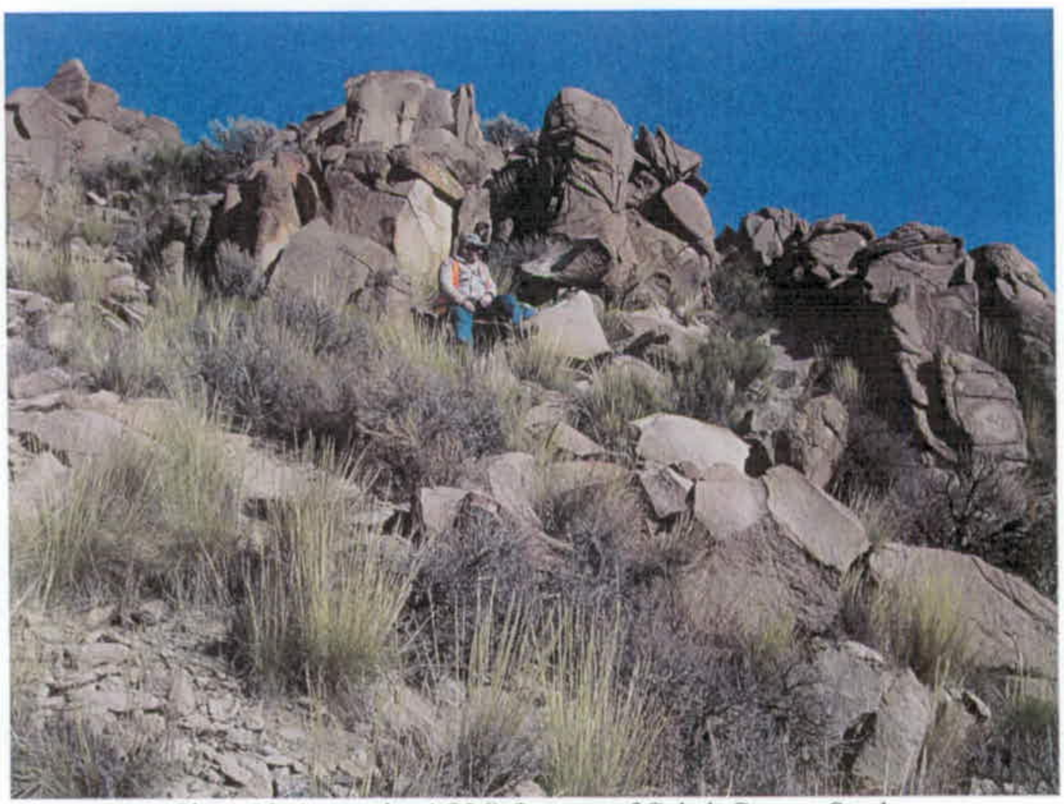


Photo 12: (waypoint AG26) Outcrop of Cobalt Canyon Stock

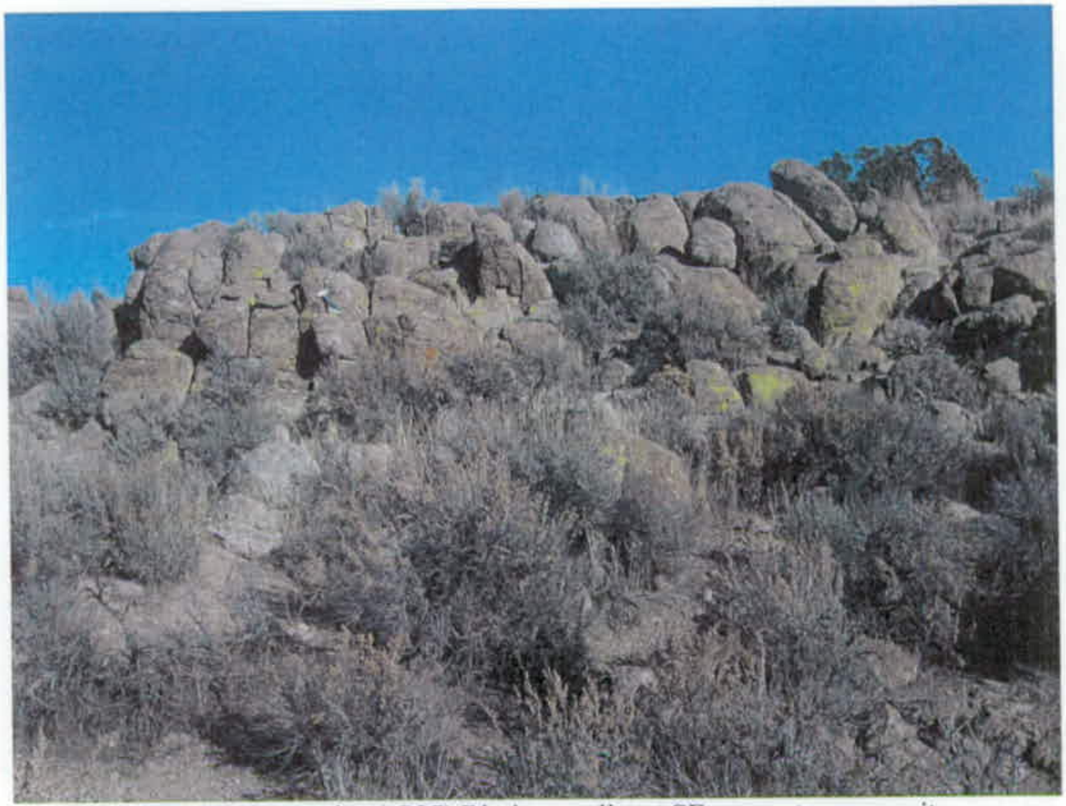


Photo 13: (waypoint AG27) Biotite tonalite at SE access to quarry site

Photo 14: (waypoint AG27) View up drainage to Peak 5734

Photo 15: (Mile 1.1) Cliff of Tt2 unit on road to SE quarry site access

Photo 16 (Mile 1.1) Tfa in Cobalt Canyon


Photo 17: (Mile 1.1) View east down Cobalt Canyon

Appendix B
Field Evaluation of Quarry Site NN-9A

Quarry Field Evaluation Checklist

Quarry Designation: NN-9A

Field Team: Q1 and Q2

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

Basalt ridge approximately 2500 feet wide, with a gently sloping 1-5% slope on the west side of the ridge leading into a mining claim approx. 1000 feet west of the ridge peak. On the east side of the ridge is a 20-30 feet vertical walled basalt outcrop with a steep, approximately 30% grade slope leading to the flat (1% grade) approximately 1500 feet wide valley between the primitive gravel road and the toe of the east side of the ridge. Within this flat valley area are two approximately 3-5 feet wide dry washes or ephemeral streams which possibly flow during or after rain events.

B. Surface Water (near stream/river?), what flow?, intermittent)

Two dry washes, first at the toe of the slope on the east side of the ridge and the other approximately 500 feet east of the first dry wash. Both appear to flow in a southeasterly direction.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

There is adequate acreage available for a plant facility southwest of Willow Witch Well, approx. 19.05 acres, approx. slope 1-3%, some grading of the plant area may be required to achieve a flat level surface. There is also the option of shifting the Office/Plant area south away from the Willow Witch Well area, since the valley bottom appears to remain relatively flat throughout the boundary limits.

D. Existing Access roads (where are they?, can they be improved? show on maps)

There is an existing access road to the site from state route 375 to the north. The access road is a single lane gravel road that will need improving if it is to be the main access road to the quarry site. At the quarry site there is a primitive gravel road leading to the top of the ridge. However, there are some sections of steep grade of less than 500 feet in length that will need improvement to allow better access to the top of the ridge. Approximately 2.9 miles of road will need to be improved at the site and between the site and the railroad siding.

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

Adequate room for railroad siding and loading yard approximately 1 mile northwest of the quarry site at the intersection of the proposed alignment and an existing primitive road, approximately 37.05 acres. The grade at the proposed siding and loading area is approx. 1%.

F. Room for Waste Dump (need ~flat to ~gently sloping topo)

There is adequate room for a waste dump within the boundaries of the proposed plant/office site.

G. Access Roads (to highway and RR alignment)

There is access to the proposed quarry site from both Route 375 to the north and there is also access to Route 375 to the east. From the site, the existing primitive road leads north and intersects Route 375 after approximately 27.7 miles. Also from the site, the existing primitive road leads south then east and intersects Route 375 after approximately 15.5 miles. Both primitive roads will need slight improvements and grading to allow better access to the proposed site. The road between the proposed site and the proposed railroad siding is a distance of approximately 1.1 miles. There is currently an existing primitive road leading to the siding area however, it will need improvements and grading to accommodate transport vehicle traffic.

i. Topographic conditions for new road

The road between the quarry site and the railroad siding will need to be graded due to a section of steep grade leading out of a wash 1/4 mile northwest of Willow Witch Well approximately 50 feet long and at a grade of approx 15%.

ii. Cut slopes (soil/rock)

A road will have to be constructed leading from the access road to the quarry pit a distance of approximately 1000 feet.

2. DEPOSIT FEATURES

A. Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

B. Tonnage (provided in this deposit [W x L x H])

This site could produce approximately 40 million tons (in-situ) of material based on an area of 325 acres of mineable material averaging 36 feet thick.

C. Overburden (note thickness/type)

We anticipate 0-10 feet of gravelly, silty fine SAND with a trace of cobbles as overburden. This will have to be confirmed with borings.

D. Deposit Features

Qtb (Basalt flow)

i. Rock Type/Description (use S&W rock descriptions)

BASALT; high to very high strength; dark grey; slightly vesicular in upper 2-3 feet of face (otherwise non-vesicular) slightly porphyritic

ii. Thickness/Depth (need minable thickness)

Estimated maximum thickness 50 feet, estimated minimum thickness 30 feet, to be confirmed with borings.

iii. Rock Structure (block sizes/joint or fracture spacing)

Medium spaced joints, 8-24 inches
Smooth undulating joints; open (no cement)
Block size distribution on 15'H by 40'W outcrop

Block Size	% Distribution
>2'	50%
1-2'	30%
6"-1'	10%
<6"	10%

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

We anticipate slightly vesicular zones at the top of each basalt flow layer (avg. 20ft thickness); i.e. 2-3 weak zones each approx. 2 ft thick in a 50 ft high quarry face (approx. 10% dilution)

E. Rock Quality

Estimated RQD= 70-90%

i. Samples for testing (100 pounds minimum; describe sample; taken)

Collected approx. 4 bags NN-9A-S1

ii. Rock hammer test

Clear ringing sound when hammered, indicating very high to high strength.

iii. Schmidt hammer test

(45°)= 50, 60, 52, 54, 49

(horiz oriented hammer)= 54, 60, 58, 58, 52

F. Groundwater — Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No evidence of groundwater in the immediate pit area.

G. Future Explorations

We recommend 15 borings for the footprint of the quarry pit as shown in the figure.

i. Drill rig access

Existing road leading to top of ridge is adequate for a 4WD or track drill access, under normal dry conditions.

ii. Type of rig

4WD or track mounted drill recommended.

iii. Locations and depths of borings

Each boring should bottom at an elevation of 5985 ft. (see map for locations)

iv. Geophysics alignments

Due to good outcrop exposures, no surface geophysics anticipated.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

Sage and desert grasses, approx 5-10% ground cover.

B. Visibility (would quarry be visible from road?)

Quarry site is visible from the primitive single lane road, Quarry site is approx 20-30 miles from nearest paved road (SR 375).

4. OTHER FEATURES

A. Power (is power nearby or need on-site generation)

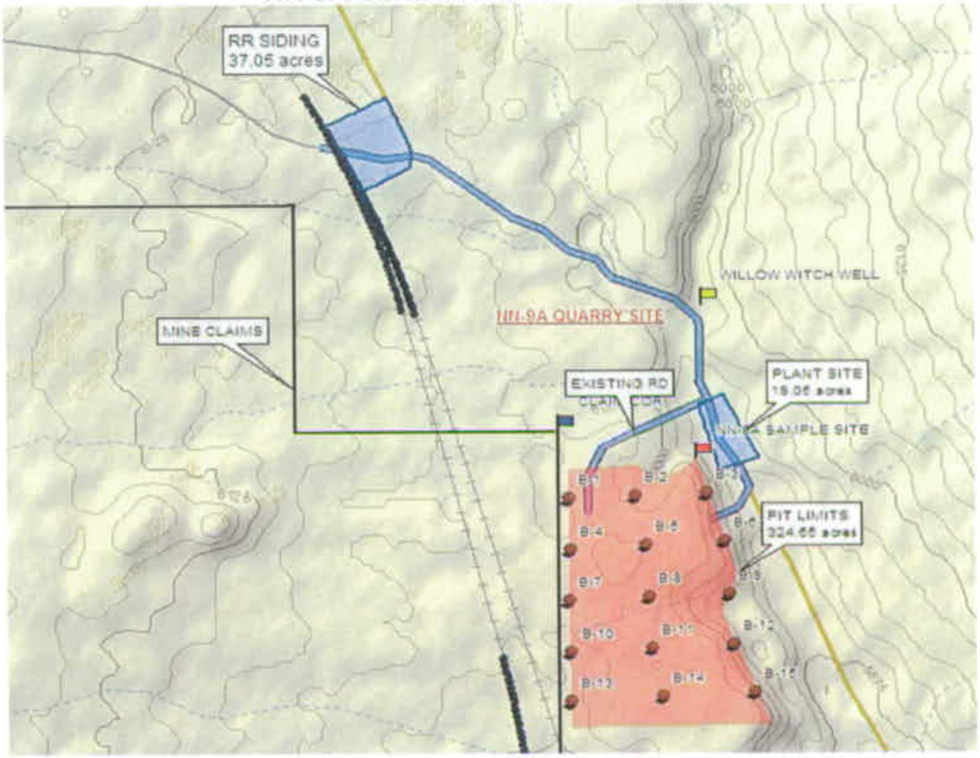
Nearest electric lines are approx. 27 to the north and 15.5 miles to the southeast.

B. Water (groundwater studies by others)

Willow Witch Well (N37.8413°, W116.2096°), flows approx. 5 gpm (artesian), currently being used for cattle, adjacent to quarry processing site.

Boring	Latitude	Longitude	Collar Elev.	Floor Elev.	Overdrill	Total Depth
B-1	N37.83101°	W116.21759°	6026	5970	10	66
B-2	N37.83115°	W116.21363°	6018	5970	10	58
B-3	N37.83134°	W116.20943°	5993	5970	10	33
B-4	N37.82822°	W116.21753°	6034	5970	10	74
B-5	N37.82848°	W116.21299°	6048	5970	10	88
B-6	N37.82873°	W116.20837°	5973	5970	10	13
B-7	N37.82553°	W116.21766°	6030	5970	10	70
B-8	N37.82576°	W116.21287°	6041	5970	10	81
B-9	N37.82592°	W116.20807°	5947	5970	10	-13
B-10	N37.82275°	W116.21758°	6017	5970	10	57
B-11	N37.82297°	W116.21265°	6030	5970	10	70
B-12	N37.82314°	W116.20779°	5973	5970	10	13
B-13	N37.82009°	W116.21750°	6020	5970	10	60
B-14	N37.82034°	W116.21204°	6039	5970	10	79
B-15	N37.82056°	W116.20655°	6002	5970	10	42
TOTAL ESTIMATED DRILLING FOOTAGE						791

NN-9A CORE DRILLING PROGRAM



NN-9A Photos

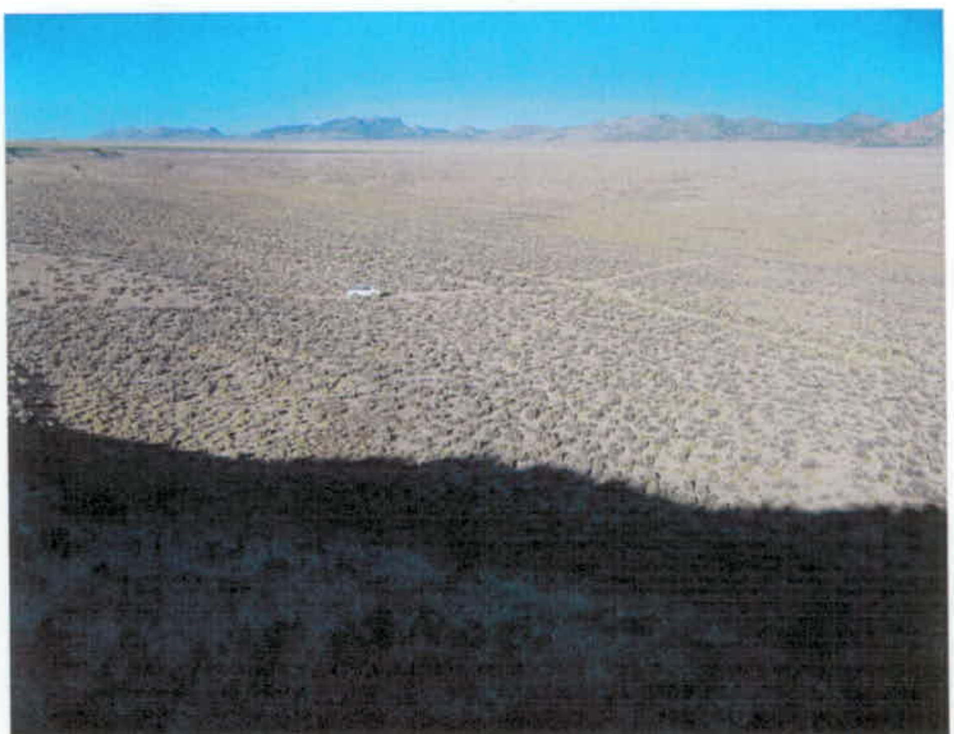


Photo 1075: View of the proposed office/crusher site in the flat valley bottom, also in photo is the primitive access road leading to the top of the proposed quarry, View is northeast (N38.83336°, W116.209801°).

Photo 1048: View of the outcrop at the sample location. (N37.832878°, W116.209542°)

View of the Willow Witch Well showing storage tank approx. 12 ft. tall and 20 ft. in diameter. Water flowing from outlet pipe 10 feet above ground surface. Level of water in the tank was approx. 5 feet deep flowing out of outlet at 5 gpm.

Appendix C
Field Evaluation of Quarry Site NN-9B

Quarry Field Evaluation Checklist

Quarry Designation: NN-9B - BASALT

Field Team: Q2

Note: The potential quarry site NN-9B consists of large exposures of basalt and dacite. We classified and sampled both rock types. We also prepared Field Evaluation Checklists for both rock types. Based on our observations in the field, we determined that the basalt has superior potential for ballast production within NN-9B. Therefore, we are not including the NN-9B Dacite in the list of ranked sites. We will retain the dacite samples, but we do not intend to submit them for laboratory testing. The Field Evaluation Checklist for the dacite is attached to the end of this NN-9B-Basalt report for information.

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

A narrow ridge composed of basalt extending from northwest to southeast terminating in the south at approximately N37.79346°, W116.18642°, and approximately 500 feet wide at the 5900 ft. elevation line at N37.800778°, W116.193686°. Both the east and west sides of the ridge are steep with slopes of 10-20%. There are outcrops of basalt on both the east and west sides of the ridge with vertical faces approximately 15-25 feet tall. There is a terrace on the east side of the ridge approximately 1000 feet wide and 70 feet in elevation above the floor of the valley to the east which has a base elevation of 5790 ft. There is an ephemeral stream (dry wash) at the toe of the west facing slope of the ridge and a dry wash at the toe of the east facing slope of the ridge, between the terrace and the ridge.

B. Surface Water (near stream/river?), what flow?, intermittent)

Three dry washes, the first is located at the toe of the slope on the west side of the ridge, the other is between the terrace to the east and the toe of the east slope, and the third is between the terrace and the primitive access road to the east. All dry washes appear to flow in a southeasterly direction and are typically 3-4 feet wide.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

The proposed plant site (shown in blue) covers approximately 16.5 acres on a flat, gently sloping alluvial surface. It is located roughly 1500 ft southwest of the quarry site.

D. Existing Access roads (where are they?, can they be improved? show on maps)

The quarry, plant and RR siding sites are not currently accessible by existing roads. Approximately 3.5 mi of new road construction will be required for access. In addition, about 4 mi of existing dirt roads from the Cedar Pipeline Ranch (N37.75280°, W116.12736°) will need to be improved to permit all-weather access to the site.

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

The proposed RR siding, located at N37.79775°, W116.20053° (shown in blue) covers about 16 acres on a flat, gently sloping alluvial surface. It is located approximately 1200 ft. northwest of the plant site at the nearest rail alignment location.

F. Room for Waste Dump (need ~flat to ~gently sloping topo)

There is adequate room for a waste dump within the boundaries of the proposed plant/office site and the grade is approx. 1-3%.

G. Access Roads (to highway and RR alignment)

Currently there are no access roads to the proposed railroad siding or to the top of the quarry site. There is a primitive access road leading to the area east of the site and from this access road approximately 2.6 miles of new road will need to be constructed. From the existing primitive access road there is access to Route 375 to the north, a distance of approximately 31 miles, additionally there is access to Route 375 by following the primitive access road to the south where it meets a paved road at Cedar Pipeline Ranch after a distance of 4 miles. From Cedar Pipeline Ranch to Route 375 the road is paved and intersects Route 375 after approximately 8.5 miles.

i. Topographic conditions for new road

The proposed road leading from the existing primitive access road to the top of the quarry, cuts up a steep slope on the south tip of the ridge, approx. slope 10-15%. Because there are some sections of 10-15% slope these steep sections will have to be graded to allow better access to the site and siding. The road connecting the quarry to the Office/Plant site follows a gently sloping valley parallel to the proposed alignment and minimal grading will be required for the construction of the new road.

ii. Cut slopes (soil/rock)

The proposed roads will have to cut into the steep areas to allow a more gradual sloped road capable of large machinery travel, typically the material being cut through is alluvium consisting of a silty, gravelly SAND, however there may be some small sections particularly the road leading to the quarry area that may have to be cut through rock.

2. DEPOSIT FEATURES

A. Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

B. Tonnage (provided in this deposit [W x L x H])

This pit (shown in red in the site map) covers approximately 60 acres. The estimated average depth is 15 ft, based on measurement of numerous outcrops on the east side of the ridge. Core drilling is required to confirm this estimate. If the average 15 ft depth is achievable this pit will be capable of producing roughly 3 million tons of basalt ballast rock.

C. Overburden (note thickness/type)

We anticipate 0-10 feet of gravelly, silty fine SAND with a trace of cobbles as overburden. This will have to be confirmed with borings.

D. Deposit Features

Qtb (Basalt flow)

i. Rock Type/Description (use S&W rock descriptions)

BASALT; medium high to high strength; dark grey; slightly vesicular in upper 5 feet of face (otherwise non-vesicular) slightly porphyritic; fresh with 1mm. of desert varnish.

ii. Thickness/Depth (need minable thickness)

Estimated maximum thickness 25 feet, estimated minimum thickness 15 feet, to be confirmed with borings.

iii. Rock Structure (block sizes/joint or fracture spacing)

Medium to thick spaced joints, avg. approx. 3 feet
Smooth undulating joints; open (no cement)
Block size distribution on 12'H by 40'W outcrop

Block Size	% Distribution
>2'	60
1-2'	20
6"-1'	10
<6"	10

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

We anticipate slightly vesicular zones at the top of each basalt flow layer (avg. 3-5 feet thickness).

E. Rock Quality

Estimated RQD= 60-70% in face.

i. Samples for testing (100 pounds minimum; describe sample; taken)

Collected approx. 100 lbs NN-9B-S1

ii. Rock hammer test

More than one blow to many blows required to fracture the rock indicates medium high to high strength.

iii. Schmidt hammer test

(Horiz. Oriented hammer) = 52, 50, 56, 50, 42, 52, 53, 56, 54, 48

F. Groundwater — Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No evidence of groundwater in the immediate pit area, some dry washes leading across the access roads leading to the quarry area and the siding and office areas.

G. Future Explorations

Five exploration core drill holes are proposed to define the thickness and characteristics of the basalt within the quarry footprint. Boring locations and depths are presented in the boring table included. A total of 134 ft of coring at eight sites is anticipated.

i. Drill rig access

We recommend accessing the top of the quarry from the ridgeline to the north. There is access to the top of the ridge and a track mount drill rig could follow the peak of the ridge south to the proposed quarry area.

ii. Type of rig

The terrain is steep and rough, with abundant basalt boulders up to 3 ft diameter on the surface. A track-mounted drill is recommended.

iii. Locations and depths of borings

See figure and borings and locations table.

iv. Geophysics alignments

Due to good outcrop exposures, no surface geophysics anticipated.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

Sage and desert grasses, approx 5-10% ground cover.

B. Visibility (would quarry be visible from road?)

Quarry site is visible from the primitive single lane road, Quarry site is approx 20-30 miles from nearest paved road (SR 375).

4. OTHER FEATURES

A. Power (is power nearby or need on-site generation)

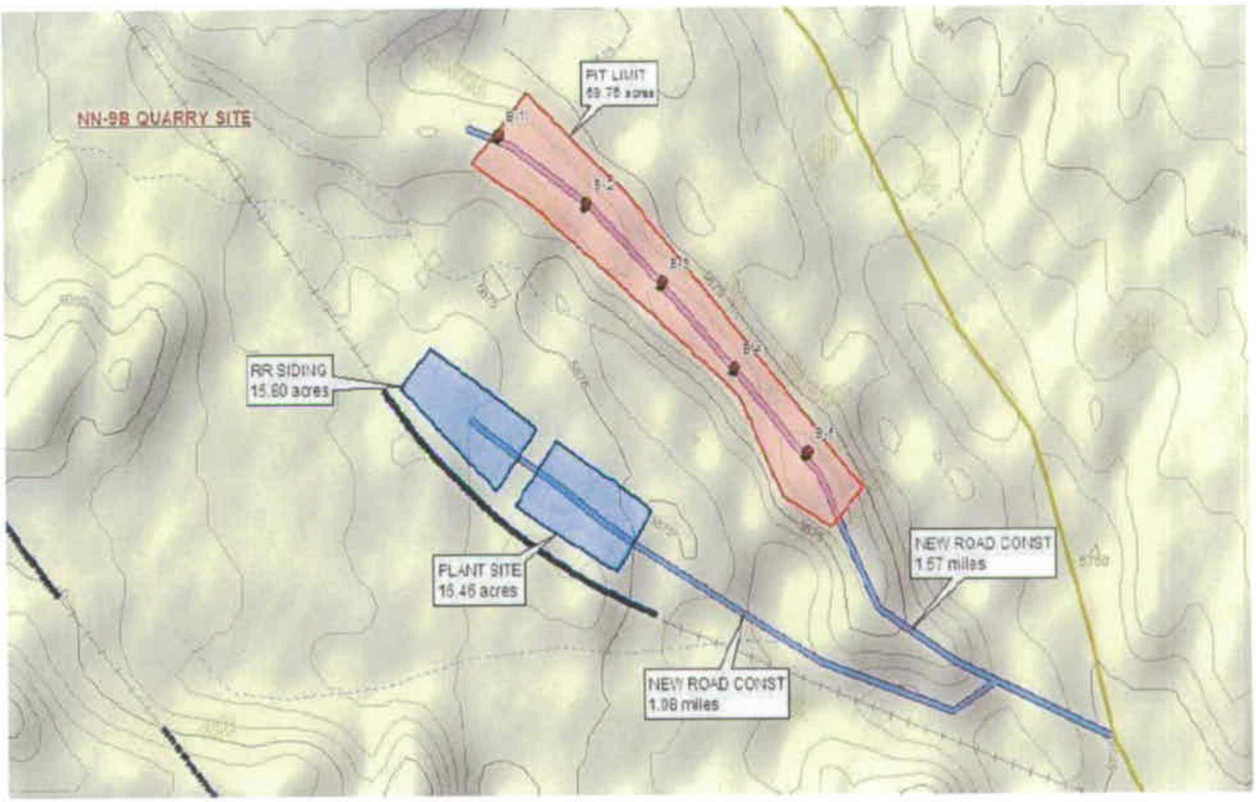
Nearest electric lines are approx. 29 miles to the north and 14 miles to the southeast.

B. Water (groundwater studies by others)

There is no water for drilling available at the quarry site. The nearest water source is at the Willow Witch well, located about 2.6 mi north of the quarry site (at N37.84155° W116.20970°). This spring produces about 5 gpm and flows into a tank that held about 10,000 gal (20 ft diam x 5 ft deep).

NN-9B: BORING LOCATIONS AND DEPTHS

BORING	LAT	LONG	COLLAR ELV	BTM ELV	OVERDRILL	DEPTH
B-1	N37.80460°	W116.19971°	5947	5920	10	37
B-2	N37.80305°	W116.19666°	5941	5920	10	31
B-3	N37.80095°	W116.19422°	5925	5920	10	15
B-4	N37.79898°	W116.19194°	5933	5920	10	23
B-5	N37.79696°	W116.18950°	5938	5920	10	28
TOTAL DRILLING FOOTAGE						134



PHOTOGRAPHS

Photo 2341: View of basalt outcropping on narrow ridge. Looking southeast. 11/17/2005.

Photo 2342: View of basalt outcropping on narrow ridge. Looking northwest. 11/17/2005.

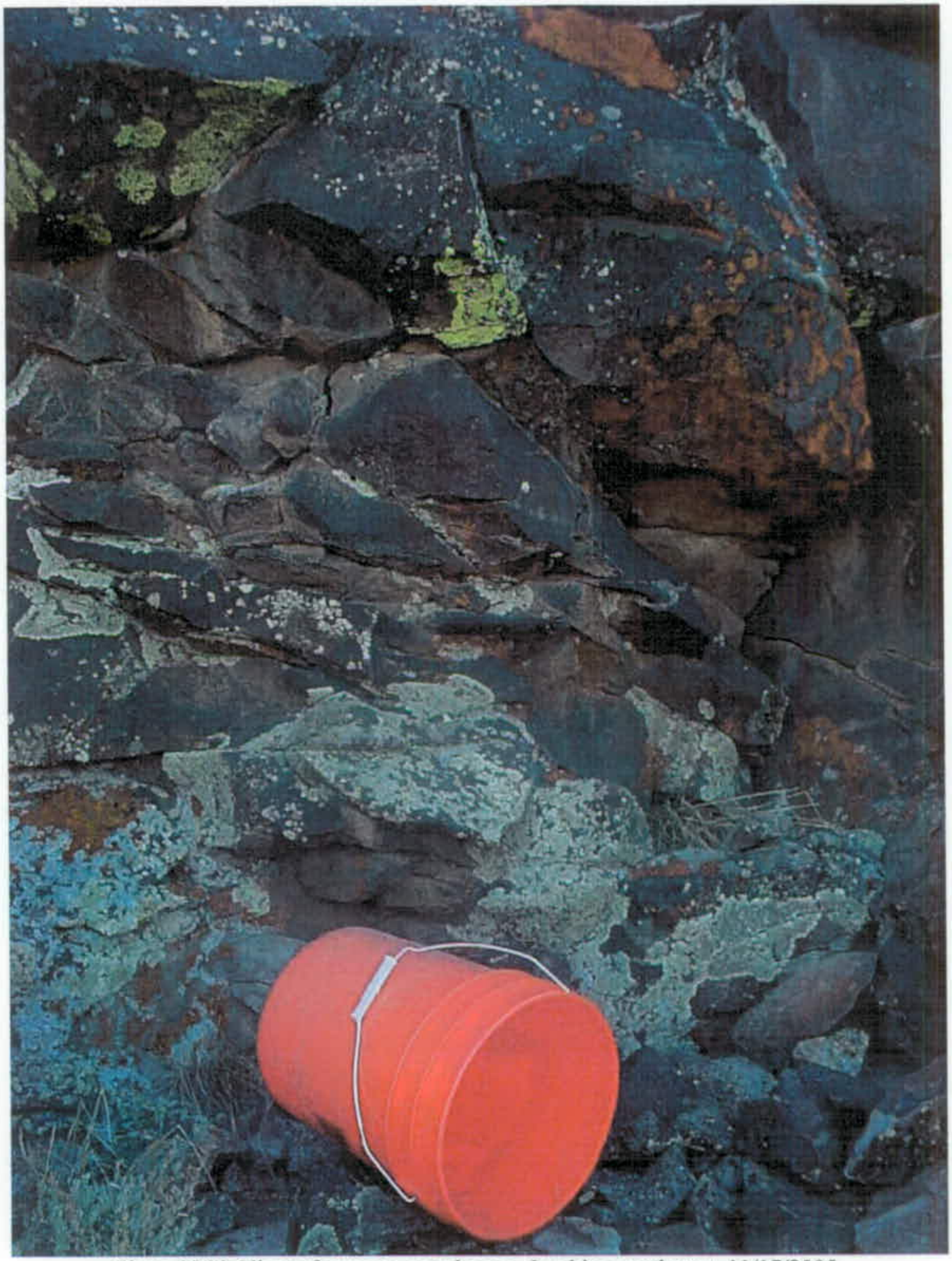


Photo 2346: View of outcrop sample area. Looking southwest. 11/17/2005.

Quarry Field Evaluation Checklist

Quarry Designation: NN-9B-Dacite

(See Note at beginning of NN-9B-Basalt Report)

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

The proposed area NN-9B consists of a narrow approximately 400-500 feet wide finger ridge of basalt in the northeast section of the area and a series of 3-4 steep (40-60% grade) peaks composed of Dacite along the southwest section of the area. The steep Dacite peaks typically top out at between 6000 and 6080 ft elevation. There is a canyon trending southeast to northwest between the basalt ridge and the Dacite peaks that is approximately 5000-600 ft wide with a dry wash 7-8 feet wide flowing down the middle of the canyon to the southeast during rain events. There is a primitive single lane gravel road along the eastern edge of the boundary marking the edge of the Wilderness Study Area to the east. The proposed quarry site for the dacite material is located on the northeast side of the southernmost dacite peak within the boundary. At this location there are two small ridges extending east approximately 500-700 ft from the peak and creating natural borders for the quarry site. Just southeast of this area is a gently sloping (2-15% grade) 500 ft wide area between the steeply sloping peak and the road which is the proposed site of the Office/Plant area.

B. Surface Water (near stream/river?), what flow?, intermittent)

There is a ravine cutting through the quarry site with a dry wash down the center which would appear to only flow during heavy rain events. There is also a dry wash on the east side of the road outside of the site limits and to the south is a rather large dry wash which has cut a canyon along the south side of the dacite peaks however this is also outside of the boundary limits.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

The proposed plant site (shown in blue) covers approximately 10.3 acres on a moderately sloping (approx. 5-15% grade)alluvial surface. It is located roughly 1200 ft southeast of the quarry site. A considerable amount of grading will be required to achieve a flat level Plant/Office site.

D. Existing Access roads (where are they?, can they be improved? show on maps)

There is currently an existing single lane primitive access road along the eastern edge of the boundary providing access to the quarry and the site. This road will require improvement and maintenance to serve as the main access road. There are no roads leading to the top of the quarry so one will have to be cut into the slope leading to the top of the terrace to provide access.

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

The proposed railroad siding loading area is located approximately 2500 feet northwest of the quarry and covers an approximate are of 11.3 acres. The location of the siding is flat averaging approx. 3-4% grade.

F. Room for Waste Dump (need ~flat to ~gently sloping topo)

There is adequate room for a waste dump within the boundaries of the proposed plant/office site and the grade is approx. 5-15%.

G. Access Roads (to highway and RR alignment)

The proposed quarry site can be accessed from the north through Reveille Valley or from the south from Cedar Pipeline Ranch. From the north the single lane gravel road through Reveille Valley will lead you to the site after a distance of approximately 33 miles. From Route 375 to the south, there is a paved road heading west off of Route 375 that leads to Cedar Pipeline Ranch approx. 8 miles, from the ranch there is a single lane gravel road heading north that leads to the proposed quarry site after a distance of approximately 3.3 miles. The Railroad alignment follows the east side of the Dacite peaks and actually runs directly through the proposed quarry site.

i. Topographic conditions for new road

Since there are preexisting roads already providing access to the site we estimate that approximately 6000 ft of road will have to be updated or constructed for the quarry site. Most slopes 5-15% in locations of proposed roads.

ii. Cut slopes (soil/rock)

The road leading from the Office/Plant site onto the top of the quarry terrace will have to be cut into the east side of the peak, however the slope is approximately a 7% grade and may not require an extensive cut be made into the slope. Slope consists of slightly silty, sandy GRAVEL overlying dacite, cut through rock may not be required.

2. DEPOSIT FEATURES

A. Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

B. Tonnage (provided in this deposit [W x L x H])

This pit (shown in red in the site map) covers approximately 14.56 acres. The estimated average depth is 53 ft, based on numerous exposed outcrops. Core drilling is required to confirm this estimate. If the average 53 ft depth is achievable this pit will be capable of producing roughly 2.7 million tons of dacite ballast rock.

C. Overburden (note thickness/type)

We anticipate 0-5 feet of slightly silty, sandy GRAVEL as overburden. This will have to be confirmed with borings.

F. Deposit Features

Ta2 (Dacite flow)

i. Rock Type/Description (use S&W rock descriptions)

DACITE; moderate to medium high strength; light pinkish-grey; fine-grained, non-vesicular, porphyritic; close to widely spaced smooth undulating joints, fresh to slightly weathered; friable and crumbly where weathered.

ii. Thickness/Depth (need minable thickness)

Estimated maximum thickness 120 feet, estimated minimum thickness 15 feet, average thickness of 53 ft., to be confirmed with borings.

iii. Rock Structure (block sizes/joint or fracture spacing)

close to widely spaced joints, avg. approx. 6"-2 feet
Smooth undulating joints; open (no cement)
Block size distribution on 10'H by 50'W outcrop

Block Size	% Distribution
>2'	10%
1-2'	50-60%
6"-1'	10-20%
<6"	10%

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

Crumbly friable material where weathered approx. 2-6" thick where weathered. We anticipate top weathered zone of 1-2 feet. Rock fractures easily and turns gravelly where weathered and exposed.

E. Rock Quality

Estimated RQD= 30-40% in face.

i. Samples for testing (100 pounds minimum; describe sample; taken)

Collected approx. 100 lbs NN-9B-Dacite, 3 bags.

ii. Rock hammer test

One blow to more than one blow required to fracture, indicates moderate to medium high strength of rock.

ii. Schmidt hammer test

(Horiz. Oriented hammer) = 65, 60, 56, 55, 55, 64, 54, 62, 58, 54

F. Groundwater — Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No evidence of groundwater in the immediate pit area, a dry wash and ravine leading into pit area but drains only immediate area and not draining a large area.

G. Future Explorations

Five exploration core drill holes are proposed to define the thickness and characteristics of the basalt within the quarry footprint. Boring locations and depths are presented in the boring table included. A total of 134 ft of coring at eight sites is anticipated.

i. Drill rig access

There are no access roads to the top of the site however slopes onto the terrace are typically 5-15%, and the ground surface is smooth with only occasional cobbles allowing offroad access up the northwest side of the quarry by 4WD or track mounted drill rigs.

ii. Type of rig

A 4WD or track-mounted drill is recommended.

iii. Locations and depths of borings

See figure and borings and locations table.

iv. Geophysics alignments

Due to good outcrop exposures, no surface geophysics anticipated.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

Sage bushes and desert grasses, approx 5-10% ground cover.

B. Visibility (would quarry be visible from road?)

Quarry site is visible from the primitive single lane road. Out of sight from any paved roads. Also faces the Wilderness Study Area so quarry is visible from the east.

4. OTHER FEATURES

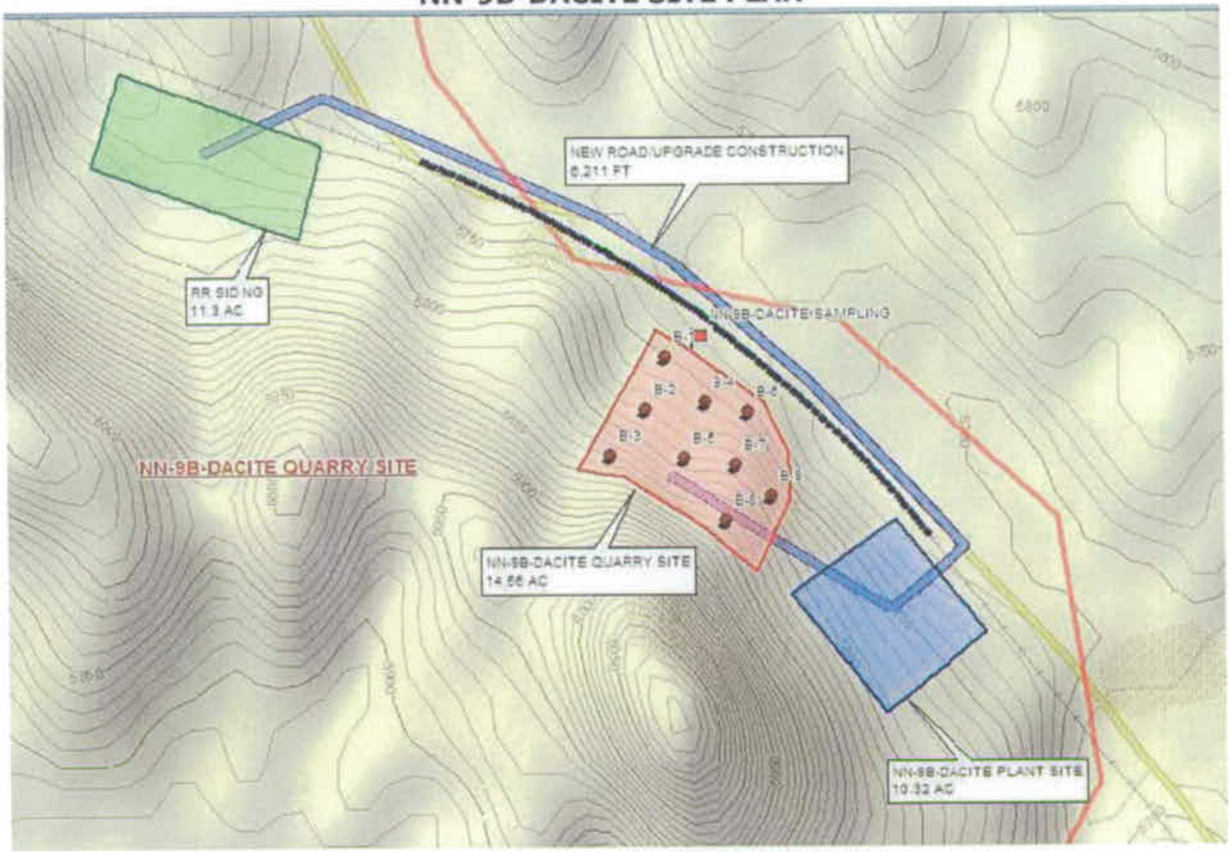
A. Power (is power nearby or need on-site generation)

Nearest electric lines are approx. 33 miles to the north and 14 miles to the southeast.

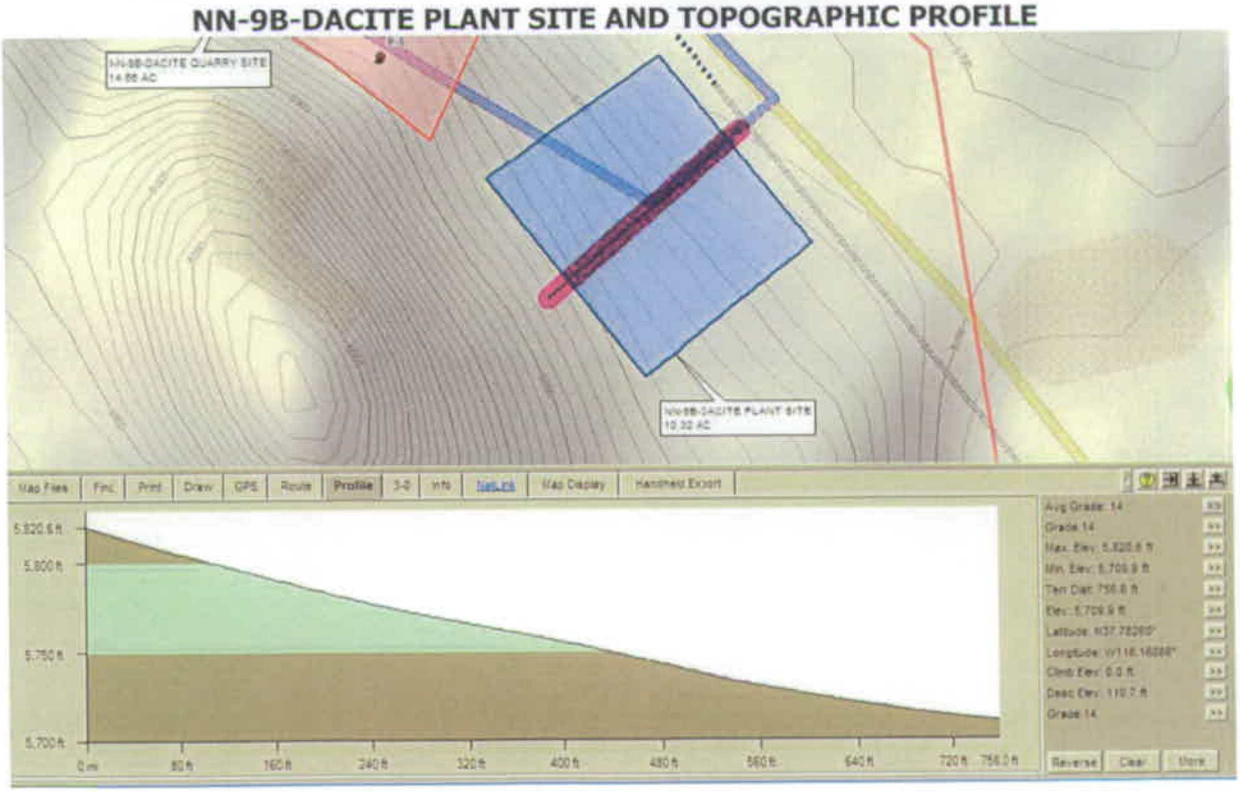
B. Water (groundwater studies by others)

There is no water for drilling available at the quarry site. The nearest water source is at the Willow Witch well, located about 4.4 mi north of the quarry site (at N37.84155° W116.20970°). This spring produces about 5 gpm and flows into a tank that held about 10,000 gal (20 ft diam x 5 ft deep). There is also water available at Cedar Pipeline Ranch 3.3 miles southeast (N37.753487°, W116.1287303°) serviced by an aqueduct of unknown flow rate.

NN-9B-DACITE SITE PLAN



NN-9B-DACITE PLANT SITE AND TOPOGRAPHIC PROFILE



Proposed Boring Depth and Location Table.

BORING	LATITUDE	LONGITUDE	COLLAR ELEV	FLOOR ELEV	EST DEPTH	OVERDRILL	TOTAL DEPTH
B-1	N37.78539°	W116.17353°	5750	5730	20	10	30
B-2	N37.78468°	W116.17385°	5780	5730	50	10	60
B-3	N37.78408°	W116.17445°	5830	5730	100	10	110
B-4	N37.78479°	W116.17286°	5750	5730	20	10	30
B-5	N37.78402°	W116.17322°	5790	5730	60	10	70
B-6	N37.78464°	W116.17213°	5745	5730	15	10	25
B-7	N37.78393°	W116.17234°	5790	5730	60	10	70
B-8	N37.78320°	W116.17250°	5835	5730	105	10	115
B-9	N37.78353°	W116.17175°	5780	5730	50	10	60
TOTAL ESTIMATED DRILLING FOOTAGE							570

PHOTOGRAPHS

PHOTO 2334: View of sampled area, looking SW (17 Nov 2005)

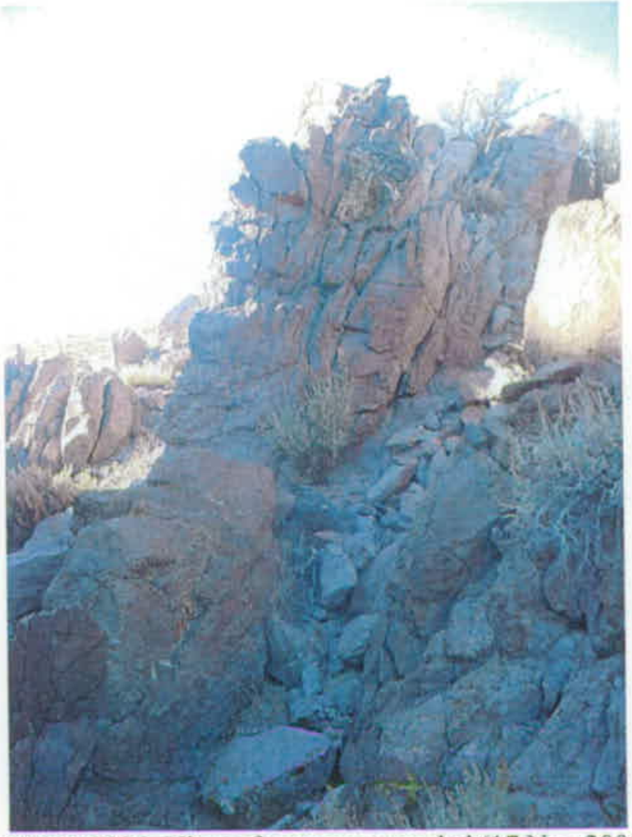


PHOTO 2335: View of outcrops sampled (17 Nov 2005)

PHOTO 2336: View of outcrops sampled (17 Nov 2005)

PHOTO 2337: View of outcrops sampled (17 Nov 2005)

PHOTO 2338: View of sampled area from road, looking SW (17 Nov 2005)

Appendix D
Field Evaluation of Quarry Site NS-3A

QUARRY EVALUATION CHECKLIST

QUARRY DESIGNATION: NS-3A
FIELD TEAM: Art Geldon and Matt Grizzell
November 20, 2005

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

Valley slopes north toward Mud Lake at grades of 2-39°; wash down center of valley. Basalt hills on both sides of valley covered with Joshua trees, shrubs, and cheat grass.

B. Surface Water (near stream/river?), what flow?, intermittent)

Wash down center of valley drains north toward Mud Lake; ephemeral flows from precipitation events at unknown frequency.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

Yes, see map.

D. Existing Access roads (where are they?, can they be improved? show on maps)

Dirt roads from Goldfield to within about 2 miles of quarry site. Roads will have to be improved in places, and a new road to the quarry site must be built from end of existing road.

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

Yes, see map.

F. Room for Waste Dump (need ☐flat to ☐gently sloping topo)

Yes, see map.

G. Access Roads (to highway and RR alignment)

i. Topographic conditions for new road

See road log for existing access roads. However, instead of using existing areas, it might be easier to reach the area by improving and extending existing roads south from US-6 past Mud Lake and up the valley.

ii. Cut slopes (soil/rock)

See road log

2. DEPOSIT FEATURES

A. Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

Deposit in T15, R43E, S35 E ½ and S 36 W ½ (see map)

B. Tonnage (provided in this deposit [W x L x H])

Width x length = 22,907,500 feet^2; thickness varies from 40 to 100 feet (based on topographic contours; average assumed to be ~60 feet, thus volume =1/4 x 109 feet^3=51,000,000 yards^{3}x 2.16 tons/yards^3= 110,000,000 tons

C. Overburden (note thickness/type)

Shallow soil, colluvium, and vegetation, except in wash. Wash filled with alluvium of unknown thickness, believed to be <30 feet.

D. Deposit Features

i. Rock Type/Description (use S&W rock descriptions)

Basalt lava flows: very high strength, dark-gray, fine-grained, varies from non-vesicular in interior of flows to vesicular at tops and other intervals; vesicles commonly filled with zeolites and other white minerals; generally fresh, but with a thin, brown weathering rind.

ii. Thickness/Depth (need minable thickness)

From topographic contours, thickness of basalt flows estimated to range from 40 to 100 feet throughout the resource area. An average thickness of 60 feet is assumed. Variably vesicular and slabby to blocky fractured, actual minable thickness averages <60 feet.

iii. Rock Structure (block sizes/joint or fracture spacing)

Generally random oriented fractures are extremely closely to widely spaced

	Block Size Distribution (%)			
Waypoint	> 2 feet	1-2 feet	6 inches-1 feet	< 6 inches
SM 389	10	25	60	5
SM 390	30	20	10	40
SM 391	Too many boulders covering rock in place to estimate block size distribution			

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/ weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

Interlayered with non-vesicular, very hard rock are layers of vesicular basalt (also very hard), slabby fractured basalt, rubble layers, intervals of gravel-cobble alluvium, and pockets of ash-fall tuff.

E. Rock Quality

RQD is expected to vary from <50% to possibly ≥ 70% from place to place. Actual RQD cannot be determined without exploration drilling.

i. Samples for testing (100 pounds minimum; describe sample; taken)

Samples collected at waypoints SM 389, 390, and 391 and mixed; 3 bags

ii. Rock hammer test

Very high strength

iii. Schmidt hammer test

SM 389 50-63, average 58
SM 390 43-59, average 51
SM 391 46-59, average 50

F. Groundwater – Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No evidence of near-surface groundwater. Abundant Joshua trees in area suggest water table is deep.

G. Future Explorations

i. Drill rig access

Dirt roads from Goldfield (see road log)

ii. Type of rig

Track rig or possibly 4WD rig with high clearance without substantial road improvement.

iii. Locations and depths of borings

A minimum of 8 borings, as shown on the map, is needed to help determine the volume and quality of basalt present.

iv. Geophysics alignments

Borehole geophysics needed to help clarify subsurface geology and hydrology.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

Moderately dense shrubs, Joshua trees common throughout the resource area.

B. Visibility (would quarry be visible from road?)

Quarry might be visible from Mud Lake.

4. OTHER FEATURES

A. Power (is power nearby or need on-site generation)

No power nearby. Would have to be extended from Goldfield on the south, or US-6, east of Tonopah, on the north.

B. Water (groundwater studies by others)

Water table might be deep, because Joshua trees prefer rocky slopes and flats with considerable depth to water. Boreholes needed to define the potentiometric surface and identify water supplies.

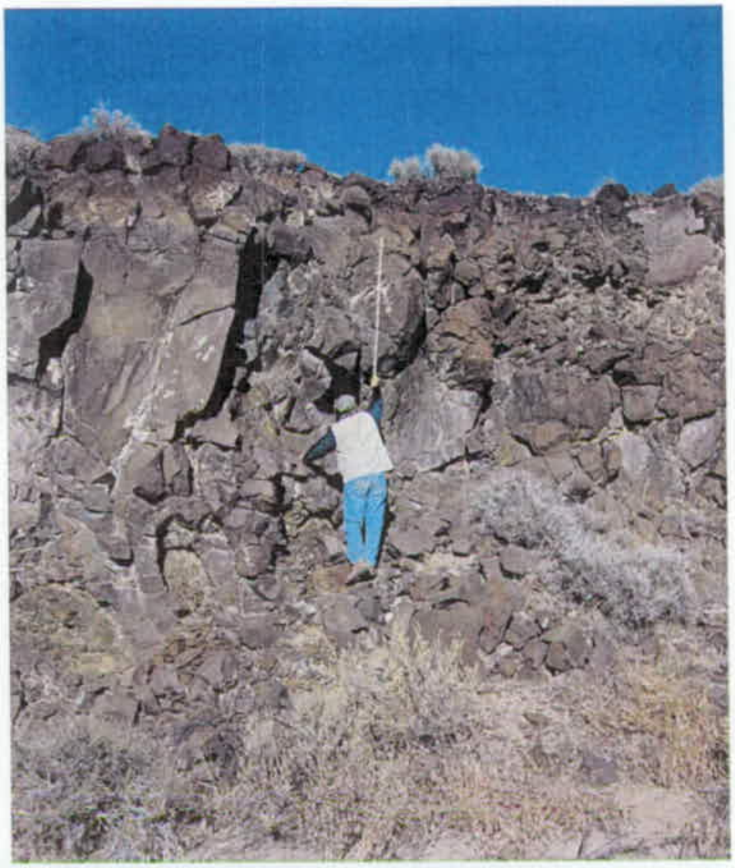
ROAD LOG TO QUARRY SITE

0.0 Goldfield at US-95.
4.9 Diamondfield (site) reached from Goldfield on well graded roads. Road forks; take right fork.
5.4 Road right to private property.
5.6 Black Butte; road forks; take right fork.
5.9 Road right to private property, road now is dirt, on rolling terrain.
6.2 View ENE of 2 basalt flows, together ~25-30 feet thick, capping hills.
7.2 Road begins to ascend a northerly aligned range of hills. Road rocky, rutted, rough; grades 6-11%.
7.9 Top of pass.
8.0 Road descends to a valley at a grade of ≤15% and curves through the valley.
8.2 Road forks; take left fork.
8.6 Road begins climbing another northerly aligned range of hills at grades of 6-20%.
9.3 Top of pass.
9.4 Road descending pass at grades of 8-12%; needs cuts and fills.
9.8 In valley; road forks; take the left fork, a dirt track.
10.2 On GF3 alignment.
10.25 Top of pass between alluvial fans sloping SE and NW; wpt SM 381.
10.4 Road left to a prospect; road becomes obscure.
11.0 Road ends; route descends a wash at 2-3% grades.
11.1 WPT SM 387: Hill of basalt on left.
11.2 Basalt in left bank of wash.
11.5 WPT SM 388 on GF3 in wash; basalt in right bank.
12.0 Basalt crops out on left, in a small hill.
12.1 Basalt crops out in right bank of wash.
12.4 WPT SM 393, basalt in right bank.
12.6 Basalt continuous from left bank to skyline.
13.0 WPT SM 389, basalt cliff on right bank.
13.3 WPT SM 390, basalt on both sides of wash.
13.6 On GF3 at SM 391; basalt outcrops on both banks.

PHOTOGRAPHS

MG-35: (No waypoint) View NE across a valley to another chain of hills, mile 7.9

MG-36/37: (No waypoint) At pass in hills, views NE to Mud Lake in area crossed by GF 3, mile 9.3

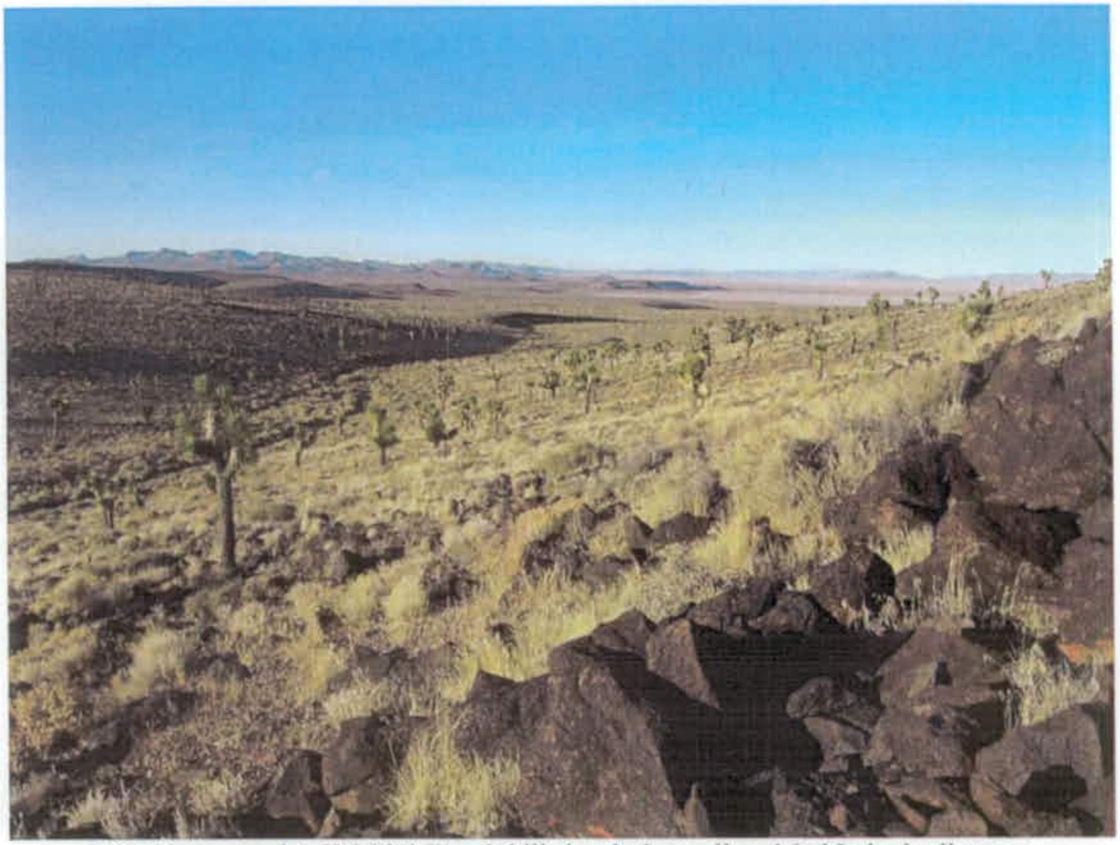


MG-38 AG0012: (waypoint SM 389) Basalt cliff on right bank of wash with rubble zones, mile 13.0

MG-39: (waypoint SM 389) View up wash (south) of vegetation 2.3 % slope

MG-40: (waypoint SM 389) Basalt outcrop, mile 13.3; basalt here on both sides of wash

MG-42/45: (waypoint SM 391) Pan NW to NE, down valley, showing basalt hills on both sides of valley, mile 13.6; on GF 3 alignment where it crosses the valley from SE to NW



MG-46: (waypoint SM 391) Basalt hills bordering valley; Mud Lake in distance.

Appendix E
Field Evaluation of Quarry Site NS-3B

QUARRY FIELD EVALUATION CHECKLIST

QUARRY DESIGNATION: NS-3B
FIELD TEAM: Art Geldon and Matt Grizzell
November 21, 2005

1. SITE FEATURES (show on map to the extent possible)

A. **Topography** (use degrees for slope gradients) The potential quarry site is on the east side of a valley flanked by low hills. The valley descends north to Mud Lake at a grade of 2-3%. A wash incised into the valley borders the quarry site on the west; the alignment borders it on the east.

B. **Surface Water** (near stream/river?), what flow?, intermittent) The wash bordering the quarry site carries ephemeral flow from precipitation events of unknown frequency (see map).

C. **Room for Plant/Office Facilities** (need 10 to 20 acres of flat land) A flat area south of basalt that would be quarried is suitable for plant/office facilities (see map)

D. **Existing Access roads** (where are they?, can they be improved? show on maps) A graded road extends from Goldfield to Black Butte, east of the site of Diamondfield, 5.6 miles from US-95 (see road log). From there, dirt roads wind their way across two chains of hills and a valley between them about 11 miles at grades of 2-20%. The route then follows a wash 0.6 miles to the quarry site.

E. **Room for Railroad Siding** (where would siding be for loading ballast cars?) A loading facility could be built near the railroad, but the proximity of the quarry to the railroad (see map) negates the need for a ballast pile in addition to that at the processing plant.

F. **Room for Waste Dump** (need ☐flat to ☐gently sloping topo) A waste dump can be located in a flat area south of the quarry (see map).

G. **Access Roads** (to highway and RR alignment)

i. **Topographic conditions for new road** An existing graded road extends about 5.6 miles from Goldfield to Black Butte, in the Goldfield Hills. Roads that become increasingly primitive along the way (ending in a dirt track) then cross two northerly aligned ranges of hills, separated by a valley before reaching the valley in which the quarry would be located. This valley slopes gently to Mud Lake, north of the quarry site. The existing roads from Goldfield have several steep stretches (Grades ≤20%) that are rocky or cut into sides of hills. Cuts and fills are needed to make these roads suitable for hauling ballast.

ii. **Cut slopes (soil/rock)** The existing roads from Goldfield have several steep stretches (grades ≤20 percent) that are rocky or cut into the sides of hills. Cuts and fills are needed to make these roads suitable for hauling ballast.

2. DEPOSIT FEATURES

A. **Location** (show on 1:24,000 scale topo to the extent possible; record T, R, Sec) The quarry site (see map) is located in T2S, R43E, S01.

B. **Tonnage** (provided in this deposit [W x L x H]) The basalt tube quarried is located where 70- and 100-foot cuts are planned along GF3. Thus, an average thickness of 70 feet is assumed. The area is about 5,400,000 ft^2. Volume is about 70 ft x 5,400,000 ft^2 = 14,000,000 yd^3. Tonnage is about 14,000,000 yd^3 x 2.16 tons/yd^3 = 30,000,000 tons.

C. **Overburden** (note thickness/type)
Thin soil and colluvium with vegetation and areas of talus.

D. **Deposit Features**

i. **Rock Type/Description (use S&W rock descriptions)** BASALT LAVA flows: high to very high strength, dark-gray, very finely crystalline to porphyritic, non-vesicular grading vertically and horizontally to slightly to very vesicular vesicles mostly filled with zeolites and other secondary minerals; fresh, with a thin, brown, weathering rind; extremely closely to widely spaced, rectangular to slabby fractures; weathered to rounded boulders or talus.

ii. **Thickness/Depth (need minable thickness)** Hills in the area appear to be basalt from top to bottom. Maximum observed thickness is 70 to 100 feet. Zones of poorer quality rock (see below) make minable thickness generally ≤70 feet.

iii. **Rock Structure (block sizes/joint or fracture spacing)**

	Block Spacing (%)			
Location (waypoint)	**2 to 4 feet**	**1 to 2 feet**	**6 inches to 1 foot**	**< 6 inches**
AG-16	30	40	20	10
AG-18	5	30	60	5

Extremely closely to widely spaced fractures; spacing and orientation variable from place to place. A dominant set of fractures, weathering from foliation planes ≤2 inches apart at AG-18 oriented N37°E, 27°NW.

iv. **Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)**
Zones of slabby fracturing, vesicular intervals and interflow gravel, sandy, and tuff in small areas, were observed at outcrops.

E. **Rock Quality**
RQD is variable and might range locally from <50 percent to >75 percent.

i. **Samples for testing (100 pounds minimum; describe sample; taken).** An area-integrated sample (probably ≥100 lbs or three bags) was collected.

ii. **Rock hammer test** The rock generally has very high strength, but strength decreases to high where slabby (extremely close to very close) fracture spacing prevails.

iii. **Schmidt hammer test**
AG-15: 51 to 60, avg. = 54
AG-16: 50 to 63, avg. = 56
AG-18: 52 to 65, Avg. = 58

F. **Groundwater** – Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem. Abundant Joshua trees indicate deep groundwater.

G. **Future Explorations**

i. **Drill rig access** Along existing roads and wash from Goldfield NE to the site.

ii. **Type of rig** 4 x 4 or track rig, depending on amount of road improvement undertaken.

iii. **Locations and depths of borings** A minimum of six borings, three along the alignment at and near 70- to 100-foot cuts are needed to determine subsurface lithology. Borings should be about 100 to 150 feet deep.

iv. **Geophysics alignments** Recommend borehole geophysics to interpret subsurface geology and lithology, but surface geophysics unnecessary.

3. ENVIRONMENTAL FEATURES

A. **Vegetation** (what type/how much/where) Shrubs, forbs, and grass, with common Joshua trees on slopes and hilltops.

B. **Visibility** (would quarry be visible from road?)
The quarry might be visible from the Mud Lake area.

4. OTHER FEATURES

A. **Power** (is power nearby or need on-site generation) Power lines are far away. Generators would be needed to supply power.

B. **Water** (groundwater studies by others) A well would be needed so supply water for processing ballast and for use by personnel. Depth to water at Mud Lake (Bonham and Garside, 1976), the low point of local drainage and groundwater flow systems, together with common Joshua trees, implies that depth to groundwater probably exceeds 300 feet.

ROAD LOG TO QUARRY SITE

1. 0.0 Goldfield at US-95.
2. 4.9 Diamond field (site, graded roads to here.
3. 5.4 Road right to private property.
4. 5.6 Black Butte, take right fork.
5. 5.9 Road right to private property; road now is dirt, undulating.
6. 6.2 View ENE of two basalt flows, about 10 and 15 feet thick capping hills. Only basalt in this part of Area NS-3B.
7. 72. Rocky road ascends chain of hills at grades of 6 to 11 percent.
1. 7.9 Top of pass.
2. 8.0 Road descends to a valley at grades of ≤15 percent.
3. 8.2 Take left fork.

4. 8.6 Road ascends a chain of hills at grades of 6 to 20 percent.
5. 9.3 Top of pass.
6. 9.4 Road descending pass at grades of 8 to 12 percent; needs cuts and fills.
7. 9.8 In valley; take left fork.
1. 10.25 Pass between alluvial falls sloping SE and NW; wpt SM381.
2. 10.4 Road left to a prospect.
3. 11.0 Road ends; route descends a wash at 2 to 3 percent grades.
4. 11.5 Wpt SM388 on GF3 in wash; basalt on right bank.
5. 11.6 Vicinity of facilities for Area NS-3B quarry.

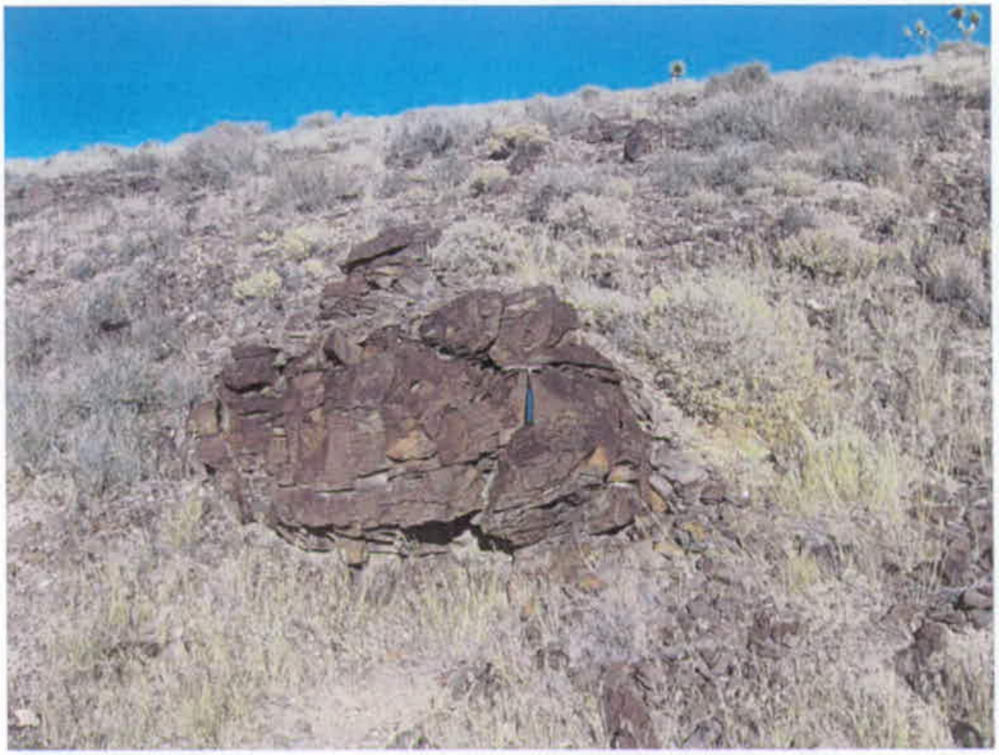
PHOTOGRAPHS

MG-34: (Mile 6.2) View East/Northeast of thin (cumulatively ~25-ft-thick) basalt flows capping hills on west side of area NS-3B. MG-47 to 51: (Mile 11.6) Pan NW to NE of basalt hills bordering a valley in which GF3 and the potential quarry site are located. Note vegetation consisting of Joshua trees, shrubs, forbs, and cheat grass.

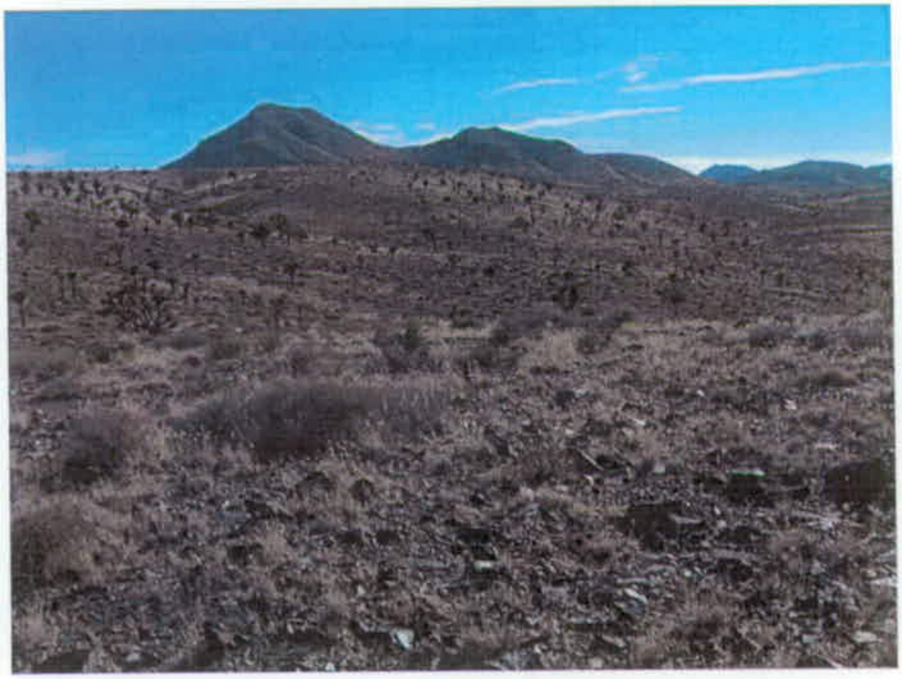
MG-53 (Near waypoint AG 15) View east from wash of basalt hill with planned 70-ft cut MG-54a: (AG 15) Outcrop of slightly to moderately vesicular, porphyritic basalt flow (QTb)

MG-55 to 58: (waypoint AG 16) Pan NW to NE of basalt hills covered with Joshua trees from top of hill with planned 70-ft cut AG-0013 (waypoint AG 16) Outcrop of non-vesicular, finely crystalline basalt flow (QTb)

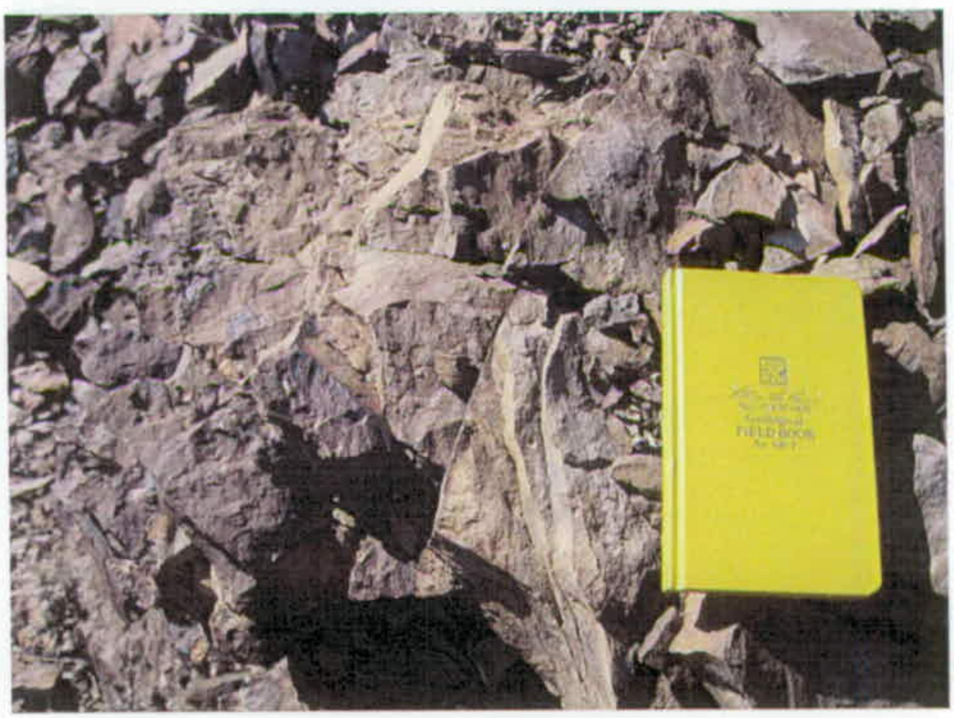
MG-59, AG-0014: (waypoint AG-17) View east from wash of hill with basalt ledge at top and talus on slopes MG-60: (waypoint AG 17) Outcrop of non-vesicular, finely crystalline basalt flow (QTb)



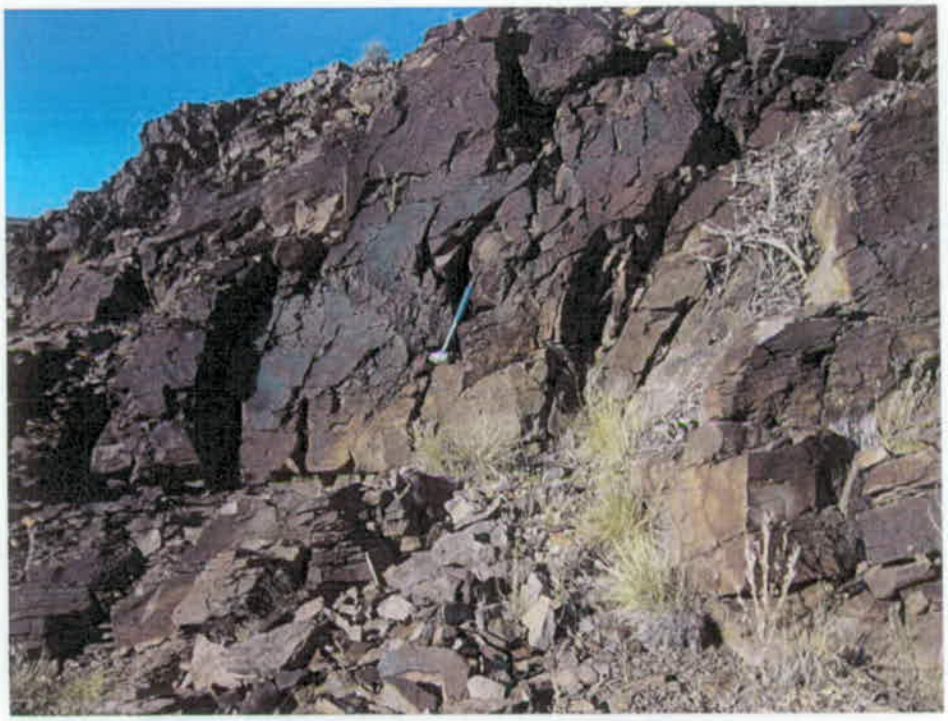
AG-0015 to 0016: (waypoint AG 17) View S to SE, upwash, of terrain and vegetation in area where quarry facilities could be constructed MG-61a: (waypoint AG 18) View west from top of hill of basalt talus covering hillside



MG-62a: (waypoint AG 18/SM 393) View south, up wash, of terrain and vegetation are where quarry facilities could be constructed MG-66a: (waypoint AG 18/SM 393) View north of area NS-3A



MG-67: (waypoint AG 18) Crenulations (slickensides?) on surface of dominant, extremely to very closely spaced fractures MG-68: (waypoint AG 18) Outcrop of non-vesicular, fine crystalline basalt flow (QTb), showing intersecting fracture sets



MG-69 (waypoint AG 17/18) View east from wash of basalt hill, with Art at base of outcrop, 30 to 40 ft below rim; talus below to base of hill.

Appendix F
Field Evaluation of Quarry Site ES-7

QUARRY FIELD EVALUATION CHECKLIST

QUARRY DESIGNATION: ES-7
FIELD TEAM: Art Geldon and Matt Grizzell
November 18-19, 2005

1. SITE FEATURES (show on map to the extent possible)

A. Topography (use degrees for slope gradients)

Access road to mesa climbs or goes around small hills at grades of <5 to 16 percent before ascending the gently sloping backside of Malpais Mesa. Grades there are ≤ 8 percent. The mesa top is relatively flat. The east face of the mesa drops 150 feet in about 600 feet (a slope of 14°) to a bench. Flat on top, the bench gradually descends about 60 feet in 700 feet (a slope of about 5°) to the rim of a canyon. It then drops about 100 feet near vertically to the floor of a wash.

B. Surface Water (near stream/river?), what flow?, intermittent)

No surface water. Eastward-draining washes with several tributaries each are present throughout Malpais Mesa. Ephemeral flow from precipitation occurs in washes. A deeply incised wash drains the quarry site.

C. Room for Plant/Office Facilities (need 10 to 20 acres of flat land)

Plant and office facilities would be located on the mesa top (see map).

D. Existing Access roads (where are they?, can they be improved? show on maps)

Exiting access roads (see log) extend 5.2 miles from the intersection of US-95 and the cemetery road north of Goldfield to the top of Malpais Mesa. For 2.2 miles, the road is bladed dirt and appears to be maintained as an all-weather road. Road after that is one-lane dirt and would have to be improved. Proposed haul road from mesa top to quarry would need to be built.

E. Room for Railroad Siding (where would siding be for loading ballast cars?)

A railroad siding would be located 0.8 mile from Goldfield between the alignment on the east and the dirt roads on the west, north, and south, in an area about 2,000 feet north-south by 800 feet east-west.

F. Room for Waste Dump (need □flat to □gently sloping topo)

A waste dump could be located on top of Malpais Mesa by the processing plant and ballast pile (see map).

G. Access Roads (to highway and RR alignment)

i. Topographic conditions for new road

See road log.

ii. Cut slopes (soil/rock)

Needed to improve existing access road to Malpais Mesa from 2.2 to 5.0 miles from US-95 and to build a haul road from the quarry to the top of Malpais Mesa.

2. DEPOSIT FEATURES

A. Location (show on 1:24,000 scale topo to the extent possible; record T, R, Sec)

The deposit is in T3S, R42E, S4, on surveyed land (see map).

B. Tonnage (provided in this deposit [W x L x H])

Primary deposit (best rock) is on lower bench. It is about 1,300 x 900 x 100 feet = 4,333,333 yd^3 x 2.16 tons/yd^3 = 9,360,000 tons. A secondary deposit of variable quality rock is about 500 x 800 x 100 feet = 1,481,000 yd^3 = 3,200,000 tons.

C. Overburden (note thickness/type)

Shallow (<1 ft.) to no colluvium.

D. Deposit Features

i. Rock Type/Description (use S&W rock descriptions)

BASALT LAVA flows: very high strength, medium to dark gray, porphyritic, finely crystalline to fine-grained ground mass, generally fresh to slightly weathered. Rock quality deteriorates above lower bench because there are many intervals of poorer quality rock interlayered with sound rock. Poorer rock can be brecciated, sheared, rubbly (i.e., boulders of basalt in a grungy matrix), or toward the top of the mesa, vesicular. Above the lower bench, there is poor exposure because of soil and vegetation where rock deteriorates. Below the bench, nearly continuous exposure to a wash. Rock generally has a light gray or brown weathering rind. Rock tends to weather to rounded boulders and glass-like gravel.

ii. Thickness/Depth (need minable thickness)

Primary, about 100 feet; secondary ≤100 feet, exact thickness is uncertain because of variable rock quality of interstratified sound and rubbly or sheared intervals.

iii. Rock Structure (block sizes/joint or fracture spacing)

Generally no preferred orientation, but below the lower bench, the walls have a preferred joint orientation of N45-50°E, 84°NW to SE. Variable fracture spacing occurs at different locations. In general very closely to widely spaced.

	Block Spacing (%)			
Location (waypoint)	**> 2 feet**	**1 to 2 feet**	**6 inches to 1 foot**	**<6 inches**
AG4	20	60	15	5
AG10	55	30	10	5
AG11	5	65	25	5
AG12	10	60	25	5

Type	Strike	Dip	Description
Joint	N45-50° E	84° NW to SE	Prominent joint set in canyon walls below bench
Shear zone	N10-20°	77-80° NW	Typical shear orientation between lower bench and about 30 feet below mesa top
Dip(?)	N18°E	36° SE	Could be top of a flow because of weathering apparent tops of columnar joints on surface

iv. Deleterious Materials, including orientation and thickness (Note: Ash layers/faults/weather contacts, shear zones, fillings, scoriaceous zones, rubble zones, etc. This is internal waste that reduces deposit size.)

See previous rock description. Possible fault zone exists between the upper slope and the bench, creating numerous shear zones and mega-breccia intervals at and above base of upper slope.

E. Rock Quality

RQD generally 70 to 90 percent.

i. Samples for testing (100 pounds minimum; describe sample; taken)

Collected samples from wash to top of mesa to get a distributed sample (omitted poor-quality rock, e.g., from rubble or shear zones).

ii. Rock hammer test

Rock has very high strength.

iii. Schmidt hammer test readings:

Location (waypoint)	45° Face	Vertical Face	Horizontal Face
AG4	46-57 (Avg. 50)		
AG9	39-52 (Avg. 47)	36-43 (Avg. 41)	49-65 (Avg. 54)
AG10	None	44-54 (Avg. 49)	42-52 (Avg. 45)
AG14	45-52 (Avg 30)	45-48 (Avg. 47)	52 (No average)

F. Groundwater – Is there evidence groundwater is near surface? Want to avoid groundwater in pit as this causes permitting problem.

No groundwater at quarry site near the surface.

G. Future Explorations

i. Drill rig access

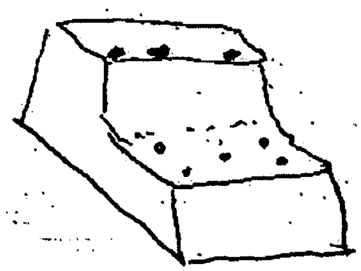
Dirt roads with ≤16 percent grade from Goldfield to top of Malpais Mesa. No existing road to recommended primary deposit (i.e., bench below mesa top).

ii. Type of rig

4WD or track rig.

iii. Locations and depths of borings

Eight borings 250 to 420 feet deep, as in sketch; three borings at mesa top each 420 feet deep. Five borings in lower bench - two at each end and one in the middle - each 250 feet deep.



iv. Geophysics alignments

Borehole geophysics to determine lithology only.

3. ENVIRONMENTAL FEATURES

A. Vegetation (what type/how much/where)

On Malpais Mesa, there are sparse shrubs and forbs on basalt colluvium and scattered Joshua trees, pinon pine, and juniper. Cheat grass and other vegetation is on the east-facing slope to the wash.

B. Visibility (would quarry be visible from road?)

Quarry would not be visible from US-95 or Goldfield. It might be visible from roads crossing Malpais Mesa outside of the quarry area.

4. OTHER FEATURES

A. Power (is power nearby or need on-site generation)

A power line parallels US-95. It is crossed under about 0.1 mile past the intersection of the cemetery road with US-95.

B. Water (groundwater studies by others)

Depth to water generally is unknown, but several springs issue from the base of Malpais Mesa. Slaughterhouse Spring issues from the Siebert Tuff (actually a sedimentary rock unit here) on the east side of the mesa. West Spring issues from Siebert Tuff on the north side of the mesa. An unnamed spring issues from Pozo Formation on the west side of the mesa. A well must be drilled for a water supply. Water near Goldfield might have poor quality from mining pollution.

ROAD LOG TO QUARRY SITE

0.0 Intersection of US-95 and cemetery road
0.2 Road forks; cemetery nearby on left fork. Take right fork.
0.6 Goldfield Bike Trail access.
0.7 Ballast stockpile area.
1.3 Road right to city dump.
1.5 West Spring at outlet of canyon descending from quarry site, about 2,000 feet SW of road. Left fork to spring. Stay on right fork. Note steep east face of Malpais Mesa.
2.2 Jeep road and borrow pit on right. Main road narrows to one lane here.
3.4 Nevada Eagle Mine workings on right (west).
4.2 Spring with a tank. Road grade here is 10 to 20 percent, rising to south.
4.4 Crossed a wash.
4.5 Turn left (east) onto a dirt road that leads up to Malpais Mesa—14 percent grade.
4.6 Road descends a hill at 16 percent grade.
4.7 Road forks, take right, gently sloping fork.
4.9 ES-7 area boundary. Road from here to top of mesa has ≤8 percent grade.
5.2 Area to east is permissible for quarrying (no mining rights).
5.9 Road ends on top of mesa—altitude 642 feet AMSL.

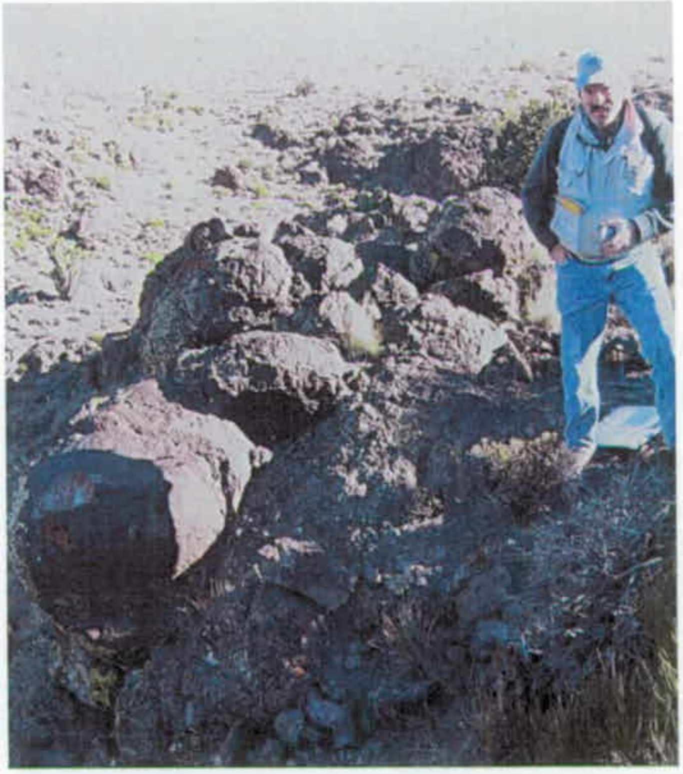
PHOTOGRAPHS

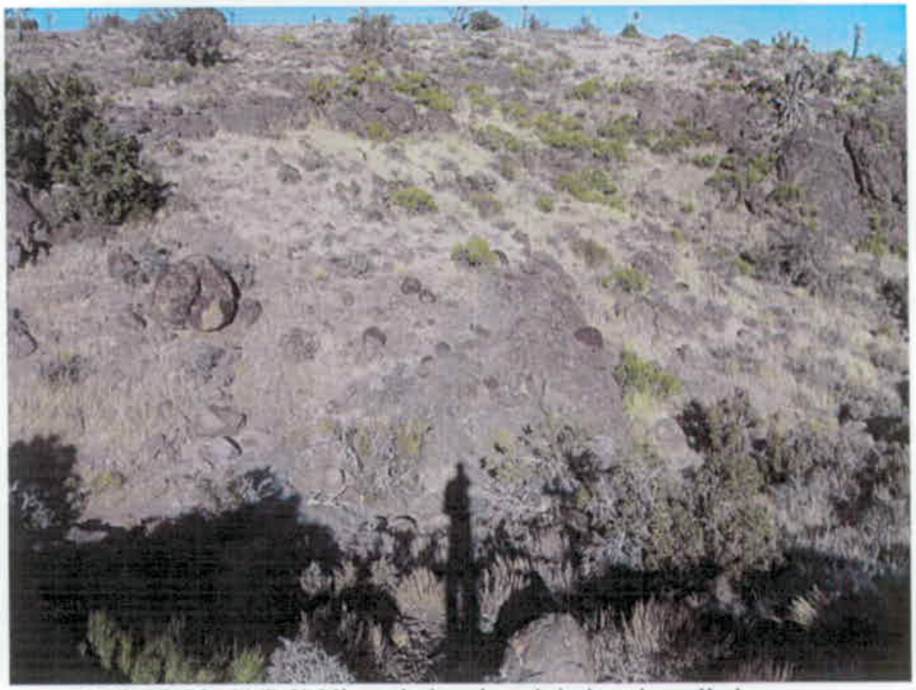
MG-13: (waypoint AG-4) View NE down canyon – note steep basalt walls

AG0004-0007: (waypoint AG-4) Panorama NE to SE of Malpais Mesa, Goldfield, and Goldfield Hills

MG-18 to 22: (waypoint AG-8) Photos along access road to Malpais Mesa


MG-24 to 26: (AG 9) Views NE down canyon, east to cliff face across wash, up a tributary canyon





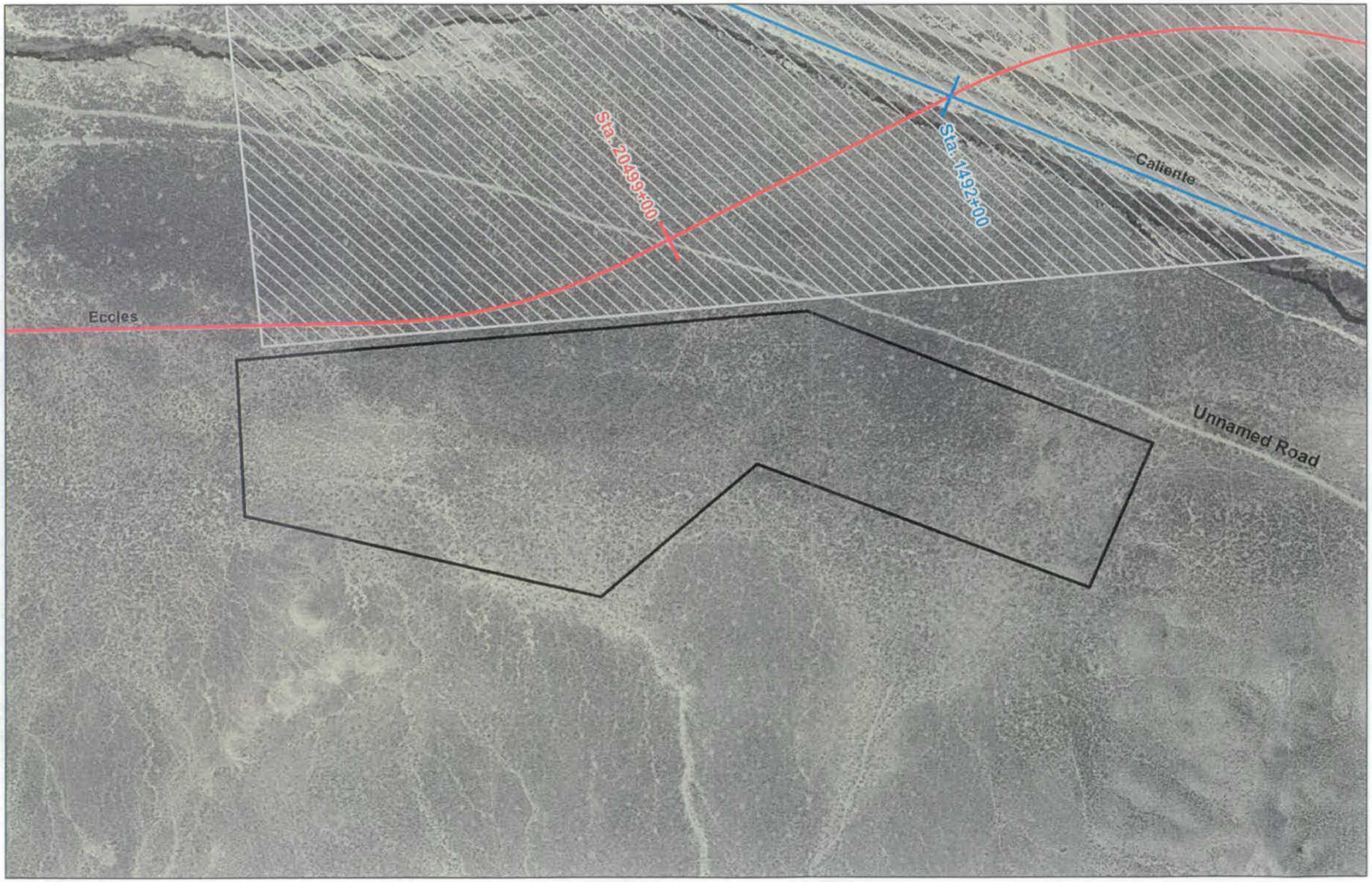
MG-27-28: (AG 9) Views below bench in basalt-walled canyon

MG-29-32: (AG-12-14) Views of outcrops between lower bench and mesa top

MG-33: (AG-4): Basalt outcrop on top of mesa.

Appendix G

Aerial Photography of Construction Camp Locations



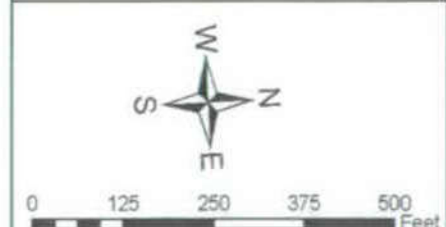
Construction Camps

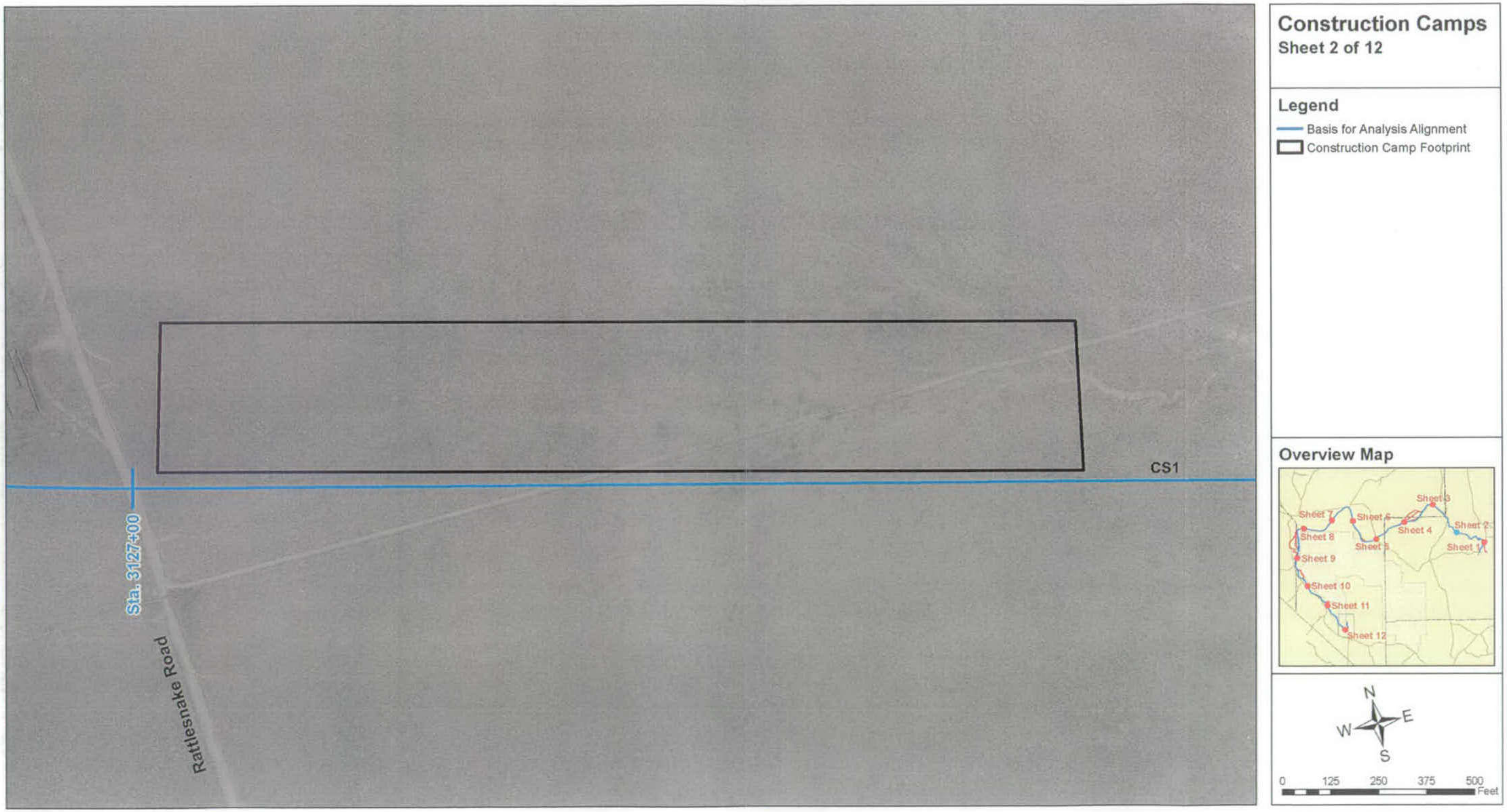
Sheet 1 of 12

Legend

- Basis for Analysis Alignment
- Alternate Alignment
- Construction Camp Footprint
- Private Property

Overview Map




Construction Camps
Sheet 2 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Overview Map
Sheet 1
Sheet 2
Sheet 3
Sheet 4
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Sheet 7
Sheet 8
Sheet 9
Sheet 10
Sheet 11
Sheet 12
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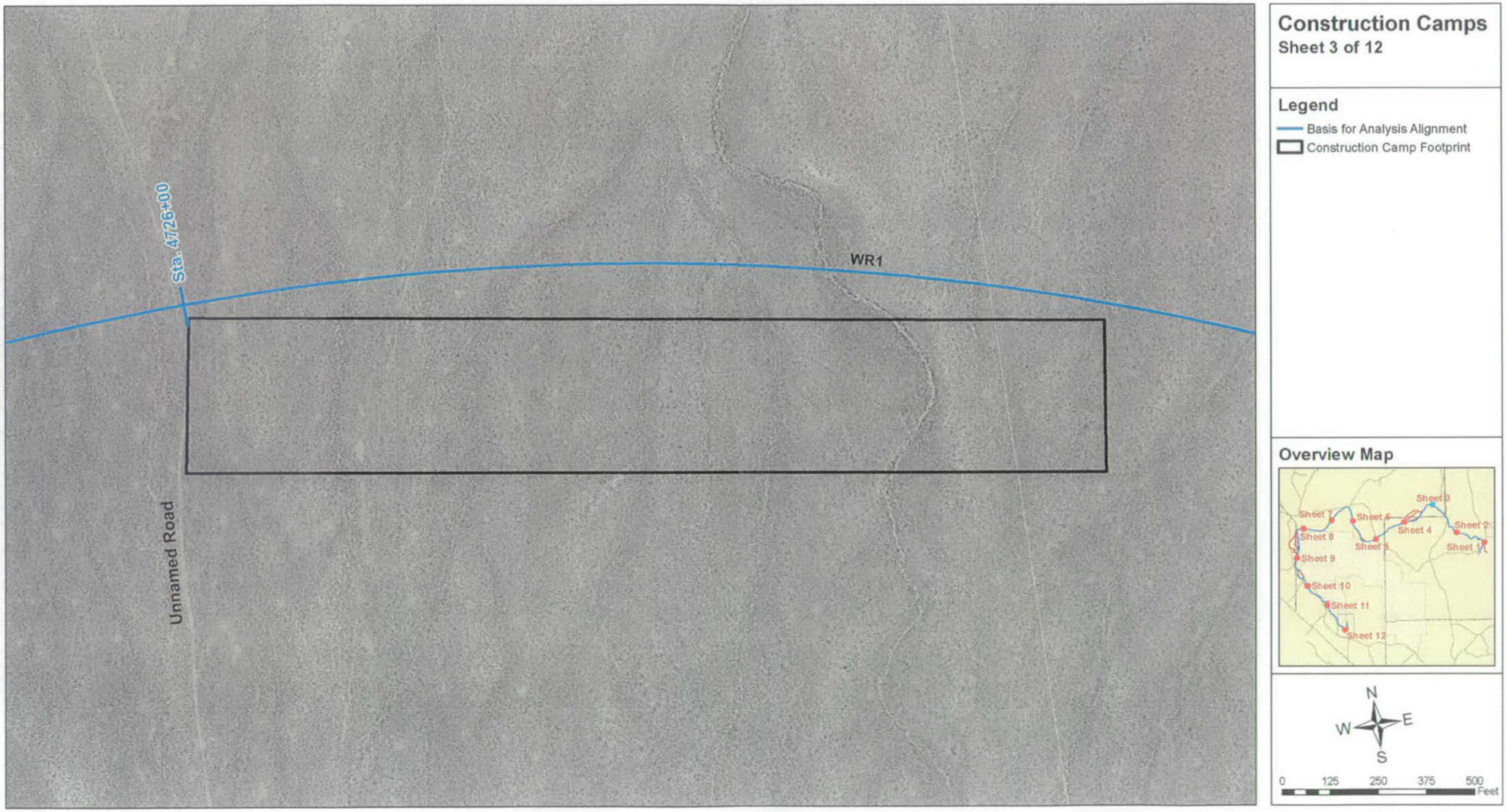
CS1
Sta. 3127+00
Rattlesnake Road


Construction Camps
Sheet 3 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Overview Map
Sta. 4726+00
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Unnamed Road
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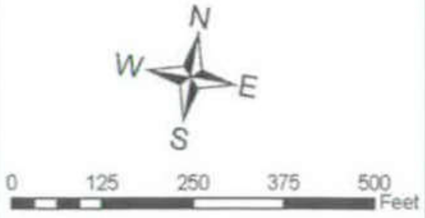
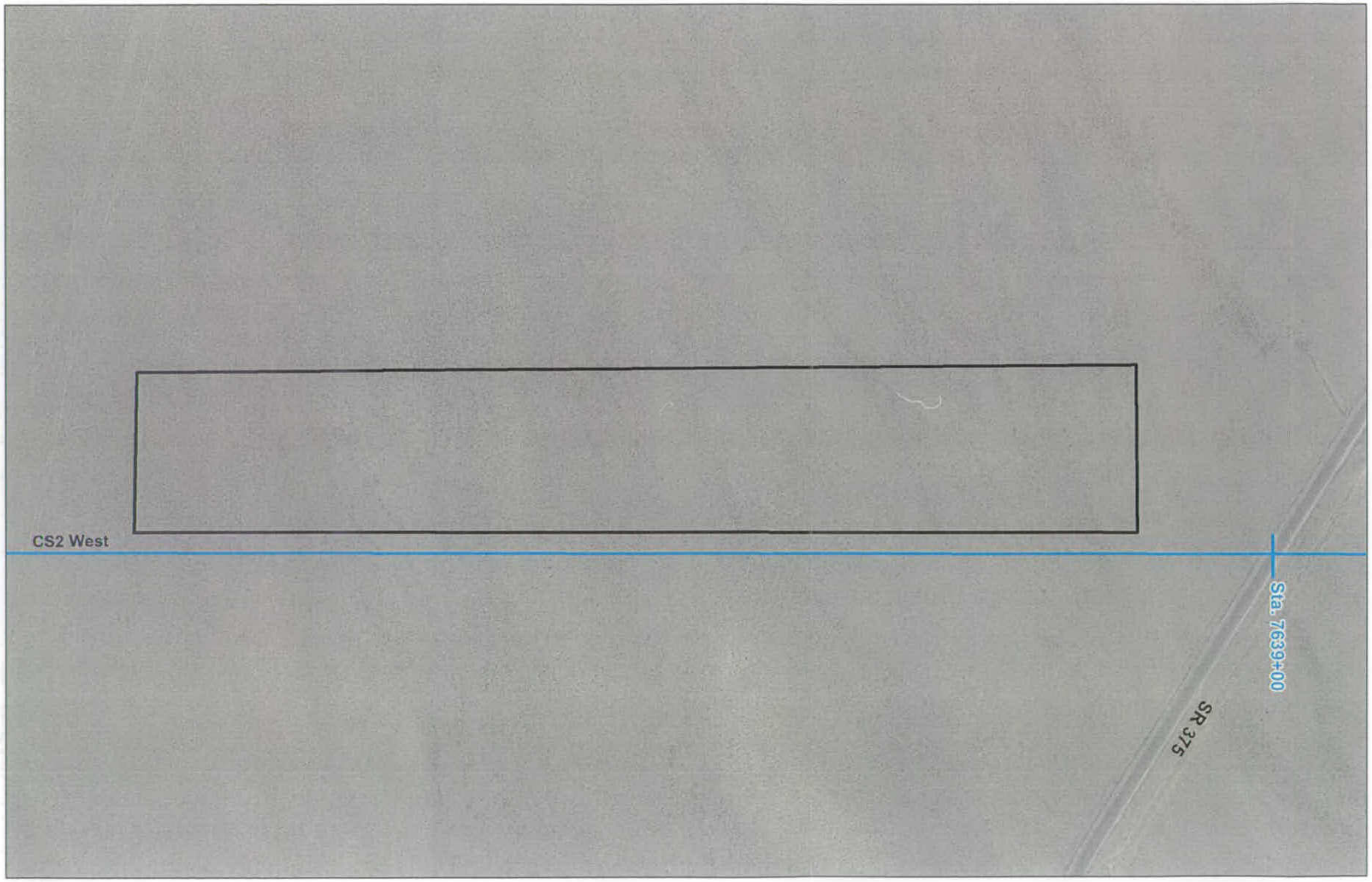
Construction Camps
Sheet 4 of 12

Legend
Basis for Analysis Alignment
Construction Camp Footprint

Overview Map

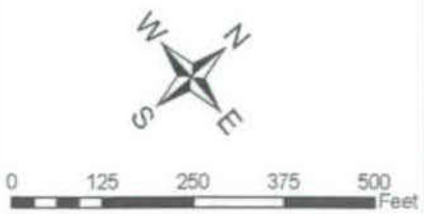



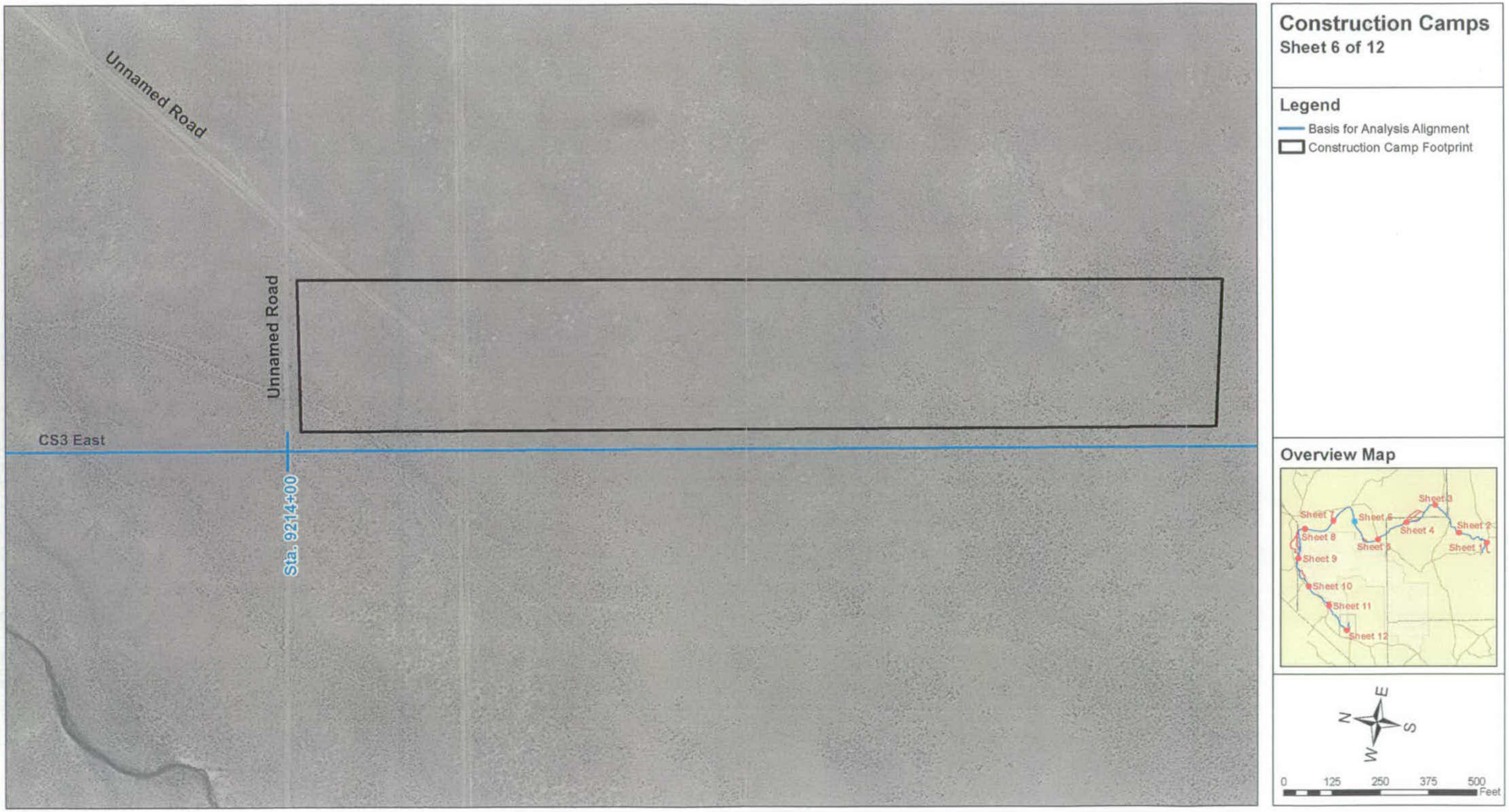


Construction Camps
Sheet 5 of 12

Legend
- Basis for Analysis Alignment
- Construction Camp Footprint

Overview Map




Unnamed Road
Unnamed Road
CS3 East
Sta. 9214+00
Construction Camps
Sheet 6 of 12
Legend
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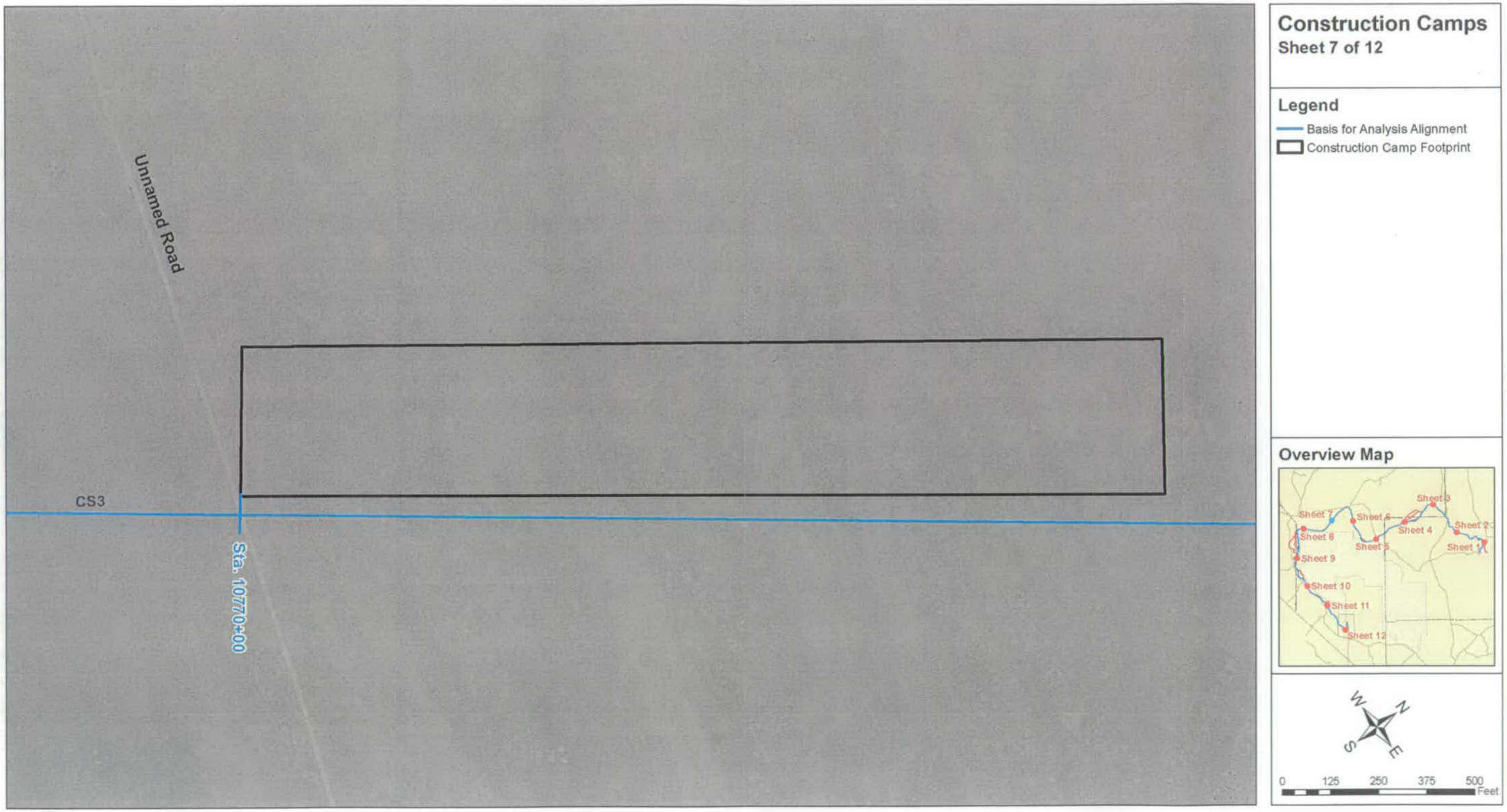
Feet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CS3
Sta. 10770+00
Construction Camps
Sheet 7 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
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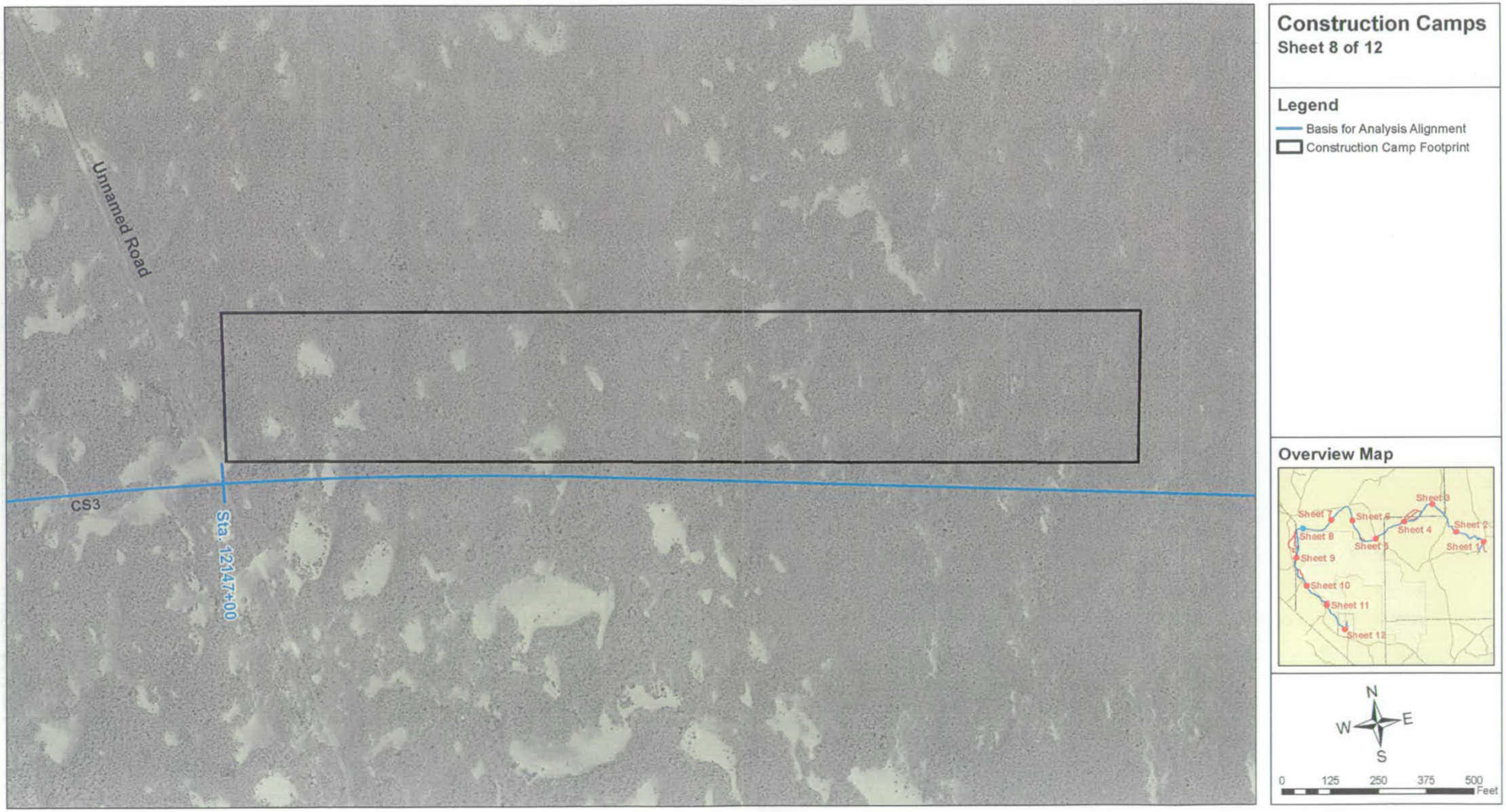
Unnamed Road
CS3
Sta. 12147+00
Construction Camps
Sheet 8 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Overview Map
Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7
Sheet 8
Sheet 9
Sheet 10
Sheet 11
Sheet 12
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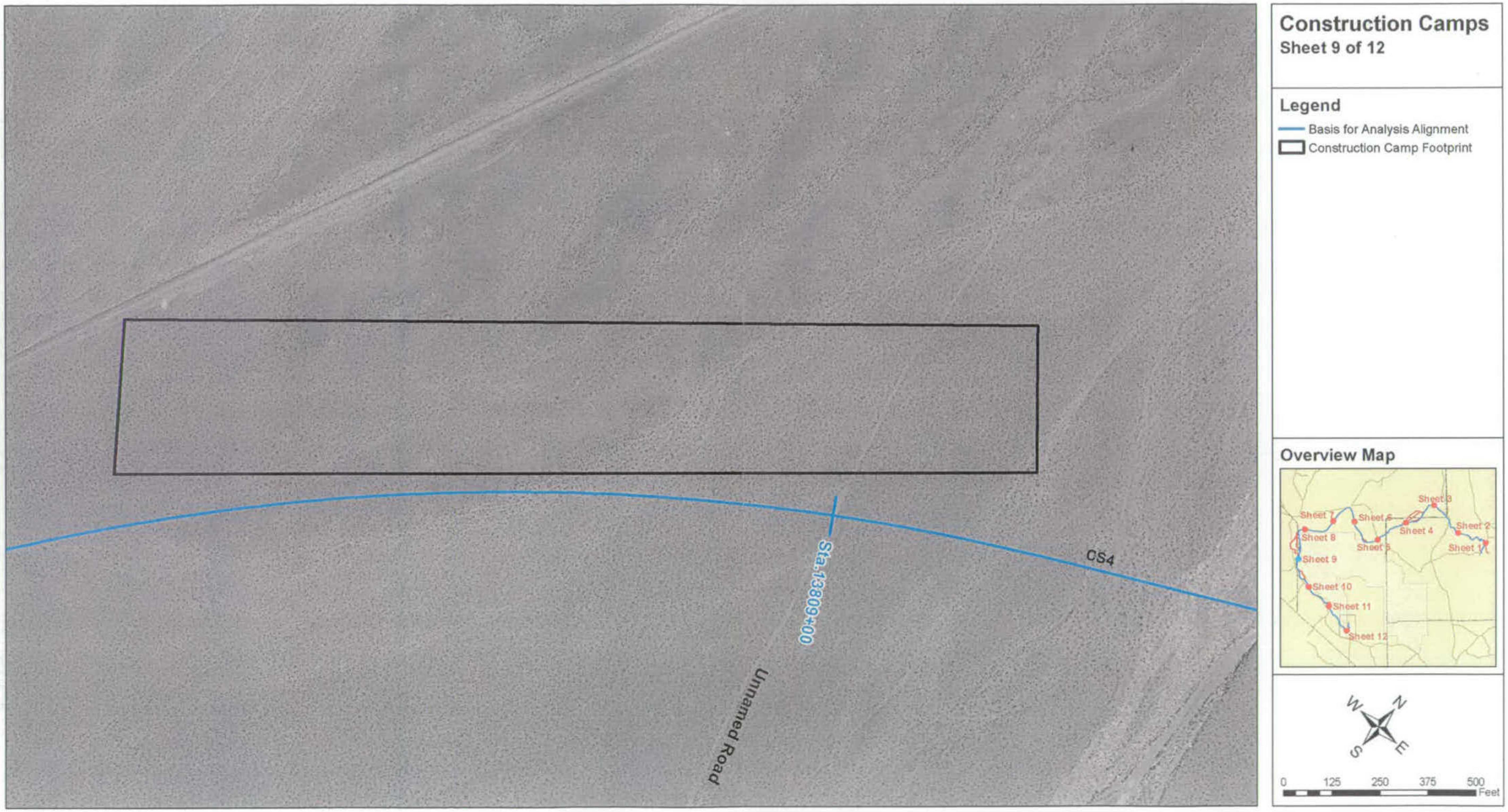
Sta.13809+00
CS4
Unnamed Road
Construction Camps
Sheet 9 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Overview Map
Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
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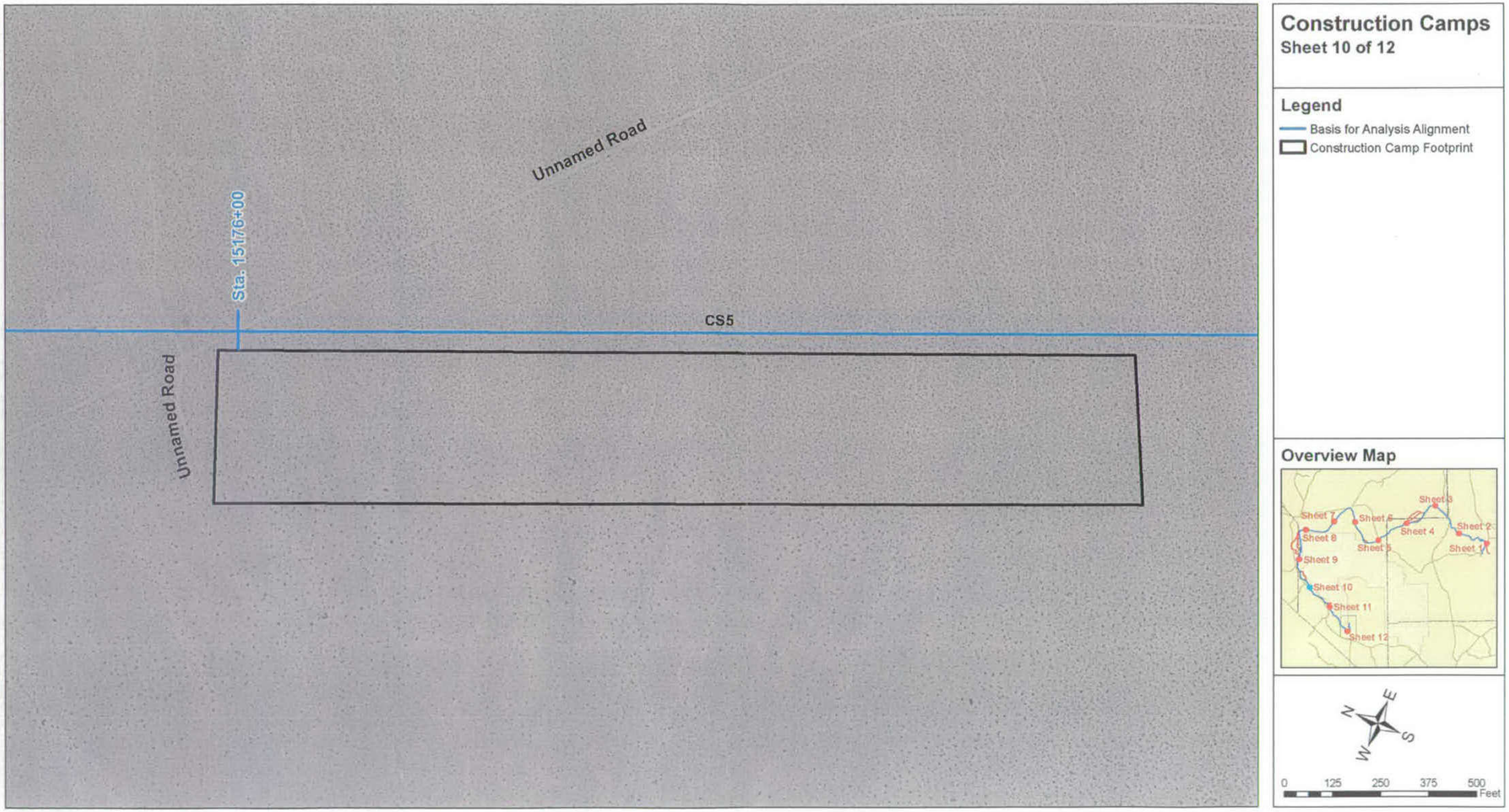
Construction Camps
Sheet 10 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Overview Map
Unnamed Road
Sta. 15176+00
CS5
Unnamed Road
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Feet


Cat Canyon Road
Sta. 16391+00
OV1
Fleur de Lis Road
Construction Camps
Sheet 11 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Private Property
Overview Map
Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7
Sheet 8
Sheet 9
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Sheet 11
Sheet 12
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CS6
Sta. 17760+00
Unnamed Road
Construction Camps
Sheet 12 of 12
Legend
Basis for Analysis Alignment
Construction Camp Footprint
Nevada Test Site
Overview Map
Sheet 1
Sheet 2
Sheet 3
Sheet 4
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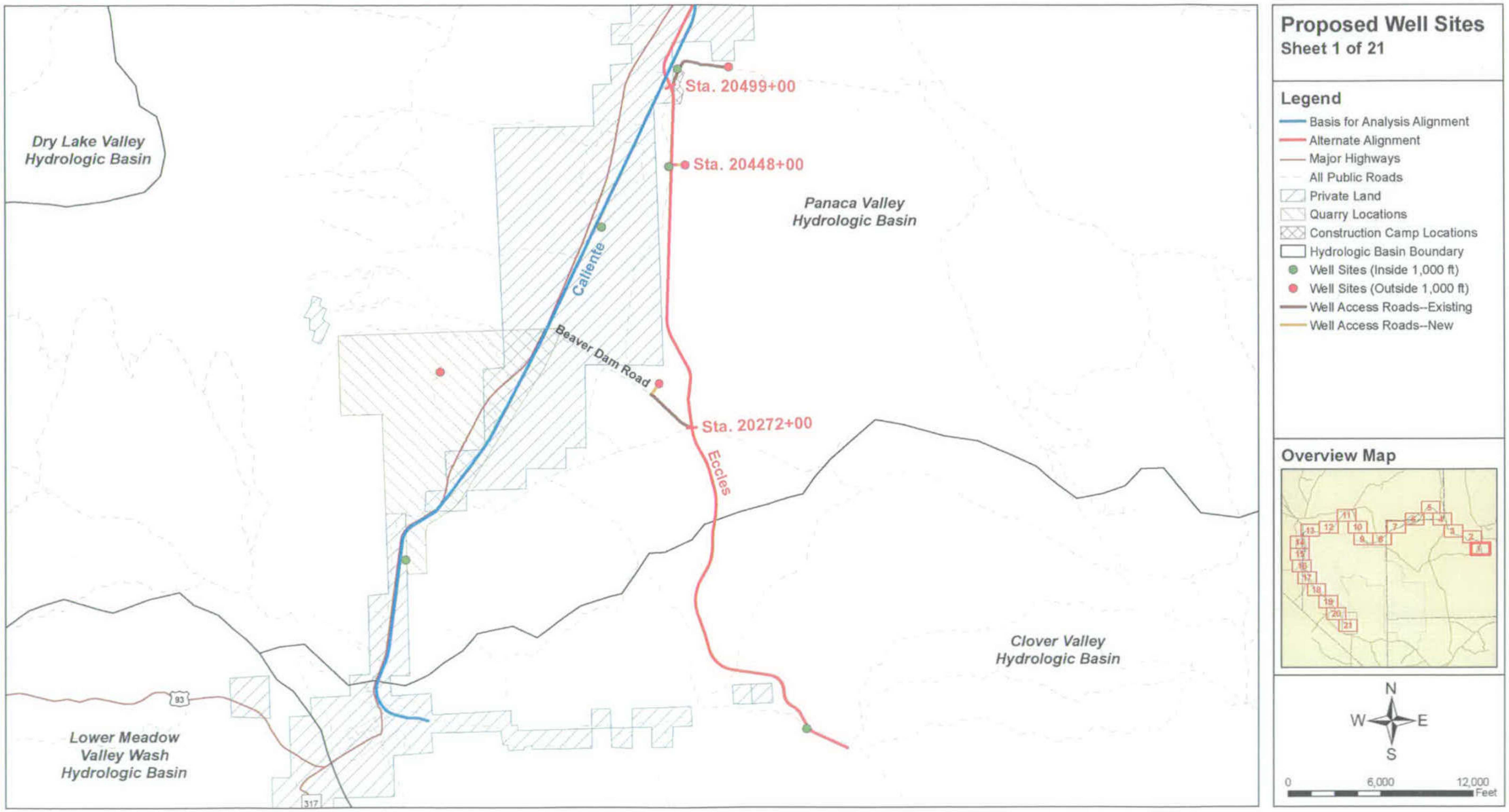
Appendix H
Well Location Detail Maps


Proposed Well Sites
Sheet 1 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Quarry Locations
Construction Camp Locations
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Well Access Roads--New
Overview Map
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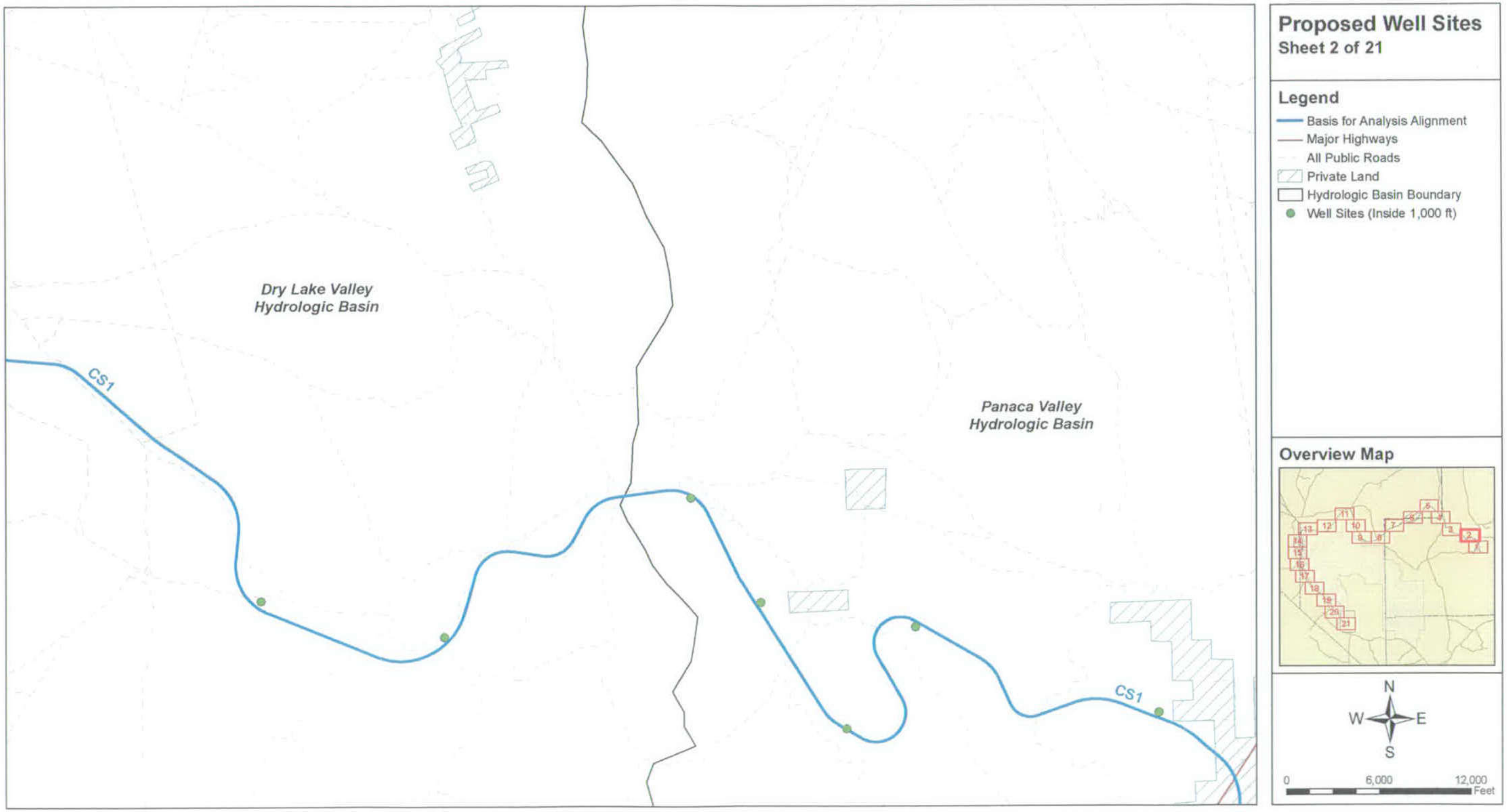
12,000
Feet
Dry Lake Valley Hydrologic Basin
Panaca Valley Hydrologic Basin
Clover Valley Hydrologic Basin
Lower Meadow Valley Wash Hydrologic Basin
Sta. 20499+00
Sta. 20448+00
Sta. 20272+00
Caliente
Eccles
Beaver Dam Road
93
317


Proposed Well Sites
Sheet 2 of 21
Legend
Basis for Analysis Alignment
Major Highways
All Public Roads
Private Land
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Overview Map
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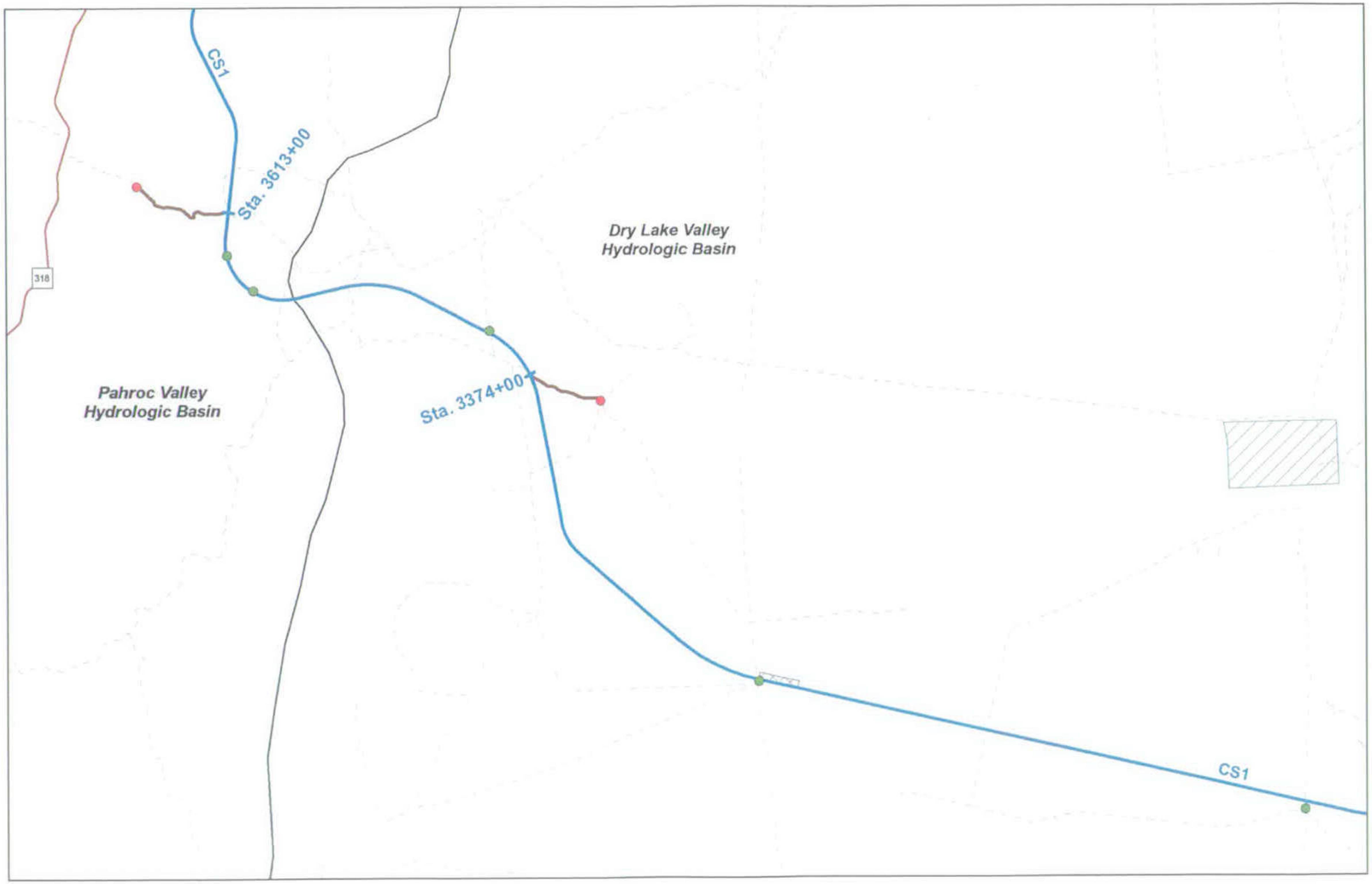
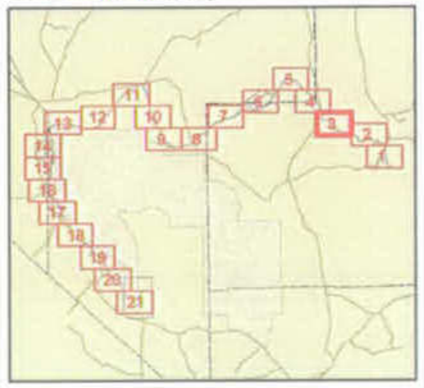
Dry Lake Valley
Hydrologic Basin
Panaca Valley
Hydrologic Basin
CS1
CS1

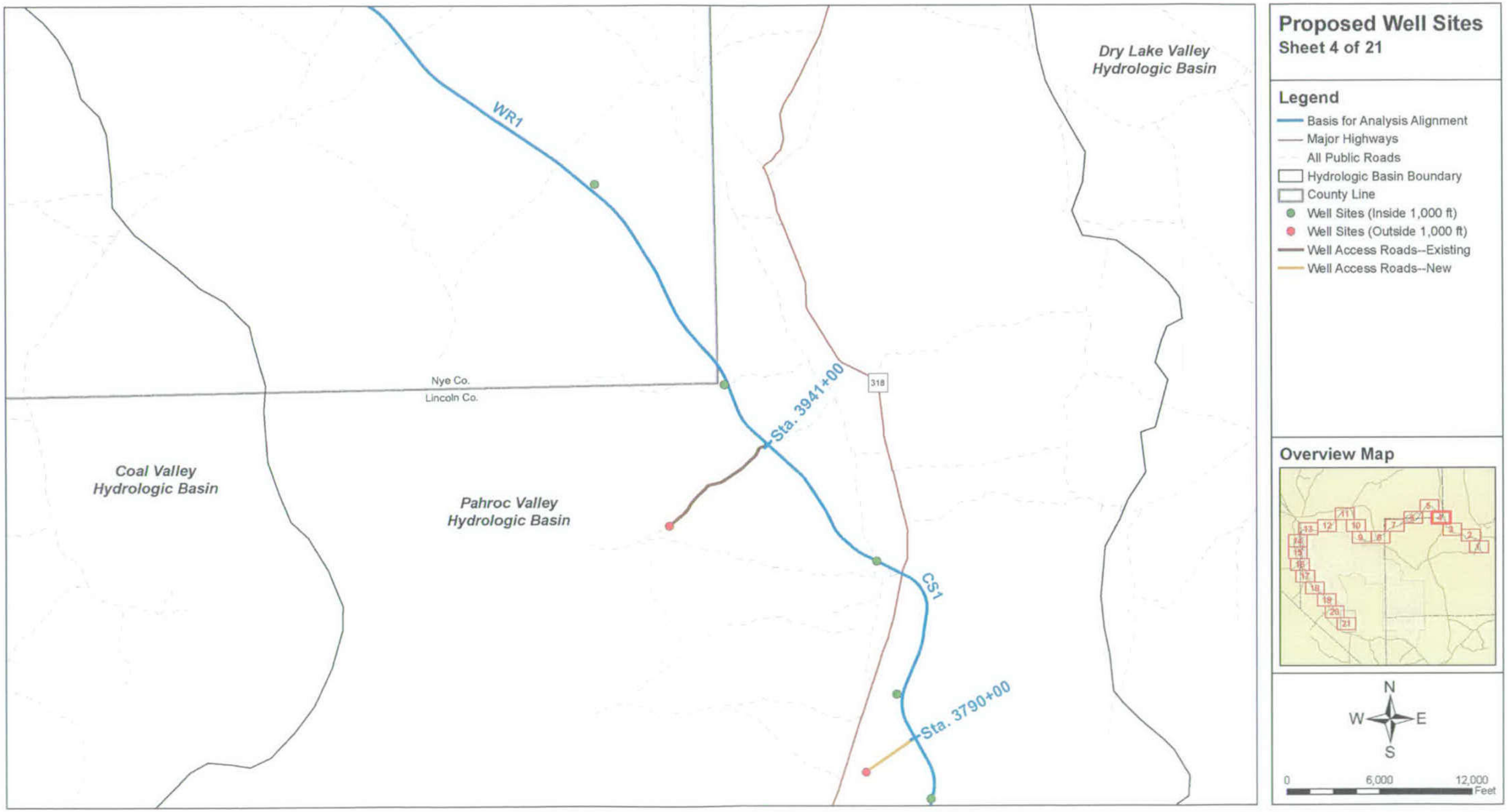


Proposed Well Sites
Sheet 3 of 21

Legend
- Basis for Analysis Alignment
- Major Highways
- All Public Roads
- Private Land
- Construction Camp Locations
- Hydrologic Basin Boundary
- Well Sites (Inside 1,000 ft)
- Well Sites (Outside 1,000 ft)
- Well Access Roads--Existing

Overview Map





Dry Lake Valley Hydrologic Basin
WR1
Nye Co.
Lincoln Co.
Sta. 3941+00
318
Coal Valley Hydrologic Basin
Pahroc Valley Hydrologic Basin
CS1
Sta. 3790+00
Proposed Well Sites
Sheet 4 of 21
Legend
Basis for Analysis Alignment
Major Highways
All Public Roads
Hydrologic Basin Boundary
County Line
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Well Access Roads--New
Overview Map
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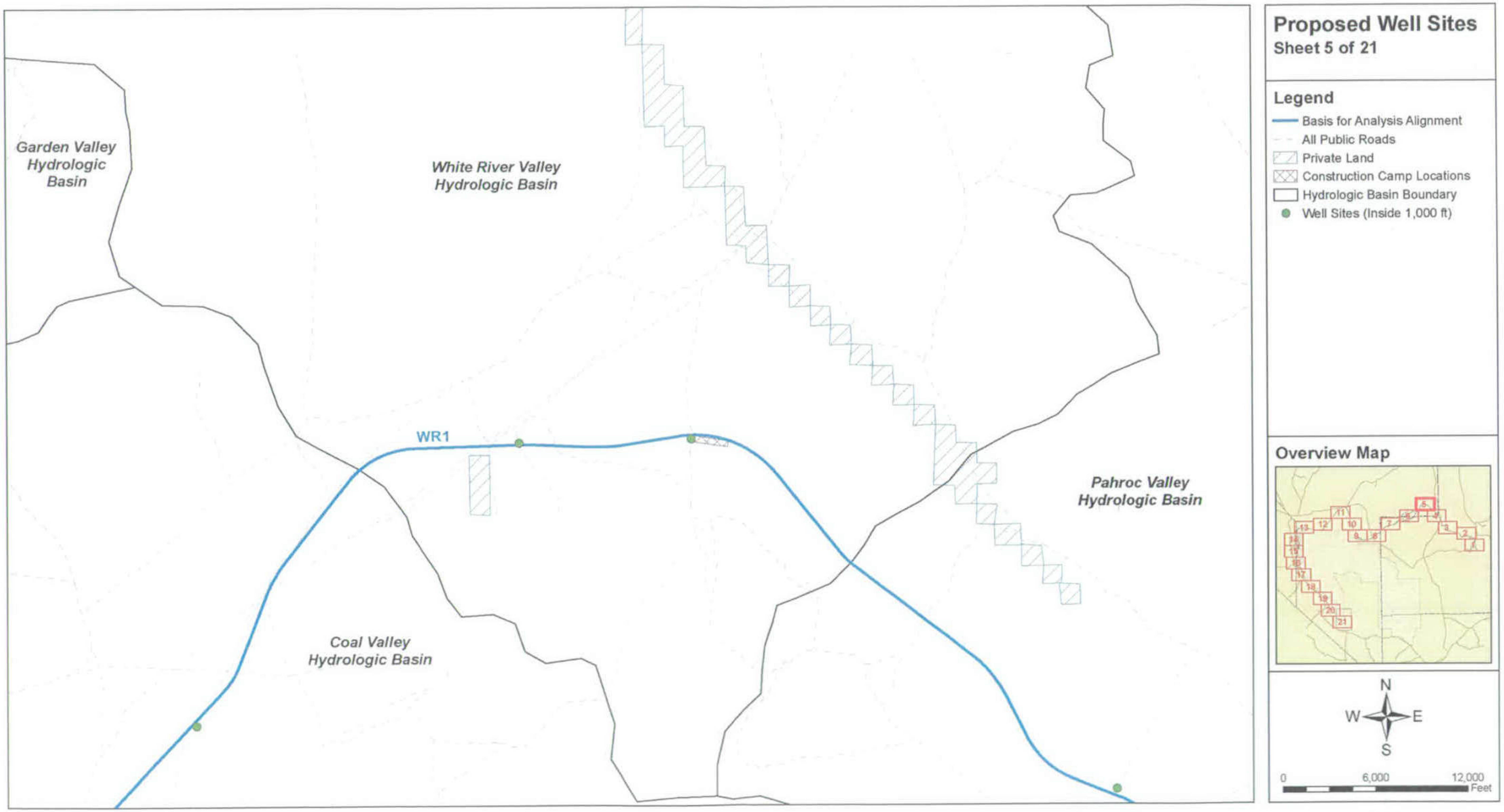

Garden Valley Hydrologic Basin
White River Valley Hydrologic Basin
WR1
Pahroc Valley Hydrologic Basin
Coal Valley Hydrologic Basin
Proposed Well Sites
Sheet 5 of 21
Legend
Basis for Analysis Alignment
All Public Roads
Private Land
Construction Camp Locations
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Overview Map
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Proposed Well Sites
Sheet 6 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Private Land
Hydrologic Basin Boundary
County Line
Well Sites (Inside 1,000 ft)
Overview Map
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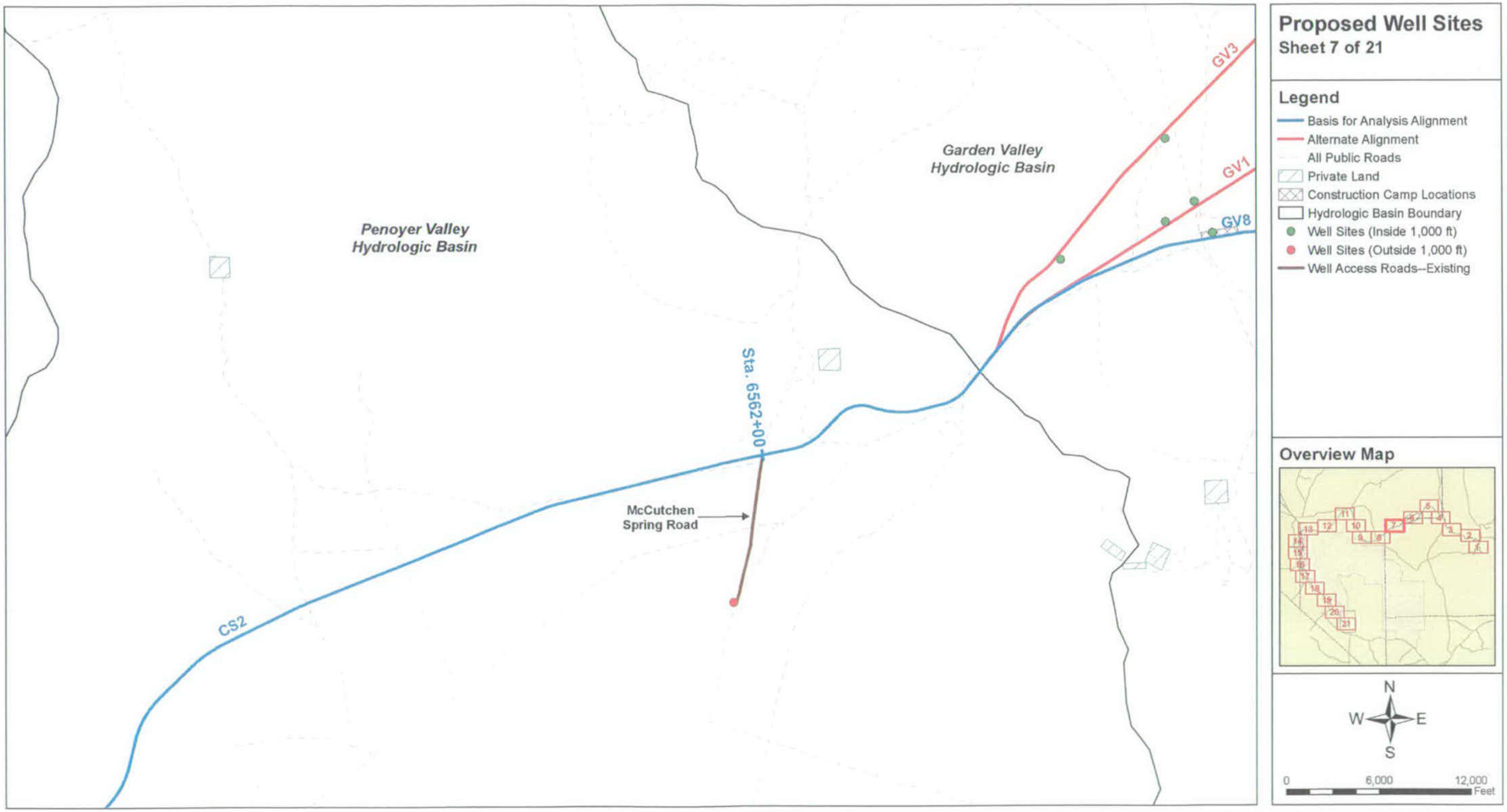
Garden Valley
Hydrologic Basin
Coal Valley
Hydrologic Basin
GV3
GV1
GV2
GV8
Nye Co.
Lincoln Co.



Penoyer Valley
Hydrologic Basin
Garden Valley
Hydrologic Basin
GV3
GV1
GV8
CS2
Sta. 6562+00
McCutchen
Spring Road
Proposed Well Sites
Sheet 7 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Private Land
Construction Camp Locations
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Overview Map
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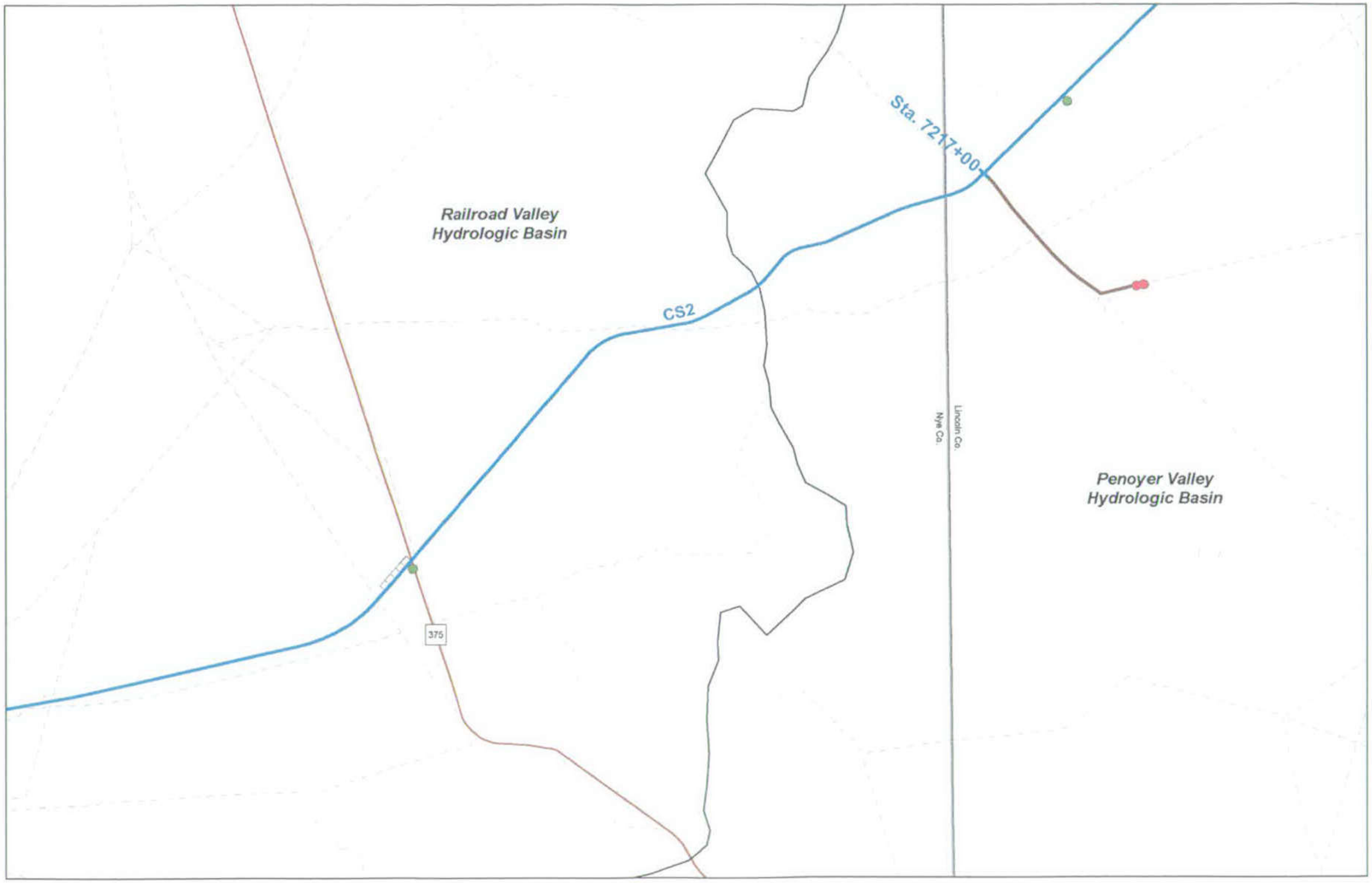
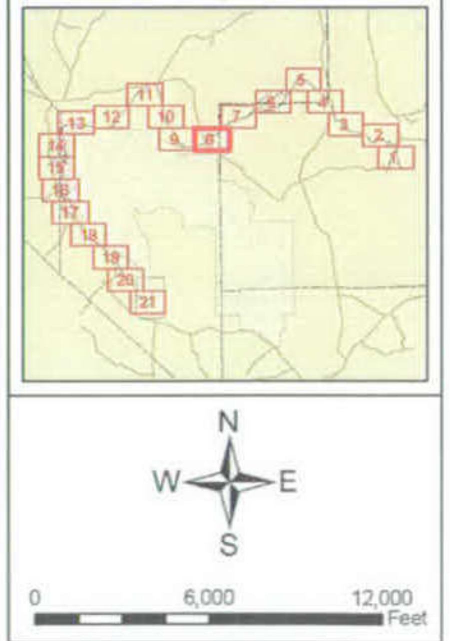
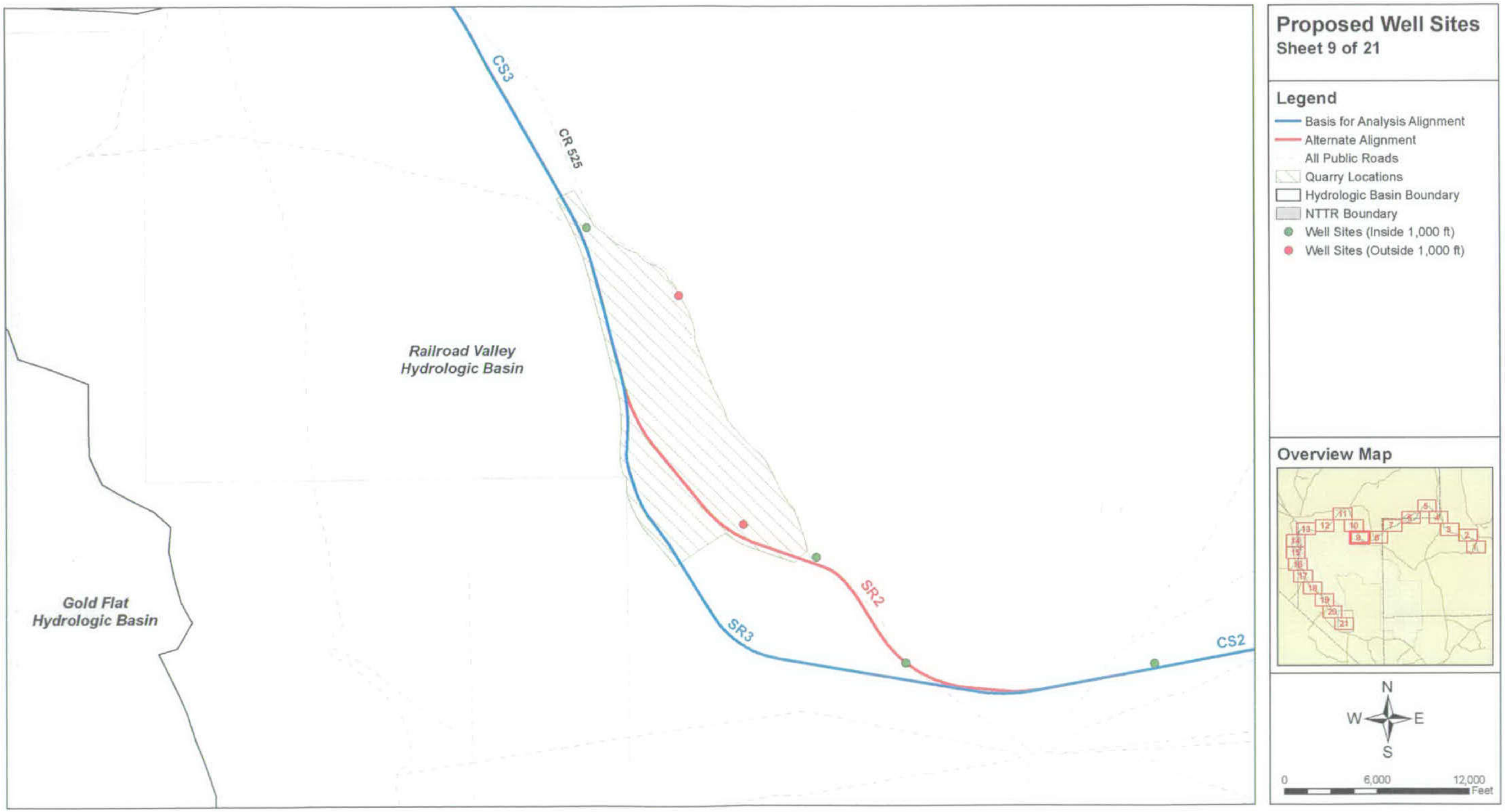


Proposed Well Sites
Sheet 8 of 21

Legend
- Basis for Analysis Alignment
- Major Highways
- All Public Roads
- Construction Camp Locations
- Hydrologic Basin Boundary
- County Line
- Well Sites (Inside 1,000 ft)
- Well Sites (Outside 1,000 ft)
- Well Access Roads--Existing

Overview Map




CS3
CR 525
Railroad Valley
Hydrologic Basin
Gold Flat
Hydrologic Basin
SR2
SR3
CS2
Proposed Well Sites
Sheet 9 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Quarry Locations
Hydrologic Basin Boundary
NTTR Boundary
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Overview Map
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Proposed Well Sites
Sheet 10 of 21
Legend
Basis for Analysis Alignment
All Public Roads
Private Land
Construction Camp Locations
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Overview Map
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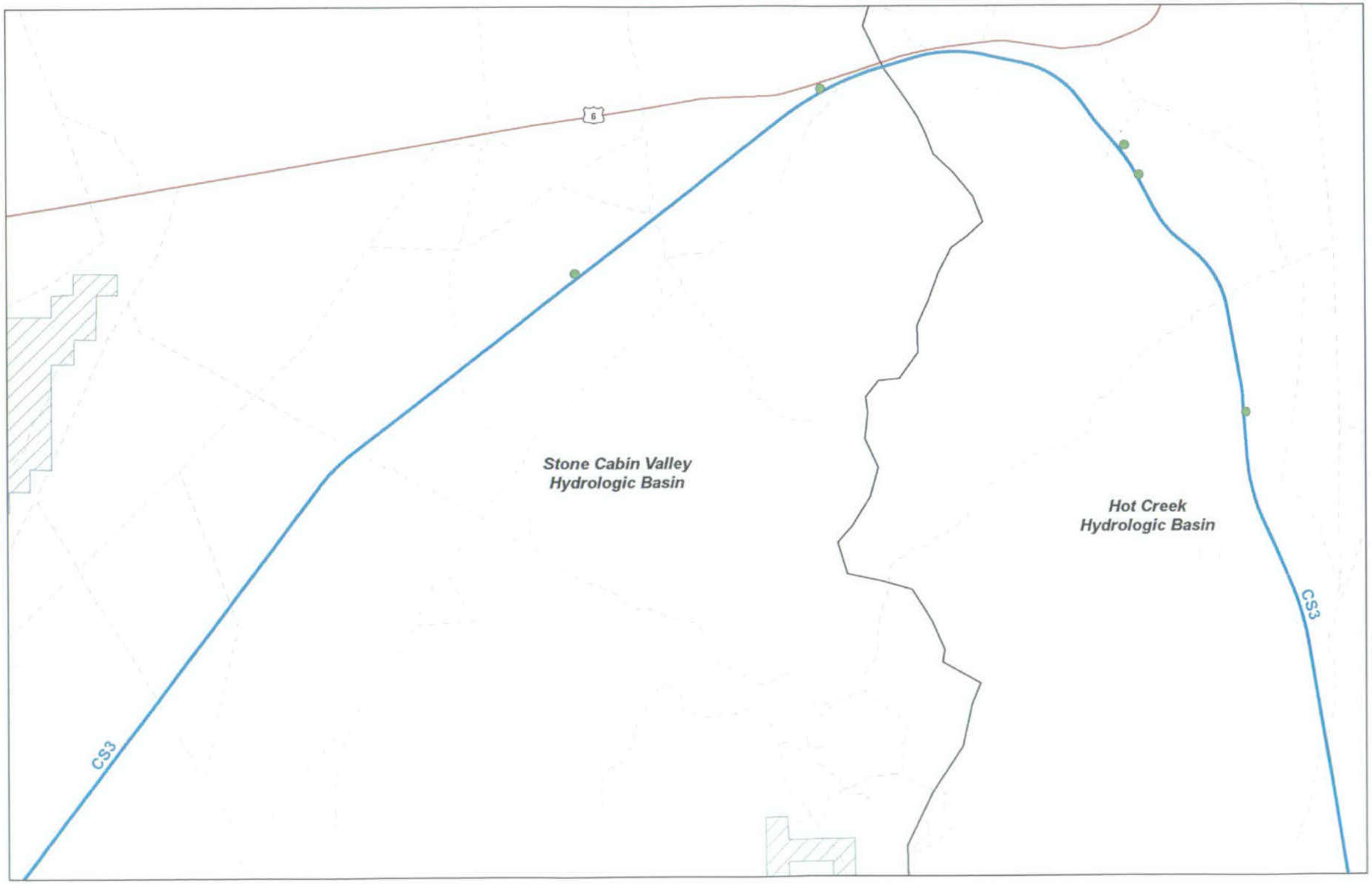
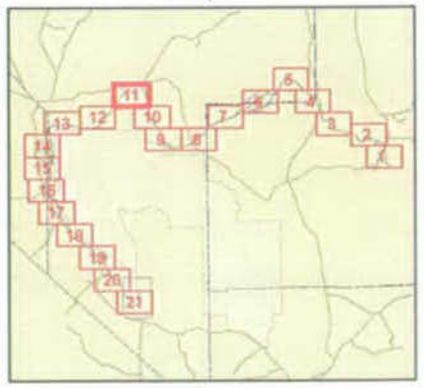
Hot Creek
Hydrologic Basin
Railroad Valley
Hydrologic Basin
Cactus Flat
Hydrologic Basin
CS3

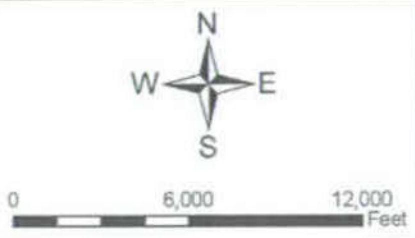


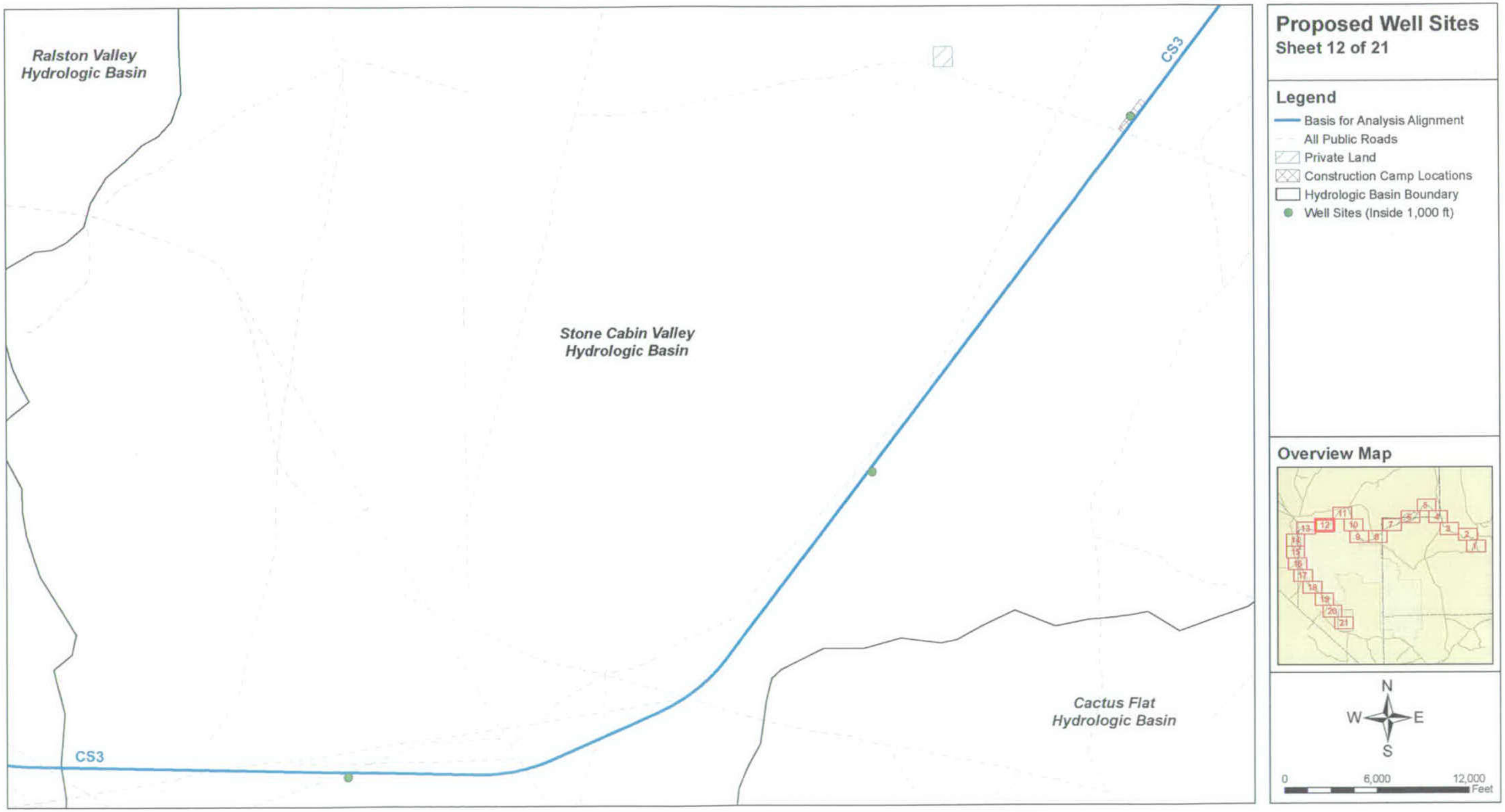
Proposed Well Sites
Sheet 11 of 21

Legend
- Basis for Analysis Alignment
- Major Highways
- All Public Roads
- Private Land
- Hydrologic Basin Boundary
- Well Sites (Inside 1,000 ft)

Overview Map






Ralston Valley
Hydrologic Basin
CS3
Stone Cabin Valley
Hydrologic Basin
CS3
Cactus Flat
Hydrologic Basin
Proposed Well Sites
Sheet 12 of 21
Legend
Basis for Analysis Alignment
All Public Roads
Private Land
Construction Camp Locations
Hydrologic Basin Boundary
Well Sites (Inside 1,000 ft)
Overview Map
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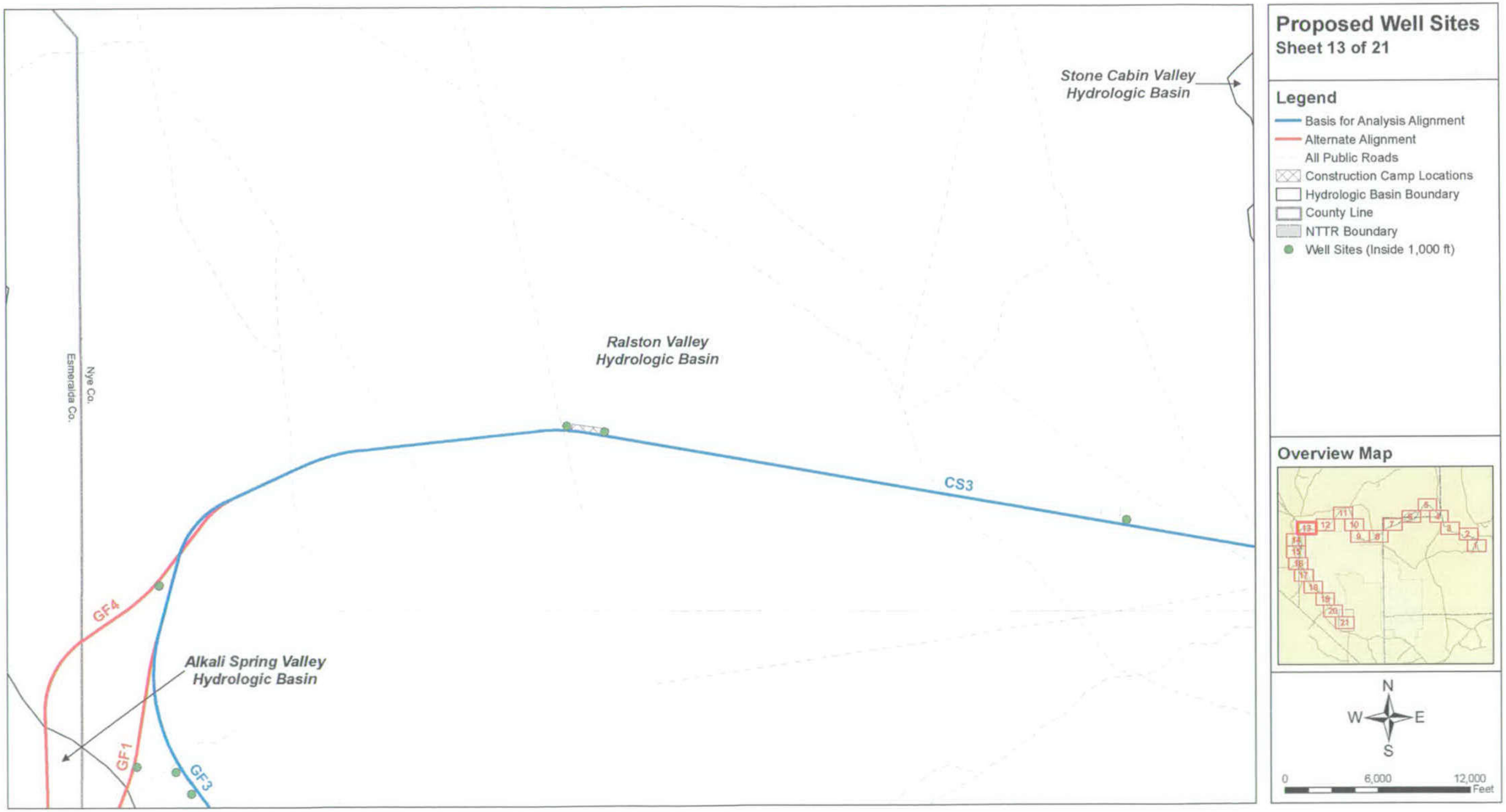
Proposed Well Sites
Sheet 13 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Construction Camp Locations
Hydrologic Basin Boundary
County Line
NTTR Boundary
Well Sites (Inside 1,000 ft)
Overview Map
Stone Cabin Valley Hydrologic Basin
Ralston Valley Hydrologic Basin
Alkali Spring Valley Hydrologic Basin
Esmeralda Co.
Nye Co.
CS3
GF4
GF1
GF3
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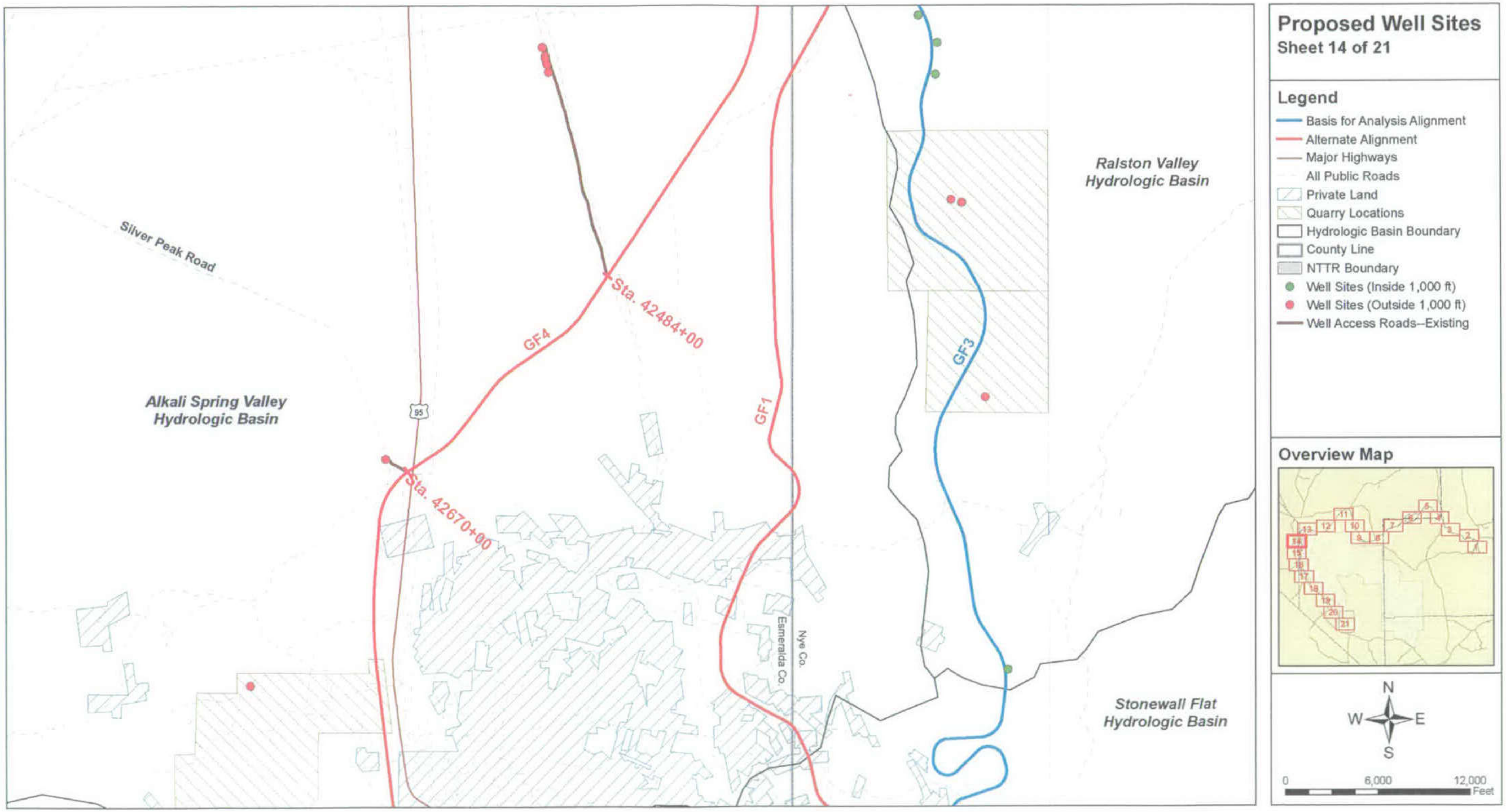
Feet


Proposed Well Sites
Sheet 14 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Quarry Locations
Hydrologic Basin Boundary
County Line
NTTR Boundary
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Overview Map
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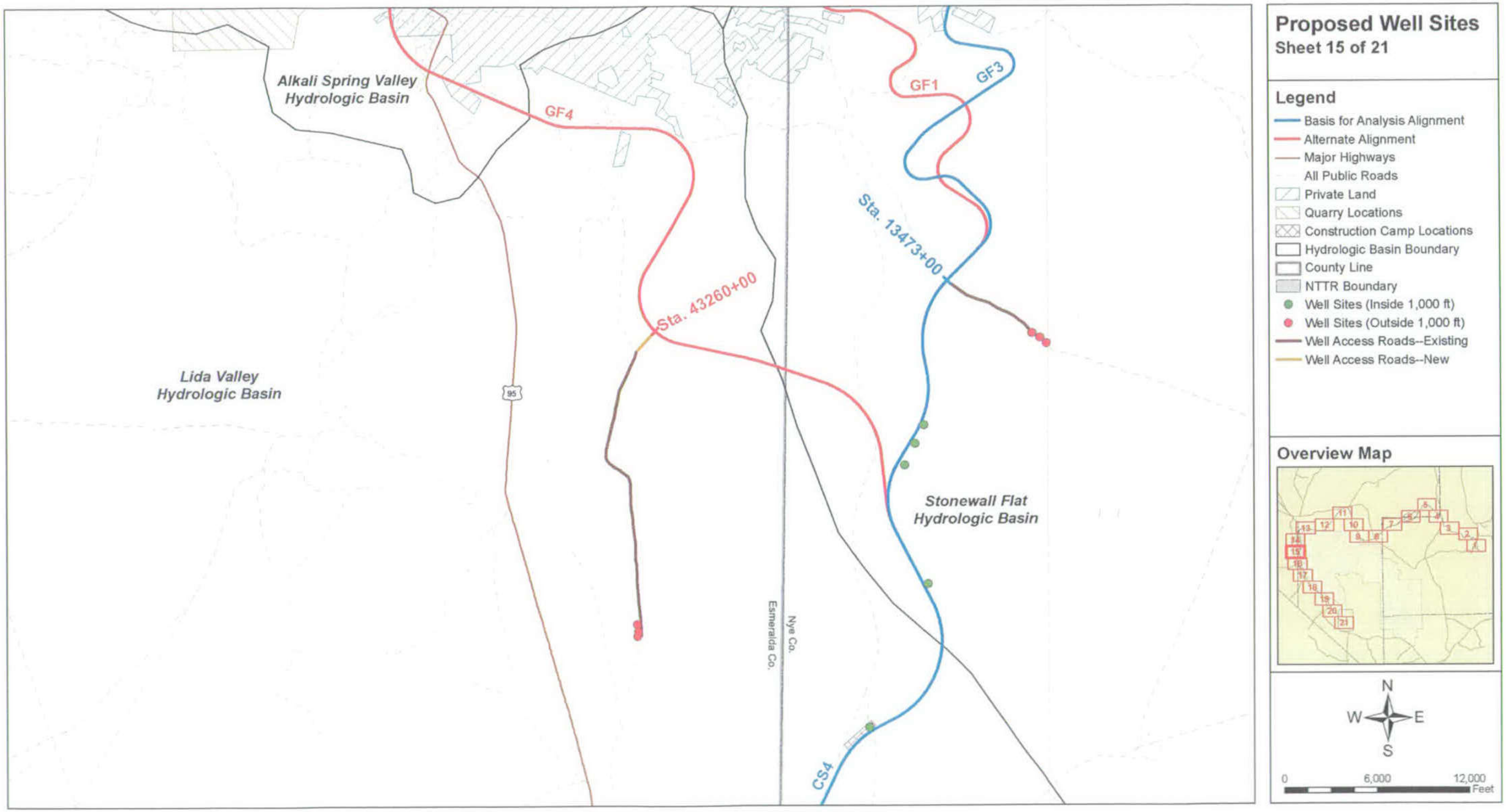
12,000
Feet
Ralston Valley Hydrologic Basin
Alkali Spring Valley Hydrologic Basin
Stonewall Flat Hydrologic Basin
Silver Peak Road
Sta. 42484+00
Sta. 42670+00
GF4
GF1
GF3
95
Esmeralda Co.
Nye Co.


Proposed Well Sites
Sheet 15 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Quarry Locations
Construction Camp Locations
Hydrologic Basin Boundary
County Line
NTTR Boundary
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Well Access Roads--New
Overview Map
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Feet
Alkali Spring Valley
Hydrologic Basin
Lida Valley
Hydrologic Basin
Stonewall Flat
Hydrologic Basin
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GF1
GF3
CS4
Sta. 43260+00
Sta. 13473+00
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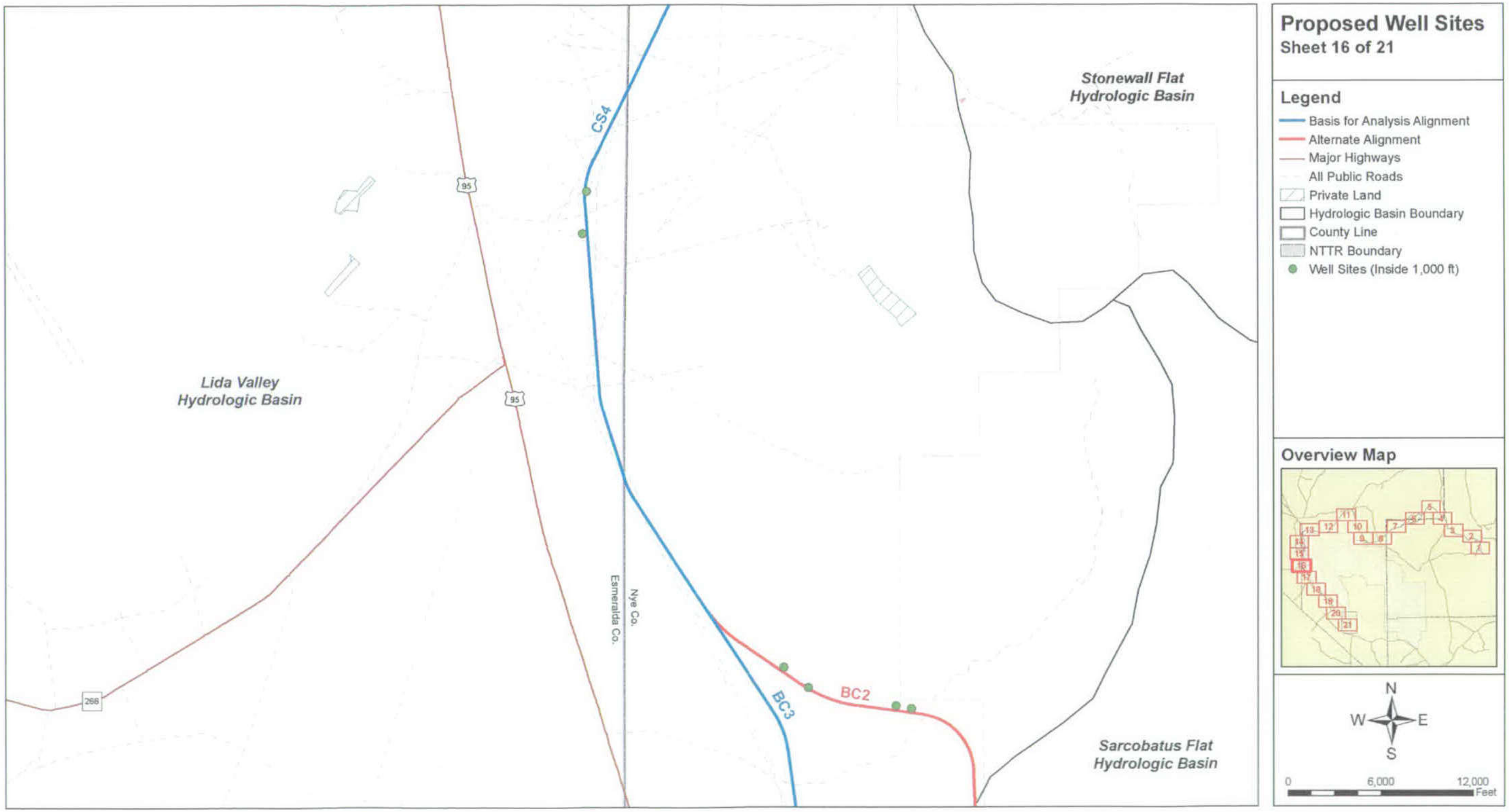
Nye Co.


Proposed Well Sites
Sheet 16 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Hydrologic Basin Boundary
County Line
NTTR Boundary
Well Sites (Inside 1,000 ft)
Overview Map
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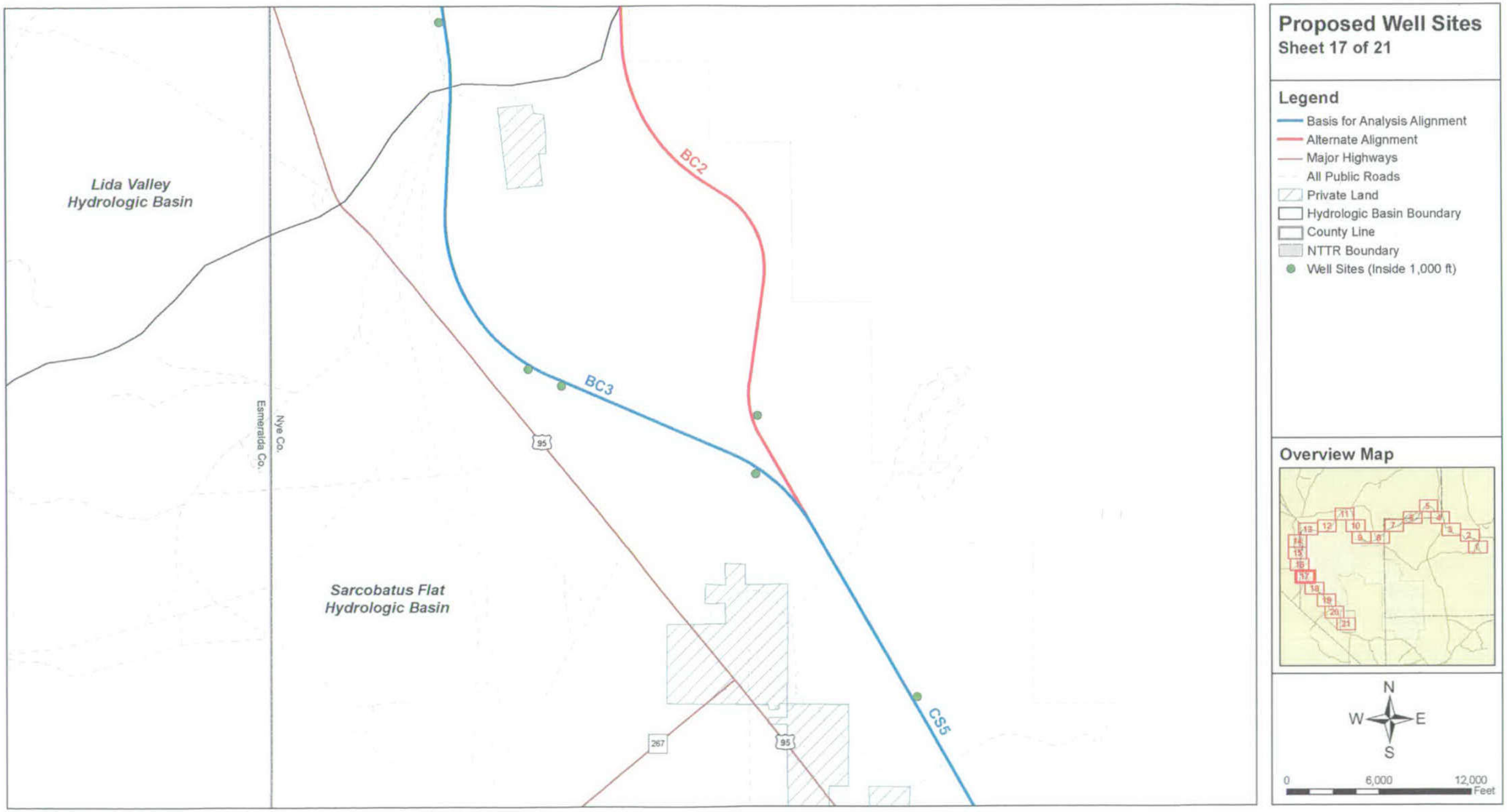
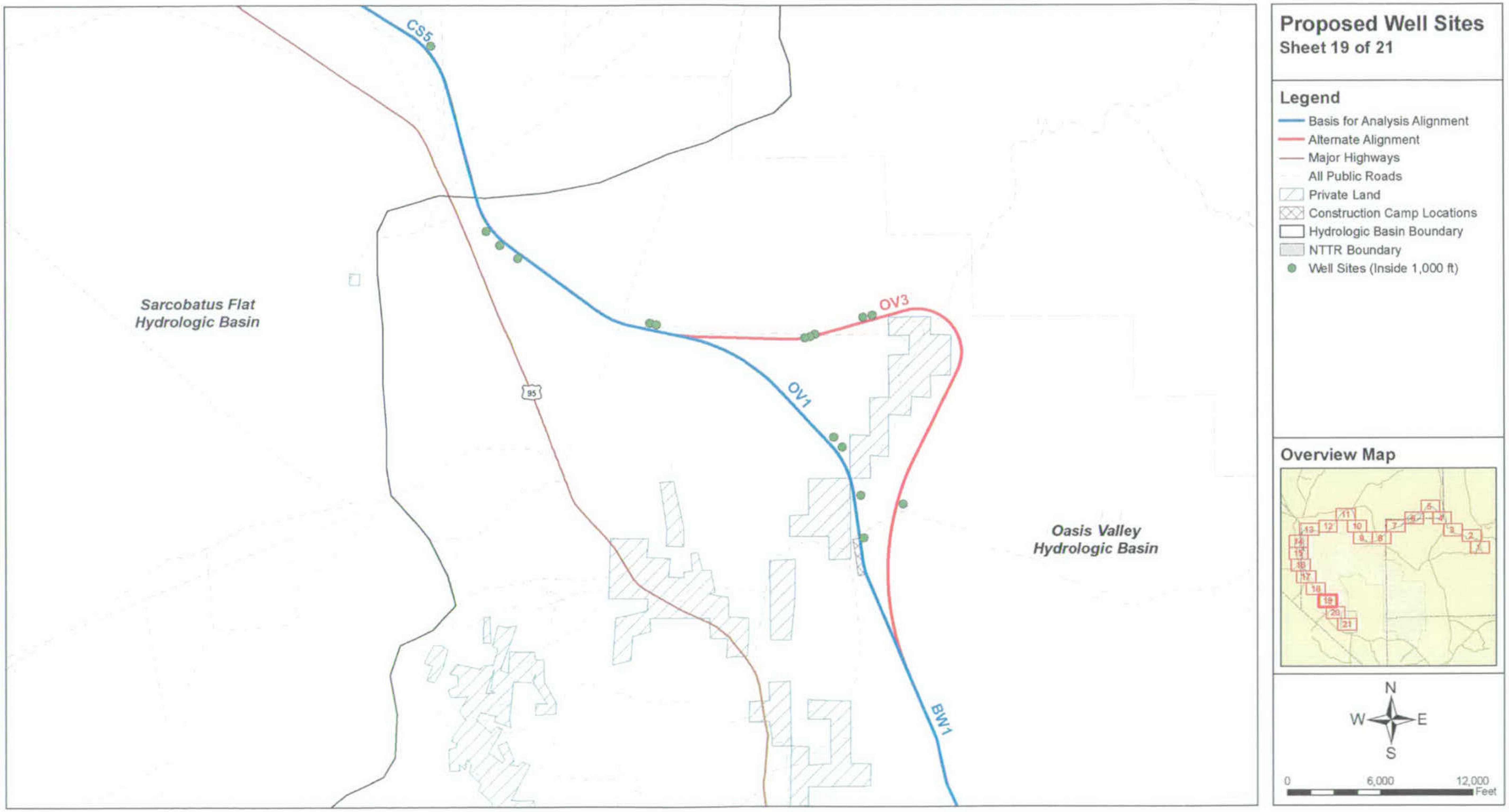
Feet
Stonewall Flat
Hydrologic Basin
Lida Valley
Hydrologic Basin
Sarcobatus Flat
Hydrologic Basin
CS4
BC3
BC2
95
95
266
Esmeralda Co.
Nye Co.

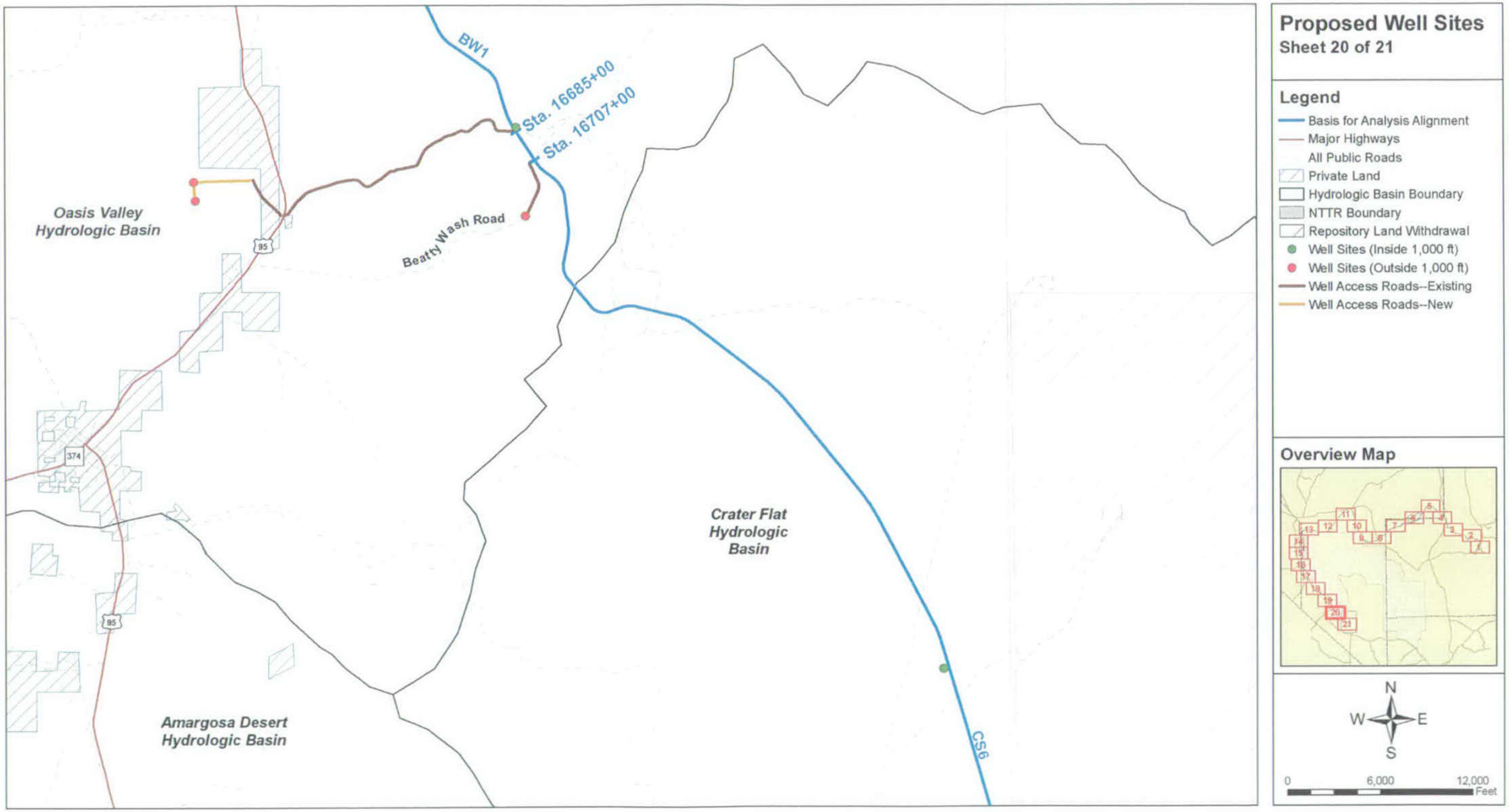


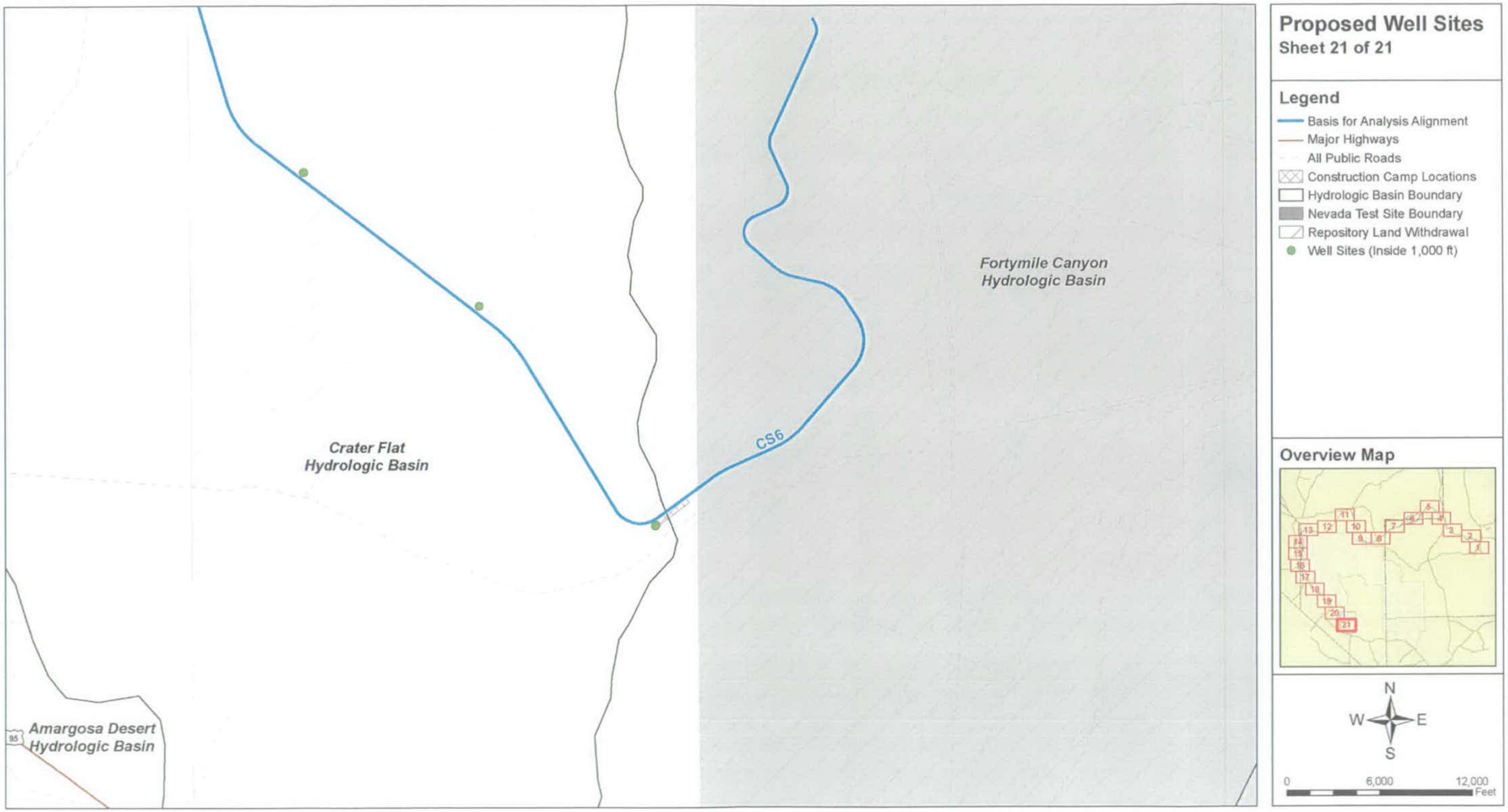
Lida Valley Hydrologic Basin
Sarcobatus Flat Hydrologic Basin
Esmeralda Co.
Nye Co.
BC2
BC3
CS5
95
95
267
Proposed Well Sites
Sheet 17 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Hydrologic Basin Boundary
County Line
NTTR Boundary
Well Sites (Inside 1,000 ft)
Overview Map
N
W
E
S
0
6,000
12,000
Feet


Proposed Well Sites
Sheet 18 of 21
Legend
Basis for Analysis Alignment
Major Highways
All Public Roads
Private Land
Construction Camp Locations
NTTR Boundary
Well Sites (Inside 1,000 ft)
Overview Map
N
W
E
S
0
6,000
12,000
Feet
CS5
CS5
95
Sarcobatus Flat
Hydrologic Basin

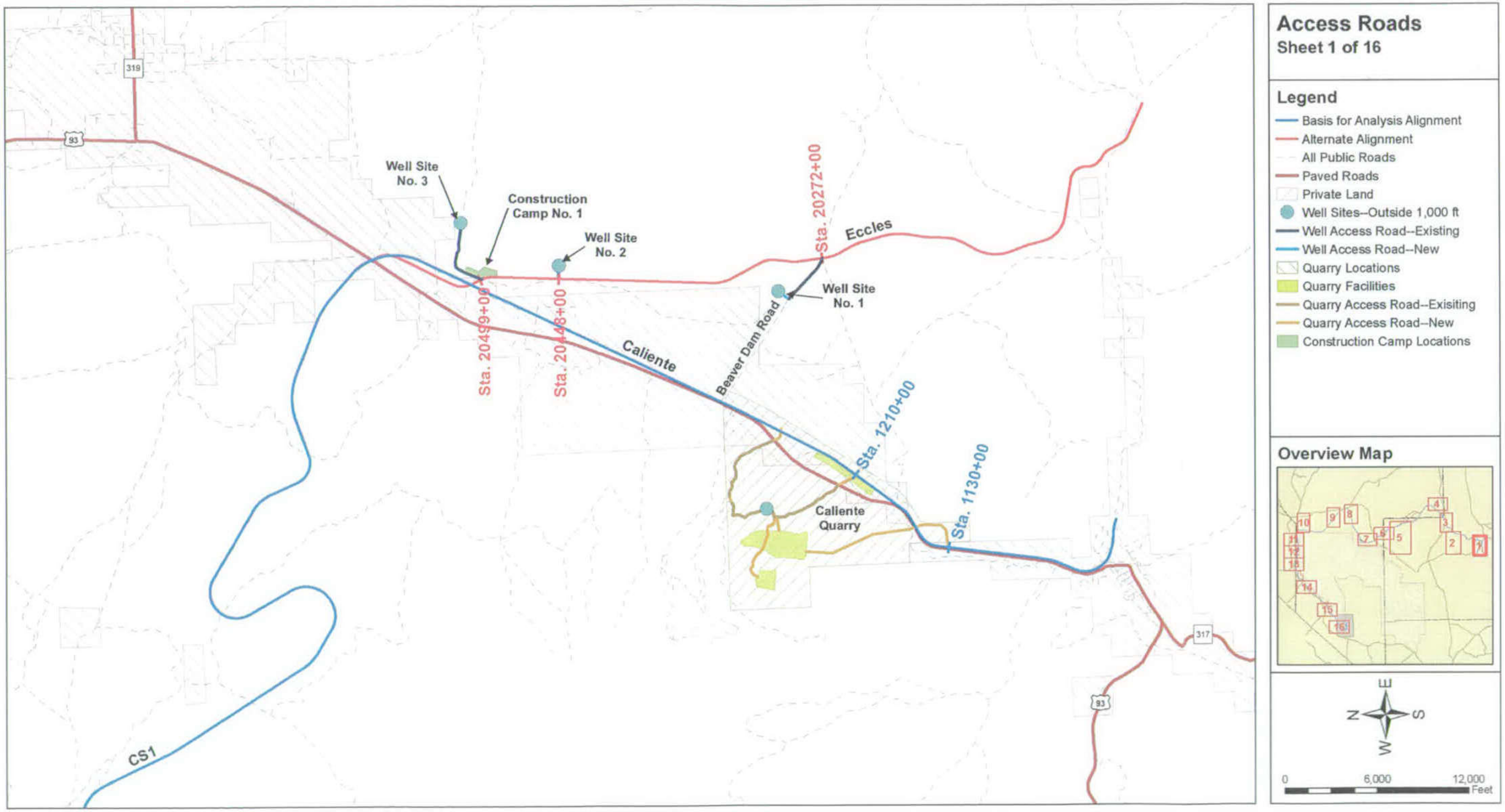


CS5
OV3
OV1
BW1
95
Sarcobatus Flat
Hydrologic Basin
Oasis Valley
Hydrologic Basin
Proposed Well Sites
Sheet 19 of 21
Legend
Basis for Analysis Alignment
Alternate Alignment
Major Highways
All Public Roads
Private Land
Construction Camp Locations
Hydrologic Basin Boundary
NTTR Boundary
Well Sites (Inside 1,000 ft)
Overview Map
N
W
E
S
0
6,000
12,000
Feet


Proposed Well Sites
Sheet 20 of 21
Legend
Basis for Analysis Alignment
Major Highways
All Public Roads
Private Land
Hydrologic Basin Boundary
NTTR Boundary
Repository Land Withdrawal
Well Sites (Inside 1,000 ft)
Well Sites (Outside 1,000 ft)
Well Access Roads--Existing
Well Access Roads--New
Overview Map
N
W
E
S
0
6,000
12,000
Feet
BW1
Sta. 16685+00
Sta. 16707+00
Beatty Wash Road
Oasis Valley Hydrologic Basin
Crater Flat Hydrologic Basin
Amargosa Desert Hydrologic Basin
95
374
CS6


Proposed Well Sites
Sheet 21 of 21
Legend
Basis for Analysis Alignment
Major Highways
All Public Roads
Construction Camp Locations
Hydrologic Basin Boundary
Nevada Test Site Boundary
Repository Land Withdrawal
Well Sites (Inside 1,000 ft)
Overview Map
N
W
E
S
0
6,000
12,000
Feet
Fortymile Canyon
Hydrologic Basin
Crater Flat
Hydrologic Basin
CS6
Amargosa Desert
Hydrologic Basin

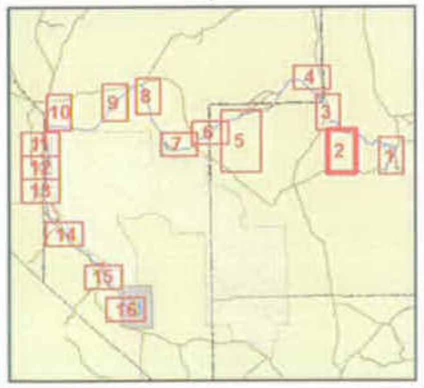
Appendix I
Access Road Detail Maps

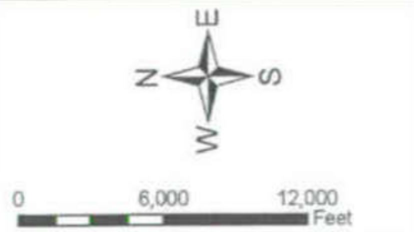

Access Roads
Sheet 1 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
Private Land
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Well Access Road--New
Quarry Locations
Quarry Facilities
Quarry Access Road--Exisiting
Quarry Access Road--New
Construction Camp Locations
Overview Map
0
6,000
12,000
Feet
Well Site No. 3
Construction Camp No. 1
Well Site No. 2
Well Site No. 1
Sta. 20272+00
Sta. 20499+00
Sta. 20448+00
Eccles
Caliente
Beaver Dam Road
Sta. 1210+00
Sta. 1130+00
Caliente Quarry
CS1
319
93
317

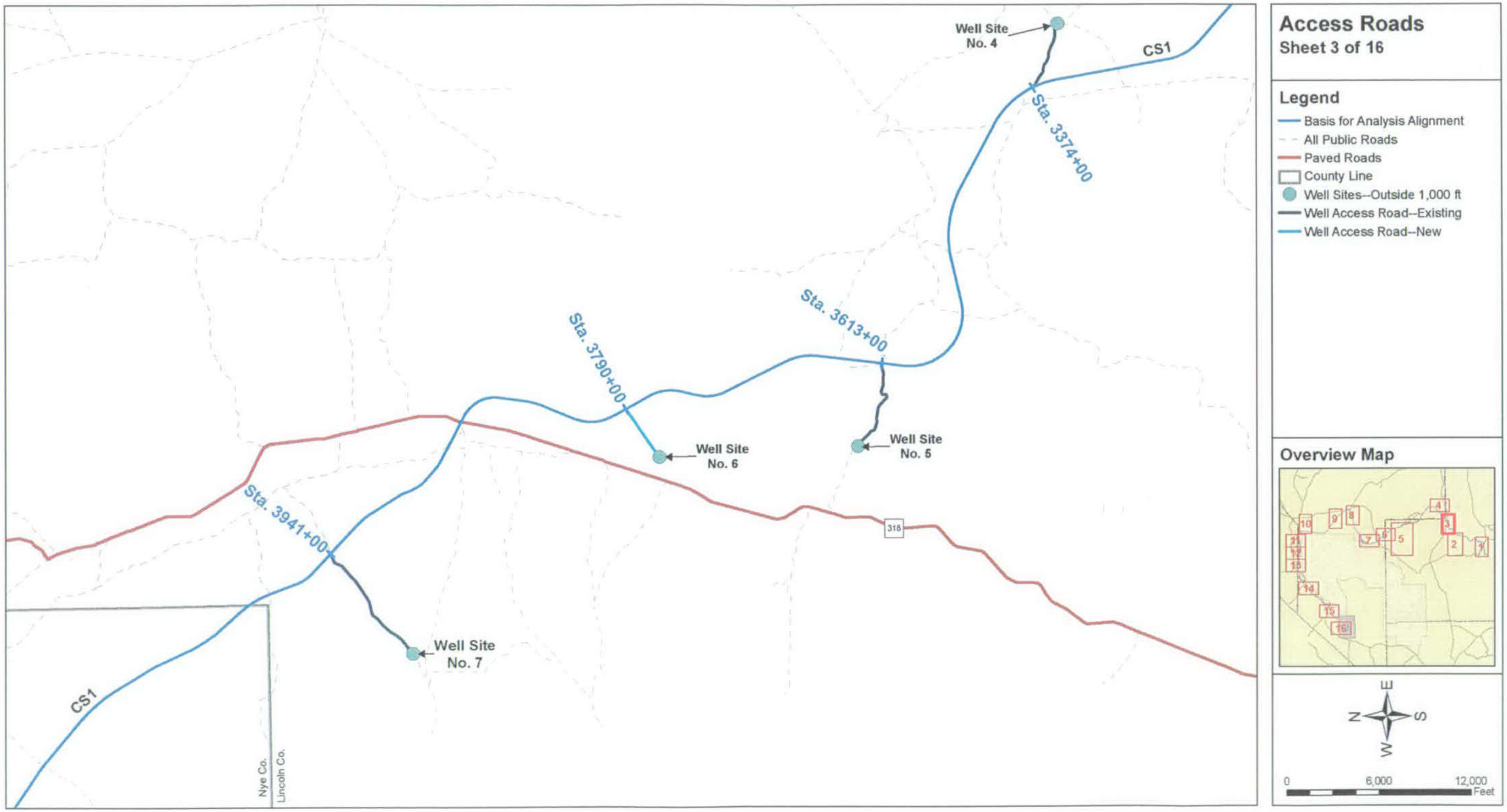
Access Roads
Sheet 2 of 16

Legend
- Basis for Analysis Alignment
- All Public Roads
- Paved Roads
- Construction Camp Locations
- Con. Camp Access Road--Existing

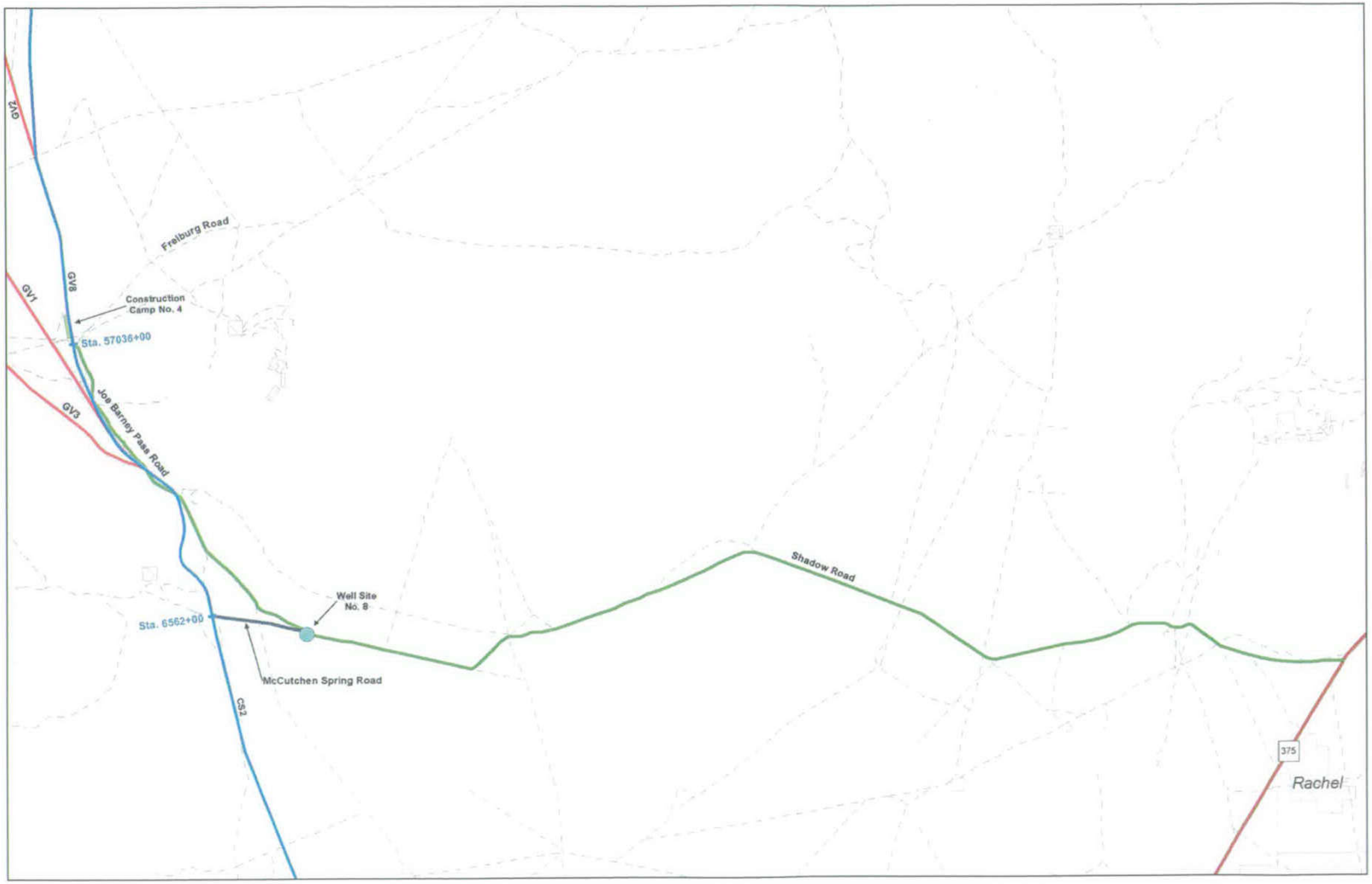
Overview Map






Access Roads
Sheet 3 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
County Line
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Well Access Road--New
Overview Map
Well Site No. 4
CS1
Sta. 3374+00
Sta. 3613+00
Sta. 3790+00
Well Site No. 6
Well Site No. 5
Sta. 3941+00
Well Site No. 7
318
CS1
Nye Co.
Lincoln Co.
N
E
S
W
0
6,000
12,000
Feet

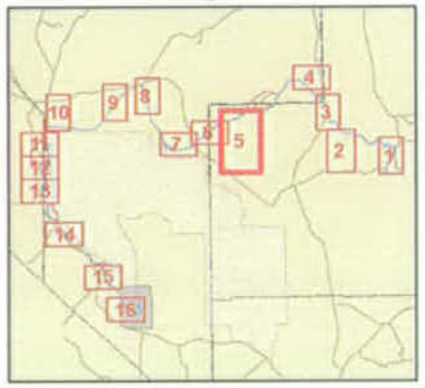

Access Roads
Sheet 4 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
Private Land
County Line
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
N
W
E
S
0
6,000
12,000
Feet
Construction Camp No. 3
Sta. 4726+00
WR1
Nye Co.
Lincoln Co.
318

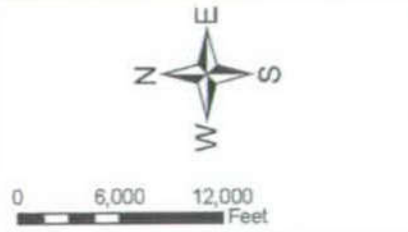


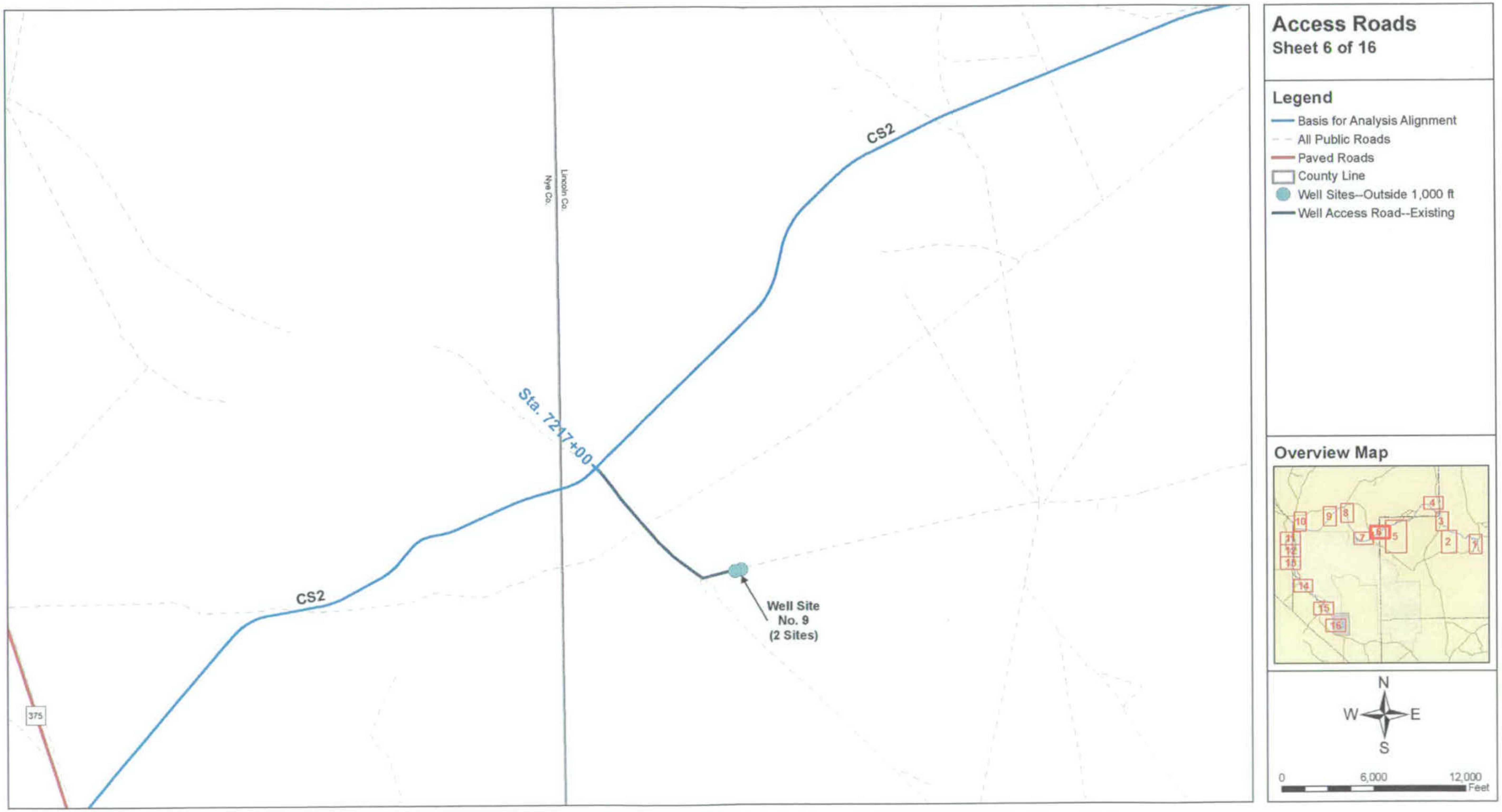
Access Roads
Sheet 5 of 16

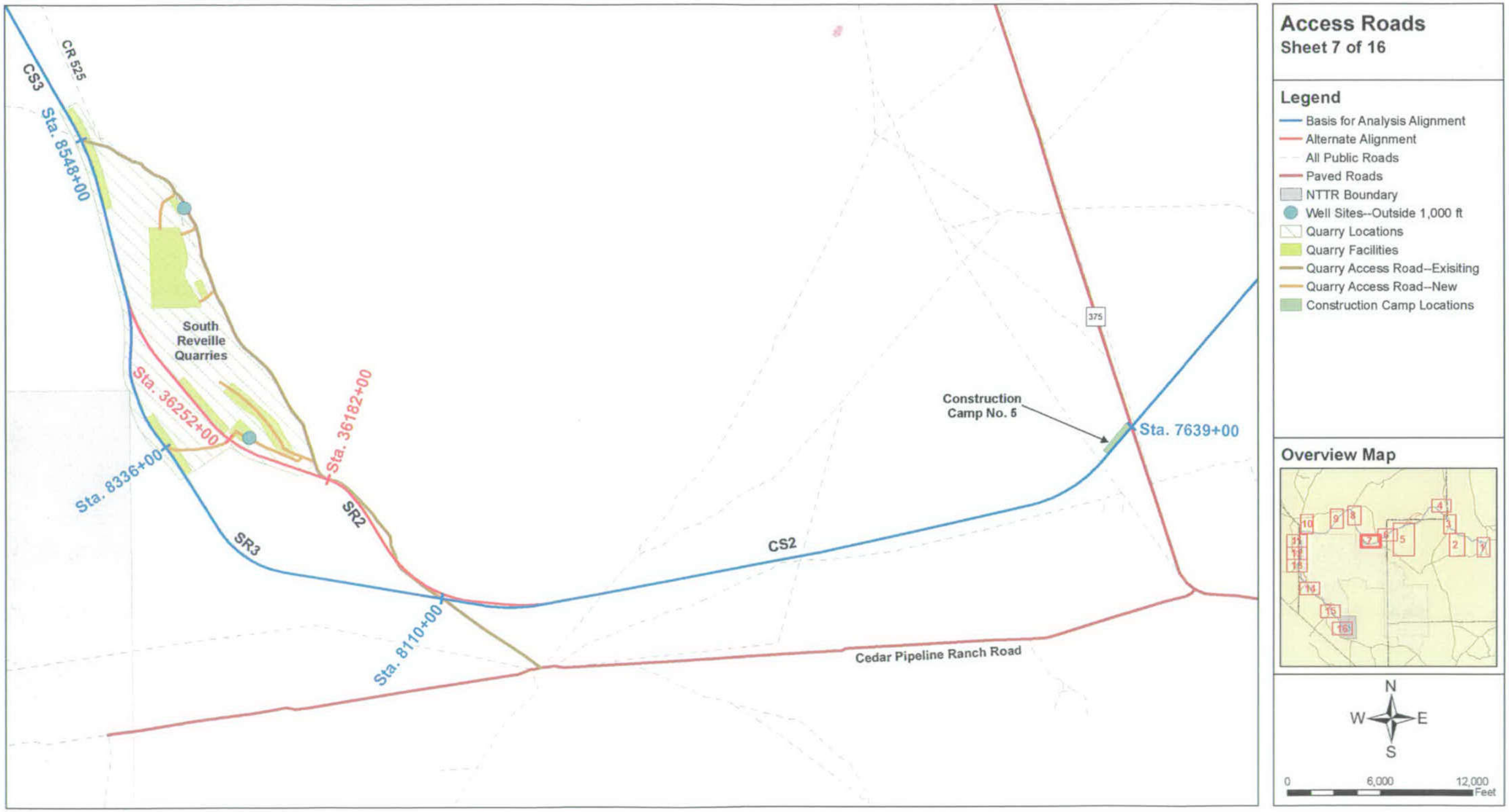
Legend
- Basis for Analysis Alignment
- Alternate Alignment
- All Public Roads
- Paved Roads
- Private Land
- Well Sites--Outside 1,000 ft
- Well Access Road--Existing
- Construction Camp Locations
- Con. Camp Access Road--Existing

Overview Map





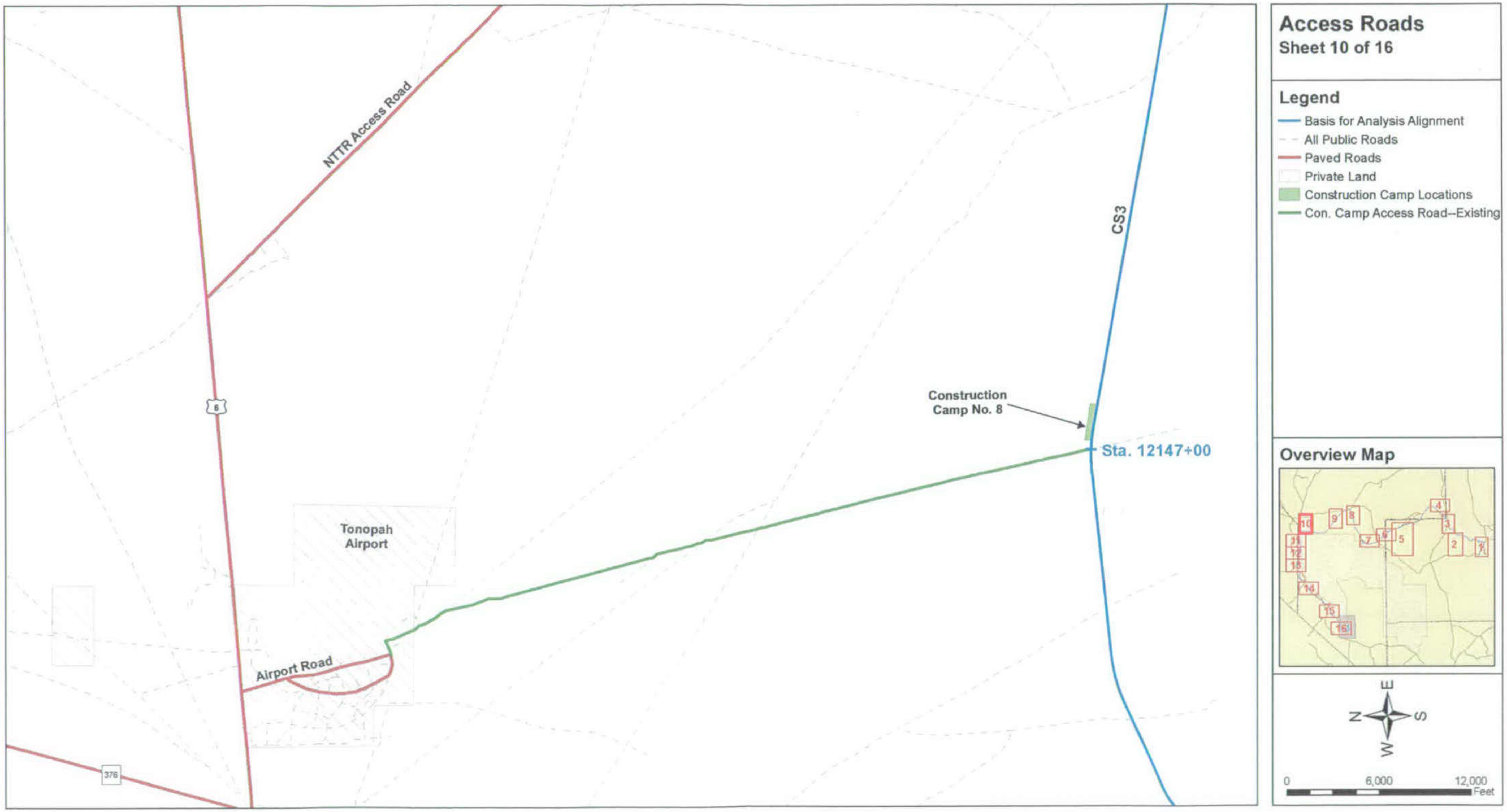

CS2
CS2
Sta. 7217+00
Nye Co.
Lincoln Co.
Well Site No. 9 (2 Sites)
375
Access Roads
Sheet 6 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
County Line
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Overview Map
N
W
E
S
0
6,000
12,000
Feet

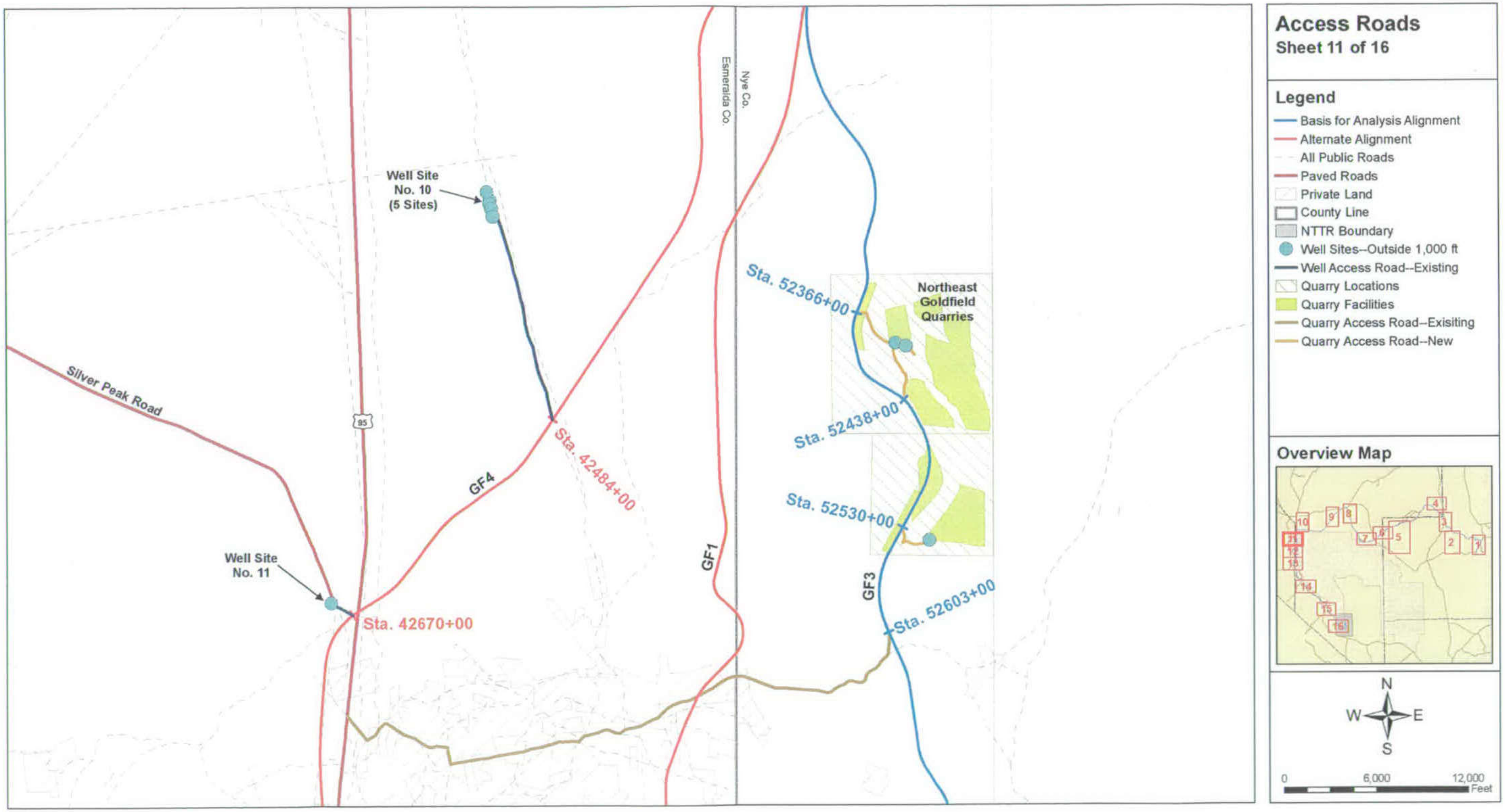


CS3
CR 525
Sta. 8548+00
South Reveille Quarries
Sta. 36252+00
Sta. 36182+00
Sta. 8336+00
SR3
SR2
CS2
Sta. 8110+00
Cedar Pipeline Ranch Road
Construction Camp No. 5
Sta. 7639+00
375
Access Roads
Sheet 7 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
NTTR Boundary
Well Sites--Outside 1,000 ft
Quarry Locations
Quarry Facilities
Quarry Access Road--Exisiting
Quarry Access Road--New
Construction Camp Locations
Overview Map
N
W
E
S
0
6,000
12,000
Feet

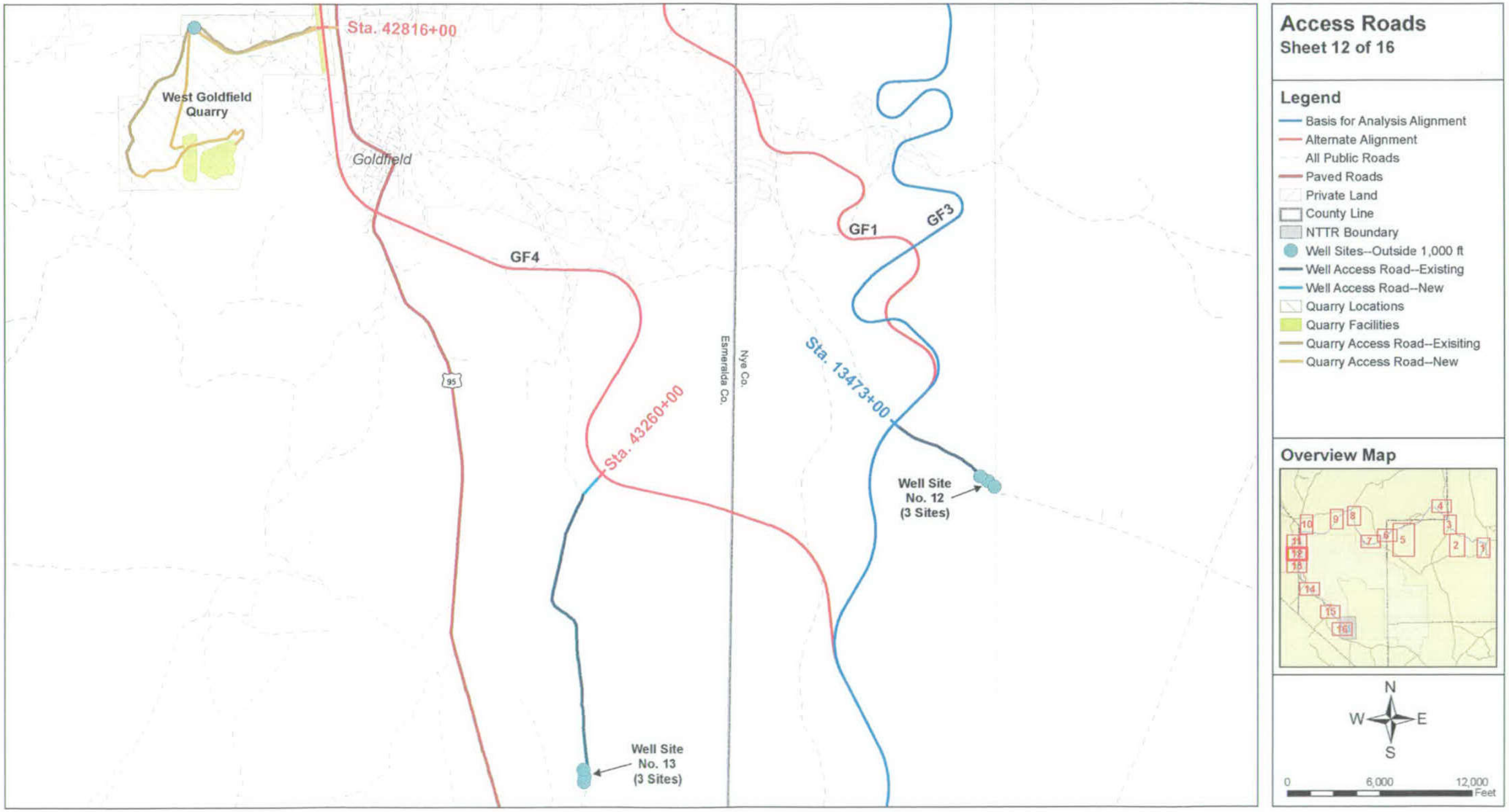
375
6
CS3
Sta. 9214+00
Construction Camp No. 6
Access Roads
Sheet 8 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
Private Land
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
E
N
S
W
0
6,000
12,000
Feet


CS3
CS3
6
Sta. 10770+00
Construction
Camp No. 7
Golden Arrow - Silver Bow Road
Access Roads
Sheet 9 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
Private Land
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
E
N
S
W
0
6,000
12,000
Feet


Access Roads
Sheet 10 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
Private Land
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
NTTR Access Road
CS3
Construction Camp No. 8
Sta. 12147+00
Tonopah Airport
Airport Road
6
376
E
N
S
W
0
6,000
12,000
Feet



Access Roads
Sheet 11 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
Private Land
County Line
NTTR Boundary
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Quarry Locations
Quarry Facilities
Quarry Access Road--Exisiting
Quarry Access Road--New
Overview Map
N
W
E
S
0
6,000
12,000
Feet
Well Site No. 10 (5 Sites)
Well Site No. 11
Silver Peak Road
95
GF4
GF1
GF3
Sta. 42484+00
Sta. 42670+00
Esmeralda Co.
Nye Co.
Sta. 52366+00
Northeast Goldfield Quarries
Sta. 52438+00
Sta. 52530+00
Sta. 52603+00

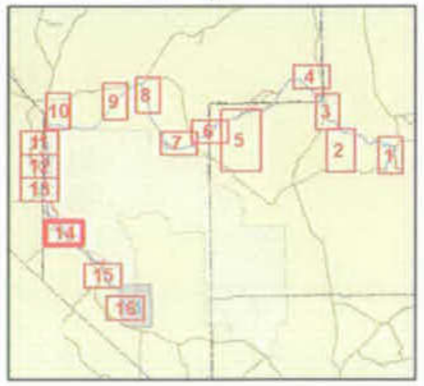

Sta. 42816+00
West Goldfield Quarry
Goldfield
GF4
95
Sta. 43260+00
Esmeralda Co.
Nye Co.
GF1
GF3
Sta. 13473+00
Well Site No. 12 (3 Sites)
Well Site No. 13 (3 Sites)
Access Roads
Sheet 12 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
Private Land
County Line
NTTR Boundary
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Well Access Road--New
Quarry Locations
Quarry Facilities
Quarry Access Road--Exisiting
Quarry Access Road--New
Overview Map
N
W
E
S
0
6,000
12,000
Feet

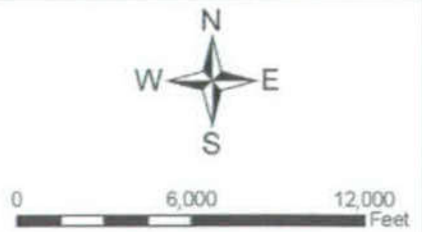

Construction Camp No. 9
Sta. 13809+00
CS4
95
266
Esmeralda Co.
Nye Co.
BC3
BC2
Access Roads
Sheet 13 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
Private Land
County Line
NTTR Boundary
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
N
W
E
S
0
6,000
12,000
Feet

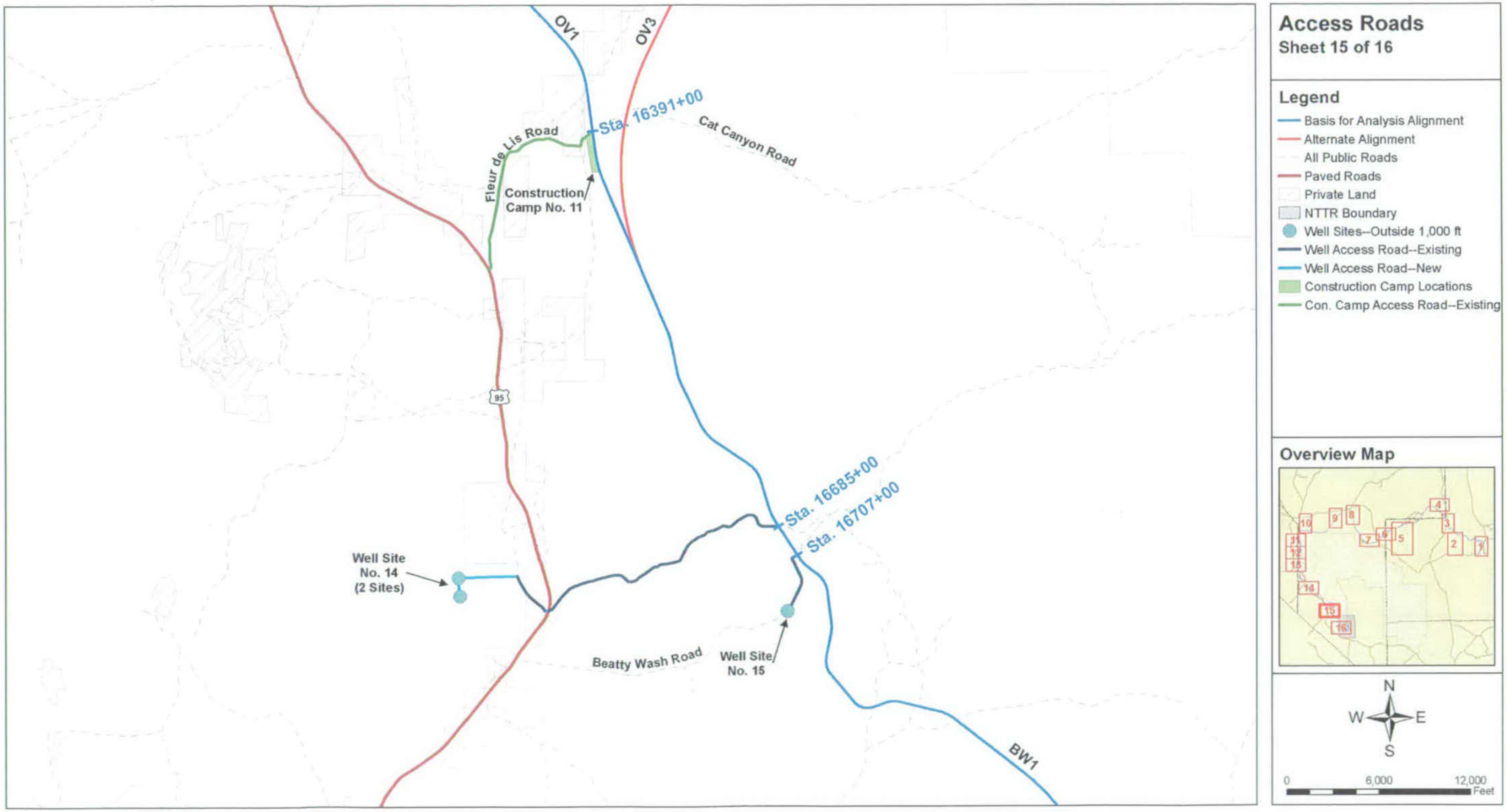
Access Roads
Sheet 14 of 16

Legend
- Basis for Analysis Alignment
- All Public Roads
- Paved Roads
- Private Land
- NTTR Boundary
- Construction Camp Locations
- Con. Camp Access Road--Existing

Overview Map







Access Roads
Sheet 15 of 16
Legend
Basis for Analysis Alignment
Alternate Alignment
All Public Roads
Paved Roads
Private Land
NTTR Boundary
Well Sites--Outside 1,000 ft
Well Access Road--Existing
Well Access Road--New
Construction Camp Locations
Con. Camp Access Road--Existing
Overview Map
N
W
E
S
0
6,000
12,000
Feet
OV1
OV3
Sta. 16391+00
Cat Canyon Road
Fleur de Lis Road
Construction Camp No. 11
95
Sta. 16685+00
Sta. 16707+00
Well Site No. 14 (2 Sites)
Beatty Wash Road
Well Site No. 15
BW1


CS6
CS6
Construction Camp No. 12
Sta. 17760+00
95
Access Roads
Sheet 16 of 16
Legend
Basis for Analysis Alignment
All Public Roads
Paved Roads
NTTR Boundary
Nevada Test Site Boundary
Repository Land Withdrawal
Construction Camp Locations
Con. Camp Access Road--Existing
Con. Camp Access Road--New
Overview Map
N
W
E
S
0
6,000
12,000
Feet