CULTURAL RESOURCES INVENTORY AND MONITORING PROGRAM -

NEWBERRY VOLCANO EGS DEMONSTRATION PROJECT: -
MICRO SEISMIC ARRAY LOCATION STUDY -

UNITED STATES GEOLOGICAL SURVEY LLC, DAVENPORT -
NEWBERRY HOLDINGS LLC, and ALTAROCK ENERGY, INC. -

DESCHUTES NATIONAL FOREST, DESCHUTES COUNTY, OREGON -

July 2010; revised and amended November 2011 -

BRHC Report Number 122 -

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STATE OF OREGON
CULTURAL RESOURCES SURVEY COVER SHEET

Author(s) Name: Last **Horne** First **Stephen**

Title of Report: **Cultural Resources Inventory and Monitoring Program**
Newberry Micro Seismic Array Project

Date: **November 6, 2011**

Contractor: **Basin and Range Heritage Consultants**

Agency: **Deschutes National Forest (INFRA Report No. R2012060103004)**

Client: **Alta Rock Energy, Inc, Sausalito, California**

County: **Deschutes**

Township: **T21S** Range: **Range 11E** Section: **25 and 36**
Township: **T21S** Range: **Range 12E** Section: **16,17,19,20,21, 27,28,29,30,33, and 36**
Township: **T22S** Range: **Range 12** Section: **4 and 6**

Quad(s): **USGS 7.5' Lava Cast Forest, OR 1962, photorevised 1981**
USGS 7.5' Paulina Peak, OR 1962, photorevised 1981

Project Acres: **4.5** Survey Acres: **14.6**

CD Submitted? ✔ Yes ___No Does this replace a draft? __Yes ✔ No

Project activity: **Geotechnical Research** Archaeological Permit No.: **USFS ARPA BEN747**

Field note Location: **Basin and Range Heritage Consultants, Terrebonne, Oregon**
Curation Location**: No collections**

Sites Found? ____Yes ✔ No Prehistoric: **0** Historic: **0**
Historic Properties Found? ___Yes ✔ No Historic Property: **0**
TCP(s) found? __Yes ✔ No Isolates Found? __Yes ✔ No

Keywords: **Newberry Volcano, Geothermal Development, Seismic Testing**

SHPO Trinomial No.: **None** Temporary No.: **None**

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Summary

This report addresses the cultural resources implications of development of a micro seismic array (MSA) on the west slope of Newberry Volcano between US Highway 97 and Paulina Lake. The MSA is part of a larger program of geophysical testing in support of potential geothermal development ("Newberry Geothermal Project").

A survey was conducted in 2010 for proposed sensor and sending stations. Through testing of that array, the need for additional stations was identified. The additional locations were surveyed in 2011. This report compiles results from 2010 and 2011 surveys.
The 2010 survey examined 28 stations. The 2011 survey examined nine stations.

The study consisted of review of documents and intensive pedestrian survey at multiple locations. This cultural resources report amends and replaces documentation of archaeological survey and monitoring conducted for the Newberry Micro Seismic Array (MSA) Project during 2010 (Horne 2010). The purpose of amending the original 2010 report is to address revisions in the planned seismic array that have arisen during the perfection of array design.

Intensive archaeological survey produced negative results. A *No Historic Properties Affected* determination is recommended. No additional monitoring is recommended.

Project Information

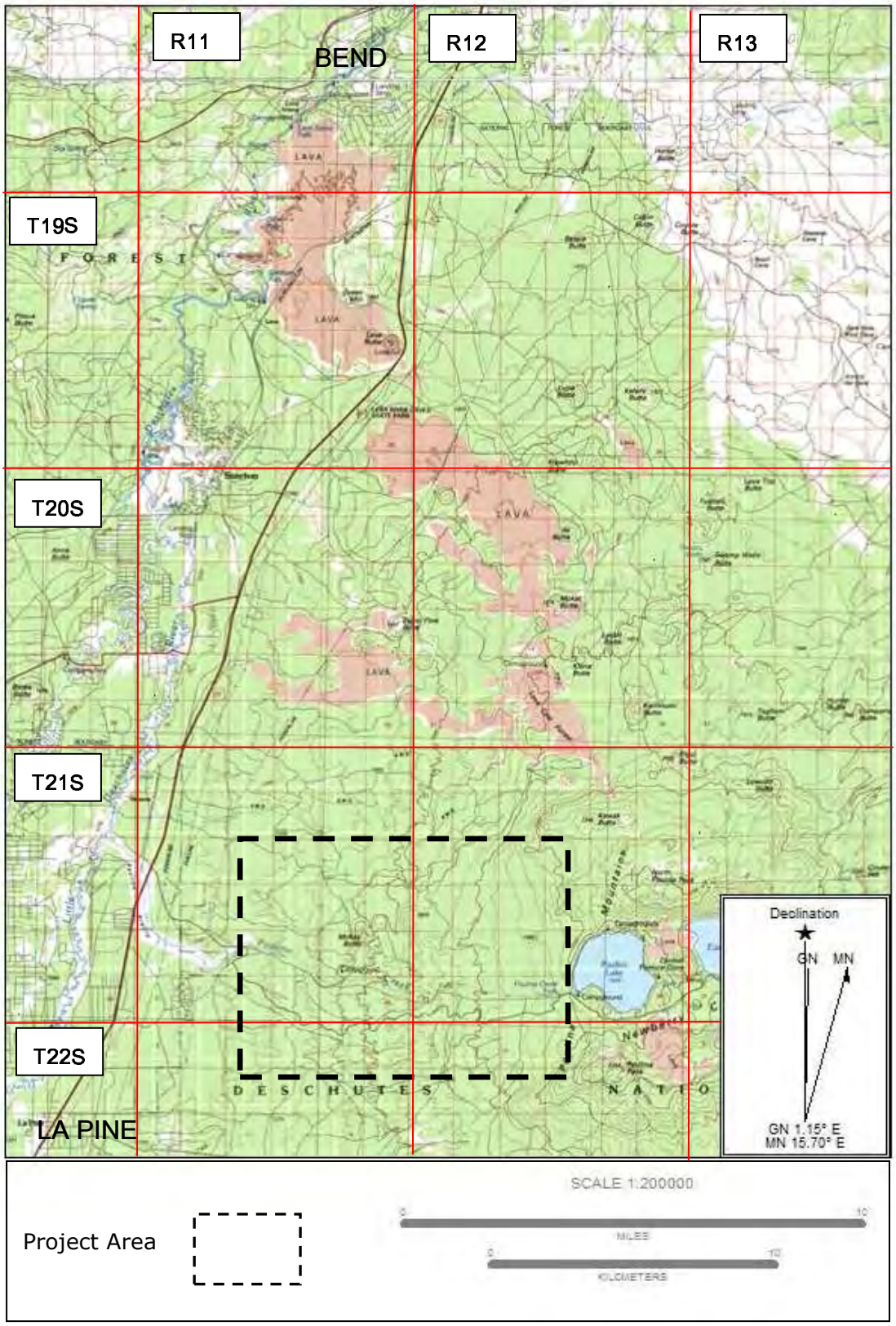
Undertaking Description: United States Department of the Interior, United States Geological Survey (USGS), Davenport Newberry Holdings LLC (Davenport) and Alta Rock Energy, Inc. are the Operators for the proposed undertaking. The Operators wish to continue geophysical testing to determine the seismic characteristics of the subsurface in and around the west slope of Newberry Crater (Figure 1), particularly within the area surrounding the Davenport geothermal wells. Such information will allow scientists to accurately locate earthquakes in the area, both naturally occurring and from induced seismicity that may arise from geothermal reservoir stimulation activities.

The undertaking expands a network of micro seismic sending and sensor stations. The stations are of two types, each with a corresponding impact footprint. One type of station is established in wells ("downhole stations") while a second type is established in shallow hand-excavated pits (shallow subsurface-mounted). Existing roads are planned for access, thus there will be no new construction of roads or temporary access.

Tribal consultation was not conducted as a component of the program of work documented in this report. Such consultation and consideration of the effects of the undertaking on previously unreported traditional cultural properties or other sites/locations of cultural value were conducted by the Forest Service and the Bureau of Land Management during environmental review for the Newberry Geothermal Project.

Area of Potential Effect (APE): The APE for this project is the potential impact footprint of the sensor and sending stations. Since the two types of stations (downhole and shallow subsurface-mounted) are constructed in different ways, their footprints are distinct. Downhole sensors require the use of drilling equipment; the shallow subsurface-mounted sensors are placed in small, shallow, hand-excavated pits.

Figure 1. Project Vicinity and Project Area



The potential impact footprint and APE for downhole sending and sensor units is estimated as 9375 square feet (871 square meters) arrayed in a polygon 125 feet long by 75 feet wide. This area encompasses an area required for access and positioning of drilling equipment. For the purpose of APE definition, locations where shallow subsurface-mounted sensors are to be placed in hand excavated pits were treated as if they were locations of downhole sensors. The actual construction footprint of all stations is expected to be much smaller than the areas established for the APE.

Design of the Survey and Monitoring: The survey examined the APE of each of 37 individual locations. The disparity between the number of locations examined for this report (37) and the number of locations that were selected by the Operators for development (21) is a result of changes in coordinates that were made by the Operators while the 2010 survey effort was in progress. This change resulted in the survey of 16 locations that were withdrawn from consideration as seismic stations.

At each location a survey polygon (40 meters by 40 meters square [130 by 130 square feet]) encompassing the APE was established to allow flexibility in exact placement of seismic stations. Each survey area was an equilateral polygon 1,600 square meters (17,222 square feet) in area oriented north-south and centered on the UTM coordinates listed in Tables 1 and 2. Each polygon was surveyed with parallel transects spaced at ten meter intervals. Where the survey polygon extended into the road, the roadbed was also inspected.

Field surveyors were provided latitude to relocate planned stations and their respective APE in order to avoid locations of known or discovered archaeological sites.

Monitoring was required by the Deschutes National Forest as a condition of the 2010 permit issued to the Operators. This condition was put in place because of the likelihood of encountering subsurface deposits that are covered or obscured by recent tephra, a phenomenon occurring widely in the region (McFarland 1989, Musil 2005). When drilling commenced, samples of cuttings from the hole were visually examined and grab samples were screened through 1/8-inch hardware cloth.

The focus of monitoring was examination of the upper 1.5 meters (5 feet). Below this depth, drillers insert a conductor pipe (or "start pipe") 4.5 feet long into the bore hole and cuttings are removed by compressed air. These cuttings were only cursorily examined since they are widely scattered.

Environmental and Cultural Context Summary

This project area is situated in central Oregon near the interface of the Columbia-Snake River and Pacific Mountain System physiographic provinces (Franklin and Dyrness 1988, Hunt 1974). In the project vicinity, the topography is characterized by a gently rolling ridges and flats interrupted by prominent buttes. Although the upland location of the project is a primarily dry, perennial Paulina Creek is within the project area. The dominant vegetation in the project area is coniferous forest dominated by ponderosa pine or lodgepole growing in soils derived from volcanic tephra with a typical understory of manzanita, bitterbrush, and clumping perennial grasses. The project area extends across elevations ranging approximately from 5000 to 6500 amsl (1524 to 1981 meters amsl).

The dominant modern use of the vicinity is national forest management and recreation.

The project area is situated near the convergence of three great cultural regions of the Late Archaic: the Northern Great Basin, Southern Columbia Plateau, and the Cascade Range (Connolly et al. 1999). Prehistoric cultures of the Northern Great Basin, primarily Northern Paiute, shared a dispersed settlement pattern and an economic strategy that included hunting of both large and small game and gathering of a wide variety of wild plant foods (Houser 1996, Jenkins et al. 2004). Paiute groups wintered along the middle Deschutes River near Bend (Suphan 1974:64). Prehistoric cultures in the Southern Columbia Plateau shared a number of major traits, including a riverine settlement pattern with large winter villages situated in river valleys; reliance on diverse subsistence resources with a particularly complex fishing technology; sharing of subsistence resources, particularly evident during salmon runs; intergroup kinship ties; extensive, institutionalized trade networks; and limited political integration. Little is known about Late Archaic land and resource use of the project region by cultures of the Cascade Range cultural region. Groups that may have used the area include the Tenino, Molalla, the Klamath, and, perhaps, even the Modoc (Houser 1996:12).

Although prehistorians entertain a lively debate about cultural history in the area (Ruby 1992), there is broad consensus on the general characteristics and development of prehistoric cultures (Lohse 2005). The Paleoindian and Early Archaic cultures of the central Oregon region, Clovis and Pre-Clovis (13000-10000 BP), Windust (10,000-8000 BP), Cascade (8000-4500 BP), were mobile, moving with the seasons to exploit a wide range of plant and animal resources. Middle Archaic cultures, experiencing widespread cooling and increased moisture (Bryson et al. 2009), favored an increasingly semi-sedentary settlement pattern that facilitated intensified exploitation of more localized resources, including salmon and plant foods. Contracting stem and corner notched points, cobble tools, net sinkers, hopper mortars and pestles and pithouses appear in the archaeological record. Late Archaic cultures of the region experienced climatic conditions much closer to our present climate. Winter pithouse villages with storage features and roasting ovens developed along larger rivers and tributaries. Arrow points appeared by 2500 BP but dart points continued in use. Scraping tools, groundstone tools, gaming pieces, and rock art characterize the Late Archaic.

Euroamericans pushed into the area in the early 19th century, exploring for routes over the Cascades and for such economic uses as trapping. Peter Skene Ogden, trapper and explorer, recorded a visit to the Deschutes in December of 1825. Nathanial Wyeth camped on the Deschutes near Bend in 1834, and John C. Fremont visited in 1843. Settlement came considerably later, with lowland areas beginning to infill during the mid to late 19th century (Tonsfeldt 2007). The uplands characteristic of the project area remained unsettled and most of the land remained in the public domain until incorporated into the Cascade Range Forest Reserve and the other permutations of public ownership leading to the modern National Forest boundary. Railroad logging became the dominant land use in the project vicinity (Gregory 2001) until unsustainable cutting levels forced logging operations farther south.

Documentation and Fieldwork Effort

Records Search USFS Bend-Fort Rock District: Prior to field investigation, District/Forest Master Survey Map(s) (MSM), references in the District cultural resources library, and Historic Inventory Maps(s) (HIM), were reviewed to identify and evaluate prior archaeological surveys, known cultural resources, and area sensitivities. The records review was conducted on June 10 and 11, 2010 by Basin and Range Heritage Consultants. Based on this review the principal expectation in all survey areas is evidence of prehistoric archaeological sites (due to the nearby proximity of large and well-known obsidian toolstone sources and water sources) and evidence of railroad logging grades and associated features.

Many prior archaeological surveys have been conducted in the project area; almost without exception these are large area surveys done in support of timber management. Many of these surveys are quite old and fail to meet contemporary standards. Further, reports documenting the majority of these surveys did not provide a sufficient measure of assurance that prior survey at the seismic stations was sufficiently intensive to meet present standards.

Although documentation of traditional cultural properties and other sites/properties of Native American importance is beyond the scope of this investigation, no such properties are documented in available Forest Service records.

Dates of Field Survey: July 2010 and October 2011.

Field Personnel: Stephen Horne

Weather and Surface Visibility: Weather for the 2010 field effort was warm and clear; weather for the 2011 field effort was cool and clear. Surface visibility for the project as a whole was typical for forested environments, ranging from 80-90 percent in plantations to 20-40 percent in second growth forests.

Method: Intensive pedestrian survey was conducted at 37 individual locations. The area surveyed included the APE (defined above) and a buffer for a total of 1,600 square meters (17,222 square feet) at each location. The pedestrian survey consisted of parallel transects spaced ten meters apart with surface scrapes conducted as appropriate where surface litter precluded ground visibility.

The 2010 field effort examined 28 potential locations. The 2011 field effort examined nine additional sensor stations. The total area surveyed in both the 2010 and 2011 field efforts is 5.9 hectares (14.6 acres). Figures 2-6 display the location of each seismic station, including the withdrawn locations, differentiated by the year of survey. The locations are shown as points since they are too small in area to display their actual configuration on the landscape at a 1:24000 scale.

Table 1. 2010 Field Effort Locations: Legal Description, Quadrangle, and UTM Coordinates

ID	Quad	Public Lands Survey System		UTM Zone 10 Coordinates[1]		Monitored
		T&R	Section	Easting	Northing	
MSA-1	Lava Cast Forest	T21SR12E	NW1/4 SW1/4 S17	0634636	4845850	Withdrawn
MSA-1-RC	LavaCast Forest	T21SR12E	NW1/4 SW1/4 S17	0634798	4845677	Yes
MSA-2	Paulina Pk	T21SR12E	NE1/4 NW1/4 S20	0635062	4844853	Withdrawn
MSA-3	Lava Cast Forest	T21SR12E	SE1/4 SW1/4 S16	0636869	4845516	Withdrawn
MSA-3-RC	LavaCast Forest	T21SR12E	NE1/4 SW1/4 S16	0636739	4845764	Yes
MSA-4	Paulina Pk	T21SR12E	SE1/4 SE1/4 S20	0635961	4843838	Withdrawn
MSA-4-RC	Paulina Pk	T21SR12E	SE1/4 SE1/4 S20	0636099	4843886	Yes
MSA-5	Paulina Pk	T21SR12E	SE1/4 SE1/4 S21	0637592	4843662	Yes
MSA-50	Paulina Pk	T21SR12E	NE1/4 SE1/4 S21	0637699	4843971	Withdrawn
MSA-6	Paulina Pk	T21SR12E	NE1/4 SW1/4 S28	0637004	4842360	Withdrawn
MSA-7	Paulina Pk	T21SR12E	SW1/4 SW1/4 S28	0636379	4841984	Yes

MSA-70	Paulina Pk	T21SR12E	SE1/4 SW1/4 S28	0636693	4842163	Withdrawn
MSA-8	Paulina Pk	T22SR12E	NE1/4 NW1/4 S4	0636770	4840169	Withdrawn
MSA-8-RC	Paulina Pk	T22SR12E	NE1/4 NW1/4 S4	0636827	4840069	Yes
MSA-9	Paulina Pk	T22SR12E	NE1/4 NW1/4 S5	0635203	4840142	Withdrawn
MSA-10	Paulina Pk	T22SR12E	NE1/4 NE1/4 S6	0634698	4840148	Withdrawn
MSA-10-RC	Paulina Pk	T22SR12E	NE1/4 NE1/4 S6	0634555	4840216	Yes
MSA-11	Paulina Pk	T21SR11E	NE1/4 SE1/4 S36	0632853	4840731	Withdrawn
MSA-11-RC	Paulina Pk	T21SR11E	SE1/4 SE1/4 S36	0632737	4840630	Yes
MSA-12	Paulina Pk	T21SR12E	SW1/4 SW1/4 S30	0633471	4842003	Withdrawn
MSA-13 & MSA-13-RC[2]	Paulina Pk	T21SR11E	SE1/4 SE1/4 S25	0633017	4842174	Yes
MSA-14	Paulina Pk	T21SR12E	SW1/4 NW1/4 S29	0634857	4842831	Withdrawn
MSA-15	Paulina Pk	T21SR12E	SW1/4 SW1/4 S19	0633222	4843857	Withdrawn
MSA-15-RC	Paulina Pk	T21SR12E	NW1/4 SW1/4 S19	0633128	4843907	Yes
MSA-16	Paulina Pk	T21SR12E	NW1/4 NE1/4 S32[3]	0635531	4841912	Withdrawn
MSA-17	Paulina Pk	T21SR12E	SE1/4 SW1/4 S29	0635162	4842092	Withdrawn
MSA-17-RC	Paulina Pk	T21SR12E	SE1/4 SW1/4 S29	0635306	4842197	Yes
55-29 Pad	Paulina Pk	T21SR12E	SW1/4 NE1/4 S29	0635539	4842789	Yes

[1]NAD83 [2]MSA-13 and MSA-13-RC are essentially the same location [3]On section line

Table 2. 2011 Field Effort Locations: Legal Description, Quadrangle, and UTM Coordinates

ID	Quad	PLS		UTM Zone 10 Coordinates[1]	
		T&R	Section	Easting	Northing
NN24	Paulina Pk	T21S R12E	NE1/4 NE1/4 S29	636165	4843500
NN19	Paulina Pk	T21S R12E	SE1/4 SE 1/4 S29	636174	4841956
NN17	Paulina Pk	T21S R12E	SW1/4 SW 1/4 S29	634722	4842214
NM22	Paulina Pk	T21S R12E	SE1/4 NE1/4 S29	636186	4842823
NM06	Paulina Pk	T21S R12E	NE1/4 SW1/4 S28	656904	4842721
NM40	Paulina Pk	T21S R12E	NW1/4 SE1/4 S27	638638	4842621
NM11	Paulina Pk	T21S R11E	NW 1/4 SE1/4 S36	632589	4840868
NM41	Paulina Pk	T21S R12E	NE1/4 SE1/4 S33	637716	4841042
NN18	Paulina Pk	T21S R12E	NE1/4 SW1/4 S21	636736	4844144

[1]NAD83

Results and Consultant's Recommendations

No cultural resources were identified during the intensive pedestrian survey of 37 micro seismic stations. No historic structures, historic districts, or traditional cultural properties were identified during the records search.

A finding of *No Historic Properties Affected* is recommended because of the absence of historic properties within the surveyed locations.

The consultant also recommends that no further monitoring be conducted in association with this project and similar projects that have such small footprints and a correspondingly low risk of effect.

The consultant advises that in the unlikely event of discovery of hidden subsurface cultural materials during establishment of the sensor stations that the Forest Archaeologist be notified immediately.

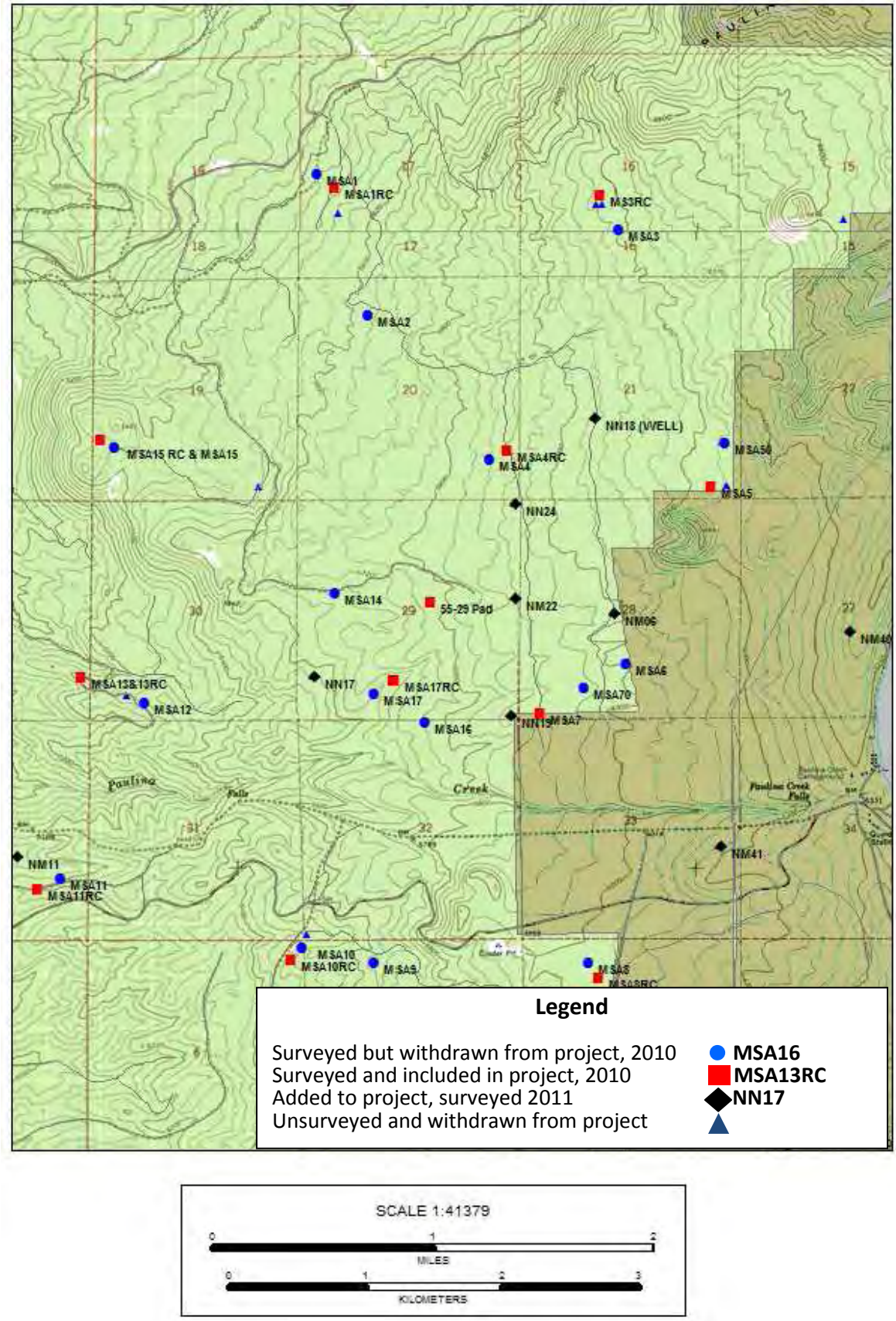


Figure 2. Overview of Survey Units in Project Area.

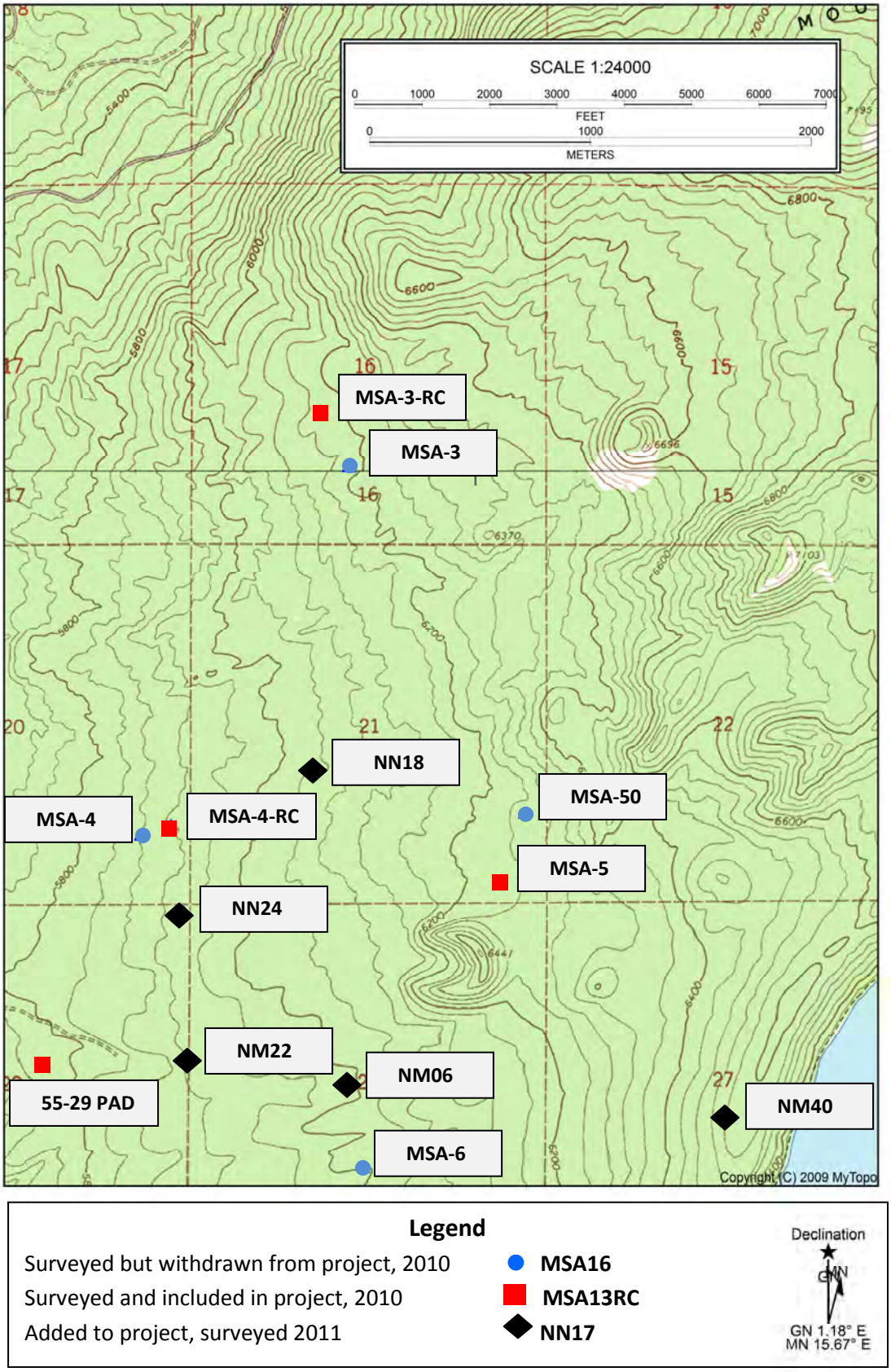
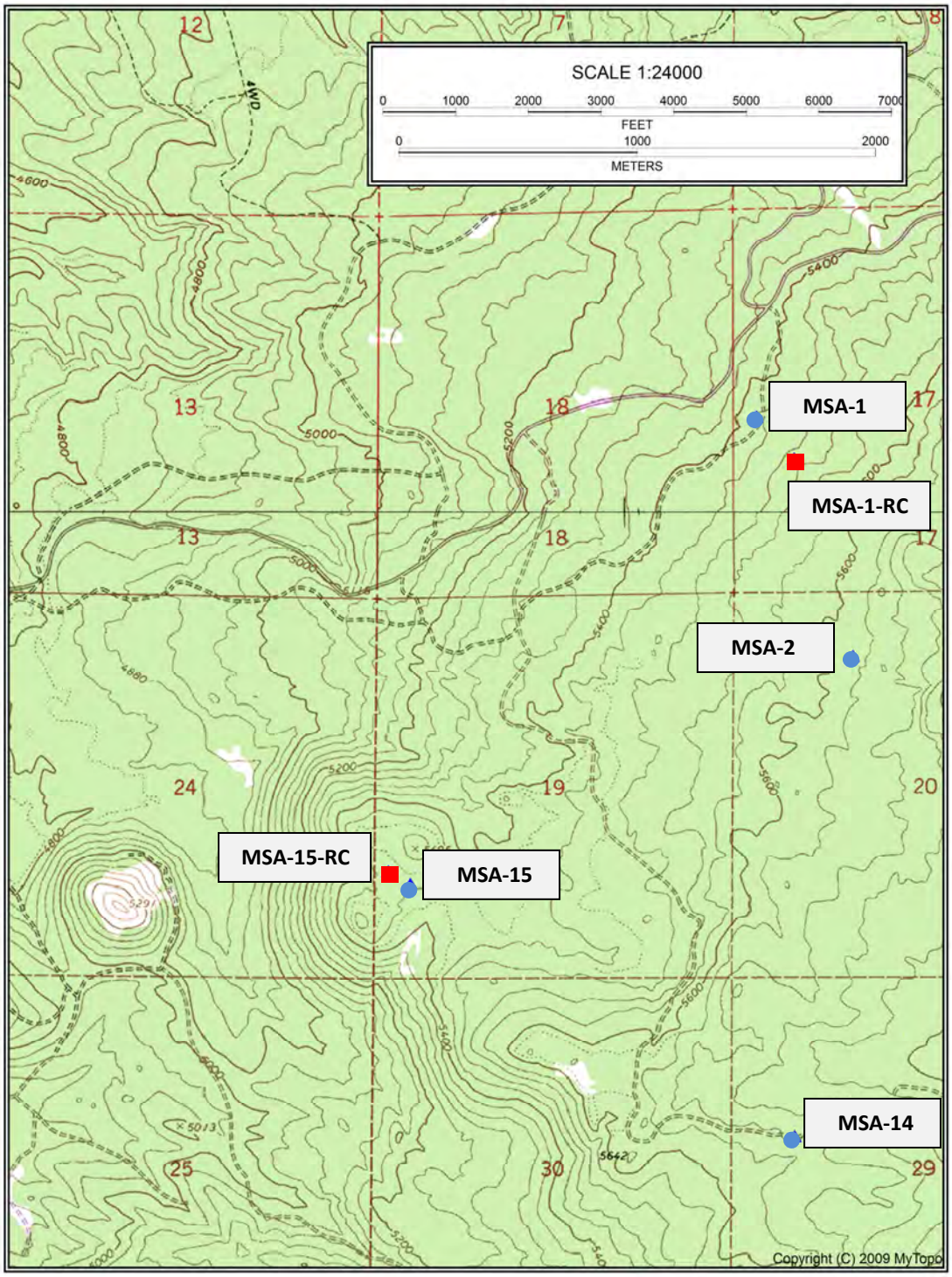


Figure 3. Location of Survey Units in Northeast Quadrant of Survey Area

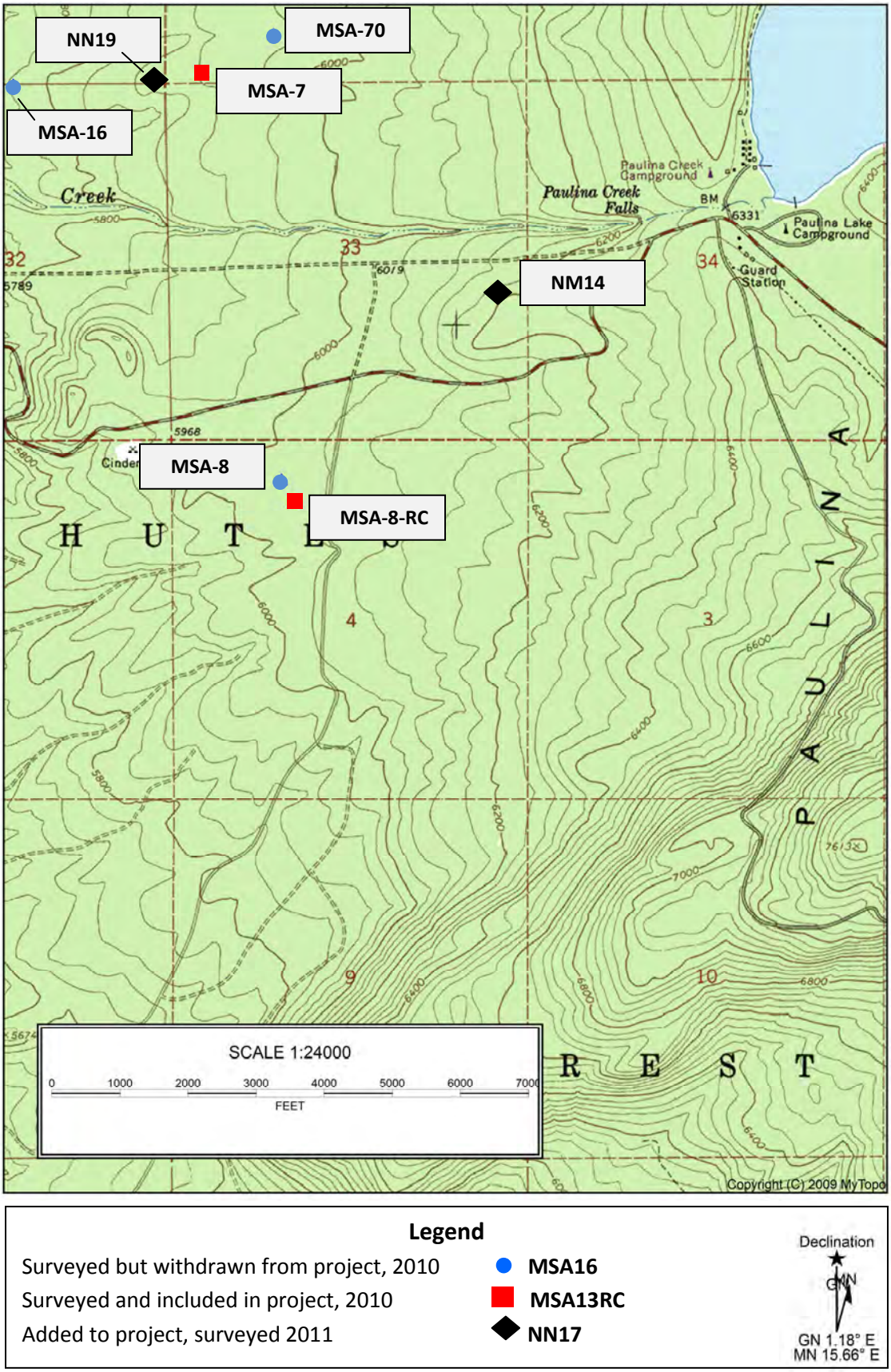


Legend

Surveyed but withdrawn from project, 2010	●	**MSA16**
Surveyed and included in project, 2010	■	**MSA13RC**
Added to project, surveyed 2011	◆	**NN17**

Declination
GN 1.14° E
MN 15.68° E

Figure 4. Location of Survey Units in Northwest Quadrant of Survey Area

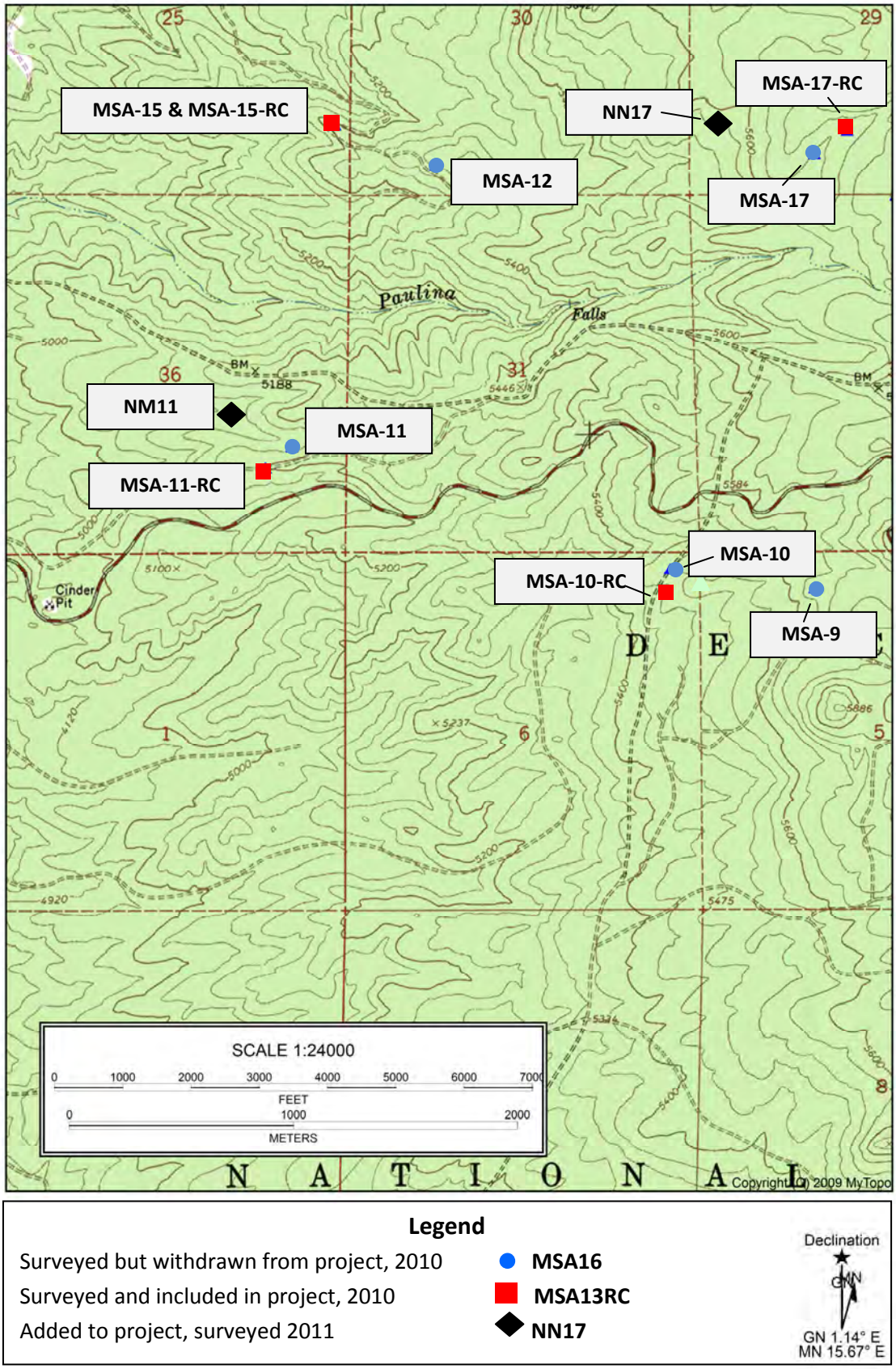


Legend

Surveyed but withdrawn from project, 2010	**MSA16**
Surveyed and included in project, 2010	**MSA13RC**
Added to project, surveyed 2011	**NN17**

Declination
GN
GN 1.18° E
MN 15.66° E

Figure 5. Location of Survey Units in Southeast Quadrant of Survey Area



Legend

Surveyed but withdrawn from project, 2010	MSA16
Surveyed and included in project, 2010	MSA13RC
Added to project, surveyed 2011	NN17

Declination
GN 1.14° E
MN 15.67° E

Figure 6. Location of Survey Units in Southwest Quadrant of Survey Area

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