

Middle Rio Grande Flood Control Project
Vegetation Database
The Hink and Ohmart Legacy Dataset



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Middle Rio Grande Flood Control Project

Vegetation Database

*The Hink and Ohmart Legacy Dataset*¹

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Introduction

The Albuquerque District of the U.S. Army Corps of Engineers (Corps) is currently investigating flood-control measures along the Rio Grande from Albuquerque through Belen, New Mexico. The objective of the Middle Rio Grande Flood Control Project is to reduce the potential for property damage and loss of life resulting from high-magnitude flows in the Rio Grande. In the early 1980s, the Corps contracted for biological surveys throughout the middle Rio Grande valley (Hink and Ohmart 1984³; hereafter "H&O") which included 111 superimposed vegetation and bird survey transects. Beginning in 2003, repeat bird sampling was initiated on a selected set of the original H&O transects by Hawks Aloft, Inc., and in 2005-06 repeat vegetation sampling was conducted by Natural Heritage New Mexico (hereafter "NHNM") on 46 of these transects to determine current vegetation conditions. The same field methods with minor alterations were used as in the 1984 survey to allow direct comparisons across time with respect to vegetation change (Milford et al. 2006 & 2007). To conduct the change analysis, the original H&O legacy dataset needed to be brought into a database compatible with current data. Most of the original H&O raw vegetation and bird data was acquired by the Corps in 2007 and resided as paper files at the Corps' Albuquerque office. Beginning in 2010, this dataset was reviewed, the relevant content organized, and then entered into a digital relational database (MS Access). We report here on the structure and content of the database and provide summary statistics on how it is related to the specifics of legacy data. We also evaluated data gaps between the current and legacy data, and make recommendations for filling those gaps. And lastly, we provide a plan that outlines the next steps in the actual analysis of changes in vegetation characteristics over the past 20 years in the Middle Rio Grande.

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³ Hink, V.C., and R.D. Ohmart. 1984. Middle Rio Grande Biological Survey. Prepared for U.S. Army Corps of Engineers, Albuquerque, NM. (Contract No. DACW47-81-C-0015).

Hink and Ohmart Legacy Vegetation Database

Natural Heritage New Mexico created and populated a Microsoft Access relational database for all of the current data collected during the 2005-2006 vegetation re-sampling of the H&O transects (see Milford et al. 2007 for details on the database structure rationale). This database formed the foundation for the data entry of the H&O 1980s data; a few modifications, however, were necessary to accommodate data entry of the legacy data. Four new tables were added to the existing database of 15 tables to track vegetation community types assigned to the transect lines at different points in time and to track alterations that occurred to the lines (e.g., fires, thinning, etc.). Of the 19 tables, eleven were created just for the USACE Middle Rio Grande survey data, with an additional eight supporting tables from the NHNM Ecology database (Figure 1, Appendix A). A copy of the database containing all the available 1980s data is provided on the CD included with this report. On the CD, there is also a set of Microsoft Excel spreadsheet files created from the database, and containing the same data, and a set of pdf files of the original datasheet scans. The CD includes a readme.txt file with instructions for use of the CD, and a digital copy of this report.

As an initial step in the data-basing process, the original H&O datasheets acquired by the Corps in 2007 were scanned at the Corps offices and saved as Adobe acrobat pdf files. These were sent to NHNM where they were printed and used for data entry. The set of original data sheets acquired by USACE included only 101 of the 111 original sites and only included tree and shrub count data (Table 1 and see Appendix B for a set of map sheets showing the available end point locations for the 1984 transects and the locations of the 2005-2006 re-sampling transects). None of the vegetation cover plot data nor the foliary density data was provided—for this we will rely on the summary values in the original reports in the subsequent analysis.

Data on the original datasheets was recorded using plant codes devised by H&O. A list of these codes was provided among the original datasheets by USACE. Additional plant codes were also obtained from the 1984 H&O report and cross-walked to current scientific names and NHNM database species codes (Table 2). Within the database, plants were entered using the NHNM plant seven-letter codes, which are in turn linked to the table “tblSpeciesFloristic” in the database that contains full scientific and common names, and the national USDA Plants database code for each species (see <http://plants.usda.gov/>) to ensure long-term retrieval of the correct species name. There were only a few cases of unidentified species where NHNM was not able to determine the correct species identification for a specific code. These were entered into the database as “UNIDT X”, for unidentified tree species X. Where X was whatever identifier provided on the datasheet for the unknown species.

Verification of 1984 H&O Vegetation dataset

Vegetation in the 1984 H&O report was analyzed based on community type and structure type (referred to as community-structure (C-S) types). These types were assigned to an entire survey line per Tables 1 and 2 of the 1984 H&O report. These C-S types were used in the verification of the tree and shrub count data. Because we only had the tree and shrub count data, we were only able to do a direct comparison of the entered original data against the estimated

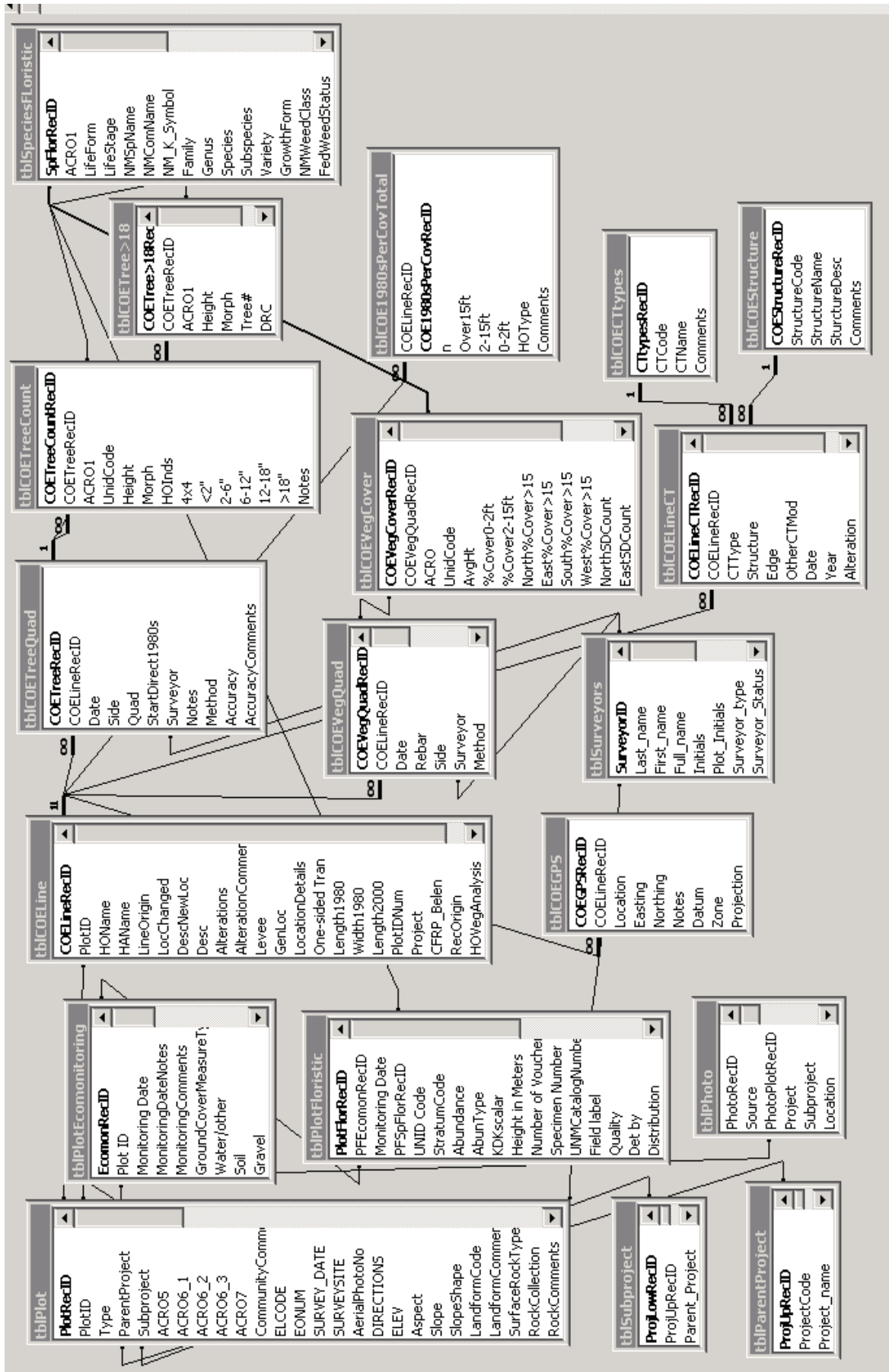


Figure 1. USACE Middle Rio Grande vegetation sampling database tables and their relationships to each other.

Table 1. List of Primary Hink and Ohmart 1984 transects showing the count of tree plots entered per site from the original data sheets obtained in 2007.

Transect Name	CT Code	Structure Code	Edge	No Data	Number 1980s Tree Plots	Transect Name	CT Code	Structure Code	Edge	No Data	Number 1980s Tree Plots
GN01	SC/C/MH	V			25	NW17	C/CW	VI			30
GN02	SC	VI	E - river		25	NW18	C/CW	I	E - river		25
GN03	SC	V			50	SE04	C/RO	I			50
GN04	SC	VI			50	SE05	C/RO	I	E- levee		25
GN05	SC	VI			50	SE06	DR	VI	E- levee		50
GN06	C/J	I			50	SE07	C/CW	IV			50
GN07	C/RO	IV			50	SE08	C/CW	I			25
GN08	C/J	I			50	SE09	SB	VI		0	
GN09	DR	VI			50	SE10	C/CW	III	E - river		25
GN10	C/RO	IV			50	SE11	C/CW	I			50
GN11	C/J	IV			50	SE12	C/CW	I	E- levee		25
GN12	C/J	IV			50	SE13	DR	VI	E- levee		50
GN13	C/RO	III	E - river		25	SE14	C/CW	III	E- levee		25
GN15	C/RO	I			50	SE15	DR	VI	E- levee		50
GN16	C/RO	I			50	SE16	C/CW	V		0	
GS01	C/CW	II			25	SE17	C/CW	I			50
GS02	C/CW	I	E- levee		25	SE18	RO	VI			50
GS03	DR	VI	E- levee		50	SE19	C/RO	III	E - river		25
GS04	C/CW	V			25	SE20	C/RO	I	E- levee		25
GS05	C/CW	I	E - river		25	SE21	DR	VI	E- levee		50
GS06	C/CW	I			25	SE22	C/CW	II	E- levee		25
GS07	SC	VI			50	SE23	DR	VI	E- levee		50
GS08	SC	V			50	SE24	C/CW	III	E- levee		25
GS09	SC	VI			50	SE25	DR	VI	E- levee		50
GS10	SC	VI			50	SW00	RO	V			40
GS11	SC	VI			50	SW01	MH	V			5
GS12	RO	V			50	SW02	C/CW	IV			50
GS13	DR	VI	E- levee		50	SW03	C/RO	II			25
GS14	SC	VI			25	SW04	C/CW	I	E- levee		25
GS15	SC	VI			25	SW05	DR	VI	E- levee		50
GS16	SC	VI			25	SW06	C/CW	V			50
KW01	C/RO	II			25	SW07	C/CW	V		0	
KW02	C/CW	I	E- levee		25	SW08	C/CW	I			25
KW03	DR	V	E- levee	0		SW09	C/CW	V			25
KW04	C/RO	I			25	SW10	C/CW	V			25
KW05	C/CW	IV			25	SW11	C/CW	V	E- levee		25
KW06	SB	VI		0		SW12	DR	VI	E- levee		25
KW07	C/CW	I	E - river		20	SW13	C/CW	I			25
NE01	C/RO	I			50	SW14	C/CW	III	E- levee		25
NE02	C/CW	IV			50	SW15	DR	VI	E- levee		25
NE03	C/CW	IV			25	SW16	C/CW	V			50
NE04	C/CW	IV	E- levee		25	SW18	C/RO	I			50
NE05	DR	VI	E- levee		50	SW19	C/RO	I			25
NE07	C	V			20	SW20	RO	V			50
NW06	C/CW	V			25	SW21	C/RO	I	E- levee		25
NW07	C/RO	I	E- levee		25	SW22	DR	VI	E- levee		50
NW08	DR	VI	E- levee		50	SW23	SB	VI		0	
NW09	SB	VI		0		SW24	C/CW	I	E - river	0	
NW10	C/CW	V	E- levee		25	SW25	SB	VI		0	
NW11	DR	VI	E- levee		50	SW26	RO	V			30
NW12	SB	VI		0		SW27	C/RO	I	E- levee		25
NW13	C/CW	VI			40	SW28	DR	VI	E- levee		25
NW14	C/CW	I			50	SW29	MH	V			20
NW15	C/CW	IV			50	SW30	MH	V			25
NW16	C/CW	VI			40	SW31	DR	V	E- levee		40
						SW32	DR	V	E- levee		25

Table 2. List of plant codes and abbreviations used on 1980s data sheets and in 1984 Hink and Ohmart report, with USDA Plants database code, NHNM database code, and common and scientific names.

Hink & Ohmart Code	Description	USDA PLANTS Database Code	NHNM Database Code	Scientific Name	Common Name
A	Amorpha	AMFR	AMOFRU	<i>Amorpha fruticosa</i>	desert indigobush
Al	Ailanthus	AIAL	AIALT	<i>Ailanthus altissima</i>	tree of heaven
	Allenrolfea	ALOC2	ALLOCC	<i>Allenrolfea occidentalis</i>	iodinebush
Ag	Agriculture				
AN	Annuals		UnidF	unidentified forb	unidentified forb
Atx	Atriplex, Saltbush	ATCA2	ATRCAN	<i>Atriplex canescens</i>	fourwing saltbush
B, Bac	Baccharis	BASA4	BACSAL	<i>Baccharis salicina</i>	false willow
C	Cottonwood	PODEW	POPDELW	<i>Populus deltoides</i>	Rio Grande cottonwood
Cat	Cattail	TYPHA	TYPHA	<i>Typha</i> spp.	cattail
Ch 1	Cholla #1	CYIM2	CYLIMB	<i>Cylindropuntia imbricata</i>	tree cholla
Ch 2	Cholla #2	CYLE8	CYLEP	<i>Cylindropuntia leptocaulis</i>	Christmas cactus
CE	Chinese Elm	ULPU	ULMPUM	<i>Ulmus pumila</i>	Siberian elm
CW	Coyote Willow	SAEX	SALEXI	<i>Salix exigua</i>	coyote willow
D	Dead		UNIDT	unidentified tree	unidentified tree
Dr	Drain				
E	Edge				
Eq	Equisetum	EQUIS	EQUISE	<i>Equisetum</i> spp.	horsetail
G	Gravel				
Gr	Grass				
GW	Goodding's Willow	SAGO	SALGOO	<i>Salix gooddingii</i>	Goodding's willow
		ERNA10 or	ERINAU or	<i>Ericameria nauseosa</i> or	rubber rabbitbrush or
Ha	Happlopappus	ISOCO	ISOCOM	<i>Isocoma</i> sp.	goldenbush
I	False Indigo (Amorpha)	AMFR	AMOFRU	<i>Amorpha fruticosa</i>	desert indigobush
J, Jp	Juniper	JUNIP	JUNIFE	<i>Juniperus</i> spp.	juniper
L	Litter				
LJ	Levee Jack				
	Locust	RONE	ROBNEO	<i>Robinia neomexicana</i>	New Mexico locust
Ly	Lycium	LYPA	LYCPAL	<i>Lycium pallidum</i>	wolfberry
M	Melilotus, sweet clover	MEOF	MELOFF	<i>Melilotus officinalis</i>	yellow sweetclover
MB	Mulberry	MOAL	MORALB	<i>Morus alba</i>	white mulberry
				<i>Forestiera pubescens</i> var.	
NMO	New Mexican Olive	FOPUP	FORPUBP	<i>pubescens</i>	New Mexico olive
Op, pp	Opuntia, Prickly Pear	OPUNT	OPUNTI	<i>Opuntia</i> spp.	pricklypear

Table 2. cont.

Hink & Ohmart Code	Description	USDA PLANTS Database Code	NHNM Database Code	Scientific Name	Common Name
Plu	Pluchea, arrowweed	PLSE	PLUSER	Pluchea sericea	arrowweed
PW,					
PLW	Peachleaf Willow	SAAM2	SALAMY	Salix amygdaloides	peachleaf willow
R	Rocks				
RB	Rabbitbrush	ERNA10	ERINAU	Ericameria nauseosa	rubber rabbitbrush
Rd	Road				
Ri	Ribes, Currant, Gooseberry	RIBES	RIBES	Ribes spp.	currant; gooseberry
Rip	Riparian				
RO	Russian Olive	ELAN	ELAANG	Elaeagnus angustifolia	Russian olive
RT	Russian Thistle	SATR12	SALTRA	Salsola tragus	prickly Russian thistle
S	Soil				
Sa	Sand				
SB	Smokebush	DALEA	DALEA	Dalea spp.	prairiedlover
SBM	Screwbean Mesquite	PRPU	PROPUB	Prosopis pubescens	screwbean mesquite
SC	Salt Cedar	TARA	TAMRAM	Tamarix ramosissima	saltcedar
SE	Siberian elm	ULPU	ULMPUM	Ulmus pumila	Siberian elm
SG	Sage	ARTEM	ARTEMI	Artemisia spp.	sagewort, sagebrush
SS	sand sage	ARFI2	ARTFIL	Artemisia filifolia	sand sagebrush
Stm	Stem				
SW, Sn	Snakeweed	GUSA2	GUTSAR	Gutierrezia sarothrae	broom snakeweed
STX	Sticks				
T	Twigs				
Tr	Trunk				
Tr	Tree		UNIDT	unidentified tree	unidentified tree
		SAAM2 or		Salix amygdaloides and/or	
TW	Tree Willow	SAGO	SALIXT	Salix gooddingii	tree willow
VC	Virginia Creeper	PAIN10	PARINS	Parthenocissus inserta	Virginia creeper
WG	Wild Grape	VITIS	VITIS	Vitis spp.	grape
Yu	Yucca	YUCCA	YUCCA	Yucca spp.	yucca
"/"	Edge (between e.g. Ag/Dr)				

densities of major tree and shrub species in Table 6 of the original H&O report and the relative density (RD) values provided in Table V-1 in the appendix of the 1984 H&O report. The rest of the values in Table V-1 were generated from the 15 x 15-ft vegetation-cover sample plots, for which we did not receive original data sheets.

For the analysis, we followed the methods outlined on pages 13-16 in the 1984 H&O report to generate absolute density as the average number of plants per acre and the relative density values from the raw data. For each transect, the number of individuals per acre by species and size class (>10 ft for canopy trees; 2 to 10 ft for shrubs) was calculated by multiplying the mean number of individuals per 50 x 100-ft tree count plot for a transect by 8.712. The 8.712 value is from the H&O report, and is created by dividing 43,560 sq ft by 5,000 sq ft, or one acre divided by the area of a tree plot. The absolute density by species and size class were summarized by C-S type by averaging the values across all transects belonging to a given type. These are presented in Table 3 along with corresponding values from Table 6 of the 1984 H&O report. Similarly, to obtain relative density by height class, the means for all species per transect were summed to give total density, and this used to calculate percentage density of total density by species. Relative density by species and height class was then summarized for each C-S type. Table 4 holds the relative density values by C-S type and the corresponding values from Table V-I in the 1984 H&O report appendix.

When comparing the estimated tree and shrub densities and relative densities calculated from the database against those provided in the 1984 report, there was a basic congruence (Tables 3 & 4). Very few of the numbers are exactly the same, but that is to be expected, as the tabulation and calculation for the 1984 report were mostly done by hand on paper while the current numbers were calculated in Access and Excel, i.e., most differences are attributable to rounding errors between the two sets of numbers. However, even with the rounding differences, there were individual cases where the numbers varied significantly between the 1984 summary tables and the current tables. These errors are sometimes isolated differences in one or two cells for a given C-S type, and in other cases they occur very frequently across many cells within a C-S type.

Difficulties calculating all the averages by hand may account for some of these errors, but in some C-S types the errors are of such magnitude that it seems likely that a different set of transects were used to calculate those averages then reported by H&O, even though there is no mention in the report of exceptions or changes. While we followed the methods outlined in the 1984 report in assigning transects lines to C-S types per Tables 1 and 2 at the front of the report, there are some inconsistencies between those tables and the ones in their appendix. In Table V-2 of the H&O appendix, a subset of transects was used for vegetation-cover summaries and their C-S types are not always the same as those listed in the body of the text. Without better documentation it is impossible to determine C-S reassignments that may have occurred for transects not used in the vegetation cover summary. Compounding the problem were C-S types assigned to transects in the body of the 1984 report that are not included as C-S types in any of the summary tables. These transects may have been rolled into other types, but this is not documented anywhere in the report.

Table 3. Estimated density of major tree and shrub species expressed as average number of plants per acre by C-S type. Values in bold are those calculated by NHNM from the original data, while those in parentheses come from Table 6 in the 1984 Hink and Ohmart report. Species codes used are presented in Table 2.

Species	C/RO				C/CW						VI	
	I	EI	II		I	EI	EIII	IV	EIV	V		EV
C>	92.7 (91)	40.9 (41)	110.6 (111)		90.3 (100)	113.7 (116)	43.7 (62)	116.6 (118)	93.4 (89)	33.2 (33)	30.5 (34)	15.1 (15)
C<	3.56 (4)	1.9 (4)	40.1 (40)		10.6 (11)	13.5 (38)	11.5 (9)	38.1 (38)	42.9 (20)	16.2 (10)	4.7 (5)	257.1 (257)
RO>	128.3 (127)	103.2 (103)	42.9 (43)		15.5 (20)	14.6 (35)	5.0 (53)	14.7 (15)	1.4 (9)	22.7 (23)	24.0 (22)	4.0 (4)
RO<	102.6 (102)	62.5 (63)	40.1 (40)		28.5 (34)	19.9 (18)	0.5 (36)	13.2 (14)	1.7 (19)	10.1 (10)	12.2 (12)	19.0 (19)
SC>	48.2 (48)	16.8 (17)	16.6 (2)		34.5 (42)	15.3 (24)	45.9 (46)	12.0 (12)	2.1 (1)	48.1 (73)	12.7 (13)	13.1 (14)
SC<	86.4 (87)	46.1 (46)	22.7 (9)		145.6 (146)	22.2 (37)	33.2 (77)	84.5 (84)	9.8 (7)	195.2 (198)	7.6 (8)	164.8 (166)
CW>	0.2 (P)				1.4 (1)	0.1 (1)	2.1 (2)	0.2 (P)		35.6 (0)	1.0 (1)	2.0 (2)
CW<	29.6 (29)	31.6 (32)	50.7 (50)		185.1 (185)	104.7 (98)	283.0 (475)	49.6 (58)	189.6 (165)	1120.7 (1121)	2185.3 (1191)	670.5 (679)
TW>	1.3 (3)	5.3 (6)	11.2 (11)		2.0 (2)	7.2 (12)	28.9 (16)	1.0 (1)		2.3 (2)	10.8 (12)	0.7 (1)
TW<	1.1 (1)	18.2 (19)	24.6 (24)		2.2 (2)	4.6 (9)	5.9 (7)	4.5 (5)	0 (P)	1.9 (5)	2.6 (3)	13.3 (5)
SE>	0.9 (1)	0.4 (P)			.03 (P)	0.1 (P)	1.2 (1)	0.03 (P)		0.1 (P)	2.6 (3)	
SE<		0.6 (1)				0.3 (0)	0.1 (P)			0.1 (P)	3.1 (3)	0.2 (P)
NMO>	0.07 (P)				0.1 (P)			0.03 (P)		0.3 (P)	0.2 (0)	
NMO<			0.5 (1)		1.0 (1)		4.9 (2)	0.03 (P)		0.3 (P)	32.9 (33)	
J>												
J<	.03 (0)					0.1 (0)		0.1 (0)				
K	4.1 (4)	5.8 (6)	11.7 (11)		7.0 (6)	31.6 (12)	1.9 (1)	2.2 (3)	2.1 (40)	7.2 (7)	16.2 (16)	2.2 (2)
SW<	35.4 (35)	1.2 (1)	1.9 (2)		155.7 (156)	1.0 (2)	0.3 (2)	2.9 (3)	1.4 (2)	71.8 (72)	1.0 (1)	2.5 (2)
Wb<		13.7 (0)			0.2 (0)	2.0 (0)	0.5 (0)					
Rb<												
Misc. Shrubs	1.0 (1)	1.6 (15)	5.6 (6)		1.0 (P)	0.8 (2)	20.6 (22)	1.0 (P)	0.7 (2)	1.6 (2)	40.2 (41)	0.2 (P)

Table 3. cont.

Species	General Study Area											
	SB.VI	MHV	RO.V	RO.VI	DRV	DR.VI	C/JI	C/JIV	C/ROIV	SC.V	SC.VI	SC.VIA
C>			11.8 (12)		0 (1)	2.3 (3)	49.7 (50)	28.1 (46)	62.5 (48)	0.3 (P)	0.02 (0)	0.05 (P)
C<	(9)		118.9 (119)			1.0 (1)	3.0 (2)	0.7 (15)	26.7 (10)			
RO>			102.2 (120)	9.4 (9)	8.7 (13)	5.7 (5)	11.8 (12)	25.7 (34)	42.6 (33)	0.8 (1)	1.2 (1)	0.1 (P)
RO<	(1)	0.4 (P)	97.8 (98)	56.3 (69)	4.6 (9)	5.3 (4)	8.4 (8)	31.8 (38)	43.3 (37)	0.9 (P)	1.3 (1)	0.1 (P)
SC>			15.7 (15)	3.0 (3)	1.3 (23)	1.6 (1)	0.8 (1)	0 (P)	0.4 (P)	35.1 (24)	2.3 (2)	13.1 (13)
SC<		10.1 (11)	30.2 (31)	14.8 (15)	3.9 (12)	8.9 (9)	0.2 (P)	0.3 (8)	12.5 (1)	78.2 (745)	1438 (1331)	52.6 (53)
CW>			76.0 (74)	8.0 (8)	1.0 (24)	9.9 (12)			1.6 (0)		0.5 (1)	
CW<	(14)	143.7 (142)	322.9 (231)	127.5 (129)			0 (1)					
TW>			0.2 (P)		0 (1)	0.7 (1)	0.8 (1)			0 (P)	0.02 (P)	
TW<		7.0 (7)	0.4 (P)			1.1 (1)	0.5 (1)	0 (P)	0.4 (0)		0.09	
SE>					0.2 (P)	0.6 (1)						
SE<					0.1 (P)	0.6 (1)						
NMO>						0.2 (P)	0.5 (1)	0.3 (P)	0.2 (P)			
NMO<						1.5 (2)	2.2 (2)	5.1 (3)	0.8 (P)	0.3 (P)		
J>							14.5 (15)	20.1 (14)	2.4 (4)			
J<							201.4 (204)	122.1 (90)	29.3 (64)		0.04 (P)	
I<			1.3 (1)		0 (1)	6.2 (7)		0 (P)	0.3 (0)			
SW<			10.3 (10)	1.2 (1)		0.2 (P)		0 (P)	0.1 (0)	0.2 (P)	1.3 (2)	
Wb<						1.3 (1)				31.3 (25)	45.5 (58)	0.23 (P)
Rb<								16.8 (12)	24.0 (44)			10.3 (9)
Misc. Shrubs			0.2 (P)	1.74 (2)	0 (P)	1.6 (2)	9.8 (10)	315.9 (22)	12.5 (14)	3.6 (1)	3.6 (5)	46.8 (48)

Table 4. Relative density of major tree and shrub species expressed as percentage of total density by C-S type. Values in parentheses come from Table V-1 in the appendix of the 1984 Hink and Ohmart report. Species codes used are presented in Table 2.

C-S Type	Canopy				Shrub							
	C	RO	SC	TW	C	RO	SC	CW	SW	I	TW	J
C/CW I	60.4 (61)	11.6 (12)	21.4 (25)	5.0 (1)	5.0 (2)	6.2 (6)	32.7 (27)	36.8 (34)	10.4 (29)	4.2 (1)	3.9 (<1)	
C/CW IV	83.2 (81)	8.1 (10)	8.1 (8)	0.4 (<1)	15.6 (19)	11.9 (7)	37.1 (41)	31.0 (28)	1.3 (1)	1.0 (1)	1.7 (2)	
C/CW V	35.8 (25)	15.7 (18)	26.7 (56)	8.3 (2)	5.8 (<1)	0.9 (<1)	10.6 (14)	74.2 (79)	2.6 (5)	1.4 (<1)	0.9 (<1)	
C/CW VI	51.3 (42)	15.3 (11)	25.5 (39)	4.9 (8)	29.2 (22)	6.5 (2)	11.5 (15)	50.5 (60)	0.5 (<1)	0.9 (<1)	0.4 (<1)	
DR V	10.2 (3)	47.4 (34)	16.1 (61)	1.6 (3)		24.5 (4)	0.9 (5)	71.6 (91)		1.8 (<1)		
DR VI	20.3 (30)	32.0 (50)	12.9 (10)	6.3 (10)	3.1 (<1)	7.1 (3)	14.9 (6)	56.7 (83)	0.5 (0)	7.4 (5)	2.7 (<1)	
C/RO I	34.7 (34)	48.8 (47)	12.1 (18)	2.0 (1)	1.7 (2)	40.7 (39)	19.9 (33)	12.4 (11)	3.5 (13)	2.7 (2)	4.9 (<1)	2.5 (0)
C/RO II	66.3 (66)	20.5 (26)	7.8 (1)	5.4 (7)	20.9 (20)	20.4 (20)	11.3 (5)	25.0 (27)	1.0 (1)	5.8 (6)	10.5 (13)	
C/RO IV	57.1 (56)	39.6 (39)	2.7 (5)		17.0 (9)	28.4 (33)	7.7 (<1)	1.0 (0)	0.1 (0)	0.2 (0)	0.1 (0)	19.6 (57)
	C	RO	SC/J	TW	C	RO	SC	CW	SW	NMO	TW	J
C/J I	63.6 (64)	15.1 (15)	19.6 (19)	1.0 (1)	1.4 (1)	4.5 (4)	0.2 (0)			1.5 (0)	0.8 (<1)	84.9 (94)
C/J IV	39.4 (48)	34.2 (36)	25.7 (15)		0.3 (9)	10.3 (22)	0.1 (5)	0.0 (<1)		1.6 (0)		36.8 (53)
	C	RO	SC	TW	C	RO	SC	CW	SW	I	TW	J
RO V	6.1 (8)	79.5 (82)	14.3 (10)	0.1 (<1)	18.0 (36)	31.9 (29)	22.4 (9)	16.0 (22)	2.1 (3)	0.4 (0)	0.1 (<1)	
RO VI		76.1 (75)	23.9 (25)			68.6 (73)	18.0 (16)	9.8 (8)	1.5 (1)			
	C	RO	SC	TW	C	RO	SC	CW	SW	I	Wb	J
SC V	0.6 (0)	1.8 (4)	97.7 (96)	0.0 (<1)		0.5 (0)	74.4 (97)		0.1 (0)		19 (3)	
SC VI	0.6 (0)	9.8 (33)	77.4 (66)	0.3 (0)		0.1 (0)	82.1 (95)		0.0 (<1)		0.0 (4)	
	C	RO	SC	TW	C	RO	SC	Rb	SW	I	Sa	J
SC VI A	0.8 (0)	0.8 (0)	91.7 (100)				59.1 (48)	7.2 (8)			<1 (44)	
	C	RO	SC	TW	C	RO	SC	CW	SW	I	TW	J
MH V			33.3 (0)			0.3 (0)	6.4 (7)	89.0 (89)			1.4 (0)	

C-S Types not calculated by Hink & Ohmart 1984												
C-S Type	Canopy				Shrub							
	C	RO	SC	TW	C	RO	SC	CW	SW	I	TW	J
C V	99.2		0.2		75.8		0.9	1.2	21.8	0.2	0.1	
C/CW II	45.3	0.4	3	1.3	8.2	0.3	35.1	38	2.6	13.1	3.1	
C/CW III	36.5	4.2	30.4	20.6	2.5	0.1	11.3	79	0.1	0.4	2	
C/RO III	47.5	34.2	16.4	0.7	13.9	37	33.6	6.7	0.6		0.8	4.8
SC/CMH V	34.1	48.4	17.6		0.4	4.4	78.4	13.1			0.5	

For the comparison of density per acre, the congruence between the 1984 numbers and the currently calculated ones were much better when the general study area transects were excluded from the analysis of the C-S types that were not classified as 'general study area' C-S types (see header on Table 3). For the C-S types classified as 'general study area' general study area transects were of course used. The averages calculated without the general study area transects are the ones provided in Table 3. For raw density, of the 23 C-S types, six stand out as having the least agreement between the 1984 report and the computer-calculated averages: C/CW EI, C/CW EIII, C/CW EIV, DR V, C/J IV and C/RO IV, and future analysis will need to take this into consideration.

For the calculation of relative density, removing the general study area transects from the analysis generally made the numbers less congruent with 1980s numbers, and thus the full set of transects were used to create Table 4. In the 1984 report relative density was only calculated for 17 C-S types, and edge transects were not considered separately. Here again five of the C-S types stood out as having the least agreement with the computer-calculated averages: C/CW I, C/CW V, DR V, DR VI and C/RO I, while two more C-S types, C/CW VI and C/RO IV, also had a relatively high number of discrepancies.

There were 10 transects missing in the 1980s dataset that were either from the intensive study area or the general study area. These were concentrated in the sandbar (SB) C-S type. In fact we have no data for any of the SB transects. Also missing is data for one drain (DR) transect (KW03), two cottonwood/coyote willow V (C/CW V) transects (SE16 and SW07) as well as one C/CW I transect (SW24). Transect SW07 is a very short transect in Los Lunas around an artificial pond, and may not have been included in the analysis for CS types regardless.

Plan for sampling and future analysis

To meet the objective of an assessment of vegetation change based on comparing the current vegetation with that measured 30 years ago on the H&O transects will require additional field sampling, but the analysis potential is excellent. While all the original vegetation data obtained is for tree plots, for the analysis of vegetation change there is a variety of summary data contained in the 1984 H&O report that can be used for comparison with current condition data. For example, Table V-1 of the 1984 appendix contains relative density, cover and frequency for dominant tree and shrub species for various community-structure types. Table V-2 contains average total percent cover values by community-structure types, as well as the totals for each of the two or three transects used to create the C-S type averages. Table 6 in the 1984 report also includes estimated densities of major tree and shrub species by C-S type, while Table 7 of the original H&O report contains percent cover and frequency for plant species by C-S type. Where we are reasonably certain of transect assignments to summarized C-S groups, we can make similar summaries using the current vegetation data.

We estimate that a robust analysis of change will require around 40 transects. Using maps and information provided by USACE, HAI, and from in-house knowledge, 62 transects out of the 111 were identified with potential for use in historical vegetation comparisons (Table 5 and Appendix B). Of these, 26 were resampled in 2005-06. However, a number of transects that

were resampled had been altered by either fire or clearing of non-native understory prior to their sampling in 2005-06. In addition, it must be remembered that exact placement of transect lines for re-measurement was based on mapped locations at 1:24,000 scale—there were no stakes or other monuments put in place in the original survey. Adding to the spatial uncertainty, 10 of the 22 resampled transects had been moved slightly to significantly away from their 1980s location to accommodate the bird survey work. Accordingly, the 43 transects remain that we consider candidates for analysis. Of these, only 17 were sampled in 2005-06; transects that were burned or thinned extensively were excluded. Hence, an additional 20+ transects need to be sampled that have been minimally altered by fire or thinning. Twelve transects on Table 5 have been identified as having the highest potential to meet that goal, and there are an additional 14 that may be possible. The underlying premise is the desire for transects that reflect long-term changes in hydrology and possibly climate rather than treatment or fire (from this point forward burned and thinned transects can be used for analyzing treatment effects).

Work Plan

We propose the following work plan to complete the analysis of vegetation change based on the H&O transects:

Task 1. In consultation with the Corps, outline specific hypotheses to be tested with the current and legacy data. These are expected to include changes in stand density and composition, and understory composition as they relate to changes in hydrology and relatively short-term climatic patterns. Concurrently, the Corps shall digitize the 1984 mapping into a shape file of polygons that can be compared with new H&O mapping.

Target date: January 30, 2012.

Task 2. Based on the hypotheses, generate a final list of sites to be sampled to support the analysis.

Target date: April 30, 2012.

Task 3. Field reconnaissance to confirm the list.

Target date: June 30, 2012.

Task 4. Conduct a field campaign following previously established methods

Target date: July 1 to September 30, 2012.

Task 5. Field data processing including voucher identification, database loading and quality control.

Target date: December 30, 2012.

Task 6. Working collaboratively with Corps biologists, conduct an analysis of vegetation using multivariate statistical techniques and potential spatial analysis with respect to hydrological changes and vegetation response.

Target date: June 30, 2013.

Task 7. Complete final report suitable for publication with review by the Corps.

Target date: December 30, 2013.

Table 5. List of original Hink and Ohmart transects indicating which might be used for historical vegetation analysis. ‘Yes’ transects are those most likely to be still in unaltered condition and which have not yet been resampled, ‘maybe’ transects are likely to still be in unaltered condition, while ‘no’ transects have most likely been altered. *indicates a transect would require permission to access

Original Hink and Ohmart Transects										
GenLoc	Name	C-S 1980s	C-S 2000s	1980s Veg Analysis	Location Changed	Alterations	1980s	2005	2006	Historical Veg Analysis
Jemez River	GN01	SC/C/MH V	MH V	no		Dried?	25			
Jemez River	GN02	SC VI	SC VI	yes		Thinned - 2001?	25			
Jemez River	GN03	SC V	SC V	yes		Thinned - 2001?	50			
Jemez River	GN04	SC VI		yes			50			maybe*
Jemez River	GN05	SC VI		yes			50			maybe*
Cochiti	GN06	C/J I		yes			50			maybe*
Cochiti	GN07	C/RO IV		yes			50			maybe*
Cochiti	GN08	C/J I		yes			50			maybe*
Cochiti	GN10	C/RO IV		yes			50			maybe*
Cochiti	GN11	C/J IV		yes			50			maybe*
San Idefonso	GN12	C/J IV		yes			50			maybe*
San Idefonso	GN13	C/RO III		no			25			maybe*
San Idefonso	GN15	C/RO I		no			50			maybe*
San Idefonso	GN16	C/RO I		no			50			maybe*
Bernardo, 3 mi NE	GS01	C/CW II		no			25			yes
Bernardo, 3 mi NE	GS02	C/CW I		no			25			yes
Bernardo Bridge	GS04	C/CW V	C/CW V	no		Partial Burn 2003	25			maybe
Bernardo Bridge	GS05	C/CW I	BURN	no		Burned 2003	25			maybe
Bernardo Bridge	GS06	C/CW I	BURN	no		Burned 2003	25			maybe
Bernardo Bridge	GS07	SC VI	SC VI	yes	1980s Map?		50			
Bernardo Bridge	GS08	SC V	SC V	yes	1980s Map?		50			
Bernardo, 2 mi S	GS09	SC VI	SC VI	no		Burned 2003	50			
Bernardo, 2 mi S	GS10	SC VI	SC VI	yes		Burned 2003	50			
Bernardo, 2 mi S	GS11	SC VI	SC VI	no		Burned 2003	50			
La Joya	GS12	RO V		no			50			
La Joya	GS14	SC VI	SC V	yes	no		25	25		yes
La Joya	GS15	SC VI	SC V	no	no		25	25		yes
La Joya	GS16	SC VI	SC V	no	no		25	25		yes
Albuquerque	KW01	C/RO II	C/RO I	yes	partial	Thinned 2006 - post veg data	25	25		yes
Albuquerque	KW02	C/CW I	C II	no	no	Thinned - 2005	25	25		yes

Original Hink and Ohmart Transects

GenLoc	Name	C-S 1980s	C-S 2000s	1980s Veg Analysis	Location Changed	Alterations	1980s	2005	2006	Historical Veg Analysis
Albuquerque	KW05	C/CW IV	C II	no	no	Thinned - 2003	25			
Albuquerque	KW06	SB VI		yes						
Albuquerque	KW07	C/CW I		no			20			maybe
Albuquerque	NE01	C/RO I	C II - Artificial	yes		Thinned 2005	50			
Albuquerque	NE02	C/CW IV	C II - Artificial	yes	no	Thinned 2003	50	25	25	yes
Albuquerque	NE03	C/CW IV	C II	no	no		25	25	25	yes
Albuquerque	NE04	C/CW IV		no			25			maybe
Albuquerque	NE07	C V	C II - Artificial	no		Thinned 2005	20			
Corrales	NW06	C/CW V	C II	yes	partial	Selective Thinning 2003	25			25 yes
Corrales	NW07	C/RO I	C/RO I	no	no		25			25 yes
Corrales	NW09	SB VI	NMO V	yes	yes	Burned - 20+ years (1980s?)	25			22 maybe
Corrales	NW10	C/CW V	C/NMO I	no	yes		25			25 maybe
Bernalillo	NW12	SB VI	OP	yes		Thinned 200?				
Bernalillo	NW13	C/CW VI	CW V to CW VI	yes	No	Thinned 2006	40	23	25	yes
Bernalillo	NW14	C/CW I	C/RO I to C II	yes	yes	All Thinned by 2006	50	25	25	no
Bernalillo	NW15	C/CW IV	OP	no		Destroyed 2005 - Housing	50			
Corrales	NW16	C/CW VI	RO V	yes	partial	Selective Thinning 2006	40			20 maybe
Corrales	NW17	C/CW VI	C-RO/CW III	yes	No		30			25 yes
Bernalillo	NW18	C/CW I	OP	no		Burned, cleared, housing?	25			
Albuquerque	SE03	None listed	report	no		Thinned S 2005				22 no
Isleta	SE04	C/RO I	C II	yes		Burned? Thinned 2005	50			
Isleta	SE05	C/RO I	C II	no		Burned? Thinned 2005	25			
Isleta	SE07	C/CW IV		yes			50			
Isleta	SE08	C/CW I		no			25			maybe
Bosque Farms	SE09	SB VI		no						no
Bosque Farms	SE10	C/CW III		no			25			maybe
Bosque Farms	SE11	C/CW I	C II	yes	partial	Thinned?	50			25 maybe
Bosque Farms	SE12	C/CW I	C II	no	partial	Burn, then thinned 2004?	25			25 no
Bosque Farms	SE14	C/CW III	C II	no	partial	Thinned 2004	25	26	26	no
Los Lunas	SE16	C/CW V	C/RO I	no	partial	Thinned post veg work?				25 maybe

Original Hink and Ohmart Transects

GenLoc	Name	C-S 1980s	C-S 2000s	1980s Veg Analysis	Location Changed	Alterations	1980s	2005	2006	Historical Veg Analysis
Los Lunas	SE17	C/CW I		no			50			yes
Bosque Bridge	SE18	RO VI	RO V	yes	No		50			25 yes
Bosque Bridge	SE19	C/RO III		no			25			yes
Bosque Bridge	SE20	C/RO I		no			25			yes
Los Lunas	SE22	C/CW II	C II	no	No	Mostly naturally open	25			25 yes
Bosque Farms	SE24	C/CW III		no			25			maybe
Isleta	SW00	RO V	RO V	yes		None?	40			yes*
Isleta	SW01	MH V	MH V	yes		None?	5			maybe*
Isleta	SW02	C/CW IV		yes			50			yes*
Isleta	SW03	C/RO II		yes			25			yes*
Isleta	SW04	C/CW I		no			25			yes*
Los Lunas	SW06	C/CW V		yes			50			yes
Los Lunas	SW07	C/CW V		no		Artificial pond site		10		maybe
Los Lunas	SW08	C/CW I		yes			25			maybe
Los Lunas	SW09	C/CW V		no		N 1800 may have burned 1990s	25			maybe
Los Lunas	SW10	C/CW V	BURN	yes			25			maybe
Los Lunas	SW11	C/CW V	BURN	no			25			no
Los Lunas	SW12	BURN		yes			25			?
Los Lunas	SW13	C/CW I		no			25			maybe
Los Lunas	SW14	C/CW III		no			25			maybe
Belen	SW16	C/CW V		no			50			maybe
Bosque Bridge	SW18	C/RO I		no			50			yes
Bosque Bridge	SW19	C/RO I		no			25			yes
Bosque Bridge	SW20	RO V		yes			50			yes
Bosque Bridge	SW21	C/RO I		no			25			yes
Los Lunas	SW23	SB VI		no						no
Los Lunas	SW24	C/CW I	C/CW I	no	partial					25 maybe
Belen	SW25	SB VI		no						no
Belen	SW26	RO V	RO V	yes	partial	Mowed 1990s, Burn 2007	30			25 yes
Belen	SW27	C/RO I	BURN	no	partial	Burned 2007, Thinned 2008	25			25 yes
Isleta Marsh	SW29	MH V		yes			20			maybe*
Isleta Marsh	SW30	MH V		yes			25			maybe*

New HAI transects, all of which could be used to aid description of the current state of vegetation in the MRGB

GenLoc	Name	C-S 1980s	C-S 2000s	Veg	LocChanged	Alterations	1980s	2005	2006
Albuquerque	NE08		C/NMO I	no		Thinned 2005			25
Albuquerque	NE09		OP	no		Thinned 2005		23	
Corrales	NW19		C II	no					24
Corrales	NW21		C/NMO I	no					25
Rio Rancho	NW23		OP	no		Burned, Thinned			15
Corrales	NW24		C/NMO I	no		Selective Thinned 2006			25
Corrales	NW26		C/NMO I	no		Selective Thinned 2006			25
Corrales	NW28		NMO V	no		Selective Thinned 2006			25
Corrales	NW29		BURN II	no					
Bosque Farms	SE30		C I	no		S thinned			25
Albuquerque	SE31		C/SC II - Artificial	no		Thinned 2005		25	
Albuquerque	SE32		CW V to OP	no		Some Thinning 2006?			19
Albuquerque	SE33		C/SC	no		Burned, Thinned			25
Albuquerque	SE34		OP	no		Thinned 2005			15
Belen/Los Lunas	SW33		C/CW I	no		None			25
Belen	SW34		CW V	no		Burned, Thinned			24
Belen	SW35		RO V	no		Burned, Thinned			25
Belen	SW36		C-RO/CW III	no		Burned, Thinned			25
Albuquerque	AXB01		MH V	no					
Albuquerque	AXB02		C/SC	no					
La Joya	GS17		RO V	no		None			25
La Joya	GS19		MH V	no					
La Joya	GS20		MH V	no					

References

- Hink, V.C., and R.D. Ohmart. 1984. Middle Rio Grande Biological Survey. Prepared for U.S. Army Corps of Engineers, Albuquerque, NM. (Contract No. DACW47-81-C-0015).
- Milford, E., E. Muldavin, and A. Browder. 2007. Vegetation sampling for the Middle Rio Grande: Resampling the 1984 Hink and Ohmart transects, Year II. Natural Heritage New Mexico Publ. No. 07-GTR-312. Natural Heritage New Mexico, University of New Mexico, Albuquerque, NM. 19 p. + CD.
- Milford, E., E. Muldavin, and K. Mann. 2006. Vegetation sampling for the Middle Rio Grande: Resampling the 1984 Hink and Ohmart Transects. Natural Heritage New Mexico Publication No. 06-GTR-294. 17 p.

Appendix A: Database table descriptions with field names and descriptions.

tblCOELine

This table stores data related to each transect: location, condition, description. Links to tblCOEGPS and tblPhoto to store UTM's for each rebar and data on photos taken at each transect. Links to tblCOETreeQuad for tree data and tblCOEVegQuad for vegetation cover data. Also links to tblPlot in NMNH Ecology database.

Name	Type	Size	Description
COELineRecID	Long Integer	4	Unique field to serve as primary key for tblCOELine.
PlotID	Long Integer	4	Plot id associated with each transect. Displaying Plot ID, but storing PlotRecID from tblPlot.
H&Oname	Text	50	Hink and Ohmart name for the line.
HAName	Text	50	Hawks Aloft name for the line.
LineOrigin	Text	50	Is this an original Hink and Ohmart line, was it moved by Hawks Aloft or is it a new Hawks Aloft line?
Desc	Memo	Open	General description of the transect.
Alterations	Text	50	Select whether the area the transect falls within has had; no alterations, alterations performed by man, alterations by fire, or alterations by both man and fire.
AlterationComment	Memo	Open	Comments relevant to the type of alterations or disturbance to the site.

tblCOEGPS

This table stores UTM's (Nad27, Zone 13) for each rebar on each transect.

Name	Type	Size	Description
COEGPSRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEGPS.
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Location	Text	50	Location of the rebar in feet along the transect.
Easting	Long Integer	4	Easting of the gps location of the rebar on the transect (Nad 27, Zone 13).
Northing	Long Integer	4	Northing of the gps location of the rebar on the transect (Nad 27, Zone 13).
Notes	Memo	Open	Any notes relevant to the gps location of the rebar.

tblCOELineCT

This table stores community type (CT) and structure assignments for each line, and also tracks changes in community and structure types).

Name	Type	Size	Description
COELineCTRecID	Long Integer	4	Unique field to serve as the primary key for tblCOELineCT
COELineRecID	Long Integer	4	Primary key from tblCOELine.
CTType	Long Integer	4	Primary key from tblCOECTtypes
Structure	Long Integer	4	links to Primary key from tblCOEStructure but shows StructureCode
Edge	Text	50	Is this an edge community and if so what type
OtherCTMod	Text	50	Other modifiers on CT type
Date	Date/Time	8	Date CT assignment or change first applicable
Year	Long Integer	4	Year CT assignment or change first applicable
Alteration	Text	50	If this is a change in CT type, what caused the change, if known
Notes	Text	250	Any notes relevant to the this CT assignment or change

tblCOECTtypes

This table stores community type (CT) codes, names and definitions.

Name	Type	Size	Description
CTtypesRecID	Long Integer	4	Unique field to serve as the primary key for tblCOECTtypes
CTCode	Text	50	Hink and Ohmart Community type code.
CTName	Text	250	Full name of community type
Comments	Text	250	Comments about community type or name

tblCOEStructure

This table stores structure type codes, names and definitions.

Name	Type	Size	Description
COEStructureRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEStructure
StructureCode	Text	50	Code for Hink and Ohmart structure type
StructureName	Text	50	Name for Hink and Ohmart structure type
StructureDesc	Text	250	Description of structure type
Comments	Text	250	Comments about structure type

tblCOE1980sPerCovTotal

This table stores the total percent cover values that were provided in the original 1984 Hink and Ohmart report Appendix Table V-2, for a selected set of transects that were used to calculate the 1984 community-structure type average covers.

Name	Type	Size	Description
COE1980sPerCovRecID	Long Integer	4	Unique field to serve as the primary key for tblCOE1980sPerCovTotal
COELineRecID	Long Integer	4	Primary key from tblCOELine.
n	Long Integer	4	Number of 15x15 ft vegetation quads used to calculate average cover
Over15ft	Long Integer	4	Average percent cover for the 15 foot and over vegetation layer
2-15ft	Long Integer	4	Average percent cover for the 2-15 foot vegetation layer
0-2ft	Decimal	16	Average percent cover for the 0-2 foot vegetation layer
HOType	Date/Time	8	Hink and Ohmart community-structure type average to which this transect was applied
Comments	Text	250	Any comments relevant to the this record

tblCOETreeQuad

This table stores data relevant to each quad surveyed for trees: location, date, surveyor, method used. Links to tblCOETreeCount and tblCOETree>18, which store the stem counts and cover estimates for each species, and the diameter root crown of trees over 18" respectively.

Name	Type	Size	Description
COETreeRecID	Long Integer	4	Unique field to serve as the primary key for tblCOETreeQuad
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Date	Date	8	Date of survey.
Side	Text	50	Side of the transect on which the trees were counted.
Quad	Text	50	Location of quad along transect.
Surveyor	Long Integer	4	Displaying the full name of each surveyor, but storing the primary key from tblSurveyors, SurveyorID.
Notes	Memo	Open	Any comments or notes relevant to the tree count quads.
Method	Text	50	Count Methods were changed early in the survey, prior to transect NE03; select "Prior to NE03" if the transect was read before the change at NE03; select "After NE03" if after.
Accuracy	True/False	1	Mark yes or check if the accuracy of this count is reliable. Do not check if there are issues related to the count.
AccuracyComments	Memo	Open	Notes relevant to the issues with the accuracy of the count.

tblCOETreeCount

This table links to tblTreeQuad; stores the stem count and cover (described as number of 4x4 squares) of each species surveyed within each tree quad. COETreeCountRecID, Long Integer, 4, Unique field to serve as the primary key for tblCOETreeCount.

Name	Type	Size	Description
COETreeRecID	Long Integer	4	Primary key from tblCOETreeQuad.
ACRO1	Long Integer	4	Displaying the acronym of the species counted, but storing the SpFlorRecID tblSpeciesFLoristic.
UnidCode	Text	50	Code assigned to collected, unidentified species.
Height	Text	50	Select whether the shrubs/trees counted were in the 2-10ft. height category or the >10ft. height category.
Morph	Text	50	Morphology of the trees/shrubs counted.
HOInds	Long Integer		Number of individual from HO data 1984.
4x4	Long Integer	4	Number of 4x4 squares occupied by the canopy of the species surveyed.
<2"	Long Integer	4	Number of stems greater than 2" in diameter.
2-6"	Long Integer	4	Number of stems between 2" and 6" in diameter.
6-12"	Long Integer	4	Number of stems between 6" and 12" in diameter.

12-18"	Long Integer	4	Number of stems between 12" and 18" in diameter.
>18"	Long Integer	4	Number of stems greater than 18" in diameter.
Notes	Memo	Open	Any notes relevant to each species counted.

tblCOETree>18

This table is linked to tblCOETreeQuad and stores diameter root crown for each tree over 18" in diameter.

Name	Type	Size	Description
COETree>18RecID	Long Integer	4	Unique field to serve as the primary key for tblCOETree>18.
COETreeRecID	Long Integer	4	Primary key from tblCOETreeQuad.
ACRO1	Long Integer	4	Displaying the acronym for each species surveyed, but storing SpFlorRecID from tblSpeciesFLoristic.
Height	Text	50	Select whether the shrubs/tree measured was in the 2-10ft. height category or the >10ft. height category.
Morph	Text	50	Morphology of the trees/shrub measured.
Tree#	Long Integer	4	Arbitrary number to separate individuals of the same species and tree quad with measurements greater than 18".
DRC	Double	8	Diameter root crown of individual trees greater than 18"; measurement taken in inches.
Notes	Memo	Open	Any comments relevant to the individual tree measured.

tblCOEVegQuad

This table stores data relevant to each vegetation quad sampled: date, surveyor, method used. Links to tblCOEVegCover, which stores cover estimates for each species.

Name	Type	Size	Description
COEVegQuadRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEVegQuad.
COELineRecID	Long Integer	4	Primary key from tblCOELine.
Date	Date	8	Date of the survey.
Rebar	Text	50	Rebar at which the vegetation quad was located
Side	Text	50	Side of the transect on which the vegetation quad was located.
Surveyor	Long Integer	4	Surveyor that recorded the data at vegetation quad.
Method	Text	50	Vegetation Cover methods were changed early in the survey; select "Original H&O" if the transect was read before the changes, or select "Modified Heritage" if after.
Notes	Memo	Open	Notes pertaining to the specific quad.
NorthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the north .
EastSDCount	Long Integer	4	Dot counts from the spherical densiometer to the east.
WestSDCount	Long Integer	4	Dot counts from the spherical densiometer to the west.
SouthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the south.
SDCountComments	Memo	Open	Comments relevant to the spherical densiometer dot counts.
NorthSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
EastSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
SouthSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.
WestSD%	Long Integer	4	Percentage calculated from the spherical densiometer dot counts.

tblCOEVegCover

This table stores cover estimates for each species surveyed within each vegetation quad. Links to tblCOEVegQuad and tblSpeciesFloristic.

Name	Type	Size	Description
COEVegCoverRecID	Long Integer	4	Unique field to serve as the primary key for tblCOEVegCover.
COEVegQuadRecID	Long Integer	4	Primary key from tblCOEVegQuad.
ACRO	Long Integer	4	Displaying the acronym for each species surveyed, but storingSpFlorRecID from tblSpeciesFLoristic.
UnidCode	Text	50	Unidentified code number from field data.
AvgHt	Double	8	Average height for the species, in feet.
%Cover0-2ft	Double	8	Percent cover under 2ft tall.
%Cover2-15ft	Double	8	Percent cover from 2-15ft tall.
North%Cover>15	Double	8	Percent cover of species over 15ft tall within the north.
East%Cover>15	Double	8	Percent cover of species over 15ft tall within the east.
South%Cover>15	Double	8	Percent cover of species over 15ft tall within the south.
West%Cover>15	Double	8	Percent cover of species over 15ft tall within the west.
NorthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the north.
EastSDCount	Long Integer	4	Dot counts from the spherical densiometer to the east.
WestSDCount	Long Integer	4	Dot counts from the spherical densiometer to the west.
SouthSDCount	Long Integer	4	Dot counts from the spherical densiometer to the south.
SDCountType	Text	50	Select whether this spherical densiometer count was for the entire quad - "Total count", or if it was for the species in this record - "Count for this species."
Notes	Memo	Open	Any comments relevant to the individual species within this quad.

tblSpeciesFLoristic

This table contains information for each of species found, and is a basic table from the NMNH Ecology database.

Name	Type	Size	Description
SpFlorRecID	Long Integer	4	Primary key for the species floristic table.
ACRO1	Text	8	NHNM seven-letter code
LifeForm	Double	8	1=tree 2=shrub 3=grass 4=forb 5=lichen/algae/fungi 6=other
NMSpName	Text	60	NHNM Accepted full name, genus and species, variety or subspecies, and, if plant is a tree, growth form.
NMComName	Text	35	Common name as assigned by NHNM botanist.
NM_K_Symbol	Text	50	Kartez symbol for current New Mexico name.
Family	Text	50	
Genus	Text	50	
Species	Text	50	
Subspecies	Text	50	
Variety	Text	50	
GrowthForm	Text	50	Text field describing the stages of tree growth: seedling, yng regen, adv regen, mature.
NMWeedClass	Text	2	NM Weed status class - A, B or C from state weed status link to tblNMWeedClass.
FedWeedStatus	True/False	1	Is this plant federally listed as a noxious weed? See tblFedWeeds.
OtherStateWeedStat	True/False	1	Does this plant have noxious weed status in a state other than NM? See tblOtherStateWeeds.
MasterAcronym	Text	8	NHNM grouping acronyms.
Origin	Text	15	Native or introduced.

tblPlot

This table contains all the basic data for a plot, and is the base table for records in the NMNH Ecology database.

Name	Type	Size	Description
PlotRecID	Long Integer	4	Unique number to identify each record and serve as the primary key.
PlotID	Text	7	Plots are named with a standard of last two digits of year, team leader's or project's initials, and three digits in numerical order as plots are established, e.g. 03AB001, 03AB002, etc.
Type	Text	3	RP Releve Plot, QP Quick Plot, VP Video Plot, MP Map Point.
ParentProject	Long Integer	4	Storing Record ID from Project table and showing project code.
Subproject	Long Integer	4	Storing Record ID from subproject table and showing subproject code.
SURVEY_DATE	Date	8	Date the survey took place.
SURVEYSITE	Text	255	Sites delineated for the purpose of the field work only, usually assigned by project manager.
DIRECTIONS	Memo	Open	Directions that can be useful in finding the plot again.
Vegetation Desc/Site Features	Memo	Open	Description of the vegetation and any significant site features.
Adjacent Communities	Memo	Open	Any communities surrounding the occurrence surveyed.
Animals	Memo	Open	Any evidence or sighting of animals.
Disturbance Evidence	Memo	Open	Any evidence of disturbance, e.g., tire tracks, cropping/grazing, garbage, fire scars, etc.
Botanist	Long Integer	4	Surveyor that served as botanist for the plot.
CommentFieldQC	True/False	1	Were the comment fields QCd for appropriate language?
ComFieldQCInitials	Text	3	Initials of the person responsible for QCing the comment fields.
CommFieldQCDate	Date	8	Date the comment fields were QCd.
DataQC	True/False	1	Were the following fields QCd: Plot type, Project/Subproject, Date, Surveyor, Botanist, UTM's, Community Acronyms, Ground Cover, Life Form Cover.
DataQCInitials	Text	3	Initials of the person responsible for QCing the above data fields.
DataQCDate	Date	8	Date the data fields were QCd.
OrigPlotID	Text	25	If the plot came from a source outside of NHNM or an alternate ID was created for data entry, enter the original plot id here.

tblPhoto

This table stores data concerning the photos taken at a plot or for a project. Stores information such as focal length, exposure number, and the location the print/slide is archived.

Name	Type	Size	Description
PhotoRecID	Long Integer	4	Unique number to identify each record and serve as the primary key.
Source	Text	50	Was the photo from a plot; not from a plot, but from Heritage; or

PhotoPlotRecID	Long Integer	4	Plot ID for the plot at which the photo taken.
Project	Long Integer	4	Storing Record ID from Project table and showing project code.
Subproject	Long Integer	4	Storing Record ID from subproject table and showing subproject code.
Location	Text	42	General location at which the photos were taken. e.g., Bandelier National Monument, Holloman AFB, etc.
Date	Date	8	Date the photo was taken.
PhotoLogRollNo	Text	50	Name used to identify the roll of film on the photo log.
Keywords	Memo	Open	Keywords to help identify the subject matter of the photo. e.g., short grass prairie, mixed conifer forest, blue spruce fringe forest, Texas Horned Lizard, etc.
AddFilePath	Text	50	Additional directory info for digital photos beyond general subproject photo location.
ExpNo/FileName	Text	50	The number of the individual exposure taken or, in the case of digital photos, the file name for the individual photo.
Photographer	Text	50	Name of the person who took the photo.
Azm	Long Integer	4	Azimuth or direction the photo was taken.
FocalLength	Long Integer	4	Focal length of the photo.
Desc1	Text	42	Description of the subject matter of the photo. e.g., across slope from plot center.
Desc2	Text	42	If description is longer than 42 characters (label program limitation), put overflow here.
Sensitive	True/False	1	Does this photo contain a sensitive element or community?
Comments	Memo	Open	Any comments relevant to this individual exposure.
Film/Dig	Text	50	Was photo originally taken with film or digital camera?

tblPlotEcomonitoring

This table connects tblPlot to tblPlotFloristic. It allows data from more than one visit to a plot location to be recorded.

Name	Type	Size	Description
EcomonRecID	Long Integer	4	Unique number to identify each record and serve as primary key.
Plot ID	Text	7	Plot ID from tblPlot.
Monitoring Date	Date	8	Date Plot was visited/revisited.
MonitoringComments	Memo	Open	Comments relevant to this visit to the plot.
PlotFlorQC	True/False	1	Was plot floristic QCd?
PlotFIQCInitials	Text	3	Initials of the person responsible for qc'ing plot floristic.
PlotFIQCDate	Date	8	Date floristic was QCd.

tblPlotFloristic

Stores data and id for each plant recorded at the plot, e.g. abundance value, collection info, and notes taken at plot.

Name	Type	Size	Description
PlotFlorRecID	Long Integer	4	Primary key for plot floristic.
PF'EcomonRecID	Long Integer	4	Record ID from ecomonitoring table.
Monitoring Date	Date	8	Date of the survey.
PFSpFlorRecID	Long Integer	4	Storing the record ID from species floristic, but looking up ACRO1.
UNID Code	Text	50	Unidentified code number from field data.
Abundance	Double	8	Should contain *only* Percentage cover values - either directly from the field or converted scalars - unconverted scalar values belong in the field AbunScalar.
AbunType	Text	50	Explains missing values and gives info on how abundance was measured in the field (see look up tblPlotFlorAbunType for information on codes).
KDKscalar	Text	5	Unconverted Modified Domin-Krajina scalar abundance values read up from tblModDomKrajinaScalar.
Height in Meters	Double	8	Average height measured in meters.
Number of Vouchers	Text	5	How many specimens were collected? If plant was not collected, but is a unid from another plot, enter NO.
Specimen Number	Text	10	Specimen number from the data sheet. (F1, G4, T2, etc.)
UNMCatalogNumber	Text	10	Numbering system used by UNM herbarium.
Field label	Text	50	What was written on the label in the field?
Quality	Text	2	Quality of the vouchered specimen.
Det by	Text	50	Who was responsible for identifying the vouchered specimen?
Distribution	Text	50	What herbaria received the specimen?
Comments	Text	250	Any comments relevant to this particular plant, including references to other plots where the plant was collected.
Phenology	Text	50	Flowering, fruiting, or dead annual.

tblSurveyors

This table contains information on the surveyors at Natural Heritage New Mexico.

Name	Type	Size	Description
SurveyorID	Long Integer	4	Primary key for Surveyor table.
Last_name	Text	50	Surveyor's last name.
First_name	Text	50	Surveyor's first name plus middle initials if relevant.
Full_name	Text	50	Surveyor's full name first, initials, last.
Initials	Text	50	Surveyor's initials.
Plot_Initials	Text	50	Surveyor's initials as used in PlotIDs.
Surveyor_type	Text	50	How was this person connected to NMNHP?

tblParentProject

This table contains information describing each Parent Project.

Name	Type	Size	Description
ProjUpRecID	Long Integer	4	Primary key for the ProjectUpper table.
ProjectCode	Text	50	Code used to identify the project.
Project_name	Text	50	Full project name.

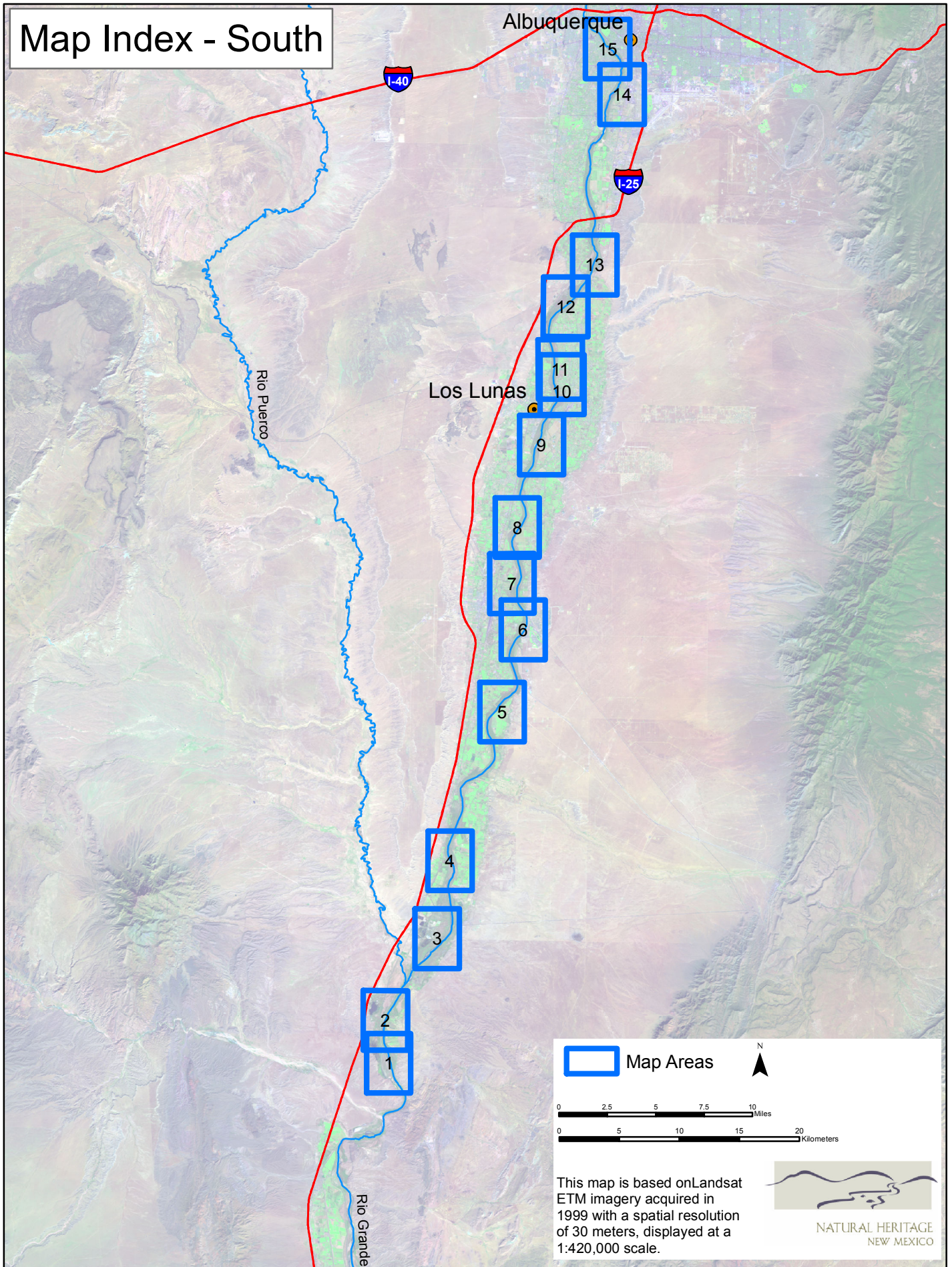
tblSubproject

This table contains information describing each Subproject.

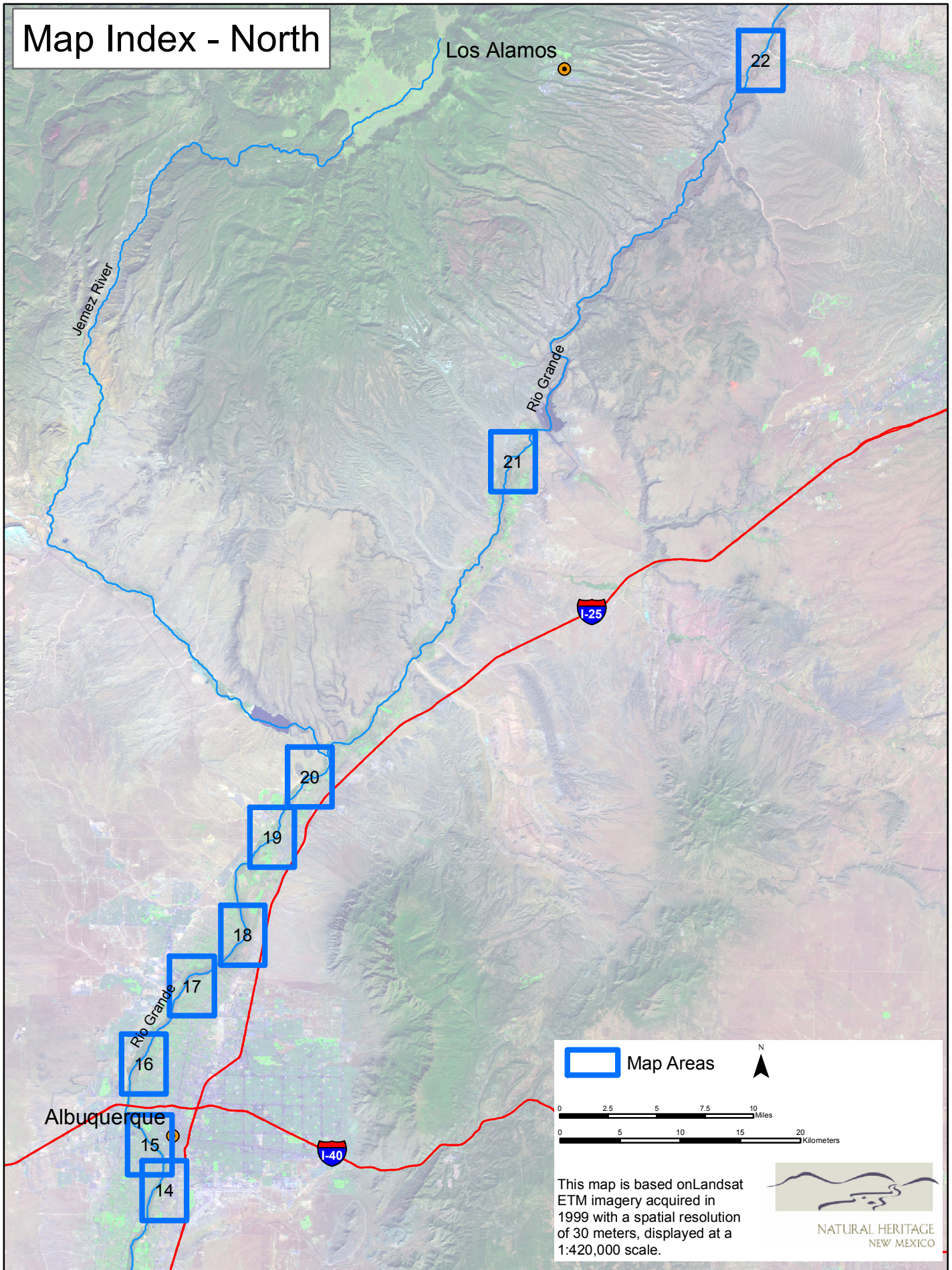
Name	Type	Size	Description
ProjLowRecID	Long Integer	4	Primary key for the ProjectLower table.
ProjUpRecID	Long Integer	4	Primary key from the ProjectUpper table.
Parent_Project	Text	50	The main project that this subproject falls under.
SubprojectCode	Text	50	Project code for the subproject.
Subproject_name	Text	50	Full name of the project.
Description	Memo	0	Description of what the subproject entails.
Start Date	Date	8	Date work started.
End Date	Date	8	Date subproject completed.
Supervisor	Long Integer	4	Person responsible for organizing the subproject.
PI	Long Integer	4	Person responsible for overseeing the parent project.
Photos	True/False	1	Are there photos associated with this subproject?
DigPhoto_Loc	Text	250	Directory path to master photo directory for subproject.

Appendix B: Map sheets showing approximate locations for 1984 Hink and Ohmart transects and locations of 2005-2006 NHNM re-surveyed transects. First two pages are a map index showing general location of the following 22 map sheets.

Map Index - South



Map Index - North



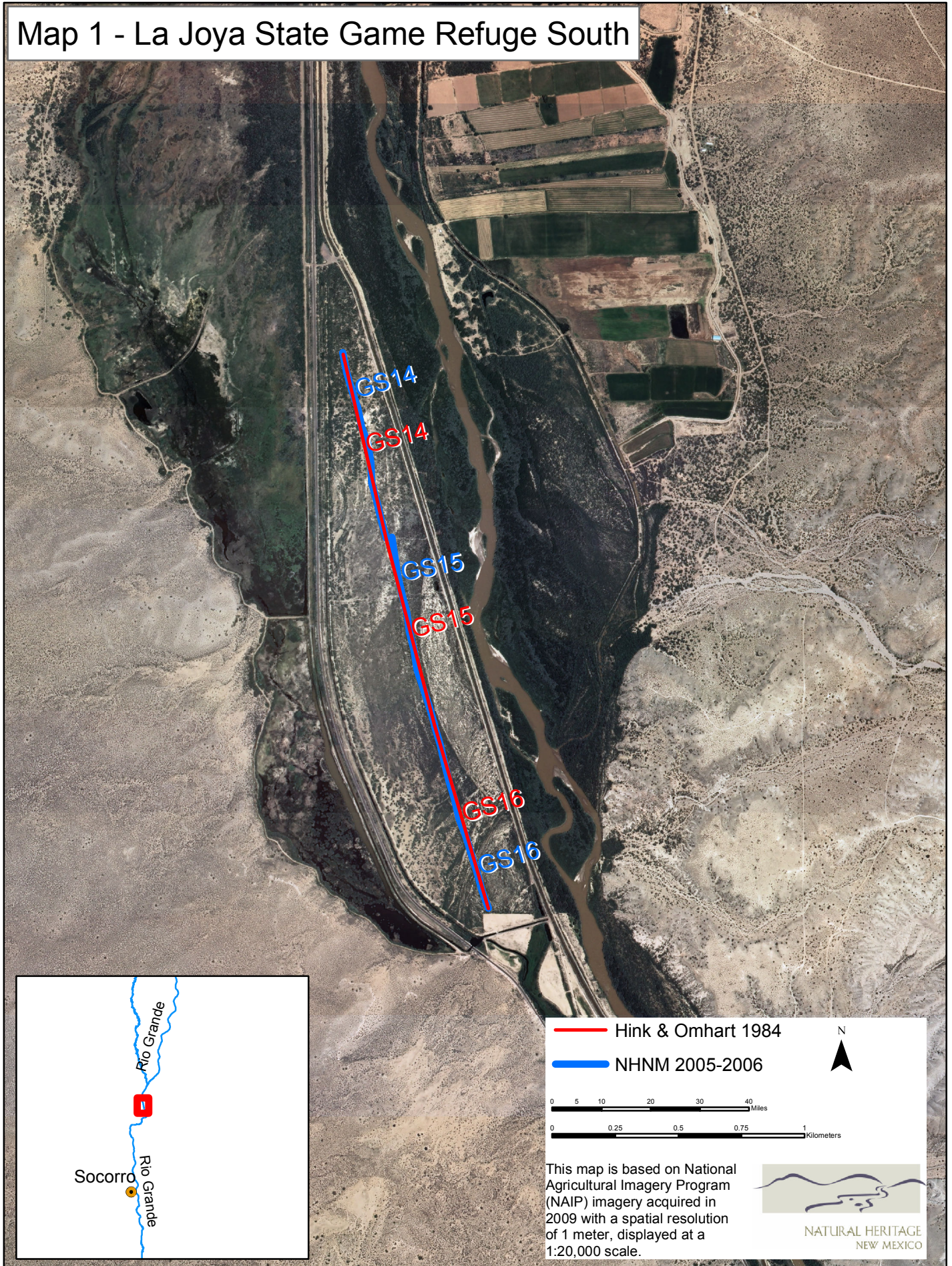
Hink & Omhart 1984 - Transect Map Index		
Transect	Map Number	Map Name
CT04	16	Albuquerque Los Griegos
CT20 - VERIFY	5	Jarales South
EG01	18	Corrales
EG04	16	Albuquerque Los Griegos
EG19(A)	5	Jarales South
EG19(B)	5	Jarales South
EG19(C)	5	Jarales South
EG19(D)	5	Jarales South
EG20	5	Jarales South
GN01-02	20	Santa Ana Pueblo
GN03	20	Santa Ana Pueblo
GN04	20	Santa Ana Pueblo
GN05	20	Santa Ana Pueblo
GN06(N)	21	Cochiti Pueblo
GN06(S)	21	Cochiti Pueblo
GN07	21	Cochiti Pueblo
GN08	21	Cochiti Pueblo
GN09	21	Cochiti Pueblo
GN10	21	Cochiti Pueblo
GN11	21	Cochiti Pueblo
GN12	22	San Ildefonso Pueblo
GN13	22	San Ildefonso Pueblo
GN15	22	San Ildefonso Pueblo
GN16	22	San Ildefonso Pueblo
GS01	4	Abeytas
GS02-03	4	Abeytas
GS04	3	Bernardo
GS05	3	Bernardo
GS06	3	Bernardo
GS09	3	Bernardo
GS09(N)	3	Bernardo
GS10(N)	3	Bernardo
GS10(S)	3	Bernardo
GS11(N)	3	Bernardo
GS11(S)	3	Bernardo
GS12	2	La Joya State Game Refuge North
GS13	2	La Joya State Game Refuge North
GS14	1	La Joya State Game Refuge South
GS15	1	La Joya State Game Refuge South
GS16	1	La Joya State Game Refuge South
KW01	16	Albuquerque Los Griegos
KW02-03	16	Albuquerque Los Griegos
KW04	16	Albuquerque Los Griegos
KW05	16	Albuquerque Los Griegos
KW06-07	16	Albuquerque Los Griegos

Hink & Omhart 1984 - Transect Map Index		
NE01	16	Albuquerque Los Griegos
NE02	16	Albuquerque Los Griegos
NE03	16	Albuquerque Los Griegos
NE04-05	16	Albuquerque Los Griegos
NE07	19	Rio Rancho North
NW06	17	Alameda
NW07-08	17	Alameda
NW09(N)	18	Corrales
NW09(S)	17	Alameda
NW10-11	18	Corrales
NW12(N)	19	Rio Rancho North
NW12(S)	19	Rio Rancho North
NW13	19	Rio Rancho North
NW14	19	Rio Rancho North
NW15	19	Rio Rancho North
NW16	17	Alameda
NW17	18	Corrales
NW18	19	Rio Rancho North
SE01-02	14	Albuquerque South Valley
SE03	14	Albuquerque South Valley
SE04	13	Isleta Pueblo North
SE05-06	13	Isleta Pueblo North
SE07	12	Isleta Pueblo South
SE08	12	Isleta Pueblo South
SE09-10	11	Peralta
SE11	11	Peralta
SE12-13	11	Peralta
SE14-15	11	Peralta
SE16	10	Los Lunas North
SE17	9	Los Lunas South
SE18	5	Jarales South
SE19	5	Jarales South
SE20-21	5	Jarales South
SE22-23	9	Los Lunas South
SE24-25	10	Los Lunas North
SW00	13	Isleta Pueblo North
SW01	13	Isleta Pueblo North
SW02	13	Isleta Pueblo North
SW03	13	Isleta Pueblo North
SW04-05	13	Isleta Pueblo North
SW06	10	Los Lunas North
SW07	10	Los Lunas North
SW08	9	Los Lunas South
SW09	9	Los Lunas South
SW10	9	Los Lunas South
SW11-12	9	Los Lunas South

Hink & Omhart 1984 - Transect Map Index		
SW13	8	Tome
SW14-15	8	Tome
SW16	7	Belen North
SW18	5	Jarales South
SW19	5	Jarales South
SW20(N)	5	Jarales South
SW20(S)	5	Jarales South
SW21-22	5	Jarales South
SW23-24	10	Los Lunas North
SW25	6	Belen South
SW26	6	Belen South
SW27-28	6	Belen South
SW29-31	12	Isleta Pueblo South
SW30-32	12	Isleta Pueblo South

NHNM 2005-2006 - Transect Map Index		
Transect	Map Number	Map Name
GS14	1	La Joya State Game Refuge South
GS15	1	La Joya State Game Refuge South
GS16	1	La Joya State Game Refuge South
GS17	2	La Joya State Game Refuge North
KW01	16	Albuquerque Los Griegos
KW02	16	Albuquerque Los Griegos
KW04	16	Albuquerque Los Griegos
NE02	16	Albuquerque Los Griegos
NE03	16	Albuquerque Los Griegos
NE08	17	Alameda
NE09	17	Alameda
NW06	17	Alameda
NW07	17	Alameda
NW09	18	Corrales
NW10	18	Corrales
NW13	19	Rio Rancho North
NW14	19	Rio Rancho North
NW16	17	Alameda
NW17	18	Corrales
NW19	18	Corrales
NW21	18	Corrales
NW23	19	Rio Rancho North
SE03	14	Albuquerque South Valley
SE11	11	Peralta
SE12	11	Peralta
SE14	11	Peralta
SE16	10	Los Lunas North
SE18	5	Jarales South
SE22	9	Los Lunas South
SE30	10	Los Lunas North
SE31	15	Albuquerque Downtown
SE32	15	Albuquerque Downtown
SE33	14	Albuquerque South Valley
SE34	14	Albuquerque South Valley
SW07	10	Los Lunas North
SW24	10	Los Lunas North
SW26	6	Belen South
SW27	6	Belen South
SW33	8	Tome
SW34	7	Belen North
SW35	6	Belen South
SW36	7	Belen North

Map 1 - La Joya State Game Refuge South



— Hink & Omhart 1984

— NHNM 2005-2006



0 5 10 20 30 40 Miles

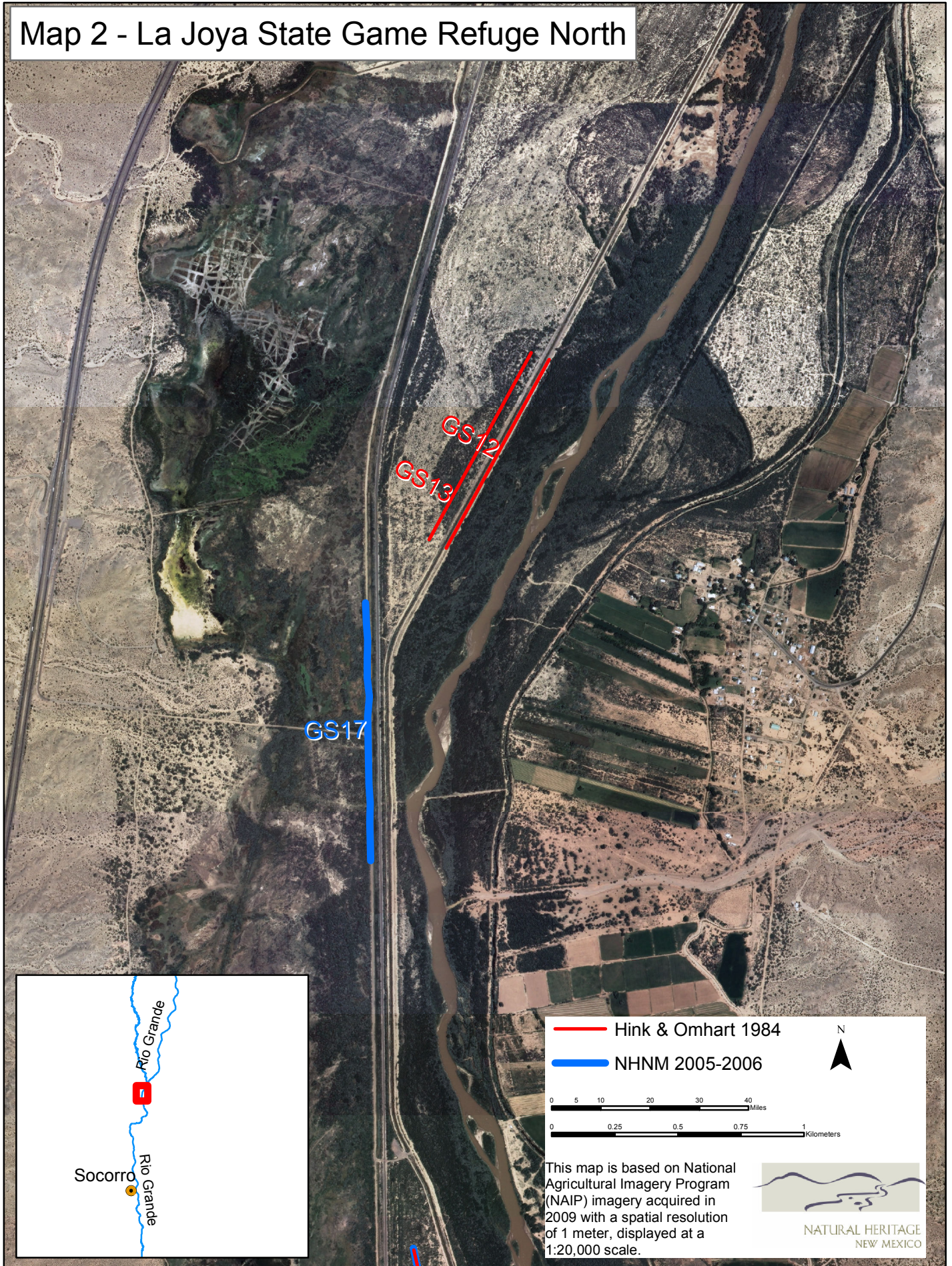
0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.

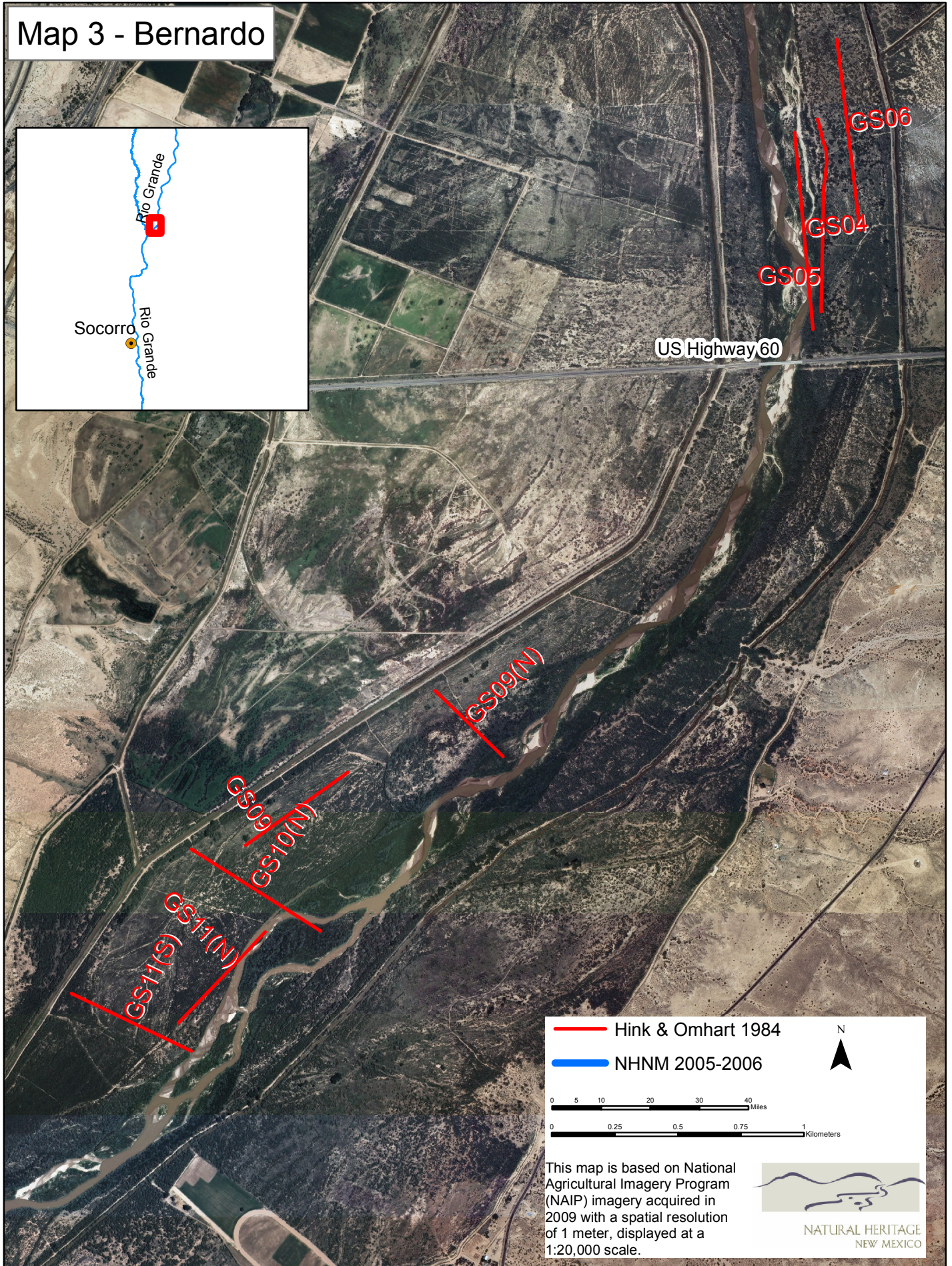
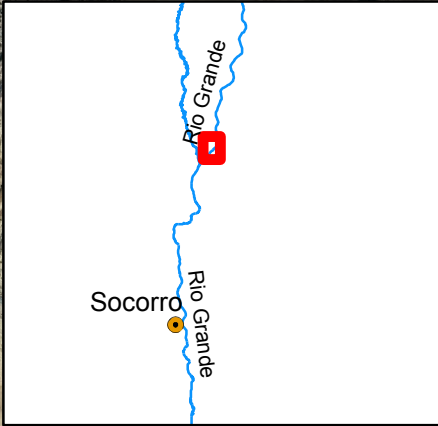


NATURAL HERITAGE
NEW MEXICO

Map 2 - La Joya State Game Refuge North



Map 3 - Bernardo



— Hink & Omhart 1984
— NHNM 2005-2006

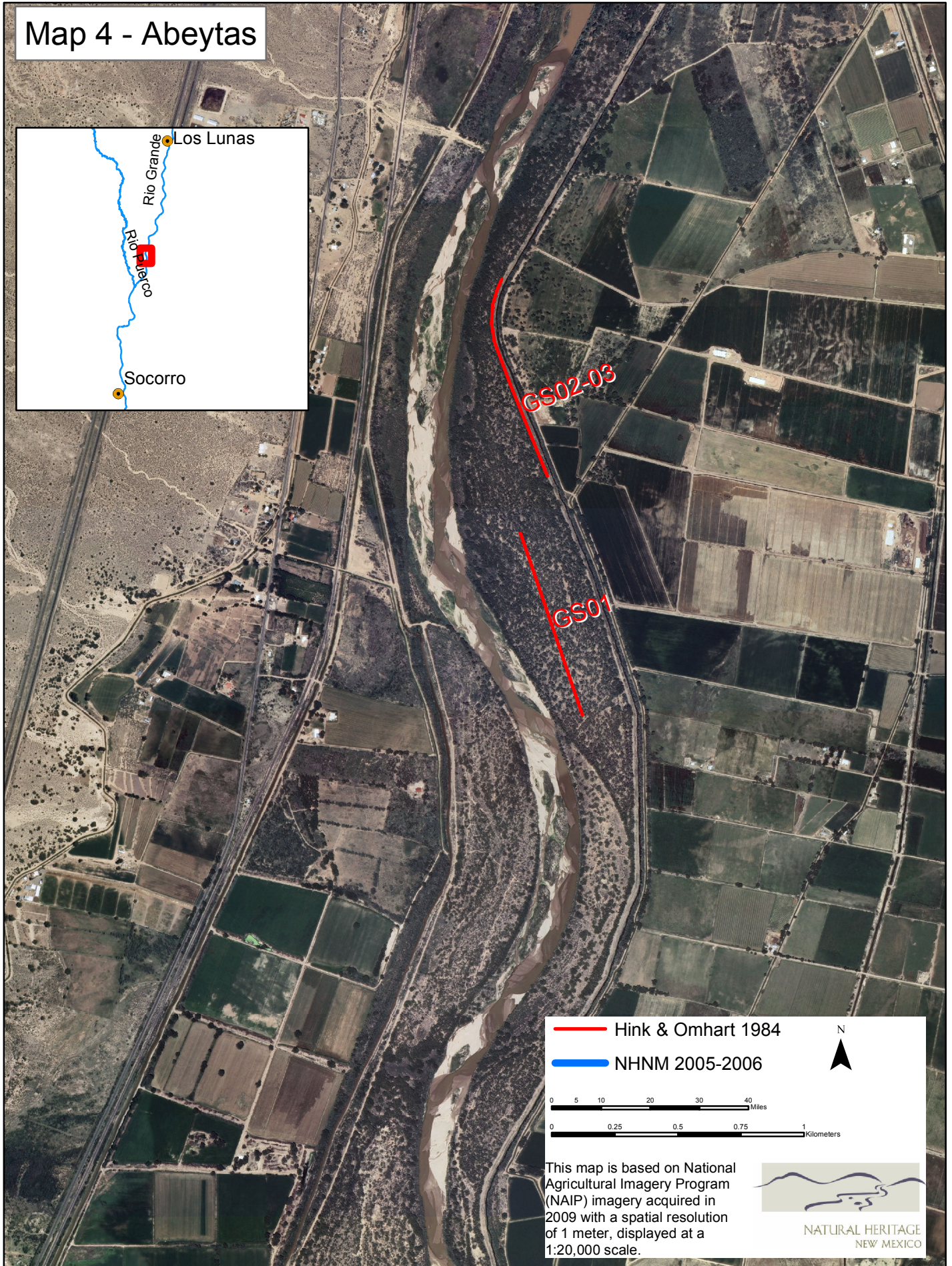
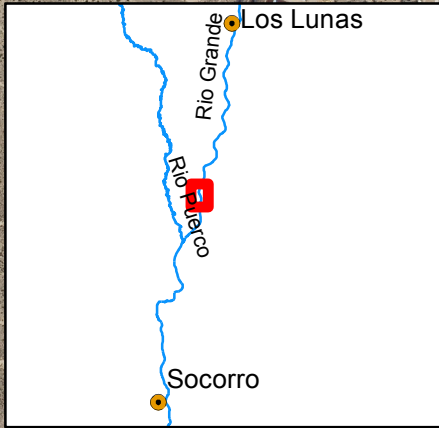
N

0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 4 - Abeytas



— Hink & Omhart 1984
— NHNM 2005-2006

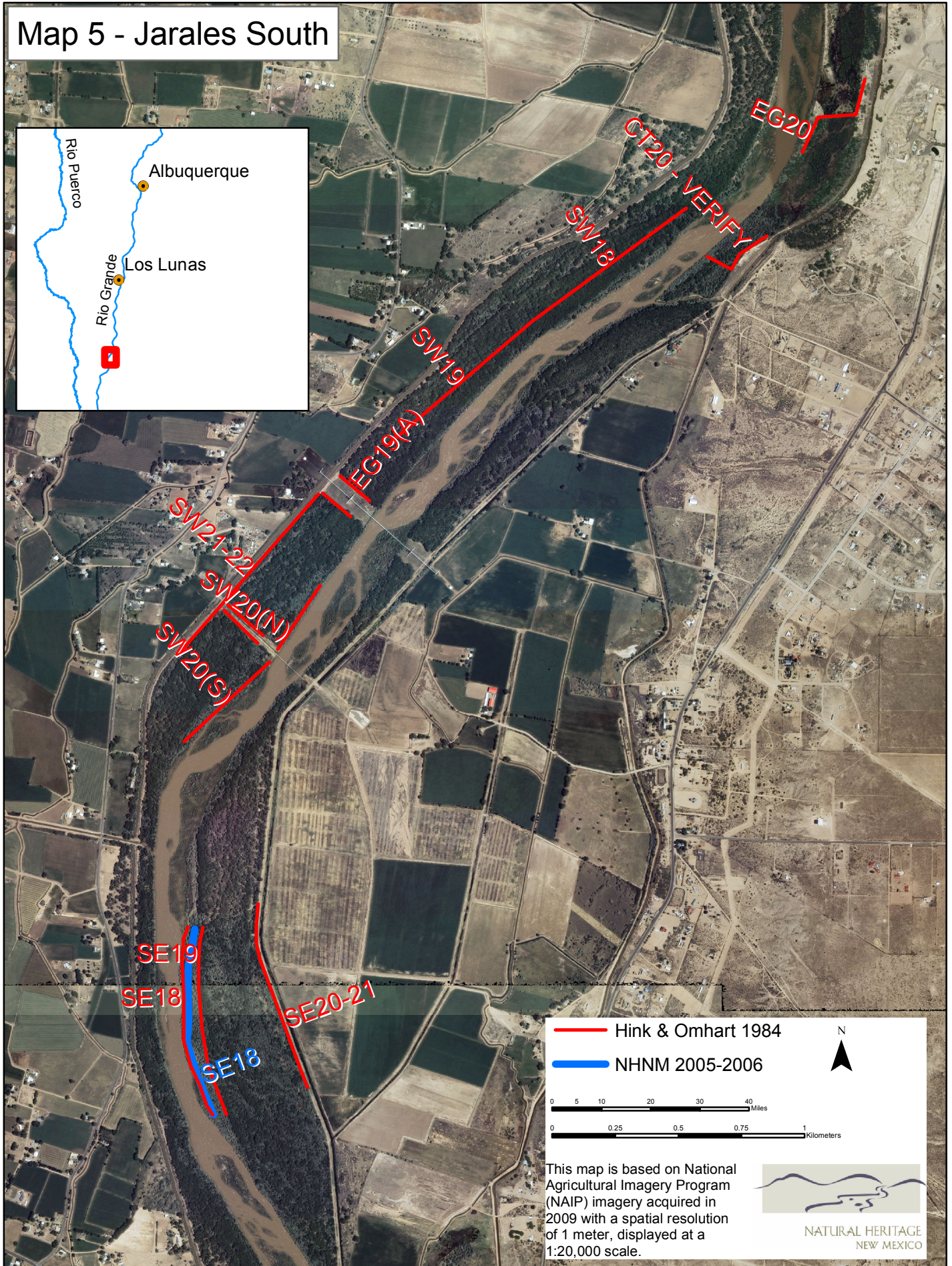
0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

N

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 5 - Jarales South



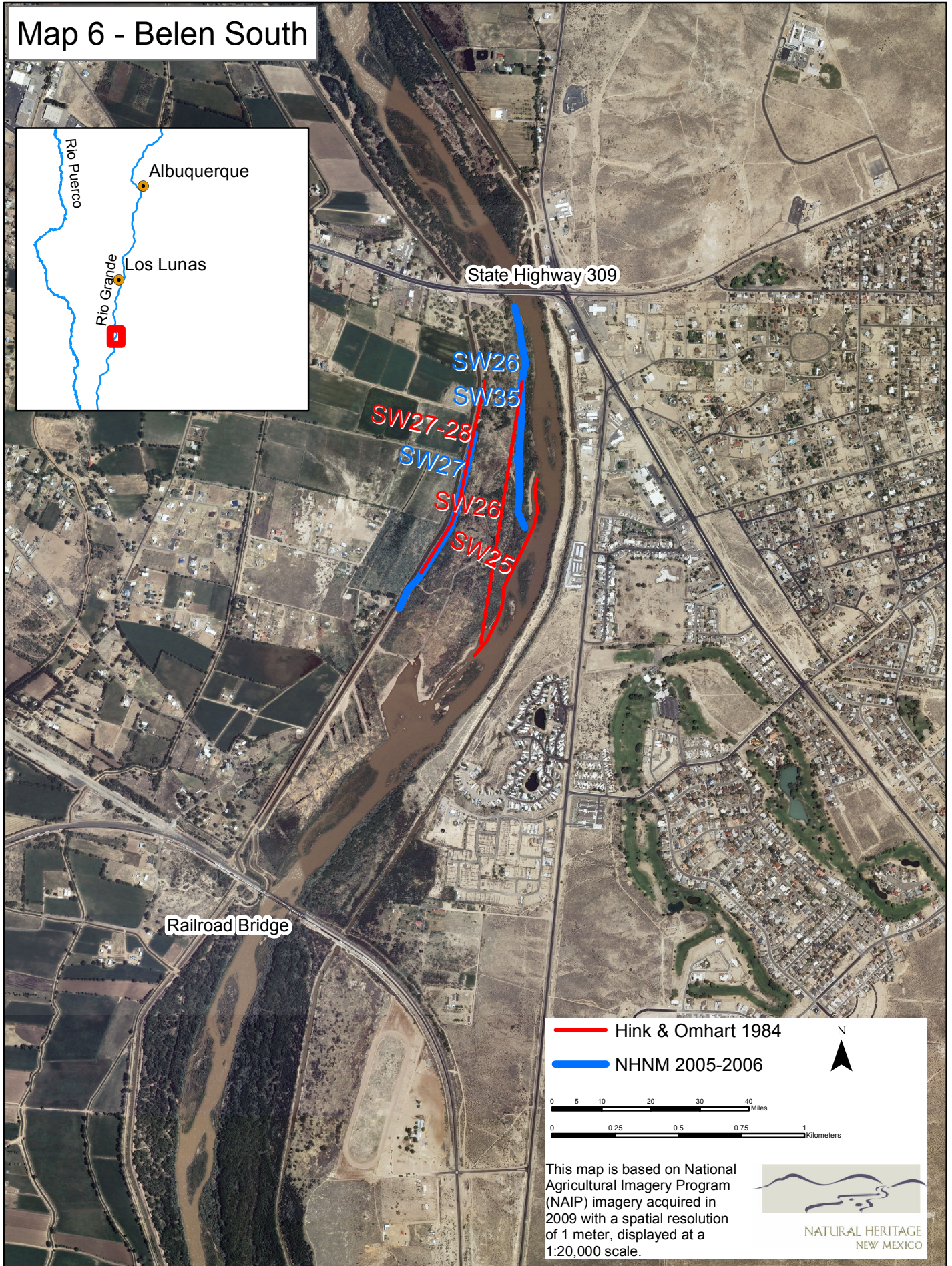
— Hink & Omhart 1984
— NHHM 2005-2006

0 5 10 20 30 40 Miles
 0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 6 - Belen South



— Hink & Omhart 1984
— NHNM 2005-2006

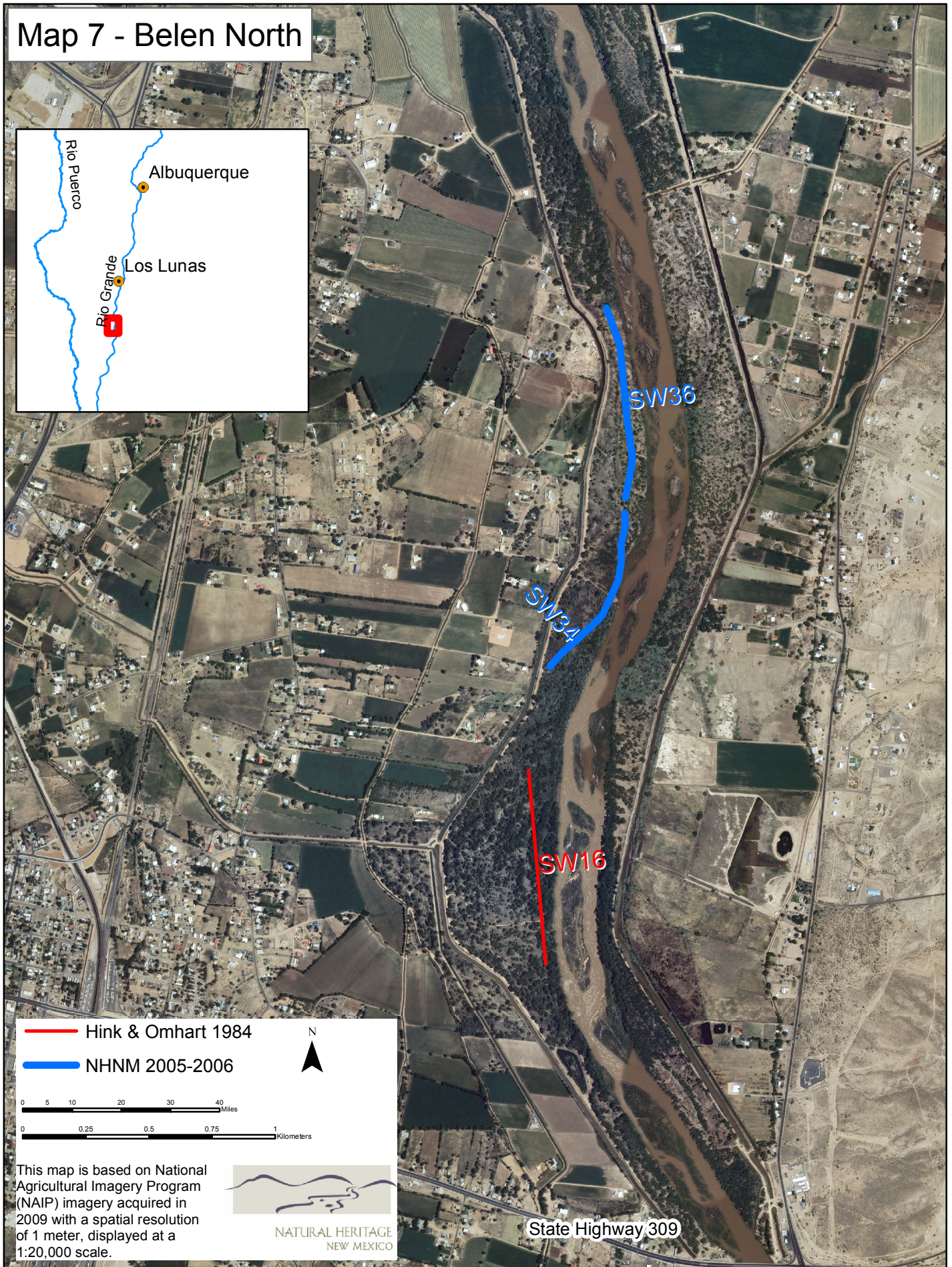
0 5 10 20 30 40 Miles
 0 0.25 0.5 0.75 1 Kilometers

N
▲

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 7 - Belen North



— Hink & Omhart 1984
— NHHM 2005-2006

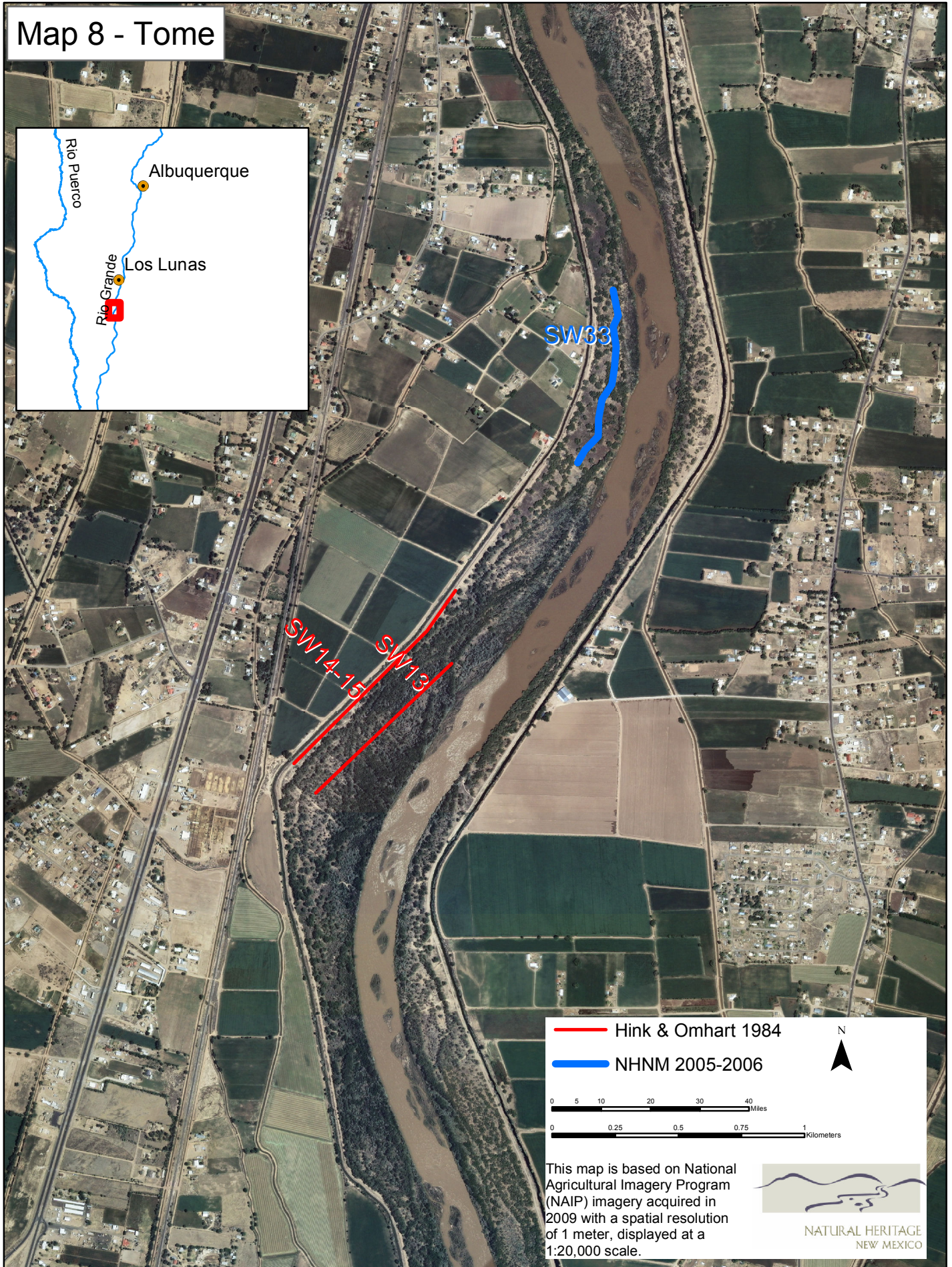
N

0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 8 - Tome



— Hink & Omhart 1984

— NHHM 2005-2006

N



0 5 10 20 30 40 Miles

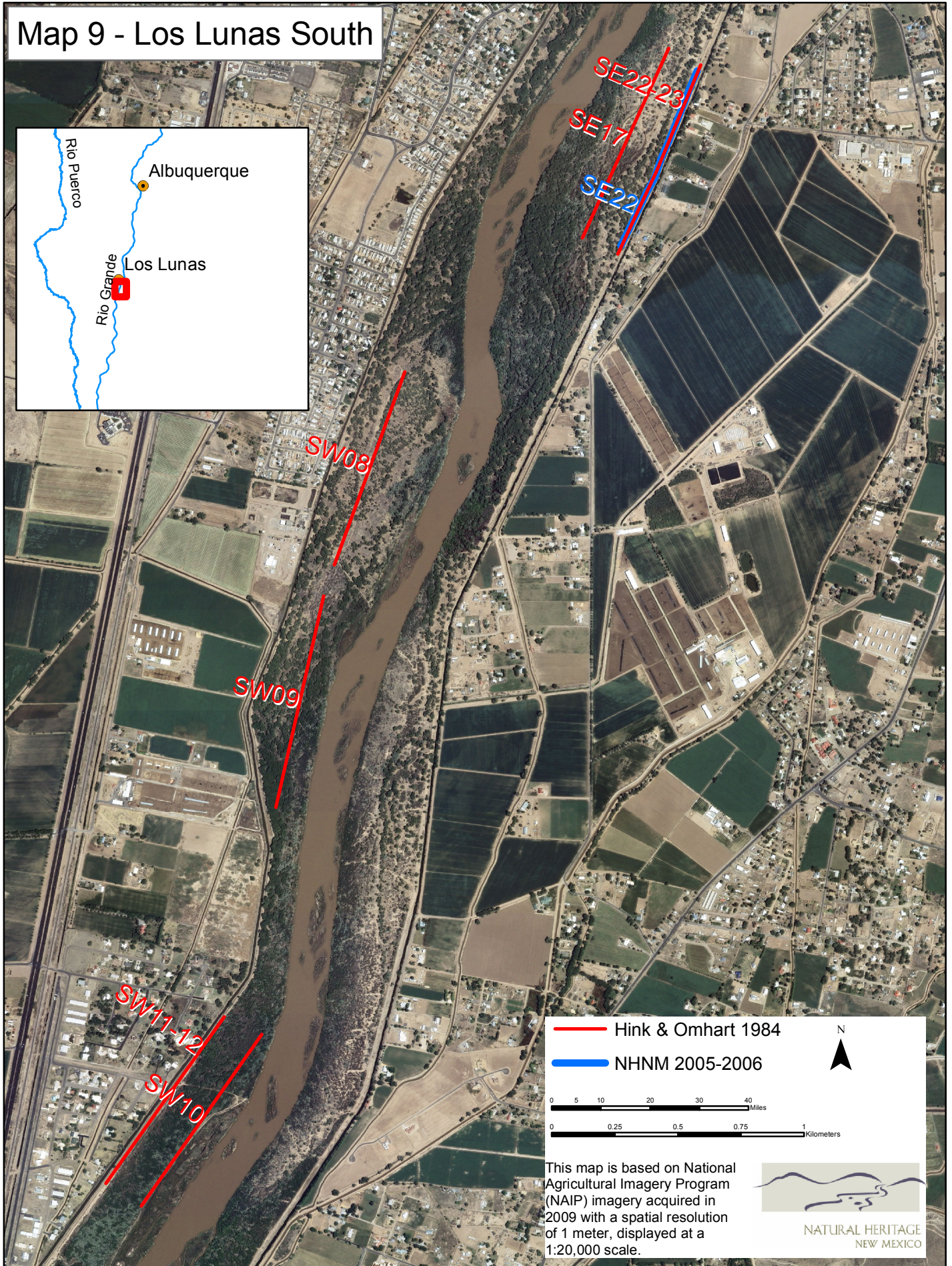
0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



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Map 9 - Los Lunas South



— Hink & Omhart 1984
— NHNM 2005-2006

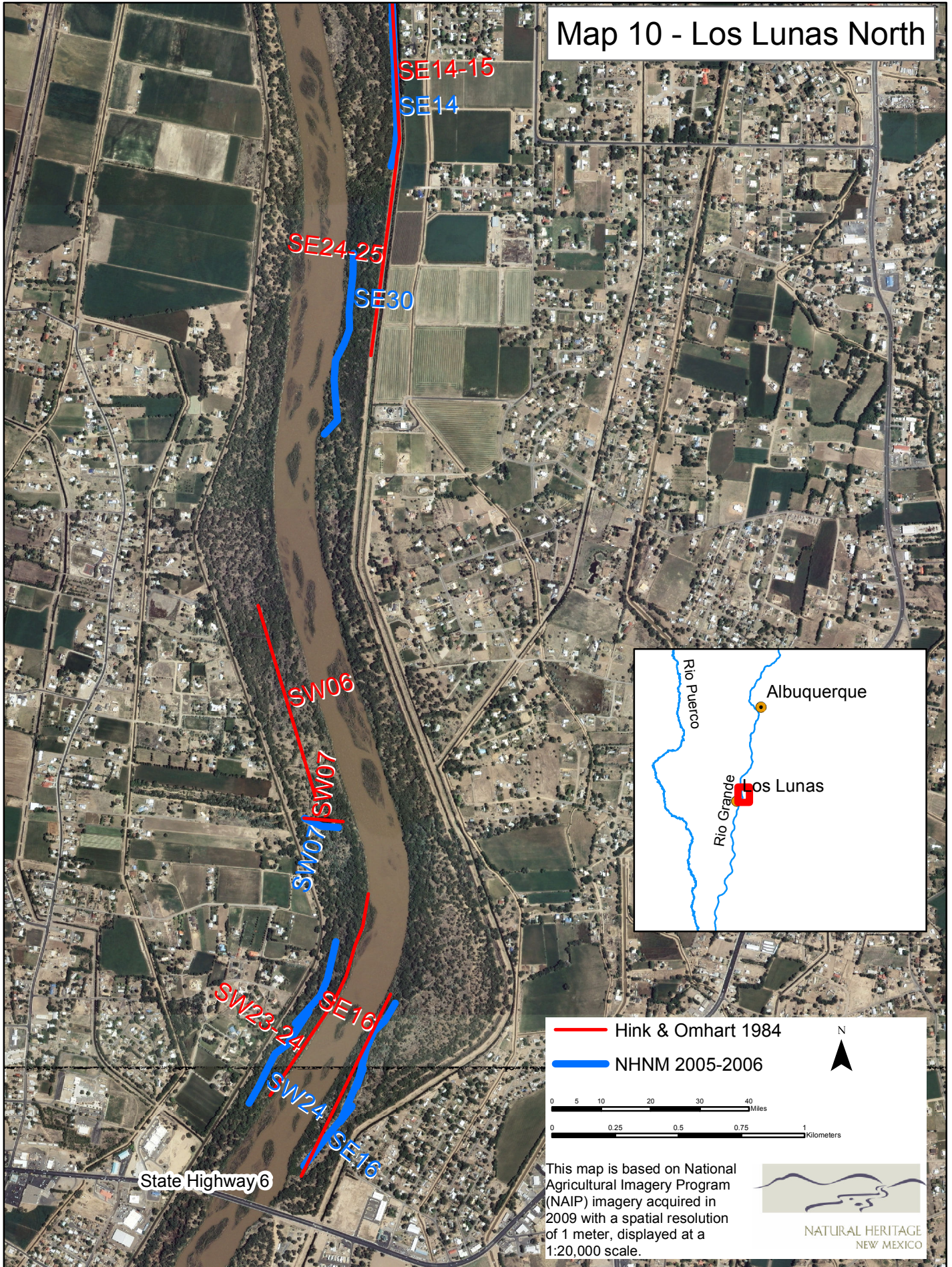
0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

N

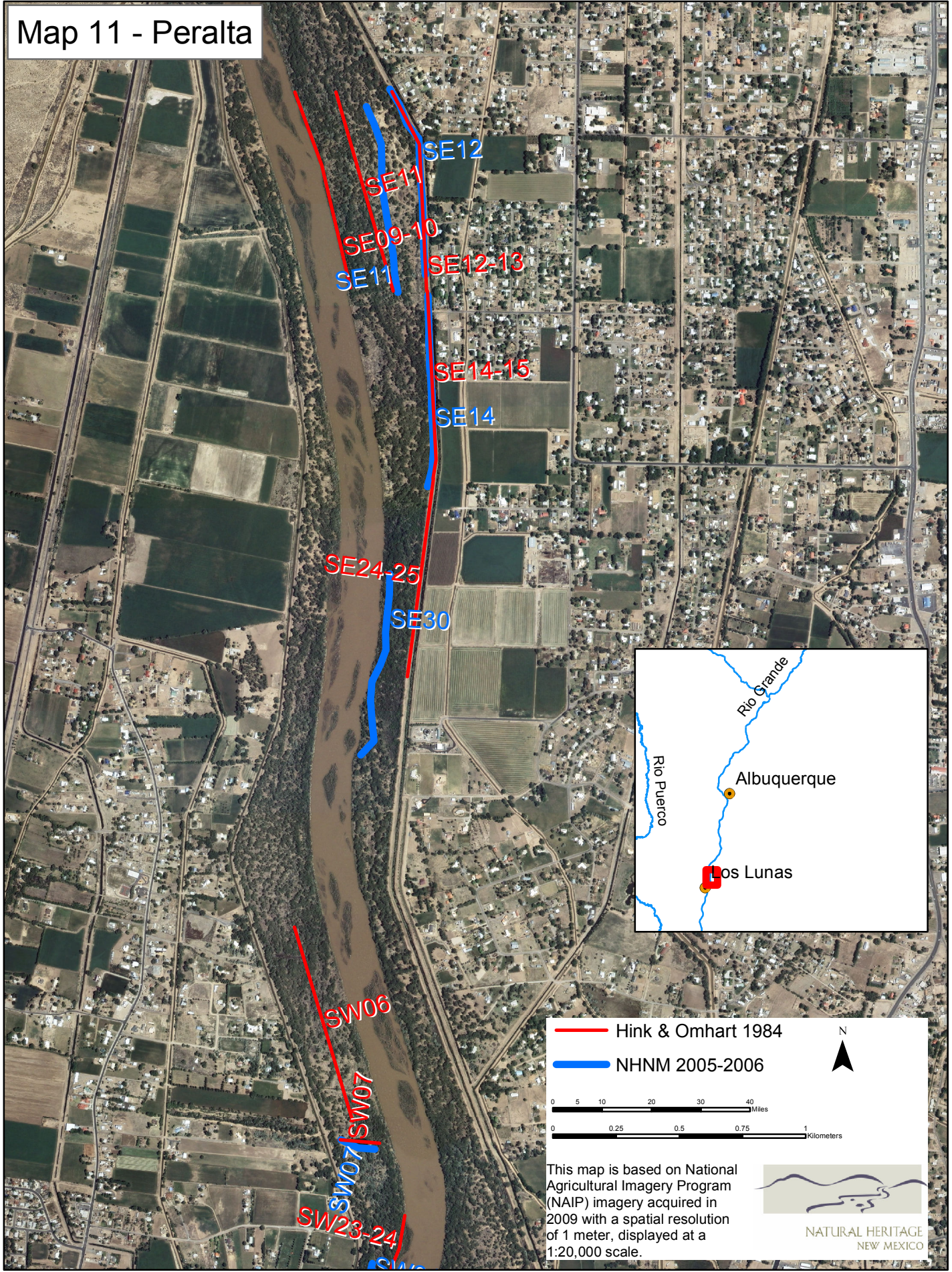
This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 10 - Los Lunas North



Map 11 - Peralta



— Hink & Omhart 1984
— NHNM 2005-2006

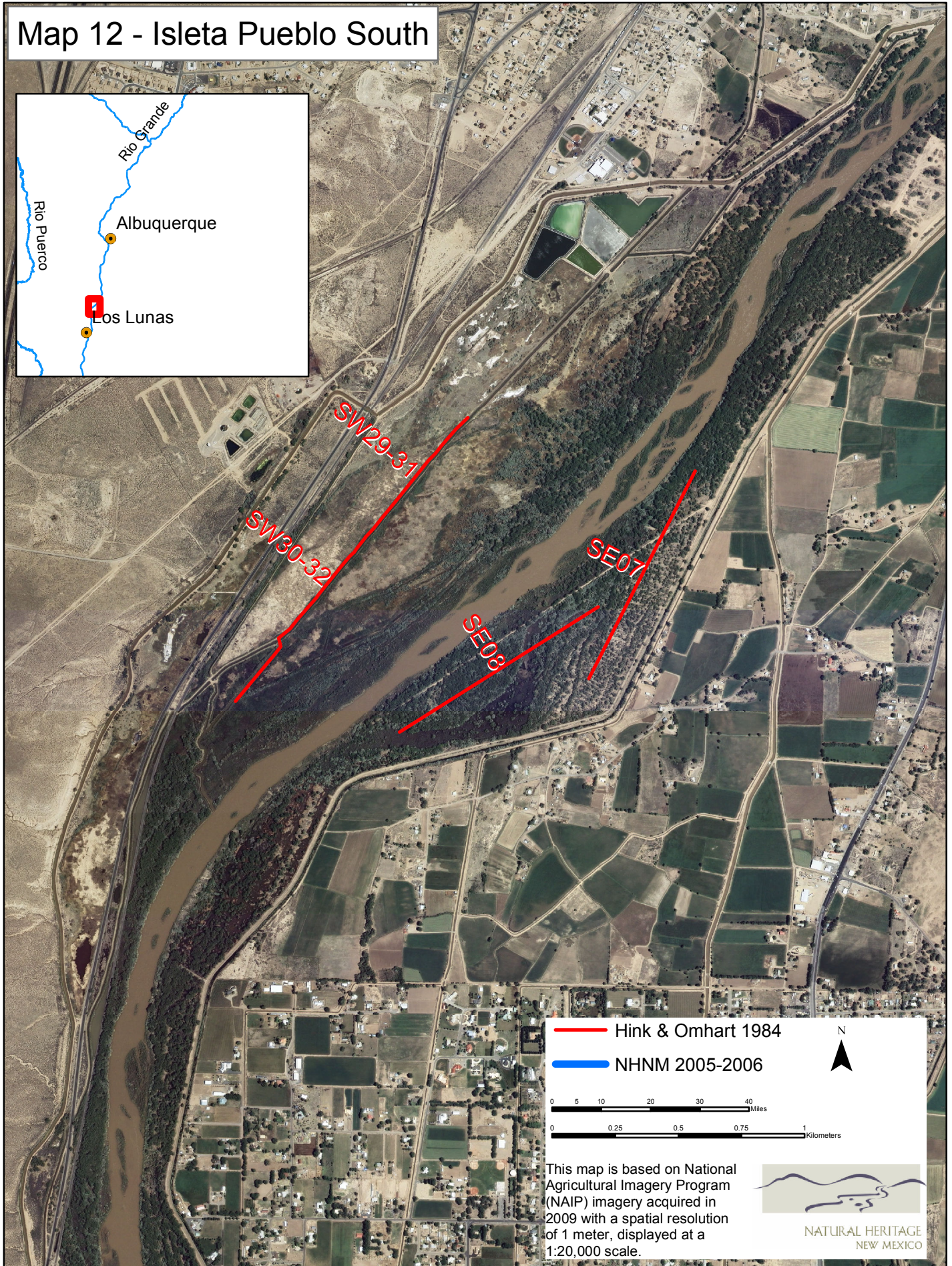
0 5 10 20 30 40 Miles
 0 0.25 0.5 0.75 1 Kilometers

N

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 12 - Isleta Pueblo South



— Hink & Omhart 1984
— NHHM 2005-2006

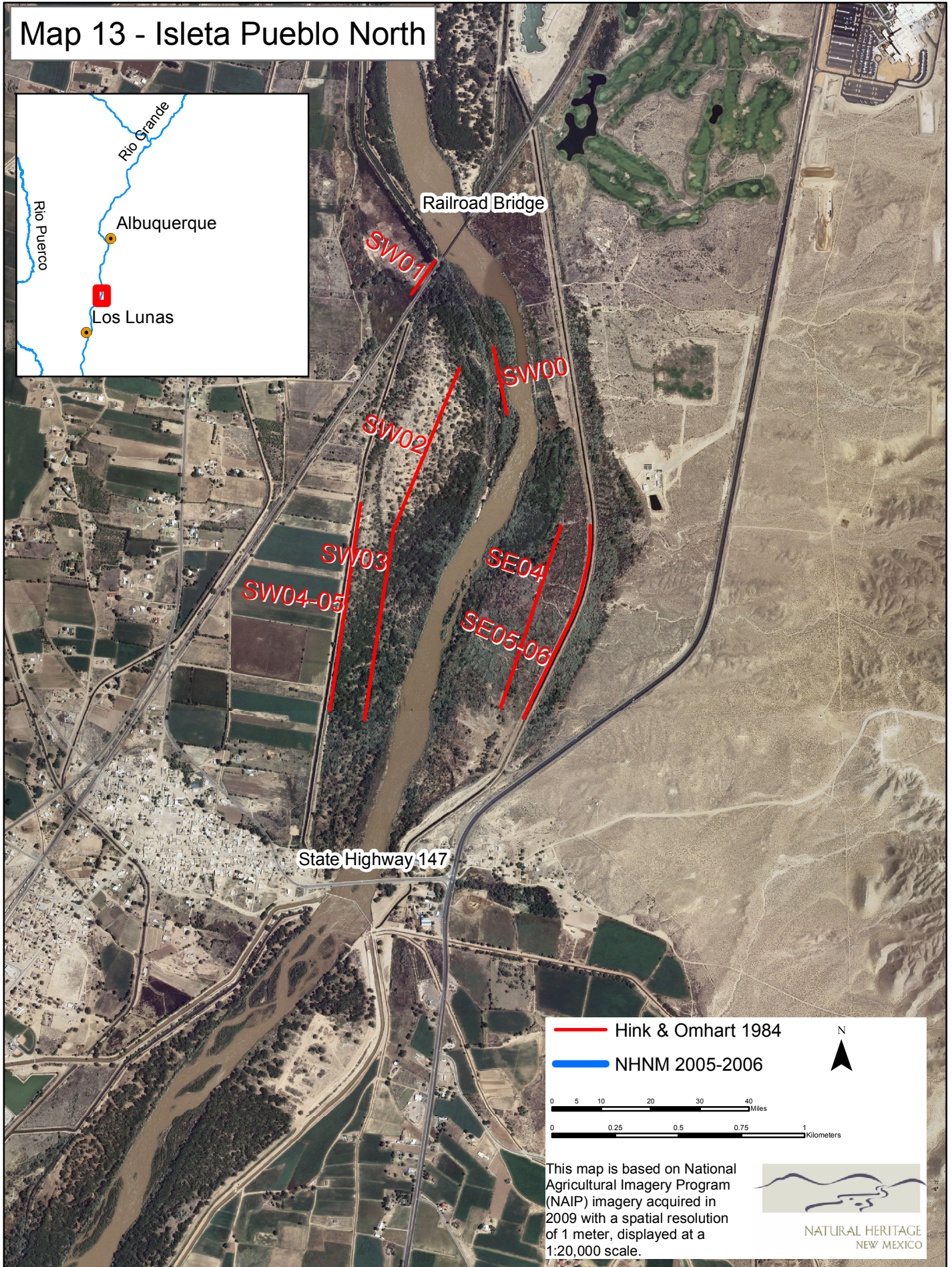
0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

N

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 13 - Isleta Pueblo North



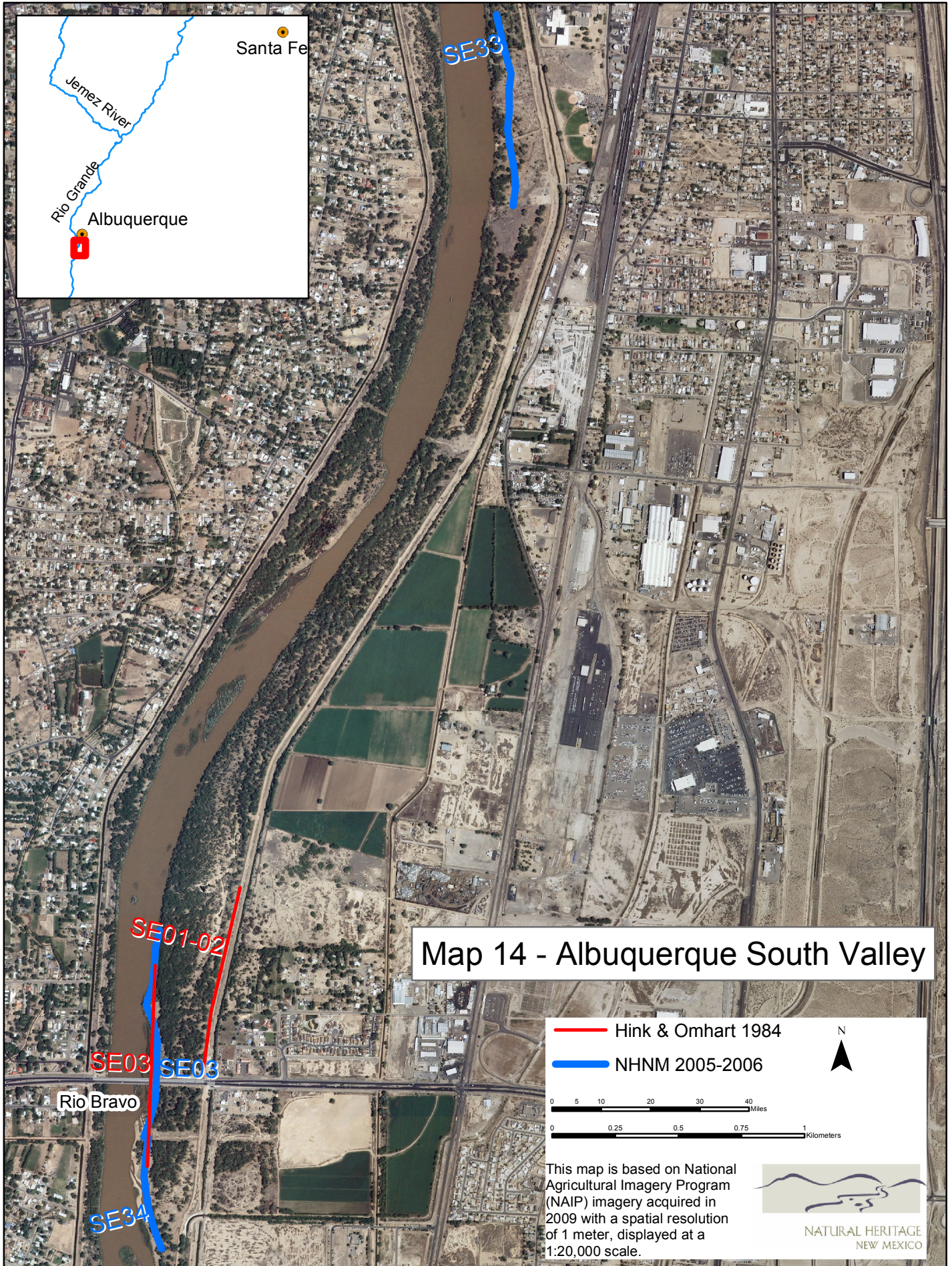
— Hink & Omhart 1984
— NHNM 2005-2006

0 5 10 20 30 40 Miles
0 0.25 0.5 0.75 1 Kilometers

N

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.





Map 14 - Albuquerque South Valley

— Hink & Omhart 1984
— NHNM 2005-2006

N

0 5 10 20 30 40 Miles

0 0.25 0.5 0.75 1 Kilometers

This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 15 - Albuquerque Downtown



— Hink & Omhart 1984
— NHNM 2005-2006

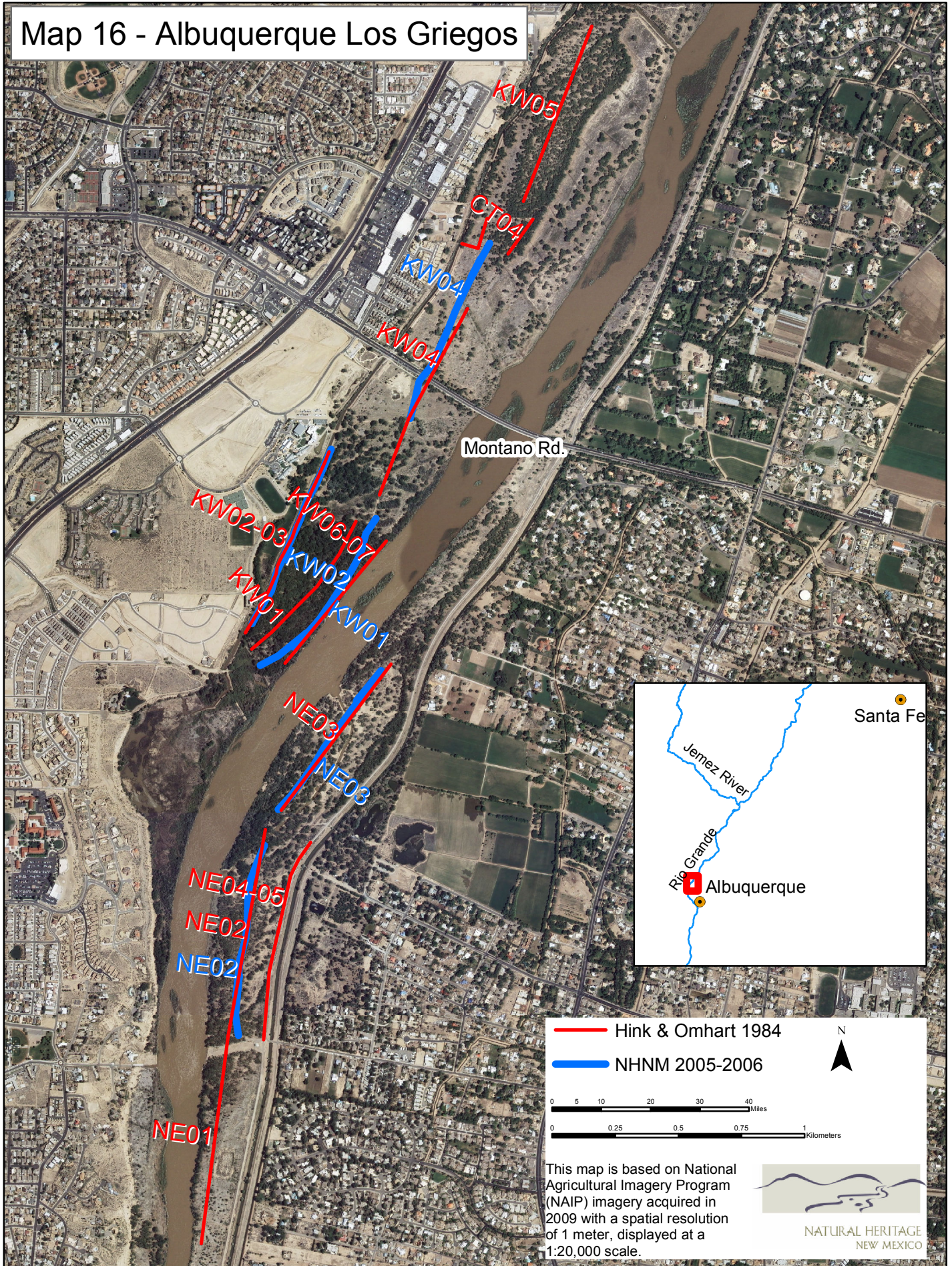
N

0 5 10 20 30 40 Miles
 0 0.25 0.5 0.75 1 Kilometers

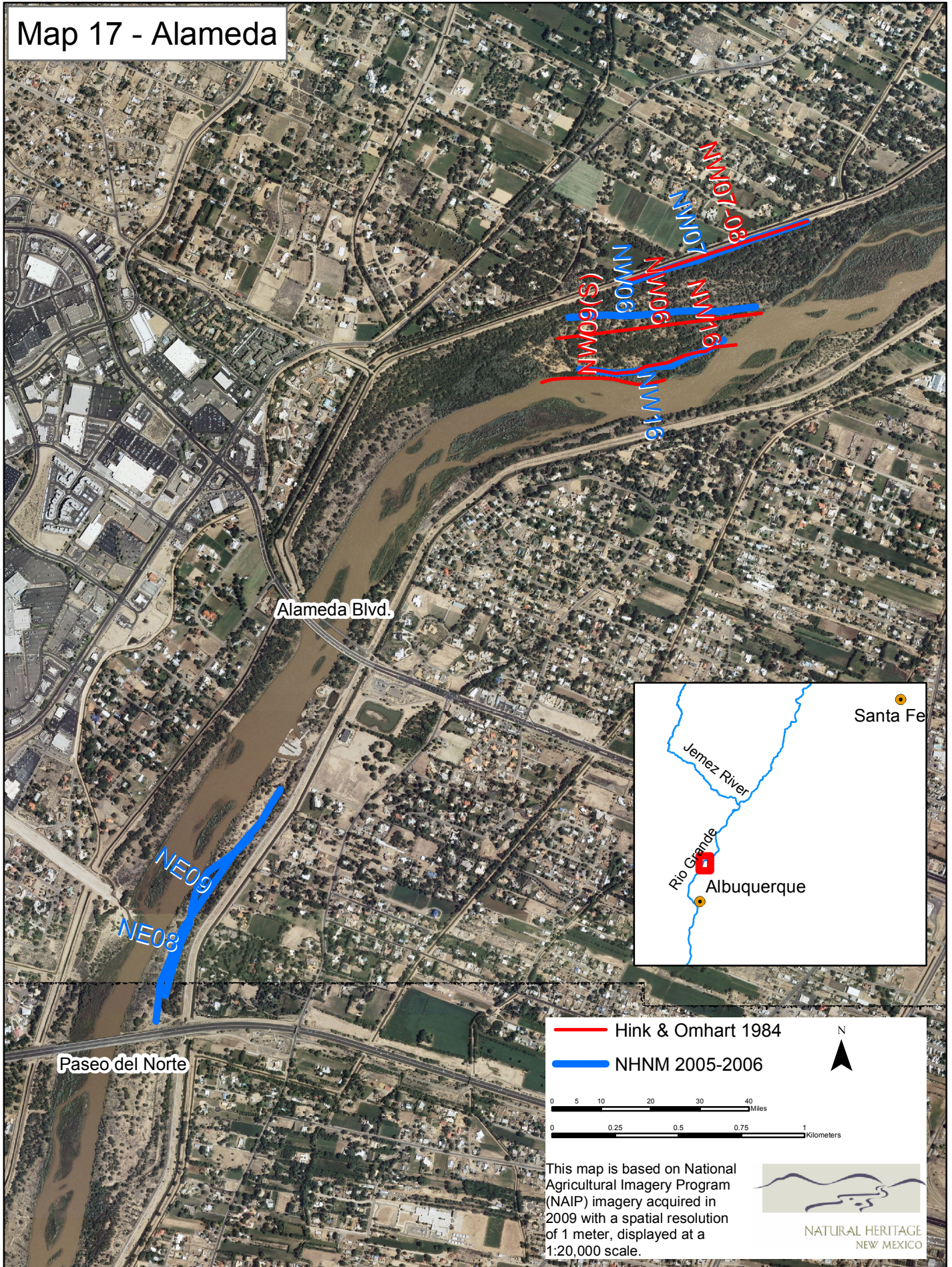
This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



Map 16 - Albuquerque Los Griegos



Map 17 - Alameda



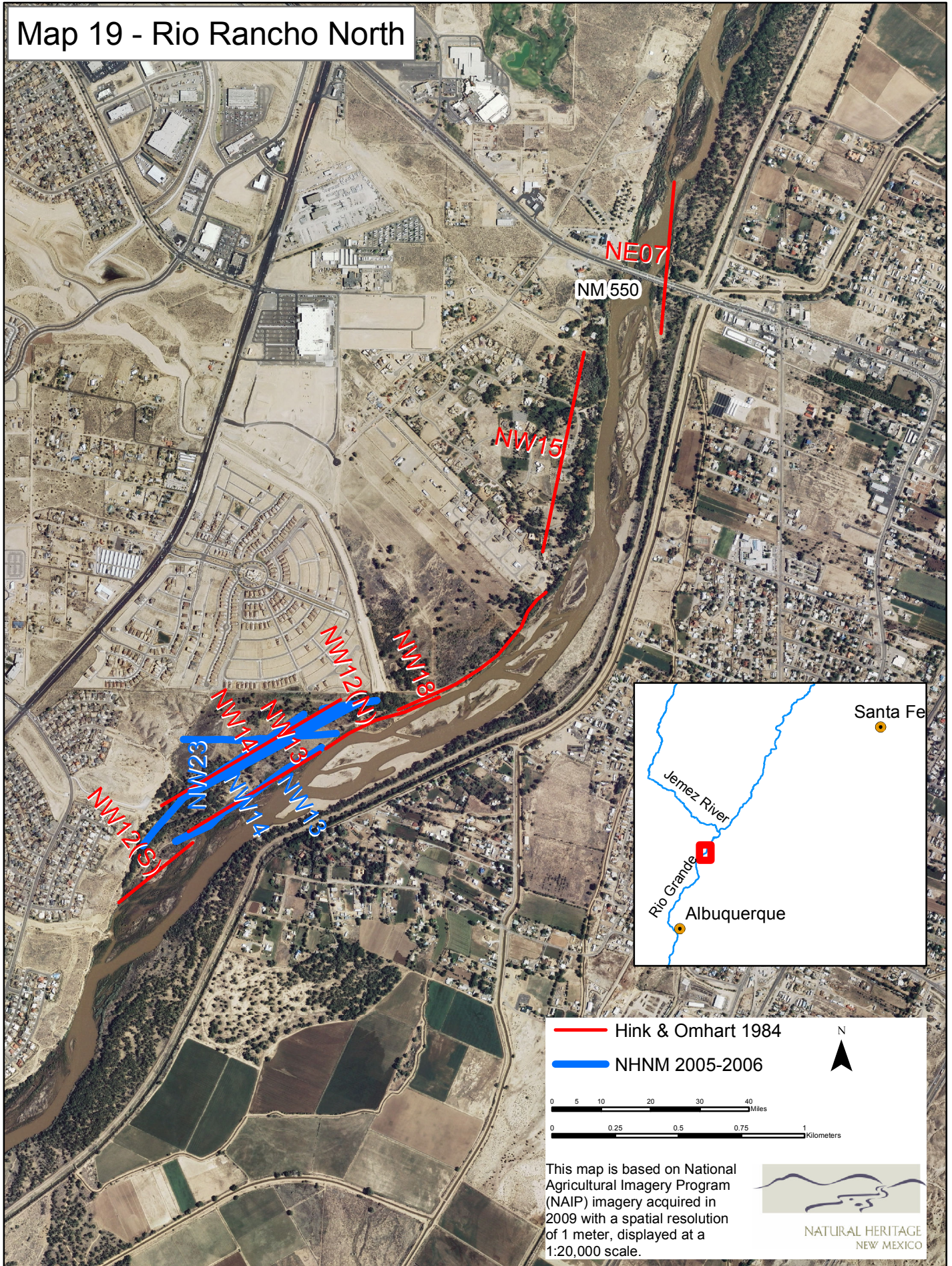
Map 18 - Corrales



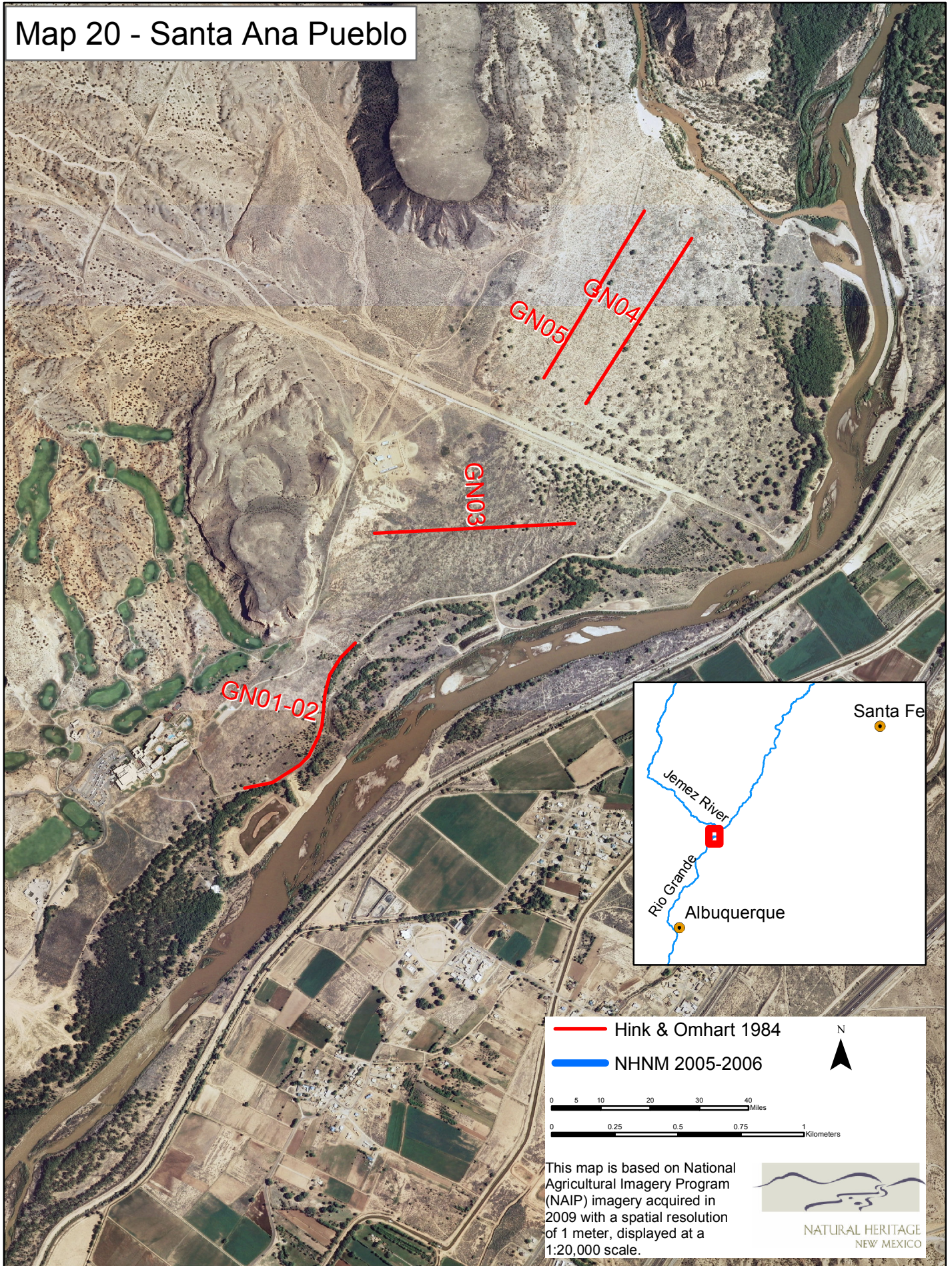
This map is based on National Agricultural Imagery Program (NAIP) imagery acquired in 2009 with a spatial resolution of 1 meter, displayed at a 1:20,000 scale.



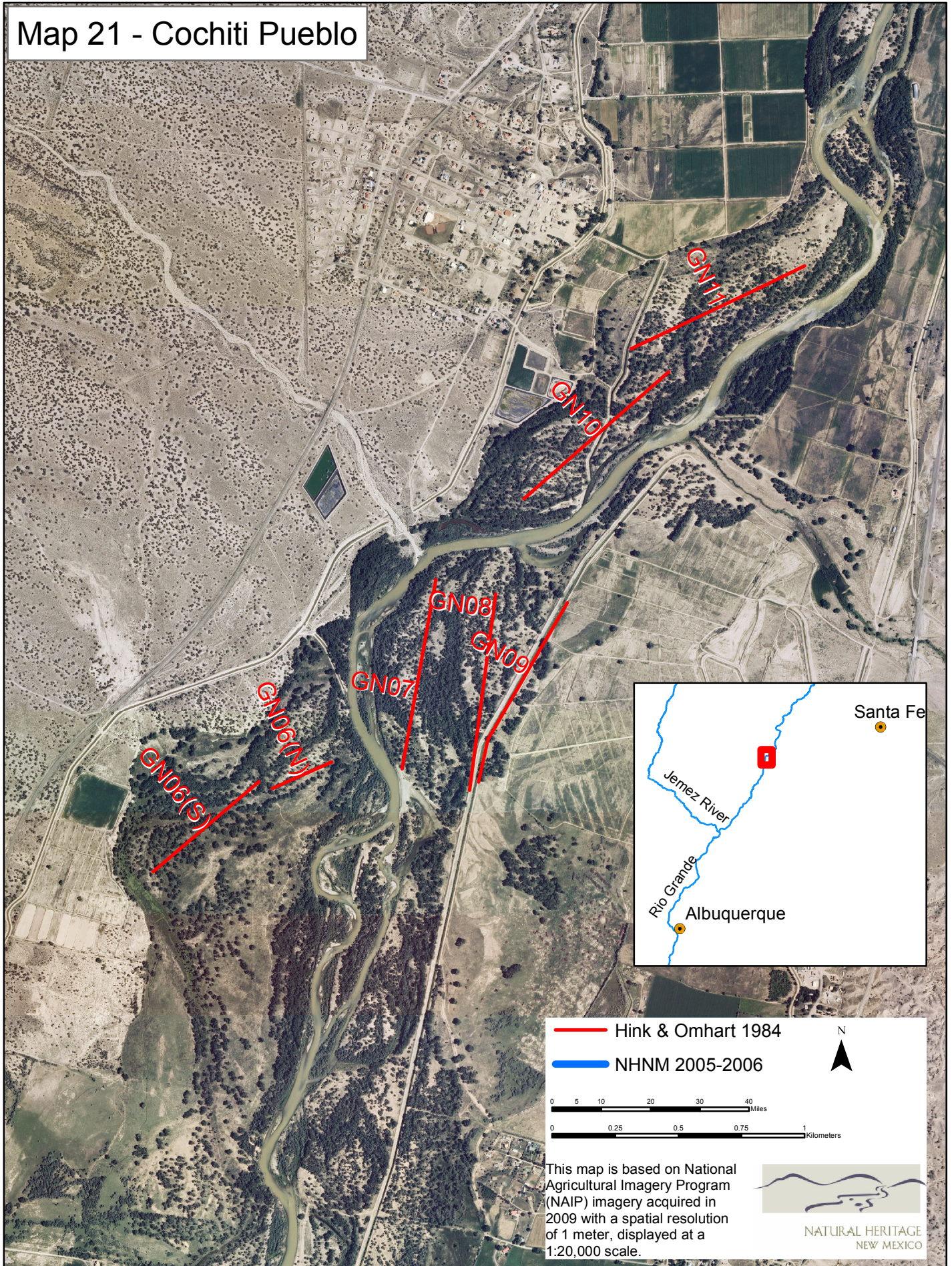
Map 19 - Rio Rancho North



Map 20 - Santa Ana Pueblo



Map 21 - Cochiti Pueblo



Map 22 - San Ildefonso Pueblo

